Oracle RDBMS 12c New Features

THEMA AVOND

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Grid IT

Agenda

- Chapter 1: Introduction
- Chapter 2: Multitenant Architecture
- Chapter 3: Upgrade Features
- Chapter 4: Flex Cluster
- Chapter 5: Global Data Service
- Chapter 6: Overview RDBMS Features

vijfhart

Introduction

- Wie heeft 12c launch van Oracle bekeken?
- Wie denkt.. Kan ik deze release niet overslaan?
- Wie heeft de 12c documentatie bekeken?
- Wie heeft 12c geïnstalleerd?
- Wie heeft een omgeving gemigreerd naar 12c?
- Wie heeft 12c in productie?
- Wie wil volgend jaar beginnen met 12c?

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Introduction

- National Institute of Standards and Technology's (NIST) definition of cloud computing:

> Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction

Introduction

- Oracle RDBMS 12**c** designed for the **cloud**
  - **Continue to increase service levels**: Multitenant, Data Guard far Sync, Global Database Services
  - **Provide continuities availability**: Flex Cluster, Global Data Service, Application Continuity, Flex ASM
  - **Manage many database as one**: Multitenant
  - (**Rapid) Provisioning and Cloning**: Cloud Control, Duplicate Database features, DBClone
  - **Manage Data Growth**: Partitioning, ASM, Heat Map, Big Data
  - **Defense-In-Depth for maximum Security**: Separation of duties, Comprehensive Auditing, Privilege Analysis


ORACLE
DATABASE
12c
ORACLE
Building Flow

- Chapter 1: Introduction
- Chapter 2: Multitenant Architecture
- Chapter 3: Upgrade Features
- Chapter 4: Flex Cluster
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Introduction

- Database consolidation when you have many databases
- Reducing the number of separate databases
- But keeping database applications isolated and unchanged
- Will lower the overhead in relation to hardware and number of databases on a host
- Will lower the costs for administration and operation

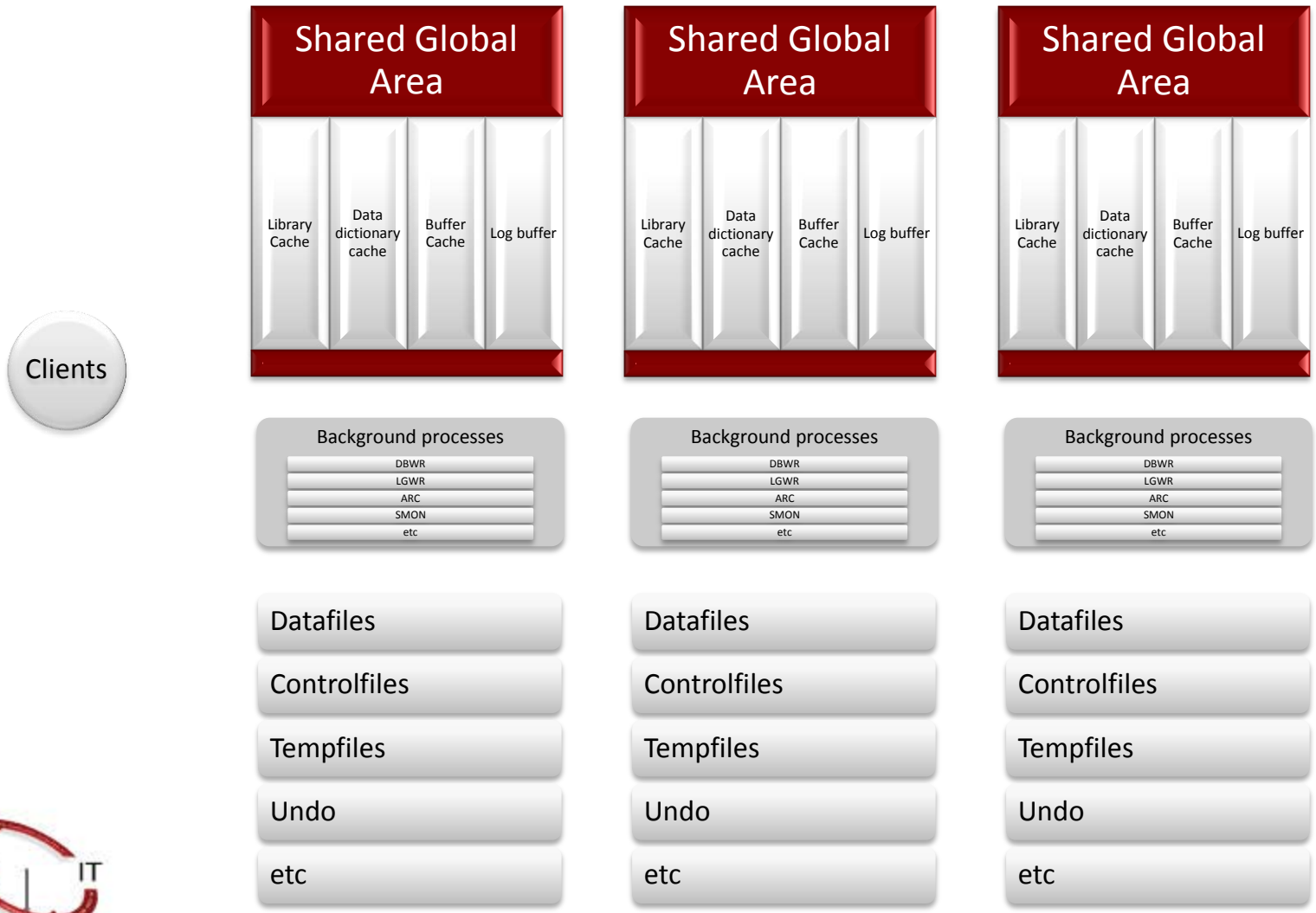
- Simplify patching and upgrading
- Challenges in manageability and resource management

