Distributed Database

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REPLICATION

Reliability

Problem:

How to maintain

- atomicity
- durability

properties of transactions

Fundamental Definitions (1)

- Reliability
  - A measure of success with which a system conforms to some authoritative specification of its behavior.
  - Probability that the system has not experienced any failures within a given time period.
  - Typically used to describe systems that cannot be repaired or where the continuous operation of the system is critical.
- Availability
  - The fraction of the time that a system meets its specification.
  - The probability that the system is operational at a given time *t*.

Fundamental Definitions (2)

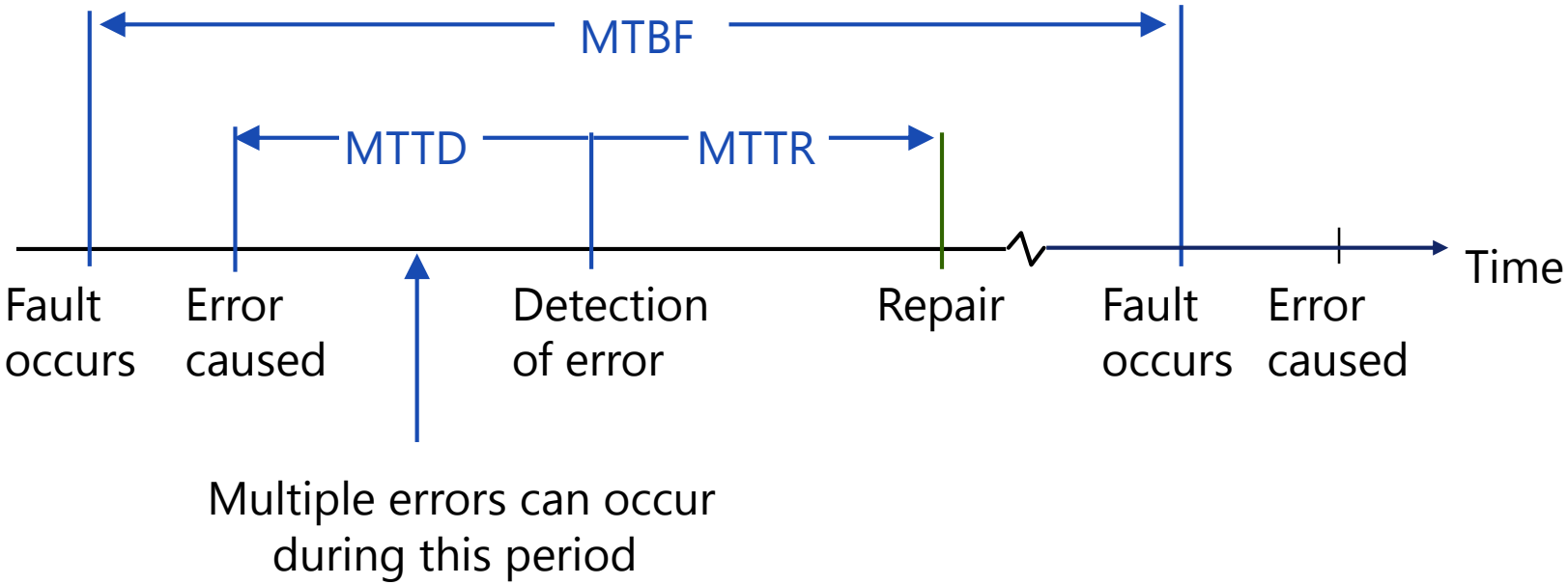
- Failure
  - The deviation of a system from the behavior that is described in its specification.
- Erroneous state
  - The internal state of a system such that there exist circumstances in which further processing, by the normal algorithms of the system, will lead to a failure which is not attributed to a subsequent fault.
- Error
  - The part of the state which is incorrect.
- Fault
  - An error in the internal states of the components of a system or in the design of a system.

