Database Management

LEARNING OBJECTIVES

- Understand database Backup/Recovery processes

- To understand how TRANSACTION LOG processing enables DBMS backup and recovery

DBMS Backups & Replication

Two VERY IMPORTANT concepts:

1. Database Backups

2. Database Replication

BOTH rely on Transaction Log Processing

DBMS Backups

First we look at database BACKUPs:

The DBA's “bottom line”: Never, Ever lose data !!

So we run database backups. How often?

Depends on
- the size of the database
- the number of users
- the frequency of updates
- how critical the database is to the organization

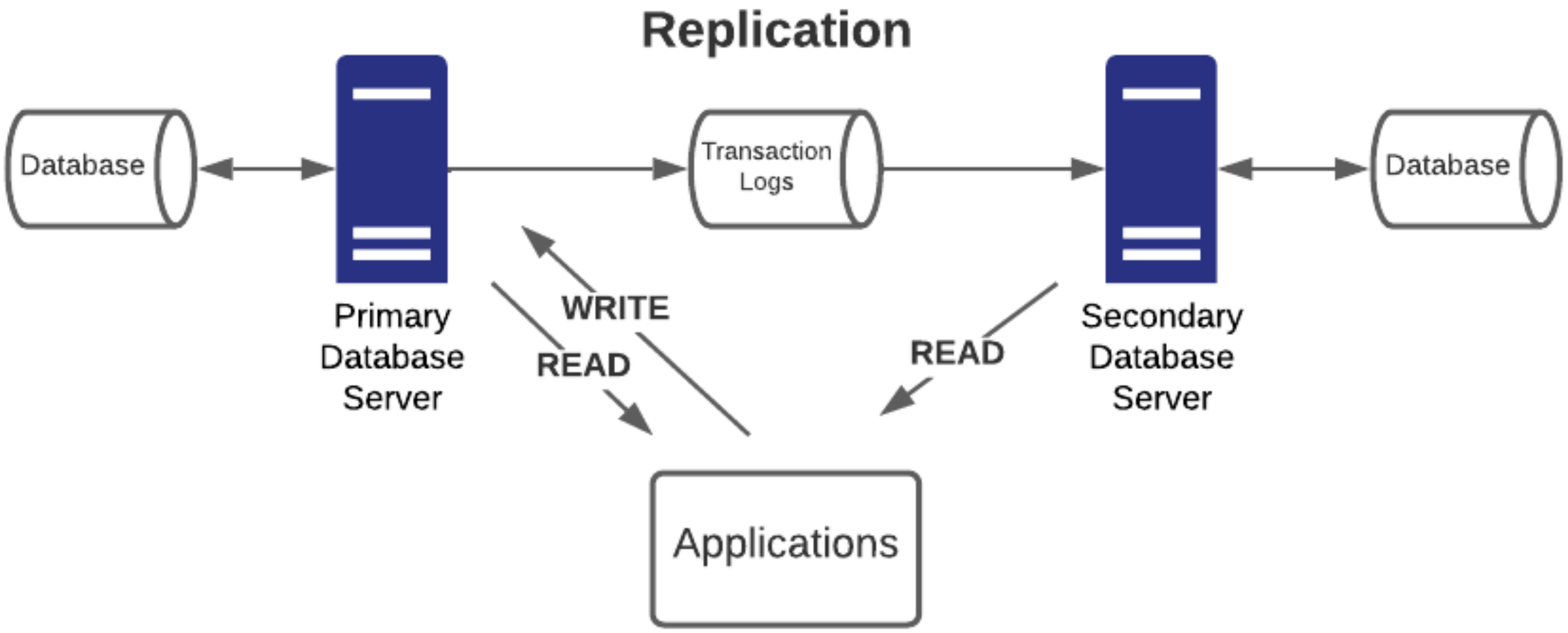
DBMS Replication

Some systems are SO CRITICAL that we keep redundant copies up-to-date at all times.

If the PRIMARY database fails, we switch application use over to the STAND-BY copy of the database.

