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# Managing Oracle Database 12*c* with Oracle Enterprise Manager 12*c*

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# Oracle Database 12*c* Manageability

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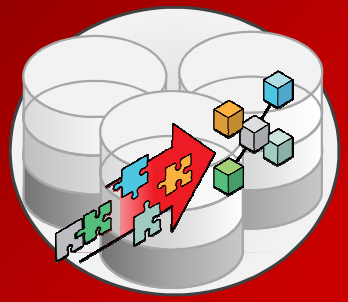
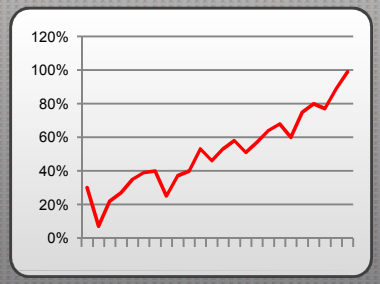
# ORACLE DATABASE MANAGEMENT

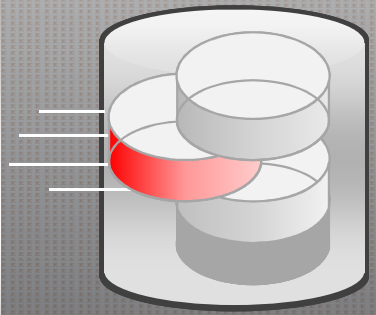
ORACLE ENTERPRISE MANAGER 12c



**Embedded Management**




**Proactive Performance Management**



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# Oracle Enterprise Manager Database Express 12*c*

## Integrated, GUI Management Tool for Database Administration

### Integrated Install

- Pre-configured & installed with the database
- Runs inside database
- No extra MW components
- Leverages XDB server inside db for web services
- Supports SI, RAC, SE, EE

### Small Footprint

- Disk: 20 MB
- Runtime: zero when idle
- Minimal CPU, memory overhead
- 100% of UI rendering performed in browser
- DB Server only runs SQL

### Comprehensive Administration

- Basic admin support for:
  - Storage management
  - Security management
  - Configuration management
- Advanced performance diagnostics and tuning

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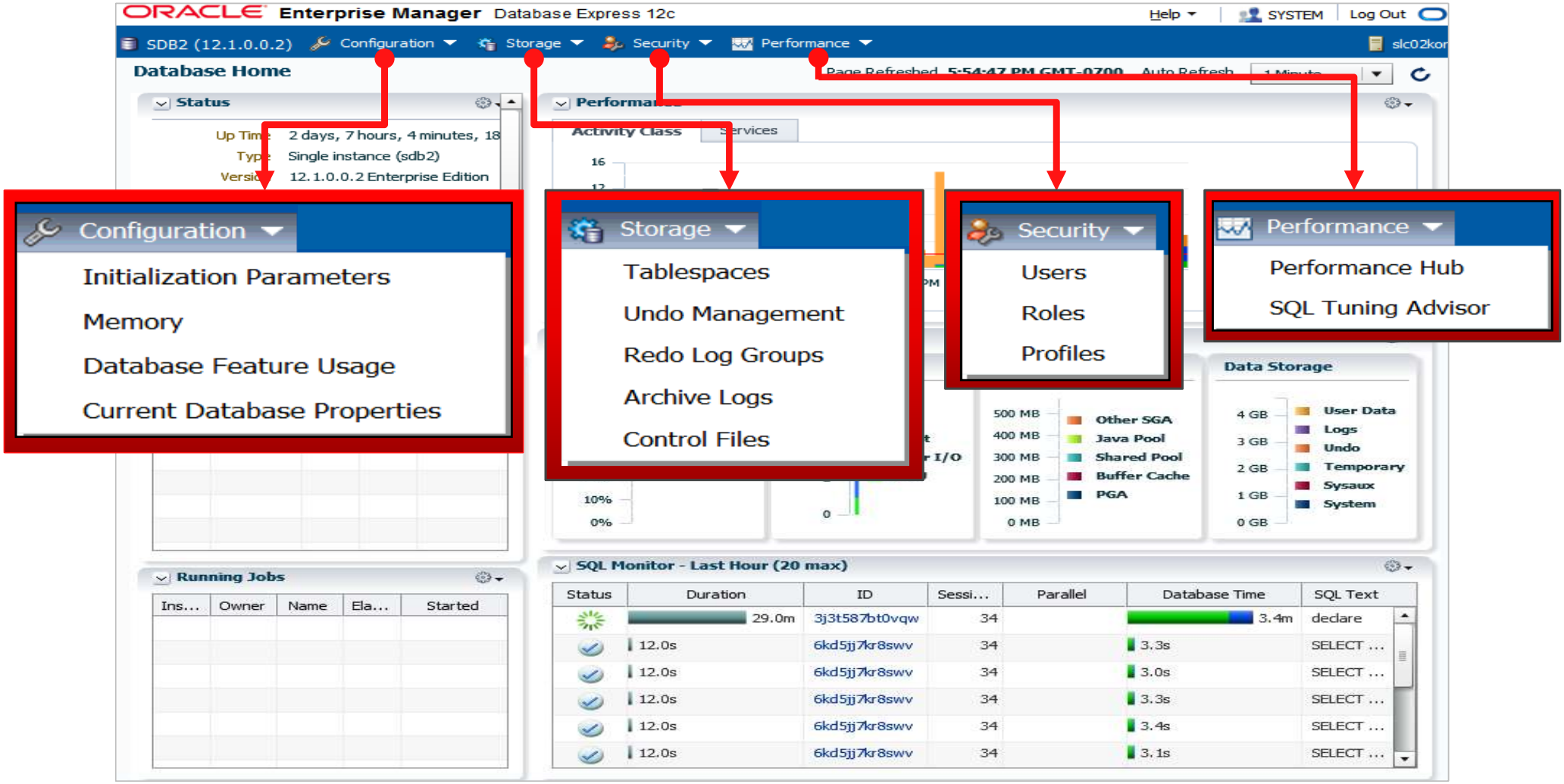
# Enterprise Manager Database Express Menus

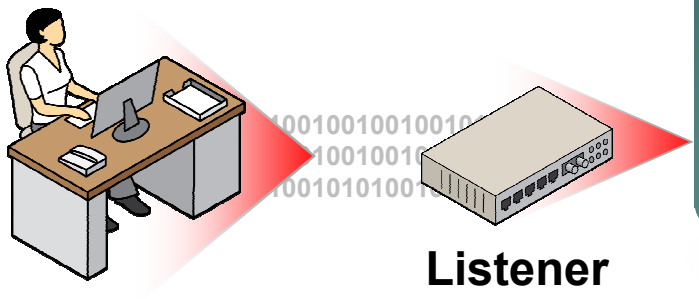


# Architecture

## Request Handling in EM Express

### EM Express Servlet

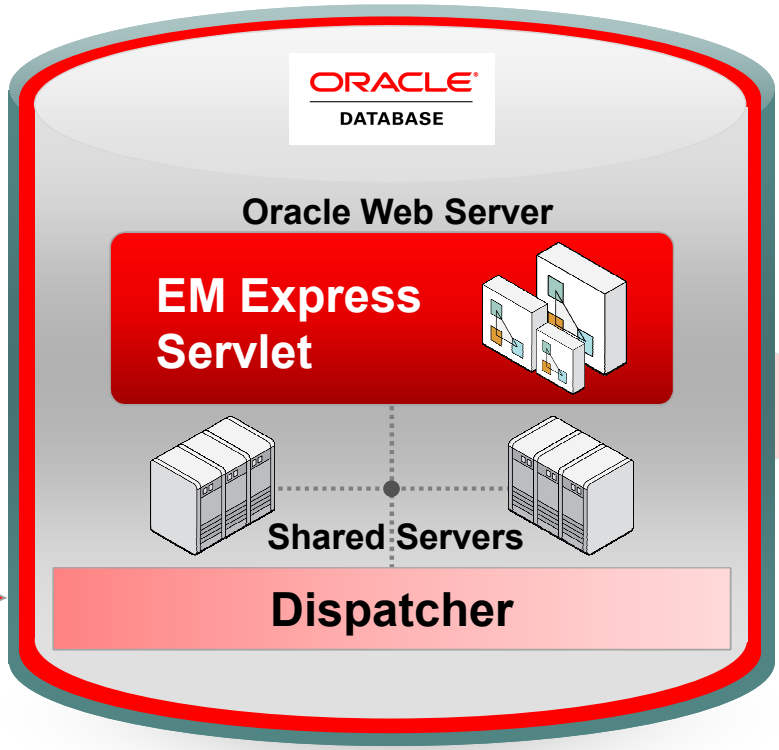
- Authenticates and validates
- Serves the request by executing queries inside DB
- Writes the output to response stream



Request



Listener



Browser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# ORACLE DATABASE MANAGEMENT

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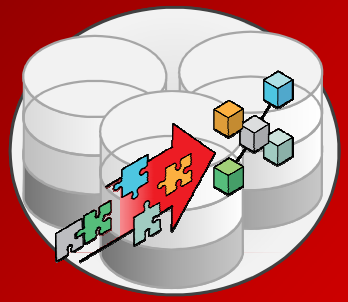

