Data Management using

Prisma

Course Roadmap

Web Client

Request

Response

Web Server

Frontend development

HTML for page content & structure

CSS for styling

JavaScript for interaction

Backend development

Web API

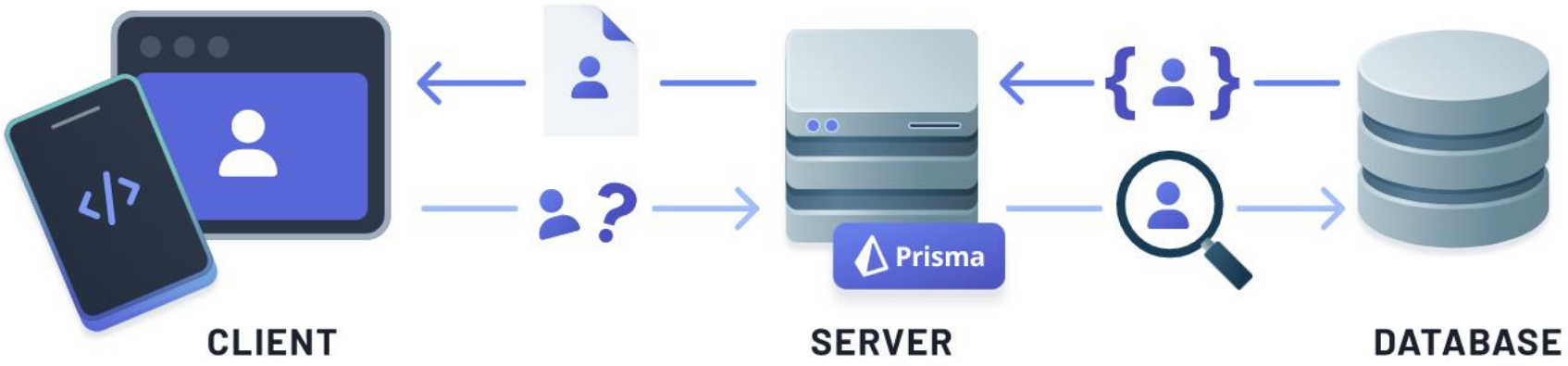
Web Pages

Data Management

Outline

1. What is Prisma?
2. Data Model (Prisma Schema)
3. Migration (Apply changes to DB)
4. Queries (using Prisma Client)
5. Aggregation Queries

What is Prisma ?



What is Prisma?

- Prisma is a server-side library that simplifies read and write data to the database in an intuitive and efficient way
- Open-source Object-Relational-Mapper (ORM), includes:
  - **Prisma Schema**: used to define the **data model** (entities and relations)
  - **Prisma Migrate**: apply schema changes to DB
  - **Prisma Client**: auto-generated to query data
  - **Prisma Studio**: GUI to view and edit data in your DB
- Why Prisma?
  - Facilitates defining the data model
  - Helps reducing the amount of code to read/write to a DB
  - Less or no SQL code to read/write to a DB
  - Abstract database-specific details => makes easier to change from one database to another

schema.prisma

- **Data Model** is defined in 1 file (**schema.prisma**)
  - Specifies the app entities and their relations
  - Syntax used is Prisma Schema Language (PSL)
- schema.prisma also specifies:
  - **Data source**: defines the data source details:
    - Database Provider (e.g., a PostgreSQL or SQLite)
    - Connection Url (e.g., postgresql://janedoe:mypassword@localhost:5432/mydb)
  - **Generator**: specifies what client should be generated based on the data model (e.g., Prisma Client)

Prisma DB providers

Reminder – Next.js getting started

- Create an empty folder (with no space in the name use **dash -** instead)
- Create next.js app (select **No** for all questions except for **TypeScript select Yes**)

```
npx create-next-app@latest --experimental-app .
```

```
√ Would you like to use TypeScript with this project? ... No / Yes
√ Would you like to use ESLint with this project? ... No / Yes
√ Would you like to use Tailwind CSS with this project? ... No / Yes
√ Would you like to use `src/` directory with this project? ... No / Yes
√ What import alias would you like configured? ... @/*
```

This creates a new **`Next.js`** project and downloads all the required packages

- Run the app in dev mode: **`npm run dev`**

Prisma – Getting started

- Install the Prisma packages using:

```
npm install prisma --save-dev
npm install @prisma/client
```

- Also install **Prisma VS Code extension**
- Set up Prisma with this command:

