



The TRELLIS™ Real-Time Infrastructure Optimization Platform

User Guide

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Technical Support Site

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures. Visit <https://www.VertivCo.com/en-us/support/> for additional assistance.

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1 PRODUCT OVERVIEW

The *Trellis*™ Real-Time Infrastructure Optimization platform, version 5.0.4, is the total Data Center Infrastructure Management (DCIM) Solution that reduces the complexity and operating costs of a data center. Its intuitive design simplifies your tasks and makes running your data center manageable. By identifying, tracking and monitoring assets, as well as analyzing critical data, you can make better decisions to optimize your environment both today and when planning future changes.

The total *Trellis*™ platform solution minimizes inventory management and asset health management. It allows every member of your data center team to view the infrastructure as a whole or by individual assets and quickly access informative data.

With the *Trellis*™ Real-Time Infrastructure Optimization platform, you can perform the following operating tasks that are necessary to optimize your data center's efficiency:

- Reduce the total cost of ownership of data centers
- Proactively manage energy usage
- Predict infrastructure failures before they occur
- Optimize server and power chain headroom
- Communicate with and control equipment with different communication protocols and physical interfaces
- Automate policies and procedures to reduce operational costs
- Extend the useful life of existing data centers

1.1 Users/Tenants

Each *Trellis*™ platform supports multiple users/tenants. The *Trellis*™ Administrator role has the ability to create and manage users. The *Trellis*™ Administrator role can also create the Tenant Administrator role to help create and manage tenants.

For more information, see the following:

- [Administration of Your System and Users](#) on page 89
- [Tenants](#) on page 111

1.2 Platform Architecture

The *Trellis*™ platform architecture includes the platform services, optional modules, the powerful *Trellis*™ Intelligence Engine and Application Programming Interfaces (APIs) that allow you to build your system. These components gather and present a variety of types of data in a meaningful way. Together, they allow you to see what is happening in your data center, decide on a plan of action, resolve a problem and optimize performance.

1.2.1 TRELIS™ platform services

The platform services enable communication between hardware and software. They are located on the *Trellis*™ platform servers and run in the background. These intelligent services ensure that all platform components are accessible by all authorized parties and function within the suite. The platform services are listed in the following table.

Table 1.1 Available Platform Services

Authentication	Licensing
Authorization	Report Engine
Console Framework	Reporting
Dashboard	Scheduling
Email/SMS Services	Symbols Library
Event Engine	Trust Store
Import/Export	

1.2.2 TRELIS™ platform modules

The *Trellis*™ platform consists of the following modules that can be combined to create specialized infrastructure management solutions:

- The *Trellis*™ Inventory Manager module provides the ability to collect a detailed catalog of all inventory in your data center. With this module you can see where all devices are located and understand how much capacity (heat, space and power) is consumed or available at any point in the data center. This information is based on faceplate or derated values.
- The *Trellis*™ Site Manager module, with its separately installed *Trellis*™ Intelligence Engine, tracks and reports the health of facility-critical devices and provides information about power, cooling and environmental conditions, such as temperature and humidity. The Energy Insight feature in this module, provides greater visibility into energy consumption and uses PUE calculations to measure operating efficiencies within the data center.
- The *Trellis*™ Process Manager module provides organization, management and tracking processes. This module brings together your process details, task ownership and workflow status.
- The *Trellis*™ Power Systems Manager module adds a comprehensive view of the data center power system from the utility entrance to rack power distribution. This view helps managers and engineers cut energy costs and maximize capacity. When all of the modules are combined with the *Trellis*™ Power Systems Manager module, they provide the total data center management solution.
- The Project feature allows data center managers to plan, assign, execute and audit changes in the data center, faster and more intelligently. With this feature, you can view the location of devices over time.
- The *Trellis*™ Thermal Systems Manager module is used to reduce power costs and improve data center efficiency by monitoring and managing real-time thermal visualization in your data center. For optimal functionality of this module, the *Trellis*™ Site Manager module, with its Intelligence Engine, must also be installed.

1.2.3 TRELIS™ Intelligence Engine

With the *Trellis*™ Intelligence Engine, real-time communications are possible within the solution. The data collection engine is responsible for polling and collecting data from all the managed elements in a data center. The Intelligence Engine can be installed on Red Hat® Enterprise Linux® or Ubuntu operating systems on a standalone server or in a virtual environment.

The Intelligence Engine processes and aggregates data and then sends the data for storage and/or consumption by the platform. The transferred data is encrypted using the Single Socket Layer (SSL) protocol and is stored in the database. The raw data is consolidated, averaged and uploaded into the platform, and is used to present data and create trend graphs. If normal communication occurs between the engine and the platform, data is retained per the data retention policy; however, if communication is interrupted, the most recent seven days of data is stored locally and sent to the platform when communication is restored.

Two versions of the *Trellis*™ Intelligence Engine are available to choose from. One engine is provided with the *Trellis*™ Site Manager module and the other engine is provided when you order the Avocent® Universal Management Gateway appliance. An overview of their functionality is explained in the following sections. For more information about the Intelligence Engine, see [Data Collection Engine](#) on page 44. For more information about the appliance, see [Avocent® Universal Management Gateway Appliance](#) on page 4.

Avocent® Site Manager module's TRELLIS™ Intelligence Engine

Along with the previously mentioned functionality, the module's Intelligence Engine allows you to collect the following additional types of information:

- Parametric data points - Measurable values such as temperature, humidity, battery capacity and voltage
- Operational data points - Non-numeric information about the device operational state such as On/Off, Eco mode, Cooling and In Bypass
- Device status - Monitored device status (Normal, Not Responding, Critical, Warning, Info or Maintenance Mode) that is polled separately from the parametric and operational data points
- Events - Changes in operational state and device-generated alarms, or results from the thresholds set in the user interface



CAUTION: If the device does not support secure mode, the data transfer from endpoint devices is not secure.

1.2.4 TRELLIS™ platform RESTful APIs

The *Trellis*™ Real-time Infrastructure Optimization Platform RESTful APIs provide access to the resources and functionality of the *Trellis*™ software. With the ability to query containers and symbols, the APIs support full create, read, update and delete (CRUD) operations on devices and their connections.

Additional features include pagination through query results, localization of messages, projections to control the level of detail in the responses, sorting and predefined queries. The formats for the supported request and response messages are Java Script Object Notation (JSON) and Extensible Markup Language (XML) over a secure HTTP connection.

Detailed examples of the HTTP requests, information about headers, query parameters and schema for resource requests and responses, are explained in the API help. All the API information can be found in the API Help Resources section of the *Trellis*™ Platform RESTful API documentation.

The *Trellis*™ Real-time Infrastructure Optimization Platform RESTful API documentation can be accessed using the following link when you replace <TrellisSystem> with the fully-qualified domain name of the front machine:
<https://<TrellisSystem>/api/help/trellisrestfulapi.html>.

1.3 Avocent® Universal Management Gateway Appliance

The *Trellis*™ platform can be used with the Avocent® Universal Management Gateway appliance. This appliance has its own *Trellis*™ Intelligence Engine that provides real-time communications. This 1U rack appliance serves as a single point of access and administration of target devices. It supports secure remote and out-of-band management of IT assets from any location worldwide.

Depending on the model, the Avocent® Universal Management Gateway appliance supports keyboard, video and mouse (KVM), serial and service processor (SP) capabilities, thereby consolidating key functionality into one package. These features provide the ability to remotely perform server management tasks, including power control and console access on managed target devices. Multiple administrators can be logged into an appliance simultaneously and use the web user interface or command line interface (CLI) utility.

For additional information about the appliance, see the Avocent® Universal Management Gateway Appliance Installer/User Guide.

NOTE: The physical appliance should be installed with a secure connection to the platform server before the appliance can be enrolled, added to the catalog and placed in inventory.

1.4 Bulk Data Processing Tool

The Bulk Data Processing tool is an application that allows you to export and import data in the *Trellis*™ platform database. You can create, update and delete large quantities of data using this tool. User-defined properties for containers, device categories, connections and ports, can also be bulk loaded. For more information, see [Data Management](#) on page 277.

NOTE: Java version 8 or later is required to use the Bulk Data Processing tool.

1.5 Avocent® DSView™ Management Software Access

The DSView™ Session feature allows you to manage devices in the DSView™ software from the *Trellis*™ platform. Access to DSView software is based on user permissions. All mouse controls and keyboard actions work as they do in the DSView software.

1.6 Common Access Card (CAC)

The CAC feature is supported in the *Trellis*™ platform software. This feature requires the platform to have the appropriate Public Key Infrastructure (PKI) certification loaded via the Certificate Replacement procedure. See [CAC Certification](#) on page 327 for instructions to activate and deactivate the CAC feature on the server side.

1.7 Mobile Access

The *Trellis*™ Mobile Suite is an optional application that allows you to quickly access and manage the *Trellis*™ platform data from your mobile device. This ensures that you can always keep your environment up to date. Either online or offline, you can add, identify, audit, move and delete devices, and you can edit power connections from your mobile interface without returning to your desk. With a wireless network connection from the *Trellis*™ Mobile Suite app to the *Trellis*™ Real-Time Infrastructure Optimization Platform database, you can also view a floor plan in three-dimensional (3D) view, duplicate devices, check capacities and respond to alarm notifications.

To learn more about the *Trellis*™ Mobile Suite application, ask your *Trellis*™ platform representative.

1.8 Installation Overview

Professional Services installs and assists with the initial setup of your environment in the *Trellis*™ platform software. In preparation for the installation, be sure to read The *Trellis*™ Real-Time Infrastructure Optimization Platform Pre-Installation Guide. In addition, you must complete the list of prerequisites provided by Professional Services before the installation can be performed.

Whereas installation is not possible by our customers, other operations, such as upgrades, backup and restore, shutdown, restart and maintenance procedures, can be performed by our customers. See the www.VertivCo.com web site for the TRELIS™ Real-Time Infrastructure Optimization Platform Administrator's Guide, as applicable, for Microsoft® Windows® or Red Hat® Enterprise Linux®.

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2 USER INTERFACE (UI) OVERVIEW

The HTML5 interface offers a sleek look and feel, better performance and an intuitive user experience. All the features and icons you need for any possible task are displayed in each window, giving you more control throughout the product.

The user interface streamlines the management of your environment by providing the following features and more, which are designed to get you to your destination in the product as quickly as possible, reduce time and effort and maximize your efficiency:

- A single application to manage your facilities and/or data center
- Process planning for equipment installation and removal
- Enterprise-wide project control
- Multi-tenant functionality
- Real-time device monitoring and alarm notifications
- Data center mapping
- Textual and graphical-based views of your inventory
- Device search by name
- Sort table column values down to the rack level
- Direct access to notifications
- Undock one or more opened windows and work in a different window
- Intuitive create, read, update and delete (CRUD) procedures
- Display devices with their upstream and downstream devices in the Connections Topology View
- Filter data and power connections in the inventory list
- View all available one-line diagrams from a power landing window
- View the states of devices across the main menus for frequently used options (2D, graphical connections for 2D and reports)
- Navigate through the *Trellis*™ platform UI without losing context of your area of interest
- Print any windows
- Map and display virtual machines (VMs)

NOTE: All views and reports have the virtual hosts and guests associated with the physical device they reside on during the last sync. This feature requires connecting to VMware vCenter version 5.5 or 6.

2.1 Browser Requirements and Recommendations

User interface browsers:

- Google Chrome™ version 40.0 to 63.0 and higher
- Microsoft Windows 10 Edge

Symbol portal browsers:

- Google Chrome™ version 40.0 to 63.0 and higher

3D feature browsers:

- Google Chrome™

General recommendations for the supported browsers:

- The minimum screen resolution is 1280 x 1024.
- If on-screen data is not updating correctly, clear the browser cache.
- If security certificate warnings are displayed while using an HTTPS connection to access the *Trellis™* platform, ignore the warning and proceed to access the site.
- Disable pop-up blockers.
- If accessing graphical pages, use Adobe Flash Player version 12.0 or higher.
- When importing or exporting data using Internet Explorer, select *Tools - Internet Options - Advanced*, then under the HTTP 1.1 settings section, deselect *Use HTTP 1.1*.

2.2 Getting Started

Please read this entire guide before creating and managing your environment in the software. This section provides an overview of the UI and globally used procedures. Additional procedures are provided in the following chapters of this guide.

After receiving your username and password, you can log into the UI. The login window is used to enter your credentials.

To log into the *Trellis™* platform UI:

1. Open a web browser and enter the *Trellis™* platform **https://<fully qualified domain name of the front machine>/trellis** console URL.
2. Enter your username and password and then click *LOGIN*.

NOTE: You will be prompted to reset your password the first time you log in. The password requirements are 5-128 alphanumeric characters, at least one uppercase letter, at least one lowercase letter and at least one number.

To reset your password:

After opening a web browser to the *Trellis™* platform console URL, click *Forgot My Password* and follow the displayed instructions.

2.3 Using the User Interface

The software has an intuitive UI with smart functionality that simplifies device and user management. Each user interface window includes the pivot bar, context menu and content area. Navigation is performed using basic point-and-click or click-and-drag actions.

The pivot bar is used to select the type of information to view. Selecting a pivot bar icon also displays the context menu which allows you to access more specific functionality. After you select an icon in the pivot bar and a context item, the content area, shown as the *Devices* and *Space_2* panels in the following figure, displays the enterprise containers and devices in the *Devices* panel and the contents of the selected container in the right panel. Information fields or dialogs are also displayed with the applicable icons and buttons.

Active events and alarms are indicated by the icons displayed in the upper right corner. The number beside the icon indicates how many notifications are active and waiting for a response. The list of current alarms can be displayed in a drop-down window from each alarm type icon. These icons are not displayed when there are no active events or alarms.

Beside the Alarm/Event icons is the avatar drop-down menu. The menu allows you to access the software, installation and plug-in information, select user preferences, provide feedback and sign out.

Each content panel has a set of icons in the upper right corner of the panel. The content panels can be filtered and customized to display only selected fields. You can collapse or expand the content or you can pop windows out from the software for continuous viewing while you work in other windows. There are also horizontal (left and right) and vertical (up and down) scrollbars to view entire lists and columns.

The total number of assets listed and the window numbers are displayed in the lower window, as well as arrows that provide direct access to the previous, next or a specific window. These components are explained in the following figure and tables.

Figure 2.1 Portfolio Window

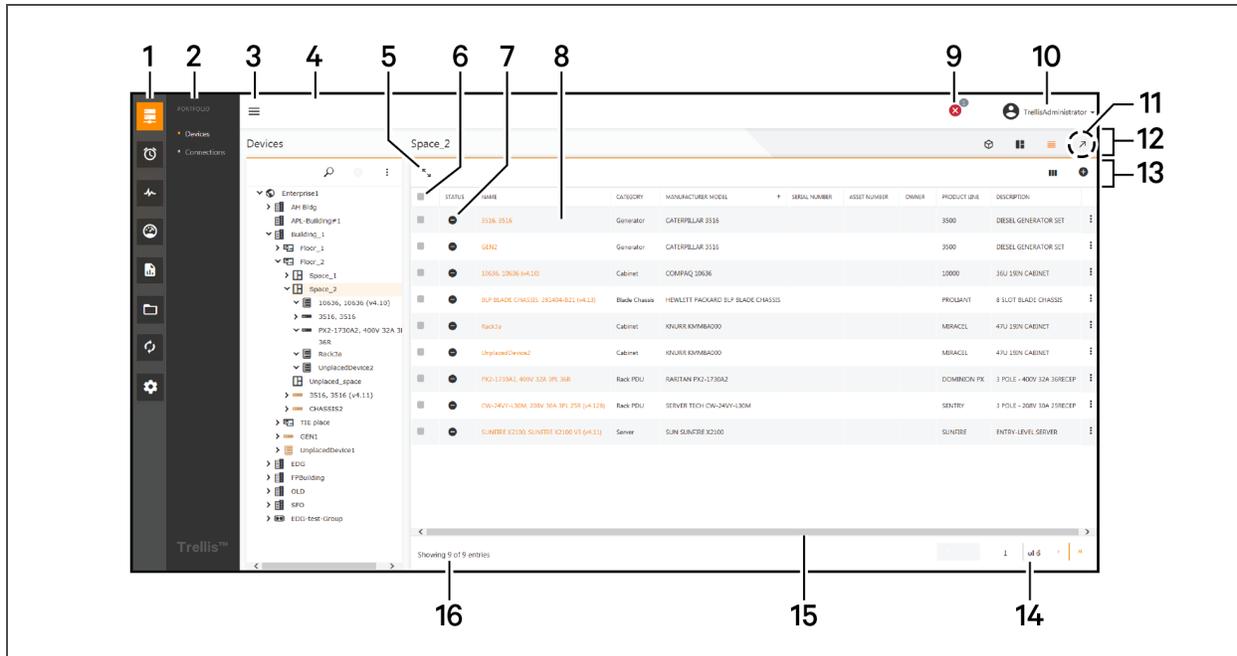


Table 2.1 Devices Panel Descriptions

ITEM	NAME	DESCRIPTION
1	Pivot bar icons	Allow one-click navigation to all of the major functionality of the <i>Trellis</i> ™ platform application. See the following table for the descriptions of the pivot bar functionality.
2	Context menu	Displays the menu of windows that are accessible from the current view.
3	Pop-out icon	Expands/collapses the Devices panel and content panels to/from full screen.
4	Devices Panel	Displays the inventory list.
5	Expand/Collapse icon	Expands/collapses the content panel to fill the available space; returns it to the original space.
6	Checkbox column	Provided to select each device for configuration. The checkbox in the header selects all the checkboxes.
7	Status Symbols	Indicates the severity of events/alarms.
8	Content panel	Displays the content for the item selected in the context menu.
9	Alarm/Event status icon	Indicates the number of active alarms in your data center. The number indicates a sum of alarms that are currently active and require a response. This icon opens the Active Alarms window.
10	Avatar drop-down menu	System and user profile information such as the help documentation, software version and user information.
11	Pop-out icon	Provides the ability to undock and view one or more windows while working in other windows in the user interface.
12	View icons	Displays the 3D, Graphical Edit or Device Table icons to change the view. Additional views are displayed, depending on the module.
13	Header Icons	Names for the information provided in each column.
14	Entry and window counts	Displays the number of entries in the lower left corner and the windows are numbered in the lower right corner of the window.
15	Scrollbar	Vertical scrollbars move up and down to view all rows and a horizontal scrollbars move left or right to view all columns.
16	Object counter	A summary count of items in the content panel.

Table 2.2 Pivot Bar Icon Descriptions

ICON	NAME	DESCRIPTION
	Portfolio	Accesses the Devices, Connections and Thermal context menu windows; used to add, arrange, modify, move and delete your assets in the software.
	Alarms	Accesses the Alarm Settings, Active Alarms and Alarms History windows. These windows allow you to configure alarms, view and manage event and alarms for the monitored devices in the data center and review the history of the alarms for trends.
	Monitoring	Accesses the Configuration, Events, Data Collection Engine and SNMP Trap Configuration windows.
	Dashboard	Graphs and charts that display PUE, Electrical Energy Consumption, Capacity Trend, Building Power Systems and the Workload/Performance per process and participant.
	Reports	Accesses the functions of the Reports window, used to create, run, edit, copy, paste, delete and filter reports.
	Projects	Creates, edits and deletes projects.
	Process	Accesses the <i>Trellis</i> ™ Process Manager module functionality which allows you to organize and track your data center by requesting details for processing tasks such as adding, moving, decommissioning and renaming equipment.
	Administration	Accesses the system window for licensing, user roles, permissions, passwords and user notifications. (The User Profile configuration is accessed using the avatar in the upper right corner.)

Table 2.3 Icon Descriptions

ICON	NAME	DESCRIPTION
	3D	Displays the selected object in 3D view and accesses all the 3D view capabilities of the selected object (floor, space, zone, rack, chassis, cabinet or device).
	Active	Represents a device's alarm state as active.
	Add	<p>In the Devices panel, adds a new object to the selected container. This icon adds a new device from the catalog or adds it from your existing inventory where it will move it to the current device panel. A drop-down list of containers such as buildings, floors, groups and spaces can be added. The options depend on the object selected in the Devices panel.</p> <p>In the content panel, this icon opens the applicable panels for the selected object.</p> <p>In the Properties panel, this icon adds specific properties.</p>
	Actions	In the Devices panel, provides access to the additional actions available for a device or container.
	Acknowledged	Acknowledges the alarm.
	Alarms	Displays the alarm status of the selected device on the floor image.
	Align Bottom	Located in the Alignment drop-down list; aligns selected devices to the lowest device.
	Align Center	Located in the Alignment drop-down list; aligns selected devices to the center device.
	Align Horizontal	Located in the Alignment drop-down list; aligns selected devices horizontally.
	Align Left	Located in the Alignment drop-down list; aligns selected devices to the leftmost device.

Table 2.3 Icon Descriptions (continued)

ICON	NAME	DESCRIPTION
	Alignment	This icon is enabled when one or more devices are selected. The options are: Align Left, Align Right, Align Top, Align Bottom, Align Center, Align Middle, Align Horizontal and Align Vertical.
	Align Middle	Located in the Alignment drop-down list; aligns selected devices to the middle device.
	Align Right	Located in the Alignment drop-down list; aligns selected devices to the rightmost device.
	Align Top	Located in the Alignment drop-down list; aligns selected devices to the highest device.
	Align Vertical	Located in the Alignment drop-down list; aligns selected devices vertically.
	Assign Tenant	Assigns the alarm to another person.
	Arrange	
	Automation	Opens the Automation Settings window to configure the alarm settings; accessible from the content header icon or the vertical ellipses icon.
	Backup/Resets defaults	Opens a window to confirm backup of the Avocent Universal Management Gateway appliance. Resets the settings to defaults. Resets the alarm assignments to the default settings.
	Building Settings	Container that is added to the enterprise; contains floors, spaces, zones and devices. In the PUE panel, you can click this icon to view the PUE graph and devices of another building. You can select a new building and update the PUE target and/or thresholds.
	Bulk Tool Download	Downloads the Bulk Data Processing tool.

Table 2.3 Icon Descriptions (continued)

ICON	NAME	DESCRIPTION
	Checkbox	Used to select a specific entity such as an alarm, group, notification, rule, template; the header checkbox is used to select all alarms.
	Clear	Clears the alarm.
	Clear Search	Clears the results and returns to the original Devices panel.
	Colorization	Displays a colorized view of specific capacity settings.
	Columns	Used to show or hide specific columns.
	Connections	Opens the view of a subset of the Devices panel in order to view and manage connections.
	Connector	Shown on the Connections panel.
	Copy	Used to copy devices and reports.
	Critical	Highest severity for alarms.
	Date	Used to select a start date, time and one of the following intervals: 15 Minutes, 1 Hour, 1 Day or 1 Month.
	Delete	Removes the selected object and any contents; does not delete the object from your inventory list. The object is disabled until the object is pasted to a new location. If pasting an object in the same location as an existing object, a conflict is triggered and the device being pasted is placed in Unplaced Devices in the new location or as the parent of the new location.

Table 2.3 Icon Descriptions (continued)

ICON	NAME	DESCRIPTION
		<p>Used to delete the selected object and its contained objects. A caution is displayed to warn you that all contents will also be deleted.</p> <p>Ends all active sessions for the user.</p> <p>You need to select a connection first to enable the icon, then click the icon to remove the connection. This only removes the connection and keeps the device in the view.</p>
	Details	Accesses the configuration panels for the selected device/object; accessible from the content header icon or the vertical ellipses icon.
	Device	Equipment that is added to a floor, space or zone; can contain other devices or ports.
	Device Table	Device Table icon, which is the Portfolio default view; opens the Devices and contents panels; displays all the containers and devices found within the selected object; used to add objects and manage their locations; also used to search for, edit and delete assets.
	Device Timeline	Depicts a rack as it appears in the current state, as well as all future rack versions, based on any upcoming tasks that impact the rack. The device timeline feature is enabled in Graphical Edit and Elevation view.
	Drawing Space/Zone	Used to draw a rectangle space, custom space, rectangle zone or custom zone.
	Edit	<p>Activates the fields to be edited; as you begin entering information, some fields auto-complete your entry with options.</p> <p>With rights to edit, this icon displays editing options for a selected container such as changing a name or deleting a container. Deleting the container deletes all objects in the container.</p> <p>Used to modify placed inventory.</p>
	End Session	<p>Ends all the active sessions for the selected user.</p> <p>Stops monitoring.</p>
	Enroll	
	Enterprise	Top level of the inventory; contains buildings, floors, spaces, zones and devices.

Table 2.3 Icon Descriptions (continued)

ICON	NAME	DESCRIPTION
	Expand Level	In the Topology window, this displays additional levels in a device's topology.
	Expand View	Expands the content to fill the screen.
	Export Bulk Data Processing File	Exports the Bulk Data Processing file.
	Export Floor	In 3D view, allows you to export the floor image; the camera icon saves the image in PDF format and the plan icon creates a printable file.
	Filter	<p>Allows you to refine the device or port information you want to show or hide.</p> <p>In Graphical View, you can filter specific levels, such as:</p> <ul style="list-style-type: none"> • Ceiling: Show or hide devices placed on the ceiling. • Drop Ceiling: Show or hide devices placed on the drop ceiling. • Raised Floor: Show or hide devices placed on the raised floor. • Floor: Show or hide devices placed on the floor. <p>In the Corrections window, you can filter Power Openings, Data Openings, Locked Openings, Connected Openings, Dry Contact Openings and Service Processors' port options.</p> <p>In the Topology window, you can filter data or power connections.</p>
	Floor	Container that is added to a building; contains spaces, zones and devices.
	Graphical Edit	<p>Opens the selected object in 2D view, allows you to edit the view and access all the Graphical Edit view capabilities for the object, such as placing the selected object.</p> <p>For a floor, space and zone, the selected object is presented in a top-down view. For a rack, chassis, cabinet or other devices, the selected object is presented in Elevation view to show a front, back or side view. This view can also be used to verify consumption and capacity for space, power and cooling.</p>
	Group	Indicates a group.

Table 2.3 Icon Descriptions (continued)

ICON	NAME	DESCRIPTION
	Hide/Show Devices	Toggles to hide or show the Devices panel. The Hide icon (gray) removes the Devices panel to allow more room for the content panel. The Show icon displays the Devices panel.
	Information	Indicates a change; provides information about an alarm.
	Input Plug	Represents a device receptacle.
	Label	Displays text labels for the graphical views.
	Legend	Shows or hides the legend for certain windows where it might be useful to hide the legend.
	Levels	Displays the levels (Ceiling, Drop Ceiling, Raised Floor, Floor and Space Grid) for placing a device.
	Levels Options	Selects/deselects the device placement options: Ceiling, Drop Ceiling, Raised Floor, Floor and Space Grid.
	List All Reports	Lists all reports for filtering purposes.
	Maintenance	Toggles the device in and out of Maintenance Mode. The wrench icon indicates the device is in maintenance mode.
	Metric	Displays the Metrics dashboard.
	Normal Status	Device is operating normally.
	Not Communicating	Devices are not communicating with the <i>Trellis</i> ™ platform software.

Table 2.3 Icon Descriptions (continued)

ICON	NAME	DESCRIPTION
	One-Line Diagram	Displays the one-line diagram view.
	Outlet Receptacle	Outlet for a connection.
	Paste	Used to paste copied devices and reports.
	Pin	Pins are bookmarks to Navigation History.
	PDU Edit View and Branch Breaker View	Opens the PDU and Branch Breaker assignment panels.
	Pop-out	Provides the ability to undock and view one or more windows while working in other windows in the user interface.
	Power Capacity	Indicates the power capacity.
	Print	In the Active Alarms window, this icon is used to print one or all data. In Topology View, this icon produces a PNG image of the current topology to print in any size.
	Print	On the PUE Dashboard, this icon prints information that is in the cloud.
	Add PUE	Opens the Add PUE window for configuration; accessible from the content header icon or the vertical ellipses icon.
	Subtract PUE	Opens the Subtract PUE window for configuration; accessible from the content header icon or the vertical ellipses icon.
	Remove PUE	Opens the Remove PUE window for configuration; accessible from the content header icon or the vertical ellipses icon.

Table 2.3 Icon Descriptions (continued)

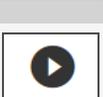
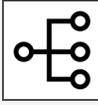
ICON	NAME	DESCRIPTION
	Rack/Space Capacity	Indicates the rack device is placed; also indicates the space capacity.
	Reduce Level	In the Topology window, this reduces the number of device levels in a device's topology.
	Reload	Refreshes the received data.
	Remove Selection	Removes an existing connection.
	Rename	Displays the fields to redefine a name.
	Replace	Opens the Replace UMG window to select a replacement UMG.
	Restart	Opens the Restart UMG window to confirm you want to stop and start monitoring the selected device.
	Rotate Left	Rotates the selected object 90 degrees to the left; located on the Device Placement window.
	Rotate Right	Rotates the selected object 90 degrees to the right; located on the Device Placement window.
	Run Report	Creates a report.
	Save	Saves the current task or item.
	Search	In the Devices and Connections windows, the search function provides a way to find containers, devices and device images in your enterprise without losing context of your work. The autocomplete feature lists options to narrow your search. Upon selecting the context item, the system offers appropriate filters for that variable, and preliminary results for you to select from.

Table 2.3 Icon Descriptions (continued)

ICON	NAME	DESCRIPTION
		Catalog Search, Inventory Search and Global or advanced criteria search options allow you to add additional information such as manufacturer name, model, category, description or product line and more to locate a device.
	Select	Allows you to select objects in a graphical view. In Graphical Edit view, this icon selects the type of cursor action. The options are: Selection (Default) - Used to select or move objects on the canvas. Zoom Window - Used to zoom into specific areas of the canvas. Pan - Ability to move the entire canvas to area desired.
	Set as Home Page	Sets the current custom dashboard as the home page.
	Settings	Opens the Monitoring Control window to configure monitoring for each device; accessible from the content header icon or the vertical ellipses icon. In the Connections window, this displays the auto connect front or rear options and the power options in Amps, kW or kVA value options. In the Topology window, this displays the following layout format options: Down, Up, Left, Right or Center.
	Space	Container that is added to a floor; contains zones and devices.
	Start Date	Date to begin the task.
	Start Date/Time	Date and time to start the task.
	Status Not Available Remove item	Indicates the object is not being monitored. In the Properties panel, this icon removes specific properties.
	Stop	Opens the Confirmation window to confirm if you want to stop monitoring a device; accessible from the content header or the vertical ellipses icon. This icon is also used as the End Session icon.
	Sync	Opens the Global Data Synchronization window to synchronize the platform data. See Synchronizing global data files on page 173.

Table 2.3 Icon Descriptions (continued)

ICON	NAME	DESCRIPTION
	Assign Tenant	A tenant can be assigned to a container (Building, floor, space and zone) or a device.
	Thermal	Displays thermal information.
	Topology	Displays or hides the topology of the selected device with its upstream and downstream devices (and device port connection dependencies).
	Trending	Opens a capacity window with a graphic to show the trending capacity for the selected device.
	Unenroll	Opens the Un-Enroll UMG window to confirm the un-enroll operation.
	Unplaced Devices	Displays an area designated for unplaced devices with all the available unplaced devices for the selected container. The counter on the icon displays the number of unplaced devices available for the selected counter.
	Up	Allows you to go up or back to a higher level of the inventory hierarchy. Used to expand the current inventory list. For example, if you have a rack as the root node with its children, clicking the Up icon displays the rack's parent zone is the new root node and its children are expanded under it.
	Upgrade	Initiates an upgrade.
	Validate	Runs a validation check.
	Vertical Ellipses	When a container/device is selected in the Devices panel, this icon appears on the right end of each device's row in the content panel. This icon provides a drop-down menu of the functions that can be performed on the selected device.
	Warning	Second highest severity for alarms.

2.3.1 Configuring your user profile

As a user, you can manage your own password, email settings, hours you are available to receive notifications, unit of measure and set up the color theme and graphical colorization for the user interface.

NOTE: The servers for email/SMS messaging must also be configured in order to receive notifications. For more information, see [Configuring email and SMS notification servers](#) on page 101.

NOTE: The rights and permissions of users are managed by an administrator from the User Management window. See [User Management](#) on page 118.

Table 2.4 Profile Window Descriptions

NAME	DESCRIPTION
Change Password	Fields to enter a new password and confirm the password
Email Settings	Field to enter your email address
Notification Schedule	Toggles to select the beginning and end dates and times to receive email or SMS messages
Theme	Light and Orange selections to personalize your UI
Unit of Measure	Imperial or Metric
Graphical Colorization	Color and product association fields

To access the Profile window to manage personal settings:

1. In the upper right corner of the window, click the avatar drop-down arrow and select *Profile*.
2. For each panel, complete the fields and click *SAVE*.

To change your password:

1. In the Change Password panel, enter and repeat your password.
2. Click *SAVE*.

To configure your email settings:

1. In the Email Settings panel, click the Edit icon.
2. Enter your email address and click *SAVE*.

NOTE: Enter the Add (+) character before the SMS number.

To configure your notification profile:

1. In the Notification Schedule panel, click the Edit icon.
2. Click the day, select the hours, select the dates to not receive notifications and click *SAVE*.

To configure the unit of measure:

1. Click the Administration icon and select *System Settings*.
2. In the Unit Of Measure panel, click the Edit icon.
3. Click the Imperial or Metric radio button and click *SAVE*.

To configure the UI theme:

1. In the Theme panel, click the Edit icon.
2. Click the Light or Orange radio button and click *SAVE*.

To add graphical colorization to devices on a floor:

1. In the Graphical Colorization panel, click the Edit icon.
2. Complete the Name, Device and Color fields and click SAVE.

2.3.2 Navigation history and bookmarks

As you navigate the software, each location is automatically saved to allow you to return to visited windows in a session. The navigation history can be cleared or hidden.

You can also save bookmarks for an unlimited number of windows, as well as floors, in order to return to them during a future session. Bookmarks persist across sessions until you remove the bookmark.

To display the navigation history:

Click the History icon on the pivot bar menu panel.

To clear the navigation history:

Close your browser.

To display the current bookmarks:

Click the Pins icon on the pivot bar menu.

To add or delete a bookmark:

1. Open the window to be bookmarked.
2. In the pivot bar menu window, click the Pins icon.

-or-

In the pivot bar menu window, click the Delete icon beside the bookmark's name.

To open the navigation history/bookmark panel when it is closed:

1. Hover the cursor over the up arrow on the bottom of the pivot bar menu panel.
2. When Show is displayed, click the arrow.

To close the navigation history/bookmark panel when it is open:

1. Hover the cursor over the down arrow on the pivot bar menu panel.
2. When Hide is displayed, click the down arrow.

2.4 Understanding Views

The three main views are: Device Table, Graphical Edit (2D) and 3D. Additional views can be selected from these views.

NOTE: Adobe® Flash® Player version 12 or higher is required for graphical views.

Not all views are available for all container/device types. Normally, if you are viewing an object in a particular view and you select another object that is supported in the same view, the view updates with the new object's contents. However, if you are viewing a device in a particular view and you select another object that is not supported in the same view, the new object is displayed in the default Device Table view.

Device details, ports and power connections are displayed in one or more views, and depending on the module, additional views may be available. For example, dashboards provide data in graphs, timelines and calendars. Each view and container or device selection also displays the applicable set of icons in the header.

2.4.1 Device Table view

The Devices window is the default window when you select the Portfolio pivot bar icon. The left panel in this window displays the list of containers and devices you add to your inventory. The left panel must be expanded to view all the containers and devices.

When you select a container or device from the left panel, the selected item's name and contents are displayed in the right panel, which is also referred to as the Device Table. Selecting one or more devices in the Device Table also displays the applicable icons above the table.

The checkbox in the table header allows you to select all the displayed items (25 per window) simultaneously. The Device Table elements are described further in [Icon Descriptions \(continued\)](#) on page 21.

To expand the enterprise:

Click the enterprise arrow.

-or-

Click any container's arrow.

Understanding Device Table icons

For each container or device selected, the applicable task icons are displayed in the upper right corner. Some icons, such as the Search, Add, Edit, Delete, Filter and Reload icons, function the same in all windows. Therefore, the procedures for these icons are similar except for the fields that need to be filled or selected. For these fields, the title explains what information is needed and any required fields are shown. You can usually either enter the information or click a drop-down arrow to select an item from a menu. After you enter or select the information, saving the information completes the operation.

Where applicable, other icons may be visible for the 3D, Graphical Edit (2D), Elevation and Device Table views.

2.4.2 Graphical Edit view

Graphical Edit view is used to create a top-down perspective of the floor-mounted equipment in your data center. For this view's background, you can create a floor in the software or import an .svg image of a floor. Imported floors are created using space polygons, based on the CAD walls of the .svg backdrop image. Once the floor is added to the Graphical Edit view, you can create usable and unusable spaces and zones on the floor.

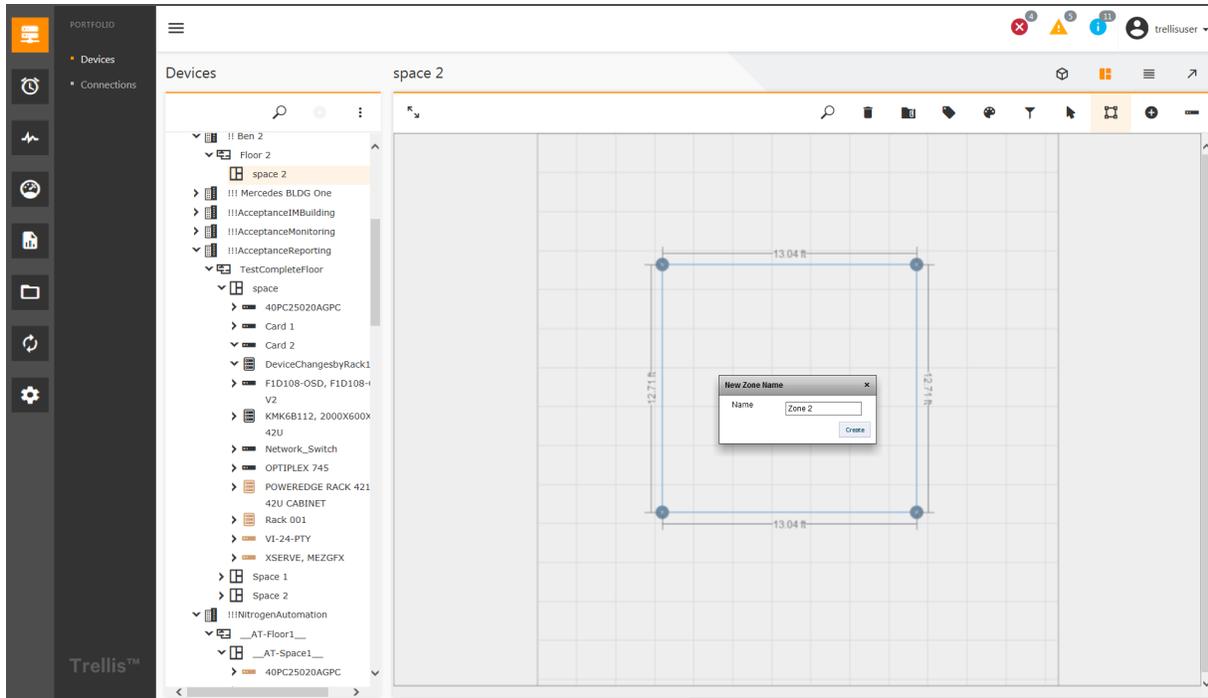
After containers and devices are imported to the system, you can drag their 2D symbols from the Stored panel to the floor. The search feature allows you to search for the imported symbols in the catalog or find placed and unplaced devices in your inventory.

Each device is marked "placed" after you drag it to the desired location on the floor. Placed device symbols can be color-coded to signify capacities, such as how much space, power and weight is available in each rack, the number of available ports and the heat output of each rack. Placed devices can be moved to the Unplaced Devices panel to remove all placement properties.

You can access each device's Properties panel and the Elevation and Device Table views from Graphical Edit view. In the Elevation and Device Table views, you can show the front and back of equipment or connections, and you can rotate devices left and right. A snap-to feature is also included that allows you to place and edit objects efficiently. Text labels can be added to identify devices so that when you hover over a device on a floor, the label is displayed.

For the Graphical Edit icons, see [Icon Descriptions \(continued\)](#) on page 21.

Figure 2.2 Graphical Edit View



Using levels

In Graphical Edit view, levels can be used to represent the placement of devices in your data center and the status of your devices, including monitored environmental sensors. By default, all equipment is placed on the floor, unless the space contains a raised floor, in which case the default is the raised floor. You must edit the device to place it on other levels such as the drop ceiling or ceiling levels. A device can be placed in a space on one or more of the following levels: ceiling, drop ceiling, raised floor or floor, which are defined in the following table. The Status, Text, Space Grid and Background options are also defined.

NOTE: Red highlighting indicates when a device from stored inventory is added to a specific level.

Table 2.5 Level Descriptions

NAME	DESCRIPTION
Status	Status of devices when monitoring is enabled.
Text	Displays and hides text. If disabled, the text remains on the floor, but is not visible unless you hover the cursor over the placed text.
Ceiling	Displays or hides devices placed on a ceiling.
Drop ceiling	Displays or hides devices placed on a drop ceiling.
Raised Floor	Displays or hides devices placed on a raised floor.
Floor	Displays or hides devices placed on a floor.
Space Grid	Enables or disables the grid lines on a floor.
Background	Enables or disables the background of the floor.

NOTE: Devices can be placed on different levels, but cannot span multiple levels.

NOTE: If devices are hidden on a floor in Graphical Edit view, use the Filter icon to verify the correct level is active.

To verify or edit the correct device placement level:

1. Click the Portfolio icon and expand the enterprise.
2. Select a floor and click the Graphical Edit icon.
3. Select a device on the floor and click the Edit icon.
4. In the Device Placement window, verify the level.

-or-

Select a new level and click *SAVE*.

For more information, see the following:

- [Placing a device on different floor levels](#) on page 148
- [Importing an AutoCAD Floor Plan to Use as a Background](#) on page 174

Properties panel

The Properties panel is displayed for spaces, zones and devices in Graphical Edit and 3D view. The panel can be accessed from the Properties icon or by clicking a device. The panel initially only displays the Details card; however, you can customize the panel by adding an unlimited number of the available properties.

The Details card includes the CEILING HEIGHT, DROP CEILING HEIGHT, RAISED FLOOR HEIGHT fields, the owners' name and email fields and the option to place a device in Maintenance Mode. On this card, you can also access and edit devices' data metrics, dimensions, connections and user-defined properties, and assign one or more tenants to a device.

Figure 2.3 Properties Panel



Space properties:

Customization of the Space Properties panel includes the heat, power, weight and space capacities.

- Grid (with offsets, tile size and ascending columns)
- Vertices (with X/Y coordinates of a space) for placement
- User-defined properties including dimensions

Zone properties:

Customization of the Zone Properties panel includes the heat, space and power capacities.

- Power and input/output voltages
- User-defined properties, including dimensions, physical placement and zone vertices

Device properties:

Customization of the Device Properties panel includes the heat, space, weight and power capacities.

- Power and input/output voltages
- Tenants
- User-defined properties including dimensions
- Alarm with manufacturer
- Edit, Connections, Monitoring and icons

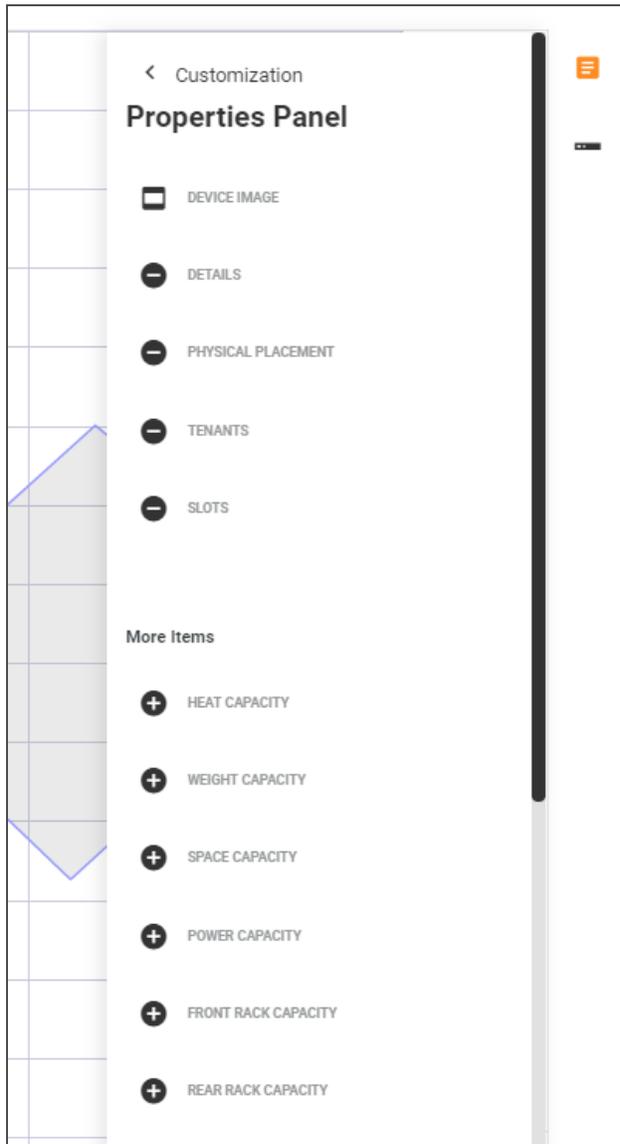
You can see a device's critical alarms with a description, date, time, manufacturer, tenant, name, IP address, protocol and element library. You can navigate to connections and metrics, and if a device is monitored, you can access the monitoring and metrics from its Properties panel. You can also access the web page of a selected, monitored device for more information.

Additional field parameters can be added in the Customization Properties panel. The *HIDE N/A CARDS* or *VIEW N/A CARDS* selections display or hide information that is not configured or not applicable.

NOTE: A monitored device can be displayed in Elevation view.

NOTE: Properties that are not configured or do not apply, can be hidden from view. If you select to add one of these properties, a message indicates if it is not applicable.

Figure 2.4 Customization Panel



Tenants can be assigned to a building, floor, space, zone or rack/device, based on what is accessible to a tenant, and can be viewed from this panel. If there are more than three tenants, a drop-down list provides the additional tenants.

For more about tenants, see [Tenants](#) on page 111.

To display the Properties panel:

1. Click the Portfolio icon, click a building and select a floor.
2. Click the Graphical Edit or 3D icon.
3. Click the space, zone or rack/device on the floor and click the Properties icon.
4. Click *Customize* to add values to the view.

NOTE: Tenants are displayed for the properties.

5. Click the Edit icon to make changes or the Assign Tenant icon to assign responsibility to a tenant.

-or-

Click the device and click the Properties icon. Then click the Edit icon to make changes, the Connections icon to modify the device's connections or the Assign Tenant icon to assign responsibility to a tenant.

NOTE: You can also navigate to Metrics and Monitoring.

To display the Properties panel from Graphical Edit view:

Click the device in the rack.

To customize the Properties panel:

1. In the Properties panel, click *Customize*.
2. Click the Add icon for each type of information you want to modify and click *Done Customizing* when complete.

To go to the web page of the monitored device:

In the upper left corner of the Properties panel, click the name of the monitored device.

2.4.3 3D view

In 3D view, you can view an entire floor or a single space within a floor. This view illustrates the width, depth and height dimensions and allows you to rotate the entire image. For 3D icons, see [Icon Descriptions \(continued\)](#) on page 21.

Depending on your permissions, the following are functions of the 3D view keyboard and mouse controls.

Table 2.6 3D View Keyboard and Mouse Controls

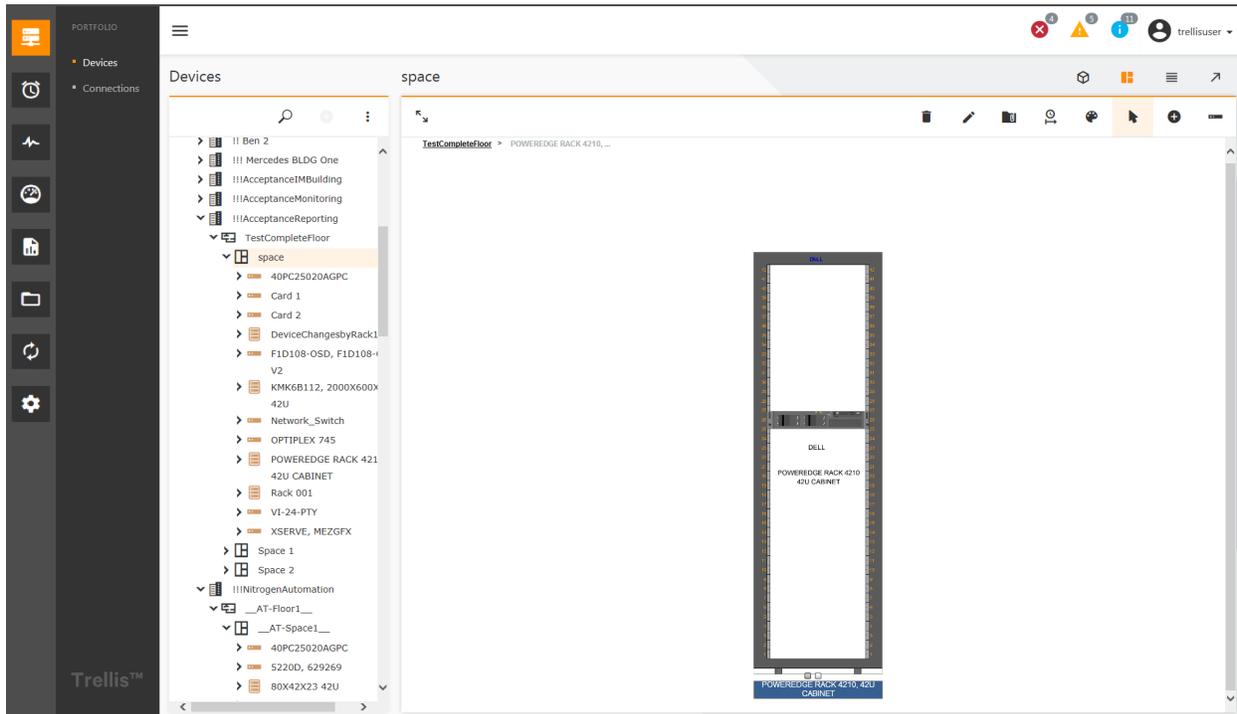
FUNCTION	DESCRIPTION
Highlight a Device	Using the mouse, left-click a device to view it in a magnified view and click X to close the magnified view. If a second device is selected, the first device is deselected.
Manipulate Magnified Device Table view	Use the left mouse button to rotate the magnified view.
Manipulate Space and Axis View	Click the left mouse button to rotate the space and axis views. Click the mouse button to pan the space and axis view.
Zoom Space and Device	Spin the mouse wheel to zoom in and out in the space and Device Table views, or press and hold the shift key and click the up and down arrows to zoom in and out.
Center space and Devices	Click and hold the mouse wheel or center key mouse button to move everything in a space or Device Table view to the center of the workspace.
Rotate Objects	Press the up, down, left and right keyboard arrows to rotate objects.
Pan Objects	Press Ctrl , then press the up, down, left and right keyboard arrows to pan objects.
Space Boundaries	Select and double-click the space boundary to view the space walls, drop ceiling and ceiling levels. Double-click the floor boundary to show the floor wall.
Viewing a Device	Select and double-click a device to open it in Elevation view.
Viewing zero U	In Elevation view, click the zero-U (0U) device icon in the upper left corner to show and hide devices on the outside of the rack.

2.4.4 Elevation view

Elevation view is a front/rear graphical representation of a floor-mounted device, such as a rack (or cabinet), with all the devices and any placeholder devices installed in the rack. Elevation view can be opened from 3D, Graphical Edit or Device Table view. After it is open, you can use the icons under the graphic to display the rack's front or rear view and place a device in the rack or in the zero-U space of the rack. The Elevation view header icons follow the same functionality as the content icons.

NOTE: Monitored and unmonitored devices are shown in the Elevation view of the device.

Figure 2.5 Elevation View of a Rack



To open Elevation view from 3D view:

In Graphical Edit view, click the device.

-or-

Click the *Select* icon to surround multiple racks and double-click to open *Elevation* view.

To open Elevation view from Graphical Edit view:

In Graphical Edit view, double-click a device.

2.5 Creating Your Portfolio

Before managing your inventory, you must create a representation of the containers and devices that reside in your physical enterprise. All the containers and devices you add are contained in the Enterprise container, which was created by Professional Services during installation. After your inventory is created, selecting any container or device (with contents) expands or collapses the inventory list.

NOTE: The Enterprise container cannot be deleted, but you can change its name. Sub-enterprises can be renamed and deleted.

2.5.1 Devices

Your inventory is created in the Devices window, which is the default window when you select the Portfolio pivot bar icon. The Devices window includes the Devices panel with the inventory list and a content panel that displays the contents of the selected container in the inventory list.

When creating your enterprise, the preferred sequence is to add any sub-enterprises or buildings to the enterprise component first, and then add floors to the buildings and add spaces to the floors. Like a physical environment, each space contains racks and other floor-mounted equipment, and the rack/floor-mounted equipment contains devices. If applicable, making up the lowest level are the devices' ports, which must be added in order to create connections. For more about connections, see [Connections](#) on page 33.

NOTE: The name of any container/device can contain up to 256 alphanumeric characters.

NOTE: Adding, editing or deleting a container/device in the Devices panel updates the content in related windows.

In the Devices window, you can modify, move and delete your devices in the software. You can view your devices' status, edit their properties and configure them for monitoring. The content panel columns can be adjusted, and you can list the information in ascending or descending order, sort the information down to the rack level and use the category, model, manufacturer and status filters to make the list more manageable. You can also view and manage containers/devices in graphical views selected from the window's header icons.

Only the applicable icons/functionality for the selected object are displayed. For example, selecting a floor, space or rack in the Devices panel allows you to view or edit it in the Topology or Device Table view, so only those icons can be selected. Selecting a building in the Devices panel allows you to view or edit it in Device Table view. The CRUD operations are available in Device Table view, and the editing icons used to perform the CRUD operations, are displayed above the applicable content. Non-functional icons are gray.

NOTE: Devices shown in orange are not placed.

For more information, see the following:

- [Portfolio Window](#) on page 9
- [Icon Descriptions \(continued\)](#) on page 21
- [TRELLIS™ Inventory Manager Module](#) on page 133

2.5.2 Device history

Device history includes a general and a detailed description of a device-related event. The date and time is provided as well as the name of the user responsible for the event.

To view a device's history:

1. Click the Portfolio icon.
2. In the Devices window, click a building, floor and device.
3. Click the Events icon.

2.5.3 Connections

Power and data connections are possible using the *Trellis*™ Inventory module. You can create connections in the software and manage them as a device. Connections can be viewed from the Portfolio pivot bar icon in the Connections window and in a Topology diagram. For more about connections, see [Working with Power and Data Connections](#) on page 155. For information about creating device connection topologies, see [Creating device topologies](#) on page 159.

2.6 Using Alarms

The Active Alarms, Alarm History and Alarm Settings windows can be accessed from the Alarms pivot bar icon. The Active Alarms and Alarm History windows provide details about alarms. The Alarm Settings window is used to configure alarm information, including thresholds.

If alarms exist, the applicable alarm icons, Critical, Warning and/or Information, are displayed in the upper right corner of the UI. The number of current alarms is shown beside each alarm icon.

From the alarm icons, you can open the applicable alarm summary panel, check alarms and return to your current task. If the alarm requires immediate attention, you can go to the Active Alarms window.

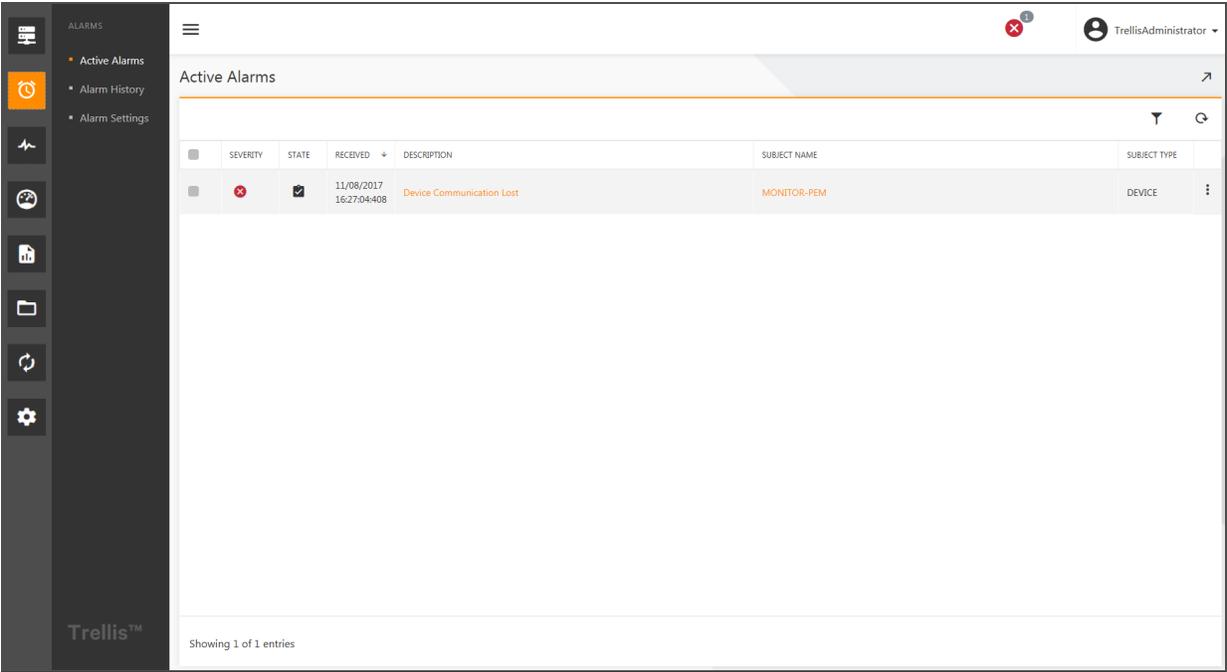
2.6.1 Active Alarms

The Active Alarms window is the default Alarms window. It displays events that have breached a previously set threshold. This view contains each device's alarm severity, state, date/time, description and its subject name and type. Each event listed in the Alarms window is assigned a severity of either Warning, Critical or Informational. (See [Icon Descriptions \(continued\)](#) on page 21.

From this window you can view an alarm's details and attach notes to the details, filter active alarms by a specific time period or group them based on certain criteria, list active alarms in ascending or descending order, assign a user to an alarm, acknowledge alarms, clear alarms and access the latest metrics for an active alarm.

NOTE: If a rack is housing devices that have an alarm, the alarms are pushed up to the rack.

Figure 2.6 Active Alarms Window



The screenshot shows the 'Active Alarms' window in the Trellis interface. The window title is 'Active Alarms' and the user is logged in as 'TrellisAdministrator'. The table below lists the active alarms:

SEVERITY	STATE	RECEIVED	DESCRIPTION	SUBJECT NAME	SUBJECT TYPE
Critical	Warning	11/08/2017 16:27:04:408	Device Communication Lost	MONITOR-PEM	DEVICE

Showing 1 of 1 entries

Table 2.7 Active Alarms' Window Descriptions

COLUMN	DESCRIPTION
SEVERITY	Indicates the severity (Warning, Critical or Informational) of the alarm
DATE/TIME	Date and time the alarm is activated
DESCRIPTION	Describes the alarm and is a link to the Alarm Details window
STATE	Active, Acknowledge or Clear
SUBJECT NAME	Name of the device and is a link to the Latest Metrics window
SUBJECT TYPE	Device type

To display active alarms by severity:

1. Click the Alarms icon and select *Active Alarms*.
2. Click the Reload icon to refresh the window.

-or-

Hover the cursor over the *Severity* column header and click the arrow to view alarms in ascending or descending order.

To display active alarms by date range and/or group them:

1. Click the Alarms icon and click the Reload icon.
2. Click the Filter icon and in the Filter window, select a date range.

-and/or-

Click the Group By drop-down arrow, select the type to group and click *CLOSE*.

To display an alarm's details and add notes to the Alarm Details window:

1. In the Active Alarms window, locate the alarm and click the link in the DESCRIPTION column.
2. In the Alarm Details window, ensure the Notes tab is selected.
3. In the Notes field, enter your notes and click *ADD NOTE*.

To retrieve the most current alarm notification:

1. In the Active Alarms window, click the Reload icon.
2. Click the DATE/TIME column header to list the dates in ascending or descending order.

To view read-only alarm details:

In the Active Alarms window, click the alarm's link in the DESCRIPTION field.

-or-

Click the alarm's subject name link to go to the Metrics Latest Readings window.

NOTE: You can also click the alarm's checkbox and click the Edit icon to view the alarm's details.

To acknowledge or clear one or more alarms:

1. In the Active Alarms window, enable the checkbox of one or more alarms.
2. Click the Acknowledge icon.

-or-

Click the Clear icon.

To acknowledge or clear all alarms:

1. In the Active Alarms window, click the header checkbox to select all checkboxes.
2. Click the Acknowledge icon.

-or-

Click the Clear icon.

To assign a user to an alarm:

1. In the Active Alarms window, click an Alarms' checkbox and click the Assign icon.
2. In the Users window, search for or scroll to a user, click the user's checkbox and click **SAVE**.

2.6.2 Alarm History

The Alarm History window provides access to the Alarm Details window which displays read-only details about each alarm and includes a place to store notes. This window contains cleared alarms, their severity, state, name, type and description, the duration of each alarm and the time the alarm clears. The content header provides icons to search the alarms, filter and sort columns and reload the information.

Table 2.8 Alarm History Column Descriptions

COLUMN	DESCRIPTION
SEVERITY	Level of severity of the alarm.
STATE	Can be Active or Cleared.
DATE/TIME	Date and time the alarm was received.
DESCRIPTION	A general alarm description, such as Equal to Warning Start, Device Communication Lost, Output Overcurrent and so on. The description is a link to access more details.
SUBJECT NAME	Device's name. The name is a link to access more details.
SUBJECT TYPE	Type of device.

To view an alarm's history:

1. Click the Alarms icon and select *Alarm History*.
2. In the Alarm History window, click the alarm's checkbox.
3. Click the Edit icon.

-or-

In the alarm's row, click the link in the alarm's Description column.

-or-

In the alarm's row, click the vertical ellipses icon and select *Edit*.

To clear one or multiple alarms' history:

1. In the Alarm History window, click one or more checkboxes of the alarms to be cleared.
2. Click the Clear icon.

To clear all alarms' history:

1. In the Alarm History window, click the checkbox in the content header.
2. Click the Clear icon.

2.6.3 Alarm Settings

The Alarm Settings window is used to view and override the available alarms for devices. By default, all available alarms that can be assigned to a device are listed with the alarm severity, alarm type and a description. The listed alarms can be sorted by removing the severity and/or description columns. You can also assign a severity (Critical, Warning or Information) to each alarm type, list the alarm types in ascending or descending order or restore the default alarm settings. For more information, see [Viewing and assigning alarm severity levels](#) on page 208.

Table 2.9 Alarm Settings Window Descriptions

COLUMN	DESCRIPTION
SEVERITY	Lists the assigned severity
ALARM TYPE	Lists the types of available alarms that can be assigned to devices
DESCRIPTION	Describes each alarm type

To assign/modify the severity level for one or more alarms:

1. Click the Alarms icon and select *Alarm Settings*.
2. In the Alarm Settings window, enable an alarm's checkbox.
3. For the same alarm, click the Critical, Warning or Information header icon.

-or-

Click the Reset Defaults icon.

2.6.4 Alarm Panels and Cards

The alarm panels (critical, warning and information) provide quick access to active alarms. If the alarm icons in the header include a number to represent the number of active alarms, the alarm panel presents each alarm on a summary "card." You can use a scrollbar to search for an alarm. There can be up to 25 of the latest active alarms displayed per type. The following information is provided for each alarm:

- How many days the alarm has been active
- Reason for the alarm
- Name of the affected device
- Name and description of each alarm
- Avatars assigned to the alarm

Also on each card are the Acknowledge, Assign and Clear icons. These icons are displayed when you hover the cursor over the top of each card. From these icons, you can acknowledge you are aware of an alarm, assign a user/tenant to the alarm or clear the alarm when no further action is required. If there are no alarms, an Alarms Cleared message is displayed.

The Acknowledge icon is displayed on a card to indicate the alarm is being addressed. Alarms do not have to be acknowledged; however, after an alarm is acknowledged, it is displayed until the alarm is assigned or cleared.

The Assign icon on a card opens the Assign menu of available users/tenants which are each represented by a unique avatar. If the avatar menu exceeds the window, you can use the search field or the scrollbar to find an avatar. One, multiple or all avatars can be assigned to an alarm and displayed on the card. One, multiple or all avatars can also be removed from an alarm.

If more information is needed to make a decision about an alarm, you can access any of the alarm windows from the Alarms pivot bar icon.

To acknowledge an alarm:

1. Click the applicable alarm icon in the upper content window.
2. In the opened panel, locate the alarm and hover the cursor over the upper right corner of the card.
3. Click the Acknowledge icon.

To assign one or more users to an alarm:

1. Click the applicable alarm icon in the upper content window.
2. In the opened panel, locate the alarm and hover the cursor over the upper right corner of the card.
3. Click the Assign icon.
4. In the Assign menu of avatars, click one or multiple checkboxes and click *Assign*.

-or-

In the Assign menu header, click *To all users* and click *Assign*.

To clear an alarm:

1. Click the applicable alarm icon in the upper content window.
2. In the opened panel, locate the alarm and hover the cursor over the upper right corner of the card.
3. Click the Clear icon.

To close the Assign menu:

Click the X icon in the Assign panel.

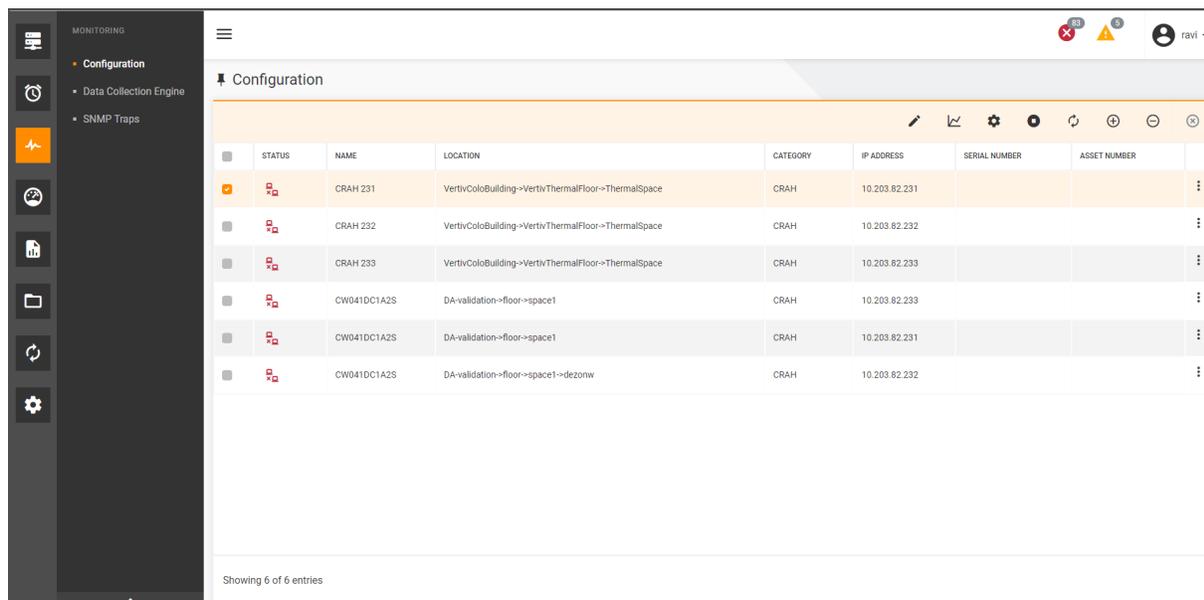
To close the alarm panel:

Click the arrow in the alarm panel header.

2.7 Monitoring

The Monitoring pivot bar icon is used to configure and view monitored devices' events. Collected device data, data collection engines, protocols and custom data points can be managed from this icon.

Figure 2.7 Monitoring Configuration Window



2.7.1 Configuration window

The Configuration window is the default window for the Monitoring icon. From this window, devices can be filtered by category, manufacturer, model, status and/or name. Selecting *None* displays all the options. You can select any or all fields to filter devices. For example, you can enter a general name such as PDU and select to only display Liebert PDUs. Each column can be displayed or hidden, so you can display only the information you need.

After selecting a device, you can manage the following information:

- Edit configuration and polling interval details
- Access datapoint metrics
- Configure collection rules and control data points (unit of measure and data point value for parametric data points)
- Configure thresholds (Low Critical, Low Warning, High Critical, High Warning, Target, Equals Critical and Equals Warning)
- Stop monitoring
- Configure automation to escalate rules/alarms to one or more users, assign trigger commands, assign users to alarms and suppress alarms
- Add, subtract or delete PUE; for additional PUE configuration information, see [Understanding Energy Insight and Efficiency](#) on page 195.

To filter, adjust columns and verify the status of monitored devices:

1. Click the Monitoring icon, and in the displayed Configuration window, click the Filter icon.
2. In the Filters window, click the drop-down arrow for each filter and select the applicable device category, manufacturer, model and status.

-and/or-

Select *None* to display all the options for each drop-down arrow.

-and/or-

Enter a device name in the field.

3. Click *CLOSE*.

To configure a device:

1. Click the Monitoring icon to open the Configuration window.
2. Enable a device's checkbox and click the Settings icon.

-or-

Click the device's vertical ellipses icon and select *Settings*.

3. In the Collection Rules panel, click the Column icon to refine the view.
4. Locate the data point name, click its vertical ellipses icon and select *Edit*, and in the Edit Collection Settings window, enter the interval number, select the unit and click *SAVE*.

-or-

Click the checkbox in the header to select all the data point names, select the Edit icon and in the Edit Collection Settings window, enter the interval, select the unit and click *SAVE*.

5. In the Configuration panel, click the Filter icon and Column icon as necessary to refine the view.
6. Click the checkbox of the device and click the Edit icon.
7. In the displayed window, enter the data point value and click *SAVE*.
8. In the Control panel, click the Filter icon and Column icon as necessary to refine the view.
9. Locate the control data point, click its vertical ellipses icon and select *Edit*, then complete the control data point fields and click *SAVE*.

-or-

Select the checkbox in the header to select all the control data points, click the Edit icon, complete the control data point fields and click *SAVE*.

NOTE: If a data point has a null value, the Last Updated field is updated with the current time.

NOTE: Control data points are typically enumerated data points, but it is possible for a control data point to be parametric.

10. In the Thresholds panel, click the Filter icon and Column icon as necessary to refine the view.
11. Locate the data point name, click its vertical ellipses icon and select *Edit*. In the Edit Threshold Settings window, enter the numerical thresholds, select the critical and warning values as applicable and click *SAVE*.

-or-

Click the checkbox in the header to select all the data point names and click the Edit icon. In the Edit Threshold Settings window, enter the numerical thresholds, select the critical and warning values as applicable and click *SAVE*.

To monitor an IP address with multiple Universal Management Gateway engines:

NOTE: Multiple devices can be configured for monitoring by the same IP address across multiple engines.

NOTE: Prior to assigning a device's IP address to an engine's IP address, the engine's address must be added to the Engine IP Address drop-down list on the *Monitor - Configuration* window.

1. Click the Monitoring icon and click *Data Collection Engine*.
2. In the list of engines, locate and note the IP address range of the engines you want to monitor a device.
3. Click the Edit icon, scroll to the Discovery Configuration panel and click the Add icon.
4. In the Add IP Address Range window, select the IP address type (IPV4, IPV6), enter the IP address range(s) to add to the list of selectable engines in the Device's panel and click *SAVE*.
5. Click the Portfolio icon, search for and click a device's checkbox and click the Monitor icon.
6. In the Configuration panel, enter the IP Address to be used to monitor the device.
7. Click the Engine IP Address drop-down arrow and select a different engine to monitor the device's IP address.
8. Select another device and enter the same IP address as the previous device.
9. Click the Engine IP Address drop-down arrow and select the IP address of another engine to monitor the device.
10. Continue to select and assign devices as necessary and click *SAVE*.

To stop monitoring one, multiple or all devices:

1. Click the Monitoring icon.
2. In the Configuration window, click the checkbox of one or multiple devices.

-or-

Click the header checkbox to select all devices.
3. Click the Stop icon, and in the Confirmation window, select *YES* to continue.

To configure a device for monitoring, see [Configuring a device for monitoring and data collection](#) on page 150.

To configure automation:

1. In the Configuration window, click the vertical ellipses icon for each device and select *Automation*.

-or-

Click the checkbox in the header to select all the devices and click the Automation icon.
2. In the Escalation Rules panel, click the Filter icon and Column icon to refine the view.
3. Click the Add icon to add an alarm rule.
4. If you click the Add icon, click the Edit icon in the Summary panel and Trigger Commands panels, complete the fields and click *SAVE*.
5. In the Assign Alarms panel, click the Edit icon.
6. Enter the user's name in the Search field, select the user's checkbox and click *SAVE*.
7. In the Suppress Alarms panel, click the Edit icon.
8. Select the start and end dates from the drop-down calendars and click away from the calendar.
9. Search for and click the checkbox of one or multiple alarm types and click *SAVE*.

-or-

Click the ALARM TYPE checkbox in the content header and click *SAVE*.

To acknowledge and assign an alarm to one or more users:

1. Click the Portfolio icon, expand the enterprise and select a monitored device.
2. Select a monitored device, click the Alarms icon and click *Active Alarms*.
3. Click the alarms' checkbox and click the Acknowledge icon.
4. Click the Assign icon and in the Users window, begin entering a name in the Search field.
5. Click the checkbox of the name to assign the alarm and click *SAVE*.

To configure an alarm trigger for escalation to one or more users :

1. Click the Monitoring icon, enable the monitored device's checkbox and click the Automation icon.
2. In the Escalation Rules panel, click the Add icon.
3. In the Summary panel, add a Trigger Name and complete the USER, TIME and UNIT fields.
4. Begin entering the Alarm Type in the Search field until it is displayed.
5. Click the alarm type's checkbox and click *SAVE*.

To add, subtract or remove the PUE:

1. Click the Monitoring icon and click the device's checkbox.
2. Click the Add PUE icon, select the FACILITY or IT load type and click *ACCEPT*.

-or-

Click the Subtract PUE icon, select the FACILITY or IT load type and click *ACCEPT*.

-or-

Click the Remove PUE icon to delete the PUE.

2.7.2 Bulk Monitoring

With the bulk monitoring feature, you can simultaneously configure multiple devices for monitoring. When you select multiple devices for monitoring, the Monitor header icon is disabled and the Bulk Monitoring header icon is enabled.

NOTE: The devices must be in the same category and manufactured by the same manufacturer.

The Bulk Monitoring window is used to define the devices to be monitored. Here, the model and number of devices is pre-populated and the displayed fields are relative to your Range Type and Protocol field selections. After all the required fields are complete, the SAVE button is activated for you to save your configuration.

The bulk monitoring fields are described in the following table.

Table 2.10 Bulk Monitoring Field Descriptions

NAME	DESCRIPTION
Manufacturing Model	Manufacturer of the selected devices
Devices To Monitor	Number of devices selected to monitor
Element Library	Drop-down list to select the library used by the devices
Range Type	Drop-down menu with the following options: <ul style="list-style-type: none"> Comma Separated - Non-sequential IP addresses Secondary - Sensors on devices Sequential - Beginning and ending IP addresses
Comma Separated	Displays when the Comma Separated option is selected in the Range Type field; used to enter the list of IP addresses separated by a coma
Protocol	Drop-down list of the available protocols
Primary Device IP Address	Displays when the Secondary option is selected in the Range Type field; used to enter the primary device's IP address
Secondary Device IP Address	Displays when the Secondary option is selected in the Range Type field; used to enter the secondary device's IP address
Start IP Address	Displays when the Sequential option is selected in the Range Type field; used to enter the starting IP address
End IP Address	Displays when the Sequential option is selected in the Range Type field; used to enter the ending IP address
Communication Properties	Properties specific to each protocol

To establish bulk monitoring:

NOTE: Prior to using the bulk monitoring feature, verify your browser pop-up blocker is off.

1. Click the Portfolio icon, and in the Devices window, expand the enterprise.
2. In the device list, select a container.
3. Select multiple devices in the container and click the Bulk Monitoring icon.
4. In the Bulk Monitoring window, click the drop-down arrows and select the element library, protocol and range type.
5. Verify the displayed fields are complete, verify the device properties and click **SAVE**.

NOTE: The required fields are marked.

6. Click the Bulk Monitoring header icon.

NOTE: The time to perform the bulk monitoring process is effected by the number of devices.

7. When a message indicates the process is complete, you can click the X in the window header and view the monitored devices in the Devices window.

2.7.3 Data Collection Engine

In the Data Collection Engine window, you can view an engine's status, name, category, manufacturer model and IP address, enroll a single engine, review its details, sync, unenroll, restart, replace, upgrade and perform a backup of it. When you select multiple or all the enrolled engines, you can unenroll, restart and upgrade or back up all of the engines simultaneously. You can also monitor an IP address across multiple engines (standalone and appliance). A message asks you to confirm the operation before the system proceeds with the task. For more information about data collection engines, see [Data Collection Engine](#) on page 123.

2.7.4 SNMP Trap configuration

SNMP Traps are used to identify problems in your network. SNMP traps can be formatted as a notification and sent from agents to third-party systems, such as a network management system (NMS). SNMP trap destinations must be configured in order to collect SNMP traps for alarms. Protocols shows the properties for the supported protocol and SNMP trap configurations. The Add and Edit icons are used to modify the properties of the protocol configuration. For more information, see [Configuring SNMP traps](#) on page 211.

2.8 Understanding Dashboards

Dashboards are provided to view devices' status, global status, thermal status, metrics, Power Usage Effectiveness (PUE), active alarms and space, power and cooling capacity. In addition, a read-only scheduler dashboard allows you to view projects and project tasks, such as Virtual Inventory synchronization and Purge Analytic Reports, that are not related to projects created with the Projects module.

NOTE: Both the platform and Site Manager licenses are required in order to use dashboards.

The following are additional benefits of dashboards:

- Readings show all of the measured data details collected from a device. Graphs and charts can be created from selected data points.
- Configurable data points allow you to change adjustable set points or other data points.
- Control data points allow you to remotely change data point values on a device.
- Dry contacts can be environmental sensors or other devices that are wired into the hardware.
- Groups that a device belongs to are listed in the Groups window.
- Supported power, heat and space capacities can be displayed for a monitored device. The Manufacturer's list information from the symbol also appears here, and is editable in this instance.
- Device monitoring parameters are displayed in the Network Information window.
- Monitor settings for a device, what type of data is monitored and capturing events and data points.
- Automated Actions commands can be set up to occur on alarm triggers, which allow automated actions like alarm escalation, device shutdown and alarm communication.
- Unmonitored devices display a smaller set of device properties.
- Dashboards can be shared within the same tenancy, including the top tenancy.

NOTE: Generally, devices do not generate monitored data points or alarms on their own, although a rack can have a capacity alarm due to a preset threshold in the *Trellis*™ platform.

Custom dashboards can also be created. For more about custom dashboards, see [Custom Dashboards and Widgets](#) on page 65.

2.8.1 Global Status

The Global Status dashboard is the default dashboard displayed when the Dashboard pivot bar icon is selected. It displays the location and status of each building in your data center around the globe. The Global Status dashboard displays the following map views:

- World View – Default page
- Country View – Displays a view of the selected country (for example, USA)
- Province/State View – Displays a view of the selected state or province, if it exists. The province/state code must be entered to view the building in the state view. See the following tables for countries with province/state views (for example, FL – Florida – displays Florida’s counties). The following countries provide state/province views:
 - Canada
 - France
 - Germany
 - Netherlands
 - Norway
 - United States

Plotting building coordinates

The latitude/longitude coordinates of a building are required in order to display a building on a Global dashboard map. These coordinates can be entered from the building’s details window. You can also visit the [https://www.latlong.net/Latitude/Longitude Tool](https://www.latlong.net/Latitude/Longitude-Tool) link and select a building from the Global Status dashboard building placement drop-down menu.

To place a building on a map using latitude/longitude coordinates:

1. Click the Dashboard icon, click *Global Status* and click the Buildings icon.
2. Scroll to and click the building.
3. In the opened window, enter the latitude/longitude coordinates and click *SAVE*.
4. Verify the building is on the map.

NOTE: An error message is displayed if you enter latitude/longitude coordinates not associated with a country.

To return to the previously viewed map:

In the Global Status window, click the Previous Map icon.

To print the Global Status map:

In the Global Status window, click the Print icon.

State/Province view

For countries that provide state/province maps, you must enter the state code in the Building Detail window or select the building from the placement drop-down list. If this value is not entered, the building is not displayed in the state/province view. The following tables list the correct codes.

