CON6757
Improving Application Continuity

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Safe Harbor Statement

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Announcing Oracle Database 12c Release 2 on Oracle Cloud

• Available now
  – Exadata Express Cloud Service

• Coming soon
  – Database Cloud Services
  – Exadata Cloud Machine

Oracle is presenting features for Oracle Database 12c Release 2 on Oracle Cloud. We will announce availability of the On-Prem release sometime after Open World.
Program Agenda

1. Problems Faced
2. Are your building blocks in place?
3. Easy steps for Application Continuity
4. Epsilon - Production Implementation
What problems face users at database outages?
In-Flight Work

Pre-12c Situation

Database outages cause loss of in-flight work, leaving users and applications in-doubt

– Restart applications and mid-tiers
– User frustration
– Cancelled work
– Duplicate submissions
– Developer pains
– Errors at scheduled maintenance

Sorry. Internal Server Error - 500 Error
We are currently experiencing an issue with our servers on coolcar.com. Please come back later.
How do we solve for all applications?

- Transparent to applications and mid-tiers
- Scales to internet and cloud operations
- Covers every driver and most application features
- Same everywhere – connecting, failover, interfaces
- Takes HA adoption out of the developers hands to operation only
Are your building blocks in place?
Runtime Affinity. Failover within and across Sites.

Production Site

RAC
– Online Rolling Maintenance
– Scalability
– Server HA

RAC One
– Online Rolling Maintenance
– Server HA

Replicas

Active Data Guard
– Scheduled switchover
– Data Protection, DR
– Query Offload

Data Guard
– Scheduled switchover
– Data Protection, DR

GoldenGate
– Scheduled switchover
– Active-active replication
– Heterogeneous

Sharding
– Massive OLTP
– Scheduled switchover
– Active-active replication
– Heterogeneous
12cR2 Oracle Real Application Clusters
Continuous Service Availability

“Always Running”

Real Application Service Levels

- Scales PDBs and Services
- 2 second detection on EXA
- Recovery in low seconds
- Drains work gradually
- Recovers in-flight with AC
12cR2 Oracle Active Data Guard

Continuous Service Availability

Recover in-flight with Application Continuity

ADG sessions survive standby role change

Drain then switchover, AC recovers stragglers

Switchover to <db_resource_name> [wait]
12cR2 Oracle Multitenant

Continuous Service Availability

Online PDB relocate
Drain and cut over in under 10 seconds

Relocate and Drain Read service ahead

Final REDO Apply

Application Continuity moves stragglers

CDB1

CDB2

GL, AP, OE

OE, PO

TNS COMMON LISTENER REGISTRATION

TNS LISTENER
Use Services for Location Transparency

Services provide a “dial in number” for your application

- Regardless of location, application keeps the name
- Moving, reshaping, prioritizing controls how a service is offered
- Batch and OLTP separated
- DB and PDB names for admin only
Are your connections properly configured?

12c R2 Same for All Drivers

```
alias = (DESCRIPTION =
  (CONNECT_TIMEOUT=90)  (RETRY_COUNT=20)(RETRY_DELAY=3)
  (TRANSPORT_CONNECT_TIMEOUT=3)
  (ADDRESS_LIST =
    (LOAD_BALANCE=on)
    ( ADDRESS = (PROTOCOL = TCP)(HOST=primary-scan)(PORT=1521))
  (ADDRESS_LIST =
    (LOAD_BALANCE=on)
    ( ADDRESS = (PROTOCOL = TCP)(HOST=secondary-scan)(PORT=1521)))
  (CONNECT_DATA=(SERVICE_NAME = gold-cloud)))
```

**Automatic Retries**

**Configure in One Place**

**LDAP or TNS names**

**ALWAYS use a service that is NOT DB/PDB name**
Use FAN to Eliminate TCP Timeouts, Drain on planned

12cR2 FAN
All Applications
Drivers and pools break-out & drain

On by Default, Auto-Configured
Supports 11.2, 12.1, and later databases
## 12c FAN On by Default and Auto-Configured

