

Exam Objective: Reduce space related error conditions through proactively managing tablespace usage.

An important function of a database administrator is to ensure that users always have the space they need. Tablespaces should have sufficient space and out-of-space errors avoided.

In Oracle 10g, you can proactively manage tablespace usage by the use of database alerts. An alert informs you if a tablespace is running low on disk space. As a response, you can add more space thus reducing out-of-space error conditions.

The information required by Oracle 10g, to help you proactively manage tablespaces is collected in the Automatic Workload Repository (AWR). The automatic workload repository is new in Oracle 10g acts as a centralized repository of statistics that can be used by various other components in the database. This new feature is also useful for growth trend analysis and capacity planning of the database.

You can define Tablespace thresholds in the database. A threshold is defined in terms of the fullness of the tablespace. Two levels of thresholds can be defined: CRITICAL and WARNING thresholds. Thresholds are expressed in terms of a percentage of the tablespace size or in terms of bytes. Default values are 85% for warning thresholds and 97% for critical thresholds. You can modify them if desired. If a tablespace crosses either of these thresholds, an appropriate alert is raised.

All this functionality is implemented using the DBMS_SERVER_ALERTS package.

Actions you can perform when a threshold is reached include:

- Add more space to the tablespace by making its datafiles autoextensible, resize existing files manually or add a new file.
- Free up space by shrinking sparsely populated objects in the tablespace.

Guidelines

- Proactive tablespace management is supported only by locally managed tablespaces.
- Thresholds should not be set for read-only or offline tablespaces.
- For temporary tablespaces all threshold values correspond to the space currently used by all sessions creating temporary segments.

- For undo tablespaces the threshold corresponds to the space utilized by active and unexpired extents.
- For tablespaces that have auto-extensible files, thresholds are computed according to the maximum file size specified by your or the operating system, whichever is applicable.

PROACTIVELY MANAGING TABLESPACES

A new background process known as the **MMON** background process is responsible for checking to see if threshold values have been reached.

This process looks for tablespace threshold violations every 10 minutes by using an in-memory calculation.

Each instance contains an internal table that tracks the space usage of every file in the database. If a threshold is reached an alert is triggered. The alert will be cleared once you have responded to the alert and the fullness of the tablespace has now gone below the defined threshold value.

Threshold values can be set or unset using the Enterprise Manager.

A tablespace's space-used thresholds can be set using the Enterprise Manager's Manage metrics page. This page is accessed from the **Database's home page -> Related Links -> Manage Metrics -> Edit Thresholds (button)**.

In addition to Edit Metric thresholds, tablespace space used threshold values can be enabled or disabled when creating the tablespace via the EM database Administration function. **Select the Database Home Control Page -> Administration Tab -> Tablespaces Link.**

EXAM OBJECTIVE: RECLAIM WASTED SPACE FROM AND INDEXES USING THE SEGMENT SHRINK FUNCTIONALITY

SHRINKING SEGMENTS IN ORACLE 10g

In Oracle 10g, a shrink operation is an online in-place operation that results in the high water mark being reset after compacting the Oracle blocks making them denser and releasing unnecessary free blocks back to the tablespace. These free blocks can be reused for other segments requiring additional blocks.

Shrinking can improve the performance of queries and DML operations since Oracle has to read fewer blocks especially during full table scans. In some cases even problems such as row-chaining may be reduced if Oracle touches the block during the shrink process.

GUIDELINES

- In heap-organized segments, ROW MOVEMENT must be enabled. This can be done when the table is created or later by manually issuing the command:
SQL> ALTER TABLE *tablename* ENABLE ROW MOVEMENT;
- Segments in Automatic Segment Space Managed (ASSM) tablespaces cannot be shrunk if:
 - The table has function-based indexes or long columns.
 - The table is clustered.
 - The table has on-commit materialized views or ROWID-based materialized views. Materialized views that are based on a primary key need not be refreshed or rebuilt after a shrink operation.
 - It is a LOB segment.
 - It is an IOT mapped table or IOT overflow segment.
- During and after shrinking of segments, there is no need for index maintenance; all indexes remain in a usable state.
- You can issue commands from the command-line or use the EM interface.

