Oracle Database Lifecycle Management
From Provisioning to Compliance & Everything In-Between
Agenda

• Database Lifecycle Management: Key Drivers
• Database Lifecycle Management
  • Discovery and Initial Provisioning
  • Patching and Change Management
  • Configuration and Compliance Management
• References and Case Studies
• Summary of benefits with focus on Exadata and 12c multitenant databases
Top 12 Database Administrative Challenges
IOUG Survey (2012)

- Diagnose Performance: 47%
- Patch to Current Levels: 39%
- Provisioning Systems: 20%
- Manual Repetitive Tasks: 31%
- Tune SQLs: 44%
- Resource & Capacity Planning: 28%
- Manage Large No. of Databases: 31%
- Handle Security Threats: 29%
- Promoting Database Changes: 24%
- Rapid Growing Database Structures: 20%
- Tracking System Configurations: 21%
- Metering & Chargeback Reporting: 17%
Top 12 Database Administrative Challenges

Lifecycle Management Challenges

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IOUG 2012 Survey - Between Big Data to Databases in Cloud
Database Lifecycle Management

1. **Discovery & Provisioning**
   - Discover assets and provision software on them

2. **Patching & Change Management**
   - End-to-end management of patches, upgrades, and schema changes

3. **Configuration & Compliance Management**
   - Track inventory, configuration drifts and compliance
Database Lifecycle Management

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Automated Discovery
Know What you have

Without Enterprise Manager

Run Standalone Network Discovery Tool

Manual discovery with Host and Server names

Challenges and Problems

Cumbersome process
Risk of missing out

Enterprise Manager 12c Solutions

Network scan of known software and ports

Agent-based automated discovery of unmanaged targets
Two Layer Discovery

**Network Discovery**

- IP scanning techniques based on Nmap
- Discover unmanaged (no EM agent installed) servers and services on a port (ie TNS Listeners)
- Promote targets from “Unmanaged” to “Managed”
- Integrated workflow for agent deployment

**Agent Discovery**

- Automated Daily discovery
- Discovery scripts run to find Not Yet Managed (NYM) software (targets)
- Newly discovered targets in Auto Discovery Results – Non-Host Targets
- Promote targets from “Unmanaged” to “Managed”
- Install details automatically populated.
Promoting Discovered 12c Database

DB12 Container Database

DB12 Pluggable Databases
Provisioning Databases
Provision test, development or production systems

**Without Enterprise Manager**
- Manual or scripts based Installation
- Silent Mode installation with response/template files

**Challenges and Problems**
- Long and Error Prone process
- Lack of Standardization

**Enterprise Manager 12c Solutions**
- Automated Mass Deployment
- Standardization using Provisioning Profiles
- Role and Access Separation
DB Cloning using EM12c Provisioning

DB Provisioning

- Mass Deployment of Oracle Software (Database, Real Application Clusters)
- Supports all versions up to 12.1 including Pluggable Databases
- Gold Image cloning and standardized software deployment via Profiles
- Lock down access for controlled and error free deployments

Save Gold image (and optionally data) from source systems to EM software library

Deploy saved Image and data to target systems with customizations

Source DB systems

Software Library Storage

Target DB Systems
Multitenant Database Provisioning

EM enabled fast, flexible copy and snapshot of 12c Pluggable Databases

- Create CDBs with multiple PDBs
- Unplug and plug full data and application
- Useful for
  - Upgrade Testing
  - Functional Testing
  - Agile development
- Storage efficient snapshots within a container database
Standardizing Deployments

EM enabled fast, flexible copy and snapshot of 12c Pluggable Databases

• Provisioning **Profile**
  • Gold image with specific patches, configuration, etc
  • Stored and versioned in Software Library
• Clear separation of Designer and Operator roles
• **Lock Down**
  • Inputs to Deployment Procedure that cannot be edited by Operators
• Used together guarantees standard deployment of new databases
Profiles and Lockdown

Capturing Provisioning Profiles

Locked values shown in read only mode
Challenge:

• Growing application sprawl
• Application deployment was slow, complex and expensive
• Database infrastructure was “rapidly falling into legacy”
• GOAL: Make BT #1 for customer service and cost reduction

After Oracle Enterprise Manager:

• Consolidated databases onto private DBaaS Cloud
• IT team now manages 30% more databases with 20% fewer personnel hours
• No more wasted time: harmonized management tools, processes, and methodology
• Reduced server sprawl, increase operational efficiencies by deploying databases faster
“Spinning up a database, a process that used to take two to three weeks, now takes us only 19 minutes, something like a 1,000% improvement in deployment time. Accelerating deployment to this degree has brought us much closer to the customer service levels our business goals demand.”

