WHITE PAPER

Selecting the Optimal Path to Private Cloud

Sponsored by: EMC

Laura DuBois Randy Perry
John Daly
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EXECUTIVE SUMMARY

Cloud computing models offer a new approach for IT organizations to deliver business services to end users. By implementing their own internal or "private" cloud infrastructures, IT organizations can deploy a technology model that provides both flexible IT architectures and dynamic business agility. The private cloud model, once fully implemented, offers capacity on a pay-as-you-go basis. That is, it provides a method of freeing and uniting computing capacity that had been isolated within business units. It makes system resources accessible to applications that span the entire organization. At its full potential, cloud computing can ultimately accelerate business innovation and transformation.

IDC finds that firms are considering three approaches to building an infrastructure platform to deliver internal or "private" cloud services to end users: integrated infrastructure systems, reference architectures, and "build your own" systems. This paper presents IDC's insights about implementing an internal or "private" cloud technology model and how this strategy can allow IT organizations to respond to and support business demand with dynamic business agility. It discusses the benefits and considerations firms must be aware of with these three different approaches to establishing the foundation for a private infrastructure-as-a-service (IaaS) cloud. That is, it discusses three different approaches to building modular, scalable, and standardized hardware configurations for cloud.

As this document highlights, when firms move to reference architecture or integrated infrastructure system strategies, they gain material cost and time-to-market advantages over traditional IT. Reference architecture and integrated infrastructure system strategies offer advantages over a "build your own" approach. Reference architectures reduce overall costs per year and time to deploy infrastructure by almost 25%. Integrated infrastructure systems reduce overall costs by 55% and time to deployment by 65%. Additionally, the converged model enables more efficient use of available IT capacity than traditional IT. The higher utilization rates drive down hardware costs and make long-term infrastructure planning more reliable and efficient. These material benefits make both reference architectures and integrated infrastructure systems an imperative for IT organizations.

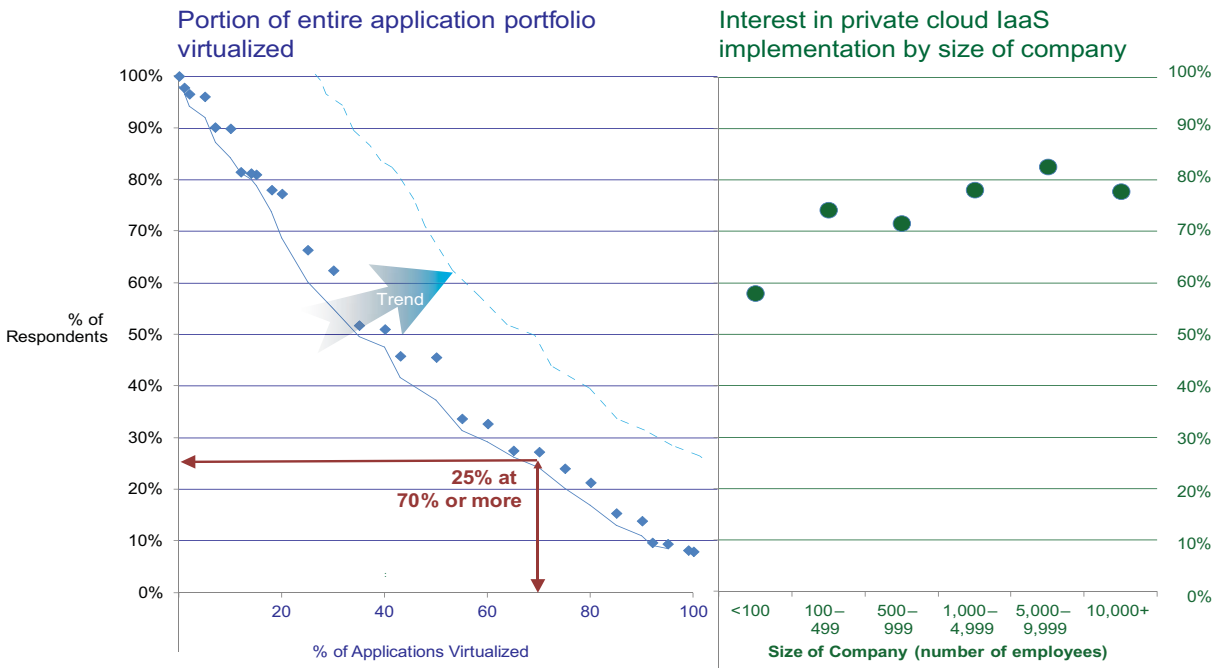
Global Headquarters: 5 Speen Street Framingham, MA 01701 USA P.508.872.8200 F.508.935.4015 www.idc.com

