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CHAPTER 1

Intro to Relational Databases

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AGENDA

- Course Introduction
- Intro to Databases
- Building First Database with Excel
- The Need for an Professional Database
- Different Types of Databases
- Interacting with Databases
- Database for the Course

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Course Introduction

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Course Objectives

- ✅ Get to operate a wide range of SQL database, in particular SQLite
- ✅ Basic proficiencies in SQL query language
- ✅ SQL aggregation using GROUP BY statement
- ✅ Advanced queries with logics and various functions
- ✅ Identify primary keys and foriegn keys
- ✅ SQL JOINs to combine tables with different dimensions
- ✅ SQL tables management using SQL statements
- ✅ ERD diagram to visualize SQL table linkages

Database 101

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What is Database?

A database is a **collection of information** that is **organized** so that it can be **easily accessed, managed and updated**. Computer databases typically contain aggregations of data records or files, containing information about sales transactions or interactions with specific customers.

-- Whatis.com

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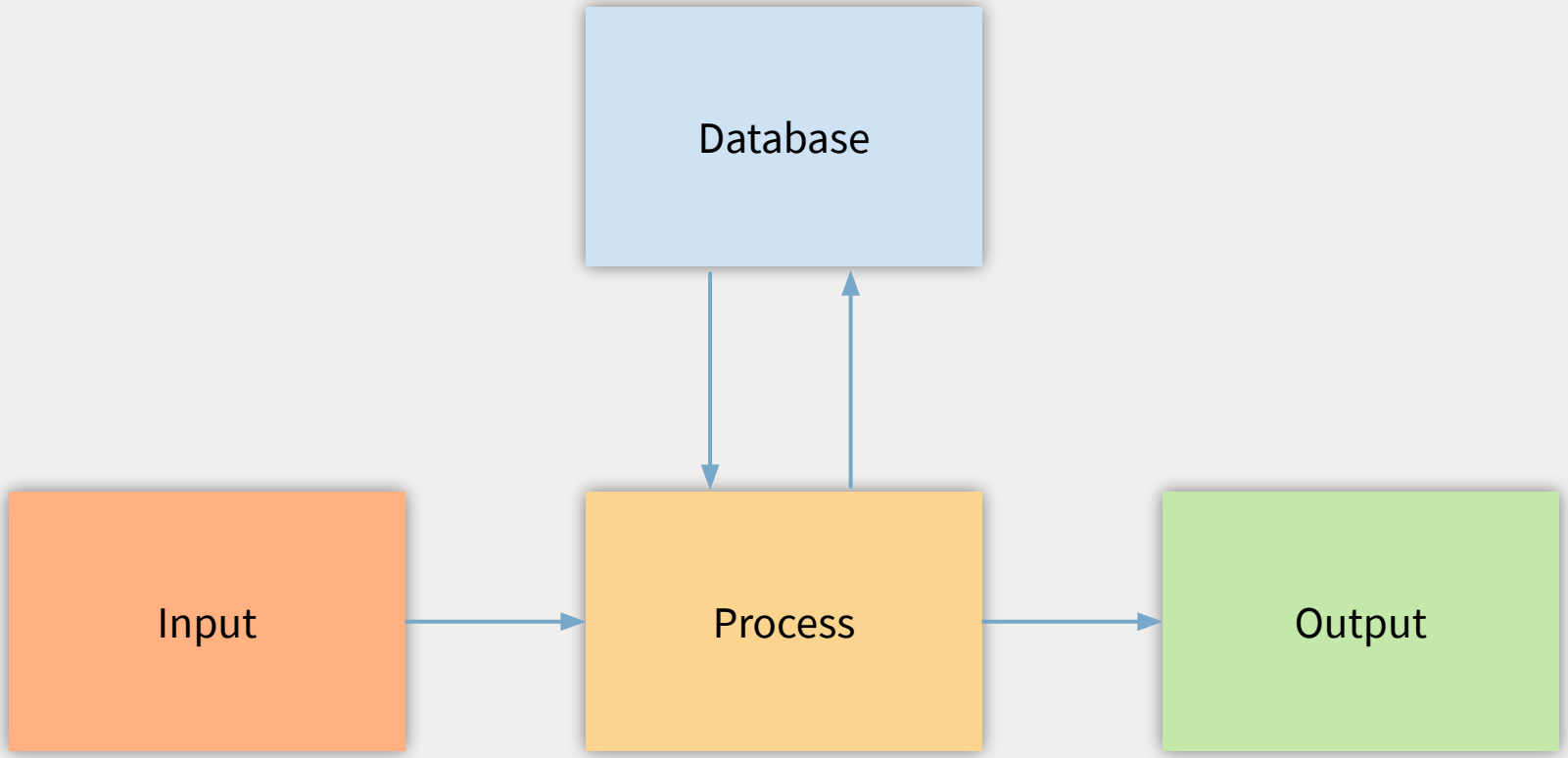
Elements of a SYSTEM



