ER - DIAGRAM

LECTURE 1: Databases

ER - Diagram

Entity Relationship model

ER - Diagram

- Visual representation of the ER conceptual data model.
- High-level design.
- Not linked to the implementation or hardware.

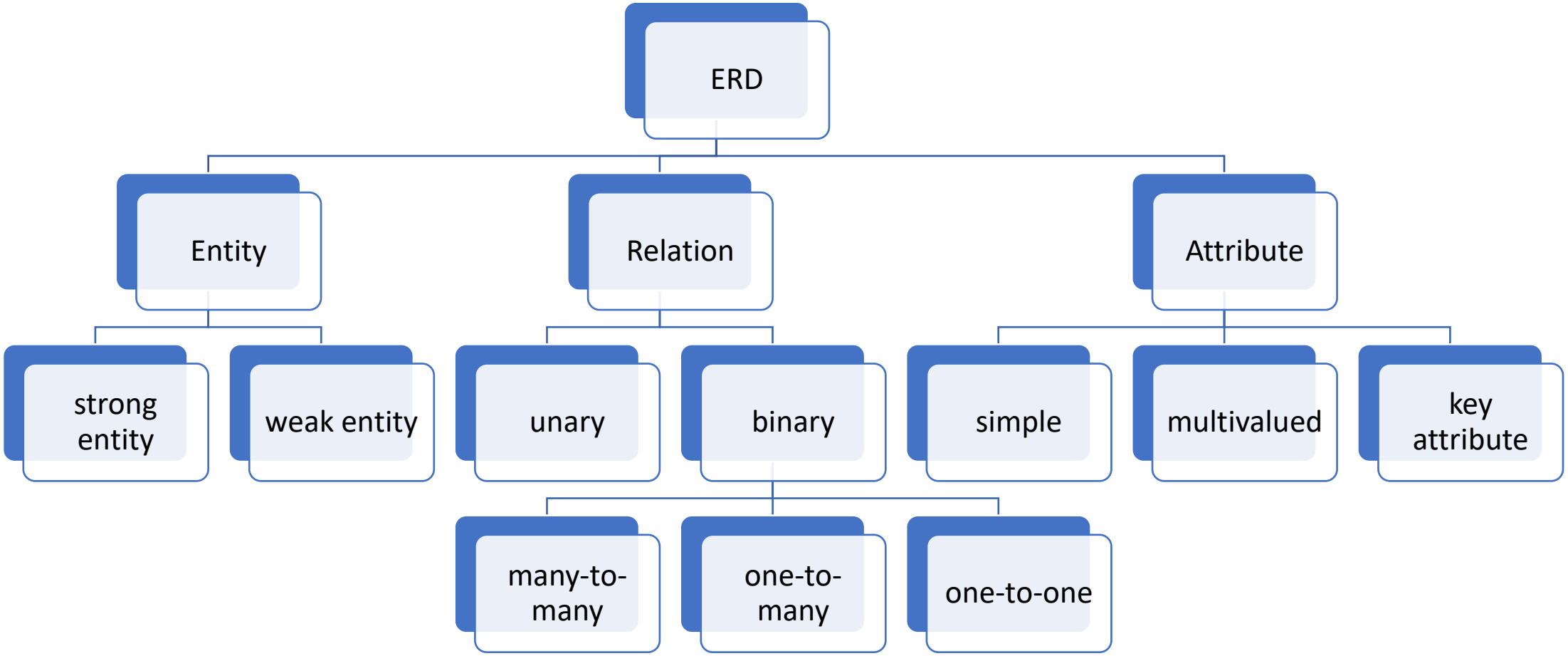
- Peter Chen proposed ERDs in 1976.

ER - Diagram

- User story/requirement analysis → **ER** →relational database schema.
- Easy to translate into relational tables.

- Describes the logical structure of the (relational) database.
- Suitable for structured systems (fixed, well-defined schema).

ERD - components



ER - Diagram

person, place, activity, event, concept, real world object etc.

usually a noun

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links entities (unary, binary, ternary).

