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WHITE PAPER

Dbvisit StandbyMP for Oracle AWS RDS Environments

This white paper explores practical and cost-effective solutions for creating resilient Oracle SE environments within AWS's Database as a Service (DBaaS) environments, specifically RDS Custom.

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1.0 Introduction

This white paper explores practical and cost-effective solutions for creating resilient Oracle SE environments within AWS's Database as a Service (DBaaS) environments, specifically RDS and RDS Custom. Recognizing that effective Disaster Recovery (DR) is a critical requirement for business-critical databases, this paper compares RDS's Multi-AZ DR and RDS Custom Warm Standby DR options. The paper then introduces a highly resilient and cost-effective architecture using RDS Custom + Oracle Standard Edition Licensing + Dbvisit StandbyMP Warm Standby.

When deploying Oracle databases in AWS, organizations typically choose between two services: Database as a Service (DBaaS), which includes AWS RDS and AWS RDS Custom, or Infrastructure as a Service (IaaS) through AWS EC2. Our Dbvisit customers leverage both RDS Custom and EC2, with each organization selecting the service that best meets its environmental needs and desired level of control. This white paper is designed for those evaluating DBaaS solutions, specifically RDS and RDS Custom, and does not cover IaaS options like EC2.

The structure of the white paper is as follows:

- The importance of HA/DR in the cloud.
- Evaluation of RDS Oracle Multi-AZ DR.
- The Benefits of a warm standby compared to RDS Multi-AZ's Standby Replica.
- Evaluation of RDS Custom + Warm Standby architecture managed by Dbvisit StandyMP.
- Summary of findings and a recommended architecture proposal.

2.0 Why Disaster Recovery is Needed in the Cloud

Business critical databases on Oracle Standard Edition (SE) must meet high uptime standards, with minimal data loss (RPO) and rapid recovery (RTO) from any outage. These requirements demand resilience against a wide range of potential disasters, including natural disasters, internet disruptions, user errors, power outages, data corruption, and hardware failures.

Outages Demonstrate the Vulnerability of Cloud Services: While AWS aims for their infrastructure to achieve a 99.5% uptime for single-instance deployments, this does not mean your database will be available 99.5% of the time.

- **User error or internal actors:** Misconfigurations or unintended data deletions can make your database unavailable even when AWS infrastructure is fully operational.
- **Internet disruptions**: Internet backbone issues, such as damaged cables, can disrupt entire regions or significantly degrade performance for extended periods, regardless of cloud infrastructure status.
- **Natural disasters:** Though infrequent, cloud hardware is still affected by natural disasters. For instance, summer heatwaves regularly take out public cloud data centers for more than ten hours.

The unfortunate truth is that without a DR solution, your databases are not resilient and your RPO and RTO requirements may not be met, even in the cloud.

2.1 The Importance of Understanding Regions When Discussing Disaster Recovery in the Cloud

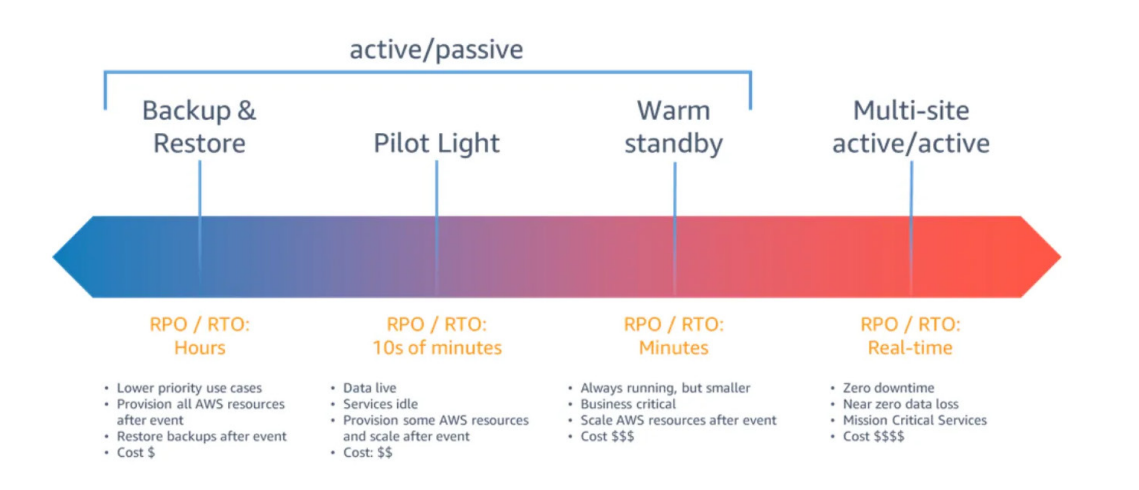
In AWS, two core aspects influence where and how resilient systems are deployed: Regions and Availability Zones (AZs).

