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Agenda

• Maximum Availability Architecture (MAA)
• E-Business Suite MAA
  • Target Architecture
  • Oracle Database MAA
  • E-Business Suite High Availability
• E-Business Suite Disaster Recovery
  • Creating the Standby Site
  • Operational Procedures
  • Automating Switchover and Failover
• E-Business Suite MAA Demonstration
  • Test Configuration
  • Site Failure
Maximum Availability Architecture (MAA)
Maximum Availability Architecture (MAA)
Maximum Availability = Unbreakable Architecture + Best Practices

• **Oracle's best practices blueprint** based on proven Oracle high availability technologies and recommendations
  • Technology + Configuration + Operational Practices
  • Applications, Enterprise Manager, Application Server, Collaboration Suite and Database
  • Constantly validated and enhanced as new products and features become available
  • Focused on reducing unplanned and planned downtime
  • Focused on making our customers successful
• Papers published to the Oracle Technology Network (OTN)
Presentation Focus

• This presentation is focused on Oracle E-Business Suite Release 12 MAA
• Please see the MAA home page for detailed papers covering Oracle E-Business Suite 11i MAA
  • http://www.oracle.com/technology/deploy/availability/htdocs/maa.htm
E-Business Suite MAA
E-business Suite MAA
Target Architecture

Primary Site

Oracle RAC and ASM
Oracle Database
HA Storage

Application Tier

Database Tier

Disaster Recovery Site

Oracle RAC and ASM
Oracle Data Guard
Oracle Standby Database
HA Storage
E-business Suite MAA

Oracle Database MAA

Real Application Clusters
& Clusterware
  Fault Tolerant
  Server Scale-Out

Primary Site

Database Servers

Storage

Data Guard
  Fully Active
  Failover Replica

Disaster Recovery Site

Database Servers

Storage

Automatic Storage
Management
  Fault Tolerant
  Storage Scale-Out

Flashback
  Correct Errors by Moving Back in Time

Recovery Manager &
Oracle Secure Backup
  Low Cost High Performance
  Data Protection and Archival
E-business Suite MAA
Transitioning to RAC and ASM

• Metalink note 388577.1 describes how to migrate Oracle Applications Release 12 running on a single database instance to a Real Application Clusters (RAC) environment running Oracle database server 10g Release 2 with Automatic Storage Management (ASM)
  • https://metalink.oracle.com/metalink/plsql/ml2_documents.showDocument?p_database_id=NOT&p_id=388577.1
**E-business Suite MAA**

**Application HA Features**

- **Hardware Load Balancers**
  - Redundant Configuration

- **Application Tier**
  - Multiple Web Servers
    - Load Balanced

- **Database Tier**
  - Multiple Forms Servers
    - Load Balanced

- **Parallel Concurrent Processing**
  - Fault tolerant batch processing
  - Database or Application Tier
E-business Suite MAA
Load Balancing Configuration

• Load balancing distributes client requests across multiple application tier nodes providing additional scalability and fault tolerance
• Load balancing implementation requires adding and configuring additional application tier nodes and configuration of the load balancer
• Metalink note 380489.1 describes the application configuration options in detail:
  • https://metalink.oracle.com/metalink/plsql/ml2_documents.showDocument?p_database_id=NOT&p_id=380489.1
• Load balancer configuration is vendor specific
  • Persistence through cookies is required
E-business Suite MAA
Parallel Concurrent Processing

• Parallel concurrent processing allows concurrent managers to execute on multiple server nodes at the same time providing additional scalability and fault tolerance.

• The feature is detailed in the Oracle Applications System Administrator's Guide, Release 12:
  • [http://download.oracle.com/docs/cd/B34956_01/current/acrobat/120sacg.pdf](http://download.oracle.com/docs/cd/B34956_01/current/acrobat/120sacg.pdf)

• Metalink note 388577.1 explains additional considerations when using PCP with RAC:
E-business Suite MAA
Target Architecture

Primary Site
- Oracle RAC and ASM
- Oracle Database

Disaster Recovery Site
- Oracle RAC and ASM
- Oracle Standby Database

Application Tier
- HA Storage

Database Tier
- Oracle Data Guard
E-business Suite
Disaster Recovery
E-business Suite Disaster Recovery

• In this section we describe how to setup and operate a E-Business Suite disaster recovery site
• A detailed paper describing this process will be published on the MAA home page shortly
  • http://www.oracle.com/technology/deploy/availability/htdocs/maa.htm

• The DR setup process relies heavily on the Rapid Clone utility, which currently does not support RAC databases
• Although we describe the RAC steps in this section, we recommend you wait until Rapid Clone supports RAC before using this process in a RAC environment
• Please see Metalink note 406982.1 for details:
  • https://metalink.oracle.com/metalink/plsql/ml2_documents.showDocument?p_database_id=NOT&p_id=406982.1
E-business Suite Disaster Recovery
Creating the Standby Site

