#APISummit 2021

API TESTING SUMMIT 2021

Automated Testing of GraphQL API

Unmesh Gundecha

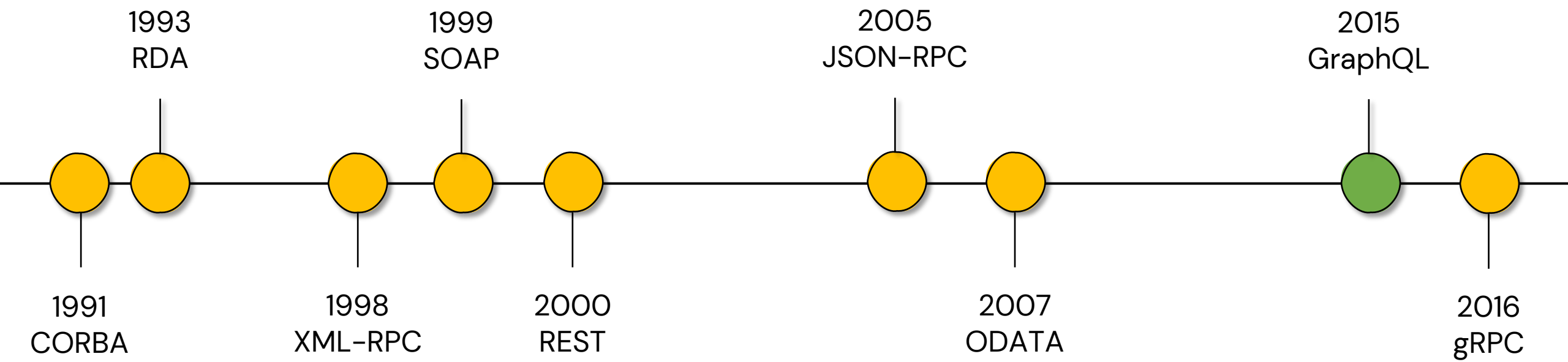
Senior Architect, Test Engineering DveOps and Developer Experience (DX)

Find me on LinkedIn - https://www.linkedin.com/in/upgundecha/ | Twitter @upgundecha

Contents

- A brief history of API
- What is GraphQL?
- REST vs GraphQL
- Benefits of GraphQL
- How GraphQL Works?
- Testing Tools
- Schema and Types
- Queries and Mutations
- Demo (Playground, Postman & Supertest)
- Resources

A brief history of API



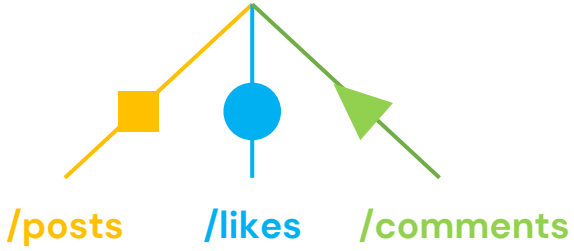
API styles over time, Source: Rob Crowley

What is GraphQL?

A query language for your API

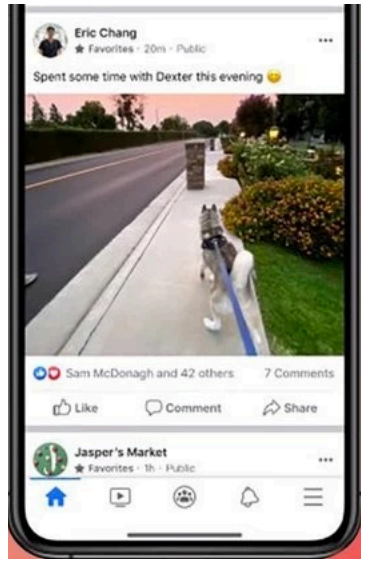
Built at Facebook in 2012 and open sourced in 2015

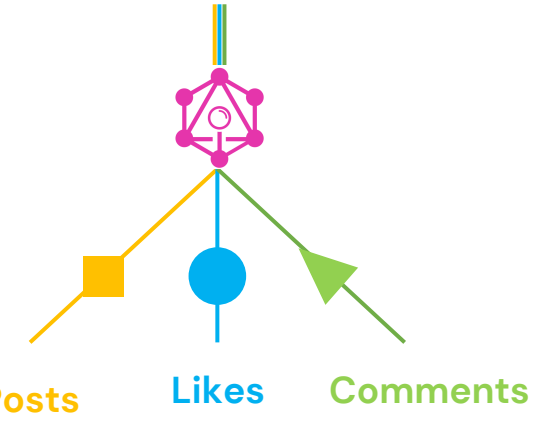
REST



Facebook Mobile App back in 2012

GraphQL





Fetching data with multiple API calls

Performance degradation with over fetching

Fetching data with a single API call

What is GraphQL?

GraphQL is **a query language for APIs** and a runtime for fulfilling those queries with your existing data. GraphQL provides a complete and understandable description of the data in your API, gives clients the power to ask for **exactly what they need** and nothing more, makes it easier to evolve APIs over time, and enables powerful developer tools.

