multiverse

Database Fundamentals

Session 1

Session Outline

Learning Objectives

- Explain the concepts and uses of a **relational database management system**
- Identify the different types of **key** in a RDBMS
- Understand the principles of **normalisation** on a relational database

Introduction to Databases

A Database Management System (DBMS) provides...

...an efficient, reliable, convenient and safe multi-user storage and access to massive amounts of persistent data.

A Database is ...

- → Massive
- → Persistent
- → Safe
- → Multi-user
- → Convenient
- → Efficient
- → Reliable

Key Concepts

→ Data Model

→ Schema vs Data

→ Data Definition Language (DDL)

→ Data Manipulation Language (DML)

Key People

→ DBMS Implementer

→ Database Designer

→ Database Application Developer

→ Database Administrator

Relational Databases

Relational Database Management System (RDBMS):
A database where data is organised into tables with defined relationships between them

Efficiency

Redundancy

Update Issues

Deletion

Standardisation

Increased speed and storage

Efficiency

Redundancy

Update Issues

Deletion

Standardisation

Less redundant and duplicated data

Efficiency

Redundancy

Update Issues

Deletion

Standardisation

Fewer problems updating data

Efficiency

Redundancy

Update Issues

Deletion

Standardisation

Less chance of deleting important data

Efficiency

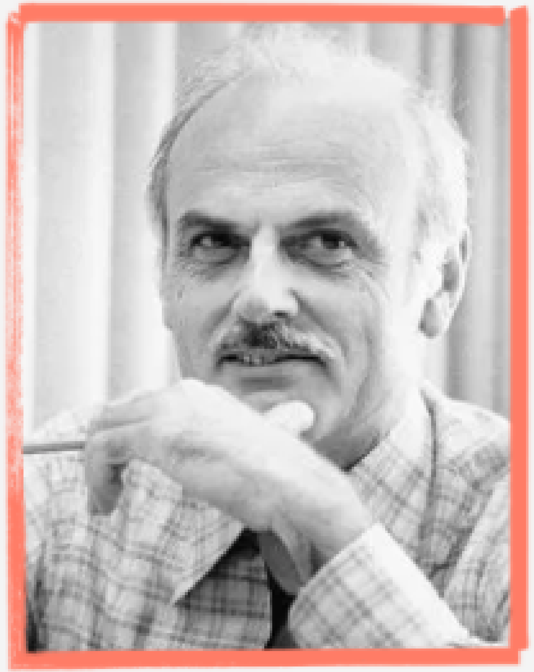
Redundancy

Update Issues

Deletion

Standardisation

Design follows consistent principles



The Relational Model

EMP_ID	EMP_NAME	DPT_ID
111	Alex	10
112	Liz	20
113	Joshua	10
114	Zoe	NULL

Employee

DPT_ID	DPT_NAME
10	Sales
20	HR
30	Operations

Department

The Relational Model

EMP_ID	EMP_NAME	DPT_ID
111	Alex	10
112	Liz	20
113	Joshua	10
114	Zoe	NULL

Employee

DPT_ID	DPT_NAME
10	Sales
20	HR
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Department

The Relational Model

EMP_ID	EMP_NAME	DPT_ID
111	Alex	10
112	Liz	20
113	Joshua	10
114	Zoe	NULL

Employee

DPT_ID	DPT_NAME
10	Sales
20	HR
30	Operations

Department

The Relational Model

Schema: A structural description of relations in a database

EMP_ID	EMP_NAME	DPT_ID
111	Alex	10
112	Liz	20
113	Joshua	10
114	Zoe	NULL

Employee

DPT_ID	DPT_NAME
10	Sales
20	HR
30	Operations

Department

The Relational Model

Instance: Data stored in database at a given point in time

EMP_ID	EMP_NAME	DPT_ID
111	Alex	10
112	Liz	20
113	Joshua	10
114	Zoe	NULL

Employee

DPT_ID	DPT_NAME
10	Sales
20	HR
30	Operations

Department

The Relational Model

NULL: the absence of a value

EMP_ID	EMP_NAME	DPT_ID
111	Alex	10
112	Liz	20
113	Joshua	10
114	Zoe	NULL

Employee

DPT_ID	DPT_NAME
10	Sales
20	HR
30	Operations

Department


Categories
categoryID
categoryName
description
picture
Order Details
orderID
productID
unitPrice
quantity
discount
Orders
orderID
customerID
employeeID
orderDate
requiredDate
shippedDate
shipVia
shipName
shipAddress
shipCity
shipRegion
shipPostcode
shipCountry
Shippers
shipperID
companyName
phone
Products
productID
productName
categoryID
supplierID
quantityPerLabel
unitPrice
unitsInStock
unitsOnOrder
reorderLevel
discontinued
Suppliers
supplierID
companyName
contactName
contactTitle
address
city
region
postcode
country
phone
email
Customers
customerID
companyName
contactName
address
city
region
postcode
country
phone
email
Employees
employeeID
lastName
firstName
birthDate
hireDate
address
city
region
postcode
country
phone
email
reportsTo
Employee Territories
employeeID
territoryID
Territories
territoryID
description
regionID
Region
RegionID
description

SHIPPERID	COMPANYNAME	PHONE
234	BigShippers	01302858888
235	DeliverForce	01302823444
236	ShipUK	01709282327
237	WeShip	01302339188

shippers_table

The Alternative...

