

IaaS: PERFORMANCE UPGRADE

How this cloud resource can boost IT infrastructure services enterprisewide, and support Big Data and disaster recovery projects

Executive Summary

Many enterprises find great appeal in outsourcing some or all of their computing infrastructure. It's cost-effective, scalable, flexible, efficient and, most important, allows the organization to focus on innovation and the mission instead of managing infrastructure. It also provides helpful tools to manage and analyze growing stores of data, handle capacity spikes and test the waters for new products and services.

More and more, organizations are seeing the benefits of infrastructure as a service. According to a recent Frost & Sullivan report, adoption of IaaS rose in every category from 2011 to 2012 – those adopting IaaS, planning to adopt it or considering adoption.

The missing piece of the puzzle is the service provider – one that understands the technology, can evaluate an organization's needs, and implement, integrate and manage the infrastructure effectively.

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A Solution for Today's IT World

The way that enterprises conduct business, respond to customers and promote innovation has changed dramatically over the past decade. Today, managers are taking control of departmental or organizationwide initiatives from start to finish. They're not only hiring the talent, developing the program and process, and setting and measuring goals, they are also deploying the right technology to do the job, often bypassing the IT department completely.

The reasons that enterprises are moving in this direction are simple: It leads to more effective results, at less cost and in less time. Unlike the IT department, which tends to serve a broad range of needs and requirements, line-of-business managers have a deep understanding of their customers, their product lines and their business goals.

Increasingly, organizations are finding infrastructure as a service to be an excellent enabler of this productive business model. IaaS is a pay-as-you-go initiative that provides the entire infrastructure layer via the cloud: network services, computing services as physical or virtual machines, storage, physical facilities for servers and other equipment, and a hypervisor for running virtual machines. Organizations access the infrastructure on demand via a secure Internet connection.

\$5.4 billion: The amount the U.S. government will spend on IaaS by 2017

Source: *Perspective: Growth and Slight Contraction – Government Cloud Spending by U.S. Federal Agency*, IDC, July 2013

Infrastructure as a service is extremely scalable and flexible, making it a useful resource for a variety of scenarios. For example, enterprises with significant cyclical or seasonal spikes can benefit from this type of infrastructure, which enables them to reduce costs during slower times and ensure capacity and speed during busy times. The drastic spikes in usage that occur during product development and testing are also well-suited to the IaaS model, for the same reasons.

While many organizations choose to dip a toe into the IaaS waters by using the cloud-based model for seasonal spikes or development and testing, others choose to use it only for noncritical applications that don't need more expensive on-premises data center resources. Still others choose to move to IaaS when new hardware expenditures otherwise

would have to be made in-house, or for new projects or major applications.

Take the example of moving to a new customer relationship management (CRM) application. The nature of the application requires the organization to collect large quantities of data, which will in turn affect its servers, storage and network. The enterprise may choose to move the new CRM application to an IaaS environment, which will run the application and its related data. In the process, the organization will avoid having to add new hardware and storage and may reduce the workload for IT staff that would have had to manage the application.

None of this would be possible without the service provider behind the scenes, providing the infrastructure; helping to migrate applications, workloads and data; integrating IaaS into the enterprise; and managing the service. With the right contractual deal in place, complete with approved service-level agreements (SLAs), organizations can be assured that as soon as the decision is made to launch a new product or initiative, the computing service required will be available in a matter of minutes or hours, instead of the days or weeks it could take with an on-premises data center.

The ROI of IaaS

Enterprises choose to move infrastructure to the cloud for a variety of reasons, though cost is often a major driver. However, it can be difficult to show the return on investment (ROI) of a move to the cloud, since so many variables are in play.

Direct costs are relatively easy to quantify. If an organization doesn't have to replace aging or malfunctioning hardware or networking equipment, or add storage to accommodate growing stores of data, that's money left in the coffer. The same with facilities and labor; with infrastructure in the cloud, much less physical space is needed by an organization. The same is true of IT staff. And if software is included in the IaaS offering, software licensing fees also can be greatly reduced.

