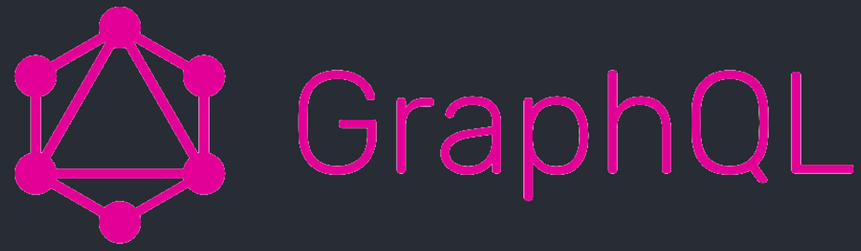
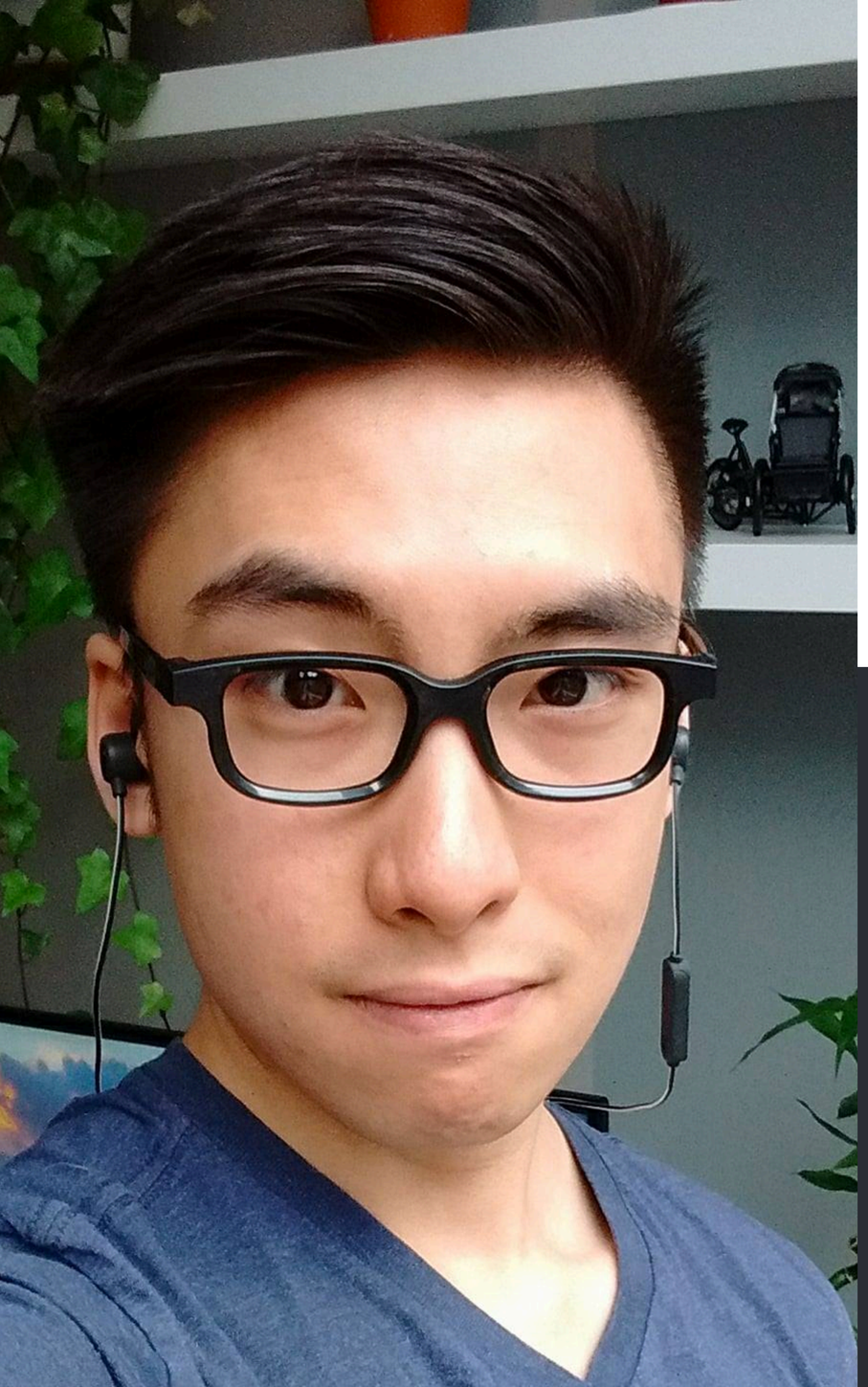
Clone this:

https://github.com/hlminh2000/gql-demo-1

Some requirements:
- node.js



A REST alternative



By day

Software developer

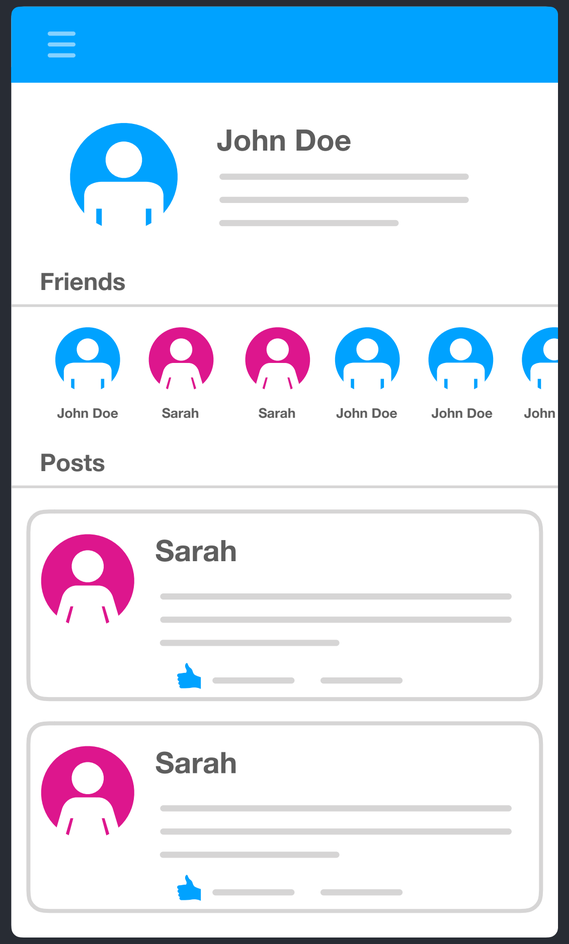
@ Ontario Institute for Cancer Research

By night

Organizer & mentor

@ freeCodeCamp Toronto study group

Traditional REST API model



/user/1234

```
{
    "id": 1234,
    "name": "John Doe",
    "email": "johndoe@email.com",
    "age": 23,
    "postIds": [23, 54, 12],
    "friendsIds": [2341, 3453]
}
```

/user/2341

```
{
    "id": 2341,
    "name": "Justin Timberlake",
    "email": "justin@email.com",
    "age": 23,
    "postIds": [45, 76, 32],
    "friendsIds": [4565, 6756]
}
```

/user/2345

```
{
    "id": 2345,
    "name": "Justin Richardson",
    "email": "justinrichardson@email.com",
    "age": 9000,
    "postIds": [56, 233, 756],
    "friendsIds": [2234, 678]
}
```

...

/post/23

```
{
  "text": "I'm feeling happy",
  "likes": [ {"user": "Steve"}, {"user": "Someone"} ],
  "comments": [
    { "author": "Steve", "text": "Me too" }
    { "author": "John", "text": "What's up" }
  ]
},
```

...

- takes at least 3 network requests

- under & over fetching

- how do you know what endpoint to hit?

- how do you know what data will be received?

...

