5

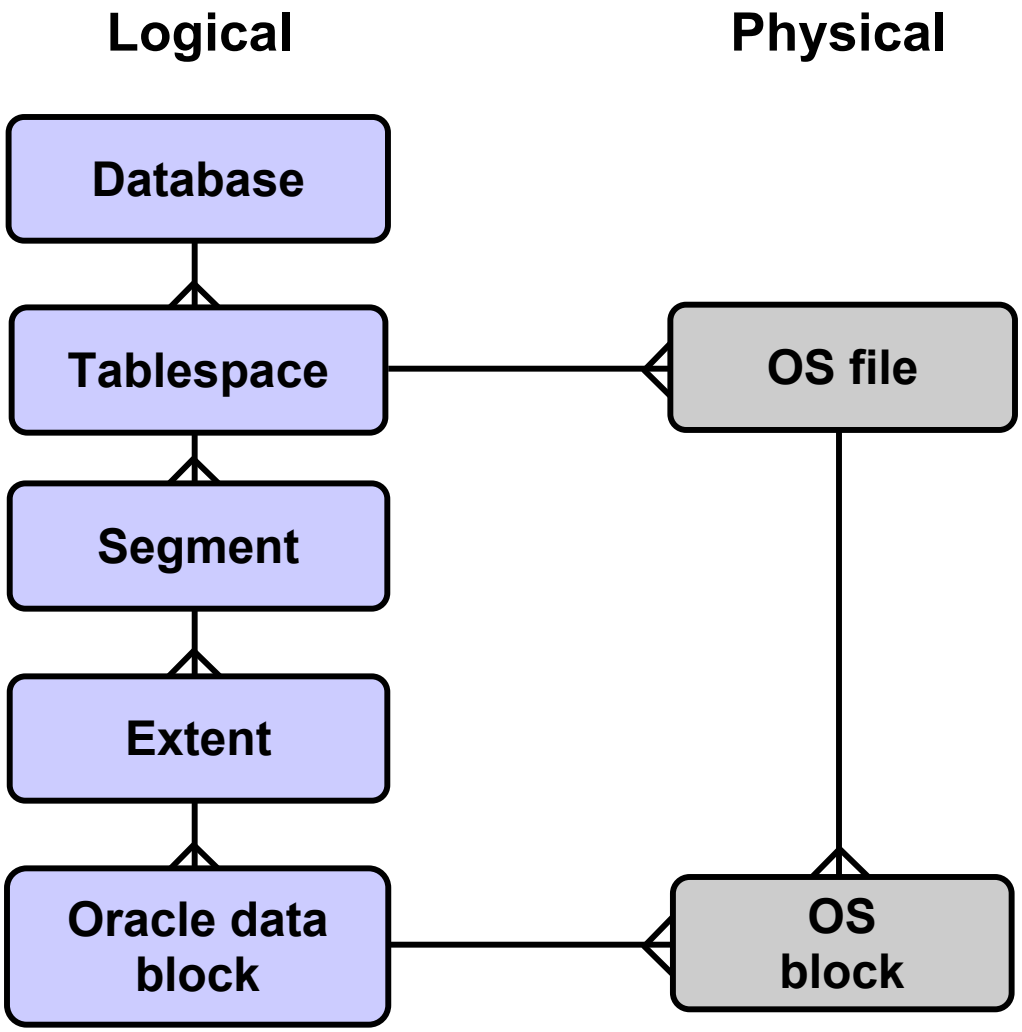
Managing Database Storage Structures

Objectives

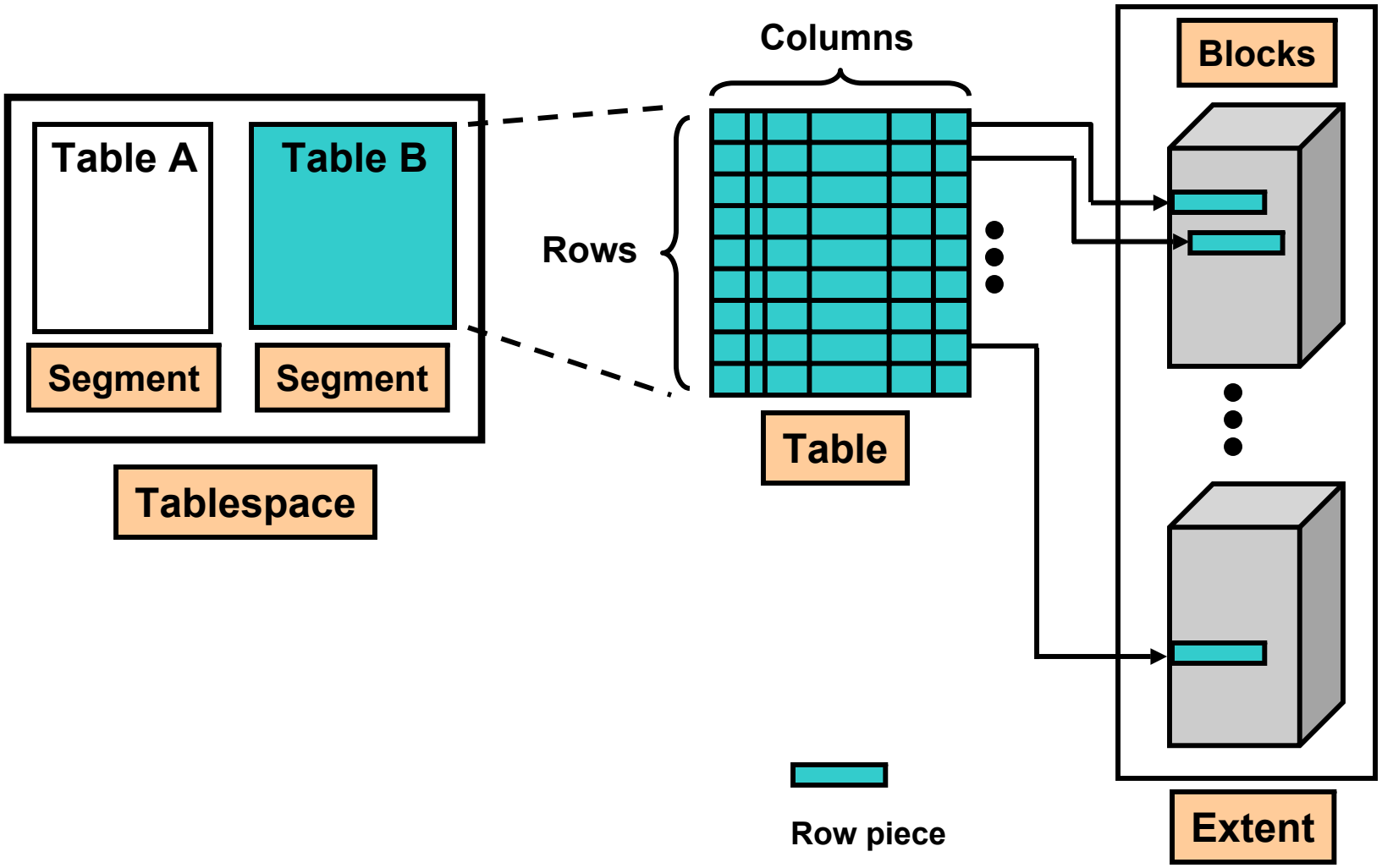
After completing this lesson, you should be able to do the following:

