Real World Experience
Improving ODP.NET Application Availability at Epsilon

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- Snapshot of Epsilon
- Improving ODP.NET Application Availability – Real World Experience

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Snapshot of Epsilon

We deliver personalized connections, build loyalty and drive business for brands around the world

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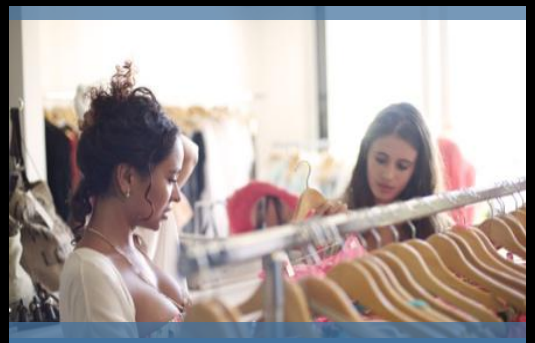
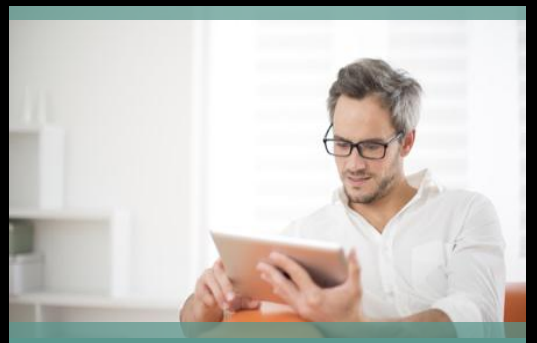
Data

Know each of your customers on a meaningful level with Agility Audience, our premier solution offering unrivaled customer information, data resources and tools.



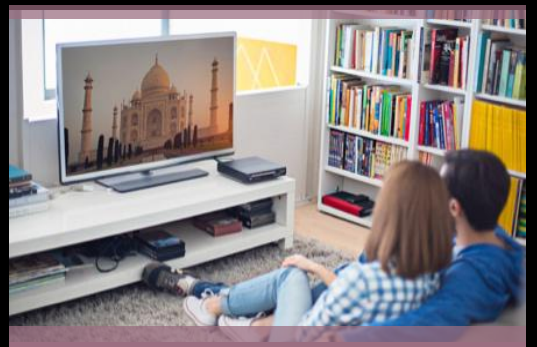
Loyalty

Create a one-of-a-kind loyalty program and grow long-lasting customer relationships with Agility Loyalty® and our full suite of loyalty capabilities and services.



Digital Messaging

Orchestrate personalized conversations taking your marketing where it needs to go with Agility Harmony®, the first platform built to be omnichannel from the ground up.



Media Reach

Optimize your media mix with the customer data, marketing technology and channels expertise that Epsilon and Conversant provide. We deliver personalized content that gets results.

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Improving ODP.NET Application Availability at Epsilon

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High Level Business Requirements

- Real time POS integration with extreme performance and availability requirements
- System needs to be fault tolerant
- Maintenance needs to be performed while system is online
- Real-time monitoring and reporting of system performance and health
- Web API call SLA less than 100ms for simple transaction and 500ms for complex transaction

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Challenges Before ODP.NET HA implementation

- No draining method available using dedicated connection model
- Planned maintenance required application service reset - major pain point
- No protection for application API calls during unplanned outages e.g. node failure
- Large number of dedicated connection uses higher amount of CPU and memory in application server

