Capgemini

Oracle 11g DBA Fundamentals Overview

Lesson 10: Managing Storage

Objectives

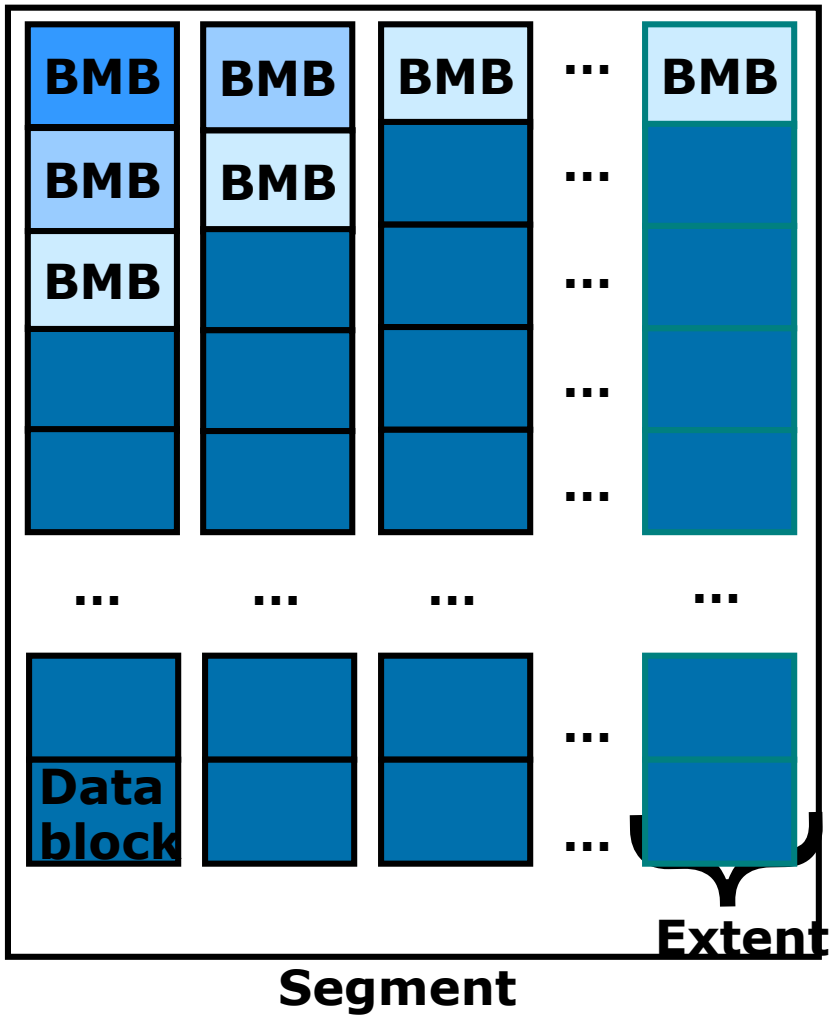
- After completing this lesson, you should be able to:
  - Describe how the Oracle database automatically manages space
  - Proactively monitor and manage tablespace space usage
  - Use the Segment Advisor
  - Reclaim wasted space from tables and indexes by using the segment shrink functionality
  - Manage resumable space allocation
  - Describe the concepts of transportable tablespaces and databases

Space Management: Overview

Space is automatically managed by the Oracle database. It generates alerts about potential problems and recommends possible solutions. Features include:

- Oracle Managed Files (OMF)
- Free-space management with bitmaps ("locally managed") and automatic data file extension
- Proactive space management (default thresholds and server-generated alerts)
- Space reclamation (shrinking segments, online table redefinition)
- Capacity planning (growth reports)

Free Space Management



- Automatic
- Enabled by the use of locally managed tablespaces
- Tracked by bitmaps in segments

Benefits:

- More flexible space utilization
- Run-time adjustment
- Multiple process search of BMBs

Types of Segments

A segment is a set of extents allocated for a certain logical structure. The different types of segments are:

- Data segment
- Index segment
- Temporary segment

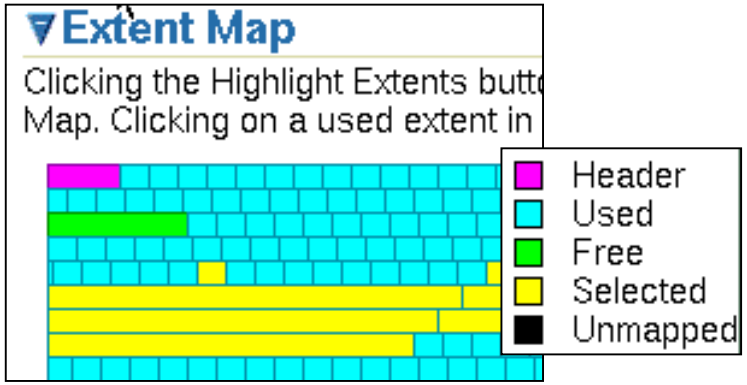
Segments are dynamically allocated by the database.

Allocating Extents

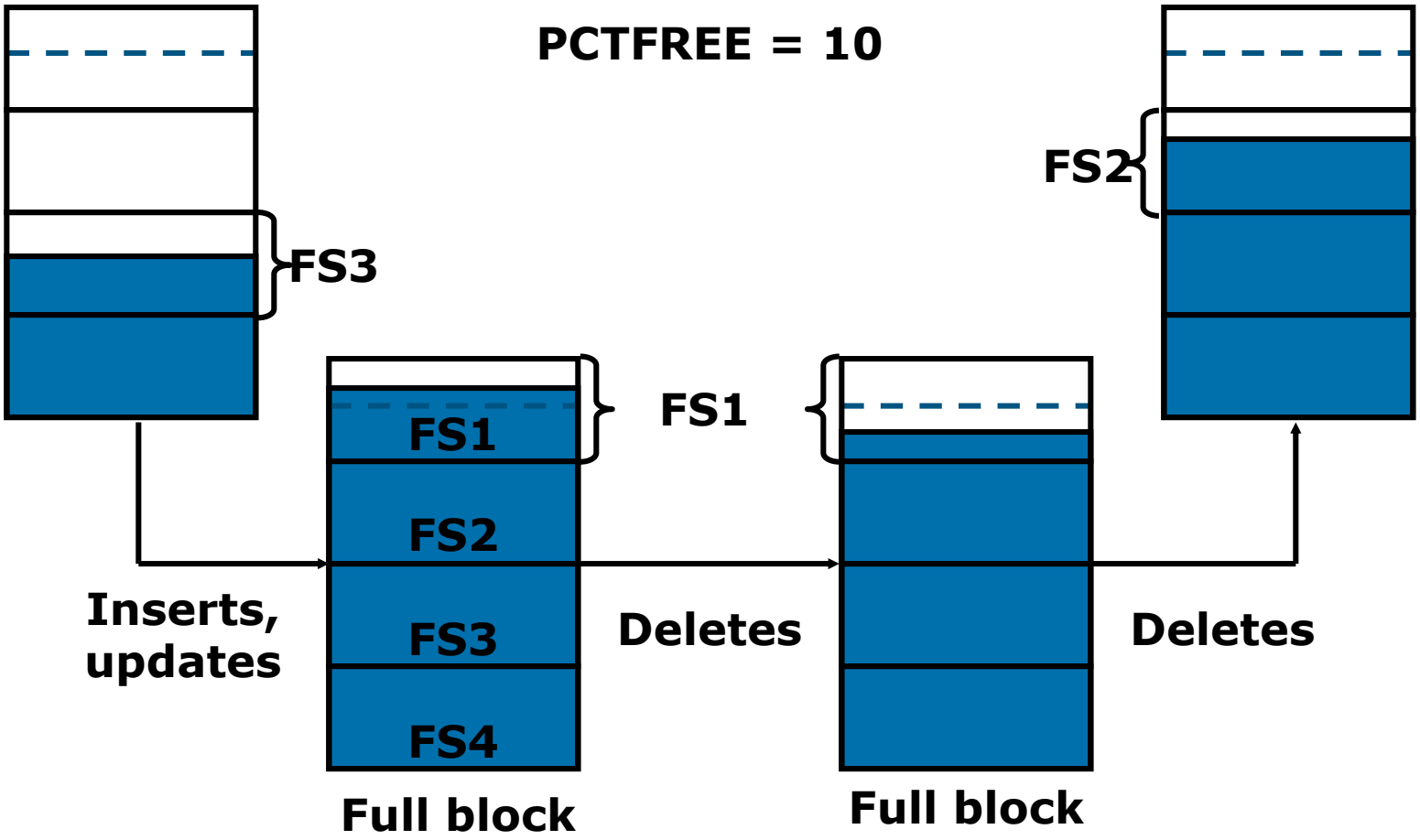
Searching the data file's bitmap for the required number of adjacent free blocks

