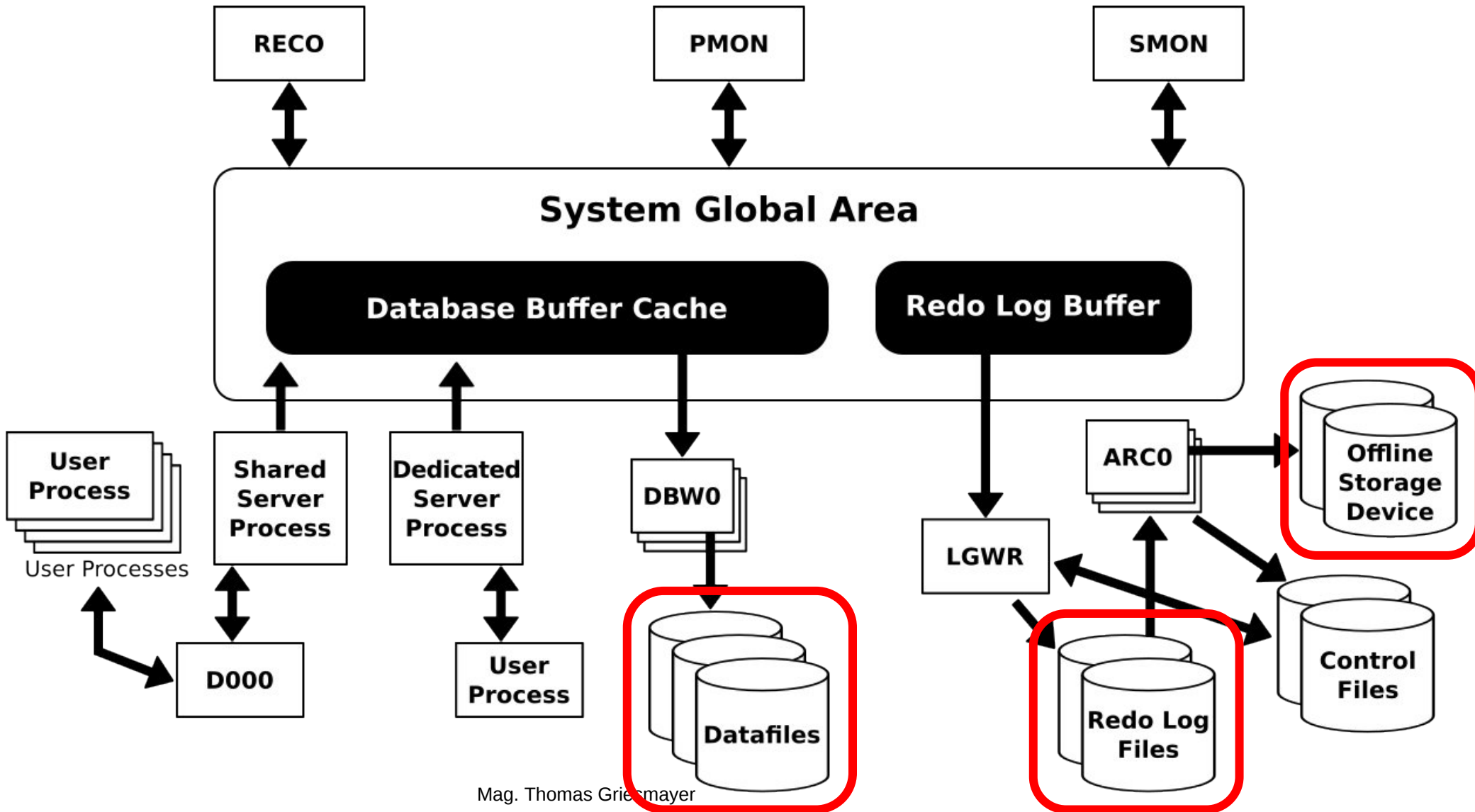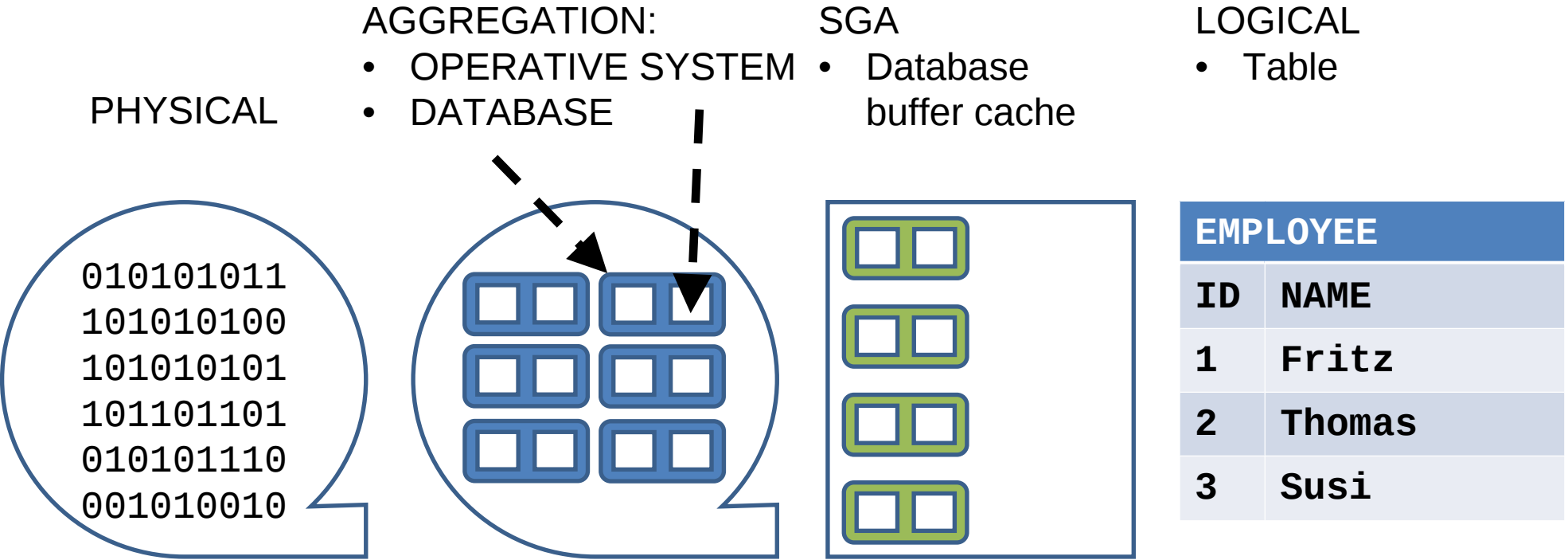# Storage structures