Table 2.11 Canadian Provinces

PROVINCE	PROVINCE/REGION/STATE CODE
Alberta	AB
British Columbia	BC
Manitoba	MB
New Brunswick	NB
Newfoundland and Labrador	NF
Northwest Territories	NT
Nova Scotia	NS
Nunavut	NU
Ontario	ON
Prince Edward Island	PE
Quebec	QC
Saskatchewan	SK
Yukon	YT

Table 2.12 France Regions

REGION	PROVINCE/REGION/STATE CODE
Alsace	A
Aquitaine	B
Basse-Normandie	P
Bourgogne	D
Bretagna	E
Centre	F
Champagne-Adrienne	G
Corse	H
Franche-ComtA	I
Guadeloupe	GP
Guyane franASaise	GF
Haute-Normandie	Q
Languedoc-Roussillon	K
Limousin	L
Lorraine	M
Martinique	MQ
Mayotte	YT
Midi-PyrA@nA@es	N
nord-Pas-de-Calais	O
Pays de la loire	R
Picardie	S
Poitou-Charentes	T
Provence-Alpes-CA'te-d'Azur	U
RhA'ne-Alpes	V
RA@union	RE
AZle-de-France	J

Table 2.13 Germany Provinces

PROVINCES	PROVINCE/REGION/STATE CODE
Baden-Württemberg	BW
Bayern	BY
Berlin	BE
Brandenburg	BB
Bremen	HB
Hamburg	HH
Hessen	HE
Mecklenburg-Vorpommern	MV
Niedersachsen	NI
Nordrhein-Westfalen	NW
Rheinland-Pfalz	RP
Saarland	SL
Sachsen	SN
Sachsen-Anhalt	ST
Schleswig-Holstein	SH
Thüringen	TH

Table 2.14 Netherlands Provinces

PROVINCE	PROVINCE/REGION/STATE CODE
Drenthe	DR
Flevoland	FL
Friesland	FR
Gelderland	GE
Groningen	GR
Limburg	LI
Noord-Brabant	NB
Noord-Holland	NH
Overijssel	OV
Utrecht	UT
Zeeland	ZE
Zuid-Holland	ZH

Table 2.15 Norway

COUNTY	PROVINCE/REGION/STATE CODE
Akershus	AK
Aust-Agder	AA
Buskerud	BU
Finnmark	FI
Hedmark	HE
Hordaland	HO
Måre og Romsdal	MR
Nord-Trøndelag	NT
Nordland	NO
Oppland	OP
Oslo	OS
Rogaland	RO
Sogn og Fjordane	SF
Sør-Trøndelag	ST
Telemark	TE
Troms	TR
Vest-Agder	VA
Vestfold	VF
Åstfold	OF

Table 2.16 United States

STATE	PROVINCE/REGION/STATE CODE
Alabama	AL
Alaska	AK
Arizona	AZ
Arkansas	AR
California	CA
Colorado	CO
Connecticut	CT
Delaware	DE
District of Columbia	DC
Florida	FL
Georgia	GA
Hawaii	HI
Idaho	ID
Illinois	IL
Indiana	IN
Iowa	IA
Kansas	KS
Kentucky	KY
Louisiana	LA
Maine	ME
Maryland	MD
Massachusetts	MA
Michigan	MI
Minnesota	MN
Mississippi	MS
Missouri	MO
Montana	MT
Nebraska	NE
Nevado	NV
New Hampshire	NH
New Jersey	NJ
New Mexico	NM
New York	NY

Table 2.16 United States (continued)

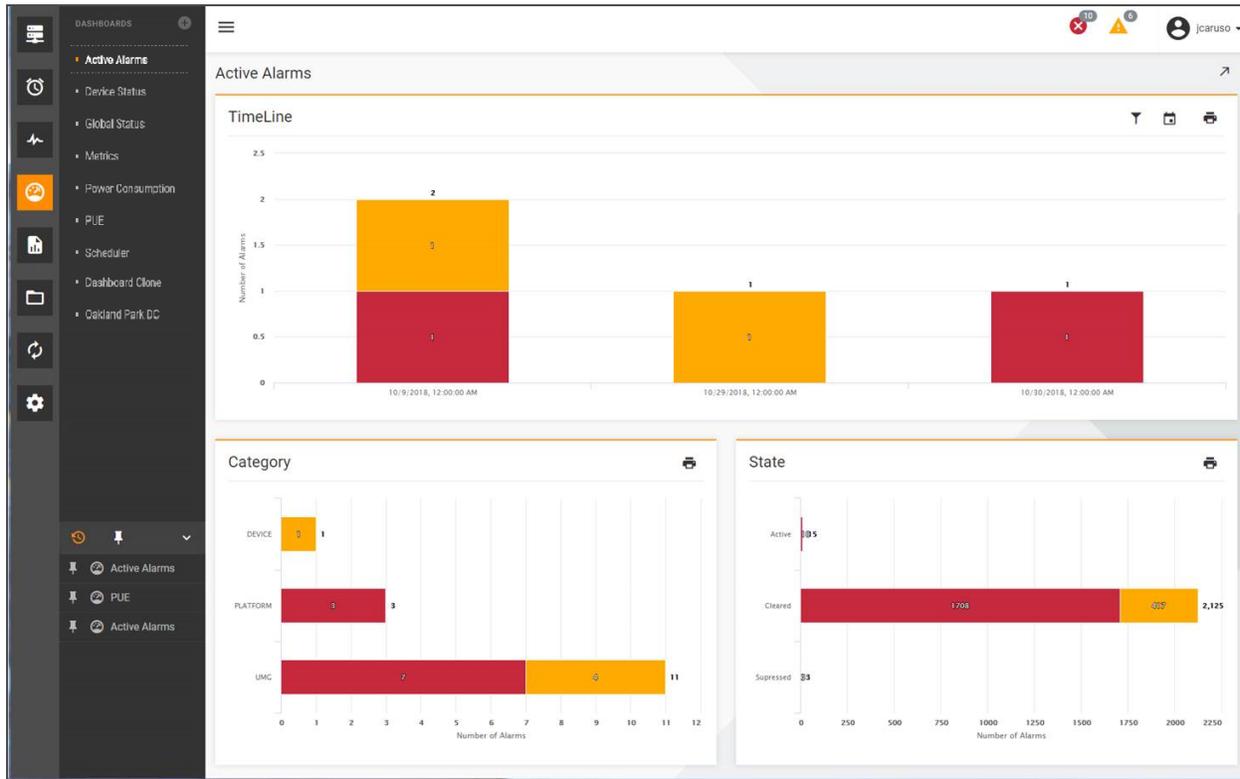
STATE	PROVINCE/REGION/STATE CODE
North Carolina	NC
North Dakota	ND
Ohio	OH
Oklahoma	OK
Oregon	OR
Pennsylvania	PA
Rhode Island	RI
South Carolina	SC
South dakota	SD
Tennessee	TN
Texas	TX
Utah	UT
Vermont	VT
Virginai	VA
Washington	WA
West Virginiaia	WV
Wisconsin	WI
Wyoming	WY

2.8.2 Active Alarms

The Active Alarms dashboard displays a read-only summary of active alarms using graphs. In this window, you can view the number of active alarms by the Critical, Warning, Stacked and Information filters.

The panels display the filtered alarms in graphs. The TimeLine panel displays alarms by a selectable start date and interval setting. On the TimeLine, you can hover the cursor over the columns to display the alarm details. The Category panel displays the alarms by device type. In the State panel, alarms are displayed in the following alarm states: Active, Cleared, Suppressed, Historical, Closed and None. Each panel can be printed.

Figure 2.8 Active Alarms



To filter alarms on the TimeLine panel:

1. Click the Dashboard icon and click *Active Alarms*.
2. In the TimeLine panel, click the Filter icon.
3. Click to enable or disable the *Critical*, *Warning*, *Stacked* or *Information* options.

To configure a start date and intervals for alarms:

1. Click the Dashboard icon and click *Active Alarms*.
2. In the TimeLine panel, click the Date icon.
3. In the Start Date window, select the date, enter the time and click *SAVE*.

To print the Active Alarms panels:

1. Click the Dashboard icon and click *Active Alarms*.
2. Click the Print icon in the TimeLine, Category or State panel.

2.8.3 Device Status

This dashboard displays the status of individual device categories or the entire monitored infrastructure. It opens with the Floor UPS devices' alarms displayed and the last time the data was updated. Other devices' status can be displayed by searching for and selecting another device category.

The results show critical and warning alarms for the selected device category, how many devices are not in the alarm state and how many devices in the category are not communicating.

You can also click the sections in the graphics to access more details. Examples are:

- *Search*: Opens the Inventory Search window to select and display other device category types
- *Alarm*: Opens the Active Alarms window to view more details
- *Not Communicating*: Opens the Monitoring window to display the specific category of devices

Figure 2.9 Device Status Dashboard



To view a Device Status dashboard:

1. Click the Dashboard icon and click the Search icon.
2. In the Inventory Search window, enter a keyword for the type of device you want to display.
3. From the displayed list, select the device category and click *SEARCH*.

To access more details:

Click any section to access more details.

2.8.4 Metrics

The Metrics dashboard provides the latest values from monitored devices. Results are based on the assigned data points and the selected start date and time. You can scroll or search for a device. A message lets you know if you select a device that is not applicable.

Two devices can be compared on this dashboard. Aggregated analytics are used for a general comparison of the devices or a comparison of humidity, power and temperature readings. You can add as many data points as needed.

You can hover the cursor over the graph to view details. Selecting fewer devices zooms in to view the graph.

If you save or pin the data, you can go back to it at a later time. You can also pin devices to go to their data history after you sign off and sign back in. The current results are printed from this window.

Figure 2.10 Metrics Dashboard

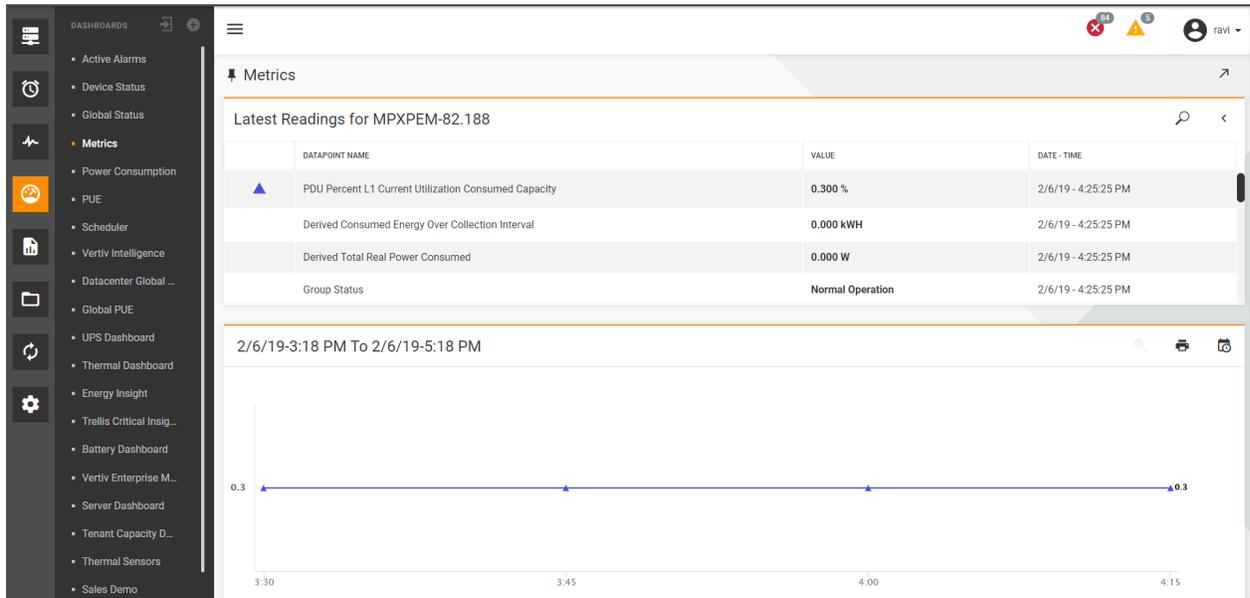
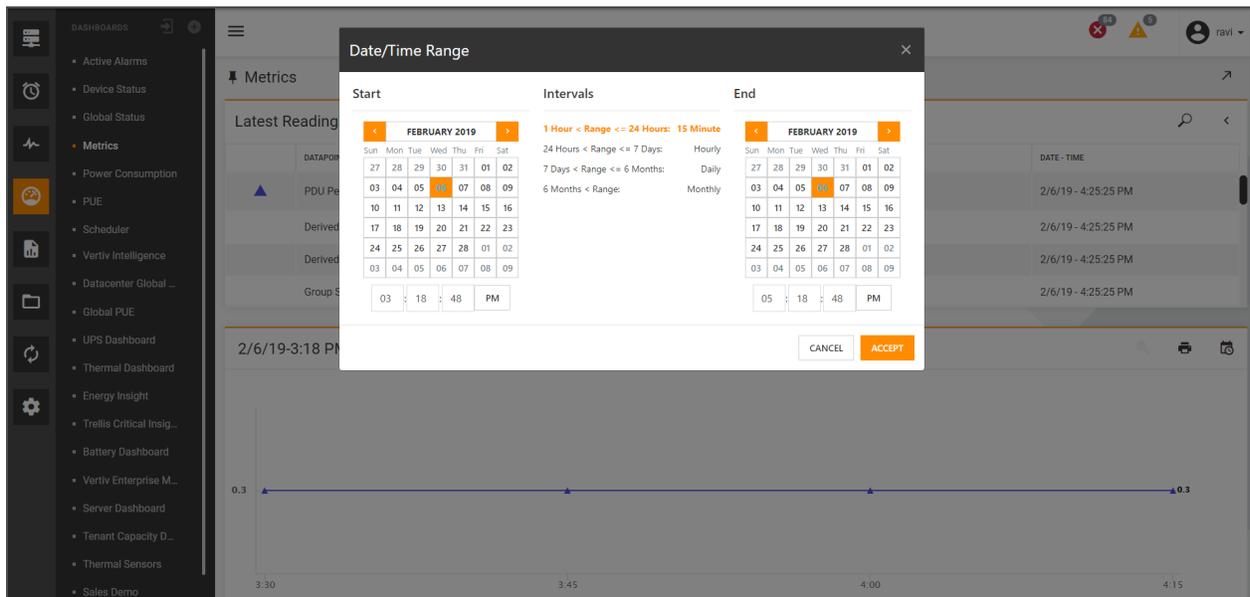


Figure 2.11 Assigning the Date/Time Range



To configure the Metrics dashboard for a device:

1. Click the Dashboard icon, select *Metrics* and click the Search icon.
2. In the Inventory Search window, enter the device type and click *SEARCH*.
3. Locate and select the device in the list and click the device's Metrics icon.

To configure the start and end dates:

1. In the Metrics window lower panel, click the Date/Time Range icon.
2. Select a start date and time and click *ACCEPT*.

To compare device metrics:

1. In the Metrics window, click the Compare Devices (>) icon.
2. Click the Search icon, search for a second device and click the device's Metrics icon.

To print the Metrics panel:

1. Click the Dashboard icon and click *Metrics*.
2. In the lower panel, click the Print icon.

NOTE: This window can be accessed directly from the Active Alarms window. See [Active Alarms](#) on page 34.

2.8.5 Power Consumption

The Power Consumption dashboard is used to simulate adding and removing devices, such as servers, to verify if the power load for a specified space and rack is within the designed capacity. This dashboard includes the Racks, Breakers, Topology and Power Distribution windows that provide the relative information.

The vertical ellipses icon in the header is used to select the space to review, default unit of measurement, show or hide the breaker load chart, select the phase balance percentage (used to calculate phase balance) and configure the software to remember the selected space and/or tab for future access.

NOTE: After adding each applicable device, a message says the device is acceptable or overloads the instance.

To configure the Power Consumption dashboard:

1. Click the Dashboard icon and click *Power Consumption*.
2. The first time in the Power Consumption dashboard, click a space's radio button and click *SELECT*.

-or-

After the first time, click the vertical ellipses in the upper right corner, click *Settings* and click a space under *Settings*.

3. In the Widget Options panel, select the applicable default options and click *SAVE*.

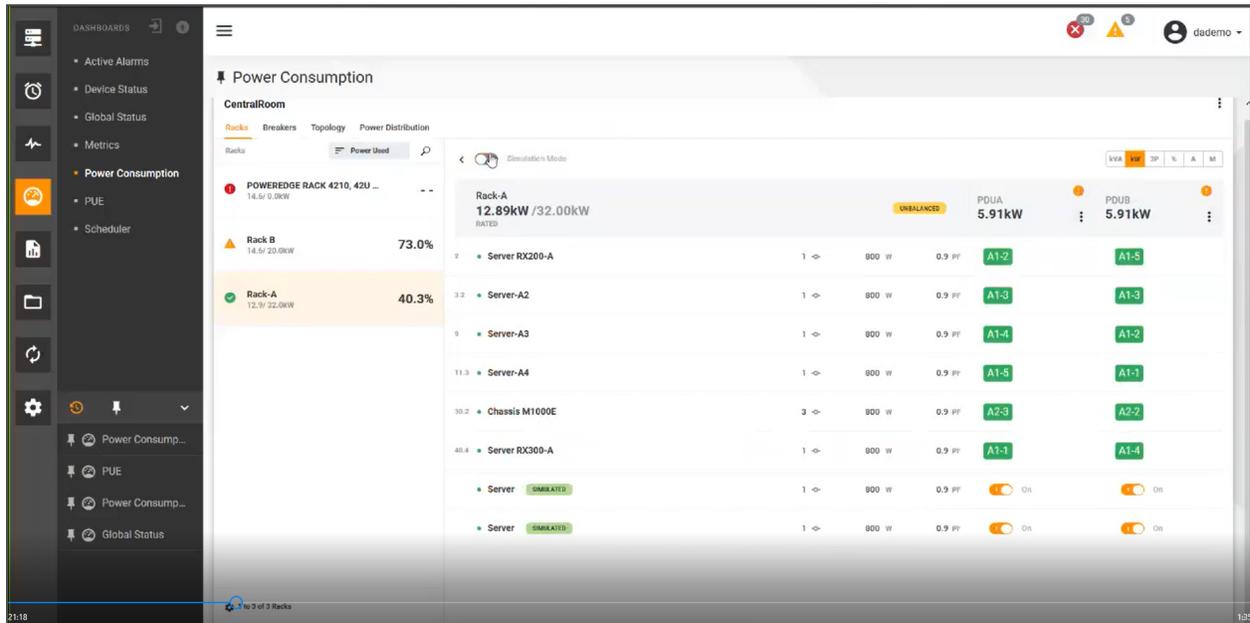
NOTE: After accessing the Power Consumption window the first time, the previously selected space is displayed by default until you select a new space.

Racks

The Racks window is the default Power Consumption dashboard. It lists the available racks in the selected space and the power details of the racks. You can scroll to locate a rack in the list or sort them using *Power Used* or *Power Available*. A legend in the upper right corner provides selectable units of measure for power results. The options are: kVa (kilo-volt-ampere), kW (Kilowatt), 3P (3P-Phase - power consumed per phase), % (Percent power being consumed), A (Amps) and M (Measured in real-time). Only the applicable units of measurement are displayed.

Racks are listed on the left side of the panel. For each rack, the consumed and designed power is shown, as well as the percentage of used power and a graphical representation. The lower left panel includes an option to select the number (20, 40, 60) of racks to display. In the middle of the window under the rack name is the RU location of the rack, total power consumed (in bold) and the designed power value. If there are servers in the rack, they are listed under these values. The server's rack unit (RU) is to the left of the server name. If there are PDUs in the rack, the PDUs, their ports and the total amount of power being consumed by each PDU is displayed on the right.

Figure 2.12 Power Consumption Racks



To display a rack's power consumption values:

1. After a space is selected in the Power Consumption dashboard, select a rack in the Space's window.
2. In the Widget options panel, select the applicable default options and click SAVE.

Breakers

The Breakers window describes the panelboards and breakers that are connected to a selected rack. This dashboard displays how much power is consumed by each breaker and the load values for each breaker phase (A, B or C).

Simulation Mode allows you to view panelboards and their breakers.

Figure 2.13 Power Consumption Breakers

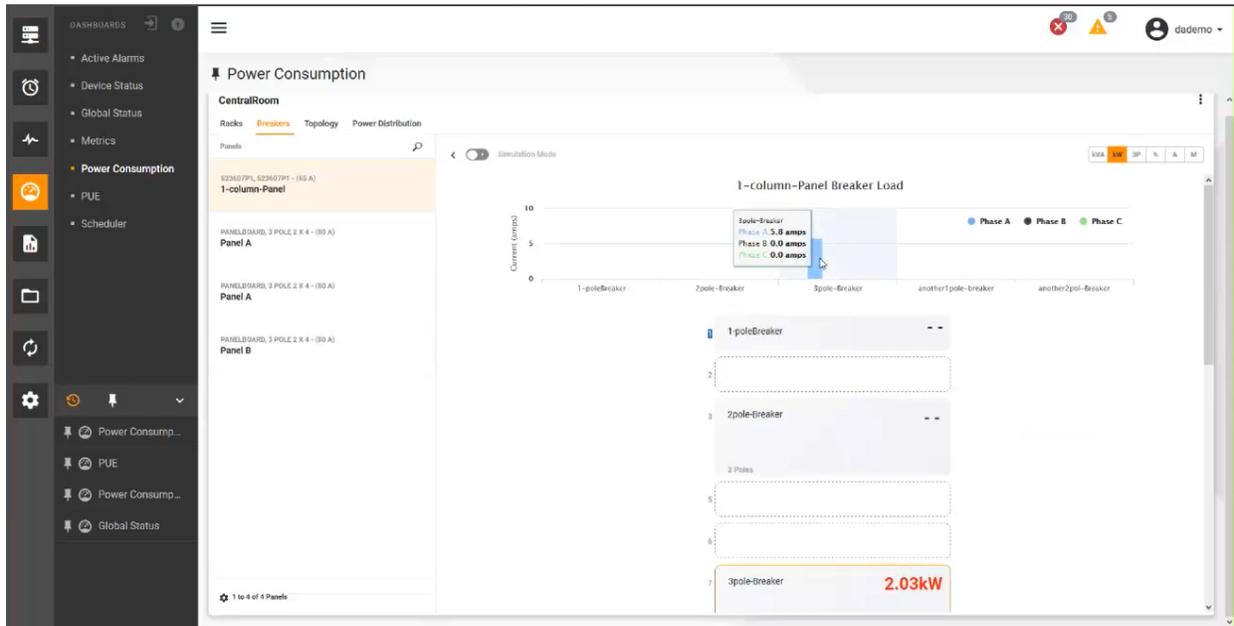
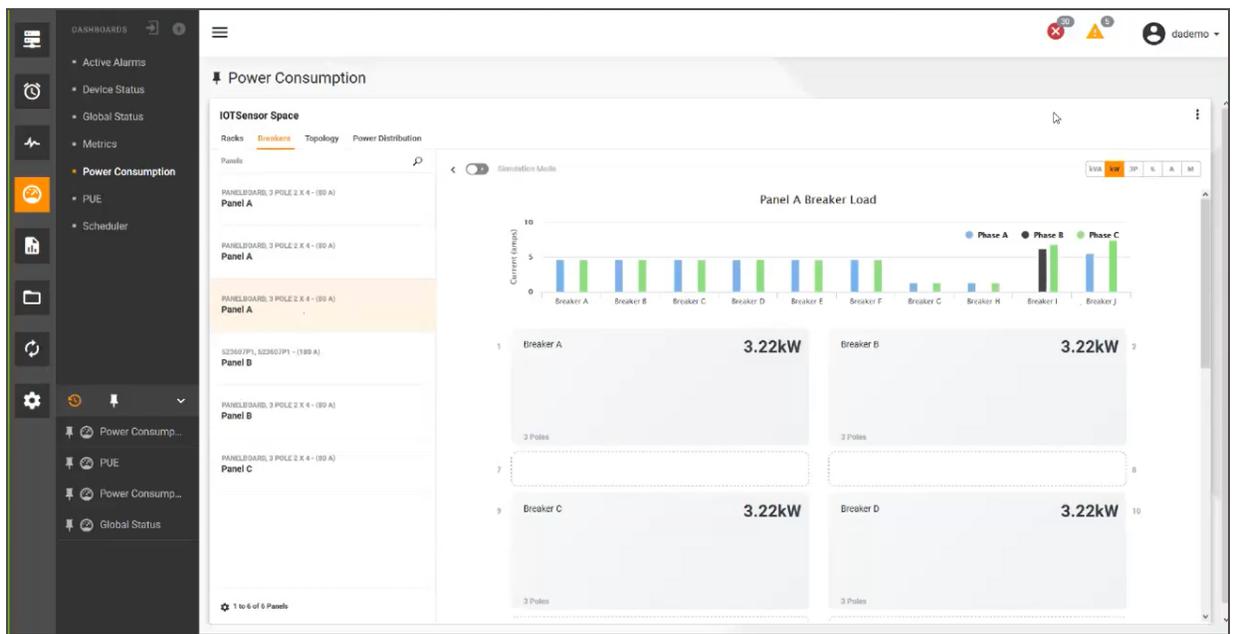


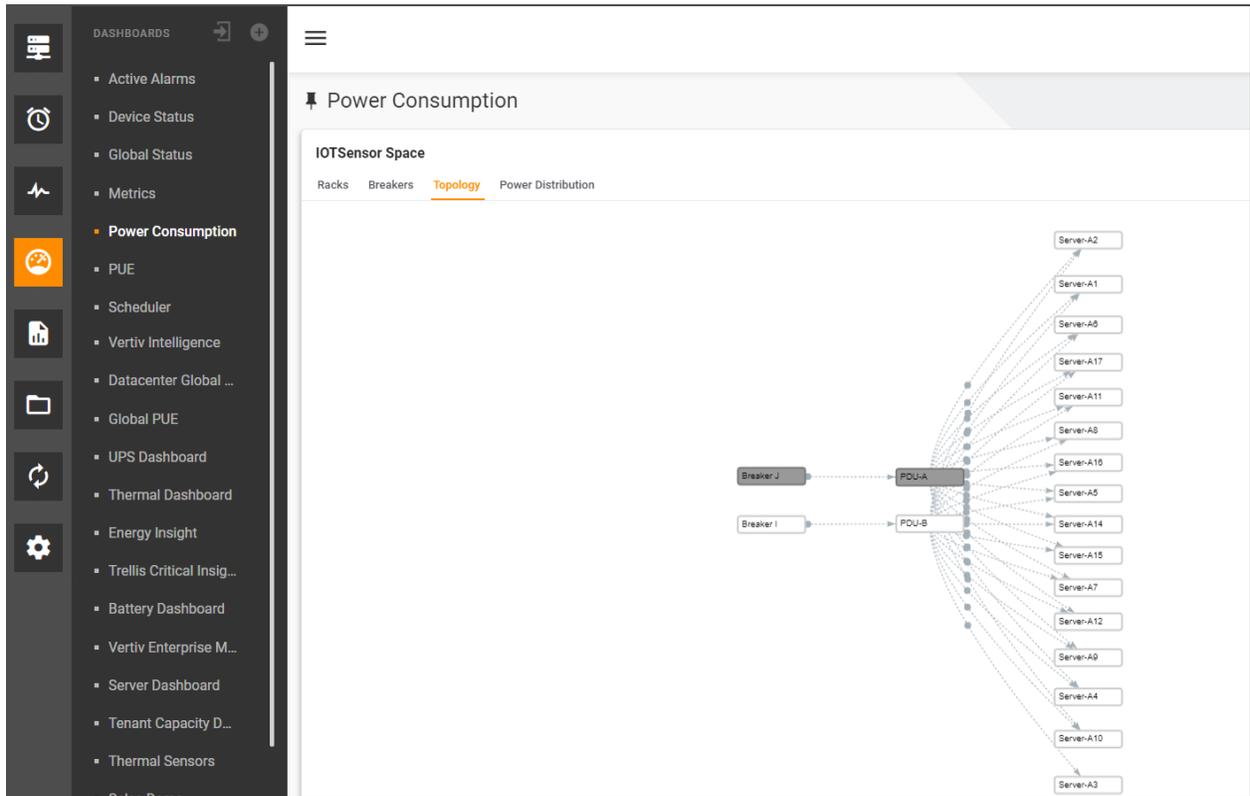
Figure 2.14 Panelboard Breaker Consumption Values



Topology

The Topology window illustrates power distribution from the electrical panel to the servers. The diagram shows which breakers and PDUs are supplying power to each server. Clicking a PDU in the diagram displays its Properties panel. The Properties panel displays the manufacturer, device, assigned tenants, monitoring details, available power/weight/space, the device's location and user-defined properties. The Properties panel items can be customized.

Figure 2.15 Topology



To display a PDU's Properties panel:

1. In the Power Consumption dashboard header, click *Topology*.
2. In the diagram, click a PDU.
3. In the displayed Properties panel, click the arrows in each section to details.

To customize the Properties panel:

1. With the PDU's Properties panel displayed, click the *Customize* button.
2. Select the items to add or remove from the Properties panel.
3. Click *Done Customizing*.

Power Distribution

The Power Distribution window illustrates the flow of the consumed power in a space. The following figure illustrates the power flow utilization from panel to breakers to PDUs to servers.

Figure 2.16 Power Distribution Window

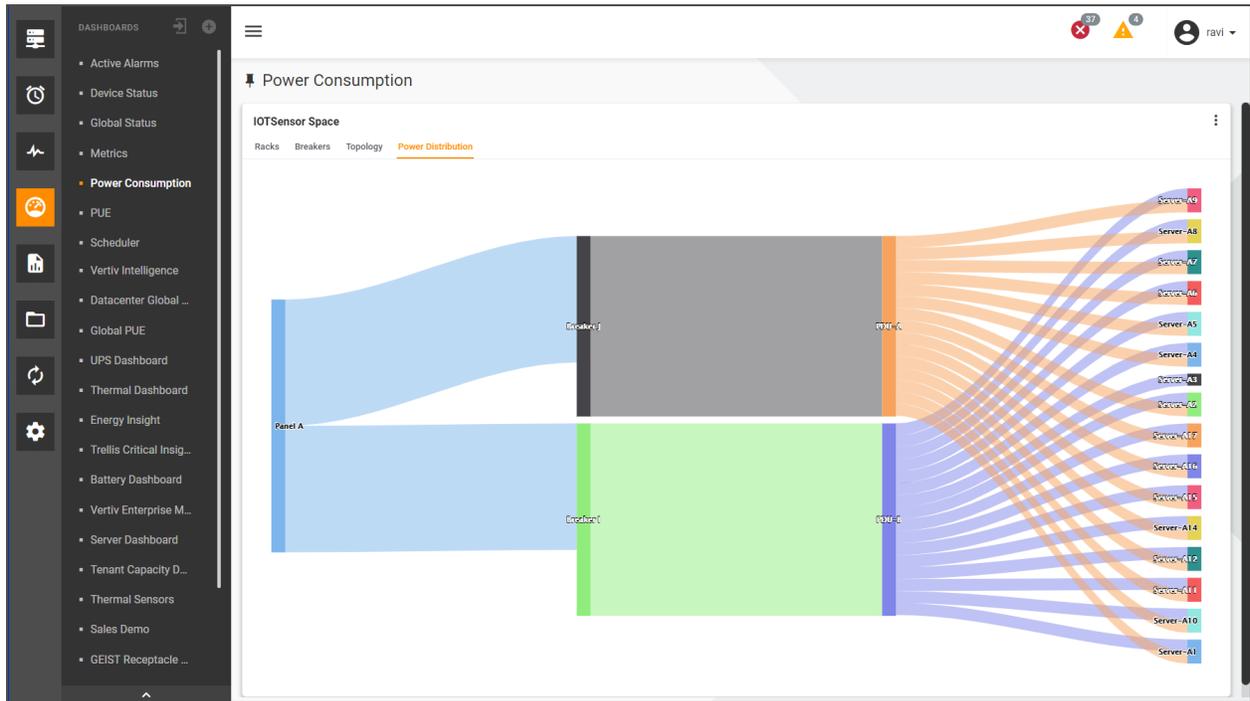
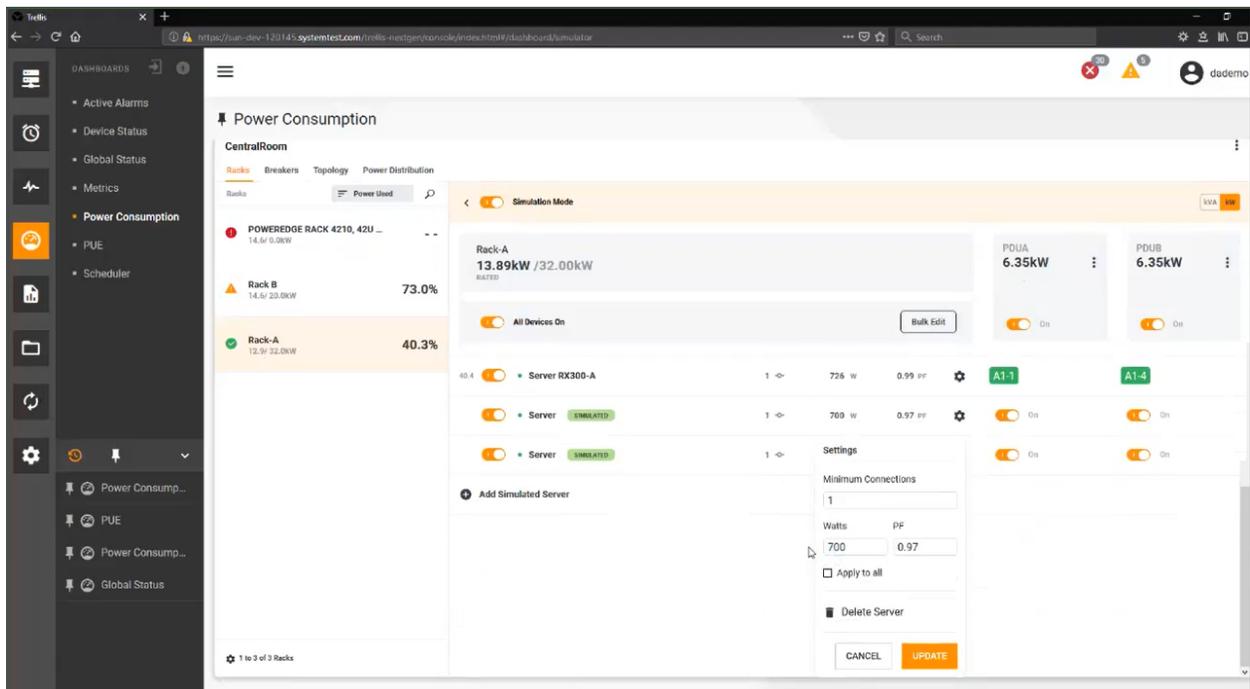


Figure 2.17 Simulation Mode



To modify the power consumption and power factor of server instances:

1. In the Racks or Breakers window, click to enable the Simulation Mode switch.
2. Click the vertical ellipses in the dashboard header and click *Settings*.

3. Modify the applicable widget options and click *SAVE*.

To verify the maximum number of servers that can be supported by a PDU:

1. In the Racks or Breakers window, click to enable the Simulation Mode switch.
2. Click the Add Simulated Server icon.
3. Continue to add servers until the power factor (PF) exceeds the maximum allowed value.

-or-

Change the consumption values of the servers.

-or-

Click the simulated servers' switches to enable or disable them to verify how many servers the PDU can handle.

To edit the designed power values and power factors of simulated servers:

1. In the Racks or Breakers window, click to enable the Simulation Mode switch.
2. Click the Add Simulated Server icon to add servers.
3. Click the *Bulk Edit* button, enter new power value and power factor values and click *Apply*.

-or-

Click the Settings icon, change individual server consumption values and click *Update*.

Simulation Mode

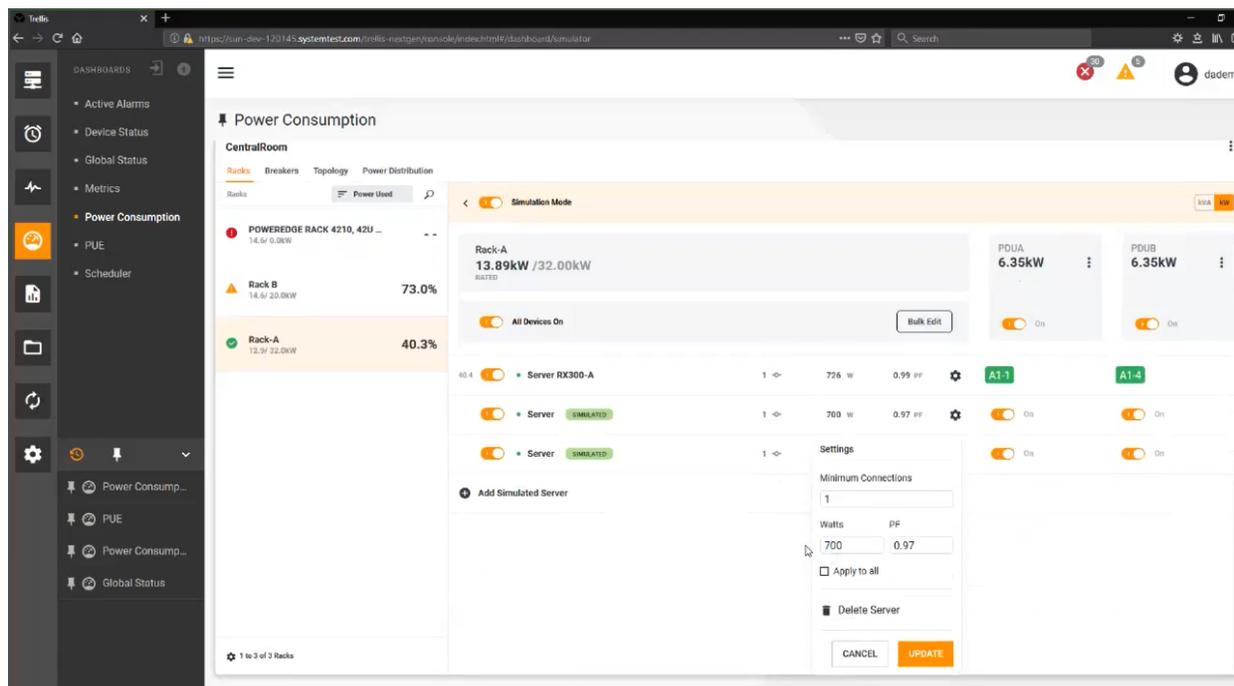
The Simulation Mode allows you to view power used versus power available and test power capacity scenarios. For example, you can verify how many PDUs are needed to power devices and how many servers can be connected to a PDU.

Simulated servers are labeled in order to keep track of them. For each simulated server you can verify the amount of power consumed and for each PDU you can verify the total power consumed as you add servers. If the PDU power is totally consumed, you can find a PDU with available power and available rack space to move one or more servers. If a PDU is off, you can see how the added power will affect a redundant PDU.

You can perform the following in this mode:

- Plan with available and used power values
- Determine which racks/PDUs have capacity to add a server
- Display power simulation with one or multiple PDUs
- Display all the receptacles in the rack
- Display all the power ports in a server
- Apply bulk or singular server edits

Figure 2.18 Simulation Mode



To modify the power consumption and power factor of server instances:

1. In the Racks or Breakers window, click to enable the Simulation Mode switch.
2. Click the vertical ellipses in the dashboard header and click *Settings*.
3. Modify the applicable widget options and click *SAVE*.

To verify the maximum number of servers that can be supported by a PDU:

1. In the Racks or Breakers window, click to enable the Simulation Mode switch.
2. Click the Add Simulated Server icon.
3. Continue to add servers until the power factor (PF) exceeds the maximum allowed value.

-or-

Change the consumption values of the servers.

-or-

Click the simulated servers' switches to enable or disable them to verify how many servers the PDU can handle.

To edit the designed power values and power factors of simulated servers:

1. In the Racks or Breakers window, click to enable the Simulation Mode switch.
2. Click the Add Simulated Server icon to add servers.
3. Click the *Bulk Edit* button, enter new power value and power factor values and click *Apply*.

-or-

Click the Settings icon, change individual server consumption values and click *Update*.

2.8.6 Power and cooling data

Since the navigator persists your location in the data center, you can jump to the Power and Cooling panels of the *Trellis*™ platform UI without losing context of your area of interest. The Metrics (or Latest Readings) Dashboard supports viewing and comparing two devices at the same time. This provides analytics over various real-time data like power, cooling and so on. The following is additional information about power and cooling windows:

- The power landing window lists the topologies.
- A list of all the buildings that have topology diagrams are displayed in the power panel. When you select the *Add* icon to create a new diagram, a prompt asks you to associate it to an existing building. The topology diagram construction uses the same icon as Graphical Edit view. When you select the *Add* icon, you are provided a list of inventory in the selected building. You can filter to reduce the list and drag the selected asset into the topology diagram, where it is converted into an electrical symbol and removed from the Search Results List.
- Selecting an asset in a graphical view displays the thermal capacity, CFM and cooling efficiency data for that device.
- Selecting Average Rack Temperatures shows all of the cooling data for a rack in the selected location. You can filter and sort real-time data to look for anomalies or compare metrics across devices.
- Sensor readings allow for a more granular view of readings for sensors that are mounted on racks. The readings can also be sorted or searched, giving visibility to higher values.
- Service Processor readings allow for a more granular view of readings for servers that are mounted on racks. The readings can also be sorted or searched, giving visibility to higher values.
- You can view datapoint threshold settings for any cooling device.

2.8.7 Power Usage Effectiveness (PUE)

PUE is an industry metric for measuring how well a data center is delivering energy to its IT equipment. It has been adopted globally as the preferred standard for determining performance efficiency.

The PUE dashboard allows you to view and print the PUE for a building using selected devices and a selected range of dates. The PUE graph, located in the upper panel, provides the PUE results based on the selected target values, threshold values and devices in the building. In the graph, the target is the optimal PUE value you want the device to have. The threshold values, Good, Fair and Poor, are assigned in the Building Settings window.

Under the PUE graph is a time bar that allows you to zoom in to view the PUE history in shorter timeframes, such as a specific day or during the hours in a day.

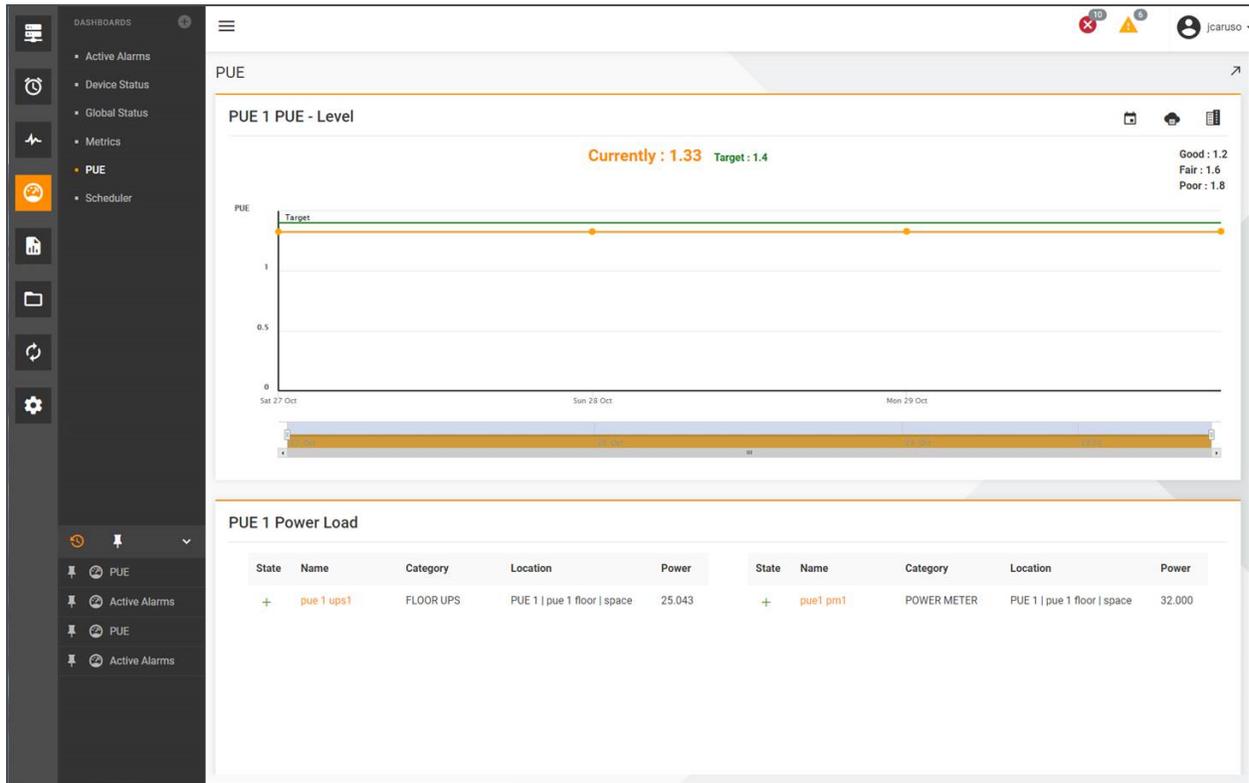
The lower panel provides the power load from each selected IT or facility device and includes each device's category and location.

NOTE: For more about Highcharts, a third party supplier for the graphical charts, click [Highcharts.com](https://www.highcharts.com).

NOTE: When collecting data, you can only select a date prior to the date the PUE data collection.

See [Understanding Power Usage Effectiveness \(PUE\)](#) on page 196.

Figure 2.19 PUE Dashboard



To add a building to the PUE dashboard options:

1. Click the Portfolio icon, expand the enterprise and select a building.
2. Click the Edit icon, and in the Details window, scroll down to the PUE Configuration panel.
3. Complete the fields and click *SAVE*.

To add or subtract devices to/from the PUE configuration:

1. Click the Monitoring icon.
2. In the Configuration window, select the device to add, subtract or remove from the PUE configuration.
3. Click the Add, Subtract or Remove icon.

To see the PUE dashboard of another building:

1. Click the Dashboard icon and select *PUE*.
2. In the PUE dashboard, click the Building Settings icon.
3. In the Building Settings window, click the Building drop-down arrow and select a building.
4. If necessary, update the target and thresholds.

To change the start date:

NOTE: The start date must be a date prior to the configuration date.

1. Click the Dashboard icon, select *PUE* and click the Start Date icon.
2. In the Start Date window, click the date and click *ACCEPT*.

To zoom in to a more specific time period:

1. In the PUE dashboard, click and hold the rectangle tab on either end of the second bar graph.
2. Slide the tab left to right to alter the view of the upper graph.

To print the graph:

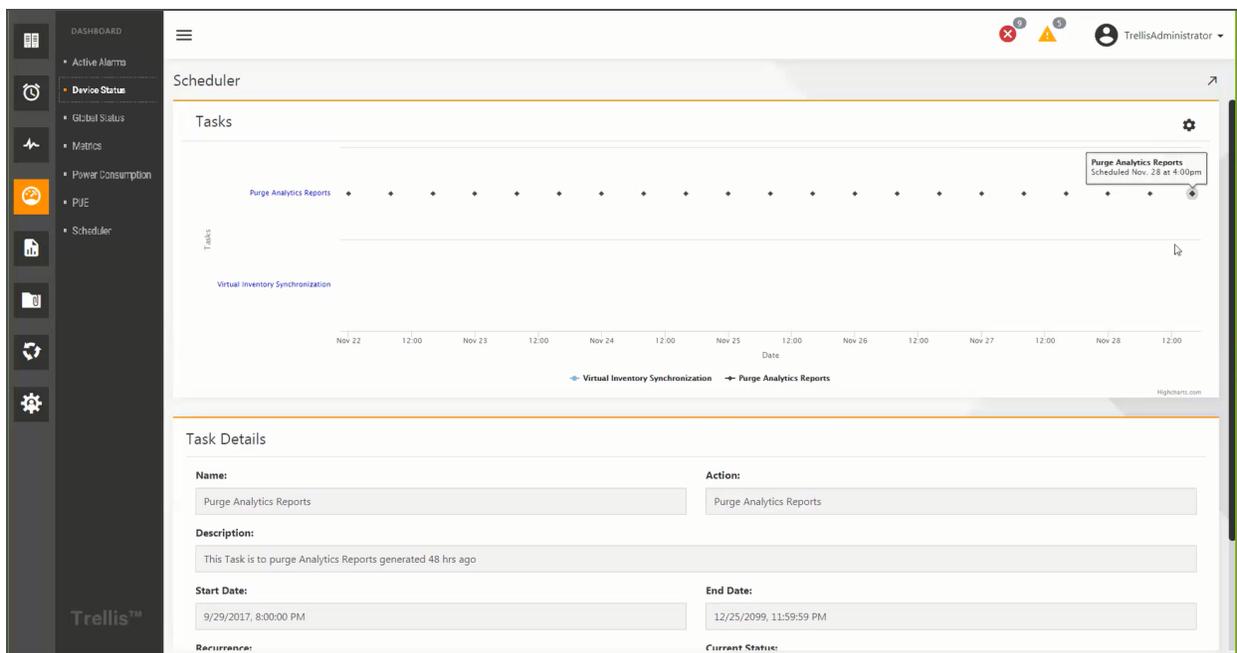
Click the Dashboard icon, select *PUE* and click the Print icon.

2.8.8 Scheduler

The Scheduler dashboard is a read-only view of project tasks on a timeline. You can hover the cursor over the timeline to display task details such as the dates analytic reports are purged. The Range icon displays a drop-down menu with the 1 DAY, 3 DAYS, 5 DAYS or 7 DAYS options.

In the Tasks graph, Purge Analytics Reports is the system maintenance task that purges old analytic reports from the *Trellis*™ environment. This task is executed three times per day. Virtual Inventory Synchronization is the system maintenance task responsible for keeping the current *Trellis*™ virtual inventory updated. This task is executed twice per hour for the length of time to perform each task.

Figure 2.20 Scheduler Dashboard



To schedule a report:

1. Click *Reports* and under Folders, select the template type.
2. Under Report Templates, select a report template and select *Schedule*.
3. Enter a job name and description, enable the Start Date and Time radio button and click the calendar icon to select a date.
4. Slide the hour and minute bars to the desired time and click *Close*.
5. If applicable, select a time zone from the drop-down list.
6. For Recurrence, click *Run Once* and click *Next*.

-or-

Click *Repeat*, select additional options and click *Next*.

7. For Parameters, under Set the Parameter Values, select a report from the Use saved values list and click *SAVE*.

-or-

Select the applicable parameters in each field and click *Next*.

8. For Report Output Properties, enter a name, description and select a file format.
9. Select a language from the Output Translation drop-down list and click *Submit*.

To archive/purge events using the Scheduler:

1. Click *Scheduler* to display the scheduler calendar, select *New Task* and enter a task name, description and action name.
2. Select *Archive Alarms and Events* from the Action Types list.
3. Select an action from the Added Actions list and click *Add Action*.
4. Select *Schedule* to open the Scheduling Information window.
5. Click *Run Now*.

-or-

Select a later date and click *Next*.

6. Click *Add to Calendar* to create the new task containing the Archive Alarms and Events action type, and execute at the scheduled time.

2.9 Custom Dashboards and Widgets

Custom dashboards can be created and accessed from the dashboard menu. A custom dashboard is created by adding widgets to a customer-created dashboard. An unlimited number of widgets can be created on each dashboard, but you may want to group certain widgets on separate dashboards. Each widget is automatically added after the last widget in the dashboard or you can drag widgets to place them in a specific order.

NOTE: Only the originator can view custom dashboards. You can export and import custom dashboards in order to share a dashboard with other users across tenancy. The file is the same dashboard name with the extension .tboard. After exporting the file, it can be sent via email or other methods.

The following are some of the available widgets to add to a custom dashboard.

Table 2.17 Widget Descriptions

WIDGET	DESCRIPTION
Active Alarms	Active warning and critical alarms
Datapoint Gauge	Device data points and status
Datapoints Average Gauge	Device data points average
Datapoints Tabular	Lists data point trends
Datapoints Trend	Unlimited number of data points on a single device
Devices Trend	Device trends
Enterprise Capacity	Overall data center capacity
Global Status	Status of all the data center around the globe
PUE Gauge	Current PUE value and the target value of a building
PUE Timeline	PUE values for one or more buildings on a timeline
Rack Consumed Space	Consumed space in a rack
Rack Capacity	Available and consumed space, power and cooling values based on the tenants
Receptacles Control	Values for all rack PDUs or power strips and one common receptacle
Receptacles Datapoints Trend	Trending values for multiple receptacles' data points
Receptacles Devices Trend	Trend of available data points of common devices and one receptacle
Receptacles Table	Lists the receptacles of the selected rack PDUs or power strips; receptacles can be deselected
Thermal	Thermal values for data and trending information and comparisons
URL	URL data, such as a data center cam

The following widget sizes are possible, depending on the widget type: one fourth, one half, three fourths or full. Views can be based on a date (Last Day, Last 3 Days, Last Week, Last Month, Last Year or Custom), and a color legend can be displayed to identify devices.

If you create a widget and then select a device and a data point, you must save the widget to retain the selections and data. If you reload the widget without saving, you will see the widget in the initial state again with no data saved.

Any custom dashboard can be set as your default homepage for the *Trellis*™ platform UI. The Home Page icon in the header is orange when a dashboard is selected as the default homepage.

The PUE Gauge, PUE Timeline, Active Alarms, Datapoint Gauge, Table and Receptacle Table widgets poll the server for information every minute. All other widgets update information when you refresh the window.

Some widgets can be used to compare different buildings or different devices in a single widget. For example, you can compare different buildings in the PUE Timeline widget. For device comparisons, the Devices Trend widget compares the same data point on multiple devices, and the Receptacles Devices Trend widget compares a common data point for multiple devices, with one different receptacle for each device.

Other widgets can also be used to compare devices or buildings. For example, you can use the Datapoint Gauge widget to display a datapoint value for one device, and add more Datapoint Gauge widgets side-by-side with the same data point and a different device.

The following procedure is an example of creating a dashboard to view information about a device and a sensor on the device.

To create a custom dashboard with one or more widgets:

1. Click the Dashboard icon and click the Add icon in the DASHBOARDS menu header.
2. In the New Dashboard window, enter a name for the new dashboard and click *SAVE*.
3. In the new dashboard, click the Add Widget icon in the middle of the window or in the header.
4. In the Add Widget window, select a widget type from the list and enter a name for the widget in the field.

NOTE: The name must have at least three alpha characters.

5. Select the widget size, click *SAVE* and click the Add Widget icon.
6. Click *SELECT DEVICE* and enter the device type in the Inventory Search window.
7. Select the type of data points, click *UPDATE* and wait for the latest reading.
8. If you want to check a trend on the same device (such as a sensor for the device), in the Inventory Search window, click the Add Widget icon and click *SEARCH*.
9. Click the data point type, enter the minimum and maximum values and click *UPDATE*.

To export a custom dashboard:

NOTE: If the original user modifies the dashboard, those changes are not reflected in the imported dashboard. The export/import functionality only works with the data available in the dashboard when it is exported.

Click the Dashboard icon and click the Export icon.

To import a custom dashboard:

Click the Dashboard icon and click the Import icon.

To configure a custom dashboard as the UI home page:

With a custom dashboard displayed, click the Set as Home page icon in the header.

NOTE: If you delete a custom dashboard that is set as the home page for the UI, the dashboard defaults to the Global Status dashboard.

To edit a dashboard name:

1. Click the Dashboard icon and hover the cursor over the dashboard's name to display the Edit icon.
2. Click the dashboard's Edit icon, and in the Edit Dashboard window, enter the new name and click *SAVE*.

To delete a dashboard:

1. Click the Dashboard icon and click a dashboard.
2. In the dashboard's window, click the Delete icon and click *DELETE*.

To edit a widget's name:

In the widget header, click the Edit icon and enter a new name, click *UPDATE* and click *SAVE*.

-or-

In the DASHBOARDS panel, hover the cursor to the right of the widget and click the Edit icon, enter a new name and click *SAVE*.

NOTE: The same procedures are used to view, edit or delete standard and custom dashboards.

NOTE: With the dashboard displayed, you can hover over a widget's header to view the size options and select a size for the widget.

To change a widget's building:

Click the vertical ellipses icon, click *Settings*, select a device or building and click *SAVE*.

To change a widget's start date:

Click the calendar icon, click the new start date and click *ACCEPT*.

To display a widget's legend and identify the devices by color:

Click the Legend icon.

To delete a widget:

1. Click the Dashboard icon and select a dashboard.
2. On the individual widget panel, click the vertical ellipses icon and select *Delete*.

2.9.1 Active Alarms

The Active Alarms widget provides the total Active Warnings and Active Criticals data collected, which is based on the dates you select to start obtaining data and the widget size you select. The smallest widget size displays the total Active Warnings and Active Criticals and the Timeline, Days and Calendar are hidden. The larger widget sizes display the total Active Warnings, Active Criticals and the active alarms on a timeline.

To add and configure the Active Alarms widget:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Add Widget window, select *Active Alarms* and enter a name for the widget.
3. Select a widget size and click *SAVE*.
4. Hover the cursor over the timelines to see the total active alarms for specific days.
5. To change the widget size, click the vertical ellipses and select a size icon.
6. To delete the widget, click the Vertical Ellipses icon and click *Delete*.
7. To change the date to start retrieving data, click the Calendar, click the start date.

Figure 2.21 Level Two - Used Space Example

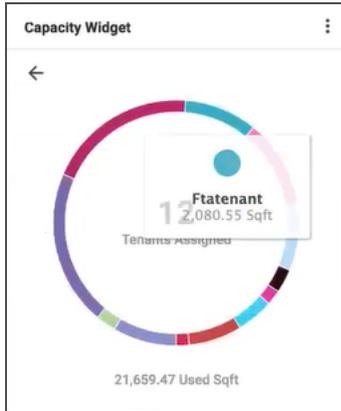


Figure 2.22 Level Three - Remaining Space Example



To add and configure the Capacity widget:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Add Widget window, select *Capacity*, enter a name for the widget and click *SAVE*.
3. In the Capacity panel, click the drop-down arrow, select *Space*, *Power* or *Cooling* and click *SAVE*.
4. Verify the total, sold and available space (square footage).
5. Click the color to display the space (square footage)/power/cooling of the sold space and the number of tenants.
6. Verify the assigned space (square footage)/power/cooling and hover the cursor over the colors to see which tenants are using the space, power or cooling and how much they are using.
7. Click the vertical ellipses icon, click *Settings* and select another capacity (space, power or cooling) to view.

To select a different capacity option:

1. Under Capacity Widget, click the back arrow.
2. In the Capacity widget, click the drop-down arrow, select *Space*, *Power* or *Cooling* and click *SAVE*.

2.9.2 Capacity

The Capacity widget allows you to see the total, used and remaining values for space, power or cooling capacity based on the tenants in a building. The Enterprise Capacity widget can also be added to a dashboard in order to display overall data center capacities.

Three levels of information can be displayed. Level one displays the total, sold and available square footage/power/cooling and the number of tenants. Level 2 displays the total number of used square footage/power/cooling, that is assigned to each tenant. Level 3 displays the remaining space/power/cooling totals. Red indicates power values in kW and blue indicates space or cooling. Cooling is also shown in kW values.

Figure 2.23 Level One - Total, Sold and Available Space Example

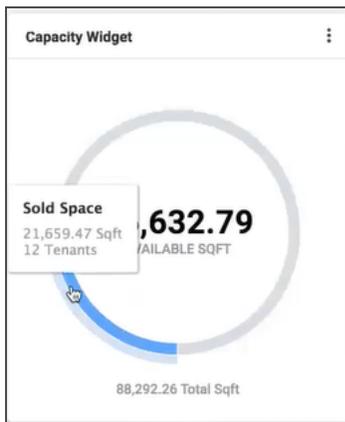


Figure 2.24 Level Two - Used Space Example

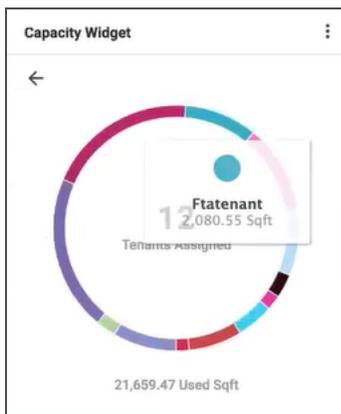
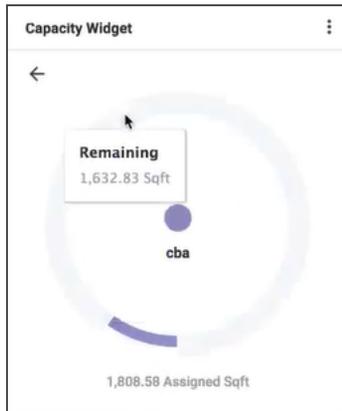


Figure 2.25 Level Three - Remaining Space Example



To add and configure the Capacity widget:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Add Widget window, select *Capacity*, enter a name for the widget and click *SAVE*.
3. In the Capacity panel, click the drop-down arrow, select *Space*, *Power* or *Cooling* and click *SAVE*.
4. Verify the total, sold and available space (square footage).
5. Click the color to display the space (square footage)/power/cooling of the sold space and the number of tenants.
6. Verify the assigned space (square footage)/power/cooling and hover the cursor over the colors to see which tenants are using the space, power or cooling and how much they are using.
7. Click the vertical ellipses icon, click *Settings* and select another capacity (space, power or cooling) to view.

To select a different capacity option:

1. Under Capacity Widget, click the back arrow.
2. In the Capacity widget, click the drop-down arrow, select *Space*, *Power* or *Cooling* and click *SAVE*.

2.9.3 Global Status

The Global Status widget is the default widget displayed when the Dashboard icon is selected. This widget displays building information for data centers around the globe. You can hover the cursor over the continents to see the number of buildings in each location and how many total alarms are active for the facility.

When a building is selected, the side panel displays the building's warning and critical alarms, as well as the following additional details: latitude, longitude, power, thermal and space consumed. If you select a larger widget size, the active alarms are displayed over time. The buildings are color coded in the chart.

To add and configure the Global Status widget:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Add Widget window, select *Global Status* and enter a widget name.
3. Select a widget size and click *SAVE*.
4. Click the vertical ellipses icon to change the widget size or delete the widget.

2.9.4 Datapoint Gauge

The current, minimum and maximum data point values are shown on the Datapoint Gauge widget. The status and name of the device datapoints are displayed. Results can be red to green for a battery, blue to violet for temperature or green to red for all other values.

Figure 2.26 Datapoint Gauge Widget Example



To add and configure the Datapoint Gauge widget:

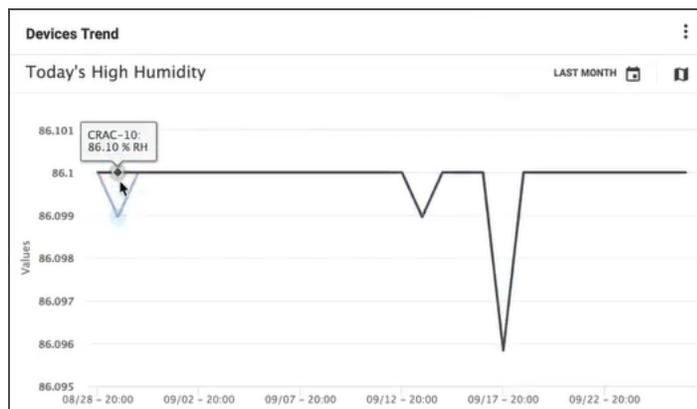
1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Add Widget window select *Datapoint Gauge* and enter a name for the widget.
3. Select a widget size, if applicable, and click *SAVE*.
4. Click *SELECT DEVICE*.
5. In the Inventory Search window, enter a device type, such as CRAC, and click *SEARCH*.
6. Click the Add icon for a device and select the data points from the list.
7. If applicable, enter the minimum and maximum values.
8. Click *SAVE*.

NOTE: If desired, click the vertical ellipses icon, select *Settings*, select the refresh icon to search for and change the device to see its current datapoint values.

2.9.5 Devices Trend

The Devices Trend widget is used to collect data from multiple devices and a common datapoint. Collecting data for this widget may take extra time based on the selected devices and the number of devices. The type of data and values are dependent on the datapoint selected. The start date is selectable using the calendar icon and a legend lists each device being represented in the graph and the color used to identify it.

Figure 2.27 Devices Trend Widget Results Example



To add and configure the Devices Trend widget:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Add Widget window, select *Devices Trend* and enter a name for the widget.
3. Select a widget size, if applicable, and click *SAVE*.
4. In the Devices Trend panel, click the Category drop-down arrow and select a device type.
5. In the list of devices in the selected category, click the checkbox for one or more devices.
6. Click the radio button for the devices' common datapoint and click *SAVE*.
7. Hover the cursor over the graph for details by date.

2.9.6 Datapoints Trend

The Datapoints Trend widget displays the trend of an unlimited number of data points on a single device. Collecting data for this widget may take extra time based on the selected data points and the number of data points. The values can be retrieved by device, date and the type of trending category being retrieved. A color legend indicates the trend categories. In the data trend panel, black indicates humidity and blue indicates temperature.

To add and configure the Datapoints Trend widget:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Add Widget window, select *Datapoint Trend* and enter a name for the widget.
3. Select a widget size, if applicable, and click *SAVE*.
4. Enter a name, select a widget size icon and click *SAVE*.
5. In the Inventory Search window, select the device.
6. In the Datapoints Trend window, select as many data points as you want and click *SAVE*.

2.9.7 Datapoint Table

This widget renders the list of datapoints. Each row contains the name, current value and the actual threshold, if any. For each datapoint, the left side bar indicates the alarm status using the following colors: Green = normal, orange = warning, red = critical and gray = no value. The threshold values are provided on the right.

In this widget, you can change the device and/or receptacles, and you can select a different widget size. The larger widget size displays additional datapoint information, such as Low Critical, High Critical, Equals Warning, Equals Critical and the Target.

Figure 2.28 Datapoint Table Widget Results Example

Datapoint Tabular							
CRAC-10	Low Warning	High Warning	Low Critical	High Critical	Equals Warning	Equals Critical	Target
HOT WATER / HOT GAS STATE Off					--	--	
RETURN HUMIDITY 68.50% RH	130.00	22.20			--	--	
EXT AIR SENSOR B HUMIDITY 66.10% RH					--	--	

To add and configure the Datapoint Table widget:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Add Widget window, select the *Datapoint Table* and name the widget.
3. Select the widget size, if applicable, and click *SAVE*.
4. In the Datapoint Table panel, click *SELECT DEVICE*.
5. In the Inventory Search window, enter the device and click *SEARCH*.
6. In the list of devices, click the Add icon to add a device and click *SEARCH*.
7. In the Datapoint Table panel, click as many datapoint checkboxes as desired and click *SAVE*.

2.9.8 PUE Gauge

After all the information is completed and saved, this widget displays the current minimum, maximum, target and actual PUE value for a building.

To add and configure the PUE Gauge widget:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Add Widget window, select *PUE Gauge*, enter a name for the widget and click *SAVE*.

NOTE: The widget name must be at least three characters.

3. In the PUE Gauge widget, click the vertical ellipses icon and select *Settings*.
4. Click the up/down arrows, select a building from the list and click *SAVE*.

NOTE: Only buildings with a PUE configuration are listed.

2.9.9 PUE Timeline

A building's PUE values can be shown over a period of time. The different widget sizes allow you to decide how much information you want to display. The data is retrieved from the selected start date to the current date. In the results, the legend identifies each building by color.

To add and configure the PUE Timeline widget:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Add Widget window, select *PUE Timeline* and enter a name for the widget.

3. Select a widget size icon and click *SAVE*.
4. In the Timeline panel, hover the cursor over the buildings, click the Add icon to select one or more buildings in the list and click *SAVE*.

NOTE: Only buildings with a PUE configuration are listed.

To change one or more buildings for the PUE Timeline:

1. On the Timeline widget, click the vertical ellipses icon and click *Settings*.
2. In the Timeline panel, hover the cursor over the buildings, click the Add icon to select one or more buildings in the list and click *SAVE*.

To add and configure the Receptacles Table widget:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Add Widget window, select **Receptacles Table**, enter a name and click *SAVE*.
3. In the Receptacles Table panel, click *SELECT DEVICE* and click *SAVE*.
4. In the Inventory Search window, enter a rack or power strip and click *SEARCH*.
5. In the list of devices, click the Add icon to select a device.
6. In the Receptacle Table panel, select and/or deselect the applicable receptacles to collect data from and click *SAVE*.

NOTE: The scrollbar scrolls left to right to show all the columns.

To change the datapoint types:

Click the eye icon in the Receptacles Table header, then scroll to and select the applicable datapoints.

NOTE: By default, six datapoint categories are displayed in each Receptacle Table widget.

2.9.10 Receptacle Control

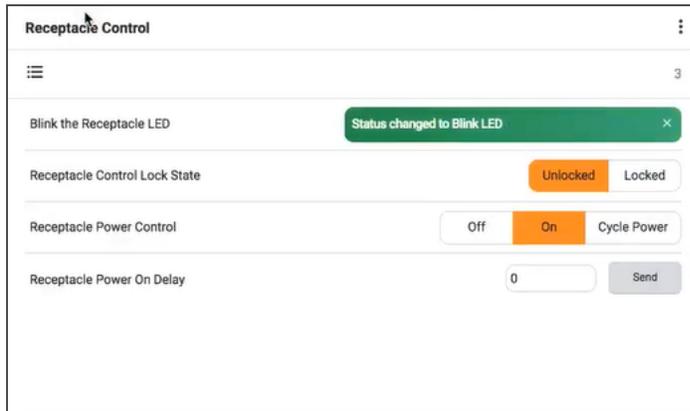
This widget displays the values for all rack PDUs or power strips and one common receptacle. A green response shows the status of the data points.

For power, the following options can be applied:

- Blink the Receptacle LED options are No Action or Blink LED.
- Receptacle Control Lock State options are Unlocked or Locked.
- Receptacle Power Control options are Off, On or Cycle Power.
- Receptacle Power On Delay options leave the field as is or change the field to the number of seconds you want to delay before turning the power on.

NOTE: When selecting to change one of these options, a warning tells you how many devices will be effected by the change. You can select to show the affected devices and then change or continue with the operation.

Figure 2.29 Configuring the Receptacle Control Widget Options



To add and configure the Receptacle Control widget:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Receptacle Control panel's left list, click the checkbox of one, multiple or all devices.
3. Under Common Receptacles, select a common receptacle for the previously selected devices and click *SAVE*.

NOTE: In displayed list of control datapoints, you can click the upper left button to display or hide the list of devices.

NOTE: The name of the selected receptacle appears in the upper right corner.

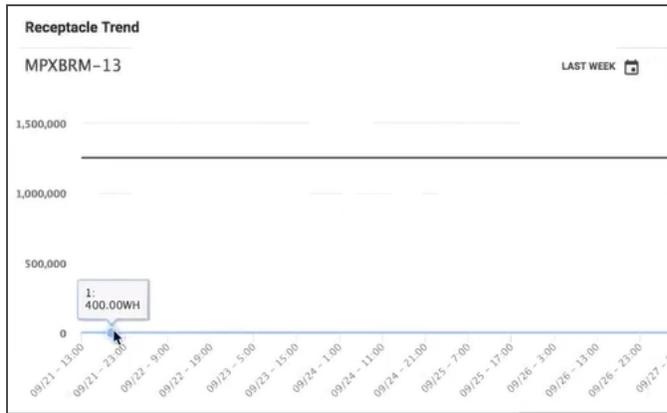
NOTE: Every time you click to change a datapoint, a message provides which and how many devices will be affected by that selection. A Warning states how many devices will be affected by the action. You can click *Show devices* to see the names of the affected devices.

4. In the Warning statement, click *CONTINUE*.
5. In the devices menu with affected devices, click *CONTINUE*.
6. After the datapoint message is displayed, click *SAVE*.

2.9.11 Receptacles Datapoints Trend

This widget allows you to get the trending values for a common datapoint of multiple receptacles. You can change the receptacle and the start date, and you can display the legend to identify the receptacles in the graph.

Figure 2.30 Receptacles Datapoints Trend Widget Example



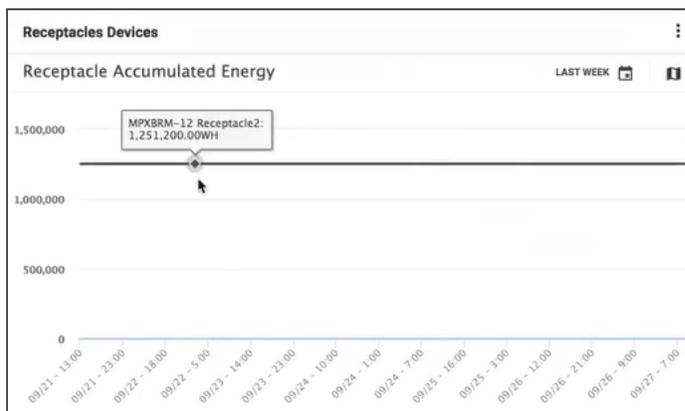
To add and configure the Receptacles Datapoints Trend widget:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Add Widget window, select *Receptacles Datapoints Trend* and enter a name.
3. Select the widget size and click *SAVE*.
4. In the Receptacle Trend panel, click *SELECT DEVICE*.
5. In the Inventory Search window, enter a device type, such as a rack PDU, and click *SEARCH*.
6. Click the Add icon for the device.
7. In the Receptacle Trend panel, select/deselect the receptacles on the left and select a common datapoint for the receptacles on the right and click *SAVE*.

2.9.12 Receptacles Devices Trend

The Receptacles Devices Trend widget displays the trend of one datapoint that is common to several devices. You can change the receptacle and the start date, and you can display the legend to identify the receptacles in the graph.

Figure 2.31 Receptacles Devices Trend Widget Example



To add and configure the Receptacles Devices Trend widget:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Add Widget window, select *Receptacles Devices Trend* and enter a name for the widget.

3. Select the widget size and click *SAVE*.
4. In the Receptacles Devices panel, click the checkboxes to select one, multiple or all rack PDUs or power strips in the list.
5. For each device's receptacle, click the Receptacle drop-down arrow and click the radio button of the applicable receptacle.
6. Click the radio button of the applicable, common datapoints for the receptacles and click *SAVE*.

2.9.13 URL

The URL widget displays an external URL in your dashboard, such as for a datacenter cam. This widget can be four different sizes.

Figure 2.32 URL Widget Example



To add and configure an external URL:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Add Widget window, select a widget and enter a name for the widget.
3. Select a widget size, if applicable, and click *SAVE*.
4. In the New Dashboard window, enter a device name and click *SAVE*.
5. In the displayed window, click the Add Widget icon.
6. Click *Active Alarms*, enter a name for the widget, select a widget size and click *SAVE*.
7. In the URL panel, click the URL and click *SAVE*.

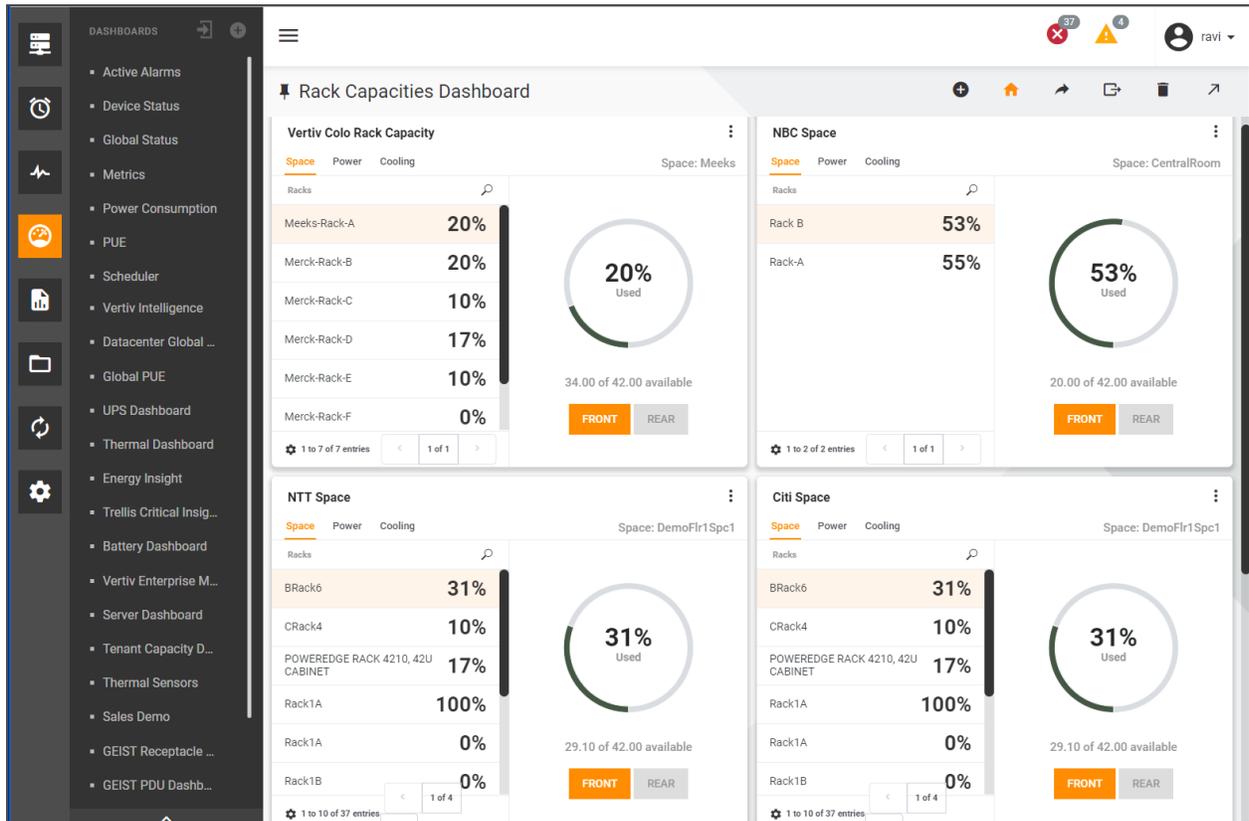
NOTE: Not all facilities allow this widget application.

2.9.14 Rack Capacity

The Rack Capacity widget displays the space (default) and the derated power and cooling consumption values from a rack in the selected space. The Settings option on the vertical ellipses icon provides a list of the available spaces. When a space is selected, all the racks in the space are listed in the window. The number of racks in the list is displayed in the lower border of the widget.

Selecting a rack displays the total percentage of used space, power and cooling as well as the actual used and available consumption values. When the Space window is selected, the consumption is displayed for the front or rear of the rack.

Figure 2.33 Rack Capacities Widget



To create the Rack Capacity widget for rack space, power and cooling:

1. After a dashboard is created, click the Add Widget icon.
2. In the Add Widget window, scroll to and select *Rack Capacity*.
3. Enter a name for the widget, select the size and click *SAVE*.
4. In the widget header, click a space's radio button and click *SAVE*.
5. Click a rack from the list to view the space consumption percentages, and under the image, click the *FRONT* and *REAR* buttons to display the space consumption in both sides of the rack.
6. Click *Power* and *Cooling* to display the power and cooling consumption percentages, respectively.
7. (Optional) Click the vertical ellipses icon and select from the following:
 - Select *Settings*, modify the settings and click *SAVE*.
 - Select *Clone Widget*, select the details for the cloned widget and click *SAVE*.
 - Select *Delete*.

2.9.15 Receptacles Table

This widget applies for rack PDUs or power strips and creates a table of their receptacles. When you select a device, its receptacles are automatically selected, however, you can deselect the ones you are not interested in.

Figure 2.34 Receptacle Table Widget Example

MPXBRM-13	Derived Consumed Energy Over Collection Interval (WattHours)	Derived Total Real Power Consumed (Watts)	Receptacle Accumulated Energy (KiloWatt Hours)	Receptacle Apparent Power Consumed Capacity (VA)	Receptacle Available Current Until Alarm (Amps AC RMS)	Ca
1	--	--	0.4	--	15.2	
2	--	--	1251.2	--	15.2	
3	--	--	404.8	--	15.2	

You can select as many datapoint categories as you would like from the eye icon in the table header. By default, the Receptacles Table displays the following values for each receptacle:

- Derived Consumed Energy Over Collection Interval (Watt Hours)
- Derived Total Real Power Consumed (Watts)
- Receptacle Accumulated Energy (KiloWatt Hours)
- Receptacle Apparent Power Consumed Capacity (VA)
- Receptacle Available Current Until Alarm (Amps AC RMS)

To add and configure the Receptacles Table widget:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Add Widget window, select *Receptacles Table*, enter a name and click *SAVE*.
3. In the Receptacles Table panel, click *SELECT DEVICE* and click *SAVE*.
4. In the Inventory Search window, enter a rack or power strip and click *SEARCH*.
5. In the list of devices, click the Add icon to select a device.
6. In the Receptacle Table panel, select and/or deselect the applicable receptacles to collect data from and click *SAVE*.

NOTE: The scrollbar scrolls left to right to show all the columns.

To change the datapoint types:

Click the eye icon in the Receptacles Table header, then scroll to and select the applicable datapoints.

NOTE: By default, six datapoint categories are displayed in each Receptacle Table widget.

2.9.16 Receptacle Control

This widget displays the values for all rack PDUs or power strips and one common receptacle. A green response shows the status of the data points.

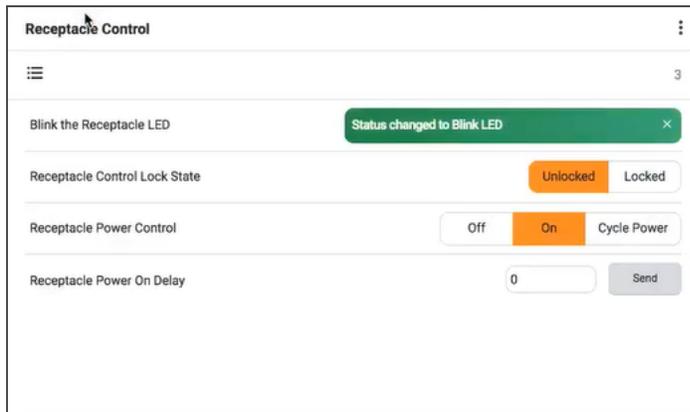
For power, the following options can be applied:

- Blink the Receptacle LED options are No Action or Blink LED.
- Receptacle Control Lock State options are Unlocked or Locked.
- Receptacle Power Control options are Off, On or Cycle Power.

- Receptacle Power On Delay options leave the field as is or change the field to the number of seconds you want to delay before turning the power on.

NOTE: When selecting to change one of these options, a warning tells you how many devices will be effected by the change. You can select to show the affected devices and then change or continue with the operation.

Figure 2.35 Configuring the Receptacle Control Widget Options



To add and configure the Receptacle Control widget:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Receptacle Control panel's left list, click the checkbox of one, multiple or all devices.
3. Under Common Receptacles, select a common receptacle for the previously selected devices and click **SAVE**.
4. With the displayed list of control datapoints, you can click the upper left button to display or hide the list of devices.

NOTE: The name of the selected receptacle appears in the upper right corner.