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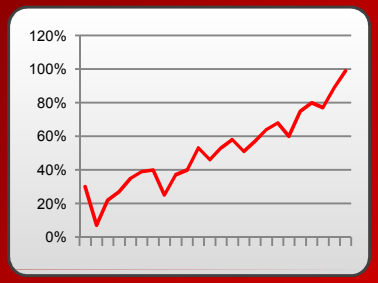
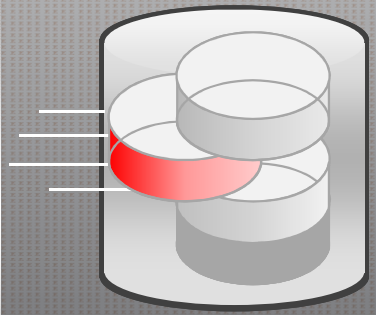



**Proactive Performance Management**



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# Automatic Performance Diagnostics

## The ADDM Family:
## A Continuous Evolution in Database Performance Management

| ADDM | Compare Period ADDM | Real-Time ADDM | Enhanced Real-Time ADDM |
|---|---|---|---|
| • Diagnose persistent performance issues<br>• Uses AWR snapshots<br>• Automatically runs every hour | • In-depth performance comparison across two periods<br>• Uses AWR data<br>• Manually triggered | • Hung or extremely slow databases<br>• Uses a normal and diagnostic mode connection<br>• Manually triggered | • Proactively detect & diagnose transient performance spikes<br>• Uses in-memory data<br>• Automatically runs every 3 seconds |


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# Enhanced Real-Time ADDM

## Database Self-Monitors for Serious Performance Issues

In DB12c

- **Proactive problem detection & analysis**
  - Very light weight check (in memory, latchless) runs every 3 seconds
  - When detects bad performance trends, triggers further analysis
  - Analyzes High CPU, I/O spikes, memory, interconnect, hangs, deadlocks
  - Proactively identifies a problem before it threatens application performance
- **For current spikes, Real-Time ADDM can be manually triggered**
  - For short duration (5-min) performance spikes, i.e. transient, high impact problems
  - Provides actionable advice for critical issues
  - Collects rich data set for analysis
- **Stores reports and data in AWR for historical analysis**


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# Triggers for Further Analysis

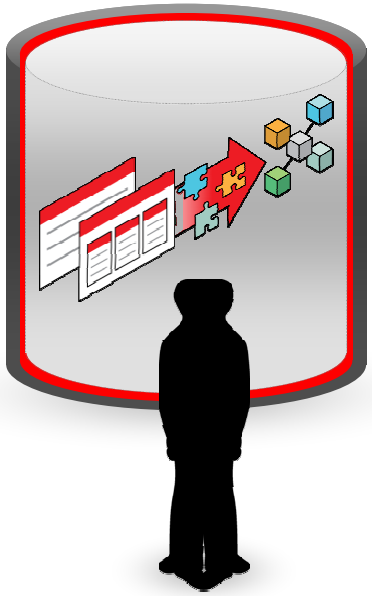
| # | Rule | Condition |
|---|---|---|
| 1 | High Load | Average active sessions greater than 3 times the number of CPU cores |
| 2 | I/O bound | Impact on active sessions based on single block read performance |
| 3 | CPU bound | Active sessions greater than 10% of total load and CPU utilization great than 50% |
| 4 | Over-allocated memory | Allocation over 95% of physical memory |
| 5 | Interconnect bound | Single block interconnect transfer time based |
| 6 | Session Limit | Session limit close to 100% |
| 7 | Process Limit | Process limit close to 100% |
| 8 | Hung Session | Significant number of hung sessions. If this number is greater than 10% of total sessions |
| 9 | Deadlock Detected | Any deadlock detected by hang analyzer |

# Monitoring Complex Database Operations

## What's Really Happening inside the Database

### Challenge

- Real-Time SQL & PL/SQL Monitoring only monitors a single execution
- How does a DBA monitor a composite operation such as a batch job?



### Solution

- Real-Time Database Operations Monitoring
- **Benefit:** Allows DBAs to analyze and tune complex composite DB operations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# Real-Time Database Operations Monitoring

In DB12c

## Know What's Happening and Resolve Issues Faster

- **Database monitoring of application jobs**
  - Grouping of SQLs, sessions for the application jobs
  - Key scenarios: ETL operations, Quarter End Close jobs
- **Real-time monitoring driven by application specified tagging**
  - Oracle Data Pump jobs automatically monitored
  - Tagging ability in PL/SQL, OCI, JDBC
- **Visibility of top SQL statements, system and session performance metrics**
- **Avoids the overhead of SQL*Trace**


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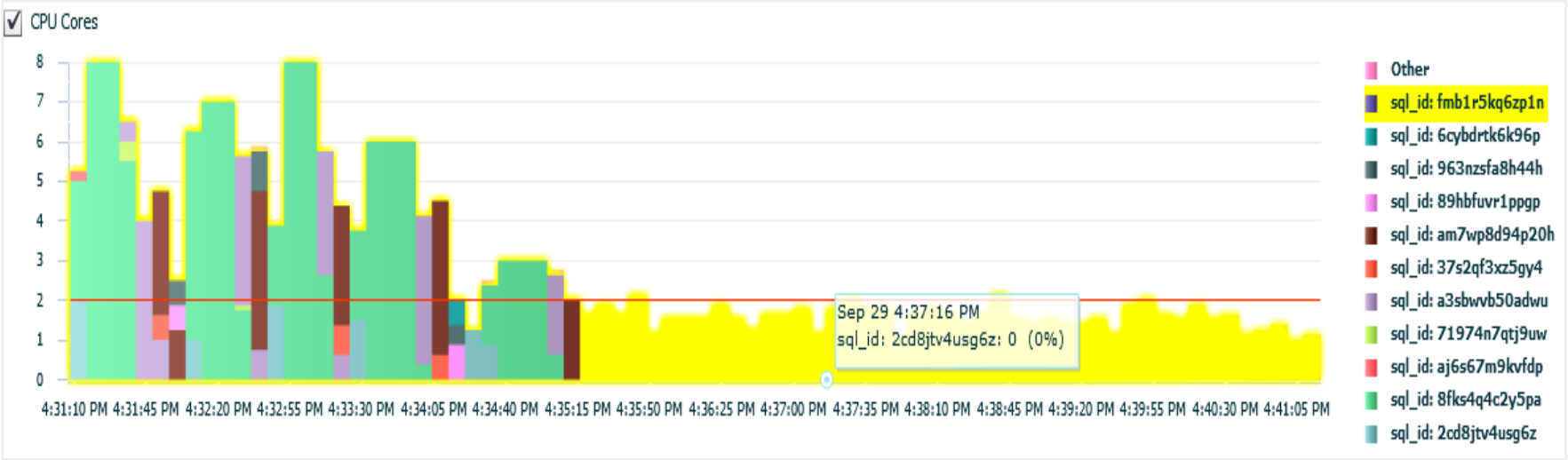
# Monitor Composite Database Operations




- **Oracle Database 11*g*: Support for simple DB operations**
  - PL/SQL procedures/functions
- **Oracle Database 12*c*: NEW support for composite operations**
  - Session(s) activity between 2 points of time defined by application code or DBA
  - For example; SQL*Plus script, batch job, or ETL processing
  - At most one DBOP per DB session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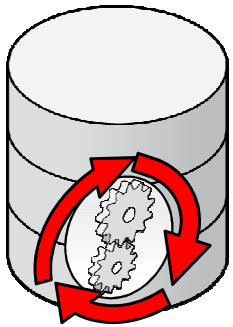
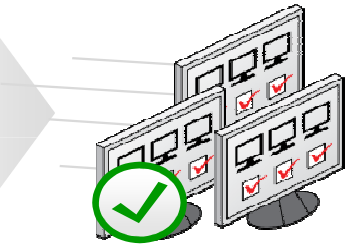
# Automatic Report Persistence to Disk

NEW
In DB12c

- Automatically stores Real-Time SQL Monitoring and Real-Time ADDM reports in AWR
  - Every minute, reports of top 5 (elapsed time) SQL or DB-Ops from Real-Time SQL Monitoring
  - Automatic triggered reports from Real-Time ADDM drill-down analysis
- View persisted historical reports in EM Cloud Control or EM DB Express
- Reports are compressed to save space
- Reports are purged based on AWR retention policy