Surren Partab
Chief Technology Officer
BT Operations
Database Lifecycle Management

1. Discovery & Provisioning
   Discover assets and provision software on them

2. Patching & Change Management
   End-to-end management of patches, upgrades, and schema changes

3. Configuration & Compliance Management
   Track inventory, configuration drifts and compliance
Patching
Maintaining Patch Levels

**Without Enterprise Manager**
- Manual installation either directly or using scripts
- Multiple people involved across multiple hours to cover the environment

**Challenges and Problems**
- Predictability
- Downtime Management
- Scalability

**Enterprise Manager 12c Solutions**
- Automated Mass Deployment
- Minimize Downtime, identify issues with pre requisite check
- Patch Templates and Compliance Standards
Typical Database Patch Management Process

• Complex
• Manual
• Error Prone
• Time consuming

Total Rollout Effort (Per Quarter): 25 weeks!!!
Based on a large customer’s experience with 1000+ databases)
Patch Management with EM 12c

- Detect and verify patching success
- Detect drift from existing gold images and rebuild them for future software rollouts
- Patch Compliance tracking and reporting
- Revert to previous version in case of regression

- Support Rolling patches for RAC, Pluggable Databases
- Support out-of-place patching/upgrade for single instance databases
- Support patching Exadata Database Cluster Stack
- Support Group based patching
- Push button Patching by “Operators”

- Advise/recommend patches based on configuration
- Provides patch rating and community feedback
- Create Patch Plans & templates to apply multiple patches in a single downtime
- Detect conflicts and file merge requests
- Perform pre-flight dependency and impact analysis

🌟 New or Significantly Enhanced
Patch Recommendations

- Connected to My Oracle Support
  - **Online** Mode
  - Directly accessible within Enterprise Manager
  - Complete integration with My Oracle Support
- Support for disconnected datacenters
  - **Offline** Mode
  - No connectivity to My Oracle Support
- Proactive patch recommendations for Oracle recommended patches (including CPU, PSU..)
  - Downloads Metadata from My Oracle Support and computes for the targets within Cloud control
- Rich Information about patches like bugs fixed, associated KM articles, number of downloads, trends
Simplified Patching Process

- **Step 1:** Select Patches and Targets
- **Step 2:** Choose options for Deployment (*Deployment Procedures are auto picked*)
  - (In-Place, Out-of-Place, Rolling, Non-Rolling)
- **Step 3:** Run Validations – Comprehensive Analysis for Patch conflicts and Target level sanity
- **Step 4:** Review -> Prepare-> Deploy
  - Prepare the system for patching ahead of Downtime.
  - For cases like Out of the Place patching, Clone the Oracle Home and Patch the cloned Oracle Homes ahead of downtime.
Predictable Patching with Pre-flight Checks

- Comprehensive real time sanity and conflict checks prior to patch deployment
- Patch conflict checking:
  - Among patches within the patch plan
  - Between patches in plan and current inventory
- Optional post check pause saves valuable maintenance window time by performing checks ahead of time

- Target availability
- OPatch and OUI checks
- Inventory Sanity
  - Locks, Access
- System space
- Cluster verification - cluvfy, srvctl Config
- sqlplus access
- Patch Conflicts
- ...

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Out-of-Place Patching

• **Minimum Downtime**
  – Database remains available while patch applied to cloned home.