ISSUING COMMANDS TO SHRINK SEGMENTS

You can issue the command to shrink a table (heap or IOT), partition, sub-partition, LOB, index, materialized view or materialized view log.

Syntax:

ALTER TABLE *tablename*

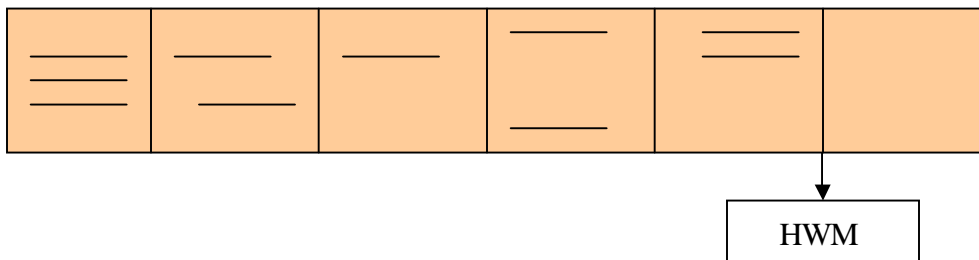
SHRINK SPACE [COMPACT] [CASCADE];

shrink space: is used to shrink space in a segment.

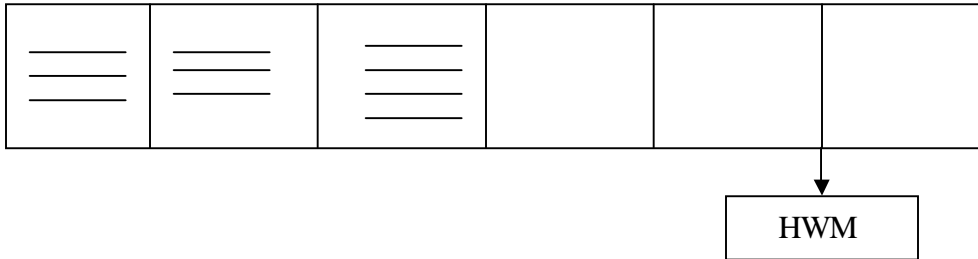
compact: All rows are moved to the left of the segment followed by the an adjustment to the High Water Mark is performed followed by the space above the HWM being released.

cascade: results in the shrink operation being cascaded to all dependent segments that support a shrink operation. This is however not done in the case of materialized views, LOB indexes, IOT mapping tables and IOT overflow segments.

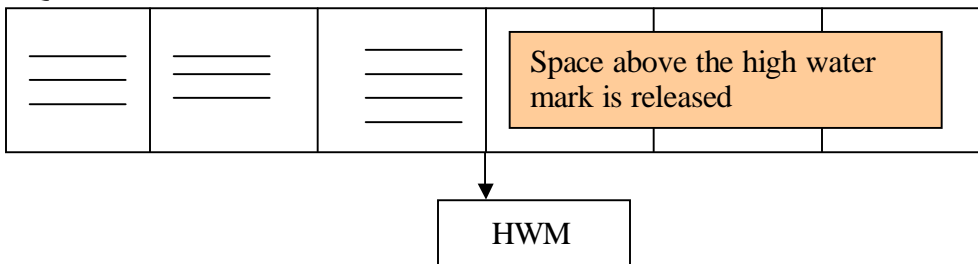
Examples: Consider a segment called ORDERS that you wish to shrink.



```
SQL> ALTER TABLE orders SHRINK SPACE COMPACT;
```



```
SQL> ALTER TABLE orders SHRINK SPACE;
```



Using the Enterprise Manager for shrinking segments:

The actions of shrinking can be done using the **Segment Advisor Wizard** of the EM or perform an individual schema object shrink. This wizard may be launched via a tablespace. You can also enable or disable row movement. Within EM you can also view segment space statistics as well as manage any segment space alerts which may arise.

