GraphQL

* Is new API standard that was invented & open sourced by Facebook
* Enables declarative data fetching
  + Allows API to specify exactly which data it needs
* GraphQL server exposes single endpoint and responds with exactly the data it needs

Why GraphQL

* Increased mobile usage creates need for efficient data loading
  + Low powered devices, sloppy network were the initial reasons graphQL was developed by Facebook
* Variety of different frontend frameworks and platforms on the client-side
* Fast development speed & expectation for rapid feature development

GraphQL is not only for React Developers

* Facebook uses GraphQL since 2012 in their native mobile apps
* GraphQL can be used with any programming language and framework
* GraphQL is used by other big companies such as Coursera yelp and twitter

GraphQL vs REST

* Great idea in REST: stateless servers and & structured access to resources
* REST is a strict specification
* Rapidly changing requirements on client-side don’t go well with REST

**Key: GraphQL was developed to cope with the need for more flexibility and efficiency in client server communication**

Example: Blogging App with REST

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Graphical user interface

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Traditional REST

* API endpoint ‘**/users/<id>**’ only needs **id** and **name**
  + Adding **Address** and **birthday** puts extra strain on user’s data plan
* We are actually downloading data that we don’t want to display
* To be conservative on usage 🡪 you need to refine API for that specific purpose
  + Not a good idea when the app needs quick iteration

GraphQL

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* Fetches everything on single request
  + Allows to fetch only needed data 🡪 saving data on user
* Advantages
  + No more over – and under fetching
  + **Overfetching:** Downloading unnecessary data
  + **Underfetching:** An endpoint doesn’t return enough of the right information; need to send multiple requests (n+1 requests problem)

**Rapid Product Iterations**

* REST: structure endpoints according to clients’ data needs
* No need to adjust API when product requirements and design change
* Faster feedback cycles and product iterations

**Insightful Analytics**

* Fine-grained info about what data is read by clients
* Enables evolving API and deprecating unneeded API features
* Great opportunities for instrumenting and performance monitoring

**Benefits of Schema & Types**

* GraphQL uses strong type system to define capabilities of an API
* Schema serves as contract between client and server
* Frontend and backend teams can work completely independent from each other

**Core Concepts**

* **Schema Definition Language**
  + Is it’s own type for defining it’s own schema

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* + **!** following the type means that this field is ***required*.**

A picture containing graphical user interface

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* Note that we just created a *one-to-many*-relationship between Person and Post since the posts field on Person is actually an *array* of posts

* **Fetching data with queries**
  + REST APIs, data is loaded from specific endpoints
    - Each endpoint has a clearly defined structure of the information that it returns.
    - This means that the data requirements of a client are effectively *encoded* in the URL that it connects to.
  + GraphQL APIs typically only expose *a* ***single endpoint*.**
    - it’s completely flexible and lets the client decide what data is actually needed.
* **Basic queries**

Example 1

Rectangle

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Response

Graphical user interface

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* **Queries with Arguments**
  + GraphQL, each field can have 0 or more arguments

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* **Writing Data with Mutations**
  + Next to requesting information from a server, the majority of applications also need some way of making changes to the data that’s currently stored in the backend
  + Changes made using **mutations**
    - creating new data
    - updating existing data
    - deleting existing data

Shape

Description automatically generated with medium confidence

* **Realtime Updates with Subscriptions**
  + Is to have a *realtime* connection to the server in order to get immediately informed about important events
  + It initiates and holds a steady connection to the server.

Example

Shape, rectangle

Description automatically generated with medium confidence

* **Defining a Schema**
  + The *schema* is one of the most important concepts when working with a GraphQL API
  + Writing Query type

Graphical user interface

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* + Writing  Mutation type

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* + Writing Subscription type

Shape, rectangle

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Example (Full schema)

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**Big Picture (Architecture)**

* **Architectural Use Cases**
  + GraphQL server with a connected database
  + GraphQL server to integrate integrate existing system

**Useful libraries**

1. Bcrypt

**npm** **install** jsonwebtoken bcryptjs

**Running node**

node src/index.js

**Accessing GUI Database**

npx prisma studio

**Setting up prisma + Apollo + node**

**npm** **install** apollo-server

**npm** **install** @prisma/cli --save-dev

npx prisma init

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Text

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3. write database script

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4. run script command

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**Updating Prisma database**

npx prisma migrate dev --name "add-user-model" --preview-feature

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**Regenerating Prisma Client**

npx prisma generate

**Extending the GraphQL schema**

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### Implementing the resolver functions

**Realtime graphQL Subscriptions**

 The goal is to implement two subscriptions to be exposed by your GraphQL server:

* Send realtime updates to subscribed clients when a new Link element is *created*
* Send realtime updates to subscribed clients when an existing Link element is *upvoted*
* **What are GraphQL Subscriptions?**
  + Subscriptions are a GraphQL feature that allows a server to send data to its clients when a specific *event* happens.
    - Subscriptions are usually implemented with [WebSockets](https://en.wikipedia.org/wiki/WebSocket).
* **Implementing GraphQL subscriptions**
  + Is done using PubSub from the apollo-server library

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**Pagination**

1. Take 🡪 limit
   1. Means taking x elements after a provided start index
2. Skip 🡪 start Index
   1. If skip not provided it’s 0 by default

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**Sorting**

* In prisma it is possible to return lists of elements that are sorted (ordered) according to specific criteria

Example

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**Referring the total amount of Link elements**

* <> </> means React.Fragment

**Writing Mutation**

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Oncomplete 🡪 is a very useful feature

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**Authentication**

**Subscription with Apollo (client)**

yarn add subscriptions-transport-ws