

# Converged Infrastructure: Addressing the Efficiency Challenge

Lee Garber



**Vendors are combining computing, storage, and networking systems into one integrated IT infrastructure, promising more efficiency and flexibility than traditional silo-based approaches.**

**T**here are three things that datacenter and cloud-system operators most look for in their technology: efficiency, efficiency, and efficiency.

Many companies work with large amounts of bursty data, which places growing demands on their computing, storage, and networking infrastructures, which adds complexity and cost to their operations.

In the typical datacenter architecture, computing, storage, and networking reside in separate silos. This requires companies to buy the infrastructure elements separately and spend considerable time and money integrating, optimizing, and testing them. Scaling and flexibly using these systems can be difficult and, in some cases, costly.

Many organizations want to simplify matters. “They want more efficiency,” said Jed Scaramella, IDC’s research manager for enterprise servers.

To achieve this, vendors are taking a radical approach by releasing product packages that offer customers a converged infrastructure, with a preconfigured, scalable pool of computing, storage, and networking resources run by a centralized management tool.

Proponents say this optimizes the interaction among the resources. They contend that the approach reduces costs, scales more easily, and cuts complexity. These are all important factors in today’s economy, in which many organizations have reduced budgets and staffs.

The rise of cloud computing—which requires a flexible pool of resources—is a major force driving demand for and development of converged-infrastructure systems, according to Adam Fore, director of virtualization solutions marketing for vendor NetApp.

Several companies—such as Hewlett-Packard, IBM, NetApp, and VCE—are already selling converged-infrastructure systems.

However, the new approach may not appeal to all users and must still overcome several obstacles before being widely adopted.

## CONVERGING ON CONVERGED STORAGE

In the past, companies would buy separate computing, storage, and networking products and architect them into one system.

“That whole process takes months and months,” Fore noted. “Different teams must figure out what the com-

pany needs and then build out the environment to meet those needs. Then they have to run tests to make sure it’s tuned correctly. And there’s provisioning and optimization. This is time-consuming and requires specialized expertise.”

Silo-based systems can also be costly to operate. “IT organizations currently spend 70 percent of their budget just on the maintenance of their existing infrastructures,” said Rick Lacroix, VCE’s director of corporate communications. With the silo approach, users can add capacity but can’t form their resources into one large pool that they can use as needed.

Moreover, this approach doesn’t support *multitenancy*, in which one instance of an application can serve multiple users, a property necessary for cloud computing.

All these problems are complicated by the explosion in computer and mobile-device users, and in the amount of information they work with.

This challenge is particularly critical for datacenters, which must swiftly and accurately handle huge but varying amounts of information around the clock.

Now, IT organizations are under pressure to reduce costs and increase

business agility. This is accelerating the move to converged infrastructures.

### The technology

Converged-infrastructure systems can contain components all from the same vendor or from different companies.

Vendors typically offer only certain types of computing, storage, and networking equipment as part of their converged systems. Customers generally can't pick and choose the components they want to include.

"A converged infrastructure brings together the three fabrics into a single architecture that's been prevalidated and presized for certain loads," noted Fore. "It's a single design, an end-to-end architecture with a management tool that's going to handle all of these layers."

In essence, customers determine the workload their system must handle and then buy a system designed specifically for that workload. As workloads increase, they add capacity.

"Virtualization is the technological development that is at the foundation of all of this," said VCE's Lacroix.

Converged systems use virtualization to enable different computing, storage, and networking components to connect flexibly and run as a single "virtual appliance," with resources that can be utilized as needed. The elements are linked at the management layer and designed in advance to operate together. Because of the need for effective centralized control of the system, Scaramella noted, "The management software is the key element."

### Benefits

One of converged infrastructure's biggest benefits is that customers can buy a system and start using it often within hours, instead of perhaps months, without spending a lot of time and money setting it up.

The approach also reduces costs because only commodity hardware is

used, rather than specially designed or modified products, said Randy Kerns, senior strategist with the Evaluator Group, a market research firm.

The hardware is optimized, pre-configured, preengineered, pretested, and preintegrated to work together and handle the amount and type of data an organization deals with. Because the approach concentrates management in a single tool—instead of separate ones for computing, storage, and networking—it reduces

**Converging computing, storage, and networking into one infrastructure promises greater efficiency, but adoption faces several hurdles.**

management complexity and the amount of support staff necessary. Having one vendor provide a converged system, even if the components come from several vendors, streamlines the patch, update, and service processes.