COACH ID	COACH NAME	NO_COHORTS	ASSISTANT	APPRENTICE	COHORT	AGE	LIN
1	Steph	5	Ashray	Adam	Standard	20	Eva
1	Steph	5	Ashray	Natasha	Outliers	19	Bori
2	Ben	2	Ashray	Kingsley	Patch	23	Mila
3	Tony	3	John	Grace	Sprite	21	Mila
1	Steph	5	Ashray	Greta	Outliers	22	Isabe
4	Bruce	5	John	Alison	Movers	20	Henr

Difficult to insert new data

COACH ID	COACH NAME	NO_COHORTS	ASSISTANT	APPRENTICE	COHORT	AGE	LIN
1	Steph	5	Ashray	Adam	Standard	20	Eva
1	Steph	5	Ashray	Natasha	Outliers	19	Bori
2	Ben	2	Ashray	Kingsley	Patch	23	Mila
3	Tony	3	John	Grace	Sprite	21	Mila
1	Steph	5	Ashray	Greta	Outliers	22	Isabe
4	Bruce	5	John	Alison	Movers	20	Henr

Cannot modify existing data

COACH ID	COACH NAME	NO_COHORTS	ASSISTANT	APPRENTICE	COHORT	AGE	LIN
1	Steph	5	Ashray	Adam	Standard	20	Eva
1	Steph	5	Ashray	Natasha	Outliers	19	Bori
2	Ben	2	Ashray	Kingsley	Patch	23	Mila
3	Tony	3	John	Grace	Sprite	21	Mila
1	Steph	5	Ashray	Greta	Outliers	22	Isabe
4	Bruce	5	John	Alison	Movers	20	Hen

Cannot delete information

COACH ID	COACH NAME	NO_COHORTS	ASSISTANT	APPRENTICE	COHORT	AGE	LIN
1	Steph	5	Ashray	Adam	Standard	20	Eva
1	Steph	5	Ashray	Natasha	Outliers	19	Bori
2	Ben	2	Ashray	Kingsley	Patch	23	Mila
3	Tony	3	John	Grace	Sprite	21	Mila
1	Steph	5	Ashray	Greta	Outliers	22	Isabe
4	Bruce	5	John	Alison	Movers	20	Henr

Keys

Primary Key

A unique identifier for each **row in a table**

COACH ID	COACH NAME	NO_COHORTS	ASSISTANT
1	Steph	5	Ashray
2	Ben	2	Ashray

coach_table

Primary keys...

...cannot be NULL

...must be unique

...should rarely be changed

...given a new value when a new record is created

Foreign Key

A field in one table that is a primary key in **another table** . These keys enable relationships between tables and allow them to be joined

APP_ID	NAME	COACH_ID
16	Adam	1
23	Natasha	1
20	Kingsley	2

apprentice_table

COACH_ID	NAME	ASSISTANT
1	Steph	Ashray
2	Ben	Ashray

coach_table

Composite Key

Two or more columns together acting as a **primary key**

APPRENTICE_ID	MODULE_ID	GRADE	COACH_ID
1	1	99	1
1	2	75	1
2	1	80	2
2	2	78	2

assignment_table

Activity

In groups discuss how this table can be redesigned into something more useable.

- How many tables would you create?
- What are the primary/foreign keys?
- What information would be placed in each?

coach_table	program_table	cohort_table	apprentice_table
coach_id	apprenticeship	cohort_name	app_name
coach_name	TA	coach_id	age
no_cohorts			LM
apprenticeship			apprenticeship
			company_name
			cohort

Normalisation

Normalisation is the process of structuring a database to reduce data redundancy and improve data integrity.

Why Normalise a Database?

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Databases are more efficient

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Data is prevented from being stored in multiple locations (insert anomaly)

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Updates are prevented from being made to some data but not others (update anomaly)

Why Normalise a Database?

Databases are more efficient

Data is prevented from being stored in multiple locations (insert anomaly)

Updates are prevented from being made to some data but not others (update anomaly)

Data is prevented from being lost when it is not supposed to be, or not deleted when it should (deleted anomaly)

Why Normalise a Database?

Data is more accurate

Why Normalise a Database?

