OpenWorld 2017
CON6704 - Latest Innovations and Customer Deployments for Online Planned Maintenance

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Real Application Clusters Development
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Safe Harbor Statement

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Program Agenda

1. Continuous Availability
2. Broader Coverage – support for all applications
3. Reduce Maintenance Impact & Risk
4. Simplify and Automate
5. Customer Stories
Difference between High Availability and Continuous Availability

**High Availability**
- Minimizes downtime
- Guaranteed data commitment
- In-flight work is lost
- Rolling maintenance at DB
- Predictable runtime performance
- Errors may be visible
- Design for single failure
- Basic HA building blocks

**Continuous Availability**
- Removes downtime from user perspective
- Runtime data corruption protection
- In-flight work is preserved
- Maintenance is hidden
- Predictable performance during outages
- Errors only if unrecoverable
- Designed for multiple concurrent failures
- Builds on top of HA
What kind of outages?

Unplanned Outages

Planned Maintenance
Patches
Repairs
Upgrades
Changes

Unpredictable Response & Throughput

Site Disasters

Data Corruption

Human Errors

Which outage classes does your business need to handle?
Users should see no errors during maintenance

Preventable Situation

There is no reason for users to see downtime during scheduled database maintenance

- Service is unavailable
- Application owners unable to agree maintenance windows
- Long running jobs see errors
- DBA’s and engineers work off hours
- Application and middleware components need to be restarted

Family Holidays website is down
"Our online transaction services are currently unavailable. Our server may be temporarily down or we may be performing routine maintenance functions scheduled every Sunday from 12 a.m. to 5 a.m. (Eastern Standard Time). We apologize for any inconvenience."
Broader Coverage for All Applications
Rolling Maintenance – More Drain Points

Move services in advance
Replace connections where applications don’t notice

- Connection Pools
- Connection tests
- Web requests
- Transaction boundaries

Continue on a new connection with states restored
## Drain Application Servers

<table>
<thead>
<tr>
<th>Application Server</th>
<th>Test Name</th>
<th>Connection Test to DB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle WebLogic – Generic &amp; Multi data sources</td>
<td>TestConnectionsOnReserve</td>
<td>isUsable</td>
</tr>
<tr>
<td></td>
<td>TestConnectionsOnCreate</td>
<td>SQL – SELECT 1 FROM DUAL</td>
</tr>
<tr>
<td>Oracle WebLogic  Active GridLink</td>
<td>embedded</td>
<td>isUsable</td>
</tr>
<tr>
<td>IBM WebSphere</td>
<td>PreTest Connections</td>
<td>SQL - SELECT 1 FROM DUAL</td>
</tr>
<tr>
<td>Red Hat JBoss</td>
<td>check-valid-connection-sql</td>
<td>SQL - SELECT COUNT(*) FROM DUAL</td>
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<tr>
<td>Apache TomCat</td>
<td>TestonBorrow</td>
<td>SQL - SELECT 1 FROM DUAL</td>
</tr>
<tr>
<td></td>
<td>TestonRelease</td>
<td></td>
</tr>
<tr>
<td>ODP.NET Unmanaged</td>
<td>Connection.status</td>
<td>OCI_ATTR_SERVER_STATUS</td>
</tr>
</tbody>
</table>
## Drain Applications

<table>
<thead>
<tr>
<th>Application</th>
<th>Condition</th>
<th>Connection Test to DB</th>
</tr>
</thead>
<tbody>
<tr>
<td>eBusiness Suite</td>
<td>Connection borrowed from Weblogic</td>
<td>TestConnectionsOnReserve with &quot;BEGIN NULL; END;&quot;</td>
</tr>
<tr>
<td>Fusion Applications</td>
<td>Connection returned to WebLogic and C++ pools and checked</td>
<td>TestConnectionsOnReserve with isValid OCIPing OCI_ATTR_SERVER_STATUS</td>
</tr>
<tr>
<td>Siebel</td>
<td>Connection requested</td>
<td>OCI_ATTR_SERVER_STATUS</td>
</tr>
<tr>
<td>Peoplesoft</td>
<td>Connection requested</td>
<td>OCIPing</td>
</tr>
<tr>
<td>Customer</td>
<td>Custom pool with Meta data table Checks status every 60s</td>
<td>OCI_ATTR_SERVER_STATUS</td>
</tr>
</tbody>
</table>
# Oracle Pools – Drain, Up, Rebalance

