Microsoft

SAP on Oracle on Azure
Simplified & Updated Best Practices

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Customer **S**olutions & **I**ncubation
Azure Core - SAP On Microsoft

Microsoft Azure

Customer Excellence

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Top 12 – New Guidance for SAP on Oracle on Azure

1. Use the most recent **Oracle Linux** version available (Oracle Linux 8.6 or higher)
2. Use the most recent **Oracle Database** version available with the latest SAP Bundle Patch (SBP) (Oracle 19 Patch 15 or higher) 2799920 - Patches for 19c: Database
3. Use **Automatic Storage Management** (ASM) for small, medium and large sized databases on block storage
4. Azure **Premium Storage SSD** or Premium Storage SSD v2 should be used. Do not use Standard or other storage types
5. ASM removes the requirement for Mirror Log. Follow the guidance from Oracle in Note 888626 - Redo log layout for high-end systems
6. Use **ASMLib** and do not use udev
7. Azure NetApp Files deployments should use **Oracle dNFS** (Oracle's own high performance Direct NFS solution)
8. Large databases benefit greatly from **very large SGA sizes**. Large customers should deploy on Azure M-series with 4TB or more RAM size.
   a. Set Linux **Huge Pages** to 75% of Physical RAM size
   b. Set **SGA** to 90% of Huge Page size
9. **Oracle Home** should be located outside of the "root" volume or disk. Use a separate disk or ANF volume. The disk holding the Oracle Home should be 64GB or larger
10. The size of the **boot disk** for large high performance Oracle database servers is important. As a minimum a P10 disk should be used for M-series or E-series. Do not use small disks such as P4 or P6. This may cause performance problems
11. **Accelerated Networking** must be enabled on all VMs. Upgrade to the latest OL release if there are any problems enabling Accelerated Networking
12. Check for updates in this **documentation** and SAP note 2039619 - SAP Applications on Microsoft Azure using the Oracle Database: Supported Products and Versions

Storage Options SAP on Oracle on Azure

There are two recommended and supported storage deployment patterns for SAP on Oracle on Azure:

1. Oracle **Automatic Storage Management** (ASM)
2. Azure NetApp Files (ANF) with Oracle **dNFS** (Direct NFS)

Checklist for Oracle Automatic Storage Management:

1. All SAP on Oracle on Azure systems are running **ASM** including Development, QAS and Production. Small, Medium and Large databases
2. Use **ASMLib** and not UDEV. UDEV is required for multiple SANs, a scenario that does not exist on Azure
3. ASM should be configured for **External Redundancy**. Azure Premium SSD storage is has built in triple redundancy. Azure Premium SSD and SSD v2 matches the reliability and integrity of any other storage solution. For additional safety customers can consider **Normal Redundancy** for the Log Disk Group but this is generally not required
4. No Mirror Log is required for ASM 888626 - Redo log layout for high-end systems
5. ASM Disk Groups configured as per Variant 1, 2 or 3 below
6. ASM **Allocation Unit size = 4MB** (default). VLDB OLAP systems such as BW may benefit from larger ASM Allocation Unit size. Change only after confirming with Oracle support
7. ASM Sector Size and Logical Sector Size = **default** (UDEV is not recommended but requires 4k)
8. Appropriate ASM Variant is used. Production systems should use Variant 2 or 3

Note: Azure Host Disk Cache for the DATA ASM Disk Group can be set to either **Read Only** or **None**. All other ASM Disk Groups should be set to None.

Use ASM – there are many performance and administration advantages!

Oracle ASM Variant 1

Variant 1 – small to medium data volumes up to ~**3TB**, restore time not critical

Customer has small or medium sized databases where backup and/or restore + recovery of all databases can be accomplished by RMAN in a timely fashion. Example: If a complete Oracle ASM disk group with data files from one or more databases is broken and all data files from all databases need to be restored to a newly created Oracle ASM disk group using RMAN.

Oracle ASM disk group recommendation:

ASM Disk Group Name	Stores	Azure Storage
+DATA	- All data files - All temp files - Control file (first copy) - Online redo logs (first copy)	3-6 x P30 (1TB) To increase DB size add additional P30 disks
+ARCH	- Control file (second copy) - Archived redo logs	2 x P20 (512GB)
+RECO	- Control file (third copy) - RMAN backups (optional) - Fast recovery area (optional)	2 x P20 (512GB)

Oracle ASM Variant 2

Variant 2 – medium to large data volumes between ~**3TB** to ~**12TB**, restore time important

Customer has medium to large sized databases where backup and/or restore + recovery of all databases cannot be accomplished in a timely fashion.

Usually customers will use RMAN, Azure Backup for Oracle and/or disk snap techniques in combination.

Oracle ASM disk group recommendation:

ASM Disk Group Name	Stores	Azure Storage
+<DBNAME>_DATA[#]	- All data files - All temp files - Control file (first copy)	3-12 x P30 (1TB) To increase DB size add additional P30 disks
+OLOG	- Online redo logs (first copy)	3 x P20 (512GB)
+ARCH	- Control file (second copy) - Archived redo logs	3 x P20 (512GB)
+RECO	- Control file (third copy) - RMAN backups (optional) - Fast recovery area (optional)	3 x P20 (512GB)

Oracle ASM Variant 3

Variant 3 – very large data and data change volumes in excess of ~5TB, restore time crucial

Customer has very large databases where backup and/or restore + recovery of a single databases cannot be accomplished in a timely fashion.

