

CON8260 - Database as a Service Cookbook

Strategies and Tips for Successful Deployment

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Session Abstract

CON8260

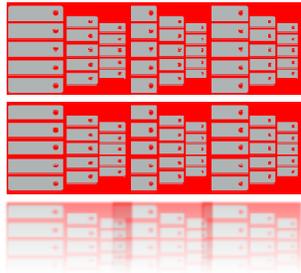
The need to reduce IT costs and increase business agility and focus is driving businesses to consolidate to Oracle Database Cloud and deploy a database as a service (DBaaS) model. However, given the many challenges and choices available in this process, the road to DBaaS requires a systematic approach, from planning, testing, and capacity planning to deployment. This session discusses proven strategies; various tools such as Oracle Enterprise Manager's Consolidation Planner feature and Oracle Real Application Testing; and how best to use them for a successful deployment of DBaaS.

Program Agenda

- 1 Current Challenges
- 2 EM 12c Solution
- 3 Summary

Key Challenges and Solutions

Unmanaged asset sprawl



- **28%** have an annual database instance growth of more than **20%**
- Less than **50%** have consolidated

Consolidation

Configuration Pollution



- **Too many** versions, patch levels and sizes
- **400 variants** out of 1400+ across 3 major releases for a large telecom customer

Standardization

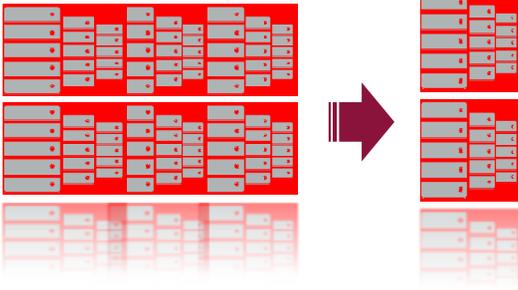
Slow time to delivery



- **Days to Weeks** to provision new database services or clone production databases for key projects

Automation

Consolidation Planning, Validation and Sizing



Enterprise Manager 12c provides

- ✓ Consolidation Planning for physical to virtual, commodity to Engineered Systems and dedicated to multitenant database
- ✓ Validation of the database consolidation architecture with Consolidation Planner
- ✓ Validation of SQL performance and identification of regressions using SQL Performance Analyzer
- ✓ Validation of consolidated workload by capturing and replaying real workload using Real Application Testing



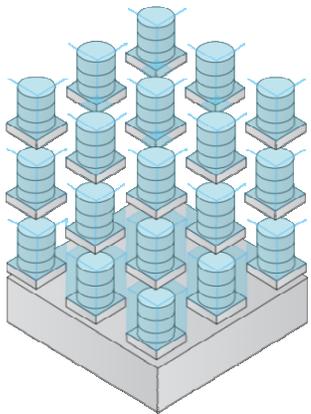
Allied Irish Bank (AIB) consolidated its Oracle Database platform with the help of Real Application Testing and 25% less testing resources

Consolidation: DBaaS Architectures

EM12c Supports Database Versions 10gR2 to 12c

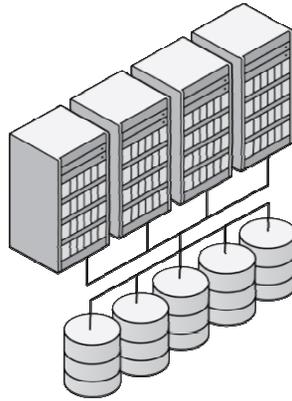


Virtual Machines



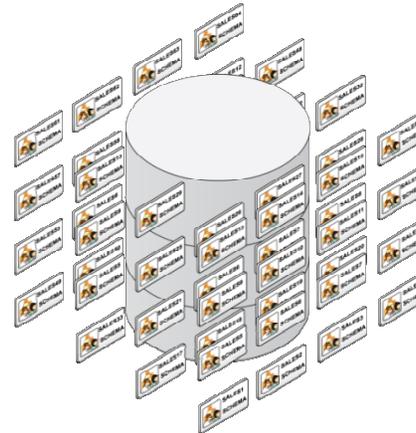
Share servers

Dedicated DBs



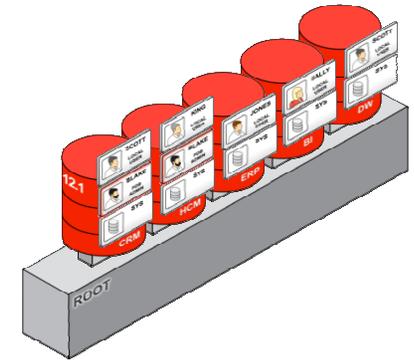
Share servers and OS

Dedicated Schema(s)



Share servers, OS and database

Pluggable DBs



Share servers, OS and database

Increasing Consolidation

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EM12c DBaaS: Unmatched Architectural Choices

	Virtual Machines	Dedicated DB	Dedicated Schemas	Pluggable DB
Consolidation Density	Low-Moderate	High	Highest	Highest
Management	Very complex (VM Sprawl)	Easy	Easy to Involved (based on required resource isolation)	Easy
Isolation	Excellent	Good	Least	Good
Implementation & Onboarding	Easy	Easy	Difficult	Easy
Application Suitability	Some (workload dependent)	All	Home grown; requires app validation	All but have to be certified for Database 12c

Consolidation: Challenges

What consolidation strategy and platform to use?

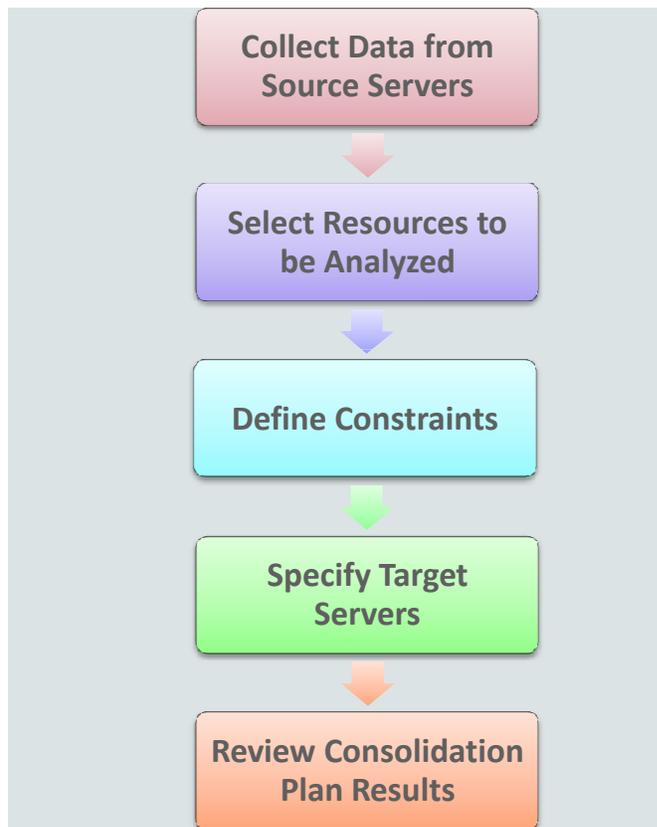
How to test the chosen consolidation strategy?

Can the system handle peak workloads, can workloads co-exist together?

How to minimize consolidation risk?