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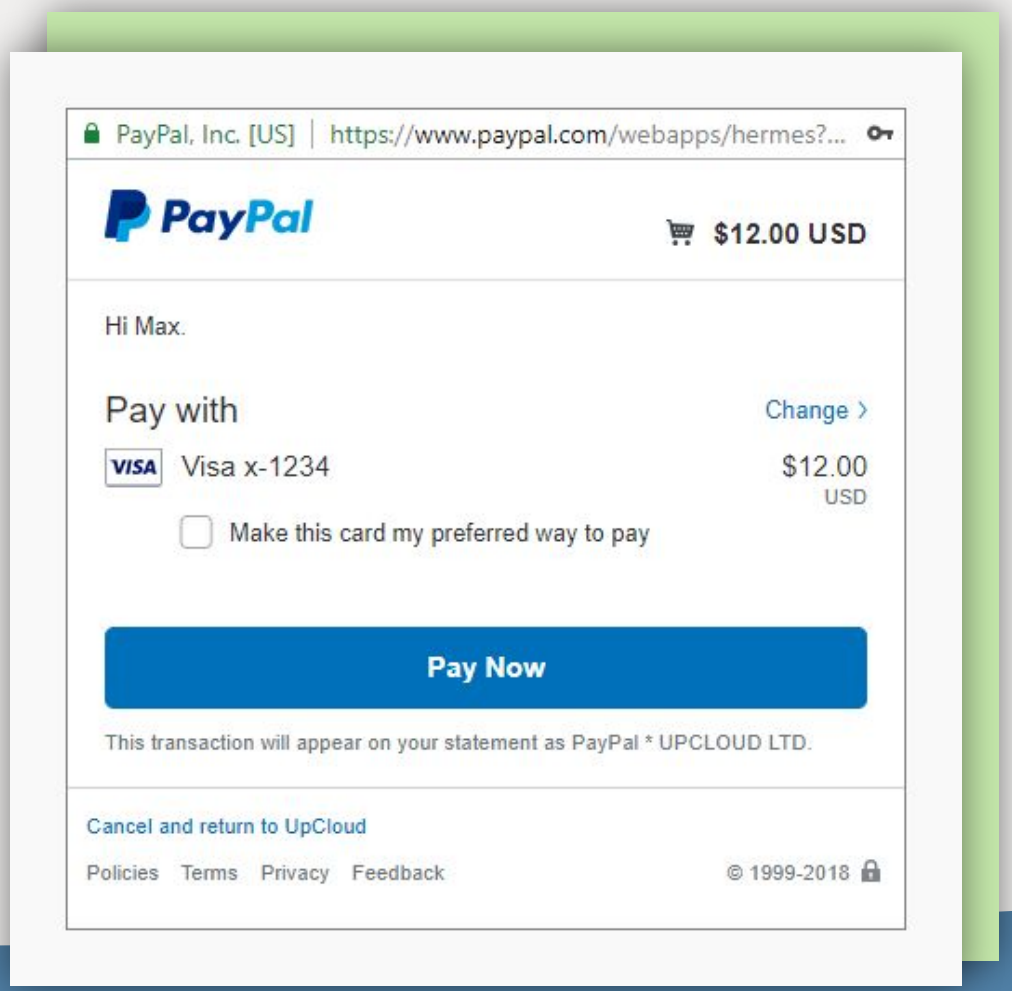
Which Applications use Database?



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Why Do We Need Databases?

