A Brief Look At

OpenStack

This eBook discusses topics that anyone considering an OpenStack private cloud will find interesting. It explores OpenStack's market penetration and some of the key drivers for technology adoption. The book also outlines selected use cases, and provides insight on some key OpenStack components — Nova and Neutron.

a publication of Bright Computing

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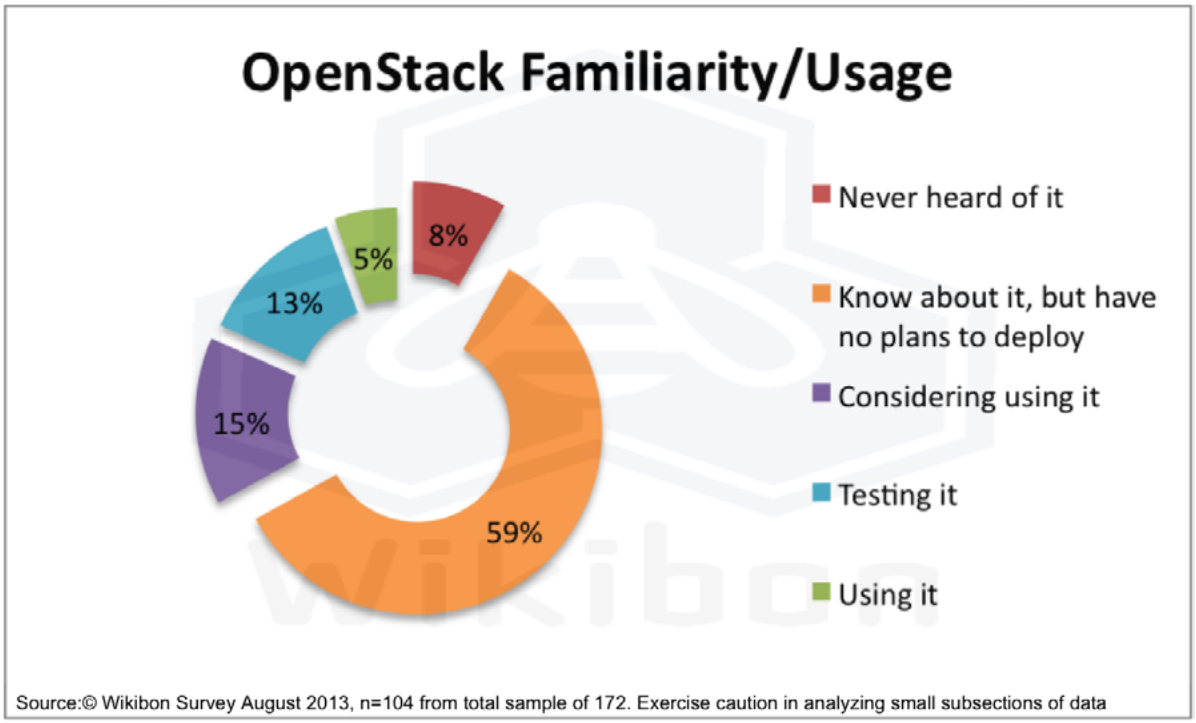
INTRODUCTION

Understanding OpenStack

The cloud computing revolution continues to change the way organizations view their IT resources. OpenStack cloud software provides a common, open source platform that can be used by corporations, service providers, researchers, and anyone else that wants to deploy a cloud.



CHAPTER ONE

A User's Perspective

The Arguments Every OpenStack User Must Make

For some time now, critics have suggested that OpenStack may offer lower total cost of ownership, but fails to deliver on agility and uptime compared to other cloud services.

A recent story on ReadWrite quoted industry insiders who suggested OpenStack is merely a way to "fool" senior management into believing that a company has moved to cloud computing. TechRepublic, meanwhile, stated that OpenStack remains too complex to offer real opportunities for innovation.

We asked Sam Charrington, a cloud computing analyst and founder of St. Louis-based CloudPulse Strategies, how he would respond to these criticisms of OpenStack if he were making the business case.

This interview has been edited and condensed for clarity.

Bright Computing: Why should organizations think about using OpenStack?