Source: https://graphql.org/

REST vs GraphQL

1. Filter down the data
2. Aggregate the data
3. Waterfall requests for data

from this

```
/users/id
/users/id/posts
/post/id/likes
/post/id/comments
```

1. Receive exactly what you ask for
2. No filtering or aggregation
3. Single call

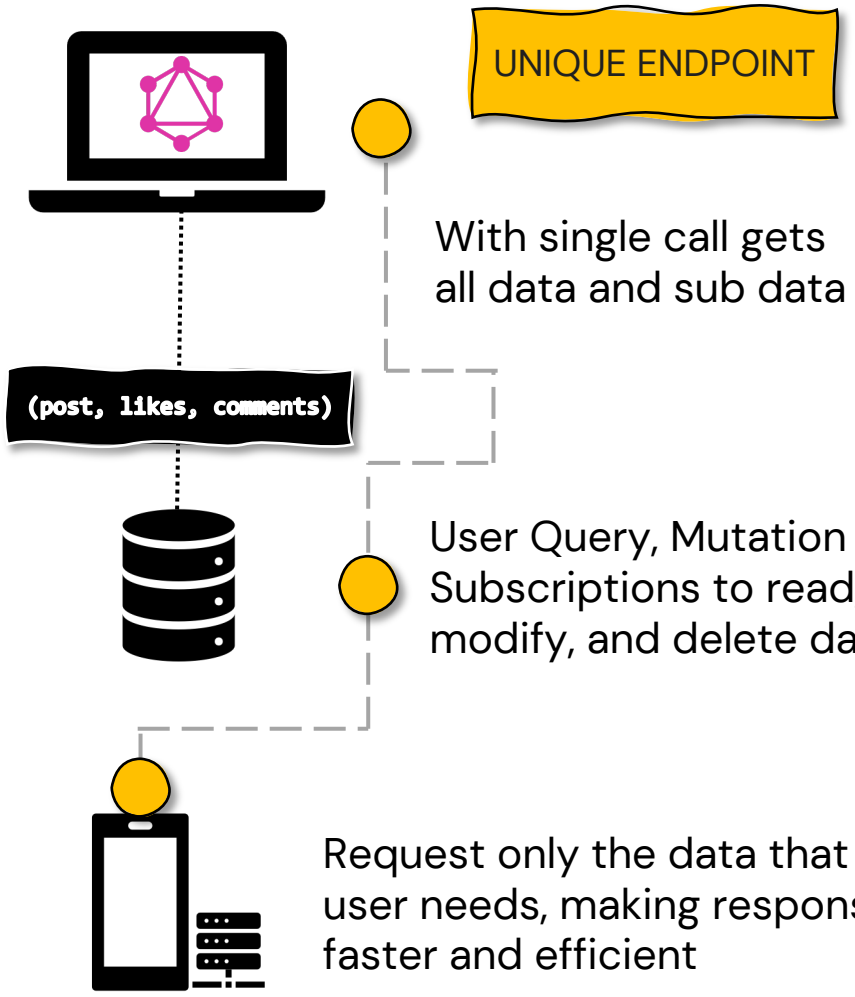
to this

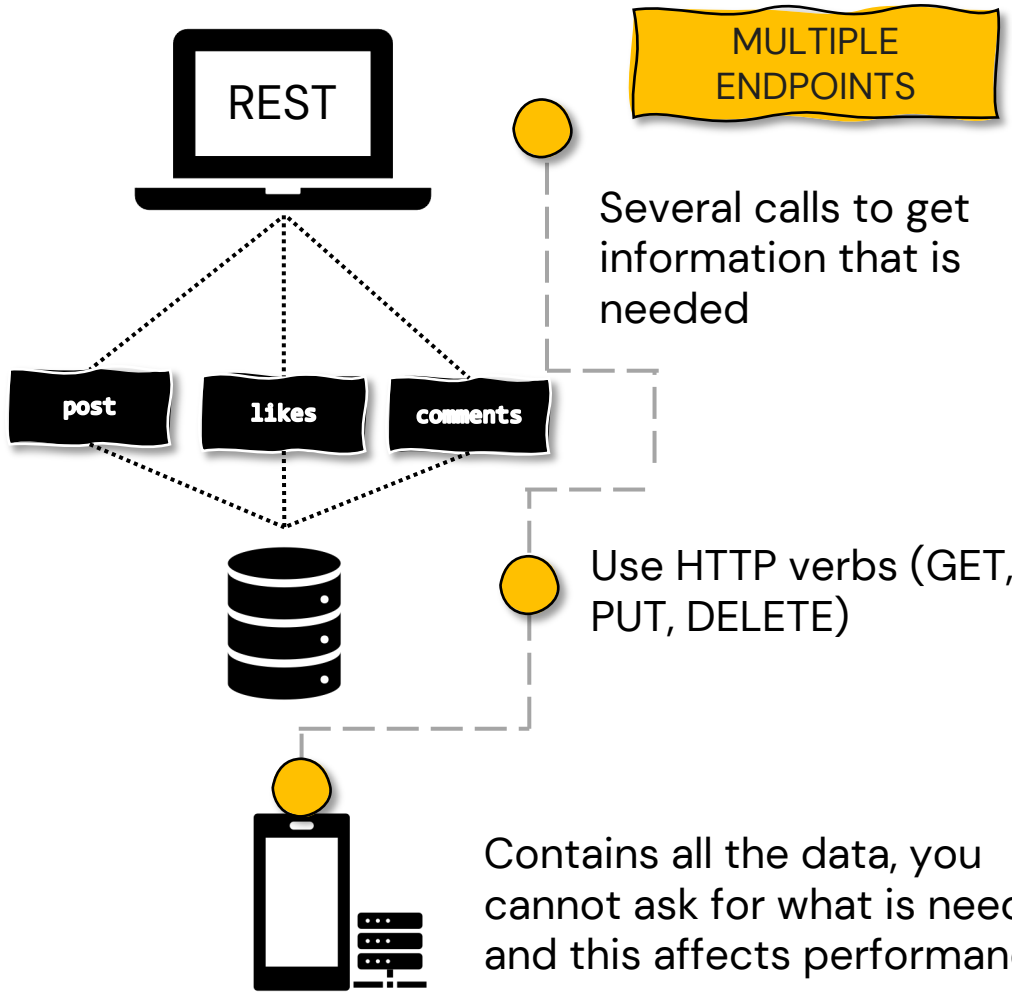
```
query {
  User(id: 1) {
    name
    posts {
      title
      likes
     }
     comments(last: 3) {
        name
        text
      }
    }
  }
}
```

