

ROLE OF CLOUD COMPUTING IN ENGINEERING INSTITUTIONS

KUNAL BHUSHAN RANGA

Asst. Professor, Dept. Of Computer Science & Application, Engineering College Bikaner.

kunalranga@gmail.com

ABSTRACT

The Indian Education sector has seen a fantastic rise in the field of higher education which has led to the demand for the automation of education sector at all the levels in order to cater to the need of information of various stakeholders. Due to burst in the field of communication technology everyone expects the access of relevant information in fast, accurate and anytime anywhere manner. Information management of the educational sector including statutory bodies for the purpose of transparency and control over various information systems is the need and expectation of stakeholders. These stakeholders belong to different diversified background and have different perspectives and information needed for their participation.

The technological development in the abstraction and encapsulation of the IT resources has been successfully implemented with the help of cloud architecture. This technology not only caters to the various stakeholders; it also ensures the sharing, availability, security and reliability of information involved.

This paper is a study of cloud-based computing model with Indian Education as a scenario and comparing the various existing tools and applications that can be readily used or customized for educational purpose. It also proposes architecture for the implementation of cloud computing in educational system. Finally, it concludes with the comparative study of various cloud-based services available at different levels of cloud architecture for academia.

Keywords: Cloud Applications; Google Apps; Microsoft Live; Indian Education Sector.

1. INTRODUCTION

The IT industry has seen a remarkable shift from application development to application deployment due to the facility of multi-tier architecture. This in turn has enabled the automation of many domains or sectors for the purpose of information availability and reliability to the stakeholders and ease in availability of information to others. Let us study one such technology i.e., cloud computing that is implemented in the Indian education sector.

Due to revolutionary and remarkable growth in mobile technology the challenge in managing the information is even more as user has raised their expectation about the availability of information. Hence there is need of strong backbone information system that can cater the changing need of stakeholders and should be able to survive in this era of fast changing technology. Cloud based computing model is one of the options for developing a robust system.

1.1 Cloud and Its Types

Cloud computing is the use of computing resources (hardware and software) that are delivered as a service over a network (typically the Internet). The name comes from the use of a cloud-shaped symbol as an abstraction for the complex infrastructure it contains in system diagrams.

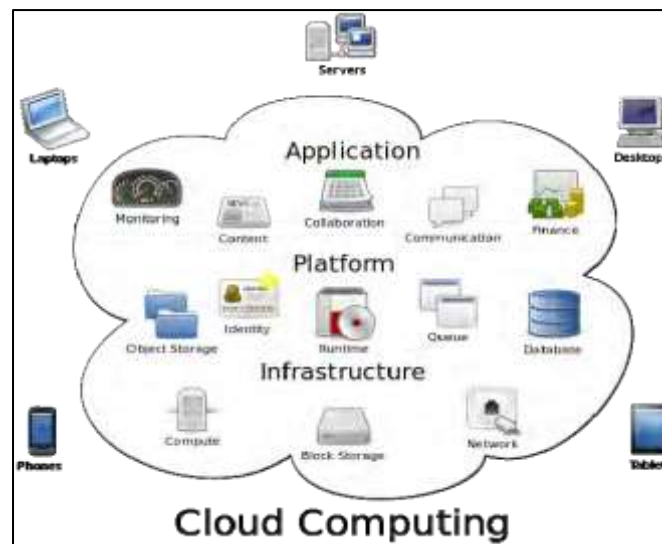
Cloud computing has four types based on the deployment. They are:

1.1.1 Private cloud which deals with the delivery of cloud services to a restricted set of consumers, usually within a single organization.

1.1.2 Public cloud that is concerned with the delivery cloud services to a relatively unrestricted set of consumers.

1.1.3 Community cloud which handles cloud infrastructure shared by several organizations and supporting a specific community that has shared concerns.

1.1.4 Hybrid cloud that is a composition of two or more clouds (private, community, or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability.



1.2 Layers in Cloud Architecture

In addition to the above, Cloud computing entrusts remote services with a user's data, software and computation. Based on the services, following are the types.

1.2.1 Infrastructure as a service (IaaS) where cloud providers offer computers, as physical or more often as virtual machines, and other resources.

1.2.2 Platform as a service (PaaS) is a category of cloud computing services that provide a computing platform and a solution stack as a service. Along with SaaS and IaaS, it is a service model of cloud computing.

1.2.3 Software as a service (SaaS) which is sometimes referred to as "on-demand software", is a software delivery model in which software and associated data are centrally hosted on the cloud. SaaS is typically accessed by users using a thin client via a web browser.

1.2.4 Storage as a service (STaaS) that is a business model in which a large service provider rents space in their storage infrastructure on a subscription basis.