- Describe how table row data is stored in blocks
- Define the purpose of tablespaces and data files
- Create and manage tablespaces
- Obtain tablespace information
- Describe the main concepts and functionality of Automatic Storage Management (ASM)

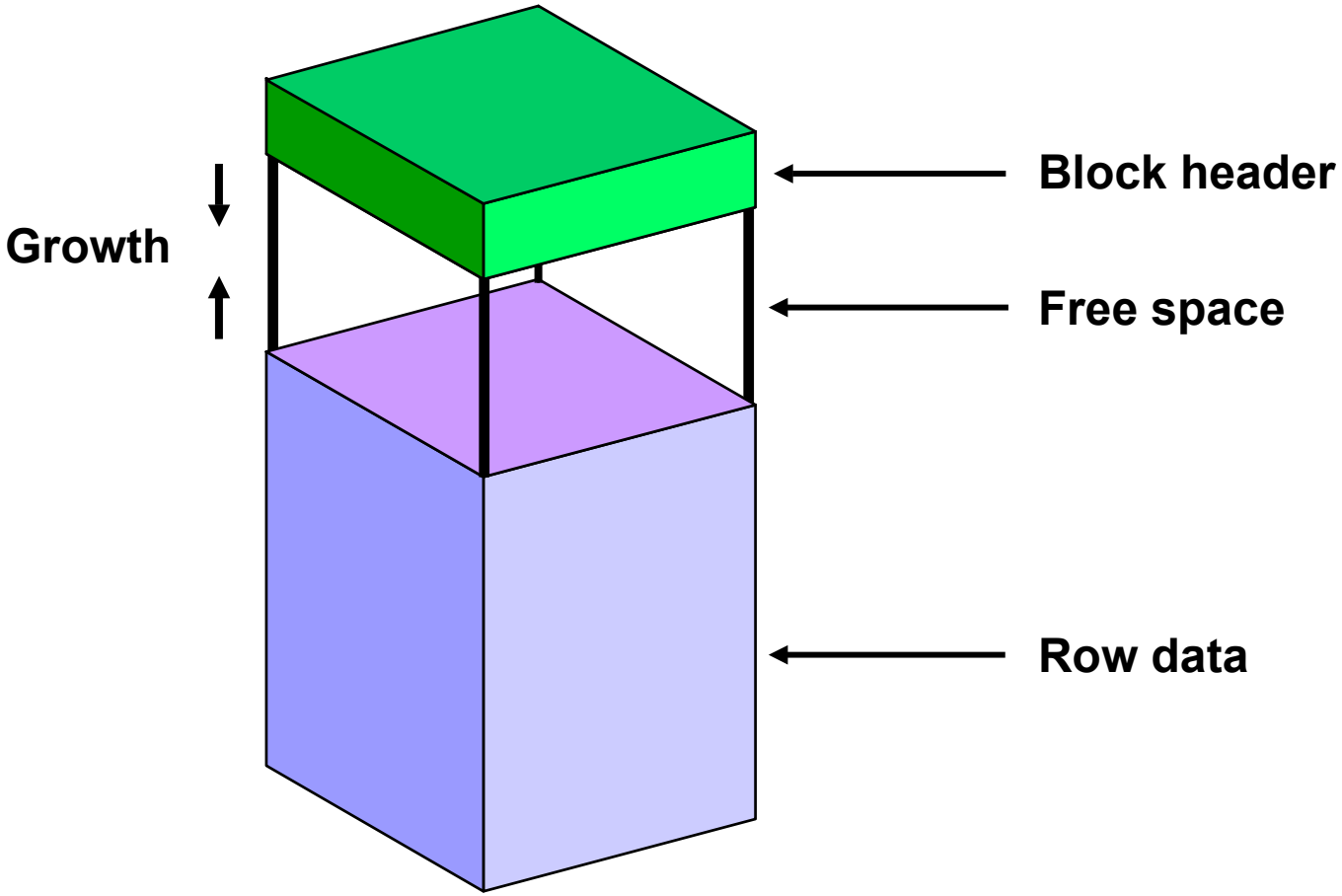
Storage Structures



How Table Data Is Stored



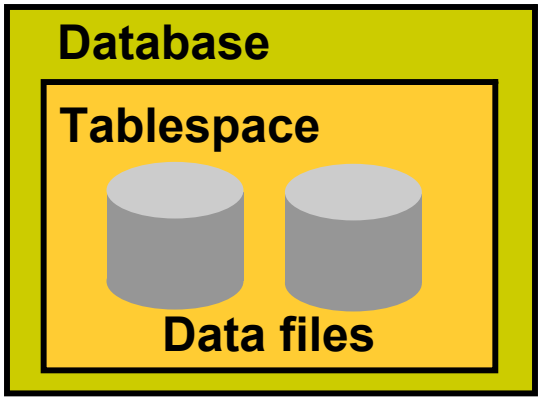
Anatomy of a Database Block



Tablespaces and Data Files

The Oracle database stores data logically in tablespaces and physically in data files.

- Tablespaces:
  - Can belong to only one database
  - Consist of one or more data files
  - Are further divided into logical units of storage
  - Are a repository for schema object data
- Data files:
  - Can belong to only one tablespace and one database
  - Are the underlying files that make up a tablespace



Oracle Managed Files (OMF)

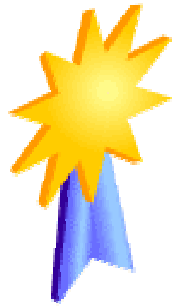
Specify file operations in terms of database objects rather than file names.

Parameter	Description
DB_CREATE_FILE_DEST	Defines the location of the default file system directory for data files and temporary files
DB_CREATE_ONLINE_LOG_DEST_n	Defines the location for redo log files and control file creation
DB_RECOVERY_FILE_DEST	Defines the location for RMAN backups

Example:

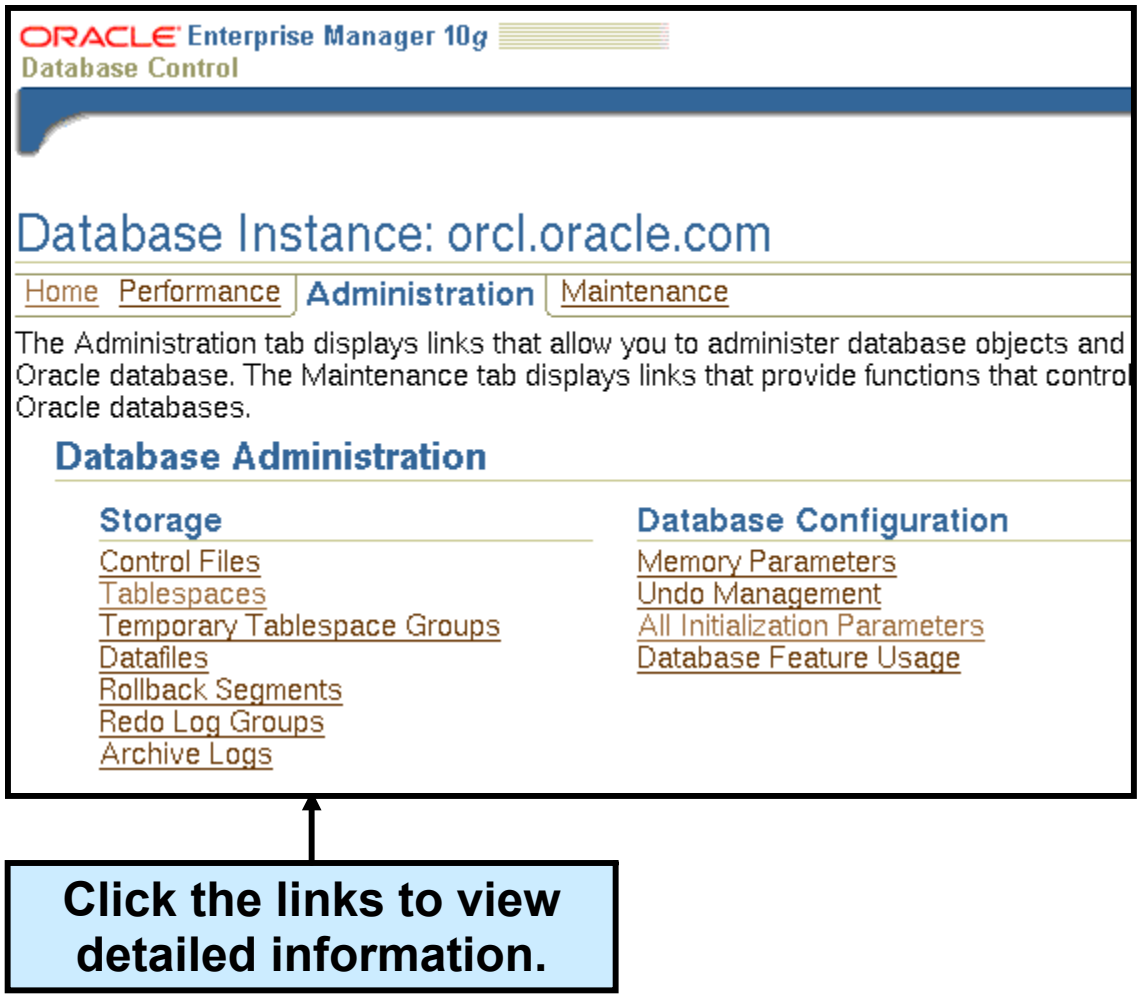
```
SQL> ALTER SYSTEM SET DB_CREATE_FILE_DEST = '/u01/oradata';
SQL> CREATE TABLESPACE tbs_1;
```

Space Management in Tablespaces

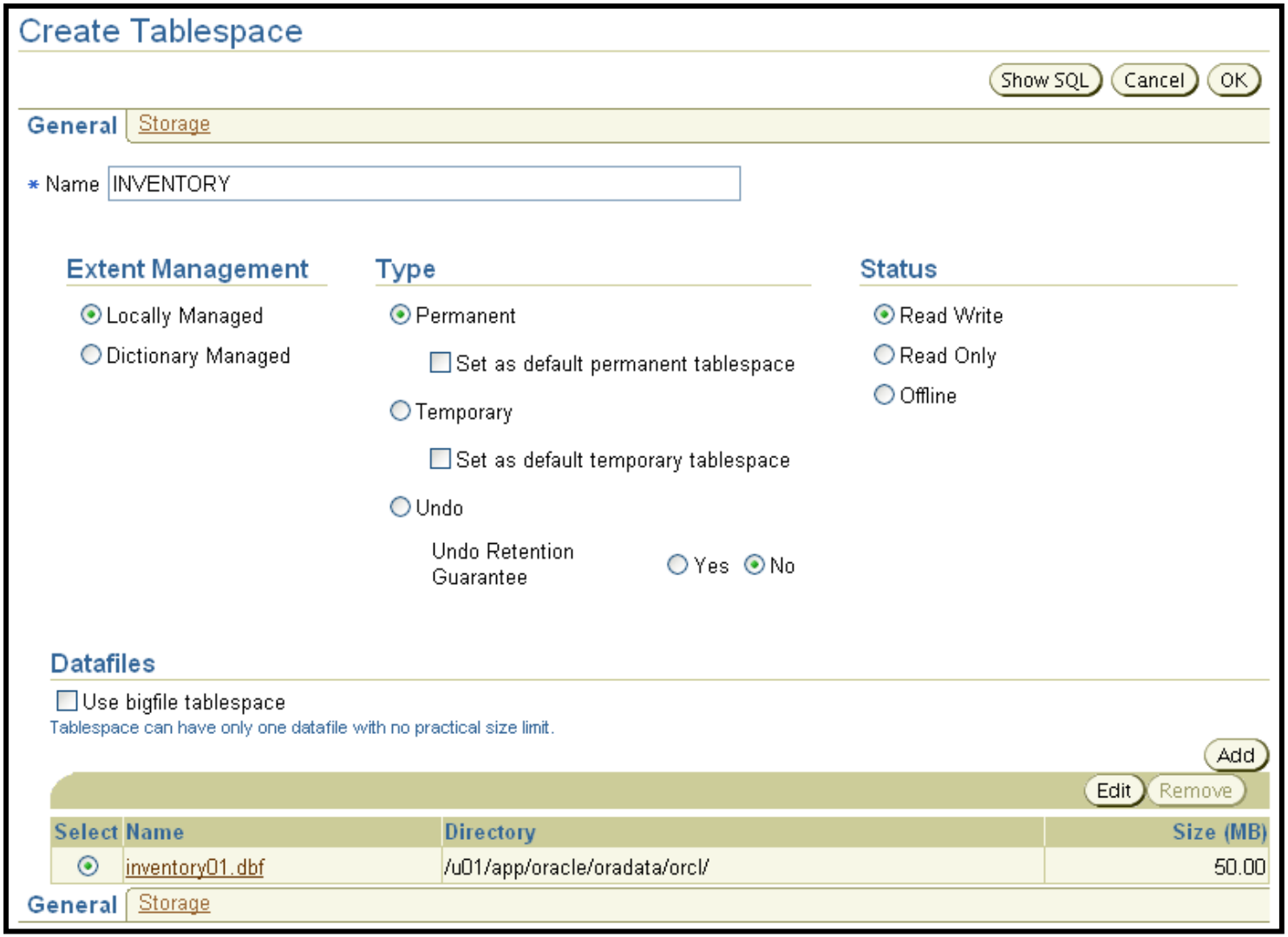


- Locally managed tablespace:
  - Free extents are managed in the tablespace.
  - A bitmap is used to record free extents.
  - Each bit corresponds to a block or group of blocks.
  - The bit value indicates free or used extents.
  - The use of locally managed tablespaces is recommended.
- Dictionary-managed tablespace:
  - Free extents are managed by the data dictionary.
  - Appropriate tables are updated when extents are allocated or unallocated.
  - These tablespaces are supported only for backward compatibility.

