Capgemini

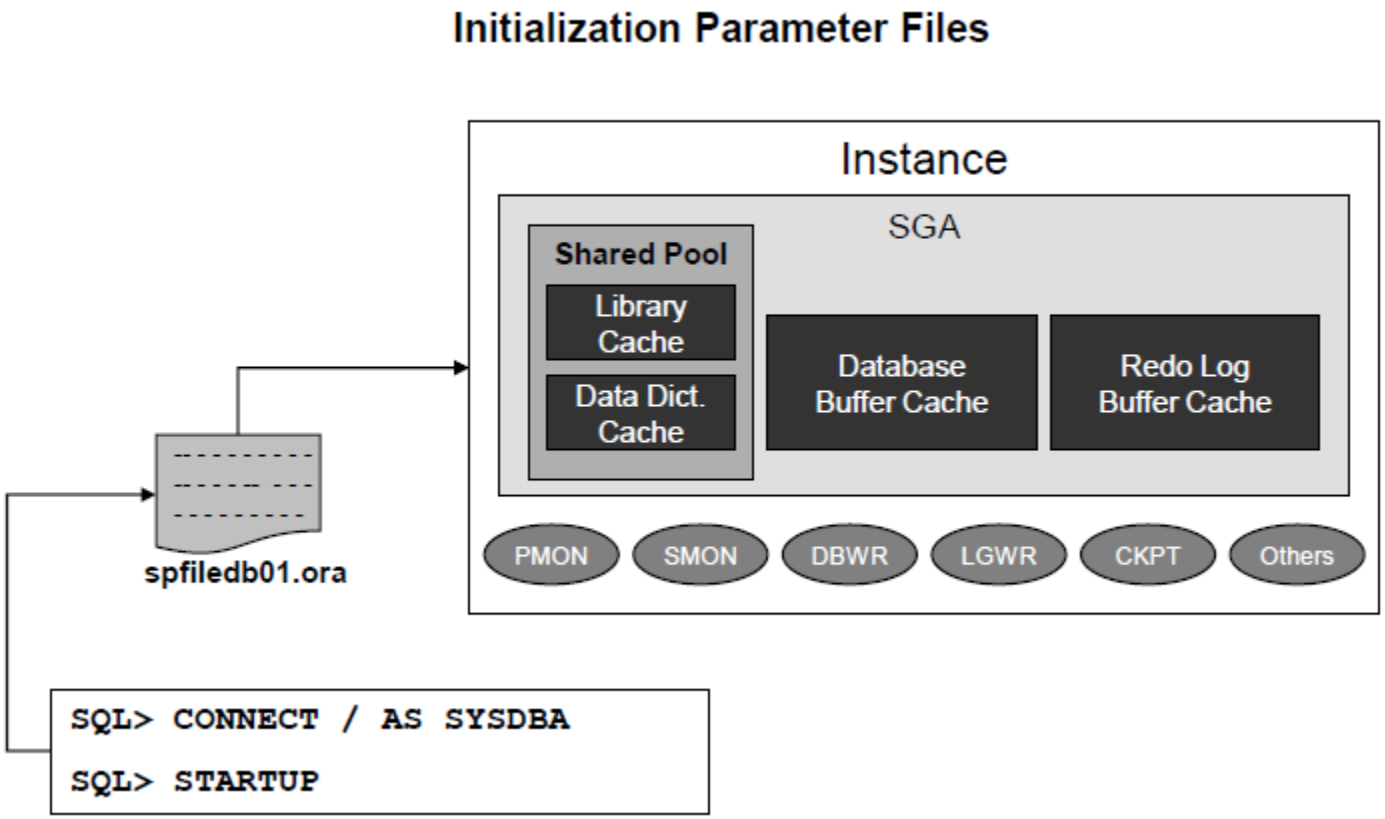
SAP BASIS Introductory Training Program

Day 12 : Agenda

- **Database Management**
- **Break**
- **Concepts of Segments and DB Tools**
- **Lunch Break**
- **Database Monitoring**
- **Exercise & Break Out Session**

Database Management

Database Management



Initialization Parameter Files

- Static parameter file – PFILE
  - PFILE is a text file that can be modified with an operating system editor
  - Modifications to the file are made manually
  - Changes to the file take effect on the next startup
  - Default location $ORACLE_HOME/dbs
  - Default file name initSID.ora
- Persistence parameter file – SPFILE
  - Binary file with the ability to make changes persistent across shutdown & startup
  - Maintained by the Oracle server
  - Records parameter value changes made with the `ALTER SYSTEM` command
  - Can specify whether the change being made is temporary or persistent
  - Values can be deleted or reset to allow an instance to revert to the default value
  - Default file name spfileSID.ora
  - Default location $ORACLE_HOME/dbs

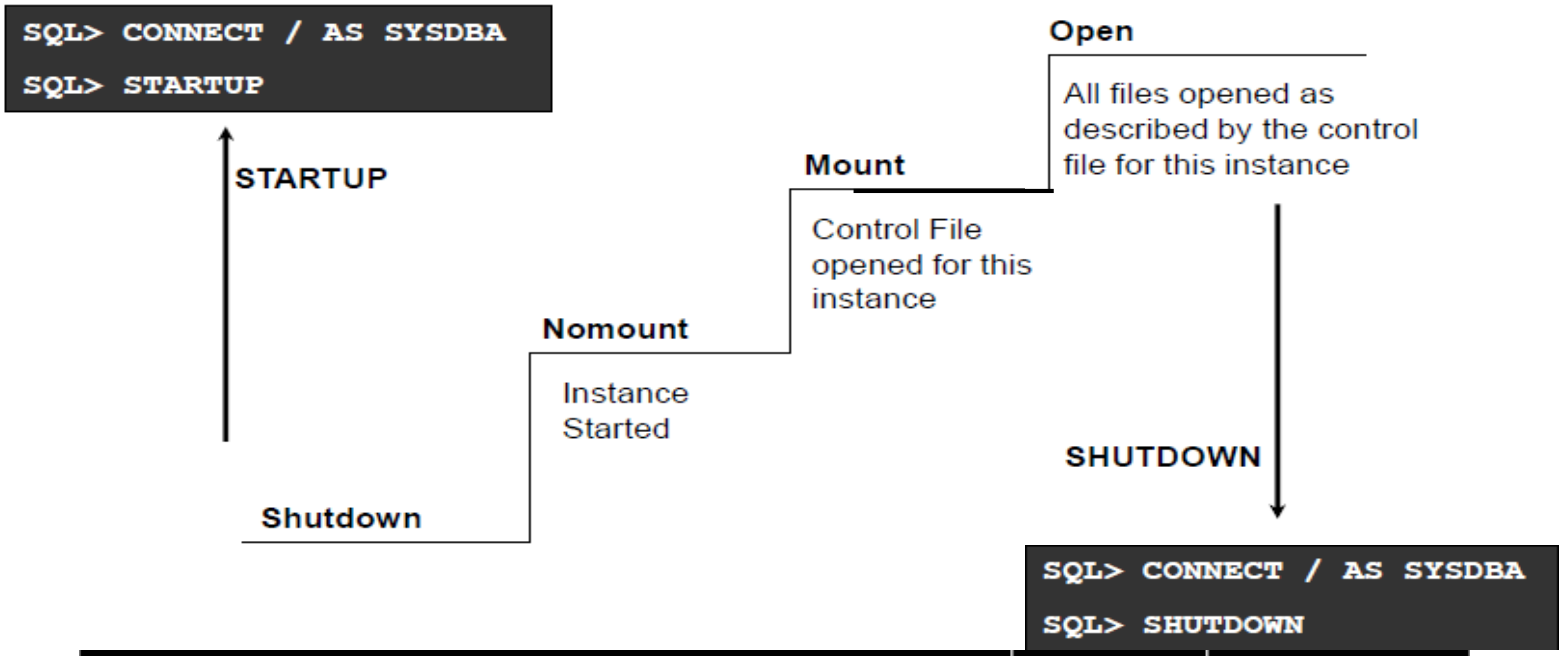
- Creating an SPFILE
  - `CREATE SPFILE FROM PFILE;`
- Modification to SPFILE
  - `ALTER SYSTEM SET PARAMETER = VALUE [SCOPE = MEMORY|SPFILE|BOTH];`

Redo Log & Control Files

Store information about database structure and state
Stored in Oracle_Base\oradata\SID
Three separate control files by default:
- CONTROL01.CTL
- CONTROL02.CTL
- CONTROL03.CTL
- All contain same data
- At least one must be present

