Rackspace®
Cloud Databases

Fast. Open. Fully managed.

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1. Introduction

Relational databases are a pillar of enterprise operations and business management. Because of their role in underpinning mission-critical workloads, IT leaders face unique challenges in managing them — namely, investing in time-consuming administration, ensuring consistent performance and scaling to meet spikes in user demand.

Rackspace Cloud Databases is a stand-alone relational database service designed to address those challenges. Built on OpenStack®, Cloud Databases allows Rackspace customers to easily provision and manage multiple MySQL database instances, save time on maintenance and administration, and transition between database distributions with little hassle. Instances are provisioned in a single-tenant, container-based environment and are accessible via the Rackspace internal ServiceNet network. Each database instance is optimized for performance. Cloud Database customers can choose between MySQL, Percona or MariaDB as the database technology.

Because Cloud Databases' internal architecture was explicitly designed to provide a unique, high-performance relational database service in the cloud, it creates an environment that is:

- Fully managed
- Performant
- Open
- Reliable

These benefits alone should resonate with IT executives and database administrators, but another differentiator of Rackspace service is its **Fanatical Support**®. This allows IT leaders to focus entirely on improving efficiencies and servicing new technology requests, rather than maintaining infrastructure to support database operations.

WHAT TYPE OF BUSINESS IS BEST SUITED FOR CLOUD DATABASES?

Cloud Databases is a fully managed service for customers who want to focus on developing or growing their applications and not worry about the underlying database infrastructure. The service offers both automated and on-demand backups and restores, integrated monitoring, redundant storage, scalability to grow based on your application needs and full control of your database application. While it can be leveraged by any customer with a Rackspace cloud account, this service is ideal for companies that are looking to leverage a scalable database solution in the cloud without having to manage the hardware or database services needed to run a database on a dedicated server. Users can access all these parameters through an easy-to-use control panel.

2. Key Challenges of Managing Relational Databases

IT leaders often face three key issues when it comes to relational databases:

Administration pains: In many organizations, database administrators spend a disproportionate amount of time managing existing databases. The opportunity cost of this administrative work can be significant because it leaves DBAs little time to provision, test and tune new databases that support further application development.

Performance stability: Ensuring fast, consistent performance is difficult for any database because high I/O workloads are especially impacted by resource constraints. This can lead to inconsistent results and frustrating experiences for customers.

Expensive scalability: Scaling relational databases to process increasingly large volumes of data requires expensive DBA expertise and significant planning, which can lead to difficulties in reading, writing, and replicating data; poor database uptime and availability; and a lack of data redundancy.

3. The Benefits of Cloud Databases

FULLY MANAGED SOLUTION

Rackspace set out to build a robust service that makes it simple for businesses to deploy, optimize and scale their MySQL databases on demand in the cloud. This frees up customers' DBAs to focus on improving applications.

As a fully managed database hosting solution, Cloud Databases offers customers access to Rackspace experts. That means Rackspace DBAs and customer data engineers (CDEs) help design, configure, manage, scale, optimize and secure customer database environments. And with Rackspace industry-leading Fanatical Support, customers receive consultation and services relating to a wide range of issues, such as schema design and query optimization.

Examples of services included with Rackspace:

Deployment	Architecture design, optimization and configuration
	Assistance designing data models
	Data migration assistance
	Security configuration (ACL, accounts, etc.)
Maintenance	Advanced administration, monitoring and alerting
	Managed patching and updates
	Upgrades of MySQL, Percona or MariaDB versions
Scaling	Consultation with Rackspace DBAs to solve scalability challenges
	Provision new instances
	Resizing and/or growing instances
Optimization	Performance tuning and issue diagnosis
	Query optimization
Backups and DR	Disaster recovery solutions (DR) and business continuity
	Recommend and plan replication to DR site
	Participate in DNS management for failover to DR site
	Participate in DR RTO/RPO requirements
	Restores from backups
	Automatic backups

In addition, the cloud infrastructure underpinning Rackspace Cloud Databases allows for easy and fast provisioning, and its intuitive control panel empowers both advanced DBAs and less experienced users to monitor and manage databases. With just a couple clicks through the Cloud Database control panel, users can quickly configure or create a new instance, user or database. This database-as-a-service (DBaaS) model allows Cloud Databases customers to avoid performing application changes that relate to the database because they can simply connect the app to the database and allow the service to seamlessly scale, maintain and manage all back-end functions.

