

Software-Defined Data Center: Is Your Infrastructure Ready?



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The software-defined data center (SDDC) is an emerging market trend that describes how IT resources can be defined in software, provisioned according to policies, and delivered via API integration. The goal of SDDC is to accelerate the speed of service delivery to users and application owners, drive down costs, and decrease complexity.

To achieve this, data centers have to move beyond basic provisioning tasks and be able to quickly deliver integrated services that span the infrastructure. Compute, networking, and storage have to be defined and managed in software to create a data center that's fully automated, policy enforced, and application driven.

Sound too good to be possible? The reality is that Cisco and NetApp are well on the way to being able to deliver these capabilities, particularly with the [FlexPod® converged infrastructure platform](#).

In this article we look at some of the hardware requirements—compute, network, and storage—as well as the management and orchestration needs of the software-defined data center. We explain what you need to be aware of if you're moving toward a software-defined data center today.

Delivering on the Promise of SDDC

Loosely speaking, a software-defined data center is driven by two critical capabilities:

- **Manageability.** This requires tight integration with underlying hardware, the ability to customize management through APIs, and the ability to choose to use the tools you prefer.
- **Programmability.** Applications must be able to provision and access services directly from IT infrastructure as needed.

Explore

NetApp and FlexPod Win Accolades

In 2013 FlexPod has been racking up significant awards:



FlexPod with Microsoft Private Cloud won a Best of TechEd 2013 award in the Systems Management category. The Best of TechEd awards, cosponsored by Microsoft and Windows IT Pro, recognize Microsoft partners that offer innovative products and services.



NetApp was chosen as the Microsoft Server Platform Partner of the Year for 2013 for the way that FlexPod "helps customers easily deploy highly scalable Microsoft Private Cloud solutions."

ING Direct: Bank In a Box

To accelerate dev/test, the ING DIRECT team had a vision: Provide a copy of the bank to anyone, at any time, for any purpose, at the lowest possible cost. This includes a full set of the bank's applications, services, and configurations and 5.5 terabytes of data.

In an ideal world, you'd be able to apply SDDC capabilities to any and all underlying hardware, but, right now, the key to success with SDDC is choosing underlying devices that provide the necessary level of manageability and programmability.

This means that you have to have a level of consistency across your entire infrastructure. If your management software can't talk to your storage, or your switch lacks open APIs, you could be stuck. The following sections explore the requirements for each infrastructure element in more detail.

Although it's certainly possible to put together infrastructure that delivers on the promise of SDDC, in many cases converged infrastructure solutions, especially FlexPod, may offer the fastest and easiest path to success.

Compute

When you think about compute, it's easy to conclude that server and desktop virtualization are enough to satisfy SDDC compute requirements; in fact it's a common mistake to believe that virtualization is synonymous with SDDC.

Although there's no question that virtualization has been revolutionary, when you dig a little deeper you discover that compute for SDDC requires two additional things:

- Better control over the hardware
- Support for multiple hypervisors

Control at the Hardware Layer

In virtualized environments there are almost always hardware challenges associated with things like the BIOS version, firmware, and the [instruction set of the processor](#). Incompatibilities can introduce limitations or complications. Anyone who's ever attempted to do a vMotion® operation to a server that doesn't have the right BIOS or firmware settings knows that this is true. In some instances [a single firmware configuration difference](#) may be enough to prevent vMotion activity between servers.

In addition, many if not most data centers still have a combination of virtualized and bare-metal servers. Ideally, a software-defined data center should be able to manage bare-metal servers with the same dexterity as virtual servers and support all workloads equally well.

The capability to provide service profiles that work at the physical layer, and can work in concert with your virtual infrastructure, is a key part of Cisco® UCS™. The Service Profile is able to make sure that the underlying server environment is configured appropriately for whatever is going to run on the server, whether it's one hypervisor, multiple hypervisors, or a bare-metal OS install.

Multiple Hypervisors. If you aren't doing so already, it's likely that you'll run multiple hypervisors in your data center within the next few years. For example, it is common to run Microsoft® Exchange in a Microsoft virtualized environment. When you use a single vendor for both application and virtualization and it comes time to call for support, you know there won't be any complications. The situation is similar with Oracle® Database and Oracle VM. This multi-hypervisor model means that both your underlying hardware and your management will need to be increasingly hypervisor agnostic.

Cisco is expanding UCS functionality and UCS Manager software to make UCS even more flexible, more

Find out how the team made that vision a reality using FlexPod and Microsoft Private Cloud.