Data is more accurate

Storage space is reduced

ID	BRAND	COMPANY	SUPERMARKET	COUNTRY	PRICE	RATING	RATING
101	Aero	Nestle	Coop/Tesco	UK	1.70	10	Excellent
101	Aero	Nestle	Sainsburys	UK	One Sixty	10	Excellent
102	Bounty	Mars	Walmart	USA	1.30	2	Bad
102	Bounty	Mars	Tesco	UK	1.20	2	Bad
102	Bounty	Mars	Sainsburys	UK	1.10	2	Bad

FIRST NORMAL FORM	SECOND NORMAL FORM	THIRD NORMAL FORM
→ Each cell only contains one data point → Each column contains only one data subject → Columns should each have a unique name → Identification should not rely on the way the data is sorted	→ Compliant with 1NF → Each table contains relevant data → There are no partial dependencies	→ Compliant with 2NF → There are no transitive dependencies

First Normal Form

Each cell only contains one data point

ID	BRAND	COMPANY	SUPERMARKET	COUNTRY	PRICE	RATING	RATING
101	Aero	Nestle	Coop/Tesco	UK	1.70	10	Excellent
101	Aero	Nestle	Sainsburys	UK	One Sixty	10	Excellent
102	Bounty	Mars	Walmart	USA	1.30	2	Bad
102	Bounty	Mars	Tesco	UK	1.20	2	Bad
102	Bounty	Mars	Sainsburys	UK	1.10	2	Bad

First Normal Form

Each cell only contains one data point

ID	BRAND	COMPANY	SUPERMARKET	COUNTRY	PRICE	RATING	RATING
101	Aero	Nestle	Coop	UK	1.70	10	Excellent
101	Aero	Nestle	Tesco	UK	1.70	10	Excellent
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102	Bounty	Mars	Walmart	USA	1.30	2	Bad
102	Bounty	Mars	Tesco	UK	1.20	2	Bad
102	Bounty	Mars	Sainsburys	UK	1.10	2	Bad

STUDENT	NUMBER
Allie	07551502613
Bernard	07723871451, 07464998651
Charlotte	07818771127

STUDENT	NUMBER 1	NUMBER 2
Allie	07551502613	
Bernard	07723871451	07464998651
Charlotte	07818771127	

STUDENT	NUMBER
Allie	07551502613
Bernard	07723871451
Bernard	07464998651
Charlotte	07818771127

First Normal Form

Each column contains only one data type

ID	BRAND	COMPANY	SUPERMARKET	COUNTRY	PRICE	RATING	RATING
101	Aero	Nestle	Coop	UK	1.70	10	Excellent
101	Aero	Nestle	Tesco	UK	1.70	10	Excellent
101	Aero	Nestle	Sainsburys	UK	One Sixty	10	Excellent
102	Bounty	Mars	Walmart	USA	1.30	2	Bad
102	Bounty	Mars	Tesco	UK	1.20	2	Bad
102	Bounty	Mars	Sainsburys	UK	1.10	2	Bad

STUDENT	MISC
Allie	Spaghetti
Bernard	Toyota
Charlotte	Blue

STUDENT	FAV FOOD
Allie	Spaghetti
Bernard	
Charlotte	

First Normal Form

Each column contains only one data type

ID	BRAND	COMPANY	SUPERMARKET	COUNTRY	PRICE	RATING	RATING
101	Aero	Nestle	Coop	UK	1.70	10	Excellent
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101	Aero	Nestle	Sainsburys	UK	1.60	10	Excellent
102	Bounty	Mars	Walmart	USA	1.30	2	Bad
102	Bounty	Mars	Tesco	UK	1.20	2	Bad
102	Bounty	Mars	Sainsburys	UK	1.10	2	Bad

First Normal Form

Columns should each have a unique name

ID	BRAND	COMPANY	SUPERMARKET	COUNTRY	PRICE	RATING	RATING
101	Aero	Nestle	Coop	UK	1.70	10	Excellent
101	Aero	Nestle	Tesco	UK	1.70	10	Excellent
101	Aero	Nestle	Sainsburys	UK	1.6	10	Excellent
102	Bounty	Mars	Walmart	USA	1.30	2	Bad
102	Bounty	Mars	Tesco	UK	1.20	2	Bad
102	Bounty	Mars	Sainsburys	UK	1.10	2	Bad

First Normal Form

Columns should each have a unique name

ID	BRAND	COMPANY	SUPERMARKET	COUNTRY	PRICE	RATING_NUM	RATING_DESC
101	Aero	Nestle	Coop	UK	1.70	10	Excellent
101	Aero	Nestle	Tesco	UK	1.70	10	Excellent
101	Aero	Nestle	Sainsburys	UK	1.6	10	Excellent
102	Bounty	Mars	Walmart	USA	1.30	2	Bad
102	Bounty	Mars	Tesco	UK	1.20	2	Bad
102	Bounty	Mars	Sainsburys	UK	1.10	2	Bad

