Safe harbor statement

The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, timing, and pricing of any features or functionality described for Oracle's products may change and remains at the sole discretion of Oracle Corporation.

ORACLE

Consolidate, Migrate and Analyse Databases with Confidence using Enterprise Manager

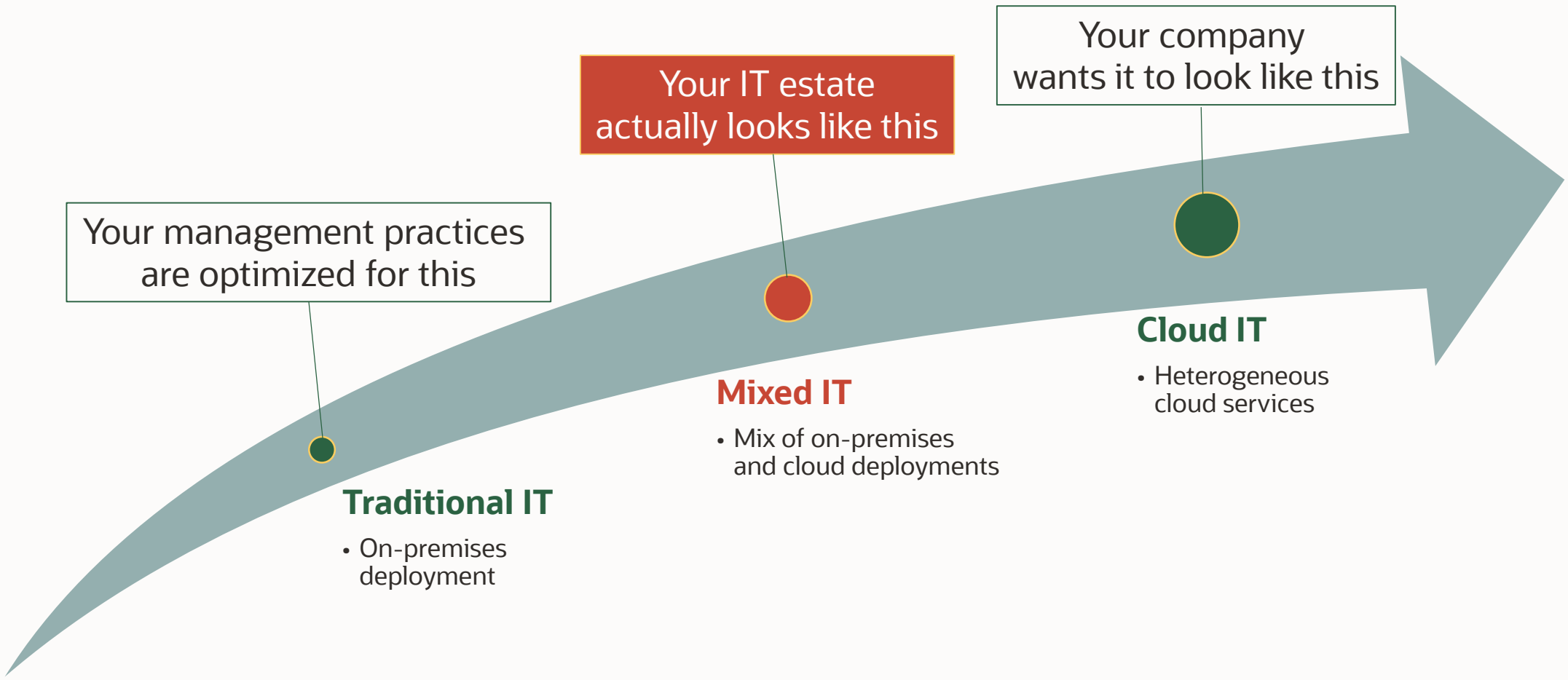
Akshay Sangaonkar
Enterprise Manager Product Management

Agenda

1. Why Migrate to Oracle Cloud?
2. Enterprise Manager for Oracle Cloud
3. Enterprise Manager Migration Workbench
4. Demo
5. PDB Lifecycle Management and Hybrid PDBaaS

Why Migrate to Oracle Cloud?

Enterprise Cloud Journey Progressing Faster Than Your Systems Management Maturity

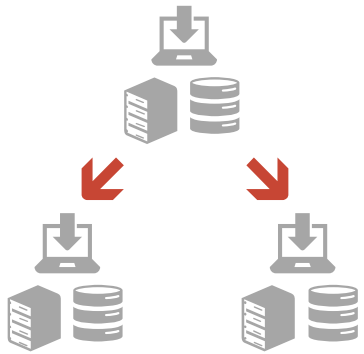


Enterprise Manager for Oracle Cloud

Enterprise Manager for Oracle Cloud

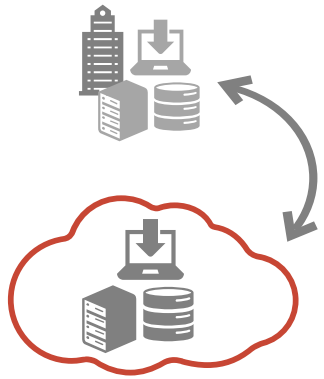
Single tool to Provision, Migrate, Monitor, Manage, Diagnose and Analyze

RAPID PROVISIONING



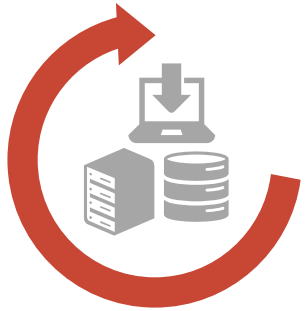
Quick Provisioning on Private or Public Cloud

MIGRATION TOOLS



Migrate DB workloads with zero re-tooling and zero downtime

CENTRALIZED MANAGEMENT



Easily upgrade and centrally Manage databases

CLOUD INTEGRATION

Integration with Object Store, Autonomous or non-Autonomous DBs

COMMON ARCHITECTURE, STANDARDS AND PRODUCTS

Migrate to Cloud using Enterprise Manager

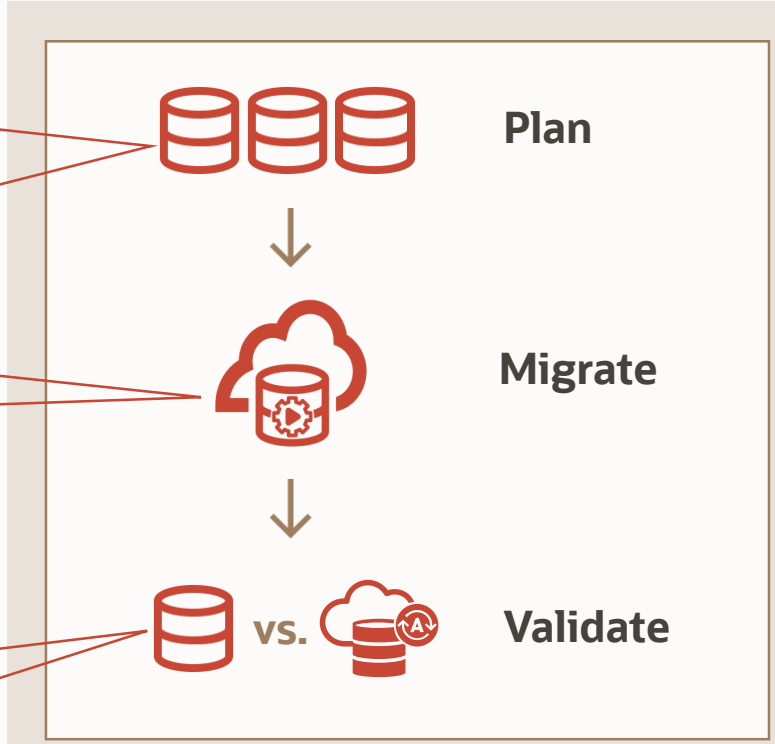
Today's Database Migration Needs

What databases can I consolidate?

What dependencies do I need to account for in my migration plans?

What mechanism should I use to perform the migration, and how do I use it?

How does my new environment compare against my old environment?



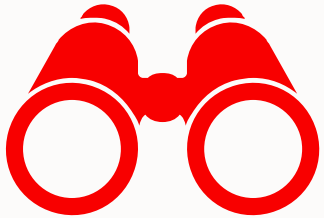
Secure

Efficient

Agile

Migration using EM

PLAN



Consolidation Estimation, Dependency Analysis

MIGRATE

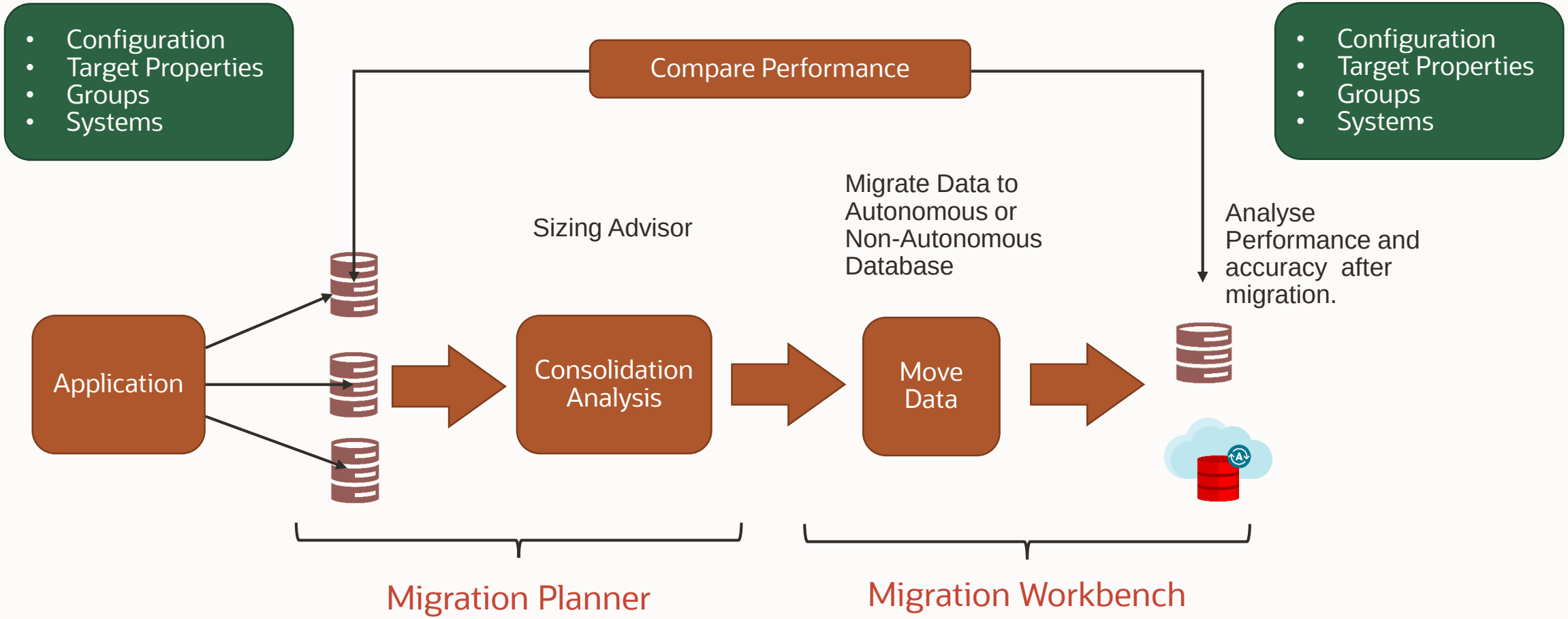
Datapump, RMAN, ADG, TTS, Zero-Downtime

ANALYZE

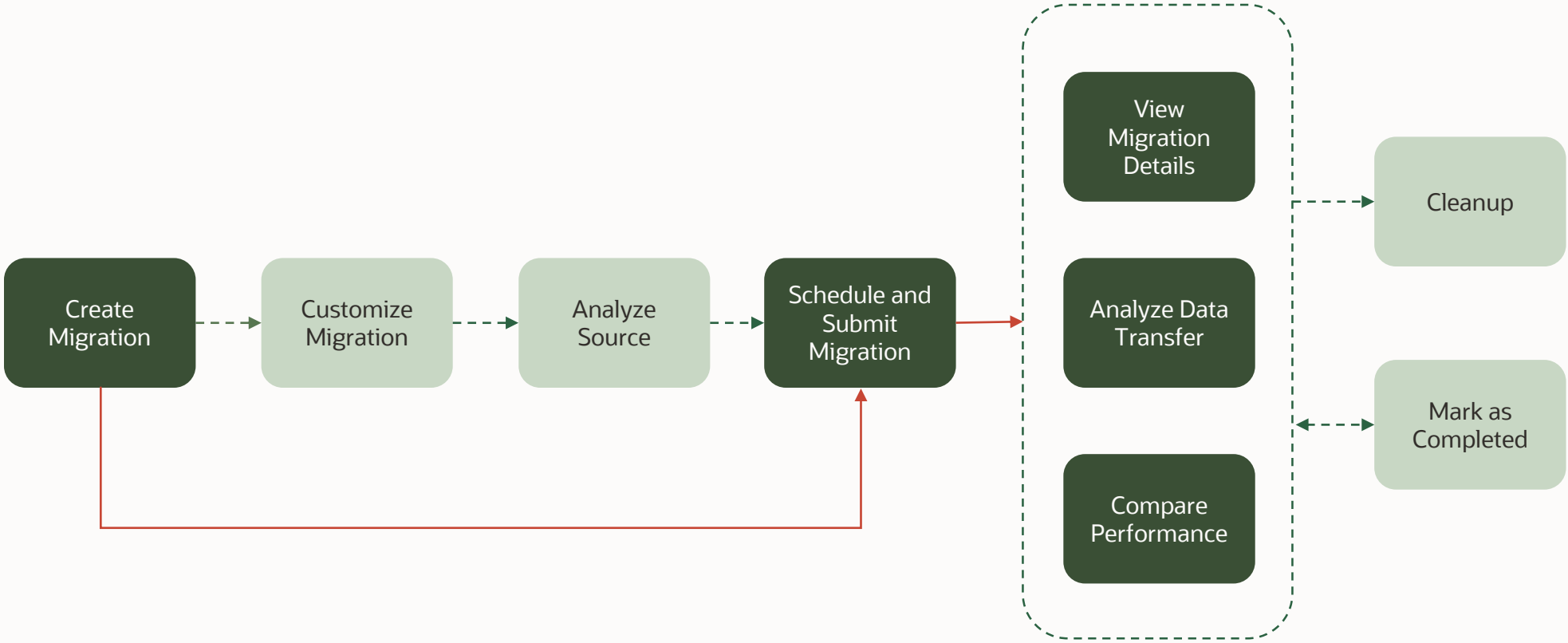
Schema Comparison, Performance Comparison

Migration Workbench Preview

Step-by-step migration process



Complete Migration Process with Database Migration Workbench



Enterprise Manager Migration Workbench

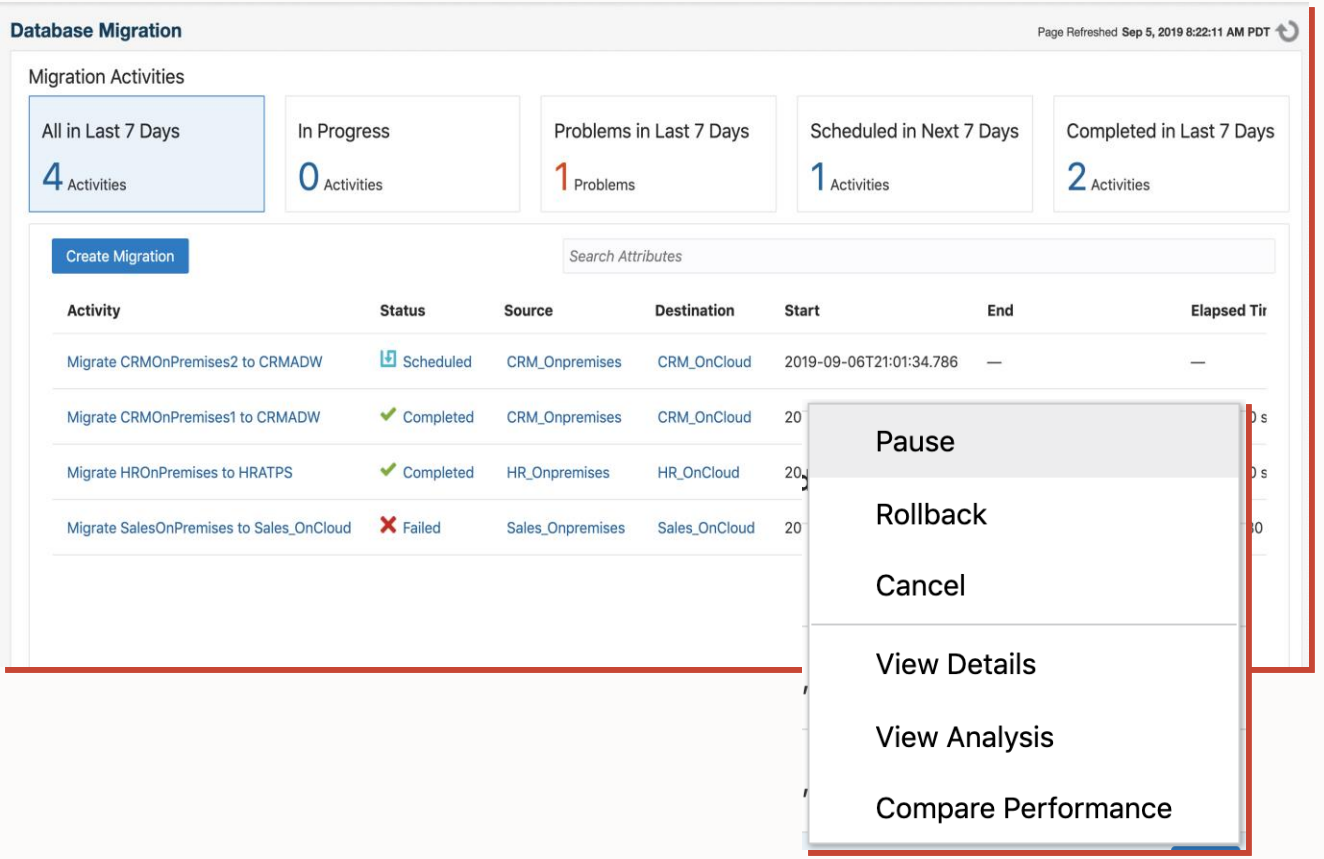
Consolidate, Migrate and Analyse

Database Migration Workbench

Launchpad for Guided Migration

Plan

- Single workbench that integrates all needs for migration – sizing, performance comparison.
- Track migration in real-time
- Customizable migration workflows
- Pause, Rollback or Cancel the entire workflow.

