EDB

EDB Postgres Distributed Always On: **The End of the Reign of Oracle RAC**

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POWER TO POSTGRES

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INTRODUCTION

'Always On' is a hallmark of digital transformation. Digital businesses never sleep. Mobile apps, websites, IoT systems, social media, telcos, and financial services are operating 24 by 7. Hour-long maintenance windows are a thing of the past.

Whereas outages used to cost money because of missed transactions, today they cost customers. Credit cards that are rejected because the service is not available move to the back of the wallet; payment gateways that are offline for more than a few seconds get replaced by vendors with better availability; content that doesn't load instantaneously all the time is soon forgotten; security systems that cannot generate access keys are unacceptable.

Databases are foundational for all of these services. Their 'Always On' mojo, also known as High availability (HA), is constrained by what the database can support. If the database can only achieve 99.99% availability, then the whole solution cannot exceed that service level.

This whitepaper takes the reader through a discussion of what it means to be 'Always On', what the obstacles are, and how EDB Postgres Distributed creates a Postgres®-based alternative to proprietary solutions, such as Oracle® Real Application Cluster (RAC). We end with a discussion of the business case for Postgres Distributed.

1. What does it mean to be Always On?

What does it mean to be Always On?

Not too many years ago, High Availability referred to technologies that protected software systems from hardware and network failures. Clustering solutions, for example, would automatically fail over when the underlying server malfunctioned. That reflected a very software system-centric point of view. Today, HA refers to service availability—today's definition is independent of why a software or hardware component has failed. HA measurement takes planned and unplanned maintenance activities into account, not just hardware and network failures. That means that HA solutions for the database need to be able to guarantee database service availability including the unavoidable maintenance windows for hardware, OS, and the database software.

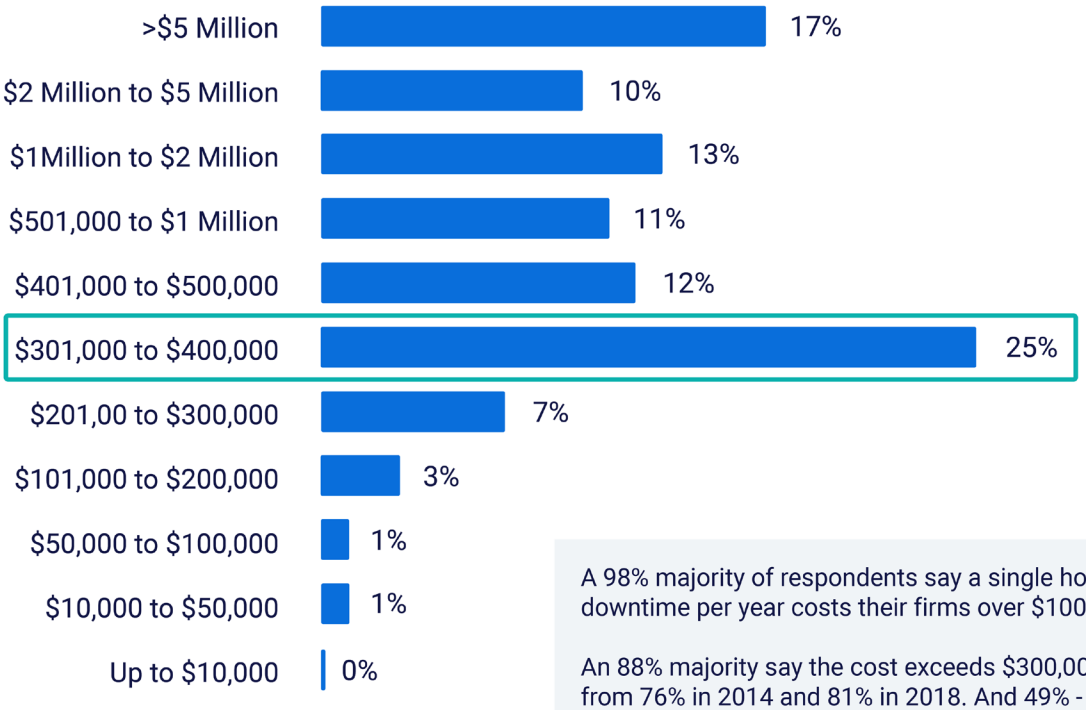
1.1 Who needs this?

