

3300 kW, Tier 3, Chilled Water, 70,000 ft²

DESIGN OVERVIEW

Data Center IT Capacity

1100 kW per Data Hall
3 Independent Data Halls

Design Application Range

This design can be applied and modified to suit power ranges from 1100 kW to 2200 kW per hall

Target Availability

Tier 3

Annualized PUE at 100% Load

1.4 in Dallas, TX, USA

Total Racks and Average Density

110 watts/ft² – 220 watts/ft²
Supported Range: 2.5 – 16 kW/rack

IT and Facility Floor Space

70,000 ft²
This design's attributes are based on: 10,000 ft² Data Halls

Regional Voltage and Frequency

480V, 60Hz

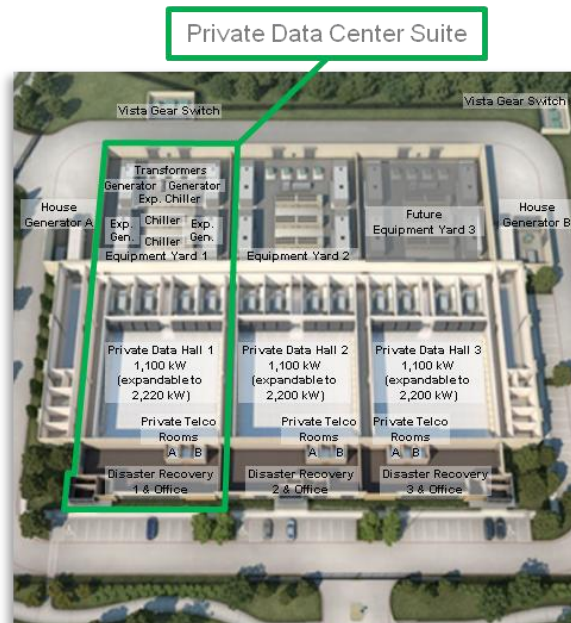
ABOUT THIS DESIGN

- Speed to Market advantages over legacy process (10 months time-to-market)
- Lower capital and operational expenses with modular and scalable deployment
- Fully integrated and instrumented “out of the box”
- Well suited to co-location service providers interested in building tenant controlled private data suites

INTRODUCTION

Customers place a high value on the ability to simplify and reduce the time needed to plan and design a data center project, since the planning process of most projects can be iterative and thereby expensive. Schneider Electric's data center reference designs help customers optimize this process by providing them with validated, proven, and documented data center physical infrastructure designs. 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.

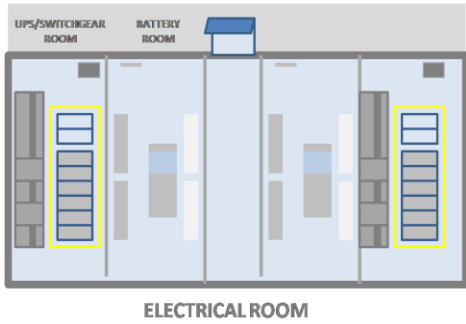
Reference Design 22 is a 3.3MW total IT load built out in 3 independent 1.1MW Data Halls. The design consists of 2N UPS for each data hall and an N+1 air cooled chiller per data hall. Each Data Hall can be expanded to 2.2MW of IT load, if needed, for a total of 6.6MW at full expansion. This document includes design information for three sections: IT space, facility power, and facility cooling.



Each private Data Center Suite provides:

- Dedicated 2N electric, N+1 mechanical infrastructure
- No shared infrastructure or equipment
- Pre-engineered expansion of critical load from 1,125 kW to 2,250 kW
- Tenant-controlled Private Disaster Recovery office space
- Tenant-controlled Equipment Yard
- Tenant controlled A&B Telco Rooms
- Tenant-controlled private entrance and private security station with mantraps
- Biometric readers into each private Data Hall
- Tenant control of critical infrastructure

Facility Power



DESIGN OPTIONS

This reference design can be modified as follows to add or substitute in the following items:

- Permanent Load Bank
- Battery Plants – Wet cell / VRLA
 - Battery Runtime
- UPS
 - Symmetra PX, Symmetra MW, other
 - Smaller UPS for non-critical loads. Ex. Fire systems
- Generator
 - On or offsite optional power generation
 - Prime-rated generator
 - Closed transition to utility
 - Diesel/Natural Gas

This Facility Power system supplies all of the critical and noncritical components within the data center. The architecture used in this electrical design is dual path with 2N UPSs and generators to each Data Hall. A total of 3000A is supplied to the data hall via switchgear feeding downstream electrical and mechanical switchboards. A total of 1100KW (expandable to 2200kw per data hall) is available to the IT room via four 600 kW *Symmetra MW* UPS systems, in a 2N configuration. The UPS also provides 11 minutes of VRLA battery runtime at full load. The batteries are housed and maintained in an isolated battery room.

