

How can your IT Infrastructure Withstand the Pressure of Digitalization?

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Abstract— With the significance transformation to digitalization and globalization of any business model, IT infrastructure has become and played an important role in achieving the business goals. IT infrastructure are growing at larger scale and has expanded the boundaries of technology to make the most experiences possible. Managing IT infrastructure as per business requirement is a huge challenge for any organization as complexity of business models need to be updated with market trends and it required huge and updated infrastructure to accelerate their business requirement. Modern infrastructure helps maximizing customer satisfaction. This paper has intended as case study for how your infrastructure can survive the pressure of the digital economy. Quantitative approach and comparative analysis were adopted in data collection phase.

Keywords— Modern Datacenter, Digital Economy, Cloud Computing, E-Business

I. INTRODUCTION

Businesses are growing at larger scale and spreading around the globe. Every aspects of a business from small to larger scale has become dependent on IT infrastructure as digitalization has become an essential part of every business models. Growing at such larger scale has also opened the doors for IT infrastructure to expand the boundaries. Every day industry comes with the new requirement which is much needed to meet with the help of IT infrastructure to accelerate the business goals. Now question is that if our IT infrastructure is such capable of achieving and sustaining the pressure of this digital world with using traditional IT equipment? Well said by Stephen Covey; “*You cannot change the fruit without changing the root of tree*”. Similar thing applies for your organizations that you cannot achieve your business goals without modernizing your datacenter which can sustain the current workloads.

There are many studies which have already done now a days on modernizing the datacenter which can accelerate the business goals by achieving all the aspects of digital transformation.

Target audiences for this paper is small to large scale each industry including Health, Education, Financial, Industrial, Corporate Sectors including all areas who are looking forward to enhancing business goals with the help of digitalization.

This paper has been focused on modernizing your infrastructure by using different techniques which combines compute, network, storage, and management to improve business agility by integrating traditional datacenter’s hardware to converged infrastructure. Moving to cloud and also leveraging the Software Defined Datacenter (SDDC) [1] are few of the other techniques available. It helps in driving transformation with modern applications, creating experiences by utilizing the digital workspace, and securing the customer’s trust by enhanced security. There are different methods discussed in section II-A, II-B, and II-C. We will also discuss in Section III and V about the benefits and gaps by leveraging the modern datacenter. Section IV has been discussed about the methodology been used for this paper. Section VI and VII discussed about the discussion and conclusion about this paper.

II. MODERNIZE YOUR DATACENTER

In earlier days, businesses were using traditional datacenter which was known as Hardware defined datacenter. Every device of a datacenter was driven in a form of hardware which required datacenter space, physical intervention, high usages of power, and management of infrastructure was also quite hectic. Using the traditional infrastructure, managing the IT datacenter and resources was quite difficult and it also put an additional effort when scaling the infrastructure.

With the sweeping of digital transformation across all industries, you need right technology to sustain the wave and to remain competitive in era of digital transformation. Now days your business need agility, operational excellence, efficiency, cost effective, availability, scalability, reliability, performance, and security in this digitally driven world. You need a datacenter which should be more focus on the business goals rather utilization of resources and time in managing the Infrastructure. You need a datacenter which should only not be dependence on premises rather should

accessible across globe without any extra overhead on OPEX and CAPEX with proper security in place.

A. Modern Virtualization

Transformation of any businesses depends on your IT Infrastructure and it always begins with the virtualization. Hardware defined datacenter is now old days and software defined datacenter (SDDC) showing in Fig1 has covered the market to mitigate these all traditional issues and to accelerate the business goals. Modern virtualization includes transformation of every layer of an IT datacenter which includes Compute Virtualization, Network Virtualization, Storage Virtualization, Application Virtualization, and Desktops Virtualization. It provides the consistent infrastructure and delivery of application across environment with very less efforts and cost on IT infrastructure. It also increases the IT agility and create a platform for private and public cloud.

- Reduce CAPEX and OPEX cost
- Provides 99.99% SLA
- Simplifies resource management
- Allows centralized management
- Abstraction of hardware and reduce datacenter space
- Power saving
- Reduce Carbon Density
- Provides scalability and resiliency
- Business Agility

Another way of modernizing your datacenter is using Hyper-Converged Infrastructure.

