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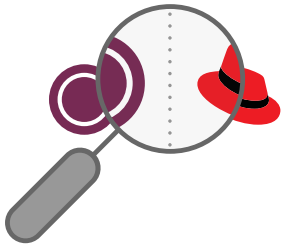
Comparing Red Hat OpenStack Platform and Canonical's Charmed OpenStack

July 2020

Introduction



OpenStack is an essential component of every modern organisation which uses private cloud infrastructure for better economics, improved security and a higher level of flexibility. Over the last few years, it has evolved and become a de-facto standard for implementing cloud computing platforms. It is one of the three most active open source projects in the world with 1,003 developers from 188 organisations involved in the Ussuri release development. According to 451 Research's Market Monitor from September 2019, it's combined market size worldwide is $7.7BN.

Of the many companies involved in OpenStack development, Red Hat and Canonical are leaders. According to the OpenStack User Survey Report from 2018, both companies have been powering over 70% of production clouds together outside of the China market. Red Hat and Canonical each offer their own production-grade OpenStack distribution and have built substantial customer portfolios across various market sectors. However, this has been achieved using a completely different approach towards OpenStack deployments, operations and support.

This whitepaper performs a detailed comparison of Red Hat OpenStack Platform and Canonical's Charmed OpenStack. We show how the differences in both distributions impact the business value brought by OpenStack to organisations in terms of lower capital and operational costs, increased flexibility and simplicity of use. Finally, we demonstrate that choosing the right OpenStack distribution is an important decision for organisations planning to deploy OpenStack, as the wrong choice may result in implementation delays, vendor lock-in and an inflating TCO (total cost of ownership).

An overview

This whitepaper starts with a brief overview of both companies and their OpenStack distributions. Each of them has a different structure, work culture and mission. Both are leaders in open source and OpenStack but with different business models. The information below provides context to help understand the differences in the distributions.

About Red Hat

Red Hat's mission is to provide open source technologies for enterprises. Its business model is based on licensing their proprietary software components added on the top of existing open source technologies, such as Linux or OpenStack, and providing commercial support for them. Red Hat is one of the main contributors to OpenStack, primarily focusing on exploring incubating projects. The company provides a rich portfolio of enterprise software products. Those include RHEL (Red Hat Enterprise Linux), Red Hat OpenStack Platform, Red Hat VIrtualization, Red Hat OpenShift, Red Hat Ceph Storage, Red Hat Satellite and Red Hat Ansible Automation Platform.

About Canonical

Canonical's mission is to deliver, maintain, secure and sustain open source software from cloud to desktop and devices. The company is the publisher and maintainer of Ubuntu, the most popular Linux distribution, and provides a rich portfolio of software for enterprises, mid-size and small businesses, and individuals. Those include Charmed OpenStack, Charmed Kubernetes, Charmed Ceph, Landscape, MAAS, Juju, MicroK8s and Kubeflow. Its business model is based on providing commercial support for those products. Canonical is actively involved in OpenStack development, primarily focusing on improving the stability of core OpenStack components.

Red Hat OpenStack Platform

Red Hat OpenStack Platform is a commercial OpenStack distribution offered by Red Hat for enterprises. Its primary focus is to provide an OpenStack platform that is stabilised according to enterprise needs. Red Hat OpenStack Platform is primarily based on the TripleO (OpenStack on OpenStack) upstream project but requires Red Hat's proprietary components to be included in order to get support. TripleO aims to use the same technologies to deploy OpenStack itself that OpenStack uses to provision virtual machines. The platform follows the same conservative approach as RHEL, providing support for the latest OpenStack release with a significant delay for ensuring stability. Red Hat offers their OpenStack distribution across different market sectors, including enterprises, financial institutions and telcos. Cited customers include BBVA, Verizon, Turkcell and Paddy Power Betfair.

Canonical's Charmed OpenStack

Canonical's Charmed OpenStack is a 100% open source OpenStack distribution that is publicly available for everyone. Canonical's mission is to provide OpenStack that can be deployed, maintained and upgraded economically. The distribution is fully based on the OpenStack Charms upstream project and always becomes available within two weeks of the upstream release for the latest features and bug fixes while ensuring stability through constant testing and patching. For enterprise customers looking for commercial support, Canonical offers consulting, support and fully managed services for Charmed OpenStack. The customer portfolio spans various market sectors, from enterprises, financial institutions and telcos to governments. Canonical's OpenStack customers include Cisco, BT, Rabobank, Bloomberg and Tesco.