Recommendation: Use Consolidation Planner



Extract Resource Utilization Data

Use CPU, Memory, Disk Storage, Disk IO, Network IO

Use Business Constraints
Use Technical Constraints

Specify Physical or Virtual
Specify Existing or Planned

Review Consolidation Ratio
Review Target server utilization

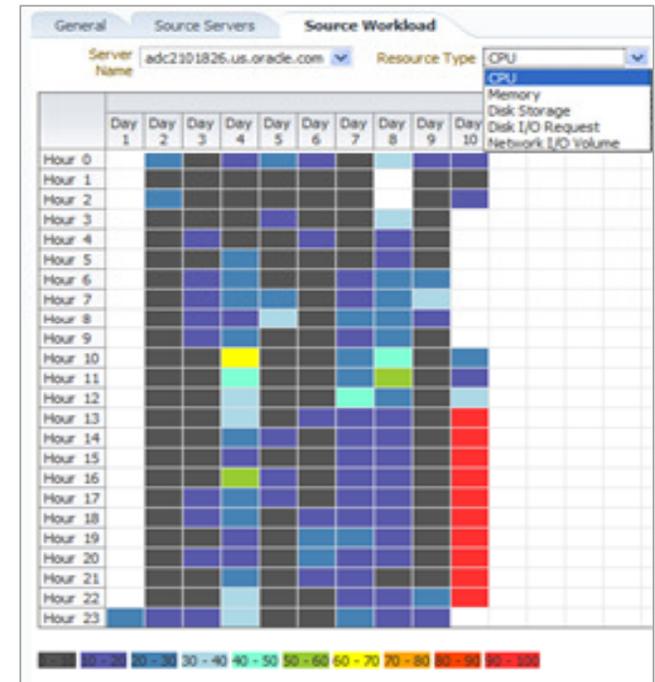
Recommendation: Use Consolidation Planner

Use Consolidation Scenario Report to pick the best strategy for consolidation

Use the following in the Consolidation Report

- Consolidation ratio
- Destination server utilization
- Source to Target server mapping
- Confidence of meeting requirements based on historical samples
- Manually mapped consolidation constraint violations
- Servers that cannot be consolidated (Exceptions)

Recommended to do few trials & scenarios to come up with best strategy



Recommendation: Use Consolidation Planner

Identify under-utilized or over-utilized servers

- Use Enterprise Manager target performance and configuration data

Determine candidates for consolidation

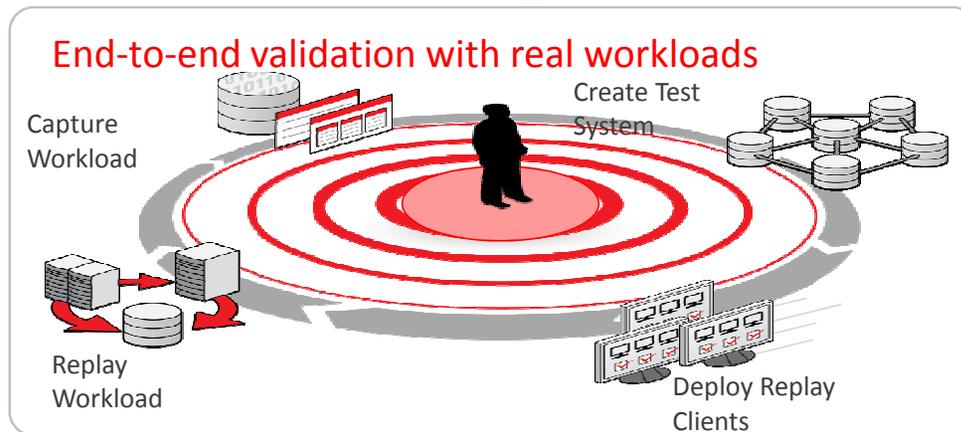
- Maximize server density
- Maintain performance commitment
- Satisfy business, compliance, and technical constraints

Work for physical and virtual environments

Lookup of SPECint[®] data which is integrated

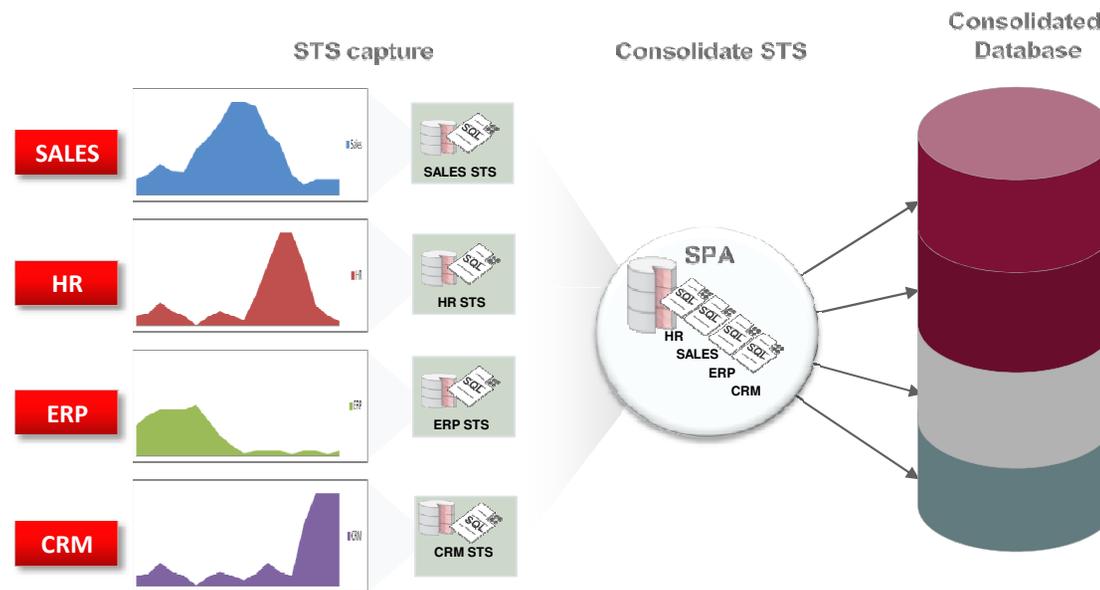
Lookup for out of the box support for Exadata

Use Real Application Testing for Validation



Consolidation Type	Tool	Validation Test
Server, OS, Schema, CDB	SQL Performance Analyzer	SQL unit testing for response time in consolidation scenario
Server, OS	Database Replay	Load, performance validation for throughput
Schema, CDB	Consolidated Database Replay	Replay multiple workloads against one database for throughput and scalability validation

Recommendation: Use SQL Performance Analyzer for Consolidation Validation



Validate SQL performance for consolidated database

Capture SQL workload for each database in STS

Merge STS

Execute SPA for all workloads together in consolidated environment using merged STS

