Rackspace® Private Cloud Powered By OpenStack®: The Customer Experience

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1. Introduction

Industry analysts expect rapid growth in the private cloud market over the next five years as CIO's use private clouds to transform their IT environment. This growth expectation is not surprising as private clouds provide businesses with many features of a public cloud along with the security, control, and performance of a dedicated environment. While private clouds provide many advantages, they are also exceedingly complex and are difficult to manage. They must be implemented and managed by experts who understand cloud architecture and know how to upgrade, patch, monitor, and scale a cloud environment. Adding to this challenge is the fact that these experts are difficult to find, hire, and retain. For many companies it doesn't make sense to attempt to build this capability on their own. They want an expert to help them build and manage their private cloud.
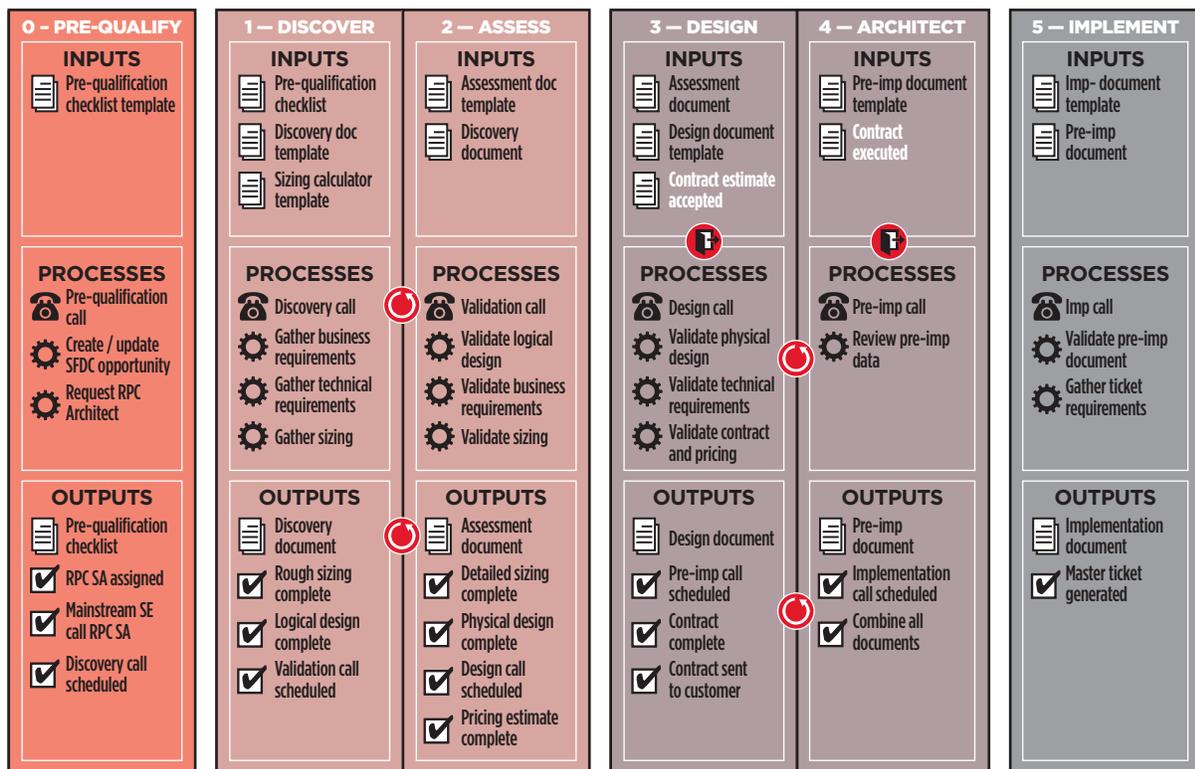
As the #1 managed cloud company, Rackspace® specializes in managing customers' environments so they can focus on their core business. Our OpenStack® private cloud solution, Rackspace Private Cloud (RPC): Powered by OpenStack, delivers the agility and efficiency of a public cloud, along with the security, control, and performance of a dedicated environment. It can be deployed in a Rackspace data center, on a customer's premises, or in both locations. Most importantly, Rackspace Private Cloud is operated by our team of OpenStack experts, is backed by **Fanatical Support**®, and delivers industry-leading SLA's including our 99.99% OpenStack API uptime guarantee.

The purpose of this document is to provide an in-depth look at how we deliver an exceptional experience throughout planning, delivering, and operating your private cloud and through the additional services that we offer.

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2. Planning For Your Cloud

Rackspace Private Cloud uses a six-phase solution design process to help you design your private cloud.

