Data Mobility for Oracle Database

Jim Williams – ASM Product Management
Ricardo Gonzalez – ACFS Product Management

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Program Agenda

1. Introduction
2. Oracle Storage Roadmap
3. Business Challenges Solved
4. Conclusion

Storage Experts Session at the RAC booth in Demo Grounds on Wednesday at 2:00pm

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A Different Perspective

- Past OOW presentations feature and function focused.
- I/T evolution to Cloud Architecture requires a different perspective.
- Roadmap focus is *past*, *present*, *near future*, and *beyond*.
- Storage Experts Session at the RAC booth in Demo Grounds on Wednesday at 2:00.

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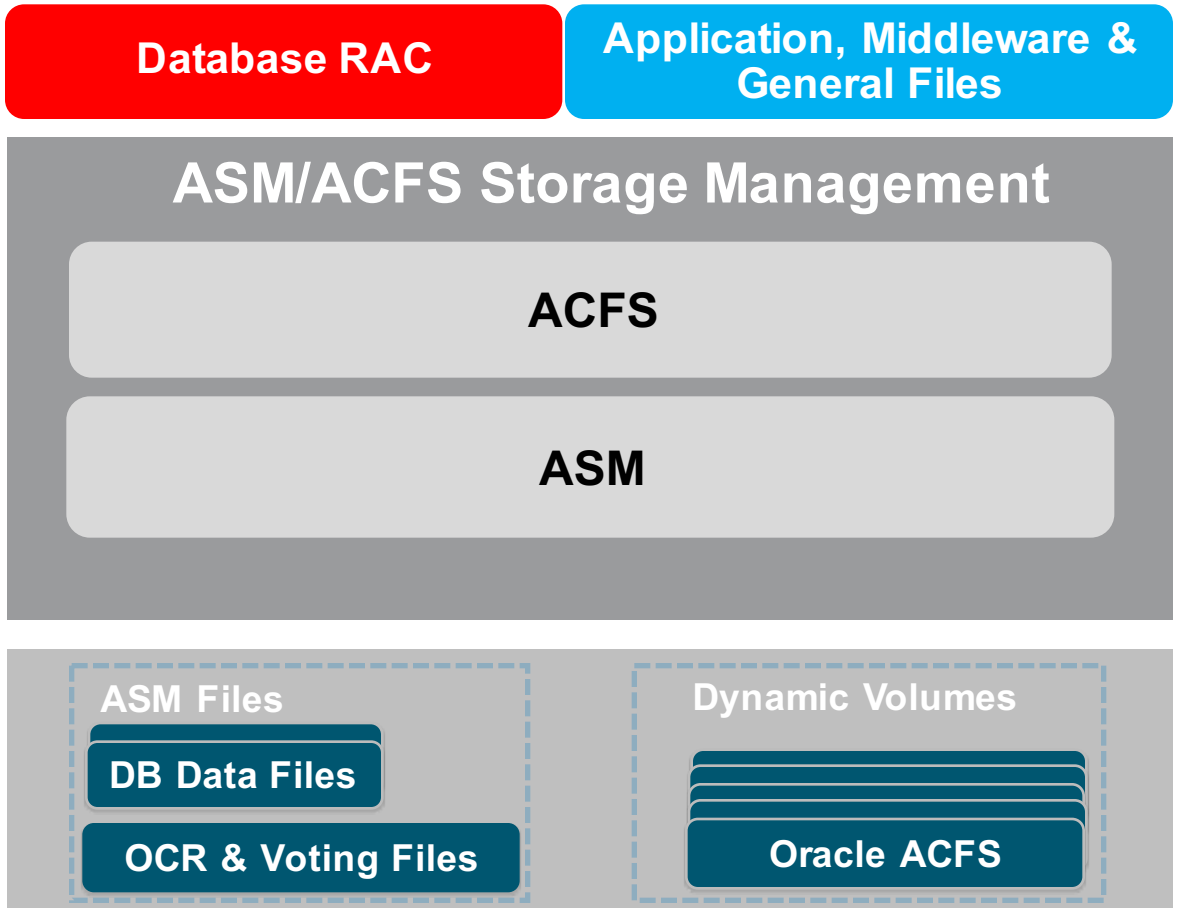
Classical ASM/ACFS Architectural Presentation



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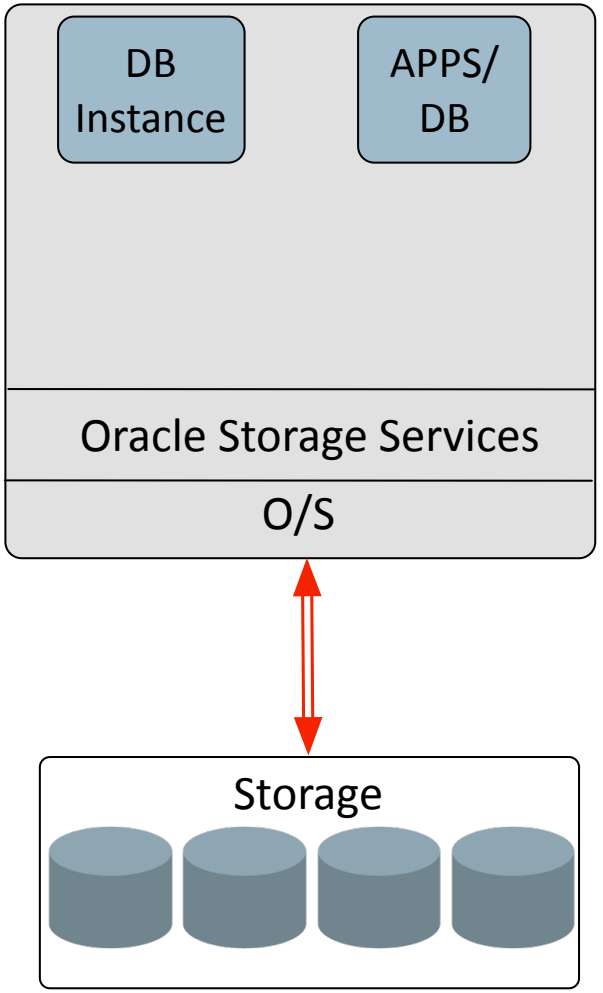
ASM & ACFS are Oracle Storage Services

- Another perspective:
  - ASM/ACFS as a platform for storage management – *Oracle Storage Services*.
  - Support applications and databases for standalone servers and clusters.
  - Moving forward, Oracle Storage Services provide foundation for cloud computing.



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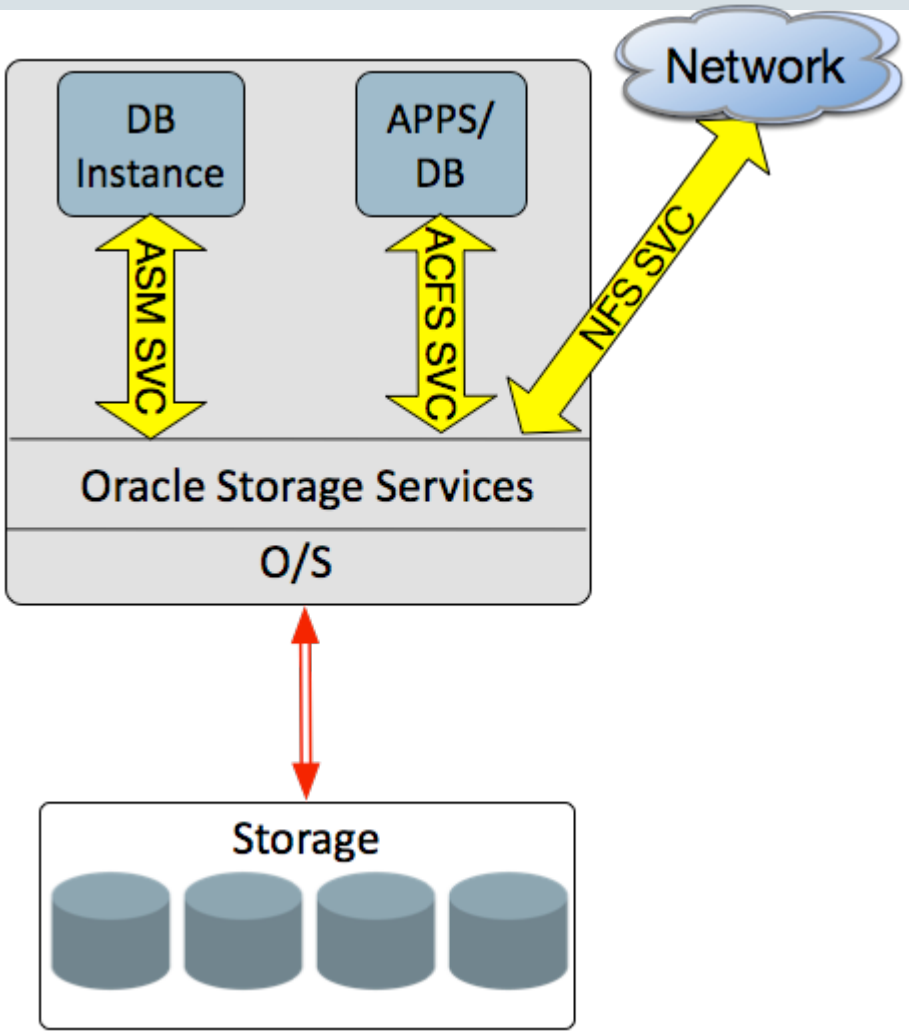
Examples of Oracle Storage Services

Roadmap of storage architecture models:

- *(Past)* Standalone Cluster Storage
  - Grid Infrastructure Release 11.2
- *(Current)* Cluster Domain Storage
  - Grid Infrastructure Release 12.2
- *(Near Future)* Converged Storage
- *(Beyond)* NUSA Storage