B. Hyper-Converged Infrastructure

In traditional days, there was huge segregation between Compute, Network, and Storage devices in a datacenter. It was causing to consume much datacenter space as well as other resources of a datacenter. Management of all separate devices was also too hectic to manage. Different teams were sitting to manage all different devices.

Organizations today are running with different tiers of architecture which includes Computer, Network, Storage. Along with that, management of those tiers are also an important part of IT infrastructure. In a traditional way of datacenter, these tiers required lot of efforts to procure, manage, and scale on demands. With the emerging of digitalization, businesses are not concerned about the managing the IT infrastructure in such a way which has some dependency on investing time, cost, and overhead on managing the IT datacenter. They don't want to wait for IT infrastructure to host and support their applications. They are only concern about the better availability, manageability, performance, scalability, & recoverability. That's too in controlled cost and lack of losing enterprise security.

Modern datacenter which includes Hyper-Converged Infrastructure (HCI) [3] absolute all tiers and combined everything in a single rack which provides higher performance if compute, storage, network along with leverage of better manageability. It saves money and provides higher agility. It lowers the CAPEX and OpEX cost because you just need to buy HCI hardware and don't need to buy storage arrays, controllers, network switches, Fibre Channel switches. HCI allows more responsibilities to business and bring the environment in production in few hours. It's pre-built hardware and you just need to spin up the workloads in minutes. It has one click operations for provisioning, planning, scaling, and upgradation with lower cost, more control and higher security. Below Fig.3 is showing architecture of Hyper-Converged Infrastructure.

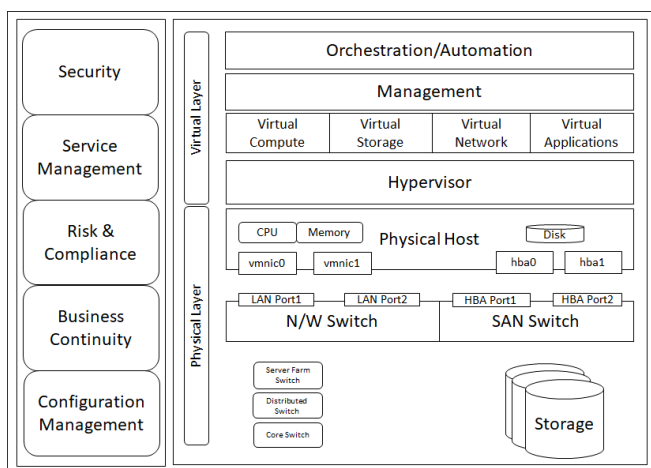


Fig. 1: Modern Virtualization using SDDC

Virtualization [2] abstract the physical hardware and pool the resources to provides the application availability on a server which is known as Virtual machine. It creates a layer of underlying hardware and enable to run multiple server on a single hardware. Hypervisor helps to segregate the physical and virtual layer. On top of virtual machine, you run computer, network and storage resources which enables utilization and efficiency. Modern virtualization also helps in Virtualizing application using containers such as Kubernetes. Below Fig2 is showing the basic architecture of traditional and modern datacenter.

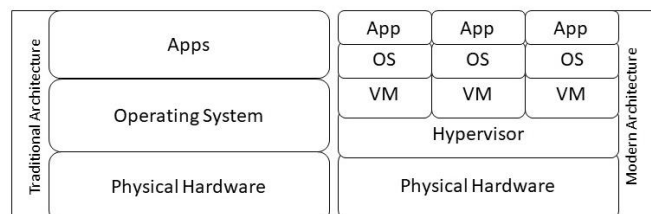


Fig. 2: Traditional vs Modern Architecture

Along with that, it also helps you to provide better Availability, Manageability, Performance, Recoverability, Resiliency, Security and Scalability. Benefit of moving to modern virtualization are followings.

