

Upgrading to 12.2 in the cloud Tales from the battlefield

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Moscone West - 3001

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Secure-24 Company Overview



Highlights

- Founded 2001 in Southfield, MI
- 600+ employees, < 8% turnover
- 87% First Tier Resolution and 98% Customer Satisfaction
- Ranked one of ComputerWorld's 100 Best Places to Work in IT for 5 years running



Scale

- Trusted by clients with total annual revenues exceeding US \$1Trillion
- 16 consecutive years of double digit growth
- 200+ global customers
- 20+ global industries



Innovation

- Academy Model
- Highly automated
- All FLASH storage
- SLAs through the application layer
- Customer portal provides transparency
- 8% annual investment in R&D



Oracle Focus

- Certified Oracle Platinum Partner
- 240+ Oracle client environments
- Investment in advanced technology



Corporate Direction

- Build the leading IT Services company in United States
- Five Pillars: Quality, Customer Service, Security, Process and Automation
- Continue strong organic growth
- Support international expansion

Secure-24 has 16 years of experience delivering managed IT operations, application hosting, and support services to enterprises worldwide. We manage SAP, Microsoft, Oracle, and other mission critical applications across all industries.

Company Profile

FOUNDED

Secure-24 was founded in 2001 and since then has grown to 450 employees and has received recognition as one of Computerworld's Best Places to Work in IT

HEADQUARTERS

Secure-24 is headquartered in Southfield, MI



OPERATION CENTERS

Serving customers around the globe, Secure-24 has 2 Operation Centers in Michigan, 1 in Nevada and 1 in Hyderabad India.

DATA CENTERS

Secure-24 has 3 data centers in Michigan, 1 in Nevada, plus several global partnerships. We only choose the safest locations for our data centers.



Secure-24 is a leading provider of managed hosting, enterprise cloud computing and IT outsourcing. As an Oracle Gold Partner, Secure-24 delivers full technical support of Oracle EPM applications with proven methodology and demonstrated successes in infrastructure, management, upgrades, migrations and support engagements.

About Mike Gangler

- **Oracle ACE**

- Oracle DBA for over 30 years, working with Oracle since version 4
- Team Lead and Senior Database Specialist at Secure-24
- Currently serving on the board of the Southeast Michigan Oracle Professionals (SEMOP) group
- Currently serving on the board of the Michigan Oracle User Summit (mous.us)
- Charter member of the Board of Directors for the International Oracle Users Group (IOUG) – www.ioug.org
- Follow me on my Blog <http://mjgangler.wordpress.com>
- twitter! @mjgangler



Philosophies – Associated with this Project

- The Devil is in the details ~ Proverb
- “Plan for the worst, Hope for the Best”, - My First Manager

Today's Discussion

Case Study – Learn the battle field stories of migrating and upgrading databases from 11.2.0.2 to 12cR2

Agenda:

- Overview of project
- Challenges
- Upgrade / Migrate Strategies
 - Processes used to migrate data to the private cloud
 - Upgrade processes used and available to upgrade the databases
- Errors encountered and resolutions to the migrations and upgrades
- Lessons Learned
- Questions

Overview of project

- Moving, Migrating and Upgrading > 52 Oracle Databases
- Source of databases in Southern USA and Destination in Plymouth, MI.
- Databases moved in over by Applications in Pods
- Scope to reduce license costs and CPU's
- 14 Month Project
- Most Pods/migrations need to be completed during the weekends
- Agile Development – Constant Changes

Overview of project (cont)

- Source Database (Southern US)
 - 4 Exadata Machines (2 Production/ 2 Development)
 - Databases Running Oracle Version 11.2.0.2
 - Most Home Grown Applications
 - Database sizes between 50Gb and 11TB
 - Many Different Tnsnames files using databases (Citrix Servers)
 - Databases using ASM Storage
 - Databases in RAC Clusters between Exadata Machines
 - Approx. 252 CPU Oracle Cores between Exadata Machines

Overview of project (cont)

