

Data Centres (DC)

- Changing Environment
- “What does this mean for Managers and Designers?”

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Data Centres (DC) Are Changing

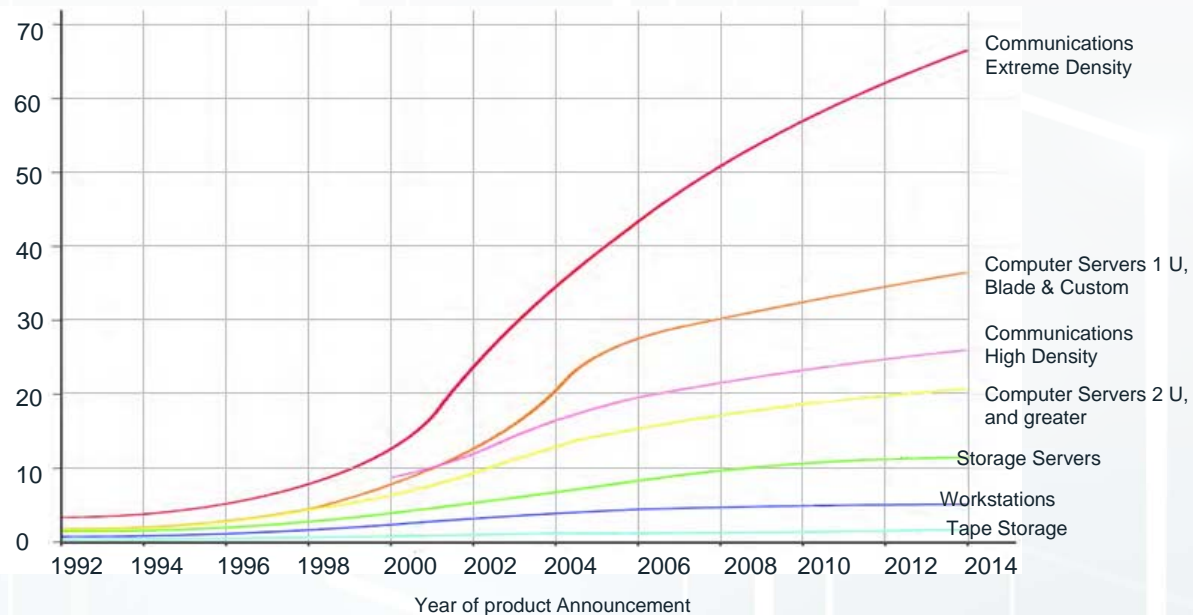
- With IoT, everything is connected and requires increased resources, networks, power, cooling
- While the network cabling seems to be reducing, we have a new challenge with power management or cable management
- Devices are getting larger, while shrinking??
 - Servers continue to improve performance and power demand is growing
 - Network devices are changing, increased demands and size
 - Storage has become much more dense requiring less space, but increased power demands



Equipment Heat Load Trends

Heat Load in kW per rack (Based on cabinet footprint = 0.65 sq.M (7 sq.ft))

Most cabinets today ~0.8 sq.M

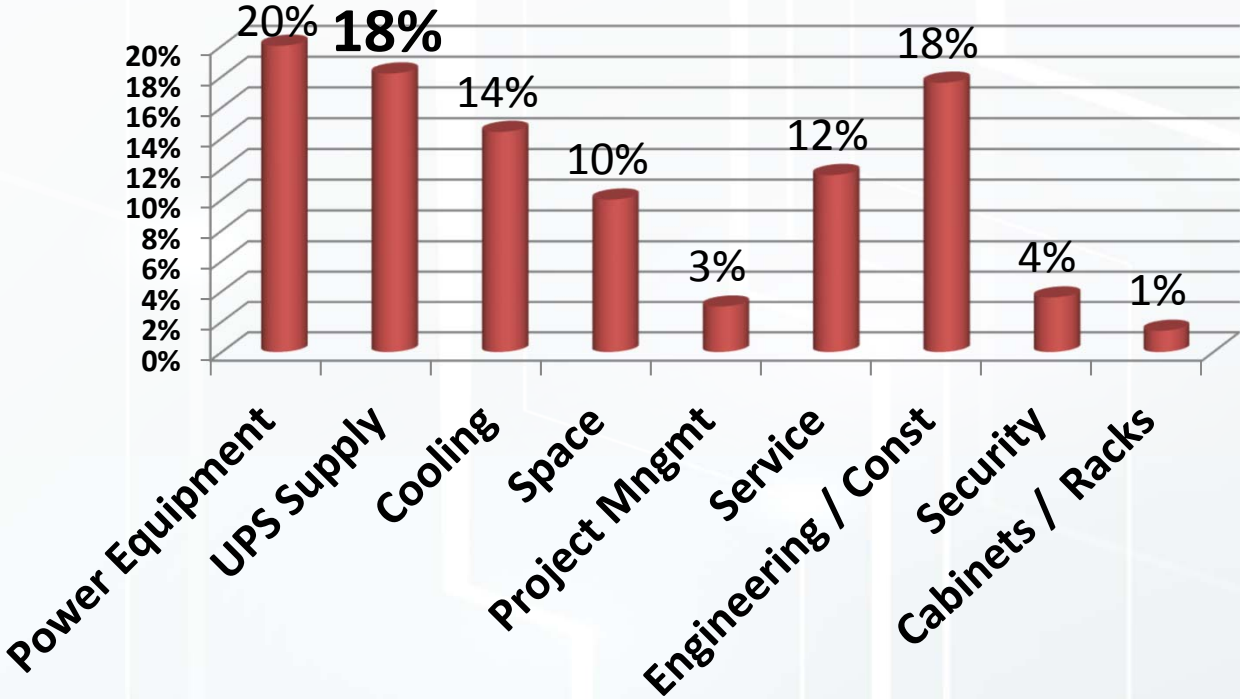


Source: "Datacom Equipment Power Trends and Cooling Applications"
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Data Centre Costs are changing

- Previous DC costs per ~\$10,000USD/SqM (~\$1000/Sq.Ft.)
- Today depending on design and redundancy this can be more than 5 times that amount
- Where is the money being spent?

