informacijski inženjering

20. hroug
godišnja konferencija

Downgrade Oracle Database Enterprise to Standard

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About me

- Oracle ACE 2011
- Working with Oracle technology since 1989
- Installation, configuration and support for various Oracle products
  - Database
  - Internet application server
  - Fusion middleware
  - Hyperion EPM
- System architect
  - Architecture planning
  - Capacity planning
  - Performance tuning
- Numerous successful projects based on Oracle technology
- Trainer experience, Oracle courses for
  - Database administrators
  - Application server administrators
- Speaker on various Oracle conferences
  - IOUG
  - EOUG
  - HrOUG
  - SiOUG
  - SrOUG

Why downgrade ?

- Reduce licensing cost – standard edition at least three times cheaper than enterprise edition
- Standard edition is licensed per processor and not per core
- There are no per processor minimums – minimum is 5 NUP licenses
- Limited by maximum number of server sockets:
  - Standard edition four sockets
  - Standard Edition One two sockets

Why downgrade ?

- Virtualization
- If you virtualize Enterprise edition database with Vmware or Xyper-V you must license all server physical cores – licensing based on virtual cores is not allowed
- Licensing per virtual cores is allowed only if you use Oracle virtualization products: Oracle VM or Solaris containers

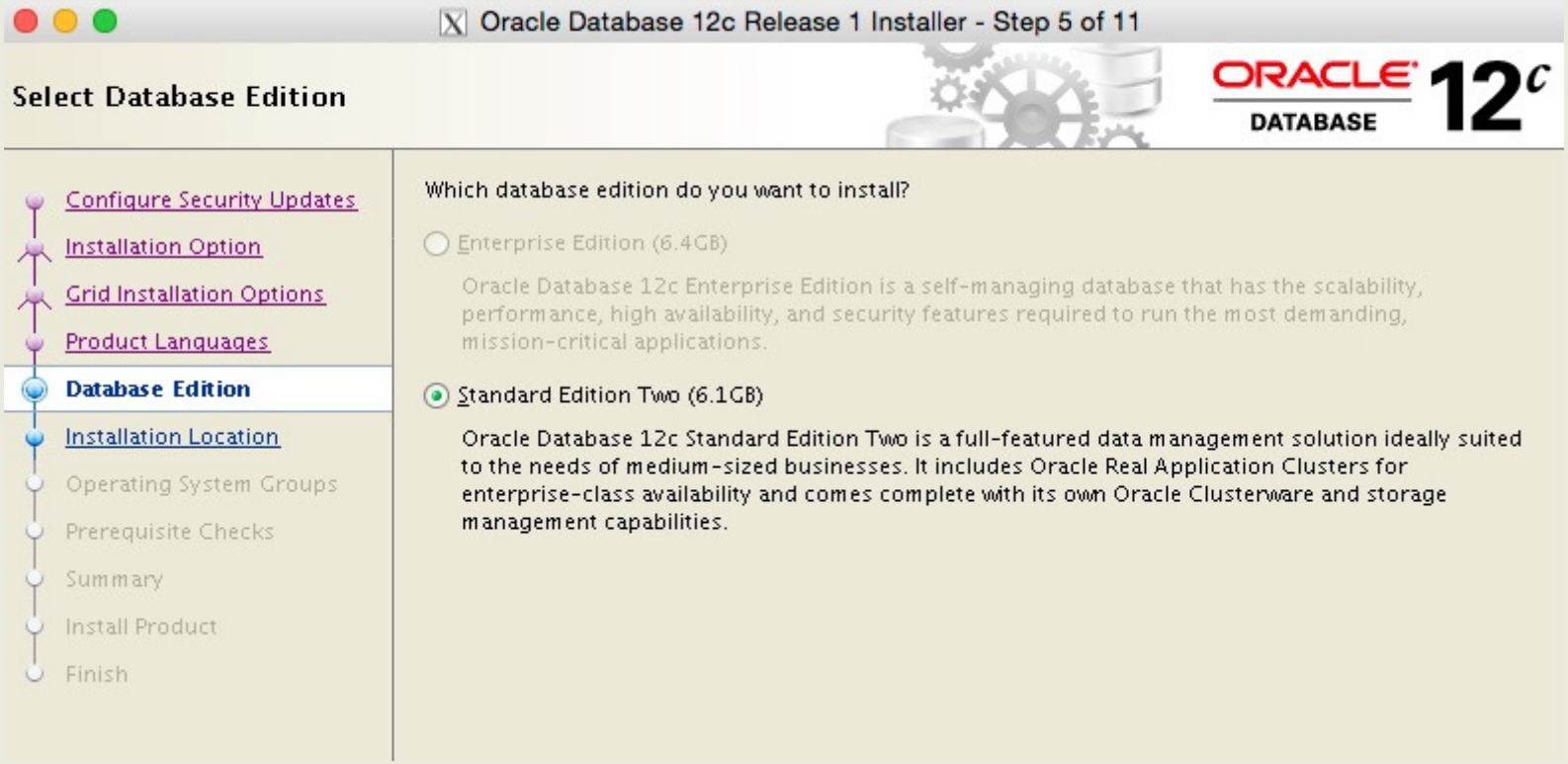
Oracle Database Standard Edition 2

- SE2 will be released on September 1, 2015 with initial Database 12c release version 12.1.0.2 (there is no plan to create SE2 release on earlier versions of the database).
- SE2 Pricing is $17,500/socket (same as SE). Named User Plus (NUP) remains $350, but NUP minimum is now 10 per Server (the minimum is no longer per customer).
- SE2 will continue to include RAC (RAC clusters are limited to 2 nodes, and each node must be a single-socket server)
- SE2 usage limitations: SE2 may be licensed to run only on servers with maximum of two (2) sockets.

Oracle Database Standard Edition 2

- each Oracle Database Standard Edition 2 database may use a maximum of 16 CPU threads at any time.
- when used with Oracle Real Application Clusters, each Oracle Database Standard Edition 2 database may use a maximum of 8 CPU threads per instance at any time.

