A Survey on Build Private Cloud Computing implementation tools

[1]Rana M Pir, [2]Rumel M S Pir, [3]Imtiaz U Ahmed

[1]Lecturer, [2]Assistant Professor, [3]Lecturer
[1]Leading University, Sylhet Bangladesh,
[2] Leading University, Sylhet Bangladesh,
[3]Cox's bazar International University Bangladesh

_____

Abstract— **Nowadays Cloud computing is an attractive computing model since it allows for resources to be provisioned according on a demand basis. Cloud users can rent or shared resources as they become required. This model motivated several software industry and academic, non-academic institutions to develop cloud solutions. This paper presents and discusses the how to create own cloud using state-of-the of different solutions for cloud computing and also discuss which are the solutions available and what are the challenge to build own private cloud.**

Index Terms—**Cloud Computing, Virtualization, Nodes, Private Cloud, Data Center.**
_____

I. INTRODUCTION

Cloud Computing has kicked off the next big wave in business computing, namely Private Cloud Computing. It is offering many benefits including business agility, security, scalability and reduced administration resulting in a lower Total Cost of Ownership for any size and type of company. The recent innovations in mobile device and virtualization technologies, including today's comprehensive wireless access to high-speed Internet, have all contributed to the acceleration of Cloud Computing.
Well respected analysts are predicting exceptional growth for Cloud Computing products and services in the coming years.
Some of open source solution like Eucalyptus,Openstack,Cloudstack, Xen Cloud Platform (XCP)   and licensed version like Microsoft System center, VMware and Rackspace Cloud solution provides to build own private cloud..
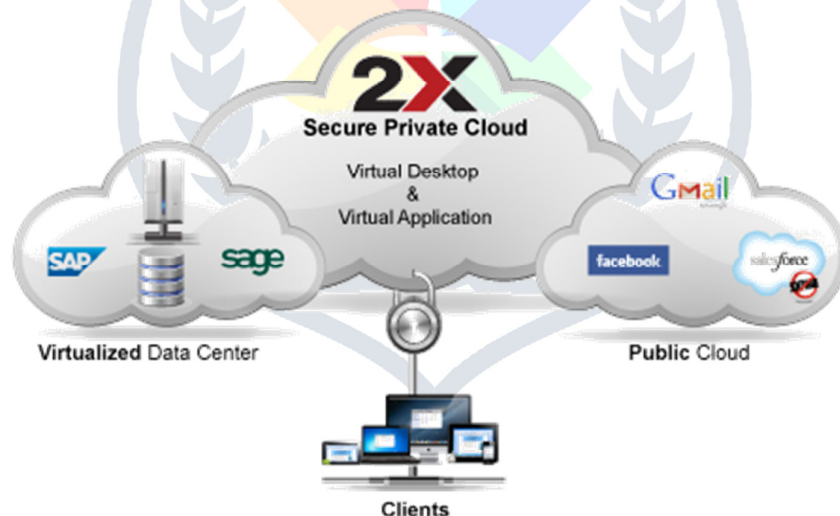
II. ABOUT PRIVATE CLOUD COMPUTING

Cloud Computing began with the Public Cloud where a service provider makes resources available to the public either for free or with a pay as you go model. This can include computing services, applications and storage. This model is low cost and easy to set up with no need to worry about scalability as you only pay for what you use. Examples of the Public Cloud include Google Apps and Amazon Web Services.

The Public Cloud addressed the needs of the market but it was not tailored to the needs of individual companies. While it offers many benefits, there are certain applications that require stricter control over data. This has lead to the evolution of Private Cloud Computing or delivering IT as a service securely within your own infrastructure.

The reality is that most organizations are in fact offering a Hybrid Cloud, combining the best of both worlds from the Public Cloud and Private Cloud. Ideally, the hybrid approach allows a business to take advantage of the scalability and cost-effectiveness that a public cloud computing environment offers without exposing mission-critical applications and data to third-party vulnerabilities.

Therefore, the Private Cloud becomes an inevitable necessity. In this guide we will discuss exactly what Private Cloud Computing is, how to implement it and the benefits it can bring to your organization.

