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Blade Computing and the Public Sector

A new paradigm for the future

Blade computing is becoming a more important part of the IT Director's arsenal. Whilst often seen as a way of providing 'servers in a different form factor', blade computing in fact offers significant benefits in flexibility and responsiveness to business needs as well as big savings in power, cooling and floor space. This paper looks at the particular challenges in public sector IT – the need to find efficiency savings at the same time as offering better service to citizens – and discusses the particular circumstances in which blade computing will be right for the public sector IT manager.

- Public sector IT departments are no different from their private sector counterparts in being set up in 'silos' of different hardware, operating systems, applications and storage. This leads to inefficiency in usage – Quocirca research has shown CPU usage as low at 10% and storage utilisation only at 30%. The cost of managing this diversity only adds to the burden in an environment where significant efficiency gains are required to meet government targets
- Blade computing offers significant benefits to the hard-pressed government IT manager: it consolidates infrastructure, reducing on-going management overheads; it gives potentially big savings in heat, power and floorspace; 'plug and play' installation of new hardware enables applications to be deployed or scaled up quickly; it allows quick and cost-effective means of providing processing power for complex data analysis and applications can be re-provisioned quickly to respond to urgent requests which require intensive data analysis
- Pressure on public sector IT is more acute than ever: the range of applications is vast, the problem of 'silos' is as great if not more so than in the private sector, re-organisations are constant, the pressure on IT to contribute to savings and deliver improved services is immense and finally, the public service is about to be directly targeted to contribute towards the reduction of greenhouse emissions.
- The move to a 'shared services' agenda – functions such as HR, Finance and IT being run by one body on behalf of others – means that datacentres are going to become bigger and will need to be able to respond quickly and efficiently to their various clients.
- In this environment, blade computing offers many potential benefits to the public sector IT manager. The cost savings will of course be of interest to all across the public sector, including those who have outsourced IT and other business processes who should be looking to share a part of the cost savings that their suppliers will be benefiting from.
- In terms of benefits other than cost, particular areas of interest will be those where fast and flexible application implementation will bring about business efficiencies, those where data has to be available across organisations, where high levels of compute power are needed quickly and cost-effectively. Those organisations considering offering shared services to others will find the benefits of blade computing of even more interest.

REPORT NOTE:
This report has been written independently by Quocirca Ltd to address certain issues found in today's public sector organisations. The report draws on Quocirca's extensive knowledge of the technology and business arenas, and provides advice on the approach that organisations should take to create a more effective and efficient environment for future growth.

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1 Introduction to blade computing

1.1 Data centre background and the problems today

Traditionally, IT has developed along the lines of a number of silos with a wide range of legacy systems that have built up over time. Applications will frequently have been built on different hardware, which in turn will run different operating systems and access a wide range of data sources. A typical IT installation will have a diverse mixture of hardware, many of which reproduce the same functionality of hardware elsewhere in the infrastructure. Quocirca research has shown that CPU utilisation may well be under 10% on average, with storage utilisation at under 30%. Such redundancy of resources leads to consequent high overheads in power use, effective cooling and maintenance costs. With such infrastructure "stacks" being monolithic, it is very difficult to make better usage of these resources – there is simply not enough time for re-provisioning the resources with new operating systems, application servers and the application itself to make better usage of the resources.

Servers are also saddled with a historical architecture – standard motherboards with standard layouts. Direct Attached Storage (DAS), which can not easily be shared, is typically used for at least part of the organisation's storage, and this means single points of failure and high heat sources. Software is installed using optical devices such as CD-ROMs or DVD drives, with only intermittent usage still requiring power availability to be built into the server power supply. Resilience is built in by having multiple pieces of each hardware resource. Each part of the hardware requires of its own power capability, which builds up to the need for dedicated high-output power supplies running well below their capabilities, with internal cooling capabilities designed to meet the peak heat dissipation of the overall unit, combined with large areas of empty space to ensure that the servers do not overheat.