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usually a verb

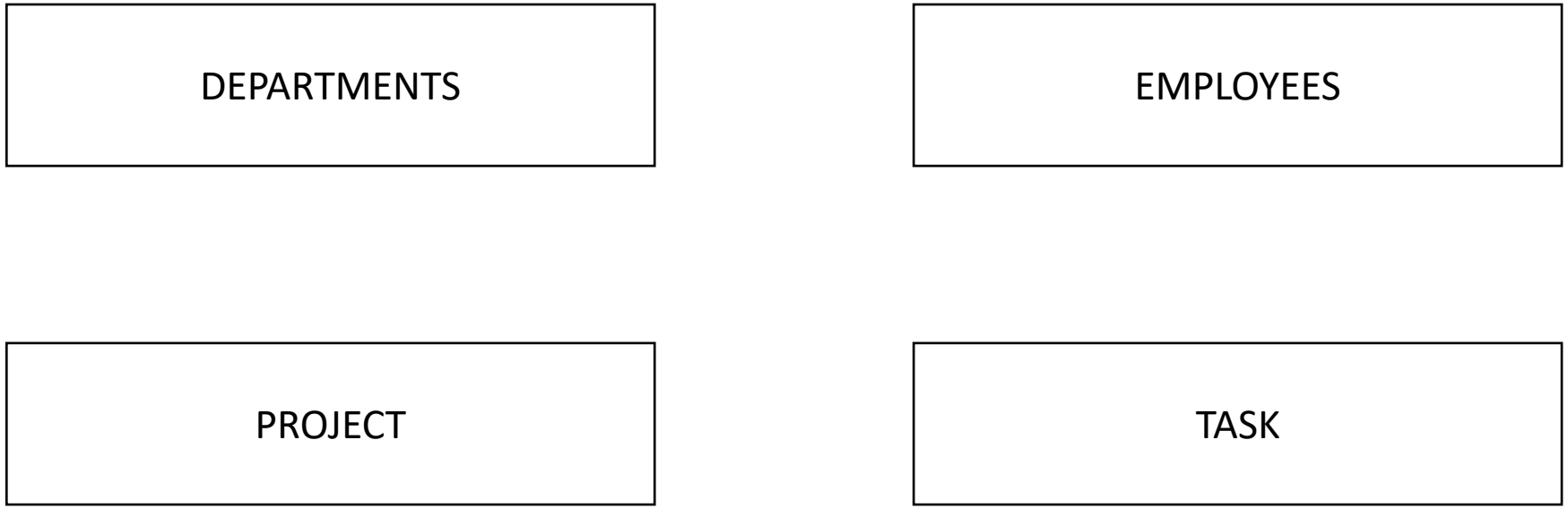
describes entities or relations

Entities

- Unique names, uppercase characters
- Graphical representation: rectangles

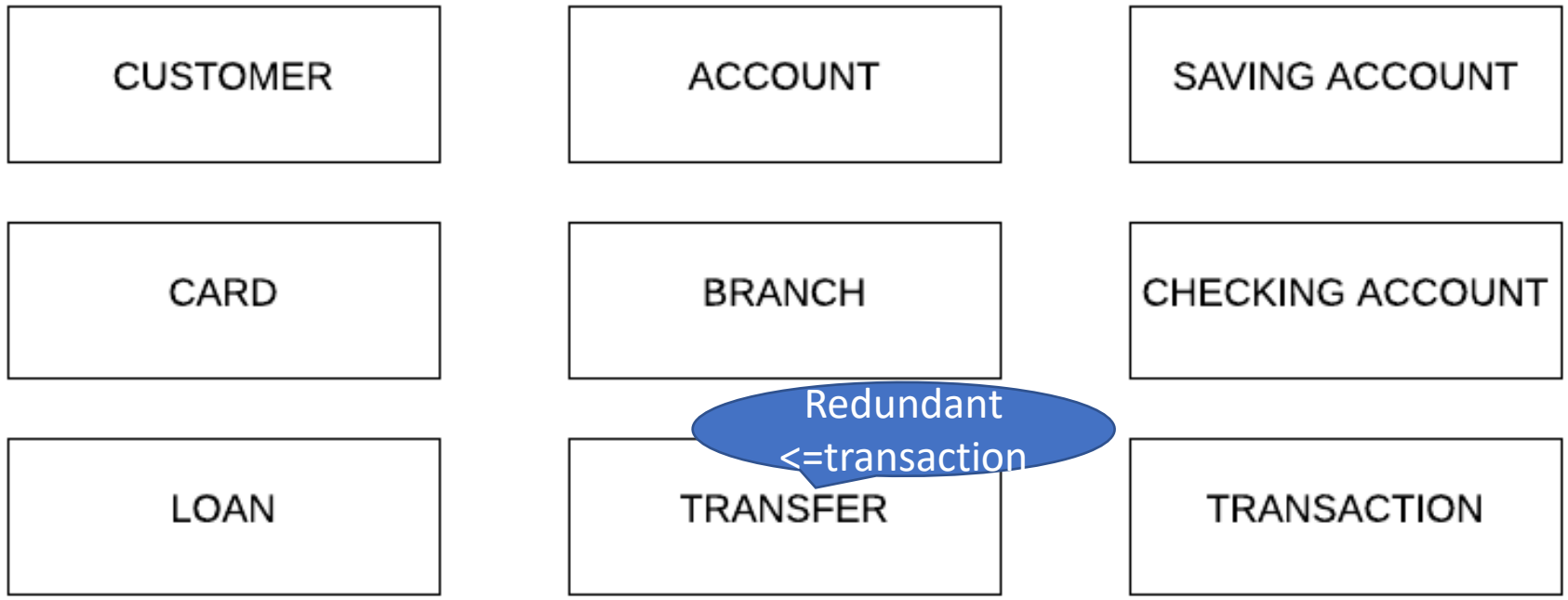
- Relational database: entity → table (line & columns)
- Primary key: attribute or group of attributes that uniquely identifies an entity instance

