A Better Approach to Leveraging an OpenStack Private Cloud

David Linthicum
Executive Summary

The latest bi-annual survey data of OpenStack users\(^1\) shows a nice progression of the OpenStack into the mainstream of enterprises, but the data also projects continued challenges related to ease of deployment and management\(^2\). A common pattern of the survey is that OpenStack provides value to enterprises, specifically as a private cloud, but lacks certain features that make it readily applicable for enterprise IT. Installation and configuration, as well as some operational activities have proved to be a challenge.

One thing is clear from the survey: Interest in OpenStack continues to rapidly grow. For example:

- The project is made up of 20 million lines of code.
- More than 585 companies have supported OpenStack in some way.
- The OpenStack Foundation counts almost 40,000 people actively engaged in the community.

\(^1\) http://www.openstack.org/assets/survey/April-2016-User-Survey-Report.pdf
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Specially noted was the fact that OpenStack had issues with deployment, including:

- “OpenStack lacks far too many core components for anything other than very specialized deployments.”
- “Takes a lot of work to decide on deployment architecture, deploying, and maintaining the software.”
- “Frequent releases; keeping up in an operational working deployment model is hard to achieve.”

So, what's an enterprise that wants to implement OpenStack to do, in the quickest and most efficient way? Also, what about operations, deployments, and use of APIs to access most of the services of OpenStack?

In this article, we'll cover the benefits of private cloud and the challenges of OpenStack. We'll also review how to get the best-of-breed OpenStack deployments that work the first time. We'll see how to minimize the hassle; thus reducing the costs, increasing agility and compressing the time to production.

<table>
<thead>
<tr>
<th>Like</th>
<th>Don’t Like</th>
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<tbody>
<tr>
<td>Community</td>
<td>Lack of comprehensive documentation</td>
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<td>Flexibility</td>
<td>Poor consistency across components</td>
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<td>Innovation</td>
<td>Cumbersome deployment automation</td>
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<td>Lack of vendor lock-in</td>
<td>Maturity of specific projects and clarity on which projects are most mature</td>
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<td>Ecosystem</td>
<td>Focus on core projects, not side projects</td>
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<td>Evolution</td>
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<td>API driven infrastructure</td>
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However, all is not well. Within the same survey, the Foundation asked its members what they most like and dislike about using OpenStack. The following was noted.

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The Value of the Private Cloud

Most enterprises are eager to leverage cloud computing, but not so eager to place core business processing and critical business data on public clouds. There may even be legal restrictions on where data may exist, as we have seen in the financial and health verticals, where some types of data may not exist outside the enterprise or beyond certain geographical borders.

Issues around security represent another reason that enterprises more readily turn to private clouds. While public clouds provide rudimentary security subsystems that have thus far had a good track record, most enterprises do not consider them as secure as systems that exist on-site, or, are remotely hosted but completely under the enterprise’s control.

Finally, there are performance issues when leveraging public clouds, including the natural latency of leveraging the Internet. This is more a matter of how the applications and systems are designed, than actual limitations of the cloud. Performance concerns are valid in some instances; for example, problem domains with a high amount of data transfer between the data server and the consumer.

Figure 1 shows the primary business drivers of leveraging OpenStack, mostly for use as a private cloud. The primary drivers, as you can see, are standardization, avoiding vendor lock-in, agility, and operational efficiency.

![Figure 1: Top business drivers for OpenStack.](http://www.openstack.org/assets/survey/April-2016-User-Survey-Report.pdf)
Private clouds, including those based upon OpenStack, provide the following specific services:

**Self-service**

The most important concept of private cloud computing is self- or auto-provisioning, which is the ability of an application or a user to dynamically allocate resources, such as storage and compute, during operations. This is typically accomplished by invoking a provisioning API, or manually allocating the resources. In some cases, the resources are automatically provisioned as needed. In addition, these resources can be de-provisioned after use with the same mechanisms.

