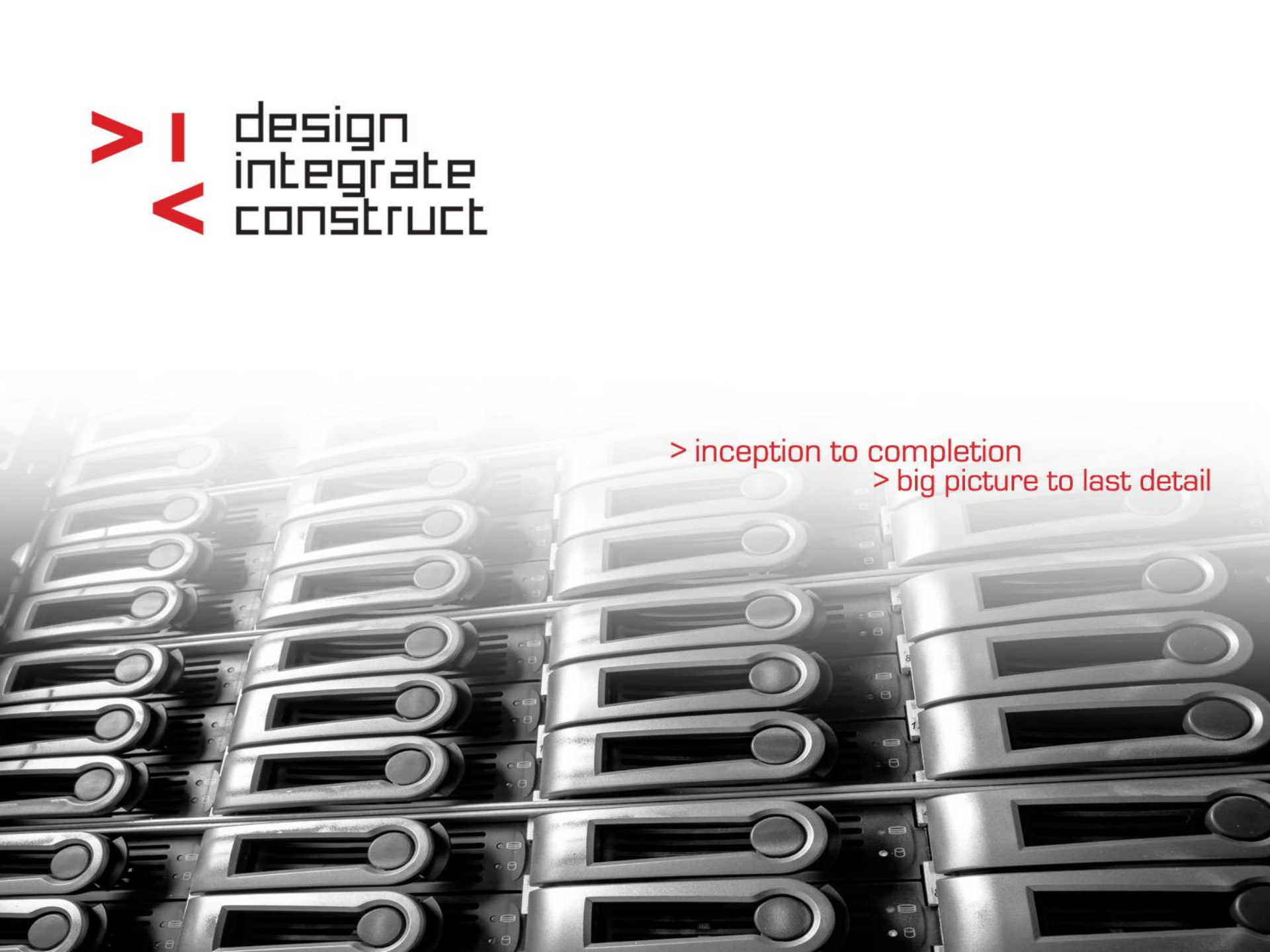
design
integrate
construct



> inception to completion
> big picture to last detail


Think BIG for Small Data Centers

design
integrate
construct

Typical Small DC

- Large Server Rooms (or “Comms” Room)
- Diversity of equipment: Contain servers, storages, routers, switches, IP services (telephony, CCTV,...)
- Serves the internal operation of the company that owns it
- Normally located within the Company offices (Hq or Head Office)
- Serve the building IT infrastructure too
- Less than 200 kW

design
integrate
construct

Small DCs
How they are typically done

design
integrate
construct

Small DCs
How they are typically done

- Raised floor, UPS, Security, Fire protection …
- Quick Fixes
- Mismatching UPS configuration – such as hot stand-by with different sizing, bypass from different sources ….
- CRAC units (sometimes) oversizing (most of the times)
- Over cooling, room cooling instead of equipment cooling, …

design
integrate
construct

Small DCs
How they are typically done

- Air leaks
- Cables under the raised floor obstructing the airflow
- Not ready to host high density
- Falsely “Concurrently Maintainable”

  (Dual delivery paths are not separate,

  Fuel supply to gensets forming a weak link)

Small DCs

How they are typically done

design
integrate
construct

Market Trends of Small Data Centers

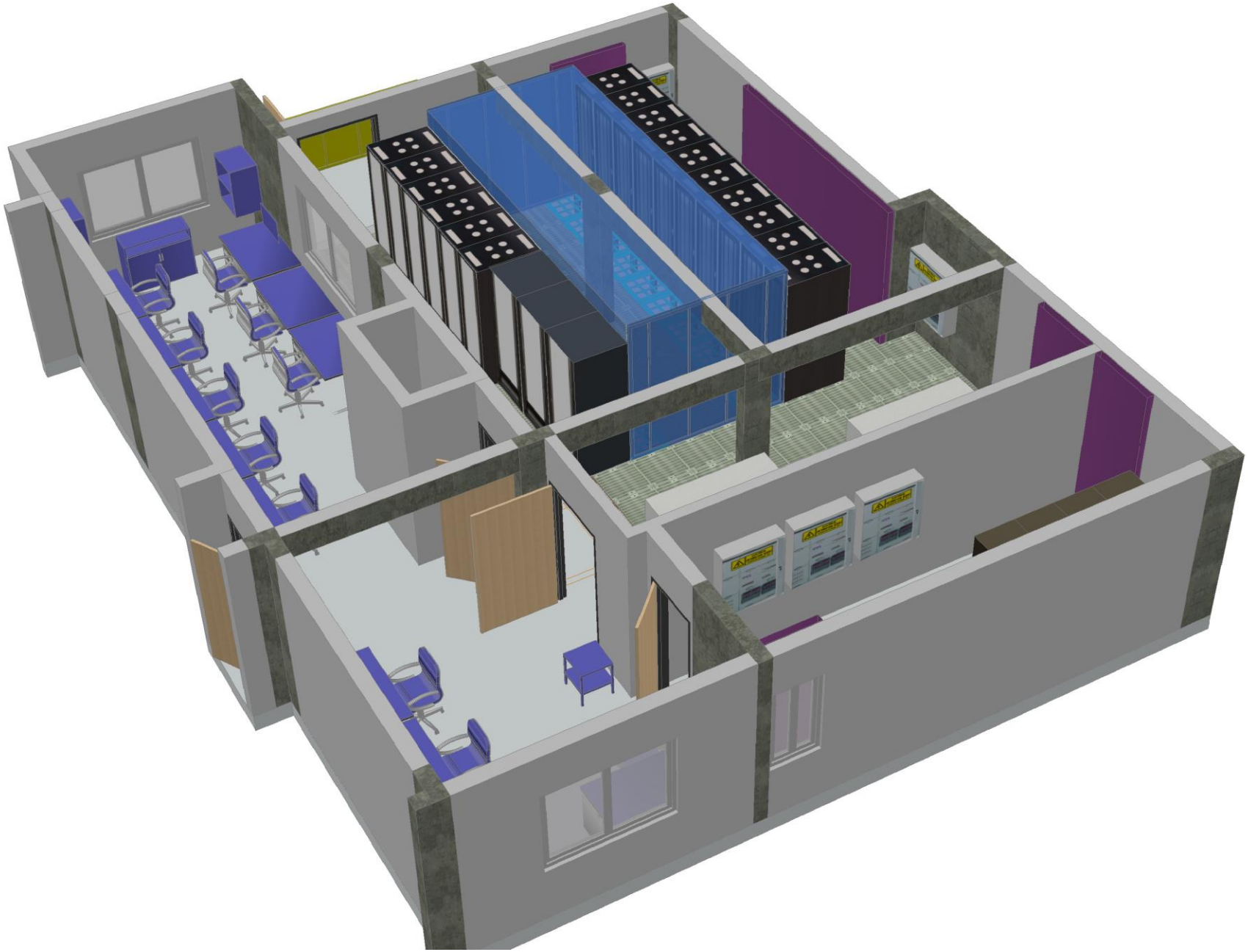
design
integrate
construct

Will corporations migrate their services to the Cloud instead?

design
integrate
construct

Is it worth rethinking ?