Faults to Failures

Types of Faults

- Hard faults
  - Permanent
  - Resulting failures are called hard failures
- Soft faults
  - Transient or intermittent
  - Account for more than 90% of all failures
  - Resulting failures are called soft failures

Failures

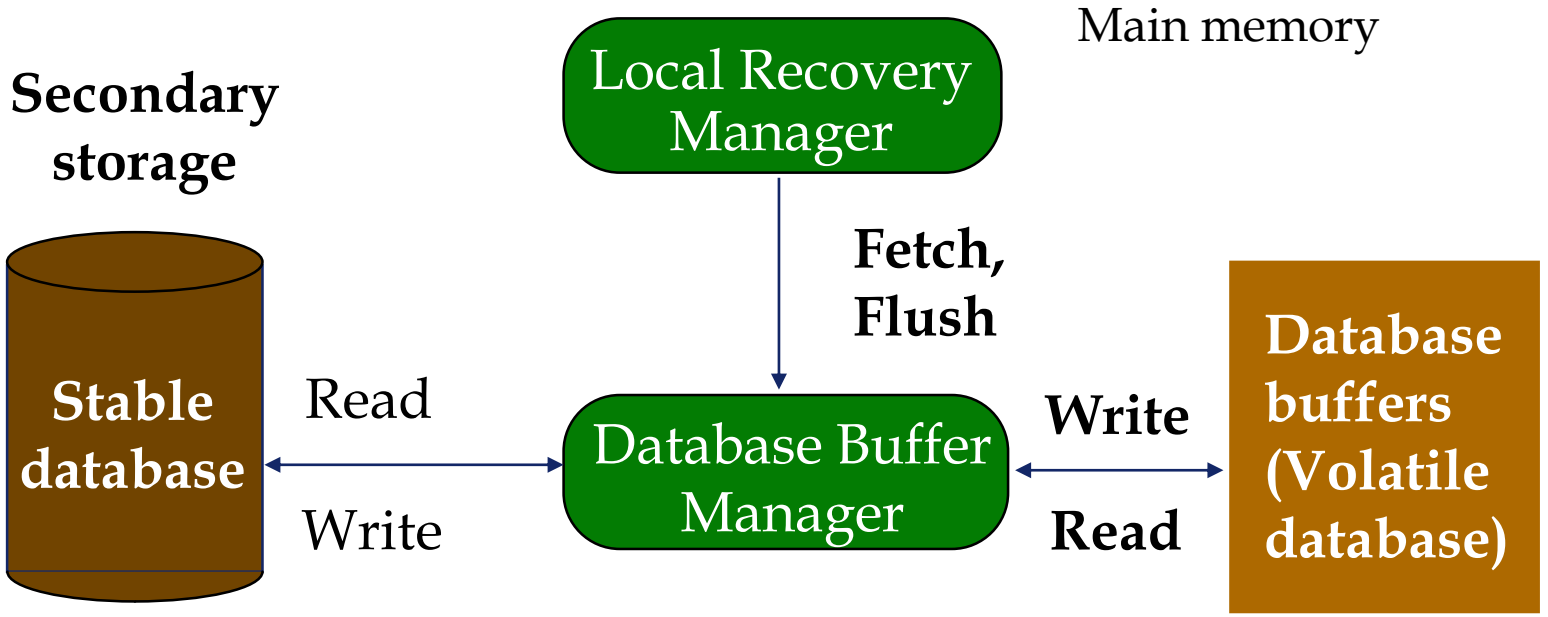

MTBF
MTTD
MTTR
Time
Fault occurs
Error caused
Detection of error
Repair
Fault occurs
Error caused
Multiple errors can occur during this period

Local Recovery Management – Architecture (1)

- Volatile storage
  - Consists of the main memory of the computer system (RAM).

- Stable storage
  - Resilient to failures and loses its contents only in the presence of media failures (e.g., head crashes on disks).
  - Implemented via a combination of hardware (non-volatile storage) and software (stable-write, stable-read, clean-up) components.