PRIVATE CLOUD AS BUSINESS AGILITY

At its end state, cloud computing can ultimately accelerate business innovation and drive transformation. Virtualization has made these goals attainable, and enterprises realize the potential. As IT organizations virtualize more of their internal infrastructure (servers, storage, network), they move more aggressively to provide their customers with private cloud IaaS (i.e., servers, storage, network, operating system, system management, and security). As depicted in Figure 1, over 70% of datacenters have now virtualized 25% or more of their applications with 25% having virtualized 70% or more, and over 70% of organizations with more than 100 employees intend to provide internal IaaS via the private cloud model.

FIGURE 1

Virtualization Maturity and Private Cloud Adoption



Source: Virtualization levels from IDC's *Virtualization Survey*, 2011 and 2012 (n = 404)
Private cloud interest from IDC's *CloudTrack Survey*, 2012 (n = 801)

The Best Ways Forward to Private Cloud

IDC has found that organizations building private cloud offerings progress through stages of successive maturity, with each stage requiring increasing investment —– not only from IT but also from line-of-business budgets throughout the organization — and offering, in turn, increasing value. Their path forward invariably covers the three essential areas of technology, people, and process:

- **Technology.** Establishing the "right" cloud infrastructure, platform, and software (The cloud journey begins with virtualization and a flexible hardware infrastructure to support it. Together they are the foundation for the private IaaS.)
- **People.** Building critical organizational attributes such as cloud skills, service-driven culture, leadership, and interdepartmental collaboration (between IT and line of business)
- **Process.** Implementing key business processes for managing end-to-end service, enterprisewide cloud architecture usage, vendor activity and performance, and overall compliance with the organization's standards for cloud deployment

However, the technology path comes first and most critically. The first of these technical steps involves virtualization — the task of abstracting compute, storage, and networking resources. Once an organization establishes the virtualization of a substantial portion of the base infrastructure — the technology stack up to and including the hypervisor — it can move to providing private cloud IaaS capabilities.

The Foundation: Modular, Scalable, and Standardized Infrastructure

Firms that have successfully built a private cloud have virtualized not only server nodes but also storage and network resources, thus allowing for the pooling and consequent flexible deployment of these resources. Standardizing key technology elements such as servers, network, storage, and hypervisors enables workload portability and compatibility with other cloud system software. In addition, this requires consistent and standardized hardware.

Limiting an IT infrastructure to a single configuration architecture would immensely simplify cloud deployments, but the requirements for multiple service levels and workload types demand a level of configuration diversity. Most successful large cloud deployments have reduced their server configuration architectures to a handful of (fewer than seven) different types. Many successful private cloud implementers opt for integrated infrastructure systems that consist of preintegrated, modular units of compute, storage, and networking that allow IT to add blocks of physical resources in a repeatable, scalable fashion.

In whatever manner, a robust, proven architecture continues to be the key to business success in private cloud deployments. Let's consider three different ways to achieve a consistent, standard infrastructure platform for private cloud: **prebuilt or integrated infrastructure systems** such as VCE Vblock, **reference architectures** such as EMC's VSPEX, and **traditional or "build your own" systems** — building the environment independently using internal infrastructures and standards established before cloud implementation.

- **Integrated infrastructure systems** such as Vblock systems from VCE offer customers a means to buy preconfigured, ready-to-deploy infrastructure. They typically include blade server chassis, network fabric manager (e.g., Cisco's Nexus network platforms), virtualized storage systems (e.g., EMC's VMAX or VNX storage systems), a preferred hypervisor (e.g., VMware's vSphere), and IT automation software. Integrated infrastructure systems allow administrators to move away from deploying each element (server, storage, and network) individually and toward deploying ready-to-run preconfigured infrastructure tuned together for high performance across multiple workloads.

- **Reference architectures** such as EMC's VSPEX provide users or partners with a tested and validated design blueprint for building a complete system. These architectures provide guidance on layout size and deployments for each component in the mix. They differ from integrated infrastructure systems in that they offer more flexibility in the components that make up the solution stack, but they do not provide integrated, seamless support across all the separate elements from multiple vendors.