First Normal Form

Identification should not rely on the way data is sorted

ID	BRAND	COMPANY	SUPERMARKET	COUNTRY	PRICE	RATING_NUM	RATING_DESC
101	Aero	Nestle	Coop	UK	1.70	10	Excellent
101	Aero	Nestle	Tesco	UK	1.70	10	Excellent
101	Aero	Nestle	Sainsburys	UK	1.6	10	Excellent
102	Bounty	Mars	Walmart	USA	1.30	2	Bad
102	Bounty	Mars	Tesco	UK	1.20	2	Bad
102	Bounty	Mars	Sainsburys	UK	1.10	2	Bad

STUDENT	FAVOURITE SOUP
Allie	Tomato
	Mushroom
Charlotte	Pea

STUDENT	FAVOURITE SOUP
Allie	Tomato
Allie	Mushroom
Charlotte	Pea

FIRST NORMAL FORM	SECOND NORMAL FORM	THIRD NORMAL FORM
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Second Normal Form

Each table contains relevant data

ID	BRAND	COMPANY	SUPERMARKET	COUNTRY	PRICE	RATING_NUM	RATING_DESC
101	Aero	Nestle	Coop	UK	1.70	10	Excellent
101	Aero	Nestle	Tesco	UK	1.70	10	Excellent
101	Aero	Nestle	Sainsburys	UK	1.6	10	Excellent
102	Bounty	Mars	Walmart	USA	1.30	2	Bad
102	Bounty	Mars	Tesco	UK	1.20	2	Bad
102	Bounty	Mars	Sainsburys	UK	1.10	2	Bad

Second Normal Form

Each table contains relevant data

SUPERMARKET	PRICE	COUNTRY
Coop	1.70	UK
Tesco	1.60	UK
Sainsburys	1.60	UK
Walmart	1.30	USA
Tesco	1.20	UK
Sainsburys	1.10	UK

price_table

ID	BRAND	COMPANY	RATING_NUM	RATINC
101	Aero	Nestle	10	Exce
102	Bounty	Mars	2	Ba

chocolate_table

Second Normal Form

SUPERMARKET	PRICE	COUNTRY
Coop	1.70	UK
Tesco	1.60	UK
Sainsburys	1.60	UK
Walmart	1.30	USA
Tesco	1.20	UK
Sainsburys	1.10	UK

price_table

ID	BRAND	COMPANY	RATING_NUM	RATIN
101	Aero	Nestle	10	Exce
102	Bounty	Mars	2	Ba

chocolate_table

Second Normal Form

Compliant with 1NF

SUPERMARKET	PRICE	COUNTRY
Coop	1.70	UK
Tesco	1.60	UK
Sainsburys	1.60	UK
Walmart	1.30	USA
Tesco	1.20	UK
Sainsburys	1.10	UK

price_table

ID	BRAND	COMPANY	RATING_NUM	RATINC
101	Aero	Nestle	10	Exce
102	Bounty	Mars	2	Ba

chocolate_table

Second Normal Form

Compliant with 1NF

SUPERMARKET	PRICE	COUNTRY
Coop	1.70	UK
Tesco	1.60	UK
Sainsburys	1.60	UK
Walmart	1.30	USA
Tesco	1.20	UK
Sainsburys	1.10	UK

price_table

Second Normal Form

Compliant with 1NF

CHOCOLATE_ID	SUPERMARKET	PRICE	COUNTRY
101	Coop	1.70	UK
101	Tesco	1.60	UK
101	Sainsburys	1.60	UK
102	Walmart	1.30	USA
102	Tesco	1.20	UK
102	Sainsburys	1.10	UK

price_table

Second Normal Form

There are no partial dependencies

CHOCOLATE_ID	SUPERMARKET	PRICE	COUNTRY
101	Coop	1.70	UK
101	Tesco	1.60	UK
101	Sainsburys	1.60	UK
102	Walmart	1.30	USA
102	Tesco	1.20	UK
102	Sainsburys	1.10	UK

price_table

Partial dependencies occur when a table with a composite key has a field which is only dependent on part of it

Second Normal Form

There are no partial dependencies

CHOCOLATE_ID	SUPERMARKET	PRICE	COUNTRY
101	Coop	1.70	UK
101	Tesco	1.60	UK
101	Sainsburys	1.60	UK
102	Walmart	1.30	USA
102	Tesco	1.20	UK
102	Sainsburys	1.10	UK

price_table

Second Normal Form

Second Normal Form

There are no partial dependencies

CHOCOLATE_ID	SUPERMARKET	PRICE
101	Coop	1.70
101	Tesco	1.60
101	Sainsburys	1.60
102	Walmart	1.30
102	Tesco	1.20
102	Sainsburys	1.10

price_table

Second Normal Form

There are no partial dependencies

SUPERMARKET	COUNTRY
Tesco	UK
Walmart	USA

supermarket_table

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Third Normal Form

There are no transitive dependencies

ID	BRAND	COMPANY	RATING_NUM	RATING_DESC
101	Aero	Nestle	10	Excellent
102	Bounty	Mars	2	Bad

chocolate_table

Transitive dependencies occur when a field can be inferred from another field that not the primary key

