International Journal on Applications in Electrical and Electronics Engineering
Volume 1: Issue 8: August 2015, pp 1-5. www.aetsjournal.com ISSN (Online) : 2395-3527

Cloud Computing

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Abstract— Cloud computing is location independent computing, whereby shared servers provide resources, software, and data to computers and other devices on demand, as with the electricity grid. Or more simply, remote computing. Cloud computing is a natural evolution of the widespread adoption of virtualization, service-oriented architecture and utility computing. Details are abstracted from consumers, who no longer have need for expertise in, or control over, the technology infrastructure "in the cloud" that supports them..

A cloud service has three distinct characteristics that differentiate it from traditional hosting. It is sold on demand, typically by the minute or the hour; it is elastic -- a user can have as much or as little of a service as they want at any given time; and the service is fully managed by the provider (the consumer needs nothing but a personal computer and Internet access). Significant innovations in virtualization and distributed computing, as well as improved access to high-speed Internet and a weak economy, have accelerated interest in cloud computing.

In this paper we are also going to discuss the advantages, applications, structures, types and how the cloud computing works. These data's would give a brief knowledge about cloud computing so that we could know about one of the world's newest technologies.

Keywords— Cloud computing, cloud service

I. INTRODUCTION

- *CLOUD COMPUTING*

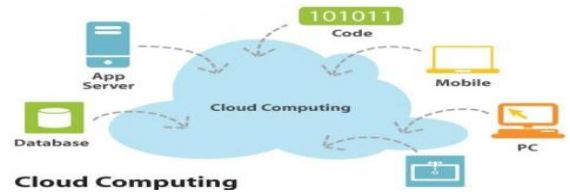
1) Life before cloud computing

Traditional business applications have always been very complicated and expensive. The amount and variety of hardware and software required to run them are daunting. You need a whole team of experts to install, configure, test, run, secure, and update them.

When you multiply this effort across dozens or hundreds of apps, it's easy to see why the biggest companies with the best IT departments aren't getting the apps they need. Small and mid-sized businesses don't stand a chance.

What is a Cloud Computing?

- Cloud Computing is Internet – ("CLOUD") based development and use of computer technology ("COMPUTING").
- Cloud Computing is a general term for anything that involves delivering hosted service over the Internet.
- It is used to describe both a platform any type of application.
- Cloud computing also describes applications that are extended to be accessible through the Internet.
- These cloud applications use large data centers and powerful services that host Web applications and Web services.
- Anyone with a suitable Internet connection and a standard browser can access a cloud application.



User of the cloud only care about the service or information they are accessing – be it from their PCs, mobile devices, or anything else connected to the Internet – not about the underlying details of how the cloud works.

WHAT IS DRIVING CLOUD COMPUTING?

The CLOUD COMPUTING is driving in two types of categories.

They are as follows:

- Customer perspective
- Vendor perspective

Customer perspective:

- In one word: economics
- Faster, simpler, cheaper to use cloud computation.
- No upfront capital required for servers and storage.
- No ongoing for operational expenses for running datacenter.
- Application can be run from anywhere.

Vendor perspective:

- Easier for application vendors to reach new customers.
- Lowest cost way of delivering and supporting applications.
- Ability to use commodity server and storage hardware.
- Ability to drive down data center operational cots.

Types of services:

B. *These services are broadly divided into three categories:*

- *Infrastructure-as-a-Service (IaaS)*
- *Platform-as-a-Service (PaaS)*
- *Software-as-a-Service (SaaS).*

1) Infrastructure-as-a-Service (IaaS):

Infrastructure-as-a-Service (IaaS) like Amazon Web Services provides virtual servers with unique IP addresses and blocks of storage on demand. Customers benefit from an API from which they can control their servers. Because customers can pay for exactly the amount of service they use, like for

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electricity or water, this service is also called utility computing.

