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A Proposed Campus Building Process in Cloud Computing

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Abstract– A good understanding of the cloud computing technology, its components and their interrelationships is crucial for decision makers who intend to adopt this novel technology. Towards the end-goal of establishing a simple cloud computing platform which satisfies some of the scientific needs of the academic and research community within the academic institutions, in this paper we propose a simple design of a cloud computing platform for a school or a University and illustrate the components of this platform and their interrelationships. This paper helps to better understanding of the technology that enables the academic community to perform research experiments on clouds in order to design more efficient portals and gateways for the clouds, and facilitate the adoption of this novel computing.

Index Terms– Cloud Computing Technology, Building and Research Community

I. INTRODUCTION

THE campus itself is a cloud, and this campus cloud could have many other clouds inside. Each cloud inside represents a building within the campus cloud, mostly they are the departments e.g., (IT, Business) departments [1], [3].

We will illustrate the cloud building process for the campus, then the sub clouds for the departments and then the labs and so on. We will also illustrate the multilevel security mechanisms can be used for protection, simply have multilevel security within the campus cloud that we will talk about later in this paper.

The rest of this paper is organized as follows: research methodology is described in section 2. Section 3 describes the literature review and related work. The proposed Campus Building Process, Campus cloud architecture and campus cloud security are discussed in section 4. Section 5 discusses campus cloud management. Finally, conclusions are drawn in section 6.

II. LITERATURE REVIEW AND RELATED WORK

Cloud computing had been studied in many published papers; those papers discussed the cloud computing aspects, technologies and challenges.

The Luis M. vaquero et al. [4] were focusing on the energy consumption in the cloud computing. The paper looks for where a better energy mechanism will be better applied, it is also discussed the approaches have arisen to reduce the energy consumption in cloud computing.

The Junaid et al. [3] discussed the development in the cloud computing and the need for the security techniques to be used within designing the clouds like ensuring availability on demand and to make the clouds meet the required requirements for effectively securing the clouds. This paper mostly focused on security analysis and intrusion detection, proposed an abstract model for the intrusion detection. The paper has some recommendations that can be used while building and merged with the architecture building process for any cloud.

The Zhiweixu et al. discussed the classes of manifesting the computing data, the first is the customer facing applications, and the second is backed applications each one of them manifest a certain amount of data. The paper reviews some researches related to data computing in Internet services, like improving system utilization, improving system availability, improving performance, and improving energy efficiency.

III. PROPOSED CAMPUS BUILDING PROCESS

In this paper, we will illustrate a small size campus; that has two departments: IT department and the business department, the campus is new and the proposed campus network is built from scratch. The campus cloud is a private cloud resources are available only for the campus users, the cloud infrastructure operated by the campus, available exclusively to campus students and researchers.

The campus cloud two departments the first one will be Building A and the second one will be Building B our cloud will look like as shown in Figure 1 [4], [5], [7]. The proposed design will take in consideration network service characteristics such as: the Quality of Service (QOS), the

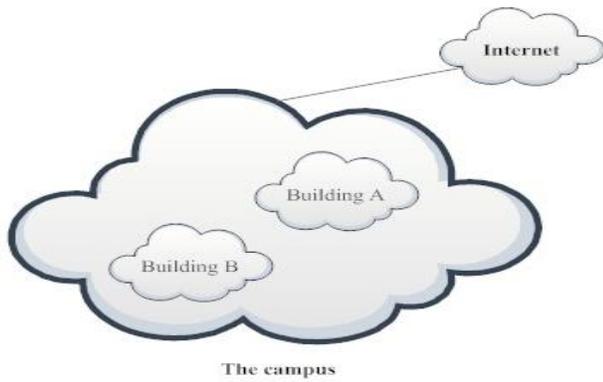


Figure 1: The campus cloud: two departments

RMA (Reliability, Maintainability, Availability), up time, flexibility, manageability, and usability for the (User, Applications, Devices, and the whole Network). Data flow is the traffic density and direction within the cloud, there are two kinds of data flows either Bidirectional or unidirectional flows, two unidirectional flows to enhance performance and to avoid congestions and will be denoted F1, F2, ...[10], [11], [13].

