Educational Cloud: Utilization of IaaS versus PaaS Services

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ABSTRACT--Cloud computing is the provision of dynamically scalable and often virtualized resources as a service over the Internet on a utility basis. Users need not have knowledge of, expertise in, or control over the technology infrastructure in the "cloud" that supports them. Cloud computing services often provide common business applications online that are accessed from a web browser, while the software and data are stored on the servers. The cloud has become a widely used term in academia and the industry. Education has not remained unaware of this trend, and several educational solutions based on cloud technologies are already in place, especially for software as a service cloud. However, an evaluation of the educational potential of infrastructure and platform clouds has not been explored yet. An evaluation of which type of cloud would be the most beneficial for students to learn, depending on the technical knowledge required for its usage, is missing. In this synopsis, the term cloud is used as a metaphor for the Internet, based on how the Internet is depicted in computer network diagrams and is an abstraction of the underlying infrastructure it conceals.

*Keywords*—**Cloud, course, education, evaluation.**

1. INTRODUCTION:

Cloud computing refers to the use of Internet ("cloud") based computer technology for a variety of services. It is a style of computing in which dynamically scalable and often virtualized resources are provided as a service over the Internet. Users need not have knowledge of, expertise in, or control over the technology infrastructure "in the cloud" that supports them.

Cloud computing is Internet-based computing, whereby shared "resources" (servers, disk space, firewalls, backup, software and the services needed to install and support it) are provided to users to their personal computer, laptop and other devices on-demand, like a utility (electricity, water, etc.). SaaS, or "software as a service" is a cloud computing service. The end user only pays for the service of using the software on an as-needed, subscription basis, or simply uses the service. Some examples of cloud-based applications are Sales force CRM, Google Apps, Zoomerang, YouSendIt.com, etc. Some examples of free cloud applications are Face book, Gmail and even your bank's online account access.

Fig(1): Architecture Visual Model of cloud computing definition
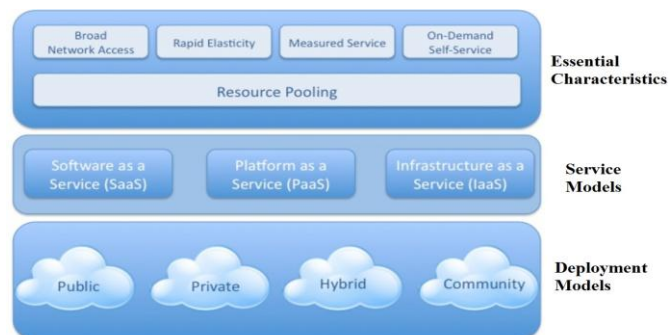
2. Related Work:

Among available IT, several distributed technologies have been employed to support education by increasing the range of available resources at a reduced cost. SOAs advocate for the usage of open and standard-based interfaces to facilitate the reutilization and integration of several educational tools [2], [3]. Examples of service-based educational environments include Learn Serve. This system allows pupils to search and select learning contents that are later presented sequentially.

Other service-oriented approaches introduced

the usage of grid services for enabling widespread access to computational and hardware resources [4]–[6]. As discussed in [7], grids and clouds are different paradigms whose differences and similarities render the distinction fuzzy. For the sake of brevity, the differences can be summarized by recalling the four main elements offered by a cloud: on-demand provision, SLAs, scalability, and a pay-per-use billing model. The interested reader is referred to [7] for a more detailed comparison. Gimolus was an environmental learning grid-enabled tool consisting of a topo- logical database joined to a visualization tool that let pupils study the effects of several phenomena on the ground. Similarly, COVASE let users' avatars interact in a virtual environment to learn fluid dynamics and finite state analysis [5]. These were shown in real time, and needed high computational power to reach optimum performance and usability. In terms of hard-ware resources, Isilab built a lab consisting of remotely con- trolled electronic equipment such as a signal generator, an oscilloscope, and a patch panel relying on proprietary protocols and presenting a proof of concept . In addition to access to hard- ware and computing power, Gridcole offered mechanisms to guide learners through the realization of collaborative learning situations according to sequences of activities as specified in "learning scripts" written by lecturers .

Although they all allowed for the implementation of unprecedented learning situations, these service-oriented systems (including grid-service based ones) relied on statically provisioned resources: Computing power and the required hardware had to be present before they could be used. They also had to be federated (under an administrative procedure that shares these resources with a selected group of organizations also sharing their own resources). This need for shared on-site resources resulted in higher costs (reduced efficiency) for permanently-on resource significantly; service-oriented approaches still represented an important impact of the supporting technologies: the selection and aggregation (integration) of often incompatible, ready-to-use services. Any deviation from this selection/aggregation pattern typically requires the action of a technical administrator.