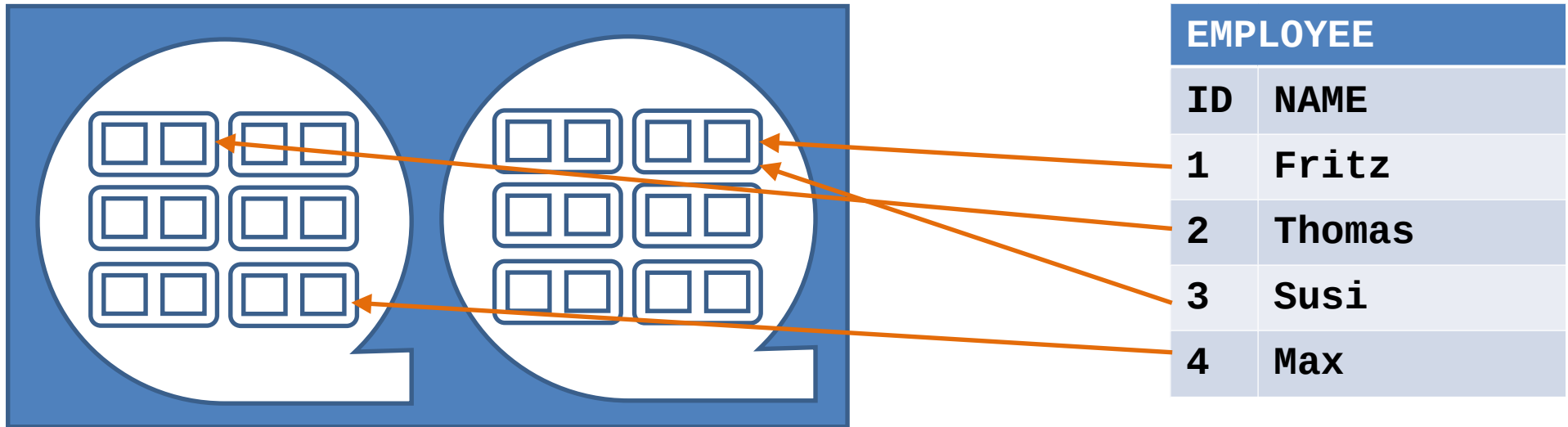Mag. Thomas Griesmayer

Mag. Thomas Griessmayer

- Physical structures are provided by the operating system - Files.

  BIT -> BYTE -> Operative system block -> Database block

- Logical structures are organized by Oracle.

  table

PHYSICAL	AGGREGATION: • OPERATIVE SYSTEM • DATABASE	SGA • Database buffer cache	LOGICAL • Table

EMPLOYEE	
ID	NAME
1	Fritz
2	Thomas
3	Susi

010101011
101010100
101010101
101101101
010101110
001010010

- A database is divided into logical storage units called tablespaces.

- A tablespace consists of one or more physical datafiles.

- Database objects assigned to a tablespace are stored in the physical datafiles of that tablespace.

