

How Table Data Is Stored

A datafile with records

	KING ...	5000 ... 10		
	MILLER ...	1300 ... 10		
	10 ACCOUNTING	NEW YORK		

← EMP record

← EMP record

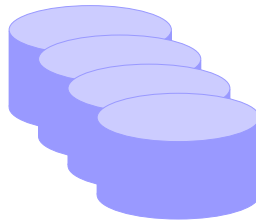
← DEPT record

```
SELECT SUM(sal) FROM EMP NATURAL JOIN DEPT
WHERE dname='ACCOUNTING';
```

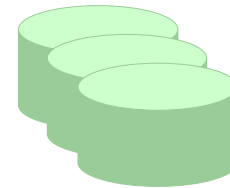
Physical Database Structure



Control files



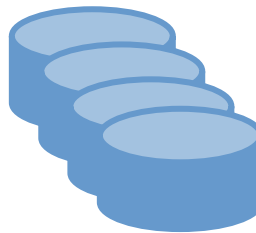
•Data files



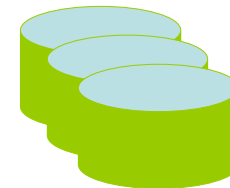
•Online redo log files



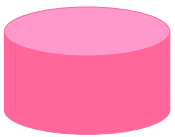
•Parameter file



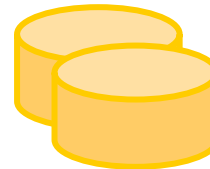
•Backup files



•Archive log files



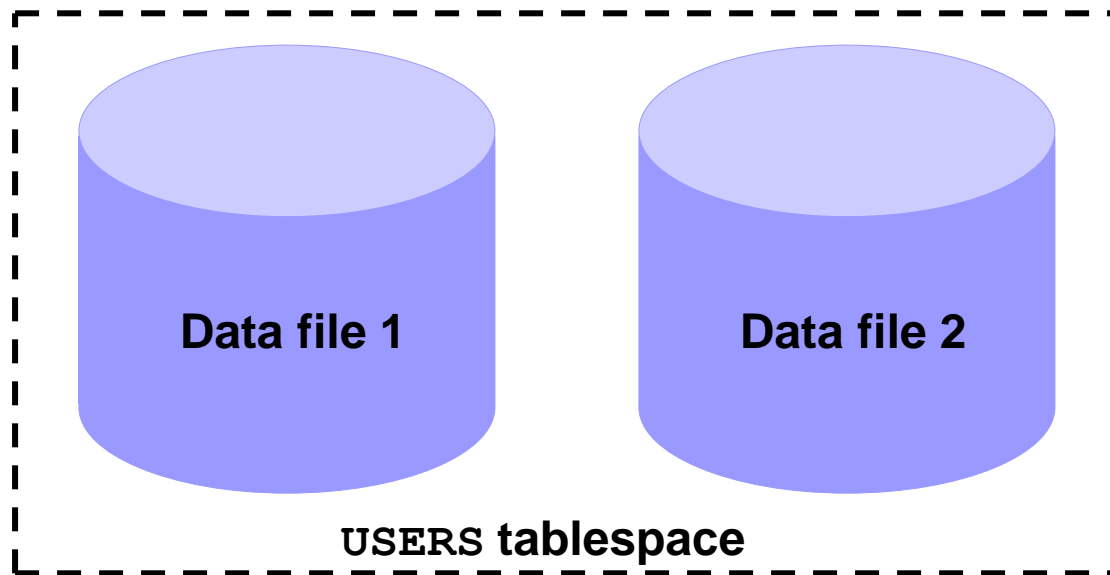
•Password file



•Alert and trace log files

Tablespaces and Data Files

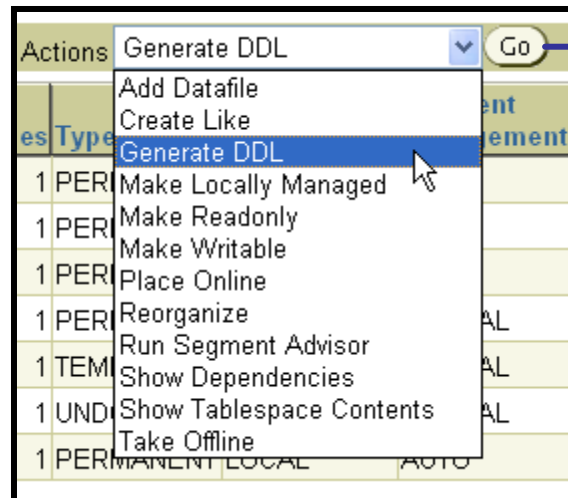
- Tablespaces consist of one or more data files.
- Data files belong to only one tablespace.



SYSTEM and SYSAUX Tablespaces

- The SYSTEM and SYSAUX tablespaces are **mandatory** tablespaces.
- They are created at the time of database creation.
- They **must be online**.
- The **SYSTEM** tablespace is used for core functionality (for example, **data dictionary** tables).
- The auxiliary **SYSAUX** tablespace is used for **additional database components** (such as the Enterprise Manager Repository).

Actions with Tablespaces




Show DDL

```
CREATE SMALLFILE TABLESPACE "EXAMPLE" DATAFILE
'/u01/app/oracle/oradata/orcl/example01.dbf' SIZE 100M REUSE AUTOEXTEND ON
NEXT 640K MAXSIZE 32767M NOLOGGING EXTENT MANAGEMENT LOCAL SEGMENT SPACE
MANAGEMENT AUTO
```

Return

Dropping Tablespaces