Distribution comparison

In the following section, we will perform a detailed analysis of the differences between Red Hat OpenStack Platform and Canonical's Charmed OpenStack. We will evaluate how each distribution influences and impacts the business value OpenStack can deliver to an enterprise. For a more detailed comparison, refer to the appendix at the end of this whitepaper.

Licensing

We start the comparison by looking at licensing. While OpenStack itself is 100% open source, various OpenStack distributions may rely on tools which are not open source and require a subscription. For example, OpenStack vendors may use their proprietary tools to install and operate OpenStack. This results in vendor lock-in and prevents users from leveraging the benefits of open source software. For example, if there is a bug in the OpenStack installer, they are dependent on the vendor to fix this bug, rather than fixing it themselves or benefitting from a community member doing so. Being fully vendor-dependent results in reduced flexibility, time spent on looking for and applying workarounds or can even lead to situations where the production cloud is not operational at all.

One such OpenStack distribution is Red Hat OpenStack Platform. Although the underlying engine, TripleO, is open source and hosted under the governance of the OpenStack Foundation, Red Hat packages their OpenStack Platform with a proprietary installer. This installer, called Red Hat OpenStack Platform Director, provides an additional layer on top of TripleO and requires a subscription to be purchased. This stack is shown in Fig. 1. Although Red Hat provides a trial period during which organisations can try Red Hat OpenStack Platform for free, the entire platform cannot be used after the trial period expires. This means that organisations have to cover all of their environments, including production, development and staging, with the subscription. This subscription, as we will show in the next section, is expensive.

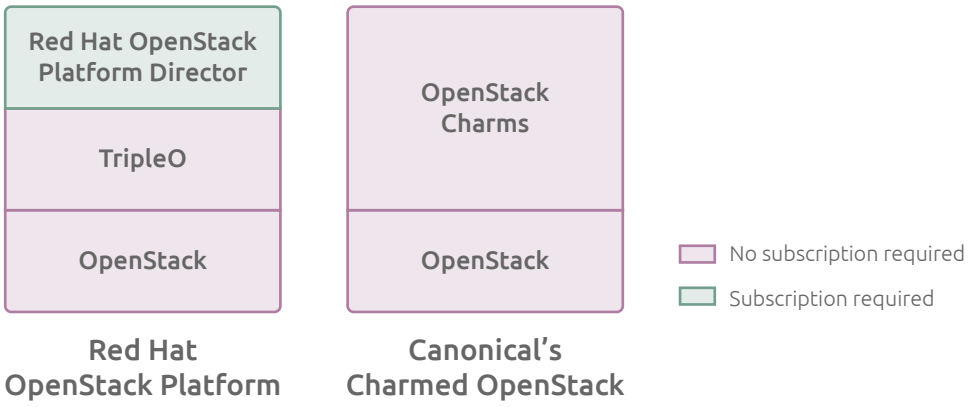


Fig.1. Red Hat OpenStack Platform and Canonical's Charmed OpenStack software stack.

In turn, Canonical's Charmed OpenStack is 100% open source. It is fully based on OpenStack Charms which are an official OpenStack project hosted under the governance of the OpenStack Foundation. This provides absolute transparency and helps to stay compliant with the upstream. Moreover, Charmed OpenStack does not require a subscription which means that organisations can try it and use it free of charge for as long as they need. For enterprise customers, Canonical provides consulting, support and fully managed services for OpenStack if desired, but organisations can re-use the artefacts provided by Canonical to deploy as many clouds as they want. They can also decide which environments to cover with the subscription that may result in substantial cost savings as usually, not all environments require full support. This results with increased flexibility in budgeting private cloud infrastructure.