Organizations often find it more difficult to quantify the soft cost benefits that come with infrastructure as a service. One is uptime: With a service-level agreement, an IaaS provider is promising to keep the infrastructure up and running. That's worth a lot to an organization. One way to quantify it is by calculating how much an hour of downtime will cost the enterprise, and then calculating how many hours of downtime have been experienced in the previous 12 months with an on-premises infrastructure.

Another difficult-to-measure cost is the growth of the business itself. Spending time and money maintaining infrastructure is time not spent innovating. Redirecting that staff time can pay off in many ways.

The Benefits of IaaS

The last thing a CIO wants to worry about when working to improve an organization is whether the infrastructure can keep pace with the need to innovate and respond to competitive pressures. IaaS is a good solution to the problem in many ways.

It can reduce infrastructure costs, provide virtually limitless scalability and agility, and accelerate time to market.

And it does this in a model that virtually ensures uptime (most service providers guarantee at least “five nines” of uptime in their SLAs) and the highest levels of security and compliance.

According to Yankee Group research, the top five motivators for using IaaS are: cost savings on hardware and infrastructure; capacity management; disaster recovery/business continuity; cost savings on IT staffing and administration; and the ability to access new skills and capabilities.

Cost savings: An obvious benefit of moving to the IaaS model is lower infrastructure costs. No longer do organizations have the responsibility of ensuring uptime, maintaining hardware and networking equipment, or replacing old equipment. IaaS also saves enterprises from having to buy more capacity to deal with sudden business spikes. Organizations with a smaller IT infrastructure generally require a smaller IT staff as well.

The pay-as-you-go model also provides significant cost savings. Because IaaS use is metered, organizations pay for only the capacity needed at any given time. This method also allows them to avoid large fixed monthly or annual fees for benefits they may not use. The IaaS model demands no upfront charges, bandwidth utilization fees or minimum term commitments.

Scalability and flexibility: One of the greatest benefits of IaaS is the ability to scale up and down quickly in response to an enterprise's requirements. IaaS providers generally have the latest, most powerful storage, servers and networking technology to accommodate the needs of their customers.

This on-demand scalability provides added flexibility and greater agility to respond to changing opportunities and requirements. This is especially helpful in building and dismantling test and development environments, which greatly benefit from this increased speed and agility.

Faster time to market: Competition is strong in every sector, and time to market is one of the best ways to beat

the competition. Because IaaS provides elasticity and scalability, organizations can ramp up and get the job done (and the product or service to market) more rapidly.

Support for DR, BC and high availability: While every enterprise has some type of disaster recovery plan, the technology behind those plans is often expensive and unwieldy. Organizations with several disparate locations often have different disaster recovery and business continuity plans and technologies, making management virtually impossible.

IaaS provides a consolidated disaster recovery infrastructure, reducing costs and increasing manageability. Frost & Sullivan research has determined that CIOs consider business continuity and preparing for disaster recovery the top drivers for adopting IaaS.

If disaster strikes, employees can access the same infrastructure they have always accessed via an Internet connection, from wherever they happen to be. This includes everything the organization needs to function as usual – email, web servers and critical applications. The result: quick recovery with no loss of data.

Focus on business growth: Time, money and energy spent making technology decisions and hiring staff to manage and maintain the technology infrastructure is time not spent on growing the business. By moving infrastructure to a service-based model, organizations can focus their time and resources where they belong, on developing innovations in applications and solutions.

Top Benefits of IaaS

- ✓ No upfront charges or fixed monthly fees
- ✓ Pay for only what the organization uses
- ✓ Wide choice of services
- ✓ Increased business agility
- ✓ Instantly scalable
- ✓ High availability
- ✓ Disaster recovery/business continuity
- ✓ Increased security
- ✓ 24/7 support
- ✓ Smaller environmental impact than traditional data centers
- ✓ Self-service via a desktop console
- ✓ Avoidance of technology obsolescence
- ✓ Foundation for business intelligence and predictive analytics

Big Data? No Problem

Enterprises today won't get far without the tools they need to make intelligent, informed decisions, improve time to market and keep costs at bay. In many ways, a move to IaaS can help achieve these goals.

Informed decisions start with the right data. Increasingly, that includes not only traditional structured data from databases, but also unstructured data – everything from transactional and social media data to images, audio, web logs, email files and sensor data.