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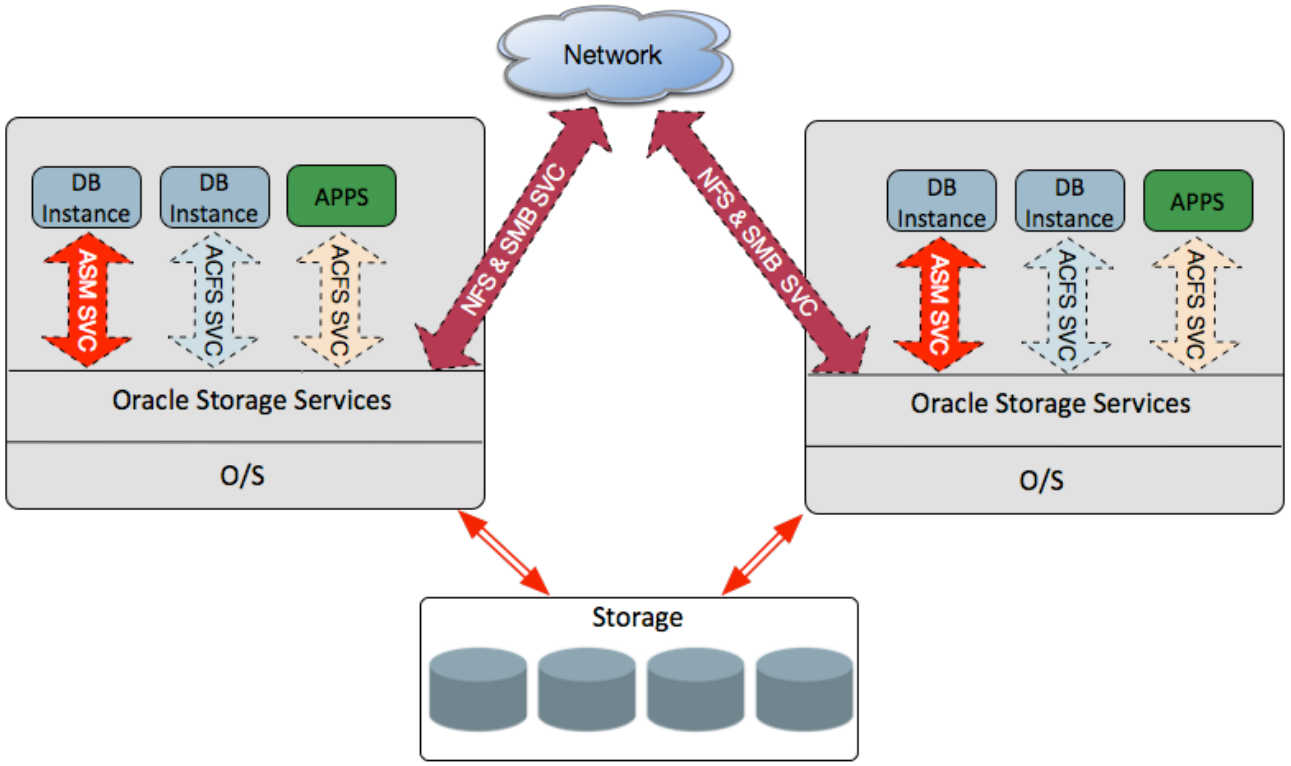
Standalone Cluster Storage Model (Past)



- Standalone clusters.
- All data is physically local to cluster.
- Storage Services
  - ASM Local Service
  - ACFS Local Service
  - NFS/SMB Service
- Based on Grid Infrastructure Release 11.2.

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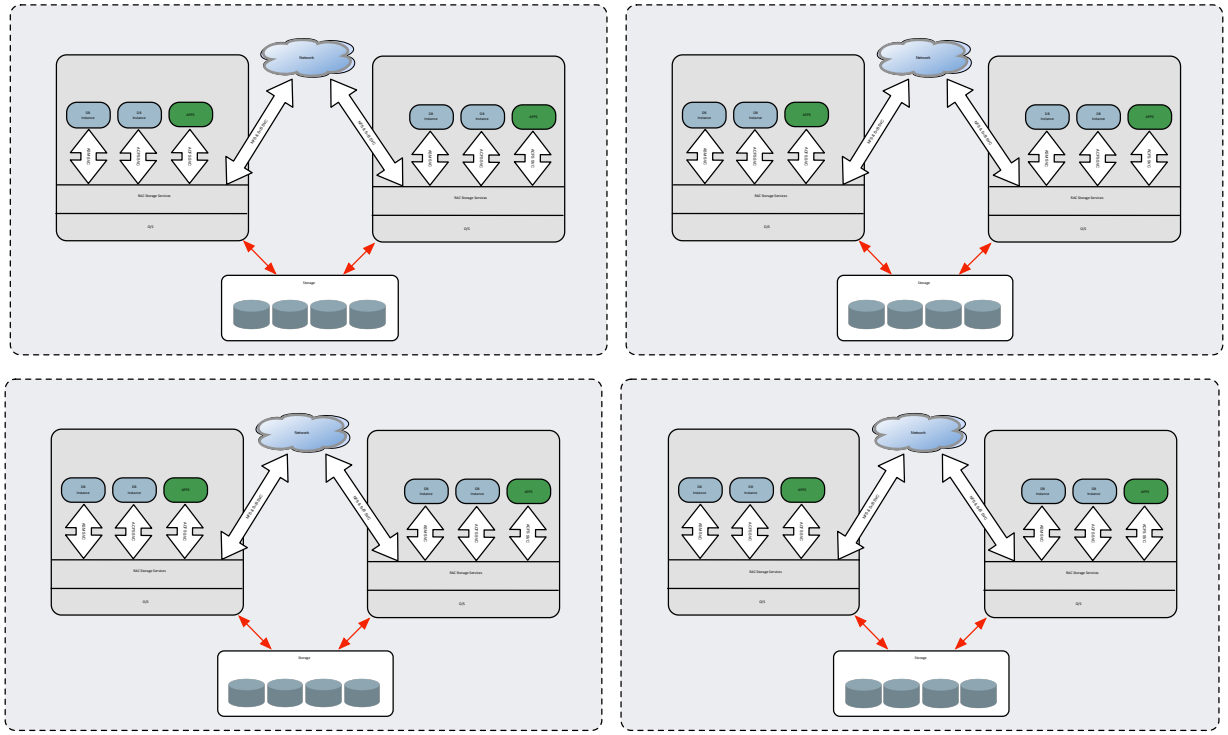
Standalone Cluster Storage Model



- Independent Name Spaces i.e. Disk Groups and files systems are individually addressed.
- Limited Data Mobility.
  - Manual Disk Group dismount and remount across clusters.

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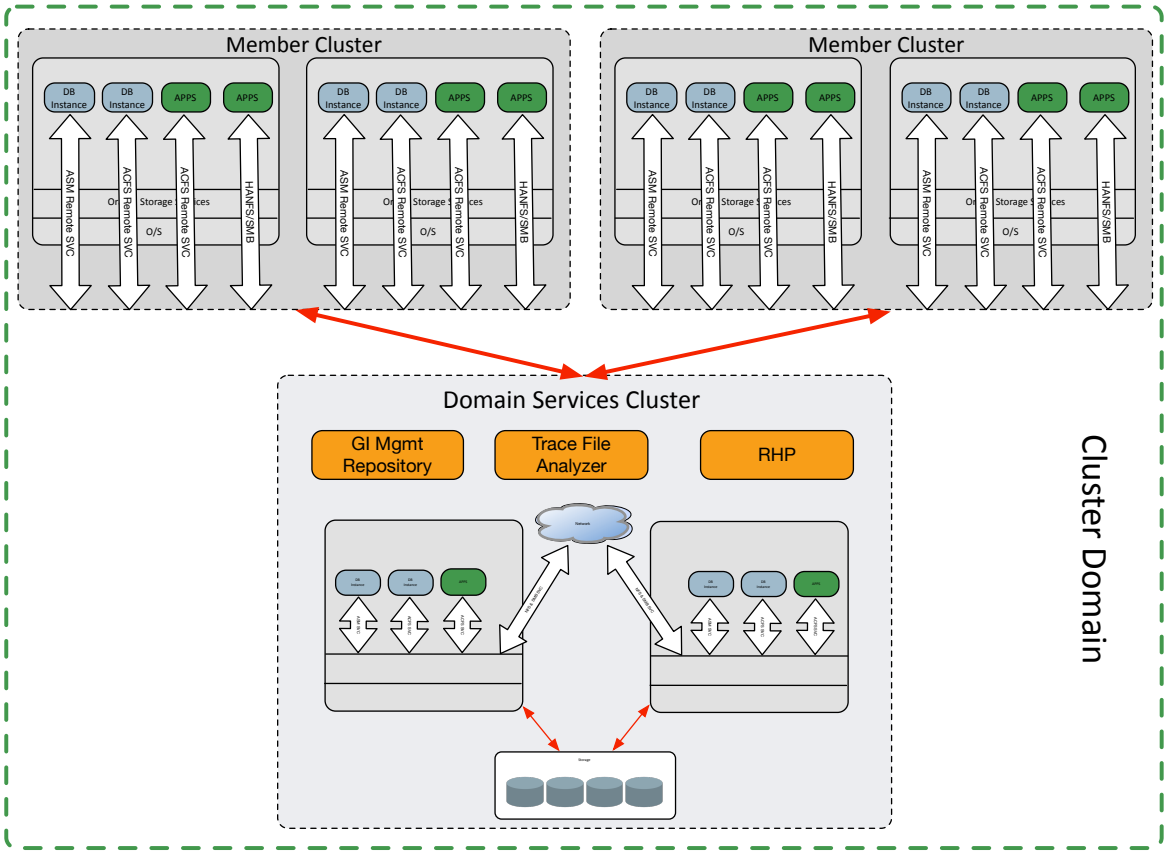
Cluster Domain Storage Model (Current)



- Single Domain Service Cluster and many Member Clusters.
- One single shared Name Space exposed to Cluster Domain.
  - Member Cluster access via SAN or Network
- New Storage Services include:
  - ASM Remote Service
  - HA-NFS/SMB
- Available in Grid Infrastructure 12.2.

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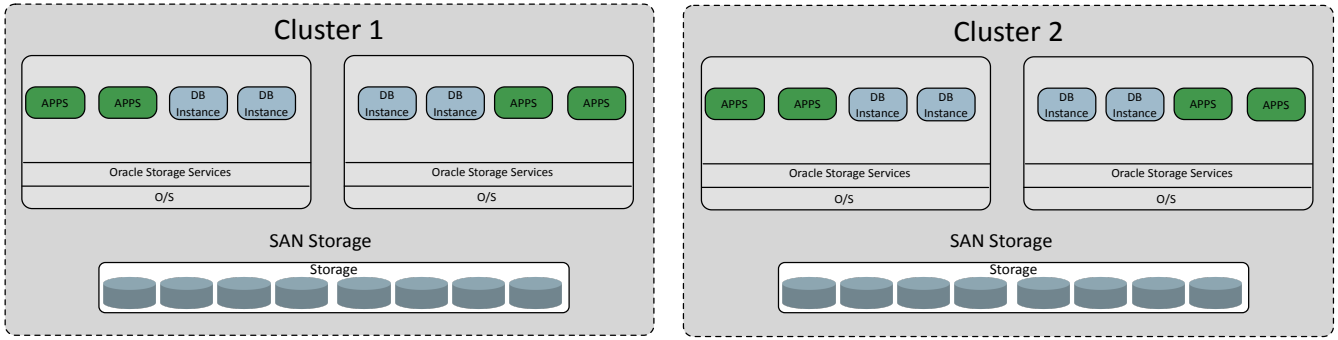
Converged Storage Model (Near Future)



