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# Oracle Cluster Domains: Managing the Cluster Estate

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**May 22, 2019**

# Safe Harbor Statement

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# Program Agenda

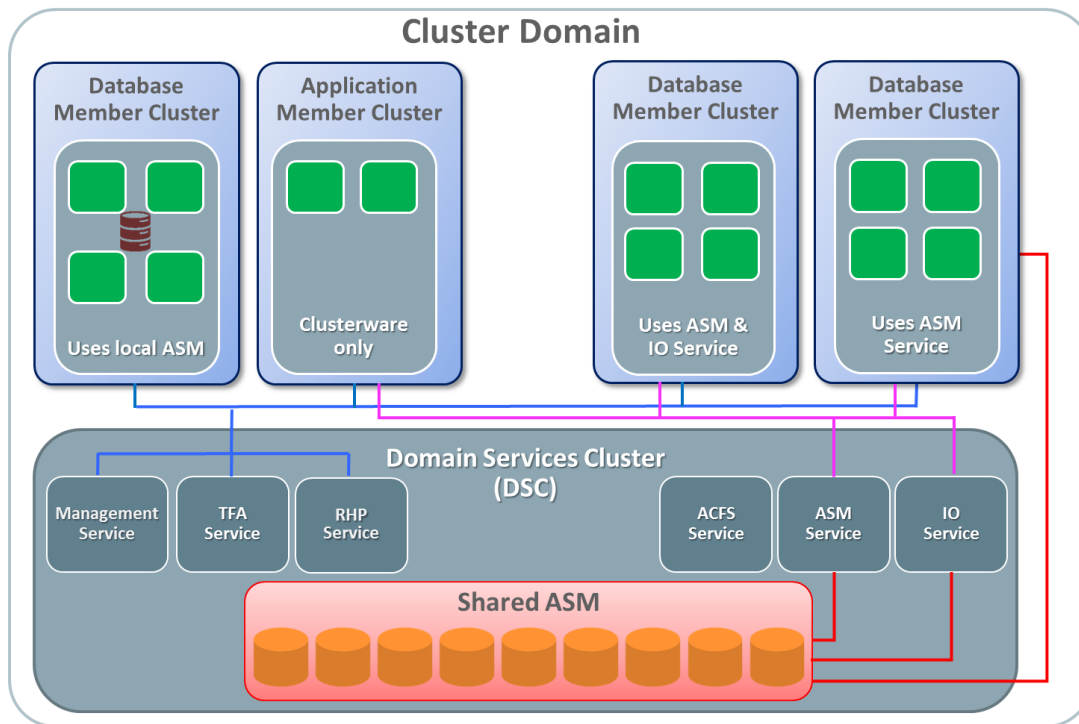
- 1 ➤ Cluster Domain Overview
- 2 ➤ Customer Use Case

# Program Agenda

- 1 Cluster Domain Overview
- 2 Customer Use Case

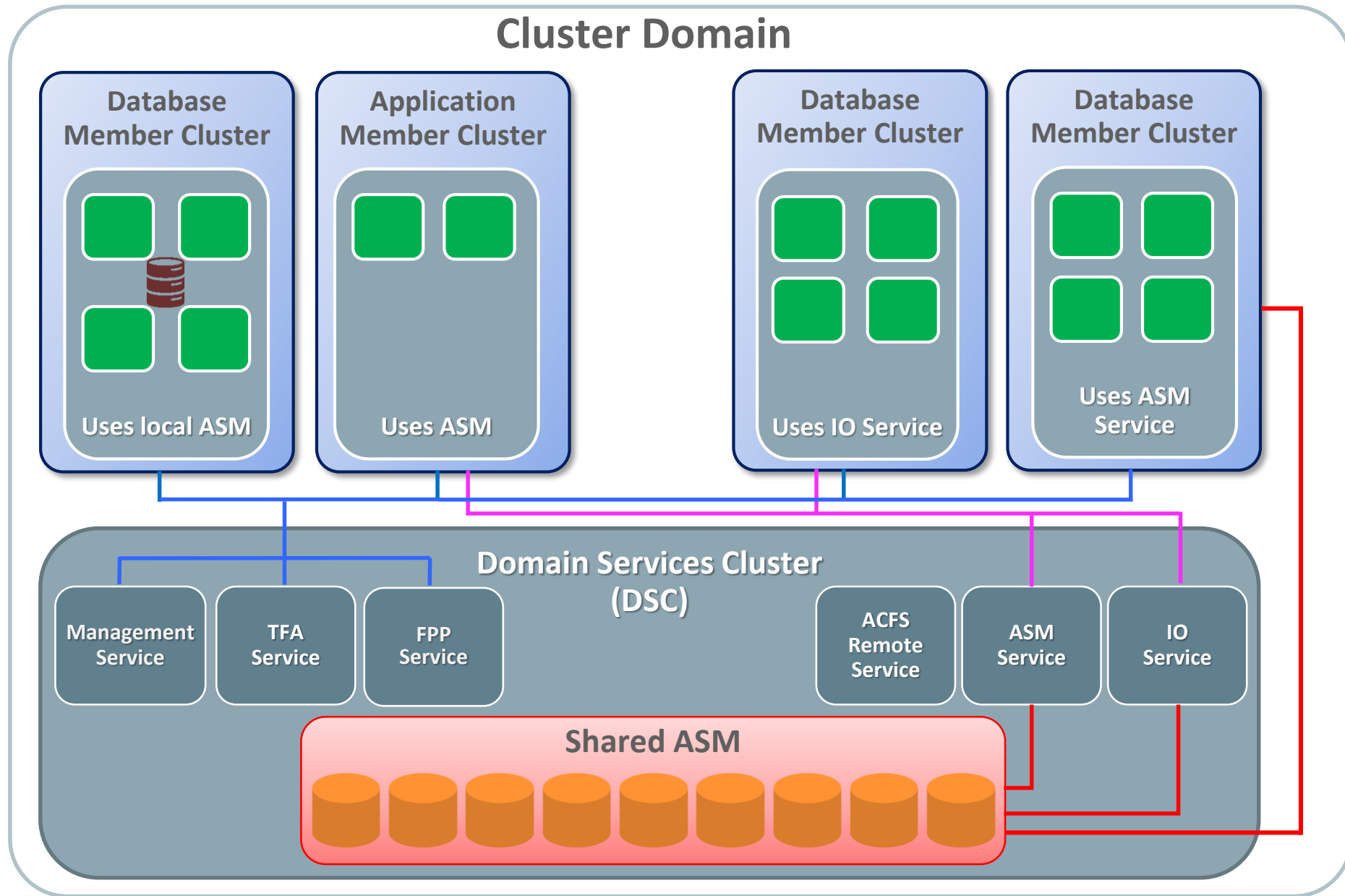
# Oracle RAC 12c Rel. 2 Cluster Domain

Centralized Management for Cluster Estates “too big to manage” otherwise

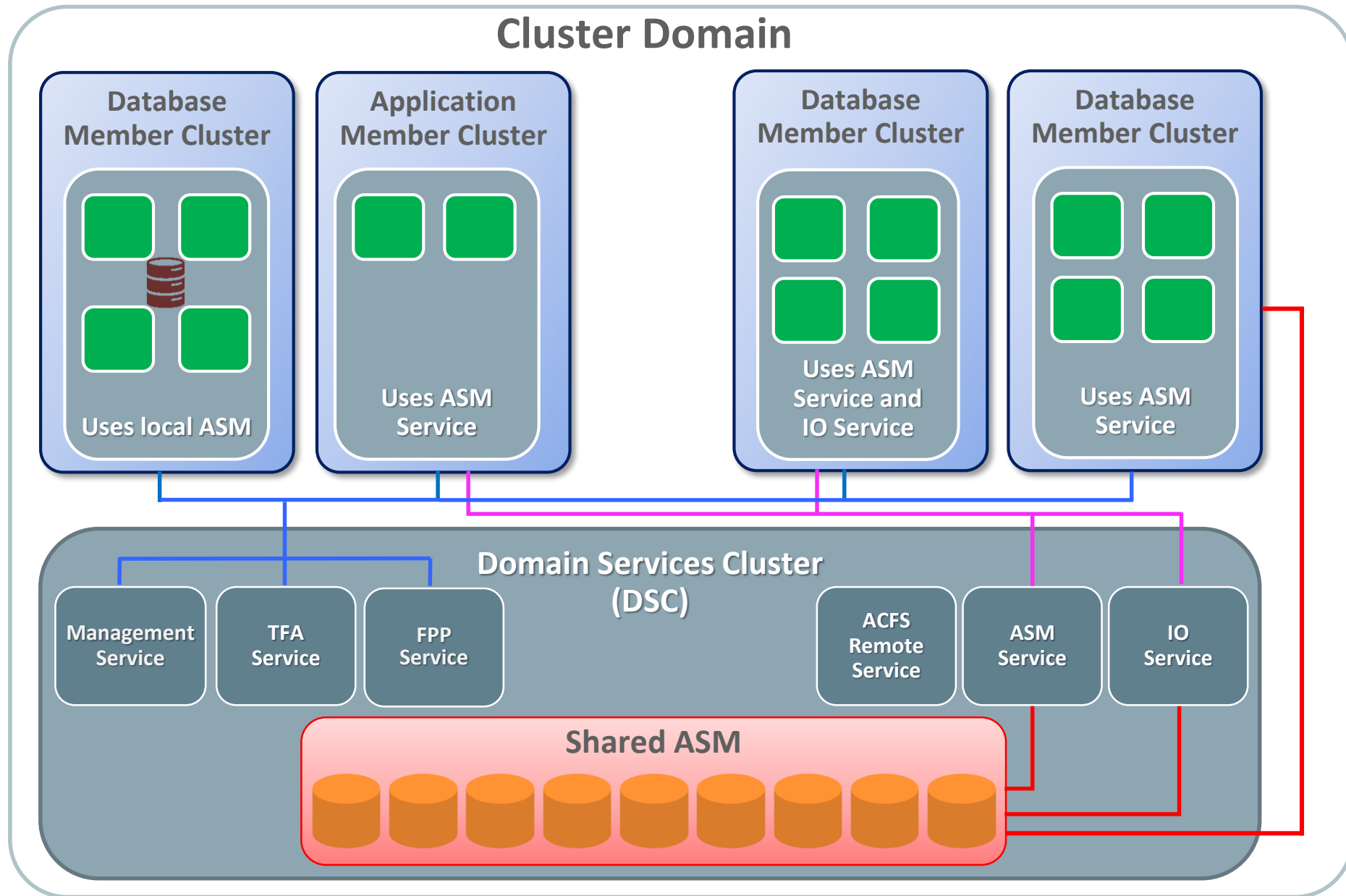


- Simplified Management
  - Fleet Management for installation, update, patching and maintenance
- Reduced Local Overhead
  - Member Clusters benefit from the consolidation of common services on the Domain Services Cluster
- Improved IO Performance
  - Utilizing consolidated shared storage

