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OpenStack and Cloud Computing

OpenStack – A Primmer…….. And Obvious Evidence The Road To Adoption Is In Full Force……………

Anyone that is remotely paying attention to all the Cloud Technologies discussions in the last 12-18 month have heard of OpenStack. Companies that are looking to reap the rewards of Cloud Computing will often hear things like, "Open-source, avoiding vendor lock in, IaaS, time to market, flexibility, Capex vs Opex and control. What does all this mean?

Overview: Cloud Computing / Cloud Deployment Types/ Cloud Service Categories

In order to obtain a better understanding of OpenStack it is important to have a fairly good background of Cloud Computing, Cloud Deployment Types and Cloud Service Categories.

Cloud Computing - As I mentioned in one of my other Cloud articles, a new company starting out would never consider building a power plant in their back lot. They would simply call their energy company and start the service. The advantages of not building your own energy power plant in your back yard is rather similar in today's Cloud technology where a modern IT organization might not want to rely on the normal data centers that are used today since they are significantly inefficient. The key elements of Cloud computing are the following:

- *On-demand self-service-* Provision capabilities such as server time and network storage as needed
- *Broad network access* – Available over the network via workstations, laptops, mobile phones, etc.
- *Location transparent resource pooling* – Resources are pooled to serve multiple consumers with different physical and virtual resources with location independence.
- *Rapid elasticity* – Provisioned and released sometimes automatically. Scale rapidly with demand and often appear to be unlimited
- *Measured service with pay per use* – Metering capability to the type of service (storage, processing, and bandwidth) monitored, controlled.

Cloud Deployment Types - The Cloud is not actually a technology, it can be seen as more of an approach to building IT services by harnesses the power of servers, as well as virtualization technologies that combine servers into large computing pools and divide single servers into multiple virtual machines. And there are several different deployment models for implementing cloud technology. Cloud services can be deployed in different ways, depending on the organizational structure and the provisioning location. The three main deployment models are the following

- Public Clouds – Owned by the company providing the Cloud services and users share hardware with other users
- Private Clouds - Owned by the user company as well as managing the hardware and software
- Hybrid Clouds – Combination of public and private Clouds (critical/sensitive date would be handled by the Private Cloud)

Cloud Service Categories – In the last few years several new Cloud service categories are beginning to surface but the three most common are the following.

- Infrastructure as a Service (IaaS) - The IaaS layer offers storage and compute resources that developers and IT organizations can use to deliver business solutions.

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- o   Examples: Amazon AWS, Rackspace, Google Cloud Storage, IBM
- **Platform as a Service (PaaS)** - The PaaS layer offers black-box services with which developers can build applications on top of the compute infrastructure.
  - o   Examples: Windows Azure, Force.com, Cloud Foundry, NetSuite, IBM BlueMix)
- **Software as a Service (SaaS)-** In the SaaS layer, the service provider hosts the software and maintains it.
  - o   Examples:, Salesforce, Google Apps, Concur)

OpenStack

OpenStack is a cloud operating system that controls large pools of compute, storage, and networking resources throughout a datacenter, all managed through a dashboard that gives administrators control while empowering their users to provision resources through a web interface. In general it is Infrastructure as a Service (IaaS) operating system for building and managing cloud computing platforms for public, private and Hybrid clouds. Cloud computing can often mean different things, but typically the industry talks about running different items "as a service"—software, platforms, and infrastructure. OpenStack falls into the latter category and is considered Infrastructure as a Service (IaaS) The main task of OpenStack it to provision Virtual machines (VM's *in Cloud language) and related services.*

OpenStack History – The beginnings started in July 2010 when NASA and Rackspace combined forces and started an open source based Cloud platform and named it OpenStack. The major contribution at that time was NASA giving the NOVA (compute) component and Rackspace giving Swift (storage). Sometime later other companies made contributions making more applications integrated with OpenStack. The first release was in late 2010 which was named Austin and new releases come about every six months with the most recent release in April 2014 which was named "Ice House". OpenStack is managed by the OpenStack Foundation, a non-profit which oversees both development and community-building around the project. The Foundation has more than 16,000 members from 140 countries and over 850 different organizations and have received more than $10 million in funding to fulfill the OpenStack mission of becoming the ubiquitous cloud computing platform.