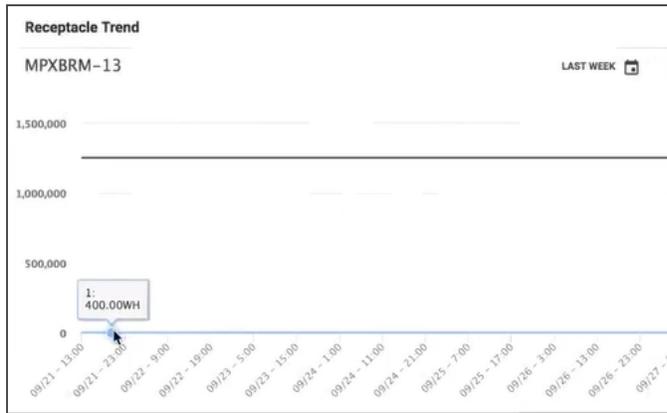
NOTE: Every time you click to change a datapoint, a message provides which and how many devices will be affected by that selection. A Warning states how many devices will be affected by the action. You can click *Show devices* to see the names of the affected devices.

5. In the Warning statement, click *CONTINUE*.
6. In the devices menu with affected devices, click *CONTINUE*.
7. After the datapoint message is displayed, click *SAVE*.

2.9.17 Receptacles Datapoints Trend

This widget allows you to get the trending values for a common datapoint of multiple receptacles. You can change the receptacle and the start date, and you can display the legend to identify the receptacles in the graph.

Figure 2.36 Receptacles Datapoints Trend Widget Example



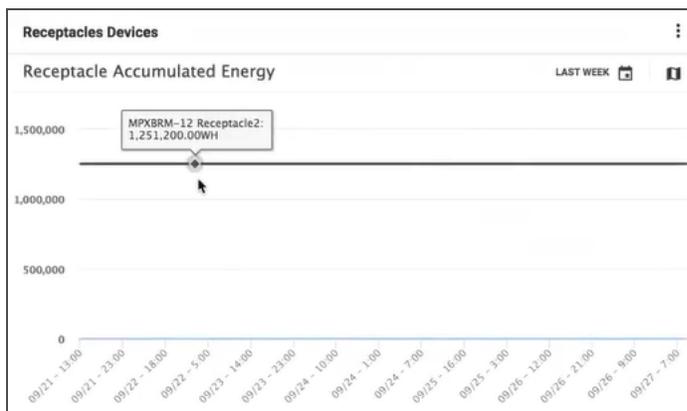
To add and configure the Receptacles Datapoints Trend widget:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Add Widget window, select *Receptacles Datapoints Trend* and enter a name.
3. Select the widget size and click *SAVE*.
4. In the Receptacle Trend panel, click *SELECT DEVICE*.
5. In the Inventory Search window, enter a device type, such as a rack PDU, and click *SEARCH*.
6. Click the Add icon for the device.
7. In the Receptacle Trend panel, select/deselect the receptacles on the left, select a common datapoint for the receptacles on the right and click *SAVE*.

2.9.18 Receptacles Devices Trend

The Receptacles Devices Trend widget displays the trend of one datapoint that is common to several devices. You can change the receptacle and the start date, and you can display the legend to identify the receptacles in the graph.

Figure 2.37 Receptacles Devices Trend Widget Example



To add and configure the Receptacles Devices Trend widget:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Add Widget window, select *Receptacles Devices Trend* and enter a name for the widget.

3. Select the widget size and click *SAVE*.
4. In the Receptacles Devices panel, click the checkboxes to select one, multiple or all rack PDUs or power strips in the list.
5. For each device's receptacle, click the Receptacle drop-down arrow and click the radio button of the applicable receptacle.
6. Click the radio button of the applicable, common datapoints for the receptacles, and click *SAVE*.

2.9.19 Tenant Capacity

Available Space, Power and Cooling capacity widgets are displayed on the Tenant Capacity Dashboard. Each widget provides tenant capacity data for the entire data center.

For the Space Capacity widget, the first image displays the available square feet and the total consumed square feet. You can hover the cursor over the blue colored segment to view the total square feet sold and how many tenants occupy the space. Clicking the blue segment displays a color-coded representation of all the tenants occupying the space and the amount of space assigned to each tenant. Clicking an individual tenant displays the square footage assigned to the tenant.

For each Tenant Capacity widget, the vertical ellipses provides the Settings, Clone Widget and Delete options as follows:

- Settings displays the Space, Power and Cooling options.
- Clone Widget is used to clone the existing widget and make modifications.
- Delete allows you to remove the widget.

To configure the Tenant Capacity widget:

1. Click the drop-down arrow, select *Space, Power or Cooling* and click *SAVE*.
2. Click *Add Widget* and select *Enterprise Capacity*.
3. Enter a name for the widget and click *SAVE*.

To display how many square feet a tenant is consuming:

1. On the widget, click the drop-down arrow, select *Space, Power or Cooling* and click *SAVE*.
2. On the displayed image, hover the cursor over the blue segment to display the total square footage consumed and the total number of tenants in the data center.
3. Click the blue segment to display all the tenants (by colored segments) and the total amount consumed by each tenant.
4. Click any of the color-coded tenants to display the tenant's total assigned and consumed values.

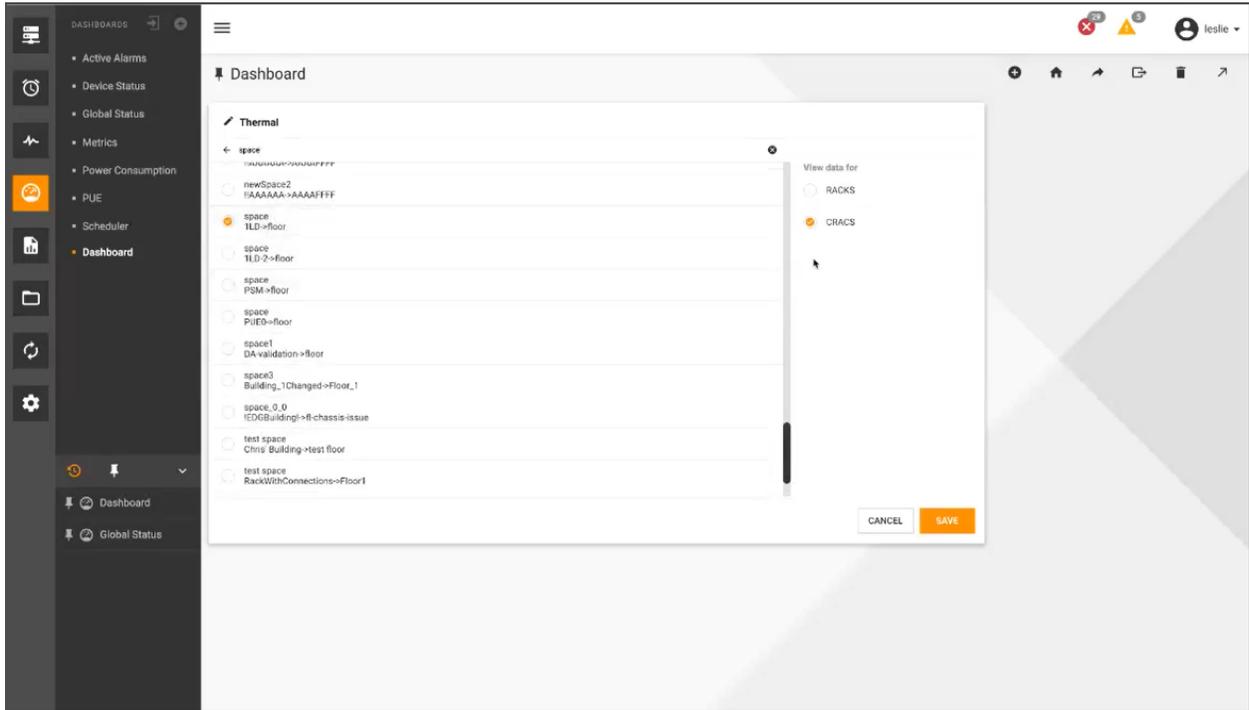
2.9.20 Thermal

If monitored devices are equipped with sensors (data points), rack and CRAC thermal data can be real-time values from the Thermal widget. After a space is selected, the name of the space is displayed on the widget with a list of the devices located in the space. If there are many devices, you can search for or scroll through the list of devices. From the vertical ellipses icon, you can change a widget's size and settings, and clone or delete it.

Information is displayed based on the following date options selected from the Date icon: Last day, Last 3 Days, Last Week, Last Month, Last 6 Months, Last Year and Custom. The legend icon, which can be displayed or hidden, helps you to identify the data for each sensor.

NOTE: A message displays if there are no applicable racks or CRACs to collect data.

Figure 2.38 Thermal Space Window



You can also display trending data point values for selected racks and CRACs. You can hover the cursor over the lines to view the values in time.

Figure 2.39 Trending Data Points

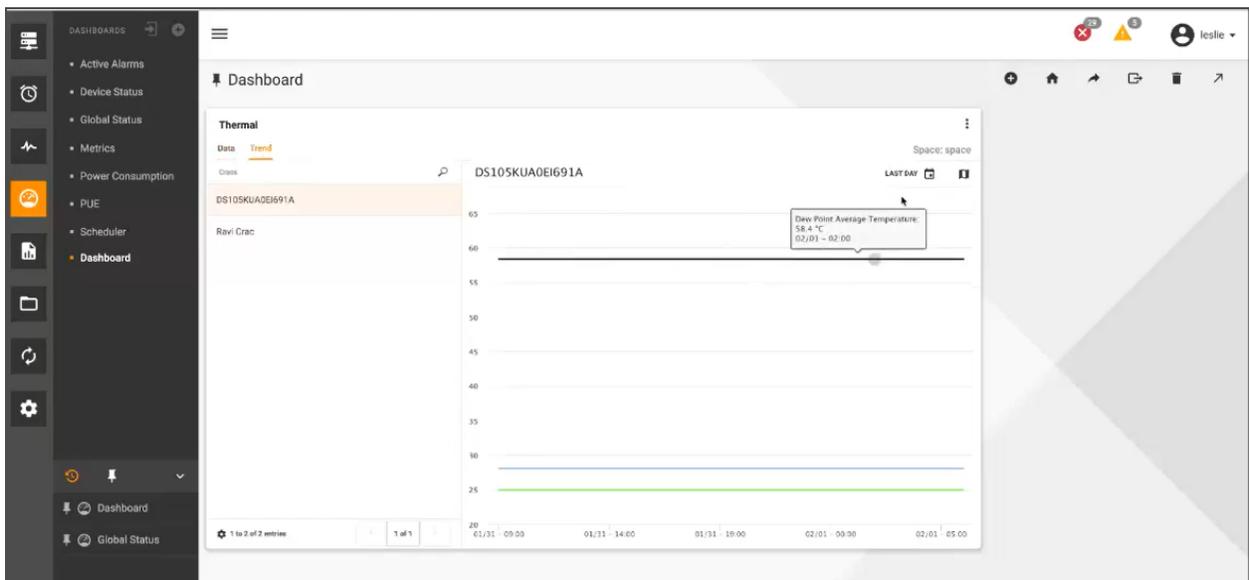
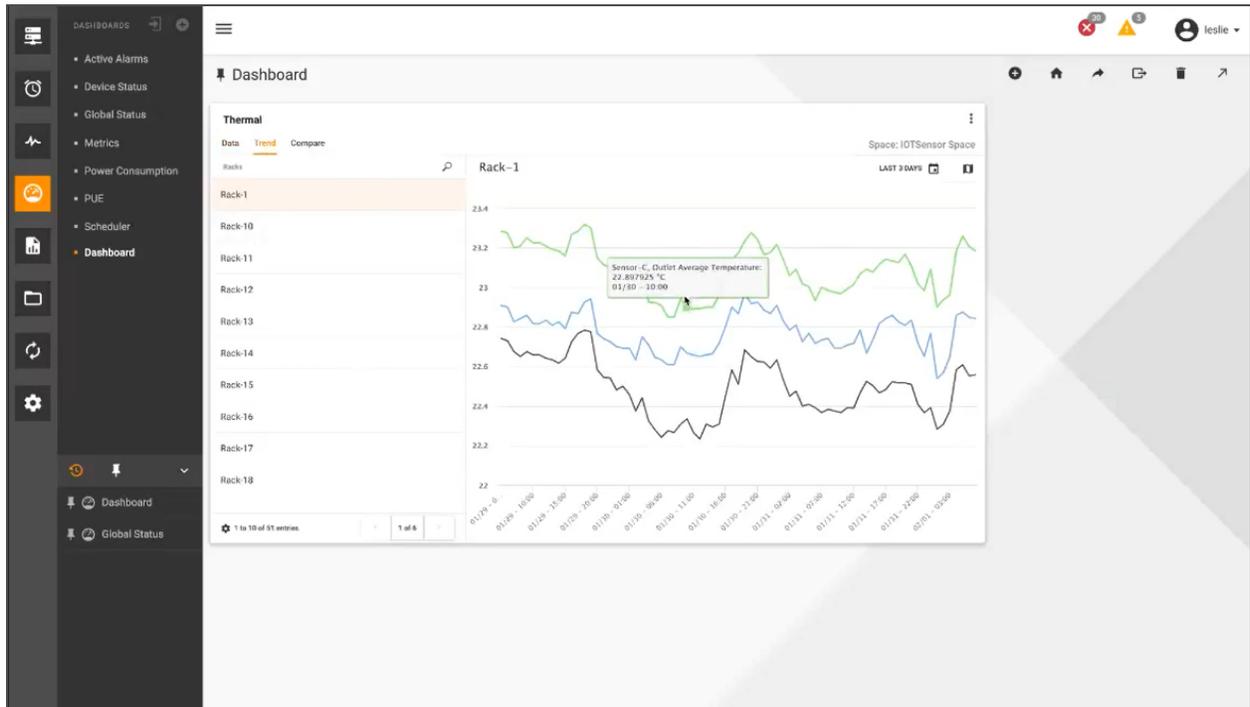


Figure 2.40 Trending Values



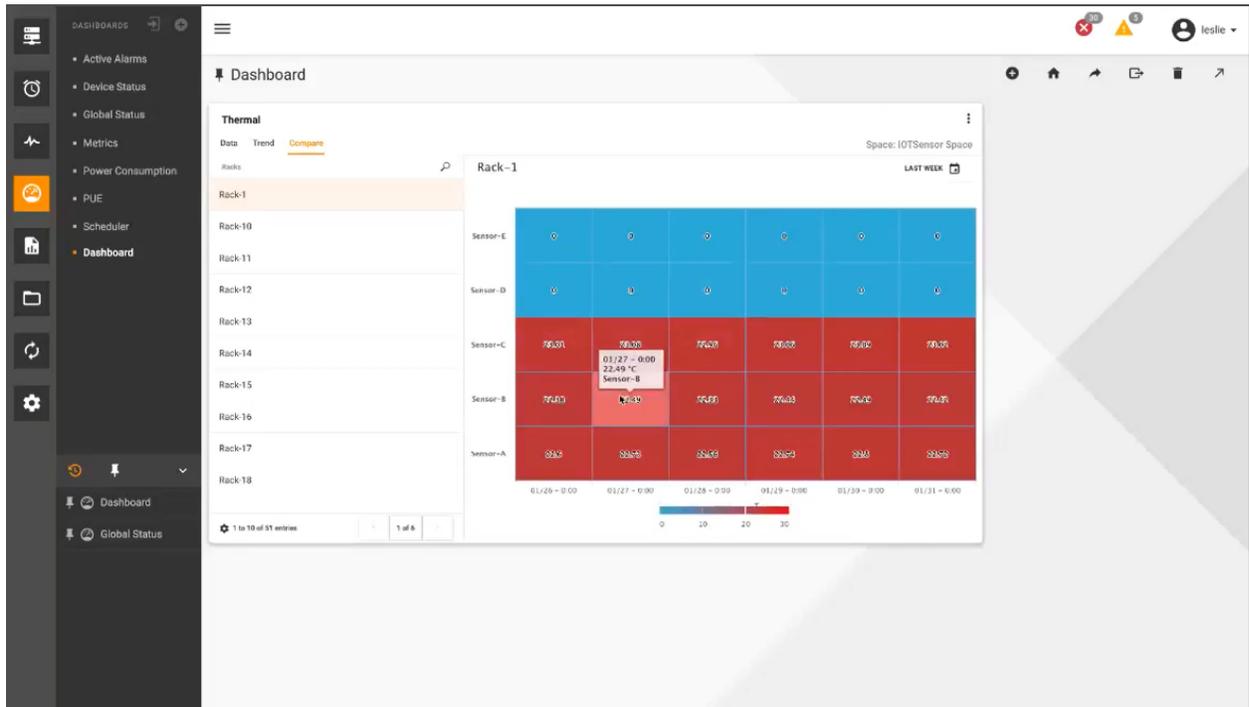
The following table defines the data and trend widget elements. In the window, Data displays the received data point values and Trend displays datapoint results displayed on a timeline.

Table 2.18 Thermal Data and Trend Widget Descriptions

NAME	DESCRIPTION
Data	
Datapoints - Inlet Air Temperature	Average of sensors in the rack OR the same sensor at different times?
Exhaust Air Temperature	Average of sensors in the rack OR the same sensor at different times?
Temperature Difference	Difference in inlet and exhaust temperatures
Sensors	Name of the sensor
Inlet Average Temperature	Average temperature of the sensor at the inlet
Exhaust Average Temperature	Average temperature of the sensor at the exhaust
RU Height	Height of a rack space
Trend	
Supply Air Temperature	Temperature of the supply air
Inlet Air Temperature	Temperature of the inlet air
Cooling Compressor Utilized	Percentage of cooler utilization
Value	Use value of each datapoint
Unit of Measure	Fahrenheit, Centigrade
Return Humidity	Humidity being returned
Dew Point	Point at which dew is formed
Net Sensible Cooling Capacity	The result after the gross cooling capacity is produced by the air conditioning unit via the heat exchanger.

When you select to display thermal data point values for racks, you can also compare heat maps of all the sensors in a rack. The comparisons are configured for a particular date. The legend represents a range of cold to hot temperatures using blue to red colors, respectively.

Figure 2.41 Comparison Chart



To add a Thermal widget:

1. After a dashboard is created, click the Add Widget icon.
2. In the Add Widget window, scroll to and select the *Thermal* widget.
3. Enter a name for the widget, select a size and click **SAVE**.
4. In the Thermal widget, use the Search icon to search for the space.
5. Select a Space radio button to view its thermal data.
6. Select the RACKS or CRACS radio button and click **SAVE**.
7. With Data selected in the header, select the racks or CRACS to display the thermal results.

To change the widget size, clone the widget or delete the widget:

In the widget, click the vertical ellipses icon and click the applicable option in the drop-down list.

To edit the widget name:

Click the Edit icon beside the widget name and edit the name.

To change the space and/or device type:

1. In the widget, click the vertical ellipses icon and click *Settings*.
2. Select the space's radio button and click **SAVE**.

-and/or-

Select the RACKS or CRACS radio button and click **SAVE**.

To compare temperature sensors:

1. In the Thermal Dashboard, click the Compare icon.

2. Select a rack and compare the sensors.
3. If applicable, click the Calendar icon and change the time.

2.9.21 URL

The URL widget displays an external URL in your dashboard, such as for a datacenter cam. This widget can be four different sizes.

Figure 2.42 URL Widget Example



To add and configure an external URL:

1. In the Dashboard window, click the Add Widget icon in the middle of the window or in the header.
2. In the Add Widget window, select a widget and enter a name for the widget.
3. Select a widget size, if applicable, and click *SAVE*.
4. In the New Dashboard window, enter a device name and click *SAVE*.
5. In the displayed window, click the Add Widget icon.
6. Click *Active Alarms*, enter a name for the widget, select a widget size and click *SAVE*.
7. In the URL panel, click the URL and click *SAVE*.

NOTE: Not all facilities allow this widget application.

2.10 Using Reports

The Reports feature, which is accessed from the Reports icon, provides the following functionality:

- Enhanced, interactive reporting capabilities using interactive charts
- Assigning each user a personal workspace to copy, save, schedule and customize reports
- Interactive options to sort, filter, show or hide columns and customize formats
- Multi-selecting optional prompts with the ability to focus on specific filters for faster access to data
- Automatic purging of reports after 48 hours

For more information about reports, see [Reports](#) on page 255.

2.11 Managing Processes

The *Trellis*™ Process Manager module is provided to help you organize and track the process tasks in your data center. Managing your processes reduces errors and improves data center efficiency. For more about processes, see [TRELLIS™ Process Manager Module](#) on page 213.

2.12 Understanding Projects

The Projects icon allows you to create and track projects. After a project is created, you can add tasks to it. Both projects and tasks can be edited and deleted. The status of projects and tasks can be Planned, Started, On Hold or Completed.

For more about Projects, see [Managing projects](#) on page 247.

2.13 Administration of Your System and Users

The Administration context menu allows an administrator to manage system and user configurations. The content menu options and their functionality are defined in the following table.

Table 2.19 Administration Context Menu Descriptions

NAME	DESCRIPTION
Account Policies	Configure password, lockout and SSO policies and authentication providers.
User Management	Manage users.
User Groups	Manage user groups.
Roles	Manage roles.
Notification Settings	Configure the notification settings, rules and templates, email server and SMS server.
Events	View system events.
System Settings	View and edit licensing, DSView software, the collection setting, Help access location and firmware settings. This window includes a download icon for the Bulk Data Processing tool and a Floor Export icon.
Symbols Viewer	Displays the Catalog Symbols list; allows you to locate symbols to place them.
User Defined Properties	Configure properties for a range of components in the <i>Trellis</i> ™ platform, such as devices, containers and buildings.

2.13.1 Account Policies

The Account Policies window is the default Administration window. It is used to perform the CRUD operations for the Password Policies, Lockout Policies, SSO Policies and Authentication Providers for your enterprise. The authentication server must be previously created in the system and then selected in this window in order to edit or delete the server. All criteria in each panel on this window must be filled in or selected to complete your operation. After you complete an operation, click the back arrow to return to the Account Policies window.

NOTE: The SAVE button becomes active when a change is made.

Assigning Password Policies

Passwords are automatically generated and validated against the local policy for complexity and sent to the user via email or SMS. You can prevent or reduce password reuse by enforcing the password history and requiring a minimum password age. When a password policy is changed, the new policy becomes effective the next time a user changes their password.

Table 2.20 Password Policy Window Descriptions

NAME	DESCRIPTION
Adjust Password Complexity	Allows you to alter the password complexity
Upper and Lower Case Letters	Allow passwords to contain both upper and lower case letters
Store Reversible Encryption Password	Enables reversible encryption; supports application protocols that require a user password for authentication
Numeric Characters	Allows passwords to contain numbers
Daily Reminders before Expiration	Reminder of expiration of your password
Non-alphanumeric	Allows passwords to contain special characters
Minimum Password Length	Minimum number of characters in your password
Maximum Password Age (days)	Maximum number of days for your password
Enter Password History	Prevents users from using the same password after their current password expires
Notification Before Expiration (days)	Final reminder of password expiration
Minimum Password Age (days)	Minimum number of days for your password to be valid

To create or update a password policy:

1. Click the Administration icon and select *Account Policies*.
2. In the Password Policies panel, complete the fields and click *SAVE*.

Assigning Lockout Policies

An account lockout policy defines account lockout conditions. You can set the number of invalid log-in attempts that users are allowed before the system locks their account. You can also set the length of lockout durations and the number of minutes after which the lockout counter resets.

Table 2.21 Lockout Policy Window Descriptions

NAME	DESCRIPTION
Login Attempts Before Lockout	Maximum number of attempts to log in before you are locked out
Lockout Duration (minutes)	Length of time for the lockout before you are allowed to try logging in again
Reset Login Attempts After (minutes)	Resets the number of login attempts after the designated number of minutes
Session Inactivity Interval (minutes)	Log out automatically after inactivity for the designated number of minutes
Must be Unlocked By Administrator	Enables/disables the requirement for an administrator to unlock an account

To create or update a password or lockout policy:

1. Click the Administration icon and select *Account Policies*.
2. In the Lockout Policies panel, complete the fields and click *SAVE*.

Assigning a Single-Sign On (SSO) policy

The SSO policy is used to enable/disable a redirect to a URL.

Table 2.22 SSO Policies Window Descriptions

NAME	DESCRIPTION
Enable Redirect	Enable/disable the ability to reroute messages
Redirect URL	URL to which account messages are redirected

To configure the SSO policy:

1. Click the Administration icon and select *Account Policies*.
2. In the SSO Policies panel, click to enable or disable the URL redirect feature.
3. If you enabled the redirect policy, enter the URL to be directed to and click *SAVE*.

Configuring authentication providers

Prior to creating a custom authentication provider in the *Trellis™* platform, the following are required:

- The *Trellis™* platform version 4.0.1 or higher must be installed and active.
- All necessary files (Java project) are in the `/u01/trellis/support/extensions/mbeatypes` file.

Creating an authentication provider

The New Authentication Provider window allows TrellisAdministrators or Super Tenants to create or edit authentication servers. All fields must be complete in order to create an authentication server.

NOTE: The pop-out icon can be used to display a read-only view of the Authentication Server Properties.

Table 2.23 New Authentication Provider Window Descriptions

NAME	DESCRIPTION
Name	Name of the provider
Port	Name of the port
Base DN	Address of the provider
User Base DN	User base
Username	User's name
Host	Host of the authentication provider
Root	Root of the authentication provider
Group Base DN	Group base
Type	Type of authentication; Active Directory or LDAP
Password	Password of the user
SSL Mode	Enables/disables SSL Mode
Use Anonymous Browsing	Enables/disables Using Anonymous Browsing
Chasing Referrals	Enables/disables Chasing Referrals

Custom header authentication

The authentication server can be configured in the Account Policies window. The custom header authentication feature is used to bypass the standard log-in process if you are authenticating via a third party, API-based, single sign-on solution. When configured for custom header authentication, pre-configured authentication headers are present in the initial request that permits access to the platform. If the required values are not present in the headers, the platform presents the traditional log in window. An optional SSL certificate check can also be enabled to further validate any authentication requests.

WebLogic Server® custom identity assertion functionality

A token from outside of the Oracle® WebLogic Server® is passed to an identity assertion provider. The provider is responsible for validating tokens of that type and is configured as active. If the token is validated, the identity assertion provider maps the token to a WebLogic Server® username and sends that username back to the WebLogic Server®, which then continues the authentication process. Specifically, the username is sent via a Java Authentication and Authorization Service (JAAS) CallbackHandler and passed to each configured Authentication provider's LoginModule, so the LoginModule can populate the subject with the appropriate principals.

The WebLogic Server® custom authentication provider requires the following components:

- ExampleCallbackHandlerImpl.java: for authentication context
- ExampleIdentityAsserter.xml: for configuring headers
- ExampleLoginModule.java: for populating groups
- ExampleProviderImpl.java: for asserting or validating header tokens
- Miscellaneous files for building the MBean jar:
 - Commo.dtd
 - build.xml

- `setWLSEnv.sh`: The environment or WebLogic Server® version for which the provider is being created; this file resides in the `/u01/fm/11.1.1.7/wlserver_10.3/server/bin` directory.

To add custom headers:

1. Add and modify the following token types to the `CustomIdentityAsserter.xml` file:

```
<MBeanAttribute
Name = "SupportedTypes"
Type = "java.lang.String[]"
Writeable = "false"
Default = "new String[] { &quot; CUSTOMER-ID, USERNAME, USER-ID,
SESSION-KEY&quot; }"
/>
<MBeanAttribute
Name = "ActiveTypes"
Type = "java.lang.String[]"
Default = "new String[] { &quot; CUSTOMER-ID, USERNAME&quot; }"
/>
```

2. Modify the `CustomProviderImpl.java` file to handle the logic for additional providers.
3. Run the following commands to build the custom jar from the custom provider directory:

```
./setWLSEnv.sh
ant build
```

4. Verify the customAuthentication provider jar is in your directory to confirm the build.

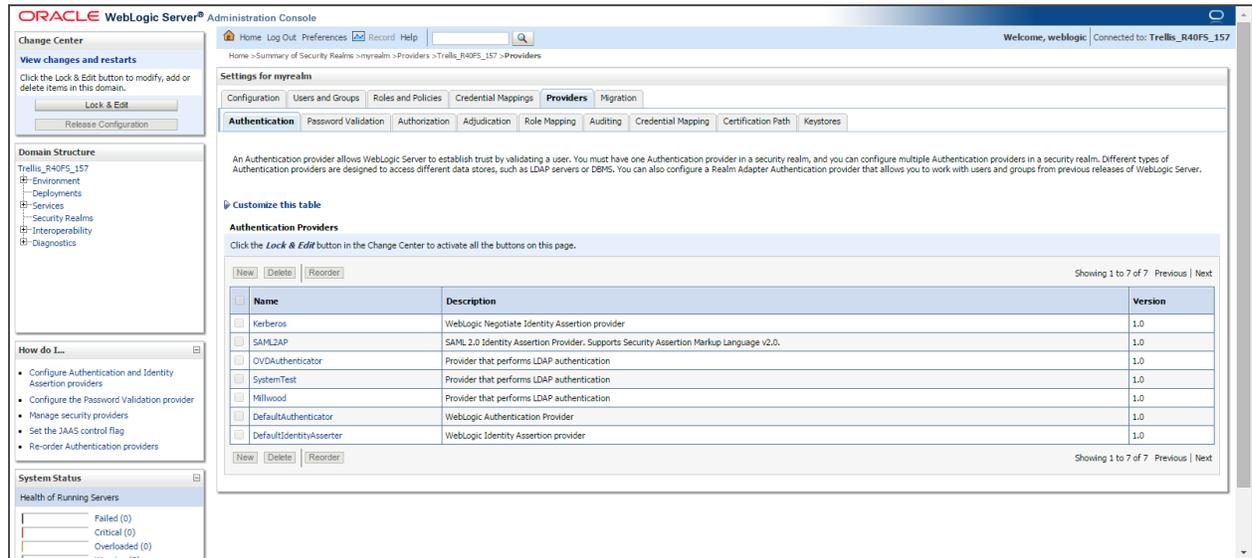
To configure a custom authentication provider:

1. Copy the `CustomAuthenticationProvider.jar` to the following directory:

```
/u01/fm/11.1.1.7/wlserver_10.3/server/lib/mbeantypes
```

2. Restart all servers on the front machine of the *Trellis™* platform.
3. Log into the WebLogic Server® Administration Console, navigate to *Security Realms - myrealm* and click the *Providers- Authentication* tabs.

Figure 2.43 Settings for myrealm



4. In the Change Center panel, click *Lock & Edit*.
5. In the Authentication Providers panel, click *New*.
6. Enter the name and type, such as **ExampleIdentityAsserter**.
7. Click *Reorder* to move ExampleIdentityAsserter to the first one in the list and click *OK*.
8. Click *Activate Changes* and restart all servers on the front machine.

Adding an external authentication source

Authentication is the process of verifying the identity of a user attempting to access the system. The *Trellis™* platform uses LDAP or Windows Active Directory for authentication. Internal default authentication properties are configured during installation. After adding an external authentication source, external groups can be mapped to internal groups. The external users in the mapped group inherit all Coarse Grain Authorization (CGA) and Fine Grain Authorization (FGA) permissions that are assigned to the internal group. In addition, if you customize the default security configuration to use a custom authentication provider, you must use the administration icon supplied by that security provider to create a user.

NOTE: New authentication instances appear at the top of the list.



CAUTION: Please contact Professional Services before adding an external authentication source.

To add an external authentication source:

1. Click the Administration icon and select *Account Policies*.
2. In the Authentication Providers panel, click the Add icon.
3. In the New Authentication Provider window, complete the fields and click *SAVE*.

NOTE: Enabling SSL Mode provides maximum security and automatically sets the Port Number field to the default port number 636. Disabling SSL Mode is the least secure mode, which automatically sets the Port Number field to the default port number 389. The hosts must be manually verified through ODSM before the Active Directory will function with SSL mode properly. For more information, contact Technical Support or Professional Services.

4. Click the Credentials panel's Edit icon, complete the fields and click *SAVE*.

NOTE: For Active Directory, the username should be the Distinguished Name (DN) of a user in your directory.

5. In the server restart message, click *OK*, and if you are using an unsecured connection, click *OK* in the warning to transmit credentials and clear the text.
6. Stop the *Trellis™* platform as follows:
 - a. Stop the *Trellis™* platform on the front machine.
 - b. Stop the *Trellis™* platform on the back machine.
7. Start the *Trellis™* platform as follows:
 - a. Start the *Trellis™* platform on the back machine.
 - b. Start the *Trellis™* platform on the front machine.
 - c. Log into the *Trellis™* platform UI and verify the *Trellis* application is working properly.

To remove external authentication sources from the UI:

1. Click the Administration icon and select *Authentication Servers*.
2. Click the authentication source and click the Delete icon.

To create an authentication provider in the software:

1. Click the Administration icon and select *Account Policies*.
2. Scroll down to the Authentication Providers panel and click the Add icon.
3. In the New Authentication Provider window, complete the fields and click *SAVE*.

To undock the Authentication Server Properties window and display a read-only view:

On any window, click the pop-out icon.

To verify the entered data:

On any window, click the back arrow.

Mapping a group

When adding an external group, you must map the external group to an internal group and assign an Active Directory (AD) server to the group. See [Configuring authentication providers](#) on page 91.

NOTE: The servers must be restarted after adding the authentication service or an error message is displayed when mapping the group.

To map an external group to an internal group:

1. Click the Administration icon and select *User Groups*.
2. Click the Add icon, add a group name and click *SAVE*.
3. Click the Administration icon and select *User Groups*.
4. In the User Groups window, select the checkbox of the group to be mapped and click the *Edit* icon.
5. In the External Groups panel, select the applicable AD server from the drop-down menu.
6. Click the checkbox of the external group in the list.

-or-

Search for an external group.

-or-

Click the All External Groups checkbox.

7. Click *SAVE*.

2.13.2 Events window

Events are occurrences or changes to inventory that the platform detects and records. The Events window displays the ongoing status of events. The Events window also allows you to manage the following processes:

- Verify the appropriate actions have taken place in response to system issues
- Capture events from equipment
- Monitor communication between IT system management software and monitoring software
- Filter the events by date range (Past 8 Hours, Past 24 Hours, Past 72 Hours, Past Week, Past 30 Days, Past 365 Days or Custom) or group (Severity, Source Name, Category, Date, Description, Subject Name or None).
- Reload the data

Managed event information includes, but is not limited to, the following columns.

Table 2.24 Event Window Descriptions

COLUMN	DESCRIPTION OF DISPLAYED INFORMATION
SEVERITY	Displays the severity of the event (critical, warning or information)
CATEGORY	Displays the type of each event
DATE/TIME	Date and time the system received the event
DESCRIPTION	Brief description of the event
DETAILED DESCRIPTION	Detailed description of the event
SUBJECT NAME	Name (item, group, user or location) of the subject impacted by the event
SOURCE NAME	Name of the source

For more information, see the following:

- [Configuring notification rules](#) on page 99
- [Configuring Alarms](#) on page 208

To view events and event details:

1. Click the Administration icon and click *Events*.
2. Click the subject name and in the Event Details window, scroll to view all the details.
3. Click *X* in the upper right corner to close the Event Details window.

To filter events:

1. In the Events window, click the Filter icon.
2. In the Filter window, click the Date Range drop-down arrow, select a range of dates and click *CLOSE*.

-and/or-

Click the Group By drop-down arrow, select a group from the list and click *CLOSE*.

To sort the columns:

1. In the Events window, click the Columns icon.

2. Click to select or deselect the columns.

2.13.3 Notification Settings

Automatic notifications can be configured to inform you of events and alert you of alarms that may require immediate attention. They are delivered by email or short messaging service (SMS), which can be sent in Rich Text or Plain Text formats. The notification function itself can be tested to ensure notifications are received. You can also create templates and rules to customize notifications.

NOTE: The email address, SMS number and their servers must be configured in advance to designate a notification's sender and recipient.

NOTE: SMS text messaging is supported for AT&T® and Verizon Wireless networks.

Notifications are normally sent immediately following an event or an alarm; however, notifications can also be delayed. For example, if you take a server offline for system upgrades, you can set a delay for 120 minutes so that a notification is only sent if the server remains offline more than 120 minutes.

Scheduling your work hours designates when you are available to receive notifications. Specific or all alarm notifications are configured from a plan or device.

NOTE: Configuration of work hours and the method of notification is independent of configuring user roles.

NOTE: For each *Trellis*™ platform module, the applicable driver must be configured to handle traffic for each specific channel and type of notification.

Table 2.25 Notification Settings Window Descriptions

COLUMN	DESCRIPTION
RULE SET	Displays the configured rules
NOTIFICATION DELAY	Delay specified for the notification
DELAY UNIT	Displays the selected units (MINUTES, SECONDS or MILLISECONDS) to delay the unit

Before assigning notifications to a role, see the following:

- [Configuring email and SMS notification servers](#) on page 101
- [Configuring SNMP traps](#) on page 211

Configuring notification templates

Notification templates can be created and edited to save time when creating similar notifications. The notification text is created in the Primary Text and Multiple Trigger Text panels. Selectable tokens (variables) that are populated by the system can be appended to the text in these panels.

Figure 2.44 Edit Notification Template Window

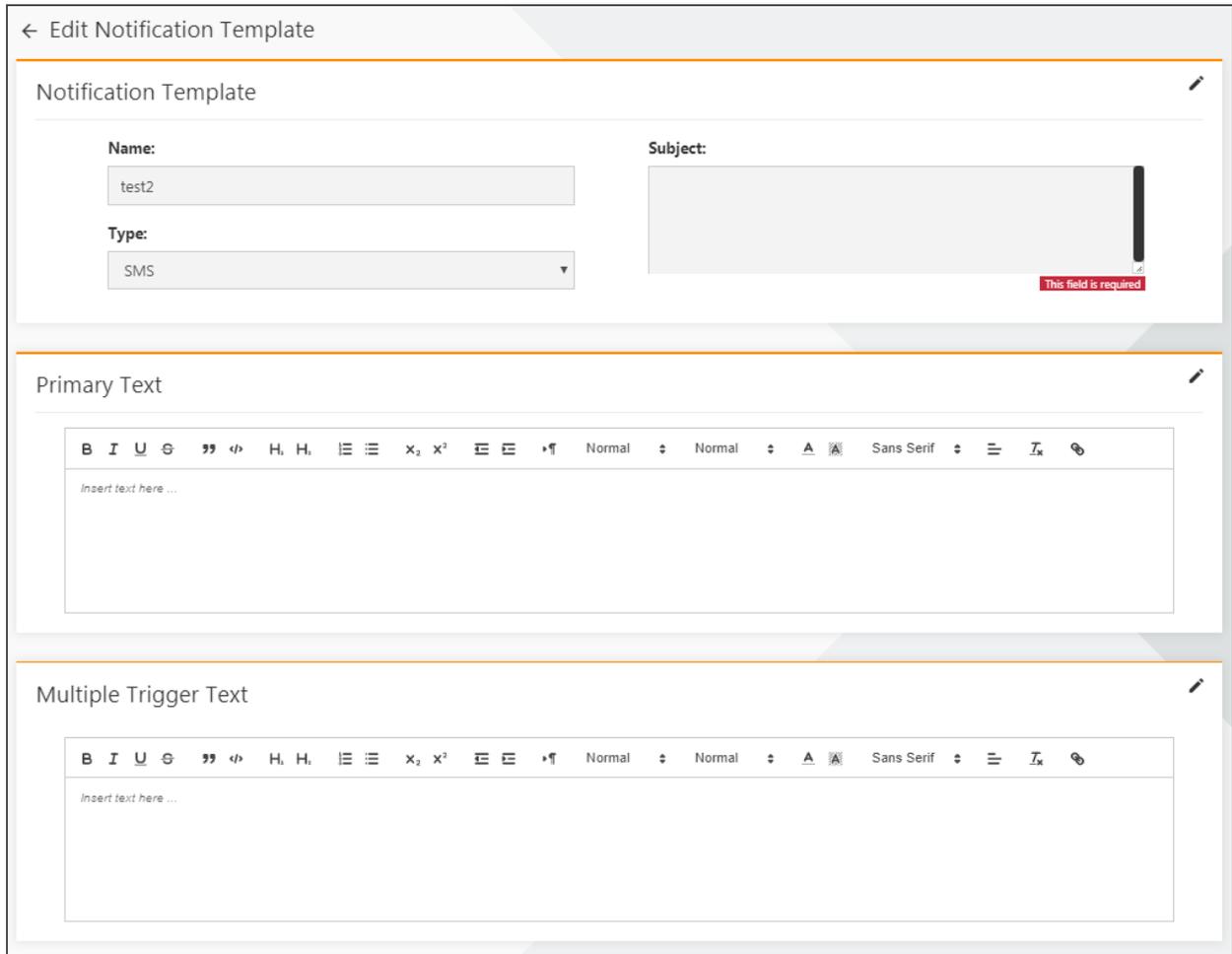


Table 2.26 Templates Panel Descriptions

COLUMN	DESCRIPTION
NAME	Name of the template
TYPE	Type of the template
EMAIL SUBJECT	Subject added to the email

Table 2.27 Edit Notification Template Window Descriptions

COLUMN	DESCRIPTION
NAME	Name of the notification template
TYPE	Type of notification template
EMAIL SUBJECT	Subject for the email

To add a notification template:

1. Click the Administration icon and select *Notification Settings*.

2. In the Templates panel, click the Add icon.
3. In the Notification Template panel, complete the fields, enter a subject and click *SAVE*.

To edit a notification template:

1. Click the Administration icon and select *Notification Settings*.
2. In the Templates panel, select a template and click the Edit icon.
3. In the Notification Template panel, complete the fields, enter a subject and click *SAVE*.
4. In the Primary Text panel, enter and format a message.
5. Click the Add icon, and in the Template Tokens window, enter a token in the Filter Tokens field to search for it.

-or-

Scroll to and select one or more tokens.
6. Click *SAVE*.
7. In the Multiple Trigger Text panel, enter and format a message.
8. Select one or multiple tokens and click *SAVE*.

To delete a notification template:

1. Click the Administration icon and select *Notification Settings*.
2. In the Templates panel, select one or multiple templates and click the Delete icon.

-or-

Click the checkbox in the header to select all templates and click the Delete icon.

Configuring notification rules

One or more notification rules can be created to send a notification from a specific device or all devices, and from a specific alarm or all alarms. Notifications can be delayed and one or more notifications can be triggered at a time.

Filters are provided for devices and alarms in order to only receive the necessary notifications. For each notification rule set, you can select the category/container, floor and/or space of a device. For the selected category, you can select the device type and one or more alarm types. The alarm results can be specified for one, multiple or all the selected alarm types.

Table 2.28 Add Notification Rule Window Descriptions

NAME	DESCRIPTION
Name	Field used to enter a new rule's name
Type	Drop-down list with the SNMP and SMS/Email options
Delay	Amount of time to delay before sending a notification
	Drop-down list with the MINUTES, SECONDS and MILLISECONDS options
Templates	List of templates to use for the notification

Figure 2.45 Edit Notification Rule Window

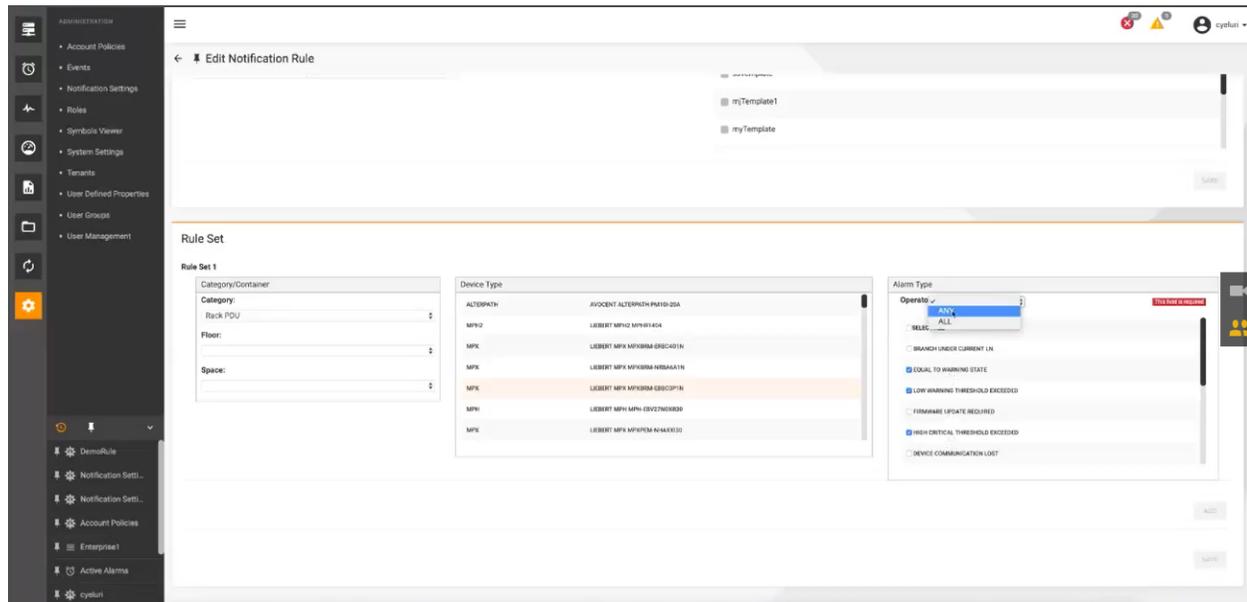


Table 2.29 Add Notification Rule Window Descriptions

NAME	DESCRIPTION
Name	Field used to enter a new rule's name
Type	Drop-down list with the SNMP and SMS/Email options
Delay	Amount of time to delay before sending a notification
	Drop-down list with the MINUTES, SECONDS and MILLISECONDS options
Templates	List of templates to use for the notification

To add a notification rule:

1. Click the Administration icon and select *Notification Settings*.
2. In the Rules panel, click the Add icon.
3. In the Notification Rules panel, complete the fields, select a template and click *SAVE*.
4. In the Rule Set panel, click the Edit icon and select a category, floor and space from the drop-down arrow.
5. Click one or more device rule sets and click *SAVE*.

To edit a notification rule:

1. Click the Administration icon and select *Notification Settings*.
2. In the Rules panel, click a rule's checkbox and click the Edit icon.
3. In the Notification Rules panel, complete the fields and click *SAVE*.
4. In the Rule Set panel, select a category from the drop-down arrow.
5. If applicable, select a floor and a space from the drop-down arrows.
6. Select one or more device types and alarm types.
7. Click the Operator drop-down arrow, select *ANY* or *ALL* of the alarm types to send notifications and click *ADD*.

To delete a notification rule:

1. Click the Administration icon and select *Notification Settings*.
2. In the Rules panel, select one or multiple rules and click the Delete icon.

-or-

Click the checkbox in the header to select all rules and click the Delete icon.

Configuring email and SMS notification servers

Notifications for alarms can be sent by email or SMS to one or more roles. Notifications can be sent for a specific alarm or all alarms from a floor, a device or a group of devices.

The incoming and outgoing servers can be configured to send notifications to *Trellis™* platform users via email or SMS.

NOTE: Configuring SMS for notifications allows you to utilize Microsoft Exchange Server 2010 or a third-party SMS service provider.

Table 2.30 Email Server Window Descriptions

NAME	DESCRIPTION
Use Email Server	Activates or deactivates using the email server to retrieve notifications
Outgoing IP/Host	IP address of the notification's sender
Outgoing Port	Outgoing port of the notification
Outgoing Username	Username of the notification's sender
Outgoing Password	Password of the notification's sender
Access Point	Point of access
Default Sender	Sender unless another sender is assigned
Incoming IP/Host	IP address of the notification recipient
Incoming Port	Incoming port of the notification
Incoming Username	Username of the notification's recipient
Incoming Password	Password of the notification's recipient
Register Access Point	A button used to register an access point
SEND TEST EMAIL	Sends a confirmation email for notifications

Table 2.31 SMS Server Window Descriptions

NAME	DESCRIPTION
Use SMS Server	Activates or deactivates using the SMS server to retrieve notifications
Outgoing IP/Host	IP address of the notification's sender
Outgoing Port	Outgoing port of the notification
Outgoing System Id	System Id of the notification's sender
Outgoing Password	Password of the notification's sender
Outgoing System Type	System type of the notification's sender
Account Id	Sender's Id account number
Default Sender	Sender unless another sender is assigned
Incoming IP/Host	IP address of the notification's recipient
Incoming Port	Outgoing port of the notification
Incoming System Id	System Id of the notification's recipient
Incoming Password	Password of the notification's recipient
Incoming System Type	System type of the notification's recipient
Access Point	Point of access
Register Access Point	A button used to register an access point

To add or edit the email and/or SMS notification server configurations:

1. Click the Administration icon and select *Notification Settings*.
2. Scroll down to view the Email Server and SMS Server panels.
3. Click the Edit icon in the applicable panel.
4. Click to enable or disable the Use Email Server and/or the Use SMS Server slide button.
5. Update the field entries, select or deselect to enroll the access point and click *SAVE*.

Adding an attachment to an email notification

With write access permission, you can configure notifications to include device status/real-time data when an alarm occurs. For example, temperature threshold and current temperature data can be configured to be sent with a notification for a high temperature alarm. Read access permission is required to view the notification.

2.13.4 Roles

Roles define general permissions and resource rights, and are used to assign those permissions and rights to a user or a user group. General permissions are system rights, such as to create a plan. Resource rights are equipment rights, such as to reboot a server.

The Administrator role, created during the installation process, has complete access to all *Trellis*™ platform permissions, including to add, edit, duplicate and remove roles. After adding each user, they are assigned to one of the following default role categories and then general permissions are added:

- Administrative
- Operator
- Planning

- Reports

In the Roles window, you can add, edit or delete roles; however, a role must be selected or named to enable it to be edited or deleted from the system. You can also search and sort roles, assign roles to a user or a user group and edit roles and users that are assigned to user groups.

Permissions are assigned to roles and roles can be customized by combining types of permissions, such as Events and Alarms Management and Real-Time Data Management. If two permissions are assigned to a role with different levels of rights to the same operation, the role with the highest level of rights overrides the role of the lower level. Notifications can also be assigned to a role.

Rights are assigned to containers (buildings, floors, spaces or zones) and after rights are assigned, containers can be filtered by the applied rights, as well as by container type. The following container rights can be added, edited and deleted in the Edit Role window:

- None - Prevents the assigned user from viewing properties of a particular container in the portfolio. When a new role is created, all policies are defaulted to None.
- View - Allows the assigned user to only view properties of a particular container in the portfolio.
- Manage - Allows the assigned user to view, modify and delete a particular container in the portfolio.

NOTE: Configuration of work hours and the method of notification is independent of configuring user roles. For more information about configuring work hours and notifications, see [Configuring your user profile](#) on page 22.

Using the built-in user role

The *Trellis*™ platform provides one built-in user role, TrellisAdministrator, that gives you complete access to all *Trellis*™ platform modules and permissions. The built-in user role cannot be edited or deleted. Several built-in user permissions are also provided. You can add a role and assign one or several built-in permissions to the role, which allows or restricts user access to certain modules or menus.

NOTE: Some permissions are not available if the feature license is not active.

NOTE: Equipment can be assigned to a role in the Assign Rights window. The equipment is assigned by the level of its container.

Table 2.32 Roles Panel Columns

COLUMN	DESCRIPTION
NAME (required field)	Name assigned to the role
CATEGORY	Category the role is assigned to
DESCRIPTION	Description of the role

To create a role:

1. Click the Administration icon, select *Roles* and click the Add icon.
2. In the Role panel, enter a name (required) and select one of the categories.
3. Enter a description and click *SAVE*.

To edit a role's summary, rights, permissions and notifications:

1. Click the Administration icon and select *Roles*.
2. In the Roles window, click the role's checkbox and click the Edit icon.
3. For the applicable panels in the Edit Role window, complete the fields and click *SAVE*.

NOTE: The Rights, Permissions and Notifications Search fields can be used to narrow your search.

Adding permissions

Adding permissions to user roles ensures that users can perform their jobs and prevents roles from becoming too restrictive. If a user with the role of Project Planner wants to run a report in *Trellis*™ Inventory Manager prior to moving equipment, the Project Planner is denied access to the report. This happens because the default permissions for the Project Planner role restrict those users from running reports. You can solve this problem by adding the Reporting – Inventory Manager permission to the Project Planner role.

If a user has two roles that grant different levels of permissions to the same operation, the role with the highest level of permissions overrides the lower level. For example, a user with read/write permissions to an operation from one role and read only permissions to the same operation from another role, has read/write permissions.

You can also add the following permission types to roles:

- Identity Management
- Task Management
- License Management
- System Configuration Management
- Event and Alarm Management
- Real-Time Data Management
- Reports Management

Using permissions for operations

All other name assignments, such as FacilitiesEngineer and ITEngineer, are used for permissions. Users can be assigned the following user permissions.

Table 2.33 User Roles

NAME	PERMISSIONS
FacilitiesEngineer	Read/write access for all <i>Trellis</i> ™ Site Manager module capabilities
FacilitiesTechnician	Read access only for all <i>Trellis</i> ™ Site Manager module capabilities
ITEngineer	Read/write access for all <i>Trellis</i> ™ Inventory Manager module capabilities
ITTechnician	Read access only fro all <i>Trellis</i> ™ Inventory Manager module capabilities
ReportUser	Read access only for all <i>Trellis</i> ™ Inventory Reports capabilities
ReportAdministrator	Read/write access for all <i>Trellis</i> ™ Inventory Reports capabilities
ProgrammaticAPI	Read/write access for many <i>Trellis</i> ™ platform capabilities
ProcessAdministrator	Read/write access for all <i>Trellis</i> ™ platform Process module capabilities
ProcessOperator	Read access only for all <i>Trellis</i> ™ platform Process module capabilities
FacilityTechSimple	Read access only for all <i>Trellis</i> ™ platform facility capabilities
FacilityTechAdvanced	Read/write access for all <i>Trellis</i> ™ platform facility capabilities
BPMComposerAdmin	Read/write access for all <i>Trellis</i> ™ platform BPM capabilities

NOTE: Some permissions are not available when the feature license is not active.

Creating a custom role

Creating a custom role gives the administrator more control over functions that a specific user might need. When creating and assigning custom roles, you can focus on the function and containers in the *Trellis™* platform and consider what roles are needed for the user to access function and device data.

Fine Grained Authorization (FGA) provides a level of security where roles are granted to view or manage access rights to resources such as enterprises, buildings, floors, spaces and zones, that are created in the *Trellis™* platform. Users are able to view and manage resources based on their roles' assigned rights.

NOTE: The *Trellis™* platform System Administrator always has full access rights to all resources in the *Trellis™* platform.

You can give this custom Planning Architect role the following general permissions:

- Report User
- Report Administrator

You can create a custom role by:

- Combining permission types (for example, Event and Alarm Management and Real-Time Data Management)
- Adding permissions to a pre-configured role (for example, IT Engineer role + Event and Alarm Management)
- Combining pre-configured roles (for example, Facilities Technician and IT Engineer)

To create a custom role:

1. Click the Administration icon, select *Roles* and click the Add icon.
2. In the Add Role window, enter a name with alpha-numeric characters and no spaces.
3. Select a category from the drop-down list, enter an optional description and click *SAVE*.
4. (Optional) Proceed to assign rights, permissions and notifications.

To assign rights to a role:

1. Click the Administration icon and select *Roles*.
2. Click the role's checkbox and click the Edit icon.
3. In the Rights panel, click the Search icon and enter descriptive information in the Search field, select the item from the results and click *SEARCH*.

-or-

Click the enterprise checkbox and click the None or View header icon to assign rights to the entire enterprise.

NOTE: You must assign View rights to the enterprise in order to see containers in the Portfolio. Any items in UNPLACED INVENTORY, such as GROUPS and Universal Management Gateway appliances, appear in the Portfolio when you assign the View rights to the enterprise, although all other containers are NONE.

-or-

Double-click the enterprise level checkbox, select each component and click the None or View header icon, as applicable.

4. If applicable, select the *None*, *View* or *Manage* user right options in the Policy column.

NOTE: The child container inherits the policy of the parent container or device. For example, if the parent container policy is set to Manage, then all containers under the parent are automatically set to the View policy.

5. In the Policy selection list box, click the down arrow, select *View* or *Manage* and click *SAVE*.

Another approach to setting policies is to start from the bottom up. For example, change the child containers and then proceed to the parent containers. If you do not have assigned rights, a note appears to inform you that you are not authorized to perform the operation.

NOTE: If upgrading from *Trellis™* platform software version 3.2 to 3.3, all current users inherit the same assigned rights.

To assign permissions to a role:

1. Click the Administration icon and select *Roles*.
2. Click a role's checkbox and click the Edit icon.
3. Scroll to the Permissions panel, click one, multiple or the header checkbox and click *SAVE*.

To assign notifications to a role:

1. Click the Administration icon and select *Roles*.
2. Click a role's checkbox and click the Edit icon.
3. Scroll to the Notifications panel, click one, multiple or the header checkbox and click *SAVE*.

To assign a notification rule to a role:

1. Click the Administration icon and select *Notification Settings*.
2. In the Rules panel, click a rules' checkbox and click the Edit icon.
3. In the Notification Rules panel, modify the Type and Delay fields.
4. Search for and select a template and click *SAVE*.

To assign a rule set to a role:

1. Click the Administration icon and select *Notification Settings*.
2. Click the rule's checkbox and click the Edit icon.
3. Scroll to the Rule Set panel and select the applicable rule set.
4. Click the Alarm Type checkbox, if applicable, and click *SAVE*.

To clear rights from a role:

1. Click the Administration icon and select *Roles*.
2. Click the role's checkbox and click the Edit icon.
3. In the Rights panel, expand the enterprise.
4. Click the applicable containers/devices and click the None header icon.

. To delete a role:

1. Click the Administration icon and select *Roles*.
2. Search or scroll the list and click one, multiple or the header checkbox and click the *Delete* icon.

2.13.5 Symbols Viewer

Device symbols are available to represent devices in your inventory. A device symbol can be replaced with a different model or brand, however, if you attempt to replace a symbol with a symbol from a different device category, or one that does not fit in the space, you will receive a conflict message. Replacement symbols retain the name, owner, notes, data and power connections and other device properties of the original device.

A new symbol can also be requested, if needed. The following are required before replacing or updating a device symbol:

- Activation of a current support agreement
- Implementation of the *Trellis*™ platform software
- Accessibility to the symbols web site
- Installation of the most current symbols library in your existing local library
- Placement of existing symbols on a floor

After the symbol is ready, you will be notified by email with a link to the latest library; after which you can upload the symbol package and add the symbol to your catalog.

For additional information about requesting symbols, see [Working With Catalog Symbols and Element Libraries](#) on page 170.

NOTE: To replace symbol functionality, the programmatic names of ports and the symbol extension properties must match.

In the Symbols Viewer window, you can search for a symbol in the inventory catalog. You can also filter by grouping the symbols and sorting the following columns.

Table 2.34 Symbols Viewer Window Descriptions

COLUMN	DESCRIPTION
MODEL QUALIFIER	Model of the symbol
MANUFACTURER	Manufacturer of the symbol
UPLOAD DATE	Date the symbol was uploaded
VERSION	Version of the symbol

NOTE: Multi-selection is not available.

To search for and replace a symbol:

1. Click the Administration icon, select *Symbols Viewer* and click the Search icon.
 2. In the Symbols Viewer panel, click the Search icon, enter the name or model number for the device and click *SEARCH*.
 3. In the results, click the vertical ellipses icon of the applicable device and select *Update*.
 4. If the correct model is shown in the Model field, click *SEARCH*.
- or-
- Enter the model in the Search field and click *SEARCH*.
5. In the results, click the Symbol Replacement icon (belonging to the same category as the symbol being replaced).

To filter the symbols list:

1. Click the Administration icon and select *Symbols Viewer*.
2. In the Symbols Viewer window, click the Filter icon.
3. In the Filter window, click the Group By arrow and select *None, Model, Model Qualifier* or *Manufacturer*.
4. Click *CLOSE*.

To sort (show/hide) the columns:

1. Click the Administration icon and select *Symbols Viewer*.
2. In the Symbols Viewer header, click the Columns icon.
3. Click the icon to show or hide the Manufacturer, Model Qualifier, Upload Date and Version columns.

2.13.6 System Settings

The System Settings window contains configuration fields for your licenses, DSView™ management software configuration, collection setting, help location, unit of measure selection, allowing duplicate serial numbers and firmware settings and the events and alarms archive.

Activating Licensing

The Licensing panel is used to verify and activate the license-related information for the users, devices and symbols. If you are unable to activate your licenses online, please contact Technical Support for activation assistance.

Table 2.35 Licensing Window Descriptions

COLUMN/FIELD	DESCRIPTION
Entitlement ID	System's license ID
DEVICES AVAILABLE	Number of devices that the license supports
NAME	Name of the license
LICENSES	Number of the valid or expired licenses for each license name/type
EXPIRATION DATE	Date the license expires
ACTIVATION ID	ID used to activate the license
FULFILLMENT ID	ID used to confirm the license

To activate a new license:

1. Click the Administration icon and select *System Settings*.
2. In the Licensing panel, enter the Entitlement ID/license number, click *ENTER* and click *ACTIVATE*.
3. Log out of the *Trellis™* platform and log in again with an account that has the *Trellis™* platform Administrator role to activate the license.

NOTE: A blank value in the Expiration Date field means a permanent license is activated.

NOTE: The license for the *Trellis™* Site Manager module is required to enroll the *Trellis™* Intelligence Engine or the Avocent® Universal Management Gateway appliance.

To verify the platform version:

Click the avatar drop-down menu and click *About* to view the currently installed version of the *Trellis™* platform, patches and their release dates.

Assigning the Collection Setting

The *Trellis™* platform software gathers data point values that are received for each data point definition. The *Trellis™* platform software reports the collected data point values to the platform for storage in the *Trellis™* platform database. Change of Value is the default reporting mode. The system configured data point reporting modes are:

- Interval - data points are collected at their configured interval rate. The collected values are aggregated every 15 minutes and reported to the platform for storage in the *Trellis*™ platform database.
- Change of Value - data points are collected at their configured interval rate. The data points are only reported to the platform when a change is recognized in the value.

Table 2.36 Collection Setting Window Descriptions

NAME	DESCRIPTION
Interval radio button	Storing the data points' results each time they are polled
Change of Value radio button	Storing the data only when the value has changed

To select the collection setting method:

1. Click the Administration icon, select *System Settings* and scroll to the Summary panel.
2. Enable the Interval radio button.
-or-
Enable the Change of Value radio button.
3. Click *SAVE*.

2.13.7 Using the Help file

The Help file provides information about the UI and includes operation instructions. The Help file can be accessed from the Vertiv™ web site or it can be downloaded and accessed from a local server.

To select the location for the Help information:

1. Click the Administration icon and select *System Settings*.
2. In the Summary panel, enable the Vertiv Web Site radio button and click *SAVE* to complete the procedure.
-or-
Enable the *Trellis Server* radio button and proceed to the next steps to select a local server for the Help file.
3. Click *SELECT FILE* and then navigate to and select the file.
4. Click *Upload Help file* and click *SAVE*.

Unit of Measure

The Unit of Measure options are Imperial or Metric.

To configure the unit of measure:

1. In the Unit Of Measure panel, click the Edit icon.
2. Click the Imperial or Metric radio button and click *SAVE*.

Configuring duplicate serial numbers

The Serial Number duplicate setting provides the option to duplicate devices' serial numbers. The toggle icon is orange when activated.

To allow or not allow duplicate serial numbers:

1. Click the Administration icon, select *System Settings* and scroll to the Summary panel.

- Under Serial Number, click the Allow Duplicate toggle icon to allow or not allow serial numbers and click *SAVE*.

Integrating Avocent® DSView™ management software

The *Trellis*™ platform software supports DSView™ management software. A test can be performed to verify the connection is active.

Table 2.37 DSView Configuration Window Descriptions

NAME	DESCRIPTION
Status	Indicates the current status of a device: Normal, Maintenance or Not Responding
Server Name	DSView™ server IP address
Service Account Name	DSView™ software account username
Port	Port used to connect the DSView system to the <i>Trellis</i> ™ software system
Password	DSView software account password
Serial Number	Serial number of the DSView software
Asset Number	Asset number of the DSView software
IP Address	IP address of the DSView software

To connect the DSView™ software to the *Trellis*™ platform software:

- Click the Administration icon and select *System Settings*.
- In the DSView Configuration panel, complete the fields and click *CONNECT*.

To update the connection to the DSView™ software:

- Click the Administration icon and select *System Settings*.
- In the DSView Configuration panel, update the fields and click *SAVE*.

To disconnect the connection to the DSView™ software:

- Click the Administration icon and select *System Settings*.
- In the DSView Configuration panel, click *DISCONNECT*.

Managing Firmware Settings

The Firmware Settings panel is used to upload firmware files to edit, filter or sort them.

Table 2.38 Firmware Settings

COLUMN	DESCRIPTION
NAME	Name of the firmware
VERSION	Version of the firmware
UPLOAD DATE	Date each firmware file is uploaded

To upload firmware:

- Click the Administration icon and select *System Settings*.
- Scroll to the Firmware Settings panel and click the Add icon.

3. In the Upload Firmware window, click *SELECT FILE*.
4. Locate and select the file and click *UPLOAD*.

To locate and edit the firmware file:

1. Click the Administration icon and select *System Settings*.
2. Scroll to the Firmware Settings panel.
3. Click the Filter icon to simplify the search.

-or-

Click the Columns icon to sort the columns.

4. Modify the information and click *SAVE*.

Configuring the Event and Alarms Archive

The event and alarms archive task can be run once, weekly or monthly. You can also select a date and time or run the task immediately.

To edit the event and alarm archive settings:

1. Click the Administration icon and select *System Settings*.
2. Scroll to the Events and Alarms Archive panel and click the Edit icon.
3. Select when to run the task and click *SAVE*.

Downloading the Bulk Data Processing tool

The Bulk Data Processing tool is provided to manage large amounts of data. To download and use the Bulk Data Processing tool, see [Data Management](#) on page 277.

2.13.8 Tenants

Tenants are users that can own or share containers/devices with other tenants, such as in colocation (COLO) environments. These users require another level of permissions to ensure each tenant can only access the information for their assigned containers or devices.

After the Trellis Administrator or a user with the Tenant Administrator role create a tenant, the following can be assigned to tenants:

- Containers and devices
- Rack RU level ownership
- Individual receptacles
- User, role and group notifications
- *Trellis*™ Inventory module monitoring operations for objects owned by tenants
- Reports
- Fine-grain authorization (FGA) under tenancy
- Dashboards within the same tenancy, including the top tenancy

After the tenant's container/device assignments are complete, the tenant must be authorized to see devices in the rack. The Device Table view displays only the assigned containers/devices to each tenant. In Graphical Edit and 3D view, each tenant's inaccessible containers/devices are displayed as gray objects.

Tenant Administrator

The *Trellis*™ administrator can create the Tenant Administrator role to manage tenants within the tenant level. The Tenant Administrator role only has rights to what is assigned to it. This can be permissions for a floor, space, zone, rack/rack RU, device and/or ports.

Each tenant and the tenant's roles, permissions and user groups, can only be created by the *Trellis*™ administrator or a tenant administrator with the applicable permissions.

To create a tenant administrator:

1. Click the Administration icon and click *Roles*.
2. Enter the role name and description (optional) and select the Administrative category.

NOTE: Only alphanumeric characters are allowed in the name. Extra spaces are not allowed.

NOTE: The default tenant admin role cannot be deleted.

To create a tenant:

1. Click the Administration icon, click *Tenants* and click the Add icon.
2. In the New Tenant window, enter the name and email. The description is optional.
3. Click the avatar circle, select the tenant's avatar color and click *SAVE*.

NOTE: An email is automatically sent to the tenant with a temporary password and instructions to create a new password.

User avatar

Avatars are created when a tenant is added. They are used to identify the user assigned to the avatar and are displayed for assignments, such as assigning and managing alarms.

When assigning a name to a tenant, the avatar adds the first two capital letters in the name to the avatar. If no capital characters exist, the first character is used. Avatars can be modified or deleted, but the name cannot be changed.

To delete an avatar:

1. Click the Administration icon, click *Tenants* and click a tenant's checkbox.
2. Click the Delete header icon and click *DELETE*.

Configuring Tenant Assignments

A tenant's email, description and avatar can be edited. A tenant's name is not editable.

To search for and edit a tenant's email, description and avatar:

1. Click the Administration icon, click *Tenants* and click the Search icon.
2. In the Search field, enter the tenant's avatar initials or name.
3. When the tenant is shown in the list, click the tenant's checkbox and click the Edit header icon.
4. In the Edit Tenant window, modify the tenant's email and/or description and click the avatar.
5. Click a new color from the chart and click *SAVE*.

NOTE: Editing the email and description also edits the User Tenant's email and description.

To assign a role or group to a tenant:

1. Click the Administration icon and click *User Management*.
2. Click the Search icon and enter the user's name in the Search field.
3. From the displayed list, click the tenant's checkbox and click the Edit header icon.
4. In the Edit User window, scroll to the Roles panel, click the applicable role's checkbox and click *SAVE*.

To assign a tenant to a building, floor, space, zone, rack and device:

1. Click the Portfolio icon, and in the Devices panel, click a building's checkbox.

NOTE: You can select the ASSIGN RECURSIVELY checkbox to assign the currently selected tenant to all containers and devices within the current container.

2. Click the Assign Tenant content header icon, search for or scroll to the tenant and place the cursor over the tenant row.
3. Click the Assign Tenant icon in the tenant's row and click *SAVE*.
4. Select a floor in the building and click the Assign Tenant header icon.

NOTE: You can select the 3D or Graphical Edit header icon to complete the procedure graphically.

5. Click the Assign Tenant icon, search for or scroll to the tenant and place the cursor over the tenant row.
6. Click the Assign Tenant icon in the tenant's row and click *SAVE*.
7. Click a space on the floor and click the Assign Tenant icon.
8. Click the Assign Tenant icon, search for or scroll to the tenant and place the cursor over the tenant row.
9. Click the Assign Tenant icon in the tenant's row and click *SAVE*.
10. Click the rack in the space, click the Assign Tenant icon, search for and click the tenant's checkbox and click *SAVE*.
11. Click the Assign Tenant icon, search for or scroll to the tenant and place the cursor over the tenant row.
12. Click the Assign Tenant icon in the tenant's row and click *SAVE*.
13. Search for a server, then select and drag the server to the rack.
14. Click the Assign Tenant icon, search for and click the tenant's checkbox and click *SAVE*.
15. Click the rack, click the individual slots to be assigned to a tenant and click *SAVE*.

NOTE: The Tenant Rack window displays which RU ports are available.

NOTE: A message appears if you are not permitted to perform an action for an RU.

NOTE: Settings apply for the user and not for the session, so they are retained until they are changed.

To delete a tenant:

1. Delete any containers/devices assigned to the tenant.
2. Click the Administration icon, click *Tenants* and click the Search icon.
3. In the Search field, enter the tenant's avatar initials or name, and when displayed, click the tenant's checkbox.
4. Click the Delete header icon and click *DELETE*.

NOTE: Procedures to add, edit or delete a tenant, or manage tenant-assigned containers/devices, are the same as the procedures for users. Roles, rights, permissions, user groups and notification rules and reports are performed the same as for standard users. The only exception is selecting *Administration - Tenants* instead of *Administration - User Management*.

For more information, see the following:

- [Roles](#) on page 102
- [Adding permissions](#) on page 104
- [User Groups](#) on page 116
- [Configuring notification rules](#) on page 99

2.13.9 Assigning tenants to containers recursively

Tenants can be simultaneously assigned to containers and devices within a parent container.

After a tenant is created, the tenant can be assigned at the building, floor, space and rack level. After assigning a tenant recursively, the tenant is assigned to all the child components in the container.

NOTE: A device has no devices inside it and therefore does not require the Assign Recursively feature.

Tenants can also be unassigned recursively to remove tenancy at the same container levels.

To assign or unassign a tenant recursively:

1. Open the container at the level to receive the assignments.
2. Click the Assign Tenants header icon.
3. In the container's window with the list of available tenants, click one or more assigned tenants, click the Assign Recursively or Unassign Recursively checkbox and click *SAVE*.

2.13.10 User Defined Properties

The User Defined Properties (UDP) window is used to add, edit and delete user-defined properties for devices and connections. All fields must be completed in order to perform an operation. In this view, you can search for user-defined properties, filter the list, sort (show/hide) columns and select multiple assets for deletion. Similar to the search function, when you begin entering the name of a device, the auto-fill displays a list of probable devices. You can also verify the association of a property to a device or area.

Existing properties can be viewed in the Defined Properties list. Assignable properties are the name, input type (string, date, date time or numeric), default value and category assignments. A UDP name can be used across categories, but duplicate names are not allowed in the same category. For example, when using Temp-Rack in a category, you can create the property name Temp-Server, but not Temp-Rack. New properties are added to the end of the User Defined Property list.

The following are selectable categories and some of the applicable types for each category:

- Containers - Enterprise, Building, Floor, Space, Zone
- Device - All, Blade Chassis, Circuit Branch Breaker, Breaker Panel, Card, Main Breaker, PDU, Power Rail, Rack, Rack PDU, Sensor, Server, Subfeed Breaker, Telecom Switch, UPS and others
- Connections - Data Connection, Power Connection
- Ports - Data Port, Power Port, Slot, Receptacle and others

Figure 2.46 Adding User-Defined Properties

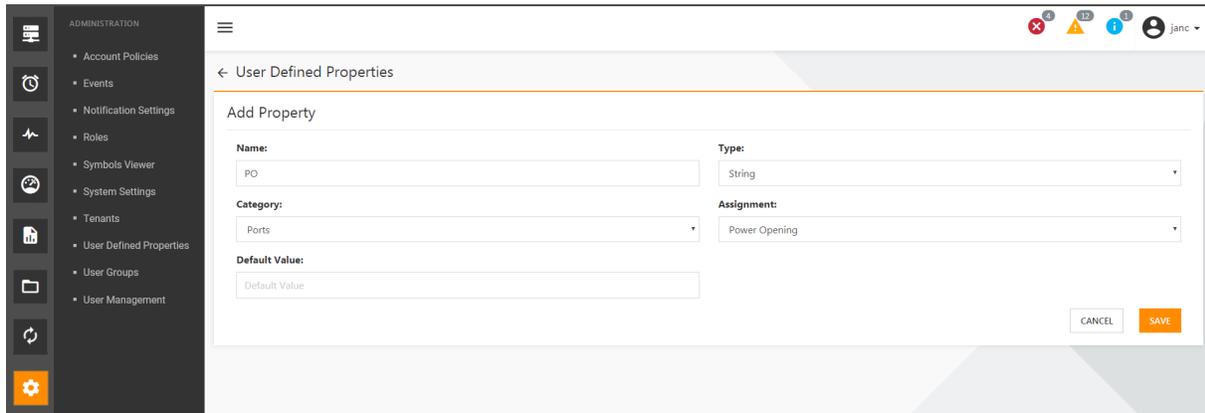


Table 2.39 User-Defined Properties' Window Descriptions

COLUMN	DESCRIPTION
NAME	Name of the property to be configured or edited
TYPE	Property type: String, Numeric, Date, Date/Time
CATEGORY	Category the device belongs to
ASSIGNMENT	Assigned container: Enterprise, Building, Floor, Space, Zone, Container
DEFAULT VALUE	Default date and time; can be cleared and reset
TENANT	Person assigned to the user-defined property

To add user-defined properties:

1. Click the Administration icon and select *User Defined Properties*.
2. In the User Defined Properties window, click the Add icon.
3. In the Add Property panel, complete the fields and click *SAVE*.

To edit user-defined properties:

1. Click the Administration icon and select *User Defined Properties*.
2. In the User Defined Properties window, select a name and click the Edit icon.
3. In the Edit Property window, complete the fields and click *SAVE*.

To verify a user-defined property:

1. Click the Portfolio icon and select a container or device for which the user-defined property was created.
2. Click the vertical ellipses icon of the container or device and select the Edit option.
3. In the Edit Property panel, locate the changes.
4. Navigate to the window with the updated user-defined property.

To search for user-defined properties in the *Trellis™* platform catalog:

1. Click the Administration icon and select *User Defined Properties*.
2. In the User Defined Properties window, click the Search icon.

3. In the Search field, begin entering the name and when the auto-complete provides a list, check the property's checkbox.

4. Click the Edit icon.

-or-

Click the vertical ellipses icon and select *Edit*.

5. In the Edit Property window, complete the fields and click *SAVE*.

-or-

Click *CLEAR* to enter new information and click *SAVE*.

To delete user-defined properties:

1. Click the Administration icon and select *User Defined Properties*.

2. In the User Defined Properties window, click a user-defined property's checkbox.

3. Click the Delete icon.

-or-

Click the vertical ellipses icon and select *Delete*.

To filter user-defined properties:

1. Click the Administration icon and select *User Defined Properties*.

2. In the User Defined Properties window, click the Filter icon.

3. In the Filter window, click the Group By arrow.

4. Select *None*, *Name* or *Type* and click *CLOSE*.

To sort the user-defined properties' columns:

1. Click the Administration icon and select *User Defined Properties*.

2. In the User Defined Properties window, click the Columns icon.

3. Click *Type*, *Assignment* or *Default Value*.

2.13.11 User Groups

In the User Groups window, you can add, edit or delete the *Trellis*™ platform user groups to/from the system. You can search for and sort user groups, filter columns, assign roles to user groups and edit roles and users that are assigned to user groups. The multi-select feature is available for the delete operation.

When you create a new user group, it is automatically assigned to an internal authentication source. After you create a group, you can add users to it. Also, after an internal group is created, you can map it to an external authentication source, map the external group to an internal group and assign a role to the group. For more information about authentication, see [Adding an external authentication source](#) on page 94.

NOTE: You can cancel changes at any time.

NOTE: In this guide, when referring to the Edit, Delete, End Session or Reset Password icon, use either the icons displayed above the table headers or click the vertical ellipses icon and select the Edit, Delete, End Session or Reset Password icons.

Table 2.40 User Management Functions

NAME	DESCRIPTION
Users	Creating users and assigning users to groups and roles
User Groups	Creating, assigning and managing user groups
Roles	Creating and assigning permissions to roles
Authentication	Managing user access to resources
Account Policies	Creating user sessions policies, for example, password expiration and whether the user needs defined session policies
Notifications	Configuring roles for notification of events and alarms

Table 2.41 User Groups Window Column Descriptions

COLUMN	DESCRIPTION
SOURCE	Authentication source that is authenticating the users in the group
NAME	Name of the user group
ROLES	Role of the group

Table 2.42 Roles Window Column Descriptions

COLUMN	DESCRIPTION
CATEGORY	Used to select a specific role
NAME	Used to select a specific role
DESCRIPTION	Used to describe a specific role

To search for a user group:

1. Click the Administration icon and select *User Groups*.
2. Click the Search icon and enter information to search all groups with your entry.

To add a group:

1. In the User Groups window, click the Add icon.
2. In the Group panel, enter a group name and click *SAVE*.

To add or edit user group details:

1. In the User Groups window, locate the user group, click its vertical ellipses icon and select *Edit*.
-or-
Click the user group's checkbox and click the Edit icon.
2. For each panel (Users, Roles and External Groups), enter a name in the Search field, and when the name is displayed, click its checkbox and click *SAVE*.

To sort the user group list:

In the User Groups window, click in the NAME header field.

To filter the user group list:

In the User Groups window, click the Columns icon and select or deselect Name and Roles.

To delete one or more user groups:

Click one or more user group's checkboxes, click the vertical ellipses icon and select *Delete*.

-or-

Click the checkbox in the header to select all user groups and click the Delete icon.

2.13.12 User Management

From the User Management window, an administrator can add a user, edit user details, apply restrictions to a user, assign a user to a role or a group, remove a user, end a user's session and reset a user's password. You can search for users and sort columns in the first view. After a user is added, selecting the user enables additional fields and displays the icon to perform more operations, such as to edit or delete a user, as well as assign roles to a user. Multi-selection is available for the delete user, end user session and reset password operations.

NOTE: Users can manage personal settings. For more about User profile settings, see [Configuring your user profile](#) on page 22.

NOTE: In this guide, when referring to the Edit, Delete, End Session or Reset Password icon, you can use either the icons displayed above the content headers or click the vertical ellipses icon and select the Edit, Delete, End Session or Reset Password icons.

Table 2.43 User Management Window Descriptions

NAME	DESCRIPTION
SOURCE	Displays if the source is internal or external

Table 2.44 Add User Fields

NAME	DESCRIPTION
Username	Name of the user
Email	Email of the user
Mobile Phone	Mobile phone of the user
Fax	FAX number of the user
Address	Address of the user
City	City of the user
State	State of the user
Postal Code	Postal code of the user
Company	Company of the user

Table 2.45 Restrictions Panel Descriptions

NAME	DESCRIPTION
Change Password at Next Login	Enables/disables the requirement to change the password at the next login
Password Never Expires	Enables/disables the ability to keep the same password indefinitely
Account is Locked	Enabled after a user exceeds the configured number of login attempts or if the user password is expired
Cannot Change Password	Enables/disables the ability to change the password
Account is Disabled	Enables/disables the account
Account Never Expires	Enables/disables the account's expiration
Expires	Date the user restriction is terminated; drop down menu with a calendar
Search for Roles field	Used to search for roles
Role Name checkbox	Used to select role names

To add a user:

NOTE: The *Trellis*™ platform generates the first user password and sends it to the user.

1. Click the Administration icon and select *User Management*.
2. In the User Management window, click the Add icon.
3. In the User window, enter the user's name without any spaces and the user's email address.
4. Complete the fields and click *SAVE*.

NOTE: An email is sent to the user with the username and password.

To search for a user:

1. In the User Management window, click the Search icon.
2. In the Search field, begin entering the username and when it is displayed in the list, click its checkbox.
3. Select the icon in the content header for the applicable operation.

To sort the user list:

In the User Management window, click the SOURCE or NAME table header.

To add/remove columns:

1. In the User Management window, click the Columns icon.
2. Select or deselect the Source header.

To edit a user's summary information, restrictions and role name:

1. In the User Management window, click the user's checkbox and click the Edit icon.
2. In each panel, complete the fields and click *SAVE*.

To end one or multiple user sessions:

1. In the User Management window, click one or multiple user's checkboxes.
2. Click the End Session icon.

To delete one, multiple or all users:

1. In the User Management window, click one or multiple user's checkboxes.
2. Click the vertical ellipses icon and select *Delete*.

To reset one, multiple or all passwords:

1. In the User Management window, click one or multiple user's checkboxes.
2. Click the Reset Password icon.
3. Verify the results in the Information window.

