5.2 MW, Pod-based build, Chilled Water, 85000 ft^2

DESIGN OVERVIEW

Data Center IT Capacity
5.2 MW

Target Availability
Tier III with 2N power distribution and less-redundant generator configuration

Annualized PUE at 100% Load
1.43 in Miami, FL USA
1.24 in Montreal, Canada
1.31 in St. Louis, MO USA

Total Racks and Average Density
864 traditional racks at 6 kW/rack

Data Center Overall Space
Min. 85000 ft^2

Regional Voltage and Frequency
480V, 60Hz

ABOUT THIS DESIGN

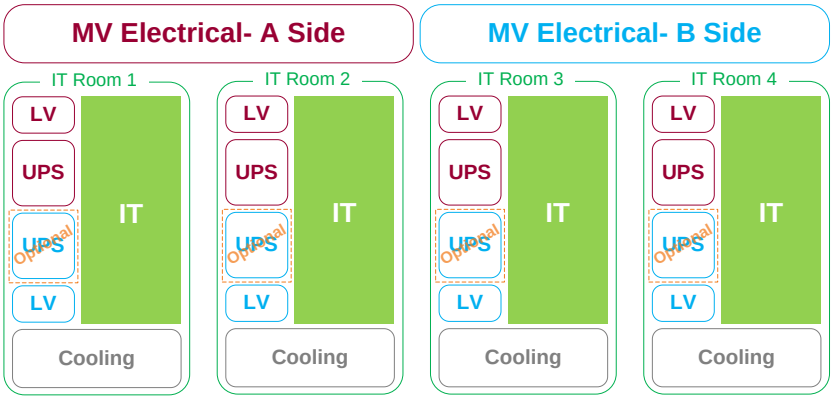
- IT Space and power distribution designed to enable pod-by-pod deployment
- HyperPod containment system allows for fully populated and/or hyper-converged racks to be rolled in place
- Galaxy VX UPS with Li-Ion batteries
- Battery backup on one power path only allows for cost savings (optional)
- 6 kW density racks with hot aisle containment
- Chilled water heat removal system

INTRODUCTION

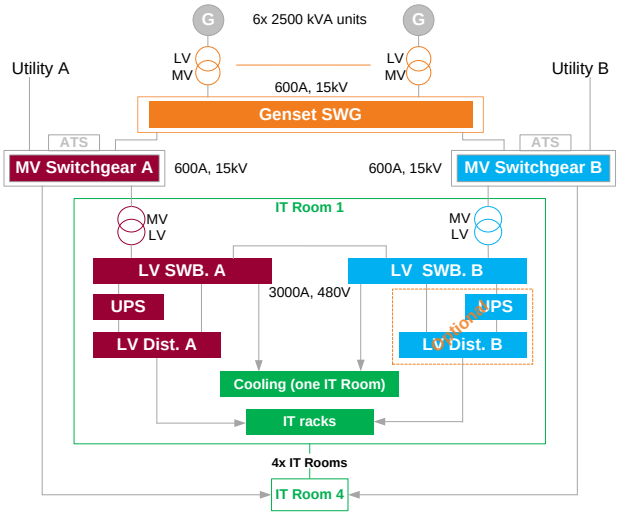
The planning process of most projects can be iterative and thereby expensive. Data center projects are burdened with these challenges and can benefit greatly from simplification and time savings. Schneider Electric's data center reference designs help optimize the planning process by providing validated, proven, and documented data center physical infrastructure plans. The use of these designs has a positive impact on not just the project itself, but also on the performance, reliability, and efficiency of the data center over its lifetime.

This reference design was developed for colocation customers planning medium to large data centers, with a focus on increased speed and lower cost of deploying a pod-based architecture, avoiding the need to modify the data center ceiling infrastructure to accommodate cabling and piping, by using the HyperPod containment system instead. For scalability and lower-cost, IT rooms can be built in stages and an alternative UPS redundancy scheme is proposed. This data center includes four rooms with 1296 kW of IT capability, along with a chilled water perimeter cooling system serving each room. Together these rooms and systems constitute the building blocks for the data center. Each expansion, therefore, can occur in increments of 1296 kW of IT load.

Reference Design 65 includes information for three areas: facility power, facility cooling, and IT space. Combined together, they comprise the integrated power, cooling and structural systems required to meet the design's specifications in this overview document.