Introduction

- Fast provisioning of a new or existing database
- Fast redeployments by unplug and plug of a database
- Patch or upgrade by unplug and plug into a container database of a higher version
- Quickly patch or upgrade many databases in one run

- License: <> Enterprise Edition, one Container Database with one Pluggable database allowed

Concept


Clients
Shared Global Area
Library Cache
Data dictionary cache
Buffer Cache
Log buffer
Shared Global Area
Library Cache
Data dictionary cache
Buffer Cache
Log buffer
Shared Global Area
Library Cache
Data dictionary cache
Buffer Cache
Log buffer
Background processes
DBWR
LGWR
ARC
SMON
etc
Background processes
DBWR
LGWR
ARC
SMON
etc
Background processes
DBWR
LGWR
ARC
SMON
etc
Datafiles
Controlfiles
Tempfiles
Undo
etc
Datafiles
Controlfiles
Tempfiles
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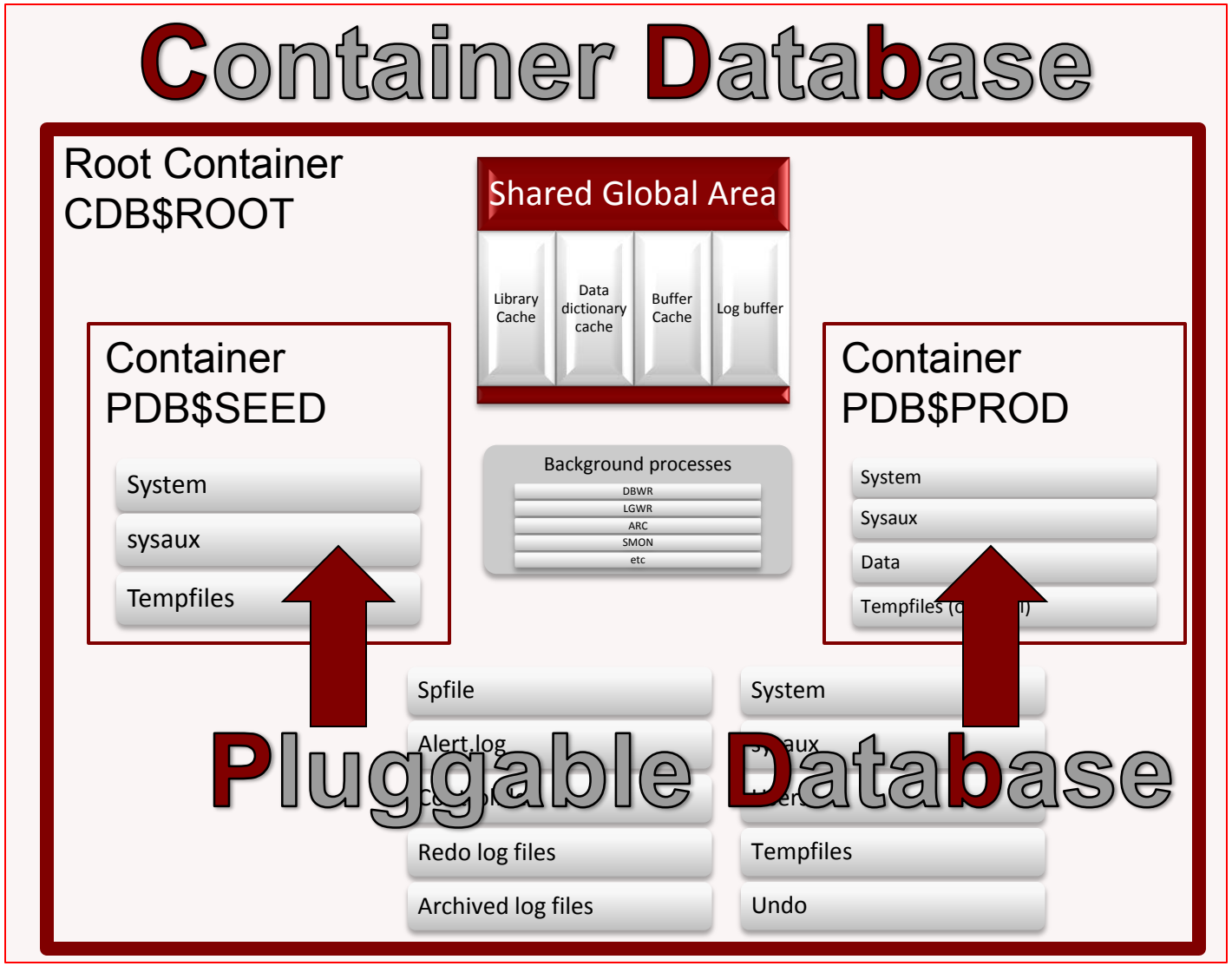
etc
Datafiles
Controlfiles
Tempfiles
Undo
etc

