

THE POWER OF CONVERGENCE

Comparing – and combining – IT components into an optimized solution yields many worthy advantages.

Executive Summary

An IT environment built piecemeal can lead to inefficiency and waste. And the larger a system grows, the more difficult it becomes to properly manage without an army of administrators constantly monitoring the behemoth's every move. At some point, efficient operation simply becomes dauntingly difficult.

To keep IT resources under control, smart organizations are turning away from a hodgepodge of enterprise expansion to the more manageable strategy of converged infrastructure or CI. With this approach, numerous IT components are combined into a single, optimized solution. Network infrastructure and capacity are shared among all lines of business, with a single vendor providing a point of contact for IT-related issues. The IT infrastructure grows organically and seamlessly as needed.

This white paper will explain the benefits of CI, the reasons for considering such a platform and compare available architectures. It will also examine the most popular CI solutions and their advantages.

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The Current Situation

A converged infrastructure solution combines multiple computing solutions into a single, managed system. In most cases, components within a CI deployment are designed to work together. At the very least, all components within the CI have been extensively tested to ensure that no hardware or software incompatibilities exist within the system. Because of the tight integration of components, most CI systems can be managed from a single point of control regardless of how many lines of business are using the computing resources or what types of applications are running.

Converged infrastructure is rapidly growing in popularity and use. A Zenoss study, *The State of Converged Infrastructure – 2013*, reports that 30 percent of IT decision-makers are using some form of CI, while 51 percent are planning or considering adoption of the technology.

Even so, it's still a relatively new concept being driven by the need to manage increasingly large and complex enterprise infrastructures. Companies that implement CI are looking to save money and improve the efficiency of their IT operations while allowing IT staff to focus on core business functions.

Many enterprise networks have grown haphazardly over time. Numerous businesses have expanded their infrastructures in silos, with IT resources deployed to support different lines of business or locations. An office in Seattle might have its own servers, storage devices and networking equipment that are completely different from hardware deployed at an office in Houston. Not only might the equipment be configured differently, but it may come from different vendors as well.

Even within one location, different departments in a company might have their own servers or security appliances with their own special needs. In a worst-case scenario, this disparate architecture can extend all the way down to the software used. With different hardware and software trying to run and share information, incompatibilities and problems can become an everyday occurrence.

The situation becomes more complicated as these systems grow over time. When one group needs to improve capacity or performance, administrators may simply add new devices to existing systems, often without regard to what is already in place. Older equipment may not be phased out, adding yet another layer to manage.

Building an IT architecture piecemeal over time can lead to increased costs, lost productivity and network bloat. Managing such an environment can become increasingly difficult, and any upgrades only add to the problem.

The CI Environment

By contrast, a converged infrastructure solution looks at the organization's needs as a whole. The idea is to create a single environment that can serve an entire organization regardless of the number of users, their physical locations or their individual needs.

Once a CI infrastructure is in place, growth can happen efficiently from that core. Devices can serve more than one group or location within a company, which allows capacity to more closely match needs, without money being spent on unused capabilities. Older equipment can also be phased out in favor of newer resources.

A number of strategies can make CI deployment more manageable. Appliance-based models combine servers, storage devices, networking hardware and software into a single machine. This appliance is then simply attached to a network.

With an appliance-based solution, an IT department doesn't have to worry that components aren't compatible, because they all reside within a single device. This also makes management of the infrastructure seamless, as administrators can concentrate on a single interface for monitoring the health of the architecture.

What Is Converged Infrastructure?

Converged infrastructure consolidates IT resources into a single, manageable system. CI solutions can vary from cloud-based tools to virtualized machines to network appliances to various combinations of these.

Servers are at the heart of any CI solution. Instead of separate servers for print, web, content and operations, a converged infrastructure folds them into one place. Data storage devices are also a critical element of CI.

Storage devices can make up much of the bloat on networks. So many organizations benefit from consolidating them. Networking equipment also is included in many (but not all) CI products. And finally, software can also be a part of a CI solution.

A CI solution gives an organization a single place from which to manage its IT infrastructure, whether through a specific appliance or via a graphical user interface (GUI) on an administrator's terminal.