Pricing model

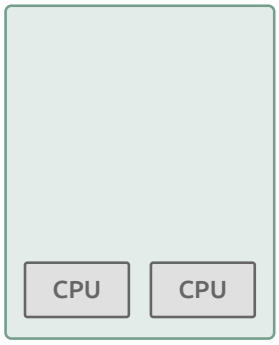
Although not all OpenStack vendors require a subscription for usage of their distribution, all of them rely on the subscription to provide commercial support. This is where the pricing becomes a decisive factor. Every organisation, regardless of size, wants to receive the best possible services with the best economics.

Red Hat only supports OpenStack deployments made through the Red Hat OpenStack Platform Director. Various types of subscriptions, including Red Hat OpenStack Platform, Red Hat OpenStack Platform (without a guest OS) and Red Hat Ceph Storage are available, depending on the node destination. Although Red Hat's pricing for OpenStack is not publicly available, an estimated price of a Red Hat OpenStack Platform subscription unit is 5,000 USD per socket-pair. In addition, all nodes in the cluster have to be covered with a RHEL subscription at the price of 1,299 USD per socket-pair.

A per socket-pair pricing model means that a separate subscription is needed for every 2 CPUs (central processing units). As a result, the cost increases as the number of workloads grow, making this an expensive option when scaling. In turn, Canonical uses a per host pricing model, regardless of the number of CPUs inside of the host, under the Ubuntu Advantage for Infrastructure (UA-I) subscription. This means that if the number of workloads grows, Canonical's customers can just switch to more powerful hardware instead of purchasing additional subscriptions, as adding and removing hardware is fully automated, including bare metal provisioning. They can also plan the deployment carefully without having to purchase more subscriptions than they actually need during the initial roll-out of the cloud.

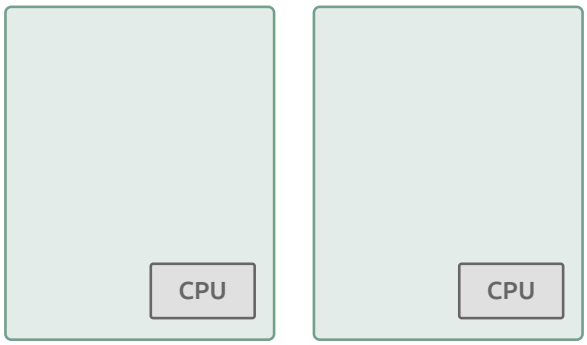
The difference between per socket-pair and per host pricing model, based on a compute node example, is shown in Fig. 2:

a. One host with 2 CPUs



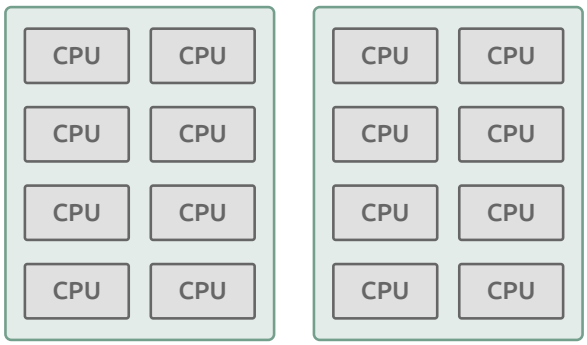
Canonical: **1 subscription (1,500 USD)**
Red Hat: **1 subscription (~6,300 USD)**

b. Two hosts with 1 CPUs



Canonical: **2 subscription (3,000 USD)**
Red Hat: **2 subscription (~12,600 USD)**

c. Two hosts, each with 8 CPUs



Canonical: **2 subscription (3,000 USD)**
Red Hat: **8 subscription (~50,400 USD)**

Fig.2. Per socket-pair vs per host pricing model.

The biggest problem with the per socket-pair pricing model is the lack of transparency and control over the costs compared to the per host pricing model. It is much easier to predict the growth rate of physical hosts than the growth rate of socket-pairs. This is especially true in environments where virtual machines have dedicated CPUs assigned, such as NFVI (network function virtualisation infrastructure) scenarios. As a result, a per socket-pair pricing model can quickly result in an ever-inflating TCO. Per host pricing allows enterprises to thoroughly estimate annual operational costs and enables full transparency when budgeting for future changes.

