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Hyperconverged Infrastructure

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HPE has recently released a Dummies book describing its hyperconverged infrastructure. *Hyperconverged Infrastructure for Dummies* can be found at

https://www.hpe.com/us/en/resources/integrated-systems/hyperconverged-infrastructure-dummies.html?pp=false&jumpid=sc_fhmt17uanr_aid-510318809

The book describes HPE's hyperconverged infrastructure product, SimpliVity. Hyperconverged infrastructure combines compute, storage, networking, and data services into a single physical system. The software that enables hyperconvergence runs on standard x86 systems. Its distributed architecture lets you cluster multiple systems within and between sites that can be managed through a single interface.

To understand hyperconvergence, we will discuss virtualization, the software-defined data center, and cloud computing.

Virtualization

Today, most services running in a data center run in a virtual environment. Applications run as virtual machines, many of which are hosted on a single physical server. Administrators consider the virtual environment for running new applications rather than building a new physical environment.

Virtualization helps organizations consolidate many of their servers to run on a common platform on top of a hypervisor, which allocates resources of the physical server to the virtual machines (VMs). Before virtualization, it was not uncommon to find a data center populated with hundreds of physical servers running at 15% capacity. As a result of virtualization, organizations enjoy a much higher return on their investment.

IT departments used to be required to maintain separate groups of people to manage separate hardware resources – servers, storage, networking. Furthermore, different workloads created resource challenges that pushed them to develop infrastructure environments on a per-server basis. Virtual desktops, for instance, have vastly different resource usage patterns than server virtualization projects. Even worse, the devices often required separate management consoles.

Virtualization is heavily dependent upon storage. Many VMs are running on a single host and accessing storage for their own needs. The database system has to jump all over the disk to service the combined load of the VMs. Continued consolidation of VMs contributes to random I/O workloads, each with its own pattern for reading and writing to storage. Highly random I/O streams adversely affect overall performance as VMs contend for disk resources.

Virtual desktops are a particular problem. Sometimes they only need ten or twenty input/output operations per second (IOPS). However, when they are being brought up, IOPS can skyrocket due to the boot storms and login storms. This typically occurs at the beginning of the day.

The best outcome in any environment is to eliminate writes to disk before they ever happen. In a hyperconverged environment, many operations do not have to touch disk because of caching in RAM.

In the modern data center, disk capacity is not an issue. Capacity has become plentiful as vendors release bigger drives. However, performance has barely improved. With the addition of disaster recovery, the demand for WAN bandwidth has increased. Given this reality, the data center infrastructure needs to optimize for performance and latency, not capacity and throughput.

Inline deduplication provides the level of efficiency needed. It consists of only reading the data, applying deduplication, and writing the data as it is being transferred to another destination.

In a hyperconverged environment, backup and replication are applied directly to individual applications (or VMs).

The Software-Defined Data Center

A software-defined data center (SDDC) employs a high degree of virtualization. Storage, servers, and even WANs are virtualized. This eliminates resources that are traditionally locked within a single-purpose device and creates a shared-resource pool for applications. Instead, the SDDC uses commodity x86 hardware. Virtualization abstracts the hardware components of the data center and overlays them with a common software layer.

There are many advantages to an SDDC:

- Predictability – Services operate in a predictable way at a predictable cost.
- Scalability – The data center can't be a limiting factor when expansion becomes necessary.
- Utilization – Because a hyperconverged data center is built on common components, high utilization rates are easy to achieve.
- Personnel – A company can operate a data center with fewer personnel because there are no traditional resource islands.
- Provisioning – An SDDC offers agility and flexibility, which reduces provisioning times for new services.

Resource islands are inherently inefficient. The broader the IT environment, the easier it is to achieve operational economies of scale. Don't think about each individual resource as its own island. Instead, focus on the overall scale of all resources.

IT staff wants to lower the risk in their operations. Applications must be highly available, and data must be safe. As more diverse hardware is installed, achieving these goals becomes more difficult. Companies can reduce these risks by adopting a hyperconverged infrastructure. Then It can quickly and easily deploy new applications and services in response to business demands.

