



High density reference design for AI

AI Reference Design #006

4x 1.2MW NVIDIA Blackwell DGX SuperPODs

A full data center environment designed for a 5MW solution with distribution redundancy, using three NVIDIA Blackwell DGX SuperPODs.

Design principles

- 1. Design both Power and Cooling together** to optimize AI infrastructure.
- 2. Power is at a premium.** Eliminate stranded power by aligning AI clusters to data center 'capacity blocks.'
- 3. Consider total cost of ownership, redundancy, and blast radius** in AI power and cooling designs, and the tradeoffs among them.
- 4. Handle AI workload surges** though system-level controls and power and cooling buffers.
- 5. Design for a mix of liquid and air cooling**, which have a combined and interdependent impact on the ability to remove heat.
- 6. Design for the future.** AI power density will rapidly grow toward 500kW per rack.

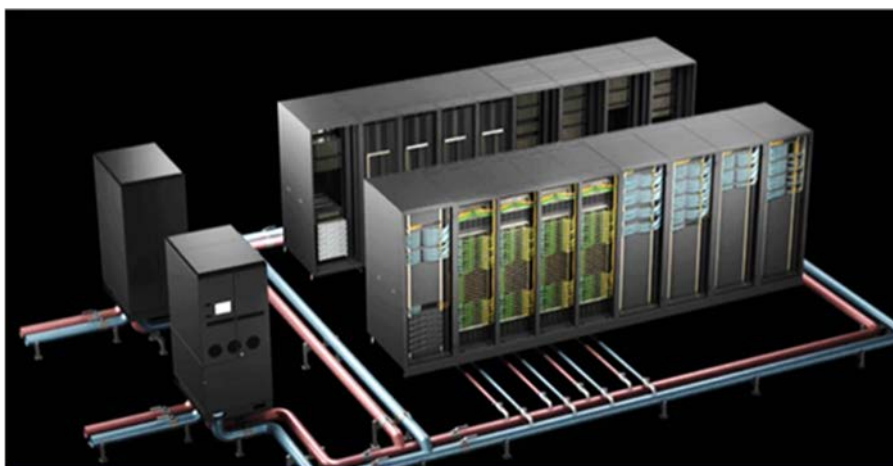


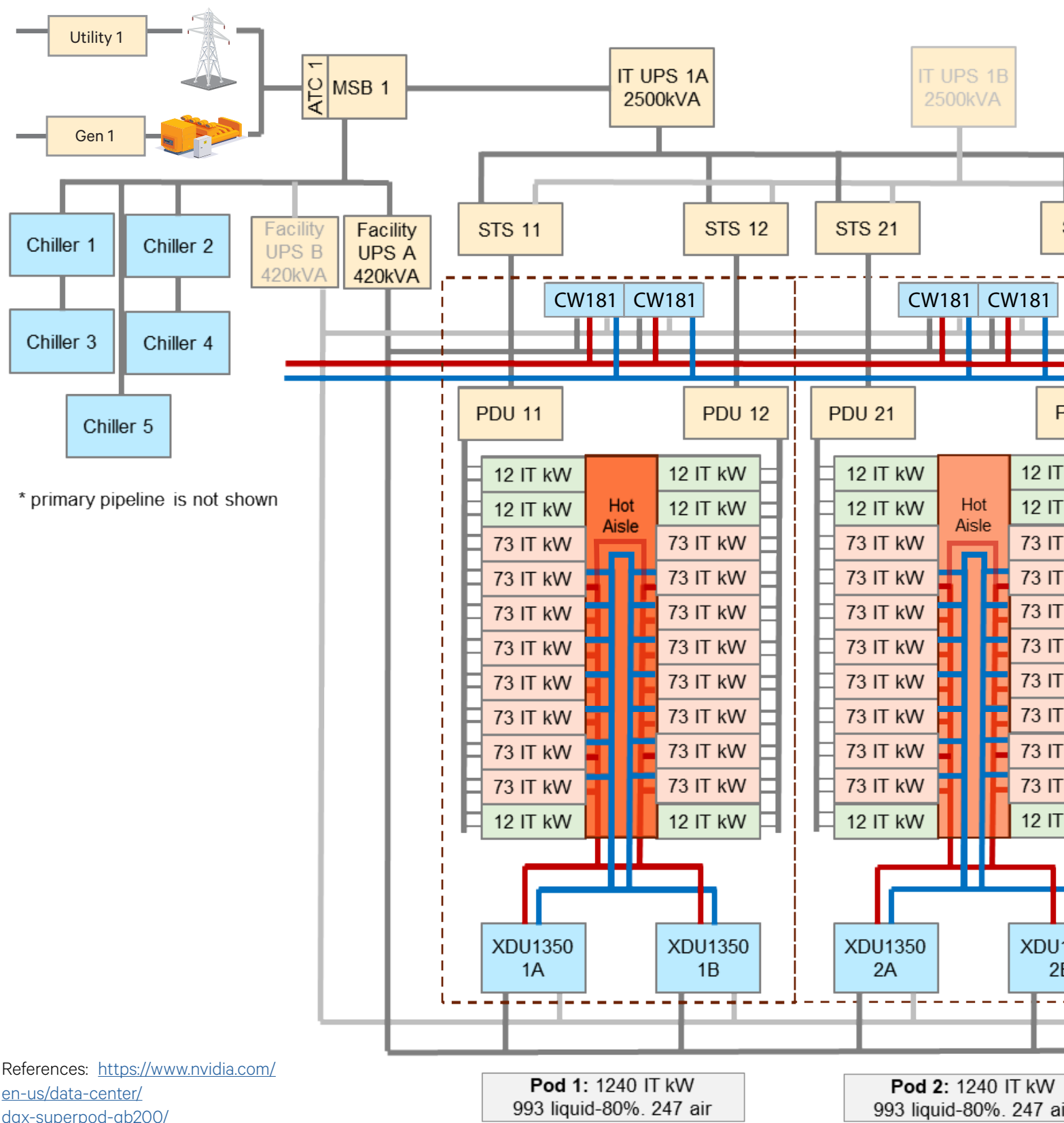
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Design summary

