International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 9 Issue 12, December-2020

Elasticity in Cloud Computing Case Study: Sudan Electronic Passport Cloud Computing

Amin Babiker Abd El Nabi Mustafa[1], Emadeldin G.M. Suliman[1], Abdelhameed Kadafor[2]
[1]Department of communication engineering, Faculty of engineering, Al-Neelain University, Khartoum, Sudan
[2]Department of Management information system, School of management Studies, Ahfad University for Women, Omdurman, Sudan

Abstract:- Cloud computing is a new technology which managed by a third party "cloud provider" to provide the clients with services anywhere, at any time, and under various circumstances. In order to provide clients with cloud resources and satisfy their needs, cloud computing employs virtualization and resource provisioning techniques. The process of providing clients with shared virtualized resources (hardware, software, and platform). One of types of cloud computing is Private cloud is a computing model that offers a proprietary environment dedicated to a single business entity. The e-passport private cloud computing is one of the first private cloud computing in Sudan. In this paper we study the migration of electronic passport (e- passport) datacenter from a traditional physical datacenter to a highly elastic virtual data canter using virtual technology (hypervisor). We followed elasticity in e-passport cloud computing through explain the concept of virtual data center, private cloud, cloud computing service models, Virtualization and explain the e-passport cloud components .We made a comparison between the physical electronic passport data center and the virtual electronic passport data center (the e-passport private cloud computing) in term of elements (number of servers, number of processors, size of RAM and down time). Finally we monitor the comparison result to clarify the extent in elasticity when transition to e-passport cloud computing.

Keywords: Virtualization; Cloud computing; dada center.

1. INTRODUCTION

Cloud computing has been gaining more popularity in the last decade and has received a great deal of attention from both industrial and academic worlds. The main factor motivating the use of cloud platforms is the arability to provide resources according to the customer's needs or what is referred to as elastic provisioning and de-provisioning. Therefore, elasticity is one of the key features in cloud computing that dynamically adjusts the amount of allocated resources to meet changes in workload demands.

The idea of cloud computing is based on a very fundamental principal of „reusability of IT capabilities'. The difference that cloud computing brings compared to traditional concepts of "grid computing", "distributed computing", "utility computing", or "autonomic computing" is to broaden horizons across organizational boundaries.

In this study the Vertical scaling methodology in the Ministry of Interior - e-passport section by tries to examine the applied elasticity models for e-passport cloud systems to cope with the varying workloads (storage space, application, memory, users, etc.) is proposed.

Virtualization occurs when a virtual version of something is created instead of an actual version. The combination of hardware and software engineering that creates Virtual Machines (VMs) and enables multiple operating systems to run on the same platform. In the field of Information Technology, the fundamental change happening all over is obviously Cloud Computing. Virtualization in computing is creation of virtual (not real) of virtual something such as hardware, software, platform or an operating system or storage or a network device [19]. In a virtualized environment IT enterprise has to adopt and manage many changes as the virtual environment if born to quick changes as compared to that of the physical environment. Because of virtualization clouds are scalable and agile. Virtualization can also be defined as a technology that has the capability of logically separating the physical resources of a server and use them as different isolated machines, called Virtual Machines. The single CPU becomes many virtual CPUs, and the RAMs become many virtual RAMs and same becomes the case for Hard Disks. Virtualization [20] [21] [22] [23] is a technique which allows to create abstract layer of system resources and hides the complexity of hardware and software working environment. Virtualization enhances hardware independence, isolation of guest operating system and encapsulation of entire virtual machine grouped in a one file. Virtualization is commonly implemented with hypervisor [24] [25] technology, which is a software or firmware elements that can virtualizes system resources.

In this paper we follow and address the concept and the application of elasticity and study elasticity in cloud computing state of virtualization in Ministry of Interior e-passport section in cloud computing through explaining the concept of private cloud, e-passport cloud components, cloud modes, full virtualization, storage and its database. We try to explain the applied elasticity models for e-passport cloud when increase storage space, application, memory, users, etc. Also we examine and monitoring e-passport cloud to test access time from a side to the data center, the time down for server.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 9 Issue 12, December-2020

The objective of the research is to explain the e-passport cloud components and addressing the concept of full virtualization along with the concept of virtual machine life cycle. Also to study the elasticity in e-passport cloud computing.

2. METHODOLOGY

To deploy the elasticity solutions, one or hybrid of the following methods is implemented: horizontal scaling, vertical scaling. Horizontal elasticity allows adding new instances while vertical elasticity, referred to as fine-grained resource provisioning, allows resizing the resources of the instance itself to cope with the runtime demand. The instances can be VMs, containers, or application modules. Horizontal and vertical techniques have their advantages and shortcomings. Horizontal elasticity is simple to implement and it is supported by hypervisors. It has been widely adopted by many commercial providers. However, horizontal elasticity can lead to inefficient utilization of the resources due to the fact that it provides fixed or static instances, which sometimes cannot fit exactly with the required demand. On the contrary, vertical elasticity allows resizing the instances but it is not fully supported by all hypervisors, although new hypervisors such as Xen, VMware support it.

