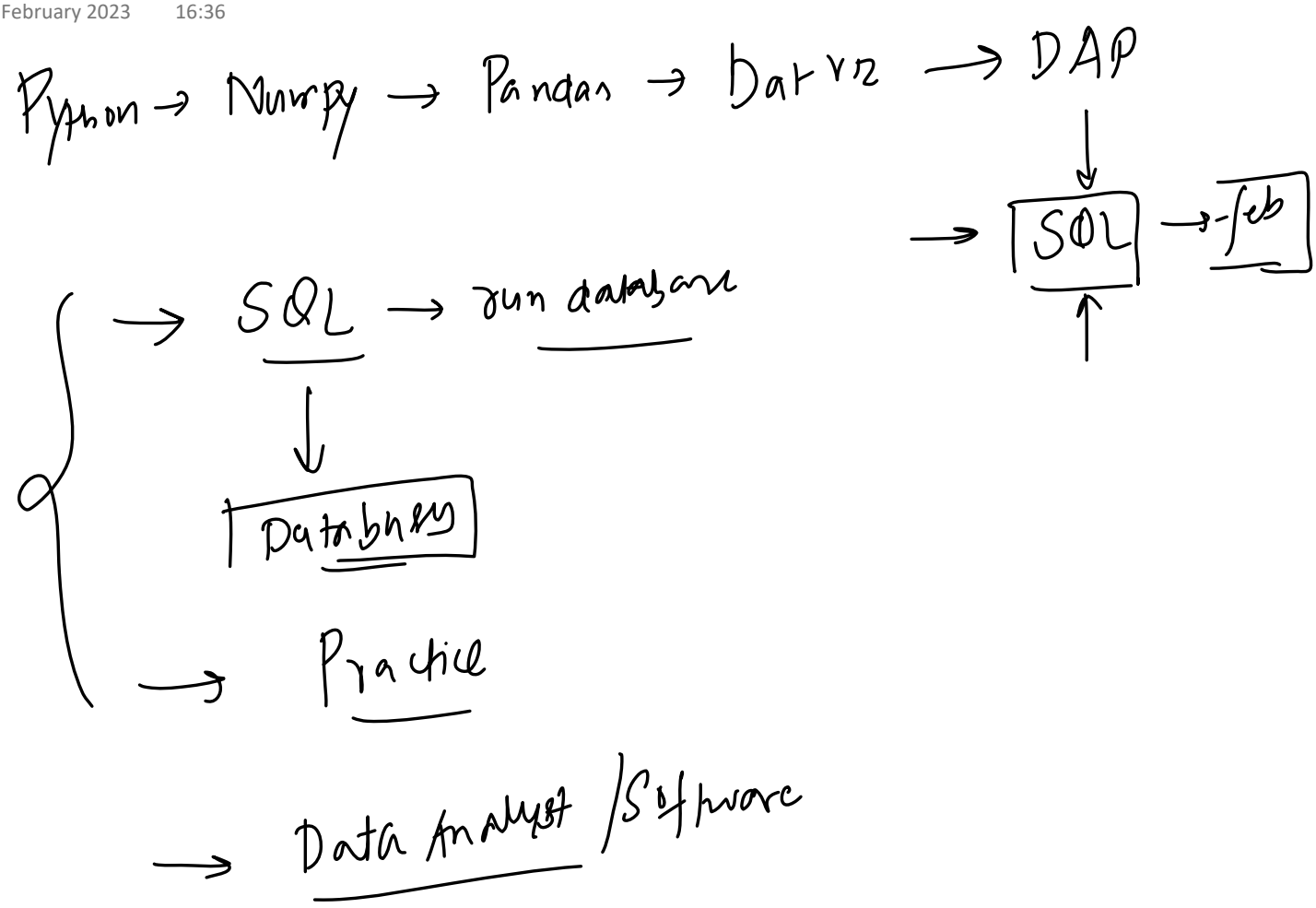
1. Before starting

06 February 2023 16:36



2. Importance of Data

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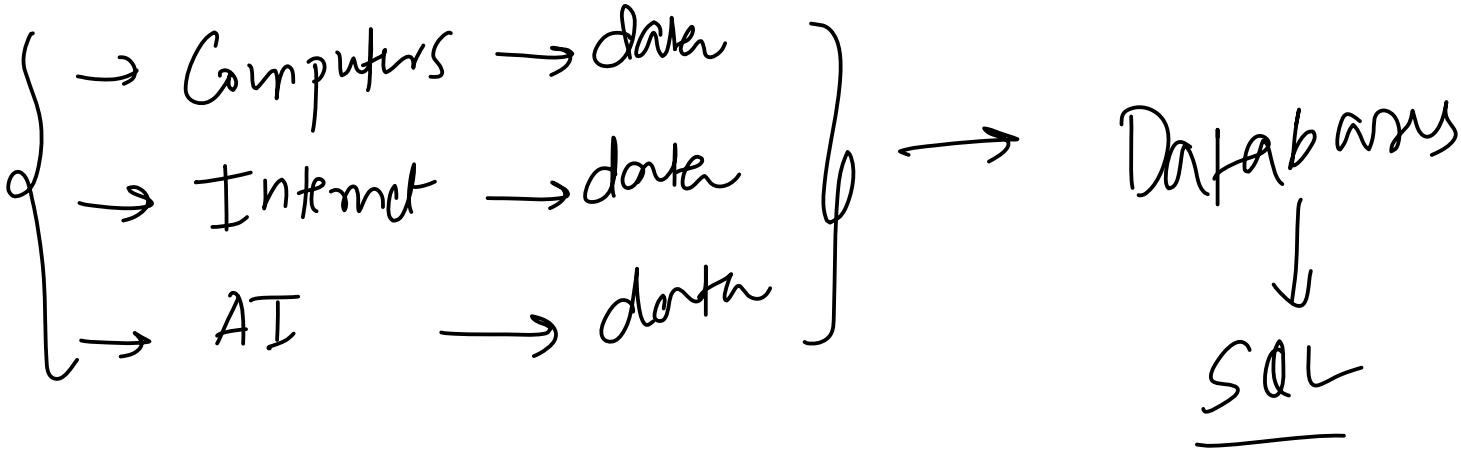

3. What are Databases?

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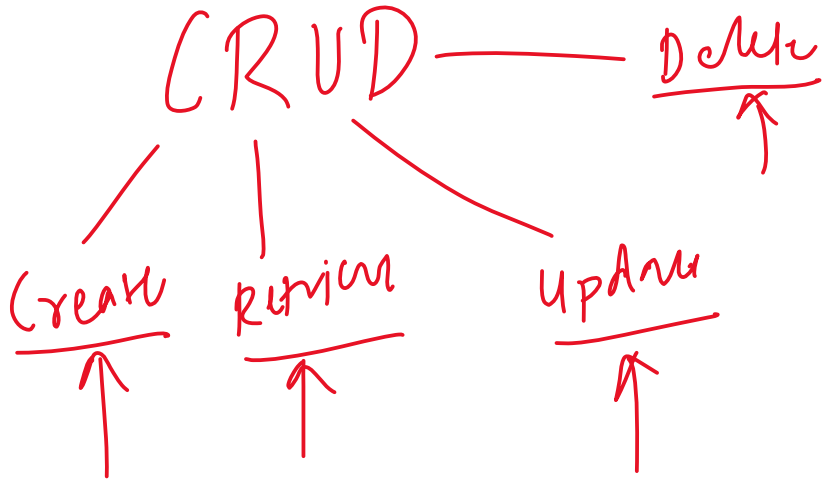
A Database is a shared collection of logically related data and description of these data, designed to meet the information needs of an organization

Data Storage: A database is used to store large amounts of structured data, making it easily accessible, searchable, and retrievable.