- Destination Database(s) (Plymouth, MI.)
 - Oracle Personal Cloud Appliance
 - 30 Machines setup using Oracle VM's (4 Production, 25 Dev,Test)
 - OEL6 Linux
 - Most Databases upgraded to 12.2
 - Handful of databases upgraded to 11.2.0.4
 - Multitenant Database (CDB)
 - Databases using DirectNFS / ZFS Storage (NON-ASM)
 - Non-RAC Databases
 - Trusted Partition License (.25 Core)
 - Approx. 236 CPU Oracle Cores Currently Setup

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Challenges:

- Network challenges – Southern States → Plymouth, Mi.
- Exadata had Hybrid Columnar compression datatypes
 - Tables had to be exported and imported during cutover
- Many Applications and databases not using primary keys
- Large databases (150 GB to 11TB)

Challenges (Con't):

- < 6 hours to migrate the data during the cutover
- Home Grown Applications using obsolete code (i.e. wm_concat)
- Many TNSNAMES.ora files spread across world – Different Citrix locations (About 25)
- 11.2.0.2 – Bug eliminated use of Network Exports/imports
- Asm Disk storage on Source – Non-ASM on Destination
- Lack of Patches applied – in over 3 years
- Application dependencies (i.e. database links had hardcoding Servers)

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 - Migrate and Upgrade Strategies (11.2.0.2 to 12.2 CDB)
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Migrate and Upgrade Strategies (11.2.0.2 to 12.2 CDB)

- Export , Copy, import
 - Issues with Large Databases
 - Network latency – Slow
 - Missing Synonyms, database links
 - Old Version with Bugs that eliminated Network Import
 - Slow process – Moving data 3 times
- DBUA
 - Latency issues
 - Use Source machines to upgrade
 - After Upgrade need to move Destination
 - Slow process – moving data multiple times

Migrate and Upgrade Strategies (11.2.0.2 to 12.2 CDB) - Con't

- Transportable Tablespaces
 - Network Latency
 - Application dependencies – sharing tablespaces
 - Bug with 11.2.0.2
 - Slow
- Standby database
 - Additional storage
 - Setup may take a few days
 - Best approach for most databases
- RMAN
 - Network Latency
 - Slow process – large databases
 - Additional Storage

Migrate and Upgrade Options (11.2.0.2 to 12.2 CDB) - Con't

- 3rd Party Tools:
 - Logical Replication
 - Streams
 - Golden Gate
 - DBVISIT
 - Issues with Application dependencies – Lack of primary keys, Exadata Columnar Compression,etc)
 - Costly
 - Many post cutover activities – i.e. rebuilding primary keys, sequences, compression data

Upgrade Strategies used to upgrade the databases

- Project Approach
 1. Planning
 2. Data Gathering
 3. Testing
 4. Upgrade/ Migration
 5. Quarterly Patching

Upgrade Strategies used to upgrade the databases (Cont)

- Step #1 – Create Standby Database on new location using RMAN restore – Prior to cutover.
 - NOTE – Used standby databases and dbvisit standby tool (Depends on size)
- – Step #2 – During cutover
 - Apply Logs, Open database in upgrade mode
 - Upgrade database to 11.2.0.4 –
 - \$OH/rdbms/admin/catupgrd.sql, catuppst.sql
- Step #3 – Run Pre-upgrade script
 - Run Oracle 12c – pre-upgrade script on 11.2.0.4 database
 - Fix Errors (i.e. Apex, 10G passwords)

Upgrade Strategies used to upgrade the databases (Cont.)