### All Oracle use ONS

<table>
<thead>
<tr>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>JDBC Universal Connection Pool</td>
</tr>
<tr>
<td>JDBC Thin Driver (12.2)</td>
</tr>
<tr>
<td>OCI/OCCI driver</td>
</tr>
<tr>
<td>ODP.NET Unmanaged Provider (OCI)</td>
</tr>
<tr>
<td>ODP.NET Managed Provider (C#)</td>
</tr>
<tr>
<td>OCI Session Pool</td>
</tr>
<tr>
<td>WebLogic Active GridLink</td>
</tr>
<tr>
<td>Tuxedo</td>
</tr>
<tr>
<td>Listeners</td>
</tr>
</tbody>
</table>

### Auto-Configured

```sql
DESCRIPTION =
  (CONNECT_TIMEOUT=90) (RETRY_COUNT=20) (RETRY_DELAY=3) (TRANSPORT_CONNECT_TIMEOUT=3)
  (ADDRESS_LIST =
    (LOAD_BALANCE=on)
    (ADDRESS = (PROTOCOL = TCP)
      (HOST=primary-scan) (PORT=1521)))
  (ADDRESS_LIST =
    (LOAD_BALANCE=on)
    (ADDRESS = (PROTOCOL = TCP)
      (HOST=second-scan) (PORT=1521)))
  (CONNECT_DATA=(SERVICE_NAME=gold)))
```

- **ONS Node Set 1**
- **ONS Node Set 2**
Align your Timeouts

Application Timeout

- FSFO + Crash Recovery
- 2 x MISSCOUNT + FSMT

MISSCOUNT or EXA Special

FAST START MTTR TARGET (FSMT)

AC REPLAY TIMEOUT

FAST START FAILOVER (FSFO)

Crash Recovery (FSMT + Open)

AC REPLAY TIMEOUT

Application Timeout (SLA)
Easy Steps for Application Continuity

Unplanned outages should be hidden from applications
Application Continuity

In-flight work continues

- Replays in-flight work on recoverable errors
- Masks hardware, software, network, storage errors and timeouts
- 12.1 JDBC-Thin, UCP, WebLogic Server, 3rd Party Java application servers

OCI, ODP.NET unmanaged, JDBC Thin on XA, Tuxedo, SQL*Plus
- RAC, RAC One, & Active Data Guard
Application Continuity Demonstration
<table>
<thead>
<tr>
<th>1 – Normal Operation</th>
<th>2 – Outage Phase 1: Reconnect</th>
<th>3 – Outage Phase 2: Replay</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Client marks database requests</td>
<td>• Checks replay is enabled</td>
<td>• Replays captured calls</td>
</tr>
<tr>
<td>• Server decides which calls can &amp; cannot be replayed</td>
<td>• Verifies timeliness</td>
<td>• Ensures results returned to app match original</td>
</tr>
<tr>
<td>• Directed, client holds original calls, their inputs,</td>
<td>• Creates a new connection</td>
<td>• On success, returns control to the application</td>
</tr>
<tr>
<td>and validation data</td>
<td>• Checks target database is</td>
<td></td>
</tr>
<tr>
<td></td>
<td>valid for replay</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Uses Transaction Guard to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>guarantee last outcome</td>
<td></td>
</tr>
</tbody>
</table>
## Easy Steps for Application Continuity

<table>
<thead>
<tr>
<th>Check</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify Requests</td>
<td>Use Oracle pools and return the connections, or add boundaries</td>
</tr>
<tr>
<td>No deprecated Java</td>
<td>Use <strong>ORACHk</strong> to know no deprecated Java (Java only)</td>
</tr>
<tr>
<td>Set Initial State</td>
<td>Do nothing for most apps, <strong>FAILOVER_RESTORE=LEVEL1</strong> for most others</td>
</tr>
<tr>
<td>Grant Keep</td>
<td>Grant keeping mutable values, e.g. seq.nextval, sysdate, systimestamp</td>
</tr>
<tr>
<td>Skip a request</td>
<td>Use a different connection or disable to skip replaying a request</td>
</tr>
<tr>
<td>Report Protection</td>
<td>Use <strong>ORACHk</strong> to report your coverage</td>
</tr>
</tbody>
</table>
Run the AC Assessments

How effective is Application Continuity for your application?
Where Application Continuity is not in effect - what steps need to be taken?