Assigning scalable permissions

For larger organizations, scalable administration allows you to organize and manage permissions more efficiently. Assigning scalable permissions involves assigning user groups to roles and then adding users to the groups. User groups can be added to represent organizations within the company, for example, by geographic structure, job function or management structure.

To assign scalable permissions:

1. Create a role, create a user group and assign the role to the user group.
2. Create users or add existing users to the user group.

2.14 Virtualization

The *Trellis*™ platform has the ability to map and show Virtual Machines (VM), as well as track devices when they are moved. VM tracking is basically associating the VMs to a physical host. Any data coming from a virtual manager in the *Trellis*™ platform is read only.

All views and reports have Virtual Hosts and Guests associated with the physical device they reside on during the most recent sync. Based on the type of Virtual Host selected, you can poll for information to get a list of the additional virtual hosts and/or virtual machines.

2.14.1 Virtual Machine (VM) Controller

The VM feature adds the new device category, Virtual Machine Controller, which is a device that contains a virtual host. The VM Controller is accessible in the Portfolio Devices window. It is searchable and can be configured similar to all other devices; however, this device type does not have any physical properties and cannot be placed.

Virtual Host types are:

- VMWare VCenter version 5.5 and 6
- VMWare ESX/ESXi
- VM Portfolio
- VM Host and Server functions

The virtual guest/host properties include:

- Device Name (mandatory and retrieved from the VM Host)
- Owner
- Owner Email
- Notes
- Category

- Description
- Web Page

Criteria you can add/assign are:

- Name - Name of Host (can be used for discovery)
- Type - Used to select a Virtual Host Types
- Username - Username to log into the VM Host
- Password - Password to log into the VM Host
- Address - Protocol type and IP address to log into the VM Host

VM Host and Server functions

For devices to be used as a VM Host, you must promote one of the following device categories: Server, Blade or Chassis, to enable connectivity and interrogation.

VM Controller Promotion

For devices in the Server, Blade or Chassis category, a VM Controller Promote icon appears in the upper Details window. The VM Controller icon is enabled unless the device is already promoted to a Virtual Machine Controller or if the device is not in the Server, Blade or Chassis category.

For devices that have only VM Host information, when selecting another Virtual Machine Controller, its VM Host information is copied to the Virtual Machine Controller with the physical properties. When selecting devices in the Server, Blade or Chassis category, the device is promoted to a Virtual Machine Controller and its Virtual Machine Controller properties are populated with the other Virtual Machine Controller Host information. The Virtual Machine Controller with VM Host information is removed from the system and cannot be discovered again until the Virtual Machine Controller it is assigned to is deleted.

2.14.2 VM Schedule Service

If the device is promoted to Virtual Machine controller with valid information for the VMWare VCenter, the *Trellis™* platform creates a scheduled service to communicate to the VMWare VCenter. This service returns all ESX servers in the VMWare VCenter and creates a VM controller for each object. The service compares the unique ID names of the ESX servers to all VM controller names, resulting as follows:

- If any of the ESX servers' unique ID names are found to be associated to an existing VM controller name, and it has an additional VM controller, such as IP address information, that ESX server is not created for the VM controller.
- If any of the ESX servers' unique ID names are found to be associated to an existing VM controller, and it does not have an additional VM controller, such as IP address information, that ESX server information is sent to the VM controller extended properties.
- If any of the ESX servers' unique ID names are not found associated to an existing VM controller, that ESX server information is used to create a new VM controller.

To promote one, multiple or all devices to be used as a VM Host:

On the Details window, locate and select the device's checkbox, click its vertical ellipses icon and select *Edit*.

-or-

Click multiple devices' checkboxes or the header checkbox, select the Edit header icon and click *SAVE*.

To promote a device that is not currently merged with a VM Host:

1. Click the VM Controller Promote icon to create a new panel in the Details window called Virtual Machine Controller.
2. Enter a name for the VM Host, which can be matched up with the VM Host discovery that auto-fills the rest of the parameters for the VM controller.
3. If the information is not auto-filled, enter all the network information, such as the username, password and IP address to log into the Host and the type of Virtual Host, in order to trigger this Virtual Machine Controller to be part of the VM Schedule Service.
4. Click *SAVE*.
5. After you add the host filename and credentials, import a certificate into the *Trellis*™ platform to ensure communication is secure.

To create a Virtual Machine Controller for all discovered ESX servers:

1. Click the Portfolio icon and in the Devices panel, click the Add icon and add a Dell® server to use as the VM controller.
2. Click the added server and in the VM controller dialog, enter the IP address, username, password, protocol, domain and port for the virtual center.
3. From the Type drop-down menu, select *VMware vCenter* and click *Submit*.
4. Verify the following:
 - Original Dell® server is now a VM controller.
 - ESX servers associated with the virtual center are added to the Portfolio ESX server category.

3 DATA COLLECTION ENGINE

The external, software-based *Trellis*[™] Intelligence Engine and the embedded *Trellis*[™] Intelligence Engine component of the Avocent[®] Universal Management Gateway appliance continuously query and analyze information that is collected from devices (IT and facility equipment) in the data center. After the data is collected, the information is provided to the applicable platform software modules.

From the *Trellis*[™] platform, you can enroll either engine in order to monitor devices. Both engine types can be replaced and unenrolled. The following additional functions are supported for both engines:

- Multi-selection - Allows you to select one or more engines to perform the unenroll function.
- Protocol browser - Command line utility on the Avocent[®] Universal Management Gateway appliance and *Trellis*[™] Intelligence Engine used to interface to target devices (monitored devices).
- Element Library - Includes a quick installation feature.
- Service Processor monitoring - Monitors service processors as a device.
- One engine service - Runs the engine service as root.
- Restart all Intelligence Engine services - Allows the administrator to restart all the engine services from the *Trellis*[™] platform.
- Restart individual Intelligence Engine services - Allows the administrator to restart individual services via command line.
- Engine restart - Allows the administrator to restart the engine and create events.
- Intelligence Engine start alert - Logs an engine start and sends an alert.
- Backup - Allows you to back up the engine configuration, delayed events and L2 data, if present. The multi-select feature can also be used.
- Encryption - Provides monitored device communication properties.

The following functions are supported for only the external *Trellis*[™] Intelligence Engine software:

- Upgrade - Upgrade the external *Trellis*[™] Intelligence Engine software via the *Trellis*[™] platform UI.
- Upgrade history - Display all the upgrades on the external *Trellis*[™] Intelligence Engine, including the upgrade file and the upgrade completion time.
- Backup history - Back up the engine configuration, delayed events and L2 data, if present, via command line.
- Multi-selection - Select one or more engines to perform the upgrade, upgrade history and backup history functions.

The following are references to additional resources that discuss the *Trellis*[™] Intelligence Engine:

- For the supported operating systems and PostgreSQL databases, see the TRELLIS[™] Real-Time Infrastructure Optimization Platform Pre-Installation Installer/User Guide.
- For backup/restore and upgrade procedures, see the administrator's guides for Red Hat[®] Enterprise Linux[®] and Microsoft[®] Windows[®].
- For instructions to update *Trellis*[™] platform certificates, see the administrator's guides for Red Hat[®] Enterprise Linux[®] and Microsoft[®] Windows[®]. We recommend you also contact Professional Services or Technical Support to assist with certificate upgrades.
- If your platform uses the appliance-based engine to collect data, see [Upgrading the External *Trellis*[™] Intelligence Engine Software](#) on page 131.
- For more information about the appliance and its engine's features and functionality, see the Avocent[®] Universal Management Gateway Appliance Installer/User Guide.

3.1 Data Collection Engine Details

For each data collection engine you can access the following details: view a summary of its software and firmware versions, IP address and protocol, data collection load data, versions of the element libraries, connected service processors' details, managed device's details, backup history and upgrade history. You can also view and configure polling intervals and the discovery configurations. The following table provides more about each panel.

Table 3.1 Data Collection Engine Details

NAME	DESCRIPTION
Summary	Displays the selected engine's version, element library, monitoring appliance name and IP address, protocol, Intelligence engine version and firmware version.
Overview	Displays the data collection partition illustrating the total data points being collected. The used and available power capacity totals and percentages are also displayed to verify if the engine is becoming overloaded.
Element Libraries	Element libraries are listed by name with the version. Element libraries can be added from this panel.
Service Processors	Service processors are listed with the following information: status, discovered name, IP address, mapped device name and location, manufacturer, model and MAC address.
Device Status Polling Interval	Allows you to configure how often to poll devices for data.
Discovery Configuration	Allows you to discover devices by type and address range. Configurations can be added, modified and deleted.
Managed Devices	Displays the following information about managed devices: state, name, category,
Backup History	Includes the date, filename, version, file size and the number of devices monitored by the engine.
Upgrade History	Lists the Intelligence Engine upgrades including the upgrade date, filename, version, firmware/OS version and status of the engine.

To access a data collection engine's details:

1. Click the Monitoring icon and click *Data Collection Engine*.
2. Click an engine's checkbox and click the Edit icon.
3. Scroll to the applicable panel.

To add element libraries:

1. In the Element Libraries panel, click the Add icon.
2. In the Install Element Library window, select the library.
3. Click the Schedule date drop-down arrow, select a date and click *SAVE*.

To configure the polling interval for a device:

1. In the Device Status Polling Interval panel, enter the interval.
2. Click the Unit drop-down arrow and select SECONDS, MINUTES or HOURS.
3. Click *SAVE*.

To discover devices in a range of IP addresses:

1. In the Discovery Configuration panel, click a checkbox and click the Edit icon.
2. In the Edit IP Address Range window, click the drop-down arrow and select *IPV4* or *IPV6*.
3. If applicable, modify the IP address range and click *SAVE*.

3.2 Data Collection Engine Service Command

The service management script command, MSScont.sh, allows you to start, restart and view the Intelligence Engine services and their current status.

3.3 Service Processor Support

The Intelligence Engine uses the Service Processor Management (SPM) protocol. The SPM upgrade modules can be installed or uninstalled via the *Trellis*™ platform. After the modules are installed from the *Trellis*™ platform UI and added to the *Trellis*™ platform, they are provided as a selectable option. The supported service processors are listed in the following table.

Table 3.2 Supported Service Processor Element Libraries Using the SPM Protocol

MANUFACTURER	ELEMENT LIBRARY
Cisco	cisco-ucs
Dell	dell-poweredge
Fujitsu	fujitsu-primergy
HP	hp-bladesystem
IBM	ibm-bladecenter ibm-systemx
SUN	sun-enterprise sun-fire

See [Supported Service Processor Profiles](#) on page 332.

To install or upgrade the SPM software package in the *Trellis*™ platform UI:

1. From the online *Trellis*™ platform Symbol Portal, select *Trellis*™ platform version 4.0.2 and higher to download and install the Service Processor Symbol upgrade package.
2. In the platform UI, click the Administration icon and click *System Settings*.
3. Scroll to the Firmware Settings panel and click the Add icon.
4. Click *SELECT FILE*, select the file and click *UPLOAD*.

NOTE: Upload the service processor manager software package using a supported operating system.

5. Click the Monitoring icon, select *Data Collection Engine* and select one or more data collection engines from the list.

NOTE: When selecting multiple engines for an upgrade, the engines must use the same operating system, either Red Hat® Enterprise Linux® or Ubuntu.

6. Click the Upgrade header icon, select the checkbox of the firmware to upgrade and click *UPGRADE*.
7. After the SPM package is installed and upgraded, select the SPM protocol and enter the required properties to monitor the service processors' monitored devices.

Mapping Service Processors (SPs)

The software also recognizes service processors that are being managed by the Avocent® Universal Management Gateway appliance. After an SP is enrolled to an appliance, it must also be enrolled to a device in the *Trellis*™ platform.

You can also access and map or unmap service processors from the Data Collection Engine window.

NOTE: The IP address must be configured in the *Trellis™* platform before you map the SP.

To configure an SP:

1. Click the Portfolio icon and click *Connections*.
2. In the Connections window, click the Filter icon and select *Service Processors*.
3. Make sure Connections is also selected.
4. Navigate to the device with the SP.
5. On the panels, click to connect an SP to a device.

To map or unmap an SP:

1. Click the Monitoring icon and click *Data Collection Engine*.
2. Locate and select the Universal Management Gateway and click its Edit icon.
3. Scroll to the Service Processor panel to display the list of service processors.
4. If monitored, select the SP from the list.

-or-

If not monitored, search for the SP In the Inventory Search window.

5. An update is displayed when the connection is complete.

3.4 Firewall Ports

See [TRELLIS™ Intelligence Engine Firewall Ports](#) on page 333.

3.5 Encryption

By default, the Intelligence Engine encrypts communication properties for monitored devices. The backup of the Intelligence Engine containing the configuration data and database are also encrypted. The Intelligence Engine uses the Symmetric type of encryption algorithm. The full name of the algorithm is AES and the key length is 256 bits.

3.6 Default Install Options

The database and backup data have default storage locations that can be overridden. The device properties can also be encrypted or unencrypted.

Table 3.3 Install Options for the Intelligence Engine

INSTALL OPTION	DEFAULT VALUE	SUPPORTED VALUE	DESCRIPTION
DBLocation	/mss-db	Any valid local or shared drive location that is accessible by running installation and PostgreSQL.	Location where the Intelligence Engine stores collected data. If normal communication occurs between the engine and the platform, L1 data is retained for two days; however, if there is a communication interruption, the most recent seven days of L2 data is stored and sent to the platform when communication is restored.
BackupLocation	/iebackup	Any local or shared drive location accessible by sudo permission user and engine backup services.	Location where the Intelligence Engine stores the engine backup executed from the <i>Trellis</i> ™ platform. This is assigned using the <i>Backup Engine</i> button on the Data Collection Engine web page for the selected Intelligence Engine.
Encrypted	true	true/false.	By default, the <i>Trellis</i> ™ Intelligence Engine encrypts the device communication properties. Changing the encrypted value to false causes the Intelligence Engine installer to configure the engine to store unencrypted device communication properties in the database.
AcceptEULA	No	yes/no.	Accept the EULA by setting the value to yes.

NOTE: If an invalid value is set, a warning message is displayed and installation proceeds with the default value.

To configure or override the default installation options:

1. After extracting the *ie_installer.tar.gz* file, enter **cd ie_installer** to change to the *ie_installer* directory.
2. In a text editor (such as *vi*), open the *install-prop.ini* file and select an option.

3.7 Installing a Data Collection Engine

The *Trellis*™ Intelligence Engine, whether it is the software or the embedded firmware in the Avocent® Universal Management Gateway appliance, can be downloaded from the <http://www.VertivCo.com/TrellisDownloads> URL and installed using PuTTY or a similar program. The downloaded package contains the following applicable tar.gz installer and the corresponding MD5 checksum:

- Red Hat® Enterprise Linux®: *ie_installer-<version>-RELEASE-RHEL.tar.gz*
- Ubuntu: *ie_installer-<version>-RELEASE-UBUNTU.tar.gz*

To install the data collection engine:

1. Enter **tar zxvf ie_installer.tar.gz** to extract the *ie_installer.tar.gz* folder.
2. Enter **cd ie_installer** to change to the *ie_installer* directory.
3. On a supported operating system, run the applicable script (**./install-intelligence-engine-redhat.sh** for Red Hat® Enterprise Linux® or **./install-intelligence-engine.sh** for Ubuntu) to install the Intelligence Engine with the default installation options.

-or-

Run the applicable script (**./install-intelligence-engine-redhat.sh** for Red Hat® Enterprise Linux® or **./install-intelligence-engine.sh** for Ubuntu) and change the default options for the Backup location, Enable/Disable Encryption and/or Database location. See [Default Install Options](#) on page 126.

NOTE: During the installation, you are required to read and accept the EULA to continue installation of the Intelligence Engine.

4. If the engine is running, run the **MSScont.sh status** command to verify the status of the engine.

-or-

If the engine is running, run the `MSScont.sh stop` command to stop the engine.

-or-

If the engine is not running, run the `MSScont.sh start` command.

5. After the installation is confirmed as shown in the following example, see [Enrolling a Data Collection Engine to enroll the Intelligence Engine in the *Trellis*™ platform.](#)

Example: Message Displayed After Installation

```
Preparing to unpack intelligence-engine.deb ...
.....
Using database path /mss-db with available size 11259604
Using backup path /iebackup with available size 11259604
Database will be encrypted
Installation is almost done.. Please wait..
[=====] (100%) Done
Successfully installed the Intelligence Engine!!!
It took 24 seconds to install the dependencies.
It took 45 seconds in total to finish the installation.
```

3.8 Enrolling a Data Collection Engine

After configuring the time and date for the appliance itself, the engine can be enrolled in the platform software.

To enroll a data collection engine:

1. As administrative user, log into the platform UI.
2. Place the Intelligence Engine symbol in the *Trellis*™ Inventory Portfolio.
3. Click the Monitoring icon, select *Data Collection Engine* and click *Enroll*.
4. Click the checkbox of the data collection engine, click *Next* and enter the IP address of the engine. Leave the default port number as 4440.

NOTE: Separate the address range using a dash with no spaces. Additional ranges can be separated with a comma.

5. After enrollment is complete, click *Details - Element Library* and install the Element Library to the data collection engine.

NOTE: Additional Element Libraries can be added as required.

6. On the bottom of the window, click the calendar icon in the Date field, select a minute later, click *Schedule the Upload* and click *Close* to schedule the element library upload.

3.9 Viewing Data Collection Engine Details

For each engine in the *Trellis*™ platform UI, a summary provides general details, the Element Libraries, service processors, device status polling intervals and discovery configuration information.

To view the Intelligence Engine's details from the UI:

1. Click the Monitoring icon and click *Data Collection Engine*.
2. Locate and click the checkbox for the engine and click the Edit icon.
3. Scroll to view each panel.

-or-

Update the editable panels and click *SAVE*.

3.10 Restarting a Data Collection Engine

If the Intelligence Engine is enrolled in the platform, you can restart all the Intelligence Engine services to the platform and monitored devices. After you restart and re-establish communication to the platform, the OK or Started status is displayed in the Events window.

To restart the Intelligence Engine from the UI:

1. Click the checkbox to select all engine's.
2. Click the Restart icon in the content header.

-or-

Click the vertical ellipses icon and select *Restart*.

3. In the confirmation message, click *RESTART*.

3.11 Replacing a Data Collection Engine

The data collection engine can be replaced from the *Trellis™* platform version 4.0.2 and higher. The engine replacement procedure is the same for all data collection engines.

NOTE: The Avocent® Universal Management Gateway appliance must be in the Nonresponding state before it can be replaced.

Table 3.4 *Trellis™* Intelligence Engine and Appliance Feature Matrix

DATA COLLECTION ENGINE MODEL FROM (APPLIANCE MUST BE IN RESPONDING/NOT RESPONDING STATUS AND ACTIVE STATE)	DATA COLLECTION ENGINE MODEL TO (ENROLLED AND RESPONDING STATUS)	FIRMWARE AND INTELLIGENCE ENGINE VERSION	MANUAL EL INSTALLATION TO REPLACE THE DATA COLLECTION ENGINE
2000	4000	From and To must be the same version	Optional
2000	6000	Must be the same version on From and To	Optional
2000	2000	From and To must be the same version	Optional
4000	4000	From and To must be the same version	Optional
4000	6000	From and To must be the same version	Optional
6000	6000	From and To must be the same version	Optional
2000, 4000 and 6000	Intelligence Engine	Any Appliance Firmware to Intelligence Engine 4.6	Optional

To replace a data collection engine:

1. After enrolling and installing a data collection engine, click the checkbox of the data collection engine to be replaced.

2. Click the Replace header icon.

-or-

Click the vertical ellipses icon and select *Replace*.

3. In the confirmation window, enter criteria to find and select the data collection engine to replace the old data collection engine and click *REPLACE*.

3.12 Uninstalling a Data Collection Engine

When the data collection engine is uninstalled from the host operating system, all the devices monitored by it are also uninstalled/removed.

NOTE: For tracking/auditing purposes, it is recommended to unenroll the data collection engine or unmonitor the devices it is monitoring from the *Trellis*™ platform UI prior to uninstalling the data collection engine.

To uninstall the data collection engine:

1. Enter **SSH** to log into the data collection engine hosted operating system.
2. Enter the **sudo su** command.
3. Enter **cd /etc/mss/scripts** to change the directory.
4. For Red Hat® Enterprise Linux®, execute the **./uninstall-intelligence-engine-redhat.sh** command.

-or-

For Ubuntu, execute the **./uninstall-intelligence-engine.sh** command.

3.13 Unenrolling a Data Collection Engine

Unenrolling a data collection engine is performed from the *Trellis*™ platform UI. This unenrolls the data collection engine from the platform and host operating system. It also removes all monitoring configurations from the data collection engine. One, multiple or all data collection engines can be selected to perform the unenroll operation. The event is logged as successful or failed and includes the user that initiated the unenrollment.

NOTE: The engine must be enrolled in order to be unenrolled.

During the unenroll operation, if the data collection engine is in the Not Responding Status mode or the platform is unable to reach it, you can use the manual procedure to unenroll an engine. Manual unenroll does not unmonitor the devices in the platform or unenroll the engine from the platform.

To unenroll a data collection engine:

1. As administrative user, log into the *Trellis*™ platform UI.
2. Click the Monitoring icon and select *Data Collection Engine*.
3. Click one, multiple or all checkboxes in the list of enrolled and active data collection engines.
4. Click the UnEnroll header icon.

-or-

Click the vertical ellipses icon and select *UnEnroll*.

5. In the confirmation message, click *YES*.

To manually unenroll the external *Trellis*™ Intelligence Engine software:

1. Enter **SSH** to the data collection engine host operating system as the user with sudo permission.

2. Enter `cd /etc/mss/utility` and navigate to the `/etc/mss/utility` folder.
3. Enter the `sudo ./UnEnroll.sh` command.

To manually unenroll the engine in the Avocent® Universal Management Gateway appliance:

1. Using `admin`, enter `SSH` to access the data collection engine hosting the appliance.
2. Enter `cd /mss/engine/bin` to go to the `/mss/engine/bin` folder.
3. Execute the `./mss-run UnEnroll.sh` command.

NOTE: This manually unenrolls the engine from the host operating system. If the data collection engine is still enrolled in the platform, see the "To unenroll a data collection engine" procedure.

3.14 Upgrading the External *Trellis*™ Intelligence Engine Software

To upgrade the software:

1. Click the Monitoring icon and select *Data Collection Engine*.
2. Click the checkbox of the engine and click the Upgrade icon.
3. In the Select firmware to upgrade window, click the firmware version's checkbox and click *UPGRADE*.
4. In the Scheduler window, select *Schedule the upgrade now*.

-or-

Select a specific date/time and click *OK*.

5. Click the *Add to Calender* button to confirm the schedule.

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4 TRELLIS™ INVENTORY MANAGER MODULE

Now that you understand the UI, you are almost ready to create a custom environment and begin managing your inventory.

The *Trellis™* Inventory Manager module is used to manage your infrastructure devices and is designed to minimize time, effort and errors. With this module you can know where assets are located, how they are connected and who is responsible for them. In addition, a set of text and graphical icons allow your data center infrastructure team to map out floor space and manage asset inventory.

The *Trellis™* Inventory Manager module provides the following benefits:

- Searching and locating the full data center inventory
- Creating realistic floor plan models by importing AutoCAD plans as .svg files for the floor background
- Organizing the data center plan by creating spaces to quickly differentiate between areas, such as production
- Viewing spaces and zones in a customizable XY-tiled format to get a more accurate location of devices
- Viewing device details, including properties, capacities and contained devices
- Viewing power connections between device ports and the upstream and downstream devices
- Planning current and future layouts of your data center floor using Graphical Edit view and timelines
- Running reports on your inventory, as well as rack and space availability

NOTE: When used in conjunction with the *Trellis™* Site Manager module and a data collection engine, the *Trellis™* Inventory Manager module also provides access to real-time power and cooling values.

4.1 Searching for Containers or Devices

The Search feature allows you to search through your catalog and inventory of containers and devices. The catalog contains the available device symbols that can be added to the enterprise and inventory contains the placed and unplaced devices in your inventory.

To search for a container or device using the Search icon:

1. Click the Portfolio icon and click the arrow to expand the enterprise.
2. Click the container to house the device and click the Search icon.
3. In the Search window, begin entering a keyword until a list of suggestions is displayed.
4. Select the applicable category or type and click *SEARCH*.

To search for device symbols:

1. Click the Portfolio icon and click the Add header icon.
2. Select *Catalog* or *Inventory*.
3. Enter a keyword in the Search field, click *SEARCH* and continue searching until the device name is listed.

NOTE: If the list is not totally visible, scroll to view the entire list.

4. Click the Add icon to add the device and click *SAVE*.

To clear the Search field:

Select the Search entry and press **Delete** on your keyboard.

To search for and add a device in Graphical Edit view:

1. Click the Portfolio icon, expand the enterprise and click a floor in the Devices panel.

2. In the content header, click the Graphical Edit icon, click the Add icon and select *Catalog*.
3. In the Catalog Search field, enter a keyword, category and/or manufacturer for the device to refine your search and click *SEARCH*.
4. In the displayed list, highlight the device name and drag the symbol to the space on the floor.

NOTE: Right-click the placed device to assign an alarm, configure the environmental threshold or change the status of the device.

To place a device in maintenance mode while in Graphical Edit view:

1. After a device is placed in a space in Graphical Edit view, right-click the device and select Maintenance Mode.
2. Select the start date, time, end date and time.
3. Click the radio button to automatically reset the device to normal on the end date and click Save.

-or-

Click the radio button to require a manual reset and click Save.

Figure 4.1 Catalog Search Window

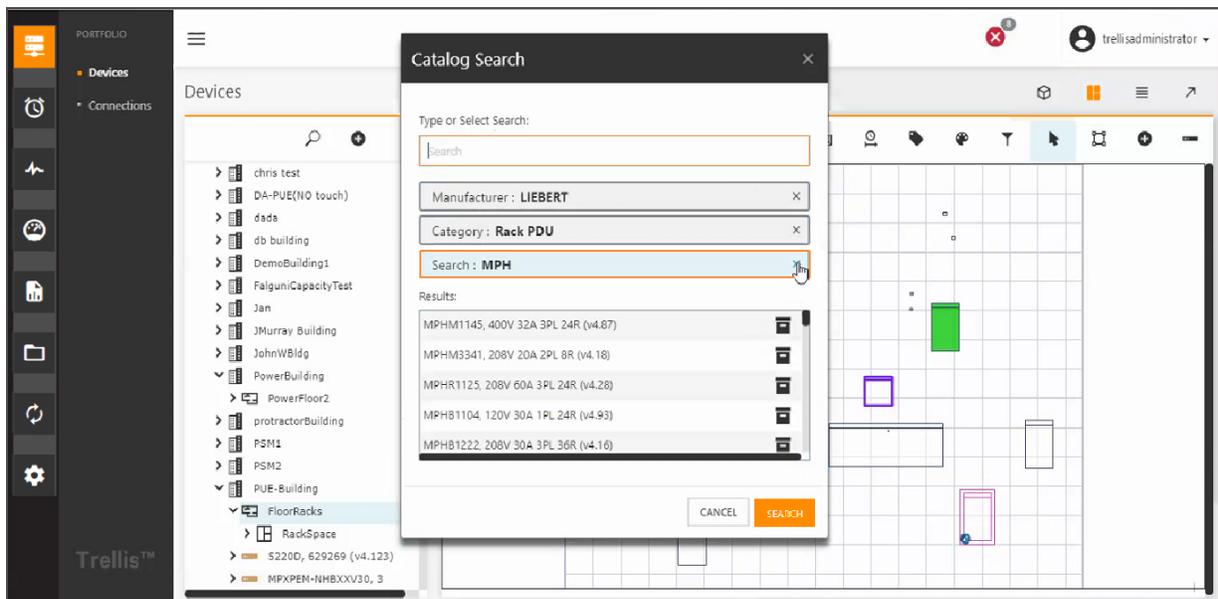
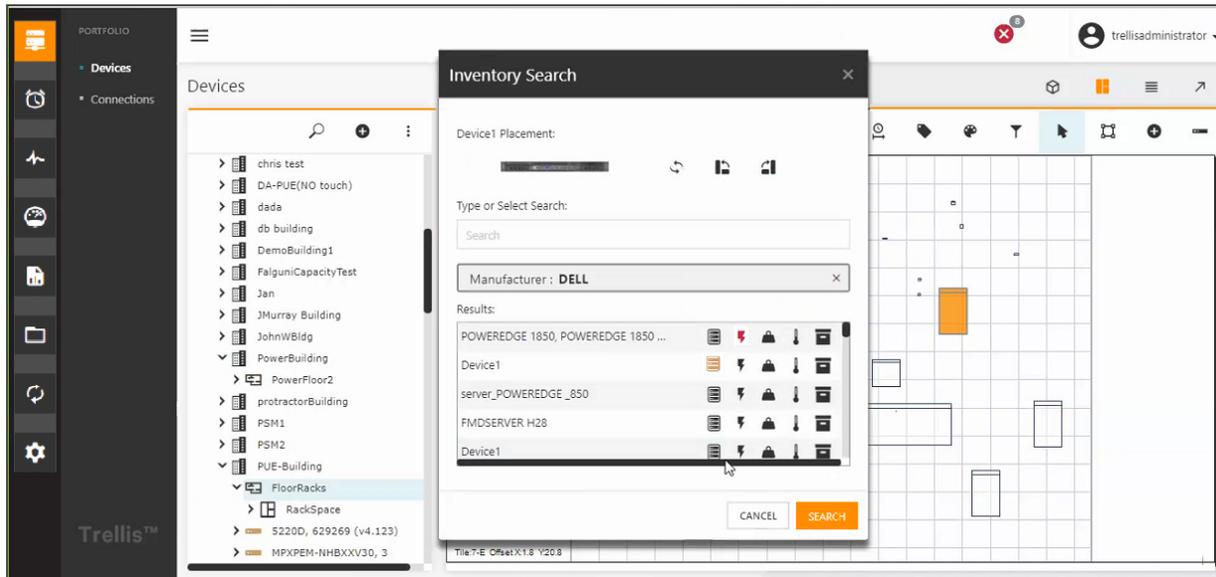


Figure 4.2 Inventory Search Window



4.1.1 Searching for devices and symbols

The Search feature allows you to find the devices and symbols that you add to the *Trellis™* platform software. From the Search icon you can perform a global search by entering known information about an asset. As you begin entering information in the Search field, the auto-complete feature lists options for you to complete the entry. After performing a search for all the devices that meet the entered criteria, if a symbol is added to the database, you can select a specific device from the displayed results and view a symbol of the asset with its dimensions. In Graphical Edit view, symbols can be rotated and flipped before placement.

To learn more about symbols, see [Working With Catalog Symbols and Element Libraries](#) on page 170.

If a device image is not in the catalog, see [Submitting a new symbol request](#) on page 171.

4.1.2 Using device placeholders

When a requested device is not provided, you can mount a placeholder to reserve the space until the new device is available. Placeholder symbols are located in the catalog and are available in different sizes.

Properties and connections can be assigned to placeholder symbols as you would assign them to other devices. This includes capacities and/or consumptions, which are added to the total consumption values for the rack where the device resides.

To add a reserved or placeholder symbol:

1. Click the Portfolio icon and expand the enterprise.
2. Select the appropriate container, click the Add icon and select *Catalog*.
3. In the Type or Select Search box, enter **Reserved/Placeholder** and click *SEARCH*.
4. Select the appropriate size for the symbol, click the Add icon and click *Save*.
5. Select the container and select the Graphical Edit icon to view the container in Elevation view.

6. If desired, select the floor, click the Graphical Edit icon and drag the reserved/placeholder symbol from Unplaced inventory to the desired location.

To view the contents of a building, floor and space:

Click the Portfolio icon, and in the Devices panel, click the enterprise, building or group arrow to expand the list under it and view its contents.

To edit container or device details:

1. In the Devices panel, click the container or device checkbox and click the Edit header icon.
-or-
In the content panel, identify the container or device, click its vertical ellipses icon and select *Edit*.
-or-
In the content panel, click to enable the container or device's checkbox and select the Edit icon.
2. For each panel, complete the fields and click *SAVE*.

To return to the previous window:

Click the back arrow in the header.

To delete a container (enterprise, building, floor or space):

1. Click the Portfolio icon and expand the enterprise.
2. In the Devices panel, click the container's checkbox and click the *Delete* icon.

To delete a device:

1. Click the Portfolio icon, expand the enterprise and select the device.
2. In the content panel, select the device and click the Delete icon.

-or-

In the content panel, click to enable the device's checkbox, select the Delete icon and click *DELETE* to confirm the operation.

4.2 Working With Floors

After you create a building in the Portfolio Devices panel, you can add a floor to the building to represent a physical floor in your building. Each building can contain multiple floors.

In the Portfolio Devices window, you can select a floor and view it in Graphical Edit view or 3D view. In Graphical Edit view you can select and modify an item on the floor, assign levels to the item on the floor or add a space to the floor. In 3D view, you can print the snapshot or landscape of the floor.

In the Portfolio window, you can assign the attributes of the selected floor, including the altitude of the floor. The altitude can be a range between -1500 to 20000 feet (-457 to 6096 meters). After a floor is created, you can proceed to create one or more spaces on the floor.

For more information, see the following:

- [Graphical Edit view](#) on page 24
- [3D view](#) on page 30

- [Working With Spaces](#) on page 138
- [Understanding Consumption Capacities](#) on page 151

4.2.1 Creating and editing a floor

The following procedures explain how to create and edit a floor.

To create a floor:

1. Click the Portfolio icon and expand the enterprise.
2. Select a building where you want to add the floor.
3. In the Devices panel, click the Add icon.
4. In the Summary window, complete the fields for the floor and click *SAVE*.

To edit a floor's details:

1. Click the Portfolio icon and expand the enterprise.
2. In the Devices panel, click the floor and click the Edit header icon.
3. For each panel, complete the fields and click *SAVE*.

To delete a floor:

1. Click the Portfolio icon and expand the enterprise.
2. Select the building and the floor.
3. Click the *Delete* icon and click *DELETE* to confirm.

NOTE: A floor cannot be deleted from Graphical Edit view or 3D view.

4.2.2 Adding a text label to a floor

Text can be added to a floor as well as its contained spaces and zones.

To add a text label to a floor:

1. Expand the enterprise and select a building and a floor.
2. Click the Graphical Edit icon and click the Label icon.
3. Click on the floor, click in the text box and begin entering text.
4. Click the box line and move the cursor to move the text on the floor.

To hide text on a floor:

Select the text box, click the Filter icon and click the Text option to disable.

To display hidden text:

Click the Select icon and hover the cursor over the area where the text was placed.

4.3 Working With Spaces

One or more spaces can be created on a floor in 3D, Graphical Edit or Device Table view. Spaces can be a rectangle or a custom design. After a space is created, you can assign the colorization and level attributes using the icons in the content header. The space level height options are a ceiling, drop ceiling or a raised floor. Ceiling height is the distance between the floor level and the ceiling level. The drop ceiling height is the distance between the floor level and the drop ceiling level and the raised floor height is the distance between the floor level and the raised floor level. The maximum ceiling height is 50 feet. If one or more devices are in a space, the platform allows the space height to be greater.

Space properties are defined in the following table.

Table 4.1 Space Window Descriptions

FIELD NAME	DESCRIPTION
Name	Name of the space (required)
Owner	Owner's name of the space
Notes	Additional information about the space
Ceiling Height (ft)	Default is 16.00
Drop Ceiling Height (ft)	Default is 12.00
Raised Floor Height (in)	Default is 24.00
Floor Tiles	All Tile information stays disabled until the values are defined. The measurements are: Feet (Default) Inches Meters Centimeters Millimeters
Tile Height	Default is 2.0
Tile Width	Default is 2.0
Tile Offset X	Default is 0.0
Tile Offset Y	Default is 0.0
Column Start	When the user selects a Column pattern it is automatically populated with the first value. For example, if 'A... ZZ' is selected populate it with 'A'. Validates against the Column Pattern Selected
Column Pattern	A... ZZ - Default ZZ... A 0... 999 00... 999 000... 999 999... 0 999... 00 999... 000
Row Start	When the user selects a Row pattern it is automatically populated with the first value. For example, if 'A... ZZ' is selected populate it with 'A'. Validates against the Row Pattern Selected
Row Pattern	A... ZZ - Default ZZ... A 0... 999 00... 999 000... 999 999... 0 999... 00 999... 000
Column Exclusions	Validates against the Column Pattern Selected. Should have placeholder that shows examples.

Table 4.1 Space Window Descriptions (continued)

FIELD NAME	DESCRIPTION
Row Exclusions	Validates against the Row Pattern Selected. Should have placeholder that shows examples.
Column/Row Delimiter	None (Default) - Dash /Forward Slash \Backward Slash _ Underscore . Period
List	Column First (Default) Row First

NOTE: Heights for drop ceilings or raised floors must be configured prior to assigning devices to those levels.

NOTE: Spaces cannot be nested. For example, you cannot add a space to an existing space.

For more information, see the following:

- [Graphical Edit view](#) on page 24
- [3D view](#) on page 30
- [Working With Racks](#) on page 142
- [Working With Devices](#) on page 144
- [Understanding Consumption Capacities](#) on page 151
- [Working With Standard and Unusable Zones](#) on page 141

To create a space on a floor in the Portfolio Devices window:

1. Click the Portfolio icon, expand the enterprise and select a floor.
2. In the Devices panel, click the Add icon, complete the Summary fields and click *SAVE*.

NOTE: Before adding spaces, zones or devices to a floor in Graphical Edit view, click the Filter icon to ensure the appropriate level is selected, such as the Floor level.

To create a space on a floor in Graphical Edit view:

1. Click the Portfolio icon, expand the enterprise and select a floor.
2. Click the Graphical Edit icon.
3. Click the Filter icon and select the level for the space.
4. Click the Rectangle Space icon and select *Rectangle Space* or *Zone* or *Custom Space* or *Zone*.
5. Draw the space on the floor, and in the New Space Name window, enter a name and click *Create*.

To assign or edit properties of a space:

1. Click the Portfolio icon, expand the enterprise and select a space.
2. For each panel, complete the fields and click *SAVE*.

To edit the data points of a space:

1. Click the Portfolio icon, expand the enterprise and select a space.
2. Click the Graphical Edit icon.
3. With the floor displayed, click the Select icon and click *Select*.

4. Click the space, right-click and select *Edit Points*.
5. Place the cursor over a point and move the cursor.

NOTE: Points can also be added or deleted.

To delete a space:

In the Portfolio Devices window, select the space and click the Delete icon.

-or-

In Graphical Edit view, select the space, click the Delete icon and click *DELETE* to confirm the action.

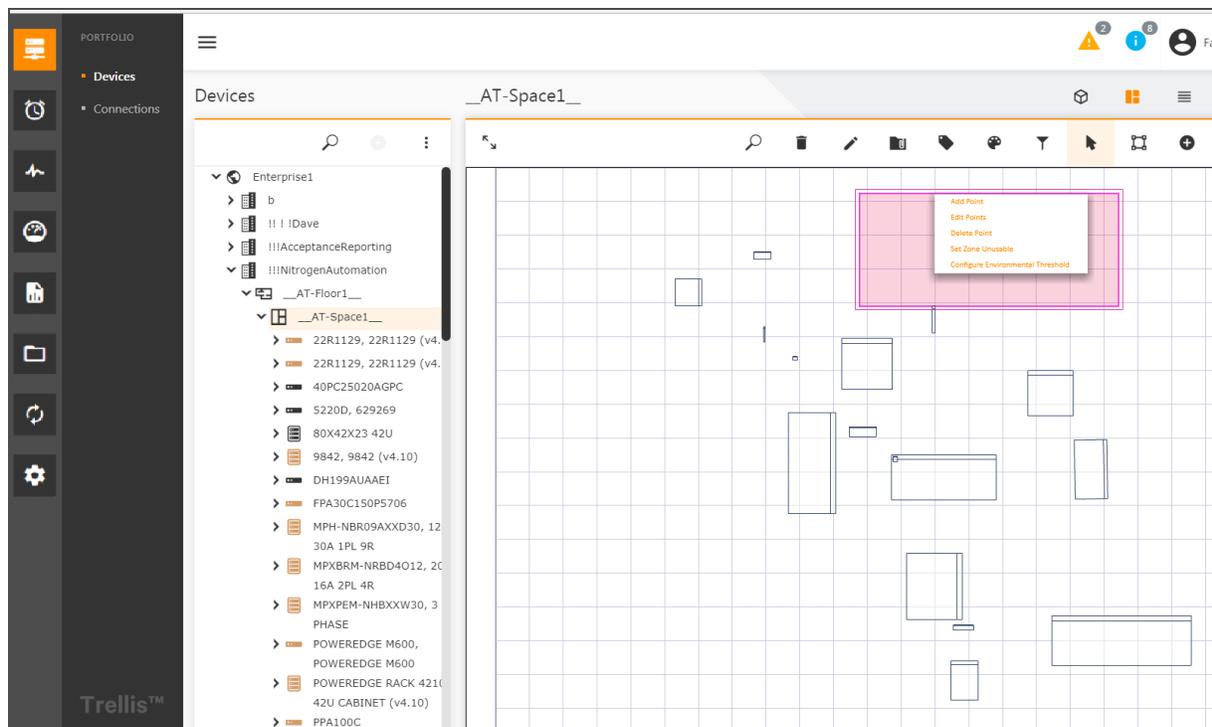
4.4 Working With Standard and Unusable Zones

Zones can be created in Graphical Edit view to define areas within a space. A zone can be a rectangle or a custom shape. Zones can be placed above, on or below a floor and can be created in areas where floor-mounted items cannot be placed.

There are two types of zones, standard and unusable. A standard zone can contain devices while an unusable zone cannot. For example, if you want to designate a zone for service processors, it is a standard zone. Also, if your data center contains a desk, it is an unusable zone, because devices cannot be placed in that part of your data center.

After a zone is created, you can click the zone's border and add, edit or delete points in the zone's border, delete the entire zone, set the zone as unusable or configure an environmental threshold for the zone. You can also search for and drag-and-drop devices from inventory, add a text label and color a zone.

Figure 4.3 Managing Zones



An unusable zone is managed like a standard zone with the following exceptions:

- A standard zone can contain devices while an unusable zone cannot. For example, if you want to designate a zone for service processors, it is a standard zone. Also, if your data center contains a desk, it is an unusable zone because devices cannot be placed in that part of your data center.
- An unusable zone cannot overlap other zones on the same level; however, an unusable zone can overlap another zone if they are on separate levels.
- If you have multiple levels visible and you create an unusable zone, the zone spans all the levels.
- If more than one level is selected, the zone is transparent. If the zone is placed under a device, the zone is gray.

To create a zone:

1. Click the Portfolio icon, expand the enterprise and select a space.
2. Click the Graphical Edit icon.
3. Click the Filter icon and click the level icons for the zone.
4. Click the Rectangle Space icon and select *Rectangle Zone* or *Custom Zone*.
5. Draw the zone on the floor and in the New Zone Name window, enter a name for the zone and click *Create*.

To edit points of a zone:

1. Click the Portfolio icon, expand the enterprise and select a floor.
2. Click the Graphical Edit icon.
3. With the floor displayed, click the Select icon and click *Select*.
4. Click the zone, right-click and select *Edit Points*.
5. Select a point and move the cursor.

To delete a zone:

Select the zone and click the Delete icon.

To mark a zone as Unusable:

1. In the Portfolio window, select a floor and click the Graphical Edit icon.
2. With the floor displayed, click the Select icon and click *Select*.
3. Click the zone's border to highlight it, right-click the zone and select *Set Zone Unusable*.

To delete an unusable zone:

1. In Graphical Edit view, click the Select icon and click *Select*.
2. Click to highlight the unusable zone and click the Delete icon.

4.5 Working With Racks

After you have created a space, racks can be added to the space, and then other devices, such as switches, servers and service processors, can be placed within the racks. This section provides information that is specific to racks. See [Working With Devices](#) on page 144 for additional information about devices/racks.

4.5.1 Adding and deleting a rack

Racks can be added in Portfolio and Graphical Edit view. After a rack is added, you can update its properties or delete it.

To add a rack in the Portfolio window:

1. Click the Portfolio icon and expand the enterprise.
2. Click to highlight the space, click the Add icon and select *Catalog*.

3. Search for and select the added rack, click Add and click SAVE.

To add a rack in Graphical Edit view:

1. Click the Portfolio icon and expand the enterprise.
2. Select a floor and click the Graphical Edit icon.
3. In Graphical Edit view, click the Add icon and select *Catalog*.
4. Search for a rack and drag the rack name to a space on the floor.
5. Select the added rack and click the Edit header icon.
6. Update the Rotation, Level, Grid Tile Name, Grid Tile X Offset, Grid Tile Y Offset or Z Offset.

To delete a rack:

1. Click the Portfolio icon and expand the enterprise.
2. Enable one or more rack checkboxes and click the Delete icon.
3. When the confirmation message appears, click *Delete Device*.

4.5.2 Selecting and moving one or more racks

When you add a rack, you can designate its placement and move one or more racks within a space.

To move a rack:

1. Click the Portfolio icon, expand the enterprise, building and floor.
2. Click the Graphical Edit icon and click the Select icon.
3. Move the cursor to the side or bottom of the rack until the cross-hair icon is displayed, and drag it to the new location.

To select multiple racks in Graphical Edit view:

1. Click the Portfolio icon and expand the enterprise.
2. Select the floor with the rack and click the Graphical Edit icon.
3. Click the rack.

-or-

Click the *Select* icon and surround a group of racks.

-or-

Select multiple specific racks by clicking the *Select* icon and holding the **Ctrl** key while clicking each additional rack.

4.5.3 Copying and pasting racks

When copying and pasting racks consider the following functionality:

- All the rack attributes are also copied; however, "Copy <n>" is added to the rack name, where (n) is an integer that increments for every copy made of the original devices. The contained devices retain the same name.
- All the devices within the racks are copied.
- All power or data connections are copied. If a device has a connection outside the selected devices, the outside connections are not copied.
- The spatial relationship between the selected racks is preserved.

- If multiple users copy a group of racks and either delete or move them, the paste does not occur and a warning message is displayed.

To copy and paste racks:

1. Click the Portfolio icon, expand the enterprise and click the floor in the Devices panel.
2. Click the Graphical Edit icon, click and drag a box around one or more racks on the floor, right-click and select *Copy Device(s)*.
3. Move the cursor to the desired location in a space, right-click and select *Paste Device(s)*.

4.5.4 Rotating a rack

To rotate a rack:

1. Click the Portfolio icon, expand the enterprise, building, floor (and space if applicable) and then click the rack.
2. Click the Graphical Edit icon, click the rack and click the Edit icon.
3. In the Device Placement window, enter the rotation value, select the Rotate Left or Rotate Right icon and click *SAVE*.

4.5.5 Modifying rack properties

To modify rack properties:

1. Click the Portfolio icon and expand the enterprise.
2. Select the rack, modify the properties and click *SAVE*.

4.5.6 Assigning an RU starting number and position

When assigning the RU position in a rack, the starting number is zero or one and the starting position is either top or bottom. For racks that do not have device RU numbering, the default is the number one beginning at the bottom.

NOTE: The rack must be empty to modify the configuration. When you place a device into a rack, the settings become disabled, so you must empty the rack of all devices first.

To assign a starting number and position to an RU:

1. Click the Portfolio icon and expand the enterprise.
2. Select the rack and click the *Edit* icon.
3. Click the *Start Number* drop-down arrow and select *0* or *1*.
4. Click the *Start Position* drop-down arrow, select *Top* or *Bottom* and click *SAVE*.

4.6 Working With Devices

A device can be a piece of equipment such as a server, power distribution unit (PDU) or a floor-mounted device (rack, cabinet and so on). Devices, with their contents, can be added directly to a space or can be placed in a rack within a space. The space must exist on a floor before adding a device.

After a device is added, its properties can be assigned or edited in the selected device's Summary, Information, User Defined Properties and Capacities panels as follows:

- The Summary panel includes the device's name, RFID position, RFID Tag, Owner, Owner Email, Asset Number, Serial Number, Barcode Number, Start Number (for the rack), Start Position (for the rack) and Notes. If the properties are changed in one location, the properties are automatically updated in related windows.

- The Information panel provides the manufacturer, model, model qualifier, category, depth, height, width, weight, symbol version, licensing tier and a general description. From this panel you can also select to view a device's details, ports and projects information.
- The properties in the User Defined Properties panel are custom properties created by the user for containers and devices. The Properties panel can be customized to hide or show specific properties. Saved property preferences affect all browsers and are retained when you log out.
- Capacities includes the following information where applicable: Power, Floor Space, Heat, Weight, Blade Slots and Rack Space.

NOTE: Devices can be rotated and/or flipped before placement.

See [Managing panelboards](#) on page 161 to add panelboards and related components.

To view device properties in Graphical Edit or 3D view:

1. Click the Portfolio icon, expand the enterprise and select a device on a floor.
 2. Click the Graphical Edit icon.
- or-
- Click the 3D icon.
3. Click the device, scroll down to display the properties and click X to close the Properties window.

To customize device properties, see [Properties panel](#) on page 26.

4.6.1 Adding a device to a container and assigning its properties

To add a device to the Device Table:

1. Click the Portfolio icon and expand the enterprise.
2. Select the appropriate container, click the Add icon in the content panel header and select *Catalog*.
3. In the Type or Select Search box, enter search criteria (keyword, category and/or manufacturer) for the applicable symbol and click *SEARCH*.
4. In the Catalog Search Results list, click the Add icon for the applicable device and click *SAVE*.
5. If desired, select the floor, click the Graphical Edit icon and drag the symbol from Unplaced inventory to the applicable location.

To add an unplaced device in Graphical Edit view:

1. From the Portfolio Devices panel, select the container to house the device and click the Graphical Edit icon.
2. Click the Unplaced icon, then click and drag the symbol from Unplaced inventory to the container.

To add a container to a floor or space in Graphical Edit view:

1. Click the Portfolio icon and expand the enterprise.
2. Select the floor or space, click the Graphical Edit icon and click the Add icon in the content panel header.
3. Select *Catalog* or *Inventory* and then in the *Type or Select Search* box, enter search criteria (keyword, category and/or manufacturer) to refine the search and click *SEARCH*.
4. Select and drag the device's image to the floor or space.

To add a device to a rack in Graphical Edit view:

1. Click the Portfolio icon and expand the enterprise.

2. Select a rack (or similar container) on a floor, click the Graphical Edit icon and click the Add icon in the content panel header.
3. Select *Catalog* or *Inventory* and then in the Type or Select Search box, enter search criteria (keyword, category and/or manufacturer) to refine the search and click *SEARCH*.
4. Select and drag the device's image to the rack.

To assign or edit properties for a device:

1. Click the Portfolio icon, expand the enterprise and select a device.
2. In the content panel, click the device's checkbox and click the Edit icon.
3. Edit the applicable properties and click *SAVE*.

4.6.2 Bulk renaming devices

You can rename one or more devices in the Devices panel. You can also rename multiple devices in the same category. The name can be a category, a custom name or no name. Adding a prefix and/or a suffix makes each device's name unique. If you want to add a prefix and/or suffix, it can be alphabetic, numeric or custom. The Prefix Starts at entry and Suffix Starts at entry designate the beginning character of the prefix/suffix. After selecting the parts of the name, you can preview an example of the name.

NOTE: If you select a device from a category that is not applicable, a message appears. If this occurs, you can select the Custom category and then enter a new name.

To rename two or more devices simultaneously:

1. Click the Portfolio icon, expand the enterprise to show the devices and click the devices' container.
2. In the container panel, click the checkboxes of all devices to be renamed and click the Rename icon.
3. In the Rename window, click the PREFIX, NAME and SUFFIX drop-down arrows and select the prefix, name and suffix.
4. Click the Prefix Starts at, Name and Suffix Starts at fields, enter the applicable characters and click *SAVE*.

4.6.3 Moving a floor-mounted device in a space

Floor-mounted devices can be moved from one space to another.

To move a device within a space in Graphical Edit view:

1. Click the Portfolio icon and expand the enterprise.
2. Click a floor and click the Graphical Edit icon.
3. Click the Select icon and highlight the device.
4. Hover the cursor over the border of the device until the cross-hair is visible.
5. Click and drag the device to a different location in the space.

To move a device within a rack:

1. Click the Portfolio icon and expand the enterprise.
2. Click a floor and click the Graphical Edit icon.
3. In Graphical Edit view, select and double-click a rack to open Elevation view.
4. Click and drag the device to the desired location in the rack.

4.6.4 Moving devices to containers in Elevation view

When a device and two containers are visible in Elevation view, a device can be moved from one container into the other container. For example, if two racks are visible in Elevation view, you can drag a server from one rack (container 1) to the other rack (container 2).

NOTE: Only one device can be moved at a time.

To move a device in Elevation view:

1. Click the Portfolio icon and expand the enterprise.
2. Click a building and a floor and click the Graphical Edit icon.
3. Select both devices and double-click to open Elevation view.
4. Drag a device from one container to the other container.
5. If the device triggers a placement or capacity violation, click *Cancel* on the warning window to stop the operation.

NOTE: If another user makes a change, a message is displayed advising that your window is being refreshed.

6. If you click *Continue*, the device is placed with the violations.

4.6.5 Placing a device in a zero U space in a rack

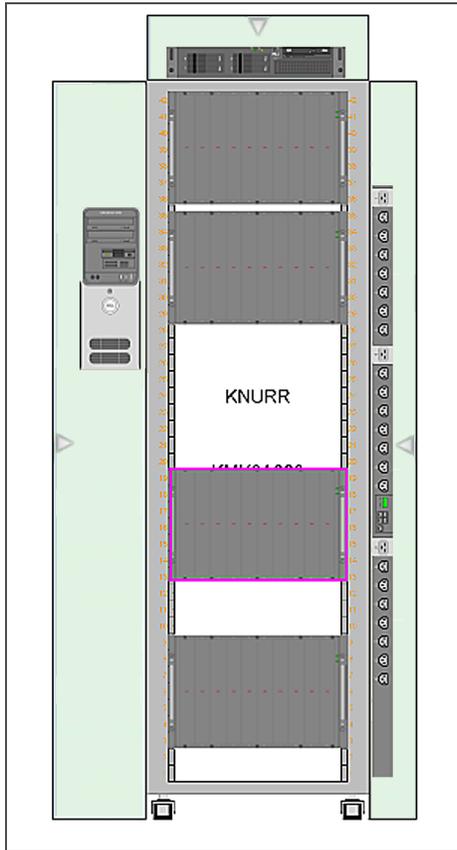
Racks have zero U space identifiers (left, right, top or bottom) where devices can be placed. If multiple devices are placed in the top zero U space, they are automatically stacked on top of each other. If multiple devices are placed in the bottom zero U space, they are automatically stacked under each other. As devices are removed, the stacks are readjusted.

Before placing a device in a rack, you can flip the device to display either the front or rear view.

To place a device in zero U space:

1. Click the Portfolio icon and expand the enterprise.
2. Select the floor and click the Graphical Edit icon.
3. In Graphical Edit view, double-click a rack to open Elevation view.
4. Click the Add icon and select *Catalog* or *Inventory*.
5. Search for and select the device, drag the image of the device to the applicable zero U space of the rack.
6. After the zero U space becomes visible, verify placement by clicking the arrow to open and close the zero U space.

Figure 4.4 Zero U Space in a Rack



4.6.6 Placing a device on different floor levels

A device, including its monitored environmental sensors, can be placed on a floor, under a raised floor and in the ceiling plenum, which is a space used for air circulation for heating, ventilation and air-conditioning.

NOTE: Devices cannot span multiple levels.

To use the Filter (levels) option:

1. In Graphical Edit View, click the *Filter* icon and verify that only the applicable levels are active (enabled).

NOTE: Spaces, zones and devices are added to all active levels.

2. Select a device and place it on the active floor.

NOTE: The device icon is visible on the active level where it is placed. A device may not be visible if a larger device is placed over it in upper levels.

3. Click each filter option to view where devices are placed and perform any of the following tasks:
 - Click *Status* to see the status of the devices when monitoring is enabled.
 - Click *Text* to display or hide text. If disabled, the text remains on the floor, but is not visible unless you hover over where text was placed.
 - Click *Ceiling* to display or hide devices placed on the ceiling level.
 - Click *Drop Ceiling* to display or hide devices placed on the drop ceiling level.

- Click *Raised Floor* to display or hide devices placed on the raised floor level.
- Click *Floor* to display or hide devices placed on the floor level.
- Click *Space Grid* to enable or disable the grid lines on the space.
- Click *Background* to enable or disable the background on the floor.

4.6.7 Copying and pasting devices

In Graphical Edit view, you can copy and paste one or more devices from a space to a different area in the same space or another space on the floor. When copying and pasting multiple devices, the spatial relationships between the selected devices are preserved.

The following are required conditions when you copy and paste a device in a space:

- All the attributes are copied; however, the name attribute "Copy" is added. The contained devices retain the same name.
- Any modules or cards in slots are copied.
- If the device is a rack, all devices contained in the rack are copied.
- Only connections made within a rack are copied.
- No monitor-specific information is copied.
- If multiple users copy a group of devices and either delete or move them, the paste does not occur and a warning message is displayed.

To copy and paste one or more devices:

1. Click the Portfolio icon, expand the enterprise and click the floor in the Devices panel.
2. Click the Graphical Edit icon, click and drag a box around one or more devices on the floor, right-click and select *Copy Device(s)*.
3. Move the cursor to the desired location on the floor or space, right-click and select *Paste Device(s)*.

4.6.8 Rotating a device

Devices can be rotated on a space or in a container.

To rotate a device:

1. Click the Portfolio icon, expand the enterprise, building and floor and then select the floor or space.
2. Click the Graphical Edit icon and click and hold the blue rotate icon while rotating the device.

-or-

Click the Graphical Edit icon, click the device and click the Edit icon. Then, in the Device Placement window, enter the rotation value or select the Rotate Left or Rotate Right icon and click *SAVE*.

4.6.9 Creating device groups

Grouping devices allows you to manage similar devices. For example, you can create an SP group to simultaneously manage the group across multiple floors and spaces.

To create a device group:

1. Click the Portfolio icon and expand the enterprise.
2. In the Devices panel, click the Add icon and select *Group*.
3. In the Summary panel, complete the fields and click *SAVE*.

4. Verify the group (identified by the group icon) is added to the Devices panel.

To add a device to a group:

1. Click the Portfolio icon and expand the enterprise.
2. In the Devices panel, select a group, click the Actions icon and select *Details*.
3. In the Group Contents panel, enter a keyword and click *SEARCH* to display a list of possible devices.
4. In the Search Results list, click the Add icon for each device to be added to the group.

To delete devices in a group:

1. Click the Portfolio icon and expand the enterprise.
2. In the Devices panel, select a group, click the Actions icon and select *Details*.
3. In the Group Contents panel under Devices in Group, click the Remove icon for each device to be removed from the group.

To delete a group and any devices in the group:

1. Click the Portfolio icon and expand the enterprise.
2. In the Devices panel, select the group, click the Actions icon and select *Delete*.
3. Click *DELETE* to confirm the action.

4.6.10 Configuring a device for monitoring and data collection

Data can be collected from devices and used to manage trends and availability in your data center. Both the *Trellis™* Inventory and Site Manager modules are required in order to use this feature. Also, the *Trellis™* Intelligence Engine or enrolled Avocent® Universal Management Gateway appliance is required and your platform software must include the symbol and element library with the device. With these components in place, you can proceed to configure the specific device for monitoring.

For additional information, [Working With Catalog Symbols and Element Libraries](#) on page 170.

To configure a device for monitoring:

1. Click the Portfolio icon, then scroll to and select the device.
2. Click the Monitor header icon.

NOTE: This window varies depending on the protocols available in the current local element library for a specific device model. The drop-down options combine the protocol with the interface device and the connection type.

To configure a device for collecting data:

1. Click the Portfolio icon and expand the enterprise, building, floor and space.
2. Click the device and click the Metrics icon in the central panel.
3. On the Metrics window select the list of data points and click the Start Date/Time icon in the content panel.
4. Select the data and time of the metrics you want to see and click *Accept*.

NOTE: To configure the polling rate for gathering the parameters that determine the status of a device, see [Configuring device status polling](#) on page 151.

NOTE: To verify symbol and element library information and update monitoring synchronization of device symbols with the data collection engine, see [BMS Integration, Symbol and Element Libraries](#) on page 172.

To stop monitoring a device:

1. Click the Monitoring icon.
2. In the Configuration window, click the Search icon and enter a keyword to locate the device.
3. With the monitored device displayed, click its checkbox, click the Stop icon and click YES.

4.6.11 Configuring device status polling

The polling rate can be configured for gathering the parameters that determine the status of a device. Device status polling can be configured per device or it can be applied to all devices in a particular device category. For example, you can set a higher polling rate for the UPS category and a lower rate for the CRAC category.

If a managed device fails to respond to the poll, a device unavailable alarm event is displayed in the Active Alarms window. The device status and corresponding icons are Normal, Not Responding, Critical, Warning, Info or Maintenance.

To change the device status polling configuration:

1. Click the Monitoring icon, click the checkbox of a monitored device and click the Edit icon.
2. In the Device Status Polling Interval panel, enter an interval number, select *SECONDS*, *MINUTES* or *HOURS* from the drop-down list and click *SAVE*.

4.7 Understanding Consumption Capacities

Consumption capacities can be configured for a building, floor, space, zone or device. Thresholds can be configured for floor and rack space, thermal, power and weight; however, a threshold capacity may or may not be applicable. Most thresholds can be configured in Portfolio or Graphical Edit view, but floor capacities must be configured in the Portfolio window. It is also important to configure the capacities at each level before starting to populate a floor or space. At any time, you can also see the building capacities which are the aggregated values from all the building's floors.

Hover over to see unit conversions from to metric.

Thresholds are configured using aggregated values. If no aggregated values are available, the following measured capacity values are used:

- Aggregated values - Faceplate values for a device in respect to connections and containment, such as a rack with the combined values of power consumers in the rack

The following categories are used when calculating capacities:

- Rated - Faceplate value assigned by the manufacturer
- Designed - User-defined value for the percentage of consumption compared against the rated value
- Reserved - User-defined value for the percentage of capacity reserved compared against the designed value
- Consumed - Aggregated value for the percentage consumed compared against the designed value
- Remaining - Aggregated value for the percentage of the remaining capacity, once reserved and consumed and subtracted from the designed value
- Instead of using specific capacities, you can select a percentage of the designed capacity

4.7.1 Power Trending dashboard

The Power Trending dashboard provides the real-time power consumption trend over a period of time.

To configure the Power Trend dashboard:

1. Click the Portfolio icon and expand the enterprise.

2. Select the building and other containers, and select a monitored device.
3. In the monitored device's panel, click the Trending header icon.

To check the power or thermal trending capacity data:

1. In the Devices panel, select a floor.
2. In the content panel, select a component.
3. Click the Trending header icon.

4.7.2 Capacity Trend

The Capacity Trend data (displayed as graphs) allow you to determine the capacity trend. For more about capacity trend, see [Capacity Trend Dashboard](#) on page 191.

To determine the capacity trend:

1. Select a building, floor, space, capacity domain and a device category.

NOTE: A building, capacity domain and device category are required.

2. Click the up or down arrows to select the % consumed and % remaining filters and click *Get Devices*.

4.7.3 Power and Thermal Capacity Forecasting Dashboard

The Power and Thermal Capacity Forecast graphs provide capacity forecasts from planned, aggregated data. The rated, designed and currently remaining values are used to evaluate if power or thermal consumption is within the designed limits or approaching the configured threshold. These graphs become more accurate as data is collected.

Power and thermal capacities must be configured for the selected floor, space or monitored device prior to receiving forecast results. The monitored device must also be added to the space on a floor. See [Working with floor and space capacities](#) on page 153.

Building capacities are determined by aggregated data from every floor in the building. Zone capacities are determined by aggregated data from your planned floor or space capacities.

The graph lines are described as follows:

- Solid blue line: the current trend in terms of history
- Solid horizontal red line: the floor/space/device capacity.
- Dotted blue line: the forecast.
- Red point where you will reach your capacity
- Red dotted line: where you are or will be exceeding your capacity

To view the Power and Thermal Capacity Forecast:

1. From the Portfolio - Devices window, select a floor, space or monitored device.
2. Click the Trending icon.

NOTE: The Trending icon only appears for floors, spaces and monitored devices.

4.7.4 Floor Space Capacity panel

The Floor Space Capacity panel provides the square footage of the space, the rated, designed, reserved, consumed and remaining space from the aggregated data. The rated, designed, consumed and remaining values are used to evaluate if floor space consumption is within the designed limits or approaching the configured threshold.

4.7.5 Working with floor and space capacities

Users are required to set up the power and thermal capacities for floors and spaces, as well as add monitored devices to spaces residing on the floor.

Colorization is used to indicate consumed and remaining capacities. To learn more about colorization, see [Working With Colorization](#) on page 166.

To add floor or space capacities in the Portfolio window:

NOTE: The floor/space must include monitored devices.

1. Click the Portfolio icon and in the Devices panel, click the floor.
2. In the content panel, click the Edit header icon.
3. In the Power Capacity and Thermal Capacity panels, enter the rated and designed capacity values and click *SAVE* in each panel.
4. In the Devices panel, click the space.
5. In the content panel, click the Edit icon.
6. In the Power Capacity and Thermal Capacity panels, enter the rated and designed capacity values and click *SAVE* in each panel.

To add or edit floor or space capacities in Graphical Edit view:

1. Click the Portfolio icon and expand the enterprise, building and floor or space.
2. Click the Graphical Edit icon.
3. In the Devices panel, click the Action icon and click *Details*.
4. Scroll to the Capacities panels and click the Edit icon.
5. Complete the fields and click *SAVE*.

4.7.6 Working with power capacities

Power capacities are configured using aggregated values and assigned threshold values. Colorization is used to indicate consumed and remaining capacities for power. To learn more about colorization, see [Working With Colorization](#) on page 166.

To modify power capacities:

1. Click the Portfolio icon and expand the enterprise.
2. In the Devices panel, click the Action icon and click *Details*.
3. Scroll to the Capacity panels, select the *Power* capacity type and select the unit of measure.
4. For a container (floor, space, zone or rack), enter the rated and designed value for the aggregated capacity.

-or-

For a contained power consumer device, modify the designed value for consumption.

-or-

For a power distributor device, modify the designed value for the aggregated capacity. The aggregated consumed power is based on all downstream power consumers and is displayed per phase in Amps.

NOTE: The consumed power capacity for a container is the sum of the designed power capacity for all contained power consumers. The remaining capacity is the designed capacity which includes the reserved and consumed power.

5. Click *Save*.

4.7.7 Working with thermal capacities

Thermal capacities are configured using aggregated values and assigning threshold values. Colorization is used to indicate consumed and remaining capacities for thermal. To learn more about colorization, see [Working With Colorization](#) on page 166.

To modify thermal capacity values:

1. Click the Portfolio icon and expand the enterprise.
2. In the Devices panel, select the floor and the device on the floor.
3. Click the Edit icon and scroll to the Thermal Capacity panel.
4. Modify the designed value and click *SAVE*.

4.7.8 Working with blade slot capacities

Blade slot capacities provides the number of blade slots available in the chassis. For a rack, it is the sum of all slots across all the blade chassis's placed in it. Blade slots rated, consumed and remaining, all get accumulated into the rack with all the blade chassis placed in it. Colorization is used to indicate consumed and remaining capacities for blade slots. To learn more about colorization, see [Working With Colorization](#) on page 166.

NOTE: Blade slot capacities are read only; they cannot be entered or changed by a user.

NAME	DESCRIPTION
Blade slots rated	Total number of blade slots in the chassis
Blade slots consumed	Sum of all slots occupied by blade servers inside the chassis
Blade slots remaining	Sum of all open slots remaining in the blade chassis

To view blade slot capacity values:

1. Click the Portfolio icon and select a space from the Devices panel.
2. Locate a rack, click its vertical ellipses icon and select *Edit*.
3. Scroll down to the Capacities panel to view the blade slot capacity values.

4.8 Understanding Consumption and Operational Thresholds

Both consumption and operational thresholds are supported by the *Trellis*™ platform. Consumption thresholds can be configured for weight, thermal, space and power. Configuring these thresholds provides a way to manage the placement of equipment on a floor more efficiently. Operational thresholds can be configured using both the *Trellis*™ Inventory Manager module and the *Trellis*™ Site Manager module. Operational thresholds apply for the operation of any device and are configured using parametric data points and enumerated data points. Configuring these thresholds provides a way to stay informed about the status of critical infrastructure equipment.

For information about alarm thresholds, see [Managing alarm thresholds](#) on page 211.

NOTE: Planning thresholds are not available in real-time mode.

4.8.1 Operational thresholds for a parametric data point

With the *Trellis*™ Site Manager module, devices and device accessories can be configured to provide data point values and threshold values that are evaluated by the embedded controller in the device.

If a data point value received from a device either has no threshold or does not have a threshold you need, you have the option of creating and configuring the threshold and attributes in Portfolio or Graphical Edit view.

The supported thresholds for parametric data points are:

- High/Critical
- High/Warning
- Low/Warning
- Low/Critical

To configure a threshold for parametric data points:

1. Click the Monitoring icon.
2. In the Configuration window, click the Search icon and locate the device.
3. Click the device's vertical ellipses icon and select *Settings*.
4. Scroll to the Thresholds panel and locate the applicable datapoint name.
5. In the Edit Threshold Settings panel, complete the fields and click *SAVE*.

4.8.2 Operational thresholds for an enumerated data point

In some cases, devices provide data points where the values are not parametric, which means they do not fall into a contiguous range with consistent meaning. The value of these non-parametric data points is commonly called an enumerated data type with a value that has a specific meaning.

The supported thresholds for enumerated data points are:

- Critical
- Warning

To configure a threshold for enumerated data points:

1. Click the Monitoring icon.
2. In the Configuration window, click the Search icon and locate the device.
3. Click the device's vertical ellipses icon and select *Settings*.
4. Scroll to the Thresholds panel and locate the applicable datapoint name.
5. Select *Enumerate Datapoint*, edit the threshold value (Equal to Warning/Equal to Critical) and click *SAVE*.

4.9 Working with Power and Data Connections

Device connections are managed the same as other devices. They can be created, modified and deleted in the Connections window. The Connections window displays your inventory as it is listed in the Devices panel, except your inventory (containers, devices and ports) is displayed in two, side-by-side panels, where one is for upstream devices and the other is for downstream devices/connections. It does not matter which side is downstream or upstream.

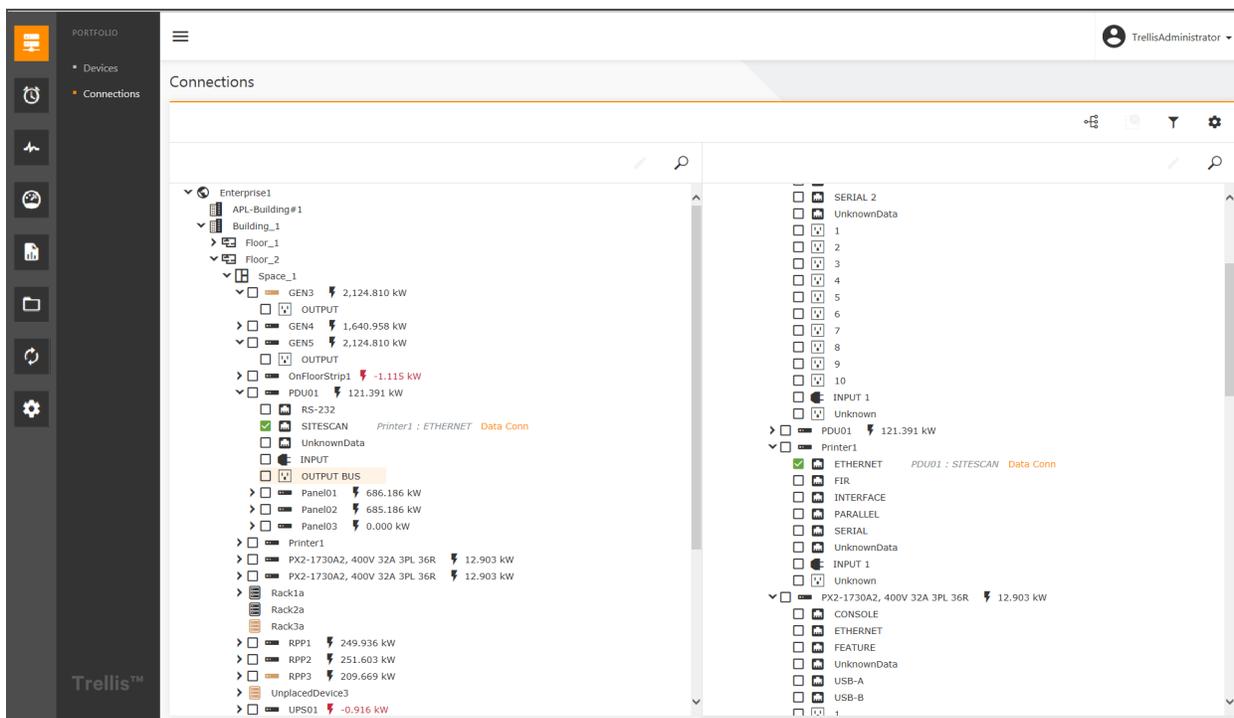
When creating power connections, you must drill down to the inputs/outputs for each provider and consumer of power. The connection is made by selecting an input device in one panel and a compatible, logical output device in the remaining panel. For example, if making an upstream connection from a breaker to a rack PDU, you must drill down to the output on the breaker listed in one panel, and drill down to the input on your rack PDU in the remaining panel.

When you select two compatible ports and the connection is validated, a green check is displayed in the checkbox of each port and an editable label appears beside the two connected ports. The name of the connected device and port are also displayed beside the connected ports. If the connection is not validated, for example, if you attempt to connect a data port to a power port, a message informs you that the connection is incompatible and asks you to replace the current connection or find another port.

NOTE: Data ports can be identified by the UnknownData label; Power ports can be identified by the Unknown label.

NOTE: Multiple connections are possible on port types that allow it, and these connections are indicated by an icon.

Figure 4.5 Power and Data Connections



The status of a port can be identified by its checkbox as follows:

- Available ports have an unfilled checkbox.
- Selected ports have a solid-filled checkbox.
- Connected ports have a green check in the checkbox.
- Locked ports have a red-filled checkbox. (A locked port must be unlocked to perform an action on it.)

NOTE: An error message informs you if the maximum number of connections is reached. Many-to-one or one-to-many connections can be made for data connections. One-to-one connections can be made for power connections.

NOTE: If the power load is exceeded when you connect devices, the Load Violation message appears, but allows you to continue if desired.

NOTE: Connections can also be viewed in Topology diagrams. See [Creating device topologies](#) on page 159.

4.9.1 Assigning power and data connections

Before assigning or changing connections, you can filter the port types by the Power Openings, Data Openings, Locked Openings, Connected Openings, Dry Contact Openings and Service Processors options.

To create a connection:

1. Click the Portfolio icon and click *Connections*.
2. Expand either panel until the device port to be connected is displayed.
3. Click the checkbox of the available (unfilled) port.
4. In the other tree, expand the tree until the device port to be connected is displayed.
5. Click the checkbox of the second port.
6. Verify both selected checkboxes have a green check and the port connection label is displayed beside the ports.

To edit a port connection's label:

1. In the Connections window, click the port's connection label and click the Edit header icon.
2. In the opened window, click the Edit icon, update the fields and click *SAVE*.

To delete a connection:

1. Click the Portfolio icon and click *Connections*.
2. Expand either panel until the device port to be disconnected is displayed.
3. Click the checkbox of the connected port to deselect it.
4. In the Port Connected window, click *DELETE*.

4.9.2 Auto connecting patch panel ports

In the Connections window, you also have the ability to auto connect patch panel data ports. This feature allows you to specify ports on the front or rear of a device. When using the auto connect feature, make sure the Data Openings filter is selected and either the Auto Connect Front or Auto Connect Rear port settings are selected.

To auto connect patch panel ports:

1. Click the Portfolio icon and click *Connections*.
2. Click the Settings icon and select *Auto Connect Front* or *Auto Connect Rear*.
3. Expand the applicable patch panel on each side to view all of the ports.
4. Select the checkbox for the applicable patch panel from each side to auto connect.
5. When the Auto connect message is displayed, click *ACCEPT* for the software to auto connect the remaining ports on the front and rear of the patch panels.

NOTE: The previous patch panel connections are removed when auto connecting ports.

4.9.3 Configuring dry contact connections

A managed device can have associated devices and associated contact closure openings. If a device with dry contact openings is selected, its details, including the severity of alarms for the dry contacts, are displayed. When a dry contact opening is selected, its details are also displayed and the values are refreshed each time a selection is made.

To add dry contacts:

1. Select a monitored device and select *Accessories* from the list.
2. Enter a device in the Search field and click *Search*.
3. When the monitored device is displayed, drag the image to the content area.
4. For devices without dry contact openings, the device is added to the list of devices.

-or-

For devices with dry contact openings, on the dry contacts list, select one or more dry contacts and click *Select* to associate them with the device.

The dry contacts are added to the list unless the dry contacts are already an accessory to a device. In this case, a warning message is displayed.

4.9.4 Configuring power-phasing nomenclature for a building

The default power-phasing label can be changed. The following are the power-phasing nomenclature options for a building:

- L1, L2, L3 (default) applied to every object in the system
- A, B, C
- R, S, T
- X, Y, Z
- R, Y, B
- R, W, B
- U, V, W

To configure the power-phasing nomenclature:

1. Click the Portfolio icon and select a building in the Devices panel.
2. Click the Actions header icon and select *Details*.
3. In the Summary panel, click the Edit icon and scroll to the Power Phasing Label field.
4. Click the drop-down arrow, select the label nomenclature and click *SAVE*.

4.9.5 Control Data Points

NOTE: Control data points are typically enumerated data points, but it is possible for a control data point to be parametric.

Data points are used to monitor devices. For each selected, monitored device, you can view its data points on the Control panel. The Control panel includes the data group, value, unit of measure and/or localized enumerated value list for each data point. The data groups and data points are listed in alphabetical order and are shown as ON or OFF. The data point name, along with the unit of measure and data point value for parametric data points, are also displayed. If a data point has a null value, the Last Updated field is updated with the current time.

Table 4.2 Opening Window Descriptions

FIELD	DESCRIPTION
Label	Name of the receptacle per the symbol inventory
Assigned Label	Device Assigned Label per OBWI
Asset Tag 1	Update Asset Tag of the actual device, stored in the device itself
Asset tag 2	Update Asset Tag of the actual device, stored in the device itself
Lock Status	Locked or Unlocked
Default Label	Default assigned label of the device
Type	Line source
Number of Legs	Same as phase of the device
Media	Indicates if the port is a media port and displays what kind

Table 4.3 Control Window Descriptions

FIELD	DESCRIPTION
Blink the Receptacle LED	Sends blink commands to the LED on the PDU outlet
Receptacle Control Lock State	Sends the lock command to lock the PDU outlet from connection
Receptacle Power Control	Sends the on/off command to the PDU outlet
Power Delay (Seconds)	Power delay in on/off PDU state

To configure the receptacle controls:

1. Click the Portfolio icon, expand the enterprise and select the monitored device.
2. Click the Connections icon, click the checkbox of the receptacle and click the Settings icon.
3. In the Opening panel, enter the information, select *Locked* or *Unlocked* and click *SAVE*.
4. In the Control panel, select the applicable controls, enter the power delay in seconds and click *SEND* for each updated field.

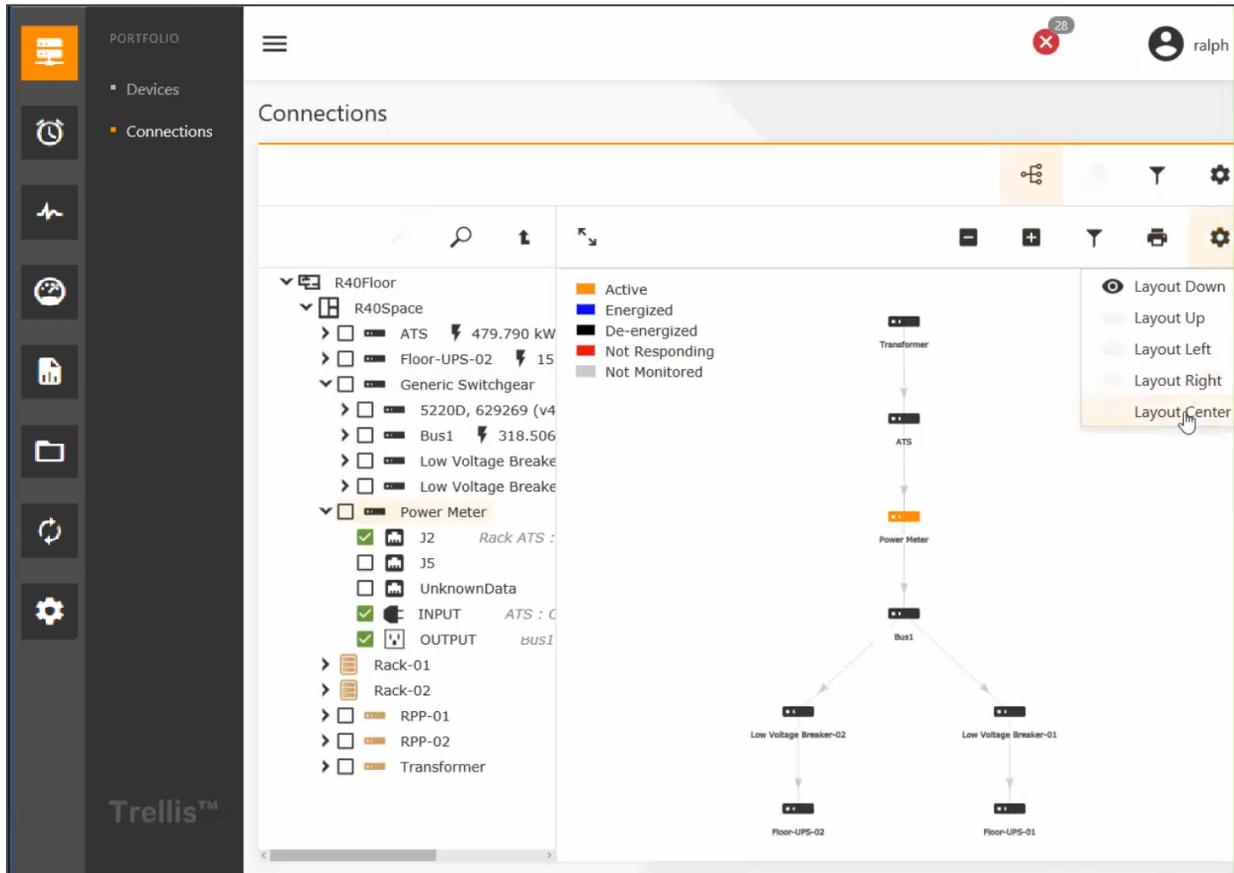
4.9.6 Creating device topologies

The dynamic device topology feature allows you to create and view data and power connections and show the directional path between monitored devices. This is possible for all monitored equipment from the utility entrance to floor PDUs, power panels and standalone panelboards. Pre-designed symbols are available for the devices and supplemental metering. The symbols are contained in a catalog and the devices are selected from your inventory.