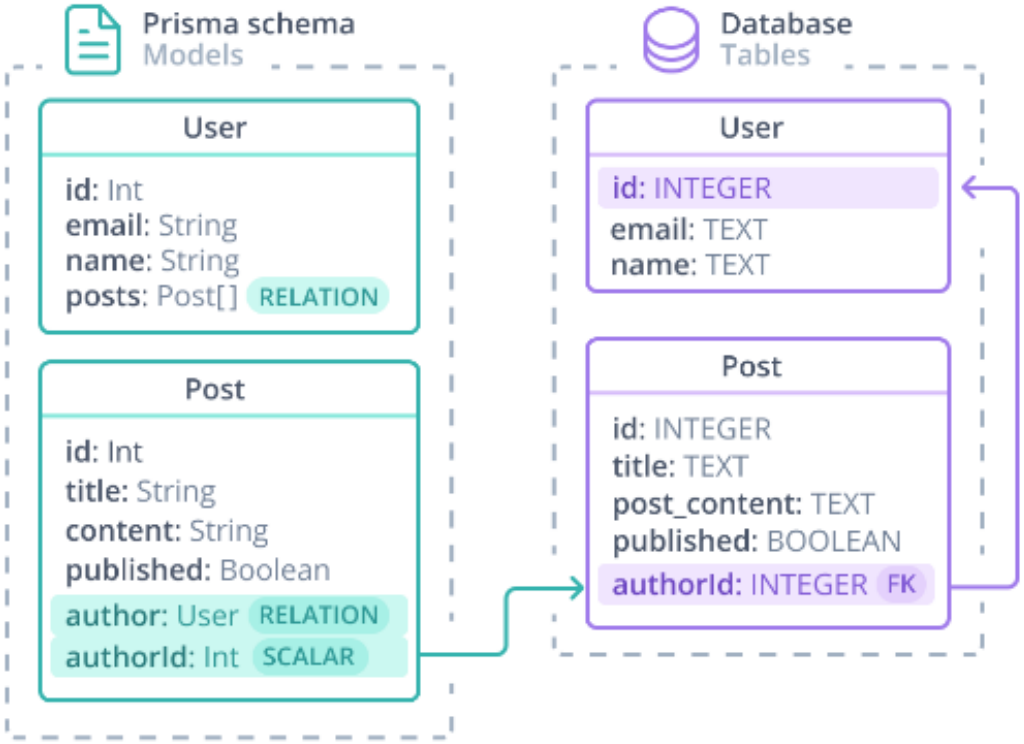
```
npx prisma init --datasource-provider sqlite
```

  - This creates a new **prisma** directory with **schema.prisma** file and configures SQLite as your database
  - You can define the data model inside **schema.prisma** file

Data Model

Data Model

- Data Model (aka. Schema) have two main purposes:
  - Represent the tables in the underlying database: Data Model is used to create the database tables using **Prisma Migrate**
  - Serve as foundation to generate **Prisma Client** API



Defining fields

- Each model entity defines fields
- Each field in the model has a type, e.g. the **`id`** has the type **`Int`**
  - A field type could be scalar type such as Int, String, Boolean or could be another Model
  - Optional type modifiers: **[]** Makes a field a list

  ? Makes a field optional
- Fields may contain field attributes to define:
  - Primary keys with the **`@id`** attribute
  - Unique keys with the **`@unique`** attribute
  - Default values with the **`@default`** attribute
- More info

