



# Software Defined Systems

**Week 5**

**Introduction to Software Defined Data Center(SDDC)**

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## **Introduction to Software Defined Data Center(SDDC)**

# Learning objectives

- Define Software Defined Data Center (SDDC)
- Identify the core components of an SDDC (compute, storage, networking)
- Compare and contrast SDDC with traditional data center architectures.
- Analyze the architectural considerations for designing an SDDC.
- Discuss various SDDC implementation approaches

# The Need for SDDC

- The internet is changing how digital businesses operate.
- Increased internet users and mobile devices lead to more online activities.
- This generates massive data that companies can collect and analyze.
- Organizations need to explore new data center architectures to improve IT agility.
- Accelerating technology service delivery while minimizing complexity and costs is essential.

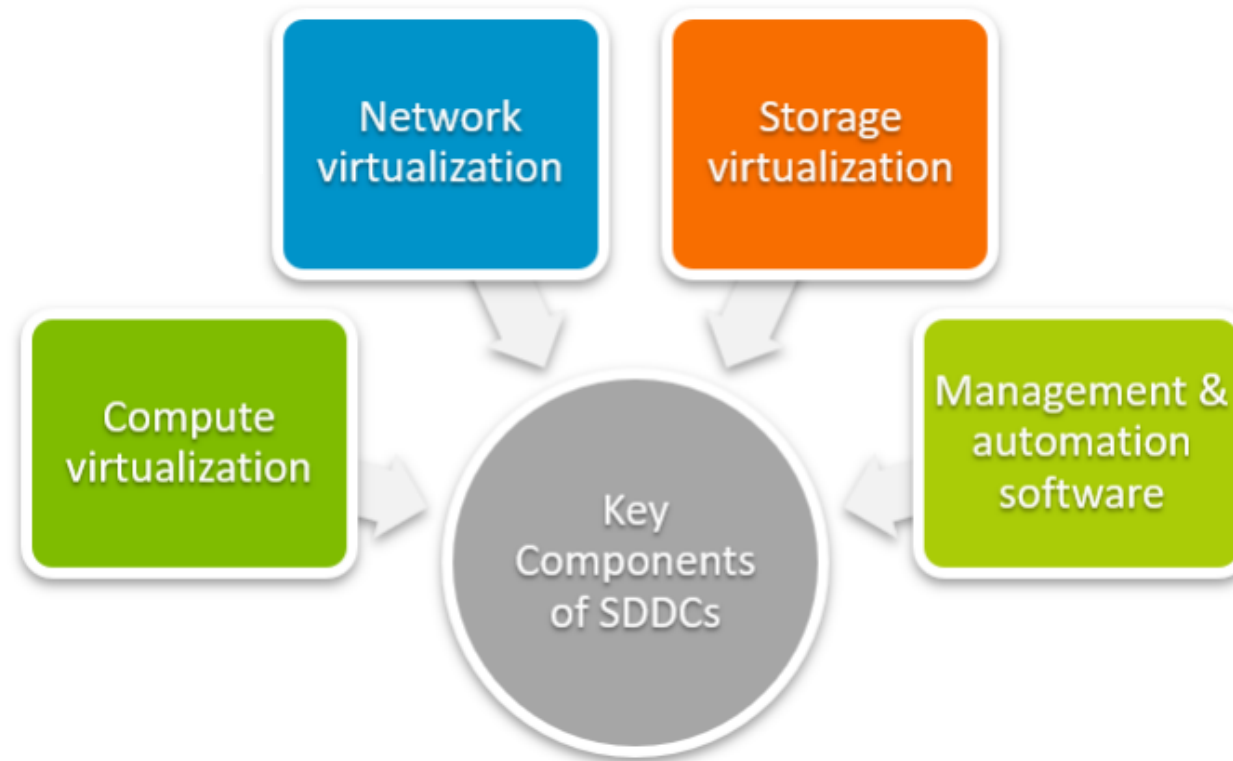
# What is SDDC?

- Software Defined Data Center (SDDC) is an architectural approach to design and management.
- Leverages software-based automation and virtualization technologies.
- Abstracts and pools data center resources for more efficient management.

