



Automated patching : Pivot from Manual to Scalable with Oracle Database Lifecycle Management Pack

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About me

- Oracle Technologist since 1995
- Specialist in RAC, VLDB, Golden Gate & 24x7 installations
- Managed Large Oracle ERP programs as program manager
- Varied responsibilities at Paypal including DB engineering/architecture/operations
- MongoDB/Cassandra/Couchbase

About Paypal

- Oracle powers our transactional data
- One of the largest private clouds in the world
- 16PB stored on Oracle
- 10+ TB streamed daily via Goldengate
- 192 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 **56** currencies,
and hold balances in their PayPal accounts in **25** 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.

Business Challenge of Compliance & Configuration

Increasing burden of responding to internal and external audits and enforcing standards

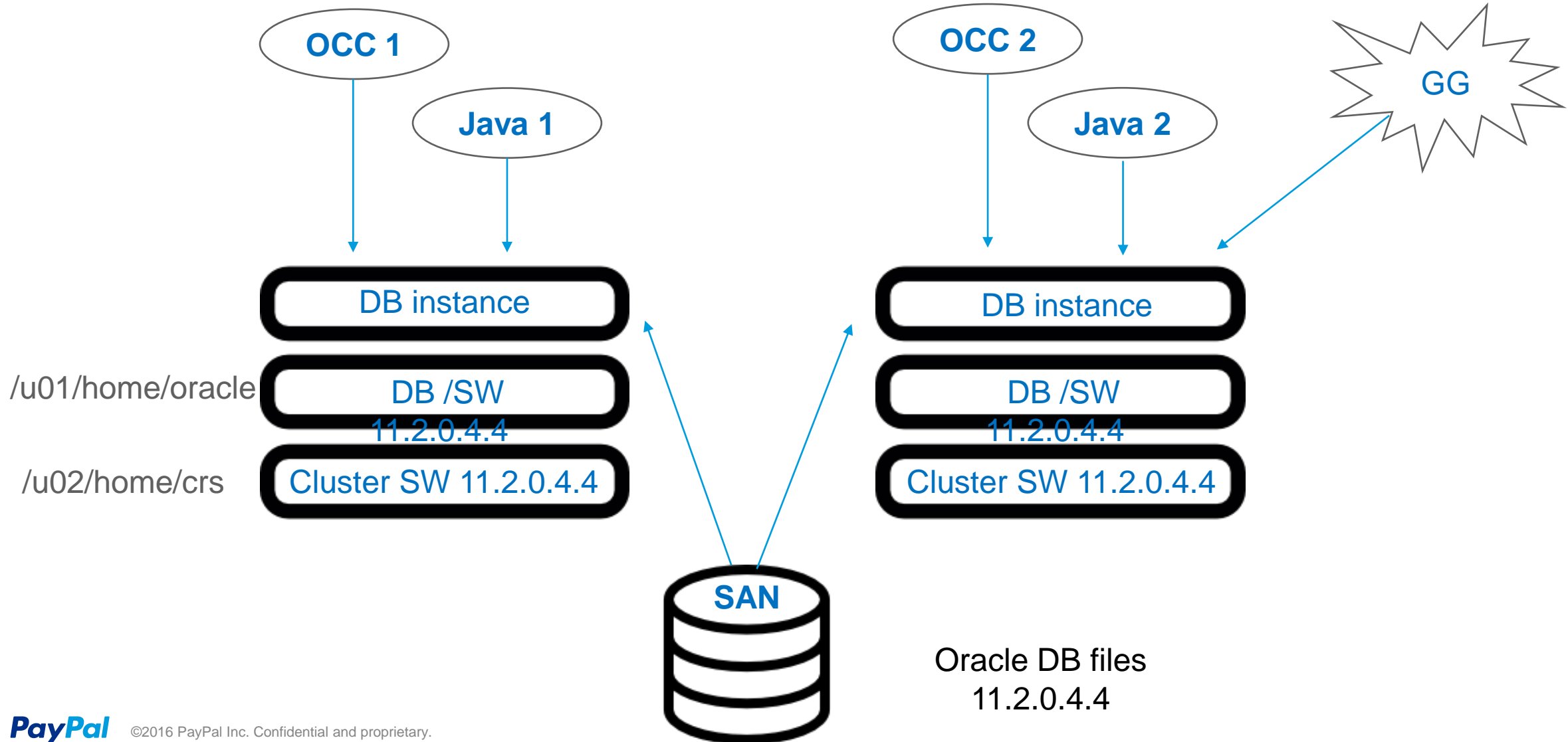


- Initial deployment via gold images radically reduced build times
- Patching remained an enormous business challenge
- Aside from availability impacts, required 4-8 hours of dedicated DBA time per cluster