<table>
<thead>
<tr>
<th>No</th>
<th>Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Analyze and Report Coverage</strong></td>
</tr>
<tr>
<td>2</td>
<td><strong>Report usage of deprecated Java Classes</strong></td>
</tr>
</tbody>
</table>

Available in ORAchk

https://blogs.oracle.com/WebLogicServer/entry/using_orachk_for_coverage_analysis
12cR2 Application Continuity for Long Running

- Applications that borrow a connection and do not return until completed
- Purges committed transactions as its goes
- Session states reset and replay through outside your TX
- Rules apply
History of NEC/Oracle alliance

The NEC and Oracle alliance is continuous over a quarter of a century

- **1987**: NEC and Oracle OEM contract started (first in Japan)
- **1997**: NEC and BEA alliance started
- **2000**: Development alliance for mission critical systems
- **2005**: STA (Strategic Technology Alliance) started
- **2006**: NEC’s RAC 10gR2 fast failover best practice
- **2008**: NEC’s RAC 11gR1 fast failover best practice
- **2012**: NEC high available Linux DB platform
- **2013**: Zero error planned DB maintenance and unplanned DB outage solution
- **2015**: Zero error solution enhancement for cloud
- **2015, 2016**: Won Global Partner Award: Database

Won Global Partner Award: Database 2015, 2016
DB Instance Down

Confirmed no errors to all tenant’s clients

WebLogic

PDB services

PDBs

RAC Node#1

RAC Node#2

No Errors!!!

Application wait FSMT (max)

: request and response

DB Reconfig & Recovery

FAN

instance down

Reconnect

Application Continuity
Public Network Down

Confirmed no errors to all tenant’s clients

WebLogic

RAC Node#1

RAC Node#2

PDB services

PDB services

Public Network down

No Errors!!!

Application wait 1s

Reconnect

Application Continuity

: request and response
DB Node Down

Confirmed no errors to all tenant’s clients

No Errors!!!

Application wait Misscount+FSMT (max)

WebLogic

RAC Node#1

RAC Node#2

PDB services

PDBs

PDB services

PDBs

GRID + DB Reconfig & Recovery

Reconnect

FAN

Application Continuity

No Errors!!!

Node down

: request and response
PDB Online Relocate

Confirmed no errors to all tenant’s clients

Application Continuity enables no error replay

(2) Open & Start Service

WebLogic

CDB#1

Migration PDB

CDB#2

(1) Relocate

Online Copy

REDO sync

request and response

WebLogic

CDB#1

... Other PDBs

CDB#2

Other PDBs

Other PDBs

Confirmed no errors to all tenant’s clients
Application Continuity Performance
WebLogic Server Active GridLink and Real Application Clusters

- Response time (ms)
  - select & update
- Throughput (tx/s)
  - select & update

- CPU per transaction
  - AP server CPU
  - DB server CPU
- Memory per transaction
  - AP server memory

AC OFF vs AC ON

MedRec Application
Lessons Learned

• Align timeouts to allow failover and replay

• Return connections to pool between requests.

• Use the recommended TNS to auto-configure FAN and Retry

• Use mutable values. Think of mutables in terms of delayed execution.

• If the application sets values outside the application – use FAILOVER_RESTORE

• If testing and using V$instance etc, select from the driver itself, not in requests
Real World Experience
Improving Application Continuity at Epsilon

Gairik Chakraborty
Agenda

• Snapshot of Epsilon
• Production Implementation
Snapshot of Epsilon
Epsilon at a Glance

- Epsilon is all-encompassing global marketing company, we are global leader in turning data-driven marketing into lasting relationships.
- More than 7000 associates and 70 offices worldwide
- Largest permission-based e-mailer in the world, delivering over 47 billion emails annually
- World’s leading source of data with information covering over 250 million consumers and 273M devices
- More than 2,000 global clients, including 26 of the Fortune 100
  - 9 out of 10 Top Banks
  - 8 out of 10 Top Retailers
  - The Top 10 Pharmaceutical Companies
  - The Top 10 Automotive Companies
Epsilon at a Glance