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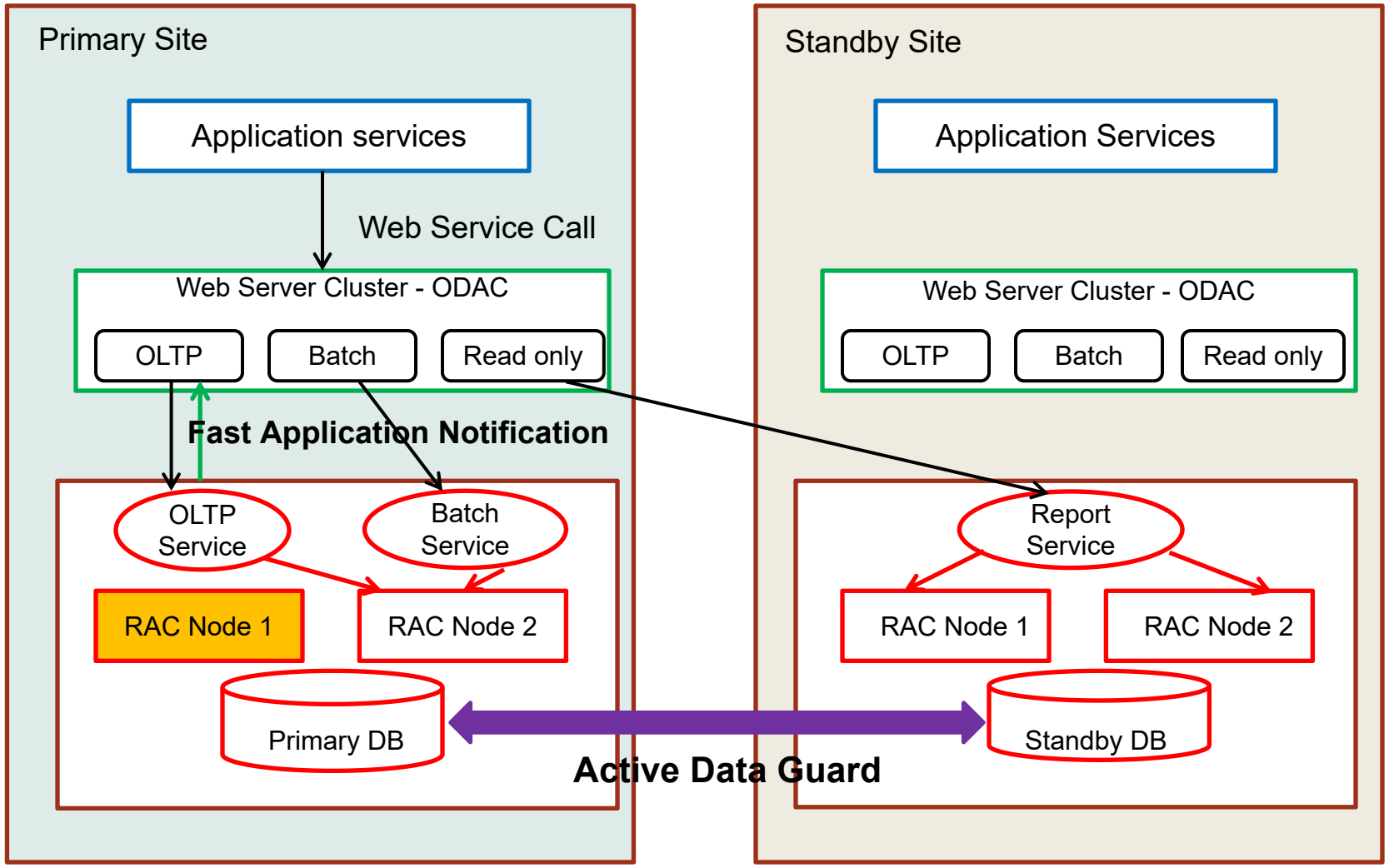
Scheduled maintenance: Application service placement



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Handling Planned Maintenance

- Ensure port 6200 is open in firewall between database and application server for Fast application notification messages from ONS

- Use Connection pool with proper settings required for application

<add key="DefaultConnectionString" value="User ID=<APP_USER>;Password=<PASSWORD>;Data Source=<TNS_ALIAS>;Decr Pool Size=5;Incr Pool Size=5;Max Pool Size=200;Min Pool Size=10;HA Events=True; Load Balancing=True; Connection Timeout=40" />

- For batch workload (which doesn't run all the time) , recommend to use Min Pool size 0 for complete connection draining

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Handling Planned Maintenance

- Ensure application connections are returned back to pool once work is done for smooth draining
- Set TraceOption=1 , TraceLevel=127 (only during debugging)

```
for i in $( ls -l|awk '{print $9}' ); do
        echo filename: $i
        cat "$i"|grep "OracleConnection"|grep -i Open|grep -i "(ENTRY)"|wc -l
        cat "$i"|grep "OracleConnection"|grep -i Close|grep -i "(ENTRY)"|wc -l
        cat "$i"|grep "OracleConnection"|grep -i Dispose|grep -i "(ENTRY)"|wc -l
done
```

- Disable trace before production implementation
- Resource utilization is much less while using connection pooling compared to dedicated connection
- Using ServiceRelocationConnectionTimeout along with fast connection failover (HA events=true) helps to hide errors during data guard switchover brownout period.

