

CIO

SUMMIT
2010

The **21st**
Century CIO

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Do more with less with your
data centre – A customer's
perspective

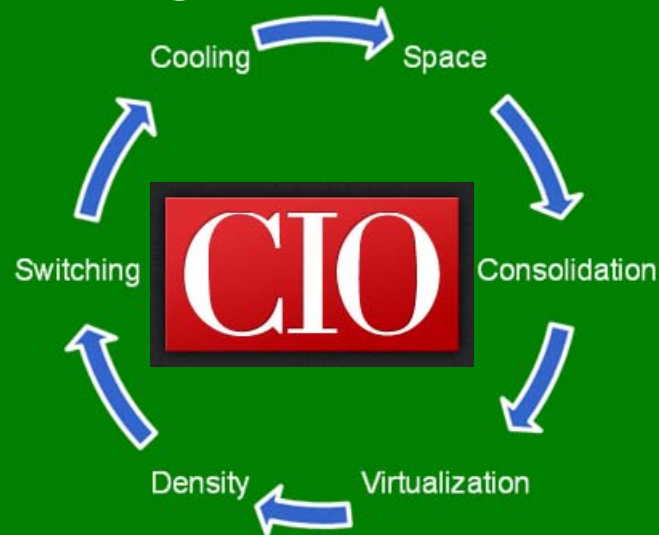
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Today's Enterprise Data Centre

“Doing more with less”



High Density Data Centres

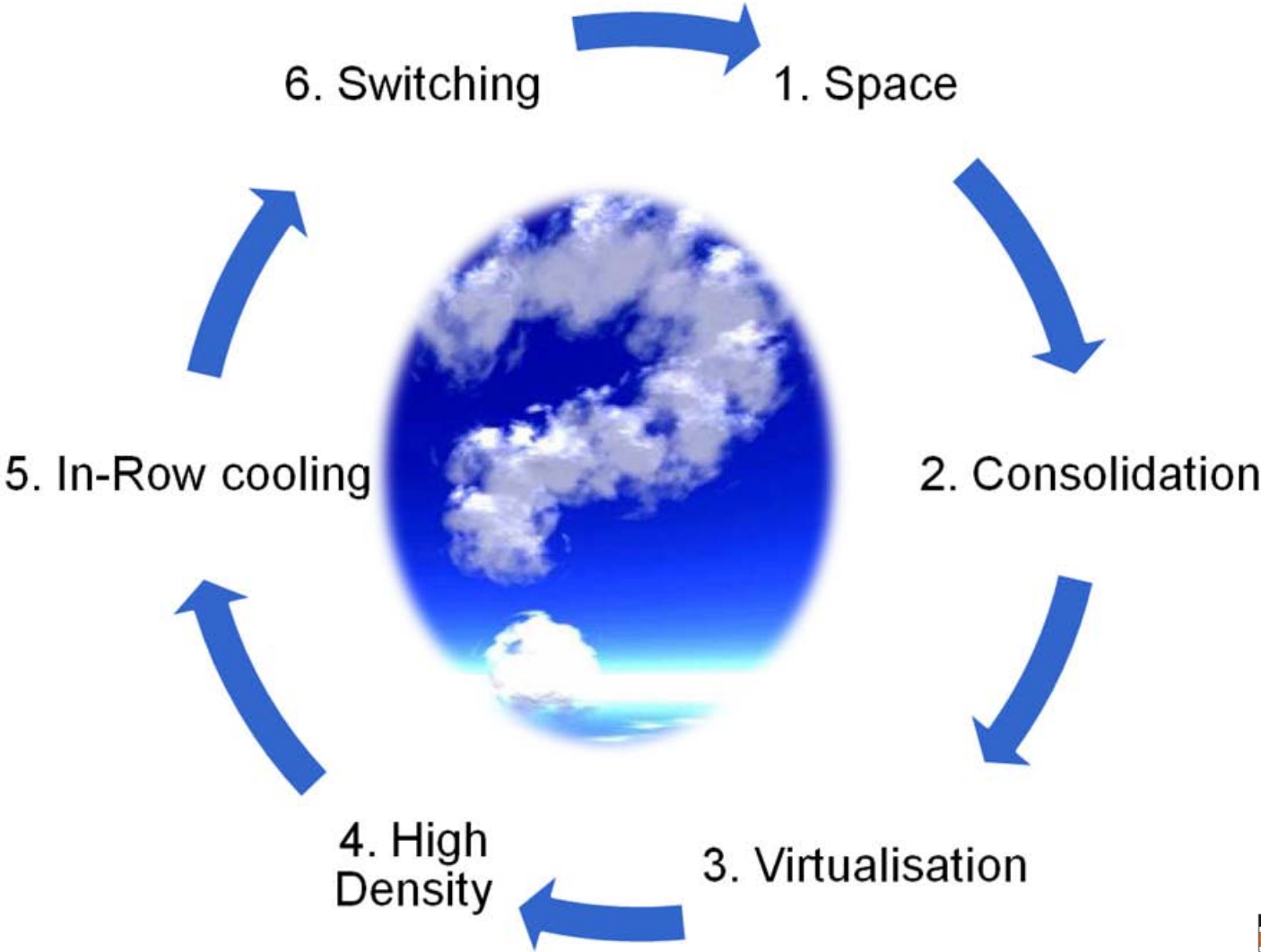


“Not a question of if, it’s a matter of when.”