 **Warning**


No

Yes

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 the OS

Edit View Delete Actions Generate DDL Go											
Select	Name 	Size (MB)	Used (MB)	Used (%)	Free (MB)	Status	Datafiles	Type	Extent Management	Segment Management	
<input checked="" type="radio"/>	EXAMPLE	100.0	68.2	<div><div></div></div>	68.2	31.8	✓	1	PERMANENT	LOCAL	AUTO
<input type="radio"/>	INVENTORY	5.0	0.1	<div><div></div></div>	1.2	4.9	✓	1	PERMANENT	LOCAL	AUTO
<input type="radio"/>	SYSAUX	240.0	237.2	<div><div></div></div>	98.8	2.8	✓	1	PERMANENT	LOCAL	AUTO
<input type="radio"/>	SYSTEM	470.0	468.1	<div><div></div></div>	99.6	1.9	✓	1	PERMANENT	LOCAL	MANUAL
<input type="radio"/>	TEMP	20.0	0.0	<div><div></div></div>	0.0	20.0	✓	1	TEMPORARY	LOCAL	MANUAL
<input type="radio"/>	UNDOTBS1	35.0	9.6	<div><div></div></div>	27.3	25.4	✓	1	UNDO	LOCAL	MANUAL
<input type="radio"/>	USERS	5.0	3.0	<div><div></div></div>	60.0	2.0	✓	1	PERMANENT	LOCAL	AUTO


Viewing Tablespace Information

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



TABSPACE_NAME	STATUS	CONTENTS	LOGGING	EXTENT_MAN	ALLOCATIO	SEGMENT
SYSTEM	ONLINE	PERMANENT	LOGGING	LOCAL	SYSTEM	MANUAL
UNDOTBS1	ONLINE	UNDO	LOGGING	LOCAL	SYSTEM	MANUAL
SYS_AUX	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

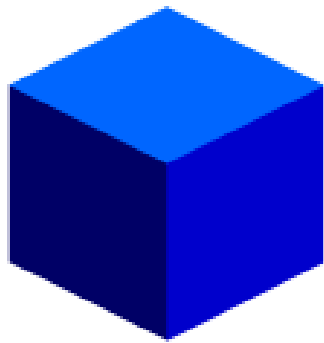
```
SELECT ts#, name FROM v$tablespace
```



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

Segments, Extents, and Blocks

- Segments exist within a tablespace.
- Segments are made up of a collection of extents.
- Extents are a collection of data blocks.
- Data blocks are mapped to disk blocks.