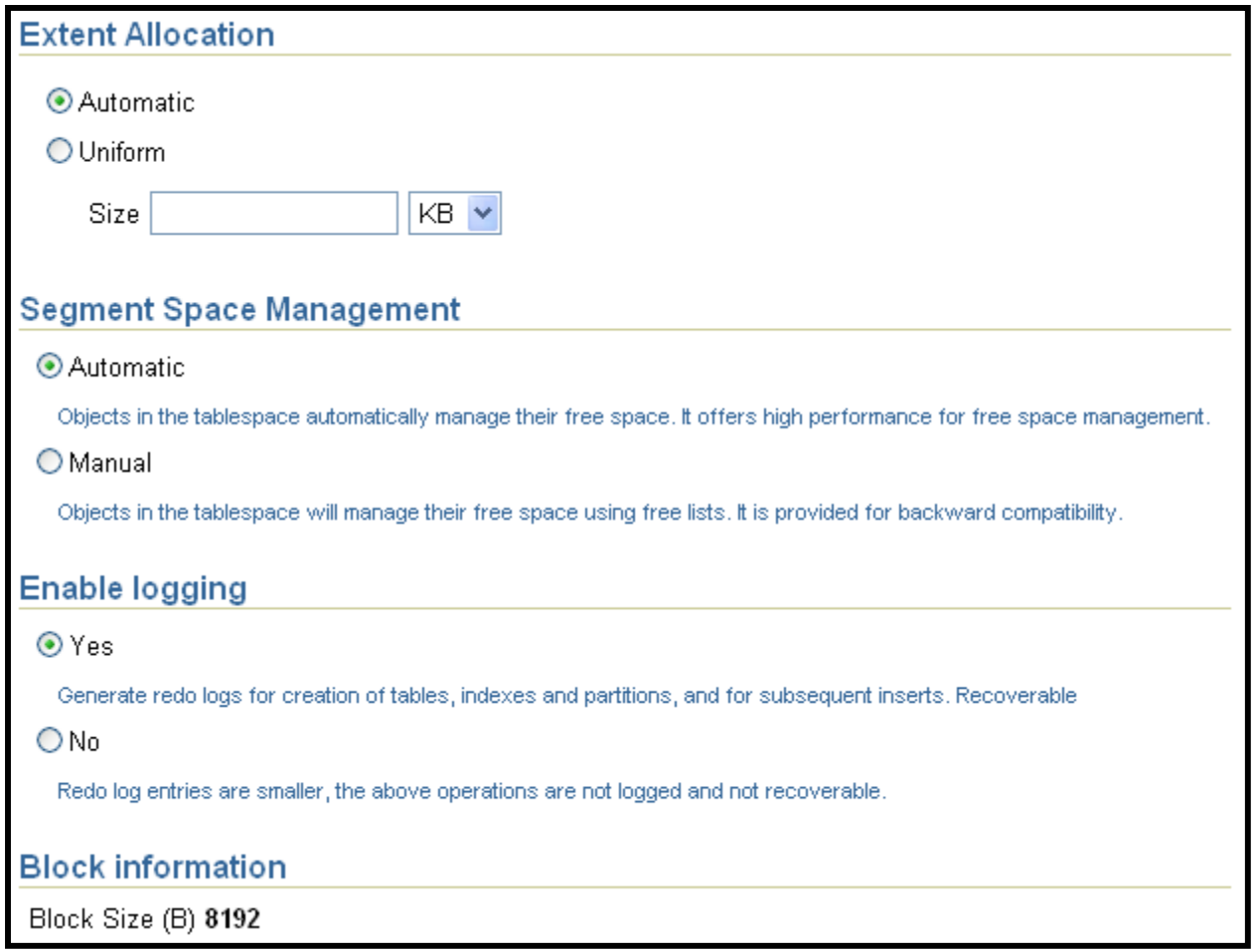
Exploring the Storage Structure



Creating a New Tablespace

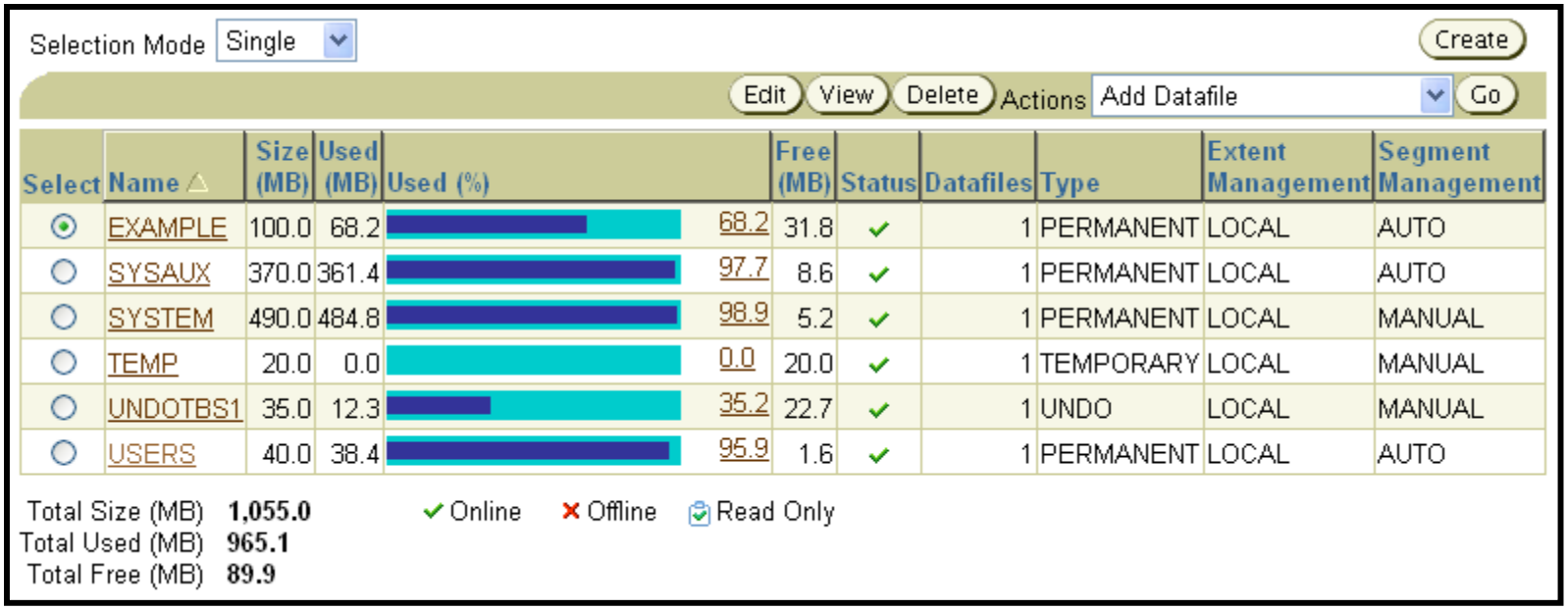


Storage for Locally Managed Tablespaces

