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A Study of Standards of Cloud Computing Service Delivery Models

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A Service delivery model supports the cloud environment in various ways as and when these models are required and preferred. Even then several standards must be followed while allowing for the implementation.[SD09] The expectations of business world are heading towards the attainment of business functions ranging from packaged business applications to custom application development at a fraction of the time and cost of traditional on- premises platforms. With this growth in enterprise use of cloud-computing comes a corresponding increase in responsibility on the part of vendors to provide cloud- computing platforms that offer outstanding service delivery. Salesforce.com is the leader in enterprise cloud computing, having more than 10 years of experience in delivering highly available, secure, and scalable cloud-computing applications based on the Force.com platform which is well versed in every aspect of service delivery, from infrastructure to security, policies, and procedures. The Force.com platform adheres to the seven standards outlined below. They're the building blocks of the best practices every successful cloud-computing platform should follow:

1. World-class security – Provision world-class security at every level.

2. Trust and transparency – Provide transparent, real-time, accurate service performance and availability information.

3. True multitenancy – Deliver maximum scalability and performance to customers with a true multitenant architecture.

4. Proven scale – Support millions of users with proven scalability.

5. High performance – Deliver consistent, high-speed performance globally.

6. Complete disaster recovery – Protect customer data by running the service on multiple, geographically dispersed data centers with extensive backup, data archive, and failover capabilities.

7. High availability – Equip world-class facilities with proven high- availability infrastructure and application software.

1. World-Class Security

Security is more than just user privileges and password policies. It's a multidimensional business imperative, especially for platforms that are responsible for customer data. Cloud-computing platforms must have detailed, robust policies and procedures in place to guarantee the highest possible levels of:

- Physical security
- Network security
- Application security
- Internal systems security
- Secure data-backup strategy
- Secure internal policies and procedures
- Third-party certification

2. Trust and Transparency

Cloud-computing platforms should provide customers with detailed information about service delivery and performance in real time, including:

- Accurate, timely, and detailed information about service performance data and planned maintenance activities

- Daily data on service availability and transaction performance
- Proactive communications regarding maintenance activities

3. True Multi-tenancy

Leading Web applications—including Google, eBay, and Sales force CRM—run on a single code base and infrastructure shared by all users. A multitenant architecture allows for high scalability and faster innovation at a lower cost. Single-tenant systems, on the other hand, are not designed for large-scale cloud-computing success. The internal inefficiencies of maintaining a separate physical infrastructure and/or separate code lines for each customer make it impossible to deliver quality service or innovate quickly.

Multitenancy is:

- The platform for high performance
- The platform for high availability
- The platform for rapid innovation

Multi-tenancy provides customers with the following benefits:

- Efficient service delivery, with a low maintenance and upgrade burden
- Consistent performance and reliability based on an efficient, large-scale architecture
- Rapid product release cycles

4. Proven Scale

With any cloud-computing service, customers benefit from the scale of the platform. A larger scale means a larger customer community, which can deliver more and higher- quality feedback to drive future platform innovation. A larger customer community also provides rich opportunities for collaboration between customers, creating communities that can share interests and foster best practices. Cloud-computing platforms must have:

- Proof of the ability to scale to hundreds of thousands of subscribers
- Resources to guarantee the highest standards of service quality, performance, and security to every customer
- The ability to grow systems and infrastructure to meet changing demands
- Support that responds quickly and accurately to every customer
- Proven performance and reliability as customer numbers grow

5. High Performance

Cloud-computing platforms must deliver consistent, high-speed systems performance worldwide and provide detailed historical statistics to back up performance claims, including

- Average page response times
- Average number of transactions per day

6. Complete Disaster Recovery

Platforms providing cloud-computing services must be flexible enough to account for every potential disaster. A complete disaster recovery plan includes:

- Data backup procedures that create multiple backup copies of customers' data, in near real time, at the disk level
- A multilevel backup strategy that includes disk-to-disk-to-tape data backup in which tape backups serve as a secondary level of backup, not as the primary disaster-recovery data source. This disk-oriented model ensures maximum recovery speed with a minimum potential for data loss in the event of a disaster.

7. High Availability

Any platform offering cloud-computing applications needs to be able to deliver very high availability. Requirements for proving high availability include:

- Facilities with reliable power, cooling, and network infrastructure
- High-availability infrastructure: networking, server infrastructure, and software
- N+1 redundancy
- Detailed historical availability data on the entire service, not just on individual servers

DESIGN ISSUES OF CLOUD ARCHITECTURE

Cloud computing architecture refers to the set of interconnected servers, storage systems, and control nodes that can enable distributed computing. Each cloud computing system typically has both a front end, the client computer, and a back end that consists of application servers, data storage, and some type of control node. The network that connects everything is another important facet that can be associated with cloud computing architecture. Components in cloud computing architecture may be connected to each other locally or via the Internet, and the client typically accesses them through the Internet.

