



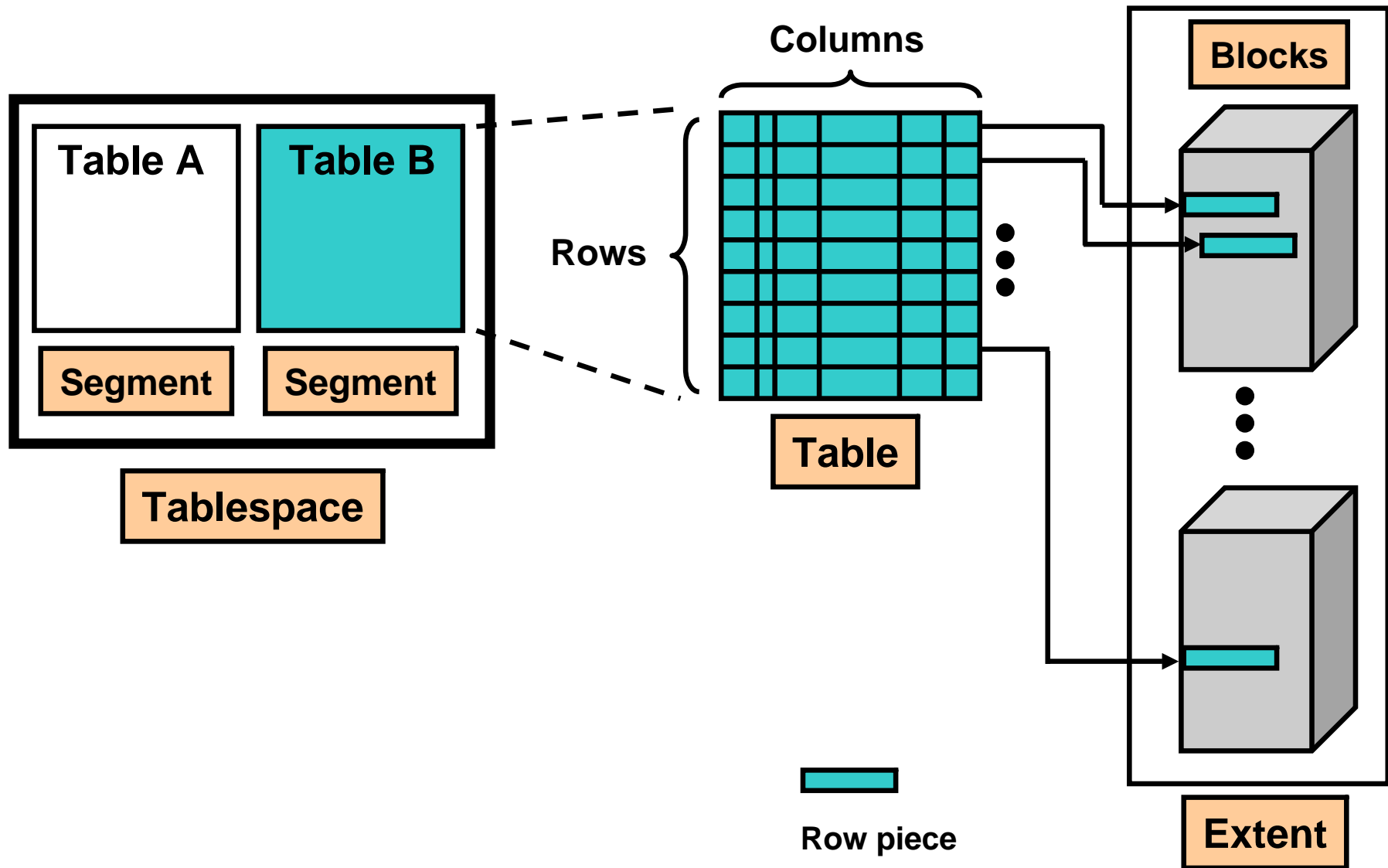
# Managing Database Storage Structures

# Objectives

