Private Cloud Secure Computing

Gurudatt Kulkarni, Niraj Patil, Pradip Patil

Abstract: Cloud computing is an increasingly popular paradigm for accessing computing resources. 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. This paper discuss the characteristics and benefits of private cloud computing. It proceeds to discuss the private cloud characteristics and formation as well as implementation. This paper aims to provide a means of understanding and investigating Private cloud... This paper also outlines the responsibilities of private cloud provider and the facilities to consumer

I. INTRODUCTION

Cloud-computing is Internet-("CLOUD-") based development and use of technology ("COMPUTING"). Cloud computing is a general term for anything that involves delivering hosted services over the Internet. It is used to describe both a Platform and type of Application.[4] Cloud computing also describes applications that are extended to be accessible through the Internet. These cloud applications use large data centers and powerful servers that host Web Application and Web services. Cloud computing delivers IT capabilities as services-on-demand. This scalable and elastic model provides advantages like faster time-to-market, no capex and pay-per-use business model. While there are several such benefits, there are challenges in adopting public clouds because of dependency on infrastructure that is not completely controlled internally and rather shared with outsiders. Several enterprises, especially large ones that have already invested in their own infrastructure over the years are looking at setting up private clouds within their organizational boundaries to reap the benefits of cloud computing technologies leveraging such investments. This paper describes the different options available, highlighting the key advantages and challenges posed by each and the approach enterprises should be taking in adopting cloud computing with minimal risk. Gartner's official definition of cloud computing is " A style of computing where scalable

and elastic IT-enabled capabilities are delivered as a service to customers using Internet technologies."[1] We also describe five defining attributes of cloud computing: service-based, scalable and elastic, shared, metered by use, uses Internet technologies. A key to cloud computing is an opaque boundary between the customer and the provider. Graphically, that looks like this:
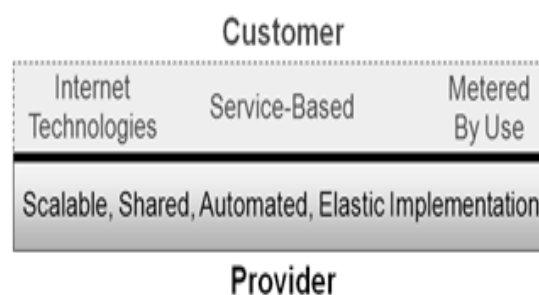

Figure 1.0 Cloud Basic Structure [1]

1. Public Clouds And Challenges [2]

Public clouds like Amazon AWS, Microsoft Azure, Google App Engine offer infrastructure and platforms as services over the internet. In public clouds, resources and costs are shared by users who use them over the internet on pay per use model. This model appeals especially to startups and small organizations that have not invested in hardware resources and are looking for ways to avoid the large capex involved in procuring infrastructure upfront. Even though there are several benefits like cost savings, faster time to market, etc., from this model, there are a few challenges listed below that are preventing wide scale adoption of public clouds.

■ Security: The biggest roadblock is the potential security issues due to multitenant nature of public clouds. There is security and privacy concerns with sharing same physical hardware with unknown parties that need to addressed.

■ Reliability and Performance: [2] Performance and availability of the applications are important criteria defining the success of an enterprise's business. However, the fact that organizations lose control over IT environment and important success metrics like performance and reliability, and are dependent on factors outside the control of the IT organizations makes it dangerous for some mission critical applications.

■ Vendor Lock-in: Cloud computing services offered by different vendors are not governed by any standards as of today. Depending on the vendor, the applications have to undergo changes to adapt to the service.

■ Leveraging Existing Investment: Most large organizations that have already invested in their own data centers would see a need to leverage those investments as an important criterion in adopting cloud computing.

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■ Corporate Governance and Auditing: [2]
Performing governance and auditing activities with the corporate data abstracted in the public cloud poses challenges, that are yet to be addressed.

■ Maturity of the Solutions: Some of the PaaS offering like AppEngine offer limited capabilities like only a subset of JDO API.

II. PRIVATE CLOUD BASICS [2,5]

Private cloud is "A form of cloud computing where service access is limited or the customer has some control/ownership of the service implementation."

In a Private Cloud, the infrastructure policies are governed by a single organization where workloads and data can be moved to and from internal and external data centers. Private Clouds provide an organization a single point of control for security, manageability, privacy, audit, compliance and governance. Graphically, that means that either the provider tunnels through that opaque boundary and limits service access (e.g., to a specific set of people, enterprise or enterprises), or the customer tunnels through that opaque boundary through ownership or control of the implementation (e.g., specifying implementation details, limiting hardware/software sharing). Note that control/ownership is not the same as setting service levels – these are specific to the implementation, and not even visible through the service.
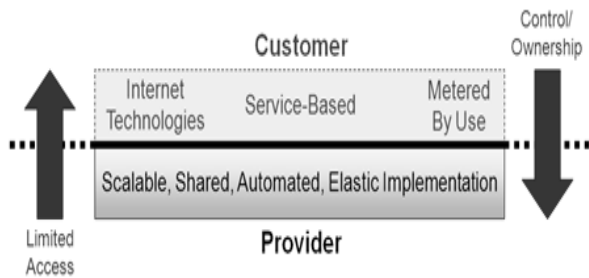

Figure 3.0.Private Cloud [1]

The ultimate example would be enterprise IT, building a private cloud service used only by its enterprise. But there are many other examples, such as a virtual private cloud (the same as the example above, except replace 'enterprise IT' with 'third-party provider'), and community clouds (the same as a virtual private cloud, except opened up to a specific and limited set of different enterprises).