What Can be done to improve (while keeping the costs down) ?



design
integrate
construct

Some good thoughts can:

Increase reliability

Decrease downtime

Improve operation

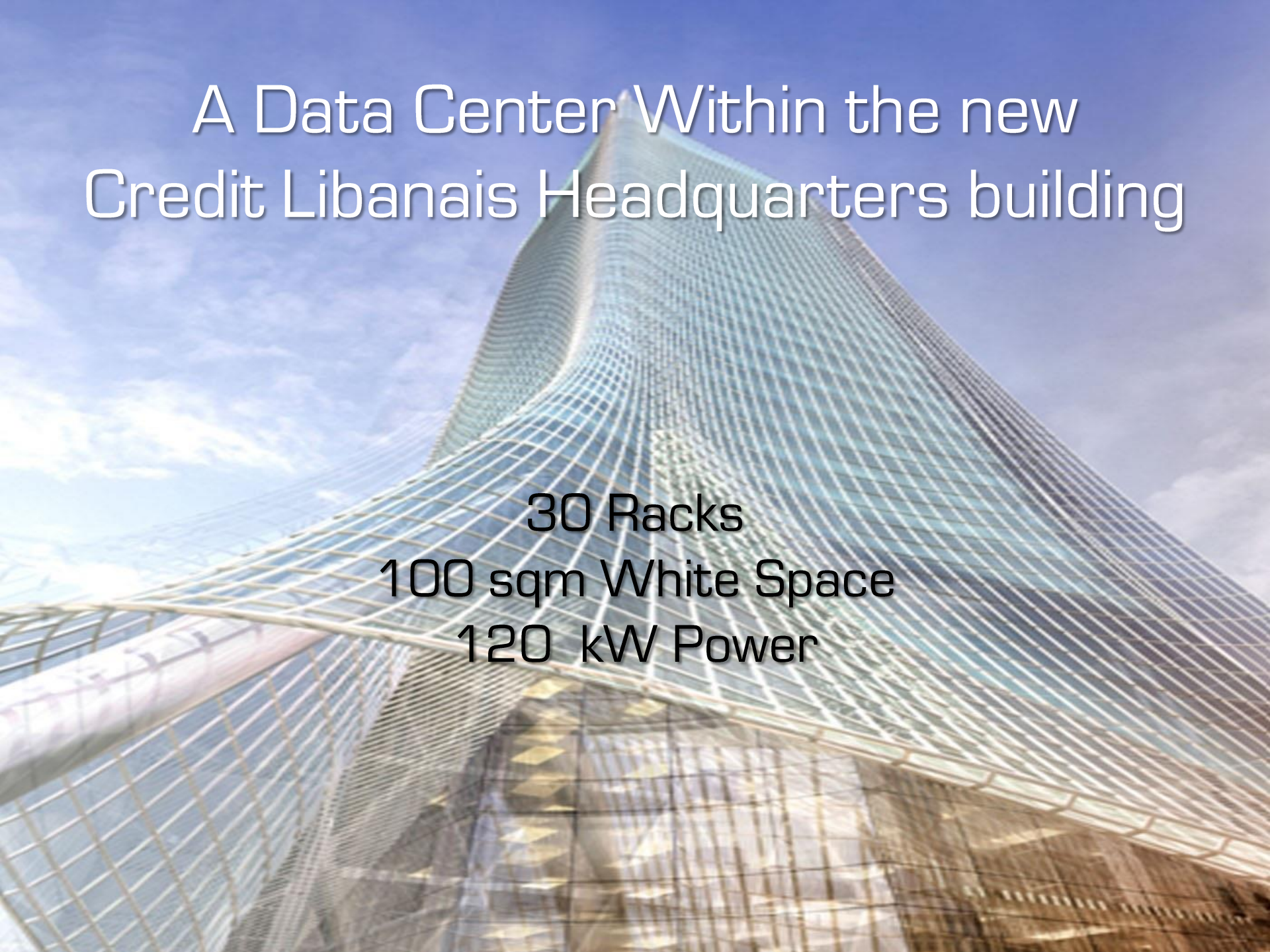
Consume less energy

Ensure expandability and flexibility

Ready to handle higher density

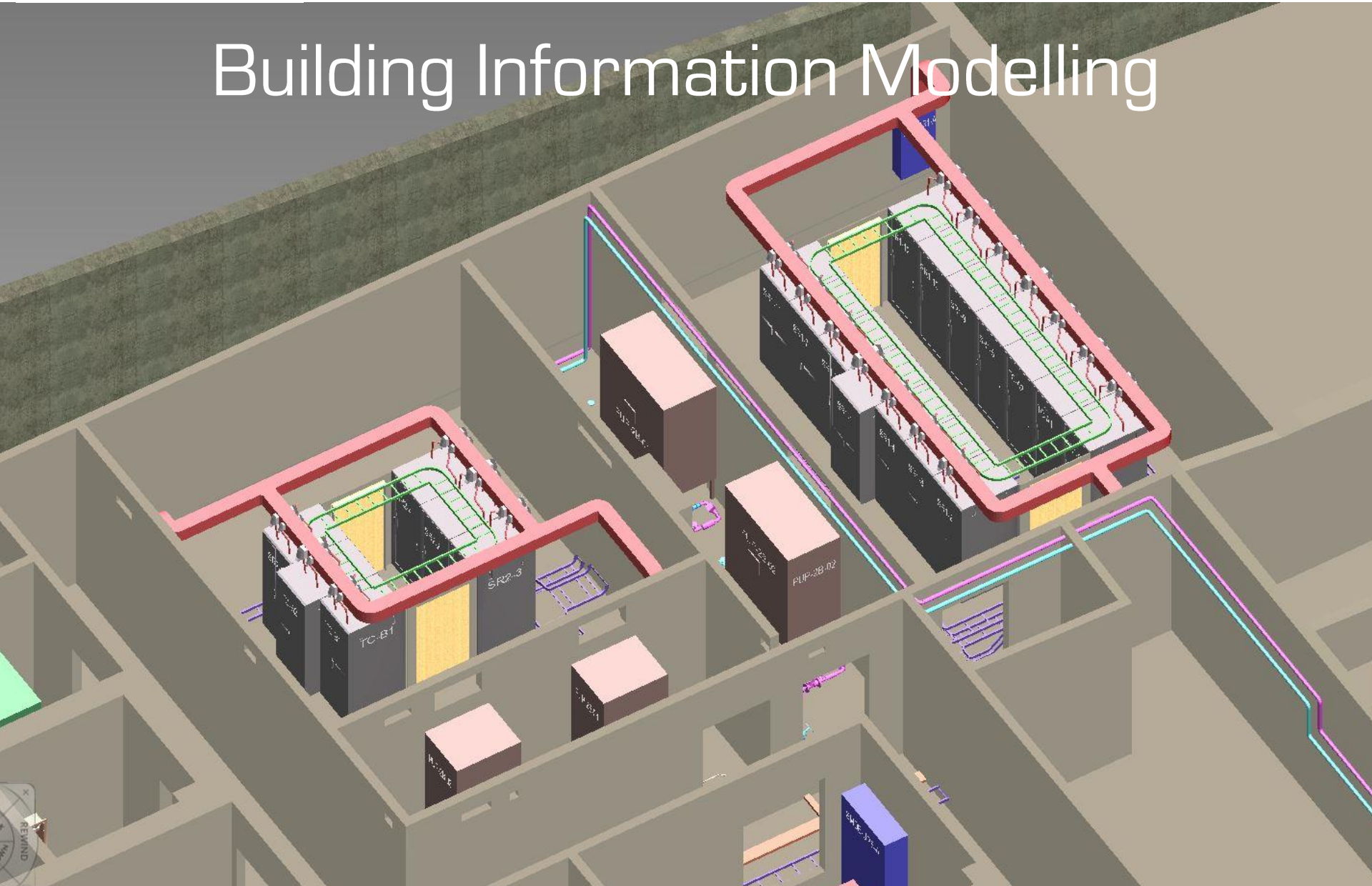
design
integrate
construct

Typical Case study


A Data Center Within the new
Credit Libanais Headquarters building
30 Racks
100 sqm White Space
120 kW Power