Most CI solutions offer a single support contact for most IT-related issues. This is typically true even if the solution consists of hardware and software from multiple vendors.

Most appliance-based solutions are deployed in rack-mounted configurations, so they fit easily into any data center. They can often be expanded by adding appliances as needed, with capacity and load balanced automatically by design and shared among all devices.

Some vendors are bundling different technologies, such as virtualization or automated disaster recovery, into their CI offerings. Implementing virtualization allows administrators to manage both physical and virtual infrastructures in a federated manner.

IBM, which provides CI solutions to customers ranging from small businesses to large enterprises, calls its offerings PureSystems expert integrated systems. And VCE, formed by a partnership between Cisco Systems, EMC and VMware, calls its offerings Vblock integrated infrastructure systems. NetApp has partnered with Cisco and other vendors on its FlexPod line of CI solutions, and HP uses only its own components in its HP ConvergedSystem solutions.

Converged Infrastructure Benefits

Although converged infrastructure is a relatively new concept, many companies have already deployed CI solutions, at least on a limited scale. Thus, the benefits and value of CI can be measured.

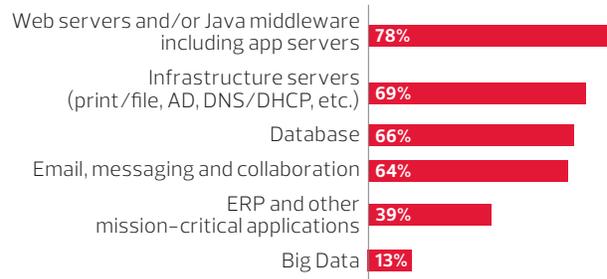
A study conducted by Forrester Research for HP found that 37 percent of survey respondents reported saving between 5 percent and 10 percent on their overall IT budgets using CI. Another 15 percent of respondents said they saved between 11 percent and 20 percent overall. The study also determined that larger CI deployments tended to return larger benefits than smaller deployments.

Most companies that responded to the survey found savings in the areas of power consumption, storage management, new system configuration, patching system firmware and virtual machine management. In addition, 60 percent of the respondents found that deploying new software and hardware within a CI environment took either slightly less or significantly less time than with a traditional architecture, in which IT assets had to be pushed out to a large network or even installed by hand on multiple machines.

The benefits of CI begin with the physical infrastructure. Many machines are combined into one system, or at least fewer systems. Thus, CI takes up less floor space – sometimes dramatically less – than a sprawling IT environment. According to the Forrester survey, companies have successfully moved web, Java, middleware, print, file, Domain Name System and Dynamic Host Configuration

CI is Now a General Purpose Enterprise Platform

“What applications are you running on your converged infrastructure system?”



Base: 100 North American and European enterprise IT infrastructure and operations decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of HP, March 2013

Protocol servers into a CI environment. Databases, email, messaging, collaboration, enterprise resource planning and even mission-critical applications were also consolidated. In a few cases, companies even consolidated Big Data applications along with the terabytes of information that drive them.

The reduction in physical space requirements that organizations see with converged infrastructure often is accompanied by savings in other areas. With fewer machines running, power consumption frequently decreases. Cooling also tends to be more efficient, further reducing energy consumption. With fewer cables and fewer devices vying for IP addresses, networking is simplified. In some cases, an infrastructure that previously took up a cavernous data center floor can be moved to a smaller room supporting the CI.

A converged infrastructure also eliminates the need for an organization's IT department to make sure that different components will work together. A CI provider pre-integrates each component of the solution, certifying that the pieces work together and reducing the potential for problems down the line.

CI also reduces the demand for data center workers, as a smaller staff can manage the consolidated systems. Those staff members can respond to IT problems more quickly as well, since CI offers a single management interface that allows an administrator to manipulate every aspect of a CI architecture. The IT staff won't have to hunt down problems hidden within hundreds of servers, devices and network hardware. Instead, problems can be identified quickly and fixed efficiently.

CI and the Cloud

Converged infrastructure is uniquely suited for cloud operations. In fact, it's a relatively easy next step for hardware operating in the efficient architecture of CI. Organizations can make excellent use of their IT resources by deploying CI as the basis for an eventual leap to the cloud. Once the CI infrastructure is in place and the organization needs additional capacity, it can be obtained by using either the popular OpenStack protocol or common hypervisors that allow easy scalability and movement of virtual machines to the cloud.

