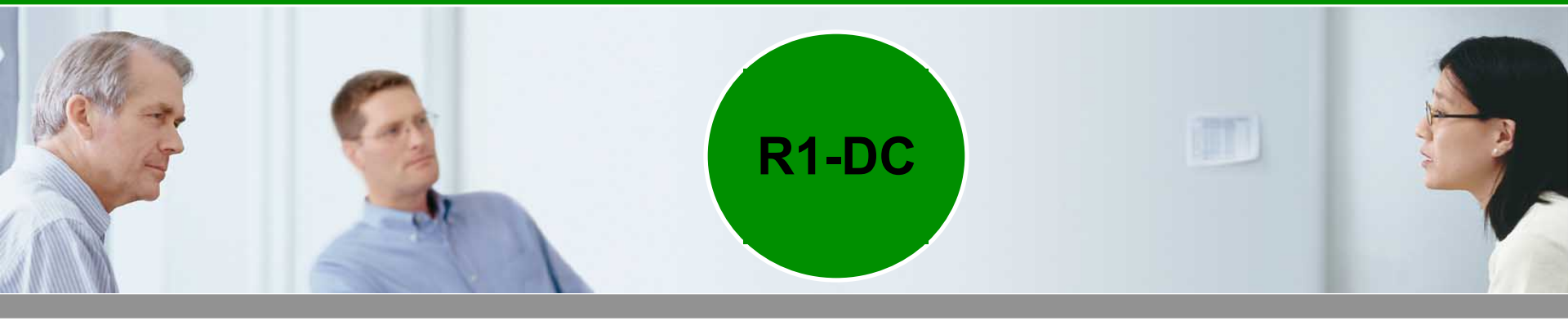
Introducing UNSW's R1 Data Centre



Our New High Density Data Centre

Right here

Right now

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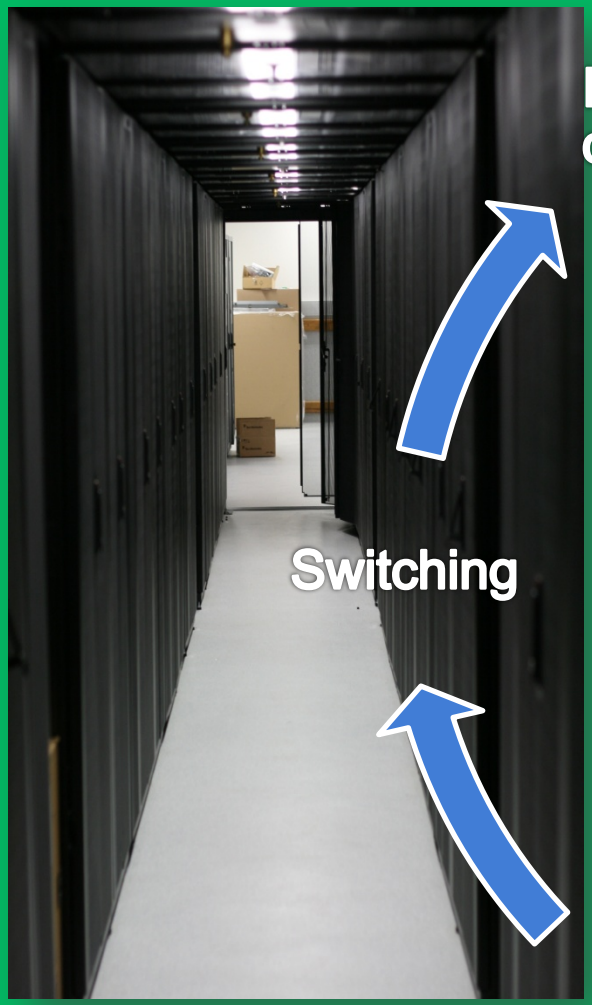
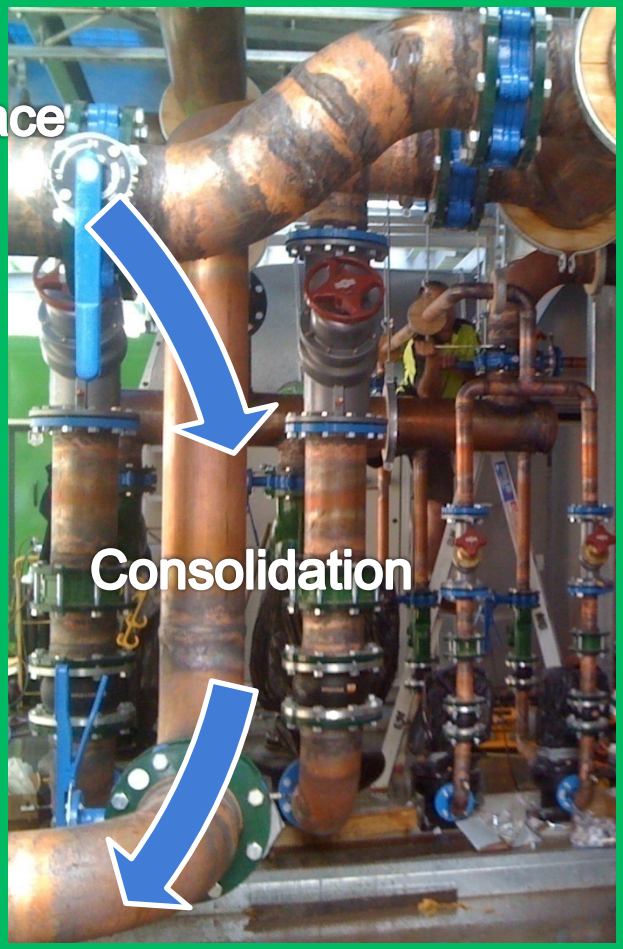
R1-DC

