

ORACLE



Oracle Global Data Services

Overview

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Mission Critical Database Product Management - Oracle Database High Availability (HA), Scalability, and Maximum Availability Architecture (MAA) Team

Challenges of deploying highly available systems



Cost and complexity



Lack of skills



Risk of failure

Original MAA reference architectures

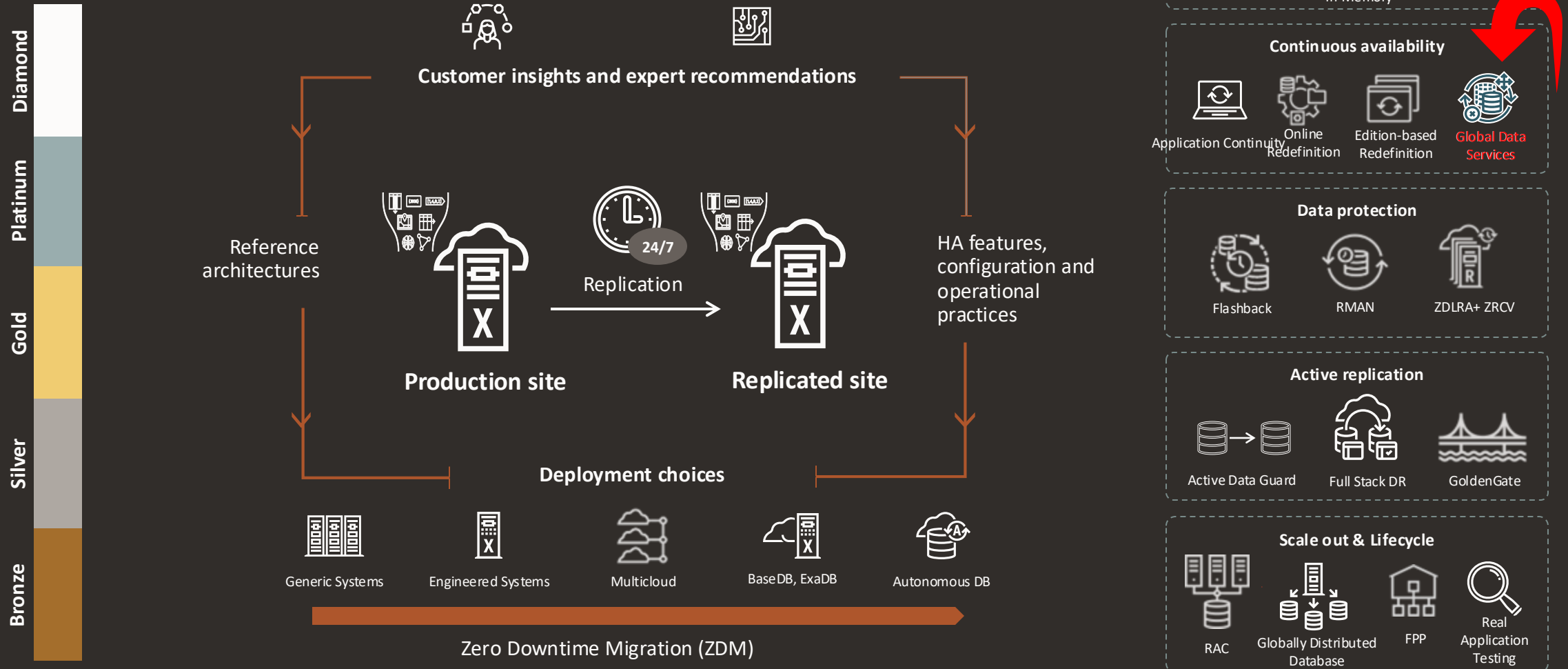
Availability service levels



Bronze	Silver	Gold	Platinum
Dev, test, prod Single instance DB Restartable Flashback Technologies Backup/restore 	Prod/departmental Bronze + Database HA with RAC Application Failover Zero Downtime Software Update 	Business critical Silver + DB replication with Active Data Guard or Data Guard Comprehensive Data Corruption 	Mission critical Gold + GoldenGate and Active/Active Edition-based redefinition 
Instance Failure: Minutes to an hour Disasters – Hours to days	Instance Failure: Less than 60 secs (brown out) Disasters – Hours to days	Instance Failure: Less than 60 secs (brown out) Disasters – < 5 min	Instance Failure :Zero or single-digit secs Disasters – Zero or near-zero



Next Gen Maximum Availability Architecture (MAA)



Next-Gen MAA Reference Architectures

Availability service levels for the next generation of Oracle Database



Bronze	Silver	Gold	Platinum	Diamond (NEW)
Dev, test, prod Single instance DB Restartable Backup/restore 	Prod/departmental Bronze + Database HA with RAC or Local Data Guard Client failover HA best practices Application Continuity (optional) 	Business critical Silver with RAC + DB replication with (Active) Data Guard with automatic failover Client failover DR best practices 	Mission critical Gold with Exadata <i>and either option:</i> Option 1: GoldenGate with Oracle Database 19c <i>OR</i> Option 2: (Active) Data Guard with Oracle AI Database 26ai 	Extreme availability Configuration GoldenGate 26ai replicas, <i>each running:</i> Oracle AI Database 26ai + RAC on Exadata + (Active) Data Guard 
Recoverable local failure: Minutes to hour Disasters: Hours to days RPO < 15 min	Recoverable local failure: seconds to minutes Disasters: Hours to days RPO < 15 min	Recoverable local failure: Less than 60 seconds Disasters: < 5 min RPO = zero or near zero	Recoverable local failure: Less than 20 seconds Disasters: < 30 secs RPO = zero or near zero	Recoverable local failures: Less than 10 seconds Disasters zero to 10 secs RPO = zero or near zero



Agenda

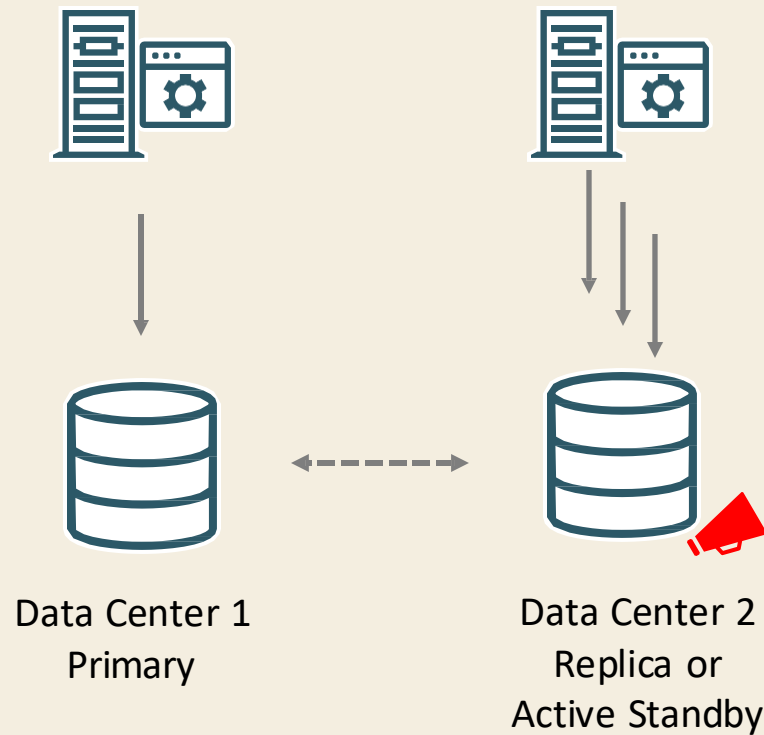
- Workload management challenges of mission critical databases
- Introduction to Global Data Services (GDS)
- GDS Concepts and Architecture
- GDS Common Use Cases
- Customer Case Studies
- Summary, Q&A

Agenda

- **Workload management challenges of mission critical databases**
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Challenges of Mission-Critical Databases

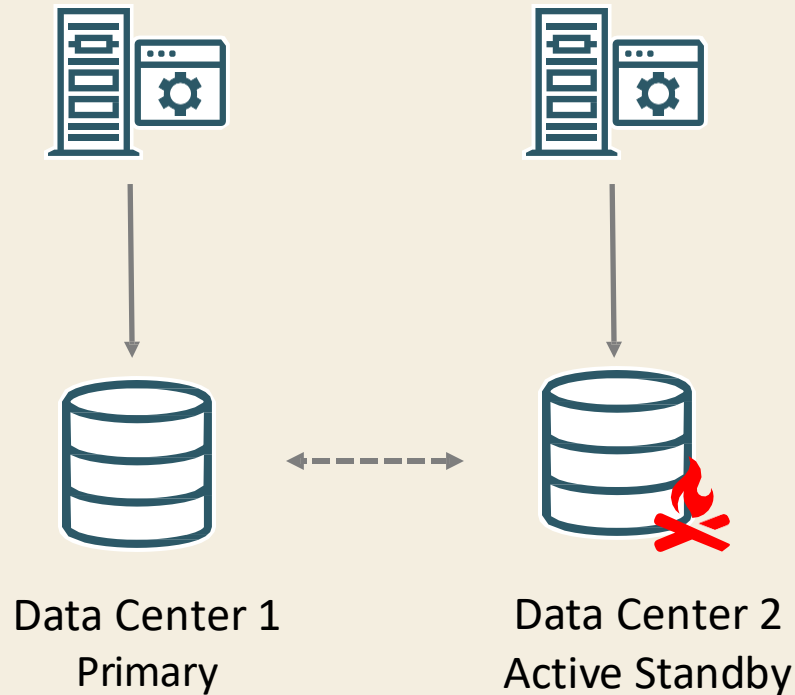
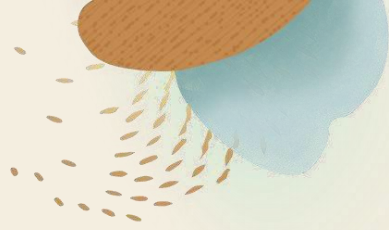
No Workload Balancing



- Even though you may have multiple replicas or standby databases, there's no built-in way to automatically balance workloads across them.
- That means some databases are overloaded while others sit idle -- leading to poor resource utilization and performance bottlenecks.

Challenges of Mission-Critical Databases

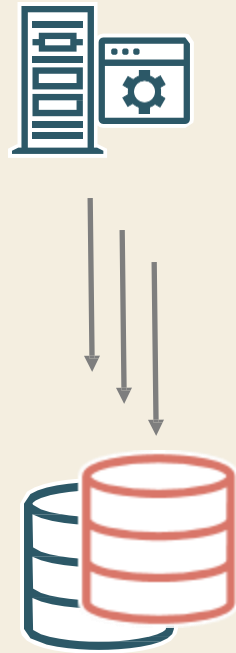
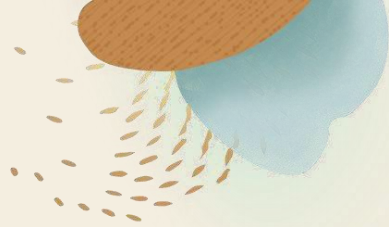
No Automated Service-Level Failover



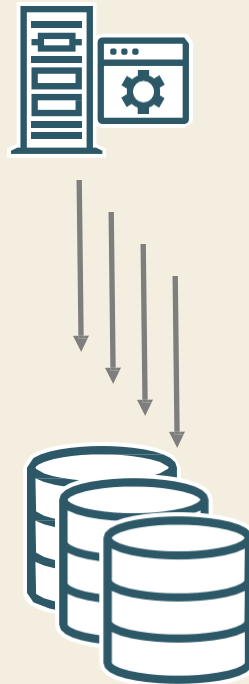
- If a database becomes unavailable, there's no seamless way for applications to fail over to a standby.
- This lack of service-level failover results in application downtime -- often at the worst possible times -- because the system isn't resilient at the service layer.

Challenges of Mission-Critical Databases

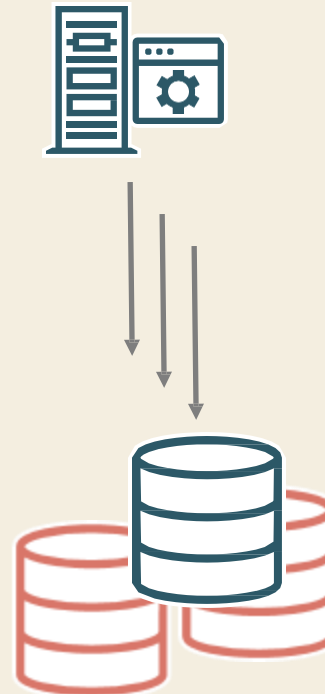
Fragmented Management



Data Center 1



Data Center 2



Data Center 3

- As database deployments grow across regions and clouds, managing them becomes challenging.
- There's no single, centralized way to orchestrate services across all these databases.
- This makes administration error-prone and inefficient.

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What is Oracle GDS?



“Oracle GDS is an Intelligent Workload Router, Dynamic Load-Balancer, and Service Orchestrator”

GDS extends the concept of services across database replicas.

Supports Oracle Databases, Standby Databases, GoldenGate Replicated Databases, Oracle Globally Distributed Database, Oracle True Cache, Raft Replication, and more.