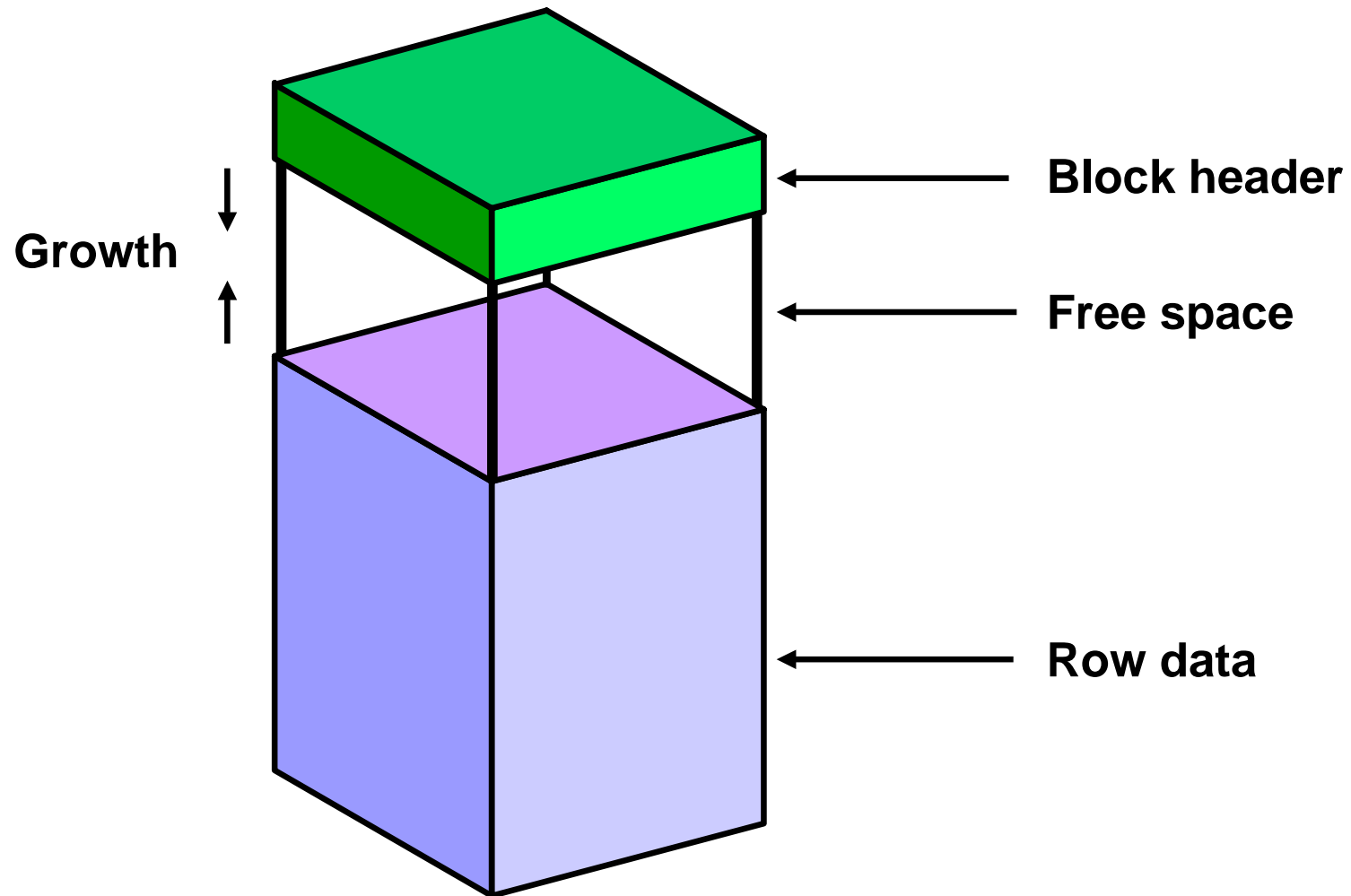
After completing this lesson, you should be able to:

- Describe the storage of table row data in blocks
- Create and manage tablespaces
- Obtain tablespace information


# How Table Data Is Stored



# Database Block: Contents



# Exploring the Storage Structure



The screenshot displays the Oracle Enterprise Manager 11g Database Control interface. At the top, the title bar reads "ORACLE Enterprise Manager 11g Database Control". Below this, the "Database Instance: orcl.oracle.com" is specified. A navigation bar contains links for "Home", "Performance", "Availability", "Server", "Schema", and "Data Movement". The "Storage" section is highlighted, showing a list of links: "Control Files", "Tablespaces", "Temporary Tablespace Groups", "Datafiles", "Rollback Segments", "Redo Log Groups", "Archive Logs", "Disk Groups", "Migrate to ASM", and "Make Tablespace Locally Managed". To the right, the "Database Configuration" section lists "Memory Advisors", "Automatic Undo Management", "Initialization Parameters", and "View Database Feature Usage".

**Click the links to view detailed information.**

# Creating a New Tablespace

**Create Tablespace**

Show SQLCancelOK

GeneralStorage

\* NameINVENTORY

**Extent Management**

☒ Locally Managed

☐ Dictionary Managed

**Type**

☒ Permanent

☐ Set as default permanent tablespace

☐ EncryptionEncryption Options

☐ Temporary

☐ Set as default temporary tablespace

☐ Undo

Undo Retention Guarantee

☐ Yes☒ No

**Status**

☒ Read Write

☐ Read Only

☐ Offline

**Datafiles**

☐ Use bigfile tablespace

Tablespace can have only one datafile with no practical size limit.

Add

Select	Name	Directory	Size (MB)
	No items found		

ORACLE

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# Creating a New Tablespace

**Add Datafile** Cancel Continue

Storage Type **Automatic Storage Management** ▾

\* DiskGroup **DATA** ▾

Template **<Default>** ▾

Alias Directory

Alias Name

Tablespace **INVENTORY**

File Size  **MB** ▾

☐ Reuse Existing File

**Storage**

☒ Automatically extend datafile when full (AUTOEXTEND)

Increment  **MB** ▾


Maximum File Size ☒ Unlimited ☐ Value  **MB** ▾

✓ **TIP** Changes made on this page will NOT take effect until you click Continue

**Add Datafile**

Storage Type **File System** ▾

\* File Name

\* File Directory  

Tablespace **INVENTORY**

File Size  **MB** ▾

☐ Reuse Existing File

**Choose the appropriate Storage Type**

# Storage for Tablespaces

General	Storage
<b>Extent Allocation</b>	
<input checked="" type="radio"/> Automatic	
<input type="radio"/> Uniform	
Size <input type="text"/> <input type="button" value="KB"/> <input type="button" value="↑"/>	
<b>Segment Space Management</b>	
<input checked="" type="radio"/> Automatic	
<small>Objects in the tablespace automatically manage their free space. It offers high performance for free space management.</small>	
<input type="radio"/> Manual	
<small>Objects in the tablespace will manage their free space using free lists. It is provided for backward compatibility.</small>	
<b>Compression Options</b>	
<small>Enabling data segment compression can reduce disk usage.</small>	
Compression <input checked="" type="radio"/> Disabled	
<input type="radio"/> Enabled on direct-path INSERT operations only	
<input type="radio"/> Enabled on all operations	
<b>Enable logging</b>	
<input checked="" type="radio"/> Yes	
<small>Generate redo logs for creation of tables, indexes and partitions, and for subsequent inserts. Recoverable</small>	
<input type="radio"/> No	
<small>Redo log entries are smaller, the above operations are not logged and not recoverable.</small>	
<b>Block information</b>	
Block Size (B) <b>8192</b>	



# Tablespaces in the Preconfigured Database

- SYSTEM
- SYSAUX
- TEMP
- UNDOTBS1
- USERS
- EXAMPLE (optional)







**Tablespaces**

Object Type: Tablespace

**Search**  
Enter an object name to filter the data that is displayed in your results set.  
Object Name    
By default, the search returns all uppercase matches beginning with the string you entered. To run an exact or case-sensitive match, double quote the search string. You can use the wildcard symbol (%) in a double quoted string.