How the Cloud Is Changing IT

Major cloud service providers are changing expectations of how a data center should operate. The best architectural design elements from clouds have been brought to the hyperconverged world and packaged for affordability.

Major clouds are based on commodity hardware. It is the software in a hyperconverged environment that provides the services. This includes recovering from commodity hardware failures. Scalability is easily obtained by simply adding more commodity resources under the umbrella of the software. Thus, scalability can be achieved in small bite-sized pieces.

Hyperconvergence brings cloud-type consumption to IT without compromising performance, reliability, or availability. Rather than making huge buys every few years, IT simply adds small building blocks of infrastructure to the data center as needed.

Converged Infrastructure

Convergence and SDDCs are aimed at reducing the infrastructure clutter, complexity, and cost of data centers. Converged infrastructure products combine the server and storage components in a single box. They provide a single localized resource pool, offering simplified management and faster time to deployment.

However, converged infrastructure has some limitations. Resource ratios, such as CPU:storage:network, are fixed, making them less flexible than some organizations require. The products cannot always be used by existing infrastructure.

Hyperconverged Infrastructure

Hyperconvergence delivers simplification and savings by consolidating all required functionality into a single infrastructure stack running on commodity x86 servers. Hyperconvergence brings many features that make legacy services obsolete in some IT environments:

- Data protection via backup and replication.
- Deduplication.
- Wide-area network (WAN) optimization.
- Solid-state drive arrays.
- Public cloud gateways.

Advantages of a Hyperconverged Infrastructure

Hyperconvergence brings several advantages to an application:

- Software Focus - Since hyperconvergence is software based, it provides the flexibility required to meet current and future business needs without having to rip and replace infrastructure components.
- Centralized System Management – Since all components are combined in a single shared resource pool, IT can manage resources across individual nodes as a single federated system.
- Enhanced Agility – All resources in all physical data centers reside under a single administrative umbrella. Therefore, workload migration is quite straightforward.
- Scalability and Efficiency – Hyperconvergence is a scalable building-block approach that allows IT to expand by adding units in small step sizes.

- Cost-Effective Infrastructure – Hyperconverged systems have a low cost of entry and a low cost of ownership.

- Easy Automation – All resources are combined under central management tools. IT doesn't have to worry about structures from different manufacturers since everything is encapsulated in one environment.

- Focus on VMs – Hyperconverged systems use VMs as the basic constructs of the environment. It is easy to move workloads around to different data centers.

- Shared Resources – Hyperconvergence enables an organization to deploy may kinds of applications in a single shared resource pool. Hyperconvergent systems include many kinds of storage – from flash to hard disks – in each appliance.

- Data Protection – Backup, recovery, and disaster recovery are built in.

How to Apply Hyperconvergence

Existing infrastructure does not have to be replaced in order for hyperconvergence to be of immediate value.

- Consolidating servers and data centers – Hyperconvergent products integrate seamlessly with the existing environment.

- Modernizing technology – The implementation of hyperconvergent is non-disruptive. New architectures can be phased in while old ones are phased out.

- Deploying new tier-1 applications – Deploy new workloads in a hyperconverged environment to gain its inherent operational benefits.

- Deploying VDI – Deploy virtual desktop infrastructure (VDI) in a hyperconverged infrastructure.

- Managing sites remotely – In a hyperconverged environment, the entire infrastructure from local to remote resources is controlled by a single management system.

- Performing testing and development – Create a test and development environment so that bad code isn't released into production. Hyperconvergence supports test and development with management tools that create logical separations between these functions and production.

- Modernizing backup and implementing disaster recovery – Hyperconvergence is a simple way to achieve backup and disaster recovery goals.

HPE SimpliVity

HPE's SimpliVity hyperconverged infrastructure delivers the performance, resiliency, and data protection that today's systems require. It provides a pay-as-you-go building block approach to IT infrastructure, workload-centric management, efficient optimization of capacity and performance, and built-in data protection and resiliency.

HPE SimpliVity delivers all infrastructure and data services for virtualized workloads on a pair of its Proliant servers. HPE SimpliVity provides a hyperconverged infrastructure with more agility, efficiency, and resiliency at less cost and complexity. For more information, go to www.hpe.com/info/hc.