Oracle Multitenant Deployment on Oracle Exadata

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Agenda

- Introduction
- Engineered Systems Topology/ Landscape
- Multitenant DB 12c
- Exadata DB12c Enterprise Architecture
- Migration Methodology & Criteria
- HA - Backup/ Recovery for PDB
- Benefits – Business
- Benefits – Operational
- Lessons Learned
- Our Vision
The Sherwin-Williams Company

- Largest Producer of Paint & Coatings in US, among Top 3 worldwide
- Founded in 1866, Cleveland, OH
- 2016 is 150th Anniversary
- 2013 - $10.19 billion in sales
- Business in 120+ Countries
- 34,000+ employees
- 4,000+ Company Owned Stores
- 90+ Manufacturing Facilities Globally
Leading Sherwin Williams Brands

- Dutch Boy
- Martin Senour
- H&C
- Sherwin Williams
- Cuprinol
- Pratt & Lambert
- Thompson's WaterSeal
- Duralk
- Minwax
- Duran
- Krylon
- Purdy
- M.L. Campbell
- Ronseal
Extensive experience with Oracle Databases, E-Business Suite and related technologies

Member of Customer Advisory Board for Oracle EBS ATG and Oracle Exalogic

Master’s degree in Computer Science

18 years experience working on Oracle technologies

Worked as Lead DBA, Architect, EBS System Administrator, IT Manager

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Business/ Technical Drivers for Engineered Systems

◆ Challenges
  ▪ Complexity of using Veritas Clusterware with Solaris / Scalability
  ▪ Performance of business processes/ R12 Upgrade / Clones; Stability
  ▪ Improving time to market of solutions
  ▪ Stability and Manageability with Engineered Architecture
  ▪ Consolidation
      ▪ Magnitude of infrastructure reduction, impact on servers and licenses
  ▪ Application Server Management:
      ▪ Cost, time and effort related to Maintenance
      ▪ Service level of upgrading and deploying new services
  ▪ Performance improvement of business processes
  ▪ Provides an opportunity to reduce management & administration costs
  ▪ Optimize the workload of Oracle software / application
  ▪ Sizing (Capacity available on-Demand)
  ▪ Single vendor for support
Engineered Systems Landscape

◆ Portfolio
  – 9 Exadatas, 4 Exalytics & 7 Exalogics

◆ Exadata - 9 Racks
  – One X2-2 ¼ Rack (HP – High Performance HDD)
  – Two X2-2 ½ Rack (HP – High Performance HDD)
  – Three X2-2 ½ Rack (HC – High Capacity HDD)
  – Three X4-2 ½ Rack (HC – High Capacity HDD)

◆ Exalogic - 7 Racks
  – Three X3-2 ¼ Rack
  – Four X3-2 ½ Rack

◆ Exalytics - 4 Machines
  – Four X3-4 (Hyperion deployment)
SW Database Footprint

- Databases – ~450
- RAC Clusters - ~ 175
- DataGuard as DR Solution for Business Critical Applications
- Platform
  - Solaris
  - Linux
- Deployed Exadata to run DB 11gR2 to support EBS environment (first deployment in 2011)
Multitenant DB 12c

◆ Traditional Architecture
  – Memory & Background Processes required for each Database
  – Consolidation achieved via Server Virtualization, DBs sharing Servers, Schema consolidation

◆ Database 12c brings in Multitenancy to the Database

◆ CDB – Container Database
  – Contains controlfiles, datafiles, undo, tempfiles, redo logs, root owned data dictionary and those that are visible to all PDBs

◆ PDB – Pluggable Database
  – Needs to contain information specific to itself, made up of datafiles & tempfiles, includes its own data dictionary, containing info. about PDB specific objects

◆ Memory and processes required for multitenant container DB only
◆ No changes required to the application
Multitenant Architecture

- Components of Container Database

- Pluggable Databases (PDBs)