III. PUBLIC VERSUS PRIVATE CLOUD [2]

There are several types of cloud computing deployment scenarios.
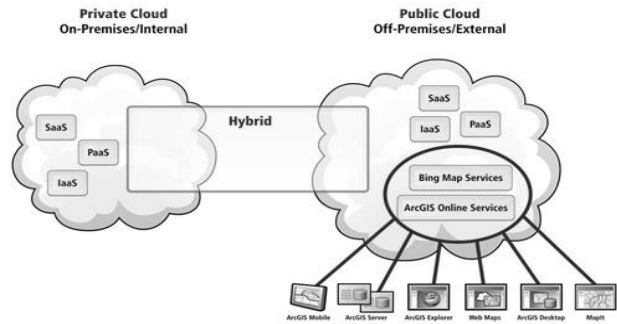

Figure 4.0 Public Vs Private Cloud [5]

The National Institute of Standards and Technology (NIST) is emerging as the preferred provider of the de facto definition of cloud computing and the distribution models, seen here with some Esri examples.[5]

- Public Cloud

The public cloud is the most commonly referenced regarding the topic of cloud computing, where the infrastructure and applications are owned by the organization selling cloud services.

- Private Cloud

Since many traditional vendors and users are not quite ready to jump into public cloud computing or are restricted from doing so, the cloud service tiers are replicated within a private cloud environment, behind the firewall, and maintained within the parameters of the host organization.

IV. ENTERPRISE PRIVATE CLOUDS

In order to overcome these challenges, organizations are looking at enterprise private cloud offerings. Enterprise private cloud solutions help organizations leverage the existing IT environment and create a cloud computing platform in the private internal network. This model overcomes several challenges faced in public cloud adoption. Enterprise private clouds are seen as a natural progression of initiatives like virtualization already taken up by 14 several organizations. Enterprise private cloud solutions add capabilities like self service, automation and charge back over the virtualized infrastructure.
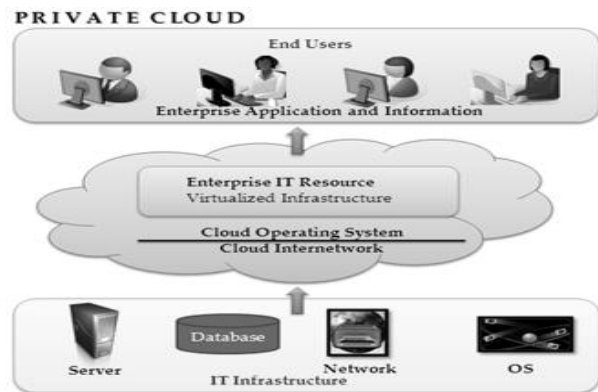

Figure 5.0 Private Cloud Generic Structure

The private cloud solution should have a self service portal that enables users request infrastructure and platforms as a service. It should contain a service catalog that lists the categories and the services available, the associated SLAs and costs. The service portal should enable reserving as well as requesting the services on demand.

Automation The private cloud solution should have certain traits -

- A provisioning engine that automates the provisioning of the infrastructure
- Workflow driven with built-in approval mechanisms enabling governance
- Enable user management and integration with enterprise authentication and authorization mechanisms
- Enable enforcing enterprise policies on resource allocation through a rules engine
- Enable capturing the common deployment patterns using templates.

Self-service and automation helps reduce the time-to-market so that users can request platform that should have the following components —

- Monitoring and Management: Track various metrics at the software and infrastructure level
- Metering & Chargeback: Track the usage of the various services and allow charging back mechanisms to be plugged in
- SLA Management: Enable, define and monitor SLAs for the services Patch Management: Enable patches to be rolled out to the various software components used.
- Reports: Generate reports on usage, SLA adherence, etc. Incident Management: Generate alerts when there are issues and provide ticketing mechanism to track and resolve incidents.
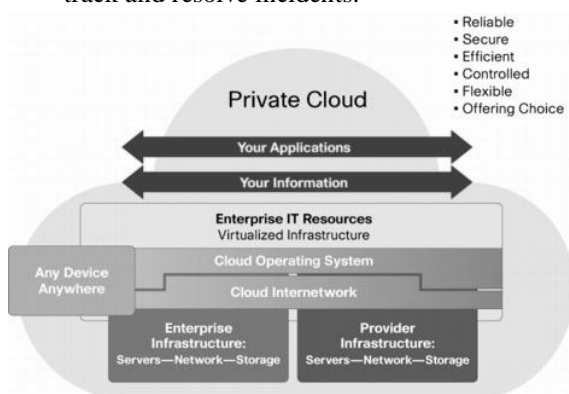

Figure 5.1 Formation of Private Cloud [3]

V. CONCLUSION

Benefits of going with private cloud is increased control and monitoring of resources, flexibility of customization, ability to recover from failure, and the ability to scale up or down depending upon demand. Private cloud is less vulnerable to hackers' attack by restricting access to its resources to authorized users and administrators only. On contrary of public cloud, private cloud provides businesses with inherent protection from DoS attacks through secured infrastructure. Private clouds are also provides path for future upgradation to public cloud. Organizations are still reluctant to go with private clouds because users still have to buy, build, and manage the infrastructure and thus do not benefit from CAPEX reduction. Due to these constraints, they cannot reap full benefits of cloud computing. A permanent application, or one that has specific requirements on quality of service or location of data, is most suitable to deploy in a private or hybrid cloud. Enterprise IT organizations use their own private cloud(s) for mission critical and other secured systems deployment.

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