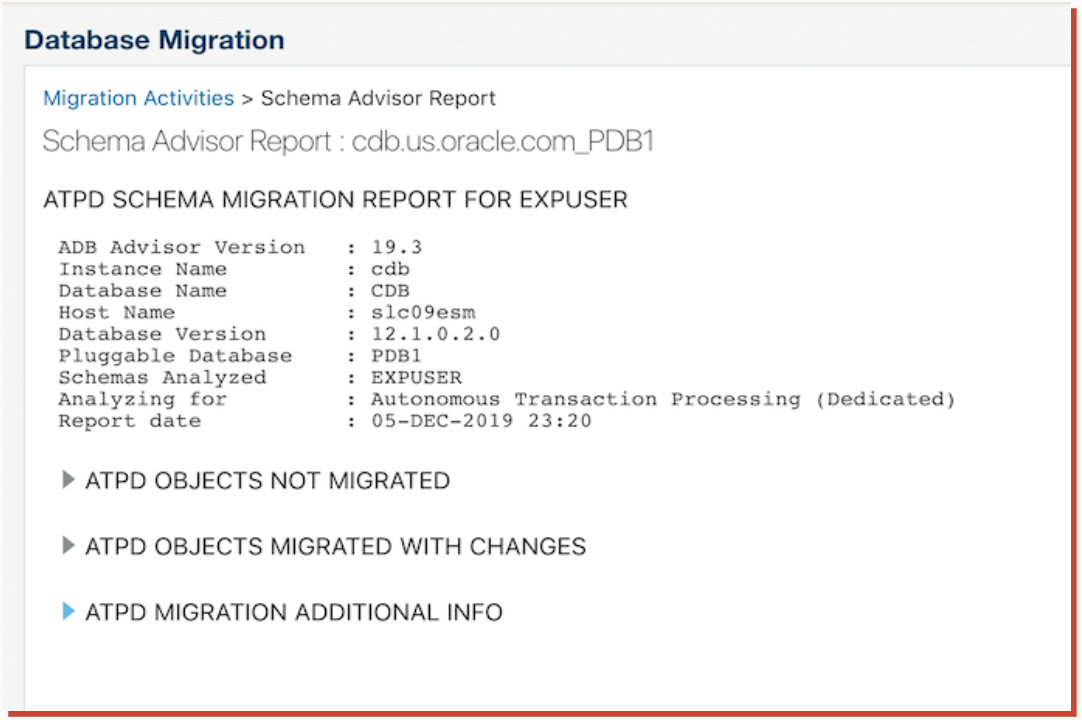


Schema Advisor

Plan

Runs on existing schema and generates a summary of migration status including

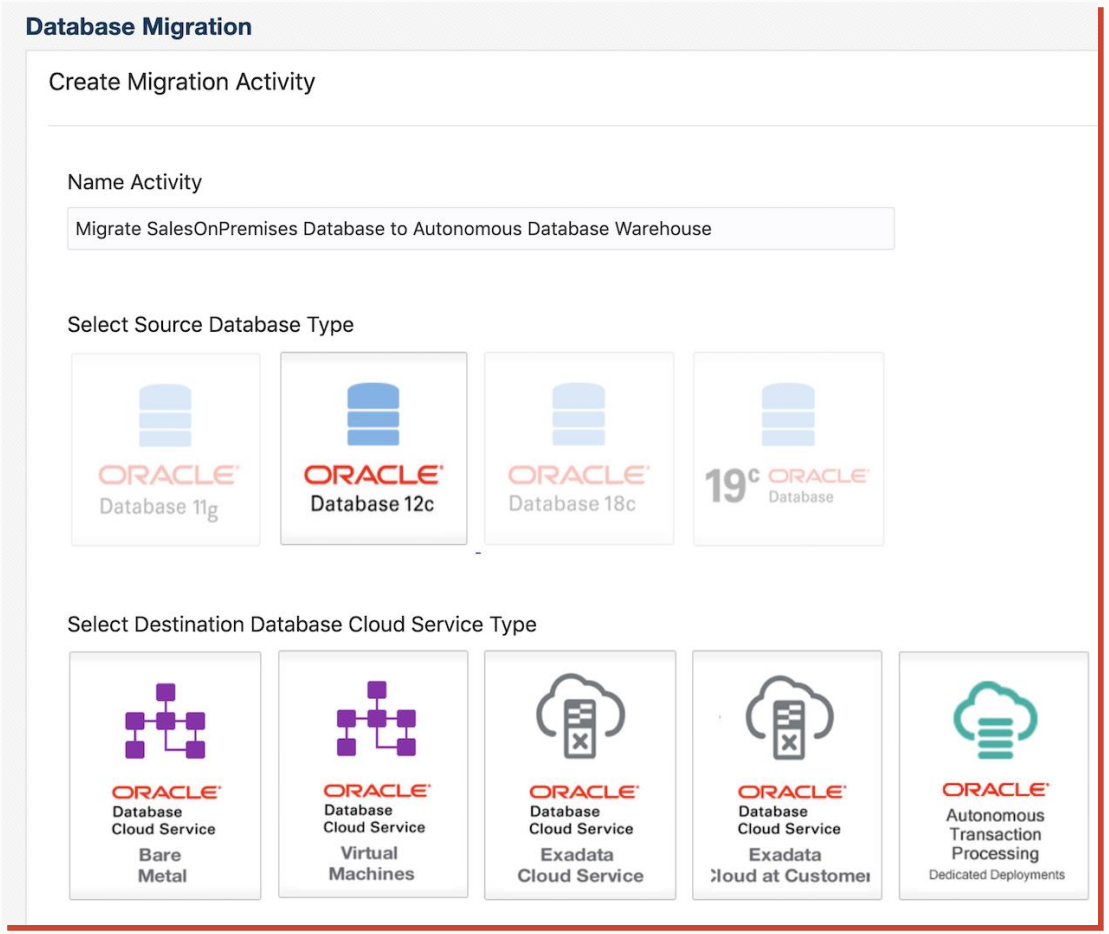
- Objects that cannot migrate due to lockdowns or restrictions on certain data types.
- Oracle Database Options that do not apply on destination database
- Objects that will migrate with certain corrective actions
- List of automated corrective actions



Database Migration landscape

Unified experience for all migration scenarios

Migrate

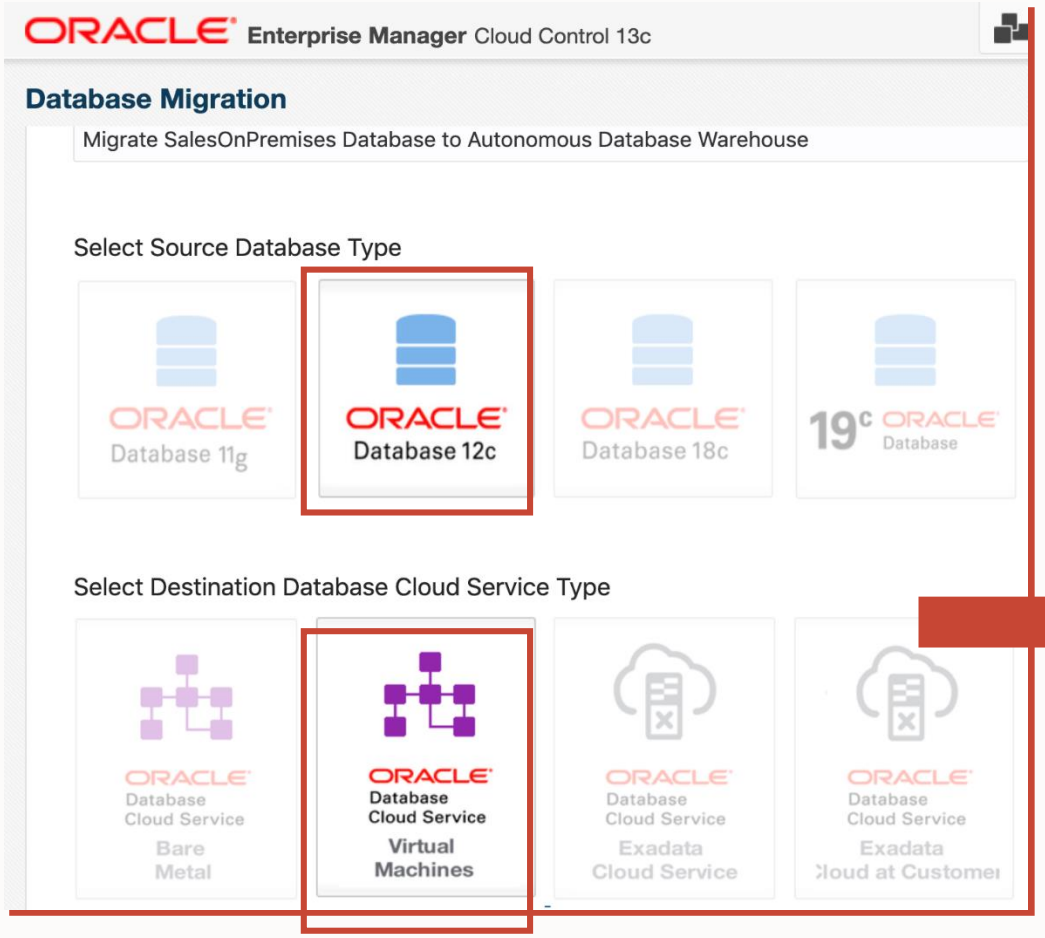


- Autonomous Databases
  Datapump
- Exadata Cloud at Customer
  Datapump, RMAN, nZDT
- Exadata Cloud Service
  Datapump, RMAN, nZDT
- Databases running on VM and BM
  Datapump, RMAN, nZDT, continuous refresh
- Databases running on OCI Compute
  Datapump, RMAN, nZDT, continuous refresh
- Compute within own datacenter
  Datapump, RMAN, nZDT, continuous refresh

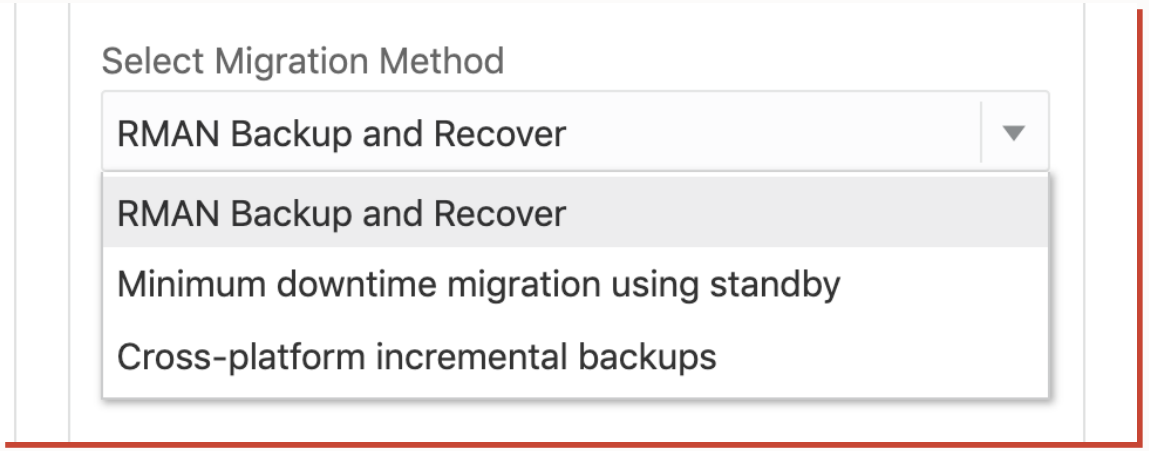
Migration Options for all configurations

Automatic recommendations for applicable migration methods

Migrate



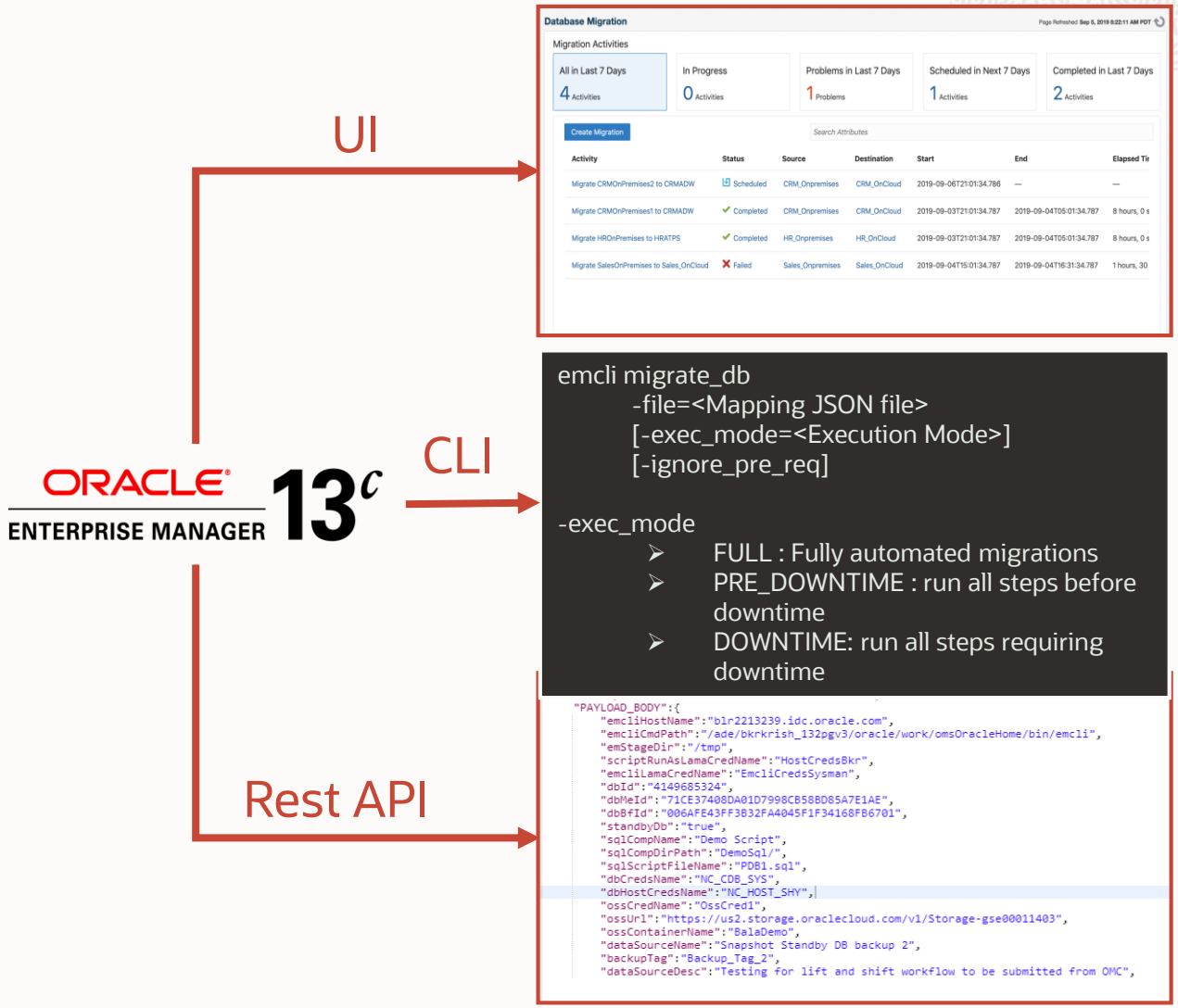
- Single workbench integrating all migration methods.
- Automatic recommendations for suitable migration methods.



Database Migration Workbench
Choice of tools

Migrate

- Functionality available via
  - User Interface
  - Command Line Interface
  - Rest API
- Complete control of DevOps
- Integrate with Enterprise Automation Standards



Minimum Downtime Migration

Online Migration to Minimize Downtime of Source Database

Migrate

- Minimizes downtime of source Database
- Online Migration using **Oracle Data Guard Standby**
- Best practices for MAA
- Create a standby database on Oracle Cloud
- Only downtime required during switch-over from primary to standby
- Options to run manual or fully automated migration using EMCLI

emcli migrate_db

-file=<Mapping JSON file>

[-exec_mode=<Execution Mode>]

[-ignore_pre_req]

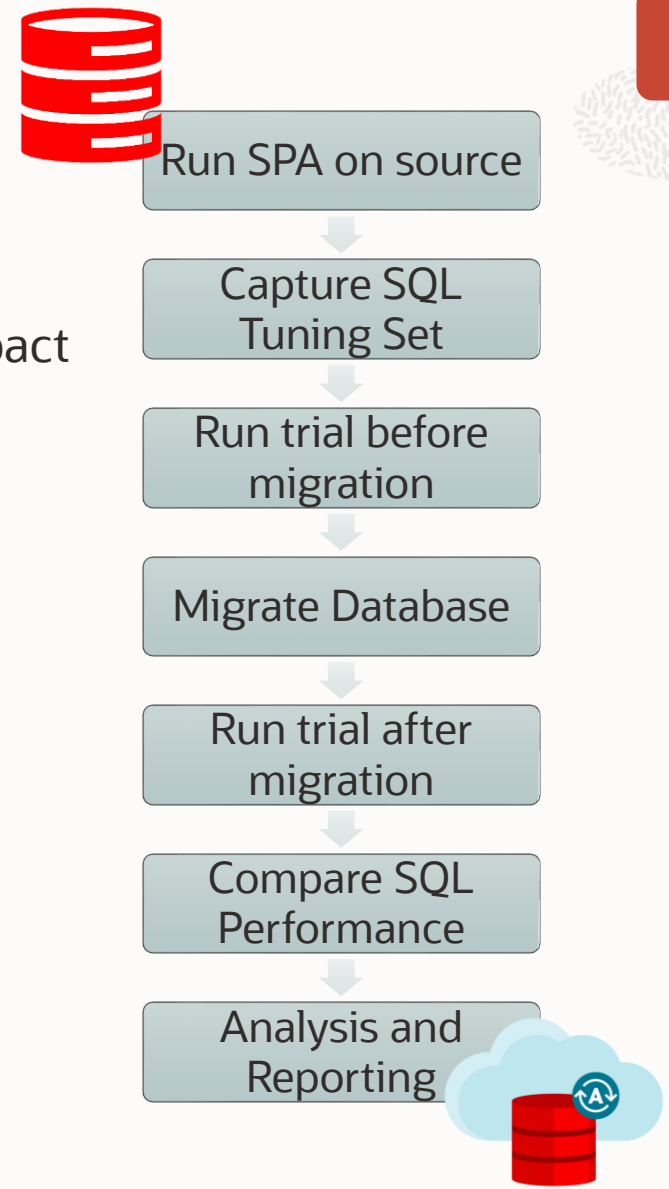
-exec_mode

- FULL : Fully automated migrations
- PRE_DOWNTIME : run all steps before downtime
- DOWNTIME: run all steps requiring downtime

Performance Comparison

Comparison using SQL Performance Analyzer

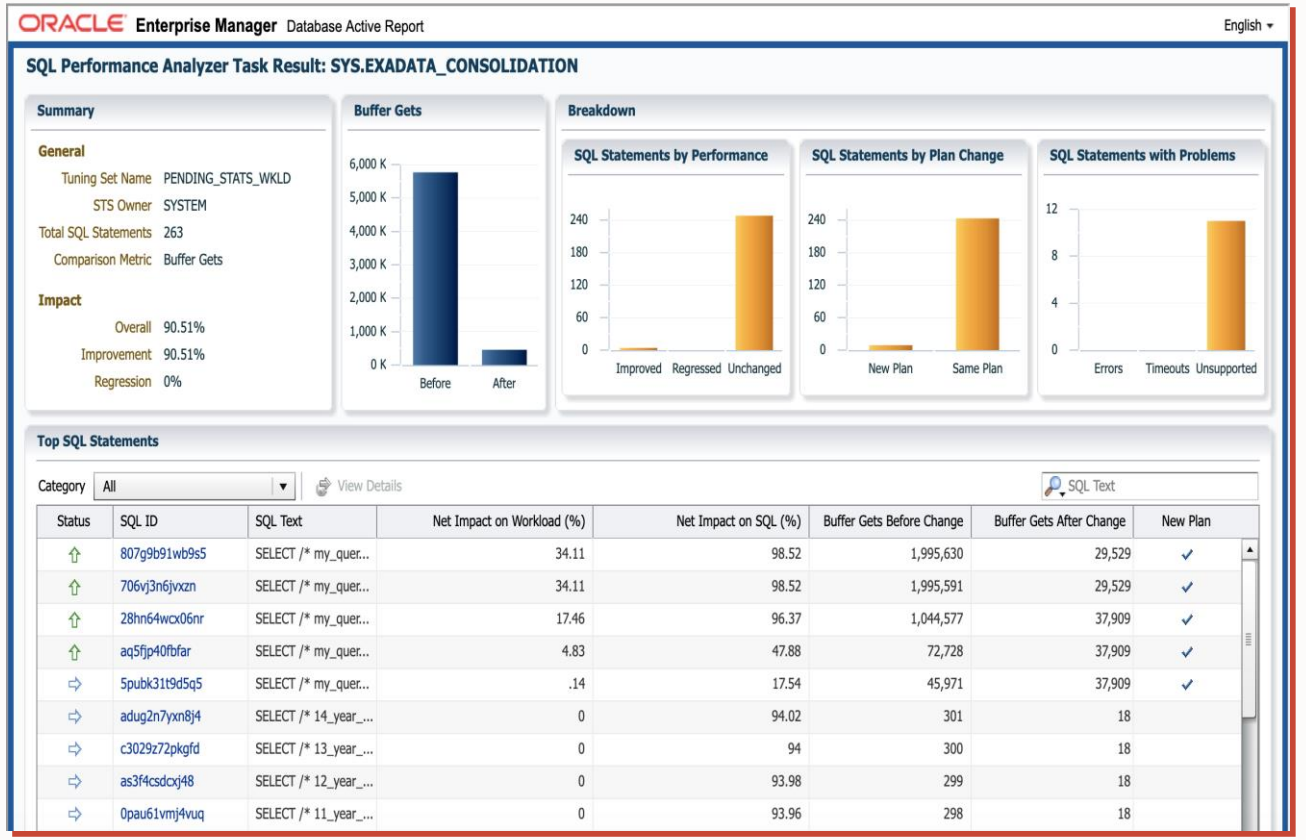
- Compare SQL performance before and after migration
- Based on historic transactional data analyze potential impact on application
- Comparison based on
  - Elapsed Time
  - CPU Time
  - User I/O Time
  - Buffer Gets
  - Physical I/O
  - Optimizer Cost
  - I/O Interconnect Bytes



Performance Comparison
Simple and flexible

Analyze

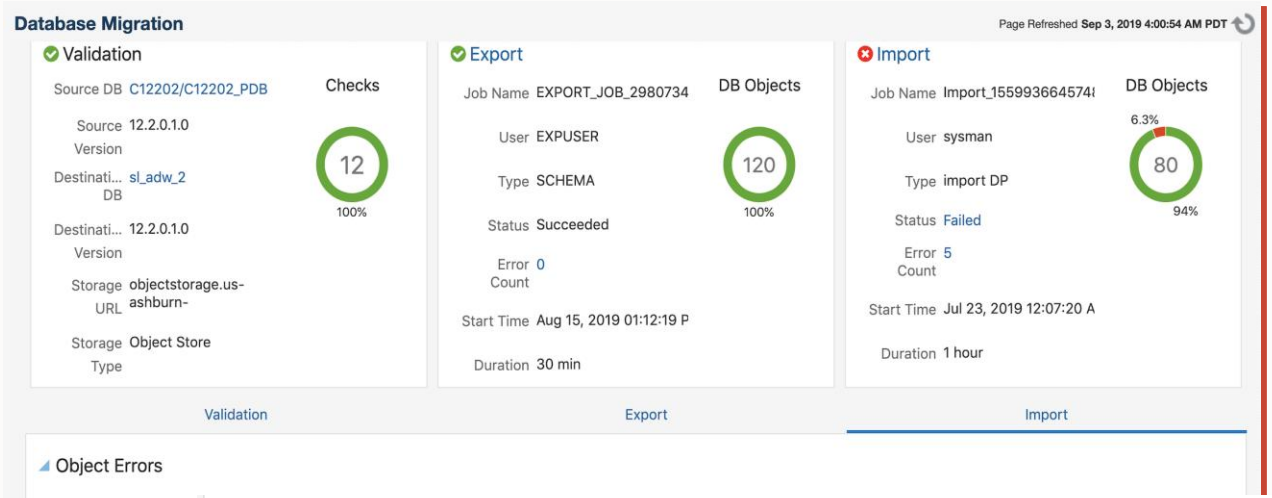
- DevOps
  - Out-of-Box Solution
  - No preparation required
  - Simple and automatic.
- Production
  - User need to enable STS before start of migration
  - This STS used to compare performance after migration
  - Accurate and flexible.



