

# RUMAD

Rutgers Mobile App Development

# Overview

For this section, we'll be covering:

- Databases
- Setting up Supabase

The background is a solid dark red color. On the left side, there is a faint, stylized illustration of a smartphone. The phone's screen displays a white icon of a mask with triangular eye cutouts. Below the screen, there is a white icon of a lightbulb. The phone's outline and internal components are rendered in a lighter shade of red, creating a subtle watermark effect.

# Databases

# What is a database?

- Collection of structured information (data)
- Allows users to store, retrieve, update, and delete data efficiently

## Columns (Attributes)



First Name	Last Name	Address	City	Age
Mickey	Mouse	123 Fantasy Way	Anaheim	73
Bat	Man	321 Cavern Ave	Gotham	54
Wonder	Woman	987 Truth Way	Paradise	39
Donald	Duck	555 Quack Street	Mallard	65
Bugs	Bunny	567 Carrot Street	Rascal	58
Wiley	Coyote	999 Acme Way	Canyon	61
Cat	Woman	234 Purrfect Street	Hairball	32
Tweety	Bird	543	Itotltaw	28

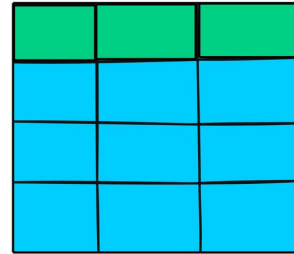
## Record



# Types of Databases?

- Relational Databases
  - Tabular format
  - Uses SQL for querying
- Non-Relational (NoSQL) Databases
  - More flexibility in the way data is stored
  - No standardized querying language

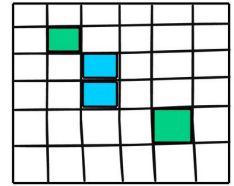
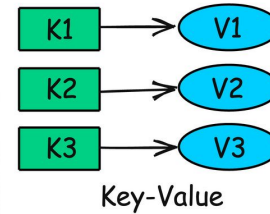
SQL



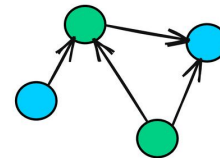
Relational

[blog.algomaster.io](http://blog.algomaster.io)

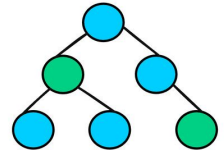
NoSQL



Column Store



Graph



Document

# Why do we need databases?

Recall the homework exercises we did:

- We have a tasks-cases.json with all our tasks.
- We imported these task cases into an **in-memory** list called **tasks**.
- We did operations on this list but what happens when we restart our server?  
What happens when we need to store 100K → 1M tasks?

Databases are essential for storing large amounts of data in one place. With databases, organizations can quickly access, manage, modify, update, organize and retrieve their data.

# What is a DBMS?

- Database Management System
  - Software for creating, managing, and interacting with databases
- Examples of DBMS:
  - **mySQL**
  - **MongoDB**
  - **Supabase**





# Relational Databases



# What is a Table?

- A database is a collection of **tables**.
- A table is a structured way of storing data in rows and columns.
- Row = a record in your table
- Column = an attribute/property

**Ex:** You can have a table of students with columns: name, netID, major

The rows of the table is each instance of a student.

## Columns (Attributes)

First Name	Last Name	Address	City	Age
Mickey	Mouse	123 Fantasy Way	Anaheim	73
Bat	Man	321 Cavern Ave	Gotham	54
Wonder	Woman	987 Truth Way	Paradise	39
Donald	Duck	555 Quack Street	Mallard	65
Bugs	Bunny	567 Carrot Street	Rascal	58
Wiley	Coyote	999 Acme Way	Canyon	61
Cat	Woman	234 Purrfect Street	Hairball	32
Tweety	Bird	543	Itotltaw	28

## Rows (Records)

# How to interact with a DB?

## C.R.U.D Operations

### 1. **Create**

- a. Inserting a record of data into your DB

### 2. **Read**

- a. Getting/Selecting data from your DB

### 3. **Update**

- a. Updating an existing record

### 4. **Delete**

- a. Deleting a record from your DB

We'll go into more detail later!