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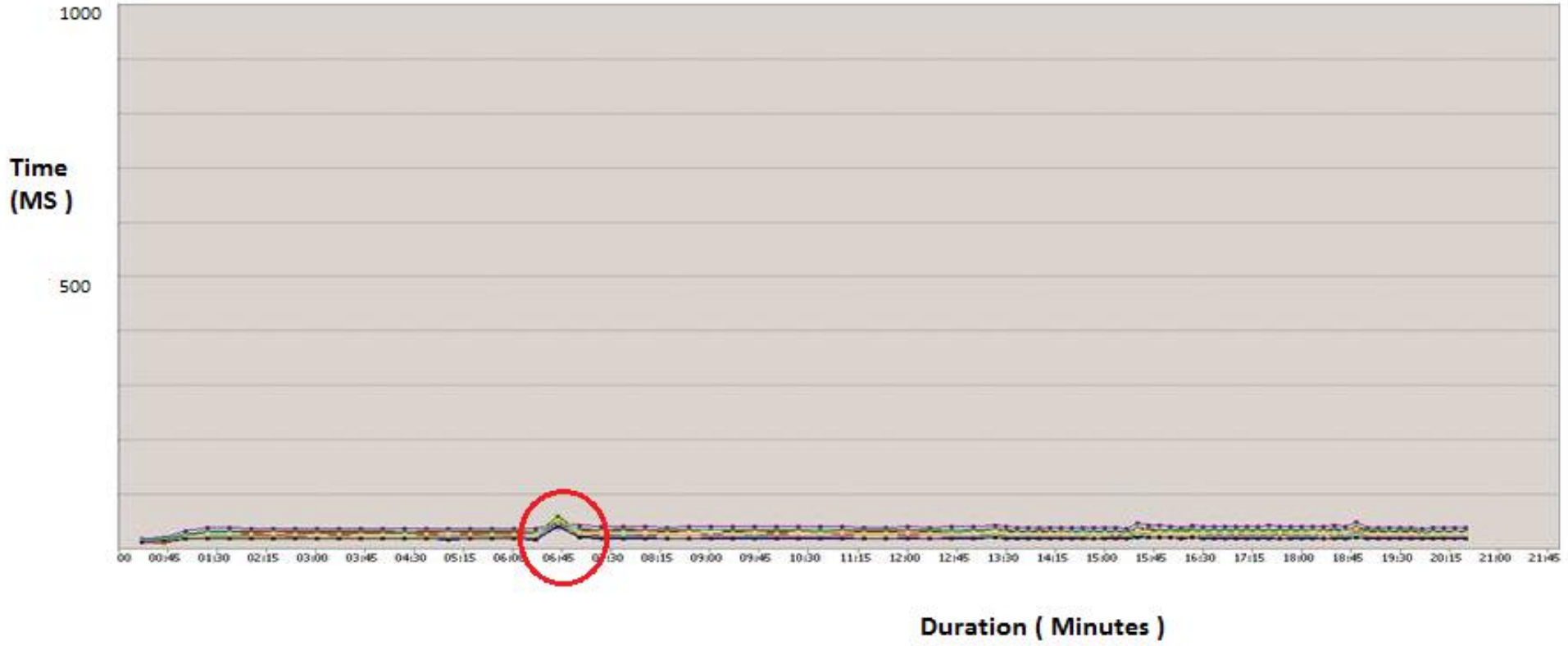
Handling Planned Maintenance

srvctl relocate service -db t1fusn -service OLTP_SERVICE -oldinst t1fusn1 -newinst t1fusn2 -drain_timeout 20 -stopoption Immediate



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Handling Unplanned Outage

Feature	Unmanaged Driver	Managed Driver
Fast Application Notification	Yes	Yes
Transaction Guard	Yes	Yes
Application Continuity	Yes	No

- Pre 12.2 , Transaction guard along with ODP.NET implementation can be used to handle unplanned outage
- Implementation is not out of the box and requires custom code in error handling section
- Application Continuity is out of the box solution to handle unplanned outage (requires 12.2 RDBMS and 12.2 ODAC) , uses transaction guard internally.

