Next Generation Cloud Computing
Technology in Education System

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Abstract:
Education plays an important role in maintaining the economic growth of a country. Now a days the Classroom teaching is changing and students are becoming more technology oriented and Therefore in his changing environment, it’s important that we think about the latest technologies to incorporate in the teaching and learning process. One of the latest technologies prevailing now days is “Cloud Computing”. By sharing IT services in the cloud, educational institution can outsource noncore services and better concentrate on offering students, teachers, faculty, and staff the essential tools to help them succeed. This white paper focuses on the impact of cloud computing on the education system and how we can provide the quality education by using the above technology.

KEYWORDS: Cloud computing, higher education, SaaS, PaaS, IaaS, virtualization

Cloud computing is a model for enabling ubiquitous, convenient, on-demand access to a shared pool of configurable computing resources. Cloud computing and storage solutions provide users and enterprises with various capabilities to store and process their data in third-party data centers. The term "moving to cloud" also refers to an organization moving away from a traditional CAPEX model (buy the dedicated hardware and depreciate it over a period of time) to the OPEX model (use a shared cloud infrastructure and pay as one uses it). Since 2000 cloud computing has come into existence. In early 2008, NASA’s Open Nebula, enhanced in the RESERVOIR European Commission-funded project, became the first open-source software for deploying private and hybrid clouds, and for the federation of clouds. Microsoft Azure became available in late 2008.

In July 2010, Rackspace Hosting and NASA jointly launched an open-source cloud-software initiative known as OpenStack. The early code came from NASA’s Nebula platform as well as from Rackspace’s Cloud Files platform. On March 1, 2011, IBM announced the IBM Smart Cloud framework to support Smarter Planet. On June 7, 2012, Oracle announced the Oracle Cloud. Amazon announced the product on March 29, 2011.
Implementation of Cloud Technology in Education System

Cloud computing technology can provide better solutions for our education system. Cloud computing can enable users to control and access data via the Internet. The main users of a typical higher education cloud include students, faculty members, administrative staff, examination section and admission section. All the main users of the institution are connected to the cloud. Separate login is provided for all the users for their respective work. Teachers can upload their class Tutorials, assignments, and tests on the cloud server which students will be able to access all the teaching material provided by the teachers via Internet using computers and other electronic devices both at home and University campus and 24x7x365. The education system will make it possible for teachers to identify problem areas in which students tend to make mistakes, by analyzing students’ study records. In doing so, it will also allow teachers to improve teaching materials and methods.

This will not only make it possible for students to use online teaching materials during class but they will also be able to access these materials at home, using them to prepare for and review lessons.

The cloud helps ensure that students, teachers, faculty, parents, and staff have on-demand access to critical information using any device from anywhere. Cloud computing is an extension of the concept of distributed computing – which is the process of running a program or application over many computers connected by a network. The Internet makes this process easily achievable even for the general user.

NIST (US National Institute of Standards and Technology) defines cloud computing as:

“a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction”.

Cloud computing service models

Learn the key concepts of the infrastructure, platform, and software as a service models

In this three-part series find straightforward, real-world examples of cloud computing to help eliminate the confusion around the concept. Each article in this series covers one of the three service models of cloud computing, beginning with infrastructure as a service, then moving to platform as a service, and finally software as a service. After reading this series, cloud computing will feel like much more than simply a buzzword.

This three-part series introduces you to the concept of cloud service models for infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS); each article provides real-world examples of the service models. A matrix comparing attributes and concepts across all three models appears in each article.
Infrastructure as a service (IaaS)

In the most basic cloud-service model - and according to the IETF (Internet Engineering Task Force) - providers of IaaS offer computers – physical or (more often) virtual machines – and other resources. IaaS refers to online services that abstract user from the detail of infrastructure like physical computing resources, location, data partitioning, scaling, security, backup etc. A hypervisor, such as Xen, Oracle VirtualBox, KVM, VMware ESX/ESXi, or Hyper-V runs the virtual machines as guests. Pools of hypervisors within the cloud operational system can support large numbers of virtual machines and the ability to scale services up and down according to customers' varying requirements. *IaaS clouds often offer additional resources such as a virtual-machine disk-image library, raw block storage, file or object storage, firewalls, load balancers, IP addresses, virtual local area networks (VLANs), and software bundles.* IaaS-cloud providers supply these resources on-demand from their large pools of equipment installed in data centers. For wide-area connectivity, customers can use either the Internet or carrier clouds (dedicated virtual private networks).

