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Software Defined Data Center [SDDC] Concepts

Logesh Rajendran
Solution Architect- Cloud
Smart world & communications, L&T construction
Chennai, Tamil Nadu, India

***Abstract*-Data center is a facility built with IT equipment's and support infrastructures, which enables an organization to delivery IT services. Data center predominantly contains compute, storage, networks interconnecting entire physical equipment's using a communication network and this equipment's helps businesses to organize, process, store, and retrieve large amount of data. Virtualization and Cloud have significantly impacted the data center infrastructures particularly in the network infrastructure. There are many additional demands in today's data centers where the devices and applications are increasing. This paper explains the technology of server virtualization, storage virtualization and network virtualization present in the modern data center which is termed as Software Defined Data Center (SDDC).**

***Keyword*- Data centers, Virtualization, Cloud, SDDC, SDN, SDS, Software-defined.**

I. INTRODUCTION

Software-defined data center (SDDC; also: virtual data center, VDC)A software-defined data center is usually an enterprise class data center using cloud computing and virtualization techniques. Typically, an SDDC will have server virtualization, storage virtualization and network virtualization. All these components will be managed by a software layer that will provide centralized and integrated data centermanagement for all resources.When everything is virtualized, it makes it much easier to provision, deploy, monitor, and maintain. The network and its component resources are nothing but software abstractions that all can be managedthrough a single interface. Resources are software-defined, which can be automated, orchestrated which increases the speed of delivery of network resources.

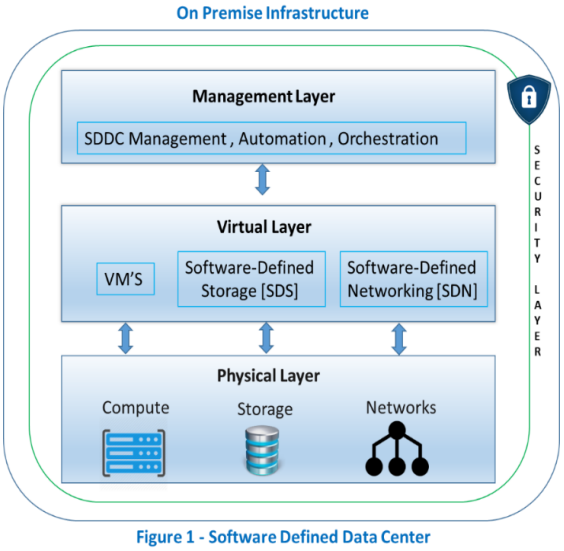

Figure 1 - Software Defined Data Center

The software is capable of creating and mapping server, storage, networking resources, which provides much greater agility, flexibility, and reliability.A fully implemented SDDC can detect and adapt spikes in demand, scaling infrastructure automatically when necessary to accommodate surges in traffic and optimize performance.

II. ELEMENTS OF A SOFTWARE-DEFINED DATA CENTER

SDDC architecture has three basic layers: physical layer,virtual layer and management layer (refer figure 1). Explanation of each layer are detailed below,

1. Physical layer - The physical layer is the actual hardware compute, storage and networking gear that takes up space in the data center.There are other physical components as well which helps to build infrastructure.

2. Virtual layer - The virtual layer is the software that abstracts compute, storage, network resources which delivers as –a service.

3. Compute virtualization or server virtualization - Using a hypervisor, compute virtualization abstracts operating systems and applications from physical servers. As a result, administrators can use virtual machines (VMs) to run multiple, distinct applications and operating systems on a single server. For more than a decade, organizations have used compute virtualization to reduce server sprawl to improve resource utilization(figure1a).