Downstream of the UPS, the power distribution architecture utilizes a combination of LV panels and power distribution units (PDUs). Additional switchboards power more LV transformers and panels to support voltage transformation needs, building loads and lighting.

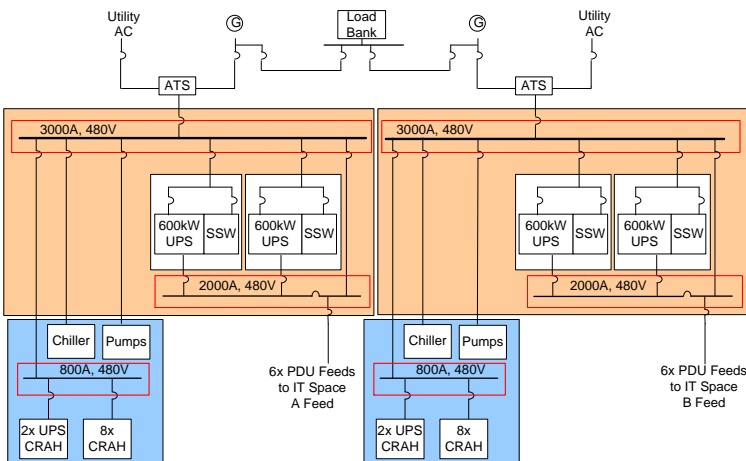
The generator plants are designed at 2N with 2.25 MW, EPA Tier 2 standby generators for each independent data hall with 8 hours of runtime at full load for each data hall. This design incorporates an “open transition” switching scheme between the site and the utility.

The design includes peripheral devices like fire panels, access control and network intelligence. Power meters have been placed throughout the electrical path to monitor power quality and to allow for predictive maintenance of the system.

Every component in this design is built and tested to the applicable ANSI, NEMA, UL or IEEE standards.

Further design details are available in the one-line diagram, as part of the engineering package.

FACILITY POWER BLOCK DIAGRAM

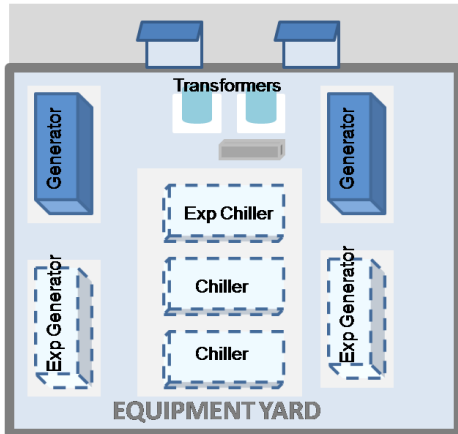


FACILITY POWER ATTRIBUTES (per Data Hall)

Name	Value	Unit
Total power to IT per Data Hall	1100	kW
Total Amps per Data Hall (main bus)	3000	A
Input voltage (main bus)	480	V
Switchboard kAIC	100	kA
Power path	Dual	
Generator redundancy	2N	
Generator runtime	8	Hr
IT space UPS capacity	1200	kW
IT space UPS redundancy	2N	
IT space UPS runtime @ rated load	11	minutes
IT space UPS output voltage	480, 120/208	V

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Facility Cooling



This mechanical design utilizes air-cooled chillers as a primary method of heat dissipation. The architecture consists of two-420 ton (1460 kW) air-cooled packaged chillers in an N+1 configuration to supply cooling, with the possibility of adding a third chiller in case of an IT capacity expansion, for each data hall. The chillers are located outdoors. Additionally, an on-board heat exchanger on each chiller provides economization. N+1 redundant pumps ranging from 10 to 15 HP operate at variable speed (VFD) to control the pressure and flow rate as conditions warrant.

Additional CRAH units or AHU's are included to provide critical cooling to the UPS and battery rooms (N+1) as well as N cooling in non-critical areas as required.

To extend availability of chilled water during a power outage, redundant 7000 gallon water storage tanks can be installed to provide 2 minutes of continuous cooling.