Records information to undo action query changes
.log extension
Stored in Oracle_Base\ORADATA\SID
Pre-image
Rollback segment

Starting Up a Database



Task	SYSDBA	SYSOPER
Start the database	X	X
Shut down the database	X	X
Perform database recovery operations	X	X
Recover the database to a specific point in time	X	
Create a new database within an existing database instance	X	
Receive all system privileges with Admin Option	X	

Table 11-3 Tasks that SYSDBA and SYSOPER users can perform

Shutting Down the Database

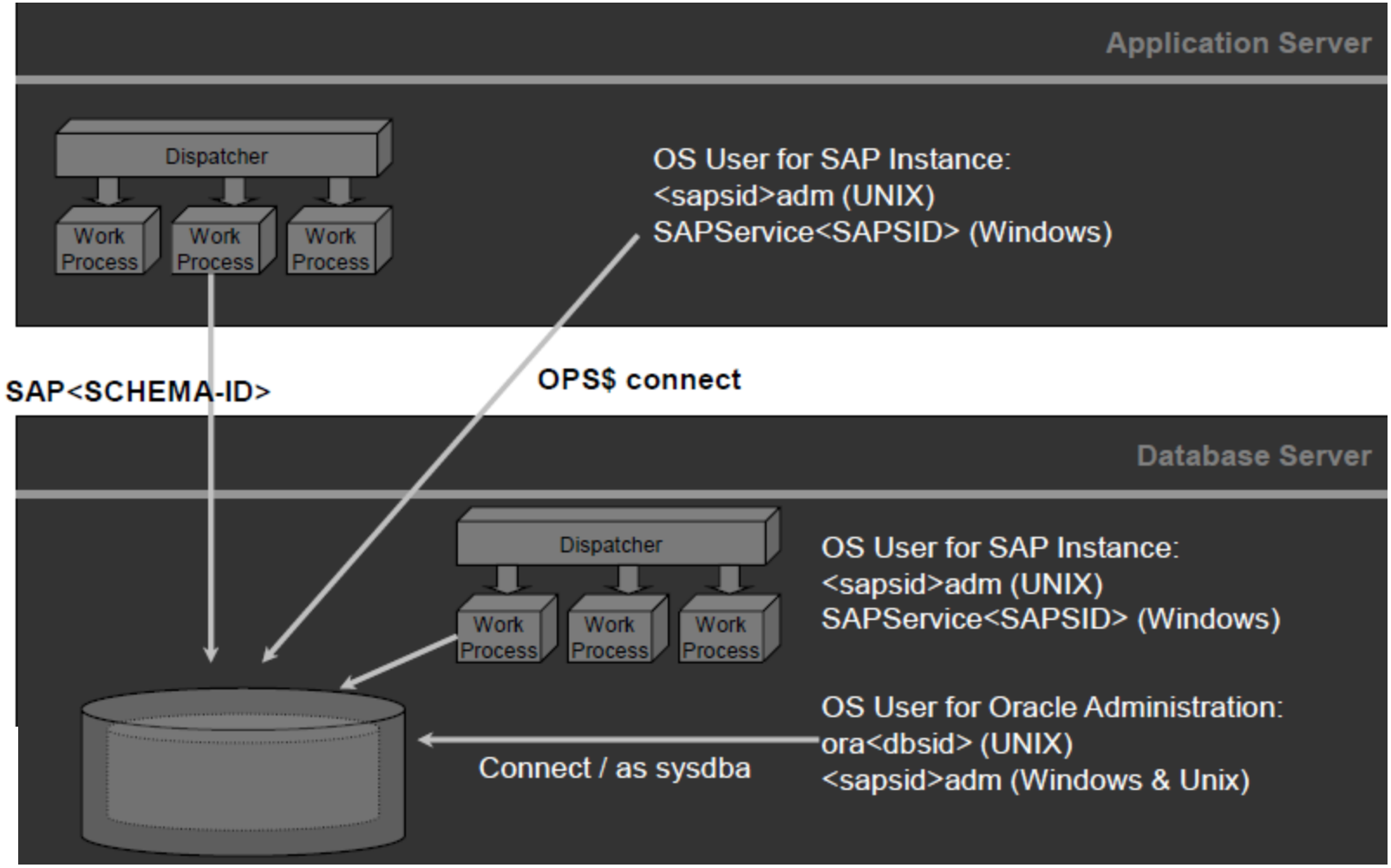
Shutdown Mode	A	I	T	N
Allow new connections	X	X	X	X
Wait until current sessions end	X	X	X	O
Wait until current transactions end	X	X	O	O
Force a checkpoint and close files	X	O	O	O

Shutdown Mode:

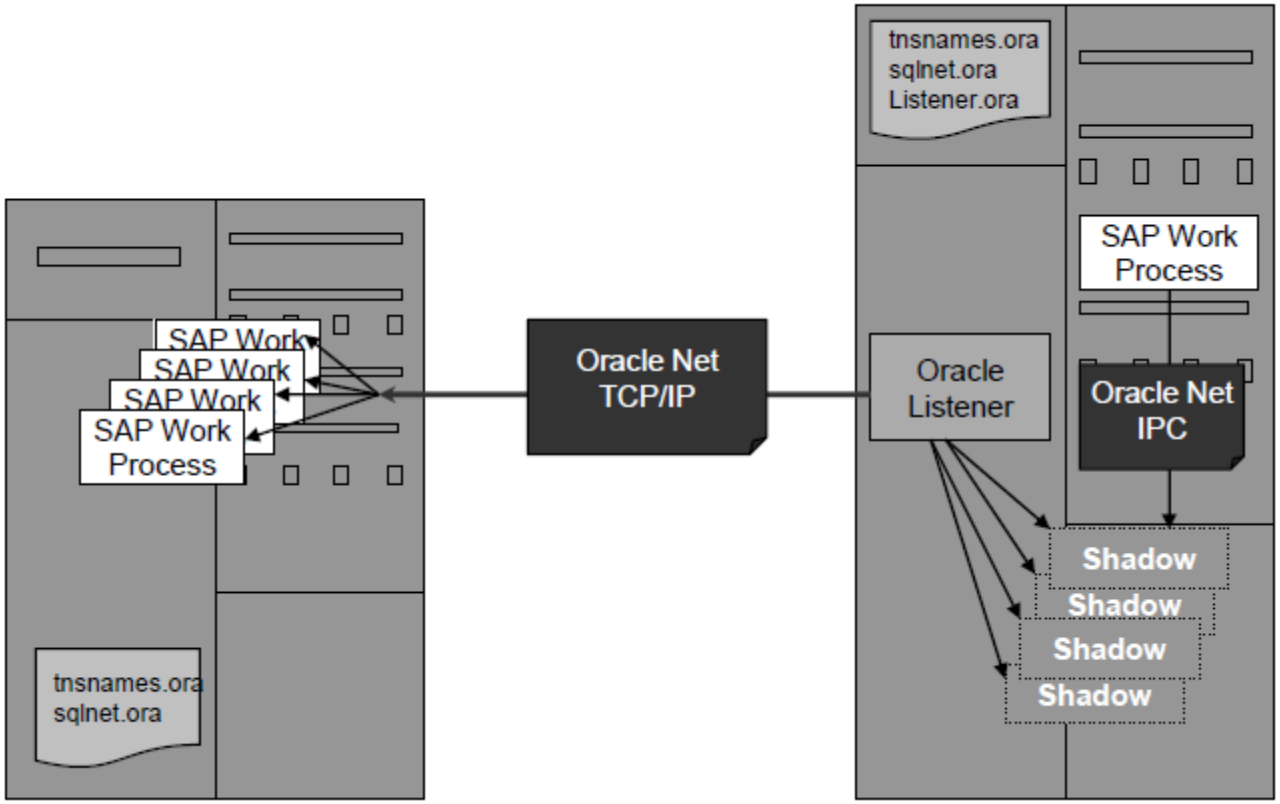
- N – Normal
- T – Transactional
- I – Immediate
- A – Abort

