Exercise 13

Create a simple GraphQL server in Node.js using Mongo as a database server

Prior Knowledge
Unix Command Line Shell
Some simple JavaScript (node.js)

Learning Objectives
Understand GraphQL

Software Requirements
Node.js
npm/yarn
Mongo
Visual Studio Code

Thanks to this guide which this is heavily based on:
https://freo.me/do-node-graphql

Steps

1. First let's install MongoDB client tools

   ```
   sudo apt install mongodb-clients mongo-tools -y
   ```

2. Now let's run mongodb in a container:

   ```
   docker run -p 27017:27017 mongo
   ```

3. Check it works in a new terminal instance:

   ```
   mongo
   ```

4. Please note that we haven't set up any security for the database. This is not a good thing. Don't do this in production :-)

5. Type
   `exit`
   to leave the mongo client command prompt.

6. Clone my simple sample repository:

```
cd ~
git clone https://github.com/pzfreo/graphql-example.git
cd graphql-example
yarn install
```

7. Import some data into Mongo:

```
mongoimport -d test -c bios bios.json
```

   This is this data:
   https://docs.mongodb.com/manual/reference/bios-example-collection/

8. Have a look using the mongo client

```
mongo

> use test
switched to db test

> db.bios.find({})
```

   You should see something like:

```
{ "_id" : 4, "name" : { "first" : "Kristen", "last" : "Nygaard" },
"birth" : ISODate("1926-08-27T04:00:00Z"), "death" :
ISODate("2002-08-10T04:00:00Z"), "contribs" : [ "OOP", "Simula" ],
"awards" : [ { "award" : "Rosing Prize", "year" : 1999, "by" :
"Norwegian Data Association" }, { "award" : "Turing Award", "year" :
2001, "by" : "ACM" }, { "award" : "IEEE John von Neumann Medal",
"year" : 2001, "by" : "IEEE" } ] }
```

9. Exit the mongo client

10. Take a look at our app:

    ```
    code index.js
    ```

    The first part imports and sets up the connection to the Mongo database.

```
const express = require('express');
const graphqlHTTP = require('express-graphql');
const { buildSchema } = require('graphql');
const { MongoClient } = require('mongodb');

const context = () => MongoClient.connect('mongodb://localhost:27017/test', { useNewUrlParser: true })
  .then(client => client.db('test'));
```

    Next is the definition of the GraphQL schema.

```
// Construct a schema, using GraphQL schema language
const schema = buildSchema(`
  type Query {
    bios: [Bio]
    bio(id: Int): Bio
  }
  type Mutation {
    addBio(input: BioInput) : Bio
  }
  input BioInput {
    name: NameInput
    title: String
    birth: String
    death: String
  }
  input NameInput {
    first: String
    last: String
  }
  type Bio {
    name: Name,
    title: String,
    birth: String,
    death: String,
    awards: [Award]
  }
  type Name {
    first: String,
    last: String
  },
  type Award {
    award: String,
    year: Float,
    by: String
  }
`);
```

The next interesting part is:

```
46  // Provide resolver functions for your schema fields
47  const resolvers = {
48    bios: (args, context) =>context().then(db => db.collection('bios').find().toArray()),
49    bio: (args, context) =>context().then(db => db.collection('bios').findOne({ _id: args.id })),
50    addBio: (args, context) => context()
51      .then(db => db.collection('bios').insertOne(
52          { name: args.input.name,
53            title: args.input.title,
54            death: args.input.death,
55            birth: args.input.birth}))
56      .then(response => response.ops[0])
57  };
```

This defines what queries do when called.

For example,

- when you do a GraphQL query “bios”
- this will do a mongodb

  `db.collection(‘bios’).find().toArray().`

The rest of the file is basically "boilerplate" and would be almost the same in any other example using express-graphql to implement graphql.

```
55  const app = express();
56  app.use('/graphql', graphqlHTTP({
57    schema,
58    rootValue: resolvers,
59    context,
60    graphiql: true
61  }));
62  app.listen(4000);
63
64  console.log(`🚀 Server ready at http://localhost:4000/graphql`);
```

One interesting thing to note is the enabling of *GraphiQL:*

```
graphiql: true
```

This is super cool and we'll see it in a minute.

