The future belongs to SOFTWARE DEFINED DATA CENTERS
Introduction

Software-defined data centers (SDDC) is being hailed as the next big thing in the realm of IT infrastructure. One of the prime reasons for this increased interest in SDDC by a growing number of CIOs and CTOs can be attributed to the success and increased adoption of cloud computing in recent times. Although there is lot of ongoing deliberation by C-suites executives at the moment on the adoption of SDDCs for their organizations, it is yet to attain increased acceptance in the realms of business. Like all new technologies that are met with reluctance initially, SDDC too is currently transitioning the initial product cycle phase.

SDDC is an integrated platform that enables organizations to mark a radical shift in the way they consume IT services.

It offers unprecedented flexibility, efficiency, and automation. Software-defined data centers bestow just the right set of capabilities to propel organizations towards business growth.

Some may argue that SDDC is an extended version of the same old and conventional data centers which were hardware centric. Although their argument holds significance to some extent, SDDC is much more agile, secure, and flexible in comparison to conventional data centers. Considering these advantages of software-defined data centers over conventional hardware centric data centers, various organizations have started embracing this new technology.
What is SDDC?

**SDDC** is a data storage facility where all components of infrastructure, namely storage, networking, security, and CPU, are virtualized and delivered as service. The tasks associated with provisioning, operation, configuration, and deployment of the entire infrastructure are abstracted from hardware, and are solely implemented through software. Using the SDDC approach, application layer can be abstracted from the physical infrastructure layer, which further facilitates a wide scope of uses, including managing, computing, storing, networking, and deploying various business applications as well as infrastructure components in a cloud environment.

There are three main building blocks of software defined data center, and those are:

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**NETWORK VIRTUALIZATION**

In computing, network virtualization is defined as the process of combining software and hardware network resources as well as network functionality into one software-based administrative entity. This is a method of integrating all the resources in a network by dividing the bandwidth into various channels. Each of those channels is independent from others, and can further be assigned or reassigned to any device or server in real time.

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**SERVER VIRTUALIZATION**

Server virtualization is the masking of server resources, including the identity as well as number of various individual physical servers, operating systems, and processors, from server users. The server administrator makes use of one software application to split a physical server into various virtual environments.

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**STORAGE VIRTUALIZATION**

This is the method of integrating storage from various devices into a single storage device that can be managed or monitored from a central console. Storage virtualization enables better and enhanced functionality as well as more advanced features in data storage systems.
Virtualization not only helps in decoupling or separating workloads from hardware, but also makes the overall data center services inexpensive and convenient to consume, configure, or manage. More importantly, SDDC brings governance, operations, and automation to IT through a unified cloud management framework. As cloud management platform is deeply integrated with virtualization layer, it offers comprehensive automation and operations to a data center environment, which further makes it possible to efficiently orchestrate monitoring, management, and provisioning across all the workloads and infrastructures of SDDC.

In an SDDC, software abstraction virtualizes most of the datacenter components, including storage, networking, and computing, whereas infrastructure management functions are controlled by policy-driven software. Using the SDDC approach, several critical network functions, such as load balancing, switching, or even routing, can be performed using software, instead of hardware. This not only helps in creating application-based or service-based environment, but also in increasing the agility of datacenters exponentially. As a result, this concept – SDDC – has successfully been able to garner immense popularity and acceptability in the business world.

Need for Software-Defined Architecture

For organizations across domains, technology plays a major role in conceptualizing, planning, as well as implementing various result-oriented business initiatives. As mobile services and public cloud have successfully been able to enhance Line-of-Business expectations, IT companies struggle to keep pace with the rising expectations. Owing to IT incapability to meet the rising business expectations, organizations often have to shell out huge amount of resources.
To cut down the expenditures on technology as well as to efficiently capitalize on the sea of business opportunities, it is very important for CIOs to develop a result-oriented approach. CIOs must incorporate an efficient IT strategy that can meet the rising demand. IT must act as strategic partner for an organization, and Software-Defined Architecture ensures that.

Being a strategic partner to organizations, IT must build credibility besides being a business enabler. It should deliver secure, efficient, flexible IT services, and should become a service broker to both public cloud as well as private cloud services, which can be clubbed under one management and functional framework. This is also termed as “hybrid cloud,” and the software-defined architecture makes it possible. It defines a platform common to both public and private clouds. To define every infrastructure service, software defined data centers implement the computer science principles of server utilization, which is entirely based on pooling, isolation, and abstraction, to the rest of the infrastructure services. The management and monitoring process of SDDC is automated with the help of a cloud management platform to control both off-premises as well as on-premise resources.

