Pivot from Manual to Scalable with Oracle Database Lifecycle Management Pack

Ashwin Vaidya & Sarah Brydon -- Sep 22, 2016
Sarah Brydon
Senior Manager, Data Platform Security

About me

- Oracle DBA since 1996, Oracle Certified Master
- Specialist in RAC, VLDB & 24x7 systems
- Background in financial and scientific companies
- Secured PCI, PII, SOX, HIPAA and patent data
- Responsible for database platform security and hardening across PayPal and PayPal Credit
- [http://www.linkedin.com/in/sarahbrydon/](http://www.linkedin.com/in/sarahbrydon/) or follow me on Twitter at @sarah_brydon

About PayPal and PayPal Credit

- Oracle powers our transactional data
- One of the largest private clouds in the world
- 16PB stored on Oracle
- 10+ TB streamed daily via Goldengate
- 184 million active accounts
Two decades ago, our founders invented payment technology to make buying and selling faster, secure, and easier—and put economic power where it belongs: **In the hands of people.**
Global scale

Our customers can accept payments in 100 currencies, withdraw funds to their bank accounts in 57 currencies, and hold balances in their PayPal accounts in 26 currencies.

Almost 8,000 PayPal team members provide support to our customers in over 20 languages.

We are a trusted part of people’s financial lives and a partner to merchants in 200+ markets around the world.
PayPal is leading the transformation

**AT SCALE***

- 184 Million Active Accounts**
- $282 Billion TPV
- $9.24 Billion Revenue***
- 4.9 Billion Transactions

**WITH MOMENTUM***

- +17 Million Active Accounts Gained in 2015
- +27% y/y TPV Growth****
- +24% y/y Transaction Growth

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*Stats are full year 2015, unless otherwise noted.
**Stat is Q1 2015
***Revenue is presented on a non-GAAP pro forma basis, and includes the impact of pro forma adjustments directly attributable to the separation of the company from eBay Inc. on July 17, 2015 had they existed historically.
****Calculated on an FX-neutral basis
Business Challenge of Compliance & Configuration
Increasing burden of responding to internal and external audits and enforcing standards

- Initial deployment via gold images radically reduced build times
- Patching remained an enormous business challenge
- Aside from availability impacts, required 4-8 hours of dedicated DBA time per cluster
Delivering Patching Automation

Leveraging the Power of the LifeCycle Management Pack
Ashwin Vaidya
Senior Engineer, Database Platform Security

About me

- Oracle Technologist since 1995
- Specialist in RAC, VLDB, Goldengate & 24x7 installations
- Previously employed at several Fortune 500 organisations
- Varied responsibilities at Paypal including DB engineering/architecture/operations
- Support Oracle & Mongodb/Cassandra/Couchbase

About Paypal

- Oracle powers our transactional data
- One of the largest private clouds in the world
- 16PB stored on Oracle
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RAC RAC Everywhere : A basic Oracle DB @ Paypal

- **OCC 1**
  - Java 1
  - DB instance
  - /u01/home/oracle
  - DB /SW 11.2.0.4.4
  - Cluster SW 11.2.0.4.4
- **OCC 2**
  - Java 2
  - DB instance
  - /u02/home/crs
  - DB /SW 11.2.0.4.4
  - Cluster SW 11.2.0.4.4

SAN

Oracle DB files
11.2.0.4.4
Patching a DB: Rolling patching is a must to ensure 100% availability

112044 → 112049

OCC 1

Java 1

DB instance1

/u01/home/oracle
DB /SW 11.2.0.4.4
Cluster SW 11.2.0.4.4

OCC 2

Java 2

DB instance 2

/u02/home/crs

Oracle DB files 11.2.0.4.4

SAN
Patching a DB: Rolling patching is a must to ensure 100% availability

112044 → 112049

OCC 1
Java 1
DB instance 1
DB /SW 11.2.0.4.4
Cluster SW 11.2.0.4.4
/u01/home/oracle
/u02/home/crs

OCC 2
Java 2
DB instance 2
DB 11.2.0.4.9
Cluster 11.2.0.4.9

SAN
Oracle DB files
11.2.0.4.4

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Patching a DB: Rolling patching is a must to ensure 100% availability

