COMMUNITY
RESEARCH

x86 Server virtualisation check point

How dynamic should your data centre be?

Andrew Buss, Freeform Dynamics Ltd, November 2010

We hear a lot about the self-service data centre, where everything is highly automated and virtualised, and where dynamic provisioning allows seamless deployment, management and billing. This is a compelling vision, and one we probably should be working to achieve, but just how realistic is it in today's investment environment?

KEY FINDINGS

Data centres are considered to be in good shape and not in need of radical overhaul

While there are undeniably many challenges associated with running a large x86 server environment or data centre, this does not translate into the need for a wholesale overhaul of existing assets or a completely new approach for the sake of it. Many of the issues may be helped by adopting new technologies such as virtualisation, but these need to be considered in terms of how they can incrementally improve or build upon what is already in place.

Outright ownership of servers shows little sign of changing

Despite the economic issues of the last few years, approaches to server procurement still favour outright purchasing. Few companies put much emphasis on alternative options such as financing or leasing, let alone hosting or cloud. Opinions are slowly starting to change, as the future outlook is slightly less hostile to using externally procured services to support the physical infrastructure.

Virtualisation is being widely adopted but is limited mainly to consolidation activity

Virtualisation has become a central tenet of data centre strategy, but a lack of experience, skills and tools, as well as the pressing need to reduce costs, have limited its role to enabling server consolidation. Consolidation is a natural progression for server managers, which fits in with and complements existing server provisioning and management practices. This comes at the cost of some additional complexity in getting to grips with the abstraction that virtualisation provides.

Dynamic Infrastructure needs IT and the business to tie together for full effect

The vision of a fully dynamic infrastructure is appealing, but the journey is not without challenges and risks. IT may gain some advantages from adopting elements of continuously optimised infrastructure, but the level of investment required in terms of platforms and tools may put such an investment out of reach when based on the returns for IT alone. For the benefits to be fully realised, the business needs to be in the driving seat, so that the investment return can be realised and amplified across the business.

Power and efficiency savings are more of a focus than 'Green IT'

'Green' has been one of the most hyped and controversial topics of the last decade, with a lot of focus in both column inches and legislation. Despite this, the majority of companies have no real focus on the environment and sustainability, and only one in eight allow 'Green' principles to guide IT investment and behaviour. Even though there may not be an explicit commitment to 'Green IT', focusing on power efficiency and reduction makes good operational and business sense.

The study upon which this report is based was independently designed and executed by Freeform Dynamics and performed in collaboration with The Register news and information site. Feedback was gathered via an online survey of 386 IT professionals from the UK, USA and other geographies. The study was sponsored by Intel.

Introduction

Virtualisation is fast becoming a central pillar of data centre activity. The majority of companies have deployed virtualisation technologies in order to consolidate all or part of their x86 server infrastructure. This is often portrayed as the first step on a journey, where initial consolidation activities to reduce physical server numbers could ultimately lead to a flexible pool of computing, network and storage resources that are continuously monitored, managed and automated, to provide an optimised and dynamic IT infrastructure.

We can segment the "virtualisation journey" into four distinct stages, which we shall reference frequently throughout the report. To keep things simple both in the report and on the charts we will refer to these as:

- **Server consolidation** – The use of virtualisation to run multiple workloads on a single server.
- **Resource pooling** – The use of virtualised server 'pools' that are managed from an operational standpoint as a single computing resource to support a mix of workloads.
- **Dynamic infrastructure** – The use of automated virtualisation management facilities allowing workloads to be easily moved around the internal infrastructure to achieve continuous optimisation.
- **Cloud resourcing** – The use of virtualisation management facilities allowing workloads to be easily moved between local infrastructure and an external 'cloud' service to deal with rapid expansion, transient over-spill, etc.

While consolidation activities follow familiar concepts and techniques and are thus a natural fit, dynamic IT requires a step change in IT strategy, investment and management, which impacts both IT and the business. For IT departments that are not under pressure from the business to have more responsive and flexible IT service provisioning, could adopting dynamic IT still be justified based on operational cost reduction and the general lowering of the burden on IT?

In this report we review where organisations are on the journey, and indeed whether or not it is valid to talk in terms of a journey at all. We examine the views of senior IT managers, technical decision makers and IT management professionals to determine what the reality is today, and what the future holds for companies considering the relevance of moving to the next level of virtualisation.