Open Source – OpenStack is a cloud computing platform available to anyone and it is freely licensed to use, copy, study, and change the software in any way, and the source code is openly shared so that people are encouraged to voluntarily improve the design of the software. This is in contrast to proprietary software, where the software is under restrictive copyright and the source code is usually hidden from the users. OpenStack is released under the terms of the Apache License 2.0. Because of its open nature, companies and individuals can add additional components to OpenStack to help it to meet their needs. The goal of the OpenStack Foundation is to serve developers, users, and the entire ecosystem by providing a set of shared resources to grow the footprint of public and private OpenStack clouds, enable technology vendors targeting the platform and assist developers in producing the best cloud software in the industry. At the core of OpenStack is the community and collaboration. The same rules for the code apply to documentation too. Ideally any code contribution that is merged into the base has documentation to go with it.

Code release process- OpenStack is currently on a 6-month release cycle that is normally in line with Ubuntu-*Linux* operation system revisions. The stages are planning, design summits, launch pad blueprints, Implementation, QA and release.

OpenStack Building Modules – The OpenStack community has collaboratively identified several "Programs" of OpenStack, which are distributed as a part of any OpenStack system and officially maintained by the OpenStack community. Having a modular approach while keeping the stack open source provides an easy integration between the modules. Each module has minimum dependency on each other.

- Object Store (codenamed "Swift") provides object storage.
- Image (codenamed "Glance") provides a catalog and repository for virtual disk images.
- Compute (codenamed "Nova") provides virtual servers upon demand.
- Dashboard (codenamed "Horizon") provides a modular web-based user interface for all the OpenStack services.
- Identity (codenamed "Keystone") provides authentication and authorization for all the OpenStack services
- Network (codenamed "Neutron") provides "network connectivity as a service" between interface devices managed by other OpenStack services (most likely Nova).
- Block Storage (codenamed "Cinder") provides persistent block storage to guest VMs.
- Metering (Codename Ceilometer) provides telemetry services, which allow the cloud to provide billing services to individual users of the cloud.
- Orchestration (codename "**Heat")** is the component of OpenStack, which allows developers to store the requirements of a cloud application in a file that defines what resources are necessary for that application.

- Database Service (Code name "Trove") allows users to quickly and easily utilize the features of a relational database without the burden of handling complex administrative tasks.
- Key management (Code name "*Barbican*") ReST API designed for the secure storage, provisioning and management of secrets
- Common Libraries (Code name "Oslo") a set of python libraries containing code shared by OpenStack projects

The following are new capabilities under development for the Juno revision and beyond:

- Bare metal (Code name "*Ironic*") provides the capability to provision bare metal servers
- Queue service (Code name "*Marconi*") cloud messaging and notification service for developers building applications on top of OpenStack
- Data processing (Code name "*Sahara*") simple means to provision a Hadoop cluster on top of OpenStack

With every new release, more and more automation is coming in OpenStack which is making it the choice of Cloud Operation system

No Vendor lock-In- Since OpenStack is an open standard and most of the IT vendors are supporting OpenStack resulting on no single vendor lock-in. Having an open standard removes the concern of a proprietary single vendor lock-in for customers and creates a large ecosystem that spans and scales. Corporations, service providers, large/small business need to deploy large scale Cloud deployments but in order to do these very complex deployments a solid operating system is needed in order to tie things together and do critical automation for on demand usage. There are solutions available in the market but they come with issues such as customer lock-in. The OpenStack approach is to have cloud operating system as open, which prevents a single vendor lock-in situation, and since it is open it is highly cost effective for all customers. Many companies will make code contributions and the dependency on a single type of hardware will be low with the assurance the solution will work with any hardware.