112044 → 112049

OCC 1

Java 1

DB instance 1

/u01/home/oracle

DB / SW
11.2.0.4.4

Cluster SW 11.2.0.4.4

OCC 2

Java 2

DB instance 2

/u02/home/crs

DB 11.2.0.4.9

Cluster 11.2.0.4.9

SAN

Oracle DB files
11.2.0.4.4

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Patching a DB: Rolling patching is a must to ensure 100% availability

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Patching a DB: Rolling patching is a must to ensure 100% availability

112044 ➔ 112049

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Manual Patching – Creating a Gold Image

- AIX
- SOLARIS
- LINUX

DB 11.2.0.4.4
Cluster 11.2.0.4.4

(22191577)PSU9
22904370(grid)
22883138(grid+db)
19168005(db)

DB 11.2.0.4.9
Cluster 11.2.0.4.9

TAR BALL
OEM PROFILE
Manual-Patching
Using the TAR BALL/PROFILE deployment

- Shutdown
- Move 11204 to 11204_OLD
- Move 112049 to 11204
- Copy 11204_OLD/Config files to 11204/Config
- Start CRS
- Start DB
1. Application connections rolls are a significant challenge (OCC/Java pools/ GG)

2. Brown-outs due to reconfiguration at instance startup/stop, necessitate minimum no of stops/starts

3. Exact moment of startup/stop db instance need to be controlled

4. Patching GRID+ DB Home required db owner/super user privileges

5. PSU patching is actually PSU++ Patching

PayPal version will have for example:

PSU patch &

- 5 additional “cluster + DB” patches
- 2 cluster only patches
- 4 DB only patches
OEM – Patching Plan

• Advantages:
  • OEM has inbuilt procedures for fine-grained control of each step including DB start/stop
  • OEM has all the metadata/admin framework readily available, including methods for allowing limited root access
  • Patching Plan – Out of place patching

  1. Copy
  2. Apply Patch

• Stop database instance
• Point to 112049 home
• Start database instance
Issues with Patching Plan

1. Cannot combine multiple patches with one patching plan - a problem for PSUs with MLRs added
2. Out of place patching changes home name
3. One-off, piecemeal patching.
4. Does not use a standard gold image, so end state is neither guaranteed nor stable.
Automation with Scripts

1. Total Control
2. Uses OEM framework. Gold Image deployment is the core strategy
3. Can be submitted with a wrapper OEM job
4. Lets us keep the same HOME name

Cons

• Need to push the scripts to every node being patched and manage those deployments
### OEM Job & scripts

**ORACLE Enterprise Manager Cloud Control 12c**

**Job**
- **Ended**: Aug 16, 2016 12:24:17 PM GMT-07:00
- **Elapsed Time**: 7 minutes, 35 seconds
- **Previous Try**: Aug 16, 2016 11:34:41 AM GMT-07:00