Selection Mode: Single

Actions: Add Datafile

Select	Name	Allocated Size(MB)	Space Used(MB)	Allocated Space Used(%)	Auto Extend	Allocated Free Space(MB)	Status	Datafiles	Type	Extent Management	Segment Management
<input checked="" type="radio"/>	EXAMPLE	100.0	78.8	 78.8	YES	21.2	✓	1	PERMANENT	LOCAL	AUTO
<input type="radio"/>	SYSAUX	697.2	663.9	 95.2	YES	33.3	✓	1	PERMANENT	LOCAL	AUTO
<input type="radio"/>	SYSTEM	750.0	744.2	 99.2	YES	5.8	✓	1	PERMANENT	LOCAL	MANUAL
<input type="radio"/>	TEMP	27.0	0.0	 0.0	YES	27.0	✓	1	TEMPORARY	LOCAL	MANUAL
<input type="radio"/>	UNDOTBS1	100.0	16.1	 16.1	YES	83.9	✓	1	UNDO	LOCAL	MANUAL
<input type="radio"/>	USERS	5.0	4.1	 82.5	YES	0.9	✓	1	PERMANENT	LOCAL	AUTO

Total Allocated Size (GB) **1.64**    ✓ Online    ✗ Offline    📖 Read Only  
Total Used (GB) **1.47**  
Total Allocated Free Space (GB) **0.17**

# Altering a Tablespace

Edit View Delete Actions Add Datafile Go

Select	Name	Allocated Size(MB)	Space Used(MB)	Allocated Space Used(%)	Auto Extend	Allocated Free Space(MB)	Status	Datafiles	Type	Extent Management	Segment Management
<input checked="" type="radio"/>	EXAMPLE	100.0	78.8	<div><div></div></div> 78.8	YES	21.2	✓	1	PERMANENT	LOCAL	AUTO
<input type="radio"/>	SYSAU										

Edit Tablespace: EXAMPLE

Actions Add Datafile Go Show SQL Revert Apply

General Storage Thresholds

Name

Bigfile tablespace **No**

**Extent Management**
☒ Locally Managed
☐ Dictionary Managed

**Type**
☒ Permanent
☐ Set as default permanent tablespace
☐ Encryption 
☐ Temporary
☐ Set as default temporary tablespace
☐ Undo

**Status**
☒ Read Write
☐ Read Only
☐ Offline
Offline Mode

**Datafiles**

Edit Remove Add

Select	Name	Directory	Size (MB)	Used (MB)
<input checked="" type="radio"/>	example.265.688820635	+DATA/orcl/datafile/	100.00	<div><div></div></div> 78.81

# Actions with Tablespaces

Selection Mode Single ↓ Create

Edit View Delete Actions Add Datafile Go

Select	Name	Allocated Size(MB)	Used(%)	Auto Extend	Allocated Free Space(MB)	Status	Datafiles	Type	Extent Management	Segment Management
<input checked="" type="radio"/>	EXAMPLE	100.0	78.8	YES	21.2	✓	1	PERMANENT	LOCAL	AUTO
<input type="radio"/>	SYSAUX	697.2	95.2	YES	33.3	✓	1	PERMANENT	LOCAL	AUTO
<input type="radio"/>	SYSTEM	750.0	99.2	YES	5.8	✓	1	PERMANENT	LOCAL	MANUAL
<input type="radio"/>	TEMP	27.0	0.0	YES	27.0	✓	1	TEMPORARY	LOCAL	MANUAL
<input type="radio"/>	UNDOTBS1	100.0	17.1	YES	82.9	✓	1	UNDO	LOCAL	MANUAL
<input type="radio"/>	USERS	5.0	4.1	YES	0.9	✓	1	PERMANENT	LOCAL	AUTO