Platform-as-a-Service (PaaS):

Platform-as-a-Service (PaaS) is a set of software and development tools hosted on the provider's servers. Developers can create applications using the provider's APIs. Google Apps is one of the most famous Platform-as-a-Service providers. Developers should take notice that there aren't any interoperability standards (yet), so some providers may not allow you to take your application and put it on another platform.

Software-as-a-Service (SaaS):

Software-as-a-Service (SaaS) is the broadest market. In this case the provider allows the customer only to use its applications. These applications can be anything from web based email, to applications like Twitter.

C. TYPES BY VISIBILITY:

1) Public cloud:

Public cloud or external cloud describes cloud computing in the traditional mainstream sense, whereby resources are dynamically provisioned on a fine-grained, self-service basis over the Internet, via web applications/web services, from an off-site third-party provider who shares resources and bills on a fine-grained utility computing basis.

Hybrid cloud:

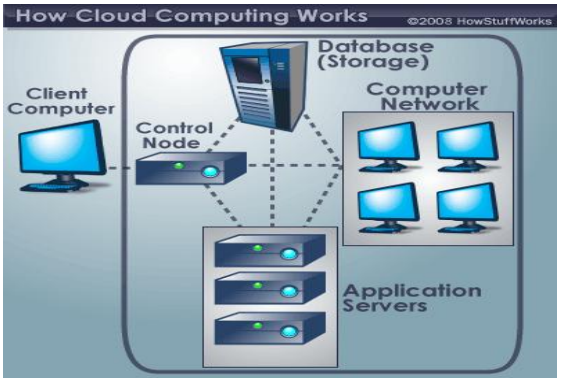
A hybrid cloud environment consisting of multiple internal and/or external providers] "will be typical for most enterprises". A hybrid cloud can describe configuration combining a local device, such as a Plug computer with cloud services. It can also describe configurations combining virtual and physical, collocated assets—for example, a mostly virtualized environment that requires physical servers, routers, or other hardware such as a network appliance acting as a firewall or spam filter.

2) Private cloud:

Private cloud and internal cloud are neologisms that some vendors have recently used to describe offerings that emulate cloud computing on private networks. These (typically virtualization automation) products claim to "deliver some benefits of cloud computing without the pitfalls", capitalizing on data security, corporate governance, and reliability concerns. They have been criticized on the basis that users "still have to buy, build, and manage them" and as such do not benefit from lower up-front capital costs and less hands-on management, essentially "lacking the economic model that makes cloud computing such an intriguing concept".

HOW DOES CLOUD COMPUTING WORK?

Supercomputers today are used mainly by the military, government intelligence agencies, universities and research labs, and large companies to tackle enormously complex calculations for such tasks as simulating nuclear explosions, predicting climate change, designing airplanes, and analyzing which proteins in the body are likely to bind with potential new drugs. It does that by networking large groups of servers that often use low-cost consumer PC technology, with specialized connections to spread data-processing chores across them. By contrast, the newest and most powerful desktop PCs process only about3 billion computations a second. Let's say you're an executive at a large corporation. Your particular responsibilities include making sure that all of your employees have the right hardware and software they need to do their jobs. Buying computers for everyone isn't enough -- you also have to purchase software or software licenses to give employees the tools they require. Whenever you have a new hire, you have to buy more software or make sure your current software license allows another user. It's so stressful that you find it difficult to go.



A typical cloud computing system

Soon, there may be an alternative for executives like you. Instead of installing a suite of software for each computer, you'd only have to load one application. That application would allow workers to log into a Web-based service which hosts all the programs the user would need for his or her job. Remote machines owned by another company would run everything from e-mail to word processing to complex data analysis programs. It's called cloud computing**,** and it could change the entire computer industry.