When this data (typically referred to as Big Data) is stored in a scalable environment and easily accessible, it can be combined with analytics and business intelligence tools to gain deeper insights into the competitive landscape, predict trends, improve business operations and relationships with customers, and create better products and processes.

The financial, pharmaceutical and scientific industries have been mining large data sets to solve complex problems for many years, and other industries are catching up. Today, virtually every industry is looking for more meaning, patterns and relationships in data.

While it's possible to store, manage and analyze Big Data on in-house servers, it can be challenging because the workloads can vary greatly in size and scope. Analyzing this type of data also requires a tremendous amount of processing power.

With IaaS, much of that data is stored in the cloud, allowing organizations to more easily run complex queries and analytics without moving the data. Because the IaaS model is so elastic, it can stretch to accommodate and support the processing power required by the analytic algorithms.

IaaS is a common solution for enterprises facing Big Data analytics challenges. According to a 2013 report from Constellation Research, *Nine Cloud IaaS Trends for 2014 and Beyond*, Big Data is very well-suited to IaaS: "Understandably, organizations do not want to buy the hardware for Big Data experimentation or validation projects, so looking for IaaS vendors to help with these projects is an intuitive choice."

With a cloud-based infrastructure, so much is possible. Consider these scenarios:

- A global enterprise can create a competitive intelligence portal for its executives with up-to-the-minute data gathered from a variety of sources.
- A large online retailer can use predictive analytics to manage pricing in a way that improves profitability and satisfies customers.

- A large financial institution can analyze daily trade and quote activity across all markets, relying on the elastic infrastructure to add virtual machine nodes as needed to handle capacity.

A Service Enabler

In addition to providing scalable infrastructure for day-to-day computing needs, IaaS can be an enabler for a growing array of services built on top of it. Organizations that take advantage of services on demand are preparing to meet next-generation challenges: more competition, greater pressures and faster time to market. At the same time, they are meeting the needs of today's workers, who want more self-service; an anytime, anywhere workplace; more virtual collaboration; and greater flexibility.

Computing as a service: CaaS is exactly what it sounds like: access to computing resources on demand. Like all cloud-based models, it's a pay-as-you-go approach that applies to virtual server access for a wide range of applications. With this model, users can quickly add capacity for busy periods or important projects, and reduce it when requirements change, all managed with a self-service, web-based portal.

High-performance computing: This is used to help solve the most complex problems, such as those involving hedging, risk management, complicated simulations and millions of scenarios and calculations. These calculations require expensive supercomputers that are much more easily provided via the cloud than purchased for on-premises use.

When delivered via IaaS, high-performance computing can be useful outside its traditional realms of science and engineering. It can be applied for analyzing and monitoring large volumes of data and workflows, and it can help analysts simulate product designs.

In addition to providing the ability to analyze complex data sets, a high-performance infrastructure can increase innovation while decreasing time to market.

Analytics or business intelligence as a service: Many IaaS providers include some level of analytics capabilities with their services, such as management dashboards for tracking daily activity and usage in real time. But increasingly, organizations want more. With the underlying storage and computing power already available, layering analytics as a service or business intelligence as a service on top makes a lot of sense.

These tools provide the same technology as on-premises solutions – analysis and data mining of historical and

current data; the ability to find insights and patterns and predict outcomes; and application of business rules and parameters – but on a pay-as-you-go basis, without owning the underlying infrastructure. With both structured and unstructured data growing so rapidly and the need to include new data sources, such as social media and sensor data into analysis, analytics as a service is a good option.

Many areas within an organization can benefit from analytics as a service. For example, in the area of demand forecasting, marketers can more easily determine which products will be in greater demand during the coming season. Service-based enterprises can use analytics to identify which customers may defect to the competition based on a selection of criteria. The finance arm of an enterprise could use the technology to identify which investments are likely to yield the best returns within a specific time frame.

Testing and development: In many cases, testing and development are the first functions enterprises use when they move infrastructure to the cloud. That's because they take advantage of one of the cloud's chief strengths: scalability.

With testing and development, systems analysts and engineers need large amounts of computing and networking power for short periods of time. IaaS supports all phases of testing and development, with the necessary security and SLAs to support even the most mission-critical projects.