Ubuntu Advantage for Infrastructure (UA-I) is an enterprise subscription for Ubuntu, covering all aspects of the infrastructure, including Ubuntu Server, OpenStack, Ceph and Kubernetes. It includes commercial support, production-grade SLAs (service level agreements), Kernel Livepatch Service and up to 10 years of security patches. Ubuntu Advantage for Infrastructure is available in three variants: Essential, Standard and Advanced, each of which offer different levels of support. The annual cost of an Advanced subscription is 1,500 USD per host.

Consulting services

OpenStack is known to be a complex system. Although the installers which are usually available as part of commercial distributions significantly simplify its initial deployment, organisations which have no previous experience with OpenStack still struggle with designing the cloud and making choices of hardware, SDN (software-defined networking) controllers and storage platforms. This slow decision making and implementation process could be invested in utilising OpenStack to bring value to the business. In response to this challenge, various OpenStack vendors offer consulting services for their distributions.

Red Hat's approach towards consulting for OpenStack is to engage with potential customers through an SDF (solution delivery framework) which consists of three stages: discover, design and deploy. Across these stages, Red Hat consultants provide products, services and custom engagements to help their customers design and build their private cloud infrastructure based on the Red Hat OpenStack Platform. The pricing is calculated individually based on consulting units which are credits that can be redeemed for consulting services. This means that the customer pays for work hours of Red Hat's consultants instead of the actual deliverables. This can lead to budgeting challenges as customers often do not know how many consulting units are needed to meet their requirements. An estimated price of Red Hat OpenStack Platform delivery is 10,000 USD per week of engagement with a Red Hat consultant.

Instead of building snowflakes, Canonical takes a completely different approach to OpenStack design and delivery. For its customers, Canonical offers the Private Cloud Build (PCB) service at a fixed price. The service includes a reference architecture, BOM (bill of materials) for various choices of certified hardware and Charmed OpenStack delivery. For more demanding customers, Canonical offers the Private Cloud Build Plus service which expands the PCB service with on-site design workshops to prepare an optimal, customised design that meets customers' needs. By consuming consulting services at a fixed price, organisations benefit from a transparent and predictable cost.

Private Cloud Build (PCB) is a consultancy package for Charmed OpenStack which includes cloud delivery based on reference architecture and certified hardware options. Additional services and add-ons, such as on-site design workshops, custom architecture and non-standard SDN, and storage solutions are available under the PCB Plus package. Using PCB leverages the Infrastructure-as-Code (IaC) approach, making the deployments repeatable and drastically reduces the time required to deploy OpenStack. PCB is available at a fixed price and costs 75,000 USD.

Support services

While consulting services allow organisations to accelerate the initial roll-out of their OpenStack cloud, support services allow them to stay updated post-deployment and use help when needed. Both Red Hat and Canonical offer commercial support for their OpenStack distributions. These include bug fixes, security patches, production-grade SLAs and ongoing support. Everything that is needed for a production OpenStack.

So is there anything that differentiates Red Hat OpenStack Platform from Canonical's Charmed OpenStack with regards to the commercial support? Apart from Canonical offering a more economical support model with predictable pricing as shown in Fig.2, the only difference between the two is the maximum support timeline. While Red Hat provides five years of support for their OpenStack distribution, Canonical commits to provide security patches for Charmed OpenStack for an additional five years as part of the ESM (Extended Security Maintenance) package available for enterprise customers under the Ubuntu Advantage for Infrastructure subscription. This results in up to ten years of security and provides enterprises with the flexibility to plan their upgrade while staying patched.

Managed services

Managed OpenStack is a fully managed private cloud service provided by Canonical which enables organisations to fully outsource their OpenStack operations. Managed OpenStack includes daily OpenStack maintenance, upgrades, monitoring and incident, and problem resolution. The annual cost of the Managed OpenStack service is $4,275 USD per host.

In some situations, organisations may not be ready to operate OpenStack post-deployment by themselves. This is because OpenStack usually requires dedicated human resources to maintain it. Although large enterprises usually have a dedicated operations team or can afford to hire as needed, this may not be the case for mid-size and small businesses. Moreover, even if they have resources, organisations may still face other challenges when operating OpenStack. These include lack of knowledge, lack of experience, lack of on-prem conditions to host the cloud or time constraints. All of that results in a lot of time spent on learning new technologies and prevents organisations benefiting from the value brought by OpenStack immediately.