In scenarios where a particular application relies on a significant number of databases (i.e., hundreds or thousands), Cloud Databases' API is an ideal solution. It gives companies full access to their MySQL instances — a benefit not offered by other relational database service providers.

In addition, Cloud Databases makes it easy for customers to vertically scale their database up and down as needed. Customers can scale RAM (from 512MB to up to 64GB) as their workload changes and scale storage up (as high as 300GB, with larger volumes available upon request) with zero downtime.

FULL, OPEN ACCESS

Another major benefit of using Cloud Databases is the freedom to choose between MySQL variants. Cloud Databases includes support for multiple MySQL-compatible variants and versions, including MySQL, Percona Server and MariaDB. Each of these variants provides unique appeal to businesses for different reasons:

- MySQL remains the world's most widely used open-source relational database service in part because it is easy to use and supports numerous operating systems and development interfaces. A slight drawback to MySQL is that it cannot scale with high write/read ratios.

- Percona Server is a MySQL alternative offering breakthrough performance, scalability, features and instrumentation. Self-tuning algorithms and support for extremely high-performance hardware makes it the clear choice for organizations that demand excellent performance and reliability from their MySQL database server.

- MariaDB is a popular community-developed replacement for MySQL that features bug fixes, performance improvements and strict binary and API compatibility with MySQL.

Because Cloud Databases is built on OpenStack®, companies can maintain full control of their database. In fact, customers can enable the root user on their database instance directly through Cloud Databases' CLI or API, or control granular user permissions by enabling the root user for the database instance and logging in through MySQL directly.

"Rackspace says they have Fanatical Support, and they absolutely do. It allows me to focus on the things I do well and not have to worry about all these other things that are over my head or not in my realm of expertise… without Rackspace, we couldn't do what we do."