Data Model Example

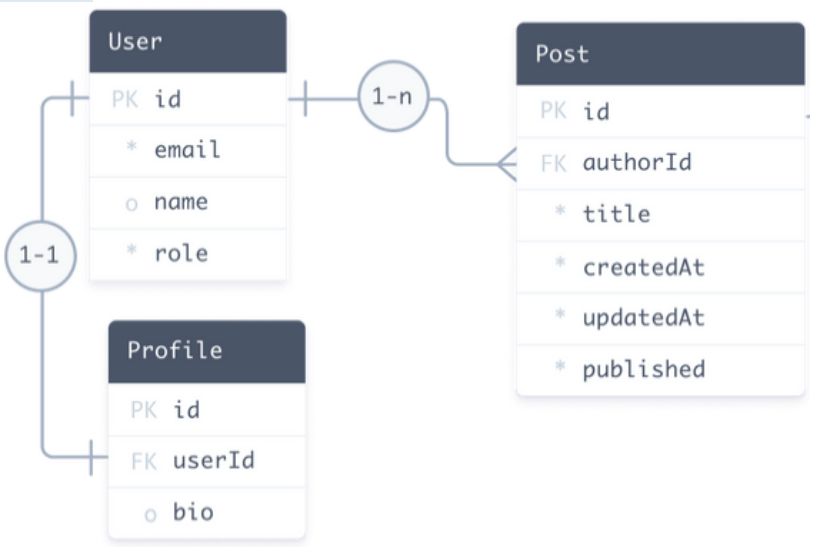
```prisma
model User {
  id      Int      @id @default(autoincrement())
  email   String   @unique
  name    String?
  role    Role     @default(USER)
  posts   Post[]
  profile Profile?
}

model Profile {
  id     Int    @id @default(autoincrement())
  bio    String
  user   User   @relation(fields: [userId], references: [id])
  userId Int    @unique
}

model Post {
  id          Int        @id @default(autoincrement())
  createdAt   DateTime   @default(now())
  updatedAt   DateTime   @updatedAt
  title       String
  published   Boolean    @default(false)
  author      User       @relation(fields: [authorId], references: [id])
  authorId    Int
}

enum Role {
  USER
  ADMIN
}
```

DB Schema



Modeling relations

- User / Post relation is made up of:
  - The scalar **authorId** field, which is referenced by the `@relation` attribute, is the foreign key that connects **Post** and **User**
  - The two relation fields: **author** and **posts** do not exist in the database table.
    - Relation fields define connections between models at the Prisma level and exist only in the Prisma schema and generated Prisma Client, where they are used to access the relations

@@unique & @@id

Composite primary key

```
model User {
  firstName String
  lastName  String
  email     String  @unique
  isAdmin   Boolean @default(false)

  @@id([firstName, lastName])
}
```

Composite Unique key

```
model User {
  id        Int     @id @default(autoincrement())
  firstName String
  lastName  String
  email     String  @unique
  isAdmin   Boolean @default(false)

  @@unique([firstName, lastName])
}
```

@map

- By default, model filed names are the same as the DB table column names
- @map attribute can be used for mapping between model fields and table columns
  - e.g., the **`content`** field maps to the `post_content` database column

```
model Post {
  id        Int     @id @default(autoincrement())
  title     String
  content   String? @map("post_content")
  published Boolean @default(false)
  author    User?   @relation(fields: [authorId], references: [id])
  authorId  Int?
}
```

Migration
(Apply changes to DB)

Migration

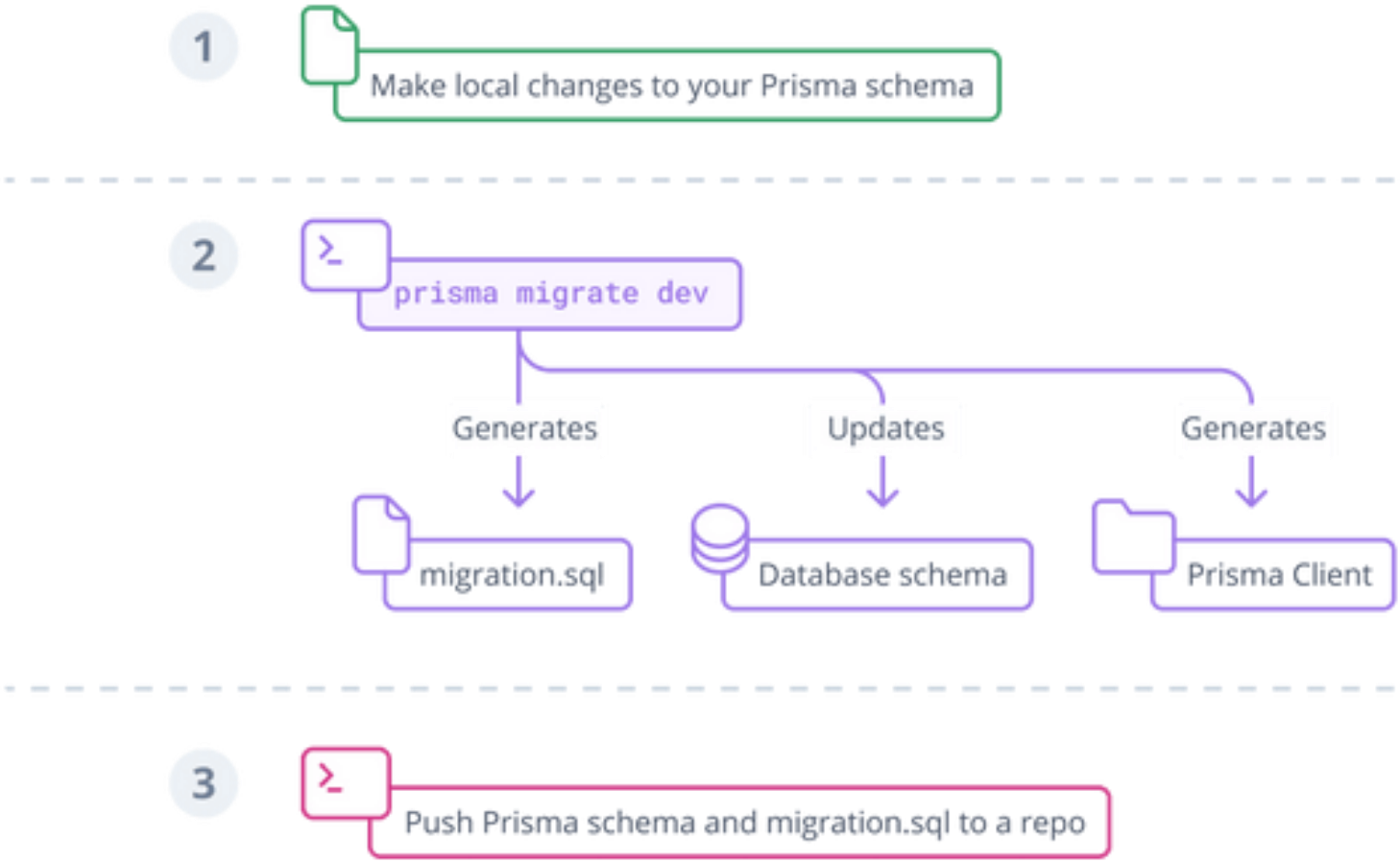
- Prisma Migrate auto-generates SQL migration file from the Prisma schema to apply the changes to the database:
  - Keep your database schema in sync with your Prisma schema (while keeping existing data in your database)