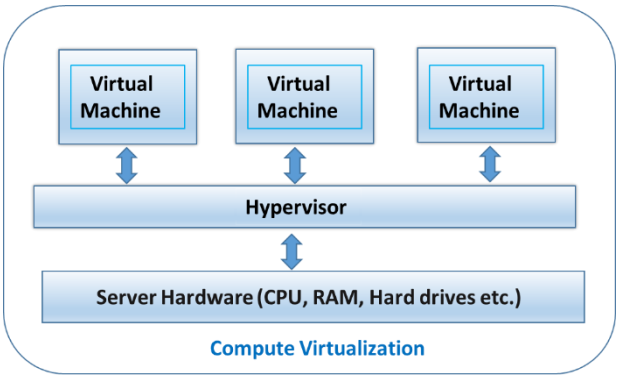

Figure 1a

4. Software-defined storage (SDS) -The Software-defined storage controller is a software that manages, abstracts, pools, and automates the physical storage systems into policy-based virtual storage pools(figure 1b). Through the use of automation and orchestration, the controller enables self-service access to a catalog of storage resources. Users provision storage using data services, which may block, file, or object services.

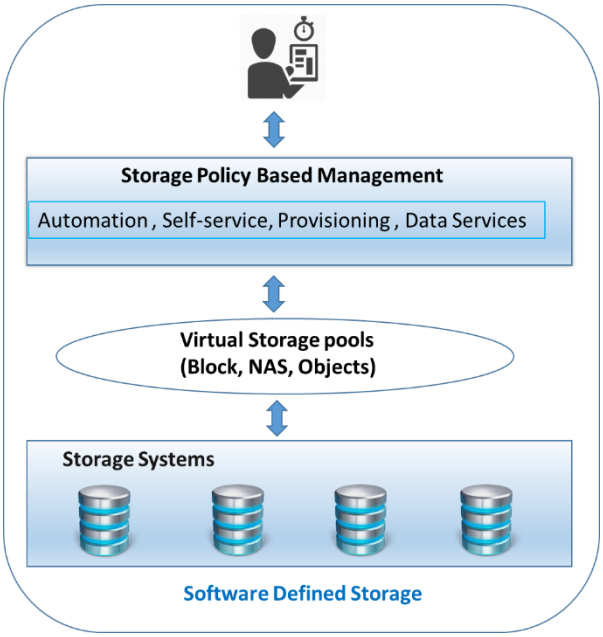

Figure 1b

5. Software-defined Networking (SDN)– Network virtualization (figure 1c)enables to provision and manage networks independently of the physical hardware. The abstraction of resources allows to move easily of workloads across data centers without physical constraints and provides flexibility. The right network virtualization solution will also incorporate security capabilities to safeguard networks and isolate workloads.SDN Controllers are the "brains" of the network. SDN Controllers offer a centralized view of overall network and enable network administrators to dictate the underlying systems (like switches and routers) how the forwarding plane should handle network traffic.SDN could be a hardware orsoftware.The advantages of using SDN are to make the network traffic secured by usingMicrosegmentation. Microsegmentation is different from VLAN's and ACL's which is used in a traditional network. In traditional network traffic moves North-South direction, it passes through the security tools andprotects the business. The rise of East-West traffic means the traffic bypasses firewalls, intrusion prevention systems and other security systems and enabling malware to spread very quickly. Microsegmentation is a method of creating secure zones in a data center where resources can be isolated from one another if a breach happens, the damage is minimized. Microsegmentation is typically done in software level, making it agile.

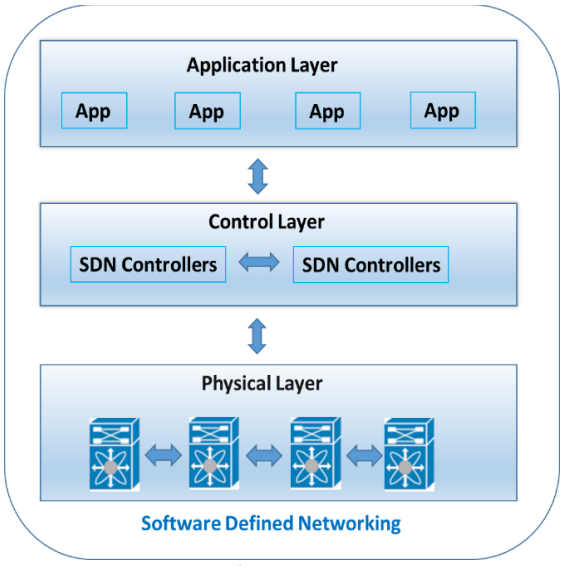

Figure1c

6. Management layer - The management layer that ties everything together. This includes a software-defined data center solution, orchestration tools and/or automation capabilities that make it possible to run the data center from a centralized interface.