Oracle Global Data Services

Primary Use Cases



Oracle Global Data Services (GDS) supports **two primary use cases**, each leveraging Global Service Managers (GSMs) differently:

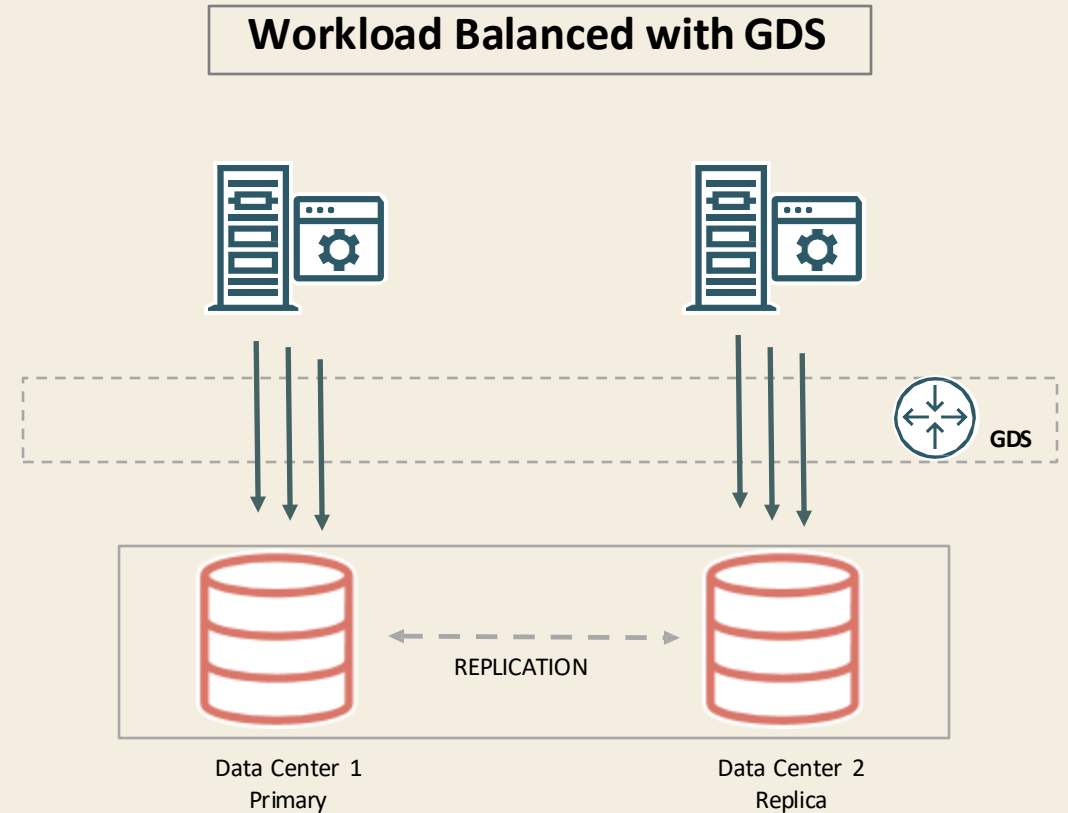
Replicated Database Environment: In replicated setups -- such as those using Active Data Guard, GoldenGate, or True Cache -- GSM listeners act as **Remote Listeners**. They direct application traffic to the most suitable database instance based on availability, database role, workload, location, or replication lag, ensuring high availability, load balancing, and centralized management.

Distributed Database Environment: In distributed setups, like Oracle Sharded Databases, GSMs function as **Shard Directors**. They are data-aware, intelligently routing application connections to the appropriate database shard based on data distribution, optimizing performance and scalability. This is a specialized use case for GDS tailored for sharded architectures.

Oracle Global Data Services

Automated Workload Routing and Load-Balancing

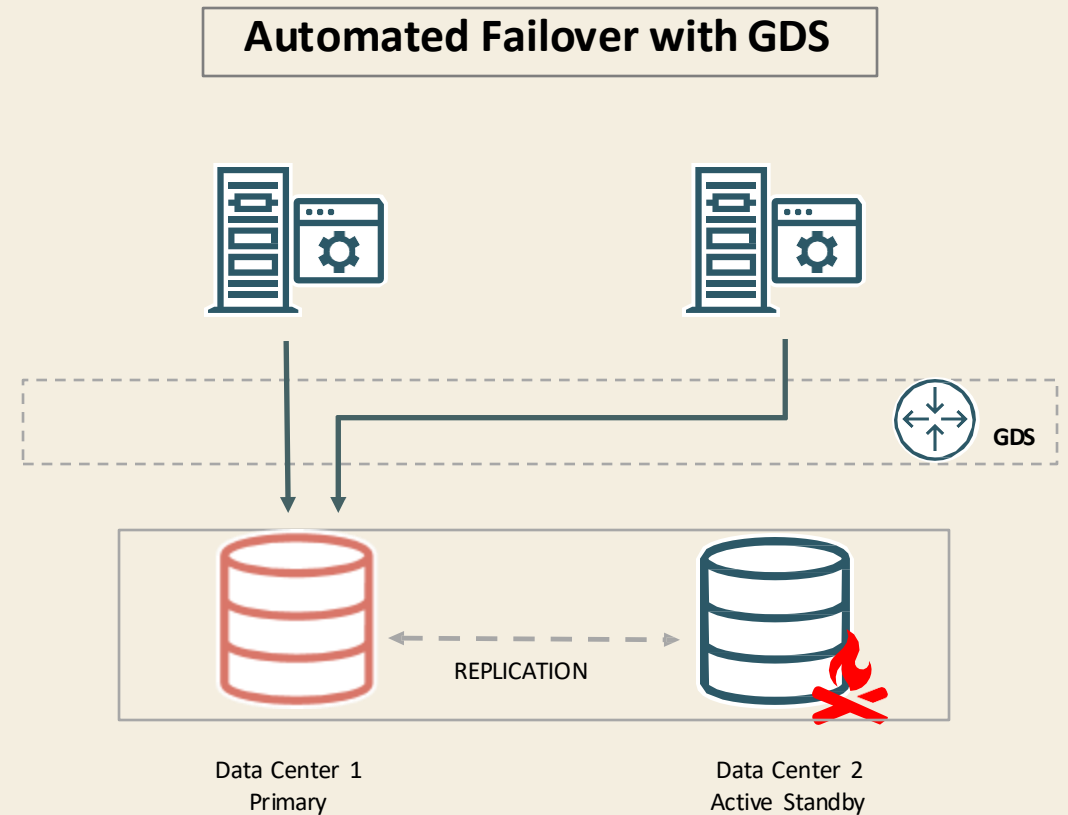
- ✓ Oracle GDS intelligently routes workloads to the best-suited database resource -- based on region, role, lag thresholds, and service placement rules.
- ✓ This means your read and write traffic can be distributed dynamically across your database estate, making the most of your available infrastructure.
- ✓ It can ensure some resources are not sitting idle while other resources are overloaded.



Oracle Global Data Services

Automated and Transparent Service Failover

- ✓ With Oracle GDS, application services automatically fail over to a surviving database when the primary database becomes unavailable -- **without manual intervention**.
- ✓ The process is seamless and transparent to the application, significantly reducing downtime and eliminating user impact during planned or unplanned outages.

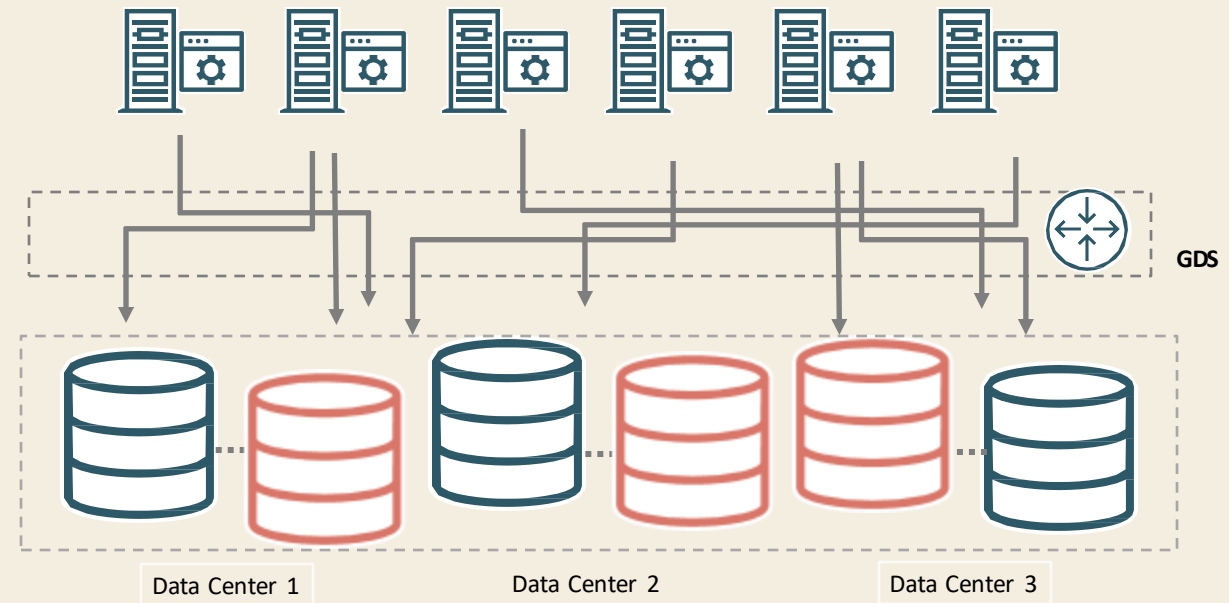


Oracle Global Data Services

Centralized Service Management

- ✓ GDS provides a unified control plane for managing services across all your databases -- no matter where they reside.
- ✓ Whether it's a RAC primary, a standby, a replica, or a database cache instance, services can be created, moved, drained, and monitored from one place.
- ✓ This simplifies operations and gives you full visibility and control.

Enterprise-Wide Data Services Managed with GDS



Agenda

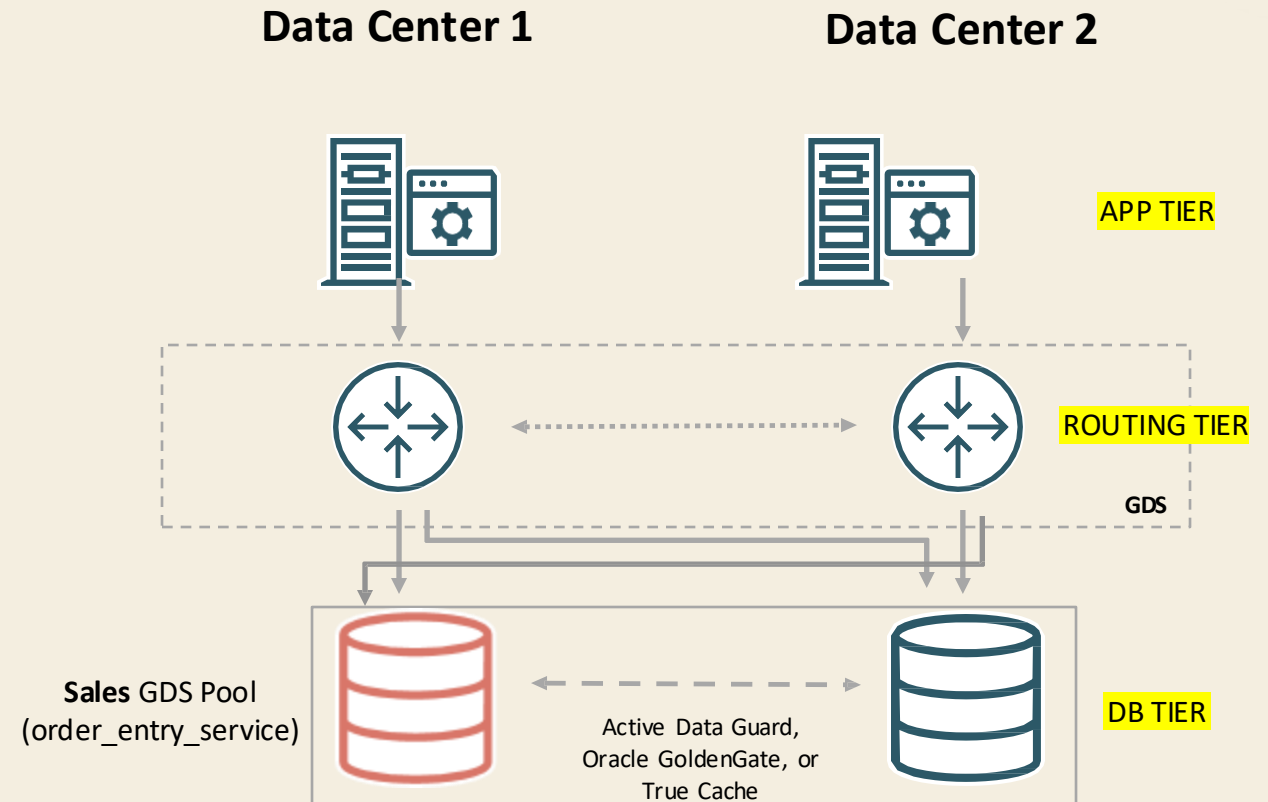
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GDS Deployment Topology & Architecture

GDS acts as a **routing tier** between applications and databases. Applications connect to GDS, which intelligently routes requests to the best database instance based on availability, load, and location. This ensures optimal performance and seamless access.

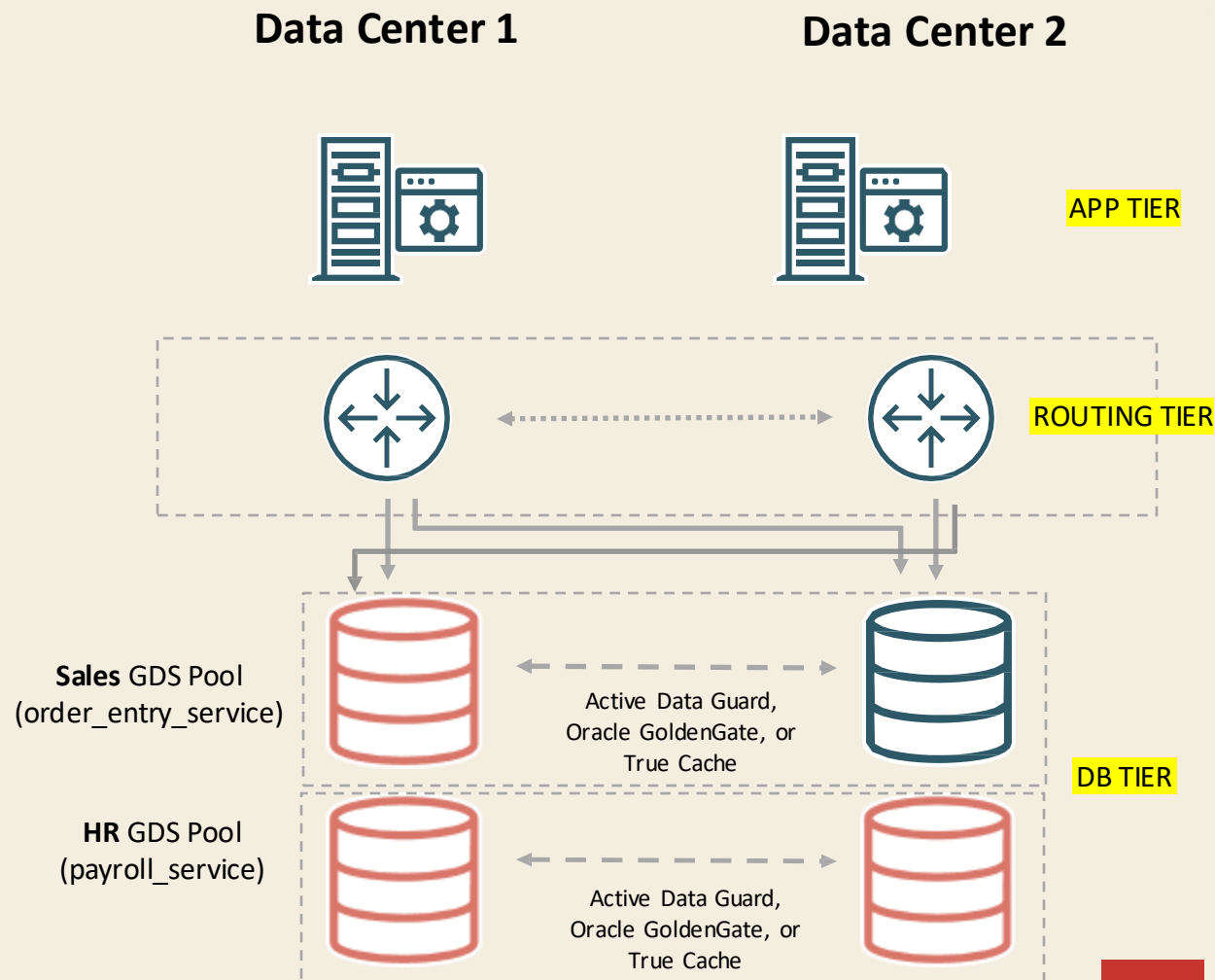
The **GDS Catalog** stores all configuration metadata, while **Global Service Managers**, or GSMs, handle routing and failover. Together, they create a unified framework that simplifies management across complex, distributed environments.