Charles Nolan

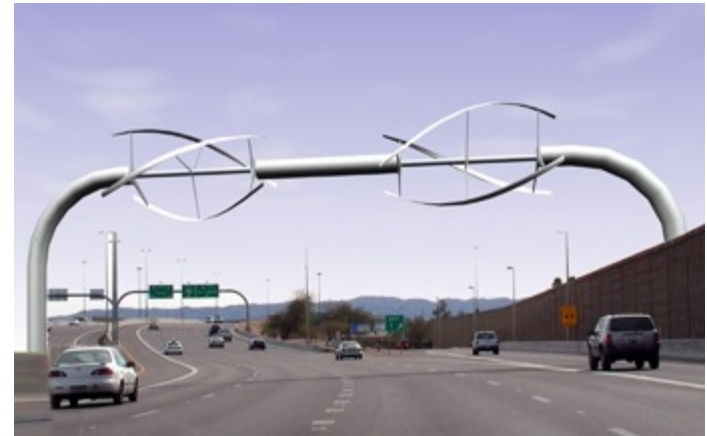
Trends – Clouds, Density, Virtualisation, Consolidation, Environment Convergence – “it’s a Journey not a destination”



1.) Space – growth, environment, facility, technology

“2010 computing requires 2010 infrastructure”

- Drivers for Space
Growth of servers, storage
- Upgrades required
- AC, UPS, floor, power
- Aging infrastructure
- old, inefficient, low density cooling,
power availability
- Energy Efficient drivers
- waste, measurement
- 2010 computing
requires 2010 infrastructure

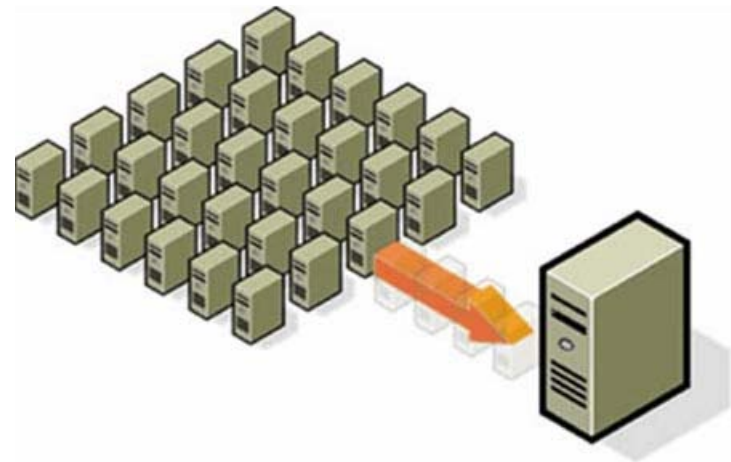


Space requires Consolidation

2. Consolidation

“doing more with less”

- Shared Services model
- Centralisation
- Utilisation
- Reducing numbers of boxes
- Data Centre reduction
- Increase resource utilisation
- Decrease costs
- Manage growth

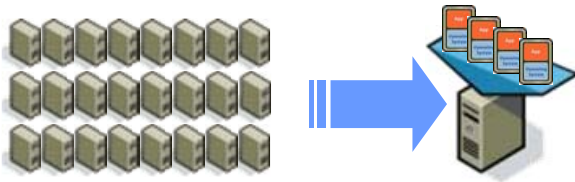


Consolidation requires Virtualisation

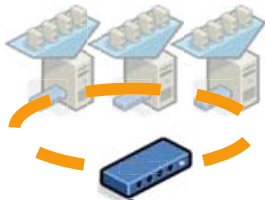
3. Virtualisation – Not just Servers, networks, and storage.

“virtualize your Data Centres too”

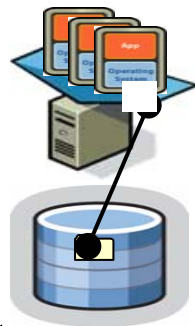
■ Virtual Servers



■ Virtual Networks



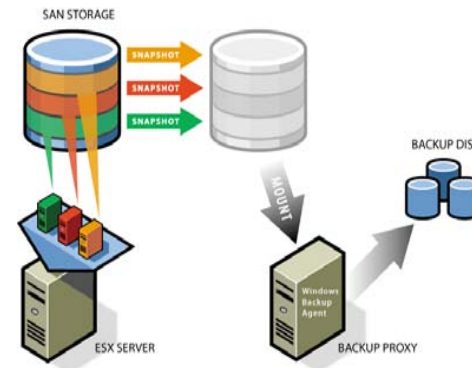
■ Virtual Storage



■ Virtual Data Centres

Virtualisation drives Higher Density ...