Oracle Database Standard Edition 2



Oracle Database Standard Edition 2

- SE and SE1 customers will continue to receive Premier Support for existing licenses through the terminal release. Support Details:
  - Release 12.1.0.1: Premier Support will continue until September 1, 2016. At that time, SE and SE1 will go into Sustaining Support
  - Release 11.2.0.4: The release is currently within Extended Support. The Extended Support fees have been waived for the first year of Extended Support, 2/1/15-1/31/16.

Oracle Database Standard Edition 2 License Migration

- Customers may migrate from SE to SE2 using 1:1 migrations (Processor or NUP). There is no license or support charge for the migration
- Migrating customers must accept contractually the new SE2 License Definitions and Rules described above.
- This means that existing SE customers must comply with new SE2 limitations:
  1. 2-socket maximum server size (SE was 4-socket),
  2. Technical 16 thread cap per database will apply in SE2, and
  3. 10 NUP per Server minimum (was 10 min per customer)

Oracle Database Standard Edition 2 License Migration

- Depending on the SE customer's environment, they may need to
  1. downsize server to 2-sockets if they had deployed on 4-socket server(s),
  2. purchase additional Named User Plus licenses to comply with the SE2 minimum, or
  3. possibly upgrade to Oracle Database Enterprise Edition if they were running SE database on >16 threads.

Oracle Database Standard Edition 2 License Migration

- Customers may migrate from SE1 to SE2 using 1:1 migrations (Processor or NUP). There is a migration fee equivalent to 20% uplift in current SE1 support fee
- Migrating customers must accept contractually the new SE2 License Definitions and Rules described above.
  1. 2-socket maximum server size (SE1 was 2-socket, no change),
  2. Technical 16 thread cap per database will apply in SE2, and
  3. 10 NUP per Server minimum (was 5 NUP min per customer)

Oracle Database Standard Edition 2 License Migration

- Depending on the SE1 customer's environment, they may need to
  - purchase additional Named User Plus licenses to comply with the SE2 minimum, or
  - possibly upgrade to Oracle Database Enterprise Edition if they were running SE1 database on >16 threads.