Identify errors & SQL regressions

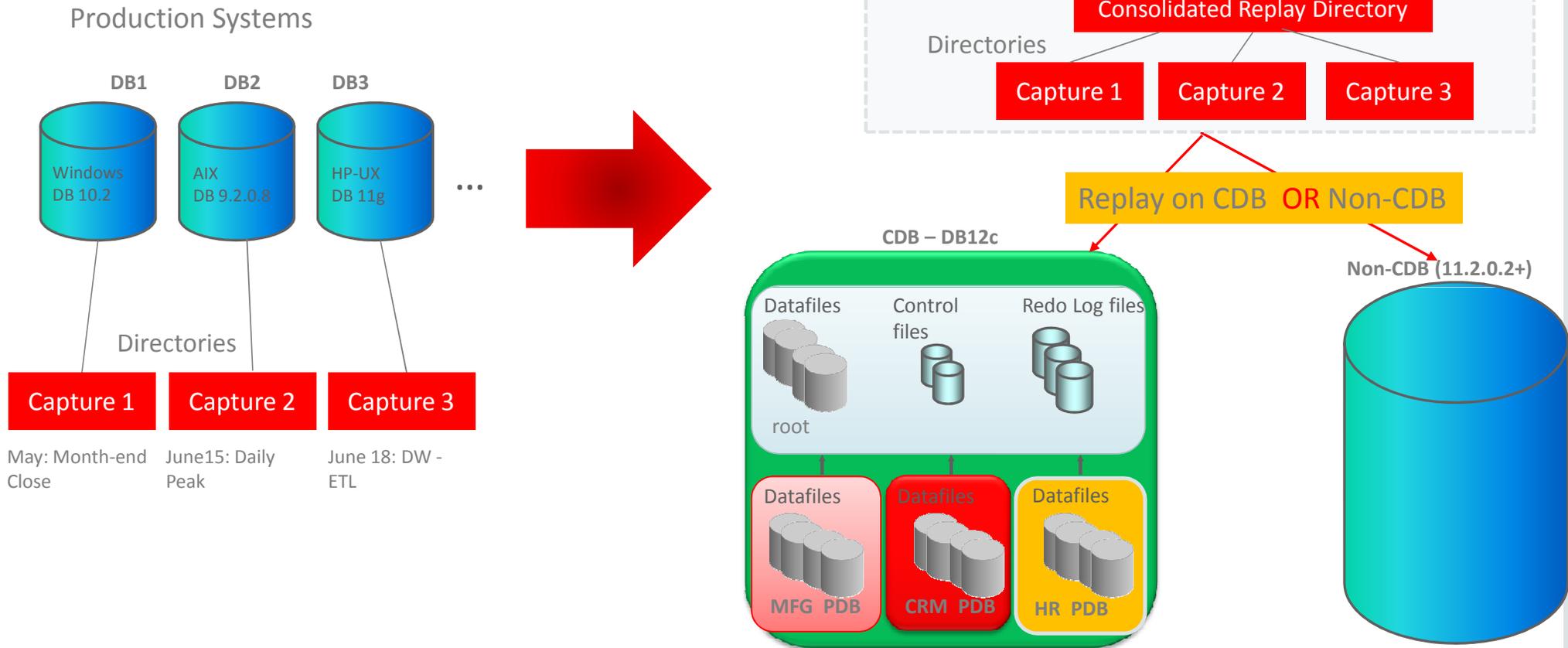
Review response time

Remediate

Validate auto-implementation of SQL Profiles on each PDB on a day to day basis

Recommendation: Use Consolidated Database Replay

Test System



Recommendation for Sizing: Use Database Replay

Strategies for Scale Up

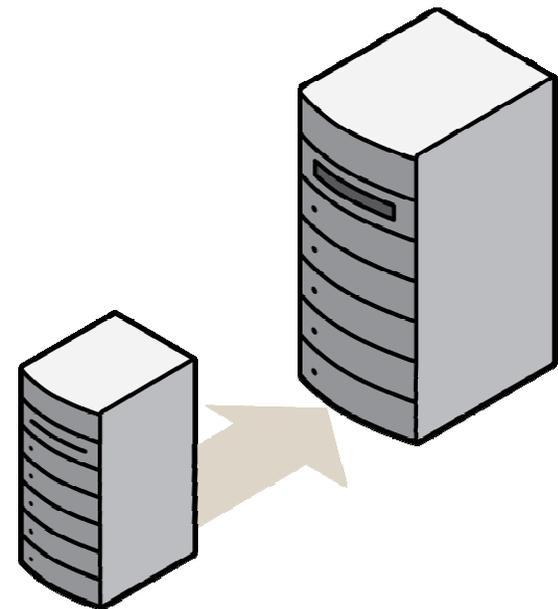
Scale up with multiple PDBs

Scale up multiplier

Scale up by scheduling concurrent replays

Scale up by workload folding

Scale-up with Schema Remapping

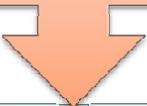


Recommendation for Sizing Techniques

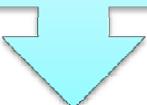
Objective	Recommended Technique to be used
Response time unit testing when consolidation	Consolidated SPA trials
Stress Testing	Scale Up Multiplier, Connect Time, Think Time
Server Consolidation	Database Replay
Database Consolidation	Consolidated Database Replay
Workload Scale Up	Time-Shifting , Workload Folding
Schema Consolidation	Scale-up With Schema Remapping, Consolidated Database Replay
CDB/ PDB Consolidation	Consolidated Database Replay with service name mapping to each PDBS

Recommendation for Database Replay Methodology

Group databases based on common attribute like type of application, OLTP,DSS, Mixed workload



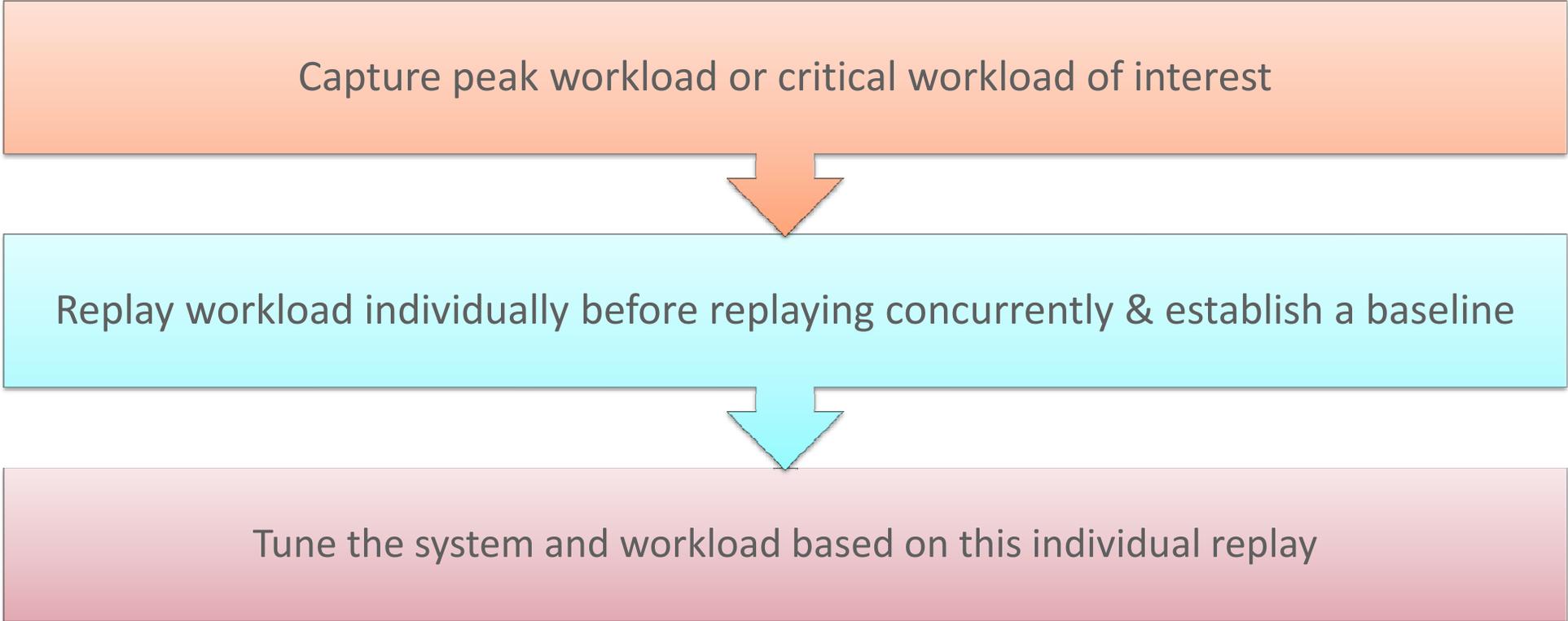
Consolidating less than 10 databases, capture workload across all databases and replay