- Fewer boxes
- More applications
- Higher utilisation
- Faster provisioning
- Increased efficiency



4. High Density – The Challenge – “More or Less”

“Power (Kw) as a measure - not space (m2) ”

+ More Servers

- Less Racks

+ More Efficient power use

- Less Power

+ More power per rack

- Less Space

Power (kW) as a measure, not space (m²)

Higher Density drives Chassis & blades servers

■ Power efficiency

■ 300-400 virtual servers/chassis

– 3 chassis per rack

– (up to 12-20 KW/rack)

■ Density saves space

■ In-built resiliency

■ Redundant capability essential



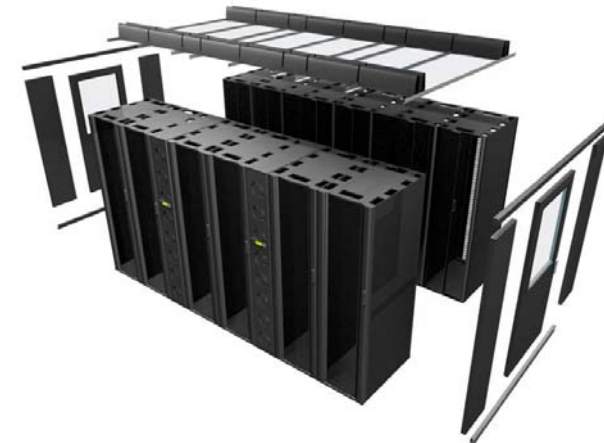
Chassis Servers drive InRow cooling

5. In-Row Cooling – “DCs in a Pod”

“Cool the rack not the room”



- Cool the rack not the room
- 2 kw/rack moves to 20+kw/rack with HD
- Energy Efficiency,
- *POD becomes the Data Centre*
- Separate DCs within a hall
- *No false floors to hide under*



InfraStruXure®
DATA CENTRES ON DEMAND

PODs drive switching and cabling

6. Switching – SAN, network and cabling

- “wiring it all togetherwith glass!”

How to get 1200 servers switched out of one rack ?

- Chassis switching & no copper (where possible)
- DC switching becomes POD switching
- *the POD is the Data Centre*
- Row switching becomes rack switching
- top-of-rack is the go
- Top-of-rack switching, reducing copper
- Switching configuration – uplink and downlink
- plus resiliency



Switching drives rack layout and space – the cycle begins again

Green Initiatives

Concern, Consideration, Design, Implementation, Management

- Re-use of existing building
- Minimise building works – no false floors
- Responsible building methods
- Higher utilisation of processor farms
- Greater utilisation of shared storage
- No water wasted on cooling
- Cooling equipment directly – not entire rooms
- Insulated rooms without windows
- Balanced cooling across PODs
- Hot-aisle containment no mixing of hot & cold air
- Shorter paths to cooling
- Less temperature range between hot and cold air
- Higher density efficient servers
- Less power usage overall
- More efficient ratio of electrical load to IT load
- Energy efficient UPS systems



“Green is gold – efficiency drives down costs”

Results – Getting it done

- “get by with a little help from your friends”

- New Energy efficient High Density Data Centre design & consulting
- Canberra Data Centres
- POD-based InRow cooling infrastructure
- APC InfraStruXure
- Construction and Building Project management
- UNIPOINT (with UNSW Facilities Management & IT at UNSW)
- Chassis Servers and Chassis Switches
Dell - M1000, M905/605, Dell/Cisco – 3130G
- Data Centre Cabling design and implementation
- UNSW IT Infrastructure
- Integration and Project Management
- UNSW IT Infrastructure
- Unified Switching – in-rack & POD(FC, FCOE & E)
Cisco Nexus - 7000, 5000
- Consolidation environments
Microsoft Windows 2003/8, Vmware - ESX, SRM, LCM