FACILITY POWER BLOCK DIAGRAM



DESIGN OPTIONS

This reference design can be modified as follows without a significant effect on the design's performance attributes:

- Add a UPS to alternate power path
- Change UPS batteries
  - Location
  - Type (VRLA or Li-Ion)

FACILITY POWER ATTRIBUTES

Name	Value	Unit
Total bus amps (MV bus)	600	A
Input voltage (MV bus)	15	kV
MV Switchboard kAIC	25	kA
Generator Redundancy	N+1	
Total amps (main LV bus)	3000	A
Input voltage (main LV bus)	480	V
LV Switchboard kAIC	85	kA
Power path	Double	
IT space UPS capacity	6000	kW
IT space UPS redundancy	N (Optional 2N)	
IT space UPS runtime @ rated load	5	minutes
Facility cooling UPS capacity	None	kW
Facility cooling UPS redundancy	N/A	
Facility cooling UPS runtime @ rated load	N/A	minutes

Facility Power

Medium Voltage (MV) Distribution

The facility power system supplies energy to the critical and non-critical components within the data center, with high reliability levels. Two Premset switchboards, each rated at 15 kV, 600 A and 25 kA (2s), make up the MV distribution, providing A and B side power downstream to IT and cooling equipment. Backup power is provided by six diesel generators in an N+1 redundant arrangement, where each generator is paired with an LV/MV step up 2500 kVA Power Dry II VPI cast resin transformer (5.75% short circuit impedance) and a Premset switchboard rated at 15 kV, 600 A and 25 kA (2s), with automatic transfer built into the design. This generator plant is shared across the facility, allowing capital costs savings from additional switchgear and over-sizing.

Low Voltage (LV) Distribution

Downstream from the MV distribution, the 2N redundant distribution is separated into 8 LV sections for the four IT rooms, cooling systems, and auxiliaries. The LV distribution for each IT room is made up of two Power Dry II 2500 kVA transformers (5.75% impedance), each coupled with an QED6 LV lineup, rated at 480 V and 85 kA (1s) with a 3000 A bus, providing power to the main and alternate power paths. One of these QED6 lineups feeds two 750 kVA Galaxy VX UPSs with Li-Ion batteries on side A, while the second QED6 lineup directly feeds the IT load from side B, to guarantee 2N LV power distribution. This arrangement allows for cost, footprint and weight savings, while still maintaining a high level of reliability. As an option, another set of Galaxy VX UPSs can be placed on the alternate path to provide the IT load with both A and B-side UPS backup.

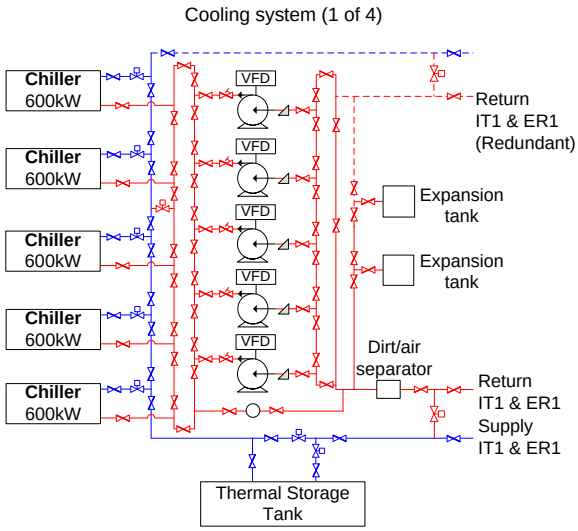
Cooling systems and auxiliary loads for all IT rooms also receive power from the LV section, provided by A and B-side distribution from two additional QED6 lineups, rated at 480V, 85 kA (1s), with a 1200 A bus, which is designed to automatically switch between feeds.

The facility power system is designed to also support integrated peripheral devices like fire panels, access control systems, and environmental monitoring and control devices. Additionally, power meters in the electrical path monitor power quality and allow for predictive maintenance & diagnostics of the system. These meters also integrate with StruxureWare Power Monitoring Expert.