Organizations that want to maintain complete control of their IT environment, while employing cloud computing, generally elect to establish a private cloud. With this model, sensitive data and applications remain under the control of the

organization, which is responsible for both physical and logical security.

Conversely, many organizations expand from CI into public clouds, in which a service provider makes resources such as software and storage available to customers over the Internet. Examples of public clouds include IBM's Blue Cloud, Sun Cloud and the Windows Azure Services Platform. Combining an organization's CI-enabled private cloud with a public cloud creates a hybrid cloud architecture.

A hybrid cloud may, for example, host high-security information on a private cloud and run day-to-day business infrastructure on a public cloud leased from and maintained by a provider. With a solid CI to work from, any cloud configuration is possible.

In fact, moving a CI deployment to the cloud has many advantages. A move to the cloud opens more floor space for an organization. And the cloud bolsters disaster recovery operations because data isn't locked down at one location.

But the biggest advantage is that cloud CI providers offer dynamic IT infrastructure growth as needed. If a company suddenly needs more capacity, instead of experiencing downtime or poor performance, more cloud-based resources can be easily added, with the company paying for the increased capacity.

A cloud-based CI solution works the other way too. It allows an organization to easily reduce the resources it uses — and the bills it must pay for those resources — if extra capacity isn't needed or used.

With a well-managed CI solution, IT staff and administrators can concentrate less on being network mechanics, keeping disparate components cabled (sometimes cobbled) together. Instead, they can use their skills to support new company initiatives and business growth.

In fact, 40 percent of the respondents in the Forrester study said IT workers were able to shift their focus from maintenance to new initiatives once a CI solution was implemented. In addition, 73 percent of respondents reported that implementation of CI resulted in improved IT responsiveness to new business requirements.

Another benefit that many organizations find with a converged infrastructure is that capacity is used more efficiently.

What Comprises a Converged Infrastructure Solution?

These solutions are completely integrated and sold as a completely integrated IT offering, but they comprise the following technologies:

Networking	Typically large modular core switches
Servers	Blade servers
Virtualization Software	Hypervisor and management software
Data Storage	Network-attached storage

Addressing Orchestration

One of the hidden benefits of a converged infrastructure solution can also become one of its most productive advantages. Many CI vendors talk about how their product reduces the need for resources to manage day-to-day IT infrastructure requirements. But how does CI accomplish this goal? Orchestration is the key.

Orchestration is a fancy way of describing automation. In a well-orchestrated system, the computers can find problems and deal with them without human intervention. While orchestration can work in a traditional IT architecture, accomplishing such a goal is a massive technical challenge.

An IT staff trying to achieve a useful level of orchestration in a traditional architecture must deal with differences in server types, disparate software and machines running independently in silos or at remote locations. At best, orchestration might occur within a silo or for a group, but almost never across an entire infrastructure.

The concept of converged infrastructure changes that. With IT resources pooled and managed from a single interface, automation rules can be created that apply to an entire infrastructure. The *Wikibon Primer on Converged Infrastructure* estimates that with traditional network topography, about 70 percent of an IT budget in money and time is devoted to simply "keeping the lights on." With a CI solution in place and effective use of orchestration, that figure could drop to 50 percent or lower. And for a large organization, that 20 percent can equal a lot of time and money.

The pooling of IT resources allows the organization to look at the IT infrastructure as a whole and consider all available resources when planning to expand or reduce capacity.

As data grows at every organization, the need for more efficient storage grows with it. A CI solution can help organizations deal with the greater demand for storage of more data and for longer periods. By virtualizing storage, a CI solution can reduce cost and complexity. This also adds flexibility, resiliency and scalability. Shared storage allows different physical servers to access storage resources so they can support the various applications they host.

Finally, with all resources consolidated on fewer machines, many processes can be automated. Policies can be set one time and applied across an entire CI network. Patching software or adding new programs can take place from one location with no need to push updates across a network. This reduces the risk that some obscure server might miss out on a security patch, creating vulnerability.

