Consolidate Oracle E-Business Suite Databases in Oracle Database 11g Release 2 Grid: Case Study

John Tao, Lead Applications DBA
Kai Yu, Senior Engineer
Session ID#0845
Agenda

• Introduction to Enterprise Grid
• Dell 16 Node Grid Infrastructure Design
• Grid Implementation based on Oracle 11g RAC
• Deploying Oracle EBS Databases on the Grid
• QA
Introduction to Oracle Grid

Challenges to the Traditional Corporate Computing Architecture

- Consists of island-like systems
- Little or no resource sharing: low resources utilization
- Hard to dynamically adapt changing workload
- A lot of systems, too many Varity, difficult to manage
Introduction to Enterprise Grid

Dell’s Approach: Enterprise Grid Architecture

– Consolidate databases, applications onto a common Grid platform based on Dell servers and storage resource.
– Provide Platform as a Service to for the databases
– Provide Database Infrastructure as a Services based on Grid based cluster Infrastructure for multiple applications.
– Integrate all the resources to allow provisioning on demand: dynamically provisioning to meet the workload needs
– Scalability and High availability and flexibility
Dell 16 Node Oracle EBS DB Grid Design

Oracle EBS Database Grid Design

- Based on 16 Node Oracle 11g R2 Grid Infrastructure
- Consolidate multiple Oracle EBS Databases
- Support multiple versions of Oracle E-Business Suites
- Support multiple versions of Oracle Databases
Dell 16 Node DB Grid Architecture Design

Scalable Grid Hard Infrastructure Design:
- Servers: 16 Nodes Dell M610 blades: 8 CPUS, 100 GB Memory. Blade servers work well for Grid infrastructure
- Storages: Dell EqualLogic iSCSI SAN: PS6000XV
Dell 16 Node Oracle EBS DB Grid Design

Scalable Grid Hard Infrastructure Design

(private interconnect) C1
(iSCSI) B1
(public) A1

C2 (private interconnect)
B2 (iSCSI)
A2 (public)

Each half-height blade will have an Ethernet port corresponding to the respective A1, B1, C1 and A2, B2, C2 I/O modules.

Back view of M1000

Power Connect 6200

Back PS6000XV

Global Marketing
Dell 16 Node Oracle EBS DB Grid Design

Grid System Architecture Design

**Database Grid Architecture Design**

- **EBS 1**
  - Database 1
    - Disk Group "+GRID_1"
  - Node 1, Node 2, Node 3
- **EBS2**
  - Database 2
    - Disk Group "+ARCH_1"
  - Node 4, Node 5, Node 6
- **EBS3**
  - Database 3
    - Disk Group "+DATA_1"
  - Node 7, Node 8, Node 9
- **EBS N**
  - Database N
    - Disk Group "+DATA_2"
  - Node 10, Node 11, Node 12
  - Disk Group "+FRA_1"
  - Node 13, Node 14, Node 15, Node 16

**Oracle EBS APPs tier**

- 16 Nodes RAC
  - Each RAC database serves an EBS Instance

**Oracle ASM diskgroups for RAC Databases**

- Oracle 11g R2 Clusterware+ASM

**EqualLogic PS6000XV Storage Arrays**

- ocr
- arch1
- arch2
- arch3
- lun1
- lun2
- lun28
- lun30
- lun29
- lun30
- fra1
- fra4
Grid Implementation on Oracle 11gR2 RAC

- 11gR2 Grid Infrastructure configuration
  - OS: OEL 5U5 Kernel: 2.6.18-194.17.4.0.1.el5 \( x86_64 \)
  - Networks configuration

  Eth0 for public, eth2 and eth3 forms bond0 for private interconnect
  eth4 and eth5 connected to EqualLogic Storage through two redundant switches

  32 IPs for iSCSI connections
  16 Public IPs:
  16 Private IPs
  16 VIPs
  3 SCAN-IPs
Grid Implementation on Oracle 11gR2 RAC

- EqualLogic iSCSI SAN volumes, Raid 1+0 configuration
  - Data Volumes: 17 Lun: 700GB, DATA_1 diskgroup: 12 TB
  - Data Volumes: 9 Lun: 700GB, DATA_2 diskgroup: 6.4TB
  - Reserved for 21 reserved. Total: 47 * 700GB = 32TB
  - Data Volume: OCR: 3GB, GRID_1 diskgroup: 3GB
  - Data Volumes: ARCH0-7: 250GB, ARCH_1 diskgroup: 2TB
  - Data Volumes: FRA0-7: 250GB, FRA_1 diskgroup: 2TB

- Establishing host access to EqualLogic volumes
  - Use iscsiadm utility to create iSCSI interfaces
    - rpm -qa|grep -i iscsi-initiator
    - service iscsi start; chkconfig iscsi on
    - iscsiadm -m iface -l iface_eth4 --op=new,
    - iscsiadm -m iface -l iface_eth4 --op=update –n iface.hwaddress -v <hwaddress>
Grid Implementation on Oracle 11gR2 RAC

- Discover the iSCSI volume
  - Edit /etc/iscsi/iscsid.conf to specify the login for the volumes
  - iscsiadm -m discovery -t st -p <storage IP> --interface=eth4-iface --interface=eth5-iface