Sizing extents with storage clauses:

- UNIFORM
- AUTOALLOCATE
- Viewing extent map
- Obtaining deallocation advice



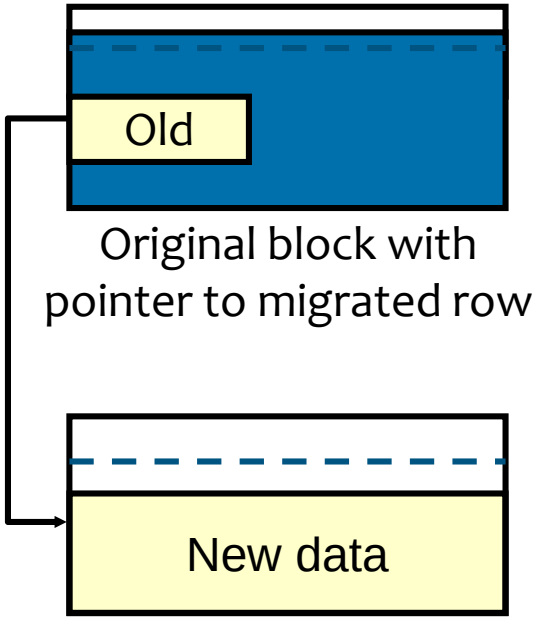
Block Space Management



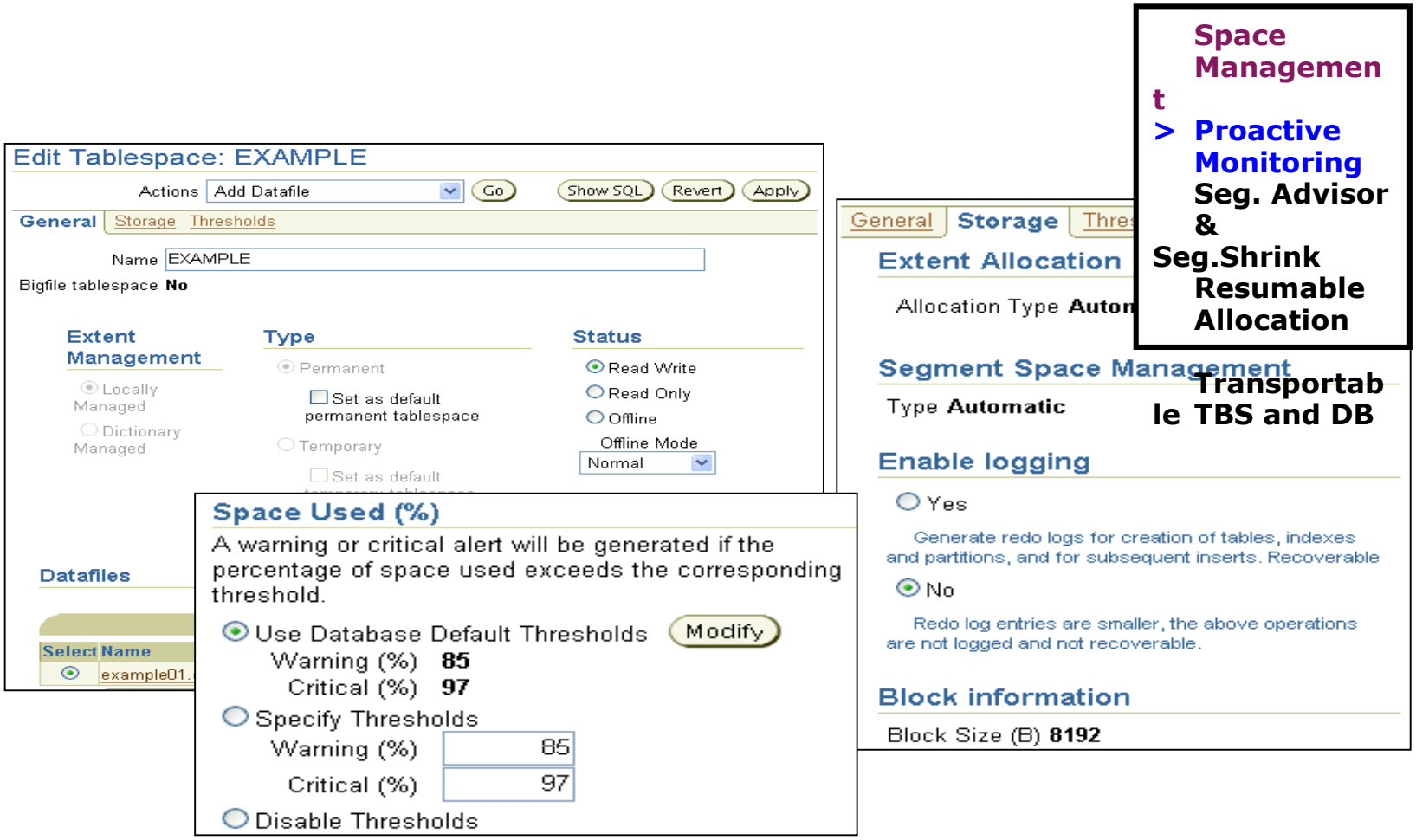
Row Chaining and Migration

Example:

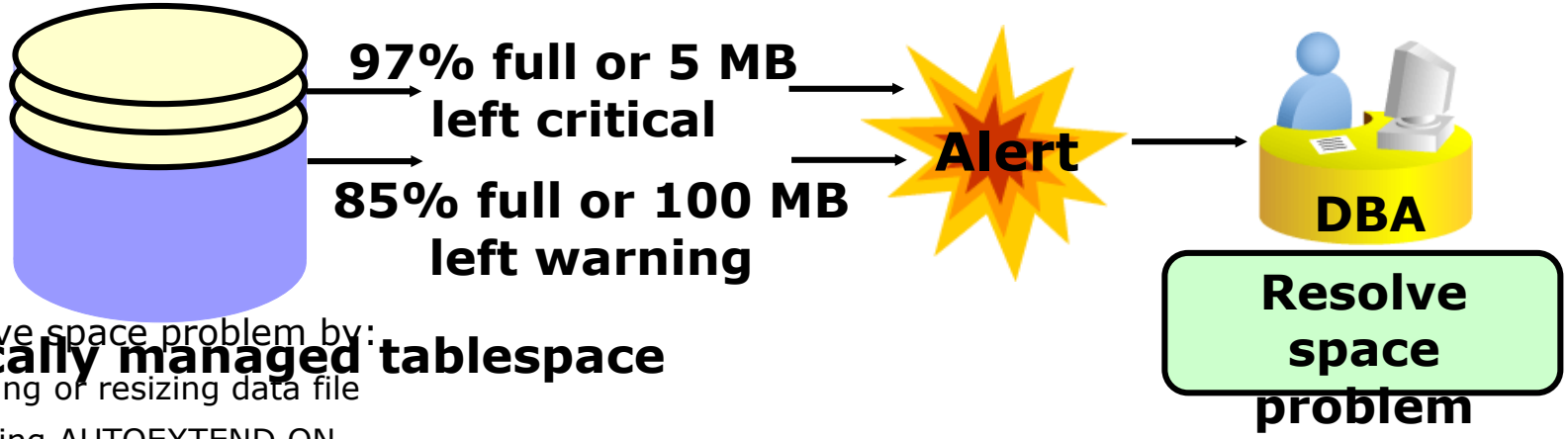
- On update: Row length increases, exceeding the available free space in the block.
- Data needs to be stored in a new block.
- Original physical identifier of row (ROWID) is preserved.
- The Oracle database needs to read two blocks to retrieve data.
- The Segment Advisor finds segments containing the migrated rows.