As an organization's demand increases, it's easier, quicker, and less expensive to add resources to a converged system than to a silo-based system. A converged system is built on a standardized infrastructure, which means users can just plug in new component servers, or more storage or networking capacity.

"The process of procuring, setting up, and provisioning a new physical server might take three months in a traditional IT environment, while assigning and provisioning a new virtual server in a [VCE] Vblock [system] takes minutes," noted Lacroix. Converged systems provide a flexible, scalable pool of resources and capabilities such as multitenancy, both central to cloud computing. This

makes cloud-computing adoption easier.

According to Charles King, principal analyst with market research firm Pund-IT, "Big Data solutions that allow organizations to analyze and gain value from unstructured and semistructured information that doesn't or can't fit into traditional relational databases [represent] one of the poster children for converged systems. In many cases, these datasets are so large that trying to use traditional solutions would severely impact analytics performance. Converged systems are designed and tuned to deliver [this with] consistent, optimal performance."

"Because they are designed for specific applications and processes," he added, "they tend to deliver higher performance than conventional systems, which is especially critical in areas that leverage very large databases—business analytics and business intelligence, for example."

### Challenges

Despite its promise, cloud computing is not without significant challenges.

"The biggest disadvantages are capital expenditures, the upfront costs. Specialized systems simply cost more," noted King. "There may be considerable [operating expenditure] benefits down the road, but many companies tend to focus more on [capital expenditures]."

Because converged platforms use a limited number of products and technologies selected by the vendors involved, they don't offer flexibility of choice and may not appeal to companies with specific product and technology preferences, Lacroix said.

Preconfigured products cannot be changed, if a company wants to make adjustments, without possibly causing problems for the overall system. Also, users are locked in to the specific vendor or vendors whose systems they've bought. "Once a customer buys into a system," King explained,

“it’s often very difficult to move to or integrate another vendor’s solutions.”

According to Kerns, converged infrastructure is a big change from previous approaches, which makes some potential users nervous. “Most customers view their information as critical,” he explained. “Any change that introduces potential risk faces a headwind of [concern]. If the converged [system] is not perceived to be as reliable or has limitations in support or capabilities, that will be a challenge.”

IDC’s Scaramella said potential users will ask, “Is the technology mature enough to run business workloads?”

## IMPLEMENTATIONS

Several vendors are selling converged-infrastructure systems, each with its own take on the approach. HP and IBM each sell converged-storage systems based on components they make, saying this guarantees that the elements will work together well.

Other vendors, such as NetApp and VCE, sell systems based on components from multiple providers, saying this enables more choice of the best components, better performance, and price flexibility without locking users into a single vendor.

## IBM

IBM’s PureSystems implementation consists of the company’s own computing, storage, and networking building blocks for datacenters. By leveraging virtualization, PureSystems creates a pool of resources forming an infrastructure on which companies can run applications and services.

PureSystems consists of PureFlex, which provides the computing, storage, and networking infrastructure; and PureApplication, used for application deployment. There are express, standard, and enterprise versions of the system for small, moderate, and large workloads, respectively. PureSystems supports four operating systems and five hypervisors.

vmware

- vSphere
- vShield zones
- vCenter



- Cisco SAFE
- Nexus 1000V
- Nexus 2000/5000/7000
- Unified Computing System
- Gigabit Ethernet



- MultiStore
- NetApp Data Motion
- 10 Gigabit Ethernet
- Network file System (NFS)/Internet small computer-system interface (iSCSI)

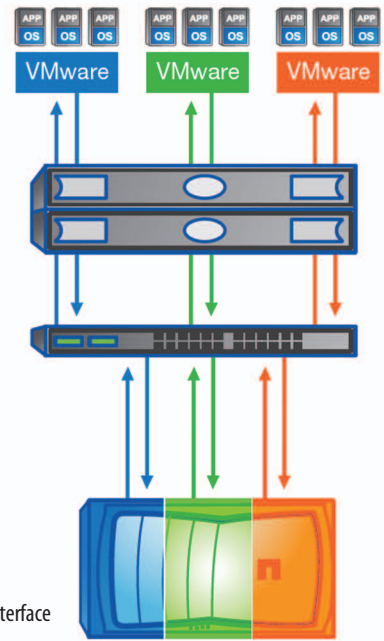


Figure 1. NetApp offers converged systems that integrate NetApp storage with Cisco servers and networking equipment. The systems can also work with virtualization software like that offered by VMware.

