

Cloud Computing - A Review

Varun Arora¹, Sukhwinder Singh²

¹Student, ²Mentor

¹²Department of Electronics and Electrical Communication Engineering,
PEC University of Technology, Chandigarh, India

Abstract: “Cloud” computing – a relatively recent term, defines the paths ahead in computer science world. Being built on decades of research it utilizes all recent achievements in virtualization, distributed computing, utility computing, and networking. It implies a service oriented architecture through offering softwares and platforms as services, reduced information technology overhead for the end-user, great flexibility, reduced total cost of ownership, on demand services and many other things. This paper is a brief survey based on readings on “cloud” computing and it tries to address, related research topics, challenges ahead, pros and cons and future scope.

Keywords: cloud, data storage, email, software, platform, infrastructure.

Introduction

Cloud computing is the next generation in computation. Maybe Clouds can save the world; possibly people can have everything they need on the cloud. Cloud computing is the next natural step in the evolution of on-demand information technology services and products. The Cloud is a metaphor for the Internet, based on how it is depicted in computer network diagrams, and is an abstraction for the complex infrastructure it conceals. It is a style of computing in which IT-related capabilities are provided “as a service”, allowing users to access technology-enabled services from the Internet (i.e., the Cloud) without knowledge of, expertise with, or control over the technology infrastructure that supports them. Email was probably the first service on the “cloud”. As the computing industry shifts toward providing Platform as a Service (PaaS) and Software as a Service (SaaS) for consumers and enterprises to access on demand regardless of time and location, there will be an increase in the number of Cloud platforms available. But it seems that Cloud computing cannot save the universe. Cloud computing cannot run for President. Cloud computing is a very specific type of computing that has very specific benefits. But it has specific negatives as well. And it does not serve the needs of real businesses to hear only the hype about cloud computing – both positive and negative. One thing that is hoped to be accomplished with this paper is not only a clear picture of what the cloud does extremely well and a brief overview of them, but also a short survey on their criteria and challenges ahead of them.

Architectural Layers of Cloud Computing

Sun’s view of cloud computing is an inclusive one: cloud computing can describe services being provided at any of the traditional layers from hardware to applications. In practice, cloud service providers tend to offer services that can be grouped into three categories: software as a service, platform as a service, and infrastructure as a service. Software as a service (SaaS) Software as a service features a complete application offered as a service on demand. A single instance of the software runs on the cloud and services multiple end users or client organizations. The most widely known example of SaaS is salesforce.com, though many other examples have come to market, including the Google Apps offering of basic business services including email and word processing. Although salesforce.com preceded the definition of cloud computing by a few years, it now operates by leveraging its companion force.com, which can be defined as a platform as a service. Platform as a service (PaaS) Platform as a service encapsulates a layer of software and provides it as a service that can be used to build higher-level services. There are at least two perspectives on PaaS depending on the perspective of the producer or consumer of the services:

- Someone producing PaaS might produce a platform by integrating an OS, middleware, application software, and even a development environment that is then provided to a customer as a service. For example, someone developing a PaaS offering might base it on a set of Sun™ xVM hypervisor virtual machines that include a NetBeans™ integrated development environment, a Sun GlassFish™ Web stack and support for additional programming languages such as Perl or Ruby.
- Someone using PaaS would see an encapsulated service that is presented to them through an API. The customer interacts with the platform through the API, and the platform does what is necessary to manage and scale itself to

provide a given level of service. Virtual appliances can be classified as instances of PaaS. A content switch appliance, for example, would have all of its component software hidden from the customer, and only an API or GUI for configuring and deploying the service provided to them.

PaaS offerings can provide for every phase of software development and testing, or they can be specialized around a particular area such as content management. Commercial examples of PaaS include the Google Apps Engine, which serves applications on Google's infrastructure. PaaS services such as these can provide a powerful basis on which to deploy applications, however they may be constrained by the capabilities that the cloud provider chooses to deliver.

Infrastructure as a Service (IaaS)

Infrastructure as a service delivers basic storage and compute capabilities as standardized services over the network. Servers, storage systems, switches, routers, and other systems are pooled and made available to handle workloads that range from application components to high performance computing applications. Commercial examples of IaaS include Joyent, whose main product is a line of virtualized servers that provide a highly available on-demand infrastructure.