- Login to iSCSI storage:
  - iscsiadm -m node -p group_ip_address --interface iface_name --login,

- Creation storage multipath devices using Device Mapper Multipath: edit /etc/multipath.conf:

```bash
oracle:/ASM2:/u02/oradata/asm> more /etc/multipath.conf

blacklist {
    devnode "^sd[a]$
}
defaults {
    user_friendly_names no
}
devices {
    device {
        vendor "EQLOGIC"
        product "100E-00"
        path_grouping_policy multibus
        getuid_callout "/sbin/lsmod -m -d /bs
        features "1 queue_if_no_path"
        path_checker readsector0
        fallback immediate
        path_selector "round-robin 0"
        no_path_retry 5
        rr_min_io 10
        rr_weight priorities
    }
}
```
Grid Implementation on Oracle 11gR2 RAC
Grid Implementation on Oracle 11gR2 RAC

- **11g R2 Grid Infrastructure Configuration**
  - GI Oracle HOME(Clusterware and ASM)

```sql
SQL> /
ARCH_1 /u02/oradata/asm/archive_lun04 250.004883
ARCH_1 /u02/oradata/asm/archive_lun01 250.004883
ARCH_1 /u02/oradata/asm/archive_lun03 250.004883
ARCH_1 /u02/oradata/asm/archive_lun02 250.004883
DATA_1 /u02/oradata/asm/data_lun13 700.004883
DATA_1 /u02/oradata/asm/data_lun17 700.004883
DATA_1 /u02/oradata/asm/data_lun20 700.004883
DATA_1 /u02/oradata/asm/data_lun05 700.004883
DATA_1 /u02/oradata/asm/data_lun01 700.004883
DATA_1 /u02/oradata/asm/data_lun21 700.004883
DATA_1 /u02/oradata/asm/data_lun06 700.004883
DATA_1 /u02/oradata/asm/data_lun16 700.004883
DATA_1 /u02/oradata/asm/data_lun07 700.004883
DATA_1 /u02/oradata/asm/data_lun18 700.004883
DATA_1 /u02/oradata/asm/data_lun15 700.004883
DATA_1 /u02/oradata/asm/data_lun12 700.004883
DATA_1 /u02/oradata/asm/data_lun08 700.004883
DATA_1 /u02/oradata/asm/data_lun03 700.004883
DATA_1 /u02/oradata/asm/data_lun09 700.004883
DATA_1 /u02/oradata/asm/data_lun02 700.004883
DATA_1 /u02/oradata/asm/data_lun04 700.004883
DATA_2 /u02/oradata/asm/data_lun33 700.004883
DATA_2 /u02/oradata/asm/data_lun24 700.004883
DATA_2 /u02/oradata/asm/data_lun27 700.004883
DATA_2 /u02/oradata/asm/data_lun32 700.004883
DATA_2 /u02/oradata/asm/data_lun29 700.004883
DATA_2 /u02/oradata/asm/data_lun34 700.004883
DATA_2 /u02/oradata/asm/data_lun26 700.004883
DATA_2 /u02/oradata/asm/data_lun28 700.004883
DATA_2 /u02/oradata/asm/data_lun31 700.004883
FRA_1 /u02/oradata/asm/fra_lun04 250.004883
FRA_1 /u02/oradata/asm/fra_lun01 250.004883
FRA_1 /u02/oradata/asm/fra_lun03 250.004883
FRA_1 /u02/oradata/asm/fra_lun02 250.004883
GRID_1 /u02/oradata/asm/orr_css1 3.00292969
```

Shared NAS mounted on all 16 nodes:
/u01/app/grid/product/11.2.0.2/grid_1
Must run multicast patch before running root.sh during GI install
Listener running in GI home

The ASM diskgroups and ASM disks create on the EqualLogic volumes.
Grid Implementation on Oracle 11gR2 RAC

- Multiple Oracle HOMEs
  - On shared NAS mounted on all 16 nodes, but registered on requested instance nodes
- Pre-11gR2 version databases with 11gR2 GI
  - Required to ping CRS on all 16 nodes
    
    $GRID_HOME/bin/crsctl pin css -n ausmegnovdev01 ausmegnovdev02 ausmegnovdev03 ausmegnovdev04 ausmegnovdev035 ausmegnovdev06 ausmegnovdev07 ausmegnovdev08 ausmegnovdev09 ausmegnovdev10 ausmegnovdev11 ausmegnovdev12 ausmegnovdev13 ausmegnovdev14 ausmegnovdev15 ausmegnovdev16

  - To list pinned node(s):
    
    [oracle@ausmegnovdev01.us.dell.com /home/oracle]
    
    $ $GRID_HOME/bin/olsnodes -t -n ausmegnovdev01 1 Pinned ausmegnovdev02 2 Pinned
    
    ausmegnovdev16 16 Pinned
- Multiple Database services: database instances allocation
## Grid Implementation on Oracle 11gR2 RAC