This is analogous, if not directly reflective, of the benefits of public cloud. However, the infrastructure is in your direct control, thus specialized security and compliance issues are easier to manage. The system is as efficient as possible, with both the resources and the dollars spent. This provisioning mechanism also provides the elasticity that many attribute as an advantage of cloud computing, or the ability to expand and contract the use of cloud resources as needed to support the application.

**Auto-scaling**

Auto-scaling refers to the use of automated mechanisms inside of the applications to automatically allocate resources, including compute and storage, as needed. This is different from self-scaling (covered next), in that the platforms scales automatically, based upon preset policies or settings. For example, if utilization is greater than 80 percent, the system will automatically provision additional machine instances.

**Self-scaling**

Self-scaling is much like auto-scaling, but you can directly control the provisioning of resources from an application by using APIs, or from some kind of admin console. This provides more direct control over the use of resources, and can thus provide better cost efficiencies and better performance, within some use cases.

**Centralized Management**

Centralized management refers to the ability to operate the private cloud, even if the private cloud is distributed within the enterprise network. Provisioning (discussed above) can be centrally controlled, as can security, governance and usage based accounting.

The value of centralized management is that a centralized IT organization can maintain control over the use of private cloud, such as OpenStack clouds. There are fewer human resources that are required, and we’re able to operate the cloud at a greatly reduced cost.

**Understanding the ROI**

The ability to determine the ROI of cloud computing is not a simple modeling exercise, as most people seem to think. To truly understand and calculate the business values of using private cloud computing requires a complex and dynamic analysis that is unique to the problem domain you’re trying to address.
In other words, the value of private cloud computing depends directly upon the type of business, the core business processes and the specific problems you’re looking to solve. Additionally, you need to determine how much value you truly get from the increased agility and scalability that are core benefits of cloud-based platforms.

Challenges with a “Raw” OpenStack Private Cloud

As covered in the OpenStack survey, there are many issues and challenges with “raw” OpenStack private clouds, which include lack of documentation, lack of consistency, poor and cumbersome deployments, etc. These can be boiled down into:

- Complexity Challenges
- Management Challenges
- Configuration Challenges
- Upgrade Challenges
- Value Challenges

Complexity Challenges

Complexity challenges, as revealed by the survey, have long been a limitation of OpenStack. “Nine themes emerged. On the positive side, community support, avoiding vendor lock-in, consistency, stability, and the importance of open source were key drivers. On the negative side, complexity, difficulty in deployment, inconsistency, and lack of stability were cited.”

4 http://www.openstack.org/assets/survey/April-2016-User-Survey-Report.pdf
Management Challenges
Management and operations is another challenge, considering that “raw” OpenStack does not have a sound management approach and enabling technology. As one user put it for the Survey: “There are many operations that can be executed with the command line clients that cannot be done using the dashboard.”

Configuration Challenges
Configuration management becomes another challenge when dealing with raw OpenStack. There are no formal APIs or approaches to provide configuration management. This may not yet be on the radar screen for many enterprises until more OpenStack private clouds move into production. Configuration management becomes important when you reach a tipping point of complexity and components, and it’s a must-have to provide any sort of scalable private cloud operations.

Upgrade Challenges
Along the same lines of configuration challenges are the changes around upgrades. The complexity or “raw” OpenStack means that we need to go through a very complex upgrade path when new code is released. Thus, once we get the OpenStack cloud into production, we need to go through the same painful process each and every time upgrades are released.

Value Challenges
Finally, and most important, is the value that the private cloud is able to deliver. Given the challenges that were just listed, you need to consider that each of these cost dollars and diminish the value. We are moving to private cloud to gain value around efficiency and agility. If we have many challenges, as listed above, the value won’t be there.

A Better OpenStack, and Better Private Cloud
The biggest benefit OpenStack has brought to the industry is the standardization of core cloud computing interfaces. It’s important to provide a layer of abstraction, allowing partners to provide value-added differentiation, while guaranteeing interoperability with other vendors.