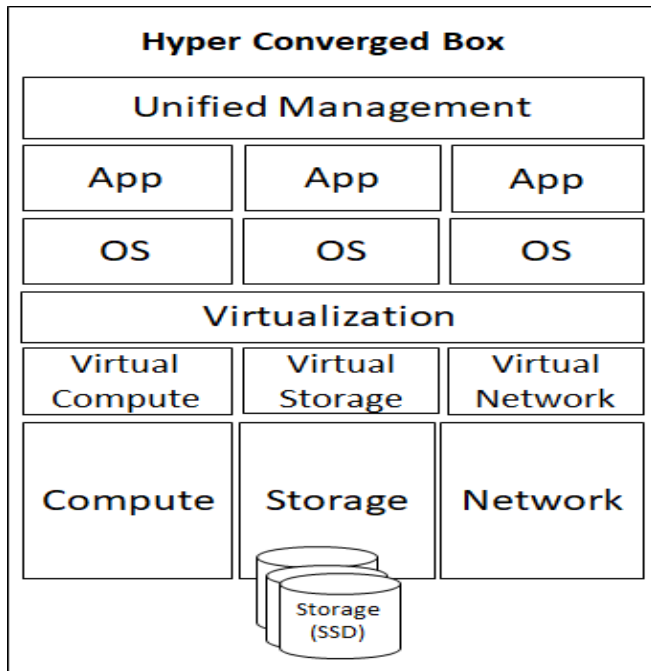


Fig. 3: Architecture of Hyper-Converged Infrastructure (HCI)

Compute, Storage, Network, and management equipment are in same box. All equipment is delivered through an x86 Intel based server. As per report from Gartner, HCI reduce rack space in datacenter by 16:1, reduction of power cost is down to 50%, and cooling cost reduced by 25%. The benefits which includes in Hyper-Converged Infrastructure (HCI) are as follows:

- HCI comes with flash technologies which deliver higher performance at lower costs.
- Compute hardware are more powerful.
- Inbuilt server virtualization for all workloads.
- Capable for Cloud Principles.
- Flexible deployment options.

C. Transformation to Cloud Computing

In earlier days, Infrastructure of IT was dependant on hardware defined datacenter which is now transforming to software defined datacenter which is accessible globally with the use of internet. It means that your IT infrastructure and applications are accessible over the internet with the help of Cloud Computing by using IaaS, PaaS, and SaaS terminologies. NIST has defined Cloud computing [4] reference architecture showing in Fig.4. Cloud Computing has emerged at larger sector these days in any business model. Whoever required IT related work, think about cloud computing. In fact, if you are not a part of any business and keep an individual identity as a person, student, or mobile user, then also you interact with application based on Cloud technology for your day to day usages. As per Gartner press release [4], forecasted growth in Overall IT Spend is \$3.7 Trillion in 2018. Growth in Security spend is \$91.4 Billion in 2018 and increase in Security losses is \$600 Billion in 2017.

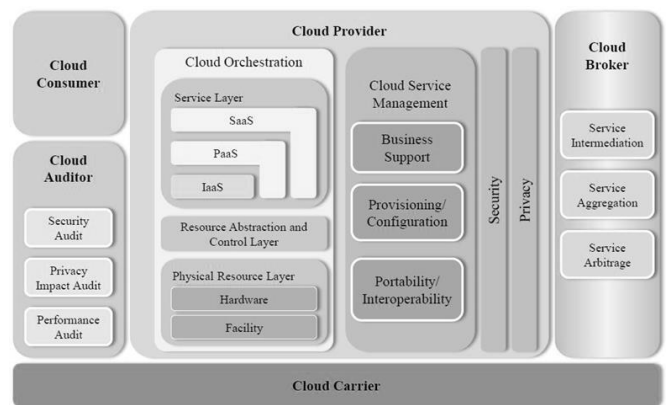


Fig. 4: NIST Reference Architecture of Cloud Computing

There are five things listed below which need to be ensure while transforming a business to Cloud Computing.

- Operational Excellence
- Reliability
- Performance
- Cost
- Fault Tolerance

III. BENEFITS

Modernization of IT infrastructure is the digital future of business. Cloud-based apps are the lifeline of any modern organization - driving revenue, breeding competitive differentiation and connecting workers with essential data quicker than ever before. However, these functions demand superior operational efficiency. Cloud technology promises the ability to meet these demands. Migrating your workload to the modern datacenter can open up a host of new possibilities for your business, helping you to achieve increased IT agility, operational consistency, lower TCO, flexible scalability and a truly hybrid infrastructure.