CI Solutions and How They Compare

Because converged infrastructure can involve many components – from servers to software, networking hardware to storage devices, and can be either hardware- or cloud-based (or some combination of the two) – a full CI solution can involve products from several different vendors. As such, many CI providers are partnerships of several different IT manufacturers working together to produce an integrated solution.

VCE's Turnkey Lineup

VCE is one of the largest CI providers that has a partnership of different companies at its core. Formed in 2009 as a joint venture between EMC, Cisco Systems and VMware, it produced its first product in 2010 with the introduction of the Vblock system line.

Vblock is a hardware box made up of several different rack-mounted components that can be deployed in existing data centers. It uses Cisco's Unified Computing System (UCS) for computing capacity and Nexus switches as its networking component. EMC contributes its NX and VMAX storage technology as well as its Ionix Unified Infrastructure Manager software, which creates a single point of management for all components. By consolidating management into a single panel, Vblock solutions can dissolve data center silos and improve IT productivity. All Vblock units are purpose built with virtualization in mind, and higher-end Vblock units take advantage of vCloud, which makes them turnkey private cloud solutions.

Several Vblock systems make up the VCE arsenal. All have been extensively tested to ensure that the components work together as a single unit. All are installed by VCE technicians and integrated into a company's existing architecture, and all are considered to be turnkey solutions.

VCE's most basic CI solution is the Vblock System 100, which can be delivered in one of two configurations. This solution is designed to address the needs of small to midsize organizations, as well as branch offices and remote locations of larger organizations. The larger of the two configurations is designed to fit in an existing data center; the smaller can be housed in a simple computer closet. Either unit can be up and running within 30 days of the order being placed. And like all Vblock solutions, they are ready for virtualization.

The Vblock System 200, which is also targeted at midsize organizations, adds capacity to support a variety of applications, including the core IT services needed to sustain a virtual desktop infrastructure (VDI).

The Vblock System 300 adds significant capacity, which can be used to support multiple applications and user groups. The 300 can handle mission-critical applications, VDI environments, mixed workloads and most cloud services, all at the same time.

The king of the Vblock line is the 700 series, which can support an organization of almost any size. It's robust enough to handle Oracle databases, Microsoft Exchange servers with massive numbers of users, SharePoint operations and VDI. The Vblock Series 700 can host and manage thousands of virtual machines simultaneously.

Vblock solutions use VCE Vision Intelligent Operations for systems management, which optimizes services and integrates directly into VMware technologies. This system also provides an extensible application programming interface for other management tools.

With multiple levels to match a wide variety of needs at a wide range of cost, VCE's Vblock line can serve any organization looking to deploy a new CI solution or add to an existing infrastructure.

NetApp's Flexible CI Approach

NetApp's FlexPod is also an appliance-based solution, though it's a bit less tightly controlled than the Vblock configurations. The FlexPod Datacenter solution is designed to serve large enterprises, while the FlexPod Express serves small and midsize organizations.

The FlexPod solutions use Cisco Nexus 5000 and 7000 Series switches as the heart of their networking components. Cisco also provides its Unified Management software, which gives administrators a single point of contact to manage all IT infrastructure needs. Storage is handled

Converged Infrastructure Comparison Chart

	HP ConvergedSystem	NetApp FlexPod	VCE Vblock
Supported OS	Windows, Red Hat, SUSU	Windows, Red Hat, SUSU	Windows, Red Hat, SUSU
Blade/Node Chassis	HP BladeSystem c-Class (10U)	Cisco UCS 5108 Blade Server Chassis (6U)	Cisco UCS 5108 Blade Server Chassis (6U)
Maximum Number of Nodes Supported	16 half-wide nodes or 8 ProLiant DL380p	4 full-wide, or 8 half-wide nodes	4 full-wide, or 8 half-wide nodes
Max. Server per Chassis Full Width	8 ProLiant DL380p	8 nodes	8 nodes
Max. Compute per Chassis Half Width	16 nodes	8 nodes	8 nodes
Max. CPU Cores per Chassis	160 or 256	128	128
Max. Processor Sockets per Node	2 Sockets	2 or 4 Sockets	2 or 4 Sockets
Node/Blade CPU	Intel Xenon	Intel Xenon	Intel Xenon
Node Internal Disk Drive	2x 2.5-in. SFF 300GB SAS	2x 2.5-in. SFF SAS or 15mm SATA or SSD	2x 2.5-in. SFF SAS or 15mm SATA or SSD
Half-wide Node I/O Throughput	40Gbps	40Gbps	40Gbps
Half-wide Node Mezzanine I/O Adapter Slots	1	1	1
Full-wide Node Mezzanine I/O Adapter Slots	N/A	2	2

