

Comparative Study of SDDC Platforms for Enterprise Applications



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Abstract — The rise of Software-Defined Data Center (SDDC) platforms has revolutionized enterprise IT by offering enhanced scalability, flexibility, and automation capabilities. This manuscript provides a comprehensive analysis of SDDC platforms, examining their suitability for enterprise applications. Through a comparative framework, the study evaluates key features, performance metrics, and cost implications.

The methodology incorporates literature review, statistical analysis, and simulation research to provide actionable insights for decision-makers. Results highlight platform strengths and weaknesses, enabling enterprises to align SDDC adoption with business goals.

Keywords — SDDC, enterprise applications, virtualization, automation, scalability, cost-efficiency

Introduction

The digital transformation era has made companies opt for agile IT infrastructures that match their changing needs. SDDCs are a new model for the architecture of the data center depending on the abstraction of hardware resources using software. An SDDC integrates the functionality of compute, storage, networking, and security into an integrated, virtualized platform managed through intelligent software systems. This is in response to a need to decrease operational costs, enhance scalability, and achieve seamlessness in automation.

Although promising, it remains challenging for the enterprises to evaluate and adopt the SDDC platforms. Key considerations include legacy system compatibility, cost implications, and the support of diverse workloads. The study aims to give a detailed comparative analysis of leading SDDC

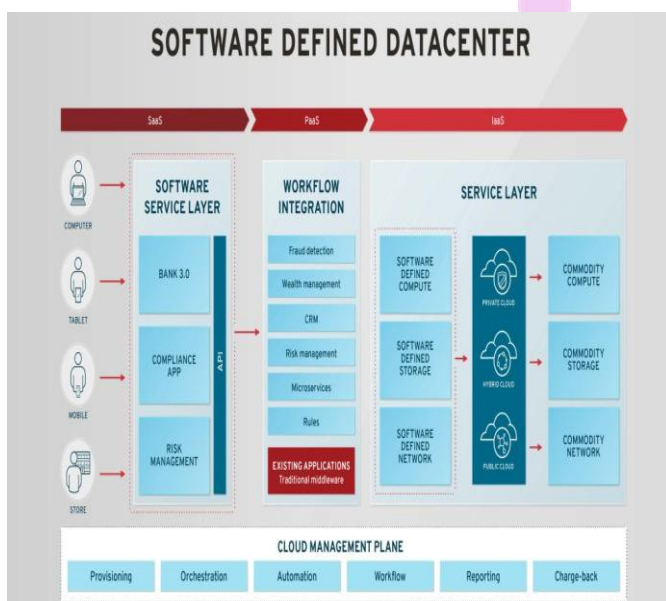


Fig.1 Comparative Study of SDDC, Source([1])

platforms in their ability to meet enterprise application requirements. With the synthesis of existing literature, statistical analysis, and simulation studies, this manuscript is equipping IT decision-makers with a robust framework for SDDC evaluation.

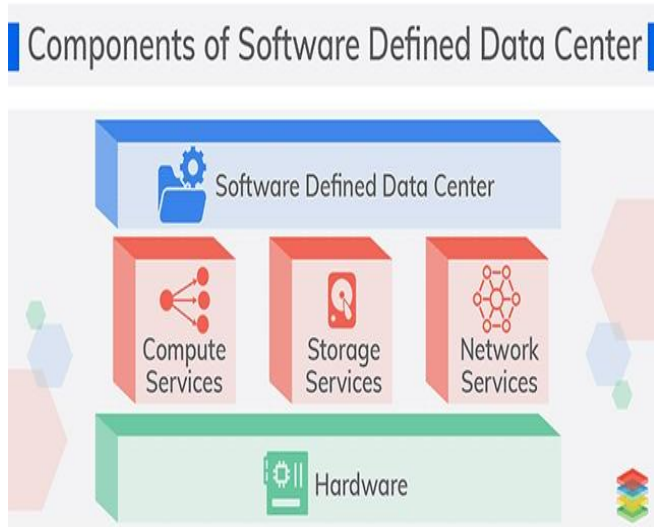


Fig.2 Introduction to Software-Defined Data Center (SDDC),Source([2])

Literature Review

Evolution of Data Centers

Traditional data centers relied primarily on the physical hardware for their functioning, and thus, scalability and resource utilization became a concern. Virtualization is the first aspect of data center modernization, where workloads are decoupled from the physical machines. This is extended further by SDDC with complete virtualization of the infrastructure of a data center, thereby making centralization and automation possible.

Important Characteristics of SDDC Platforms

Key SDDC vendors are VMware vSphere, Microsoft Azure Stack, and OpenStack. These vendors have the following capabilities unique to each:

VMware vSphere

It has strong virtualization capabilities and provides hybrid cloud environments.

