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Data Center Optimization:

Making material, sustainable cost reduction whilst starting the journey towards a cloud-enabled business model.

Sustained increases in data volumes, heightened performance expectations, regulation, globalization, security and environmental concerns are all causing enterprises to consider their data center strategies. As well as this, the need to ensure that investment in ageing, insecure and failing infrastructure represents value for money, plus the opportunities afforded by virtualization and cloud computing, make the question of determining the right strategy less straightforward. This paper is intended to highlight the key business issues that a CIO should consider before making further investment in physical data centers.

Data centers are not often positioned at the heart of an organization's competitive advantage, but consider that in the future their performance and configuration will be key to:

1. Rapid accessibility of business knowledge and business intelligence;
2. Reputation—data center efficiency and integrity will govern your customer's perception of your company;
3. The ability to access the financial benefits of new cloud computing business models;
4. The ability to access new operating models, e.g. remote infrastructure management;
5. The ability to respond to business demand and quickly provision new cloud services (desktop as a service, SaaS) for business differentiation.

Add the unique nature of an organization's business model, for example the seasonal variation in retail demand, and this suggests a careful consideration to the right "infostructure" strategy and the important contribution of the configuration of the physical data centers.

The Reality of Data Centers

Many of today's data centers were built ten to twenty years ago. They were not designed to support the power requirements of today's technologies (e.g. blades), and as a result do not have N+1 architectures, have very poor power efficiency ratings, are difficult to physically re-configure, and don't meet today's environmental standards. Floor space can be full, whilst, ironically, compute capacity is under-utilized, a phenomena caused by a fragmented, siloed approach to the procurement of new capacity, often sized for peak loads.

In many cases data centers are hosting application portfolios that are unknown, redundant and underutilized—leading to waste and or commercial exposure (e.g. under licensed and / or unsupported hardware and software).

Many organizations inherit, rather than plan, their data center estates—often as a consequence of merger and acquisition activity. Their physical and data resources become randomly and poorly distributed, and disparate technologies lead to limited flexibility and agility. The subsequent lack of cohesive operational support, and frequent lack of disaster recovery, adds business risk that is difficult to quantify until it's too late.

Given that failures are impossible to avoid, CIOs need to consider how their existing infrastructure design, operating processes and controls would withstand public scrutiny or audit?

In one case, hundreds of servers were reduced by a factor of 12 to 1, and the 20 sites across which they were distributed reduced to just two. Return on investment of less than 18 months is not untypical.

But much also changed in the last five years. There have been fundamental shifts in physical data center design, advancements in fresh air and evaporative cooling, waste management, and increasingly smaller, modular designs to allow build out capacity to better match demand. Virtualization has improved server utilization, but has also fundamentally changed the means by which hardware, software and networks can be remotely maintained and managed. Improvements in applications portfolio management, monitoring, measurement and rationalization have enabled IT to better identify and retire redundant functionality and costs.

And so it is not surprising that in a recent Capgemini project investigating a UK organization's data center landscape, the hundreds of servers were reduced by a factor of 12 to 1, and the 20 sites across which they were distributed reduced to just two. Return on investment of less than 18 months is not untypical.

Optimizing the data center infrastructure has, until now, not been a top priority for many CIOs, in particular as the Total Cost of Ownership has often not been visible. However, this has changed, discretionary spend has been cut and the data center estate offers a valuable opportunity to deliver sustainable cost reductions.

