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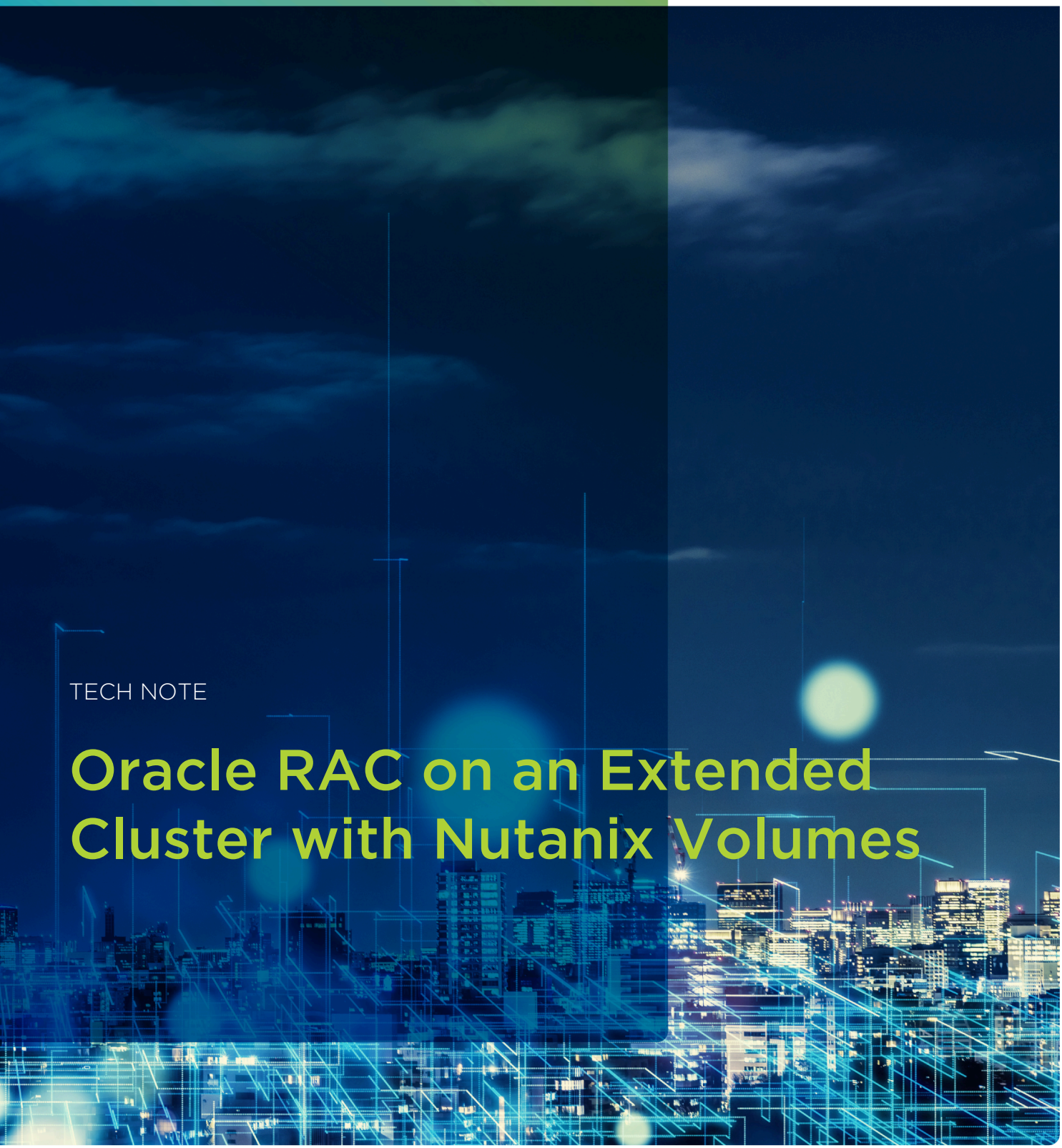

TECH NOTE

# Oracle RAC on an Extended Cluster with Nutanix Volumes

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# 1. Executive Summary

Nutanix software provides a complete datacenter infrastructure solution for your production and development Oracle Databases, eliminating the complexity of traditional IT infrastructure. Nutanix delivers predictable performance, linear scalability, and web-scale cost efficiency for your transactional and analytical Oracle Database environments. With powerful self-healing, data protection, and disaster recovery capabilities, Nutanix keeps your applications running and your critical data protected on VMware vSphere or Nutanix AHV. As a member of the Oracle PartnerNetwork (OPN) program, Nutanix is committed to your success.