- Collection of tightly integrated servers.
- Supports either SAN

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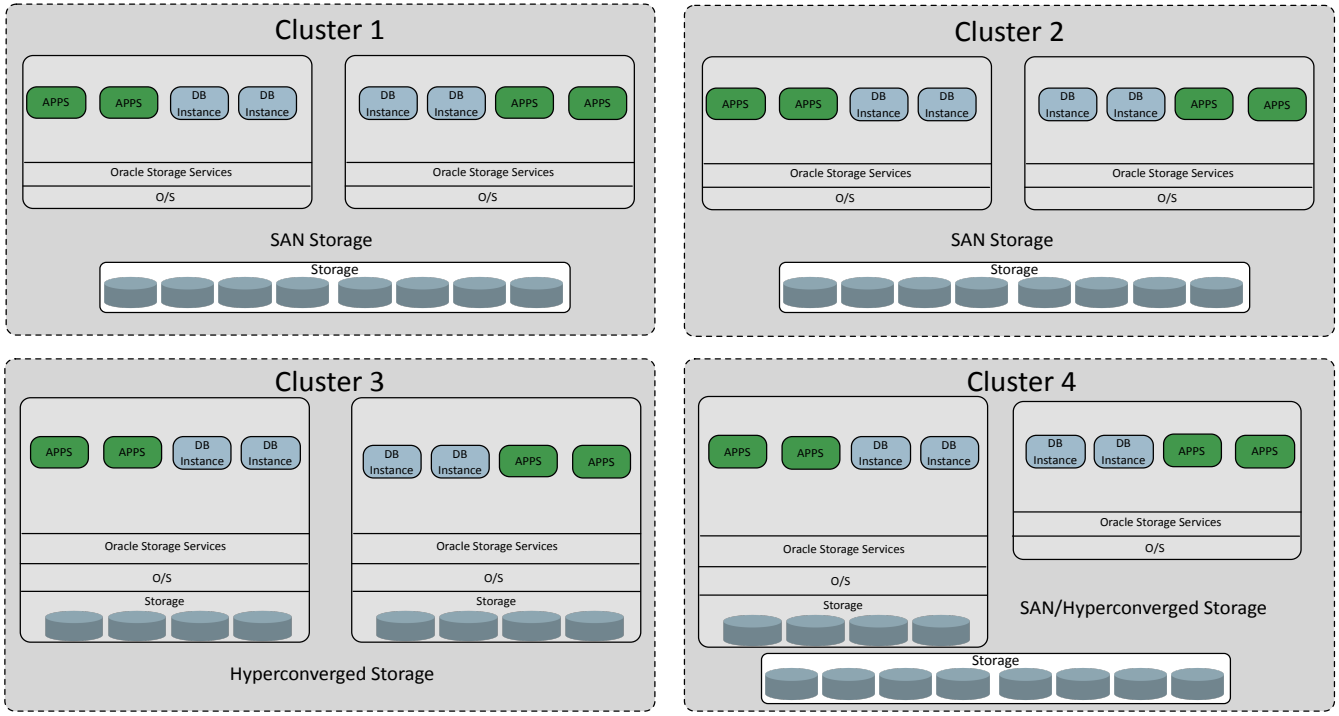
Converged Storage Model



- Supports either SAN or hyper-converged storage. (Clouds)
- Independent Name Spaces.

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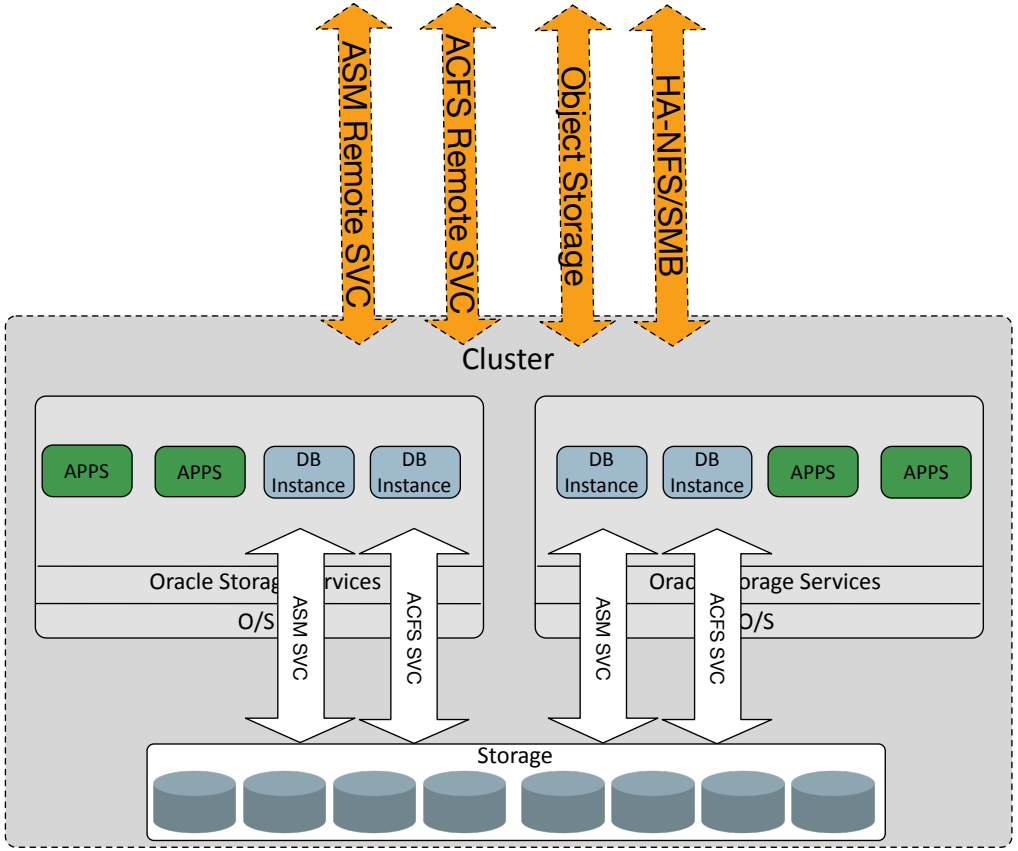
Converged Storage Model



- New set of remote access services introduced.
- Storage Services:
  - ACFS Local
  - ASM Local
  - ACFS Remote
  - ASM Remote*
  - HA-NFS/SMB
  - Object Storage

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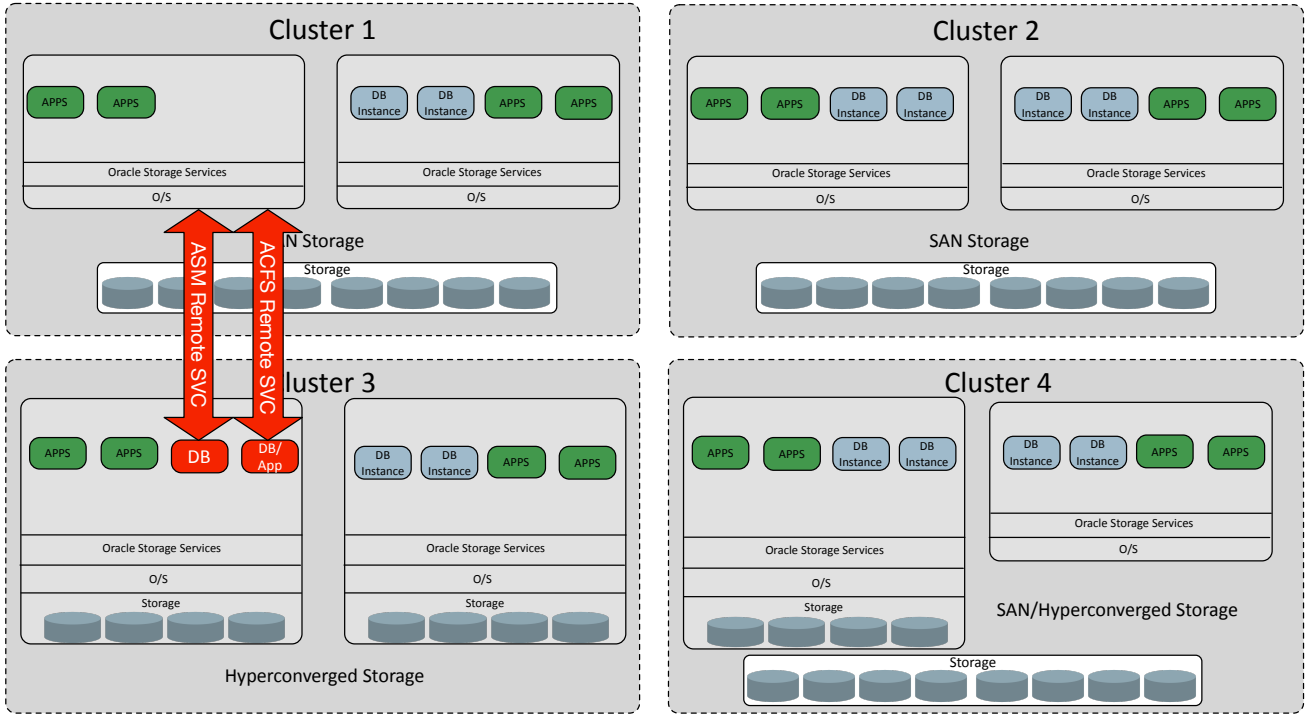
Converged Storage Model



- Enables database instance and application access to storage in different clusters via network.
- Cloud storage foundation.

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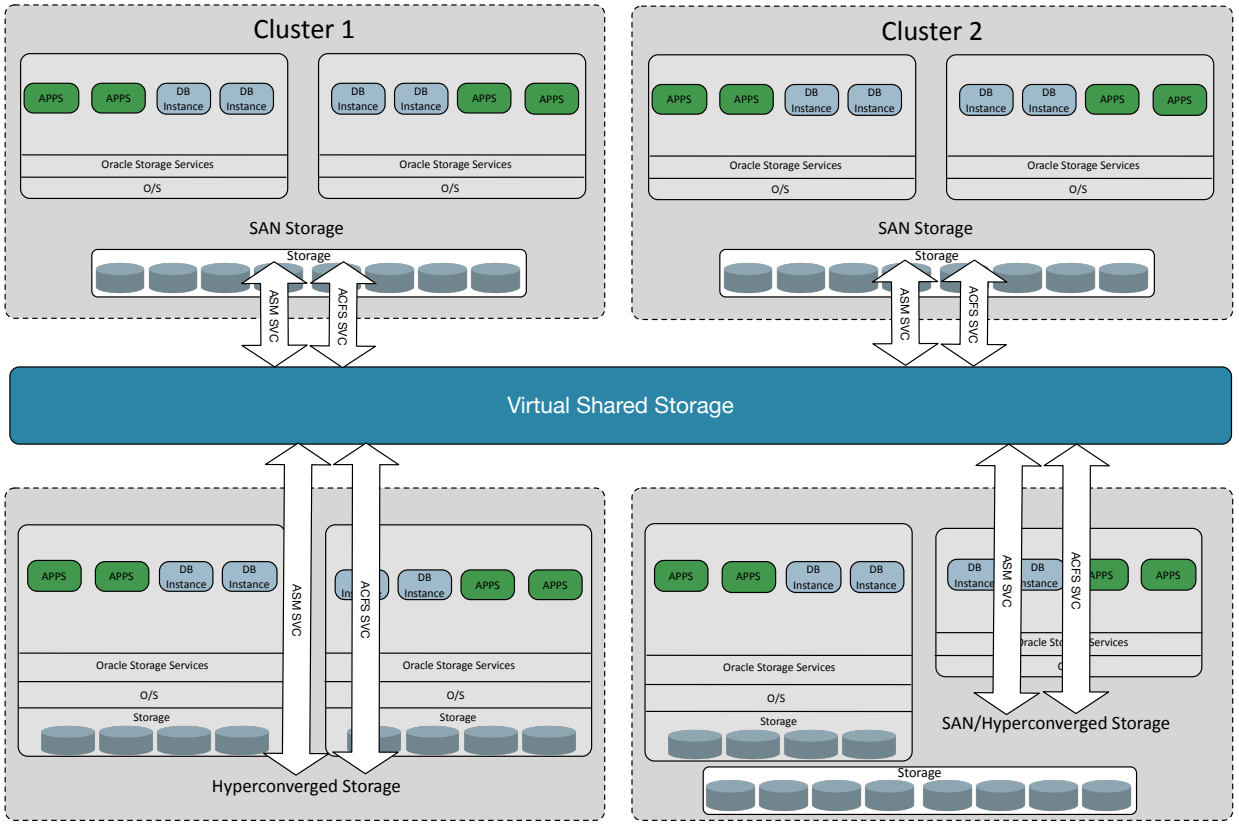
Non-Uniform Storage Architecture (NUSA) Model (Beyond)



- Support for SAN-based and hyper-converged storage.
- NUSA virtualizes storage from many clusters into a single common *Name Space*.
- Virtual Shared Storage pool shared by databases and applications.
- Cross-cluster data placement optimized for workload and reliability requirements.
- Cloud foundation+++.