# What is SDDC?

- SDDC virtualizes all elements of the infrastructure, **networking, storage, CPU, and security** [\[1\]](#).
- Delivers these elements as a service.
- Results from years of evolution in server virtualization.

# Key Components of SDDC



Source: <https://www.bmc.com/blogs/what-is-a-software-defined-data-center/>

# Compute Virtualization

- Compute virtualization allows users to create software implementations of computers that can be turned up or turned down as needed, decreasing provisioning time.
- SDDCs heavily rely on server virtualization technologies, such as **hypervisors** like VMware vSphere or Microsoft Hyper-V, to create virtual machines (VMs) that run multiple operating systems and applications on a single physical server.

# Compute Virtualization - Tools

- VMware Workstation
- VMware Fusion
- Vagrant
- Microsoft Hyper-V
- RedHat Virtualization

# Network Virtualization

- Network virtualization, where the network infrastructure servicing your VMs can be provisioned without worrying about the underlying hardware.
- Network infrastructure needs telecommunications, firewalls, subnets, routing, administration, DNS, etc., are configured inside your cloud SDDC on the vendor's abstracted hardware. No network hardware assembly is required.

# Network Virtualization - Tools

- VMware NSX - Best for zero-trust security
- Check Point Virtual Systems - Best for network automation
- Cisco Enterprise NFV - Best for Cisco infrastructure
- Microsoft Azure Virtual Machines - Best for Windows Server Environments
- oVirt - Best open-source virtualization management solution
- Red Hat OpenStack Platform - Best for large-scale deployments

# Storage Virtualization

- Storage virtualization, is the pooling of physical storage from multiple storage devices into what appears to be a single storage device -- or pool of available storage capacity.
- A central console manages the storage.
- It allows the pooling of multiple storage devices, such as hard drives, solid-state drives (SSDs), or network-attached storage (NAS) systems, into a single virtualized storage system.

# Storage Virtualization - Tools

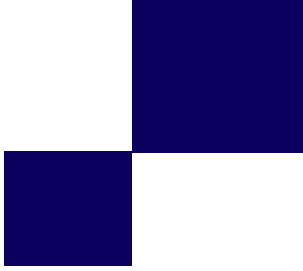
- StarWind Virtual SAN
- Nutanix Acropolis
- Red Hat Hyperconverged Infrastructure
- DataCore SANSymphony

# Management and Automation Software

- SDDCs use management and automation software to keep business critical functions working around the clock, reducing the need for IT manpower.
- Remote management and automation is delivered via a software platform accessible from any suitable location, via APIs or Web browser access.