Automatic Analysis



Persistent Reports:
- Top SQL/DB-ops
- Real-time ADDM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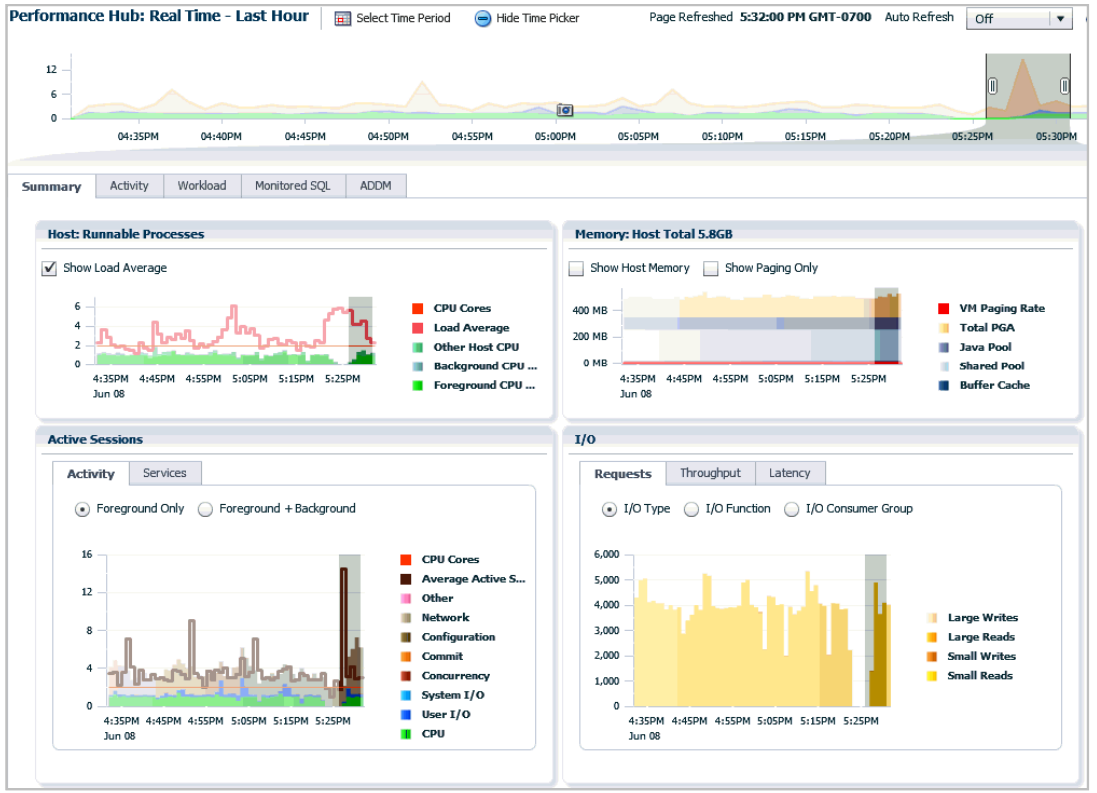
# Database Performance Hub

NEW

## Unified Performance Monitoring

- Single view of DB performance
  - ADDM, SQL Tuning, Real-Time SQL Monitoring, ASH Analytics
- Switch between ASH analytics, workload view, ADDM findings and SQL monitoring seamlessly
- Supports both real-time & historical mode
- Historical view of SQL Monitoring & ADDM reports
- Dedicated tab for RAC

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# ORACLE DATABASE MANAGEMENT

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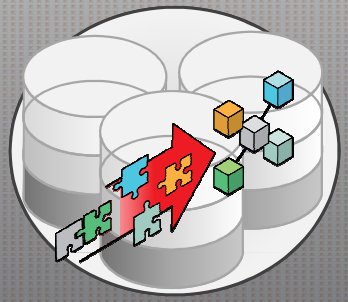

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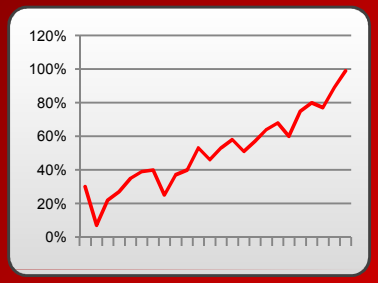


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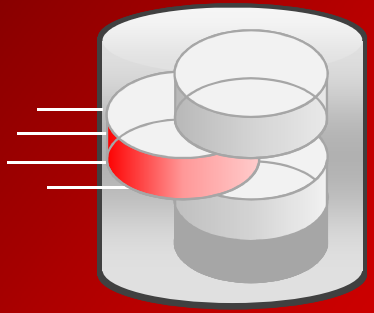

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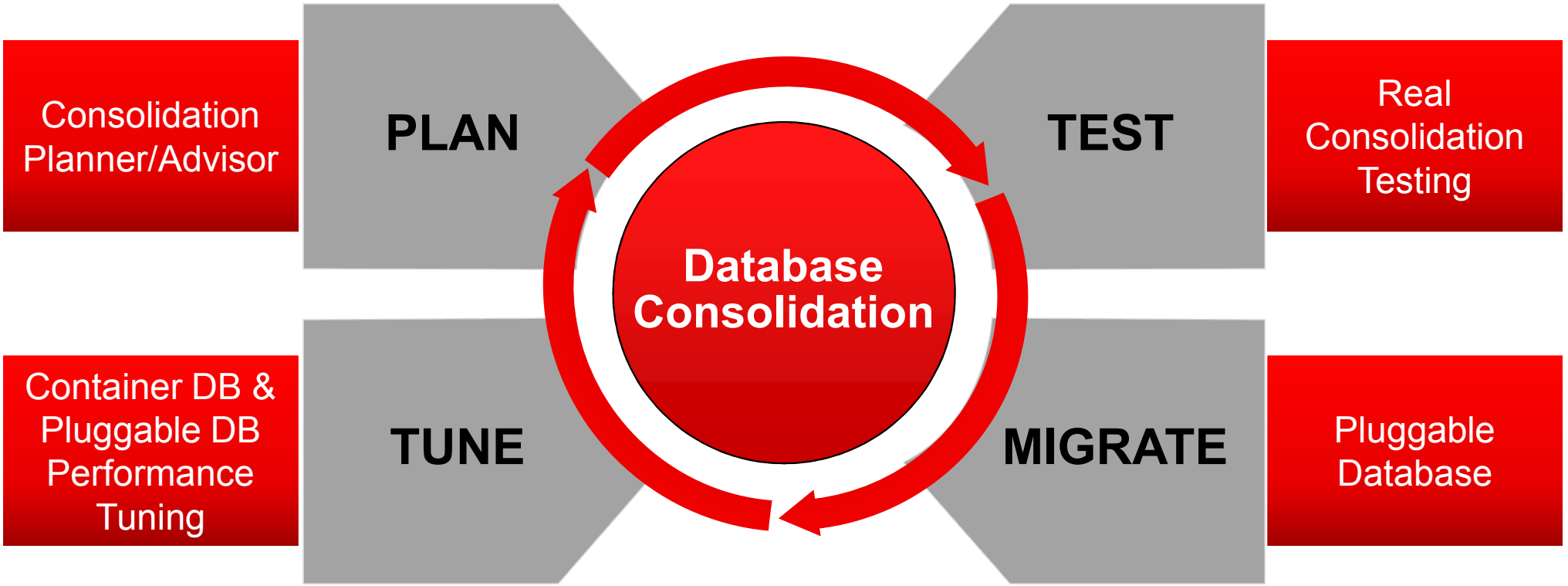
# Database Consolidation

## Full Support Across Entire Consolidation Lifecycle





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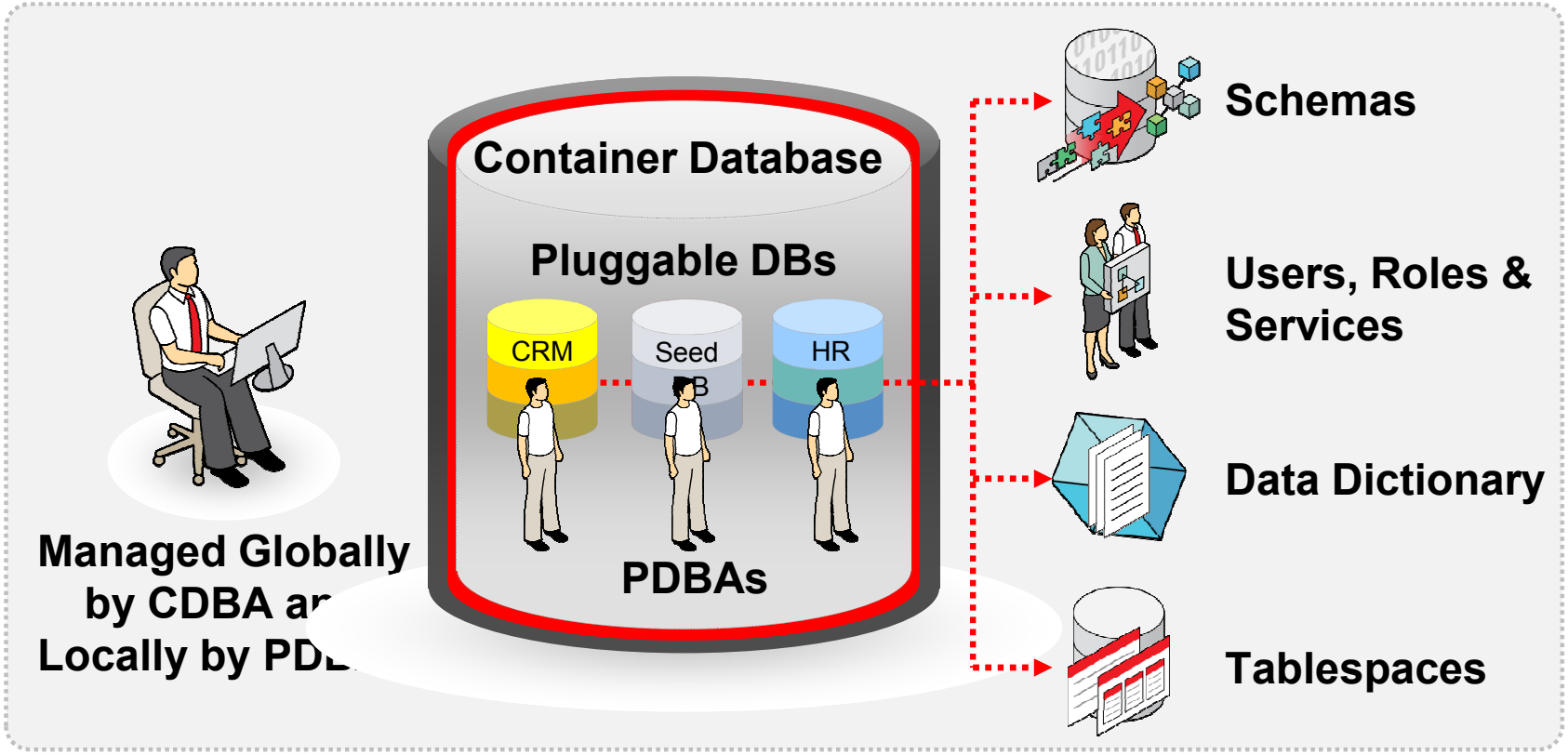
# Pluggable Databases