Average DC Cost



Metals in a DC

- Racks / cabinets and metal pathways represent less than 2% of the over all cost
 - The cost does not include any active components i.e. servers, storage devices, etc...
- Many organizations are moving to a cloud computing solutions faster than initially anticipated
- Changes are happening within the DC environments

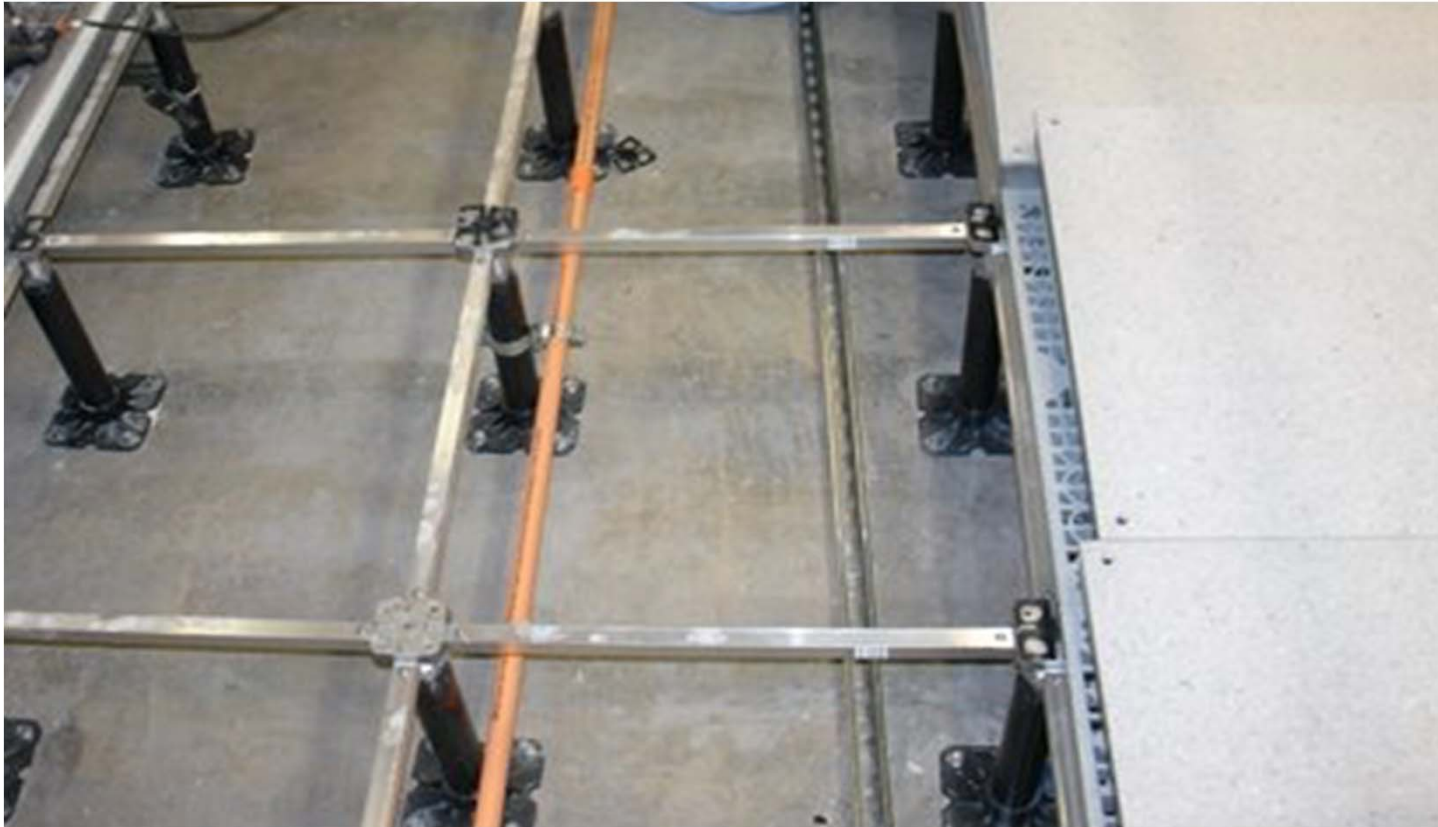
What is a Modern Data Centre?

- Does it have a raised floor?
- Is Containment used
 - Hot Aisle Containment (HAC)
 - Cold Aisle Containment (CAC)
 - VED/Chimney Cabinet solution?
- Device requirements are changing
- Other areas are being affected
- Will we still see large DC – 100+ cabinets and how will the space be configured?

Raised Floor

- What value does a raised floor provide?
 - Supply air plenum
 - Cable pathway
 - Power delivery
- Is the value worth the cost?
 - Typical floor $\sim 675\text{M}_2$ (5480ft₂) $\sim \$130\text{k USD}$ - $\sim \$180\text{k USD}$
- What are the challenges when using a raised floor?