Vertical scaling is the process of modifying resources (CPU, memory, storage or both) size for an instance aturn time. It gives more flexibility for the cloud systems to cope with the varying workloads. There are many works that only focus on CPU vertical resizing, other works, and focus on memory resizing. It is worth noting that, there have been many techniques used in literature for memory resizing such as EMA, page faults, ballooning. While there exist some proposals, that control both resources (CPU, memory). Is a particular work that not only controls both resources (CPU, memory) but also coordinates the degree of vertical resizing of the CPU in relation to the memory Proposes mechanism to resize CPU, Disk and memory? Profit Bricks and Right Scale cloud providers offer this feature to their customers.

In this study we propose the Vertical scaling methodology in the Ministry of Interior - e-passport section by try to examine the applied elasticity models for e-passport cloud systems to cope with the varying workloads (storage space, application, memory, users, etc.)

3. RESULTS

Achieving high scalability in virtualized data centers requires address spaces that support large number of tenants and their VMs. Furthermore, since today's commodity switches often have limited memory size, it is necessary to keep the Table 1shows the maximum number of tenants, VMs per tenant, and the size of the forwarding table. The maximum numbers of tenants and VMs depend mainly on the number of bits used to identify tenants and VMs.

Table1: ePassport Physical data center specifications:

Server number	**RAM per Server**	**Processor no per Server**	**Power Consumption**	**User**
16-20	4GB	2	24kwh/day	200
Downtime	**Backup**		**Network Speed**	
1-24 hours	unreliable		1 GB/s	

Table2: ePassport Virtual data center specifications:

Physical Server no.	**Virtual Server no.**	**Processor per Server**	**Power Consumption**	**Network User no.**
8	16-20	4-8	9 Kwh/day	400
Downtime	**Backup**	**RAM**	**Speed**	
0.99	reliable	64-128 GB	4GB/s	

Table 3: Comparison between physical and virtual data

	Physical	**Virtual**
Server number	16-20	8
RAM	4GB	64-128 GB
Processor	2	4-8
Power Consumption	24Kwh/day	9Kwh/day
User	200	400
Downtime	1-24 hours	0.99
Backup	unreliable	reliable
Speed	1GB/s	4GB/s

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 9 Issue 12, December-2020

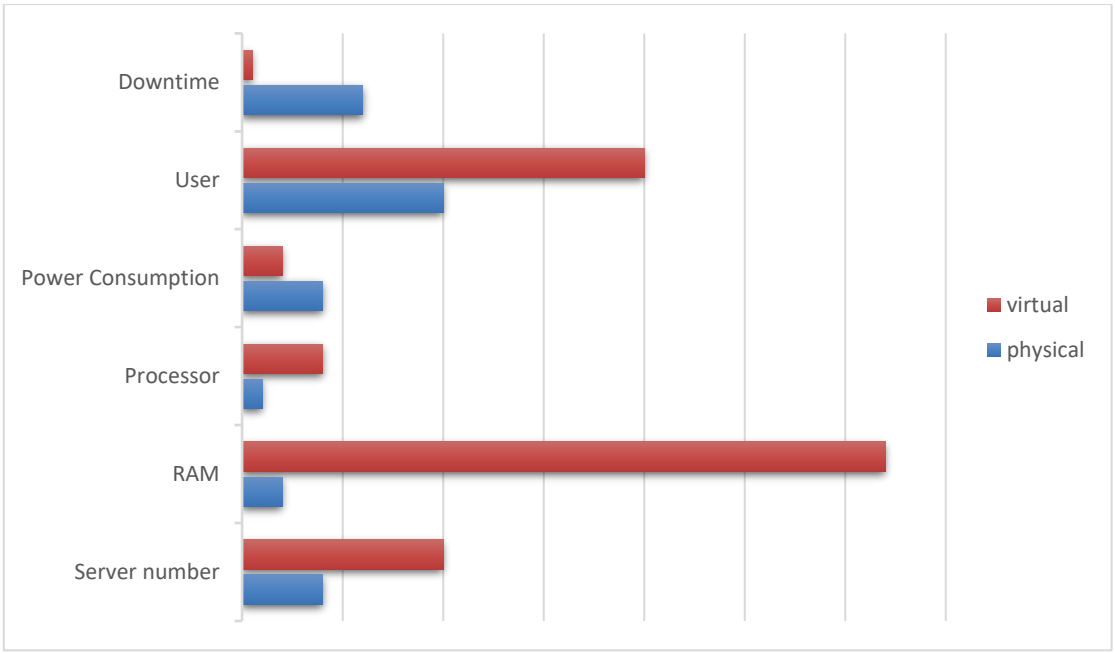

Figure1: Comparison between physical and virtual data

4. DISCUSSION AND CONCLUSION

The application section of this study examined the elasticity in cloud computing and virtualization and this .The following elements were included:

-The state of virtualization in Ministry of Interior e-passport section e-Passport cloud components.