GET /posts/?user_id=1234

GET /user/1234/friends

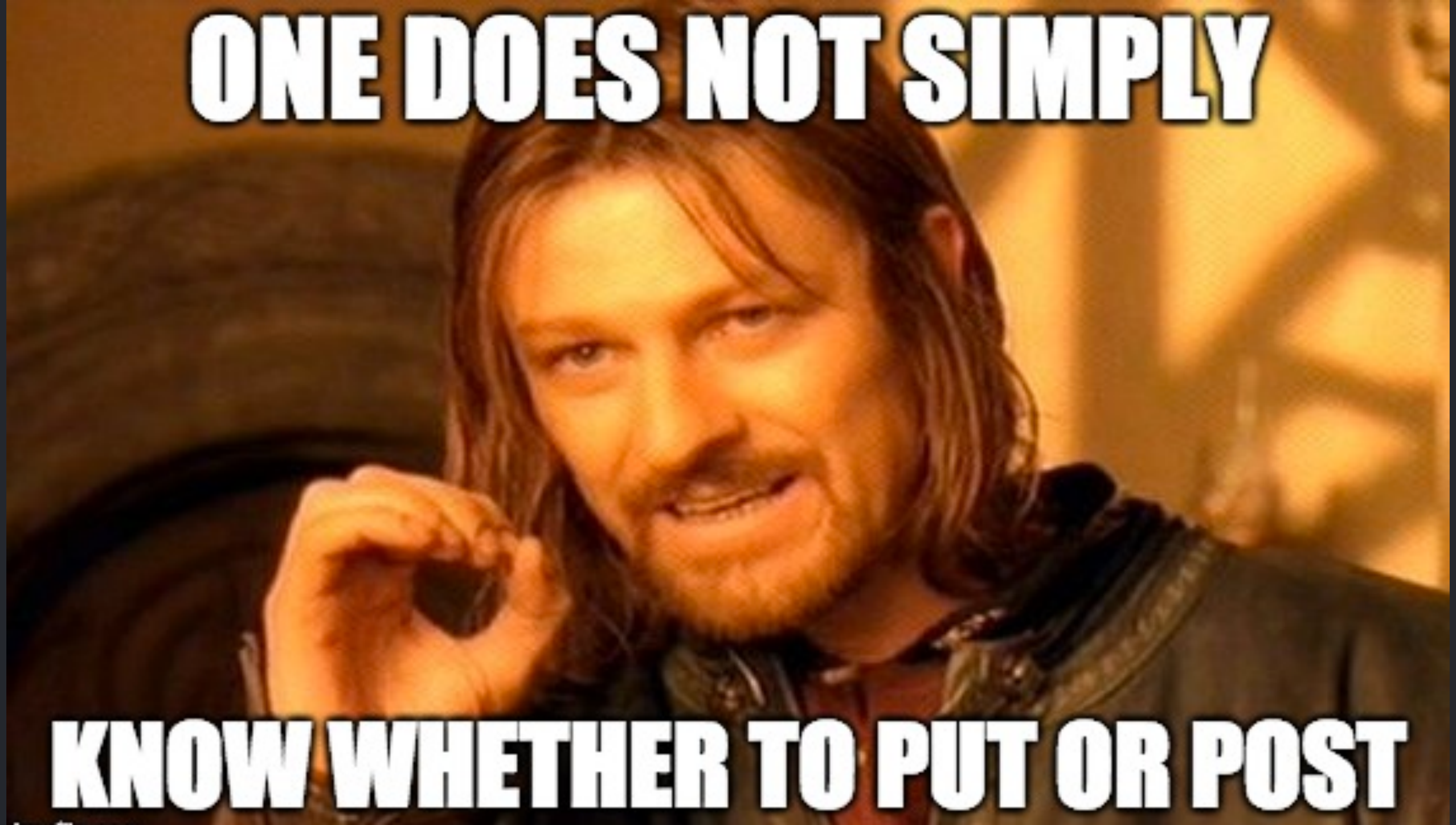
POST /postsByUser

```
{
    userId: 1234
}
```