A. Data Privacy Strategy in One Rack Solution

Several studies have identified different types of data privacy strategies for securing user data in modern datacenter. Every layer of modern datacenter are secure in better way and provides security and control for the environment. Data-in-rest and Data-in-transit is more secure using modern encryption methods such as AES, RSA, Homomorphic, GAMAL, 3DES, TLS, and EL. In traditional datacenter, since every tier had a different identity and segregation, hence it was quite challenging for a customer to manage the security in a controlled way.

B. Availability

With the help of different availability strategy from hardware to hypervisor and Apps, Cloud services provides availability in a better way than a traditional datacenter. It has site resiliency by using different regions and availability zones in each regions. In case any disaster happens, it will migration the workloads of your business to different physical location which is known as region.

In case a application is down due to any instance or compute node, it has availability at compute level. It will automatically migration all workloads to different computes existing on different hypervisor. So, you get availability at

each layer. A customer need not to worry about the applications. Cloud providers commit to achieve SLA of 11 – 9s.

C. Manageability

Manageability is quite simple and centralized in the cloud datacenter. You don't need to roam around the datacenter to check your devices status as it was in earlier days. You will have single console which can achieving monitoring and managing entire infra in one eye.

D. Scalability

Your resources of business are more scalable horizontal and vertical. There is no need of shutting down a server then increase resources. There is no need of shut the physical datacenter down and then scale resources by physically moving the devices to different location. It's just a one click away to scale any resources in of your IT infrastructure.

E. Pay as you Go

The best thing in Cloud services is that you don't need to spend entire amount to purchase resources in single go despite not knowing the fact that it would be usable or not. Here if you opted for cloud services, you can use resources as per your requirement. Cloud providers will charge only for those which have been used.

F. Accessibility from Anywhere

When your business has moved to cloud, it will be accessible from pocket. You don't need to carry your datacenter resources or devices along with you. You just need to access console from anywhere and start using entire infrastructure from anywhere at any time.

G. Performance

There are several ways of accessing resources in cloud environment. Once you will migrate the infrastructure, you get numerous ways to choose different type of resources from low to high performance depending on the cost. When using high end performance resources, your environment provides performance better than a traditional datacenter at lower cost. Each component of a datacenter including CPU, Memory, Storage, Network is much better in performing and staging your applications.

H. Security

These days, managing security is getting harder, not easier. Business technologies continue to improve at breakneck speeds — unfortunately, so do cyberthreats. Despite advances in security technologies, cybercriminals seem to stay one step ahead thanks to accessible and easy-to-use hacking tools. The numbers show that this is more than just a baseless impression, as 66% of respondents have faced a major security incident such as a data breach or DDoS attack in the last year alone. Nine in 10 firms have fallen victim to minor incidents (a phishing attempt, malware infection, or lost/stolen asset), not to mention 16% of companies have dealt with over 10 minor incidents in the last 12 months alone. Furthermore, these threats come from all directions; most come from external sources, but 40% of companies reported incidences that originate from internal sources as well. The result of these ongoing threats is that

today's IT risk and compliance decision makers consider their organizations to be more susceptible to threats today, compared with two years ago when Forrester conducted a similar study.

Modern datacenter provides Zero Trust Security which is an important step for any organization. It protects your datacenter with attacks and different types of threats. Its improved security and network visibility. By doing this, business continuity has also been increased. It uses micro segmentation to separate the day-to-day business data from the sensitive or proprietary data within the organization.

IV. METHODOLOGY

This research paper is a quantitative study of few companies which has recently moved their business to Modern Datacenter. A deep analysis has done with the different layer of people in these companies. Interacted with Management, technical team, SMEs, End users and customers to know the answer of questions what the issues and challenges customer faces when they plan to modernize the IT infrastructure. How we could modernize our traditional datacenter to sustain the pressure of digitalization, and what are the risks and benefits exist in doing the modernization. There are four phases which was done during the research.

- First phase of plan was to identify the existing problem and to list out the consequences.
- Second phase contained planning the transformation into actions.
- Third phase was to observe and collect the data to understand the cohesive portrait of the situation. This involved collecting and examine the workshop data.
- The last phase of the process was to know the issues and learning from the action.