Sam Charrington: It is all about achieving greater agility. [OpenStack] is great to address questions such as, "What could we do as a business if it took us minutes to provision resources and not weeks?" Or "What could we do as a business if we could cut the time developers waste on chasing down resources and focus that on more creative activity?"

BC: How can you calculate return on investment (ROI) on an OpenStack implementation more accurately?

SC: Both private and public clouds should be looked at for transformation, including team, business, and industry transformation. That is the true opportunity. Not everyone, however, sees it as this. If you dramatically shift the way business is done, deliver capabilities faster, or do things that you couldn't do otherwise, it is a softer ROI than being able to replace a bunch of VMware licenses with OpenStack. So you can get too focused on ROI and just look at cost savings, but that could mean you are missing out on more innovation and limit your options for bigger wins down the road.

BC: What are some of the most common OpenStack implementation challenges?

SC: The issue is that ease of use continues to get in the way of OpenStack adoption – it is harder to get started than many people would like, and as the platform grows with adding new projects, it is also not getting any easier. Having multiple choices for storage and networking makes it harder to install, but this also creates a lot of flexibility and power too.

BC: Where is OpenStack weakest when compared to AWS or VMware?

SC: They are very different beasts. OpenStack is more of a private cloud to date, but as more hosted implementations happen on OpenStack, they could be more comparable. The strength of an OpenStack-based public cloud is portability, and in using its APIs in multiple places. There really are limited on-premises options with AWS, while with OpenStack you can run both on-premises and in the cloud. Also, the AWS API is supported by a lot of tools because of its market presence and it is a lot more mature. VMware hasn't been successful in building its own public clouds and to make things more portable to date.

BC: Where do you stand in terms of the debate on public vs. private clouds?

SC: The typical enterprise is experimenting with both technologies. There still is a lot of confusion between virtualized environments and private clouds. And IT managers need to understand the degree of automation that is behind private clouds, such as provisioning, scaling, and management features.

BC: If you aren't an Internet-native corporation like Facebook or Google, is there still a role that OpenStack can play?

SC: Yes, but it isn't because of your question's implication. I tend to think of OpenStack as a more commercially acceptable version of what Google and Facebook are building for themselves. These companies have their own internal management platforms and put a lot of time and effort into things that aren't really applicable for most enterprises. OpenStack tries to help enterprises that can't build these tools and tries to replicate some of the elements in these platforms. We are starting to see enterprises look more carefully at continuous development, (although) there is a lot of waterfall development still being done. More of them are trying to transition to DevOps, but it requires a culture change that is significant. The big benefit here is to enable a higher degree of agility, and that makes them useful for enterprises that want to do this.

CHAPTER TWO

OpenStack's Future

Why the Internet of Things Will Be Driven by OpenStack

The Internet of Things not only promises a plethora of devices, such as wearables and connected cars, but also guarantees there will be a deluge of data that requires processing. That means cloud infrastructures must keep pace, which experts say provides enterprises an opportunity to leverage OpenStack.

OpenStack is a good foundation for any vendor or supplier of Internet of Things (IoT) platforms and services, according to René Büst, senior analyst and cloud practice lead at Crisp Research.

In Büst 's opinion, an IoT platform provider could deliver enablement services, or ways to facilitate online connectivity, by offering OpenStack to a service provider or vendor of IoT products. Whereas large enterprises that have comprehensive experience running complex IT infrastructure could run their own OpenStack environments for IoT applications.

Still early days

Right now, enterprises adopting OpenStack to support the IoT are looking at it mostly as a means to develop services, said Büst. These include mobile backend

services, event hubs for connecting devices such as sensors, streaming analytics services, machine learning services, and edge location services.

"OpenStack is just an infrastructure base," he said. "It gives you the liberty to basically run every type of owned software and service on it. The more (by default) value-added services that are provided by the OpenStack Project, the easier they are to build and deliver IoT projects."

Büst said the OpenStack community can help the technology become a viable platform for IoT if they develop more high value-added services that encapsulate specific use cases, such as OpenStack Sahara, which is intended to provide an easier means of provisioning Hadoop clusters to analyze big data.

In Predictions 2015: Software Platforms Drive Internet Of Things Adoption, published by Forrester Research in November 2014, the research firm predicted the IoT trend is about to enter a second stage in its development that will focus on software application platforms that provide pre-built connectivity, security, management, and analytics capabilities.