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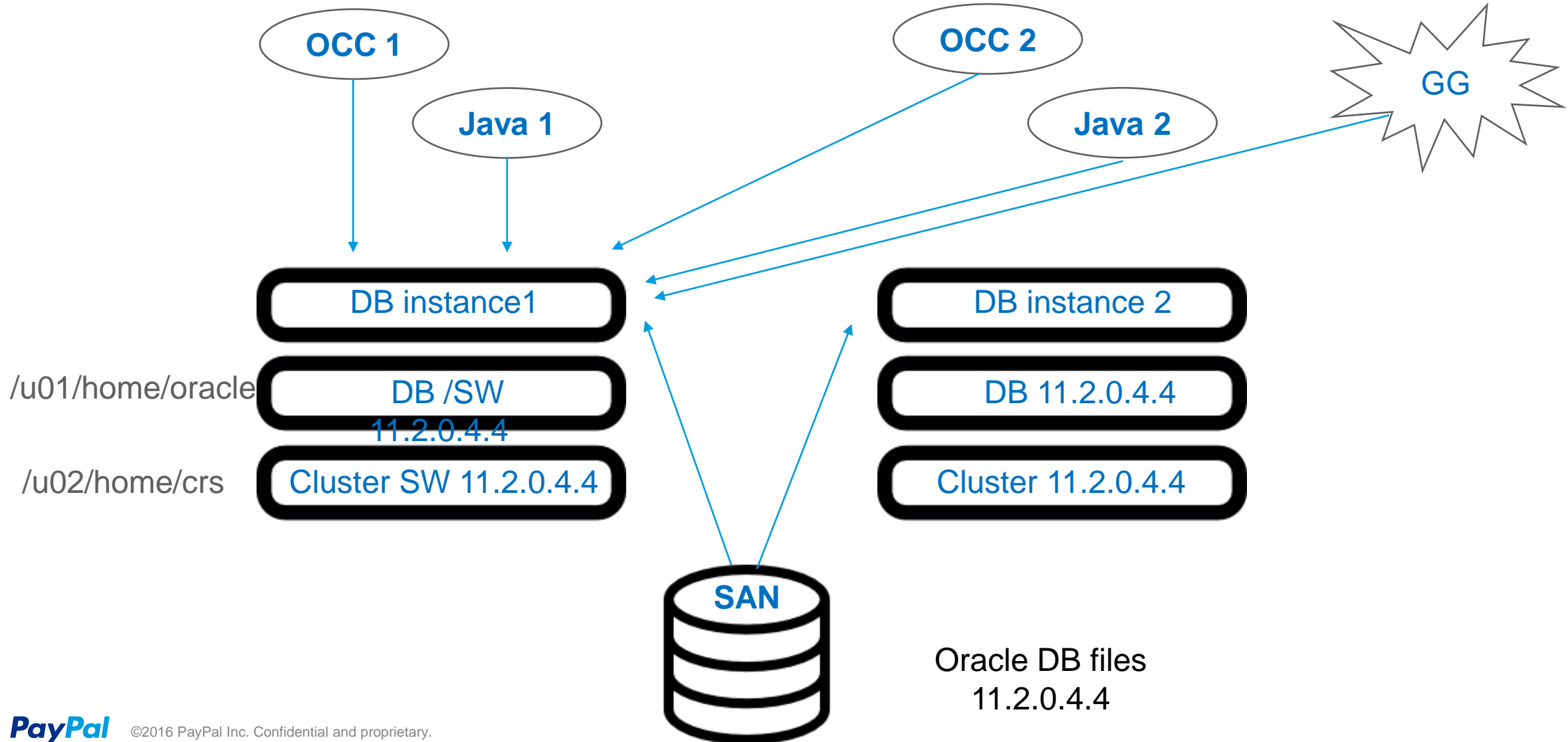
1. Typical Paypal Database Environment
2. Patching an Oracle DB at Paypal
3. Critical facets of a Patching Experience
4. OEM Patching Plan feature
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RAC RAC Everywhere : A basic Oracle DB @ Paypal



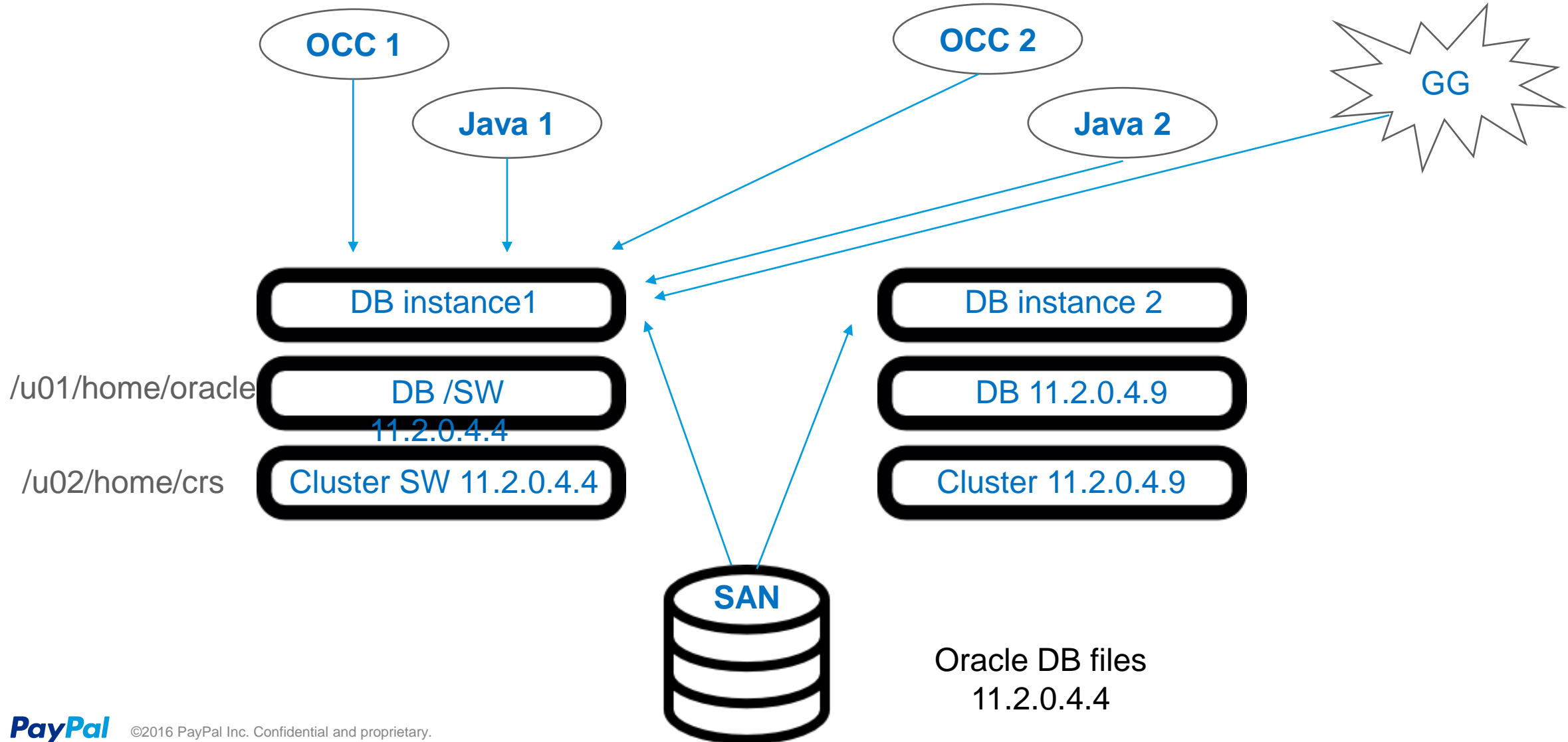
Patching a DB : Rolling patching is a must to ensure 100% availability