## Cluster Domain

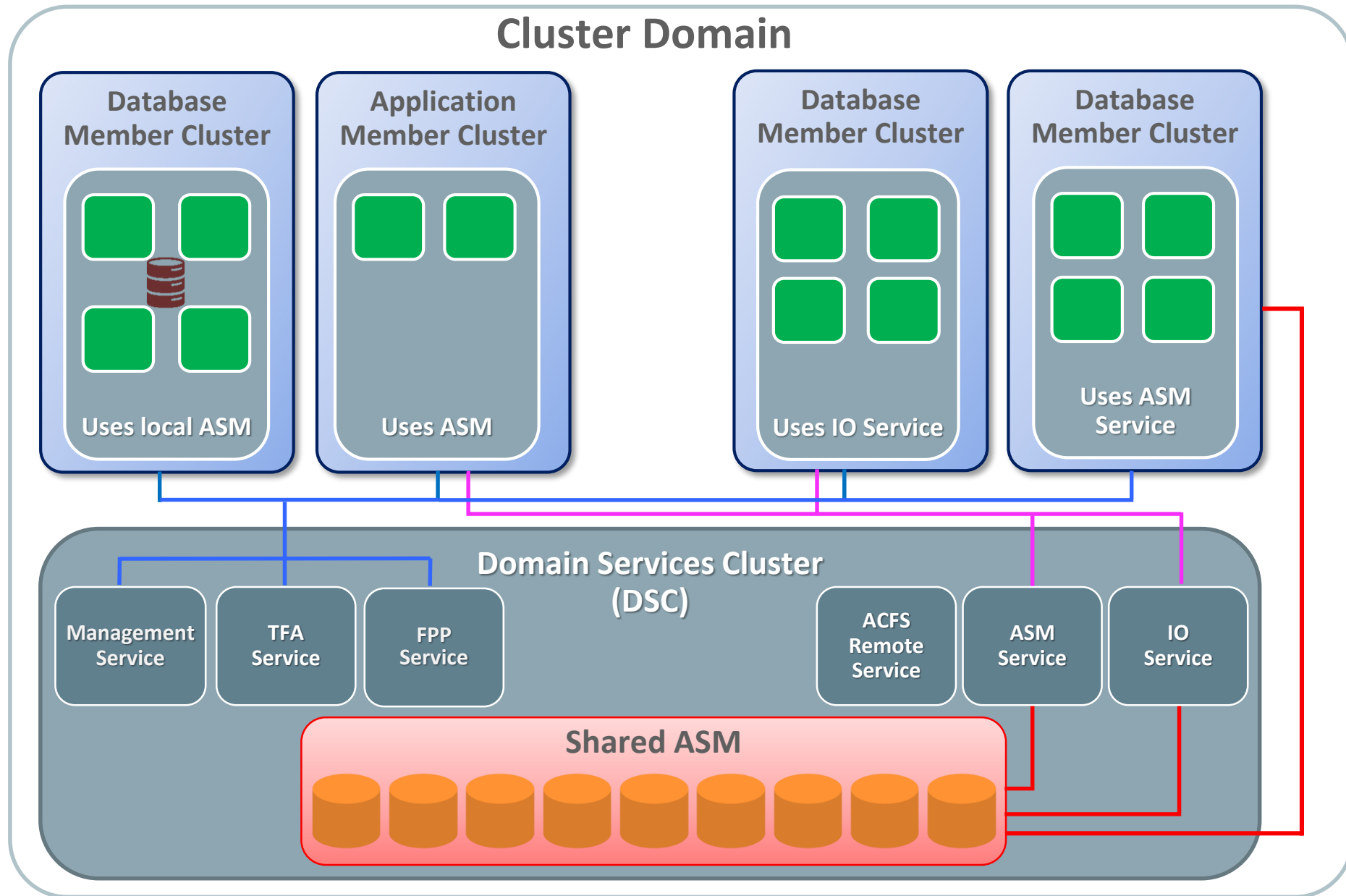


## Cluster Domain



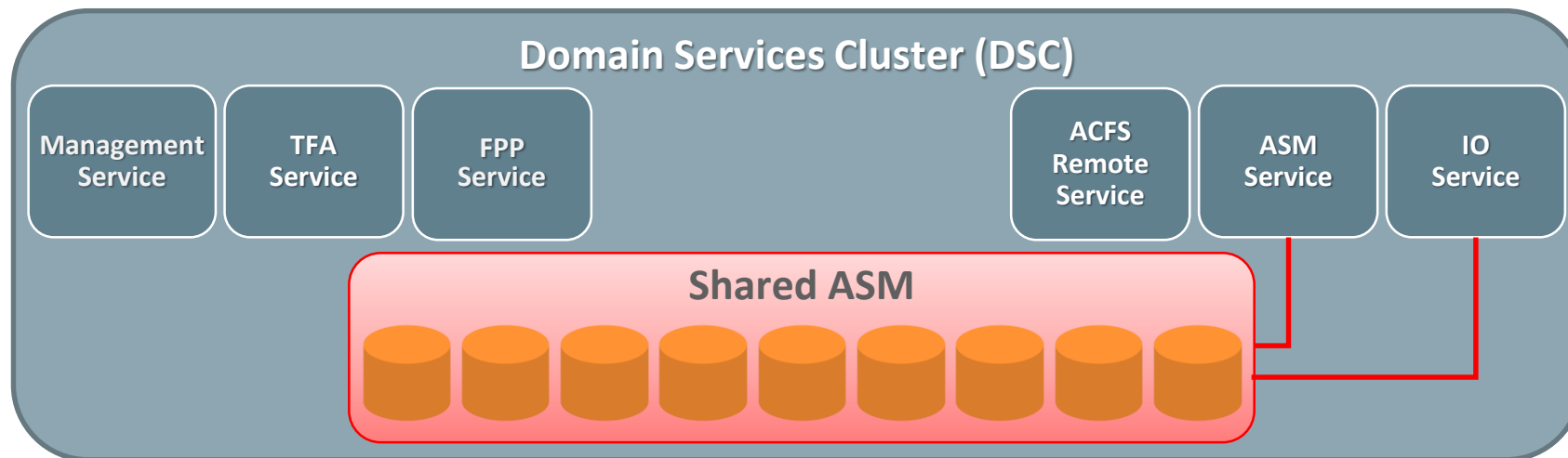


## Cluster Domain



# The DSC – The Heart of the Cluster Domain

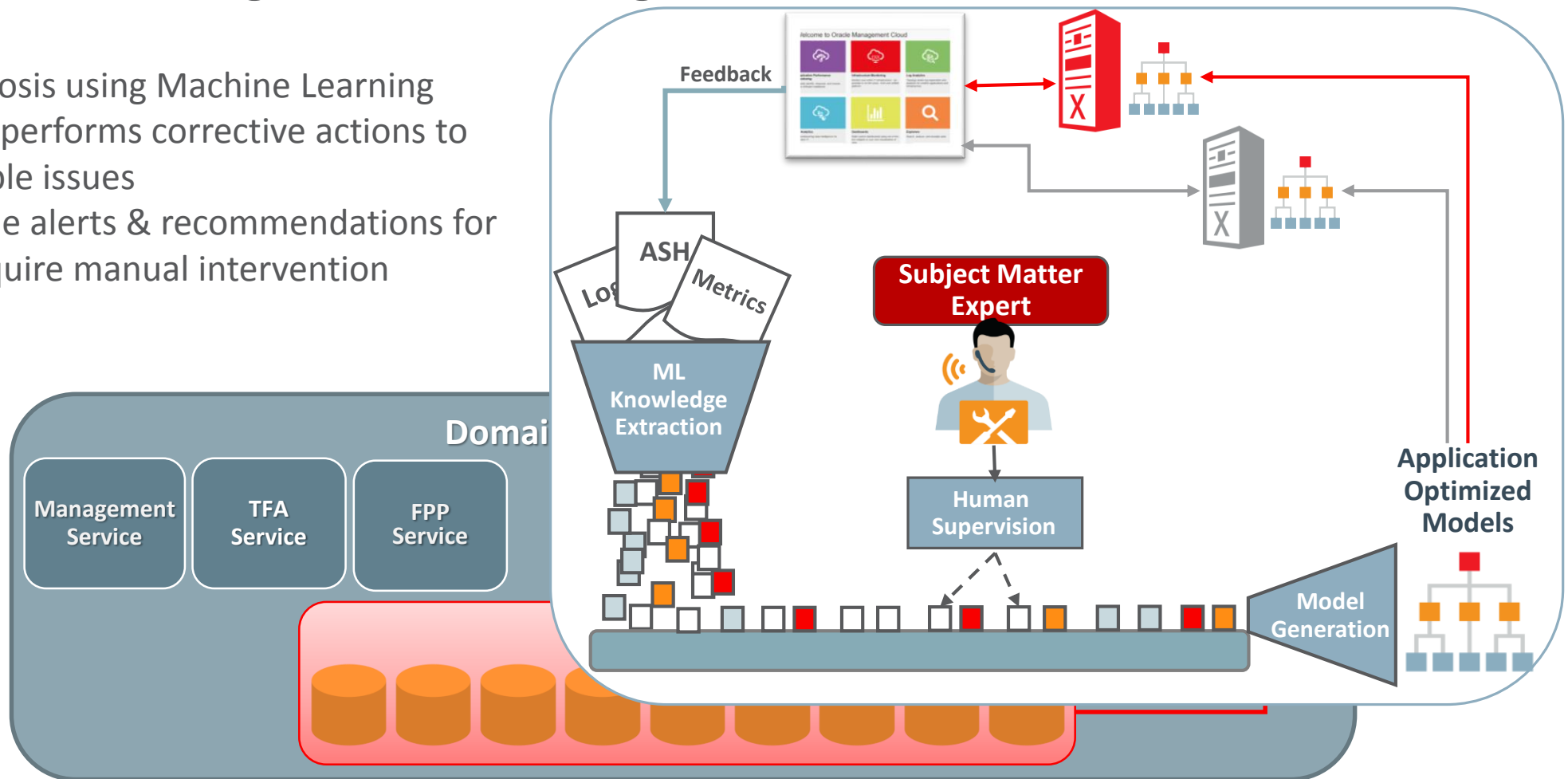
- The DSC hosts services that are consumed by Member Clusters, including:
  - Management Service for centralized and simplified management
  - Trace File Analyzer (TFA) for centralized diagnostics
  - Fleet Patching & Provisioning (FPP) for software fleet management
  - Storage Services (ACFS, ASM direct or indirect over IO Service)