Marketing Data
Helps Brand to understand customers and connect with them

Insights and Strategy
Understand what customers and prospects are doing and thinking. How and when they engage with brands

Marketing Technology
Technology platforms enables connection between customer and Brands

Creative Services
Connects customer to brands at emotional level through strategic thinking, creative digital design, art direction

Agility Harmony
Next generation digital messaging platform developed by marketers for effective multichannel campaigns including e-mail, mobile and social media

Media reach
Always have right digital or offline presence to deliver targeted messages to potential customers
About Me

- Senior Director, Database Technology team
- High availability and Engineered Systems implementation for multiple large fortune 100 clients
- Working on Big Data and Cloud deployments for Marketing technology platforms
- Over 15 years of experience working on Oracle technology platform
- OCP and OCE (DB 12c, RAC and Exadata)
Improving Application Continuity at Epsilon
High Level Business Requirements

• Global customer with extreme performance and availability requirements
• Zero downtime requirement for entire application stack
• System needs to be fault tolerant including entire site failure
• Maintenance needs to be performed while system is online
• Real-time monitoring and reporting of system performance and health
Previous State and Challenges

Previous State

• Database version 11gR2 RAC 11.2.0.4
• Application was using WLS 12.1.3
• Active Data Guard with reporting workload running from DR site
• Application servers sitting idle on DR site

Challenges

• Network maintenance in a data center requires application downtime
• Significant investment for DR site, most of the resources stays idle
• No protection for unplanned outages including node failures
• Many manual steps required to switch over application to DR site and process involves downtime
• Customer wanted zero downtime solution
Current State and Resolutions

Actions

• Database upgraded to 12c – 12.1.0.2
• Application is now using WLS 12.2.1
• Database hardware platform using Exadata X5-2
• Active / Active Replication between the sites using GoldenGate – version 12.2

Outcome

• Connection pool drains quickly after receiving FAN events
• **No longer application server restart** required for planned maintenance or unplanned outage of Oracle stack
• **Application Continuity replays** transactions during unplanned outage – which would have failed otherwise.
  **No impact to user experience**
• WLS coherence federated caching feature helps to replicate cached data across multiple data center and keeps application server in sync
• GoldenGate replication keeps databases in sync at both data centers
• Moved to a supported release good till 2018
Technology Stack

- Exadata X5-2 Primary and DR site

- Application servers use:
  - WebLogic Server 12.2.1 with Active Gridlink
  - Federated Coherence caching

- Oracle Database 12c (12.1.0.2)
  - Real Application Clusters (RAC)
  - Active Data Guard
  - Fast Application Notification (FAN)
  - Application Continuity (AC)
  - Transaction Guard (TG)

- Oracle GoldenGate (12.2) for active-active replication
Normal Operation: Application Service Placement

Site 1
- Web Server cluster
  - WLS 12.2.1
- Application Server Cluster
  - WLS 12.2.1
  - OLTP
  - Batch
  - OLTP Service
    - RAC Node 1 12.1.0.2
  - Batch Service
    - RAC Node 2 12.1.0.2
- Site 1 DB

Site 2
- Web Server cluster
  - WLS 12.2.1
- Application Server Cluster
  - WLS 12.2.1
  - OLTP
  - Batch
  - OLTP Service
    - RAC Node 1 12.1.0.2
  - Batch Service
    - RAC Node 2 12.1.0.2
- Site 2 DB

Connections:
- Federated Caching
- Golden Gate Replication
Scheduled Maintenance: Application Service Placement

Site 1

Web Server cluster
WLS 12.2.1

Application Server Cluster
WLS 12.2.1

OLTP

Batch

OLTP Service

RAC Node 1
12.1.0.2

RAC Node 2
12.1.0.2

Site 1 DB

Site 2

Web Server cluster
WLS 12.2.1

Application Server Cluster
WLS 12.2.1

OLTP

Batch

OLTP Service

RAC Node 1
12.1.0.2

RAC Node 2
12.1.0.2

Site 2 DB

Federated Caching

Federated Caching

Fast Application Notification

Golden Gate Replication

Golden Gate Replication
Unplanned Outage: Application Service Placement

Site 1

- Web Server cluster
  - WLS 12.2.1
- Application Server Cluster
  - WLS 12.2.1
  - OLTP
  - Batch
  - RAC Node 1
    - 12.1.0.2
  - RAC Node 2
    - 12.1.0.2