Data Analysis: A database can be used to perform complex data analysis, generate reports, and provide insights into the data.

Record Keeping: A database is often used to keep track of important records, such as financial transactions, customer information, and inventory levels.

Web Applications: Databases are an essential component of many web applications, providing dynamic content and user management.



4. Properties of an Ideal Database

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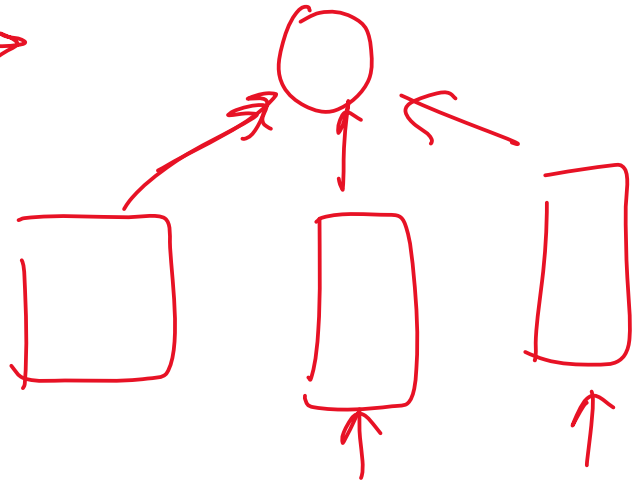
1. Integrity
2. Availability
3. Security
4. Independent of Application
5. Concurrency