EXAM OBJECTIVE: THE SEGMENT ADVISOR

The Enterprise Manager (EM) provides an interface to the segment shrink functionality. The advisor is accessible from Enterprise Manager (Home > Advisor Central > Segment Advisor) or from PL/SQL by using the DBMS_ADVISOR package. It offers the option of selecting various inputs and scheduling a job to get shrink advice.

The segment advisor is a tool that can be used to determine if an object is a good candidate for a shrink operation. It makes recommendations based on the current space usage, as well as growth trend information that it has gathered. You also have the option to specify the duration for analysis. A longer duration would result in more comprehensive results. Results generated by the Segment advisor are stored in the Automatic Workload Repository (AWR) for future reference. Once the recommendations are made, you can make decisions about whether to implement the recommendations or not. Shrinking can be done at an individual object level or at a tablespace level.

GROWTH TREND REPORTS

In addition to providing recommendations about segment shrinking, the segment advisor can also be used for generating growth trend reports. Growth trend data is collected in the **Automatic Workload Repository (AWR)** and used by advisories and reporting tools to generate growth trend reports.

Growth trend reports can be retrieved using Enterprise Manager Console.

Using EM, go to **Database Control -> Administration Tab -> Schema section -> Tables -> Segments tab.**

GUIDELINES

- The data present in AWR can be used to indicate past growth trend as well as for predicting future growth patterns. The workload repository collects the persistent space-usage statistics automatically at snapshot creation (every 60 minutes, and stored in the system-defined WR schema) or when server-generated alerts are triggered (by the MMON background process every 10 minutes).
- Supports only to locally managed tablespaces.
- You can also have a feature to estimate the amount of resources the creation of a new segment would require. Based on the structure of the tables or index and an estimated number of rows, Oracle 10g gives you an estimate of the amount of disk space that is likely to be consumed by the object.

EXAM OBJECTIVE: USE THE UNDO ADVISOR

In Oracle 10g, there is a new interface known as the undo advisor that can be used to automatically analyze and advise you on undo tablespace size and the low threshold undo retention setting.

You can use the undo advisor to set the time period for which the undo tablespace should retain data and to analyze the impact of a new undo retention setting. By choosing the time period that best represents the system activity; the undo tablespace usage analysis gives you recommendations for the undo retention length and the correct size of the undo tablespace.

You can use the EM interface to launch the undo advisor or use the procedures of the DBMS_ADVISOR package.

To navigate to the Undo Advisor page, select **undo advisor** from the **Undo Management page**. Click on Undo Advisor and Click on the value adjacent to the Low Threshold Undo Retention. The top of this page shows the current auto-tuned undo retention time and undo tablespace size.

The Undo Advisor can be used to find answers to the following questions about your undo configuration:

1. What is the maximum undo retention time that is required to guarantee successful query?
The time period corresponds to the longest running query. You can find the **Longest Running Query** on the Undo Management Page under System Activity and Tablespace usage.
2. Does my database have enough space to accommodate the maximum undo retention given the current tablespace configuration?
This can be obtained from the **Best Possible Undo Retention** under analysis on the Undo Advisor page. If the time period is longer than the longest running query, your undo tablespace will be configured adequately.
3. What if the best possible retention time is less than my longest running query?
If this is the case, your undo tablespace is too small. You need to either allow it to extend automatically or manually extend it. To figure out the required new size of your tablespace, on the Undo Advisor page **New Undo Retention** field, plug in the value of your longest running query. Enter an appropriate Analysis Time Period and click **Update Analysis and Graph**. Under Analysis, note the Required Tablespace size for New Undo Retention.
4. How do I configure undo to accommodate Flashback operation?
Undo Advisor can be used to configure your tablespace and undo retention properly to support flashback operations.

In case certain undo related errors such as Snapshot Too Old errors occur during the time period you have chosen for the analysis, the undo advisor provides recommendations on how to avoid these errors.

The Undo Advisor can be invoked using the DBMS_ADVISOR package. The recommendations generated can be viewed manually using the DBA_ADVISOR_% views.