Raised Floor - Plan



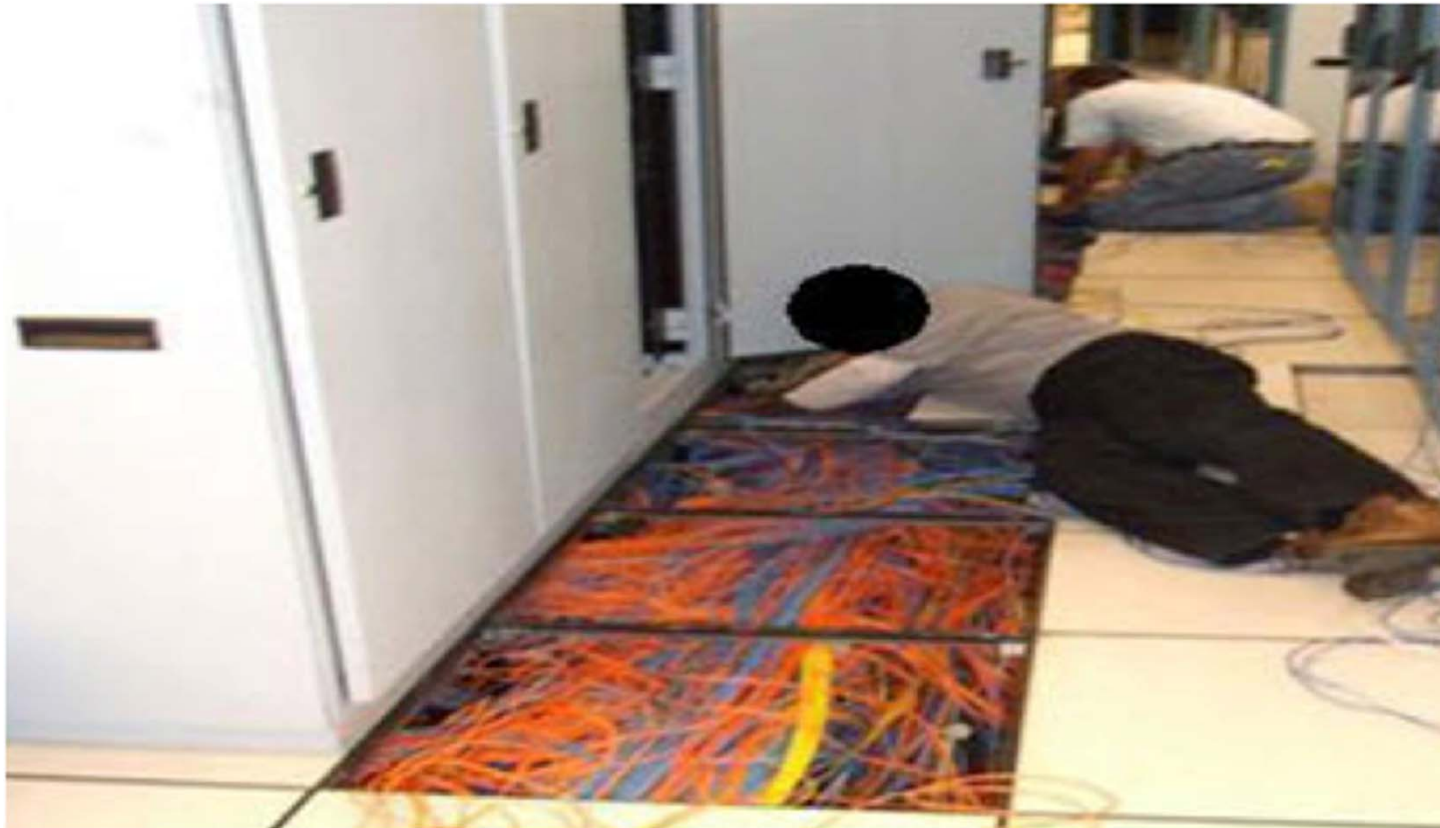
Raised Floor – Piping



Raised Floor – Cooling Piping

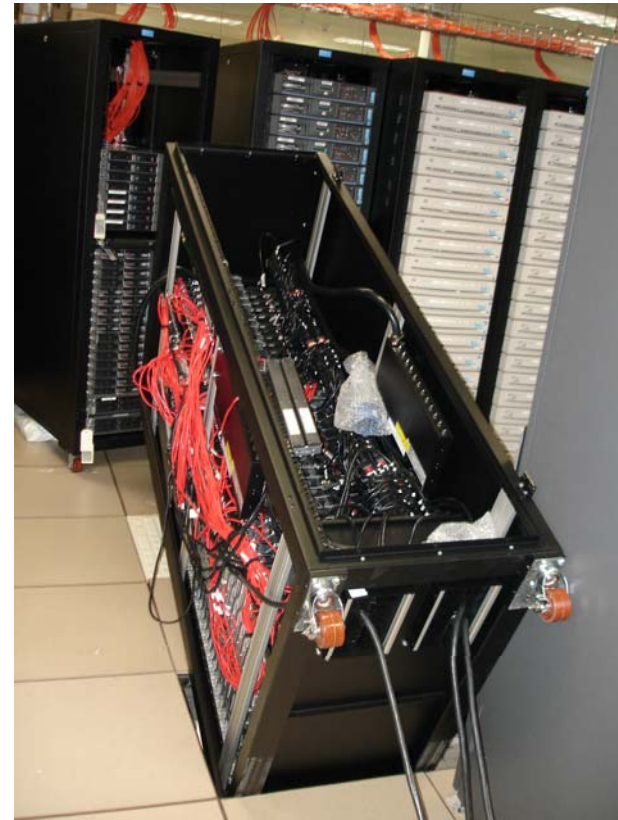


Raised Floor



Raised Floor Concern

- Brand new cabinet / install
- Legacy floor - tile tilted out of the floor



Raised Floor

- Air supply plenum, can be a real challenge depending on design, management and planning
- But is the floor really required?
 - Can Power, Network cabling be provided?
 - What about cooling lines?
- What are the challenges for designs without raised floors?

Non Raised Floor Hybrid HAC – VED Cabinet



Non Raised Floor – HAC Pod



Non Raised Floor – CAC w/In-Row



Non Raised Floor - HAC & In-Row



Non-Raised Floor Design Challenges

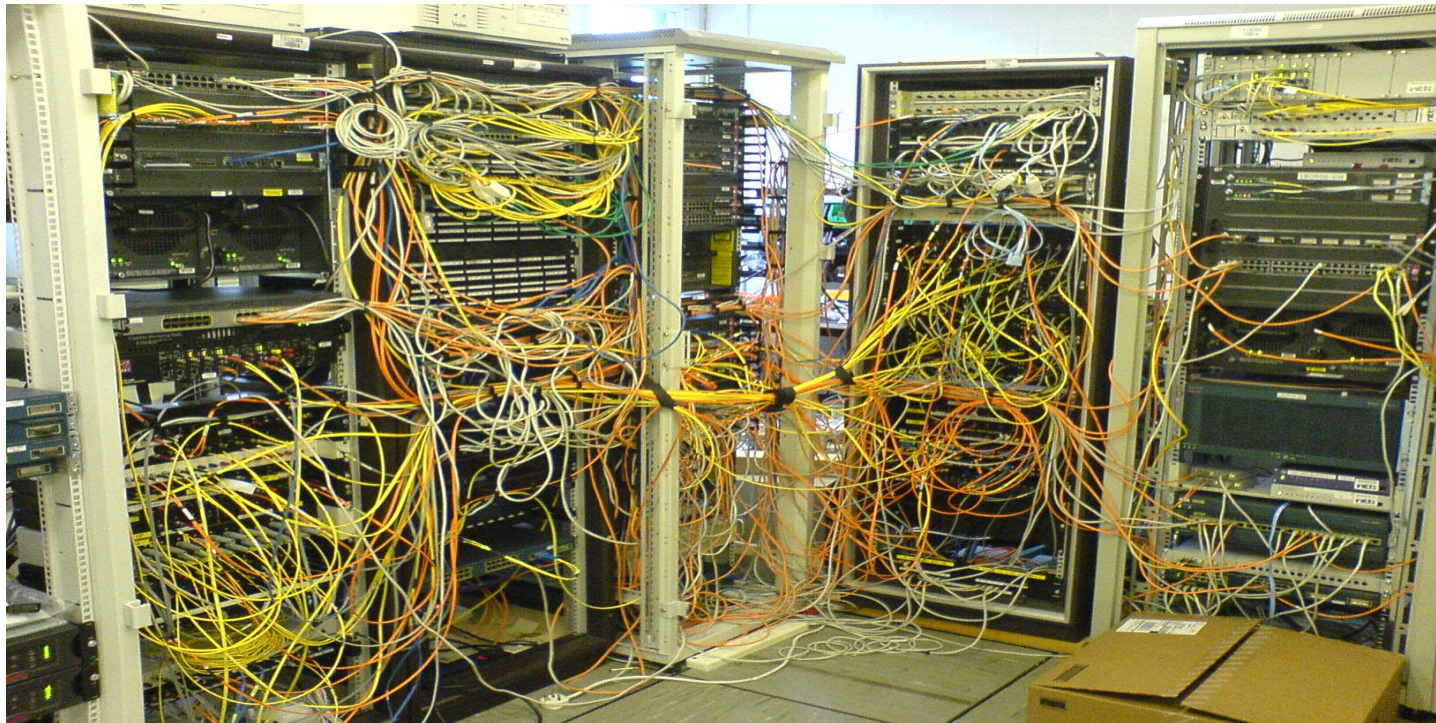
- ??
- Perception!
- Over head cabling looks ugly
- But what about power distribution?
- Where can the cooling lines be ran?
- How can air get to properly cool devices?
- Designs need to allow for varying densities (1kW – 30+kW)

