Oracle 10g on Solaris to Oracle RAC 11gR2 on Linux Upgrade

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Who We Are

- Autodesk is a world leader in 2D and 3D design, engineering, and entertainment software
- 99 percent of the Fortune 100 use Autodesk® products
- 10+ million users globally, 800,000 companies, 187 countries
- 6,600 employees worldwide
- FY10 revenue of $1.7B
What We Did

Physical standalone servers:
- 2 Sun SunFire VX240
- 3 Sun SunFire VX440
- Independent storage
- Multiple versions or Oracle

Upgrade/Consolidate:
- 3 Dell R710
- Shared storage
- Single version
How We Did It...
Challenges/Goals

- Move ~15TB of data 90 miles to new datacenter
- Upgrade to Oracle 11gR2
- Cross-platform upgrade
- Increase performance
- Minimal downtime
- Simplify landscape
- No data loss
Multiple Upgrade Methods

**Database Upgrade Assistant (DBUA)**
- GUI (Wizard) interface
- Easiest upgrade
- Medium downtime

**Data Guard (MAA method)**
- Scripts
- Most complex
- Least downtime

**Export/Import**
- Scripts
- Allows data defragmentation
- Cross-Platform
- Longest downtime

**Manual Upgrade**
- Scripts
- Time consuming
- Medium downtime
Data Movement

- NetApp SnapMirror technology

- Leverage dedicated backup 1Gbps circuit between DCs
Export/Import Upgrade

- New 3 node Cluster
- Dell R710
- Redhat Linux 5.3
- 11gR2 RAC

ASM Diskgroup

Final 11gR2 ASM Storage

Migration NFS Volume

- Temporary location
- Holds export dump files
- Import from this location

SnapMirror Destination

- Receives Snapshot from source
- VERITAS file system

Production

UPGRADE

- Transitional Server
- Sun V440
- Solaris 10
- 11gR1 Non-RAC
Export/Import Timings

- New 3 node Cluster
  - Dell R710
  - Redhat Linux 5.3
  - 11gR2 RAC

- Transitional Server
  - Sun V440
  - Solaris 10
  - 11gR1 Non-RAC

- ASM Diskgroup
  - 56 hours import (P8)
  - 5.4TB final db size
  - 32% reduction (compressed)

- Migration NFS Volume
  - 4.2TB dump size
  - 19 hours export (P8)

- SnapMirror Destination
  - 8TB source db size
Maximizing Export/Import Performance

- DataPump instead of original export/import
- Fast storage drives, preferably Fiber Channel 15K RPM
- Parallelism

```bash
expdp system directory=data_pump_dir dumpfile=cpidprd1_%U.dmp logfile=cpidprd1_cpi_exp.log schemas=cpi parallel=8
```
Migration Time

<table>
<thead>
<tr>
<th>Task</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>SnapMirror replication</td>
<td>2 days</td>
</tr>
<tr>
<td>Export</td>
<td>19 hours (source READ ONLY)</td>
</tr>
<tr>
<td>Import</td>
<td>56 hours (source READ ONLY)</td>
</tr>
</tbody>
</table>

- During the export/import process source database remained online in READ ONLY mode until the new database was live.

- Once live the increased processing power allowed for quick catch-up of 3 day backlog.
Previous Configuration

- Five Solaris servers, (3) Sunfire V440, (2) V420
- Various memory configurations 4, 8 and 16GB
- Solaris 9 and Solaris 10
- VERITAS File Systems
- Multiple storage appliances (EMC and NetApp)
- Oracle 9i and 11gR1
- Oracle Partitioning (11gR1 databases)
- Oracle Compression (11gR1 databases)
Final Configuration

- Three Dell R710s
  - 64Gb RAM
  - Two Quad-core 2.8GHz processors
- Redhat Linux 5.3 (2.6.18-128 kernel)
- Dedicated NetApp FAS3160 Cluster
- Oracle 11gR2 Real Application Clusters
- Oracle 11gR2 Enterprise Edition
- Oracle 11gR2 Automatic Storage Management
- Oracle Advanced Compression
- Oracle Partitioning
Benefits Realized

**Reduced Cost**
- Replacing expensive hardware with commodity

**Reduced Complexity**
- Oracle RAC 11gR2
- Standard architecture

**Reduced Storage**
- Oracle Advanced Compression 11gR2
- 32% reduction in storage

**Reduced Downtime**
- Oracle RAC 11gR2
- Service failover
- Ability to patch CRS with no DB downtime

**Increased Scalability**
- Oracle RAC 11gR2
- Workload Management
- Services

**Increased Availability**
- Oracle RAC 11gR2
- Multiple nodes
- Service failover

**Increased Performance**
- Oracle ASM, RAC & RDBMS 11gR2
- Cheaper/faster hardware
- 10x improvement in I/O response time using ASM
- 3x application response improvement
- 2.5x application load capacity
- Better PQ memory management

**Increased Manageability**
- Oracle RAC & RDBMS 11gR2
- Global AWR
- Improved CRSCTL and SRVCTL commands
- ASMCMD (Command Line for ASM)
- OCR + Voting disk both in ASM
Lessons Learned

- Test, test, test (test)
- Apply the most recent PSU available
- Not all features are appropriate (test)
- Involve all engineering and application teams early, including Storage, Network and Server Administrators, not just DBAs
- Engage Professional Support Services if needed
Next Steps

- Consolidate databases
  - 5 databases => 1
  - Schemas instead of databases
  - RAC services

- Improve memory and CPU resource allocation

- Further simplify landscape

- 11.2.0.2 (11gR2 Patchset 2)
  - Bug fixes
  - Improved PQ statement queuing
  - Memory stress protection feature
Recommended Resources

- Oracle 11gR2 Upgrade Companion (Note 785351.1)
- Oracle 11gR2 Upgrade Guide
  - http://awill.us/9APJXe
- Oracle 11gR2 Installation Guides
  - http://awill.us/a64s4W
- Oracle Support Upgrade Advisor (Note 250.1)
- Oracle MAA Best Practices Portal
  - http://www.oracle/goto/maa