- Root

- CDB

- PDBs
Multitenant DB 12c - Features

◆ Rapid Provisioning

◆ Manageability
  – PDBs managed as one with multitenant
  – All PDBs backed up as one
  – Point-in-time recovery at PDB level
  – All PDBs covered by one standby DB

◆ Enhanced Consolidation

◆ Security
  – Local user is defined in PDB only
  – Common user based on privilege granted

◆ Portability - Unplug / Plug PDB

◆ Fast Cloning of PDBs
  – PDBs cloned in same CDB or from remote CDB
Database Upgrade / Patching

- Simplified / Flexible DB Upgrade

1. Upgrade in-place
2. Flexible Upgrade
Topology - DB Multitenant

Database Cluster

ExaData X2-2
½ Rack

Application Tier

Java- Tomcat
.Net
.Net
FMW

Stibo Ecommerce DB
Formulation System DB
Mosiac System DB
GlobalComm DB

Multitenant Container Database (CDB)

Database – 12c (12.1.1.0) RAC

Oracle 12c Grid Infrastructure (CRS + ASM)

Compute Node1
Compute Node2
Compute Node3
Compute Node4
Exadata Topology for Enterprise DBs
Shared DR (Asymmetric)
Drivers/ Reasons for Multitenant 12c

- Consolidation
  - Reduce the infrastructure footprint
  - High density – ability to consolidate more

- Schema consolidation adds complexity in migration & lifecycle of databases

- Server consolidation needs high memory and processing

- Virtualization (VM for each DB) leads to infrastructure sprawl, increases the complexity of lifecycle operations

- Exadata is our platform for Tier1 Databases and running 12c on Exadata brings the agility; speed to market

- Lower operating cost

- Enhanced stability & reliability
Migration Approach / Methodology

- Upgrading to Multitenant 12c
  - Upgrading the pre 12c databases in-place
  - Plug-in upgraded databases

- Migrate using replication
  - Provision PDB
  - Replicate data using Datapump

- Create PDB for new projects (applications deployment)

Our Approach -

- Migrating databases directly to 12c PDB using Datapump, where CDB is running on Exadata
  - More effective
  - Endian conversion (DBs from Solaris)
  - Challenges with 2 step process (Old HW Capacity, compatibility challenges; underlying Grid Infra/ ASM needs to be upgraded)
Migration Criteria

◆ Which database will go to Multitenant 12c?
  – Non-EBS and Non-DW Databases are candidates for Multitenant 12c
  – Includes the databases for FMW applications, Web applications, Custom applications, COTS applications

◆ Decision Criteria -
  – SLA requirement
  – Application Certification for Database 12c
  – Business needs allow PDBs to be co-located

◆ Logical grouping of candidate DBs in to different CDBs

◆ For the Apps not certified with DB12c; migrate 11g DBs to Exadata (12c Grid Infra & ASM)
Intend to consolidate all candidate databases into various Multitenant 12c CDBs, achieving high consolidation density.

Hardware – Using three Exadata X2-2 systems.

Database migration tied to application tier migration to Exalogic for Tier1 applications and UCS for Tier2 applications.

Current State –
- Number of CDBs – 3 Clusters
- Number of PDBs – 20

Applications using the PDBs – Stibo (Ecommerce), Formulation, GlobalComm, Mosaic etc.
Benefits of Multitenant 12C

◆ Enables efficient consolidation of databases
  – Reduce the infrastructure footprint

◆ Building block for Private Cloud, which complements the Engineered Systems platform

◆ Brings Agility by allowing Rapid Provisioning
  – Creating PDB   - Cloning PDB

◆ Simplified management

◆ Security – Provide the necessary isolation for different application databases
HA and Backup/Recovery for the PDBs

Exadata

Infiniband

RAC Node1

RAC Node2

Multitenant Container Database (CDB)