- Welcome to our newest UNSW Data Centre



In-Row cooling

Space



Consolidation

Virtualization

High Density

Switching

R1-DC

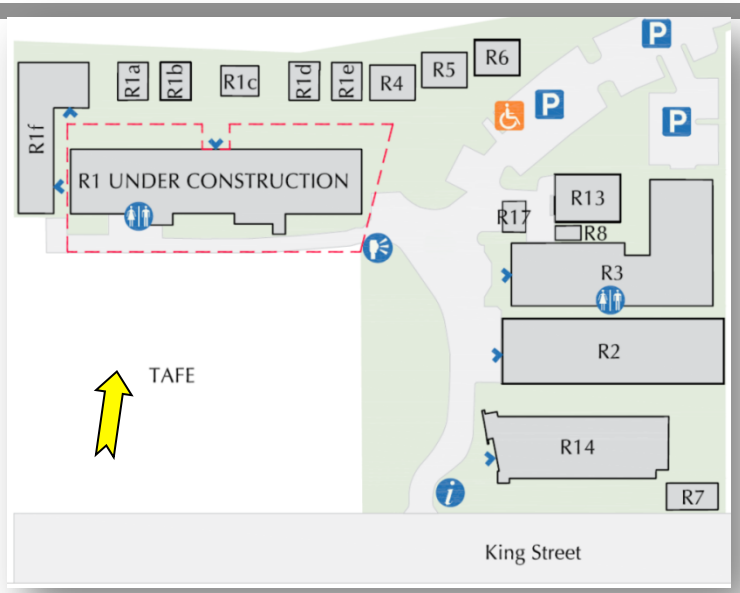
R1-DC

R1 – Location on UNSW Randwick campus

…. Keeping it in the family – managing our real costs

Front entrance to the new R1 Data Centre

- Located in historical tramways building on the Randwick campus
- Recycles an old building and minimises footprint and environmental impact
- Opportunity for solar connection to North facing roof
- Convenient but distinct from Kensington Campus