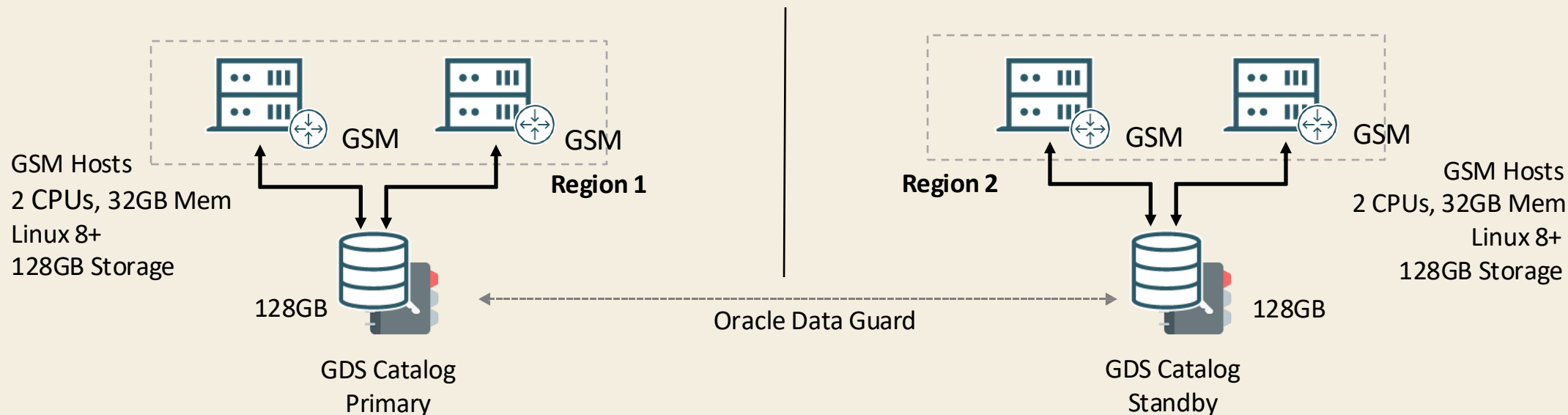
GDS Deployment Topology & Architecture

A single GDS deployment can manage **multiple database pools**, each containing multiple databases—whether RAC, single-instance, Active Data Guard, GoldenGate, or True Cache setups.

The database pools group databases by application workloads, providing manageability, flexibility and scalability.



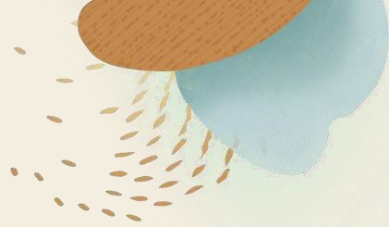
Oracle Global Data Service (GDS) Deployment Reference Architecture



- ❑ One GSM on each Linux host (or VM)
- ❑ Dedicated database for GDS catalog
- ❑ 2 GSMs per deployment
- ❑ Replicated infrastructure

- ✓ GSM host fault tolerance
- ✓ GDS catalog database failure tolerance
- ✓ Login storm handling
- ✓ Protection during planned maintenance

- Linux 8 and above
- GSM 26ai and above
- Database 26ai and above
- Data Guard



GDS – A Shared Infrastructure

- Oracle Global Data Services is designed to scale.
- A single GDS configuration can manage up to:

- ***5,000 GDS pools***
- ***10 regions***
- ***5 Global Service Managers per region***
- ***10,000 database instances***
- ***10,000 global services***
- ***And over 1,000 mid-tier connection pools***

- This makes GDS a suitable shared infrastructure for large and complex environments.

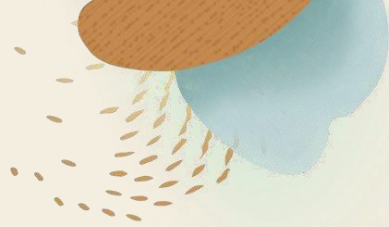
For a database to be part of a GDS managed database pool, there are a few requirements:

- It must be Oracle Database Enterprise Edition, version 12.1 or later
- It can be a single instance or a RAC database
- It may run on commodity hardware or Oracle Engineered Systems like Exadata or ODA
- It can serve as a primary, standby, replica, or True Cache node
- It must be managed using GDSCTL or the Enterprise Manager plug-in
- It must be licensed for either Oracle Active Data Guard or Oracle GoldenGate

GDS Components

- **Global Service Manager**, or GSM, acts as the intelligent traffic controller—routing connections, monitoring databases, and enforcing service policies.
- **GDS Catalog**, a centrally managed metadata repository that keeps track of regions, database pools, database roles, services and service attributes.
- **Global Services**, represent application services configured to span multiple databases (within or across regions).
 - These services are what applications connect to, and they're placement location-aware, role-aware, and latency-aware.
- Finally, GDSCTL, the command-line **GDS Control Utility**, allows you to configure and manage everything -- regions, services, databases, and pools -- all from a central interface.

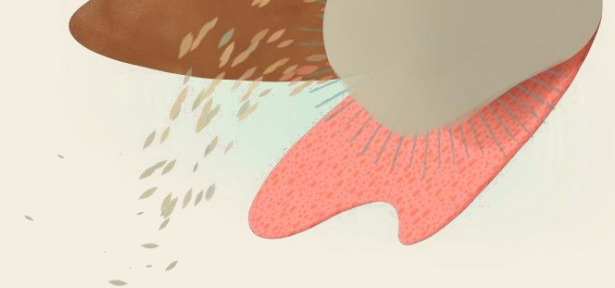
What Does Global Service Manager (GSM) Do?



- Regional Database Listener
 - Acts as a regional endpoint for database client connections, providing a single access point into your database estate.
- Intelligent Connection Routing
 - Performs real-time and connect-time load balancing to efficiently distribute workloads across database instances and ensure optimal resource utilization.
- Service Failover Management
 - Automatically manages service relocation and failover between databases during planned maintenance or unexpected outages, ensuring continuous application availability.
- Publishes Real-Time Notifications (FAN Events)
 - Utilizes Oracle Notification Service (ONS) to broadcast Fast Application Notification (FAN) events, enabling rapid response from client applications during service status changes and runtime load-balancing advisory updates.
- Centralized Database Service Management
 - Provides centralized control and orchestration of global services across distributed and replicated databases, simplifying management and improving operational efficiency.
- Runtime Load-Balancing Advisory
 - Communicates database runtime performance metrics to clients for adaptive workload routing, optimizing application responsiveness and database resource usage.

Oracle Global Data Services (GDS) Licensing

In a nutshell



Oracle Active Data Guard and Oracle GoldenGate are commonly used replication technologies in Oracle GDS setups.

- **Active Data Guard:** If you use Oracle Active Data Guard as the replication technology for your Database pool, then Oracle Global Data Services usage is included with your Oracle Active Data Guard (ADG) license.
- **Oracle GoldenGate:** If you use Oracle GoldenGate as the replication technology for your database pool, then you may be covered because Oracle Active Data Guard license is included with Oracle GoldenGate licenses.

Please discuss any licensing questions with your account manager.

GDS Deployment

High-level steps

1. Install GSM Software (on your designated servers).

You need at least one GSM per region, but we recommend two for high availability.

2. Create the GDS Catalog Database (ahead of time).

The GDS Catalog holds the central metadata for your GDS configuration.

3. Set up Administrative Access.

Create GDS administrator accounts and grant the required privileges.

4. Configure GDS.

This includes creating the GDS catalog, registering GSMs, defining regions and pools, adding databases, and setting up global services.

5. Configure Client Connectivity.

Finally, make sure applications and connection pools are configured to connect through GDS.

GDS Deployment

Setup GDS accounts and privileges

- On the **GDS Catalog** database:
SQL> create user mygdsadmin identified by passwd_mygdsadmin;
SQL> grant gsmadmin_role to mygdsadmin;

SQL> alter user gsmcatuser account unlock;
SQL> alter user gsmcatuser identified by passwd_gsmcatuser;
- On each of the **GDS Pool** databases:
SQL> alter user gsmuser account unlock;
SQL> alter user gsmuser identified by passwd_gsmuser;

GDS Deployment

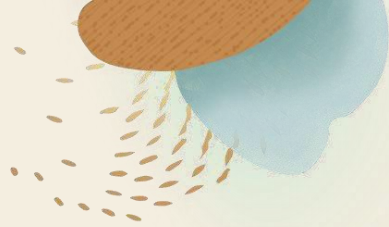
Configure GDS and setup Global Services using GDS Control Utility (GDSCTL)

- **create catalog** -database <host_name>:1521:catdb.acme.com –user mygdsadmin/passwd_mygdsadmin
-region siteA, siteB
- **add gsm** -gsm gsm1 -listener 1571 -catalog <host_name>:1521:catdb –region siteA
- **start gsm** –gsm gsm1
- ...
- **add gdspool** -gdspool sales
- **add database** -connect <host_name>:1521:**db01** -gdspool sales –**region SiteA**
- **add database** –connect <host_name>:1521:**db02** -gdspool sales –**region SiteB**
- **add service** -service sales_qry_srvc -gdspool sales -**preferred** db01 –**available** db02
- **start service** -service sales_qry_srvc –gdspool sales

Client Connectivity in GDS – TNS Entry

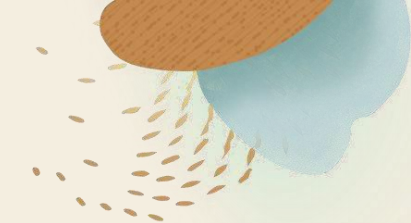
```
sales_reporting_srvc =
  (DESCRIPTION=
    (CONNECT_TIMEOUT=90) (RETRY_COUNT=30) (RETRY_DELAY=3) (TRANSPORT_CONNECT_TIMEOUT=3)
    (FAILOVER=ON)
    (ADDRESS_LIST =                                Datacenter A's GSMS
      (LOAD_BALANCE=ON)
      (ADDRESS = (PROTOCOL = TCP) (HOST = gsm-host1a) (PORT = 1522))
      (ADDRESS = (PROTOCOL = TCP) (HOST = gsm-host2a) (PORT = 1522))
    )
    (ADDRESS_LIST =                                DatacenterB 's GSMS
      (LOAD_BALANCE=ON)
      (ADDRESS = (PROTOCOL = TCP) (HOST = gsm-host1b) (PORT = 1522))
      (ADDRESS = (PROTOCOL = TCP) (HOST = gsm-host2b) (PORT = 1522))
    )
    (CONNECT_DATA =
      (SERVICE_NAME = sales_reporting_srvc.sales.oradbcloud) (REGION=WEST)
    )
  )
```

GDS-Ready Application Requirements



- ❑ Define the Global Services as per the application requirements
 - ❑ Use Oracle Integrated Connection Pools/Drivers (OCI, JDBC, ODP.NET, WebLogic)
 - IBM WebSphere, Apache Tomcat, Red Hat JBoss are supported when using Oracle UCP
 - For UCP, include the ojdbc8.jar, ucp.jar and ons.jar in the CLASSPATH
 - ❑ Connection URL (or TNS entry) must include:
 - GSM Listener end points
 - CONNECT_TIMEOUT, RETRY_COUNT, RETRY_DELAY, TRANSPORT_CONNECT_TIMEOUT parameters
 - SERVICE_NAME
 - For locality-based routing, specify client's REGION
-
- ❑ Use 12.2+ clients - Fast Connection Failover (FCF) is auto-enabled
 - For pre 12.2 clients, enable (FCF) via `setFastConnectionFailoverEnabled = true`
 - ❑ Set planned draining period system property for graceful draining
 - For UCP - `Doracle.ucp.PlannedDrainingPeriod=30`

Handling Client Connection, Load Balancing & Failover with GDS



- All GDS clients benefit from **connect-time load balancing**, or CLB. When a client connects, GDS selects the best database instance based on current load and availability.
 - For Oracle integrated connection pool clients, like JDBC or OCI, GDS offers **run-time load balancing**, or RLB. RLB dynamically picks a cached connection to the least loaded database instance for each work request, maximizing efficiency during runtime.
 - In a GDS setup, JDBC connection pools use RLB advisory published by GSMs to balance workloads across databases using a process called '**Gravitation**' — which ensures instances capable of handling more requests get more workload.
- To ensure high availability, GSM publishes instance **UP and DOWN events** and the Oracle client connection pools perform connection removal and pre-establishment based on these events.
 - Finally, Oracle clients leverage GDS's **Oracle Notification Service**, or ONS, to receive **Fast Application Notification (FAN) events**. These events drive connect-time and run-time load balancing, as well as Fast Connection Failover, or FCF, ensuring seamless client experiences.