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Business Challenge – Need to relocate Databases and Applications between Servers and Clusters

- Workload in one server/cluster is at maximum capacity, but there is available capacity in another server/cluster.
- Need for planned downtime for maintenance may require relocating a database or application workload.

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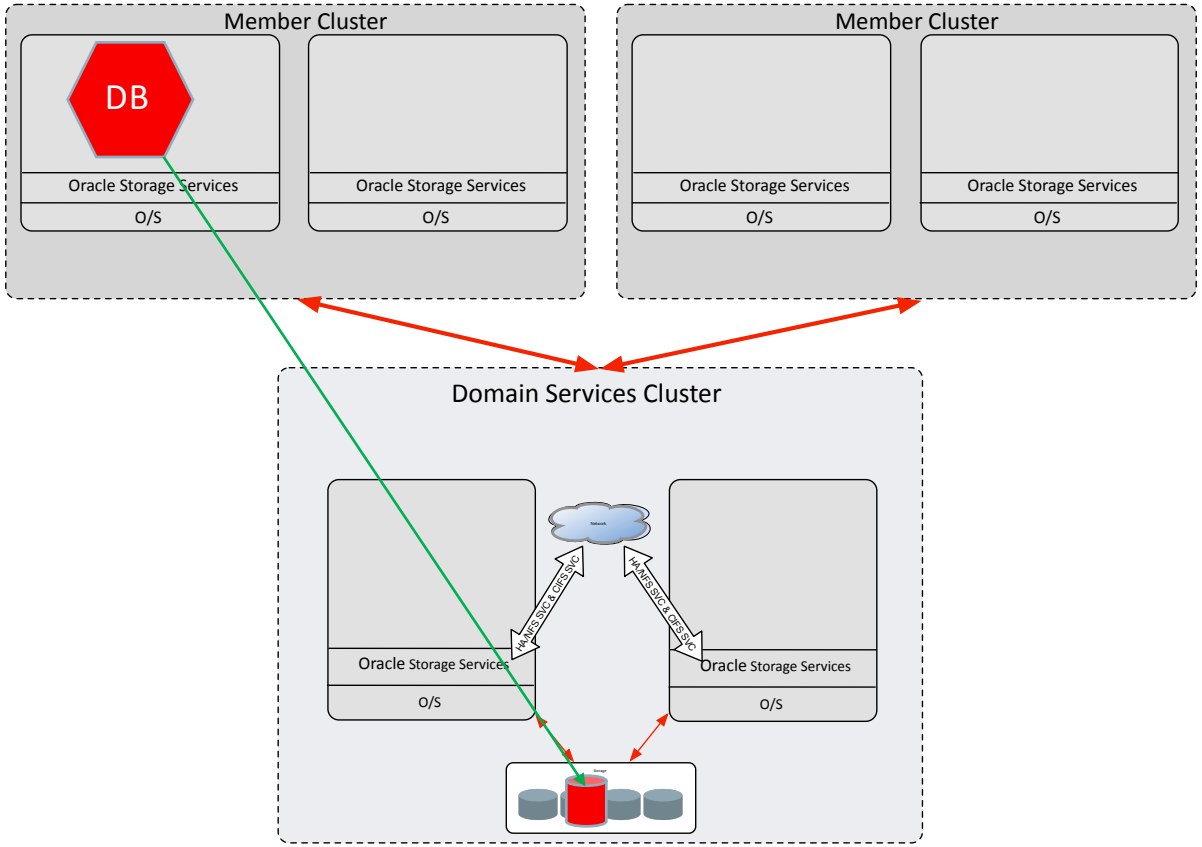
Database on ASM/ACFS relocated within Cluster Domain Storage Model (Current)



- Database instance running on Member Cluster, but out of capacity.
- Capacity available in another Member Cluster.
- Move database instance from one Member Cluster to another Member Cluster with available capacity.

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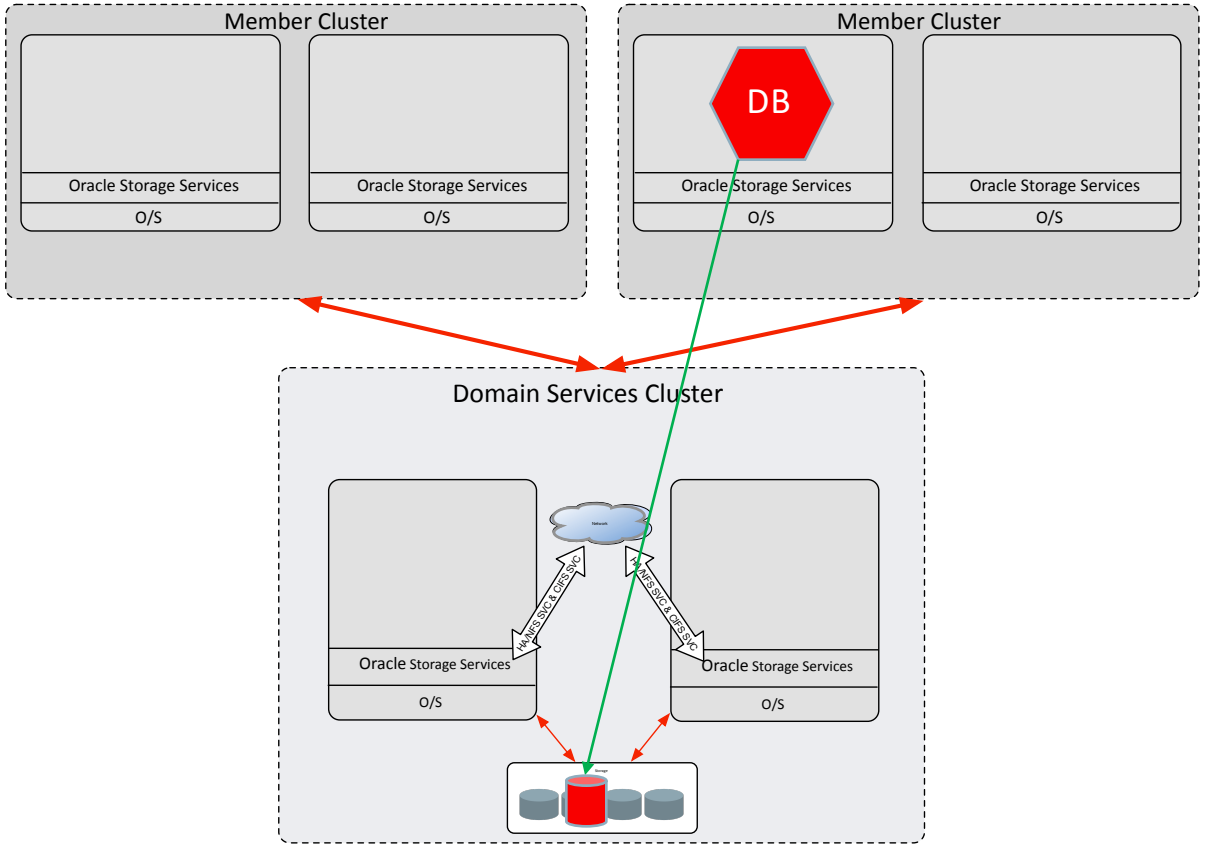
Database on ASM/ACFS relocated within Cluster Domain Storage Model (Current)



- New database instance in secondary cluster is started.
- Application data can be accessed between Member Clusters as well.
- No impact or downtime to the database.
- Available now in ASM
  Coming in Next Generation ACFS

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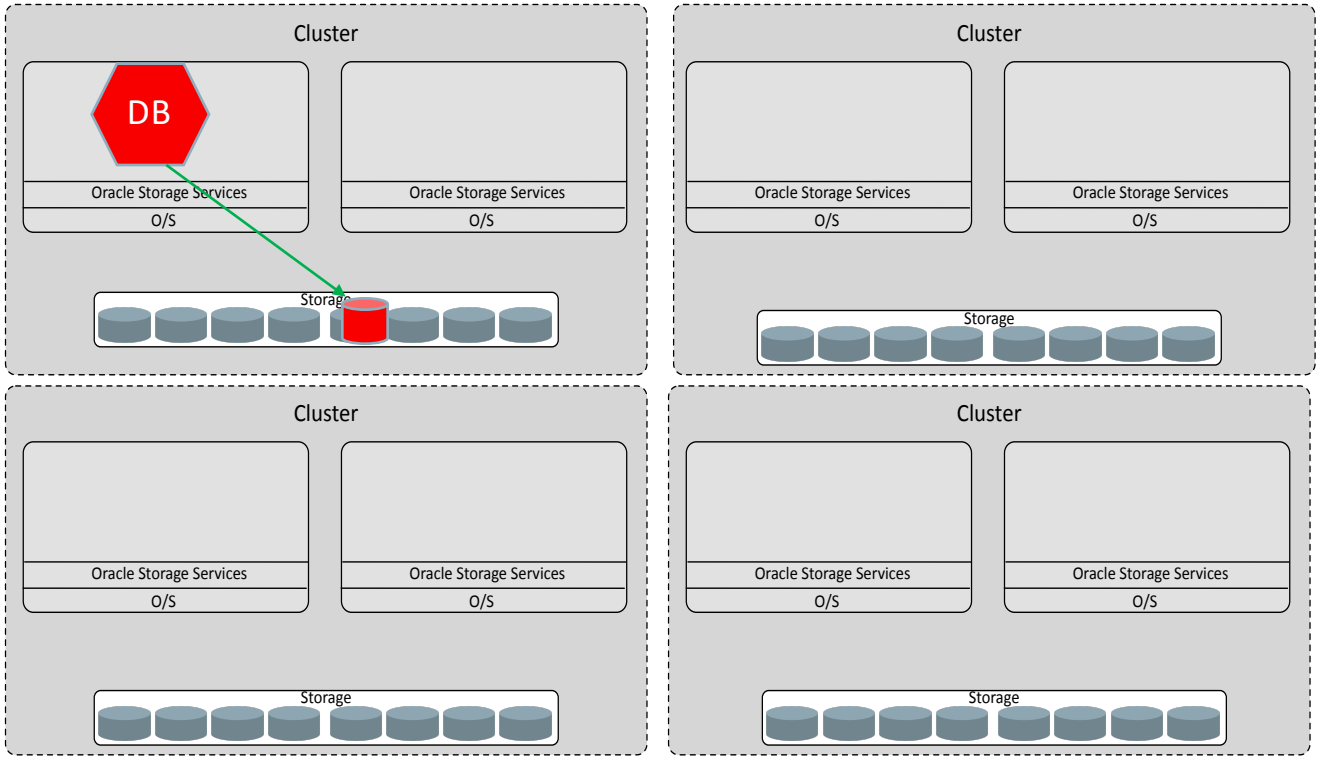
Database on ASM relocated within Converged Storage Model (Near Future)



- Initial state of database instance in an Converged Storage Model cluster.