Inputs into this report

As a foundation for our discussion we'll be using input gathered via a research study completed in August 2010, during which feedback was gathered from 386 respondents via an online survey.

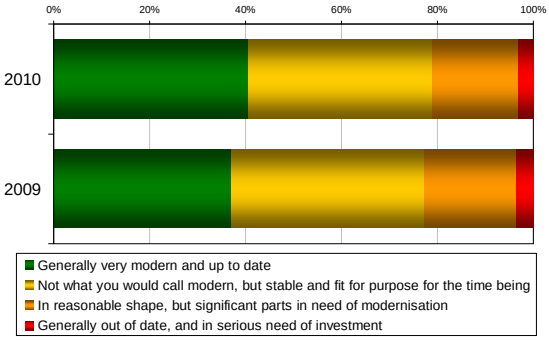
Those who participated in the study were mainly IT professionals or managers from a range of organisation sizes and industries, with representation predominantly from the UK and USA, and a number of respondents from other geographies (see Appendix for more details).

Given that the research was conducted online, we were particularly conscious of the potential for bias towards respondents who had more of an interest in virtualisation. To counter this, we structured the survey around the general theme of x86 server trends. We have, therefore, been able to compare those with more extensive virtualisation experience against respondents who have a more limited exposure.

The study was designed and executed on an independent basis by Freeform Dynamics Ltd (www.freeformdynamics.com) and conducted in association with The Register news and information site (www.theregister.com). The study was sponsored by Intel.

Data centre improvements continue apace

To get things started, it is useful to understand how virtualisation and dynamic IT fit into the broader context of server investment, challenges and priorities. Looking at x86 server estates at a high level, it is clear that the vast majority of environments either function reasonably well or are bang up to date, with no pressing need to undergo radical restructuring. The server world is not changing overnight, as we can see in the similarities in the makeup of the server environment between 2009 and 2010 (Figure 1).

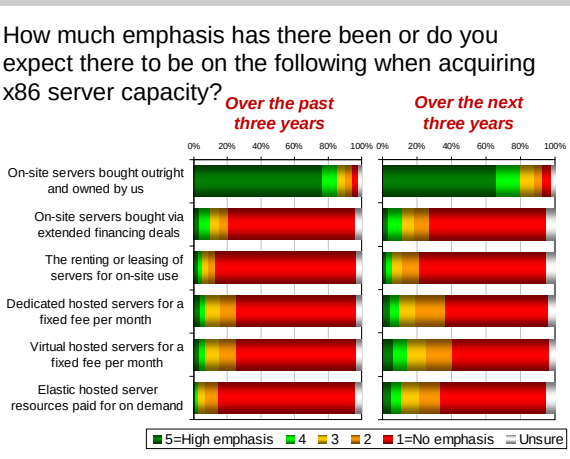


Data centres are generally fit for purpose and undergo continual modernisation.

Figure 1

Infrastructure modernisation tends to be an ongoing process, with a certain proportion of the data centre being replaced by more modern hardware on a rolling basis as kit ages and moves out of warranty or becomes unfit for purpose, either in feature set or performance. We can see this reflected in the attitudes of server managers to kit replacement, where the vast majority of server managers plan to replace server equipment after a period of between three and five years.

The lack of a pressing need to change is also reflected in how organisations source server or computing capacity. Most companies have traditionally bought x86 servers outright, and this has remained true despite the existence of financing and leasing alternatives, and the more recent emergence of external server hosting or cloud services (Figure 2).



While the overwhelming preference is to continue to own servers outright, there is increasing attention being paid to using external capacity in the future.

Figure 2

The severe economic recession has not caused this to change in a meaningful way, and it does not look like this acquisition-centric buying behaviour is going to change in the near-term. Many IT departments are comfortable buying kit in the usual way which is interesting given the frequent reference made to a notional shift from capital expenditure to operating expenditure.

While it remains small, it is worth noting the growing interest in using external hosting or cloud providers to provide server capacity. This increase in interest is irrespective of whether companies have implemented dynamic infrastructure, server consolidation or do not make use of virtualisation. Of course, expressions of interest do not always translate into action - as we shall see later in this report, other factors, such as the ability of IT to integrate accounting and procurement policies, have an influence on actual uptake. However, it does show that awareness of the solutions available is growing, and that server managers feel this could be a solution to some of the infrastructure issues that they face.