5. Types of Databases

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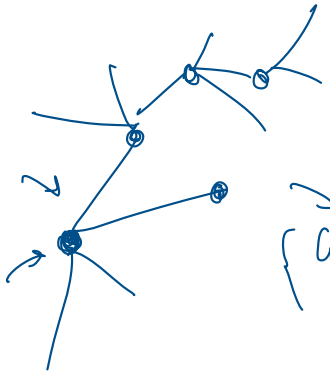
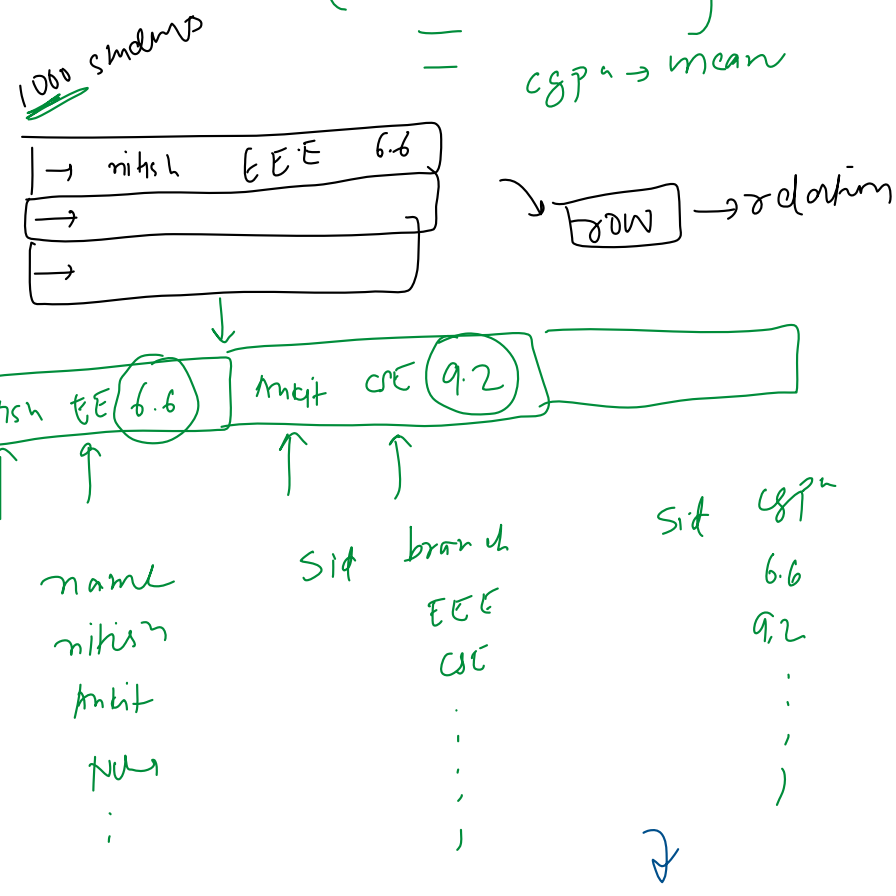
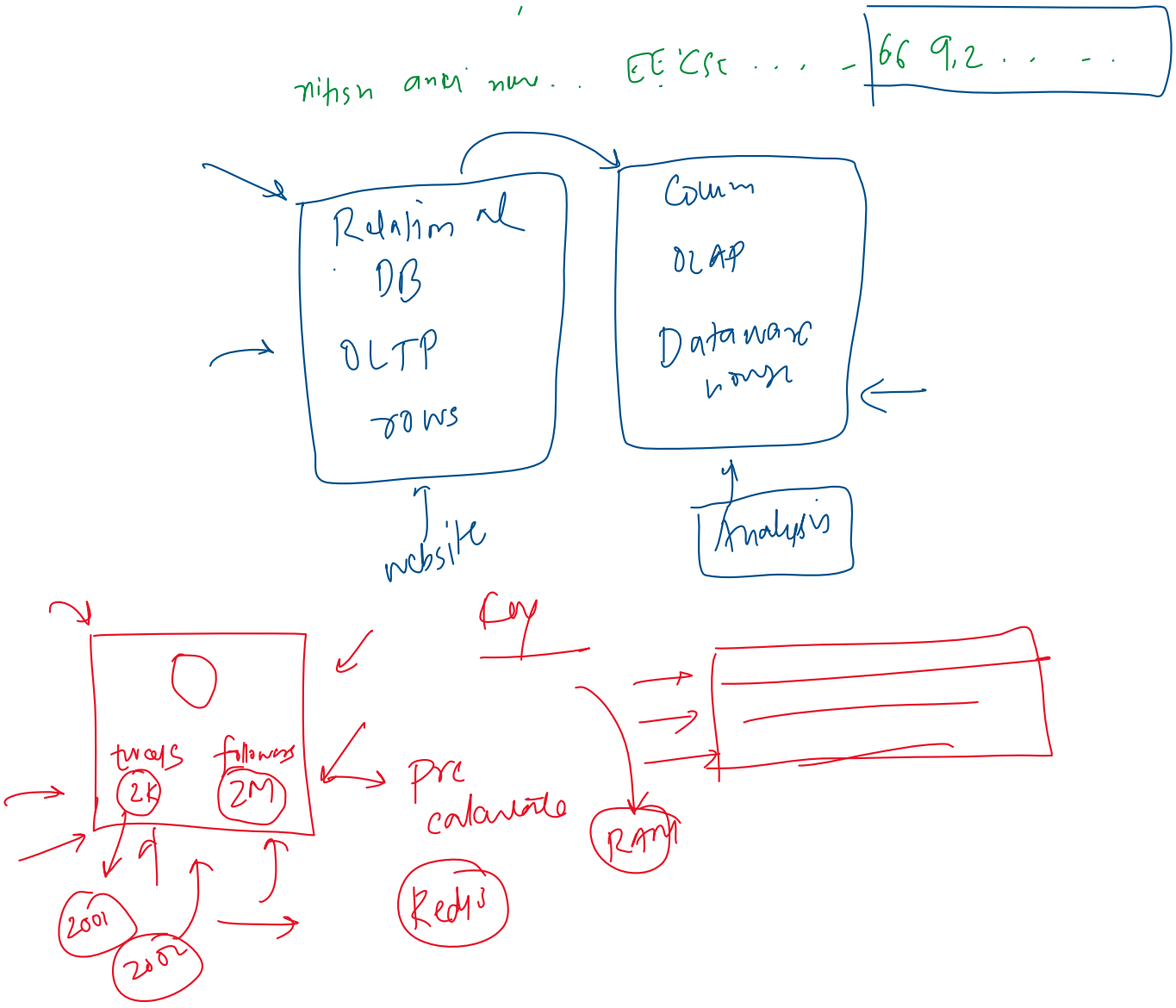
1. Relational Databases -
   Also known as SQL databases, these databases use a relational model to organize data into tables with rows and columns.
2. NoSQL Databases -
   These databases are designed to handle large amounts of unstructured or semi-structured data, such as documents, images, or videos. (MongoDB)
3. Column Databases -
   These databases store data in columns rather than rows, making them well-suited for data warehousing and analytical applications. (Amazon Redshift, Google BigQuery)
4. Graph Databases -
   These databases are used to store and query graph-structured data, such as social network connections or recommendation systems. (Neo4j, Amazon Neptune)
5. Key-value databases -
   These databases store data as a collection of keys and values, making them well-suited for caching and simple data storage needs (Redis and Amazon DynamoDB)

