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Data centre energy efficiency

KPI's and Harmonisation is the way forward for ISO, says Simon Campbell-Whyte, Executive Director of the DCA.

I'VE always liked the word "harmonisation". The word conjures up a peaceful aura of smooth simplicity and well-being. Unfortunately the path to harmonisation may not be quite like that for the data centre industry. We also remain very far from that place. The data centre industry is still subjected to a diverse range of fragmented metrics, standards and guidelines that at best confuse and at worst completely mislead.

Despite this the industry can point to great strides forward in energy efficiency, improved resilience performance and innovative ways to meet the needs of ever changing ICT deployments. However the measurement and reporting of these successes is not one of the industry's strong points. I'm not going to write more about PUE abuse here, but it certainly does serve as an example of where just as much bad practice and good practice is hidden by misuse of a KPI metric.

"Best practice" guidelines are another area of confusion, and a target for harmonisation, how does a data centre manager decide on which one to follow? EU Code of Conduct, Green Grid Maturity Model, both are well respected, others? There are in actual fact quite a few out there, mostly well intentioned and put together, but which is best for me and my data centre? Can I compare them? Which is most up to date and relevant to the technology I have deployed? Indeed, these are valid arguments for harmonisation.
So with this in mind, I was pleased to attend the first Workgroup meeting for ISO in Frankfurt where work started on a programme of international standards for energy management KPI's and harmonisation of guidelines for resource efficient data centres. This can only be a step forward for the industry which the DCA is keen to contribute to. DCA members can find out more information regarding standards development at **www.data-central.org**

Data-Central.org update

We continue to build data-central.org with new functionality, services and content – members can now build a public profile of their organisation, writes Louise Fairley, Marketing Manager at the DCA.

IF you haven't yet got around to visiting the site, you will find plenty of options to engage with the industry with new features being added on a regular basis.

DCA Webinars are back

Now the holiday season is over, we kick off the DCA webinar channel with a series of themed webinars – first up is the DCA outsourcing summit which aims to provide advice to users and buyers of data centre services and on strategies to use and risks to avoid. You can view recordings of part one held on September 11th which featured Barry Lewington of PTS Consulting who looks at the critical area of how you successfully manage service provider relationships and Eugene O'Sullivan of GlassHouse Technologies who takes us through how to implement a data centre migration whilst minimising the risk and cost to your organisation.

You will also find a lively discussion on the DCA Question Time panel session hosted by Dr Jon Summers which covered many of your questions. Please remember these are free to attend, and can be found on the Brighttalk Data Centre Alliance webinar channel. Watch out for part two of the data centre "outsourcing" series scheduled for October 9th.

If you would like to take part or suggest a theme for a DCA webinar summit please email **info@datacentrealliance.org**

Fundamentals of sound data centre design

By Wayne Lee Valentine- Department Manager, Facilities Management and Infrastructure Projects. Malta Information Technology Agency.

During the last decade, the data centre landscape has evolved dramatically influenced by a confluence of Internet revolution, accelerated and widespread technology adoption and use as well as increased significance of business critical information systems.

Hosting requirement sophistication, including "always-on" prerequisites have and continue to gain increased attention within the data centre community. As hosting demands and energy costs rise, data centre professionals continually seek optimal baselines for addressing such challenges.

In order to address some of these challenges, the consideration for a number of key criteria and principles have been increasingly evident. These criteria and principles are considered to form a minimum baseline for coming up with a flexible data centre design blueprint. These principles include:

- Scalable to cost effectively support future growth plans and emerging technologies;
- Modular, independent and segmented Computer Rooms;
- Multi-Tier Data Centre Zoning and Purpose Fit Environment to enable easier adaptation for specific and custom hosting requirements;
- Strong consideration of energy use inline with the EU Code of Conduct on Data Centres.

Principle 1: Scalable to support future growth plans and technologies

It is considered difficult to right sizing a general purpose data centre, designed to cater for non-uniform growth requirements in a prescriptive fashion. A degree of flexibility to cater for emergent properties must be considered from the outset. Sound engineering and design must give the appropriate consideration to flexibility and adaptability in this context.

A number of influencing factors which shape emergent properties which effect data centre growth path is described pictorially in Figure 1. It also provides a set of parameters intended to assist in right-sizing the investment.

Principle 2: Modular and independent computer rooms

In view of the ongoing technological improvements, it is sensible to design the Data Centre facilities infrastructure with strong flexibility in mind.

Technology evolves quickly; hence the data centre building facilities necessitate flexible mechanisms to adapt to rapid transformations. In some cases, medium-term parallel running of similar environments during systems migrations poses higher demands on the data centre facilities infrastructure.

Data Centre facilities are known to have a relatively long lifespan (10 to 15 years), while IT equipment has a much shorter lifespan. This gap brings to light the ongoing need to align the data centre infrastructure facilities with the fresh hosting requirements.

Typical example is the deployment of high density equipment such as Blade servers. These devices consume much more power and cooling than standard servers mainly because equipment is greatly denser.