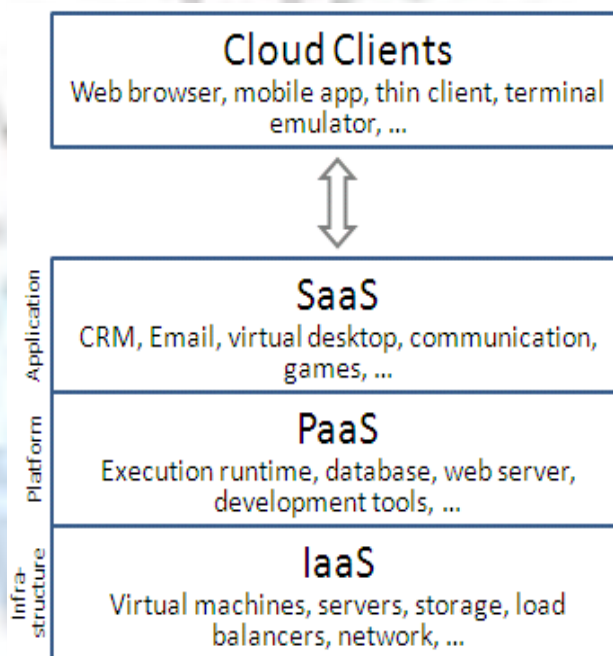


Fig. 1: representing Cloud Computing Layers.

Cloud Computing

Cloud computing is a paradigm that focuses on sharing data and computations over a scalable network of nodes. Examples of such nodes include end user computers, data centers, and Web Services. We term such a network of nodes as a cloud. Basically cloud is a metaphor for internet and is an abstraction for the complex infrastructure it conceals. The main idea is to use the existing infrastructure in order to bring all feasible services to the cloud and make it possible to access those services regardless of time and location. Whether it's called Cloud Computing or On-demand Computing, Software as a Service, or the Internet as Platform, the common element is a shift in the geography of computation. When you create a spreadsheet with the Google Docs service, major components of the software reside on unseen computers, whereabouts unknown, possibly scattered across continents. The shift from locally installed programs to cloud computing is just getting under way in earnest. Shrink wrap software still dominates the market and is not about to disappear, but the focus of innovation indeed seems to be ascending into the clouds. Some substantial fraction of computing activity is migrating away from the desktop and the corporate server room. The change will affect all levels of the computational ecosystem, from casual user to software developer, IT manager, even hardware manufacturer.

Recently, a lot of vendors have started talking about “cloud computing” in their marketing materials. Merrill Lynch has estimated a \$160- billion addressable market opportunity, including \$95- billion in business and productivity applications, and another \$65-billion in online advertising for Cloud Computing. But the main question is whether the users are ready to give up using services on their local machines and shift to the Cloud since shifting to cloud computing has both advantages and disadvantages for all possible users; nevertheless, they may have different level of importance for different users.

- **PROS**

Reduced Cost: Cloud technology is paid incrementally (you pay only for what you need), saving organizations money in the short run. Money saved can be used for other important resources.

1. **Increased Storage:** Organizations can store more data than on private computer systems.
2. **Highly Automated:** IT personnel not needed to keep software up to date as maintenance is the job of the service provider on the cloud.
3. **More Mobility:** Employees can access information wherever they are, rather than having to remain at their desks.
4. **Allows IT to Shift Focus:** No longer having to worry about constant server updates and other computing issues, government organizations will be free to concentrate on innovation.

- **CONS**

GNU founder Richard Stallman says that the interesting thing about cloud computing is that we've redefined cloud computing to include everything that we already do. One reason you should not use web applications to do your computing is that you lose control. It's just as bad as using a proprietary program. But certainly shifting to cloud computing has other problems including:

1. **Security:** Is there a security standard?
2. **Reliance on 3rd Party:** Control over own data is lost in the hands of an “difficult-to-trust” provider.
3. **Cost of transition:** Is it feasible for me to move from the existing architecture of my data center to the architecture of the cloud?
4. **Uncertainty of benefits:** Are there any long term benefits?