Regions: An AWS Region represents a distinct geographical area that's independent and separated by vast distances—across countries or even continents, from all the other regions. By deploying applications in different regions, organizations can mitigate the risk of region-wide events, such as large weather systems and earthquakes. Each region can include multiple availability zones (AZs).

Availability Zones: An independent data center or set of data centers within a region. Each region has multiple availability zones connected by high bandwidth low latency networks.

For organizations with short RTO/RPO needs, AWS recommends deploying a standby environment in a separate region to mitigate a complete region outage.

For Oracle SE deployments on AWS, there is currently no supported option for an out-of-region standby option on RDS. However, since April 2024, RDS Custom has supported Oracle SE, enabling the creation of out-of-region warm standby databases using Dbvisit StandbyMP. This means that highly resilient Oracle SE deployments are now possible on both AWS's DbaaS (RDS Custom) and IaaS (EC2) environments, providing a versatile DR strategy for cloud-hosted Oracle SE.



3.0 Multi-AZ DB Instance Deployments Overview and Limitations

The technology and performance of AWS Multi-AZ varies according to the database platform. This section focuses on the Oracle SE Multi-AZ architecture.

In Oracle SE Multi-AZ, Amazon's technology synchronously writes data to both primary and standby environments and is not committed until both writes are confirmed. While providing DR protection, this setup has limitations around the ability to offload reporting, performance impacts, and disaster coverage.

Limitations of Oracle Multi-AZ Standby Replication:

- Lack of Read Access on Standby: The standby replica is not accessible for read access, meaning reporting cannot be offloaded to the standby despite paying for that full database license.
- Increased Write Latency: Synchronous writing to both primary and standby environments introduces a slight increase in write and commit latency, impacting transactional performance.
- In-Region Failover Only: Multi-AZ is limited to in-region failover, leaving databases vulnerable to region-wide outages, which compromises both RPO and RTO objectives.

These limitations mean that while Multi-AZ offers foundational DR capabilities, organizations should investigate alternative solutions that can provide broader resiliency and further operational benefits like taking backups from the standby or the offloading of reporting.

AWS Multi-AZ DB Instance Deployments: https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/Concepts.MultiAZSingleStandby.html

3.1 Limitation: Lack of Read Access on the Standby

A common benefit of best-practice DR technology is the ability to offload reporting and testing workloads to the standby environment, effectively doubling infrastructure use without additional cost. This is not possible with Oracle SE Multi-AZ on RDS.

Because Oracle SE RDS Multi-AZ uses AWS synchronous block-level storage replication there is no true warm standby environment available for reporting and testing. Therefore, even though an additional Oracle SE license is required (or charged), the infrastructure cannot be used for reporting, testing or backup purposes. This limitation applies regardless of whether you are deploying via a license-included or Bring Your Own License (BYOL) model, adding cost without corresponding performance benefits. For further details on AWS licensing see AWS Oracle RDS Licensing Documentation.

3.2 Limitation: No Region Outage Protection

When deploying Oracle SE in a Multi-AZ configuration, companies are protecting themselves against a data center outage, but not a regional outage. This is because replication can only be configured within the region. While this is a good improvement over a single-instance deployment, it leaves companies exposed to in-region performance issues and downtime which do occur and can be lengthy. This limitation can be avoided by using RDS Custom or EC2 environments and third-party software to create a true out-of-region warm standby database.