The piping architecture of the mechanical system feeds the segmented distribution loop supplying chilled water to the perimeter CRAH units. These units are configured at N+1 redundancy for each data hall.

Further design details including placement of valves, piping, etc. can be viewed in the cooling system schematic included with the engineering package for this reference design.

DESIGN OPTIONS

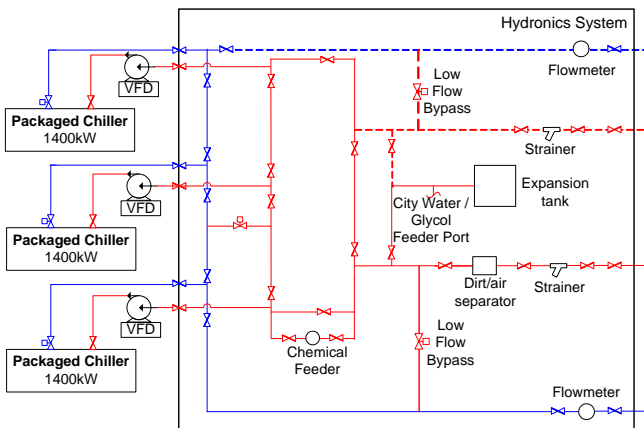
This reference design can be modified as follows without a significant effect on the design's performance attributes:

- Storage tank, size may be varied according to required runtime
- Intelligent meters and sensors
- StruxureWare Building Operation

FACILITY COOLING ATTRIBUTES (Per Data Hall)

Name	Value	Unit
Total cooling capacity	2800	kW
IT cooling capacity	1100	kW
Input voltage	480	V
Heat rejection medium	Chilled water	
Mechanical redundancy	N+1	
Outdoor heat exchange	Air-cooled packaged chiller	
Coolant supply temperature	60	F
Coolant return temperature	71	F
Storage tank size	7000	gallons
Ride-through time	2	minutes
Economizer type	Water-side	

FACILITY COOLING BLOCK DIAGRAM





DESIGN OPTIONS

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

- Add environmental and security management
- Change rack options (tall, wide, deep)
- Change power distribution options (rack PDU type: basic, switched)
- Add *StruxureWare Data Center Expert*

IT Space

The IT capacity of this design can be scaled from 1100 kW to 2200 kW. This IT space is an example of what could be used to populate a data hall of this size. Likewise, this design can be used as a baseline that starts unpopulated and grows as tenancy of the data hall builds over time.

This IT space design specifies all of the physical infrastructure systems, as well as their physical arrangement/spacing, required to meet the overall design's performance attributes. This includes racks, PDUs, rack power distribution, cooling units, and airflow management systems.

Each pair of rows (pod) within the IT space can be "stepped and repeated" in a standardized and predictable manner. This enables rightsizing of power and cooling that scales with IT growth. Each pod can support an average power density from 2.5 up to 16 kW per rack. All the pods are outfitted with integrated power and cooling distribution.

Each pod is powered by floor mount factory-configured power distribution units (PDUs). Every rack is configured with a metered rack-mount PDU to enable remote monitoring of the units for efficiency and capacity management.

Each pod is cooled by N+1 perimeter *Uniflair chilled water* CRAHs that control the supply of cool air by monitoring temperature variation at the rack level. In addition, *In-Row RC* cooling units can be supplemented to provide a high density cooling solution in place of room coolers.

The security of the room is maintained at multiple points. At the rack level, access is controlled by a door lock and sensor. At the room level, security cameras are utilized for monitoring.

IT ROOM ATTRIBUTES (Per Data Hall)

Name	Value	Unit
IT load	1100	kW
Input voltage	480	V
Supply voltage to IT	120/208	V
Average density	2.5 – 16	kW/rack
Number of racks	69 – 440	racks
IT floor space	10000	ft ²
Single or dual cord	Dual	
Heat rejection medium	Chilled water	
CRAC/CRAH type	Room-based CRAH	
CRAC/CRAH redundancy	N+1	
Containment type	None	