Oracle designed the Real Application Clusters (RAC) architecture as an availability solution for a single datacenter. Oracle RAC on extended clusters enables you to recover quickly from a site failure even when the datacenter is at more than one site. This setup significantly impacts latency, however, and works best when the sites are relatively close (within 100 kilometers, or around 60 miles, of each other).

This tech note discusses how an Oracle RAC database on extended clusters can run on Nutanix using Volumes. The database can support production environments that require datacenter or rack high availability; however, because of its complexity, only use this niche setup when necessary. Nutanix Cloud Platform software allows you to run this design alongside other Oracle databases or application workloads, doing away with the complexity and expense of siloed resources.

# 2. Introduction

## Audience

This tech note is part of the Nutanix Solutions Library. We wrote it for IT administrators and solutions architects responsible for designing, managing, and supporting Oracle Database deployments on Nutanix infrastructures. Readers should already be familiar with Oracle Database, the Linux OS, and Nutanix.

## Purpose

In this document, we cover the following topics:

- Overview of the Nutanix Cloud Platform.
- Overview of Oracle and Oracle RAC on Nutanix.
- The advantages of running Oracle RAC on extended clusters with Nutanix.
- Solution configuration details.

Unless otherwise stated, the solution described in this document is valid on all supported AOS releases.

## Document Version History

| Version Number | Published | Notes |
|---|---|---|
| 1.0 | September 2017 | Original publication. |
| 1.0 | September 2018 | Updated Nutanix overview. |
| 1.0 | January 2019 | Updated product information and solution details. |
| 1.0 | June 2020 | Content refresh. |

| Version Number | Published | Notes |
|---|---|---|
| 1.0 | June 2021 | Refreshed content. |
| 1.0 | June 2022 | Refreshed content. |

# 3. Oracle on Nutanix

Digital transformation demands that IT evolve beyond offering basic services and become more agile, decreasing the time to production and increasing scalability. Business-critical applications, such as Oracle databases, require us to think beyond vanilla provisioning of the operating system.

Virtualization addresses these needs well but sometimes we must still use physical Oracle Database instances because of licensing or organizational requirements. Nutanix supports a variety of scenarios, bringing web-scale benefits to both virtualized and bare-metal deployments of Oracle databases.

We designed Nutanix software to run any application and converged storage and compute in the same appliance, eliminating the complexity of standalone storage solutions. Nutanix supports VMware vSphere, Microsoft Windows Server 2012 R2 with Hyper-V, and Nutanix AHV, allowing you to choose the right hypervisor for your needs.

Nutanix Volumes can export iSCSI volumes to a single instance of Oracle or to Oracle RAC instances running directly on physical servers. Using our volume group (VG) technology, Volumes can also export volumes directly to VMs running on the same Nutanix cluster. Typical Oracle database deployment tasks —such as backup, disaster recovery, snapshots, and clones—are still available and, in fact, work even better in the Nutanix cluster.

Running Oracle on Nutanix provides several advantages:

- Low latency and predictable performance, so database administrators (DBAs) can start small and linearly scale both performance and capacity nondisruptively as needs grow.
- Ability to handle a wide range of database workload types, including transactional, analytical, or a mix of the two on the same platform.
- Shorter time to production: You can deploy datacenter infrastructure in just hours.

- High availability and data redundancy, allowing the Oracle database and supporting applications to stay up and running even if the underlying hardware has issues.
- Integrated snapshots, remote replication, and metro-level availability to protect the database in addition to Oracle's native data protection capabilities.
- Simplified management that removes multipathing, zoning, and masking from your workflows.
- Support for Oracle Automatic Storage Management (ASM) without any caveats or restrictions.

# 4. Scope

Oracle Database is one of the most widely used enterprise-grade databases in the market. It supports numerous business-critical application functions, such as enterprise resource planning, supply chain management, and customer relationship management.