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GDS Use Cases

GoldenGate

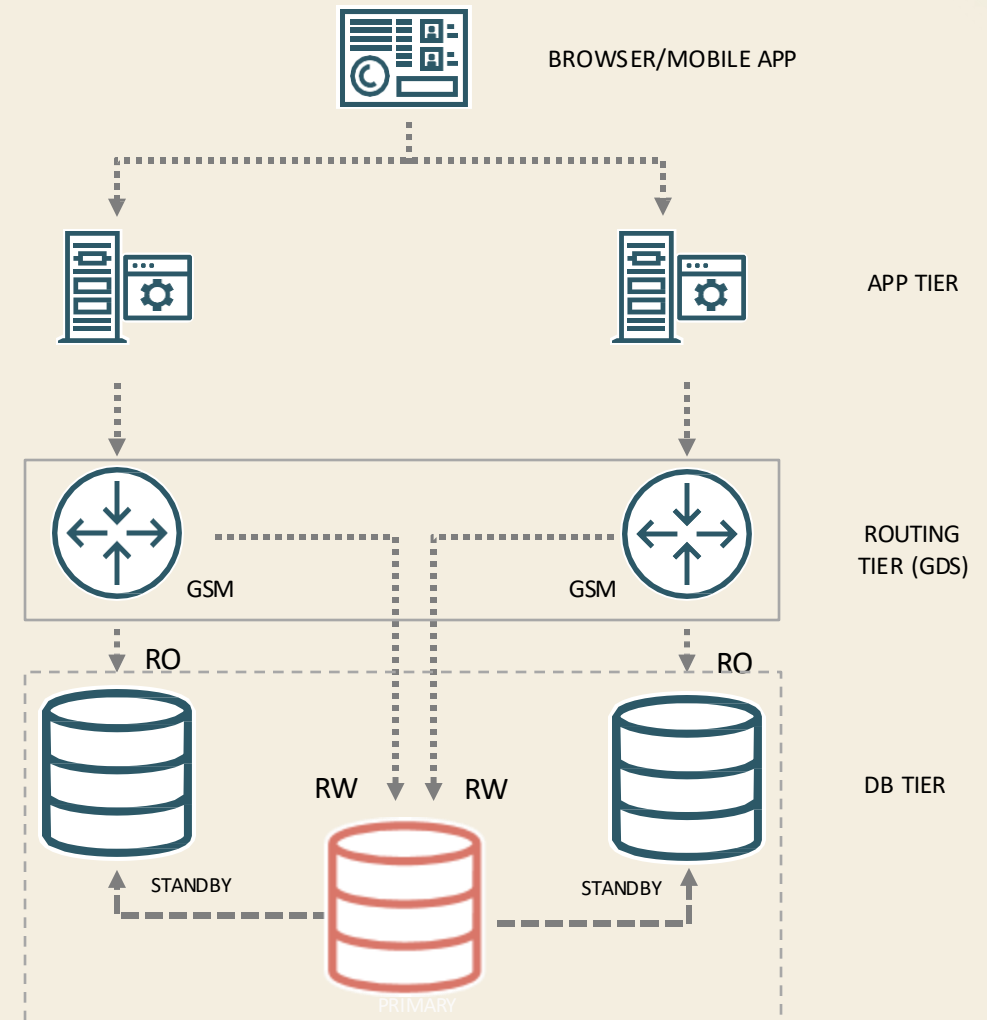
1. Active-Active Multi-Region Deployment with OGG and ADG (Load-balancing)
2. Service Failover for Oracle GoldenGate Master-Replica
3. Region Affinity in Active/Active Oracle GoldenGate

Active Data Guard

1. Service Failover with Active Data Guard (ADG)
2. Role based Global Services with ADG
3. Load Balancing for Reader Farms
4. Routing based on Replication Lag Tolerance for ADG

True Cache

1. Critical Query Workloads (Performance)
2. Query Workload (Availability)



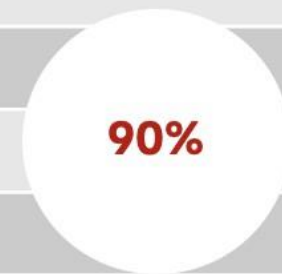


To start using Oracle GDS effectively, all you have to do is :-

- 1. Understand your workloads**
- 2. Construct (compose) your database pool**
- 3. Create global services**

Understanding application workloads: Typical RW & RO Workload Distributions

Application	Workload	Examples
E-commerce Applications	Read-Write	Processing orders (creating new orders, updating order status, managing inventory)
		Adding or updating product information
		Managing customer accounts (registration, profile updates, address changes)
		Processing payments
		Writing reviews and ratings
	Read-Only	Browsing products and catalogs
		Viewing product details and reviews
		Tracking order status
		Searching for products
		Displaying personalized recommendations



Understanding application workloads: Typical RW & RO Workload Distributions

Application	Workload	Examples
Customer Relationship Management (CRM) Systems	Read-Write	• Adding new contacts and accounts
		• Updating customer information
		• Logging customer interactions (calls, emails, meetings)
		• Creating and managing sales opportunities
		• Tracking and updating customer support tickets
	Read-Only	• Viewing customer profiles and history
		• Generating reports and dashboards
		• Analyzing customer data and trends
		• Searching for contacts or accounts
		• Viewing sales pipelines



Example workload dissection and analysis – Banking industry

#	Workload Type	Description
1	OLTP / Transaction Processing	Real-time customer transactions (deposits, withdrawals, transfers, payments). Requires low latency and ACID guarantees.
2	End-of-Day Batch Processing	Daily interest calculations, statement generation, and ledger consolidation. Often CPU/storage intensive.
3	Regulatory & Compliance Reporting	Generation of reports for central banks, auditors, or internal compliance teams (e.g., Basel, SOX, AML).
4	Ad-Hoc Business Intelligence (BI)	Dynamic queries by analysts, product teams, or managers for trend spotting, campaign analysis, etc.
5	Customer 360 Views	Composite, read-only queries aggregating data from multiple modules for customer portals or CRM integration.
6	Fraud Detection / Real-time Analytics	Pattern matching on transactional data using rules or models to flag anomalies. Requires very fast reads.
7	Machine Learning Model Training	Offline model training on historical data for credit scoring, churn prediction, fraud patterns, etc.
8	Model Inference Workloads	Lightweight, read-mostly workloads that execute ML models (e.g., scoring a loan or payment transaction).
9	Data Ingestion & Integration	ETL/ELT jobs importing external feeds (e.g., market data, payment networks) or synchronizing with core apps.
10	Audit Trail / Logging Access	Read-heavy access to historical logs for internal audits or external review.
11	API-based Access Workloads	External services (e.g., mobile apps, fintech APIs) making transactional or inquiry requests.
12	Disaster Recovery (DR) Drills	Simulated access for validating readiness of the DR site, including service relocation and load behavior.
13	Test / UAT / Shadow Production	Internal testing workloads (possibly with masked data) that must not interfere with live systems.
14	User Authentication / Session Management	Lightweight access workload validating user credentials, often hitting dedicated auth schemas.
15	Cash Management & Treasury Ops	Bulk fund movement, reconciliation, FX conversion, and interbank settlements.
16	Loan & Credit Approval Workflows	Multi-step workflows involving data verification, scoring, and approvals. May involve read/write workloads.

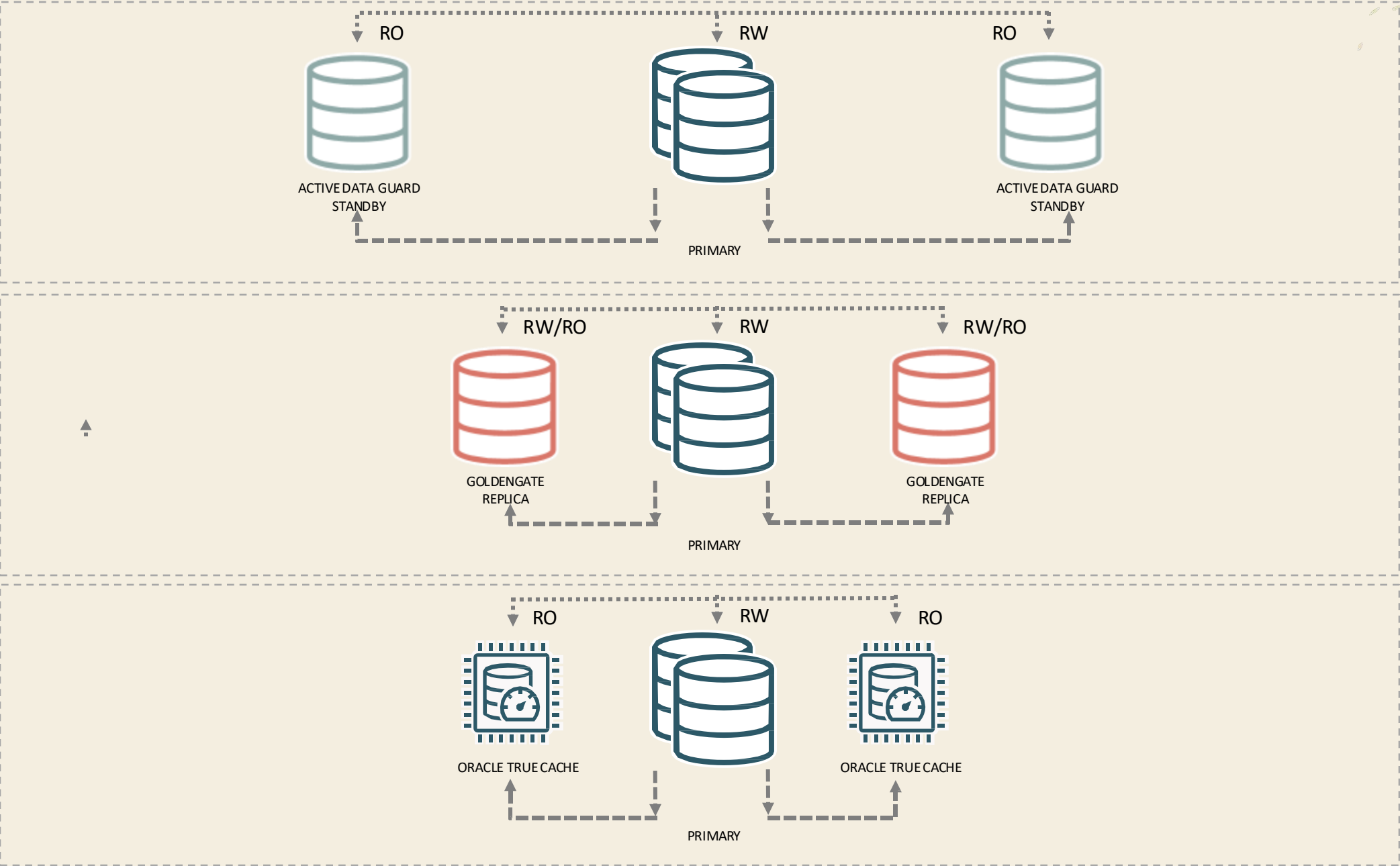


Example workload dissection and analysis – Banking industry

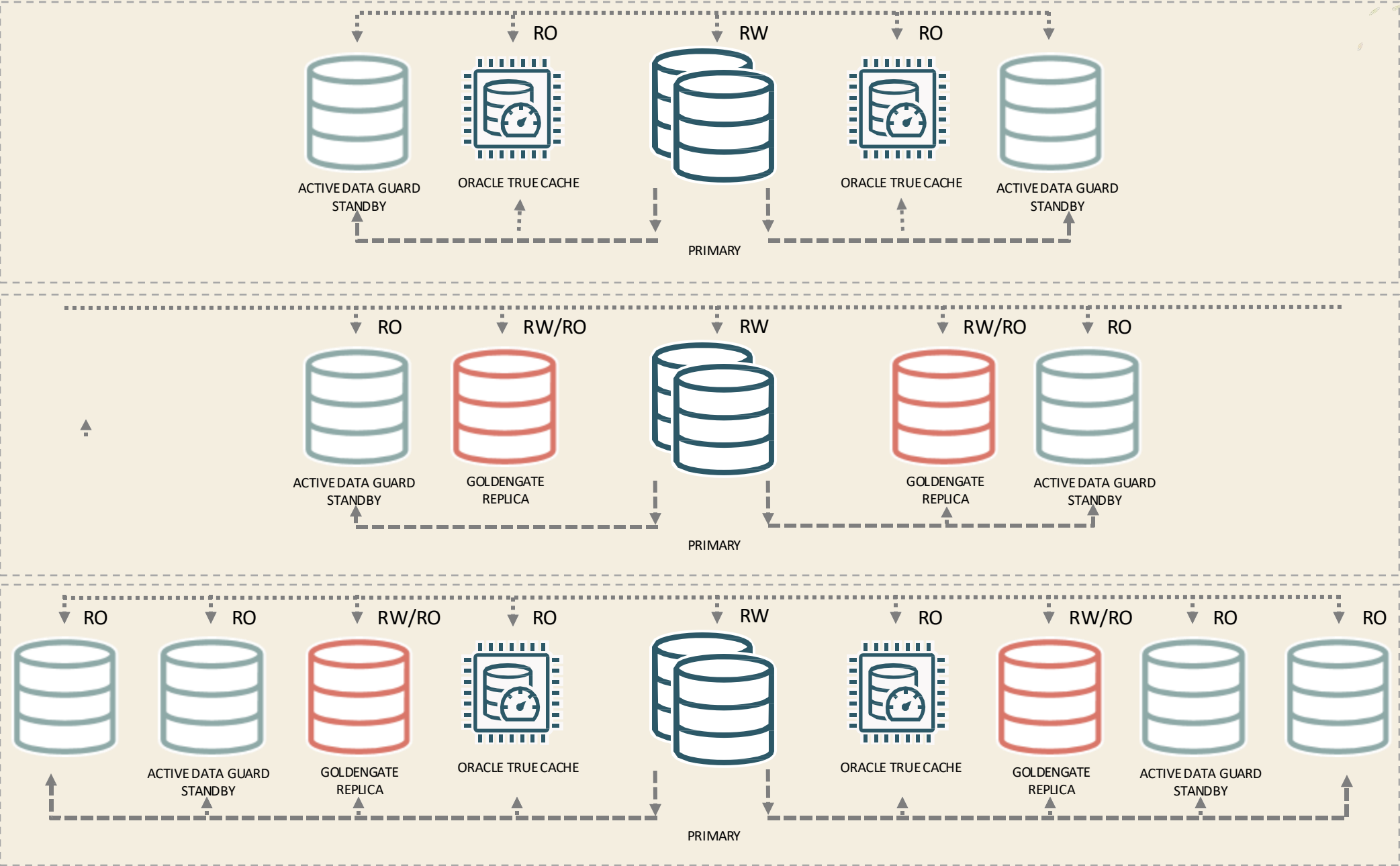
# Workload /Service	R/W Profile	Primary Objective	Typical Trigger / Time Profile	Duration , Concurrency	Performance Requirement	HA Requirement	Potential Service-Level Policies (GDS)
Core Teller 1Transactions	READ-WRITE	Real-time creation & update of customer accounts, balances, and transfers	Branch hours (08:00–18:00 local) – steady, peak at open/close	< 1 sec per txn, 2–5 k TPS	Critical – sub-second	Tier-1: Automatic failover, TAC replay, CLB=LONG	
Mobile / Internet 2Banking API	READ-WRITE	High-volume self-service banking (balance, transfer, bill pay)	24x7; peaks during commuting & lunch hours	< 500 ms, bursty (10 k+ TPS)	Critical	Global load balancing, region-affinity, TAC	
End-of-Day General 3Ledger Batch	READ-WRITE (heavy writes)	Post daily balances to GL tables	Nightly 22:00-02:00	2–4 hrs, serial	High – finish before day start	Preferred to primary, lag-aware standby fallback	
Regulatory / 4Compliance Reporting	READ-ONLY	Generate mandated daily/weekly reports	Scheduled windows 03:00-05:00	30–60 min, CPU-heavy	High – SLA to regulators	Route to reader farm, CLB=SHORT	
Real-Time Fraud 5Analytics	PREDOMINANTLY READ-ONLY	Score transactions for fraud within 200 ms	Continuous stream, 24x7	Millisecond latency, GPU / ML infra	Critical	True Cache preferred, failover to primary	
Customer-360 6Dashboards	READ-ONLY	Serve customer service agents with unified view	Business hours 07:00-19:00	< 2 sec, 100s concurrent	Medium	Standby pool, region-aware routing	
Ad-hoc Data Science 7Exploration	READ-ONLY	Analysts run exploratory SQL / ML feature extraction	Weekdays 09:00-18:00	Variable, may spike	Low	Low-priority service on lag-tolerant replica	
AI Model Inference 8(OLTP Path)	READ-ONLY	Invoke ML model to approve loan / payment	Inline with OLTP call	< 100 ms	Critical	Route to True Cache, TAC enabled	
ETL /Data Integration 9Loads	READ-WRITE (bulk)	Bulk ingest from external systems to ODS	Hourly micro-batches	10–30 min jobs	Medium	Dedicated service to primary, drain during peak OLTP	
Backup G Compliance Scans	READ-ONLY	RMAN backups, vulnerability scans, checksum	Off-peak 01:00-05:00	2–6 hrs	Low	Run only on standby; suspend on lag breach	