Total Allocated Size (GB) **1.64**    ✓ Online    ✗ Offline    📄 Read Only  
 Total Used (GB) **1.47**  
 Total Allocated Free Space (GB) **0.17**

## Show DDL

Return

```
CREATE SMALLFILE TABLESPACE "EXAMPLE" DATAFILE '+DATA/orcl/datafile/example.265.688820635'
SIZE 100M REUSE AUTOEXTEND ON NEXT 640K MAXSIZE 32767M NOLOGGING EXTENT MANAGEMENT LOCAL
SEGMENT SPACE MANAGEMENT AUTO
```

# Dropping Tablespaces

 **Warning**

Once a tablespace has been dropped, the objects and data in it will no longer be available. To recover them can be a time consuming process. Oracle recommends a backup before and after dropping a tablespace.

Are you sure you want to delete Tablespace EXAMPLE?


☒ Delete associated datafiles from storage

No Yes

<div><div>Edit</div><div>View</div><div>Delete</div><div>Actions</div><div>Add Datafile</div><div></div><div>Go</div></div>											
Select	Name	Allocated Size(MB)	Space Used(MB)	Allocated Space Used(%)	Auto Extend	Allocated Free Space(MB)	Status	Datafiles	Type	Extent Management	Segment Management
<input checked="" type="radio"/>	EXAMPLE	100.0	78.8	<div><div></div></div> 78.8	YES	21.2	✓	1	PERMANENT	LOCAL	AUTO
<input type="radio"/>	SYSAUX	697.2	663.9	<div><div></div></div> 95.2	YES	33.3	✓	1	PERMANENT	LOCAL	AUTO
<input type="radio"/>	SYSTEM	750.0	744.2	<div><div></div></div> 99.2	YES	5.8	✓	1	PERMANENT	LOCAL	MANUAL
<input type="radio"/>	TEMP	27.0	0.0	<div><div></div></div> 0.0	YES	27.0	✓	1	TEMPORARY	LOCAL	MANUAL
<input type="radio"/>	UNDOTBS1	100.0	17.1	<div><div></div></div> 17.1	YES	82.9	✓	1	UNDO	LOCAL	MANUAL
<input type="radio"/>	USERS	5.0	4.1	<div><div></div></div> 82.5	YES	0.9	✓	1	PERMANENT	LOCAL	AUTO


# 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_MANAGEMENT	ALLOCATION_TYPE	SEGMENT_SPACE_MANAGEMENT
SYSTEM	ONLINE	PERMANENT	LOGGING	LOCAL	SYSTEM	MANUAL
SYSAUX	ONLINE	PERMANENT	LOGGING	LOCAL	SYSTEM	AUTO
UNDOTBS1	ONLINE	UNDO	LOGGING	LOCAL	SYSTEM	MANUAL
TEMP	ONLINE	TEMPORARY	NOLOGGING	LOCAL	UNIFORM	MANUAL
USERS	ONLINE	PERMANENT	LOGGING	LOCAL	SYSTEM	AUTO
EXAMPLE	ONLINE	PERMANENT	NOLOGGING	LOCAL	SYSTEM	AUTO

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



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



# Viewing Tablespace Contents

**Show Tablespace Contents**

Size (MB) **100.0**  
Block Size (KB) **8**

Used (MB) **78.8**  
Used (%) **78.8**

Extent Mgmt **LOCAL**  
Segment Mgmt **AUTO**

Auto Extend **Yes**  
Extents **882**

Return

**Segments**

Search

Segment Name

Type  
All Types

Minimum Size (KB)

Minimum Extents

Go

By default, the search returns all uppercase matches beginning with the string you entered. To run an exact or case-sensitive match, double quote the search string. You can use the wildcard symbol (%) in a double quoted string.