Design Attributes

OVERVIEW	Value	Unit
Target availability	Tier 3	Tier
Annualized PUE at 100% load (Dallas, TX)	1.4	
Data center IT capacity	3300	kW
Data center overall space	70000	ft ²
Average density	2.5 – 16	kW/rack
FACILITY POWER	Value	Unit
Total amps (main bus)	3000	A
Input voltage (main bus)	480	V
Switchboard kAIC	100	kA
Power path	Dual	
Generator redundancy	2N	
IT space UPS capacity	1200	kW
IT space UPS redundancy	2N	
IT space UPS runtime @ rated load	11	minutes
IT space UPS output voltage	480 – 120/208	V
Facility cooling UPS capacity	N/A	kW
Facility cooling UPS redundancy	N/A	
Facility cooling UPS runtime @ rated load	N/A	minutes
FACILITY COOLING	Value	Unit
Total cooling capacity	2800	kW
Input voltage	480	V
Heat rejection medium	Chilled water	
Mechanical redundancy	N+1	
Outdoor heat exchange	Air-cooled packaged chiller	
Coolant supply temperature	60	F
Coolant return temperature	71	F
Storage tank size	7000	gallons
Ride-through time	2	minutes
Economizer type	Water-side	
IT SPACE	Value	Unit
IT load	1100	kW
Input voltage	480	V
Supply voltage to IT	120/208	V
Average density	2.5 – 16	kW/rack
Number of racks	69 – 440	Racks
IT floor space	10000	ft ²
Single or dual cord	Dual	
Heat rejection medium	Chilled water	
CRAC/CRAH type	Room-based CRAH	
CRAC/CRAH redundancy	N+1	
Containment type	None	

Data Center Infrastructure Management (DCIM) System



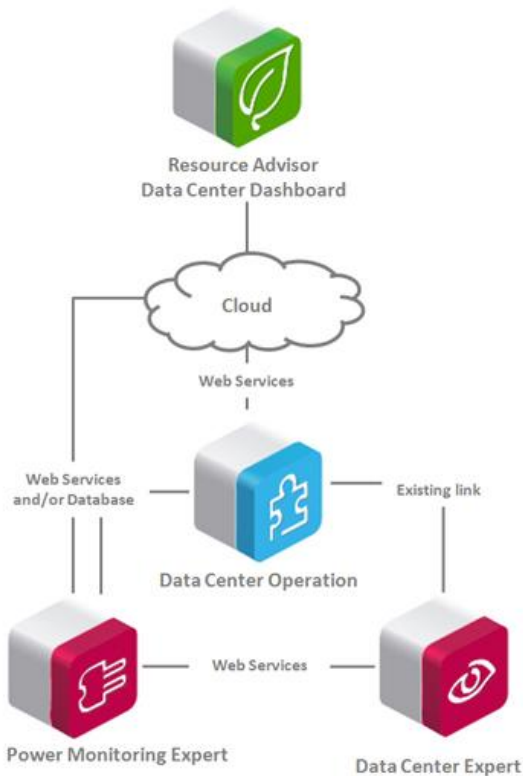
Good design and quality construction alone do not ensure a highly available & efficient data center. DCIM provides on-going monitoring and control to ensure the facility lives up to its design intent. *StruxureWare for Data Centers* is a software management suite designed to collect and manage data about 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.

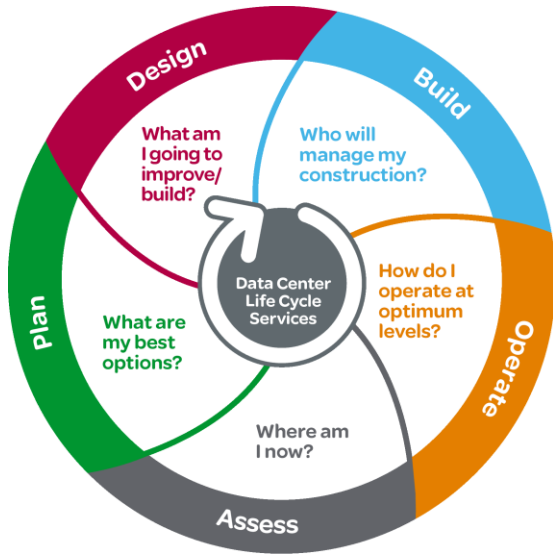
Enterprise level: C-level executives can drive their sustainability strategy efficiently, choosing the best scenario that meets their business objective to conserve enterprise-wide resources.

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.



> **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

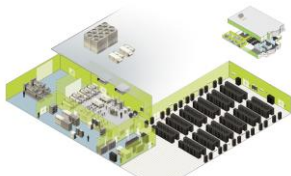
2

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:



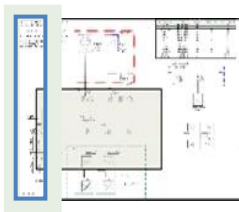
3D spatial views



Floor layouts

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.



One-line schematics



Bill of materials

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.