Analyze migration workflow

Identify and Remediate failures efficiently

Analyze



- Step-by-step analysis of migration
- Drill-down at the object level migration
- What objects succeeds or fail
- Deep insights and reasoning for failed objects

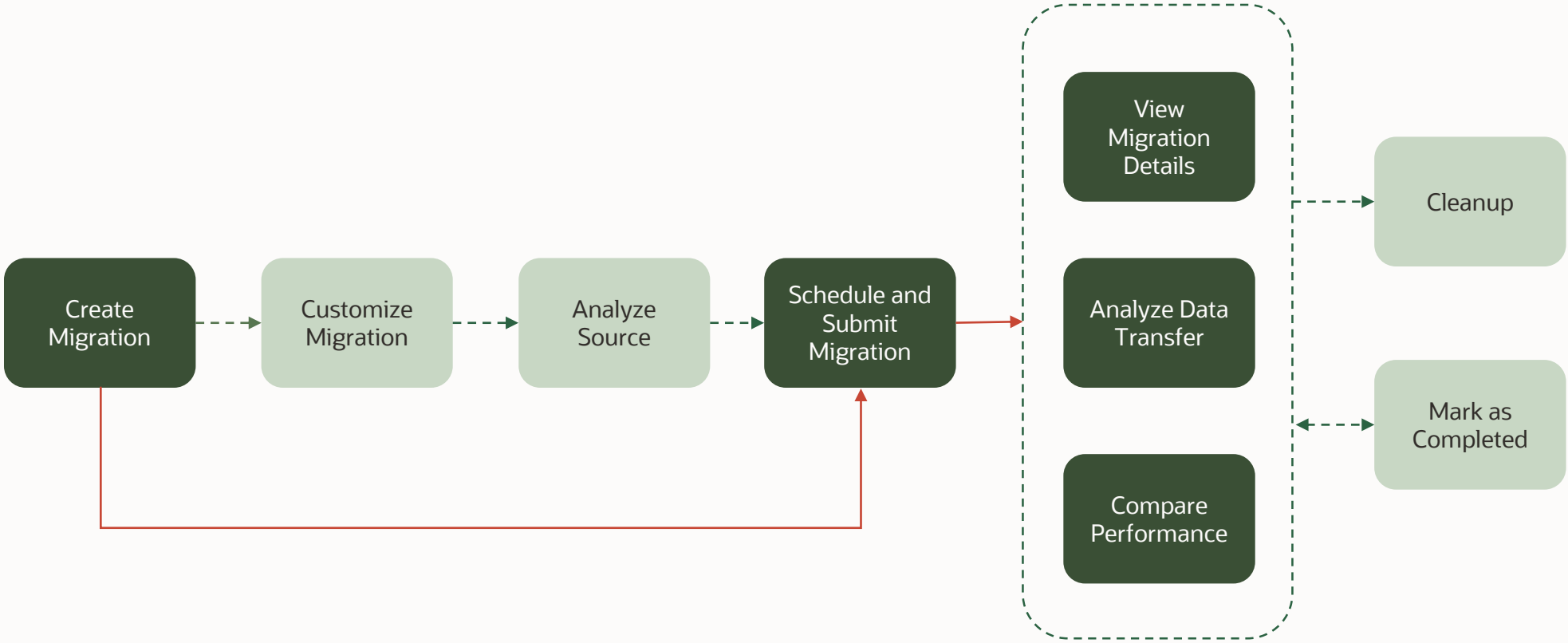
Object Errors

Schema	Object Type	Object Name	Processed	Errors	Error Message
SALES	USER	NA	1	1	
	USER	EXPUSER	1	1	ORA-31684: Object type USER:"EXPUSER" already exists
SALES	CONSTRAINT	NA	2	2	
	CONSTRAINT	SYS_IOT_TOP_001	1	1	ORA-00001: unique constraint (SALES.SYS_IOT_TOP_001) violated
	CONSTRAINT	SYS_IOT_TOP_002	1	1	ORA-00001: unique constraint (SALES.SYS_IOT_TOP_002) violated

Demo

Migrate to Autonomous Database using Enterprise Manager

Complete Migration Process with Database Migration Workbench



Hybrid PDB as a Service

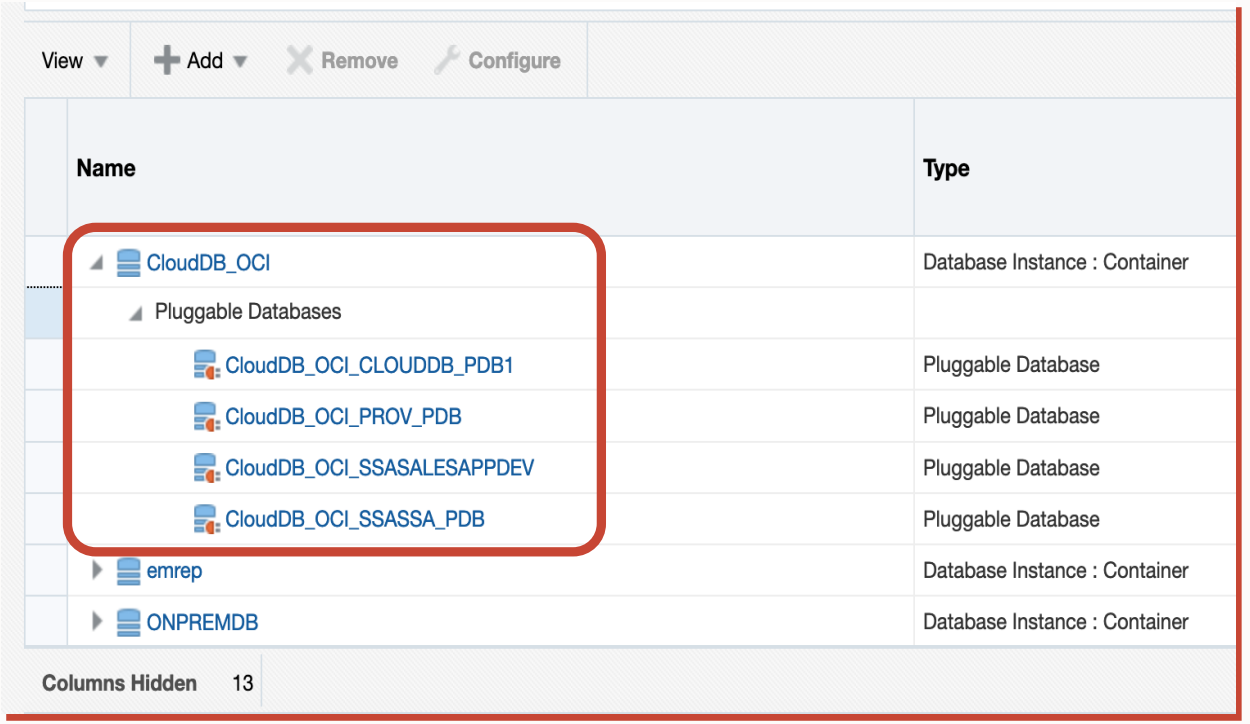
On-premises and OCI provisioning

Simple Unified User Experience

EM for Oracle Cloud (OCI) Database Cloud Service (DBCS)

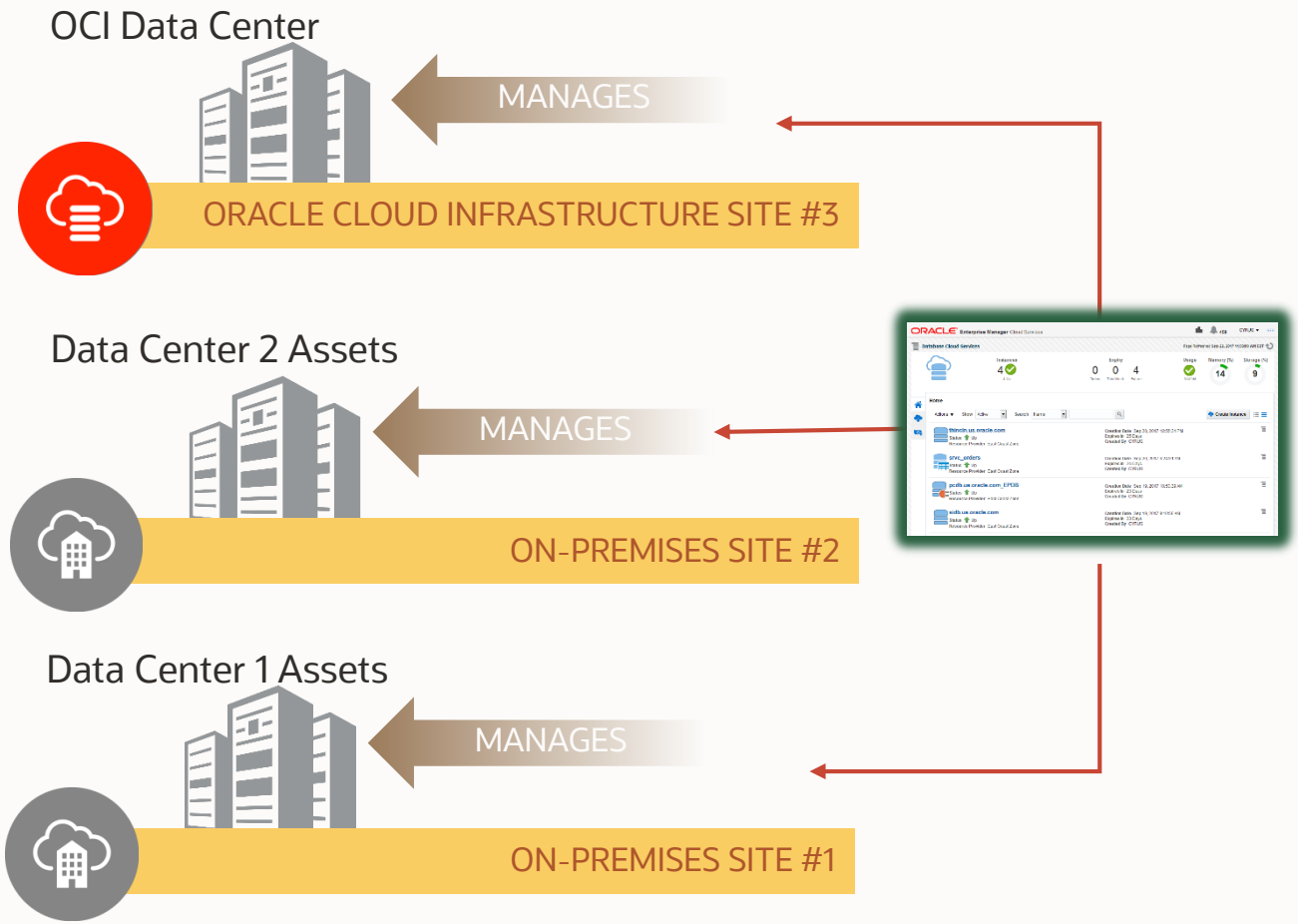
Manage Databases running in OCI DBCS

- On-premises EM or Marketplace EM
- Discover DBCS running on VM/BM
  - Deploy EM agent on host where OCI DB System is running
  - Discover CDB within DB System in EM
  - Requires OCI Connectivity
- Use DBLM and CMP features to manage pluggable databases.



OCI Database Discovered in EM

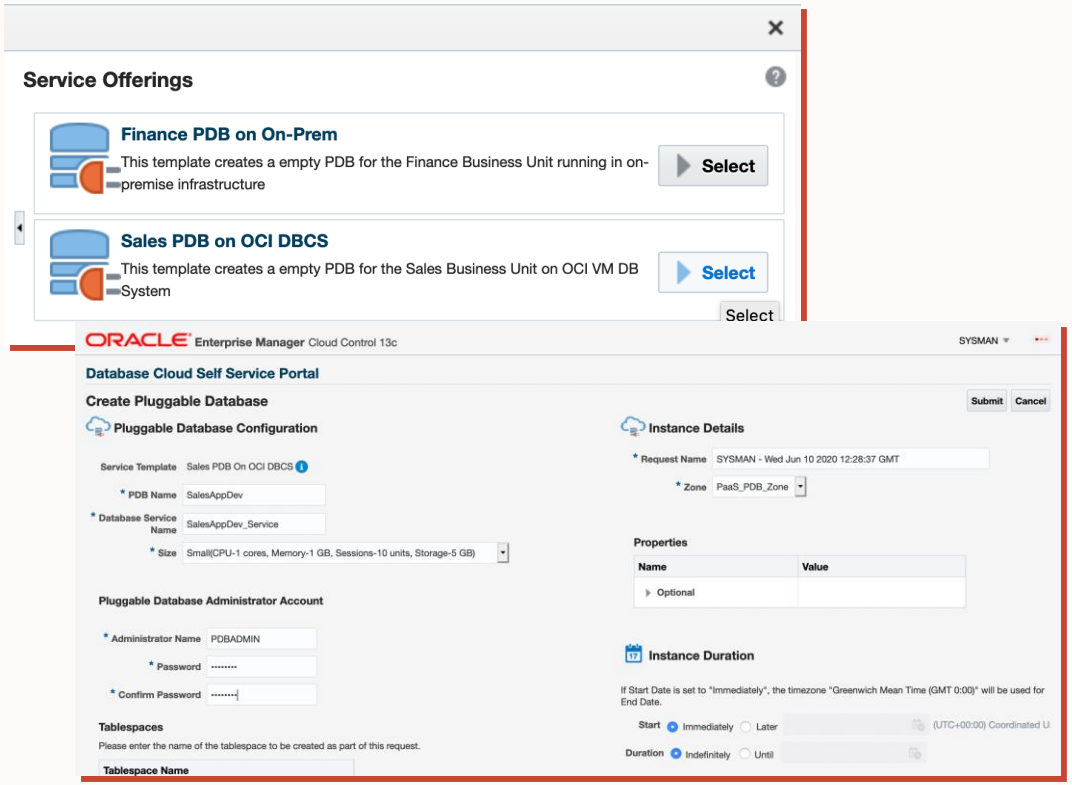
Self Service : Provision and Manage Database Assets



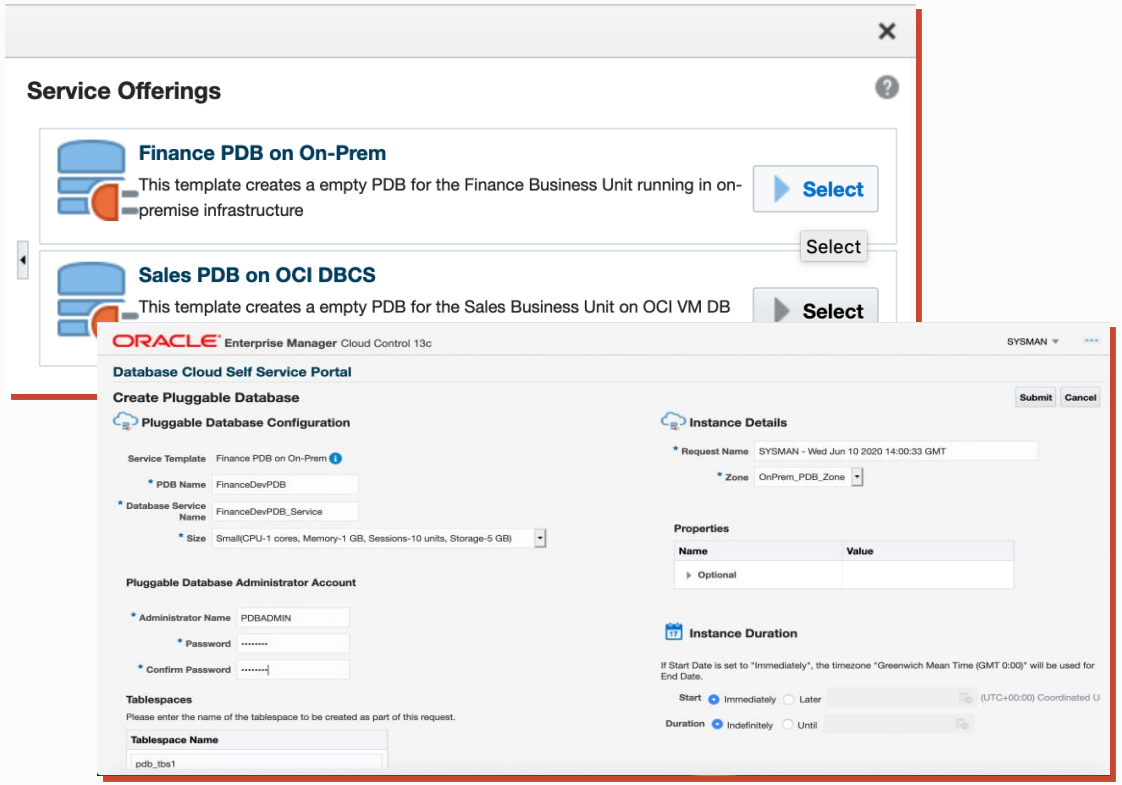
- Provision and manage **on-premises** assets with Enterprise Manager 13c
- Extended database management for **OCI-based** assets, with Enterprise Manager 13c Release Update 4 and above
- **Manage your entire Oracle Database fleet at scale, with less effort**
- **Same user experience, regardless of platform**

Self Service

Simple, Unified Provisioning for Onpremise and OCI Data Center



Provisioning PDB on OCI DBCS on VM



Provisioning PDB in Onpremise Data Center

Migrating and Managing Databases in Hybrid Cloud : Summary

Migrating Databases

- IaaS Flavors
  - Provisioning
    - Gold image based provisioning
    - PDB (empty/with data) provisioning
  - Cloning/Migration
    - Database links based cloning
    - Backup and Recovery
    - Data pump export/import
    - Transportable Tablespaces (cross-platform)
  - Migrate non-CDB to PDB
- PaaS (Autonomous Database) GA in RU7
  - Migration Workbench
    - Data pump

Managing Databases in Cloud

- IaaS Flavors
  - Complete Database LCM (Provisioning, Patching, Config/Compliance)
- PaaS (DBCS on VM/BM)
  - Multitenant Management
    - Provision
    - Clone / Refreshable Clone
    - Unplug/Plug
    - Relocate
    - Delete
    - Unified Self Service Portal to manage PDB's in on-premises and OCI data center

ORACLE

The world of Hybrid Management

Björn Bolltoft

Product Management
Oracle Product Development

Agenda

1. Database Migration Planner
2. Manage Databases in Cloud
3. Enterprise Manager Chargeback & Metering

Database Migration and Consolidation: Considerations

What database migration/consolidation strategy to use?

Can workloads co-exist together for the chosen strategy, what conflicts exist?

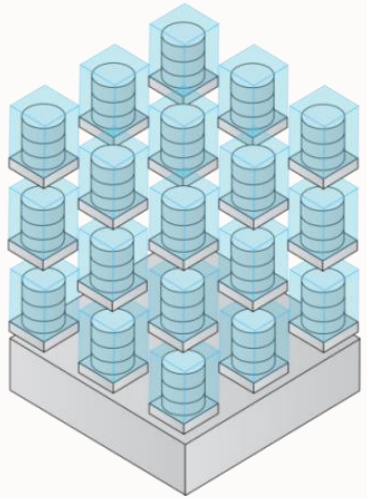
Can the system handle peak workloads while maintaining performance?

How to perform migration with reduced downtime?

How to test the chosen consolidation strategy to minimize risk?