Which one should you use?






Relational
DB
OLTP
rows
Colum
OLAP
Datawarehouse
website
Analysis
tweets
followers
2K
2M
2001
200
Key
Pre calculate
Redis
RAM

6. Relational Databases

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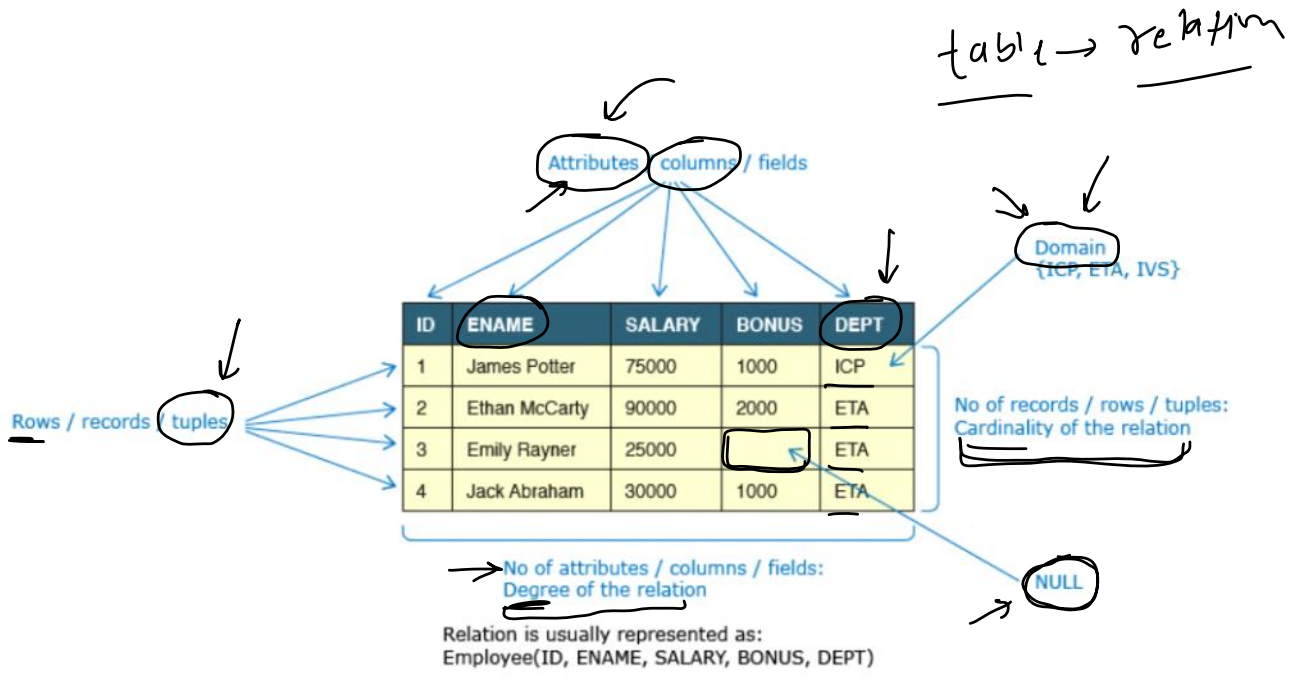
Also known as SQL databases, these databases use a relational model to organize data into tables with rows and columns.



ID	ENAME	SALARY	BONUS	DEPT
1	James Potter	75000	1000	ICP
2	Ethan McCarty	90000	2000	ETA
3	Emily Rayner	25000		ETA
4	Jack Abraham	30000	1000	ETA

7. What is a DBMS

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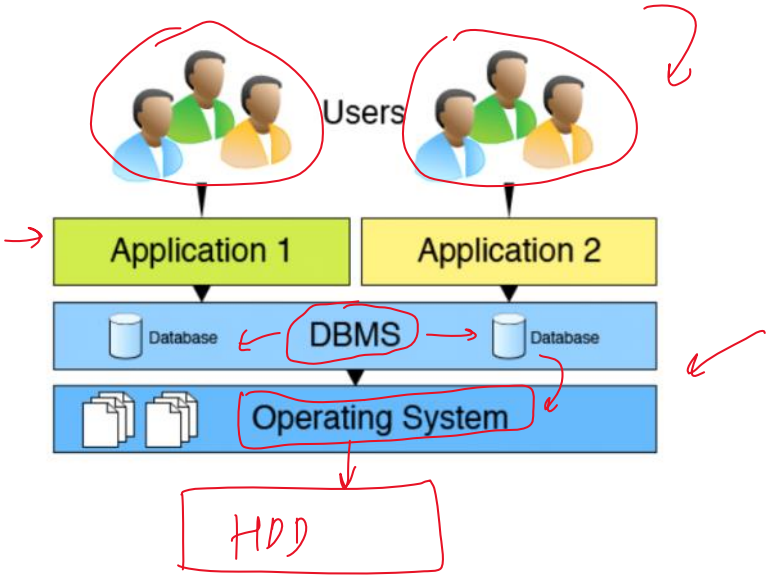
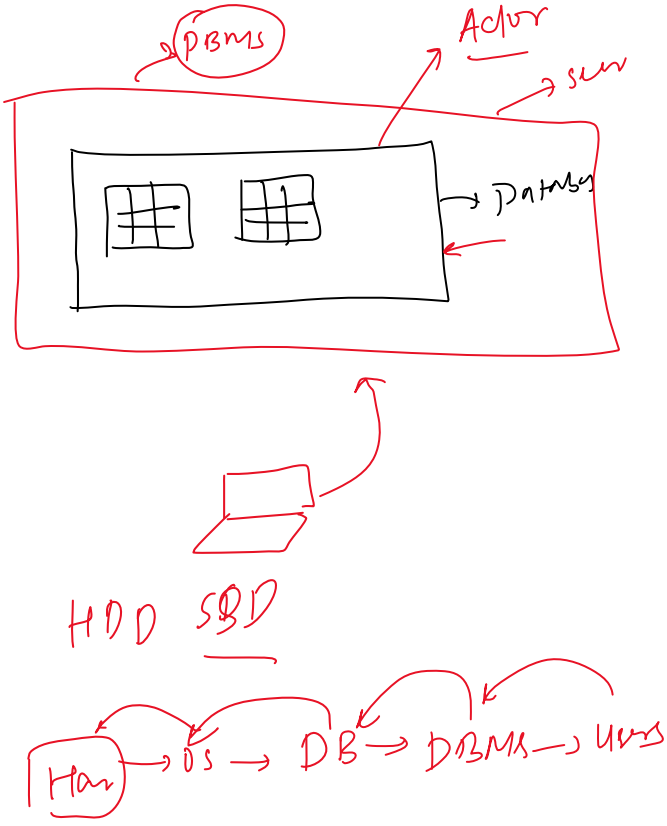
A database management system (DBMS) is a software system that provides the interfaces and tools needed to store, organize, and manage data in a database. A DBMS acts as an intermediary between the database and the applications or users that access the data stored in the database.