Segment



Extents

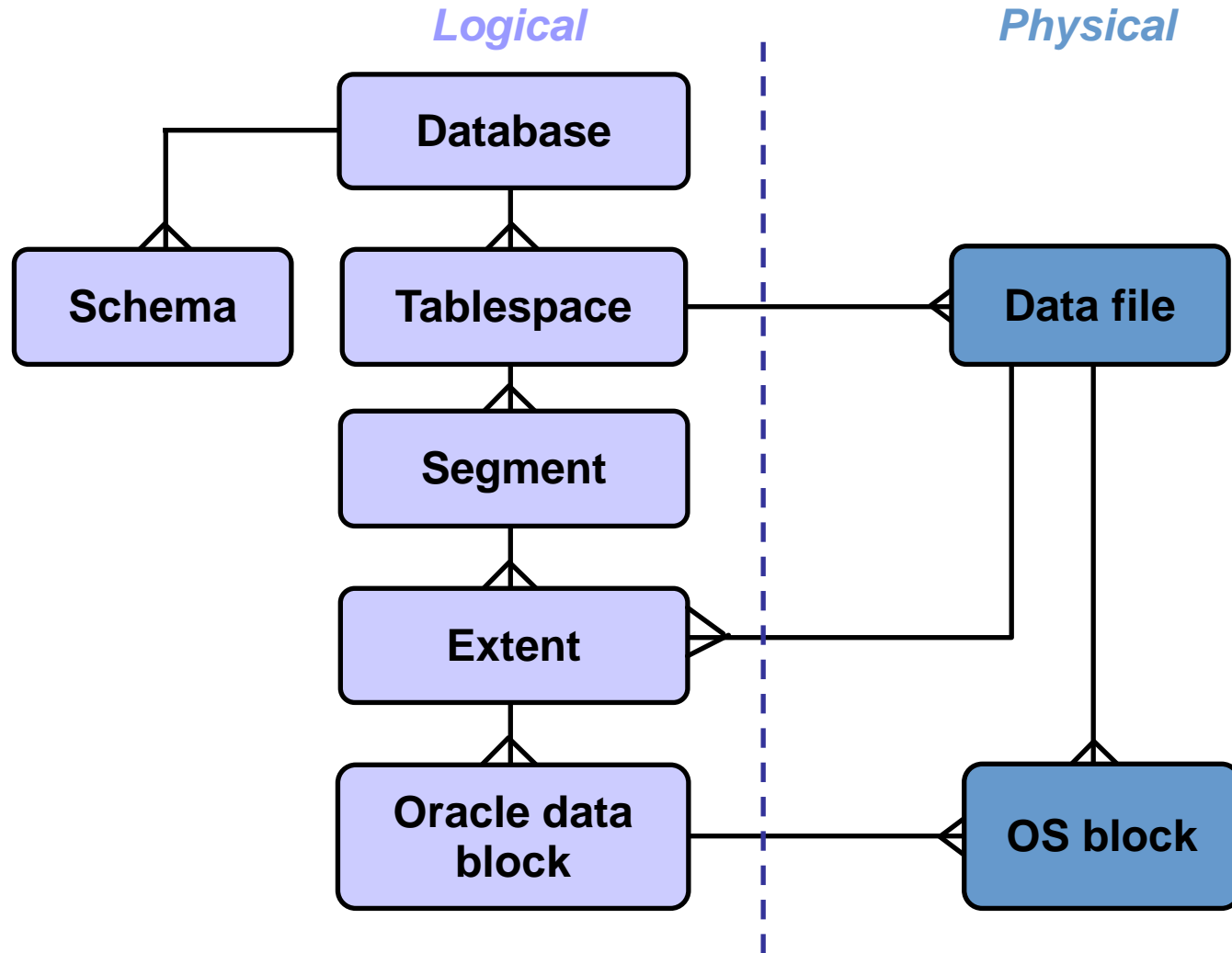


**Data
blocks**



**Disk
blocks**

Logical and Physical Database Structures



Viewing Tablespace Contents

Database Instance: [EDRSR10P1_orcl.us.oracle.com](#) > [Tablespaces](#) > [View Tablespace: EXAMPLE](#) > Show Tablespace Contents

Show Tablespace Contents

Size (MB) **100.0** Used (MB) **68.3** Extent Mgmt **LOCAL** Auto Extend **Yes**
Block Size (KB) **8** Used (%) **68.3** Segment Mgmt **AUTO** Extents **836**

Segments

Search

Segment Name Type Minimum Size (KB) Minimum Extents

You can use the wildcard symbol (%) in the segment name.

