A Sight into Cloud Computing

[1]Monika Verma, [2]Amardeep Singh, [3]Vandana, [4]Sukhnandan Kaur
[1,2]Dept. of CSE, Swami Vivekanand Institute of Engineering & Technology, Banur, Punjab, India

Abstract
In this technological world, we engulf with a variety of new advancements, out of these the one we are going to discuss is cloud computing. Cloud Computing, the long-held dream of computing as a utility, has the potential to transform a large part of the IT industry, making software even more attractive as a service and shaping the way IT hardware is designed and purchased. Cloud computing provides the architecture for creating market-oriented Clouds by leveraging technologies such as Virtual Machines; provides thoughts on market-based resource management strategies that encompass both customer-driven service management and computational risk management to sustain SLA oriented resource allocation.

Keywords
Cloud Computing, Types of cloud computing, Capability maturity model, Global cloud exchange.

I. Introduction To Cloud Computing

Cloud Computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the datacenters that provide those services. The services themselves have long been referred to as Software as a Service (SaaS), so we use that term. The datacenter hardware and software is what we will call a Cloud.

When a Cloud is made available in a pay-as-you-go manner to the public, we call it a Public Cloud ; the service being sold is Utility Computing. Current examples of public Utility Computing include Amazon Web Services, Google App Engine, and Microsoft Azure. We use the term Private Cloud to refer to internal datacenters of a business or other organization that are not made available to the public. Thus, Cloud Computing is the sum of SaaS and Utility Computing, but does not normally include Private Clouds.

The advantages of SaaS to both end users and service providers are well understood. Service providers enjoy greatly simplified software installation and maintenance and centralized control over versioning; end users can access the service "anytime, anywhere", share data and collaborate more easily, and keep their data stored safely in the infrastructure. Cloud Computing does not change these arguments, but it does give more application providers the choice of deploying their product as SaaS without provisioning a datacenter: just as the emergence of semiconductor foundries gave chip companies the opportunity to design and sell chips easily, Cloud Computing allows deploying SaaS—and scaling on demand—without building or provisioning a datacenter.

From a hardware point of view, three aspects are new in Cloud Computing:

1. The illusion of infinite computing resources available on demand, thereby eliminating the need for Cloud Computing users to plan far ahead for provisioning.
2. The elimination of an up-front commitment by Cloud users, thereby allowing companies to start small and increase hardware resources only when there is an increase in their needs.
3. The ability to pay for use of computing resources on a short-term basis as needed (e.g., processors by the hour and storage by the day) and release them as needed, thereby rewarding conservation by letting machines and storage go when they are no longer useful.

In a nutshell, it is quite vivid , "A Cloud is a type of parallel and distributed system consisting of a collection of interconnected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements established through negotiation between the service provider and consumers."

II. Types Of Cloud Computing System

Depending on the type of provided capability, there are three scenarios where Clouds are used:

a) Infrastructure as a Service:IPs manage a large set of computing resources, such as storing and processing capacity. Through virtualization,they are able to split, assign and dynamically resize these re-sources to build ad-hoc systems as demanded by customers, the SPs. They deploy the software stacks that run their services. This is the Infrastructure as a Service (IaaS) scenario.

b)Platform as a Service:Cloud systems can offer an additional abstraction level: instead of supplying a virtualized infrastructure, they can provide the software platform where systems run on. The sizing of the hardware resources demanded by the execution of the services is made in a transparent manner. This is denoted as Platform as a Service (PaaS). A well-known example is the Google Apps Engine .

c)Software as a Service:Finally, there are services of potential interest to a wide variety of users hosted in Cloud systems. This is an alternative to locally run applications. An example of this is the online alternatives of typical office applications such as word processors. This scenario is called Software as a Ser-vice (SaaS). Fig.1 is an Example of SaaS.

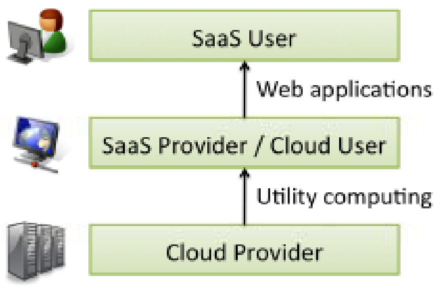

Fig.1: Example of software as a service (SaaS)

III. Cloud Computing Maturity Model:

Capability maturity model is a reference model for inducting the software process maturity into different levels. It can be used to predict the most likely outcome to be expected from the next project that the organization undertakes. CMM cam be used two ways:

1) Capability evalution.
2) Software process assessment.

