1. Introduction

Roles of Transactions
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2. Transactions in the Architecture of a DBMS
Nine capabilities of a DBMS by Codd

1. Integration
2. Operations
3. Catalog
4. Views
5. **Consistency Control**
6. Data Protection
7. **Transactions**
8. Synchronization
9. Recovery
Transaction properties

A transaction is a sequence of operations (actions), which transfers a database from a consistent state into another eventually changed consistent state, applying the ACID properties.

- Aspects:
  - Semantic integrity: Correct (consistent) database state after the end of transactions
  - Run-time integrity: Avoid errors caused by simultaneous access of several users to the same data
ACID Properties

- **Atomicity:**
  Transactions are either completed, or not performed at all.

- **Consistency:**
  If the database is in a consistent state before a transaction starts, the database is also consistent after the transaction has ended.

- **Isolation:**
  A user who is working on the database should not notice any other user working on it.

- **Durability:**
  The result of a transaction must be permanently stored within the database, after the transaction is completed.
Architecture of DBMS

Set-Oriented Interface (SOI) → Data System
- Translation, Access Path Selection, Access Control, Integrity Control

Record-Oriented Interface (ROI) → Access System
- Data Dictionary, Currency Pointer, Sorting, Concurrency Control

Internal Record Interface (IRI) → Storage System
- Record Manager, Access Path Management, Lock Management, Log/Recovery

System Buffer Interface (SBI) → Buffer Management
- System Buffer Management with Page Replace Strategy

File Interface (FI) → Operating System
- External Storage Management

Device Interface (DI) →
Storage hierarchy

- Cache
- Main Memory
- Disk Memory
- Optical Disk
- Magnetic Tapes
- Tertiary Storage
- Secondary Storage
- Primary Storage