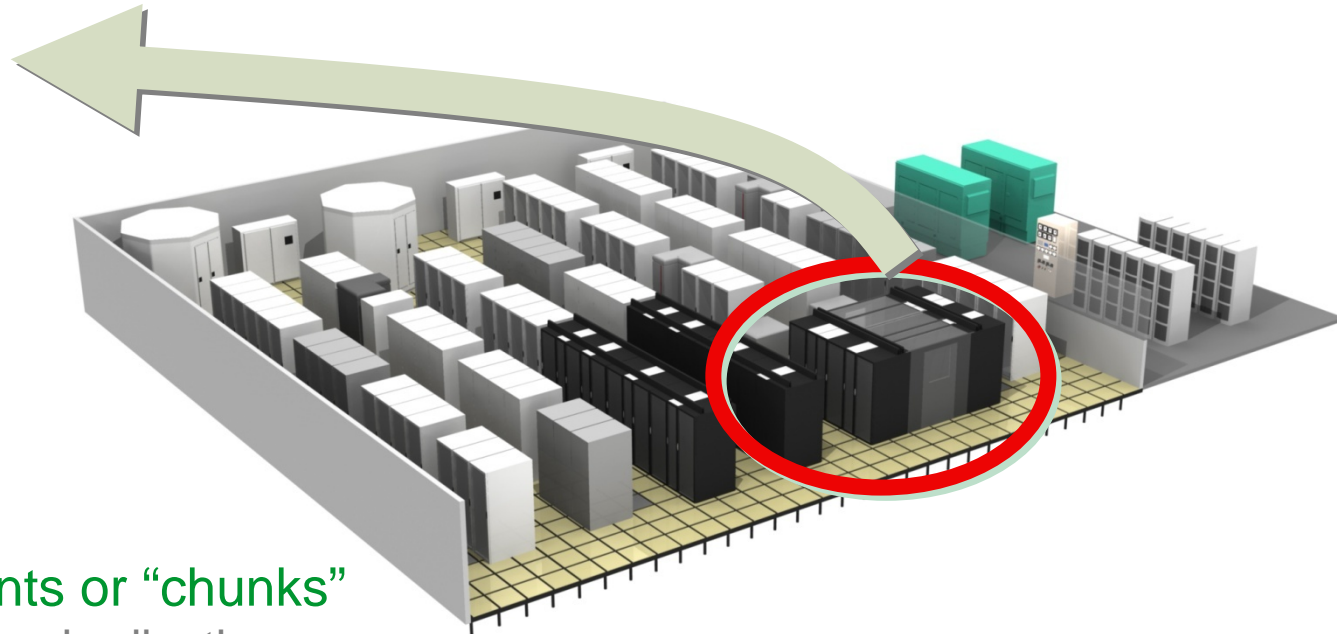
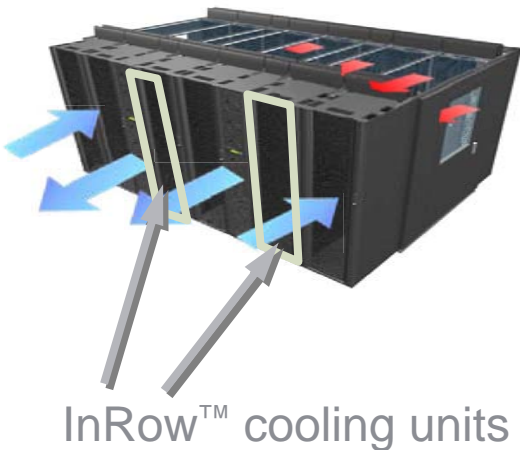


Remember

- “your takeaway menu”

- *2010 computing requires 2010 infrastructure*
- *Consolidation requires Virtualization*
- *Virtualize your Data Centres too*
- *Power (Kw) as a measure - not space (m2)*
- *Cool the rack not the room*
- *The POD is the Data Centre*
- *No false floors to hide under*
- *Wire it all togetherwith glass*
- *Green is gold – efficiency drives down costs*
- *Get by with a little help from your friends*
- *More or less - it's a journey – not a destination*

Ready Conversion of legacy data centres to high density - Drop-in a “POD”



- **Building out in increments or “chunks”**
 - “Step and Repeat” standardization
 - Easy physical segmentation into a zone or cage
 - Easy electrical and billing segmentation
 - Reduction of up front costs
 - Targeted or variable densities – “High Density Zone”
- **Use of standardized and integrated components**
 - Single source supplier

Where to next ?

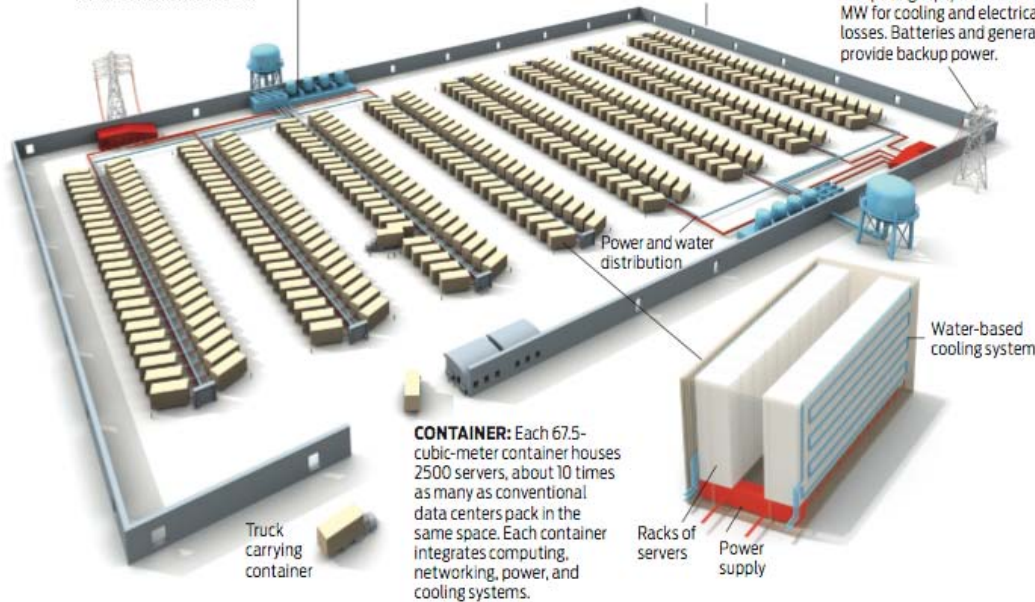
Gen 3 – fully containerised data centers



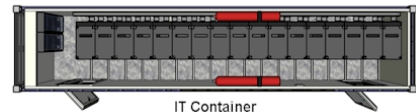
COOLING: High-efficiency water-based cooling systems—less energy-intensive than traditional chillers—circulate cold water through the containers to remove heat, eliminating the need for air-conditioned rooms.