III. PRIVATE CLOUD COMPUTING

The Private Cloud is essentially a Cloud Infrastructure that operates solely for a single organization or where the service access is limited to a specific group of people. Private Cloud Computing is comprised of networking, server hardware (which usually provides server virtualization), storage and management tools and Application management tools. This is most often managed internally but also can be hosted externally by a Managed Service Provider (MSP), which is then known as a Virtual Private Cloud.

Benefits of Private Cloud Computing

- **Mobility / Access** – Private Cloud computing provides simple and secure access whenever you want, wherever you are.
- **Scalability** – Private Cloud computing allows seamless scalability for your business.
- **Data Security** – Private Cloud computing provide the security concerns around Public Cloud computing by allowing companies to maintain own security policy and control of access to data.
- **Offsite Data Backup** – the Private Cloud ensures your data is safely backed up on an offsite location.
- **Universal Printing & Scanning** – Private Cloud Computing provides easily accessible printing and scanning from any location.
- **Client Device Independent** – enable the use of employees' own mobile device without compromising security.
- **Resource Sharing** – a Private Cloud solution ensures organizational efficiency through effective resource sharing.
- **Reduced Workload for IT Administrators** – by using built-in automation tools for Private Cloud solutions, the workload for IT administrators is reduced.
- **Business Agility** – using virtual servers instead of physical servers, IT administrators can quickly scale-up capacity as required, and deploy new applications quickly without the need to build and test hardware.
- **Uptime & High Availability** – the systems management tools of Private Cloud computing can detect when the infrastructure supporting an application is about to go down, and launch a new virtual machine to shift the load over.
- **Uptime & Reliability** – business critical applications can be kept within the Private Cloud by applying SLA's so they continue to operate in an outage, while less important services can be supported cost-effectively to the Public Cloud.
- **Capital Expenditure** – Private Cloud computing eliminates the cost for constant hardware and software upgrades, therefore reducing IT related capital expenditure.
- **Control over Regulatory Environments** – the Private Cloud allows for adherence to regulatory constraints around data locality, disaster recovery and privacy.

IV. CREATING A PRIVATE CLOUD

Once the benefits of Private Cloud computing are understood the right model must be selected to fit the business needs. There are several questions that have to be answered in order to setup a Private Cloud. Should you build your own Private Cloud or a Virtual Private Cloud? Which Cloud Solution used for build Private cloud? What platform will be used to create the infrastructure? Can security threats be contained? How will it be managed?

Here we discuss some open source and licensed version of cloud Solution.

Eucalyptus:

 Eucalyptus is an open source cloud platform that enables organizations to create private clouds inside their data centers using existing virtualized infrastructure. Eucalyptus enables IT organizations to build Amazon Web Services (AWS)-compatible private clouds that can pool together existing virtualized IT resources and provide them to its customers in a flexible, on-demand, pay-as-you-go basis.