Concept - CDB


Container Database
Root Container
CDB$ROOT
Shared Global Area
Library Cache
Data dictionary cache
Buffer Cache
Log buffer
Container
PDB$SEED
System
sysaux
Tempfiles
Background processes
DBWR
LGWR
ARC
SMON
etc
Container
PDB$PROD
System
Sysaux
Data
Tempfiles
Clients
Spfile
Alert log
Redo log files
Archived log files
System
Tempfiles
Undo
Pluggable Database

Concept - CDB

- Concept of Container Database (CDB) architecture
- Concept of Pluggable Database (PDB) architecture
- Before Oracle 12c we now talk about non-CDB architecture
- System Database Administrators connect to the CDB as a whole
- System Database Administrators connect to a PDB or the PDB admin user connects to manage the PDB

Concept - CDB

- Inside the Container Database there is only one ***Root*** Container
- Inside the Container Database there can be more other types of containers
- Those containers are called ***Pluggable Databases*** (PDB)
- Up to 252 PDB containers can be added in a container database
- For users and application like the < Oracle 12c databases

Concept - CDB

- Container Database has a Container Database Instance
- The container/instance itself has container ID 0 (zero)
- Inside the Container Database there is the ***Root*** Container
  - Oracle provided container, will always exists
  - Name is *CDB$ROOT*, container ID 1
  - *CDB$ROOT*, is like repository
  - Service-name is equal to the *CDB name*
  - Physically contains the following files:

controlfiles, redo log files, system, sysaux, users, tempfiles, undo

Concept - PDB

- Inside the container, like the default root container, a **seed** pluggable database exists
- This **seed** pluggable database is called *PDB$SEED*
- Container ID for PDB$SEED is 2
- PDB$SEED exists only for cloning, create a new PDB in just a few seconds
- PDB$SEED contains a system tablespace, sysaux tablespace and tempfile.

Concept - PDB

- Pluggable Databases share the SGA with others
- Each block in the buffer cache has a reference to a PDB id
- PDB has its own Data Dictionary, but shares common objects of the root container
- PDB data dictionary size is around 200MB

Multitenant Database

Training

- Training **Oracle Database 12c: Multitenant Database**

  - Introductie - concept
  - Software installatie
  - Creatie 12c Database Containers
  - Administratie van Database Containers - Pluggable
  - Backup en Recovery Database Containers

  - Datum: 25 November 2013

Questions

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Upgrade

- *some* Upgrade 12c New Features
  - New Pre-Upgrade Information Tool
  - Parallel Processing for Database Upgrade
  - Enhanced Pre and Post Upgrade Summary Report
  - Grid Infrastructure Upgrade Enhancements
  - Oracle XML Database
  - Pluggable Databases

Direct Upgrade

- Direct Upgrade to Oracle RDBMS release 12c

Source Database	Target Database
10.2.0.5	12.1.X
11.1.0.7	12.1.X
11.2.0.2 or higher	12.1.X

Indirect Upgrade

- Indirect Upgrade to Oracle RDBMS release 12c

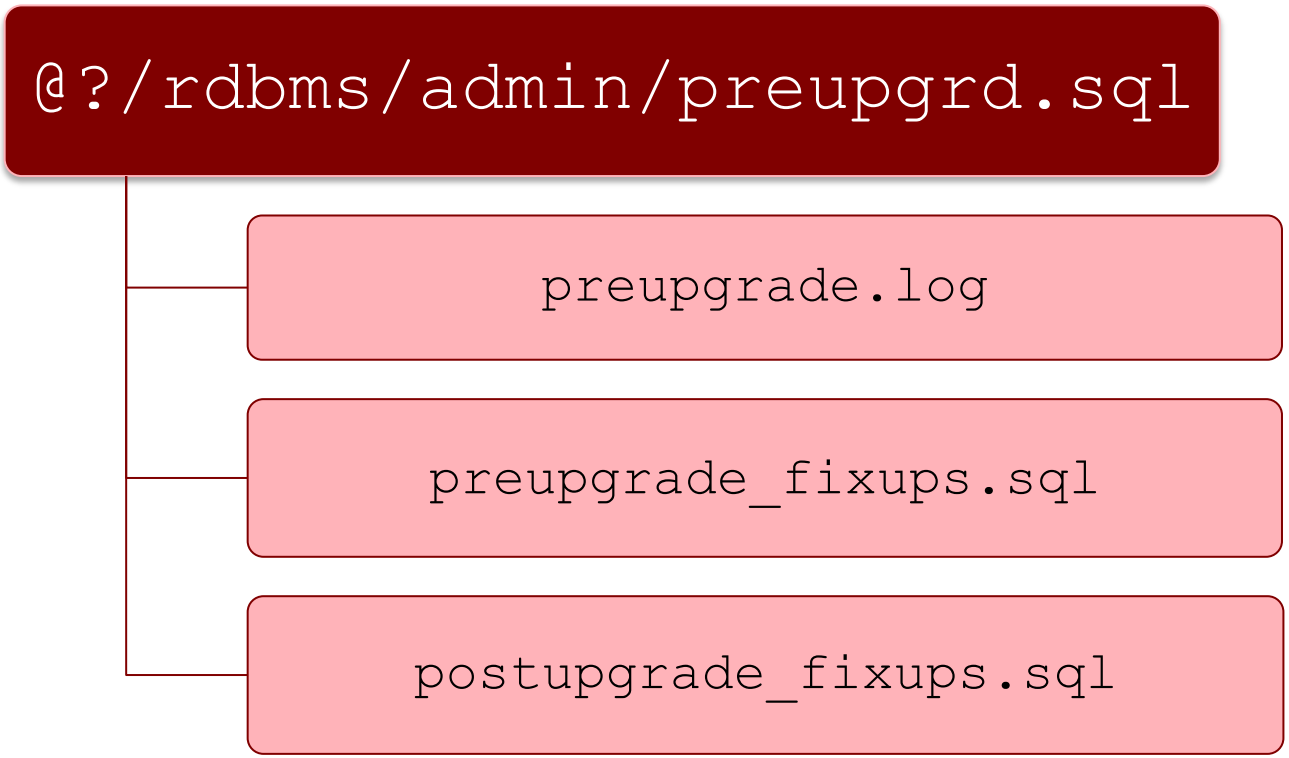
Source Database	Intermediate Upgrade	Target Database
11.2.0.1	11.2.0.2 or higher	12.1.X
11.1.0.6	11.10.7 or => 11.2.0.2	12.1.X
<=10.2.0.4	10.2.0.5 or higher	12.1.X
<=10.1.0.5	10.2.0.5 or higher	12.1.x
<=9.2.0.8	9.2.0.8 -> 11.2.0.2 or higher	12.1.x