The increasing consumerication and globalization of business has eliminated the concept of a planned maintenance window. Gone are the weekly downtimes when IT could upgrade or migrate a server. First the windows shrunk as businesses expanded globally, and then they disappeared completely when transactions, website visits, customer inquiries, and influx of IoT data started to happen continuously. Remember when businesses had paper-based credit card processing as a backup solution? Those machines are gone—today credit card processing is expected to work all the time, and rejections or retries because of downtime have become unacceptable. Single sign-on solutions (SSO) are another example. Because of ongoing security threats they have become the standard across the enterprise—and SSO needs to work all the time 24x7, otherwise business stops.

In that situation, even minute-long outages will cause a storm of help desk calls and can lead to a delay in business transaction processing.

The ITIC 2020 Global Server Hardware, Server OS Reliability Survey shows that HA requirements are growing dramatically. "99.99%—four nines of uptime—has become the minimum acceptable reliability standard." The cost of an hour-long outage is estimated at over $100,000 and 34% of organizations estimated that cost to exceed $1 million.

Eighty-eight Percent of Firms Say Hourly Downtime Costs Exceed $300K in 2020



Source: ITIC 2020

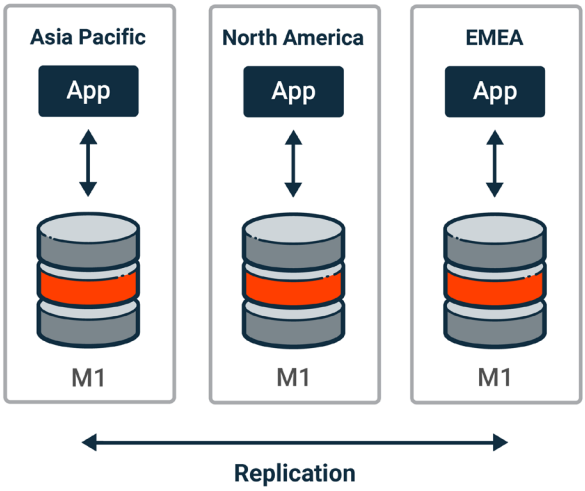
A 98% majority of respondents say a single hour of downtime per year costs their firms over $100,000.

An 88% majority say the cost exceeds $300,000 up from 76% in 2014 and 81% in 2018. And 49% - four in 10 enterprises - say hourly downtime costs their firms $1M TO >5M

We can easily illustrate this with an example: Imagine a brand that may have thousands of locations and eCommerce with payment processing of 100 business transactions per second. If the average transaction is $85 and there is an outage or unplanned downtime of five minutes, then that business will miss out on 30,000 transactions—and be out $2.5M in revenue. This disappoints 30,000 customers directly, plus the friends and family they talk to.

2.2 Customer case study: ClickUp

ClickUp™ is a SaaS project management and collabroation company experiencing massive growth with customers spanning individuals to large enterprises supporting over 100,000 teams globally.



Postgres Distributed from EDB has contributed to the 99.99% uptime for 12 consecutive months of ClickUp's seven-node global deployment. Click here for more details.

2.3 Why is this so hard?

Two things make 'Always On' very difficult: Maintenance is necessary—the OS and the database have functionality and security patches, and those patches have to be applied. Even in the best of cases, one has to plan for approximately four such events per year. Innovative software, like Postgres, also has annual major releases and many users want to take advantage of the new functionality. One such maintenance operation can easily consume the majority of the downtime budget. On top of this, one has to budget for potential schema changes or data management operations that may require exclusive locks.

HA Rating	Downtime/month (days:hours:min:secs)	Downtime/year (days:hours:min:secs)
99%	00:07:18:00	03:15:36:00
99.5%	00:03:39:00	01:19:48:00
99.9%	00:00:43:48	00:08:45:36
99.99%	00:00:04:23	00:00:52:34
99.999%	00:00:00:26	00:00:05:15

2. Moving from RAC to EDB Postgres Distributed

Moving from RAC to EDB Postgres Distributed

For many years, Oracle RAC was the poster child for highly available database services, a capability that it achieves through a shared disk architecture that leverages high-speed memory interconnects, and is often used in environments that demanded four or even five nines of availability. One of the key advantages of RAC was the ability to apply many minor version upgrades without shutting down the database service. This article gives a good overview of how RAC works, how it evolved, and where some of the weaknesses of the shared disk/single database approach are.

Up until now, Postgres mostly provided streaming replication-based HA solutions built on a primary/standby architecture, which are less capable of handling downtime-free maintenance and generally need a minimum of 20-30 seconds to address underlying hardware and network failures. These solutions are generally not suitable for above 99.99% availability requirements.