Local Recovery Management – Architecture (2)



Update Strategies

- In-place update
  - Each update causes a change in one or more data values on pages in the database buffers
- Out-of-place update
  - Each update causes the new value(s) of data item(s) to be stored separate from the old value(s)

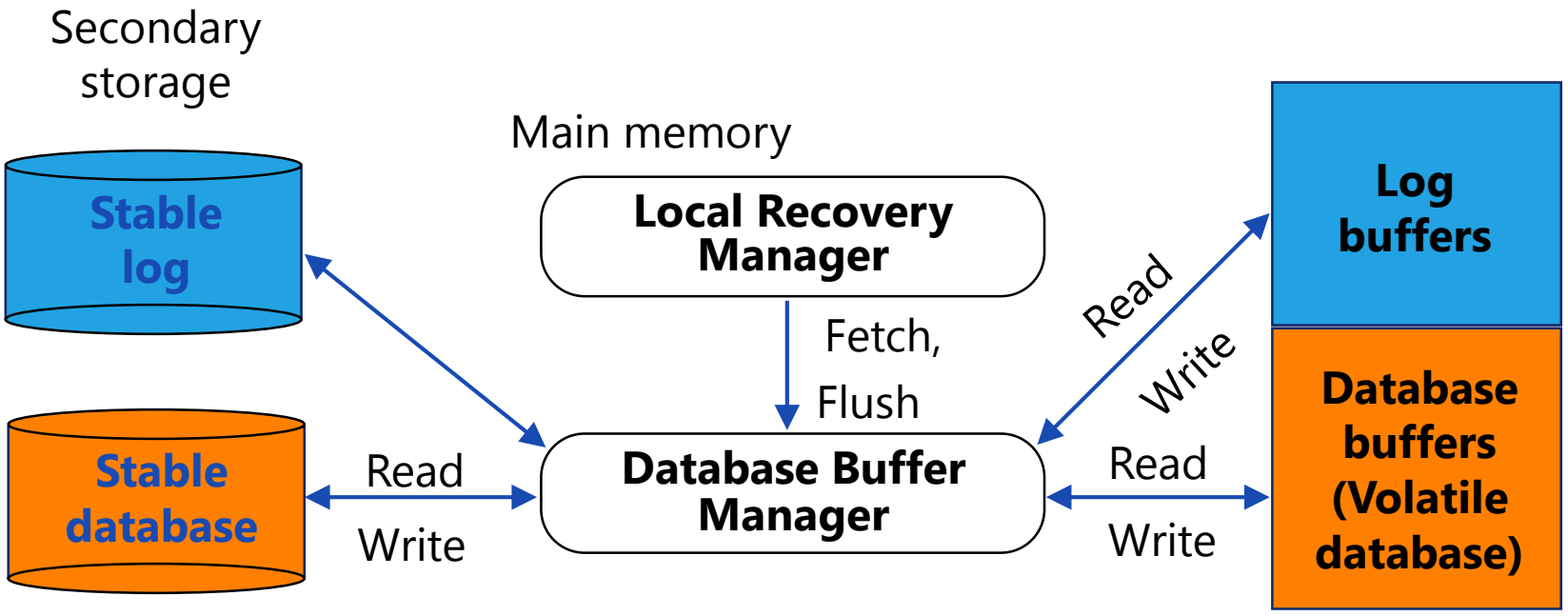
Logging

The log contains information used by the recovery process to restore the consistency of a system. This information may include ;

- transaction identifier
- type of operation (action)
- items accessed by the transaction to perform the action
- old value (state) of item (before image)
- new value (state) of item (after image)

...

Logging Interface



KEMAMPUAN AKHIR YANG DIHARAPKAN

Mahasiswa secara aktif, kreatif dan dapat ber-inovasi dalam menanyakan mengenai proses perkuliahan dalam mengerti dan memahami tentang *Distributed Dbms Reliability*

Thank You !

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