## Database Consolidation Using Oracle Database 12*c*

NEW
In DB12c





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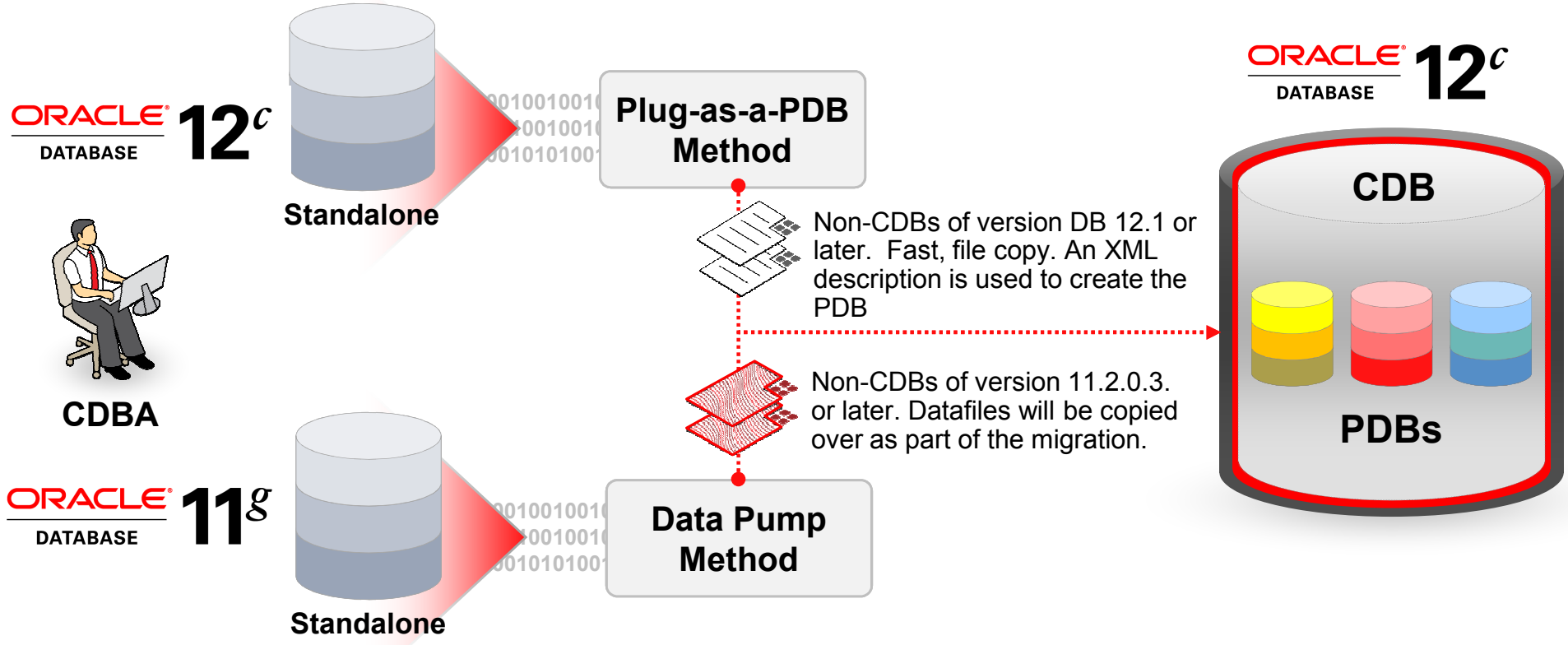
# Upgrading to a Pluggable DB

## How Do I Migrate My Standalone Database to a CDB?

NEW
In DB12c





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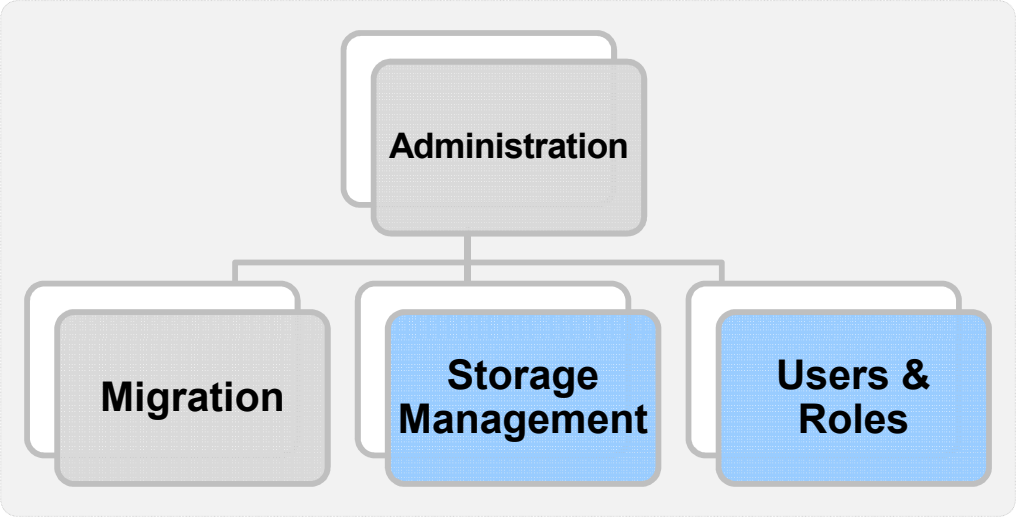
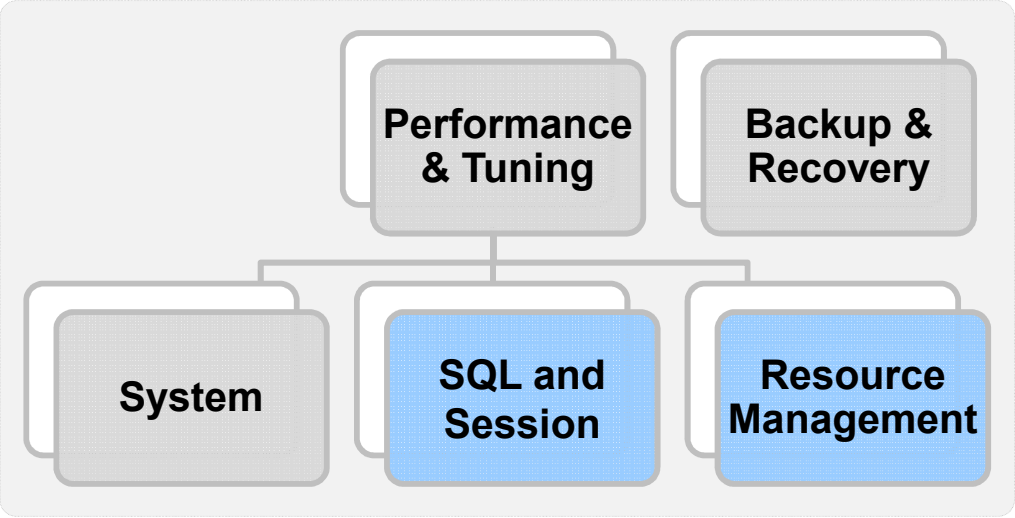
# Management of Pluggable Databases