With Postgres Distributed, EDB has introduced a Postgres database extension that enables extreme high availability for Postgres clusters. It uses logical replication of data and schema in a mesh-based multi-master architecture, plus a robust set of features and tools to manage conflicts and monitor performance. This means applications with the most stringent HA demands of 99.999% availability can be run with confidence on Postgres.

When deployed on premises, many Oracle RAC deployments require special hardware to get the benefits of RAC. In the cloud, RAC is only available on the Oracle Cloud (see Oracle Database Support for Non-Oracle Public Cloud Environments (Doc ID 2688277.1)). Postgres Distributed however, uses commodity hardware, is deployable in every major cloud and can be deployed in every data center. This flexibility, combined with EDB Postgres' native compatibility with Oracle PL/SQL, makes Postgres Distributed the only credible alternative to Oracle RAC on premises and in the cloud.

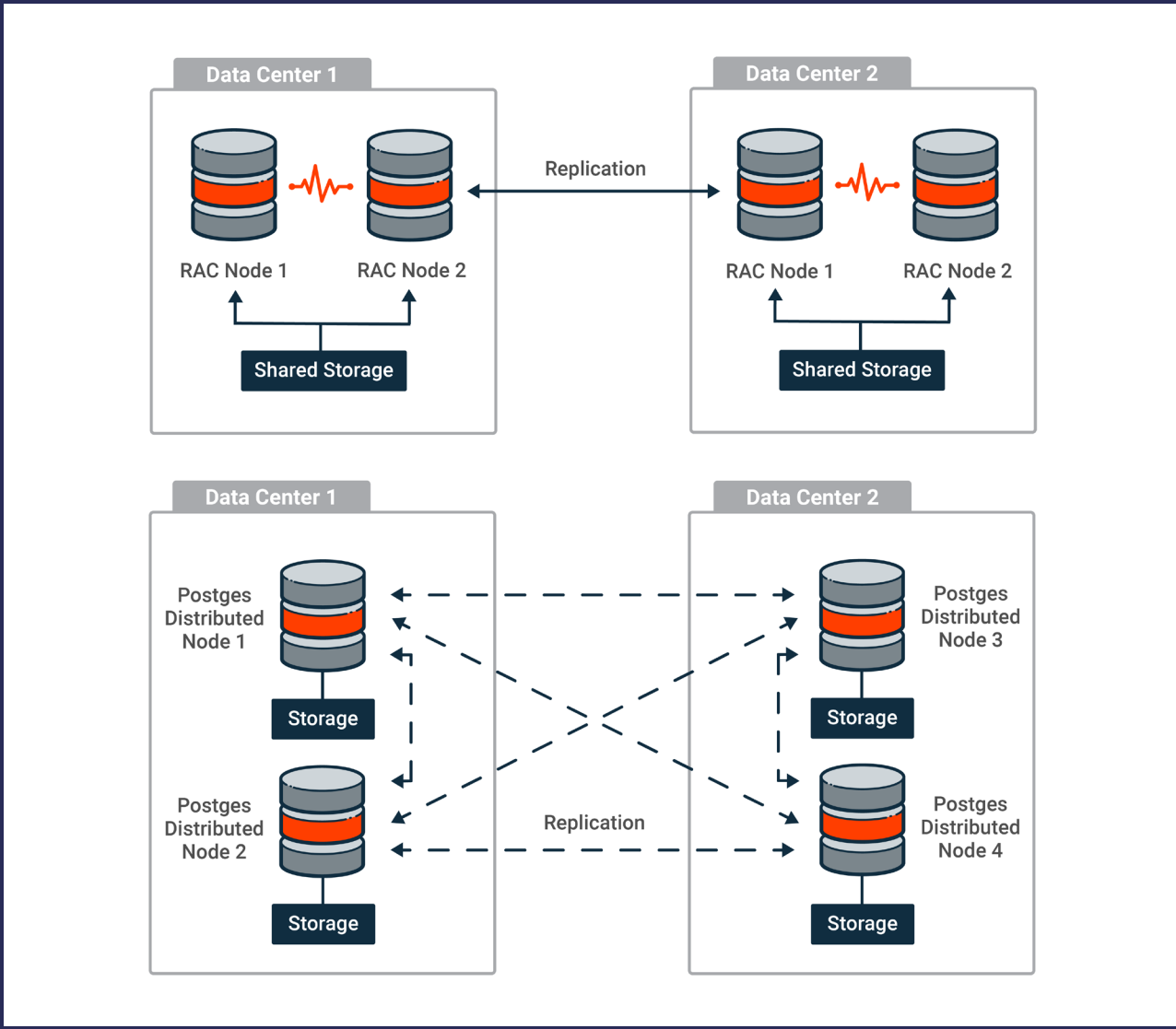


Figure 1: Comparing Oracle RAC shared disk architecture with Postgres Distributed shared nothing