In Figure 2, P1 means full network capacity, reliability, availability and delay). Each department has its own main server (or server farm) that acts as managing server that handles all user request, perform resource scheduling, authorization, security as will explained later. Also it coordinates between the two departments; monitors the campus cloud performance, stores the software images, offer

storage area for students and researchers and finally it performs network management tasks [15], [17], [19].

The wireless devices in each floor provide wireless access for mobile users, and can be used for buildings connectivity to provide fault tolerant network paths, these wireless devices are connected to the wired network. We can add multi levels of security, these levels can be between the campus cloud and the outside, or between the two buildings (using firewalls and Intrusion prevention system). Also we can add another level of security between labs; we used VPNs, different VLANs [18], [20].

Other security application can be used to provide availability (zombie protection, Denial of Service, malicious resource exhaustion, platform attacks), ensure integrity (workload state integrity, Guest OS Integrity) and ensuring confidentiality (Backdoor protection).

For more security and professionalism we can also use network honey pot, Penetration text and Application controls [21], [22].

Figure 3 shows how the physical diagram of the two departments will look like and floors and labs locations and offices locations and so on. The two departments are similar and each one of them will have two floors only [10].

Let us go further inside the Figure 3, each building has a room contains: the main server(s), storage device, the management device, firewalls and other security devices.

To ensure maximum security all the switches used in the diagram are VPN enabled switches; there are different VPNs to be located to specific users. Table 1 shows a typical IP addresses allocation used in our campus cloud [12], [13].