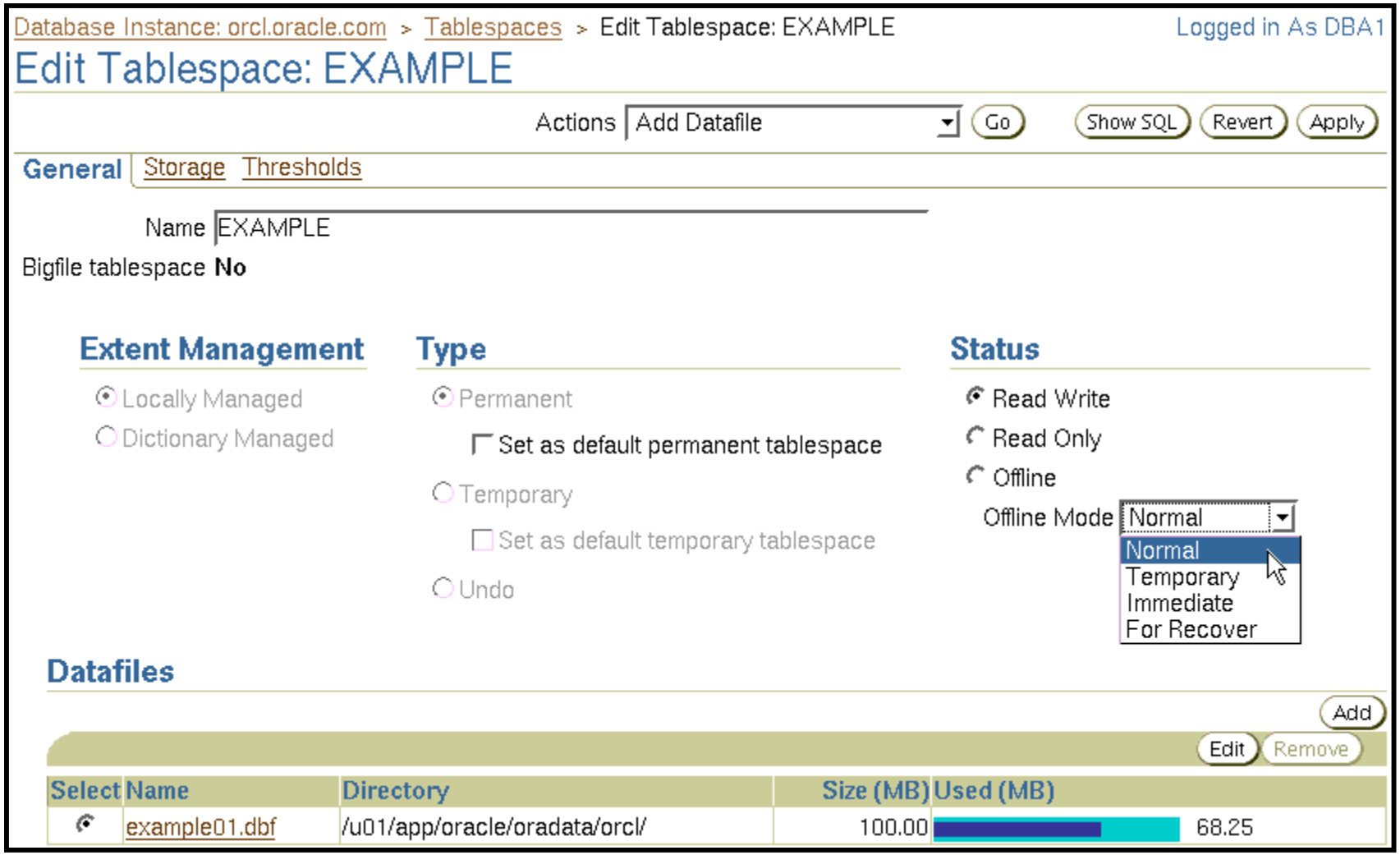


Tablespaces in the Preconfigured Database

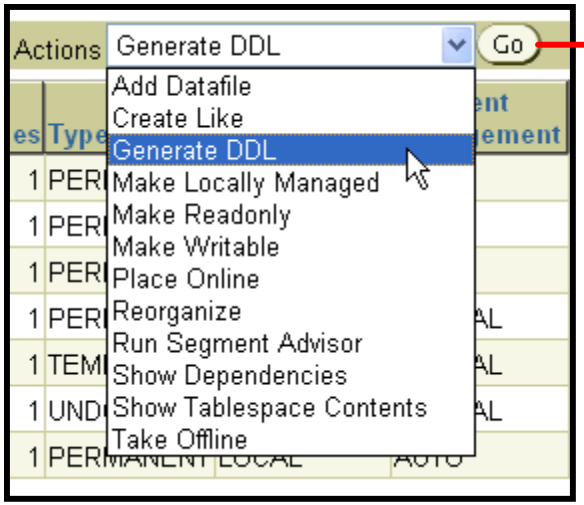
- SYSTEM
- SYSAUX
- TEMP
- UNDOTBS1
- USERS
- EXAMPLE