DBMS Replication

STAND-BY copy of a database: Relies on technology called REPLICATION



DBMS Backups

The need for database backups:

- A database can crash or become corrupt
- If a critical database is down it may shut down an entire organization
- DBAs must be able to quickly **recover** a broken database
- The database must be **restored** to its full operational state just prior to the disaster
- Requires the use of a **backup** copy, and all **transaction logs** created since the backup

DBMS Backups

Types of backups

Full versus **Incremental**

– The backup software copies the entire database (“full”) versus copying only rows changed since the last “full” (“incremental”)

– Every database data page has a "changed" indicator

DBMS Backups

Types of backups

COLD Backup

Stop all database traffic and back it up as quickly as possible

- May be “full” or “incremental”
- Faster than a WARM backup
- Requires downtime – database is offline
- Invconvenient to the organization

DBMS Backups

Types of backups

WARM Backup

Take the backup while database traffic is in-progress

- May be “full” or “incremental”
- Takes longer than COLD backup
- No downtime
- Less inconvenient for the user community

DBMS Backups

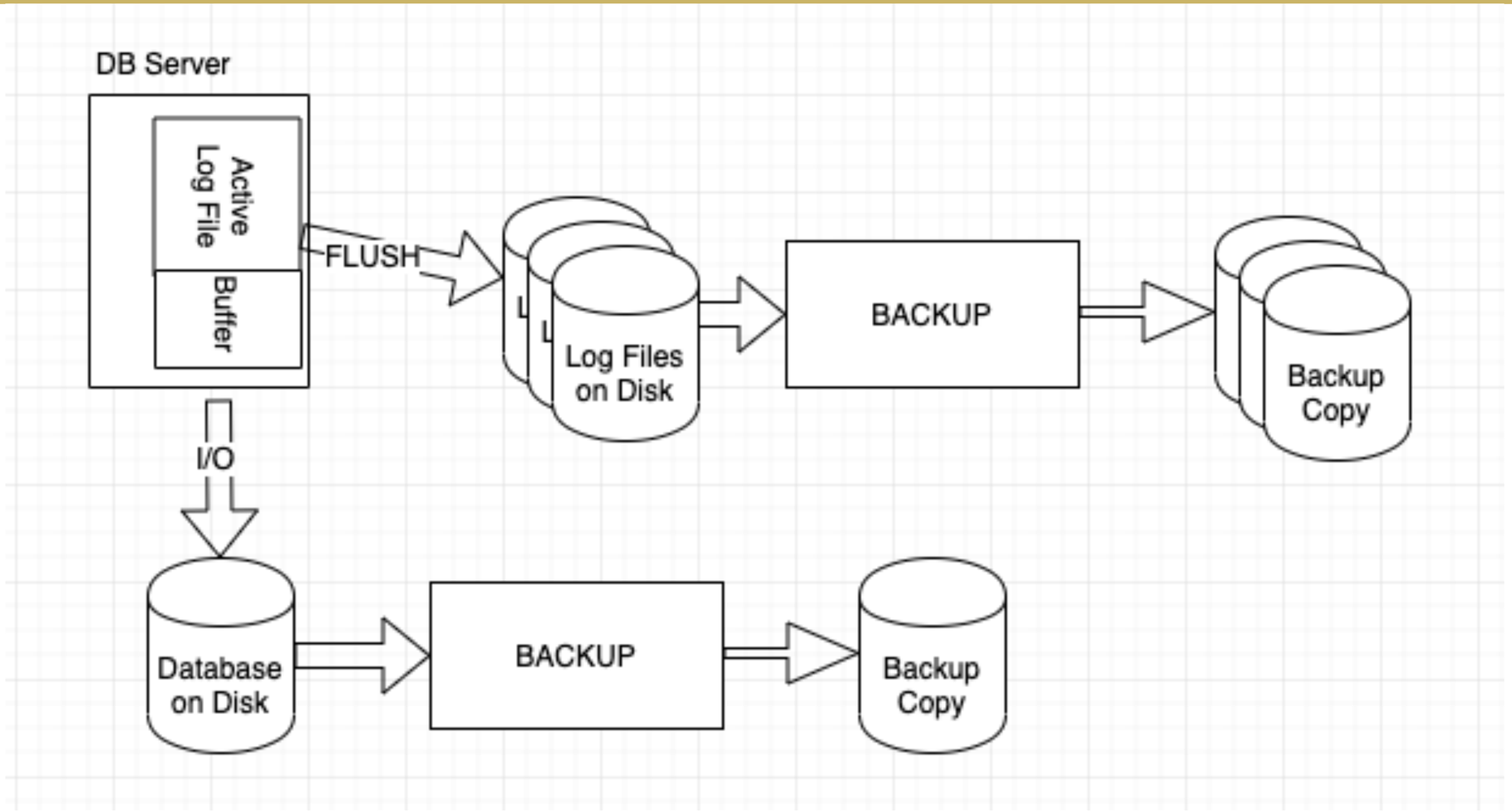
Types of backups

HOT STAND-BY

- Keep a duplicate copy of the database up-to-date and available for failover at all times
- Created via **replication** from transaction logs