Site 2

- Web Server cluster
  - WLS 12.2.1
- Application Server Cluster
  - WLS 12.2.1
  - OLTP
  - Batch
  - RAC Node 1
    - 12.1.0.2
  - RAC Node 2
    - 12.1.0.2

Connections:
- Federated Caching
- Golden Gate Replication
- Fast Application Notification
- Transaction Guard
- Application Continuity

Site 1 DB - Site 2 DB
Application Continuity Assessment

1. Clean up Concrete Classes

Oracle Application Continuity Assessment Report

System Health Score is 99 out of 100 (detail)

Summary

<table>
<thead>
<tr>
<th>OS/Kernel Version</th>
<th>LINUX X86-64 OELRHEL 6 2.6.32-504.23.4.el6.x86_64</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of nodes</td>
<td>1</td>
</tr>
<tr>
<td>Hostnames</td>
<td>1</td>
</tr>
<tr>
<td>orachk Version</td>
<td>12.1.0.2.6_20160207</td>
</tr>
<tr>
<td>Collection</td>
<td>orachk_dclux_web01_032316_122036.zip</td>
</tr>
<tr>
<td>Duration</td>
<td>17 seconds</td>
</tr>
<tr>
<td>Executed by</td>
<td>appweb</td>
</tr>
<tr>
<td>Arguments</td>
<td>-asmhome_../asm/asm-5.1/lib/all/asm-all-5.1.jar -javahome /app01/java/jdk1.8.0.72 -appjar /app01/广电/weblogic_domains/gr_web_domain/servers/web01/tmp/WL_user/p10-广电-web-devenv-ant3-16</td>
</tr>
<tr>
<td>Collection Date</td>
<td>23-Mar-2016 12:20:42</td>
</tr>
</tbody>
</table>
Concrete class check - results

Application Continuity Summary

<table>
<thead>
<tr>
<th>Outage Type</th>
<th>Status</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete class checks</td>
<td>Total: 28092 Passed: 28089 Warning: 0 Failed: 3 (Failed check count is one per file)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FAILED</td>
<td>[com/epsilon][/model/MegaMenuContentHtmlData][Field] name=htmlClob, descr=Lorale/sql/CLOB; lineo=unknown</td>
</tr>
<tr>
<td></td>
<td>FAILED</td>
<td>[com/epsilon][/model/MegaMenuContentHtmlData][Method] name=getHtmlClob, descr=Lorale/sql/CLOB; lineo=73</td>
</tr>
<tr>
<td></td>
<td>FAILED</td>
<td>[com/epsilon][/model/MegaMenuContentHtmlData][Method] name=setHtmlClob, descr=Lorale/sql/CLOB; lineo=78</td>
</tr>
<tr>
<td></td>
<td>FAILED</td>
<td>[com/epsilon][/model/MegaMenuContentHtmlData][Field] name=htmlClob, descr=Lorale/sql/CLOB; lineo=unknown</td>
</tr>
<tr>
<td></td>
<td>FAILED</td>
<td>[com/epsilon][/model/MegaMenuContentHtmlData][Method] name=setHtmlClob, descr=Lorale/sql/CLOB; lineo=73</td>
</tr>
<tr>
<td></td>
<td>FAILED</td>
<td>[com/epsilon][/model/MegaMenuContentHtmlData][Method] name=setHtmlClob, descr=Lorale/sql/CLOB; lineo=78</td>
</tr>
<tr>
<td></td>
<td>FAILED</td>
<td>[com/epsilon][/model/MegamenuContentData][Field] name=megamenuHtmlTemplate, descr=Lorale/sql/CLOB; lineo=unknown</td>
</tr>
<tr>
<td></td>
<td>FAILED</td>
<td>[com/epsilon][/model/MegamenuContentData][Method] name=getMegamenuHtmlTemplate, descr=Lorale/sql/CLOB; lineo=23</td>
</tr>
<tr>
<td></td>
<td>FAILED</td>
<td>[com/epsilon][/model/MegamenuContentData][Method] name=setMegamenuHtmlTemplate, descr=Lorale/sql/CLOB; lineo=26</td>
</tr>
</tbody>
</table>
Action Item