The topology can be expanded to include multiple upstream and downstream devices and you can select the automatic device layouts (Down, Up, Left, Right or Center) or you can manually arrange the devices to reflect devices and their data or power paths in your data center.

Colors are used to represent the devices' status (Active, Energized, De-energized, Not Responding or Not Monitored), filters can be selected to display devices by type (Data or Power), opening type (Power, Data, Locked or Connected Openings) and capacities (remaining or consumed). Descriptive labels can also be added.

Figure 4.6 Device Connections in a Topology Diagram



The following procedures apply for both data and power connections.

To display a device's topology:

1. Click the Portfolio icon and select *Connections*.
2. In the Connections window, select a device and click the *Topology* icon.
3. Click the Search icon, enter a value and click *Search*.
4. Click the Filter icon and select the type (Power Openings, Data Openings, Locked Openings, Connected Openings, Dry Contact openings or Service Processors).
5. Click the Settings icon and select the format (Layout Down, Layout Up, Layout Left, Layout Right or Layout Center).

-or-

Manually click and arrange each device.

6. After the Connection window opens, verify the connections.

To change the topology settings to get the desired view:

1. Click the Portfolio icon, click *Connections* and click the connected device.
2. Click the Filter icon and enable/disable the filter options.
3. Click the Settings icon and enable the Auto Connect Front or Auto Connect Rear checkbox.

4. Enable the power unit type (Amps, kW or kVA).
5. Click the Topology icon to verify the device is the root node.
6. Using the Settings icon, change the topology view.

To change the connection topology settings to get the desired view, do one of the following:

Press **SHIFT + Upkey/Downkey** to zoom in and out of the topology view (similar to the 3D Controls).

-or-

Hold the right mouse button and move the mouse to move the image up, down, left or right in the window.

-or-

On the keyboard, press **Ctrl + Upkey/Downkey/Leftkey/Rightkey** (similar to the 3D Controls).

To view a device's physical topology:

1. Click the Portfolio icon, click the Search icon in the Device's panel and search for a device.

-or-

Click the Portfolio icon and navigate to a floor with a connected device.

2. Select the connected device and click the Topology icon.

To display the device status in Topology View:

1. Click *Levels* to expand the panel.
2. Enable the Status checkbox in the panel to display the status of devices in the Topology View.
3. When you hover over or select the monitored device, the status is displayed. The different device states are Critical, Warning, Maintenance and Not Responding. These states are populated based on:
 - Alarm generation
 - If a device is in maintenance mode
 - If a simulator is in unstable mode and you cannot ping the device for the latest readings

To display the consumed power for each power distributor:

1. Click *Levels* to view the panel.
2. Enable the Data Points checkbox to display the data points of the device and select *Measured Consumed Capacity* or *Measured Remaining Capacity* and a unit of measurement in KiloWatts (kW), Amps (A), Kilo Volt Amperes (kVA) or percentage measurements.
3. Select and drag the switchgear image to the Topology View.

4.9.7 Managing panelboards

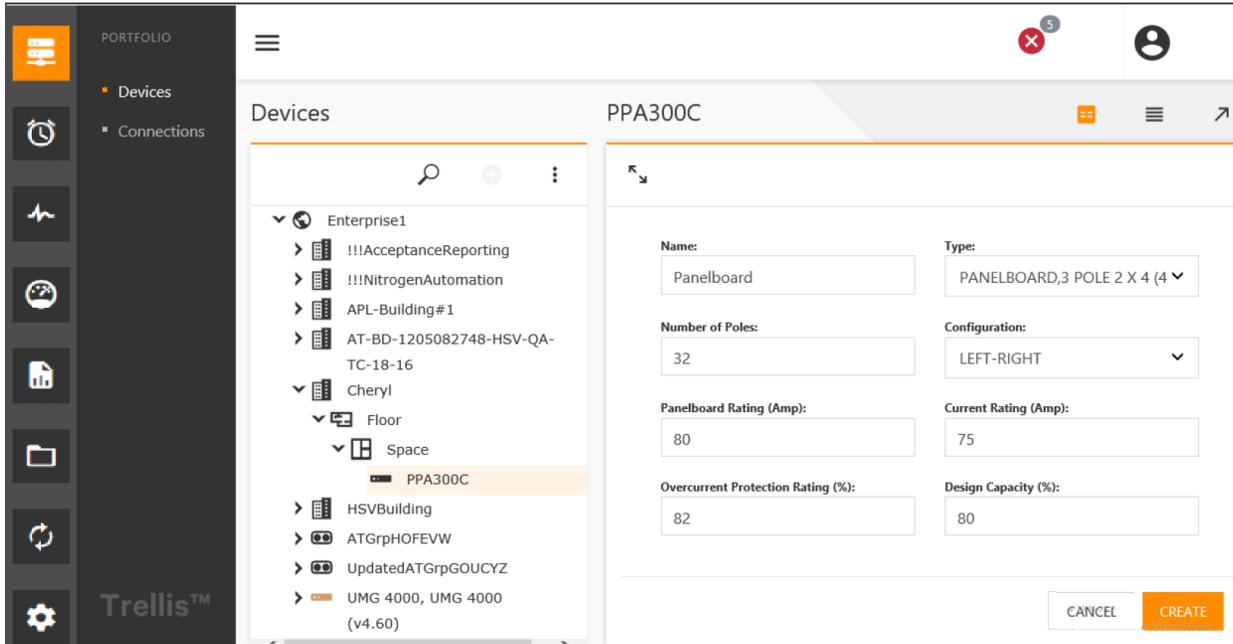
From the Portfolio pivot bar icon, you can add a panelboard (also called a breaker panel) or a subfeed breaker to a floor power distribution unit (PDU) or remote power panel (RPP). After a panelboard is configured and added to the PDU/RPP, circuit branch breakers and subfeed breakers can be added. You can search for a panelboard, circuit branch breaker or subfeed breaker from the Catalog Search or Inventory Search panel to add them to the PDU/RPP. In order to add or delete a breaker panel, circuit branch breaker or subfeed breaker, the floor PDU/RPP and the panelboard must be open.

NOTE: Prior to adding any devices, see [Working With Devices](#) on page 144 and [Searching for Containers or Devices](#) on page 133.



CAUTION: Always consult with your facility engineer to verify the circuit schematic or wiring diagram before configuring a panelboard.

Figure 4.7 General View of a Floor PDU with Panelboards and Devices



The Configuration fields are described in the following table.

Table 4.4 Panelboard/Circuit Branch Breaker/Subfeed Configuration Fields

NAME	FIELDS	DESCRIPTION
Panelboard (Breaker Panel)	Name	Unique name given to a device
	Type	Name and poles
	Panelboard Rating (Amp)	Maximum current the panelboard supports
	Number of Poles	Number of legs
	Configuration	Circuit arrangement on the panelboard; can be selected from a drop-down menu (top to bottom, left to right or a single column)
	Current Rating (Amp)	Rated value representing a device's current in Amps
	Overcurrent Protection Rating (%)	Overcurrent percentage over the rating that the panelboard can support
Panelboard Branch Breaker	Name	Unique name given to a device
	Type	Name and poles
	Current Rating (Amp)	Rated value representing a device's current in Amps
	Overcurrent Protection Rating (%)	Percentage over the standard breaker rating at which it will trip
	Design Capacity (%)	Manufacturer's rated capacity for the device
Subfeed Breaker	Name	Unique name given to a device
	Type	Name and poles
	Current Rating (Amp)	Rated value representing a device's current in Amps
	Overcurrent Protection Rating (%)	Percentage over the standard breaker rating at which it will trip
	Design Capacity (%)	Manufacturer's rated capacity for the device

NOTE: If you need to modify any information after a panelboard component is configured, you must first delete it and then add it back on the panelboard within the Main Panelboard Breaker window. See [Searching for Containers or Devices](#) on page 133.

To add a breaker panel (panelboard):

1. Click the Portfolio icon and in the Devices panel select a floor PDU or RPP.
2. In the content panel header, click the displayed PDU Edit icon.
3. In the Panelboards panel header, click the Add icon, complete the fields and click *CREATE*.

To delete a panelboard:

Select the panelboard and click the Delete icon.

NOTE: A displayed message states the selected panelboard includes contained devices and external connections will be deleted. This action cannot be undone.

NOTE: See [Searching for Containers or Devices](#) on page 133.

To add a circuit branch breaker to a breaker panel:

1. Click the Branch Breaker icon.
2. In the content panel, click the L1 Add icon to add a branch breaker in position 1.

3. In the Position 1 panel, complete the fields and click *CREATE*.

Figure 4.8 Adding a Branch Breaker in Position 1

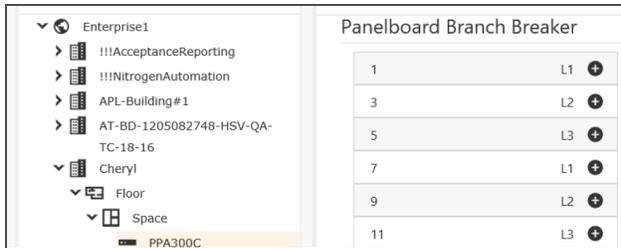
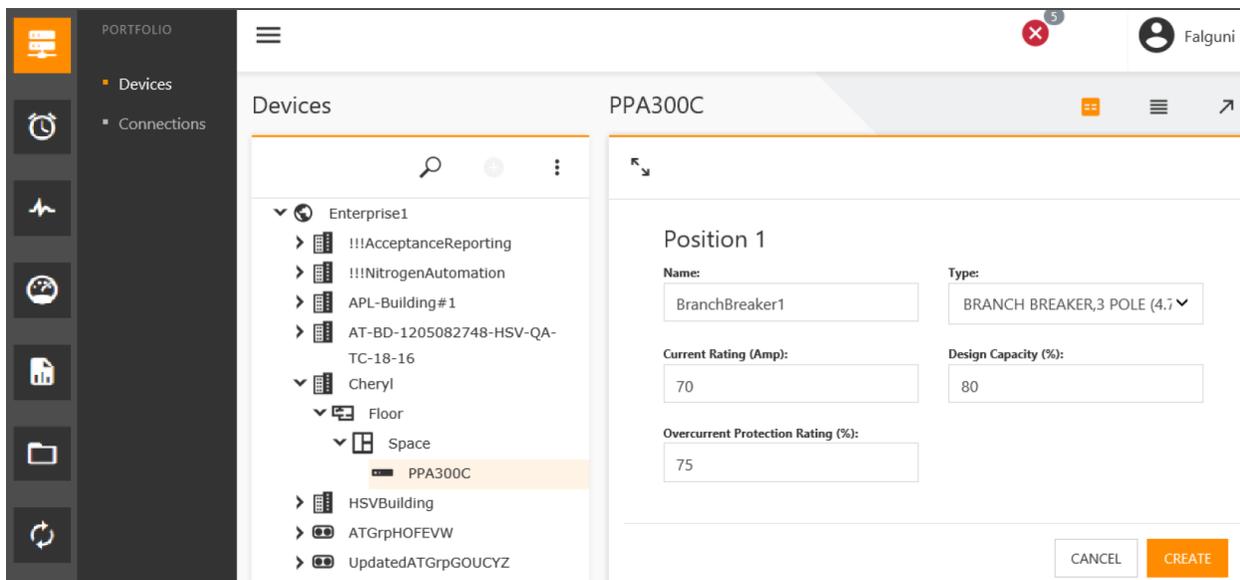


Figure 4.9 Position 1 Panel



To delete a circuit branch breaker:

1. Click the panelboard with the circuit branch breaker to be deleted.
2. Click the Branch Breaker icon, scroll down to locate and select the circuit branch breaker and click the Delete icon.

Figure 4.10 Three Branch Breakers for Three Poles

Panelboard Branch Breaker		
1	BranchBreaker1	L1
3		L2
5		L3
7		L1
9		L2
11		L3
13		L1
15		L2
17		L3

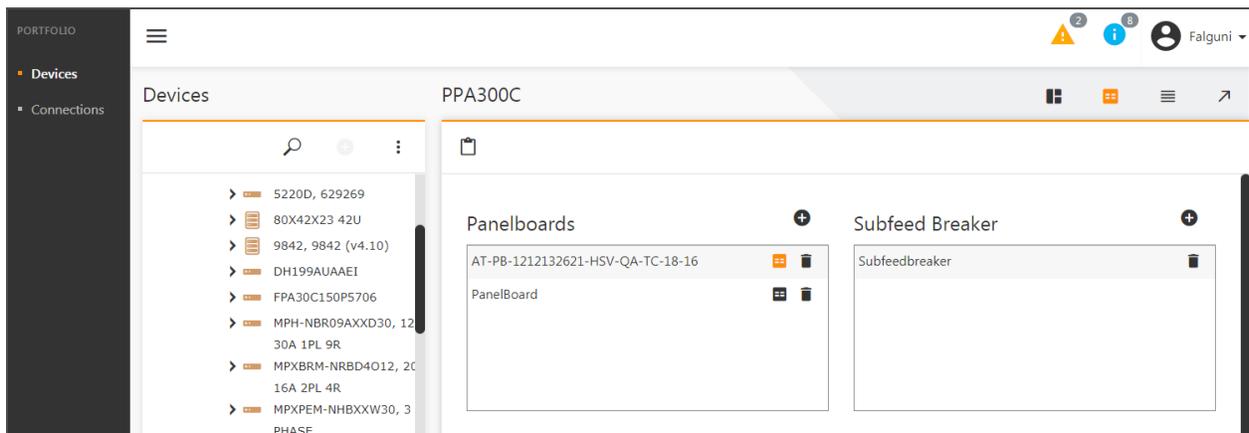
NOTE: If the subfeed field is displayed in the window while creating the panelboard, it can be connected during configuration of the panelboard.

See [Searching for Containers or Devices](#) on page 133.

To add a subfeed breaker to a panelboard:

1. Click the Portfolio icon and in the Devices panel, select a floor PDU or RPP.
2. In the content panel header, click the displayed PDU Edit icon.
3. In the Subfeed breaker panel, click the Add icon, complete the fields and click *CREATE*.

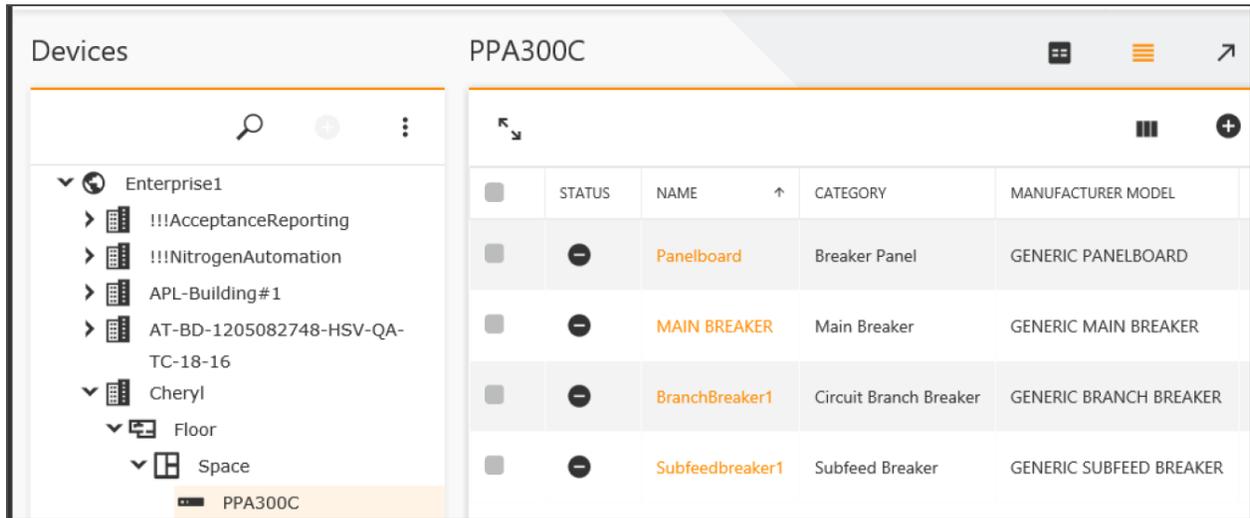
Figure 4.11 Adding a Subfeed Breaker



To delete a subfeed breaker:

In the Subfeed breaker panel, click the subfeed breaker and click the Delete icon.

Figure 4.12 Verifying the Panelboard, Circuit Branch Breaker and Subfeed Breaker are Added



4.10 Working With Colorization

The colorization feature uses colors to indicate if there is additional power or space capacity in a specific location, identify Critical Infrastructure Equipment (CIE) and check environmental conditions. Colorization is based on the thresholds you configure for the devices you have permissions to manage. If you change a parameter in a colorization configuration, the color is updated based on the new parameters.

The following instances can be identified using colorization:

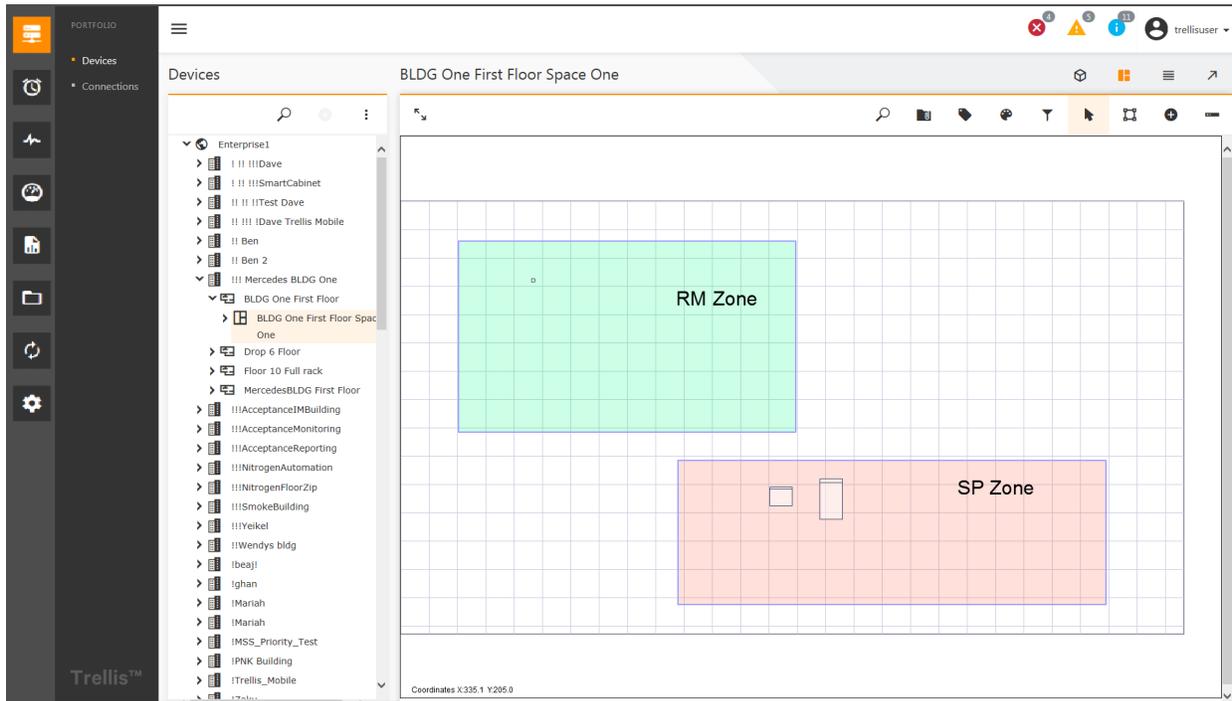
- Available Rack Space
- Rack Power Remaining
- Rack Space Consumed
- Reserved Rack Space
- Critical Infrastructure Equipment
- Environmental Conditions
- Blade Slots Available
- User Defined Colorization

The user-defined colorization feature allows custom colorization configurations. See [Creating and deleting user-defined colorization](#) on page 170.

4.10.1 Zone colorization

Zone colorization is used to designate high-density zones, networking areas, storage areas and pending projects, or in the case of collocated facilities, to differentiate between customer spaces.

Figure 4.13 Zone Colorization



To add color to a zone:

1. Click the Portfolio icon, expand your enterprise and select a space in the Devices panel.
2. Click the Graphical Edit icon, click the *Select* icon and highlight the zone.
3. Click the Edit header icon and click the Color field in the Zone Properties window to view the color palette.
4. Select a color, click the Save button and verify the zone changes to the selected color.

4.10.2 Available rack space

Racks that are located in a space (top-down view only) can be colorized to show the percentage of rack space that is available for placing a device. One colorization can be enabled at a time and colorization is applied and displayed for only the racks you are authorized to view.

The number of rack units for rack space available is calculated against the rack space threshold, if available. Otherwise, it is based on the maximum rack space capacity. The resulting values are applied to the front and the back of the rack. This means if you set the rack space threshold to a single value of 70%, the front capacity is set to 70% and the rear capacity is set to 70%. The colorization persists until deactivated by the user.

To colorize available space in a rack:

1. In Graphical Edit view with the floor displayed, click the Colorization icon and select *Available Rack Space*.
2. Select *Front* or *Rear* and click *Apply*.
3. In the Colorization panel, verify the percentage of available rack space.

4.10.3 Rack space consumed

Devices and racks that are located in a space can be colorized to show the percentage of space consumed by a device type, including the devices inside racks. A range of colors are used from green representing a low percentage to red representing a high percentage of consumption.

The percent of rack space consumed is calculated against the rack space threshold, if available. Otherwise, it is based on the maximum rack space capacity. This is limited to space within a rack and is placed in an RU. The colorization is persistent across sessions and different plans. When a new colorization is selected from the colorization drop-down list, the previous colorization is cleared and new parameters are displayed.

NOTE: If the racks on the floor are empty, the device list is also empty. The device list populates as racks get populated with devices such as servers and blade chassis.

To view the rack space consumed:

1. In Graphical Edit view with the floor displayed, click the Colorization icon and select *Rack Space Consumed*.
2. Select the device type to view the rack space capacity consumed and click *Apply*.

4.10.4 Reserved rack space

Space can be reserved in a rack for future placement of devices. This selection colors the devices and racks in a space to indicate the percentage of space consumed by reserved placeholders.

The racks having reserved space are highlighted in blue and the remaining racks are displayed with the default background color white.

To colorize reserved rack space:

1. In Graphical Edit view with the floor displayed, click the Colorization icon.
2. Select *Reserved Rack Space*, and click *Apply*.

4.10.5 Rack power remaining

This function uses colors to show the percentage of available rack power capacity for all power consuming devices associated to a rack. This information is useful when searching for a place for a power consuming device.

Results come from designed data. A range of colors from green at 100% remaining power capacity to red at 0% remaining power capacity is available. The colors are based on total kilowatts (kW) consumed. The consumed power is the sum of the designed power for all power consuming devices associated with the rack. If the device is associated to the rack, but not placed, it shows the consumption of power.

To display rack power remaining:

1. In Graphical Edit view with the floor displayed, click the Colorization icon.
2. Select *Rack Power Remaining*, verify the colorization for the remaining power for Designed Data and click *Apply*.

4.10.6 Critical infrastructure equipment

One color can be used to indicate all devices on a floor that are considered critical and racks containing critical infrastructure devices. The Critical Infrastructure flag is configured for the devices at the symbol level itself and cannot be accessed via the *Trellis*™ platform software.

The racks containing critical infrastructure and critical devices on the floor are highlighted in blue.

To colorize critical infrastructure equipment:

1. In Graphical Edit view with the floor displayed, click the Colorization icon.
2. Select *Critical Infrastructure Equipment* and click *Apply*.

4.10.7 Blade slots available

The racks containing blade chassis have blade slots. The racks containing blade chassis are highlighted in blue. The remaining are displayed with the default background color (white).

When this option is selected from the click the Colorization icon., the racks are highlighted based on the consumption of blade slots in that rack. The colorization is dark green for 100% availability of the blade slots, then followed by various shades and ending with dark red to indicate 0% availability of the blade slots.

To colorize consumed blade slots:

1. In Graphical Edit view with the floor displayed, click the Colorization icon.
2. Select *Blade Slots Available* and click *Apply*.

4.10.8 Environmental conditions

With the *Trellis™* Site Manager module, certain environmental conditions can be monitored using sensors. After values are configured for temperature or humidity conditions, colorization is used to represent High Critical, High Warning, Low Warning and Low Critical results. Results are indicated by rectangles at the RU location of the corresponding sensor. For sensors placed in the left and right RU, rectangles are displayed beside the corresponding RU position.

If both temperature and humidity environmental conditions are selected, whichever has the highest priority is displayed. In Elevation View, each sensor type in a rack can be configured.

NOTE: Only one colorization template is applied at a time.

To configure a space's Environmental Threshold:

1. In Graphical Edit view, select and right-click the space and select *Configure Environmental Threshold*.
2. In the displayed window, click the drop-down arrow, select *Temperature (Fahrenheit)* and assign the threshold name and value.
3. Click the drop-down arrow again and select *Humidity (Relative Humidity)*.
4. Assign the threshold name and value and click *Save*.

To colorize environmental conditions:

1. In Graphical Edit view with the floor displayed, click the Colorization header icon.
2. On the drop-down list, select *Environmental Conditions*, enable or disable the applicable checkboxes.
3. Click the applicable threshold and click *Apply*.
4. Double-click a rack to see its Elevation view, then navigate back to the Graphical Edit view of the floor to verify the selected colorization.
5. In the Colorization dialog, select *None* to remove all colorization.

NOTE: If no colorization is selected in Graphical Edit view, the Elevation view also has no colorization. However, in Elevation view, you can choose *Select a Colorization* from the drop-down list to add colorization in both Elevation view and Graphical Edit view. If you do not select another colorization when the Elevation view of the rack is displayed, the original colorization still exists when you return to the floor in Graphical Edit view.

NOTE: In Elevation view, you can choose *Select a Colorization* from the drop-down list to add colorization in both Elevation and Graphical Edit views.

NOTE: If no colorization is selected in Graphical Edit view, the Elevation view also has no colorization.

If you do not select another colorization when the Elevation view of the rack is displayed, the original colorization still exists when you return to the floor in Graphical Edit view.

In either Graphical Edit or Elevation view, you can choose *Select a Colorization* from the drop-down list to add colorization in both the Graphical Edit and Elevation views.

4.10.9 Creating and deleting user-defined colorization

One or more expressions can be added to each user-defined colorization to further define them. Expressions can be created to use colors to signify various attributes, including the following:

- Name
- Owner
- Model
- Manufacturer
- Model Qualifier
- Category
- Product Line

To create or modify a user-defined colorization instance:

1. Click the avatar drop-down menu and select the User - Profile icon.
2. Scroll down to the Graphical Colorization panel.
3. Click the Add icon, complete the fields and click *SAVE*.
4. Click the Portfolio icon and expand a building, floor and space in the Devices panel.
5. Select a space, click the Graphical Edit icon and click the Colorization icon.
6. From the drop-down list, click *User Defined Colorization*, select the user colorization configured in steps 1-3 and click the *Apply* button.

To delete a user-defined colorization configuration:

1. Click the avatar drop-down menu and select the User - Profile icon.
2. Scroll down to the Graphical Colorization panel.
3. Select the user-defined colorization to be deleted and click the Delete icon.

4.11 Working With Catalog Symbols and Element Libraries

A symbol package provides inventory and monitoring related meta data that is used for creating various device instances in the *Trellis™* platform software. If the device is going to be monitored, the symbol package must provide monitoring-related information such as an element library for that symbol. A typical symbol package for monitored devices contains the following elements:

- Device images (.png format) for the front and rear view of the device
- Resource bundle files for localization
- Symbols collection .xml file with the device inventory related meta-data
- Factory element library with the tar.gz extension that contains shared libraries and meta-data

- Zero or more custom element libraries, depending on whether the symbol is downloaded from a portal or customized
- *Trellis™* Global Data Dictionary (TGDD) as the source of truth for all the ENUMs, data point definitions, event definitions and so on
- Master data file to store the CDM seed data

The Catalog Symbols window displays the current items and devices in your inventory that have symbols. Symbol libraries can be replaced, removed, requested, uploaded and distributed and the history of symbols can be uploaded with the name, version and date of the upload.

Symbols can be filtered by the following columns or by entering filter criteria in the text box above each column:

- Manufacturer
- Model Qualifier
- Model
- Version Major
- Version Minor
- Date Installed
- Monitored

To learn about element libraries in the symbol package, [Understanding Element Libraries](#) on page 199.

4.11.1 Submitting a new symbol request

If you cannot find a symbol, you can submit a request for a new symbol.

After the symbol request is submitted and approved, a researcher identifies the best rendering of the requested symbol and Drawing Services produces the new symbol. After Quality Assurance ensures the symbol meets requirements, the symbol is uploaded for access.

The timeframe from a customer request to availability is about four to five weeks. When the new symbol file is uploaded, information pertaining to the symbol is updated and a notification is sent to you.

NOTE: A bulk request can be submitted for a large number of devices such as for 1000 devices.

To submit a symbol request:

1. Go to <http://symbolsorder.VertivCo.com>.
-or-
From the Catalog Symbols window, click the *Symbol* web site button (using Internet Explorer).
2. Enter your login credentials, press **Enter** and click *Request Symbols*.
3. Scroll down the page, click *Select Existing Symbols* to search the catalog and enter or select criteria to find the symbol.

NOTE: To increase the number of search results, provide the least amount of information that covers the range into which the symbol fits.

4. Click *Locate* and on the List of Symbols, verify the search results do not contain the symbol.
5. Click *Add* and on the New Symbol Detail box, enter the full manufacturer name in the Manufacturer box (without abbreviations).

NOTE: To search for a manufacturer, click the *Locate Manufacturer* button.

6. Enter the model number in the Model Number box.

NOTE: In the Model Number box, do not enter the name of a product line, series or family.

7. Select an available symbol type from the drop-down list. If the device type is not listed, select *Other* and specify the device type in the Comments field.
8. In the Monitoring field, select *Yes* or *No* to signify if the device requires an element library.
9. Select the appropriate mounting type from the drop-down list (rack-mounted or floor-mounted devices).
10. In the Comments field, enter any additional information regarding the device that would be helpful when creating the symbol. If you selected *Other* in the Symbol Type field, include the device type in your comments.

NOTE: All other fields are not required but are helpful if you have the information to provide to the Symbols Team.

11. In the Upload a File field, click *Browse* to attach manuals, specifications, pictures or any other documentation you may have available to create the symbol.
12. Click *Create* on top of the page and on the main request form, click *Submit Request* to process the request.

NOTE: An email is sent to you when a new library is published that contains the new symbol.

4.12 BMS Integration, Symbol and Element Libraries

The device monitoring feature of the *Trellis™* platform supports all monitored devices, including monitored devices of the Building Management System (BMS) module. This module uses custom element libraries and element library (EL) synchronization to update the monitoring configurations of devices. The BMS module, included with the symbol library, provides the ability to create custom element libraries so that a common device instance or a BMS device can be used for different sets of data points. This feature is applicable for all the monitored devices in your enterprise.

If you are interested in BMS functionality, Professional Services is available to perform the configuration and activation. After the initial configuration, you can view, create, monitor and update devices using custom device symbols. You can also import an existing symbol library, customize an element library inside it and export it back as a new symbol with the same symbol version. Each item in the element library must be altered using the custom element library tool. The exported symbol .zip file can be uploaded to the *Trellis™* platform software via existing symbol upload functionality.

4.12.1 Creating a custom symbol library using BMS integration

To create a BMS instance:

1. Click the Portfolio icon and expand the building node to place the device.
2. Click the Search icon, begin entering the device name in the field, select the name from the auto-complete list and click *SEARCH*.
3. Select and drag the symbol to the list to create a device instance.
4. Click the Edit icon.

To view symbol properties:

1. Click the Administration icon and select *Symbols Viewer*.
2. Begin entering the symbol name, select the symbol from the displayed list and click the Search icon.
3. In the Category drop-down menu, select *Building Management System* and click *SEARCH*.
4. Under the Search button, verify the manufacturer, model and category for the device.
5. Click the *Building Management System* folder, select the device and view the properties on the Summary panel.

4.12.2 Synchronizing global data files

Global data for a device must be synchronized between the *Trellis™* platform software and the data collection engine that monitors the device. This synchronization ensures the TGDD and master data used by the device are supported by the engine. This functionality can be either triggered on an ad-hoc basis or can be scheduled using the Scheduler dashboard.

To synchronize global data files (Master Data and TGDD) with the appliance:

1. Click the Monitoring icon and select *Data Collection Engine*.
2. Identify the data collection engine, click its vertical ellipses icon and click the Edit icon.
3. Complete the Summary panel fields, and in the Element Libraries panel, click the Add icon.
4. In the Install Element Library window, select and schedule to install a library and click *SAVE*.
5. In the Discovery Configuration panel, click the Add icon.
6. In the Add IP Address Range window, enter or select information to complete the fields and click *SAVE*.
7. Click *Global Data File Synchronization* to verify the currently installed and synchronized files and select the file to be synchronized.
8. Under Schedule Global Data Files Synchronization, click *Synchronize Now*.

-or-

Click *Schedule Synchronization*.

9. Click the task to open the calendar and in the Summary panel, select the task to confirm that the file is synchronized with the appliance.

4.12.3 Monitoring a primary or secondary device

Minor differences exist in the displayed information of a monitored primary or secondary device. For a primary device, the device name is displayed. For a secondary device, the name of the primary device (whose IP address is used for monitoring) is displayed.

Before configuring a device for monitoring, an element library must be selected. The list of available libraries includes the factory-provided element library and all the custom element libraries for that symbol version.

The following are additional requirements before any device can be monitored:

- For a secondary device, ensure its associated primary device is already monitored (IP address is already present in the system).
- For a primary device, the IP address is not used.
- The element library for the device must be pushed to the appliance that is listening to the IP address of the device.
- The most current TGDD data and master data, if available, must be pushed to the appliance that is listening to the IP address of the device (using Global Data Synchronization).

All the custom element libraries have the same symbol version as that of the factory-provided element library, however, they have different element library versions.

To monitor a primary or secondary device:

1. Click the Portfolio icon and locate the device.
2. Click the vertical ellipses icon of the device and select *Monitor*.
3. Click the Edit icon and enter or select the name, protocol and IP address of the device.
4. Click *SAVE*.

To verify the device is being monitored:

Click the Monitoring icon and verify the device is added to the list of monitored devices in the Configuration window.

4.12.4 Updating the element library for a primary or secondary device

The main functionality of BMS integration is being able to quickly make changes for data points to be monitored. For an existing monitored device, specific communication-related parameters can be modified. An element library can also be re-selected, such as by changing the IP address (for primary devices) and protocol values. After this, you can reconnect the device and begin monitoring again.

NOTE: IP addresses can only be changed for primary devices.

To update the element library for a primary or secondary device:

1. Click the Monitoring icon and click the device's checkbox in the Configuration panel.
2. Click the Edit header icon, update the Element Library and click *SAVE*.

i

4.13 Importing Data

Data import is performed using the Bulk Data Processing tool. For more about bulk data processing, see [Data Management](#) on page 277.

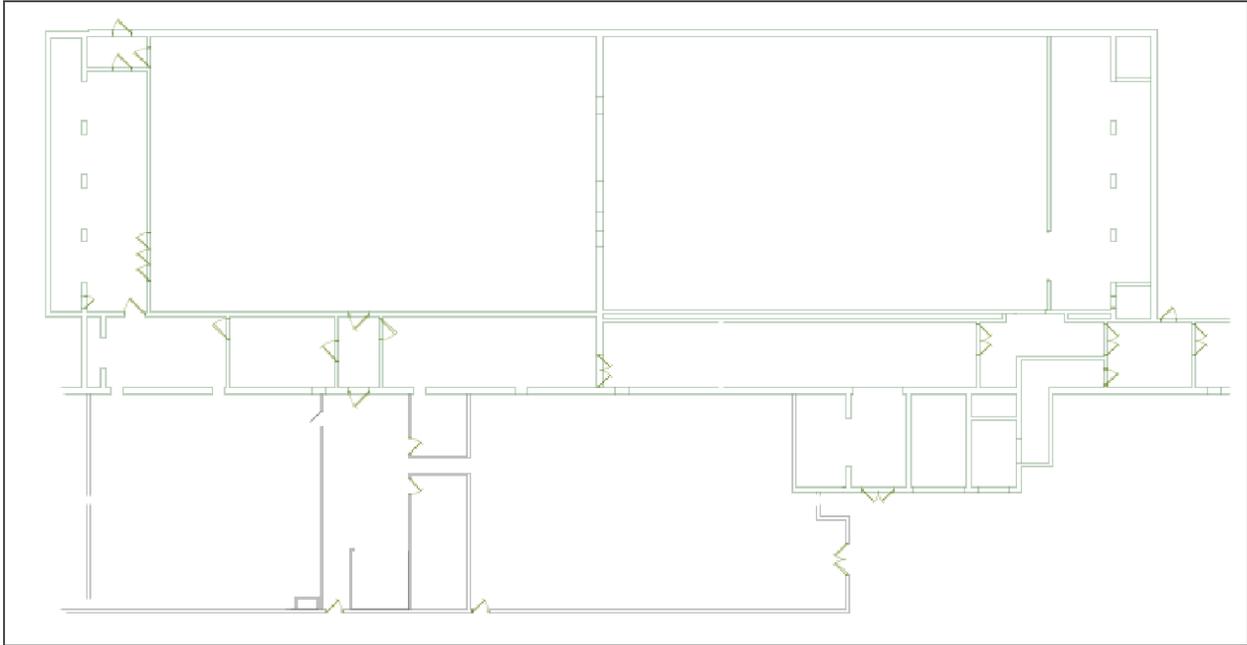
4.14 Importing an AutoCAD Floor Plan to Use as a Background

If you already have an existing floor plan created in AutoCAD, you can convert it to an .svg file and import it into the *Trellis*™ platform to use as a background. In Graphical Edit view, the floor plan becomes your background and can be imported to any floor. This allows you to map your floor plan by drawing shapes to represent spaces and zones.

Importing a floor plan involves the following procedures:

- Loading, cleaning and converting a floor plan
- Scaling the .svg file and editing the final file dimensions
- Importing the .svg file as a background

Figure 4.14 Example of a Floor Plan Used as a Background



4.14.1 Software tool requirements for image conversion

To convert a floor plan to an .svg file, you must have software tools that allow you to load, edit and manipulate the current floor plan format as well as convert it to an .svg file. The following example software tools can be used in this process:

- TurboCAD® Deluxe is a commercial 2D/3D Computer Aided Drafting (CAD) program. It can load a variety of formats, including AutoCAD formats such as .dwg, .dxf and .dgn. After a CAD drawing is loaded, it can be manipulated to display only required elements. After the drawing is cleaned up, TurboCAD can save the CAD image in the .svg format for importing into the *Trellis™* platform.
- Inkscape is an open source product that can be downloaded from the Internet. It allows manipulation of .svg images. This tool is used to modify the dimensions of the .svg image to match the architectural dimensions of the actual drawing. It establishes a uniform scale for the image that can be read by the *Trellis™* platform.
- Wordpad .svg files are XML documents. Manual changes should be made as a result of the Inkscape modifications. Wordpad or any other suitable text editor can be used to make these changes.

4.14.2 Loading, cleaning and converting a floor plan

Basic clean up may be required before an existing floor plan can be converted to the .svg format. After loading the CAD file into TurboCAD, you can clean the drawing, designate the architectural dimensions of the final rendering and save it as an .svg file.

NOTE: Any commercial 2D/3D CAD program can be used, however, this procedure uses TurboCAD.

To load, clean and convert the floor plan to an .svg file:

1. Load the drawing and select the levels.
2. Select the graphics for the final drawing, move them across levels and change their colors.
3. Add text and delete any levels or graphics as needed.

NOTE: In TurboCAD there is a level manipulation tool that can facilitate this process and also select individual drawing items to see the respective levels to which they belong.

4. After the cleanup, select all elements in the drawing to verify the architectural size of the drawing. After the floor plan is cleaned up and the dimensions are determined, click *Save As* in the CAD program to save the floor plan in the .svg file format.

NOTE: TurboCAD shows the height and width of the selected items measured in inches. If the drawing was created using a different unit of measure, convert it to inches to get the proper dimensions for scaling.

NOTE: Record the height and width dimensions to use later when scaling the .svg file.

4.14.3 Scaling the .svg file and edit the final file dimensions

The file conversion is complete and now the .svg file is an XML file that requires scaling and editing to match the architectural dimensions noted during the cleaning process.

When using a scaling program such as Inkscape, the height and width parameter values are automatically set to 100% when the file is saved. After scaling the file, an XML text editing program must be used to manually edit the height and width of the drawing to be ten times the architectural dimensions that you noted when cleaning your floor plan. This helps to ensure the dimensional scaling is accurate.

NOTE: The following procedures use Inkscape to normalize the .svg floor plan file to a common scaling factor and use WordPad to edit the .svg file dimensions, however, similar programs can be used.

To scale the .svg file:

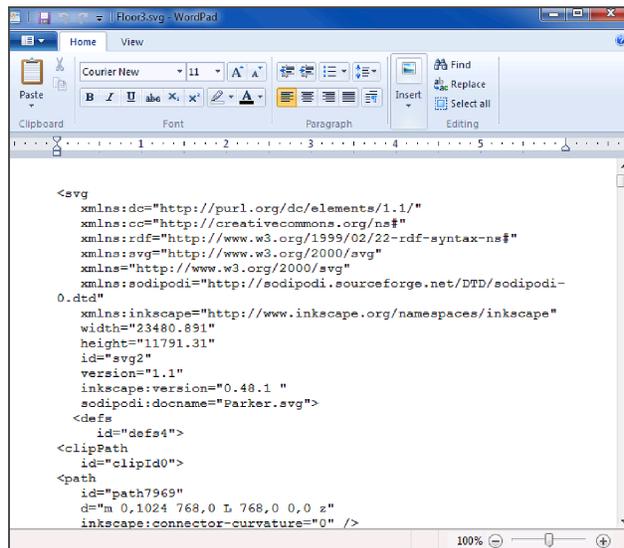
1. In a scaling program such as Inkscape, click *File - Open* and select the .svg file to be scaled.
2. Click *File - Document Properties* to open the Document Properties dialog box and locate the architectural dimensions recorded during the cleaning process.
3. Still in Inkscape under the Custom size option, adjust the height and width to be ten times the previously noted dimensions.
4. Click *Edit - Select All* to select all the vectors in the image and verify the current dimensions of the selected vectors.
5. Verify the values are set to pixels (px), change the X, Y, W and H fields to zero (0) and click *SAVE*.

NOTE: Changing the fields causes the selected vectors to fill out the document to its edges. Occasionally, changing one property causes another to change, so ensure the values match exactly as listed.

To edit the .svg file dimensions:

1. In a text editing program such as WordPad, open the .svg file and in the XML code, locate the height and width parameters, shown as 23480.891 and 11791.31 in the following figure.
2. Change the height and width parameters to ten times the height and width that you identified when cleaning up your floor plan and save the .svg file to be imported directly into Graphical Edit view.

Figure 4.15 Example .svg File in WordPad



4.14.4 Importing the .svg file as a background

When editing is complete, the floor plan can be imported into the *Trellis™* platform.

To import an .svg file as a background:

1. Click the Portfolio icon, expand the enterprise and click a floor.
2. Click the Actions icon and select *Details*.
3. In the Summary panel, click the Edit icon.
4. Drop your image in the image box and click **SAVE**.

-or-

Click the image box, choose the .svg file to upload, click *Open* and click **SAVE**.

5. Verify the background on the floor.

4.14.5 Drawing squares and polygons on the imported background

After importing a background image file of the floor, the Graphical Edit icon allows you to draw spaces and zones to fit the image. You can draw rectangles or polygons for both spaces and zones.

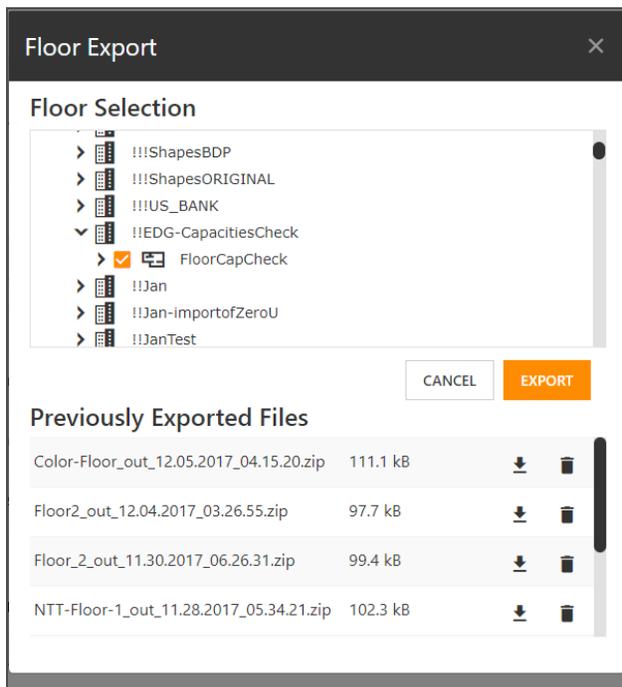
The rectangle drawing icons allow you to create a defined space or zone within your background or within the console workspace. After you select the icon, you can draw an outline of the space.

The custom drawing icon is used when the space or zone is not a square or rectangle. After you add a point, the *Trellis™* Inventory Manager module creates the line segment until you add the next point. After the space is created, you can configure your tile system.

4.15 Exporting a Floor

A floor can be exported and reimported for use in the Bulk Data Processing tool. After you export the floor, you will receive an email with the link to download a .zip file. The .zip file contains Excel™ and YAML files, which are the files used by the Bulk Data Processing tool.

Figure 4.16 Selecting a Floor to Export



To export a floor:

1. Click the Administration icon and click *System Settings*.
2. In the upper right corner, click the Floor Export icon.
3. Select a building, select a floor and click *EXPORT*.

4.16 Using the DSView™ Software Session

The following sessions can be launched from the *Trellis™* platform in a DSView™ session:

- KVM Session
- Serial Session
- Unit overview
- Telnet session
- RDP
- VNC
- SSH
- DVC
- Display Units view

NOTE: Devices must be accessible by the DSView™ software to be able to launch using the *Trellis™* platform.

Figure 4.17 DSView™ Software Configuration

DSView Configuration

Server Name:

Port:

Service Account Name:

Password:

To view and modify devices using DSView™ software:

1. In the *Trellis™* platform software, click the Administration icon and select *System Settings*.
2. In the DSView™ Configuration panel, click the Edit icon.
3. Complete the fields for the device you want to access in the DSView™ software as follows:
 - a. Enter the DSView™ Server IP address in the Server Name field.
 - b. Enter the DSView™ User Account name in the Service Account Name field.

NOTE: Entering a server name or a DSView™ service account name prompts an error.

NOTE: The Service Account Name requires access rights for the DSView software to successfully launch a support session.

- c. Enter the port number and password and click **SAVE**.
4. Click the applicable session type to launch it.

Figure 4.18 DSView™ Session

The screenshot shows the Avocent DSView 4 Management Software interface. The main content area displays a table of appliances under the heading "Appliances - All". The table has columns for Name, Port, Type, Firmware Version, Status, Action, Site, and IP Address. A tooltip labeled "Internet options" is visible over the table.

Name	Port	Type	Firmware Version	Status	Action	Site	IP Address
0b-dd-38-p-43	43			Idle	Serial Session		
0b-dd-38-p-44	44			Idle	Serial Session		
0b-dd-38-p-45	45			Idle	Serial Session		
0b-dd-38-p-46	46			Idle	Serial Session		
0b-dd-38-p-47	47			Idle	Serial Session		
0b-dd-38-p-48	48			Idle	Serial Session		
MPU4032-10-6C-FF		MPU4032		Idle			10.207.16.12
DCIM-A #12 (10.	1			Idle	KVM Session		
DCIM-A #13 (10.	2			Idle	KVM Session		
DCIM-A #10 (10.	3			Idle	KVM Session		
DCIM-A #11 (10.	4			Idle	KVM Session		
HP_DL360p GEN8	5			Idle	KVM Session		
Cisco UCS C210	6			Idle	KVM Session		
Win 7 Client	7			Idle	KVM Session		
PowerEdge R320	8			Idle	KVM Session		
DCIM-A #14 (10.	9			Idle	KVM Session		
Cisco UCS C220	11			Idle	KVM Session		

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5 TRELIS™ POWER SYSTEMS MANAGER MODULE

The *Trellis*™ Power Systems Manager module provides insight into the critical power system of the data center. This module builds on the device monitoring capabilities of the *Trellis*™ Site Manager module to provide system level management from the utility entrance to rack power distribution. It provides a comprehensive view of resource utilization and capacity with awareness of the active power path and the status of each device in the power system.

The Building Power Systems dashboard and capacity charts provide the capacity of the building power elements on a single page. Capacities are provided for the primary infrastructure power devices of generators, automatic transfer switches, UPSes and switchgear mains for a building.

Another dashboard displays trends using power capacity reports. Reports can have multiple graphs for each device on a single page and can be exported as a CSV or PDF file. Filters allow report customization by building, floor, space, device domain, device category, consumed and/or remaining capacity and range of time.

Dynamic one-line diagrams can be created to illustrate the critical power path in the data center. One-line diagrams also allow you to view the status of each monitored device and identify devices that are dependent on another infrastructure device.

In a real-world scenario, after receiving a notification that one of the power supplies for a server is without power, you can navigate to that server in the software, verify its connections and identify the device at the remote end of the connection. You can also verify what other devices are connected to that same device and check their status using the software.

The *Trellis*™ Power Systems Manager module provides the following benefits:

- Viewing power system resource utilization and capacity
- Increasing awareness of the active power path and device status in the power system
- Understanding the dependencies of the entire power system
- Visualizing the combined status and capacity of paralleled power devices
- Creating and verifying connections using one or more inputs to many outputs in the Graphical Edit view
- Moving and rotating devices for viewing and placement
- Displaying all downstream devices impacted by the operational state of another device
- Editing, restoring and deleting port expressions for determining the state of connections

5.1 Module Requirements

The *Trellis*™ Power Systems Manager module requires the *Trellis*™ Site Manager module configuration information as follows:

- Site Manager Module - A licensed *Trellis*™ Site Manager module is required to receive device data and alarms and configure power capacity thresholds.
- Dependencies on Site Manager Module - The Power Systems Manager module has a dependency which builds on the capabilities of the Site Manager module and requires an active *Trellis*™ Site Manager license to function properly. The Site Manager module allows you to review data in Device Table view and configure power capacity thresholds for use with the Power Systems Manager module. In addition, the Site Manager module allows you to configure and send notifications when the thresholds you configure are exceeded.

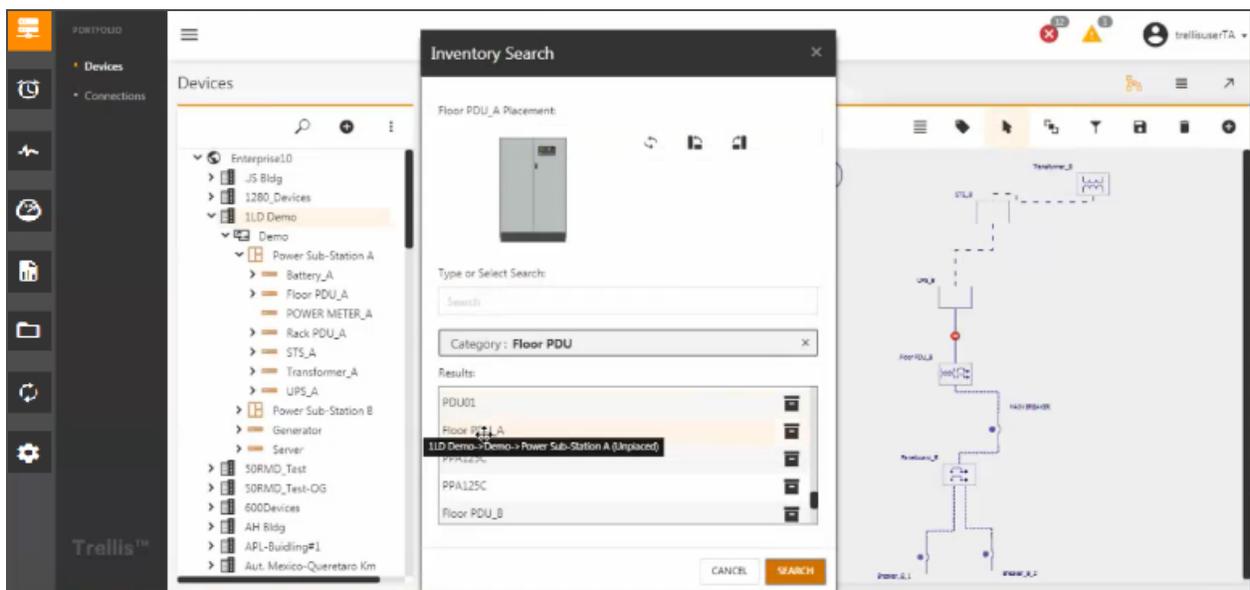
To access and work on Power Systems Manager functionality, you must enable the Power Systems Manager license after enabling the Site Manager module license.

5.2 Understanding One-Line Diagrams

The one-line diagram feature of the *Trellis™* Power Systems Manager module allows you to efficiently and precisely represent connected devices in your data center environment. One-line diagrams are used to illustrate device connections, supplemental metering and instrumentation. This allows you to better understand the energized power path through power equipment.

A one-line diagram, accessed from the building level, can be created for all equipment in the data center from the utility entrance to floor PDUs, power panels and standalone panelboards. Images for the devices and supplemental metering are contained in the catalog and added from the inventory list. Symbols are provided to indicate electrical components and more. Labels can be created to identify devices and add additional information to the diagram.

Figure 5.1 Adding a Device to a One-Line Diagram



One-Line Diagram Icons provide the following functions:

- Align - Drop-down menu of the following eight options used for device placement; Align Left, Align Right, Align Top, Align Bottom, Align Center, Align Middle, Align Vertical and Align Horizontal options
- Label - Used to create free-form, blank text labels allow you to add
- Select - Displays the drop-down menu to choose the following options; also deselects the Select icon when clicked a second time
 - Select - Selects a component in the one-line diagram
 - Pan - Moves the one-line diagram in the window
 - Zoom window - Zooms in on a specific area in the one-line diagram or zooms out for a wider view; activated with the scrolling mouse button
- Arrange - Allows you to straighten the connection lines to 90 degrees
- Filter - Displays the drop-down menu to display or hide Text, Text Annotation, State, Status and Data Points
- Save - Saves the one-line diagram with your changes
- Delete - Removes the selected device from the one-line diagram only
- Add - Used to add devices located in Inventory

5.2.1 Using One-Line Diagram symbols

Connection nodes are not visible and are only provided in the following table as a reference to the location of the connection line intersections with the device images. The equipment device name string is visible when symbols are placed on a diagram. The string is movable, so it can be placed in the best viewing area. The default location is to the right of the symbol.

Table 5.1 One-Line Diagram Symbols

IMAGE	DESCRIPTION
	Automatic Transfer Switch (ATS).
	Centralized Static Switch. NOTE: This symbol does not change state.
	Chiller.
	Circuit breaker, low-voltage-draw out type (Closed).
	Circuit breaker, low-voltage-draw out type (Open).
	Circuit breaker, low-voltage-draw out type (Not Monitored). NOTE: The state of the disconnect is displayed if known. If the state cannot be detected, use the "Not Monitored" version of the disconnect.
	Circuit breaker, low-voltage-fixed position type, subfeed breaker (Closed).
	Circuit breaker, low-voltage-fixed position type subfeed breaker (Open).
	Circuit breaker, low-voltage-fixed position type, subfeed breaker (Not Monitored). NOTE: The state of the disconnect is displayed if known. If the state cannot be detected, use the "Not Monitored" version of the disconnect.
	Circuit breaker, medium-voltage-fixed position (Closed).
	Circuit breaker, medium-voltage-fixed position (Open).
	Circuit breaker, medium-voltage-fixed position (Not Monitored). NOTE: The state of the disconnect is displayed if known. If the state cannot be detected, use the "Not Monitored" version of the disconnect.

Table 5.1 One-Line Diagram Symbols (continued)

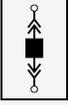
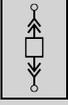
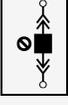
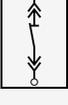
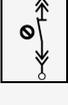
IMAGE	DESCRIPTION
	Circuit breaker, medium-voltage-draw out type (Closed).
	Circuit breaker, medium-voltage-draw out type (Open).
	Circuit breaker, medium-voltage-draw out type (Not Monitored). NOTE: The state of the disconnect is displayed if known. If the state cannot be detected, use the "Not Monitored" version of the disconnect.
	Condenser or drycooler.
	Coolant Distribution Unit (CDU), also known as a Modular Pumping Unit (MPU).
	CRAC, CRAH; also known as a Modular Cooling Unit.
	Generator.
	Isolator, low-voltage switch-fixed position type (Closed).
	Isolator, low-voltage switch-fixed position type (Open).
	Isolator, low-voltage switch-fixed position type (Not Monitored). NOTE: The state of the disconnect is displayed if known. If the state cannot be detected, use the "Not Monitored" version of the disconnect.
	Isolator, low voltage switch-draw out position type (Closed).
	Isolator, low voltage switch-draw out position type (Open).
	Isolator, low-voltage switch-draw out position type (Not Monitored). NOTE: The state of the disconnect is displayed if known. If the state cannot be detected, use the "Not Monitored" version of the disconnect.

Table 5.1 One-Line Diagram Symbols (continued)

IMAGE	DESCRIPTION
	PDU (floor) without panelboards, with subfeeds and breakers.
	PDU (floor) with panelboards, without subfeeds and breakers.
	PDU (floor) with panelboards, without subfeeds and breakers. The subfeeds should be displayed below the symbol connected to the openings.
	RPP with panelboard.
	RPP with panelboard, subfeeds and breakers. The subfeeds should be displayed below the symbol connected to the openings.
	UPS with remote battery string (dual input UPS).
	UPS with remote battery string (single input UPS).
	Power meter.
	Surge protection device.
	Static switch (STS).
	Switchgear with busbar. This device(s) container including multiple buses showing upstream and downstream connection nodes. There can be multiple buses within a container. The bus can be extended and connected devices can be moved along the bus. The container itself can be extended vertically and horizontally. The bounding box for these enclosures are built dynamically by the application.
	Transformer.

5.2.2 Creating and reading a one-line diagram

With the *Trellis™* Power Systems Manager module, you can build dynamic one-line diagrams that illustrate the flow of power through your data center. The flow of power and arrangement of elements and symbols on a one-line diagram follow a standard left-to-right and top-to-bottom sequence. Animated dashes indicate the connection is active and responding to the connection expressions.

Only a single, one-line diagram is allowed per building. All devices used in your one-line diagram must exist in your *Trellis™* platform inventory so you can search for them and add their image to the diagram. After you drag each image to the diagram, you can move the image to a specific location, align multiple images and add a label. The devices' consumed and remaining capacities can also be configured and displayed on the one-line diagram under each device's name.

When the one-line diagram becomes larger than what can be shown on the screen, a panoramic view appears in the upper left corner to assist in navigating the larger drawing being viewed.

NOTE: If you remove devices from the diagram, the devices and connections continue to exist in the Portfolio Device Table and Connections windows.

To create a one-line diagram:

1. Click the Portfolio icon and select a building in the Devices panel.
2. Click the One-Line Diagram header icon, click the Add header icon and select *Inventory*.
3. In the Type or Select Search field, enter a keyword, category or manufacturer and click *SEARCH* to find a device in the inventory.
4. Scroll to and select the device and note the displayed message that provides the device's location for placement.
5. Click the Select header icon and click *Select* in the drop-down menu.
6. Select and drag the image to the one-line diagram and place the device as desired.

NOTE: The image has a red box around it when it is placed or if the device is not compatible and cannot be placed.

7. After the device is placed, click the Select header icon and choose *Select* to deactivate the icon.
8. Repeat adding devices as necessary to complete the diagram.

To align devices:

1. In the one-line diagram, click multiple devices.
2. Click the Align header icon and select the applicable icon to align the devices.

To add a label:

1. In the one-line diagram, click the Label header icon and enter text in the active box.
2. While the text box is still active, position the label as desired.
3. Click the Select icon and choose *Select* from the drop-down menu.

To move a device:

1. In the one-line diagram, click the Select header icon and choose *Select*.
2. Click the device, and when the cross appears, move the device as desired.
3. Click the Select header icon, choose *Select* to toggle the icon off and click the Save icon.

To pan the one line drawing:

1. In the one-line diagram, click the Select header icon and choose *Pan*.
2. Click the drawing and move it in the window.

To zoom the one-line diagram in and out:

1. In the one-line diagram, click the Select header icon and choose *Zoom window*.
2. Use your mouse's scrollbar to zoom in or out as desired.
3. Click the Select header icon and choose *Zoom window* again to fit the one-line diagram in your window.

To filter annotations:

In the one-line diagram, click the Filter header icon and click to display or hide the Text, Text Annotation, State, Status and/or Data Points.

To delete a device from the one-line diagram:

1. In the one-line diagram, click the device and click the Delete header icon.
2. Click *Remove* and click the Save icon.

-or-

Right-click the device, select *Remove Device(s)* and click the Save icon.

5.2.3 Creating a one-line diagram for multiple-equipment systems

The multi-equipment, one-line diagram displays systems, such as multi-module UPS, multiple CRACs within a zone or multiple chillers, that are bound together in a cooling plant. The diagram can also display the electrical dependencies of the complete electrical infrastructure, which includes utility feeds, switchgear, PDUs and rack PDUs.

To create a one-line diagram for multiple-equipment systems:

1. Click the Portfolio icon, click a building and click the *One-Line Diagram* header icon.
2. Search for symbols and devices to add to the diagram and drag them to the workspace.

5.2.4 Viewing connection states

Electrical connection states can be viewed in a one-line diagram by hovering over the connection.

The following are possible connection states:

- Active - Electrical potential (voltage) and current flow across the power connection
- Energized - Electrical potential across the power connection (voltage), but there is no current flow
- De-Energized - No electrical potential across the power connection or it is below the defined threshold used to recognize electrical potential
- Not Monitored - The platform has been configured to not evaluate the state of this connection, possibly because of a lack of monitoring information or interest in the state of the connection
- Not Responding - Status of the power connection cannot be determined at this time due to lack of data

To display a connection's state in a one-line diagram:

1. Open the one-line diagram and select the connected, monitored device.
2. Click *Port state* to Open Expression Builder, open *Active/Energized Expression*, update the expression as required and click *Save*.
3. In the one-line diagram, hover the cursor over the connection line to view the connection state.

5.2.5 Displaying dependent devices from a one-line diagram

For the purpose of power maintenance planning, the View Downstream Devices feature can be used to list power connections between power distributors and power consumers.

To display dependent racks from a one-line diagram:

1. Verify the one-line diagram exists with equipment and power connections.

NOTE: Only power distributors have the View Downstream Devices option enabled from the right-click menu.

2. Click the Portfolio icon, right-click a building and click the One-Line Diagram header icon, then highlight and right-click a device and select *View Downstream Devices*.

NOTE: The Device Table or Elevation view opens for the selected device after clicking the device hyperlink for monitored and non-monitored devices. If a device is located in a rack, you can click the device to access the Rack Elevation view.

3. With the dependent, floor-mounted devices visible in Elevation view, click the *Text* header icon to change to Device Table view.
4. In the table, which contains devices by device category in the order of the downstream power connection, select a device and click *Properties* to update the information.

NOTE: A building could be excluded if a one-line diagram is already at the building level.

5.2.6 Displaying updated data point values in a one-line diagram

When a data point value for a device is changed through the simulator, the server retrieves updated data point values after the collection interval has passed and the updated data point value appears in the Latest Reading window or panel and in the one-line diagram.

5.2.7 Creating Port Expressions

Port expressions can be configured for monitored ports and displayed in one-line diagrams. One of the features created with port expressions are the animated dashes that emulate the direction of power. Expressions can be created to show device port openings, lock/unlock openings and add user-defined properties. The opening state expression components are active or energized. These expressions are created by selecting specific components.

To create or remove a port expression:

1. Click the Portfolio icon and click *Connections*.
2. Click the monitored port's name and click the Edit header icon in the same panel.
3. If desired, in the Opening panel, enter a new label name, change the lock status and click *SAVE*.
4. If you want to create or remove an active port expression, click the Edit icon in the Opening State panel and perform one of the following steps:
 - Click the Add Expression icon under Active and select the applicable state expression components.
 - Select an existing active expression and click the Remove Expression icon.
5. If you want to create or remove an energized port expression, click the Edit icon in the Opening State panel and perform one of the following steps:
 - Click the Add Expression icon under Energized and select the applicable state expression components.
 - Select an existing energized expression and click the Remove Expression icon.

5.2.8 Overriding one-line diagram port expressions

By default, initial device port expressions are commonly provided in the Element Library by device, port and state (active or energized). However, for a few devices the default expressions are not specified. For these devices' ports, the default expressions can be overridden and you can apply a default expression to be applied in the One-Line Diagram Port State Expression View based on the device's category, port name and state.

To create the default expression configuration file:

1. Locate the configuration file in the defaultExpressions directory on the *Trellis*[™] platform front machine under U02/domains/<Your Domain> (Red Hat[®] Enterprise Linux[®]).

-or-

Locate the configuration file in the defaultExpressions directory on the *Trellis*[™] platform front machine under U02/domains/<Your Domain> (Windows).

NOTE: This directory contains an initial empty ExpressionDefaultTypes.properties file where the default expressions are configured. This folder, and the file it contains, are created by default the first time a device and/or port is selected in the Topology View that does not already contain default expressions.

2. If the folder does not exist, create the folder as follows.
 - a. Open the topology for a building, select a monitorable device and a port (one for which a default expression is known not to exist).
 - b. Open the Port State Expressions view.

NOTE: The message “Opening expressions are not available for this device” is displayed, and the defaultExpressions folder and empty ExpressionDefaultTypes.properties are created automatically in the default expressions folder.

3. Edit the ExpressionDefaultTypes.properties file and add the default expressions to be used in the *Trellis*™ platform.

NOTE: Each default expression is keyed by the Device Category, Opening Name, State and the Default Expression to be used for entering data into the ExpressionDefaultType.properties file.

4. Edit the expression again as follows:
 - a. Open the topology, select a device and a port.

NOTE: This automatically reads the configuration file and picks up the expression that matches the device category, port name and state. After the default expression is picked up from the configuration file, it is displayed in the Port State Expressions view.

- b. Edit the default expression as needed and save.
5. After making changes to the default expressions, if reverting changes is necessary, click *Restore to Default* to override any changes and re-install the initial default expression (from the configuration file).

5.2.9 Assigning and Suppressing Alarms

To assign or suppress alarms:

1. Click the Monitoring icon.
2. In the Configuration window, select the device and click the Automation header icon.
3. In the Automation Settings window, scroll to the Assign Alarms panel and click one, multiple or all the applicable checkboxes to assign the alarms.

-or-

Scroll to the Suppress Alarms panel, select the start and end dates and click the checkbox of one, multiple or all alarms.

4. Click *SAVE*.

5.3 Building Power Systems Dashboard

The Power System Status Dashboard shows the state, consumed capacity and percent utilization for key elements of the power system. For example, status can be shown for the main breaker of the switchgear, utility mains, generators, automated transfer switches and UPS systems. The displayed status can also be saved as a PDF file.

The dashboard displays graphs, a list of available critical power devices within the selected building and the following information:

- Device name

- Design Capacity
- State
- Load kW/Load Amps
- Load %

To view the Building Power Systems dashboard:

1. Click the Dashboard icon and select *Building Power Systems*.
2. Under the Rules panel, select a building from the drop-down menu.
3. In the UPS Rating (in kW) \geq field (optional), enter a value and click *Get Devices*.

NOTE: Values refresh in real time while polling.

5.4 Capacity Trend Dashboard

The Capacity Trend dashboard displays trends for device power capacity and utilization.

To view and export the Capacity Trend dashboard:

1. Click the Dashboard icon and select *Capacity Trend Dashboard*.
2. Under the Capacity Trend Dashboard Rules panel, select the building, floor (optional), space (optional), domain and category.
3. In the % Consumed $>$ and % Remaining $<$ fields (optional), enter the values and click *Get Devices*.
4. Click the *Create Chart* icon next to one or more devices to view trending graphs and use the checkboxes to filter information.
5. If desired, click *Exports As CSV* to open a spreadsheet with details about the device and click *Save as PDF* to save the file in PDF format.

NOTE: Values refresh in real-time while polling.

5.5 About Switchgear Equipment

Switchgear is an enclosure with a combination of electrical disconnect switches, fuses or circuit breakers used to control, protect and isolate electrical equipment. Some switchgear equipment also has gauges or meters that provide kilowatt hours (kWh), volts and other information.

With switchgear equipment you can perform the following:

- Interconnect multiple devices to work in conjunction to control the flow of electricity in the data center
- Provide protection from the interruption of short-circuit and overload fault currents while maintaining service to unaffected circuits
- Isolate circuits from power sources and increase availability by allowing alternate power sources to feed the same load

5.5.1 Changing switchgear properties

After adding a generic switchgear device to the floor, you can change its properties to match your specific switchgear. To make these changes, you need the name and email of the owner, name of the device, dimensions, manufacturer, model, model qualifier, notes, lock device position, serial number, asset number and bar code number of the generic switchgear to match the properties of the switchgear on your floor.

NOTE: Because switchgear devices are often custom built, it is a best practice to change the dimension properties of the switchgear you add in the *Trellis*™ platform to match those of the installed switchgear.

To change switchgear properties:

1. Click the Portfolio icon, expand the enterprise and select the switchgear.
2. In Device Table view, select the Switchgear link under the Name column.
3. Click the Edit icon, update the information and click *SAVE*.

5.5.2 Adding, modifying and deleting a busbar

Busbars are commonly used in switchgear devices to provide a common electrical point for tying together multiple breakers, switches, meters and other devices. These bars are usually made of copper or aluminum.

To add a busbar to switchgear:

1. Click the Portfolio icon, expand the enterprise and select a switchgear.
2. Click the Graphical Edit icon to launch the Elevation view of the switchgear.
3. Select and right-click the switchgear image.
4. In the Switchgear components list, select *Add Bus*.

To modify busbar properties in switchgear:

1. Click the Portfolio icon, expand the enterprise and select a switchgear.
2. Select the busbar, click the Edit icon, modify the properties and click *SAVE*.

To delete a busbar from switchgear:

1. Click the Portfolio icon, expand the enterprise and select a switchgear.
2. Select the busbar and click the Delete icon.

5.5.3 Adding, modifying and deleting breakers and switches

Breakers and switches are also commonly found in switchgear. Properties can be used to identify the purpose of breakers and switches or properties can be used for reporting purposes. For example, a breaker that is the Main can be listed in the Building Power Systems dashboard on the Switchgear Main Breaker chart.

The following devices can be added to switchgear:

- Surge Protective Device
- ATS
- Transformer
- Centralized Static Switch
- Medium Voltage Circuit Breaker
- Low Voltage Circuit Breaker
- Subfeed Breaker
- Low Voltage Switch
- Low Voltage Isolator
- Power Meter
- STS
- Medium Voltage Switch

To search for and add a device to switchgear:

1. Click the Portfolio icon, expand the enterprise, building, floor and space, and select the switchgear.
2. Click the Add icon, select *Catalog*, search for a device and drag the name of the device from the catalog to the switchgear.

To modify properties of a device that is contained in switchgear:

1. Click the Portfolio icon, expand the enterprise, building, floor and space, and select the switchgear.
2. Select the device contained in the switchgear.
3. Click the Edit icon, modify its properties and click *SAVE*.

To delete a device that is contained in switchgear:

1. Click the Portfolio icon, expand the enterprise, building, floor and space, and select the switchgear.
2. Click the device and click the Delete icon.

NOTE: A confirmation message states all contained devices and external connections will be deleted and this cannot be undone.

NOTE: The state of a monitored device in switchgear is listed in the State column in Elevation view of the switchgear.

5.6 Managing Load Accumulation Power Connections

Load accumulation identifies the full potential of power consumption per phase for each power distributor, which is based on all the downstream power consumers. Load accumulation is not applicable when data center equipment properties are considered on the following circuits:

- low-voltage breaker
- medium voltage breaker
- low voltage switch
- medium voltage switch
- low voltage isolator

Depending on the configuration of a selected power distributor, the following additional options may be available:

- Tie
- Load bank
- MOB - Module output breaker
- QE - Output isolator
- MFB - Module feeder breaker
- MFI - Module feeder isolator
- MFS - Module feeder switch

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6 TRELLIS™ SITE MANAGER MODULE

Management of alarm notifications is an integral part of building efficiencies within the data center. Using the *Trellis*™ Site Manager module keeps systems running at peak performance and ensures maximum use of time and resources. It tracks and reports on the health of facility-critical devices and provides information on power, cooling and environmental conditions such as temperature and humidity.

Customizable notifications and threshold validation allow you to focus on critical, active alarms that need immediate attention. This increases the ability to find and work out issues with critical infrastructure devices. It also presents device level data with trends and provides total and detailed insight into the status and environmental conditions of the data center.

In addition, the *Trellis*™ Site Manager module allows you to configure and send notifications when the thresholds you configure are exceeded.

NOTE: The *Trellis*™ Intelligence Engine, provided with the Avocent® Universal Management Gateway appliance or the *Trellis*™ Site Manager module, is required for real-time monitoring and alerting features. To learn more about the Intelligence Engines, see [Data Collection Engine](#) on page 123.

The *Trellis*™ Site Manager module provides the following benefits:

- Assuring business-critical continuity with comprehensive event management and alarm notifications
- Creating user-defined rules regarding email notifications and reducing time sorting through messages
- Monitoring business-critical infrastructure and environmental conditions of the data center
- Configuring and managing alarm significance
- Managing alarm notifications via SMS and email
- Toggling between active and cleared alarms
- Access to editable web page, camera and device support URLs
- Collecting and analyzing real-time data
- Understanding and tracking inefficiencies within devices and sub-systems
- Identifying real-time power consumption
- Calculating utility cost at the system and unit levels
- Complying with industry-approved efficiency metrics
- Determining current and future energy needs based on historical data
- Viewing operating efficiency losses and recognizing areas for performance improvements
- Configuring source and currency to be used for utility cost calculation
- Viewing the configured Power Usage Effectiveness (PUE) level (0, 1 and 2)
- Viewing electrical energy consumption
- Monitoring service processors

6.1 Understanding Energy Insight and Efficiency

A unified, customizable dashboard provides visibility into the energy consumption and operating efficiency of the data center. IT managers are able to use the gathered information to determine system peak performance, maximize energy usage, minimize energy waste and reduce utility costs. With this feature, managers can view current and historical efficiency metrics, as well as calculate both consumption and costs for data centers that are not yet properly instrumented for measuring facility and IT load.

The following are required for energy calculations:

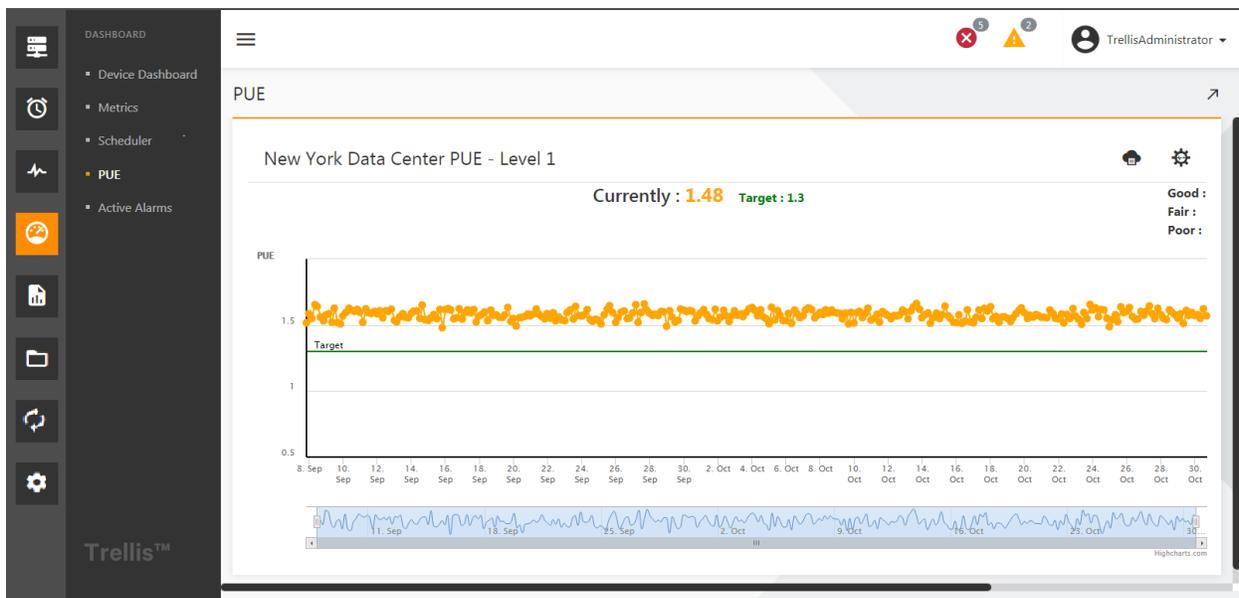
- One appliance must be enrolled and all devices must be monitored by the appliance and functioning in a normal operating state.

6.1.1 Understanding Power Usage Effectiveness (PUE)

PUE measures the relationship between the total facility energy consumed and the IT equipment energy consumed. This information is displayed in a graph format and can be printed from the PUE dashboard. The PUE metric is calculated by dividing the Total Facility Power by the IT Equipment Power. The formula is:

$$\text{PUE} = \frac{\text{Total data center energy consumption or power}}{\text{IT energy consumption or power}}$$

Figure 6.1 PUE Dashboard



Persisted PUE values originating from the Time Series Database (TSD) are displayed as the following values:

- Period value - Selectable based on predefined weekly, monthly or yearly values
- Historic value - Graph chart with current and previous values
- PUE value - Computed with power or energy sampling frequency, but not meeting the configured PUE configuration minimum sampling frequency

The following PUE categories 0-2 are recommended for calculating PUE measurements within a data center:

- PUE category 0 is a demand-based calculation that represents the peak load during a 12-month measurement period.

IT power is represented by the demand kilowatt (kW) reading of the UPS system output, or sum of outputs if more than one UPS system is installed, as measured during peak IT equipment utilization. Total data center power is measured at utility meters and reported as demand kW on the utility bill. Consistent measurement can provide valuable data that assists in managing energy efficiency.

PUE category 0 can only be used for all-electric data centers and not for data centers that also use other types of energy such as natural gas and district chilled water.

- PUE category 1 is a consumption-based calculation that represents the IT load by a 12-month total kilowatt hour (kWh) reading of the UPS system output or sum of outputs if more than one UPS system is installed.

This cumulative measurement requires the use of kWh consumption meters at all measurement points. The total energy is obtained from the utility company bills by adding the 12 consecutive monthly kWh readings and annual natural gas or other fuel consumption readings (converted to kWh).

This measurement method captures the impact of fluctuating IT and cooling loads and provides a more accurate overall performance picture than PUE category 0.

- PUE category 2 is a consumption-based calculation that represents the IT load by a 12-month total kWh reading taken at the output of the PDUs supporting IT loads or sum of outputs if more than one PDU is installed.

This cumulative measurement requires the use of kWh consumption meters at all measurement points. The total energy is determined in the same way as category 1.

This measurement method provides additional accuracy of the IT load reading by removing the impact of losses associated with PDU transformers and static switches.

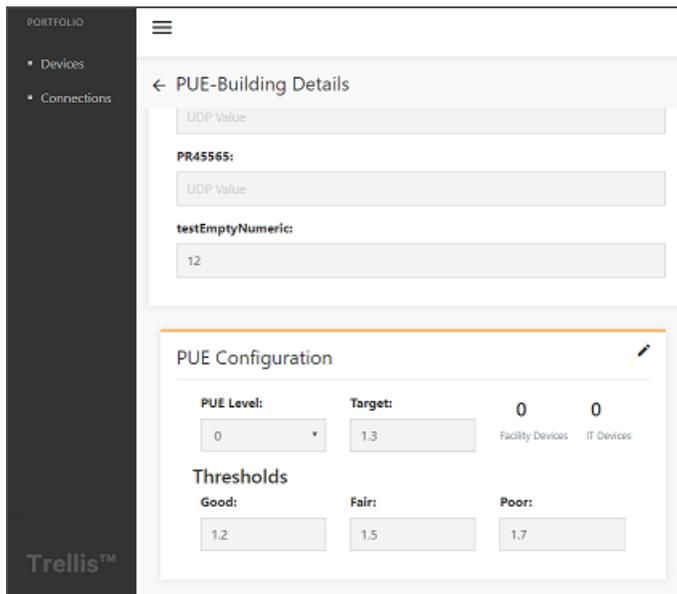
6.1.2 Configuring PUE levels, targets and thresholds

The PUE results can be viewed in the PUE dashboard after the following configurations are completed:

- The PUE must be configured for a particular building using the same IT and Facility Load devices.
- IT load devices (floor UPSes or floor PDUs) and facility load devices (power meters) in the configured building must be monitored using supported monitoring protocols.

The following figure shows a building's PUE configuration.