REST vs GraphQL

	REST	GraphQL
Architecture	Server-driven	Client-driven
Organized in terms of	endpoints	Schema and types
Format	XML, JSON, HTML, Plain Text	JSON
Self documenting	No	Yes
Learning Curve	Easy	Medium
Community	Large	Growing
Versioning	Yes	Not Required (depreciation of types)
Use Cases	Public APIs, resource driven apps	Mobile APIs, complex systems, micro-services

Source https://www.altexsoft.com/blog/soap-vs-rest-vs-graphql-vs-rpc/





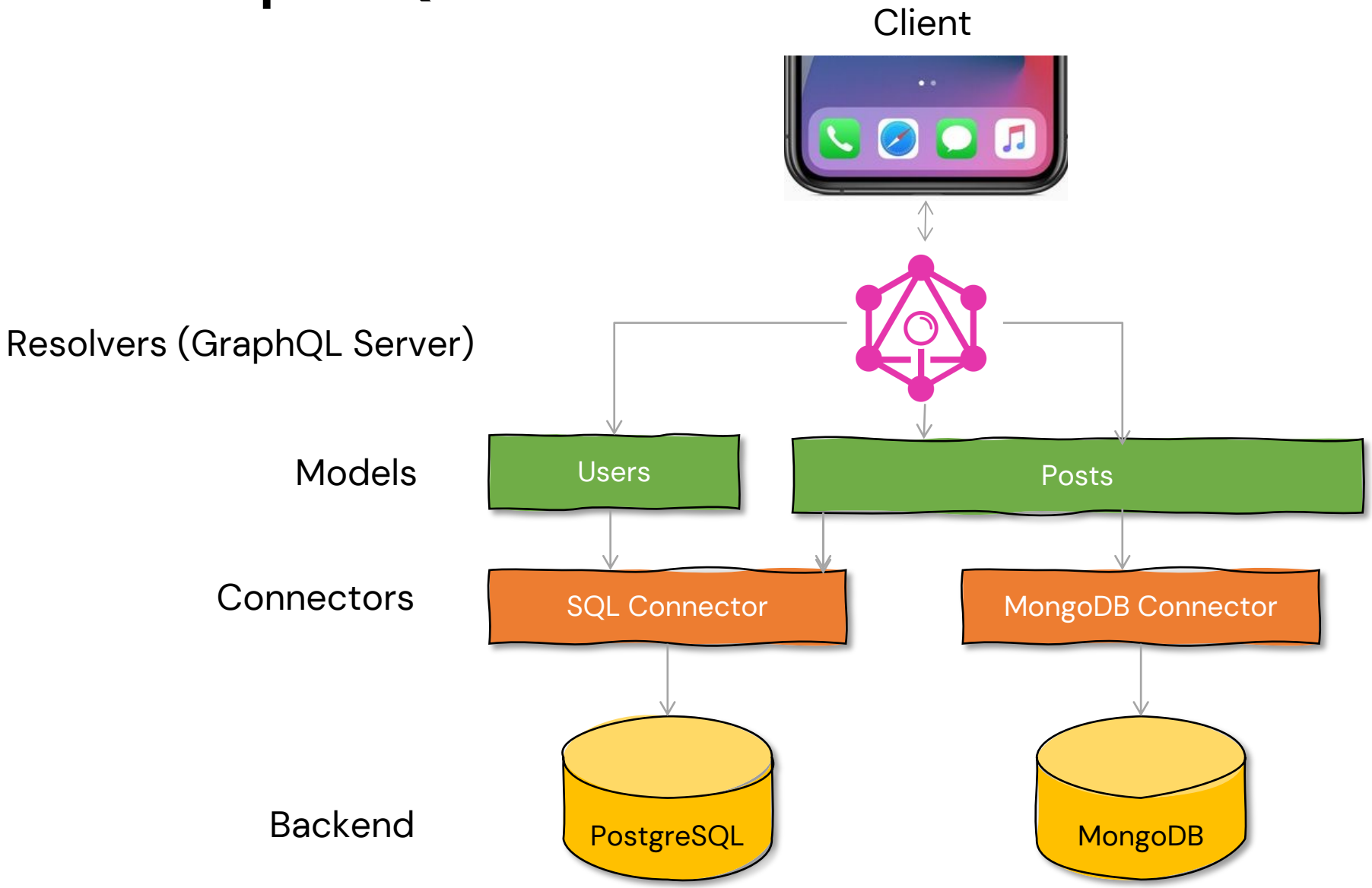
Server driven,
Doesn't required versioning (types can be deprecated
Growing community and adoption
Self documenting
Use cases - Mobile APIs, complex systems, micro-services

Client driven
Versioning adds complexity
Widely used and large user community
Lack self documentation
Use cases - Public APIs, resource driven apps

