TECHNOLOGY ASSESSMENT

OpenStack: Approaching Critical Mass

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IDC OPINION

The battle for the cloud system software market is building as virtualization evolves into IaaS clouds. Established proprietary virtualization vendors like VMware and Microsoft have a big enterprise presence and want to convert that into cloud business. On the open source side, there are no less than four major projects competing for resources, with OpenStack attracting much of the attention. OpenStack has built a tremendous amount of momentum and industry support. Findings include:

☒ With the creation of the OpenStack Foundation, the community will accelerate and 2013 is shaping up to be a big commercial test of OpenStack in the market as several public clouds and software distributions go to market.

☒ OpenStack has several key technology and business challenges to address as it competes for the open cloud throne. If it can successfully navigate these challenges, IDC believes that OpenStack can be a significant player in the cloud market and disrupt and spread out in a variety of ways much like Linux did before it.

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Cloud and Virtualization System Software: Technology Assessment

IN THIS STUDY

This IDC study examines the readiness of OpenStack to address the public and the private cloud markets. OpenStack is an open source project that has been building a considerable amount of industry support and is reminiscent of the meteoric rise of Linux more than a decade ago.

SITUATION OVERVIEW

Much of the virtualization battle today has moved beyond the hypervisor and into a layer of system software above it to create IaaS clouds, which IDC terms cloud system software. Cloud system software presents an additional higher level of abstraction above the hypervisor, and instead of presenting virtualization APIs, it exposes cloud APIs. Cloud system software also goes beyond compute, tightly integrating similar technologies in storage and networking. Full cloud software suites can also include higher-level systems management software.

The cloud system software market is diverging into two primary classes. One, a public cloud–inspired model that was pioneered by Amazon:

☑ Is designed for maximum scale and cost efficiency

☑ Focuses on availability by zones instead of by VM, with more of the availability responsibility as part of the application architecture

☑ Provides cloud services such as object storage, elastic scaling, load balancing, and database

☑ Leans toward commodity hardware

☑ Focuses on new apps written for cloud environments

☑ Is designed to create types and levels of services, which apps are then written to utilize

The other primary type of cloud system software is an evolution of traditional enterprise server virtualization seen more in private cloud deployments and:

☑ Is compatible with existing applications

☑ Focuses on making sure mission-critical VMs never go down, with availability primarily a function of the infrastructure

☑ Accommodates enterprise hardware and architectures (SANs, VLANs, etc.)

☑ Is designed and tuned to meet individual application requirements

Traditional enterprise players like VMware and Microsoft are strong in the private cloud market, evolving their virtualization install bases into clouds. Newer open source cloud projects like OpenStack, CloudStack, and Eucalyptus were started to

create Amazon-style public clouds. As these vendors mature, each is beginning to pick up characteristics of the other, allowing customers to deploy both styles of cloud with the same software platform and more hybrid styles with characteristics of public and private types.

OpenStack is arguably the hottest open source cloud system software project today, with tremendous industry momentum and backing. Control of the project, which was started by Rackspace and NASA as an open alternative to VMware and Amazon, has been passed onto the newly created OpenStack Foundation. The foundation is charged with promoting the development, distribution, and adoption of OpenStack. Key members of the foundation include:

☑ **Platinum:** AT&T, Canonical (Ubuntu), HP, IBM, Nebula, Rackspace, Red Hat, and SUSE

☑ **Gold:** Cisco, Cloudscaling, Dell, DreamHost, Intel, Mirantis, Morphlabs, NEC, NetApp, Piston, VMware, and Yahoo!

Platinum and Gold members must commit a set amount of monetary and developer resources to the project, but membership levels also extend to individuals and corporations that don't need to pay fees and can participate in development or community building. According to the foundation, membership currently is composed of more than 5,600 individual members from 87 countries and 850 different organizations. The foundation has also secured more than $10 million in funding.

Key points in understanding OpenStack include:

☑ The OpenStack project is actually made up of many individual subprojects. The modular design of OpenStack is meant to provide maximum flexibility, and modules can generally be used in combination or stand alone. A set of modules tagged as "core," such as compute, storage, and networking, are the essential parts of OpenStack. Other modules are considered to be in "incubation" and can be promoted to core if the module attracts enough interest. The foundation will likely create another designation that is in between core and incubation for projects that have matured but may not necessarily be considered core.