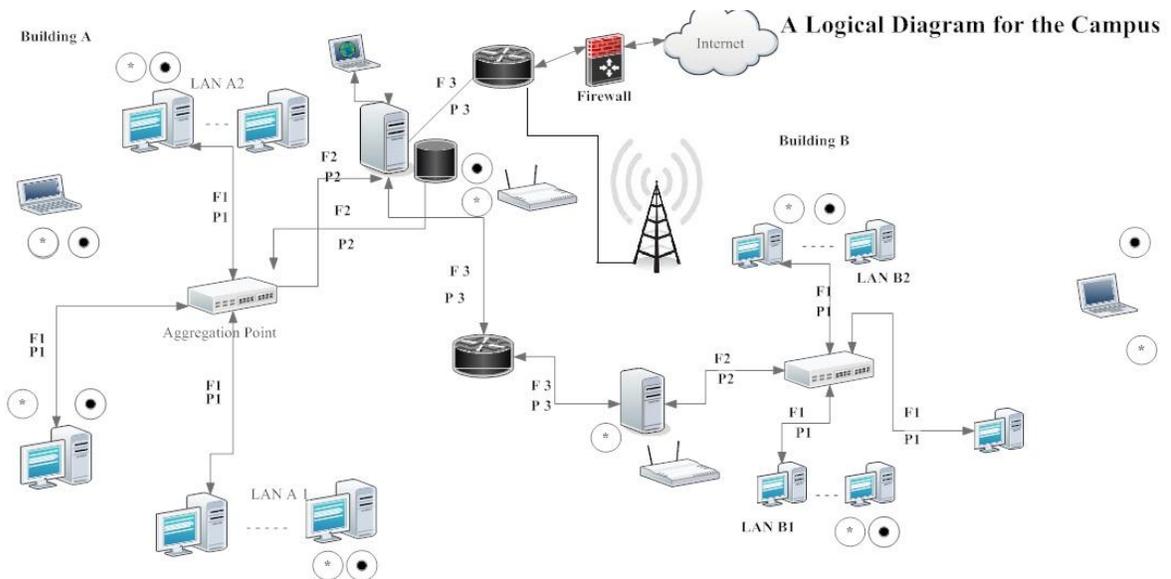


Figure 2: A Logical diagram for campus

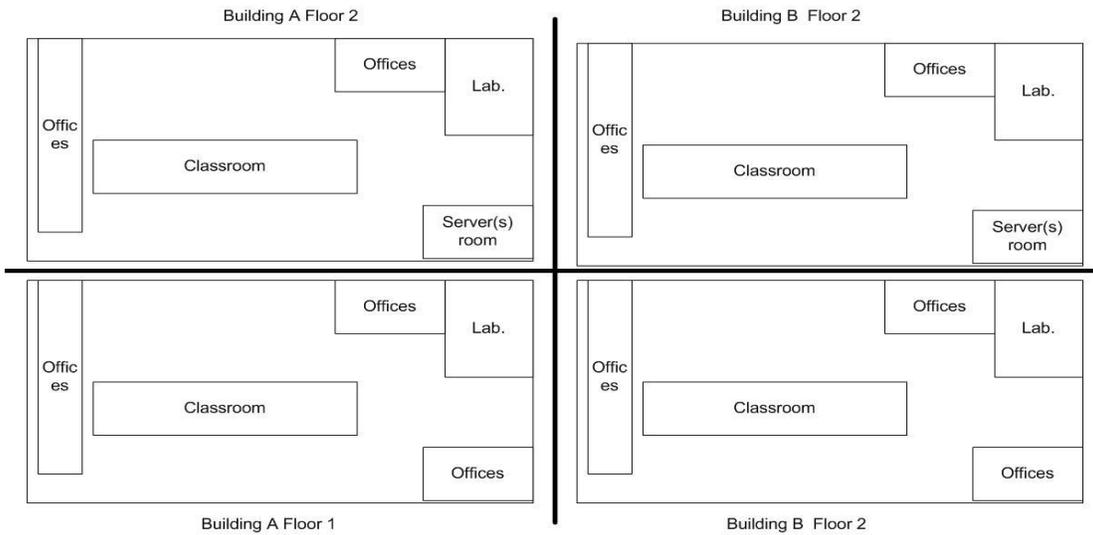


Figure 3: Physical diagram of the two departments

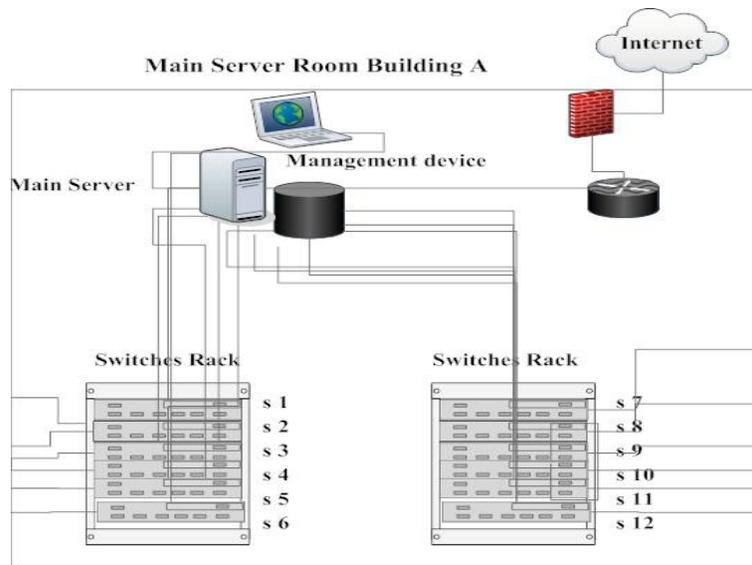


Figure 4: Detailed Overview

Table1: IPs representation in Server and Router

| Server | Router |
|--|--------------------------|
| Public IP address for the whole campus ranging 172.x.x.x | - built in firewall |
| Private IP address building A ranging 192.168.x.x | - no access list enabled |

IV. PROPOSED CAMPUS CLOUD MANAGEMENT

In the campus cloud there is number of devices need to be managed for troubleshooting, monitoring, and for configuration, either the whole cloud, or part of it.

FCAPS (fault, configuration and accounting, performance and security management) is another type of management that can be added. The whole management can be done by certain protocol such as SNMP protocol [20], [16].

Management flows can be either In band or Out of Band: In band means that the management traffic share the same paths as the network traffic, while the out of band means that the management traffic uses different paths, which provides a better management mechanism because the network can be congested or under some security threat or attack, or some H/W or S/W configuration problem [18], [19].