• **Rapid Recovery**
  – Switchback to original Oracle Home in case of issue

• **Complete Support**
  – Single Instance
  – RAC Clusters
  – Includes Data Guard configurations
Rolling Real Application Cluster patching

- Zero Downtime Rolling Patch Orchestration across RACs
- Patch support Grid Infrastructure (or Clusterware) Bundles, applying the patch to both GI and RAC OH one node at a time or on all nodes simultaneously
- Supports patching for Clusterware or GI, ASM, and Pluggable Databases
- Supports version 10.2.0.x and onwards (*includes DB12c*)
Mass Automated Database Upgrades

Automation in scale

- Upgrade Standalone, RAC, and Data guard (Primary-Standby) Databases from older versions to higher versions (supports DB12c)

- RAC Database Upgrades:
  - Full stack upgrade covering Grid Infrastructure and RAC DBs
  - Flexibly upgrade to suit the operational and testing needs (GI only, Few RAC DBs or All RAC DBs)
  - Minimize downtime by upgrading software and Database separately
  - Comprehensive pre-requisite checks including RAC checks, cluster verify (CVU) checks, can be updated directly from MOS
  - Integrated back up and restore policies
  - Rolling Upgrade using Transient logical standby for Data Guard based Primary and Standby Databases
  - Support upgrading multiple standby environments
Change Management
Applying Database Schema Changes from Dev to Prod

Without Enterprise Manager
Use SQL Scripts

Manual operation to validate and propagate changes

Challenges and Problems
Manual
Lack of Preview
Scalability

Enterprise Manager 12c Solutions

- Data Comparison and Baselining

- Validate and Propagate Planned Changes
Schema and Data Comparison

**Baselines:**
- Capture database and schema definitions
- Baseline Versioning
- History of changes

**Comparison**
- Baseline with database
- Database with database
- Schema with schema
- Data Comparison

**Automated Propagation**
- Propagate desired changes – Change Plans
Propagate Planned Changes

- Validate planned changes to identify conflicts or previously applied changes.
- Preview and edit validated changes before applying.
- Generate SQL script of final set of validated changes.
- Apply validated planned changes
Change Activity Planner
Track Long Running Processes

- Plan, Monitor, Act and Track in Real Time – Processes running over long periods of time and involves multiple people or teams
- Leverages the configuration management data to find accurate state of activities
Change Activity Plans - Define Process flows
Create - Tasks, Tasks Groups with dependency & sequencing

- Create Change Activity Plan with Tasks Groups and Tasks
- Define dependencies, sequencing, e.g: Do it in Test/QA env then move it to Production post approvals.
- Orchestrate from EM (Jobs, Patch plans, DPs..) or outside EM
- Associate targets – Groups, LOBs, query based on Configuration attributes while creating tasks
- Automatic task assignments based on target ownership
- Flexible scheduling allows you to define start time and the effective duration of the plan
Change Activity Plans: Separation of views...

Manager’s View

- Monitor status across all plans, quickly identify plans that need attention
- Track individual plans and their tasks
- Handle assignments and ownership changes
- Track Progress
- Generate Reports for Management Reporting
Change Activity Plans: Separation of views

DBA’s View

- Identify and Manage all tasks posted
- Quickly get to top tasks, tasks that need attention
- Allows acknowledgement and other human flows
- Complete action for standards tasks like patching, compliance rollouts, etc. From within EM.
- Add Comments and review Audit trail
CASE STUDY

PATCH MANAGEMENT

$11.5 Billion in Net License Revenue
66,000 Employees
2,004 Managed Targets

FOCUS ON
Patch Management, Security and Compliance

Challenge:

- Mandatory corporate and industry regulations meant strict auditing requirements
- Patching was manual and resource intensive
- Needed to patch 1,200 production and non-production databases every quarter

After Oracle Enterprise Manager:

- Leverage the comprehensive integration between My Oracle Support and Enterprise Manager for end-to-end patch automation and provisioning
- Increased admin productivity by removing manual error-prone tasks
- Adherence to security and compliance requirements

BENEFITS

- Cut DBA patching efforts from 3,600 hours down to 540 hours
- Using EM, Cisco lowered their downtime for maintenance by 50%
- Reduced human error and incidents during patching and upgrades
- Systems are now highly scalable and automated
- Saved over $200K per year in IT operational costs with patching automation
Database Lifecycle Management

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Configuration Management
Ensure Consistent Configurations