Consolidating greater than 10 databases, capture workload for one database per group and replay

Recommendation for Database Replay Methodology (Cont)

Capture peak workload or critical workload of interest

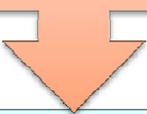


Replay workload individually before replaying concurrently & establish a baseline

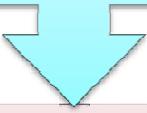
Tune the system and workload based on this individual replay

Recommendation for Database Replay Methodology (Cont)

Use multiple sizing techniques for same workload (see slide 11 for techniques)



Tune the system based on this consolidated replays and sizing technique



Re-run the same test and observe key metrics like DB time, CPU time, memory usage, response time & other SLA'S as applicable

Recommendation for Database Replay Methodology (Cont)

Scale up & replay workload to the number of databases in the group

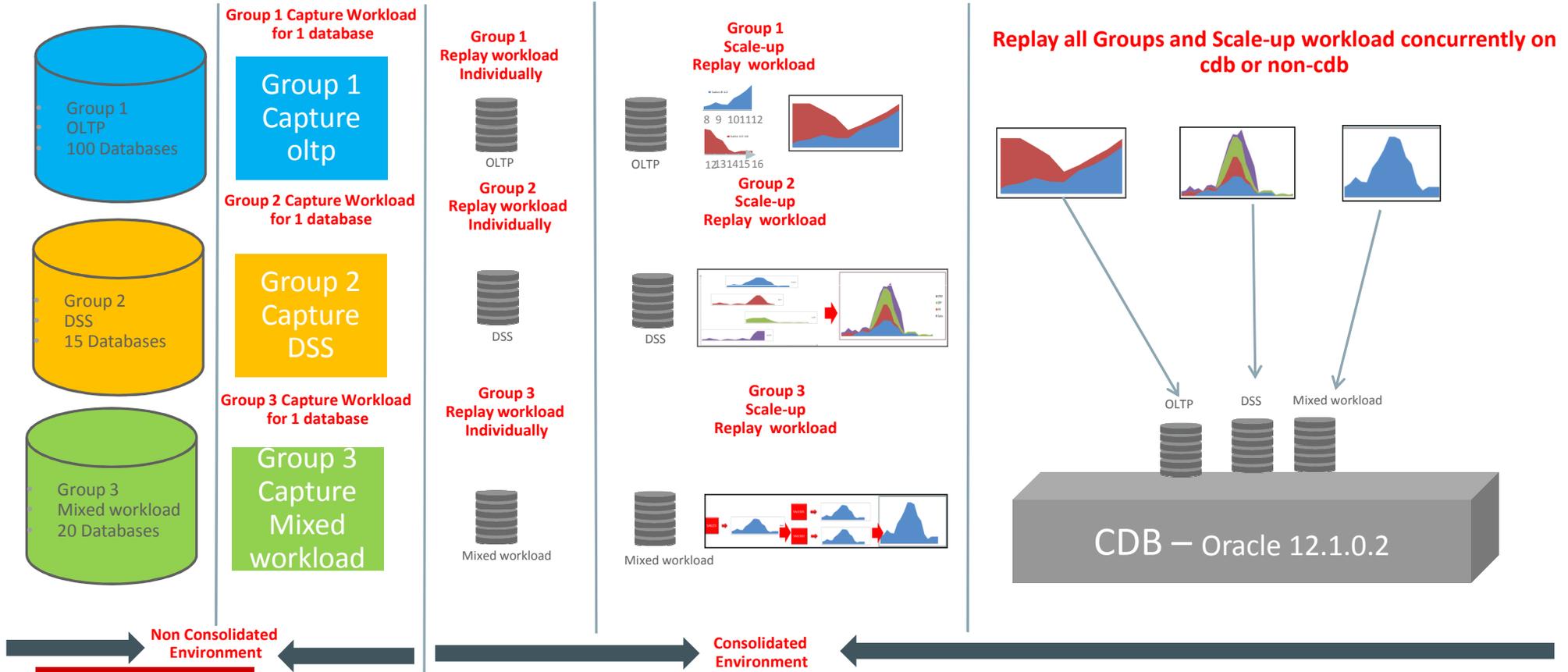


Follow the same steps for each group

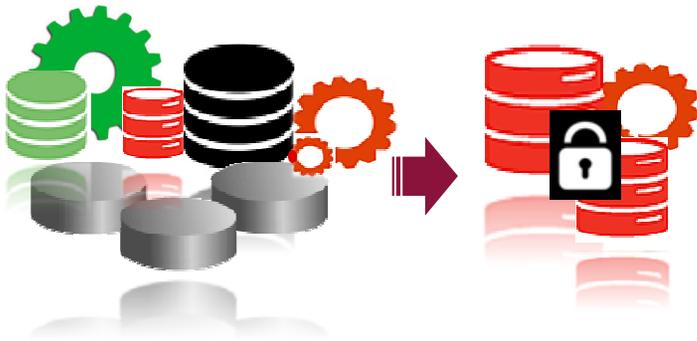


Replay scaled up workload for all groups concurrently

Recommendation for Database Replay Methodology



Configuration Standardization



Enterprise Manager 12c enables

- ✓ Single **Service Catalog** with predefined configurations and sizes to minimize variants
- ✓ Ongoing Compliance checks to detect violations and mapping to industry standards like STIG and PCI
- ✓ Drift management to detect differences across a fleet of databases
- ✓ Automated patch management under minimum downtime to bring configurations back to compliance



Telecom Italia has created a single Service Catalog to streamline operations that previously hosted 700 different configurations across 1000+ databases