**Targets**:
- **Go**

**Status**:
- **All**

#### Expand All | Collapse All

<table>
<thead>
<tr>
<th>Name</th>
<th>Targets</th>
<th>Status</th>
<th>Started</th>
<th>Ended</th>
<th>Elapsed Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>.paypal.com</td>
<td>.paypal.com</td>
<td>Succeeded</td>
<td>Aug 16, 2016 12:16:42 PM GMT-07:00</td>
<td>Aug 16, 2016 12:24:17 PM GMT-07:00</td>
<td>7.6 minutes</td>
</tr>
<tr>
<td>Task: ORA_PATCH_READINESS_VFY_00</td>
<td>.paypal.com</td>
<td>Succeeded</td>
<td>Aug 16, 2016 10:56:19 AM GMT-07:00</td>
<td>Aug 16, 2016 10:56:28 AM GMT-07:00</td>
<td>9 seconds</td>
</tr>
<tr>
<td>Task: ORA_INIT_CHECKPOINT_01</td>
<td>.paypal.com</td>
<td>Succeeded</td>
<td>Aug 16, 2016 11:34:43 PM GMT-07:00</td>
<td>Aug 16, 2016 11:36:26 AM GMT-07:00</td>
<td>2.1 minutes</td>
</tr>
<tr>
<td>Task: ORA_STOP_SERVICES_02</td>
<td>.paypal.com</td>
<td>Succeeded</td>
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<td>Aug 16, 2016 11:36:26 AM GMT-07:00</td>
<td>1.7 seconds</td>
</tr>
<tr>
<td>Task: ORA_MOVE_OCC_03</td>
<td>.paypal.com</td>
<td>Succeeded</td>
<td>Aug 16, 2016 11:41:35 AM GMT-07:00</td>
<td>Aug 16, 2016 11:41:39 AM GMT-07:00</td>
<td>4 seconds</td>
</tr>
<tr>
<td>Task: ORA_PRE_DBSTOP_CHECKPOINT_05</td>
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<td>Succeeded</td>
<td>Aug 16, 2016 11:41:39 AM GMT-07:00</td>
<td>Aug 16, 2016 11:41:42 AM GMT-07:00</td>
<td>3 seconds</td>
</tr>
<tr>
<td>Task: ORA_STOP_DB_06</td>
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<td>Succeeded</td>
<td>Aug 16, 2016 11:41:39 AM GMT-07:00</td>
<td>Aug 16, 2016 11:41:42 AM GMT-07:00</td>
<td>3 seconds</td>
</tr>
<tr>
<td>Task: ROOT_SWITCH_CRS_07</td>
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<td>Succeeded</td>
<td>Aug 16, 2016 11:41:42 AM GMT-07:00</td>
<td>Aug 16, 2016 11:41:42 AM GMT-07:00</td>
<td>3 seconds</td>
</tr>
<tr>
<td>Task: ORA_RELINK_CRS_08</td>
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<td>Succeeded</td>
<td>Aug 16, 2016 11:41:42 AM GMT-07:00</td>
<td>Aug 16, 2016 11:41:42 AM GMT-07:00</td>
<td>3 seconds</td>
</tr>
<tr>
<td>Task: ROOT_START_CRS_09</td>
<td>.paypal.com</td>
<td>Succeeded</td>
<td>Aug 16, 2016 11:41:42 AM GMT-07:00</td>
<td>Aug 16, 2016 11:41:42 AM GMT-07:00</td>
<td>3 seconds</td>
</tr>
</tbody>
</table>

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OEM Job & scripts
The future is here!

Fleet Management with OEM!
Database Fleet Maintenance

New! Simplified Software Configuration Standardization at Scale

Scan the Fleet
- Discover Configuration Pollution
  a. Run Advisor to analyze the database estate
  b. Identify required standard configurations
  c. Prepare Reference environments for each standard configuration

Create Gold Image
- Create Gold Image
  a. List available images
  b. List versions of an image
  c. Make a version “Current”

Subscribe Databases to a Gold Image
- Subscribe Databases to a Gold Image
  a. List subscriptions of an image
  b. Validate subscriptions

Push Image and Switch
- Deploy Image
  a. Shadow Home is created
- Switch Database
  a. Migrate Listener
  b. Update Database: SI, GI, RAC, Standby
1. End State driven management
2. Can be run from a central location (Uses EMCLI, the OEM command line interface)
3. Uses gold image
4. Granular control
5. Drift management (spotting outliers) and compliance tracking is easy.
OEM Fleet Management - Start
Targets/Databases/Maintenance (Software Standardization Advisor)

Database Maintenance

Welcome to Software Standardization Advisor!
Software Standardization Advisor can be used as a suggestion to:
- Standardize software configurations.
- Reduce the number of configurations based on the patch levels across your databases.
- Streamline and automate software upgrades and patching.

Analysis of your Enterprise

Software Installations: 0
Collections Completed: 0

Current Unique Software Configurations (67)

Recommended Software Configurations (13)

Product: Oracle Database
Release: 11.2.0.4.0
Platform: 23
Installations: 216

Criteria Used: Product, Release, Platform
OEM Fleet Management Flow -- Prepare

FOR GRID HOME*

1. Create Gold Image for GRID_HOME (off a patched & baked CRS env). (image is created with image_id)
2. If need be, update the Gold Image (each update gets a version id)
3. Set the latest/desired version as CURRENT

FOR DB HOME*

1. Create Gold Image for DB_HOME (off a patched & baked DB env). (image is created with image_id)
2. If need be, update the Gold Image (each update gets a version id)
3. Set the latest/desired version as CURRENT

