

BUILD GREEN

BUILDING A COMPLETELY GREEN DATA CENTRE IS A FANTASTIC WAY FOR COMPANIES TO DRAMATICALLY SHRINK THEIR ENERGY COSTS AND IMPROVE THEIR GREEN CREDENTIALS



Designing and building a green data centre is not just about what you put inside the building, but also about how, and where you construct the actual data centre. With the very high corporate power costs in the region, many companies are looking to shrink their data centre energy costs through the utilisation of more energy efficient equipment, better data centre design, and cooling methods that do not have to rely entirely on air conditioning.

Enterprises also need to be aware of developments in both data centre software and hardware that can reduce their energy costs and improve efficiency.

CONSTRUCTING YOUR DATA CENTRE

Designing a green data centre is partly about the building and partly about the infrastructure inside the building.

“Here in the Middle East we have the challenge of very little natural shade and consistently high temperatures. The most common approach is to create artificial shade where possible. This is often done by using solar panels on the roof which helps to absorb the sun before it can reach the outer fabric of the building. Another option that is often talked about is building the data centre underground. This is not as simple as it sounds. If the data centre is part of a larger building, the area that is above ground acts as a giant radiator in the summer bringing heat to the data centre, rather than taking it away,” explains James Coughlan, business development manager, Middle East at data centre solutions expert Cannon Technologies.

In the region, outside air cooling is just not viable for most of the year, this means that companies need to develop more creative solutions to cool their data centre efficiently without using huge amounts of power.

“In areas where outside cooling is not available, then water-side economisers and close-coupled cooling may make more sense,” states Carrie Higbie, global director of data centre solutions and services at data centre solutions expert, The Siemon Company.

“Insufficient airflow or cooling caused by higher density IT equipment creates hot spots that result in premature equipment failure, system crashes, random reboots and poor system performance.”

Olivier Delepine, vice-president, Gulf Countries, IT Business, Schneider Electric

Regardless of cooling methodology, however, one must first determine the capacity needs of the space in terms of power to carefully plan the solution, according to Siemon. Whatever is chosen it should be scalable in both directions to accommodate the fluctuations in technology. Wasted capacity will undermine any attempt to be green and not enough capacity will limit the technology that can be deployed.

“Once the means is determined then it is important to determine the needs across the white space. In many data centres there is a need for extra capacity within the space, creating higher density zones rather than engineering the entire space for high density,” says Higbie.

Inside the data centre, the goal is to drive lower power consumption and meet green targets through innovative cooling, aisle containment and power efficient equipment and understanding the need to address specific sustainability and availability metrics before construction begins, is essential to ensure that performance requirements and operational benefits are weighed equally in the design of a green data centre.

According to Cisco, the inclusion of the latest sustainable technologies to support the facility’s infrastructure is an important first step in the design process.

“Through the use of photovoltaic technology and natural

FIVE CRITERIA TO HELP ENSURE...

The ‘Green’ traits that make a data centre ‘Green’

1. Meters should be designed in to the blueprint to break down energy usage to the level of components, such as different size servers, switches, the SAN, and a UPS, and which business units are charged for the power being used by those components.

2. Energy usage should be continuously monitored to determine peak and low energy demands. Ideally the capability to measure energy capacities on a total data centre level, right down to the circuits to make all are within acceptable limits.

3. An energy savings plan should be documented and rewarded. This will drive behaviour to measure and use energy sparingly.

4. CPU throttling should be switched on for the servers, and the range of power consumed under

a variety of loads should be focussed on by the IT department.

5. Thermal profiling units should be used in the data centre to identify hot spots and ensure the optimal cooling practise.

Source: Cisco

“Through the use of photovoltaic technology and natural day lighting for the entire facility, the green data centre can maximise the use of renewable energy without seriously impacting the facility’s ROI.”

Scott Manson EMEA account director, Cisco

day lighting for the entire facility, the green data centre can maximise the use of renewable energy without seriously impacting the facility’s RoI. In addition, through the installation of efficient fixtures and implementing an environmentally friendly natural drainage system, we can make big steps to protect and conserve water,” says Scott Manson EMEA account director at network specialist Cisco.