112044 → 112049



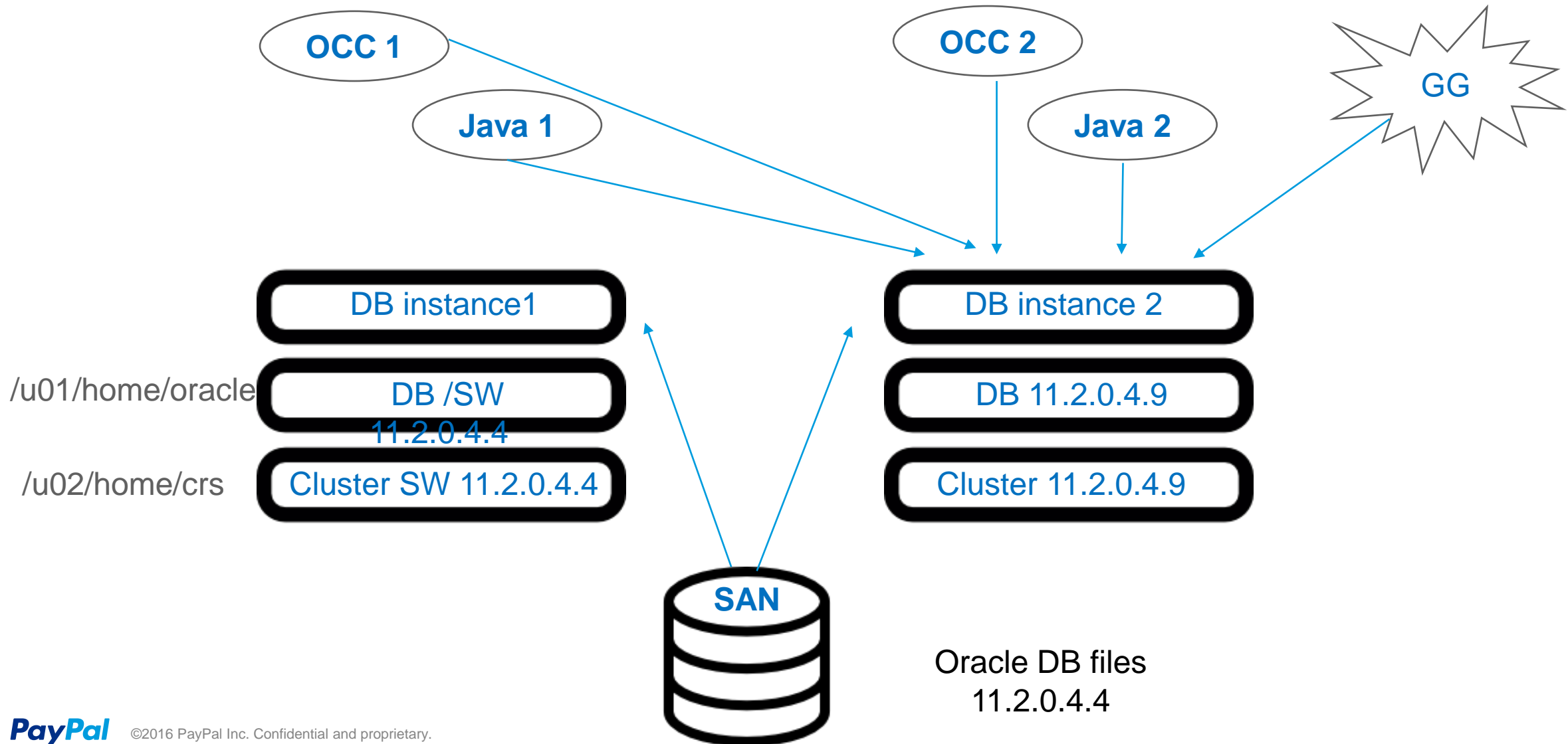
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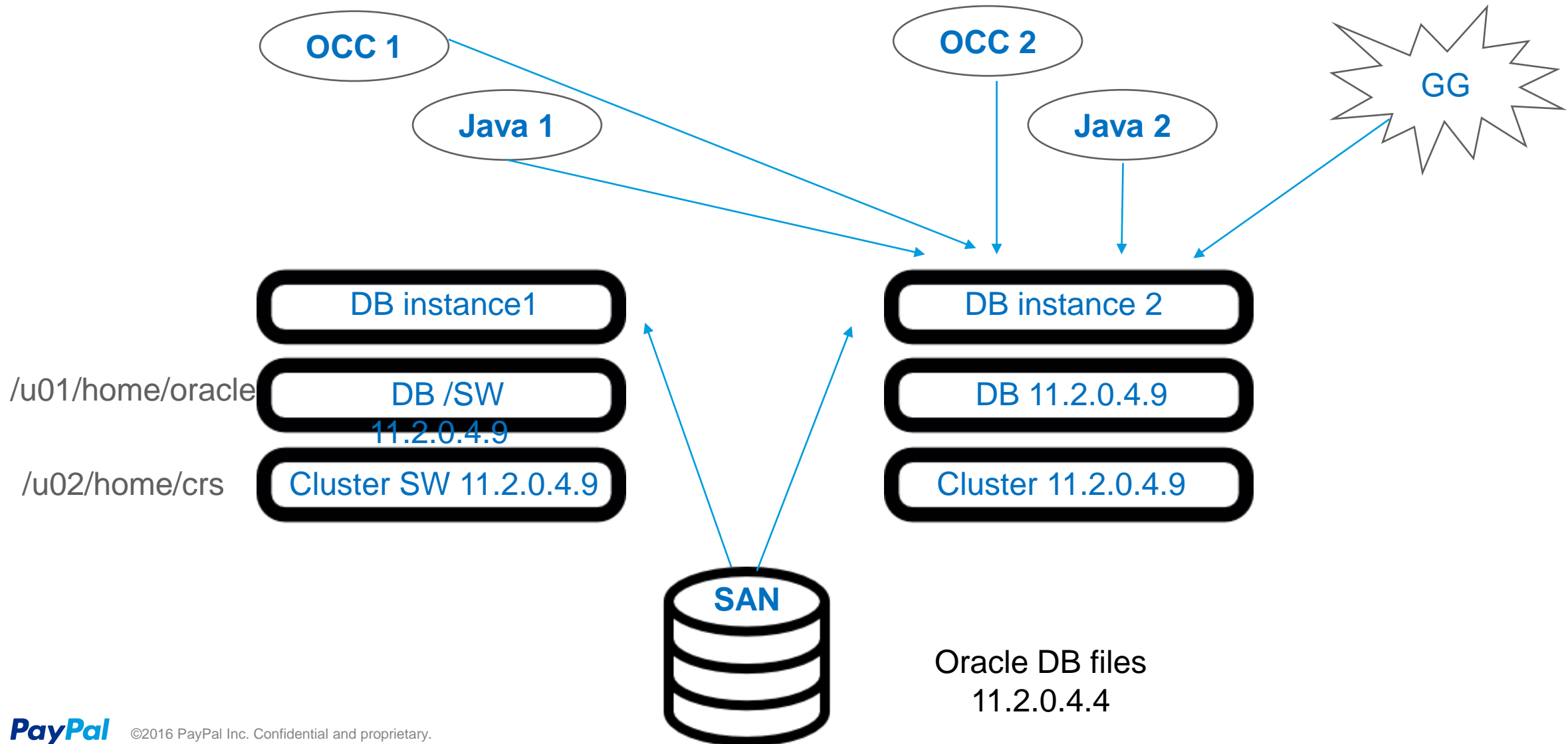
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