Cloud computing has not remained unaware of education's importance, and it promises users that they can employ their de- sired applications and hardware resources without the necessity of, for instance, purchasing the software and having the frustration of installing it or dealing with differences among versions, licensing, etc. A several fold increase in efficiency (diversity of resources, ease of use, and reduced cost) can thus be expected, thereby helping educators and students to reach the intended results faster.

There are already some proposals to apply cloud technologies in educational environments. Some relevant efforts to use IaaS cloud technologies in education include StarHPC. StarHPC prepackaged a VM image used by students, the scripts used by an administrator, and a virtual image of the Amazon Elastic Computing Cloud (EC2) machine used to build the cluster shared by the class. At the PaaS level, more open and testable experimental platforms are needed in a lab-level with PCs. Tian *et al.* presented a higher abstraction-level framework for managing PaaS in a virtual cloud computing lab. Yin *et al.* built a GAE-based course sharing platform , but did not perform an evaluation of the usefulness of the cloud for learning purposes. Also, Seattle offered a community-based effort to set up a platform environment [online APIs offering capabilities for managing files, network resources, threads (called timers and locking APIs), and miscellaneous (other online libraries for doing exits, etc.)] to help to deliver a cloud in the educational environment that promoted resource usage. Other authors proposed a layered architecture for an e-Learning cloud, focused on delivering SaaS. Similarly, Hu and Zhang presented a case study of a mechanical engineering course redesign where learning effect- tiveness is compared to its traditional and online-only course delivery. SaaS aims at offering online services to end-users, so in this regard it is similar to any general online learning tool. As another type of cloud, SaaS clouds still benefit from the SLAs, dynamic provision, automated scaling, and pay-per-use models that characterize the cloud capabilities

mentioned in the Introduction, which is an important difference to traditional online learning platforms. All this interest in clouds is justified by the perceived advantages they bring. However, this increasing number of tools and architectures for IaaS/PaaS supported education *has not been accompanied by a real assessment on the effectiveness of these approaches,* that an individual and comparative evaluation is still missing for IaaS and PaaS in order to ascertain their real potential in some scenarios.

Of all the cloud-related works, only Hu *et al.* performed a comparison on the efficiency of online models versus traditional models. This evaluation was not focused on the impact of supporting technologies or the perceived ease of use and acceleration of the learning process. Furthermore, the appropriate level of abstraction (i.e., IaaS or PaaS) that should be delivered to students to enable them to focus on the course topics has not been analyzed by previous works. That is, previous reports do not present an exhaustive evaluation of the advantages of using different type of clouds and the educational outcome obtained (average qualification, perceived ease of usage, time to obtain the desired results, etc.).

This paper presents data on how the utilization of clouds can be useful for achieving not only resource-usage/cost optimization, but also for enhancing students' results. Furthermore, the most appropriate abstraction level at the cloud stack (IaaS or PaaS) is analyzed.

3. Cloud computing in education:

With cloud computing in education, you get powerful software and massive computing resources where and when you need them. Use cloud services to best combine:

- On-demand computing and storage.
- A familiar development experience with on-demand scalability.

Online services for anywhere, anytime access to powerful web-based tools.

The advantages that come with cloud computing can help you resolve some of the common challenges you might have while supporting your education institution.

- **Cost.** You choose a subscription or, in some cases, a pay-as-you-go plan—whichever works best with your organization's business model.
- **Flexibility.** Scale your infrastructure to maximize investments. Cloud computing allows you to dynamically scale as demands fluctuate.
- **Accessibility.** Help make data and services publicly available without jeopardizing sensitive information.
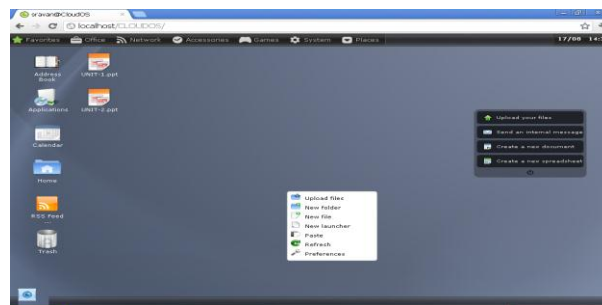
fig(2) : View of EduCloud Interface

Cloud interface is a simplified operating system that runs just a web browser, providing access to a variety of web-based applications that allow the user to perform many simple tasks without booting a full-scale operating system. Because of its simplicity, Cloud can boot in just a few seconds .The operating system is designed for Notebooks, Mobile Internet Devices, and PCs that are mainly used to browse the Internet.