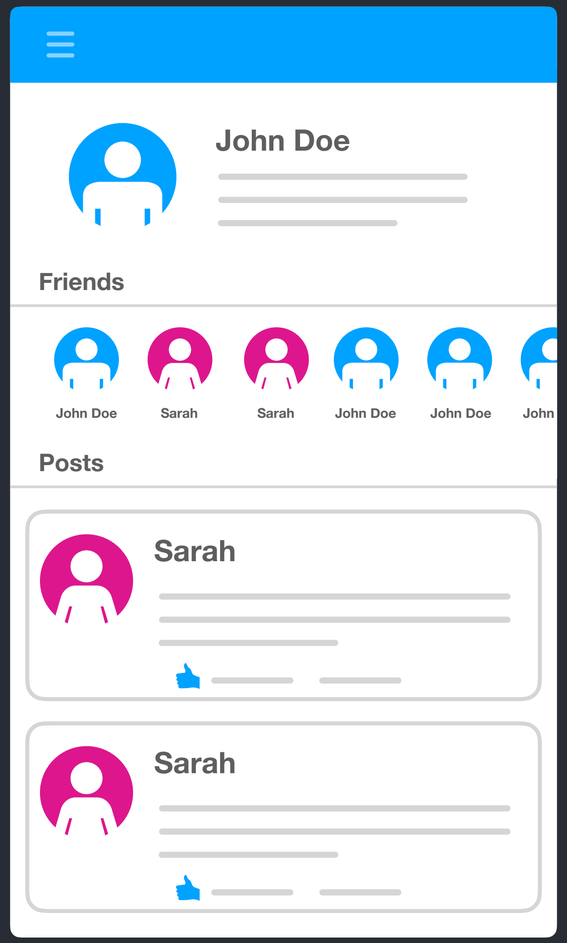
Is this the best we can do?

The problem over time:

- Too many ad-hoc endpoints
- Some end points grow too big
- WAIT, THAT'S NOT EVEN REST!


ONE DOES NOT SIMPLY
KNOW WHETHER TO PUT OR POST

GraphQL



/graphql

```
Query {
  user(id: 1234) {
    id
    name
    description
    friends {
      name
    }
    posts {
      text
      likes
    }
  }
}
```

```
{
  "id": 1234,
  "name": "John Doe",
  "description": "some guy who likes to code",
  "friends": [
    { "name": "Justin Timberlake"},
    { "name": "Justin Richardson"},
    ...
  ],
  "posts": [
    {
      "text": "I'm feeling happy",
      "likes": [{"user": "Steve"}, {"user": "Someone"}]
    },
    ...
  ],
}
```

- Single end point to serve all data needs
- Provides a typed schema for your API
- HTTP is only the transport mechanism

Some facts

Developer	Facebook Open Source
Initial release	**July 2015**
Latest release	**June 2018** (first “non Draft RFC”)
Languages with implementation libraries	C# Microsoft .NET, Clojure, Elixir, GO, node JS, php, python, Ruby, Java, and more…

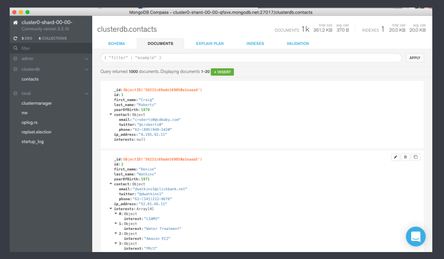
Who uses GraphQL?

Enough pitching…

Let’s jump right in!

A UI client for GraphQL APIs

MongoDB Compass



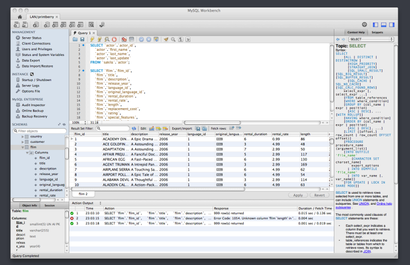
BSON queries

Query results

mongodb://user@pass:host:27017/db

mongoDB.

Mysql Workbench



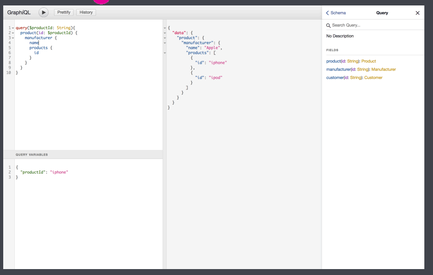
SQL queries

Query results

jdbc:mysql://hostname:3306/db

MySQL

GraphqiQL



GraphQL Queries

Query results

http://myApi.com/graphql

API

GraphQL

Front-end: Performing Query

```
Query {
  user(id: 1234) {
    id
    name
    friends {
      id
      name
      favoriteColor
    }
  }
}
```


```
{
  "data": {
    "user": {
      "id": 1234,
      "name": "John Doe",
      "friends": [
        {
          "id": 2341,
          "name": "Justin Timberlake",
          "age": 23
        },
        {
          "id": 2345,
          "name": "Justin Richardson",
          "age": 9001
        }
      ]
    }
  }
}
```