Non Raised Floor Design

- Cables look really ugly!!

Cable Management

- If anything is not managed, it can be an issue



Over Head - Network Cabling



Typical Power Distribution



Over head – Power Distribution



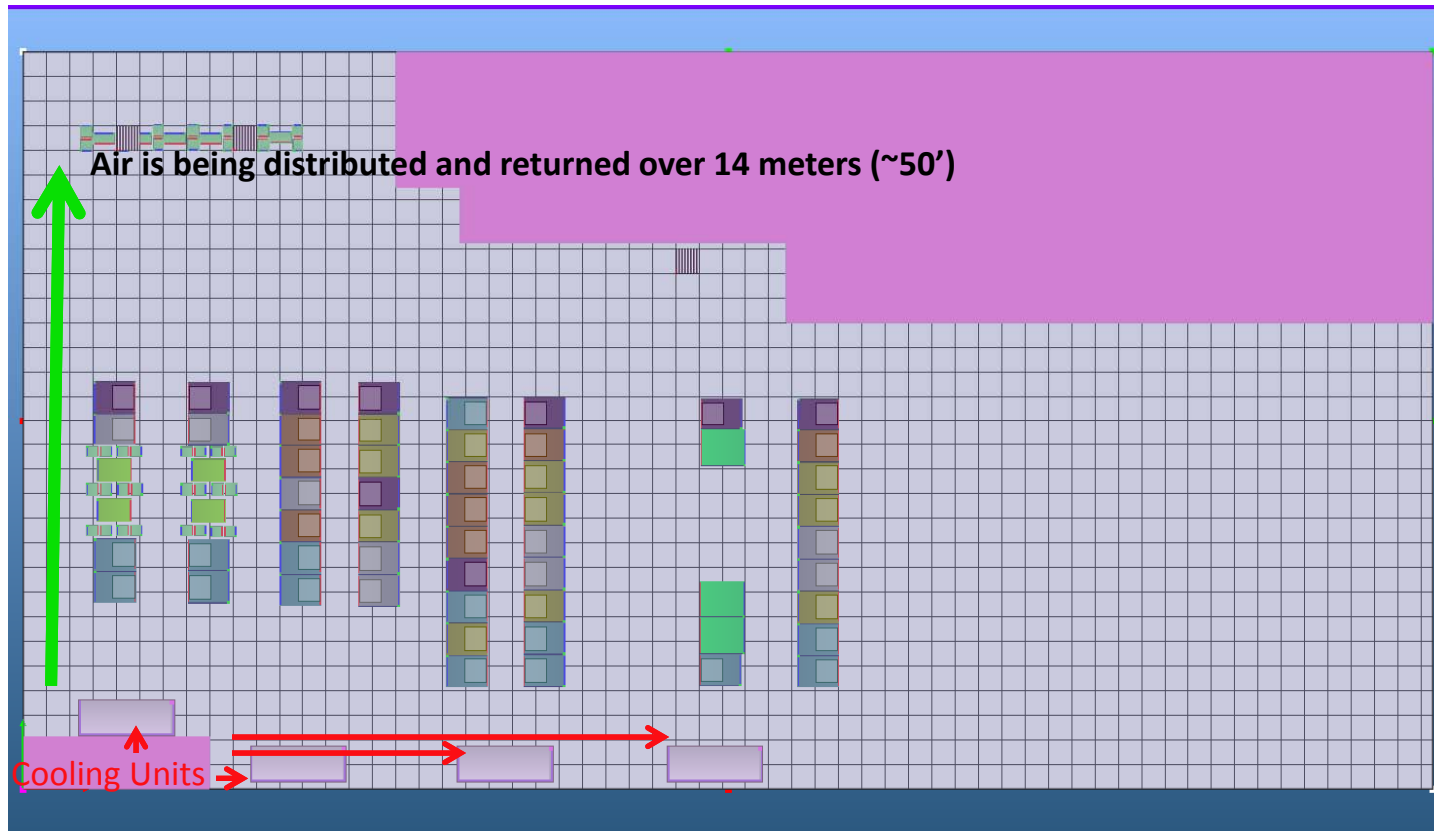
Over Head – Power Distribution



Cooling Lines – Over Head?



