Database administration advanced

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Agenda

Tablespaces, Datafiles, and Control Files
   a.   Allocate More Space for a Database
   b.   Types of tablespaces
   c.   Managing space

Tablespaces, Datafiles, and Control Files

https://docs.oracle.com/cd/B19306_01/server.102/b14220/physical.htm

Tablespaces, Datafiles, and Control Files

- Logically -> Tablespaces
- Physically -> Datafiles
- 1 or more tablespaces = Oracle Database
- Each tablespace has at least 1 datafile
    - 1 tablespace - 1 datafile (Minimum)
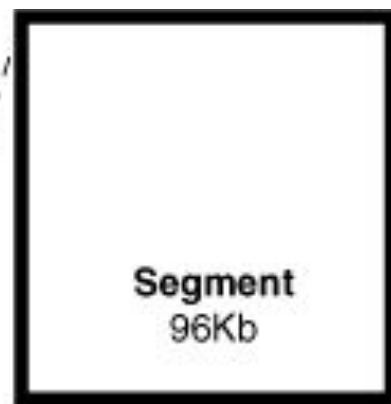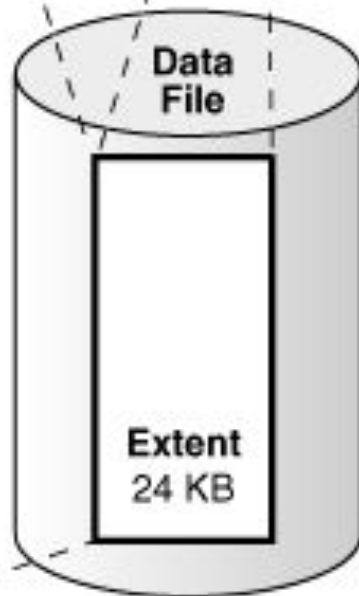   - 3 tablespaces - each 2 datafiles (6 datafiles)

Tablespaces' Overview

- **Database** = one or more logical storage units (**tablespaces**).
- Tablespaces are divided into logical units of storage (**segments**),
- Segments are divided into **extents**.
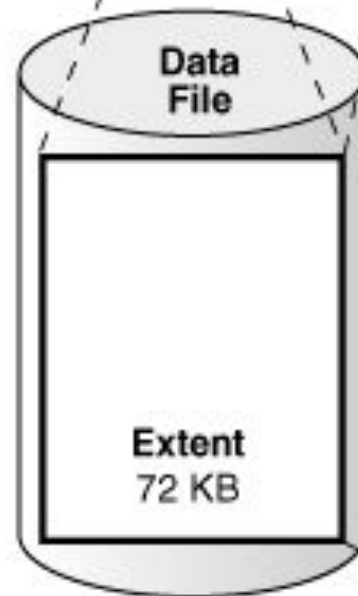- Extents are a collection of contiguous **blocks**

Data Blocks

2 KB
2 KB
2 KB
2 KB
2 KB
2 KB
2 KB
2 KB
2 KB
2 KB
2 KB
2 KB

Segment
96Kb

Data File

Extent
24 KB

Data File

Extent
72 KB

Data Blocks

2 KB	2 KB	2 KB
2 KB	2 KB	2 KB
2 KB	2 KB	2 KB
2 KB	2 KB	2 KB
2 KB	2 KB	2 KB
2 KB	2 KB	2 KB
2 KB	2 KB	2 KB
2 KB	2 KB	2 KB
2 KB	2 KB	2 KB
2 KB	2 KB	2 KB
2 KB	2 KB	2 KB

Tablespaces' Overview

- System interfaces to create and delete files as needed
    - Tablespaces
    - Redo log files
    - Control files