Sources of Value

Improvement is often focused on four main opportunities:

1. The cost of physical facilities: Facilities and infrastructure typically account for a quarter of IT operating spend (though it is important to note that in many organizations facilities costs are not considered as part of the IT budget). A key contributor is the cost of energy; the average data center currently uses twenty times the power of a normal office of similar size. When coupled with the need to reduce carbon emissions, energy measurement and consumption is now an integral design factor. In many countries, governments are providing the incentives to improve, both through voluntary targets and new laws, for example the UK's CRC Energy Efficiency Scheme that becomes effective in April 2010, and UK companies will be required to buy carbon allowances to cover their emissions;
2. Improving utilization: Data centers are critically under-utilized with levels of utilization between 10-30% not uncommon. Increasing utilization leads either to the opportunity to decommission expensive maintenance on under-used equipment, or to repurpose it for other applications, and ultimately to reduce floor space;
3. Operational management and disaster recovery: The operation of the servers and storage within the data center is the key to unlocking the power of the available assets and providing an environment that can support business needs in a more agile way. The objective being to reduce the need for manual intervention—through virtualizing and automating service and systems management to accepted industry standards. This includes implementing effective and proportionate disaster recovery—no longer a secondary or optional issue for organizations, in the wake of the increasing burden of regulatory compliance;
4. Applications portfolio rationalization: Before embarking on a program of consolidating or optimizing a data center estate, organizations should examine the effectiveness of their applications portfolio. Physical consolidation provides the opportunity to retire underutilized functionality and thus reduce their absolute capacity requirement.

Finding the Right Path

The key to unleashing the true benefits of data center optimization lies in a well thought out and comprehensive strategy. There are three areas that deserve careful consideration:

1. Analysis and discovery phase of the current state, to understand;
   - The inventory of assets (sites, hardware, network, software and licenses);
   - Staffing levels and activities;
   - The services provided (i.e. production, development and test) and the required service levels;
   - The current contractual landscape, number of suppliers and how the services are charged e.g. by server, by rack or floor space, by subscription;
2. Design of the future state—based on striking a balance between application user / customer requirements and the desire to optimize costs:
   - Performance, utilization peaks and troughs—the need for agility;
   - Accessibility and data handling;
   - Business continuity;
   - Physical and IT security;
3. The migration path—mapping how these services may best be provided, given:
   - Current and predicted commercial benchmarks;
   - Appropriate operational standards (e.g. ITIL V3, ISO 20000, SAS 70);
   - Availability of required service levels and guarantees;
   - Access to capability whether in-house, third party support, or outsourced;
   - The constraints/risks;
   - The business case for change.

The intended outcome is a more efficient data center estate that lays the foundation for:

- Improved service levels, new models and reduced staffing;
- Faster time-to-service, improved agility and utilization;
- Improved utilization of infrastructure, reduced power consumption;
- Improved vendor negotiation through centralization;
- A more adaptive and creative use of the organization's information assets.

The Journey to the Cloud

The process of redeploying an organization's data resources involves thorough scoping of the unique business needs, as well as its ongoing strategic goals and plans. It is almost inevitable, as CIOs and senior stakeholders within organizational structures examine their ongoing IT and business technology profiles, that they will also be considering the opportunities afforded by cloud computing and services.

However, since most in the mid-term will use services provided from both traditional data centers and cloud services, the role of optimization is also to lay the foundations for an infrastructure that can use the best of both—the hybrid cloud model. The path to an efficient and flexible infrastructure is therefore phased to allow for the best growth, using the most appropriate technologies, platforms and applications in each phase of development:

Firstly, the organization needs to consolidate and standardize the server and storage estate. Secondly, wherever possible, organizations should virtualize as much of their data centers as they can, to decouple the applications from the physical infrastructure components so they can be dynamically assigned to run on any available platform. In parallel, steps should be taken to automate the management and optimization of the services based on well-defined policies.

By taking these steps, an infrastructure can be created that will ultimately be able to support a combined in-house/cloud estate. If an application is peaking beyond the capacity of the in-house estate, it can access additional compute power from the cloud, from a trusted and secure supplier (often referred to as 'cloud burst'). Issues such as cloud interoperability due to proprietary APIs, and image and data storage formats, remain, but the ultimate goal of cloud computing is a seamless and secure elasticity, providing flexible computational power to cope with unpredictable demand.

Data center optimization programmes must have a pragmatic focus on near-term efficiencies, while being mindful of market trends and the likelihood of moving to hybrid in-house/cloud delivery models in the longer term.

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