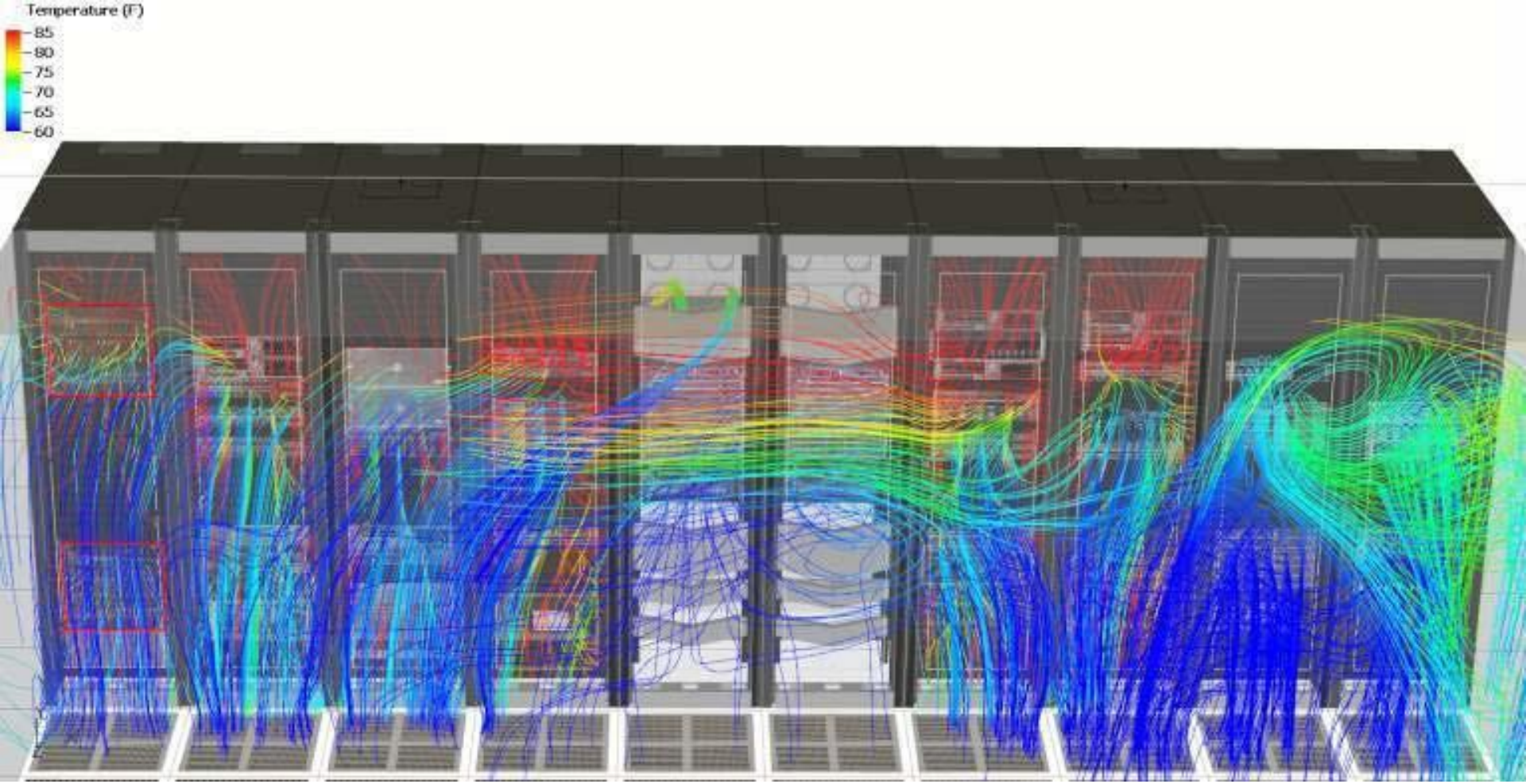
design
integrate
construct

Building Information Modelling

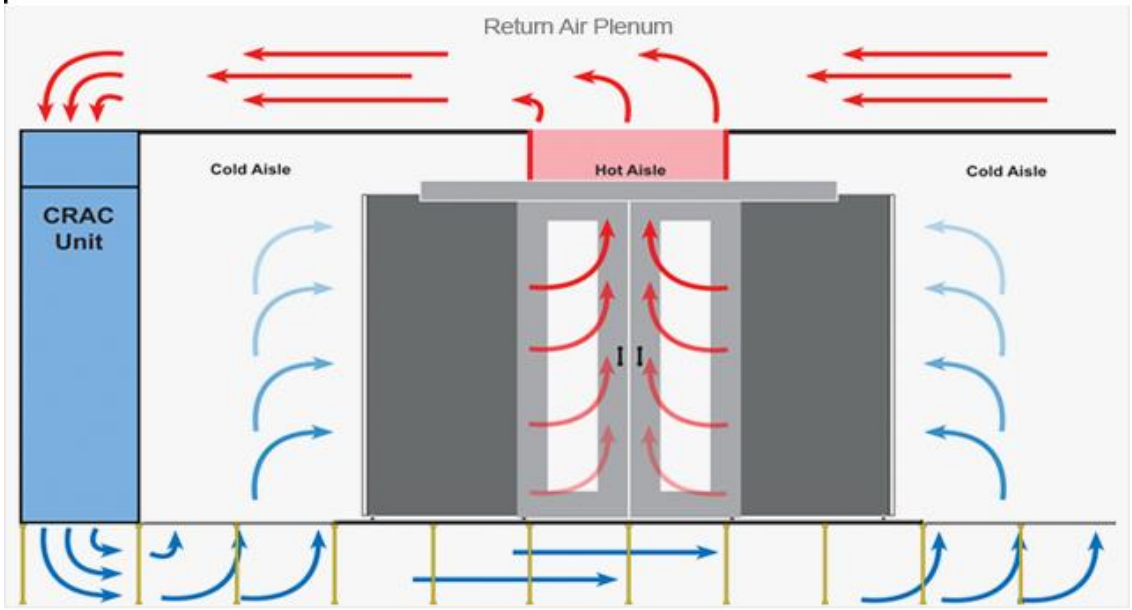


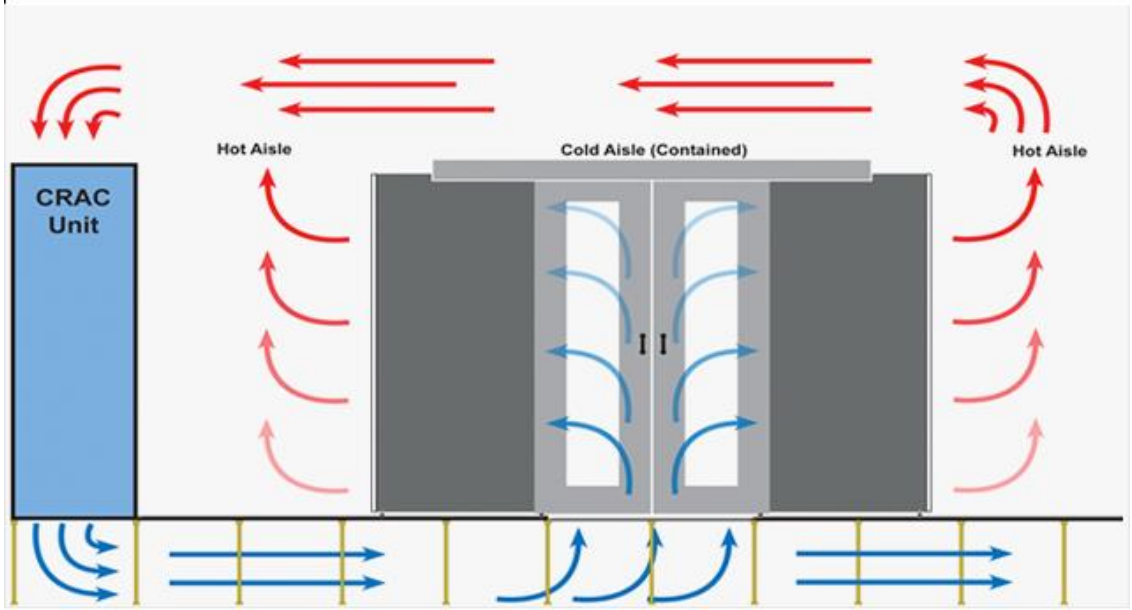
design
integrate
construct

Computational Fluid Dynamics



Hot Aisle Containment





Cold Aisle Containment

cold aisle containment

Cooling System: Chilled Water or Direct Expansion?