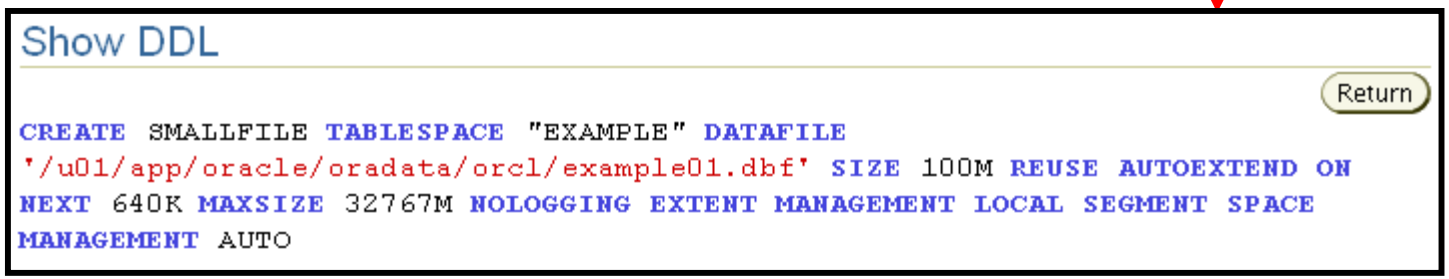


Altering a Tablespace

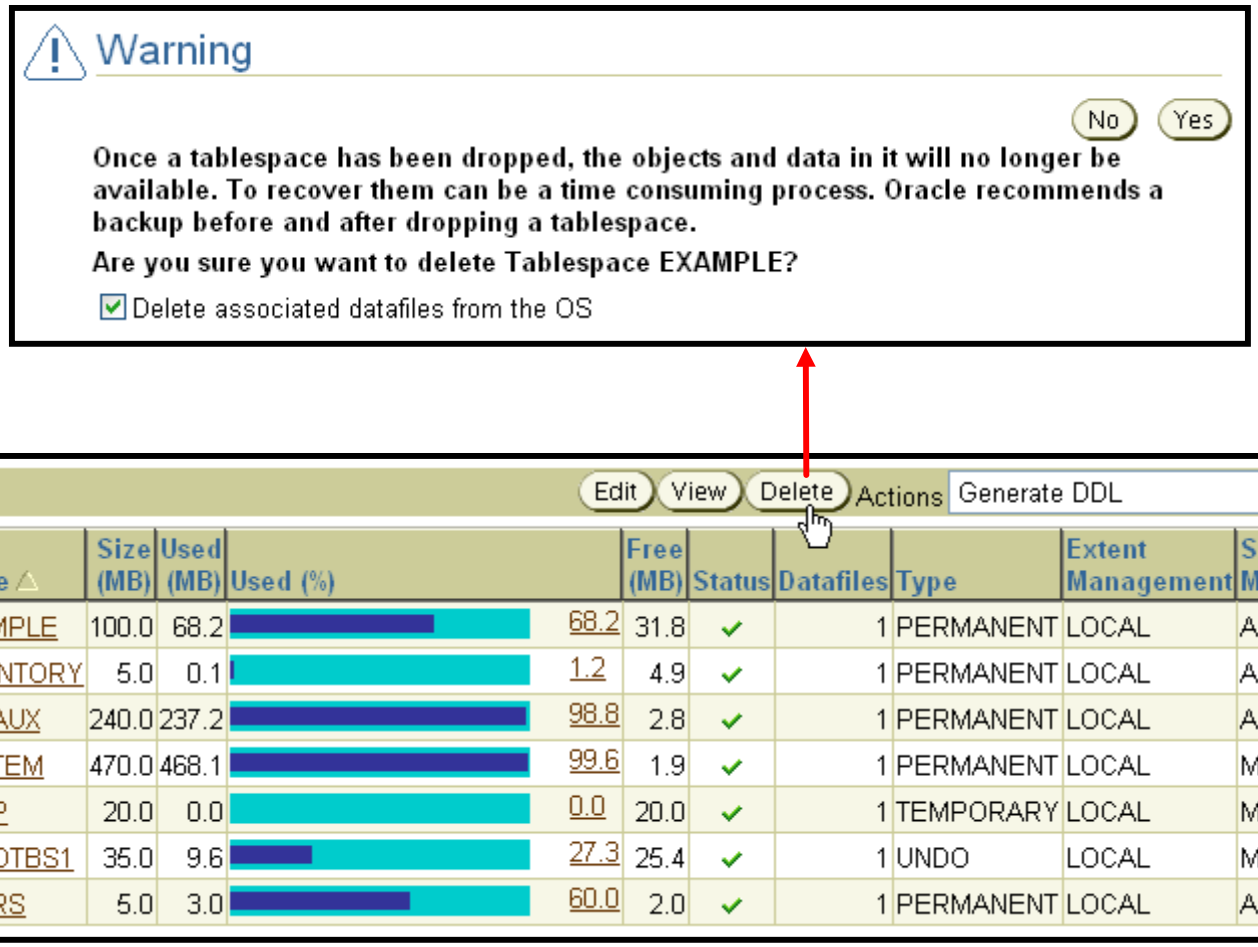


Actions with Tablespaces





Dropping Tablespaces



Viewing Tablespace Information

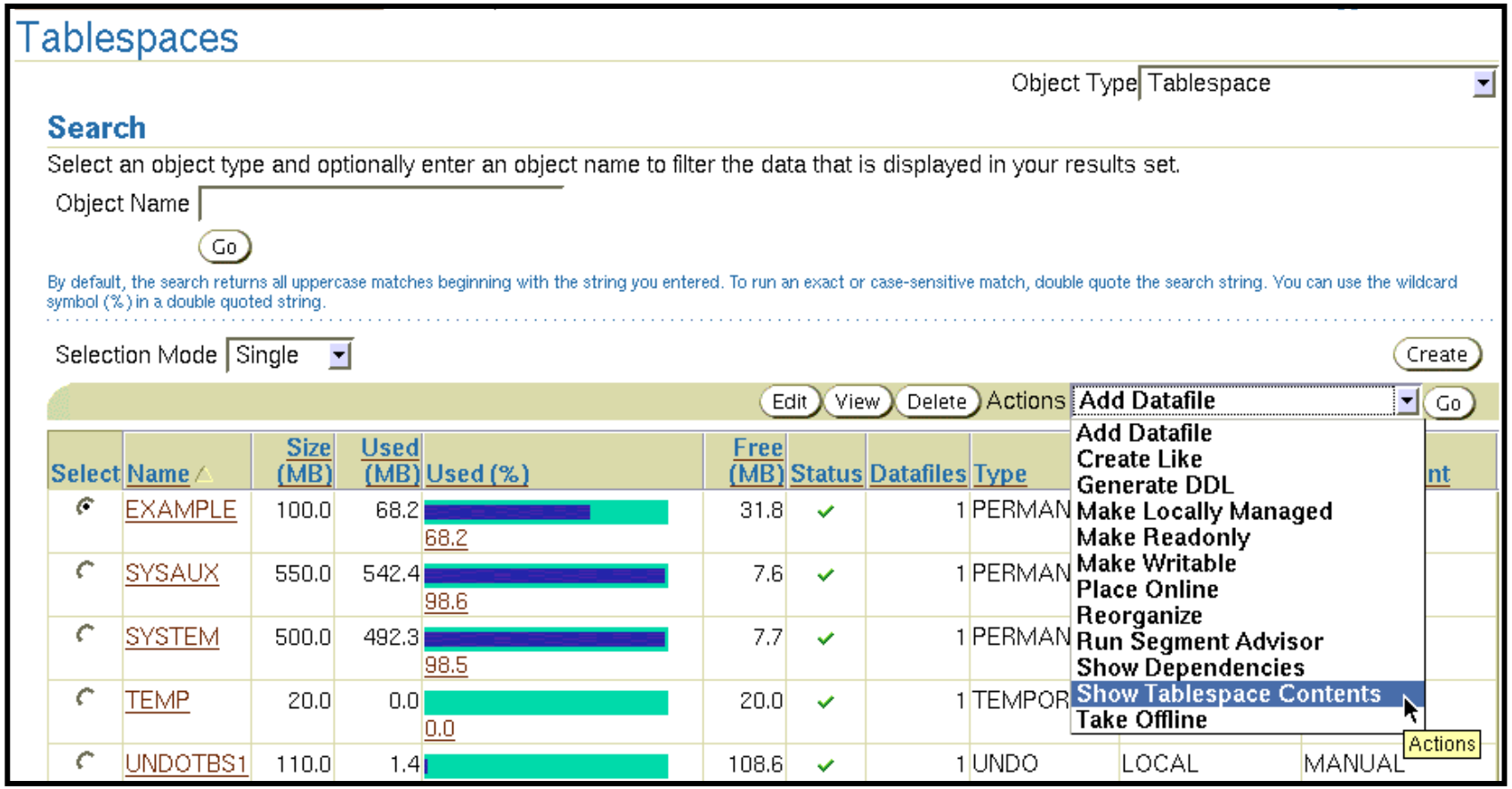
```
SELECT tablespace_name, status, contents, logging, extent_management,
allocation_type, segment_space_management
FROM dba_tablespaces
```

