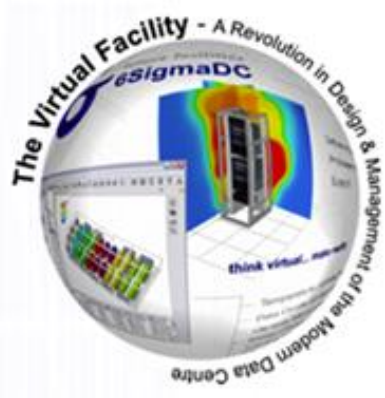
future facilities
6SigmaDC

Welcome to the Model Data Centre

A New Approach

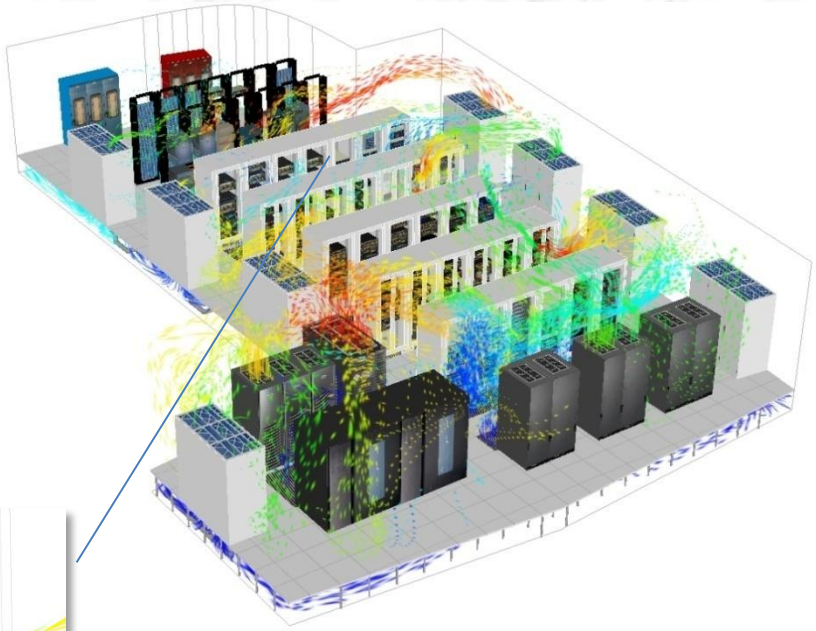


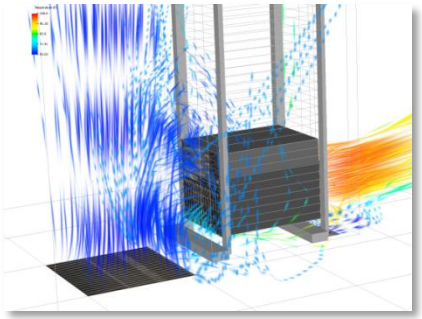
Agenda

- Understanding the Real Challenge
- A New Approach
- The Variables
- The Way Forward
- Case Studies

Understanding the Real Challenge

- The main function of a Data Center is to house, power and protect IT equipment
- The biggest challenge for 80%+* of Owner/Operators is obtaining the right balance between Space, Power and Cooling
- Cost of “processing” is decreasing while the cost of protecting/maintaining IT equipment is increasing.
- Why?