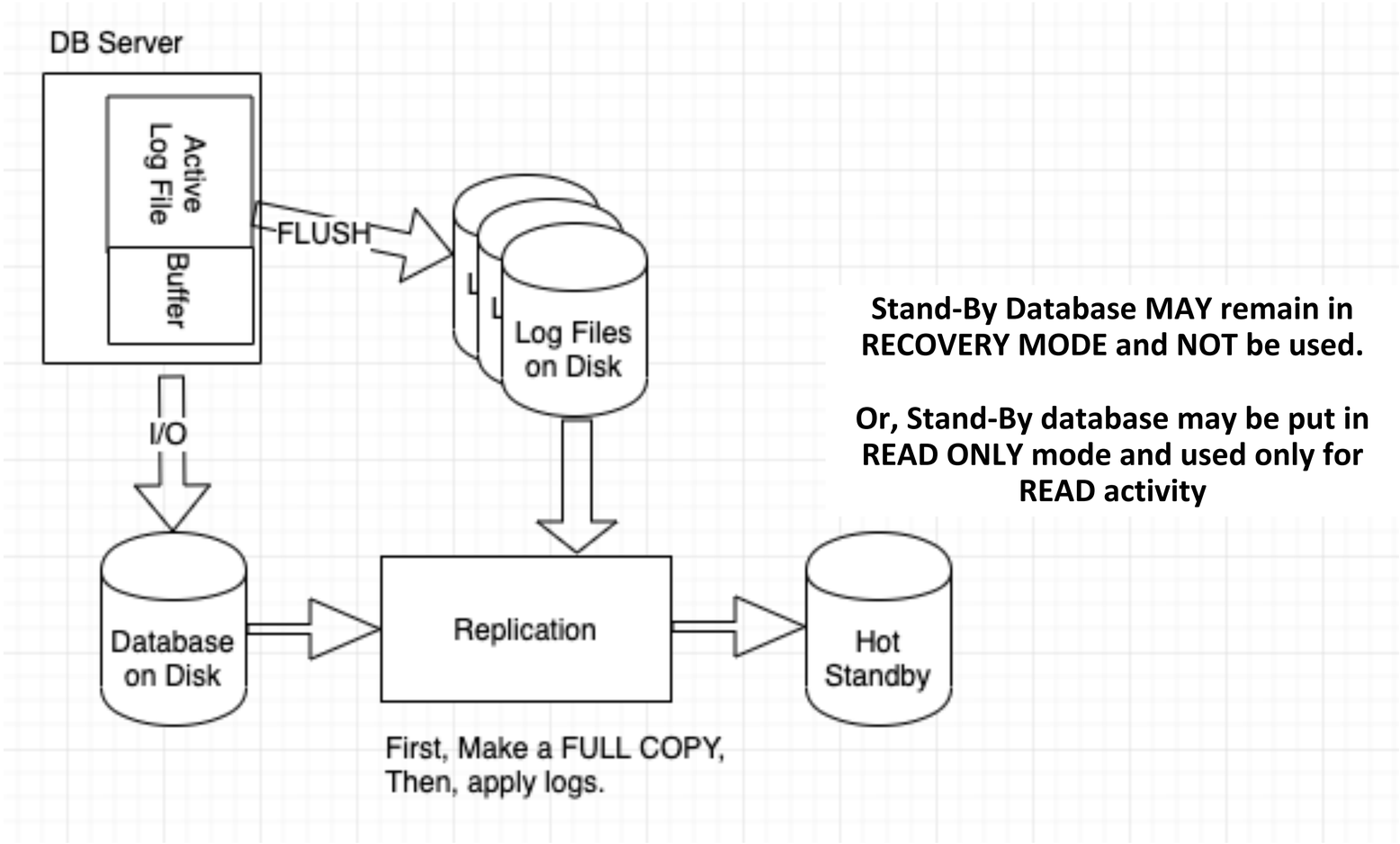
DBMS Backups

Standard Backup:



DBMS Backups

Hot Standby (via Replication):

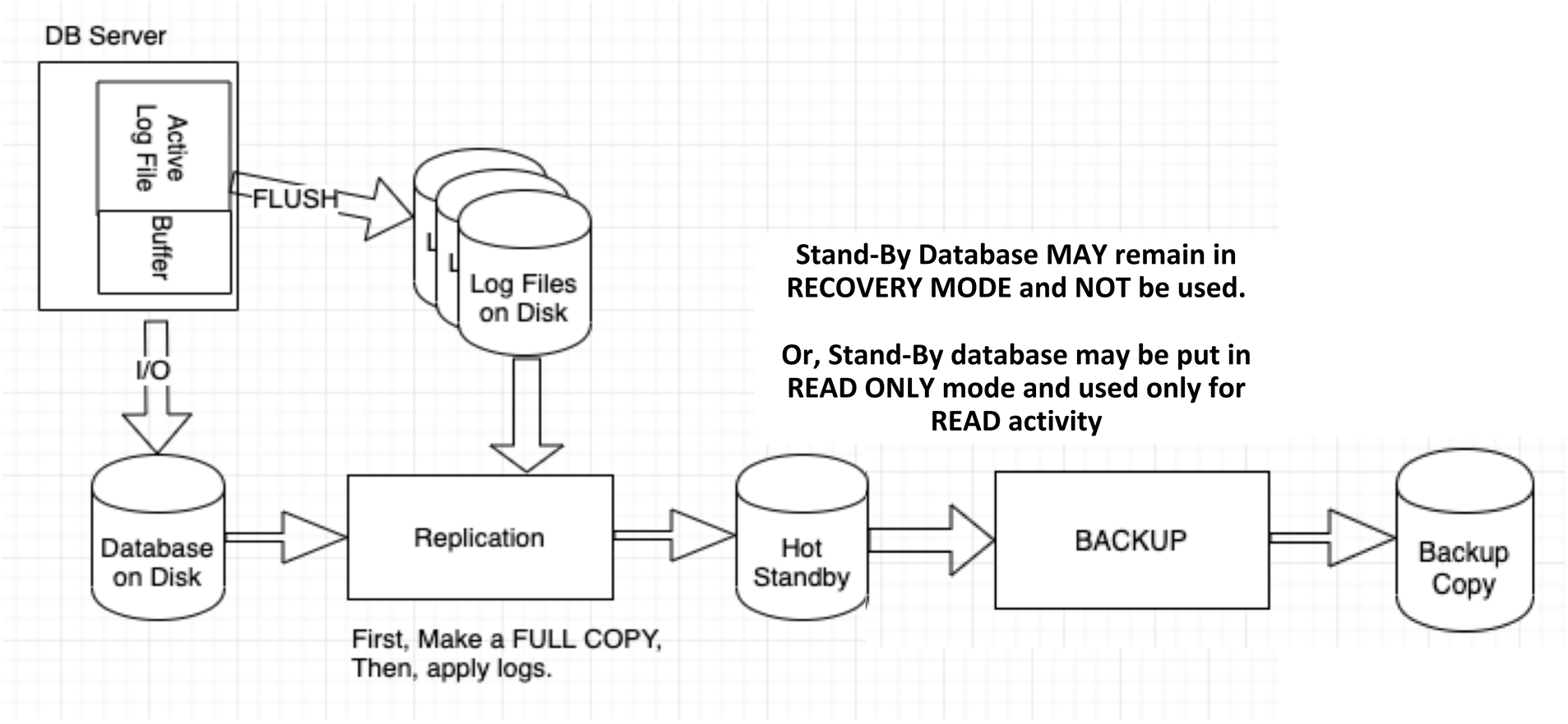


Stand-By Database MAY remain in RECOVERY MODE and NOT be used.