Challenges Faced by Traditional Hardware-Centric Datacenters

Who does not know the significance of an agile and robust datacenter? With the ever increasing demand as well as dependency on IT services, the time has come to offer on-demand services that are elastic and secure in nature. One of the reasons, traditional datacenters and methodologies, which took significant time to procure and provision, are almost at the verge of becoming a thing of the past!

At present, organizations leave no stone unturned to make their IT infrastructure agile and flexible, and for the same purpose, they have started designing as well as operating their own datacenters. They aspire to deliver private cloud based services which are similar to that of leading and renowned public cloud service providers. Now, the question arises whether it can be accomplished using the conventional approach?
No doubt that conventional data centers have successfully been able to meet the business requirements for over decades; however, the recent shifts in business approaches, advent of multiple mission-critical functions, and acceptance of e-commerce websites in the business world have made it difficult for hardware-centric datacenters to stand tall on these expectations.

Out of all the challenges faced by traditional hardware-centric datacenters, three of the most common ones are:

- The architecture of conventional datacenter is predominantly based on vendor-specific software and hardware dependencies. This not only gives rise to proprietary technologies, but limits the flexibility of datacenters.

- In traditional datacenters, equipment vendors dictate the refresh cycle for network as well as storage equipment. This has influential impact on speed of datacenter innovation as well as on its scalability.

- Most datacenter equipments in hardware-specific datacenters require manual configuration and arrangement.

These challenges have compelled IT leaders to ponder upon inducing the concepts of software-defined infrastructure (SDI) into the overall datacenter architecture.
One of the major concerns for CIOs and CTOs across industrial domains is how to make their IT infrastructure more adaptable and flexible according to ever changing application environment. Besides this, they are also laden with the responsibilities of minimizing their overhead expenditures in this regard. To meet all these requirements, the concept of Software-Defined Infrastructure has emerged as the most idyllic solution.

Software Defined Infrastructure (also referred to as “SDI”) is defined as a computing infrastructure which is entirely controlled by software, without any interference from any operator. It is not at all dependent upon any hardware-specific dependencies. As conventional architecture of datacenter - based on hardware technologies - is not at all agile, most business leaders are looking forward to this new trend.

Using the traditional network infrastructure, it is not at all feasible to meet the growing demands of cloud computing as well as application bandwidth, besides managing a complex traffic patterns.

Some of the key issues associated with conventional network infrastructures are:
Some of the major factors that have made the traffic pattern complex are cloud computing and high-bandwidth applications. It must be ensured that data is accessible from anywhere, anytime, and nobody has time to wait on a slow network. Although, security still holds the paramount importance, one has to manage and monitor various other aspects to ensure that the ever increasing demands of consumers are met with pertinent support.

The virtualization approach has made most servers and storage agile as well as automated; however, the demands on network are hugely dependent upon complex provisioning and configuration. This not only is time-consuming, but also enhances the probabilities of human errors or security risks. To keep up with constantly scaling demands as well as requirements, it is very important to make the network more responsive.

SDN: Future of Networking

The ever increasing demands on network compel businesses to embrace next generation networking - Software Defined Networking. Various organizations have embraced SDN to capitalize on the opportunities that new and emerging technologies bestow. The prime goal of SDN is to simplify the network by implementing automated configuration process. Using the SDN approach, IT teams can conveniently configure the systems, located at distant zones, from one central controller. Thus, they are no more compelled to manually configure various switches, routers, firewalls, or access points. In essence, considering the wide range of advantages that SDN has in store, it can be easily deduced that it is a comprehensive next-generation networking solution.
SDS: Future of Storage

Software-Defined Storage is a revolutionary approach to data storage wherein programming which controls storage related tasks is decoupled from physical storage hardware. This helps in managing policy-based provisioning as well as management of data independent of the remaining hardware. Using this approach, IT organizations can pay much more emphasis on storage-related services, rather than spending their time on hardware. This enables organizations to use storage resource more efficiently, and its administration can be simplified as well as conveniently managed through automated policy-based management. In essence, it would not be an exaggeration to claim that SDS is future-ready data storage approach.