# A.C.I.D. Properties

A **good** relational database is **ACID**-compliant

## A - Atomicity

- “All or Nothing” - if one part of the transaction fails, all changes are reverted

## C - Consistency

- All rules/constraints are followed no matter what.

## I - Isolation

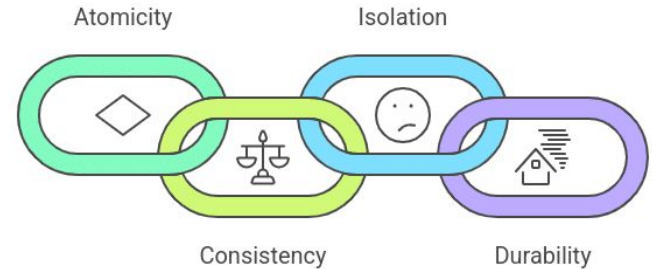
- When concurrent transactions are made, each one behaves as if it's the only one.

## D - Durability

- Once a transaction is successfully completed, the result is permanent. (Crashes & restarts don't wipe/revert the database)

**Transaction** = sequence of one or more operations on the DB

ACID Properties in Database



# SQL Relationships

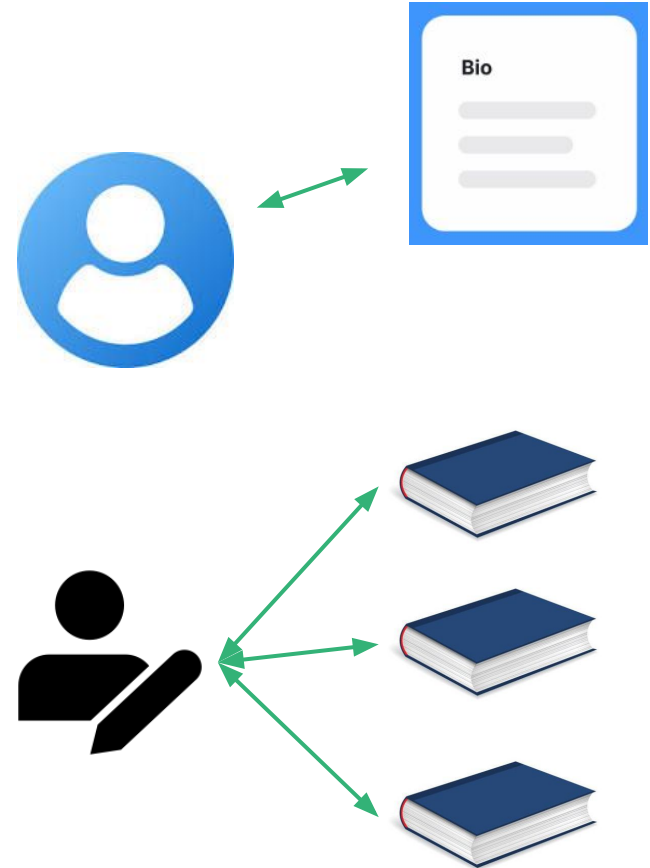
There are 4 main kinds of relationships between tables in Relational Databases:

## 1. One to One

- a. **One** Record in Table A → **One** Record in Table B
- b. Ex: A user has only one user profile and vice-versa

