

VNUNet – Monitoring Data Centre Efficiency

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Data centre energy efficiency has been getting an enormous amount of attention recently.

While some companies on both the buy and sell sides are treating the issue as 'green IT', the fact is that there are a number of drivers, not least of which is the realisation a few years ago that fully loaded rack systems have the ability to boil a kettle almost as fast as they can process a transaction.

The inability physically to increase rack density due to cooling considerations was a real show-stopper toward high density distributed computing.

For those of us who started our IT careers back in the days of IBM big iron there is a certain irony in the re-emergence of huge cooling and machine room air-con as enablers for continued data centre growth.

In addition to the cooling concerns, data centres are also short on go-go juice. Approval for new data centres in London has been put on hold as utility companies cannot keep up with the demand for power.

With London busy planning and building for the 2012 Olympics the electricity requirements of the future games venues are taking priority,

while any new data centres are finding themselves towards the bottom of the customer priority list.

The problem of available cheap electricity is not confined to Olympic cities. China and India are ramping up their computing capabilities and requirements, while energy supplies are already constrained.

South Africa's largest city, Johannesburg, is suffering daily scheduled energy cuts due to the complete inability of the power suppliers to meet current demand.

The power companies euphemistically call this "load shedding", a term in which the local business leaders manage to find humour as they sit in unlit meeting rooms and drink pre-brewed coffee from a thermos.

Less amusing is the ongoing economic meltdown resulting from the power supply constraints, which are expected to continue for at least four years.

For Johannesburg the end of cheap and abundant energy supply has already arrived, and the city serves as a test-tube example of what faces many other cities unless the rate of increase in energy use is reined in.

Meanwhile, in addition to the constraints of heat and power, the need to reduce greenhouse gas emissions is the urgent and highest priority.

Perhaps for that reason many efforts to address the total energy footprint of IT equipment in the data centre and elsewhere, and the associated building environmental control systems, is being labelled 'green'. This is the sharp end of 'green IT' - as tactical as it is necessary.

Almost every possible hardware architecture, software stack alternative or outsourcing model claims some sort of environmental benefit.

For data centre planners and operators, however, the challenge is in understanding the relative merits of all the various designs of IT equipment, mounting architecture, room design and associated software approaches, and their relative 'green' credentials.

Some data centre operators have therefore begun to seek clarity by turning to independent measures of data centre energy requirements.

One such approach is that offered by The Green Grid, which describes itself as "an association of IT professionals seeking to dramatically raise the energy efficiency of data centres through a series of short-term and long-term proposals".

The Green Grid has proposed a set of related metrics that seeks to define and standardise

expressions of IT equipment and data centre efficiency.

Power Usage Effectiveness (PUE), and its reciprocal Data Centre Infrastructure Efficiency (DCIE), are defined by The Green Grid.

PUE is a measure purely of the efficiency of IT equipment, while DCIE embraces the energy efficiency of associated building environmental systems such as heat exchangers, UPS, switch gear, batteries, network, storage, lighting and so on.

Of course it might be argued that DCIE is by far the more useful of the two, as without all the infrastructure included under its measure the IT equipment embraced under PUE would never be deployed in a production environment.

Perhaps the more important question is whether either PUE or DCIE are enough to provide guidance down the path towards managing IT's contribution to a low greenhouse gas emissions economy.

In addition to understanding the energy requirement of a data centre it is important to understand the productive workload that results.

A useful analogy is vehicle fuel efficiency, which has traditionally been expressed in terms of miles per gallon, or gallons per mile (or the metric equivalents).

These ratings, while useful, are slowly being augmented with workload measures; for example, miles per gallon is being replaced by miles per gallon per passenger (MPG/PP).

In short, a six-seater wagon that does 30 MPG has a better MPG/PP than a two-seater sports car with the same MPG rating.

This is recognised to an extent by The Green Grid which proposes a further metric: Data Centre Productivity (DCP).

DCP includes a measure of useful work compared to the total power consumption of a data centre. It is also a useful calculation and better than no calculation at all.

Where it falls short, however, is in measuring the usefulness of the workload itself as far as its overall contribution to reducing greenhouse gas emissions.

Arguably, a data centre where some or all of the workload delivers services that provide for the reduction of the overall greenhouse gas emissions of an organisation is a more useful workload than one that does not.

Indeed, if a data centre's power consumption increases as a result of performing additional work, and that workload provides the means for 1,000 staff to telecommute or tele-meet (thus avoiding the emissions associated with travel)

then the power usage increase attributed to the data centre is a good thing.

PUE and DCIE measurements increase, while the fully loaded greenhouse gas emissions of the organisation decrease.

What is currently lacking in any attempt to define a standardised measure of data centre energy efficiency is a measure of workload usefulness, in the context of the overall greenhouse gas footprint of a company.

Business urgently requires a standardised and regulated way of calculating emissions. Sustainability efforts urgently require those measurements to deliver transparency through regular reporting of performance.

Any such measure must be 'fully loaded', meaning it must consider emissions associated with peripheral but related business activities, such as the commuting patterns of employees.

PUE and DCIE are good small first steps for IT. Transparent reporting of overall business emissions is one large step for mankind.

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