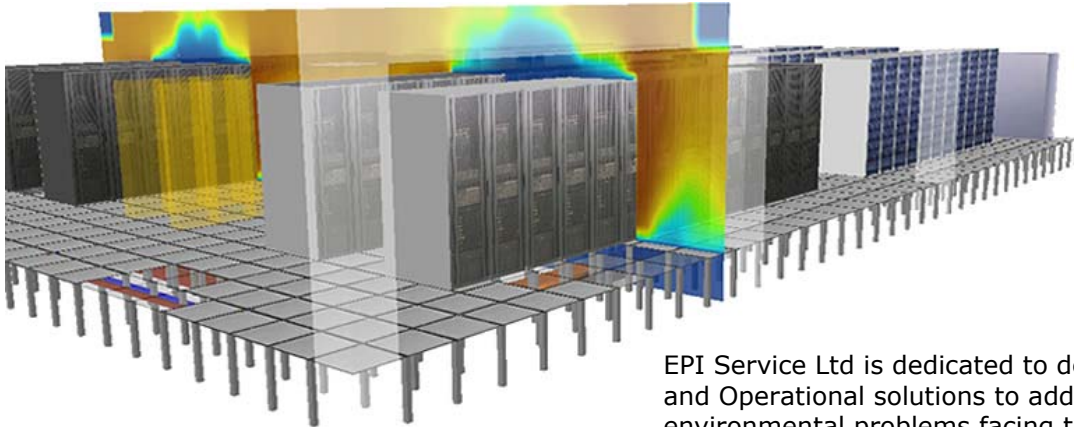


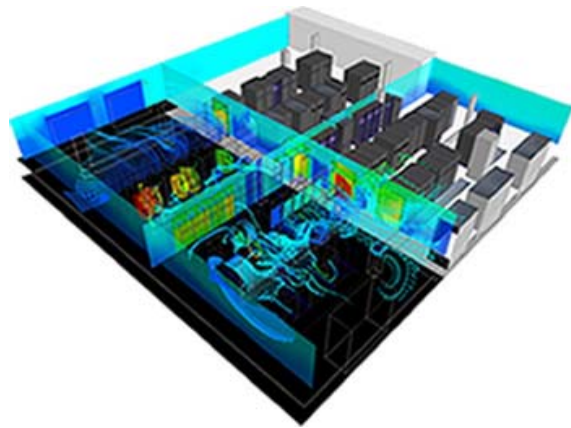


The Virtual Facility

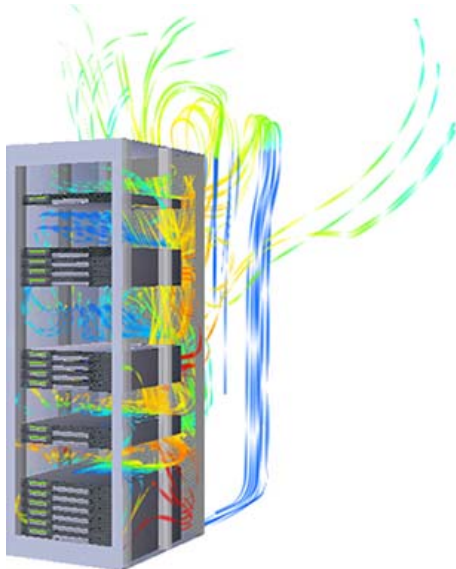


EPI Service Ltd is dedicated to delivering Design and Operational solutions to address the emerging environmental problems facing the modern Mission Critical Facilities. We do this by offering a unique approach through creating a full 3D "Virtual Facility Model" (VFM).

The **Virtual Facility Model** represents the full 3 Dimensional environmental behaviour of the data centre. It removes the invisible nature of air flow and heat transfer and allows the operator better control of the facility. This is referred to as Airflow Modelling and is done at both the room and cabinet level.



At **Room Level** it allows the operator to predict the thermal impact of equipment installation and movement within the facility, thus minimising the risk of hot spots. An additional benefit is the potential cost reduction resulting from a more effective ventilation strategy.



At **Cabinet Level** it can be used to determine the temperature of the air entering the inlet of the sub-rack in order to eliminate risk of overheating due to poor equipment configuration. It can further help assess the effect of incorporating blanking plates, ventilated doors or plinths.

The Virtual Facility Model and its environmental characteristics are created using Flomerics' FLOVENT Software. This is a tailored Computational Fluid Dynamics (CFD) package, designed for prediction of air movement, heat transfer and

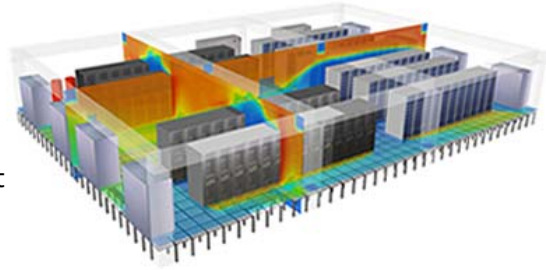
New Facility Design

Undertaking this analysis can produce several business benefits.

