Advanced Converged Infrastructure: Creating On-Premises Private Cloud

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As always, IT is under pressure to deploy infrastructure capable of improving resource utilization and reducing costs while addressing productivity and agility. In particular, enterprises are constantly looking to virtualization, object technology, and various cloud infrastructures to update mission-critical applications — especially those that include both structured and unstructured data. This Technology Spotlight looks at convergence — an evolving digital transformation technology — and its implications for the enterprise. This document discusses VersaStack, a joint converged infrastructure solution from IBM and Cisco, and provides some guidance for businesses looking to convergence to update their IT operations.

Introduction: The Rise of Convergence

Enterprises of all sizes are undertaking digital transformation projects intended to streamline costs of doing business, strengthen customer relationships, capitalize on new sources of revenue, and improve workforce productivity. IT teams are finding that the levels of scale and agility needed in today's environment cannot be achieved using their long-standing practice of buying individually managed silos of datacenter resources. As big data concerns and cloud computing continue to grow, the underlying technology infrastructure is being pushed to the limit. Enterprises are at a critical point in time due largely to the increasing adoption of 3rd Platform applications that focus on social, mobile, cloud, and big data environments. These environments require new levels of scale, automation, and agility that do not align well with discrete datacenter resources.

As a result, IT teams are shifting away from deploying standalone servers, networking, and storage systems in favor of fully integrated solutions that can be centrally managed with tools that offer new levels of automation. Technologies such as server virtualization, for example, have helped drive considerable savings by enabling better infrastructure utilization rates and higher levels of application resiliency. Converged systems represent another area of datacenter innovation that has been helping companies achieve new levels of cost reduction and operational efficiencies as well as better alignment of IT processes with business-centric needs.

These converged systems consolidate servers, storage, and networking onto either a single platform or an array of centrally managed resources. They are increasingly built with new technologies (e.g., flash media, software-defined data services) and architectures (e.g., server based, scale out) that are driving previously unmet levels of cost and operational efficiencies. Importantly, converged systems are increasingly deployed as a platform for private clouds and a critical component to holistic hybrid cloud environments. According to IDC research, the demand for converged systems (including hardware and software) will drive this emerging market to almost $4 billion in sales in 2019.

In addition, digitalization, social networking, Internet of Things (IoT), digital sensors, and other applications have multiplied demand for unstructured data storage capability supporting video, text, photos, streaming data, and documents. Enterprises face growing demand for large-scale, object-based storage environments to manage and maintain unstructured data sources. Because of this increase in demand, IDC expects the file- and object-based storage market to continue to grow at a 5.8% CAGR through 2020. This growth can be attributed to the shift toward the software-defined storage technologies as well as multicloud/hybrid cloud infrastructures, significantly driving the need for converged systems.

Converged Infrastructure

Converged systems are different from traditional hardware platforms and architectures in that they use a modular building-block approach to rapidly scale up resources and workloads. Because converged systems are pre-integrated and engineered to optimize network traffic, they are simpler to deploy and maintain while reducing processing and network overhead and latency. Converged systems are pre-integrated, vendor-certified systems containing server hardware, storage systems, networking equipment, and basic element/systems management software. These systems may come from one vendor or multiple vendors when there is a formal, signed intercompany agreement.

Management software includes embedded or integrated management and control software optimized for the auto-discovery, provisioning, and pooling of physical and virtual compute, storage, and networking resources shipped as part of the core, standard integrated system. These systems can be designed and deployed to support general-purpose, distributed workloads that present disparate service-level agreement (SLA) profiles, or they can be engineered to run optimally for a single workload such as a critical corporate database.

Converged systems continue to evolve and now natively collapse disparate storage, compute, and storage networking functions into a centrally managed solution comprising x86 hardware and storage arrays. In addition to integrating storage and compute functions into a single solution, all advanced converged systems employ:

- A distributed file system or an object store that serves as the data organization, management, and access platform

- A hypervisor that provides workload adjacency, management, and containerization in addition to providing the hardware abstraction layer and hosting essential management software needed to manage the platform

- An (optional) Ethernet switch to provide scale-out and/or high-availability capabilities

Pre-integrating these elements eliminates the need for customers to do the work themselves, and systems can be tested and managed as one element. These more advanced converged systems make it easier for IT to incorporate object technology and make on-premises IT more like private cloud.