Pre-Upgrade Tool

- Run the pre-upgrade tool in all cases
- Copy the `preugrd.sql` and `utluppkg.sql` from 12c ORACLE HOME environment
- Execute `preupgrd.sql` in the source database
- Also possible to use SQLPLUS from 12c environment and connect to source database
- Examine the output

Pre-Upgrade Tool

- Log location: `$ORACLE_BASE/cfgtools/…/preupgrade`



Parallel Processing

- Parallel Processing for Database Upgrade
  - Previous release only recompile was in parallel
  - Integrated in Database Upgrade Assistant
  - Database Upgrade Assistant **default** runs in parallel
  - `catupgrd.sql` called by `catctl.pl`

```
SQL> startup upgrade
SQL> exit

$ORACLE_HOME/perl/bin/perl
$ORACLE_HOME/rdbms/admin/catctl.pl -n 4 -l
$ORACLE_HOME/diagnostics catupgrd.sql
```

Upgrade

Training **Oracle Database 12c: Migreren naar RDBMS 12c**

- Introductie upgrade naar Oracle RDBMS 12c
- Upgrade New features 12c
- Voorbereiden upgrade naar Oracle RDBMS 12c
- Uitvoeren migratie naar Oracle RDBMS 12c
- Overzicht Oracle RDBMS 12c features

- Datum: 26 November 2013

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Grid Infrastructure

- *some* GRID Infrastructure features:
  - Application Continuity
  - Flex Cluster
  - What-if options
  - Generic Agent – Application Agents
  - Server Categories
  - Multi-Cluster GNS
  - Multi-Subnet SCAN
  - Management Database
  - OCR backup stored in ASM

Cluster Types

- Three types of Cluster introduced in Oracle 12c:
  - **Standard Clusters:**

    This is the type of cluster which customer have running as non-Oracle 12c environment. Or have installed during a Oracle 12c cluster configuration and not selected to use a Flex Clusters. Max number of nodes are 64

  - **Flex Clusters:**

    This is a new type of Cluster introduced in Oracle 12c, which can be larger than the standard cluster. Max 200 nodes, where HUB nodes max will be 64 and Leaf Nodes 136