Previous attempts to minimise the size problems of servers have concentrated on trying to condense what there is into smaller boxes – the motherboards, the storage, the optical drives and so on remain, but we try to fit them into smaller units that can be stacked into a standard 19 inch rack, similar to those used within the old telecoms wiring closets. Although this has brought some benefits, power utilisation and heat dissipation remain major problems.

In many data centres, the main constraint to growth is no longer the actual real estate required for the servers – compute density has increased such that most data centres are not fully populated. The main constraints are the provision of uninterruptible power and the removal of the heat being generated within such small, but highly powerful, computers.

Therefore, we now have large data centres, where the pressures being placed upon the IT department are such that management of the existing resources and any sort of growth are both difficult. The plethora of hardware combined with the heat and power constraints brings many problems:

- hardware, particularly server and storage, use is inefficient and costly – more kit is bought in than necessary;
- new applications are more costly to develop than they should be – the simplest and quickest option is often to put them on new servers rather than distribute them around, adding to cost in the long term;
- the overheads on the IT department are higher than they should be – more staff are needed to maintain and troubleshoot the excess kit;
- overall systems management is difficult to impossible, yet a fault in one application silo can have a domino effect on other servers in the data centre, due to power and heat constraints.

1.2 What is blade computing and how can it help?

In blade computing, a single chassis contains a number of 'blades'. Each blade may contain one or more processors and memory, and may also contain its own storage capabilities, along with network connections. However, each function may be kept separate – CPU blades may be installed as a collection of resource, with storage blades being elsewhere in the chassis, or indeed being kept completely separate as Network Attached Storage (NAS) or as a Storage Area Network (SAN). A blade chassis is intelligent, enabling the blades to share data and power, and the whole unit can be engineered for optimum cooling. The chassis allows resilience to be built in using multiple power supplies, redundant networking blades, automatic failover from one blade to another on failure and so on. The chassis manages much of the necessary wiring between blades via high-speed data busses, so lowering the amount of external wiring required.

Blade computing therefore has significant benefits for hard-pressed IT managers:

- it allows consolidation of the data centre infrastructure and reduces complexity of the hardware to be managed, simplifying the IT department's management structure and the range of skills required, hence lowering management costs

- it reduces other costs as well: floor space is further reduced over that gained from using rack-mounted servers, fewer external cables are required and less power is needed for running the equipment and for cooling it. The cost of providing a backup power supply in case mains failure is also reduced
- it enables the IT department to respond quickly to the changes in the business requirements: 'plug and play' installation of new hardware enables applications to be implemented or scaled up quickly
- it improves performance for analytical applications: blade computing is a very quick and cost-effective means of putting a lot of compute power to complex analytical applications.

Internally, blades are not as standardized as standard tower and rack-mount servers – there is little chance to expand them via adding internal cards. However, as each blade is optimized for specific function, this is not a requirement – users are unlikely to upgrade CPUs, change graphics cards, have the need to replace inbuilt network capabilities, as all of these can be done through the replacement of the specific blade. As the blades themselves are built from commodity components (standard disk drives, standard CPUs, standard network interface chip sets, etc), the cost of individual blades is kept low through economies of scale.

Through today's basic hardware resilience, blades are manufactured for long term usage. Indeed, this capability means that updating infrastructures is far easier than previously – individual blades can be pulled from the system and replaced with newer blades with faster capabilities or more functionality, and will automatically be brought into the existing infrastructure. This is just repeated until all old blades have been swapped out for new blades. Even where the new functionality requires a new chassis (something that is bound to happen every few years), the new chassis can be put in place beside the old, and the new blades in the new chassis can progressively take the load from the old chassis/blades, until the point is reached where the old chassis/blades can be swapped out and removed.

Overall, blade computing can deliver significant benefits in terms of flexibility and its ability to enable IT to support the business quickly and cost-effectively. It can enable the IT department to take a close look at its hardware and realise savings. With all the major hardware vendors now shipping second or third generation blades, the technology is fundamentally proven. For many, though, the problem remains in the need to change technology mindset from an application/server one to a function/infrastructure one. Historically, organisations have bought an application that can run on the chosen hardware/operating system stack choice. Moving towards a more function driven paradigm, where technology is there solely to support the needs of the organisation and users, there is a strong need to review this approach – and to see where blades, along with a service oriented architecture (SOA) can help to build a flexible platform for the future.