# The DSC Management Service

## Applied Machine Learning for Database Diagnostics

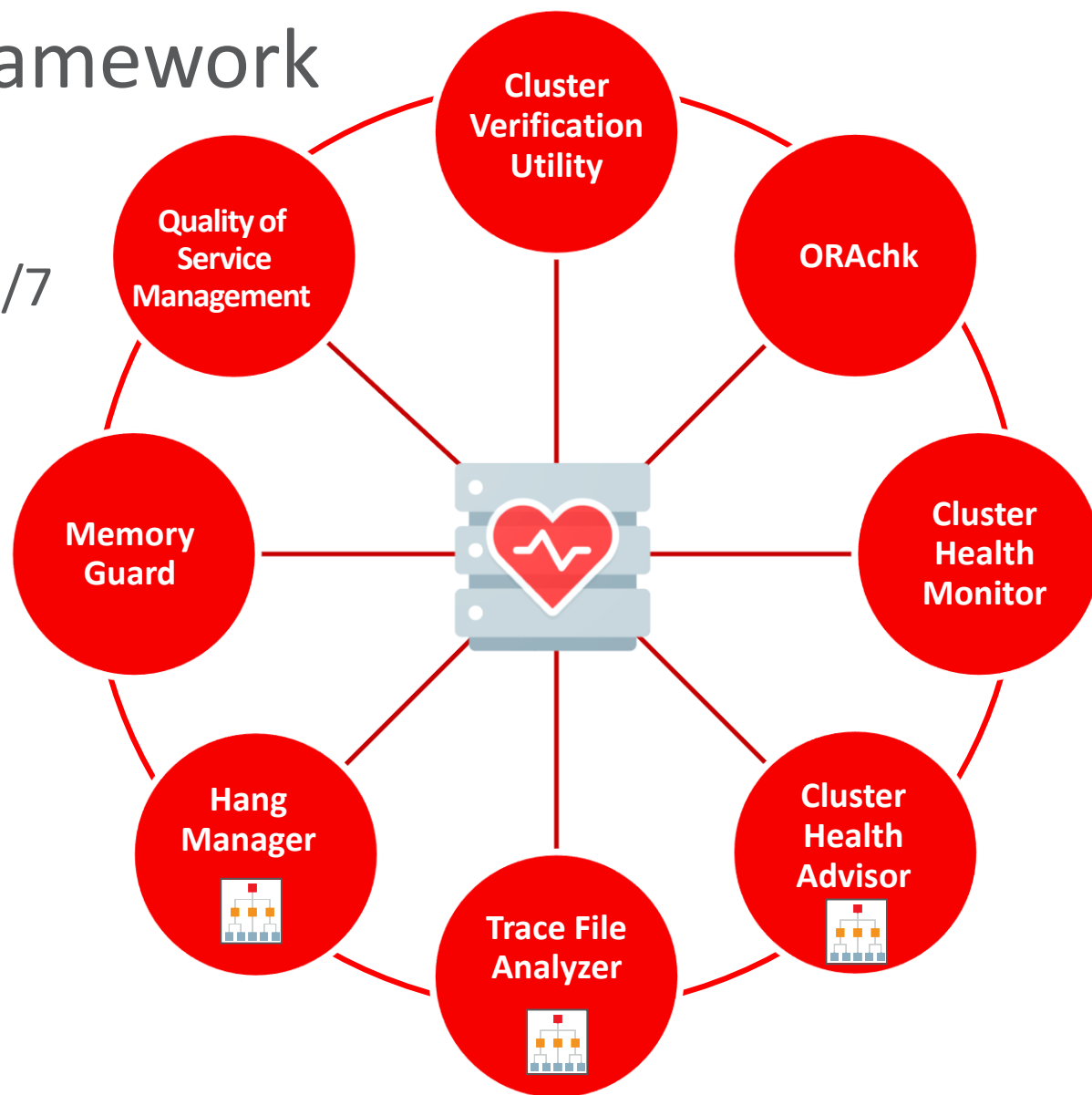
- Efficient diagnosis using Machine Learning
- Automatically performs corrective actions to prevent possible issues
- Provides simple alerts & recommendations for issues that require manual intervention



# Oracle Autonomous Health Framework

## Powered by Applied Machine Learning

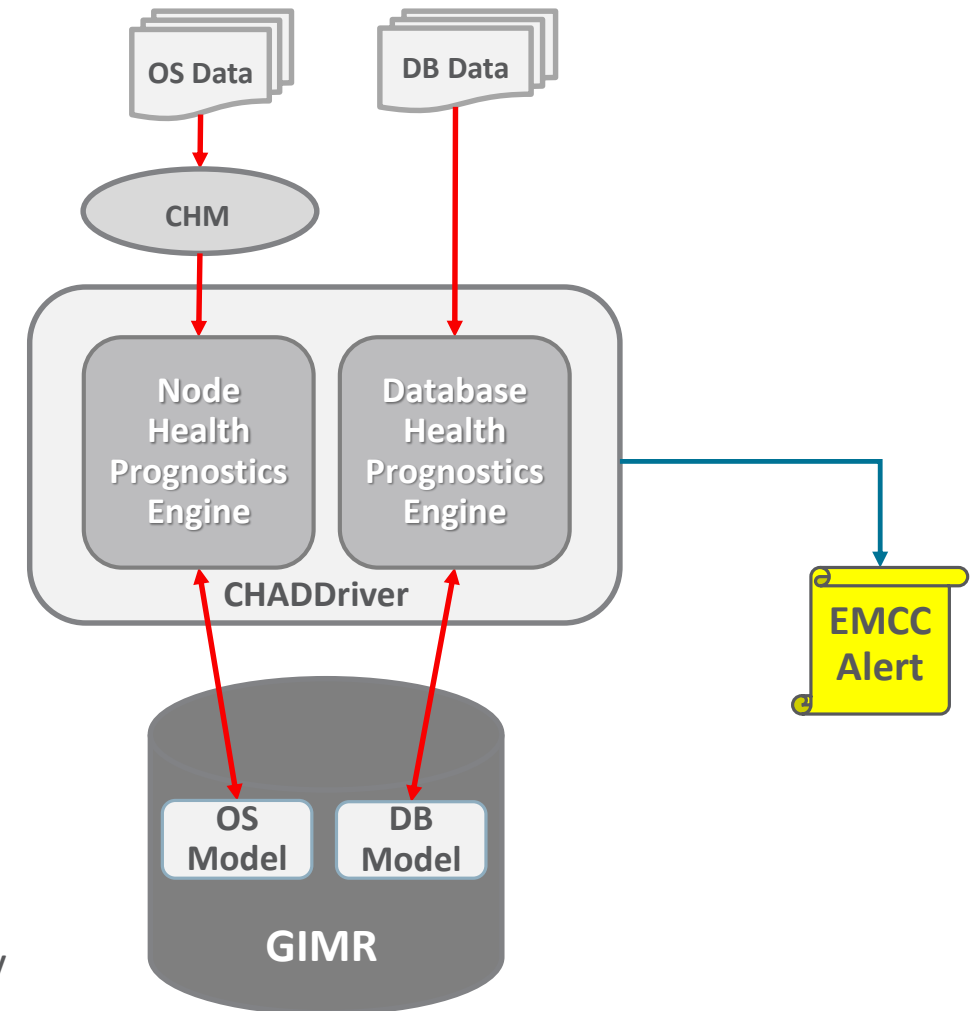
- Integrates next generation tools running 24/7
- Discovers Potential Issues and Notifies with Corrective Actions
- Speeds Issue Diagnosis and Recovery
- Preserves Database and Server Availability and Performance
- Autonomously Monitors and Manages resources to maintain SLAs



# Cluster Health Advisor (CHA) Architecture Overview

- Monitors in real-time Oracle database\* systems and their hosts
- Detects early impending as well as ongoing system faults
- Diagnoses and identifies the most likely root causes
- Provides targeted actions for prevention or escalation of DB/server problems
- Generates relevant alerts and notifications for rapid response

\*Oracle RAC/R1N databases only



Incident Manager

Incident Manager > Incident Details

Page Refreshed Sep 29, 2017 12:08:13 PM PDT

**ASM Cluster-wide Disk Utilization on Host rwsbi06 Database/Cluster rwsbi0508-mb2 Instance . The Cluster Health Advisor (CHA) detected slower tl...** [Open in new tab](#)  
Unassigned, Not acknowledged

- General
- Events
- Notifications
- My Oracle Support Knowledge
- All Updates
- Related Events
- Related Metrics

Incident Details

ID	766
Metric	Alert Level
Metric Group	CHA Alerts
Key	CHA_INCIDENT_STATE_CHANGE_CLUSTERWARE_rwsbi0508-mb2__CHA...
Target	rwsbi0508-mb2 (Cluster) <span></span>
Incident Created	Sep 29, 2017 7:06:45 PM GMT
Last Updated	Sep 29, 2017 7:06:45 PM GMT
Summary	ASM Cluster-wide Disk Utilization on Host rwsbi06 Database/Cluster rwsbi0508-mb2 Instance . The Cluster Health Advisor (CHA) detected slower than expected disk performance because the high disk I/O demand from the other servers increased the utilization of the shared disks. Review the CHA findings and corrective actions from the other servers and database instances in the cluster for IO issues. Add disks to the database disk groups.
Internal Event Name	cha_alerts:cha_alert_level
Event Type	Metric Alert
Category	Unclassified

Show internal values for attributes ...