<table>
<thead>
<tr>
<th>DB Server</th>
<th>Env</th>
<th>DB Name</th>
<th>Instance</th>
<th>Listener Port</th>
<th>Oracle Home</th>
<th>OH Version</th>
<th>PSU Version</th>
<th>ASM DG</th>
</tr>
</thead>
<tbody>
<tr>
<td>ausmegnovdev01</td>
<td>DevSupt</td>
<td>geba1dd</td>
<td>geba1dd1</td>
<td>1530</td>
<td>/u01/app/oracle/product/11.1.0/db_1</td>
<td>11.1.0.7.6</td>
<td>Jan 2011</td>
<td>DATA_1</td>
</tr>
<tr>
<td></td>
<td>Nov Dev</td>
<td>gebd2dd</td>
<td>gebd2dd1</td>
<td>1548</td>
<td>/u01/app/oracle/product/11.1.0/db_2</td>
<td>11.1.0.7.7</td>
<td>Apr 2011</td>
<td>DATA_2</td>
</tr>
<tr>
<td></td>
<td>patch</td>
<td>gebd1ht</td>
<td>gebd1ht</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GRC DEV Rep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ausmegnovdev02</td>
<td>Sept DEV</td>
<td>gebd1dd</td>
<td>gebd1dd1</td>
<td>1538</td>
<td>/u01/app/oracle/product/11.1.0/db_2</td>
<td>11.1.0.7.7</td>
<td>Apr 2011</td>
<td>DATA_1</td>
</tr>
<tr>
<td></td>
<td>GRC DEV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ausmegnovdev03</td>
<td>ProdQA</td>
<td>gebd2rt</td>
<td>gebd2rt1</td>
<td>1559</td>
<td>/u01/app/oracle/product/11.1.0/db_1</td>
<td>11.1.0.7.6</td>
<td>Jan 2011</td>
<td>DATA_1</td>
</tr>
<tr>
<td></td>
<td>GRC UAT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ausmegnovdev04</td>
<td>Training</td>
<td>geba1rt</td>
<td>geba1rt1</td>
<td>1538</td>
<td>/u01/app/oracle/product/11.1.0/db_1</td>
<td>11.1.0.7.6</td>
<td>Jan 2011</td>
<td>DATA_1</td>
</tr>
<tr>
<td></td>
<td>ESP SND</td>
<td>gebe1st</td>
<td>gebe1st</td>
<td>1528</td>
<td>/u01/app/oracle/product/11.1.0/db_2</td>
<td>11.1.0.7.7</td>
<td>Apr 2011</td>
<td>DATA_2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ausmegnovdev05</td>
<td>Sept SIT</td>
<td>gebd2tt</td>
<td>gebd2tt1</td>
<td>1548</td>
<td>/u01/app/oracle/product/11.1.0/db_2</td>
<td>11.1.0.7.7</td>
<td>Apr 2011</td>
<td>DATA_1</td>
</tr>
<tr>
<td></td>
<td>Archive UAT</td>
<td>arcrut</td>
<td>arcrut</td>
<td>1555</td>
<td>/u01/app/oracle/product/11.1.0/db_1</td>
<td>11.1.0.7.6</td>
<td>Jan 2011</td>
<td>DATA_1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ausmegnovdev06</td>
<td>Sept SIT</td>
<td>gebd2tt</td>
<td>gebd2tt2</td>
<td>1548</td>
<td>/u01/app/oracle/product/11.1.0/db_2</td>
<td>11.1.0.7.7</td>
<td>Apr 2011</td>
<td>DATA_1</td>
</tr>
<tr>
<td></td>
<td>Archive Rep</td>
<td>arcred</td>
<td>arcred</td>
<td>1548</td>
<td>/u01/app/oracle/product/11.1.0/db_1</td>
<td>11.1.0.7.6</td>
<td>Jan 2011</td>
<td>DATA_1</td>
</tr>
<tr>
<td></td>
<td>Archive DEV</td>
<td>arcrdd</td>
<td>arcrdd</td>
<td>1540</td>
<td>/u01/app/oracle/product/11.1.0/db_1</td>
<td>11.1.0.7.6</td>
<td>Jan 2011</td>
<td>DATA_1</td>
</tr>
<tr>
<td>ausmegnovdev07</td>
<td>VMWare POC</td>
<td>gebd3rt</td>
<td>gebd3rt1</td>
<td>1522</td>
<td>/u01/app/oracle/product/11.1.0/db_1</td>
<td>11.1.0.7.6</td>
<td>Jan 2011</td>
<td>DATA_1</td>
</tr>
<tr>
<td></td>
<td>ESP CRP2</td>
<td>gebe2ct</td>
<td>gebe2ct</td>
<td>1568</td>
<td>/u01/app/oracle/product/11.1.0/db_2</td>
<td>11.1.0.7.7</td>
<td>Apr 2011</td>
<td>DATA_1</td>
</tr>
<tr>
<td></td>
<td>Archive UAT</td>
<td>arcrot</td>
<td>arcrot</td>
<td>1555</td>
<td>/u01/app/oracle/product/11.1.0/db_1</td>
<td>11.1.0.7.6</td>
<td>Jan 2011</td>
<td>DATA_1</td>
</tr>
<tr>
<td>ausmegnovdev08</td>
<td>ESP DEV</td>
<td>gebe2dd</td>
<td>gebe2dd1</td>
<td>1538</td>
<td>/u01/app/oracle/product/11.1.0/db_1</td>
<td>11.1.0.7.6</td>
<td>Jan 2011</td>
<td>DATA_1</td>
</tr>
</tbody>
</table>
Deploying Oracle EBS Databases on Grid