Figure 6.2 PUE Level, Target and Threshold Configuration



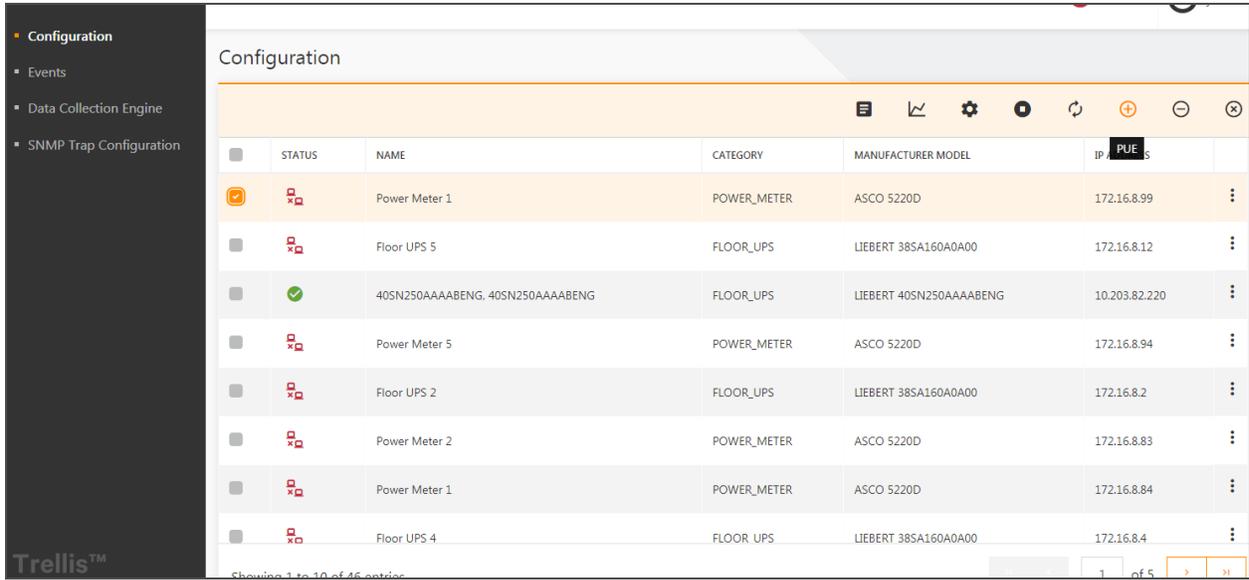
To configure a building's PUE level, target and thresholds:

1. Click the Portfolio icon and expand the enterprise.
2. In the Devices panel, click a building and click *Edit*.
3. Scroll to the PUE Configuration panel, refer to the following table to complete the fields and click *SAVE*.

Table 6.1 PUE Level Configurations

PUE LEVEL	GOOD	FAIR	POOR	PUE TARGET VALUE
0	1.2	1.7	2.0	1.4
1	1.1	1.5	2.0	1.3
2	1.2	1.7	2.0	1.4

Figure 6.3 PUE Configuration



To add or remove the IT load devices (floor UPSes, floor PDUs) and facility load devices (power meters) to the PUE configuration:

NOTE: Supported monitoring protocols are required.

1. Click the Monitoring icon and on the Configuration window, click to enable the checkbox of the device.
2. Click the Add PUE (+) icon and in the Add PUE window, click the Load Type drop-down arrow, select the IT or FACILITY load type and click *ACCEPT*.

-or-

Click the Subtract PUE (-) icon and in the Subtract PUE window, click the Load Type drop-down arrow, select the IT or FACILITY load type and click *ACCEPT*.

-or-

Click the Remove PUE (X) icon to remove the device from the PUE configuration and click *ACCEPT*.

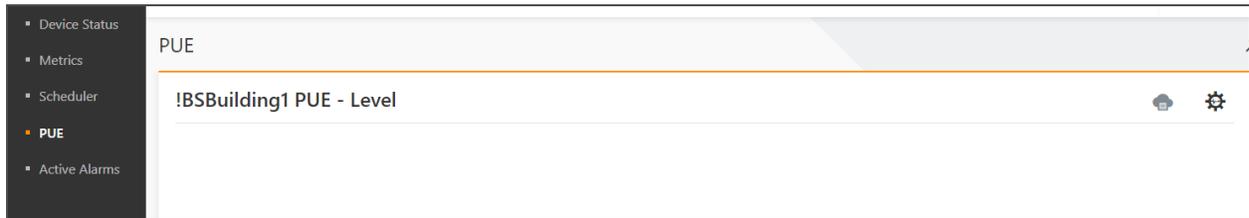
NOTE: If the user changes the PUE level of an existing PUE configuration, the level is automatically updated and the devices are removed. The PUE configuration ID remains the same.

NOTE: There are no restrictions on device types.

Viewing the PUE dashboard

After configuring the PUE details for a building, you can view the historical values in the PUE dashboard.

Figure 6.4 PUE Dashboard

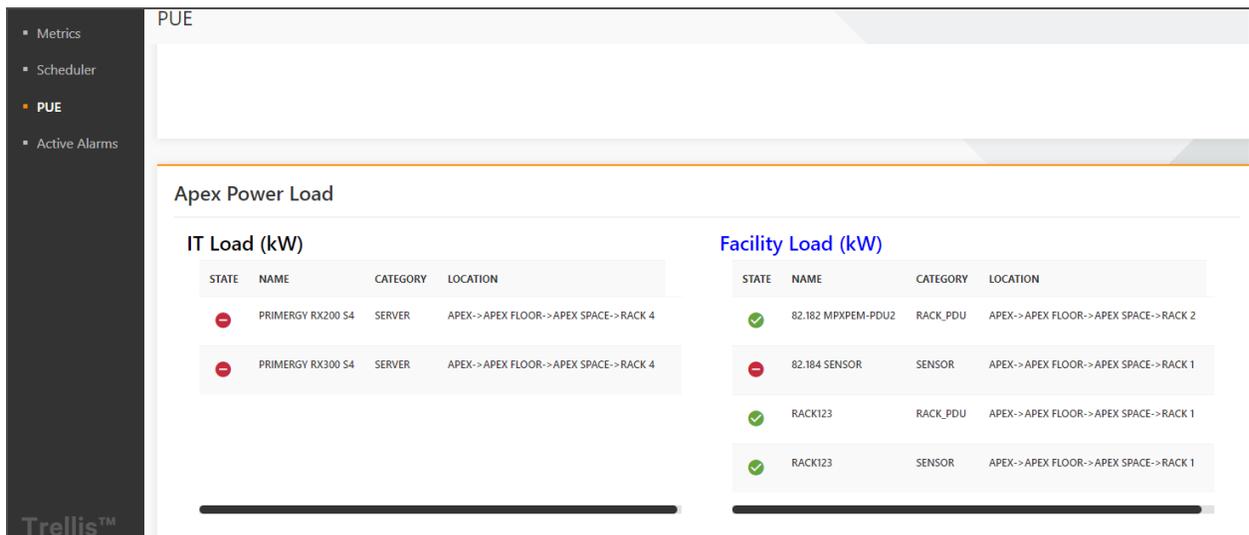


To view the PUE level, target and thresholds of a building:

1. Click the Dashboard icon and select *PUE*.
2. Scroll down to view the devices for the corresponding PUE configuration with IT and Facility devices.

NOTE: Building settings can be viewed/updated from the Monitoring window or the PUE dashboard.

Figure 6.5 IT Load and Facility Load Devices



6.2 Understanding Element Libraries

An element library is included in the symbol package and can be identified by the tar.gz extension. Each element library is associated with a unique symbol package name and version. A typical element library contains shared libraries and data definition files. Shared libraries are .so files that act as a driver for communicating with the data collection engine. Data definition files are XML files that contain information related to supported protocols, communication parameters, supported events, collection rules, analysis rules and so on. This is a meta-data file that is used by applications for monitoring-related functionality.

The two types of element libraries are factory and custom.

6.2.1 Factory element library

A factory element library is uploaded with a symbol upload (from the Administration Console of the *Trellis™* platform); however, the version of the symbol package and its element library are independent of one another. Also, for any device type, two factory element libraries cannot have the same symbol version and cannot have two symbols that use the same factory element library.

6.2.2 Custom element library

The customized version of a factory element library is created with a customization tool that uses input from an existing symbol package (containing the factory element library) and outputs a modified symbol package with the custom element library and the factory element library. Similar to the factory element library, a custom element library is associated with an element library package name, element library package version and a symbol version. The version of the symbol package (with the custom element library) is the same as that of the symbol package version with the factory element library because both element libraries are basically created for same symbol. So for the custom element library there is a one-to-many relationship between the symbol package version and the element library version.

The following applies for the platform, version 3.0 and after:

- The symbol package tag and version number remain unchanged when a custom element library is created for a given symbol.
- The element library version number is changed to have a unique value for a given symbol version when a custom element library is created from a factory version of symbol (or from an existing custom symbol).
- The symbol version is the basis used to identify all the related factory and custom element libraries to be available in the element library drop-down list on the device monitoring window.

The custom element library can be distinguished from the factory element library when its XML attribute “isOnsite” is set to true. (The element library customization tool performs this operation, so the file should not be modified.)

The customization tool also performs the following tasks:

- Customizes the factory element library per site map for any protocol and any existing factory symbol with element library
- Adds/removes data points for an element library
- Changes data point address for data points commands and events
- Changes the scaling for data point and commands
- Maps active/inactive states of events
- Imports/exports .csv files for quick element library customization and replication of multiple similar models on site; bulk element library creation by importing .csv.
- Increments the element library version for customized element libraries
- Gives a custom EL name for newly customized element libraries
- Gives a custom symbol qualifier for platform version 2.2 and older
- Gives a visual mock-up peek of the Device Table view from the Data Display tab
- Displays symbol details like categories, images, openings and extensions from the Symbol tab
- Browses through multiple customized element libraries under the same factory element library
- Stores a global database of the already customized element libraries for future reference

NOTE: After changing an element library for a device instance, the alarms are per device and not per the data point of a device. Data point information is only displayed in the description of the alarm. Due to this, when an element library associated with a device instance is modified, for example, from a factory element library to a custom element library, there is no change in the generated and displayed list of alarms. All the alarms continue to be displayed until the alarms for the data point, which are not measured anymore, are cleared manually.

6.2.3 Using element libraries

Element libraries define the protocols that the device uses to communicate between the data points that can be monitored and the events the device can generate for its various configurations.

The supported protocols are:

- BACnet
- Modbus
- SNMP (versions 1, 2 and 3)
- Velocity/IP

For a device to be monitored, the element library for that device must be uploaded to the appliance and the device symbol must be associated with its element library. The version of the symbol determines which version of the element library is supported. This is particularly important when adding the ability to monitor an existing symbol that previously did not have monitoring capabilities.

A single element library can support multiple symbols within a product family. However, after the initial appliance enrollment, you may need to add additional element libraries to your appliance. The version of the element library must be compatible with the version of the *Trellis*™ Intelligence Engine and the platform software.

NOTE: Certain functionality within the platform software may only be supported with a specific version of the element library.

To upload new element libraries to an appliance:

1. Click the Administration icon and select *Symbols Viewer*.
2. In the Symbols Viewer content header, click the Add icon.
3. In the Upload Symbols window, click SELECT FILE and navigate to the file.
4. Select the file and click *UPLOAD*.

To verify the element library is uploaded to an appliance:

Click the Administration icon and select *Symbols Viewer*.

6.3 Monitoring iCOM-S Devices

The iCOM-S software integration feature is provided to allow you to monitor multiple rooms simultaneously. Site information is used to compare the Site values collected in the *Trellis*™ platform and the values shown in this window. You can select each room in the upper left corner to display its information. For example, you can view the data points for each room. The rooms are aggregated into the site level and can be expanded to display temperatures. The devices can be combined into groups in order to monitor a group of devices.

NOTE: This feature is only available in the *Trellis*™ Intelligence Engine, version 4.6.1.5 or higher. It is not available in the Avocent® Universal Management Gateway-based embedded engine.

Figure 6.6 iCOM-S Software User Interface With Site Information



To find iCOM-S symbols in the database and add the iCOM-S devices to your data center:

Search for the iCOM-S symbols. See [Searching for Containers or Devices](#) on page 133.

Select the iCOM-S symbols and create a device in the Portfolio window. The site, group and room are displayed as Site: SUP22K0000X, Group: SUP22K000XGROUP and Room: SUP22K000XROOM.

To monitor an iCOM-S device:

1. Make sure the applicable element library is pushed to the *Trellis*[™] Intelligence Engine.
2. In the Network Configuration window, click the Element Library drop-down arrow, select an iCOM-S device (for example, *liebert-icom-s*) and click *Continue*.
3. Select the *HTTP* protocol and enter the iCOM-S device's IP address.
4. Click *Next* and use the default values for the communications properties.
5. Enter the Object Id of the iCOM-S Site device.

NOTE: See the following procedures to log into the iCOM-S software and find the Object Id for the room.

To monitor a room device:

1. Make sure the applicable element library is pushed to the *Trellis*[™] Intelligence Engine.
2. In the Network Configuration window, click the Element Library drop-down arrow, select the *liebert-icom-s* element library and click *Continue*.
3. Select the *HTTP* protocol and enter the iCOM-S device's IP address.
4. Enter the Object Id of the iCOM-S room device.

NOTE: See the following procedures to log into the iCOM-S software and find the Object Id for the room.

5. After monitoring results are complete, you can compare the latest readings in the *Trellis*[™] platform user interface to what is shown in the iCOM-S device software.

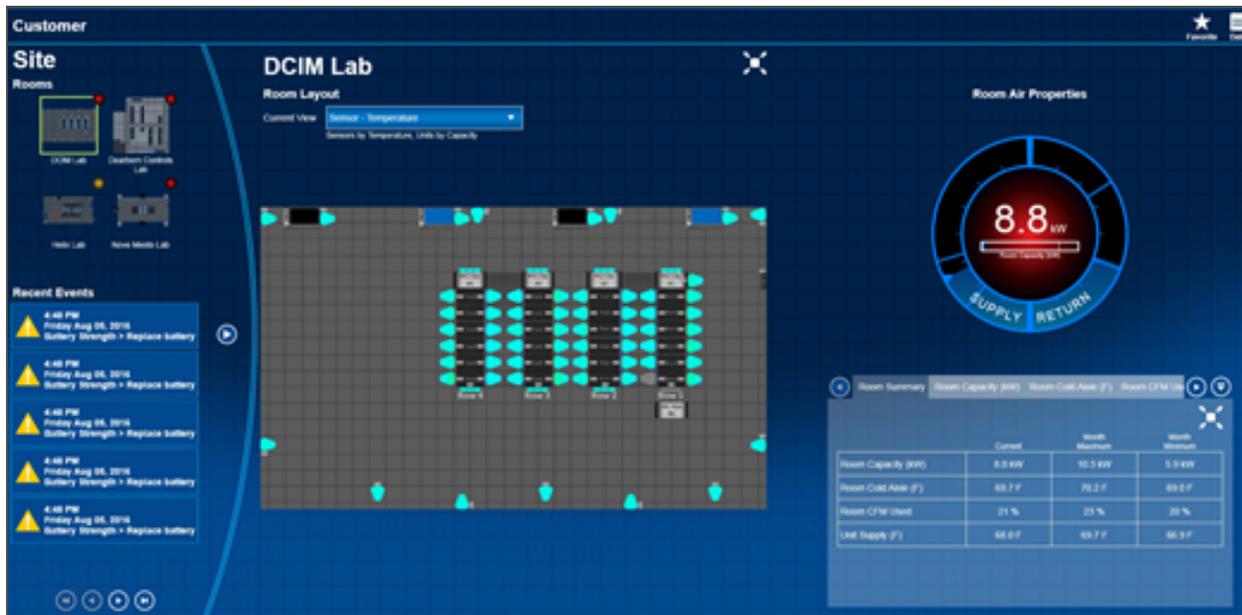
NOTE: To monitor a group, follow the procedure to monitor a room, replacing Room with Group.

To log into the iCOM-S software UI:

1. Log into the iCOM-S software using **admin** privileged user.
2. Select the Site, Rooms and Group data to be displayed.

The following example window is displayed when the DCIM Lab room is clicked. The rooms you select during monitoring are displayed to allow you to compare the rooms. These are the same rooms mentioned earlier to get the Object Id during monitoring.

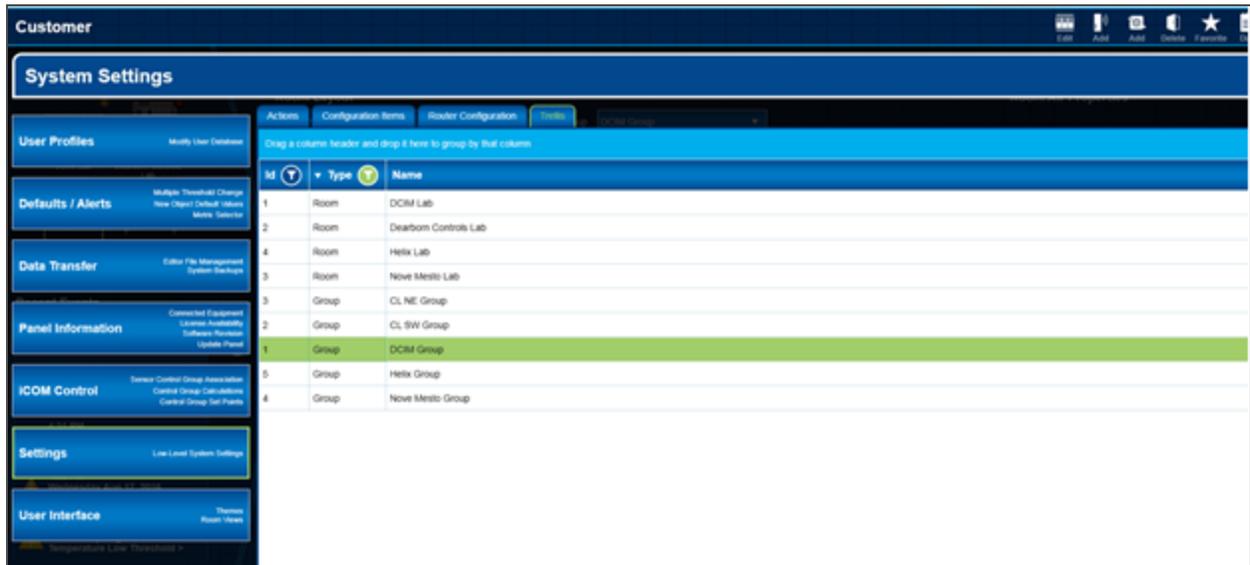
Figure 6.7 Comparing Rooms



To find the Object Id for the Site, Group and Room in the iCOM-S user interface:

1. Open the iCOM-S user interface and log in using **admin** privileged user.
2. Click the Settings icon located in the upper right corner.
3. In the System Settings panel, click *Settings*.
4. Click the *Trellis™* tab to find the Object Id of the Site, Group and Room.

Figure 6.8 System Settings



6.4 Placing and Moving Sensors in Racks

Sensors are used to monitor the temperature in racks; however, placing or moving sensors can affect the temperature thresholds, depending on how the sensor is configured in the Configuration - Global Thresholds window. If the Reset option is selected on the *Global Thresholds - Global Sensor Thresholds* window, when you place or move a monitored sensor from one location to another while in Device Table or Elevation view, the sensor's temperature thresholds are automatically assigned and updated. Also, when you click the sensor and drag it to a new location in Elevation view, the placement properties are updated with the new type and/or location.

To validate sensor changes:

1. In Device Table or Graphical Edit view, open a floor, select a rack and click the 3D or Graphical Edit icon.
2. From the rack view, select the monitored sensor.
3. Click the Monitoring icon, select *Configuration* and click *Thresholds*.
4. On the Sensor Thresholds panel, click the arrow next to the sensor name to expand the threshold settings for that specific device.

For information about using the *Trellis™* RESTful API, see the *Trellis™* RESTful API User Resources Guide.

For information about using the Bulk Data Processing tool to import sensor configurations, see [Data Management](#) on page 277.

6.4.1 Sensor locations in Elevation view

The following table lists the sensor location changes that cause a temperature threshold change. The (X) indicates which changes cause the temperature to change and Not Applicable (NA) indicates the moves that do not cause the temperature to change.

Table 6.2 Sensor Locations: Elevation View

CURRENT LOCATION	NEW LOCATION	DRAG/DROP PLACEMENT METHOD	
		INLET	EXHAUST
Front left rail	Rear left rail	NA	NA
Front left rail	Rear right rail	NA	NA
Front right rail	Rear left rail	NA	NA
Front right rail	Rear right rail	NA	NA
Rear left Rail	Front left rail	NA	NA
Rear left rail	Front right rail	NA	NA
Rear right rail	Front left rail	NA	NA
Rear right rail	Front right rail	NA	NA
Top (Zero U)	Front left rail	X	NA
Top (Zero U)	Front right rail	X	NA
Top (Zero U)	RU location inside rack (front side)	X	NA
Top (Zero U)	Rear left rail	NA	X
Top (Zero U)	Rear right rail	NA	X
Top (Zero U)	RU location inside rack (rear side)	NA	X
Top (Zero U)	Front right rail	NA	NA
Top (Zero U)	Front left rail	NA	NA
Top (Zero U)	Rear right rail	NA	NA
Top (Zero U)	Rear left rail	NA	NA
Bottom (Zero U)	Front left rail	X	NA
Bottom (Zero U)	Front right rail	X	NA
Bottom (Zero U)	RU location inside rack (front side)	X	NA
Bottom (Zero U)	Rear left rail	NA	X
Bottom (Zero U)	Rear right rail	NA	X
Bottom (Zero U)	RU location inside rack (rear side)	NA	X
Bottom (Zero U)	Front right rail	NA	NA
Bottom (Zero U)	Front left rail	NA	NA
Bottom (Zero U)	Rear right rail	NA	NA
Bottom (Zero U)	Rear left rail	NA	NA
Any RU location inside rack (front side)	Rear	NA	NA
Any RU location inside rack (rear side)	Front	NA	NA
Stored Inventory (in fly-out)	Front left rail	X	NA
Stored Inventory (in fly-out)	Front right rail	X	NA

Table 6.2 Sensor Locations: Elevation View (continued)

CURRENT LOCATION	NEW LOCATION	DRAG/DROP PLACEMENT METHOD	
		INLET	EXHAUST
Stored Inventory (in fly-out)	RU location inside rack (front side)	X	NA
Stored Inventory (in fly-out)	Rear left rail	NA	X
Stored Inventory (in fly-out)	Rear right rail	NA	X
Stored Inventory (in fly-out)	RU location inside rack (rear side)	NA	X

6.4.2 Sensor locations in the Portfolio window

The following table lists the sensor location changes that cause a temperature threshold change. The (X) indicates which changes cause the temperature to change and Not Applicable (NA) indicates the moves that do not cause the temperature to change.

Table 6.3 Sensor Locations: Portfolio Window

CURRENT LOCATION	NEW LOCATION	DRAG/DROP PLACEMENT METHOD	
		INLET	EXHAUST
Front left rail	In same rack (rear side)	NA	X
Front left rail	In another rack (rear side) in the same space, different space or rack in the stored inventory of a space, floor, building or enterprise	NA	X
Front left rail	Rear left rail	NA	NA
Front left rail	Rear right rail	NA	NA
Front right rail	In same rack (rear side)	NA	X
Front right rail	In another rack (rear side) in the same space, different space or rack in the stored inventory of a space, floor, building or enterprise	NA	X
Front right rail	Rear left rail	NA	NA
Front right rail	Rear right rail	NA	NA
Rear left rail	In same rack (front side)	X	NA
Rear left rail	In another rack (front side) in the same space, different space or rack in the stored inventory of a space, floor, building or enterprise	X	NA
Rear left rail	Front left rail	NA	NA
Rear left rail	Front right rail	NA	NA
Rear right rail	In same rack (front side)	X	NA
Rear right rail	In another rack (front side) in the same space, different space or rack in the stored inventory of a space, floor, building or enterprise	X	NA
Rear right rail	Front left rail	NA	NA
Rear right rail	Front right rail	NA	NA
Top (Zero U)	In same rack (front side)	X	NA
Top (Zero U)	In same rack (rear side)	NA	X
Top (Zero U)	In another rack (front side) in the same space, different space or rack in the stored inventory of a space, floor, building or enterprise	X	NA
Top (Zero U)	In another rack (rear side) in the same space, different space or rack in the stored inventory of a space, floor, building or enterprise	NA	X
Top (Zero U)	Front right rail	NA	NA
Top (Zero U)	Front left rail	NA	NA
Top (Zero U)	Rear right rail	NA	NA
Top (Zero U)	Rear left rail	NA	NA
Bottom (Zero U)	In same rack (front side)	X	NA
Bottom (Zero U)	In same rack (rear side)	NA	X
Bottom (Zero U)	In another rack (front side) in the same space, different space or rack in the stored inventory of a space, floor, building or enterprise	X	NA
Bottom (Zero U)	In another rack (rear side) in the same space, different space or rack in	NA	X

Table 6.3 Sensor Locations: Portfolio Window (continued)

CURRENT LOCATION	NEW LOCATION	DRAG/DROP PLACEMENT METHOD	
		INLET	EXHAUST
	the stored inventory of a space, floor, building or enterprise		
Bottom (Zero U)	Front right rail	NA	NA
Bottom (Zero U)	Front left rail	NA	NA
Bottom (Zero U)	Rear right rail	NA	NA
Bottom (Zero U)	Rear left rail	NA	NA
Front of rack	In another rack (front side) in the same space, different space or rack in the stored inventory of the space, floor, building or enterprise	NA	X
Any RU location inside rack (front side)	In another rack (rear side) in the same space, different space or rack in the stored inventory of a space, floor, building or enterprise	NA	X
Any RU location inside rack (front side)	Rear	NA	NA
Any RU location inside rack (rear side)	In same rack (front side)	X	NA
Any RU location inside rack (rear side)	In another rack (front side) in the same space, different space or rack in the stored inventory of a space, floor, building or enterprise	X	NA
Any RU location inside rack (rear side)	Front	NA	NA
Stored inventory of space, floor, building or enterprise	In any rack (front side)	X	NA
Stored inventory of space, floor, building or enterprise	In any rack (rear side)	NA	X

6.5 Configuring Alarms

With the *Trellis*™ Site Manager module, events can denote a transition in the state of one or more monitored devices. Events can also result from a user-defined threshold being crossed by one or more monitored devices. Device and threshold-generated events are considered as alarms by the platform software and are displayed in the Active Alarms window. Device-generated alarms are received immediately, but threshold alarms are impacted by the polling rate because they rely on the last data sample. This information allows you to determine what devices need immediate attention.

A hierarchy for notifications can be created to escalate unattended alarms. Users and User Groups can be added within each level of the hierarchy.

After selecting a device, you can view a complete list of the alarms for that device from any of the following windows/panels:

- Alarm Settings
- Alarm Escalation Trigger
- Notification Rule

6.5.1 Viewing and assigning alarm severity levels

Alarms can be assigned by each individual device. Multiple alarms can be selected for a device category and you can change the severity level for all the selected alarms. Also, if alarms are normalized across device types, such as UPS device types, you can select from the list of normalized alarms to change the mapping. For example, you can change Critical to Warning.

The default displayed columns provide the severity and state of the alarm, the start date and time the alarm was received, and the alarm's description, subject name and subject type. The active alarms can be filtered by a range of pre-set or custom dates and/or by grouping the active alarms by the start date, severity, description and source name. Additional alarm notes, history and/or the transitions, are also provided.

NOTE: Each time you click the SEVERITY header, the list alternates between ascending or descending order.

To filter alarms:

1. Click the Alarms icon, select *Active Alarms* and click the Filter icon.
2. In the Filter window, click the Date Range drop-down arrow, select a range and click *CLOSE*.

-or-

Click the Group By drop-down arrow, select a type and click *CLOSE*.

To view and clear additional alarm details:

1. Click the Alarms icon, select *Active Alarms* and select an alarm.
2. In the header, click the Edit icon.
3. If applicable, add a note and click *ADD NOTE*.

-or-

Select an alarm and click the Clear icon.

To modify the severity level for one, multiple or all alarms:

1. Click the Alarms icon and select *Alarm Settings*.
2. In the Alarm Settings window, select one or multiple alarm types.
3. In the header, click the Critical, Warning, Information or Reset Defaults icon.

6.5.2 Renaming the default alarm severity

This global configuration allows you to rename the following default severity levels: critical, warning and informational. Any changes are applied to all managed equipment.

To modify the name of an alarm severity level:

1. Click the Alarms icon, click *Alarm Settings* and click the Edit icon.
2. Highlight the icon name, enter the new name and click *SAVE*.

6.5.3 Assigning active alarms

Alarms can be assigned to specific users. After an alarm is assigned, an email or SMS message is sent and assignees are notified according to their notification schedule. Users can only view and manage alarms that have been assigned rights to them through roles.

To assign active alarms:

1. Click the Alarms icon.
2. In the Active Alarms window, select an alarm and click the Assign header icon.
3. In the Users window, search for and select one, multiple or all users and click *SAVE*.

6.5.4 Acknowledging alarms

Active alarms can be acknowledged in the Active Alarms or Alarm History windows. When an alarm is acknowledged by a user, the name of the user and the date and time of the acknowledgment is recorded. After acknowledgment, another user cannot acknowledge the same alarm.

To acknowledge alarms:

1. Click the Alarms icon.
2. In the Active Alarms window, select one, multiple or all alarms.
3. Click the Acknowledge header icon.
4. In the context panel, click *Alarm History* to verify the acknowledgment.

6.5.5 Clearing alarms

If a resolved alarm is not automatically cleared by an event, it can be manually cleared.

To clear an alarm:

1. Click the Alarms icon.
2. In the Active Alarms window, select one, multiple or all alarms.
3. Click the Clear header icon.

6.5.6 Adding comments to alarms

Comments can be added to any of the alarms in the Active Alarms window.

To add comments to an alarm:

1. Click the Alarms icon.
2. In the Active Alarms window, select one, multiple or all alarms.
3. Click the Edit header icon.
4. Click the *Notes* tab and enter comments in the box.

NOTE: The Notes box can be enlarged by clicking and dragging the lower right corner down.

6.5.7 Viewing Device Metrics

Metrics can be viewed for one or more devices.

To view metrics for the device associated with an alarm:

1. Click the Alarms icon.
2. In the Active Alarms window, select one or more alarms.
3. Click the Device Metrics icon.

6.6 Managing Alarms

Managing alarms includes suppressing alarms, managing alarm thresholds and configuring SNMP Traps.

6.6.1 Suppressing alarms

Alarms can be suppressed for a specific device. If needed, you can also un-suppress an alarm before the specified time has lapsed.

Suppressing individual alarms received from a device on a floor

Individual and multiple alarms that are triggered intermittently can be suppressed for a specified duration. Read and write access is required to view the floor and suppress alarms received from managed equipment.

To suppress individual alarms received from a device on a floor:

1. Click the Monitoring icon and click a device's checkbox on the Configuration window.
2. Click the Automation icon, scroll to the Suppress Alarms panel and click the Edit icon.
3. From the drop-down menus, select a start and end date, select the alarms you want to suppress and click *SAVE*.
4. Navigate to the floor of the monitored device.

NOTE: Time duration includes the start date and time and the end date and time.

6.6.2 Managing alarm thresholds

The six alarm threshold levels are High Critical, High Warning, Low Warning, Low Critical, Equal to Warning and Equal to Critical. The threshold values for any of these alarms can be defined so that when the values are exceeded, an alarm is generated and displayed in the Active Alarms window.

To configure threshold alarms:

1. Click the Monitoring icon and select a monitored device's checkbox.
 2. Click the Settings header icon and scroll to the Thresholds panel.
 3. Click the threshold types' checkbox and click the Edit header icon.
- or-
- Locate the threshold type, click its vertical ellipses icon and click *Edit*.
4. In the Edit Threshold Settings window, complete the fields and click *SAVE*.

6.6.3 Configuring SNMP traps

Alarms received in any supported protocol, including SNMP traps from SNMP devices, can be translated into SNMP traps (v1, v2 or v3) before they are forwarded. SNMP traps can also be forwarded to third-party systems such as Network Management Systems (NMS). Target/destination information must also be completed before the collected and generated active alarms can be forwarded.

NOTE: When configuring notification rules for SNMP traps, a Management Information Base (MIB) may be required. Please contact Customer Support to request the MIB database files.

To add and configure an SNMP trap:

1. Click the Monitoring icon, click *SNMP Traps* and click the Add icon.
2. In the Add SNMP Trap panel, complete the fields and click *SAVE*.

NOTE: The SNMP Name and IP Address fields are required.

To edit SNMP details:

1. Click the Monitoring icon and select *SNMP Traps*.
2. Click the configured SNMP Trap's checkbox and click the Edit icon.
3. In the Edit SNMP Trap window, complete the fields and click *SAVE*.

To delete one or all SNMP Traps:

1. Click the Monitoring icon and select *SNMP Traps*.
2. Select the configured SNMP Trap's checkbox, click its vertical ellipses icon and click *Delete*.

-or-

Click the checkbox header to select all traps and click the Delete icon.

6.7 Configuring Maintenance Mode

When a device is placed in maintenance mode, an wrench icon is displayed next to the device. Any maintenance changes are added to the event log.

To assign or unassign a device to maintenance mode:

1. Click the Portfolio icon, expand the enterprise and select a monitored device.
2. In the content panel, click the device's checkbox and click the Maintenance header icon to assign the device.

-or-

Click the monitored device's checkbox and click the Maintenance icon to unassign the device.

7 TRELLIS™ PROCESS MANAGER MODULE

The *Trellis*™ Process Manager module is provided to create, organize and track tasks in order to reduce errors and improve data center efficiency. A request form with the space, power, storage and network connection requirements, is created to install, move, decommission or rename equipment in your data center. Each request is forwarded to the roles that are responsible for completing the tasks. As tasks are completed, the *Trellis*™ Process Manager module tracks and automatically updates the status of each request.

The Process Request, Process Tracker Views, Task List Views, Process Reports and standard dashboards can be accessed from the standalone interface that is launched from the Process pivot bar icon. When you select a task in the upper section, the selected task is displayed under the task list.

7.1 Business Processes

Each process is dependent on specific user roles, human tasks, business roles and objects. Process dependencies are described later in this chapter.

The *Trellis*™ Process Manager module includes the following default processes:

- Installing Equipment
- Moving Equipment
- Decommissioning Equipment
- Renaming Equipment

The following are the Process Manager context Administration Area windows:

- Organization:
 - Roles
 - Calendars
 - Organization Units
 - Parametric Roles
 - Extended User Properties
- Flex Fields:
 - Public Flex Fields
 - Protected Flex Fields
- Task Administration:
 - Approval Groups
 - Evidence Search
 - Task Configurations
- Application Preferences:
 - Application Preferences

To allow external users access to the *Trellis*™ Process Manager module, see [Adding an external authentication source](#) on page 94.

7.2 Tasks

The Process Tasks window is the default Process window which lists current tasks for the logged in user.

7.2.1 Process Request

You can initiate a request to install, move, decommission or rename equipment in the data center by pressing the *Applications* button and selecting the process (if you have the applicable requester role). The request form includes fields for the space, power, storage and network connection requirements.

The request follows a workflow that is forwarded to the roles that are responsible for completing each of the tasks. The *Trellis™* Process Manager module tracks each process and automatically updates the status of the request.

NOTE: Names are usually continuous without spaces. In the following tables, a line break is used to allow the table to fit on the page and is not an indication that there is a break in the name.

7.2.2 Equipment Install

The equipment install process provides an end-to-end flow to install a device in a data center. A typical device installation requires provisions for space, power and network cabling. This business process provides separate roles for provisioning these requests. After all the provision requests have been approved, the device is created in the *Trellis™* Inventory. When the task is complete, a notification is sent to the requester to confirm the installation was successful. The installed device can then be viewed in the Portfolio window.

NOTE: This process does not utilize web forms.

Table 7.1 Process Details: Equipment Install

NAME	DESCRIPTION
Process Name	EquipmentInstallationProcess
Service Oriented Architecture (SOA) Project Name	EquipmentInstallationProcess
UI Project Name	EquipmentInstallationUI

User roles

The equipment installation process is dependent on the following user roles:

- EquipmentInstallationProcess.EquipmentRequestor: Initiates the process of equipment installation
- EquipmentInstallationProcess.Approvers: Approves the equipment installation request; used if the business rule dictates manual approval
- EquipmentInstallationProcess.DataCenterTechnician: Provisions space for the device to be installed, allows you to edit the placement and specify the exact location where a device is to be installed; responsible for final confirmation before the service call is made for device creation and placement
- EquipmentInstallationProcess.PowerTechnician: Creates power connections for the selected devices and confirms the connections to ensure the system can proceed with device installation; used if the initial request has a requirement for power provision
- EquipmentInstallationProcess.StorageProvisioner: Provides a storage space and confirms the available space so the system can move ahead with device installation; used if the initial request has a requirement for a storage provision
- EquipmentInstallationProcess.NetworkProvisioner: Creates data connections for the selected devices and confirms the connections so the system can proceed with device installation; used if the initial request has a requirement for network provision
- EquipmentInstallationProcess.Administrator: Views and corrects all error scenarios

Human tasks

The equipment install includes the following human task components.

Table 7.2 Human Tasks: Equipment Install

TASK NAME	ROLE	PATTERN	TITLE	OUTCOME	DESCRIPTION
EquipmentInstall Initiator_HT	EquipmentInstallation Process.Equipment Requestor	Initiator	Initiate Equipment Install	Submit	Starting point of the process; responsible for triggering the request for equipment install.
EquipmentInstall Approver_HT	EquipmentInstallation Process.Approvers	Simple	Approve Equipment Install	Approve, Reject	Role used if a manual approval is needed (as per the business rule DetermineInstall ApprovalRules_BR), when the request is submitted.
Provisioning Space_HT	EquipmentInstallation Process.DataCenter Technician	Simple	Provision Space For Equipment Install	Submit	Provisions space in the building for the specified device. When complete, it approves the request for further actions.
Provisioning Power_HT	EquipmentInstallation Process.Power Technician	Simple	Provision Power For Equipment Install	Ok	Provisions power in the building for the specified device; when complete, approves the request for further actions.
Provisioning Network_HT	EquipmentInstallation Process.Network Provisioner	Simple	Provision Network For Equipment Install	Ok	Provisions the network in the building for the specified device. When complete, approves the request for further actions.
Provisioning Storage_HT	EquipmentInstallation Process.Storage Provisioner	Simple	Provision Storage For Equipment Install	Ok	Provisions storage in the building for the specified device; when complete, approves the request for further actions.
Provisioning Cabling_HT	EquipmentInstallation Process.Network Cabler	Simple	Provision Network Cabling For Equipment Install	Ok	Provisions additional network cabling in the building for the specified device; when complete, approves the request for further actions.
Equipment Installer_HT	EquipmentInstallation Process.DataCenter Technician	Simple	Install Equipment	Ok	Installs the equipment; after you complete this task, service calls are made by the process to create the device in the software.
TrellisIntegration ErrorResolution_HT	EquipmentInstallation Process.Administrator	Simple	Trellis Integration Error Resolution	Ok	Admin role used to view and resolve all the integration errors that can happen while performing service calls or notifications.
Notify Administrator_HT	EquipmentInstallation Process.Administrator	Simple	Notify Administrator	Ok	Sends a notification to the administrator.

Business rules

The following are the business rules for this component.

Table 7.3 Business Rules: Equipment Install

RULE NAME	DECISION FUNCTION	ASSOCIATED DATA OBJECT	DESCRIPTION
DetermineInstallApproval Rules_BR	DetermineInstallApprovalRules_BR_DecisionService	EquipmentInstallDO, approvalOutcome	Determines if manual approval is needed for this installation

Business objects

The following are the business objects for this component.

Table 7.4 Business Objects: Equipment Install

BUSINESS OBJECT NAME	MODULE NAME	REFERENCE RESOURCE	PURPOSE
ApprovalRuleBO	EquipmentInstall Module	ApprovalRuleBO.xsd	Determines if manual approval is needed for this equipment install
EquipmentInstallBO	EquipmentInstall Module	EquipmentCUDRequest.xsd	Required to store information related to creation of the device such as symbol information and placement information
TrellisIntegrationError SummaryBO	EquipmentInstall Module	TrellisIntegrationError SummaryBO.xsd	Stores any integration, error-related data
FaultBO	FaultModule	BPMFault.xsd	Describes the fault parameters and composite instance information where the fault happened while processing the request

Data objects

The following are the data objects for this component.

Table 7.5 Data Objects: Equipment Install

DATA OBJECT NAME	DATA OBJECT TYPE	REFERENCE RESOURCE DATA OBJECTS	DESCRIPTION	USAGE
approvalNeededOutcome	String	NA	Stores the business rule execution outcome	Used to decide if an approval is needed based on a business rule
EquipmentInstallDO	EquipmentInstall Request	EquipmentCUD Request.xsd	Contains cost center, preferred location and equipment information	Used by human task components to transfer data
approvalOutcome	String	NA	Indicates the outcome of the approval	Stores the approval outcome
errorList	TrellisIntegrationError SummaryBO	TrellisIntegrationError SummaryBO.xsd	Stores the integration errors	Used for the flow of handling integration errors by Process Manager admin
InitiatingUser	String	NA	Stores the initiating user	Used during the notification flow to notify the initiating user about the process' outcome
PowerProvisionOutCome	EquipmentInstall Request	EquipmentCUD Request.xsd	Stores the outcome of power provisioning	Used in the power provisioning flow
NetworkProvisionOutCome	EquipmentInstall Request	EquipmentCUD Request.xsd	Stores the outcome of network provisioning	Used in the network provisioning flow
TaskOutcome	String	NA	Outcome of the task	Used to check if a task's outcome is withdrawn
taskPriority	Int	NA	Priority of the task	Used by all task components to set the task's priority
ApprovalRuleDO	ApprovalRuleBO	ApprovalRuleBO.xsd	Not used	Not used

Service Calls

The following table describes the service calls available for this component.

Table 7.6 Service Calls: Equipment Install

SERVICE NAME	WSDL NAME	PURPOSE
PreCannedProcessService	PreCannedProcessServiceV1.wsdl	Used to perform the create device operation in asynchronous manner

The WSDL is invoked in an asynchronous manner. The Request port type is the PreCannedProcessServicePortType file which uses InstallEquipments as the operation and EquipmentInstallRequest as the message type. The Callback port type is the PreCannedProcessServiceCallBackPortType file which uses InstallEquipmentsCallBack as the operation and EquipmentInstallResponse as the message type. Both of these messages are constructed using element types that are defined in the PreCannedMessagesBulk-v1.0.xsd file. Core Elements are under the EquipmentAttributes child element inside the Equipment element which represents one instance of equipment. The following table describes the major elements in the request.

Table 7.7 Core Elements: Equipment Install

ELEMENT NAME	DESCRIPTION
BuildingName	Building name
DesignPowerCapacity	Designed power capacity for this device
DeviceName	Name of the device to be installed
DeviceType	Type of device
Id	Represents the device ID and is generated by the software after the device is created
Manufacturer	Device manufacturer
Model	Device model

The placement-related elements provide placement related information. They are located inside the Placement child element of EquipmentAttributes. The following table describes the placement related elements.

Table 7.8 Placement Related Elements: Equipment Install

ELEMENT NAME	DESCRIPTION
SpaceName	Space name.
SpaceId	Universally unique identifier (UUID) for the space.
ParentId	UUID for the container device. Examples of parent containers are rack or switch gear.
Type	Parent device type. For example, a rack.
XCoordinate	Required when a device is placed directly inside a space and specifies the X coordinate of the device from the space origin.
YCoordinate	Required when a device is placed directly inside a space and specifies the Y coordinate of the device from the space origin.
ZCoordinate	Required when a device is placed directly inside a space and specifies the Z coordinate of the device from the space origin.
Rotation	Defines the degree of rotation with which the device would be placed on floor or inside a parent container. This rotation is with respect to the symbol image.
RackSide	Side of the rack where a device is to be placed; required if the parent container is rack. The possible values are front or rear.
RU	Rack unit (RU) is a unit of measure used to describe a space in a rack. One rack unit equals 1.75 inches high (44.45 mm).
Location	Zero U location of a device; applicable if the zero U placement is inside a rack as a parent container.
UHeight	Rack unit height inside the zero U space; applicable if a device is placed inside zero U.
XOffset	X offset inside zero U placement; applicable if device is placed inside zero U.
X Position	Allows you to move a unit from side-to-side in an RU space. When a device is rotated to sit on its end, it can be moved horizontally to allow space for a side-by-side installation.

The connection-related elements provide data connection and power connection-related information. They are located inside the connections element which is part of the DeviceAttributes. This element has zero or more occurrences based on the connections specified by the requestor.

Table 7.9 Connection Related Elements: Equipment Install

ELEMENT NAME	DESCRIPTION
ConnectedFromPort	Port name on device
ConnectedToDevice	Target device name
ConnectedToPort	Port name on target device
ConnectionType	Connection type (POWER_CONNECTION or DATA_CONNECTION)

The response contains a connections-related response and a placement-related response. If there is an error, it is populated as part of the ErrorMessage and ErrorCode elements which are inside the EquipmentInstallResponseMessage > PreCannedResponseStatus > Status message.

Task Flows

This process, which is part of the EquipmentInstallationUI project, includes the following task flows:

- EquipmentInstallApprover_HT_TaskFlow: Associated with the task to approve or reject the device installation
- EquipmentInstallInitiator_HT_TaskFlow: Associated with the task to submit the request for a new device installation
- TrellisIntegrationErrorResolution_HT_TaskFlow: Associated with the error resolution flow to handle BPM-Trellis Integration errors

To initiate an equipment install request:

1. Click the Process icon and log into the standalone interface with the installation requester process role user.
2. Click *Applications* and select the *InstallEquipment* link in the left navigation panel.
3. Enter the project name, date for completion and cost center.
4. Using the radio buttons, select the provisioning requirements for power, network, storage and urgency.
5. From the drop-down menu, select a building and a floor and click the Add icon.
6. Search for the equipment. See [Searching for Containers or Devices](#) on page 133.
7. Select the equipment and click *OK*.
8. If desired, enter the device name and any additional details.
9. Repeat steps 5 and 6 for any additional equipment to be added, attach any supporting documentation and click *Submit*.

After the process request is submitted, an email notification is sent to approve the request.

To approve an equipment install request:

1. Click the Process icon and log into the standalone interface with the installation approver process role user.
2. From the My Tasks list, double-click the *Approve Equipment Installation* request and select *Accept*, *Reject* or *Claim*. If the request is accepted, an email notification is sent to provision space for the equipment.

-or-

If the request is rejected, the approver enters a reason for rejection, clicks *OK* and *Reject*.

-or-

If the request is claimed, the task is assigned to the approver.

To provision space for an equipment install request:

1. Click the Process icon and log into the standalone interface with the installation data center technician process role user.
2. From the My Tasks list, double-click the *Provision space for Project* request.
3. Select *Edit Placement* and select placement details from the drop-down menus.
4. Enter the applicable RU and click *OK*.

After the space is provisioned, if applicable, an email notification is sent to provision power.

To provision power for an equipment install request:

1. Click the Process icon and log into the standalone interface with the installation power technician process role user.
2. From the My Tasks list, double-click the *Provision power for Project* request.
3. Select *Edit Connection* and click *Add*.
4. Search for the device. See [Searching for Containers or Devices](#) on page 133.
5. Select the device, select the port and click *OK*.
6. From the drop-down list, select the name of the port and click *OK*.

After the power is provisioned, if applicable, an email notification is sent to provision the network.

To provision a network for an equipment install request:

1. Click the Process icon and log into the standalone interface with the installation network provisioner process role user.
2. From the My Tasks list, double-click the *Provision network for Project* request.
3. Select *Edit Connection* and click *Add*.
4. Search for the device. See [Searching for Containers or Devices](#) on page 133.
5. Select the device, select the port and click *OK*.
6. From the drop-down list, select the name of the port and click *OK*.

When all provisioning is complete, a successful equipment install message is displayed to the user and an email notification is sent to all the approvers.

When all provisions are complete, the Install Equipment Task is created and assigned to the Data Center Technician.

To confirm equipment install requests:

1. Click the Process icon and log into the standalone interface with the installation data center technician process role user.
2. From the My Tasks list, double-click the *Install Equipment for Project* request and click *OK*.

When the install is confirmed, the request is closed. If there are any errors during the process, the task is assigned to the administrator for error resolution.

To resolve integration exceptions:

1. Click the Process icon and log into the standalone interface with the installation administrator process role user.
2. From the My Tasks list, double-click the *Resolve integration Exceptions Equipment Install for Project* request.
3. Verify all device statuses and click *OK*.

After a task is created, the task can be reassigned or withdrawn.

To reassign or withdraw a task:

1. Click the Process icon and log into the standalone interface with the applicable installation process role user (dependent on which task is being withdrawn).
2. From the My Tasks list, double-click the task and click *Actions*.
3. Select *Reassign* from the drop-down menu to reassign the task.

-or-

Select *Withdraw* from the drop-down menu to withdraw the request.

7.2.3 Decommission Equipment

Decommission Equipment is a process request to decommission equipment from the data center. After the process request is submitted, an email notification is sent to approve the request. When the decommission equipment request is approved, sub-tasks for decommissioning power, storage and network connections are created. After all of the tasks and sub-tasks are complete, the decommission is confirmed and the request is closed. When the physical decommission is complete, the selected device is removed from the *Trellis™* platform.

If an error occurs during the decommission task, a notification is sent to the administrator with details about the error.

Process Details

The following are the process details for this component.

Table 7.10 Process Details: Equipment Decommission

NAME	DESCRIPTION
Process Name	DeviceDecommissionProcess
SOA Project Name	EquipmentDecommissionProcess
UI Project Name	EquipmentDecommissionUI

User Roles

The equipment decommission process is dependent on the following user roles:

- EquipmentDecommissionProcess.Requestor: Initiates the process of equipment decommission, schedules the process and provides final confirmation for the action
- EquipmentDecommissionProcess.Approver: Approves the equipment installation request and gets involved if a business rule dictates manual approval
- EquipmentDecommissionProcess.PowerTech: Confirms power decommissioning
- EquipmentDecommissionProcess.StorageProvisioner: Confirms storage decommissioning
- EquipmentDecommissionProcess.NetworkCabler: Confirms decommissioning of network cabling
- EquipmentDecommissionProcess.Administrator: Handles administration tasks such as resolving error scenarios, sending notifications and so on

Human tasks

The equipment decommission includes the following human task components.

Table 7.11 Human Tasks: Equipment Decommission

TASK NAME	ROLE	PATTERN	TITLE	OUTCOME	DESCRIPTION
Decommission Initiator_HT	EquipmentDecommission Process.Requestor	Initiator	Initiate Device Decommission	Submit	Starting point of the process; responsible for triggering the request for device decommissioning action.
Decommission Approver_HT	EquipmentDecommission Process.Approver	Simple	Approve Equipment Decommission Request	OK	After the request is submitted, if manual approval is needed (as per the business rule DetermineDecommission ApprovalRules_BR), this task is displayed.
Schedule Decommission_HT	EquipmentDecommission Process.Requestor	Simple	Schedule Device Decommission	OK	Performs scheduling of the decommission action.
Decommission Power_HT	EquipmentDecommission Process.PowerTech	Simple	Decommission Power	OK	Performs power decommissioning.
Decommission Storage_HT	EquipmentDecommission Process.Storage Provisioner	Simple	Decommission Storage	OK	Performs storage decommissioning.
Decommission NetworkCabling_HT	EquipmentDecommission Process.NetworkCabler	Simple	Decommission Network Cabling	OK	Performs network cabling decommissioning.
Physical Decommission_HT	EquipmentDecommission Process.Requestor	Simple	Physical Decommission of Device	OK	Final process approval; after this role confirms the action, the process invokes the software for actual device deletion.
TrellisIntegration ErrorResolution_HT	EquipmentDecommission Process.Administrator	Simple	Device Decommission: Resolve Trellis Integration Errors	OK	The admin role is used to view and resolve all the integration errors that can happen while performing service calls or notifications.
Notify Administrator_HT	EquipmentDecommission Process.Administrator	Simple	Decommission Process Errors	OK	Sends notification to the administrator.

Business rules

The following are the business rules for this component.

Table 7.12 Business Rules: Equipment Decommission

RULE NAME	DECISION FUNCTION	ASSOCIATED DATA OBJECT	DESCRIPTION
DetermineDecommission ApprovalRules_BR	DetermineDecommission ApprovalRules_BR_DdecisionService	DecommissionDO, approvalNeededOutcome	Determines if manual approval is needed for device decommissioning.

Business objects

The following are the business objects for this component.

Table 7.13 Business Objects: Equipment Decommission

BUSINESS OBJECT NAME	MODULE NAME	REFERENCE RESOURCE	PURPOSE
ConfigBRRResponse	DecommissionModule	ConfigBRRResponse.xsd	This is the approver's approval response for the equipment move.
DecommissionBO	DecommissionModule	EquipmentCUDRequest.xsd	Required to store information related to decommissioning of device such as cost center and placement information.
TrellisIntegrationErrorSummaryBO	DecommissionModule	TrellisIntegrationErrorSummary.xsd	Stores an integration error related data.
FaultBO	FaultModule	BPMFault.xsd	Describes the fault parameters and composite instance information where the fault happened while processing the request.

Data objects

The following are the data objects for this component.

Table 7.14 Data Objects: Equipment Decommission

DATA OBJECT NAME	DATA OBJECT TYPE	REFERENCE RESOURCE DATA OBJECTS	DESCRIPTION	USAGE
DecommissionDO	EquipmentDecommission Request	EquipmentCUD Request	Stores device information	Stores device and placement information.
approvalNeeded Outcome	String	NA	Stores outcome as string	Checks outcome of the approval (REJECT, AUTOMATIC_APPROVE and so on).
processCorrelationId	String	NA	Correlation ID for the process	This sets the process correlation ID.
errorList	TrellisIntegrationError Summary	TrellisIntegrationError SummaryBO.xsd	Stores the integration errors	Flow of handling integration errors by the admin.
InitiatingUser	String	NA	User that starts the process	Stores the creator field value; used in the To setting while sending notifications.
taskOutcome	String	NA	Stores the outcome of task	Displays task outcome.
ApprovalOutput BRDO	ConfigBRResponse	ConfigBRResponse.xsd	Stores approval outcome for business rule	Indicates outcome of the business rule evaluation for the manual approval of decommissioning.
taskPriority	Int	NA	Priority of the task	Sets priority for the tasks.

Service Calls

Table 7.15 Service Calls: Equipment Decommission

SERVICE NAME	WSDL NAME	PURPOSE
DeviceAsyncBulkServiceV10	DeviceAsyncBulkService-v1.0.wsdl	Performs the delete device operation in asynchronous manner

The WSDL is invoked in an asynchronous manner. The DeviceServiceBulkPortType request port type uses DeleteDevices as the operation and DeleteDevicesRequest as the message type. The DeviceServiceBulkCallBackPortType callback port type uses the DeleteDevicesCallBack operation and the DeleteDevicesResponse message type. The following information is populated as the request and is part of the common schema.

Table 7.16 Common Elements: Equipment Decommission

ELEMENT NAME	DESCRIPTION
correlationId	Correlation ID for the process. This is not related to software Device ID, but is the correlation ID used in the Service Oriented Architecture (SOA).
ID	ID of the device to be deleted. (This ID element is declared as Request Message > Device > ID).

The response contains delete operation related information. If there are any errors, they are populated as part of the ErrorMessage and ErrorCode.

Task Flows

The following task flows are available when decommissioning equipment:

- DecommissionInitiator_HT_Taskflow: Associated with decommissioning equipment

- `TrellisIntegrationErrorResolution_HT_Taskflow`: Associated with the error resolution flow for handling software integration errors

To decommission equipment:

1. Click the Process icon and log into the standalone interface with the decommission requestor process role user.
2. Click *Applications* and select the *Decommission Equipment* link in the left navigation panel.
3. In the Process tasks window/panels, click *Decommission Equipment*.
4. Enter the proposed decommission date, reason for decommission, decommission power, decommission network and decommission storage.
5. Enter the project name, cost center, cost center manager and project comments.
6. Attach any supporting documentation and click the Add icon.
7. Search for the equipment. See [Searching for Containers or Devices](#) on page 133.
8. Select the equipment to be decommissioned and click *Submit*.

NOTE: When decommissioning devices with children, do not include the individual children because they are automatically decommissioned as their chassis are decommissioned.

To approve or reject a decommission equipment request:

1. Click the Process icon and log into the standalone interface with the decommission approver process role user.
2. In the My Tasks list, click *Approve Equipment Decommission* and click *Approve*. An email notification is sent to decommission the space.

-or-

Click *Reject*, enter a reason for the rejection, click *OK* and *Reject*.

To schedule a decommission:

1. Click the Process icon and log into the standalone interface with the decommission requestor process role user.
2. In the My Tasks list, click *Schedule Decommission* and click *OK*. After the task is completed, the decommission power, decommission storage and decommission network cabling subtasks are created, and if applicable, an email notification is sent to the respective provisioner.

To decommission a space, power or network:

1. Click the Process icon and log into the standalone interface with the applicable decommission process role user.
2. In the My Tasks list, click the decommission request and click *OK*.

NOTE: After the sub-tasks for provisioning power, storage and network connections are complete, a request is sent to the initiator for the physical decommission.

3. On the My Tasks list, click the physical decommission request and click *OK*.

To physically decommission a process request:

1. Click the Process icon and log into the standalone interface with the decommission requestor process role user.
2. In the My Tasks list, click the *Physical decommission* request and click *OK*. After the task is complete, an email notification is sent to the requester.

7.2.4 Move Equipment

The Move Equipment process is used to create an end-to-end flow to move your equipment from one location to another in the software. A typical device move action requires provisions for space, power and network cabling. This business process provides separate roles for provisioning these requests. After all the provision requests are approved, the application uses the Inventory Manager application to move the device in Inventory. A separate notification is sent to the requestor that includes process approvals and if the move is successful. The moved device can be verified in Portfolio window.

Process Details

Table 7.17 Process Details: Equipment Move

NAME	DESCRIPTION
Process Name	DeviceMoveProcess
SOA Project Name	DeviceMoveProcess
UI Project Name	DeviceMoveUI

User Roles

The move equipment process is dependent on the following user roles:

- DeviceMoveProcess.ProcessOwner: Responsible for creating the request to move, provision for storage, power, network at a new location and decommission the storage, power and network at an old location
- DeviceMoveProcess.DataCenterTechnician: Provides the final confirmation before making a service call for the actual device movement

Human Tasks

This process includes the following human task components.

Table 7.18 Human Tasks: Equipment Move

TASK NAME	ROLE	PATTERN	TITLE	OUTCOMES	DESCRIPTION
InitiateDevice Move_HT	DeviceMove Process. ProcessOwner	Initiator	Initiate Device Move	SUBMIT	Starting point for the process and is responsible for triggering the request for the device move action.
ApproveEquipment MoveRequest_HT	DeviceMove Process. ProcessOwner	Simple	Approve Equipment Move Request	APPROVE, REJECT	Request is submitted, if manual approval is needed (as per the business rule "DetermineApproval_BR"), then this role is displayed.
ProvisionSpace_HT	DeviceMove Process. ProcessOwner	Simple	Provision Space For Equipment Move	SUBMIT	Performs the provisioning space action in the data center for the specified device. After the action is complete, it approves the request for further actions.
ProvisioningPower_ HTDeviceMoveProcess. ProcessOwner	DeviceMove Process. ProcessOwner	Simple	Provision Power For Equipment Install	OK	Performs the provisioning power action in the data center for the specified device. After the action is complete, it approves the request for further actions.
ProvisioningNetwork_ HT	DeviceMove Process. ProcessOwner	Simple	Provision Network For Equipment Move	OK	Performs the provisioning network action in the data center for the specified device. After the action is complete, it approves the request for further actions.
ProvisioningStorage_HT	DeviceMove Process. ProcessOwner	Simple	Provision Storage For Equipment Move	OK	Performs the provisioning storage action in the data center for the specified device. After the action is complete, it approves the request for further actions.
ProvisionNetwork Cabling_HT	DeviceMove Process. ProcessOwner	Simple	Provision Network Cabling For Equipment Move	OK	Performs the provisioning additional network cabling action in the data center for the specified device. After the action is complete, it approves the request for further actions.
MoveDevice Physically_HT	DataCenter Technician	Simple	MoveDevice Physically	OK	Performs the action of moving the equipment. This is the last human task in the flow. After this task is completed by the user, the service calls are made by the process to move the device in the software.
Decommission Power_HT	DeviceMove Process. ProcessOwner	Simple	Decommission Power	OK	Performs the decommissioning action of the existing power cabling which was used at the device's previous location.
Decommission Storage_ HT	DeviceMove Process. ProcessOwner	Simple	Decommission Storage	OK	Performs action of decommissioning the existing storage which was used at the device's previous location.
Decommission Network Cabling_HT	DeviceMove Process. ProcessOwner	Simple	Decommission Cabling	OK	Performs action of decommissioning of the existing network cabling which was used at device's previous location.
ResolveIntegration Exceptions_HT	DeviceMove Process. ProcessOwner	Simple	Software Integration Error Resolution	OK	The admin role is used to view and resolve all the integration errors that occur while performing service calls or notifications.
NotifyAdministrator _HT	DeviceMove Process. ProcessOwner	Simple	Notify Administrator	OK	Sends notifications to the administrator.

Business Rules

This process includes the following business rule components.

Table 7.19 Business Rules: Equipment Move

RULE NAME	DECISION FUNCTION	ASSOCIATED DATA OBJECT	DESCRIPTION
DetermineApproval_BR	DetermineApproval_BR_ DecisionService	MoveDO, ApprovalOutcome	Determines if manual approval is needed for device movement

Business Objects

This process includes the following business objects components.

Table 7.20 Business Objects: Equipment Move

BUSINESS OBJECT NAME	MODULE NAME	REFERENCE RESOURCE	PURPOSE
BusinessRuleOutputBO	MoveModule	BusinessRule OutputBO.xsd	Indicates the approval outcome to move the equipment
MoveBO	MoveModule	MoveBO.xsd	Required to store information related to movement of a device such as symbol information, cost center information and placement information
TrellisIntegrationError SummaryBO	MoveModule	TrellisIntegrationError SummaryBO.xsd	Stores any integration error-related data
FaultBO	FaultModule	BPMFault.xsd	Describes the fault parameters and composite instance information where the fault happened while processing the request

Data objects

The following are the data objects for this component.

Table 7.21 Data Objects: Equipment Move

DATA OBJECT NAME	DATA OBJECT TYPE	REFERENCE RESOURCE FOR DATA OBJECTS	DESCRIPTION	USAGE
MoveDOe	EquipmentMove Request	EquipmentCUD Request	Stores device information	Stores device and placement information
ApprovalOutcome	String	NA	Stores outcome as string	Checks the outcome of approval (REJECT, AUTOMATIC_APPROVE and so on)
NetworkProvision Outcome	String	NA	Stores outcome of network provisioning	Used in the network provisioning flow
PowerProvision Outcome	String	NA	Stores outcome of power provisioning	Used in the power provisioning flow
StorageProvision Outcome	String	NA	Stores outcome of storage provisioning	Used in the storage provisioning flow
NetworkCabling ProvisionOutcome	String	EquipmentCUD Request.xsd	Stores outcome of network cabling provisioning	Used in the network cabling provisioning flow
errorList	TrellisIntegrationError SummaryBO	TrellisIntegrationError SummaryBO.xsd	Stores the integration errors	Used for the integration error handling flow; by the admin
PowerDO	EquipmentMove Request	EquipmentCUD Request.xsd	Stores device move related information which is used in power provisioning flow	Used in the power provisioning flow (ProvisionPower human task)
DataDO	EquipmentMove Request	EquipmentCUD Request.xsd	Stores device move related information which is used in data provisioning flow	Used in the network provisioning flow (ProvisionNetwork human task)
BusinessRuleOutputDO	BusinessRule OutputBO	BusinessRule OutputBO.xsd	Stores outcome of business rule	Used to check if the business rule implies to perform a manual approval
taskState	String	NA	Stores value of task state	Used to check if the task is withdrawn
taskPriority	String	NA	Priority of the task	Used by all components to set task priority

Service Calls

The following are the service calls for this component.

Table 7.22 Service Calls: Equipment Move

SERVICE NAME	WSDL NAME	PURPOSE
PreCannedProcessService	PreCannedProcessServiceV1.wsdl	WSDL is used to perform the move device operation in asynchronous manner.

The WSDL is invoked in an asynchronous manner. The PreCannedProcessServicePortType request port type uses MoveEquipments as the operation and EquipmentMoveRequest as the message type. The callback port type is PreCannedProcessServiceCallBackPortType which uses MoveEquipmentsCallback as the operation and EquipmentMoveResponse as the message type. Both of these messages are constructed using element types which are defined in the PreCannedMessagesBulk-v1.0.xsd file. The core elements are under the EquipmentAttributes child element inside the Equipment element which represents one instance of equipment. The following table describes the major elements in this schema.

Table 7.23 Core Elements: Equipment Move

ELEMENT NAME	DESCRIPTION
BuildingName	Building name.
DesignPowerCapacity	Designed power capacity for this device.
DeviceName	Name of the device to be moved.
DeviceType	Type of the device to be moved.
ID	ID of the device. It is generated by the software after the device is created.
Manufacturer	Manufacturer of the device.
Model	Model of the device.

The following placement related elements are located inside the Placement child element of EquipmentAttributes.

Table 7.24 Placement Related Elements: Equipment Move

ELEMENT NAME	DESCRIPTION
SpaceName	Space name.
SpaceID	UUID for the space.
ParentID	UUID for the container device such as a rack or switchgear.
Type	Parent device type such as a rack.
XCoordinate	Required when a device is placed directly inside space and specifies the X coordinate of the device from the space origin.
YCoordinate	Required when a device is placed directly inside a space and specifies the Y coordinate of the device from the space origin.
ZCoordinate	Required when a device is placed directly inside a space and specifies the Z coordinate of the device from the space origin.
Rotation	Defines the degree of rotation with which the device is placed on a floor or inside a parent container. This rotation is with respect to the symbol image.
RackSide	Side of the rack where a device is placed; required if the parent container is a rack. The possible values are front or rear.
RU	Number for the rack unit space where the device is located.
Location	Zero U location of a device; applicable if the zero U placement is inside a rack as parent container.
UHeight	Rack unit height inside the zero U space; applicable if a device is placed inside the zero U position.
XOffset	X offset inside zero U placement; applicable if the device is placed inside the zero U position.
X Position	Allows you to move a unit from side-to-side in an RU space. When a device is rotated to sit on its end, it can be moved horizontally to allow space for a side-by-side installation.

The connection related elements provide data connection and power connection related information. They are located inside the connections element which is part of DeviceAttributes. This element has zero or more occurrences based on the connections specified by the requestor.

Table 7.25 Connection Related Elements: Equipment Move

ELEMENT NAME	DESCRIPTION
ConnectedFromPort	Port name on the device
ConnectedToDevice	Name of the target device name
ConnectedToPort	Port name on the target device
ConnectionType	Connection type (POWER_CONNECTION or DATA_CONNECTION)

The response contains connections related and placement related information. If there is an error, it is populated as part of the ErrorMessage and ErrorCode elements which are inside the EquipmentInstallResponseMessage - PreCannedResponseStatus - Status response.

Task Flows

The DeviceMove project task flows are:

- ApproveDeviceMoveTF - Associated with the approver device move, which is responsible for approving or rejecting the device move action
- DecommissionNetworkCablingTF - Associated with decommissioning of the network cabling
- DecommissionPowerTF - Associated with decommissioning of power cabling
- DecommissionStorageTF - Associated with decommissioning of storage space

- DeviceDetailsTF - Used to get device details and power and data connection related information
- DeviceMoveRequestTF - Used to initiate the device move action
- MoveDevicePhysicallyTF - Associated with the device physical movement action page
- ProvisionNetworkCablingTF - Associated with the network cabling provision
- ProvisionNetworkTF - Associated with the network provision
- ProvisionPowerTF - Associated with the power cabling provision
- ProvisionSpaceTF - Associated with the space provision
- ProvisionStorageTF - Associated with the storage provision
- ResolveIntegrationExceptionsTF - Associated with the error resolution flow for handling software integration errors

To initiate a move equipment request:

1. Click the Process icon and log into the standalone interface with the move requestor process role user.
2. Click *Applications* and select *Move Equipment*.
3. Enter the project name, complete by date and cost center.
4. Using the radio buttons, select the provisioning requirements for power, network, storage and urgency.
5. Click the Add icon to add the requested equipment.
6. Search for the equipment. See [Searching for Containers or Devices](#) on page 133.
7. Select the equipment and click *OK*.
8. If desired, enter the device name and any additional details.
9. Repeat steps for any additional equipment to be added.

NOTE: Power is configured separately for each device.

10. Attach any supporting documentation and click *Submit*.

After the process request is submitted, an email notification is sent to approve the request.

To approve a move request:

1. Click the Process icon and log into the standalone interface with the move approver process role user.
2. In the My Tasks list, double-click the *Approve request for Equipment Move* and select *Accept*, *Reject* or *Claim*.

NOTE: If the request is accepted, an email notification is sent to provision space for the equipment.

-or-

For a rejected request, enter a reason for rejection, click *OK* and *Reject*.

-or-

For a claimed request, the task is assigned to the approver.

When the Move Equipment request is approved, sub-tasks for provisioning space, power, storage and network connections are created.

To provision space, storage, power or network:

1. Click the Process icon and log into the standalone interface with the applicable move process role user.
2. From the My Tasks list, double-click the request and click *Claim*.
3. Enter the placement details and click *Approve*.

4. Repeat these steps for each sub-task, as required.

After all of the sub-tasks are complete, a request to physically move the equipment is created.

To approve the physical move:

From the My Tasks list, double-click the *Move Devices Physically* request and click *OK*.

NOTE: After the task is completed, the decommission power, decommission storage and decommission network cabling sub-tasks are created, and if applicable, email notification is sent to the respective provisioner.

To decommission a moved device:

1. From the My Tasks list, double-click *Decommission power of the equipment move* and click *OK*.
2. Double-click *Decommission storage for the equipment move* and click *OK*.
3. Double-click *Decommission Network Cabling for the equipment move* and click *OK*.

When all tasks are completed, the decommission is confirmed and the request is closed.

7.2.5 Rename Equipment

Rename Equipment is the process for requesting to change the equipment name. This process provides end-to-end flow for renaming a device in your data center. A typical device equipment rename requires the requester to submit a rename request and the approver to approve or reject the same. This business process provides separate roles for these two actions. After the request is approved, the application uses the *Trellis™* Inventory Manager software to rename the device in the *Trellis™* platform inventory. A separate notification is sent to the requester indicating if the task is was successful. Even though the process name indicates server rename, the process is applicable for all device categories.

Process Details

The following are the process details for this component.

Table 7.26 Process Details: Equipment Rename

NAME	DESCRIPTION
Process Name	ServerRenameProcess
SOA Project Name	ServerRename
UI Project Name	ServerRenameUI

User Roles

The equipment rename process is dependent on the following user roles:

- ServerRename.Requester: Initiates the process of to rename equipment
- ServerRename.DataCenterTechnician: Approves the equipment rename request
- ServerRename.ProcessOwner: Views and fixes all the error scenarios

Human Tasks

The following are the human tasks for this component.

Table 7.27 Human Tasks: Equipment Rename

TASK NAME	ROLE	PATTERN	TITLE	OUTCOMES	DESCRIPTION
ServerRename Initiator_HT	ServerRename. Requester	Initiator	Initiate Server Rename	SUBMIT	Starting point of the process; triggers the request for equipment rename
ChangeServer Name_HT	ServerRename. DataCenter Technician	Simple	Approve Equipment Install	APPROVE, REJECT	User approves or rejects the request for renaming; reject cancels the action
TrellisIntegration ErrorResolution _HT	ServerRename. ProcessOwner	Simple	Trellis Integration Error Resolution	OK	Admin role used to view and resolve all the integration errors which can happen while performing service calls or notifications
Notify Administrator_ HT	ServerRename. ProcessOwner	Simple	Notify Administrator	OK	Notifies the administrator

Business Objects

The following are the business objects for this component.

Table 7.28 Business Objects: Equipment Rename

BUSINESS OBJECT NAME	MODULE NAME	REFERENCE RESOURCE	PURPOSE
ServerRenameBO	ServerRenameModule	EquipmentCUDRequest.xsd	Determines if manual approval is needed for the equipment install
TrellisIntegrationError SummaryBO	ServerRenameModule	TrellisIntegrationError SummaryBO.xsd	Stores any integration error related data
FaultBO	FaultModule	BPMFault.xsd	Describes the fault parameters and composite instance information where the fault happened while processing the request

Data Objects

The following are the data objects for this component.

Table 7.29 Data Objects: Equipment Rename

DATA OBJECT NAME	DATA OBJECT TYPE	REFERENCE RESOURCE FOR DATA OBJECT	DESCRIPTION	USAGE
ServerRenameDO	EquipmentRenameRequest	EquipmentCUDRequest.xsd	Contains cost center, project name and equipment rename information	Used to decide if an approval is needed based on a business rule
renameOutcome	String	NA	Stores the string to approve or reject the rename operation	Verifies if the outcome is approved
errorList	TrellisIntegrationErrorSummaryBO	TrellisIntegrationErrorSummaryBO.xsd	Stores the integration errors	Used for the integration error handling flow, by the admin
initiatingUser	String	NA	Stores the initiating user	Notification flow element to notify the initiating user about the process outcome
taskOutcome	String	NA	Outcome of the task	Used to check if a task outcome is withdrawn
taskPriority	Int	NA	Priority of the task	Used by all task components to set a task's priority

Service Calls

The following are the service calls for this component.

Table 7.30 Service Calls: Equipment Rename

SERVICE NAME	WSDL NAME	PURPOSE
DeviceAsyncBulkServiceV10	DeviceAsyncBulkService-v1.0.wsdl	Used to perform rename device operation in asynchronous manner

The WSDL is invoked in an asynchronous manner. The request port type is DeviceServiceBulkPortType which uses UpdateDevices as the operation and UpdateDevicesRequest as the message type. The callback port type is DeviceServiceBulkCallBackPortType which uses the UpdateDevicesCallBack operation and the UpdateDevicesResponse message type.

The following common schema is populated in the request.

Table 7.31 Service Calls: Common Schema: Equipment Rename

ELEMENT NAME	DESCRIPTION
ID	ID of the equipment in the software to be renamed
Name	Suggested name for the device

The response contains an operation-related response. If there are any errors, they are populated as part of the ErrorMessage and ErrorCode components.

Task Flows

This process has the following task flows which are part of the ServerRenameUI project:

- ServerRenameInitiator_HT_TaskFlow – Associated with the initiator human task to submit the request to rename a device
- TrellisIntegrationErrorResolution_HT_TaskFlow – Associated with the error resolution flow for handling integration errors

To initiate a rename equipment request:

1. Click the Process icon and log into the standalone interface with the rename requestor process role user.
2. Click *Applications* and select the Rename Equipment link in the left navigation panel.
3. Enter the project name, complete by date and cost center.
4. Click the Add icon to add the requested equipment.
5. Search for the equipment. See [Searching for Containers or Devices](#) on page 133.
6. Select the equipment and click *OK*.
7. Enter the suggested name change and click *Submit*.

After the process request is submitted, an email notification is sent for approval.

To rename a device:

1. Click the Process icon and log into the standalone interface with the rename data center technician process role user.
2. From the My Tasks list, double-click *Approve Equipment Rename Request* and select *Approve*, *Reject* or *Claim*.
3. If the request is approved, an email notification is sent to the requester, the rename is confirmed and the request is closed.

-or-

For a rejected request, enter a reason for rejection, click *OK* and *Reject*.

-or-

For a claimed request, the task is assigned to the approver.

7.2.6 Process Tracker Views

The Process Tracker Views panels enable you to interact with business processes based on the roles assigned to you, view the entire process from beginning to end and see which activities are pending or completed.

Process tracking includes:

- Displaying all the instances for all the workflows
- Viewing the list of process instances pending in your Inbox
- Viewing the history of process instances
- Executing tasks
- Searching for instances by different criteria
- Saving searches as views
- Viewing the details of an instance, including the audit trail

7.2.7 Task List Views

The Task List Views selections are dependent on your role. The My Tasks, Initiated Tasks and Administrative tasks selections access the applicable content. The content can be searched, sorted, filtered or customized and tasks can be reassigned to another role. You can also display the following task views:

- Due Soon
- High Priority

- Past Day
- Past Week
- Past Month
- Past Quarter
- New Tasks

The Edit icon is used to create and edit user views. All other modifications to the content are performed similarly.

Search

Advanced Search panel - Conditions are Initiated, Initiator and Number.

My Tasks

The My Tasks list is the default view which displays tasks and task owners. The task assignments are role dependent. You can view the status of a task from this view and select one of the following actions: Request Information, Reassign, Create Sub Task, Escalate, Suspend, Withdraw, Skip Current Assignment or Create To-Do Task.

The Task Status/Chart Display States are:

- Assigned
- Completed
- Suspended
- Withdrawn
- Expired
- Errored
- Alerted
- Info Requested

Initiated Tasks

Your initiated tasks can be displayed using Initiated Tasks. Selecting a specific task displays the details for that task.

Administrative Tasks

The Administrative Tasks workspace displays the tasks for which you are responsible.

7.3 Administrative Areas

The Organization, Flex Fields, Task Administration and Application Preferences windows are discussed in the following sections.

7.3.1 Roles

The Roles window contains a list of roles and assigned users. A user must be assigned to a role in order to perform a task. The Process Administrator can add any user with the Process Operator or Process Administrator role to one or any number of roles within each process. Each role is described in the Human tasks section for each process.

The following are the three roles associated with the Process Manager module:

- BPMComposerAdmin - User has full access to Business Process Manager (BPM) Composer and can customize, model and deploy a process. This role is required to log into BPMComposer.

- ProcessAdministrator - User is the administrator for Process Manager and can set up users for approvals.
- ProcessOperatorRole - User is assigned tasks; generally, uses Process Manager daily.

To add an Internal user or an External user group to a process role:

1. Click the Process icon and log into the standalone interface as an administrative role user.
2. Click the Administration icon and click *Roles*.
3. In the Roles window, select the role's name.
4. In the Members window, click *Grant the role to the user, group or role* button.
5. Expand a drop-down menu and do one of the following:
 - Select *Users* to search Trellis Internal User(s) to assign to the BPM role.
 - Select *Groups* to search the Active Directory (AD) Group(s) to assign to the BPM role.

NOTE: Do not use Trellis Internal User Groups mapped to AD Groups.

6. Click *OK* and *Save*.

NOTE: The Advanced checkbox is enabled automatically when you enter text in the blank fields.

7.3.2 Calendars

One or more sets of holidays can be created as a list and added to a calendar. The calendar adds the specified holidays when computing the duration of a task or process. You can create as many holiday rules as needed for different calendar rules.

To create a holiday list:

1. Click the Holiday List Add icon and enter a name in the pop-up.

-or-

Click the Edit icon.

-or-

Click the Delete icon.
2. Click the Add icon in Details, add a holiday and click *SAVE*.

To add a holiday list to the calendar:

1. Click the Add icon and on the Add a Calendar pop-up box, enter the calendar name and click *OK*.
2. Select the time zone and holiday list from the drop-down menu, enable the applicable days and times and click *SAVE*.
3. In the confirmation message, click *Yes* to continue.

7.3.3 Organization Units

An organization unit represents departments or divisions within an organization. Organization units can contain child organization units, creating a hierarchy that corresponds to your organization. The following are defined when you create an organizational unit:

- Organizational unit name
- Time zone
- Members of the organization unit, which can include users, groups, application roles or parametric roles

- Optional parent organization unit
- Optional business calendar

When a process is associated with an organization unit, only members of that unit and its children can see that process and the tasks initiated by it. Root and child units can be created and added to your organization. Units can also be edited or deleted.

To add an organizational unit:

1. Click the Process icon and log into the standalone interface as an administrative role user.
2. Click the Administration icon and select *Organization*.
3. Click the drop-down arrow and select *Root Organization Unit*.

-or-

Click the drop-down arrow and select *Child Organization Unit*.

4. In the Create Organization Unit window, verify the unit's name and click *OK*.
5. Click *Save*.

-or-

Click *Revert* to reset your changes, and on the confirmation message, click *Yes*.

6. Verify the confirmation window.

7.3.4 Parametric Roles

Parametric roles are groups of users' logical roles created by the administrator that define either members of an organizational unit or task assignees. Members of parametric roles are dynamically evaluated at runtime by specifying them as a parametric query in this workspace.

To create a parametric role:

1. Click the Add icon and enter a name under Details.
2. Under Define Parameters, use the drop-down menus to select conditions for the parametric role.
3. If desired, you can enter an application name and click the Search icon.

-or-

Click the Search icon and on the Select Application Role pop-up box, use the drop-down menus to select the role and context for the application.

4. In the confirmation message, click *OK*, expand *Parameters*, click the Add icon to add a parameter and enter the name.
5. Select *Number* or *String*, use the drop-down menus to select conditions for the parametric role and click *SAVE*.

7.3.5 Extended User Properties

Sometimes when properties have already been specified in the Oracle Internet Directory or some other LDAP directory, additional properties, specific to an organization and roles, may be necessary. In these cases, extended user properties are useful. For example, you can specify that a given user with any representative role is located in a geographical region. From a functional point of view, there is only one role, but the individual user is associated with a property and that property has a value assigned for that user.

To add an extended user property:

1. Click the Process icon and log into the standalone interface as an administrative role user.
2. Click the Administration icon and select *Extended User Properties*.
3. Click the Add icon under Properties.
4. Enter a name, select a type, enter a value and click *SAVE*.

To map an Extended User Property:

1. Click the Add icon under Map Properties.
2. Search for and select the user, assign the properties and click *Save*.

7.3.6 Flex Fields (Public and Protected)

Human workflow mapped flex fields store and query use case-specific custom attributes. These custom attributes typically come from the task payload values. Storing custom attributes in mapped attributes provides the following benefits:

- Displayed as a column in the task listing
- Filter tasks in custom views and advanced searches
- Used for a keyword-based search

Public and Protected Flex Fields are used for mappings. All or selected attributes such as number and date for Public Flex Fields, can be edited by task type. Administrators and users with the appropriate privileges can map both public and protected mapped attributes. They see both a Public Flex Fields node and a Protected Flex Fields node in the Administration menu.

To browse all mappings:

1. Click *Browse all mappings*.
2. Select a row in the label table to display all the payload attributes mapped to a particular label.