Randwick Campus showing new R1 Data Centre

Old Randwick Tram Depot with R1 building in background

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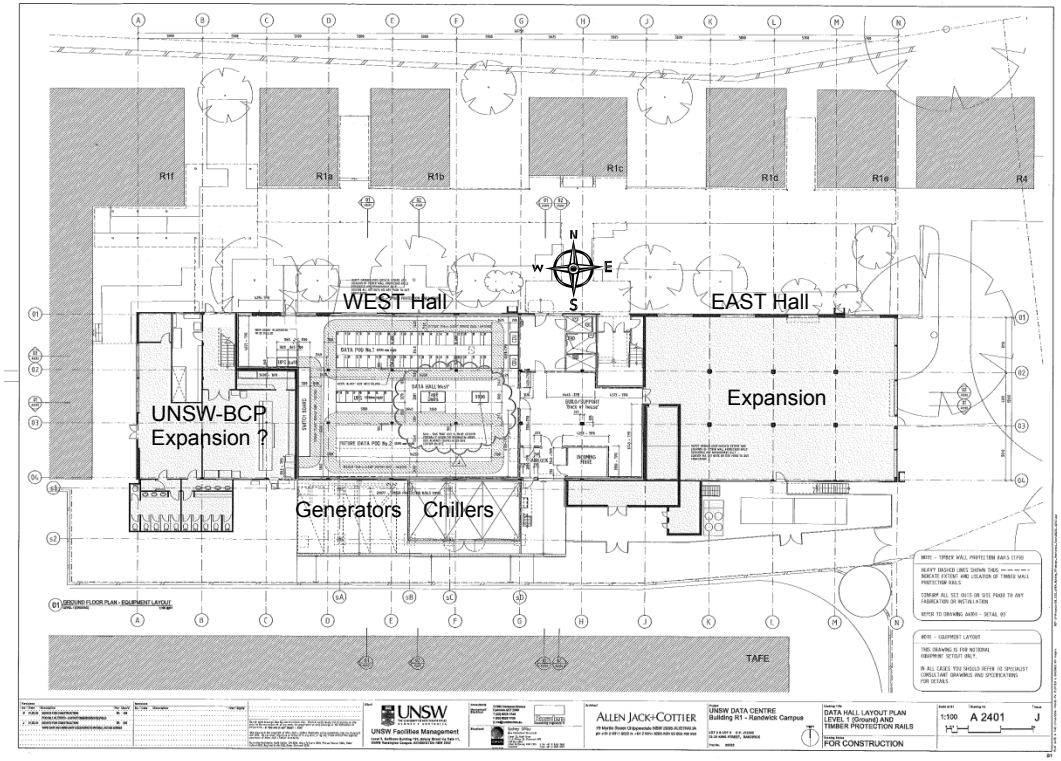
Two halls

….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.

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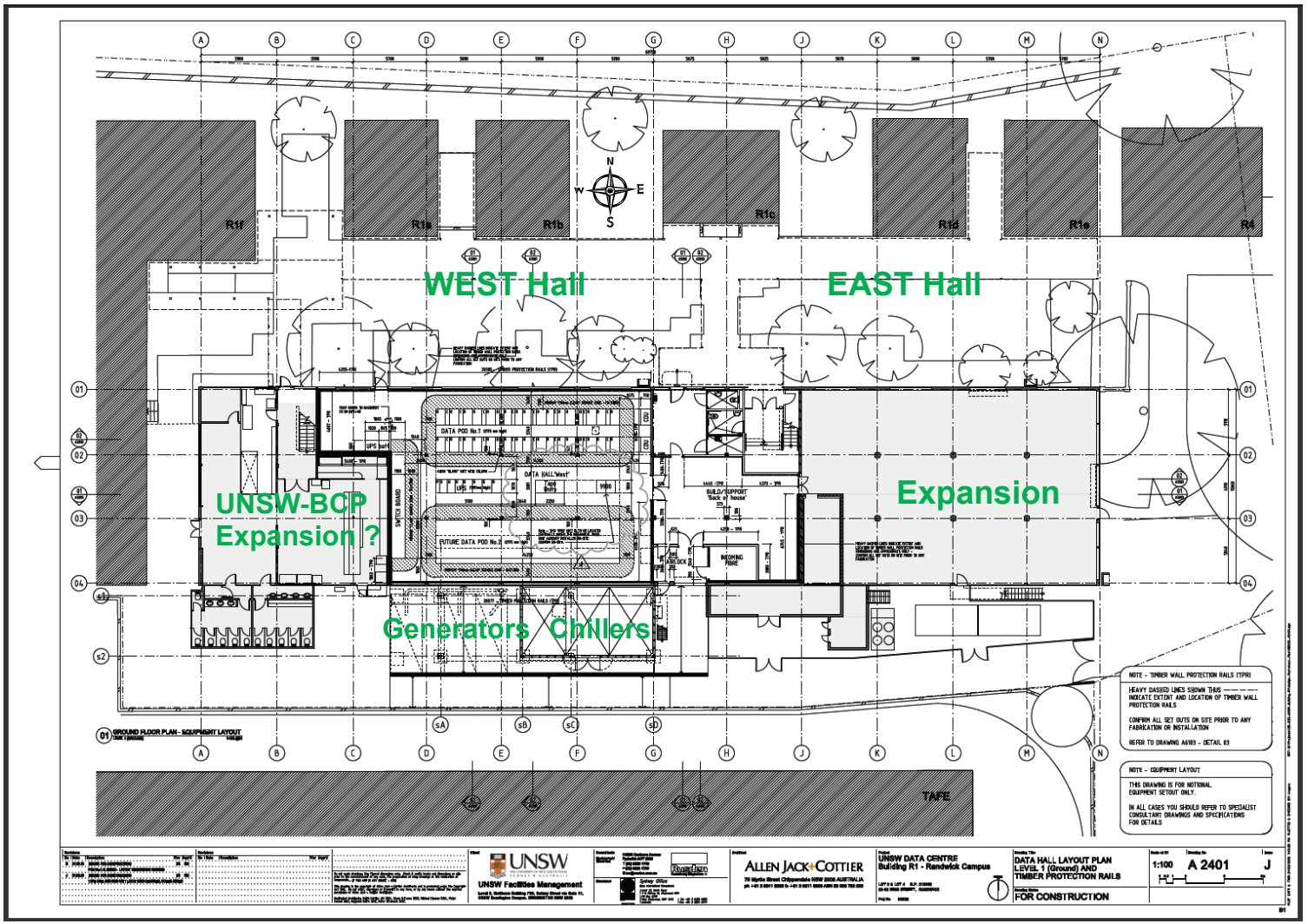
The bigger picture