• Oracle recommends to replace concrete classes with new interfaces

<table>
<thead>
<tr>
<th>Old types</th>
<th>New interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>oracle.sql.ARRAY</td>
<td>oracle.jdbc.OracleArray</td>
</tr>
<tr>
<td>oracle.sql.STRUCT</td>
<td>oracle.jdbc.OracleStruct</td>
</tr>
<tr>
<td>oracle.sql.CLOB</td>
<td>oracle.jdbc.OracleClob</td>
</tr>
<tr>
<td>oracle.sql.BLOB</td>
<td>oracle.jdbc.OracleBlob</td>
</tr>
<tr>
<td>oracle.sql.REF</td>
<td>oracle.jdbc.OracleRef</td>
</tr>
<tr>
<td>oracle.sql.OPAQUE</td>
<td>oracle.jdbc.OracleOpaque</td>
</tr>
<tr>
<td>oracle.sql.Nclob</td>
<td>java.sql.NClob</td>
</tr>
<tr>
<td>oracle.sql.BFILE</td>
<td>oracle.jdbc.OracleBfile</td>
</tr>
</tbody>
</table>

• Refer My Oracle support note 1364193.1 for more details
Application Continuity Assessment

2. Coverage Analysis - results

Application Continuity Summary

<table>
<thead>
<tr>
<th>Outage Type</th>
<th>Status</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coverage checks</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TotalRequest = 398</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PASS = 389</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WARNING = 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FAIL = 9</td>
<td></td>
</tr>
</tbody>
</table>

| FAIL                         | [FAIL] Trace file name = QO1_SPI_ora_33017_trc Row number = 4005 |
|                             | SERVICE NAME = (QO1_SP_WEB_SSL_SERVICE) MODULE NAME = (JDBC Thin Client) ACTION NAME = null CLIENT ID = null |
|                             | Coverage(%) = 20 ProtectedCalls = 1 UnProtectedCalls = 0 |

| FAIL                         | [FAIL] Trace file name = QO1_SPI_ora_83837_trc Row number = 32339 |
|                             | SERVICE NAME = (QO1_SP_WEB_SSL_SERVICE) MODULE NAME = (JDBC Thin Client) ACTION NAME = null CLIENT ID = null |
|                             | Coverage(%) = 20 ProtectedCalls = 1 UnProtectedCalls = 0 |
Database side configuration

1. Enables Transaction Guard
2. Enables application Continuity

```
D1-RUS1 > srvctl config service -d d01-SP -s d01-SP_web_ssl_service.RUS.qa
Service name: D01-SP_WEB_SSL_SERVICE.RUS.QA
Server pool:
Cardinality: 2
Disconnect: false
Service role: PRIMARY
Management policy: AUTOMATIC
DTP transaction: false
AQ HA notifications: true
Global: false
Commit Outcome: true
Failover type: TRANSACTION
Failover method: BASIC
TAF failover retries: 10
TAF failover delay: 3
Connection Load Balancing Goal: LONG
Runtime Load Balancing Goal: SERVICE_TIME
TAF policy specification: BASIC
Edition:
Pluggable database name:
Maximum lag time: ANY
SQL Translation Profile:
Retention: 86400 seconds
Replay Initiation Time: 300 seconds
Session State Consistency: DYNAMIC
GSM Flags: 0
Service is enabled
Preferred instances: D01-SP1,D01-SP2
Available instances:
```
Special Considerations

- Need to think about sequences, systimestamp, sysdate, SYS_GUID usage in application.

