The Benefits of Cloud on University System

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Abstract

With the growth of the number of students and their data, the cloud will help university to deal with different challenges about security, privacy and compliance, and to get some advantages of infrastructure to the cloud such as universal access, low entry cost, elasticity, scalability, and so on. This paper is going to illustrate an operation that allows university to migrate its system to the cloud with the purpose of meeting its requirements.

Keywords: Cloud, security, privacy, compliance, low entry cost, elasticity, scalability, to migrate

1. Introduction

Cloud Computing is associated with a new paradigm for the provision of IT infrastructure and large data processing methods for all types of resources [1]. In addition, some new cloud-based technologies must be adopted appropriately because contact with large data for simultaneous processing remains difficult to process. Current technologies are all designed to utilize processing power while aggregating resources and providing a single system view [2]. Among these technologies, cloud computing is becoming a solid architecture for large-scale IT processing and revolutionizing the way IT is extracted and used. In addition, the important goal of these technologies is to provide a computing platform capable of handling large data volumes (Big Data) [3], such as multimedia and unstructured large data sets.

Therefore, Cloud system has been increasingly applied in the field of business for the migration of a company system. Migrating the university system to the Cloud, however, is newly utilized in educational domain to convince the Moroccan universities to utilize Cloud. In this sense, we are going to convince Sidi Mohammed Ben Abdellah University, Fez to adopt the cloud system.

2. The definition of Cloud

The term Cloud today generally refers to a new model of both distribution and consumption of computing which consists of making available through the communication networks and on demand, a set of resources (computing power, data storage, applications, etc.) and services (management, administration, etc.). Cloud solutions rely primarily on virtualization and automation technologies [4]. Three key features of the Cloud are different from traditional computing:

• Pooling and dynamic capacity allocation (elastic adaptation to load variations)

• Services instead of technological products with continuous and automatic update

• Self-service and pay-per-use

Although there are many definitions of Cloud, [2] define it as "a parallel and distributed computing system consisting of a collection of inter-connected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements (SLA) established through negotiation between the service provider and consumers." Additionally, the pool of resources is typically exploited by a pay-per-use model in which guarantees are offered by the Infrastructure Provider by means of customized Service Level Agreements [5].

2.1. Web Server

Web server is a computer program that uses the HTTP protocol to serve up website pages requested by administrators to provide information to their students. This website might be created using a variety of technologies such as HTML (hypertext markup language), CSS (cascading style sheets), Javascript (scripting language), Python (programming language), and MySQL (database).

Availability of cloud-based service leads to meet the specifications of the existing technical environment and to handle the specifications of the existing technical environment, as well as expected growth. However, to adopt this cloud-based service need to utilize the best practices [6].

2.2. Cloud Architecture

According to the National Institute of Standards and Technology (NIST) [7], these are the five specific qualities that define cloud computing:

• on-demand self-service
• broad network access
• resource pooling
• rapid elasticity or expansion
• measured service

2.3. Cloud Based Delivery

- *The software-as-a-service (SaaS)*service-model involves the cloud provider installing and maintaining software in the cloud and users running the software from their cloud clients over the Internet (or Intranet). The users' client machines require no installation of any application-specific software - cloud applications run on the server (in the cloud) [8].
- Platform as a service (PaaS) is cloud computing service which provides the users with application platforms and databases as a service [9].
- Infrastructure as a service (IaaS) is taking the physical hardware and going completely virtual (e.g. all servers, networks, storage, and system management all existing in the cloud). In other words, businesses pay a fee to run virtual servers, networks, storage from the cloud [10].
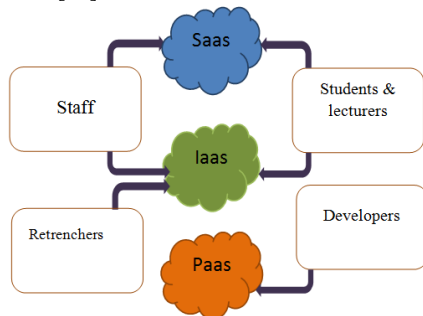

Fig.1: The main structures of the IT services users in any institution using Cloud Computing.

2.4. Deployment Models.

Private cloud: The cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers.

Community cloud: The cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations).

Public cloud: The cloud infrastructure is provisioned for open use by the general public. It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them.