….everything designed for future modular expansion



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Water Mist Fire Suppression

….inert gas– no CFCs – clean air, clean conscience

Pod-based nitrogen-fired water mist solution attached to VESDA fire suppression (Pod 1 only on Day One with capacity to supply 3 additional pods.

• Discharges in pulses after fire detection, before total release if fire not initially suppressed

• 99.5% recovery of servers and 99.95% recovery of storage after discharge

Mark Fisher-Chief IT Architect with nitrogen discharge water mist fire suppression system

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Monitoring Systems

Together – Fire, Electrical, Mechanical, IT, Security

- Vesda Fire Detection
  - Fire sensors coupled to firesuppression and alarm systems
- Samsung Video cameras
  - Connected to both Security and IT systems
- APC In-Row Cooling
  - Connected to APC Infrastruxure monitoring
- BMS system
  - Manages mechanical and electrical (generators, chillers, pumps and power)
- APC Infrastruxure integrated IT monitoring
  - Manages all the IT POD-based equipment including sensors, cameras, and power rails
- Security
  - Connects through to Campus security

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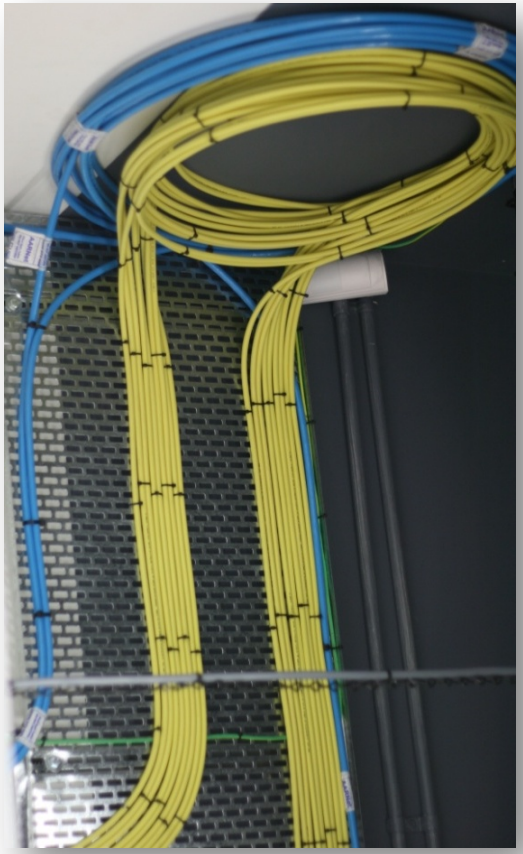
Campus connections