Non Raised Floor Design



Non Raised floor



Additional Benefits

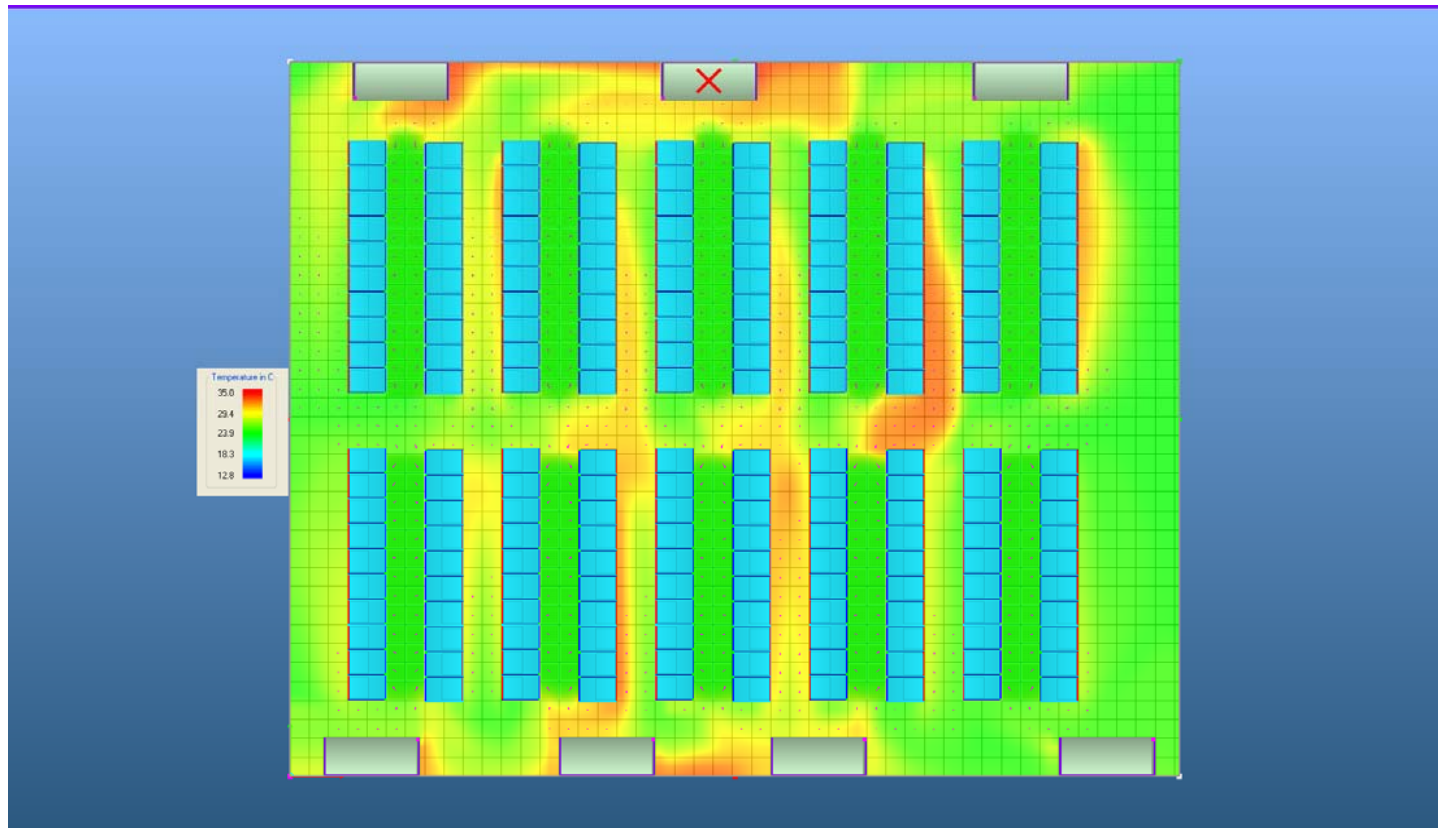
- Greater flexibility
 - No ramps or stairs
- Provides cooling redundancy
- Does the raised floor limit the ability to properly cool?

Case Study

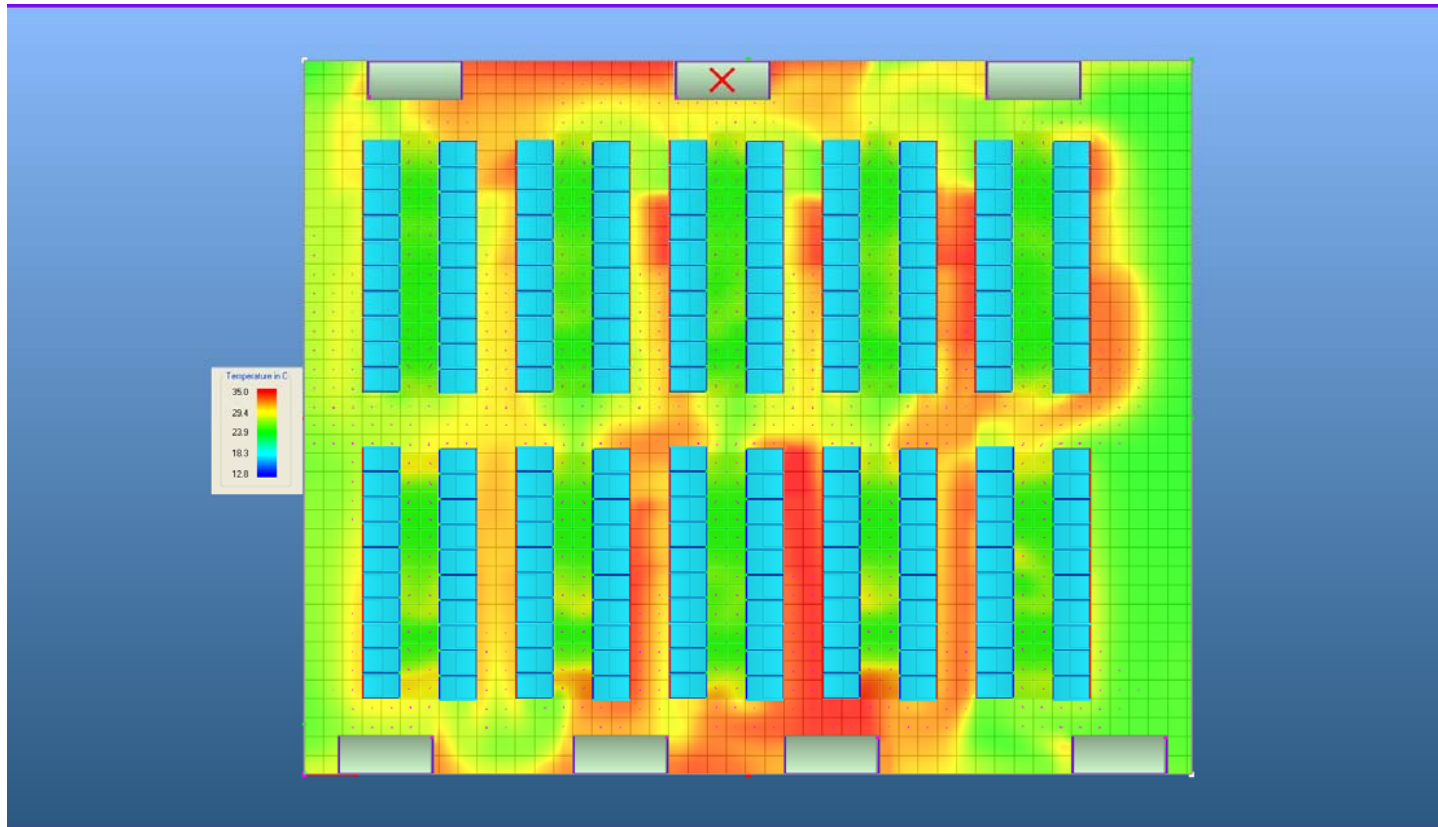
1MW Data Center with Raised Floor

- Model is based on
 - Space is ~22.7M (~75') wide by ~27.8M (~91') across, hard deck is ~4M (~13') above raised floor
 - Raised floor is ~1M (~3') in height
 - Dropped ceiling is ~3M (~10') above raised floor
- Cooling units are suggested as Stulz chilled water units model # CCD-2800-CWE
 - CRAC units are capable of ~41,000 CMH (~24k CFM) each for a total air flow of ~285,000 CMH (~168k CFM)
 - Required airflow is ~268,000 CMH (~158k CFM)
 - Temperature is set at ~24 degree C (~75 degree F) on all units
- Cabinet loads are 5kW each for a total load of ~1MW