Front-end: Performing Mutation

```
Mutation {
  newUser(userData: {
    name: "Andrew",
    age: 10
  }) {
    id
    name
    age
    friends {
      name
    }
  }
}
```

```
{
  "data": {
    "newUser": {
      "id": 2342,
      "name": "Andrew",
      "age": 10,
      "friends": []
    }
  }
}
```

Front-end: Using variables

query

```
Mutation($myNewUser: UserInput) {
  newUser(userData: $myNewUser) {
    id
    name
    age
    friends {
      name
    }
  }
}
```

variables

```
{
  "myNewUser": {
    "name": "Andrew",
    "age": 10
  }
}
```

Can be factored out of GraphQL and passed in from your Javascript

Front-end: The resulting http request

```
Mutation($myNewUser: UserInput) {
  newUser(userData: $myNewUser) {
    id
    name
    age
    friends {
      name
    }
  }
}
```

```
{
  "myNewUser": {
    "name": "Andrew",
    "age": 10
  }
}
```

```
fetch("http://myApp.com/graphql", {
  method: "POST",
  headers: { "Content-Type": "application/json" },
  body: JSON.stringify({
    query: `
      Mutation($myNewUser: UserInput) {
        newUser(userData: $myNewUser) {
          id
          name
          age
          friends {
            name
          }
        }
      }
    `,
    variables: {
      "myNewUser": {
        "name": "Andrew",
        "age": 10
      }
    }
  })
})
```

In practice… example usage with a GraphQL client library

```
export default (gql`{
  user(id: 1234) {
    id
    name
    age
    friends {
      id
      name
      favoriteColor
    }
  }
}`)(({data: {user}}) => (
  <div>
    <h1>{user.name}</h1>
    <h2>{user.age}</h2>
    <li>
      {user.friends.map(friend => (
        <div key={friend.id}>
          <h3>{friend.name}</h3>
        </div>
      ))}
    </li>
  </div>
));
```

```
export default graphql(gql`
  Mutation($myNewUser: UserInput) {
    newUser(userData: $myNewUser) {
      id
      name
      age
      friends {
        name
      }
    }
  }
`)(({ mutate }) => (
  <button
    onClick={() => mutate({
      variables: {
        "myNewUser": {
          "name": "Andrew",
          "age": 10
        }
      }
    })}
  >
    New User
  </button>
));
```

- Directly bind UI data and actions to server model
- Reduces need for client-side state management and “data plumbing”

Back-end: GraphQL schema

```
interface Entity {
  id: ID!
}

type User implements Entity{
  id: ID!
  name: String!
  favoriteColor: String!
  friends: [User]
}

type FriendShip {
  from: User
  to: User
  createdTime: String!
}

input UserInput {
  name: String!
  favoriteColor: String!
}
```

```
type Query {
  user(id: ID!): User
}

type Mutation {
  newUser(userData: UserInput): User
  newFriendship(from: ID!, to: ID!): FriendShip
}
```

Built-in scalar types:

Int: A signed 32-bit integer

Float: A signed floating-point value

String: A UTF-8 character sequence

Boolean: true or false

ID: signifies a unique identifier, meant to be non-human readable

interface: abstract types that include a list of fields for other types to implement

type: represents a type of object you can **READ** from the API

input: represents an object type you can **SEND** to the API
Note: notice the difference between the User type and the UserInput type

Query: a special type every GraphQL schema has that defines all the entry points

Mutation: a special type that defines all the write operations that can be performed (in the REST world, that's all of POST, PUT, PATCH and DELETE)

Other features: **enum**, **union** types, custom **scalar** types, **directives**

Back-end: Resolvers

Schema

```
type User implements Entity {
  id: ID!
  name: String!
  age: Number!
  friends: [User]
}

type Query {
  user(id: ID!): User
}
```