X	**NO**
O	**YES**

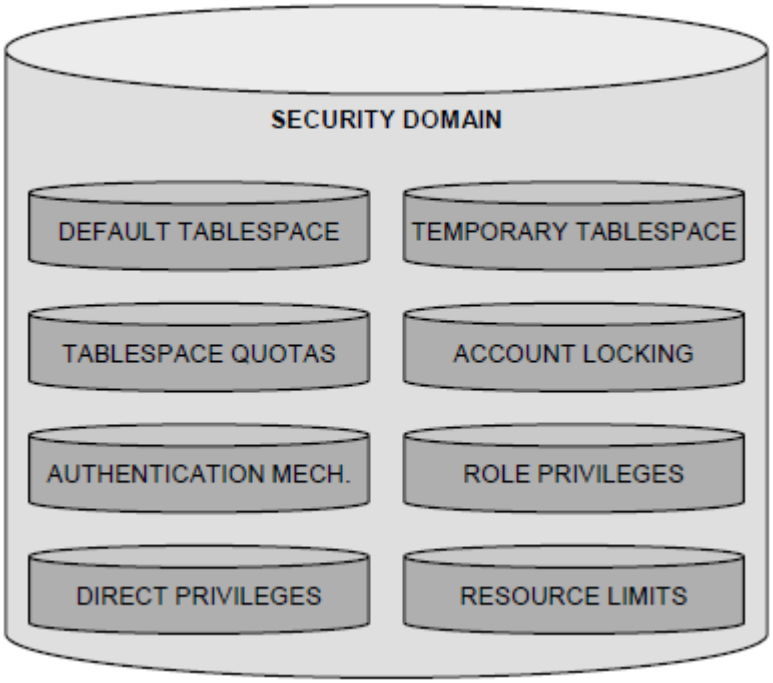
Operating System and Database User



Net Services



Database Management – Users and Security Management



System Privileges required for database administration	
Privilege Name	**Operations Authorized**
SYSDBA	Startup, Shutdown, Create DB, Arcivelog, Backup, Recovery, ….
SYSOPER	As for SYSDBA but without create DB, and without ability to lock user data

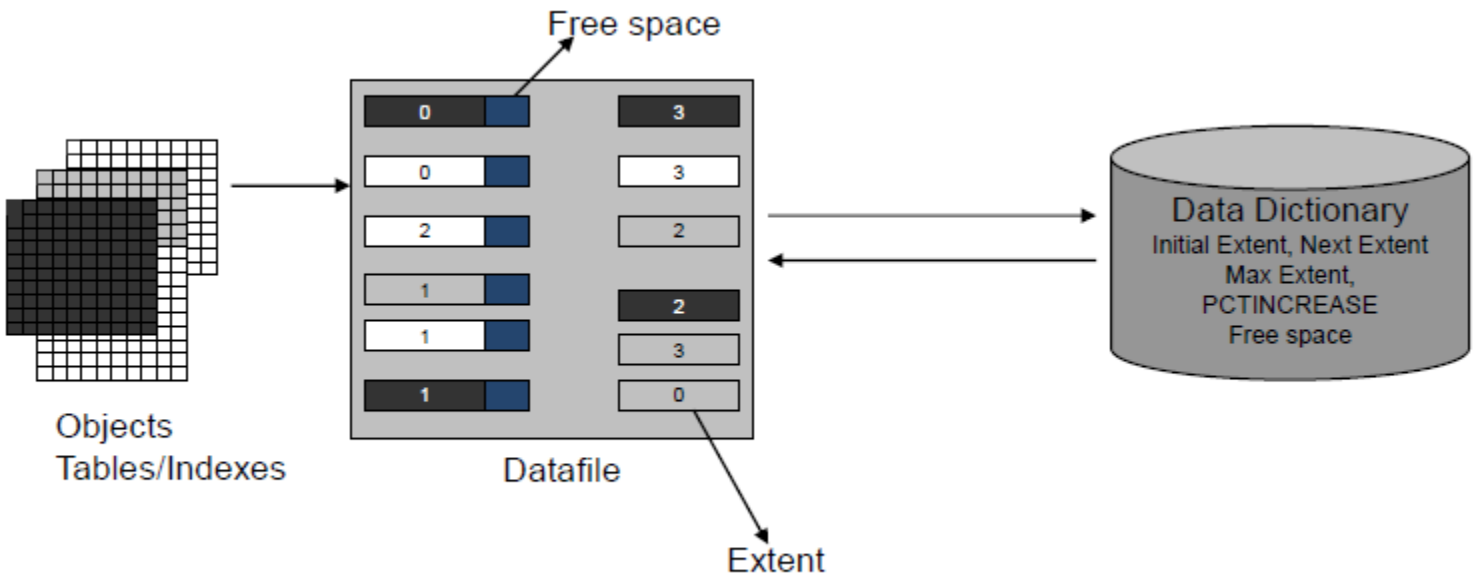
SAP Operating System Users and Groups

Operating System Users & Groups in SAP System in Oracle		
OS – User	**OS – Group**	**Privileges in Oracle**
Unix environment		
ora<dbsid>	dba oper	Full administration of all instances Restricted administration of all instances
<sapsid>adm	dba oper	Full administration of all instances Restricted administration of all instances
Windows environment		
<sapsid>adm	ORA_<DBSID>_DBA ORA_<DBSID>_OPER ORA_DBA	Full administration of instance Restricted administration of instance Full administration of all instances
SAPService<SAPSID>	ORA_<DBSID>_DBA ORA_<DBSID>_OPER ORA_DBA	Full administration of instance Restricted administration of instance Full administration of all instances

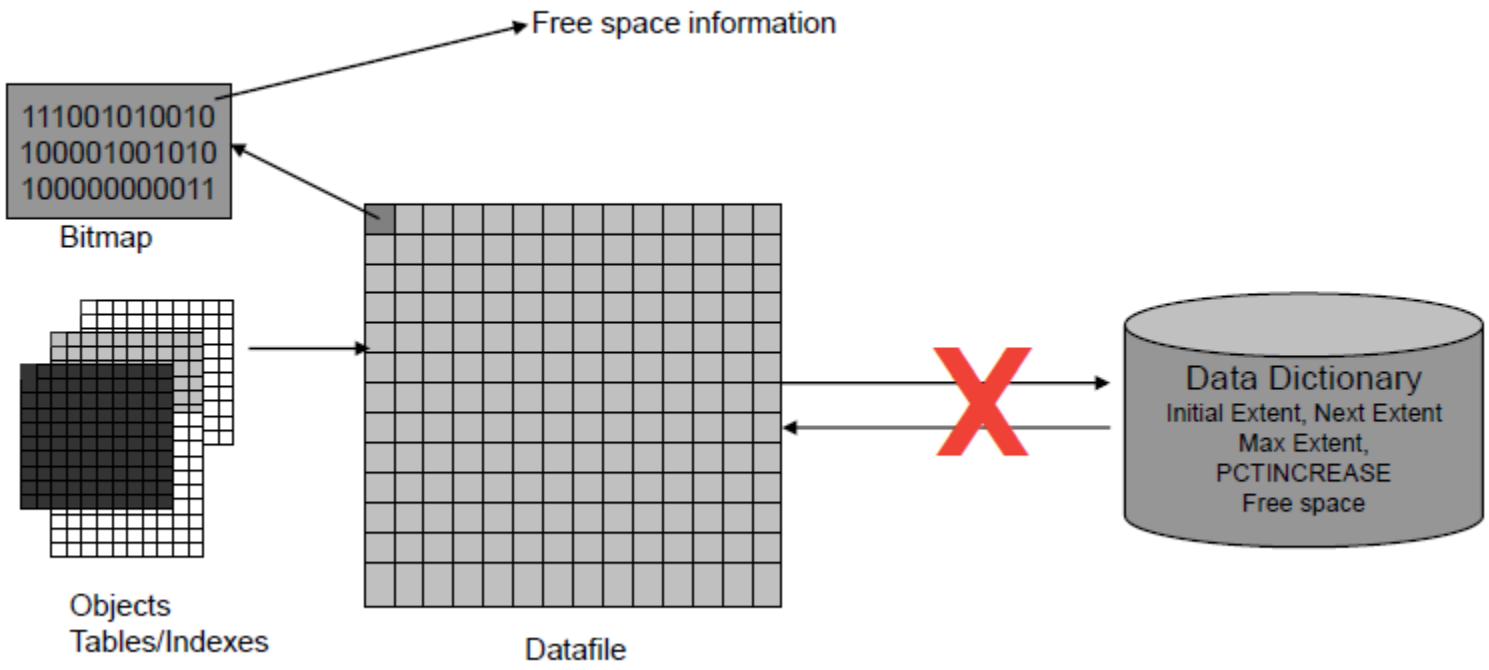
Space Management in Tablespaces

- Locally managed tablespaces:
  - Free extents recorded in bitmap
  - Each bit corresponds to a block or group of blocks
  - Bit value indicates free or used
- Dictionary-managed tablespaces:
  - Default method
  - Free extents recorded in data dictionary tables