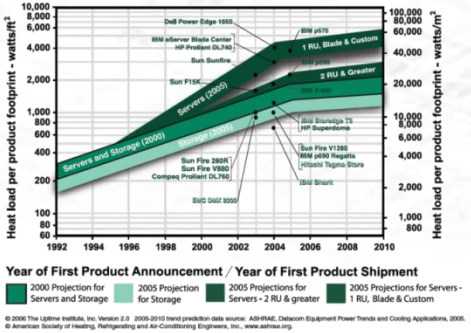


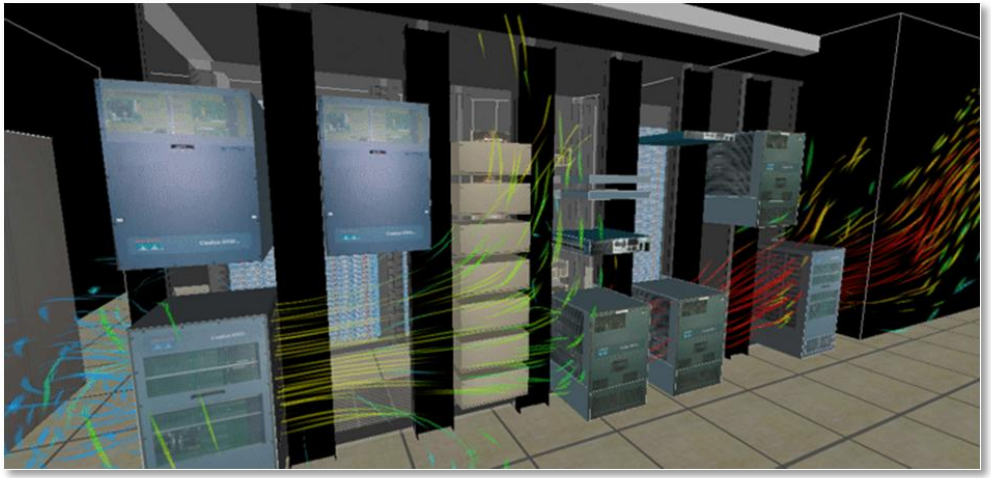


* Gartner survey

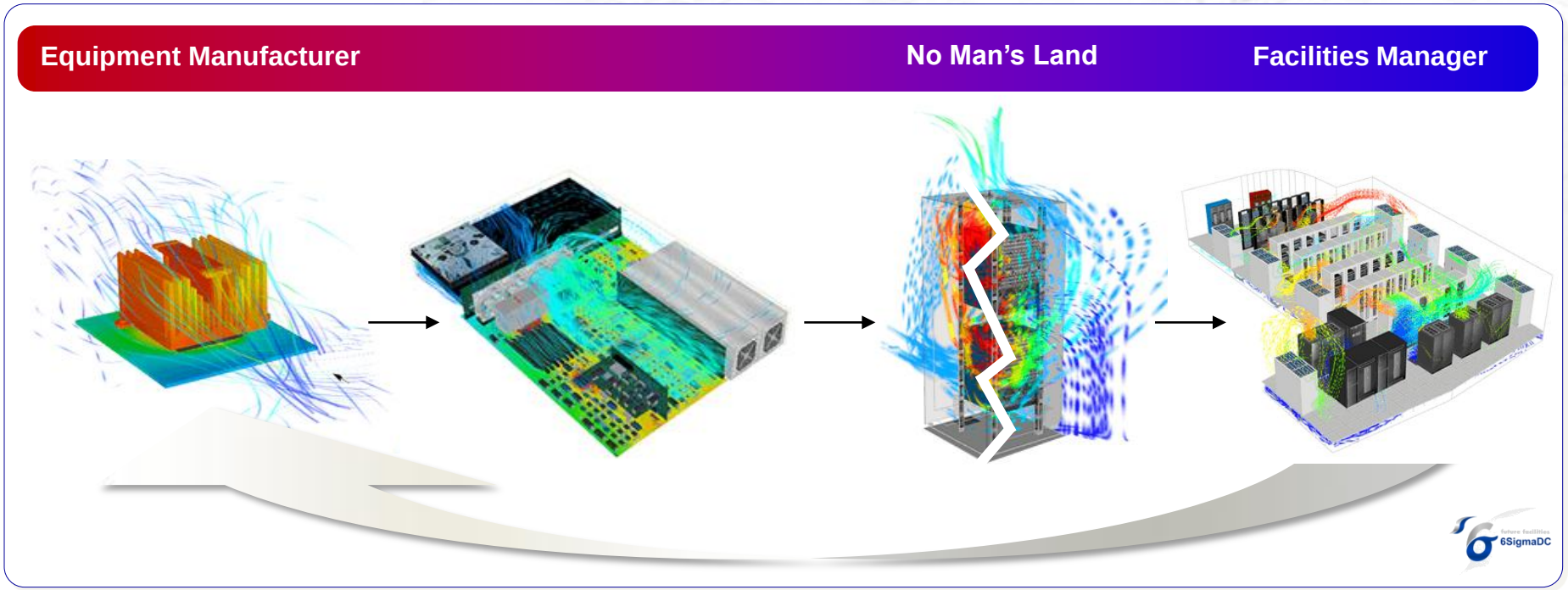
Understanding the Real Challenge

- Traditionally designed facilities are unable to cope with power density growth
- Owner/Operators forced to upgrade infrastructure but still getting localized hotspots
- Risk of thermally induced equipment downtime is becoming greater





Increasing Power Densities Affects the Entire Supply Chain

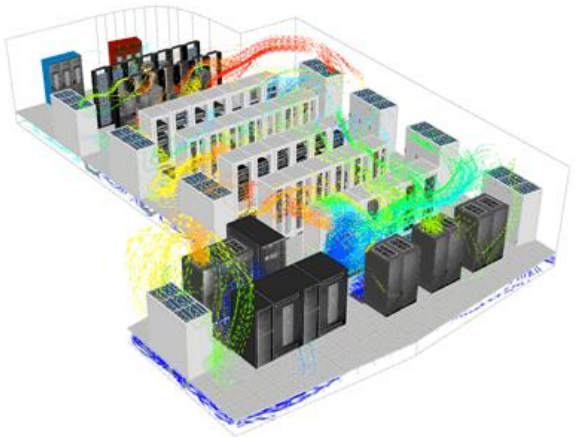


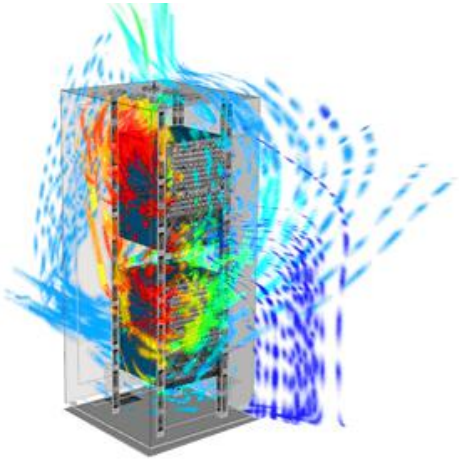
There is a lack of effective communication between the Equipment Suppliers and the Building Services Industry

A New Approach
(The Physics of the Facility)