- If original values are not preserved, replay will be rejected

GRANT [KEEP DATE TIME | KEEP SYSGUID].. [to USER]
GRANT KEEP SEQUENCE.. [to USER] on [sequence object];
ALTER SEQUENCE.. [sequence object] [KEEP|NOKEEP];

- 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;
Oracle JDBC Replay Driver

- At WebLogic Server choose Application Continuity enabled JDBC data source
Application Continuity tracing

- **RDBMS**

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

- **Web Logic Server**

  -Dweblogic.debug.DebugJDBCReplay=true

- **JDBC driver**

  -Djava.util.logging.config.file=configfile
  -Doracle.jdbc.Trace=true

Reference : https://docs.oracle.com/middleware/1221/wls/JDBCA/ds_oracledriver.htm#JDBCA787
Lessons Learned

• Use JDBC statement cache instead of WebLogic statement cache
  
  https://docs.oracle.com/middleware/1221/wls/JDBCA/ds_oracledriver.htm#JDBCA608

• For Application Continuity assessments, refer following:
  
  https://blogs.oracle.com/WebLogicServer/entry/using_orachk_to_clean_up
  
  https://blogs.oracle.com/WebLogicServer/entry/using_orachk_for_coverage_analysis
Business Benefits

• Scheduled maintenance (Database and OS patching) of Oracle technology stack can be done without disrupting business user experience. (meet security compliance as well as uptime SLA)

• Application restart is no longer required after planned maintenance or unplanned outages.

• No application call failures seen in case of unplanned outage improves end user experience

• Using Oracle technologies - Real Application Clusters on Exadata -Fast Application Notification Transaction Guard, Application Continuity, Golden Gate and Web logic Server coherence caching, Epsilon is able to deploy zero downtime solution across multiple sites.
Next Steps

- Use Application Continuity for ODP.NET to hide unplanned outages without any application code change

- Implementation of zero downtime solution for long running batch workload
Q&A?
Transaction Guard

Code your own
– hide unplanned outages
Transaction Guard
First RDBMS to preserve COMMIT Outcome

Guaranteed Commit Outcome

- Allows applications to deal with failures and timeouts correctly
- Without Transaction Guard, retrying can cause logical corruption
- Application Continuity uses Transaction Guard
- JDBC-thin, OCI/OCCI, ODP.NET unmanaged

12.2 ODP.NET managed, XA applications
How Transaction Guard Works

Oracle 12c Drivers

authenticate
........
........
COMMIT;

<get a new session>
Force commit outcome
COMMITTED?
COMPLETED?

Oracle 12c Database(s)

assign LTXID
start transaction

Session

New Session
Same DB Image

Preserve & Return
COMMIT OUTCOME

LTXID

SQL, PL/SQL, RPC

COMMIT

Error or timeout

GET_LTXID_OUTCOME

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Transaction Coverage

**Inclusions**

- Local
- Commit on Success (auto-commit)
- Distributed and Remote
- DDL, DCL, parallel DDL
- PL/SQL with embedded COMMIT
- PL/SQL with COMMIT as last call
- Read-only (allowed for)

**XA for one-phase optimizations and promotable XA**

**Exclusions**

- Active Data Guard with database links used to commit at primary
Transaction Guard – Key Takeaway

First RDBMS to preserve commit outcome

• Users should not see misleading errors when a transaction really did commit.

• Once the commit outcome is returned, the result never changes.

• Safe to return success or resubmit for applications and mid-tiers
NEC is ready to provide Highly Available and Maintainable Cloud platform with Application Continuity, Real Application Clusters, Oracle Multitenant, Oracle Security options and WebLogic Server Active GridLink on NEC HW. I believe this platform brings phenomenal value to our cloud customers because it hides unplanned outages and scheduled maintenance from application users.

Yuki Moriyama  
Deputy General Manager, NEC Corporation
NEC at Oracle OpenWorld 2016

NEC Session
- Oracle Cloud AppDev for Enterprise Java Applications [CON7098]
  - Wednesday, Sep 21, 4:15 p.m. - 5:00 p.m. | Marriott Marquis—Salon 4/5/6

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  - Deep Learning
    - Image & Text Analytics
  - Highly Compliant, Secure Private Cloud
  - Mission Critical Infrastructure
    - Premises, Cloud, Hybrid
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  - PCIe Switch Over Ethernet
  - Enhanced Security Solutions
    - Automated Workflow & Notifications

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