[More](#)

Software-Defined Storage

Is software-defined storage in your future? Vaughn Stewart detailed the NetApp take on SDS in last month's issue of Tech OnTap including virtualized storage services, multi-platform support, and application self-service.

[More](#)

manageable, and more amenable to the software-defined paradigm. All APIs for the environment are exposed, and UCS—whether part of a FlexPod solution or by itself—is hypervisor agnostic and works with any of the hypervisors from VMware, Microsoft, Oracle, Citrix, and Red Hat. UCS management can scale up to allow management of 10,000 or more servers via UCS Central.

Networking

Software-defined networking in the form of VLANs and other network virtualization technologies has been around for more than 20 years. Recent advancements include converged fabric and virtualized switching. The major requirements for networking in the software-defined data center are:

- Multiprotocol support
- Open management and programmability

Multiprotocol Support. This is largely about being able to support the various SAN and NAS protocols that a data center—whether it's software defined or not—may require. This includes Fibre Channel and/or Fibre Channel over Ethernet (FCoE) to support SAN as well as IP networking to support iSCSI and NAS protocols like NFS and CIFS.

As with compute, it really comes down to the capabilities and limitations of the underlying hardware. NetApp and Cisco have pushed hard to achieve industrywide acceptance for FCoE, and we provide support for end-to-end FCoE from storage to host. This means that you need only one cable between servers and storage to support any NAS or SAN protocol that your applications require. You cable once and use software to define the traffic that goes over the wire. As a result, your infrastructure can support any requirement without needing physical changes—an obvious requirement for anything bearing the name "software defined."

Open Management and Programmability. Software-defined networking (SDN) is being widely discussed and debated. The emerging SDN framework can be ideal for some environments, but additional options are needed, especially to support environments that already have substantial investments in network infrastructure.

Cisco developed the [Cisco Open Network Environment \(ONE\)](#) framework as a broad approach to make networks more open, programmable, and application led. ONE incorporates SDN as well as other network deployment models.

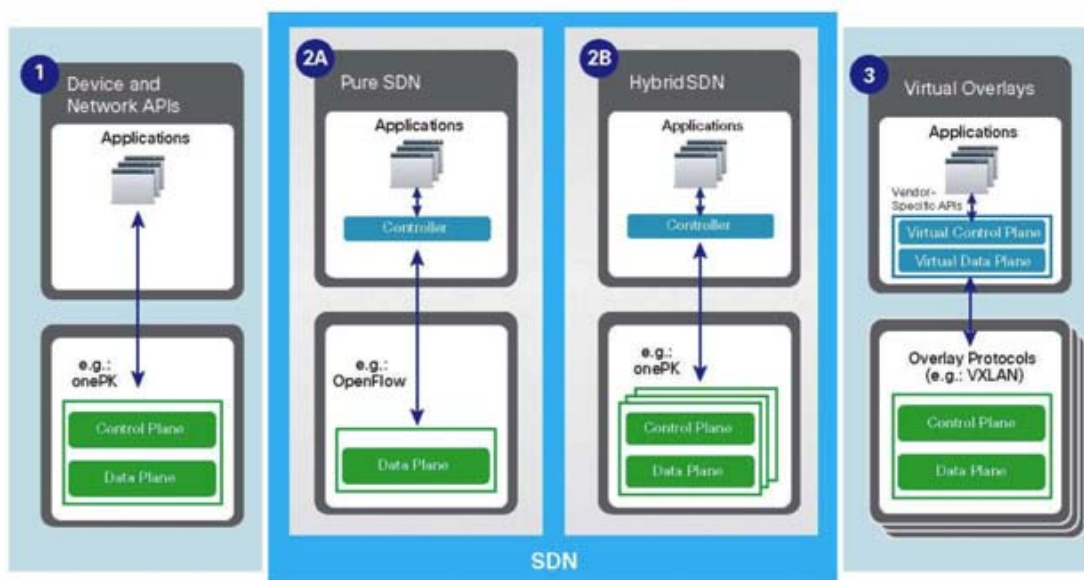


Figure 1) The Cisco Open Network Environment (ONE) incorporates SDN and a number of other network

deployment models.

The Cisco ONE framework enables you to utilize your existing network infrastructure while being able to add new technologies and services and capitalize on new opportunities. It fully integrates underlying network infrastructure and services with application environments, allowing applications to talk to the infrastructure and the infrastructure to better respond to application requests. This facilitates new business models and allows developers to communicate directly to the network without having to understand all the underlying complexities and subsystems.

You can learn more about Cisco ONE by reading the [ONE white paper](#) or this [blog post](#).

Storage

When it comes to the software-defined data center, manageability and programmability are no less important in the storage layer than they are in the compute and network layers.