Proactive Tablespace Monitoring



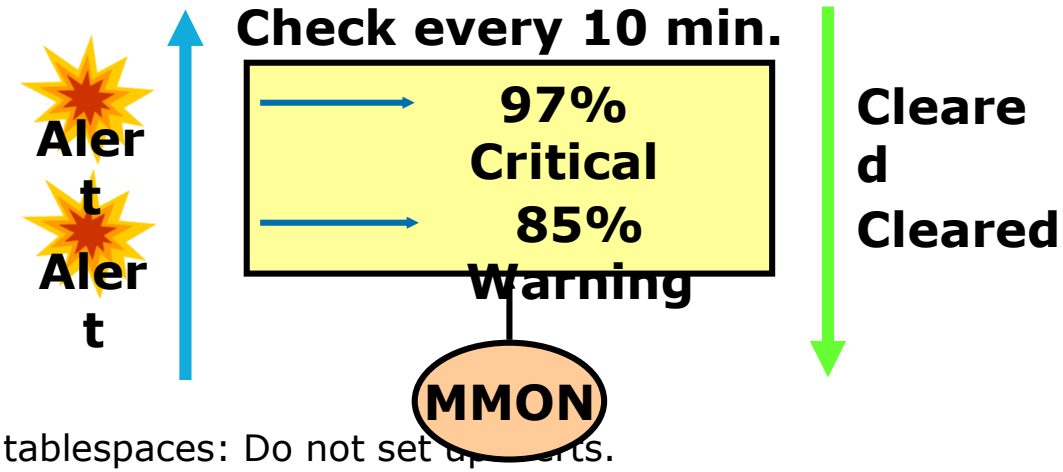
Thresholds and Resolving Space Problems



Resolve space problem by:

- Adding or resizing data file
- Setting AUTOEXTEND ON
- Shrinking objects
- Reducing UNDO_RETENTION
- Checking for long-running queries in temporary tablespaces

Monitoring Tablespace Space Usage



Read-only and offline tablespaces: Do not set up alerts.

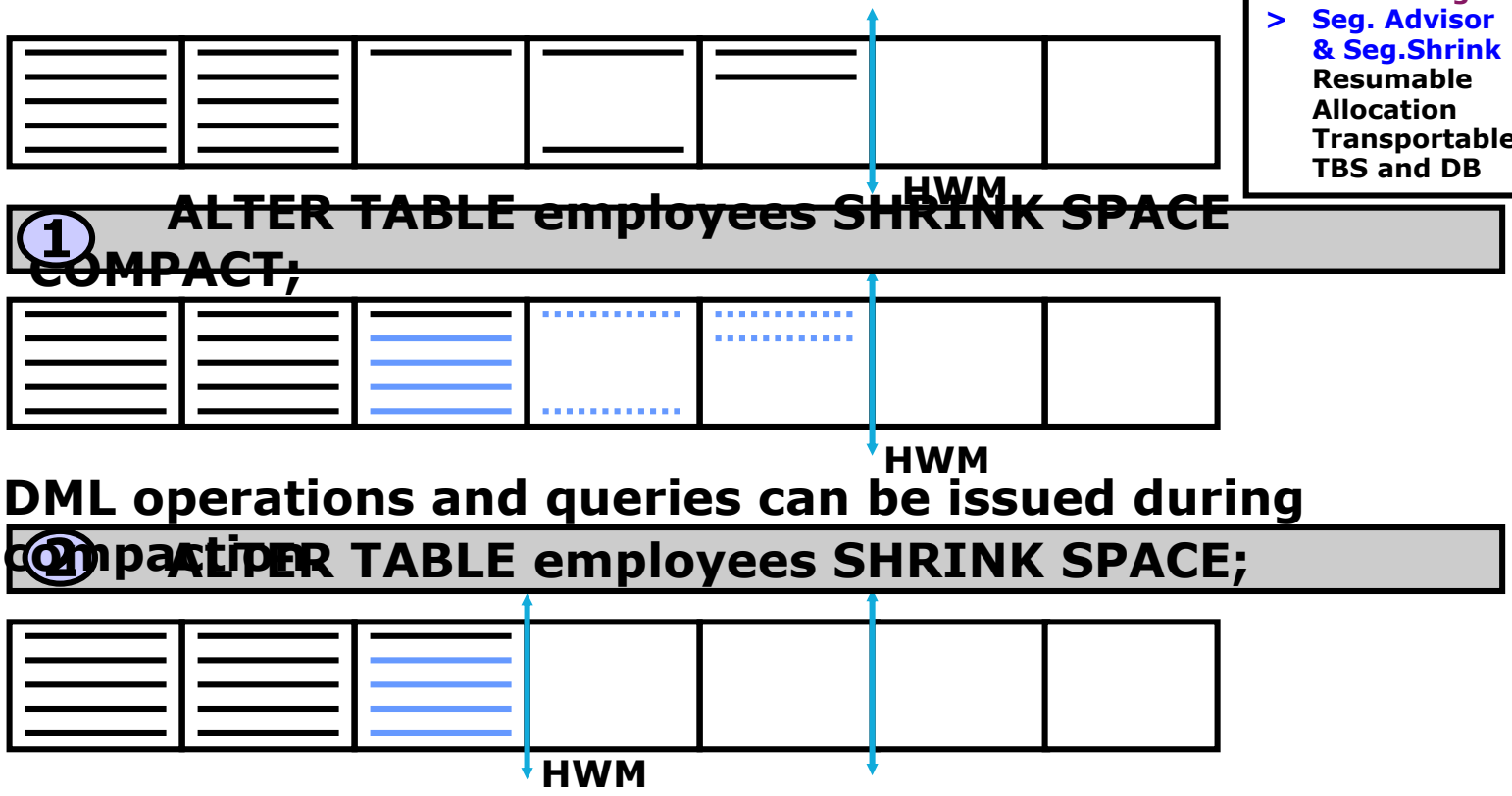
Temporary tablespace: Threshold corresponds to space currently used by sessions.

Undo tablespace: Threshold corresponds to space used by active and unexpired extents.

Autoextensible files: Threshold is based on the maximum file size.

Shrinking Segments

- Space Management
- Proactive Monitoring
- > Seg. Advisor & Seg.Shrink
- Resumable Allocation
- Transportable TBS and DB



DML operations are blocked when the HWM is adjusted.

Results of Shrink Operation

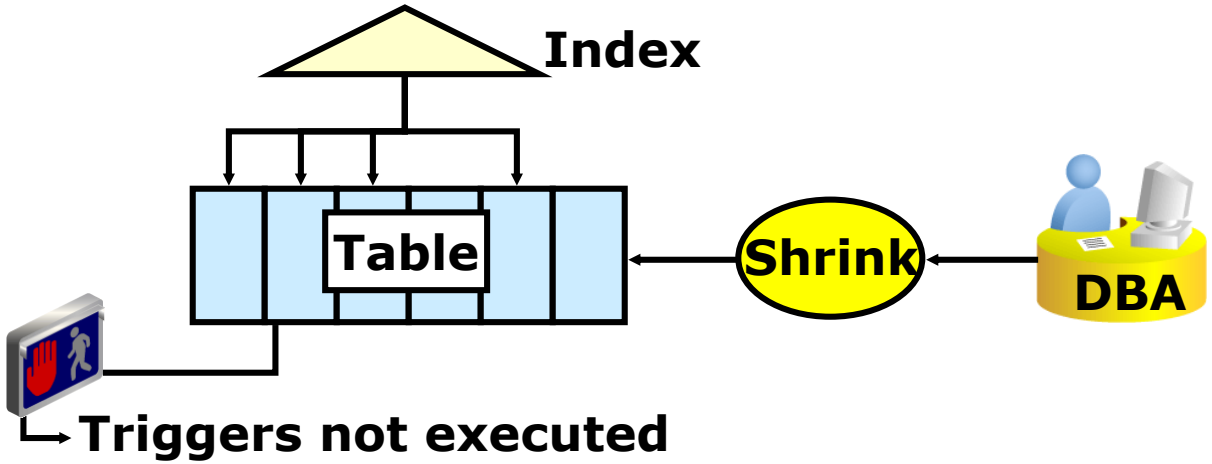
Improved performance and space utilization