## Separation of Duties—CDBA vs. PDBA




**CDB Only**
**CDB and PDB**

**CDB Management:**
Holistic database and instance management

**PDB Management:**
Application centric management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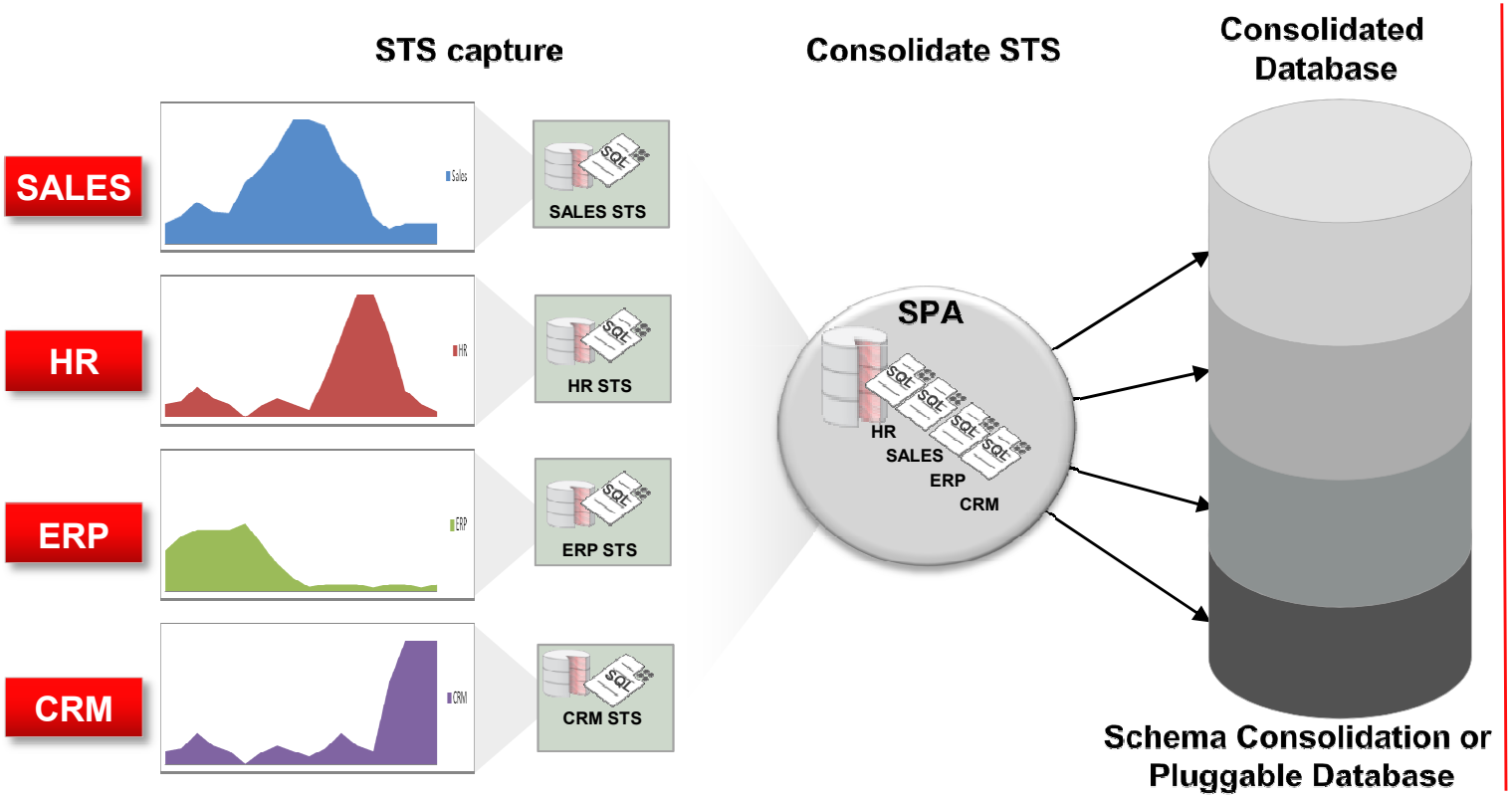
# Consolidated SQL Performance Analyzer (SPA)

## Consolidation Testing using Real SQL Workload




- Validates SQL performance for consolidated database
- SQL workload captured for each database in STS
- SPA executes all workloads together in consolidated environment
- Identifies SQL regressions and helps remediate them
- Existing SPA capability in DB 11.1 works for schema consolidation
- Will support Pluggable DB consolidation in DB12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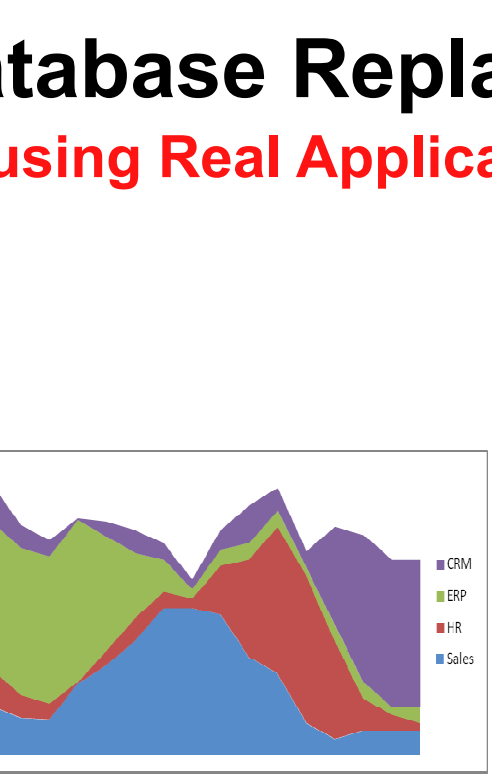
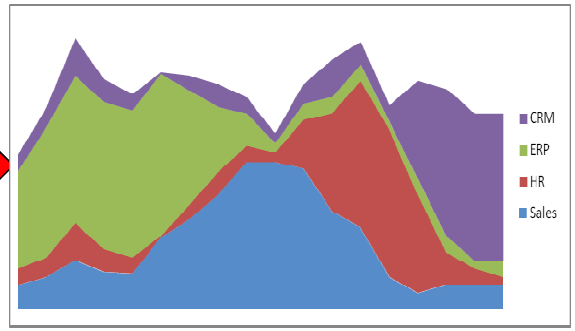
# Consolidated Database Replay

## Consolidation Testing using Real Application Workload




Available now in DB11.2

**Workload**




**Consolidated Workload Replay**

- Enables DB consolidation testing
- Allows workload captured on different databases to be replayed concurrently
- Works for schema consolidated databases or pluggable databases
- Available now as a patch to DB11.2.0.2, 11.2.03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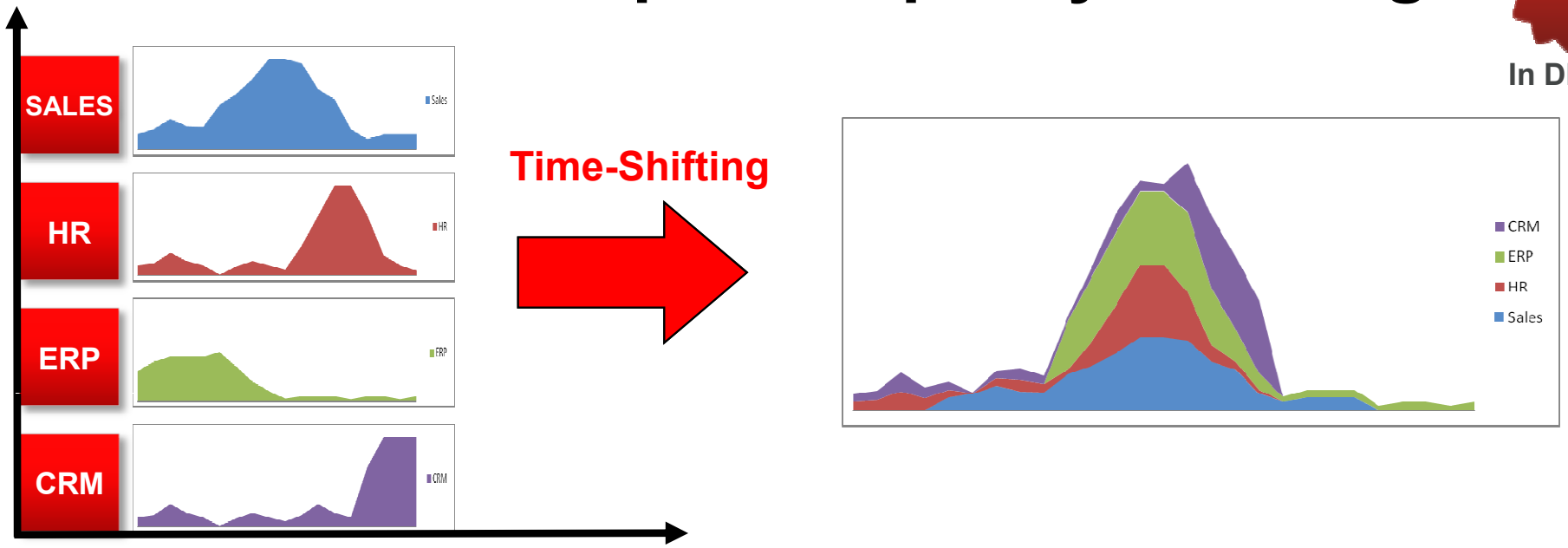
# Workload Scale Up for Capacity Planning