III. SDDC BENEFITS

Below are some benefits of Software Defined Data Center

1.Automation and Orchestration

These features can extend the benefits of automation and orchestration intoany IT services delivery workflow. Any complex IT services can be deployed in a standard, repeatable fashion.

2.Data Center Management

Traditional DC may have multiple IT tools to manage the infrastructure, whereas SDDC allows managing everything within few clicks of button and single platform provides for monitoring, scaling compute, storage and networking resources.

3.Faster IT service delivery

By using Automation and software-defined mapping of server, storage and networking resources provides increased agility, control, efficiency and reliability whendeploying enterprise technology services. Scaling up or down will be much faster and easier.

4.Time savings

SDDC managers can configure, monitor and manage their infrastructure from centralized console which doesn't require to navigate multiple consoles like traditional data center. In SDDC automation handles multiple jobs which minimize the human efforts on routine activities

5.Cost Savings

Adapting Software –defined infrastructure can run on commodity hardware which is comparatively less in cost.Extracting virtual layer of Compute, Storage, and Networking are basically pooled together which can be used effectively, which reduces Total Cost of Ownership (TCO) as well.

IV. SDDCCHALLENGES

Below are few list of challenges in Software Defined Data Center

1. Technology Adoption- Migration of existing infrastructure to SDDC will depend on many factors like hardware and software to work seamlessly in SDDC after migration which rise the technical complexity. Many organizations still in favour of traditional data center as they already have hands-on experience. In generalSDDC will be good to establish for Greenfield rather than Brownfield data centers.

2.Skill set Challenges

Require specialized skills in each technology like Compute, Storage and Networking virtualizationswere many organization may not have resources to deploy, configure, and manage SDDC on their own rather they depend on respective vendors.Developing a team in new technology involves time and cost.

3. Scaling on Existing Networks

Software Defined Networking is flexible and agile however it may not make existing network flexible, on-demand provisioning, contract and expanding the network.

V. CLOUD AND SDDC

Cloud and SDDC have many things in common, delivers infrastructure as a service, utilizing pooled and virtual resources of infrastructure. Management and orchestration tools are sometimes common for both cloud and SDDC which enables to manage via common tool. Organizations often deploy private cloud and SDDC at the same time because both are complementing each other. By implementing SDDC on cloud-based infrastructure it reduces the timeand deliver services faster. Similarly, by adopting cloud-based management tools, it can eliminate thetime for installing those tools on local infrastructure. Migrations from on premise SDDC to cloud would be much easier. Not only on-premise solutions, SDDC can be utilized to offer a private cloud, public cloud or even hybrid cloud service to external customers.Rising data growth pushes SDDC further to extend the services on "SDDC on Cloud" SDDC on Cloud (figure2) helps an organization to plan, deploy, maintain everything on cloud, this can eliminate the on premise data center and further helps to cut down capital cost of setting-up on premise SDDC solutions. Cloud service provider will help any organization to establish their data center on their cloud infrastructure by providing isolated infrastructure with built-in cyber security features. This is further simplified.

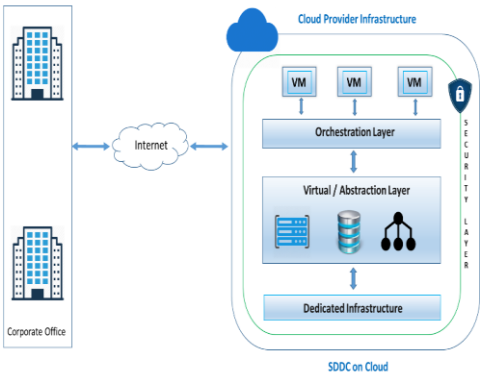

Figure2

VI.CONCLUSION

SDDC technology stepping into larger scale as organizations moving towards automation and software driven approaches. There is huge increase in resource demands, data growth, which eventually push the data center to adapt new trends which helps organizations more on cut down the cost. No matter how it evolves. SDDC should be robust enough to tackle virtually any workload the enterprise can throw at it. Hence data centers are inevitable for IT world.

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