In response to the aforementioned challenges, some OpenStack vendors offer fully managed services for their distribution. Managed OpenStack solutions fill in the gaps between the business and the technology and allow organisations to fully transfer the risk associated with OpenStack operations. In order to be able to offer such services, OpenStack vendors usually require that the cloud is deployed by them through the consulting services. However, in most cases, organisations can take control of their cloud at any given time and terminate the contract when no longer needed.

This is exactly what Canonical offers for its Managed OpenStack service. Although the cloud is deployed by Canonical's field engineers as a part of the PCB service and is maintained by Canonical's operations team, customers can always request a handover. This is also something that Canonical can help with by offering comprehensive training services for customer's operations team members. In turn, Red Hat does not offer managed services leaving their customers on their own with post-deployment maintenance. Moreover, as the cumulative cost of UA-I and Managed OpenStack (5,775 USD per host) is lower than the cumulative cost of Red Hat subscription for OpenStack (~6,300 USD per socket-pair), in fact Canonical's customers can get fully managed private cloud service at a better price than Red Hat's OpenStack customers.

OpenStack maintenance

Although fully managed services for OpenStack are a tempting solution for many organisations, due to various reasons they are not always an option. While most organisations rely on vendor's consulting services to deploy OpenStack, they usually maintain the cloud by themselves post-deployment. How easy this maintenance is becomes a decisive factor. As OpenStack maintenance includes lifecycle management, configuration, daily operations and integration with external components, a lot of resources are required to operate it. In most cases, a dedicated team is hired to maintain the cloud. An organisation then needs to evaluate how many employees are required which will impact its ongoing OpEx costs.

While Red Hat OpenStack Platform Director provides full automation of the initial OpenStack deployment process, its support for ongoing OpenStack maintenance is very limited. Most of the tasks, such as scaling out the cluster, have to be either run manually or in a semi-automated way. In turn, Charmed OpenStack expands automation to daily OpenStack maintenance by using a model-driven approach based on OpenStack Charms. This is possible by abstracting the entire complexity behind OpenStack and exposing the configuration of the cloud in the form of a model which can be easily updated by the operations team. As a result, organisations have to spend less time performing daily maintenance tasks. This means that fewer FTEs (full-time equivalents) are required to operate the cloud which results in significant cost savings.

Release cadence

OpenStack is a quickly evolving project, thus it is released according to well-defined release cadence. A new version of OpenStack becomes available every six months. This allows OpenStack users to estimate feature delivery timelines, design an upgrade plan for and apply it at any given time in the future. However, not all OpenStack distributions follow the upstream release process with the same predictability.

Historically, Red Hat's release cadence was not predictable at all. Although starting with OpenStack Platform 16, Red Hat now commits to release new versions of their OpenStack distribution on a regular basis, support for the latest upstream OpenStack version is still coming with a few months delay. This is because the release cadence of Red Hat OpenStack Platform follows the same conservative approach that the company applies for RHEL; striving to ensure stability over anything else.

However, Canonical commits to release new versions of Charmed OpenStack within two weeks from the upstream release. This means that customers can upgrade to the latest stable upstream version shortly after it becomes available. As new versions usually come with a lot of new features, various enhancements and bug fixes, the sooner organisations can access them, the sooner they can start extracting the business value brought by them. At the same time, stability is ensured through the constant integration testing and patching process. The Charmed OpenStack release cadence is shown in Fig. 3.