NEW

In DB12c




- Enables capacity planning by scaling up workload replay
  - **Time-shifting:** Align workload peaks for maximum concurrency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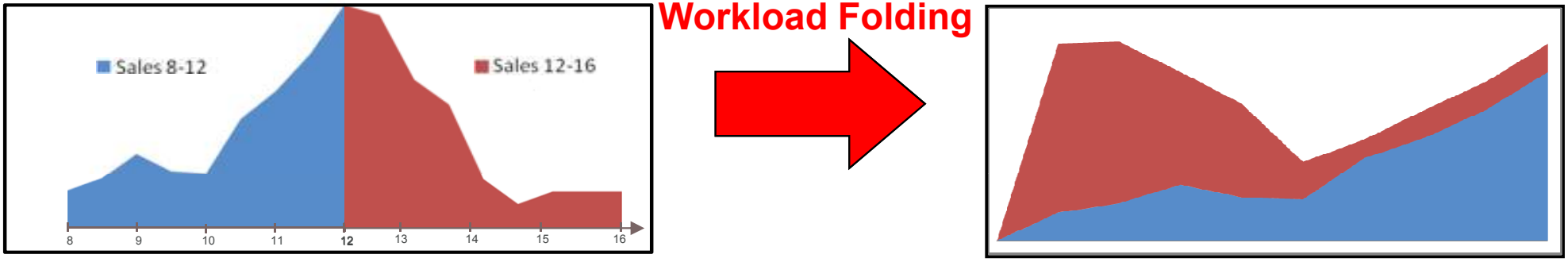
# Workload Scale Up for Capacity Planning

In DB12c




- Enables capacity planning by scaling up workload replay
  - **Time-shifting:** Align workload peaks for maximum concurrency
  - **Workload folding:** Split single capture into multiple pieces and replay them concurrently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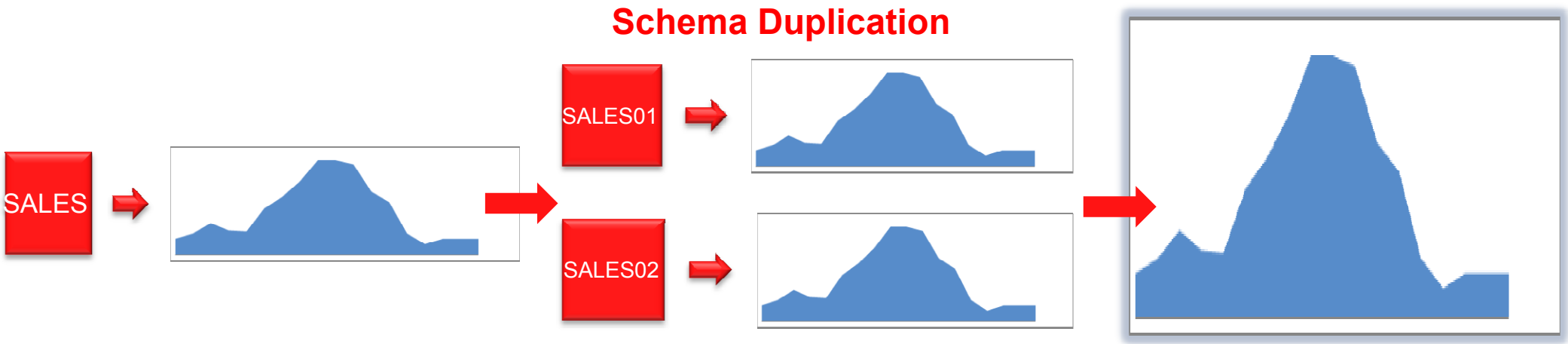
# Workload Scale Up for Capacity Planning

NEW

In DB12c




- Enables capacity planning by scaling up workload replay
  - **Time-shifting:** Align workload peaks for maximum concurrency
  - **Workload folding:** Split single capture into multiple pieces and replay them concurrently
  - **Schema duplication:** Duplicate and replay workload in each schema concurrently
- Part of Database Replay feature under Real Application Testing Option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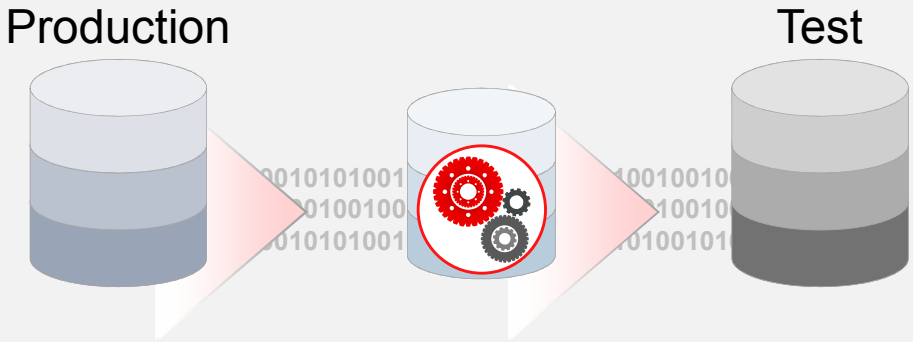
# At-Source Data Masking

## Secured Testing using Real Data

NEW
In DB12c

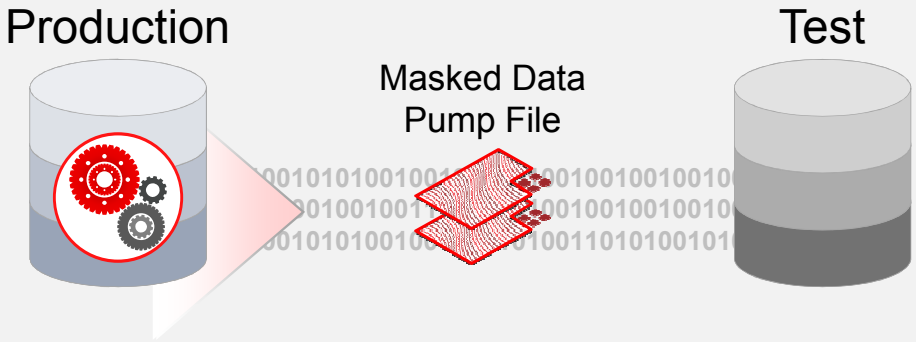
### Before




Clone-and-Mask

Production data is copied to Test and then masked.

### NEW




At-Source-Masking

Sensitive data is masked at the source before it leaves the production DB. Staging copy not required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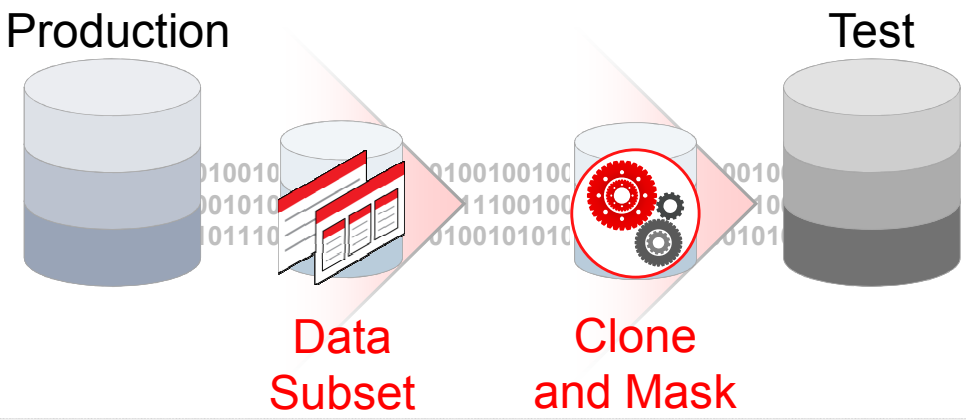
# Integrated Subsetting and Masking

## Maximum Compliance with PCI

In DB12c

### Before




Production data had to be subsetted first and then sensitive data masked separately.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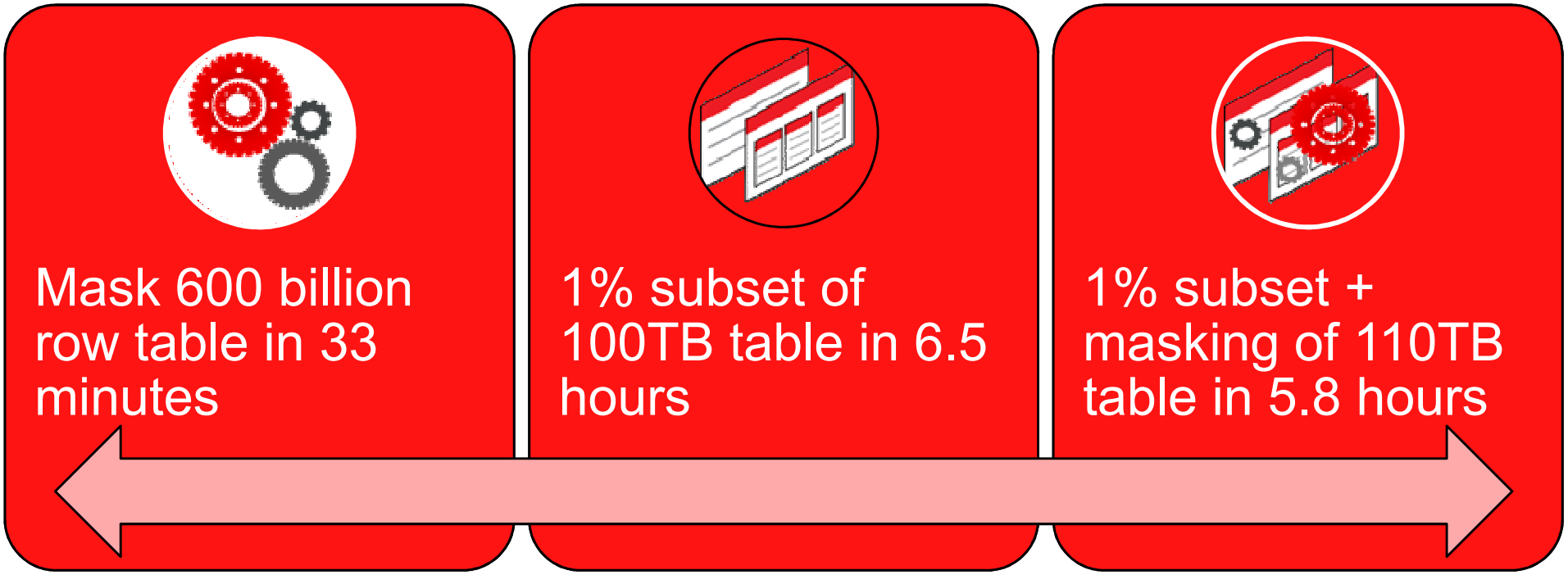
# High Performance Data Masking and Subsetting