Metric Data

Critical Threshold	Not Applicable
Warning Threshold	Not Applicable
Number of Occurrences	0
Last Known Value	Critical

Tracking

☒ Acknowledge  Add Comment ...  Manage ...  More ▼

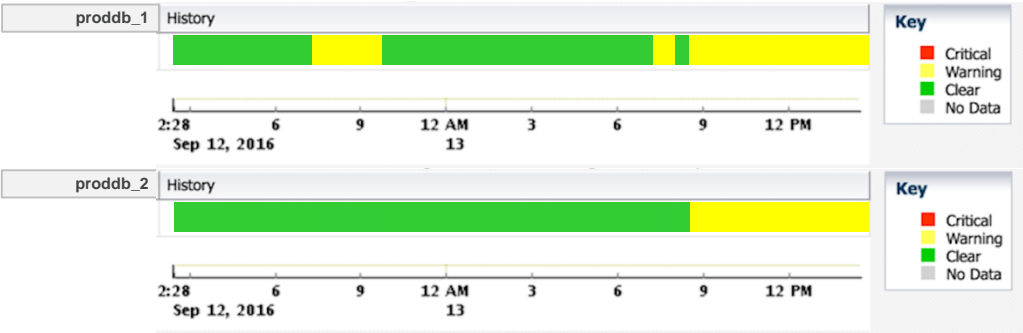
Escalated	No	Owner	-
Priority	None	Acknowledged	No
Status	New		
Last Comment	Incident created by rule (Name = Incident management rule set for all targets, Create incident for critical metric alerts [System generated rule]).: on Sep 29, 2017 7:06:45 PM GMT		
<input checked="" type="checkbox"/> This incident will be automatically cleared when the underlying issue is resolved.			

Guided Resolution

Diagnostics	Actions	Corrective Actions <span></span>
<a href="#">Problem Analysis</a>	<a href="#">Edit Thresholds</a>	No corrective action defined.
<a href="#">View Metric Help</a>		<a href="#">Add corrective action</a>

Cluster Health Advisor

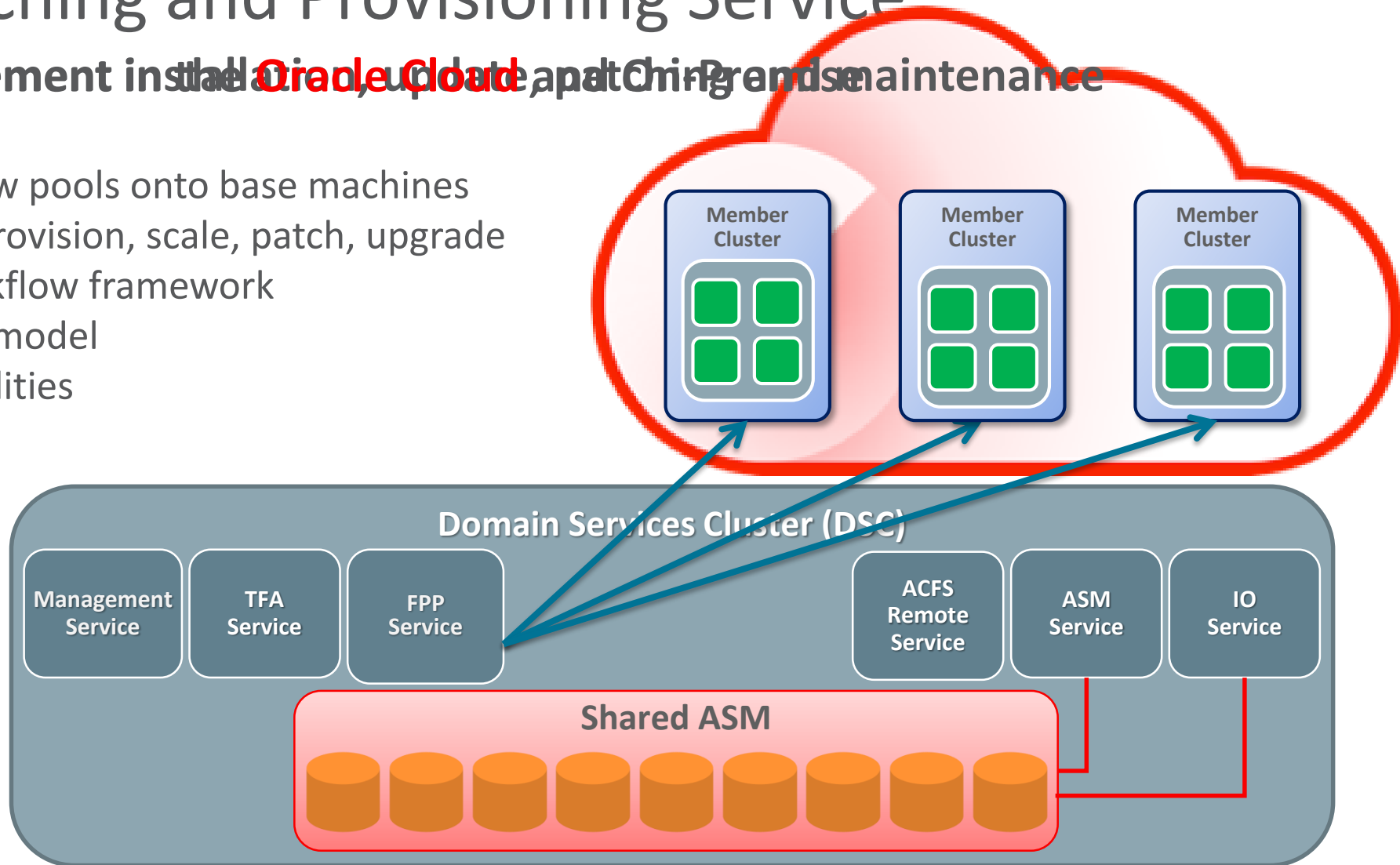
Problem	The degradation is caused by a higher than expected utilization of shared storage devices for this database. No evidence of significant increase in I/O demand on the local node.
Confidence	95.17%
Action	Validate whether there is increase in I/O demand on other nodes than the local and find I/O intensive SQL . Add more disks to disk group or move database to faster disks.



# Fleet Patching and Provisioning Service

## Fleet Management in the Oracle Cloud, update, patch, upgrade and maintenance

- Provision new pools onto base machines
- DB and GI: provision, scale, patch, upgrade
- Custom workflow framework
- Notification model
- Audit capabilities



# Zero Impact Patching

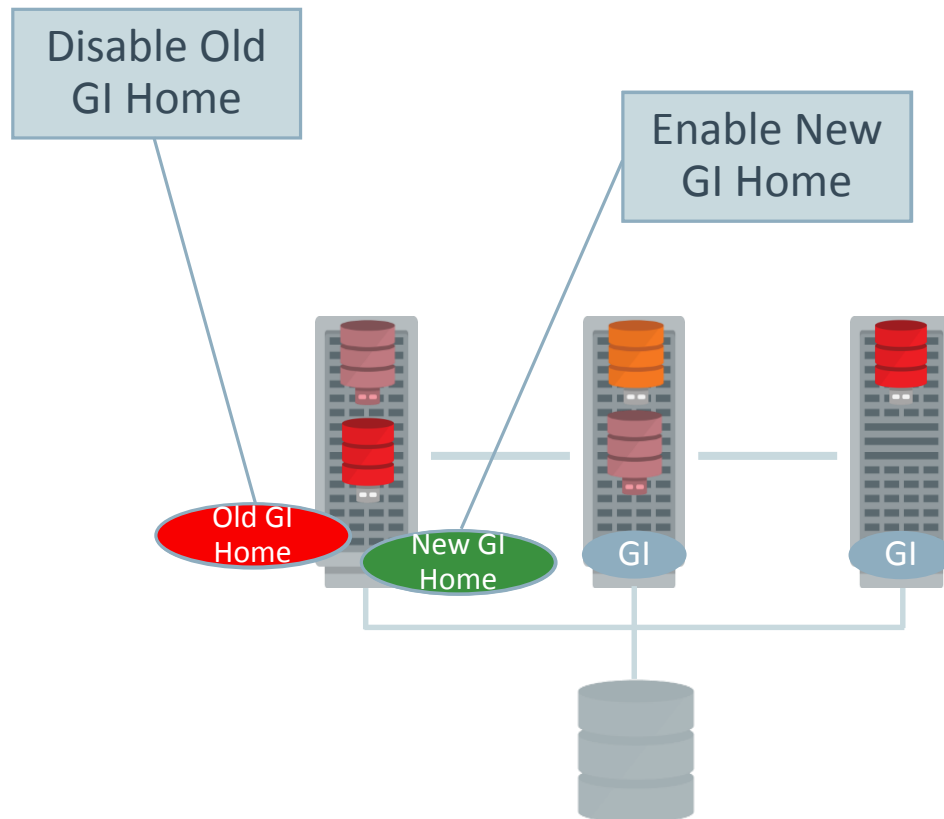
## Never take down a database instance to patch Grid Infrastructure

- Zero Impact Patching enables patching of the Oracle Grid Infrastructure without interrupting database operations.
- Patches are applied out-of-place and in a rolling fashion with one node being patched at a time while the **database instance(s) on that node remain up and running**.
- Zero Impact Patching supports Oracle Real Application Clusters (RAC) databases on clusters with two or more nodes.