Each hardware component associated with cloud computing architecture typically communicates using application programming interfaces (APIs), such as various web services. The front end of the architecture, which is what the client or user sees and interacts with, can take a variety of different forms. Some instances of cloud computing use common interfaces, such as web browsers, that can access cloud based email or other services. Other uses of cloud computing have proprietary software systems that are designed for specific tasks.

The back end portion of the architecture typically consists of three main components. One of these components is data storage, where information can be placed for later retrieval. Data may be stored on the cloud by clients or by cloud applications. The data capacity of a cloud system is typically quite large to allow for redundancy. This basically means that the data storage component in cloud architecture is usually designed to store more than one copy of each data set in case any part of the system becomes damaged or inaccessible.

Application servers are another important component associated with cloud computing architecture. Cloud architecture typically involves a number of different application servers, each of which can be responsible for a different function. Each of these servers is usually designed to run one program or service, and many of them may be available to the client through the front end interface. This sort of distributed setup can allow the system to function in a more streamlined way than earlier monolithic designs.

The final components that can be instrumental in cloud computing architecture are control nodes. These specialized computers may be connected to data storage and application servers via the Internet or another network. The front end usually interfaces with a control node, allowing the client to interact with the application servers. Control nodes typically also connect application servers and clients to data storage.

To create the cloud environment certain issues needed to be considered. [AA09] For instance which applications and data sources used by the application will run in the cloud. These apps or data probably reside within the corporate data center, requiring that the cloud-based app be able to reach into the data center to access them. In these cases, the best option is for apps or data sources to be made available as services that can be called remotely. Despite service-oriented architecture fervor, though, many applications and data sources have not been front ended with service interfaces. And even with workarounds such as screen scaping, these approaches are inelegant, make a cloud-based application more complex and tend to be fragile. Furthermore second issue is data backup. While Infrastructure as a Service (Iaas) offerings allow traditional SQL Server databases to run, there is still need to perform data backups to ensure recoverability in case of crashes. Since the data and applications may reside in different places, the established backup mechanisms won't work.

Thus Cloud environments are not all created equal: They offer different mechanisms to implement applications. Amazon Elastic Compute Cloud (EC2), for instance, delivers "empty" virtual machines into which any type of software may be installed and run; achieving scalability for individual applications is left up to the application creator.

By contrast, Google and Microsoft provide programming frameworks (Google Apps, a component-based framework, and Microsoft's Azure Services Platform, a .NET-based framework, respectively) that transparently scale, relieving the app creator of that burden; however, these frameworks limit a system designer's architectural options.

BUSINESS ARCHITECTURE

Cloud computing facilitates its acceptors with a new business environment involving a great change in their business models and collaborate in powerful new ways in their customers, suppliers and trading partners. [EC09] According to a part from a book Dot Cloud, it’s all Amazon and Google’s hard work that initiates the new lessons to the business world. Simply now the time moves towards the services after the evolution of internet. Even internet is also treated as the source of services in which user is interested and not the underlying technologies. While most people have become accustomed to using services such as emailing or searching or shopping on the Internet, by extension, it makes sense that business technologies should be accessible in the same way. What’s important for companies to consider today is that cloud computing isn’t about technology; it’s about technology-enabled business models and business innovation. The most positive thing about cloud is that to move inside the cloud companies don’t have to dump their data centers and move to datacenter boarding houses in the sky (Amazon, Microsoft, Sun, Dell, IBM, Google, et al). Even the resources already lies within the companies can became the elements in overall IT architectures: three-tier client/server, n-tier distributed object computing, and other forms of distributed computing architectures. So, let's consider some of the major forms of cloud computing that are bubbling up: consumer clouds, public clouds, private clouds, and hybrids, about which I will discuss later in detail. [CA08] There are many reasons behind the cloud adoption by companies summarized by Jinesh Varia Technology Evangelist Amazon Web Services in his article "Cloud Architecture" , some of which should be discussed before we move on to the cloud architecture in business point of view. First If an organization have to build a large-scale system it may cost a fortune to invest in real estate, hardware (racks, machines, routers, backup power supplies), hardware management (power management, cooling), and operations personnel. Because of the upfront costs, it would typically need several rounds of management approvals before the project could even get started. Now, with utility- style computing, there is no fixed cost or startup cost. Also in the past, if one got famous and its systems or infrastructure did not scale it became a victim of its own success. Conversely, if one invested heavily and did not get famous, he became a victim of his failure. By deploying applications in-the-cloud with dynamic capacity management software architects do not have to worry about pre-procuring capacity for large-scale systems. The solutions are low risk because it is based on "you scale only as you grow". Cloud Architectures can relinquish infrastructure as quickly as one got them in the first place (in minutes).

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