# Management and Automation Software - Tools

- Cisco Unified Computing System
- VMware EVO SDDC
- OpenStack



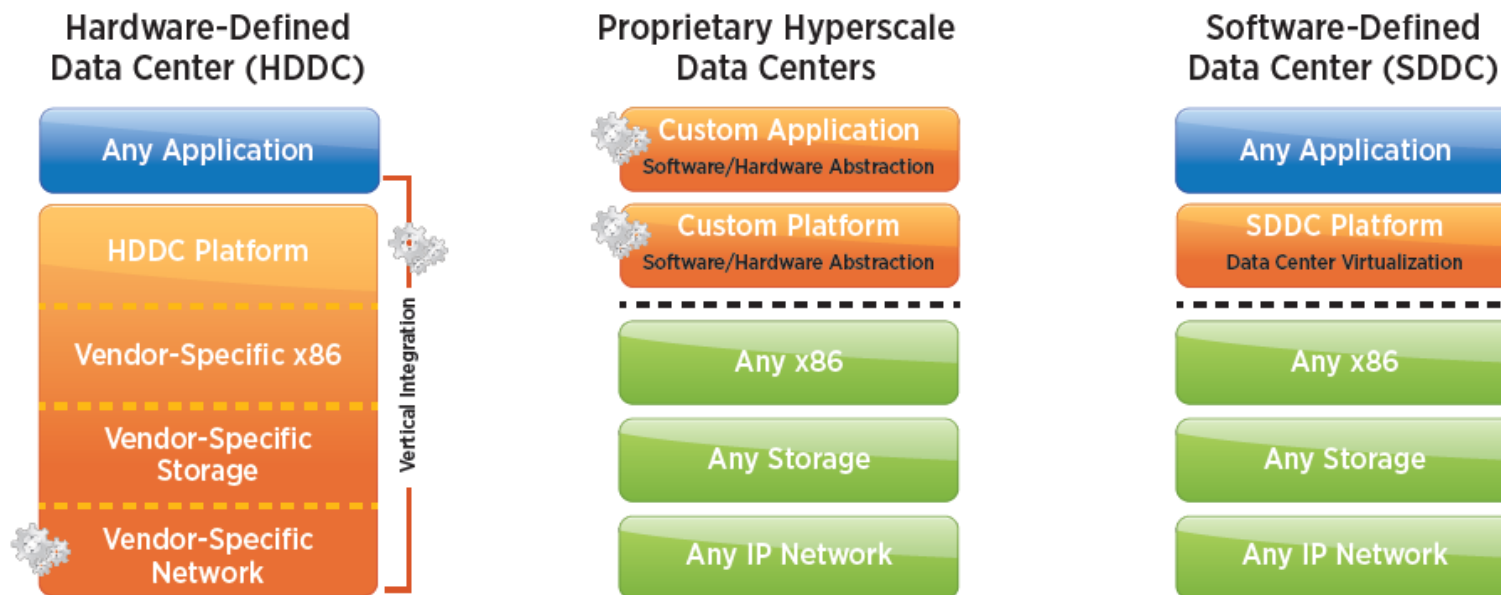
# Data Center Models

# Data Center Models

- Four key requirements for SDDC applicability:
  - Support for traditional applications.
  - Building on existing IT skills.
  - Seamless management across on-premises and cloud services.
  - Secure and elastic scaling.

# Data Center Models (VMware)

- The VMware is an SDDC platform that enterprises can adopt to run any application on top of any x86, storage, and IP network hardware.



Source: <https://www.ntpro.nl/blog/archives/2906-Technical-White-Paper-VMware-Software-Defined-Data-Center.html>



# **SDDC vs Traditional Data Centers**

# SDDC vs Traditional Data Centers

- All infrastructure in SDDC is fully virtualized.
- Physical servers, networking gear, and storage arrays are abstracted from the workloads that run in the SDDC.
- Virtualization not only decouples workloads from hardware but also makes data center services easy and inexpensive to configure, manage, and consume.

# SDDC vs Traditional Data Centers

- SDDC integrates automation, governance, and business insights through a cloud management platform.
- Purpose-built management tools provide comprehensive insight.

# SDDC vs Traditional Data Centers

- An SDDC architecture is also geographically agnostic because the logically defined infrastructure resources can span across data centers, including those owned by IT or cloud service providers leveraging the same SDDC platform.
- Using the SDDC cloud management platform to holistically manage these data centers those of IT and those of the service provider enables enterprises to operate a hybrid cloud.