- The backup and recovery features of Oracle Database enable you to back up or recover at the tablespace level.

EMPLOYEE	
ID	NAME
1	Fritz
2	Thomas
3	Susi
4	Max

Oracle Database

SYSTEM Tablespace · **SYSAUX Tablespace** · **UNDO Tablespace** · **USERS Tablespace** · **TEMP Tablespace**

Logical Structures

Physical Structures

Control file · Server Parameter file · Datafile · Datafile · Datafile · Datafile · Tempfile · Password file · Online Redo Logs

Fast Recovery Area

Backup Set 1 · Backup Set 2 · Archived Redo Logs
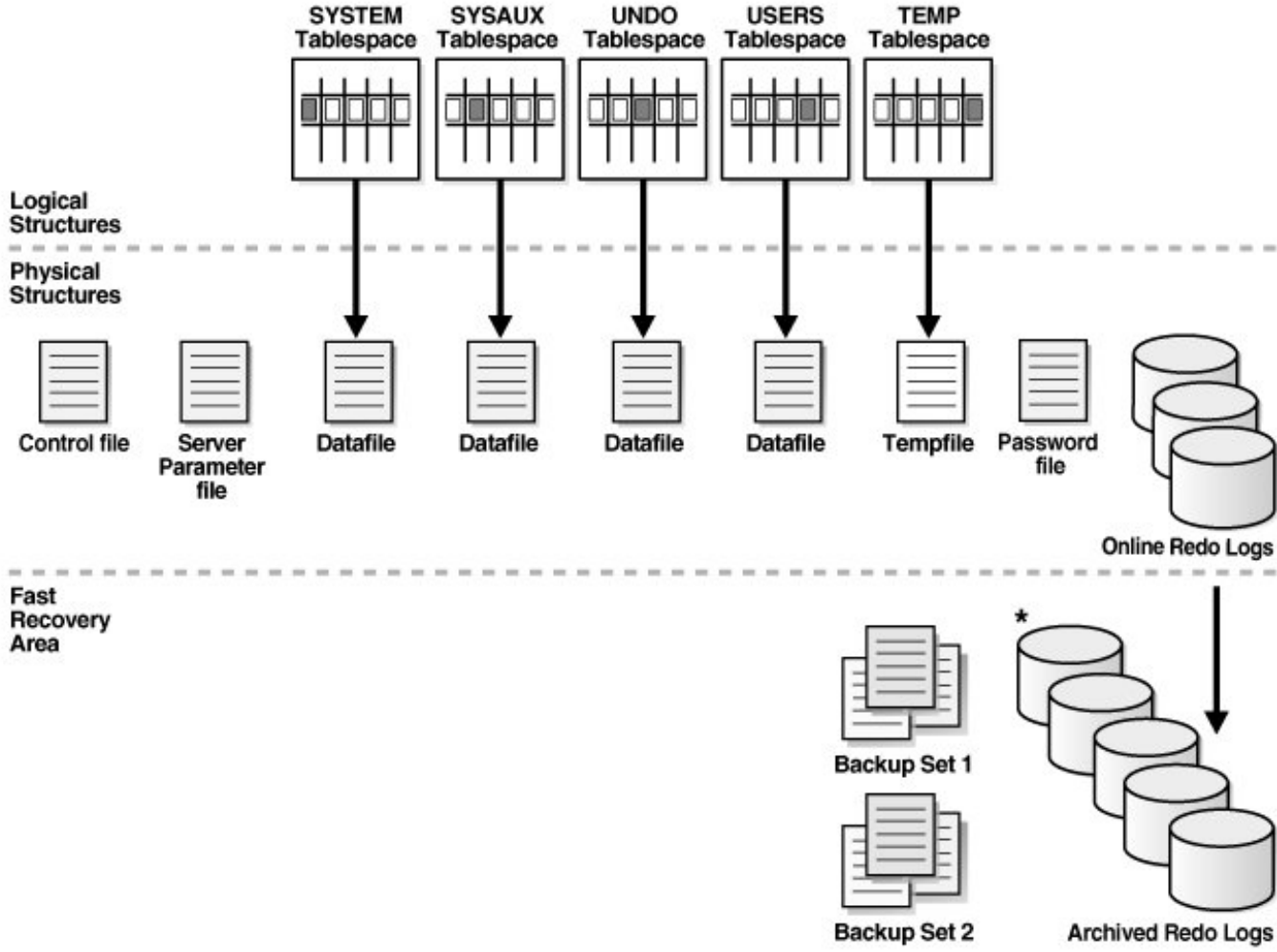
* Archived Redo Logs present only after turning on log archiving (ARCHIVELOG mode)