STRUCTURE: A 24 000-square-meter facility houses 400 containers. Delivered by trucks, the containers attach to a spine infrastructure that feeds network connectivity, power, and water. The data center has no conventional raised floors.

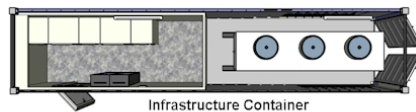
POWER: Two power substations feed a total of 300 megawatts to the data center, with 200 MW used for computing equipment and 100 MW for cooling and electrical losses. Batteries and generators provide backup power.



"All-in-One" Design (example layout)



IT Container



Infrastructure Container

Multi-container Design (example layout)



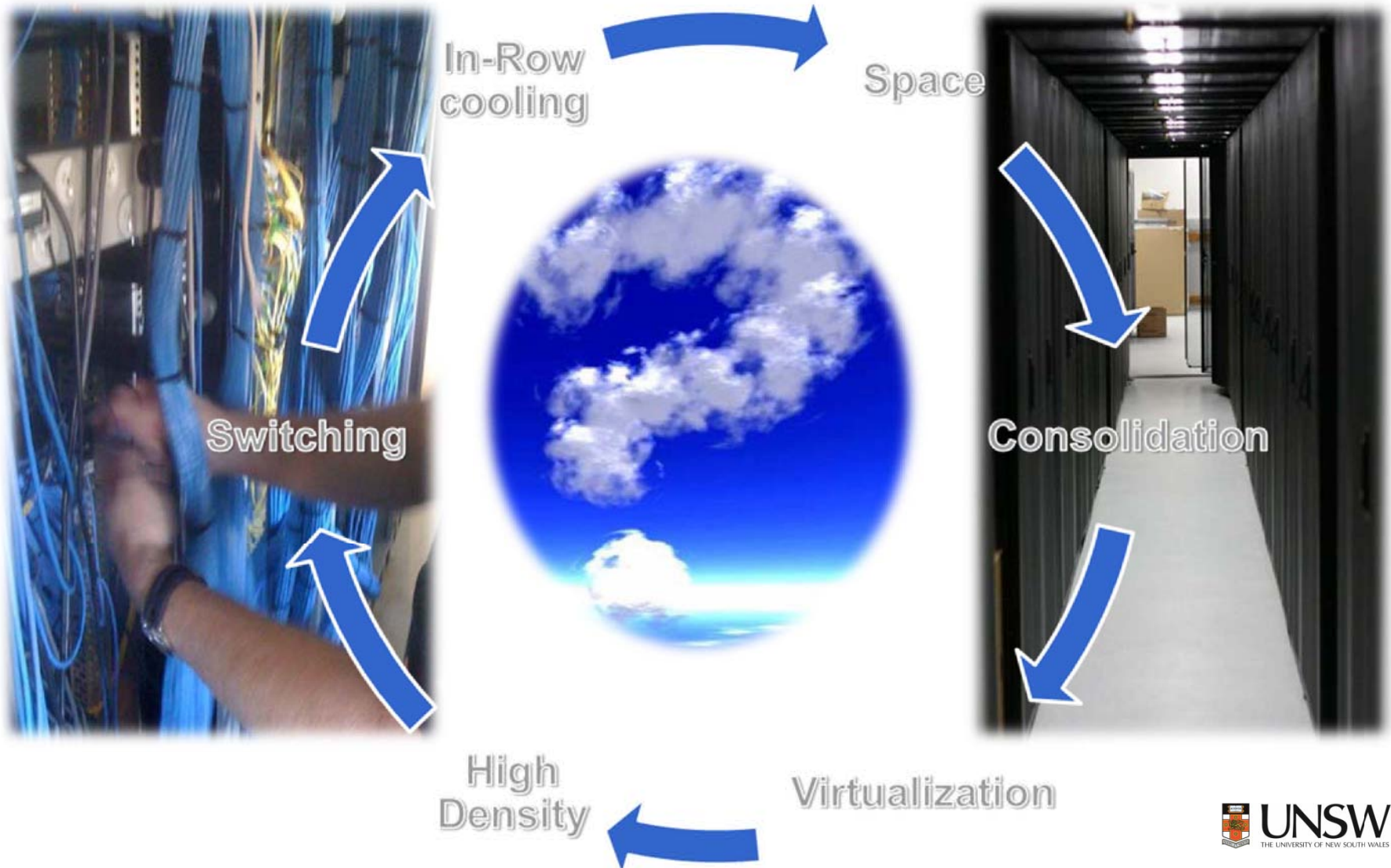
"The container is the server – mechanical, electrical and compute"

Convergence – “it’s a Journey not a destination”