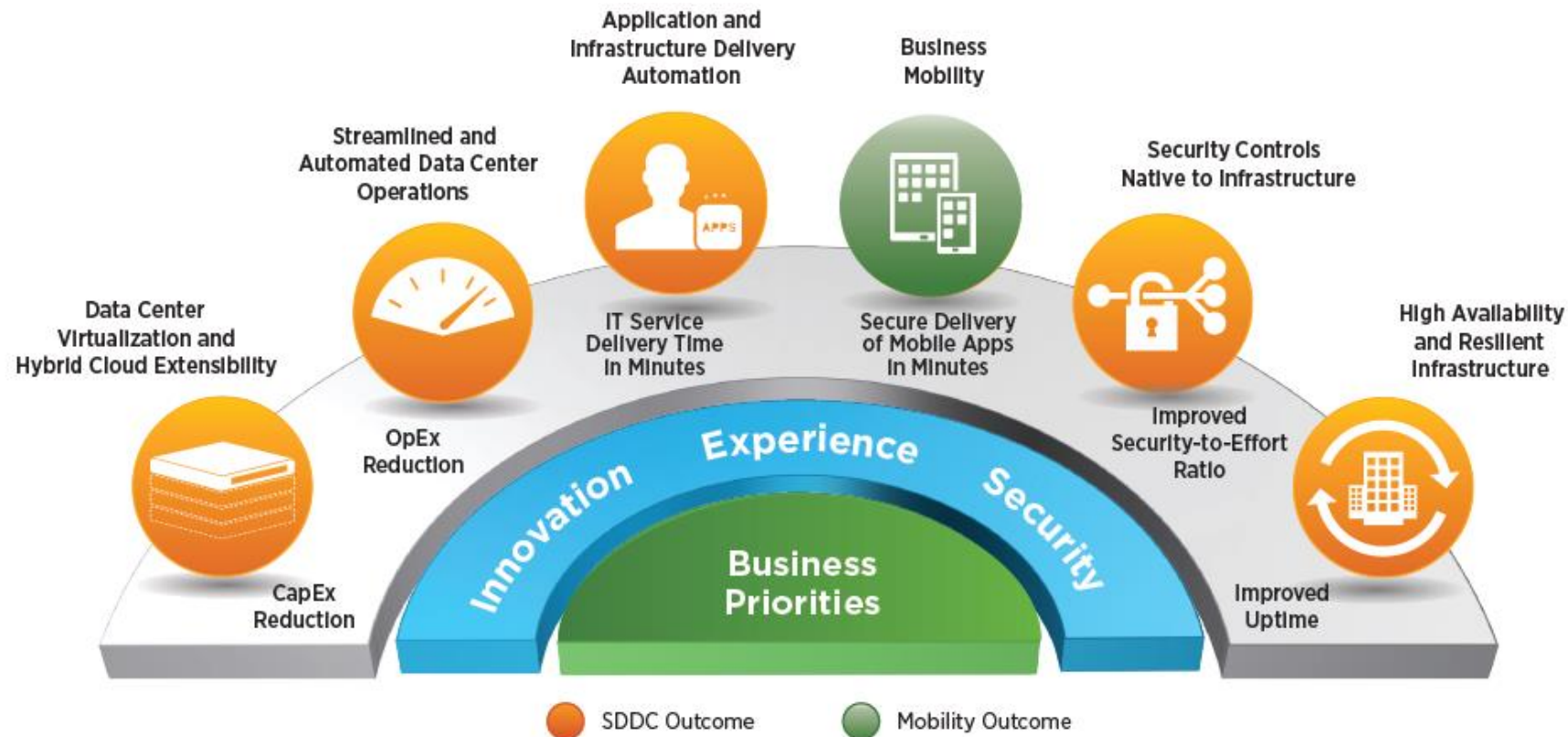
# Outcomes Delivered by SDDC

- First, it enables companies to shift resources toward innovation and business growth by driving efficiency and ensuring that IT no longer is a rate-limiting step in launching new business projects.
  - Data Center Virtualization and Hybrid Cloud Extensibility
  - Streamlined and Automated Data Center Operations
  - Application and Infrastructure Delivery Automation

# Outcomes Delivered by SDDC

- Second, SDDC helps companies deliver secure and resilient services.
  - Security Controls Native to Infrastructure
  - High Availability and Resilient Infrastructure

# Outcomes Delivered by SDDC



Source: <https://www.ntpro.nl/blog/archives/2906-Technical-White-Paper-VMware-Software-Defined-Data-Center.html>

