Greening of the data centre

There are numerous ways to save energy and implement a policy to keep track of energy usage.

The recent 2009 BICSI European conference held in Dublin, Ireland focused on new networking technologies and new initiatives "for going green" for the IT industry.

It prompted me to do some more research on this topic, in particular as it relates to energy savings in data centres. I came across a comprehensive and well thought out document that was published in October 2008 by the European Commission Directorate-General JRC Institute for Energy, Renewable Energies Unit entitled "Code of Conduct on Data Centres Energy Efficiency."

Available online, it was created in response to the need to reduce environmental, economic and energy supply impacts in data centres. Developed in collaboration with the British Computer Society and IT equipment vendors, this is a voluntary code of conduct. Participants, including data centre owners and operators, who choose to abide by the code are expected to select, adopt and implement energy efficient best practices and report energy consumption every year.

Endorsers of the code, including vendors, consultants, associations and institutions, are expected to develop products, solutions and programs to enable data centre owners and operators to meet the expectations of the Code of Conduct.

Let's look at some industry trends related to data centre growth and economics. Many of these statistics are from a presentation by Microsoft on Next Generation Data Centres at the BICSI European conference in Ireland.

Server infrastructure is doubling every year. Network capacity is growing by a factor of nine times in four years. In the past, the cost of physical space was the primary consideration in data centre design. Today, power and cooling costs more than the IT equipment it supports.

In 2006, U.S. data centres consumed an estimated 61 billion kilowatt-hours (kWh) of energy accounting for about 1.5% of the total electricity consumed in the U.S. that year. Current projections are that data centre power consumption will exceed 100 billion kWh by 2011 in the U.S. alone. From these statistics, it is obvious that data centre energy savings is a big priority and is needed to reduce the environment impact of CO2 emissions and to lower the total cost of operating (TCO) data centre facilities.

Where do the energy costs come from and what are the opportunities to save energy? According to recent studies, it is estimated that cooling accounts for up to 40% of a data centre's energy load. Furthermore, the cooling process itself is often accompanied by excessive energy waste, largely due to an oversupply of cold air by computer room air conditioning (CRAC) units that are attempting to compensate for inefficiencies in the cooling process.

A substantial amount of cold air produced by the CRAC units can bypass the IT load through misplaced perforated tiles, unsealed openings or pathways between hot and cold aisles.

A study conducted by Uptime Institute on 19 large computer rooms found that, on average, the air supplied to a data centre is 2.6 times the amount of cold air actually consumed by the IT load. Clearly, implementing methods to improve air management and cooling efficiency can provide a very large payback in energy usage.

The EU Code of Conduct Best Practices provides some design concepts of how this can be achieved. The intent is to contain and separate the cold air from the heated return air on the data floor. The different design concepts include Hot aisle containment; Cold aisle containment; Contained rack supply, Room return; Room supply, Contained rack return; Contained rack supply, Contained rack return

It also provides guidelines on the selection and deployment of new IT equipment and services and a value system to rate the importance of different factors in the decision making process.

Some of these factors include power consumption of the device at the expected utilization or applied workload, operating temperature and humidity ranges in accordance with new ASHRAE recommendations, power management features, energy star labeling, deployment of grid and virtualization technologies, development and selection of efficient software.

This includes software for reporting energy use and comparison of IT workload with energy use. These are but a small number of the techniques that are available to improve data centre efficiencies.

It is an exciting time for IT infrastructure that is rapidly evolving to meet the ever increasing global demand for information capacity and to do it efficiently.

A large part of the equation has to do with how much energy (in kilowatt-hours) is required to produce the actual work that is performed (for example million of transactions performed in a day) compared to the total facility energy consumption.

The total facility energy consumption equals the main IT equipment consumption, the redundant IT equipment energy consumption, the cooling system consumption plus the miscellaneous infrastructure equipment consumption. There are numerous ways to save energy and implementing a policy to keep track of energy usage and the work performed is a win-win situation for everyone involved.

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