BACHELOR OF COMPUTER APPLICATIONS

SEMESTER 6

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CLOUD COMPUTING

Unit 6

Accessing the Cloud

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1. INTRODUCTION

How you will interact with your cloud will depend on many factors, not the least of which is the provider you use. There are a number of development tools that allow you to build your applications and several browser options that you can use to access those applications. In this unit, we will discuss the tools that you can use to connect with the cloud so you can realise which tools will work best for your organisation and your particular needs.

1.1 Objectives

After studying this unit, you should be able to:

- *Explain the platforms of cloud computing.*
- *Discuss cloud web applications.*
- *Define the role of API in cloud computing.*
- *List and explain the browsers for cloud.*

2. PLATFORMS

A platform is how a cloud computing environment is delivered to you. In this section, we'll take a closer look at how the cloud can be produced and presented to you.

2.1 Web Application Framework

A web application framework is used to support the development of dynamic websites, web applications, and web services. "The point of a framework is to reduce the overhead that comes with common activities in web development. For instance, frameworks provide libraries that are already written, so the developer doesn't have to reinvent the wheel every time a website is developed. AJAX continues to evolve. For instance, while JavaScript claims a place in the acronym for AJAX, it is not the only client-side language that can be used for developing an AJAX application. Languages like VBScript can be used, as well. Further, XML is not required for data exchange. JavaScript Object Notation (JSON) is a widely used alternative. HTML and plain text can also be used. Pros and Cons AJAX does some things right but struggles with others. Among its advantages are the following capabilities:

- Often, multiple pages on a website contain the same information. If those pages were coded by hand, the same content would have to be written into each and every page. AJAX allows a web application to simply retrieve new information and adjust how the content is presented. This is very efficient and reduces the amount of bandwidth consumed and reduces load times.
- Using asynchronous requests allows the client's web browser to be more interactive and respond quickly to user inputs. The user may even perceive the application to be faster.
- Connections to the server are reduced because scripts and style sheets need to be downloaded only once.

Disadvantages to AJAX include.

- Dynamically created web pages do not show up in the browser's history engine, so clicking on the Back button would not re-create the last seen page.
- It is difficult to bookmark a dynamically created web page.
- If a browser does not support AJAX or if JavaScript is disabled, AJAX functionality cannot be used.

- There is no standards body behind AJAX, so there is no widely adopted best practice to test AJAX applications.

Python Django

Django is an open-source web application framework written in Python. Originally, it was created to manage news sites for The World Company and released publicly under a BSD license in July 2005. In June 2008, it was announced that the Django Software Foundation would be the authority for Django. Django was developed to ease the creation of database-driven websites and use the reusability of components. Django utilises the principle of DRY (Don't Repeat Yourself). It also uses an administrative CRUD (create, read, update, and delete) interface that is dynamically generated.

2.2 Web Hosting Service

You will need a web hosting service that will allow you to store your data and applications. This is what we think of when the term "cloud provider" is used. This is the organisation that will host your data. Some web hosting services include Amazon Elastic Compute Cloud and Mosso.

Amazon Elastic Compute Cloud

Amazon Elastic Compute Cloud (http://aws.amazon.com/ec2) is a web service that provides resizable compute capacity in the cloud. Amazon EC2's web service interface allows you to obtain and configure capacity with minimal friction. It provides complete control of your computing resources and lets you run on Amazon's computing environment. Amazon EC2 reduces the time required to obtain and boot new server instances to minutes, allowing you to quickly scale capacity, both up and down, as a client's computing requirements change. Amazon EC2 changes the economics of computing by allowing you to pay only for the capacity that you actually use.

EC2 uses Xen virtualisation. Each virtual machine called an instance, is a virtual private server and can be one of three sizes: small, large, or extra large. Instances are sized based on EC2 Compute Units, which is the equivalent CPU capacity of physical hardware. One EC2 Compute Unit equals a 1.0–1.2GHz 2007 Opteron or 2007 Xeon processor. The service initially offered Sun Microsystems OpenSolaris and Solaris Express Community Edition. In

October 2008, EC2 added the Linux and Windows Server 2003 operating systems to its offerings.

Mosso

Mosso is the home of The Hosting Cloud and CloudFS, providing enterprise-grade hosting and storage services. Mosso provides an easily managed interface so that developers, designers, and IT managers can deploy reliable web applications quickly and easily, as well as a high-performance cloud-based storage service. Founded by two Rackspace employees, The Hosting Cloud is built upon a cross-platform, clustered- computing architecture.