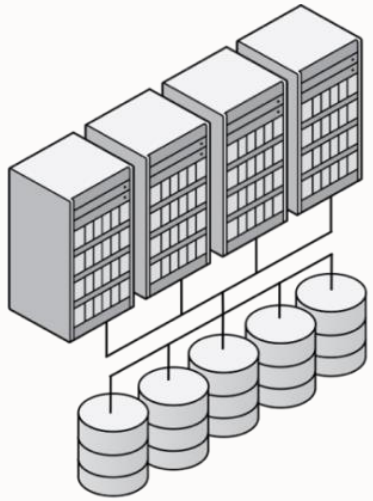
Consolidation Alternatives

Virtual Machines



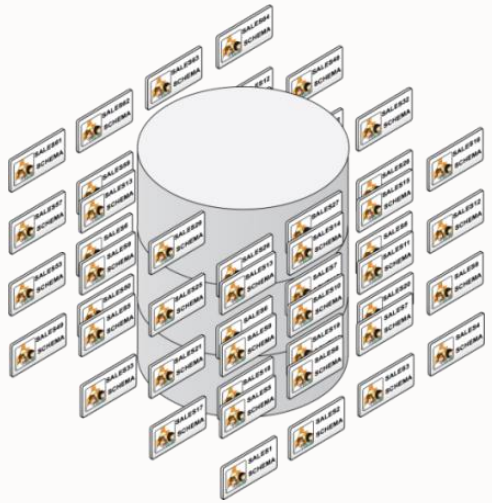
Share servers

Dedicated DBs



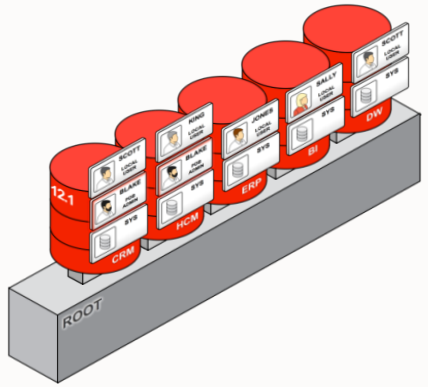
Share servers and OS

Dedicated Schema(s)



Share servers,
OS and database

Pluggable DBs

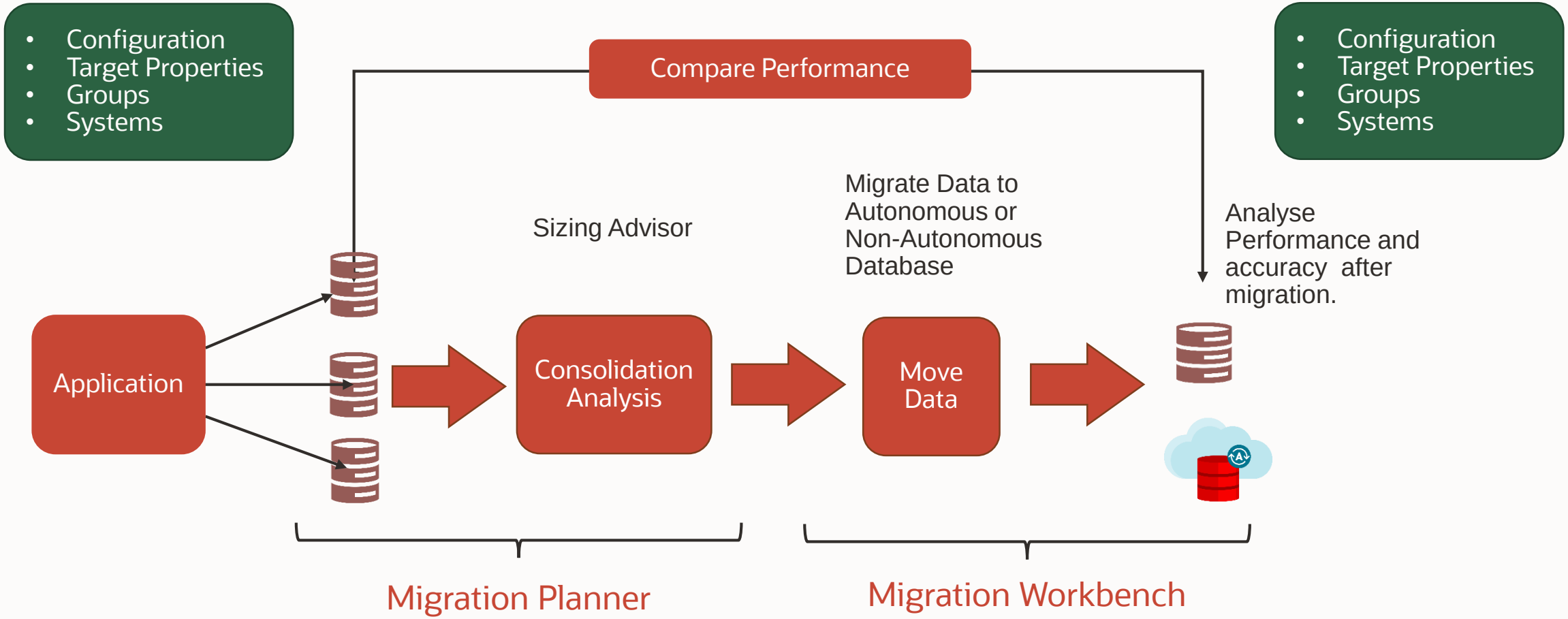


Share servers,
OS and database

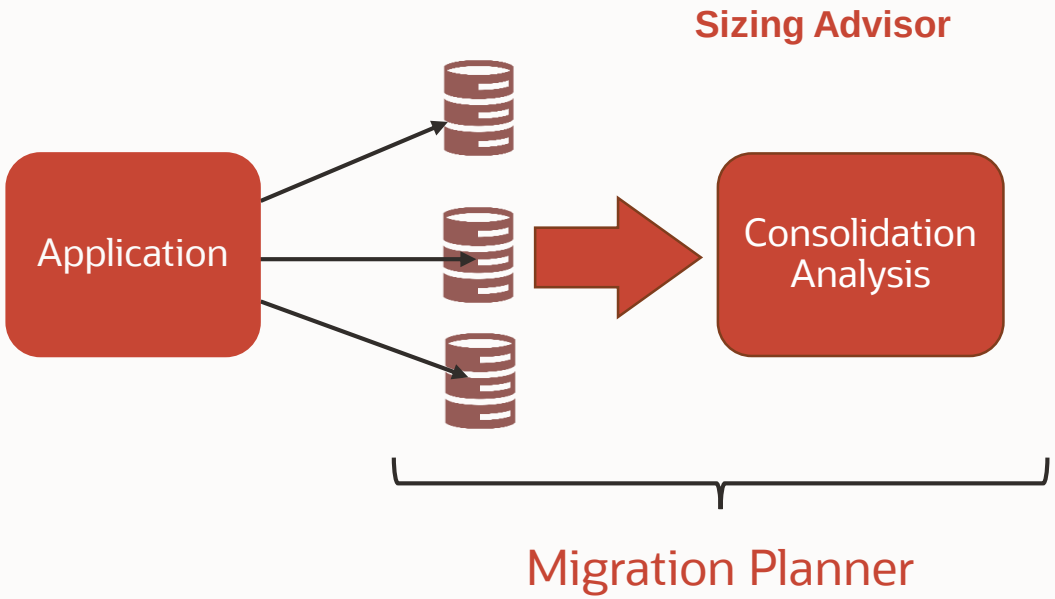
Increasing Consolidation

Migration Planner and Migration Workbench

Step-by-step migration process



Database Migration Planner



Comprehensive analytic solution for planning database migrations and consolidation

Provides a risk-free and accurate approach to consolidation by eliminating guess work, human errors

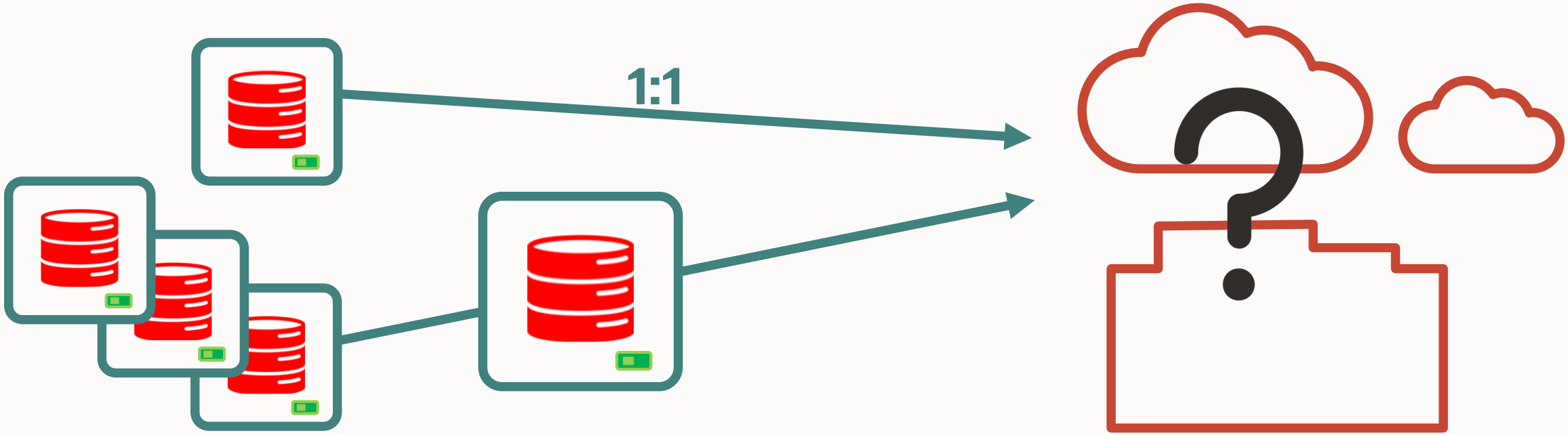
- Analysis based on historical workload (DB, Host metrics)
- Automation in all phases of consolidation from planning to deployment

Provides a flexible approach for various customer scenarios

- 10.2 DB versions and higher support
- Oracle Private Cloud, **Oracle Compute Cloud shapes (OC3-7, OC1M-OC5M)** or Exadata
- Support for workload capacity / cloud shape planning for single or consolidated databases

Analyze Cloud Capacity / Cloud Shape Required

The DB Migration Planner can be used when consolidating multiple databases or to analyze if one or multiple databases can be moved to the cloud and what cloud shape that is required to meet the required capacity



Database Consolidation Workbench

End-to-end Consolidation Solution

Plan

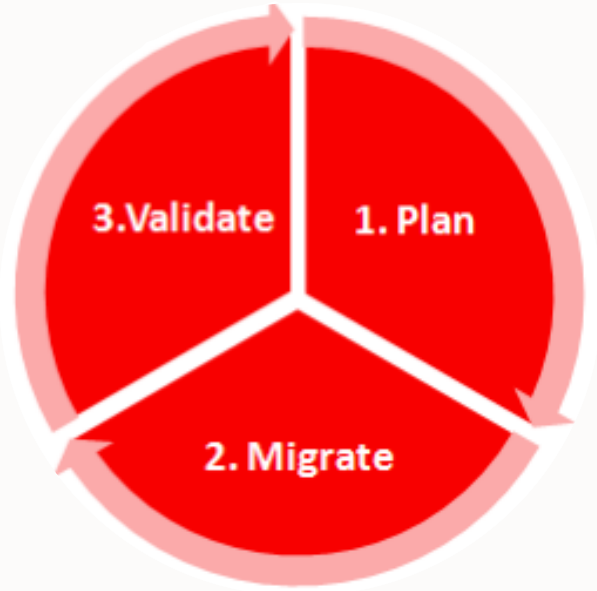
- Gives consolidation advice by identifying candidate databases for the designated consolidation platform using AWR data

Migrate

- Implements consolidation plan by migrating databases to new consolidation platform Migration Workbench

Validate

- Validates consolidation plan with Real Application Testing (SPA) by running test workloads on consolidated databases and concurrency tests with Database Replay



Database Migration Planner

Key Features and Planning Advice

Estimates resource utilization under various consolidation scenarios

- Ultra Conservative (peak maximum) → Aggressive (average)

Supported consolidation modes

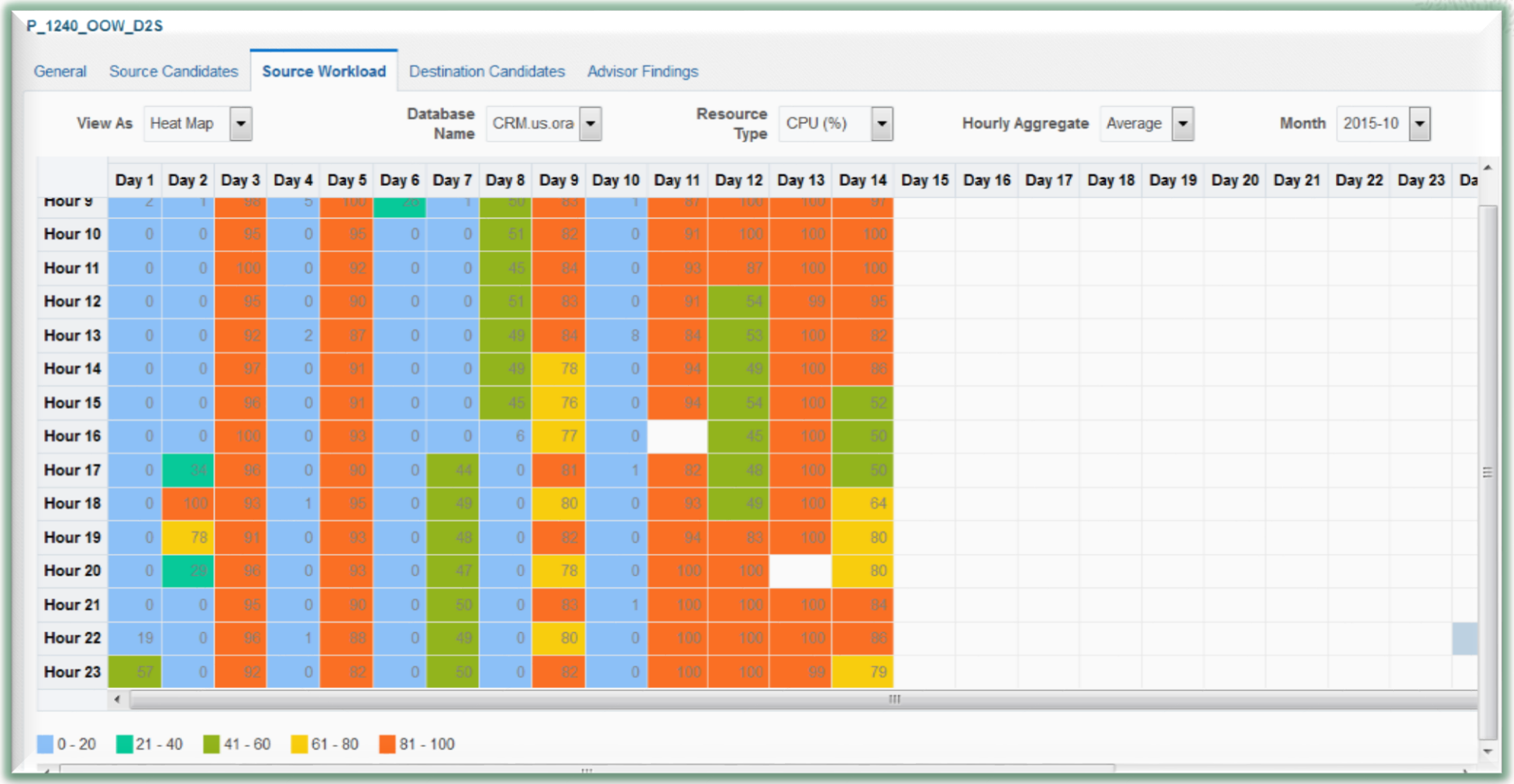
- Database-to-Database (Multitenant) consolidation
- Database-to-Server (Server, e.g. Exadata) consolidation
- Oracle Public Cloud consolidation

Consolidation optimization advice

- Identifies conflicts based on workload characteristics, Exadata suitability
- Storage/Platform advice: impact of compression on I/O & storage, impact of I/O offloading & Flash Cache

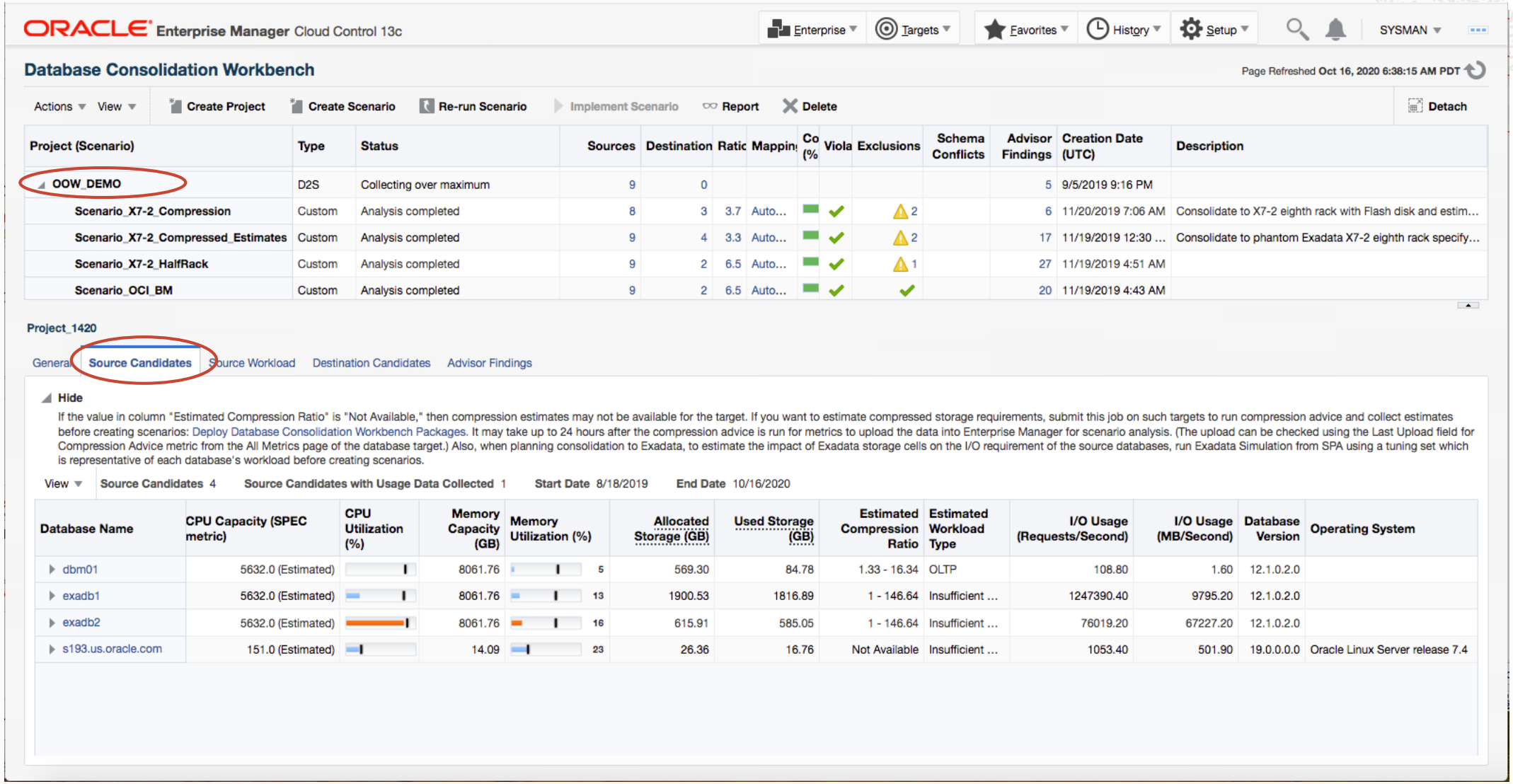
Database Migration Planner Heatmap

1. Plan



Migration Planner – Screen Shot demo

1. Plan



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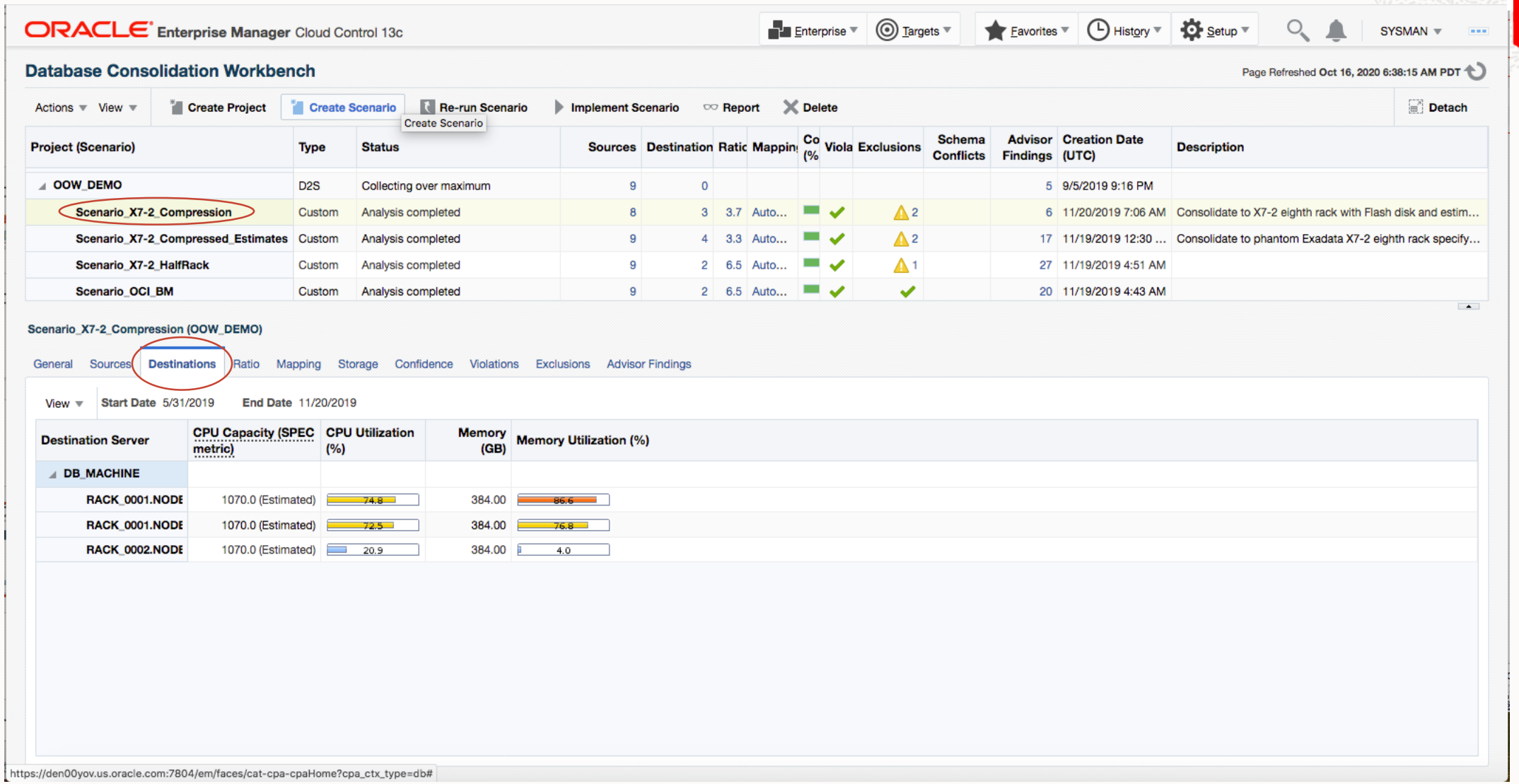