Tablespaces' Overview

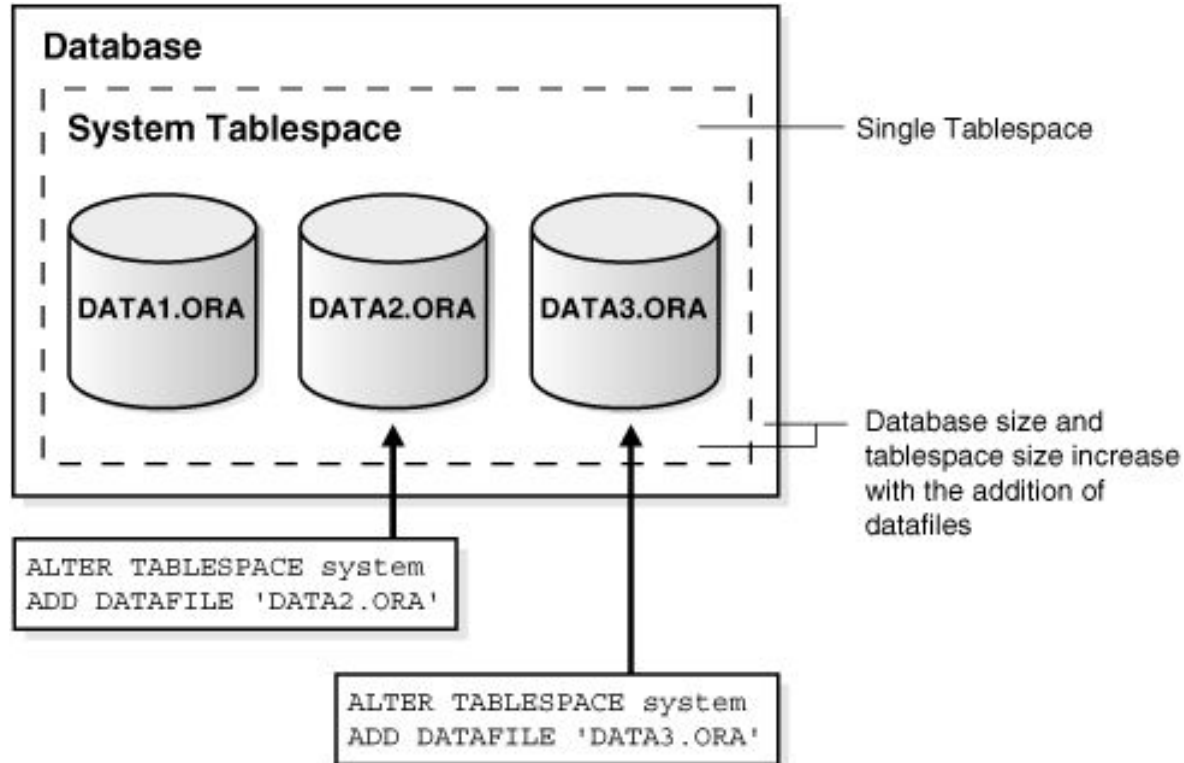*The size of a tablespace is the size of the datafiles.*

The size of a database is the collective size of the tablespaces.
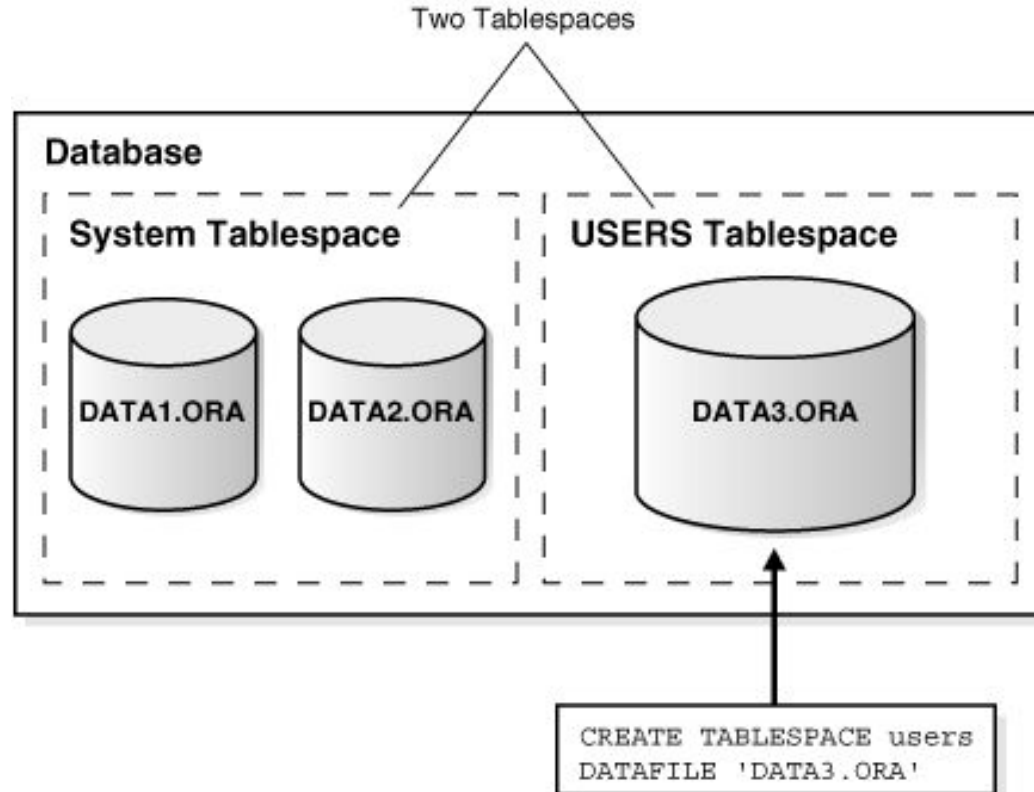
Allocate More Space for a Database