Dictionary Managed Tablespaces



Locally Managed Tablespaces



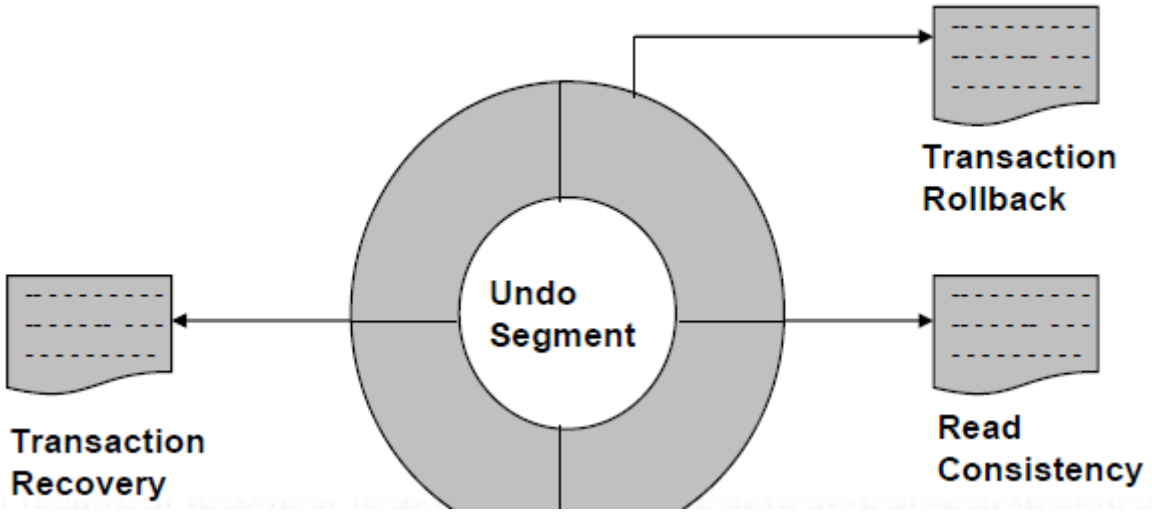
Tablespace Management

- Locally Managed Tablespace
  - The LOCAL option of the EXTENT MANAGEMENT clause specifies that a tablespace is to be locally managed. By default a tablespace is locally managed.
    - Reduced contention on data dictionary tables
    - No undo generated when space allocation or deallocation occurs
    - No coalescing required

- Dictionary Managed Tablespace
  - Segments in dictionary managed tablespaces can have a customized storage, this is more flexible than locally managed tablespaces but much less efficient.
    - Extents are managed in the data dictionary
    - Each segment stored in the tablespace can have a different storage clause
    - Coalescing required

Undo Tablespace

- From Oracle 9i Rollback segments have been replaced by Undo tablespace
- Used to store undo segments
- Cannot contain any other objects
- Extents are locally managed
- Can only use the DATAFILE and EXTENT MANAGEMENT clauses of the CREATE TABLESPACE command

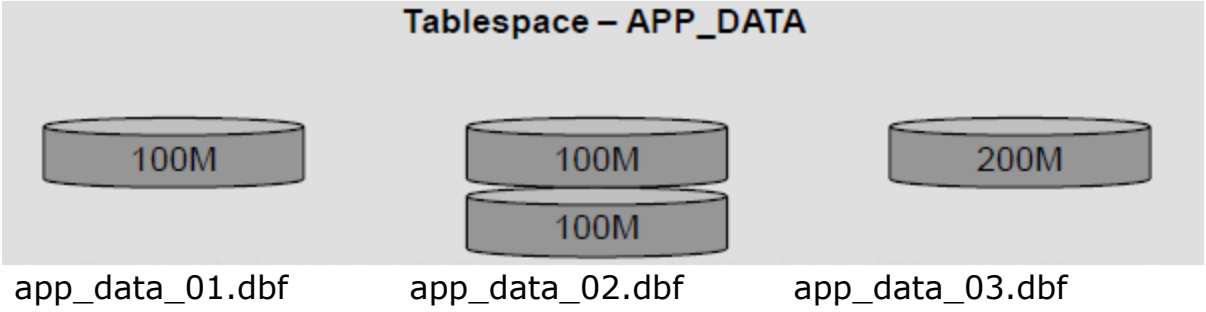


Tablespace – Offline Status

- Offline tablespace is not available for data access.
- Some tablespaces must be online:
  - SYSTEM
  - Tablespaces with active undo segments
  - Default temporary
- To take a tablespace offline:
  - `ALTER TABLESPACE userdata OFFLINE;`
- To bring a tablespace online:
  - `ALTER TABLESPACE userdata ONLINE;`

Resizing a Tablespace

- Add a data file
- Change the size of a data file:
  - Automatically
  - Manually
- Enabling Automatic Extension of Data Files
  - `ALTER DATABASE DATAFILE '/u01/oradata/userdata02.dbf' SIZE 200M AUTOEXTEND ON NEXT 10M MAXSIZE 500M;`
- Changing the Size of Data Files Manually
  - `ALTER DATABASE DATAFILE '/u03/oradata/userdata02.dbf' RESIZE 200M;`



Datafile Management

- Adding Data Files to a Tablespace
  - `ALTER TABLESPACE app_data ADD DATAFILE '/u01/oradata/userdata03.dbf' SIZE 200M;`
- Moving Data Files
  - The tablespace must be offline.
  - The target data files must exist.
  - `ALTER TABLESPACE userdata RENAME DATAFILE '/u01/oradata/userdata01.dbf' TO '/u01/oradata/userdata01.dbf';`

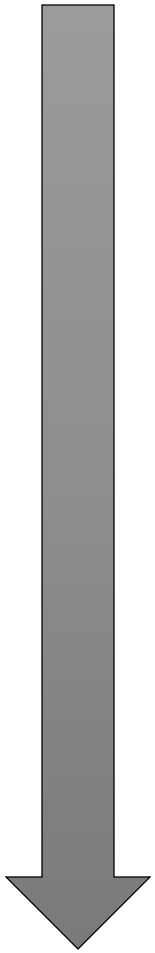
Tablespace Information

- Tablespace information:
  - DBA_TABLESPACES
  - V$TABLESPACE
- Data file information:
  - DBA_DATA_FILES
  - V$DATAFILE
- Temp file information:
  - DBA_TEMP_FILES
  - V$TEMPFILE

Break

Concept of Segments and DB Tools

Database Storage Hierarchy



- Tablespace
  - One or more Data Files
- Segment
  - Partitioned Data
- Extent
  - Growth rule for segment
- Data block
  - Database storage data block
  - Operating system blocks