database files

Containers

Images

Volumes

Dev Environments BETA

Docker Scout EARLY ACCESS

Learning center

Extensions

oracle21c

gvenzl/oracle-xe:21-full

ecda68130a8b

1521:1521

Logs	Inspect	Bind mounts	**Terminal**	Files	Stats

```
sh-4.4$ ls -l /opt/oracle/oradata/XE/XEPDB1
total 1030212
-rw-r----- 1 oracle oinstall  10493952 Oct  7 19:12 griesmayer1.dbf
-rw-r----- 1 oracle oinstall  10493952 Oct  7 19:18 griesmayer2.dbf
-rw-r----- 1 oracle oinstall 408952832 Oct  7 19:23 sysaux01.dbf
-rw-r----- 1 oracle oinstall 304095232 Oct  7 19:23 system01.dbf
-rw-r----- 1 oracle oinstall 223354880 Oct  7 17:33 temp01.dbf
-rw-r----- 1 oracle oinstall 104865792 Oct  7 19:23 undotbs01.dbf
-rw-r----- 1 oracle oinstall   5251072 Oct  7 19:12 users01.dbf
```

```
sh-4.4$ cat /opt/oracle/product/21c/dbhomeXE/dbs/init.ora
db_name='ORCL'
memory_target=1G
processes = 150
audit_file_dest='<ORACLE_BASE>/admin/orcl/adump'
audit_trail ='db'
db_block_size=8192
open_cursors=300
remote_login_passwordfile='EXCLUSIVE'
undo_tablespace='UNDOTBS1'
control_files = (ora_control1, ora_control2)
compatible ='11.2.0'

sh-4.4$ ls /opt/oracle/product/21c/dbhomeXE/bin/orapwd
/opt/oracle/product/21c/dbhomeXE/bin/orapwd
```