Constructing (composing) database pool – manage replicated databases as one unit



Constructing (composing) database pool – manage replicated databases as one unit



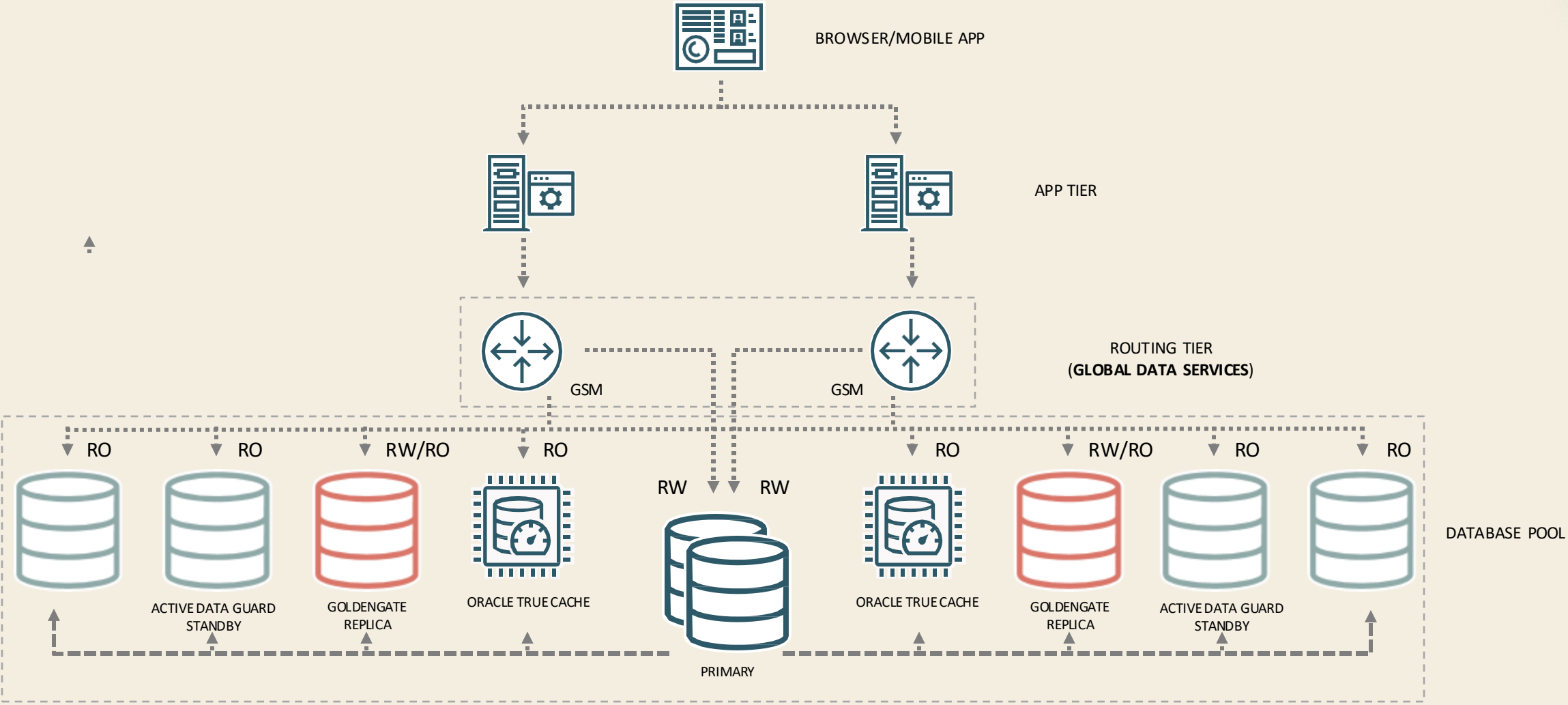
DATABASE POOL

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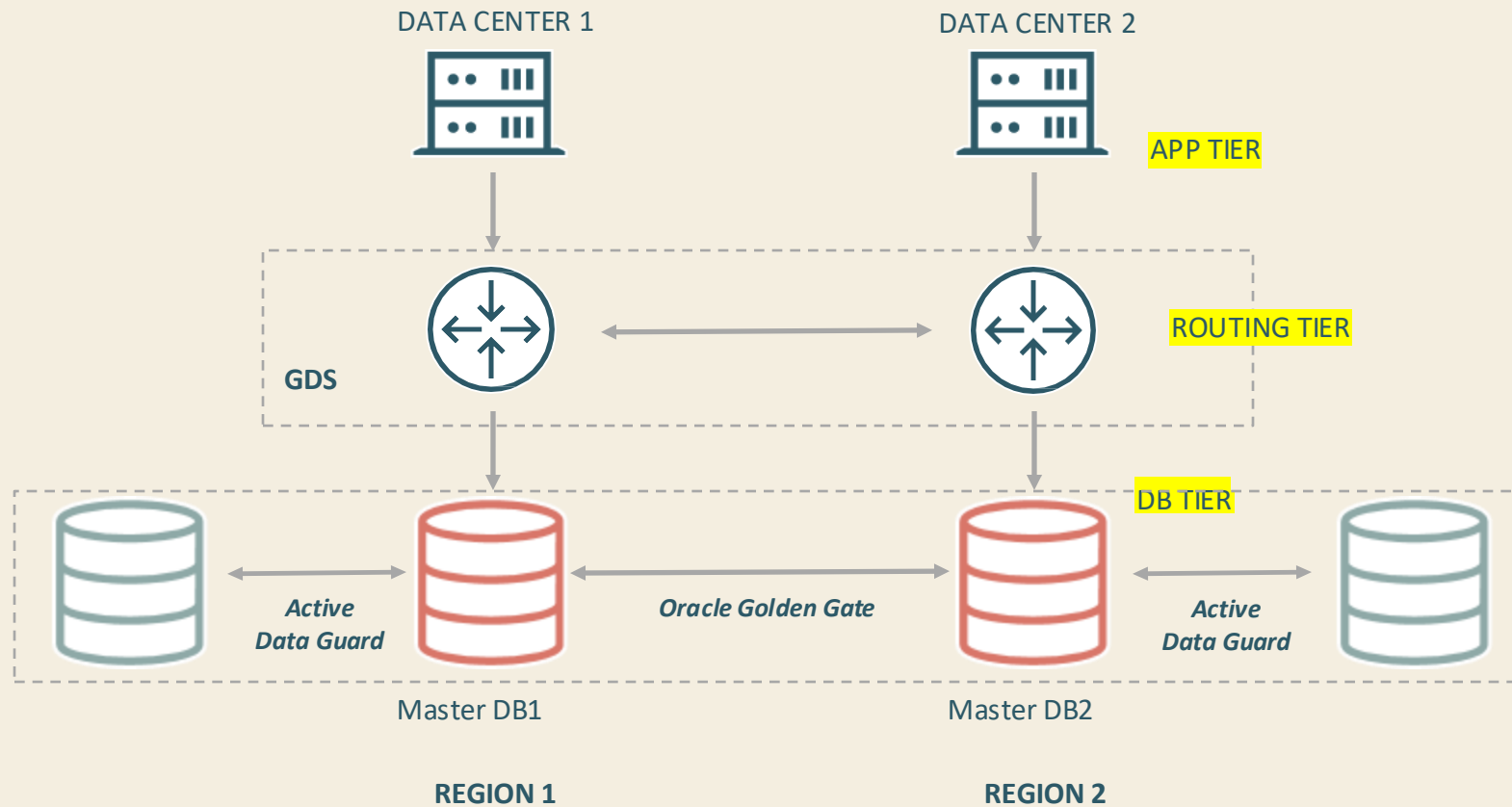


Build modular, plug-and-play database architectures and achieve Continuous Application Availability and High-Performance!



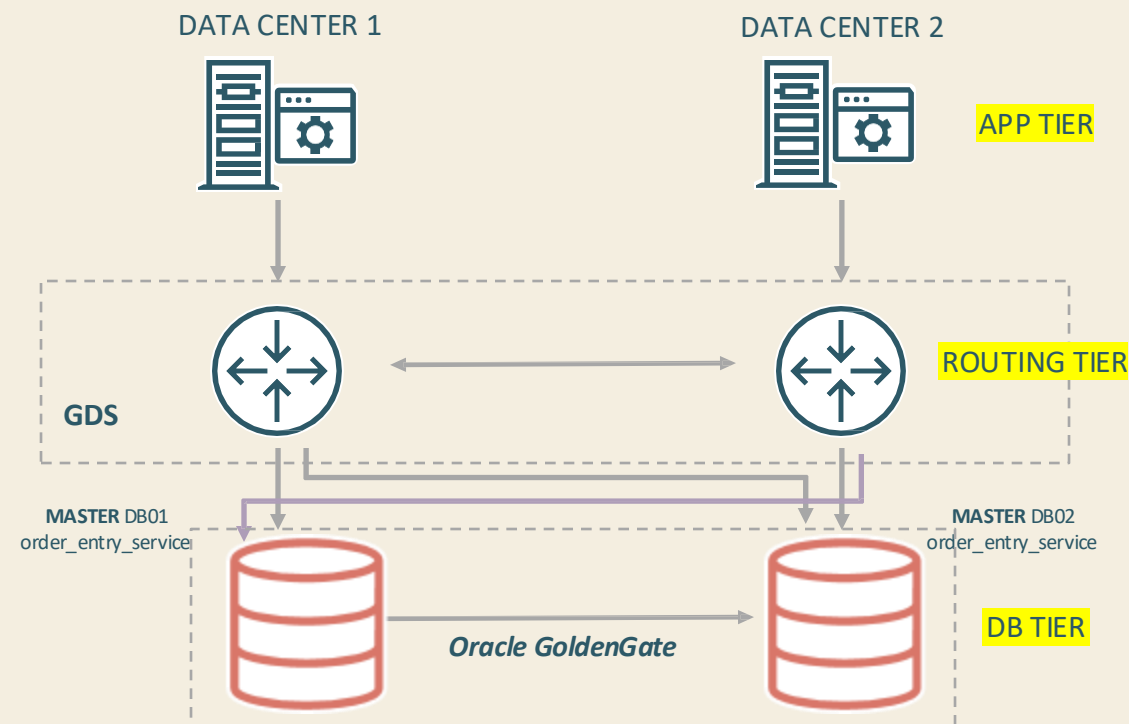
Active-Active Multi-Region Deployment with OGG and ADG

Deploy Dynamic Load-Balancing and Failover in GoldenGate Active Data Guard Configurations



Dynamic Load-balancing in Active-Active Golden Gate Configuration

- Application handles multi-master conflict resolution
- GDS provides connect-time and run-time load balancing (within and across data centers) for all work requests



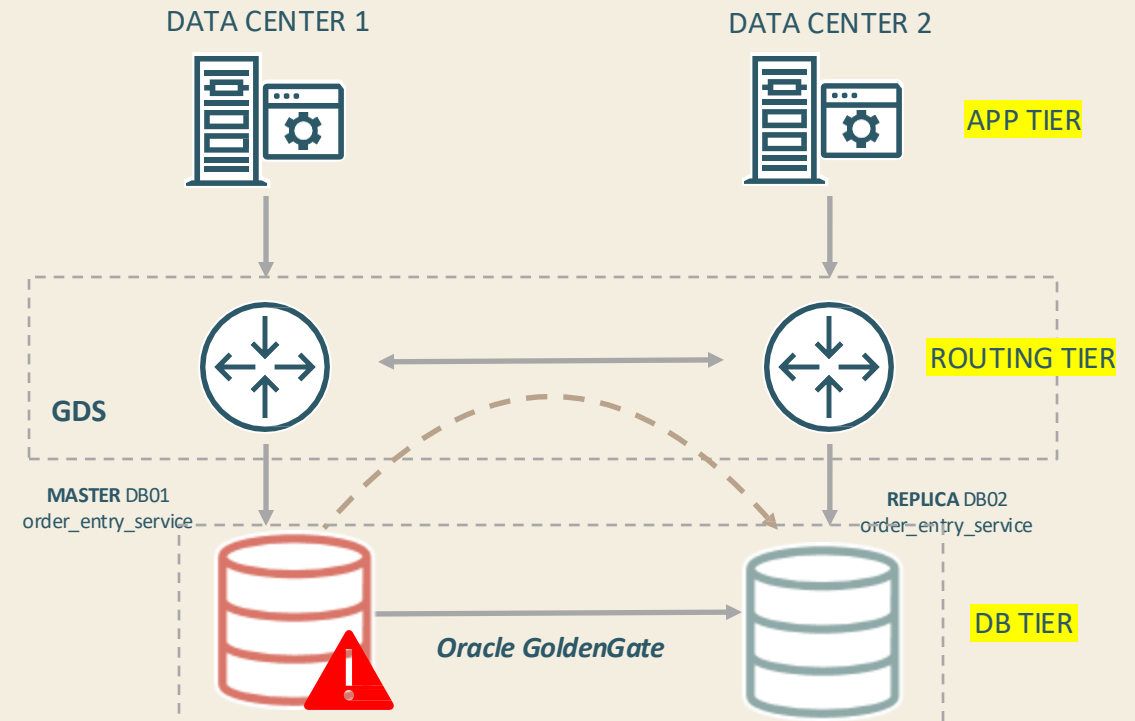
```
GDSCTL>add service -service order_entry_srvc
-gdspool sales -preferred all -clbgoal LONG
```