So, while the way things are bought is not changing that fast, can the same be said of the on-going challenges seen in server management and operations?

Operational issues remain the biggest server challenge

When we asked about which general areas are the most challenging in relation to x86 servers, three of the top five challenges involve operations and management – namely overstretched staff, patch management, and availability and recovery. These topics have been with us for a long time and are unlikely to be solved anytime soon (Figure 3).

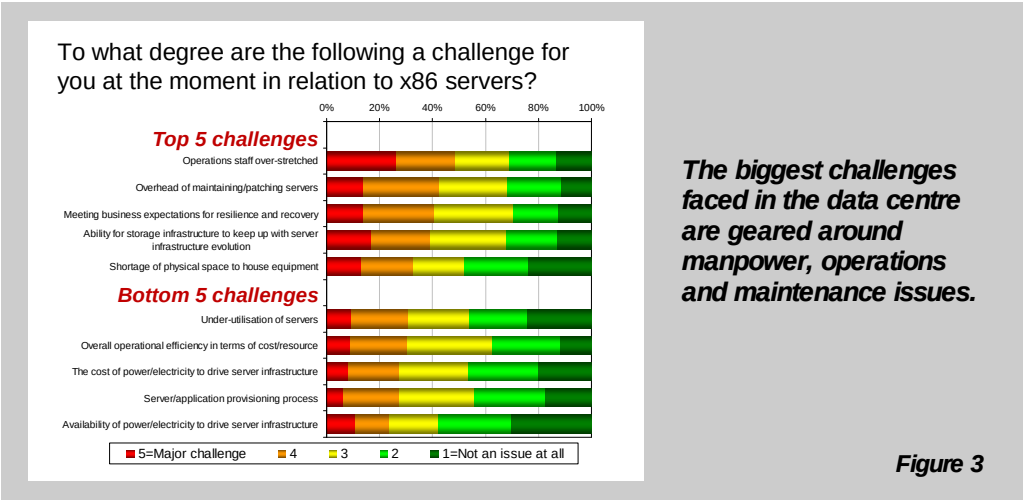
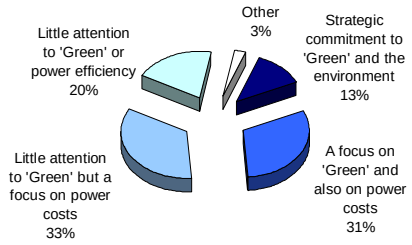


Figure 3

Looking at the five least challenging issues is also illuminating, as these are all major factors that tend to influence investment in virtualisation solutions. The implication is that, for many if not most data centres, there are many pressing priorities that are all competing for attention – which is particularly relevant when we think about issues of power supply and costs. While the environment may be top of mind for politicians, in the world of business, few companies incorporate "Green IT" as a core value, which in turn influences how departments such as IT plan and justify their investments.

The reality is that in most cases, the closest that many IT departments come to "Green IT" is to optimise certain aspects, such as reducing power and cooling, or increasing utilisation (Figure 4).

Which of the following best describes what 'Green IT' means to your organisation at the moment?



"Green IT" may be making headlines, but the reality on the ground translates to increased operational efficiency.

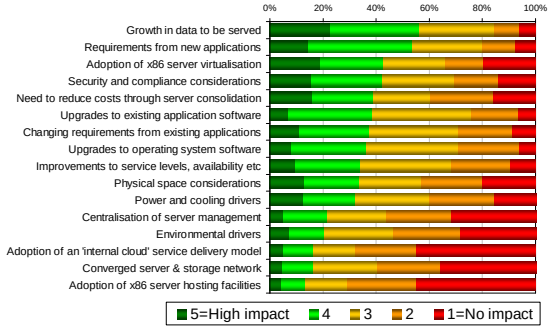
Figure 4

This high level view of the server landscape is useful for us to put everything in perspective when looking at the impetus behind the adoption of virtualisation. For most organisations, things are generally OK, with nothing fundamentally broken, but as we shall see below, there are a number of areas that remain challenging.