high temperature chilled water

High Temperature Chilled Water

Comparison of Chiller Efficiencies

6 deg c water temp

Evaporator	
Leaving fluid temperature	6.0°C
Delta T	8.0°C
Ambient summer	39.8°C
Model reference	EWAQ260DAYN
Application	STD
Option Code	N----
Cooling	
Capacity	229.1kW
Power input	103.5kW
EER	2.2
ESEER	3.73
Evaporator	
Fluid flow rate	6.8l/s
Fluid pressure drop	18958Pa

power input: 103 kw

10 deg c water temp

Evaporator	
Leaving fluid temperature	10.0°C
Delta T	8.0°C
Ambient summer	39.8°C
Model reference	EWAQ210DAYN
Application	STD
Option Code	N----
Cooling	
Capacity	212.3kW
Power input	84.5kW
EER	2.5
ESEER	4
Evaporator	
Fluid flow rate	6.3l/s
Fluid pressure drop	28899Pa

power input: 84 kw

High Temperature Chilled Water

Comparison of Chiller Efficiencies

6 deg c water temp

Evaporator	
Leaving fluid temperature	6.0°C
Delta T	
Ambient summer	
Model reference	
Application	
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Cooling	
Capacity	
Power input	103.5kW
EER	2.2
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Evaporator	
Fluid flow rate	6.8l/s
Fluid pressure drop	18958Pa

19% Better Efficiency

10 deg c water temp

Evaporator	
Leaving fluid temperature	10.0°C
	8.0°C
	39.8°C
	EWAQ210DAYN
	STD
	N----
	212.3kW
Power input	84.5kW
EER	2.5
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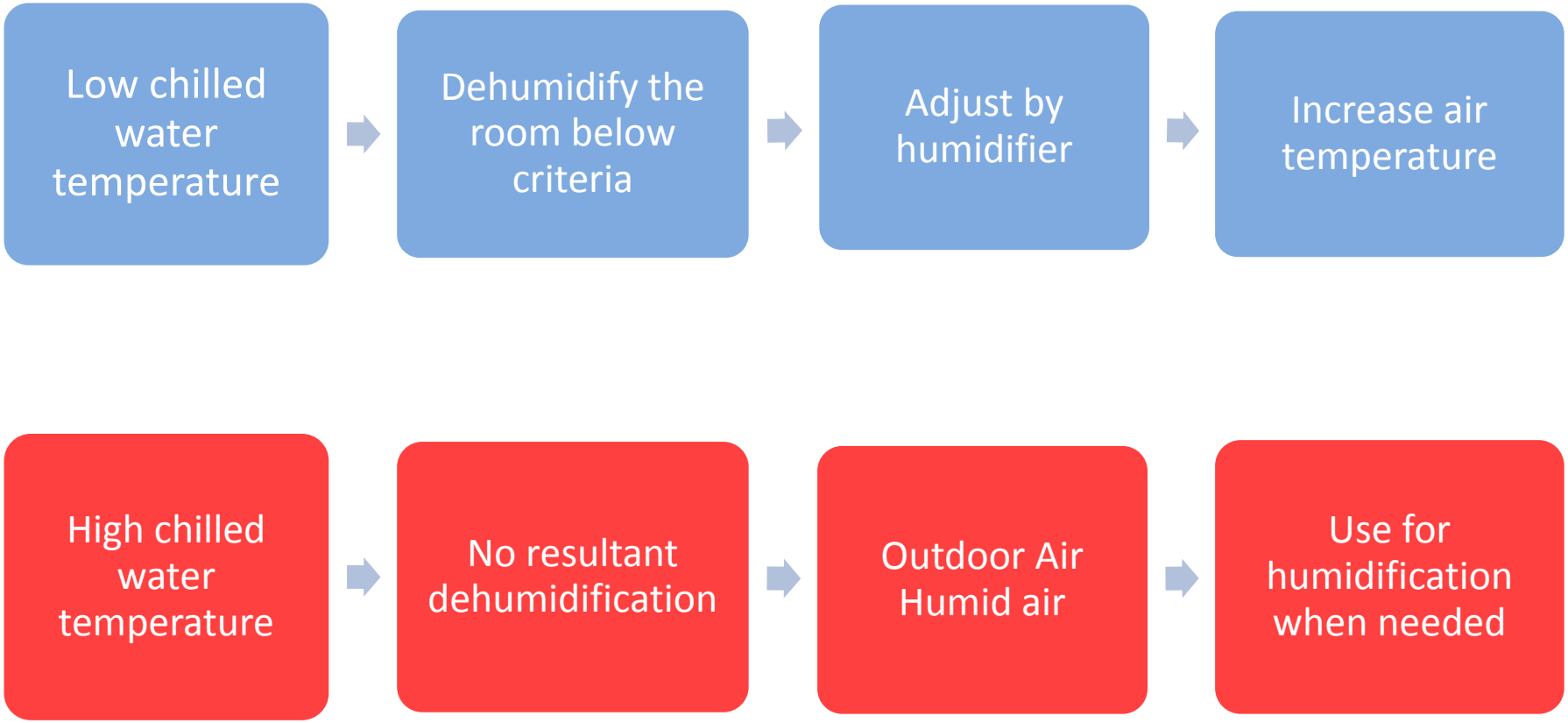
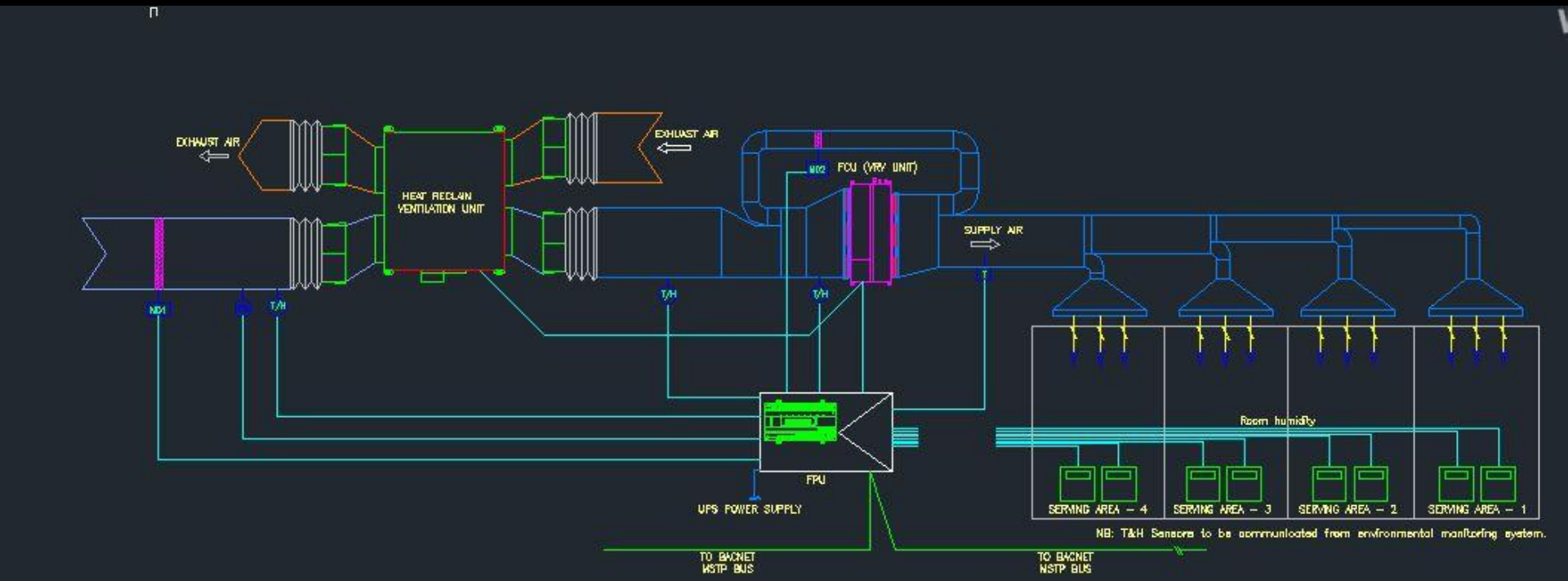
power input: 103 kw