Capability evalution and software process assessment differ in motivation, objective and the final use of the result. Capability evalution provides a way to assess the software process capability of an organization. The result of capability evalution indicates the likely contractor performance, if the contractor is awarded a work. Therefore, the result of software process capability assessment can be used to select a contractor. On the other hand, software process assessment is used by an organization with the objective to improve its process capability. Thus this type of assessment is for purely internal use.

We begin by considering capability maturity for enterprises exploiting clouds, considering a number of key characteristics: business strategy, governance, procurement methods , applications, information and information security as shown in Table. 2.

Table 1 : Description of CMM for Cloud Computing

Cloud computing	Level 1	Level 2	Level 3	Level 4	Level 5
CMM	Initial services	Architectural services	Align and responsive	measurable	Optimized and dynamically reconfigurable
Business prospective	Componentized business unit	Strategy and vision for broad adoption across business	Cloud services integrated across business	Impact of cloud on business lines measured	Multiple cloud supplies used, seamless transition
Cloud governance	External supplier	Based on best practice	Cloud and enterprise practice	Compliance metrics established and applied	Dynamically monitored and enforced
Procurement methods	Standard contractual arrangements utilized	Best practice in closed procurement adopted, SLAs emerging	Support team established, common services environment, automated SLA	Procurement cycles made for deployment efficiency and consumption	Dynamic and changing SLAs and optimization
Cloud applications	Additional functionality and siloed applications	Application enables new enterprise activities	Process integration across enterprise enhanced productivity	Cloud applications measured for impact	Dynamically changing services
Information prospective	Cloud services offer information based applications	Enterprise services metadata available	Single enterprise ontology, shared with partners to enhance delivery	Cloud based information services measured for quality	Information services evolving in response to change enterprise strategy

Level-1: We present capability maturity model for enterprises exploiting services in row 1.level 1 represents today's environment where users of cloud services are adopting offerings to enable additional functionality and controlling the risk via standard outsourcing risk management processes, .the cloud service is consumed within the business unit and is typically soloed off from the rest of the enterprise's .information security is focused at the perimeter.

Level-2: At level-2 best practice begins to emerge surrounding the adoption of cloud services within an enterprise, and the enterprise begins to roll out a broader adoption strategy. This in turn generates enterprise level metadata which underpins new information based services.

Level-3: At the level-3 cloud and other business processes become aligned, enabling a more integrated management activity. This in turn delivers enhanced productivity. It also facilitates a single enterprise cloud ontology, which then shared with partners and suppliers can directly enhance delivery. The importance of cloud to the enterprise results in a dedicated support function being maintained within the enterprise. The information security function delivers monitoring and audibility across the enterprise.

Level-4: At level 4 the impact of cloud on the enterprise become measureable , compliance metrics are established and services and applications are measured for quality. Information security functions for cloud are also measured for impact on the overall risk mitigation strategy.

Level-5: At the level-5 cloud services become dynamically reconfigurable in response to the increased awareness delivered by the various metrics and changing operating requirements. Governance mechanisms can be dynamically monitored and enforced. Procurement methods become dynamic with SLAs requiring an agile and perhaps automated solution in order to provide the agility required by the enterprise. Information security mechanisms also require additional automation and multi level security solutions will need to be present and effective.

From an enterprise perspective it is at the point of crossing maturity levels that changes is likely,for all characteristics. With change comes the potential for introduction of information security vulnerabilities, and alongside opportunities for designing in privacy. Consider the governance perspective: in the lower maturity levels best practice will be based upon existing outsourcing practice .However,as cloud exploitation matures this is unlikely to be sufficient since the dynamic business models and agility of service deployment will move at a faster pace.New best practice in risk management will certainly be required,and this will impact governance.

We can use this cloud exploitation capability maturity model to motivate a privacy maturity model for clouds which elucidates the enterprise architecture characteristics which will offer opportunities to deliver privacy perserving functionality and will necessarily vary as cloud adoption matures.