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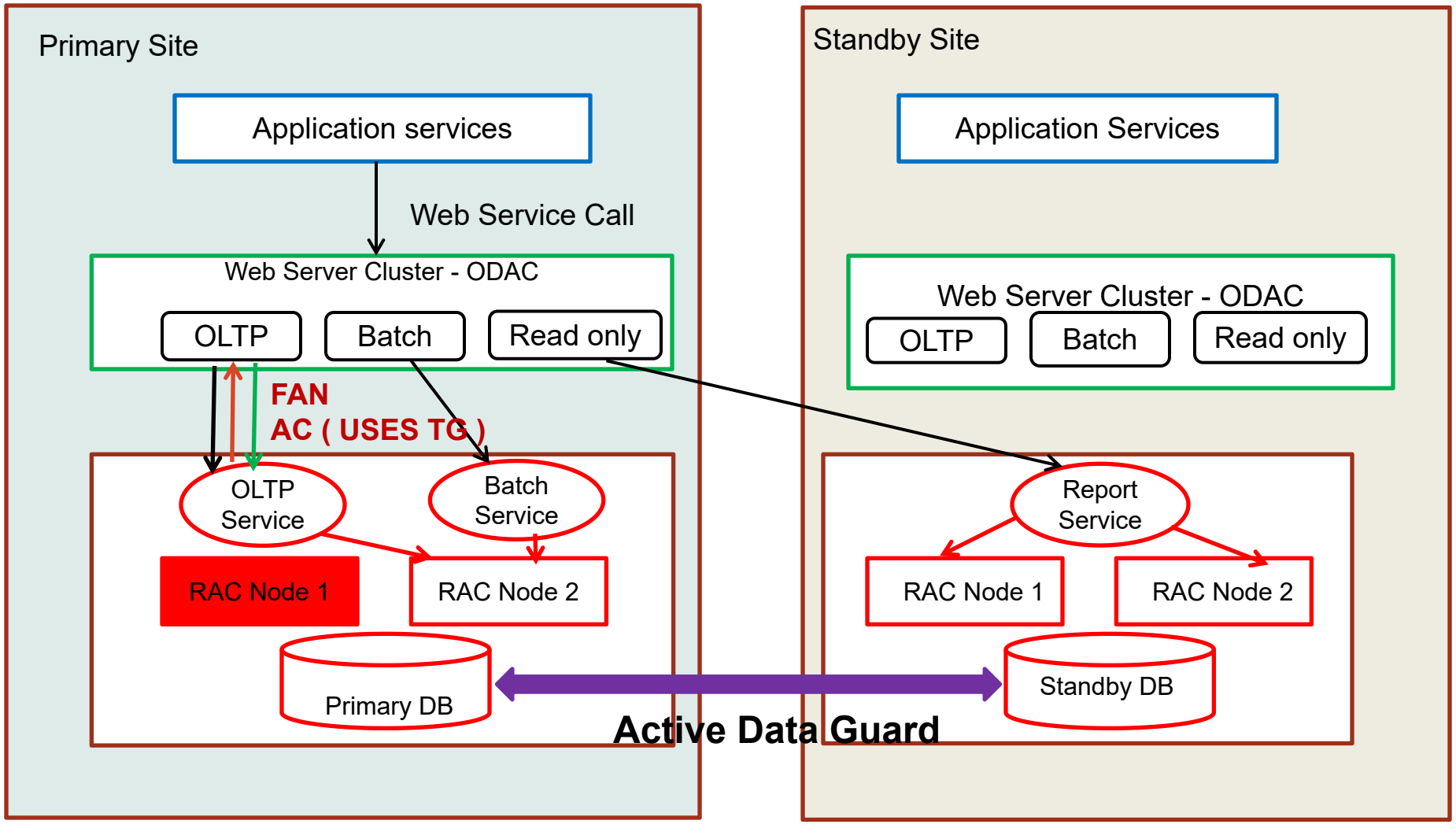
Unplanned Outage: Application service placement