- The facility is now a box housing high powered electronics components.
- It is no longer a ***BUILDING SERVICES*** problem.
- It is an ***ELECTRONICS COOLING*** problem and hence an IT issue.
- It needs to be divided into two complementary parts:

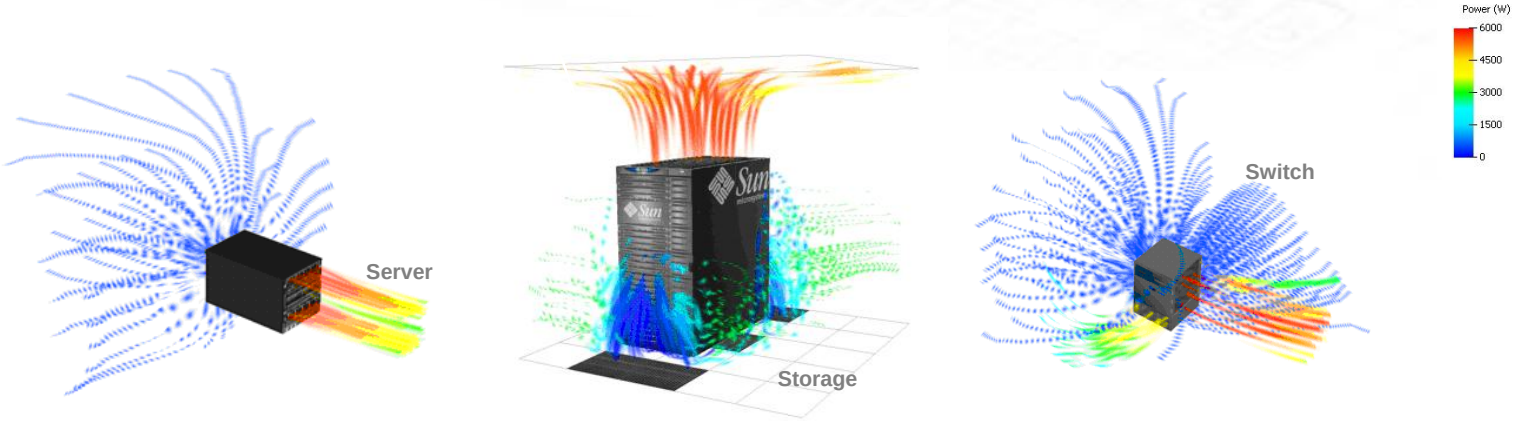
The Room Level	The Cabinet/Rack Level





Variable 1:
Equipment Architecture

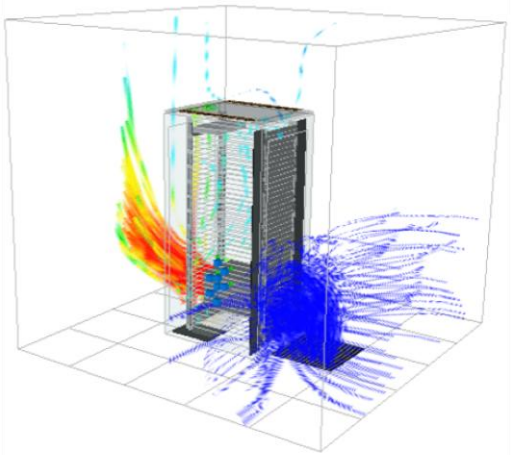
- Continuously changing thermal/cooling specifications of IT equipment

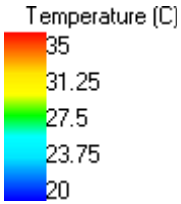


Different Generations of Equipment Exhibit Different Thermal Behaviour

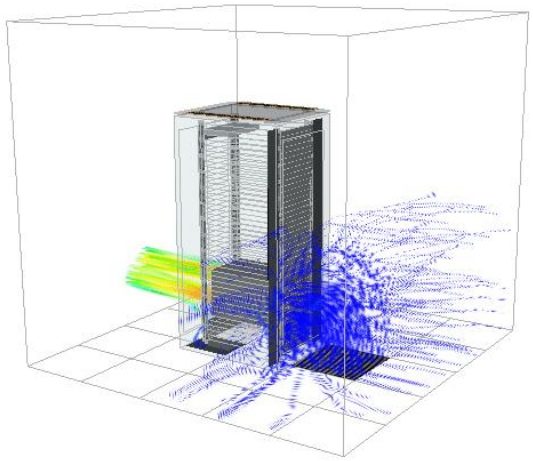
- Two identical cabinets are shown each containing different generations of IBM's Blade Center.

IBM Blade Centre 1





IBM Blade Centre H

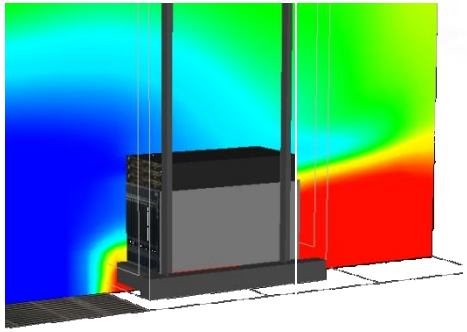


The air exhausted differs considerably in temperature between the two pieces of equipment.

Different Generations of Equipment Exhibit Different Thermal Behaviour

- Adjusting the configuration of a cabinet effects the equipment's inlet temperatures.