Service Catalog

Definition

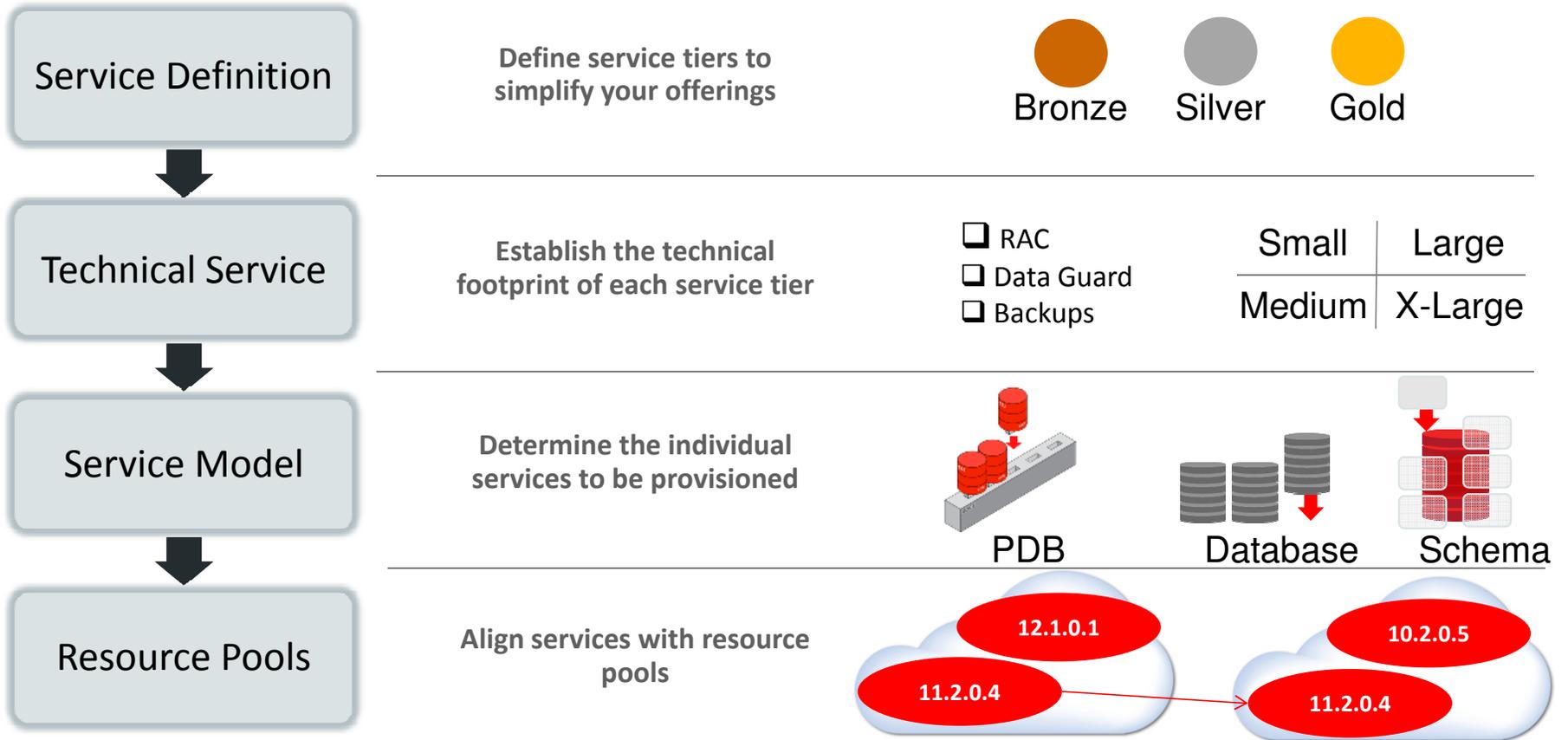
- A collection of *standardized* services available to *selected consumers* for on demand, *self service provisioning*

Benefits

- Establish and enforce effective standardization
- Repeatable and predictable deployment
- Helps identify service costs
- Helps reduce the database management overhead



EM12c DBaaS Service Catalog for Provisioning



Database Service Levels and Sizes

	Primary	Standby(s)	EM12c R4
1	SI	-	✓
2	SI	SI	✓
3	RAC	-	✓
4	RAC	SI	✓
5	RAC	RAC	✓
6	RON	-	✓
7	RON	RON	✓

SI – Single Instance
 RAC – Real Application Clusters
 RON – RAC One Node

A. Define your own service levels

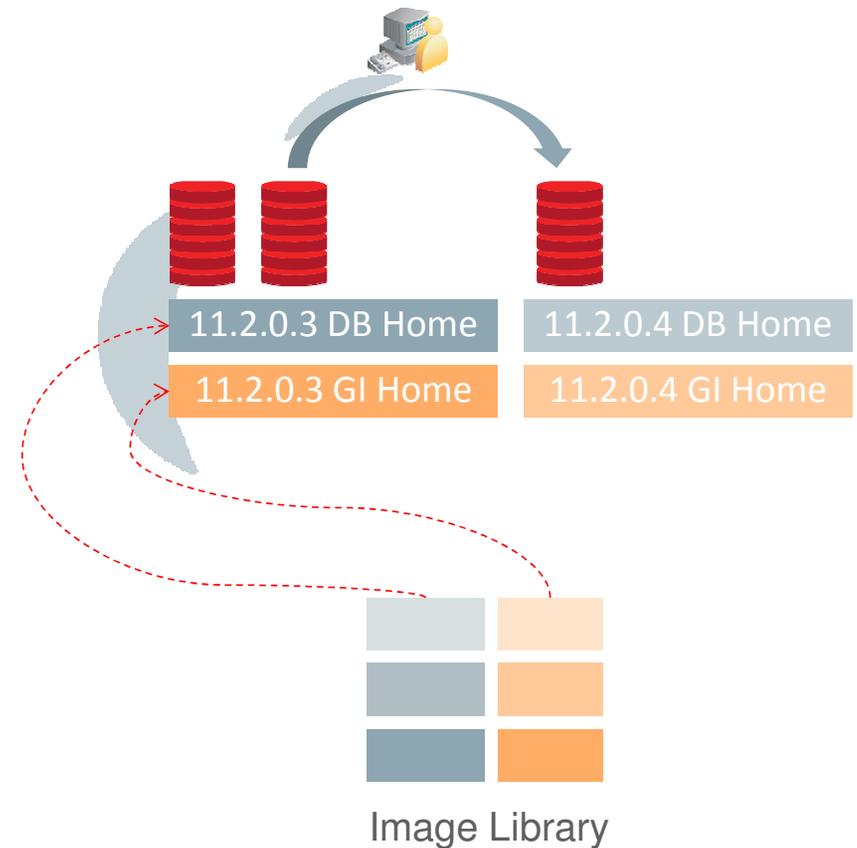
PLATINUM	RAC-RAC-SI
GOLD	RAC-SI
SILVER	RAC
BRONZE	SI

B. Set your own sizes

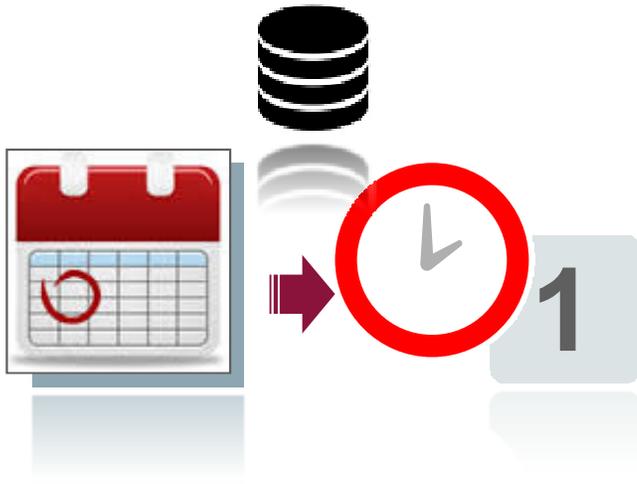
Size	CPU Core	RAM GB	Storage
S	1	6	50 GB
M	2	12	250 GB
L	4	24	1,250 GB
XL	16	48	5 TB