There are three components to Mosso's offering:

- **Cloud Sites.** Advertised as "the fastest way to put sites on the cloud," it runs Windows or Linux applications across hundreds of servers.
- **Cloud Files.** Provides unlimited online storage for media (examples include backups, video files, and user content), which is served out via Limelight Networks' Content Delivery Network.
- **Cloud Servers.** Able to deploy from one to hundreds of cloud servers instantly and create advanced, high-availability architectures.

2.3 Proprietary Methods

In addition to the widely used standards (like AJAX and Django), individual companies offer their own proprietary methods to connect to the cloud. Microsoft and Force.com are two examples of companies that have designed their own infrastructure for connecting to the cloud.

Azure

The Azure Services Platform is Microsoft's cloud solution that spans from the cloud to the enterprise data centre. Further, it delivers content across the PC, web, and phone. The platform combines cloud-based developer capabilities with storage, computational, and networking infrastructure services, all hosted on servers operating within Microsoft's global data centre network. This provides developers with the ability to deploy applications in the cloud or on-premises and enables experiences across a broad range of business and consumer scenarios.

The Azure Services Platform provides developers with the ability to create applications while taking advantage of their existing skills, tools, and technologies, such as the Microsoft.NET Framework and Visual Studio. Developers also can choose from a broad range of commercial or open-source development tools and technologies and access the Azure Services Platform using a variety of common Internet standards, including HTTP, representational state transfer (REST), and Atom Publishing Protocol (AtomPub). Key components of the Azure Services Platform include the following:

- Windows Azure for service hosting and management, low-level scalable storage, computation, and networking
- Microsoft SQL Services for a wide range of database services and reporting
- Microsoft .NET Services, which are service-based implementations of familiar .NET Framework concepts such as workflow and access control.
- Live Services for a consistent way for users to store, share, and synchronise documents, photos, files, and information across their PCs, phones, PC applications, and websites.
- Microsoft SharePoint Services and Microsoft Dynamics CRM Services for business content, collaboration, and rapid solution development in the cloud

Force.com

Force.com, a PaaS from Salesforce.com, is another way to create and deploy business applications. By replacing the complexity of software platforms with a complete, scalable service, Force.com provides developers with a fast path to turn ideas into business impact. Force.com Features Force.com PaaS provides the building blocks necessary to build any kind of business application and automatically deploys them as a service to small teams or entire enterprises. The Force.com platform gives customers the ability to run multiple applications within the same Salesforce.com instance, allowing all of a company's Salesforce.com applications to share a common security model, data model, and user interface.

The multitenant Force.com platform encompasses a complete feature set for the creation of business applications such as an on-demand operating system, the ability to create any database on demand, a workflow engine for managing collaboration between users, the Apex Code programming language for building complex logic, the Force.com Web Services API for programmatic access, mashups, and integration with other applications and data, and now Visualforce for a framework to build any user interface.

Visualforce

As part of the Force.com platform, Visualforce gives customers the ability to design application user interfaces for any experience on any screen. Using the logic and workflow intelligence provided by Apex Code, Visualforce offers the flexibility to meet the requirements of applications that feature many different types of users on a variety of devices. Visualforce uses HTML, AJAX, and Flex for business applications. Visualforce enables the creation and delivery of any user experience, offering control over an application's design and behaviour. Visualforce provides a page-based model built on standard HTML and web presentation technologies and is complemented with both a component library for implementing common user interface elements and a controller model for creating new interactions between those elements. Visualforce features and capabilities include

- Pages Enable the design definition of an application's user interface. This enables developers to create new pages using standard web technologies, including HTML, AJAX, and Flex. Pages allow developers to create any user experience with standard web technologies.
- Components Provide the ability to create new applications that automatically match the look and feel of Salesforce applications or easily customise and extend the Salesforce user interface to specific customer and user requirements. Customers can create a user experience by assembling existing user interface elements.
- Logic Controllers Enable customers to build any user interface behaviour. Customers can use Visualforce to quickly create a new look and feel that leverages existing application functionality. The standard controller gives customers the ability to inherit and reuse any standard Salesforce UI behaviour like new, edit, and save.

SELF-ASSESSMENT QUESTIONS – 1

1. A web application framework is used to support the development of _____ web sites.
2. Django is an open-source web application framework written in Python. State [True/False]
3. Name the three components of Mosso's offering.

3. WEB APPLICATIONS

If you are going to use applications on the cloud, there are many to choose from. Much of your decision-making process will come down to your provider and what they offer. In this section, we'll talk about the choices you have in existing cloud applications.