You can deploy Oracle databases as a single instance or using RAC. Oracle RAC distributes the database across multiple nodes while sharing a common storage pool. DBAs increasingly turn to Oracle RAC for performance scalability and high availability. Extended clusters enable you to spread your Oracle RAC across multiple geographically distant sites, each with its own storage; this configuration provides greater infrastructure high availability against datacenter failure than a local Oracle RAC can offer.

This document describes a two-node Oracle RAC database connected to Nutanix over iSCSI across two clusters. The Nutanix clusters use Volumes and function as storage systems and compute for the Oracle database. This architecture works across two datacenters or in the same datacenter. For geographically distant sites, ensure that you have sufficient bandwidth between sites to meet your required performance levels.

> Note: This tech note describes a niche setup that you shouldn't use as a general-purpose configuration.

This setup also provides high availability for Oracle RAC across Nutanix racks. For example, if you place each of your two Nutanix clusters on its own rack and connect them to separate electrical grids, this configuration provides high availability for the Oracle database even with a complete rack failure. Another advantage of running Oracle RAC on extended clusters with the Nutanix Cloud Platform software is that you don't incur the expense of maintaining siloed resources to support different performance requirements. With Volumes, you can run all your virtual and bare-metal workloads, including business-critical applications, alongside the design we describe without fear of noisy neighbors.

# 5. Solution Configuration

This section introduces the architectural design for the two-node Oracle RAC database on extended clusters with Nutanix AHV and AOS.

## Architecture Diagram

This solution comprises the following elements:

- Two Nutanix clusters with AHV.
- Two Oracle Linux VMs:
  - One VM on each cluster.
  - Four vNICs per VM (one for public, one for private, and two for iSCSI).
  - Two Nutanix VGs for the Oracle Cluster Registry and voting disk—one VG on each cluster.
  - Two Nutanix VGs for the Oracle ASM DATA disk group—one VG on each cluster.
  - Two Nutanix VGs for the Oracle ASM FRA (flash) disk group—one VG on each cluster.
  - An Oracle Cluster Registry and voting disk at a third site for Oracle Clusterware quorum.

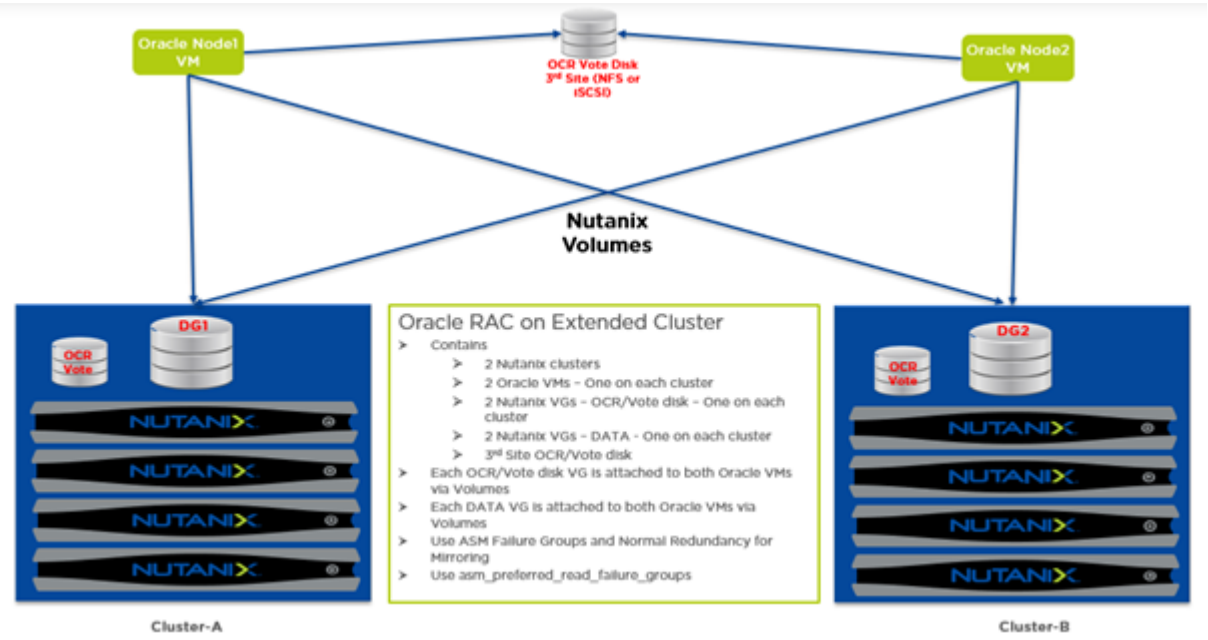



Figure 1: Oracle RAC on Extended Cluster Design

## Software Resources

This design used the following software resources:

- Nutanix AHV
- Oracle Linux
- Oracle 12cR1 Grid Infrastructure
- Oracle 12cR1 Database

## Network Configuration

The following table presents the network configurations used in this solution.