Self Service Software Maintenance

- Process
 - Pools subscribe to DB and GI images
 - New images automatically get deployed to servers in the pool
 - Self Service users or Admin can choose to migrate DBs over to the new home
- Benefits:
 - Out of place patching and upgrade with reduced downtime
 - Subscription based, and at mass scale
 - Flexibility to users to move to new software version on their terms
 - Track compliance across cloud and non-cloud environments



Automation for Database



Enterprise Manager 12c enables

- ✓ Single click deployment of single instance, RAC, pluggable databases and schemas, optionally with DR setup
- ✓ Intelligent placement and governance through access control, quota and showback
- ✓ Instant, storage efficient cloning of databases using **Snap Clone**
- ✓ Automation of lifecycle operations like backup, restore, patching, upgrade
- ✓ RESTFUL APIs for integrating with orchestration services



NAV reduced new database provisioning time from 6-7 days to 18 minutes using Enterprise Manager 12c

Process Challenges

70000
refresh/year

2000+
Dev/Test DB

3 – 5 TB
Typical DB size

RMAN
full clones

10 - 20
issues/day

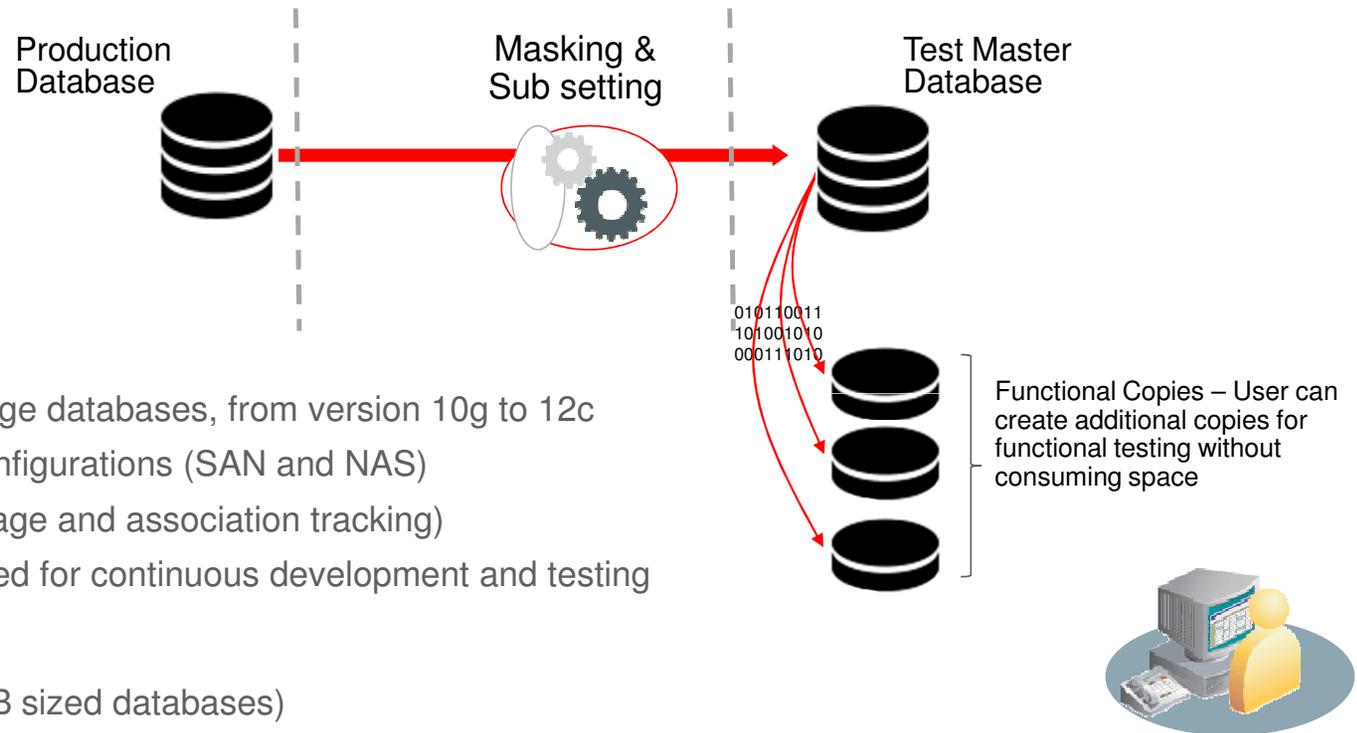
EMC & NetApp
storage

“Database Refresh
is a
necessary evil!”