power input: 84 kw

High Temperature Chilled Water



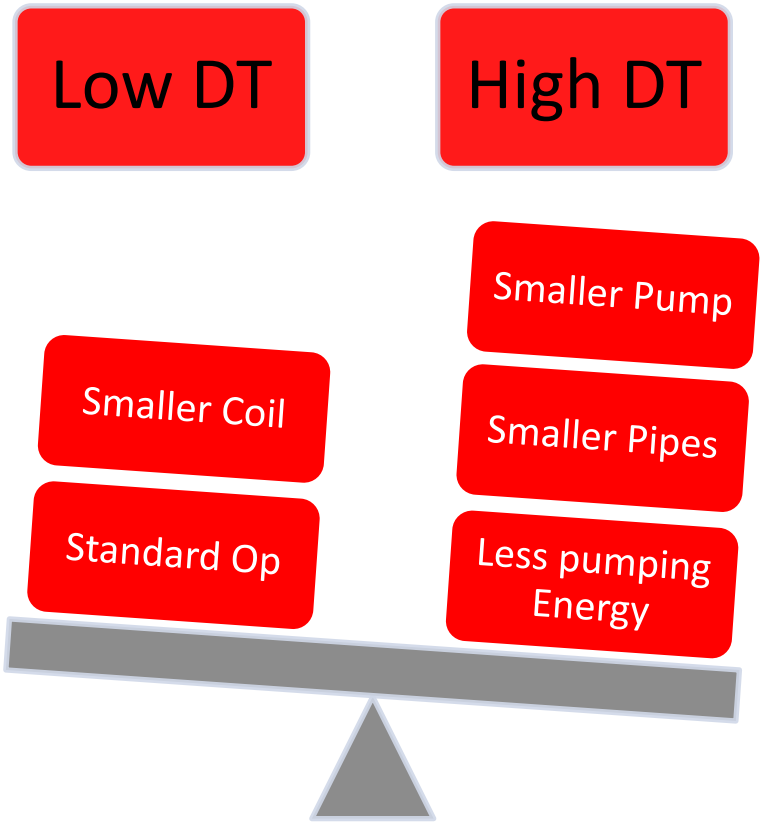
Why Do you need a humidifier in a hot and warm Weather?



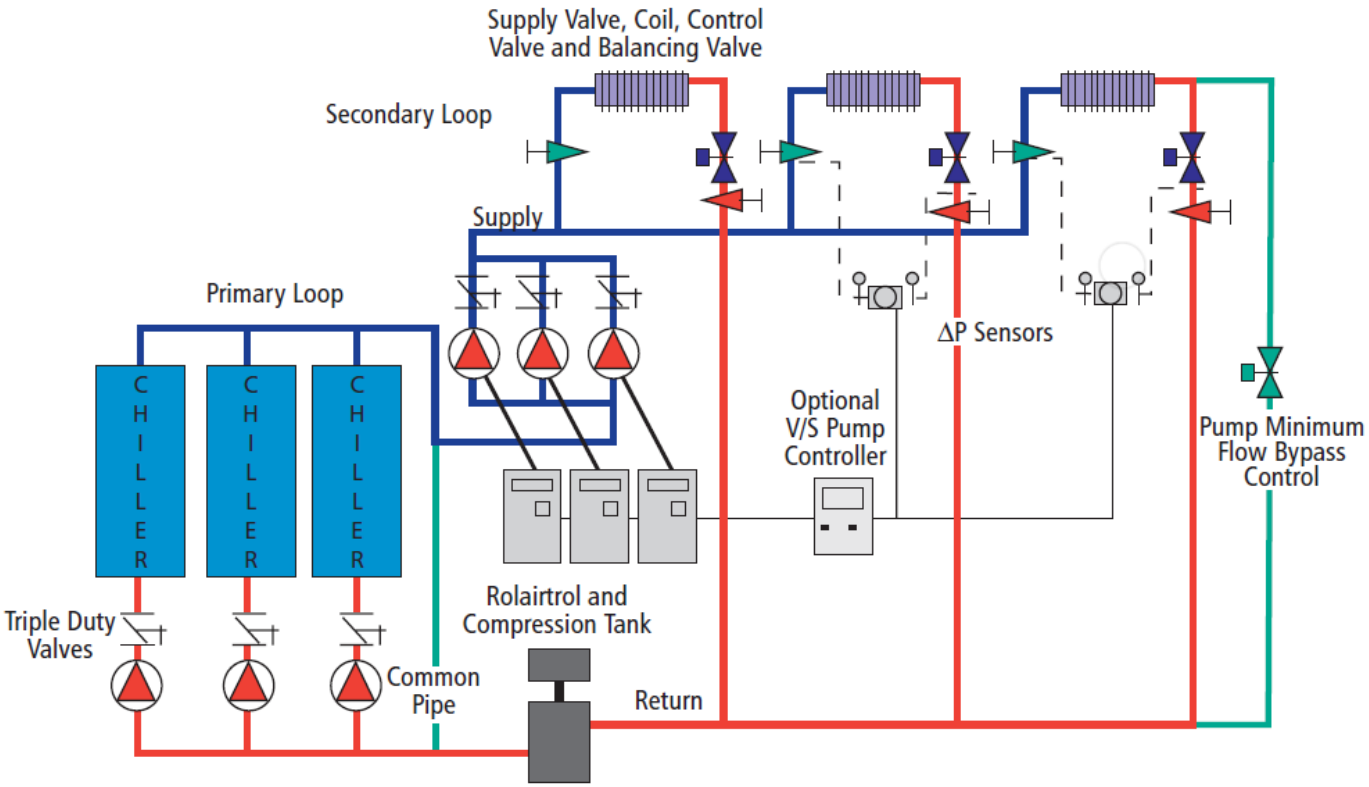
High Differential Temperature Chilled Water

Resulting in:

- Smaller Pumps
- Smaller pipe diameters
- Smaller valves
- Smaller pumping energy