☑ The OpenStack project does not include the hypervisor; instead, it relies on existing industry hypervisors. It works, with varying levels of support and features, with VMware, Hyper-V, KVM, and Xen. Xen and KVM are the best supported currently, with KVM being the most popular and used in most of the reference architectures.

☑ The scope of the OpenStack project is very broad, addressing compute, storage, and networking for infrastructure as well as extending into systems management, automation, security, and portals. While OpenStack does not include every software piece needed to create a large-scale, complex cloud, the scope of the project is currently larger than other open source competitors and will grow over time with the incubation projects.

☑ OpenStack is a technology and not a solution in and of itself. An analogy would be comparing OpenStack to the Linux kernel. The Linux kernel is a core

technology, but it takes much more than the kernel to make a full OS distribution. Likewise, OpenStack is a core cloud technology, but it still requires other elements to make a cloud. OpenStack can be used by cloud providers to create cloud services and by enterprises to create private clouds. Real-world OpenStack products may use the technology in different ways, with a variety of enhancements that may make various OpenStack-based products and services look very different from each other.

FUTURE OUTLOOK

Today, most OpenStack deployments are by public cloud providers that are early adopters of technology and use OpenStack in a DIY deployment and support model. 2013 will be the year that OpenStack goes commercial, with offerings becoming available for enterprise and service providers that want commercial support. In addition, key OpenStack cloud services such as HP and Rackspace have recently gone GA, making OpenStack widely available from cloud providers. Many factors will contribute to the success of OpenStack in the market in 2013 and over the next few years:

◻ **The hypervisor.** IDC expects that cloud providers deploying OpenStack will, for reasons of cost and support with OpenStack, continue to use primarily KVM and Xen open source hypervisors. However, in the enterprise, VMware and Microsoft make up the lion's share of the market. While OpenStack does work with VMware and Hyper-V, support for these is second tier. Both Microsoft and VMware have committed to improving support in OpenStack for their hypervisors, but it is likely that they will always lag behind the open source hypervisors, making them less attractive as choices for OpenStack customers. One of the reasons enterprises may want to use their existing VMware or Microsoft hypervisor with OpenStack is that many of their applications are certified and supported on that hypervisor. However, IDC believes that most customers and ISVs will view OpenStack as a new and different enough environment that those certifications will not carry over. While the hypervisor may be the same, the way OpenStack manages things like storage, networking, and management will be different enough to qualify it as a new environment. This may reduce the desire for enterprise customers to use their existing hypervisors and go with open source KVM or Xen, which don't enjoy the market share of proprietary software today in the enterprise market. As hypervisors commoditize, IDC believes that customers will care less and less about the hypervisor used. IDC's 2012 *Cloud System Software Survey* shows this trend, with 53% of enterprises willing to adopt a new hypervisor when deploying cloud system software.

◻ **APIs, openness, and lock-in.** OpenStack has developed its own open API as part of the project. Cloud APIs have been a big focus of the industry, with controversy over openness, standards, Amazon APIs, and lock-in:

❑ Standards, while useful, always lag behind innovation. Cloud standards do exist today, but they are not complete or do not move fast enough for cloud vendors or projects, and to further confuse matters, there may also be multiple standards for the same thing. Just because something is approved

as a standard doesn't mean that people actually implement it or use it. An "open" API should follow relevant and popular standards as fit, but standards will not drive API development or offer a universal solution to API compatibility and lock-in.

❑ Amazon Web Services (AWS) is the most popular public cloud service today, and many see the Amazon APIs as the de facto APIs that others need to adopt. While compatibility with the Amazon APIs is one aspect, using the Amazon as the core API for a developing cloud platform is simply unfeasible. The Amazon APIs are the intellectual property of Amazon, and the development of those APIs is controlled fully by Amazon. A project like OpenStack cannot innovate against APIs that a third party controls. However, OpenStack as well as other open source cloud projects do provide varying levels of Amazon API compatibility, allowing them to interface with AWS. However, API replication is only part of this discussion. It is relatively easy to implement an API but much more difficult to fully replicate the behavior of that API.