Rackspace Private Cloud Powered By OpenStack: Six-Phase Solution Design Process

0 - PRE-QUALIFY	1 — DISCOVER	2 — ASSESS	3 — DESIGN	4 — ARCHITECT	5 — IMPLEMENT
INPUTS	**INPUTS**	**INPUTS**	**INPUTS**	**INPUTS**	**INPUTS**
Pre-qualification checklist template	Pre-qualification checklist Discovery doc template Sizing calculator template	Assessment doc template Discovery document	Assessment document Design document template Contract estimate accepted	Pre-imp document template Contract executed	Imp- document template Pre-imp document
PROCESSES	**PROCESSES**	**PROCESSES**	**PROCESSES**	**PROCESSES**	**PROCESSES**
Pre-qualification call Create / update SFDC opportunity Request RPC Architect	Discovery call Gather business requirements Gather technical requirements Gather sizing	Validation call Validate logical design Validate business requirements Validate sizing	Design call Validate physical design Validate technical requirements Validate contract and pricing	Pre-imp call Review pre-imp data	Imp call Validate pre-imp document Gather ticket requirements
OUTPUTS	**OUTPUTS**	**OUTPUTS**	**OUTPUTS**	**OUTPUTS**	**OUTPUTS**
Pre-qualification checklist RPC SA assigned Mainstream SE call RPC SA Discovery call scheduled	Discovery document Rough sizing complete Logical design complete Validation call scheduled	Assessment document Detailed sizing complete Physical design complete Design call scheduled Pricing estimate complete	Design document Pre-imp call scheduled Contract complete Contract sent to customer	Pre-imp document Implementation call scheduled Combine all documents	Implementation document Master ticket generated

The documentation we gather during this process ensures you won't be asked the same question multiple times by different team members and that we provide a smooth transition from designing to deploying and operating your cloud. Our consultative approach starts with getting a clear understanding of your objectives and discussing how RPC can help meet your needs. After our initial discussion, you have the option to have RPC Solution Architects meet with you onsite to conduct a two-day design session. During this session, we assess your current state environment and discuss your business requirements, technical requirements, and sizing needs for your cloud. This process includes gathering information about your applications, infrastructure environment, security and compliance needs, systems management capabilities, capacity management, and operational readiness. All of this information

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is documented in your "customer requirements" report and reviewed with you for accuracy. After you've validated your report, we put together a detailed cloud design document for your environment that includes hardware, software, and network requirements, your cloud architecture and summary of architectural design decisions, a network diagram, and several cloud specific details like your availability zones, tenant configuration, user roles, virtual instance design, and monitoring specifications.

Once you approve your cloud design, we begin preparing for implementation by creating a pre-implementation document, which summarizes the key information associated with your cloud delivery including deployment location, support services, Glance backend storage selection, networking configurations, tenant names, and availability zones. Your cloud deployment is scheduled following your approval of the pre-implementation document.

3. Delivering Your Cloud

The Rackspace Private Cloud delivery process includes your cloud deployment, post-deployment quality check, and a live walk through of your environment. An RPC Deployment Engineer leads your cloud deployment and uses a prescribed installation workflow throughout the deployment process. The installation workflow includes preparing the deployment and target hosts, configuring the deployment, and running the foundation, infrastructure, and RPC Ansible Playbooks. As part of this process, your RPC Deployment Engineer translates your cloud requirements into configuration files and uses these configuration files and our RPC Ansible Playbooks to deploy your cloud environment.

Immediately following your cloud deployment, we run an extensive quality check to verify your cloud has been set up properly and is functioning as intended. The RPC post-deployment quality check includes a series of tests designed to verify that your configuration files are accurate and persistent, that your monitoring services and alarms were configured properly, and that each cloud service is responding as designed. To test your configuration files, we reboot the physical devices in your cloud and verify that each setting is accurate following the reboot. This includes ensuring that the appropriate version of RPC software is installed, your Galera clusters survived the reboot, your requested users and tenants were created and assigned the appropriate role, the correct networks were created, your Glance images were uploaded, and your

floating IPs were created and can be used to access instances remotely. Following the configuration file test, we run through a series of monitoring playbooks to ensure that your monitoring services and alarms are configured properly and that each cloud service passes its specific test. During this step, we run a monitoring setup Ansible Playbook to verify that your monitoring services are configured properly, we run local API checks on each OpenStack service (e.g., for Cinder, we verify that the API can return a list of volumes and snapshots; for Glance, we verify that the API can return a list of images), we verify that the Galera and RabbitMQ clusters are synchronized, that we can log in to the Horizon dashboard using your admin user credentials, and that we can connect to other services within your cloud including Logstash and Elasticsearch.