Every component in this Reference Design is built and tested to the applicable ANSI standards. Further design details and schematics are available in the engineering package available

Facility Cooling

FACILITY COOLING BLOCK DIAGRAM



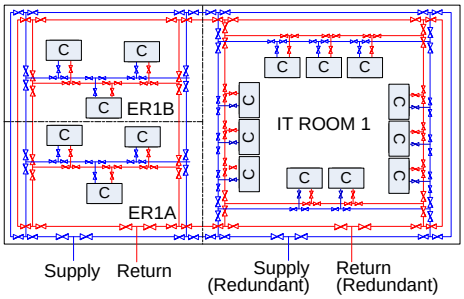
The facility cooling design is comprised of four identical stand-alone cooling systems, each with a dual-path piping system, five packaged chillers with free cooling capabilities and 14 Uniflair chilled water room-based computer room air handlers (CRAHs) that deliver clean and conditioned supply air to the IT and electrical rooms, in an N+1 configuration. The redundant piping system across the IT and electrical distribution rooms provides an alternate path for chilled water, in case of cooling equipment failure. In addition, thermal storage systems are offered to provide continuous cooling after a power outage or chiller restart. Thermal storage tanks should be sized to accommodate the ramp-up time of the chillers and building topology. Additional air handling units are added to supply fresh air in the building.

Warm return air from the IT equipment is ducted to a common ceiling plenum, from which each Uniflair cooling unit draws air and supplies the data center with a flood of cool air at the perimeter of the IT and electrical rooms.

This design is instrumented to work with StruxureWare Building Operation software.

Further design details such as dimensions, equipment placement, temperature set points, pipe sizing, flow rates, and pressure drops are available in the engineering package.

Piping inside electrical and IT rooms (1 of 4)



DESIGN OPTIONS

This reference design can be modified as follows without a significant effect on the design's performance attributes:

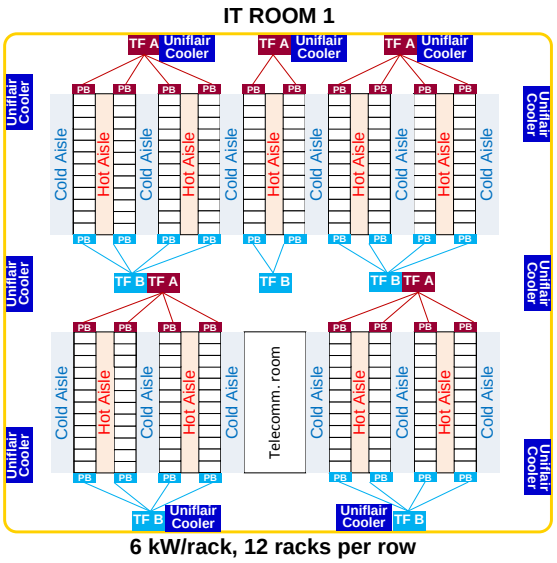
- Reduce redundancy to the module, not frame, level
- Eliminate secondary water supply tank size, or change its size
- Use water-saver mode to rely more on direct expansion and reduce water consumption

FACILITY COOLING ATTRIBUTES

Name	Value	Unit
Total cooling capacity	7500	kW
Input voltage	480	V
Heat rejection medium	Chilled water	
Mechanical redundancy	N+1	
Outdoor heat exchange	Packaged chiller with free-cooling	
Coolant supply temperature	59	F
Coolant return temperature	69	F
Storage tank size per cooling system	7750	gallons
Ride through time	5	mins
Economizer type	Water-side	

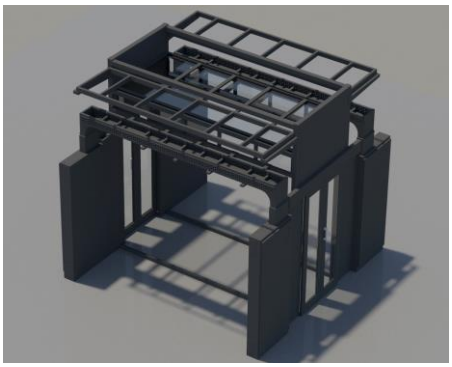
IT Space

IT ROOM LAYOUT



6 kW/rack, 12 racks per row

HYPERPOD CONTAINMENT SYSTEM

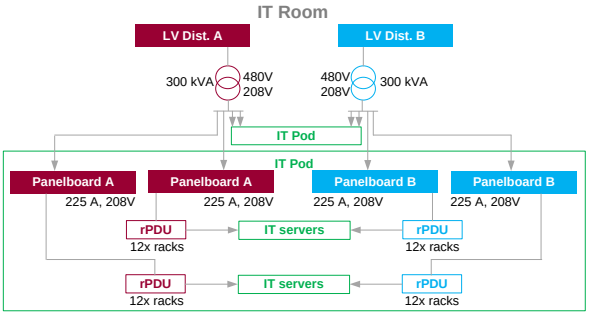


Four IT rooms make up the entire IT space of this design. Each of the rooms is comprised of 9 pods, or 18 rows, housing 24 racks each, for a total of 216 racks per IT room. Each rack is capable of an average of 6 kW for a total of 1.3 MW per room, with 5.2 MW worth of IT capacity in aggregate.