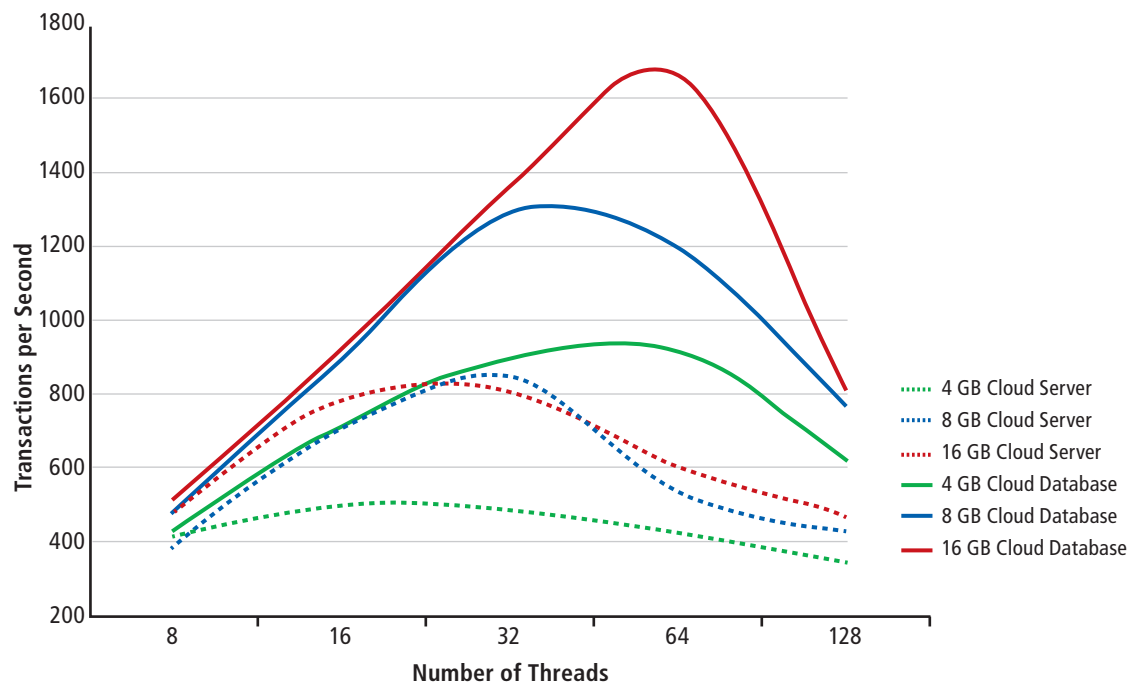_**– TJ Horlacher**_
CTO of SnapPages

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FAST, HIGH-PERFORMANCE INFRASTRUCTURE

Cloud Databases is tailored to deliver fast, predictable performance for high I/O MySQL database workloads. Cloud Databases instances come preconfigured for peak performance. Customers can also customize the default configuration settings and make persistent changes to further optimize for specific workload using the CLI and API.

The chart below shows the difference between running MySQL on Cloud Databases versus running it on Rackspace general-purpose Cloud Servers. In this particular example, performance was measured using sysbench, with a table size of 2 million rows run from a 4GB Cloud Server client with 200Mbps of network throughput and a Cloud Database instance of identical specifications.

The results show that the Cloud Databases generally perform better than their Cloud Server counterparts, especially when under load.
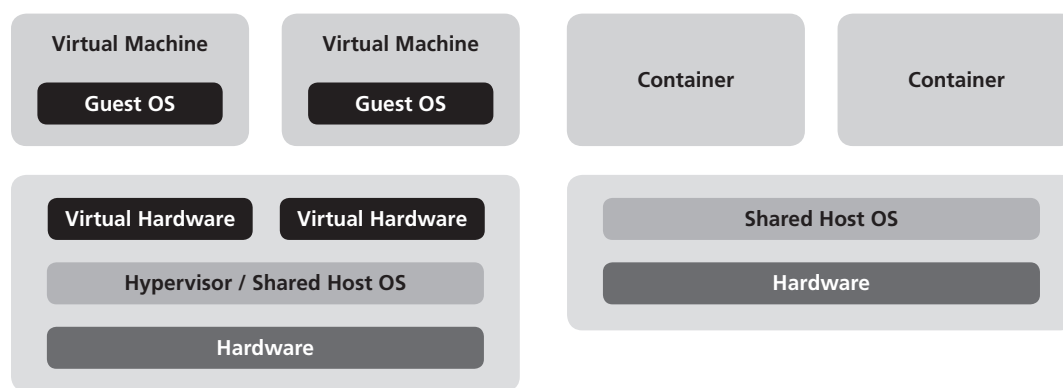

MySQL Performance – Cloud Servers vs. Cloud Databases

Info source: http://www.rackspace.com/blog/cloud-databases-and-block-storage-benchmarks-cost-of-performance-and-the-overprovisioning-tax/

CONTAINER-BASED VIRTUALIZATION

Part of what allows Cloud Databases to create this high-performance infrastructure is container-based virtualization. Traditional hardware virtualization uses virtualized memory, processors and hard drives that can impose significant penalties for databases and often require significant overhead from running multiple operating systems. Container-based virtualization, on the other hand, provides close-to-native performance with higher density, no virtual hardware and a single, shared OS.

Virtual Machine	Virtual Machine	Container	Container
Guest OS	Guest OS		

Virtual Hardware	Virtual Hardware	Shared Host OS	
Hypervisor / Shared Host OS		Hardware	
Hardware			

ATTACHED STORAGE VOLUMES

Each Cloud Databases instance also comes with an attached storage volume. Storage volumes are automatically provisioned on a shared Internet Small Computer System Interface (iSCSI) storage area network (SAN) that provides increased performance, scalability, availability and manageability with synchronous replication across available storage clusters. Applications with high I/O demands are performance-optimized, and data is protected through both local and network RAID-10.