- **Traditional/"build your own" systems** refer to the option of constructing infrastructure in the traditional manner of selecting, acquiring, and configuring separate server, storage, network, and system software elements and assembling these technologies onsite as was done for traditional on-premise IT workloads. In these cases, the customer takes on the responsibility of ensuring virtualized storage and network for the virtualized server environment.

Each of these approaches can help customers achieve the goal of providing "modular, scalable, and standardized infrastructure." Ultimately, the approach that offers an IT organization the most effective IT simplification will prevail. That is, all IT organizations need to devote more of their resources to projects that center on speeding IT services to the business units, engaging with their customers via IT, and improving the productivity of their own workforce. On the other hand, IT organizations are still faced with stagnant budgets, and many must seek cost-competitive new systems that deliver greater IT efficiency.

Enterprises are balancing these demands and constraints to pick the path that provides the greatest improvements in IT staff efficiency and utilization of IT resources within the budget allowed. Additionally, an organization may wish to leverage discrete IT infrastructure that has not reached obsolescence. Thus, it must consider budget as well as current infrastructure within the datacenter. The following discussion provides a closer look at the typical infrastructure build and deployment process and the way that these separate approaches affect each step in the process.

MEASURING THE RELATIVE VALUE BY PATH TO PRIVATE CLOUD

To determine the quantifiable benefits that each of these infrastructure paths to private cloud offers, IDC pooled a compendium of over 40 return-on-investment (ROI) primary research interviews of enterprise datacenters that implemented integrated infrastructure systems. IDC complemented this base of data with two additional interviews of firms that had used VSPEX reference architectures to build their IT infrastructures and then compared the costs of both with the costs of traditional environments. This research uncovered:

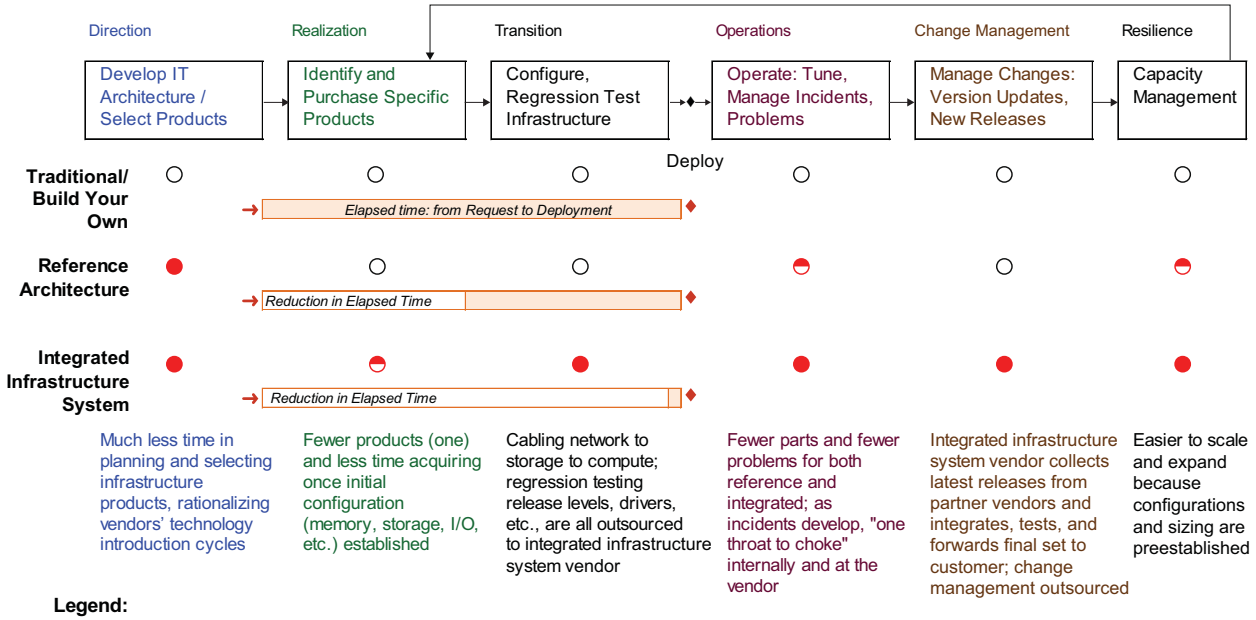
- IT hardware spending (server, storage, network)
- Operational costs associated with IT asset selection, deployment, operation, and maintenance
- System and business application delivery speed
- Application resiliency

The enterprises employ between 100 and 98,000 employees; operate in North America and South America, Asia/Pacific, and Europe; and represent a range of business sectors: healthcare, financial services, manufacturing, service providers, and government. Each company also differs across levels of age of infrastructure, IT sophistication, virtualization rates, and cloud maturity.