Redundancy is another element that merits attention when designing facilities infrastructure. Redundancy allows security in the event of failure, uninterrupted operations during upgrades and maintenance. The result of this evolution in technology will allow a reassessment of the Data Centre Lifecycle through technology refresh of its infrastructure. For this purpose, the design segmentation and

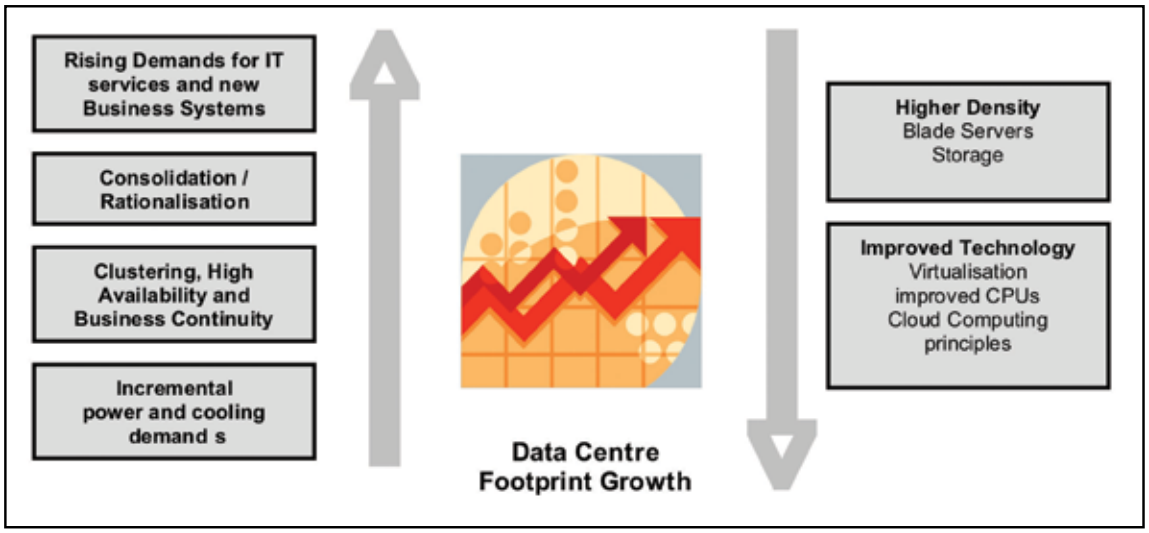


Figure 1: Right Sizing the Data Centre

Factors influencing the data centre footprint growth

- ↑ Rising Demands for IT service and new Business Systems: The need for hosting new business systems is continued.
- ↑ Consolidation/Rationalisation: Over the last decade, numerous organisations have adopted strategies which apply varying degrees of consolidation with the intent to reduce maintenance overheads and decreasing the Total Cost of Ownership.
  In conjunction with consolidation initiatives, organisations have also exercised a centralisation initiative, whereby, to the extent possible, ICT systems are centralised into enterprise Data Centres to capitalize on economies of scale.
- ↑ Clustering, High Availability and Business Continuity Requirements: Approaches employed to group relevant computing (including networking etc) resources intended to work together with an overall objective to maximize uptime and ensure business continuity.
- ↑ Incremental power and cooling demands: Recent hardware developments such as high density computing resources have introduced significant increases to power and cooling requirements in the context of the data centre footprints.
- ↓ Higher Density: The benefit to space is immediate and obvious, whilst achieving a greater density of processing power and storage capacity. Typical example includes Blade servers - slim, hot-swappable servers normally row mounted in chassis; typically with independent memory, processor, storage, network software, applications and operating systems software - but sharing power, cooling, floppy drives, switches and ports.
- ↓ Improved Technology: Innovative technologies which maximise resource use and reduce cost including Virtualisation, Cloud Computing and Blade servers.
  These concepts contribute to varying degrees depending on context to save resources either when deployed in isolation or grouped together, with an objective to maximise resource utilization; consume less energy and utilise less space, reduce the time-to-deploy.

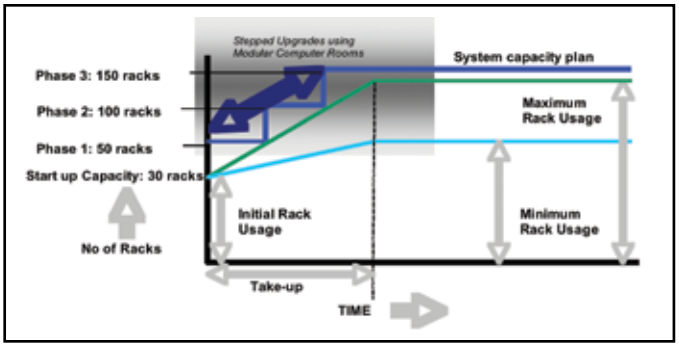
modularity should also extend to some advance planning for an eventual facilities infrastructure refresh.