New Challenges Facing IT and the Benefits of Advanced Converged Infrastructures

IT needs to address the massive amount of unstructured data and associated object-based storage solutions. To be effective, converged infrastructures must offer a pre-tested and integrated solution that removes IT complexity and reduces associated IT labor. In short, enterprises need a flexible computing strategy and an infrastructure that supports dynamic resource allocation and increased utilization and is easy to deploy, operate, and manage while lowering operating expenses. Furthermore, effective object-based storage environments must be able to scale with linear performance and be highly available, easily managed, and cost effective.

The real challenge for most IT leaders is in driving change. This change can be in the IT processes, the technology used, and/or the people responsible for the change, and revolutionary technology shifts such as advanced convergence and related private cloud solutions can involve the most change. To make converged infrastructure possible, IT organizations must consider:

■ **Management.** Some solutions require administrators to work with multiple system and element management software products that must be further consolidated to minimize the number of software suites that must be relied upon.

■ **Service and support.** There is an increased need for services targeted toward initial design and deployment as well as support contracts that include complex change management tasks (e.g., rollout of firmware upgrades).

■ **Legacy systems.** Legacy systems often hinder the ability to support next-generation applications, so construction with standardized building blocks must include support for applications that have inherently different needs associated with resiliency and data locality.

But the benefits of advanced infrastructures can be significant. The ability to natively collapse core shared storage, compute, and storage networking functions into a single solution represents a key difference between converged systems and traditional integrated infrastructure that leverages autonomous compute, storage, and networking equipment. Advanced converged systems represent a fundamental shift away from traditional SAN-attached, scale-up storage architectures, indicative of a broader trend toward server-based storage made possible by the maturity of virtual computing and advancements in software-defined storage.

Suppliers are now able to combine these technologies in a way that allows industry-standard x86 servers and storage arrays to be used as standard building blocks to be deployed in a highly virtualized, scale-out environment. A distributed file system (or object store) is combined with HDDs, SSDs, and other nonvolatile flash devices to bring data very close to the applications. This ensures predictable performance for the virtualized workloads that tend to have dynamic I/O profiles. Critical data management functions (and storage networking) enable the system to become a highly virtualized peer of the supported applications and virtual machines.

As such, advanced converged infrastructures can:

■ Reduce service/application time to market, enabling IT to respond more quickly to new business applications and projects and to shorten the time to provision new infrastructure to drive agility into IT processes and shift to an on-demand or IT-as-a-service model

■ Provide considerable reductions in capital costs by allowing users to consolidate workloads onto fewer systems without increasing risk, as well as reducing datacenter footprints and the power and cooling costs of these systems

■ Increase infrastructure management efficiency through greater levels of automation and centralized management

Considering VersaStack

VersaStack is an advanced converged infrastructure solution jointly developed by IBM and Cisco Systems. It is based on the Cisco Unified Computing System (UCS) Converged Infrastructure — including compute, network, and management components — and IBM storage solutions — which may include IBM Storwize, IBM FlashSystem, or IBM Cloud Object Storage. VersaStack enables enterprises to develop and support cloud, big data and analytics, mobility, and virtualized solutions.

The solutions offered span the entire spectrum of datacenters, including performance-critical datacenter workloads; virtualized enterprise and midsize businesses; and edge workloads that include remote offices and other remote location applications.

VersaStack is a defined set of hardware and software components that serves as an integrated foundation for virtualized and nonvirtualized solutions. The VersaStack architecture is highly modular, taking a "pod"-like approach to provide architectural flexibility and design options that enable enterprises to scale as needed. The solution can be scaled up by adding resources to existing VersaStack units and/or scaled out by adding more VersaStack units. VersaStack incorporates IBM's all-flash as well as hybrid storage technologies into a single management environment provided by Cisco's UCS Director. The critical advantage to this approach is that it eliminates the latencies associated with using software-based solutions designed for "storage rich" x86 boxes.