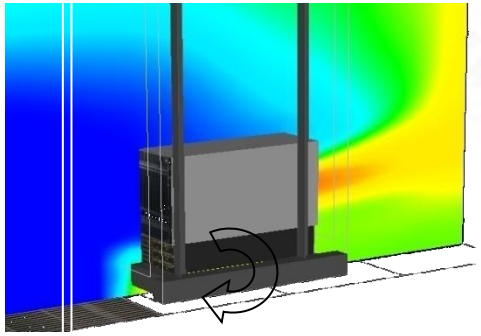
Base Configuration



Maximum inlet temperatures / °C

Blade	27.1
Server1	19.6
Server2	19.7
Server3	18.9

Server Reconfiguration



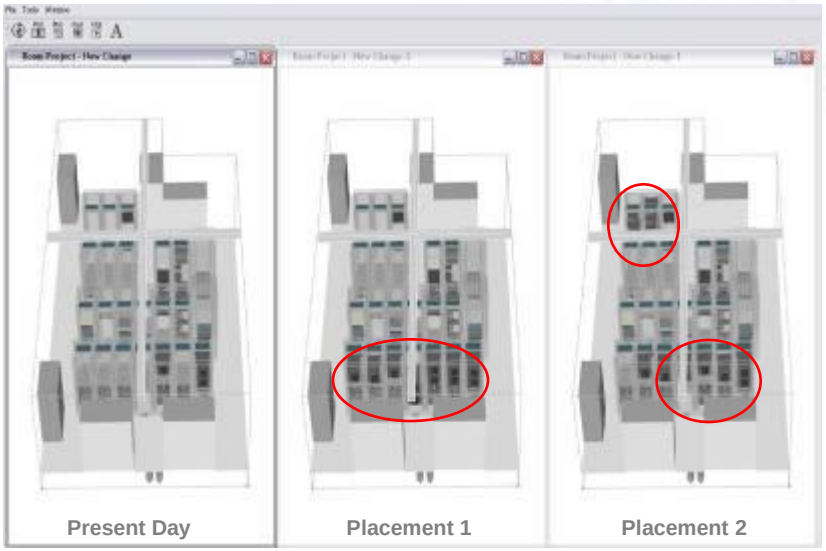
Maximum inlet temperatures / °C

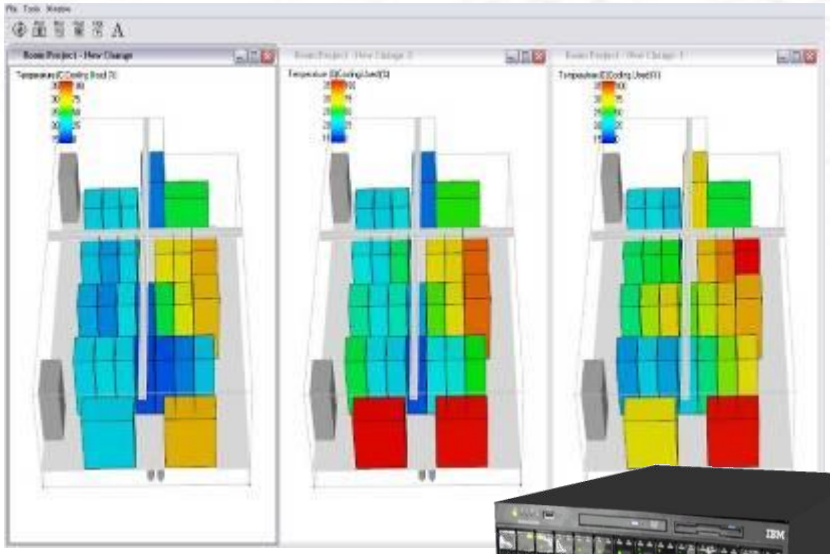
Blade	18.1
Server1	19.1
Server2	20.9
Server3	21.8

Improvement is obtained by redistributing the equipment.

Variable 2:
Load Capacity Planning (Inventory Management)