Benefits of GraphQL 

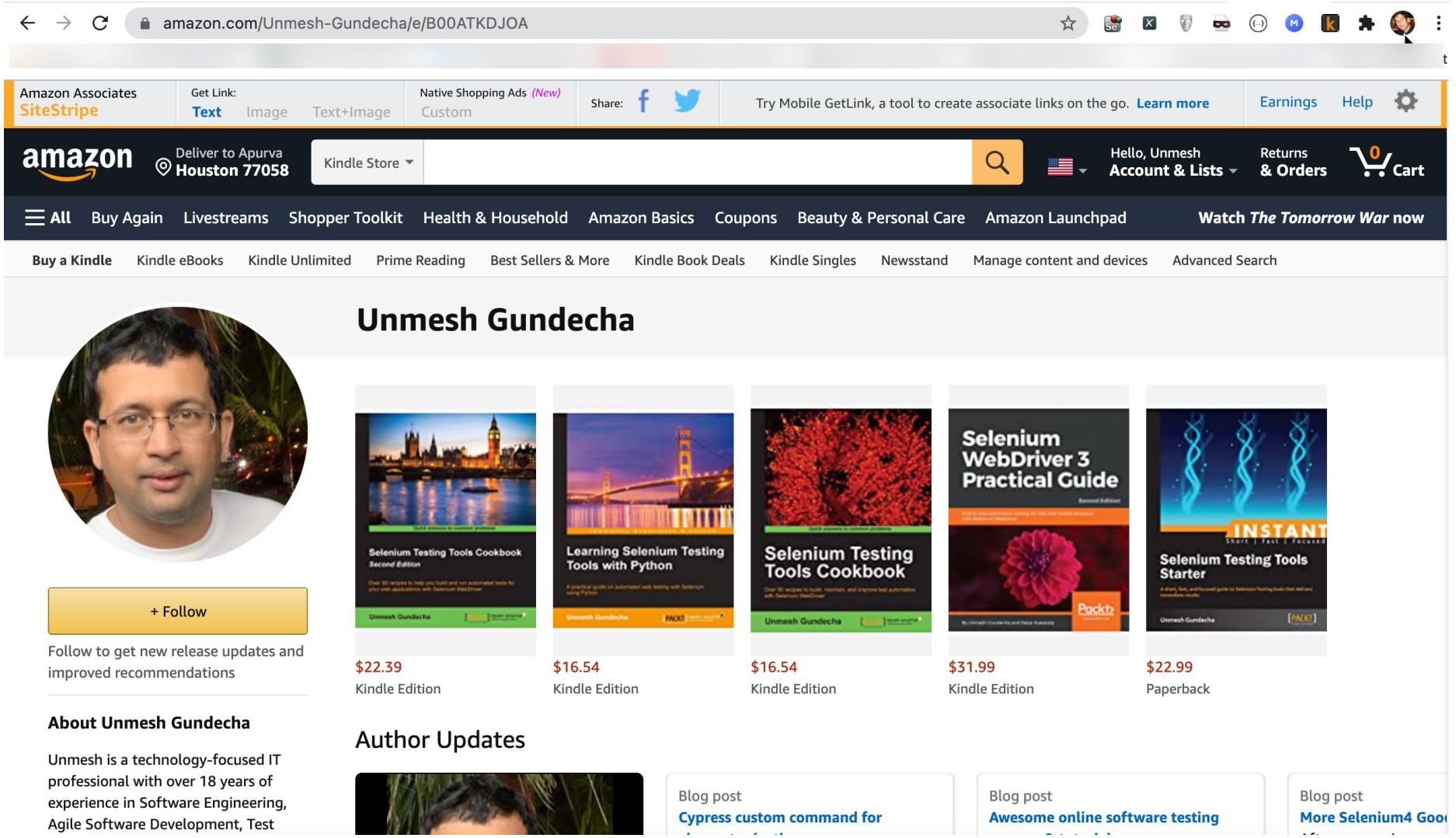
- Good fit for complex systems and microservices
- Fetching data with a single API call
- No over- and under-fetching problems
- Tailoring requests to your needs
- Validation and type checking out of the box
- Autogenerating API documentation
- API evolution without versioning
- Code-sharing

How GraphQL Works?



Query execution in GraphQL, Source: Jonas Helfer

Our demo app

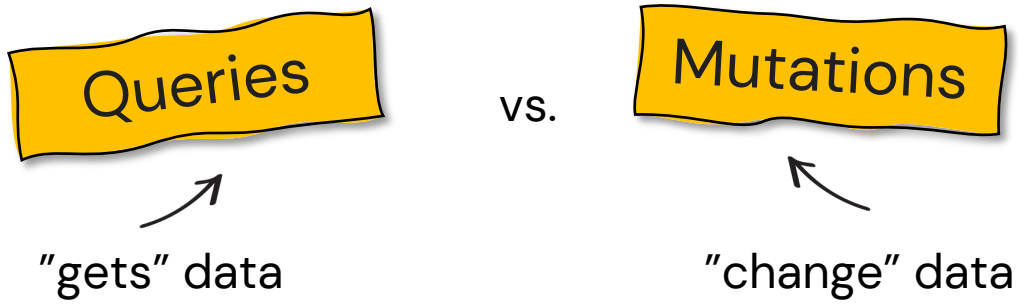

amazon.com/Unmesh-Gundecha/e/B00ATKDJOA
Amazon Associates SiteStripe
Get Link: Text Image Text+Image
Native Shopping Ads (New) Custom
Share:
Try Mobile GetLink, a tool to create associate links on the go. Learn more
Earnings Help
amazon
Deliver to Apurva Houston 77058
Kindle Store
Hello, Unmesh Account & Lists
Returns & Orders
0 Cart
All Buy Again Livestreams Shopper Toolkit Health & Household Amazon Basics Coupons Beauty & Personal Care Amazon Launchpad
Watch The Tomorrow War now
Buy a Kindle Kindle eBooks Kindle Unlimited Prime Reading Best Sellers & More Kindle Book Deals Kindle Singles Newsstand Manage content and devices Advanced Search
Unmesh Gundecha
+ Follow
Follow to get new release updates and improved recommendations
About Unmesh Gundecha
Unmesh is a technology-focused IT professional with over 18 years of experience in Software Engineering, Agile Software Development, Test
Selenium Testing Tools Cookbook Second Edition
$22.39
Kindle Edition
Learning Selenium Testing Tools with Python
$16.54
Kindle Edition
Selenium Testing Tools Cookbook
$16.54
Kindle Edition
Selenium WebDriver 3 Practical Guide
$31.99
Kindle Edition
INSTANT Selenium Testing Tools Starter
$22.99
Paperback
Author Updates
Blog post
Cypress custom command for
Blog post
Awesome online software testing
Blog post
More Selenium4 Goo