Third Normal Form

There are no transitive dependencies

ID	BRAND	COMPANY	RATING_NUM
101	Aero	Nestle	10
102	Bounty	Mars	2

chocolate_table

Third Normal Form

There are no transitive dependencies

RATING_NUM	RATING_DESC
10	Excellent
2	Bad

rating_table

Third Normal Form

Compliant with 2NF

Chocolate_ID	Supermarket	Price
101	Coop	1.70
101	Tesco	1.60
101	Sainsburys	1.60
102	Walmart	1.30
102	Tesco	1.20
102	Sainsburys	1.10

ID	Brand	Company	Rating_Num
101	Aero	Nestle	10
102	Bounty	Mars	2

Supermarket	Country
Coop	UK
Tesco	UK
Sainsburys	UK
Walmart	USA

Rating_Num	Rating_Desc
10	Excellent
2	Bad

Partial vs Transitive Dependency

Partial dependency occurs when a table has a **composite key** and a field is dependent on **one part of it**

ITEM_ID	VENDOR	PRICE	CITY
01	Tesco	1.70	London

City partially dependent on composite key

Transitive Dependency occurs when a field can be inferred from another field that is **not the primary key**

COUNTY	POPULATION	CATEGORY
Essex	1432000	large

Category can be inferred from population

Understanding how databases are designed, and why they are designed this way can make SQL - especially joins - easier to understand

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You most likely will never need to design a full on database - that’s a very specific career progression. However, understanding the principles that went into the design of the databases you work with will help your understanding of them.

Activity

Convert this table step by step so it is in Third Normal Form

Also discuss:

What are the main benefits of Data Normalisation?

How does querying change because of First Normal Form?

TRANSACTION_TABLE	PRODUCT_TABLE	STORE_TABLE	COUNTY_TABLE
id date item_no store_id	item_no item_description case_cost proof	store_id store store_address county	county population

multiverse

NoSQL

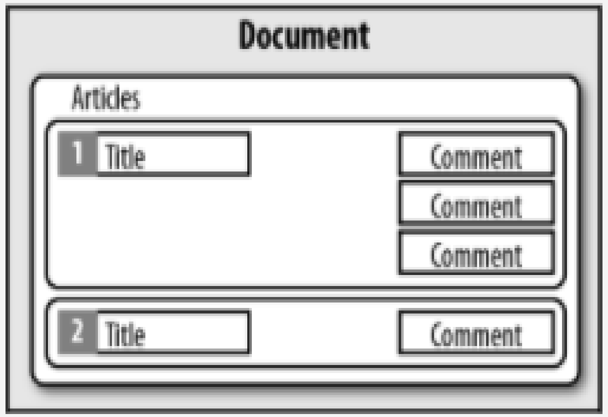
NoSQL ("Not only SQL") is an alternative to traditional relational databases that can accomodate a wide variety of data models.

Document Orientated Database

A common NoSQL database where all instances of an object is stored in one document as opposed to spread across multiple tables. To access the data you reference the internal structure

Documents are organsied into collections (similar to RDBMS tables)

E.g. XML, JSON



JSON

```
{
 contact{
   "firstname":"Bob",
   "lastname":"Smith",
   "address":"5 Oak St",
   "number":"07464998651"

 }
}
```

XML

```
<contact>
  <firstname>Bob</firstname>
  <lastname>Smith</lastname>
  <address>5 Oak St</address>
  <number>07464998651</number>
</contact>
```

Key Value Database

The simplest type of NoSQL database, where data (structured or unstructured) is mapped to a key and stored in one location. Data is extracted by referencing the key

Wrapping several keys in a JSON format creates a document

Key	Value
K1	AAA,BBB,CCC
K2	AAA,BBB
K3	AAA,DDD
K4	AAA,2,01/01/2015
K5	3,ZZZ,5623

Columnar Database

Data is stored in columns instead of rows. SQL can be used to extract data quickly as it will go down the columns for information instead of scanning each row.

A column orientated database applies the row key to each item in a column, allowing it to precisely retrieve information from a select group of columns.