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Handling Unplanned Outage

- **Connection Pool Settings**

<add key="DefaultConnectionString" value="User ID=<APP_USER>;Password=<PASSWORD>;Data Source=<TNS_ALIAS>;Decr Pool Size=5;Incr Pool Size=5;Max Pool Size=200;Min Pool Size=10;HA Events=True;Load Balancing=True;Application Continuity=true;Connection Timeout=40" />

- **Database Settings :**

1. GRANT EXECUTE ON DBMS_APP_CONT TO <app_user>;
2. GRANT KEEP SYSGUID to <app_user>;
3. GRANT KEEP DATE TIME to <app_user>;
4. SELECT 'grant KEEP SEQUENCE on '||sequence_owner||'.'||sequence_name||' to <app_user>;' FROM dba_sequences WHERE sequence_owner LIKE '<schema_owner>';
5. SELECT 'alter SEQUENCE '||sequence_owner||'.'||sequence_name||' KEEP;' FROM dba_sequences WHERE sequence_owner LIKE '<schema_owner>‘;

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Handling Unplanned Outage

```
[oracle@dc1uorclrac01 trace]$ srvctl config service -db t1fusn -service oltp_service
Service name: OLTP_SERVICE
.
AQ HA notifications: true
.
Commit Outcome: true                    => Transaction Guard Enabled
Failover type: TRANSACTION              => Application continuity enabled
Failover method:
TAF failover retries: 30
TAF failover delay: 5
.
Connection Load Balancing Goal: LONG
Runtime Load Balancing Goal: SERVICE_TIME
.
Retention: 86400 seconds
Replay Initiation Time: 300 seconds
Drain timeout: 30 seconds               => New in 12.2
Stop option: immediate                  => New in 12.2
.
Preferred instances: t1fusn1
Available instances: t1fusn2
.
```

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Handling Unplanned Outage

- **Coverage Analysis :**

  - Set trace : alter system set event='10602 trace name context forever, level 28:trace[progint_appcont_rdbms]:10702 trace name context forever, level 16' scope = spfile ;

  - Run odp.net application workload , initiate failure

  - Run orachk coverage analysis

./orachk **-asmhome** /home/oracle/jar/asm-all-5.0.3.jar **-javahome** /lfs/dba/java/jdk1.8.0_144 -**apptrc** /u01/app/oracle/diag/rdbms/t1fusn/t1fusn1/trace **1**

  - Analyze output of orachk

  - Disable trace

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Handling Unplanned Outage

Observations :

Application Continuity Summary

...

Outage Type	Status	Message
Coverage checks		TotalRequest = 62852 PASS = 13506 WARNING = 48825 FAIL = 521

	WARNING	[WARNING] Trace file name = t1fusn1_ora_22835.trc Row number = 739 SERVICE NAME = (OLTP_SERVICE) MODULE NAME = (w3wp.exe) ACTION NAME = null CLIENT ID = null Coverage(%) = 50 ProtectedCalls = 1 UnProtectedCalls = 1

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Special Considerations

- Kill session while Application Continuity is enabled at service level should use noreplay clause:

  alter system kill session 'sid, serial#, @inst' noreplay;
  alter system disconnect session 'sid, serial#, @inst' noreplay;

- odp.net CONNECT_TIMEOUT must be > ((RETRY_COUNT+1) * RETRY_DELAY)

```
OLTP_SERVICE =
 (DESCRIPTION =
 (CONNECT_TIMEOUT= 60)(RETRY_COUNT=5)(RETRY_DELAY=5)
 (TRANSPORT_CONNECT_TIMEOUT=3)
  (ADDRESS = (PROTOCOL = TCP)(HOST = dc1uorclrac-scan.res.prod.global)(PORT = 1521))
  (CONNECT_DATA =
   (SERVER = DEDICATED)
   (SERVICE_NAME = oltp_service.res.prod.global)
  )
 )
```