Schema and Types

- Schema is contract between client and server
- Each object is of specific type
- Each type defines a number of fields
- Each field has a type (String, Int, Float, Boolean)
- The exclamation mark denotes that the field is mandatory or non-nullable

```
const { buildSchema } = require("graphql");

const schema = buildSchema(`
    type Query {
        authors: [Author!]!,
        author(id: Int!): Author!
    }

    type Author {
        id: ID!
        name: String!
        books: [Book!]
    }

    type Book {
        id: ID!
        title: String!
        published: Boolean!
        year: Int!
        link: String
        rating: Float!
        author: Author!
    }
`);

module.exports = schema;
```

Queries and Mutations



Queries are used to request the data from the server. Unlike REST APIs where there's a clearly defined structure of information returned from each endpoint, GraphQL always exposes only one endpoint, allowing the client to decide what data it really needs from a predefined pattern

Mutations are used to modify data on the server. The mutations are equivalent to how you'd use the CUD operations using HTTP Verbs such as POST, PUT, PATCH and DELETE from REST APIs. In GraphQL it will always be a POST call. It is a write followed by fetch operation.

Queries

At its simplest, GraphQL is about asking for specific fields on objects. Let's start by looking at a very simple query and the result we get when we run it:

```
query {
  authors {
    name
  }
}
```

”gets”

```
{
  "data": {
    "authors": [
      {
        "name": "Unmesh Gundecha"
      },
      {
        "name": "Dima Kovalenko"
      },
      {
        "name": "James Bond"
      }
    ]
  }
}
```

Queries

```
query {
  author(id: 1) {
    name
    books {
      title
    }
  }
}
```

”gets”

```
{
  "data": {
    "author": {
      "name": "Unmesh Gundecha",
      "books": [
        {
          "title": "Selenium Testing
Tools Cookbook - Second Edition 2nd
Edition"
        },
        {
          "title": "Selenium
WebDriver 3 Practical Guide: End-to-
end automation testing for web and
mobile browsers with Selenium
WebDriver, 2nd Edition"
        }
      ]
    }
  }
}
```

Mutation

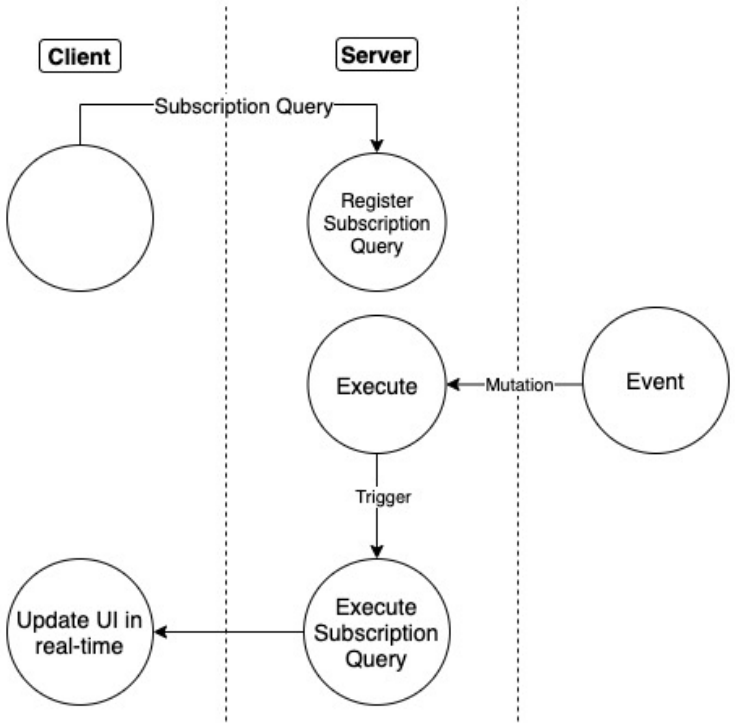
```
mutation {
  createAuthor(name: "Foo Bar") {
    id
    name
  }
}
```

”adds”

```
{
  "data": {
    "createAuthor": {
      "id": "6",
      "name": "Foo Bar"
    }
  }
}
```

Subscriptions

Subscriptions allow clients to listen to real-time messages from the server. The client connects to the server with a bi-directional communication channel using the WebSocket protocol and sends a subscription query that specifies which event it is interested in. When an event is triggered, the server executes the stored GraphQL query, and the result is sent back to the client using the same communication channel.




```
type Todo @withSubscription {
 id: ID!
 title: String!
 description: String!
 completed: Boolean!
}
```