Figure 2 provides a summary of the comparison of the three strategies (integrated infrastructure systems, reference architectures, and "build your own" systems) for building modular, scalable, and standardized infrastructure for private clouds. It compares the impact of the three approaches on IT expense and deployment speed over the phases of implementation, from planning/design to steady state maintenance and use.

FIGURE 2

Impact of Different Infrastructure Paths on Selected IT Processes, Staff Costs, and Deployment Speeds



Source: IDC, 2013

Agility/Speed Benefits

Our research indicates that using integrated infrastructure systems or leveraging reference architectures improved business agility. Most reference architecture and integrated infrastructure system users reported that the technology enabled them to deploy infrastructure assets (hardware, network, storage, software) much more rapidly than they could have by building traditionally on their own.

Integrated infrastructure system users reported that the "calendar time" involved in deploying additional new IT infrastructure (new server, storage, network capability) dropped by over 70%, from approximately five months to a little more than one month. These companies also reported a reduction of over 70% in the internal IT staff time to configure, test, and deploy this infrastructure.

In the words of one service provider, "[The integrated infrastructure system] itself only takes five days. In other words, if I wanted to take the amount of storage … and compute capacity that [this system] has and use a traditional architecture to deploy it … getting it deployed would easily take me two to three months."

Efficiency Benefits

Respondents gained significant financial benefits from reductions in the IT staff time required for datacenter processes, especially the six key processes highlighted in Figure 2. As Figure 2 depicts, organizations that use reference architectures and integrated infrastructure systems to deploy infrastructure gain the following benefits:

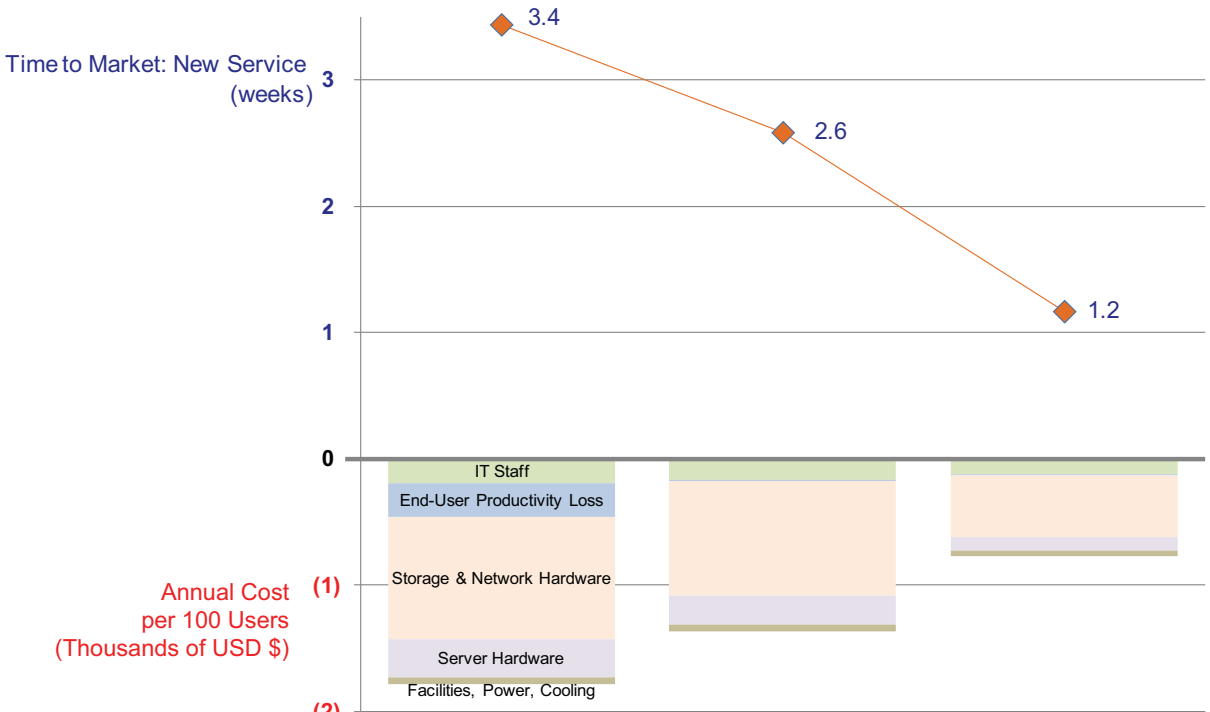
- **Direction.** Organizations reduced the amount of time and attention that management had to devote to plan and ensure infrastructure functionality that can track and match business activities and processes and applications.
- **Realization.** Once organizations solidified initial configurations for integrated infrastructure systems and reference architectures, they saved time in the process of identifying and obtaining additional capacity for scaling business needs.
- **Transition.** With integrated infrastructure systems, organizations avoided the normally labor-intensive and time-consuming process of powering, cabling, provisioning, and testing the hardware and software once "on the floor."
- **Operations.** With fewer parts and one source of problem solution (for integrated infrastructure systems), downtime and time to recovery dropped, saving IT staff time and user productivity loss.
- **Change management.** As new versions, release levels, and patches for different components (e.g., network, server, storage, hypervisor) proliferated, the benefit of "outsourcing" the task of integrating these competing releases became more pronounced, saving staff time and both planned and unplanned downtime.
- **Resilience.** Adding capacity for expanding business needs becomes easier as organizations add units of complete infrastructure — server, storage, and network — rather than figure and balance purchases of different levels of each separate server, storage, and/or network infrastructure element.

