Hyperconvergence Simplifies the Data Center

Virtualizing servers, applications and the network reduces equipment and management costs

IT resources—equipment, software, real estate and man hours—continue to sprawl in an attempt to keep pace with demand. For federal agencies, this never-ending data center creep has crowded innovative development out of budgets. Agencies struggle with increasing operations and maintenance costs as the demand for storage and processing power expands.

Over the years, going back to the Reagan administration, the government has made repeated attempts to consolidate its data centers to reduce footprint, curb redundancy, trim excess capacity and untangle complexity. Despite sustained efforts over the last few years, the current Federal Data Center Consolidation Initiative has barely made a dent, as agencies have been struggling to get an accurate count of the centers they have and determine which should be closed.

Agencies have recently shifted their emphasis to data center optimization, using virtualization and smaller form factor servers to improve efficiency. Such efforts have reduced costs, but haven't yielded substantially more available budget for innovation.

The problem is that we keep trying to address the sprawl with the same technologies that got us here in the first place. The anxiety each fiscal year is around how we are going to purchase more of the same stuff? We have more data, therefore we must need more storage. We need more processing power, therefore we must need more servers and networks. But why try to solve the problem with more of the same? What if federal CIOs and IT shops radically changed the way they address their needs for storage, networking, and compute capacity? Such a solution does in fact exist. In fact, some 170 federal programs are already supported by it. It is already radically reducing data center costs while improving mission support, security and manageability.

Come Together

This solution is hyperconverged infrastructure – the combination of servers, storage, and storage networks into a single appliance. The virtualization revolution dramatically optimized industry-standard servers, enabling similarly dramatic server and data center consolidation. However, in order for virtualization to effectively perform its magic, it required massive amounts of redundant storage and networking capacity. That traditional 3-tier architecture is as inefficient and unsustainable as pre-virtualization data centers were. Yet storage and compute requirements keep multiplying, driven by mobility, big data and the Internet of things. Enter hyperconverged infrastructure. Allow us to deconstruct.

Traditional storage architecture leverages a three (or more) tier hierarchical subsystem, accessed by servers via a network—itself composed of an array of switching devices. By moving the storage intelligence into software and running that software directly on the servers in a hyperconverged infrastructure, the once-inefficient and proprietary storage area network (SAN) is eliminated. Instead, standard top-of-rack switches are used to connect the environment as a cluster of resources. This model appears as a standard 3-tier environment to a hypervisor, but the underlying architecture is radically simpler, with exponentially fewer areas to troubleshoot and monitor, and significantly smaller in overall rack space. This eliminates the need to perpetuate legacy 3-tier architectures for virtualized environments. Instead, this brings software-defined storage to virtualized environments.

"Physically it's much simpler," says Jason Langone, director of OCONUS and Tactical Programs for Nutanix. "What hyperconvergence has done is moved the logic of the shared storage array—the deduplication, data compression, replication—everything you expect in enterprise storage, and put that in software that runs directly on the servers."

Nutanix hyperconverged infrastructure uses the company's own hypervisor for storage and evolves virtualization by an order of magnitude. Therefore,

hyperconvergence produces two seemingly opposed benefits. It gives the IT shop a step function reduction in the cost and complexity of the data center by collapsing storage into a virtual, software-defined subsystem. Yet it preserves investments agencies have made in Microsoft, RedHat or VMware hypervisor technologies—all of which can run on the Nutanix platform.

Virtualizing storage reduces complexity by incorporating storage management and control into the same appliance as the storage and compute hardware. The resulting turnkey form factor represents up to a 90 percent reduction in rack space. Equally important, hyperconvergence is massively scalable, enabling agencies to add capacity without adding complexity.

A New Kind of Architecture

The emergence of large organizations built on a virtual presence, most notably Google, Facebook, and Amazon, is possible because of a new approach to data centers. This approach—known as web-scale architecture—represents a new use of standard hardware components, open APIs, and deep virtualization—including storage.

Web-scale architecture is built around distributed system design. An instance of a given service could fail and the distributed system immediately heals around the failure, without user intervention. Web scale architecture does all the intelligence in software, without proprietary hardware. These are the lessons that organizations like Google have learned over the last decade.

"There's a lot of desire to have AWS-like capabilities, to have resources on line and available," says Langone. "[Federal agencies] are looking for more consumer grade user experiences, and much quicker access to resources. They're looking for something like Amazon within the confines of their own IA and their own datacenter."

Federal agencies can also realize the benefits from web scale architecture used to transform traditional data centers to sleek, high performing private clouds.

■ **Radically smaller space requirements:** Agencies save on the air conditioning, power and real estate costs that go along with floor space. For its IT support, one program required 60 racks of traditional gear. By moving to a hyperconverged infrastructure, that requirement shrunk to merely six racks. Infrastructure itself is dramatically smaller with hyperconvergence.

■ **Logistically easier field operations:** The smaller physical footprint and fewer moving parts are boon to the military services supporting field operations.

■ **Simple, inexpensive scalability:** No more buying double the storage capacity every year or the long procurement approval cycles and costly "rip and replace" operations required by bulky new infrastructure. You can grow capacity much faster by simply adding hyperconverged appliances incrementally, each about the size of a PC. This all means that an agency can at last have, in its own facilities, true cloud benefits while retaining critical data within government walls.

■ **Greater cybersecurity:** An Army general in the cyber command recently commented the consolidation of IT resources reduces the attack surface for malicious hackers. Hyperconvergence radically reduces the data center attack surface. Plus, the appliance's software bundle includes two-factor authentication—a requirement for privileged users coming from recent Office of Management and Budget policy.

■ **Stronger data protection and mission assurance:** The Nutanix backup and virtual machine restore capabilities are baked in, resulting in optimal recovery point and time objectives, among other features.

■ **Lower costs:** The space and power savings, mass storage reductions and ease of administration via a user-friendly management Web interface trim expenses. In addition, procuring one solution and related service and support, versus three different elements in a traditional storage approach, is inherently less expensive in hard and soft costs.

In the long term, the hyperconverged infrastructure allows agencies to reset their priorities. The data center, instead of being a cumbersome cost, becomes an agile, quickly scalable resource that supports existing enterprise applications at a high level of performance, while also helping to realize the promise of emerging solutions, such as big data, digital services and mobility.

This is the point of the data center consolidation initiative, the Federal Information Technology Acquisition Reform Act, and the overarching federal digital strategy: To start tipping expenditures away from the operation and maintenance of legacy systems and toward innovations in online services and operations that support an agency's mission.

To learn more about how Nutanix is a force for innovation in the Federal government, see our use-cases at: **http://www.nutanix.com/solutions/federal-government/federal-use-cases/**