Smart power management reduces cost and increases flexibility

An innovative lab and data centre power monitoring and management solution enables Cisco to cut operating costs and carbon emissions in labs and data centres

EXECUTIVE SUMMARY

Customer Name: Cisco Systems

Partner name: AdInfa (Ad Infinitum Multimedia Ltd)

Industry: Manufacturing

Location: worldwide

Company size: 65,000

Challenge

- Reduce operating costs and carbon emissions of Cisco's Technical Marketing Engineering lab (TME)
- Optimise limited rack space
- Create a replicable, turnkey solution

Solution

- Tracks energy consumption using a solution developed jointly by Cisco and AdInfa
- Integrates AdInfa's InSite power management system and 'smart' power strips (PDUs)
- Provides web-based remote monitoring and management

Results

- 30 per cent reduction in ICT equipment power consumption
- 50 per cent lower cooling costs
- A prototype solution for data centre power management

Challenge

Cisco's Technical Marketing Engineering (TME) Labs are at the heart of the company's sales success. Worldwide, some 1800 labs build, test and demonstrate information and communications technology (ICT) solutions on behalf of customers. It is a vital part of pre-sales activity as hardware and software are brought together to create customer testbeds for proposed solutions. These labs are data centres in their own right.

It is a dynamic environment with multiple users, each of which has different needs that require different devices and configurations. It is also one that consumes lots of power. The problem was that no one at any given time knew exactly how much power. Like data centres throughout the world, while the lab had some meters in place, it lacked a real-time, automated metering system. Experience also showed that while equipment was typically left running 24x7, the working week only accounted for some 36 per cent of that time.

The scale of the issue was underlined by the fact that Cisco's labs worldwide accounted for around 70 per cent of the company's power bill, an energy profile shared by many of its customers. Bringing the challenge into even sharper focus was the fact that Cisco had committed to reducing its green house gas omissions by 25 per cent in absolute terms by 2012 compared to 2007.

In the UK, the Bedfont Lakes equipment test and verification lab is managed by Cisco's European Technical Consulting Team. The team's responsibilities include working with Cisco partners to help them develop and take to market innovative technology solutions to customers' problems. In seeking to better manage energy at its own labs, the team turned to Adinfa (Ad Infinitum Multimedia Ltd) with which it had previously worked to collaborate on developing the latter's InSite power management system.

"Ultimately we wanted to change the behaviour of the lab's users, from an 'always-on' to an 'on-as-required,' culture," says Peter Matthews, the lab manager at Bedfont.

> **"Ultimately we wanted to change the behaviour of the lab's users, from an 'always-on' to an 'on-as-required,' culture,"**
>
> **–Peter Matthews, Lab Manager, Cisco, Bedfont.**

Solution

Cisco and Adinfa brainstormed the problem and quickly came to the realisation that no complete system was commercially available. Recognising that they would have to design and build a system using off-the-shelf components, the team devised a three-step plan.

Step One was to design and implement an automated metering and management system that harnessed the combined power of the network and the IP protocol. Step Two: automatically shut-down non-core equipment in the evening and over the weekend. Step Three: redesign the lab to remove, wherever possible, hotspots generated by core devices critical to the lab operations (as opposed to components which could be powered-off without impacting other solutions).

"Essentially, we first had to take control of the power outlet, introduce monitoring and rule-based intelligence to automate the management process, and then agree some ground rules with users," says Matthews.

The team started to create the management system by installing new power strips (Switched Power Distribution Units – PDUs) and new power cords in each rack. Minor infrastructure changes were required, such as breaker upgrades. Temperature and humidity sensors were installed in the centre. Each rack was fitted with either one or two IP-addressable, metered power strips, which were networked using Cisco switches. The PDUs get their IP address and other settings from the lab DHCP server and every PDU has a unique URL which identifies the rack, for example: *pdu-bfl-tme123.cisco.com*.

Next, InSite was installed with no service interruptions for users. Data collection from the PDUs is completed every five minutes via SNMP v2. InSite enhances the data to provide approximated kilowatt-hour (kWh) values and automatically associates these values with site-specific utility tariff data to provide reports on costs and kg of CO2. The system then aggregates these data records to limit the total amount of storage capacity. The results are displayed graphically, with various display options, such as reporting per user, per device, and per rack. Aggregation intervals range from hourly reports with five-minute granularity to daily, weekly, monthly, and yearly ranges.

InSite monitors all PDUs and devices and reports on load, power consumed, costs-per-kWh and kg-of-CO2-per-kWh the each rack. The software also monitors the ambient temperature and humidity conditions in the data centre enabling hot spots to be identified easily. The lab manager is automatically notified of exception conditions and threshold breaches in real-time, via email messaging.

An important feature of the new system is that users located any where in the world can now control 'their' devices in the lab. Information is accessible, via a browser, in an interactive, graphical format to authorised users. The InSite system and the PDU units are linked into Cisco's corporate Active Directory, allowing users to use their global user-ID and password, with all log-in activities tracked via LDAP and on-board logging. Three access levels to the PDUs have been set: read-only, user level and administrator level. While anyone can view PDU status, only authorised lab users can control the PDUs. Device configuration changes can be implemented via web GUI, Telnet, FTP file push, or scripts.