Figure 3 presents a summary of the relative quantitative benefits of the paths, measuring both operating costs and capital costs and time to market impact.

As Figure 3 illustrates, both reference architectures and integrated infrastructure systems deliver significant benefits. Reference architectures appear to reduce overall costs per year and time to deploy infrastructure by almost 25%. Integrated infrastructure systems reduce overall costs by 55% and time to deployment by 65%. The integrated infrastructure system approach or model seems to enable more efficient use of available IT capacity than traditional IT siloed models. The higher utilization rates drive down hardware costs and make long-term infrastructure planning more reliable and efficient.

FIGURE 3

Relative Infrastructure Costs per 100 Users and Deployment Speeds by Infrastructure Path



	Traditional / Build Your Own	Reference Architecture	Integrated Infrastructure System
Facilities, Power, Cooling	($52)	($52)	($43)
Server Hardware	($306)	($230)	($104)
Storage & Network Hardware	($966)	($907)	($492)
End-User Productivity Loss	($267)	($10)	($10)
IT Staff	($192)	($163)	($119)
Time to Market: New Service (weeks)	3.4	2.6	1.2

Notes:

- All costs are per 100 users per year.
- End-user productivity loss is time and money lost by users due to downtime. Downtime is the time during which a computer becomes unexpectedly unavailable to users due to system failures, including human operator errors, software anomalies (e.g., operating system failure, application software failure, or general software aging), and failures due to transient or permanent hardware failure.
- IT staff costs refers to the costs (hours multiplied by effective hourly rate, at fully loaded salary, divided by hours available per year) incurred for IT staff to select, assemble, configure, deploy, and maintain the environment and to handle help requests, diagnose problems, and repair and restore operations.
- Hardware costs represent annual cost per 100 users for amortization of assets over a three-year life cycle.
- Data is from research interviews in multiple studies from 2011 to 2013.

Source: IDC's Business Value Research, 2013

Moving to either reference architectures or integrated infrastructure systems appeared to enable these organizations to purchase modular units of infrastructure tuned to deliver higher utilization of networking, compute, and storage resources. Most of the organizations we interviewed indicated that they either could not do it themselves or could not do it as efficiently and effectively as their integrated infrastructure system and reference architecture vendors. Key findings include the following:

- **Storage and network hardware.** Increased utilization reduced storage costs by 6% for reference architectures and 49% for integrated infrastructure systems.
- **Server hardware.** Increased CPU utilization decreased server costs by 25% for reference architectures and 66% for integrated infrastructure systems.
- **Facilities, power, cooling.** Higher utilization per CPU and reduction in cabling drove down relative power costs by 16% for integrated infrastructure systems.
- **IT staff.** Easier configuration and change management support, reduced support requirements, and other efficiencies reduced IT staff costs for space requirements by 15% for reference architectures and 38% for integrated infrastructure systems.
- **End-user productivity loss.** Reduced unplanned downtime resulted in less end-user productivity loss due to the unavailability of business applications.