How do the possible blade benefits map to the needs of the public sector IT department? The following section sets out some of the particular challenges of public sector IT and how blade computing might help public sector IT departments to implement applications more effectively and cut operational costs, freeing up more funds for investment in new applications.

2 Blade computing in a public sector environment

The UK public sector is coming under pressure as never before to deliver IT-based solutions to improve services to citizens, work more efficiently and deliver data analysis in response to the political pressures of the day.

2.1 Public sector IT challenges

Public sector IT has grown in similar ways to that in the private sector with the same 'silos' of applications, hardware and operating systems. Departments have to support a huge range of applications; a medium sized local authority serving around 200,000 residents recently reported over 130 different Line of Business applications, and the merger of HM Customs and the Inland Revenue meant bringing 200 different systems into the same organisation. Within larger organisations, many different departments frequently operate their own IT: in a local authority, housing will have a different system to social services, which will have a different system to education and so on. Such structures lead to far greater overheads than really necessary for efficient running of public sector IT.

The legacy systems run by the public sector are now in need of significant updating as services move from armies of civil servants inputting data from forms to web-based services which interact directly with the public sector employees and the citizen. At the local authority, mentioned earlier, email has grown from nothing to over 5 million emails per annum and can only increase as citizens use electronic means of contacting the local authority. This creates many new problems of data storage, retrieval and analysis – as well as regulatory requirements around data protection, there is an ever increasing number of bodies who monitor public sector performance and who require reports and analysis on a regular and ad hoc basis – often as a result of a sudden political problem.

Performance criteria are therefore becoming ever more demanding as more and more citizens come to depend on "on demand" IT-based services and pressure increases on the public sector to prove efficiency and value for

money. Some public sector organisations – universities, research institutions and defence organisations, for example – need particularly high levels of compute power for complex analytical work.

The public sector is subject to seemingly never ending organisational change: an average of 16 departmental reorganisations per year has happened in central government over recent years; during the 1990s local government reorganisation redrew the boundaries of more than 100 local authorities and the government is about to issue a White Paper discussing more restructuring of local government. As well as these major changes, the need to develop applications and share data across multiple departments and agencies – data relating to child protection across health, social services, education and the police, for example – is leading to a need for the flexible development of new IT applications, often bringing together differing data sources. New applications are typically developed as pilots involving a few users; the ability to scale up from these is also important.

New applications also need to be developed quickly in response to new political pressures; the recent inability of the Home Office to track offenders who should be considered for deportation is a prime example of the need for public sector IT systems to be able to find and analyse relevant data from different departments quickly.

As well as the need to deliver new applications, the public sector is also under intense financial pressure. The Gershon review in 2004 set a target of 2.5% annual efficiency savings across government and the "Transformational Government" strategy published at the end of 2005 envisages saving 10% of operational IT spend to free up funds for new IT investment. This means that the public sector IT department needs to contain operational cost as far as possible. It needs to integrate its legacy systems into new applications as cost effectively as possible, and cannot afford wholesale 'rip and replace'.

The need to release operational efficiencies is also leading to a 'Shared Services' agenda, whereby functions such as Customer Services, HR, Finance are shared between departments. Those that run such services in an efficient way are well positioned to offer more services across the public sector; those that do not will face pressure to contract out such services to other departments or bodies.

Public sector investment in IT staff has historically been quite low, and the government has recognised the need to improve skills within the Government IT profession. However, salaries will remain low in comparison to similar positions in the private sector and in professional services companies – so creating a pressing need for systems that are more easily managed by existing staff, or that can be managed by fewer, but possibly higher paid, staff.

Finally, the UK in general is under pressure to improve its record on the environment, and this is about to be translated directly into pressure on the public sector to contribute to the effort to reduce carbon emissions. The government has conceded that it is unlikely to meet its pledge to cut carbon emissions by 20 per cent of 1990 levels by 2010, but nevertheless expects to bring it to 15-18% of that level. Its 2006 Climate Change Programme envisages the introduction of strategic targets for energy savings in central government, loans across the public sector to finance investment in energy efficiency and incentives for local authorities to take action on climate change.