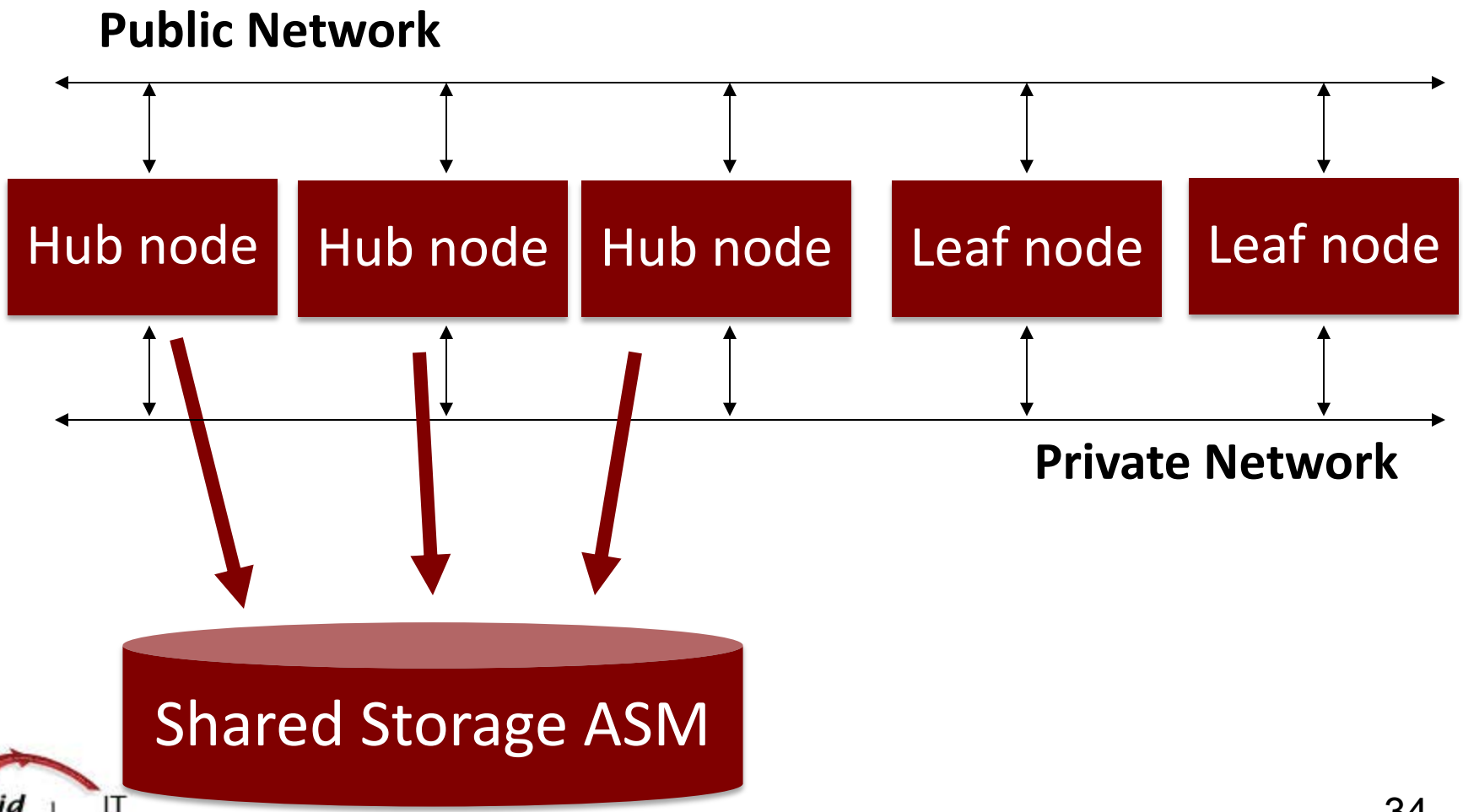
  - **Application Clusters:**

    Build a cluster environment for you applications to run on

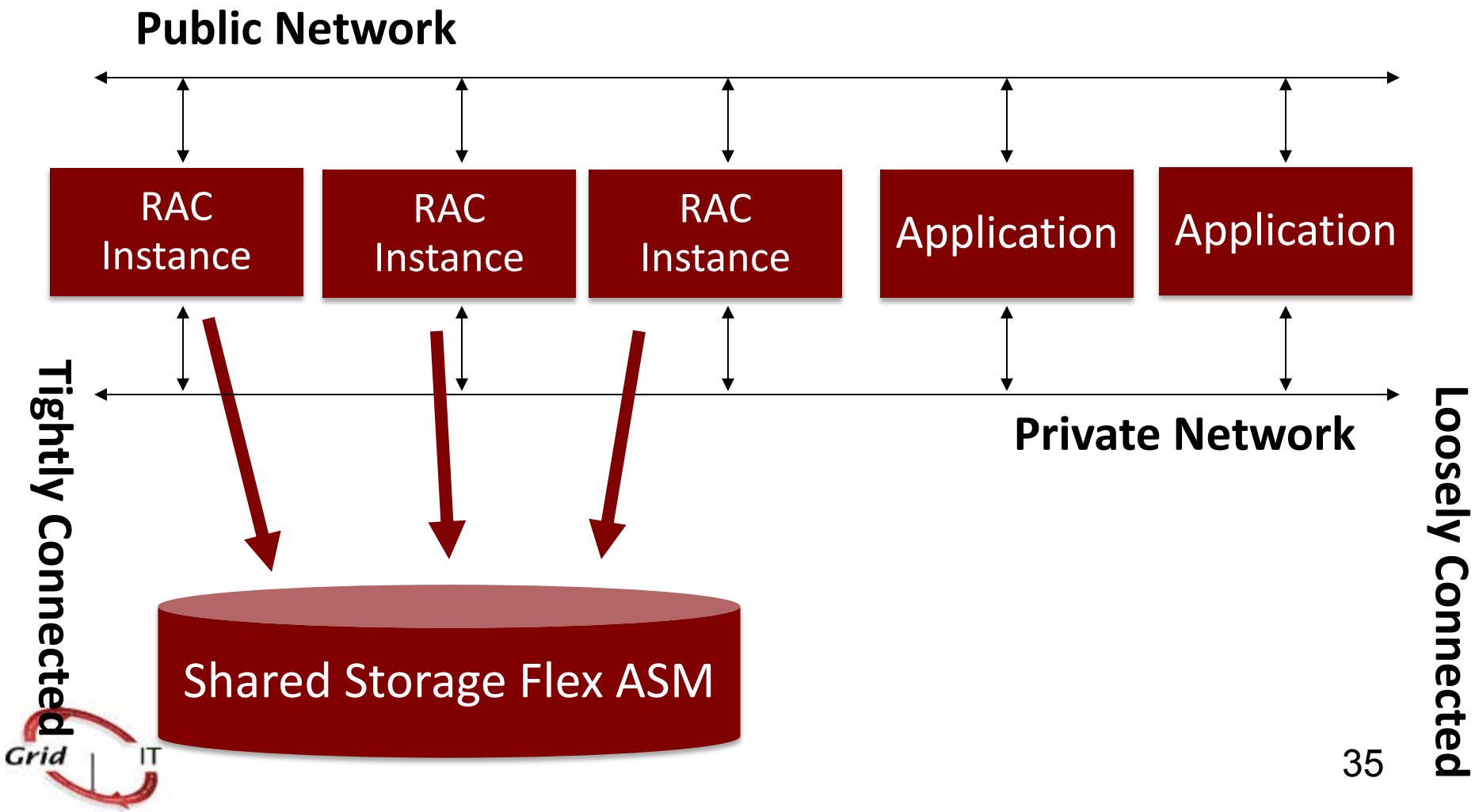
Flex Clusters

- Flex Clusters:
  - Scalable, dynamic, robust network of nodes
  - Provide a platform for a variety of applications, one of the applications can be an Oracle RAC database
  - Provide a platform for other service deployments for (automatic) High Availability
  - Large number of nodes up to 200
  - Introduce two type of nodes: **Hub Nodes** and **Leaf Nodes**

Flex Cluster



Flex Cluster



Flex Clusters

- Hub Nodes:
  - Are tightly connected with other servers in the cluster
  - Have direct access to shared storage
  - Hub nodes are the same as nodes in a standard cluster
  - Up to 64 nodes in a Flex Cluster
  - Hub node can be an anchor for a Leaf Node
  - Flex Cluster can exists of only Hub Nodes

Flex Clusters

- Leaf Nodes:
  - Introduced in Oracle 12c
  - Leaf Node can exists only if one or more Hub nodes exists
  - Servers that are loosely coupled with Hub nodes
  - Don’t require direct access to shared storage
  - Requests data through Hub Nodes
  - Provide a platform for a variety of applications, but no Oracle database instances
  - Up to 4 nodes for one Hub anchor

Flex Clusters

- Flex Cluster validation:

```
$ crsctl get cluster mode status
Cluster is running in "flex" mode


$ olsnodes –n –i -s -a
server52        1       176.16.0.136    Active  Hub