What you must check before downgrade?

- Are your applications using some Enterprise features
- To check you can query DBA_FEATURE_USAGE_STATISTICS view
- This view contains information about enterprise features that you are using
- Information from this view is used primarily for license audit to check if you are using some non licensed features

What you must check before downgrade?

- This view does not contain information about all enterprise features
- For instance this view does not check if materialized view uses query rewrite
- The only way to make sure that your applications are not using any enterprise features is to test them against downgraded standard edition database
- If your applications are using some enterprise features can you easily replace them with equivalent standard edition features?

Feature Availability for Oracle Database Editions

- In Oracle Database Licensing Information manual we can find list of Oracle features available in each database edition
- You can find there list of enterpise features now available in standard edition
- References
- Differences Between Enterprise, Standard and Standard One Editions on Oracle 12.1(Doc ID 1628809.1)
- Differences Between Enterprise, Standard and Standard One Editions on Oracle 11.2(Doc ID 1084132.1)
- Differences Between Enterprise, Standard and Personal Editions on Oracle 11.1(Doc ID 465460.1)

Some enterprise features not available in standard edition

- Diagnostic and Tuning packs
- Partitioning
- Bitmap indexes
- Parallel query/DML
- Flashback features
- Online index rebuild
- Online table redefinition
- Fine grained auditing
- Virtual private database
- Results cache
- Transportable tablespaces

Which downgrade method to use?

- The only supported method to downgrade your enterprise database to standard database is:
  1. Install software for Standard Edition database on a different server or in a different ORACLE_HOME on a same server
  2. Create new Standard Edition database with a same configuration as enterprise edition database (code page, tablespaces, parameters …)
  3. Perform a full export of your Enterprise Database
  4. Import full export from Enterprise to Standard database

Which downgrade method to use?

- You can use classic export/import or data pump export/import
- Oracle recommends to use Standard Edition export program to export data and metadata from Enterprise Edition Database

Downgrade procedure

- It is better to use data pump export than classic export because data pump export does not export database schemas used by various enterprise options: SYS, ORDSYS, EXFSYS, MDSYS, DMSYS, CTXSYS, ORDPLUGINS, LBACSYS, XDB, SI_INFORMTN_SCHEMA, DIP, DBSNMP, and WMSYS.
- SYS schema is automatically created in standard edition database and other not exported schemas we do not need.

Downgrade procedure

- Also grants on objects owned by the SYS schema are never exported
- Data pump export supports keyword EXCLUDE so we can exclude some additional schemas during export
- For instance we can not transfer Enterprise Manager Database Control repository schema to different database
- During export we will exclude SYSMAN and DBSNMP schemas
- Those schemas are created when we create target standard edition database

Downgrade procedure

- Exclude OLAPSYS schema during export
- Data pump export exports OLAPSYS schema which we can not use in standard edition database because it is used to support OLAP option in enterprise database
- Deferred segment creation is an enterprise feature
- During import to standard edition we must use keyword version=11.1 to be able to import empty tables

Downgrade procedure

- Data pump is a server based export
- We must create directory on a database server file system to store data pump export file
- In the database we must create directory object that points to a file system directory that we have prepared
- In the database we must grant read, write permission for this directory to database user that will perform export

Downgrade procedure

- Assumption is that during downgrade database platform does not change
- As an example I have downgraded Oracle Enterprise Edition database version 11.2.0.1 to Standard Edition 11.2.0.4
- Source and target platforms are on Windows Server 2008 R2

Downgrade procedure

- Downgrade enterprise edition database (source) to standard edition database on a different server (target)