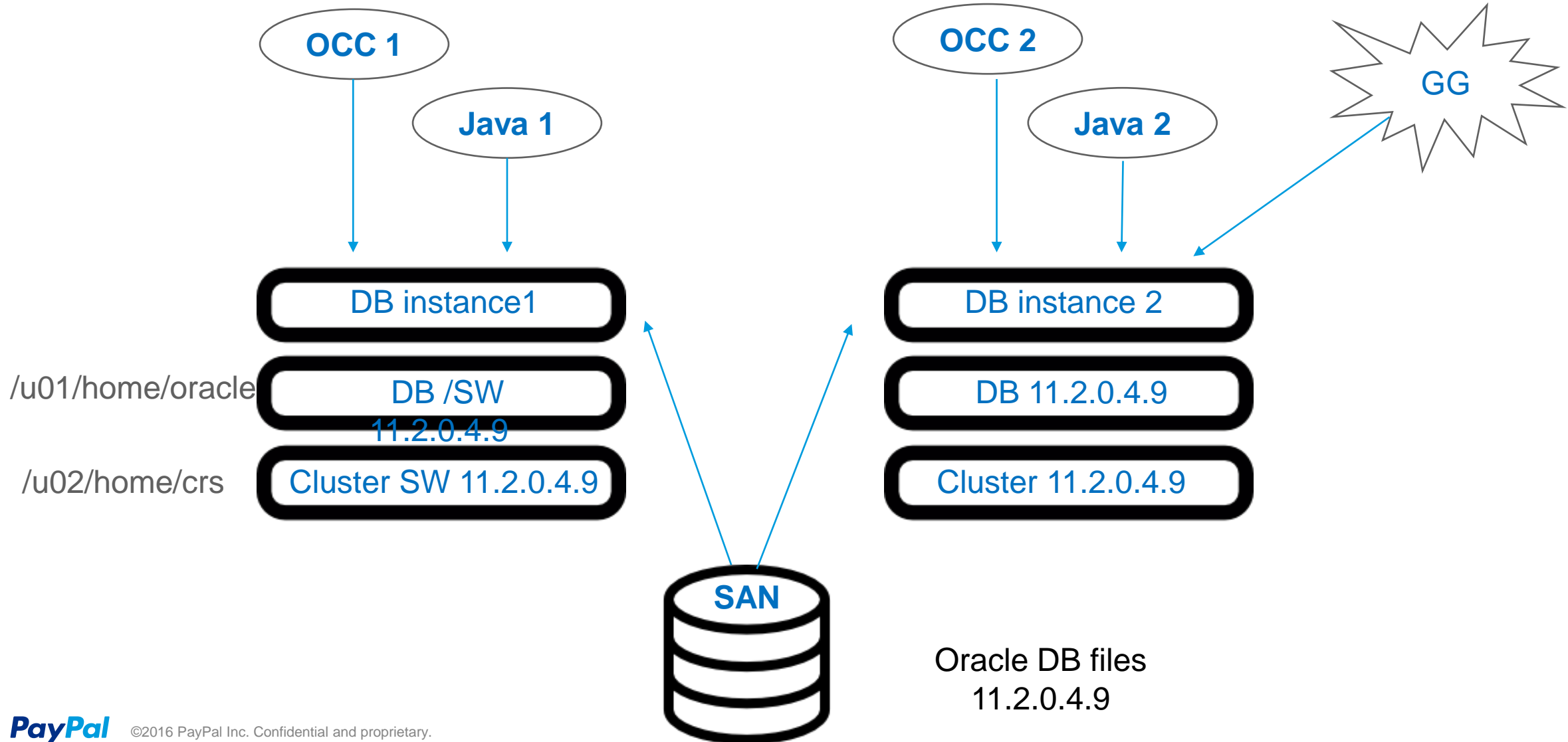
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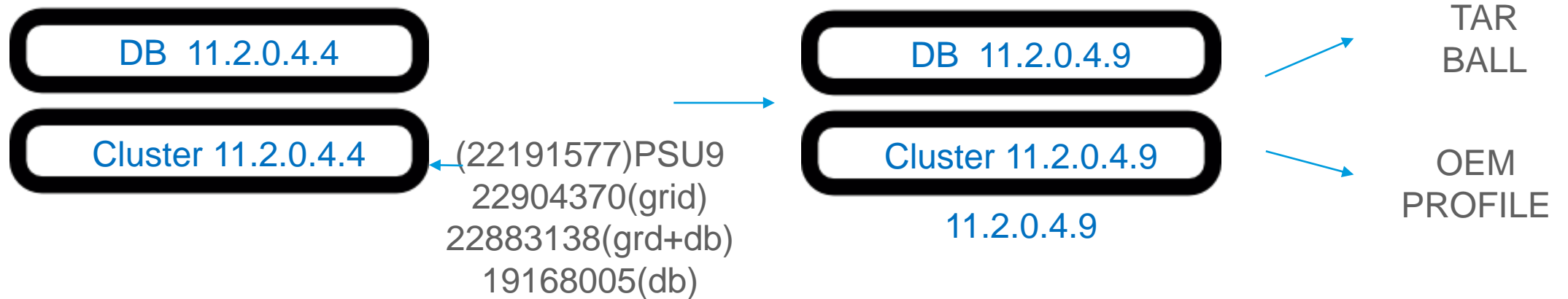
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112044 → 112049