*Table: Network Configuration*

| Purpose | Speed | Purpose |
|---|---|---|
| iSCSI | 40 GbE | Bonded iSCSI network |

| Purpose | Speed | Purpose |
|---|---|---|
| Oracle public network | 10 GbE | Public network |
| Oracle private network | 10 GbE | Oracle RAC interconnect |

For iSCSI settings on the guest VMs, refer to the Linux on AHV best practice guide and the Nutanix Volumes best practice guide.

## Oracle RAC Database Storage Configuration

We installed each Oracle RAC node with Oracle Linux and configured them with 44 cores and 256 GB of memory with 128 GB assigned to the Oracle system global area (SGA). We configured Oracle ASM disk groups with normal redundancy with a 1 MB allocation unit. The following table outlines the ASM disk group configurations.

*Table: ASM Disk Group Configurations*

| Purpose | Protocol | Nutanix Volume Groups | ASM Disk Group |
|---|---|---|---|
| OS and Oracle binary (local) | SCSI | N/A | N/A |
| Database data | iSCSI | 2 VGs: 1 per cluster | DATA FAILGROUP1, DATA FAILGROUP2 |
| FRA (flash) | iSCSI | 2 VGs: 1 per cluster | FRA FAILGROUP1, FRA FAILGROUP2 (not configured in this document) |
| OCR and voting disk | iSCSI | 2 VGs: 1 per cluster with third disk from other sources | OCRDG with third-site quorum disk |

Following are a few notes on storage provisioning from Nutanix Volumes to Oracle:

- Oracle RAC requires you to attach the shared disks to both Oracle RAC nodes. Nutanix supports SCSI-3 PR.
- We used software iSCSI to attach to the Nutanix VGs.

- You must attach the Nutanix VGs to both Oracle RAC nodes using in-guest iSCSI initiators.

The following figures show the configuration for Oracle ASM failure groups.

| NAME | NAME | PATH | MOUNT_STATUS | MODE_STATUS | FAILGROUP |
|---|---|---|---|---|---|
| DATADG | DATADG_0003 | /dev/dm-3 | CACHED | ONLINE | CFTFG1 |
| DATADG | DATADG_0000 | /dev/dm-2 | CACHED | ONLINE | CFTFG1 |
| DATADG | DATADG_0001 | /dev/dm-1 | CACHED | ONLINE | CFTFG1 |
| DATADG | DATADG_0002 | /dev/dm-0 | CACHED | ONLINE | CFTFG1 |
| DATADG | DATADG_0004 | /dev/dm-10 | CACHED | ONLINE | SAMFG2 |
| DATADG | DATADG_0005 | /dev/dm-9 | CACHED | ONLINE | SAMFG2 |
| DATADG | DATADG_0006 | /dev/dm-8 | CACHED | ONLINE | SAMFG2 |
| DATADG | DATADG_0007 | /dev/dm-6 | CACHED | ONLINE | SAMFG2 |

8 rows selected.

Figure 2: ASM Failure Groups Configuration

```
+ASM1> show parameter preferred

NAME                                 TYPE        VALUE
------------------------------------ ----------- ------------------
asm_preferred_read_failure_groups    string      datadg.cftfg1
```

Figure 3: ASM1 Preferred Read Failure Group (cftfg1)

```
+ASM2> show parameter preferred

NAME                                 TYPE        VALUE
------------------------------------ ----------- ------------------
asm_preferred_read_failure_groups    string      datadg.samfg2
```

Figure 4: ASM2 Preferred Read Failure Group (samfg2)