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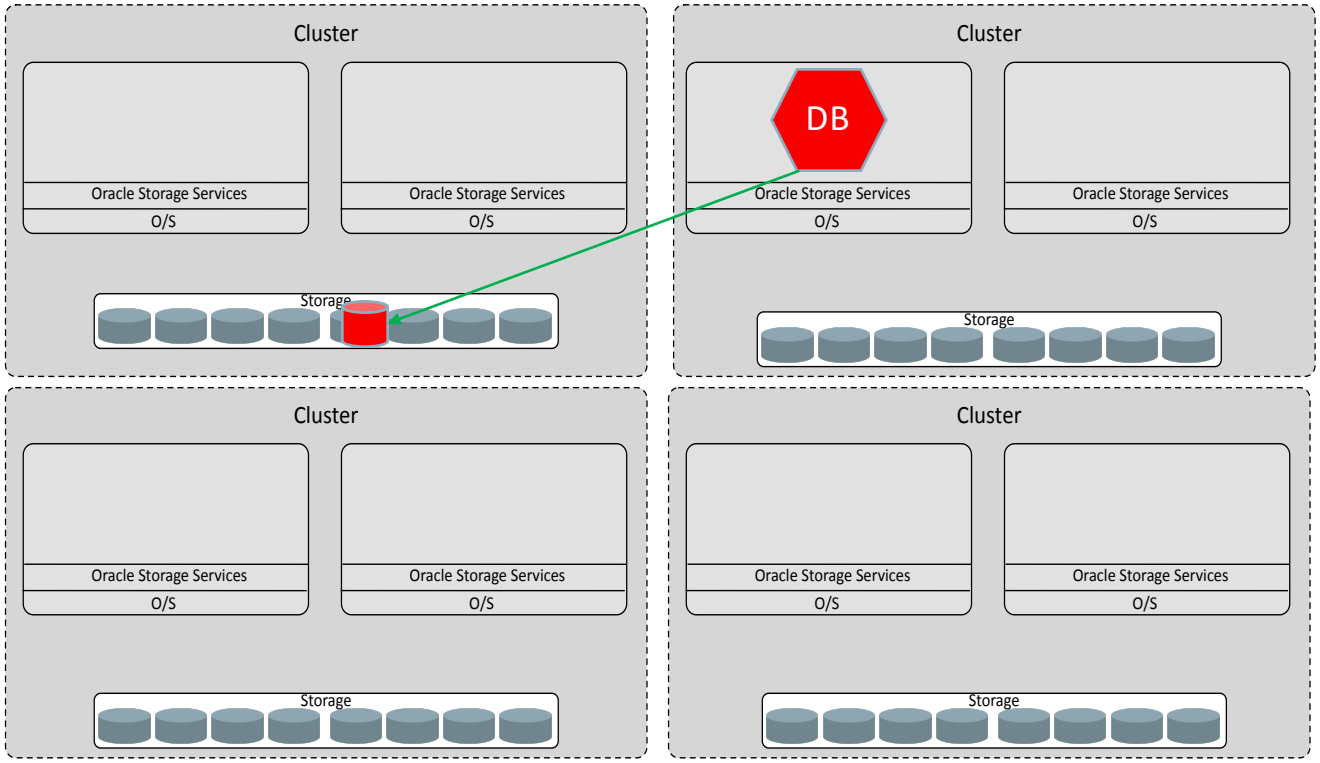
Database on ASM relocated within Converged Storage Model (Near Future)



- New database instance in secondary cluster is started.
- Works with Multitentant operations.

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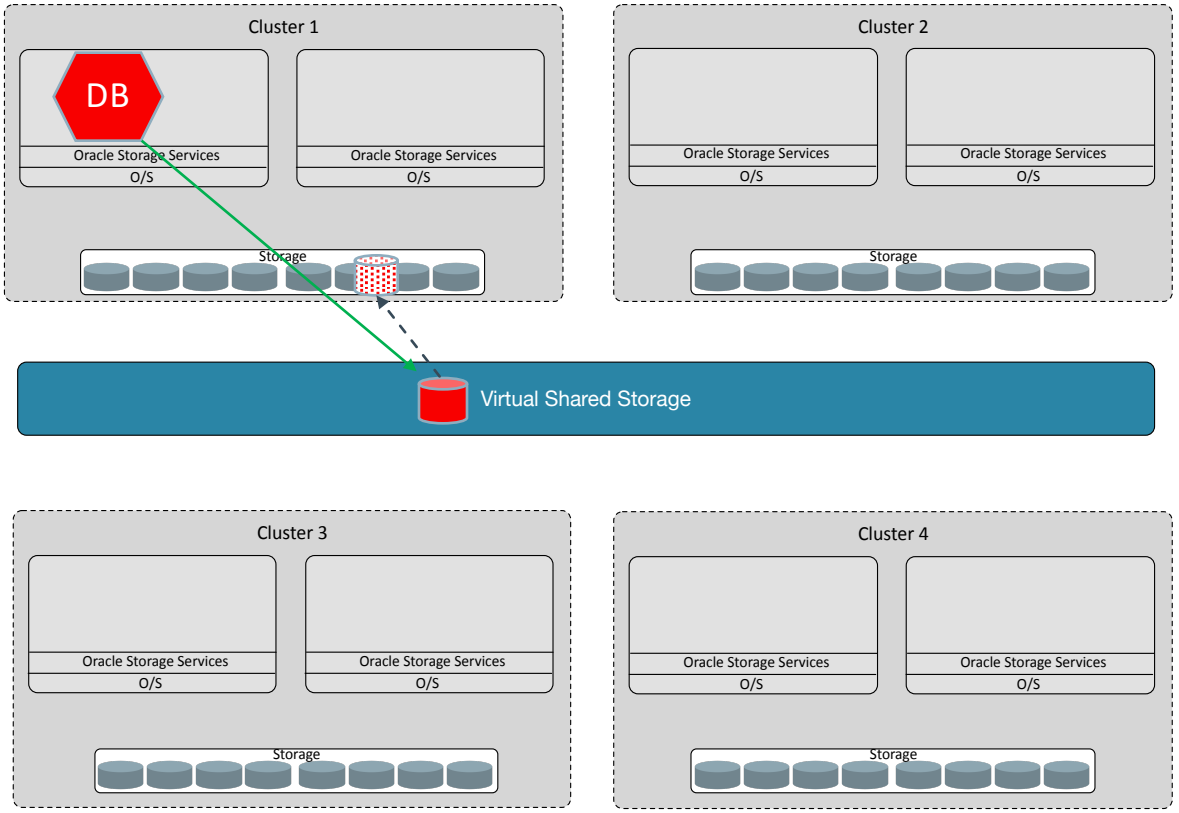
Database on ASM relocated within NUSA Storage Model (Beyond)



- Database (DB) residing in NUSA storage local to cluster 1.

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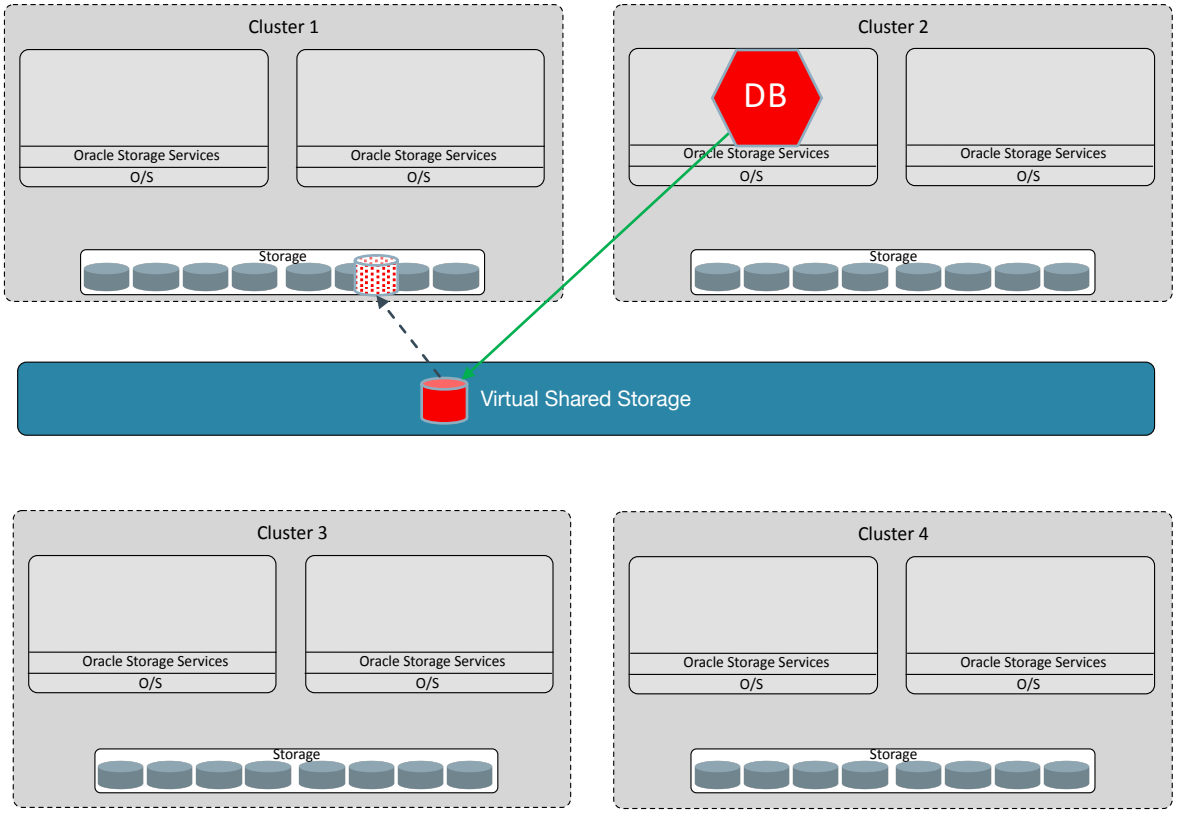
Database on ASM relocated within NUSA Storage Model (Beyond)



- DB started in secondary cluster.