4.0 A Warm Standby Alternative to Multi-AZ: Out-of-Region Standby on RDS Custom Architecture

This section will introduce an architecture of using Oracle SE + RDS Custom + Warm Standby Database (managed by Dbvisit StandbyMP) to create a cost-effective, high-performance, highly resilient, and easy-to-manage environment.

4.1 Why Choose a Warm Standby Environment?

To achieve maximum resilience in DR, AWS recommends deploying a warm standby database in a separate AWS Region. Regional outages, while infrequent, are not unheard of, and companies need to ensure their Business Continuity and DR strategy can account for such scenarios. By deploying a standby database in a separate region, organizations can protect themselves against even regional outages, meet stringent RPO/RTO objectives, and thereby achieve a highly resilient and high-performance DR strategy.

RDS-Custom + Warm Standby Solves Oracle RDS Multi-AZ Limitations:

- In-region replication limitation is solved: RDS Custom + Warm Standby supports out-of-region replication, enhancing resiliency against regional failures.
- No Read Access limitation is solved: With RDS Custom, the warm standby is accessible with read access. The standby infrastructure can therefore be used for reporting, analytics, or even taking backups.
- Synchronous Write Constraints are solved: RDS Custom together with the warm standby managed by Dbvisit StandbyMP uses asynchronous replication, which mitigates these performance issues and provides a more resilient setup.

	RDS	RDS-Custom
	Multi-AZ	Dbvisit Warm Standby
Geographical Separation	In-Region only	In or Out-of-Region
Oracle License Needed	Yes	Yes
Read-Access	No	Yes
Performance Affect	Yes	No

3.2 Overview of RDS Custom

RDS Custom is designed to provide the core automation benefits of AWS RDS, while also providing administrative access to the underlying database and operating system. This hybrid approach offers organizations the flexibility of managing database settings and OS configurations, making it particularly useful for deployments that involve third-party applications or legacy systems with specific requirements. Notably, RDS Custom maintains the same pricing structure as standard RDS.

3.21 Key Benefits of RDS Custom:

Greater Control and Flexibility: With administrative access to both the database and OS, companies can tailor configurations to meet the needs of third-party applications, legacy systems, or custom tools that require deeper integration.

Cost-Effective: RDS Custom offers the same pricing as RDS, providing added flexibility without additional costs.

This link shows the shared responsibility model for the different features across RDS, RDS Custom and EC2 deployments.

4.0 Proposition: A Highly Resilient Oracle SE2

Environment using RDS Custom and Dbvisit StandbyMP

For Oracle SE customers deploying on AWS RDS, a more resilient Disaster Recovery (DR) strategy can be achieved by utilizing Dbvisit StandbyMP to deploy and manage an out-of-region warm standby database on RDS Custom. This approach prioritizes database resiliency balanced with performance and accessibility, ensuring optimal protection and functionality.

4.1 Key Benefits of RDS Custom + StandbyMP:

- Verified Integrity: The warm standby database is continuously updated and verified by Dbvisit StandbyMP, ensuring a reliable failover option at any time.
- Regional Outage Protection: By deploying the standby in a geographically distant location, organizations gain robust protection against regional cloud outages.
- Protection Against Data Corruption: StandbyMP supports point-in-time recovery, enabling recovery from user errors or data corruption incidents, safeguarding data integrity.
- Offload Reporting: Access the warm standby for read-only usage including reporting.
- Simplified DR Testing: Integrated one-click DR testing makes DR testing straightforward, ensuring readiness without complex procedures.
- No Performance Impact: Intelligent compression and asynchronous data transfer prevent any latency impact on primary database performance, maintaining smooth operations even during replication.