V. CONCLUSION

We discussed the aspects related to campus cloud building process, we took the campus as an example to illustrate the whole process, and we tried to make it generic as much as possible illustrating our campus example. We went through the necessary steps which were: Requirements gathering and analysis, determining the flows, architecture design and cloud management

we discussed the security levels and knew the major security factors that we need and some extras, and discussed the ways that we could be applied, we can offer those things to the entity we are building this cloud for, this will provide more security and detection methods and will make a better business to the company building that cloud.

Examples of the Logical and Physical diagrams and there components and how they should be think of before we draw them and how we can combine the important information relevant to the drawings for more effective cloud implementation.

REFERENCES

- [1]. James D. McCABE, "Network Analysis Architecture, and Design", 3rd Edition.
- [2]. Efraim Turban and David King. Electronic Commerce 2010: Amanagerial Perspective, 6th Edition.
- [3]. Junaid Arshad, Paul Towned, JieXu, "An Abstract model for integrated...", The International Journal of cloud applications and computing Jan-Mar, 2011.
- [4]. Luis M. vaquero et al., "The Challenge of Service Level Scalability for the Cloud", The International Journal of cloud applications and computing, Jan-Mar, 2011.
- [5]. <http://www.webhostingsearch.com/articles/saas-security-issues.php>
- [6]. Information Security Newsletter: http://www.istf.jucc.edu.hk/newsletter/IT_03/IssueIT3_1.html
- [7]. XiaoFeng Wang, and Kehuan Zhang (May, 2010), "Side-Channel Leaks in Web Applications: a Reality Today, a Challenge Tomorrow", IEEE Symposium on Security & Privacy, 2010.
- [8]. R. L. Grossman, "The Case for Cloud Computing", IT Professional, Vol. 11(2), pp. 23-27, 2009.
- [9]. Web 2.0/SaaS Security, Tokyo Research Laboratory, IBM Research. http://www.trl.ibm.com/projects/web20sec/web20sec_e.htm.
- [10]. Shantanu Pal, SunirmalKhatua, NabenduChaki, SugataSanyal, "A New Trusted and Collaborative Agent Based Approach for Ensuring Cloud Security," Annals of Faculty Engineering Hunedoara International Journal of Engineering, Vol. 10, Issue 1, Jan 2012.
- [11]. Jessica T., "Connecting Data Centres over Public Networks", IPEXPO.ONLINE, April 20, 2011.
- [12]. "Security Consideration for Cloud Ready Data-Centres," Juniper Networks, Oct. 2009. <http://www.juniper.net/us/en/local/pdf/whitepapers/2000332-en.pdf>.
- [13]. Ian Rathie, "An Approach to Application Security," White Paper, SANS Institute. http://www.sans.org/reading_room/whitepapers/application/approach-application-security_16.
- [14]. Katzan, H., "The Education Value of Cloud Computing", Contemporary Issues in Education Research, 2010.
- [15]. L.J. Zhang and Qun Zhou, "CCOA: Cloud Computing Open Architecture", ICWS-2009: IEEE International Conference on Web Services, pp. 607-616. July, 2009.
- [16]. R. Gellman, "Privacy in the clouds: Risks to privacy and confidentiality from cloud computing," The World Privacy Forum, 2009. http://www.worldprivacyforum.org/pdf/WPF_Cloud_Privacy_Report.pdf.
- [17]. Khmelevsky, Y., and Voytenko, V., "Cloud Computing Infrastructure Prototype for University Education and Research", Proceedings of the 15th Western Canadian Conference on Computing Education, Kelowna, Canada.
- [18]. Rittinghouse, J. W., and Ransome, J. F, "Cloud Computing Implementation, Management and Security", New York: Taylor and Francis Group.
- [19]. Behrend, T. S., Wiebe, E. N., London, J. E., & Johnson, E. C. (2011). Cloud computing adoption and usage in community colleges. Behaviour & Information Technology ,
- [20]. Vouk, M. A., "Cloud Computing Issues, Research and Implementations", Journal of Computing and Information Technology.
- [21]. IBM Press. (2009, Nov 4). IBM Press Room. Retrieved March 21, 2011, from IBM:
- [22]. <http://www-03.ibm.com/press/us/en/pressrelease/28749.wss>