The Eucalyptus cloud platform primarily comprises of five main components, each briefly explained below: Cloud controller (CLC): The cloud controller is essentially a Web-based interface between Eucalyptus and the outside world. It provides cloud administrators an interface with which they can configure and manage the cloud's underlying compute, storage and network resources. It also handles high-level user authentication, quota management along with a few basic accounting and reporting mechanisms. Users can also query the CLC using Eucalyptus's command line tools called Euca2ools.
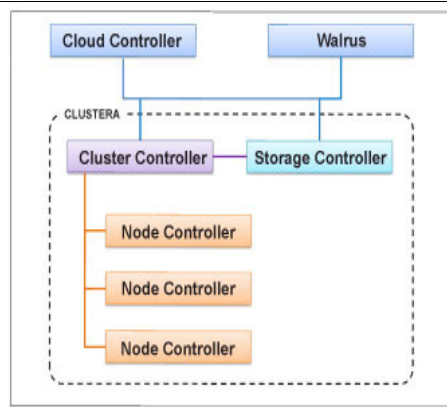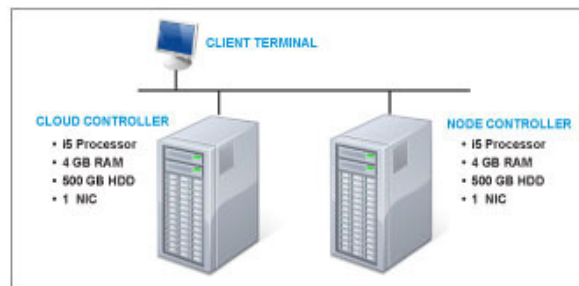
Figure1: Eucalyptus architecture
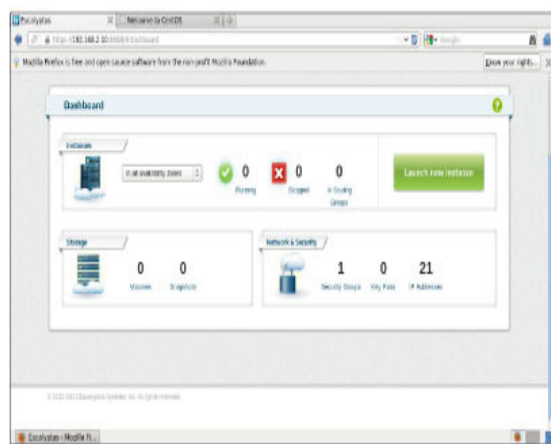
Figure 2: A demo set-up
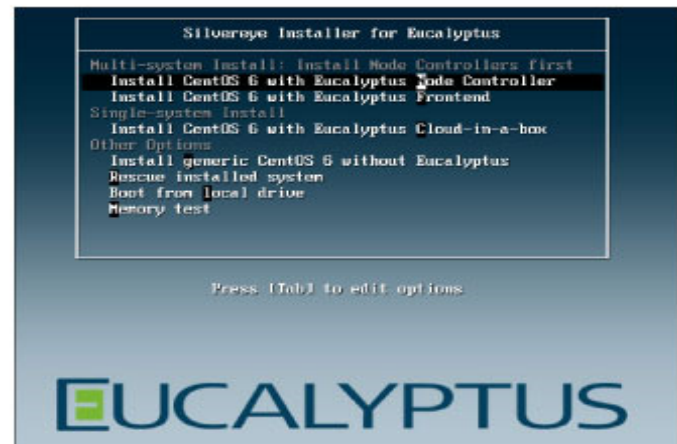

Figure 4: The Eucalyptus user console

Figure 3: Eucalyptus Faststart boot screen

OpenStack:

OpenStack is represented by three core open source projects (as shown in Figure 2): Nova (compute), Swift (object storage), and Glance (VM repository). Nova, or OpenStack Compute, provides the management of VM instances across a network of servers. Its application programming interfaces (APIs) provide compute orchestration for an approach that attempts to be agnostic not only of physical hardware but also of hypervisors. Note that Nova provides not only an OpenStack API for management but an Amazon EC2-compatible API for those comfortable with that interface. Nova supports proprietary hypervisors for organizations that use them, but more importantly, it supports hypervisors like Xen and Kernel Virtual Machine (KVM) as well as operating system virtualization such as Linux® Containers. For development purposes, you can also use emulation solutions like QEMU.

Swift, or OpenStack Object Storage, is a project that provides scalable and redundant storage clusters using standard servers with commodity hard disks. Swift does not represent a file system but instead implements a more traditional object storage system for long-term storage of primarily static data (one key usage model is static VM images). Swift has no centralized controller, which

improves and overall scalability. It internally manages replication (without redundant array of independent disks) across the cluster to improve reliability.
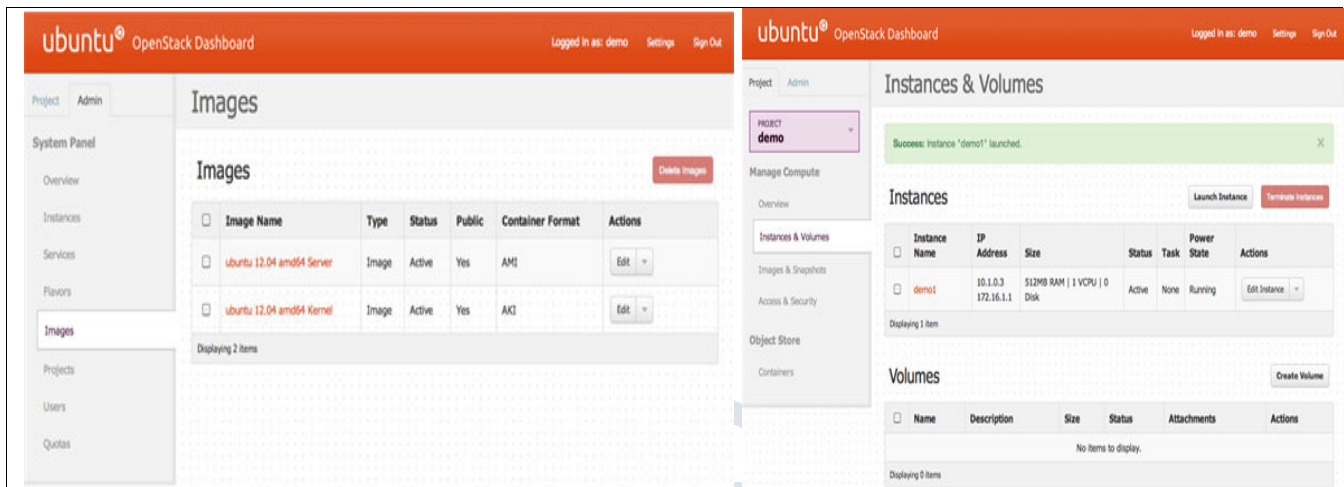