IV. Global Cloud Exchange

For Cloud computing to mature, it is required that the services follow standard interfaces. This would enable services to be commoditized and thus, would pave the way for the creation of a market infrastructure for trading in services. An example of such a market system, modeled on real-world exchanges, is shown in Fig. 2. The market directory allows participants to locate providers or consumers with the right offers. Auctioneers periodically clear bids and asks received from market participants. The banking system ensures that financial transactions pertaining to agreements between participants are carried out.

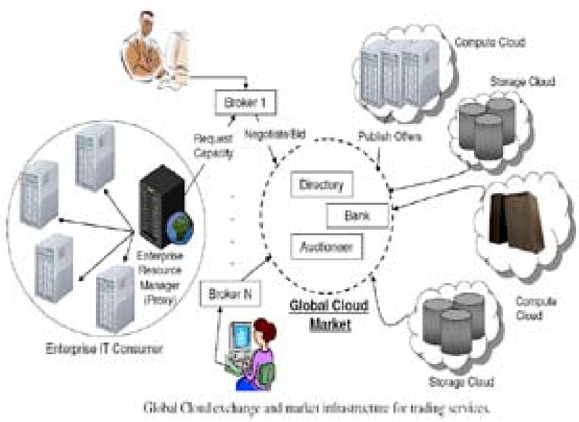

Fig. 2 : A Basic Set Of Global Cloud Exchange

Brokers perform the same function in such a market as they do in real-world markets: they mediate between consumers and providers by buying capacity from the provider and sub-leasing these to the consumers. A broker can accept requests from many users who have a choice of submitting their requirements to different brokers. Consumers, brokers and providers are bound to their requirements and related compensations through Service Level Agreements (SLAs). An SLA specifies the details of the service to be provided in terms of metrics agreed upon by all parties, and penalties for meeting and violating the expectations, respectively.

Such markets can bridge disparate Clouds allowing consumers to choose a provider that suits their requirements by either executing SLAs in advance or by buying capacity on the spot. Providers can use the markets in order to perform effective capacity planning. A provider is equipped with a price-setting mechanism which sets the current price for the resource based on market conditions, user demand, and current level of utilization of the resource. Pricing can be either fixed or variable depending on the market conditions. An admission-control mechanism at a provider's end selects the auctions to participate in or the brokers to negotiate with, based on an initial estimate of the utility. The negotiation process proceeds until an SLA is formed or the participants decide to break off. These mechanisms interface with the resource management systems of the provider in order to guarantee the allocation being offered or negotiated can be reclaimed, so that SLA violations do not occur. The resource management system also provides functionalities such as advance reservations that enable guaranteed provisioning of resource capacity.

Brokers gain their utility through the difference between the price paid by the consumers for gaining resource shares and that paid to the providers for leasing their resources. Therefore, a broker has to choose those users whose applications can provide it maximum utility. A broker interacts with resource providers and other brokers to gain or to trade resource shares. A broker is equipped with a negotiation module that is informed by the current conditions of the resources and the current demand to make its decisions.

Consumers have their own utility functions that cover factors such as deadlines, fidelity of results, and turnaround time of applications. They are also constrained by the amount of resources that they can request at any time, usually by a limited budget. Consumers also have their own limited IT infrastructure that is generally not completely exposed to the Internet. Therefore, a consumer participates in the utility market through a resource management proxy that selects a set of brokers based on their offerings. He then forms SLAs with the brokers that bind the latter to provide the guaranteed resources. The enterprise consumer then deploys his own environment on the leased resources or uses the provider's interfaces in order to scale his applications.

The idea of utility markets for computing resources has been around for a long time. Recently, many research projects such as SHARP, Tycoon, Bellagio and Shirako have come up with market structures for trading in resource allocations. These have particularly focused on trading in VMbased resource slices on networked infrastructures such as PlanetLab.

Enterprises currently employ conservative IT strategies and are unwilling to shift from the traditional controlled environments. Cloud computing uptake has only recently begun and many systems are in the proof-of concept stage. Regulatory pressures also mean that enterprises have to be careful about where their data gets processed, and therefore, are not able to employ Cloud services from an open market. This could be mitigated through SLAs that specify strict constraints on the location of the resources. However, another open issue is how the participants in such a market can obtain restitution in case an SLA is violated. This motivates the need for a legal framework for agreements in such markets, a research issue that is out of scope of themes pursued in this paper.