Resolver

```
const resolveUserById = (obj, args, context, info) => {
  return getUserById(args.id).then(user => ({
    id: user.id,
    name: user.name,
    age: user.age,
    friends: (obj, _, context, info) =>
      user.friendIds.map(id => resolveUserById(obj, { id }, context, info))
  }));
};

const resolvers = {
  Query: {
    user: resolveUserById
  }
};
```

Back-end: Resolver function signature

```
const resolveUserById = (obj, args, context, info) => {
  return getUserById(args.id).then(user => ({
    id: user.id,
    name: user.name,
    age: user.age,
    friends: (obj, _, context, info) =>
      user.friendIds.map(id => resolveUserById(obj, { id }, context, info))
  }));
};

const resolvers = {
  Query: {
    user: resolveUserById
  }
};
```

Arguments:

obj: object containing the result returned from the resolver on the parent field

args: object containing the arguments passed in from the query

context: object shared by all resolvers in a particular query, used for holding per-request states

info: contains information about the execution state of the query (field name, path from root, etc…) This is only used in very advanced cases

Return types:

One of the following:

- **null** or **undefined**, indicating object could not be found
- An **array**, if the schema indicates a list type
- A **promise**. Can be combined with arrays (array of promises or promise that resolves to an array)
- A **scalar** or **object** value

Demo app

Clone & follow instruction: https://github.com/hlminh2000/gql-demo-1

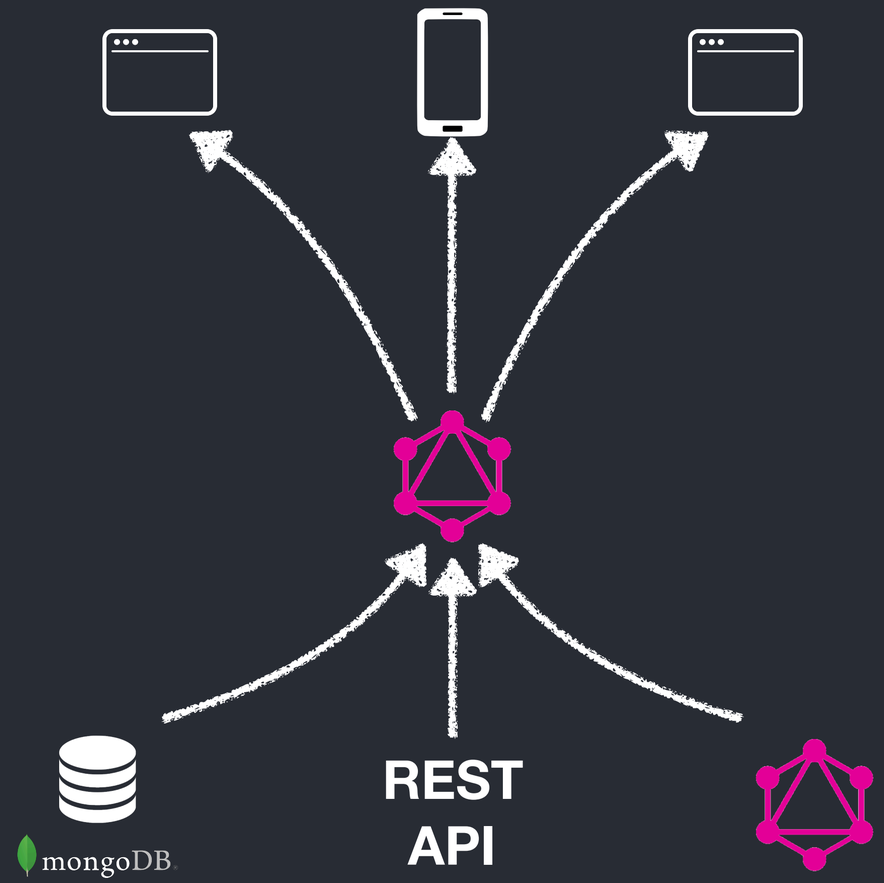
Challenge:
Make the remove buttons work

1. Create new Mutation in schema typedefs
2. Write resolver for the new mutation
3. Create a remove button with mutation applied