* Needs to be done only once for a given OS platform / IC protocol (UDP/RDS)
OEM Fleet Management Flow -- Deploy

FOR GRID HOME*

1. For the given target, subscribe to an Image(_id).
2. Deploy the image on the target cluster in a NEW_ORACLE_HOME dir.
   - CURRENT version of the subscribed image will be selected

FOR DB HOME*

1. For the given target, subscribe to an Image(_id).
2. Deploy the image on the target cluster in a NEW_ORACLE_HOME dir
   - CURRENT version of the subscribed image will be selected

* Repeat for every target cluster
OEM Fleet Management Flow -- switch / update

FOR GRID HOME*

1. Switch GRID_HOME from current to new gold (patched) previously deployed.

FOR DB HOME*

1. Switch DB_HOME from current to new gold (patched) previously deployed.
2. Start-up DB
OEM Fleet Management Flow -- Prepare

FOR GRID HOME*
1. Create Gold Image for GRID_HOME (off a patched & baked CRS env). (image is created with image_id)
   
   ```
   emcli db_software_maintenance -createSoftwareImage -input_file="data:xyz/input_cluster"
   
   Input_cluster:
   IMAGE_NAME="Grid Home 11.2.0.4.9 PSU9  Gold Image"
   REF_TARGET_NAME=Grid_home_11204_2_somenode.paypal.com
   IMAGE_SWLIB_LOC=Database Provisioning Profiles/11.2.0.4.0/solaris_sparc64
   REF_GI_CREDENTIALS=ORACLE:SYSMAN
   STORAGE_NAME_FOR_SWLIB=default_loc
   ```

2. If need be, update the Gold Image (each update gets a version id)
3. Set the latest/desired version as CURRENT
   
   ```
   emcli db_software_maintenance -getImages
   ```

FOR DB HOME*
1. Create Gold Image for DB_HOME (off a patched & baked DB env). (image is created with image_id)

   ```
   REF_TARGET_NAME=Db_home_11204_1_somenode.paypal.com
   ```

1. If need be, update the Gold Image (each update gets a version id)
2. Set the latest/desired version as CURRENT
OEM Fleet Management Flow -- Deploy

FOR GRID HOME*

1. For the given target, subscribe to an Image(_id).
   
   emcli db_software_maintenance -subscribeTarget -target_name="cluster123" -target_type=cluster -image_id=39E788794B9XXXXXX

1. Deploy the image on the target cluster in a NEW_ORACLE_HOME dir.
   - CURRENT version of the subscribed image will be selected
     
     emcli db_software_maintenance -performOperation -name="Deploy 112049 GI Home" \
     -purpose=DEPLOY_GL_SOFTWARE \
     -target_type=cluster -target_list=cluster123 \
     -normal_credential=ORACLE:SYSMAN -privilege_credential=ROOT:SYSMAN \n     -new_oracle_home="/xyz/crs/112049"

FOR DB HOME*

1. For the given target, subscribe to an Image(_id).
   
   emcli db_software_maintenance -subscribeTarget -target_name="somedb" -target_type=rac_database -image_id=39E788794B91XXXX

1. Deploy the image on the target cluster in a NEW_ORACLE_HOME dir
   
   emcli db_software_maintenance -performOperation -name="Deploy 112049 DB Home" \
   -purpose=DEPLOY_DB_SOFTWARE -target_type=rac_database -target_list=somedb \
   -normal_credential=ORACLE:SYSMAN -privilege_credential=ROOT:SYSMAN \n   -new_oracle_home="/xyz/db/11.2049"
OEM Fleet Management Flow -- switch / update

FOR GRID HOME*

1. Switch GRID_HOME from current to new gold (patched) previously deployed.

FOR DB HOME*

1. Switch DB_HOME from current to new gold (patched) previously deployed.
2. Start-up DB
State of the Nation: benefits of Fleet Management

1. Patching time 10 min/ node
2. Different DB Clusters patched in Parallel
3. Target of <15 distinct configuration looks achievable
4. Much standardized and therefore stable site
5. Compliance Reporting/ Drift Management is easier
QUESTIONS?