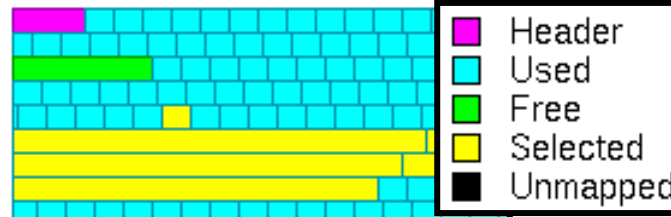
Previous 1-10 of 418 Next 10

Segment Name	Type	Size (KB)	Extents
SH.CUSTOMERS	TABLE	12,288	27
SH.SUPPLEMENTARY_DEMOGRAPHICS	TABLE	4,096	19
OE.PRODUCT_DESCRIPTIONS	TABLE	3,072	18
SH.SALES.SALES_Q4_2001	TABLE PARTITION	2,048	17
SH.SALES.SALES_Q3_2001		1,024	16
SH.SALES.SALES_Q1_1999		1,024	16
SH.CUSTOMERS_PK		1,024	16
SH.SALES.SALES_Q2_2001		960	15
SH.SALES.SALES_Q1_2001		960	15
SH.SALES.SALES_Q1_2000		960	15

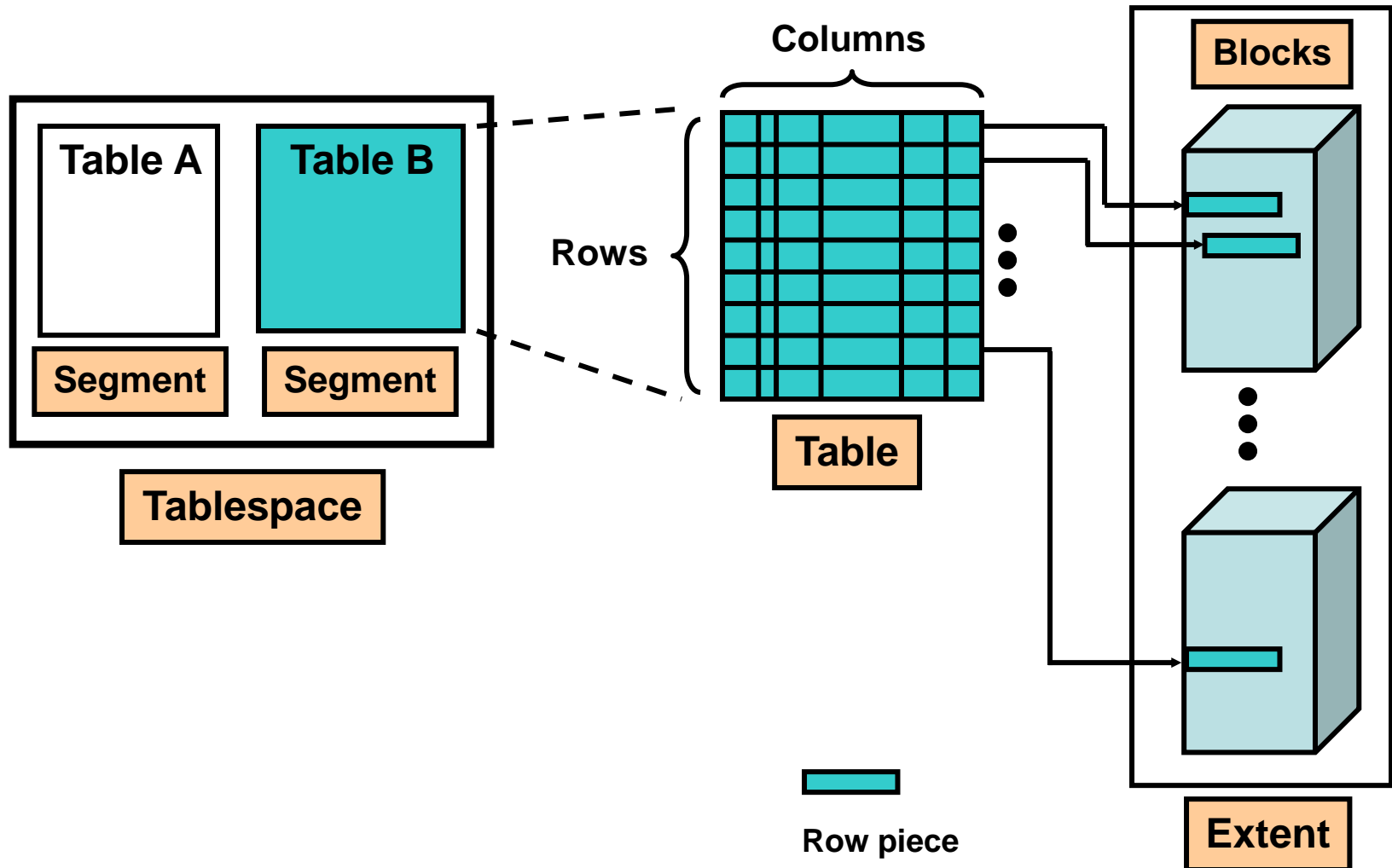
Extent Map

Extent Map

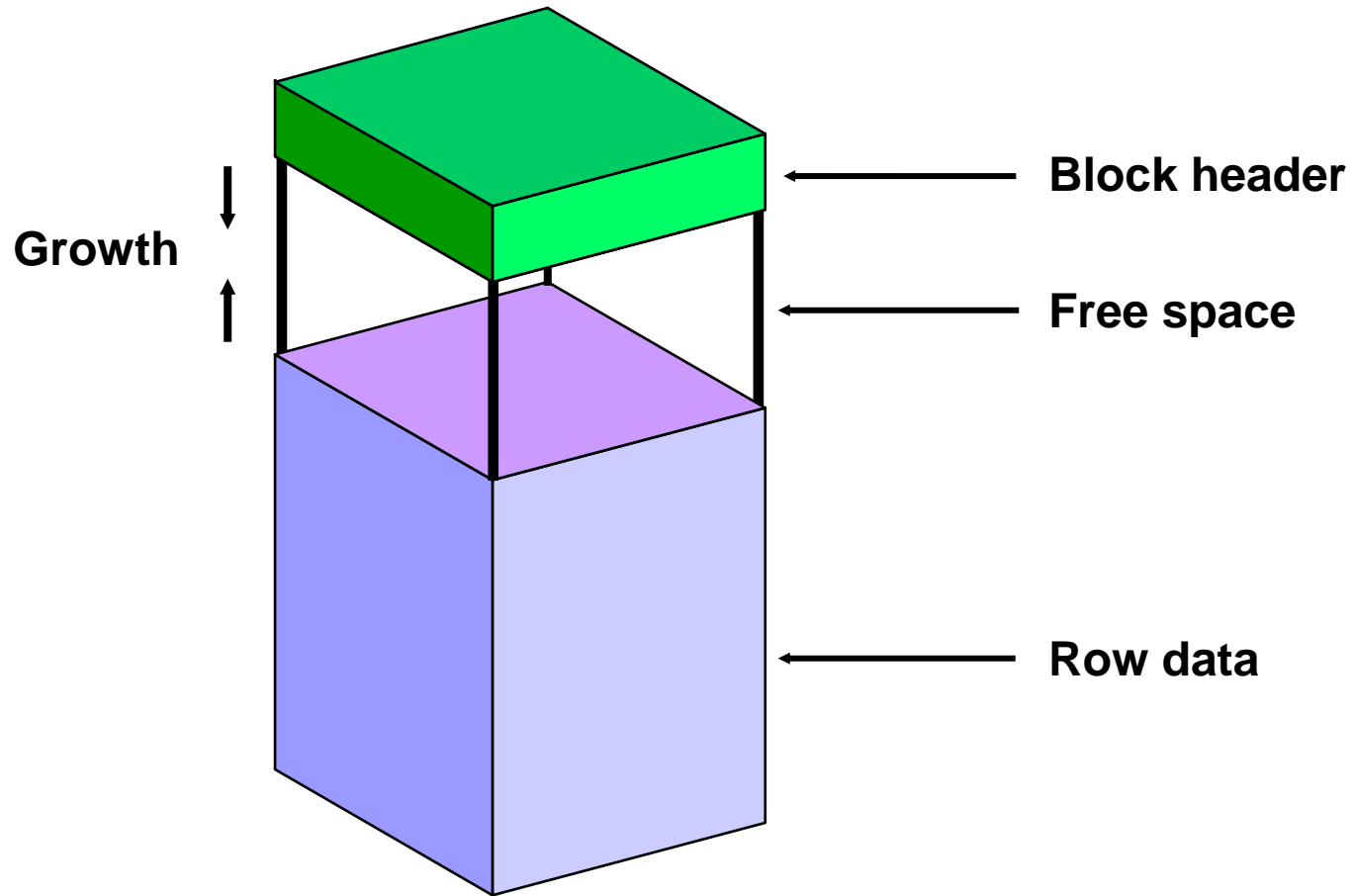
Clicking the Highlight Extents button
Map. Clicking on a used extent in