Source: https://dgraph.io/docs/graphql/subscriptions/

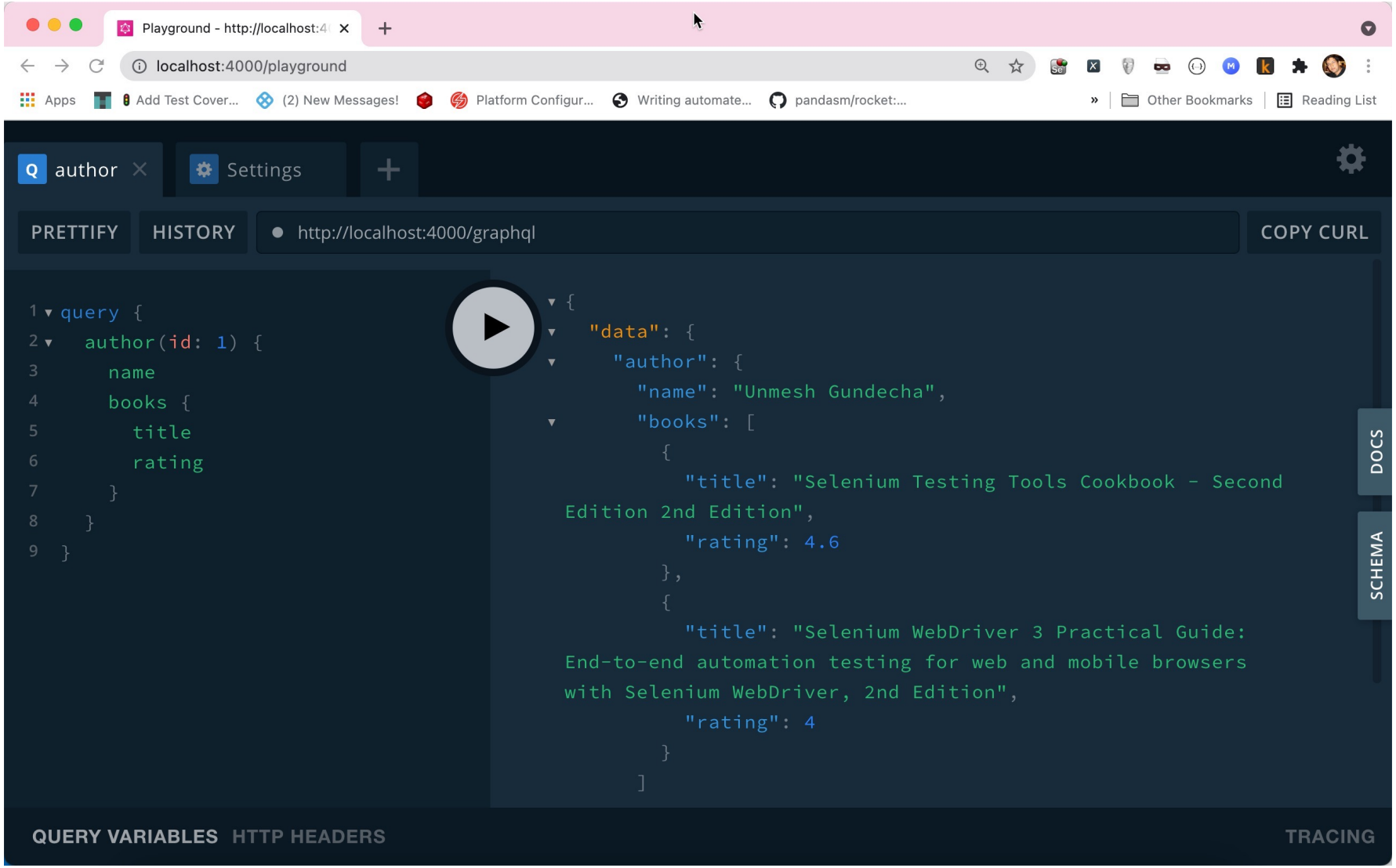
Tools for testing GraphQL

1 cURL	2 Postman	3 RestAssured
4 Karate	5 Supertest	6 Easygraphql -tester
7 RestSharp	8 graphene (Python)	9 graphql-ruby

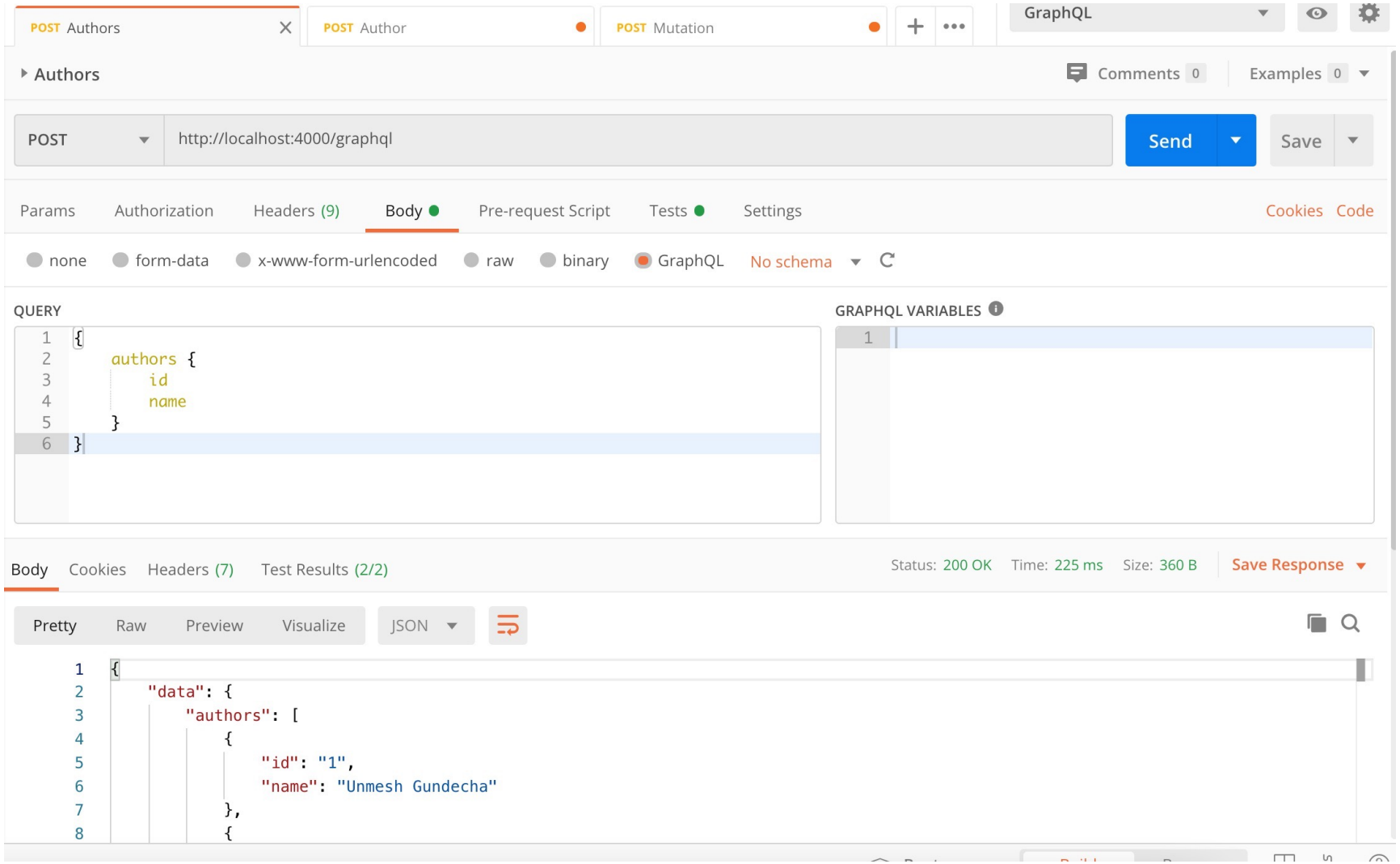
or combining any graphql client with a testing framework can be used to automate tests...