Postgres Distributed can be deployed in multiple architectures, depending on the use case requirements for hardware redundancy, data center redundancy, and recovery time objective. Figure 1 shows a high-level comparison of a two-datacenter configuration explicitly designed to achieve extreme high availability for the most demanding use cases, including datacenter redundancy. Postgres Distributed Always On Architectures, described in detail in this technical whitepaper, combines hardware redundancy, logical replication, and mesh networking to achieve a 99.999% available database infrastructure.

Key points:

- Postgres Distributed's multi-master based replication does not require time-consuming operations of failure detection and verification, followed by promotion and failover that are required by primary/standby replication systems such as Postgres streaming replication or Aurora. With Postgres Distributed, the application can simply use another master, without delay.

- Multi-master architectures make it easy to apply upgrades to one node at a time, as logical replication works well across different database versions.

- During OS or hardware maintenance operations, traffic simply gets redirected away from the current node, and after the node has caught up, it can resume taking traffic

This has convinced leading businesses to build on Postgres Distributed for their mission-critical digital business applications.

The Postgres Distributed Always On capability convinced Thales, a leading provider of security software, to combine SafeNet KeySecure and Postgres Distributed to provide extreme high availability single sign-on capabilities for their enterprise customers

ACI, a supplier of global payment solutions, leveraged Postgres Distributed's underlying conflict handling and data consistency capabilities, to handle real-time processing of high-value financial transactions in a distributed highly available model complemented with elegant conflict resolution capabilities.

3. Do the existing DBaaS provide an alternative?

Do the existing DBaaS provide an alternative?

Recent cloud native approaches, such as AWS Aurora, still struggle to achieve availability ratings that aretruly 'Always On'. As of this writing (May 2022), AWS states "If the DB cluster has one or more Aurora Replicas, then an Aurora Replica is promoted to the primary instance during a failure event. A failure event results in a brief interruption, during which read and write operations fail with an exception. However, service is typically restored in less than 120 seconds, and often less than 60 seconds." (https://docs.aws.amazon.com/AmazonRDS/latest/AuroraUserGuide/Concepts.AuroraHighAvailability.html) and the AWS SLA is limited to 99.99% (https:// aws.amazon.com/rds/aurora/sla/). This means that three or four unplanned failovers can easily exhaust the time budget, prior to any planned maintenance operations on the schema or the data! Solutions like Aurora suffer from the same weakness that any single-primary (a.k.a. single-master) technology has: failures have to be detected and verified, before promotion and failover can happen. These steps take time, and during that time the service is not available.

4. The business case for making the switch

The business case for making the switch

The costs for Oracle RAC licenses, annual maintenance, proprietary hardware, and enterprise grade SANs quickly add up. Postgres Distributed, which uses a subscription model and runs on commodity hardware that is available in every cloud, provides a significantly more cost-effective solution. EDB's internal ROI calculations indicate that even with extensive discounting, Postgres Distributed is likely a tenth the cost of RAC when considering a three- year cost of ownership.

This phenomenal ROI does not even take into account the increased deployment flexibility that customers derive from moving to Postgres. Postgres and Postgres Distributed, run in every cloud and support most leading operating systems. While cost is key, and Postgres Distributed provides a very cost-effective solution, the ability to shutter data centers and to adopt new deployment technologies, such as containers, Kubernetes, and the public cloud are key differentiators for customers that are focused on innovation and differentiation.

5. Conclusion

Conclusion

EDB Postgres Distributed is the first true way for applications that move off of Oracle onto open source-based databases and require Always On, a.k.a. 99.999% of availability.

Postgres Distributed from EDB runs on every major cloud, on all key operating systems and uses commodity hardware. This gives businesses a flexible and cost-effective way to modernize the application stacks for mission critical digital business applications.

Learn more about EDB Postgres Distributed

About EDB

Postgres is increasingly the database of choice for organizations looking to boost innovation and accelerate business. EDB's enterprise-class software extends Postgres, helping our customers get the most out of it both on premises and in the cloud. And our 24/7/365 global support, professional services, and training help our customers control risk, manage costs, and scale efficiently.

With 16 offices worldwide, EDB serves over 1,500 customers, including leading financial services, government, media and communications, and information technology organizations. To learn about Postgres for people, teams, and enterprises, visit **EnterpriseDB.com**.

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