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A SURVEY OF PRIVATE CLOUD PLATFORMS

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Abstract: As enterprises and institutions grow and their dependence on information services become ever demanding and critical to their functioning. Many choose to port their services to the Cloud. Cloud is a network based service, which does not have a physical location of its hosting – much like real clouds; they are managed by Cloud Service Providers (CSPs) who provide clients everything from software to infrastructure. These services are possible by high bandwidth data connectivity and virtualised hardware resources. Private Cloud is more or less the same, except it is managed in house by the institution and is much more secure than third party offering on public networks. In this paper we try to enumerate the need, the building process and available Private Cloud platforms to date.

Index Terms: Cloud Computing, Private Cloud, Platforms, Considerations, Eucalyptus, OpenStack

I. INTRODUCTION

Private Cloud is a cloud infrastructure operated solely by a single organisation, whether managed internally or by a third-party. Private cloud setup is implemented safely within the corporate firewall, it provides more control over the organisation's data, and it ensures security. However a private cloud shares many of the characteristics of public cloud computing including resource pooling, self-service, elasticity and pay-by-use delivered in a standardised manner with the additional control and customisation available from dedicated resources. Private clouds are ideal when you need to accelerate innovation, have large compute and storage requirements, or have very strict control, security, and compliance needs.

Many CIOs are under pressure to regularly update and patch their companies systems. This becomes a daunting job as it gets it the way of improving the systems and making them more efficient. Virtualisation provides the tools to manage this by the way of VMs. Furthermore costs can be cut in refining the cost on datacentres and their adjoining expenditures. This also reduces need of large workforce; fewer engineers can be assigned to handle and maintain systems while other can be employed to make them better.

On the process end, the implementation of VMs can reduce the footprint of process load on a single physical machine while still performing the task of multiple machines. This basically is the perk of employing virtualisation. Also on the maintenance end, the VMs are fairly easy to manage, as easy as moving files. This allows scalability and speed in deployment.

If the above are the benefits of datacentre virtualisation Cloud systems, by going a step further, building Private Cloud, as thoroughly elaborated in [1], shows how we have more adaptability and control over the services deployed. The key benefits can be the security of sensitive workloads of the organisation, control, swiftness in response to demands, and customisation. Public Cloud is always an option to extend services or shift network balance.

II. APPLICATIONS

Private Cloud has various applications, as varied as the applications for Could Computing. But the key advantage of owning a Private Cloud infrastructure would be cost or security [2]. The reason IT professionals would look for Private Cloud is that they want full customisation in terms of IaaS, PaaS and SaaS, on the other hand one would look at Public Cloud for SaaS as it becomes cost effective to host services publically. A few scenarios or applications where one would want Private Cloud would be:

Self-service: Many organisations have in-house workloads, when many deadlines are to be met, it seems natural to host services within the company infrastructure. A case-study from Intel shows reduction in service provision from an initial 90 to 14 days [3]. This also cuts out dependencies from outside CSP to provide mission critical applications to the functioning of the organisation.

Separation of services: An organisation would want the departmental workload to be held inside the enterprise while the hosted services or departments like HR who are unattached to the inner workings of the organisation can deployed outside company firewalls. In a way this promotes safety and huge security benefits. As pointed out by Tom Nolle, president of CIMI Corp., in [2], no banking company is going to host sensitive accounts information on a Public Cloud or such shared infrastructure.

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Budget: Reduction in cost is relative point to consider here. If an organisations workload consumes large bandwidth in and out of the organisation itself, then they are unnecessarily paying for their own traffic rather than to handle client traffic. So by deploying client related traffic in Public Cloud, the reach to the client, geographically, is also extended.

Agility of services: The services provided to the clients is seen to improve when the business logic of the services is separated to Private Cloud. Intel quotes that 80% of their servers are hosting self-service for office or enterprise environments [4]. So in effect they increase the speed in deployment on both ends.

After confirming that any of the above scenarios fit our needs we may have to account for some considerations below before adoption.

III. CONSIDERATIONS

A few key prospects must be considering before jumping onto the bandwagon of Private Cloud. Basic drive towards Private Cloud can be to provide more security and cut costs but other details also take precedence, as discussed in [5].

A. Workload and Infrastructure Interaction

Proper assessment of the infrastructure affordable must be done to allocate service worthy hardware and bandwidth. Any imbalance can only affect adversely.

B. Security

Most common feature which attracts organisations to Private Cloud is that the applications which have security concerns – most of which, whose workload footprint is known – can be graded from outside network. Under Private Cloud all of this is in-house and therefore of great benefit.

C. Latency

Remote hosting in some cases is attractive but for other critical applications the latency due to network can be significantly reduced in Private Cloud. Inter-organisational services depend on speed delivery and therefore have an advantage here.

D. User Experience

As mentioned before, user experience can be bettered if the geographical placement of the servers for processes intensive enterprise applications is closer; Private Cloud can provide that. Other services provided over the Web can afford to suffer latency.

E. Cost

High bandwidth data consumption on Public Cloud will be of very high cost for enterprise workloads. Instead the use of Private Cloud for such high performance needs can greatly reduce costs.

F. Hybrid Cloud

A consideration must be also allowed for the Hybrid Cloud infrastructure which is partial Private Cloud and partial Public/Community Cloud. Is certain organisations this scheme may workout well. A fore thinking design team must consider this to provide better services efficiently.