Data Centres can be planned into a number segmented Computer Rooms, each Computer Room supported by its own independent infrastructure facilities such as power distribution, UPS, fire-fighting, networking etc...

This approach provides two key design benefits, namely modular scalability and containment in case of failure.

Moreover, this approach will ensure appropriate financial investment in line with the respective system capacity growth plan and limited disruption to the operational environment during upgrading works.

The diagram (top right) portrays the modular scalability concept in line with the rack usage.



Establishing right sizing is a function of the lead time and minimum reasonable cost to provision each phase. Experience has shown that a lead time of 4-6 months is required to procure and implement a phase.

Principle 3: Multi-Tier Data Centre Zoning and Purpose Fit Environment

Nowadays, especially in view of the difficult economic times, organisations are more cautious then ever to sustain their ICT systems at an optimal cost. Organisations are adopting a new approach whereby business systems are mapped into the appropriate TIER classification hosting environment.

The aim is to provide the correct supporting infrastructure to the various business requirements without over engineering and weighty operating costs. This approach takes into account the safeguarding of quality and appropriate service levels.

In reality, not all business applications are mission critical and do not mandate highest availability infrastructure. Lower-priority applications that have lower business impact require lesser uptime protection.

When looked at prudently, it makes business sense to segregate the hosting environments into various tiers, normally referred to as Mulitier environments. Multitiered designs are a new and emerging trend in cost containment strategies.

As an example, one can compare the estimated cost to build a Data Centre environment with two different approaches.

In Scenario 1 (on next page), a single area for 50 racks, rated at TIER 3 and Scenario 2 (on next page), two areas with 25 racks each, rated at TIER 2 and 3 respectively. This assignment assumes equal rack power densities.

* Estimated cost as indicated by Gartner (April 2009).

With Scenario 2, the same-size data centre capacity is approximately 12-16% less expensive to build, freeing up capital investment. Additionally, other significant savings arise from reduced maintenance costs and power consumption.

The above concept has been devised from similar studies by Gartner as presented in their research paper, 'Mulittier Data Centres: A hybrid approach with significant cost savings' dated April 2009.

Notwithstanding the Multi-Tier Data Centre Zoning, it is paramount that the data centre complex complies in full with the general specifications of the highest TIER requirement.

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The Uptime Institute TIER classification is prolonged on the following parameters:

TIER	Design Criteria	Availability	Unplanned Downtime per annum
1	Single path for power and cooling distribution, no redundant components	99.67 %	28.8 hours
2	Single path for power and cooling distribution, redundant components	99.75 %	22 hours
3	Multiple power and cooling distribution paths, but only one active path, redundant components, concurrent maintainable	99.98 %	1.6 hours
4	Multiple power and cooling distribution paths, redundant components, fault tolerant	99.99 %	0.8 hours

Source: Uptime Institute

Principle 4: Strong consideration to energy efficiency inline with the EU code of conduct

The EU has recently published a Code of Conduct on Data Centre Energy Efficiency. The code of conduct has been created in response to the increasing energy consumption in data centres and the need to reduce the related environmental, economic and energy supply security impacts. The code of conduct is spearheaded by the EC Joint Research Centre - Institute for Energy and was published in October 2008. The aim is to inform and stimulate data centre operators to reduce energy consumption in a cost-effective manner without hampering the mission critical function of the data centre.

The projected energy consumption rise poses a problem for EU energy and environmental policies. Energy efficiency within data centres must be maximised to ensure the carbon emissions and other impacts such as strain on infrastructure associated with increases in energy consumption are mitigated. The EU Code of Conducts puts into play several recommendations including:

- A comprehensive measurement tool of all energy use throughout the entire Data Centre facility;
- The use of high efficient cooling systems based on direct and indirect free cooling, water cooled chillers and variable speed drives mechanisms;
- Modular UPS and cooling systems using latest technology for high efficiency;
- Containment of hot and cold aisle;
- Improved and effective airflow circulations;
- Stronger use of Energy Star hardware;

Although, the EU Code of Conduct is currently still a voluntary initiative, it is foreseen that the use of this framework will continue to flourish and probability become mandatory sometime in the near future.

Scenario 1: 50 Racks TIER 3

	Zone 1	Zone 2
Tier Classification	2	3
No of Racks	0	50
Average Cost per sqm in*	€5000	€6,700
Footprint required (Each rack occupies approx 10 sqm)	0m	500m
Zone Cost: (footprint x cost per metre)	€	€3,350,000
Total Cost:		€3,350,000

Scenario 2: 25 Racks TIER 3 / 25 Racks TIER 2

	Zone 1	Zone 2
Tier Classification	2	3
No of Racks	25	25
Average Cost per sqm in*	€5000	€6,700
Footprint required (Each rack occupies approx 10 sqm)	250m	250m
Zone Cost: (footprint x cost per metre)	€1,250,000	€1,675,000;
Total Cost:		€3,350,000