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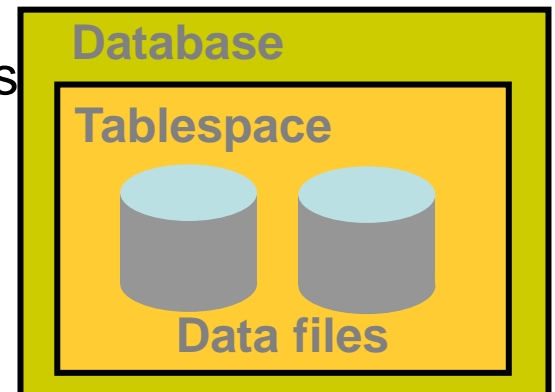
Anatomy of a Database Block



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
- Data files:
 - Can belong to only one tablespace and one database
 - Are a repository for schema object data



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.

Tablespaces in the Preconfigured Database

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

Selection Mode Single Create

Edit View Delete Actions Add Datafile Go

Select	Name △	Size (MB)	Used (MB)	Used (%)	Free (MB)	Status	Datafiles	Type	Extent Management	Segment Management	
<input checked="" type="radio"/>	EXAMPLE	100.0	68.2	<div><div></div></div>	68.2	31.8	✓	1	PERMANENT	LOCAL	AUTO
<input type="radio"/>	SYSAUX	370.0	361.4	<div><div></div></div>	97.7	8.6	✓	1	PERMANENT	LOCAL	AUTO
<input type="radio"/>	SYSTEM	490.0	484.8	<div><div></div></div>	98.9	5.2	✓	1	PERMANENT	LOCAL	MANUAL
<input type="radio"/>	TEMP	20.0	0.0	<div><div></div></div>	0.0	20.0	✓	1	TEMPORARY	LOCAL	MANUAL
<input type="radio"/>	UNDOTBS1	35.0	12.3	<div><div></div></div>	35.2	22.7	✓	1	UNDO	LOCAL	MANUAL
<input type="radio"/>	USERS	40.0	38.4	<div><div></div></div>	95.9	1.6	✓	1	PERMANENT	LOCAL	AUTO

Total Size (MB)1,055.0

Total Used (MB)965.1

Total Free (MB)89.9

✓ Online ✗ Offline 🔒 Read Only

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