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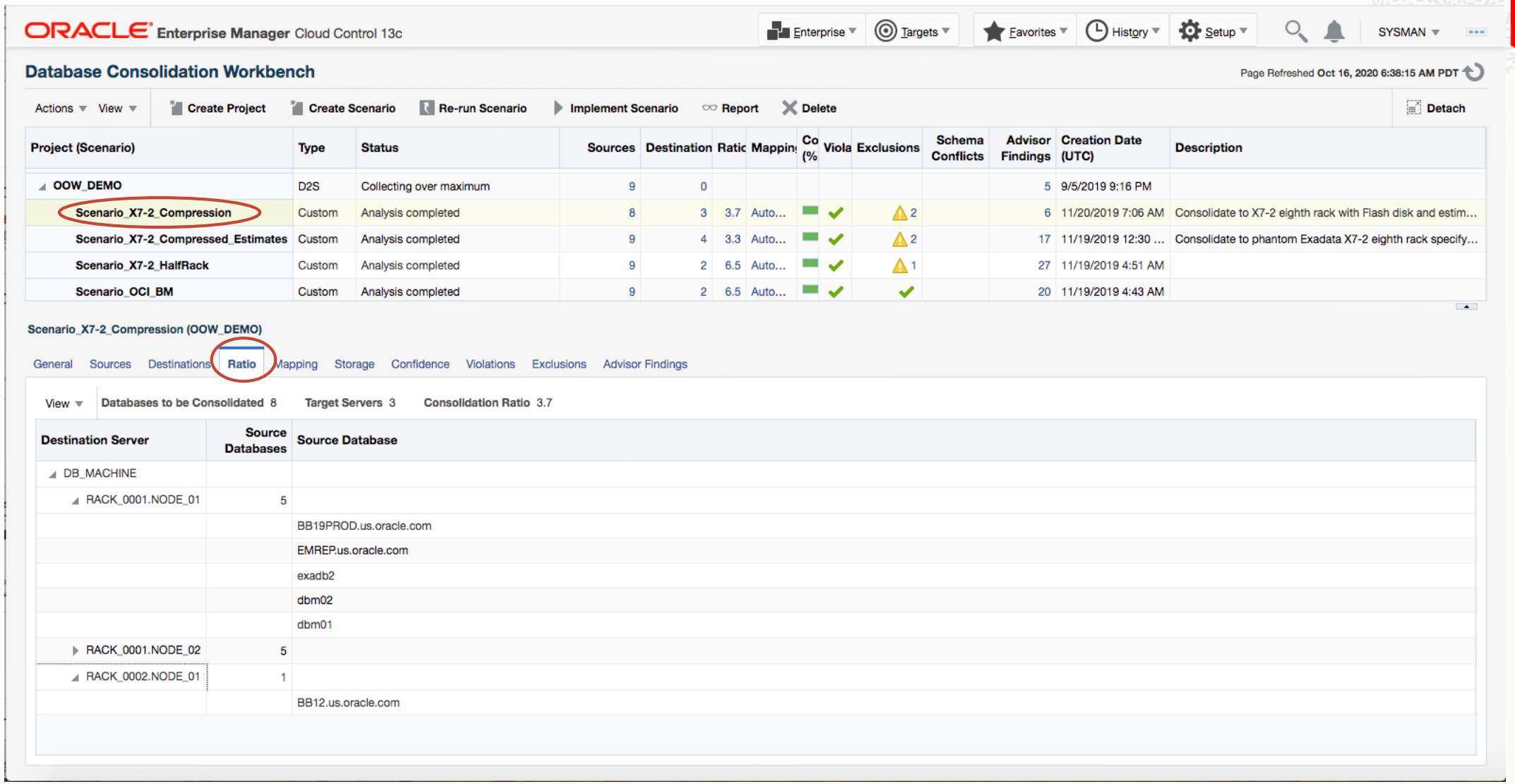

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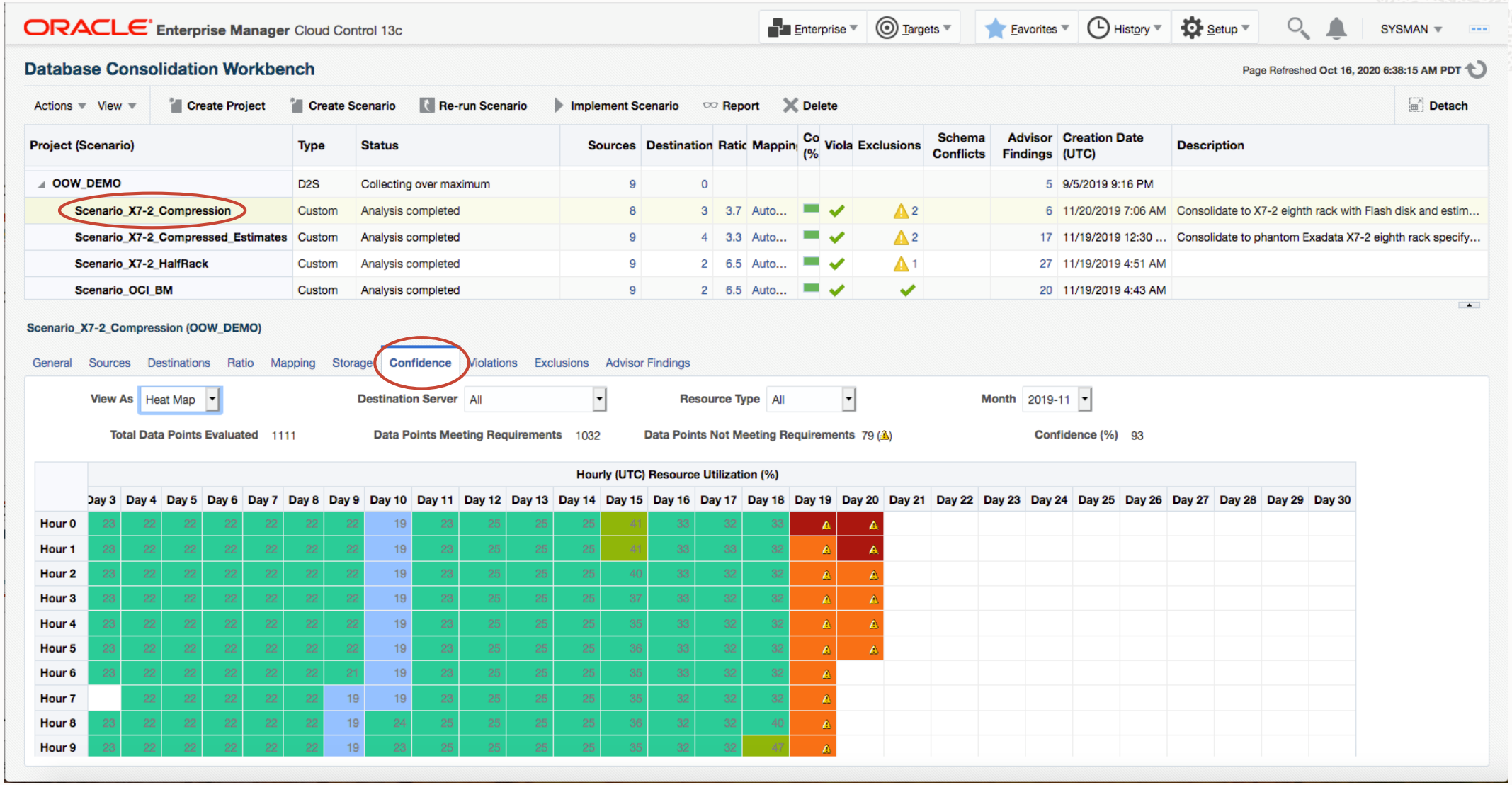

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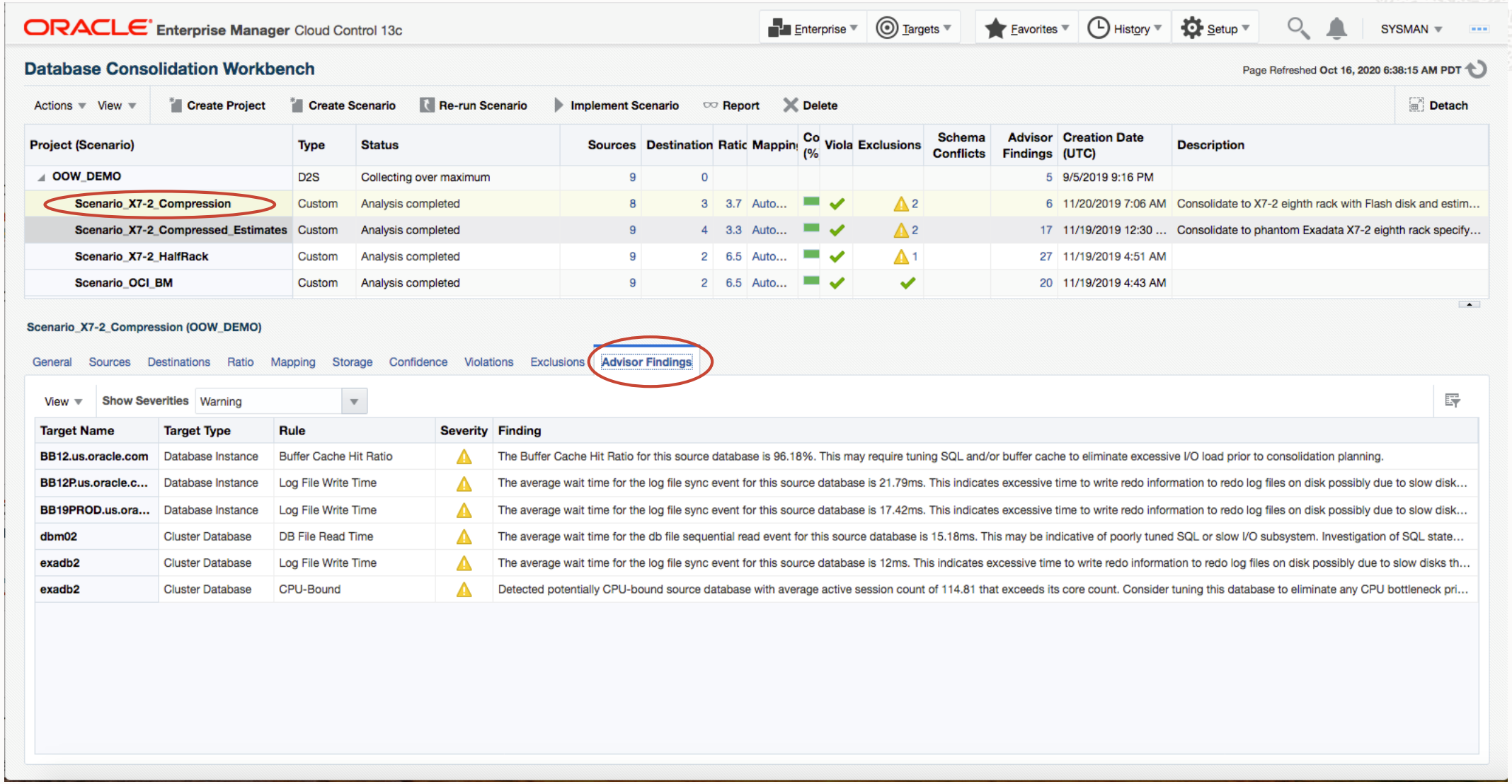

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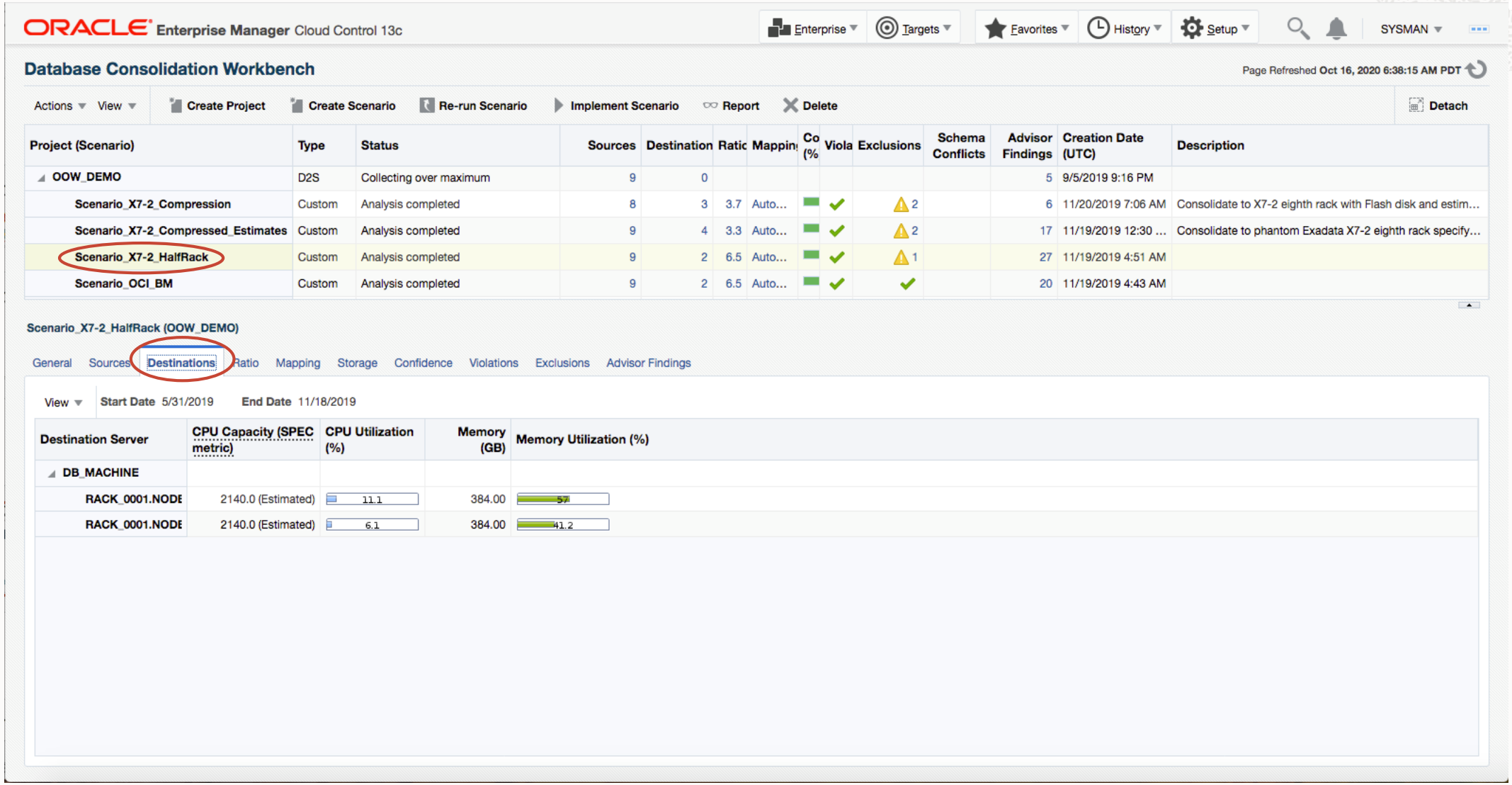

Migration Planner – Screen Shot demo

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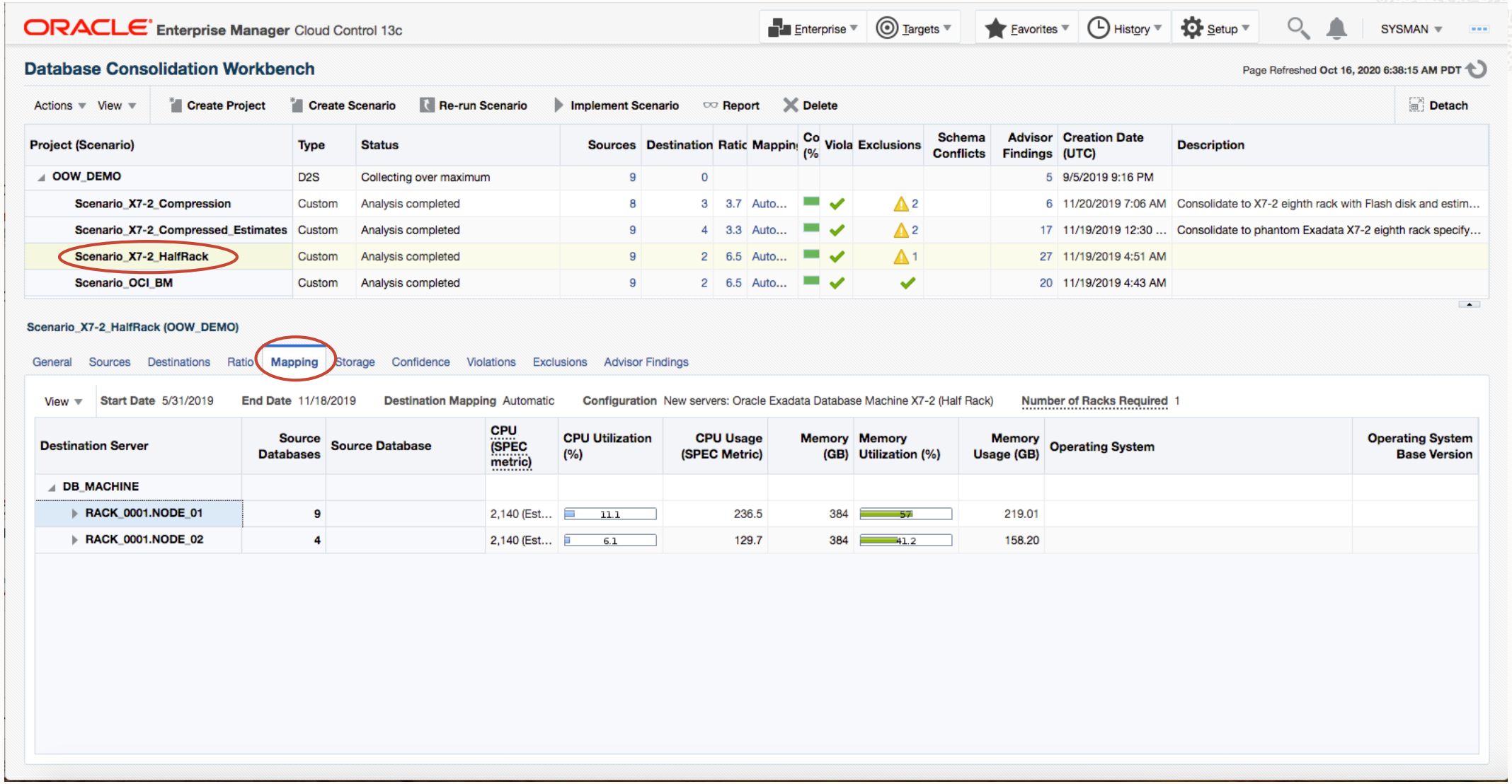