What’s needed is the ability to deploy a cloud infrastructure in hours (not days) using a single, integrated software stack. Moreover, hardware agnostic solutions are needed that do not lock-in enterprises to a specific solution. What’s more, enterprises need the ability to use existing management tools and scripts, with OpenStack’s API compatibility.

This means that we need to place management, configuration, and upgrade processes at a higher level of abstraction. In other words, we’re dealing the complexity of OpenStack using APIs that hide the complexity from the admin and developers. As OpenStack evolves, the APIs remain the same, and you can leverage the APIs to interact with OpenStack, thus eliminating many of the changes we mentioned above.
Seeking the Value

There are two points of value to consider when using higher level APIs with OpenStack, including operational value and strategic value.

Operational Value

Operational value is the value created when you evaluate how easy it is, or not, to operate your OpenStack private cloud. To better understand this value, it’s helpful to consider the inefficiencies that are present when using “raw” OpenStack, versus using OpenStack with a well-defined API (layer of abstraction). If you’re able to assign costs to the inefficiencies, you can use those as metrics to define the value of using the layered abstraction approach. In other words, once these in efficiencies are discovered and corrected, there is a value that that action will deliver back to the organization.

As you can see from Figure 2, the Abstraction APIs layer has a layer of automation between your resources and the complexities of the “raw” OpenStack private cloud. This means that you can utilize a consistent set of APIs across OpenStack releases, and across changes to the underlying code. This makes deployment, configuration, and upgrades a much easier process.

Figure 2: Using a layer of abstraction, you’re able to isolate your resources from the complexity challenges of OpenStack.
Strategic Value
The strategic value is much harder to define, but also much more valuable. It's about the benefits you'll obtain by moving the business in more strategic, better-informed directions, such as adding a product line, buying a competitor, or responding quickly to customer requests.

If we're able to provide more agility, including scalability and compressing time-to-market, that will usually drive larger benefits within the enterprise. For example, the ability to quickly align to market changes, or get new applications into production much faster. Other benefits include the ability to change major business processes around changes in laws and other regulations.

Steps to Success
What are the steps you need to take to insure that you make the right private cloud platform decisions?

1. Consider your own business requirements. This means all requirements, how they break down to storage needs, performance needs, processing needs, security needs, etc. Consider the applications that will run on your private cloud, and make sure they are represented in the requirements.

2. Define a deployment and migration process, including migration of applications and data.

3. Using your requirements, find the best private cloud solution that fits your needs, and make sure to understand how each requirement is met. Make sure to understand the complexity tradeoffs of each, and how those tradeoffs can be mitigated.

4. Consider the use of an abstraction layer, or common APIs, that will remove you from having to deal with the underlying complexities of the “raw” OpenStack stack. Understand that any complexity that's built into the platform will cost more in time and money going forward.
Suggested Solution

Overcoming the issues in implementing OpenStack requires a self-optimizing infrastructure that automatically distributes all physical and virtual assets and workloads in real time. Such a solution should take advantage of commodity servers to leverage your existing hardware. In addition, you should be able to continue to use your existing management tools and scripts, with OpenStack’s API compatibility including OpenStack Nova (compute), Cinder (block storage) and OpenStack Neutron (networking). This type of solution provides the ability to deploy your cloud infrastructure in hours (not days) using a single, integrated software stack, leveraging the approaches we’ve defined above.

Conclusion

There are a few key takeaways that you need to consider:

- According to OpenStack’s own survey, the OpenStack “raw” platform still suffers from many complexity issues that hinder the successful use of OpenStack.
- Users are looking at much longer and much more complex deployments and upgrade cycles.
- Private clouds have a great deal of value for most enterprises, but the value varies from enterprise-to-enterprise. The value exists in the technology, such as provisioning, as well as the ability to control and secure data.
- The use of APIs to provide a layer of abstraction is typically a good idea. APIs can deal with the complexity issues by providing common interfaces across all OpenStack functionality and versions.

If you’re moving to a private cloud, you’ll need to understand your own requirements and define a path to success. The solutions exist, but you first need to understand their value.