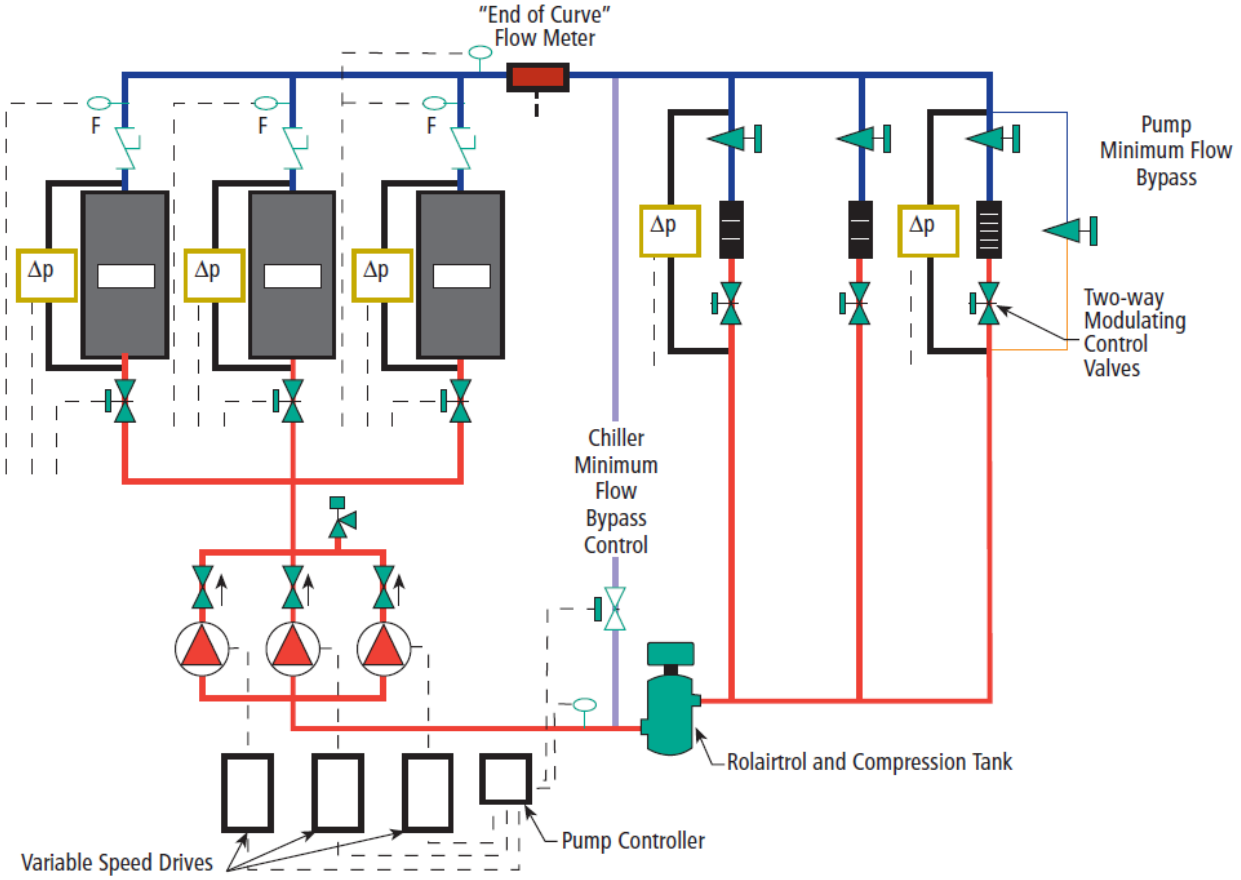


The Case of Variable Flow



Primary-Secondary System

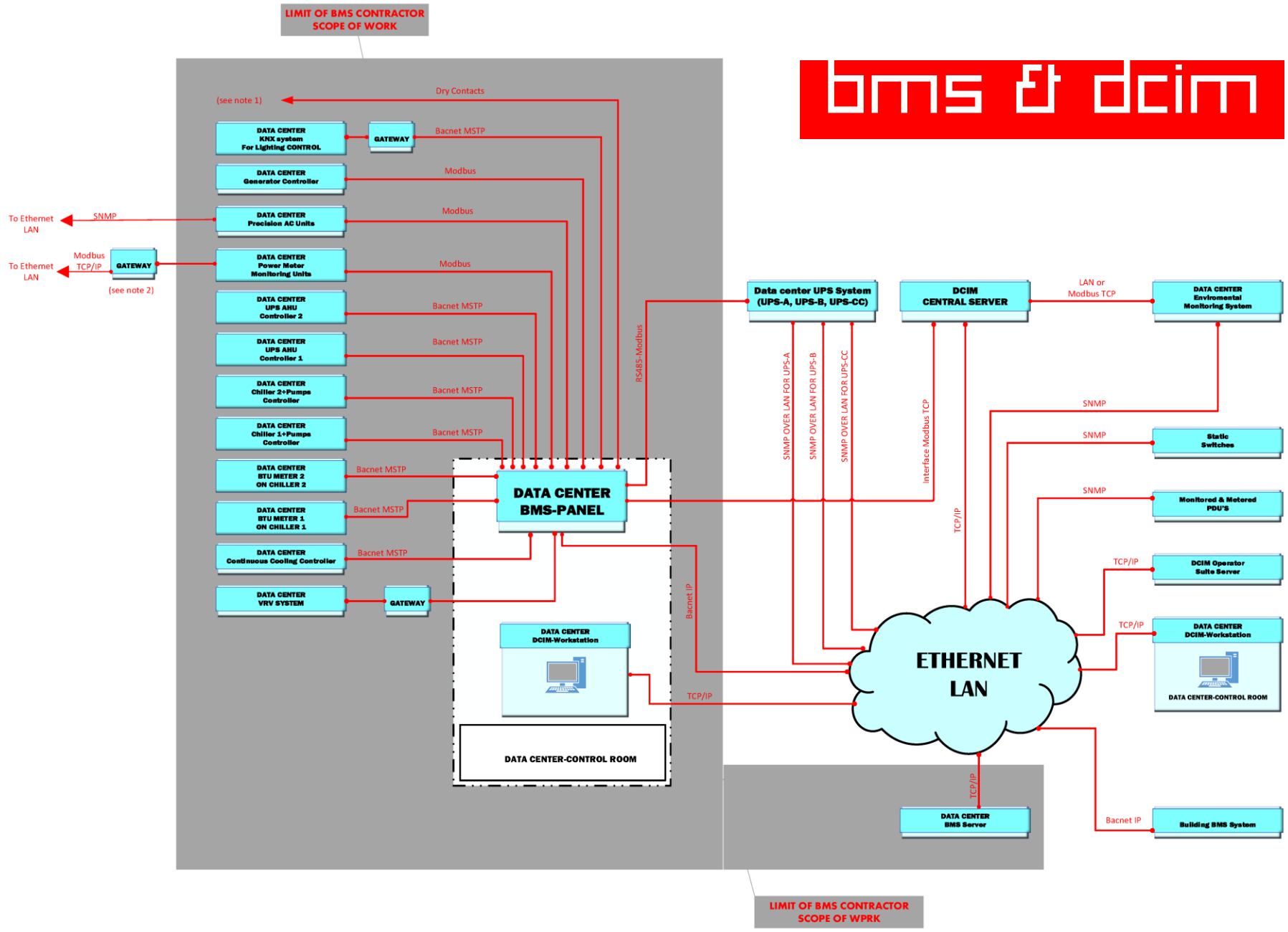
The Case of Variable Flow

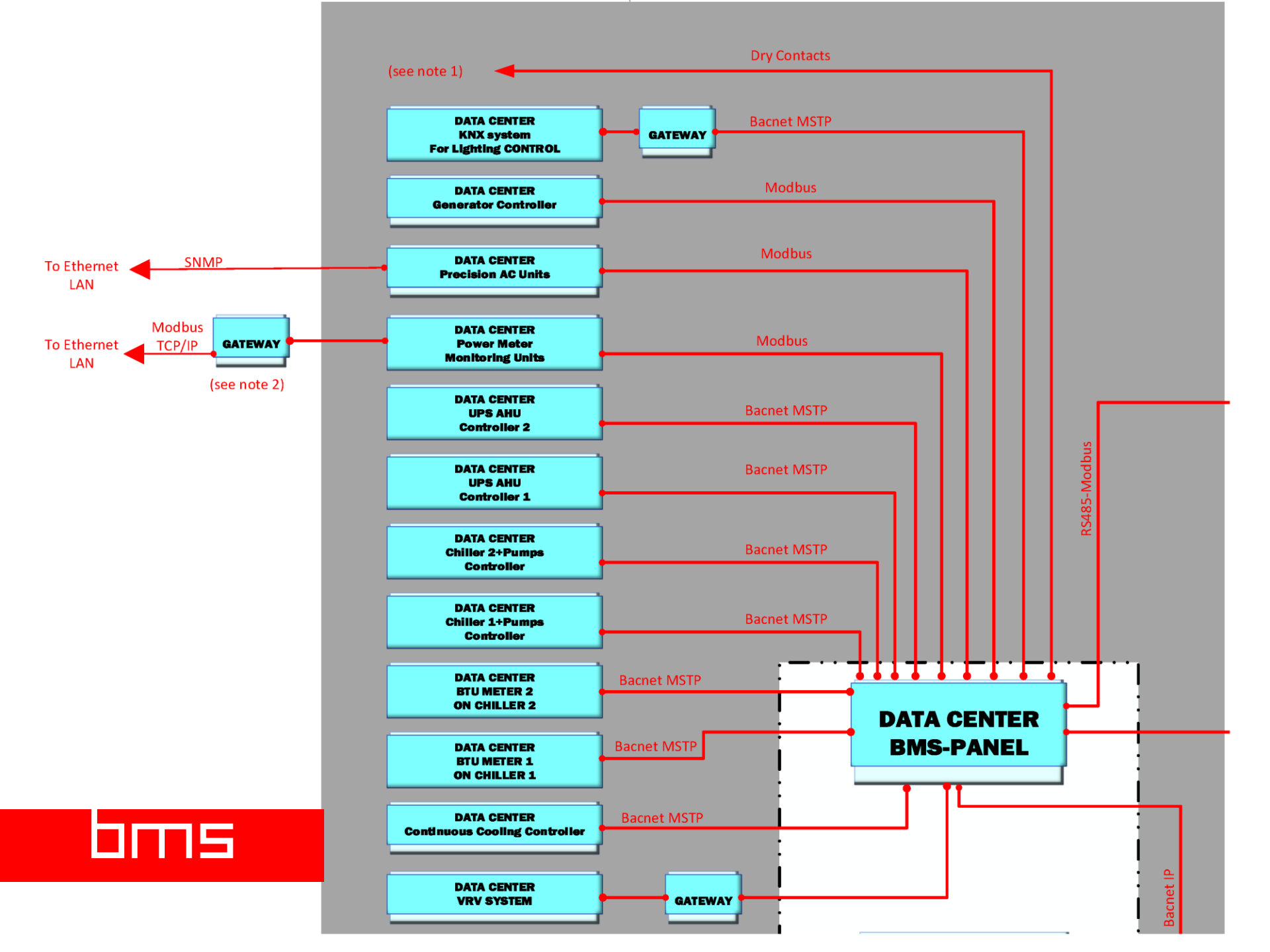


Variable Primary Flow System

Metering: Essential to Monitor and Analyze

- Measure Everything, From Source up to the PDU
- All inputs – All outputs
- Include Facilities (lighting, etc.) and NOC


LIMIT OF BMS CONTRACTOR SCOPE OF WORK
bms & dcim
(see note 1)
Dry Contacts
DATA CENTER KNX system For Lighting CONTROL
GATEWAY
Bacnet MSTP
DATA CENTER Generator Controller
Modbus
To Ethernet LAN
SNMP
DATA CENTER Precision AC Units
Modbus
To Ethernet LAN
Modbus TCP/IP
GATEWAY
(see note 2)
DATA CENTER Power Meter Monitoring Units
Modbus
DATA CENTER UPS AHU Controller 2
Bacnet MSTP
DATA CENTER UPS AHU Controller 1
Bacnet MSTP
DATA CENTER Chiller 2+Pumps Controller