Demo Time!

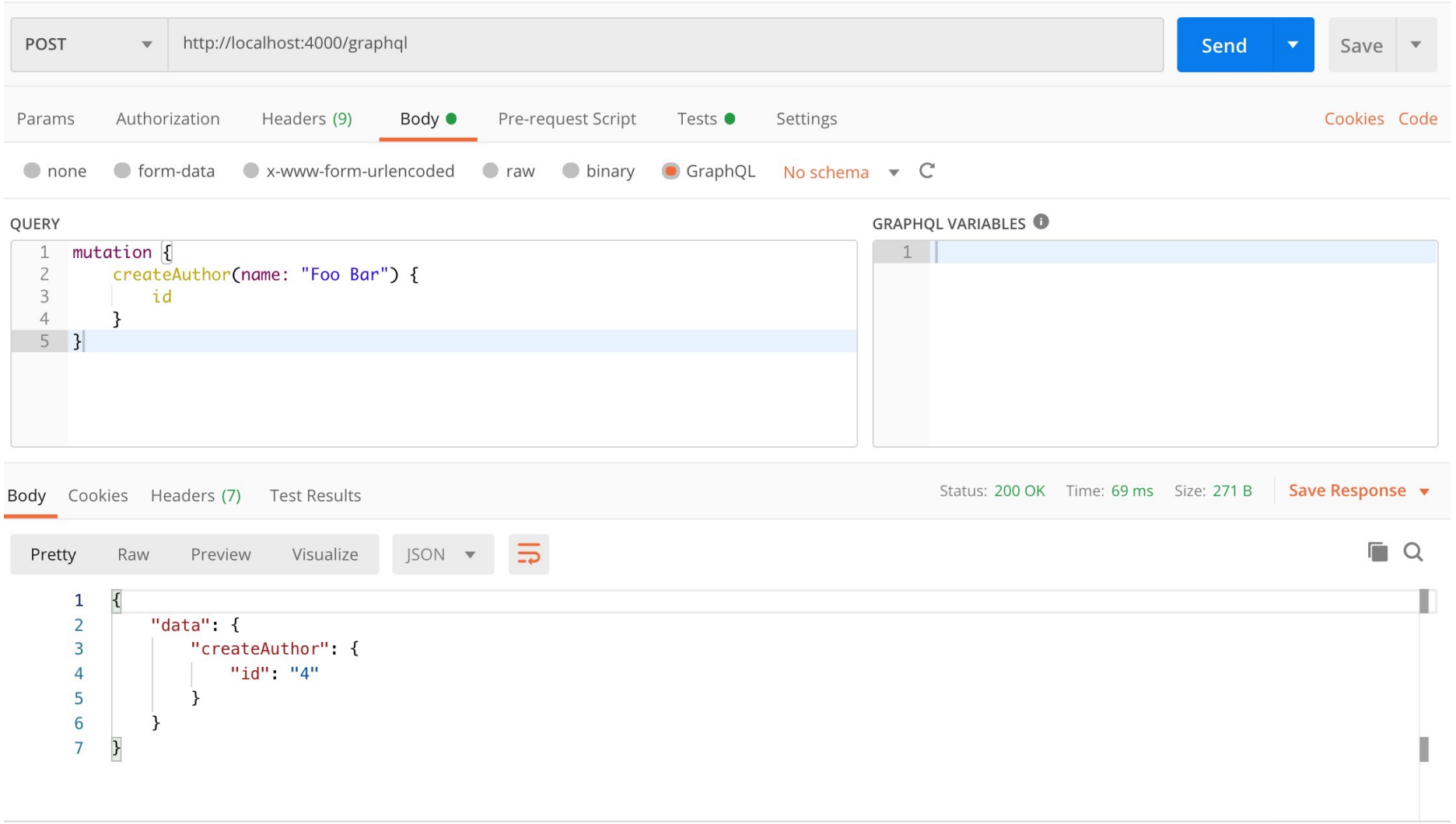
Playground


Playground - http://localhost:4
localhost:4000/playground
Apps
Add Test Cover...
(2) New Messages!
Platform Configur...
Writing automate...
pandasm/rocket:...
Other Bookmarks
Reading List
author
Settings
PRETTIFY
HISTORY
http://localhost:4000/graphql
COPY CURL
query {
author(id: 1) {
name
books {
title
rating
}
}
}
{
"data": {
"author": {
"name": "Unmesh Gundecha",
"books": [
{
"title": "Selenium Testing Tools Cookbook - Second Edition 2nd Edition",
"rating": 4.6
},
{
"title": "Selenium WebDriver 3 Practical Guide: End-to-end automation testing for web and mobile browsers with Selenium WebDriver, 2nd Edition",
"rating": 4
}
]
DOCS
SCHEMA
QUERY VARIABLES
HTTP HEADERS
TRACING

Postman - Query



Postman – Mutation



Supertest - Query

```
const app = require("../src/server");
const supertest = require("supertest");
const { stopDatabase } = require("../src/database");

const request = supertest(app);

afterAll(async () => {
  await stopDatabase();
});

test("fetch authors", async (done) => {
  request
    .post("/graphql")
    .send({
      query: "{ authors{ id, name} }",
    })
    .set("Accept", "application/json")
    .expect("Content-Type", /json/)
    .expect(200)
    .end(function (err, res) {
      if (err) return done(err);
      expect(res.body).toBeInstanceOf(Object);
      expect(res.body.data.authors.length).toEqual(3);
      names = res.body.data.authors.map((val,index) => val.name)