Without Enterprise Manager
- Maintain the details in a spread sheet
- Manually compare configurations by uploading into a database

Challenges and Problems
- Time Consuming
- Totally Reactive
- Scalability

Enterprise Manager 12c Solutions
- Identify and Track Assets
- Compare Assets and Configurations
- Track and Remediate Drifts
Blueprint Driven Collection
Configuration Collection and Extensibility

• Rich collection of target specific information for Database, Fusion Apps, Middleware, etc
  – Downloadable updated blueprints
  – Collected information uploaded to My Oracle Support to aid problem resolution

• Allow customers to augment configuration data collected by EM
  – UI driven definition utilizing rich set of out-of-box parsers
  – All configuration management features (search, history, etc) available for custom configuration collections
Topology Viewer
Map Database 12c’s Container and Pluggable Databases

• Visualize component relationships and dependencies like:
  • Hosted by
  • Installed at (Oracle Home)
  • Composite Contains (CDB -> PDB)

• Key Use Cases:
  – Dependency Analysis
  – Impact Analysis

• Customize view to match specific needs
• Add manual relationships
Adhoc Configuration Reporting

- Powerful adhoc search based on configuration values, target properties, relationships, e.g:
  - Find all databases with sga_target greater than 5GB and hosting E-Business Suite on Exadata
- Search queries based on Mgmt$ Views can be used from BI Publisher for reporting to non-EM users
- Saved Searches can be accessed and leveraged from EMCLI, e.g:
  ```
  emcli get_targets -config_search="Databases on Exadata" –target_name="exa%"
  ```
Asset Tracking
Inventory Reporting and Trending

- Display distribution of:
  - Operating Systems
  - Databases
  - Middleware
  - Fusion Applications

- Trend report
  - Growth of assets
  - Indicates possible sprawl
  - Supporting upgrade and migrations
Configuration Drift Management
Finding ‘needle’ in the hay stack

- 1-1 and 1-n comparison across Dev, test, Prod, DR environments
- Comparison of entire stack, e.g: Exadata database machine (database, grid infrastructure, compute node, storage)
- Comparison Templates to control what’s compared and how
- Automatic drift detection and notification
Compliance Management
Ensure all the Databases are compliant

Without Enterprise Manager
Lengthy manual audits of configuration, repeated each audit period

Challenges and Problems
High Cost
High Risk

Enterprise Manager 12c Solutions
- Out of the Box Compliance Library
- Monitor and Manage Compliance
- Adhere to Compliance and Generate Reports
Compliance Framework – Reusable Hierarchy

- **Compliance Framework**
  - Collection of Compliance Standards
  - Compliance Standards can be of different Target Types
  - Map Configuration Standards to real-world structure of Compliance Frameworks (PCI, COBIT, HIPAA, CIS, etc)

- **Compliance Standard**
  - Collection of Compliance Rules
  - Specific to Single Target Type

- **Compliance Rule**
  - Discreet Check or Test
  - Specific to Target Type
  - Results in Violation
Compliance Framework – Reusable Hierarchy

Gauges - Current and Lowest in Last Week
Target and Violations Details per Standard

Newly Discovered Unmanaged hosts may be risk
Least Compliant Target shows where to start
Compliance Validation – Multiple Options

- Repository Rule
  - Evaluated against repository data
  - Validated when target configuration changes
- Real-time Rule
  - Detection of real-time activities (file actions, schema actions, process actions)
  - Detection of “unauthorized” changes through automated correlation against Change Management
- Agent-Side Rule
  - Tight Integration with Configuration Extensions
  - Validation logic only returns violations
  - Recommended for custom compliance
- Weblogic Server Signature Rule
  - Deprecated
Oracle Provided DB Compliance Content

Compliance Standards

- **Pluggable Database (NEW)**
  - Storage Best Practices for Pluggable Database
  - Configuration Best Practices for Pluggable Database
  - Basic Security Configuration for Pluggable Database

- **Single Instance Database Instance (and RAC Instance)**
  - DISA Security Technical Implementation Guide (STIG) V1.8
  - Certification for Oracle Database
  - Storage Best Practices for Oracle Database
  - Configuration Best Practices for Oracle Database
  - Basic Security Configuration for Oracle Database
  - High Security Configuration for Oracle Database
  - Patchable Configuration for Oracle Database
  - Storage Best Practices for Oracle Database
  - Support Policy for Oracle Database