1. Install software for standard edition database in a different ORACLE_HOME on a source server
2. On a source server create a directory to store data pump export file

Downgrade procedure

3. In a source database:
   - Grant exp_full_database to user who will perform full export
   - Create directory object that points to a directory created on a file system in step 2
   - Grant read and write permissions on directory object to a user who will perform full export
4. Extract create statements for SYS grants from source database with a SQL script

Downgrade procedure

5. Perform a full data pump export of a source database:

```
C:\Users\Administrator>d:\Oracle\product\11.2.0\dbh
ome_SE1\BIN\expdp '/ as sysdba'
parfile=d:\Oracle\admin\oraEE\dpdump\expdp.txt
U parfile piše:
full=y
directory=DATA_PUMP_DIR
dumpfile=oraee_full.dmp
logfile=oraee_full.lst
exclude=SCHEMA:"='DBSNMP‘"
exclude=SCHEMA:"='SYSMAN',
exclude=SCHEMA:"=‘OLAPSYS',
flashback_time=systimestamp
```

Downgrade procedure

6. Install software for standard edition database on a target server
7. Create and configure standard edition database on a target server in a same configuration as source database (code page, tablespace names and sizes, parameters,…)
8. On a target server create a directory to store data pump export file and SYS grants script
9. Transfer data pump export file from source to target server

Downgrade procedure

10. Transfer script to recreate SYS grants from source to target machine
11. In a target database:
    - Grant imp_full_database to user who will perform full import
    - Create directory object that points to a directory created on a file system in step 8
    - Grant read and write permissions on directory object to a user who will perform full import

Downgrade procedure

12. Perform a full import to target database using export file from source database:
    impdp hr DIRECTORY=dpump_dir1 DUMPFILE=expfull.dmp FULL=yes LOGFILE=fullimp.lst VERSION=11.1
13. Check errors in import log file and correct them
14. Compile invalid objects with utlrp
15. Compare invalid objects in source and target databases
16. Create SYS grants in target database

Errors during Data Pump import

- Error ORA-439 When Importing Tables Created With Enabled Deferred Segment Into Oracle 11g Standard Edition
- Deferred Segment creation is enterprise feature not available in standard edition
- Data Pump import will not import into standard edition tables that have zero rows in enterprise edition database
- Workaround: set parameter version=11.1 in impdp command line because deferred segment creation is not available in version 11.1

Tasks after downgrade

- Collect statistics for fixed, dictionary and user objects in target database
- Create backup script for target database and schedule it
- Test performance and functionality of applications after downgrade

Performance problems during downgrade

- Frequent waits
  Streams AQ: enqueue blocked on low memory during data pump export
- Cause: streams_pool_size is autotuned with Automatic Memory Management
- Solution: set streams_pool_size=100M or 300M
- Reference: EXPDP And IMPDP Slow Performance In 11gR2 and 12cR1 And Waits On Streams AQ: Enqueue Blocked On Low Memory (Doc ID 1596645.1)

Performance problems during downgrade

- Data pump export job with autotuned streams pool size takes 150 minutes to create export dump file of 84 GB
- The same export job withe streams pool size set to 300M takes only 27 minutes
- Full export time was reduced by 82% !!!

Performance problems during downgrade

- Frequent log file sync wait events during data pump import
- Cause: Adaptive switching between post/wait and polling for log file sync is implemented
- Solution: Set the parameter _use_adaptive_log_file_sync = false and restart the database
- Reference: Adaptive Switching Between Log Write Methods can Cause 'log file sync' Waits (Doc ID 1462942.1)

Unsupported downgrade method

- On Internet there are a few posts about using unsupported downgrade method:
  - Install Oracle SE software in different Oracle home on the same server where Oracle EE database is configured
  - Remove EE options from EE database
  - Configure password file and spfile in SE home with necessary parameters
  - Start EE database with SE database software
  - Run catalog.sql and catproc.sql
  - Recompile invalid objects