11. Start the server

```
$ node index.js
🚀 Server ready at http://localhost:4000/graphql
```

12. You may see a warning:
```
node:4087) [MONGODB DRIVER] Warning: Current Server Discovery and
Monitoring engine is deprecated, and will be removed in a future
version. To use the new Server Discover and Monitoring engine,
pass option { useUnifiedTopology: true } to the MongoClient
constructor.
```

Ignore this!

13. In a new terminal window try:

```
http localhost:4000/graphql query='{ bios { name { first }}}'
```

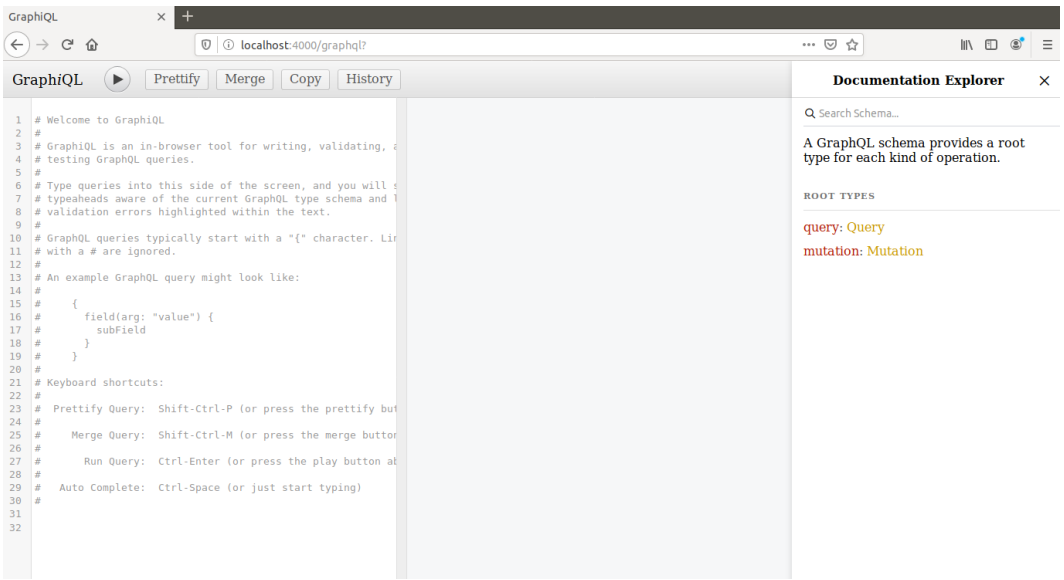
You should see something like:

```
HTTP/1.1 200 OK
Connection: keep-alive
Content-Length: 298
Content-Type: application/json; charset=utf-8
Date: Wed, 27 Nov 2019 08:56:09 GMT
ETag: W/"12a-aMvPeBKQdQnnT/UJvxWxZ4tD9Pc"
X-Powered-By: Express

{
    "data": {
        "bios": [
            {
                "name": {
                    "first": "Kristen"
                }
            },
            {
                "name": {
                    "first": "Ole-Johan"
                }
            },
…
}
```

14. Now browse to http://localhost:4000/graphql
This is the GraphiQL interface (pronounced “graphical”).

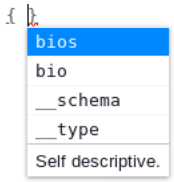
You should see something like:



15. Have a read of the commented out help.

16. Below the comments start typing:
```
{ bi
```

You will see the auto-completion kick in:



17. Add name to the query:

```
{ bios { name
} }
```

18. Hit the Play button  or Ctrl-Enter

19. You will see GraphiQL will add first / last into the query to make it into a valid query:

```
{ bios { name {
  first
  last
}
} }
```

20. You should see the query response like this:


```
{
  "data": {
    "bios": [
      {
        "name": {
          "first": "Kristen",
          "last": "Nygaard"
        }
      },
      {
        "name": {
          "first": "Ole-Johan",
          "last": "Dahl"
        }
      },
      {
        "name": {
          "first": "Guido",
          "last": "van Rossum"
        }
      },
      {
        "name": {
          "first": "Dennis",
          "last": "Ritchie"
        }
      },
      {
        "name": {
          "first": "Yukihiro",
          "last": "Matsumoto"
        }
      },
```