Or, Stand-By database may be put in READ ONLY mode and used only for READ activity

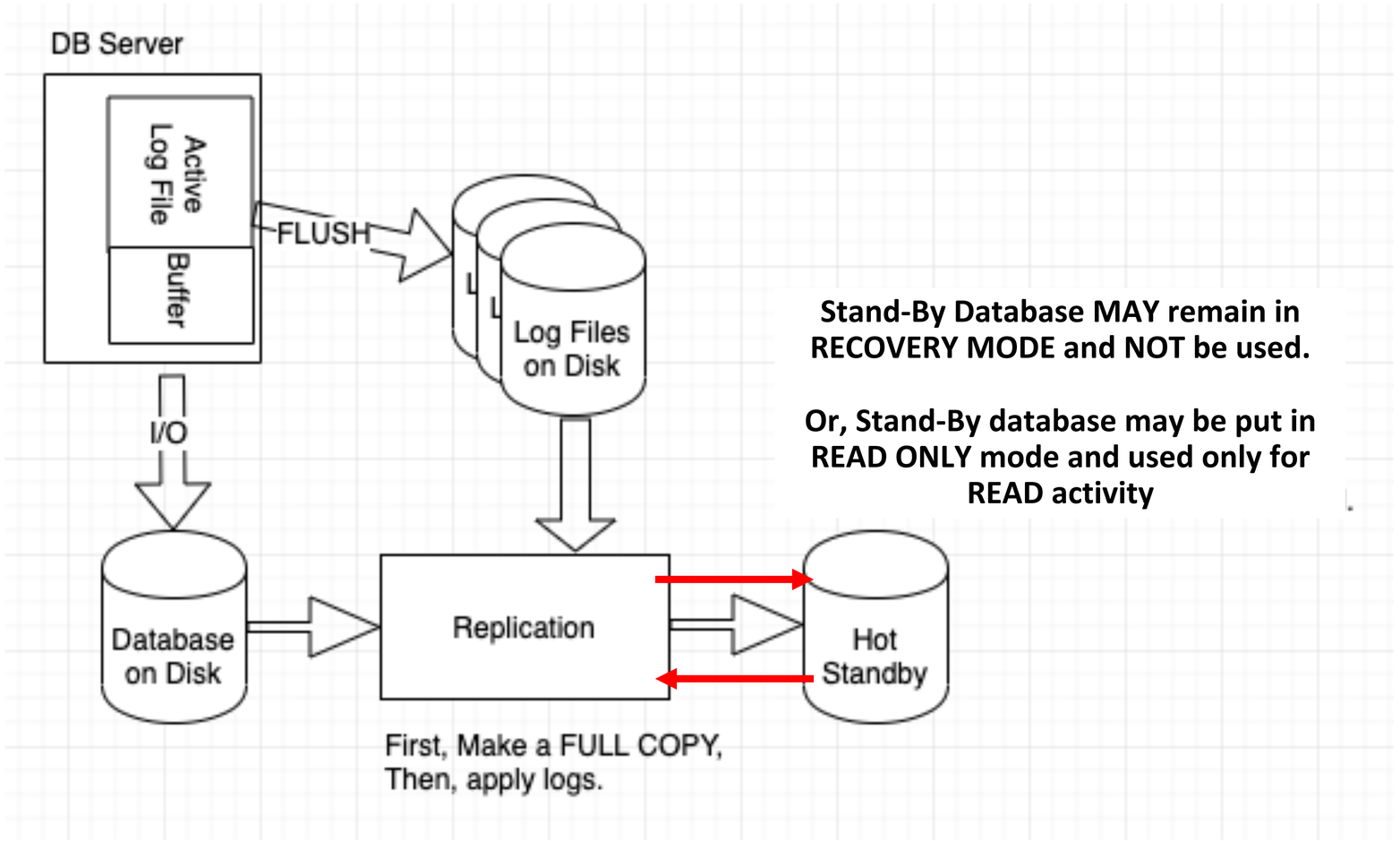
DBMS Backups

Backup from Stand-By



DBMS Backups

Hot Standby (via Replication):



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Synchronous VS
Asynchronous
…wait for ack?