An emerging cloud standard

In addition, OpenStack APIs will be a cloud standard, writes Forrester analyst Lauren Nelson in State Of Cloud Platform Standards: Q1 2014, noting today almost every public, private, and hosted private cloud provider either already has developed or is in the process of developing varying levels of support for the OpenStack APIs because of its powerful ecosystem. There also has been enterprise adoption from reputable Fortune 500 companies, such as Fidelity, Comcast, and Best Buy.

For instance, Comcast has exhibited a very high profile about embracing OpenStack, which Nelson told Bright Computing is one of the best examples of an enterprise using the platform to embrace IoT. Comcast has built a private OpenStack cloud to support video streaming applications and communication between its network and customer set-top boxes.

But there are many other IoT scenarios that could be supported by OpenStack, such as transportation systems for tracking buses that also correlate with weather data.

Nelson said enterprises of all sorts are going to find themselves supporting IoT to varying degrees, depending on their business, and already should have started to set up cloud infrastructures to handle the coming influx of data that needs processing.

Building a private cloud for targeted IoT projects is a great way to begin, and some organizations have built a secondary private cloud for that purpose. Organizations are wary of putting valuable data and intellectual property in a public cloud, although one avenue enterprises are pursuing is building out their own OpenStack environment, on premises, and processing some data in a public cloud and bringing it back inside.

The coming transformation

Adoption of cloud infrastructure such as OpenStack to support IoT, however, has not yet gone mainstream. Many organizations are just beginning the transformation to becoming more software-driven businesses and are doing little software developer enablement.

Nelson continued, "They're not realizing they have to make changes now or they will be left behind. Even if an organization starts small, it takes at least 10 OpenStack engineers to create an environment—and there is a lack of available OpenStack expertise. They will need people who are dedicated to this and who can learn it." Remember, even small, targeted IoT projects can escalate and become more expensive.

Enterprises should be aware of everything that needs to be considered before building or adopting a cloud infrastructure based on OpenStack for supporting IoT, including the architecture design and which IoT-ready and IoT-enablement services should be available.

Organizations, especially smaller or midsize ones, should consider if they really want to run an OpenStack infrastructure completely on their own, since OpenStack is complex and the right skills are still hard to come by. Instead, they should leverage OpenStack from a service provider that is managed or OpenStack-ready.

What Consolidation in the OpenStack Sector Means For Private Cloud Adoption

If there's one sign of OpenStack's increasing maturity, it's a flurry of merger and acquisitions that may have organizations rethinking the vendors with whom they partner in the future, according to Gigaom Research's latest CloudTracker report.

"OpenStack is heading towards a huge consolidation," said the report, which was released in early January, calling out EMC, which acquired Cloudscaling last year, and Cisco's interest in MetaCloud as examples of a few large commercial amalgamations. However, while some industry watchers predict consolidation, the market won't be satisfied with just a few, large players. All this opens the door to vendors who understand the platform and can guide customers through the confusion towards effective implementations.

Beyond merger activity, there's still a lot of cash being poured into other emerging OpenStack firms. According to the Funding Tracker section in Gigaom's report, in the fourth quarter of 2014 alone, firms in the space raised between $10 million and $100 million from venture capitalists. That's a good sign; it proves that there's plenty of interest in enterprises adopting the technology.

Although that may make the choice of supplier more challenging for customers, it also suggests that because large organizations have made substantial investments into this technology, OpenStack has the potential to contribute to data center transformation.

In fact, 451 Research said in its OpenStack Market Monitor & Forecast, which focuses on the key public and private vendors that directly provide OpenStack offerings, that the OpenStack market is expected to reach $3.3 billion by 2018.

"OpenStack has seen tremendous growth over the last four years in terms of investment and community expansion," wrote Al Sadowski, Research Director for 451 Research's Service Provider channel, who authored the report. "The open-source platform is increasingly a consideration for private cloud deployments, and the business models within the ecosystem continue to evolve."

451 Research is not the only one to make such bold forecasts. This year, predicts Ken Rugg, CEO of database-as-a-service vendor Tesora, the number of OpenStack projects in production or being planned will exceed the number of VMware clouds.