- **Deployment Methods**
  - **Fresh Install**
    - EBS Release 12.1.1 with 11gR1 DB
    - Can be used for new projects/systems
    - For Novora EBS 11i with 11gR1 DB to be upgraded to R12 with 11gR2 DB
  - **Clone**
    - Cloning is the method we use most as we are migrating the EBS databases from individual physical database servers to the Grid to consolidate the environments
    - Cloning keeps Oracle Home versions and patch levels, configuration, and all business data and setups
    - AD Clone registers the Oracle Home and configure the instance environments, such as listener, tns, etc.
Deploying Oracle EBS Databases on Grid

Fresh Install
- Database tier server file system layout before EBS R12 installation

![Database Tier Server File System Layout](image)

- `/opt/dell/oracle`
- `/u01/app/grid/`
- `/u01/app/oracle/`
- `/dbscratch`
- `/staging`
- `gfsr12d` for EBS R12 fresh install

- `10gR2 EM agent Home`
- `11gR1 RAC DB Oracle Home`
- `10gR2 RAC DB Oracle Home`
- `11gR2 RAC DB Oracle Home`
Deploying Oracle EBS Databases on Grid

- Database tier server file system layout after EBS R12 fresh install

![Database Tier Server File System Layout after EBS R12 Fresh Install](image-url)
Deploying Oracle EBS Databases on Grid

- Upgrade 11gR1 EBS Database to 11gR2
  - Pre-upgrade steps
    - On application tier, apply the interoperability patches 9868229, 10163753 and 11071569, and the latest autoconfig
    - Check for TIMESTAMP WITH TIMEZONE Datatype in the current database
      ```sql
      SQL> select * from v$timezone_file;
      FILENAME       VERSION
      ------------    --------
      timezlrg.dat    4
      ```
  - Install Oracle Database 11g Products from the 11g Examples CD to the 11gR2 Oracle home

After the installation, make sure the following:
- The ORACLE_BASE environment variable must be set accordingly.
- The ORACLE_HOME environment variable points to the new 11.2.0 Oracle home.
- The PATH environment variable includes $ORACLE_HOME/bin and the directory where the new perl executable is located (usually $ORACLE_HOME/perl/bin).
- The LD_LIBRARY_PATH environment variable includes $ORACLE_HOME/lib.
- The PERL5LIB environment variable points to the directories where the new perl libraries are located (usually $ORACLE_HOME/perl/lib/[perl version] and $ORACLE_HOME/perl/lib/site_perl/[perl version])
Deploying Oracle EBS Databases on Grid

- Upgrade 11gR1 EBS Database to 11gR2 (cont’)
  - Pre-upgrade steps (cont’)
    - Analyze the database with pre-upgrade information tool:
      SQL> @$11g_ORACLE_HOME/rdbms/admin/utlu112i.sql
    - Create nls/data/9idata directory
      run the $ORACLE_HOME/nls/data/old/cr9idata.pl script to create the $ORACLE_HOME/nls/data/9idata directory
      After creating the directory, make sure that the ORA_NLS10 environment variable is set to the full path of the 9idata directory whenever you enable the 11g Oracle home.
    - Apply 11.2.0.2 RDBMS interoperability patches 4247037, 9776940, 10149223, 10229719
    - If the SYS.ENABLED$INDEXES table exists, drop it:
      SQL> drop table sys.enabled$indexes;
Deploying Oracle EBS Databases on Grid

- Upgrade 11gR1 EBS Database to 11gR2 (cont’)
  - Database upgrade
    - Shut down Applications server processes and database listener
      Make sure that you do not have the LOCAL_LISTENER initialization parameter set to ensure that the database does not inadvertently point to a non-existent listener during upgrade.
    - Create a pfile from spfile and copy the pfile to the new 11gR2 Oracle Home
    - Set parameter compatible to 11gR2 and adjust the values of the initialization parameters to at least the minimum values indicated by the Pre-Upgrade Information Tool.
  - Shutdown the database
  - Set the following to the new 11gR2 Oracle home: /etc/oratab, ORACLE_HOME, PATH
Deploying Oracle EBS Databases on Grid

- Upgrade 11gR1 EBS Database to 11gR2 (cont’)
  - Database Upgrade (cont’)
    - Startup database as upgrade mode
    - Run $ORACLE_HOME/rdbms/admin/catupgrd.sql
    - Restart the database in normal mode and run Post-Upgrade Status script Toolutlu111s.sql for upgrade verification
    - Run the post-upgrade scripts catuppst.sql
    - Recompile all invalid objects with utlrp.sql and execute ORACLE_HOME/rdbms/admin/utluiobj.sql to display only those objects which are newly invalid because of the upgrade process
Deploying Oracle EBS Databases on Grid

- Upgrade 11gR1 EBS Database to 11gR2 (cont’)
- Post Upgrade Steps
  - Modify init parameters – use document 396009.1 Database Initialization Parameter Settings for Oracle Applications Release 12 as a guideline
  - Start the new database listener in 11gR2 Oracle Home
  - Copy the script adgrants.sql from Apps tier $APPL_TOP/admin and run it as sysdba in the DB node
  - Grant create procedure privilege on CTXSTS
    Copy the scripts adctxprv.sql from Apps tier $AD_TOP/patch/115/sql and run it as APPS with the following command:
    $ sqlplus apps/<APPS password> @adctxprv.sql <SYSTEM password> CTXSYS
Deploying Oracle EBS Databases on Grid