Future Scope

The future of cloud computing is bright for the companies that implement the technology now. While these are some trends that are expected in the future, the future is not limited to these trends. Remain abreast of the latest developments to help your company maintain a competitive advantage. This will make your company more profitable and productive when it can complete tasks faster and more efficiently than the competition. Cloud computing has been called the way of the future. It opens doors by making applications and technology more accessible than in previous years. Companies that would normally require enormous amounts of startup capital may only need a fraction of what was previously required to succeed. Currently, if the company can afford it, then they can have access to the full Microsoft Suite, ERP applications, CRM applications, accounting software, and a host of other applications that will improve productivity within a company. The past of cloud computing is bright, but the future of cloud computing is even brighter. Here are the trends in cloud computing.

1. **Proactive Application Monitoring**

Proactive application monitoring technology is currently available, but predictive technology and software will soon make this more robust and accurate. Companies will be able to foresee disaster and avert it, mitigating damage to their systems. This will prevent downtime and make the company safer.

2. **Cloud Computing's Role in Disaster Recovery and Remote Access**

Cloud computing enables and enhances remote access and faster disaster recovery. When companies have an emergency information security strategy with security penetration tests, companies can maintain their competitive edge within their respective industries. With cloud computing, some companies that didn't recognize a breach may recover within minutes instead of hours. Losing proprietary data can cripple a company and even cause doors to close. Every company should migrate to cloud computing for this reason.

3. More Capability

Mobile devices that rely on the cloud will become more powerful and thinner because all applications will be web-based. All mobile devices will store data that resides in the cloud, and designers can add more capability and lower costs of the phone. One example of this concept is Apple's iCloud.

4. Hybrid Cloud Computing Increases Efficiency

Hybrid cloud computing is expected to help businesses become more efficient by optimizing business process performance. Businesses are excited about hybrid cloud computing because it enhances internal infrastructure and applications. The ability to scale the strengths of local networks and cloud computing is coveted by designers.

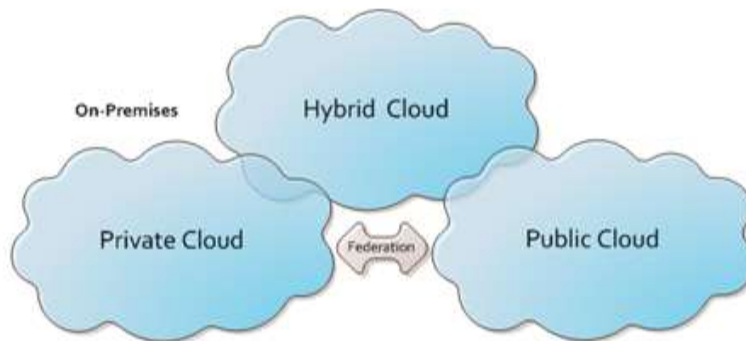


Fig.2: representing Hybrid Cloud Structure

5. Faster Interconnects

Cloud computing is still in its infancy stage. By 2020, cloud computing is expected to be a permanent solution in many organizations. Data centers will be automated and will support scalable software architecture. The future of cloud computing is bright for the companies that implement the technology now. While these are some trends that are expected in the future, the future is not limited to these trends. Remain abreast of the latest developments to help your company maintain a competitive advantage. This will make your company more profitable and productive when it can complete tasks faster and more efficiently than the competition.

Conclusion

Cloud computing is an emerging computing paradigm that is increasingly popular. Leaders in the industry, such as Microsoft, Google, and IBM, have provided their initiatives in promoting cloud computing. However, the public literature that discusses the research issues in cloud computing are still inadequate.

In a study of the research literature surrounding cloud computing, I found that there is a distinct focus on the needs of the scientific computing community. Big IT companies are also building their own version of cloud. But still there are many questions left without an answer and indeed the most important one is security.

One of the other aspects of the cloud which is left is the social aspect of it. The Cloud is going to happen but which services should be offered on the cloud and for whom. What happens if smaller IT companies start to offer their services on the cloud and no one uses them?! I believe that everything eventually can move to the Cloud. The question is if users are ready for that and if it's the right move and this need must be addressed.

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