In a cloud computing system, there's a significant workload shift. Local computers no longer have to do all the heavy lifting when it comes to running applications. The network of computers that make up the cloud handles them instead. Hardware and software demands on the user's side decrease. The only thing the user's computer needs to be able to run is the cloud computing system's interface software**,** which can be as simple as a Web browser, and the cloud's network takes care of the rest. There's a good chance you've already used some form of cloud computing. If you have an e-mail account with a Web-based e-mail service like Hotmail, Yahoo! Mail or Gmail, then you've had some experience with cloud computing. Instead of running an e-mail program on your computer, you log in to a Web e-mail account remotely. The software and storage for your account doesn't exist on your computer -- it's on the service's computer cloud.

a) SEVEN TECHNICAL SECURITY BENEFITS OF THE CLOUD:

1. Centralized Data:

Reduced Data Leakage:

This is the benefit I hear most from Cloud providers - and in my view they are right. How many laptops do we need to lose

before we get this? How many backup tapes? The data "landmines" of today could be greatly reduced by the Cloud as thin client technology becomes prevalent. Small, temporary caches on handheld devices or Net book computers pose less risk than transporting data buckets in the form of laptops. Ask the CISO of any large company if all laptops have company 'mandated' controls consistently applied; e.g. full disk encryption. You'll see the answer by looking at the whites of their eyes. Despite best efforts around asset management and endpoint security we continue to see embarrassing and disturbing misses. And what about SMBs? How many use encryption for sensitive data, or even have a data classification policy in place?

Monitoring benefits:

Central storage is easier to control and monitor. The flipside is the nightmare scenario of comprehensive data theft. However, I would rather spend my time as a security professional figuring out smart ways to protect and monitor access to data stored in one place (with the benefit of situational advantage) than trying to figure out all the places where the company data resides across a myriad of thick clients! You can get the benefits of Thin Clients today but Cloud Storage provides a way to centralize the data faster and potentially cheaper. The logistical challenge today is getting Terabytes of data to the Cloud in the first place.

b) 2. Incident Response / Forensics:

Forensic readiness:

With Infrastructure as a Service (IaaS) providers, I can build a dedicated forensic server in the same Cloud as my company and place it offline, ready for use when needed. I would only need pay for storage

until an incident happens and I need to bring it online. I don't need to call someone to bring it online or install some kind of remote boot software - I just click a button in the Cloud Providers web interface. If I have multiple incident responders, I can give them a copy of the VM so we can distribute the forensic workload based on the job at hand or as new sources of evidence arise and need analysis. To fully realize this benefit, commercial forensic software vendors would need to move away from archaic, physical dongle based licensing schemes to a network licensing model.

Decrease evidence acquisition time:

If a server in the Cloud gets compromised (i.e. broken into), I can now clone that server at the click of a mouse and make the cloned disks instantly available to my Cloud Forensics server. I didn't need to "find" storage or have it "ready, waiting and unused" - its just there.

Eliminate or reduce service downtime:

Note that in the above scenario I didn't have to go tell the COO that the system needs to be taken offline for hours whilst I dig around in the RAID Array hoping that my physical acquisition toolkit is compatible (and that the version of RAID firmware isn't supported by my forensic software). Abstracting the hardware removes a barrier to even doing forensics in some situations.

- Decrease evidence transfer time
- Eliminate forensic image verification time
- Decrease time to access protected documents

c) 3. Password assurance testing (aka cracking):

- Decrease password cracking time
- Keep cracking activities to dedicated machines

d) 4. Logging:

- "Unlimited", pay per drink storage
- Improve log indexing and search
- Getting compliant with Extended logging

e) 5. Improve the state of security software (performance):

- Drive vendors to create more efficient security software

f) 6. Secure Builds:

- Pre-hardened, change control builds
- Reduce exposure through patching offline
- Easier to test impact of security changes

g) 7. Security Testing:

- Reduce cost of testing security

II. ADOPTION FEARS AND STRATEGIC INNOVATION OPPORTUNITIES

Security:

Many IT executives make decisions based on the perceived security risk instead of the real security risk. IT has traditionally feared the loss of control for SaaS deployments based on an assumption that if you cannot control something it must be unsecured. I recall the anxiety about the web services deployment where people got really worked up on the security of web services because the users could invoke an internal business process from outside of a firewall. The IT will have to get used to the idea of software being delivered outside from a firewall that gets meshed up with on-premise software before it reaches the end user. The intranet, extranet, DMZ, and the internet boundaries have started to blur and this indeed imposes some serious security challenges such as relying on a cloud vendor for the physical and logical security of the data, authenticating users across firewalls by relying on vendor's authentication schemes etc., but assuming challenges as fears is not a smart strategy.