Web apps: With cloud-based infrastructure, enterprises have instant access to storage, web and application servers and other functions necessary to build web-based apps, and the scalability to run those apps even if the demand is unpredictable.

Web hosting as a service: IaaS provides the base for building and managing websites and deploying web apps without using in-house resources. Many IaaS providers also offer tools and applications that help with search engine optimization, along with web-building tools.

Storage as a service: Organizations may want to consider storage as a service for a variety of reasons. Hiring a storage vendor allows the enterprise to avoid a capital outlay and outsource the often complex task of storage management. Storage requires skilled personnel to manage different tiers of data and ensure its retention for legal and compliance purposes.

When remote and branch offices are involved, each with its own storage needs, the situation becomes even more

complex. Enterprises also may have to buy more storage than required to handle demand spikes during testing and development, seasonal rushes and analytics requirements. And because data keeps growing, storage needs continue to rise, requiring complex and costly data migration.

With storage as a service, the IT department can centrally manage a consolidated storage infrastructure, reprovisioning storage or checking on retention compliance via a web-based console.

Desktop as a service: The deployment of virtual desktops to users within an enterprise is a simple matter once the underlying infrastructure is in place. With desktop as a service, enterprises can provision or deprovision a virtual desktop to a user instantly. Once provisioned, a user can access the desktop on any device with a network connection after verifying his or her identity.

This structure also allows organizations to centrally and securely manage desktops. Desktop as a service is increasingly useful in enterprises with remote or traveling workers.

67%: Percentage of midsize and enterprise companies running mission-critical workloads on IaaS

Source: Enterprise Strategy Group, October 2012

Networking as a service: Enterprises can benefit from the state-of-the-art networking infrastructure that IaaS providers must maintain for their customers. This pay-per-use model allows organizations to scale up network resources to support short- or long-term projects and efforts surrounding Big Data, mobile communications and other initiatives.

In fact, according to a report from Ovum, a technology research firm, networking as a service is the next big frontier for IaaS. This is mainly because network challenges can be so time-consuming and difficult.

Disaster recovery as a service: While IaaS, by its nature, provides some level of disaster recovery capabilities, it's possible to take the concept to a higher level. With infrastructure at the base, organizations can use a service provider's processes to consolidate their disparate disaster recovery systems into one virtualized environment.

Many services are being built on top of IaaS, and more are being developed every year. These include backup as a service, monitoring as a service, communications as a service, database as a service and IT service management as a service.

Deployment: What Kind of Cloud?

IaaS can be delivered in a private cloud, a public cloud, a hybrid of public and private clouds or a community cloud. The type of cloud infrastructure an organization chooses will depend on factors such as security, cost, accessibility and collaboration. An experienced service provider is best suited to help guide the decision-making process.

Each cloud computing model may make sense for different scenarios:

IaaS in a private cloud: A private cloud dedicates the computing, storage and network resources to one enterprise. It can be delivered and installed either in the organization's data center behind its firewalls or in a service provider's data center, in a dedicated, private area.

One of the main reasons that organizations may want a private-cloud infrastructure is security. Enterprises for which security and compliance are critical, such as finance and government, often go this route.

A private cloud offers other benefits beyond security. Because the infrastructure is fully dedicated to one enterprise, the service is likely to experience fewer availability and latency issues. The environment also is fully optimized for the organization's workloads.

41.7%: The annual growth rate of IaaS by 2016, making it the public-cloud segment with the fastest growth

Source: Gartner, October 2012

IaaS in a public cloud: In this multitenant configuration, the service provider assigns portions of its cloud infrastructure to different enterprises. The organizations that share the public cloud are sharing resources, including computing power and bandwidth. The customer and the provider usually will have set SLAs regarding availability and uptime; and the customer retains control over the management of its resources and provisioning.

The public cloud is a good choice for organizations that are growing, especially those with unpredictable growth patterns. This model generally offers more abundant resources and is much more scalable. Often, enterprises choose to use public-cloud infrastructure to deliver noncore applications and virtual desktop infrastructure.

IaaS in a hybrid cloud: The hybrid approach – combining both private and public clouds – has become a very popular option for infrastructure as a service, and for good reason.