8. Core Functionalities of a DBMS

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Functions of DBMS

Data Management - Store, retrieve and modify data

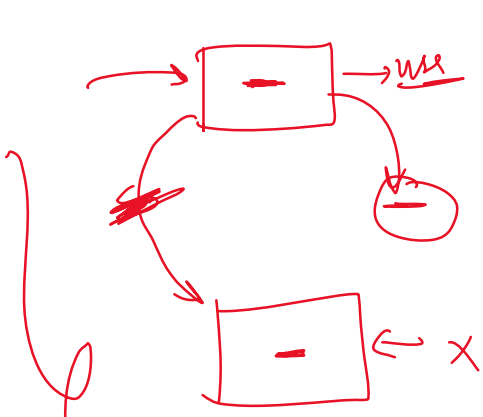
Integrity - Maintain accuracy of data

Concurrency - Simultaneous data access for multiple users

Transaction - Modification to database must either be successful or must not happen at all

Security - Access to authorized users only

Utilities - Data import/export, user management, backup, logging



9. Practical

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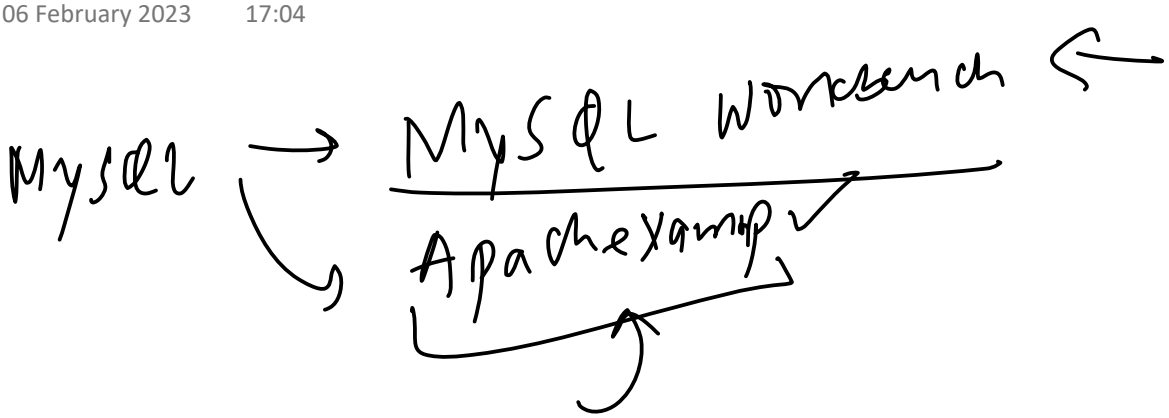
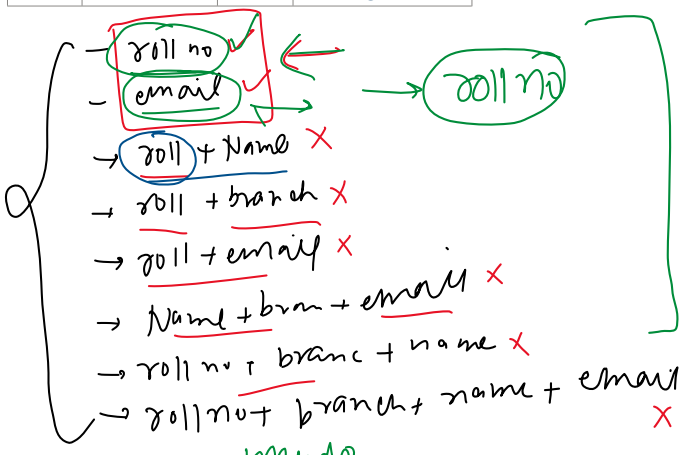