Indexes maintained

Triggers not executed

Number of migrated rows may be reduced

Rebuilding secondary indexes on IOTs recommended



Space Reclamation with ASSM

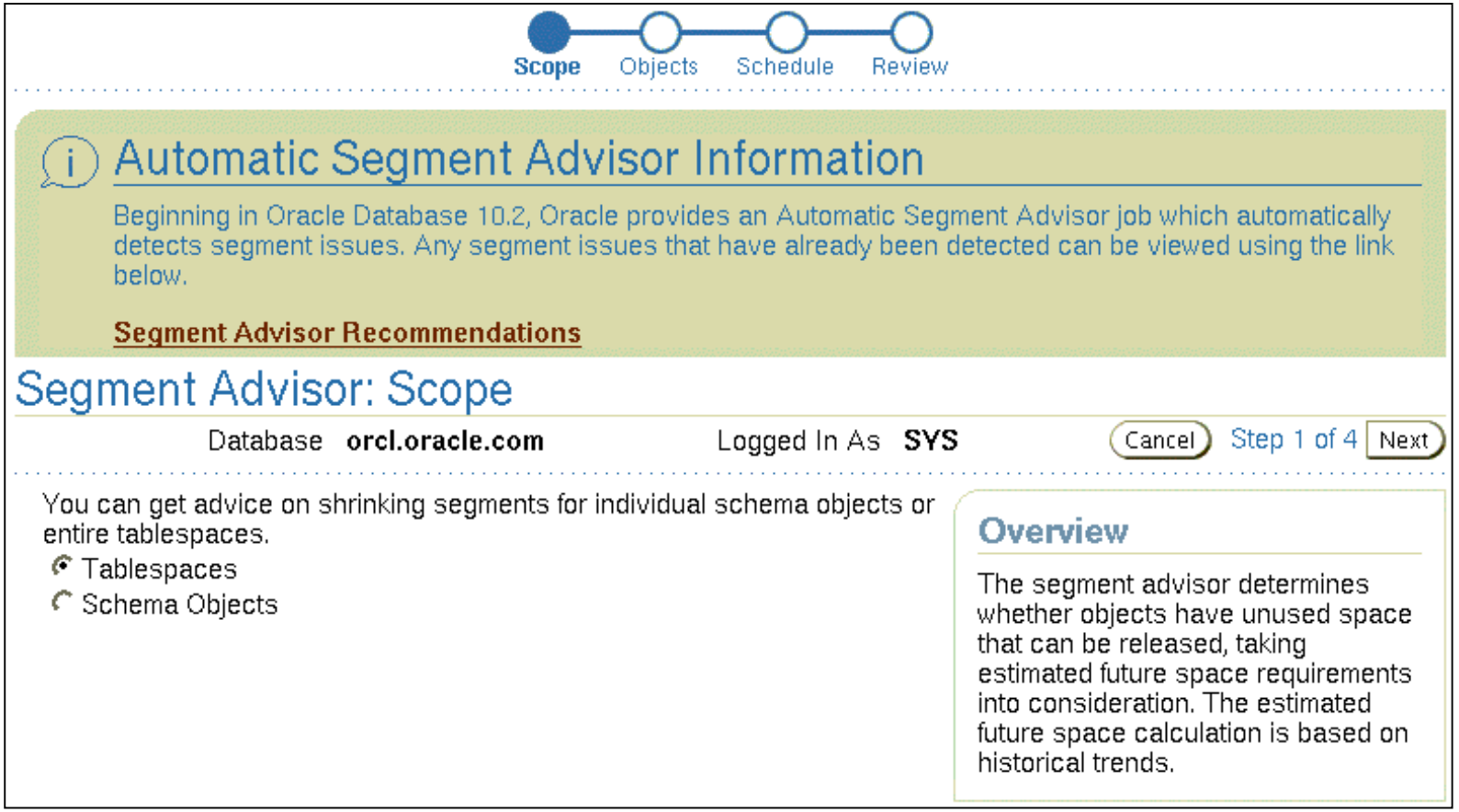
Online and in-place operation

Applicable only to segments residing in ASSM tablespaces

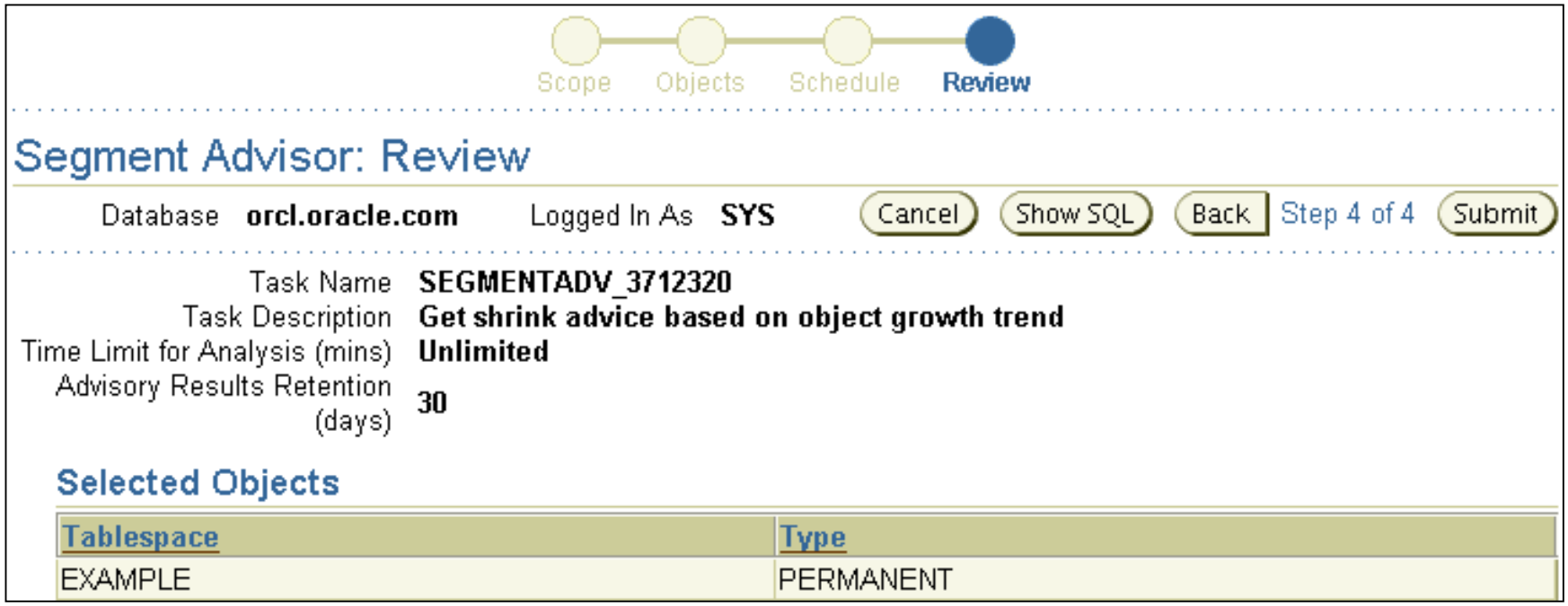
Candidate segment types:

- Heap-organized tables and index-organized tables
- Indexes
- Partitions and subpartitions
- Materialized views and materialized view logs