Results

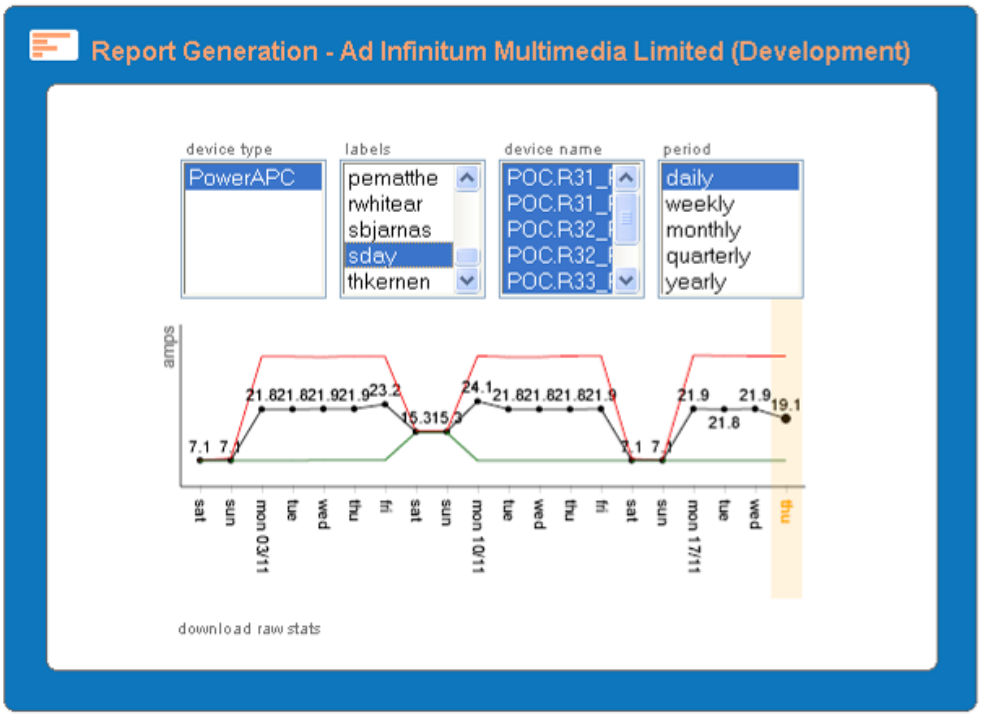
Implementing the InSite solution was fast, with the core system in and running within a day, giving immediate results and accelerating time to benefits. Return on investment, was achieved in under 12 months.

Centralised monitoring and reporting has reduced the energy consumed by rack equipment by 30 per cent. The visibility of energy use patterns provided by the solution, combined with the ability to power devices on and off, enabled new power control policies to be introduced. After some initial scepticism from users about the cost of deploying this solution, the proof provided by the InSite reports highlighted that a scheduled power-on / power-off cycle made a valuable contribution.

Power consumption during working hours averages between 200 and 220 amps. Automated power-down of non-core equipment every night reduced use to around 145 amps. At the weekend, consumption has dropped to 100 amps.

And less energy consumption means less heat being generated. In fact, the load on the cooling equipment in the data centre has been reduced by over 50 per cent, resulting in additional significant cost and energy savings and carbon reductions.

Figure 1. per user reporting



"The weekly and monthly reports opened our eyes about energy management and how much energy we consumed each week, and how big the potential savings are. Users can now see how they as individuals can help reduce our carbon footprint and that has had a dramatic impact on how they manage energy resources," says Matthews.

The solution is also enabling energy optimisation of those core network devices that have to run 24x7. Monitoring the ambient temperature and humidity conditions in the data centre enables new equipment to be deployed so that hot spots are avoided, which helps ensure cooling is used efficiently.

It is also helping the lab to make use of its limited space more efficiently. Previously, the limiting factor for adding additional equipment was the air-conditioning system's ability to keep the temperature down. By intelligently grouping lab scenarios and solutions to avoid generating hot spots, more equipment can fit into the lab room.

"Previously, power consumption increased in a linear fashion as new equipment was added, but this new solution breaks this rule and offers significant reduction of carbon emissions while maintaining full lab functionality."

–Peter Matthews, Lab Manager, Cisco, Bedfont.

Significantly, the 'Green Lab Solution' from Cisco and AdInfa has enabled the data centre to break the historic link between business growth driving the need for increased lab space, equipment and power. "Previously, power consumption increased in a linear fashion as new equipment was added," says Matthews, "but this new solution breaks this rule and offers significant reduction of carbon emissions while maintaining full lab functionality."

Next steps

Data centres worldwide account for around two per cent of the world's electricity, equivalent to the airline industry's carbon emissions. Cisco initiatives to improve the sustainability, both for itself and its customers, include Cisco EnergyWise, a new energy management architecture that allows IT operations and facilities to measure and fine-tune the power usage of devices connected to a Cisco network ranging from Power over Ethernet (PoE) devices such as IP phones and wireless access points to IP-enabled building and lighting controllers.

The InSite software is to be integrated into Cisco's EnergyWise framework. Once the functionality of the intelligent PDUs has been fully replicated into all of Cisco's network elements and servers, power consumption can be controlled with greater granularity directly from the InSite application, removing the need for intelligent PDUs.

For More Information

To find out more about AdInfa and InSite, go to: http://www.adinfa.com

More information about Cisco EnergyWise can be found at: www.cisco.com/go/energywise

Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
Singapore

Europe Headquarters
Cisco Systems International BV
Amsterdam, The Netherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at **www.cisco.com/go/offices.**