Gigaom didn't go that far, but did suggest that public/private hybrid clouds would be a focus for cloud platform vendors in the first quarter of this year. An increasingly fragmented container market, as competitors rise to challenge Docker's dominance, will nonetheless continue its move to the mainstream. And, to keep things interesting, Canonical is pushing its LXD and LXC, which is tightly integrated with OpenStack Nova, as an alternative to containers.

Bright Cluster Manager for OpenStack brings a proven cloud / cluster management software solution to the OpenStack community, thereby making it even easier to deploy a complete cloud over bare metal and manage it effectively.

CHAPTER THREE

Use Cases

Some Ways OpenStack Can Help Your Business

Hybrid Public / Private Cloud Solution

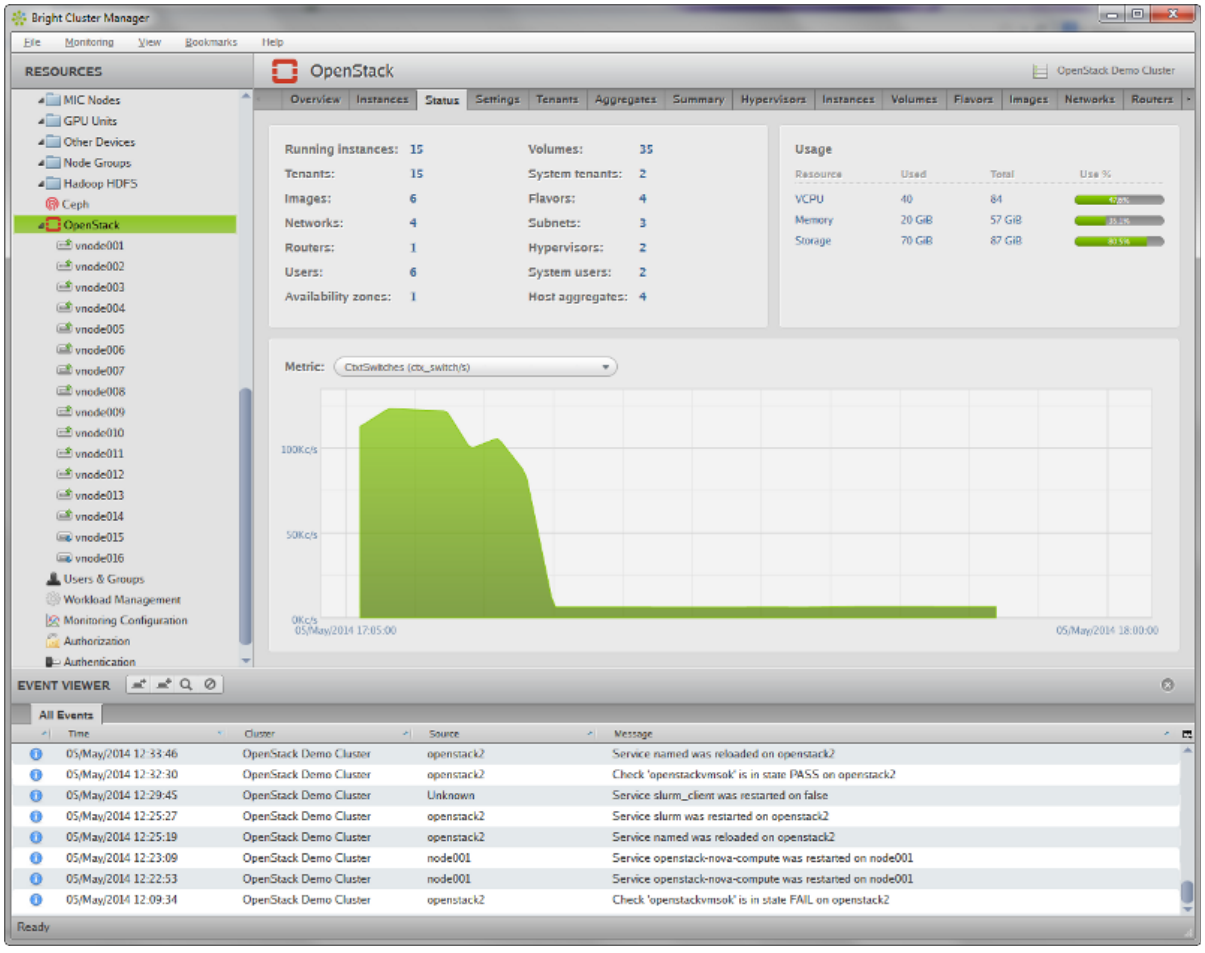
Many organizations are looking to build a private cloud infrastructure in their own data centers in order to reduce their dependence on expensive public cloud services. Using Bright's OpenStack solution puts this capability in the hands of virtually any organization. Bright Cluster Manager for OpenStack can turn a rack of servers into a working cloud in less time than you'd imagine, leaving you free to start deploying services. Now you can choose to run applications in a public OpenStack cloud or your own private cloud.