Platform as a service (PaaS)

PaaS vendors offer a development environment to application developers. The provider typically develops toolkit and standards for development and channels for distribution and payment. In the PaaS models, cloud providers deliver a computing platform, typically including operating system, programming-language execution environment, database, and web server. Application developers can develop and run their software solutions on a cloud platform without the cost and complexity of buying and managing the underlying hardware and software layers.
With some PaaS offers like Microsoft Azure and Google App Engine, the underlying computer and storage resources scale automatically to match application demand so that the cloud user does not have to allocate resources manually. The latter has also been proposed by an architecture aiming to facilitate real-time in cloud environments. Even more specific application types can be provided via PaaS, such as media encoding as provided by services.

**Software as a service (SaaS)**

In the software as a service (SaaS) model, users gain access to application software and databases. Cloud providers manage the infrastructure and platforms that run the applications. SaaS is sometimes referred to as "on-demand software" and is usually priced on a pay-per-use basis or using a subscription fee. In the SaaS model, cloud providers install and operate application software in the cloud and cloud users access the software from cloud clients. Cloud users do not manage the cloud infrastructure and platform where the application runs. This eliminates the need to install and run the application on the cloud user's own computers, which simplifies maintenance and support.

Cloud applications differ from other applications in their scalability—which can be achieved by cloning tasks onto multiple virtual machines at run-time to meet changing work demand. Load balancers distribute the work over the set of virtual machines. This process is transparent to the cloud user, who sees only a single access-point. To accommodate a large number of cloud users, cloud applications can be multitenant, meaning that any machine may serve more than one cloud-user organization. The pricing model for SaaS applications is typically a monthly or yearly flat fee per user, so prices become scalable and adjustable if users are added or removed at any point.

**Cloud clients**

User's access cloud computing using networked client devices, such as desktop computers, laptops, tablets and smartphones and any Ethernet enabled device such as Home Automation Gadgets. Some of these devices – cloud clients – rely on cloud computing for all or a majority of their applications so as to be essentially useless without it. A Cloud Provider Interface (CPI) provides an abstraction from an underlying IaaS by defining a set of functions for managing virtual machines life-cycle in which might run an elastic service.
Private cloud

Private cloud is cloud infrastructure operated solely for a single organization, whether managed internally or by a third-party, and hosted either internally or externally. Undertaking a private cloud project requires a significant level and degree of engagement to virtualize the business environment, and requires the organization to reevaluate decisions about existing resources. When done right, it can improve business, but every step in the project raises security issues that must be addressed to prevent serious vulnerabilities. Self-run data centers are generally capital intensive. They have a significant physical footprint, requiring allocations of space, hardware, and environmental controls. These assets have to be refreshed periodically, resulting in additional capital expenditures. They have attracted criticism because users "still have to buy, build, and manage them" and thus do not benefit from less hands-on management, essentially "[lacking] the economic model that makes cloud computing such an intriguing concept"

Public cloud

A cloud is called a "public cloud" when the services are rendered over a network that is open for public use. Public cloud services may be free. Technically there may be little or no difference between public and private cloud architecture, however, security consideration may be substantially different for services (applications, storage, and other resources) that are made available by a service provider for a public audience and when communication is effected over a non-trusted network. Generally, public cloud service providers like Amazon AWS, Microsoft and Google own and operate the infrastructure at their data center and access is generally via the Internet. AWS and Microsoft also offer direct connect services called "AWS Direct Connect" and "Azure ExpressRoute" respectively, such connections require customers to purchase or lease a private connection to a peering point offered by the cloud provider.
Hybrid cloud

Hybrid cloud is a composition of two or more clouds (private, community or public) that remain distinct entities but are bound together, offering the benefits of multiple deployment models. Hybrid cloud can also mean the ability to connect collocation, managed and/or dedicated services with cloud resources. Gartner, Inc. defines a hybrid cloud service as a cloud computing service that is composed of some combination of private, public and community cloud services, from different service providers. A hybrid cloud service crosses isolation and provider boundaries so that it can't be simply put in one category of private, public, or community cloud service. It allows one to extend either the capacity or the capability of a cloud service, by aggregation, integration or customization with another cloud service.