IaaS vs. PaaS

On the surface, infrastructure as a service and platform as a service (PaaS) seem interchangeable, but they have significant differences.

IaaS provides the basic infrastructure for all computing needs: computing power, storage and networking resources, as well as virtualization technology. Organizations can access the infrastructure when they need it and pay only for the resources consumed.

PaaS clouds are often layered on top of IaaS clouds and focus on making it easier for users to develop and run applications. PaaS environments provide users with programming languages, databases, operating systems, middleware and other tools (the platform) to develop applications.

Because it's cloud-based, PaaS also has elasticity, scalability and availability features, which are generally employed for application development. This allows developers to create, deploy and test applications without using in-house resources. It also allows development teams with dispersed members to collaborate.

It provides the best balance for cost, as well as the flexibility to move workloads between the private and public infrastructure when necessary.

In most cases, organizations choose to keep proprietary data on private infrastructure, where it isn't viewable or accessible by anyone who isn't authorized to access it. For example, a database with strict security requirements may be kept in a private cloud while other components of an application, such as web and application servers, may use the public cloud to maximize scalability and reduce costs.

The ability to switch between public and private infrastructure is the biggest draw for users of the hybrid cloud. For example, an enterprise may use a private cloud for its production environment, while using the public cloud for test and development, which often requires greater scalability and storage capacity.

In another scenario, an organization might use the public cloud to quickly develop a new public-facing application. After development, it could shift the application to the private cloud for deployment.

IaaS in a community cloud: Similar to a public cloud in some ways, a community cloud is dedicated to the needs of organizations in a specific industry segment, such as finance, government or healthcare. With this model, participating enterprises share infrastructure, and the service provider designs the infrastructure to support the needs of the community.

For example, a community cloud dedicated to healthcare would be fully compliant with all healthcare-related security and regulatory requirements, such as the Health Insurance Portability and Accountability Act (HIPAA). It may also have specific identity access provisioning. But as with a public cloud, community-cloud users share infrastructure, allowing them to use more bandwidth or scale up as needed.

Implementation in Three Steps

While moving to an IaaS environment has many benefits, it can be a complex undertaking. This is where a good service provider is crucial. Its job is to manage the migration and integration necessary to get enterprises up and running smoothly.

Migration

Migrating to an IaaS environment involves many steps, from standardizing hardware and software platforms to setting up service catalogs and metering services. Some service providers will carry out only part of the migration. For example, they may provide the computing power and the SLAs, but leave the customer to choose the carrier and to physically migrate applications and data.

Such a migration can be a daunting job, especially for an organization that has never undertaken such a project. For example, if an application has been running in an older environment and is moving to a cloud-based infrastructure with newer technology, a different type of server or updated operating system, it can be a complex endeavor.

With a service provider that handles the entire migration, an enterprise doesn't have to worry about troubleshooting the process. To cite another example, if an application is running too slowly after migration, it's no longer up to the organization to determine whether the problem lies in the connection, the infrastructure or the application itself. The solution requires just one call – to the service provider.

Integration

Because most enterprises still have some on-premises infrastructure (very few have their entire infrastructure in the cloud), part of the process of getting IaaS up and running is integrating IaaS into the wider organizational ecosystem. That means integrating not only hardware, networking and operating system protocols, but critical applications as well. With the service partner approach to IaaS, all bases are covered.

Management

Managing infrastructure encompasses everything from regulating power and cooling to troubleshooting and maintaining equipment. It also involves patch management and security upgrades. An IaaS provider manages all of these necessary but mundane tasks, as well as ensuring that the customer's SLAs are adhered to.

Choosing an IaaS Service Provider

Once an enterprise has proved the business case for moving some or all of its infrastructure to the cloud, the real work begins: finding a service provider that fits the organization's business needs. Every service provider differs in its infrastructure, expertise, pricing structure and availability guarantees.

According to Frost & Sullivan, the most important features or attributes for choosing an IaaS service provider are, in descending order: ease of migration to the cloud, uptime and SLAs, price, scalability, and compliance assurance.