Data centre priorities and the focus on virtualisation

We can get more insight into the issues affecting the x86 server estate by considering what areas are having the biggest impact on architecture and operations. What stands out is that server managers are juggling a bunch of competing priorities. Managing storage growth and dealing with requirements for new applications or services feature most strongly in terms of impact on investment and architecture, along with server virtualisation & consolidation, security & compliance and upgrades or changes to the application portfolio (Figure 5).

How much are the following impacting how you architect, evolve and operate your x86 server related activities and investments?



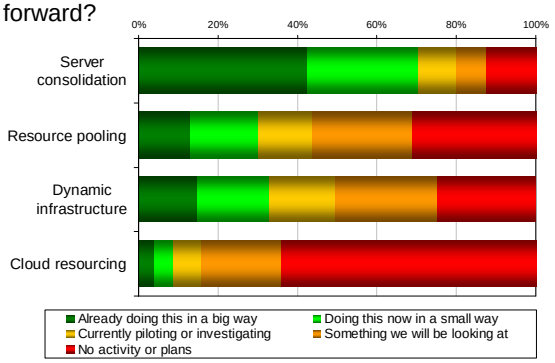
While server consolidation ranks highly, it is areas such as data management, new applications and security that have the biggest impact on server operations and architecture.

Figure 5

Interestingly, while consolidation activities feature strongly, there is little impact felt yet from either the "internal cloud" service delivery model or from hosted or cloud based server facilities, both of which appear right at the bottom of the list.

Given the number of initiatives competing for attention and funding, decision makers will inevitably focus on priorities that can deliver the clearest benefits within the shortest timeframes. On this point, then, what does this mean for the adoption of virtualisation, and how does this affect investment and architecture in the modern data centre?

To understand how to best deploy virtualisation, we can look at how different virtualisation technologies are used today, and how they fit into the longer term investment plans. It is clear that virtualisation has moved beyond the status of "laboratory rat" and into regular production. According to survey respondents, it is now the exception where server consolidation is not in use, or does not feature in future plans (Figure 6).



Virtualisation is in widespread use in many companies, but is mainly limited to consolidation activities.

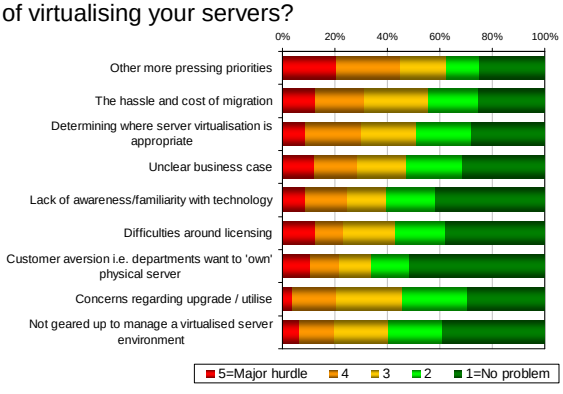
Figure 6

However, it is also readily apparent that most companies are not yet ready to progress on the journey of virtualisation beyond server consolidation. When we look at the advanced features enabled by virtualisation – resource pooling and dynamic infrastructure – these have been taken up by less than a third of companies overall, and by less than a fifth in a big way. The adoption of advanced virtualisation solutions may be low today, but the longer term outlook is more positive as such capabilities feature on the radar of many.

Of equal interest is that whatever the amount of buzz and hype surrounding Cloud, there is substantial resistance to the idea of moving workloads out of the private data centre and onto externally hosted cloud services. We shall come back to this point later, but first let us consider what is slowing virtualisation down.

Virtualisation challenges

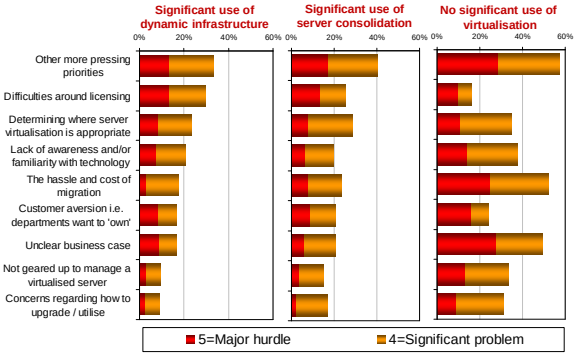
In general terms, the biggest hurdles that may get in the way of virtualising servers are operational or financial, suggesting that it is inertia, coupled with a lack of experience that puts many companies off making the leap to deploying virtualisation (Figure 7).



