Taking the heat out of data centre storage

With electricity consumption by civil government departments rising this year to 12% above 1999-2000 levels, a recent government report identified IT as the main culprit.

Dr Mike McCaig of Bull Information Systems describes how both storage technology and operational practices can be used to deliver significant power savings to a department's data centre.

The latest House of Commons Audit Committee report[1] concluded that: **"increased use of IT would appear to be the biggest single factor in the upward trend in emissions from civil departments."**

The report continued; **"The energy consumption of IT equipment and the air conditioning systems needed to keep them from overheating are becoming one of the biggest challenges facing Government efforts to become more sustainable.",** thus placing a clear emphasis on data centres as a target for energy improvement if government sustainability targets are to be met and costs controlled.

Today, in nearly all data centres, every 1kW of energy saved at the device, saves the data centre 2.5-3kW at the electricity meter; it's no surprise therefore that across the public sector IT managers are investing heavily in server virtualisation projects. Virtualisation is the most popular and heavily promoted (by the IT industry) approach to reducing the number of IT devices in the data centre and cutting spiralling electricity costs.

Notwithstanding the impressive results published by software vendors, server virtualisation is not guaranteed to be the solution which contributes the most to reducing power consumption in a data centre. Power supply, cooling, and storage are three other areas where significant savings can be made.

Growth in organizations' demand for storage is without doubt contributing significantly to the energy problem that the public sector has to solve. Despite the reductions in cost per terabyte and kilowatts per terabyte being achieved as storage

[1] Cabinet Office (2008); Greening Government ICT *Cabinet Office report, UK HM Government*

technology continues to advance, the electricity used by storage devices in global data centres is estimated to have increased at around c.20% compound annual growth rate in the period 2000-2006.

With the improvement in storage products energy performance and capacity each year, simply eliminating old technology is an obvious step towards reducing power consumption. Today's latest drives deliver over 20TB/kW, more than doubling what was available 5 years ago. In addition, the latest generation of disk subsystems have features such as policy based spin-down and adaptive cooling designed in from the start in a bid to become more energy efficient.

However, consolidation to new technology, will only deliver the promised electricity savings if the new capacity purchased is not consumed by inefficient allocation, usage and operation. Improvements in usage and operation can be made in several ways.

First, all data centres contain legacy 'junk' applications, test systems, etc and their associated data which no-one is currently using. Decommissioning of legacy applications, plus removal or archiving of their data and, where possible, removal of the devices they were run on not only directly reduces power demand but simplifies the tasks of later consolidation and virtualisation of both servers and storage. Planned storage consolidation and virtualisation will both reduce the number of discs that need to be powered and increase utilisation of those that remain.

Implementation of a tiered storage design, keeping data on the right media for its required use is another operational energy saving action to take. Larger disk drives with slower operating speeds use less energy than small high speed (high IO-rate) drives. High capacity, low power, SATA drives produce a carbon 'footprint' that can be under 10% that of high speed 'enterprise class' drives. Tapes and virtualised tape libraries are also amongst the most energy efficient means of providing storage for backup and business continuity purposes. A review of the organisations data retention policy and information lifecycle management approach may reveal where data centre on-line capacity could be replaced with off-line storage. Similarly, reviewing backup policies and utilising deduplication technology will reduce the total work performed in backup systems and reduce the volume of data being stored at any time. Effective email management and archiving can also contribute to a significant reduction of the amount of 'waste data' filling up available on-line storage space.

The deployment of thin provisioning technology provides a means of increasing the overall utilisation of storage by making allocation a dynamic activity. Some analysts estimate that utilisation of allocated storage can be as low as 20% - 30%. This happens because in order to avoid the management issues of storage reassignment during operational running, storage is commonly allocated for an applications anticipated peak demand. Estimates of power savings from use of thin provisioning range widely (from 10% to >75%) and like any other energy efficiency initiative are determined by a number of operating factors. Assuming an energy consumption of c.100W/TB, a data centre operation running 10TB of storage and achieving a 40% saving from thin provisioning would save 0.4KW/h – the equivalent of running 2 additional energy efficient servers or 5-6 desktop devices.

Overall, by applying a combination of the latest storage technology and optimal storage management practices a significant number of kilowatts can be saved in most data centres. At a time when the economics of data centre operation are fundamentally changing due to the rising cost of power, these savings above and beyond those of server virtualisation are a significant contribution which must not be ignored in the battle to achieve government sustainability targets.