10. Database Keys

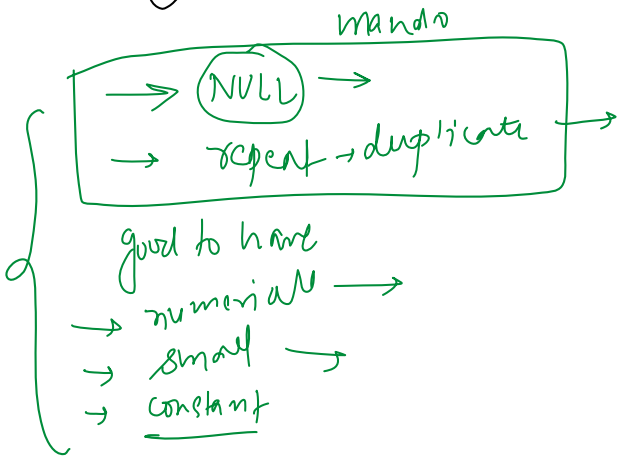
06 February 2023 17:07

A key in a database is an attribute or a set of attributes that uniquely identifies a tuple (row) in a table. Keys play a crucial role in ensuring the integrity and reliability of a database by enforcing unique constraints on the data and establishing relationships between tables.

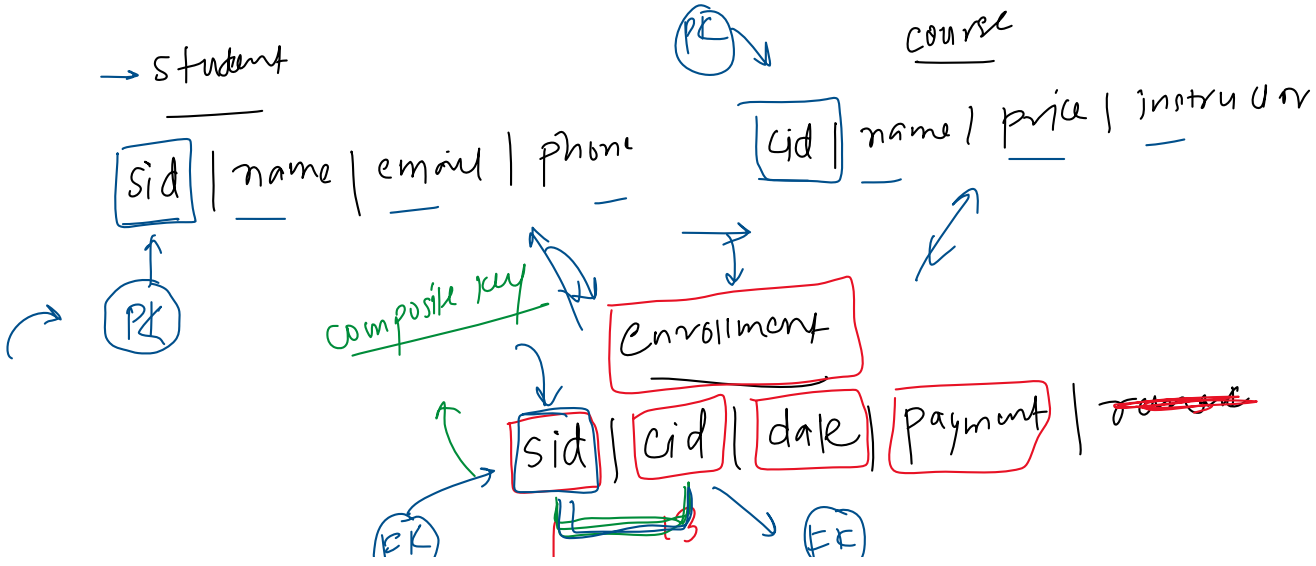
Roll no	Name	Branch	Email
1	Nitish Singh	CSE	nitish@gmail.com
2	Ankit Sharma	EEE	ankit@gmail.com
3	Neha Verma	ME	neha@gmail.com