Evolution 2010 – now at UNSW

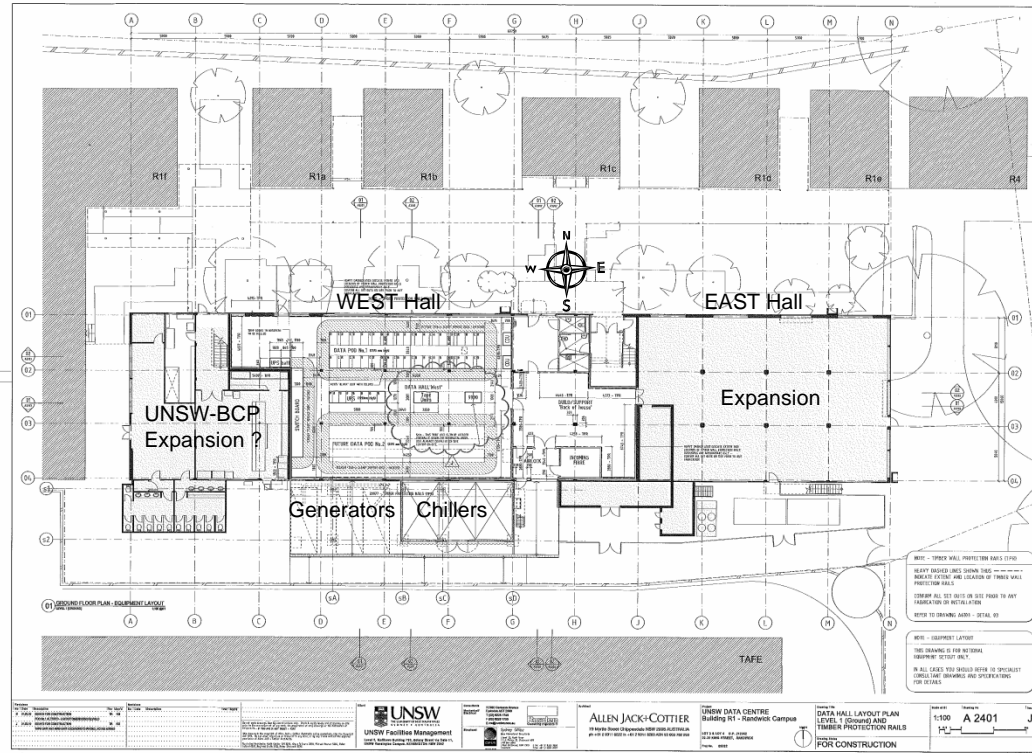
- The Changing face of UNSW Data Centres



Space – now at UNSW

....separate zones – shared mechanical infrastructure

West Hall is 350m² with room for two PODs totalling 60 racks plus 15 racks space of supporting infrastructure for UPS, Disk and Tapes



R1 Data Centre showing floor plans

East Hall is 300m² for expansion, with room for 60 additional racks plus 15 racks space of supporting infrastructure for UPS, Disk and Tapes

The West Hall is currently fitted out. Air and electrical capacity is sufficient to expand to the East hall with the addition of another chiller, some water pumps and the east Hall switchboard. Over 1Mw increase requires additional feed from existing campus substation, and generator for redundant capability.

PODs - now at UNSW

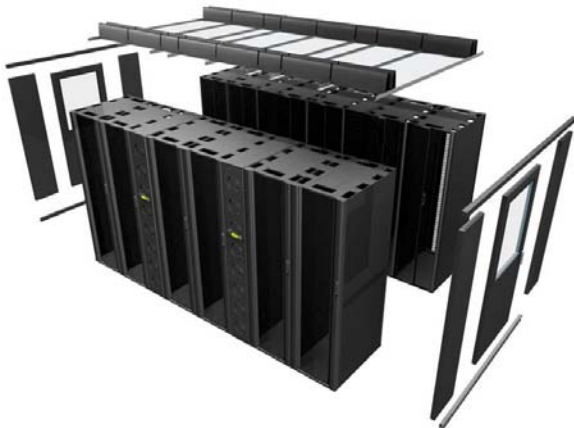
....each POD is a data centre on its own

APC POD technology:

There are two PODs planned in each Hall, with only one 30 rack POD initially in the West Hall.

Each rack is designed to supply and cool an initial average of 7.5KW/rack.

The capacity of the PODs is to cool up to 25KW/rack, meaning an initial 500KW over the entire Hall.



Schematic of a 10 rack APC POD showing hot-aisle containment as used in the new R1 data centre



Jennifer Hogan-Dell Account manager, outside POD A in the West Hall of the new R1 data centre




Joe Repici, Senior Installation Manager within the interior of POD A showing hot-aisle containment, in the West Hall of the new R1 data centre

Each POD has a central Hot Aisle where the hot-air is trapped, and re-circulated and cooled by the in-row cooling systems.

