R12 Upgrade Best Practices & Tips to Reduce Downtime

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• Managing Principal Consultant at Apps Associates Pvt. Ltd. Hyderabad
• 8 years of experience as an Oracle Apps/Business Intelligence/Fusion Middleware DBA
• Oracle certified professional
Global provider of business and technology consulting services

Founded in 2002 and achieved consistent growth
- 650+ employees
- Boston, New York, Chicago, Atlanta
- Germany, Netherlands, India, UAE

Recognized as one of the fastest growing private US companies by Inc. 500|5000 for four consecutive years

Strategic Partnerships and Certifications
- Oracle Platinum Partner
- Oracle Specializations (EBS, BI, SOA, EM12c & Database)
- AWS Advanced Consulting Partner
- CMMI Level 3 Appraised
- SSAE 16/SAS70 Type II
Agenda

• Why Upgrade
• 11i vs. R12 (Architecture Changes)
• E-Business Suite Roadmap
• Support Timelines
• Reduce Downtime – DB Considerations, App Considerations, Process Considerations
• Customer Case Study
Why Upgrade

• To be on the supported version
• Enhance the existence environment with new features
• More scalability and better performance
EBS 11.5.10.2 covered by an Exception to Sustaining Support to December 31, 2015

Longer EBS 12.1 Premier and Extended Support timelines

- Premier Support runs to December 31, 2016 (Originally was to end May 2014; 31 extra months added)
- Extended Support runs to December 31, 2019 (Originally was to end December 2018; one extra year added)
11i Architecture

**Client**
- Jinitiator

**Application**
- 9iAS 1.0.2.2
  - Servlet Engine
  - JSP
  - C4J
  - UIX
  - Reports
  - Forms

**Database**
- 9i or 10g
R12 Architecture

Client
- Java
- Windows
- Apple

Application
- ORACLE FUSION MIDDLEWARE
  - APPLICATION SERVER
- OC4J
- JSP
- BC4J
- UIX
- BI Publisher
- Forms

Database
- ORACLE DATABASE
  - 10gR2 | 11g
- Global Single Data Model
- RAC & ASM

HTTP/S

JDBC/SQLNet
# R12 Technology Stack

<table>
<thead>
<tr>
<th>Technology Component</th>
<th>Version included in 11.5.10.2</th>
<th>Version included in 12.1.3</th>
<th>Version Certified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle Tier (Forms/Reports)</td>
<td>6.0.8.25</td>
<td>10.1.2.3</td>
<td>10.1.2.3</td>
</tr>
<tr>
<td>Middle Tier Oracle Home/Java</td>
<td>1.0.2.2/1.4.2</td>
<td>10.1.3.4/1.6.0</td>
<td>10.1.3.5/1.7</td>
</tr>
<tr>
<td>Database</td>
<td>9.2.0.6</td>
<td>11.1.0.7</td>
<td>10gr2 - 10.2.0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>11gr2 - 11.2.0.4</td>
</tr>
</tbody>
</table>
## R12.1 Key Facts

<table>
<thead>
<tr>
<th></th>
<th>1110CU2</th>
<th>R12.0.4 RI</th>
<th>R12.1 RI</th>
<th>12.1.3 RUP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong># of Product Schemas</strong></td>
<td>209</td>
<td>195 (25 removed, 11 added)</td>
<td>201 (25 removed, 17 added)</td>
<td>No changes</td>
</tr>
<tr>
<td><strong># file calls in DB portion of the U driver</strong></td>
<td>104242</td>
<td>144940</td>
<td>156622</td>
<td>23408</td>
</tr>
<tr>
<td><strong>PROD db size</strong></td>
<td>31 GB</td>
<td>45 GB</td>
<td>50 GB</td>
<td>NA</td>
</tr>
<tr>
<td><strong>File system size</strong></td>
<td>26 GB</td>
<td>28 GB</td>
<td>28 GB</td>
<td>NA</td>
</tr>
<tr>
<td><strong># files shipped in RI</strong></td>
<td>268359</td>
<td>357778</td>
<td>385755</td>
<td>NA</td>
</tr>
<tr>
<td><strong># of Changed + New files in DB portion of the U driver</strong></td>
<td>NA</td>
<td>~95488 (Vs 11.5.10.2)</td>
<td>~104057 (Vs 11.5.10.2)</td>
<td>~23474 (Vs 12.1.1)</td>
</tr>
</tbody>
</table>
Upgrade Path

11.5.9
11.5.9 CU1
11.5.9 CU2
11.5.10
11.5.10 CU1
11.5.10 CU2
12.1.1
12.1.3
Upgrade Prerequisites

- Database must be on 10gR2 or higher
- EBS must be on 11.5.9 or higher
- 11i.AD.I.6
- ATG PF H Rollup 6 or higher
Reduce Upgrade Downtime

DB Considerations

- Have bigger redo logs
- Database in no archive log mode
- Disabling Auditing
- Disable flashback
- Disable TDE
- Enable Degree of Parallelism (DOP)
- Tune init.ora parameters
  - SGA_MAX_SIZE
  - PGA_AGGREGATE_SIZE
  - db_file_multiblock_read_count
Reduce Upgrade Downtime