The final step of the Rackspace Private Cloud delivery process is a live walk through of your cloud environment. While we manage and operate your cloud, we also want to help you get the most out of using it. Your walk through is led by an RPC OpenStack Engineer and serves as an introduction to your cloud. They begin the walk through by getting a sense of your familiarity with OpenStack and answering your initial questions. Following that, they will help you log into your Horizon dashboard and will guide you through the key tasks and capabilities associated with both administering and using your cloud. The key tasks and capabilities covered in the walk through include setting up Security Groups and SSH keys, reviewing and customizing your cloud resources (e.g., tenants, quotas, flavors), booting an instance, creating a volume, customizing your network, and reviewing the information in the Project, Admin, and Solutions tabs. After the live walk through ends, the delivery of your cloud is complete and you can start using your Rackspace Private Cloud.

4. Operating Your Cloud

The RPC team specializes in managing your cloud so you can focus on your core business. Our managed service offering, Rackspace Private Cloud Core and Object Storage Support, provides you with the following benefits:

Dedicated Account Manager — As an RPC customer, you are assigned a dedicated RPC Account Manager. Your dedicated account manager has an in-depth knowledge of your environment and serves as your "go to" resource to help you with any questions, issues, or planning needs for your cloud (e.g., expanding, upgrading). To manage the daily operations of your cloud, your dedicated RPC Account Manager will create a "run book" that is specific to your environment. Your run book will include your cloud configuration (e.g., software details, Ansible Playbooks, device locations, architecture), key technical and executive contact information, a list of any customized items in your environment, escalation processes, and a change management log to document all changes to your environment. Your dedicated account manager will set up a recurring monthly meeting with you to review your account, discuss your cloud performance metrics and utilization, help you plan for the future, and to audit and update your run book as necessary.

Proactive Monitoring and Maintenance — Our team of OpenStack experts proactively monitor and maintain the health of your cloud 24x7x365. Our monitoring service continually checks your disk space, disk utilization, CPU idle time, and memory capacity as well as verifying the OpenStack services (e.g., Horizon, Keystone, Neutron, etc.) and other services (e.g., Galera, RabbitMQ, etc.) in your cloud are responding to calls as intended. To help ensure the service meets your needs, your dedicated account manager will work with you to customize your settings. Through this customization process, you are able to set the frequency for how often your monitoring tests are run (e.g., every minute, every 5 minutes, etc.), define which ports are used for each test, set the thresholds for your compute, disk, and memory-related alerts, and determine which members of your organization will receive an auto-generated notification for each alert. Our monitoring service issues an alert if a warning/failure occurs or a threshold is exceeded. Each alert is assigned a severity level that includes an associated live response time guarantee. The following table includes a definition of each severity level and its associated guaranteed live response time:

Severity Level	Initial Live Response
Emergency — instances are failing or the OpenStack coud is partially or wholly inoperable	**15 minutes**
Urgent — inability to launch or terminate new instances	**1 hour**
Standard — delay in launching new instances or in interacting with the OpenStack API	**4 hours**

In addition to monitoring your cloud, we continually maintain the health and security of your environment. We proactively address security vulnerabilities and software bugs with patches; and if desired, we will work with you to develop a customized patching plan that helps meet your unique needs and usage patterns. We also keep your cloud updated so you may benefit from the security enhancements and features associated with our latest software release. Using our Linux container-based architecture, we provide you with a seamless, in-place upgrade from one RPC software release to the next – without any interruptions or downtime.

Scaling Support — As your business and cloud demands grow, we help ensure your environment scales to meet your needs. This includes optimizing your environment through performance benchmarking, future-proofing your cloud through capacity planning, and scaling your OpenStack services as needed. As we proactively monitor your cloud, we continually run performance benchmarks and fine-tune your environment based on the results. Examples of improvements we might make include updating network configurations and bonds to increase throughput, calibrating a Maria DB cluster to improve API response times, and moving to solid state drives for enhanced IOPS performance. To ensure your cloud keeps up with your business demands, your dedicated account manager will help you plan for future capacity needs by providing growth recommendations based on your current and projected resource utilization. This includes planning for select events like a major promotion or holiday that you expect will drive a significant increase in activity to your cloud services (e.g., a substantial spike in visits to your website). Another critical success factor in scaling your cloud is ensuring each OpenStack service is able to meet your unique demands. Typically, your workload will generate varying levels of demand between the multiple OpenStack services. For example, if your workload is network intensive, it might require a scaling event for your networking service, but not for the other OpenStack services in your environment. In this case, our support team would scale your Neutron networking service by leveraging our Linux container-based reference architecture. In addition to providing an in-place upgrade path, our container-based architecture

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enables us to independently scale each OpenStack service. Most providers require that you scale all OpenStack services together even if you only need to scale one service. This requirement is often due to limitations in their architecture and can lead to excess hardware spend on unnecessary service upgrades.