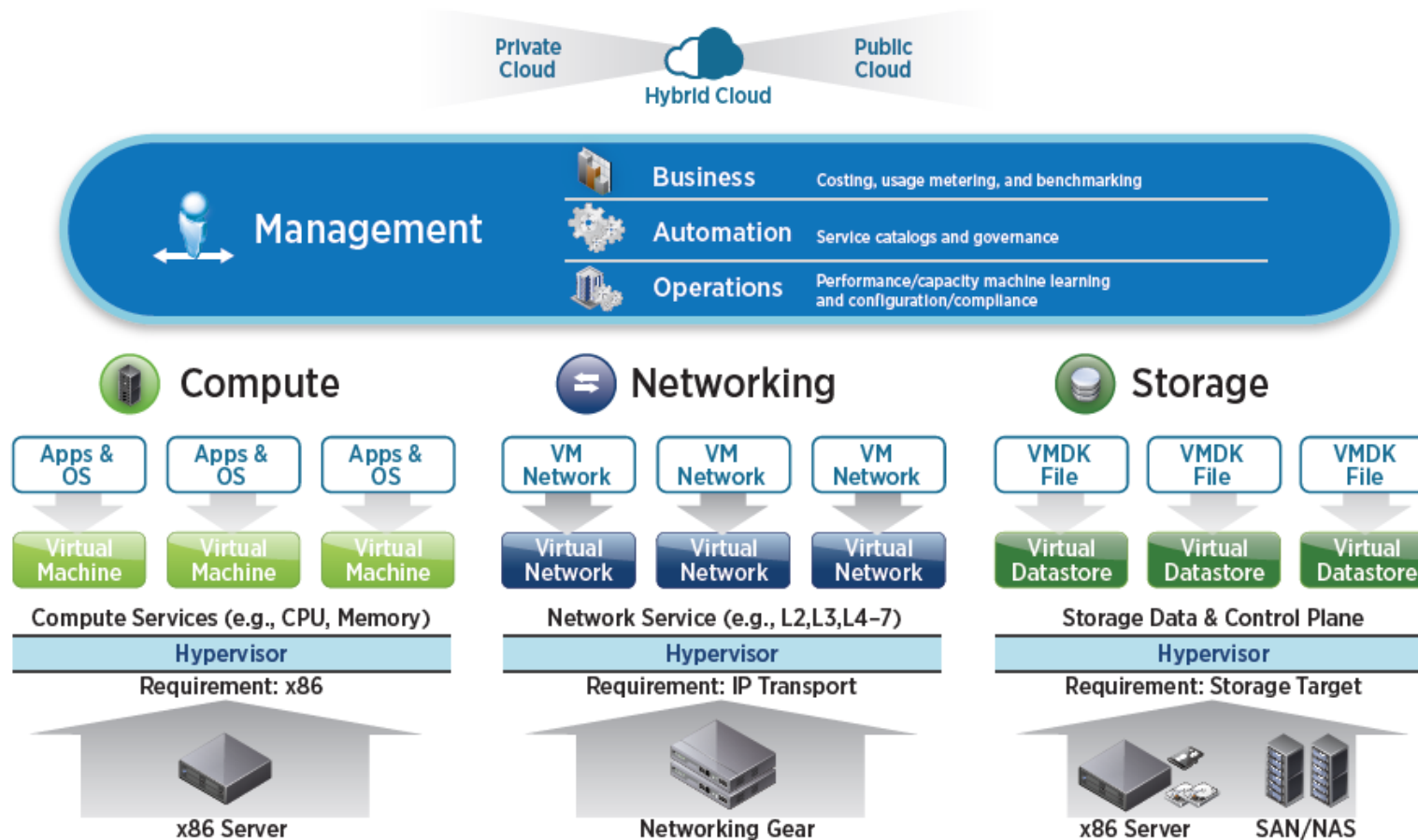


# Getting to the SDDC with VMware

# Getting to the SDDC with VMware

- VMware as a leading provider of virtualization and cloud computing solutions.
- Provides Hardware and location agnostic implementation.
- Most enterprises leverage a hybrid cloud strategy, choosing to transition existing data centers into software-defined architectures while also leveraging public cloud services.