- Upgrade 11gR1 EBS Database to 11gR2 (cont’)
  - Post Upgrade Steps (Cont’)
    - Set CTXSYS parameter
      Use SQL*Plus to connect to the database as SYSDBA and run the following command:
      SQL> exec ctxsys.ctx_adm.set_parameter('file_access_role', 'public');

- Validate Workflow ruleset
  On the Apps admin server node, run the script wfaqupfix.sql as APPLSYS with the following commend:
  $ sqlplus <APPLSYS user>/<APPLSYS password>
  @wfaqupfix.sql <APPLSYS user> <APPS user>
Deploying Oracle EBS Databases on Grid

- **Upgrade 11gR1 EBS Database to 11gR2 (cont’)**
  - **Post Upgrade Steps (cont’)**
    - **Implement and Run AutoConfig**
      
      Run the admkappsutil.pl utility to create the file appsutil.zip in the <INST_TOP>/admin/out directory.

      ```
      perl <AD_TOP>/bin/admkappsutil.pl
      ```

      Copy the appsutil.zip file from apps tier and unzip to the 11g $ORACLE_HOME

      Build the new context file for dbtier using
      $ORACLE_HOME/appsutil/bin/adbldxml.pl tier=db

      Ensure the variable s_jretop points to
      $ORACLE_HOME/jdk/jre and is not altered to any other value

      Run autoconfig on db tier and apps tier
Deploying Oracle EBS Databases on Grid

- **Upgrade 11gR1 EBS Database to 11gR2 (cont’)**
- **Post Upgrade Steps (cont’)**
  - **Gather statistics for SYS schema**
    
    Copy `$APPL_TOP/admin/adstats.sql` from the administration server node to the database server. Make sure the default temporary tablespace has at least 1.5 GB free and run `adstats.sql` in restricted mode:

    ```
    $ sqlplus "/ as sysdba"
    SQL> alter system enable restricted session;
    SQL> @adstats.sql
    $ sqlplus "/ as sysdba"
    SQL> alter system disable restricted session;
    ```
Deploying Oracle EBS Databases on Grid

- **Upgrade 11gR1 EBS Database to 11gR2 (cont’)**
  - **Post Upgrade Steps (cont’)**
    - Re-create all custom database links
    - Re-create grants and synonyms for APPS with adadmin
    - Restart Applications server processes and run adpreclone on both DB and Apps ties
  - **Synchronize Workflow views**

    Log on to Oracle E-Business Suite with the "System Administrator" responsibility. Submit a single request with the following parameters:
    Request Name = Workflow Directory Services User/Role Validation
    p_BatchSize = 10000
    p_Check_Dangling = Yes
    Add missing user/role assignments = Yes
    Update WHO columns in WF tables = No
Deploying Oracle EBS Databases on Grid
Deploying Oracle EBS Databases on Grid

- **Clone processes**
  - **Backup of Source Environment**
    - Run adpreclone script in both database and apps tier
    - Backup of Oracle Home on database server
    - Backup of database (in ASM) using rman
    - Backup of APPLTOPs on apps tier
  - **Copy of the backup set to target systems**
    - Including Oracle Home, database, and APPLTOPs
  - **Cloning Oracle Home on the Grid**
    - Restore the Oracle Home binary to the designed location
    - Run adcfgclone.pl script and respond to the prompt with correct information - such as RAC or non-RAC, port number, ASM diskgroup names for database file location, etc.
    - Oracle Home is registered to the Oracle Inventory and Listener is configured under $ORACLE_HOME/{context_name} and started
Deploying Oracle EBS Databases on Grid

- **Clone processes (cont’)**
  - **Restore database to ASM**
    - Add and make changes to the following init parameters:
      - `Db_name = {source_db_name}`
      - `control_files = +DATA_1,+ARCH_1`
        - ***Do not use the default value for control_files generated by the adclone:***
          
          ```
          control_files =
          +DATA_1/cntrl01.dbf,+ARCH_1/cntrl02.dbf,+DATA_1/cntrl03.dbf
          ```
        - `db_unique_name = {target_db_name}`
        - `db_file_name_convert = ('+DATA_1/{source_db_name}', '+DATA_1/geba1rt')`
        - `log_file_name_convert = ('+DATA_1/{source_db_name}', '+ARCH_1/{source_db_name}', '+DATA_1/{target_db_name}')`
      - **Startup nomount and restore the controlfile**
        - Controlfiles are restored with OMF names
        - Replace the init parameter control_files with the restored controlfile namesin init file
Deploying Oracle EBS Databases on Grid

- **Clone processes (cont’)**
  - Restore and recover the database using rman and open with resetlogs
  - Rename the database name from source to target with nid
  - Change the init parameter db_name = {target_db_name} in init file
  - Mount the DB and open with resetlogs
  - Post clone steps
  - For the RAC DB clone, add the redo logs, undo tables for the secondary instances
  - Add all init parameters in the pfile required for RAC database and create the spfile in ASM for all instances to use
Deploying Oracle EBS Databases on Grid