## Performance Benchmarks on Exadata X2-2 Full Rack





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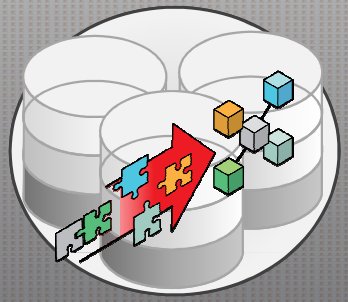

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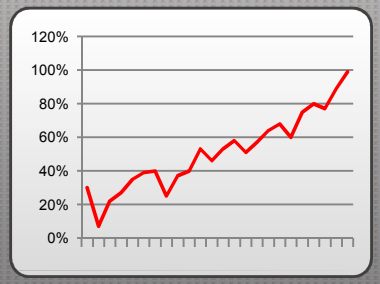
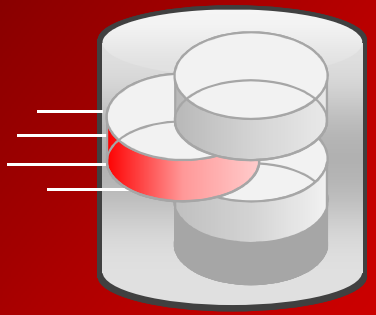



Proactive Performance Management



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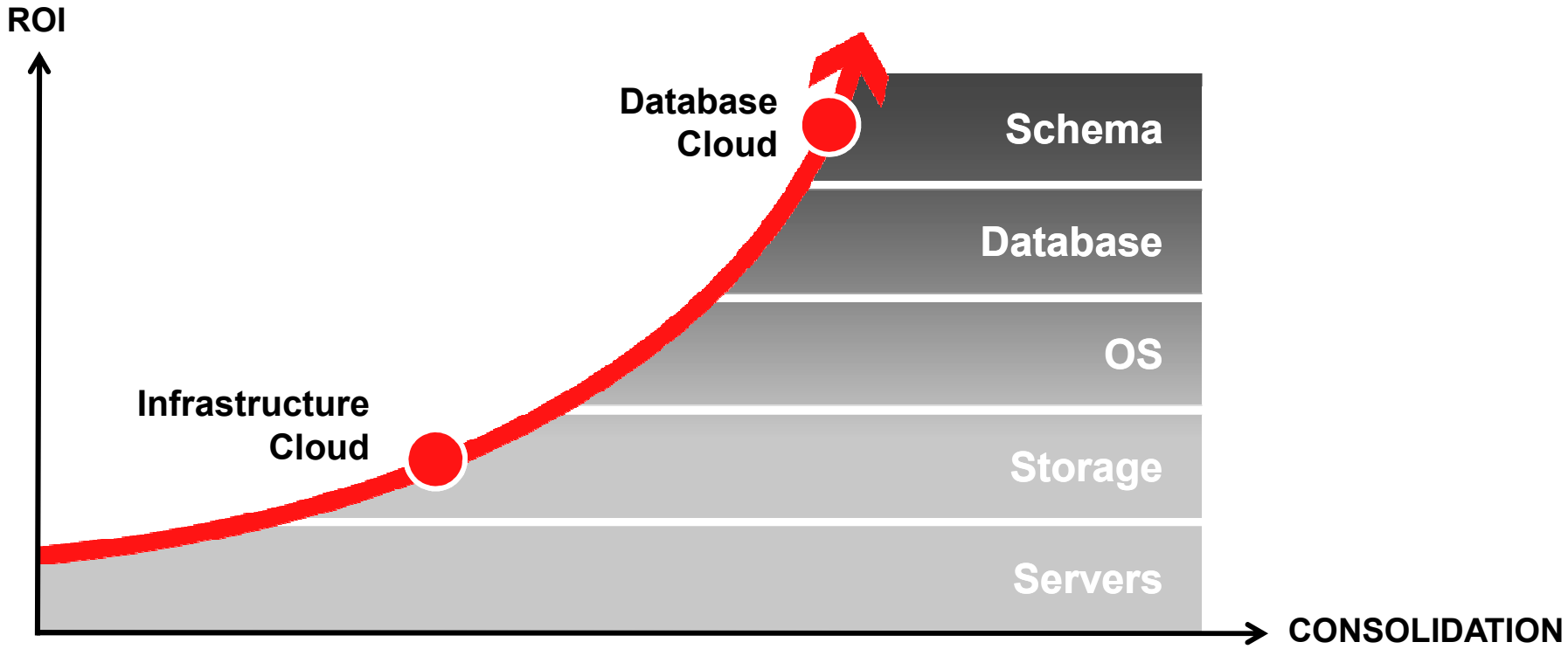
# Private Database Cloud

## Greatest Consolidation, Maximum ROI





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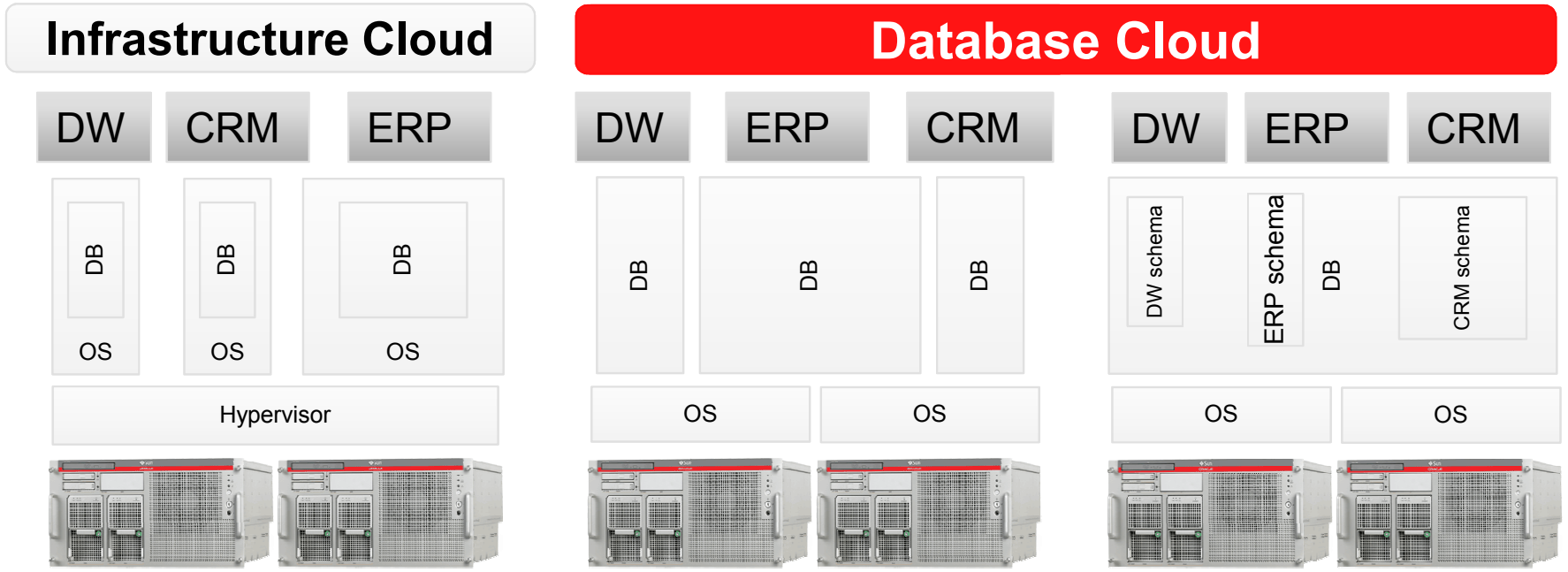
# DBaaS Cloud Models




**Infrastructure-as-a Service**
**Shared Servers**

**Database Instance-as-a-Service**
**Shared OS/Cluster**

**Schema-as-a-Service**
**Shared Database**

**Increasing Consolidation**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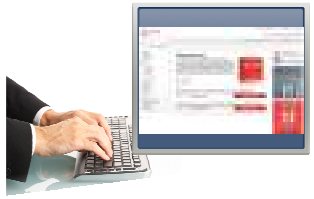
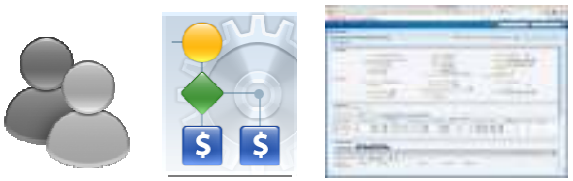
# EM12c: Most Comprehensive DBaaS Solution

- Enterprise Manager 12c supports for all three DBaaS deployment models
- Self service paradigm for database deployment and management
  - Pre-packaged, pre-configured database configurations
  - One-click provisioning and deployment of databases
  - On-demand scalability of underlying platform
- Metering and chargeback/showback for IT accountability
- Intelligent Auto-placement, Quota Management, Role based access, etc.