Companies across the globe are announcing ways to save energy and reduce costs through what they put inside the data centres, buying new hardware and services, according to Cisco.

“In the past, electricity has been treated as a pure overhead, but with rising power costs and issues regarding reliability, supply, and capacity, electricity requires its own specific focus and that should start with green principles,” states Manson.

Some of the key energy consumption principles are driving such things as the inclusion into greenfield green data centre designs as; hourly sub-metering capabilities for circuits, building meters that communicate energy consumption data to a data management system, and metre data management systems that store data and create user reports showing calculated hourly, daily, monthly, and annual energy consumption for each meter, according to Cisco.

INTERIOR LAY OUT

The three most critical challenges facing data centre managers today are without doubt, power, cooling and space. The facility should be designed with a host of energy-saving attributes, including day lighting features, reduced building footprint and rooftop solar arrays. The interior layout of a green data centre plays a significant role in saving energy, according to UAE-based cloud service and storage provider eHosting DataFort.

“Technical rooms should be on either side of the white space in separate rooms leaving 3.5 metres of area in front of Cooling Control Units. The front aisle of CCUs should be the hot aisle and place of racks longitudinal. To ensure a good flow of air there should be floor void supply air and ceiling void return air and power tray under the raised floor and overhead data trays,” says Ganesh Bhat, data centre manager, eHDF.

According to Cannon Technologies, the first step in any new data centre is to install an aisle containment solution. This

makes it easier to cool equipment and reduces the risk of thermal runaway should there be any breakdown or disruption to the cold air.

“As part of the aisle containment, it is important that the internal rack and equipment layout is as stable as possible. This makes it easy to properly seal the aisle and reduce the risk of hot and cold air mixing. To reduce the cost of cooling the cold air, there has been a gradual increase in input temperatures to the hardware. Where 10 years ago most data centres cooled air to 16C to 18C, today that air can be up to 27C,” says Coughlan.

Enterprises need to do a careful risk-to-cost assessment for every area of the data centre. With hardware failover, every server doesn’t necessarily need dual network connections and dual power supplies, according to Siemon. Creating areas inside the space that will accommodate different power requirements and cooling zones can be beneficial, allowing capacity to be placed where capacity is needed; nearly eliminating the waste of over-engineering.

HARDWARE CHOICES

When building a green data centre, the IT foundations and modular blocks inside the walls of the facility become a fundamental element in the building’s success.

Cannon Technologies recommends deploying large sensor grids, which have been a significant step forward in help make data centres greener. Sensor arrays mean that operators can see where power is being consumed, not just at the rack level but right down at the individual piece of hardware.

Sensors also enable granular monitoring of heat and humidity. If there is a breach in the containment, sensors will show that hot and cold air are beginning to mix, temperatures are climbing and there is a risk of condensation where hot and cold air meet, according to Cannon.

“Another benefit from using sensors is that they also show where the load on some hardware is leading to excessive heat spots which can be difficult to eliminate. Historically, this would have triggered a sudden increase in cold air across a large part of the facility, much of which would have been wasted. Today, operators can use this information to build automated solutions that help balance the workload across the

DATA CENTRE COOLING SOLUTIONS

- **Room Cooling: Flexible cooling solutions perfect for lower density racked and non-racked IT loads**
- **Rack Cooling: Dedicated cooling and air distribution for single racks or hot spots**
- **Row Cooling: Energy efficient solutions for low to high density racks and zones**
- **Cooling Distribution: Centralised distribution and piping for rapid deployment of row cooling**
- **Heat Rejection: Matched outdoor heat removal for operation of room, row, and rack cooling**

Source: Schneider Electric



↑ James Coughlan from Cannon says creating artificial shade is a good way to lower data centre temperatures.



↑ Olivier Delepine from Schneider Electric says enterprises need to keep up with growing heat densities.



↑ Carrie Higbie from The Siemon Company says that wasted capacity will undermine any attempt to be green.

data centre, eliminating its hot spots and improving its cooling efficiencies,” says Cannon Technologies’ Coughlan.