1. Add a datafile to a tablespace
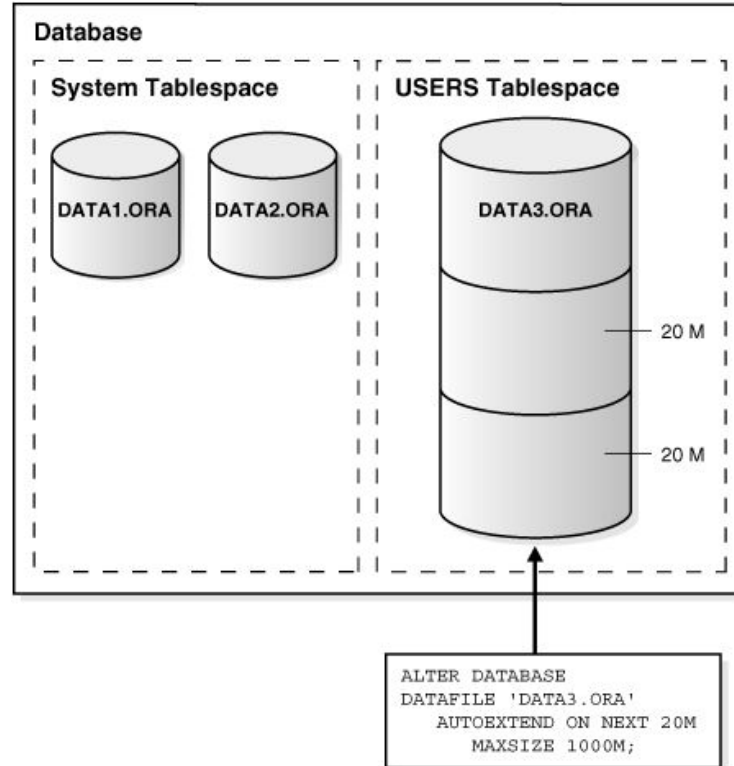2. Add a new tablespace
3. Increase the size of a datafile

Alter a tablespace (Add Datafile)

Allocate more space (Add a new tablespace)

Allocate more space (Increase Datafile(s))

```sql
CREATE TABLESPACE SALES datafile
'/u01/app/oracle/oradata/XE/sales1.dbf' size 100M,
'/u01/app/oracle/oradata/XE/sales2.dbf' size 50M
AUTOEXTEND ON NEXT 500K MAXSIZE 400M
EXTENT MANAGEMENT LOCAL
SEGMENT SPACE MANAGEMENT AUTO
ONLINE;

SELECT TABLESPACE_NAME,FILE_NAME,ONLINE_STATUS    --Para verificar
FROM DBA_DATA_FILES
WHERE TABLESPACE_NAME='SALES';

ALTER  TABLESPACE SALES ADD DATAFILE
'/u01/app/oracle/oradata/XE/sales3.dbf' size 10M;
```

Types of tablespaces

Types of tablespaces

- Bigfile Tablespaces
- The SYSTEM Tablespace
- The SYSAUX Tablespace
- Undo Tablespaces
- Default Temporary Tablespace
- Read-Only Tablespaces

Bigfile Tablespaces

- Ultralarge files - 64bits
- Up to 8 exabytes (Single large files)
- **One** datafile!
- Simplifies data management
- Smallfile tablespaces can contain up to 1024 files
- Avoid using bigfile tablespaces if there could possibly be no free space available on a disk group

Bigfile Tablespaces (Benefits)

- Increase storage
- Small -> 1024 files
- Bigfile -> 1 file 1024 times larger than smallfile
- Simplify management of datafiles
- They simplify database management by providing datafile transparency.

The SYSTEM Tablespace

- Oracle creates automatically when the database is created
- Always online
- Contains the data dictionary tables for the entire database
- "datafile 1"
- PL/SQL (Procedures, functions, packages, triggers)

The SYSAUX Tablespace

- Auxiliary tablespace to the SYSTEM tablespace
- Always created during database creation
- Centralized location for database metadata that does not reside in the SYSTEM tablespace
- Not removable nor droppable

Undo Tablespaces

- Stores undo information
- It is not possible to create tables or indexes
- DML operations within transactions
- **CREATE UNDO TABLESPACE**

Read-Only Tablespaces

- Eliminates the need to perform backup and recovery of large, static portions of a database
- Cannot be modified
- If you recover a database, is not necessary to recover read-only tablespaces

Temporary Tablespaces

- Data persists only for the duration of the session
- Improve the concurrency of multiple sort operations
- Avoid space management operations

Oracle recommends that you create **at least one additional tablespace** to store user data separate from data dictionary information

Create few tablespaces as possible 1 or 2 with auto-extent enable datafiles rather than many small datafiles.

Managing Space in Tablespaces

- KEEP TRACK OF FREE AND USED SPACE
  - **Locally managed tablespaces**: Extent management by the tablespace
    - Bitmap in each datafile to keep track of the free or used status of blocks in that datafile
      - Segment space (How free space within a segment)
        - Auto: Bitmap
        - Manual: Free list
  - **Dictionary managed tablespaces**: Extent management by the data dictionary

Managing Space in Tablespaces

"Using automatic segment space management is great for almost all Oracle applications, with the exception being super-high update tablespaces, which would use traditional freelists with multiple freelist groups"

Thank you.