The IT rooms are designed to allow for pod-by-pod deployment, since the supporting system and hot aisle containment is provisioned for each pod by the HyperPod containment system, allowing racks to be fully populated and rolled in place. Deploying HyperPod increases the cooling efficiency of the N+1 perimeter cooling units while it also provides a robust structural system to support power cabling and equipment, including end-of-pod power distribution though distribution cabinets, among other advantages.

In this design, power from the UPS systems in the electrical room is stepped down from 480 V to 208 V by 300 and 150 kVA SquareD dry-type transformers located in the perimeter of the IT pods. Four 225 A SquareD standard panelboards, located inside the distribution cabinets at the end of the HyperPod, and distribute power from the transformers to each rack, in a 2N configuration, through a power raceway that integrates seamlessly to the frame. Every rack is configured with two metered rack-mount power distribution units (rPDU), to enable remote monitoring of the units for efficiency and capacity management.

The security of the room can be maintained at multiple points with NetBotz systems installed on the HyperPod frames. At the rack level, access is controlled by a door lock and sensor and at the room level, security cameras are utilized for monitoring.



IT SPACE ATTRIBUTES

Name	Value	Unit
IT load (total – per room)	5.2 – 1.3	MW
Input voltage	480	V
Supply voltage to IT	208	V
Average density	6	kW/rack
Number of IT racks	864	racks
IT floor space	33675	ft^2
Single or dual cord	Dual	
Heat rejection medium	Chilled water	
CRAC/CRAH type	Perimeter	
CRAC/CRAH redundancy	N+1	
Containment type	Hot Aisle	

DESIGN OPTIONS

This reference design can be modified as follows without a significant effect on the design's performance attributes:

- Change voltage to the IT equipment
- Add environmental and security management
- Change rack options (tall, wide, deep)
- Change power distribution options
- Add StruxureWare Data Center Expert

Design Attributes

Overview	Value	
Annualized PUE at 100% load	1.43 / 1.24 / 1.31	
Data center overall space	85000 ft^2	
Facility Power	**Value**	**Unit**
Total bus amps (MV bus)	600	A
Input voltage (MV bus)	15	kV
MV Switchboard kAIC	25	kA
Generator Redundancy	N+1	
Total amps (main LV bus)	3000	A
Input voltage (main LV bus)	480	V
LV Switchboard kAIC	65	kA
Power path	Double	
IT space UPS capacity	1500	kW
IT space UPS redundancy	N (Optional 2N)	
IT space UPS runtime @ rated load	5	minutes
Facility cooling UPS capacity	None	kW
Facility cooling UPS redundancy	None	
Facility cooling UPS runtime @ rated load	None	minutes
Facility cooling		
Total cooling capacity	7500	kW
Input voltage	480	V
Heat rejection medium	Chilled water	
Mechanical redundancy	N+1	
Outdoor heat exchange	Packaged chiller with free-cooling	
Coolant supply temperature	59	F
Coolant return temperature	69	F
Storage tank size per cooling system	7750	gallons
Ride through time	5	mins
Economizer type	Water-side	
IT Space		
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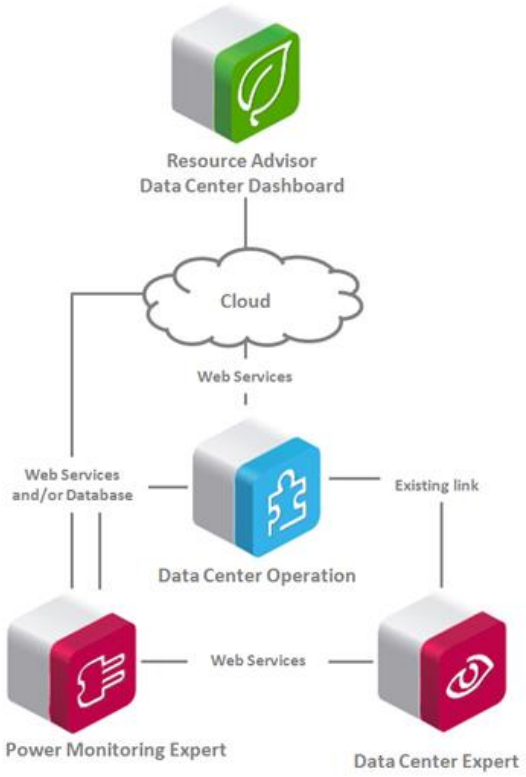
CRAC/CRAH type	Perimeter	
CRAC/CRAH redundancy	N+1	
Containment type	Hot Aisle	