Latency:

Just because something runs on a cloud it does not mean it has latency. My opinion is quite the opposite. The cloud computing if done properly has opportunities to reduce latency based on its architectural advantages such as massively parallel processing capabilities and distributed computing. The web-based applications in early days went through the same perception issues and now people don't worry about latency while shopping at Amazon.com or editing a document on Google docs served to them over a cloud. The cloud is going to get better and better and the IT has no strategic advantages to own and maintain the data centers.

SLA:

Recent Amazon EC2 meltdown and RIM's network outage created a debate

around the availability of a highly centralized infrastructure and their SLAs. The real problem is not a bad SLA but lack of one. The IT needs a phone number that they can call in an unexpected event and have an up front estimate about the downtime to manage the expectations. May be I am simplifying it too much but this is the crux of the situation. The fear is not so much about 24x7 availability since an on-premise system hardly promises that but what bothers IT the most is inability to quantify the impact on business in an event of non-availability of a system and set and manage expectations upstream and downstream.

Strategic innovation opportunities Seamless infrastructure virtualization:

If you have ever attempted to connect to Second Life behind the firewall you would know that it requires punching few holes into the firewall to let certain unique transports pass through and that's not a viable option in many cases. This is an intra-infrastructure communication challenge. I am glad to see IBM's attempt to create a virtual cloud inside firewall to deploy some of the regions of the Second Life with seamless navigation in and out of the firewall. This is a great example of a single sign on that extends beyond the network and hardware virtualization to form infrastructure virtualization with seamless security.

Hybrid systems:

The IBM example also illustrates the potential of a hybrid system that combines an on-premise system with remote infrastructure to support seamless cloud computing. This could be a great start for many organizations that are on the bottom of the S curve of cloud computing adoption. Organizations should consider pushing non-critical applications on a cloud with loose integration with on-premise systems to begin the cloud computing journey and as the cloud infrastructure matures and some concerns are alleviated IT could consider pushing more and more applications on the cloud. Google App Engine for cloud computing is a good example to start creating applications on-premise that can eventually run on Google's cloud and Amazon's AMI is expanding day-by-day to allow people to push their applications on Amazon's cloud.

BENEFITS:

Cloud computing infrastructures can allow enterprises to achieve more efficient use of their IT Hardware and software investments. They do this by breaking down the physical inherent in isolated systems, and automating the management of the group of systems as inherent in isolated systems, and automating the management of the group of systems as a single entity. Cloud computing is an example of an ultimately virtualized system, and a natural evolution for Data centers that employ automated systems management, workload balancing, and virtualization technologies. A cloud infrastructure can be a cost efficient model for delivering information services.

1) APPLICATION:

A cloud application leverages cloud computing in software architecture, often eliminating the need to install and run the application on the customer's own computer, thus alleviating the burden of software maintenance, ongoing operation, and support.

For example:

- Peer-to-peer / volunteer computing (BOINC, Skype)
- Web applications (Web mail, Facebook, Twitter, You Tube, Yammer)
- Security as a service (MessageLabs, Purewire, ScanSafe, Zscaler)
- Software as a service (Google Apps, Salesforce,Nivio,Learn.com, Zoho, BigGyan.com) Software plus services (Microsoft Online Services)
- Storage [Distributed]
  - Content distribution (Bit Torrent, Amazon Cloud Front)
  - Synchronization (Drop box, Live Mesh, Spider Oak, ZumoDrive.