V. Conclusion

To cap it all, it is revealed from this paper that cloud computing is the backbone of fast growing technological world which enhance the value of cloud computing. In this paper, we have discussed Cloud computing and some systems for Cloud computing covering the state-of-the-art. The cornerstone of this paper is the presentation of CMM. We have also presented a vision for the creation of global Cloud exchange for trading services. Apart from all these aspects, ample of other related aspects are in the way to present.

References

[1] Armbrust, Fox,Griffith, Joseph, et al, "Above the clouds: A Berkeley view of cloud computing". 2009.

[2] Vaquero, Rodero Merino,Caceres, Lindner, "A break in the clouds: towards a cloud definition". 2008

[3] Youseff, Butrico, Da Silva., "Toward a Unified Ontology of Cloud Computing". 2009.

[4] Moretti, Bulosan, Thain, Flynn., "All-pairs: An abstraction for data-intensive cloud computing". 2008

[5] Keahey, Figueiredo, Fortes, Freeman et al., "Science Clouds: Early Experiences in Cloud Computing for Scientific Applications". 2008

[6] Vouk., "Cloud Computing – Issues, Research and Implementations". 2008

[7] Vaquero,Rodero-Merino,Caceres, Lindner, "A break in the clouds: towards a cloud definition". 2008

[8] Lagar-Cavilla, Whitney, Scannell, Patchin, Rumble, et al., "SnowFlock: rapid virtual machine cloning for cloud computing". 2009

[9] Branter, Florescu, Graf, Kossmann, Kraska., "Building a database on S3". 2008

[10] Broberg, Buyya, Tari., "Creating a 'Cloud Storage' Mashup for High Performance, Low Cost Content Delivery". 2008

[11] J Dean, S Ghemawat., "MapReduce: Simplified Data Processing on Large Clusters". 2004.

[12] DeCandia, Hastorun, Jampani, Kakulapati, et al. , "Dynamo: Amazon's Highly Available Key-value Store". 2007.

Er. Monika Verma is currently working as an Assistant Professor in Computer Science and Engineering Department at Swami Vivekanand Institute of Engineering & Technology, Banur. She holds the degree of M.Tech in Computer Scienece-Hons. And B.Tech in Computer Science & Engineering. She was the Topper during M.Tech in her University. She has more than 6 years of teaching experience. Her research interests include Digital Image Processing. She has authored and co-authored many papers in International Journals, International Conferences and National Conferences and has attended many short term courses. She is Life Time Member of ISTE. She is also serving on the Editorial Board of International Journal of Managing Information Technology (IJMIT), Signal and Image Processing: An International Journal (SIPIJ), The International Journal on Computer Science and Technology (IJCST) and International Journal on Electronics and Communication Technology (IJECT). She has also written & published 02 books one on System Programming and other one on Operating Systems.

Er.Amardeep Singh is working as Associate Professor-CSE., S.V.I.E.T., Banur and is also performing the job of Head of Computer Sc. & Engineering. and Head of the Department in Swami Vivekanand Research & Technology Park. Er.Amardeep Singh has done B.Tech in Computer Science & Engg. & M.Tech. in Information Technology from Guru Nanak Dev University Campus, Amritsar. He has also done Masters in Business Administration as dual specialization in Marketing & Human Resource Management.
Now he is pursuing Ph.D. in Computer Sciences. His area of interest is Computer Networks, Parallel & Distributed Computing. He is the life member of Indian Society for Technical Education (I.S.T.E.) and has published & presented 38 papers in International/ National Journals & Conferences. He has also written & published 10 highly acclaimed books. He has attended & organized various Short Term/FDP/Workshop programs. He has Teaching & Industry Experience of more than 9.

Er. Vandana is currently pursuing her M. Tech in computer science and engineering from Swami Vivekanand Institute of Engineering and Technology,Banur. She holds the degree of B.Tech in Computer Science and Engineering from Desh Bhagat Engineering College,Mandi Gobindgarh .She was the Topper of her college during B.Tech.She holds 10 months experience as a lecturer at Desh Bhagat Engineering College, Mandi Gobindgarh.

Er. Sukhnandan Kaur currently pursuing her M. Tech in computer science and engineering from Swami Vivekanand Institute of Engineering and Technology,Banur .She holds the degree of B.Tech in Computer Science-Hons. from Baba Banda Singh Bahadur Engineering College,Fatehgarh Sahib-Hons . She holds the certification of OCP(Oracle Certified Professional).She was the member of British Council Of India. She was the member of Computer society of India.