3.1 Your Choices

You have tons of options when it comes to finding online applications. Your provider may have a stable of premade applications that you can use. For instance, Google offers a slew of applications geared toward productivity. We'll talk about some of those applications in a bit, but what if your provider doesn't offer an application that you want? It may be that someone else has already created the application, and it's simply a matter of using what they have created. For example, Force.com allows you and others to create your own apps and then make them available for others to use. If you don't see an application that you want, ask your service provider. They may have it offline somewhere, or they can point you to it.

3.2 Sample Applications

Different companies offer different things, but for the sake of understanding the market, let's take a closer look at cloud giant Google and their offerings. They have a slate of apps that are targeted right toward your enterprise. Google Apps, launched as a free service in August 2006, is a suite of applications that includes

- Gmail webmail services
- Google Calendar shared calendaring
- Google Talk instant messaging and Voice Over IP
- Start Page for creating a customisable home page on a specific domain
- More than 100,000 small businesses and hundreds of universities now use the service. "So much of business now relies on people being able to communicate and collaborate effectively," said Gregory Simpson, CTO of General Electric Company. "GE is interested in evaluating Google Apps for the easy access it provides to a suite of web applications and the way these applications can help people work together. Given its consumer experience, Google has a natural advantage in understanding how people interact together over the web." Google also offers a premium service called Google Apps Premier Edition. Google Apps Premier Edition has the following unique features:

- Per-user storage of 10GBs offers about 100 times the storage of the average corporate mailbox, eliminating the need to delete email frequently.
- APIs for business integration APIs for data migration, user provisioning, single sign-on, and mail gateways enable businesses to customise the service further for unique environments.
- Uptime of 99.9 per cent Service Level Agreements for high availability of Gmail, with Google monitoring and crediting customers if service levels are not met.
- Support for critical issues 24/7. Includes extended business hours telephone support for administrators.
- Advertising optional Advertising is turned off by default, but businesses can choose to include Google's relevant target-based ads if desired.
- Low fee: A Simple and affordable annual fee (US$50 per user account per year) makes it practical to offer these applications to everyone in the organisation.

4. API IN CLOUD COMPUTING

You are likely to use APIs (Application Programming Interface) when building your apps. There are a number of different APIs out there, and which one you use will depend on your (or your programmers') skills and which company you use for cloud services. Different cloud providers use different APIs.

What are APIs?

An application programming interface (API) is a set of programming instructions and standards for accessing a web-based program. Software companies release their APIs to the public so that other software developers can design products that are powered by their service. For example, Amazon released its own API so that website developers could more easily access information maintained on the Amazon website. By using Amazon's API, a third-party website can directly link to products on the Amazon site. APIs allow one program to speak with another. They are not user interfaces. Using APIs, programs can speak to each other without the user having to be involved. For instance, when you buy something at Amazon and enter your credit card information, Amazon uses an API to send your credit card information to a remote application that verifies whether your information is correct. As a

user, all you saw was the place to enter your credit card information, but behind the scenes, APIs were getting the job done.

An API is similar to Software as a Service (SaaS) because software developers don't have to start from scratch every time they write a program. Rather than build one program that does everything (email, billing tracking, and so forth), the application can farm out those duties to other applications that do it better.

API Creators

There are many different APIs you can use to link your organisation with your cloud applications. Whatever you need is probably already out there. You just need to do a little looking. But failing that, you might have to create your own APIs. We will discuss now with one example.

Google Gadgets

Google Gadgets is a desktop search application that enables users to search their email, files, web history, and chats. Called Google Desktop Search, this new application makes it possible for users to find information on their computers as fast and easily as they can search the Web with Google.

The Google Gadgets API is composed of three languages:

- **XML:** This is the language you use to write gadget specifications. A gadget is just an XML file placed on the Web somewhere where Google can find it. The XML file contains instructions on how to process and render the gadget. The XML file can contain all the data, or it can have reference URLs where the data can be found.
- **HTML:** HTML is the markup language used to format the pages on the web. It is generally responsible for the static portions of your web pages. HTML and XML look similar, but HTML is used to format web documents, whereas XML is used to describe structured data.
- **JavaScript:** JavaScript is the scripting language you can use to add dynamic behaviour to your gadgets.

SELF-ASSESSMENT QUESTIONS – 2

4. API stands for.
5. API is similar to _____ service.
6. Google Gadgets is a desktop search application that enables users to search called.

5. BROWSERS FOR CLOUD COMPUTING

To connect to the cloud, you and your users will most likely utilise a web browser. Which one should you use? Well, that's really up to you. Browsers tend to be mostly the same but with some subtle functional differences. There might be cases when you cannot use anything but Microsoft's Internet Explorer, but for the most part, you should be able to use any browser you want. Internet Explorer enjoys the highest market share of browser usage – 69.77 per cent (according to a December 2008 study.