User Status

User History

User Data

Website Content

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Building our First Database with Excel

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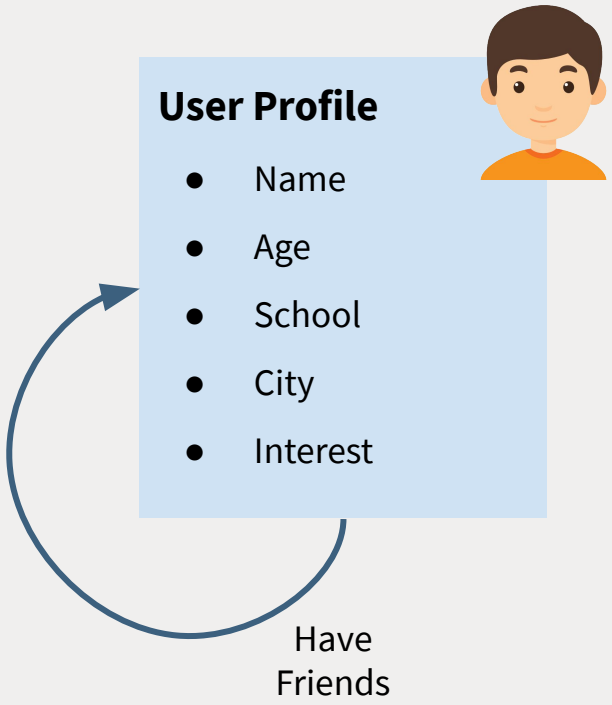
Imagine we are Facebook...



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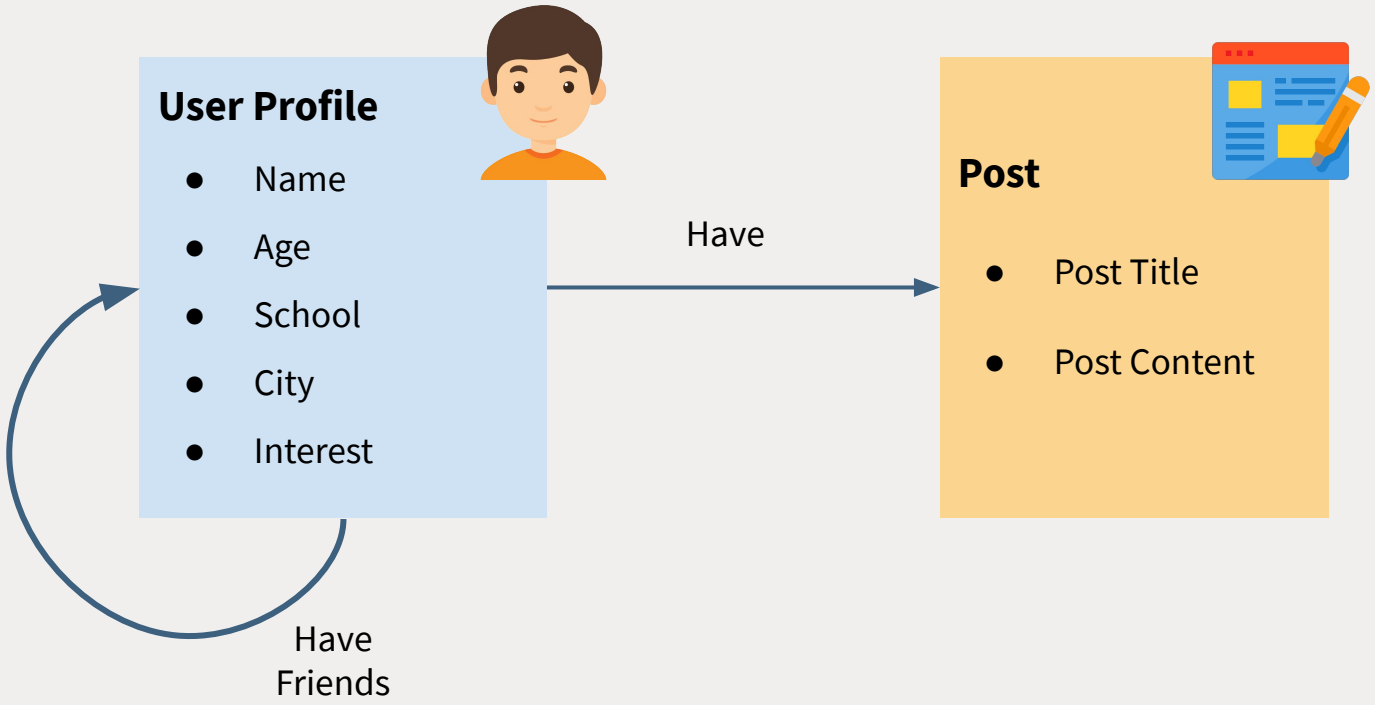