## 2. One to Many/Many to One

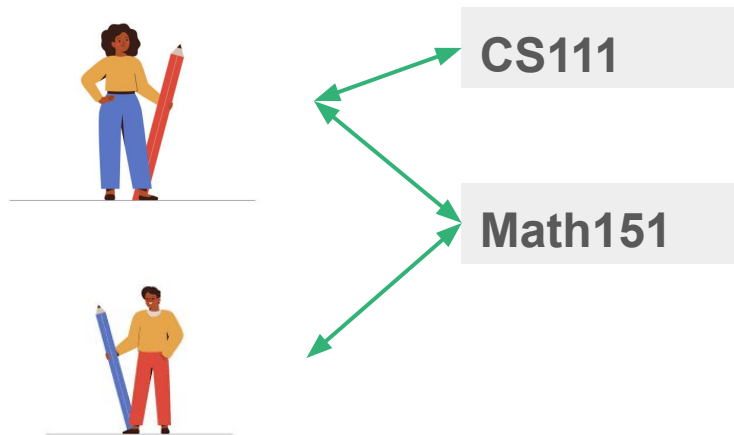
- a. **One** Record in Table A → **Many** Records in Table B
- b. Ex: An author can write many books; many books can be associated with one author



# SQL Relationships Cont.

## 1. Many to Many

- Many** Records in Table A → **Many** Records in Table B
- Ex: A student can enroll in many courses and courses can have many students



## 2. Self-Referencing

- Record(s) in Table A → Record(s) in Table A

employees		
employee_id	employee_name	manager_id
1	Alice	NULL
2	Bob	1
3	Charlie	1
		foreign key
		primary key

# Primary Keys

- **Uniquely** identifies a row through some sort of id.
- Examples:
  - customer\_id
  - student\_id
- What was the primary key for tasks in our homework exercises?

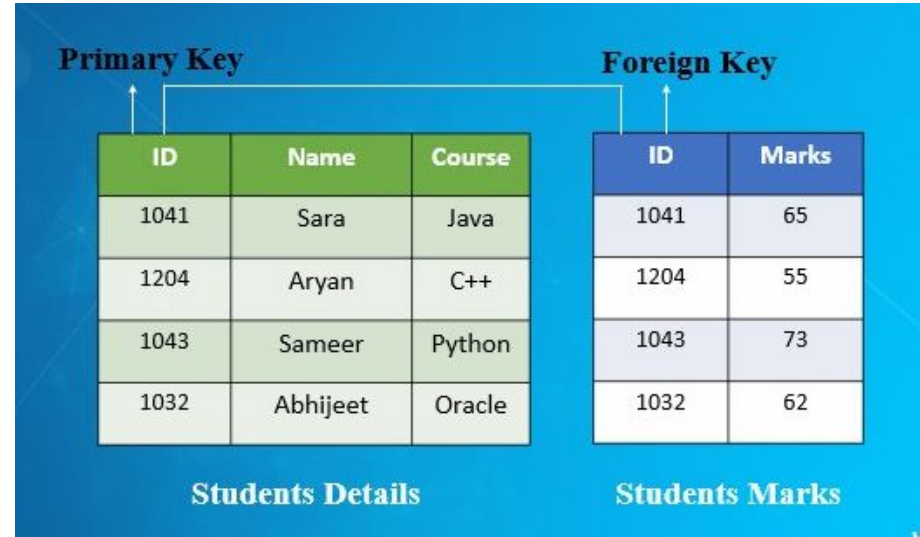


Customer ID	Forename	Surname
1	Simon	Jones
2	Emma	Price
3	Laura	Jones
4	Jonathan	Hale
5	Emma	Smith

Simple primary key

# Foreign Keys

- This is how we implement our SQL relationships
- A foreign key in one column **references** a primary key in another column
- These columns could be in different tables or the in the same table



What kind of relationship might exist between students and their grades?

# Foreign Keys

Example:

We have an Authors table and Books table

How do we establish this relation?:

1 author → the books that the author wrote

We create a column in our **books** table called **author\_id**. This will be our foreign key.

We make author\_id reference **id** in our authors table.