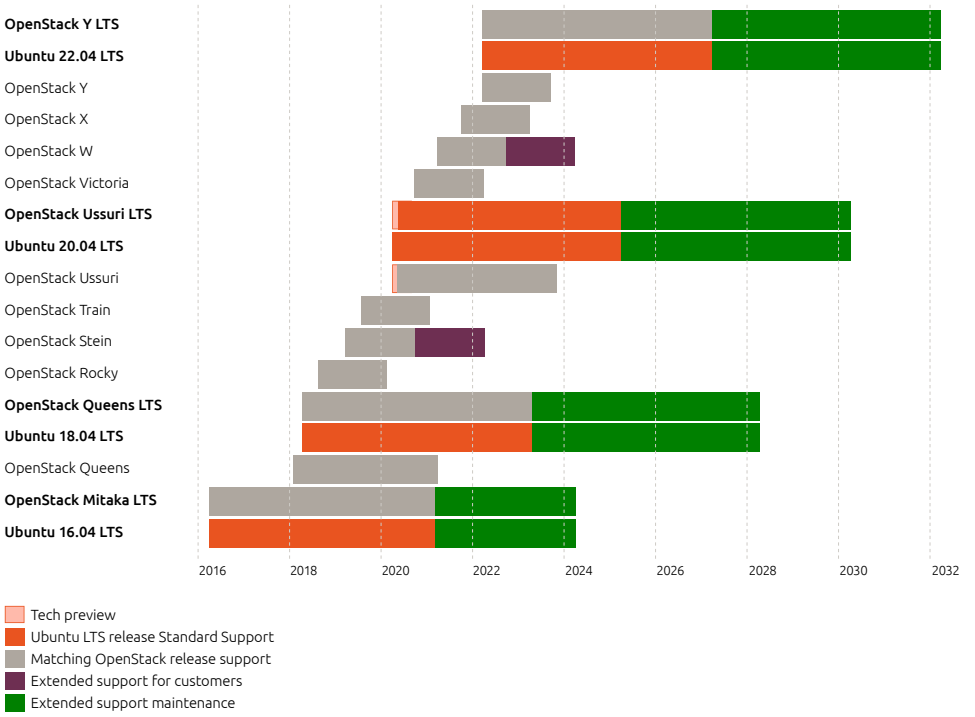


Fig. 3. Charmed OpenStack release cadence.

OpenStack upgrades

Software upgrades are an essential part of the maintenance process. The same practice should apply to OpenStack. However, OpenStack upgrades are known to be very complex. This is because OpenStack consists of various interconnected components which have to work together to provide the service to users. Thus, the upgrade procedure has to be executed very carefully as a failure of a single step results in a failure of the entire process. As a result, many OpenStack vendors have never supported OpenStack upgrades, forcing their customers to re-deploy. Re-deployments usually translate to downtime and additional work - scenarios that organisations usually want to avoid.

Historically, Red Hat was not supporting OpenStack upgrades at all. This was partially due to the fact that they have been constantly changing the underlying software stack for OpenStack installation. However, starting from Red Hat OpenStack Platform 16 upgrades are now supported. Red Hat provides a manual procedure which users can use to upgrade their cloud. This is not ideal, however, as the procedure is very complex and time-consuming. Moreover, its complexity increases as the size of the cloud grows. Not to mention very complex architectures such as those used by telcos, for example.

Canonical was one of the first OpenStack vendors offering full support for OpenStack upgrades. Canonical's Charmed OpenStack can be upgraded in a fully automated way. The operations team only has to initialise the upgrade process manually and the rest of the work is performed by OpenStack Charms. This is again possible by abstracting the entire complexity behind OpenStack and hiding it from the operations team. Fully automated upgrades allow organisations to stay up to date while meeting their availability goals. All of that results in less work required to maintain the cloud and reduced operational cost.

Multi-cloud and hybrid clouds

Although OpenStack on its own is an essential part of every modern organisation that uses a private cloud, a multi-cloud strategy is increasingly a consideration. This is especially evident in the case of containers as the entire world is moving towards cloud-native applications. Therefore, how to run containers on top of OpenStack becomes an important question. Moreover, many organisations implement a hybrid approach, running sensitive workloads in the private cloud, while outsourcing others to public clouds. How easy the private cloud can be integrated with public clouds becomes another decisive factor.

Red Hat OpenStack Platform does not provide any integration capabilities with public clouds out of the box. It is simply not designed for this purpose. As for containers, Red Hat has been promoting their OpenShift PaaS (platform-as-a-service) platform which uses Kubernetes underneath, but it is proprietary and available per an additional license. This again leads to vendor lock-in and increased operational costs as customers have to purchase a subscription for another infrastructure component and are fully dependent on the vendor.