Manual Patching – Creating a Gold Image

- SOLARIS * PRIMARY
- LINUX * ADGRO



Manual-Patching

Using the TAR BALL/PROFILE deployment



- Shutdown
- Move 11204 11204_OLD
- Move 112049 11204
- Copy 11204_OLD/Config files 11204/Config
- Start CRS
- Start DB

- Using OEM profile to deploy new dir (but keeping HOME dir same) necessitates running clone.pl



Technical Challenges to delivering successful automation

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

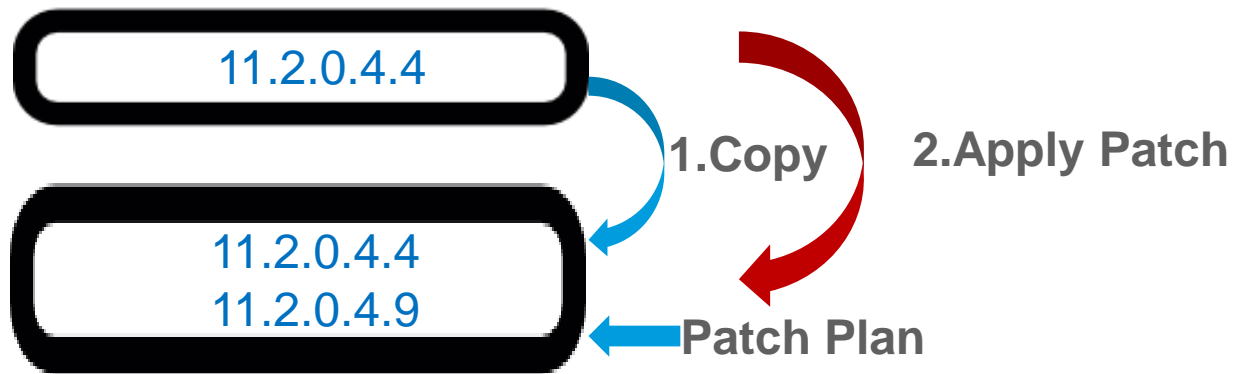
PayPal version will have for example:

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



- 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. Does not use a standard gold image, so end state is neither guaranteed nor stable.
3. Out of place patching changes home name
4. One-off , piecemeal patching.

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

The screenshot displays the Oracle Enterprise Manager Cloud Control 12c interface. The top navigation bar includes 'Enterprise', 'Targets', 'Favorites', and 'History'. A search bar for 'Search Target Name' is present. The main content area is titled 'Job' and shows a 'Log Report' for a job run. The job is identified as '11204 PSU PATCH...' and was executed on 'paypal.com'. The report shows a successful execution with a total elapsed time of 12.4 minutes. Below this, a detailed list of tasks is provided, each with its status, start/end times, and duration. The tasks include 'ORA_PATCH_READINESS_VFY_00', 'ORA_INIT_CHECKPOINT_01', 'ORA_STOP_SERVICES_02', 'ORA_CHECK_SERVICES_CHECKPOINT_03', 'ORA_MOVE_OCC_04', 'ORA_STOP_GG_05', 'ORA_PRE_DBSTOP_CHECKPOINT_06', 'ORA_STOP_DB_07', 'ROOT_SWITCH_CRS_08', and 'ORA_RELINK_CRS_09'. All tasks are marked as 'Succeeded'. At the bottom of the job details, there are buttons for 'Delete Run', 'Create Like', 'Edit', and 'View Definition'.

