Transactions

- Normally we speak about ACID transactions
  - **A**tomicity – Transactions either succeed or fail as a unit.
  - **C**onsistency – The database is always kept in a consistent state. No partial transactions
  - **I**solation – Changes made by the transaction can be seen only by the session making the change until they are committed.
  - **D**urability – When the transaction is complete, it cannot be undone.

ACID - Atomicity

- A transaction is executed completely or none of the statements are executed
  - Example: Sending €100,- from bank account K1 to K2
    - Write-off from account K1
    - Add to account K2
    - Either both operations or none!

```
update  konto
set     stand=stand-100
where   konto='K1';
```

```
update  konto
set     stand=stand+100
where   konto='K2';
```

- Cancellation can occur:
  - Cancellation by user
  - By the system (e.g. because of Deadlock)
  - Crash (Hardware-/Software error)

ACID - Consistency

- Consistency has to remain during transaction
- any data written to the database must be valid according to all defined rules including
  - constraints
  - cascades
  - triggers
  - any combination thereof

ACID - Isolation

- Parallel transactions do not effect each other
- Each transaction runs as it would be the one and only transaction

ACID - Durability

- After committing a transaction, data has to be stored permanently

- *Even in the case of system crashes –*
- *automatic Recovery (undo, redo)*