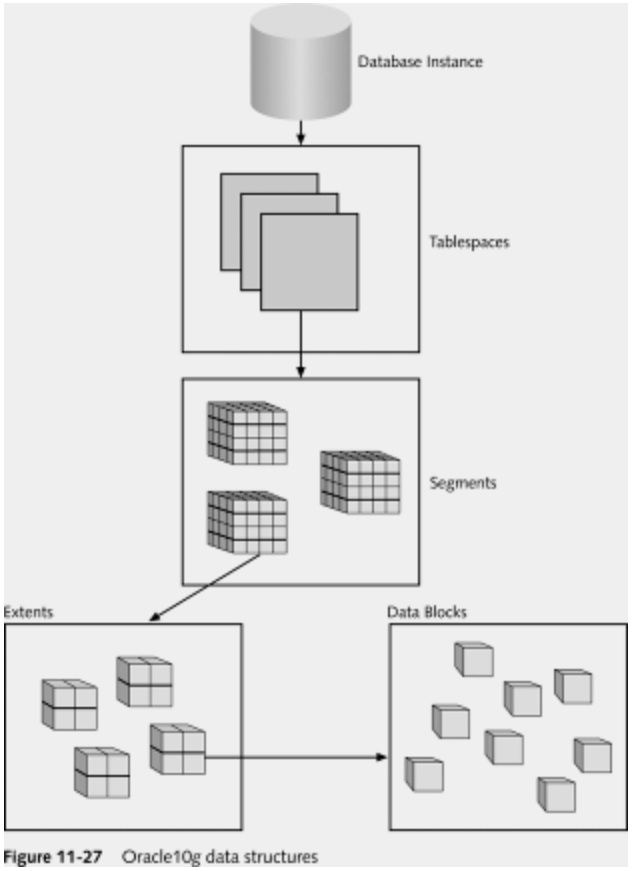
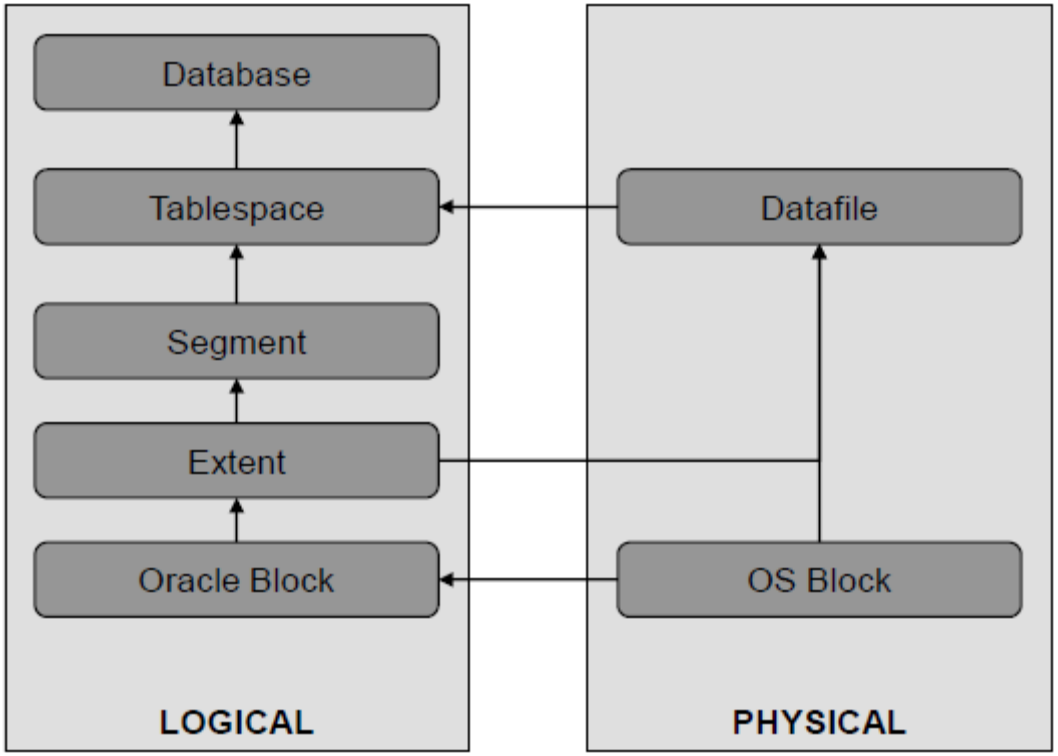


Figure 11-27 Oracle10g data structures

Database Storage Hierarchy



Tablespaces

- One or more Data files
- Stores all database structures + data
  - Tables, data, views, sp's etc…

Edit | View | Delete | Actions | Add Datafile | Go

Select	Name	Allocated Size(MB)	Space Used(MB)	Allocated Space Used(%)	Auto Extend	Allocated Free Space(MB)
◉	DEMO	100.0	2.0	2.0	NO	98.0
○	EXAMPLE	100.0	78.4	78.4	YES	21.6
○	SYSAUX	690.0	651.1	94.4	YES	38.9
○	SYSTEM	700.0	694.7	99.2	YES	5.3
○	TEMP	20.0	0.0	0.0	YES	20.0
○	UNDOTBS1	120.0	11.1	9.3	YES	108.9
○	USERS	5.0	4.1	81.2	YES	0.9

Datafiles

- .dbf extensions
- Store tablespace contents
- Stored in Oracle_Base\oradata\SID
- Use OEM to view and modify
- Grow via Extents

Name	**C:\APP\ORACLE\ORADATA\ORCL\EXAMPLE01.DBF**
Tablespace	EXAMPLE
Status	**Online**
File Size (MB)	**100.00**
Auto Extend	**Yes**
Increment (MB)	**0.62**
Maximum File Size (MB)	**32,767.00**

Segments – They Partition the data

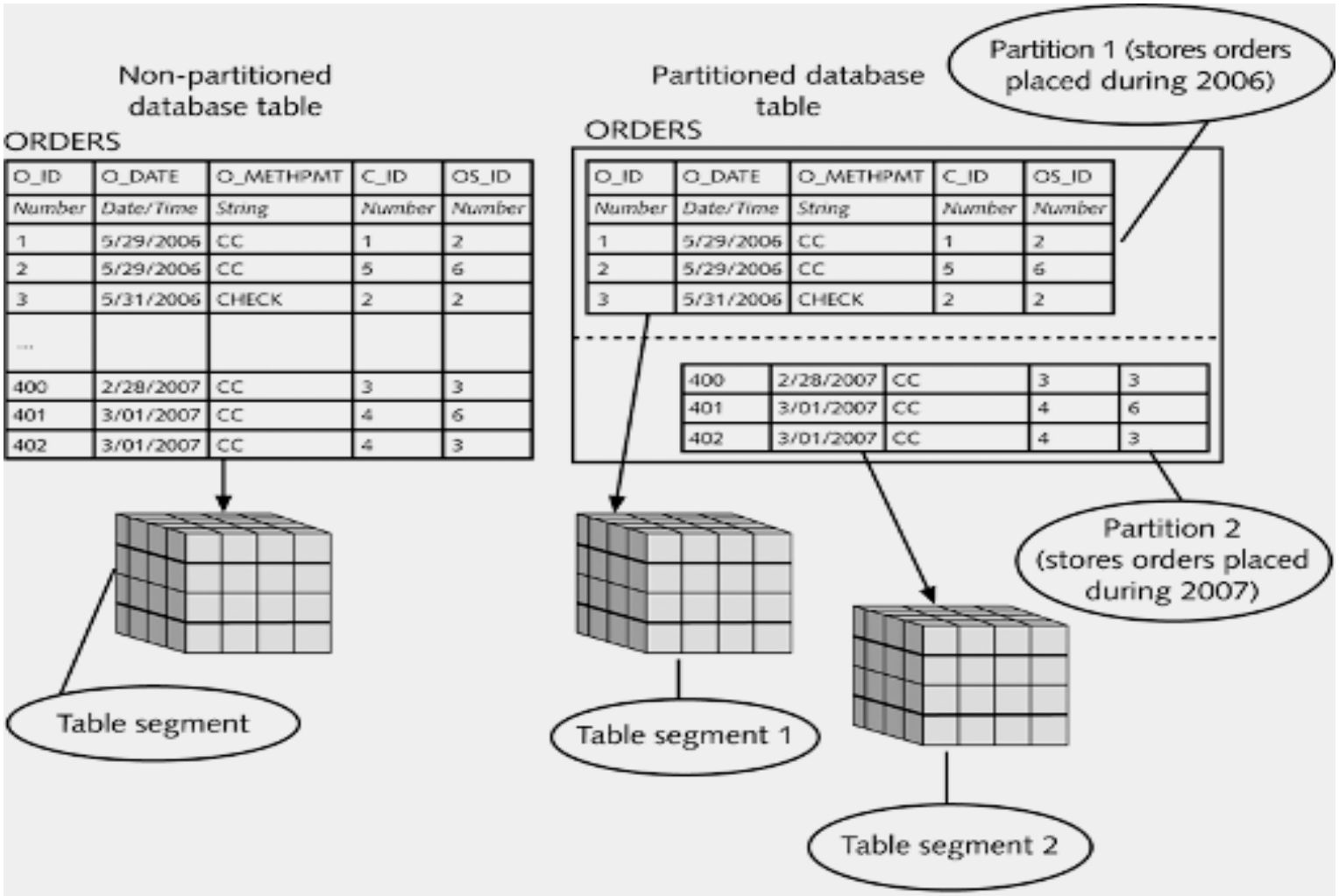
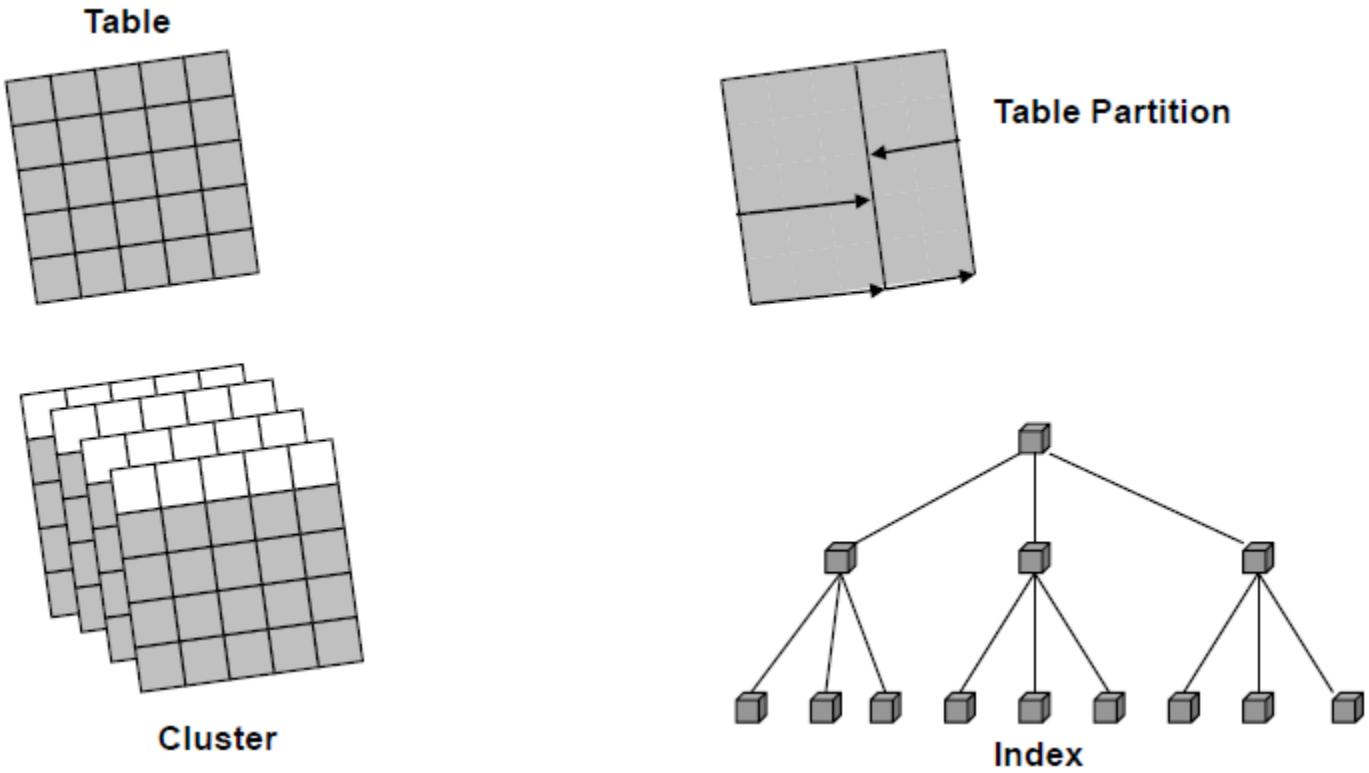