V. GAP ANALYSIS

On basis of methodology used for research and different studies of wise area, it has found that Modern Datacenter has put a tremendous impact on in the era of digital economy. It helped business to make accessibility in International market. However, there are always few concerns which has been raised by customers when we try to find the gap area. A gap analysis survey has been done with different SMEs who often interacts with customer for Pre-Sales and Post-Sales Operations. Questionnaire has been sent to them to find out what exactly the issues they have been asked by customers when propose for Cloud solution. Another study has been done with different industries such as Health, Education, Financial, and Industrial sectors. Below gaps have been identified based on all discussion.

A. Security Challenges

Businesses are moving online nowadays, making application security a top priority for enterprises. Security threats [5], [6], [7] are also increasing, creating need for visibility and context for applications across environments. Traditional security models react too late and hence it a

challenge for any environment. Security of the business's IT infrastructure is an area which is raised by every customer. Because any Cloud provider which is hosting servers, is putting it in shared DataCenter and could a security concern or critical businesses such as Banks and Security Agencies.

B. Data Privacy

Data Privacy is one the major area [8]–[11] which needs attention. Though there are lot of tools and data protection law such as GDPR (General Data Protection Regulation) [12] are in place, however every time we reach to customers, first question we get is that what about data which we are putting over network. They are very much concerned about the privacy and hacking of data because cloud computing is always located in a datacenter outside the physical premises of an organization. This needs attention. As per the Cloud Security Alliance (CSA), out of 12 top threats [13] in Cloud Computing, data breach is on top threats.

C. Adoption Gap

Most of the customers are moving to the modern approach. However, there are many who are concerned in adopting this model because of some gaps. For example; n studies of e-learning [14], [15] using modern digitalization techniques, it has helped up to better extent for society. However, there are lot of other cases such as using e-learning methods. It does not assure to verify that learning is going in right direction. Assessments are not up to the marks which is not in case of physical class rooms. There is lack of motivation in case of physical absence of mentors. This issue needs attention.

D. Initial Cost for Transformation

As per studies [16], [17], it has been identified that initial cost is a challenge for every customer while doing the transformation of existing infrastructure to modern datacenter either it's Virtualization, Cloud, or HCI.

E. Technical Skill Gaps

It has been identified by studies [18], [19], While migrating environment to cloud environment, technical skill gap is always an area which needs focus. Because it is seamless transformation but need proper skill set, hence required lot of deep dive on skilling man power.

VI. DISCUSSION

This study discusses the techniques uses to survive the pressure of digitalization. Different methods have been identified by which modern infrastructure can be transformed to provide the availability, manageability, recoverability, scalability, with lower cost and more control from security perspective. It has also been discussed and reviewed about the benefits of moving to the modern datacenter and risks exist in compared to the traditional datacentres. It has also discussed and reviewed the business model literature and how it can be transformed from traditional datacenter to Virtualization, Hyper-converged Infrastructure, or Cloud

computing without any road blocks with secured environment which should meet all aspects of a business.

There are lot of discussion on data privacy [8]–[10], concerns which every customer raises while migrating to public environment which is accessible through internet. Numerous solutions have been provided with security at each level. Now customers are more satisfied than earlier days.

VII. CONCLUSION

After the deep analysis and SMEs discussion carrying out during the research, we found lot of techniques available to sustain the load of digitalization by using modern IT infrastructure which is more cost effective and agile in achieving business goals. There are also few consequences which exists after transforming business to modern datacenter. What, how, why was found appropriate for representing change of the transformation both from organization as well as IT service provider point of view.

A. What techniques are available to handle the pressure of digitalization?

Modern Virtualization, Hyper-converged infrastructure, and Cloud Computing has provided a credible infra to business models. It has also provided wide services offering under these techniques. On demand availability and pay as you go model of Cloud Computing has saved lot of cost and time for a business.

B. How it improve to achieve business goals in era of digitalization?

By using Modern Datacenter, it provides large data center and computing capacity. Better scalability of resources put an additional benefit for the organization to avoid any crunch during peak utilization. Business can transfer existing services easily which is quite important to not forget.

C. Why transformation to modern datacenter?

Lowering the cost by reducing static hardware and software in IT infrastructure. By using pay as you go model, you can get any service at any time dynamically. It is accessible to internet hence any of your customer can access business critical application anytime and anywhere.

Modern datacenter techniques have broad the opportunity to digitalize the companies without any hassle of managing and focusing on the IT infrastructure in traditional way.

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