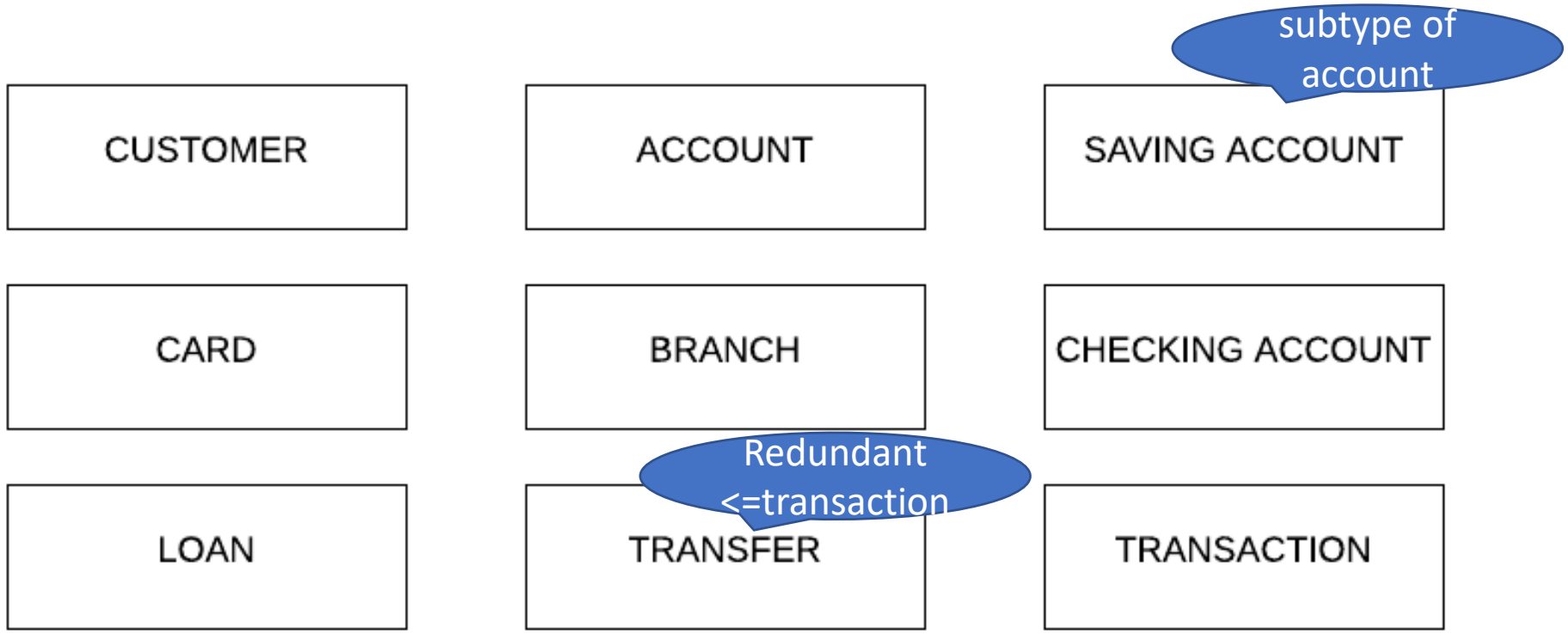
Entities

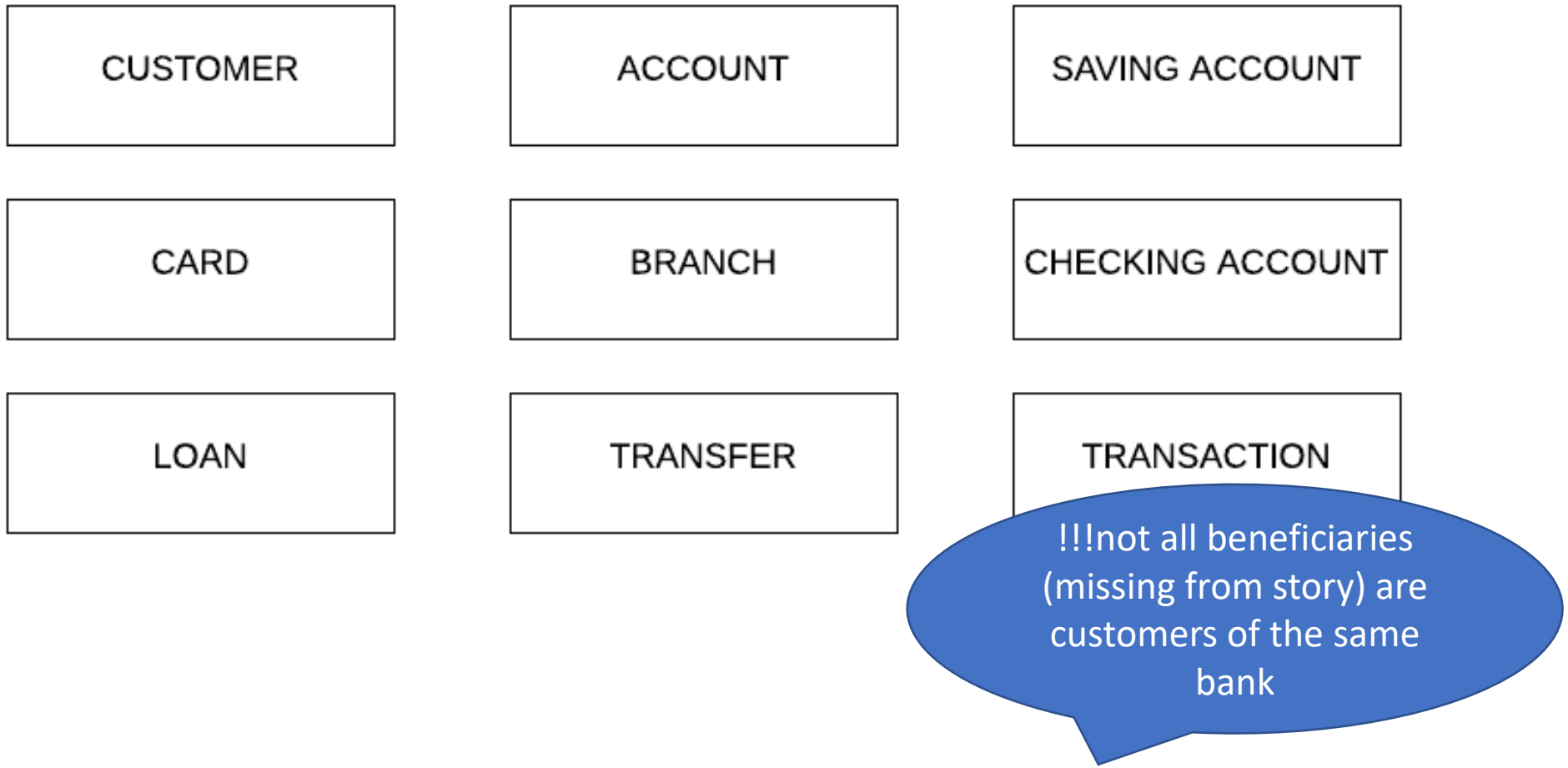


Banking -- Entities

- A customer opens a saving account or a checking account, at a bank branch. He may also access loans. For each checking account he has a card. Periodically he may withdraw money from his account or partially pay his loans. He may also transfer money from one account to another.


CUSTOMER
ACCOUNT
SAVING ACCOUNT
CARD
BRANCH
CHECKING ACCOUNT
Redundant
<=transaction
LOAN
TRANSFER
TRANSACTION


subtype of account
CUSTOMER
ACCOUNT
SAVING ACCOUNT
CARD
BRANCH
CHECKING ACCOUNT
Redundant <=transaction
LOAN
TRANSFER
TRANSACTION


CUSTOMER
ACCOUNT
SAVING ACCOUNT
CARD
BRANCH
CHECKING ACCOUNT
LOAN
TRANSFER
TRANSACTION
!!!not all beneficiaries (missing from story) are customers of the same bank

Primary key

- ***Unique*** identifier
- ***Not null*** Must be known at any moment
- ***Immutable***
- Simple
- No ambiguities

- Composed keys may be replaced with an *artificial key*.
- In many RDBMS we may use autoincremented values.

Populating a Primary Key

- Identity automatically assigns a unique sequence number to each row inserted.
- Sequence or functions (functions that generate uuid).
- Examples:
  - Postgres SERIAL (populate with sequence values)
  - MySql AUTO_INCREMENT.
  - Oracle Sequence
  - My Sql Server IDENTITY

  - Mongo ObjectID

Primary key UUID/GUID

- universally unique identifier 128-bit
- Not the best solution for clustering (sequential UUIDs might be used).

- Types:
  - Type 1 : 4 bytes + 2 bytes + 2 bytes + 2 bytes + 6 bytes = time + node
  - Type 4 : 122 bits randomly generated, 6 bits reserved for version and variant.

  - Bit for type

    type 1 2ad1db02-2ff0-11eb-adc1-0242ac120002
    type 4 a7bc2d72-7153-44a1-83df-d03dd298cf53