DB Considerations

• Disable custom triggers and business events
• Tablespace sizing
• Allocate parallel channels for RMAN backups
• Recycle bin = off
Reduce Upgrade Downtime

Application Considerations

• Use TUMS (“The Upgrade Manual Script”) to avoid tasks not relevant to the system
• Upgrade by request
• Batch size
• AD workers
• Increase ADJREOPTS, ADJRIIOPTS parameters (Ref: 557926.1)
  – Avoid errors “occurred during initialization of VM, could not reserve enough space for object heap errors”
• Distributed AD
Reduce Upgrade Downtime

Application Considerations

- Merge NLS patches
- Apply Help and NLS patches online
- Apply HR Global driver online
- Merge and apply product specific patches (post upgrade)
  - 62 patches merged as 10 patches
  - 20 hours patching time reduced to 8 hours

<table>
<thead>
<tr>
<th>Product</th>
<th>No.</th>
<th>Patch Location</th>
<th>Driver File</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Suite</td>
<td>17</td>
<td>/r12/staging/R12Upgrade/Product_Specific_Patches/Project_Suite/dest</td>
<td>u_merged.drv</td>
</tr>
<tr>
<td>Cash Management</td>
<td>1</td>
<td>/r12/staging/R12Upgrade/Product_Specific_Patches/Cash_Management/13024047</td>
<td>u13024047.drv</td>
</tr>
<tr>
<td>E-Business Tax</td>
<td>1</td>
<td>/r12/staging/R12Upgrade/Product_Specific_Patches/E-Business_Tax/10072294</td>
<td>u 10072294.drv</td>
</tr>
<tr>
<td>Fixed Assets</td>
<td>4</td>
<td>/r12/staging/R12Upgrade/Product_Specific_Patches/Fixed_Assets/dest</td>
<td>u_merged.drv</td>
</tr>
<tr>
<td>General Ledger</td>
<td>2</td>
<td>/r12/staging/R12Upgrade/Product_Specific_Patches/General_Ledger/dest</td>
<td>u_merged.drv</td>
</tr>
<tr>
<td>Payments</td>
<td>9</td>
<td>/r12/staging/R12Upgrade/Product_Specific_Patches/Payments/dest</td>
<td>u_merged.drv</td>
</tr>
<tr>
<td>Receivables</td>
<td>2</td>
<td>/r12/staging/R12Upgrade/Product_Specific_Patches/Receivables/dest</td>
<td>u_merged.drv</td>
</tr>
<tr>
<td>Payables</td>
<td>5</td>
<td>/r12/staging/R12Upgrade/Product_Specific_Patches/Payables/dest</td>
<td>u_merged.drv</td>
</tr>
<tr>
<td>Sub Ledger Accounting</td>
<td>8</td>
<td>/r12/staging/R12Upgrade/Product_Specific_Patches/Sub_Ledger_Accounting/dest</td>
<td>u_merged.drv</td>
</tr>
<tr>
<td>Human Resource</td>
<td>12</td>
<td>/r12/staging/R12Upgrade/Product_Specific_Patches/Human_Resource/dest</td>
<td>u_merged.drv</td>
</tr>
</tbody>
</table>
Reduce Upgrade Downtime
Process Considerations

• Automate the upgrade process as much as possible
  – Use Shell scripts, adalldefaults.txt, identify the steps we can do ahead of cutover time

• Time every activity and deal with bottlenecks
  – A baseline for upgrade execution time, analyse adtimrpt.sql output

• Maintain Issues & Resolution document for quick reference

• Maintain cookbook
  – Cookbook includes end to end activities along with various phases which are sequentially listed down
Reduce Upgrade Downtime

Process Considerations

• Maintain Checklist
  – Crosscheck the checklist before start any major tasks (like 12.1.1 or 12.1.3 upgrade etc.) This checklist should have SGA, PGA, job_queue_processes, parallel_max_servers, heap size etc.
Customer Case Study
## Customer Environment

<table>
<thead>
<tr>
<th></th>
<th>Source Environment</th>
<th>Target Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB Version</td>
<td>11.2.0.3</td>
<td>11.2.0.3</td>
</tr>
<tr>
<td>Application Version</td>
<td>11.5.10.2</td>
<td>12.1.3</td>
</tr>
<tr>
<td>DB Size</td>
<td>800 GB</td>
<td>800 GB</td>
</tr>
<tr>
<td>NLS Languages</td>
<td>English</td>
<td>English, Simplified Chinese</td>
</tr>
<tr>
<td>Nodes</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Operating System</td>
<td>Sun Solaris SPARC 64bit</td>
<td>Sun Solaris SPARC 64bit</td>
</tr>
<tr>
<td>DB Character set</td>
<td>WE8IS08859P1</td>
<td>AL32UTF8</td>
</tr>
</tbody>
</table>

### Customer Complexities

Custom Apps Schema
Process Flow

Pre-Downtime Tasks:
- Install 12.1.1 binaries
- Install Mod/PLSQL
- Update apps_value to apps_find in 12.1.1 binaries
- Apply Performance Patches in prepinstall mode