❑ One of the core tenets of OpenStack API openness is that the community develops the API under a transparent and collaborative process, with the results being fully open source. In this sense, until there is a universal cloud API standard (which will likely never happen), the OpenStack APIs are as open as anyone can practically expect. It is expected that multiple cloud providers implementing OpenStack will have at least a base level of interoperability with each other. To use the OpenStack trademark requires that the core OpenStack APIs be unaltered and fully supported. However, the level of interoperability and the usefulness of this compatibility in reducing migration pain remains to be tested. OpenStack is not a solution within itself, thus cloud providers enhance OpenStack with proprietary add-ons and APIs. Customers using these clouds will likely be using these functions, which may make core API compatibility a moot point if there are other functions that prevent the migration of a customer's VMs. IDC believes that core API compatibility will make migrations and interoperability easier, though neither will ever be a pleasant and easy experience. Lock-in is a problem that isn't fully solvable today, but OpenStack addresses the problem as well as practically possible.

◹ **Deployment and support model.** The pace of OpenStack is blistering, with new releases every six months. In this early innovation cycle of cloud, where each release brings significant new features and enhancements, there are no minor releases. In general, the pace of cloud is much faster than enterprise IT. Amazon and Google enhance and roll out new cloud services every few months. OpenStack is on a similar trajectory, and there likely won't be any stabilization for at least the next couple of years. This presents a conundrum for enterprises and OpenStack vendors:

❑ Upgrades have been an unaddressed problem for OpenStack. There is no built-in mechanism for non-disruptive upgrades, and each upgrade often breaks things with previous versions. OpenStack distributions see this as an

area of value-add, but the vendors can only do so much until the project stabilizes somewhat.

❑ Even if the upgrade problem can be solved in time and made non-disruptive, it's not clear that enterprises can follow the Amazon and Google model of continuous deployment. Enterprises are generally very conservative and like to extensively test, deploy, and then support a product for a very long time. However this will be at odds with OpenStack and cloud:

☑ OpenStack distribution vendors can't support an endless number of versions, and unlike Linux, vendors are looking at a different support model, likely for now an n and n-1 version support life cycle, which means that enterprises might have to upgrade once a year to remain on a supported version.

☑ Beyond vendor support, user expectations are another factor. Many enterprises are rolling out private clouds because end users are unhappy with the services provided in-house and are bypassing IT by going to the public cloud. If IT is to win back these users, it must provide a competitive alternative to the public cloud, and that means keeping pace with the likes of Amazon. If IT can't innovate quickly enough, then whatever private cloud is deployed will be viewed as obsolete in a short matter of time and users will once again bypass IT for the public cloud.

☑ **A public cloud provider.** OpenStack was originally developed from the point of view of a public cloud provider. While the software is being adapted to meet the needs of enterprise public cloud, that ecosystem will take time to build. For example, enterprises will want to use their SANs and many expect virtualization style HA that isn't part of OpenStack today. However, going too far down this road may not be the best path for OpenStack. Much of the existing legacy workload fits in better with classic server virtualization and may not be a fit for the cloud. Focusing on the emerging opportunity, the new Amazon-style applications, rather than trying to chase legacy compatibility, may be the right use of resources. Much of the market today is confused over the difference between virtualization and cloud, much less the difference between cloud architectures, so expectations and use cases will have to be set accordingly.

Key Players in the OpenStack Ecosystem

The ecosystem is critical for any platform, and the OpenStack ecosystem has been growing very rapidly.

Like Linux, much of the software ecosystem is involved in packaging OpenStack into supported distributions. To make the software consumable by enterprises, significant resources need to be invested in documentation, patching, making the install easy, and so forth. Key distros include:

☑ **Canonical (Ubuntu).** Ubuntu is currently the most popular distribution of OpenStack, as Ubuntu supported the project early on. OpenStack packages are included with Ubuntu and, for LTS versions, kept up to date for the full life cycle.