Single Backup

PDB Level Point-in-time recovery

ZFS Appliance
Benefits – Business

- Faster delivery to meet business needs
- No changes required to the Application
- Consolidation
  - Reduce Hardware footprint
  - Lower Datacenter operational cost
- Security and compliance implementation
- Reallocate resources to higher value-add activities
- Brings agility to IT delivery, supporting business initiatives
- Ability to expand portfolio; can build new capabilities
- Enable to have better RTO & RPO for DR
Benefits - Operational

- Reduced DB backup and clones times
- Managed as one (Several PDBs managed as one DB–CDB)
- Enabling application delivery team to meet business goals
- Established HA features work the same way
- DR at the CDB level
  - one Stand-by DB for all PDBs, less efforts to manage
  - New PDB implicitly gets the DR, no additional configuration
- Backup at the CDB level
  - All PDBs are backed up together
  - PDB level Point-in-time Recovery
Benefits - Operational

◆ Security
  – Isolation for application databases – PDBs

◆ Data Center Transformation
  – space savings with consolidation

◆ Scalability is simplified

◆ Enhanced performance with Multitenant DBs running on Exadata

◆ Cloud Control 12c automatically detects new PDBs

◆ No need of new backup jobs

◆ Clone a single PDB across the DB link, from one CDB to another
Strategy for Database Tier Platform

- Reference Architecture with Exadata as the platform for HA (RAC) Databases, with DataGuard as DR option
- All Tier1 Databases will be migrated/consolidated on Exadata
- Non-EBS databases consolidation with Multitenant 12c
- Upgrade databases to 12c (if Application certifies it)
- Attempt to stay on n-1 release for databases (if Application supports it)
- DB 12c In-Memory option evaluation (POC) and establish a strategy for its adoption
Exadata-DB 12c Benefits for Application

◆ Architecture
  – Enterprise Architecture is enabler for new capabilities

◆ Performance
  – Purpose built systems; enhanced Database & Application Performance
    Brings Agility to the Business Applications

◆ Consolidation
  – Platform to consolidate Oracle Apps, FMW Apps & Databases

◆ Support
  – Single vendor support, standard configuration

◆ Manageability
  – EM monitoring (HW & SW), OVM Templates, Comprehensive patching

◆ Stability/ Reliability
  – Tested comprehensively for high reliability to run large workloads

◆ Provisioning
  – Shorter provisioning time
Lessons Learned / Takeaways

- Develop a Reference Architecture – Deployment Pattern
- Complete assessment of the legacy databases is needed
- Performance tuning is usually required
- Re-architecting the legacy DB implementation often needed
- Follow the Exadata consolidation best practices guidelines
- EM Cloud Control 12c for monitoring; need updated patchset (Plugin 12.1.0.4+) to be able to fully manage PDBs
- Training for DBA; hands-on workshop to learn concepts
- Accomplish the technical objectives for the platform
- Best practices need to be operationalized
- Size of DB Connection pool
MAA Implementation

- MAA Design is the key enabler
- Leveraging ASM for Database storage; optimized with redundancy
- Using Flashback & DataGuard with MaxPerformance mode
- Using RMAN to backup Database on external ZFS appliance
- Leveraging named network for IPoIB networks
- Databases are RAC enabled for High Availability
- Additional Database listener on 10GE Network
- Business continuity, while handling unplanned outages
- Maintenance in rolling manner, minimizes planned downtime
- With DataGuard the DB can be available at DR site with no data loss
- Next steps - Site Guard; DB listener on IB network
Our Vision

- **Exadata** - Primary DB platform for applications requiring high availability and performance (75% DBs will migrate to Exadata)
- **Exalogic** – Primary Application platform for Oracle applications and middleware requiring high availability and performance (75% APPS will migrate to Exalogic)
- Using Exadata with Multitenant12c for non-EBS DBs
- DB upgrade for various application databases to 12c
- Establish the framework for seamless and quick deployment of new applications
- Continue to achieve operational excellence by following the standards and best practices for applications and databases
- Upgrade EBS to R12.2 with Database to 12c, to minimize the application maintenance downtime
Q & A
Thank You !