2.2 The application of blade computing in the public sector

In this environment, then, how can blade computing help the public sector IT manager?

Clearly, the need for operational efficiency is a major driver. Much real estate in the public sector is not ideally suited to modern datacentre needs – IT rooms exist either in somewhat old buildings, or newer, often badly built ones, neither of which provide adequate facilities for power, communications or air conditioning. Organisations needing to update their IT estate will find the power, cooling and floor space savings in blade computing can bring significant cost savings Figure 1 shows example savings from the private sector.

Figure 1: example savings, large financial institution[1]

Category	Savings
One-off savings	
Racks	£26,000
Recurring savings	
Power	£112,000
Cooling	£45,000
Floor space	£29,000

Looking across the board at savings figures shown by other major manufacturers, we see savings in the range of:

- operational savings (reconfiguration) of over 80% (Source: HP)

[1] Source: IBM

- power savings of 25%, cooling 25% and space 30% (Source: Fujitsu Siemens)
- floorspace savings of 43% (Source: Dell)

As well as savings in power and cooling contributing towards both financial savings and energy efficiency targets, the reduction in floor space can be an important issue in the public sector, which cannot afford more space to be taken up by new hardware for new applications. Whilst many organisations are reducing staff numbers, hence have no immediate use for the floor space freed up, others – in local government, for example, might be consolidating into fewer buildings and will find floorspace reduction of some benefit. Using blades where services are shared will offer additional cost savings by using less floor space than would otherwise be the case, and freeing up existing IT space for other uses, or disposal, in those departments no longer needing dedicated IT hardware for these shared services.

However, as we have seen, blade computing is more than cheaper servers in a different form factor. It provides many other benefits to the IT manager and the business.

Firstly, blade computing provides flexible support for multiple applications. A blade infrastructure is inherently dynamic – it can be provisioned and de-provisioned as needed. Therefore, a section of a blade infrastructure required for running a report during one part of the day – for example, analysing what has happened to foreign nationals released from our prisons (depending on the availability of robust data of course) - can be reprovisioned to service the on-line needs of citizens later that same day. Hardware support for one set of applications based on Microsoft Windows can easily be moved to supporting Linux-based applications at another time.

Further, storage can be virtualised and partitioned to provide secure, highly optimised capabilities that also support the needs for audit and governance. Thus, certain data sets – related to particular health issues, for example – can remain confidential.

Specialised blades can be utilised for specific tasks. Web acceleration blades can improve the response times for citizens looking at unchanging information – for example, in an emergency, a consistent data set from a single source can give out information via the web to very large numbers of people. Specialised security blades can provide high-throughput capabilities where such security is a high need. Again, as each of these blades is part of a virtualised environment, different applications can be re-provisioned throughout the environment as needed. An example could be in a shared services environment, if one particular department has a need for a quick re-work of its salaries, this can be done quickly and efficiently - so making shared services even more effective.

Moving to such architectures enables public sector IT departments to respond rapidly to changes in the business' demands: blades provide the capability for the IT department to implement new solutions or scale up from pilots very quickly based on this inherently flexible infrastructure. Being able to implement applications early enables efficiency savings to be gained that more quickly as well.

Overall, public sector IT managers face many of the same challenges as their private sector counterparts, but the pressure to deliver is even more acute and success or failure highly visible. Blade computing can offer significant benefits in terms of reducing cost and complexity, enabling better services and efficiency savings.

3 Conclusion

Blade computing has big advantages for public sector IT departments; it offers an opportunity to look at how the IT estate is managed and find operational savings as well as support new applications quickly and flexibly. It might not be appropriate in all circumstances: it might not be right for wholesale 'rip and replace' – groups using mainframes may still find that these are more space and cost efficient in the medium term than moving to blades. Similarly, where investments have been made in the not too distant past in dedicated client/server or highly specialised applications, trying to blade-enable these may not be the most efficient short-term way forwards.