- Clone processes (cont’)
  - On the secondary nodes
    - Run adcfgclone.pl script and respond with the secondary node information
    - Startup the instances
    - Post clone steps
  - Create database services using srvctl for the RAC load-balance and fail-over capability

- Apps tier – not in the scope of this presentation
Deploying Oracle EBS Databases on Grid

- Screen shots of 11i EBS + 11g R1 database
Deploying Oracle EBS Databases on Grid

- Deploying Oracle EBS Databases on Grid 11i EBS + 11g R1 Database through cloning (status: available)
- Screenshots of 11i EBS + 11g R1 database
Grid Implementation on Oracle 11gR2 RAC

- Running RAC Database for Oracle EBS instances

- Novora SIT database running on node 5 and 6:

```
[oracle@ausmegnovdev06.us.dell.com /u01/app/oracle/product/11.1.0/db_2]
$ srvctl status database -d gebd2tt
Instance gebd2tt1 is running on node ausmegnovdev05
Instance gebd2tt2 is running on node ausmegnovdev06
```
Deploying Oracle EBS Databases on Grid
Deploying Oracle EBS Databases on Grid

what's special?

- `$ORACLE_HOME/appsutil`
  - For configuration and cloning
  - Can be generated from the apps tier for the very first time - new OH or fresh install

- Parameter `utl_file_dir` in DB = `$APPLTMP` and `$APPLPTMP`
  - Challenge – can’t use the same path name for different apps servers/env

- DB trace files accessible by apps tier
  - Centralized location - `/u01/app/oracle/admin`

```
SQL> show parameter diag
NAME          TYPE       VALUE
------------------------------------
------------------
diagnostic_dest  string     /u01/app/oracle/admin
```

```
o:gebdl2tt1:/u01/app/oracle/admin/diag/rdbms>ls -ltr
```

```
total 0
drwxr-xr-x 3 oracle oinstall 80 Jun 30 09:53 gebe1st
. . . .
```
Deploying Oracle EBS Databases on Grid

what’s special?