Usually customers will use RMAN, Azure Backup for Oracle and/or disk snap techniques in combination. In this variant each relevant database file type is separated to different Oracle ASM disk groups.

Oracle ASM disk group recommendation:

ASM Disk Group Name	Stores	Azure Storage
+<DBNAME>_DATA[#]	- All data files - All temp files - Control file (first copy)	5-30 or more x P30 (1TB) or P40 (2TB) To increase DB size add additional disks
+OLOG	- Online redo logs (first copy)	3 x P20 (512GB) or P30 (1TB) (Optional "Normal" Redundancy on ASM Disk Group)
+ARCH	- Control file (second copy) - Archived redo logs	3-8 x P20 (512GB) or P30 (1TB)
+RECO	- Control file (third copy) - RMAN backups (optional) - Fast recovery area (optional)	3 x P30 (1TB) or P40 (2TB) or P50 (4TB)

SAP on Oracle on Azure NetApp Files

Azure NetApp Files (ANF) with Oracle dNFS (Direct NFS)

- The combination of Azure VM's and ANF is a very robust and proven combination implemented by many customers on an exceptionally large scale.
- Databases of 100+TB are already running productive on this combination. To start we wrote a detailed blog on how to set up this combination:
- Deploy SAP AnyDB (Oracle 19c) with Azure NetApp Files - Microsoft Tech Community

More general information

- TR-3633: Oracle Databases on NetApp ONTAP | NetApp
- NFS best practice and implementation guide | TR-4067 (netapp.com)
- Mirror Log is required on dNFS ANF Production systems

Azure VM Sizing for SAP on Oracle

Each Azure VM type has specified limits for CPU, Disk, Network and RAM. The limits are documented in the links below

The following recommendations should be followed when selecting a VM type:

1. Ensure the Disk Throughput and IOPS is sufficient for the workload and at least equal to the aggregate throughput of the disks
2. Consider enabling paid **bursting** especially for Redo Log disk(s)
3. For ANF the **Network throughput** is very important as all storage traffic is counted as "Network" rather than Disk throughput
4. Review this blog for Network tuning for M-series Optimizing Network Throughput on Azure M-series VMs HCMT (microsoft.com)
5. Review this link that describes how to use an AWR report to select the correct Azure VM

Typical deployments are **64-96 CPU** AMD or Intel E-series v5 (~700GB) and **m192ms** (4TB). Customers with >25TB trending to **m192ms**

Azure Intel Ev5 Edv5 and Edsv5-series - Azure Virtual Machines | Microsoft Docs
Azure AMD Eadsv5 Easv5 and Eadsv5-series - Azure Virtual Machines | Microsoft Docs
Azure M-series/Msv2-series M-series - Azure Virtual Machines | Microsoft Docs / Msv2/Mdsv2 Medium Memory Series - Azure Virtual Machines | Microsoft Docs
Azure Mv2 Mv2-series - Azure Virtual Machines | Microsoft Docs

SGA, High Availability & Backup

SGA Sizing

VLDB SAP on Oracle on Azure deployments leverage SGA sizes in excess of 3TB. Modern versions of Oracle handle very large SGA sizes well and significantly reduce IO. Review the AWR report and increase the SGA size to reduce read IO.

As general guidance Linux Huge Pages should be configured to approximately 75% of the VM RAM size. The SGA size can be set to 90% of the Huge Page size. A very approximate example would be a m192ms VM with 4TB of RAM would have Huge Pages set approximately 3TB. The SGA can be set to a value a little less such as 2.95TB.

High Availability

Oracle Data Guard is supported for high availability and disaster recovery purposes. To achieve automatic failover in Data Guard, you need to use Fast-Start Failover (FSFA). The Observer functionality (FSFA) triggers the failover. If you don't use FSFA, you can only use a manual failover configuration. For more information, see Implement Oracle Data Guard on an Azure Linux virtual machine.

Backup

For backup/restore functionality, the SAP BR*Tools for Oracle are supported in the same way as they are on bare metal and Hyper-V. Oracle Recovery Manager (RMAN) is also supported for backups to disk and restores from disk.

For more information about how you can use Azure Backup and Recovery services for backing up and recovering Oracle databases, see Back up and recover an Oracle Database 12c database on an Azure Linux virtual machine.

Azure Backup service is also supporting Oracle backups as described in the article Back up and recover an Oracle Database 19c database on an Azure Linux VM using Azure Backup.

Oracle on Windows + Links

- Oracle ASM is not supported on Windows. Windows Storage Spaces should be used to stripe disks
- VLDB customers are encouraged to use Oracle Linux + ASM

- Links
  - https://docs.microsoft.com/en-us/azure/virtual-machines/workloads/sap/dbms_guide_oracle Microsoft SAP on Oracle documentation (currently being updated)
  - 2039619 - SAP Applications on Microsoft Azure using the Oracle Database: Supported Products and Versions Oracle master note
  - https://aka.ms/saponazureblog

  - Woolworths Australia SAP IS-RETAIL Case Study Microsoft Customer Story-Woolworths completes large-scale SAP cloud transformation, improving efficiency, flexibility, and speed to market

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Thank you