Oracle GDS in Mission-Critical Database Architectures

Transparent Service Failover in GoldenGate Master-Replica Configuration

- Inter-database Service failover within and across regions
- Higher availability and improved manageability

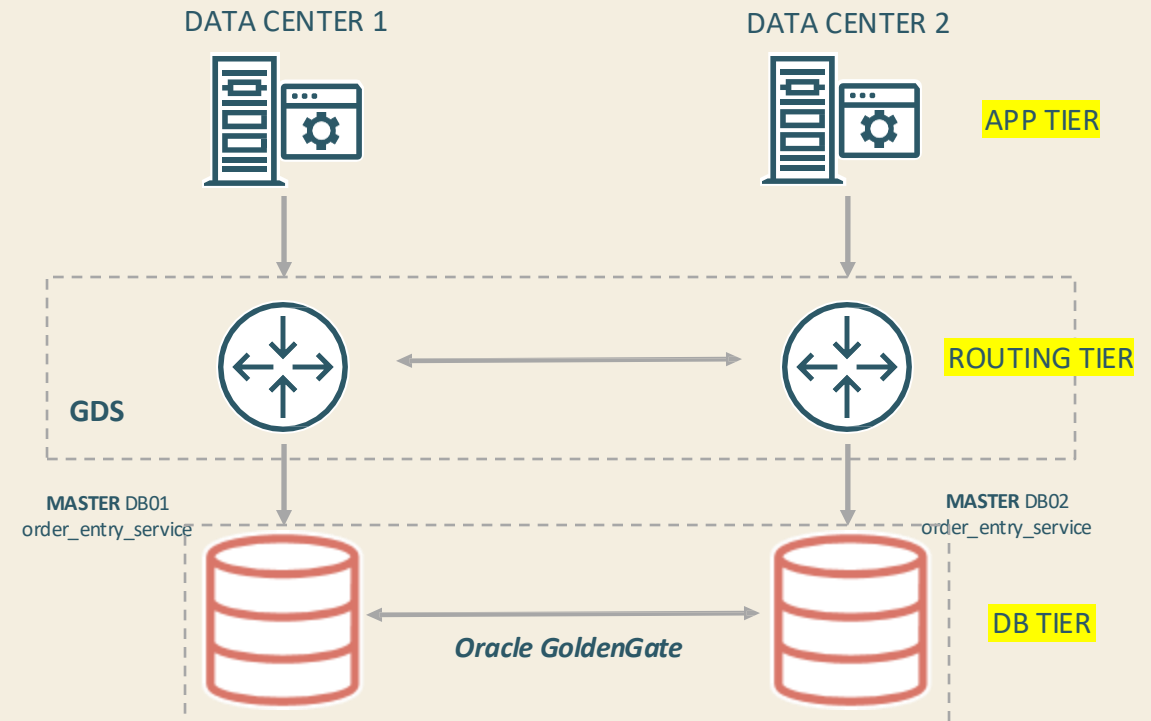


```
GDSCTL>add service -service order_service -  
gdspool sales -preferred DB01 -available DB02
```

Oracle GDS in Mission-Critical Database Architectures

Region Affinity in Active-Active Golden Gate Configuration

- Application handles multi-master conflict resolution
- GDS can route all workloads to nearest and best database in the client's region

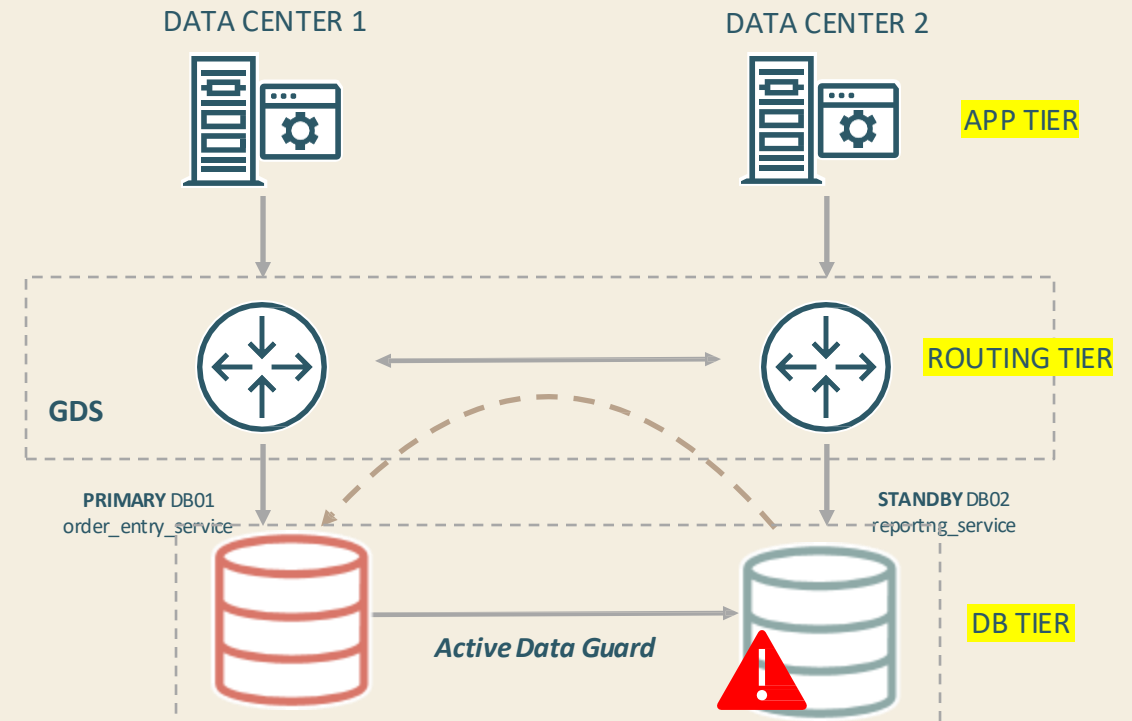


```
GDSCCTL>add service -service order_svc -gdspool sales  
-preferred_all -locality LOCAL_ONLY -region_failover
```

Oracle GDS in Mission-Critical Database Architectures

Transparent Service Failover in Active Data Guard Configuration

- Inter-database Service failover within and across regions
- Higher availability and improved manageability

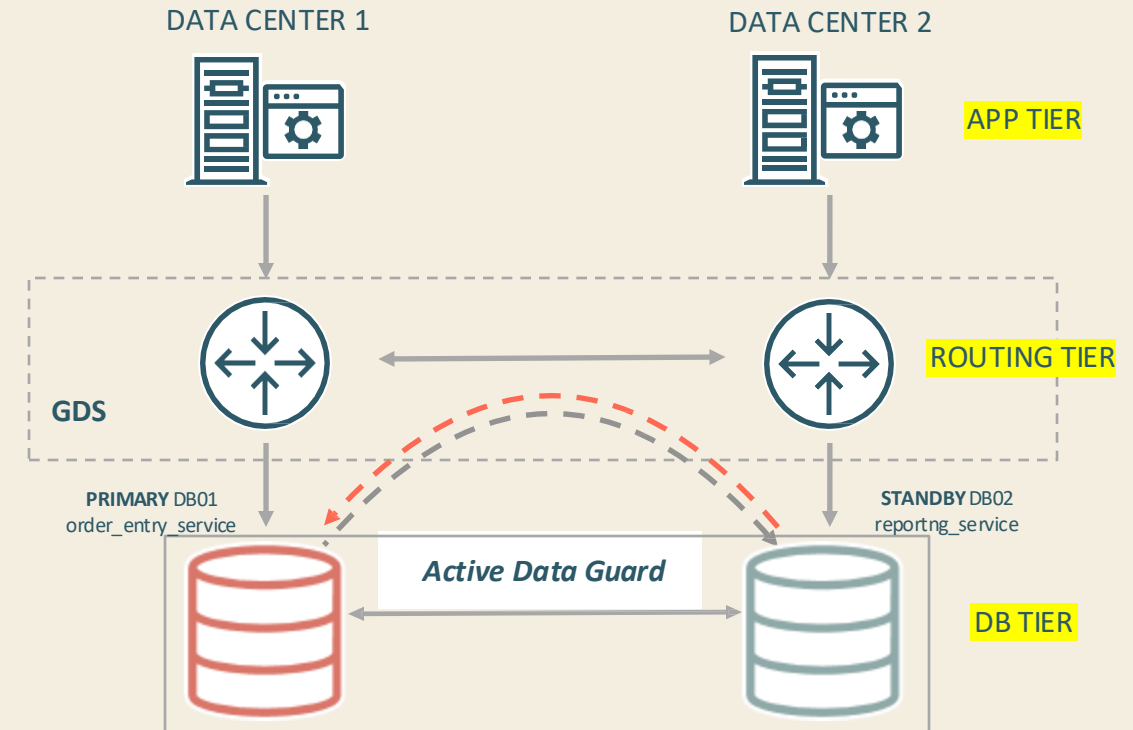


```
GDSCTL>add service -service rep_svc -gdspool sales  
-preferred_all -role PHYSICAL_STANDBY -failover_primary
```

Oracle GDS in Mission-Critical Database Architectures

Role-Based Global Services

- Order Entry Service runs on Primary
- Reporting Service runs on Standby
- Upon Data Guard role change, GDS fails over services based on Role

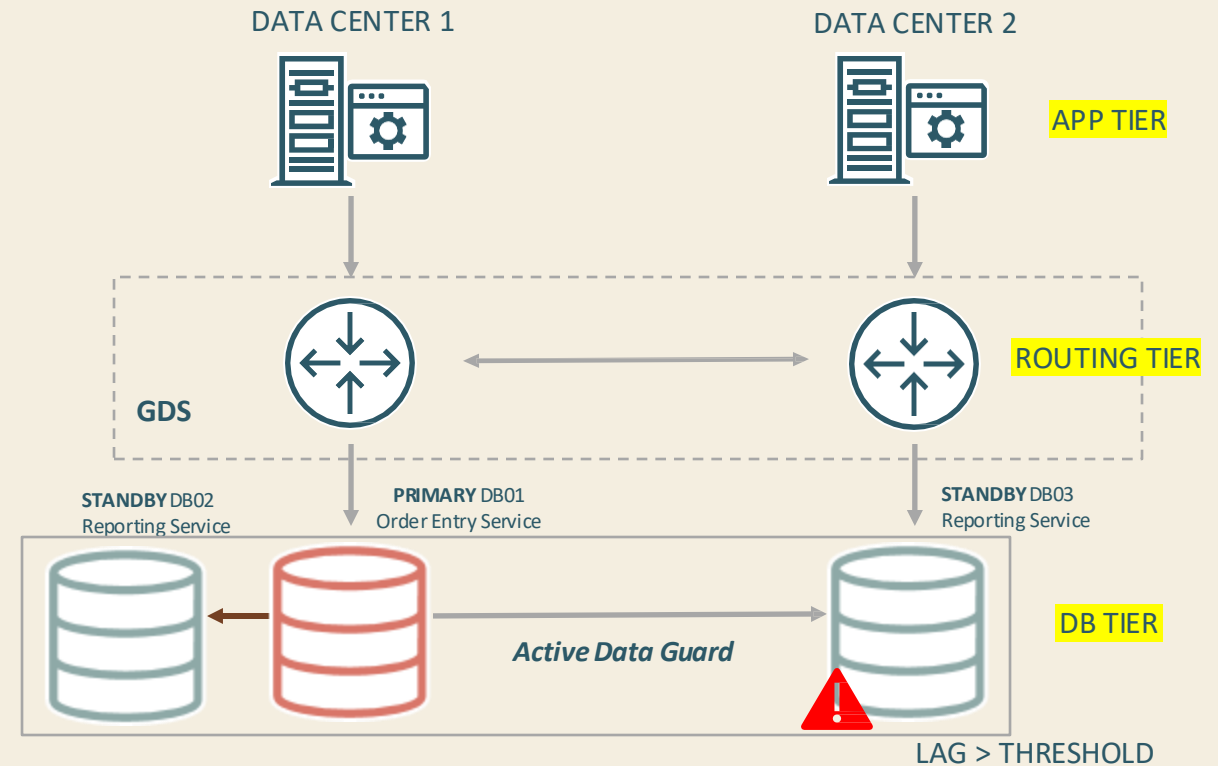


```
GDSCTL>add service -service order_entry_service -gdspool sales  
-preferred_all -role PRIMARY  
GDSCTL>add service -service reporting_service -gdspool sales  
-preferred_all -role PHYSICAL_STANDBY
```

Oracle GDS in Mission-Critical Database Architectures

Routing based on replication lag tolerance

- Specify replication lag limit for a service.
- GDS ensures that service runs on Active Data Guard standby(s) only when lag is less than this limit (or threshold)
- Effective workload distribution