Job Run: 11204 PSU PATCH...

ORACLE Enterprise Manager Cloud Control 12c

Enterprise Targets Favorites History Search Target Name

Job

Expand All Collapse All

Select	Name	Targets	Status	Started	Ended	Elapsed Time
<input type="radio"/>	▼ All Executions					
<input checked="" type="radio"/>	▼ Execution: paypal.com	paypal.com	Succeeded	Nov 9, 2016 12:00:10 PM GMT-08:00	Nov 9, 2016 12:12:35 PM GMT-08:00	12.4 minutes
	Previous					
<input type="radio"/>	▶ Task: ORA_PATCH_READINESS_VFY_00	paypal.com	Succeeded	Nov 9, 2016 10:56:53 AM GMT-08:00	Nov 9, 2016 10:58:06 AM GMT-08:00	1.2 minutes
<input type="radio"/>	▶ Task: ORA_INIT_CHECKPOINT_01	paypal.com	Succeeded	Nov 9, 2016 10:58:06 AM GMT-08:00	Nov 9, 2016 10:58:08 AM GMT-08:00	2 seconds
<input type="radio"/>	▶ Task: ORA_STOP_SERVICES_02	paypal.com	Succeeded	Nov 9, 2016 10:58:08 AM GMT-08:00	Nov 9, 2016 10:59:05 AM GMT-08:00	56 seconds
<input type="radio"/>	▶ Task: ORA_CHECK_SERVICES_CHECKPOINT_03	paypal.com	Succeeded	Nov 9, 2016 10:59:05 AM GMT-08:00	Nov 9, 2016 10:59:25 AM GMT-08:00	19 seconds
<input type="radio"/>	▶ Task: ORA_MOVE_OCC_04	.paypal.com	Succeeded	Nov 9, 2016 10:59:25 AM GMT-08:00	Nov 9, 2016 10:59:30 AM GMT-08:00	5 seconds
<input type="radio"/>	▶ Task: ORA_STOP_GG_05	.paypal.com	Succeeded	Nov 9, 2016 10:59:30 AM GMT-08:00	Nov 9, 2016 10:59:33 AM GMT-08:00	3 seconds
<input type="radio"/>	▶ Task: ORA_PRE_DBSTOP_CHECKPOINT_06	paypal.com	Succeeded	Nov 9, 2016 11:04:01 AM GMT-08:00	Nov 9, 2016 11:08:39 AM GMT-08:00	4.6 minutes
<input type="radio"/>	▶ Task: ORA_STOP_DB_07	.paypal.com	Succeeded	Nov 9, 2016 11:08:39 AM GMT-08:00	Nov 9, 2016 11:10:49 AM GMT-08:00	2.2 minutes
<input type="radio"/>	▶ Task: ROOT_SWITCH_CRS_08	.paypal.com	Succeeded	Nov 9, 2016 11:10:49 AM GMT-08:00	Nov 9, 2016 11:20:13 AM GMT-08:00	9.4 minutes
<input type="radio"/>	▶ Task: ORA_RELINK_CRS_09	.paypal.com	Succeeded	Nov 9, 2016 11:20:13 AM GMT-08:00	Nov 9, 2016 11:28:02 AM GMT-08:00	7.8 minutes
	Next 11 - 18 of 18					

Log Report

Delete Run Create Like Edit View Definition

OEM Job & scripts

The screenshot displays the Oracle Enterprise Manager Cloud Control 12c interface. The top navigation bar includes the Oracle logo, 'Enterprise Manager Cloud Control 12c', and a search bar. The main content area is titled 'Job' and shows a list of job executions. The selected job is 'Execution: paypal.com', which has a status of 'Succeeded'. Below this, a table lists the tasks and their execution details.

Select	Name	Targets	Status	Started	Ended	Elapsed Time
<input type="radio"/>	▼ All Executions					
<input checked="" type="radio"/>	▼ Execution: paypal.compaypal.com	Succeeded ⓘ	Nov 9, 2016 12:00:10 PM GMT-08:00	Nov 9, 2016 12:12:35 PM GMT-08:00	12.4 minutes
	Previous 1 - 10 of 18					
<input type="radio"/>	▶ Task: ROOT_START_CRS_10	.paypal.com	Succeeded	Nov 9, 2016 11:28:02 AM GMT-08:00	Nov 9, 2016 11:31:52 AM GMT-08:00	3.8 minutes
<input type="radio"/>	▶ Task: ORA_SWITCH_DB_HOME_11	.paypal.com	Succeeded	Nov 9, 2016 12:00:10 PM GMT-08:00	Nov 9, 2016 12:10:19 PM GMT-08:00	10.2 minutes
<input type="radio"/>	▶ Task: ROOT_RUN_DBROOT_12	.paypal.com	Succeeded	Nov 9, 2016 12:10:19 PM GMT-08:00	Nov 9, 2016 12:10:23 PM GMT-08:00	4 seconds
<input type="radio"/>	▶ Task: ORA_CHECKPOINT_AND_START_DB_13	.paypal.com	Succeeded	Nov 9, 2016 12:10:23 PM GMT-08:00	Nov 9, 2016 12:12:24 PM GMT-08:00	2 minutes
<input type="radio"/>	▶ Task: ORA_RUN_POST_PATCH_SQL_14	.paypal.com	Succeeded	Nov 9, 2016 12:12:24 PM GMT-08:00	Nov 9, 2016 12:12:27 PM GMT-08:00	3 seconds
<input type="radio"/>	▶ Task: ORA_START_GG_15	paypal.com	Succeeded	Nov 9, 2016 12:12:27 PM GMT-08:00	Nov 9, 2016 12:12:30 PM GMT-08:00	3 seconds
<input type="radio"/>	▶ Task: ORA_START_SERVICES_16	.paypal.com	Succeeded	Nov 9, 2016 12:12:30 PM GMT-08:00	Nov 9, 2016 12:12:33 PM GMT-08:00	3 seconds
<input type="radio"/>	▶ Task: ORA_FINAL_CHECKPOINT_17	paypal.com	Succeeded	Nov 9, 2016 12:12:33 PM GMT-08:00	Nov 9, 2016 12:12:35 PM GMT-08:00	2 seconds
	Next					