Bacnet MSTP
DATA CENTER Chiller 1+Pumps Controller
Bacnet MSTP
DATA CENTER BTU METER 2 ON CHILLER 2
Bacnet MSTP
DATA CENTER BTU METER 1 ON CHILLER 1
Bacnet MSTP
DATA CENTER Continuous Cooling Controller
Bacnet MSTP
DATA CENTER VRV SYSTEM
GATEWAY
RS485-Modbus
DATA CENTER BMS-PANEL
DATA CENTER DCIM-Workstation
DATA CENTER-CONTROL ROOM
Bacnet IP
TCP/IP
Data center UPS System (UPS-A, UPS-B, UPS-CC)
DCIM CENTRAL SERVER
LAN or Modbus TCP
DATA CENTER Enviromental Monitoring System
SNMP OVER LAN FOR UPS-A
SNMP OVER LAN FOR UPS-B
SNMP OVER LAN FOR UPS-CC
Interface Modbus TCP
TCP/IP
SNMP
SNMP
Static Switches
SNMP
Monitored & Metered PDU'S
TCP/IP
DCIM Operator Suite Server
TCP/IP
DATA CENTER DCIM-Workstation
DATA CENTER-CONTROL ROOM
ETHERNET LAN
TCP/IP
DATA CENTER BMS Server
Bacnet IP
Building BMS System
LIMIT OF BMS CONTRACTOR SCOPE OF WPRK