**AUTHORS**

id	name
1	Jane Austen
2	Stephen King

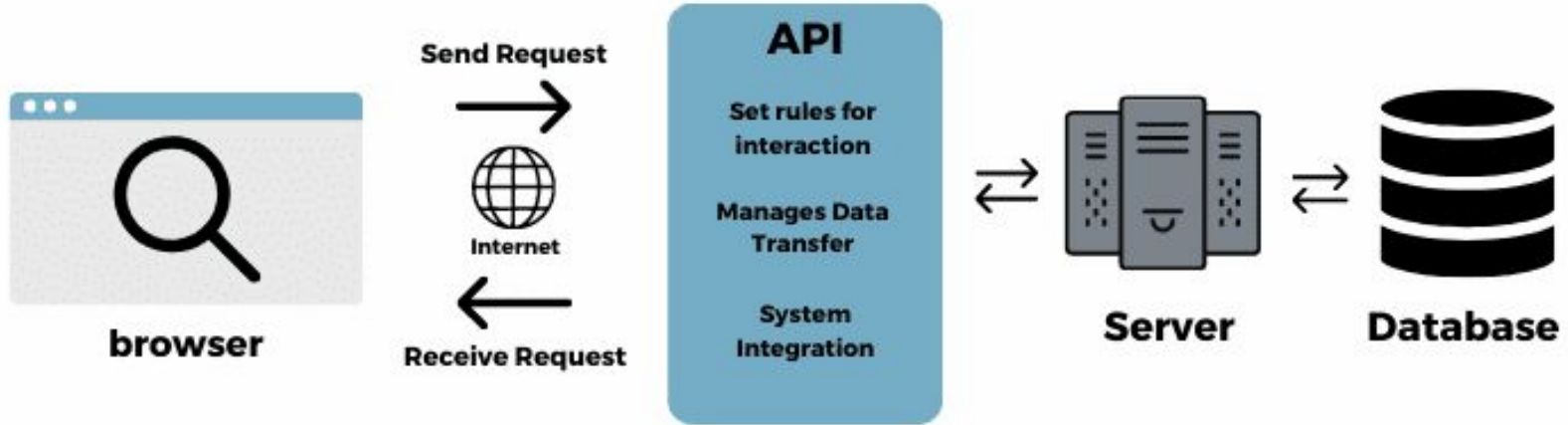
id	title	<u>author_id</u>
1	Pet Cemetery	2
2	IT	2

**BOOKS**



**GET/POST**

**C.R.U.D**



# Data Flow within an Application



**Supabase**

# What is Supabase?

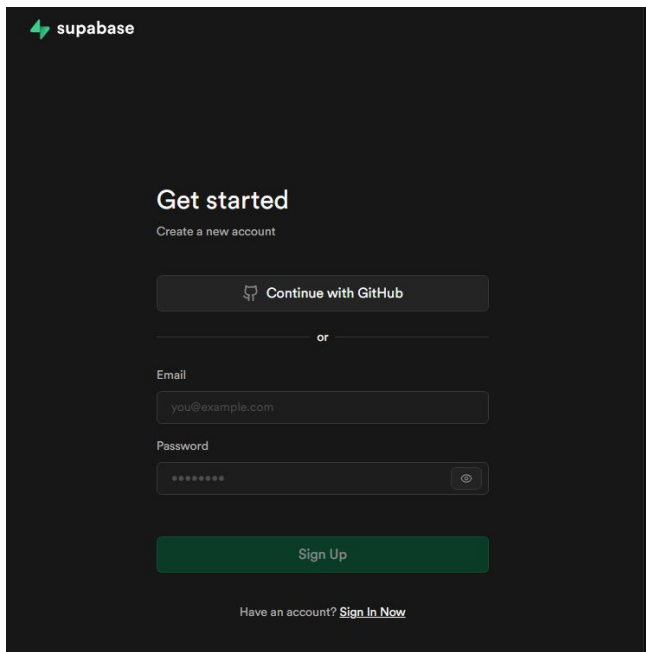
- Supabase is an open-source cloud database
  - Relational Database
  - The database exists on a cloud server
  - You don't need to host on your PC
  - BaaS – backend as a service
- Supabase is PostgreSQL\*-based
  - Real-time functionality
  - Storage & authentication
  - SQL Templates
    - If you don't know SQL!
  - Policies

\*PostgreSQL is another commonly used database

- Supabase is built upon Postgres (abstraction of Postgres)