0.9M (3ft) Elevation



1.8M (6ft) Elevation

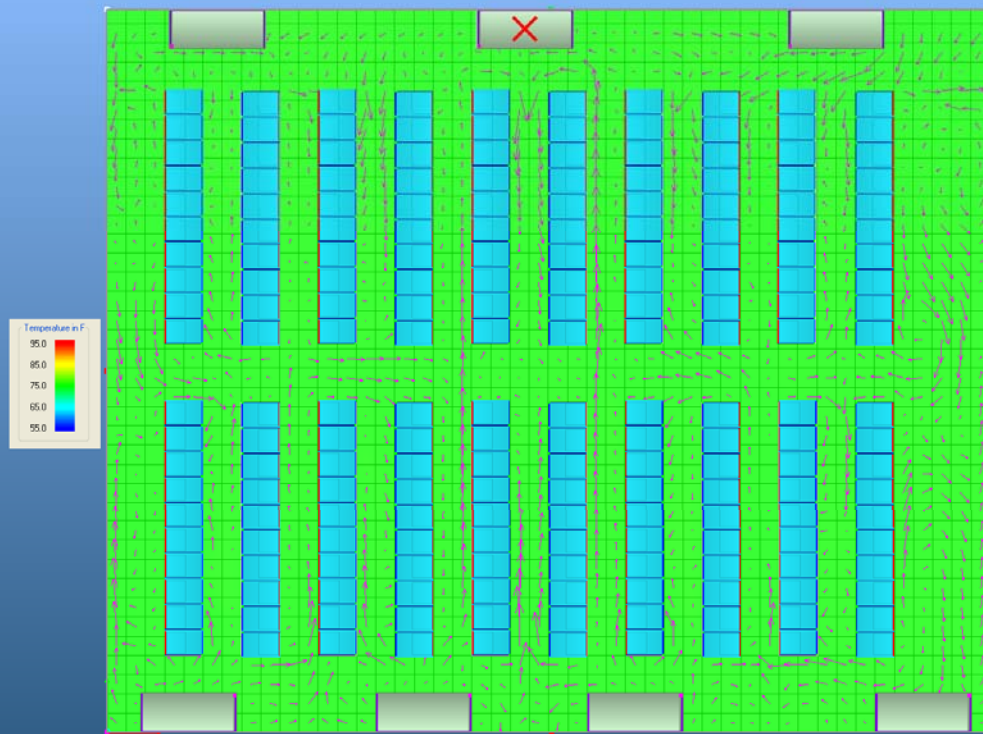


Case Study

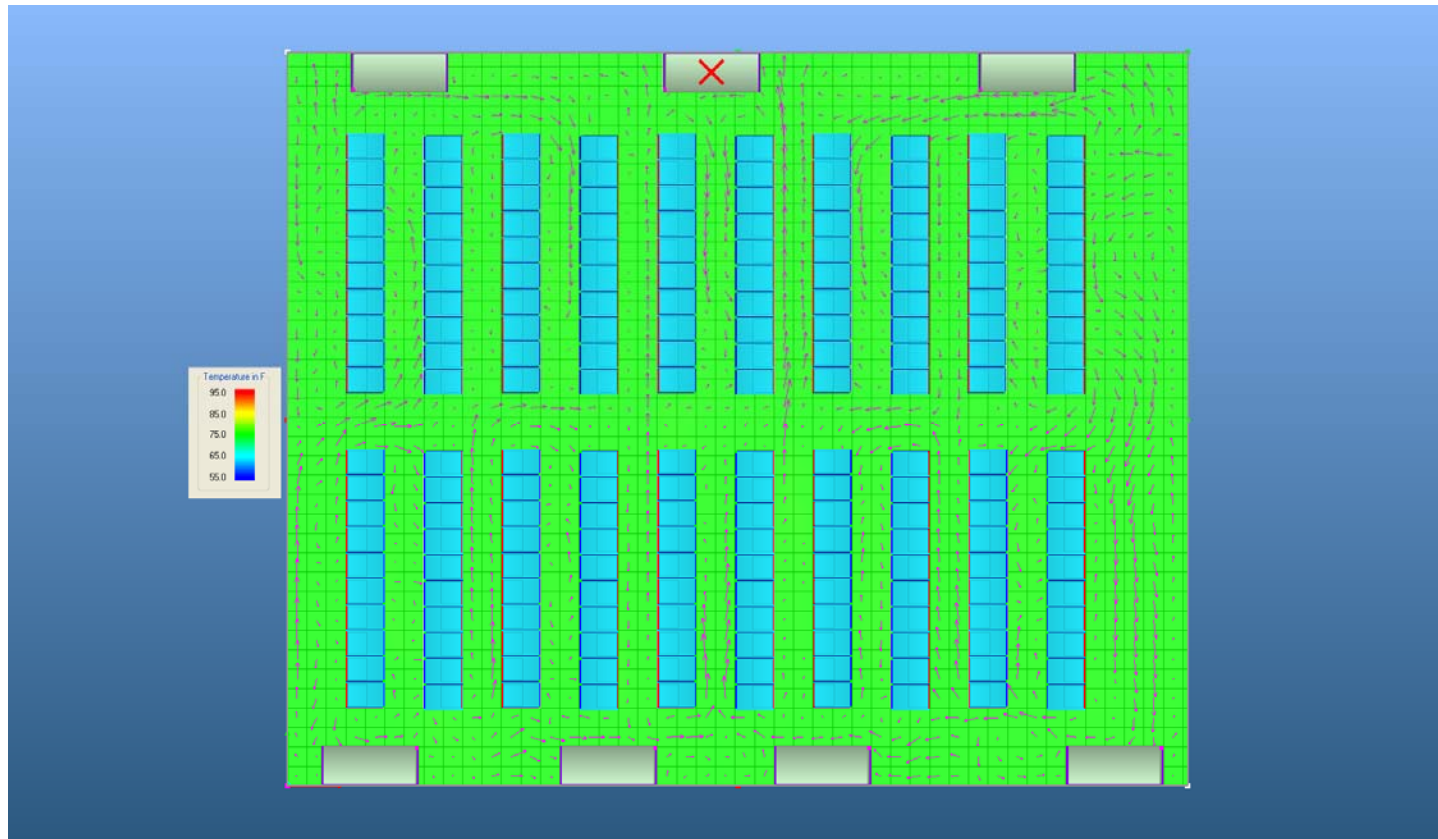
1MW Data Center **without** Raised Floor