DOs and DON'Ts

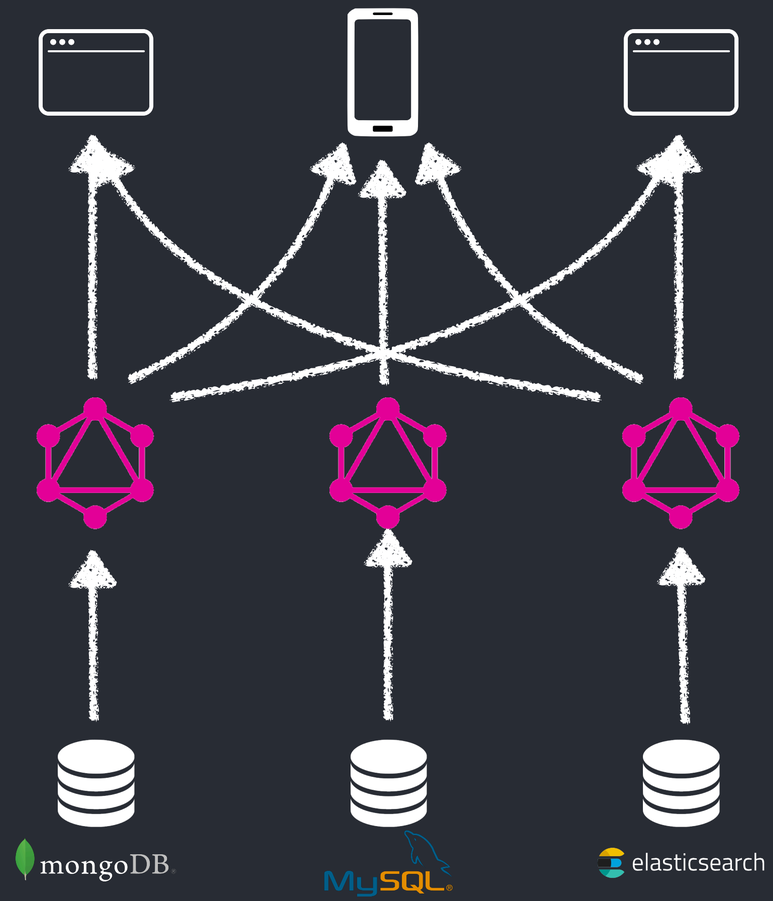
✓

One endpoint to resolve from multiple resources



✗

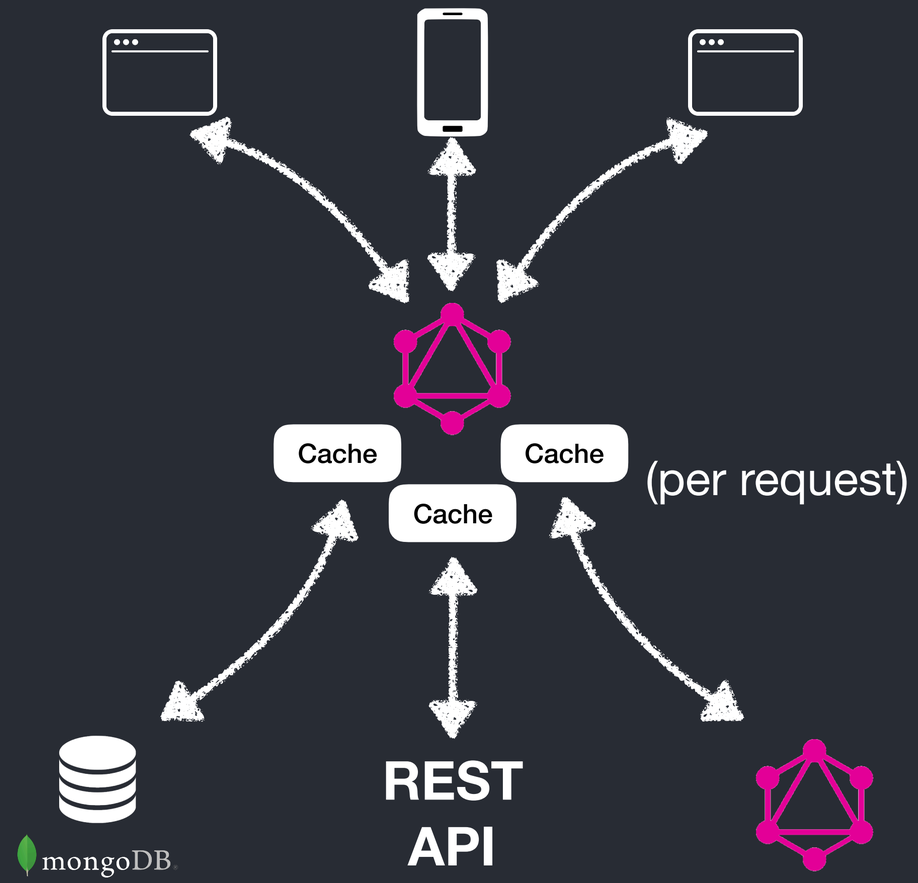
Multiple apps (or end points) to wrap each resource