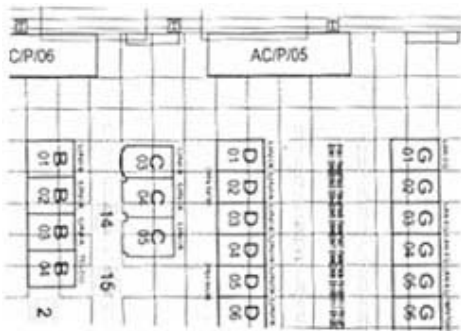
The virtual model identifies modifications that will minimise the risk of equipment overheating. Also the model ensures that all cabinets housed within the facility are exposed to good inlet conditions. This measures cuts the time spent deciding where to install equipment.

More importantly, the designer and owner can be confident that the facility will satisfy performance requirements both now and in the future as more equipment is housed.

The detailed case below shows the creation of a 3-D virtual model for a data centre. This procedure increases the certainty that the facility layout will work.

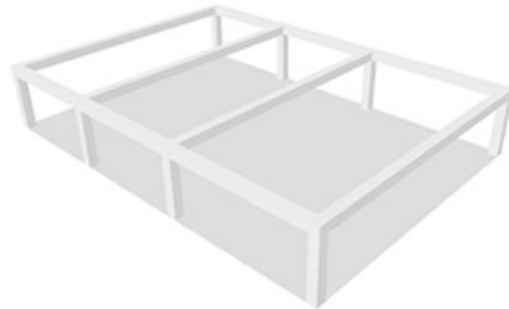


Architectural Drawing



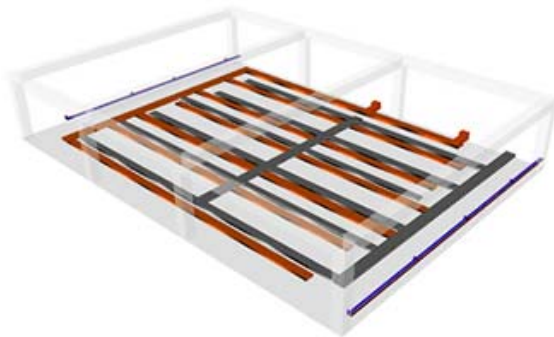
- Internal / external dimensions (Length x Breadth x Height plus wall thickness) including all void depths and ceiling heights (often provided on a floor plan)

Architectural Shell



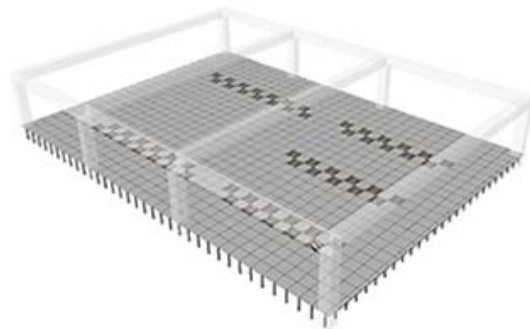
- Internal architecture and structures, particularly major obstructions to the airflow whether in the voids or the room

Floor Void Details



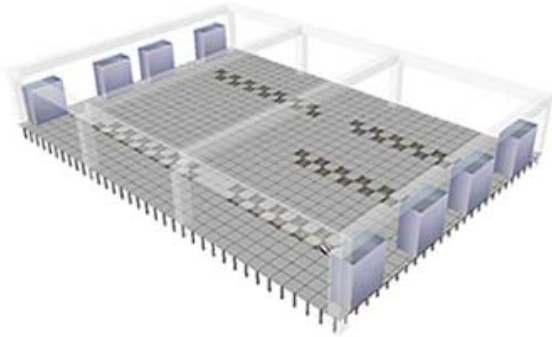
- Data and power cable routing
- Chilled water pipe layouts
- Any other obstructions in the floor void

Floor Grille Layout



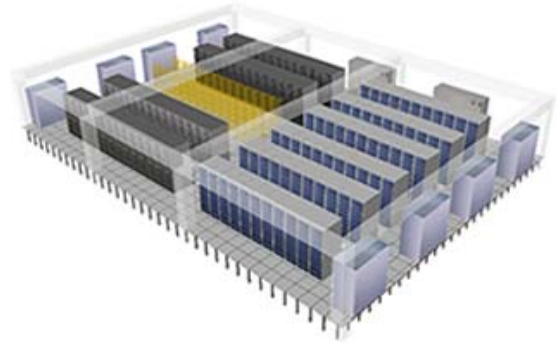
- Type(s) i.e. slotted floor grille, location
- Manufacturer & calibration data
- Air leakage paths: miscellaneous or repetitive holes for cables in the raised floor