IBM says it has added intelligence to PureSystems based on its experience providing many types of services to its customers.

## Hewlett-Packard

HP uses its own equipment in its VirtualSystems converged-infrastructure products.

The VS1, which runs up to 750 virtual machines, uses ProLiant servers for computation; a LeftHand storage-area-network appliance; HP networking equipment; and Insight Control software for managing server, storage, and networking activities.

The VS2, which runs up to 2,500 virtual machines, uses BladeSystem servers, a separate BladeSystem with a LeftHand SAN, Virtual Connect FlexFabric networking modules, and Insight Control.

The VS3, which runs up to 6,000 virtual machines, uses BladeSystem servers, 3Par SAN technology, and Insight Control.

The systems support Citrix, Microsoft HyperV, and VMware virtualization products.

## VCE

Vblock is a converged system manufactured by VCE, a company that Cisco Systems and EMC created as a joint venture with investments from Intel and VMware.

Vblock’s components are Cisco Unified Computing System servers, Cisco Nexus switches or MDS directors for networking, EMC VMAX or VNX storage systems, and VMware vSphere virtualization software. vSphere lets all of the components function as a flexible, scalable, and easily managed set of IT resources and thus is, in effect, the system’s OS, VCE’s Lacroix noted.

Vblock sells the Series 300 platform for midsize companies and the Series 700 high-end platform for large companies. The difference is the computing capacity of each system, based on the number of servers, storage capacity, and functionality provided.

## NetApp

NetApp has worked with Cisco to develop the FlexPod converged system for datacenters.

As Figure 1 shows, FlexPod components include NetApp unified storage systems, Cisco Unified Computing System servers, and Cisco Nexus switches. The FlexPod architecture can be optimized for a variety of workloads in virtualized and non-virtualized environments.

The systems are prevalidated and scalable. They provide centralized management via NetApp OnCommand or Cisco UCS technology and provide open APIs for integration with management tools from FlexPod partners—such as CA Technologies, Clouppia, and Gale Technologies—or with custom approaches.

VCE has tested and validated FlexPod with hypervisors, operating systems, applications, and infrastructure software from vendors

including Citrix, Microsoft, Oracle, Red Hat, SAP, and VMware.

**CONVERGING ON THE FUTURE**

Industry observers say converged infrastructures are particularly good for datacenters and cloud systems because they offer flexibility, scalability, and quick implementation.

According to NetApp's Fore, the systems are also good for environments such as virtual desktops, in which users' desktops are stored on a remote server, not locally. In fact, he noted, "30 percent of the Flexpod systems deployed are for virtual desktops."

However, some specialized applications may not benefit from converged infrastructure's standardized, pre-

packaged approach. Converged systems offer the most value to large enterprises, which have the biggest, most complex infrastructures, said IDC's Scaramella.

"It will have limited appeal for small-market customers. You need to have a number of servers to make it worthwhile. You need a certain level of provisioning to make this worthwhile," Fore explained.

**C**onverged-infrastructure adoption could face problems if businesses don't want to try something different or are concerned about issues such as vendor lock-in or limited hardware choice.

Fore predicted that converged systems "will be adopted widely" because "corporate systems will have to be increasingly efficient and agile to handle so much information." He noted that NetApp has seen rapid growth in FlexPod sales, acquiring 1,000 customers in 18 months.

"So far, vendors selling integrated systems for specialty workloads seem to be doing pretty well," said Pund-IT's King. "At this point, enterprises are leading the way. They have specific needs for optimized system performance and the money to pay for it. Next up will be service providers who see these solutions as the basis for new offerings. As prices fall, midmarket companies will become active participants."

"Converged infrastructure provides a simplified way of implementing advanced infrastructures," Fore said. "It lets you implement optimized datacenter architecture that's been validated to reduce technology risk." **■**

*Lee Garber is the IEEE Computer Society's senior news editor. Contact him at lgarber@computer.org.*

**cn** Selected CS articles and columns are available for free at <http://ComputingNow.computer.org>.

# Call for Articles



**IEEE Software** seeks practical, readable articles that will appeal to experts and nonexperts alike. The magazine aims to deliver reliable information to software developers and managers to help them stay on top of rapid technology change. Submissions must be original and no more than 4,700 words, including 200 words for each table and figure.

**IEEE Software**

Author guidelines:  
[www.computer.org/software/author.htm](http://www.computer.org/software/author.htm)  
 Further details: [software@computer.org](mailto:software@computer.org)  
[www.computer.org/software](http://www.computer.org/software)