Apache CloudStack:

Apache CloudStack is a top-level project of the Apache Software Foundation (ASF). The project develops open source software for deploying public and private Infrastructure-as-a-Service (IaaS) clouds.

CloudStack provides multiple methods for interacting with the CloudStack compute platform. Users can request resources through a rich menu-driven web interface. Operations personnel can use an enhanced version of the web interface or interact with CloudStack's RESTful API or command line interface (CLI). The new 3.0 UI takes things up a notch making it very intuitive for users to administer their own cloud computing so administrators can delegate infrastructure provisioning and focus on more high value tasks than spinning up servers.
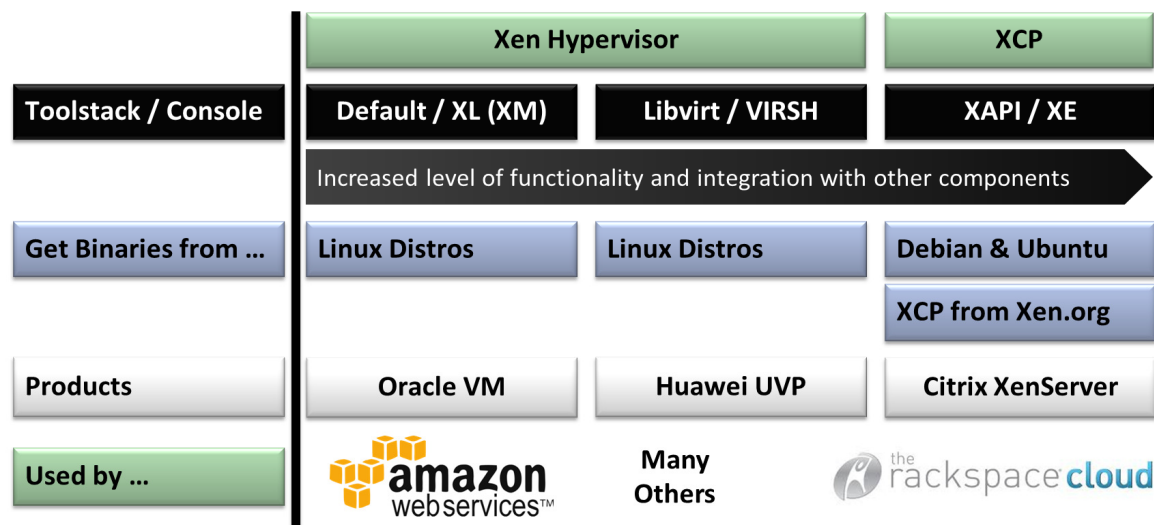
Another thing that I think sets CloudStack apart is it's networking-as-a-service capabilities. CloudStack administrator can create any number of custom network offerings in addition to the default network offerings provided by CloudStack. These offerings can be attached to the virtualized machines deployed by Cloudstack. Cloudstack allows user to choose the type of network architecture that best fits their needs. Out-of-the-box support includes the Basic Network, or flat network mode or advanced networking VLAN support and integration of network elements including external firewalls and load balancers. Administrators can offer different classes of service on a single multi-tenant physical network with a combination of networking offerings that include DHCP, Source Network Address Translation (NAT), Gateway, Load Balancing, Firewall, VPN, and Port Forwarding.
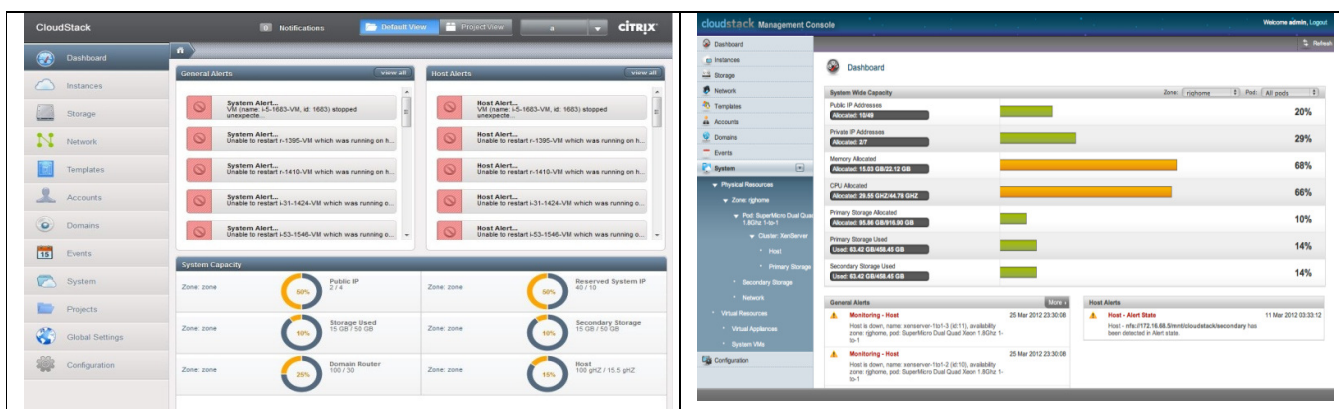
Xen Server (Xen hypervisor):