Ventilation Methodology



- Locations / dimensions of AHU's, plenums, ducts, supply and return locations
- Supply air temperature, AHU volume / cooling capacity and control strategy
- Details of fresh air locations, volumes and worst case temperatures

Proposed Equipment Layout



- Cabinet type and size
- Vent locations and sizes
- Location and orientation
- Rack power dissipation as heat rejection
- Rack fan flow rates or specifications
- Other equipment i.e. PDU & UPS

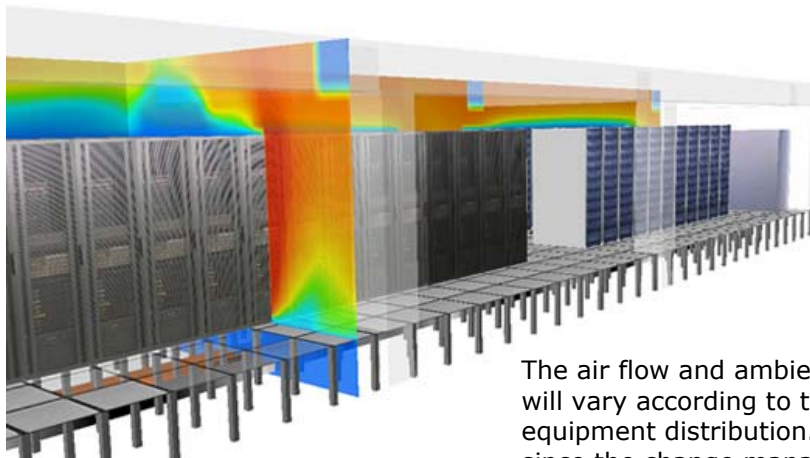
Operational Procedures For Change Management in Facilities

Designing a new facility is always based on assumptions about future equipment trends. The truth is that environmental issues within a facility always appear some times after commissioning. These are almost entirely due to on-going operational procedures.

The creation of the Virtual Facility Baseline Model is only the first step in managing the facility for its entire life cycle. However, it is necessary to adopt clear standards and methodologies for future Change Management within the facility.



Room Level Environment



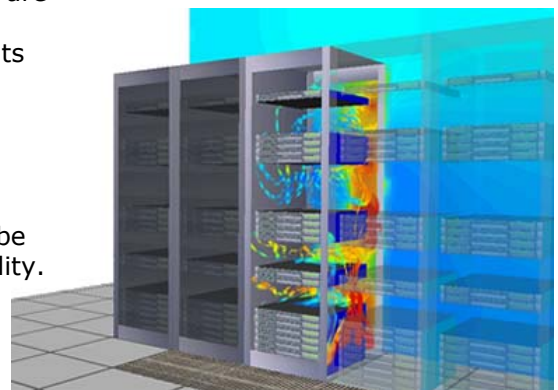
The air flow and ambient temperatures within a facility will vary according to the changes in the pattern of equipment distribution. This is obviously a moving target since the change management strategy applied will be dictated by the needs of the IT department.

With the advent of the Virtual Facility and pre-defined libraries of cabinets and other equipment it is possible to create customized methodologies that both the Facility Managers as well as the IT departments can abide by.

Internal Cabinet Environment

It is an often ignored fact that thermally induced shutdowns are likely to occur because of bad airflow distribution within the cabinet itself. In such cases even the best room environments will not save the equipment.

We offer services to define cabinet standards and libraries. These can be used by the IT departments to decide on the power loading distribution that can safeguard the thermal integrity of cabinets. These standard library items can then be used to define the distribution of power loads within the facility.



Trouble Shooting in Existing Facilities

Often the environmental issues, namely hotspots, only become apparent long after the facility has been operational. This is due to a combination of flows in the original design assumptions as well as change management of the hardware within the facility over time.

In these situations EPI Service Ltd will carry out **Site Surveys** over a period of typically 2 to 5 days to gather actual data to supplement and validate the Virtual Model of the facility.

This is done in parallel with the actual building of the Virtual Facility as described in the **New Facility Design**.



Site Survey Elements

Equipment power consumption



Airflow and temperature measurements near and surrounding the equipment



Airflow and temperature in the floor void



Cabinet types and their method of cooling



Inspecting cable penetration cut outs



Airflow and temperature measurements from perforated floor tiles