## Solution Testing Results

### Test Overview

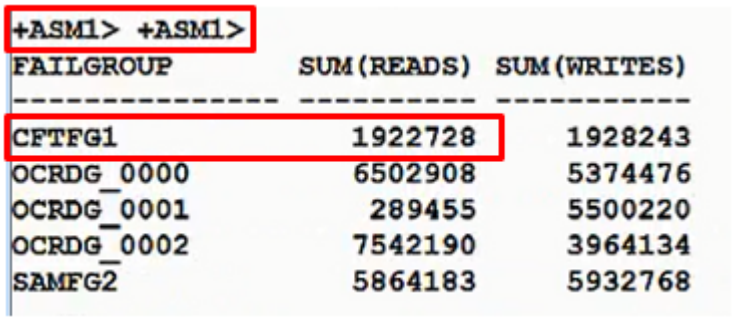
Because of the nature of the Oracle RAC on extended clusters architecture, you must ensure that you access data locally, rather than remotely. To this end, we tested the previous Oracle ASM preferred read failure group setup to show that a query against ASM1 uses CFTFG1 and a query against ASM2 uses SAMFG2. We used the following statements in this test:

- Oracle DML statement (INSERT) to insert data into a table.
- Oracle DML statement (SELECT) to query the data.
- Oracle DML statement (SELECT) to query the preferred read failure groups.

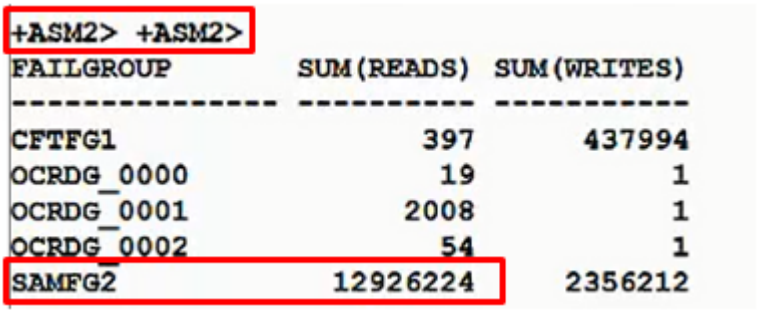
## Test Results

The following figures display the results of both ASM failure groups. As intended, for the SELECT statement we ran on the ASM1 instance, Oracle used failure group CFTFG1 for the reads. For the SELECT statement on the ASM2 instance, Oracle used failure group SAMFG2.



```
+ASM1> +ASM1>
FAILGROUP       SUM(READS)  SUM(WRITES)
--------------- ---------- -----------
CFTFG1             1922728     1928243
OCRDG_0000         6502908     5374476
OCRDG_0001          289455     5500220
OCRDG_0002         7542190     3964134
SAMFG2             5864183     5932768
```

Figure 5: CFTFG1 Read Failure Group Results



```
+ASM2> +ASM2>
FAILGROUP       SUM(READS)  SUM(WRITES)
--------------- ---------- -----------
CFTFG1                 397      437994
OCRDG_0000              19           1
OCRDG_0001            2008           1
OCRDG_0002              54           1
SAMFG2             12926224     2356212
```

Figure 6: SAMFG2 Read Failure Group Results

# 6. Conclusion

Nutanix with Volumes provides a powerful and efficient solution for Oracle RAC on extended clusters, which offers greater infrastructure high availability against datacenter failure than a local Oracle RAC. You can secure Oracle database high availability even with a complete rack failure by setting up the clusters on separate racks and electrical grids. Running Oracle RAC extended clusters on Nutanix provides low-latency storage performance, linear scalability, high availability, and simplified management.

By removing the complexity of constantly managing and optimizing the underlying compute and storage architecture, database and infrastructure administrators can focus on higher value tasks such as application refreshes, shortening time to production with improved development and test cycles.

Engage with Nutanix experts on the Nutanix NEXT Community to learn more about the benefits of the Nutanix enterprise cloud software for Oracle databases and other business-critical applications.

# 7. Appendix

## References

1. Linux on AHV best practices guide
2. Nutanix Volumes best practices guide

# About Nutanix

Nutanix is a global leader in cloud software and a pioneer in hyperconverged infrastructure solutions, making clouds invisible and freeing customers to focus on their business outcomes. Organizations around the world use Nutanix software to leverage a single platform to manage any app at any location for their hybrid multicloud environments. Learn more at www.nutanix.com or follow us on Twitter @nutanix.

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