Canonical takes a completely different approach here. The company believes in a multi-cloud partnership on Kubernetes for the purpose of running cloud-native applications. Canonical's Charmed OpenStack can be easily extended with Charmed Kubernetes services running on top of it and the entire stack is supported under the same Ubuntu Advantage for Infrastructure subscription. This means that organisations do not have to pay extra for support of the container coordination platform, benefitting from a single platform for both virtual machines and containers. Canonical's Charmed OpenStack and Charmed Kubernetes can also be easily integrated with other charmed applications running in public clouds, leading to a fully functional hybrid cloud based on the same software stack.

Security and compliance

Last but not least, security plays an important role in every organisation. Red Hat's approach towards security has always been based on relying on mature versions of the kernel and software. Being very conservative with regards to new RHEL releases and adopting new versions of OpenStack with a significant delay, Red Hat has prioritised stability over new features. But is stability the only guarantor of security? Not really and Ubuntu Server is proof of that.

By always using a new stable Linux kernel, prioritising CVE (common vulnerabilities and exposures) and applying security patches 24/7, Ubuntu Server is known to be the most secure enterprise Linux distribution. An additional layer of security can be introduced by using CIS (Center of Internet Security) hardened images. By running on the top of Ubuntu Server, Canonical's Charmed OpenStack provides the highest possible level of security.

Ubuntu Advantage for Infrastructure customers also receive access to the Kernel Livepatch Service which allows applying kernel patches on the fly, without rebooting the operating system. This results in improved stability and resiliency as OpenStack services are not affected. Finally, the entire Charmed OpenStack can be integrated with Canonical's Landscape service which provides the ability to perform security audits and generate compliance reports. It also provides traditional operating system administration capabilities for bare-metal machines, virtual machines and containers.

Conclusion

Although both Red Hat OpenStack Platform and Canonical's Charmed OpenStack are production-grade commercially supported OpenStack distributions, they differ substantially. Those differences result from distinct missions and business models of the companies behind them. While Red Hat provides an OpenStack distribution for enterprises, Canonical's mission is to deliver an OpenStack distribution that is deployable, maintainable and upgradable economically. At the same time, Canonical provides consulting, support and fully managed services for OpenStack, simplifies its deployments and operations, enables fully automated upgrades and ensures a higher level of security.

In this whitepaper, we performed a detailed comparison of Red Hat OpenStack Platform and Canonical's Charmed OpenStack. We demonstrated that choosing the right OpenStack distribution is important as the wrong choice may result in delays, vendor lock-in and an increased TCO. Finally, we proved that Canonical's Charmed OpenStack is not only cheaper than Red Hat OpenStack Platform but also provides a higher level of production readiness, required by enterprises, telcos, financial institutions and governments.

Appendix

The following tables summarises the main differences between Red Hat OpenStack Platform and Canonical's Charmed OpenStack:

	Red Hat OpenStack Platform	Canonical's Charmed OpenStack
Subscription	Required	Not required
Support pricing	Per socket-pair (~6,300 USD)	Per host (1,500 USD)
Availability of consulting services	Yes, based on consulting units (~10,000 USD per week)	Yes, at a fixed price (75,000 USD)
Availability of managed services	No	Yes
Release cadence	6 months with an LTS every 18 months	6 months with an LTS every 2 years
Maximum support timeline	5 years	10 years
Open source	No	Yes
OpenStack deployment mechanism	Red Hat OpenStack Platform Director	Juju and OpenStack Charms
OpenStack upgrades	Very complex manual procedure	Fully automated
Bare-metal provisioning tool	Ironic	MAAS
Operating System management tool	Red Hat Satellite	Landscape
Control plane	Containerised (Kolla)	Containerised (LXD)
Supported hypervisors	KVM	KVM, Hyper-V
Supported SDN platforms	OVN, OVS, Juniper Contrail, Cisco ACI, OpenDaylight	OVN, OVS, Juniper Contrail, Cisco ACI, Nuage
Supported storage platforms	Ceph, NFS	Ceph, SAN, Nexenta, Pure Storage, StorPool

Learn more

For more information about Canonical's Charmed OpenStack, please visit our website.

You may also consider reading the following materials:

- OpenStack distribution comparison
- Private cloud TCO calculator
- Canonical's consulting services for OpenStack datasheet
- Canonical's support services for OpenStack datasheet
- Canonical's managed services for OpenStack datasheet

To get in touch with Canonical about OpenStack, click here.

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