….two hearts beating as one



Fibre connections meet in the R1 MDF room

Private connection on the UNSW fibre network

- Dual 48 pair dark (private) fibre connections

Separate routes

1. Wansey Road-Alison Road–William Street-King Street
2. Anzac Parade–Moore Park–King Street

Separate North & South connections to the building

- Dedicated MDF room

Used for:

- Data network
- Storage network

Fibre Routes from Kensington Campus to new R1 Data Centre

Creates one Virtual Data Centre across two campuses

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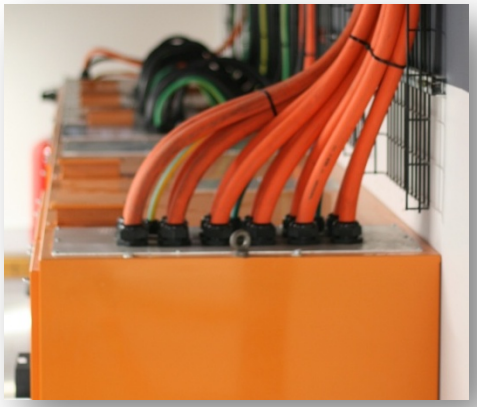
Power from the grid

….1 MW initially with more available

Grid Supply (1000KvA):
There is a single, dedicated mains sub-station supplying 1000KvA to R1. This is sufficient for both East and West halls at 7.5kW per rack.

Further power can be added by utilising spare capacity on the other 1500 KvA Randwick campus substation.



Main Switchboard (1000KvA) - delivers:

- IT Services (700KvA)
- Mechanical Services (300KvA)

Richard Smith-Production Services Manager and Jennifer Hogan-Dell Customer manager, in front of main switchboard in new R1 Data Centre

To increase IT power usage beyond 700 KvA in West Hall, or to expand into East Hall, requires an additional feed from the 1500 KvA Randwick campus substation. This would need to be either an additional line 60m under the drive, or taken from the old sub-mains board now only servicing top floor of R-1 (a preferable and cheaper solution. Energy Australia have already been requested by FM to free up power on the campus substation.

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Uninterruptible Power

… from "all or nothing" to just what you need

APC Symettra scaleable modular UPS systems providing near 100% efficiency and utilising only the power required at the time.

The 500kW (475kW N+1 configuration) IT UPS receives dual power supplies from the main switchboard. It supplies power to POD 1, and available for POD 2 when installed, at 225kW per POD. For a 30 rack POD this give an average 7.5kW per rack.

Andrew Munsie-Data Centre Manager beside IT UPS Management console in the new R1 Data Centre

IT UPS (500 KvA):
- 60x West hall IT racks at 7.5kW per rack.

Mechanical services UPS (80KvA)
- For generators, lights, pumps

Sudeep Joshi-Infrastructure Design & Capacity Manager beside the Mechanical UPS battery bank in the new R1 Data Centre

Efficient UPS technology: latest UPS technology, which means for every $100,000 of power that comes in, the modular UPS delivers more than $99,000 worth of power to the IT equipment. Under traditional UPS technology, for every $100,000 of power supplied to these UPS types results at best $87,000 worth of power available to the IT equipment.

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Diesel Generator Backup

…N+1 – guaranteed to start

Three 450KvA generators at the rear of the new R1 Data Centre

Generators:
There are 3 x 450kW generators to provide for mains outages. In times of power failure:

1. All three generators start up to provide power.
2. Once the load has been sensed, redundant generators shut down to standby mode.

Should the active generator fail, those in standby mode start up and repeat step 2.