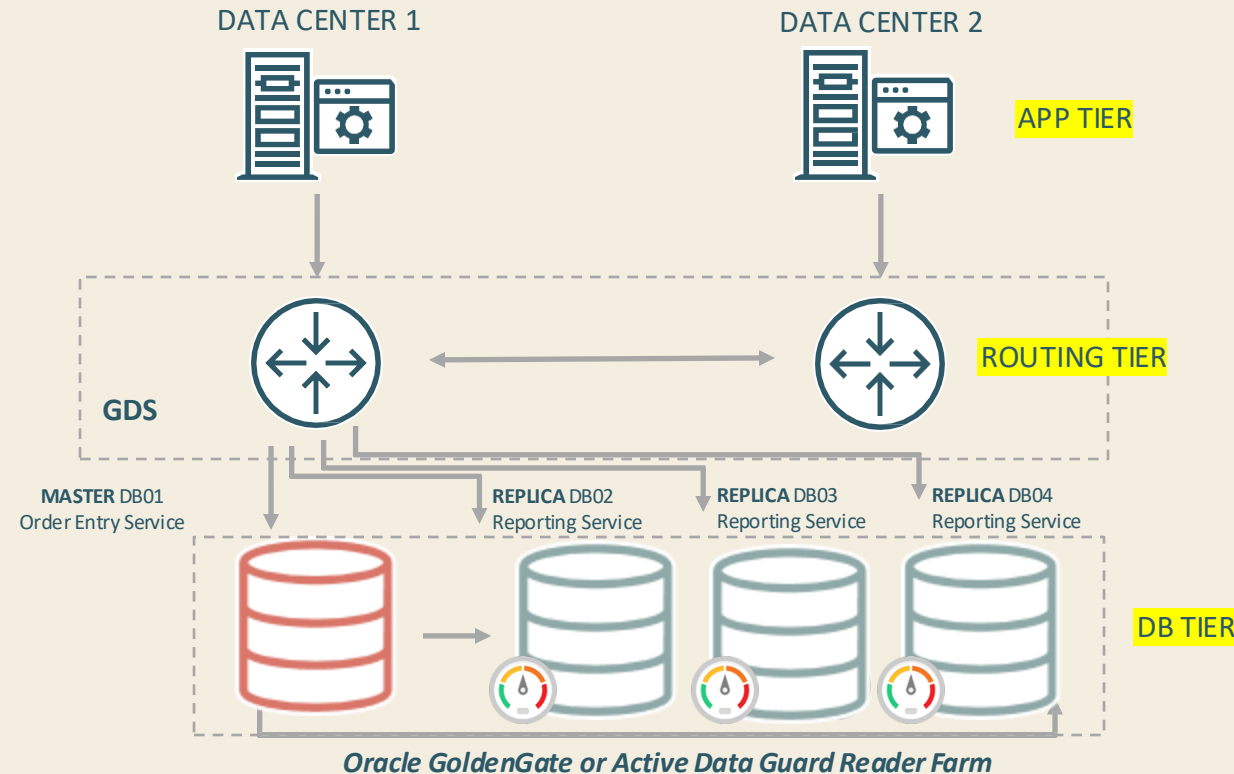


```
GDSCTL>add service -service reporting_srvc -gdspool sales  
-preferred_all -role PHYSICAL_STANDBY -lag 180 -failover_primary
```

Oracle GDS in Mission-Critical Database Architectures

Load balancing with Reader Farms

- With GDS, route Read Write (RW) workload to primary/master
- Balance Read Only (RO) workload on the reader farm
- Improved resource utilization and better scalability for Read Only workloads

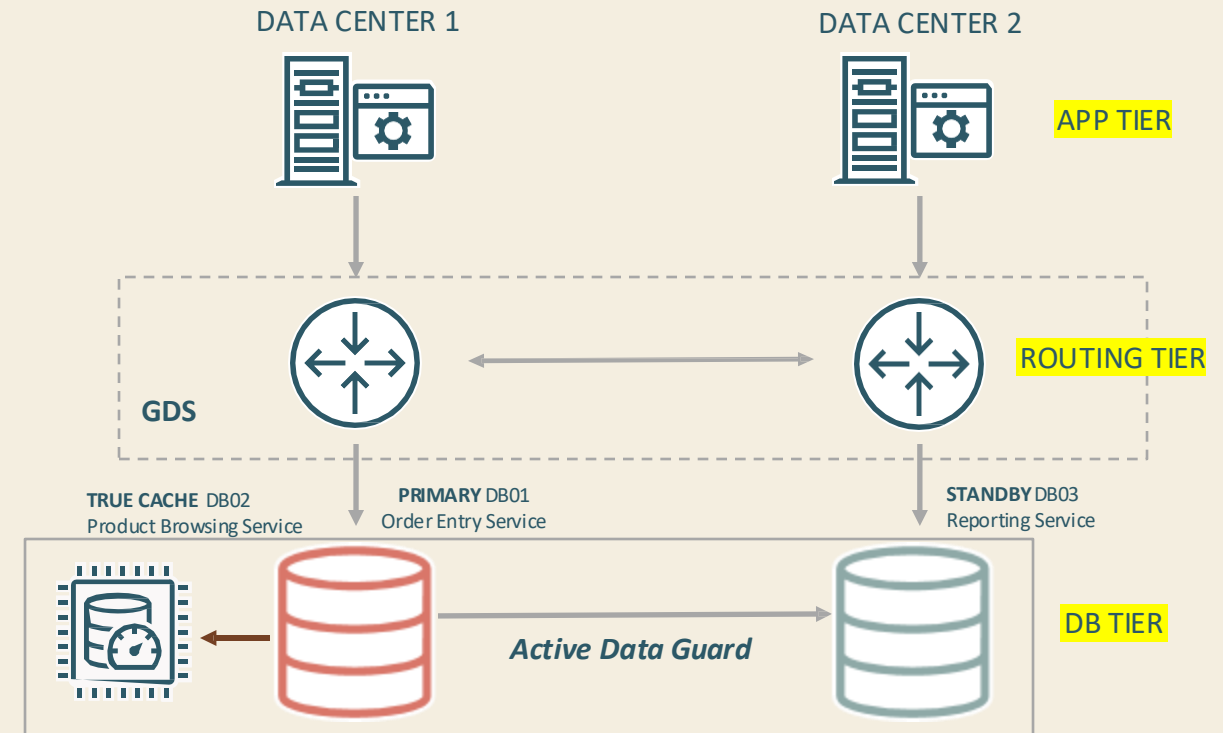


```
GDSCTL>add service -service reporting_srvc -gds pool sales  
-preferred_all -role PHYSICAL_STANDBY -clbgoal LONG -rlbgoal SERVICE_TIME
```

Oracle GDS in Mission-Critical Database Architectures

Routing based on database role (TRUE CACHE)

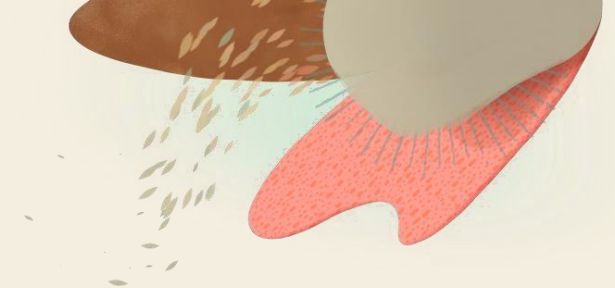
- Specify true cache to serve a service.
- GDS ensures that service runs on the TRUE CACHE instance and fails over to primary when the cache is not available
- Effective workload distribution for performance critical workloads such as product browsing, or contact look ups, etc.



```
GDSCTL>add service -service product_browsing_service -gdspool sales  
-preferred_all -role TRUE_CACHE -failover_primary
```

Mitigate **Unplanned Outage** with Oracle GDS

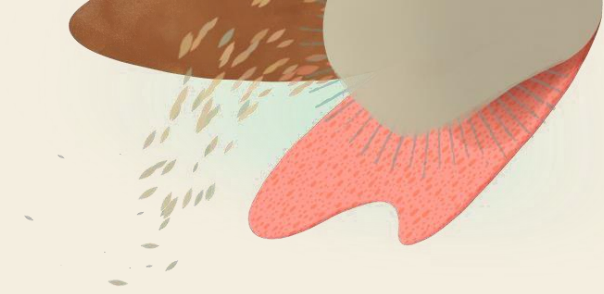
Automatic Failover of Client Workload Across Regions



- In a GDS setup, unplanned outages are handled transparently through automatic service failover. This capability ensures application continuity without manual intervention.
- Supported clients include Oracle UCP, ODP.NET, OCI, WebLogic Active GridLink, and third-party app servers like WebSphere or Tomcat -- so long as they use UCP and support FAN/FCF.
- For this to work, client-side configuration must:
 - Enable Fast Connection Failover (FCF) to subscribe to FAN events from GDS via ONS
 - Use proper TNS parameters: `RETRY_COUNT`, `CONNECT_TIMEOUT`, and `TRANSPORT_CONNECT_TIMEOUT`
- When a failure occurs -- such as a GoldenGate replica going down or a Data Guard role transition -- GDS handles the service relocation automatically based on your defined policies.
- Once the FAN event is published:
 - New connections are immediately redirected by GSM to a healthy instance in the pool
 - Idle connections are terminated cleanly
 - Active connections get marked as invalid; upon reuse, the connection pool closes and retries -- transparently establishing a session with a valid database node
- This end-to-end mechanism ensures session-level continuity and minimizes impact on applications -- especially when combined with Transparent Application Continuity (TAC).

Zero-Downtime **Planned Maintenance** with Oracle GDS

Transparently Move Client Workload Across Regions During Maintenance



- With Oracle GDS, you can perform planned maintenance - such as patching or upgrades - without bringing down applications. The key is GDS's ability to transparently relocate global services across data centers, using client-aware orchestration.
- Applications using Oracle UCP, ODP.NET, OCI, and WebLogic Active GridLink are supported. So are third-party application servers like WebSphere and Tomcat, when configured to use UCP.
- To enable this:
 - Clients must subscribe to FAN events via Fast Connection Failover (FCF)
 - TNS connect strings must include `RETRY_COUNT`, `CONNECT_TIMEOUT`, and `TRANSPORT_CONNECT_TIMEOUT`
- During a planned switchover:
 - You issue a **gdsctl relocate service** command to gracefully move the service
 - GSM posts a planned service member DOWN event for the instance prior to relocate service and a service member UP event for the instance after relocation.
 - New sessions are routed by GSM listeners to the new target database
 - Idle sessions are cleanly disconnected
 - Active sessions are **drained with zero impact** when used with Transparent Application Continuity (TAC)
- This gives you live, zero-downtime maintenance windows -- without needing application restarts, connection reconfiguration, or manual failover.

Agenda

- Workload management challenges of mission critical databases
- Introduction to Global Data Services (GDS)
- GDS Concepts and Architecture
- GDS Common Use Cases
- **Customer Case Studies**
- Summary, Q&A



A leading SaaS provider for clinical trials, offering a cloud-based platform that helps clients design and run their own trials and conduct medical research

Enabling Scalable Clinical Data Analytics with Oracle GDS

Business Objective:

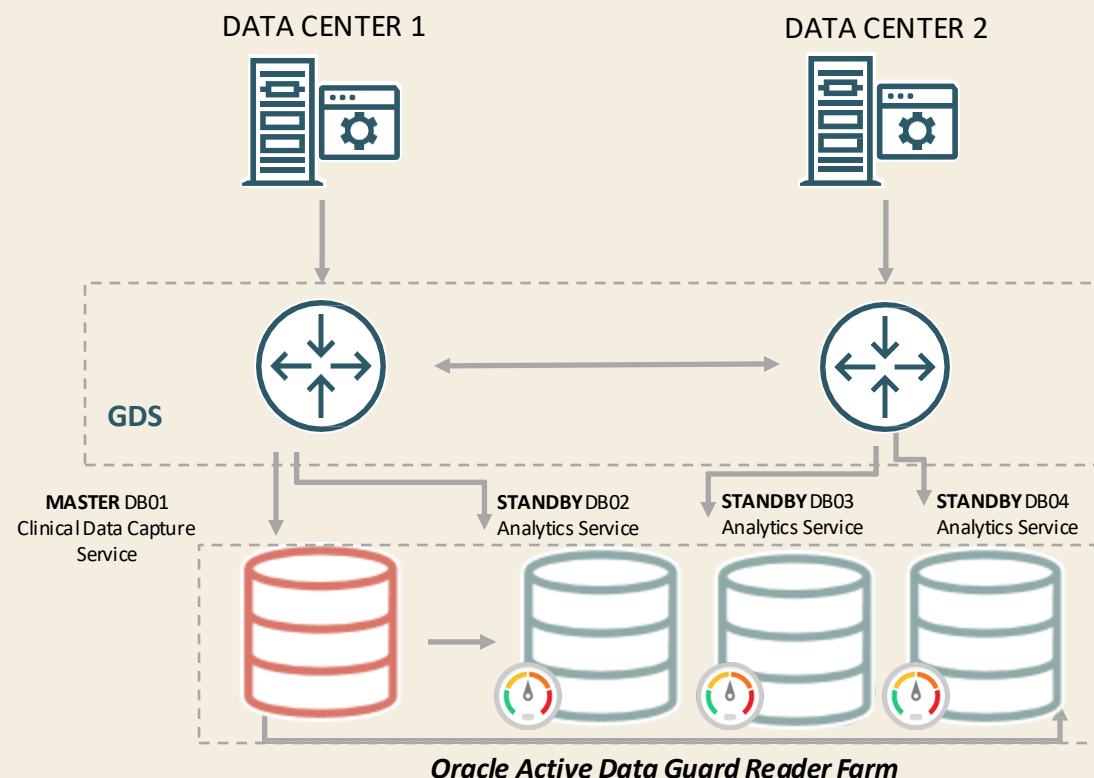
- Needed a highly scalable database architecture to support complex patient data analytics essential to clinical operations.