The biggest barriers to virtualising the server infrastructure are operational in nature, with other priorities taking precedence.

Figure 7

It is interesting to look at those cases where there is no real use of virtualisation compared to those who have real world experience. The objections raised where there is no significant virtualisation use relate mainly to the unknown, particularly management, skills and finance. Actual experience of virtualisation, even if it is limited to server consolidation, goes a long way to reducing these uncertainties, indicating that once virtualisation activities are under way there is no massive 'gotcha' to jump out and derail plans. The biggest issue is making the decision to proceed in the first place (Figure 8).



While other priorities remain a consistent hurdle to virtualisation, experience can reduce the impact and risk of many of the perceived challenges.

Figure 8

It is clear that virtualisation projects are fighting for attention and budget against many other priorities, and that the problem is most acutely felt where virtualisation is not in active use in any way. Once virtualisation is in place, it competes much more effectively for attention, indicating that it provides a significant benefit to the operations and optimisation of the server infrastructure.

It is worthwhile considering the impact of licensing, as this was the only issue felt to increase in difficulty as use of virtualisation increases. Many existing licensing models were designed for the deployment and use of software on physical servers and a static infrastructure. However, there is a growing realisation of the importance that licencing policies may have on the ultimate success of virtualisation projects. As a consequence, any virtualisation project should include licence negotiations and costs as a potential risk factor.

The business end of virtualisation adoption

One of the distinguishing features of virtualisation is that it decouples operating systems and applications from specific physical machines. This can, in principle, support fundamental changes to how IT is provisioned, and could therefore be a major enabler of the journey to Dynamic IT and beyond. From past experience however, we know that the journey needs also to encompass non-technical areas such as procurement and operations. Focusing specifically on the former, we saw at the beginning of this report, that organisations are in no great rush to change how they acquire their IT facilities. The question is, when it comes to the adoption of virtualisation and its ability to support the journey towards Dynamic IT, would it make any difference if they did?

In the research, we asked directly which approach best described the way in which organisations are modifying procurement and accounting policies to take account of flexible, virtualised server infrastructure. To keep things simple, we have grouped the responses into three general categories:

- **"Procurement/accounting policies already dealt with"**
    - Our procurement and accounting policies and processes have already been modified to account for servers being shared and/or reallocated
- **"Grappling with procurement/accounting policies"**

- We are currently dealing with sharing/reallocation situations by exception, with the help of the finance and business guys
- Procurement and accounting practices are currently preventing us from sharing/reallocating servers as much as we would like
- We are sharing and reallocating as we need to, but don't even try to sync this up with procurement and accounting because it is just too much trouble
- We are not sharing and reallocating resources that much at the moment, but see this as a potential issue down the line

- **"No one cares that much about keeping tabs"**
  - Accounting and procurement is not an issue because no one cares that much about keeping tabs on things that precisely

Despite the widespread adoption of virtualisation by way of server consolidation, less than a quarter of companies have made the move to adapt their IT procurement and accounting policies to maximise the potential benefit. Around a third have recognised the issue or are working through steps to deal with it, but the largest proportion are content to carry on with business as usual (Figure 9).