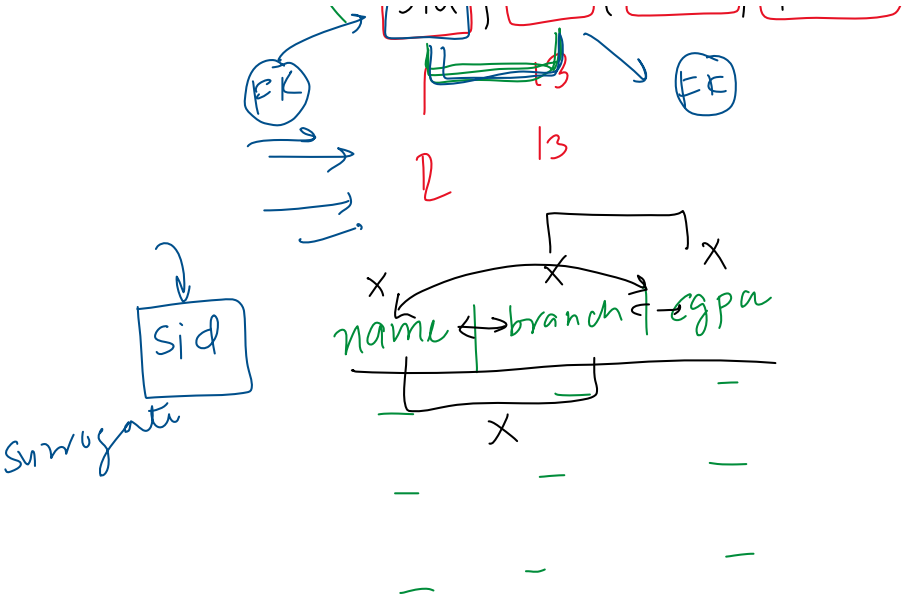


1. **Super Key** -
   A Super key is a combination of columns that uniquely identifies any row within a relational database management system (RDBMS) table
2. **Candidate key** -
   A candidate key is a minimal Super key, meaning it has no redundant attributes. In other words, it's the smallest set of attributes that can be used to uniquely identify a tuple (row) in the table
3. **Primary Key** -
   A primary key is a unique identifier for each tuple in a table. There can only be one primary key in a table, and it cannot contain null values.
4. **Alternate Key** -
   An alternate key is a candidate key that is not used as the primary key.
5. **Composite Key** -
   A composite key is a primary key that is made up of two or more attributes. Composite keys are used when a single attribute is not sufficient to uniquely identify a tuple in a table.
6. **Surrogate Key** -
7. **Foreign Key** -
   A foreign key is a primary key from one table that is used to establish a relationship with another table.



CK − PK = AK

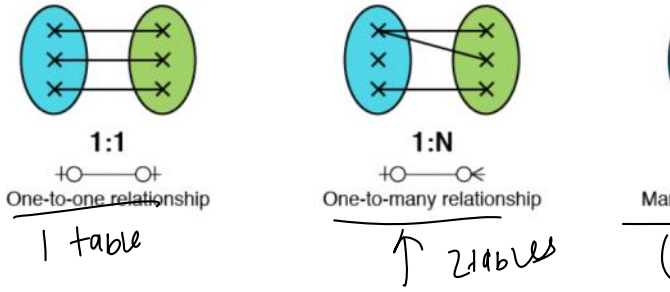



FK
FK
13
12
X
X
X
Sid
name
branch
egpa
X
Surrogate

11. Cardinality of Relationships

06 February 2023 16:43

Cardinality in database relationships refers to the number of occurrences of an entity in a relationship with another entity. Cardinality defines the number of instances of one entity that can be associated with a single instance of the related entity.



Examples

1. Person -> Driving License Number
2. Student -> college branch
3. Restaurants -> orders
4. Restaurants -> menu
5. Students -> courses

12. Drawbacks of Databases

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Complexity: Setting up and maintaining a database can be complex and time-consuming, especially for large and complex systems.

Cost: The cost of setting up and maintaining a database, including hardware, software, and personnel, can be high.

Scalability: As the amount of data stored in a database grows, it can become more difficult to manage, leading to performance and scalability issues.

Data Integrity: Ensuring the accuracy and consistency of data stored in a database can be a challenge, especially when multiple users are updating the data simultaneously.

Security: Securing a database from unauthorized access and protecting sensitive information can be difficult, especially with the increasing threat of cyber attacks.

Data Migration: Moving data from one database to another or upgrading to a new database can be a complex and time-consuming process.

Flexibility: The structure of a database is often rigid and inflexible, making it difficult to adapt to changing requirements or to accommodate new types of data.