Benefits of Cloud Computing for Institutions and Students

**Personalized Learning**: Cloud computing affords opportunities for greater student choice in learning. Using an Internet-connected device, students can access a wide array of resources and software tools that suit their learning styles and interests.

**Reduced Costs**: Cloud-based services can help institutes reduce costs and accelerate the use of new technologies to meet evolving educational needs. Students can use office applications for free without having to purchase, install and keep these applications up to date on their computers. It also provides the facility of Pay per use for some applications.

**Accessibility**: Availability of the services is the most important and desired by the user using the education Cloud 24 X7 is the availability that is needed by this system without failure. From anywhere one can login and access the information.

**User Friendly**: This new facility is user friendly and no need to worry about the complexity. It is easy to understand and easy to operate.

**Elasticity of Service**: In a single moment many students and teachers can store data, and the best part is that there is no limitation of space and thus user’s capacity to store data increase to a larger extent.

**Quality of Service**: Service quality is the most important feature and in maximum cases where exact necessities have to be fulfilled by the outsourced resources and outsourced services.
Management of data: A large amount of data is generated by each school and thus to maintain them effectively and to use it appropriately when needed is the best feature of the education cloud.

Disaster recovery: When companies/University start relying on cloud-based services, they no longer need complex disaster recovery plans. Cloud computing providers take care of most issues, and they do it faster.

Automatic software updates: Cloud computing suppliers do the server maintenance – including security updates – themselves, freeing up their customers’ time and resources for other tasks.

No Capital Expenditure (CapEx): Cloud computing services are typically pay as you go, so there’s no need for capital expenditure at all. And because cloud computing is much faster to deploy, businesses have minimal project start-up costs and predictable ongoing operating expenses.

Document control: If a company/university doesn’t use the cloud, workers have to send files back and forth over email, meaning only one person can work on a file at a time and the same document has tones of names and formats. Cloud computing keeps all the files in one central location, and everyone works off of one central copy. Employees/faculty/students can even chat to each other whilst making changes together. This whole process makes collaboration stronger, which increases efficiency and improves a company’s bottom line.

Environmentally friendly: Businesses using cloud computing only use the server space they need, which decreases their carbon footprint. Using the cloud results in at least 30% less energy consumption and carbon emissions than using on-site servers. And again, SMEs get the most benefit: for small companies/University, the cut in energy use and carbon emissions is likely to be 90%.

Security and privacy

Cloud computing poses privacy concerns because the service provider can access the data that is on the cloud at any time. It could accidentally or deliberately alter or even delete information. Many cloud providers can share information with third parties if necessary for purposes of law and order even without a warrant. That is permitted in their privacy policies which users have to agree to before they start using cloud services. Solutions to privacy include policy and legislation as well as end users’ choices for how data is stored. Users can encrypt data that is processed or stored within the cloud to prevent unauthorized access.

According to the Cloud Security Alliance, the top three threats in the cloud are "Insecure Interfaces and API’s", "Data Loss & Leakage", and "Hardware Failure" which accounted for 29%, 25% and 10% of all cloud security outages respectively — together these form shared technology vulnerabilities. In a cloud provider platform being shared by different users there may be a possibility that information belonging to different customers resides on same data server. Therefore, Information leakage may arise by mistake when information for one customer is given to other. Physical control of the computer equipment (private cloud) is more secure than having the equipment off site and under someone else’s control (public cloud). This delivers great incentive to public cloud computing service providers to prioritize building and maintaining strong management of secure services.
Conclusion
Cloud computing is a powerful new abstraction for large scale data processing systems which is scalable, reliable and available. In cloud computing, there are large self-managed server pools available which reduces the overhead and eliminates management headache. Cloud computing services can also grow and shrink according to need. Cloud computing is particularly valuable to small and medium businesses, where effective and affordable IT tools are critical to helping them become more productive without spending lots of money on in-house resources and technical equipment. Also it is a new emerging architecture needed to expand the Internet to become the computing platform of the future.

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