1.2.5 Security as a service (SECaaS) is a business model in which a large service provider integrates their security services into a corporate infrastructure on a subscription basis more cost effectively than most individuals or corporations can provide on their own, when total cost of ownership is considered.

1.2.6 Data as a service (DaaS) is based on the concept that the product, data in this case, can be provided on demand to the user regardless of geographic or organizational separation of provider and consumer.

1.2.7 Test environment as a service (TeaaS) sometimes referred to as "on-demand test environment," is a test environment delivery model in which software and its associated data are hosted centrally typically in the Internet cloud and are typically accessed by users using a thin client, normally using a web browser over the Internet.

1.2.8 Desktop as a service (DaaS) sometimes called client virtualization, as a concept, separates a personal computer desktop environment from a physical machine using the client-server model of computing.

1.2.9 API as a service (APIaaS) is a service platform that enables the creation and hosting of APIs (application programming interfaces).

1.2.10 Backend as a service (Baas) is a model for providing web and mobile app developers with a way to link their applications to backend cloud storage while also providing features such as user management, push notifications, and integration with social networking services.

1.3 Scope of Applications in Education Sector

The scope of applications in education sector is huge considering the young Indians. In an interview by Sharon Lobo in CXOtoday.com dated Feb 28, 2011 "There is a greater need for automation & process management in Indian educational institutes"; says Raj Mruthyunjayappa, MD - APAC & Europe, Talisma Corporation, educational institutions in the country have identified the need for technology to bring in higher transparency, set governance standards, improve the interactive standards between faculty and student community, centralized view of academics among other needs. Various point solutions and comprehensive ERP applications can address all of these needs.

Many colleges are also going the paperless admission route, where the entire process of application handling is managed though the web including the counseling and fee payments for courses\classes. If we look across the higher education space few of the technology implementations like Smart Card readers across the institutions, dynamic university websites & portals, student admission portals, faculty portals, student information systems for student life cycle, career/placement management, learning management system (LMS), document management systems etc. has already been implemented by most of the colleges.

Based on this information, we identify the stakeholders as Management/Trustees, Principal/Directors, Faculty, Non-Teaching staff, Students & Alumni, Aspiring candidates, Parents & Guardian, Recruiters, University/AICTE/DTE/NAAC/UGC & other governing bodies. Now let us have an idea of the existing tools and technologies used in this sector.

2. EXISTING TECHNOLOGIES USED IN EDUCATION SECTOR

This paper gives the following details of various cloud related applications based on different aspects. We have categorized the cloud solution into 2 broad categories. They are:

2.1 Free Application That Is Readily Available

These applications are available as SaaS and can be used free for educational organization. We discuss a few as given below.

2.1.1 Microsoft Live@edu provides students, staff, faculty, and alumni long-term primary email addresses and other applications that they can use to collaborate and communicate online; all for no cost to the educational institution [3].

2.1.2 Microsoft Office Web Apps - Now teachers and students can view, edit, and share Microsoft Office documents from virtually any computer with an Internet connection (PC or Mac). A few Office Web Apps are: Online companions to Microsoft PowerPoint 2010, Word 2010, Excel 2010, and OneNote 2010 which provide the following features [1].

2.1.2.1 A smart way to get work done outside of class.

2.1.2.2 A free, easy way to collaborate with colleagues and student work groups.

2.1.2.3 Available free through Windows Live SkyDrive using a Windows Live ID.

2.1.3 Google Apps:

2.1.3.1 Online companions with google word processor, spread sheet, power Point, forms etc.

2.1.3.2 A free, easy way to collaborate with colleagues and student work groups.

2.1.3.3 Available free through Google Account using as Google Drive.

Quick Comparison of features provided by above companies and its suitability for education.

Table - 1: Comparative Data of Various Cloud Services

| Sr. No | Company | Apps Name | Feature | Suitability |
|--------|-------------|--------------------------|------------------------------------|--|
| 1 | Google | Google Apps | Word Processing, Presentation, ... | Office work, Assignments, Sharing data |
| 2 | Google | Google Drive | 5GB Free | Storage and Syncing (Windows & Mac, Mobile) |
| 3 | Dropbox.com | Dropbox | 2GB | Storage and Syncing (Window, Linux, Mac, Mobile) |
| 4 | Microsoft | SkyDrive | - | - |
| 5 | Microsoft | Office 360 | - | Office work, Assignments, Sharing data |
| 6 | Adrive.com | aDrive | 50GB | Storage |
| 7 | Box.net | Box | 5GB | Storage |
| 8 | YouTube | Youtube | - | Video Hosting |
| 9 | Google | Picasa | - | Image Hosting |
| 10 | Yahoo | Fliker | - | Image Hosting |
| 11 | Microsoft | Microsoft Live@edu | - | Word Processing |
| | Microsoft | Microsoft Office WebApps | - | Office work, Assignments, Sharing data |

2.2 Non-Free & Custom Cloud Solutions

The following are the cloud solution available for the educational organization at various level of cloud architecture.