To edit mappings by task type:

1. Click *Edit mappings by task type*, enter a task type and click *Search*.
2. Select a task type and click *OK*.
3. With the task type displayed in the Edit mappings by task type field, click *Go*.
4. Select a mapping label and click *Select*.

7.3.7 Approval Groups

An approval group is a predefined set of users that are configured to act on a task in a certain pattern such as in a serial or in a parallel pattern. You can create static or dynamic approval groups. An approval group can also contain a nested approval group in the pattern.

The name of a group is necessary when specifying the approval group list builder. The pattern is used by default to order the users who must act on the task. However, when creating the list builder, the default pattern can be overridden by specifying the voting method.

To create a static or dynamic approval group:

1. Click the Process icon and log into the standalone interface as an administrative role user.
2. Click the Administration icon and select *Approval Groups*.

3. In the Groups window, click the Add drop-down arrow and select *Create Static Approval Group* or *Create Dynamic Approval Group*.
4. Select the group.
5. Enter a new name for the group and click the Members plus icon.
6. In the Add to Group window, select *User* or *Approval Group*.
7. Click the Add icon.
8. Search for the user or approval group. See [Searching for Containers or Devices](#) on page 133.
9. Click OK.

To delete a member from an approval group:

1. Click the Process icon and log into the standalone interface as an administrative role user.
2. Click the Administration icon and select *Approval Groups*.
3. Choose the appropriate member node from the approval group structure.
4. Click *Delete*, verify the approval group structure refreshes and verify the member node is deleted.

7.3.8 Task Configurations

The Task Configuration window allows you to review and modify each task's configuration details and rules that are predefined by the workflow designer. The predefined rules can be changed based on your corporate policies. You can also only show active tasks to be reconfigured. You can edit the event and data-driven rules associated with an approval flow, or reset the task after the workflow is deployed. After a task is defined, the task is committed.

The Notifications Settings panel is used to configure and manage the task status, recipient and notification header. The Notification Message is also edited in this panel, as well as setting the number of reminders to be sent to the recipient.

Expiration and Escalation Policy options are: Never Expire, Expire After, Escalate After and Renew After.

7.3.9 Application Preferences

Administrators can specify various application preferences to configure the display of the work items panel. These include preferences such as username formats, branding logos, view display counts and others.

7.4 Smart Install

In the *Trellis*™ platform release 4.0.1 and later, the Process Manager module includes the Smart Install feature which permits you to add a single device in a rack and make the power connections from one window. The Smart Install window invokes the *Trellis*™ platform services in order to select a device, select a rack with the required available space and power capacities for the device and complete the device's placement and power connections in real time.

The following items are required for the Smart Install feature:

- The Administrator must define a user ID, assign a *Trellis*™ platform role to the user with Process Manager module permissions and associate the user with the Smart Install process rule.
- The role assigned to the user must have Process Manager permissions and one of the following permissions: *FacilitiesEngineer* or *ITEngineer*. This role must be granted manage rights at the enterprise level and view or manage rights for the containers where placement needs to happen.
- The power capacity for the rack must be configured.
- The rack must have two PDUs installed with sufficient power capacity and available openings.

When the Smart Install feature is accessed, a series of panels are displayed to complete the installation. The Requested Equipment panel is used to select the device to be placed. After the device is selected, this panel includes helpful information about the device, such as the manufacturer and model number. Its space and power information is also provided in order to verify compatibility with the rack selected in a later step.

From the Preferred Location panel, you have the option to save the configured device in your environment's Stored inventory, or if you know the location you want to place the device, save it in your placed inventory. If you know the location, you can proceed to select the building, floor and space where the rack is located.

After you select a space, the racks supporting the device's space and power requirements are displayed in the Available Racks panel. The rack list is based on the following criteria:

- Sufficient space to place the device
- Available power capacity (kW) defined at the rack level
- Two PDUs installed in the rack for redundancy:
 - Each PDU has enough capacity (kW) to independently support the device
 - Each PDU has sufficient available openings to independently support the device

Racks can be sorted and filtered. Sorting arrows are displayed in the column headers when you hover the cursor over them and the filter options are entered in the device's requirements in the field above each column header. For example, to find the racks having PDUs with at least 10 openings, you can enter **>10** in the PDU1 # of Openings column. After you have created a manageable list of racks, you can compare the details of each rack and device and select a specific rack for the device.

After selecting a rack, the Rack Image, Rack Units and Power Connections panels are displayed to allow you to access additional rack information from the software. When you expand the Rack Image panel, the front or rear Elevation view of the rack can be displayed to view the available space. The Rack Units panel provides the contiguous blocks that can support the device from the front or rear side of the rack. In the Power Connections panel, you have the option to define the connections using the table or add the power connections manually at a later time. Both the Rack Units and Power Connections panels include hidden sorting arrows and filter fields like those in the Available Racks panel.

If you decide to define the power connections from this window, when you select the rack, the inputs listed in the Source Device Openings column are auto-populated with the input power openings from the symbol being added. For example, if a server has two input power openings, INPUT 1 and INPUT 2, these openings are listed in the power connections table. For each input, you can select a Target PDU name which correlates with the PDU 1 Name and PDU 2 Name lists in the Available Racks columns. After selecting the Target PDU, only the available ports for the selected PDU are listed under the PDU Openings column. Then, after selecting a port, the receptacle type is automatically displayed and the power connection's definition is complete.

NOTE: Always define one power connection at a time by selecting the PDU and PDU opening for a connection row before proceeding to define the next connection.

The Comments and Attachments panels are provided for additional details and to save relevant documentation about the install, such as approvals and e-mails. The comments are saved in the Completed task details.

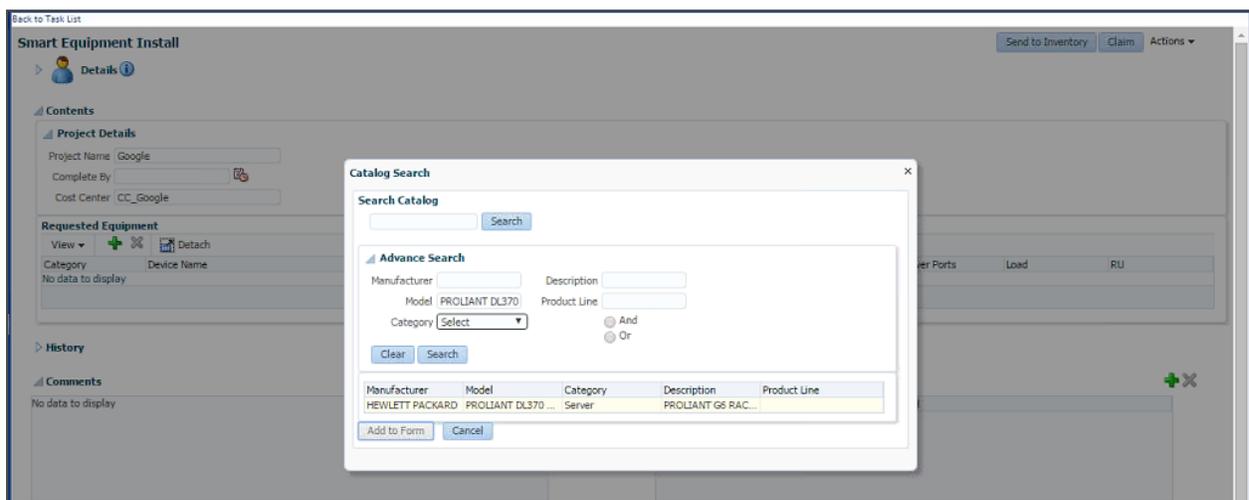
An email notification is sent to confirm the install, however, you can also verify the task entries from the Task list and view the added device in the Portfolio window. If there is an error, a message is displayed under the Project Details panel on the Error task window. An e-mail notification is also sent to you and an Error task is created in the task list. In this case, you can make the required corrections in the *Trellis*™ platform manually and click OK in the Error task list to acknowledge that the situation is resolved.

NOTE: The Smart Install feature works with real-time placement and power availability/capacity information from the *Trellis™* platform. Placement and power connection details are not retained for a saved task as these may become stale if you return to a saved task in future.

To use Smart Install to add a device:

1. Click the Process icon and log into the standalone interface as a BPM Smart Install role user.
2. Click *Applications* and select *Smart Install*.
3. On the Smart Equipment Install window, assign a project name and cost center, and if necessary, select the complete by date for the install.
4. In the Requested Equipment table, click the Add icon to add a device.
5. Search for the device. See [Searching for Containers or Devices](#) on page 133.
6. Select the device and click the *Add to Form* button.

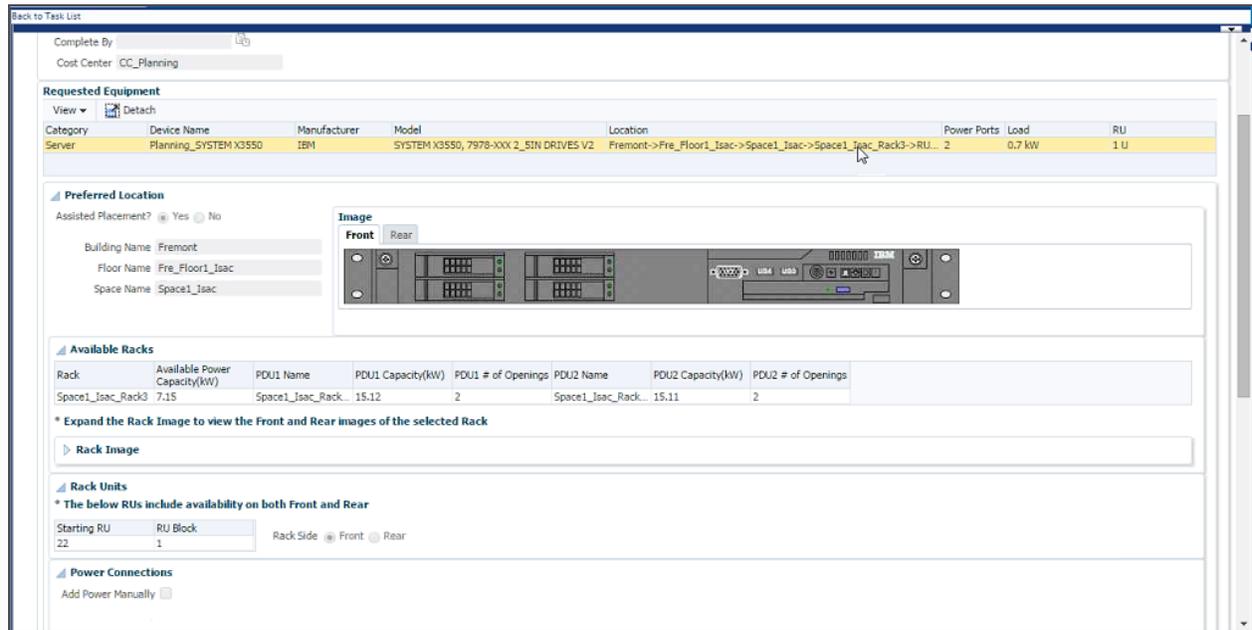
Figure 7.1 Selecting the Device to be Placed



NOTE: The Requested Equipment table displays useful information related to the symbol, such as the number of power ports, load and RU height, that are relevant to the installation.

7. In the Requested Equipment table, rename the device with a more specific identifying name.

Figure 7.2 Assigning the Device Details



8. After the image of the symbol is displayed in the Preferred Location panel, you can toggle between the front and rear views of the symbol.
9. If you know where to place the device, for Assisted Placement, click the Yes radio button and use the drop-down arrows to select the building, floor and space for the device. After selecting the space, the Available Racks table is populated with a list of racks that can accommodate the device's space and power requirements.

-OR-

If you do not know where to place the device, click the No radio button and click *Send to Stored Inventory* to create the device and place it in the Stored Inventory for your enterprise.

10. In the Available Racks panel, select a rack, and if desired, click to expand the *Rack Image* panel to view the front and rear of the rack.

NOTE: Selecting a rack from the Available Racks table displays the contiguous available RU blocks in the rack that can accommodate the device. An RU block is considered available only if both the front and rear locations in the rack are available.

11. In the Rack Units panel, select the side of the rack (Front or Rear) for placing the device, and then from the displayed available RU blocks, select the RU block. The Front radio button is the default selection.
12. In the Power Connections panel, click to enable the Add Power Manually checkbox in order to enter the power connections manually at a later time from the *Trellis™* Power Systems Manager module.

-OR-

Leave the Add Power Manually checkbox blank to continue with the power connection configuration using the Smart Install feature.

13. For each device input, click the Target PDU drop-down arrow and select the PDU for the device connection. Then click the PDU Openings drop-down arrow and select an available port on the PDU.

NOTE: The Receptacle Type field is populated to help you confirm compatibility of the connector with the receptacle.

14. In the Comments and Attachments panels, enter any additional information.
15. Click the *Send to Inventory* button to add the device in the rack with any power connections in the *Trellis™* platform.

NOTE: After the install request is submitted, the task is marked as Completed. All completed tasks can be accessed by filtering the task list.

To verify the task:

From the Portfolio window, open your Placed or Stored Inventory folder for your enterprise to view the device.

-or-

From the Process Task List Views window, select *Completed* from the status drop-down menu and click the task for the device's installation.

7.5 Process Dashboards

The Process Dashboards display graphic representations of metrics gathered during the execution of a process. This allows you to see the status of process categories within your data center. Clicking on the graph displays a specific configuration window to get further information or the configuration settings.

This section explains how to use the following types of dashboards:

- Workload per process
- Performance per process
- Workload per participant
- Performance per participant

NOTE: Each time you change the selected graph, you must click the new graph to populate the table.

To access the Process Dashboards:

1. Click the Standard Dashboards in the header of the standalone BPM.
2. Select the desired dashboard from the Show drop-down list.

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8 PROJECTS

The Project feature is used to implement changes in the data center from planning and execution to auditing and reporting. Data center managers who use actual consumption and capacity values as a baseline, can confidently say a new asset will be supported in its new location. Therefore, impact can be determined before making a capital investment.

The Projects feature provides the following benefits:

- Planning data center changes and managing relationships across projects
- Fully complying with auditing requirements using a detailed record of changes
- Previewing change impact before committing resources
- Auditing data center change history using a timeline

8.1 Managing projects

Specific project information, including the project name, owner information, start, duration and status can be added, edited and deleted. After a project is added, you can add logically-connected tasks that represent future work.

The following are Graphical Edit view options for a project:

- Current State is the status of the floor as it appears today.
- A selected project shows future changes of the floor. In the current state, these changes are shown in a transparent blue.
- Device Timeline view shows future progressive changes for a rack. The changes can be viewed from the front or rear of the rack.

8.1.1 Projects toolbar

The Projects window provides the following functions:

- Viewing projects and their tasks
- Adding, editing and removing a project
- Adding, editing and removing a task

8.1.2 Viewing a floor or space in the current or future state

The current and future state of a floor or space can be displayed in Graphical Edit and Elevation view.

To view a floor or space in its current state or a future state:

In Graphical Edit view, click the Project header icon and select *CURRENT STATE*.

-or-

In Graphical Edit view, click the Project header icon and select the project.

8.1.3 Creating projects and tasks

The Projects window allows you to add, update and delete projects and tasks. You can also create generic tasks for a project in the Projects window. Designed tasks can be created in a project after creating a building and a floor.

Figure 8.1 Projects Default Window

The screenshot displays the 'Projects Default Window' interface. On the left is a sidebar titled 'Projects' containing three items: 'AH Bldg' (green checkmark), 'Building44' (yellow warning triangle), and 'Edg1111' (blue information icon). The 'Edg1111' item is selected and highlighted in orange. The main area is titled 'Tasks' and contains a table with 10 rows of task data. At the bottom of the table area, it says 'Showing 1 to 10 of 412 entries' with navigation buttons for page 1 of 42.

	STATUS	NAME	TAG	OWNER	ASSIGNEE	
<input type="checkbox"/>	100%	PM-Rack-4	Cabinet	KNURR KMK6A000		⋮
<input type="checkbox"/>	25%	Floor1-RPP-6A	RPP	LIEBERT RDC441SB24S		⋮
<input type="checkbox"/>	5%	PM-Rack-8	Cabinet	KNURR KMK6A000		⋮
<input type="checkbox"/>	80%	PM-Rack-9	Cabinet	KNURR KMK6A000		⋮
<input type="checkbox"/>	0%	Floor1-Rack-E04	Cabinet	KNURR KMK6A000		⋮
<input type="checkbox"/>	0%	Floor1-Rack-A06	Cabinet	KNURR KMK6A000		⋮
<input type="checkbox"/>	0%	Floor1-Rack-A04-HP	Cabinet	KNURR KMK6A000		⋮
<input type="checkbox"/>	0%	Floor1-RPP-2B	RPP	LIEBERT RDC441SB24S		⋮
<input type="checkbox"/>	0%	Floor1-RPP-3B	RPP	LIEBERT RDC441SB24S		⋮
<input type="checkbox"/>	0%	Floor1-Rack-D02	Cabinet	KNURR KMK6A000		⋮

Showing 1 to 10 of 412 entries

Table 8.1 Project and Task Window Descriptions

NAME	DESCRIPTION
Name	Name of the project or task
Owner	Person responsible for the project or task
Owner Email	Email address of the owner
Duration (hrs)	Time allotted for the project or task
Start Date	Date the project or task begins
End Date	Date the project or task ends
Status	Assigned status (planned, started, on hold or completed) of the project or task
Complete	Percentage complete
Description	Description of the project or task
Order Number	Task sequence
Task Dependency	Task required in order to complete the task
Task Assignee	Person assigned to the task
Tag	Describes the general type of device
Notes	Notes about the project or task

To create a project with generic tasks:

1. Click the Projects icon and click the Add header icon in the Projects panel on the left.
2. In the Add Project window, complete the fields and click *SAVE*.
3. In the content panel, click the Add icon.
4. In the Add Task window, complete the fields and click *SAVE*.
5. Repeat steps 3-4 to add additional tasks.

To edit a project:

1. Click the *Projects* icon and in the Projects panel, select a project.
2. Click the Edit icon, modify the fields and click *SAVE*.

To edit a project task:

1. Click the Projects icon and in the Projects panel, select a project with tasks.
2. In the content panel, click a task's checkbox and click the Edit icon.
3. In the Edit Task window, complete the fields and click *SAVE*.

To search the catalog or inventory for devices in Project mode:

1. In Graphical Edit view, click the Project header icon and select a project.
2. Click the Add icon, select *Catalog* or *Inventory*, complete the fields and click *SEARCH*.

To delete a project or a task:

1. Click the Projects icon.
2. Select a project in the Projects panel.

-or-

Select a task in the content panel.

3. Click the Delete icon.

NOTE: Deleting the project cannot be undone.

8.1.4 Creating designed tasks

Designed tasks are created chronologically in a project as you add, edit, move or delete devices in Graphical Edit view. For example, when you add a device to a floor in a project, the tasks and relative data are added to the project. Tasks are created in sequence and this denotes their dependencies within the selected project.

NOTE: You cannot create a task that deletes a device if there are dependencies.

To create designed tasks:

1. Click the Projects icon, and in the Projects panel, click the Add icon.
2. In the Add Project panel, complete the fields and click *SAVE*.
3. Click the Portfolio icon and expand the enterprise.
4. Select the associated floor and click the Graphical Edit icon.
5. Click the Projects icon and from the drop-down menu, select the project.
6. On the floor plan, use the following options to make physical changes to the project:
 - Select a device, click *Move* and move the device.
 - Select a device and click the Delete header icon.
 - Select a device and right-click *Cut Device(s)*.
 - Select a device and right-click *Copy Device(s)*.
 - Select a device and right-click *Paste Device(s)*.
 - Select a device and right-click *Remove Placement(s)*.
7. After creating a project, navigate back to the Projects window to view the designed tasks for the project.

8.1.5 Completing project tasks

After you create a project and complete its tasks, a task-by-task record is created to show future changes in the selected project.

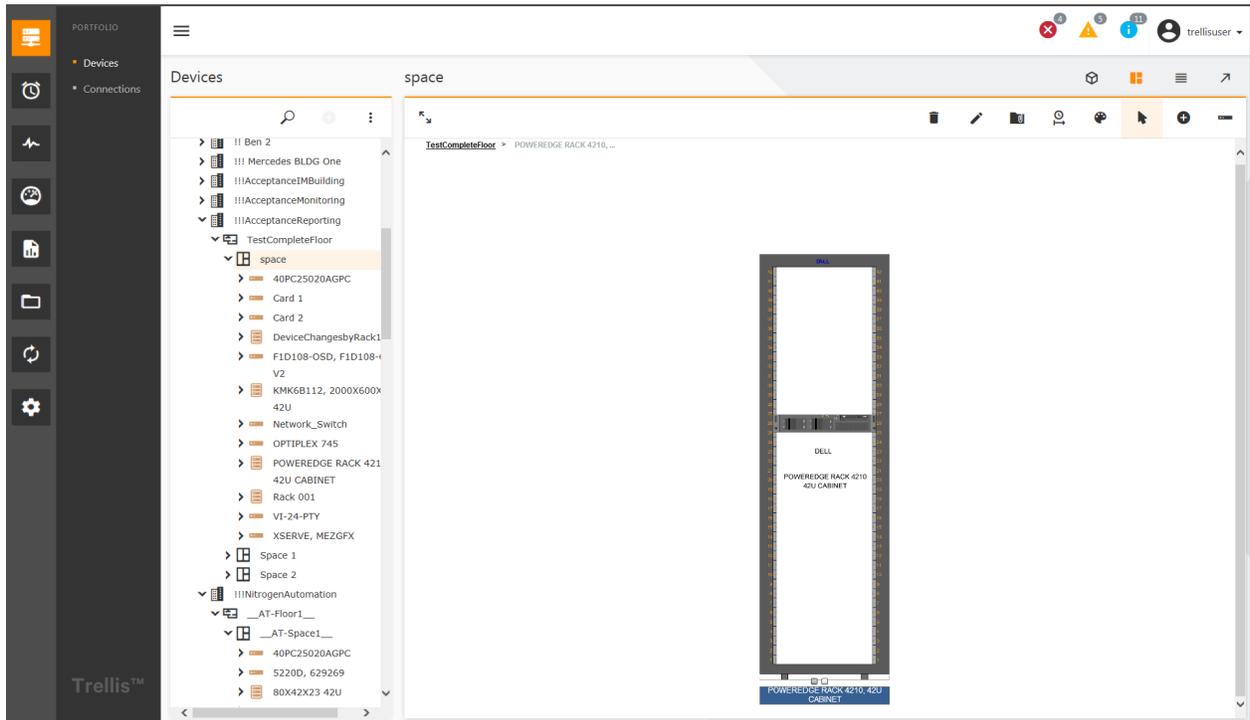
To complete a task and commit it to the current state:

1. Click the Projects icon, select the project and click the task's checkbox.
2. Click the project's Edit tool and from the Status drop-down list, select *COMPLETED*.

8.2 Using the Device Timeline

The device timeline depicts a rack as it appears in the current state, as well as all future rack versions. The device timeline is based on any upcoming tasks that impact the rack. The device timeline feature is enabled in Graphical Edit and Elevation view.

Figure 8.2 Device Timeline in Elevation View



To view a timeline for a device from Graphical Edit and Elevation view:

1. Click the Portfolio icon, expand the enterprise and select a floor or space.
2. In the Device Table, click the Graphical Edit icon.
3. Double-click the device to open Elevation view.
4. Click the *Device Timeline* header icon to view the device in its current state and with possible future changes.

NOTE: A device must be selected to display the timeline buttons.

5. Use the breadcrumbs to return to the Graphical Edit or Elevation view of the floor.

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9 TRELLIS™ THERMAL SYSTEMS MANAGER MODULE

The *Trellis*™ Thermal Systems Manager module allows you to reduce thermal-related power costs and improve data center efficiency. With this module, you can verify and balance heat loads from the room level to the device level in order to optimize your environment. Graphical views allow you to see the overall thermal aspects of your data center (space, cooling units, racks and servers) and identify the exact location of hotspots in real-time. This allows you to eliminate overheating issues in specific areas and also helps to reduce wasteful overcooling. The collected data can be printed or saved to track progress, can help you communicate any issues to your data center personnel or can be used to create reports.

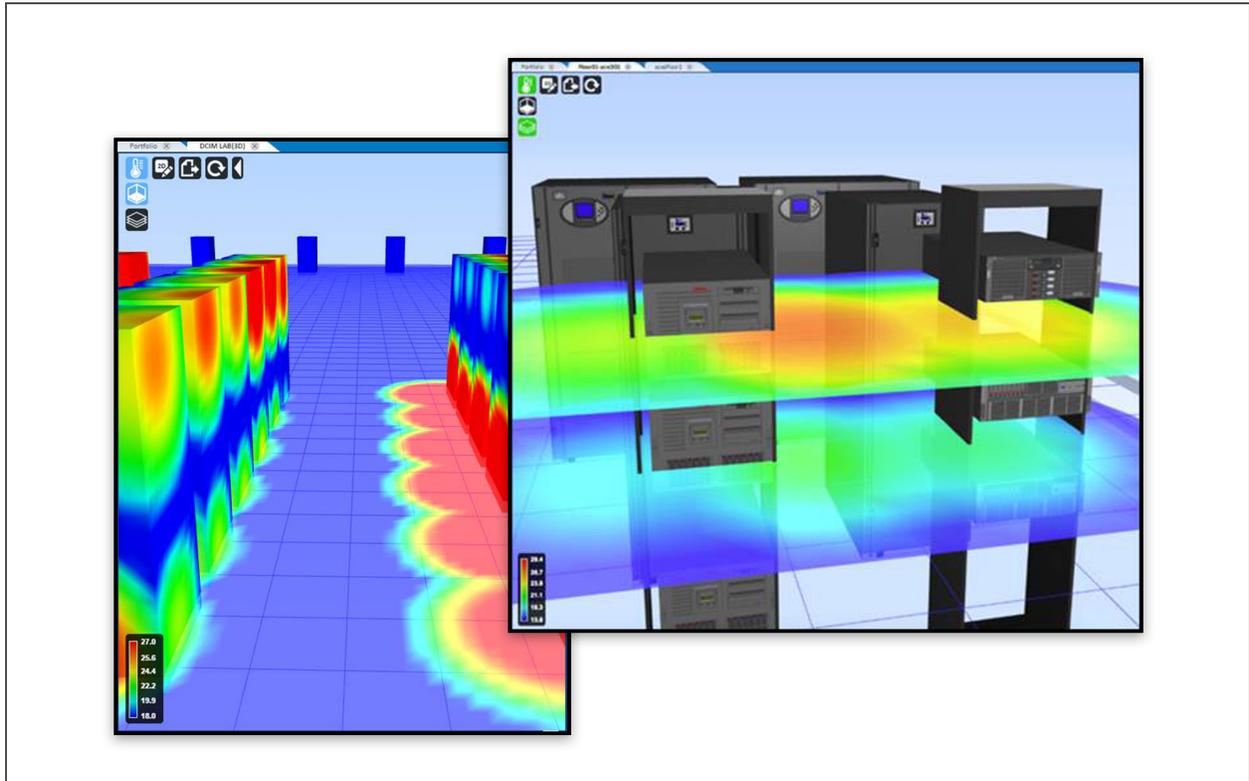
The *Trellis*™ Thermal Systems Manager module provides the following benefits:

- Visualizing hot and cold temperatures in 3D view
- Monitoring thermal energy coming from your devices
- Managing conditions to optimize capacity and system up-time
- Making informed decisions to optimize temperature and humidity
- Lowering energy costs without sacrificing system up-time
- Collecting data to plan for future deployments and manage capital expenditures

9.1 Displaying Thermal Heat Maps

Thermal heat maps are available with the licensed Thermal System Manager module. When temperature data is available, you can view the Thermal Maps icon in 3D view. If selected, you can display two types of thermal heat maps of your data center. One view is the Thermal Cover Map that shows overall connected temperatures and the second option is the Thermal Layer Map that shows temperatures as they exist at the bottom, middle and top of the racks on your data center floor. From these maps you can also change the perspective to see specific areas.

Figure 9.1 Thermal Heat Map Views



To view Thermal Heat Maps:

1. Click the Portfolio icon, select a floor and click the 3D icon.
2. Click the *Thermal Maps* icon to display the cover and layer map icons.

NOTE: If no temperature data is available, the Thermal Maps icon is not enabled.

3. Click the *Thermal Cover Map* icon to show the overall visual thermal temperatures of equipment in the data center.

-or-

Click the *Thermal Layer Map* icon to show more detail of each visual thermal layer of temperatures in a rack.

4. Use the standard keyboard and mouse controls to see specific areas of your data center. For more about keyboard and mouse controls, see [3D view](#) on page 30.

10 REPORTS

Report templates are available based on your module licenses and permissions. This information is about running *Trellis™* Inventory Manager, *Trellis™* Site Manager and *Trellis™* Thermal Systems Manager reports. For Process reports, see [TRELLIS™ Process Manager Module](#) on page 213. For creating custom reports, see [Ad Hoc Reports](#) on page 263.

Figure 10.1 Report Templates Folders



10.1 Report Permissions

The Report Administrator role and Report User role have permissions for the following tasks.

Table 10.1 Report Permissions

TASK	REPORT ADMINISTRATOR	REPORT USER
Assigning permissions to the user folder	X	X
Scheduling and running reports	X	X
Saving filters to user folders	X	X
Copying and pasting reports	X	X
Creating folders within private user folders	X	X
Sharing reports with other users	X	X
Customizing reports (filters, sort columns, hide/show columns, change fonts and colors)	X	X
Exporting reports [PDF, XLS, CSV, XLSX, XLS (paginated), XLSX (paginated)]	X	X
Publishing custom reports using iReport or the UI wizard	X	N/A

10.2 Using the Folders Menu

The Folders side bar includes the templates, sources and resources for standard and Ad hoc reports. It also includes shared components for reports and is used to store personal folders for reports. After selecting a report, it is displayed in the Report Templates table.

10.3 Using Report Templates and Folders

The Report Templates' content allows you to run, copy and delete reports, as well as filter reports to display only the information you need. Procedures to enable clicking the space next to the report template name enables the buttons for these features. You can also select a template name to select report options.

Table 10.2 Report Templates Listed by Module

FOLDER	REPORT	REPORT CONTENTS
Inventory Manager	Cable Route	Allows you to search for a device and show the connected devices. Lists ports, cable route, and each path belonging to an end-to-end data connection.
	Device Changes By Rack	Lists details of changes to rack content.
	Device Inventory	Overview of the devices based on specified filter criteria such as the name, serial number, category, manufacture, model and location of the device.
	Device Visual	Shows device information with elevation drawings. Views device information such as building, floor, space, rack name, device name, manufacturer, model, serial number, asset number, device category, card modules, capacities and UDP values. It also includes device front and rear elevation drawings.
	Inventory Metrics	Displays an overview of a Space or Zone container on user-specified filter criteria.
	Network Path Connections	Lists all external data connection paths from a device to a switch in a data center. The network connectivity view lists of all device connections. It also assists with device connection problems and status of connectivity in planning of network changes.
	Network and Power Connections	Designed to show all network and power connections on a specified device. Used to check both power and network connections on devices, troubleshooting device network and power connection problems. Shows only external connections (both power and data).
	Rack Inventory	Displays all racks and child devices based on user-specified filter criteria.
	Rack Visual	Shows rack information with elevation drawings. Provides rack information such as manufacturer, model, description, front, rear and other rack mounted devices, positions of devices based on the top and bottom of the rack space, device model information, and it also displays images for rack front and rear elevation. Allows multiple rack list selections.
	Switch Port Status	Shows count of status (total, used and available) switch ports in a data center. Views available port capacity in a data center and assists in planning new switch port installation. Switches reported include: Telecom, network, SAN and KVM connections.
	Trace Switch Connections	Provides a list of data connections from a specified switch. View connection paths on switches, troubleshooting switch connection problems, show status on connected devices and assists in planning network changes.
UDP by Device	User-defined properties of each device based on user-specified filter criteria.	
Site Manager	Alarms by Device	All alarms for each device are based on user-specified filter criteria for a specified time range.
	Consumed Capacity by Device	Total power consumption of each device based on user-specified filter criteria for a specified time range.
	Datapoints by Device	A list of devices within a specified filter criteria, showing all related data points. Each device is based on user-specified filter criteria for a specified start and end time frame.
	Energy Consumption (kWH) by Device	Energy consumption of each device based on user-specified filter criteria for a specified time range.
	Events by Date	A list of device events by date.
	Latest power consumed by device	Displays a list of devices with their current power consumption in kW. Includes

Table 10.2 Report Templates Listed by Module (continued)

FOLDER	REPORT	REPORT CONTENTS
		device details such as name, manufacturer and model information, latest timestamp and consumption value.
	Power Trend Based on Capacity	Details of changes to power consumed within a space over time. NOTE: The designed power must be configured at the floor and space level. This report is blank if the floor has no designed power value specified in the Capacities panel.
	Stranded Capacity by Rack	Displays the stranded power, based on actual loads against design loads for racks.
	Time Sensitive Events by Device	A list of time-sensitive events of each device based on user-specified filter criteria for a specified time range.
Thermal Systems	Room Cooling Capacity	Designed and consumed cooling capacity trends.
	Cooling Capacity Factor	Comparison of the total available capacity with actual required cooling capacity for the data center.

NOTE: All data values for *Trellis*™ Site Manager module reports are aggregated hourly, therefore, results displayed on reports may not match the real-time data. Only authorized resources are shown in the reports.

10.3.1 Creating a personal folder under a user folder for reports

A personal folder can be created under the user folder to store custom filter options and reports that you run often.

To create a personal folder under a user folder:

1. Click the Reports icon, right-click the *User* folder under Folders and select *Add Folder*.
2. Enter the new folder's report name and description, then click *Add*.
3. After a folder is added, select one of the following available options:
 - *Copy* to copy a folder and paste it in a user/personal folder
 - *Cut* to cut a folder and paste it in a user/personal folder
 - *Delete* to delete a user/personal folder
 - *Permissions* to change user or role permissions
 - *Properties* to change the report name and description

10.3.2 Adding a report template to a personal folder

Report templates can be added to your personal folder to access reports you run often.

To add a report template to a folder:

1. Click the Reports icon and click a folder, such as *Inventory Manager* or *Site Manager*, to view the report templates.
2. Click a report template and select *Copy*.
3. Click your folder, select *Paste* and click the template.
4. Select data from the available fields in the following filter options: Building, Floor, Space, Zone, Group and Category.
5. Click *Save*, enter the name of the created template and click *SAVE*.

- Click *Back* to return to the Report Templates window. The new template is added to the folder, which has a drop-down arrow with options.

NOTE: If the filter option is blank, there is no data available. Some filter options may have required start and end dates. If you do not select specific data in each field, the report is generated for all data in the list. For example, if you only select a building and not a floor and a space, the report includes all floors and all spaces. If you select a building, a floor and a space, the report is generated for the values selected.

NOTE: Press **Ctrl and click to select multiple options in the filter fields or press **Shift** and click to select all options in a field.**

10.4 Using Report Filters

Many of the reports can be filtered by device name, building, floor, space, zone, group or category. Selecting a report displays the Filters panel fields. Each of the filter levels is optional and one or more levels can be utilized at a time. Each report runs using the lowest level of the selected filters. For example, if you select a building and a floor, but no space or zone, the report is run for the selected floor, subject to other input.

The All, None and Inverse options are provided to select items in the filter lists. In order to use the Inverse option, you must select the items you do not want to include, then select *Inverse* to select the remaining items.

Table 10.3 Report Filters

FILTER TYPE	LIST DESCRIPTION
Device Name	Name of the device.
Start and End dates	Required selections for the start and end times for data collection.
Building	Buildings in the Enterprise node.
Floor	Floors based on the buildings selected.
Space	Spaces based on the floors selected.
Zone	Zones based on the spaces selected.
Group Input	Device groups are displayed based on the selected building, floor, space and zone. Only assigned groups for the selected criteria are displayed.
Category Input	Categories of devices in the database are displayed based on the selected building, floor, space and zone. Only available categories for the selected criteria are displayed.

10.4.1 Creating a custom filter

Custom filters can be created to run reports for different floors, spaces or zones in a building.

NOTE: The input control must be configured and added to the report.

To create a custom filter:

- Click the Reports icon and select a folder (usually a personal folder).
- In the Folders context menu, click *Shared Components - Input Controls*.
- Under Report Templates, select the type of input control.

NOTE: For more information about creating input controls, see www.jaspersoft.com.

- Enter the prompt text for the label displayed next to the type of input control, the parameter name value to match the name of the parameter in your report and a description.

5. Click *Next*.
6. In the Add Datatype window, use the default Define a Datatype radio button.

-or-

Click to enable the Select a Datatype from the repository radio button.
7. In the Set the Datatype Kind and Properties window, enter the type, name, resource ID, description and pattern for the filter and click *SAVE*.
8. If Select a Datatype from the repository is selected, go to step 9 to create a resource.

-or-

Proceed to step 11.
9. In the Edit List of Values window, enter a name, resource ID and description for the filter.
10. In the area on the right, enter a name and value for each item and click the *Add* button to add a new item.

-or-

Click the *Remove* button to remove a row.
11. After all values are added, click *Submit*.
12. Select and run a report to verify the new filter is applied and functioning.

To save a group of filters for a specific report:

1. Click the Reports icon and select a folder (usually a personal folder).
2. In the Folders context menu, click *Shared Components - Input Controls*.
3. Under Report Templates, select a report and click *Copy*.
4. In the context menu, navigate to a personal folder and click *Paste*.
5. In the content list, select a report.
6. In the Filters context fields, select the data, select the report type and click *SAVE*.
7. In the Save Values window, enter a name for the filter and click *SAVE*.

To select a group of filters for a specific report:

1. Under Use saved values, click the arrow to display the saved filters.
2. In the saved filters drop-down list, select a filter and click *Run*.
3. Click *Reset* to refresh the filter options and default to None.

10.5 Running a Report

NOTE: When loading a report, at any time you can click *Cancel Loading Data* to stop the report or click *Back* to return to the Folder.

To run a report:

1. Click the Reports icon, and under Folders select the applicable folder.
2. In the Report Templates content, click the name of the report.
3. In the header, select the applicable filters and click *Run*.

NOTE: As the report is generating, you can use the page forward and page back icons to see the report as it loads.

10.6 Editing a Report

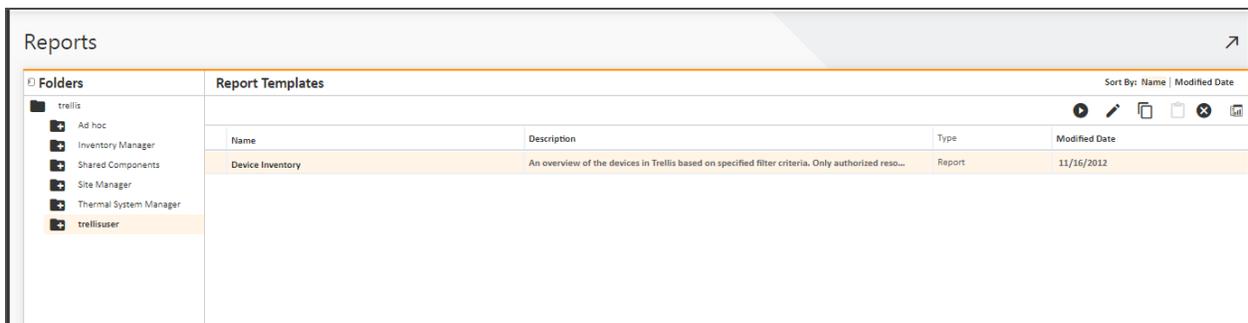
To edit a report:

1. In the Report Templates window, select the report and click the Edit icon.

-or-

Click the report and select *Edit* from the drop-down menu.

Figure 10.3 Editing a Report



2. In the Set Up the Report content, enter the report's name and description.

3. Select the Upload a Local File radio button and click *Browse*.

-or-

Select the Select a JRXML from the repository radio button and click *Browse*.

4. Click *Submit*.
5. If you selected to get the input control from the repository, in the Select Resource From Repository pop-up window, select the resource and click *Select*.
6. (Optional) If additional criteria is required, enter the criteria under Add Input Control and click *Submit*.
7. Select and run a report to verify the new filter is applied and functioning.

10.7 Exporting a Report

To export a report:

1. After a report is run, hover the cursor over the Export arrow beside the Back button and select a report format, such as PDF, and click *SAVE*.
2. In the dialog box, enable the desired information and click *OK*.

10.8 Formatting a Report

After a report is generated, its columns can be moved and sized. By clicking a column's header, additional icons are displayed from left to right to format or hide the column, filter the column or sort each column individually in ascending or descending order. The leftmost icon's format options are:

- Headings - Format the header text and table cells
- Values - Format the values and table cells
- Conditional Formatting - Adds conditions to the tables

The following procedures begin in an opened report.

To move a column to a new location:

1. Click and hold a column header to display the column's format options.
2. Click the header again, and while holding the mouse button down, drag the column to the new column position and release it.

To change a column's width:

Place your cursor over the vertical line between each column and drag the line.

To hide or show a column:

1. Click a column header.
2. In the displayed bar, click the Column options drop-down arrow and select the *Hide/Show* option.

To format the column header text and cells:

1. Click a column header.
2. In the displayed bar, click the Column options drop-down arrow and select the *Formatting* option.
3. In the Format column window, click the *Headings*, *Values* and *Conditional Formatting* tabs and select or enter the applicable formatting options.
4. Click *OK* for each window.

To filter a column:

1. Click a column header.
2. In the displayed bar, click the *Column filters* icon.
3. In the Filter column window, select the Show all rows or Show only rows where radio button.
4. Click the drop-down arrow and select the applicable rule.
5. Enter the value and click *OK*.

To sort a column:

1. Click a column header.
2. In the displayed bar, click the Ascending or Descending icon.

10.9 Scheduling a Report

Reports can be scheduled to run automatically, periodically or at a future date. When scheduling a report to run periodically, the following values are available:

- Minutes (1-59)
- Hours (1 to 24)
- Days (only one)
- Weeks (only one)

To schedule a report:

1. Click the Reports icon, click the applicable folder, click the report and click *Schedule*.
2. Enter a name and description, enable the start date and time and click the calendar icon to select a date.
3. Slide the Hour and Minute bars to the desired time.

4. Click *Run Once*.

-or-

Click *Repeat* and enable one of the following:

- No end date
- End After and enter the number of counts
- End by and enter or select a date

5. Click *Next* and under Set the Parameter Values, select the filter options and click *SAVE*.

-or-

Click *Next* to continue.

6. Enter a name and description for the scheduled report, enable one or more file formats and click *Submit*.

7. After the report is generated and you have received a notification, you can open your folder to view the report.

10.10 Ad Hoc Reports

The Ad hoc reports function allows you to create customized reports, quickly communicate data and view resource utilization. Ad hoc reports are web-based, drag-and-drop reports that can be viewed as a table, chart or in a cross-tab format. Any report can be modified to create an Ad hoc report. Reports are either saved in the Ad hoc folder for public use or in your user folder for private use.

There are several stages for creating a report. First, you select the names of the columns and rows for the report. In the software, these are listed under Fields. You can select the fields by drag-and-drop or using directional arrows. After the column and row types are selected, you can begin creating/designing the table. The columns and rows can be in any order. After the table is completed, you can change the format.

When built-in domains do not have the fields you are looking for, additional views are available by creating a new domain. New domains can be created for Ad hoc reports; however, in order to create a domain, you must be knowledgeable of the database schema and the intended purpose of the report domain. Table names ending in LITE are recommended for better performance; however, if there is no applicable LITE option, any domain table can be used.

NOTE: A Domain/Domain Editor is required in the *Trellis*™ platform user interface to connect to a pre-defined AnalyticsDS Data Source and Database Schema CDMR in order to get the available views for Ad hoc reports.

For faster report generation, there are four default domains:

- Device and Containers domain - Contains information about all devices, device placements and capacities. Container capacities are available for aggregations wherever required; also contains a summary of daily data from the Time Series Domain (TSD) for designed versus measured comparisons.
- UDP domain - Contains information about devices, their placements and user-defined properties (UDPs); also contains an instance of connection to UDPs.
- Connections domain - Contains information about all the devices, device placements and power and data connections in the system.
- Weekly Time Series domain - Contains weekly historical data of the device data points and the device placement information of the devices.

NOTE: CDMR and TSD are the only available schema to be used when creating a domain for reports.

NOTE: This information is provided to create basic ad hoc reports. For more advanced uses of the ad hoc reports feature, such as derived tables and calculated fields, see jaspersoft.com.

To create an Ad hoc report:

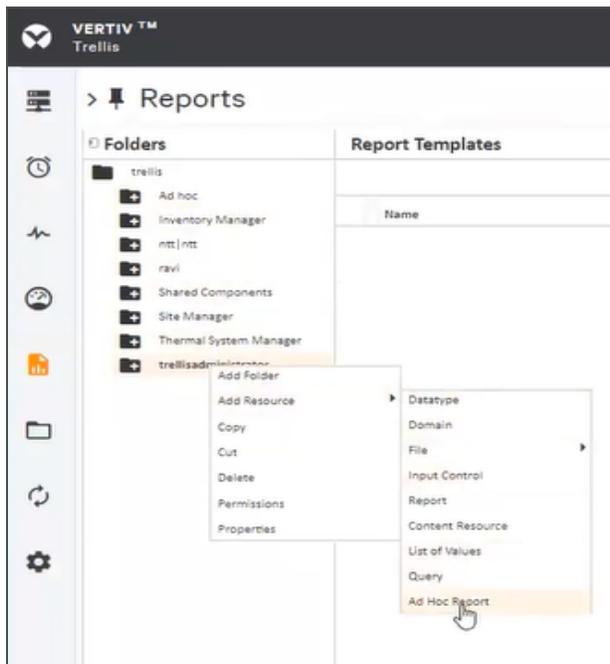
NOTE: Select a personal folder to create a private report or click the *Ad hoc* folder to create a public report.

1. Click the Reports icon.
2. Right-click the *Ad hoc* folder and select *Add Resource - Ad Hoc Report*.

-or-

Right-click a personal folder and select *Add Resource - Ad Hoc Report*.

Figure 10.4



NOTE: Personal folders are recommended for private reports and better control of reports.

3. In the Data Chooser: Source window, select *Topics*.

-or-

Select *Domains*.

NOTE: Whether you choose to select *Topic* or *Domain*, the steps are basically the same.

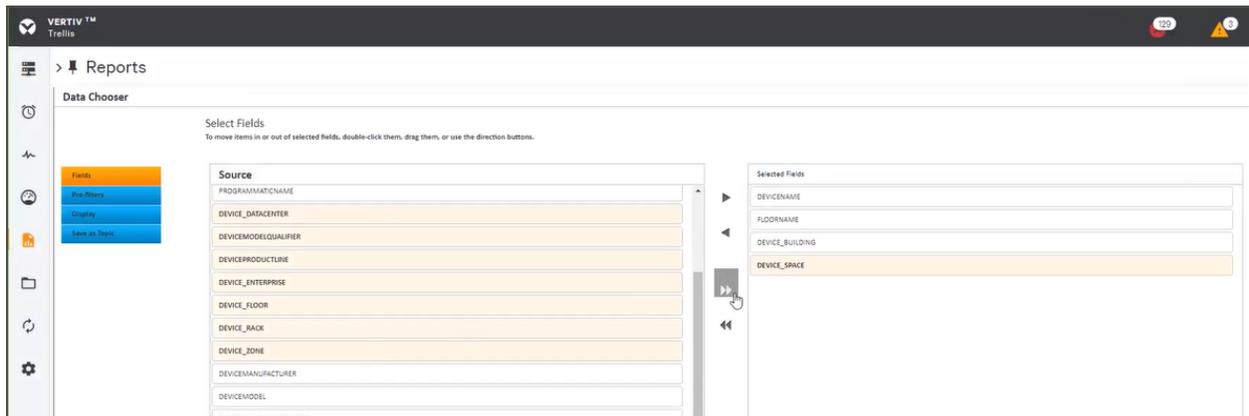
4. If *Domains* is selected, click the *Ad hoc* folder in the Data Chooser:Source window to expand the menu, select the desired domain and click *Choose Data*.
5. Under Source, use one of the following methods to select the rows and columns for your report and then move them to the Selected Fields area:
 - To select a single field, click the field name and click the single arrow.

-or-

Click the field name and drag it.

- To select multiple fields simultaneously, click the first selection, then scroll and hold the **Shift** key while selecting the second or last in the list of fields.
- To select all fields, click the double arrow.

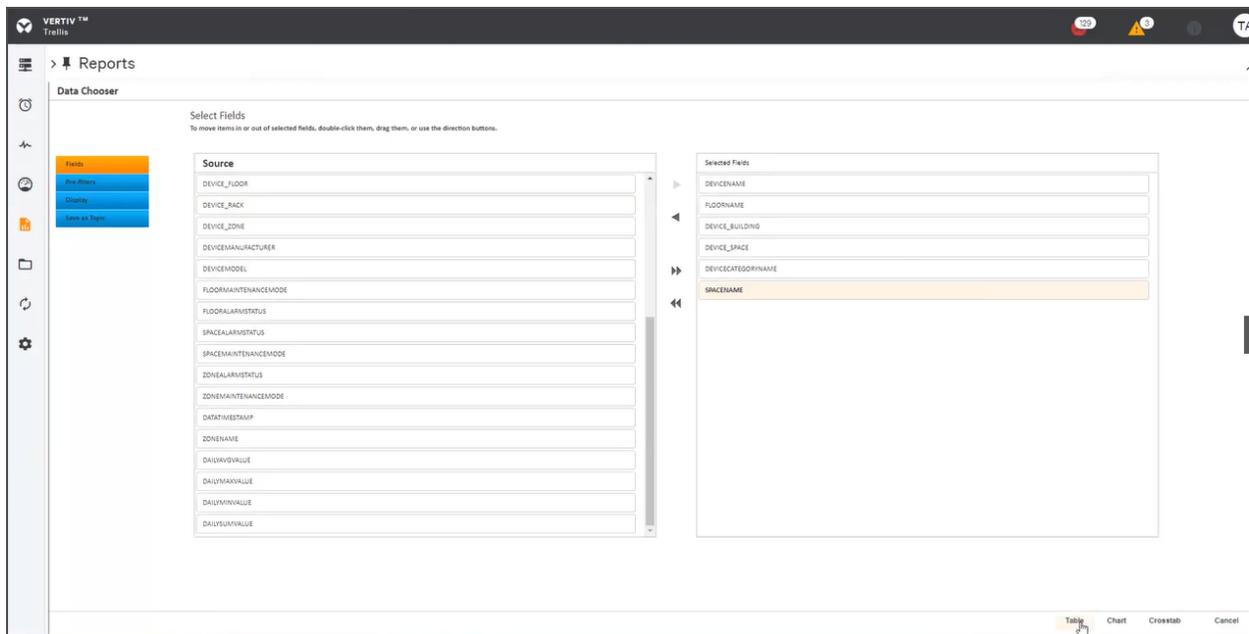
Figure 10.5 Selecting Sources for Fields



6. After selecting the type of information you want in the report, select the *Table*, *Chart* or *Crosstab* format in the lower right corner.

NOTE: After the report is created, you can select a different format.

Figure 10.6 Selecting the Format



NOTE: The column and row names you select are listed under **Fields** in the **New Ad Hoc View** window.

7. In the **New Ad Hoc View** window under **Fields**, click and drag the names to the **Column** or **Groups (rows)** fields to define the report.

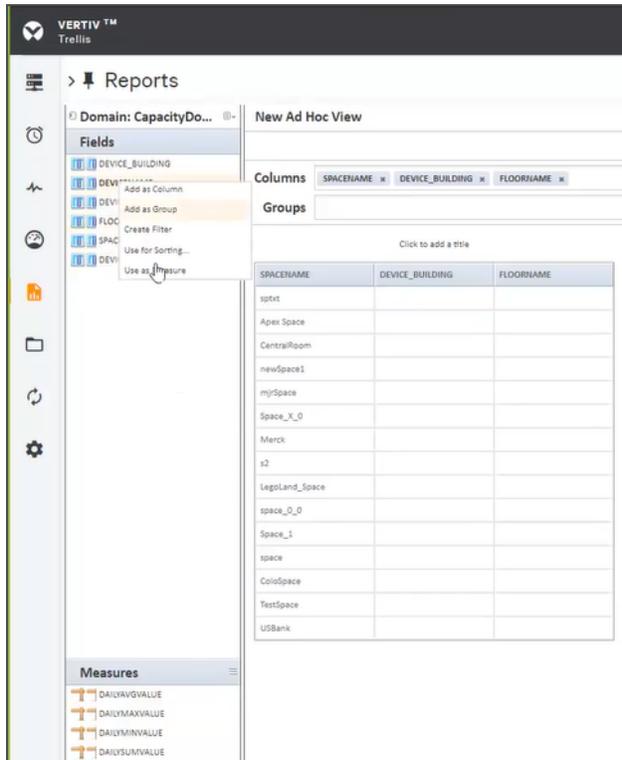
NOTE: You can also add columns or rows with measurements.

- To create columns or rows for measured values, you can click the drop-down arrow above the Field header and select to add fields. Right-click the field names with VALUE in the name and select *Use as Measure*.

-OR-

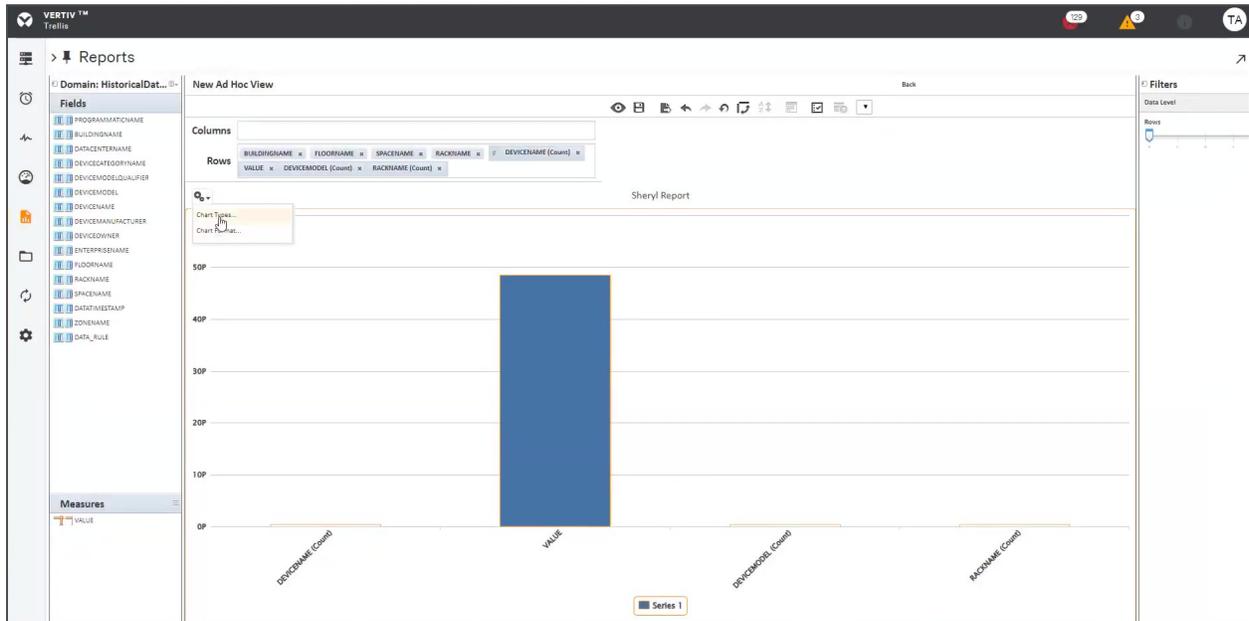
Click and drag the Value field names under the Measures title in the left panel.

Figure 10.7 Selecting Use as Measure



- Above the table, select *Click to add a title* and enter a title in the displayed field.
- To change the format of the information, click the drop-down arrow in the header and select *Chart Types* or *Chart Format*.

Figure 10.8 Saving the Chart Format



11. In the New Ad Hoc View header, hover over and click the disk (Save) icon and select one of the following:
 - Save Ad Hoc View.
 - Save Ad Hoc View As...
 - Save Ad Hoc View and Create Report.

12. Enter a data view name and a report name, and enter a description if necessary.
13. Select a personal or public folder location to save the report, and then click **SAVE**. A message confirms the save.

NOTE: Some folders, such as the Inventory Module folder, cannot be used for reports.

14. Click *Back* to go back to the Reports Templates main window to select and view the created report.
15. In the Reports Templates content, click the report type to view, run, edit, schedule or delete the report data.

-or-

Click the *Ad Hoc View* type to open, copy, delete or modify the report.

To access an Ad hoc report:

1. Click the Reports icon and select *Ad Hoc*.
- or-
- Select a personal folder.
2. Click the applicable folder containing the report and select the report name.

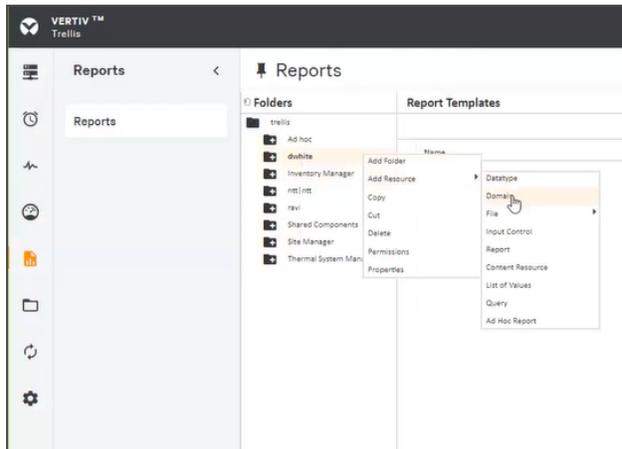
To delete a report:

Click *Close*, and in the Report Templates window, select the report, click the Delete icon and click **DELETE** to confirm.

To create a domain:

1. Click the Reports icon, click the *Ad hoc* or a personal folder and click *Add Resource - Domain*.

Figure 10.9



2. In the Add New Domain: New Domain window, enter a name.
3. Keep or change the resource identification information, and enter a description or leave the Description field blank.
4. Click *Browse*, select a destination folder (public or private) for the domain and click *Select*.
5. Click *Browse*, select *trellis - Shared Components - Data Source - Analytics Datasource* and click *Select*.
6. Under Domain Design, select the Create with Domain Designer radio button and proceed to the next step.

-or-

If a design already exists, click the Upload radio button and click *Choose File*. If a design exists, this procedure is complete.

7. In the Select Database Schema window, scroll the list to select *CDMR* and/or *TSD* from the list of schema and click *OK* for each selection.

NOTE: Only the CDMR and/or TSD schemas are available for creating a domain.

8. Under Domain Designer: New Domain, select the applicable tables.
9. Under Data Source, select the tables with LITE in the name and click the arrow to move your selections to the Selected table.

NOTE: Table names ending in LITE are recommended for better performance; however, if there are no applicable LITE options, any domain table can be used.

NOTE: The number of tables selected affects the time it takes for reports to run. At any time, you can click the *Tables* tab to return to the Data Sources window to select different tables.

10. In the header, click *Display* to display the resources to be used in the report.
11. Under Resources, select one or more resources and click the arrow to move your selections to the Sets and Items list.
12. After selecting your resource fields, click *OK* to return to the main domain window.
13. In the Properties panel, enter any details and click *Submit*.

Table 10.4 Ad hoc Report Views Example

VIEW NAME	COLUMNNAME	DESCRIPTION
COMPLEXOBJCAPACITYVIEW LITE: View of Object Capacities; each row represents a specific capacity for owner object.	OBJOID	Object identifier (OID) of the owner object, such as device, rack, building, floor, space, zone and data center.
	CAPACITYNAME	Displays the name of the capacity.
	CAPACITYTAG	Capacity tag for this capacity.
	CAPACITYVALUETYPE	Value type of the capacity object.
	CAPACITYVALUE	Actual capacity value stored for the owner/programmatic name.
	BEGINS	Valid start time for this record; always 0 (means the closest or now context).
	ENDS	Valid end time for this record; a value greater than 0 and less than 9223372036854775807.
	UOMNAME	Display name of the unit of measure associated with the capacity.
	UOMTAG	Programmatic name or tag for the unit of measure.
CONNECTIONUDPVIEWLITE: View showing the User Defined Properties (UDP) on connections.	CONNECTIONOID	Connection object identifier (OID).
	OPENINGOID	Value is never populated (deprecated).
	UPDVALUEOID	UDP object identifier (OID).
	UDPNAME	Display name of the UDP.
	UDPPROGRAMMATICNAME	Programmatic name or tag for the UDP.
	UDPDTYPE	UDP type.
	VALUETYPE	Value type of the UDP.
	STRINGUDPVALUE	If the value type is STRING, this is going to store the UDP value.
	TIMEUDPVALUE	If the value type is not STRING, the value can be represented as numeric (FLOAT, BIGDECIMAL, or TIME).

Table 10.4 Ad hoc Report Views Example (continued)

VIEW NAME	COLUMNNAME	DESCRIPTION
CONTAINerviewLITE: Overall view of containers (floors, spaces, buildings, datacenters, zones). It exposes very basic information about these types of containers, also makes reference to the parent container in the case the whole parent hierarchy is needed. This view is the result of joining the tables DCIMCOMPLEXOBJECT, ABSTRACTCONTAINER and PHYSICALPLACEMENT.	CONTAINEROID	Container object identifier (OID).
	CONTAINERNAME	Name of the container.
	CONTAINERTYPE	Type of the container.
	CONTAINERALARMSTATUS	Overall alarm status for the container.
	CONTAINERMAINTENANCE MODE	Determine if the container is in maintenance mode (if maintenance activities are being carried out in the container.)
	PARENTOID	Object identifier (OID) of the parent container this container is placed in.
	PARENTNAME	Name of the parent container where this container is located.
DATACENTERVIEWLITE: Overall view of the datacenters. It exposes very basic information about datacenters. This view is the result of joining the tables DCIMCOMPLEXOBJECT and ABSTRACTCONTAINER.	PARENTTYPE	Type of the parent container.
	DATACENTEROID	Data center object identifier (OID).
	DATACENTERNAME	Name of the data center.
	DATACENTERALARMSTATUS	Overall alarm status for the data center.
	DATACENTERMAINTENANCE MODE	Determines if the data center is in maintenance mode.

Table 10.4 Ad hoc Report Views Example (continued)

VIEW NAME	COLUMNNAME	DESCRIPTION
DEVICELOCATIONVIEWLITE: Overall view of the devices. It performs all necessary joins to maintain basic device information along with device location. This view is the result of joining the tables: DCIMCOMPLEXOBJECT, PHYSICALOBJECT, DEVICE, OBJECTCATEGORY. Also joins in the names of the denormalized placement information such as Building, Floor, Space and Zone.	DEVICEOID	Device object identifier (OID).
	DEVICETYPE	Type of device.
	DEVICENAME	Name of the device.
	DEVICEMANUFACTURER	Device manufacturer.
	DEVICEMODEL	Manufacturer model number or model name for the device.
	DEVICEMODELQUALIFIER	An additional model qualifier that differentiates two different versions of the model.
	DEVICECOMMENTS	Comments made for the device.
	DEVICEOWNER	Name of the owner of this device, entered by the user.
	DEVIDESCRPTION	Device description.
	DEVICEFULLCATEGORYNAME	Device's main category name.
	DEVICECATEGORYNAME	Programmatic name of the main category of the device.
	DEVICWEIGHT	Device weight.
	DEVICEHEIGHT	Device height.
	DEVICewidth	Device width.
DEVICEDPTH	Device depth.	
ENTERPRISEOID	Object identifier (OID) of the Enterprise the device is placed in.	
	BUILDINGOID	Object identifier (OID) of the Building the device is placed in.
	FLOOROID	Object identifier (OID) of the Floor the device is placed in.
	SPACEOID	Object identifier (OID) of the Space the device is placed in.
	ZONEOID	Object identifier (OID) of the Zone the device is placed in.
	DATACENTEROID	Object identifier (OID) of the Data center the device is placed in.
	RACKOID	Object identifier (OID) of the Rack the device is placed in.
	DEVICERACKPOSITION	If the device is placed in a rack, this is the position inside the rack that the device is located in.
	DEVICEISPLACED	Determines if a device is placed on a space with X, Y coordinates. It may pertain to the device directly or to a device placed in or on another device that meets the criteria. For example, a server in a rack is

Table 10.4 Ad hoc Report Views Example (continued)

VIEW NAME	COLUMNNAME	DESCRIPTION
		placed if the rack is placed.
	RFID	Radio Frequency Identification (RFID) tag for a device.
	RFIDPOSITION	Position of the RFID tag in the device.
	DEVICETYPEOID	Reference to the DeviceType (symbol) that the device is associated with and from which this device was created.
	DEVICEURL	URL for the main web page of the device. Could be the device portal or main console URL.
	DEVICELICENSETIERTAG	License tier associated to this device.
	DEVICEPRODUCTLINE	Product line defined by the manufacturer. This may be null if not defined by the manufacturer.
	DEVICE_DATACENTER	Name of the data center where the device is located.
	DEVICE_ENTERPRISE	Name of the enterprise where the device is located.
	DEVICE_BUILDING	Name of the building where the device is located.
	DEVICE_FLOOR	Name of the floor where the device is located.
	DEVICE_SPACE	Name of the space where the device is located.
	DEVICE_ZONE	Name of the zone where the device is located.
	DEVICE_RACK	Name of the rack where the device is located.
FLOORVIEWLITE: Overall view of the floors. It exposes very basic information about floors. This view is the result of joining the tables DCIMCOMPLEXOBJECT and ABSTRACTCONTAINER.	FLOOROID	Floor object identifier (OID).
	FLOORNAME	Name of the floor.
	FLOORALARMSTATUS	Overall alarm status for the floor.
	FLOORMAINTENANCEMODE	Determine if the floor is in maintenance mode.
SPACEVIEWLITE: Overall view of the spaces. It exposes very basic information about spaces. This view is the result of joining the tables DCIMCOMPLEXOBJECT and ABSTRACTCONTAINER.	SPACEOID	Space object identifier (OID).
	SPACENAME	Name of the space.
	SPACEALARMSTATUS	Overall alarm status for the space.
	SPACEMAINTENANCEMODE	Determine if the space is in maintenance mode.
ZONEVIEWLITE: Overall view of the zones. It exposes very basic information about zones. This view is the result of joining the tables DCIMCOMPLEXOBJECT and ABSTRACTCONTAINER.	ZONEOID	Zone object identifier (OID).
	ZONENAME	Name of the zone.
	ZONEALARMSTATUS	Overall alarm status for the zone.
	ZONEMAINTENANCEMODE	Determine if the zone is in maintenance mode.

Table 10.5 Ad hoc Report Views Example

VIEW NAME	COLUMN NAME	DESCRIPTION
COMPLEXOBJCAPACITYVIEW LITE: View of Object Capacities; each row represents a specific capacity for owner object.	OBJOID	Object identifier (OID) of the owner object, such as device, rack, building, floor, space, zone and data center.
	CAPACITYNAME	Displays the name of the capacity.
	CAPACITYTAG	Capacity tag for this capacity.
	CAPACITYVALUETYPE	Value type of the capacity object.
	CAPACITYVALUE	Actual capacity value stored for the owner/programmatic name.
	BEGINS	Valid start time for this record; always 0 (means the closest or now context).
	ENDS	Valid end time for this record; a value greater than 0 and less than 9223372036854775807.
	UOMNAME	Display name of the unit of measure associated with the capacity.
	UOMTAG	Programmatic name or tag for the unit of measure.
CONNECTIONUDPVIEWLITE: View showing the User Defined Properties (UDP) on connections.	CONNECTIONOID	Connection object identifier (OID).
	OPENINGOID	Value is never populated (deprecated).
	UPDVALUEOID	UDP object identifier (OID).
	UDPNAME	Display name of the UDP.
	UDPPROGRAMMATICNAME	Programmatic name or tag for the UDP.
	UDPDTYPE	UDP type.
	VALUETYPE	Value type of the UDP.
	STRINGUDPVALUE	If the value type is STRING, this is going to store the UDP value.
	TIMEUDPVALUE	If the value type is not STRING, the value can be represented as numeric (FLOAT, BIGDECIMAL, or TIME).

Table 10.5 Ad hoc Report Views Example (continued)

VIEW NAME	COLUMN NAME	DESCRIPTION
CONTAINERVEIWLITE: Overall view of containers (floors, spaces, buildings, datacenters, zones). It exposes very basic information about these types of containers, also makes reference to the parent container in the case the whole parent hierarchy is needed. This view is the result of joining the tables DCIMCOMPLEXOBJECT, ABSTRACTCONTAINER and PHYSICALPLACEMENT.	CONTAINEROID	Container object identifier (OID).
	CONTAINERTYPE	Type of the container.
	CONTAINERALARMSTATUS	Overall alarm status for the container.
	CONTAINERMAINTENANCE MODE	Determine if the container is in maintenance mode (if maintenance activities are being carried out in the container.)
	PARENTOID	Object identifier (OID) of the parent container this container is placed in.
	PARENTNAME	Name of the parent container where this container is located.
	PARENTTYPE	Type of the parent container.
DATACENTERVIEWLITE: Overall view of the datacenters. It exposes very basic information about datacenters. This view is the result of joining the tables DCIMCOMPLEXOBJECT and ABSTRACTCONTAINER.	DATACENTEROID	Data center object identifier (OID).
	DATACENTERNAME	Name of the data center.
	DATACENTERALARMSTATUS	Overall alarm status for the data center.
	DATACENTERMAINTENANCE MODE	Determines if the data center is in maintenance mode.

Table 10.5 Ad hoc Report Views Example (continued)

VIEW NAME	COLUMN NAME	DESCRIPTION
DEVICELOCATIONVIEWLITE: Overall view of the devices. It performs all necessary joins to maintain basic device information along with device location. This view is the result of joining the tables: DCIMCOMPLEXOBJECT, PHYSICALOBJECT, DEVICE, OBJECTCATEGORY. Also joins in the names of the denormalized placement information such as Building, Floor, Space and Zone.	DEVICEOID	Device object identifier (OID).
	DEVICETYPE	Type of device.
	DEVICENAME	Name of the device.
	DEVICEMANUFACTURER	Device manufacturer.
	DEVICEMODEL	Manufacturer model number or model name for the device.
	DEVICEMODELQUALIFIER	An additional model qualifier that differentiates two different versions of the model.
	DEVICECOMMENTS	Comments made for the device.
	DEVICEOWNER	Name of the owner of this device, entered by the user.
	DEVIDEDESCRIPTION	Device description.
	DEVICEFULLCATEGORYNAME	Device's main category name.
	DEVICECATEGORYNAME	Programmatic name of the main category of the device.
	DEVICEWEIGHT	Device weight.
	DEVICEHEIGHT	Device height.
	DEVICewidth	Device width.
DEVICEDDEPTH	Device depth.	
ENTERPRISEOID	Object identifier (OID) of the Enterprise the device is placed in.	
	BUILDINGOID	Object identifier (OID) of the Building the device is placed in.
	FLOOROID	Object identifier (OID) of the Floor the device is placed in.
	SPACEOID	Object identifier (OID) of the Space the device is placed in.
	ZONEOID	Object identifier (OID) of the Zone the device is placed in.
	DATACENTEROID	Object identifier (OID) of the Data center the device is placed in.
	RACKOID	Object identifier (OID) of the Rack the device is placed in.
	DEVICERACKPOSITION	If the device is placed in a rack, this is the position inside the rack that the device is located in.
	DEVICEISPLACED	Determines if a device is placed on a space with X, Y coordinates. It may pertain to the device directly or to a device placed in or on another device that meets the criteria. For example, a server in a rack is

Table 10.5 Ad hoc Report Views Example (continued)

VIEW NAME	COLUMN NAME	DESCRIPTION
		placed if the rack is placed.
	RFID	Radio Frequency Identification (RFID) tag for a device.
	RFIDPOSITION	Position of the RFID tag in the device.
	DEVICETYPEOID	Reference to the DeviceType (symbol) that the device is associated with and from which this device was created.
	DEVICEURL	URL for the main web page of the device. Could be the device portal or main console URL.
	DEVICELICENSETIERTAG	License tier associated to this device.
	DEVICEPRODUCTLINE	Product line defined by the manufacturer. This may be null if not defined by the manufacturer.
	DEVICE_DATACENTER	Name of the data center where the device is located.
	DEVICE_ENTERPRISE	Name of the enterprise where the device is located.
	DEVICE_BUILDING	Name of the building where the device is located.
	DEVICE_FLOOR	Name of the floor where the device is located.
	DEVICE_SPACE	Name of the space where the device is located.
	DEVICE_ZONE	Name of the zone where the device is located.
	DEVICE_RACK	Name of the rack where the device is located.
FLOORVIEWLITE: Overall view of the floors. It exposes very basic information about floors. This view is the result of joining the tables DCIMCOMPLEXOBJECT and ABSTRACTCONTAINER.	FLOOROID	Floor object identifier (OID).
	FLOORNAME	Name of the floor.
	FLOORALARMSTATUS	Overall alarm status for the floor.
	FLOORMAINTENANCEMODE	Determine if the floor is in maintenance mode.
SPACEVIEWLITE: Overall view of the spaces. It exposes very basic information about spaces. This view is the result of joining the tables DCIMCOMPLEXOBJECT and ABSTRACTCONTAINER.	SPACEOID	Space object identifier (OID).
	SPACENAME	Name of the space.
	SPACEALARMSTATUS	Overall alarm status for the space.
	SPACEMAINTENANCEMODE	Determine if the space is in maintenance mode.
ZONEVIEWLITE: Overall view of the zones. It exposes very basic information about zones. This view is the result of joining the tables DCIMCOMPLEXOBJECT and ABSTRACTCONTAINER.	ZONEOID	Zone object identifier (OID).
	ZONENAME	Name of the zone.
	ZONEALARMSTATUS	Overall alarm status for the zone.
	ZONEMAINTENANCEMODE	Determine if the zone is in maintenance mode.

11 DATA MANAGEMENT

The Bulk Data Processing tool, provided with the *Trellis*™ platform, is an application that allows you to create, update and delete large quantities of data in the platform's database.

NOTE: The Bulk Data Processing tool must be run using the `trellisAdministrator` role. It cannot be run by a tenant.

With this tool, you can perform updates such as changing names and moving devices to a different location. The types of data that can be bulk loaded includes containers, device categories, connections and ports. Containers are buildings, floors, rectangular and custom spaces (using x/y coordinates) and zones. Devices can be floor or rack mounted and include racks, servers, components, panels, breakers and so on. Connections include power and data.

NOTE: A US English version of Excel is required in order to use this tool.

The tool includes an Excel™ template for each operation (create, update and delete), and also includes a sample spreadsheet file for each template. The sample can be used as a guide when designing and filling in your spreadsheet. After the required data is entered and loaded into the *Trellis*™ platform, the platform outputs an Excel™ spreadsheet with status messages to confirm that each container, device category, connection or port is successfully loaded into the platform database. When the bulk load process is complete, the processed data can be viewed from the *Trellis*™ platform software.

The File Converter Tool is also included with the Bulk Data Processing tool in order to convert the following types of files into spreadsheets that make up a Bulk Data Processing workbook:

- Floor.zip files created with the export function of a previous version of the *Trellis*™ platform.
- CSV files for devices (excluding ports) that are produced by the Avocent® DSView™ management software. To obtain and import the DSView software files, see [Importing DSView™ 4 Management Software CSV Files](#) on page 338.

The system requirements for the Bulk Data Processing tool are within the requirements for the *Trellis*™ workstation. These requirements are listed in The TRELLIS™ Real-Time Infrastructure Optimization Platform Pre-Installation Installer/User Guide.

NOTE: The recommended chunk size is the default setting 5. If items on a spreadsheet tab are interdependent, they must not be within the same chunk.

NOTE: Java version 8 or later is required to use the Bulk Data Processing tool.

NOTE: The red-highlighted columns in the tables should only be filled using Excel™ formulas. The formulas do not become active until the "allow editing" link is selected in the applicable worksheet.

11.1 Understanding Spreadsheets

The Bulk Data Processing tool provides the following templates for bulk operations:

- *trellisCreateTemplate.xlsx*
- *trellisUpdateTemplate.xlsx*
- *trellisDeleteTemplate.xlsx*

When you click one of these template files, the Introduction window opens with a row of bulk loading spreadsheet tabs on the bottom bar. The arrows on the lower left side of the bar and the vertical slider on the lower right side of the bar are used to access different types of spreadsheets. A color-coded legend in the upper window provides the requirements for the different types of spreadsheet columns. The scroll bar in the lower right is used to adjust the spreadsheet to display all the columns after a spreadsheet is open.

The following table provides the different types of spreadsheets. As shown in the table, the Create, Update and Delete bulk load operations are possible for each spreadsheet with the exception of Zones, which can only be updated using the tool. The Required Data column lists the items that must be included in the spreadsheet before the tool can process the data.

Table 11.1 Spreadsheet Operations and Data Requirements

SPREADSHEET	OPERATIONS	REQUIRED DATA
Buildings	Create, Update and Delete	N/A
Floors	Create, Update and Delete	Buildings
Rectangular Spaces	Create and Update	Floors
Custom Spaces	Create and Update	Floors
Spaces	Delete	Floors
Unplaced Devices	Create and Delete	Floors or Spaces
Zones	Update	Spaces
Racks and Cabinets	Create, Update and Delete	Spaces
Rack Mounted Devices	Create, Update and Delete	Racks
Rack Mounted Devices (Zero U)	Create, Update and Delete	Racks
Floor Mounted Devices	Create, Update and Delete	Floors and spaces
Blades	Create, Update and Delete	Rack mounted devices
Components	Create, Update and Delete	Rack mounted devices
Power Strips (FMD)	Create, Update and Delete	Floors and spaces
Generators	Create, Update and Delete	Buildings
UPSs	Create, Update and Delete	Floors and spaces
PDU's	Create, Update and Delete	Floors and spaces
RPPs	Create, Update and Delete	Floors and spaces
Panels	Create, Update and Delete	PDU and or RPP
Breakers	Create, Update and Delete	Panels
Breaker to PowerStrip	Create, Update and Delete	Breakers and power strips
Breaker to Device	Create, Update and Delete	Breakers and rack mounted devices
PowerStrip to Device	Create, Update and Delete	Power strips and rack mounted devices
Data Connections	Create, Update and Delete	Rack mounted devices
Update Port Names	Update	Port names
Update Slot Names	Update	Slot names

When you click one of the spreadsheet tabs on the bottom bar, it opens the selected spreadsheet with the default, color-coded column headers to guide you. The first 27 rows in each spreadsheet contain formulas and data validations to make entries intuitive. If additional rows are needed, rows 3-27 can be copied and pasted into the spreadsheet beginning with row 28. See [Spreadsheet Types](#) on page 284 for descriptions of the information that can be added in each column of each spreadsheet.

11.1.1 Data received from the server

The spreadsheet's Status, id, timestamp, Object, ErrorCode and ErrorMessage columns, which have red text on a yellow background, are used as output fields and should not be modified. These columns do not require any input and are populated by the server during the loading process. After a spreadsheet is processed, you can check these columns for blank fields or error and status messages to verify the process is successful. Any rows with blank fields or returned messages can be resubmitted.

11.1.2 Connection spreadsheets

Power connections can be bulk loaded into the *Trellis*™ platform database using the Breaker to PowerStrip, Breaker to Device and PowerStrip to Device spreadsheets. Data connections can be bulk loaded using the Data Connections spreadsheet.

11.1.3 User-defined properties

The columns in each spreadsheet can be customized. You can also add UDP values to be associated with devices, connections and containers that are previously defined in the *Trellis*™ platform.

The following conditions must be met when using user-defined properties:

- The values must be a string, date, date-time or numeric value consistent with the UDP type. The cell type should be text. The supported data formats are:
 - For dates : MM/dd/yyyy
 - For date-time : MM/dd/yyyy hh:mm:ss a
- The UDP name must include the applicable container, device category, connection or port.

11.1.4 Update Port and Slot Names

You can use the Update Port and Slot Names spreadsheets to rename the data and power ports of a device as well as any available slot names.

11.2 Using the Bulk Data Processing Tool

The following procedures describe how to download the Bulk Data Processing files, populate the customer data file spreadsheets, create user-defined properties in the spreadsheets and run the tool. User-defined properties must be previously created in the *Trellis*™ platform software. To create user-defined properties, see [User Defined Properties](#) on page 114.

To download the tool:

1. Log into the *Trellis*™ platform, click the Administration icon and select *System Settings*.
2. In the content header tools, click the Bulk Tool Download icon.
3. On your workstation, locate and right-click the downloaded *bulkdatabrocessing.zip* file.
4. Click *Extract All*, go to the location to install the files on your workstation and click *Extract*.

NOTE: After the files are unzipped, you cannot rename or change the structure or location of the Bulk Data Processing files. These files are only supported from the original download location.

To populate customer data file spreadsheets:

1. In the extracted bulkdatabrocessing folder, double-click the *trellisTemplates* folder and copy the applicable template and corresponding .yaml file to the *bulkdatabrocessing/datasource* folder.

NOTE: The new spreadsheet and yaml files must be saved to the /datasource folder in order to run the tool.

2. Rename the template file by removing Template from the name, for example, *trellisCreate.xlsx*.

NOTE: The filename cannot include special characters (+, &, # and so on).

3. Open the *trellisCreate.xlsx* file and then click to open the applicable container, device or connection type page using the tabs located in the lower part of the spreadsheet.
4. If you need additional rows, before entering data, select and copy row 3 up to row 27. Select row 28 and paste the copied rows. Repeat this step as needed.

NOTE: If you need to copy multiple rows, click the first row to be copied, hold the **Shift** key and click the last row to be copied, then select **Copy**.

5. After you add the necessary rows, populate the new spreadsheet with your data as shown in the following example. See the create, update or delete sample spreadsheet in the tool's *trellisTemplates* folder and select the applicable container, device or connection type from the tabs in the lower part of the spreadsheet. Also, see [Spreadsheet Types](#) on page 284 for the definitions of the values that can be added in each column of the spreadsheets.