Row-oriented (1)

	name	age	sex	zipcode
1	thomas	18	male	1416
2	martin	33	male	1645
3	bob	25	male	1613

Column-oriented (2)

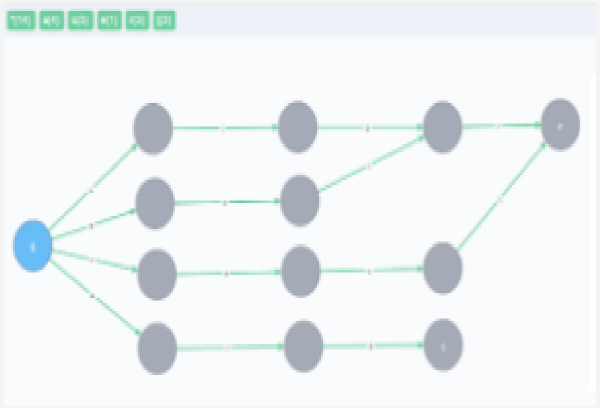
name	age	sex	zipcode
1 thomas	1 18	1 male	1 1416
2 martin	2 33	2 male	2 1645
3 bob	3 25	3 male	3 1613

Graph Database

Information is stored in nodes with the edges representing the relationships between them.

Each node is a datapoint (e.g. a customer, product, group, etc) and edges define the relationships (e.g. person (node1) is a member of this group (node2).

Querying is fast as relationships between nodes have already been defined.

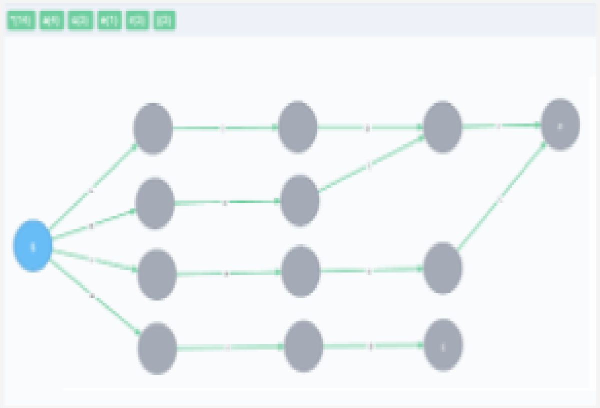


Graph Database

A node can contain any type of data (structured or unstructured) including tables

As these types of databases do not use indexing, data retrieval is fast as the query follows the edges to obtain the connected information

Facebook is an example of this where a user (node) is connected to other users and groups by edges



Key Features

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No Fixed Schema - They do not have to follow historical rules making them more flexible

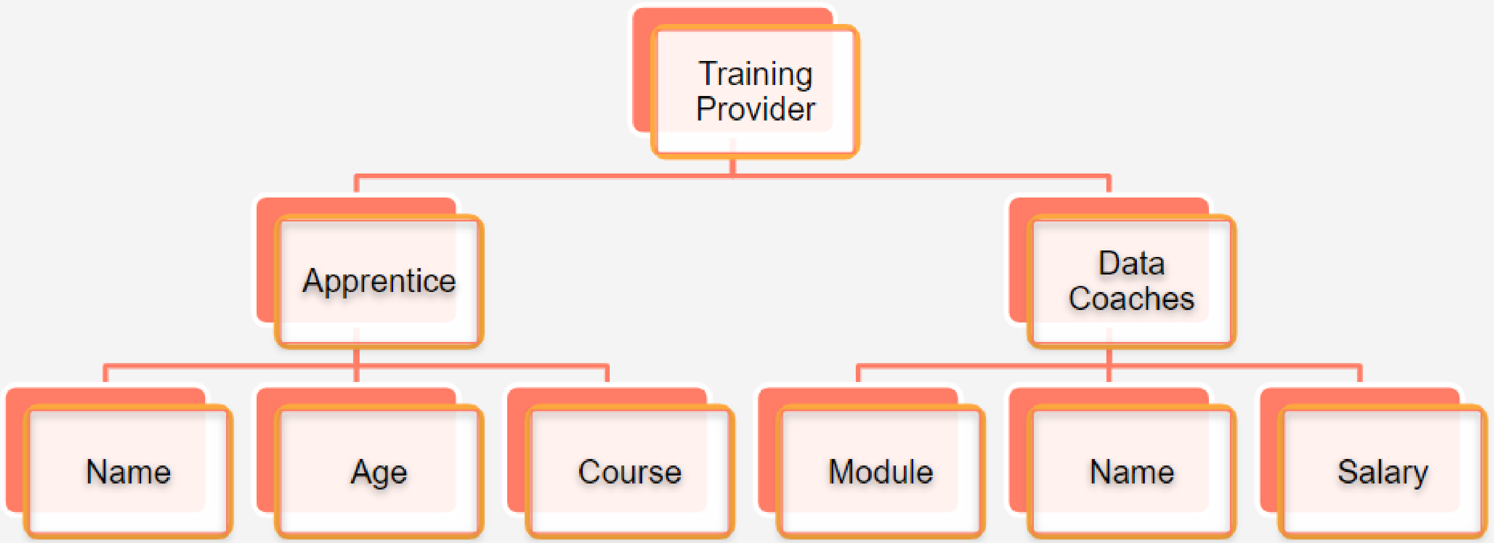
No Joins - NoSQL databases tend to store data in one large table, taking advantage of cheaper storage and faster processing where redundant data is no longer such a big issue