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Lessons learned

- Observed higher resource utilization in Web Servers (5 – 10% , it can vary depending on workload)

- Change in transaction guard API for 12.2c:

https://docs.oracle.com/database/122/ODPNT/release_changes.htm#GUID-2B9620E7-F8AB-47AA-935C-B6B9E4893DF6

- For Application Continuity setup, refer following :

http://www.oracle.com/technetwork/database/options/clustering/application-continuity-wp-12c-1966213.pdf

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Benefits after ODP.NET HA implementation

- Scheduled maintenance of Oracle technology stack can be done without disrupting business user experience. (meet security compliance as well as uptime SLA)
- No longer application server restart required for planned maintenance or unplanned outage of oracle stack – a big relief
- CPU utilization reduced in application servers after connection pool implementation
- No application call failure even in case of unplanned outage improves user experience

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Next Steps

- Use Application Continuity for ODP.NET for managed driver once available
- Implementation sharding using odp.net to support horizontal scalability of data layer

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Q&A?

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Handling methods

- Planned maintenance operations
  - OS Patching
  - Database patching
  - System migration
  - Network maintenance

- Unplanned Outages
  - Server Crash
  - Network interruption

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Technology Stack

- Exadata in both Primary and DR site
- Application server uses :
  - Web Server using ODAC 12c

- Oracle Database 12c
  - Real Application Clusters (RAC)
  - Fast Application Notification (FAN)
  - Application Continuity (AC)
  - Transaction Guard (TG)

- Oracle Active data guard for replication
- ZFS backup appliance for database backup

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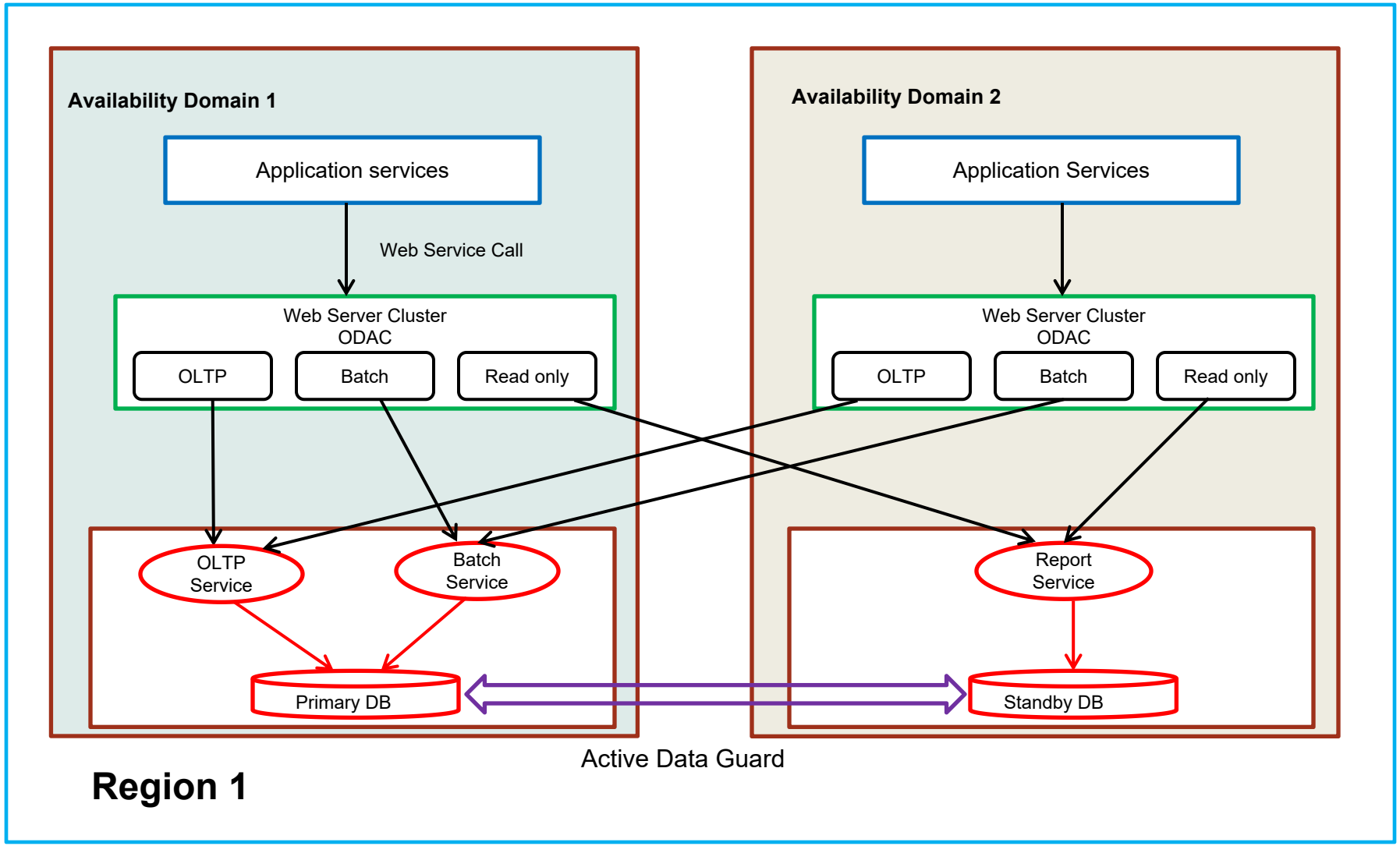
Epsilon application service placement in Cloud