Build and Deploy a Private Cloud in your Data Center

Switching your data center from discrete services to a cloud can let you get the most from your equipment. Bright's OpenStack solution makes it easy to build a working cloud, optimizing the utilization of the servers in your data center while maintaining the service levels your customers demand.

Expandable Cloud Infrastructure to Meet Expected Growth

If your business plan calls for a cloud infrastructure that grows over time, you need a cost effective way to do that. By using Bright Cluster Manager to build and manage your OpenStack cloud right from the start, you can eliminate much of the cost in both resources and time. The task of adding nodes, loading them with the right software, and configuring them properly to join the cloud becomes quick and easy.



Here Bright's Status tab summarizes an OpenStack private cloud in terms of instances, tenants, flavors, software images, networks, users, and more.

CHAPTER FOUR

Nova and Neutron

What Every OpenStack Nova User Needs To Know

The release of OpenStack Juno in October added a slew of new features to the Nova component that include networking capabilities, but as work continues on the next-generation Kilo release, experts say users can expect more advanced features in a component called Neutron, with a migration path to integrate both.

Nova, the cloud-based fabric controller used to provide OpenStack infrastructure-as-a-service, was originally the sole networking piece within OpenStack. In 2011, however, the OpenStack Quantum project, renamed Neutron, was started as a dedicated effort within OpenStack to provide full Software Defined Networking (SDN) capabilities and as a possible replacement for Nova.

With OpenStack Juno, however, both Neutron and Nova have seen improvements in networking features. This includes support for multiple networks while gaining visibility into network information by way of new data hooks. Juno also improved Network Functions Virtualization (NFV) in Nova with new multiple interface support. Meanwhile, Nova is poised to get a slew of updates with Kilo, the next version of OpenStack, including some additional networking features.

Nova's clear direction

As Michael Still, project team leader for OpenStack Compute, outlines in this video, Nova is what allows you to build a virtual machine and gives you access to it. But to do that, Still notes, it might have to orchestrate other systems, which is where Neutron could be used for configuration purposes. Ultimately, Nova is what provides access to compute resources and ties in with the other OpenStack projects. Nova is likely part of the majority of OpenStack deployments, he added.

According to Still, the recent Kilo summit in Paris provided a clear direction as to where Nova should go, including the need for big architectural improvements. One new feature already available is the ability to create sub-Novas, which are called cells. Version 2 of this feature already is underway, but not likely to be completed with Kilo. There also is a lot of interest in developing the scheduler. Another priority for Kilo is Nova-to-Neutron migration, which is close to reality. There is a plan, but it has yet to be implemented.

Donna Scott, an analyst with Cambridge, Mass.-based Gartner Inc., said Neutron is stealing some of the attention from Nova right now because it's a newer project within OpenStack and provides more advanced networking capabilities that businesses are demanding, such as automated networking across multiple data centers and clouds. "It's the (business) requirements that are pushing Neutron," she said. "You need something more sophisticated, and Neutron lays the groundwork for that."

Scott expects that in terms of new capabilities, networking updates probably will be implemented in Neutron, and said having a migration tool would be a good thing. "For anyone who starts an OpenStack deployment today, they would use Nova and Neutron together," she said.

More integration, fewer challenges

Andreas Olah, research analyst for servers with IDC European Systems and Infrastructure Solutions, also expects Nova and Neutron to continue to co-exist. He said the research firm has not done any studies that contrast Nova with Neutron yet, but that Nova remains a core component for the compute service, with Neutron fulfilling networking, Swift providing object storage, and Cinder supporting block storage as the other major OpenStack components that all need to be linked together.