- Model is based on
 - Space is ~22.7M (~75') wide by ~27.8M (~91') across, hard deck is ~4M (~13') above raised floor
 - No raised floor
 - Dropped ceiling is ~3M (~10') above raised floor
- Cooling units are suggested as Stulz chilled water units model # CCD-2800-CWE
 - CRAC units are capable of ~41,000 CMH (~24k CFM) each for a total air flow of ~285,000 CMH (~168k CFM)
 - Required airflow is ~268,000 CMH (~158k CFM)
 - Temperature is set at ~24 degree C (~75 degree F) on all units
- Cabinet loads are 5kW each for a total load of ~1MW

0.9M (3ft) Elevation – No Raised Floor



1.8M (6ft)Elevation – No Raised Floor



Data Centres of the Future

- Understanding many recent changes – Key items to focus upon?
- Recent DCD Article - **Rack Power Density Are Rising, But Slowly***
 - [“Nick Ellermann”](#) Average enterprise CoLo customer "full cab 2.4 to 3.3 kW"
 - VDI powered with GPU is a huge heat generator, driving to higher power densities
 - Retail data center in the US to go above 8.6 to 10 kW per cab
 - Cooling issues far to often
- Devices requirements are still GROWING!

Higher Densities

~14kW



~24kW



30kW+



Densities Are Increasing

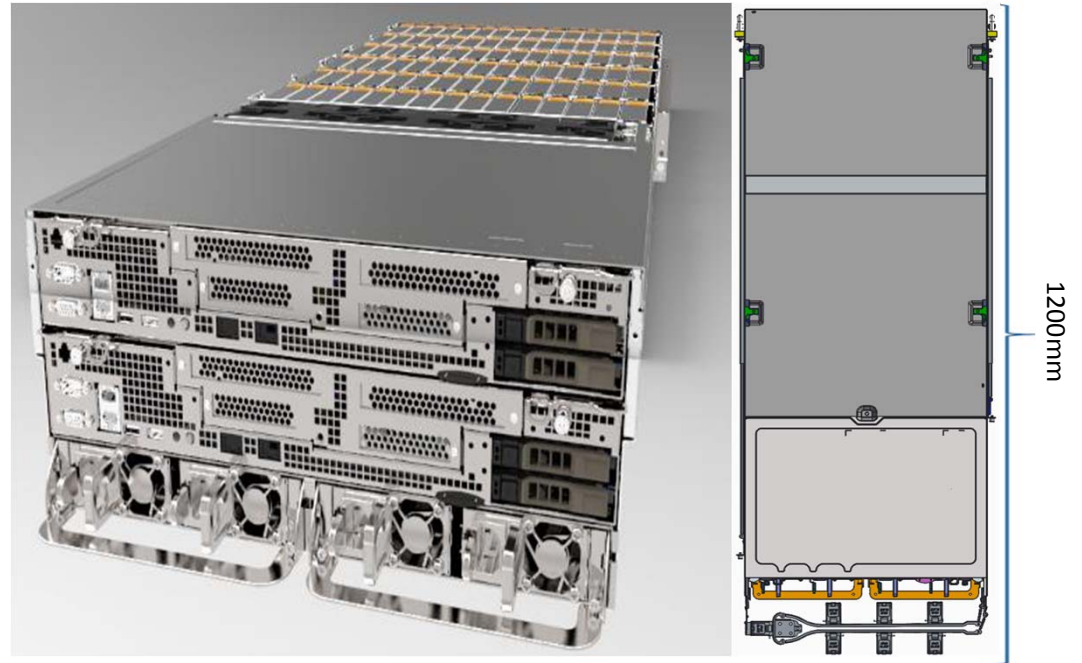
- Average Enterprise DC cabinet load has increased from ~3kW to more than 8kW
- Device utilization has increased from ~8% - 12%
 - Today many operate at more than 40% utilization
- But as densities have increased - So have the devices!!

New Devices

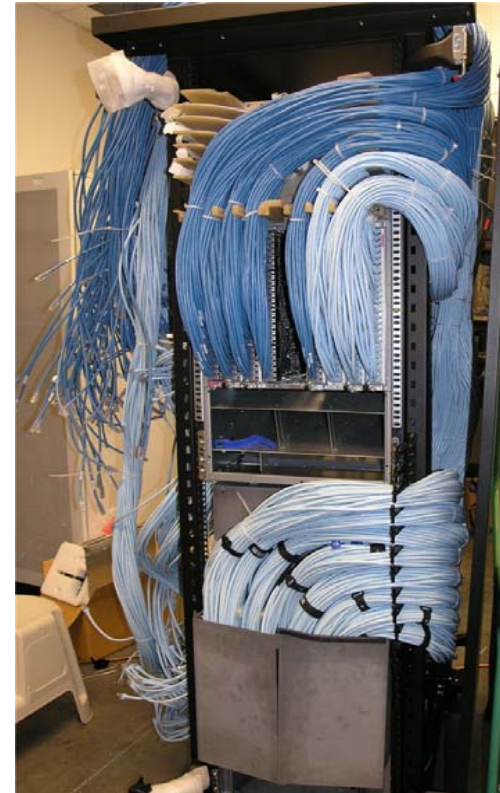
Gen 6 Isoilon in 1100mm (~43") Cabinet



New Storage Solution front to rear 1200mm (~48")



Network Devices



Meeting Device Demands

- To meet device demands cabinets and racks are changing
 - Current network device requirements state clearances on sides of devices of ~300mm (~11") requiring a ~1M (~40") wide cabinet
 - To reduce footprints many are going to taller cabinets 52U (~2.4M/~8')
- Current cabinets are ~1200mm deep (~48")
 - Future cabinets will need to be deeper potentially 1500mm+ (~60")

Future Data Centre

- Flexibility is key!
- Cost!!
- Redundancy Critical!!!



Overhead Pathways are Changing



More Efficient Pathways

From This



To This



Key Differences

- Single unified pathway
- No support from overhead
- No Fiber Duct!

