Section 08.1 - Database Concepts

Layer 7: Application

Syllabus Content Section 08: Databases

S08.1.1 Show understanding of the limitations of using a file-based approach for the storage and retrieval of data

Flat file = One big table with everything

Name	Address	Date of Order	Item Ordered	Number bought	Price per item	Total Cost
Burt	10 Downing Street	1 December 2016	Heart shaped chain	1	$500	$500
Claire	16 Pennsylvania Avenue	3 December 2016	Apple MacBook Pro	1	$2000	$2000
Sam	1642 Evergreen Terrace	28 November 2016	Red roses	12	$10	$120
Katniss	18 District Twelve	2 December 2016	Arrows	20	$15	$180

As you can see all the customer details and the order details are in one table

- Benifits
  - Very simple design
  - All data in one place
- Drawbacks
  - Becomes very big, very quickly
  - Difficult to find information
  - Multiple entries – REDUNDANCY
  - If Katniss changes her address then you have to change multiple entries
  - If table gets corrupted, everything messes up

S08.1.2 Describe the features of a relational database that address the limitations of a file-based approach

Where multiple tables are used.
So one table for customers and another for orders

Customer ID	Name	Address
1	Burt	10 Downing Street
2	Claire	16 Pennsylvania Avenue
3	Sam	1642 Evergreen Terrace
4	Katniss	18 District Twelve

Order ID	Customer ID	Date of Order	Item Ordered	Number bought	Price per item	Total Cost
Ord1	1	1-Dec-16	Heart shaped chain	1	$500	$500
Ord2	2	3-Dec-16	Apple MacBook Pro	1	$2,000	$2,000
Ord3	3	28-Nov-16	Red roses	12	$10	$120
Ord4	4	2-Dec-16	Arrows	20	$15	$180

- Benifits
  - You can change Katniss address in only one table / row and the others will update
  - If one table fails, just that table messes up
  - Smaller individual tables
- Ddrawbacks
  - More complicated structure
  - Need to view multiple tables to get all the information
  - Data dependency - If you change data in one table MAYBE all the other tables have to be rewritten

S08.1.3 Show understanding of and use the terminology associated with a relational database model

- Including entity, table, record, field, tuple, attribute, primary key, candidate key, secondary key, foreign key, relationship (one-to-many, one-to-one, many-to-many), referential integrity, indexing

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> Terminology

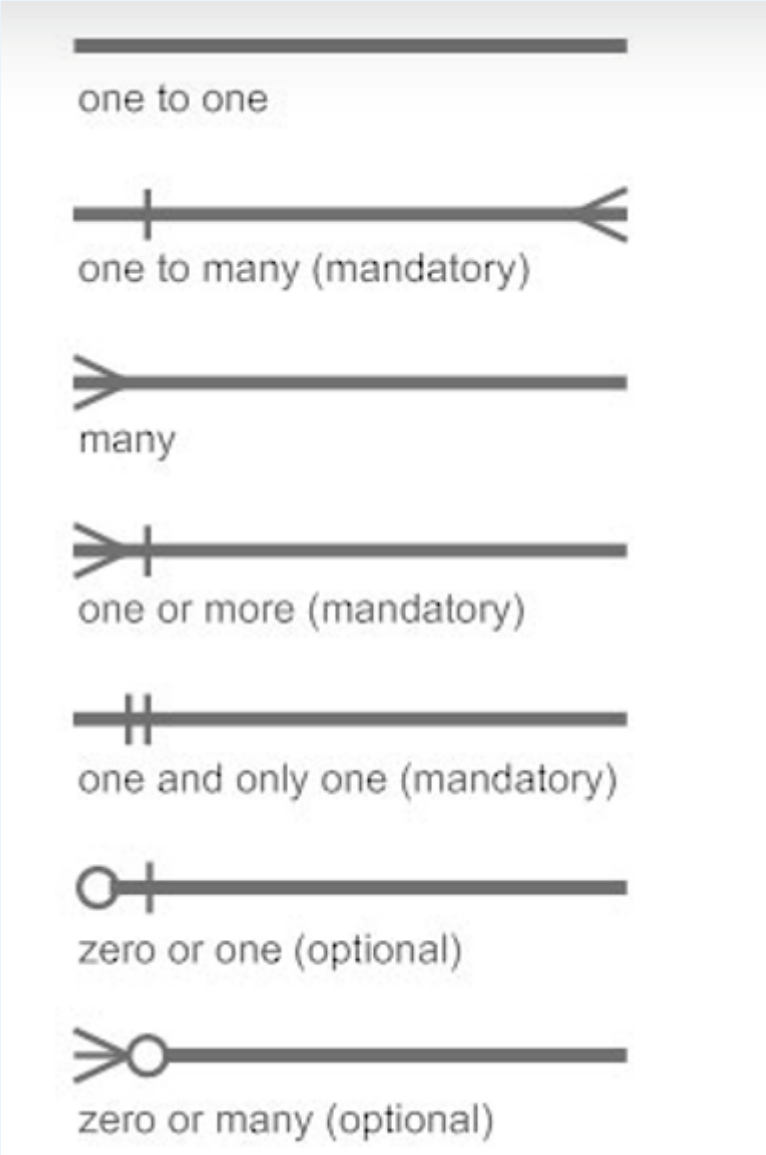
`Entity`: something that will become a table in a relational database
`Table`: Shows all the information in a database
`Record`: All the information of a one person / thing
`Field`: One piece of data about a person or thing
`Tuple`: a row in a relation storing data for one instance of the relation
`Attribute`: a column in a relation that contains values
`Primary key`: an attribute or a combination of attributes for which there is a value in each tuple and that value is unique

`Candidate key`: a key that could be chosen as the primary key
`Secondary key`: a candidate key that has not been chosen as the primary key
`Foreign key`: an attribute in one table that refers to the primary key in another table

> Relationship

- one-to-one or 1:1
- one-to-many or 1:M
- many-to-one or M:1
- many-to-many or M:M

S08.1.4 Use an entity-relationship (E-R) diagram to document a database design



S08.1.5 Show understanding of the normalisation process

- First Normal Form(1NF), Second Normal Form (2NF) and Third Normal Form (3NF)

> Zero Normal Form(0NF)

Has repeated entries of data
May have repeated fields
No primary key
Not atomic

> First Normal Form(1NF)

No repeating fields
All fields are atomic
Each record is unique
Has primary key
Must be two dimensional table
Each column should have a unique name

> Second Normal Form (2NF)

The same as 1NF
Any data not dependant on primary key will have its own table
Each column depends on the entire primary key
The fields of the table are related to the primary key of only that table

> Third Normal Form (3NF)

Same as 2NF
Fields that are not related to each other are put in new tables
These tables are linked to create relationships with their primary key
The primary key may appear as a foreign key

S08.1.6 Explain why a given set of database tables are, or are not, in 3NF

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to see if there are any non-key dependencies; that means we must look for any non-key attribute that is dependent on another non-key attribute. If there is, a new table must be defined

S08.1.7 Produce a normalised database design for a description of a database, a given set of data, or a given set of tables

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