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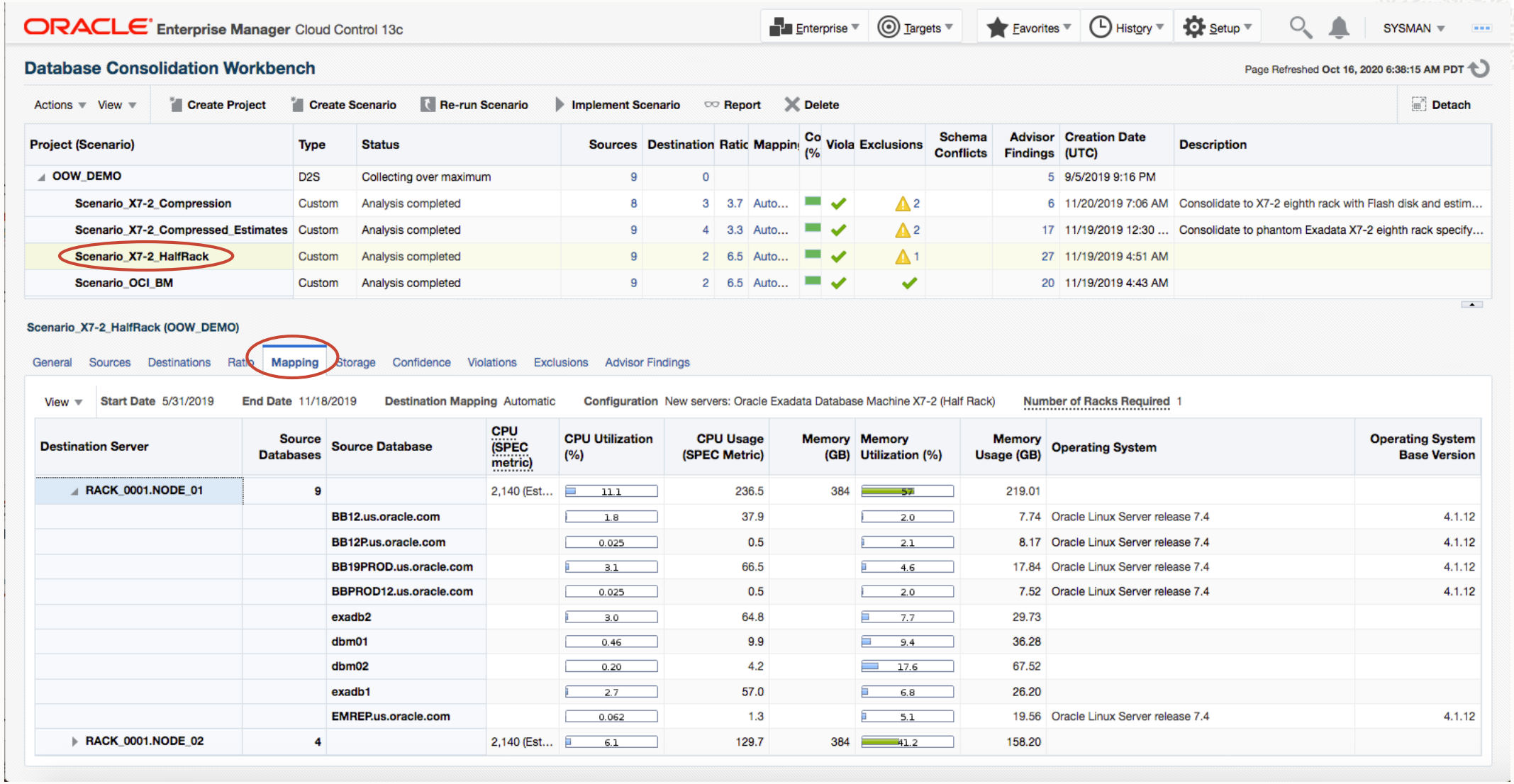

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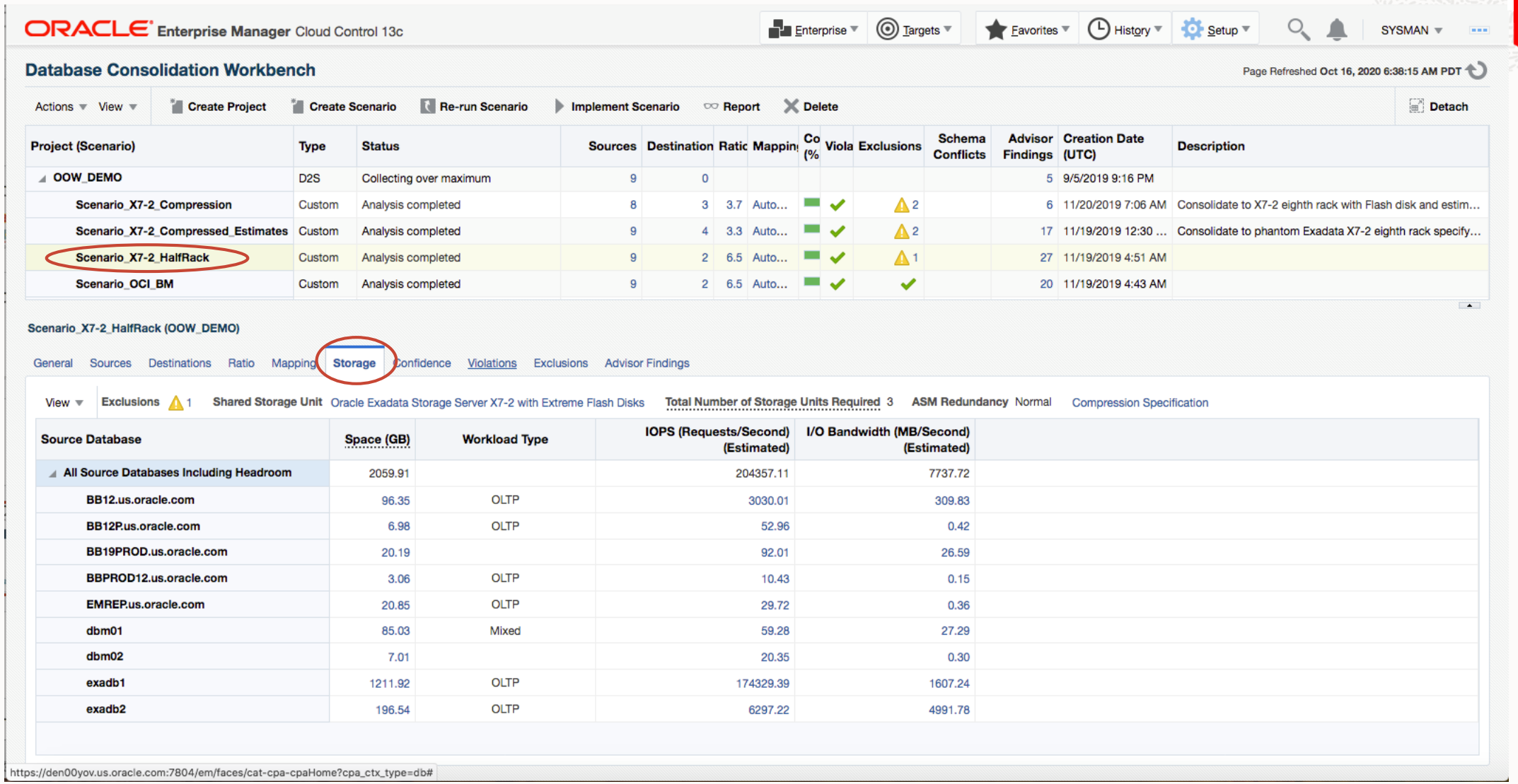
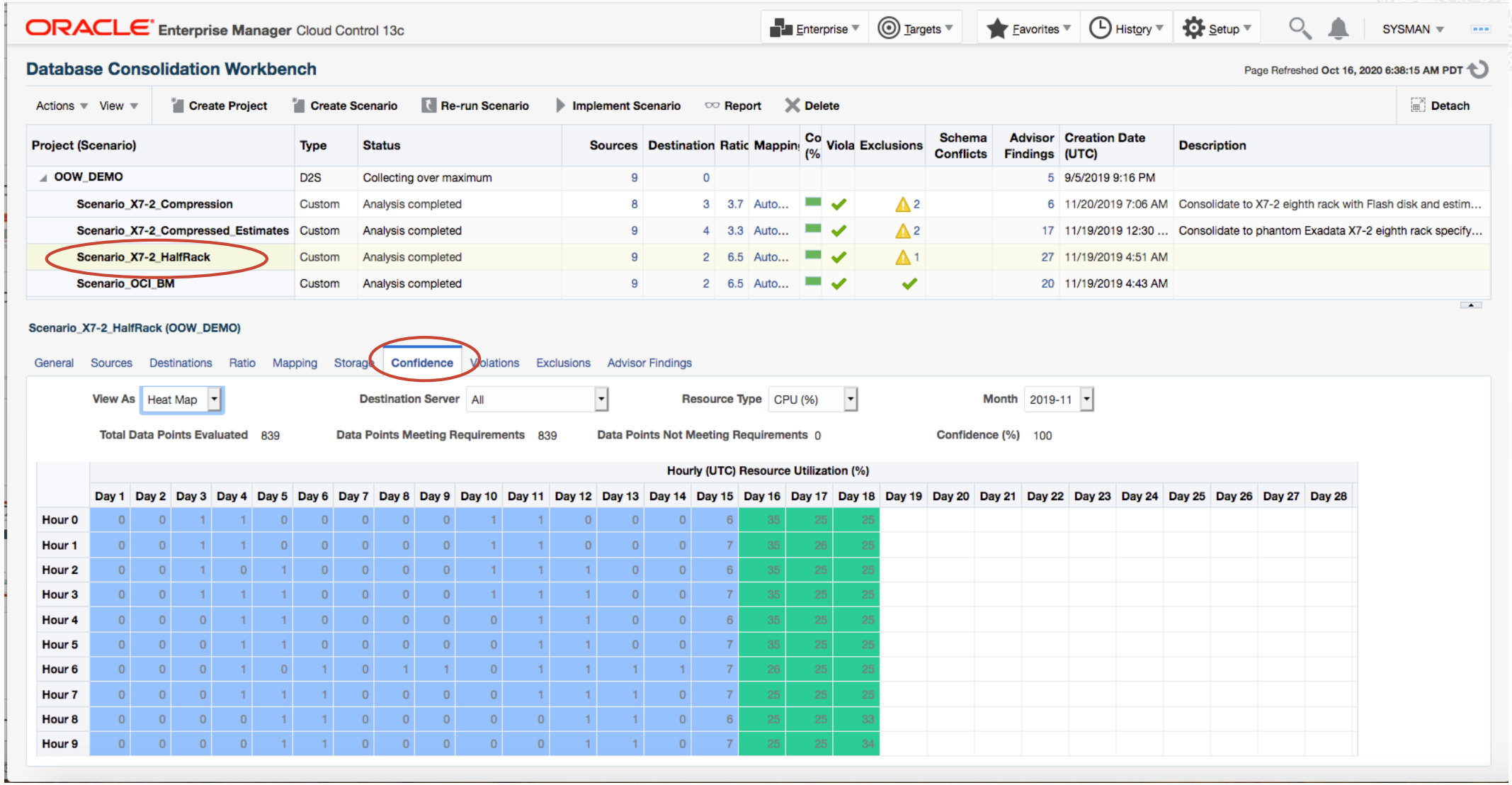
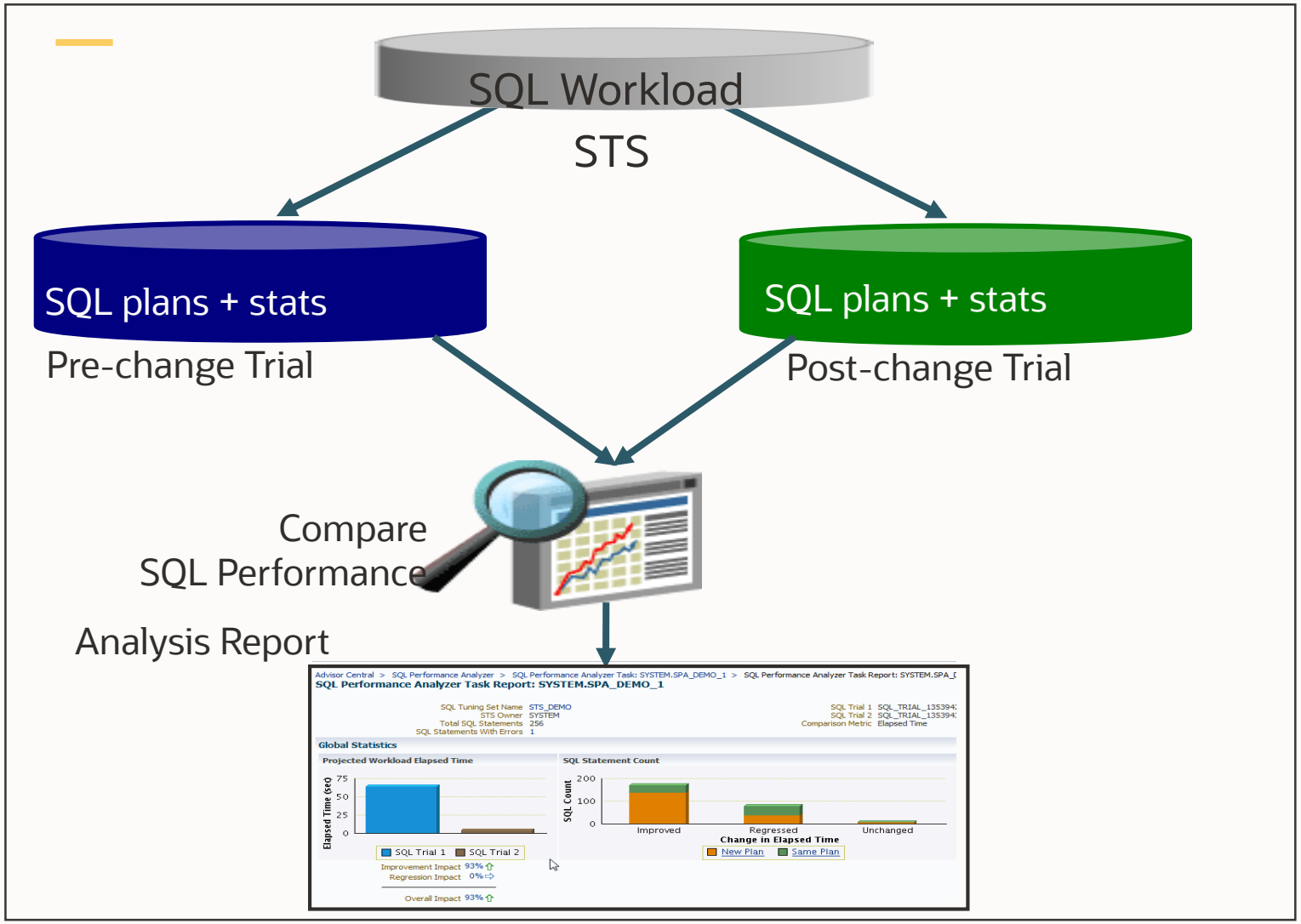


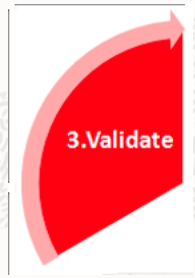
Migration Planner – Screen Shot demo

1. Plan



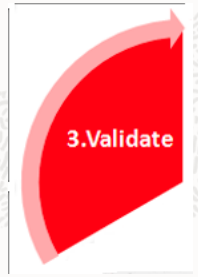
Database Migration Planner
Validating

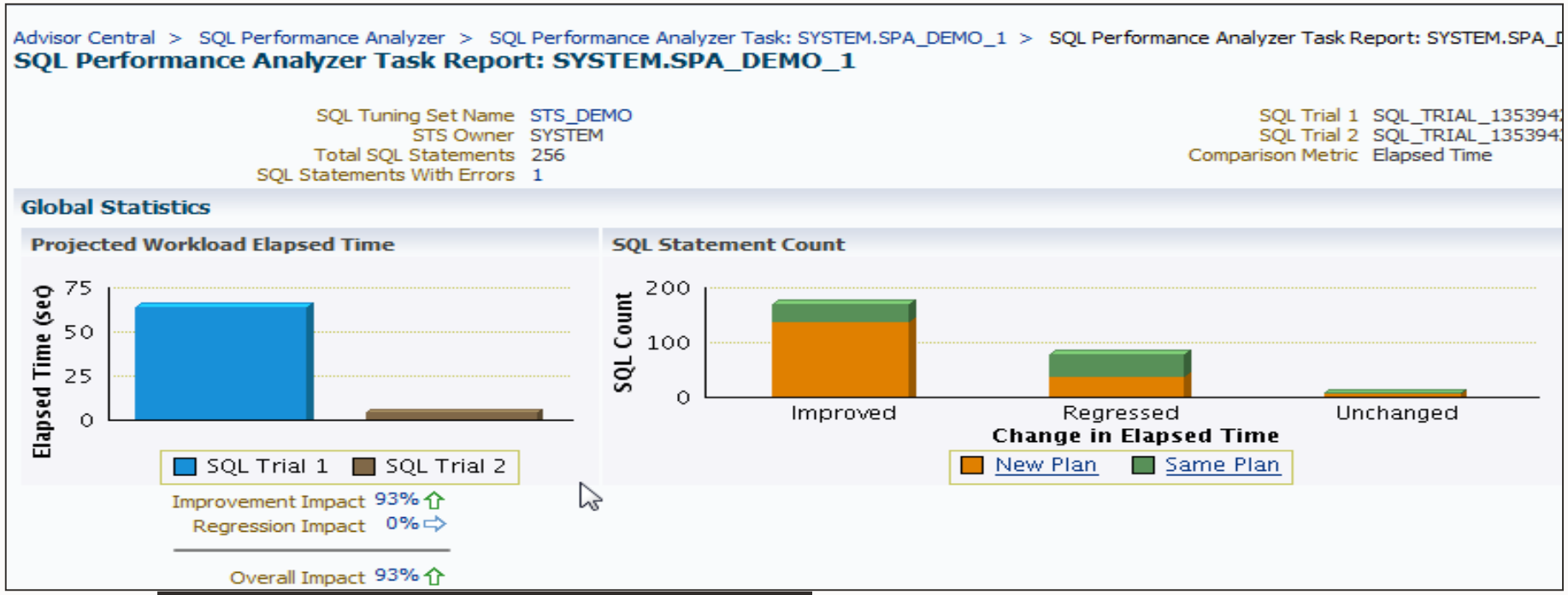


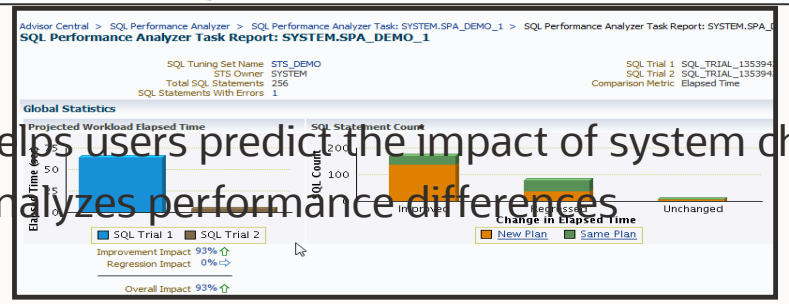


- Helps users predict the impact of system changes on SQL workload response time
- Analyzes performance differences
- Offers fine-grained performance analysis on individual SQL

Database Migration Planner
Validating





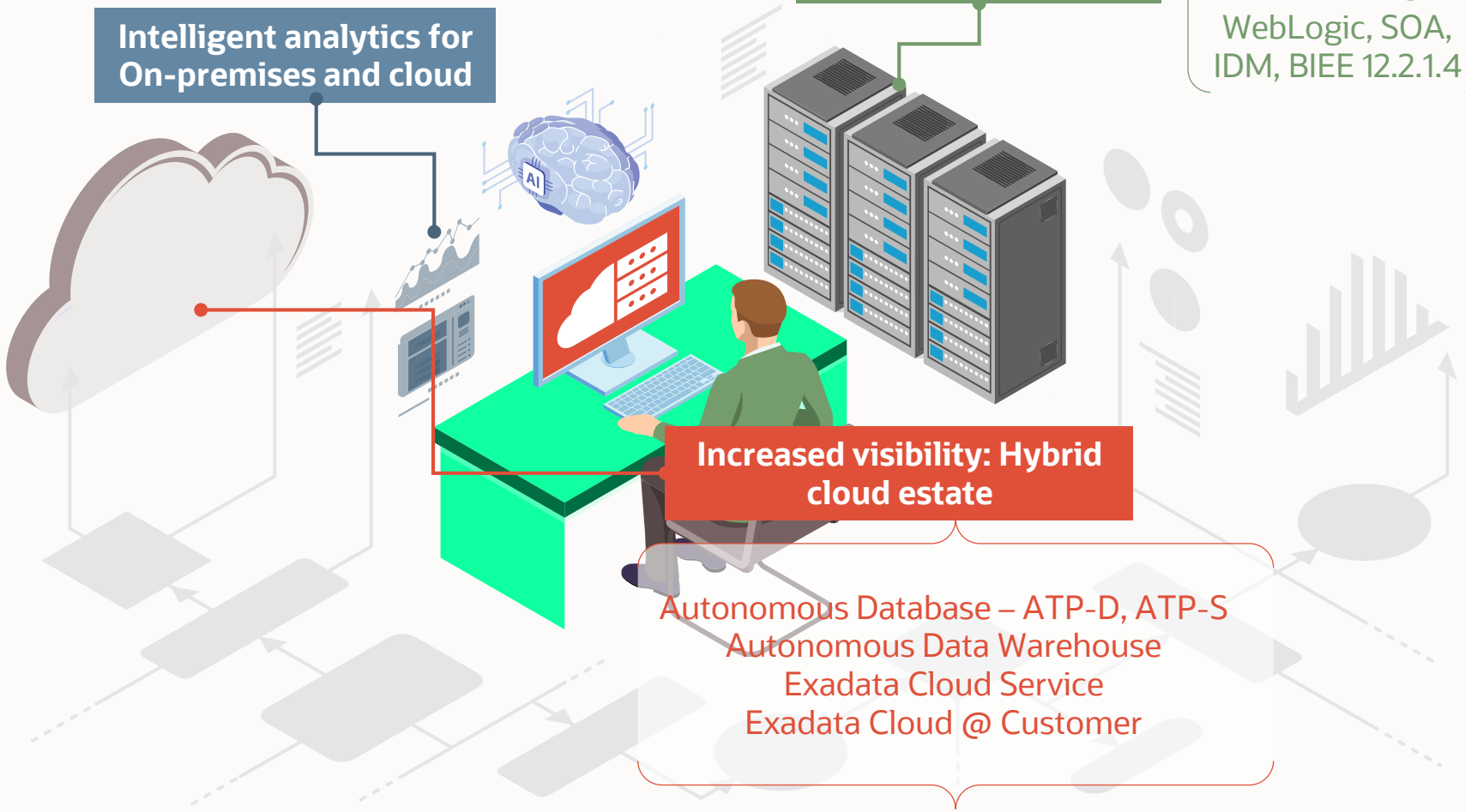


- Helps users predict the impact of system changes on SQL workload response time
- Analyzes performance differences