Hybrid cloud: The cloud infrastructure is a composition of two or more distinct cloud infrastructures (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability [7].

2.5. Best Practices of Computing Cloud in Education

Cloud computing ensures that educational institutions are more focused on research and learning than on the implementation of a complex IT infrastructure. Education-related cloud computing applications will form the foundation for future computing infrastructure in education [11]. The future base of the IT infrastructure in education will be formed as cloud applications to ensure the development of the hardware and software environment.

By using the high speeds involved in data processing in the case of resource integration through cloud computing, it will be possible to meet the high demand and reduce the pressure associated with the information explosion. This will ensure development in education using rapid changes in IT, as well as software as a SaaS service. It will do this by improving the type of resources used for educational purposes, decreasing costs and guaranteeing that the demand for green energy is met, improving the security of information and facilitating maintenance and operation of the system.

Several learning institutions are beginning their move to cloud computing by having their e-mail system delivered by outsiders, the more common was Microsoft live @ edu which is browser-based, and provides students with access to e-mail, desktop package, as well as skydrive. Live @ edu is popular because it allows students to access Microsoft products from anywhere without having to buy those [12]. Google Education App (GAE) is one of several cloud services dedicated to education. Google's features, including Talk, Mail, and Docs, provide similar benefits to Microsoft, improving online student collaboration and learning experience [13].

Cloud computing in education faces many challenges, including security, data privacy, as well as network failure [14]. Some of the obstacles related to the implementation of cloud computing in the education system presented in the following figure:
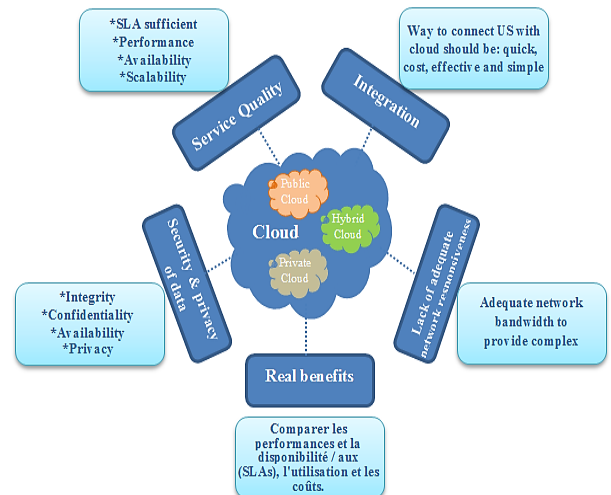

Fig.2: The common challenges of cloud computing in educational system.

3. The Benefits of Migrating the University System

To decide which legacy system or service will be migrated, it is very important to examine the benefits of migrating a particular legacy system to the cloud and to understand potential security, financial, workload-related, and relevant cloud-specific compliance issues that would make certain systems or services better candidates for cloud migration than others. New advances in processors, virtualization technology, disk storage, broadband Internet connection, and inexpensive servers have combined to make the cloud a more compelling solution.

3.1. Cloud Offering Different Advantage to the University.

The Cloud system offers different benefits [15][16] . The first one is significant cost savings since the payment only applies to applications and data. The cloud also represents a huge opportunity for Moroccan universities that have been far from the computer revolution.

The second one is improved cloud computing performance such as the speed and availability of application updates since they have a large number of processes and applications already available.

The third one is immediate access to material resources which speeds up data access times in many universities; therefore, students have free access to course materials, project, assignment instructions and instructor feedback, and also to organize discussions from a flexible and convenient location. The platform allows instructors to be personally in touch with the student via access to online courses.

The fourth one is the cloud becomes an adaptive infrastructure that can be shared by different end users, each of whom can use it in

different ways. Users are completely separated from each other, and the flexibility of the infrastructure balances the computing loads since more users are joining the system than the infrastructure configuration process becomes so standard and so simple that add building blocks to an existing grid).

The fifth ones are construction, development and maintenance costs transferred from the educational institution to the supplier, which reduces costs and increases savings.

Hence, the cloud also makes possible new classes of applications and provides services that were not used before. For example, mobile interactive apps are location, environment, and context sensitive.

3.2. Challenges of Migrating the University System to Cloud

The common concerns of any cloud migration are legal and regulatory requirements such as privacy and compliance issues.