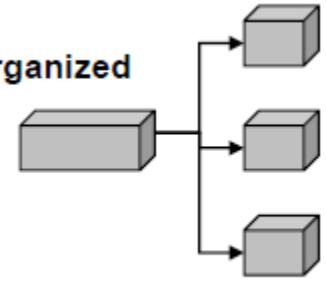
Figure 11-31 Non-partitioned and partitioned database tables and associated segments

Types of Segment

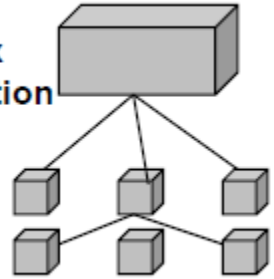


Types of Segment

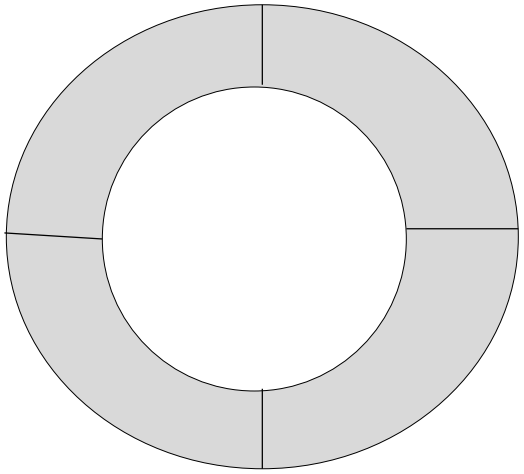
Index-Organized Table

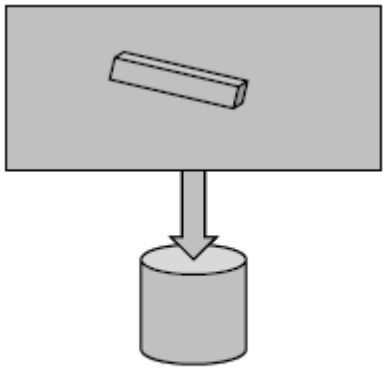


Index Partition



Undo Segment





Temporary Segment

Extents – Smallest unit added to data file

- Sequence of Data Blocks
- When an insert grows beyond the data file size allocation, a new extent is added.
- More efficient to add groups of data blocks vs. individual blocks.