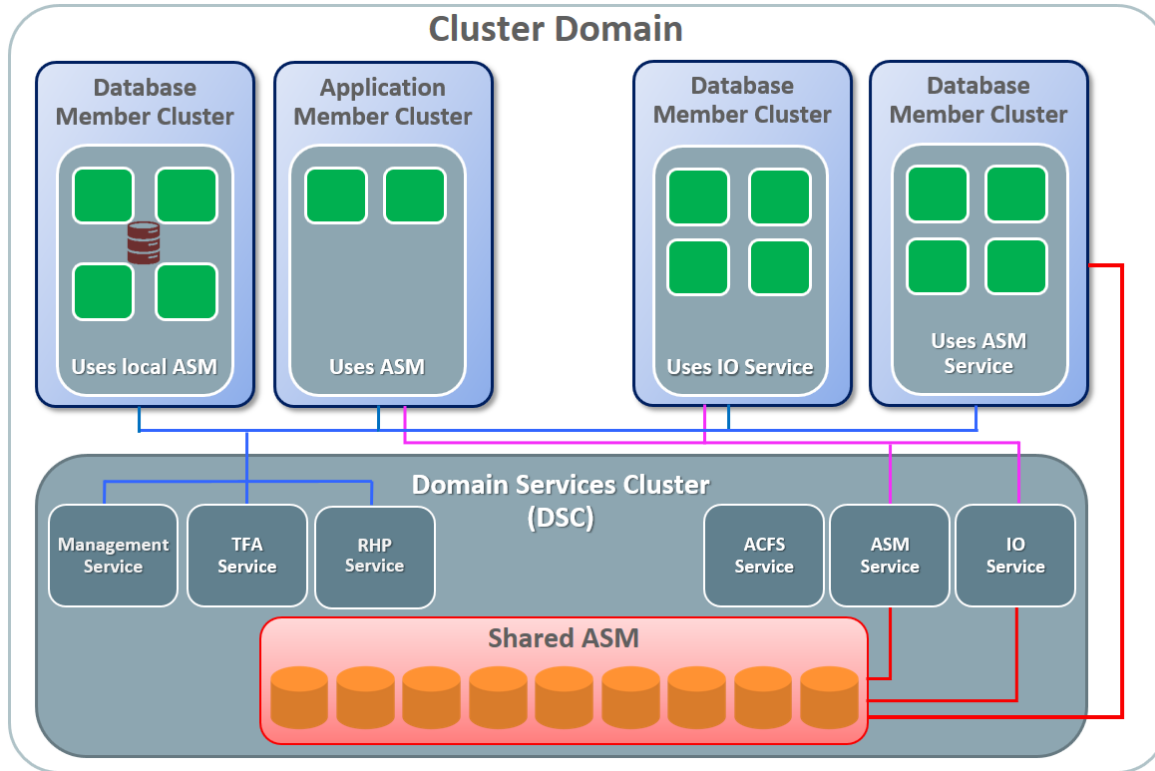
# Zero Impact Patching

Never take down a Database



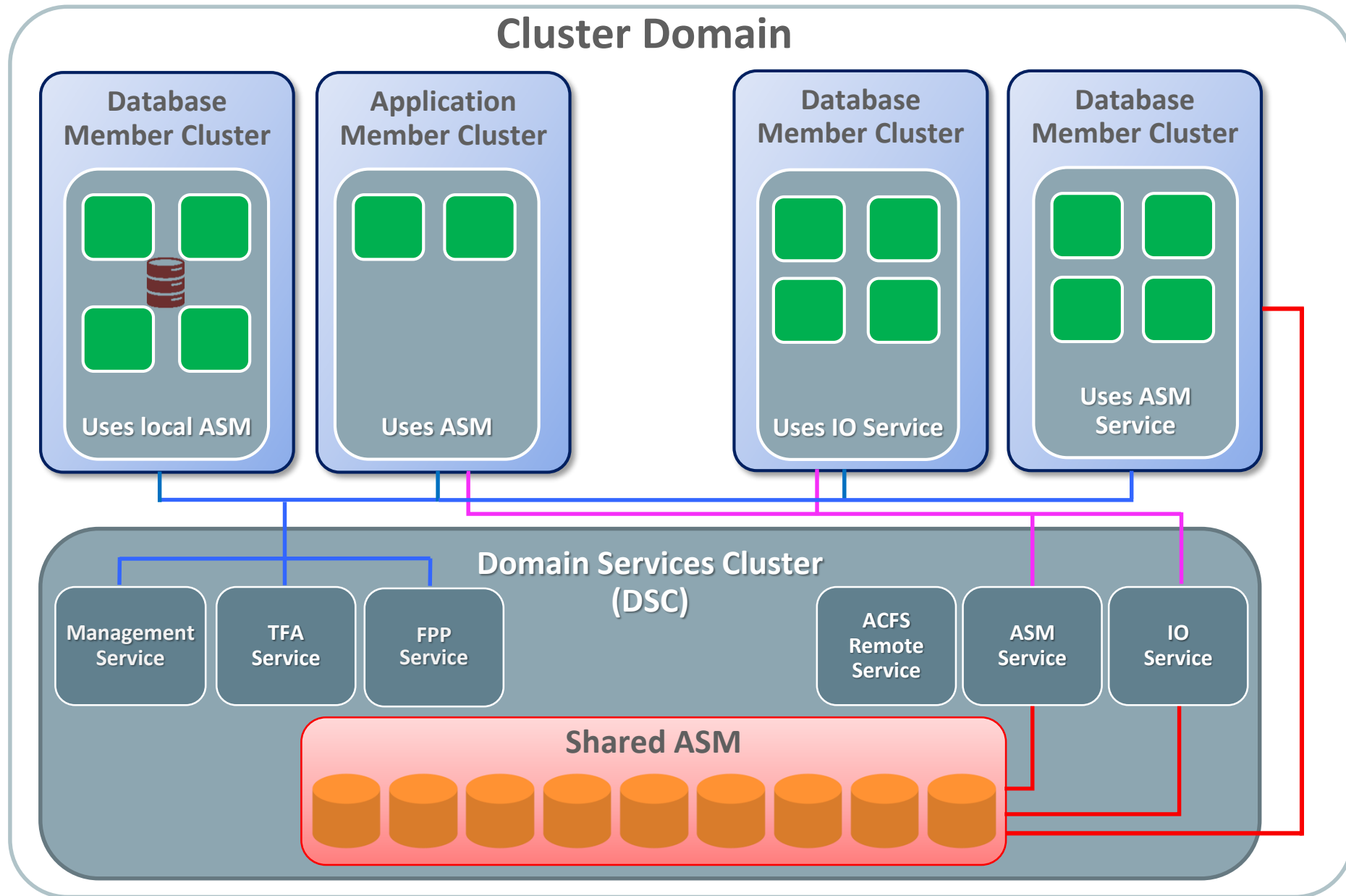
1. Node running from old GI-Home
2. Configure new GI-Home
3. Stop old GI-Home
  - no GI stack running at this point
4. Start new GI-Home
  - RDBMS instances unaffected

# Domain Services Cluster (DSC) Availability

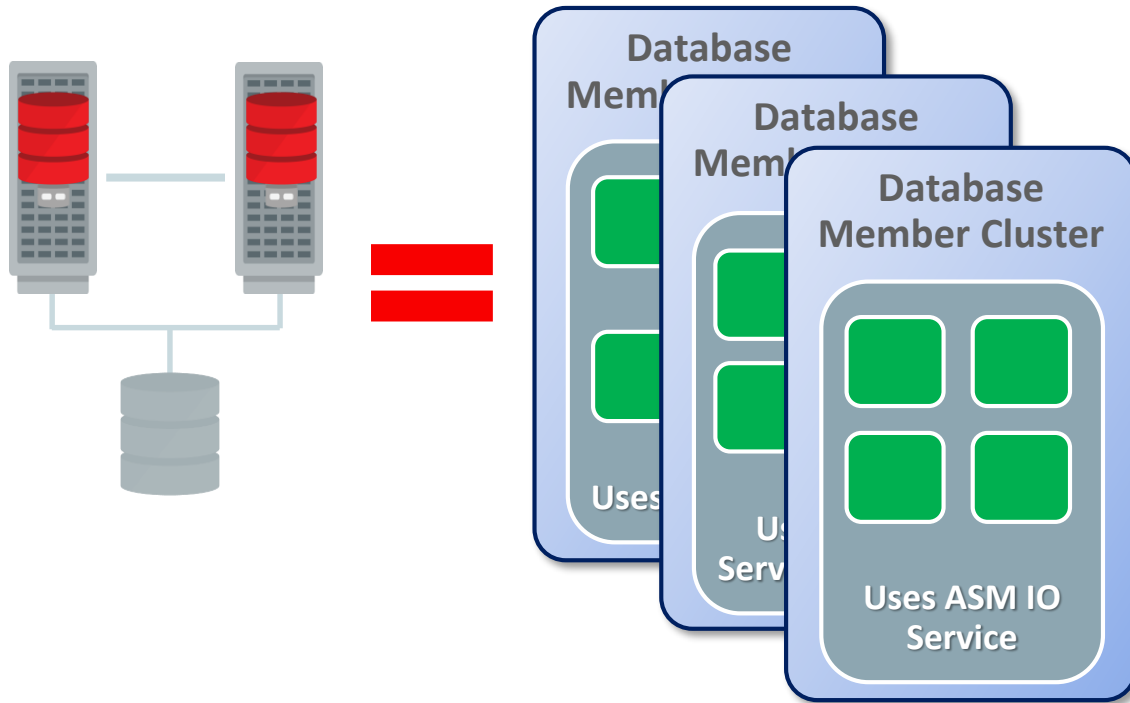


- Services provided by the DSC are unaffected by nodes joining/leaving the DSC cluster
- DSC can be patched and upgraded independently without affecting the services provided by DSC
- Use Member Clusters for user databases (not the DSC)

