

## 클라우드 컴퓨팅 - 가상 네트워크 관련 문제

모하마드 아 잠<sup>1</sup>, 밤복흥<sup>2</sup>, 아이만 압둘라 알사파르<sup>3</sup>, 알 아 민호 새 인<sup>4</sup>, 이 슬 램<sup>5</sup>, 허의남<sup>6</sup>  
경희대학교 컴퓨터공학과  
{aazam<sup>1</sup>, ayman<sup>3</sup>, alamin<sup>4</sup>, motahar<sup>5</sup>, johnhuh<sup>6</sup>}@khu.ac.kr  
<sup>2</sup>hung205a2@yahoo.com

### Cloud Computing –Virtual Network Related Issues

Mohammad Aazam<sup>1</sup>, Pham Phuoc Hung<sup>2</sup>, Aymen Abdullah Alsaffar<sup>3</sup>, Al-Amin Hossain<sup>4</sup>, Md. Motaharul Islam<sup>5</sup>, Eui-Nam Huh<sup>6</sup>  
Department of Computer Engineering , Kyung Hee University

#### Abstract

Cloud computing is an emerging technology, which allows the user to fulfill his needs by outsourcing the resources. With the passage of time, cloud computing has become an essential part of our lives. But it still requires some sort of standardization, specially in terms of user's trust, privacy, and security related things. This study presents different types of cloud computing services and their working domains along with some key virtualization related issues that are encountered by the cloud service provider as well as the user. Those key issues, related with virtual network are discussed in this paper. This study provides a basis to work further on those issues, so that the key concerns are addressed as soon as possible and cloud computing could become standardized and more prevalent.

#### 1. Introduction

Cloud computing, the recent trend in IT, takes computing from desktop to the whole World Wide Web and yet, the user doesn't need to worry about maintenance and managing all the resources. User has to bear only the cost of usage of service(s), which is called, pay-as-you-use [1], in cloud computing terms. In today's world, almost all the Internet users are the users of cloud computing service(s). "Cloud computing is not a revolutionary idea, instead, it is an evolutionary concept" [2]. With cloud computing, a smart phone can become a large data center. Extensive computing can be done even on an average computing device or smart phone, through Internet. Cloud computing is extended form of distributed computing, parallel computing, and grid computing [3]. Distributed computing refers to a computing system, in which several heterogeneous computers provide services in collaboration, over a network. While in grid computing, a computer's power and storage capacity is shared over the Internet [4]. In parallel computing, a problem is divided into discrete parts and multiple CPUs solve that problem simultaneously [5]. Main essence of cloud computing is virtualization [3]. Literally, any IT resource can be virtualized: softwares, operating system(s), CPU, storage, and even the hardware and network. Users do not even need to know where the resource(s) exactly lie physically. They only have to know how to access it.

Besides virtualization, another property of cloud is to be able to be distributed among various users and dynamically extendible. Cloud computing has two parts: front end and back end. The front-end is the user's side, while the back-end is the cloud computing service or services, like: storage, data processing, servers etc. With cloud computing, a learning object can be transformed into a service in its own, which is, learning object service [18]. Backend, also known as cloud computing service provider (CCSP) provides cloud services, by renting out the software or hardware resources, on the basis of virtualization. On the other hand, front-end, the user, needs only to access the service through Internet.

#### A. Cloud computing architecture and services

Cloud computing provides four categories of services, namely: Software as a Service (SaaS), Platform as a Service (PaaS), Networks as a Service (NaaS), and Infrastructure as a Service (IaaS) [7]. SaaS refers to application working over the Internet which is available for the user on pay-as-you-go basis [8]. User does not need to store, install, and maintain the application. Instead, only Internet connectivity is required to access the service that has been rented out by the SaaS service provider on the cloud. PaaS is providing a platform to build applications and services, with all the toolkits and resources required to do so [9]. NaaS provides virtual network(s) to the users. User can have as many