-Cloud modes

-Full virtualization

-Storage and its database

Applied elasticity models for e-passport cloud when increase Storage space.

-Application

-Clustering.

-Memory

Sharing memory

-Users:

Permissions distribution

-Cloud access time

-Virtual machine life cycle

-Performance and availability

The major contributions of this research are summarized as:

We proposed a precise definition of elasticity in the Ministry of Interior e-passport section and we highlighted the related concepts to elasticity in such as scalability and efficiency and approaches to measure elastic systems. Also we provide an extended classification for the elasticity mechanisms according to the configuration, the scope of the solution, purpose, mode, method, etc. Finally we discussed the existing container technologies and their relation to cloud elasticity.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 9 Issue 12, December-2020

5. RECOMMENDATION

By the end of this study the researcher recommend the next researchers and the practitioners to:

vsphere latest version is vshpere 7.0

Include some features as follow:

-No more Flash-based vSphere Web Client

-No more external PSC (Platform Services Controller)

-No more VMware vCenter for Windows

-No more Update Manager Plugin

-No more VNC Server in ESXi

-No more vFlash Read Cache (vFRC)

-VMware vSphere 7.0 and TLS Protocol (TLS 1.0 and 1.1 are disabled by default)

SAN Storage latest version (HPE 3PAR 9000)

-Capacity- 6000 TiB Maximum, depending on model Drive description- SFF SAS Enclosures- (48) 3PAR 9000 SFF SAS Drive Enclosure Maximum, depending on model. Maximum drives per enclosure- 24.

- Empower data at the speed of memorywith the industry's first Tier-1 storage with Storage Class Memory (SCM) and NVMe·

-Eliminate storage networking bottlenecksand accelerate performance for all-flash with new HPE3PAR 32Gb FC.

-Reduce troubleshooting and management the apaches with HPE Info Sight Advanced Performance Analytics, available in HPESSMC 3.4 management console.

REFERENCE

[1] S. A. Mostafa, S. S. Gunasekaran, A. Mustapha, M. A. Mohammed, and W. M. Abduallah, "Modelling an Adjustable Autonomous Multiagent Internet of Things System for Elderly Smart Home," in Advances in Neuroergonomics and Cognitive Engineering, Cham, 2020, pp.301
[2] M. Ficco, C. Esposito, F. Palmieri, and A. Castiglione, "A coral-reefs and Game Theory-based approach for optimizing elastic cloud resource allocation," Future Gener. Computer. Syst., vol. 78, no. Part 1, pp. 343– 352, Jan. 2018, doi: 10.1016/j.future.2016.05.025.
[3] S. R. Zeebaree, L. M. Haji, I. Rashid, R. R. Zebari, O. M. Ahmed, K. Jacksi, & H. M. Shukur, "Multicomputer Multicore System Influence on Maximum Multi-Processes Execution Time," TEST Engineering & Management, vol. 83, no. May/June, pp. 14921–14931, May 2020
[4] O. H. Jader, S. R. Zeebaree, and R. R. Zebari, "A State Of Art Survey For Web Server Performance Measurement And Load Balancing Mechanisms." International Journal of Scientific & Technology Research (IJSTR), vol. 8, no. 12, pp. 535-543, 2019.
[5] M. Singh, "Virtualization in Cloud Computing- a Study," in 2018 International Conference on Advances in Computing, Communication Control and Networking (ICACCCN), Oct. 2018, pp. 64–67, doi: 10.1109/ICACCCN.2018.8748398.
[6] M. A. Sadeeq, S. R. Zeebaree, R. Qashi, S. H. Ahmed, and K. Jacksi, "Internet of Things security: a survey," in 2018 International Conference on Advanced Science and Engineering (ICOASE), 2018, pp. 162–166
[7] Data Center Network Virtualization: A Survey Md. Faizul Bari, Raouf Boutaba, Rafael Esteves, Lisandro Zambenedetti Granville, Maxim Podlesny, Md Golam Rabbani, Qi Zhang, and Mohamed Faten Zhani
[8] Swathi T, Srikanth K, Reddy SR (2014) Virtualization In Cloud Computing, IJCSMC, Vol. 3.
[9] Lombardi L, Pietro RD (2011) secure virtualization for cloud computing, Journal of Network and Computer Applications 34: 1113-1122.
[10] Bhoyar et al., International Journal of Advanced Research in Computer Science and Software Engineering 3(3), March - 2013, pp. 695-700
[11] https://www.Red hat .com
[12] https://www.citrix.com/glossary/what-is-private-cloud.html#
[13] https://www.searchdisasterrecovery.techtarget.com/definition/cloud-disaster-recovery-cloud-DR
[14] https://www.ionos.com/community/server-cloud-infrastructure/cloud-server/introduction-to-cloud-server-clusters/
[15] https://www.techopedia.com/definition/26818/vmware-vcenter-server