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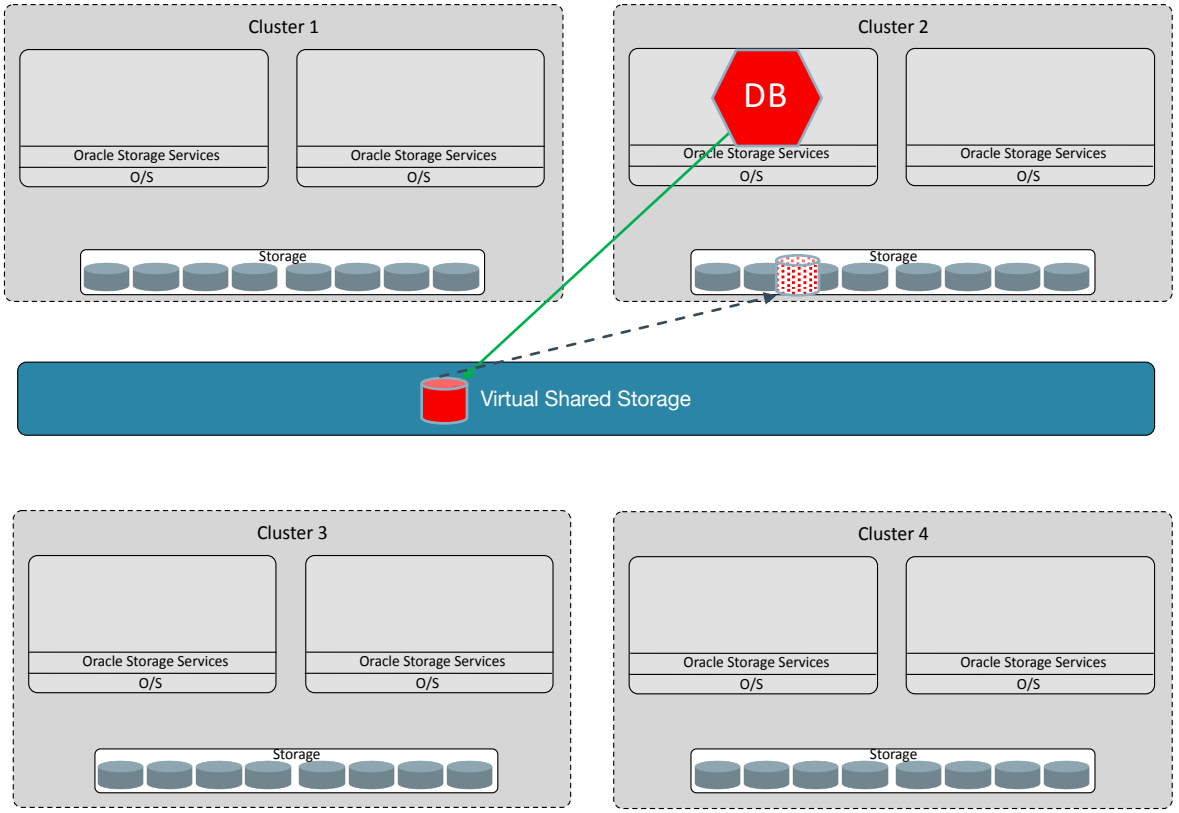
Database on ASM relocated within NUSA Storage Model (Beyond)



- Under load, data affinity between workload and storage is maintained.
- Data relocation is seamless to the workload.

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Business Challenges – Need for Provisioning Database Test and Development Environments

- Environments consisting of databases require point-in-time capture and movement to secondary environments for testing and development (Test/Dev).

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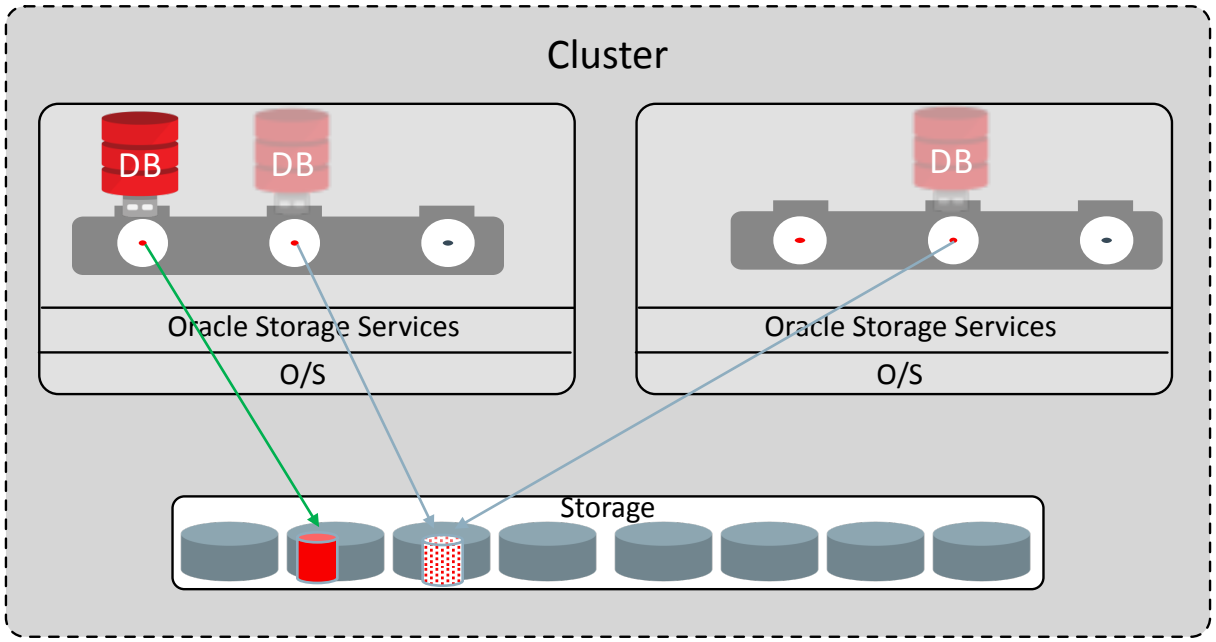
Test/Dev Provisioning Across Clusters with ACFS + Multitenant (Current)



- **Fast & Efficient** sparse clones of PDB's for Test & Dev.
- `SQL> create pluggable database snap_pdb from pdb snapshot copy;`
- PDB Clones are opened in a different node in the cluster making it accessible for Test/Dev purposes.

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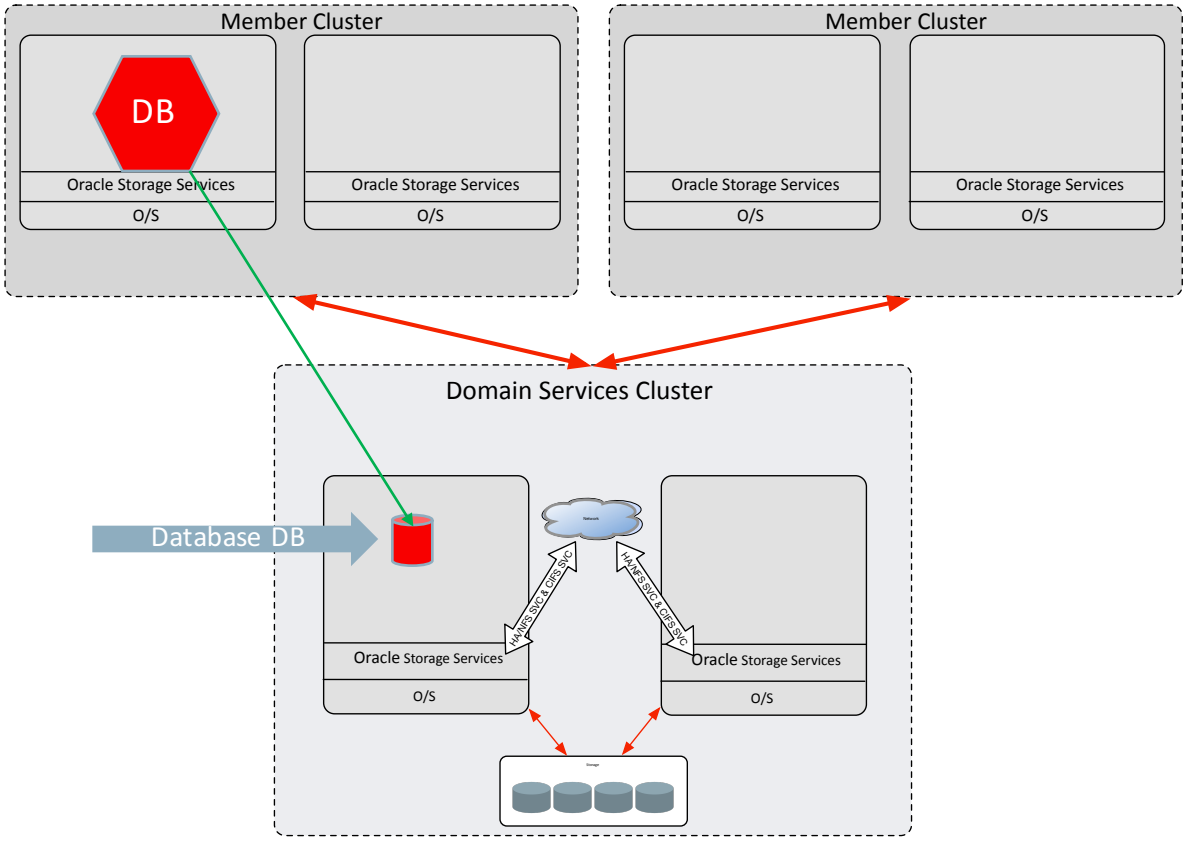
Test/Dev Provisioning Across Clusters with ASM Database Cloning in Cluster Domain Storage (Near Future)



- Initial state of production database.
- Requirement to make a point-in-time copy of database for Test/Dev.

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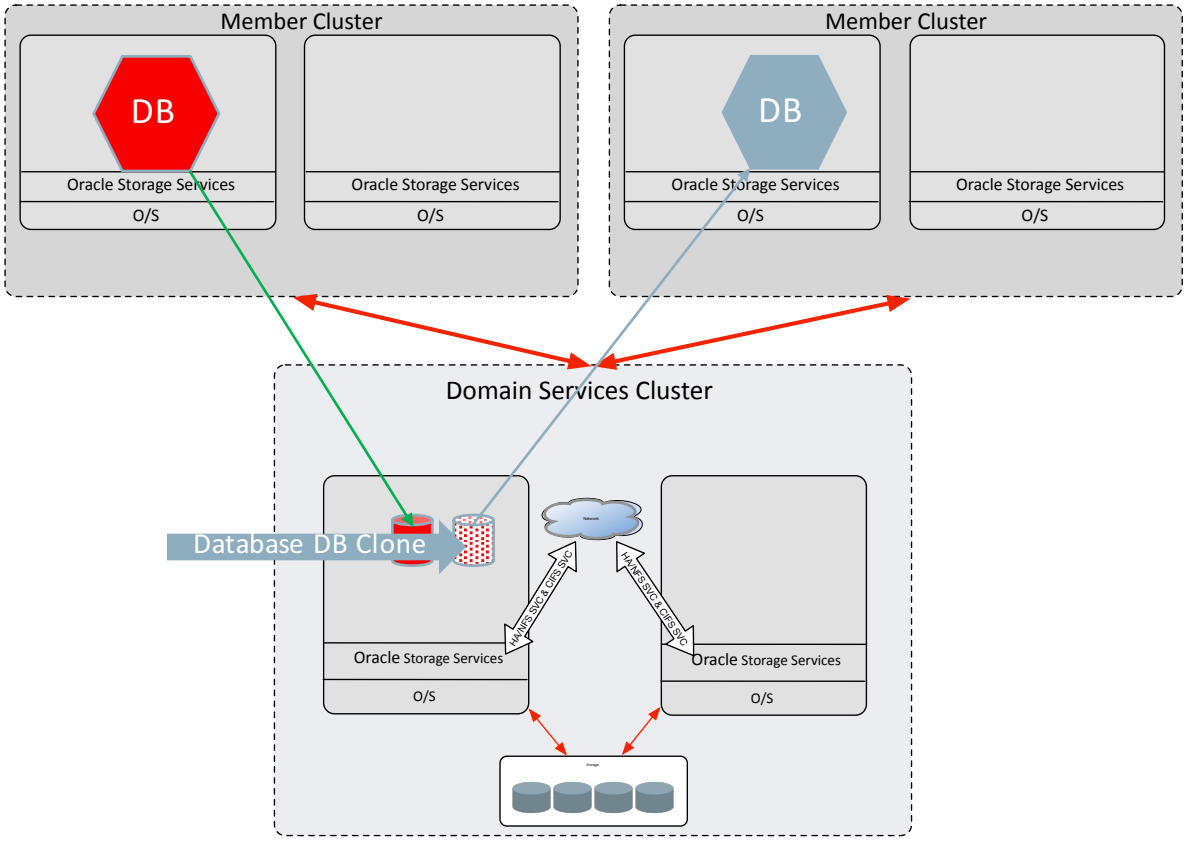
Test/Dev Provisioning Across Clusters with ASM Database Cloning in Cluster Domain Storage (Near Future)



- CDB/PDB DB is cloned from production environment.
- Test/Dev cluster accesses and utilizes new database clone.