Xen – An open source hypervisor which originated in a 2003 Cambridge University research project. It runs on Linux (though being a Type 1 hypervisor, more properly one might say that its dom0 host runs on Linux, which in turn runs on Xen). It was originally supported by XenSource Inc, which was acquired by Citrix Inc in 2007.

The Xen hypervisor is the most used virtualization platform in the cloud computing space. With leading vendors such as Amazon, Cloud.com, GoGrid, and Rackspace all using Xen, the community is able to ensure that their scalability and performance needs are met. In fact, the largest virtualization deployments in the world are primarily running the Xen hypervisor in a cloud computing environment. To better support these cloud providers, the Xen.org community created a new project in 2009, Xen Cloud Platform. Xen Cloud Platform offers ISVs and service providers a complete cloud infrastructure platform with a powerful management stack based on open, standards-based APIs, support for multi-tenancy, SLA guarantees and detailed metrics for consumption based charging. Using Xen hypervisor and Xen XCP we build Private Cloud.

	Xen Hypervisor		XCP
Toolstack / Console	Default / XL (XM)	Libvirt / VIRSH	XAPI / XE
	Increased level of functionality and integration with other components		
Get Binaries from …	Linux Distros	Linux Distros	Debian & Ubuntu
			XCP from Xen.org
Products	Oracle VM	Huawei UVP	Citrix XenServer
Used by …	amazon webservices™	Many Others	the rackspace cloud

Vmware:

VMware – is not a hypervisor, but the name of a company, VMware Inc. Our experience with VMware involves its vSphere product. vSphere uses VMware's ESXi hypervisor. VMware's hypervisor is very mature and extremely stable.