High Density – now at UNSW

....from 1 server physical to 4 physical servers virtualised per rack

FROM:	Server Type	TO:
Legacy Sun 6900 database server – 1 per rack	Database 	New Sun M5000 database servers – 4 per rack
Legacy low density Sun (V series) Unix servers	Unix	New High density Sun (T-series) Unix servers
Legacy Low density HP D-series servers	Wintel	New High Density Dell blade & rack servers
Legacy EMC SAN (35TB)	Storage	New HDS & Sun Storage (1PB)



“5x the power in 1/5 of the space - 10-20Kw per rack - from 20-200TB/rack”

UPS - now at UNSW

... from “all or nothing” to just what you need

FROM: Monolithic UPS systems providing 90% efficiency at full power utilisation not scaling down



TO: APC Symetra scalable modular UPS systems providing near 100% efficiency and utilizing only the power required at the time



Generator - now at UNSW

from possible connection to preventative capability

FROM: Connectivity, platform space and future capability for implementation of a generator after an emergency is declared but need to restart all systems.

TO: 3x containerised 500Kw generators in an N+1 configuration giving 1MW of sustainable power with 500Kw redundancy and automated switching function through UPS.



Cooling – now at UNSW

...from cooling the room to cooling the rack

FROM: Perimeter CRAC units and under-floor cooling



Andrew Munsie, Data Centre Manager, displaying the under-floor plumbing beneath a perimeter cooling Stulz CRAC unit

TO: In-row Cooling, Hot-Aisle Containment and no false floors

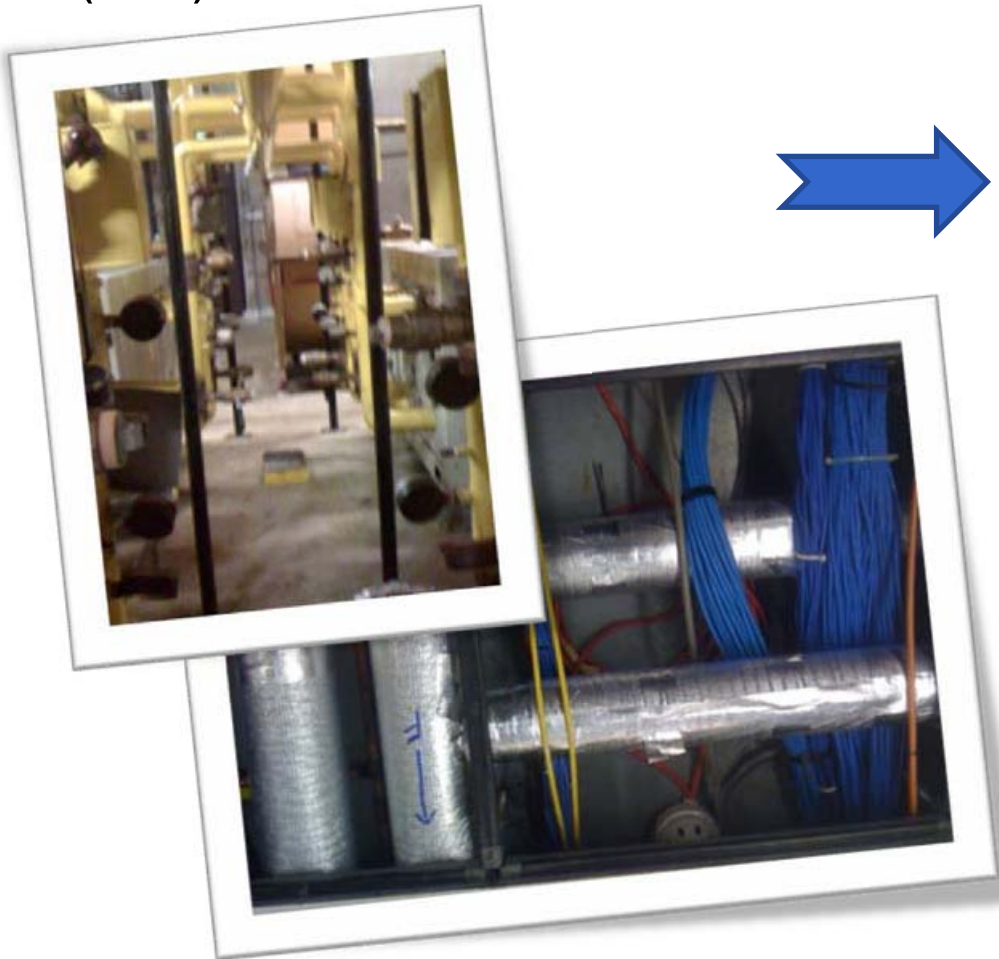


Plumbing – now at UNSW

...from under floor to overhead

FROM: Complex valve and pipe systems from pumps and compressors crowding underfloor air flow spaces to reach the perimeter cooling (CRAC) units

TO: Simplified cooling systems independently linking pumps through manifolds to in-row cooling units



Chillers – now at UNSW

...from shared water towers to dedicated air-cooled

FROM: Water-cooled chillers with shared cooling tower infrastructure and high usage of water with lower energy efficiency



TO: Dedicated air-cooled chillers with no water loss and high energy efficiency



Toby Harrison-Infrastructure Project Manager alongside one of the two 500KVA McQuay air cooled chillers outside the rear of new R1 data centre

Switching – now at UNSW

from ethernet on copper to unified storage and ethernet over fibre

FROM: Legacy DC switching and UTP/copper cabling

TO: New Unified Communications Cisco Nexus 7000 & 5020 switches with fibre to the rack



Cabling – now at UNSW

...from underfloor copper to overhead fibre

FROM: Underfloor cabling and piping mixing electrical, plumbing and data in the already restricted airflow and cooling space.