- **Cluster Database**
  - DISA Security Technical Implementation Guide (STIG) V1.8
  - Basic Security Configuration for Oracle Cluster Database Instance
  - High Security Configuration for Oracle Cluster Database Instance
  - Certification for RAC Database
  - Configuration Best Practices for Oracle RAC Database
  - Patchable Configuration for RAC Database
  - Storage Best Practices for Oracle RAC Database
  - Support Policy for RAC Database

- **Listener**
  - Basic Security Configuration for Oracle Listener
  - High Security Configuration for Oracle Listener

400+ Individual Compliance Rules
Data Governance and Compliance Challenges

- Data centers have thousands of databases containing sensitive data which may be unprotected
- Enterprises lack enterprise-wide tools to scan databases
- Limited visibility into compliance status (encryption, masking, database vault) of sensitive data
- Hard to remediate non-compliance
Enterprise Data Governance allows you to discover, scan and identify databases that may contain sensitive data automatically across your enterprise

- **Shallow Scan** – Meta data discovery
- **Deep Scan** – Sensitive data discovery
Enterprise Data Governance – Discovery

- **Meta-Data Discovery**
  - Scans dictionary for sensitive cols
  - Uses monitoring credentials
  - Searches for:
    - Sensitive table and column name patterns
    - Application signatures to identify packaged apps
    - Objects with security protections

- **Data Discovery**
  - Samples data and searches for various sensitive data patterns like card number, phone, etc.
  - Requires database credentials
Enterprise Data Governance
Configure, Discover, Classify ➔ Protection

**Configure**
- Sensitive type configuration
- Application Signature configuration
- Out of the Box Data Protection configuration

**Discover**
- Metadata Discovery
- Data Discovery

**Classify**
- Classify sensitive column types, data protection and application signatures
- Associate an Application Data Model

- Data Masking
- Redaction
- Encryption
Case Study

FOCUS ON
Configuration Consistency

CONFIGURATION MANAGEMENT
$14 Billion in Revenue
40 Oracle E-Business Suite Instances
800 Oracle Databases
1,400 Applications

Challenge:
- Consolidate 14 global datacenters to 4
- Understand configurations and track software deployments globally
- Consolidate patch reporting and eliminate manual tasks

After Oracle Enterprise Manager:
- Comprehensive tracking & understanding for all configuration changes
- Gold standard configuration established
- Automatic weekly checking for “drift” against all datacenters
- Automatic changes detection and history

BENEFITS
- Reduced IT Operations overhead by 10%
- Eliminated manual scripts and reports for monitoring
- One view to manage total environment
- Reduced migration time of new features by 30%
- Reduced unplanned outages by 10%
Benefits of Lifecycle Management
Complements Exadata’s Value Proposition

• Consolidation
  • Automated Discovery
  • Asset and inventory tracking
  • Complete visualization of stack topology

• Standardization and Compliance
  • Ongoing Drift tracking across the stack
  • Exadata specific Compliance evaluation

• Efficiency & Automation
  • Ongoing Database Provisioning
  • Patch Automation
Benefits of Lifecycle Management
Maximizes benefits of multitenant databases

• Consolidation
  • Automated Discovery
  • Migration from non-PDB to PDB
  • Complete visualization of CDB-PDB relationships

• Standardization and Compliance
  • Managing PDB sprawl
  • Ongoing Compliance evaluation for CDB and PDBs

• Efficiency & Automation
  • Ongoing Database Provisioning and Cloning
  • Patch Automation
Oracle DB Lifecycle Management Solution

Complete Lifecycle Management

- Provisioning & Cloning
- Patch Automation
- Upgrades
- Configuration Management
- Compliance Management
- Change Management

Proven, Faster ROI

140% ROI over 3 years

Cloud Foundation

Enabler of Private Database Cloud

Forrester Total Economic Impact Survey

- 140% ROI over 3 years
- 15 months payback period
Resources

Lifecycle Management on OTN

http://tinyurl.com/em12lcm