server53        2       176.16.0.128    Active  Hub
server54        100     <none>  Active  Leaf

$ crsctl get node role config -all
Node 'server52' configured role is 'hub'
Node 'server53' configured role is 'hub'
Node 'server54' configured role is 'leaf'
```

Flex ASM

- Manage FLEX ASM
  - srvctl config asm display a count value if Flex ASM is enable
  - Make sure value all is displayed if pre 12c database are host
  - ASMCMD commands to validate Flex asm: `showclustermode`

```
$ srvctl config asm

$ srvctl modify asm -count ALL

$ srvctl modify asm -count 2

ASMCMD> showclustermode
ASM cluster : Flex mode enabled
```

Flex Clusters

GI – ASM - RAC

- Training **Oracle Database 12c: GRID Infrastructure en Automatic Storage management**
  - Planning eerste kwartaal 2014, Vijfhart blog – cursus agenda
- Training **Oracle Database 12c: Real Application Cluster Administration**
  - Planning eerste kwartaal 2014, Vijfhart blog – cursus agenda

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New Features 12c

- (some) Data Guard features:
  - Global Data Services – out of the box for applications
  - Easier failover functionality – validate database
  - Far sync standby
  - SYSDG administration privilege
  - Active Data Guard, DML on temporary tables, sequences, rolling upgrade
  - Create DG solution for CDB
  - Support Application Continuity
  - Resume switchover after failure
  - Trigger fast start failover from application layer