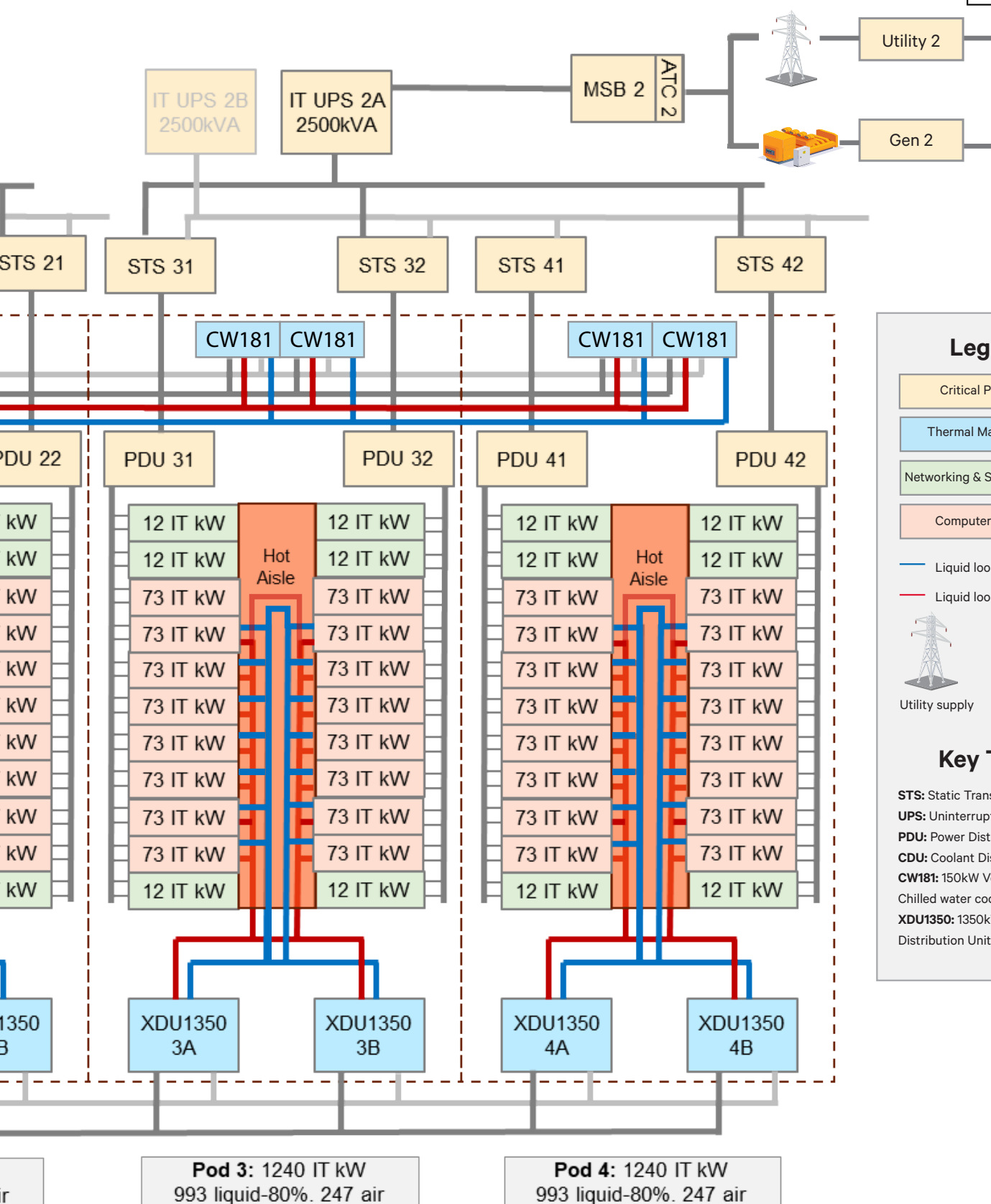
Solution Capacity	5MW
Redundancy	2N
Total IT Load	4,960kW (1240kW per POD)
Rack Density (IT load)	64 racks at 73kW, 24 racks at 12kW
Rack(s)	88
Cooling Topology	80% Liquid (direct-to-chip) 20% Air (perimeter units)
Coolant Distribution	XDU1350
Perimeter air cooling	CW181
Chiller	FH3135
Rack PDU(s)	120A rack PDU, 2 per rack
Busbar	1000A busbar, 4 per POD 120A TOB, 2 per rack
Room/Row PDU	650kVA PDU, 2 per POD
UPS for IT	2500kVA UPS, 2N, supplying both PODs
UPS for Cooling System	420kVA UPS, 2N, supplying both cooling loops