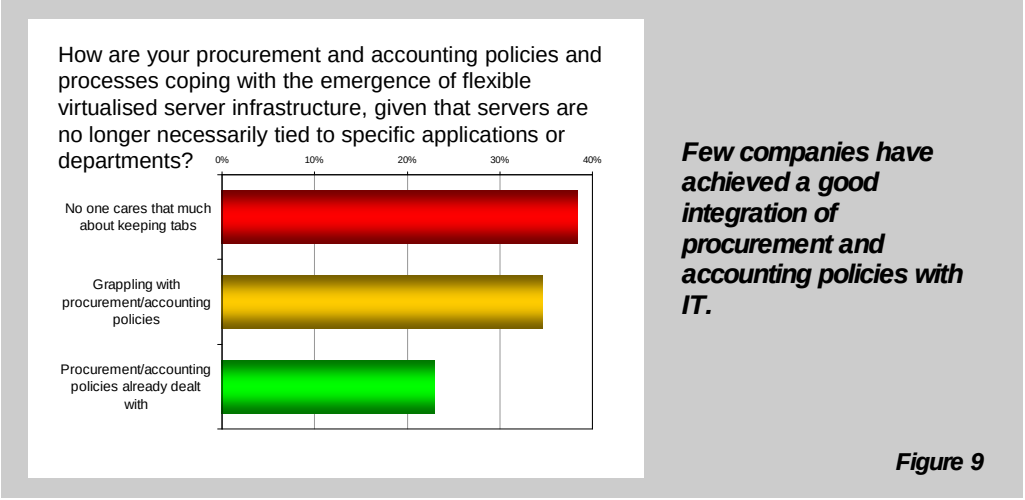
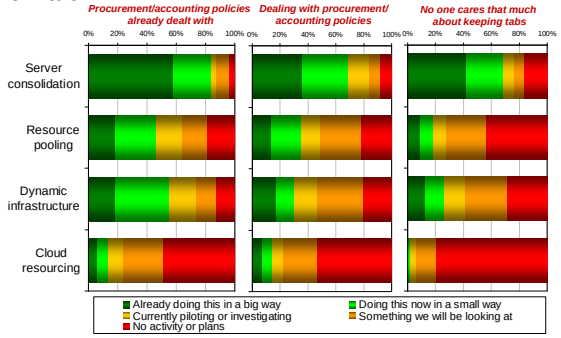


Figure 9

Returning to the question that we raised earlier on, just how does changing the approach to the procurement and accounting integration influence the adoption of virtualisation and cloud services? It is notable that server consolidation is widely adopted, even if there are no moves to integrate procurement and accounting with virtualisation. This is to be expected, as implementing server consolidation to run workloads on fewer physical servers is mainly an extension of familiar provisioning and management techniques. On the other hand, there is a lot of resistance in these companies to the use of resource pooling, dynamic infrastructure and especially cloud resourcing.

Crucially though, there is a mind-set change where companies have dealt with - and to a lesser degree started to deal with - adapting accounting and procurement policies to cope with virtualisation. There is a greater propensity to adopt virtualisation of all forms, including dynamic infrastructure and cloud resourcing (Figure 10).

Do you see a significant role for the following to optimise your on-site x86 server resources looking forward?



Where procurement and accounting policies start to take virtualisation in account, there is significantly more use of dynamic infrastructure, and resistance to cloud resourcing is far less.

Figure 10

This shift in approach to virtualisation and cloud services depending on the state of accounting capabilities is significant. Moving virtualisation to the next level beyond consolidation brings a whole host of potential around integrated management, automation, service quality assurance, performance management, flexible accounting and cross-charging. Implementing these capabilities is not dependent upon virtualisation – indeed, some IT departments developed these types of capabilities long before virtualisation emerged, based on demand from the business, and the probable outcome is that these companies have more readily taken to implementing dynamic infrastructure, as they have found it easier to do so.

Does this mean that implementing server pooling or dynamic IT should be off the menu if accounting integration is less than perfect? No, but it does make for more difficult decisions as to where or why to invest, leading to the classic chicken and egg situation. Where the business runs the same applications in the same manner as before, it will be difficult for IT departments to justify unilaterally investing in tools and techniques to turn everything into a cloud.

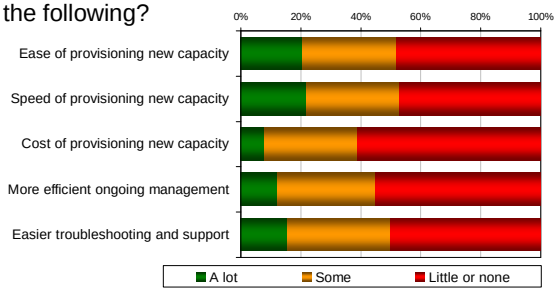
Getting the business to change, so that it can really take advantage of dynamic infrastructure will be difficult for IT to manage alone. The likely course is that this will be a slow evolution where IT adopts those elements of Dynamic IT that are cost effective and make most sense, while working to help the business gradually evolve its use of IT services as part of a longer term IT transformation strategy.

"Integrated stacks" are not seen as adding a lot of value

We have seen that virtualisation is established for consolidation and that interest in dynamic infrastructure is growing. Some IT vendors have sensed an opportunity and have developed 'integrated stacks' of server, network, storage and software which are optimised for dynamic infrastructure and virtualisation. We have also seen that continuing investment means the server estate is generally considered to be pretty good overall. How do these new proprietary integrated stacks weigh up against what we already have in place and are comfortable with?