IV. AVAILABLE TECHNOLOGIES

The next step after assessment is to implement the design. Popular IT infrastructure providers have an array of services which can be deployed easily to satisfy many corporate needs. But in an event of customisation and flexibility, the platform may seem a bit rigid to accommodate.

We enlist here two upcoming Open Source vendors who do so by allowing cost-effective and customisable platforms. Such platforms make a huge difference to the small business sector and also to educational institutions; who would want to deploy and manage their own Private Cloud. Below we can find a feature-by-feature comparison between Eucalyptus and OpenStack:

A. Eucalyptus

Eucalyptus [6] is an open source cloud computing platform for building Amazon Web Services (AWS)-compatible private and hybrid cloud computing environments.It started as a project at Rice University which became a company, Eucalyptus Systems.

B. OpenStack

OpenStack [7] is an open source cloud computing platform for public and private clouds. It was founded by Rackspace Hosting and NASA. It is released under the terms of the Apache License and managed by OpenStack Foundation,a non-profit corporate entity.

The differences between these two platforms is discussed below in the Table I. We concentrate on few noteworthy differences in different aspects, which will affect different needs of the organisation who would want to use them.

TABLE I. A TABLE OF COMPARISON BETWEEN EUCALYPTUS AND OPENSTACK

	Eucalyptus [8], [6]	OpenStack [7], [9]
Computing	The Node Controller is the core component written in C and hosts the virtual machine instances and manages the virtual network endpoints. It downloads and caches images from Walrus (which offers persistent storage to all of the virtual machines) as well as creates and stores instances. While there is no any limit to the number of Node Controllers, performance limits do exist.	OpenStack's computing Component called Nova is core part of an IaaS system. It is developed in Python and uses many external libraries such as Eventlet (for concurrent programming) and SQLAlchemy (for database access).Computations architecture is designed to scale horizontally on standard hardware.

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Storage	The Storage Controller is a component is written in Java and is the Eucalyptus equivalent to AWS (Amazon Web Services). It communicates with the Cluster (Servers in Grid) Controller and Node Controller and manages Eucalyptus block volumes and snapshots to the instances within its cluster. If an instance requires writing data to memory outside of the cluster, it should to write to Walrus, which is available to any instance in any cluster.	*Object Storage*: It is a scalable redundant storage system. Files are written to multiple disk drives spread throughout servers in the data centre, with the help of OpenStack software for ensuring data replication and integrity across the cluster. Storage clusters (Servers in Grid) scale horizontally simply by adding new servers. If server or hard drive fails, OpenStack cache its content from other active nodes to new locations in the cluster. *Block Storage*: It provides persistent block-level storage devices for use with OpenStack compute instances. It manages the creation, connection and detaching of the block devices to servers.
Networking	There are three networking modes. *Managed Mode*: In this Mode Eucalyptus manages a local network of instances, including security groups and IP addresses. *System Mode*: In this Mode, Eucalyptus assigns a MAC address and attaches the instance's network interface to the physical network through the Node Controller's bridge. System Mode does not offer flexibility in IP addresses, or VM isolation. *Static Mode*: In this Mode, Eucalyptus assigns IP addresses to instances. This Mode also does not offer flexibility in IPs, security groups, or VM isolation.	OpenStack Networking is a system for managing networks and IP addresses, it manages IP addresses, allowing for dedicated static IP addresses or DHCP. It also allows to manage traffic by dynamically rerouting IP addresses to any of your computing resources, which allows you to redirect traffic during maintenance or in the case of system failure .It also provides flexibility to users so that they can create their own networks, manage traffic and connect servers and device to one or more networks.
GUI	The Cloud Controller is a Java program that offers compatible interfaces, as well as a web interface to the users like the Eucalyptus User Console (GUI-based tool). In addition to handling incoming requests, the Controller also acts as the administrative interface for cloud management and performs high-level resource scheduling and system accounting. The Controller also accepts user API requests from command-line interfaces like euca2ools and manages the underlying computing, storage, and network sources. Only one Cloud Controller can exist per cloud which handles authentication, accounting and reporting.	OpenStack also provides administrators and users a graphical interface to access to cloud based resources.

V. ANALYSIS

As we have analysed these Open Source Cloud computing platforms, we can say that there are technical as well as philosophical differences [10] between them on overall design.

Eucalyptus on Ubuntu is argued to be a very viable platform in [1], based on limited resources for academic or educational institutions. Basic needs in such environments is that it opens up for a lot of experimentation.

But with OpenStack, its real strength is as a framework for integrating and orchestrating all the different technologies that go into building and running a production cloud, also with its flexibility for scaling and strong security features. We suggest Openstack is best suited for private cloud than Eucalyptus as it gives both the customisability of OSS and industry reliability.

VI. CONCLUSION

Cloud computing is the future in IT resource management. And all IT dependent industries need to move towards the Cloud and many are making great strides towards it. As the resources and service managed become mobile and are hosted on public networks, Private Cloud can provide a relief in manage high performance and sensitive services for organisations. Furthermore it reduces cost and also provides an in-house flexible way to manage Cloud services within an organisation. With the enumerated services and platforms in this paper we can conceive a lot more to come in this field.

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