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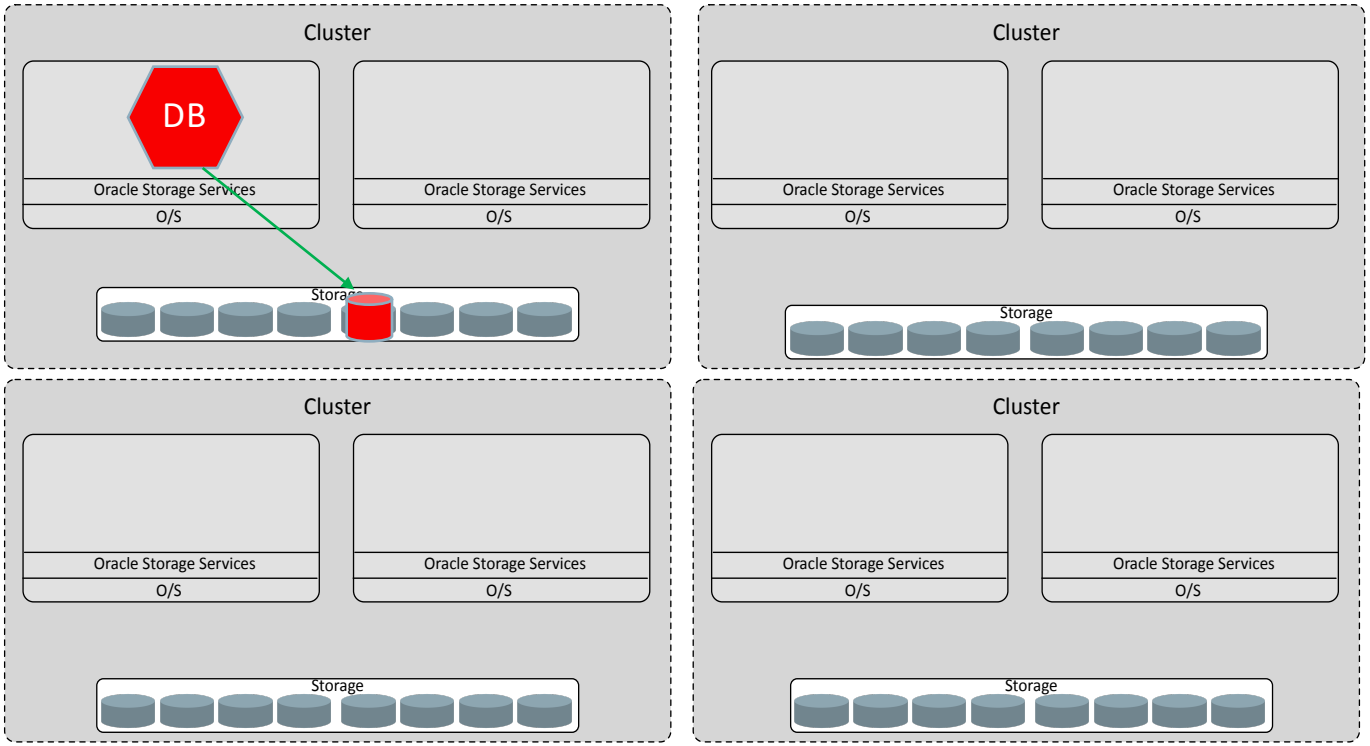
Test/Dev Provisioning Across Clusters with ASM Database Cloning with Converged Storage (Near Future)



- Initial state of production database in an integrated converged cluster.

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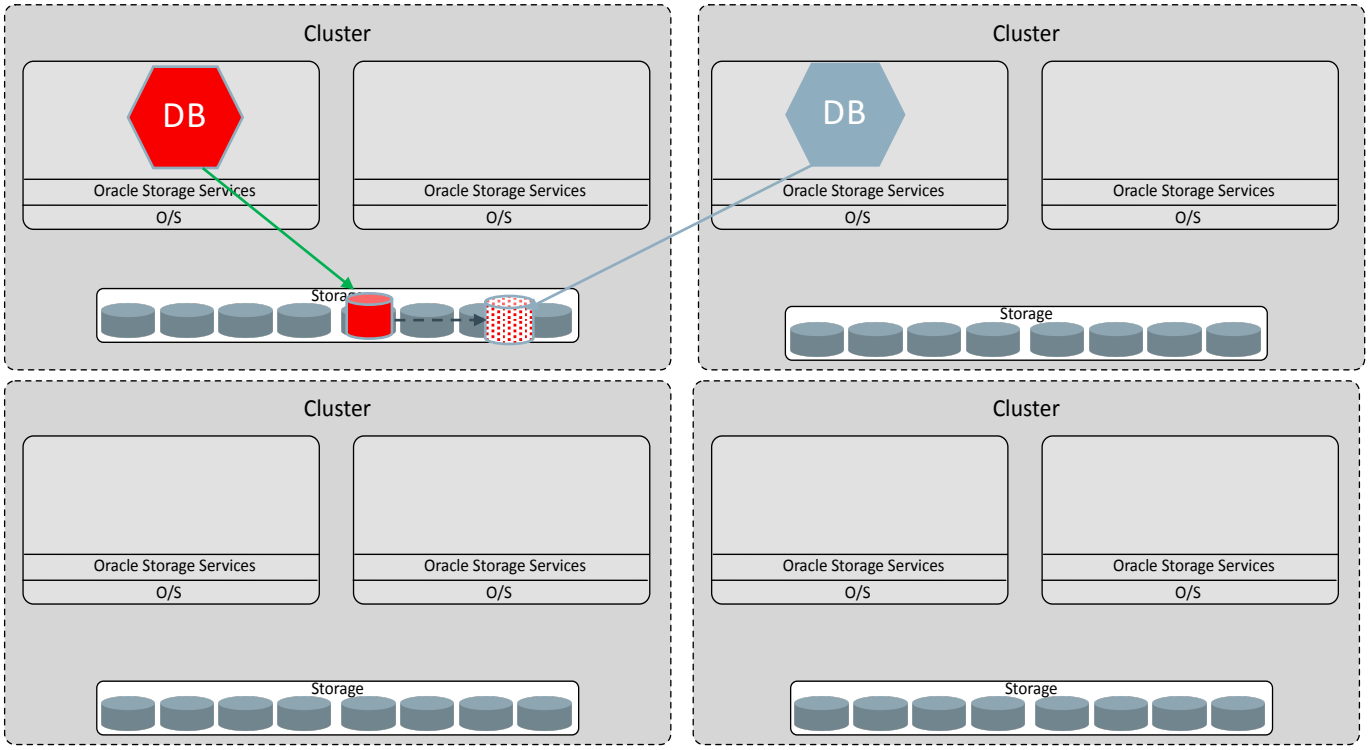
Test/Dev Provisioning Across Clusters with ASM Database Cloning with Converged Storage (Near Future)



- Database is cloned and accessed from production cluster.

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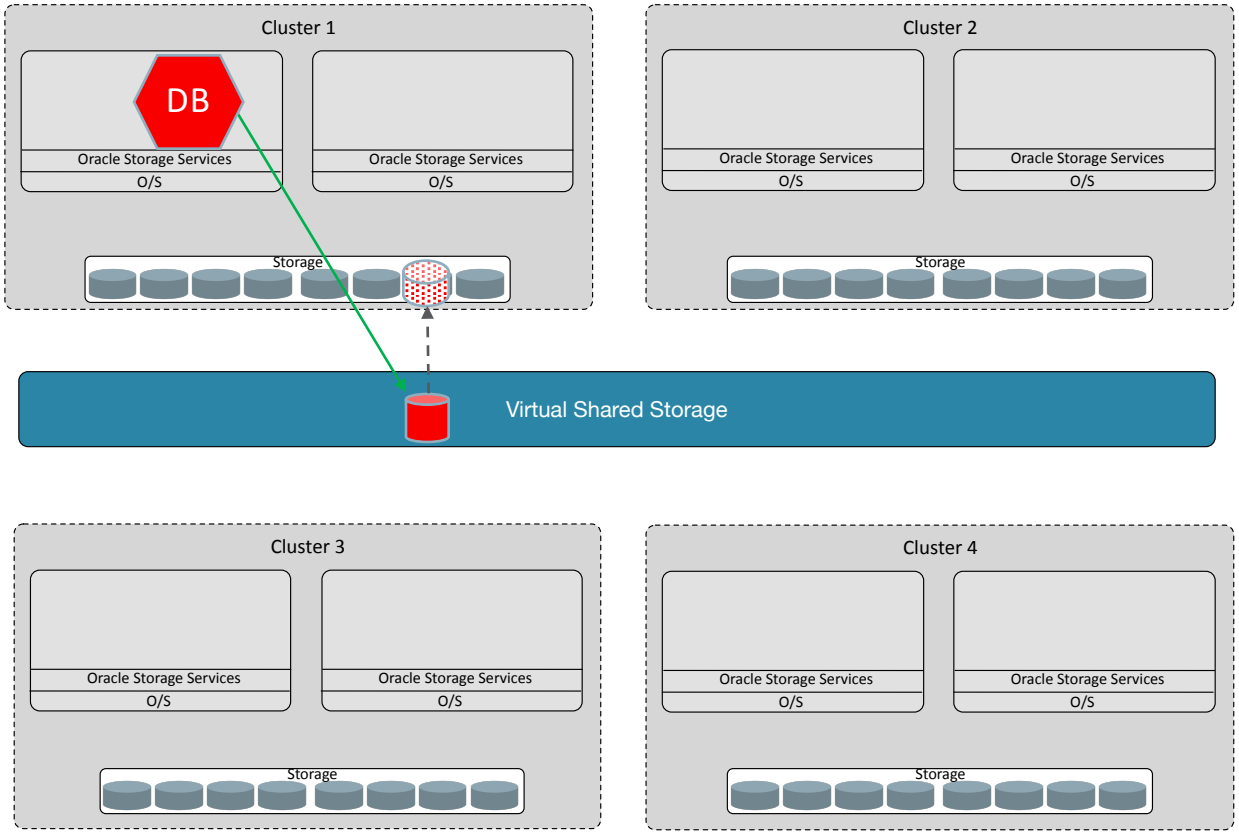
Test/Dev Provisioning Across Clusters with ASM Database Cloning with NUSA Storage (Beyond)



- Production database (DB) residing in NUSA storage local to Cluster 1.