On average, organizations in this study that deployed integrated infrastructure systems reduced their annual infrastructure costs by nearly $3.6 million ($75,778 per 100 users). Figure 3 presents the respondents' cost savings for each infrastructure element.

Making a Choice

Despite the obvious business value attributes of integrated infrastructure systems and reference architectures, the most appropriate path to infrastructure provisioning depends on a variety of other factors related to a firm's size, capital investment posture, organizational flexibility, business volatility, and technical maturity.

Integrated infrastructure systems require transformed organizations. Because storage, network, and server become one product rather than three separate products, the corresponding storage, network, and server groups must merge and realign to match. This change affects IT workflows and support requirements. This, in turn, requires that an IT organization ready itself for reorganization.

Integrated infrastructure system technologies support rapid and flexible deployment of additional capacity, which helps immensely with organizations under wide swings of business demand; for example, a financial services organization that recently acquired another and must integrate systems quickly to avoid penalties. Not all organizations need to cope with such volatility. Not all organizations need such speed.

Integrated infrastructure systems include all the infrastructure elements — storage, server, network — at once; they also include higher levels of support and integrated service — for example, the pretesting of new versions and releases of underlying partner products. This carries with it a relatively steep initial price tag — a high capital investment cost. Not all organizations command the financial flexibility to absorb the higher up-front costs.

Supplier management practices vary along a continuum. Some organizations espouse more of a sole source approach and look to a trusted vendor as a partner. Others keep all vendors in a competitive mode and look for the best in class at the lowest possible cost. The former plays more easily into the current integrated infrastructure system solution set.

Some organizations have already attained such a level of infrastructure standardization and maturity that they frankly do not benefit as significantly from the simplicity of reference architectures and integrated infrastructure systems.

CHALLENGES AND OPPORTUNITIES

The challenge that both IT suppliers and end users face is also one of the benefits, which is choice. On one hand, the ability to select from the three architectural approaches to "private" cloud infrastructure offers flexibility in deployment and potential cost savings. However, not all IT buyers will have the luxury of doing a full quantified analysis of the three strategies. And with choice can come complexity in educating customers and prospects, explaining the options to be considered. Tools such as this white paper and other TCO and ROI analysis vehicles attempt to deconstruct and highlight the results of such analytical work.

This choice also presents opportunity. The availability of these three approaches to modular, scalable, standardized infrastructure enables a much broader set of customers and IT environments to benefit from an optimal infrastructure for "private" cloud deployments. If only one approach were available, the corresponding benefits of the other approaches would be lost. For suppliers, choice presents the opportunity to better align with a broader range of customer needs — providing a complete turnkey system, offering best-of-breed integration, or providing components that integrate with existing infrastructure. Thus, choice is at once a challenge and an opportunity for users and suppliers alike.

CONCLUSION

IDC finds that firms are considering three approaches to building an infrastructure platform for delivering internal or "private" cloud services to end users. These strategies — integrated infrastructure systems, reference architectures, and traditional/"build your own" systems — are being deployed today, and each offers compelling benefits and considerations. As the analysis in the study proves, as firms move to reference architecture or integrated infrastructure system strategies, they gain material cost efficiency and time-to-market advantages.

When comparing reference architecture and integrated infrastructure system strategies, we found that both offer advantages over the traditional/"build your own" system approach. Reference architectures reduce overall costs per year and time to deploy infrastructure by almost 25%. Integrated infrastructure systems reduce overall costs by 55% and time to deployment by 65%. Additionally, the integrated infrastructure system approach or model enables more efficient use of available IT capacity than traditional IT. The higher utilization rates drive down hardware costs and make long-term infrastructure planning more reliable and efficient.

IT organizations facing time-to-market, cost reduction, and IT efficiency imperatives must increasingly consider reference architecture and integrated infrastructure system approaches to building "private" clouds.