Pre-upgrade Steps:
11.5.10.2 to 12.1.1

Post-upgrade Steps:
12.1.1 to 12.1.3

Product Specific Patches

Recruitment Setup

Discoverer Setup

Charset Conversion

Add Simplified Chinese Patch

Functional Setups

EBS Cold Backup

EBS Cold Backup

EBS HOT Backup
• Run at least one mock upgrade in the production hardware before the actual upgrade (if we have new hardware for R12 production)
• Degree of parallelism
  – Helped for bigger patches
• Performance patches
  – Cross check with Oracle support before implementing them
• `adalldefaults.txt (when Autoconfig run)`
  – Have this file in the common location and let all the patches picks the file from the common location
# Lessons Learned

Play with SGA, PGA, batch size, adworks to find the optimized value

<table>
<thead>
<tr>
<th>E2E</th>
<th>1st Round</th>
<th>2nd Round</th>
<th>3rd Round</th>
<th>4th Round</th>
<th>5th Round</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patch Workers</td>
<td>64</td>
<td>64</td>
<td>76</td>
<td>76</td>
<td>76</td>
</tr>
<tr>
<td>SGA Size</td>
<td>10 GB</td>
<td>12 GB</td>
<td>15GB</td>
<td>12 GB</td>
<td>12GB</td>
</tr>
<tr>
<td>PGA Size</td>
<td>2 GB</td>
<td>2 GB</td>
<td>2 GB</td>
<td>4 GB</td>
<td>5GB</td>
</tr>
<tr>
<td>ADDROPTS</td>
<td>3 GB</td>
<td>4 GB</td>
<td>4 GB</td>
<td>2 GB</td>
<td>2 GB</td>
</tr>
<tr>
<td>ADDROPTS</td>
<td>3 GB</td>
<td>4 GB</td>
<td>4 GB</td>
<td>2 GB</td>
<td>2 GB</td>
</tr>
<tr>
<td>Java Heap Size</td>
<td>3 GB</td>
<td>4 GB</td>
<td>4 GB</td>
<td>2 GB</td>
<td>2 GB</td>
</tr>
<tr>
<td>No of JVM Core</td>
<td>1 each</td>
<td>1 each</td>
<td>1 each</td>
<td>1 each</td>
<td>1 each</td>
</tr>
<tr>
<td>batch size</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>5000</td>
<td>10000</td>
</tr>
</tbody>
</table>

| SLA Data | 1 Year | 6 Months | 6 Months | 6 Months | 6 Months |

| Server Configuration | | | | | |
|-----------------------|-----------------|-----------------|-----------------|-----------------|
| Physical Memory | 64 GB | 64 GB | 64 GB | 64 GB | 96 GB |
| Swap Memory | 32 GB | 32 GB | 32 GB | 32 GB | 32 GB |
| No of CPUs | 32 | 32 | 32 | 32 | 48 |

| Total 12.1.1 Upgrade Time (in hours) | 46 | 35 | 34 | 31 | 25 |


| Redo Log Size | 250M | 250M | 250M | 250M | 1GB |
| Redo Log Multiplexing | Yes | Yes | Yes | Yes | Yes |
| Top Jobs | | | | | |
| cstpostimportaad.sql | 04:03:28 | 05:59:25 | 09:47:13 | Skipped this job | Skipped this job |
| adostats.sql | 03:32:37 | 02:37:33 | 02:23:05 | 02:09:25 | 2:14:54 |
| apppostimportaad.sql | 01:20:49 | 02:11:11 | 01:05:41 | 01:38:50 | 00:53:38 |
| gmfpostimportaad.sql | 01:09:21 | 01:44:53 | 01:49:04 | 01:40:32 | 01:02:12 |
| papostimportaad.sql | 01:16:30 | 01:35:58 | 03:28:46 | 01:12:07 | 00:42:31 |
| apppostimportaad.sql | 00:49:21 | 01:30:45 | 02:44:40 | 00:53:14 | 00:28:58 |
| adobjcmp.sql | 01:16:46 | 01:05:39 | 01:11:05 | 01:03:48 | 00:54:34 |
| pnuqga.sql | 01:41:13 | 00:12:49 | 00:13:17 | 00:15:51 | 00:14:54 |
| ar120gir.sql | 01:29:09 | 00:29:25 | 00:28:47 | 00:15:19 | 00:20:32 |

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Upgrade to EBS 12.1.3 vs 12.2.2/3

• You should choose EBS 12.1.3
  – Prefer to target a release on which Oracle has thousands of live customers
  – Would like to stay on 12.1 for 3-5 years before upgrading to 12.2 (Premier Support till mid 2018)
  – Are you upgrading from a release prior to 11.5.10.2

• You should choose EBS 12.2.x
  – You need the high availability provided by Online Patching
  – You want the functional enhancements that are in 12.2
  – You prefer to invest in a single project to upgrade directly to 12.2
  – You want to have hundreds of New Features comes with 12.2, Weblogic Server, Streamlined Installation
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