At the bottom right of the job details section, there are buttons: 'Delete Run', 'Create Like', 'Edit', and 'View Definition'.

Script parameters

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The top navigation bar includes 'Enterprise', 'Targets', 'Favorites', and 'History'. The main content area is titled 'Job' and shows the 'Edit OS Command' task configuration for 'ORA_PATCH_READINESS_VFY_00'. The 'Parameters' tab is active, displaying the 'Command Type' as 'Script' and the 'OS Script' as 'ora_patch_readiness_vfy_oo.sh'. The 'Interpreter' is set to 'PRIMARY_as@pal.com CKPT_23456'. A 'Target Properties' table is also visible, listing various properties and their descriptions.

Job
Edit 'Multi-Task' Library Job: 11204 PSU PATCHING PRIMARY IMAGE CKPT(TIER 1,2,3) > Edit 'OS Command' Task: ORA_PATCH_READINESS_VFY_00 >
Edit 'OS Command' Task: ORA_PATCH_READINESS_VFY_00

Cancel Continue

General **Parameters** Credentials

Command Type: Script

* OS Script: ora_patch_readiness_vfy_oo.sh
/oracle/grid/11.2.0.4
/oracle/grid/11.2.0.4_new
/oracle/db/11.2.0.4
/oracle/db/11.2.0.4_new

Interpreter: PRIMARY_as@pal.com CKPT_23456
If you change the interpreter to be used on the host instead of the default, it is recommended you provide the full path (Example: %perlbin%/perl)

Target Properties
Target properties can be used in parameters
Property names are case-sensitive. To escape '%', use '%%'.
Name Description

%emd_root%	location of Agent
%perlbin%	location of Perl binary used by Agent
%TargetName%	target name
%TargetType%	target type
%orcl_gtp_os%	Operating System
%orcl_gtp_csi%	Customer Support Identifier
%orcl_gtp_comment%	Comment
%orcl_gtp_contact%	Contact
%orcl_gtp_location%	Location
%orcl_gtp_platform%	Platform
%orcl_gtp_department%	Department
%orcl_gtp_cost_center%	Cost Center
%orcl_gtp_line_of_bus%	Line of Business
%orcl_gtp_target_version%	Target Version

CONFIG FILE

```
IMAGE_TYPE=PRIMARY
GRIDHOMECURRENT=/oracle/grid/11.2.0.4
GRIDHOMESTAGE=/oracle/grid/11.2.0.4_new
DBHOMECURRENT=/oracle/db/11.2.0.4
DBHOMESTAGE=/oracle/db/11.2.0.4_new
PRIMARY_DB_NAME=
PATCH_NUM=23054359
PATCH_DESC=JULY2016PSU
CLUSTER_DB=dblabstb_clusterdb
INSTANCE_NAME=DBLABSTB_1
DB_ROLE=PHYSICAL STANDBY
WALLET_DIR=/oracle/admin/dblabstb/wallet
STOP_SESSION_COUNT=10
INSTANCE_NUMBER=      1
NODE_INSTANCE_COUNT=1
NODE_COUNT=2
DB_INSTANCE_COUNT=2
CRS_STORAGE_OPTION=1
CRS_NODEVIPs='nodex-vip/55.55.55.0/ixgbe2,nodey-
vip/55.55.55.0/ixgbe0'
VOTING_DISKS=NO_VAL
OCR_LOCATIONS=NO_VAL
RAC_OFF=30
```

```
EMAILID=asvaidya@paypal.com
CKPT_YES=NOCKPT
LOCAL_NODE=nodex.paypal.com
CLUSTER_NODES=nodex.paypal.com,nodey.paypal.com
LOCAL_NODE_SHORT=nodex
CLUSTER_NODES_SHORT=nodex,nodey
CENTRAL_INV_LOC=/oracle/db/oralInventory
DB_HOME_NAME="Db_11204"
GRID_HOME_NAME="Grid_11204"
CLUSTER_NAME=DBLAB_cluster
NETWORKS="ixgbe2"/16.100.8.0:public,"igb1"/199.999.0.0:cl
uster_interconnect
SCAN_NAME=DBLAB-scan.paypal.com
SCAN_PORT=2115
GNS_CONF=false
ASM_DISK_GROUP=DBLAB_DATA
ASM_DISCOVERY_STRING=/dev/rdisk/c0t*d0s4
ASM_DISKS=/dev/rdisk/c0xxxx00005084d0s4
ASM_REDUNDANCY=EXTERNAL
MRP_ORIGINAL_COUNT=
GG_PROCESS_FOUND=NO
GG_HOME_EXISTS=NO
CRS_OFFLINE_COUNT=    1
```


The future is here!