Segment Name
SH.CUSTOMERS
PM.SYS_LOB0000
PM.SYS_LOB0000
SH.SUPPLEMENTAL
OE.PRODUCT_DES
SH.SALES.SALES
SH.SALES.SALES
SH.SALES.SALES
SH.CUSTOMERS_P
SH.SALES.SALES

**Extent Map**

Clicking the Highlight Extents button for a segment in the table will cause all extents that belong to that segment to be highlighted in the Extent Map. Clicking on a used extent in the Extent Map will select the segment to which that extent belongs in the segment table.

Zoom 75%

**Extent Map**

# 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	Default location for the fast recovery area

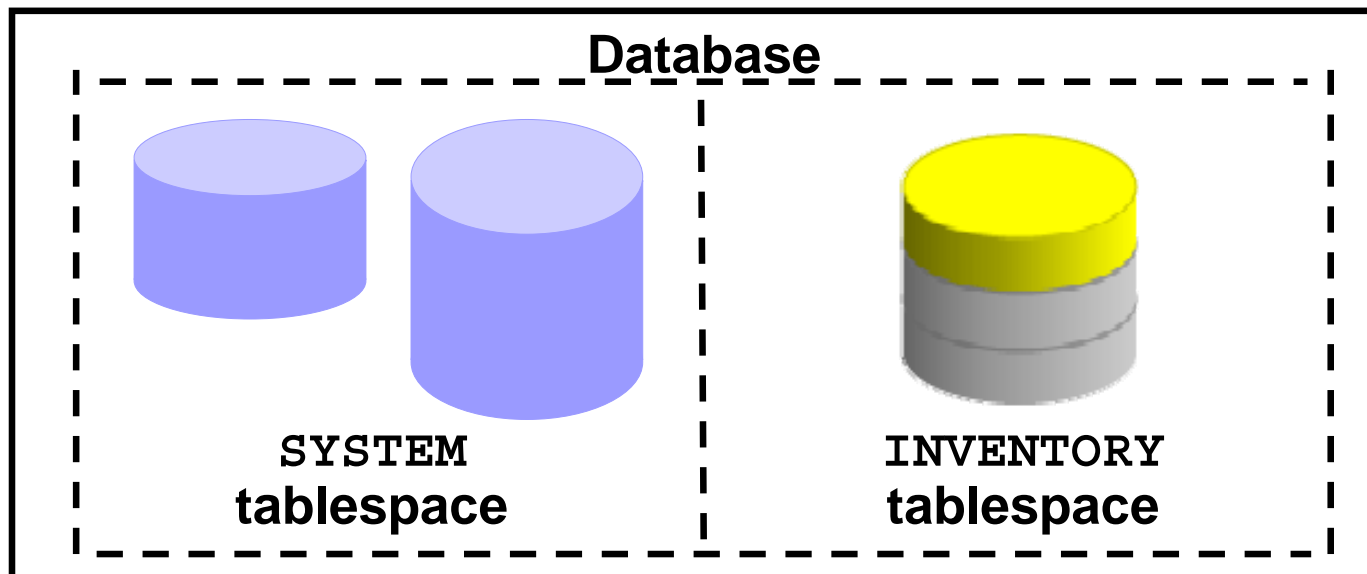
## Example:

```
SQL> ALTER SYSTEM SET DB_CREATE_FILE_DEST = '+DATA';  
SQL> CREATE TABLESPACE tbs_1;
```

# Enlarging the Database

You can enlarge the database in the following ways:

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





# Quiz

A database can have a mixture of Oracle-managed and unmanaged files.

1. True
2. False

# Quiz

Bigfile Tablespaces must have 1 file of at least 100 MB.

1. True
2. False

# Summary

In this lesson, you should have learned how to:

- Describe the storage of table row data in blocks
- Create and manage tablespaces
- Obtain tablespace information

# **Practice 7 Overview: Managing Database Storage Structures**

This practice covers the following topics:

- Creating tablespaces
- Gathering information about tablespaces