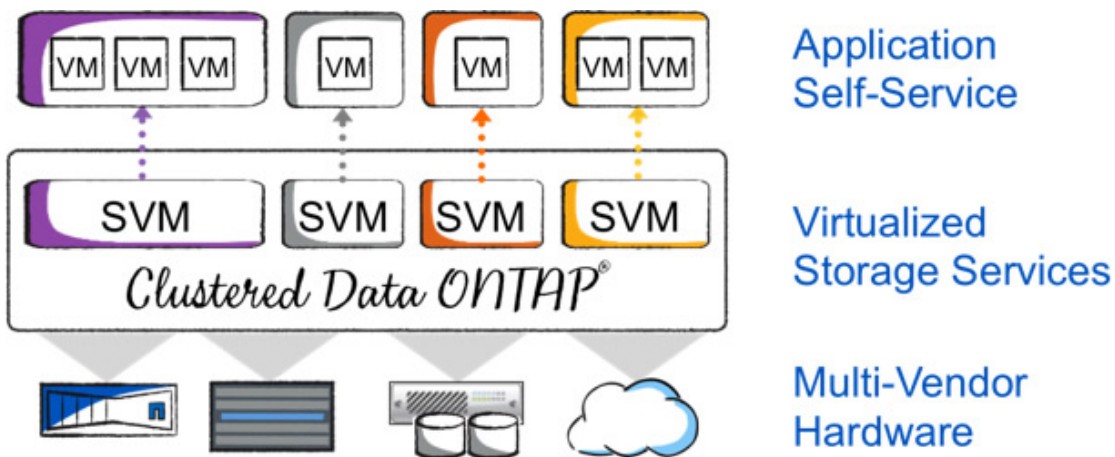


Figure 2) NetApp® storage addresses SDDC needs with virtualized storage services, support for multivendor hardware, and application self-service.

NetApp has focused on an approach to software-defined storage (SDS) that includes:

- **Virtualized storage services.** The NetApp clustered Data ONTAP® operating system provides storage services through storage virtual machines (SVMs) that confer capabilities similar to those of virtual machines and server hypervisors. These provide the basis for improved agility, role-based access control and delegation, and the ability to create storage services with predefined data protection, availability, and performance characteristics.
- **Multiplatform support.** NetApp is focused on the ability to support not just NetApp FAS hardware but third-party storage arrays through NetApp V-Series, commodity hardware, and integration with cloud service providers.
- **Application integration and self-service.** Integration across the broadest set of infrastructure, management, and application partners provides interoperability; a single, open set of APIs is standardized across all platforms that run Data ONTAP.

FlexPod solutions provide all of these storage capabilities, including the capability to incorporate third-party storage using NetApp V-Series open storage controllers. A more detailed description of the NetApp approach to software-defined storage is provided in a [previous Tech OnTap® article](#).

Management and Orchestration

When it comes to management and orchestration for the software-defined data center, there are three approaches:

- **Integrated Converged Infrastructure Managers (CIMs).** These manage servers, networks, and storage from a single pane.
- **Support for leading management tools.** This should include cloud management platforms, tools from vendors such as Microsoft and VMware, and support for major management players such as CA and BMC.
- **End-to-end open APIs.** These provide the ability to dive in programmatically to make your infrastructure do what you need it to do.

For SDDC, you can make the case that all your infrastructure hardware must support at least two of these approaches: support for leading tools and open APIs. If you have a device that can't be managed by your chosen tools or through APIs, you can find yourself with no path forward.

Most vendors of converged infrastructure lean heavily toward the first option, requiring you to use their management tools and lacking the end-to-end APIs you need for full application integration and programmatic control. This is one of the areas in which Cisco and NetApp have worked to differentiate the FlexPod platform and the components that go into it. FlexPod covers all three of the areas described above.

- For converged infrastructure management, UCS Director, based on Cisco's recent acquisition of Cloupia, is the CIM available with out-of-the-box features for FlexPod. UCS Director also supports other elements within your data center, easing the transition from traditional infrastructure to a converged infrastructure model. In addition, FlexPod comes with element managers for each infrastructure layer, including Cisco UCS Manager and NetApp OnCommand® System Manager.
- Cisco and NetApp have pursued a strategy of open management for FlexPod, which allows us to offer the broadest portfolio of supported management options, including common solutions such as OpenStack, CA, Cisco Intelligent Automation for Cloud, Microsoft System Center, and others.
- APIs are published for every aspect of FlexPod as well as detailed guidelines on what's required for FlexPod management. This means that independent software vendors and your in-house developers can take advantage of every feature the platform provides.