III. RECENT USAGE OF CLOUD TECHNOLOGY

Recently many leading companies are presenting cloud technology to the people by means of computing or storage, which have bought a new trend and dimension to the computing of a normal human. Let us see some of them below,

Dropbox:

Dropbox is one of the only online storage solutions to offer clients for Linux and Blackberry, alongside the usual Windows, Mac OS X, Android and iOS standards. Plus, an official Windows Phone app was released in January 2015. This goes a long way to ensuring that your data can be with you, no matter what flavor of technology you want to use course. Windows phone users. Microsoft has also introduced a referral incentive where users can gain 500 MB of storage for the friend who sign in through them.

Dropbox is an excellent, cross-platform solution that remains a benchmark against which others must compete. It may lack a few of the whistles and bells of its rivals, but it’s rock solid and compatible with so many applications.

Apple iCloud

iCloud is a cloud storage and cloud computing service from Apple Inc. launched on October 12, 2011. As of July 2013, the service had 320 million users.The service provides its users with means to store data such as documents, photos, and music on remote servers for download toiOS, Macintosh or Windows devices, to share and send data to other users, and to manage their Apple devices if lost or stolen.The service also provides the means to wirelessly back up iOS devices directly to iCloud, instead of being reliant on manual backups to a host Mac or Windows computer using iTunes. Service users are also able to share photos,

music, and games instantly by linking accounts via AirDrop wireless.

Apple's iCloud has become distinctly more like its rivals mentioned in this test, expanding the service as iCloud Drive to allow you to store any document, even if it wasn't created in an Apple app, and access them from a PC (via iCloud for Windows or icloud.com) in addition to iOS and OS X devices.

Google drive:

Drive works in the same fashion as most cloud storage solutions, with a local folder on your PC linked to a duplicate cloud version. Versioning is supported, as is real-time collaboration on documents via the Google Docs app. Clients are available on PC and Mac, with mobile versions for Android and iOS, but Google and Microsoft's supposed ongoing feud looks to keep the service off Windows Phone for a while to come.

A. Microsoft OneDrive:

OneDrive (previously SkyDrive, Windows Live SkyDrive and Windows Live Folders) is a file hosting service that allows users to upload and sync files to a cloud storage and then access them from a web browser or their local device. It is part of the suite of online services formerly known as Windows Live and allows users to keep the files private, share them with contacts, or make the files public. Publicly shared files do not require a Microsoft account to access.

Much of the functionality in OneDrive (previously SkyDrive) is similar to Dropbox.

Amazon Cloud drive:

Amazon Cloud Drive is a web storage application from Amazon. Its storage space can be accessed from up to eight specific devices. The devices can be mobile devices, different computers, and different browsers on the same computer. The device limit can be reached if web browser cookies are not stored, or are deleted

Box:

Box is a cloud computing business which provides file-sharing, collaborating, and other tools for working with files that are uploaded to its servers. Users can determine how their content can be shared with other users. Users may invite others to view and/or edit an account's shared files, upload documents and photos to a shared files folder (and thus share those documents outside of Box), and give other users rights to view shared files.Box offers 3 account types: Enterprise, Business and Personal.[9] Depending on the type of account, Box has features such as unlimited storage, custom branding and administrative controls. Other systems, such as Google apps, NetSuite and Salesforce can be integrated with Box.

IV. Conclusion

The switch to mostly cloud-based work has already occurred, especially through the use of browsers and social networking applications. They point out that many people today are primarily using smart phones, laptops, and desktop computers to network with remote servers and carry out tasks such as working in Google Docs, following web-based RSS (really simple syndication) feeds, uploading photos to Flicker and videos to You Tube, doing remote banking, buying, selling and rating items at Amazon.com, visiting with friends on Facebook, updating their Twitter accounts and bogging on WordPress. In future the cloud computing would be used mostly around the globe. So it would be better for the people in the computing to know about this.

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