- **Parameter utl_file_dir in DB = $APPLTMP and $APPLPTMP**

  Challenge – can’t use the same path name for different apps

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>1K-blocks</th>
<th>Used</th>
<th>Available</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>ausmtnas02:/endor_app01/common/endor</td>
<td>206515200</td>
<td>172039200</td>
<td>34476000</td>
<td>84%</td>
<td>/db/gebs/appl/app1/common/endor</td>
</tr>
<tr>
<td>ausmtnas03:/endor_app02/common/endor</td>
<td>206515200</td>
<td>640 206514560</td>
<td>1%</td>
<td>/db/gebs/appl/app2/common/endor</td>
<td></td>
</tr>
<tr>
<td>ausmtnas02:/malak_app01/common/malak</td>
<td>206515200</td>
<td>159619808</td>
<td>46895392</td>
<td>78%</td>
<td>/db/gebs/appl/app1/common/malak</td>
</tr>
<tr>
<td>ausmtnas04:/malak_app02/common/malak</td>
<td>206515200</td>
<td>3199648</td>
<td>203315552</td>
<td>2%</td>
<td>/db/gebs/appl/app2/common/malak</td>
</tr>
<tr>
<td>ausmtnas04:/han_app01/common/han</td>
<td>206515200</td>
<td>147649856</td>
<td>58865344</td>
<td>72%</td>
<td>/db/gebs/appl/app1/common/han</td>
</tr>
<tr>
<td>ausmtnas02:/han_app02/common/han</td>
<td>206515200</td>
<td>146424352</td>
<td>60090848</td>
<td>71%</td>
<td>/db/gebs/appl/app2/common/han</td>
</tr>
<tr>
<td>ausmtnas04:/windu_app01/common/windu</td>
<td>206515200</td>
<td>172366144</td>
<td>34149056</td>
<td>84%</td>
<td>/db/gebs/appl/app1/common/windu</td>
</tr>
<tr>
<td>ausmtnas03:/jedi_app01/common/jedi</td>
<td>206515184</td>
<td>61326088</td>
<td>145189096</td>
<td>30%</td>
<td>/db/gebs/appl/app1/common/jedi</td>
</tr>
<tr>
<td>ausmtnas04:/jedi_app02/common/jedi</td>
<td>206515184</td>
<td>176175856</td>
<td>30339328</td>
<td>86%</td>
<td>/db/gebs/appl/app2/common/jedi</td>
</tr>
<tr>
<td>ausmtnas02:/jango_app01/common/jango</td>
<td>165212144</td>
<td>160903240</td>
<td>4309064</td>
<td>98%</td>
<td>/db/gebs/appl/app1/common/jango</td>
</tr>
<tr>
<td>ausmtnas02:/jango_app02/common/jango</td>
<td>165212144</td>
<td>108037240</td>
<td>30339328</td>
<td>86%</td>
<td>/db/gebs/appl/app2/common/jango</td>
</tr>
<tr>
<td>ausmtnas02:/db_gebs_appl_app1/common/u4vmexar</td>
<td>258143984</td>
<td>161451232</td>
<td>96692752</td>
<td>63%</td>
<td>/db/gebs/appl/app1/common/u4vmexar</td>
</tr>
<tr>
<td>ausmtnas02:/windu_app02/common/windu</td>
<td>206515200</td>
<td>151340672</td>
<td>55174528</td>
<td>74%</td>
<td>/db/gebs/appl/app2/common/windu</td>
</tr>
<tr>
<td>ausmtnas02:/jaba_app01/common/jaba</td>
<td>206515200</td>
<td>198039328</td>
<td>8475872</td>
<td>96%</td>
<td>/db/gebs/appl/app1/common/jaba</td>
</tr>
<tr>
<td>ausmtnas03:/jaba_app02/common/jaba</td>
<td>206515200</td>
<td>80832896</td>
<td>125682304</td>
<td>40%</td>
<td>/db/gebs/appl/app2/common/jaba</td>
</tr>
<tr>
<td>ausmtnas03:/hoth_app01/common/hoth</td>
<td>206515200</td>
<td>117542944</td>
<td>88972256</td>
<td>57%</td>
<td>/db/gebs/appl/app1/common/hoth</td>
</tr>
<tr>
<td>ausmtnas04:/hoth_app02/common/hoth</td>
<td>206515200</td>
<td>105420736</td>
<td>101094464</td>
<td>52%</td>
<td>/db/gebs/appl/app2/common/hoth</td>
</tr>
<tr>
<td>ausmtnas02:/leia_app01/common/leia</td>
<td>206515200</td>
<td>160888192</td>
<td>45627008</td>
<td>78%</td>
<td>/db/gebs/appl/app1/common/leia</td>
</tr>
<tr>
<td>ausmtnas03:/leia_app02/common/leia</td>
<td>206515200</td>
<td>70587648</td>
<td>135927552</td>
<td>35%</td>
<td>/db/gebs/appl/app2/common/leia</td>
</tr>
<tr>
<td>ausmtnas02:/sifo_app01/common/sifo</td>
<td>165212160</td>
<td>148323520</td>
<td>16888640</td>
<td>90%</td>
<td>/db/gebs/appl/app1/common/sifo</td>
</tr>
<tr>
<td>ausmtnas04:/sifo_app02/common/sifo</td>
<td>165212160</td>
<td>608 165211552</td>
<td>1%</td>
<td>/db/gebs/appl/app2/common/sifo</td>
<td></td>
</tr>
<tr>
<td>ausmtnas04:/dooku_app01/common/dooku</td>
<td>165212160</td>
<td>136659936</td>
<td>28552224</td>
<td>83%</td>
<td>/db/gebs/appl/app1/common/dooku</td>
</tr>
<tr>
<td>ausmtnas02:/dooku_app02/common/dooku</td>
<td>165212160</td>
<td>2648352 162563808</td>
<td>2%</td>
<td>/db/gebs/appl/app2/common/dooku</td>
<td></td>
</tr>
<tr>
<td>ausmtnas02:/sit_common_top/common</td>
<td>103257600</td>
<td>85840704 17416896</td>
<td>84%</td>
<td>/db/gebs/appl/app_common/common</td>
<td></td>
</tr>
<tr>
<td>ausmtnas03:/sit_misc_top/misc/apps/apps_st/comn</td>
<td>141172000</td>
<td>62455648 78716352</td>
<td>45%</td>
<td>/db/gebs/appl/misc/misc/apps/apps_st/comn</td>
<td></td>
</tr>
</tbody>
</table>
# Shared or Local Storage for GI and Oracle Home?

<table>
<thead>
<tr>
<th>GI/ASM and OH Configuration</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shared GI/ASM and OH (NAS storage)</td>
<td>Patching only once; less time and effort for maintenance</td>
<td>Depending on NAS system and network; no rolling patch; everything down if issue with NAS, network, GI/ASM or OH binaries</td>
</tr>
<tr>
<td>Local GI/ASM and Shared OH</td>
<td>Patching only once for OH, less effort for OH maintenance; rolling patch for GI/ASM</td>
<td>All instances running on the OH down if issue with OH binaries</td>
</tr>
<tr>
<td>Local GI/ASM and OH</td>
<td>Rolling patch for both GI/ASM and OH, less or no down time during rolling patching; more reliable and independent from the NAS and network</td>
<td>More time and effort for patching and maintenance</td>
</tr>
</tbody>
</table>
Shared or Local Storage for GI and Oracle Home?

- Currently configured both GI/ASM and Oracle Home on shared NAS
  - NAS issue has caused downtime for all instances on all nodes

- Solution – Migrating GI/ASM and Oracle Home from NAS to local storage

- How?
  - Split current 16 node cluster into two clusters (nodes 1-8) and (nodes 9-16).
  - Current cluster will become nodes 1-8 after removing nodes 9-16 by node remove process. All instances running on current cluster on nodes 1-8
  - Rebuild nodes 9-16 to a new cluster and install GI and Oracle Home on local storage
  - Migrate all instances from nodes 1-8 to the new cluster
Migrating Shared GI and Oracle Home to Local Storage