Note: General comparison – for complete specifications see individual systems and solutions

by NetApp FAS storage arrays in various configurations. FlexPods also support virtualization through VMware or Microsoft software suites.

Instead of looking at existing architectures to pick a CI configuration that matches business needs, organizations that implement a FlexPod solution instead work with NetApp to design a pod-like configuration that meets their requirements.

NetApp doesn't actually construct the solution, but instead has them built by partners once the reference architecture is created. Each organization that deploys a FlexPod Datacenter or a FlexPod Express will own a unique configuration that is likely different from any other system. Even so, all the components, both hardware and software, have been tested and certified to work together as a single unit.

The flexibility and the compatibility of the FlexPod solution allows organizations to deploy both the Datacenter and the Express units to operate together. For example, the Datacenter unit could be housed at a main office while Express units serve remote branches, and the architecture would still be seamless to both users and administrators. All FlexPod configurations are designed for quick, easy expansion. New equipment can be added to existing pods, building on to the core unit.

NetApp has designed FlexPod to work in private, public and hybrid clouds. The solution operates with a range of cloud management platforms, including those from VMware, Microsoft, CA Technologies and Cisco. The NetApp storage technology built into FlexPod integrates with OpenStack software, making deployment of cloud services simpler, faster and more scalable.

NetApp also offers FlexPod with Microsoft Private Cloud, which combines the FlexPod hardware and software with Microsoft software such as Windows Server 2012 Hyper-V and System Center 2012 to help organizations build their own dedicated Infrastructure-as-a-Service environments.

A FlexPod deployment can serve organizations with special needs by providing an architecture that is uniquely designed for their operations. It is also an effective solution for entities that expect to grow their IT infrastructure in the future, because it allows them to establish a base pod that can meet their current needs, with plenty of upgrade options that can be snapped into place quickly when expansion is necessary.

HP ConvergedSystem

HP is one of the few IT manufacturers that makes enough different products to create its own converged infrastructure solution without relying on a partnership with others –

and they did just that at the HP Discover Barcelona 2013 conference in December. HP Converged Infrastructure uses HP's servers, storage devices, networking switches, software and services to create a total out-of-the-box CI solution from a single vendor.

Because all the equipment in HP's CI solution is manufactured and configured by HP, the company says its solutions can be up and running in as few as 20 days from the time of order. And because the solution comprises HP equipment that is specifically built to work together, the components' compatibility is assured.

Under HP's Converged Infrastructure approach, different machines are deployed for different purposes. For example, the HP ConvergedSystem for Virtualization will scale to match computing resources with preconfigured, modular virtualized systems. A single system can support as many as 1,000 virtual machines at a price HP says is 25 percent lower than all competitive CI offerings.

In fact, HP offers separate converged systems for virtualization, cloud, Big Data, client virtualization and collaboration.

The HP ConvergedSystem 100 for Hosted Desktops is another solution designed for a specific purpose. Based on the powerful HP Moonshot server, it can deliver a robust desktop experience compared with traditional VDI deployments. Using a PC-on-a-chip design, a first for data centers, the system is able to deliver six times faster graphics performance and 44 percent lower total cost of ownership (TCO) compared with normal virtualized systems.

In the area of Big Data, HP says it offers a CI solution that specifically addresses the requirements of analyzing the massive amounts of information found within any Big Data solution. The HP ConvergedSystem 300 for Vertica specifically speeds Big Data analytics, helping organizations turn raw data into information that can be used to improve decision-making and operations. HP says that its CI Big Data offering can provide those insights up to 1,000 times faster and at a 70 percent lower cost per terabyte than a legacy data warehouse.