EASY REPLICATION

For read-heavy workloads, Cloud Databases customers can also create read replicas of their database instance and use these replicas for distributing read traffic for a given application. This can significantly improve the overall application performance. Cloud Databases is also ideally suited for a large number of applications used for performing analysis and business reporting. Cloud Databases allows users to run such queries against a replica without affecting the performance of writes/updates on the source database instance.
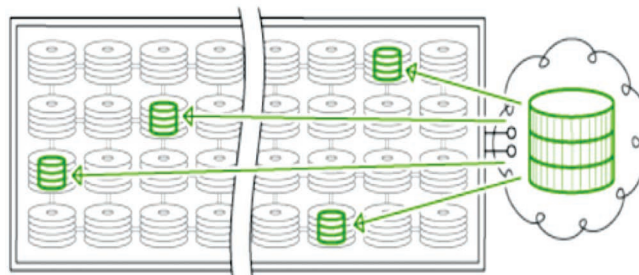
4. Worry-Free Hosting

With Cloud Databases, businesses running mission-critical MySQL workloads no longer need to worry about the stability, security or availability of their relational databases. With automated backup and restore operations supported for InnoDB and MyISAM storage engines, Cloud Databases uses a hot copy of all databases on an instance, with the resulting files stored in Rackspace Cloud Files.

Cloud Databases helps ensure service is worry-free by providing three other key features:

1. **Automatic monitoring and alarms**: Pre-configured Cloud Monitoring health checks include load average, CPU, memory, disk storage, network and multiple metrics for MySQL. Cloud Databases customers can also configure additional alarms and receive email notifications for supported metrics using the Cloud Control Panel, the Cloud Monitoring API or the Cloud Monitoring CLI.

2. **Private cloud security on the public cloud**: By default, all Cloud Database instances are protected from public internet traffic and directly accessible only through Rackspace internal ServiceNet network within the same regional data center. For further control, Cloud Databases customers can specify a host parameter when creating or modifying a user to restrict access from designated hosts only. Additionally, an SSL certificate is installed on every Cloud Database instance.

3. **High availability with true master-slave replication**: Network RAID provides synchronous replication of database volumes with automatic failover and load balancing across available storage clusters. Cloud Databases also features master-slave replication and redundant storage, both of which can be useful when the source database instance becomes unavailable. In that scenario, the replica can immediately act as the new source database instance and ensure that the application has minimal downtime.

"Rackspace has been invaluable in helping our startup succeed. The stability and performance of Cloud Databases allow us to scale in a cost-effective manner and focus on optimizing, scaling, and enhancing our Appreciation Engine product."

– Annabel Youens
CMO of The Appreciation Engine

MySQL connected to SAN storage with built-in data replication.

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5. Cloud Databases vs. Unmanaged Cloud

For organizations needing a high-performance, high-availability method of hosting a relational database in the cloud, there are few offerings that provide the depth of features, security, flexibility and scalability of Cloud Databases. That said, one of the key differentiators between Cloud Databases and alternative solutions is the value of leveraging a fully managed service versus unmanaged hosting. The chart below illustrates the differences between the two across seven important dimensions:

	Unmanaged Hosting	Rackspace Cloud Databases
Implementation	• Manual configuration of storage, networking, security, monitoring, and more • Manual testing and optimization, with a trade-off between timely deployment and future scalability	• Rackspace handles configuration and deployment • On-demand databases pre-optimized for relational databases
Deployment Options	Limited deployment flexibility (i.e., only public cloud or only dedicated servers)	Multiple deployment options architected specifically for MySQL, Percona and MariaDB: • Public cloud (Cloud Databases) • Private cloud based on Trove • Bare metal (Managed Databases) • Hybrid cloud with RackConnect
Maintenance and Monitoring	Customer must allocate significant DBA resources to monitor performance, maintenance, patching, etc.	Rackspace experts proactively monitor the network, server and database for connections, lag, status of replicas, size, number of queries, etc., 24x7x365
DBA Expertise	Customer must staff and retain increasingly large number of DBAs as the business scales	Rackspace DBAs and engineers are available to help with tasks such as replication, backups, indexing and query optimization
Performance	• Lower performance on generic virtualized servers, which are not optimized for high-I/O database workloads • Noisy neighbor problems on public cloud create inconsistency in performance	Consistent database performance on an infrastructure configured and tuned specifically to make MySQL databases run as fast as possible
Availability	"High availability" actually means creating a redundant, idle copy (that the user has to pay for), rather than a true replica that can be used to scale read workloads	Customers benefit from true master-slave replication and redundant storage
Data Portability	Expensive proprietary technologies and risk of vendor lock-in prohibit data portability	Infrastructure built on OpenStack®; database powered by MySQL ensures data portability