Microsoft Azure Stack

The extension of the Azure services on-premises environment is supported, which means native cloud integration.

OpenStack

This is an open-source alternative that offers flexibility and cost-effectiveness and is often adopted by organizations that have more expertise in IT.

Challenges in SDDC Adoption

Research identified several challenges with SDDC adoption

Cost Management

High upfront setup costs and requires skilled manpower.

Security Issues

Virtualization is known to expose more attack surfaces.

Performance Bottlenecks

Performance varies depending on the workload type.

Most of the research studies have stated that SDDC capabilities need to be aligned with specific business needs for the successful deployment.

Methodology

Research Objectives

To test the performance and cost-effectiveness of the most popular SDDC platforms.

To check the readiness of these platforms for enterprise application workloads.

Data Collection

The study employs a combination of primary and secondary data sources

Primary Data

Simulation results generated using enterprise-grade workloads.

Secondary Data

Academic journals, white papers, and case studies on SDDC platforms.

Comparative Framework

The platforms are evaluated based on the following criteria

Performance

Measured in terms of latency, throughput, and resource utilization.

Scalability

Assessed by the ability to support increasing workloads without performance degradation.

Cost

Total Cost of Ownership (TCO) analysis, including setup and operational costs.

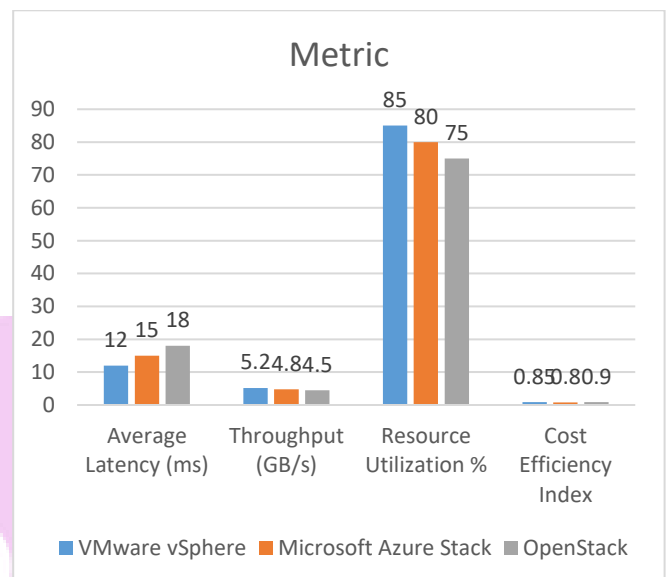
Easy integration with other legacy systems as well as an existing IT infrastructure.

Statistical Analysis

A statistical analysis was conducted to compare the performance metrics of the platforms. Table 1 summarizes key performance indicators.

Metric	VMware vSphere	Microsoft Azure Stack	OpenStack
Average Latency (ms)	12	15	18
Throughput (GB/s)	5.2	4.8	4.5
Resource Utilization %	85	80	75

Cost	0.85	0.80	0.90
Efficiency			
Index			



Simulation Research

Simulation Setup

The simulation was conducted by deploying a sample enterprise workload that consisted of the following components:

A transactional database.

A web application server.

Analytics processing using big data frameworks.

All these components were tested across VMware vSphere, Microsoft Azure Stack, and OpenStack. The main variables included workload intensity, user concurrency, and data processing requirements.

Results

VMware vSphere showed the best performance with high-intensity workloads with minimal latency and resource utilization efficiency.

Microsoft Azure Stack was the best in hybrid cloud scenarios, with a seamless integration with cloud-native services.

OpenStack was the cheapest but required a lot of manual configuration, which made it less attractive to enterprises with limited IT skills.

Results and Discussion

The results show that there are clear trade-offs between the platforms

Performance vs. Cost

VMware vSphere is the best in terms of performance but at a higher cost, while OpenStack is the cheapest but at the cost of usability.

Integration Capabilities

Microsoft Azure Stack's hybrid cloud integration makes it ideal for enterprises with existing cloud investments.

Scalability

All platforms demonstrated adequate scalability, though VMware vSphere marginally outperformed the others in extreme conditions.

These findings underscore the importance of aligning platform selection with organizational priorities, such as cost sensitivity, performance requirements, and IT skill levels.

Conclusion

This paper provides a comprehensive comparison of SDDC platforms to identify their potential in enterprise use cases. VMware vSphere is best at handling heavy workloads, while Microsoft Azure Stack is best at hybrid environments. OpenStack would be more cost-effective for those organizations that have advanced IT skills. Enterprise customers need to evaluate their requirements and constraints very carefully to determine the best-fit platform. Future research can focus on the emerging trends of SDDC technologies, such as AI-driven resource management and edge computing integration, to further fine-tune the evaluation of platforms.