They were released by the web metrics firm Net Applications). You can attribute that dominance to the fact that Internet Explorer is included with Windows, the dominant operating system in the world. But you don't have to use Internet Explorer if you don't want to. There are other options out there, just not as widely used. Mozilla's Firefox accounts for 20.78 per cent, Apple's Safari represents 7.13 per cent, while Google Chrome accounts for less than 1 per cent of the market at .98 per cent. The remaining almost 2 per cent of browsers include products like Camino, Opera, and others. Of course, these numbers are moving targets, but the market shares have been more or less the same over the months.

In this section, we'll talk about the top browsers in the market: Internet Explorer, Firefox, and Safari. Although it only accounts for less than 1% of the market, we will also talk about Google Chrome, mainly because it has been developed as a cloud computing tool.

5.1 Internet Explorer

Windows Internet Explorer 8 for Windows Vista, XP, and Windows 7 is the latest version of the popular web browser.

IE 8 Features

Internet Explorer 8 delivered a new look and enhanced capabilities that made everyday tasks such as searching, browsing multiple sites, and printing – simple and fast. The significant change in IE 8 is its rendering modes. The progressive evolution of the Web has necessitated that browsers such as Internet Explorer include multiple content-rendering methods, supporting the strict interpretation of specific web standards and behaviours designed to maintain compatibility with existing websites. Website designers generally can specify which mode they are preparing for; in the absence of detailed instructions from a website, browsers are preset to use one of the modes by default.

Internet Explorer 8 has been designed to include three rendering modes:

- One that reflects Microsoft's implementation of current web standards
- A second reflecting Microsoft's implementation of web standards at the time of the release of Internet Explorer 7 in 2006
- A third based on rendering methods dating back to the early Web

The newest rendering mode is forward-looking and preferred by web designers. In contrast, the others are present to enable compatibility with the myriad sites across the Web that are currently optimised for previous versions of Internet Explorer. While Internet Explorer 8 includes significant end-user advancements, it was also designed with developers and IT managers in mind. Microsoft engineered Internet Explorer 8 for compatibility with existing websites by adhering to some of the most essential standards for website development. Internet Explorer 8 also features improved manageability for enterprises through the enhanced support of Active Directory Group Policy, enabling IT managers to deploy and centrally manage the browser on each desktop in their network easily.

5.2 Firefox

In June 2008, Mozilla released Firefox 3, a significant update to its widespread, free, open-source web browser. Firefox 3 is the culmination of three years of efforts from thousands of developers, security experts, localisation and support communities, and testers from around the globe. Available in approximately 50 languages, Firefox 3 is two to three times faster than its predecessor and offers more than 15,000 improvements, including the revolutionary

intelligent location bar, malware protection, and extensive under-the-hood work to improve the speed and performance of the browser.

Firefox Performance

Firefox 3 is built on the Gecko 1.9 platform, resulting in a safer, easier-to-use, and more personal product. Firefox 3 uses less memory while it's running than previous releases, and its redesigned page rendering and layout engine means that users see web pages two to three times faster than with Firefox 2.

Security

Firefox 3 raises the bar for security. The new malware and phishing protection helps protect people from viruses, worms, Trojans, and spyware to keep them safe on the web. Firefox 3's one-click site ID information allows users to verify that a site is what it claims to be. Mozilla's open-source process leverages the experience of thousands of security experts around the globe.

Customisation

Firefox 3 lets users customise their browser with more than 5,000 add-ons. Firefox add-ons allow users to manage tasks like participating in online auctions, uploading digital photos, seeing the weather forecasts, and listening to music, all from the browser's convenience. The new Add-ons Manager helps users find and install add-ons directly from the browser.

5.3 Safari

Apple claims that Safari 3.1 is the world's fastest web browser for Mac and Windows PCs, loading web pages 1.9 times faster than Internet Explorer 7 and 1.7 times faster than Firefox 2. Safari also runs JavaScript up to six times faster than other browsers. It is the first browser to support the latest innovative web standards to deliver the next generation of highly interactive Web 2.0 experiences.

"Safari 3.1 for Mac and Windows is blazingly fast and easy to use and features an elegant user interface," said Philip Schiller, Apple's senior vice president of Worldwide Product Marketing. "And best of all, Safari supports the latest audio, video and animation standards for an industry-leading Web 2.0 experience."

Safari Performance

Safari features an intuitive browsing experience with drag-and-drop bookmarks, easy-to-organize tabs, an integrated Find capability showing the number of matches on a page, and a built-in RSS reader to scan the latest news and information. Safari 3.1 is the first browser to support the new video and audio tags in HTML 5 and the first to support CSS Animations. Safari also supports CSS Web Fonts, giving designers limitless font choices to create stunning new websites.