How Software-Defined Architecture Helps in Limiting Overhead Expenses

Software-Defined Architecture is an evolving concept which has various advantages over conventional hardware-centric approach. It offers unblemished and unique functionality, in conjunction with enriched utilization and management of resources; higher range of flexibility; and enhanced cost-efficiency.

Conventional hardware-centric datacenters are mostly based on proprietary hardware and application silos which compel organizations to shell out huge amount of money on equipment costs as well as on manual operations. With the advent of virtualization, data center economic has been improved substantially. Using this approach, various applications are consolidated into fewer server hosts, which further paves way for reduced CapEx and OpEx. This approach also facilitates organizations with the choice of making their storage capacity flexible without being much bothered about CapEx budget. Therefore, several IT companies leverage this approach to induce efficient management systems for various types of workloads as well as to drive aggressive cost savings.
Needs of a Software-Defined Storage System

The advent of a revolutionary concept - software-defined storage - has marked a new era, where each enterprise is looking forward to enhancing its cost-efficiency, agility, and scalability, as well as minimizing the overall complexity. Clearly, the acceptability of SDS would only increase in future, and various organizations would keenly make the move towards this new concept which is future-ready. However, before building an IT platform which offers SDS solution, one must keep the following things in mind:

**Opt for application-optimized solutions**
You must team-up with those service providers which provide turnkey solutions for various uses. The pre-configured solutions help you minimize deployment cost as well as time.

**Multiple hypervisor support**
SDS systems should not only be competent to support your current hypervisors, but must also be flexible. An IT platform with open standards can further add flexibility which is a must to adapt to changing business requirements or diverse environments.

**Global and impeccable service and support provisions**
In lieu of decoupling software and hardware, you cannot afford to complicate service and support provisions. You should always consider the services of a provider that can offer one-stop solution for both software and hardware related issues.

**Workload-appropriate configurations**
You must pay special attention to this factor, and consider the software which has policy-based tiering and hardware
Comprehensive management and monitoring
One opts for SDS approach to automate a multifaceted environment. Therefore, you should choose integrated solutions that can help you to efficiently manage as well as monitor various networking components, storage, and servers.

How SDDC Enables Unified Hybrid Cloud IT
The advent of software defined data center in cloud-centric world has brought a drastic change in the way data is managed or stored. An entirely software-defined and software-led data center can bring a radical change in the way IT infrastructure works.

The architecture of software defined data center makes the hybrid cloud not only imaginable but also possible by defining a platform which is common to both public and private clouds. The SDDC applies the computer science principles of server virtualization - abstraction, isolation, and pooling - to each and every infrastructure service. The management of SDDC is automated through a unified cloud management framework or platform. This further helps in controlling, monitoring, and managing both on-premises and off-premises resources. Thus, the concept of SDDC facilitates IT with the choice of using a hybrid cloud strategy under a unified management framework.

What CIOs need to know?
Infrastructure in a software-defined data center is entirely virtualized; this not only includes physical servers, but also storage arrays and networking gears. This concept helps in decoupling hardware’s workload, besides making it convenient and economical for businesses to consume, manage or avail data center services. However, to capitalize on the sea of business opportunities that this concept has in store, CIOs must first of all develop a basic understanding regarding its technological capabilities.
**Why SDDC approach should be preferred over conventional data center**

SDDC enables IT teams to tackle the issues that they have been facing with the conventional hardware-centric model. SDDC model is entirely based on the concept of virtualization, which helps in bringing together multiple aspects of IT environment, be it compute, networking, storage or management platform. In the SDDC approach, various IT assets are monitored and managed by software. As software is innately faster and much more flexible than hardware, one can conveniently increase its business value. The SDDC approach also bestows higher degree of liberation in the IT infrastructure design, as it offers various options for distinct types of hardware scenarios. SDDC also helps organizations in minimizing their investments on inheritance hardware, as it does not compel businesses to upgrade or refresh their infrastructure with the passage of time.