From Cloud the user can quickly boot into the main OS, because Cloud continues booting the main Operating system in the background. Combining a browser with a basic operating system also allows the use of cloud computing, in which applications and data "live and run" on the Internet instead of the hard drive. Cloud can be installed and used together with other operating systems, or act as a standalone operating system. When used as a standalone

operating system, hardware requirements are relatively low.

- First of all, signing up a free account with third-party cloud interface often means that you have limited file storage space and all your data are stored in other people's server. Next, the connection speed is dependent on the number of active users at any time.
- It creates a private cloud controlled by the system administrator, lending users mobility and universal access. Users can access their resources, e.g. files, emails, calendar events, applications, etc., from any device with a Web browser.

3.1 The EDU Cloud which we are supporting will be having

a. File Explorer
b. Document create, Edit and save capabilities
c. User and log-in management
d. Image and media file management
e. Calculator and games etc

3.1.1 File Explorer:

File Explorer is a simple and intuitive file manager you can use to transfer, copy, rename, delete and paste files but also to create folders, download or upload files and explore the Cloud OS virtual file system.

Cloud Files is the Cloud OS file manager. from Cloud Files you can upload your files and documents from your hard drive to Cloud OS, move and manage them between different instances of the application, and launch a wide variety of files to be reproduced/shown with each specific application.

To launch Cloud Files, just click on the Home icon on your Desktop or open File Manager in the Office menu at Cloud Dock. Once you are on the application, you will see three zones:

● The left bar with the common Actions and Places.

● A top bar with the current path. You can use it to navigate by text trough your Home space. Note that if you are root you will be able to navigate trough the Whole cloud OS virtual file system.

● The files space, where you will see all the files and folders inside your current directory (by default, your Home directory).

Fig(3): view of EduCloud Interface while uploading the files
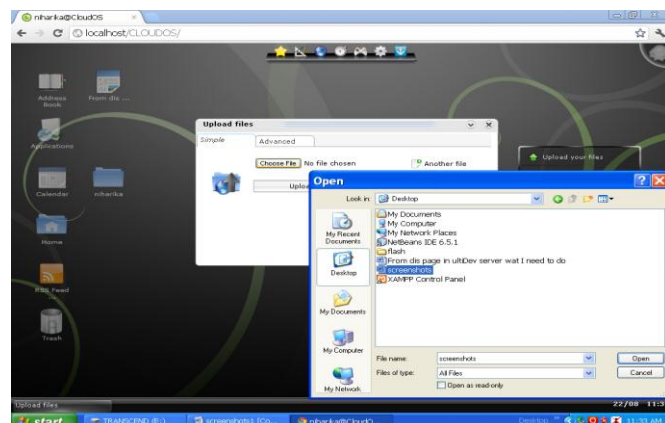
3.1.2 Document creates, Edit and save capabilities:

It's a word processor that offers you a quick and efficient way to write and edit text, HTML and Microsoft Word documents. Not only is Cloud Docs a pretty good HTML editor, but it can also be used to paste text from other applications installed on your real operating system. Cloud Doc's is the Cloud OS word processor. With Cloud Doc's you can create and edit rich documents in both Cloud OS Document format or in Microsoft Word format.

- **Creating a document:**
To create a new document, open cloud Documents.

- **Saving a document :**
To save it, just click on "Save" or "Save As" button if you have not saved before the document. Note that if you do not add any extension when saving your document, it will be saved as an Cloud OS Document, with the .Cloud document extension.

If you want to save it to be Microsoft Word compatible, just add the .doc extension at the end of the file name.

- **Opening a document:**

To open a document, you can click on "Open" button in Cloud Doc's or just click on the document from the file manager (Cloud Files).To open existing document click open and specific the filename with extension.
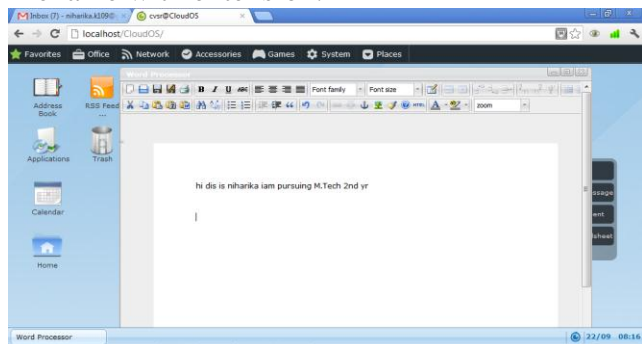
Fig(4): view of cloud interface while opening & editing a document.