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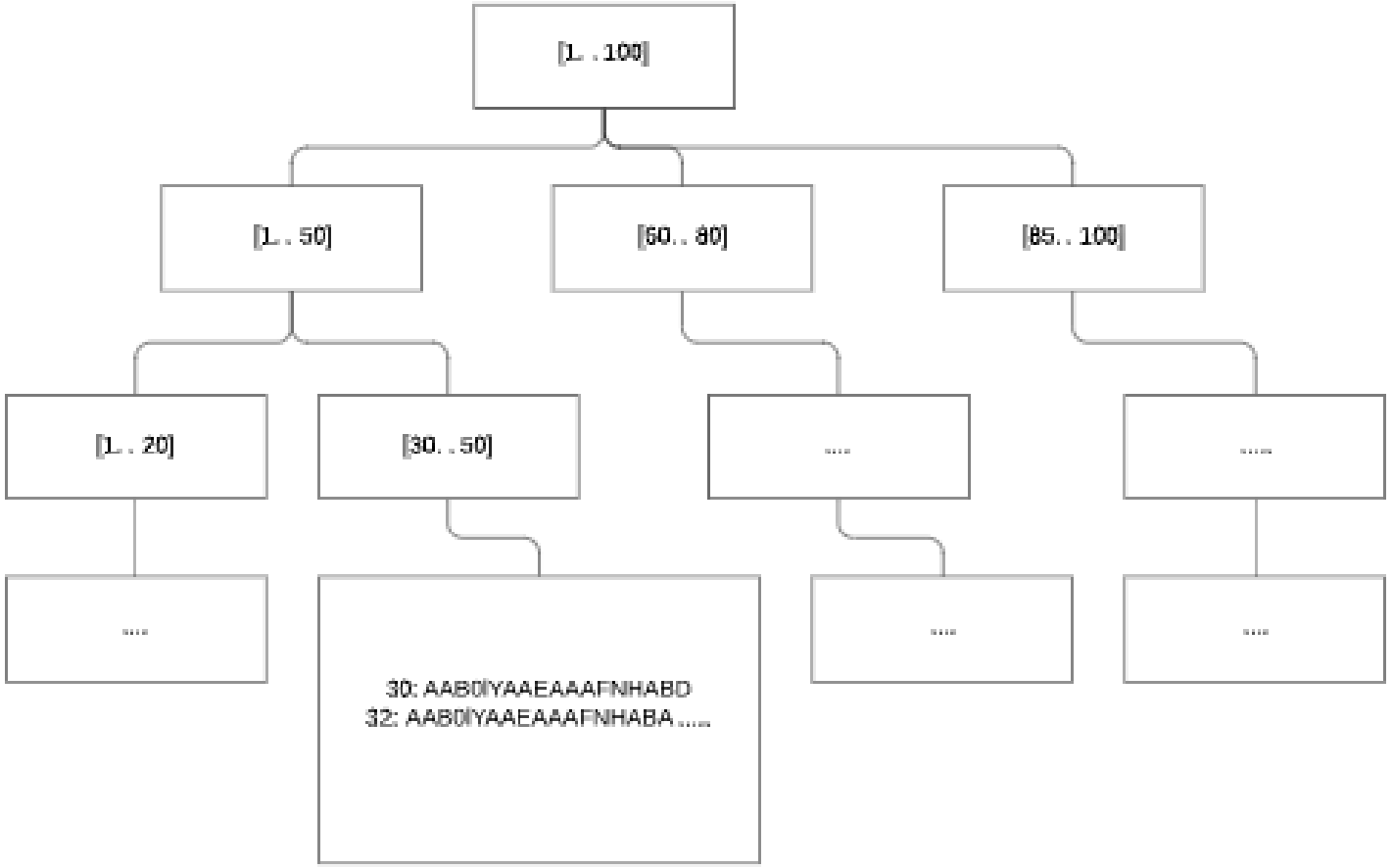