Vertiv™ 360AI

Reference design schematic



References: <https://www.nvidia.com/en-us/data-center/dgx-superpod-gb200/>



Legend

Critical Power

Thermal Management

Networking & Storage Racks

Computer Racks

Liquid loop, cold/supply

Liquid loop, hot/return



Utility supply



Generator

Key Terms

STS: Static Transfer Switch
UPS: Uninterruptible Power Supply
PDU: Power Distribution Unit
CDU: Coolant Distribution Unit
CW181: 150kW Vertiv™ Liebert®
 Chilled water cooling
XDU1350: 1350kW Coolant
 Distribution Unit (CDU)



Vertiv components of the design

Component	Details
IT UPS 1A	2,500kVA Primary UPS for both PODs
IT UPS 1B	2,500kVA Secondary UPS for both PODs
IT UPS 2A	2,500kVA Primary UPS for both PODs
IT UPS 2B	2,500kVA Secondary UPS for both PODs
Facility UPS A	420kVA Primary UPS for cooling systems (XDU1350 & CW181)
Facility UPS B	420kVA Secondary UPS for cooling systems (XDU1350 & CW181)
STS 11	STS for POD 1, power from IT UPS 1A and UPS 1B
STS 12	STS for POD 1, power from IT UPS 1A and UPS 1B
STS 31	STS for POD 3, power from IT UPS 2A and UPS 2B
STS 32	STS for POD 3, power from IT UPS 2A and UPS 2B
PDU 11	650kVA PDU supplies row 1 of POD 1, power from STS 11
PDU 12	650kVA PDU supplies row 2 of POD 1, power from STS 12
PDU 31	650kVA PDU supplies row 1 of POD 3, power from STS 31
PDU 32	650kVA PDU supplies row 2 of POD 3, power from STS 32
Busbar and Tap-off Boxes (TOB)	4x 1000A busbar per POD, 2x 120A TOB per rack
Rack PDUs for compute racks	2x 125A rack PDUs per rack
Rack PDUs for network & storage racks	2x 32A rack PDUs per rack
Chiller	5x FH3135 heat rejection for liquid cooling loop (XDU1350 and CW181), N+1 redundant
XDU1350 1A	Primary coolant distribution unit (CDU) for POD 1, redundant power from facility UPSs
XDU1350 1B	Secondary coolant distribution unit (CDU) for POD 1, redundant power from facility UPSs
XDU1350 3A	Primary coolant distribution unit (CDU) for POD 3, redundant power from facility UPSs
XDU1350 3B	Secondary coolant distribution unit (CDU) for POD 3, redundant power from facility UPSs
CW181	Air-cooling unit for POD, redundant power from facility UPSs
Rack	48U 800x1200

Design modification options

Non-redundant in each Pod

Option 1

- 2x 1000A Busbar
- 1x 63Ax2 TOB /Rack
- 2x 63A rPDU /Rack
- 2x 32A rPDU /Rack(network)

Non-redundant in each Pod

Option 2

- 4x 500A Busbar
- 2x 63A TOB /Rack
- 2x 63A rPDU /Rack
- 2x 32A rPDU /Rack(network)

Redundant in each Pod

Option 3

- 4x 1000A Busbar
- 2x 125A TOB /Rack
- 2x 125A rPDU /Rack
- 2x 32A rPDU /Rack(network)