VMware Infrastructure is a full infrastructure virtualization suite that provides comprehensive virtualization, management, resource optimization, application availability, and operational automation capabilities in an integrated offering. VMware Infrastructure virtualizes and aggregates the underlying physical hardware resources across multiple systems and provides pools of virtual resources to datacenter in the virtual environment

In addition, VMware Infrastructure brings about a set of distributed services that enables fine-grain, policy-driven resource allocation, high availability, and consolidated backup of the entire virtual datacenter. These distributed services enable an IT organization to establish and meet their production Service Level Agreements with their customers in a cost effective manner.
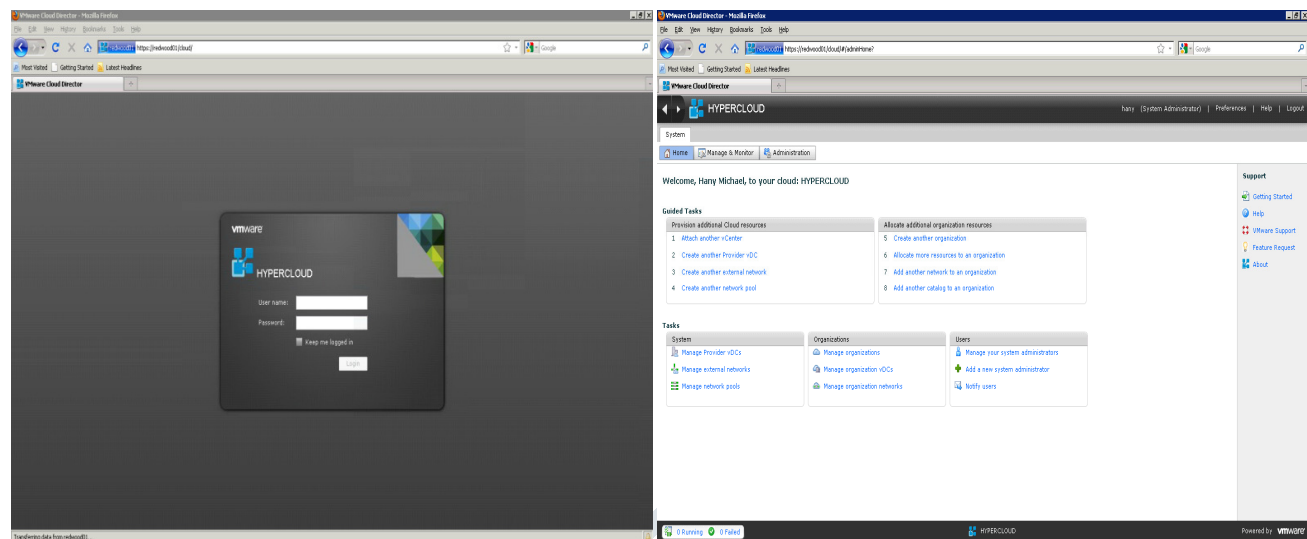
Microsoft System Center 2012:

Hyper-V – Hyper-V is a commercial hypervisor provided by Microsoft. Whilst excellent for running Windows, being a hypervisor it will run any operating system supported by the hardware platform.

Microsoft System Center 2012 is a bundled suite of systems management products that offers tools to monitor and automate virtualized environments, including private clouds based on Microsoft Hyper-V.

While all Microsoft System Center products were previously offered in standalone versions, System Center 2012 will now only be licensed as a bundled offering. This updated licensing structure is seen as a move to compete with VMware's vCenter systems management product.

System Center 2012 is available in two editions -- Standard, which can be deployed to a maximum of two virtual machines (VMs) and Datacenter, which allows for deployment to unlimited VMs. The release candidate (RC) version of the software was made available in January 2012.

The products in the System Center 2012 suite include:

- System Center Operations Manager
- System Center Configuration Manager
- System Center Endpoint Protection Manager (now integrated into Configuration Manager)
- System Center Virtual Machine Manager
- System Center Data Protection Manager
- System Center Orchestrator
- System Center App Controller
- System Center Service Manager
- System Center Advisor

System Center 2012 helps you manage your IT environments across traditional datacenters, private and public clouds, client computers, and devices. Using these integrated and automated management capabilities, you can become a trusted service provider for your business. System Center captures and aggregates knowledge about systems, policies, processes, and best practices so that you can optimize your infrastructure to reduce costs, improve application availability, and enhance service delivery.