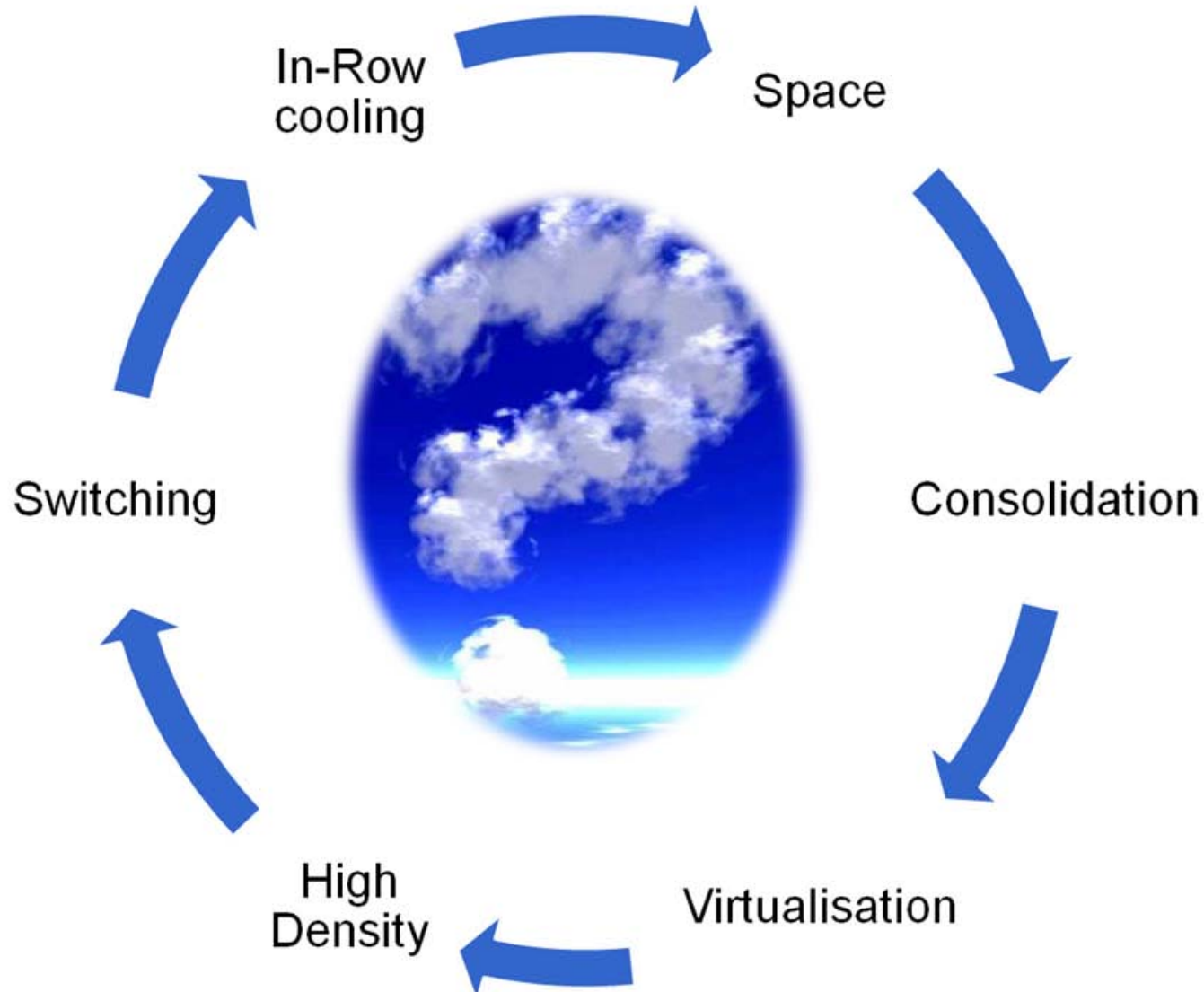
TO: Overhead piping and cabling with fibre to the rack where possible giving visibility and simplicity without restricting access and airflow.



Trends – Clouds, Density, Virtualization, Consolidation, Environment



Convergence – “it’s a Journey not a destination”





About the presenter

- Charles Nolan is an independent consultant, who specialises in systems integration, program management and project recoveries (Charles calls it, "Getting it done"). Charles has a diverse IT background spanning many years across Banking, Government, Finance, Airline, Construction, Education and Outsourcing industries. He has worked in Australia and overseas with stints with Reserve Bank, Boral, Qantas, Fujitsu, IBM, Westpac, CBA, UNSW and Emirates airline.
- Early in his career, Charles was one of the youngest senior IT managers around. However, he has proudly spent the last 10 years going back down the ladder to get more heavily involved in the project, technical and systems side of technology, leaving the upper fields free for the political players.
- Charles is currently working with University of New South Wales as an infrastructure consultant, improving and changing platforms, organisation structures and processes.

Charles Nolan believes in:

- Making it work,
- Making it happen,
and.....making a difference!

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