21. If we look at the schema (in index.js) again, you should see this part:

```
type Query {
    bios: [Bio]
    bio(id: Int): Bio
}
```

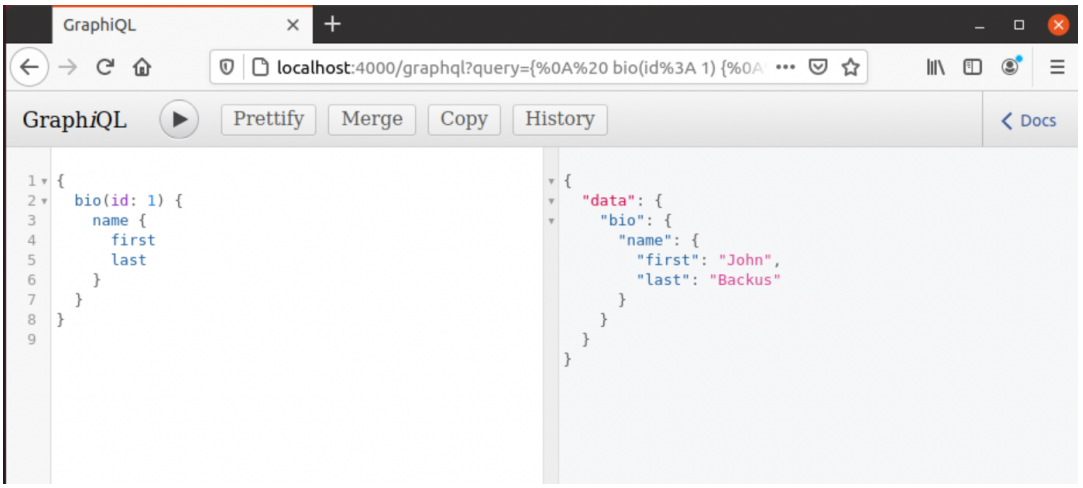
And this is the corresponding code:

```
bios: (args, context) =>context().then(db =>
      db.collection('bios').find().toArray()),
bio: (args, context) =>context().then(db =>
      db.collection('bios').findOne({ _id: args.id })),
```

What this means, is that the “bios” query has no parameters and pulls back all the records from the collection (find()), while the “bio” query has a single parameter (id) and queries the collection to findOne with that id.

22. Try out the find one method:

```
{ bio(id:1) {
  name {
    first
    last
  }
}}
```



23. Updates in GraphQL are called mutations.

Here is the part of the schema that lets us do an update:

```
type Mutation {
  addBio(input: BioInput) : Bio
}
input BioInput {
  name: NameInput
  title: String
  birth: String
  death: String
}
input NameInput {
  first: String
  last: String
}
```

And here is the code that is called when you do a mutation:

```
50    addBio: (args, context) => context()
51      .then(db => db.collection('bios').insertOne(
52        { name: args.input.name,
53          title: args.input.title,
54          death: args.input.death,
55          birth: args.input.birth}))
56      .then(response => response.ops[0])
```

24. Try adding some data into the database:

```
mutation {
      addBio(input: { name: { first: "John", last: "Smith" } })
      { name { first, last } }
}
```

25. Rerun the “bios” query and you will now see John Smith in the list

26. Re-run the update and new query from HTTPie (i.e. not using GraphiQL)

27. Is GraphQL “restful”? What reasons do you have for saying yes or no?

If you aren’t doing extensions you can remove the docker instance running Mongo and stop the node.js server.

That’s all for a basic intro to GraphQL

Extensions:

1. Add a query to search by first name and return all the records with that first name.

2. If you have done the API management lab, add your GraphQL API as a managed API (you will need to create the schema as a separate file)

   Docs are here:
   https://apim.docs.wso2.com/en/latest/learn/design-api/create-api/create-a-graphql-api/

3. **(Harder!)**
   Create an Order service that has a similar schema to our RESTful service but uses GraphQL instead.