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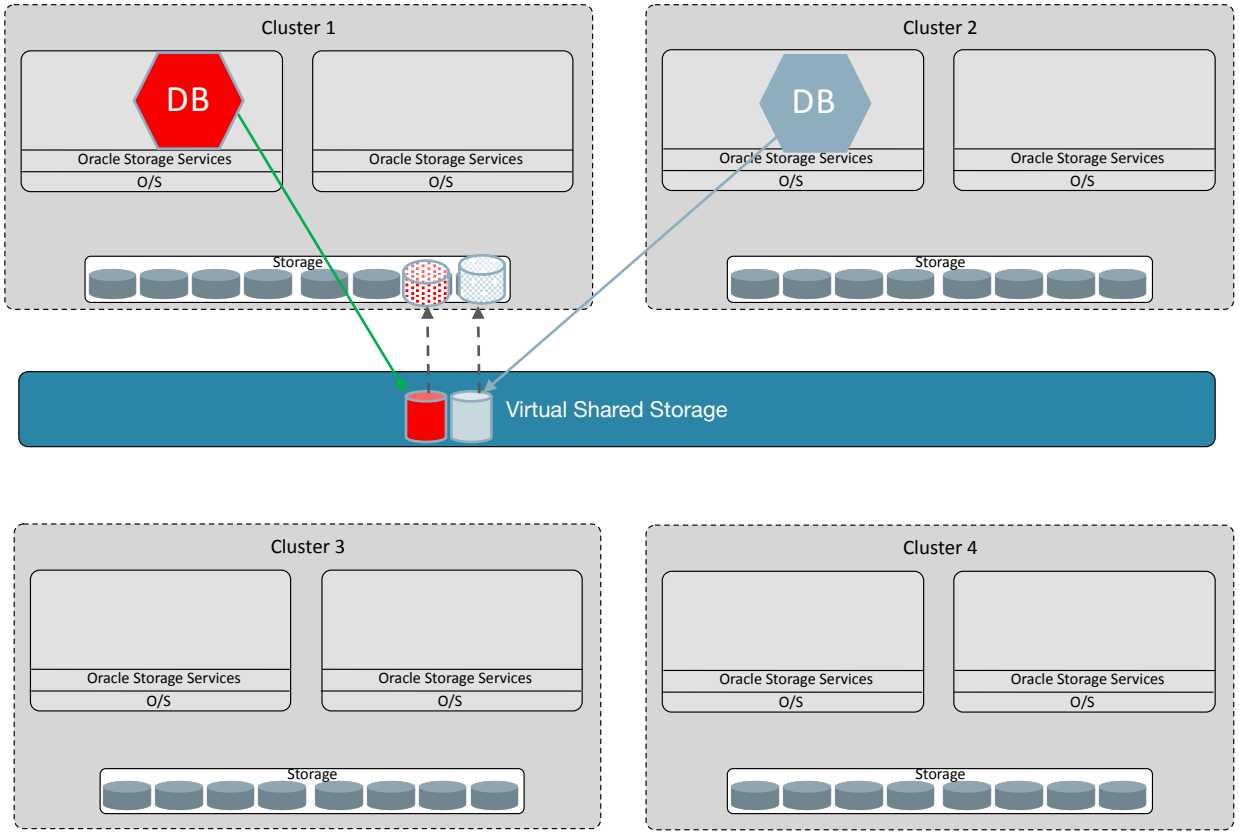
Test/Dev Provisioning Across Clusters with ASM Database Cloning with NUSA Storage (Beyond)



- ASM Database clone created and accessed from Test/Dev cluster 2.

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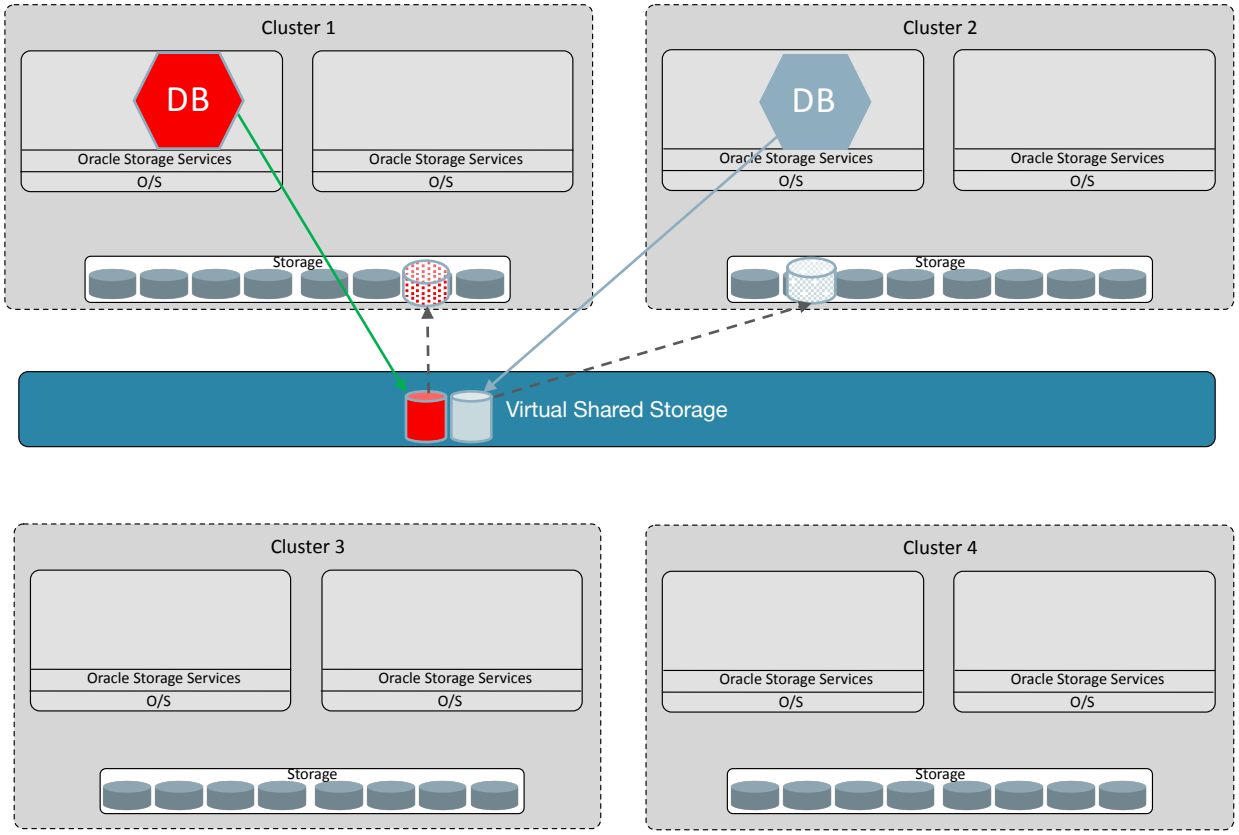
Test/Dev Provisioning Across Clusters with ASM Database Cloning with NUSA Storage (Beyond)



- Under load, data for DB in cluster 2 is relocated to physical storage local to cluster 2.

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Business Challenges – Need for Provisioning Application Test and Development Environments

- Application environments consisting of applications and data, require point-in-time capture and movement to secondary environments for testing and development (Test/Dev).

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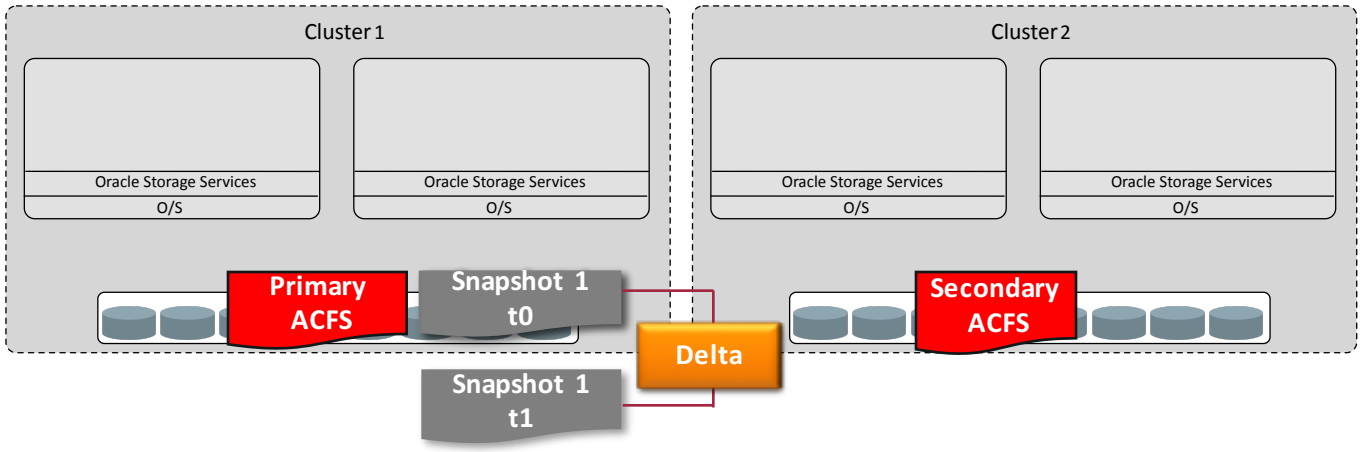
Test/Dev Provisioning Across Clusters with ACFS Replication for Applications (Current)



- Efficient replication of ACFS file systems to a remote site.
- Cross-OS/Server/Cluster replication among primary and secondary site.
- Allows for snapshots on secondary site for Test/Dev.

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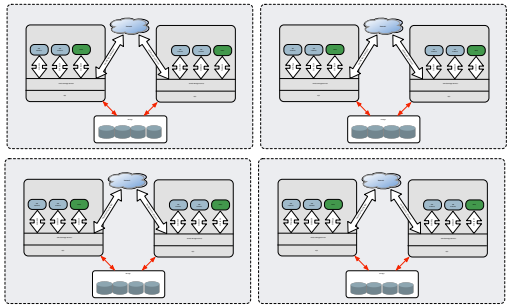
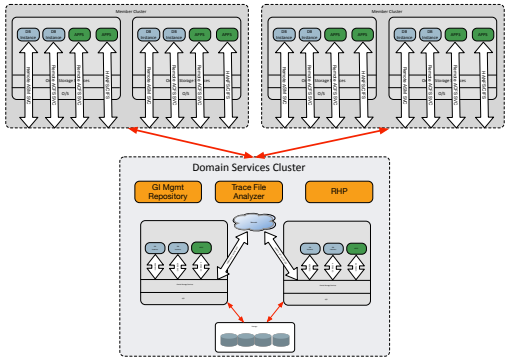
Conclusion

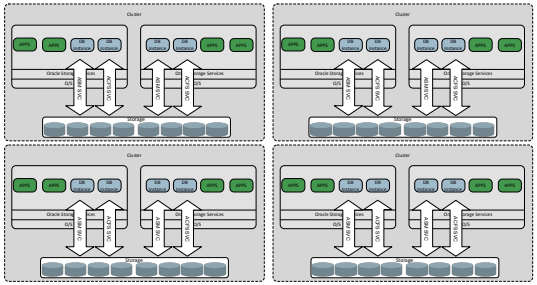
Standalone Cluster



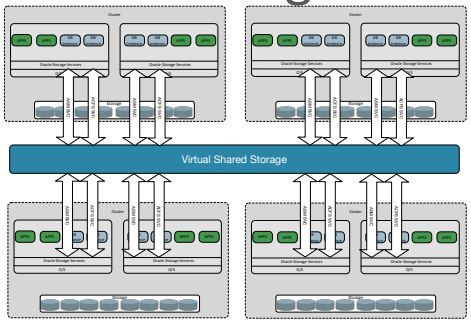
Cluster Domain Storage



Converged Storage



NUSA Storage



- Evolution to cloud computing require new storage architectures enabling data independence from the host platform.
- **Oracle Storage** throughout its evolution, provides the foundation for **data mobility** for the Oracle Database and application data.

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