Figure 11.1 Example: PDU Spreadsheet

Process	Building	Floor	Space	PDUName	Manufacturer	Model	ModelQualifier	SymbolTypeIdentifier	PlacementType	LayerName	XCoordinate	YCoordinate	Rotation	ZCoordinate	InputVolts	OutputVolts
FALSE	ROWS AND COLUMNS IN RED ARE RESERVED															
FALSE	Example: Create PDU with some optional parameters and capacities															
FALSE	Building_Floor_2	Space_1	PDU01	LIEBERT	PPA125C	PPA125C	LIEBERTPPA125CPPA125C	InSpace	RAISED-FLOOR	205	25	0	208	110		

6. Under the PROCESS column, click the drop-down arrow for each row and select *TRUE* to manually assign each row to be processed.

-or-

Click the drop-down arrow, select *FALSE* to prevent the data in the same row from being processed and proceed to process the next row.

NOTE: Selecting *FALSE* allows you to process only the rows that you are ready to process and prevents an error response due to an incomplete row.

7. Verify only the required sheets are included for processing. Otherwise, all spreadsheets included in the file are processed.

NOTE: Rows in a spreadsheet and whole spreadsheets that are after a blank field or a field with an error are not processed.

NOTE: Unnecessary spreadsheets can be deleted to improve performance when processing.

11.2.1 Referencing a component placed directly in a device

Sheets referencing components require input for DeviceName, ParentComponent and ComponentName. However, to reference a component placed directly in a device, the DeviceName must be ignored (using '@ignore') and the name should be entered as the ParentComponent. Either the device or the parent component must correspond to an item mounted directly in the rack.

Figure 11.2 Example: Creating a Card to Place Directly in a CISCO Appliance Using @ignore for the DeviceName

	Process	Building	Floor	Space	RackName	DeviceName	ParentComponent	ComponentName	Manufacturer	Model	ModelQualifier	SymbolTypeIdentifier
1												
2	FALSE											
3	FALSE											
4	FALSE											
5	FALSE	Building_1	Floor_Space_Rack1a			@ignore	CISCO01	BROADCOM01	BROADCOM	57800S430-4428		BROADCOM57800S430-4428
6	FALSE	Building_1	Floor_Space_Rack1a			CISCO01		BROADCOM01	CISCO	SFP-10 SFP-10G-LR		CISCO SFP-10G-LRSFP-10G-LR
7	FALSE											

11.2.2 Referencing a device slot in a rack-mounted device

The update slot names sheet requires input for ParentDevice and DeviceName. However, to reference a device placed directly in a rack, the ParentDevice must be ignored (using '@ignore') and the name should be entered as DeviceName. Either the device or the parent component must correspond to an item mounted directly in the rack.

Figure 11.3 Example: Renaming a Slot in a Blade Chassis Using @ignore for the ParentDevice

	Process	Building	Floor	Space	RackName	ParentDevice	DeviceName	Type	SlotName
1									
2	FALSE								
3	FALSE								
4	FALSE								
5	FALSE								
6	FALSE	Building_1	Floor_1	Space_1	Rack1a	@ignore	Blade Chassis	slot	1
7	FALSE								

11.2.3 Adding previously defined user-defined properties and values

To add previously defined user-defined properties and the UDP value to the object being created:

1. Go to the last column header on the right side of the spreadsheet and enter the prefix **UDP:** or **udp:**.
2. Without any spaces after the colon, enter the UDP category assignment followed by another colon, such as **UDP:udpCategory:** or **udp:udpCategory:**, where **udpCategory** is a previously assigned category assignment.
3. Without any spaces after the colon, enter the UDP name, such as **UDP:udpCategory:udpName** or **udp:udpCategory:udpName**, where **udpName** is a previously defined property name.
4. For each row with the added property name (for the container, device category, connection or port), enter the applicable value for the UDP under the appropriate column header.

Figure 11.4 Adding User Defined Properties

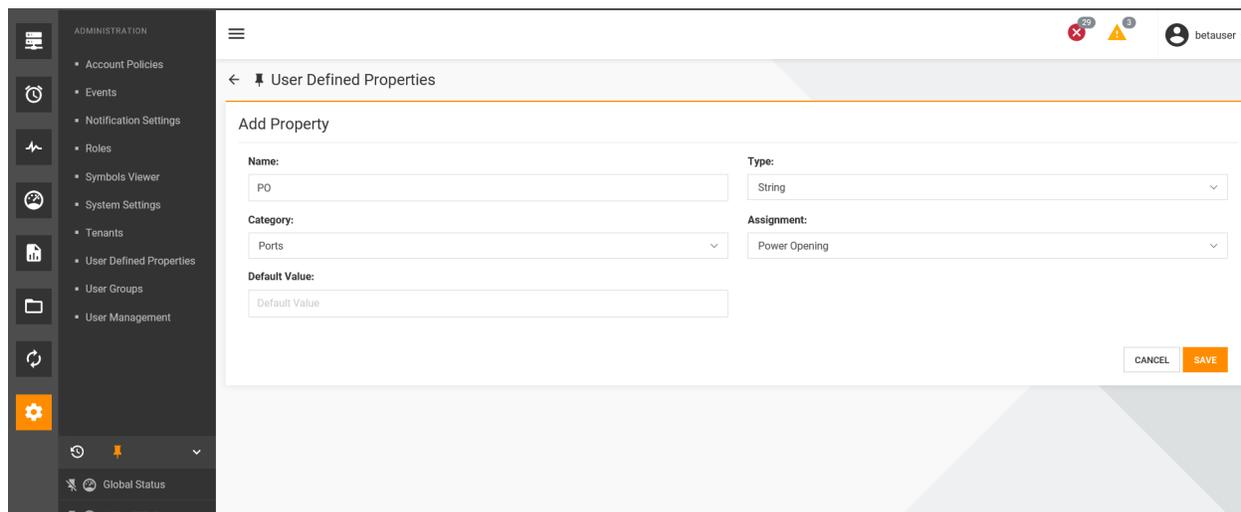


Figure 11.5 Location of the User Defined Property in the Spreadsheet

U	V	W	X	Y	Z	AA
Status	id	timestamp	Object	ErrorCode	ErrorMessage	UDP:poweropening:PO

5. After the tool is run, check the ErrorMessage column to verify all the UDPs are processed.

NOTE: If any UDPs are not processed, check for an incorrect UDP syntax.

11.2.4 Running the tool

NOTE: Only one instance of the tool can be run from a workstation at a time.

To run the tool:

1. For Windows®, run the *BulkDataProcessing.bat* file and keep the displayed Bulk Data Processing Command window open during the process.

-or-

For Red Hat® Enterprise Linux®, run the *BulkDataProcessing.sh* script.

NOTE: The Red Hat® Enterprise Linux® client must have graphical interface capabilities to run the tool.

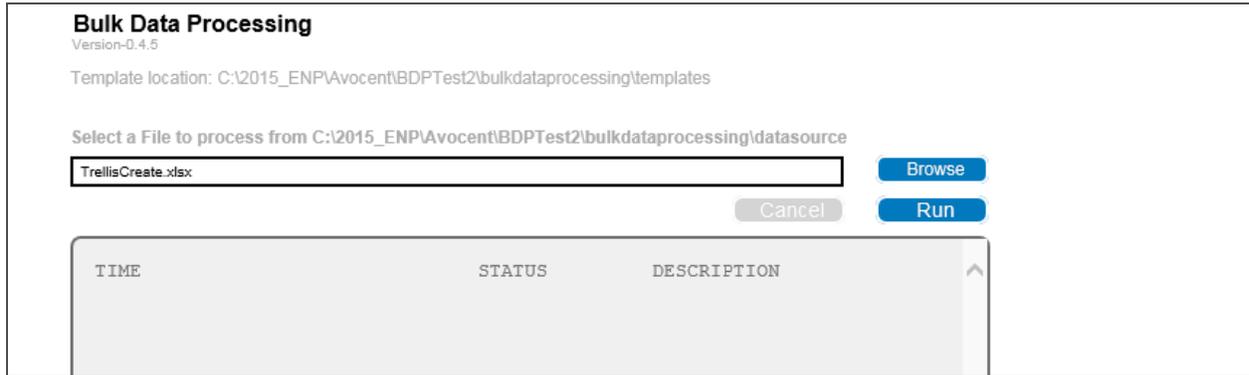
2. In the opened window, enter your username, password, the *Trellis™* platform Hostname or IP address and port number to be authorized, then click *Login*.

NOTE: The Port field specifies the port that the Bulk Data Processing tool uses to connect to applications via HTTPS. By default, the port is configured to 6443, but in some custom environments this port may be blocked by a firewall. If that is the case, use port 443.

NOTE: The account information used must have the correct permissions.

- In the Bulk Data Processing window, click *Browse* to locate the *bulkdataprocessing/datasource* folder and double-click a spreadsheet to process.

Figure 11.6 Bulk Data Processing GUI

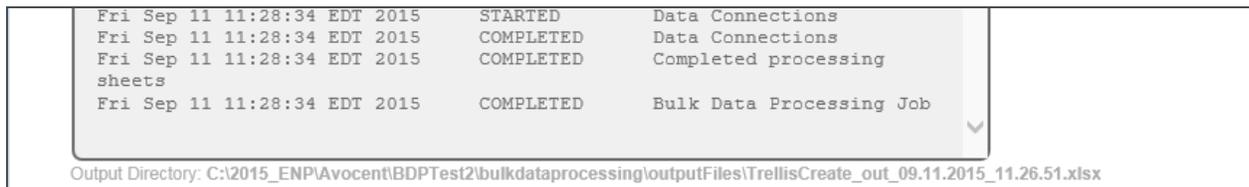


NOTE: Always execute a single entity. Executing multiple entities and/or multiple types of spreadsheets (create, update and delete) for an entity may display unexpected results.

- Click *Run* to start the tool and update the *Trellis™* platform database. See [Bulk Data Processing Error and Status Codes](#) on page 335 for status message descriptions.

NOTE: If you click *Cancel* during a process, any updates completed before the process is terminated are applied to the platform.

Figure 11.7 Bulk Data Processing Completed



- After the process is complete, using the output directory path displayed at the bottom of the window, browse to the *outputFiles* folder.
- Locate the file with the same name as the source spreadsheet and the extension *_out.xlsx*.
- In the Status column of the spreadsheet, verify the data is processed successfully from the spreadsheet to the *Trellis™* platform database.

Figure 11.8 Bulk Data Processing Output

	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL
1	Status	id	timestamp	Object	ErrorCode	ErrorMessage								
2														
3														
4	SUCCESS	1bdf5dba-c	Sep 11, 201	{id=1bdf5dba-c703-44b1-bac3-f575222c806c, returnCode=0, entity={name=Floor_1, comment=null, displayCategoryProgramn										
5														
6	SUCCESS	ad77467a-	Sep 11, 201	{id=ad77467a-a0e3-426a-a50c-529b5bfe4ba7, returnCode=0, entity={name=Floor_2, comment=B1 > F2, displayCategoryProgr										
7														
8														

NOTE: If re-running the same spreadsheet, exit and run the tool again.

8. For Windows®, click *Exit* to close the tool's browser window and the command window.

-or-

For Red Hat® Enterprise Linux®, enter **Ctrl+C** to close the tool.

11.3 Using the File Converter Tool

The File Converter tool is launched from the Bulk Data Processing tool.

To launch the File Converter tool:

1. From the Bulk Data Processing tool, click the File Converter tool link.
2. In the File Converter tool window, click the *BROWSE* button, then navigate to and select the file for conversion.
3. Enter a unique Building Name and click the *CONVERT* button.

NOTE: If the building name box is not filled in, the name defaults to **Building1**. The Bulk Data Processing output files are then placed in the **ConverterOutputFiles** folder.

11.4 Spreadsheet Types

The tables in this section provide a description of the information that you must add in each column of the different types of spreadsheets.

11.4.1 Buildings

The following table describes each column in the Buildings spreadsheet.

Table 11.2 Building Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
NewBuilding	New building name provided in the updated spreadsheet.
Building	Building name.
Owner	Owner name.
Notes	Comments.
ContactName	Contact name.
PhoneNumber	Contact phone numbers.
Address	Street address.
City	City.
State	State.
ZipCode	Zip code.
Country	Country.
Status	The results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new building.
timestamp	Date and time the building record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.2 Floors

The following table describes each column in the Floors spreadsheet.

Table 11.3 Floors Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
NewFloor	New floor name provided in the updated spreadsheet.
Building	Building name.
Floor	Floor name.
Owner	Owner name.
Notes	Comments.
Altitude	Altitude value of the floor.
PowerRated	Value of the rated power capacity in KW.
POWER-RATED-KW	Programmatic name of the rated power capacity.
PowerDesigned	Value of the designed power capacity in KW.
POWER-DESIGNED-KW	Programmatic name of the designed power capacity in KW.
PowerReserved	Value of the reserved power capacity in KW.
POWER-RESERVED-KW	Programmatic name of the reserved power capacity.
HeatRated	Value of the rated heat capacity in KW.
COOLING-RATED	Programmatic name of the rated cooling capacity.
HeatDesigned	Value of the designed heat capacity in KW.
COOLING-DESIGNED	Programmatic name of the designed cooling capacity.
HeatReserved	Value of the reserved heat capacity in KW.
COOLING-RESERVED	Programmatic name of the reserved cooling capacity.
FloorSpaceRated	Value of the rated floor space in square feet capacity.
FLOORSPACE-RATED	Programmatic name of the rated floor space capacity.
FloorSpaceDesigned	Value of the designed floor space capacity in square feet.
FLOORSPACE-DESIGNED	Programmatic name of the floor space designed capacity.
FloorSpaceReserved	Value of the reserved floor space capacity in square feet.
FLOORSPACE-RESERVED	Programmatic name of the floor space reserved capacity.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new floor.
timestamp	Date and time the floor record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.3 Rectangular Spaces

The following table describes each column in the Rectangular Spaces spreadsheet.

Table 11.4 Rectangular Spaces Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
NewSpace	New space name provided in the updated spreadsheet.
Building	Building name.
Floor	Floor name.
Space	Space name.
OriginX	X coordinate for absolute placement on the floor. To produce an unplaced space use '@ignore for this and all ordinal values.
OriginY	Y coordinate for absolute placement on the floor. To produce an unplaced space use '@ignore for this and all ordinal values.
RectangleWidth	The width of the rectangle in inches.
RectangleHeight	The height of the rectangle in inches.
OneX	X coordinate of the first polygon ordinal, specified in inches. Use '@ignore if not specifying.
TwoX	X coordinate of the second polygon ordinal, specified in inches. Use '@ignore if not specifying.
TwoY	Y coordinate of the second polygon ordinal, specified in inches. Use '@ignore if not specifying.
ThreeY	Y coordinate of the third polygon ordinal, specified in inches. Use '@ignore if not specifying.
GridLength	Length of grid square, specified in inches. Use '@ignore if not specifying.
GridWidth	Width of grid square, specified in inches. Use '@ignore if not specifying.
Owner	Owner name.
Notes	Comments.
CeilingHeight	Height of the ceiling.
DropCeilingHeight	Height of the drop ceiling.
RaisedFloorHeight	Height of the raised floor.
PowerRated	Value of the rated power capacity in KW.
POWER-RATED-KW	Programmatic name of the rated power capacity.
PowerDesigned	Value of the designed power capacity in KW.
POWER-DESIGNED-KW	Programmatic name of the designed power capacity in KW.
PowerReserved	Value of the reserved power capacity in KW.
POWER-RESERVED-KW	Programmatic name of the reserved power capacity.
HeatRated	Value of the rated heat capacity in KW.
COOLING-RATED	Programmatic name of the rated cooling capacity.
HeatDesigned	Value of the designed heat capacity in KW.
COOLING-DESIGNED	Programmatic name of the designed cooling capacity.
HeatReserved	Value of the reserved heat capacity in KW.
COOLING-RESERVED	Programmatic name of the reserved cooling capacity.

Table 11.4 Rectangular Spaces Spreadsheet Descriptions (continued)

COLUMN	DESCRIPTION
FloorSpaceRated	Value of the rated floor space capacity in square feet.
FLOORSPACE-RATED	Programmatic name of the rated floor space capacity.
FloorSpaceDesigned	Value of the designed floor space capacity in square feet.
FLOORSPACE-DESIGNED	Programmatic name of the designed floorspace capacity.
FloorSpaceReserved	Value of the reserved floor space capacity in square feet.
FLOORSPACE-RESERVED	Programmatic name of the reserved floorspace capacity.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new space.
timestamp	Date and time the space record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.4 Custom Spaces

The following table describes each column in the Custom Spaces spreadsheet.

Table 11.5 Custom Spaces Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
NewSpace	New space name provided in the updated spreadsheet.
Building	Building name.
Floor	Floor name.
Space	Space name.
OriginX	X coordinate for absolute placement on the floor.
OriginY	Y coordinate for absolute placement on the floor.
ZeroX	X coordinate for the zero polygon ordinal, specified in inches.
ZeroY	Y coordinate for the zero polygon ordinal, specified in inches.
OneX	X coordinate offset for the first polygon ordinal, specified in inches.
OneY	Y coordinate offset for the first polygon ordinal, specified in inches.
TwoX	X coordinate offset for the second polygon ordinal, specified in inches.
TwoY	Y coordinate offset for the second polygon ordinal, specified in inches.
ThreeX	X coordinate offset for the third polygon ordinal, specified in inches. Use '@ignore if not specifying.
ThreeY	Y coordinate offset for the third polygon ordinal, specified in inches. Use '@ignore if not specifying.
FourX	X coordinate offset for the fourth polygon ordinal, specified in inches. Use '@ignore if not specifying.
FourY	Y coordinate offset for the fourth polygon ordinal, specified in inches. Use '@ignore if not specifying.
FiveX	X coordinate offset for the fifth polygon ordinal, specified in inches. Use '@ignore if not specifying.
FiveY	Y coordinate offset for the fifth polygon ordinal, specified in inches. Use '@ignore if not specifying.
SixX	X coordinate offset for the sixth polygon ordinal, specified in inches. Use '@ignore if not specifying.
SixY	Y coordinate offset for the sixth polygon ordinal, specified in inches. Use '@ignore if not specifying.
SevenX	X coordinate offset for the seventh polygon ordinal, specified in inches. Use '@ignore if not specifying.
SevenY	Y coordinate offset for the seventh polygon ordinal, specified in inches. Use '@ignore if not specifying.
EightX	X coordinate offset for the eighth polygon ordinal, specified in inches. Use '@ignore if not specifying.
EightY	Y coordinate offset for the eighth polygon ordinal, specified in inches. Use '@ignore if not specifying.
NineX	X coordinate offset for the ninth polygon ordinal, specified in inches. Use '@ignore if not specifying.
NineY	Y coordinate offset for the ninth polygon ordinal, specified in inches. Use '@ignore if not specifying.
GridLength	Length of grid square, specified in inches. Use '@ignore if not specifying.
GridWidth	Width of grid square, specified in inches. Use '@ignore if not specifying.
Owner	Owner name.
Notes	Comments.
CeilingHeight	Height of the ceiling.
DropCeilingHeight	Height of the drop ceiling.

Table 11.5 Custom Spaces Spreadsheet Descriptions (continued)

COLUMN	DESCRIPTION
RaisedFloorHeight	Height of the raised floor.
PowerRated	Value of the rated power capacity in KW.
POWER-RATED-KW	Programmatic name of the rated power capacity.
PowerDesigned	Value of the designed power capacity in KW.
POWER-DESIGNED-KW	Programmatic name of the designed power capacity in KW.
PowerReserved	Value of the reserved power capacity in KW.
POWER-RESERVED-KW	Programmatic name of the reserved power capacity.
HeatRated	Value of the rated heat capacity in KW.
COOLING-RATED	Programmatic name of the rated cooling capacity.
HeatDesigned	Value of the designed heat capacity in KW.
COOLING-DESIGNED	Programmatic name of the designed cooling capacity.
HeatReserved	Value of the reserved heat capacity in KW.
COOLING-RESERVED	Programmatic name of the reserved cooling capacity.
FloorSpaceRated	Value of the rated floor space capacity in square feet.
FLOORSPACE-RATED	Programmatic name of the floor space rated capacity.
FloorSpaceDesigned	Value of the designed floor space capacity in square feet.
FLOORSPACE-DESIGNED	Programmatic name of the designed floorspace capacity.
FloorSpaceReserved	Value of the reserved floor space capacity in square feet.
FLOORSPACE-RESERVED	Programmatic name of the reserved floorspace capacity.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new space.
timestamp	Date and time the space record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.5 Unplaced Devices

The following table describes each column in the Unplaced Devices spreadsheet.

Table 11.6 Unplaced Devices Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
Building	Building name.
Floor	Floor name.
Space	Space name.
Device name	Device name.
Manufacturer	Manufacturer name.
Model	Model name.
ModelQualifier	Model qualifier name.
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names.
Placement Type	Type of placement within a container; see Placement Types on page 325.
RFIDTAG	RFID number.
RFIDPosition	RFID position.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new device.
timestamp	Date and time the device record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.6 Zones

The following table describes each column in the Zones spreadsheet.

NOTE: Zones cannot be created or deleted, but can be updated using the tool.

Table 11.7 Zones Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
NewZone	New zone name provided in the updated spreadsheet.
Building	Building name.
Floor	Floor name.
Space	Space name.
Zone	Zone name.
Owner	Owner name.
Notes	Comments.
ZoneType	Type of zone.
ZoneColor	Color of zone.
PowerRated	Value of the rated power capacity in KW.
POWER-RATED-KW	Programmatic name of the rated power capacity.
PowerReserved	Value of the reserved power capacity in KW.
POWER-RESERVED-KW	Programmatic name of the reserved power capacity.
HeatRated	Value of the rated heat capacity in KW.
COOLING-RATED	Programmatic name of the rated cooling capacity.
HeatReserved	Value of the reserved heat capacity in KW.
COOLING-RESERVED	Programmatic name of the reserved cooling capacity.
SpaceDesigned	Value of the designed space capacity.
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space capacity.
SpaceReserved	Value of the reserved space capacity.
FLOORSPACE-RESERVED	Programmatic name of the reserved floor space capacity.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the zone.
timestamp	Date and time the zone record is updated in the database.
Object	HTTP response messages.
ErrorCode	HTTP status and error codes.
ErrorMessage	HTTP status and error messages.

11.4.7 Racks and Cabinets

The following table describes each column in the Racks and Cabinets spreadsheet.

Table 11.8 Racks and Cabinets Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
NewBuilding	New building name provided in the updated spreadsheet.
NewFloor	New floor name provided in the updated spreadsheet.
NewSpace	New space name provided in the updated spreadsheet.
NewRackName	New rack name provided in the updated spreadsheet.
Building	Building name.
Floor	Floor name.
Space	Space name.
RackName	Rack name.
Manufacturer	Manufacturer name.
Model	Model name.
ModelQualifier	Model qualifier name.
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names.
RFIDTAG	RFID number.
RFIDPosition	RFID position.
LayerName	Layer name.
XCoordinate	X coordinate of the physical placement.
YCoordinate	Y coordinate of the physical placement.
GridTileLocation	Name of the Tile to place the device.
GridTileXoffset	X offset of the tile where the device will be placed.
GridTileYoffset	XY offset of the tile where the device will be placed.
Rotation	Rotation.
ZCoordinate	Z coordinate of the physical placement.
RUStartNumber	RU start number of the rack.
RackUnitsStartAtTop	True if the rack unit starts at top, otherwise, the value is false.
Owner	Owner name.
OwnerEmail	Owner email address.
Notes	Comments.
SerialNumber	Serial number of the rack.
AssetNumber	Asset number of the rack.
BarcodeNumber	Bar code number of the rack.
PowerRated	Rated power of the rack.
POWER-RATED-KW	Programmatic name of the rated power capacity in KW.

Table 11.8 Racks and Cabinets Spreadsheet Descriptions (continued)

COLUMN	DESCRIPTION
PowerDesigned	Value of the designed power capacity.
POWER-DESIGNED-KW	Programmatic name of the designed power capacity in KW.
HeatRated	Value of the rated heat capacity.
COOLING-RATED	Programmatic name of the rated cooling capacity.
HeatDesigned	Value of the designed heat capacity.
COOLING-DESIGNED	Programmatic name of the designed cooling capacity.
WeightRated	Value of the rated weight capacity.
WEIGHT-RATED	Programmatic name of the rated weight.
WeightDesigned	Value of the designed weight capacity.
WEIGHT-DESIGNED	Programmatic name of the designed weight.
RackSpaceDesigned	Value of the designed rack space capacity.
RACKSPACE-DESIGNED	Programmatic name of the designed rack space.
SpaceDesigned	Value of the designed space capacity.
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new rack or cabinet.
timestamp	Date and time the rack or cabinet record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.8 Rack-Mounted Devices

The following table describes each column in the Rack-Mounted Devices spreadsheet.

Table 11.9 Rack-Mounted Devices Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
NewBuilding	New building name provided in the updated spreadsheet.
NewFloor	New floor name provided in the updated spreadsheet.
NewSpace	New space name provided in the updated spreadsheet.
NewRackName	New rack name provided in the updated spreadsheet.
NewDeviceName	New device name.
Building	Building name.
Floor	Floor name.
Space	Space name.
RackName	Rack name.
DeviceName	Device name.
Manufacturer	Manufacturer name.
Model	Model name.
ModelQualifier	Model qualifier name.
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names.
Side	Side name.
FrontFacing	Device component orientation of the physical placement.
Uposition	U position of the physical placement.
Xposition	X position of the physical placement.
Rotation	Rotation.
RFIDTAG	RFID number.
RFIDPosition	RFID position.
InputVoltage	Input voltage amount.
Owner	Owner name.
OwnerEmail	Owner email address.
Notes	Comments.
SerialNumber	Serial number of the rack mounted devices.
AssetNumber	Asset number of the rack mounted devices.
BarcodeNumber	Bar code number of the rack mounted devices.
PowerDesigned	Value of the designed power capacity.
POWER-DESIGNED-KW	Programmatic name of the designed power capacity in KW.
HeatDesigned	Value of the designed heat capacity.
COOLING-DESIGNED	Programmatic name of the designed cooling capacity.

Table 11.9 Rack-Mounted Devices Spreadsheet Descriptions (continued)

COLUMN	DESCRIPTION
WeightDesigned	Value of the designed weight capacity.
WEIGHT-DESIGNED	Programmatic name of the designed weight.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new rack mounted devices.
timestamp	Date and time the rack mounted device record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.9 Floor-Mounted Devices

The following table describes each column in the Floor Mounted Devices spreadsheet.

Table 11.10 Floor Mounted Devices Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
NewBuilding	Building name provided in the updated spreadsheet.
NewFloor	New floor name provided in the updated spreadsheet.
NewSpace	New space name provided in the updated spreadsheet.
NewDeviceName	New device name provided in the updated spreadsheet.
Building	Building name.
Floor	Floor name.
Space	Space name.
DeviceName	Device name.
Manufacturer	Manufacturer name.
Model	Model name.
ModelQualifier	Model qualifier name.
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names.
PlacementType	Type of placement within a container; see Placement Types on page 325.
RFIDTAG	RFID number.
RFIDPosition	RFID position.
LayerName	Layer name.
XCoordinate	X coordinate of the physical placement.
YCoordinate	Y coordinate of the physical placement.
GridTileLocation	Name of the Tile to place the device.
GridTileXoffset	X offset of the tile where the device will be placed.
GridTileYoffset	Y offset of the tile where the device will be placed.
Rotation	Rotation.
ZCoordinate	Z coordinate of the physical placement.
Owner	Owner name.
OwnerEmail	Owner email address.
Notes	Comments.
SerialNumber	Serial number of the floor mounted devices.
AssetNumber	Asset number of the floor mounted devices.
BarcodeNumber	Bar code number of the floor mounted devices.
PowerDesigned	Value of the designed power capacity.
POWER-DESIGNED-KW	Programmatic name of the designed power capacity in KW.
HeatDesigned	Value of the designed heat capacity.

Table 11.10 Floor Mounted Devices Spreadsheet Descriptions (continued)

COLUMN	DESCRIPTION
COOLING-DESIGNED	Programmatic name of the designed cooling.
WeightDesigned	Value of the designed weight capacity.
WEIGHT-DESIGNED	Programmatic name of the designed weight.
SpaceDesigned	Value of the designed space capacity.
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new floor mounted devices.
timestamp	Date and time the floor mounted device record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.10 Blades

The following table describes each column in the Blades spreadsheet.

Table 11.11 Blades Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
NewBuilding	New building name provided in the updated spreadsheet.
NewFloor	New floor name provided in the updated spreadsheet.
NewSpace	New space name provided in the updated spreadsheet.
NewRackName	New rack name provided in the updated spreadsheet.
NewChassisName	New chassis name provided in the updated spreadsheet.
NewBladeName	New blade name provided in the updated spreadsheet.
Building	Building name.
Floor	Floor name.
Space	Space name.
RackName	Rack name.
ChassisName	Chassis name.
BladeName	Blade name.
Manufacturer	Manufacturer name.
Model	Model name.
ModelQualifier	Mode qualifier name.
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names.
PlacementType	Type of placement within a container; see Placement Types on page 325.
Rotation	Rotation.
SlotLabel	Slot label.
SlotNumber	Slot number.
RFIDTAG	RFID number.
RFIDPosition	RFID position
Owner	Owner name.
OwnerEmail	Owner email address.
Notes	Comments.
SerialNumber	Serial number of the blade servers.
AssetNumber	Asset number of the blade servers.
BarcodeNumber	Bar code number of the blade servers.
WeightDesigned	Value of the designed weight capacity.
WEIGHT-DESIGNED	Programmatic name of the designed weight.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new blade servers.

Table 11.11 Blades Spreadsheet Descriptions (continued)

COLUMN	DESCRIPTION
timestamp	Date and time the blade servers are created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.11 Components

The following table describes each column in the Components spreadsheet.

Table 11.12 Components Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
NewBuilding	New building name provided in the updated spreadsheet.
NewFloor	New floor name provided in the updated spreadsheet.
NewSpace	New space name provided in the updated spreadsheet.
NewRackName	New rack name provided in the updated spreadsheet.
NewDeviceName	New device name provided in the updated spreadsheet.
NewParentComponent	New parent component name provided in the updated spreadsheet.
NewComponentName	New component name provided in the updated spreadsheet.
Building	Building name.
Floor	Floor name.
Space	Space name.
RackName	Rack name.
DeviceName	Device name; see Referencing a component placed directly in a device on page 280.
ParentComponent	Parent component name; see Referencing a component placed directly in a device on page 280.
ComponentName	Component name.
Manufacturer	Manufacturer name.
Model	Model name.
ModelQualifier	ModelQualifier name.
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names.
PlacementType	Type of placement within a container; see Placement Types on page 325.
Rotation	Rotation.
SlotLabel	Slot label.
SlotNumber	Slot number.
RFIDTAG	RFID number.
RFIDPosition	RFID position
Owner	Owner name.
OwnerEmail	Owner email address.
Notes	Comments.
SerialNumber	Serial number of the rack.
AssetNumber	Asset number of the rack.
BarcodeNumber	Bar code number of the rack.
WeightDesigned	Value of the designed weight capacity.
WEIGHT-DESIGNED	Programmatic name of the designed weight.

Table 11.12 Components Spreadsheet Descriptions (continued)

COLUMN	DESCRIPTION
SpaceDesigned	Value of the designed space capacity.
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new components.
timestamp	Date and time the new component record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.12 Rack-Mounted Devices (Zero U)

The following table describes each column in the Rack Mounted Devices (Zero U) spreadsheet.

Table 11.13 Rack Mounted Devices (Zero U) Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
NewBuilding	New building name provided in the updated spreadsheet.
NewFloor	New floor name provided in the updated spreadsheet.
NewSpace	New space name provided in the updated spreadsheet.
NewRackName	New rack name provided in the updated spreadsheet.
NewDeviceName	New device name provided in the updated spreadsheet.
Building	Building name.
Floor	Floor name.
Space	Space name.
RackName	Rack name.
DeviceName	Device name.
Manufacturer	Manufacturer name.
Model	Model name.
ModelQualifier	Model qualifier name.
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names.
ZUlocation	Zero U location of the physical placement.
ZUuHeight	Zero U uHeight of the physical placement.
ZUxPosition	Zero U xPosition.
ZURotation	Zero U Rotation of the physical placement.
RFIDTAG	RFID number.
RFIDPosition	RFID position.
ZUzOrder	Zero U zOrder of the physical placement.
ZUfrontFacing	Zero U device component orientation of the physical placement.
InputVolts	Voltage input amount.
OutputVolts	Voltage output amount.
Owner	Owner name.
OwnerEmail	Owner email address.
Notes	Comments.
SerialNumber	Serial number of the power strips.
AssetNumber	Asset number of the power strips.
BarcodeNumber	Bar code number of the power strips.
PowerDesigned	Value of the designed power capacity.
POWER-TOTAL-DESIGNED-AMPS	Programmatic name of the designed total power in AMPS.

Table 11.13 Rack Mounted Devices (Zero U) Spreadsheet Descriptions (continued)

COLUMN	DESCRIPTION
PowerReserved	Value of the reserved power capacity.
POWER-TOTAL-RESERVED-AMPS	Programmatic name of the reserved total power in AMPS.
WeightDesigned	Value of the designed weight capacity.
WEIGHT-DESIGNED	Programmatic name of the designed weight.
SpaceDesigned	Value of the designed space capacity.
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new device.
timestamp	Date and time the device record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.13 Power Strips for Floor-Mounted Devices (FMD)

The following table describes each column in the power strips for floor mounted devices spreadsheet.

Table 11.14 Power Strips (FMD) Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
NewBuilding	New building name provided in the updated spreadsheet.
NewFloor	New floor name provided in the updated spreadsheet.
NewSpace	New space name provided in the updated spreadsheet.
NewStripName	New power strip name provided in the updated spreadsheet.
Building	Building name.
Floor	Floor name.
Space	Space name.
StripName	Power strip name.
Manufacturer	Manufacturer name.
Model	Model name.
ModelQualifier	Model qualifier name.
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names.
PlacementType	Type of placement within a container; see Placement Types on page 325.
RFIDTAG	RFID number.
RFIDPosition	RFID position.
LayerName	Layer name.
XCoordinate	X coordinate of the physical placement.
YCoordinate	Y coordinate of the physical placement.
GridTileLocation	Name of the Tile to place the device.
GridTileXoffset	X offset of the tile where the device will be placed.
GridTileYoffset	Y offset of the tile where the device will be placed.
Rotation	Rotation.
ZCoordinate	Z coordinate of the physical placement.
InputVolts	Voltage input amount.
OutputVolts	Voltage output amount.
Owner	Owner name.
OwnerEmail	Owner email address.
Notes	Comments.
SerialNumber	Serial number of the power strip floor mounted device.
AssetNumber	Asset number of the power strip floor mounted device.
BarcodeNumber	Bar code number of the power strip floor mounted device.
PowerDesigned	Value of the designed power capacity.

Table 11.14 Power Strips (FMD) Spreadsheet Descriptions (continued)

COLUMN	DESCRIPTION
POWER-TOTAL-DESIGNED-AMPS	Programmatic name of the designed total power in AMPS.
PowerReserved	Value of the reserved power capacity.
POWER-TOTAL-RESERVED-AMPS	Programmatic name of the reserved power total in AMPS.
WeightDesigned	Value of the designed weight capacity.
WEIGHT-DESIGNED	Programmatic name of the designed weight.
SpaceDesigned	Value of the designed space capacity.
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of new power strips.
timestamp	Date and time the power strip floor mounted device record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.14 Generators

The following table describes each column in the Generators spreadsheet.

Table 11.15 Generators Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
NewBuilding	New building name provided in the updated spreadsheet.
NewFloor	New floor name provided in the updated spreadsheet.
NewSpace	New space name provided in the updated spreadsheet.
NewGeneratorName	New generator name provided in the updated spreadsheet.
Building	Building name.
Floor	Floor name.
Space	Space name.
GeneratorName	Generator name.
Manufacturer	Manufacturer name.
Model	Model name.
ModelQualifier	Model qualifier name.
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names.
PlacementType	Type of placement within a container; see Placement Types on page 325.
RFIDTAG	RFID number.
RFIDPosition	RFID position.
LayerName	Layer name.
XCoordinate	X coordinate of the physical placement.
YCoordinate	Y coordinate of the physical placement.
GridTileLocation	Name of the Tile to place the device.
GridTileXoffset	X offset of the tile where the device will be placed.
GridTileYoffset	Y offset of the tile where the device will be placed.
Rotation	Rotation.
ZCoordinate	Z coordinate of the physical placement.
InputVolts	Voltage input amount.
OutputVolts	Voltage output amount.
Owner	Owner name.
OwnerEmail	Owner email address.
Notes	Comments.
SerialNumber	Serial number of the generator.
AssetNumber	Asset number of the generator.
BarcodeNumber	Bar code number of the generator.
PowerDesigned	Value of the designed power capacity.

Table 11.15 Generators Spreadsheet Descriptions (continued)

COLUMN	DESCRIPTION
POWER-TOTAL-DESIGNED-AMPS	Programmatic name of the designed total power in AMPS.
PowerReserved	Value of the reserved power capacity.
POWER-TOTAL-RESERVED-AMPS	Programmatic name of the reserved power total in AMPS.
WeightDesigned	Value of the designed weight capacity.
WEIGHT-DESIGNED	Programmatic name of the designed weight.
SpaceDesigned	Value of the designed space capacity.
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new generator.
timestamp	Date and time the generator record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.15 UPS

The following table describes each column in the UPS spreadsheet.

Table 11.16 UPS Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
NewBuilding	New building name provided in the updated spreadsheet.
NewFloor	New floor name provided in the updated spreadsheet.
NewSpace	New space name provided in the updated spreadsheet.
NewUPSName	New UPS name provided in the updated spreadsheet.
Building	Building name.
Floor	Floor name.
Space	Space name.
UPSName	UPS name.
Manufacturer	Manufacturer name.
Model	Model name.
ModelQualifier	Model qualifier name.
SymbolTypeIDentifier	String containing the manufacturer, model and model qualifier names.
PlacementType	Type of placement within a container; see Placement Types on page 325.
RFIDTAG	RFID number.
RFIDPosition	RFID position.
LayerName	Layer name.
XCoordinate	X coordinate of the physical placement.
YCoordinate	Y coordinate of the physical placement.
GridTileLocation	Name of the Tile to place the device.
GridTileXoffset	X offset of the tile where the device will be placed.
GridTileYoffset	Y offset of the tile where the device will be placed.
Rotation	Rotation.
ZCoordinate	Z coordinate of the physical placement.
InputVolts	Voltage input amount.
OutputVolts	Voltage output amount.
Owner	Owner name.
OwnerEmail	Owner email address.
Notes	Comments.
SerialNumber	Serial number of the UPS.
AssetNumber	Asset number of the UPS.
BarcodeNumber	Bar code number of the UPS.
PowerDesigned	Value of the designed power capacity.

Table 11.16 UPS Spreadsheet Descriptions (continued)

COLUMN	DESCRIPTION
POWER-TOTAL-DESIGNED-AMPS	Programmatic name of the designed total power in AMPS.
PowerReserved	Value of the reserved power capacity.
POWER-TOTAL-RESERVED-AMPS	Programmatic name of the reserved total power in AMPS.
WeightDesigned	Value of the designed weight capacity.
WEIGHT-DESIGNED	Programmatic name of the designed weight.
SpaceDesigned	Value of the designed space capacity.
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new UPS.
timestamp	Date and time the UPS record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.16 PDUs

The following table describes each column in the PDUs spreadsheet.

Table 11.17 PDUs Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
NewBuilding	New building name provided in the updated spreadsheet.
NewFloor	New floor name provided in the updated spreadsheet.
NewSpace	New space name provided in the updated spreadsheet.
NewPDUName	New PDU name provided in the updated spreadsheet.
Building	Building name.
Floor	Floor name.
Space	Space name.
PDUName	PDU name.
Manufacturer	Manufacturer name.
Model	Model name.
ModelQualifier	Model qualifier name.
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names.
RFIDTAG	RFID number.
RFIDPosition	RFID position.
LayerName	Layer name.
XCoordinate	X coordinate of the physical placement.
YCoordinate	Y coordinate of the physical placement.
GridTileLocation	Name of the Tile to place the device.
GridTileXoffset	X offset of the tile where the device will be placed.
GridTileYoffset	Y offset of the tile where the device will be placed.
Rotation	Rotation.
ZCoordinate	Z coordinate of the physical placement.
InputVolts	Voltage input amount.
OutputVolts	Voltage output amount.
Owner	Owner name.
OwnerEmail	Owner email address.
Notes	Comments.
SerialNumber	Serial number of the PDU.
AssetNumber	Asset number of the PDU.
BarcodeNumber	Bar code number of the PDU.
PowerDesigned	Value of the designed power capacity.
POWER-TOTAL-DESIGNED-AMPS	Programmatic name of the designed total power in AMPS.

Table 11.17 PDUs Spreadsheet Descriptions (continued)

COLUMN	DESCRIPTION
PowerReserved	Value of the reserved power capacity.
POWER-TOTAL-RESERVED-AMPS	Programmatic name of the reserved power total in AMPS.
WeightDesigned	Value of the designed weight capacity.
WEIGHT-DESIGNED	Programmatic name of the designed weight.
SpaceDesigned	Value of the designed space capacity.
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new PDU.
timestamp	Date and time the PDU record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.17 Remote Power Panel (RPP)

The following table describes each column in the RPP spreadsheet.

Table 11.18 RPP Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
NewBuilding	New building name provided in the updated spreadsheet.
NewFloor	New floor name provided in the updated spreadsheet.
NewSpace	New space name provided in the updated spreadsheet.
NewRPPName	New remote power panel name provided in the updated spreadsheet.
Building	Building name.
Floor	Floor name.
Space	Space name.
RPPName	Remote power panel name.
Manufacturer	Manufacturer name.
Model	Model name.
ModelQualifier	Model qualifier name.
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names.
RFIDTAG	RFID number.
RFIDPosition	RFID position.
LayerName	Layer name.
XCoordinate	X coordinate of the physical placement.
YCoordinate	Y coordinate of the physical placement.
GridTileLocation	Name of the Tile to place the device.
GridTileXoffset	X offset of the tile where the device will be placed.
GridTileYoffset	Y offset of the tile where the device will be placed.
Rotation	Rotation.
ZCoordinate	Z coordinate of the physical placement.
InputVolts	Voltage input amount.
OutputVolts	Voltage output amount.
Owner	Owner name.
OwnerEmail	Owner email address.
Notes	Comments.
SerialNumber	Serial number of the remote power panel.
AssetNumber	Asset number of the remote power panel.
BarcodeNumber	Bar code number of the remote power panel.
PowerDesigned	Value of the designed weight capacity.
POWER-TOTAL-DESIGNED-AMPS	Programmatic name of the designed power total in AMPS.

Table 11.18 RPP Spreadsheet Descriptions (continued)

COLUMN	DESCRIPTION
PowerReserved	Value of the reserved power capacity.
POWER-TOTAL-RESERVED-AMPS	Programmatic name of the reserved power total in AMPS.
WeightDesigned	Value of the designed weight capacity.
WEIGHT-DESIGNED	Programmatic name of the designed weight.
SpaceDesigned	Value of the designed space capacity.
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new remote power panel.
timestamp	Date and time the remote power panel record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.18 Panels

The following table describes each column in the panels spreadsheet.

Table 11.19 Panels Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
NewPanelName	New panel name provided in the updated spreadsheet.
Building	Building name.
Floor	Floor name.
Space	Space name.
PDURPPName	PDU remote power panel name.
PanelName	Panel name.
Manufacturer	Manufacturer name.
Model	Model name.
ModelQualifier	Model qualifier name.
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names.
InputVolts	Voltage input amount.
specificPropertiesBreakerPanel	Value of the specific breaker panel properties.
PanelStyle	Panel style.
NumberOfSlots	Number of slots.
PanelboardRating	Value of the panelboard rating.
SafetyFactor	Value of the safety factor.
OutputVolts	Voltage output amount.
RFIDTAG	RFID number.
RFIDPosition	RFID Position.
Owner	Owner name.
OwnerEmail	Owner email address.
Notes	Comments.
SerialNumber	Serial number of the panel.
AssetNumber	Asset number of the panel.
BarcodeNumber	Bar code number of the panel.
PowerRated	Value of the rated power capacity.
POWER-TOTAL-RATED-AMPS	Programmatic name of the rated power total in AMPS.
PowerDesigned	Value of the designed power capacity.
POWER-TOTAL-DESIGNED-AMPS	Programmatic name of the designed power total in AMPS.
PowerReserved	Value of the reserved power capacity.
POWER-TOTAL-RESERVED-AMPS	Programmatic name of the reserved power total in AMPS.
WeightDesigned	Value of the designed weight capacity.

Table 11.19 Panels Spreadsheet Descriptions (continued)

COLUMN	DESCRIPTION
WEIGHT-DESIGNED	Programmatic name of the designed weight.
SpaceDesigned	Value of the designed space capacity.
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new panels.
timestamp	Date and time the panel record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.19 Breakers

The following table describes each column in the Breakers spreadsheet.

Table 11.20 Breakers Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
NewBreakerName	New breaker name provided in the updated spreadsheet.
Building	Building name.
Floor	Floor name.
Space	Space name.
PDURPPName	PDU remote power panel name.
PanelName	Panel name.
BreakerName	Breaker name.
Manufacturer	Manufacturer name.
Model	Model name.
ModelQualifier	Model qualifier name.
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names.
PanelPosition	Position of the panel.
InputVolts	Voltage input amount.
CurrentRating	Rating of current rating.
OverCurrentProtectionRating	Rating of overcurrent protection; defaults to 80 if it is left blank.
OutputVolts	Voltage output amount.
RFIDTAG	RFID number.
RFIDPosition	RFID position.
Owner	Owner name.
OwnerEmail	Owner Email address.
Notes	Comments.
SerialNumber	Serial number of breakers.
AssetNumber	Asset number of breakers.
BarcodeNumber	Bar code number of breakers.
PowerDesigned	Value of the designed power capacity.
POWER-TOTAL-DESIGNED-AMPS	Programmatic name of the designed power total in AMPS.
PowerReserved	Value of the reserved power capacity.
POWER-TOTAL-RESERVED-AMPS	Programmatic name of the reserved power total in AMPS.
WeightDesigned	Value of the designed weight capacity.
WEIGHT-DESIGNED	Programmatic name of the designed weight.
SpaceDesigned	Value of the designed space capacity.
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space.

Table 11.20 Breakers Spreadsheet Descriptions (continued)

COLUMN	DESCRIPTION
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new breakers
timestamp	Date and time the breaker record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.20 Breaker to PowerStrip

The following table describes each column in the Breaker to PowerStrip spreadsheet.

Table 11.21 Breaker to PowerStrip Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
ConnectionType	Type of connection.
CFBuilding	Connection from the building.
CFFloor	Connection from the floor.
CFSpace	Connection from the space.
CFPDURPPName	Connection from the PDU remote power panel name.
CFPanelName	Connection from the panel name.
CFBreakerName	Connection from the breaker name.
CFOutputLabel	Connection from the output label.
CTBuilding	Connection to the building.
CTFloor	Connection to the floor.
CTSpace	Connection to the space.
CTRackName	Connection to the rack name.
CTDeviceName	Connection to the device name.
CTOpeningLabel	Connection to the opening label.
ConnectionName	Connection name.
Owner	Owner name.
MaintenanceDate	Date the maintenance occurred.
CableID	Identification of the cable.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new breaker connections to power strip.
timestamp	Date and time the breaker connections to power strip record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.21 Breaker to Device

The following table describes each column in the Breaker to Device spreadsheet.

Table 11.22 Breaker to Device Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
ConnectionType	Type of connection.
CFBuilding	Connection from the building.
CFFloor	Connection from the floor.
CFSpace	Connection from the space.
CFPDURPPName	Connection from the PDU remote power panel name.
CFPanelName	Connection from the panel name.
CFBreakerName	Connection from the breaker name.
CFOutputLabel	Connection from the output label.
CTBuilding	Connection to the building.
CTFloor	Connection to the floor.
CTSpace	Connection to the space.
CTRackName	Connection to the rack name.
CTDeviceName	Connection to the device name.
CTOpeningLabel	Connection to the opening label.
CTOpening	Connection to the opening.
ConnectionName	Connection name.
Owner	Owner name.
MaintenanceDate	Date the maintenance occurred.
CableID	Identification of the cable.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new breaker connections to devices.
timestamp	Date and time the breaker connections to device record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.22 PowerStrip to Device

The following table describes each column in the PowerStrip to Device spreadsheet.

Table 11.23 PowerStrip to Device Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
ConnectionType	Type of connection.
CFBuilding	Connection from the building.
CFFloor	Connection from the floor.
CFSpace	Connection from the space.
CFRackName	Connection from the rack name.
CFStripName	Connection from the strip name.
CFReceptacleLabel	Processes the connection from the receptacle label.
CTBuilding	Name of the building where a device connection is located.
CTFloor	Connection to the floor.
CTSpace	Connection to the space.
CTRackName	Connection to the rack name.
CTDeviceName	Connection to the device name.
CTOpeningLabel	Connection to the opening label.
CTOpening	Connection to the opening.
ConnectionName	Connection name.
Owner	Owner name.
MaintenanceDate	Date the maintenance occurred.
CableID	Identification of the cable.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new power strip connections to devices.
timestamp	Date and time the power strip connections to device record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.23 Power Strip to Breaker

The following describes each column in the Power Strip to Breaker spreadsheet.

Table 11.24 PowerStrip to Breaker Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
ConnectionType	Type of connection.
CFBuilding	Connection from the building.
CFFloor	Connection from the floor.
CFSpace	Connection from the space.
CFRackName	Connection from the rack name.
CFStripName	Connection from the strip name.
CFReceptacleLabel	Connection from the receptacle name.
CTBuilding	Connection to the building.
CTFloor	Connection to the floor.
CTSpace	Connection to the space.
CTRackName	Connection to the rack name.
CTDeviceName	Connection to the device name.
CTOpengngLabel	Connection to the opening label.
ConnectionName	Connection Name.
Status	Results can be succes (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new breaker connections to the device.
timestamp	Date and time the breaker connections to device record is created within database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.24 Data Connections

The following table describes each column in the Data Connections spreadsheet.

Table 11.25 Data Connections Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
CFBuilding	Connection from the building.
CFFloor	Connection from the floor.
CFSpace	Connection from the space.
CFRackName	Connection from the rack name.
CFDeviceName	Connection from the device name.
CFParentComponent	Connection from the parent component.
CFComponentName	Connection from the component name.
CFPortLabel	Connection from the port label.
CFPort	Connection from the port.
CTBuilding	Name of the building where a device connection is located.
CTFloor	Connection to the floor.
CTSpace	Connection to the space.
CTRackName	Connection to the rack name.
CTDeviceName	Connection to the device name.
CTParentComponent	Connection to the parent component.
CTComponentName	Connection to the component name.
CTPortLabel	Connection to the port label.
CTPort	Connection to the port.
ConnectionName	Connection name.
Owner	Owner name.
MaintenanceDate	Date the maintenance occurred.
CableID	Identification of the cable.
CableType	Type of cable.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new data connections.
timestamp	Date and time the data connection record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.25 Update Port Names

The following table describes each column in the Update Port Names spreadsheet. This spreadsheet is provided in the `trellisUpdateTemplate` file.

Table 11.26 Update Port Names Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
Building	Building name.
Floor	Floor name.
Space	Space name.
RackName	Rack name.
DeviceName	Device name; see Referencing a component placed directly in a device on page 280.
ParentComponent	Parent component under device; see Referencing a component placed directly in a device on page 280.
ComponentName	Component name under the parent component.
PortType	Power or data.
PortLabel	Label for the port.
PortName	Current name of the port.
NewPortLabel	New port label for the port.
NewPortName	New name of the port.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new data connections.
Timestamp	Date and time the update is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.26 Update Slot Names

The following table describes each column in the Update Slot Names spreadsheet. This spreadsheet is provided in the `trellisUpdateTemplate` file.

Table 11.27 Update Slot Names Spreadsheet Descriptions

COLUMN	DESCRIPTION
Process	Value must be true to process a row or false to skip the row.
Building	Building name.
Floor	Floor name.
Space	Space name.
RackName	Rack name.
ParentDevice	Parent device; see Referencing a component placed directly in a device on page 280.
DeviceName	Device name under the parent device.
Type	Slot.
SlotLabel	Label for the slot.
SlotName	Current name of the slot.
NewSlotLabel	New label for the slot.
NewSlotName	New name of the slot.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new data connections.
Timestamp	Date and time the update is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

11.4.27 Placement Types

Several of the provided template spreadsheets have a Placement Type column (where appropriate). The following table describes the fields for each Placement Type column in the spreadsheets.

Table 11.28 Placement Type Column Descriptions

PLACEMENT	PLACEMENT TYPE	REQUIRED FIELDS	VALUES	COMMENTS
Device in building	inBuilding	Building name	N/A	N/A
Device on floor	onFloor	Floor	N/A	Name of the floor where the device is placed
Device in space as a stored device	inSpace	space	N/A	Name of the space where the device is placed
Device in space at a specific location	inSpace	Layer Name	FLOOR RAISED-FLOOR DROP-CEILING CEILING @ignore	Layer where the device is placed
Device in space at specific location	inSpace	X Coordinate Y Coordinate Rotation	Any number	N/A
Server in rack	inRack	Side	FRONT REAR LEFT RIGHT TOP BOTTOM	N/A
Server in rack	inRack	Front facing	True or False	N/A
Server in rack	inRack	Uposition Xposition Rotation	Any number	N/A
Device in rack at Zero U	inZeroU	ZUlocation	BOTTOM TOP FRONT_LEFT_RAIL FRONT_RIGHT_RAIL REAR_RIGHT_RAIL REAR_LEFT_RAIL	N/A
Device in rack at Zero U	inZeroU	ZUuHeight	Any number	N/A
Blade server in chassis	inSlot	Slot Number	Any number	N/A
Blade server in chassis	inSlot	rotation	Any number	N/A
Component in Device	inSlot	DeviceName	Any device	N/A
Breaker panel in a floor PDU	onDevice	Parent device	Any device	Identified by the building, floor, space and device name
Circuit breaker in breaker panel	inPanel	Panel Position	Any number	N/A

12 APPENDICES

Appendix A: CAC Certification

After enabling CAC authentication, you are provided a valid CAC to gain access to the *Trellis*[™] platform log-in window. The following are required to enable the two-way SSL (Secure Sockets Layer) on the Oracle HTTP Server (OHS) front machine:

- The Certificate Replacement procedure needs to be applied on the target *Trellis*[™] platform environment.
- A signed certificate, signed by the same CA used on the Certificate Replacement procedure, needs to be installed in the card.

Originally, the *Trellis*[™] platform is shipped with one-way SSL on the OHS front machine, such as `https://X.X.X.X/trellis`. You can force the browser to present the certificate to the platform by activating the two-way SSL on the OHS machine. This is done by modifying the `/u02/OHS/ui01/config/OHS/ohs01/ssl.conf` file.

To activate the CAC on the server side:

1. Access the *Trellis*[™] platform front machine and edit the `/u02/OHS/ui01/config/OHS/ohs01/ssl.conf` file.
2. Change `SSLVerifyClient None` to **`SSLVerifyClient require`** and save the changes.
3. Enter the following commands to stop and restart the OHS server:
 - `/etc/init.d/trellis stop ohs`
 - `/etc/init.d/trellis start ohs`

To deactivate the CAC on the server side:

1. Access the *Trellis*[™] platform front machine and edit the `/u02/OHS/ui01/config/OHS/ohs01/ssl.conf` file.
2. Change `SSLVerifyClient require` to **`SSLVerifyClient None`**.
3. Save the changes.
4. Enter the following commands to stop and restart the OHS server:
 - `/etc/init.d/trellis stop ohs`
 - `/etc/init.d/trellis start ohs`

NOTE: A certificate replacement procedure must be used to replace expired certificates. Contact Technical Support or Professional Services for the Certificate (SSL/TLS) replacement procedure.

Appendix B: Platform Shut Down and Restart

If you are applying security patches, upgrading or performing maintenance on the *Trellis*™ platform back and front machines, a system restart is required. The following procedures can be performed on a Microsoft® Windows® or Red Hat® Enterprise Linux® operating system.

B.1 Windows operating systems

To shut down the back and front machines:

NOTE: Notify the system administrator prior to completing this procedure. After shut down, the machines need to be manually restarted.

1. Access the front machine as a user that belongs to the local administrators group using the Remote Desktop Protocol (RDP) application.
2. On your desktop, click the *Start* icon in the lower left corner of the taskbar, then right-click the *Command Prompt* application and select *Run as administrator* to open the command prompt window. This signals the operating system and User Account Control (UAC) to allow this user to act as a local administrator and manage the *Trellis*™ platform.
3. At the command prompt, enter the `c:\u01\trellis\trellis stop` command to stop the *Trellis*™ platform:
4. After the platform stops, repeat step 1 for the back machine.
5. Shut down the front machine by entering one of the following commands:

Shut down the complete Windows operating system by entering `shutdown -s -f -t 0`.

-or-

Shut down and restart the Windows operating system by entering `shutdown -r -f -t 0`.

6. Repeat step 4 on the back machine.

To apply patches or hot fixes:

1. Access the front machine as a system administrator via Remote Desktop Protocol (RDP).
2. At the command prompt, enter the `c:\u01\trellis\trellis stop` command to stop the *Trellis*™ platform.
3. Enter the `sc stop "OracleServiceORCL"` command to shut down Oracle on the back machine.
4. Enter the `sc stop "ServedLicenseInterface"` command to shut down license on back machine.
5. Stop the back machine via batch scripts.
6. Apply patches or hot fixes to the front and back machine.
7. Reboot the operating system for the front and back machine.
8. Enter the `sc start "OracleServiceORCL"` command to start Oracle on the back machine.
9. Enter the `sc start "ServedLicenseInterface"` command to start the License server on the back machine.
10. Start the *Trellis*™ platform on the back machine and then the front machine via batch scripts.

To restart the *Trellis*™ platform:

1. Turn on the back machine, then the front machine.
2. On the back machine, enter the `c:\u01\trellis\trellis start` command to start the *Trellis*™ platform:

NOTE: The Oracle® database automatically starts up with the system.

3. After the *Trellis*™ platform is running, verify the ports listed in the following table are listening.

NOTE: If you choose to not run the following commands individually, ensure you do not run more than three at a time. If the commands do not generate a listening response, enter **service trellis stop**, then **service trellis start** to restart the platform. Contact Technical Support if you have further issues.

Table B.1 Back Machine Port Verification Commands

PORT TYPE	SERVICE	COMMANDS
External	JDBC (non SSL)	netstat -ano find "0.0.0.0" find ":1521"
Internal	Node Manager	netstat -ano find "0.0.0.0" find ":5556"
Internal	OID / OVD AdminServer (Non SSL)	netstat -ano find "0.0.0.0" find ":7021"
Internal	OVD (HTTPS)	netstat -ano find "0.0.0.0" find ":7022"
Internal	OVD (LDAPS)	netstat -ano find "0.0.0.0" find ":7023"
External	OVD (LDAP)	netstat -ano find "0.0.0.0" find ":7024"
External	OID (LDAP)	netstat -ano find "0.0.0.0" find ":7026"
External	OID (LDAPS)	netstat -ano find "0.0.0.0" find ":7028"
External	OID / OVD AdminServer (SSL)	netstat -ano find "0.0.0.0" find ":7031"
External	SLI Licensing (HTTP)	netstat -ano find "0.0.0.0" find ":8080"

4. Repeat step 2 on the front machine.
5. After the *Trellis*™ platform is running, verify that the ports listed in the following table are listening.

NOTE: If you choose to not run the following commands individually, ensure you do not run more than three at a time. If the commands do not generate a listening response, enter **service trellis stop**, then **service trellis start** to restart the platform. Contact Technical Support if you have further issues.

Table B.2 Front Machine Port Verification Commands

PORT TYPE	SERVICE	COMMANDS
External	Oracle HTTP Server (HTTP)	netstat -ano find "0.0.0.0" find ":80"
External	Oracle HTTP Server (HTTPS)	netstat -ano find "0.0.0.0" find ":443"
Internal	Node Manager	netstat -ano find "0.0.0.0" find ":5556"
External	OSB Proxy (SSL)	netstat -ano find "0.0.0.0" find ":6443"
Internal	AdminServer (Non SSL)	netstat -ano find "0.0.0.0" find ":7001"
Internal	AdminServer (SSL)	netstat -ano find "0.0.0.0" find ":7002"
Internal	Jasper Server (Non SSL)	netstat -ano find "0.0.0.0" find ":7005"
Internal	ADF Server (Non SSL)	netstat -ano find "0.0.0.0" find ":7011"
Internal	ADF Server (SSL)	netstat -ano find "0.0.0.0" find ":7012"
Internal	SOA Server (Non SSL)	netstat -ano find "0.0.0.0" find ":8001"
Internal	SOA Server (SSL)	netstat -ano find "0.0.0.0" find ":8002"
Internal	OSB Server (Non SSL)	netstat -ano find "0.0.0.0" find ":8011"
Internal	OSB Server (SSL)	netstat -ano find "0.0.0.0" find ":8012"

6. From the <https://<frontserverIP>> URL, launch the *Trellis*™ platform user interface.

B.2 Red Hat® Enterprise Linux® operating systems

To shut down the front and back machines:

NOTE: Notify the system administrator prior to completing this procedure. After shutdown, the machines need to be manually restarted.

1. Stop the *Trellis*™ platform on the front machine by launching a PuTTY session, and as **oracle**, entering **service trellis stop** or **/etc/init.d/trellis stop**.
2. On the front machine, find and kill the process ID servicing port 5556 to stop the NodeManager service.
 - a. Enter **netstat -anp | grep 5556** to find the process ID servicing port 5556.
 - b. Enter **kill-1 <processid>** to re-execute the **netstat -anp | grep 5556** command and check if the process ID still exists.
 - c. If the process ID still exists, execute the command **kill -9 <processid>**.
3. After the *Trellis*™ platform stops, repeat step 1 for the back machine.
4. On the back machine, find and kill the process ID servicing port 5556 to stop the NodeManager service.
5. On the back machine, stop the database and enter the following commands:

```
sqlplus/as sysdba
```

```
shutdown immediate;
```

```
exit
```

```
lsnrctl stop
```

6. After the *Trellis*™ platform stops on both the front and back machines, either shut down the complete Red Hat® Enterprise Linux® operating system by entering:

```
su -
```

```
poweroff
```

```
-or-
```

Shut down and restart the Red Hat® Enterprise Linux® operating system by entering:

```
su -
```

```
reboot
```

To restart the *Trellis*™ platform:

1. Turn on the back machine, then the front machine.
2. On the back machine, launch a PuTTY session and enter **service trellis start** or **/etc/init.d/trellis start** at the command prompt to start the *Trellis*™ platform.

NOTE: The Oracle® database automatically starts up with the system.

3. After the *Trellis*™ platform is running, verify that the ports listed in the following table are listening.

NOTE: If you choose to not run the following commands individually, ensure you do not run more than three at a time. If the commands do not generate a listening response, enter **service trellis stop**, or **/etc/init.d/trellis stop** then **service trellis start** or **/etc/init.d/trellis start** to restart the platform. Contact Technical Support if you have further issues.

Table B.3 Back Machine Port Verification Commands

PORT TYPE	SERVICE	COMMANDS
External	JDBC (non SSL)	<code>netstat -an grep:* grep -w 1521 -m 1</code>
Internal	Node Manager	<code>netstat -an grep:* grep -w 5556 -m 1</code>
Internal	OID / OVD AdminServer (Non SSL)	<code>netstat -an grep:* grep -w 7021 -m 1</code>
Internal	OVD (HTTPS)	<code>netstat -an grep:* grep -w 7022 -m 1</code>
External	OVD (LDAPS)	<code>netstat -an grep:* grep -w 7023 -m 1</code>
Internal	OVD (LDAP)	<code>netstat -an grep:* grep -w 7024 -m 1</code>
External	OID (LDAP)	<code>netstat -an grep:* grep -w 7026 -m 1</code>
External	OID (LDAPS)	<code>netstat -an grep:* grep -w 7027 -m 1</code>
Internal	Web Logic	<code>netstat -an grep:* grep -w 7028 -m 1</code>
External	OID / OVD AdminServer (SSL)	<code>netstat -an grep:* grep -w 7031 -m 1</code>
External	SLI Licensing (HTTP)	<code>netstat -an grep:* grep -w 8080 -m 1</code>

4. Repeat step 2 on the front machine.
5. After the *Trellis™* platform is running, verify that the ports listed in the following table are listening.

Table B.4 Front Machine Port Verification Commands

PORT TYPE	SERVICE	COMMAND
External	Oracle HTTP Server (OHS) (HTTP)	<code>netstat -an grep:* grep -w 80 -m 1</code>
External	Oracle HTTP Server (OHS) (HTTP)	<code>netstat -an grep:* grep -w 443 -m 1</code>
Internal	Node Manager	<code>netstat -an grep:* grep -w 5556 -m 1</code>
External	OSB Proxy (SSL)	<code>netstat -an grep:* grep -w 6443 -m 1</code>
Internal	AdminServer (Non SSL)	<code>netstat -an grep:* grep -w 7001 -m 1</code>
Internal	AdminServer (SSL)	<code>netstat -an grep:* grep -w 7002 -m 1</code>
Internal	Jasper Server (Non SSL)	<code>netstat -an grep:* grep -w 7005 -m 1</code>
Internal	ADF Server (Non SSL)	<code>netstat -an grep:* grep -w 7011 -m 1</code>
Internal	ADF Server (SSL)	<code>netstat -an grep:* grep -w 7012 -m 1</code>
Internal	SOA Server (Non SSL)	<code>netstat -an grep:* grep -w 8001 -m 1</code>
Internal	SOA Server (SSL)	<code>netstat -an grep:* grep -w 8002 -m 1</code>
Internal	OSB Server (Non SSL)	<code>netstat -an grep:* grep -w 8011 -m 1</code>
Internal	OSB Server (SSL)	<code>netstat -an grep:* grep -w 8012 -m 1</code>

NOTE: It is recommended that these commands are run individually or approximately three at a time in order to see the responses clearly. It is very important that each of these produce a “listening” response. If any do not show a response, this means the service is not running. Try restarting the *Trellis™* platform service again by entering **service trellis stop** or **/etc/init.d/trellis stop** then **service trellis start** or **/etc/init.d/trellis start** to restart the platform. Contact Technical Support if you have further issues.

6. From the <https://<frontserverIP>> URL, launch the *Trellis™* platform user interface.

Appendix C: Supported Service Processor Profiles

The following table lists the supported SP profiles.

Table C.1 Supported Service Processor Profiles

VENDOR	SERVICE PROCESSOR	PRODUCT NAME	CURRENT VERSION
Dell	Dell C Series	PowerEdge C6220	2.53
	DRAC 5	PowerEdge 1850	1.65 (12.08.16)
	iDRAC blades	PowerEdge M805	1.65
	iDRAC6 blade	PowerEdge M710	3.80
	iDRAC6 monolithic	PowerEdge R710	2.85
	iDRAC7 blade	PowerEdge M520	2.30.30.30
	iDRAC7 monolithic	PowerEdge M320	2.32.31.30
	iDRAC8 blade	PowerEdge M630	2.30.30.30
	iDRAC8 monolithic	PowerEdge M630	2.30.30.30
	M1000E Chassis	PowerEdge M1000e	5.12
HP	iLO2	ProLiant BL480c G1	2.29
	iLO3	ProLiant DL380 G7	1.87(C)
	iLO4	ProLiant DL360p G8	2.40
IBM	IMM	System x3650 M2	YU00H2B
	IMM2	System x3250 M4	1A0072H
Cisco	UCS-C	UCS C210 M2	1.4(3y)
Fujitsu	FSC iRMC_S2	Primergy RX300 S4	5.76A
	FSC iRMC_S4	Primergy RX200 S8	8.24F
Sun	iLOM3	Sun Fire X4170 M3	3.2.4.76a

Appendix D: TRELIS™ Intelligence Engine Firewall Ports

The following are the firewall ports and configuration for the *Trellis*™ Intelligence Engine.

Table D.1 Intelligence Engine Firewall Ports

SOURCE	DESTINATION	PROTOCOL	TRANSPORT	PORT	NOTES
loopback	loopback	N/A	N/A	N/A	Configure loopback to ACCEPT: loopback 127.0.0.1/32
<i>Trellis</i> Platform Front Server (OHS)	Intelligence Engine (Red Hat Enterprise Linux)	HTTPS	TCP	4440	Communication is one direction and is over two-way SSL
Intelligence Engine (Red Hat Enterprise Linux)	<i>Trellis</i> Platform Front Machine	HTTPS	TCP	6443	Communication is one direction and is over two-way SSL
Administrator Workstation	(Red Hat Enterprise Linux)	SSH	TCP	22	Installation/maintenance access
Intelligence Engine	Target Devices	SNMP	UDP	161	Default port; Set/Get operation; requires customer confirmation
		Modbus	TCP	502	Default port; requires customer confirmation
		OPC UA	TCP	21381	Default port; requires customer confirmation
		BACNet	UDP	47808	Default port; requires customer confirmation
		Velocity (Vertiv protocol)	UDP	47808	Default port; requires customer confirmation
		Telnet	TCP	23	Default port; requires customer confirmation
Target Devices	Intelligence Engine (Red Hat Enterprise Linux)	Velocity and BACNet	UDP	47777-48117	For BACNet/IP and Velocity return traffic
SNMP Traps	Intelligence Engine	SNMP	UDP	162	SNMP Traps
Intelligence Engine	PostgreSQL (Internal)	PostgreSQL	TCP	4321	PostgreSQL database Admin
Service Processors	Service Processor Manager (SPM)	IPMI	TCP	623	N/A
		Telnet	TCP	23	Default port
		HTTPS	TCP	443	Used for discovery
		HTTP	TCP	80	Used for discovery
		SSH	TCP	23	Default port
		N/A	UDP	623	Return IPMI traffic
Service Processor Manager	Service Processors	N/A	IPMI	50000-59999	SP access
Service Processor Manager	Redis Server (Internal)	RESP	TCP	6379	Message transportation between SPM processes
Service Processor Manager	PostgreSQL (Internal)	PostgreSQL	TCP	4322	SPM PostgreSQL database Admin

Table D.2 Firewall Configuration

DIRECTION	INTERFACE	SOURCE	DESTINATION	SERVICE	ACTION	USE-CASE RECOMMENDATIONS
Input	Any	Any	Any	SNMP Trap (162)	Allow	Used to monitor SNMP devices for the Intelligence Engine
Input	Any	Any	Any	Front machine (OHS 6443)	Allow	Used for <i>Trellis</i> ™ platform management and monitoring support
Input	Any	Any	Any	Intelligence Engine (4440)	Allow	Used by the Intelligence Engine for management and monitoring support of the <i>Trellis</i> ™ platform
Input	Any	Any	Any	Velocity and BACNet Incoming	Allow	Used to monitor BACNet over IP devices for the Intelligence Engine
Input	Any	Any	Any	Modbus	Allow	Used to monitor Modbus over IP devices for the Intelligence Engine
Input	Any	Any	Any	OPC UA	Allow	Used to monitor OPC UA over IP devices for the Intelligence Engine
Input	Any	Any	Any	SNMP	Allow	Used to monitor SNMP over IP devices for the Intelligence Engine
Input	Any	Any	Any	BACNet	Allow	Used to monitor SNMP over IP devices for the Intelligence Engine
Input	Any	Any	Any	Velocity (Vertiv protocol)	Allow	Used to monitor Velocity (Vertiv protocol) devices for the Intelligence Engine

Appendix E: Bulk Data Processing Error and Status Codes

E.1 User Interface Errors

The Bulk Data Processing tool supports the following user interface errors. These errors may appear when running the tool.

Table E.1 Errors and Descriptions

ERRORS	DESCRIPTIONS
Must provide a Username	Username field is blank on login.
Must provide a Password	Password field is blank on login.
Must provide a Hostname	Hostname field is blank on login.
Username/Password are incorrect	Username or Password are incorrect on login.
Must provide a File	User attempted to run a job with no file specified.
Incorrect Host or IP	Name is entered incorrectly or server is down.
Host Rejected Connection	Server does not contain the client's certificate.
Invalid Certificate	Client's certificate is not recognized by the host.
Not a valid File type	Selected file is not .xlsx or .xls.
Incorrect Directory	Selected file to run is not in the correct path.
No corresponding YAML found	YAML file in the datasource folder does not match the selected spreadsheet to run.

E.2 Error Codes

The *Trellis*™ platform supports the following error codes.

Table E.2 Error Codes and Descriptions

ERROR CODES	DESCRIPTIONS
1000	The <i>Trellis</i> platform system encountered an unexpected condition which prevented it from fulfilling the request.
1001	Could not complete the creation of a device due to an error.
1002	Could not complete the device update due to an error.
1003	Could not complete the connection creation due to an error.
1004	Could not complete the connection update due to an error.
1005	Could not complete the connection delete due to an error.
1036	Device cannot be placed because it is a member of the wrong category.
2001	Unsupported content type.
2002	Unsupported request method.
2003	Invalid method arguments.
2004	No handler method is available.
2005	Incomplete request - missing servlet request part.
2006	Incomplete request - missing servlet request parameter.
2007	Request not valid - type mismatch.
2008	System is not licensed to perform this operation.
2011	Request could not be completed due to a fine-grained authorization violation.
2012	Resource needed to complete the request does not exist.
2013	Request not valid - invalid method arguments.
2014	Staled resource - there is a newer version of the resource.
2015	Missing task - the provided planner task does not exist.
2016	Commit out of order - planner tasks have to be committed in the correct order.
2017	Dependency out of order - the request was trying to create dependencies out of the proper order.
2018	Request not valid - the provided effective time and task combination are incorrect.
2020	Invalid symbol version - there is a newer version for the provided symbol.
2021	Symbol does not exist.
2022	Unable to place device - the parent field for placement cannot be null.
2023	Unable to place device in rack due to collision, It may be overlapping with other devices or crossing the rack boundary.
2024	Placement type is not supported.
2026	Device cannot be placed in container device because the device width and/or height is larger than container device width and/or height.
2027	Device cannot be placed because it does not fit in the specified location.
2028	Device cannot be placed in space because the device is not in space boundaries.

Table E.2 Error Codes and Descriptions (continued)

ERROR CODES	DESCRIPTIONS
2029	Device cannot be placed because it falls into unusable zone.
2030	No effective task ID - please provide a task ID in the effectiveTaskId request parameter.
2041	Unable to Update Device, unable to move device to a slot due to collision.

E.3 Status Codes

The *Trellis™* platform supports the following HTTP status codes in the output spreadsheet.

Table E.3 HTTP Status Codes and Descriptions

CODE	HTTP ERROR	DESCRIPTION
200	OK	Request successfully completed and will include a representation in it's response.
201	Created	Request that created a new resource completed successfully.
400	Bad Request	Request could not be processed because it contains missing or invalid information. For example, a validation error on an input field, a missing required value.
401	Unauthorized	Authentication credentials included with this request are missing or invalid.

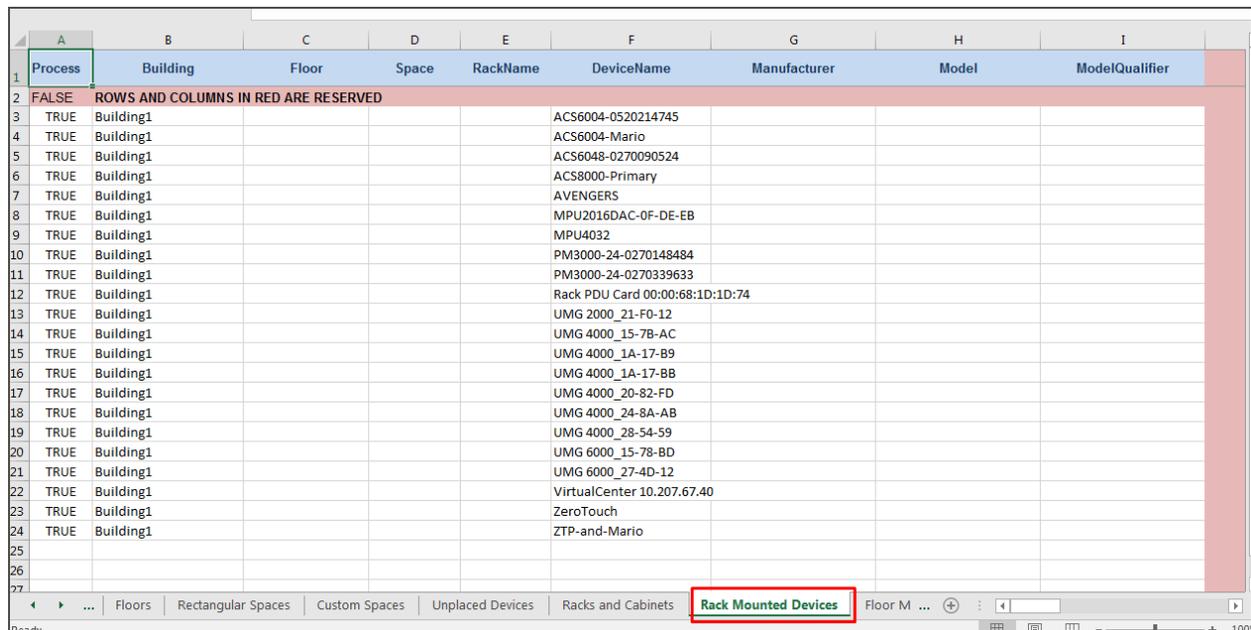
Appendix F: Importing DSView™ 4 Management Software CSV Files

The CSV files that are produced by the Avocent® DSView™ 4 management software can be imported and converted into Bulk Data Processing tool spreadsheets. The DSView™ software devices are placed in the Rack Mounted Devices spreadsheet.

Important considerations:

- Only devices are converted. No ports are processed.
- The device name and serial number are the only one-to-one mapped properties.
- After the conversion is launched, any remaining fields without a specific designation are placed in the Notes fields and the corresponding UDPs fields.

Figure F.1 Rack Mounted Devices Spreadsheet



Process	Building	Floor	Space	RackName	DeviceName	Manufacturer	Model	ModelQualifier
FALSE	ROWS AND COLUMNS IN RED ARE RESERVED							
TRUE	Building1				ACS6004-0520214745			
TRUE	Building1				ACS6004-Mario			
TRUE	Building1				ACS6048-0270090524			
TRUE	Building1				ACS8000-Primary			
TRUE	Building1				AVENGERS			
TRUE	Building1				MPU2016DAC-0F-DE-EB			
TRUE	Building1				MPU4032			
TRUE	Building1				PM3000-24-0270148484			
TRUE	Building1				PM3000-24-0270339633			
TRUE	Building1				Rack PDU Card 00:00:68:1D:1D:74			
TRUE	Building1				UMG 2000_21-F0-12			
TRUE	Building1				UMG 4000_15-7B-AC			
TRUE	Building1				UMG 4000_1A-17-B9			
TRUE	Building1				UMG 4000_1A-17-BB			
TRUE	Building1				UMG 4000_20-82-FD			
TRUE	Building1				UMG 4000_24-8A-AB			
TRUE	Building1				UMG 4000_28-54-59			
TRUE	Building1				UMG 6000_15-78-BD			
TRUE	Building1				UMG 6000_27-4D-12			
TRUE	Building1				VirtualCenter 10.207.67.40			
TRUE	Building1				ZeroTouch			
TRUE	Building1				ZTP-and-Mario			

Each CSV file imported from the DSView™ 4 software contains a maximum of up to 10,000 devices (excluding ports) and so for cases with more than 10,000 devices there are multiple files. All the files are stored in the same output folder with a suffix indicating the spreadsheet number. Each spreadsheet is also accompanied by the corresponding YAML file.

Example: Properties Mapped as Notes

Unit	Notes	Serial Number
	e:	
	f:	
	Firmware Version:	
	g:	
	h:	
	i:	
	IP Address:	
	j:	
	KVM Profile:Default KVM Session Profile	
	Location:	
	MAC Address:	
	Migration Status:	
	Model Number:	
	OSCAR:	
	Part Number:	
	Primary Contact:	
	Primary Contact Phone:	
	Secondary Contact:	
	Secondary Contact Phone:	
	Secure Mode:Unsecure	
	Site:	
	Telnet Port:	
	Type:	

Example: Properties Mapped as UDPs

AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA
UDP:Devic	UDP:Devic	UDP:Devic	UDP:Devic	UDP:Devic	UDP:Devic	UDP:Devic	UDP:Devic	UDP:Devic	UDP:Devic	UDP:Devic	UDP:Devic	UDP:Devic	UDP:Devic	UDP:Devic	UDP:Devic	UDP:Devic	UDP:Devic
	Telnet Ser								WIN-3G1T								
		520391-00							WIN-3G1T								10.207.67.
		520391-00							WIN-3G1T								10.207.67.
	Browser S			dsview/pi					WIN-3G1T								10.207.68.
		520596-00							WIN-3G1T			1.32.0.245					10.207.67.
									WIN-3G1T			3.2.0.23 rd					10.207.67.
									WIN-3G1T								
									WIN-3G1T								
									WIN-3G1T								
									WIN-3G1T								

The following is an example of importing a CSV file from the DSView™ software to the Trellis™ platform. You must complete all the required fields to be able to import to a spreadsheet.

To import the CSV files into the Trellis™ platform:

1. Log into the DSView™ software and click the *Units* tab.
2. In the Unit Views list, click *Tools*, and in the Unit Tools window, click *Export Units*.
3. In the Select Unit Properties to Export window, select the properties (IP Address, Location, Model Number, Part Number and Serial Number) to be exported and click *Add*.

NOTE: The properties appear in the CSV file in the order listed in this window.

4. Click *NEXT* two times to complete the Wizard steps.
5. After the Wizard is complete, click the *Download CSV* button to generate and download the *unitproperties.csv* file.
6. After the CSV file is downloaded, copy the file to the *converterDataSource* folder in the *bulkdatabrocessing* folder.
7. Navigate to the File Converter Tool window in the Bulk Data Processing tool, click *BROWSE* and then locate the *unitproperties.csv* file.
8. Enter the correct building name, if applicable, or leave the default *Building1* entry.
9. Click *CONVERT* to convert the files and place the spreadsheet and associated YAML files in the *ConverterOutputFiles* folder.



CAUTION: In a long running task, you can click *CANCEL* to delete all the files that are created within the same conversion.





VertivCo.com | Vertiv Headquarters, 1050 Dearborn Drive, Columbus, OH, 43085, USA

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