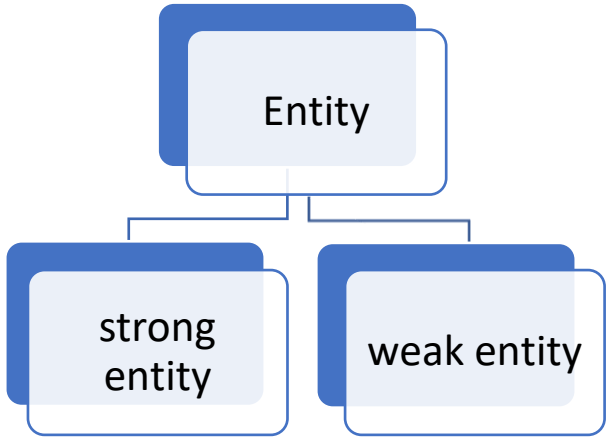
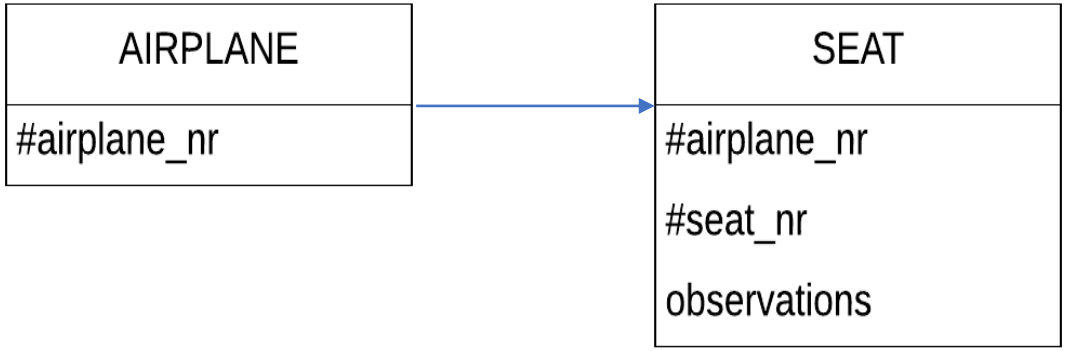