Agenda

1. Database Migration Planner
2. Manage Databases in Cloud
3. Enterprise Manager Chargeback & Metering

Increased Visibility and Intelligent Analytics



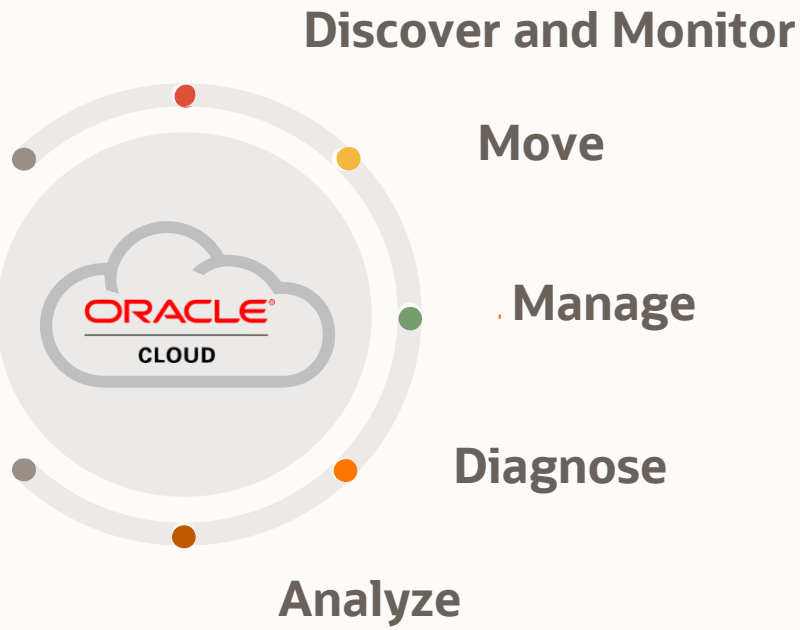
Seamless, Fleet-Wide Management of Autonomous and Cloud Databases

Adopt the cloud with confidence

- **New cloud-aware target types** for Autonomous and cloud DBs including Exadata Cloud
- **Enterprise-wide fleet dashboard** for finding “hot spots”

Optimize customer-managed components

- **Monitor** and **Respond** to performance and configuration related alerts
- **Manage** users, schema, roles, space, etc.
- **Diagnose and improve** application-level SQL logic
- **Lifecycle operations** like service instantiation, termination, scale-up/down etc., orchestrated via cloud-native APIs

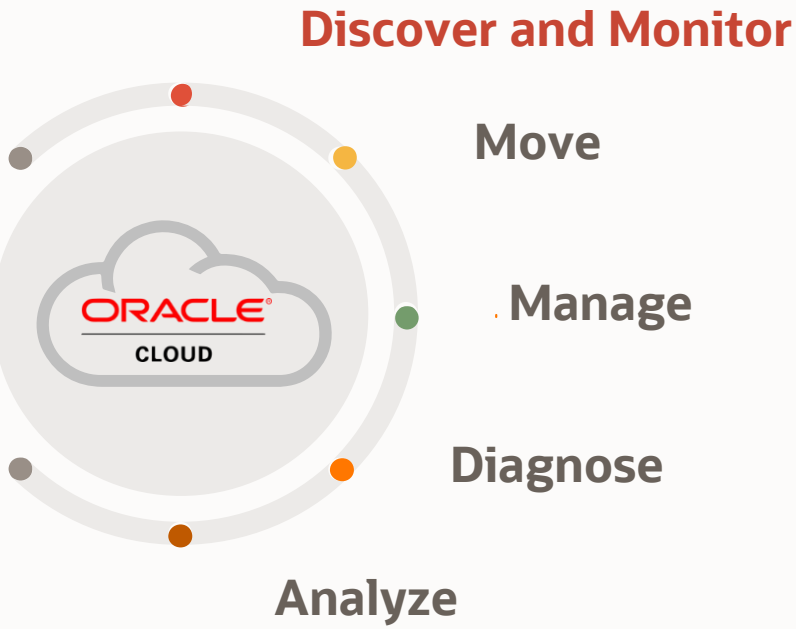


ADB Dedicated and Shared

Management with EM

Discovering Autonomous Databases

- Autonomous databases are treated as non-host targets and discovered manually using declarative process
- The EM agent that monitors the status, health, and performance of the ADB targets would run on a remote host (On-premises or OCI)
- Post discovery, EM agents start monitoring Autonomous DB and display a comprehensive set of metrics



- EM 13.3 PG supports ATP-D
- EM 13.4 RU4 adds support for ADB-S, ADW-D, ADB-D Cloud at Customer

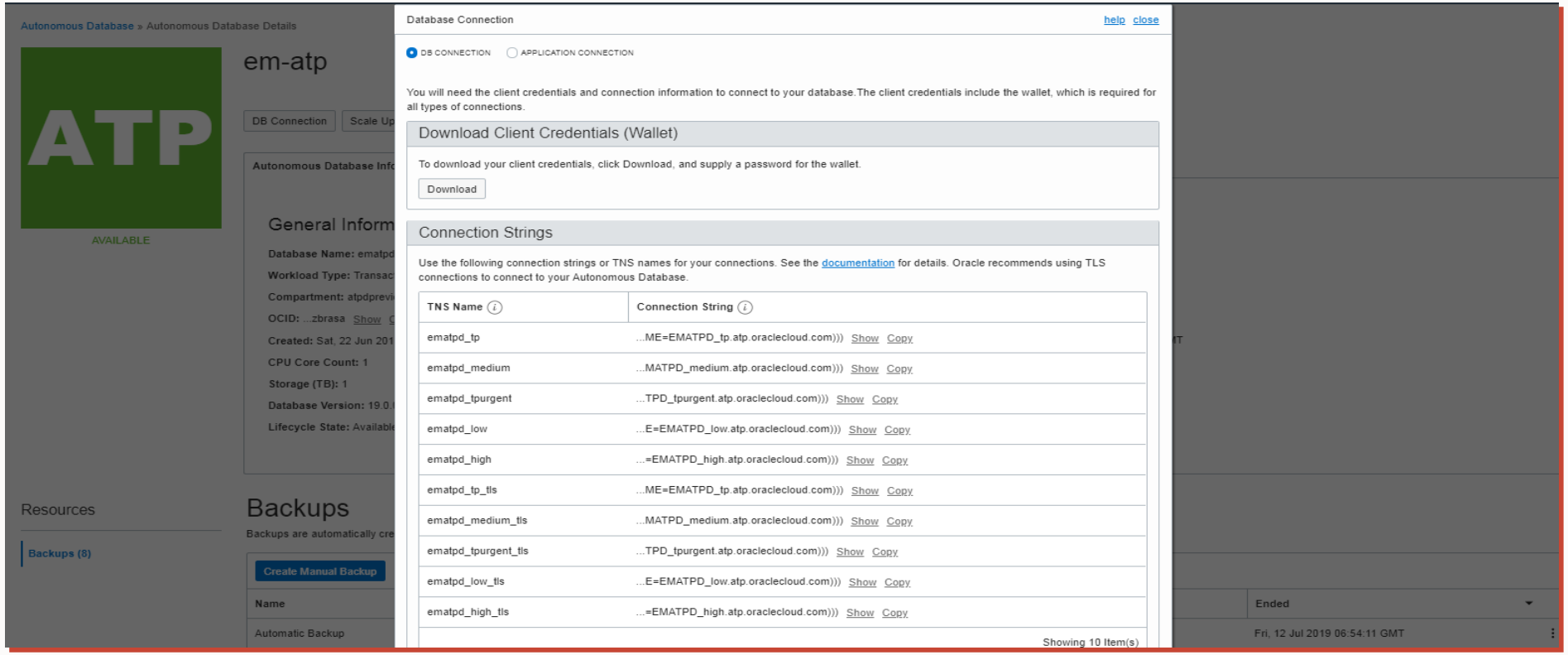
Discover Autonomous Database targets

User Experience

- ADB admin creates the database from OCI console and downloads the credentials wallet
- Installs EM on OCI Marketplace or configure On-premises EM to talk to OCI
- Logs into EM user and does a manual discovery via UI or emcli
- User inputs ADB wallet file, ADB monitoring user credential (unlocks it if needed), ADB admin credentials for active management.
- All connections would be via TCP over VPN or Fast connect.
- ADB databases are discovered and ready to be monitored via EM

Discover Autonomous Database targets

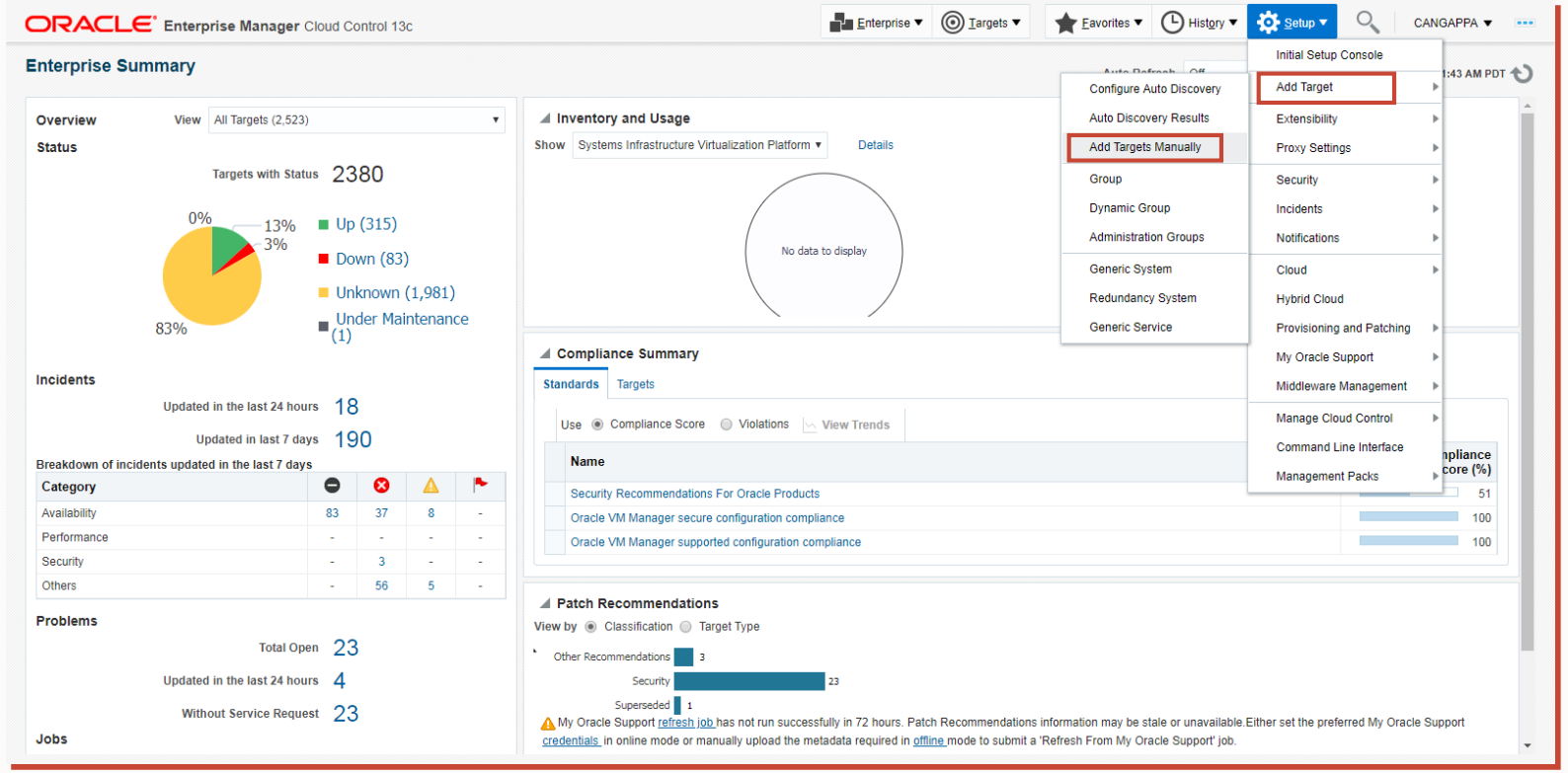
User Experience



ADB Admin: Downloads the wallet from OCI console, unlocks and reset the password for adbsnmp user

Discover Autonomous Database targets

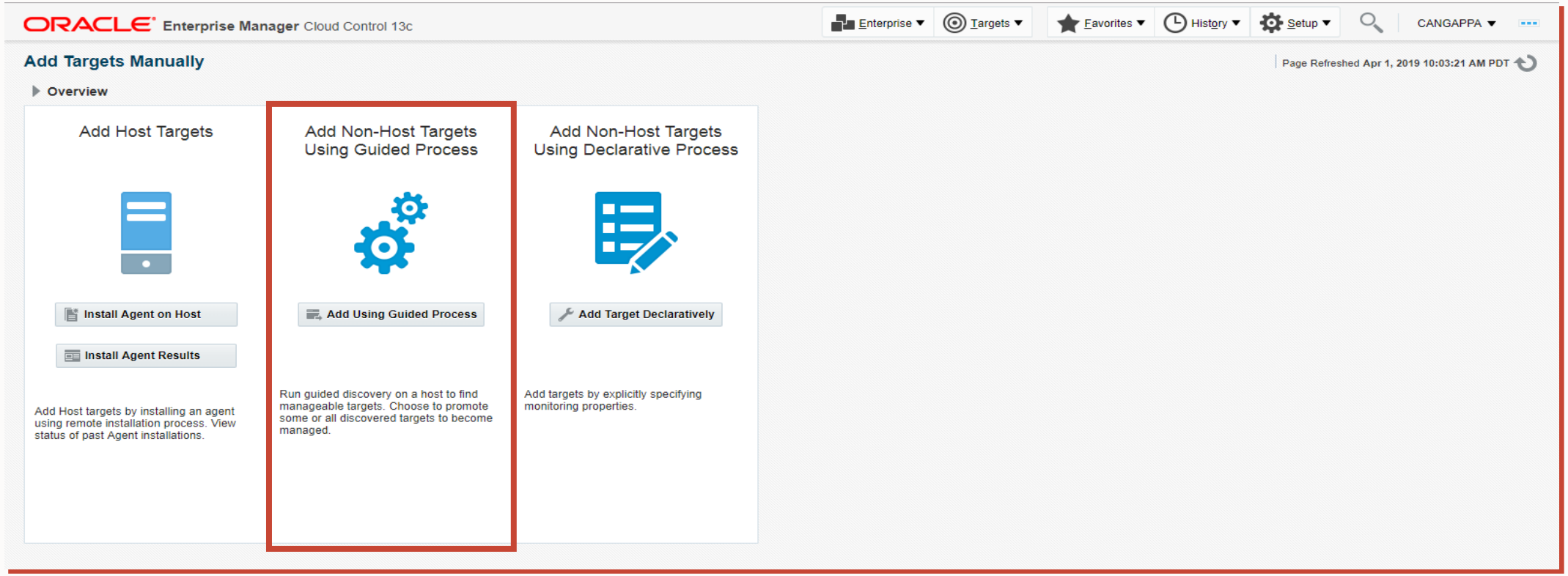
User Experience



ADB Admin: Logs into EM, does a manual discovery via UI or emcli

Discover Autonomous Database targets

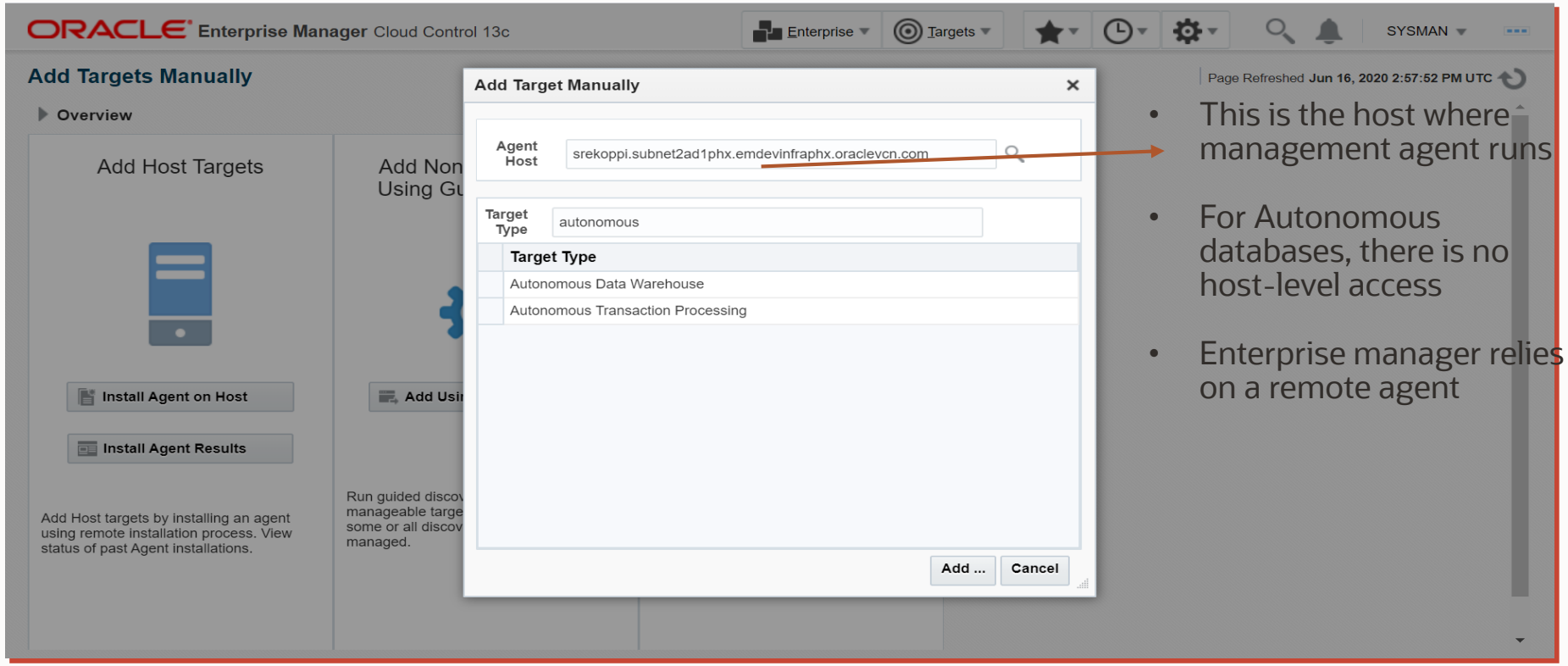
User Experience



ADB Admin: Adds ATP-D as a non host target

Discover Autonomous Database targets

User Experience



ADB Admin: Adds ATP as a non host target

Discover Autonomous Database targets

REST and EMCLI

https://<em_url>:<em_port>/em/websvcs/restful/emws/oracle.sysman.db/v0/discovery/add_cloud_db_target