24x7x365 Access To Our Team of OpenStack Experts — We provide you with direct access to our team of OpenStack experts. Many providers require their customers to submit a ticket and wait for a non-technical representative to respond before they are able to speak with a technical representative who can solve their problem. With Rackspace Private Cloud, you have direct access to our engineers who will help answer questions like "How do I boot an instance with a root file system on Cinder?" and help you work through any challenges you may be experiencing. And in striving for ongoing improvement, we continuously seek your feedback by providing you the opportunity to "rate us" after each interaction and through sending you a quarterly Net Promoter Score (NPS) survey.

5. Additional Services

In addition to our Managed Core and Object Storage Support, we offer several other services to help you move to, optimize, and get the most out of your OpenStack private cloud. Our additional services include:

Dedicated OpenStack Engineer — This service provides you with a single point of contact for your technical needs. In collaboration with your dedicated account manager, your Dedicated OpenStack Engineer will lead the lifecycle management of your cloud and provide you with ongoing training to help you optimize your environment and keep you updated on the latest features and capabilities of OpenStack.

DevOps Automation Service — Automation is key to unlocking the full potential of your cloud. Our DevOps Automation Service helps automate your application environment by treating your infrastructure as code. This service automates your process for deploying and scaling applications, helps sync your development and production environments, and tracks your environment and application health using advanced monitoring and analytics.

Cloud Enablement Services — These services help you accelerate your cloud adoption and modernize, automate, and optimize your environment. Our enablement services are grouped into the following five categories:

1. **Application Modernization** — Modernize an application to run on your OpenStack private cloud and conduct application and infrastructure assessments from basic to full spectrum security hardening, performance tuning, and environmental health checks.
2. **Agile Methodology** — Help you transform traditional "waterfall" development processes into a continuous integration/continuous delivery (CI/CD) pipeline.
3. **Big Data** — Provide you with best practices and consultation for designing, deploying, and running big data solutions (e.g., Hadoop, Cassandra, Elasticsearch, Redis, MongoDB) on an OpenStack private cloud
4. **Authentication and Federation** — Integrate your existing authentication solutions (e.g., Active Directory, LDAP) into your OpenStack private cloud and help to design federated authentication models for infrastructure and applications across multiple clouds using Active Directory or LDAP.

5. **Advanced Cloud Optimization** — Provide best practices for encapsulating an application with Docker containers and help you achieve compliance targets by providing a security architecture template that can be customized for your specific infrastructure design.

Training — Deliver in-person training designed to help you use and get the most out of your Rackspace Private Cloud environment. Our three-day course provides an overview of OpenStack, a demo of the Horizon dashboard, and a presentation and lab section for the following areas: Keystone, Glance, Networking, Nova, Cinder, Config Management, User Data, File Injection, and Host Aggregates.

6. Conclusion

Many businesses are looking at private clouds to help accelerate their IT transformation. Private clouds provide many advantages, but they are exceedingly complex and require someone to manage them. There are several providers who will help deploy a private cloud, but leave it up to you to operate and support it. And because they don't have to operate or support it, they are willing to "customize" your cloud in ways that might make it difficult for you to run, scale, or upgrade it in the future. Other providers will help you deploy a cloud and will support their cloud software, but won't actually manage and operate your cloud environment. Rackspace specializes in managing your private cloud so you can focus on your core business. We deliver a production-ready private cloud that is backed with **Fanatical Support**® and an industry-leading OpenStack API uptime SLA.

For more information about how we can help manage and support your private cloud, please visit **http://www.rackspace.com/cloud/private/openstack**.

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About Rackspace

Rackspace® (NYSE: RAX) is the #1 managed cloud company. Its technical expertise and **Fanatical Support®** allow companies to tap the power of the cloud without the pain of hiring experts in dozens of complex technologies. Rackspace is also the leader in hybrid cloud, giving each customer the best fit for its unique needs — whether on single- or multi-tenant servers, or a combination of those platforms. Rackspace is the founder of OpenStack®, the open-source operating system for the cloud. Based in San Antonio, Rackspace serves more than 300,000 business customers from data centers on four continents.

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