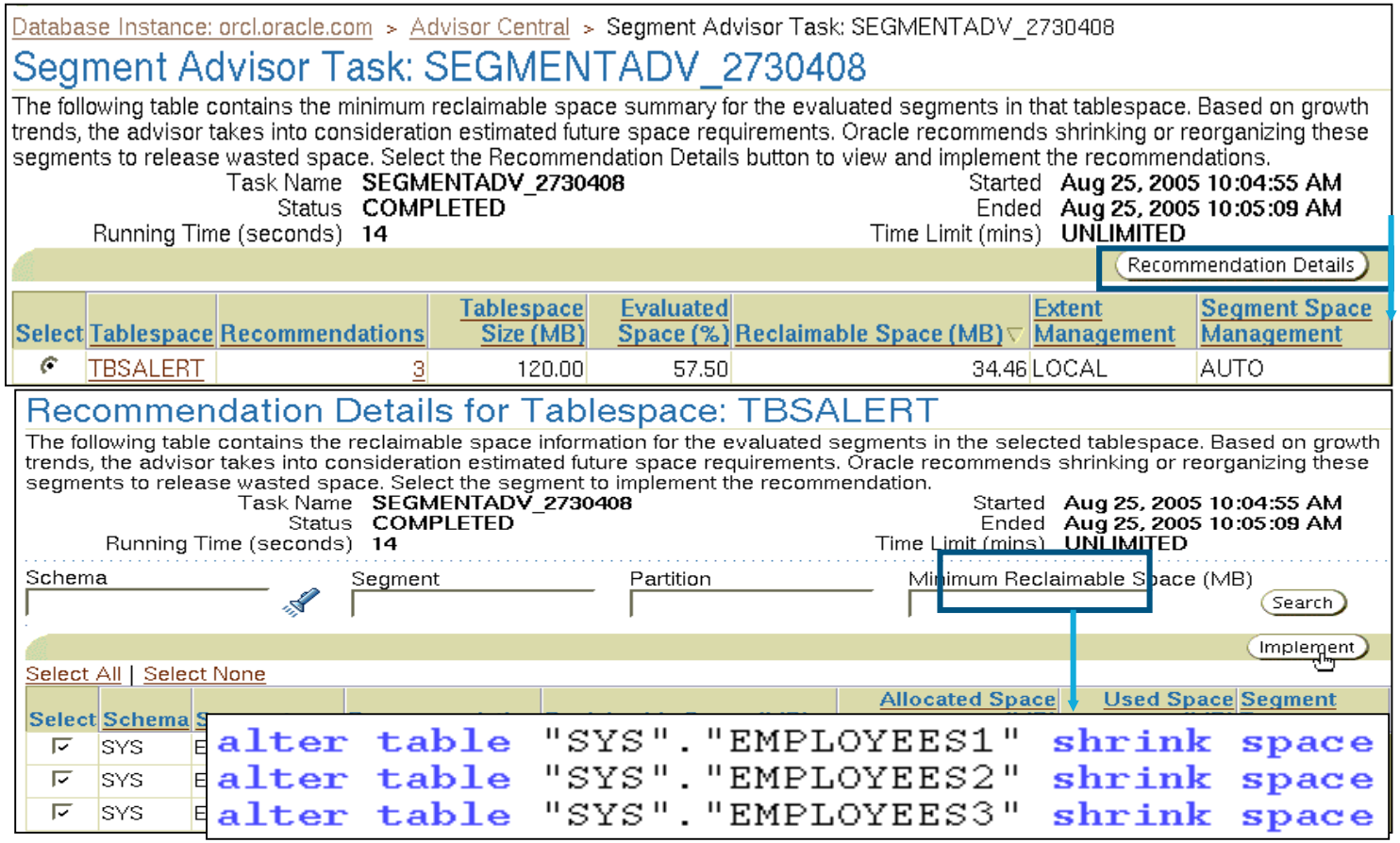
Segment Advisor: Overview



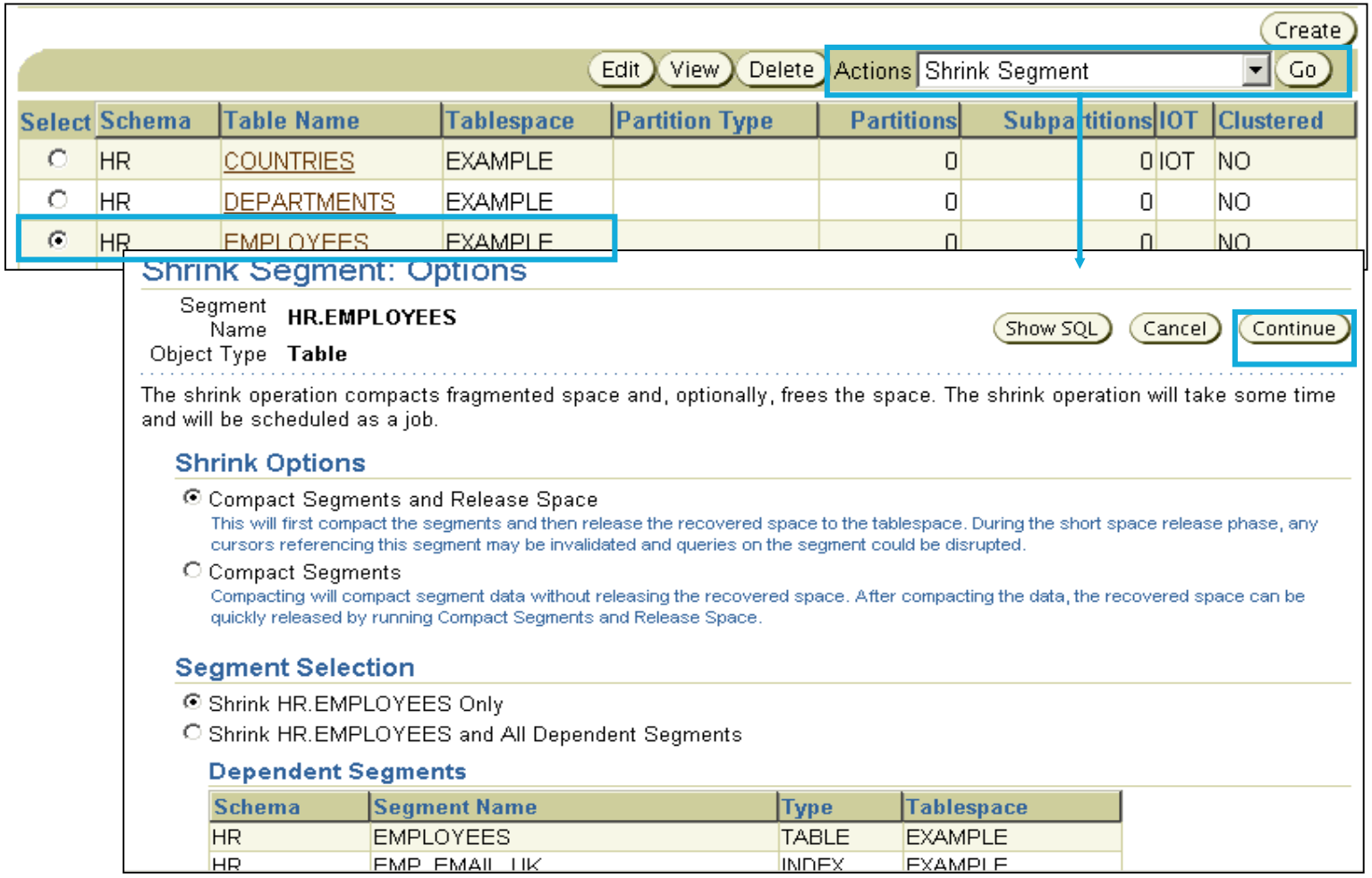
Segment Advisor



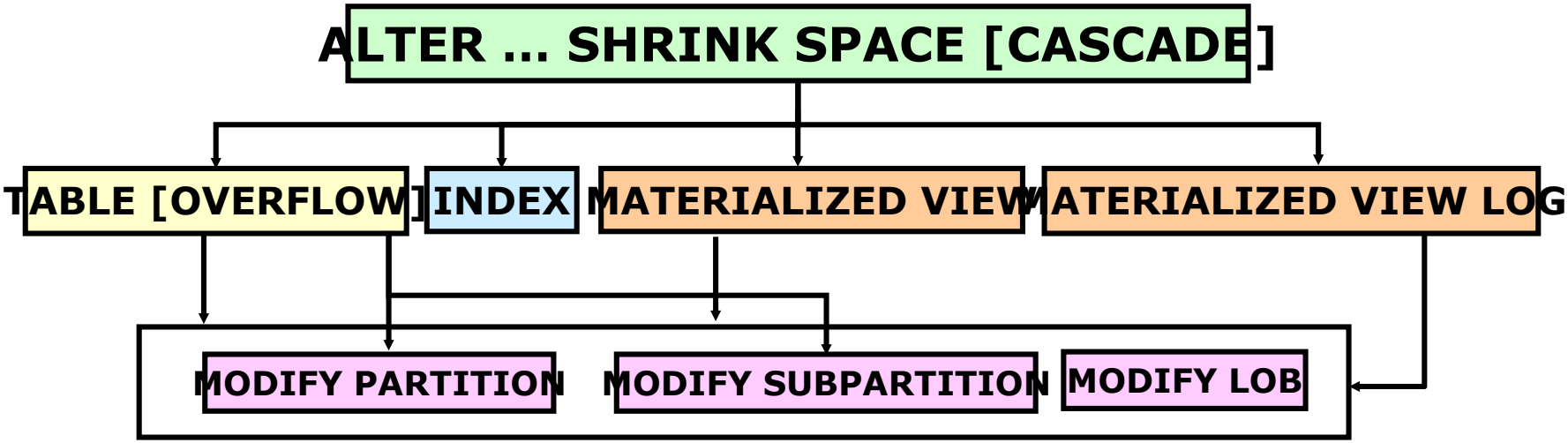
Implementing Recommendations



Database Control and Segment Shrink



Shrinking Segments by Using SQL



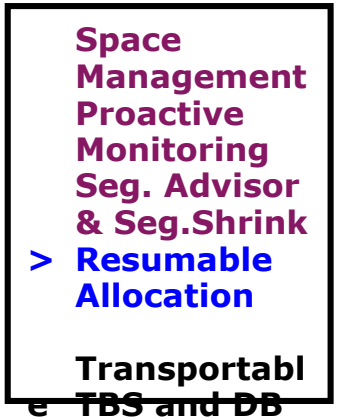

```
ALTER TABLE employees ENABLE ROW MOVEMENT;                    ①

ALTER TABLE employees SHRINK SPACE CASCADE;                   ②

ALTER TABLE employees MODIFY LOB(resume) (SHRINK SPACE);      ③

ALTER TABLE employees OVERFLOW SHRINK SPACE;                  ④
```

Managing Resumable Space Allocation



A resumable statement:

- Enables you to suspend large operations instead of receiving an error
- Gives you a chance to fix the problem while the operation is suspended, rather than starting over
- Is suspended for the following conditions:
  - Out of space
  - Maximum extents reached
  - Space quota exceeded

Using Resumable Space Allocation

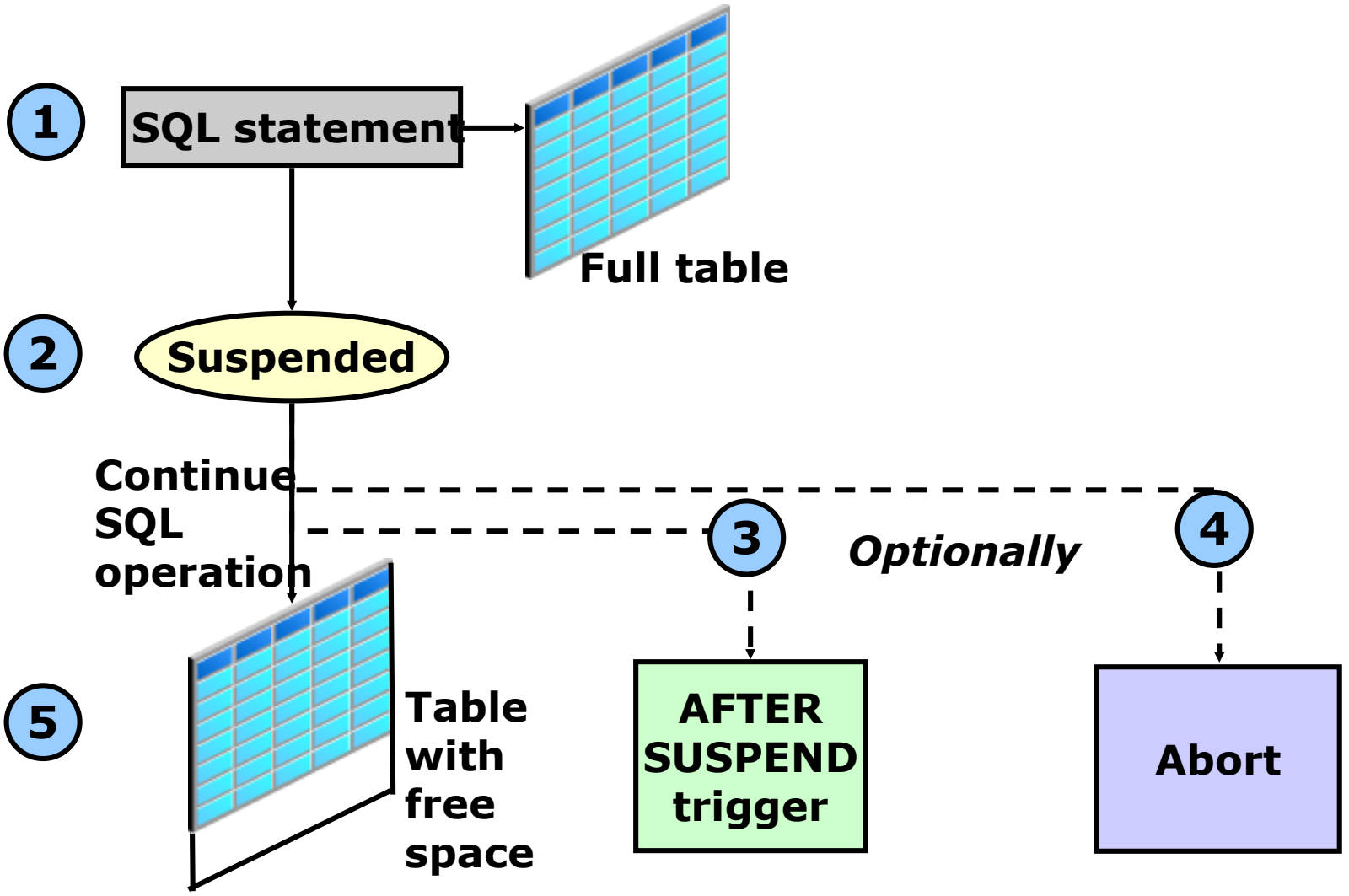
Queries, DML operations, and certain DDL operations can be resumed if they encounter an out-of-space error.

A resumable statement can be issued through SQL, PL/SQL, SQL*Loader, or the Oracle Call Interface (OCI).

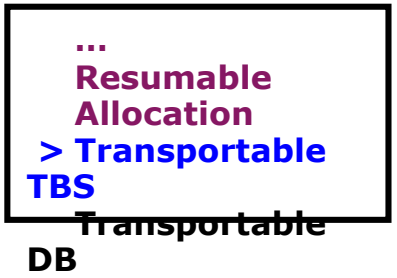
To run a resumable statement, you must first enable resumable statements for your session.

```
ALTER SESSION ENABLE RESUMABLE;
INSERT INTO sales_new SELECT * FROM sh.sales;
ALTER SESSION DISABLE RESUMABLE;
```

Resuming Suspended Statements



Transporting Tablespaces .



Concept: Cross-platform transportable tablespaces:

- Simplify data distribution between data warehouse and data marts
- Allow database migration from one platform to another
- Supported platforms:

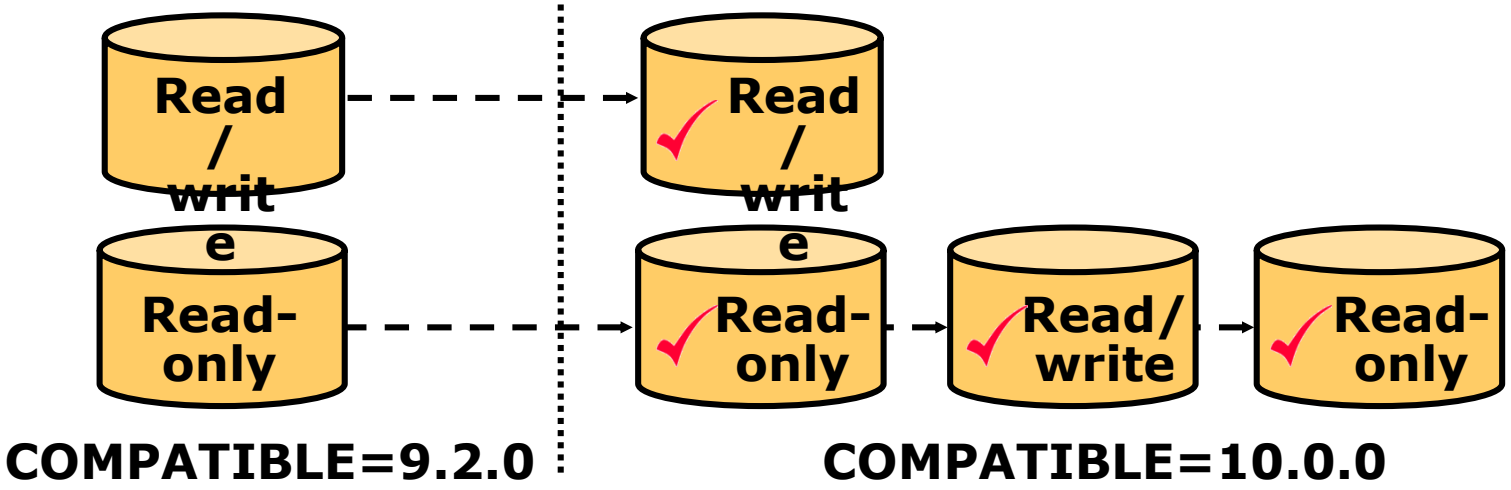
Solaris[tm] OE (32-bit)	HP-UX (64-bit)	Microsoft Windows IA (64-bit)
Solaris[tm] OE (64-bit)	HP Tru64 UNIX	IBM zSeries Based Linux
Microsoft Windows IA (32-bit)	HP-UX IA (64-bit)	Linux 64-bit for AMD
Linux IA (32-bit)	Linux IA (64-bit)	Apple Mac OS
AIX-Based Systems (64-bit)	HP Open VMS	Microsoft Windows 64-bit for AMD
		Solaris Operating System (x86)

Concept: Minimum Compatibility Level

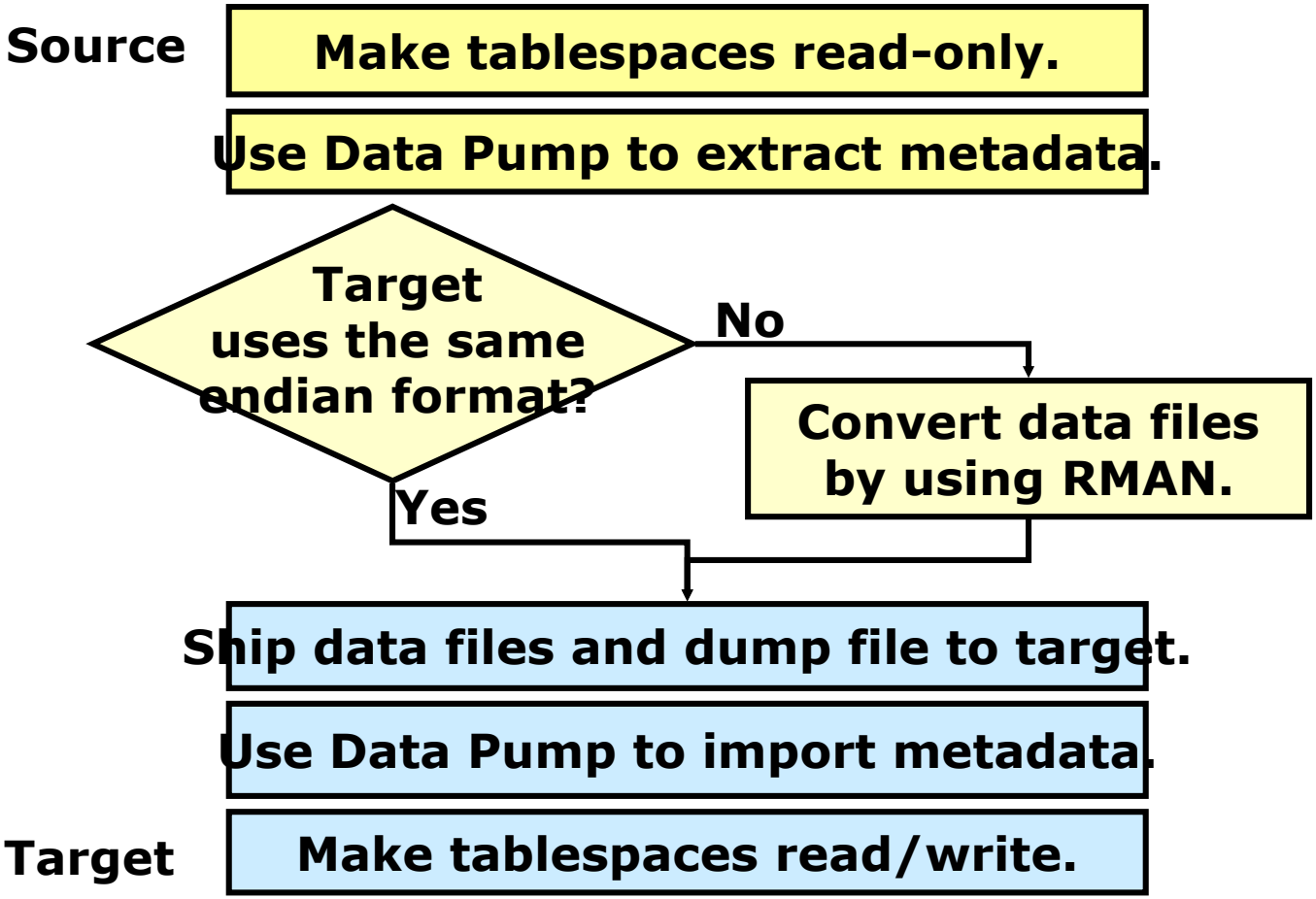
Both source and target databases must have COMPATIBLE set to 10.0.0 or higher.

Data file headers are platform-aware.

Before transporting, make sure that all read-only and offline files are platform-aware.

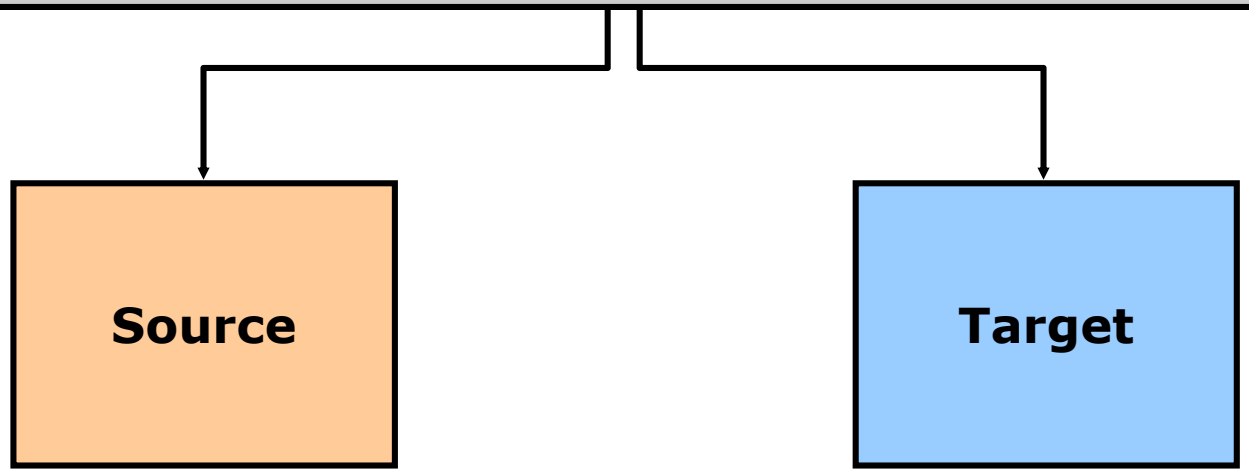


Transportable Tablespace Procedure



Determining the Endian Format of a Platform

```
SELECT tp.endian_format
FROM   v$transportable_platform tp,
       v$database d
WHERE  tp.platform_name = d.platform_name;
```



