

Security Challenges in Cloud Computing

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INTRODUCTION

The recent emergence of computing called cloud computing as a new computing paradigm has transformed the way people think about software delivery and licensing, infrastructure architectures and computing utility models. The development of cloud service model delivers business supporting tools at efficient cost without the hassle of investing in new infrastructure, training new personnel or licensing new software. It provides the enterprises to focus on the business perspective by leveraging them from hardware as well as software requirements while reducing the overall client side requirements and its complexity. It is beneficial for small medium enterprises to acquire services offered by cloud service providers (CSP's) at a nominal cost in comparison to setting up/upgrading the entire infrastructure and purchasing software licensing. Cloud Computing can be defined as:

Cloud Computing is a model for enabling convenient, on-demand network access, to a shared pool of configurable computing resources, (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction (Mell, & Grance, 2009).

Alternatively, Cloud can also be defined as a type of parallel and distributed system consisting of a collection of inter-connected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resource(s) based on service-level agreements established through negotiation between the service provider and consumers (Buyya, Yeo, Venugopal, Broberg, & Brandic, 2009).

Cloud computing is empowered by virtualization technology, this technology provides the essential cloud characteristics of location independence, re-source pooling, rapid elasticity and above all, better utilization of resources. The cloud offers several benefits like Multitenancy (shared resources), fast deployment, pay-for-use, lower costs, scalability, rapid provisioning, rapid elasticity, ubiquitous network access, greater resiliency, hypervisor protection against network attacks, low-cost disaster recovery and data storage solutions, on-demand security controls, real time detection of system tampering and rapid re-constitution of services (Mather, Kumaraswamy, & Latif, 2009).

BACKGROUND

The era of cloud computing dates back to grid computing in early 1990's when concept of high performance computing was on its emergence. In grid computing, various high performance computing machines were connected together by high speed communication links to utilize their combined enhanced efficiency towards complex computational problem solving. The grid is association of parallel and distributed systems taken into account where the resources are shared from distributed resources and allocating them in dynamic way thereby improving the performance, cost and dependency (Buyya, Yeo, Venugopal, Broberg, & Brandic, 2009).

The evolution of cloud computing from grid computing is the result of shifting of focus on managing the infrastructure performance towards the better economic way of delivering the services and computation in a abstract way with the minimal trouble at the client side.

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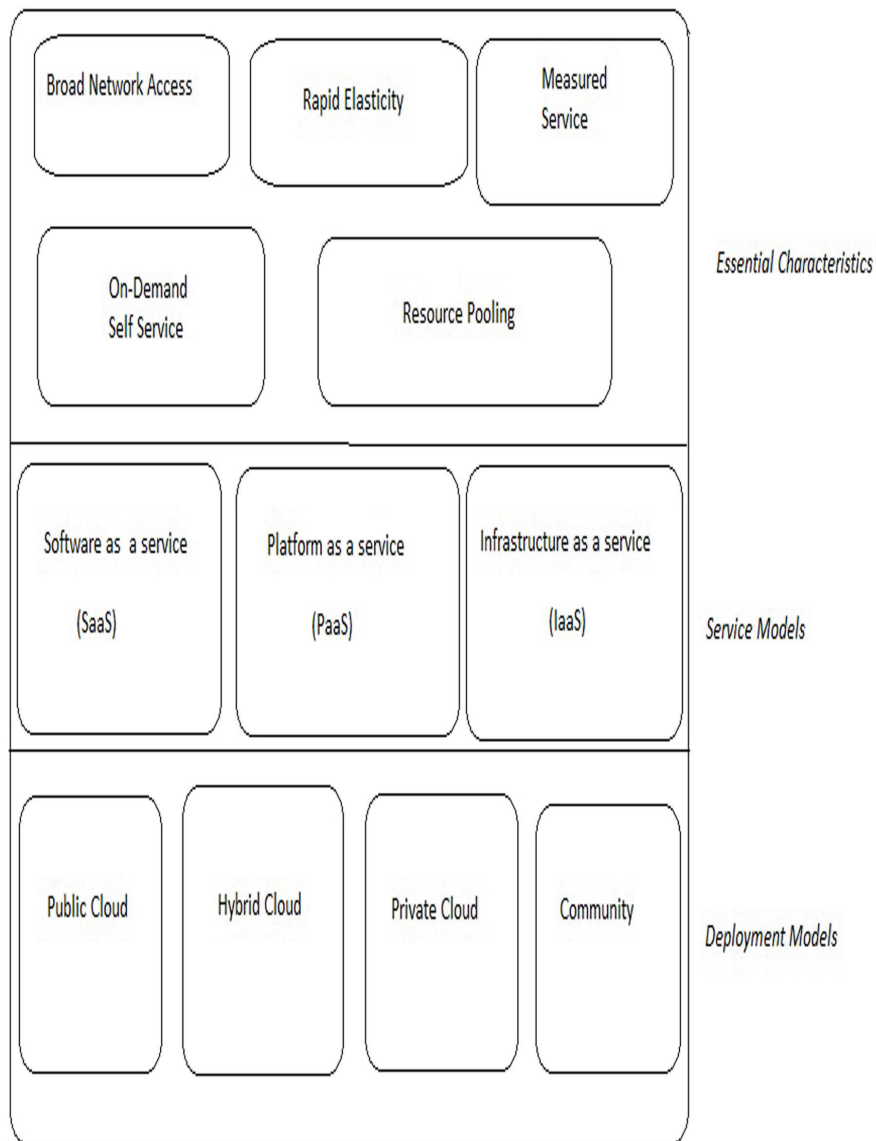
This resulted in the approach of computing as a service targeted towards business side of providing resources at an economical way (Foster, Zhao, Raicu, Lu, 2008).

Figure 1. depicts the representation model of cloud computing definition proposed by NIST which includes five essential features, three service models and four deployment models as shown (Subashini & Kavitha, 2011). Herein, the five essential features includes virtualized computing resource pool, broad network access, rapid elasticity, on-demand self-service, measured service; the three service models are Infrastructure

as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS); the four deployment models are private cloud, community cloud, public cloud and hybrid cloud.

Cloud computing offers the advantages like lower cost, business agility and focus on innovation and core competencies. The type of computing resource that is offered in a cloud defines a cloud's service model. NIST has identified three common service models that are based on what cloud services are provided: applications, platform, and infrastructure (Mell & Grance, 2009).

Figure 1. The NIST definition model of cloud computing



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