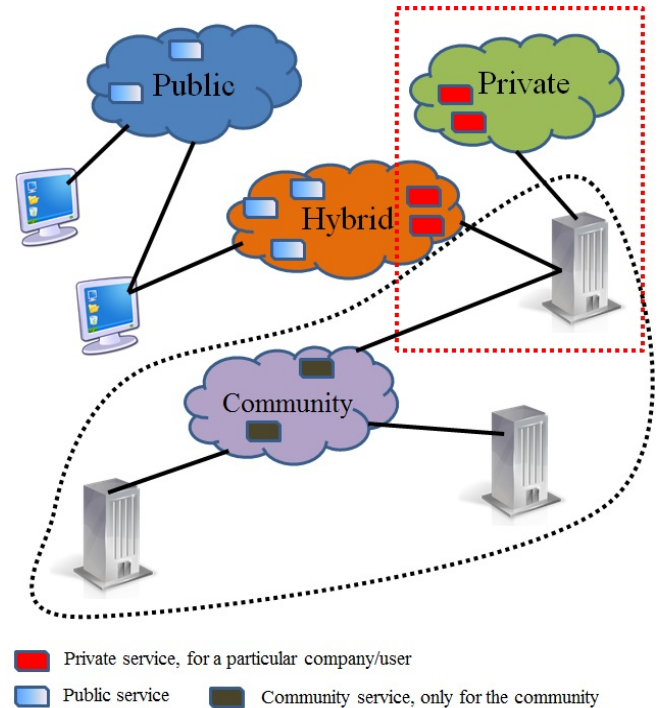
numbers of networks as required, with desired segmentation and policy enforcement. With NaaS, user can also have heterogeneous networks, for example, IPv4 and IPv6 segments working in co-existence or separately. IaaS provides computation and storage services on rental basis. Instead of purchasing expensive machines, servers, and storage devices, even for small tasks, user can outsource this task to the IaaS service provider. With storage in IaaS, not only the data is stored by the IaaS service, but also, it makes the data universally accessible over the Internet. Examples of NaaS service providers are in table 1.

<Table 1> Cloud Services Examples

Category	Services/Service Providers
SaaS	Google Apps, SalesForce, ZohoOffice[3], Layered Technologies [17], Workday, Flickr, OfficeLive, Cisco Webex, MS LiveMeeting [16]
PaaS	Microsoft Azure, GAE (Google App Engine), EC2, force.com [16].
IaaS	GoGrid, Mosso [17], Flexiscale, Joyent,
NaaS	Akamai, Vodafone, Verizon, Telstra, AT&T, BT, Limelight [16]

## 2. Cloud Types

On the basis of user’s access and administrative and service privileges, clouds have been divided in to four types: public, private, hybrid, and community cloud. The clouds which are publicly available to the user, through web browsers, are known to be public clouds [6]. A private cloud is a cloud private to a particular organization. [6]. Private cloud is more secure, since it is within an organization’s boundary. Hybrid cloud is a combination of public and private cloud. Hybrid cloud is that kind of private cloud, which is linked to one or more public cloud service(s). Hybrid cloud is when two or more organizations share a cloud, in such a way that the cloud is public within those organizations, but private outside their scope, none other than the community can access the services available on that cloud.



(Figure 1) Types of cloud and their usage boundary

## 3. Virtual Network Issues

Since cloud computing is becoming an essential part of our lives and it is growing very rapidly, it also brings some issues with it. Virtualization is an essential part of cloud computing. In virtualization, physical resources are virtualized so that they can be best utilized, with utmost efficiency, with concurrency. This section discusses about the issues of virtual network, in the context of cloud computing.

### A. Virtual Network Issues

Cloud computing is all based on virtualization, which poses further challenges. Some of the key issues are given below.

- Virtual Network switch challenges

In virtual switch, since network is extended inside a server, so it poses different types of challenges, as compared to the physical network or switch. Specifically, in terms of administration and in terms of switch management or traffic management, challenges are posed. Virtual switch reside inside a virtualization host device. So, it is managed by virtualization administrator, beyond the control of physical network administrators. This causes problem in enforcing the

administrative policies and managing network traffic. In case of switch/traffic management in a virtual network, most of the switched traffic remains within the virtual network and does not go to the physical network. Because of this, it is impossible to monitor and manage that traffic on physical network [15].

- I/O bandwidth

VM's inside a server consume CPU processing power. With more VM's more traffic is generated and thence, more processing is required from the physical CPU to move that traffic.

- Isolation

Isolation means preventing one VM to affect others. Isolation is very crucial in virtualization. In multi-user OS environment, all users get affected by an attack. To prevent this in virtualization, isolation is done among the VM's, so that an attack on a VM does not affect other VM's. In case a VM is compromised, hypervisor can restore it to its original condition, without affecting other VM's on that machine [11] [14].

- Sniffing virtual network

In a virtual shared network, VM's in a network are connected through a virtual hub. Since, VM's share that hub to access the network, so a VM can sniff the virtual network. This is also among the major issues of XEN configuration of VM's in bridge mode [15].

- Spoofing virtual network

As discussed, VM's can sniff data in a virtual network; it is also possible for a VM to do ARP spoofing and redirecting packets. This is also a common problem in the route mode of VM configuration, in XEN.