To ensure it is getting the best service provider for its needs, an organization should ask these questions:

- **Does it have technology experts on staff who have worked with all of the technologies and vendors it offers?**
This is critical; if a problem arises, it can factor into availability and scalability.
- **Does the service provider focus on one brand or solution?**
A vendor-agnostic service provider will recommend the best technology for an organization's needs and explain the pros and cons of each choice.
- **How does the provider encrypt data and ensure the security of the data?** What security certifications does it have? Is it compliant with the Payment Card Industry Data Security Standard (PCI DSS)? If the service provider doesn't show proof of the most stringent security, the customer should consider other providers.
- **How easy is it to move workloads into and out of the cloud environment?** It should be as simple as drag-and-drop.
- **What type of customer support does the service provider offer?** The service provider should be available 24/7/365. Customers should also ask about average response and resolution times.
- **How many nines of uptime does the provider guarantee?**
The more, the better.
- **Has the provider experienced downtime?** This isn't necessarily a deal breaker, but if it happens often or if the service provider has experienced downtime recently, a potential customer should investigate further.
- **What is the provider's disaster recovery strategy, and how often is it tested?** If the service provider is going to be responsible for an organization's disaster recovery, it had better have a DR plan of its own.

Conclusion

IaaS is a wise choice for many enterprises, providing the scalability and flexibility they need to remain efficient and effective. It is also an economical way to manage infrastructure, handle the increasing demands of Big Data, and enter new markets and projects more easily.

However, an effective IaaS strategy involves many choices, not only the technology, but also how the system will be managed over the long term. By teaming with a knowledgeable service provider that offers a full array of services and has long-standing relationships with major vendors, enterprises can be confident that their cloud-based infrastructure arrangement will yield excellent results.

CDW: An IaaS Partner that Gets IT

Because CDW wants to ensure that customers have the right mix of technology and services, it offers many different technologies and paths to achieving the right IaaS environment.

Preconfigured Solutions

For enterprises that want an out-of-the-box infrastructure solution that is guaranteed to work well, CDW offers proven solutions that can be managed either by the organization or by CDW:

VCE Vblock: Consists of EMC storage, Cisco System servers, VMware virtualization and Cisco networking.

IBM PureFlex System: A preconfigured, preintegrated, hardware-based infrastructure combining computing, storage, networking and virtualization capabilities under a unified management console. It supports IBM AIX, IBM i, Linux and Microsoft Windows.

IBM PureApplication System: Includes everything PureFlex offers, plus software such as DB2 and WebSphere.

HP VirtualSystem: A complete, preconfigured infrastructure platform, available for Microsoft, VMware, Citrix, Linux and Oracle Solaris.

Configurable Solutions

These solutions come preconfigured, but enterprises can choose which components they want within a framework.

EMC VSPEX: The ultimate in flexibility, the EMC VSPEX infrastructure is a proven set of reference architectures from EMC, packaged and delivered as complete solutions based on the choices an organization makes. An IT department can choose the hypervisor, server and network technology that will be combined with EMC's storage and data protection to create a complete solution. Technology partners include Brocade, Cisco, Citrix, Intel, Microsoft and VMware.

HP CloudSystem Matrix: This configurable and expandable IaaS offering is built on HP converged infrastructure technologies, such as HP BladeSystem servers and Matrix Operating Environment cloud management software. It is optimized for HP ProLiant and HP Integrity servers, HP storage and HP networking, although it also supports third-party x86 servers, networking and storage.

IBM Flex System: An IBM IaaS offering from which an organization can choose among various options: the management system, chassis, computing nodes, expansion nodes, storage and networking. Once chosen, the system is preconfigured for the user.

FlexPod Datacenter: This solution includes Cisco Unified Computing System servers, NetApp unified storage systems and Cisco Nexus networking fabric, providing virtualized computing, highly available clustered storage and unified 10 Gigabit Ethernet networking.

CDW-chosen Components

By entrusting the choice of technology to CDW, enterprises can be sure that they will get the optimum mix. An organization can choose the amount of computing and storage it needs, along with any specific components, and then establish an SLA. CDW rounds out the rest of the IaaS offering. For example, a CDW solution architect might incorporate VMware vSphere or vCloud Director, or Microsoft Hyper-V or System Center technologies, depending on the organization's specific requirements.

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