## Cluster Domain

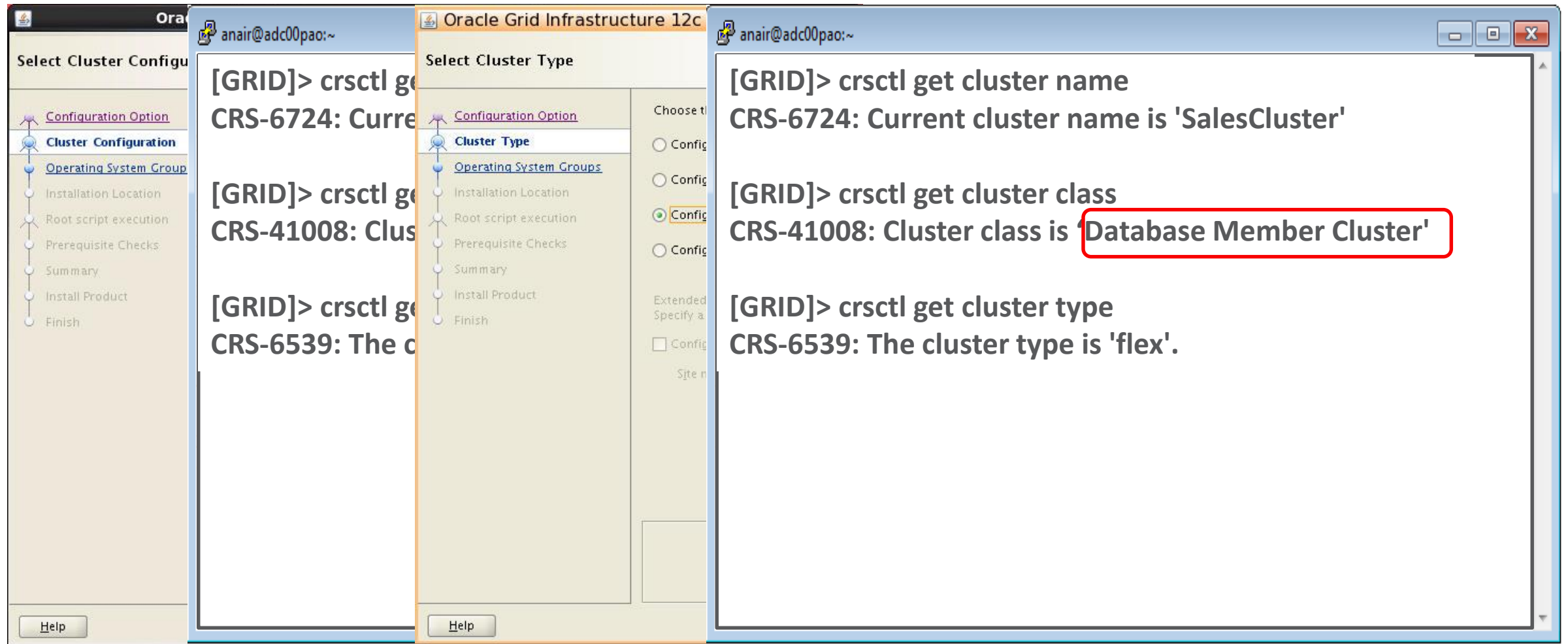


# Member Clusters = Standalone Cluster + Benefits



- A Member Cluster is a Standalone Cluster utilizing shared services on the Domain Services Cluster
- It automatically benefits from the management, TFA & FPP service.
  - ASM services are optional
  - and can be utilized as needed

# Same Tools and Commands for all Types of Deployments



The image displays three overlapping screenshots from the Oracle Grid Infrastructure 12c configuration environment. The leftmost screenshot shows the 'Select Cluster Configuration' window with the 'Cluster Configuration' option selected. The middle screenshot shows the 'Select Cluster Type' window with the 'Cluster Type' option selected. The rightmost screenshot is a terminal window showing the execution of three 'crsctl' commands to retrieve cluster information.

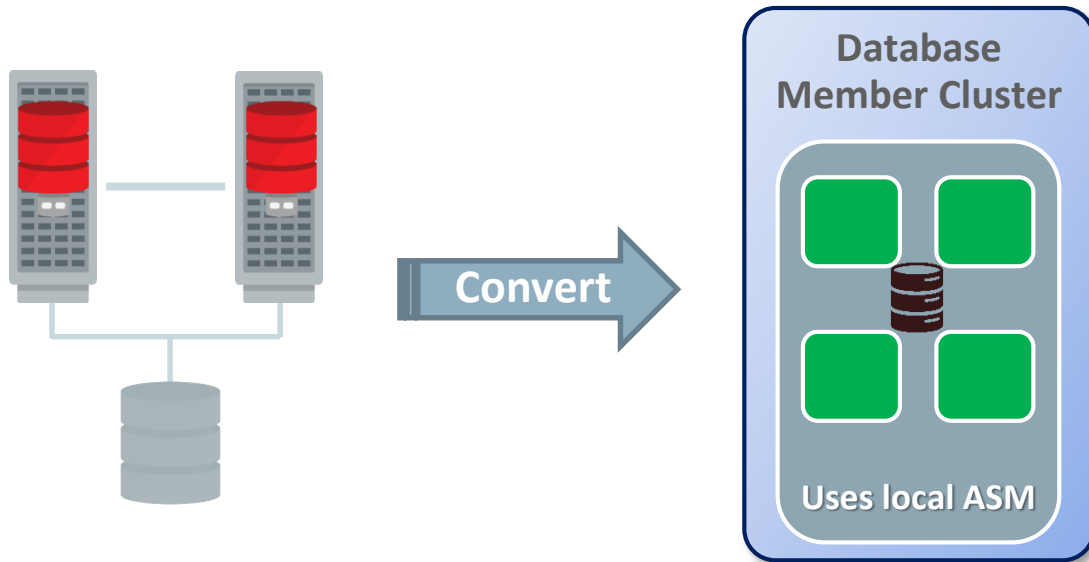
**Terminal Output:**

```
[GRID]> crsctl get cluster name
CRS-6724: Current cluster name is 'SalesCluster'

[GRID]> crsctl get cluster class
CRS-41008: Cluster class is 'Database Member Cluster'

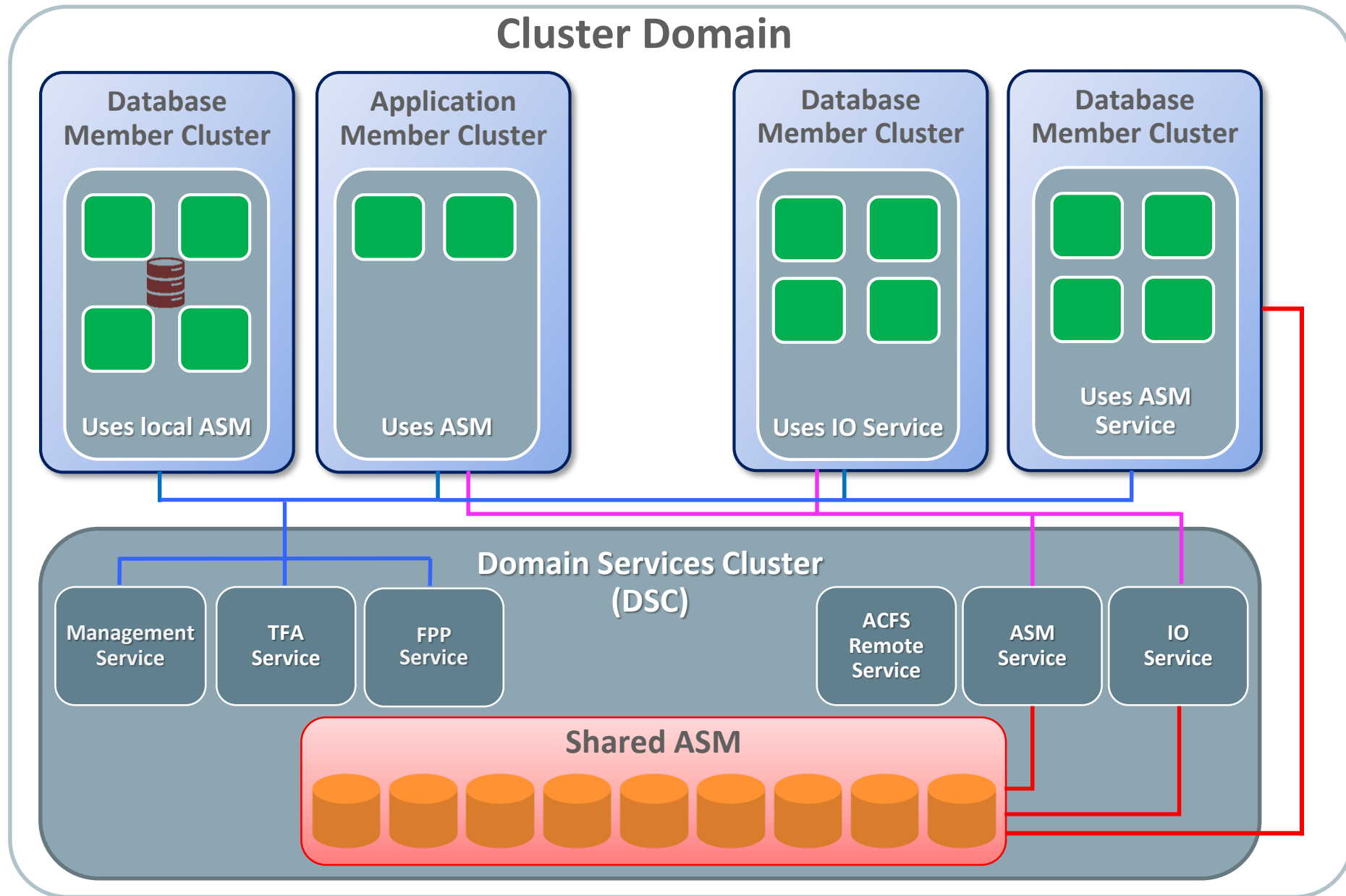
[GRID]> crsctl get cluster type
CRS-6539: The cluster type is 'flex'.
```