Nova is considered the most complex component of the OpenStack family, mainly due to its numerous processes and highly distributed nature. Nova controls the cloud computing fabric and, therefore, is at the core of the infrastructure service.

"As Nova is to continue in parallel with Neutron, the focus will be on tighter integration," said Olah. OpenStack consists of many different independent modules and there still are challenges, particularly for telecommunications customers, Nova integration with other components, such as Neutron. Olah continued, "The Juno release provided 342 new features and corrected more than 3,200 errors that were causing headaches for users of previous versions. NFV also is gaining importance in the community as the Nova Compute project provides advanced functionality, such as the Ironic bare-metal-as-a-service feature."

Overall, as good business practice, end-users should follow a step-by-step approach for deploying less critical workloads on Nova/OpenStack first, then extend to key business applications as the initial trial proves successful.

What OpenStack Users Need To Know About Neutron

Migrating users from Nova to Neutron will be a big focus of OpenStack Kilo, and experts say enterprises that have not begun the switchover to meet their more advanced networking needs should start getting ready for the transition.

While Nova is still a core component of OpenStack, it will be used primarily for compute functions, with Neutron taking over as the project that keeps in line with industry trends in networking, according to analysts. These include software-defined networking (SDN) and network functions virtualization (NFV).

The work to close the functionality and feature gap between Neutron and Nova has been ongoing since Icehouse and Juno, but based on feedback from the Paris Design Summit, transparency and track priorities have been increased, and a significant amount of time is being spent on testing.

That doesn't mean Nova is going away, said Lauren Foster, senior analyst focused on infrastructure at Forrester Research in Cambridge, Mass. "It's not Nova versus Neutron, per se," she said.

Instead, the advent of Neutron, previously known as Quantum, was driven by the realization that a separate project was needed to keep up with industry trends, such as SDN.

Time to move

Migration has been a hot topic of conversation among the OpenStack community, said Foster, and enterprises often don't move directly from one release to the next because of the quick six-month release cycle. On the other hand, she does see almost all organizations adopting Neutron to some degree eventually.

René Büst, senior analyst and cloud practice lead at Crisp Research in Germany, said Kilo's focus on migrating Nova-network installations to Neutron is a significant development, and that the Neutron team is working with the OpenStack NFV sub-team to integrate relevant features, such as better connections between hardware and Neutron Layer 2 segments. Ultimately, he said, Nova-network will disappear.

Büst also said enterprises and service providers that are new to OpenStack and have no legacy projects probably will be among the early adopters of Neutron, especially those that need to build and support complex network and SDN infrastructure.

Cloud providers that have to deliver more value-added services, such as load balancing-as-a-service (LBaaS) or security-as-a-service (SECaaS), also should be looking at Neutron.

"Nova-network is broadly used as the network-as-a-service component in most OpenStack deployments," said Büst, "but it is old-fashioned since it only supports three kinds of network topologies: Flat, Flat DHCP, or VLAN."

Neutron allows setting up more complex topologies with routers, networks, subnets and ports, he said, enabling a huge variety of networking configurations per tenant. Neutron gives additional networking capabilities that are required by more complex future workloads and use cases.

Multi-tier applications

Büst said that since multi-cloud environments are becoming more prevalent, Neutron is being used to support the backend for multi-tier web applications, as well as LBaaS. With SECaaS becoming more important, meanwhile, he expects enterprises to look at Neutron to support more deployments of intrusion detection, as well as firewall and virtual private networks, all of them "as-a-service" in the near future.

The distributed virtual routing introduced with Juno—by which routing functionality is distributed to each compute node—is a major milestone, since it is removing the need for a central Layer 3 network node, which will enable better high-availability architectures.

One analyst stated that the overall benefits of OpenStack are based on component systems, meaning if one fails, it doesn't create a system-wide failure. However, its breadth can be confusing for some organizations.

There still is a significant lack of OpenStack knowledge in the market, said Büst, and Neutron is not the only component an enterprise needs to successfully run an OpenStack environment. "All components need to tightly work together."

He recommends that enterprises increase the internal OpenStack knowledge if they want to run their own environments rather than consulting external experts.

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