**Fleet Management with
OEM!**

Database Fleet Maintenance

Database **Fleet** Maintenance

New! Simplified Software Configuration Standardization at Scale



Scan the Fleet

Discover Configuration Pollution

- Run Advisor to analyze the database estate
- Identify required standard configurations
- Prepare Reference environments for each standard configuration



Create New Image and Subscribe

Create Gold Image

- List available images
- List versions of an image
- Make a version "Current"

Subscribe Databases to a Gold Image

- List subscriptions of an image
- Validate subscriptions



Push Image and Switch

Deploy Image

- Shadow Home is created

Switch Database

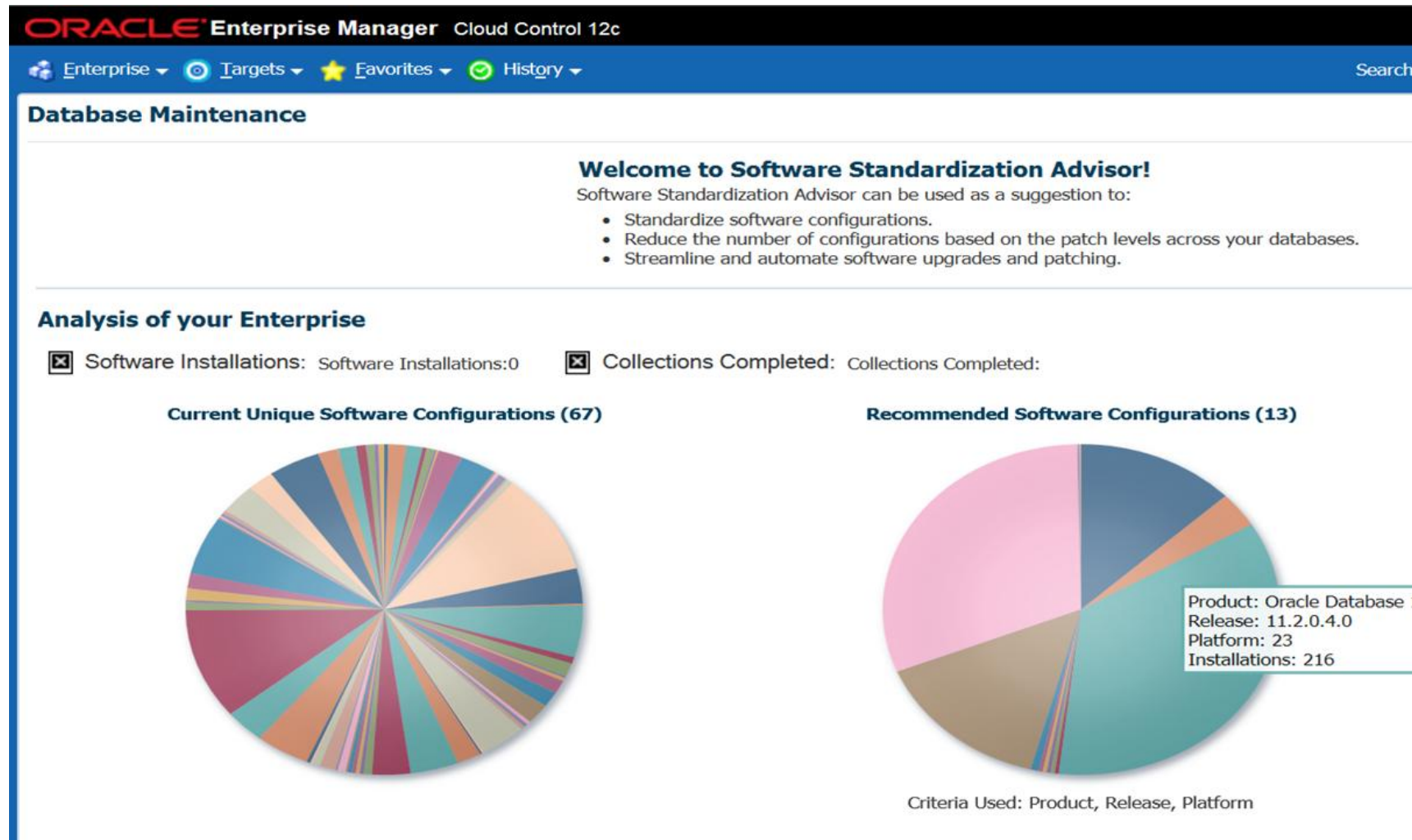
- Migrate Listener
- Update Database: SI, GI, RAC, Standby

OEM Fleet Management Features

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)



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
```

```
emcli db_software_maintenance -getImages
```

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 -updateVersionStatus -version_id=39E663C148FXXXXXX -status=CURRENT
```

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_GI_SOFTWARE \
```

```
-target_type=cluster -target_list=cluster123 \
```

-

```
-normal_credential=ORACLE:SYSMAN -privilege_credential=ROOT:SYSMAN \
```

```
-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 \
```

```
-new_oracle_home="/xyz/db/112049"
```

OEM Fleet Management Flow -- switch / update

FOR GRID HOME*

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

```
emcli db_software_maintenance -performOperation -name="Cluster123: Update GI Cluster"  
-purpose=UPDATE_GI -target_type=cluster -target_list=cluster123  
-normal_credential=ORACLE:SYSMAN -privilege_credential=ROOT:SYSMAN  
-node_list=nodex.paypal.com -startupDBAfterSwitch=false
```

FOR DB HOME*

1. Switch DB_HOME from current to new gold (patched) previously deployed.
2. Start-up DB
3. Run the required post patch SQL scripts **!!! Winner**

```
emcli db_software_maintenance -performOperation -name="nodex:Update DB Cluster"  
-purpose=UPDATE_RACDB -target_type=rac_database -target_list=somedb  
-normal_credential=oracle:SYSMAN -privilege_credential=ROOT:SYSMAN  
-node_list=nodex.paypal.com -dataguard_role=primary -ignoreStandbyPrereq=true
```

State of the Nation: benefits of Fleet Management

1. Patching time 20 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?