# Convert a Standalone Cluster to Member Cluster



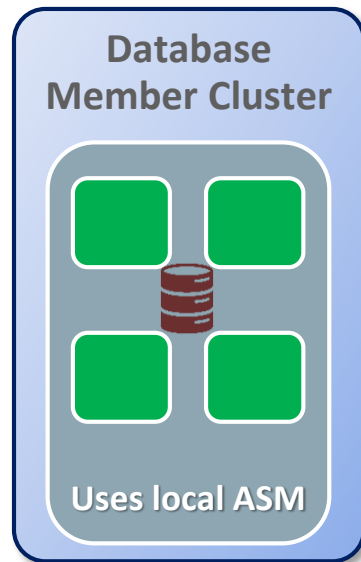
- Easy conversion from Standalone to Member Clusters
- Member Cluster GI/DB version can be higher or equal to the GI/DB version on the Domain Services Cluster

## Cluster Domain



# Database Member Cluster with Local ASM

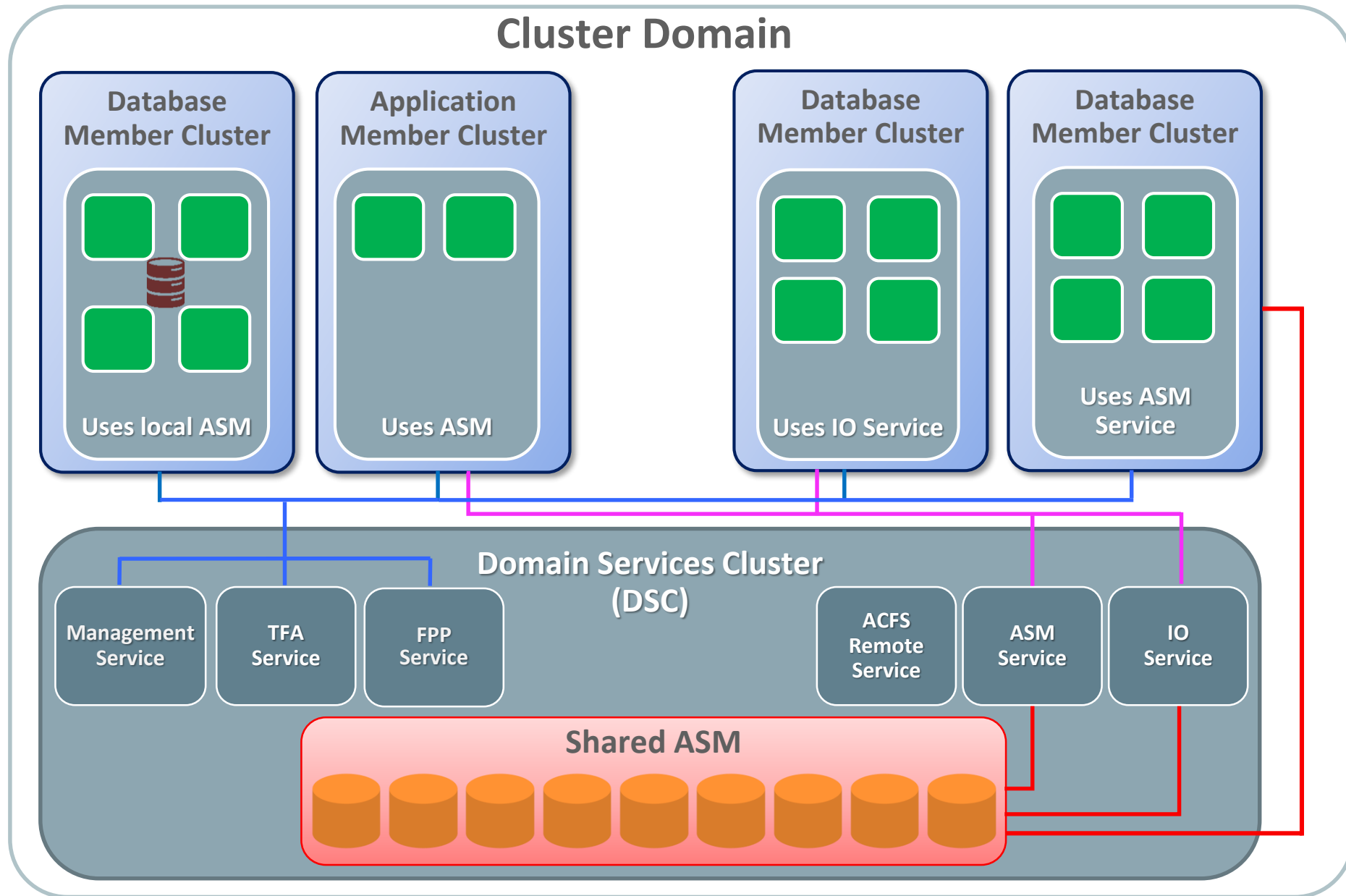
## Standalone isolation with reduced local overhead



- For databases requiring
  - Full Isolation and performance stability
  - That can benefit from the centralized Management Service on the DSC
- Particularly suitable for unpredictable workloads, or highly variable workloads
- Examples include
  - Business Intelligence and Analytics systems
  - Batch processing systems
  - Response-critical, user-facing systems



## Cluster Domain



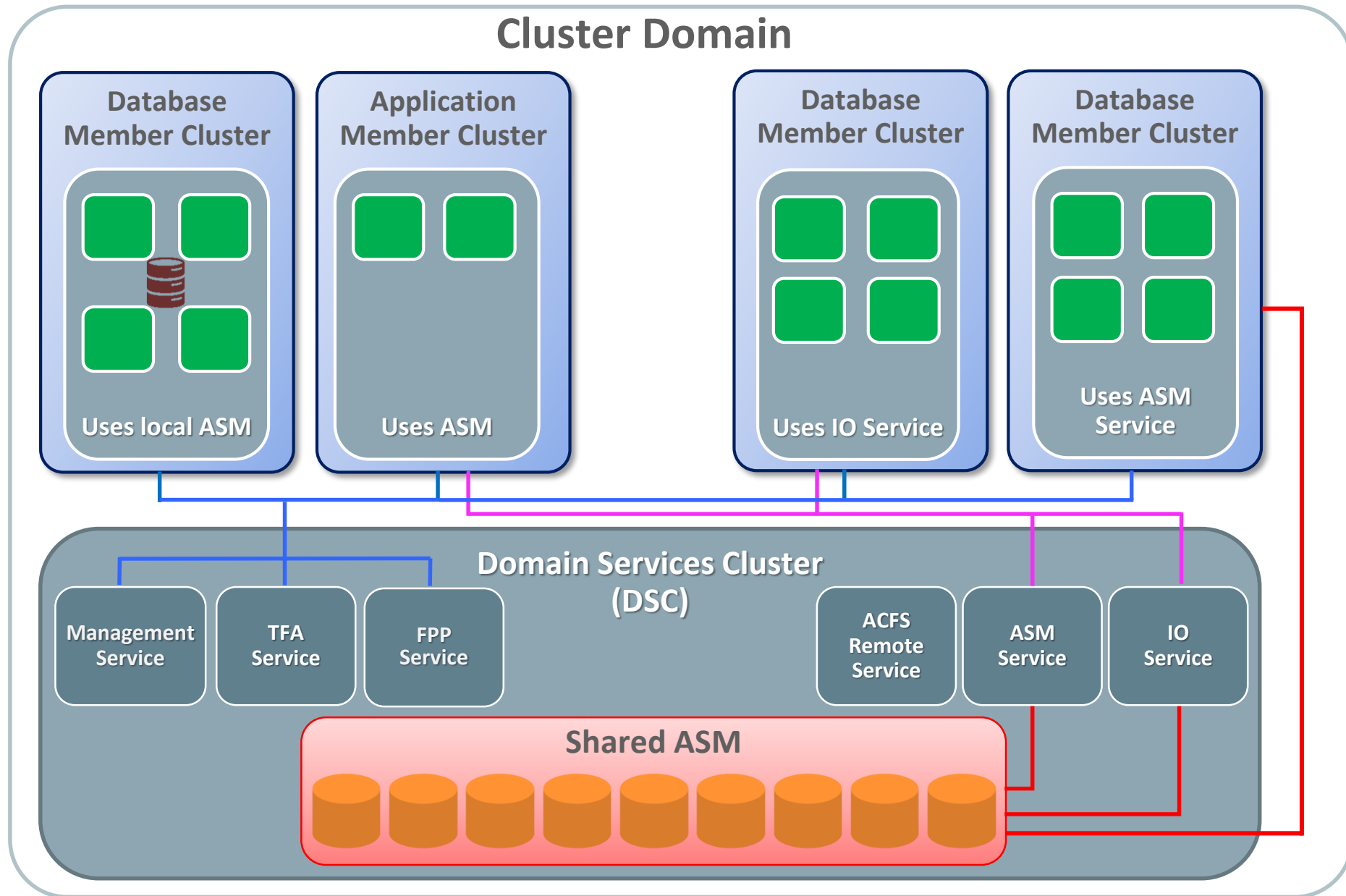
# Database Member Cluster Using ASM Service