DOs and DON’Ts

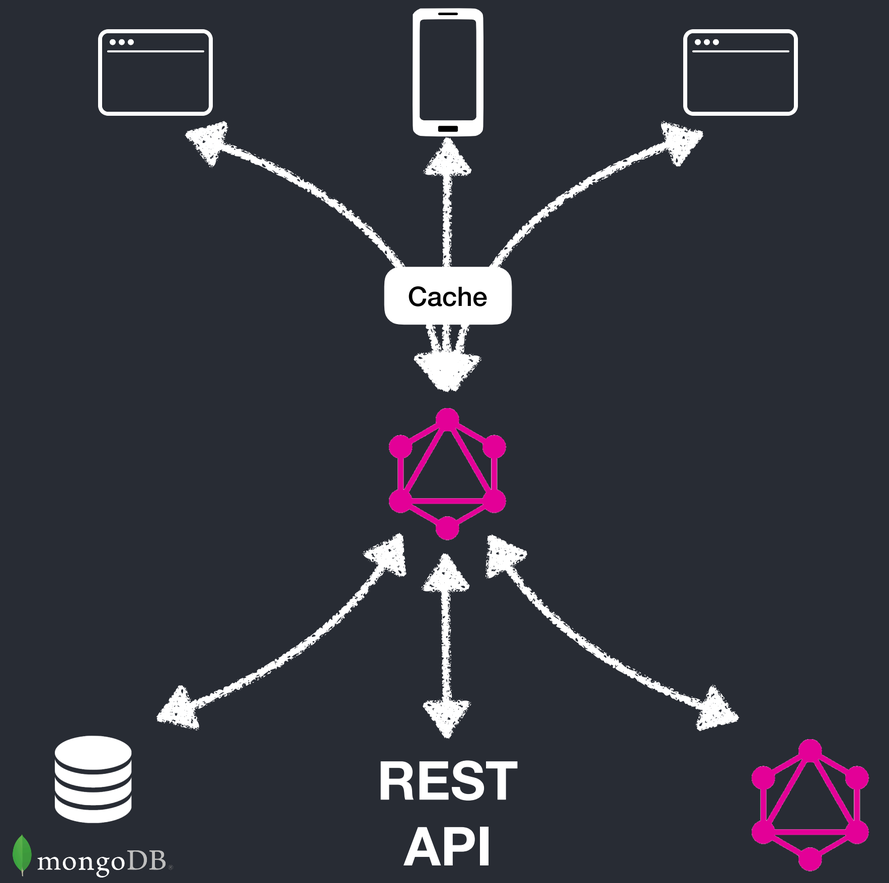
✓

Per-request caching and batching in resolver to reduce unnecessary requests



✗

Catch-all http cache will cause bad things to happen



We just scratched the surface…

Resolvers

Query

Mutations

Schema stitching

Subscription

Remote schemas

Custom scalar

Directives

The Graphql AST

…

Cool GraphQL resources

Some cool GraphQL APIs

https://github.com/APIs-guru/graphql-apis/blob/master/README.md

Apollo Launchpad - a “codepen” for prototyping Graphql APIs

https://launchpad.graphql.com/new

How to GraphQL - The Full Stack tutorial for GraphQL

https://www.howtographql.com/