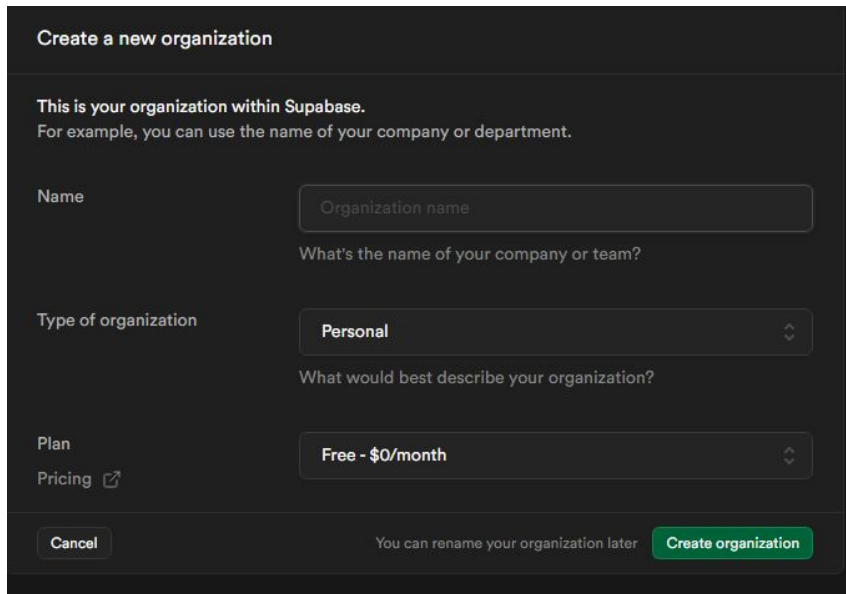


# Set Up on Supabase Website



The image shows the Supabase sign-up page. At the top left is the Supabase logo. The main heading is "Get started" with the subtext "Create a new account". There are two options to sign up: "Continue with GitHub" and "or" followed by "Email". The email field contains "you@example.com". Below the email field is the "Password" field, which is masked with asterisks. At the bottom is a green "Sign Up" button. At the very bottom, there is a link: "Have an account? [Sign In Now](#)".