System Requirements

Safari 3.1 for Mac OS X requires Mac OS X Leopard or Mac OS X Tiger version 10.4.11 and a minimum of 256MB of memory and is designed to run on any Intel-based Mac or a Mac with a PowerPC G5, G4, or G3 processor and built-in FireWire. Safari 3.1 for Windows requires Windows XP or Windows Vista, a minimum of 256MB of memory, and a system with at least a 500MHz Intel Pentium processor.

5.4 Chrome

Chrome is Google's foray into the open-source browser market. In the early days of the Internet, web pages were frequently little more than text. But today, the Web has evolved into a robust platform that enables users to collaborate with friends and colleagues through email and other web applications, edit documents, watch videos, listen to music, manage finances, and much more. Google Chrome was built for today's Web and the applications of tomorrow.

Chrome Features

Google Chrome was designed to make it easy for users to search and navigate the Web for their desired content. Features include

- A combined search and address bar quickly takes users where they want to go.
- When users open a new tab in Google Chrome, they'll see a page that includes snapshots of their most-visited sites, recent searches, and bookmarks, making it easier to navigate the Web.
- Each browser tab operates as a separate process; by isolating accounts, if one tab crashes or misbehaves, others remain stable and responsive, and users can continue working without restarting Google Chrome.

Open Source

"While we see this as a fundamental shift in the way people think about browsers, we realise that we couldn't have created Google Chrome on our own," said Linus Upson, director of engineering, Google Inc. "Google Chrome was built upon other open source projects that are making significant contributions to browser technology and have helped to spur competition and innovation." To further advance the Web's openness, Google Chrome is being released as an open-source project named Chromium. The intent is that Google will help make future browsers better by contributing the underlying technology in Google Chrome to the market while continuing to develop additional features.

Chrome Cloud

There's a lot of buzz around Chrome being an excellent tool for cloud computing. It extends the cloud into your organisation's computer and vice versa. This is mainly because of the power of the V8 JavaScript engine and built-in Google Gear. Google Gears is also open source, enabling powerful web applications by adding new features to the web browser. Major API components to Gears include:

- A database module that can store data locally.
- A WorkerPool module that provides parallel execution of JavaScript code.
- A LocalServer module that caches and serves application resources (like HTML, JavaScript, images, and so on)
- A Desktop module that lets web applications interact more naturally with the desktop.
- A Geolocation module that lets web applications detect the geographical location of their users.

It is believed that Chrome will allow desktop and web applications to merge, putting everything into the cloud so you won't have to think about both terms. Chrome is an application virtual machine for both on and offline web applications. Google Chrome can be downloaded at www.google.com/chrome. Google Chrome for Mac and Linux users is still in the works. There are several ways to connect to the cloud. How you opt to do so will depend on several factors, including your or your programmers' skills, which computing platform you use, and what your vendor offers.

SELF-ASSESSMENT QUESTIONS – 3

7. Internet Explorer 8 has been designed to include rendering modes.
8. _____ Features include an intuitive browsing experience with drag-and-drop bookmarks.

6. SUMMARY

- A web application framework is used to support the development of dynamic websites, web applications, and web services.
- Web hosting service that will allow you to store your data and applications called web provider.
- Cloud sites, cloud files and cloud servers are the three components of Mosso offerings.
- The Decision-making process helps you choose the cloud applications discussed in this unit.
- An application programming interface (API) is a set of programming instructions and standards for accessing a web-based program.
- The Google Gadgets API is composed of three languages:
- We discussed the top browsers in the market like Internet Explorer, Firefox, Safari and Chrome.

7. TERMINAL QUESTIONS

1. Explain the platforms of cloud applications.
2. Discuss cloud web applications.
3. Explain the role of API in cloud computing.
4. List and explain the browsers of cloud computing.

8. ANSWERS

Self-Assessment Questions

1. Dynamic
2. True
3. cloud sites, files, and servers
4. Application Programming Interface
5. SaaS
6. Google Desktop Search
7. Three
8. Safari

Terminal Questions

1. A platform is how a cloud computing environment is delivered to you. For more details, refer to section 2.
2. Your service provider may have a stable of premade applications that you can use. For details, refer to section 3.
3. An application programming interface (API) is a set of programming instructions and standards for accessing a web-based program. For details, refer to section 4.
4. To connect to the cloud, you and your users will most likely utilise a web browser. For details, refer to section 5.

9. REFERENCES

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