Size and Scale - No defined limits allows them to scale according to the resources available

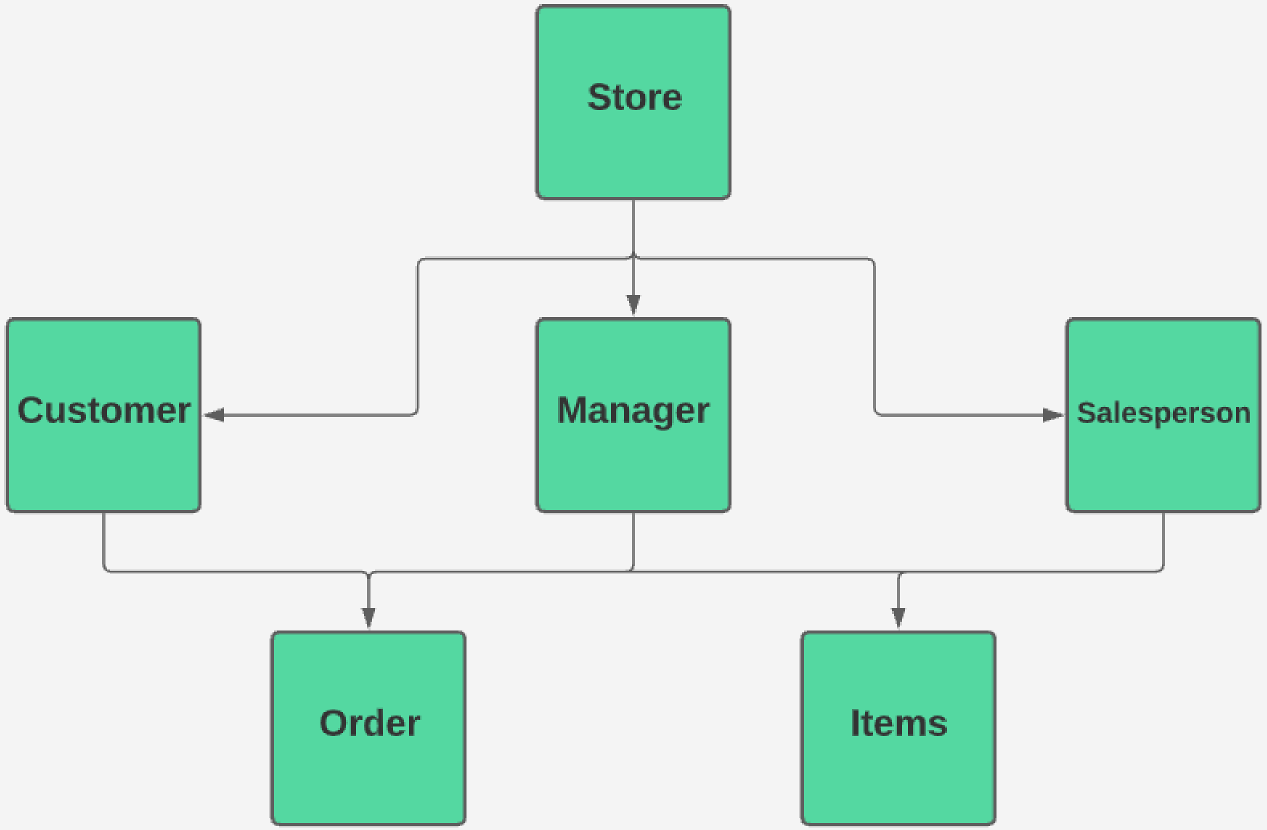
Other Types of Database

TYPE OF DB	EXAMPLES	DESCRIPTION
Relational	MSSQL, Postgres, MySQL	A very common way of managing data. It contains tables that can be joined to other tables through their relations.