**Applications using ...**

Oracle – WebLogic Active GridLink, UCP, ODP.NET managed and unmanaged, OCI Session Pool, Tuxedo, (New) Cloud Traffic Manager

3rd party App Servers using UCP: IBM WebSphere, Apache Tomcat, NEC WebOTX, Red Hat JBoss, Spring

**DBA Step**

```
svrctl [relocate|stop] service  (no –force)
```

**Sessions Drain**

Immediately new work is redirected

Gradually

Active sessions are released when returned to pools
Reduce Maintenance Impact and Risk
Improving the Maintenance Timeline

**Eliminate Steps**
Eliminating unnecessary steps is the best solution whenever possible such as:
- backup existing home
- Verify application drains

**Preparation**
- **No Risk**
  - Doing things outside the maintenance window is the preferred solution for necessary steps such as:
    - real-time checks
    - create gold image
    - out of place distribution
    - relocate service
    - drain sessions

**Maintenance Window**
- **Performance Risk**
  - Doing things during this phase is acceptable for any necessary steps that cannot be done ahead of time e.g.:
    - final pre-check
    - instantiate out of place home
    - abort sessions not drained

- **Availability Risk**
  - Eliminate this phase if possible, by either adding redundancy ($$$) or moving steps to prior phases, e.g.:
    - shut down next to last instance
    - patch home
    - de-install patches

**Shrink as much as possible**
- Move tasks to the left

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Zero Brownout

When Active-Active RAC

Relocate Services

Drain Work Gradually

Isolated Lock Domains

Align your timeouts

Application Timeout

- Drain + Switchover to Data Guard

RAC Primary

Switchover

DG Broker

RAC Standby

Drain Work

Switchover
Simplifying Major Upgrades
Oracle GoldenGate
Upgrade and Migration

Migration and Update possibilities:

• Source can be Oracle Database 8i or newer
• Migrate across endianness or operating system
• Convert from non-ASM to ASM
• Rebuild and defragment tables and indexes
• Migrate to full EHCC compression

(Note) Data Type and DDL restrictions apply
DBMS_ROLLING
Patch sets and Upgrading to new Oracle Database Releases

1. Install new Oracle version in separate homes on A & B
2. Set GUARANTEED RESTORE POINT (GRP) on A
3. Convert B to Transient Logical
4. Upgrade B to new version and
5. Synchronize B with A

4. Switchover to B
5. Fashback A to GRP
6. Mount in new/upgraded home
7. Upgrade A via redo stream
8. Synchronize A with B

My Oracle Support Note 949322.1
OJVM Rolling
OJVM PSU

Rolling Patch apply

• Prior to JAN 2017 PSU there was a requirement to run a post installation step in “UPGRADE” mode (restricted, exclusive mode)

• Starting with JAN 2017 PSU for 11.2.0.4, 12.1.0.2 and 12.2.0.1
  – Conditional Rolling Installation of the PSU is possible
  – Database is in normal (unrestricted) mode through the PSU application

RAC Rolling Install Process for the "Oracle JavaVM Component Database PSU" (OJVM PSU) Patches (Doc ID 2217053.1)
Simplify and Automate
Rapid Home Provisioning and Maintenance

- Efficient Gold Image inventory, Series management, OOP distribution
- Manage existing 11.2 and 12.1 deployments as-is
- Provision new pools onto base machines
- DB and GI: provision, scale, patch, upgrade
- Generic SW homes
- Custom workflow framework
- Notification model
- Audit capabilities
Customer Stories
Marketing Database
Design • Development • Hosting

Digital & Interactive
Email Service Provider
Web design & hosting
Real-time decision support

Loyalty Management
Technology platforms & Program Strategy Services

Data Processing Services
CDI/PDI
Data Hygiene
NCOA, PCOA, M/P

Digital Engagement
Websites, Microsites & Custom Landing Pages, Email & Mobile Campaigns, Social & Word-of-mouth Programs, Online Communities

Direct Response
Concept-to-Mailbox Campaigns, Web-to-print Technology, Database Management & In-house Lettershop

Strategic Consulting & Advanced Analytics
Program Strategies, Investment Justification, Implementation Road Maps, Customer Segmentation, ROI Analytics, Predictive Modeling & Marketing Mix Modeling

Creative Services
Strategic Thinking, Creative Ideation, Copywriting, Art Direction, Digital Design & Production

Demographics
115 million HH, 225 million individuals with 31 different sources.