3.1.3 User and log-in management:

In Cloud OS can Provide the services for access any information using him/her account Otherwise We can't Access any information From these Cloud Space. Then User can be created More than one account In Cloud interface then User login using his/her account and In Cloud Os Provide the strong security based on XML Technique. For Using the Admin account can't view, delete, modify the any other account details because in Cloud Os all account details are encrypted using XML Based Technique.

The general menu inside the Administration panel allows you to update some system's option such as the System's host name (that appears as the browser's title after the username), and some options such as allowing new users to register in your system, allowing public directories to be created, the system's default language and the Login's box theme that is being used.

To update some of the options, just change their values to the new ones and click on the "Save

changes" button. Note that you can also completely uninstall your Cloud OS from that panel, by typing your root's password and clicking on "Uninstall Cloud OS" button. This is useful when you want to completely remove your Cloud OS installation and you can't do it due to the permissions assigned to Cloud OS files during the Installation.

3.1.4 Image and media file management:

If a file is recognized by Cloud OS and is associated to an installed application, you can just click on the file without any action selected Action, and the appropriate application will be launched opening the file.

Some file types that will be recognized by Cloud OS by default are:

- Images (.bmp, .png, .jpg, .jpeg, .gif, .tiff) will be opened with the Cloud OS Image Viewer.
- MP3 Music files (.mp3) will be opened with the Cloud OS Music Player.
- Videos and movies (.flv, .avi, .divx...) will be opened with Cloud Video or Cloud Movies, depending if the DivX plug-in is needed or not.
- Microsoft Word Documents (.doc) and Cloud OS Documents (.Cloud doc) will be opened with Cloud Docs, the Cloud OS Word Processor.
- Compressed files (.zip, .tar, .tbz, .tbz2, .tgz, .tar.gz, .tar.bz2) will be opened with Cloud Archive, the Cloud OS compressing and uncompressing tool.
- Text files (.Cloud code, .txt, .py, .pl, .c, .cc) will be opened with Cloud Notes.

3.1.5. Calculator and games etc:

Obviously, a calculator, that you can use the same way you are using any other calculator. Some important functions, such as %, are missing, but it's quite useful when you really need to do some quick & basic calculations.

4. Environmentally friendly Cloud computing:

One reason for cloud computing is that it may be more environmentally friendly. First, reducing the number of hardware components needed to run applications on the company's internal data center and replacing them with cloud computing systems reduces energy for running and cooling hardware. By consolidating these systems in remote centers, they can be handled more efficiently as a group.

Second, techniques for cloud computing promote telecommuting techniques, such as remote printing and file transfers, potentially reducing the need for office space, buying new furniture, disposing of old furniture, having your office cleaned with chemicals and trash disposed, and so on. They also reduce the need for driving to work and the resulting carbon dioxide emissions.

5. Cloud Computing: Benefits and Limitations:

5.1 Location Independence

In a cloud based computing environment you access your data through a end terminal by punching in an identification key or password. You may use this password on any machine. Since the data does not reside on a specific EU terminal, the EU does not have to worry about a corrupt hard disk or a faulty RAM. You will not lose your data even if your machine breaks down. Think of this as signing into Face book or Gmail from your friend's computer when yours breaks down.

5.2 High Availability

Most cloud based services implement Continuity and DR (Disaster Recovery) solutions that back up the user data. This means that even if the primary server is down, or is brought down for maintenance, the backup system still serves the EUs. Also, it is safe to assume that most cloud based services are run from world class Datacenters, thus minimizing the risk for any kind of downtime in the first place.

5.3 No Updates:

Since applications too reside on service providers servers, that's where all the updates are implemented. In other words any OS or application patches, new versions or any other kind of changes that need to be implemented, are responsibility of the service provider. EU always gets the latest version (well, in case of a paid service you might be asked to pay for the latest features but at least security updates and patches are automatically taken care off)

5.4 No need for an Antivirus

As the data resides on service providers they implement security solutions to protect the data. It's not that Cloud Computing comes without limitations though. Here are a few you may want to look at:

5.4.1 Data Security

Now various corporations have at various times come out in the open about their services being hacked and user data compromised. In a cloud based environment this threat takes on a whole new meaning as by definition cloud computing does not all any data including the most private and confidential documents to remain off the Internet.

5.4.2 Bandwidth Dependence

In case your network in down or your data card doesn't work when you are traveling you lose all your data till the time you can connect to the Internet again.

6. Future enhancements

In future we can add more capabilities to the cloud interface like a command prompt, document editing and save in all Microsoft supported document formats etc.

7. Conclusion

This Educational Cloud interface initiative will be a step stone to make more reliable, fast and scalable cloud platform development in future.

Cloud computing will be the next big thing going to be on the internet world today.

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