Integrated stacks are, perhaps, a necessary if not vital element of the fully virtualised and dynamic data centre. The question is whether this is best served by implementing a proprietary, vendor defined stack, or by integrating kit from multiple vendors using standardised building blocks? The reality today is that proprietary stacks are generally seen as being able to help only a little, if at all, compared to the existing technologies that managers are experienced and familiar with (Figure 11).

How much do you see the emergence of 'integrated stacks', where suppliers deliver server, storage and networking capability (and even some software) as a pre-integrated platform solution helping with any of the following?



Existing server infrastructure is seen as pretty capable compared to integrated stack solutions.

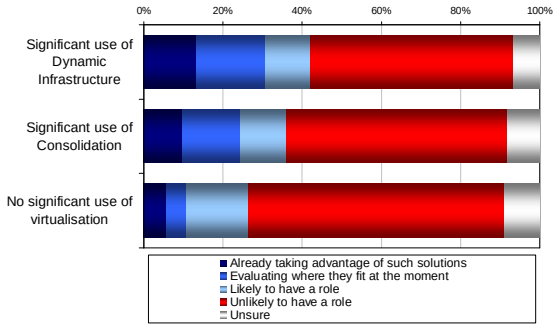
Figure 11

Integrated stacks - at least as far as the initial generations go - involve a significant architectural change across servers, applications, storage and networking in order to realise the full benefit of the integration. This type of approach is best achieved either for 'Green Field' implementations, or large scale, forklift type upgrades or refreshes, but even in these cases acceptance is still far from universal.

Often, this will involve having to choose a single vendor to provide all the hardware and much of the integration software. With the limited portfolio available, proprietary integrated stacks may also lock out other solutions.

This can be seen in the difference in attitude to the scale of use that integrated stacks are likely to have depending how virtualisation is used. The more dynamic the infrastructure, the more that interest and use increases. The clear outcome, though, is that the firmly held view remains that proprietary stacks are unlikely to play a major role outside of highly optimised environments in the foreseeable future (Figure 12).

How likely is it that these integrated stack offerings will figure significantly in your plans and activities moving forwards?



Early generations of integrated stack have yet to make a significant impact on investment decisions even in heavily virtualised environments.

Figure 12

Conclusion

The vision of a flexible and dynamic IT that is built on top of virtualisation is compelling – at least in principle. However, the findings of this report show a significant investment in existing server infrastructure, which functions well most of the time. IT managers have built up a body of experience and habits around what tends to work, and have adopted virtualisation in the form of

consolidation, as this is where it fits best with, and complements the status quo, such as architecture, management, purchasing and accounting. Stopping here for many companies will be no bad thing – they will have realised many benefits such as hardware savings, power and cooling reductions, better use of space at the expense of only a mild increase in complexity.

Moving beyond consolidation requires significantly more effort, because of the impact that dynamic IT has on existing practices, architectures and experience. This implies that there is a chasm to cross, and this is not something that IT can do purely for theoretical benefits – the investment required to realise this vision means that the IT department alone, without the drive from, or support of the business, will find it difficult to justify or implement Dynamic IT. If the business sees virtualisation as a driver of business value, not just a means to reduce spend or cut costs, then this is more likely to be achievable in practice.

Action points: practical tips for improvement

This short series of pointers is designed to distil the lessons learned from the research, and provide some practical ideas for shaping new x86 server initiatives, or reviewing existing ones.

Stick with what works as much as possible, but utilise natural change to drive improvements

Data centres and server implementations are generally felt to be quite well suited to delivering the applications and services the business demands. There is no need to press for radical change when what has been architected and implemented is well suited to what the business needs.

Ongoing refreshes are part of the overall investment strategy of the server estate, so consider introducing or trialling new concepts as part of the cycle when change is naturally happening, or when other initiatives may allow virtualisation to "piggy back" its way into use.

Virtualisation may help to alleviate existing problems, even if you do not realise it

The starting point for companies looking at virtualisation is one of uncertainty and doubt, with a lot of issues based around knowing where to begin, what to focus on, how to do it and what the ultimate benefit may be. Virtualisation competes with other pressing priorities, and without cold, hard experience to back up the argument for investment, it may take a back seat to initiatives that shout louder or are causing immediate pain.