TABLESPACE_NAME	STATUS	CONTENTS	LOGGING	EXTENT_MAN	ALLOCATIO	SEGMEN
SYSTEM	ONLINE	PERMANENT	LOGGING	LOCAL	SYSTEM	MANUAL
UNDOTBS1	ONLINE	UNDO	LOGGING	LOCAL	SYSTEM	MANUAL
SYSAUX	ONLINE	PERMANENT	LOGGING	LOCAL	SYSTEM	AUTO
TEMP	ONLINE	TEMPORARY	NOLOGGING	LOCAL	UNIFORM	MANUAL
USERS	ONLINE	PERMANENT	LOGGING	LOCAL	SYSTEM	AUTO
EXAMPLE	ONLINE	PERMANENT	NOLOGGING	LOCAL	SYSTEM	AUTO
INVENTORY	ONLINE	PERMANENT	LOGGING	LOCAL	SYSTEM	AUTO

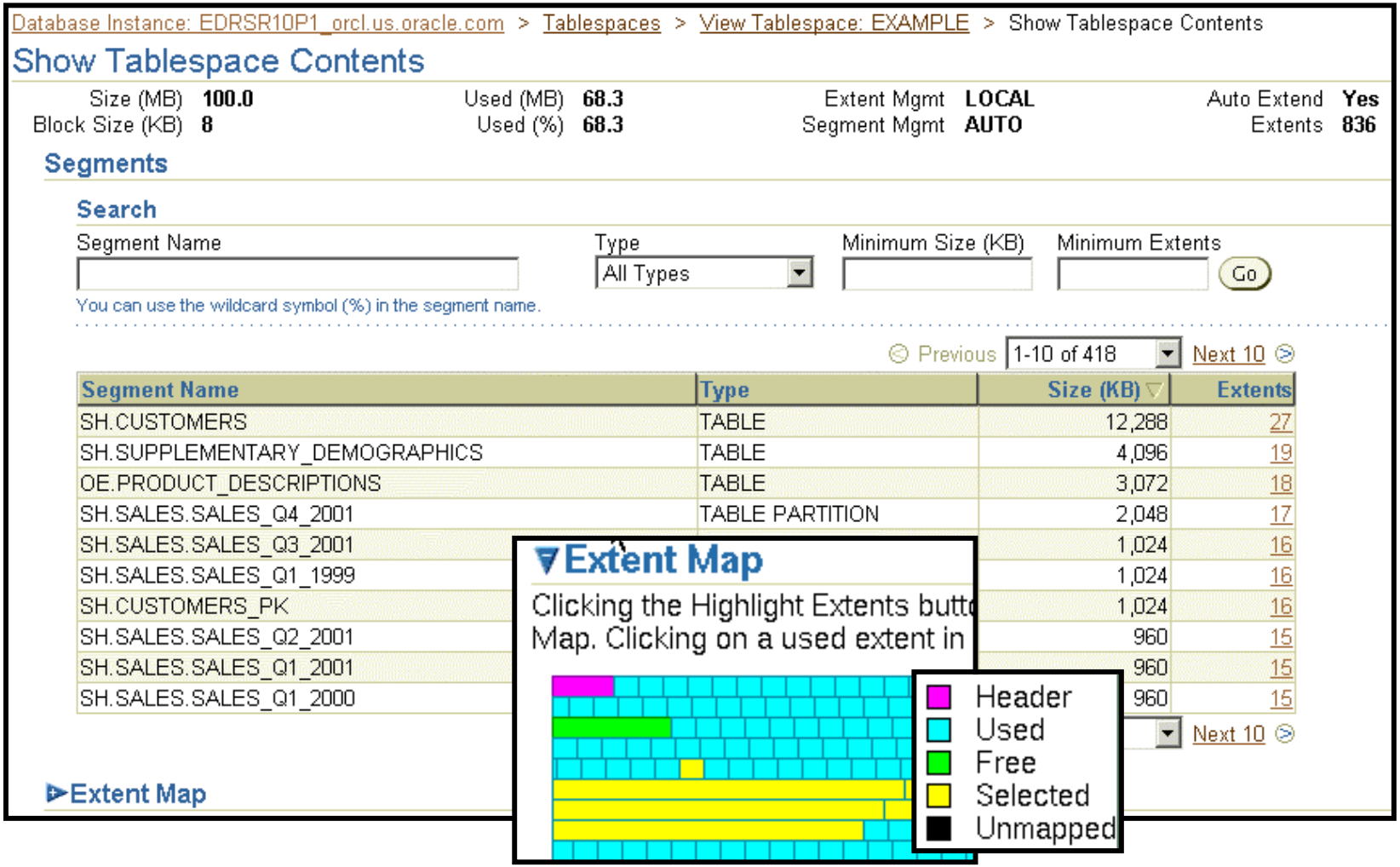
```
SELECT ts#, name FROM v$tablespace
```

TS#	NAME
0	SYSTEM
1	UNDOTBS1
2	SYSAUX
4	USERS
3	TEMP
6	EXAMPLE
7	INVENTORY

Gathering Storage Information



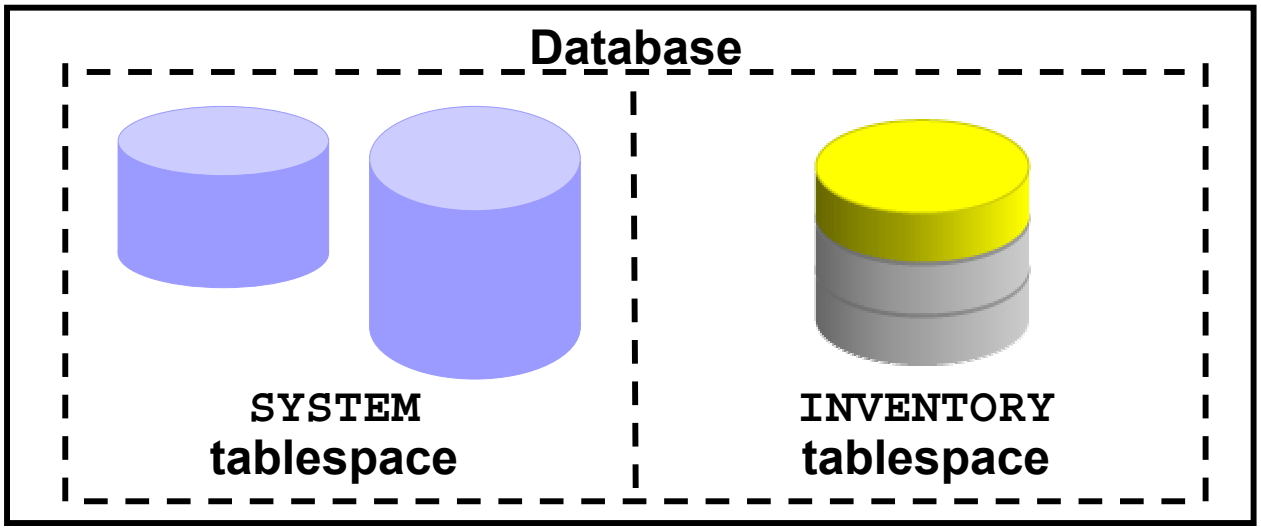
Viewing Tablespace Contents



Enlarging the Database

You can enlarge the database in the following ways:

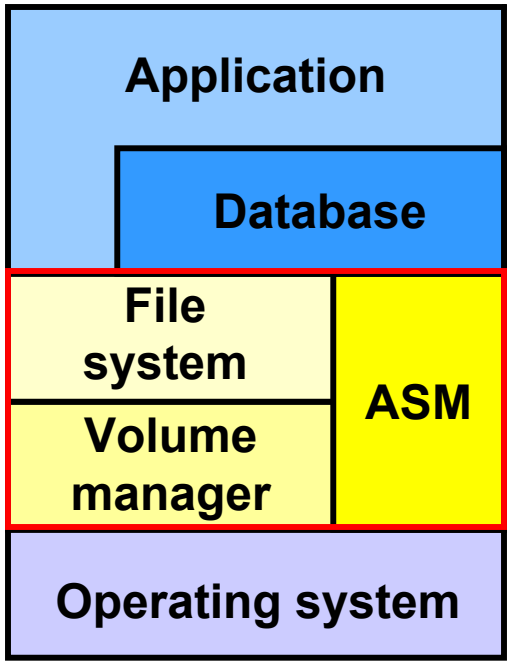
- Creating a new tablespace
- Adding a data file to an existing tablespace
- Increasing the size of a data file
- Providing for the dynamic growth of a data file



What Is Automatic Storage Management?

Automatic Storage Management

- **Is a portable and high-performance cluster file system**
- **Manages Oracle database files**
- **Spreads data across disks to balance load**
- **Mirrors data**
- **Solves many storage management challenges**

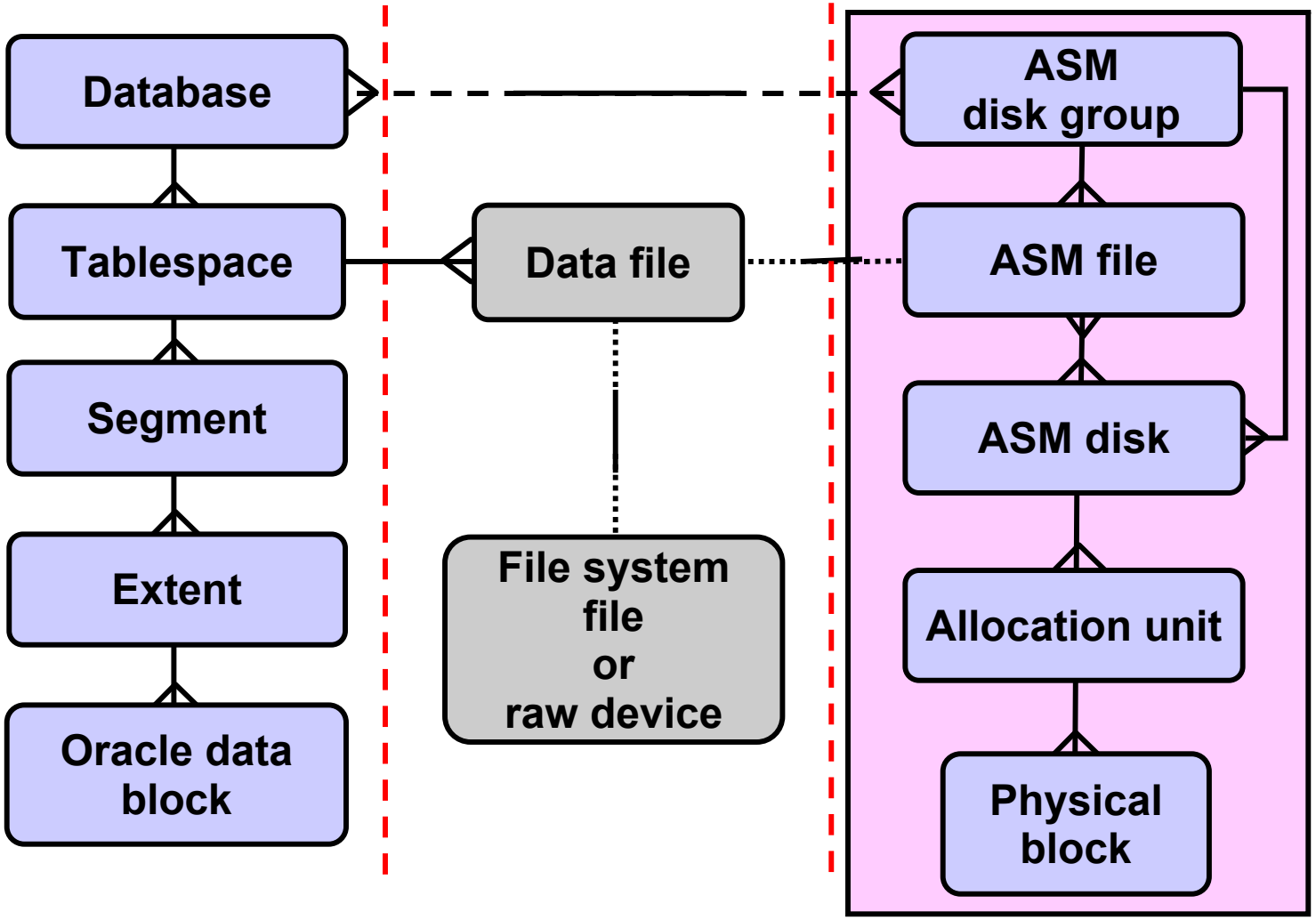


ASM: Key Features and Benefits

ASM

- Stripes files, but not logical volumes
- Provides online disk reconfiguration and dynamic rebalancing
- Allows for adjustable rebalancing speed
- Provides redundancy on a per-file basis
- Supports only Oracle database files
- Is cluster aware
- Is automatically installed

ASM: Concepts



Summary

In this lesson, you should have learned how to:

- Describe how table row data is stored in blocks
- Define the purpose of tablespaces and data files
- Create and manage tablespaces
- Obtain tablespace information
- Describe the main concepts and functionality of Automatic Storage Management (ASM)

Practice Overview: Managing Database Storage Structures

This practice covers the following topics:

- Creating tablespaces
- Gathering information about tablespaces