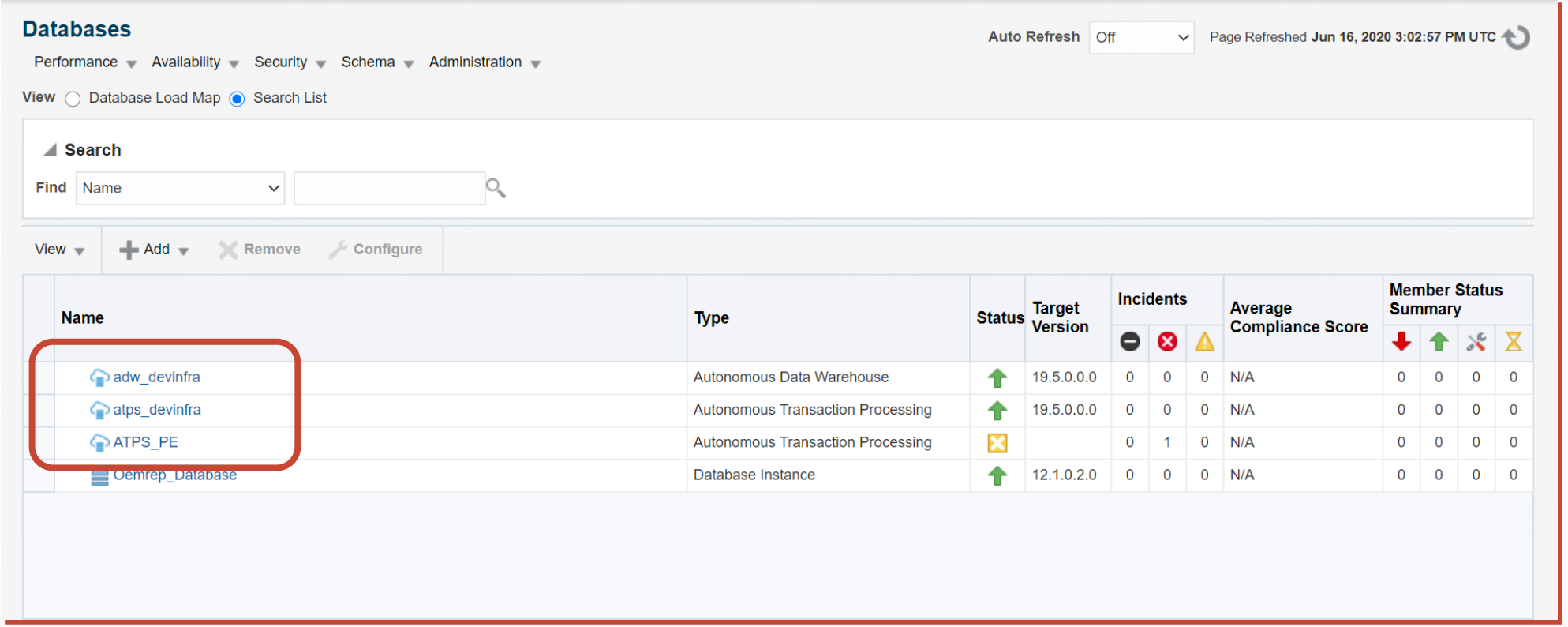
```
{
   "target_name": "adw_rest",
   "target_type":"oracle_cloud_atp",
   "agent_host": “adbhost",
   "credentials":"UserName:adbsnmp;password:<password>",

"zip_file_location":"/net/den01nrx/scratch/tekrishn/atpd/htxadw/tenant1.tenant.zip",
   "service_name":"adwp_low",
   "wallet_password":“<password>"
     "is_dedicated":"true"
}
```

```
./emcli login -username=adbuser –
password=<password>
emcli add_cloud_db_target -
credentials="UserName:adbsnmp;password:<password>" -
agent_host=“adbhost" –
target_name="demo_emcli" -
target_type="oracle_cloud_atp" -
zip_file_location="/net/den01nrx/scratch/tekrishn/atpd/htxadw/tenant1.tenant.zip" –
service_name="adwp_low" -
wallet_password="Welcome_123" –
is_dedicated="true"
```

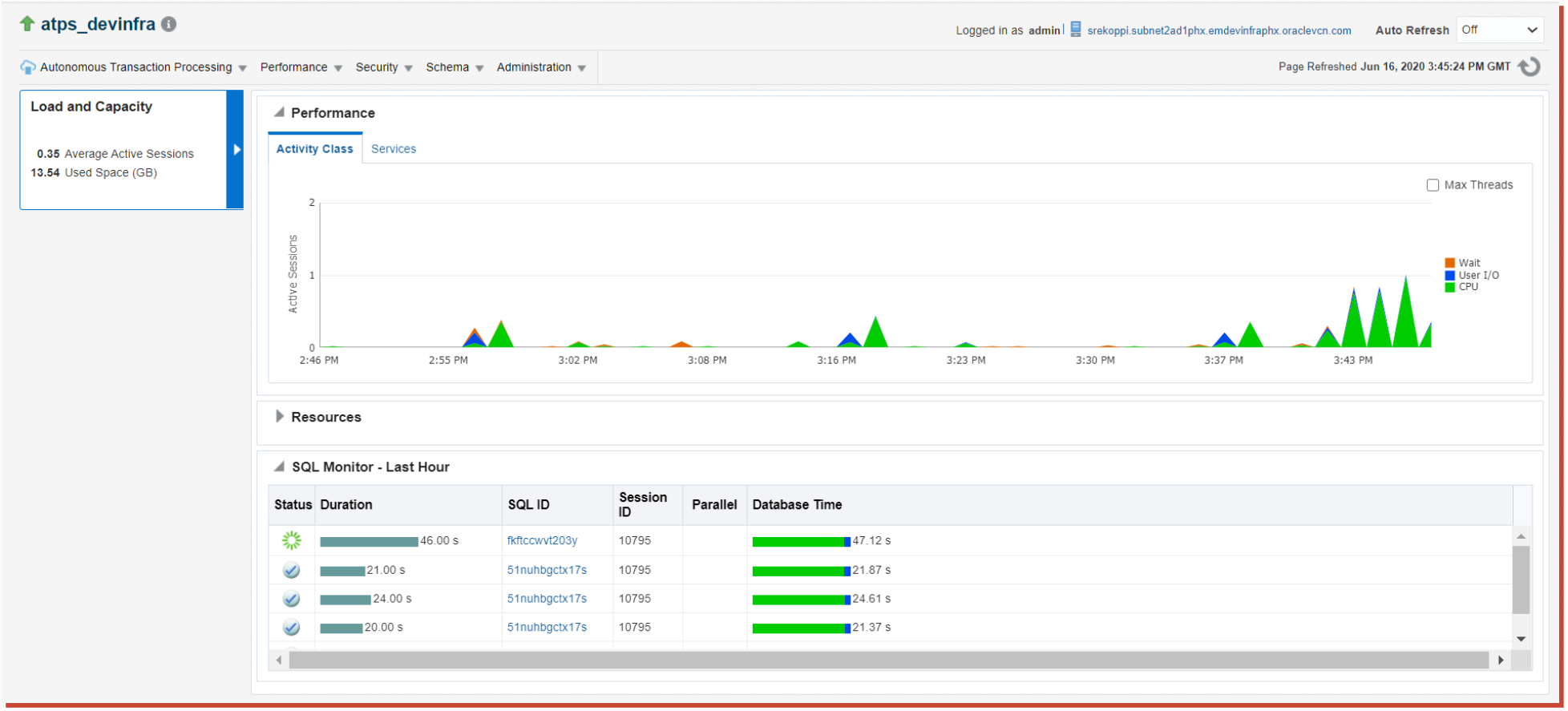
Discover Autonomous Database targets

User Experience



ADB databases are discovered and ready to be monitored via EM

ADB Home Page in EM

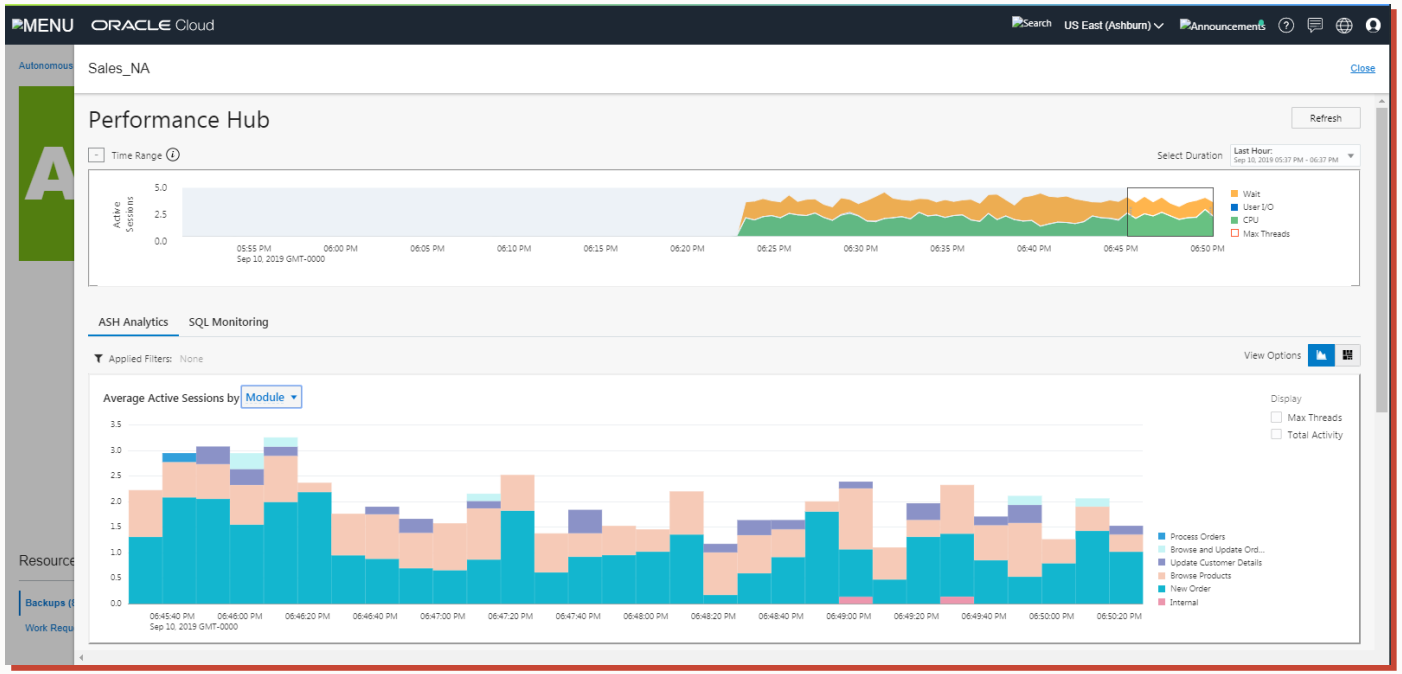


ADB Dedicated and Shared

Management In OCI Console

Performance Hub

- Integrated system-wide and session-specific views of database activity
  - ASH Analytics
  - Real-Time SQL Monitoring
  - SQL Details
  - Workload Profile
  - Blocking Sessions
  - Guided problem resolution
  - Analyze transient performance problems with the application that are short-lived



Agenda

1. Database Migration Planner
2. Manage Databases in Cloud
3. Enterprise Manager Chargeback & Metering

Why Use Metering and Chargeback?

- Increasing adoption of consolidation platforms such as Exadata
  Need to meter the resources used by each application
  - Used to measure the business value of I.T. investments
- Cloud computing / self-service
  - Need to meter resources consumed by self-service cloud users
  - Chargeback allows cloud users to take control of their I.T. Costs

Enterprise Manager Chargeback

- An out-of-the-box, integrated solution for Metering and Chargeback of Enterprise Manager targets
- Based on target metric and configuration data collected by Enterprise Manager
- Provides I.T. providers and consumers with reports showing usage and charge information
- Open integration with external applications such as billing engines

Chargeback Setup

Create Charge Plans

- Define Charge Items and Set Rates

Define Cost Center Hierarchy

- Used for charge assignment and reporting rollup/drilldown

Add Targets to Chargeback

- Turns on data gathering for selected targets

Assign Charge Plans/Cost Centers to Targets*

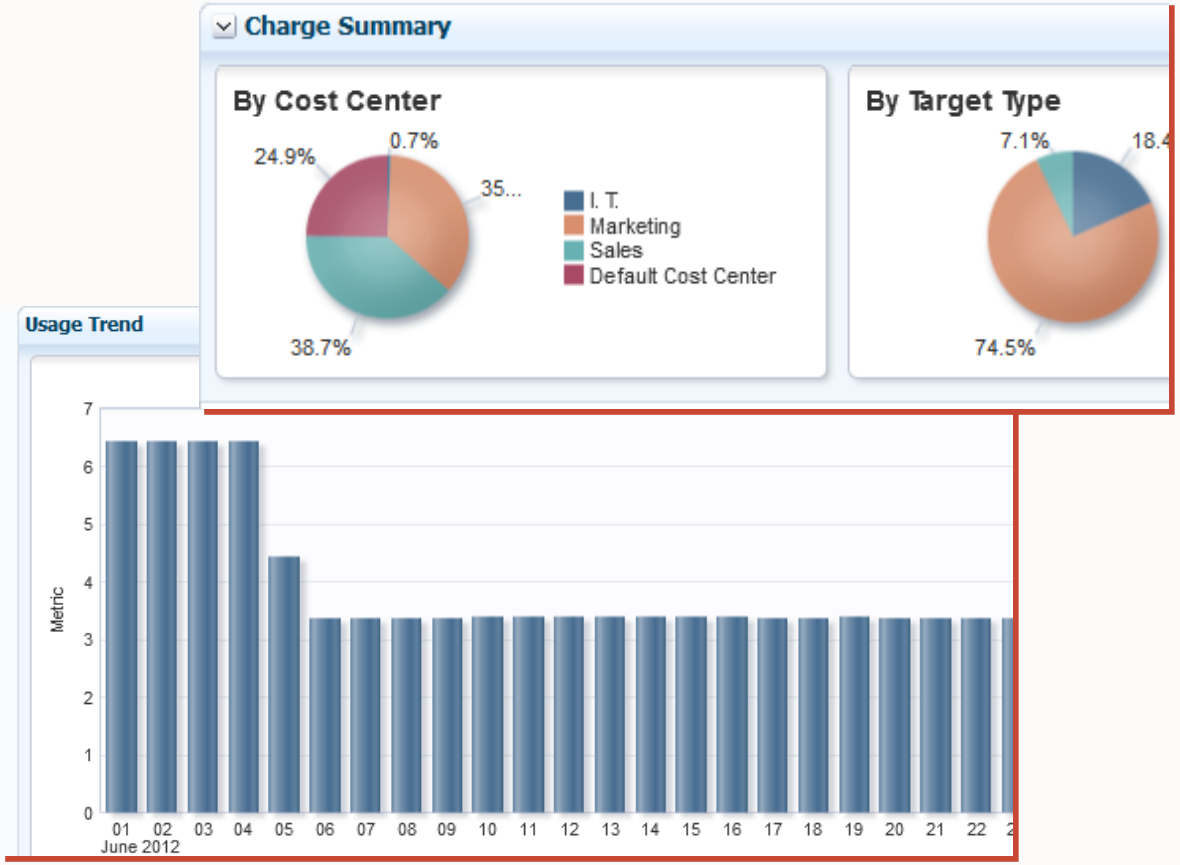
- Determines how charges are calculated and who they should be assigned to
- * Automatic assignments for Self-Service Targets

Target Charge Plan/Cost Center Assignment

- Charge Plan and Cost Center assignment determines:
  - Plan used in charge calculations
  - Cost Center the charge is allocated to
- Assignment to composite targets propagates to members
- Automatic assignment for self-service Oracle VM Zone and PaaS Infrastructure Zone targets
  - Charge Plan inherited from Zone
  - Cost Center set as Self-Service user

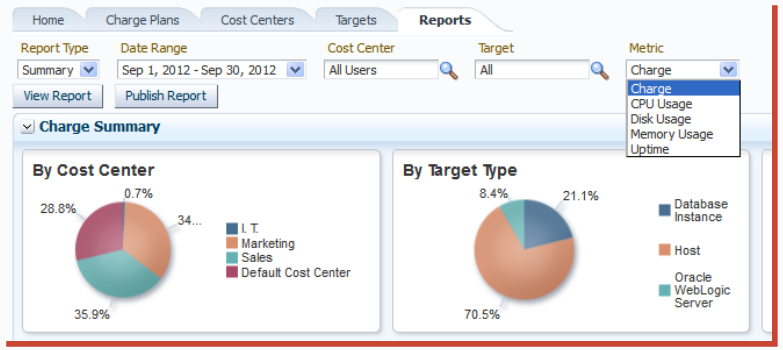
Chargeback Summary and Trending Reports

- Summary Reports
  - Show charge and resource utilization data summarized for specified period
  - Drill-down by Cost Center, Target Type, Resource
- Trending Reports
  - Show charge and utilization trend over specified period
  - Useful for I.T. resource planning

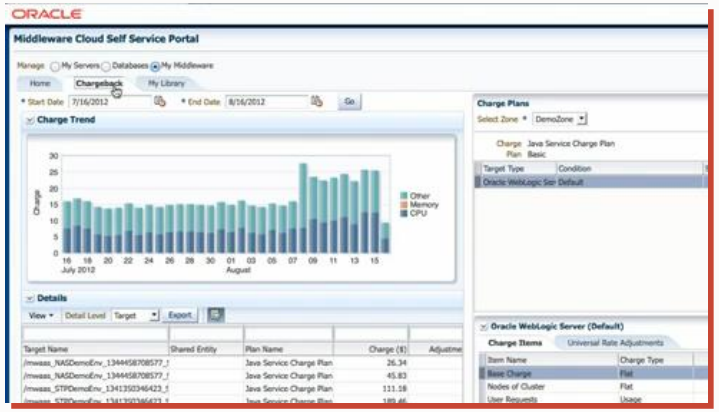


Chargeback Reporting Interfaces

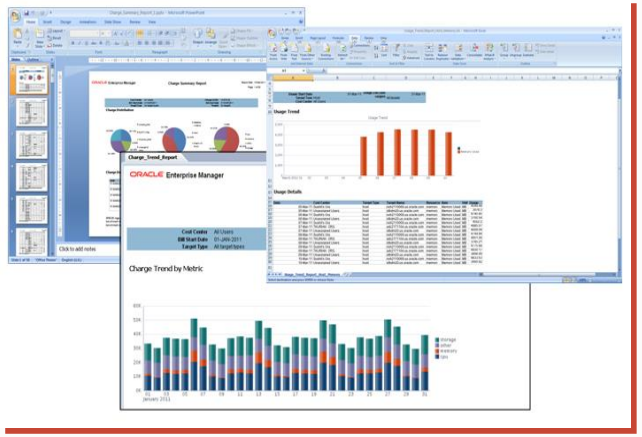
Chargeback Administrator



Self-Service Portal User



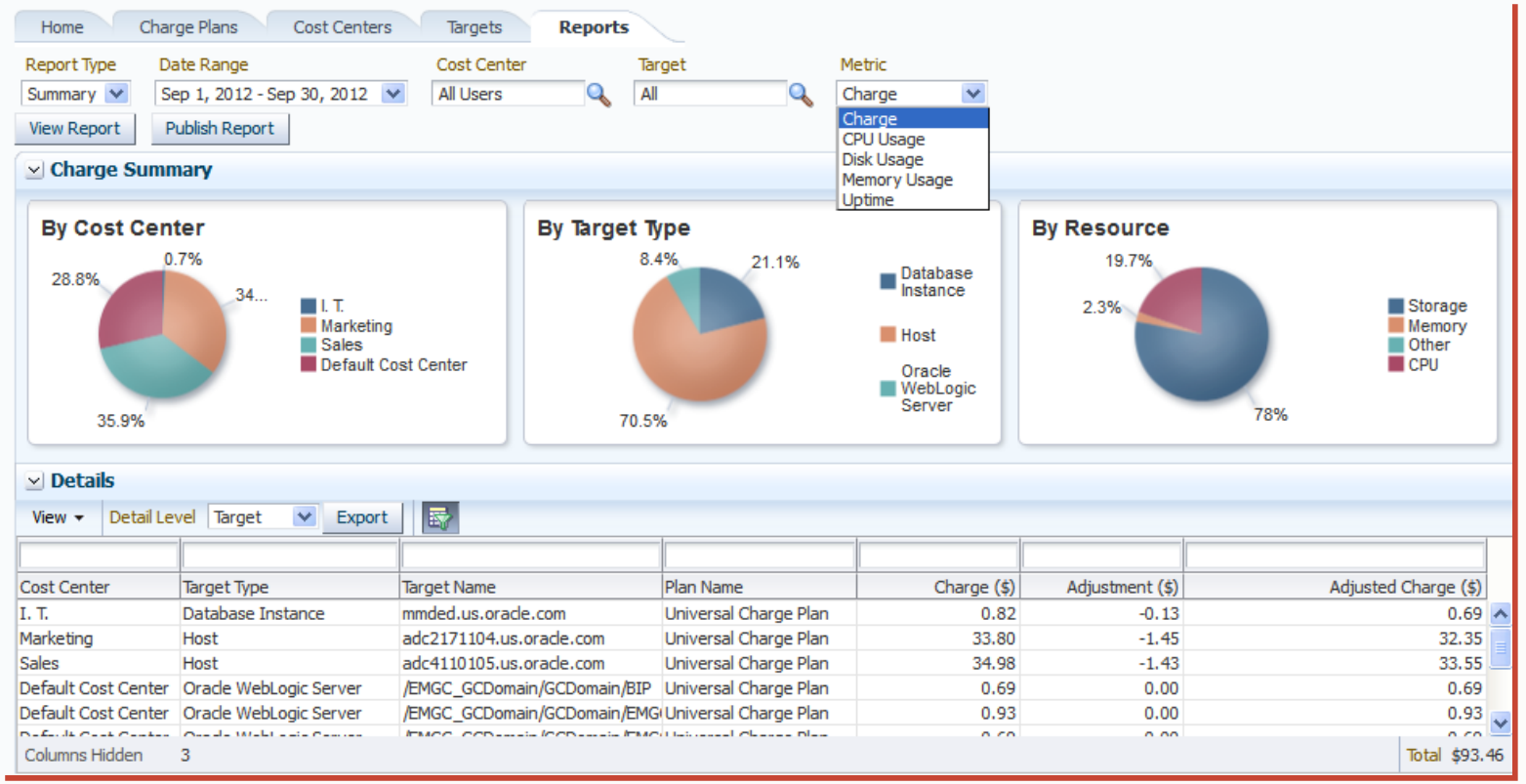
Line of Business User



- Charge reports are available from a variety of different interfaces
  - Chargeback Application
  - Self-Service Portal
  - BI Publisher

Chargeback Administrator Reports

- Summary and Trending reports for Usage and Charge
- Drilldowns
- Detail view with selectable detail levels
- Export data to Excel



Integrated Cloud

Applications & Platform Services

Thank you