	RDS + Multi-AZ	RDS Custom + Multi-AZ	RDS Custom + StandbyMP	EC2 + StandbyMP
Oracle License Needed (standby)	Y	Y	Y	Y
Easy Oracle upgrades/patches	Y	Y	Y	N
Standby environment	Y	Y	Y	Y
In-region protection (Multi-AZ)	Y	Y	Y	Y
Out-of-Region protection	N	N	Y	Y
Continual DB verification	N	N	Y	Y
Read-only Access	N	N	Y	Y
DR Testing	N	N	Y	Y
Point in Time Recovery (Log Application Delay)	N	N	Y	Y
Database Snapshots	N	N	N	Y
RTO	1-2 min	1-2 min	2 min	2 min
RPO	0	0	Max. 5 min	Max. 5 min

4.2 StandbyMP Prioritises Ease of Use

One of RDS Custom's advantages over AWS EC2 deployments is ease of use and reduced administration. This includes automation of database administration tasks, automation of backup, and support for database snapshots.

In conjunction with the advantages of RDS Custom, Dbvisit StandbyMP extends these automation and management benefits by providing intuitive management capabilities for their Oracle SE warm standby environment. This setup offers similar DR capabilities to those enjoyed by Oracle Enterprise Edition (EE) customers using Data Guard for DR, but with significantly greater usability.

User-friendly and flexible interface with StandbyMP

StandbyMP prioritizes ease of use. The intuitive GUI that allows new users to perform key actions—like a 'switchover'—in just three clicks. For advanced users, a command-line interface (CLI) is also available, offering flexibility to suit different operational preferences.

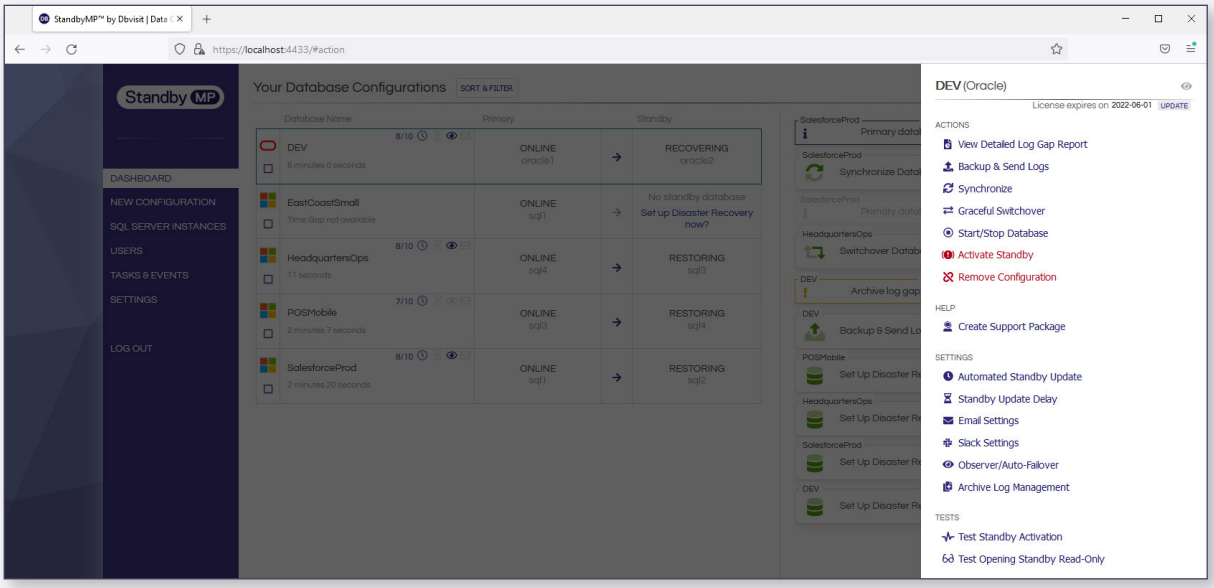


Image 1: StandbyMP Control Center showing Oracle Action Panel

4.3 StandbyMP Key Disaster Recovery Functionality

StandbyMP for Oracle SE includes an advanced array of Gold Standard DR features. A full overview of these features can be found on the StandbyMP for Oracle SE webpage. **Highlight Features:**