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# EM12c: Most Comprehensive DBaaS solution

| Requirement | Solution |
| --- | --- |
| Dedicated database instances for new projects | New database on shared infrastructure (ORACLE_HOME pools) |
| Database copy for Functional Testing | Database Instant Cloning using Copy-on-Write technology |

In EM12c


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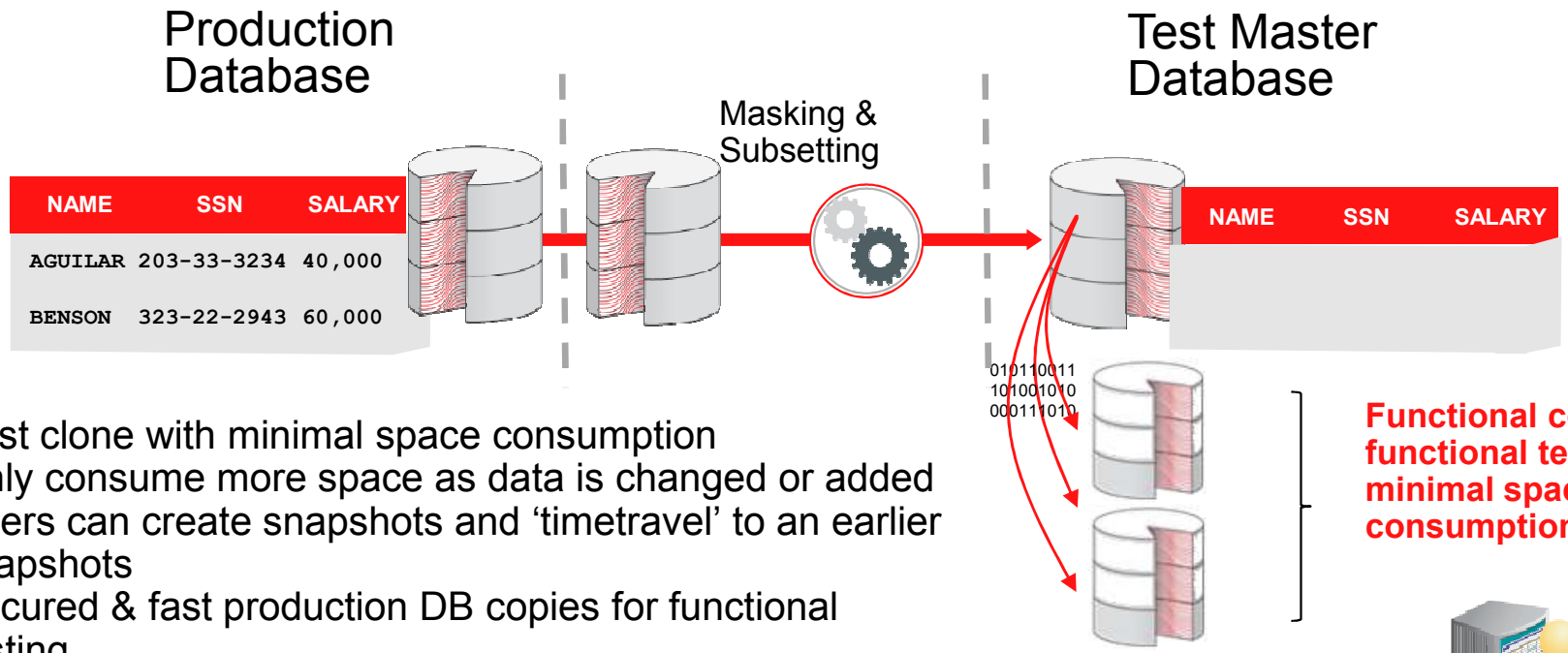
# Database Instant Cloning Using Copy on Write

## Database Provisioning in Minutes

NEW

In EM12c




- Fast clone with minimal space consumption
- Only consume more space as data is changed or added
- Users can create snapshots and 'timetravel' to an earlier snapshots
- Secured & fast production DB copies for functional testing
- Initial Support for Sun ZFS Storage & NetApp Storage
- Will be available in the next release of Self-Service-Application (SSA) Plug-In of EM12c

**Functional copies for functional testing with minimal space consumption**

ORACLE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# EM12c: Most Comprehensive DBaaS solution

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| Database copy for Functional Testing | Database Instant Cloning using Copy-on-Write technology NEW In EM12c |
| Database full copy for problem diagnosis or Load Testing | Cloning from RMAM Backups NEW In EM12c |


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# EM12c: Most Comprehensive DBaaS solution

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| Database full copy for problem diagnosis or Load Testing | Cloning from RMAM Backups In EM12c |
| Small database for quick application development | Schema-as-a-Service on shared database In EM12c |


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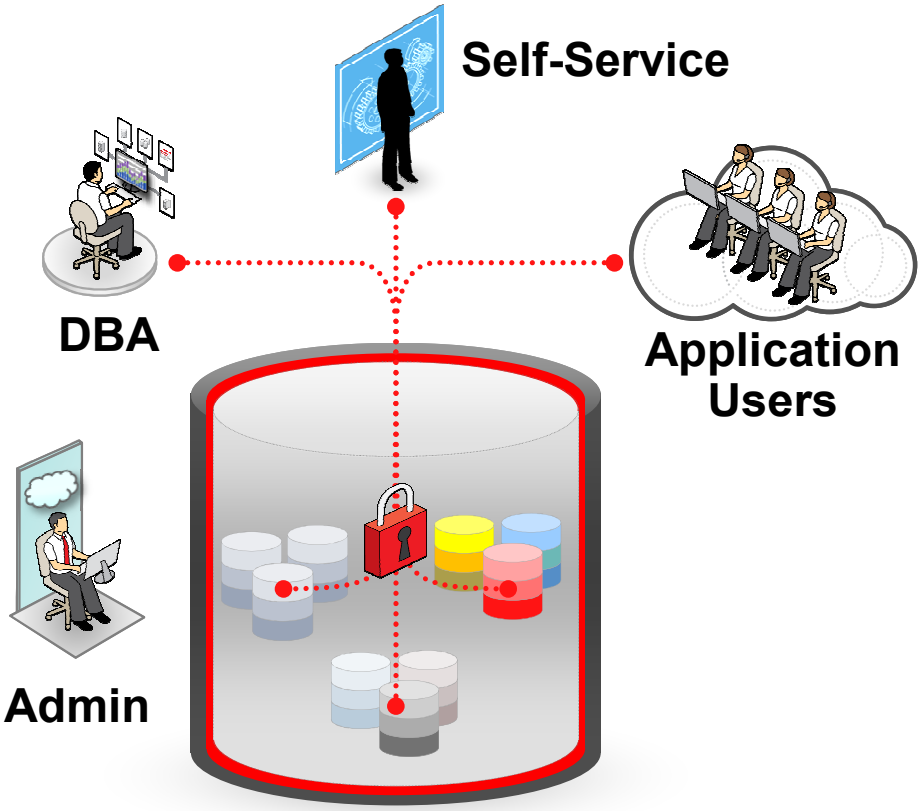
# Schema-as-a-Service




NEW

In EM12c

## Ultimate Consolidation of Databases

- Shared database deployment model enabled through self-service
- Each application user gets one or more database schema(s)
- Service level guarantee through Database Resource Manager
- Security isolation through Database Vault
- Will be available in the next release of SSA Plug-In of EM12c
- Will support Pluggable Databases

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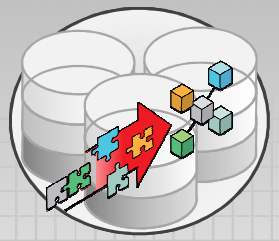
ORACLE 12c DATABASE

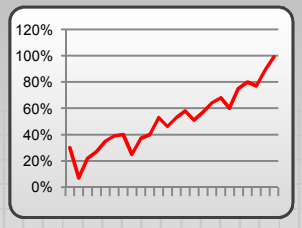
# ORACLE DATABASE MANAGEMENT

ORACLE 12c ENTERPRISE MANAGER



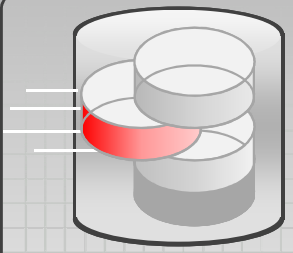
## Embedded Management

- Enterprise Manager Database Express




## Proactive Performance Management

- Proactive Real-Time ADDM
- Database Operations Monitoring
- Persistent Automatic Reports



## Latest Generation Consolidation

- Pluggable Database Management
- Real Consolidation Testing
- At-Source Subsetting & Masking

## Comprehensive Cloud Services

- Database Instant Cloning
- Schema-as-a-Service

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ORACLE DATABASE 12c

Plug into the Cloud.

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