- Christian Bilien,
Global Head of
Database Team

Automation for Database: Optimized Data Refresh

Using Enterprise Manager Snap Clone



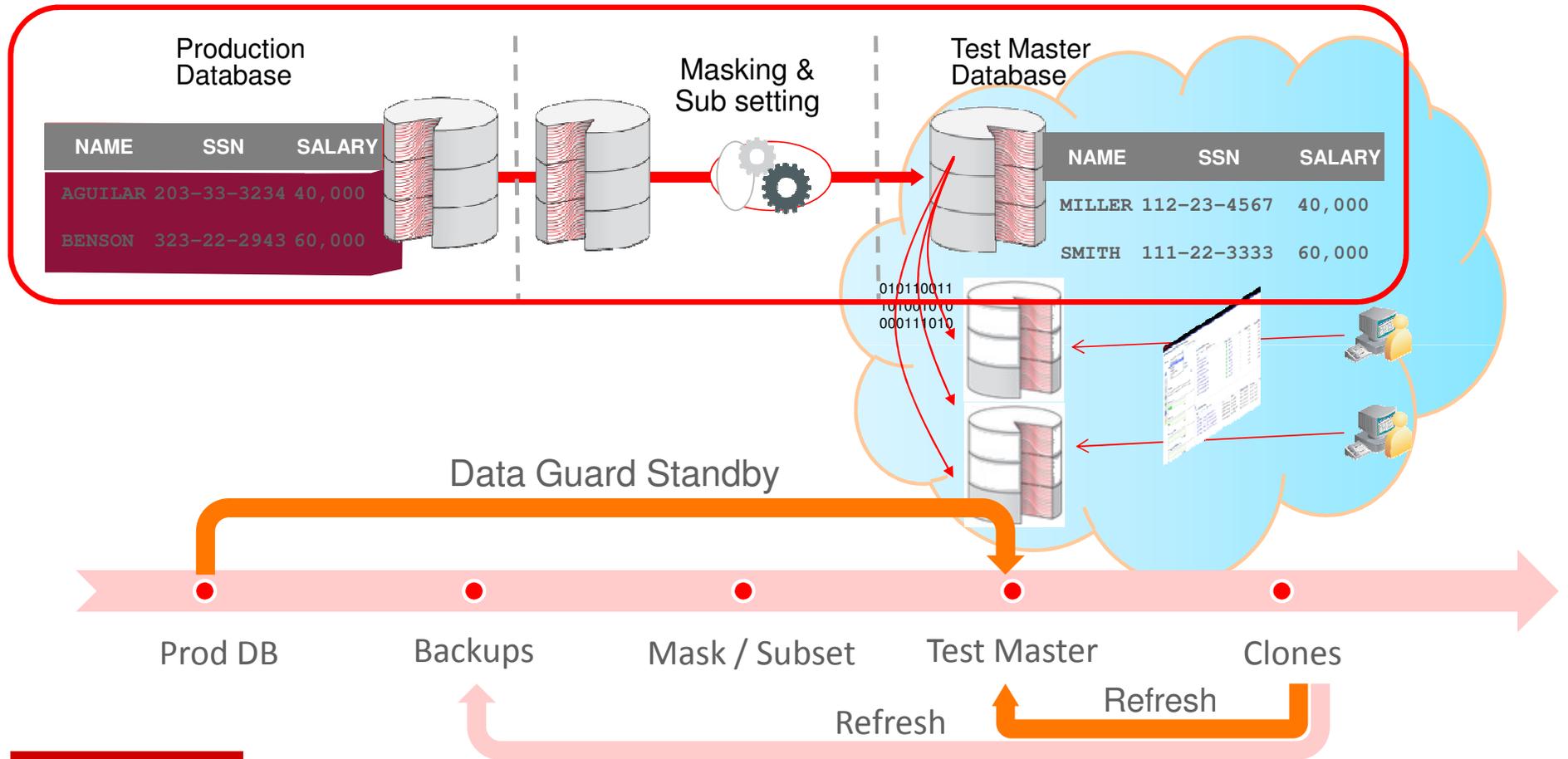
• Features

- ✓ Rapid and space efficient clones of large databases, from version 10g to 12c
- ✓ Supports ALL storage vendors and configurations (SAN and NAS)
- ✓ Integrated lifecycle management (lineage and association tracking)
- ✓ “Rewind” and “Refresh” capability suited for continuous development and testing

• Benefits

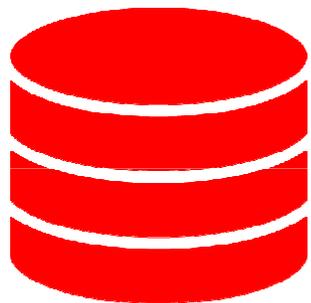
- ✓ Agile provisioning (minutes to clone TB sized databases)
- ✓ Over 90% storage savings (KBs of additional space for cloning TB sized database)
- ✓ Reduced administrative overhead for ongoing administration of clones

Data Refresh Strategies



DB Clone and Refresh – Admin Flow

Production Database



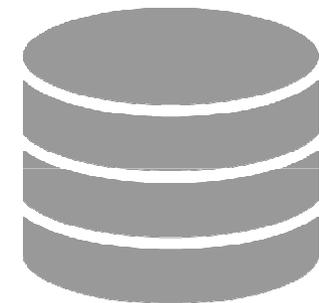
Version: 11.2.0.3

Config: 3 Node RAC

Data: RMAN Backup1

<input checked="" type="checkbox"/>	Mask
<input type="checkbox"/>	Subset
<input checked="" type="checkbox"/>	Update [Patch or Upgrade]
<input checked="" type="checkbox"/>	Change Configuration [SI / RAC]
<input type="checkbox"/>	Snap Clone
<input checked="" type="checkbox"/>	Use as Test Master

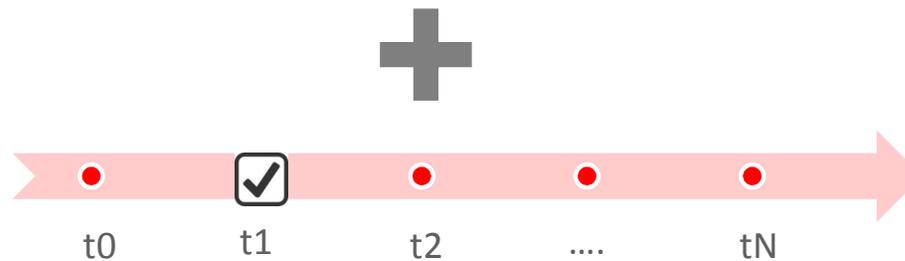
Clone / Test Master



Version: 11.2.0.4

Config: Single Instance

Data: RMAN Backup1



RMAN Backup / Data Pump / Storage
Snapshot

Self Service Provisioning and Service Catalog

The screenshot displays the Oracle Database Cloud Self Service Portal interface. On the left, there are sections for 'Notifications', 'Your Usage', and 'Databases: 4'. The main area shows 'My Databases' and 'My Requests'. A 'Select Service Template' dialog box is open, showing a search bar and a table of service templates. A red arrow points from the 'Request Database...' button in the 'My Databases' section to the first row of the table.

Service Template Name	Description
Full 1.5 TB Database Clone	Full 1.5 TB Database Clone of production database
Generic Application Schema	Generic schema on database 11.2.0.3
HR Sample Schema	Creates the HR sample schema with data.
Small 200 GB database from RMAN ba...	Small clone of database using RMAN backup
StoreFront Application Schema	Schema for the StoreFront Application with seed data on data...

- Out-of-box self service portal
- Catalog of different database configuration with varied datasets
- Resource quota based on role
- Integrated monitoring, snapshot/rollback, etc

Data Movement

Activity Breakdown

- Prod DB – Identify production database for cloning
- Backups – Take regular backups [RMAN, datapump exports, etc]
- Mask / Subset – Mask sensitive data. Optionally, subset to reduce storage footprint
- Test Master – Sanitized copy of production data for use in dev / test environments OR a Data Guard Standby database
- Clones – Full clones for performance / stress testing; snap clones for functional testing
- Refresh - Keep in sync with data changes in production

Cloning Options for Data Refresh

Full Clones

Database Native [Storage Agnostic]

**RMAN
Restore**

**RMAN
Duplicate**

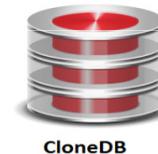
Data Pump

- Leverage your existing investments
- Cater to both functional and stress testing needs
- Maximize for best performance

Snap (Thin) Clones

Software Solution [Vendor Agnostic]

ORACLE[®]
SOLARIS
ZFS File System



Hardware Solution [Vendor Specific]