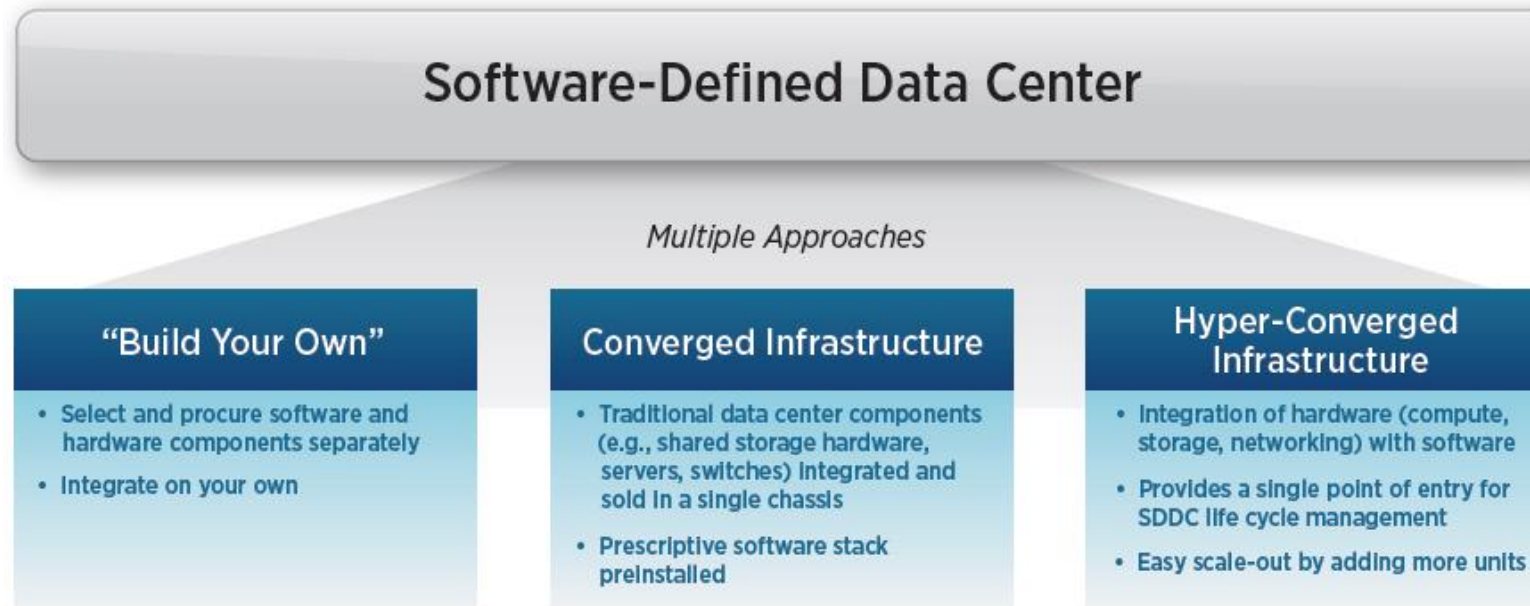
# Getting to the SDDC with VMware



Source: <https://www.indiamart.com/proddetail/vmware-software-defined-data-center-15670352397.html>

# Implementation Options

- Overall, there are three approaches to building an SDDC, each with its own benefits and rationale.



Source: <https://wahlnetwork.com/2014/08/25/evo-rail/>

# Build Your Own

- Purchase hardware and SDDC software. Integrate them in-house via reference architectures.
- It involves careful planning, significant investment, and ongoing maintenance.
- For example, most Fortune 500 companies today virtualize their servers with vSphere, the first step in building an SDDC.

# Converged Infrastructure

- Converged Infrastructure, a model through which traditional data center components such as shared **storage arrays**, **servers**, and **switches** are integrated and sold in a **single** framework.
- A prescriptive software stack frequently is preinstalled, often with server virtualization.
- This approach simplifies the hardware engineering and integration process and enables customers to adopt the remaining SDDC components—network virtualization.

# Hyper-Converged Infrastructure(HCI)

1. It preinstalls and integrates all SDDC components **server**, **storage**, and **network** virtualization, as well as **cloud management**, so the customer immediately gets the full benefits of an SDDC.
2. It essentially implements a reference architecture developed by VMware with its hardware partners, which reduces complexity for IT.
3. It automates the ongoing life cycle management of the infrastructure, whether it is updating an SDDC software component. For example a vSphere such as updating firmware from hardware vendors.

# SDDC Technologies Delivered by VMware

SDDC TECHNOLOGY/ DOMAIN	PRODUCT/ BRAND	OVERVIEW
INTEGRATED SYSTEMS OR SERVICES		
Integrated Systems	VMware EVO™	Turnkey private cloud offering for on-premises data centers, delivering an instantiated reference architecture with VMware software for the SDDC integrated with underlying hardware from VMware partners
Hosted Public Cloud	VMware vCloud® Air™	Public cloud service by VMware, based on SDDC architecture; designed to integrate with customers' on-premises private clouds to enable a hybrid cloud operating model