#### 4. Conclusion And Future Work

This paper discusses about the latest and prevailing issues in virtualization and cloud computing, in terms of physical network as well as virtual network. Unless these issues are addressed to a significant extent, cloud computing cannot be standardized and thence, cannot be prevalent. This study will make it easy to further dig out analyze the extent of these issues in cloud computing and their impact on workability of a service and service provider and also on user's trust and privacy. Since cloud computing is becoming the need of the day now, so it is also very important to address the key issues

encountered by the cloud service providers and the users. This study gives an insight of all those issues and lets researcher make their direction to work accordingly further on it in future.

#### 5. Acknowledgement

This research was supported by the MKE (The Ministry of Knowledge Economy), Korea, under the ITRC (Information Technology Research Center) support program (NIPA-2013- H0301-13-1006) supervised by the NIPA (National IT Industry Promotion Agency).

#### References

- [1] Siani Pearson et. al., "Privacy, Security and Trust Issues Arising from Cloud Computing", in the proceedings of CloudCom, Nov., 30 – Dec., 03, 2010, Indianapolis, USA
- [2] "Background of Cloud Computing" available at: <http://wikisites.cityu.edu.hk/sites/netcomp/articles/Pages/BackgroundofCloudComputing.aspx>. Accessed on: 13 September, 2012
- [3] Shuai Zhang et. al., "Cloud Computing Research and Development Trend", in the proceedings of International Conference on Future Networks, 22-24 Jan., 2010, Sanya, China.
- [4] "Difference Between Grid Computing vs. Distributed Computing", available at: <http://www.jatit.org/distributed-computing/grid-vs-distributed.htm>. Accessed on: 13 September, 2012.
- [5] "Introduction to parallel computing", available at: [https://computing.llnl.gov/tutorials/parallel\\_comp](https://computing.llnl.gov/tutorials/parallel_comp). Accessed on 13 September, 2012.
- [6] Y. Jadeja, et. al., "Cloud Computing - Concepts, Architecture and Challenges", in the proceedings of International Conference on Computing Electronics and Electrical Technologies, 21-22 March, 2012, Nagercoil, India
- [7] W Ma et. al., "The Survey and Research on Application of Cloud Computing", in the proceedings of 7<sup>th</sup> International Conference on Computer Science and Education, 02-04 November, 2012, Wuyishan Mountain, China.
- [8] J. Yang et. al., "Cloud Computing Research and Security Issues", in the proceedings of International Conference on Computational Intelligence and Software Engineering, 10-12 December, 2010, Wuhan, China.
- [9] "Network as a Service", available at: [http://docs.cloudstack.org/CloudStack\\_Documentation/Design\\_Documents/Network\\_as\\_a\\_Service](http://docs.cloudstack.org/CloudStack_Documentation/Design_Documents/Network_as_a_Service). Accessed on: 25 September, 2012.
- [10] Sara Qaisar, et. al., "Cloud Computing : Network/Security Threats and Countermeasures", Interdisciplinary Journal of Contemporary Research in Business, 2012 issue. ISSN 2073-7122
- [11] Hanqian Vu, et. al., "Network Security for Virtual Machine in Cloud Computing", in the proceedings of 13<sup>th</sup> International Conference on Computer and Information Technology, 23-25 Decemner, 2010, Dhaka, Bangladesh.
- [12] Rohit Bhadauria, et. al., "A Survey on Security Issues in Cloud Computing", IEEE Communications Surveys and Tutorials, available at: <http://arxiv.org/abs/1109.5388>
- [13] Meiko Jensen, et al., "On Technical Security Issues in Cloud Computing", in the proceedings of International Conference on Cloud Computing, 21-25 September, 2010, Bangalore, India.
- [14] Doug Hyde, "A survey on the security of virtual machines", available at: <http://www.cse.wustl.edu/~jain/cse571-09/ftp/vmsec/index.html>
- [15] Crystal Bedell, "How to solve virtual network switch problems", available at: <http://searchnetworking.techtarget.co.uk/tutorial/How-to-solve-virtual-network-switch-problems>, accessed on 11 October, 2012.

- [16] Minqi Zhou et. al., "Services in the Cloud Computing Era: A Survey", in the proceedings of 4<sup>th</sup> International Universal Communications Symposium, 18-19 October, 2010, Beijing, China.
- [17] BP. Rimal et. al., "A Taxonomy and Survey of Cloud Computing Systems" 5th International Conference on INC, IMS, IDC, 25-27 August, 2009, Seoul, Korea.
- [18] P. Kalagiakos et. al., "Cloud Computing Learning", in the proceedings of 5<sup>th</sup> International Conference on Application of Information and Communications Technologies, 12-14 October, 2011, Baku, Azerbaijan