HP integrates its ConvergedSystem with HP OneView systems management tools, allowing an administrator to manage, monitor, verify and patch every component in the IT infrastructure from a single panel. The HP solutions also are integrated with third-party management tools such as VMware vCenter.

HP's offerings allow an organization to implement a converged infrastructure in only the areas where it's needed most, leaving the rest of its IT operations alone until resources are available or needs change. This means an organization can harness the power of CI just for cloud operations alone, or desktop virtualization, or to analyze impossibly large Big Data sets that might contain invaluable information. It also means organizations can experience all the benefits of CI on a smaller scale while avoiding some of the pitfalls of a larger deployment.

Converged Infrastructure Pitfalls

Although moving to a converged infrastructure solution has many advantages, several pitfalls must be avoided. In a Forrester Research study commissioned by HP, most of the survey respondents who had deployed a CI solution reported cost savings. But 18 percent reported that they were paying as much as 10 percent more in IT costs with CI than with a traditional infrastructure.

So why did IT spending increase at these companies? Most likely, these respondents simply bought a solution that was too large for their current infrastructure. With physical appliances, laying out too much money for a machine with far more capacity than is needed is a recipe for busting a budget. To avoid this, a comprehensive study that catalogues all IT resources, their capacities and usage statistics (and any overlapping functions) is a necessity before deploying a CI solution.

It's also possible that the CI solution deployed didn't connect properly to the current infrastructure. It's up to the organization and the vendor to ensure that new hardware is compatible well before it arrives onsite, especially for converged solutions that are going to rely on existing IT infrastructure, as is the case when only servers or storage devices are being converged.

Finally, it's possible that some companies that deployed CI and found higher costs weren't willing to dispose of their existing infrastructure. The common rationale among most IT professionals is that once a server or appliance has been purchased, it becomes a "sunk" cost that cannot be recovered.

While there is value in keeping older equipment running as long as possible before upgrading or decommissioning it, if doing that means running a traditional infrastructure alongside a CI solution, costs will only increase. Although it might be painful for some IT managers, deploying CI properly means unplugging the old gear once and for all, even if doing so seems like a loss. For proper CI deployment, sometimes a loss has to happen before a gain.

CDW: A Converged Infrastructure Partner That Gets IT

To properly deploy a CI solution, an organization requires a partner that's an expert in the subject matter and that will evaluate the customer's needs to recommend a CI solution that fits perfectly. CDW is such a partner.

Our data center solution architects have a unique understanding of the entire data center operation. And our Private Cloud Accelerator offering gives you comprehensive access to the depth of their expertise.

Our approach includes:

Data Center Workshop – The cornerstone of the Private Cloud Accelerator engagement, this half-day session with a CDW data center solution architect provides for:

- Technical discussion of today's data center optimization technologies and best practices
- An overview of your current data center, including:
 - Application delivery methods and requirements
 - Disaster recovery and continuity requirements
 - Standards compliance
 - IT governance

- Identification of current challenges in your ability to provide quality IT services
- Translation of your organization's IT goals into a data center strategy

Discovery Workshops – Based on information gathered in the Data Center Workshop, CDW will recommend a series of Discovery Workshops to capture a complete and accurate picture of your current data center environment. Topic areas may include: network, server, storage and/or physical environment. Discovery Workshops are led by solution architects highly specialized in the topic areas. The solution architects will document and address:

- Your current infrastructure
- Known challenges, such as performance issues or inefficiencies
- Process and procedures for adds, moves and changes
- Technical knowledge gaps
- Best practices

To learn more about how CDW can help with converged infrastructure solutions, contact your CDW account manager, call 800.800.4239 or visit CDW.com/convergence



Vblock System 200 provides an advanced converged infrastructure. With Vblock System 200, you get a reliable, continuously available infrastructure that can keep pace with your increasing needs and offer a proven path to the benefits of virtualization and cloud computing.

CDW.com/vce



Leap ahead with an advanced storage platform from NetApp that delivers the leading performance, value and scale you need.

CDW.com/netapp



Launch your applications quickly and efficiently in the cloud with OpenStack technology. HP Cloud Compute gives you all the power and flexibility you need to run your production workloads.

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