Step #4 - Database Upgrade : upgrade your current database to Oracle 12c

- Database Upgrade Assistance(DBUA)
 - Manual upgrade using parallel Upgrade Utility /command-line tools
 - Parallel Upgrade Utility: catctl.pl and dbupgrade Script
-
- Step #5 - Move to Container Database
 - Using non-cdb to PDB approach
 - Create pluggable database <pdb_name> using tnsnames nocopy
 - NOTE – Use nocopy so data is used and not duplicated
 - Step #6 – Recompile objects, validate and test

Results of actions

- Databases – 2Terabyte and 500Gb database
 - Total time to migrate(move) and upgrade – 6 Hours
 - 2 of 6 hours was due to backup of db prior to upgrade to 12.2
- Databases – 300gb (3 databases)
 - Total time – 4 hours (including backups)

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- **Errors encountered and resolutions to the migrations and upgrades**
- Lessons Learned
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Errors encountered and resolutions to the migrations and upgrades

- Apex – Issues with no APEX installed in CDB
 - Install latest Apex version in CDB
 - Update APEX in 11.2.0.4 to same version in cdb
- Character Sets
 - Make sure CDB Characterset is highest Level (AL32UTF8)
 - In 12.2 – PDB's can have different charactersets as long as it is part of CDB Characterset
- 10G User passwords
 - In 10G – Passwords were case “Insensitive”
 - In 12cR2 – Case Insensitive Not allowed
 - Set SQLNET.ALLOWED_LOGON_VERSION_SERVER=11
 - Change password to case insensitive – before moving
 - Lock userid during upgrade

Errors encountered and resolutions to the migrations and upgrades (cont.)

- Cognos and other applications use “SID” versus Service Name
 - Set `USE_SID_AS_SERVICE_<LISTENER_NAME>=on`
- XDB component is mandatory in Oracle Database 12c
- Sync PDB failed with ORA-40365 while performing 'alter user sys account lock password expire'
 - With 12cR2 – Sys User can be now locked
 - Regenerate the password file (Old password file)
- Preserve Statistics (Before upgrade)
- Database option mismatch: PDB installed version NULL. CDB installed version 12.2.0.1.0.
 - Need to register database options – i.e DV (not Install – register only) – usually a warning

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Lessons Learned

- Plan your major upgrade process – Prepare upgrade
- Understand the new database release, research and select the upgrade
- path/method, develop the test plan, backup plan, prepare upgrade scripts – Test your upgrade process:
 - Perform test upgrade on your test database.
 - Test the upgraded test database
- Save the prior version statistics



Lessons Learned (Cont.)

- Perform the tests on the upgraded test database, identify/fix issues
- test the upgraded test database: functionality tests/performance tests
- Prepare the upgrade, backup the current production database (prior to upgrade)– Upgrade the production Database
 - If Available Save/resort points



Lessons Learned (Cont.)

- Perform the upgrade, make another backup after the upgrade
- Tune and adjust the new production database
- Tune the database, use the database new features and adapt any new DBA procedures
- Pre-upgrade script is your friend
- If standby dataguard is not available, consider using Level 0 backup and applying level 1 backups prior to cutover



Lessons Learned (Cont.)

- Delete the Database Recycle Bin
- Check for INVALID and Duplicate Objects in the SYS and SYSTEM Schemas
- Remove Outdated and Obsolete Parameters
 - SELECT name
 - FROM v\$parameter
 - WHERE isdeprectated ='TRUE'
 - ORDER BY name;



Lessons Learned (Cont.)

- Check for INVALID Components
 - `SELECT comp_name component, version, status`
 - `FROM dba_registry;`
- Check for Mandatory Components
- Remove Obsolete Components
- Apply Patch Sets, Critical Patch Updates (CPUs), and Patches
- Plan (Time) and expect issues to occur



Oracle Conferences in Detroit Area
Southeast Michigan Oracle Professionals

<http://www.meetup.com/SouthEast-Michigan-Oracle-Professionals/>

Meet monthly – 2nd Tuesday of the month
Secure-24 building

ORACLE-L list

- Global email forum
 - Over 20 years old now and still going strong
 - Anyone can subscribe and listen
 - Must ask moderator for the right to post
- Subscribe via <http://www.freelists.org/list/oracle-l>
- Archives at <http://www.freelists.org/archive/oracle-l/>
 - All conversations back to Jan 2004 is archived and available for searching

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Questions



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