**The relationship between The SDDC and hybrid cloud**

The hybrid cloud model is a universe where the business world would dwell for decades to come. Industry analysts and experts predict that by 2020, more than 75% of IT expenditures would be centered on private cloud. Considering the long term solution, businesses need an impeccable industrial-grade hybrid solution, which can further enable them to utilize the fluid pool of outside and inside resources efficiently. In this circumstance, the combination of hybrid cloud and SDDC approach can enable IT teams to seamlessly thrive in the hybrid world. Therefore, SDDC is regarded as the architectural base for unified hybrid cloud model. This enables organizations to execute and provision their apps flawlessly in on-premises private cloud.

IT teams across the globe aspire to extend their capabilities and potential to public cloud; however, they prefer using the same conventional tools they are familiar with. Moreover, they also demand the same network and security protocols. That’s where SDDC architecture takes the center stage, as it bridges the gap between on-premises and off-premises IT assets.
Significance of SDDC approach in bridging the gap between IT and business

The SDDC approach facilitates users with the option of getting instant access to the services and apps they are interested in. They can conveniently resolve their issues with the help of a few mouse clicks on a self-service portal. Thus, SDDC approach enables CIOs to bring a fundamental shift in their IT-as-a-Service (ITaaS).

Things that CIOs must know and do about SDDC

The best data center architecture that is available for IT firms today is SDDC. If an IT firm is looking forward to accelerating their app delivery, in conjunctions with serving as strategic partner to organizations, then SDDC approach is the most idyllic solution which can help you to attain your goals.

CIOs must consider SDDC as a core part of their overall cloud strategy. The SDDC is specifically designed to bridge the gap between on-premises and off-premises IT assets. Hence, it further guarantees higher business innovation and agility.

Outcomes of an SDDC approach

SDDC enables organizations to efficiently utilize their resources in the tasks related to innovation and business growth. SDDC enhances overall organizational efficiency and ensures that the roles of IT come forth in terms of launching new and innovative business projects. Some of the most favorable outcomes that have enabled organizations to widen their IT prospects are:
Automated and Streamlined Operations
This helps in enhancing the operational efficiency, as it facilitates administrators to spend more of their valuable time on value-added initiatives.

Virtualization and Unified Hybrid Cloud Extensibility
SDDC helps in significantly reducing the overall CapEx and OpEx by standardizing various services on logical resources, besides simplifying the data center footprint.

Application and Infrastructure Delivery Automation
This helps in delivering holistic IT services on demand.

SDDC also enables organizations in delivering resilient and secure services, and this happens primarily because of:

Robust Security Controls
This is yet another favorable outcome that SDDC has delivered. With micro-segmentation, it helps in shifting security controls from perimeter defense to fine-grained isolation.

Resilient Infrastructure and High Availability
SDDC simplifies the architecture which was needed to support automation and continuity of various disaster recovery processes.
Key Points to Ensure before gearing up for Software-Defined Data Centers

The wide range of benefits associated with SDDC approach has attracted various organizations. However, no matter how much eager you are shift towards SDDC approach, you must pay heed to these points before making the move:

- You should be having pragmatic, long-term, sustained, and holistic vision for SDDC
- Make proper adherence to licensing policies
- Get comprehensive training regarding the concept and technology
- Collaborate with an IT security officer who can ensure robust security
- Hire efficient data center facility operator to conduct tasks associated with converging infrastructure implementation
- Refine or reincorporate support and service provisions from OEM partners
- Execute implementation and assessment plans to align SDDC with storage, security, and network architects

There are several challenges associated with the adoption of SDDC as well. Some of the most prominent ones are:

- SDDC stack needs a smooth mechanism which can efficiently identify the legacy infrastructure, physical infrastructure, and spontaneously create a controlled environment wherein those can be integrated. Usually, the infrastructure maturity standards of an enterprise datacenter do not allow this.
- SDDCs need comprehensive monitoring and management tools as well as all-inclusive management systems.
- You would also need a common open standards-based framework, not only for SDN but also for SDS, to implement as well as leverage SDDC and interoperability among various OEM partners.
Conclusion

Software-Defined Data Center (SDDC) is based on the concept of virtualization and automation. One of the most beneficial aspects associated with the implementation of this approach is that organizations would no longer be compelled to replace their existing IT infrastructure. Organizations can adopt SDDC technologies as per their convenience and at their own pace.

The concept of software defined architecture as well as software defined datacenter enable IT to adopt a unified hybrid cloud strategy, besides enabling organizations to procure favorable outcomes in terms of security as well as efficiency. Considering these advantages, it can be inferred that the acceptability of this approach would only grow with the passage of time.