Once virtualisation has been implemented, even if only for consolidation, it is able to hold its own more effectively against competing priorities, while most of the uncertainties decrease dramatically. The increase in the perceived usefulness of virtualisation compared with other priorities suggests that virtualisation is having a positive impact on the server environment in general.

Dynamic infrastructure is a lofty goal, but needs the business to drive adoption

Just because you can build a dynamic data centre, this is not a good reason to do so. The level of investment in skills, equipment and operations to achieve a dynamic infrastructure is high. If the business demanded it, IT would have – and indeed many already have – developed dynamic IT systems independently of the adoption of virtualisation.

Justifying the investment of dynamic infrastructure based on efficiency improvements for the IT department alone may be a stretch – but when balanced against potential improvements across the whole business, it becomes much more compelling. IT can try and influence the business to change, but this will probably be a gradual evolution, and without buy-in, the investment will most likely be better spent elsewhere.

Prepare for the change that virtualisation will bring

Many companies are implementing virtualisation without preparing for the change that this might bring. The impact may be felt architecturally, with changes in how servers, storage and networking are integrated and deployed. It can also be felt operationally, with the challenges of licensing and fragmented or disjointed management tools putting the brakes on dynamic IT.

Dealing with the licensing problem requires a dual-pronged approach. The first part of the problem requires negotiation with the different vendors that supply the applications and services that run on the server infrastructure. The ultimate aim is to modify the licence terms so that they are well

aligned with the needs of the virtualised data centre. The second part of the problem involves developing a dynamic asset and licensing management solution that can accurately and effectively track usage in this new virtualised server infrastructure.

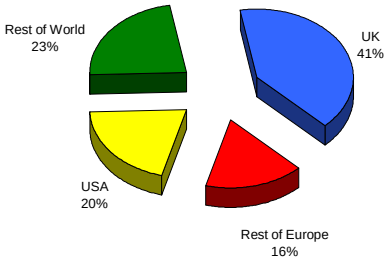
Many companies are likely to underestimate the changes that virtualisation will bring to the data centre, resulting in potential headaches down the line. Now is the time to think about these challenges and incorporate them into medium and longer term strategic planning.

Appendix A: Study Sample

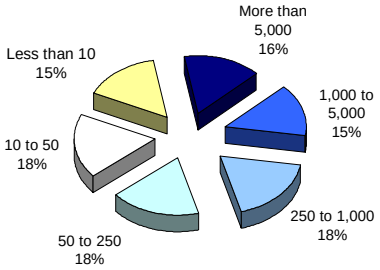
Feedback was gathered via an online questionnaire published on The Register news and information site (www.theregister.com). The respondents – totalling 386 – were largely IT professionals, representing a good cross section of job functions, and working in a range of different industry sectors.

The composition of the sample by organisation size and geography are as follows:

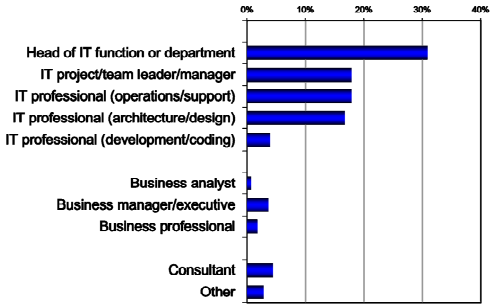
Which part of the world are you based in?



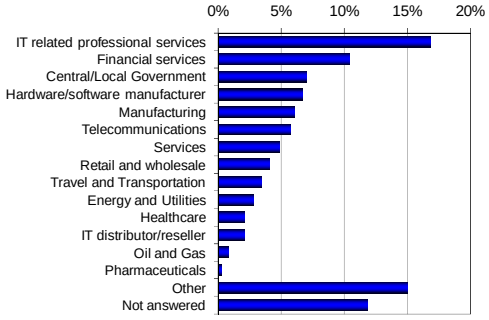
Approximately how many employees do you have in your organisation?



Which of the following best describes your role?



What is your industry sector?



Acknowledgements

Our thanks go to all those who participated in the study, whose feedback has been invaluable in providing insights into the practicalities and opportunities in this interesting, diverse and complex area.

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