Unsupported downgrade method

- It should work but is unsupported
- I have not tested that
- References
- http://oracsd.blogspot.com/2013/04/upgrade-downgrade-oracle-version.html
- http://blog.ingressit.com/2010/07/migrate-oracle-database-from-enterprise_29.html

Some enterprise features still available in standard edition

- If you create Standard edition database with templates other then custom, OLAP option will be installed in the database
- OLAP option is not supported and licensed in Standard edition and you are not allowed to use it
- Olap is not a Supported Option In The Standard Edition of The Database (Doc ID 601791.1)
- Use Of Database Templates with Standard Edition Cause Problems With OLAP(556194.1)
- How to Remove OLAP from the Standard Edition Database?(1362752.1)

Some enterprise features still available in standard edition

- You can enable Partitioning option in Standard edition database but are now allowed to use it
- Stored Outlines, enterprise feature are enabled in standard edition
- You can enable Database diagnostic and tuning packs in standard edition but are not allowed to use it

Parallel processing in standard edition

- Is possible since version 11.2 with DBMS_PARALLEL_EXECUTE package
- Reference:
- http://antognini.ch/2010/09/parallel-processing-with-standard-edition/

Monitoring Standard edition database

- AWR, ADDM, Diagnostic and Tuning packs are not available
- There are tools available to monitor it:
  - Lab128
  - Spotlight for Oracle

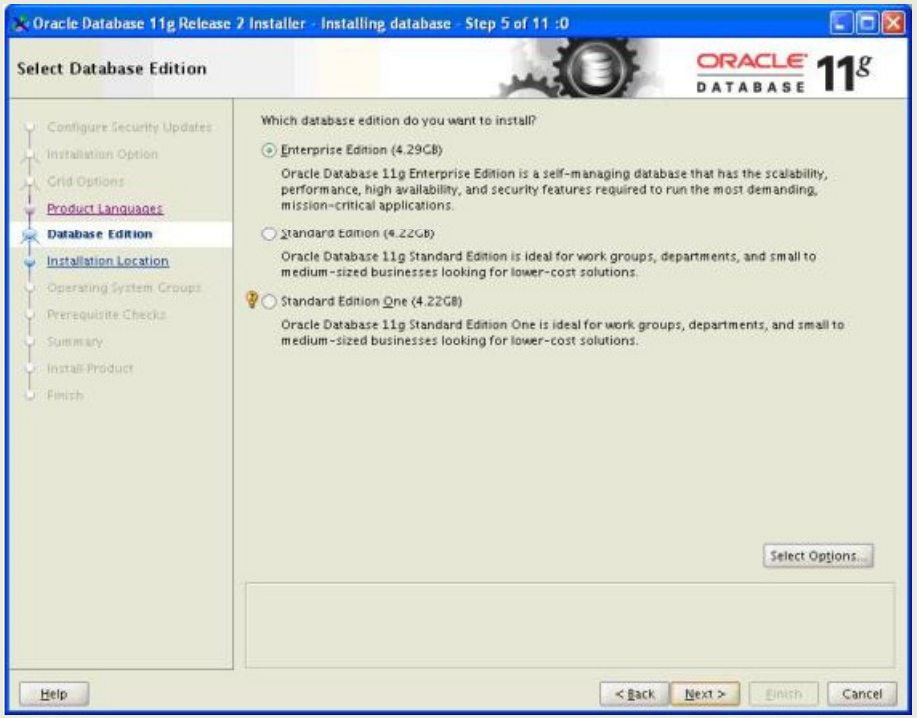
SQL Tuning is difficult

- SQL Tuning Advisor
- SQL Performance Analyzer
- Segment Advisor
- SQL Profiles
- Outlines (unsupported)

Are not available

How to find if the Database Installed is Standard One Edition?

- Only from installation logs



- Reference:
- How to find if the Database Installed is Standard One Edition? (Doc ID 1341744.1)

Questions

Thank you


thank you
tenki
ขอขอบคุณคุณ
takk
спасибо
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