Challenges Faced:

- Scale read-heavy workloads to support growing analytics needs
- Efficiently distribute read-only queries across a farm of standby databases

Results with Oracle GDS:

- Oracle GDS enabled dynamic workload routing across their standby readers, delivering seamless scalability and optimal performance
- No additional licensing cost -- GDS came included with their existing Active Data Guard environment



A global hotel and resorts chain operating in over 35 countries, running a mission-critical guest check-in and loyalty points application across regions

Enabling Always On Availability with Oracle GDS

Business Objective:

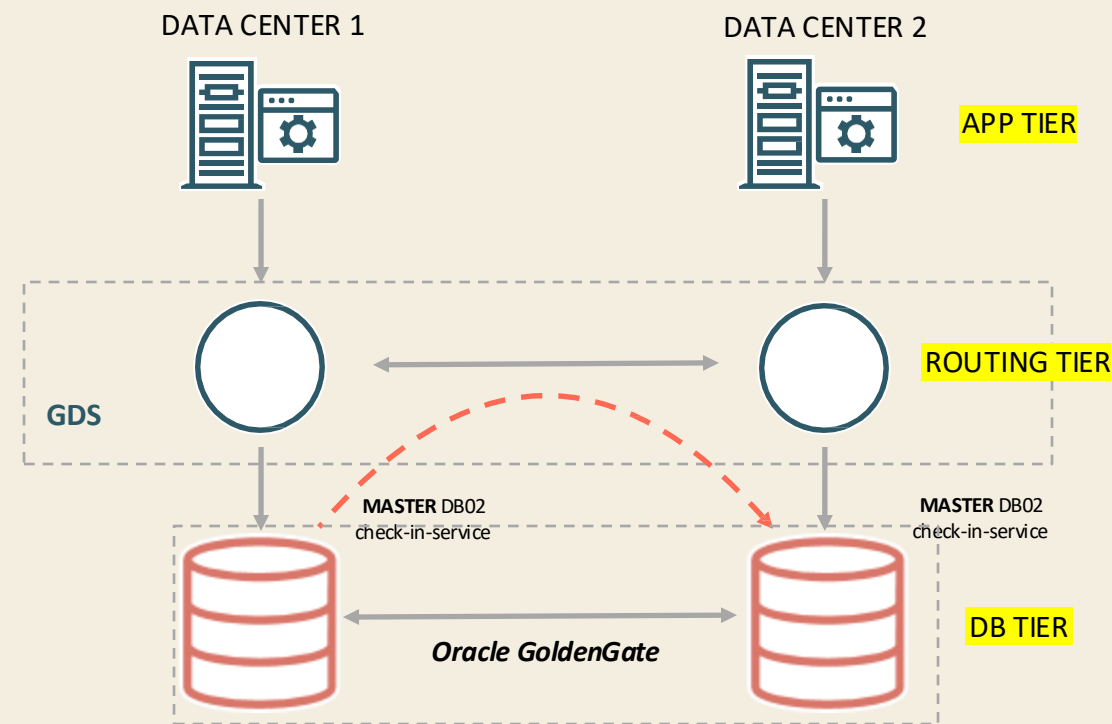
- Achieve uninterrupted application availability -- especially during frequent patching cycles and unplanned events.

Challenges Faced:

- Application downtime directly impacted hotel check-ins and guest experience
- Patching was required multiple times per week, each causing 1–2 hours of service disruption
- Downtime directly affected customer check-in at hotels

Results with Oracle GDS:

- Enabled zero-downtime patching using seamless service failover
- DBA applies the patch on standby and switches global service with no user impact.
- GDS eliminated patch-related downtime and simplified high availability operations.



A U.S. government agency operating a mission-sensitive application that requires high resilience and consistent performance across sites.

Ensuring continuous availability in a replicated environment

Business Objective

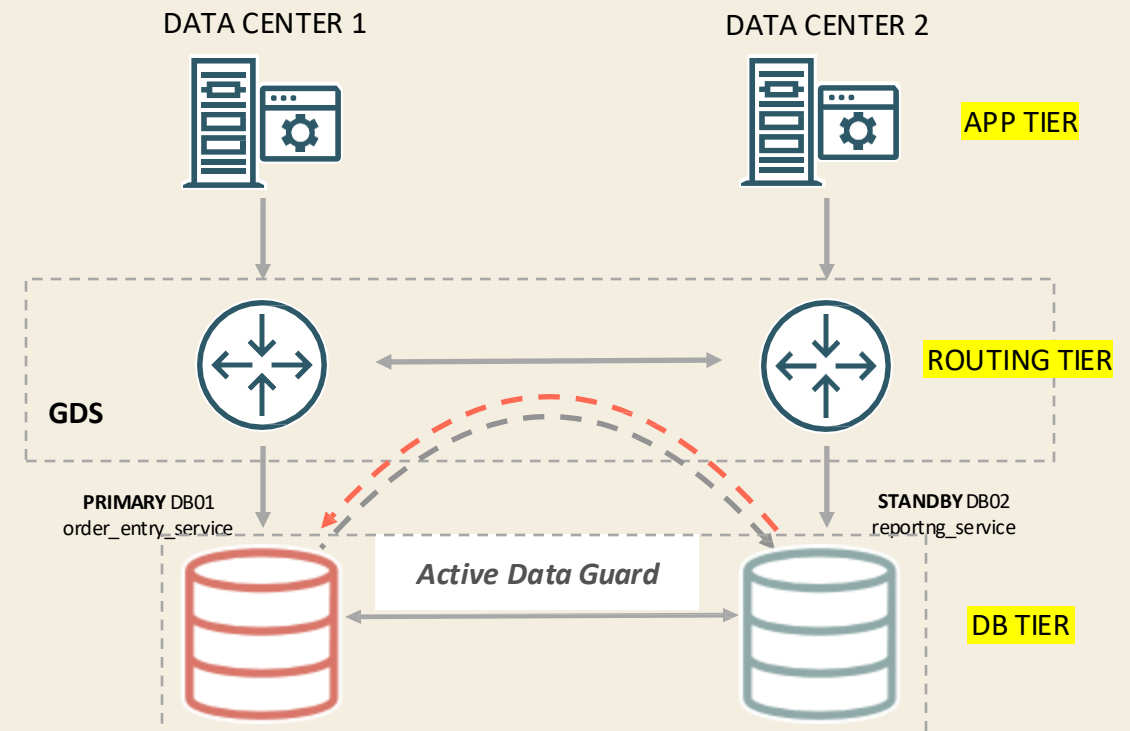
- Ensure continuous database availability and responsiveness for all application workloads in a replicated environment.

Challenges Faced

- Any outage impacted critical government operations.
- Application demanded high uptime with minimal tolerance for performance lag.
- Needed automatic handling of role transitions across primary and standby databases.

Results with Oracle GDS

- Implemented role-based global services for seamless workload routing.
- Oracle GDS now automatically relocates services on database role change.
- Achieved faster response times with region-aware workload placement.





“Global Data Services will help MorphoTrak improve systems utilization by dynamically load balancing application queries between replicated databases across distributed data centers. We had already eliminated the cost of idle capacity by deploying Oracle RAC and Active Data Guard, and Oracle Database 12c takes us to another level. It replaces static load balancing between data centers with intelligent, real-time automation that efficiently utilizes all available capacity yielding greater ROI.”

Aris Prassinos, Chief Engineer, MorphoTrak, SAFRAN Group

Oracle Internal ONLY
- pending customer paperwork
approval -



“Oracle GDS has transformed the way we manage our databases.”

Patrick Broetto, Head of Database Services

Südtiroler Informatik AG - Informatica Alto Adige SpA

Agenda

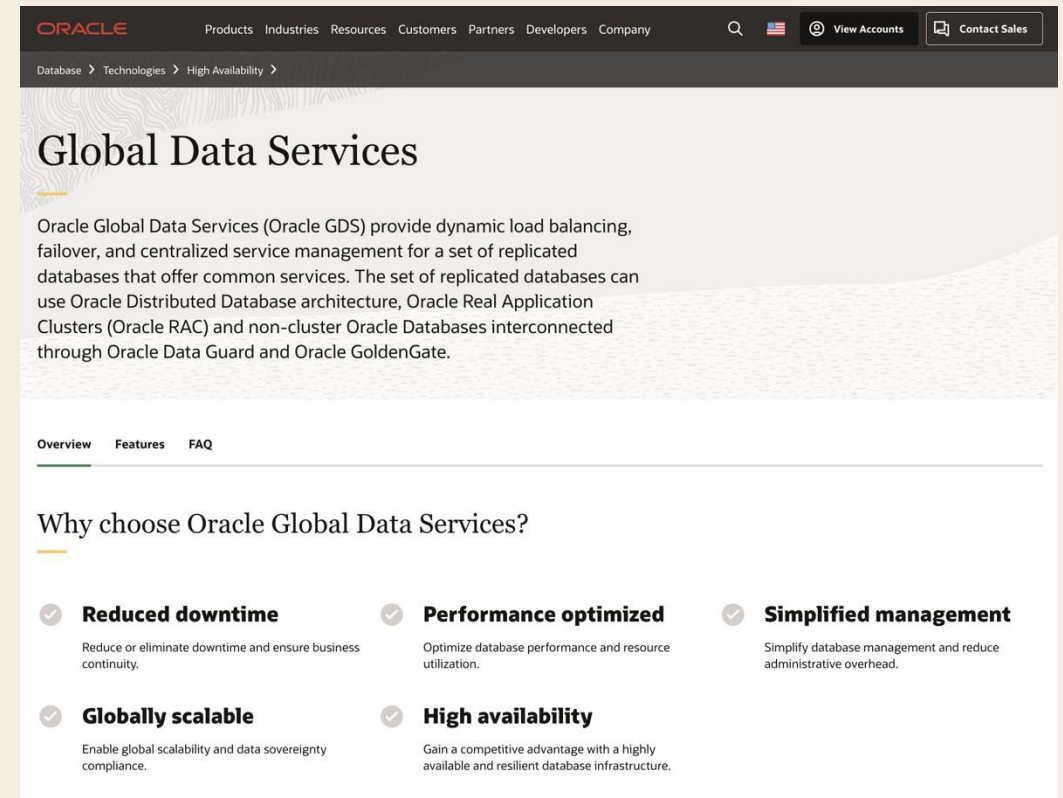
- Workload management challenges of mission critical databases
- Introduction to Global Data Services (GDS)
- GDS Concepts and Architecture
- GDS Common Use Cases
- Customer Case Studies
- **Resources**, Summary, and Q&A



GDS Product Website

Oracle Global Data Services **Product Page**

<https://www.oracle.com/database/technologies/high-availability/global-data-services/>



The screenshot displays the Oracle Global Data Services (GDS) product page. At the top, the Oracle logo is on the left, and navigation links for Products, Industries, Resources, Customers, Partners, Developers, and Company are on the right. A search icon, a US flag, and links for 'View Accounts' and 'Contact Sales' are also present. Below the navigation bar, a breadcrumb trail reads 'Database > Technologies > High Availability >'. The main heading 'Global Data Services' is prominently displayed. A descriptive paragraph follows, explaining that Oracle GDS provides dynamic load balancing, failover, and centralized service management for replicated databases, mentioning Oracle Distributed Database architecture, Oracle Real Application Clusters (Oracle RAC), and non-cluster Oracle Databases interconnected through Oracle Data Guard and Oracle GoldenGate. Below this, a tabbed interface shows 'Overview' as the active tab, with 'Features' and 'FAQ' as options. The section 'Why choose Oracle Global Data Services?' is highlighted, featuring five key benefits: 'Reduced downtime' (Reduce or eliminate downtime and ensure business continuity), 'Performance optimized' (Optimize database performance and resource utilization), 'Simplified management' (Simplify database management and reduce administrative overhead), 'Globally scalable' (Enable global scalability and data sovereignty compliance), and 'High availability' (Gain a competitive advantage with a highly available and resilient database infrastructure).

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Database > Technologies > High Availability >

Global Data Services

Oracle Global Data Services (Oracle GDS) provide dynamic load balancing, failover, and centralized service management for a set of replicated databases that offer common services. The set of replicated databases can use Oracle Distributed Database architecture, Oracle Real Application Clusters (Oracle RAC) and non-cluster Oracle Databases interconnected through Oracle Data Guard and Oracle GoldenGate.

Overview Features FAQ

Why choose Oracle Global Data Services?

- ✓ **Reduced downtime**
Reduce or eliminate downtime and ensure business continuity.
- ✓ **Performance optimized**
Optimize database performance and resource utilization.
- ✓ **Simplified management**
Simplify database management and reduce administrative overhead.
- ✓ **Globally scalable**
Enable global scalability and data sovereignty compliance.
- ✓ **High availability**
Gain a competitive advantage with a highly available and resilient database infrastructure.

GDS Documentation

Explore Oracle Global Data Services (GDS) documentation to learn concepts, setup, administration, and best practices for Oracle Database 23ai and 19c.

Oracle Database 23ai

- [Oracle Global Data Services Concepts and Administration Guide \(23ai\)](#)
- [High Availability Overview and Best Practices \(23ai\)](#)

Oracle Database 19c

- [Oracle Global Data Services Concepts and Administration Guide \(19c\)](#)
- [High Availability Overview and Best Practices \(19c\)](#)

GDS LiveLabs! Workshop on Oracle Global Data Services

Get hands-on with Oracle Global Data Services (GDS) and learn how to install, configure, and setup Oracle GDS for Oracle Database 23ai. Configure and observe how global services switchover and failover between primary and standby databases during planned and unplanned events transparently and without incurring any data loss.

<https://apexapps.oracle.com/pls/apex/r/dbpm/livelabs/view-workshop?wid=4125>

Introduction to Oracle Global Data Services (GDS)

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 2 hours

Outline

- Introduction to Oracle Global Data Services (GDS)
- Get Started
- Lab 1: Validate Workshop Environment
- Lab 2: Oracle GDS Installation
- Lab 3: Database Updates for Enabling GDS
- Lab 4: Oracle GDS Configuration
- Lab 5: Prepare a Sample Schema and Test Global Service
- Lab 6: Switchover and Failover Tests Using Global Services
- Need Help?

Prerequisites

- Familiarity with Oracle Database and Oracle Networking
- Some understanding of database services

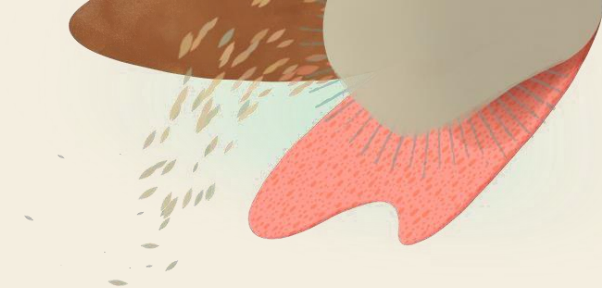
About This Workshop

Oracle Global Data Services is a feature of the Oracle Database and enables transparent high availability, disaster recoverability, global scalability, and performance. A primary database and one or more replicas constitute a GDS database pool on which Global Services are configured. During planned and unplanned events, GDS orchestrates

[Introduction to Oracle Global Data Services \(GDS\)](#)

Oracle GDS – Key Features

Summary



- **True High Availability:** Ensures continuous operation of mission-critical applications, even during planned maintenance or unplanned outages.
 - **Hands-free Automated Failover:** Automatically redirects applications to a healthy database instance in case of failures, minimizing downtime and ensuring business continuity.
-
- **Intelligent Workload Routing:** Intelligently routes application traffic to the optimal database based on factors such as client location, workload, and data lag.
 - **Dynamic Load Balancing:** Dynamically distributes workloads across database replicas, maximizing resource utilization and preventing overload.
-
- **Modular Database Architectures:** Provides an easy approach to building modular database architectures to meet application SLAs.
 - **Centralized Management:** Provides a single point of control for managing data services across your entire database infrastructure.

Q&A

Oracle Global Data Services