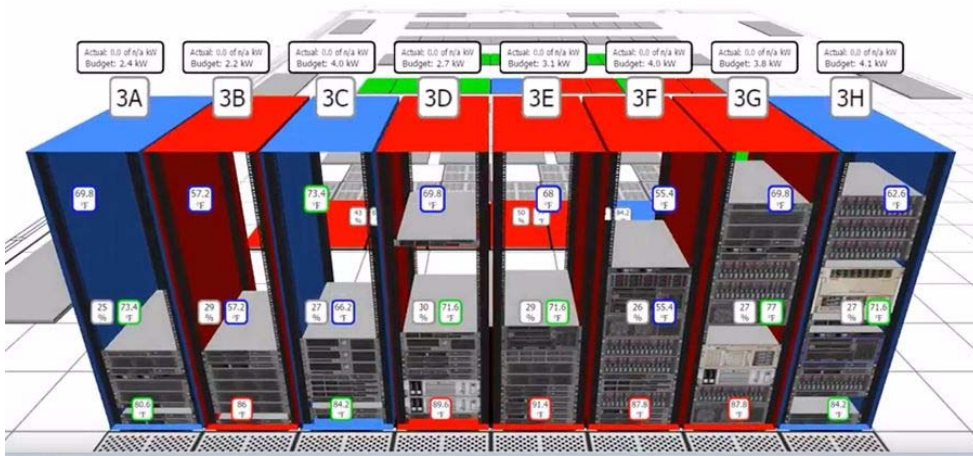
Data Centres are Changing AGAIN!

- Large DC are becoming less and less
 - Many End-Users are moving to cloud
 - Corporate DC has to be more cost effective
 - Design has to be flexible
 - Density or ability to accept varying densities has to be part of design

Data Centre Design Tool

- One of the recent improvements is DCIM solutions
 - These software solutions provide visibility into the Data Center
 - What if it could be used as a design tool?
 - What value would this provide to the Designer, the End-User and potentially Facilities Team?

Design Tool



Issue Request



Approve Request



Issue Workorder



Complete Workorder



Monitor & Manage

DCIM Solutions

- Single source for cabinet layout and elevations
 - These could be printed and placed on cabinets detailing power and network connections for all devices installed
 - Provide complete asset management with device details and configurations
- Provide Change Management
 - Allowing End-Users to manage requests for potential device installs but also detail if power and network connections are readily available
- Provide heat mapping as well as power usage
- Capacity planning tool
 - Future installs could be proposed in system and facility capacity limitations detailed
- These are just a few of the values that DCIM could provide

Data Centre Changes

- TR's / Patch and Meet Me Rooms – increasing numbers of higher density devices being installed
- These are no longer just patch or connection spaces many are becoming “ Mini Data Centres” with network devices but also active servers and storage
- These spaces are starting to require more active/precision cooling
- More and more devices are being moved to the “edge”

Devices at the Edge

Edge – for many they believe this is more of the end

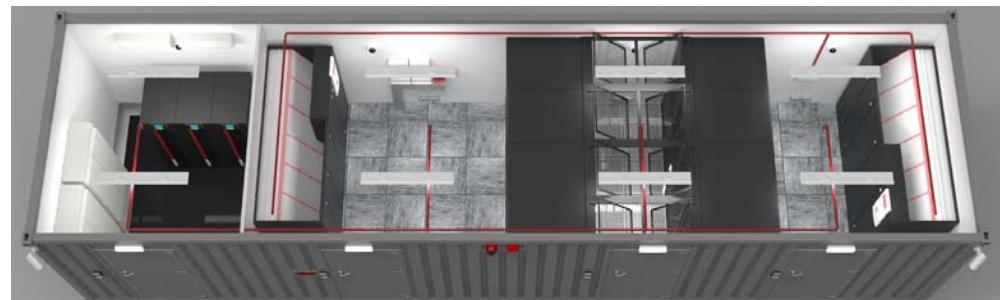
Today it is just the beginning for Data Centres

- 5G cell networks are driving a change for more cell towers/connections providing content at multiple towers connected via high speed networks
- End-Users are installing network devices in various environments to support POE devices
- These changes are changing our future Data Centre designs

Future Data Centre

- **Micro-Mobile Data Center Industry Massive Growth in 2018****
 - Plug and play unit, which has all the devices of a conventional data center offers an enterprise compact facility loaded with features including board cooling, uninterrupted UPS, storage systems and others

Micro Data Centre



Micro Data Centre

Are we starting to see once again the move to containerized solutions?

Not really but a large shift is happening in the market

- The biggest growth – is really around NEMA/IP rated cabinets
 - Many of these cabinets can be smaller than $\sim 0.22\text{M}^3$ ($\sim 8\text{ft}^3$)
 - As large or larger than most server cabinets
 - These cabinets can have basic cooling via fans
 - Or precision cooling with redundant cooling units and UPS

NEMA/IP Micro Data Centre



Data Centre are Changing

- The spaces are changing
 - Densities are increasing
 - Devices are growing in size
 - Spaces are changing
- Designs need to be flexible - able to support future growth and change
 - This is not just for the Data Centre but for all areas that have active equipment
- Will we continue to see the large Data Centres – Yes and No
 - Many End-Users will still have spaces but many will not be building as large as past
 - Some are moving to CoLo while others are moving devices to the Edge

Data Centre of The Future

- Future Spaces could radically change
 - They could be spaces that hold just storage and network devices



Thank You!

Questions??

Sources

- *DCD Article - https://www.linkedin.com/groups/122326/122326-6380473455929806853?midToken=AQG0crweXoGybw&trk=eml-b2_anet_digest_of_digests-hero-12-view%7Ediscussion&trkEmail=eml-b2_anet_digest_of_digests-hero-12-view%7Ediscussion-null-kblkf%7Ejf2u38yj%7Ey0-null-communities%7Egroup%7Ediscussion&lipi=urn%3Ali%3Apage%3Aemail_b2_anet_digest_of_digests%3BSxTe6NLkRw6P7ckkH%2BGy5Q%3D%3D
- **https://www.linkedin.com/groups/122326/122326-6385049203374112773?midToken=AQG0crweXoGybw&trk=eml-b2_anet_digest_of_digests-hero-11-discussion%7Esubject&trkEmail=eml-b2_anet_digest_of_digests-hero-11-discussion%7Esubject-null-kblkf%7Ejffovv89%7E2x-null-communities%7Egroup%7Ediscussion&lipi=urn%3Ali%3Apage%3Aemail_b2_anet_digest_of_digests%3BgJVEcgdGSpWlrraTk6hIng%3D%3D