Prisma migrate

`npx prisma migrate dev --name init`

- This command did 3 things:
  - It creates a new SQL migration file under `prisma/migrations` directory
  - It runs the SQL migration file against the database
  - Generates Prisma Client
- If the database does not exist, then I will create it
  - E.g., if the SQLite database file didn't exist, the command also created it inside the prisma directory with the name **`dev.db`** as defined via the environment variable in the .env file

Prisma migrate workflow



Queries
(using Prisma Client)

Prisma Client

- Run **`npx prisma migrate`**

(or **`npx prisma generate`**)

To generate a Prisma Client that is tailored to data models defined in **schema.prisma**

It offers auto-completion to help write the queries to read/write to DB

```
import { PrismaClient } from '@prisma/client'

const prisma = new PrismaClient()

const newAuthor = await prisma.author.create({
data: {
    firstName: 'John',
    lastName: 'Doe',
},
})

const authors = await prisma.author.findMany()
```

DB Operations

Prisma client offers the following operations for each model:

- `create/createMany`
- `update/updateMany`
- `delete/deleteMany`
- `findUnique/findMany/findFirst`
- `upsert (create or update)`
- `aggregate/count/groupBy`

Example Query

Query

```
// Creating a new record
await prisma.user.create({
  firstName: “Alice”,
  email: “alice@prisma.io”
})
```

Table

id	firstName	email
1	Bobby	bobby@tables.io
2	Nilufar	nilu@email.com
3	Jürgen	jums@dums.edu
4	Alice	alice@prisma.io

```
const user = await prisma.user.findUnique({
  where: {
    email: 'alice@prisma.io',
  },
})
```