Evidence Of OpenStack Adoption

Gartner- Lydia Leong a VP Analyst in the Technology and Service Provider group at Gartner was right on target with her prediction in September 2012 when she felt the OpenStack industry was 18-24 months from real commercial adoption of OpenStack would begin. "OpenStack seems to be on the cusp of that tipping point. OpenStack is truly becoming a *business"*

OpenStack Summit- In May 2014 in Atlanta drew 4,500 attendees, a 50% increase from the Hong Kong Summit six months earlier. Two years ago OpenStack conference attracted about 1,200 attendees. The user survey for the 2014 Summit has a significant amount of information such as business drivers, deployment types and industries.

- Five of the seven largest telcos were in Atlanta and the top three (AT&T, Verizon, and Comcast) talked about their deployments.
- About a third of the Fortune 100 was represented in Atlanta, as users, devs, operators, vendors or participants.
- 39% of commercial banks in the Fortune 500 were present in Atlanta, including the top three. Six of the top eight were present.
- More than two dozen users spoke at the Summit, in keynotes, solo presentations, panels, and vendor sessions.

If you were unable to attend the Summit you can see the presentations and videos on the OpenStack.org web site.

OpenStack job trends - According to the OpenStack Foundation, which cited the job-search website indeed.com as its source. Average yearly salary of an OpenStack engineer is US$133,000, compared to $98,000 an average non-OpenStack cloud engineer makes. The number of OpenStack engineering jobs posted this year was double the number of similar job postings last year, according to a blog entry by Claire Massey, an OpenStack Foundation marketing coordinator. She cited a BSA Global Cloud Scorecard report that predicted that 14 million cloud jobs will be created by 2015.

Industry Vendors – In every single category the top three vendors support OpenStack and the list of other vendors is growing every quarter. Cisco recently announced in April 2014 a $1 billion investment in its "Cisco Cloud Services," based on OpenStack. HP, for example, recently rebranded its cloud portfolio to be named Helion and announced a $1 billion commitment to developing its cloud based on OpenStack.

- Top 3 router vendors: Cisco, Juniper, Alcatel
- Top 3 x86 vendors: HP, Dell, IBM
- Top 3 blade vendors: HP, Cisco, IBM
- Top 3 Linux vendors: Red Hat, Canonica, SUSE
- Top 3 switch vendors: Cisco, Juniper, HP
- Top 3 Storage vendors: EMC, IBM, NetApp
- Top 3 Hypervisors: KVM, Xen (both Open source) ESXi -VMware

OpenStack vendors - There are several companies that offer services around OpenStack. Their services vary to a certain degree and some of them are taking the same source code and staying close to the original version. *"It's important that OpenStack distribution vendors not stray too far from the original code, or 'trunk', for two reasons. Besides the fact that one of the main reasons to come to OpenStack is the lack of vendor lock-in -- that's a given -- it's crucial for other vendors, such as storage and network providers, who need to be absolutely certain their drivers will work with any OpenStack distribution." -- Nick Chase, Mirantis Technical Marketing Manager*

As a vendor starts to and modify the source code to the point it to something very different they can no longer call it OpenStack. Companies that want to be a part of OpenStack but start to "wander off the reservation" will be missing out on this massive community of open source innovation and this was the reason why they became involved in OpenStack in the first place. The OpenStack foundation tracks the companies that support OpenStack

The following are some of OpenStack vendors (not ranked in any order) but not all of the companies have a clearly defined roadmap of all of their products and services surrounded by OpenStack.

- IBM
- Mirantis
- VMware
- Rackspace
- Red Hat
- Piston Cloud Computing Co.
- Canonical
- HP
- Cloudscaling
- SUSE
- Nebula
- Metacloud

OpenStack Code contributions – A visual representation of code contributions to OpenStack will show that several well-known companies such as HP, Redhat, Mirantis, Rackspace, IBM, and several other companies are making contributions in just about every release

OpenStack vs OpenNebula vs Eucalytpus vs CloudStack- A community analysis project was complete in January 2014 which gives an excellent representation of the various level of activity between all three technologies in IaaS, in every area listed OpenStack is the leader. OpenNebula, Eucalyptus and CloudStack are all Amazon API.

In the next 12-18 months more companies are going to be making the effort in learning more about the advantages of migration their IT services to some kind of Cloud technology (Public, Private, Hybrid) and a part of this process will certainly be around OpenStack, the momentum is obvious and the adoption is in full force.

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