Data Blocks – Smallest Unit Read/Written

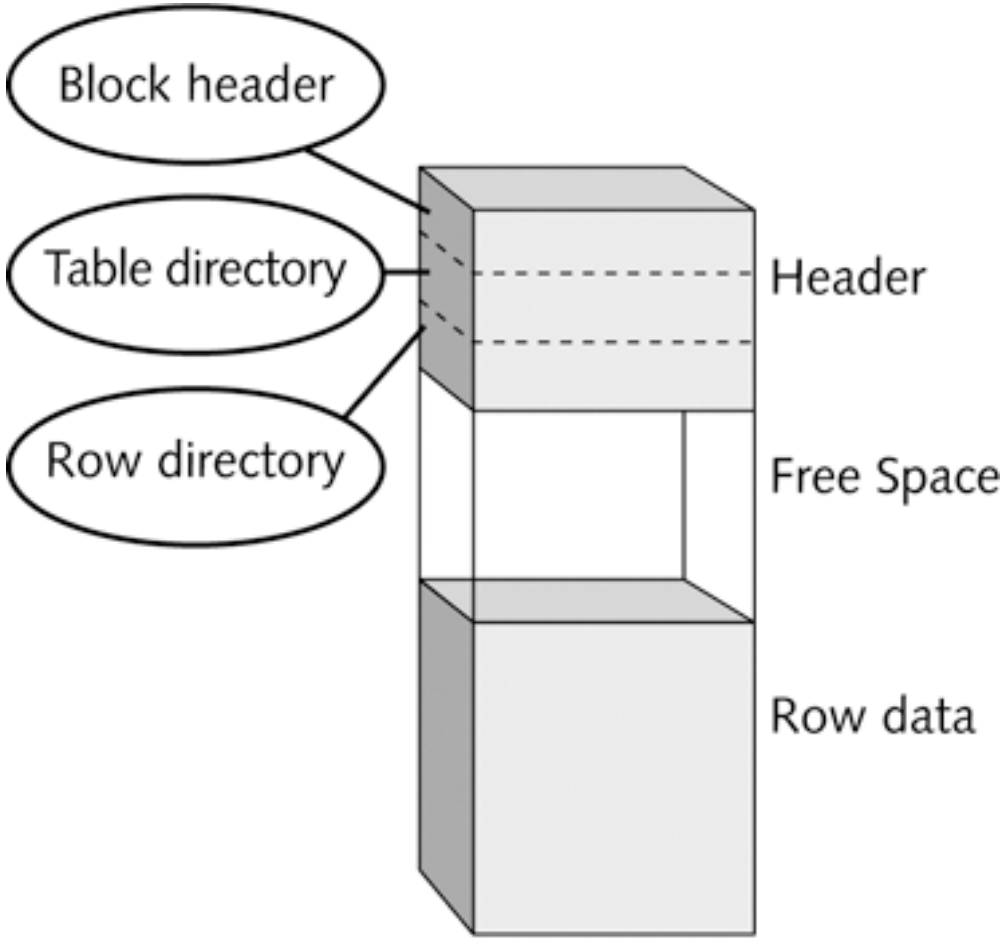
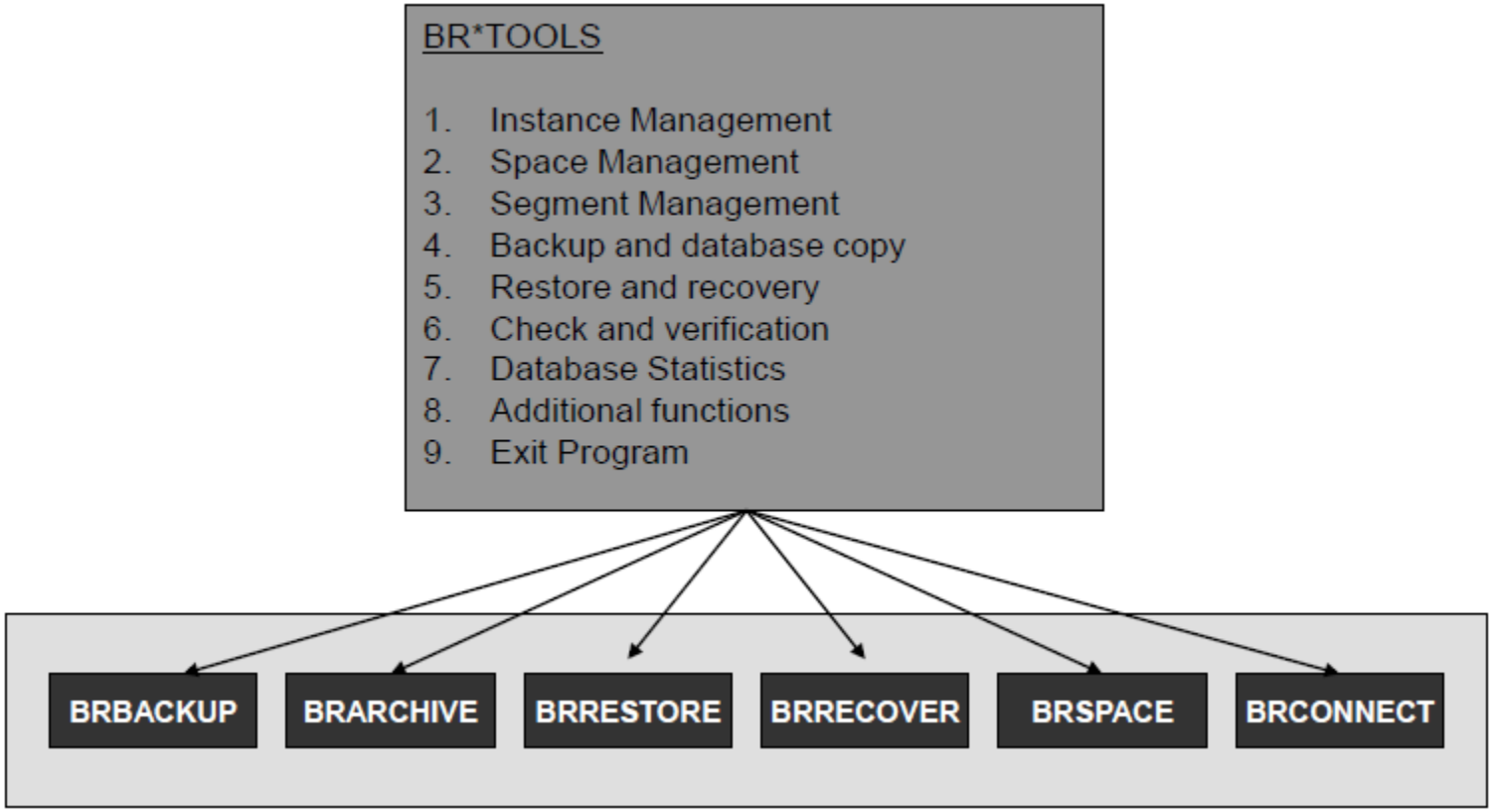


Figure 11-34 Data block components

SAP Database Administration Tools – BR*TOOLS



BR*TOOLS

BRTOOLS	Responsible Tools	Log Directory	Configuration file
1. Instance Management	Brspace	Sapreorg	Init<DBSID>.sap
2. Space Management	Brspace	Sapreorg	
3. Segment Management	Brspace	Sapreorg	
4. Backup and database copy	Brbackup/Brarchive	Sapbackup/saparch	
5. Restore and recovery	Brrecover	Sapbackup	
6. Check and verification	Brconnect/Brbackup	Sapcheck/sapbackup	
7. Database Statistics	Brconnect	Sapcheck	
8. Additional functions	Brconnect	Sapcheck	
9. Exit Program			

1=Database instance management

1. Startup database
2. Shutdown database
3. Alter database instance
4. Alter database parameters
5. Recreate database
6. Show instance status
7. Show database parameters
8. Show database owners

2=Database space management

1. Extend tablespace
2. Create tablespace
3. Drop tablespace
4. Alter tablespace
5. Alter data file
6. Move data file
7. Additional space functions

3=Database segment management

1. Reorganize tables
2. Rebuild indexes
3. Export tables
4. Import tables
5. Alter tables
6. Alter indexes
7. Additional segment functions

4=Backup and database copy

1. Database backup
2. Archive log backup
3. Database copy
4. Non-database backup
5. Backup of database disk backup
6. Verification of database backup
7. Verification of archive log backup
8. Additional functions

5=Restore and recovery

1. Complete database recovery
2. Database point-in-time recovery
3. Tablespace point-in-time recovery
4. Whole database rest
5. Restore of individual backup files
6. Restore and application of archivelog files
7. Disaster recovery

6=Database check and verification

1. Database system check
2. Validation of database structure
3. Verifiication of database blocks

7=Processing database statistics

1. Update database statistics
2. Collect missing statistics
3. Delete harmful statistics
4. Manage database statistics

8=Additional BR*Tools functions

1. Show profiles and logs
2. Clean up DBA logs and tables
3. Adapt NEXT extents
4. Change password of database user
5. Create/change synonyms for DBA tables

Maintenance of Oracle Parameters – BR*TOOLS

- To modify an Oracle parameter, start BRTOOLS or BRGUI and choose Instance management → Alter database parameters. If you already know the parameter to change, enter it in Database parameter (parameter) and continue. If you want to select the parameter from a list, do not make any changes. Choose c to continue, select - Alter database parameter, and enter the position number of the parameter (not the name) you want to change from the list of parameters.