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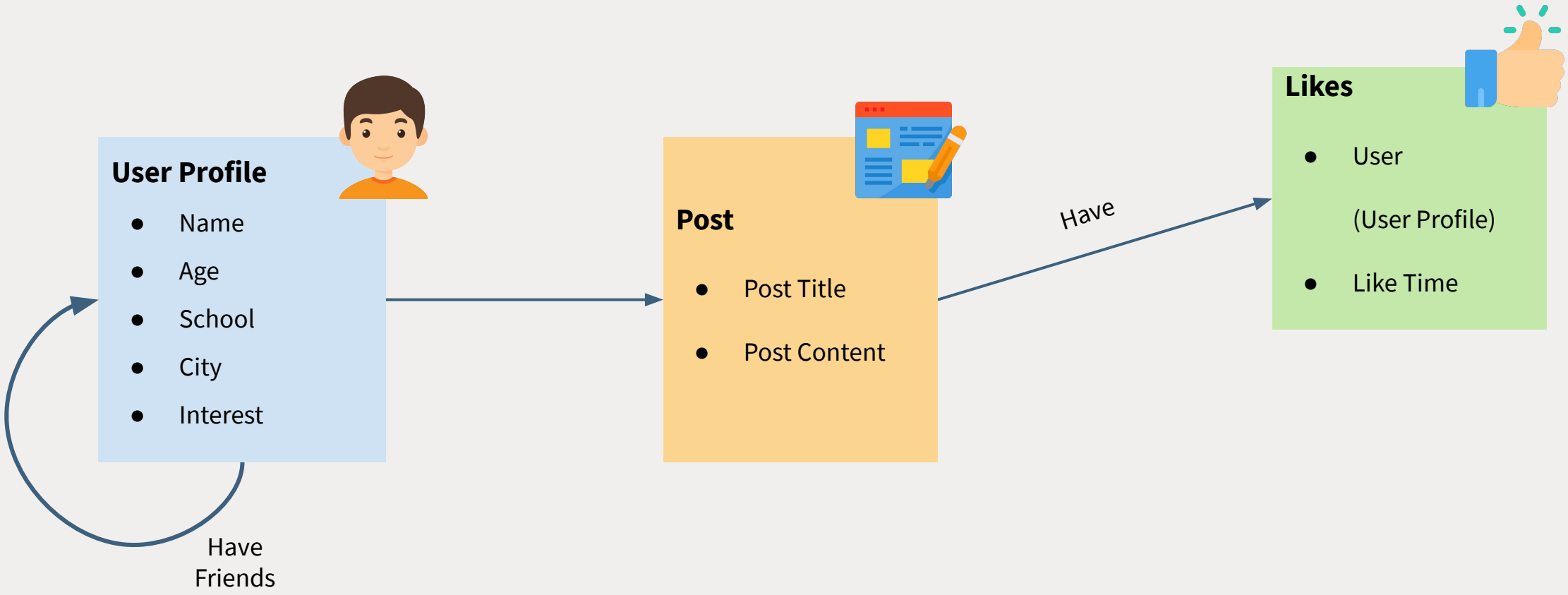