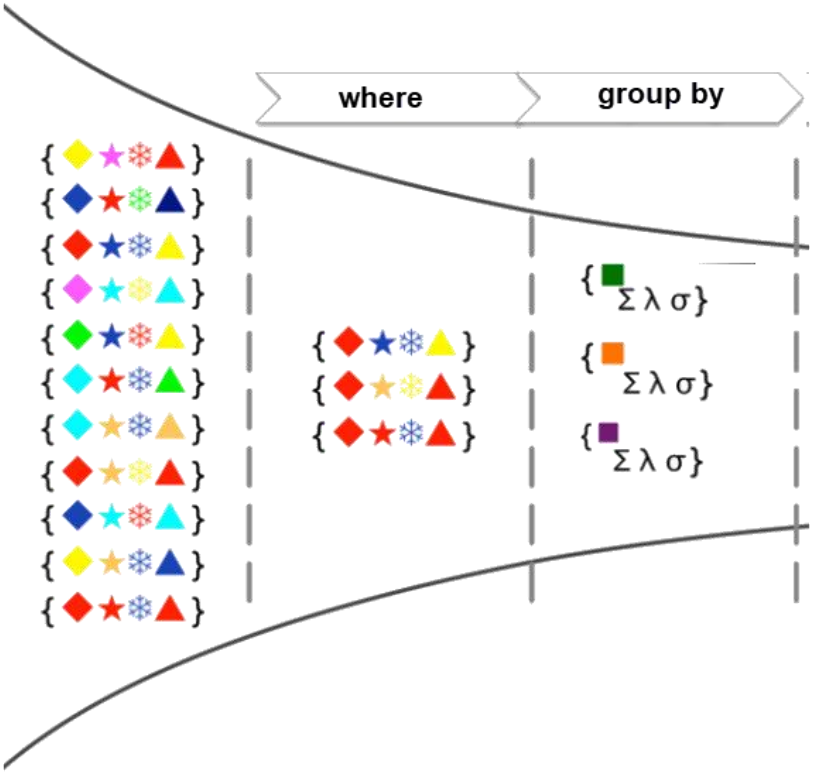
- All queries return plain old JavaScript objects

Fetching relations

- By default, Prisma will return all the scalar fields of a model
- Fetch relations with Prisma Client is done with the **include** option. For example, to fetch a user and their posts would be done as follows:

```
const user = await prisma.user.findUnique({
  where: {
    email: 'alice@prisma.io',
  },
  include: {
    posts: true,
  },
})
```

Aggregation Queries



Aggregation Queries

- Summarize data typically for reports
- How would we solve this in SQL?

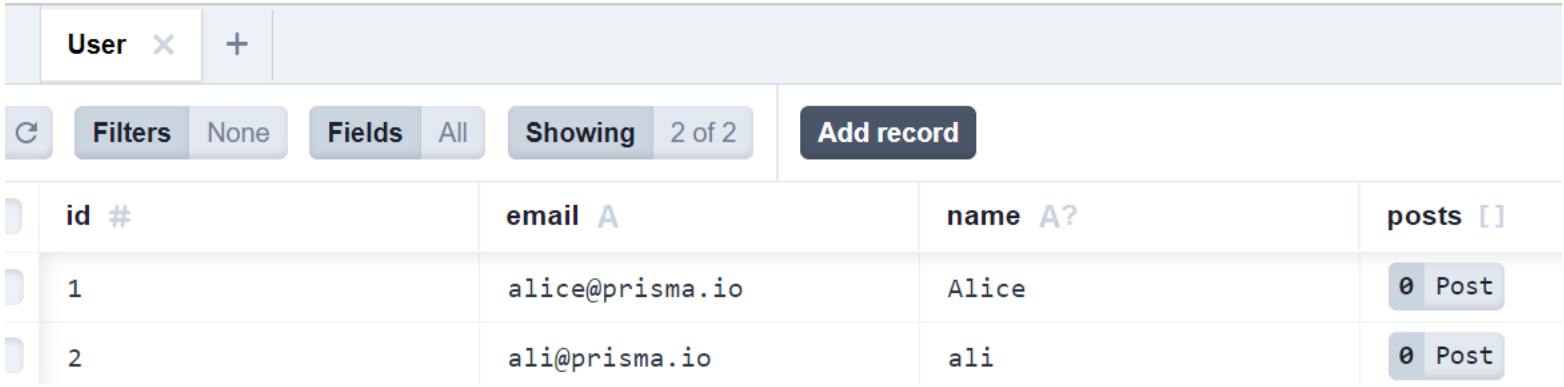
```
SELECT GROUP BY HAVING
```

- **To do** – more info

Prisma Studio

- GUI to view, explore and edit the data in the DB
  - Browse across tables, filter, paginate, traverse relations and edit data

```
npx prisma studio
```



DB Seeding

- Allows initialing the database with some data
  - Add DB init code to `seed.js` file
  - Run it using: **`npx prisma db seed`**
- **ToDo** – more info

Resources

- Prisma Documentation

https://www.prisma.io/docs/getting-started/quickstart

- Prisma Playground

https://playground.prisma.io/examples/

- Prisma Examples

https://github.com/prisma/prisma-examples

- Aggregation Queries

https://www.prisma.io/docs/concepts/components/prisma-client/aggregation-grouping-summarizing