Standalone isolation benefitting from consolidated shared storage



- For databases requiring
  - Isolation and performance stability
  - That can benefit from the centralized Management Service on the DSC
  - And the centralized ASM Storage Management Service on the DSC
- Best suited for workloads for which IO stability is important, but benefit from the centralized ASM Services on the DSC
- Examples include
  - OLTP systems
  - Reporting systems

## Cluster Domain



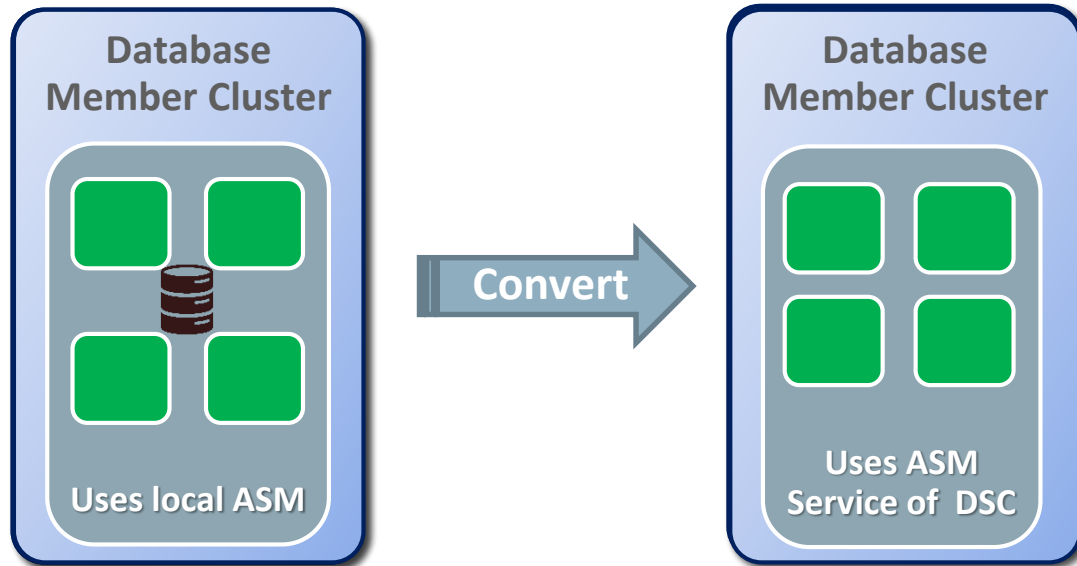
# Database Member Cluster Using the IO Service

Consolidation at its best utilizing full resource sharing



- Ideal for databases that can allow for IO path sharing with other Member Clusters
- Consider for volatile environments & less performance-critical systems
- Examples include
  - Small databases that can be highly consolidated
  - Test, integration, development systems

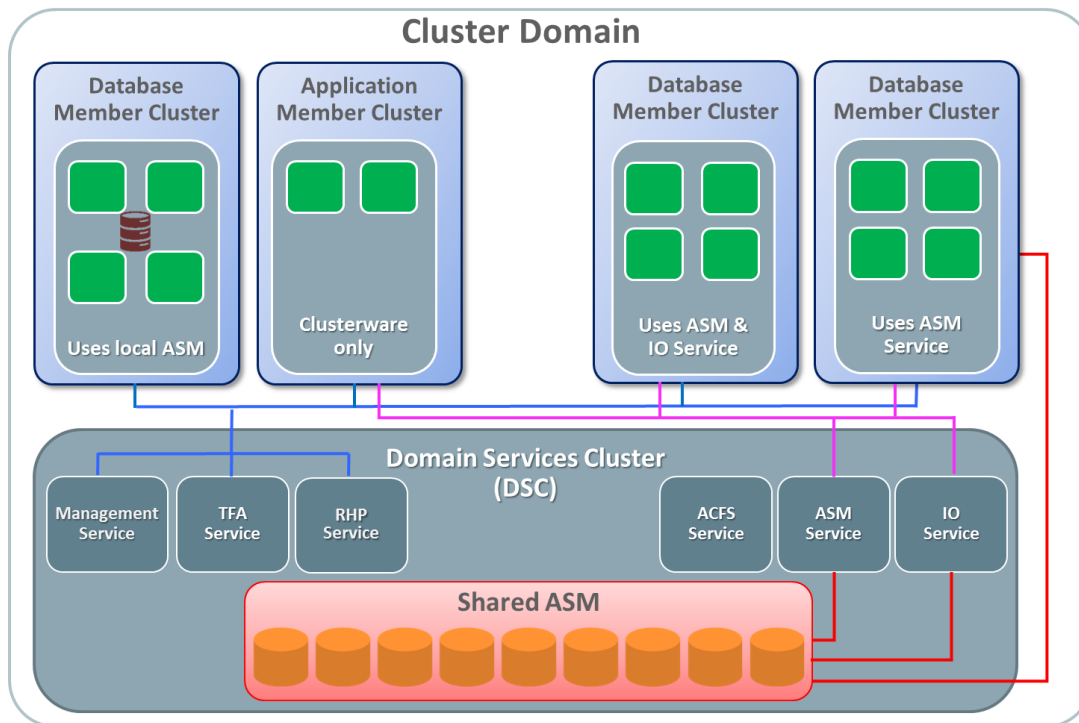
# Member Cluster Flexibility



- Easy conversion between Member Cluster types as demand
  - Direct ASM to ASM IO Service
  - ASM IO Service to Direct ASM
- Conversion requires planned downtime

# Oracle RAC 12c Rel. 2 Cluster Domain

Centralized Management for Cluster Estates “too big to manage” otherwise



- Simplified Management
- Reduced Local Overhead
- Improved IO Performance
- Role Separation
  - Departmental DBA's on Member Clusters
  - Infrastructure Owners on DSC

# Program Agenda

- 1 Cluster Domain Overview
- 2 Customer Use Case



# British Telecom: Cluster Domains in Action

Dave Hickson – Database Architect

British Telecom

October 3, 2017

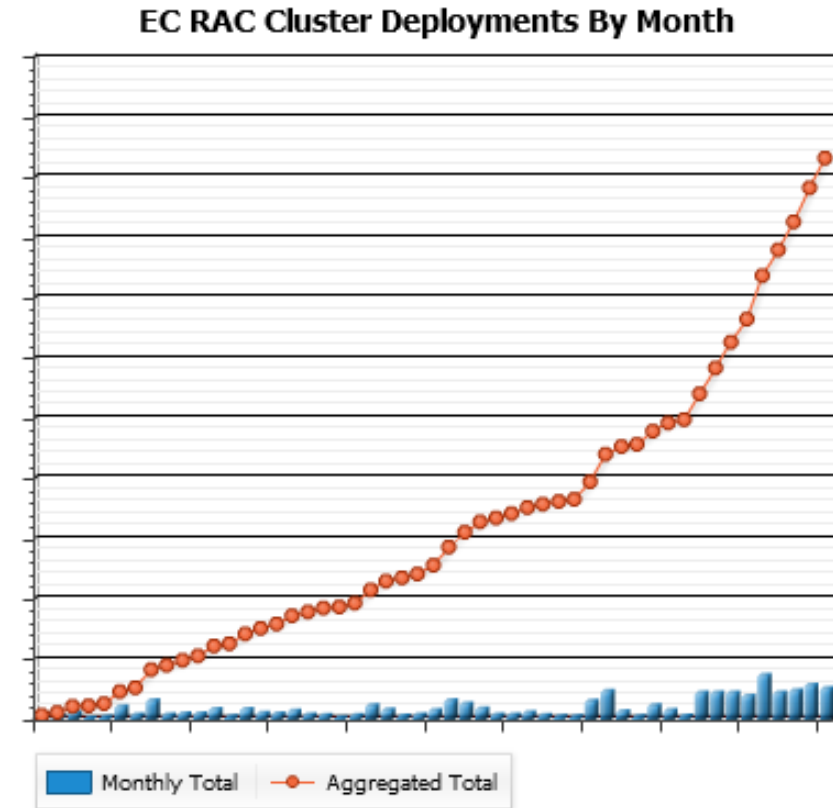


# About BT

- The UK's largest broadband provider
- The UK's largest last-mile network provider
- The UK's largest wide area network provider
- In EE, the UK's best largest and best mobile network provider
- A global footprint operating in 180 countries
- BT Sport delivering Premiership and UEFA football
- All underpinned by Technology, Service and Operations

## Context – Existing Database and RAC Services in BT

- Large scale, on-premise Enterprise Cloud
- Thousands of databases, hundreds of RACs
- Increasing rate of growth
- Lots of automation but ...
- **We need smarter ways to**
  - Deliver RAC clusters more quickly
  - Administrate more efficiently
  - Enable customer self-service
- **What we need is a more Cloud-oriented RAC architecture**



# Cluster Domains – What we've been doing

- **Test environment on BT Enterprise Cloud**
  - Four node Domain Services Cluster
  - 8 Member Clusters
  - OEM 13.2
  - VMware-based infrastructure
- **Key Features we're interested in (in no particular order!)**
  - IO Server
  - Fleet Patching & Provisioning
  - Autonomous Health Framework
  - Application Containers

# Cluster Domains – Why is this architecture attractive to us?

- **I/O Server**
  - Replace hundreds of independent pools of storage with centralised pools
  - Increase storage on member clusters without infrastructure changes
- **Fleet Patching & Provisioning**
  - Centralised management of Oracle software for patching and upgrading
- **Autonomous Health Framework**
  - Replace many independent management repositories with one

***Goal for BT is simple: Reduce Overhead of Many RAC Clusters***

## Cluster Domains – our overall impression

- **Architecturally this is the right direction**
  - Database servers run databases without having to administer infrastructure
  - “Infrastructure” tasks such as storage, performance, software managed centrally
- **Application Containers** on Member clusters enable customer self-service of new databases without overheads of infrastructure management on each cluster
- **Organisational implications:**
  - Infrastructure Team to manage Cluster Domains
  - Database Team to manage Member clusters

# Integrated Cloud

## Applications & Platform Services

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