Dry Contacts
(see note 1)
DATA CENTER
KNX system
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Generator Controller
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To Ethernet
LAN
SNMP
DATA CENTER
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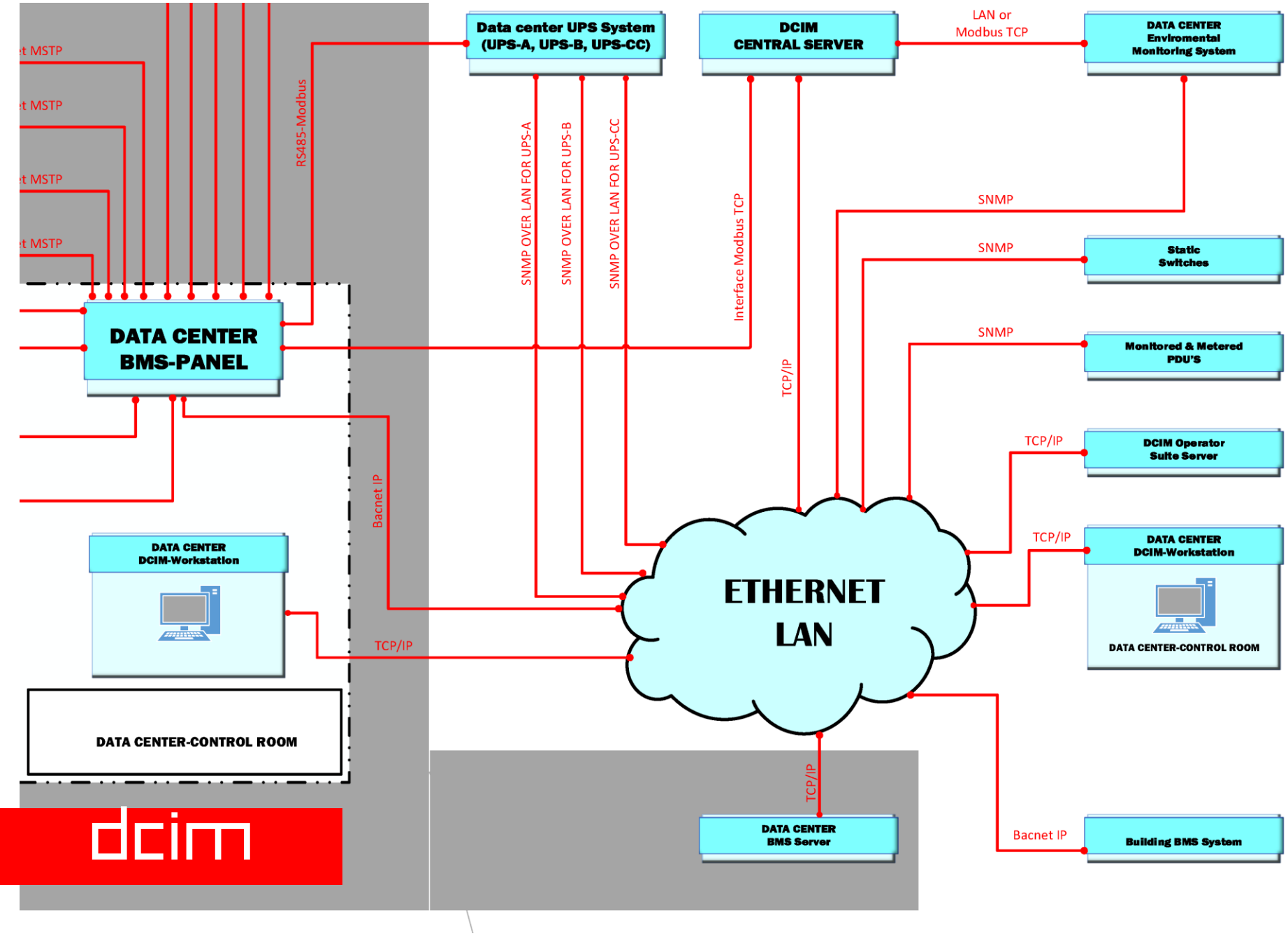
Modbus
Modbus
TCP/IP
To Ethernet
LAN
GATEWAY
(see note 2)
DATA CENTER
Power Meter
Monitoring Units
Modbus
DATA CENTER
UPS AHU
Controller 2
Bacnet MSTP
DATA CENTER
UPS AHU
Controller 1
Bacnet MSTP
DATA CENTER
Chiller 2+Pumps
Controller
Bacnet MSTP
DATA CENTER
Chiller 1+Pumps
Controller
Bacnet MSTP
RS485-Modbus
DATA CENTER
BTU METER 2
ON CHILLER 2
Bacnet MSTP
DATA CENTER
BMS-PANEL
DATA CENTER
BTU METER 1
ON CHILLER 1
Bacnet MSTP
DATA CENTER
Continuous Cooling Controller
Bacnet MSTP
DATA CENTER
VRV SYSTEM
GATEWAY
Bacnet IP
bms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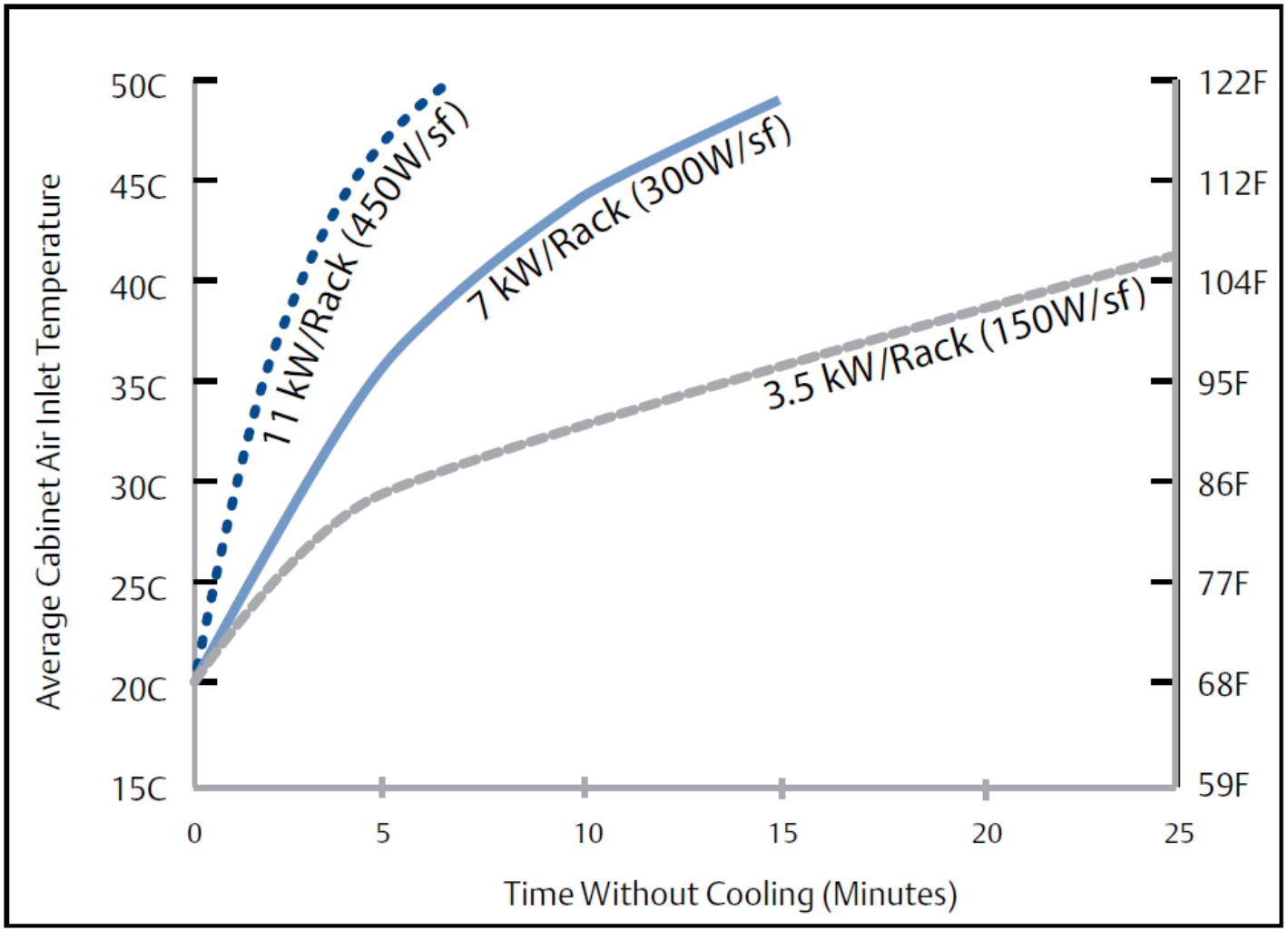
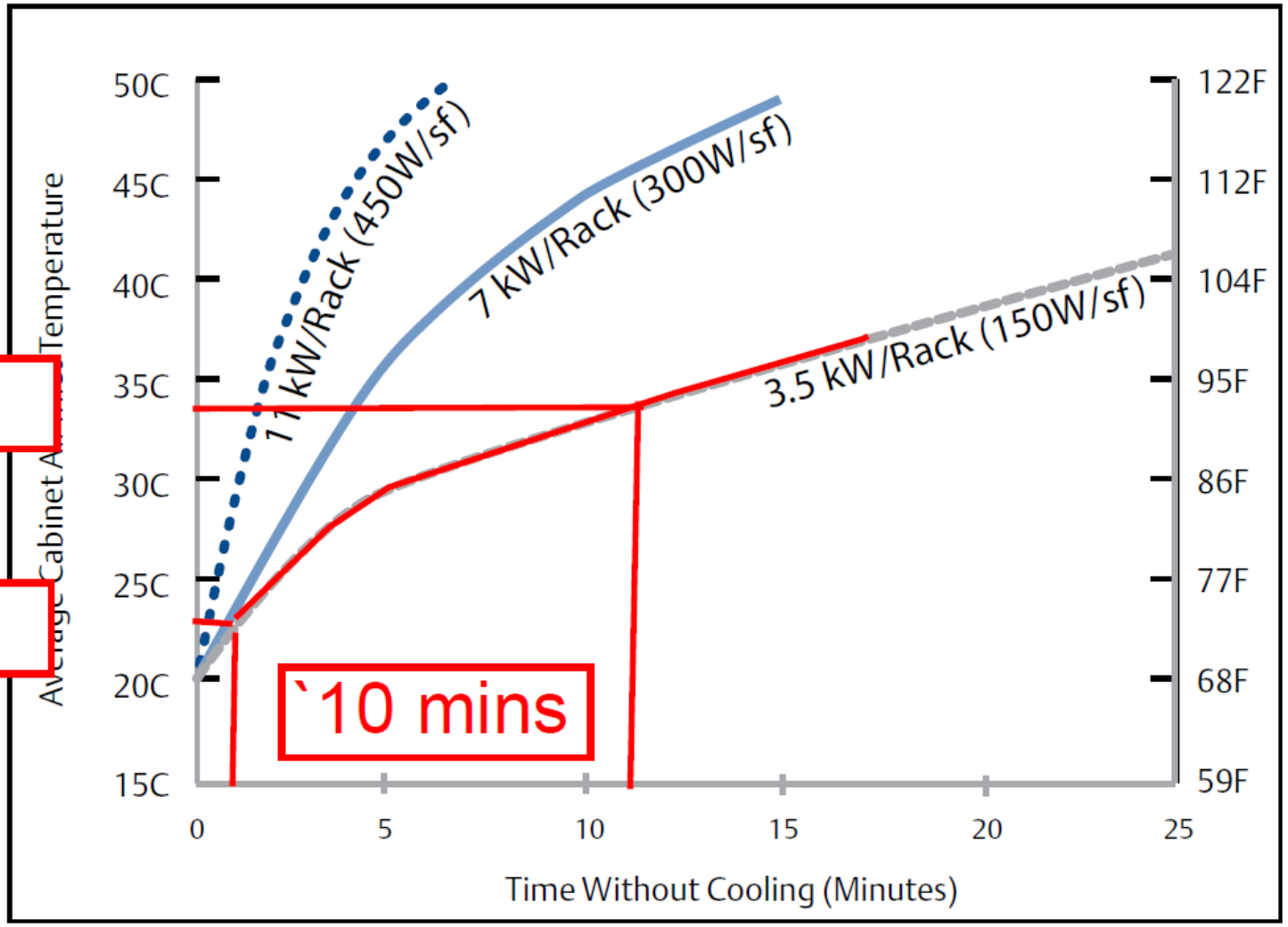
DATA CENTER-CONTROL ROOM
DATA CENTER-CONTROL ROOM
TCP/IP
DATA CENTER BMS Server
Bacnet IP
Building BMS System
dcim

The Case of Continuous Cooling



The Case of Continuous Cooling



THINK

BIG

START

SMALL

design
integrate
construct

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Thank You