System Center 2012 provides comprehensive management from the desktop to the datacenter:
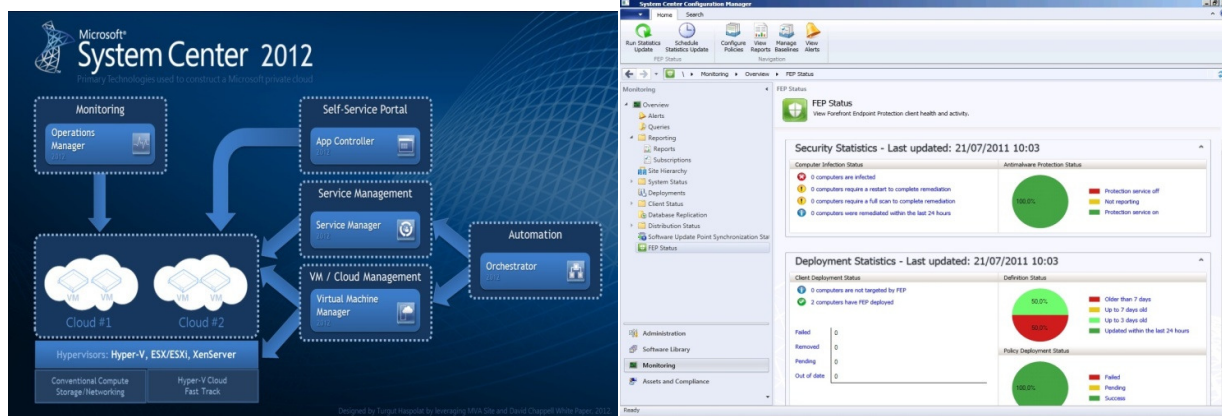
The **Rackspace Cloud** is a set of cloud computing products and services billed on a utility computing basis from the US-based company Rackspace. Offerings include web application hosting or platform as a service ("*Cloud Sites*"), Cloud Storage ("*Cloud Files*"), virtual private server ("*Cloud Servers*"), load balancers, databases, backup, and monitoring.

 KVM – a Linux based open source hypervisor. First introduced into the Linux kernel in February 2007, it is now a mature hypervisor and is probably the most widely deployed open source hypervisor in an open source environment. KVM is used in products such as Redhat Enterprise Virtualization (RHEV).

V. CONCLUSION

The evolution of Private Cloud computing is beginning to deliver on its promise, and many Company and organizations have started to build own cloud computing for Scalability, Security, Availability, Concurrency, Access of Control and Cost Transparency. Many Cloud Solutions are available for build own cloud and get benefits of Cloud computing.

REFERENCES

[1] http://www.2x.com/downloads/docs/en/whitepapers/pdf/Private_Cloud_Computing_Essentials.pdf

[2] Andersen, D. (2002) "Theoretical Approaches to Node Assignment", Unpublished manuscript. http://www.cs.cmu.edu/dga/papers/andersen-assign.ps

[3] Armbrust, M., Fox, A., Griffith, R., Joseph, A.D., Katz, R.H., Konwinski, A., Lee, G., Patterson, D.A., Rabkin, A., Stoica, I., Zaharia, M. (2009) "Above the Clouds: A Berkeley View of Cloud Computing", Tech. Rep. UCB/EECS-2009-28, EECS Department, University of California, Berkeley.

[4] Barham, P., Dragovic, B., Fraser, K., Hand, S., Harris, T., Ho, A., Neugebauer, R., Pratt, I. and Warfield, A. (2003) "Xen and the art of virtualization". In: 19th ACM symposium on Operating systems principles, New York, NY, USA.

[5] Buyya, R., Yeo, C.S., Venugopal, S., Broberg, J., Brandic, I. (2009) "Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility". In: Future Generation Computer Systems, Elsevier B. V.

[6] Chowdhury, N.M. M. K. and Boutaba, R. (2010) "A survey of network virtualization". In: Computer Networks, volume 54, issue 5, pages 862-876. Elsevier B. V.

[7] Citrix Systems. (2010) "Xen Cloud Platform - Advanced Virtualization Infrastructure for the Clouds", http://www.xen.org/products/cloudxen.html.

[8] Citrix Systems. (2010) "Xen Hypervisor", http://xen.org/products/xenhyp.html.

[9] AMAZON. (2006) "AMAZON SIMPLE STORAGE SERVICE (AMAZON S3) – API REFERENCE", HTTP://DOCS.AMAZONWEBSERVICES.COM/AMAZONS3/2006-03-01/.

[10] *System Center - Microsoft* www.microsoft.com/en-us/server-cloud/.../system-center-2012-r2/