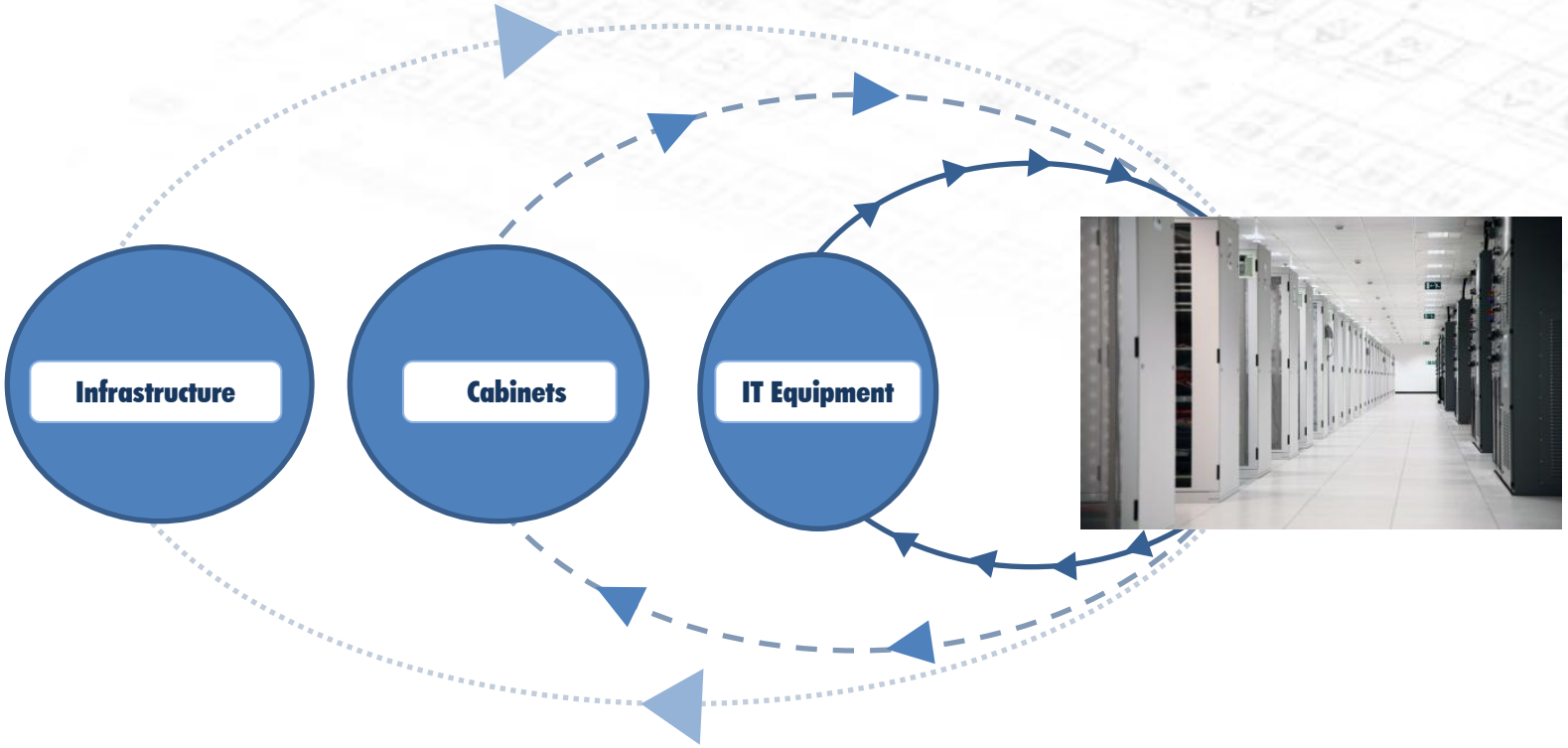
- Movement of IT equipment necessitates constant adjustment for optimal management of the Data Center