- Datafiles contains data from tables, indexes, ... and are stored in an Oracle proprietary format.
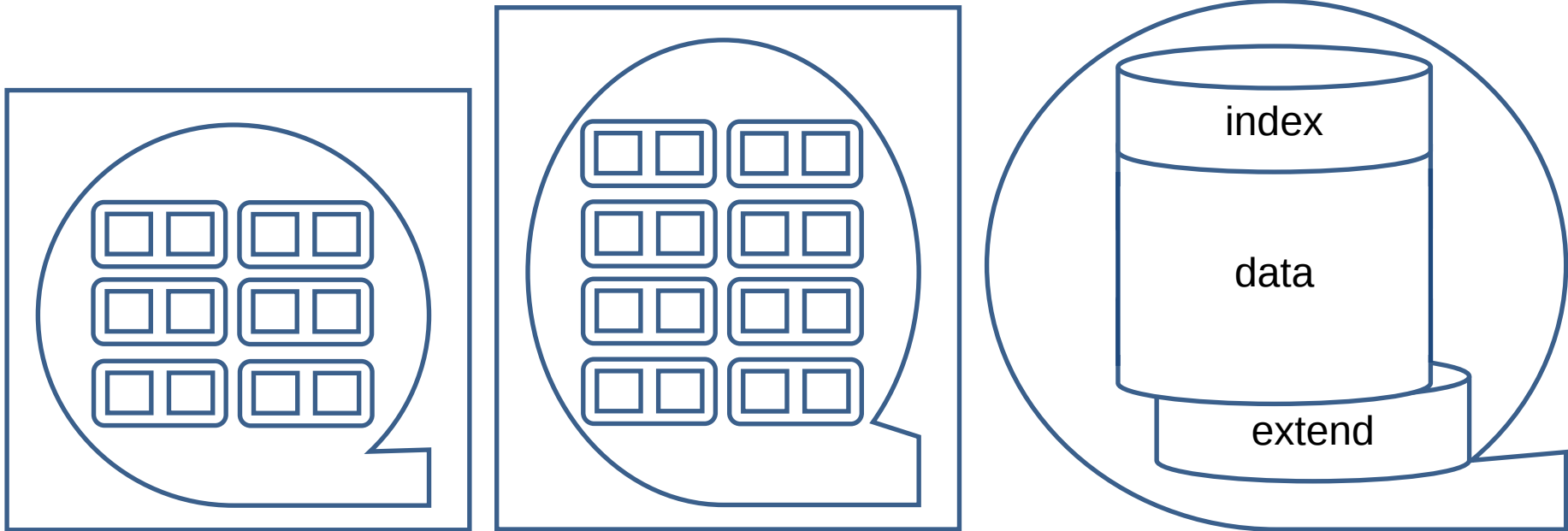
- The control file stores the physical components of the database and is used by the processes to find all files of the database.

- If any control file is lost, the database becomes unavailable.

- By installing Oracle it creates three identical files of the control file.

- By changing data the redo log file stores the changes.

- Due to a hardware failure, the data can be restored by a restore and a rerun of the redo log files.

- To protect against loosing the redo log, it is possible to keep an identical copy of the redo log.

- The redo log files are overwritten by the time.

- If the database is used in archived redo log mode, the redo log file is copied before reusing it.

```
/home/oracle/app/oracle/oradata/orcl          /home/.../2023_09_15
```

redo1909a.log

redo01.log

redo1909b.log

ARCH copy

redo02.log   redo1909c.log

current

redo03.log
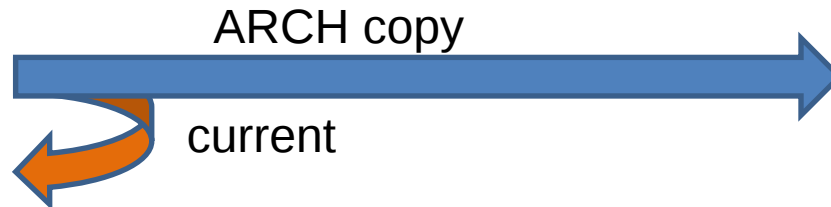
- The internal **SYSTEM** tablespace is used to manage the database. It contains the data dictionary and tables and views for administrative work.
- The **TEMP** stores temporary data. For example for sorting the result set.
- The **UNDOTBS** is used by the database to store undo information.
- The **USERS** tablespace stores permanent user objects and data.