James Leeper- Faculty IT Director, with mechanical engineer Owen Nugent, in front of one of the three 450KvA generators at the new R1 Data Centre

Once power has been restored generators sense load shedding and shut down. These generators provide sufficient capacity to also cover the East hall (N+1) when it is developed. Each generator holds sufficient fuel to run at full load for a minimum of 12 hours

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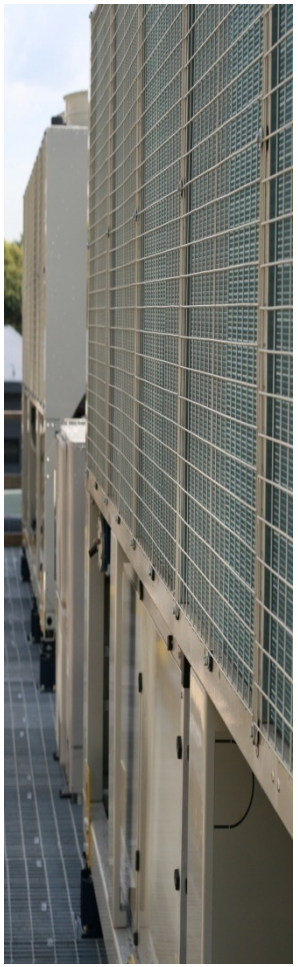
Circulation

…from above - through ground - to overhead

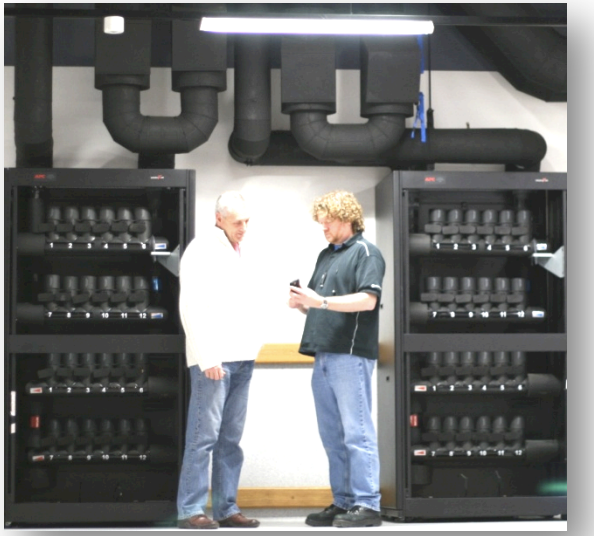


Side view on the platform of the two McQuay 500 KvA chillers at the new R1 data centre

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

Water flows from chillers through pumps to distribution units for each POD, and then by individual pipes to each in-row cooling unit.

There are no cooling towers that can waste up to 10,000 litres of water per day (based upon a comparable data centre using cooling towers).



Project manager, Nick Stace, and Data Centre manager, Andrew Munsie, alongside two of the four CDU water distribution units in the West Hall of the new R1 data centre

Pumps and distribution pipes in the plant room of the new R1 data centre

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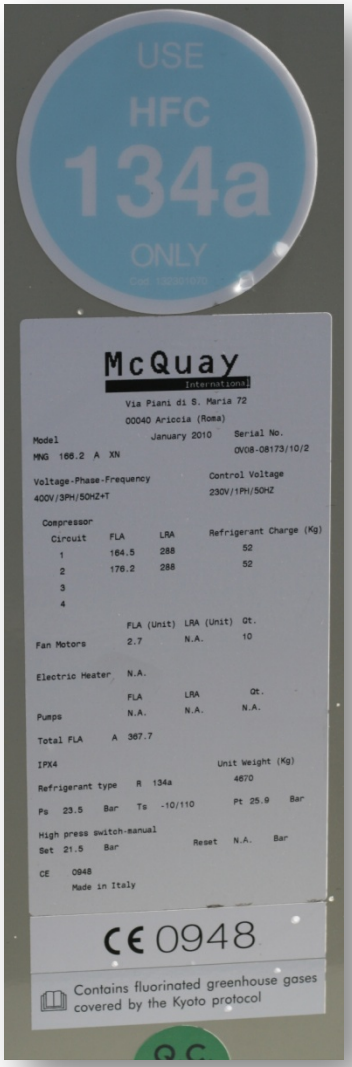
Air-cooled chillers

….not a drop of water wasted



Chillers - There are 2 x 500kW chillers in an N+1 configuration on a raised platform at the south side of the building.

The chillers supply chilled water to enable operation of:

- The air handling unit that provides conditioned air to the datacentre
- Each of the in-row coolers that are built into the POD's

In the unlikely event of a double chiller failure there is a separate tank holding, 7,200 litres of chilled water, to enable cooling to continue running whilst a graceful shutdown of all systems is carried out.