On the network and compute side, VersaStack solutions leverage Cisco networking, Cisco UCS, and the consolidated Cisco UCS Director management interface for simple, integrated management.

On the storage side, IBM storage solutions for VersaStack are based on either IBM Spectrum Virtualize or IBM Spectrum Accelerate technologies. Together, the integrated components can be utilized in both on-premises and cloud services. For example, IBM Spectrum Virtualize for Public Cloud expands on VersaStack with native storage replication between on-premises VersaStack and IBM Cloud. In addition, from a storage perspective, IBM Spectrum Virtualize enables legacy systems to become part of the converged solution, preserving capital investments. IBM Spectrum Access can be built directly on VersaStack to deliver a private cloud solution, which now has additional support for object-based data.

VersaStack is backed by Cisco Validated Designs and IBM Redbooks application guides, plus available services, to help enterprises rapidly create and deploy pre-validated, cost-effective, high-performance solutions. VersaStack executives and customers claim rapid deployment and delivery of applications with increased infrastructure efficiency and less risk, enabling the opportunity to use on-premises resources to create private cloud environments.

Challenges

IBM and Cisco face challenges as they continue to enhance VersaStack. First is the age-old concern of adopting new technology approaches. It is imperative that the companies continue to evangelize for converged systems, emphasizing the rapid deployment capabilities, the quick return on investment, and the ability to easily support multiple types of structured and unstructured data to meet the needs of today's enterprises.

In addition, the companies must emphasize how VersaStack can be integrated with legacy systems to lessen the impact of new technology. This is a major advantage included in IBM Spectrum Virtualize, which runs on VersaStack — that is, the ability to virtualize legacy storage (even from other vendors) and use caching to present hot data from old systems as if it were on modern storage. Second, because IDC predicts that the converged systems market will grow dramatically, competition also will grow as other major players enter the fray or expand their converged offerings. IBM and Cisco must continue to stress their respective strengths, position in the industry, and long partnership as critical benefits of the VersaStack solutions.

Conclusion and Essential Guidance

There is building pressure in IT to deploy infrastructure capable of improving resource utilization and reducing costs while addressing productivity and agility. In particular, enterprises are constantly looking to virtualization and the various cloud infrastructures for mission-critical applications — especially those that include both structured and unstructured data and associated storage. Converged solutions should be an important consideration for such environments. As comfort levels increase and core benefits of converged systems are realized, organizations will undoubtedly migrate more workloads to these systems.

Careful attention should be paid to the choice of hardware platforms. They must perform and be scalable to the needs of large applications as well as have the features demanded by mission-critical applications across compute, storage, and networking simultaneously. Converged infrastructure can greatly increase the reliability of systems because integration engineering is part of the system and performance can be optimized during design. In addition, management tools are key to improved operations because they reduce the number of elements to be managed as well as simplify management tasks. Good tools also will integrate physical and virtual management for better insight and coordination. As the concepts of agility and scalability have moved to the forefront of business operations, companies are aggressively looking for IT solutions that offer the necessary flexibility.

Simply put, converged systems allow the datacenter to quickly adjust to changes in the demand coming from users. IDC recommends that organizations have an understanding of the following factors when searching for the right converged infrastructure solution:

- **Total costs,** including acquisition costs, costs of training for support personnel, and operational costs involved in deploying converged systems, as well as the operational costs that can be avoided with converged infrastructure

- **Organizational needs,** developing a requirements list that includes input from all of the stakeholders within the organization

- **Enterprise workload profiles,** ensuring the specific configuration of the converged systems fits the profile of the organization, including all components, such as server, storage, and networking

The new generation of converged systems, especially systems that support object storage for vast amounts of unstructured data, offers a potent combination with which to address next-generation IT resources and improve existing IT resources to support today's business demands. To the extent that the joint venture between IBM and Cisco can meet the challenges outlined in this document, VersaStack should be on the short list of any enterprise looking at next-generation converged infrastructures.