Privacy issues can be seen when the cloud computing model requires a change from locally controlled systems, which can raise concerns about compliance with privacy regulations. Privacy rules are not uniform around the world; therefore, there is a liability risk if an organization bases its system on the cloud and the cloud provider does not guarantee the privacy policy. Take the example of the European Union (EU); although it has very strict privacy protections, a failure can result in financial penalties and /or substantial penalties. According to the Council of European Professional Informatics Companies, there are two main privacy issues: one is the loss of control over the data, and the other is the dependency on an external cloud provider.

In a cloud environment, there are also compliance issues that are not present in a traditional on-premise computing environment. Your cloud provider may require following the same rules and regulatory procedures that you must follow. You also need to make sure that your contract with the supplier describes how he/she will achieve compliance and enforcement, and incur penalties for failures. In this sense, we can think that multi-tenancy in a cloud environment affects security and compliance requirements. Because cloud migration represents a new computing model, there is a great deal of uncertainty about how security at all levels can be achieved. This uncertainty has always led IT administrators to declare that security is their number one concern with cloud computing. The ability of cloud computing to respond appropriately to privacy rules has been put into question. Many universities are looking for better opportunities to use their data and make it available to their students, but today they may face several requirements to protect the privacy of personal information. Therefore, we can say that cloud services like all IT platforms are subject to a variety of security threats [17][18]. The complexity and shared responsibilities of cloud computing are also another threat to security that could affects overall compliance.

Cloud computing is relatively new and constantly in change. Further research is required to build university confidence by identifying potential threats to security and compliance. Reference has developed security reference architecture to enhance cloud security [19].

The architecture can be expanded to support compliance by adding compliance models and best practices. The architecture proposed in the following of this approach can handle the identified threats by including appropriate security templates [20].

In addition, reliability is another key element required in cloud system. Enterprise applications are now so critical that they must be reliable and available to support 24/7 operations. In the event of failures or breakdowns, contingency plans must take effect smoothly, and in the event of a catastrophic failure, recovery plans must begin with minimal disruption.

Every aspect of reliability must be carefully considered. Additional costs may be associated with the required levels of reliability. However, the university can only do a lot to mitigate the risks and cost of failure. The establishment of a reliability roadmap will be a prerequisite for widespread adoption.

3.3. The Needs for Migrating the University System to the Cloud

Due to the growing number of registrants and the diversity of digital forms of data, the university is facing an inevitable choice to back up its data using the cloud. For this fact, several solutions are suggested to convince university officials to move their infrastructure to the cloud. The university needs assessment, leading to the identification of some solutions that offer the following characteristics: self-service, on-demand and elasticity, end-to-end reporting and automation. These features can create a compliance program, evaluate the performance of systems on existing platforms to establish a benchmark and perform the same assessment on the cloud platform. These support the idea that this university should start migrating its systems to a cloud.

4. Conclusion

Institutions are increasingly using technology to provide learning services. These institutions face a wide range of challenges in implementing these systems such as costs, lack of technical resources and resistance of key stakeholders to the implementation of the systems. Cloud-based learning systems appear to be an attractive method for enhancing learning services. They can reduce costs due to lower hardware, software requirements, and less on-site maintenance. They are also easier to deploy across multiple sites because they are centrally administered. They also provide end user with benefits such as accessibility, security and compatibility. However, the limitations of cloud learning systems are that an Internet connection is mandatory, that low speed connections reduce the efficiency of the provision of learning services and especially online learning, and that the problems surrounding the security of a cloud remain unclear. As the speed and stability of the Internet continues to improve, it seems likely that the popularity of cloud computing for learning will increase.

Organizations are progressively utilizing innovation to provide learning administrations. These establishments confront an extensive variety of difficulties in actualizing these frameworks such as costs, absence of specialized assets and protection of key partners with the execution of the frameworks. Cloud-based learning frameworks give off an impression of being an appealing technique for giving learning administrations. They can lessen costs because of lower equipment and programming prerequisites, and less on location support. They are likewise simpler to send over various destinations since they are halfway managed. They likewise give end client benefits as far as availability, security and similarity. Be that as it may, the impediments of cloud learning frameworks are that an Internet association is required, low speed associations diminish the effectiveness of the arrangement of learning administrations and particularly web based learning, and the issues encompassing the security of a cloud stay indistinct. As the speed and soundness of the Internet keeps on enhancing, it appears to be likely that the ubiquity of distributed computing for learning will.

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