Standby Site Creation Process

<table>
<thead>
<tr>
<th>Primary Apps Nodes</th>
<th>Standby Apps Nodes</th>
<th>Primary Database Nodes</th>
<th>Standby Database Nodes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Establish Standby Hardware and System Software</td>
<td>Prepare for Data Guard Operations</td>
<td>Establish Standby Hardware and System Software</td>
</tr>
<tr>
<td></td>
<td>Clone Apps Software</td>
<td>Clone Database Software</td>
<td>Establish Oracle Clusterware and ASM</td>
</tr>
<tr>
<td></td>
<td>Prepare Apps Software for DR Database</td>
<td>Backup Database</td>
<td>Prepare New Database Instance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Establish Standby Database</td>
</tr>
</tbody>
</table>

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E-business Suite Disaster Recovery
Creating the Standby Site

• Establish Standby Hardware and System Software
  • Build the standby site hardware platform
    • Think carefully about the performance and HA requirements - best to mimic production
  • Install System Software

• Establish Oracle Clusterware
  • Required for ASM and RAC

• Establish ASM
E-business Suite Disaster Recovery
Creating the Standby Site

• Prepare for Data Guard operation
  • Enable archive log mode
  • Enable forced logging
  • Create database password files
  • Configure SQL*NET communication between sites
  • Set database parameters for Data Guard
  • Create standby redo logs
E-business Suite Disaster Recovery
Creating the Standby Site

• Clone database software and prepare the standby instances
  • Run the E-Business Suite pre-clone utility on a primary database node
  • Copy the database home to the standby database servers
  • [RAC Only] Run `adclonectx.pl` on each standby database server
    • Edit the context file to adjust the `cluster_database_instances`, `instance_number`, `instance_thread`, and `undotablespace` parameter values appropriately
  • Run `adcfgclone.pl` on each standby database server
  • Configure SQL*NET Communication on standby site
  • [RAC Only] Configure and restart the listeners
  • Configure Data Guard database parameters on standby site
E-business Suite Disaster Recovery
Creating the Standby Site

• Clone the application tier to standby
  • Run the pre-clone utility on a primary applications tier node
  • Copy the software to the standby
  • Run `adcfgclone.pl` on each standby middle tier server
    • Ignore the error when running `adcfgclone.pl appsTier` which occurs due to no connection to database
  • [RAC Only] Edit the context file to point Tools OH TWO_TASK, iAS OH TWO_TASK, and Apps JDBC Connect Alias to the appropriate load balancing services
  • (Optional) Establish log and out file synchronization
    • Use your favorite tool for this, for example rsync
E-business Suite Disaster Recovery
Creating the Standby Site

• Establish the standby database
  • Back up the production database including archive logs, and the production control file
  • Restore the database to the DR site using one of the configured instances
  • Start managed recovery
• Check out MAA papers for tuning best practices:
  • [RAC Only] Register the standby database with Oracle Clusterware
E-business Suite Disaster Recovery
Operational Procedures

• Switchover
  • Be sure you are up to date with redo apply
  • Shut down the app and all but one database instance on each site
  • Prepare the primary for standby, switch the standby to primary, open, and start other instances
  • Remove the applications topology from the database
  • Run AutoConfig on database tier (twice for RAC) then middle tiers to configure the application for DR operation
  • Start the Apps
  • Convert the old primary database to a Data Guard standby
E-business Suite Disaster Recovery
Operational Procedures

• Failover (assuming you lost the primary database)
  • Convert the standby to primary operation, open, and start other instances
  • Remove the application topology from the database
  • Run AutoConfig on database tier (twice for RAC) and then on middle tier to configure the application for the DR site
  • Start the Apps
  • If and when the primary site becomes available, flashback the database to before the failure and convert the primary database to a Data Guard standby
  • If the primary site is permanently lost then recreate a standby environment
E-business Suite Disaster Recovery
Operational Procedures

- Standby testing using flashback
  - Cancel media recovery on the standby database
  - Create a guaranteed restore point on the standby database
  - Switch the redo log on the primary database
  - Activate the standby database
  - Perform testing at the standby site
  - Flashback the database to the restore point
  - Drop the restore point
  - Convert the database to physical standby and resume standby operation
E-business Suite Disaster Recovery

Automating Switchover and Failover

- Configure Data Guard Broker to automate Data Guard operation and the database failover and switchover steps
- Configure Data Guard Fast Start Failover to automatically detect a database failure and initiate failover
- Create a script to automate the application configuration and startup
- Create DB_ROLE_CHANGE trigger that will execute the script on switchover and failover
E-business Suite MAA Demonstration
E-business Suite MAA Demonstration

Hardware Vendor Partners

- Part of MAA means proving and testing our best practices, and working closely with our hardware vendor partners to ensure that our joint solutions work well together.
The demonstrations were developed and executed using HP Systems hardware and software and F5 load balancers.