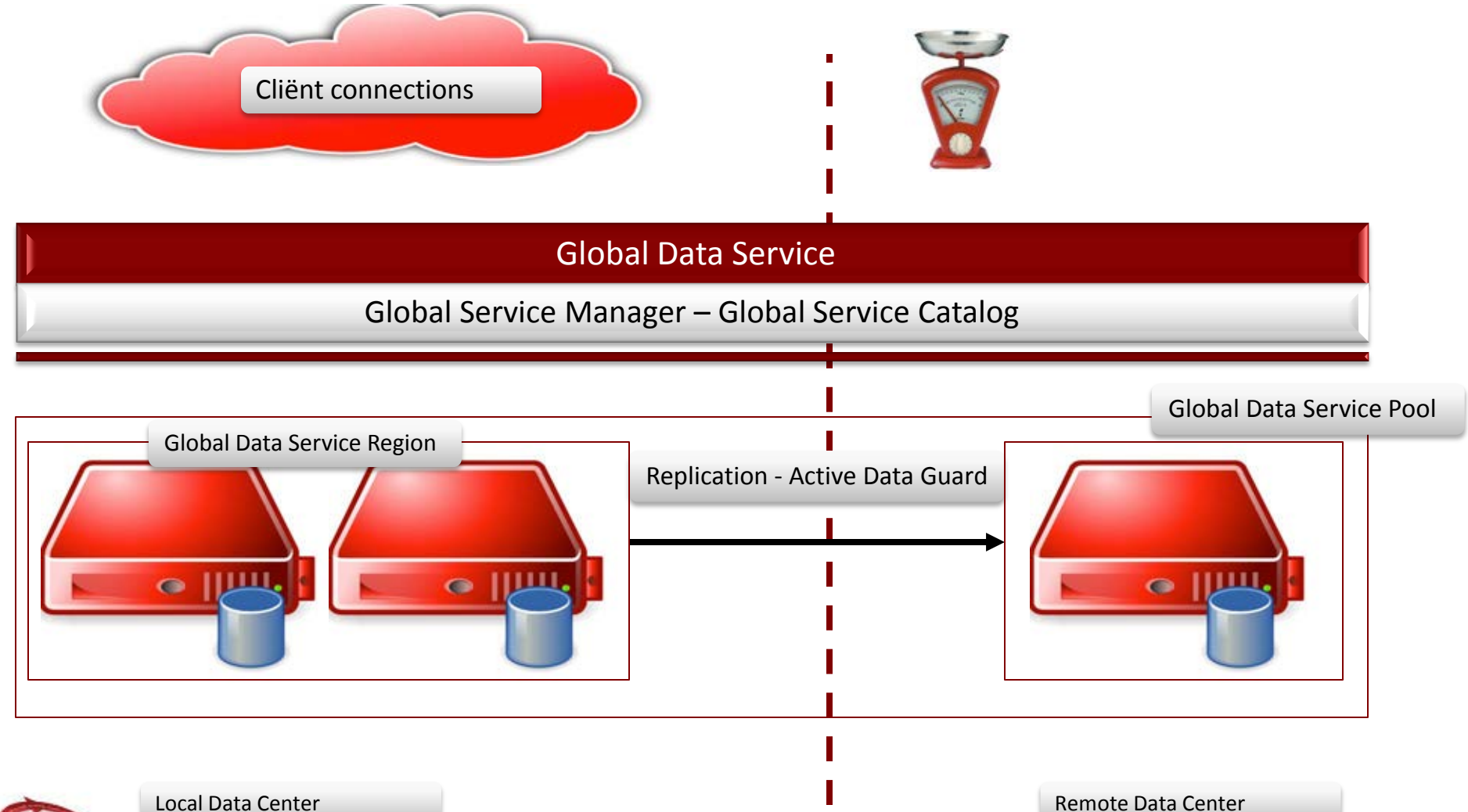
Global Data Services

- Oracle Global Data Services:
  - Global solution for Replicated Databases
    - Oracle Active Data Guard
    - Oracle GoldenGate
  - Implements the Database Service Model across a set of replicated databases
  - A virtual Multi-Instance database to database clients
  - Global Data Services span the instance of multiple databases, where local service span the instance of a single database
  - Global Data Services also called GSD Configuration

Components

- Global Data Services Components:
  - Global Data Services Pool
  - Global Data Service Region
  - Global Service Manager
  - Global Database Services Catalog
  - Oracle Notification Service Servers

Global Data Service



Data Guard

- Training **Oracle Database 12c: Data Guard Administration**

  - Planning eerste kwartaal 2014, Vijfhart blog – cursus agenda.

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General

- *some* General 12c New Features
  - Oracle Multitenant Architecture
  - CloneDB
  - Multiple indexes on Same Set of Columns
  - Online DDL operations
  - Invisible Columns
  - Data Pump full transport
  - Enterprise Manager Database Express
  - Temporary undo
  - Resource Manager Runaway Queries

Temporary Undo

- Temporary undo
  - Reduce the amount of redo stored in the undo tablespace
  - Better undo retention for transactions
  - Reduce the size of redo log
  - Reduce the sending and archive of redo
  - DML possible in Active Data Guard for temporary tables
  - Session or Database level

Temporary Undo

```
SQL> create global temporary table temp_myemp
(empl_id number(5),dept_id number(5),salary
number(8,2),gender varchar2(1),dob date,address
varchar2(40));

SQL> alter session set temp_undo_enabled=true;


SQL> select name, value from v$mystat natural
join v$statname where name = 'redo size' or
name = 'redo entries';

NAME                 VALUE
-------------------- ----------
redo entries         56
redo size            15408
```

Multiple Same column indexes

- Previous release: `ORA-01408: such column list already indexed`
- Create more that one index on the same set of columns
  - Easy testing of changing indexes and the (positive) impact on the performance
  - “ Online” index changes
  - Additional index must be created invisible

Multiple Same column indexes

- Multiple Same column indexes :

```
SQL> create index myemp_i_indx1 on
myemp(empl_id,dept_id);

SQL> create index myemp_i_indx2 on
myemp(dept_id);


SQL> create bitmap index myemp_i_indx3 on
myemp(empl_id,dept_id);
ERROR at line 1:
ORA-01408: such column list already indexed

SQL> create bitmap index myemp_i_indx3 on
myemp(empl_id,dept_id) invisible;
```