In terms of the racks and enclosures, Schneider Electric says that it is crucial to have an enclosure that is designed to meet current IT market trends and applications. The racks and enclosures should incorporate cooling, power distribution, cable management and environmental monitoring.

“Insufficient airflow or cooling caused by higher density IT equipment creates hot spots that result in premature equipment failure, system crashes, random reboots and poor system performance,” states Olivier Delepine, vice-president, Gulf Countries, IT Business, Schneider Electric.

SOFTWARE CHOICES

Automation is the key to managing a large, complex, data centre. Most modern management tools enable operations teams to build rules sets to respond quickly to certain conditions, for example a sudden increase in workload that creates a hot spot.

“If that increase is due to multiple virtual machines running on the same server, then it is possible to move some workloads to other servers and reduce the heat,” states Coughlan.

Workload capacity management tools allow operations teams to build profiles of different workloads over time. This makes it possible to model the data centre and predict when and where the workloads will increase. As a result, it is possible to identify future risks to power and cooling demand and take pre-emptive action to reduce and even eliminate risk.

Predictive tools are also able to identify when maintenance is required and to help facility management teams build highly efficient preventative maintenance programmes. Those same techniques are able to spot when drives are failing or fans in servers are in danger of failure and move workloads before there is any risk of system failure, according to Cannon. Man-

THE THREE STAGES OF...

Data centre management cycle

1. GREEN DESIGN

- Consider server virtualisation
- Develop data life cycle management framework
- Adopt data centre design to separate hot and cold air
- Use structured cabling system
- Install meters to measure energy usage

2. GREEN PROCUREMENT

- Include energy performance requirements and power management features
- Specify IT equipment that can operate in wider ranges of operating temperatures and humidity
- Specify minimum Coefficient of Performance
- Deploy computer room air-conditioners with variable speed fans

3. GREEN OPERATIONS

- Measure carbon footprint, power usage efficiencies, utilisation of servers and storage
- Switch off idle IT equipment or unmanned monitors
- Enable power management features on IT equipment
- Manage air-flow to separate hot and cold air
- Shut down unnecessary cooling equipment
- Move cooling closer to IT load
- Reduce cooling by increasing the ambient room temperature

son says that data centres, or IT centres, are essentially an organisation's repository for data.

Creating a green data centre involves the consideration of a number of facets; computer equipment, mechanical and electrical systems, and building construction as they all contribute to the design and output of maximum energy efficiency and minimum environmental impact.

"Just to elaborate further on the software element of green data centre management and operations, with respect to innovation: monitoring has become one of the most important features related to data centre efficiency and a major player in the quest for a Green technology. If you can't monitor what you have, then you also can't determine how to make it efficient," states Manson.

Lifecycle plays a role in the classification of a data centres green credentials.

The important aspect for any customer is to balance green and efficiency with hard dollar returns, which will dictate the sustainability of any green data centre project.

INNOVATIVE IDEAS

The use of solar panels to harvest energy and create artificial shade is the most common innovation seen in the region. However, it is not the only way that energy can be harvested or energy costs lowered.

"There are several sites where wind is being used to generate power, often twice daily. This is done by taking advantage

“ To ensure a good flow of air there should be floor void supply air and ceiling void return air and power tray under the raised floor and overhead data trays.”

Ganesh Bhat, data centre manager, eHosting DataFort

of the onshore/offshore pressure changes that occur early in the morning and late in the evening,” explains Coughlan.

According to Cannon Technologies, sites that use a lot of water for cooling are beginning to implement better technologies to reduce water loss. Fully contained systems help reduce the usage of desalinated water which, while heavily subsidised, is still a cost that the data centre can reduce.

"Governments could do more to encourage green initiatives. The reduction of subsidies for energy and water would force facilities to improve usage. Another way would be to follow the EU where strict energy standards are being applied to data centres and owners have to buy carbon credits. This would create an immediate fiscal incentive for data centre owners to improve green policies," says Coughlan. ●



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