Sign in to Supabase  
- Github or Email

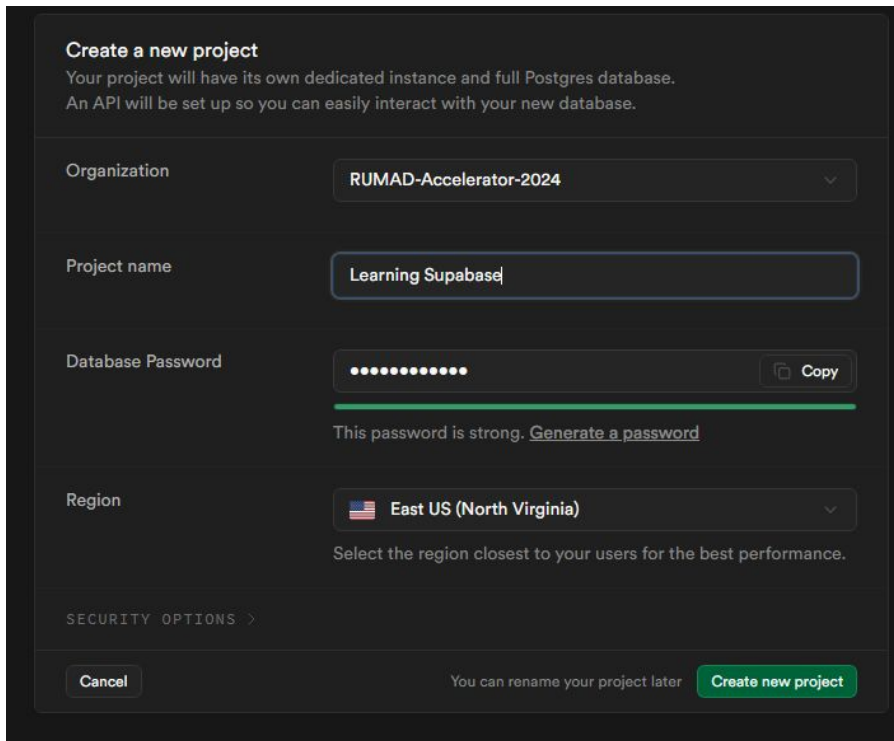


The image shows the "Create a new organization" page. The heading is "Create a new organization". Below it is a message: "This is your organization within Supabase. For example, you can use the name of your company or department." There are three main sections: "Name" with a text input field labeled "Organization name" and the prompt "What's the name of your company or team?"; "Type of organization" with a dropdown menu showing "Personal" and the prompt "What would best describe your organization?"; and "Plan" with a dropdown menu showing "Free - \$0/month" and a "Pricing" link with an external icon. At the bottom, there is a "Cancel" button, a note "You can rename your organization later", and a green "Create organization" button.

Create an organization

# Project Creation

- Create a project
- You can have multiple projects inside an organization
- Set a strong password!



**Create a new project**  
Your project will have its own dedicated instance and full Postgres database.  
An API will be set up so you can easily interact with your new database.

Organization: RUMAD-Accelerator-2024

Project name: Learning Supabase

Database Password: [masked] [Copy](#)

This password is strong. [Generate a password](#)

Region: East US (North Virginia)

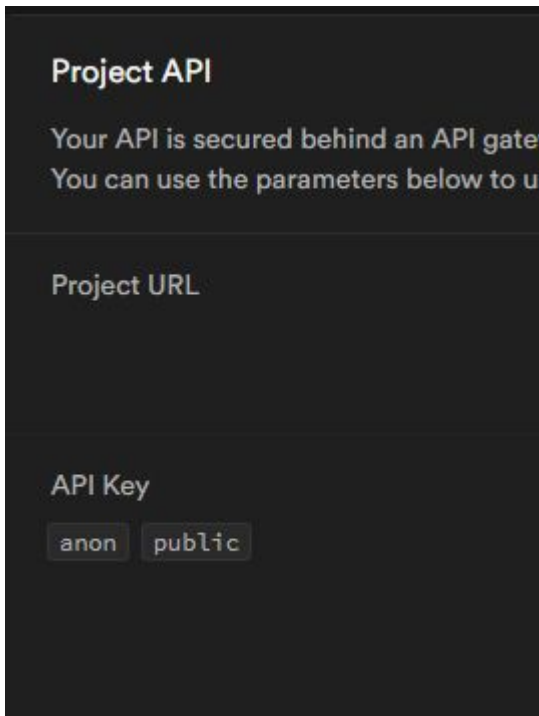
Select the region closest to your users for the best performance.

SECURITY OPTIONS >

[Cancel](#) You can rename your project later [Create new project](#)

# Supabase Config

- After basic setup of your Supabase project, you will get a list of information:
  - Project URL
  - API Key
- Used to connect your app to supabase
- This information is specific to **your database**
- Your API key should be maintained securely
  - Don't want other people accessing your database!



# Installing Supabase for Nodejs

- Use node package manager to install supabase
- Initialize supabase client
  - Supabase Url (domain)
  - Supabase Key
- **createClient** takes in your personalized url and key to connect to your database

Terminal

```
1 npm install @supabase/supabase-js
```

```
require('dotenv').config()
const { createClient } = require('@supabase/supabase-js')

//your Supabase url + public key from the supabase website!
const domain = process.env.SUPABASE_DOMAIN
const supabase_public_key = process.env.SUPABASE_PUBLIC_KEY

const supabase = createClient(domain, supabase_public_key)
```

# Questions?

Please fill out the feedback form when you have a chance!

**Feedback Form**





# Next week...

- More on Supabase
  - CRUD Operations
  - Supabase w/ NodeJS
  - Supabase Authentication

# Did you complete Week 0?



Scan here for a guide to setting up your  
development environment!