However, blade computing can offer significant advantages in a number of scenarios:

- where functional redundancy is very high and where the savings in management resource as well as heat and power can justify the investment in blades; it certainly should be considered as part of the organisation's data centre consolidation programme;
- where there is the highest priority for shared services: organisations looking to be providers of shared services will not only be interested in lower costs, but also the flexibility inherent in a blade architecture;
- where IT or other business processes are already outsourced: department heads should be asking their suppliers about the use of blade computing and ensuring that the savings offered by greater flexibility and less power and floorspace are shared with the customer as well as benefiting the supplier;
- where there is the highest priority for sharing applications and data across organisational boundaries: here again, flexibility is key;
- where there is a need for lots of processing power, for example, across organisations in health, defence and education.

In deciding whether to invest in blade computing, the IT manager will need to look at the varying offers on the market, and in particular take account of the following:

- Architectural approach: blades are not just computers - blade computing is an architectural approach, and this needs specific management capabilities to make the most out of the architecture. Blade vendors must be able to demonstrate how such an architecture will be managed, how it will be flexibly provisioned and deprovisioned, how new resources will be brought in to the architecture and so on.
- Specific Blade processors: although blade computing is seen as a means of building from commodity components, the use of highly specific specialised blades can create a far more flexible and responsive environment. Does the blade vendor support and provide such specific blades - e.g. caching blades, security blades, etc?
- Chassis design: is the chassis designed specifically for blade computing? does it provide specific solutions for power, cooling and wiring? is there forwards and backwards compatibility for existing and forthcoming blades?
- Overall heat and power needs: although blades are inherently lower power users than other computer data centre form factors, they tend to concentrate heat in smaller areas. how is heat dispersion managed? Is external cooling required, and how will this be engineered into the overall solution?

Across the public sector, cost savings will be the deciding factor when IT and business management come to consider whether to invest in blade computing. The decision can be made on a fairly straightforward investment case basis – does the investment payback? by how much and in what timeframe? As well as the cost benefits however, blade computing offers advantages in ease of management and ability to respond to business needs that should make them a core part of public sector IT strategy going forward.

About Quocirca

Quocirca is a company that carries out world-wide perceptional research and analysis covering the business impact of information technology and communications (ITC). Its analyst team is made up of real-world practitioners with first hand experience of ITC delivery who continuously research and track the industry in the following key areas:

- Business Process Evolution and Enablement
- Enterprise Applications and Integration
- Communications, Collaboration and Mobility
- Infrastructure and IT Systems Management
- Utility Computing and Delivery of IT as a Service
- IT Delivery Channels and Practices
- IT Investment Activity, Behaviour and Planning
- Public sector technology adoption and issues

Through researching perceptions, Quocirca uncovers the real hurdles to technology adoption – the personal and political aspects of a company's environment and the pressures of the need for demonstrable business value in any implementation. This capability to uncover and report back on the end-user perceptions in the market enables Quocirca to advise on the realities of technology adoption, not the promises.

Quocirca research is always pragmatic, business orientated and conducted in the context of the bigger picture. ITC has the ability to transform businesses and the processes that drive them, but often fails to do so. Quocirca's mission is to help organisations improve their success rate in process enablement through the adoption of the correct technologies at the correct time.

Quocirca has a pro-active primary research programme, regularly polling users, purchasers and resellers of ITC products and services on the issues of the day. Over time, Quocirca has built a picture of long term investment trends, providing invaluable information for the whole of the ITC community.

Quocirca works with global and local providers of ITC products and services to help them deliver on the promise that ITC holds for business. Quocirca's clients include Oracle, Microsoft, IBM, Dell, T-Mobile, Vodafone, EMC, Symantec and Cisco, along with other large and medium sized vendors, service providers and more specialist firms.

Sponsorship of specific studies by such organisations allows much of Quocirca's research to be placed into the public domain.

Quocirca's independent culture and the real-world experience of Quocirca's analysts, however, ensure that our research and analysis is always objective, accurate, actionable and challenging.

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