# SDDC Technologies Delivered by VMware

TECHNOLOGY AREA OFFERINGS		
Server Virtualization	vSphere	Server virtualization platform
Software-Defined Storage	Virtual SAN, vSphere	Policy-based storage capabilities embedded with vSphere; distributed storage capabilities provided by Virtual SAN
Network Virtualization	VMware NSX™	Network virtualization platform for the SDDC
Cloud Management Platform	vRealize	Includes both on-premises software (vRealize) and hosted management services (VMware vRealize Air™)

# Benefits of SDDC

- Implementing an SDDC architecture can offer both short- and long-term benefits.
- The primary short-term benefit is agility. With an SDDC, you can dramatically reduce the time needed to provide new resources.
- It no longer takes days or weeks to set up a new physical server, provide more storage capacity to an application or modify physical networking.
- Policy-driven automation can further accelerate provisioning, enabling you to deploy resources in minutes.

# Challenges in SDDC

- The primary challenge is gaining cross-functional agreement.
- Standardization across teams is crucial to adopting SDDC, but many traditional IT organizations are bound by siloed processes and policies that make standardization difficult.
- Getting procurement teams, development teams, IT analysts, system administrators and others aligned on new tooling and processes can take time.

# Security Considerations in SDDC



- Implementing micro-segmentation for enhanced security.
- Policy-based access controls are crucial for managing who can access specific resources within an organization.
- Continuous monitoring involves the real-time tracking of network activity to detect anomalies and potential security incidents.

# Integrating SDDC with DevOps

- Benefits of SDDC for DevOps practices.
- Enhanced collaboration between development and operations teams.
- Continuous integration and continuous deployment (CI/CD) capabilities.

# SDDC Performance Metrics

- Key performance indicators (KPIs) for SDDC.
- Matrices include resource utilization, provisioning speed, operational costs, and service availability.

# SDDC and Regulatory Compliance

- Importance of compliance in IT environments.
- SDDC leverages automation tools to enforce compliance policies consistently across the infrastructure.
- SDDC enables the implementation of dynamic policies that can adjust based on real-time conditions.
- Examples of regulations to consider (e.g., GDPR, HIPAA).

# Future of SDDC - What Lies Ahead

- Predictions for SDDC advancements.
- Impact of emerging technologies (e.g., AI, edge computing).
- The role of SDDC in digital transformation.

# Test Your Knowledge

1. How does a Software Defined Data Center (SDDC) primarily facilitate the adoption of cloud computing?
  - A) By increasing the cost of hardware infrastructure.
  - B) By introducing more complex manual management processes.
  - C) By abstracting and virtualizing physical resources.
  - D) By limiting the scalability of IT resources.

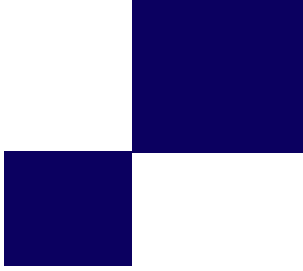
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- C) By abstracting and virtualizing physical resources.**
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**Reason:** This is the core concept of SDDC. By abstracting compute, storage, and networking, SDDC allows these resources to be pooled, dynamically allocated, and managed by software, which are key characteristics of cloud computing.

# Test Your Knowledge



2. What is the primary role of automation and orchestration in an SDDC?
- A) To increase manual configuration of hardware.
  - B) To streamline and automate IT processes, resource allocation, and management.
  - C) To limit the compatibility of different hardware vendors.
  - D) To decrease the security of the data center.

# Test Your Knowledge

2. What is the primary role of automation and orchestration in an SDDC?
- A) To increase manual configuration of hardware.
  - B) To streamline and automate IT processes, resource allocation, and management.**
  - C) To limit the compatibility of different hardware vendors.
  - D) To decrease the security of the data center.

**Reason:** SDDC uses automation and centralized control to handle tasks that used to need a lot of manual work.

# References

- [1] G. Wright and G. Kranz, "What is a software-defined data center (SDDC)?", TechTarget. [Online]. Available: <https://www.techtarget.com/searchdatacenter/definition/SDDC-software-defined-data-center>. [Accessed: Apr. 12, 2025].
- [2] P. Jha, "What is Software Defined Datacenter (SDDC)?", VMware Insight, Sep. 13, 2017. [Online]. Available: <http://www.vmwareinsight.com/Articles/2017/9/5800931/What-is-Software-Defined-Datacenter-SDDC>.



# Thank you!

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