NAS

SAN

ORACLE[®]
SUN ZFS STORAGE
APPLIANCE



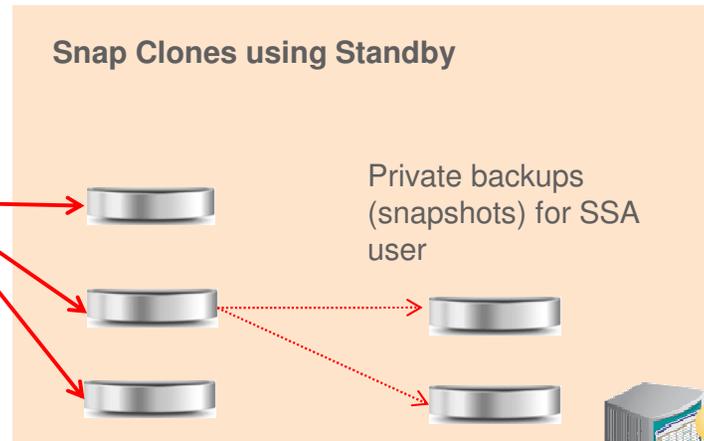
Deployment Scenarios

Production Database



Continuous or Discrete Replication

Standby / Test Master Database



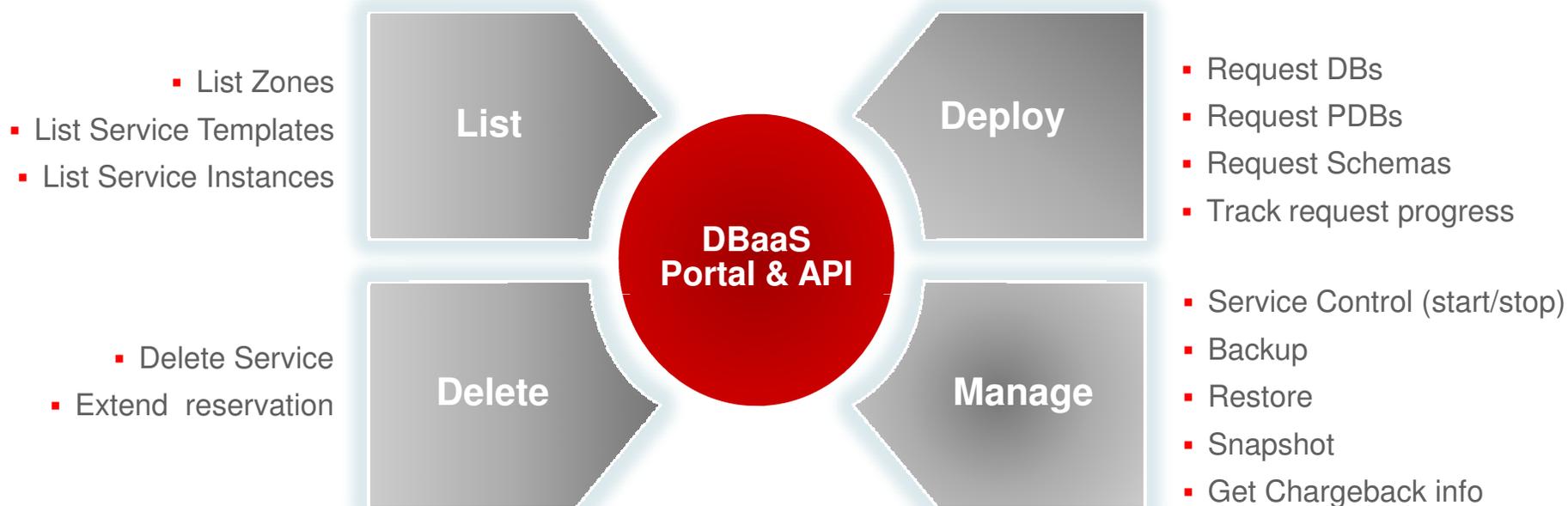
Replication Types:

Continuous

Discrete

	Continuous	Discrete
Technology	Data Guard, Golden Gate	RMAN, Snap Mirror, import/export ...
Data Refresh	Automatic and instantaneous	Manual and at scheduled intervals
Masking and Subsetting	Not possible	At source (in production), or in place at test master

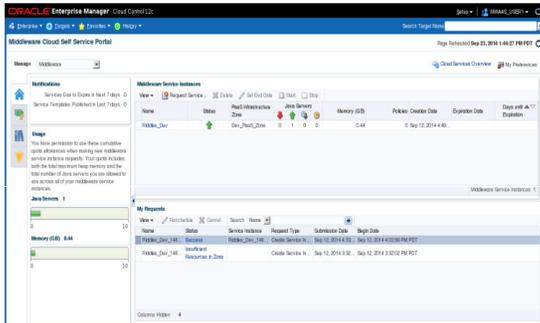
Complete APIs for Automation or Integration



DBaaS Providers:

- CRUD on Zones / Pools / Service templates / Profiles / Quota / etc

Complete REST API for Automation or Custom Portals



Out of box Self Service Portal

OR

POST :

<https://example.oracle.com/em/cloud/dbaas/zone/82CF1C28FA20A183C99D138FF8065F19>

Authorization: basic ZGVtb3VzZXI6ZGVtb3VzZXI=

Content-Type:

application/oracle.com.cloud.common.DbPlatformInstance+json

Accept:

application/oracle.com.cloud.common.DbPlatformInstance+json

Body:

```
{
  "based_on":
  "/em/cloud/dbaas/dbplatformtemplate/CC3BBB665A6BC6FFE040F00AEF252456",
  "name": "<Request name>",
  "description": "<Request Description>",
  "params":
  { "username": "Master Account username for the DB",
    "password": "Password for the Master Account on the DB"
  }
}
```



servicenow



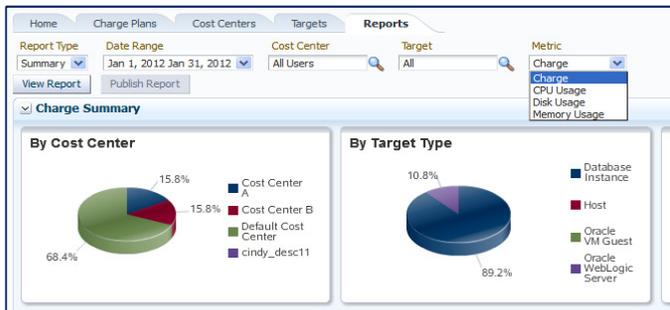
ORACLE
FUSION MIDDLEWARE
BUSINESS PROCESS
MANAGEMENT

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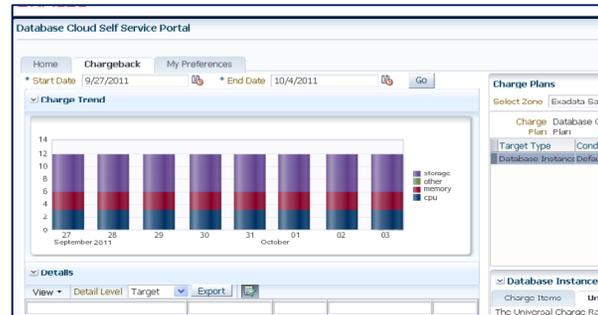
Metering and Showback

Tailored for different use cases and user types

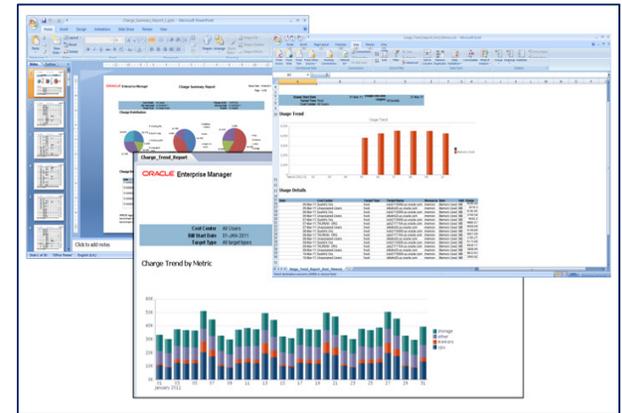
- Showback based on fixed, utilization or configuration
 - Database performance metrics, configuration items, feature-usage
 - Can be extended to leverage other metrics, e.g: business transactions
- Rollups based on LDAP
- Tailored reporting for different user personas



Chargeback Administrator



Self-Service Portal User



Line of Business User

Summary

- Jumpstart your journey to Private DBaaS
- Choice of architecture: VMs, physical, schema, multitenant databases
- Support for various service levels (single instance, HA, DR)
- Consolidation for compute, storage, and database using RAT
- Data cloning for performance testing (full clones), and functional testing (Snap Clone)
- Native storage based cloning support; no impact on performance (also supports ZFS filesystem based cloning)

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