Many of the reference architectures and cloud provider deployments use Ubuntu as it was the best supported community choice. However, these early deployments did not drive significant revenue toward Canonical as they were largely self-supported, as is typical of many cloud providers. In the enterprise, Ubuntu doesn't have a large commercial install base like Red Hat or SUSE and will be challenged to penetrate this market segment. However, Canonical has played a very large and important role in the early OpenStack community and that has led to a lot of OpenStack credibility.

☑ **SUSE.** The SUSE Cloud is SUSE's OpenStack distribution and is delivered as a standalone product. SUSE's distribution will focus on the company's previous strengths with Linux: packaging, installation, testing, hardening, backporting fixes, and hardware support. SUSE will also integrate OpenStack with its SUSE Manager and SUSE Studio products. SUSE Cloud has been available since August 2012 and is currently in pilots with customers.

☑ **Red Hat.** Red Hat's OpenStack distribution will be an add-on to RHEL and focus on making OpenStack enterprise ready and consumable. Red Hat's OpenStack distribution will also take advantage of the work Red Hat has been putting into KVM and RHEV, using those technologies underneath as well as integrating it with the rest of Red Hat's cloud portfolio. OpenStack will be the base IaaS layer, with CloudForms layered on top to enable use and management of different cloud types. OpenShift, a PaaS layer, can be added to for application development functionality. Red Hat's OpenStack product is currently in beta and expected to be finalized in early 2013.

☑ **Piston.** Piston is a start-up by one of the original founders of the OpenStack project. The distribution focuses on security hardening OpenStack and an easy USB key–based installation. It also features a unique null tier architecture for enhancing scalability and resiliency.

☑ **Nebula.** Nebula, a start-up created by one of the original OpenStack founders, is pursuing an appliance model to make OpenStack more approachable. The idea is that customers will buy an OpenStack controller appliance, which will front industry-standard servers to create an OpenStack cloud. The company is in beta mode, with no publicly announced date for availability of the product.

☑ **Cloudscaling.** Cloudscaling is one of the newest OpenStack start-ups. It is enhancing OpenStack in several ways beyond the core OpenStack technologies. Cloudscaling adds proprietary add-on modules to enhance OpenStack such as application management, topology management, monitoring, performance optimization, security, and availability. It is also noted for its work in public cloud federation, adding Google Compute Engine and Amazon support.

Outside of the pure distros, other significant vendors are heavily involved in OpenStack:

☑ **Rackspace.** As one of the creators of OpenStack, Rackspace is a particularly visible member of the ecosystem. It uses OpenStack to power the Rackspace Cloud, which offers core OpenStack services as well as Rackspace-enhanced

services. It is positioned as the open alternative to Amazon. Rackspace is also trying to build the enterprise market with its Cloud Builders program, which provides support, knowledge, and services. While Rackspace is careful not to call it a distribution, it offers commercial support for the vanilla open source packages.

- ☑ **Cisco.** Cisco is contributing heavily to the networking code in OpenStack and integrating OpenStack with its UCS servers and networking gear. Cisco has also released its own edition of OpenStack that highlights Cisco integration, but it is not a distribution with commercial support. Cisco also uses OpenStack to power its WebEx collaboration service.

- ☑ **IBM.** IBM has been a big backer of open source projects such as KVM and Linux, so its considerable support of OpenStack is no surprise. While IBM never got into the Linux distro market, OpenStack may be somewhat different. OpenStack may become embedded into some IBM products as integrated software for some use cases, but it will also likely use commercial distributions from longtime partners like Red Hat and SUSE. IBM hasn't officially announced any OpenStack products, currently focusing on adding support for its hardware. But it's a safe bet that OpenStack will eventually power some parts of IBM's hosted and on-premises SmartCloud series.

- ☑ **HP.** HP made one of the largest early commitments to OpenStack, using it to power its CloudSystem. HP's public CloudSystem cloud is based on OpenStack and enhanced with additional HP software and services. The company is focused on being price competitive with Amazon while providing an enterprise-grade cloud. CloudSystem is also available as software for on-premises deployments allowing customers to build hybrid OpenStack-based clouds.