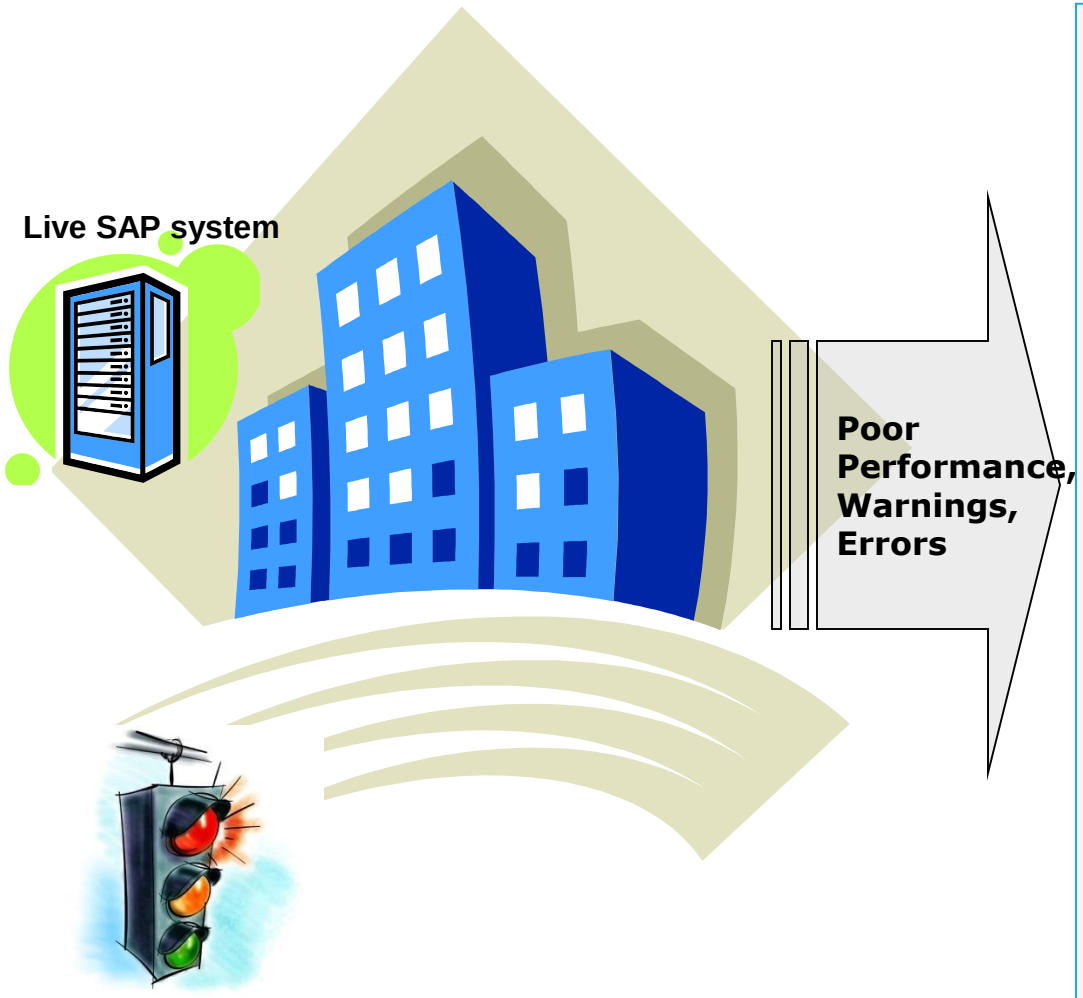
Summary

- Oracle Architecture
  - Oracle Instance
  - Memory Structures
  - Oracle Processes
- Database Management
  - Initialization Parameter File
  - Starting and Shutting down Database
  - Security and Authorization
  - Storage space management
  - Oracle Directory Structure in SAP
  - Storage Hierarchy
  - Types of Segment
  - Database Administration Tools

LUNCH BREAK

Database Monitoring

Database Monitoring – SAP Database Monitors



DBA Cockpit

DB02 DB12 DB13

DB13C DB14 ST04

SAP DBA

BR* TOOLS

DB16 DB17 DB20

DB21 DB26

Analyze the problem using SAP tool for monitoring and managing database

DBA Cockpit

DBA Planning Calendar

- The DBA planning calendar is a simple interface to schedule background jobs named DBA:* performing administrative jobs.
- These background jobs look up table SDBAC to check, depending on the SAP release, the database system, and the operating system, which operating system level command should be executed on which server.
- The DBA planning calendar provides templates for all activities that are recommended to be performed regularly on the database

DBA Operations Monitor

- Use the DBA Operations Monitor (transaction DB14 or Jobs → DBA Logs in the DBA Cockpit menu tree) to monitor online database operations.
- It is used to monitor the runtime of operations.
- The DBA Operations Monitor provides an overview of activities of any of the BR*Tools.

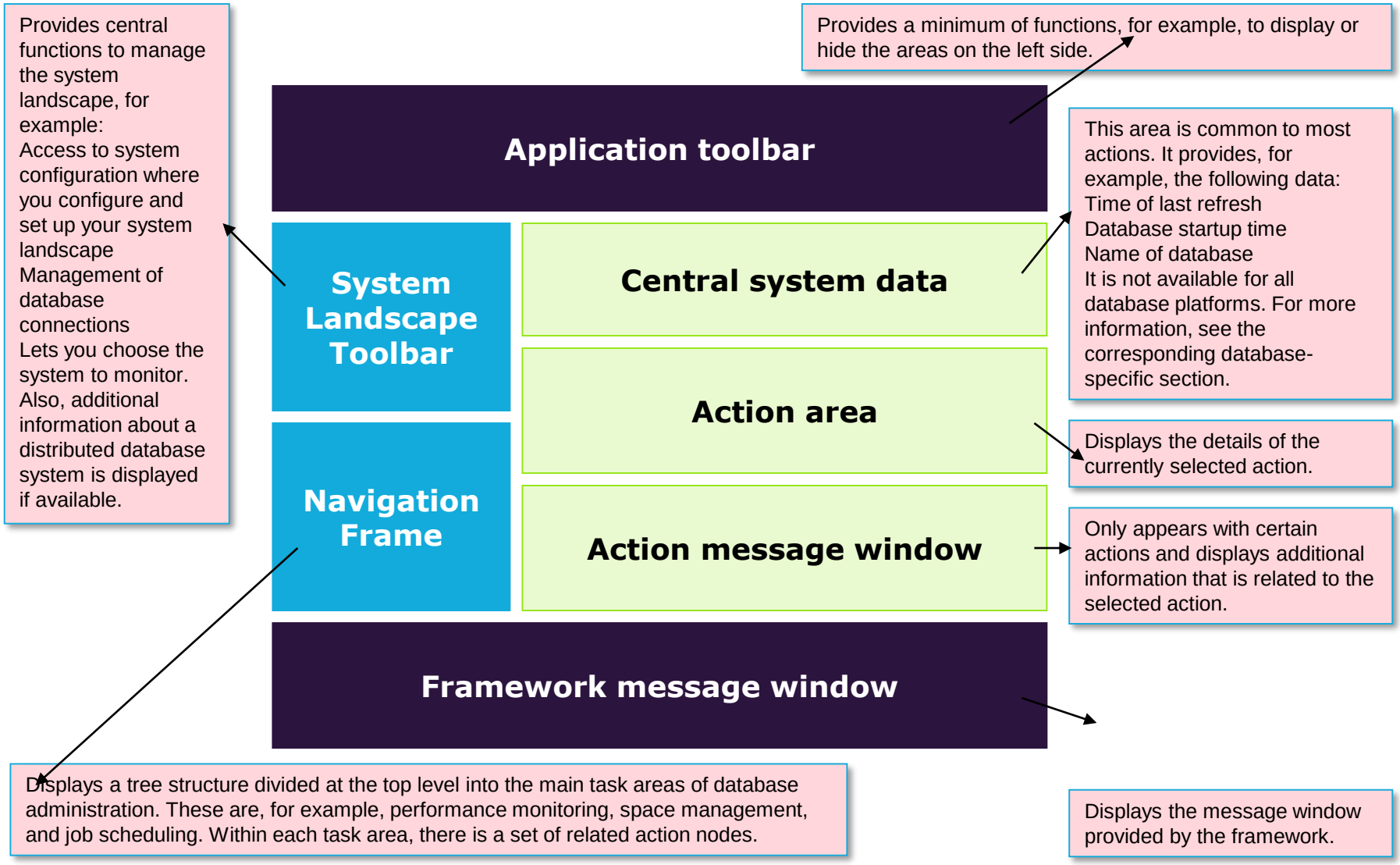
Space

- Transaction DB02 or Space → Space Overview in the DBA Cockpit menu tree shows the functions for monitoring disk space in the database.
- This overview contains information about how much disk space the database is using. To ensure that the required data for this overview is available, a background job must be scheduled first.
- Available disk space information about individual tablespaces or tables is provided in additional sub-monitors. Information is also provided about the growth of the individual database objects.

Performance

- Database performance can be analyzed with transaction ST04 or Performance →Performance Overview in the DBA Cockpit menu tree. ST04 has many functions, the most important for performance are: viewing the SQL cache, checking Oracle delays using v$system_event, and monitoring database buffer activity and monitoring Oracle shadow processes.

DBA Cockpit - Features



Performance (Oracle) – DBA Cockpit Tool

Performance Overview
Wait event analysis
SQL statement analysis
Statistical Information
Feature monitoring
Additional functions
RAC statistics

DBA Cockpit

- Check the database
- Adapt next extents
- Check and update statistics
- Clean up logs

Cost Based Optimizer (CBO) and Database Statistics

Whenever a valid SQL statement is processed Oracle has to decide how to retrieve the necessary data. This decision can be made using one of two methods:

- Rule Based Optimizer (RBO) - This method is used if the server has no internal statistics relating to the objects referenced by the statement. This method is no longer favored by Oracle and will be not be supported from Oracle 10g releases.
- Cost Based Optimizer (CBO) - This method is used if internal statistics are present. The CBO checks several possible execution plans and selects the one with the lowest cost, where cost relates to system resources.

If new objects are created, or the amount of data in the database changes, the statistics will no longer represent the real state of the database and the CBO decision process may be seriously impaired.

CBO will work efficiently only if Database statistics are updated regularly

Exercise & Break Out Session