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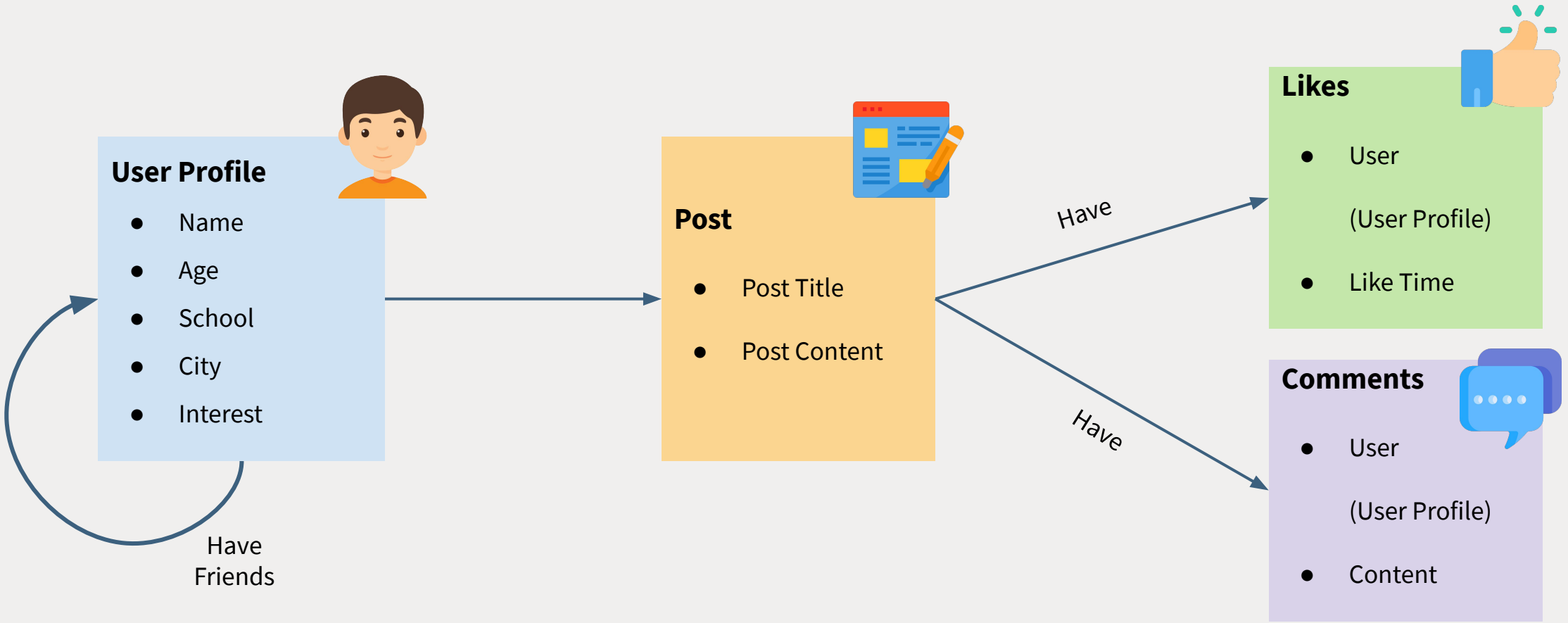
Imagine we are Facebook...



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Let’s get STARTED with Excel!

- Building a Facebook Database with Excel!
- Three important concepts:
  - **Table** - Represent a physical concept
  - **Column/Field** - Represent a property
  - **Row** - Represent a record

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Imagine we are Facebook...

🤔 The data is too complex to just write into Excel

🏢 We have to store the data somewhere - every user's hard drive?

⚙️ There must be a system to manage the data

The Need for a Professional Database

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Excel as Database? Great START, but...

- ❌ Too easy to make changes
- ❌ Hard to keep track of changes
- ❌ Cannot be accessed by multiple people at the same time
- ❌ Limited row count - 1,048,576 rows (for xlsx file)
- ❌ Cannot locate a single record easily
- ❌ Cannot create summary to large amount of data easily

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Additional Database Features

- Backup Mechanisms
- Simultaneous Connections
- Data Integrity Features
- Scalability
- Speed

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Different Types of Databases

Types of Databases

- For professional databases, there are two main types:

SQL

(Relational Database)

NoSQL

(Document Store)

- Focus of this course: **Relational Database/SQL**

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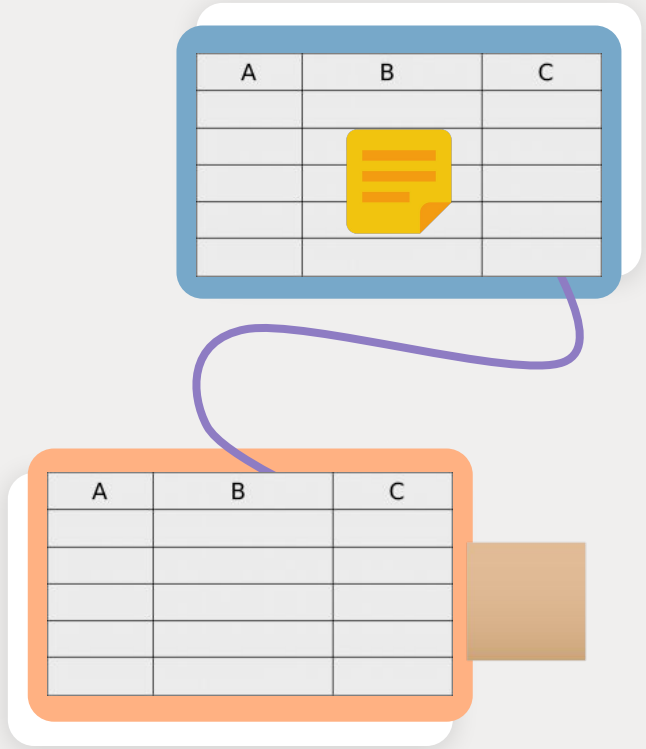
Relational Databases/SQL