- ☑ **NetApp.** Networked storage is standard for most enterprises, but OpenStack was originally developed for cloud providers that often use direct-attached storage. NetApp has been contributing to OpenStack to add support for NetApp storage hardware and technologies.

- ☑ **VMware/EMC.** VMware is a curious new addition to OpenStack, having just been recently accepted as a Gold member. Much of this was driven by VMware's acquisition of Nicira, which was leading the development of the networking technology in OpenStack. While OpenStack competes against VMware's vCloud, VMware has committed to continuing the OpenStack networking development as well as adding support for complementary VMware products such as the ESX hypervisor, RabbitMQ, and Cloud Foundry. While VMware certainly won't be pushing customers to OpenStack, it may figure that if customers do choose it, it will still have revenue opportunities. VMware's parent company, EMC, is also involved in OpenStack, adding support for VMware's storage products.

- ☑ **Mirantis.** Mirantis is one of the leading services companies providing OpenStack consulting services today. It is very involved in the community and development and has built up a respected level of expertise and experience with the technology.

- ◇ **Dell.** With Dell's renewed focus on software, Dell has integrated OpenStack with its hardware products, working with commercial OpenStack distributions. With the software acquisition spending spree that Dell has been on, it's likely that Dell will enhance OpenStack by integrating these software assets.

- ◇ **Morphlabs.** Morphlabs is a start-up that is providing OpenStack converged infrastructure appliances in partnership with Dell, Nexenta, and Arista. It assembles servers, storage, and networking and integrates them with OpenStack software as well as additional add-ons like Puppet and Crowbar. It uses an integrated support model, with Morphlabs the primary support contact for the entire appliance.

- ◇ **Nimbula.** Nimbula is a recent OpenStack member, having developed its own cloud system software product. It plans to phase in OpenStack modules over time while keeping its software that is complementary to OpenStack.

ESSENTIAL GUIDANCE

OpenStack is approaching a crucial time in its history; it is on the verge of reaching critical mass. The project and the foundation have been busy building industry support and developing code, and 2013 will see the first commercial fruits of that labor.

Major OpenStack clouds have just launched, intending to test Amazon's early lead in the public cloud market with price-competitive offerings that are billed as open and compatible alternatives. While the transition to public cloud could take a generation to fully realize, this is the first concerted effort by the industry to compete against Amazon. Customers will be paying close attention to the price, features, and stability of the OpenStack services.

Major Linux vendors will be launching commercially supported enterprise versions, bringing OpenStack into the enterprise and the ecosystem of server, storage, and networking vendors also building support. While the products will be commercially available in 2013, IDC's customer conversations indicate that the majority of the market won't be deploying cloud system software until 2014 at the earliest. However, many are starting to investigate options and plan some testing and POCs in 2013. Cloud system software in general is very early in its maturity cycle, and OpenStack will need to make some good early impressions to keep the wind in its sails.

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Related Research

- ◇ *Worldwide Virtual Machine Software 2012–2016 Forecast* (IDC #235379, June 2012)

- ◇ *IDC's Software Taxonomy, 2012* (IDC #235401, June 2012)

- *The Emergence of the 3rd Platform: How Is System Software Impacted?* (IDC #234111, April 2012)

- *Open Source Cloud System Software Battle Intensifies with CloudStack and Eucalyptus Moves* (IDC #lcUS23439912, April 2012)

- *IDC's Worldwide Cloud System Software Taxonomy, 2012* (IDC #232819, February 2012)

- *OpenStack — The Linux of Cloud System Software?* (IDC #232040, December 2011)

Synopsis

This IDC study examines the readiness of OpenStack to address the public and the private cloud markets. OpenStack is an open source project that has been building a considerable amount of industry support and is reminiscent of the meteoric rise of Linux more than a decade ago.

"OpenStack is an exciting open source cloud project that has drawn a tremendous amount of support from the community and vendors. 2013 is really a coming out year for OpenStack, with the fruits of that labor entering the commercial market for the first time. While the technology is drawing interest from customers, there are still challenges to be solved for the early project in the areas of stability, maturation, ease of use, and deployment strategies." — Gary Chen, research manager, Cloud and Virtualization System Software

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