      expect(names).toEqual(expect.arrayContaining(["Unmesh Gundecha","Dima Kovalenko","James Bond"]));
      done();
    });
});
```

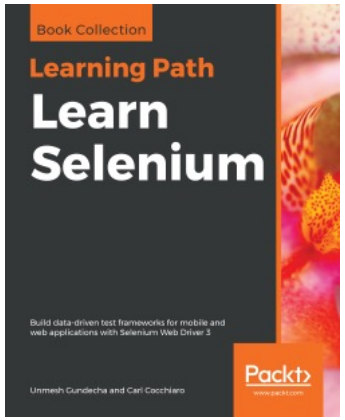
Supertest - Mutation

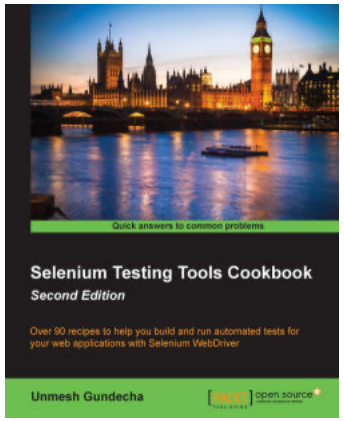
```
const app = require("../src/server");
const supertest = require("supertest");
const { stopDatabase } = require("../src/database");

const request = supertest(app);

afterAll(async () => {
  await stopDatabase();
});

test("create author", async (done) => {
  request
    .post("/graphql")
    .send({
      query:`mutation {
              createAuthor(name: "Foo Bar") {
               name
              }
            }`
    })
    .set("Accept", "application/json")
    .expect("Content-Type", /json/)
    .expect(200)
    .end(function (err, res) {
      if (err) return done(err);
      expect(res.body).toBeInstanceOf(Object);
      expect(res.body.data.createAuthor.name).toEqual("Foo Bar");
      done();
    });
});
```

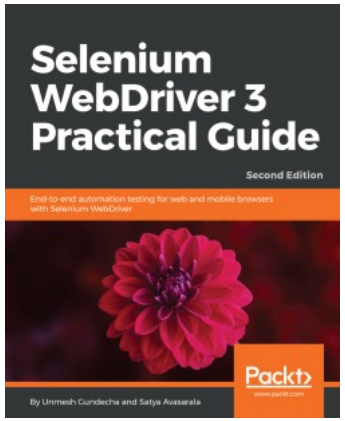
Resources

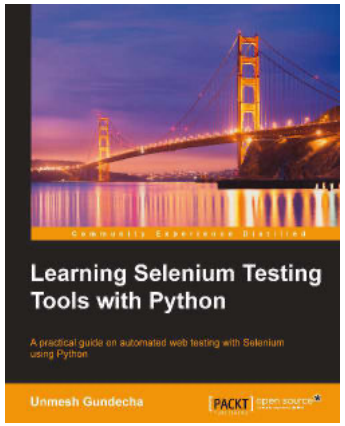
- Code from this session – https://github.com/chentsulin/awesome-graphql
- GraphQL – https://graphql.org/
- Awesome GraphQL – https://github.com/chentsulin/awesome-graphql

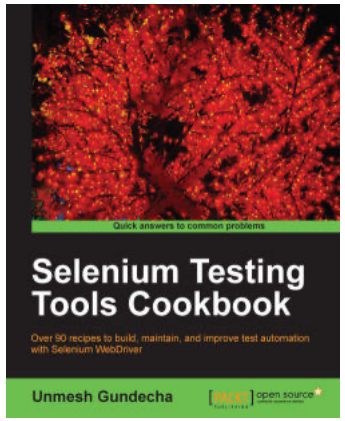
My Books & Blog











https://www.amazon.com/~/e/B00ATKDJOA

Follow me on LinkedIn - https://www.linkedin.com/in/upgundecha/ | Twitter @upgundecha