- A relational database has a clear data structure (in tables, rows, and columns)
- Each table on the **database can be linked** to each other
  - **Example**: On Facebook, a “Post” table can be linked to a “Like” table as “posts can have likes”
- SQL queries can retrieve or summarize data from tables



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Examples of Relational Databases

SQL DB (Relational DB)

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Interacting with Databases

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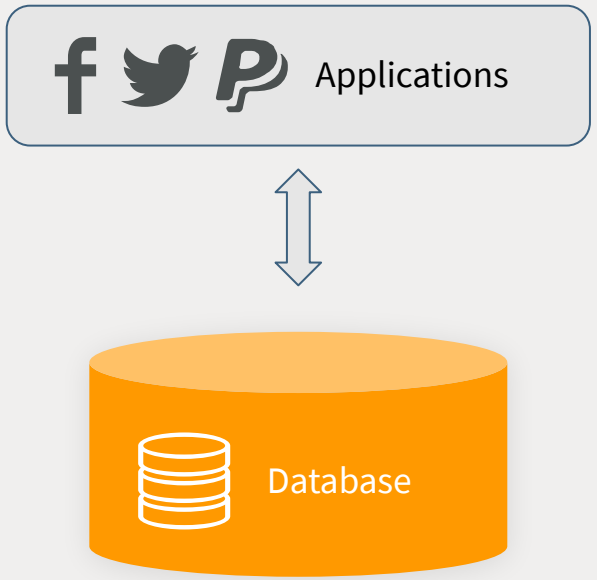
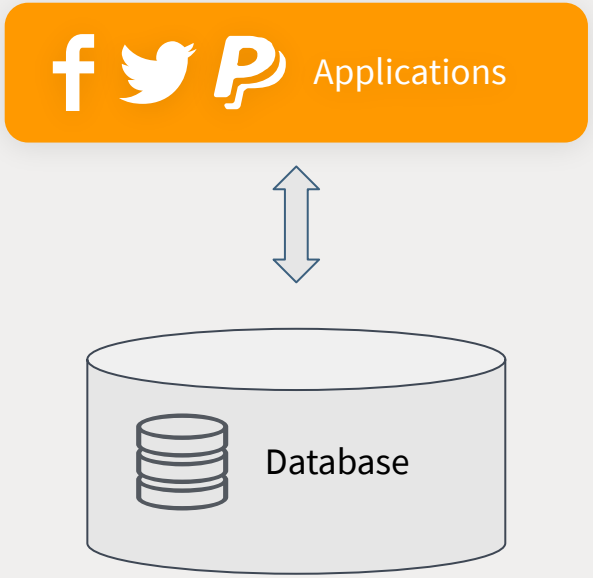
Role of a Database



- A database is both
  - data storage space, and
  - interface to pull/query the data
- Applications (e.g. apps, web pages) talk to the database to pull data
- Once the data is retrieved, the data is then displayed in the user interfaces (e.g. apps, web pages)

Role of an Application



- Apart from retrieving data, an application can also creates/updates user records according to some business logic
- Application will send instructions to the database and database will store the data accordingly

Accessing a Database

Using Database clients - web interface or application-based **(a software)**

Using programming interfaces **(a program)**

Using command line **(seldomly used)**

Database for the Course

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We'll be using SQLite!

Why SQLite?

- Run locally as a embedded database
  - **No installation** is needed
  - Other SQL databases require a server to run on (Complicated setup)
- **Can be embedded** into a program
  - WhatsApp chat history is maintained on a SQLite database on your mobile phone!
- We will walk through the database setup in the next chapter