To expand the second hall beyond 500Kw, an additional chiller can be added outside the second hall and connected to the existing pumping station.

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

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PODs

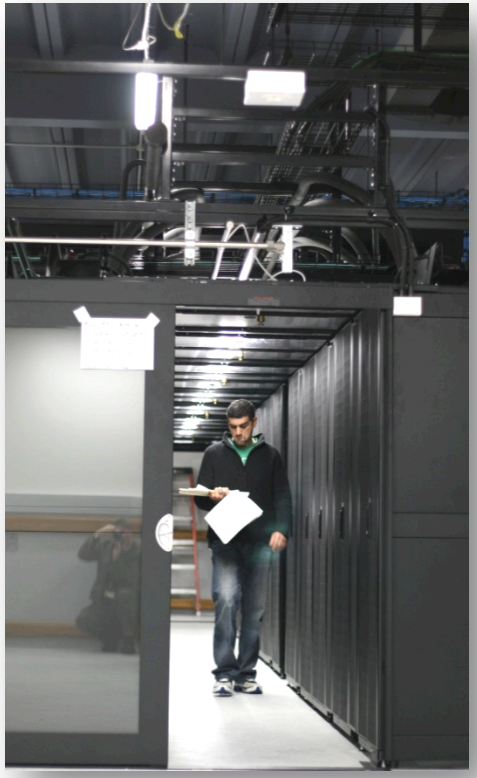
….each POD is a data centre on its own

APC POD technology:

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

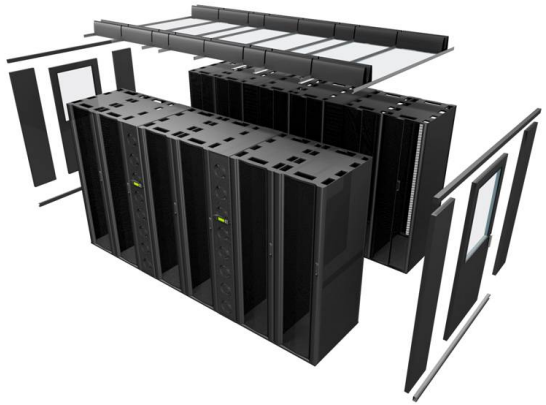
Each rack is designed to supply and cool an initial average of 7.5KW/rack.

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



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



Schematic of a 10 rack APC POD showing hot-aisle containment as used in 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.

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Cooling the rack – not the room

…in-row cooling with no false floor

In-row cooling systems

- Can cool up to 30Kw per rack
- Hall A is average 7.5Kw per rack
- Modules work together to manage the cooling across the entire POD
- N+1 redundancy spread across the POD

Design:

Using APC Infrastruxure management system, manages:

- Power usage
- Location of equipment
- Moves, Adds, Changes
- Video from connected cameras
- In-rack temperature front & rear

Pictures of an in-row cooling unit and a rack in the West Hall of the new R1 data centre.

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Switching
……unified storage with data on the network

Installation Engineer, cabling the Ampnet fibre distribution in the new R1 data centre

New Unified Communications:

- Using Cisco Nexus 7000 & 5020 switches
- Integrates storage and data networks
- Saves money – lower cost per connection
- Improves performance
- Greater resilience
- Increased reliability
- Smaller footprint – higher density
- Faster implementation
- Faster speed and volume/bandwidth
- Less power consumption

Greg Sawyer, Communications Manager, alongside Cisco Nexus 7000 & 5000 switches as used in the new R1 data centre

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Cabling

…everything overhead and fibre to the rack

Overhead services:

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

Fibre to the rack:

Fibre patching means speedy installation, speedy connections and less firehoses of copper cable.

No raised floor:
No raised floor and with all cabling being visible overhead means no cable mess under the floor or loss of cooling efficiency when opening up the raised floor to work on the cooling.

Moves, adds and changes - a reality in any data centre – is managed without the need to arrange disruptive sub-floor work.