- Move all instances running on nodes 9-16 to nodes 1-8
- Remove nodes 9-16 from the current cluster by removing cluster node process
- Obtain new IP addresses for SCAN Listener on cluster 2
- Request small size LUN for voting disk (3GB)
- Unzone some of unused LUNs and make them available to the cluster on nodes 9-16
- Remove the nodes 9-16 from the current cluster by node remove process
- Add local storage nodes 9-16 and rebuild the servers
- Install and configure the Grid Infrastructure on the local storage
- Clone the DBs from the existing cluster (nodes 1-8) to the new cluster (nodes 9-16)
- Remove DB’s from nodes 1-8
- Release the LUNs from nodes 1-8 and allocate them to nodes 9-16
- Rebuild nodes 1-8 and add them to the new cluster (nodes 9-16) by adding cluster node process
- Run the prep-install validations (pre-requisite check, CLUVFY) for CRS install
- Then we have the cluster with all 16 nodes running GI and Oracle Home on the local storage
Current Status and Future Plans

• **Currently, only Novora system databases are running on the Grid**
  – 11gR1 databases for Oracle Apps 11i
  – Archiving databases for Novora 11i
  – 11gR2 databases for Oracle Apps R12

• **Future Plans – hosting 4 major Oracle Apps 11i and R12 systems**
  – Upgrading databases from 11gR1 to 11gR2 for Novora Oracle Apps R12
  – Migrating DFS EBS 11i 10gR2 databases from individual physical servers to the grid
  – Clone non-prod 11gR1 DBs to the grid for COIN$ systems
  – Clone non-prod 11gR2 DBs to the grid for PIM systems
  – Migrating databases for other utility tools for Oracle Apps systems, e.g. GRC, ITG, etc.
  – Expected to host 50+ databases
## Comparison and Savings of Before and After Consolidation

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of servers</td>
<td>30+</td>
<td>16</td>
</tr>
<tr>
<td>Database instances</td>
<td>30+</td>
<td>50+, Have the capacity for 100+</td>
</tr>
<tr>
<td>Storage</td>
<td>50+TB total of all servers and DBs</td>
<td>32TB</td>
</tr>
<tr>
<td>Cloning Time</td>
<td>3-5 days/env (10-12 envs/quarter)</td>
<td>2-3 days/env (12-15 envs/quarter)</td>
</tr>
<tr>
<td>Patching time</td>
<td>2hrs each server – 60+ hours/quarter</td>
<td>10 hours total/quarter</td>
</tr>
<tr>
<td>DBA time</td>
<td>4 full time</td>
<td>2 full time</td>
</tr>
<tr>
<td>Cost</td>
<td>$$$</td>
<td>$$</td>
</tr>
</tbody>
</table>
Summary

- Oracle Grid Infrastructure provides great solutions for database system consolidations which include servers, storage, database management, datacenter space, etc.

- Grid Infrastructure provides high availability, scalability, efficient usability, manageability to different versions of database systems

- Cost-savings on hardware, datacenter, and DBA time

- Special considerations and configurations are required for consolidating EBS databases on the Grid
Acknowledgement

- Sreekanth Chintala – architect and strategist, design on MegaGrid/GI systems, drove database migration from individual physical servers to MegaGrid, driving on migrating GI and OH from shared NAS storage to local HD on Novora GI system

- Ravi Kulkani – DBA Eng team lead, technical support on the Novora GI implementation

- OOW Session ID#10109 : Database as a Service - How does Dell do it in a Consolidated Private Cloud?
References

- Oracle E-Business Suite on Oracle RAC and Oracle VM: Architecture and Implementation, Kai Yu and John Tao, Oracle Open World 2009, Session ID #S310132
- Implementing Oracle E-Business Suite in a scalable and reliable virtual system architecture, Kai Yu and John Tao, A Dell Technical White Paper, OAUG 2011
- Database as a Service - How does Dell do it in a Consolidated Private Cloud? Sreekanth Chintala and Ravi Kulkarni, Oracle Open World 2011, Session ID #10109
- Interoperability Notes EBS R12 with Database 11gR2 [ID 1058763.1], Oracle white paper
- Using Oracle 11g Release 2 Real Application Clusters with Oracle E-Business Suite Release 12 [ID 823587.1], Oracle white paper
- Pre 11.2 Database Issues in 11gR2 Grid Infrastructure Environment [ID 948456.1], Oracle white paper
Q&A
Thank You and QA
Contact us at john_tao@dell.com, kai_yu@dell.com or visit Kai’s Oracle Blog at http://kyuoracleblog.wordpress.com/

My OOW 2011 Conference Presentation Schedules

I will present or participate as a panelist of the following OOW sessions:

1. Ensure the High Availability and Stability of Oracle RAC: Storage and Network Side Story, Session #09385, 10/2/2011, Sunday, 01:30 PM, Moscone West - 2005

2. Launching the IOUG Virtualization SIG: 360 Degrees of Virtualization for Oracle DBA..., session #28900, IOUG Virtualization panel, 10/2, Sunday, 04:00 PM, Moscone West - 2009

3. Consolidate Oracle E-Business Suite Databases in Oracle Database 11g Release 2 Grid: Case Study, session #08945, 10/4/2011, Tuesday, 10:15 AM, Intercontinental - Intercontinental Ballroom A

4. Configuring and Managing a Private Cloud with Oracle Enterprise Manager, Oracle OpenWorld 2011 session #06980, 10/4/2011, Tuesday, 05:30 PM, Moscone South - 309, San Francisco

5. Upgrading Oracle Enterprise Manager, Using Best Practices, Oracle OpenWorld 2011 session #0733, 10/6/2011, Thursday, 01:30 PM, Intercontinental - Intercontinental Ballroom A