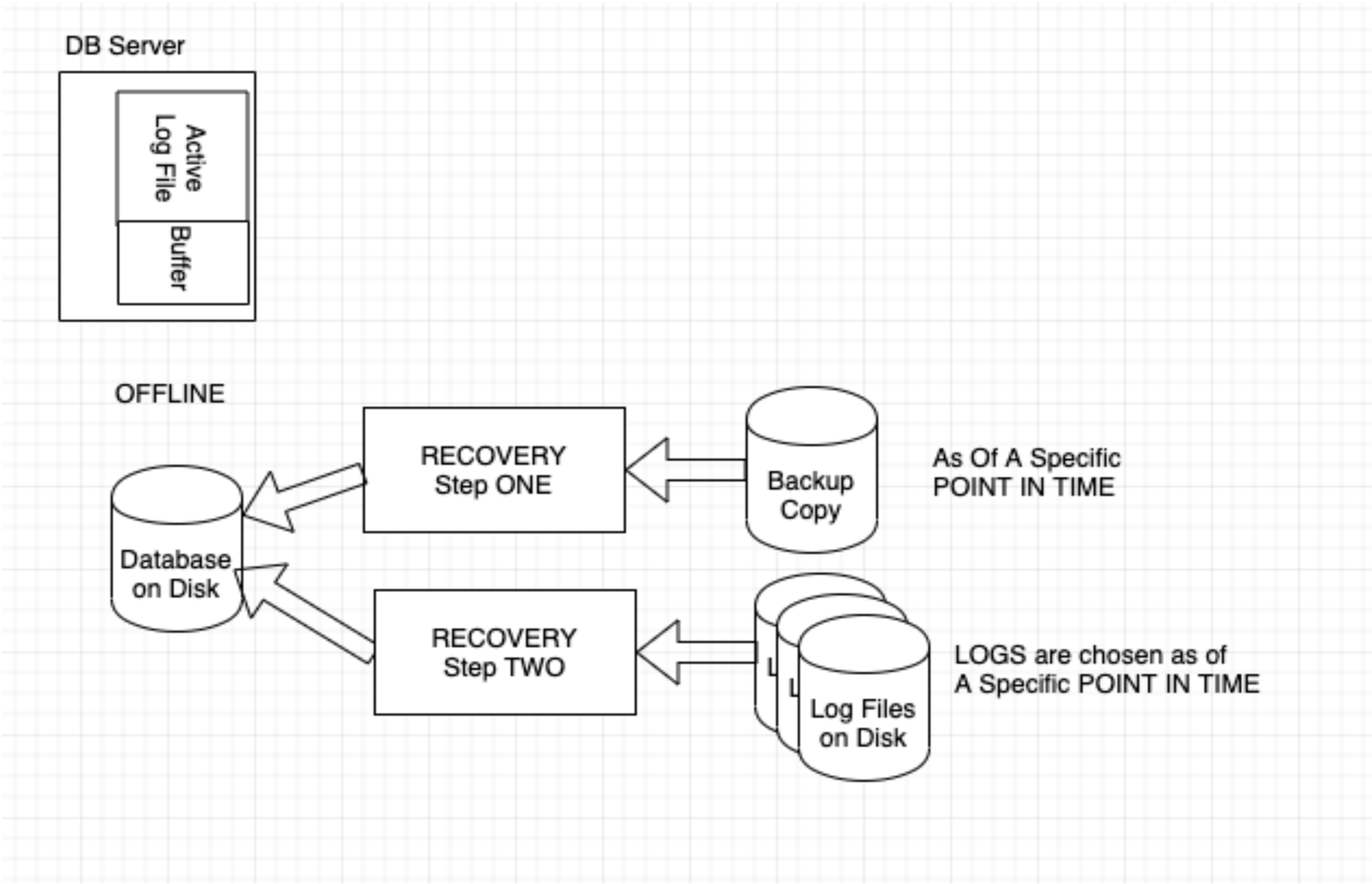
DBMS Backups

Recovering a database after a crash or corruption:

1. **Identify** the most recent complete **backup**
2. **Restore** the most recent complete **backup**
3. **Identify** the **point-in-time** of the failure
4. **Identify** the **latest transaction log file** prior to the failure
5. **Identify** the **latest transaction** prior to the failure
6. Apply transaction logs up to the last commit before the failure occurred

DBMS Backups

Standard Recovery:



Database Backups

SUMMARY

- There are several methods for database backups
- Transaction Logs enable REPLICATION
- Transaction Logs enable RECOVERY from Backup

You must back up BOTH the database AND the transaction logs!