- Inventory movement is the cause of this problem

Logical Process Timeline



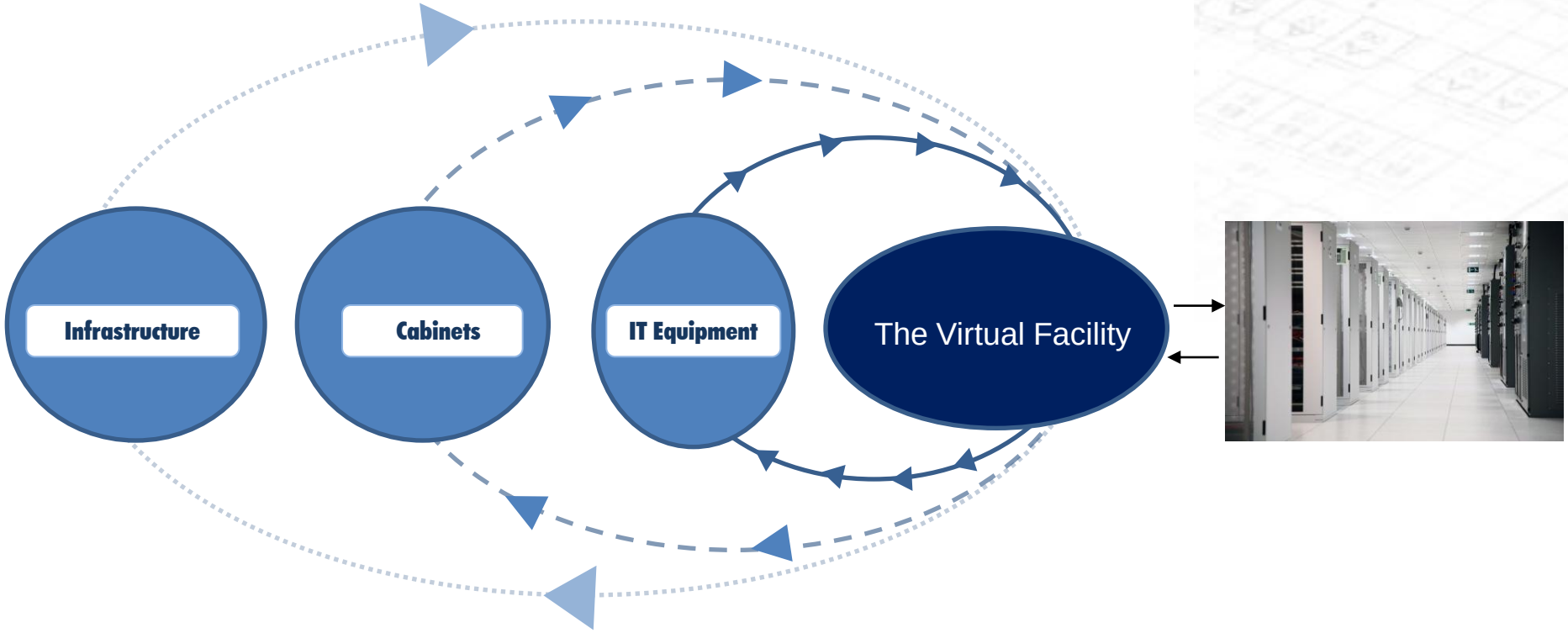
18 months

Design / Construction / Commissioning

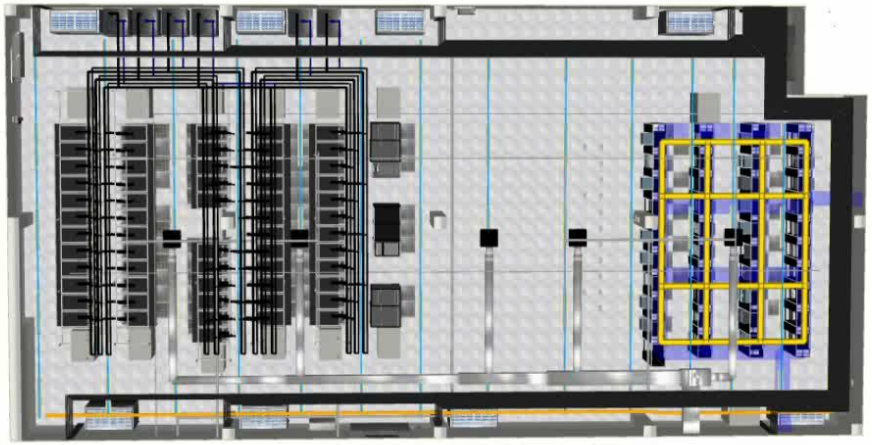
Continuous

Day to day management

Logical Process Timeline



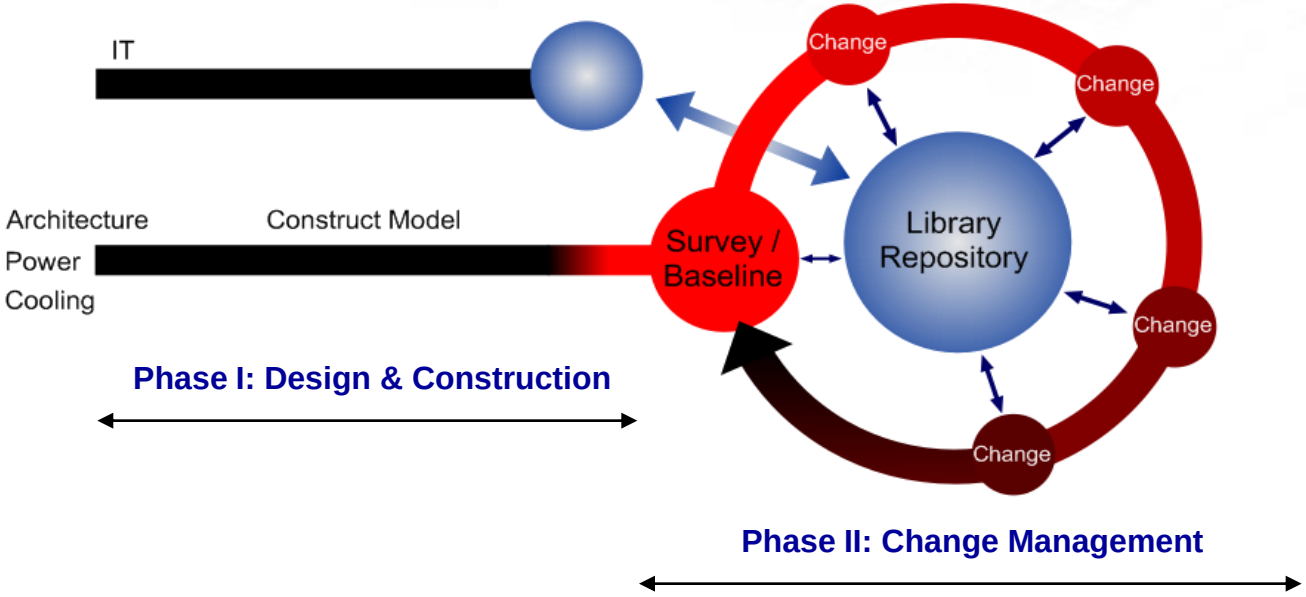
The Virtual Facility



The Data Centre Lifeline

- Data Centre lifeline phases:

1. Design construction and commissioning
2. Day-to-day operational management

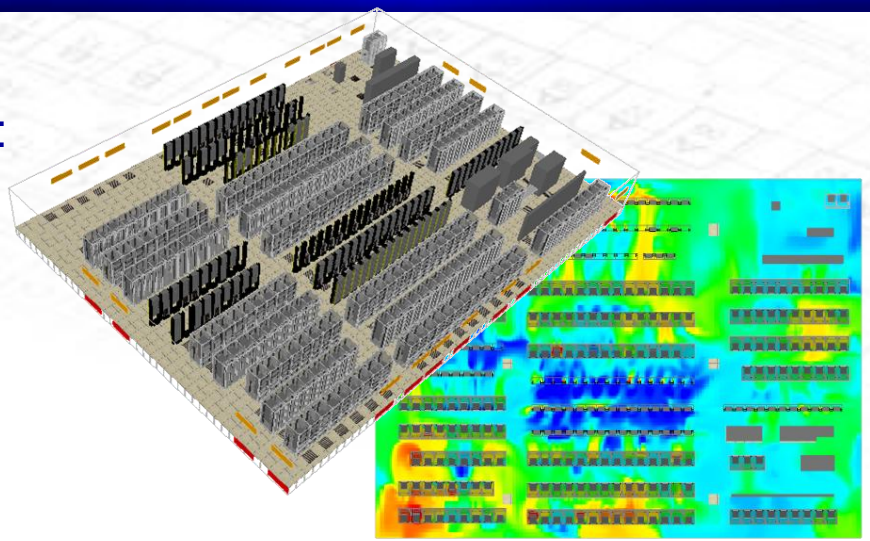


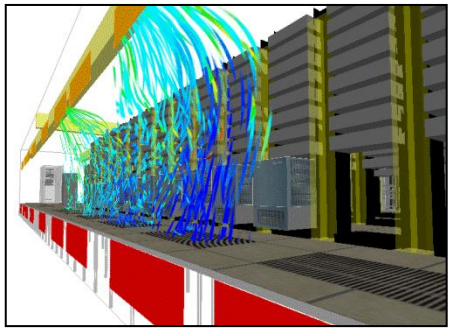
Case Studies

Sweating Existing Assets 1000m^2 Existing Facility

Redesign using existing infrastructure:

- Redistribution of grille and damper settings
- Management of uncontrolled openings
  - Reduced total openings from 63m^2 to 10m^2
- Higher underfloor pressure regime resulted in a much improved air distribution
- Cabinet reconfiguration and improved control of hot and cold aisles
- Cooling System change from Return Control to Supply
- **Extended lifetime by safely increasing load capacity from 360kW to 452kW**