6. Cloud Databases Use Cases

Cloud Databases has many unique use cases, but five of the most common are:

- Application back-end WordPress
- Application back-end ecommerce
- Web application development
- High-traffic websites
- Gaming back-end

APPLICATION BACK-END WORDPRESS

For enterprise customers who might need to manage thousands (or even millions) of pages of customer data and content, Cloud Databases is an ideal solution. This service can help organizations spin up affordable databases on demand and in real time and easily store sites, settings and code in an environment that's stable and secure. That availability and flexibility offer businesses a huge improvement over previous methods of building dedicated equipment, installing SQL, and then watching costs skyrocket.

APPLICATION BACK-END ECOMMERCE

In environments like ecommerce that experience cyclical demand and require consistent performance, Cloud Databases can save significant time and resources, and improve overall customer experience. During peak times, such as the holiday season, Cloud Databases customers can easily and quickly scale database capacity. During slower times, those same customers can scale back usage and save money, thanks to Cloud Databases' tiered pricing model.

WEB APPLICATION DEVELOPMENT

Companies building new applications must be able to keep their DBAs focused on innovation and optimization of the database layer for new apps or features, rather than simply maintaining existing databases. Cloud Databases empowers companies to make that happen by delivering a fully managed solution for MySQL and popular MySQL variants. This allows DBAs to invest their time and energy in innovative app development, rather than time-consuming database infrastructure management.

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HIGH-TRAFFIC WEBSITES

The significant strain that high-traffic websites — popular media sites or blogs, or web-based software products — put on their databases makes scalability, speed and always-on performance critical. During peak times, a high-traffic website's relational database must be able to flexibly scale alongside those spikes in traffic in order to deliver the experience its visitors expect. Cloud Databases is specifically tailored to deliver this fast, predictable performance for high I/O MySQL database workloads, partly because pre-optimized Cloud Database instances come preconfigured for peak performance. Customers can also further optimize for specific workloads using the service's CLI and API.

GAMING BACK-END

Traditionally, game developers have struggled with using relational databases as back-end infrastructures because of the inability to efficiently store heavily structured data at load. To perform optimally in this environment, relational databases needed to be highly flexible and scalable, with DBAs on hand to provide immediate guidance as the game grows. However, relational databases have traditionally been time-consuming.

With Cloud Databases, game developers can deploy MySQL databases in minutes. Add in Fanatical Support — reducing the need to hire large teams of DBAs — and Cloud Databases forms an ideal solution for gaming back-end infrastructure.

7. Conclusion

Nearly 10 years ago, global research firm Gartner reported that 80 percent of enterprise IT budgets were spent on maintenance rather than adding new value to the organization.[1] The good news? That number has gone down. The bad news? According to consulting firm CEB, 57 percent of IT spending still goes toward maintenance activities.[2]

Rackspace Cloud Databases is explicitly designed to cut some of those costs and ease the burden on IT departments to manage mission-critical relational database infrastructure. This allows CIOs and their teams to spend more time strategizing ways to help the business succeed, and less time ensuring that their databases are secure, reliable, scalable and performance-optimized.

References:

1. Gartner, "Eight of Ten Dollars Enterprises Spend on IT is 'Dead Money'"; October 2006
   http://www.gartner.com/newsroom/id/497088

2. CEB, "How CIOs Will Spend Their Time and Money in 2015"; October 2014
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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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