Data Center Infrastructure Management (DCIM) System

Good design and quality construction alone do not ensure a highly available & efficient data center. DCIM provides on-going monitoring and control to ensure the facility lives up to its design intent. StruxureWare for Data Centers is a software management suite designed to collect and manage data about a data center's assets, resource use, and operational status throughout the life cycle of the facility. This information is then distributed, integrated, and applied in ways that help managers optimize the data center's performance and meet IT, business, and service-oriented goals. From IT assets to racks, rows, rooms and buildings, StruxureWare for Data Centers delivers the right information to the right users at the right time.



Control level: Experts, on site or remotely, can control process performance and ensure business continuity in real time, while tracking energy consumption in a highly critical and secure environment.

Operations level: Functional managers can optimize operations, energy, and assets through smart analytical tools, often spanning multiple sites.

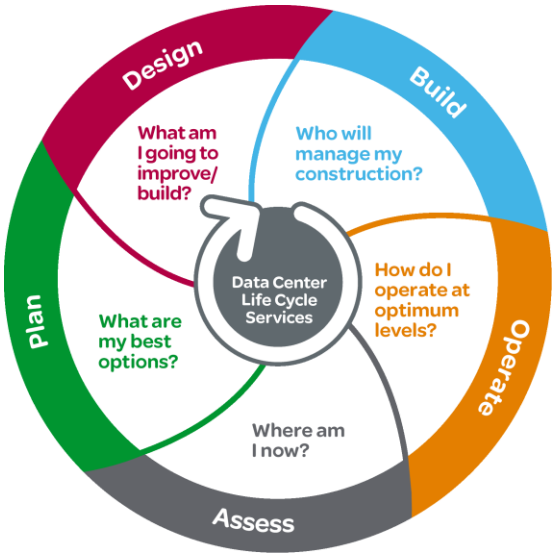
Enterprise level: C-level executives can drive their sustainability strategy efficiently, choosing the best scenario that meets their business objective to conserve enterprise-wide resources.

StruxureWare for Data Centers allows for flexibility when requirements and implementation strategies change over time. StruxureWare software applications and suites simplify integration time, improve reliability, enhance visibility to energy information, and streamline operational efficiency.

StruxureWare
for data centers

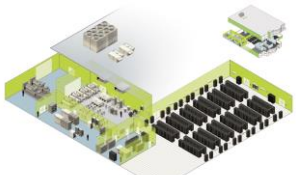
Demo:
Visit *www.apc.com/software* to learn more about *StruxureWare* for Data Centers!

Schneider Electric Life-Cycle Services

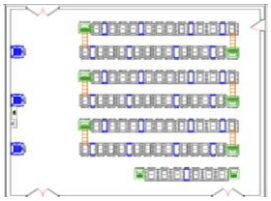


1. Team of over 7,000 trained specialists covering every phase and system in the data center
2. Standardized, documented, and validated methodology leveraging automation tools and repeatable processes developed over 45 years
3. Complete portfolio of services to solve your technical or business challenge, simplify your life, and reduce costs

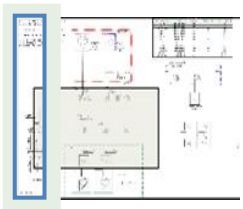
Get more information for this design:



3D spatial views



Floor layouts



One-line schematics

Bill of materials

Engineering Package

Every reference design is built with technical documentation for engineers and project managers. This includes engineering schematics (CAD, PDF), floor layouts, equipment lists containing all the components used in the design and 3D images showing real world illustrations of our reference designs.

Documentation is available in multiple formats to suit the needs of both engineers and managers working on data center projects.

> [Click here to register to receive the Engineering Package for this design](), **or email** [ReferenceDesigns@Schneider-Electric.com]().