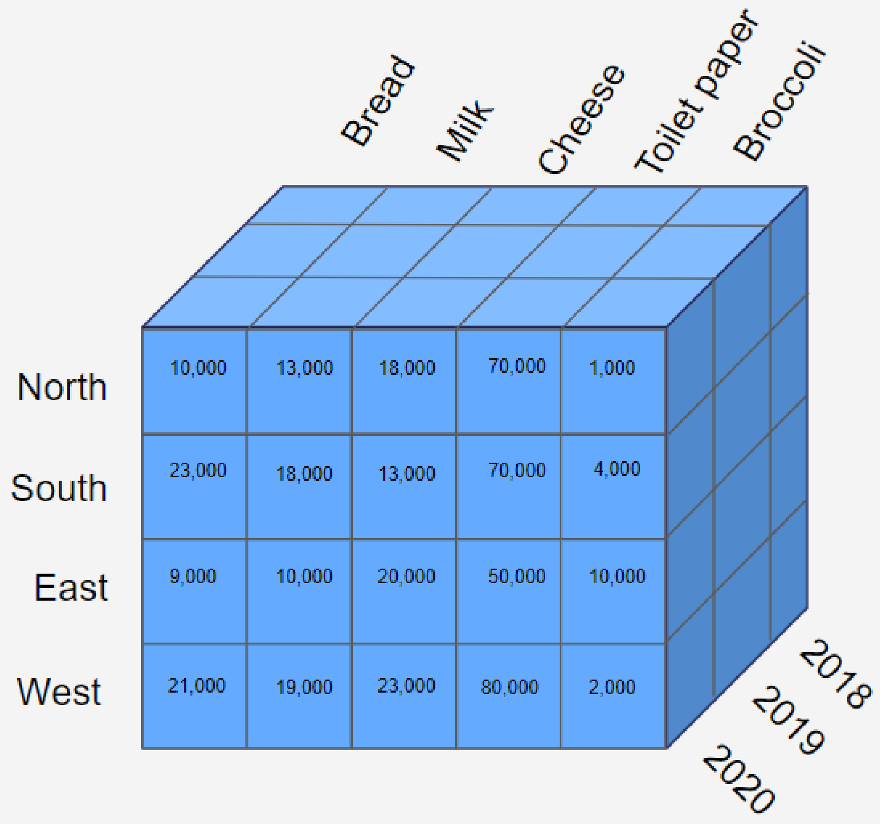
TYPE OF DB	EXAMPLES	DESCRIPTION
Hierarchical	IBM Information Management System (IMS), Windows Registry	Data is stored in a parent-children relationship nodes, in a tree like structure. The data is stored as a collection of fields where each field contains only one value. The records are linked to each other via a parent-children relationship. In a hierarchical database model, each child record has only one parent. A parent can have multiple children. To retrieve a field’s data, we need to traverse through each tree until the record is found.


Training Provider
Apprentice
Data Coaches
Name
Age
Course
Module
Name
Salary

TYPE OF DB	EXAMPLES	DESCRIPTION
Network	Data Store (IDS), IDMS (Integrated Database Management System), Raima Database Manager, TurboIMAGE	Network database management systems (Network DBMSs) use a network structure to create relationship between entities. Network databases are mainly used on large digital computers. Network databases are hierarchical databases but unlike hierarchical databases where one node can have one parent only, a network node can have relationship with multiple entities. A network database looks more like a cobweb or interconnected network of records.


Store
Customer
Manager
Salesperson
Order
Items

TYPE OF DB	EXAMPLES	DESCRIPTION
Multidimensional	Microsoft Analysis Services, Hyperion Essbase, Cognos PowerCube	Multi-dimensional databases (MDBs) use the concept of a data cube (or hypercube) to represent the dimensions of data available to users (though physically they are stored as compressed multidimensional arrays with offset positioning). An MDB with three dimensions looks like a cube, whilst an MDB with four or more dimensions is called a hypercube, and becomes more difficult to visualise. They are designed to assist with decision support systems, and to optimise online analytical processing (OLAP) and data warehouse applications.



Bread
Milk
Cheese
Toilet paper
Broccoli
North
South
East
West
10,000
13,000
18,000
70,000
1,000
23,000
18,000
13,000
70,000
4,000
9,000
10,000
20,000
50,000
10,000
21,000
19,000
23,000
80,000
2,000
2018
2019
2020

TYPE OF DB	EXAMPLES	DESCRIPTION
Object-oriented	TORNADO, Gemstone, ObjectStore, GBase	Object-oriented databases use small, recyclable separated chunks of data called objects. The objects themselves are stored in the object-oriented database. Each object contains two things: the object itself, and the metadata that explains that object (i.e. it’s purpose, what it is and where it fits in).

TYPE OF DB	EXAMPLES	DESCRIPTION
NoSQL		The ‘No’ stands for ‘Not Only’ SQL - these database seek to improve on standard SQL based DBMS by enhancing the forms of analytics available and changing the way that data is stored (no longer relational.) These databases are ideal for storing unstructured data.

Recap

Learning Objectives

- Explain the concepts and uses of a **relational database management system**
- Identify the different types of **key** in a RDBMS
- Understand the principles of **normalisation** on a relational database

ASSIGNMENT	
DATABASE DESIGN	
Use a work-related dataset to design your own relational database. You should describe the dataset, follow the normalisation steps and create an Entity Relationship Diagram (ERD).	
Word Count	Max 1500 words
Deadline	3 weeks
Deliverables	Word Document, PowerPoint, Excel File, PDF, Lucid Chart

Complete Session Attendance Log and Update Your OTJ