Overhead structured cabling of fibre and minimal UTP as used in the new R1 data centre

Overhead cabling and water distribution above POD A in the West Hall of the new R1 data centre

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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

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Results – Getting it done

- “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
  - UNIPORT (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

CANBERRA DATA CENTRES

APC by Schneider Electric

UNIPORT creating workspace

DELL

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CISCO

vmware

Microsoft

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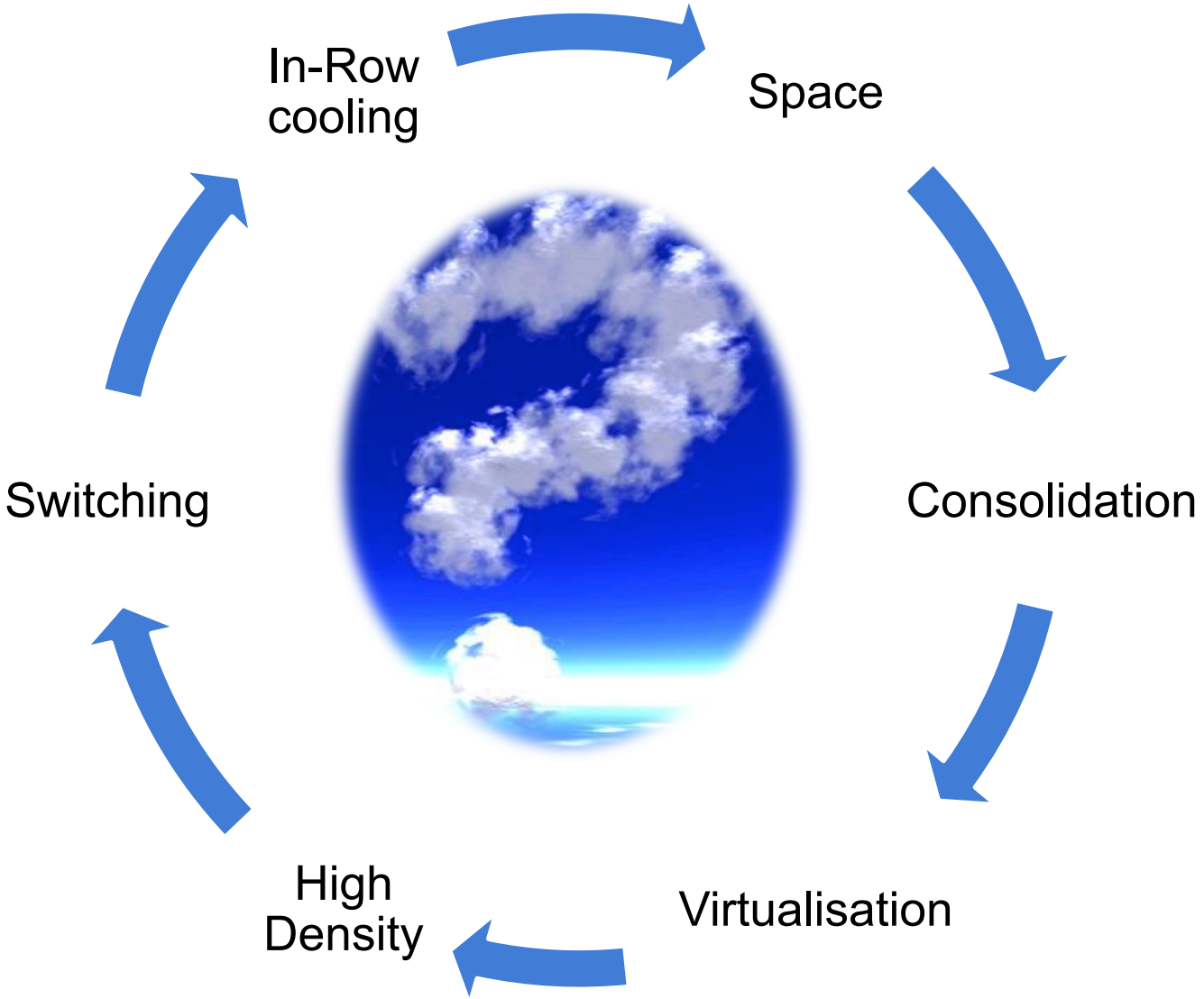
Trends – Clouds, Density, Virtualization, Consolidation, Environment, Data Centre

Convergence – "it's a Journey not a destination"



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