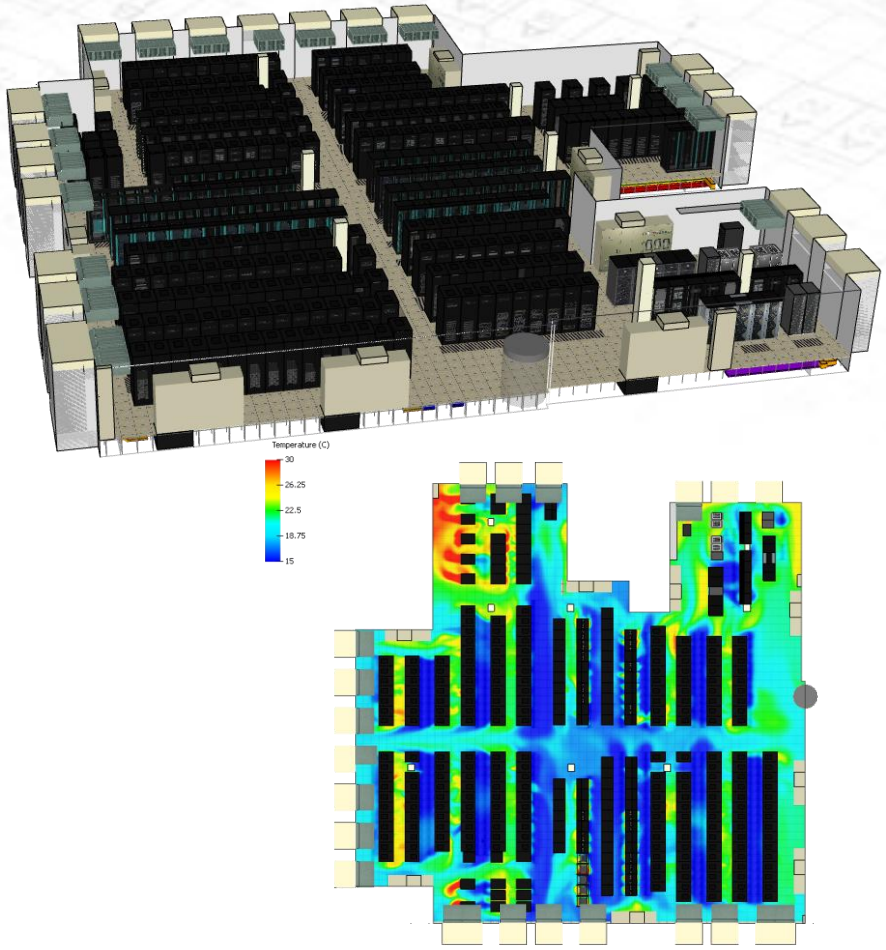


ARUP

Sweating Existing Assets 950m² Existing Facility

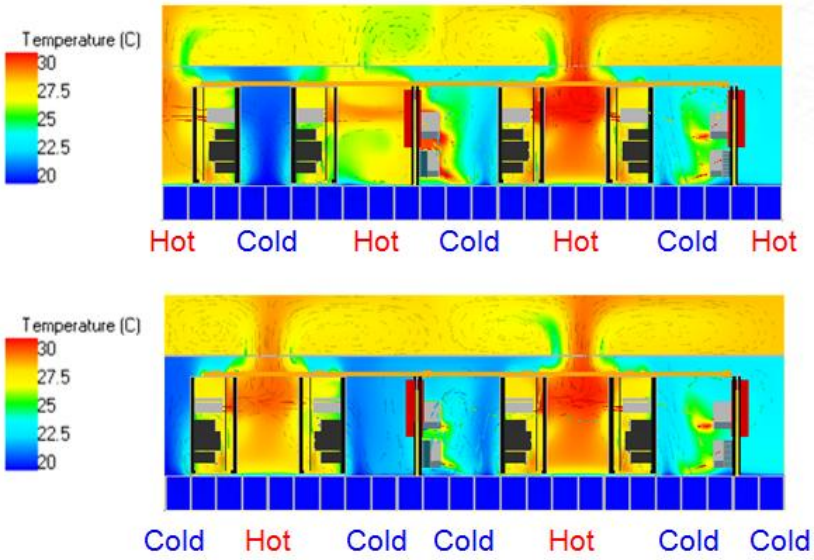
Ongoing management:

- 98% of all IT equipment >5°C Resilience of manufacturers operating limits
- Less than 10% loss of airflow from cable penetrations
- 95% of all cabinets manage effective blanking solutions
- **Ability to run at 80% design capacity already… and climbing**

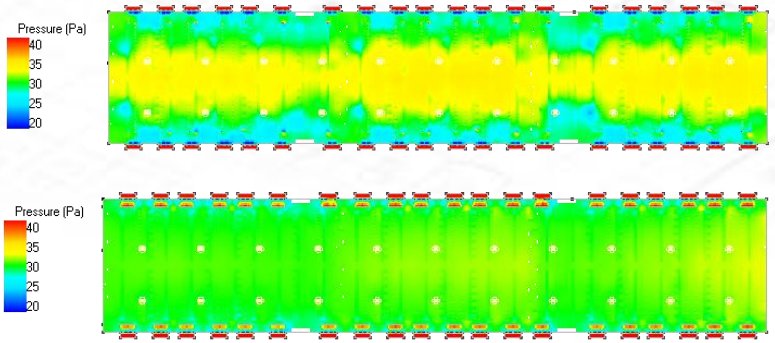


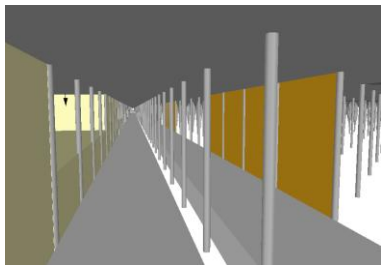
Unconventional Design 2500m^2 Platinum LEED Facility

Above floor Cabinet distribution



Below floor Pressure distribution

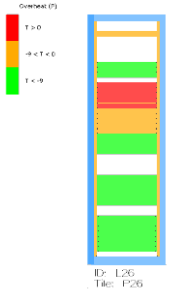




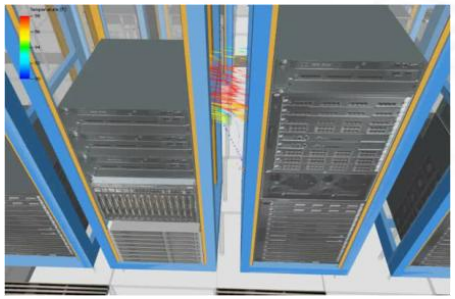
Baffle Plate Installation

- **Supply temperature set to 20^{o}C, 5 to 7^{o}C higher than a typical data centre**
- **Combined savings of 11,700 tonnes CO_2 per annum**

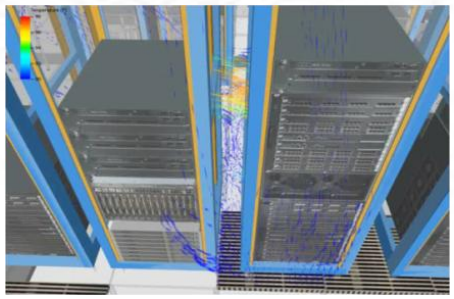
Saving Energy 650m² Testing Facility

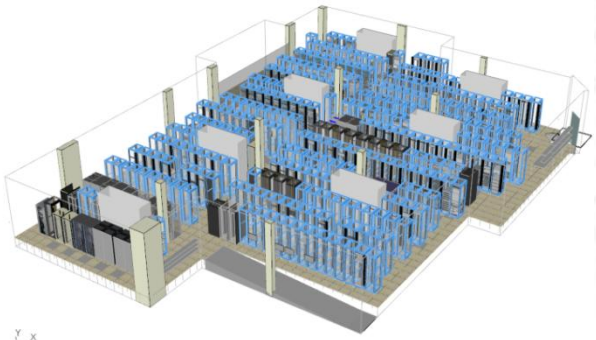


Before



After





650 square metres

1 MW of total power available

820 kW of cooling capacity

3202 units of IT equipment drawing 770 kW

Total energy bill: £ 850k per year

£400k per year in cooling energy costs

£430k per year in IT equipment energy costs

- Tactical blanking and floor grille placement reduced inlet temperatures on average by 5ºC
- No decrease in equipment resilience as determined by inlet air temperature
- Provided a potential deployment for an additional 650 units IT Equipment
- **30% reduction in power required for cooling and £125,000 per year in energy cost savings by a 4.5ºC increase in chilled water set point**

CISCO

Thank You!

Any Questions?