Financials
HH Income, Credit Card Capacity, Financials Stress Indicators, Home Value, Net Worth

Lifestyles
Self-reported lifestyles & interests from 40 million consumers

Market Activity
Online and Offline purchase information, with details RFM data For 60 millions+ HH

Triggers
Behavioral data w/life event and life stage triggers, + purchase propensity

Consumer Promotions & Events
Loyalty & Continuity Programs, Partnerships & Sponsorships, In-Store Marketing, Mobile Tours, Guerrilla Marketing & Sampling, Events

Hispanic Marketing
Consumer Promotions, Direct, Digital & Experiential Marketing
High Level Business Requirements

• New client opportunity with extreme performance and availability requirements
• Real time POS integration with over 10000 sites
• Decrease time to market
• Real-time monitoring and reporting of system performance and health
• Need to run OLTP, batch and reporting workload concurrently against real time data without impacting user experience
• Support over 2000 real-time transactions per second with SLA of less than 100 ms and 99.95% availability
• Less than 8 hours RPO and RTO
Normal Operation: Application service placement

Primary Site

- Web Server cluster
  - Web Service Call
  - Application Server Cluster
    - ODAC 12cR3
      - OLTP
      - Batch
      - Read only

  - OLTP Service
    - RAC Node 1
      - 12.1.0.2
    - Primary DB

Standby Site

- Web Server cluster

Application Server Cluster
- ODAC 12cR3
- OLTP
- Batch
- Read only

- Report Service
  - RAC Node 1
    - 12.1.0.2
  - RAC Node 2
    - 12.1.0.2

  - Standby DB
Scheduled maintenance: Application service placement

Primary Site

Web Server cluster

Web Service Call

Application Server Cluster
ODAC 12cR3

OLTP
Batch
Read only

OLTP Service

RAC Node 1
12.1.0.2
Primary DB

Batch Service

RAC Node 2
12.1.0.2

Standby Site

Web Server cluster

Application Server Cluster
ODAC 12cR3

OLTP
Batch
Read only

Report Service

RAC Node 1
12.1.0.2
Standby DB

RAC Node 2
12.1.0.2

Fast Application Notification
Scheduled maintenance: Application service placement

Primary Site
- Web Server cluster
  - Application Server Cluster
    - ODAC 12cR3
    - OLTP
    - Batch
    - Read only
  - OLTP Service
    - RAC Node 1
      - 12.1.0.2
  - Batch Service
    - RAC Node 2
      - 12.1.0.2
  - Primary DB

Standby Site
- Web Server cluster
  - Application Server Cluster
    - ODAC 12cR3
    - OLTP
    - Batch
    - Read only
  - Report Service
    - RAC Node 1
      - 12.1.0.2
    - RAC Node 2
      - 12.1.0.2
  - Standby DB
Case study – Overall transaction response time

![Graph showing overall transaction response time over time with duration in minutes on the x-axis and time in milliseconds on the y-axis. The graph indicates a consistent response time throughout the day.]
Business Benefits

- Scheduled maintenance of Oracle technology stack can be done **without disrupting business user experience**.

- Application restart is no longer required for scheduled maintenance which is a **major relief**.

- Usage of connection pool reduces CPU utilization of middle tier servers by 40%

- **Database and operating system can be patched periodically without taking any system downtime** (meet security compliance as well as uptime SLA)

- We have similar success for Java based applications using WebLogic Server Active Gridlink to hide scheduled maintenance operation **without any application code change**
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
- **2016**: Continuous Availability

Won Global Partner Award: Database 2015, 2016
Use cases

1. PDB service stop
   - Gradual connection relocate
   - Load Balance

2. RAC node maintenance
   - Applying Patch Set Update
   - Configuration change
   - Hardware maintenance

No Impact !!!
3. Data Center Maintenance

- Data Center maintenance

4. PDB migration by PDB Relocate

- Migration from on-premise to cloud
- Major version change
- Data center hardware replacement

No Impact !!!

Use case

WebLogic Active GridLink

No Impact

Client for Tenant 1

Client for Tenant 2

Data Center 1

Maintenance

Data Guard

Drain & Relocate connections

FAN

PDB1 PDB2 PDB3

PDB 252

CDB

RAC

Data Center 2

Use case

WebLogic Active GridLink

No Impact

Client for Tenant 1

Client for Tenant 2

Data Center 1

Maintenance

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Drain & Relocate connections

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WebLogic Active GridLink

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RAC
Integrated Cloud
Applications & Platform Services