[1. . 100]
[1. . 50]
[50. . 80]
[85. . 100]
[1. . 20]
[30. . 50]
....
....
....
....
....
30: AABDIYAAEAAAFNHABD
32: AABDIYAAEAAAFNHABA ....

Airline -- Entities

- The airline has one or more airplanes. An airplane has a model number, and capacity. Each flight is carried out by airplanes. An airplane is uniquely identified by its Registration_no and a flight is identified by its Flight_no. A passenger can book a ticket for a flight.

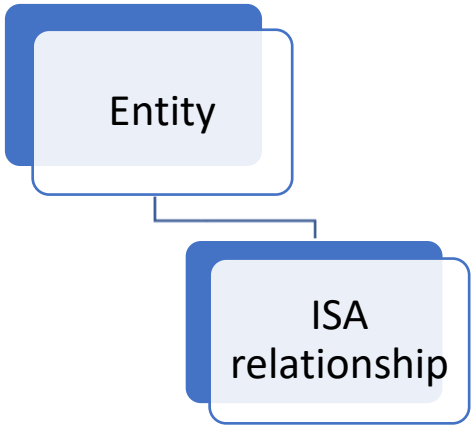
Entities

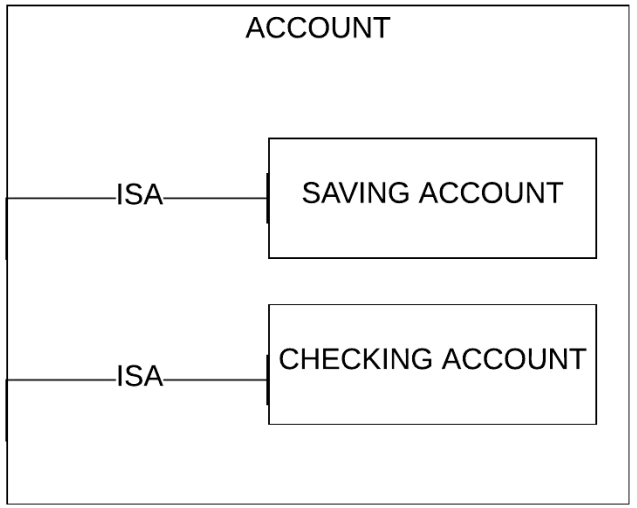




- Weak entity is an entity that depends on another entity.
- The primary key of a weak entity contains the primary key of the strong entity that it depends on + description/partial key.

Entities





- A sub-entity has the same key as the *super*-entity and all its attributes and relationships.