2.2.1 IaaS: Normally it refers to the data center and is managed by personnel at the data center. Basically, organizations do not want to manage the complexities involved in its management and hence it is outsourced, this is the driving force for cloud Computing.

2.2.2 PaaS: This refers to the hosting of the moodle or opensource educational ERP, hosting in-house developed application or hosting the developed solution by outsourcing it.

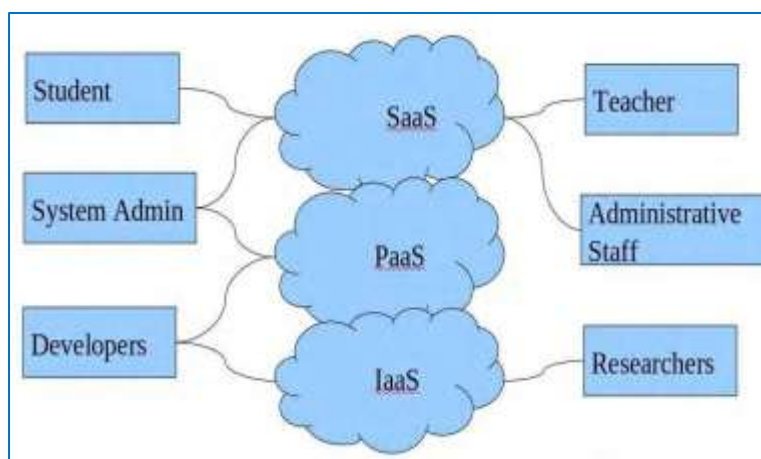
2.2.3 SaaS: This refers to the cloud-based ERP by any Third Party.

With the above options available to the implementation of educational applications in a dynamic situation, the stakeholders find convenience in the maintainability of the various functions and operations of the system.

3. CLOUD COMPUTING ARCHITECTURE

Recent times have seen the focus shifting from the application development to the application deployment. The various stakeholders (that we consider based on the role) participate in this system differently. The cloud-based architecture is shown below in fig 2. In this diagram, the cloud shaped structure represents the internet-based cloud that consists of deployed services. This cloud also consists of the most important services i.e., SaaS, PaaS and IaaS that are used to automate the education sector.

As seen in the diagram, the students, that constitute the bulk of stakeholders, and the lecturers are allowed to use the software services (SaaS) and at the same time, they have the facility for storage of data (IaaS). This is evident from the table in section II which shows a comparative of the most widely used applications. They are involved in the teaching learning process and hence their requirement on the cloud and the applications is limited to service usage and storage. Along with them, there are administrative staff who are involved in the maintaining of the documents and hence can be viewed as users of services and storage.



Education Cloud Architecture

The researchers are people involved in the research and development activities and mostly use the cloud for infrastructure (IaaS) and platform (PaaS). These people are interested and working towards the implementation innovative ideas for which they require the benefits of the platform and the infrastructure. They may be users of services, but their role as a researcher is considered.

The developers of the educational system are those who plan, develop, deploy and maintain the system by using the privileges as per the contract of working with the cloud-based companies. Their role as developers is most important for providing the back-end support.



With all these ideas and entities, the architecture of the cloud can be thought of as being private or public or community based depending on the need and scope of the system.

4. CONCLUSION

The above discussion on cloud computing as a technology and the various existing applications used in the educational sector or the development of cloud-based applications do give the people involved a lot of flexibility and dynamism to the information sharing. Educational sector has seen a lot of demand for information sharing so as to make the things more transparent from different views of the stakeholders. The cloud computing architecture gives so many options for the benefit of efficient use of data, memory and computing power so as to make green computing a reality.

REFERENCES

- 1) <http://www.microsoft.com/education/en-us/teachers/guides/Pages/webapps.aspx>
- 2) <http://www.cxotoday.com/story/there-is-a-greater-need-for-automation-process-management-in-indian-educational-institutes/>
- 3) http://www.microsoft.com/education/en-us/solutions/Pages/cloud_computing.aspx
- 4) http://en.wikipedia.org/wiki/Cloud_computing
- 5) <http://www.microsoft.com/india/education/solutions/liveedu.aspx>
- 6) <http://www.microsoft.com/india/education/solutions/liveedu.aspx>