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Driver Mapping

Managed Driver :

<section NAME="oracle.manageddataaccess.client"
TYPE="OracleInternal.Common.ODPMSectionHandler, Oracle.ManagedDataAccess,
Version=4.121.2.0, Culture=neutral, PublicKeyToken=89b483f429c47342" />

Unmanaged Driver:

section NAME="oracle.unmanageddataaccess.client"
"type="OracleInternal.Common.CustomSectionHandler, Oracle.DataAccess",
Version=4.122.1.0, Culture=neutral, PublicKeyToken=89b483f429c47342" />

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Driver Mapping

Managed Driver:

```
<oracle.manageddataaccess.client>
   <VERSION NUMBER="*">
    <SETTINGS>
     <setting NAME="TNS_ADMIN" VALUE="C:\Oracle\product\12.1.0\client_64\Network\Admin" />
    </SETTINGS>
   </VERSION>
 </oracle.manageddataaccess.client>
```

Unmanaged Driver:

```
<oracle.unmanageddataaccess.client>
   <VERSION NUMBER="*">
    <SETTINGS>
     <setting NAME="TNS_ADMIN" VALUE="C:\Oracle122\product\12.2.0\client_64\Network\Admin" />
    </SETTINGS>
   </VERSION>
 </oracle.unmanageddataaccess.client>
```

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Driver Mapping

Managed Driver:

```
<dependentAssembly>
      <assemblyIdentity NAME="Oracle.ManagedDataAccess" publicKeyToken="89b483f429c47342"
culture="neutral" />
      <bindingRedirect oldVersion="4.121.0.0 - 4.65535.65535.65535" newVersion="4.121.2.0" />
 </dependentAssembly>
```

Unmanaged Driver:

```
<dependentAssembly>
      <assemblyIdentity NAME="Oracle.DataAccess" publicKeyToken="89b483f429c47342"
culture="neutral" />
      <bindingRedirect oldVersion="4.121.0.0 - 4.65535.65535.65535" newVersion="4.122.1.0" />
     </dependentAssembly>
```

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Recommended TNS settings

```
OLTP_SERVICE=
  (DESCRIPTION=
    (CONNECT_TIMEOUT=60)(RETRY_COUNT=5)(RETRY_COUNT=5)
    (TRANSPORT_CONNECT_TIMEOUT=3)
  (ADDRESS_LIST=
   (LOAD_BALANCE=on)
     (ADDRESS=(PROTOCOL=TCP)(HOST=dc1uepsirac-scan.res.prod.global)(PORT=1521)) )
  (ADDRESS_LIST=
   (LOAD_BALANCE=on)
     (ADDRESS=(PROTOCOL=TCP)(HOST= fc1uepsirac-scan.res.prod.global)(PORT=1521)) )
     (CONNECT_DATA=(SERVICE_NAME=OLTP_SERVICE)))
```