**Hardware**
- F5 BIG-IP Local Traffic Manager v9 - 3400 Series
- HP DL145 G2 running HP Load Runner v8.1 for load generation
- HP Integrity rx2620 servers for the application tier
- HP Integrity rx4640 servers for the database tier
- HP StorageWorks EVA4000 for database storage

**Software**
- HP-UX 11i v3 (11.31) for application and database Servers
- HP Serviceguard extensions for RAC (SGeRAC) Version A.11.18
- Oracle Enterprise Manager Grid Control was used to monitor the systems
E-business Suite MAA Demonstration

Site Failure

Primary Site

Load Runner
HP DL145 G2

F5 BIG-IP LTM 3400

HP EVA 4000

F5 BIG-IP LTM 3400

Disaster Recovery Site

Application Tier

Oracle RAC and ASM

Oracle Data Guard

HA Storage

Database Tier

Oracle Database

Oracle Database

Oracle Database

Oracle Database

Load Runner
HP DL145 G2

HP EVA 4000

HP RX4640

HP RX2620

HP RX2620

HP RX2620

Oracle RAC and ASM

Oracle Data Guard

Oracle Database

Oracle Database

Oracle Database

Oracle Database
E-business Suite MAA Demonstration

Site Failure

1. System running under load on primary site
2. Power down primary site nodes
3. Users begin to receive errors in client and are redirected to fallback server where information about the outage is posted
4. Oracle Data Guard Broker detects database down and performs database failover to the standby
5. DB_ROLE_CHANGE trigger fires to execute E-Business Suite failover script
6. E-Business Suite failover script removes the topology, runs AutoConfig on DB and apps tiers, and starts the application
7. Network is switched to standby site through DNS push
8. Users are routed to standby site and login
# Database HA Sessions From Oracle Development

## Monday, Nov 12
- **S291483** - The Fastest and the Most Cost-Effective Backup for Oracle Database: What’s New in Oracle Secure Backup 10.2, 11:00 am - 12:00 pm, Moscone South 304
- **S291492** - Oracle Database 11g: Next-Generation High Availability, 12:30 - 1:30 pm, Moscone South 103
- **S291923** - Implementing Oracle Maximum Availability Architecture (MAA) at Allstate Insurance Using Oracle 10g RAC, ASM, Oracle Data Guard and Oracle Grid Control, 3:15 - 4:15 pm, Moscone South 304
- **S291484** - Oracle Database 11g Data Repair Technologies: Comprehensive, Intelligent Recovery, 4:45 - 5:45 pm, Moscone South 304

## Wednesday, Nov 14
- **S291915** - What’s New in Oracle Data Guard 11g: Revolutionizing Data Protection and Availability, 9:45 - 10:45 am, Moscone South 304
- **S291487** - Backup and Recovery Best Practices for Very Large Databases (VLDB), 11:15 am - 12:15 pm, Moscone South 304
Database HA Sessions From Oracle Development

**Wednesday, Nov 14**

- **S291920 - Oracle Active Data Guard: How to Utilize Your Standby Databases for Production Workload - What They Didn’t Print in the Manuals, 3:00 - 4:00 pm, Moscone South 304**
- **S291917 - Oracle Data Guard Tips and Tricks: Direct From Oracle Development, 4:30 - 5:30 pm, Moscone South 102**
- **S291915 - What’s New in Oracle Data Guard 11g: Revolutionizing Data Protection and Availability, 9:45 - 10:45 am, Moscone South 304**
- **S291487 - Backup and Recovery Best Practices for Very Large Databases (VLDB), 11:15 am - 12:15 pm, Moscone South 304**

**Thursday, Nov 15**

- **S291495 - Oracle Streams Replication and Advanced Queuing (AQ): What's New in Oracle Database 11g, 8:30 - 9:30 am, Moscone South 304**
- **S291499 - Best Practices for Implementing Replication with Oracle Streams in Oracle Database 10g and 11g, 10:00 - 11:00 am, Moscone South 304**
- **S291525 - Maximum Availability Architecture (MAA) Best Practices: Online Patching, Rolling Upgrades and Planned Maintenance with Minimal Downtime with Oracle Database, 11:30 am - 12:30 pm, Moscone South 104**
- **S290542 - Maximum Availability Architecture (MAA) Best Practices for Siebel 8.0, 2:30 pm - 3:30 pm, Marriott Salon 10 & 11**
Database HA Demos From Oracle Development

Monday, Nov 12 – Thursday, Nov 15
Oracle DEMOgrounds, Moscone West

- Oracle Active Data Guard
- Oracle Streams: Replication and Advanced Queuing
- Oracle Secure Backup
- Recovery Manager (RMAN) and Flashback Technologies
- Maximum Availability Architecture