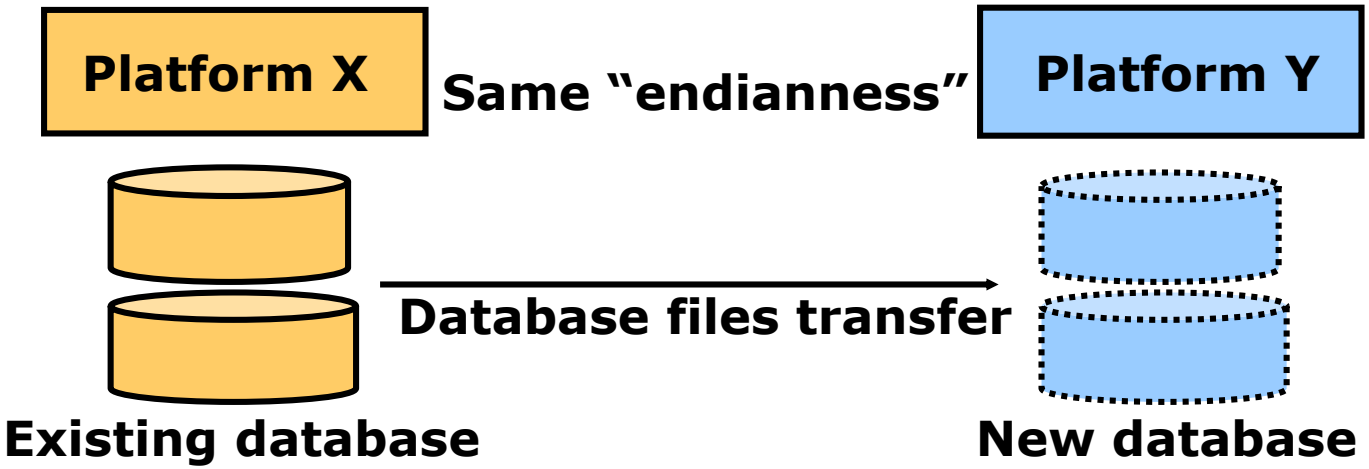
Transporting Databases

```
...
Resumable
Allocation
Transportable
TBS
 > Transportable
DB
```

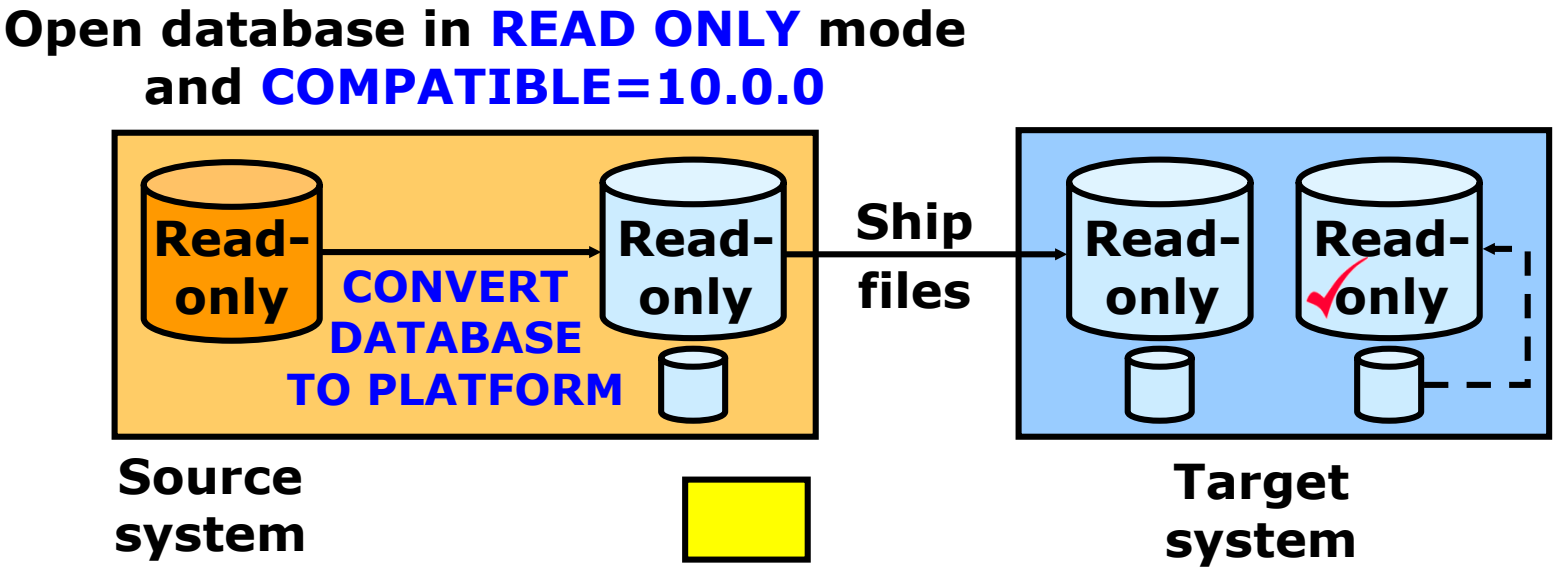
Generalize the transportable tablespace feature.

Data can easily be distributed from a data warehousing environment to da sually on smaller platforms.

A database can be migrated from one platform to another very quickly.

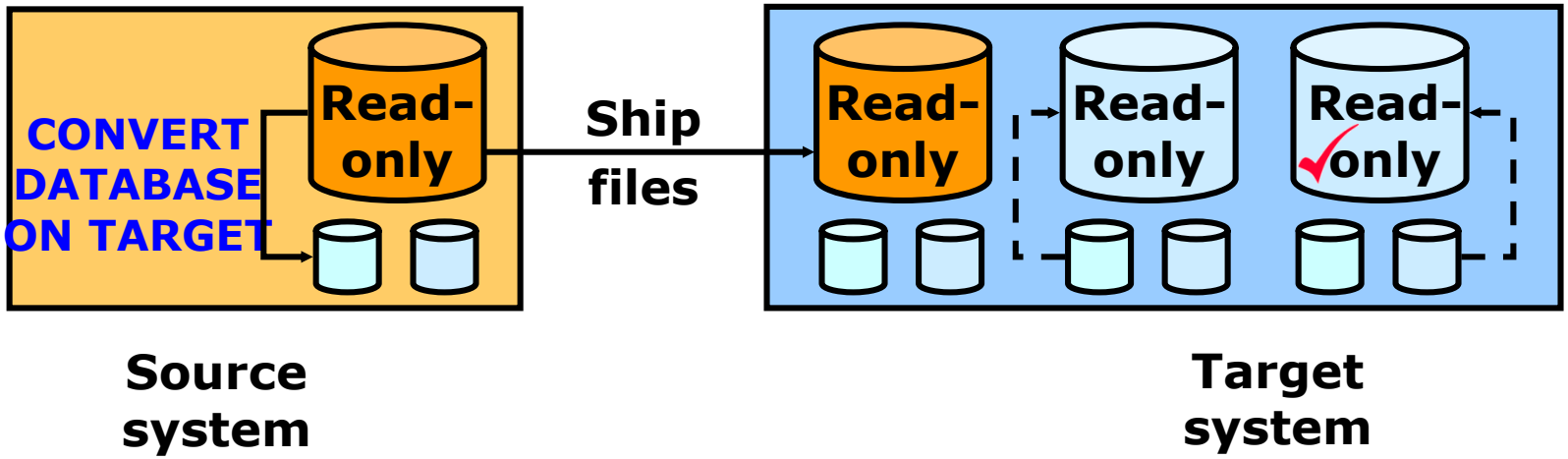


Database Transportation Procedure: Source System Conversion



Database Transportation Procedure: Target System Conversion

Open database in READ ONLY mode and COMPATIBLE=10.0.0



Database Transportation: Considerations

Create the password file on the target platform.

Transport the BFILEs used in the source database.

The generated pfile and transport script use OMF.

Use DBNEWID to change the DBID.

SUMMARY

- In this lesson, you should have learned how to:
  - Use the Oracle database to automatically manage space
  - Proactively monitor and manage tablespace space usage
  - Use the Segment Advisor
  - Reclaim wasted space from tables and indexes by using the segment shrink functionality
  - Manage resumable space allocation
  - Describe the concepts of transportable tablespaces and databases