Management:

- Realtime GUI and notifications
- Multi-database actions
- Fast single-click workflows
- Guided setup and actions

- Zero-data-loss switchover and switchback
- Point-in-time recovery
- One-click DR tests
- Read-only mode

4.4 Gold Standard DR Architecture for Oracle SE on AWS RDS Custom

Functionality:

- Automated (or one-click) failover
- Point-in-time recovery “intelligent activation”
- Zero-data-loss “graceful switchovers” and switchbacks
- One-click DR tests
- One-click resynchronization

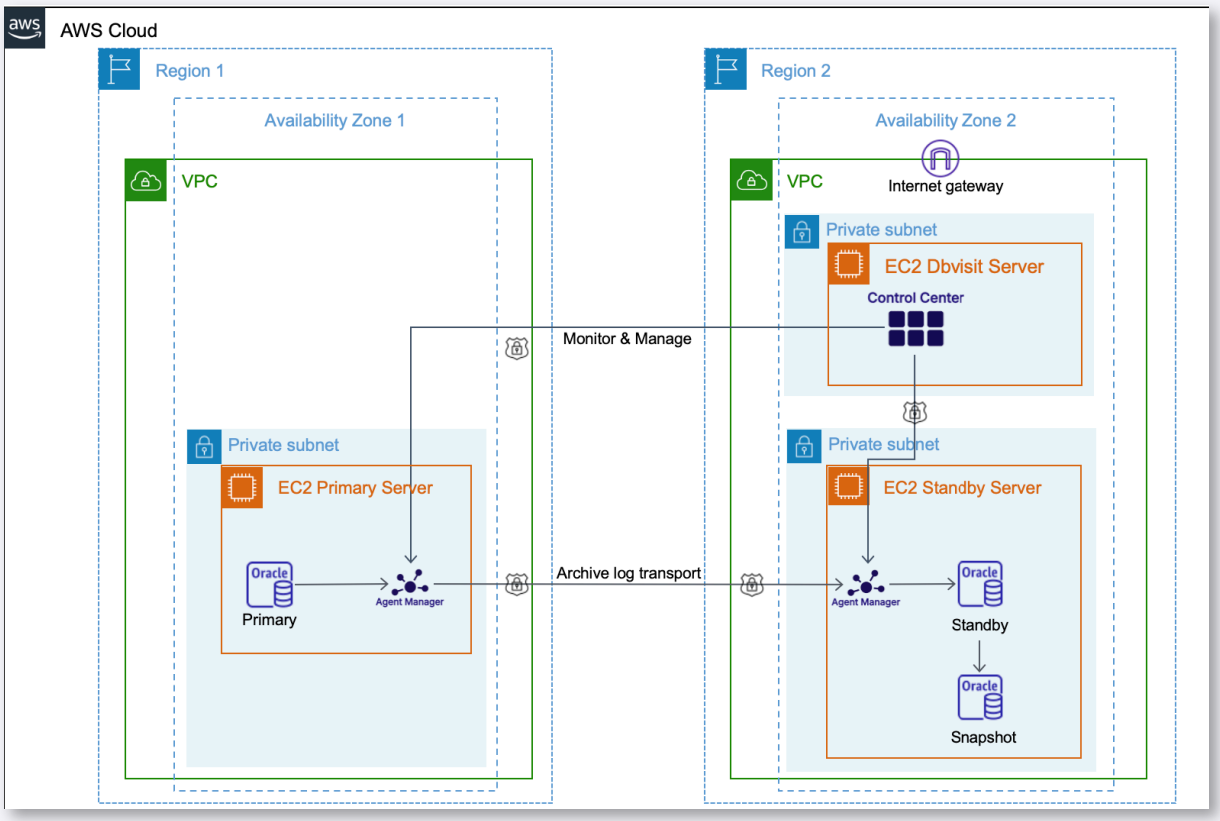
Security and Administration:

- End-to-end encryption
- Intelligent compression
- User levels and permissions

Component	Implementation Approach
Database License	Oracle Standard Edition
Database Type	RDS Custom
Primary DR method	Out-of-region warm standby managed by Dbvisit StandbyMP
Secondary DR method	Cross-Region automated backups

For companies running Oracle SE2 within AWS RDS and who need a resilient DR strategy, Dbvisit recommends the following:

ARCHITECTURE DIAGRAM



5.0 Licensing / Pricing Overview

Licensing costs between RDS and RDS Custom are identical; however, at the time of writing RDS Custom for Oracle only supports the Bring Your Own License (BYOL) option. This requirement is likely due to the flexibility and control provided with RDS Custom, which often necessitates a custom licensing approach.

> View the latest RDS Custom pricing information here.

> View the latest RDS for Oracle pricing information here.

5.1 AWS Machine Costs

As of August 2024, there is no difference in machine costs between RDS and RDS Custom. Both use the same pricing model for computing resources, allowing for straightforward cost comparison.

5.2 Oracle SE Licensing Requirements for Standby Environments

As of August 2024, there is no difference between RDS and RDS Custom Licensing Requirements for the Standby environments. Both require Multi-AZ or a warm standby to have a separate Oracle SE license for the standby.

5.21 Oracle SE Licensing Methods

The licensing options for Oracle SE differ slightly between RDS and RDS Custom:

RDS: Offers both BYOL and License Included (LI) options, where the Oracle license cost is included in the hourly charge. RDS Custom: Supports only the BYOL option, in line with its flexibility and administrative capabilities.

5.3 Dbvisit StandbyMP Licensing

StandbyMP for Oracle SE is licensed by Container Database (CDB) and, similar to Oracle SE, supports up to three Pluggable Databases (PDBs). StandbyMP uses a Bring Your Own License (BYOL) model.

Licensing Options:

- Term License: A time-limited license, ideal for organizations that prefer predictable licensing costs over a set period.
- Perpetual License: A one-time purchase that provides ongoing access to StandbyMP, suitable for long-term deployments.

Licenses and implementation services are available for purchase directly from Dbvisit or through a network of over 200 Dbvisit Partners globally.

For an estimated cost, use the Dbvisit Pricing Calculator. Oracle Enterprise Edition with Data Guard, but for a fraction of the cost.

6.0 Summary and Conclusion

Organizations looking at AWS RDS with business-critical Oracle Standard Edition (SE) databases need a robust, cost-effective DR strategy to protect against data loss, downtime, and regional outages. This white paper has outlined a highly resilient DR architecture using AWS RDS Custom and Dbvisit StandbyMP. By combining the automation and administrative flexibility of RDS Custom with the reliable, out-of-region standby capabilities of Dbvisit StandbyMP, Oracle SE customers can achieve a DR setup comparable to that of Oracle Enterprise Edition with Data Guard, but for a fraction of the cost.

This solution not only meets stringent RTO and RPO requirements but also addresses the limitations of AWS Oracle SE Multi-AZ setups by supporting out-of-region replication and the offloading of reporting tasks. For organizations seeking a DR strategy that balances resilience, cost-effectiveness, and operational simplicity, RDS Custom paired with Dbvisit StandbyMP represents a compelling choice.

Key advantages of this architecture include verified database integrity, regional outage protection, data corruption safeguards, and read-only access to the standby for reporting. Additionally, Dbvisit StandbyMP simplifies DR management with intuitive GUI, API, and CLI options, enabling swift failovers and seamless DR testing with minimal administrative overhead.

In summary, the combination of RDS Custom and Dbvisit StandbyMP empowers Oracle SE customers on AWS to build a scalable, resilient, and easy-to-manage DR environment, ensuring business continuity and peace of mind in the face of unexpected disruptions.

Key Links

- Documentation - Setting up Dbvisit StandbyMP in AWS Custom
- Dbvisit StandbyMP for Oracle SE website
- Dbvisit Pricing Calculator
- Why do I need DR in the Cloud White Paper?

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