Recovery Manager

- *some* RMAN features:
  - Recover Tables and Table partitions (PIT) from backup
  - Restore – Recover files over network (from DG environment)
  - Multi-section backup make use of block change tracking
  - SQL improvement, no “SQL” required
  - `SYSBACKUP` administration privilege
  - Backup – Restore CBD and PDBS
  - Unified Auditing and RMAN
  - Move datafiles online (read/write continue)

Recover over Network

- Restore – Recover files over network
  - Useful in scenarios to synchronize primary and standby database
  - Connect to a physical standby database
  - Tablespace, spfile, Data files or entire database
  - Backup sets are used to restore
  - Multisection backup can be used
  - Incremental backups can be used
  - Primary to standby database
  - Standby to primary database

Recover over Network

- Restore – Recover files over network
  - Use the `FROM SERVICE` clause
  - As target connect to the database which requires recovery
  - `RECOVERY` clause will create incremental backups on primary location and transfer when done

```
RMAN> connect target / as sysbackup;
RMAN> restore datafile 5 from service mystandby
section size 200m;

RMAN> connect target / as sysbackup;
RMAN> recover database from service myprimary
section size 200m using compressed backupset;
```

Security

- *some* Security features:
  - Database Auditing
  - Role and Privilege Analysis
  - Data Redaction
  - Security Control Enforcements
  - Database Application Security Architecture
  - Database Vault
  - Password Complexity Check

Password Complexity

- Three password verification functions provided:
  - `verify_function_11g`
  - `ora12c_verify_function`
  - `ora12c_strong_verify_function`
  - All function are part of `utlpwdmg.sql`
  - Applies to non-SYS users and is Pluggable aware

```
SQL> ALTER PROFILE DEFAULT LIMIT
password_verify_function <optie>;


SQL> SELECT * FROM DBA_PROFILES WHERE PROFILE =
'DEFAULT';
```

Password Complexity

- Verify_function_11g:
  - Password contains between 8 and 30 characters
  - Password is not equal the server name, or backward or appended 1-100
  - Password is not equal the user name, or backward or appended 1-100
  - Password is not too simple
  - Password differs from the previous password by at least 3 characters
  - Password includes at least 1 numeric and 1 alphabetic character
  - Password does not contain “

Password Complexity

- Ora12c_Verify_function:
  - Default when `utlpwdmg.sql` is used
  - Password contains between 8 and 256 characters
  - Password is not equal the server name, or backward or appended 1-100
  - Password is not equal the user name, or backward or appended 1-100
  - Password is not too simple
  - Password differs from the previous password by at least 3 characters
  - Password includes at least 1 numeric and 1 alphabetic character
  - Password does not contain “

Password Complexity

- Ora12c_strong_verify_function:
  - Recommended by Department of Defense
  - Password contains between 9 and 256 characters
  - Password differs from the previous password by at least 4 characters
  - Password does not contain “
  - Password contains two upper case, two lower case, two numeric characters and two special characters

```
'~   !   @   #   $   %   ^   &   *   (   )   _
-+   =   {   }   [   ]   \   /   <   >   ,   .
;?   '   :   |   (space)
```

Performance Features

- *some* Performance features:
  - Adaptive statistics – if # rows <> estimate, dynamic sampling
  - Adaptive execution plans
  - Real Time ADDM – every 3 seconds
  - Data pump with nologging option
  - PGA aggregate limit
  - Bulk load will gather stats after the load automatically
  - `DBMS_STATS` report function
  - I/O tracking

PGA_AGGREGATE_LIMIT

- PGA usage can lead to swapping, unstable – unresponsive systems
- Parameter to specify a hard limit on PGA memory usage to overcome this issue
- `PGA_AGGREGATE_LIMIT` introduced in 12c
  - Default value is 2GB or
  - 200% of PGA_AGGREGATE_TARGET or
  - 3MB * value process parameter
  - Dynamically set at database - instance level
  - Value listed in alert.log

PGA_AGGREGATE_LIMIT

- `PGA_AGGREGATE_LIMIT` exceeds its value?
  - sessions or processes can be aborted - terminated which consuming most un-tunable PGA
  - Parallel Queries treats as a single unit
  - First abort sessions, if not enough terminated sessions
- Value regardless automatic memory management configuration
- Define the value of 0 will disable this feature

PGA_AGGREGATE_LIMIT

- PGA_AGGREGATE_LIMIT:

```
SQL> show parameter pga_aggregate_limit

NAME                                 TYPE        VALUE
------------------------------------ ----------- 
pga_aggregate_limit                  big integer 2G

Mon Sep 16 09:07:53 2013
Using default pga_aggregate_limit of 2048 MB

ORA-00028: your session has been killed ORA-
04036: PGA memory used by the instance exceeds
PGA_AGGREGATE_LIMIT PGA memory used by the
instance exceeds PGA_AGGREGATE_LIMIT of 2048 MB
```

General

Training

- Training van 4 dagen Oracle New Features 12c
  - Oracle RDBMS 12c een introductie
  - Oracle RDBMS Multitenant Architectuur
  - RMAN New Features
  - Security New Features
  - SQL Tuning Features
  - DWH en ILM New Features
  - Overige handige features voor de DBA
  - Datum: 21 t/m 24 Januari 2014 – 18 t/m 21 Maart 2014

Questions

vijfhart

Thank You !

Grid