



GraphQL in Cisco's B2B

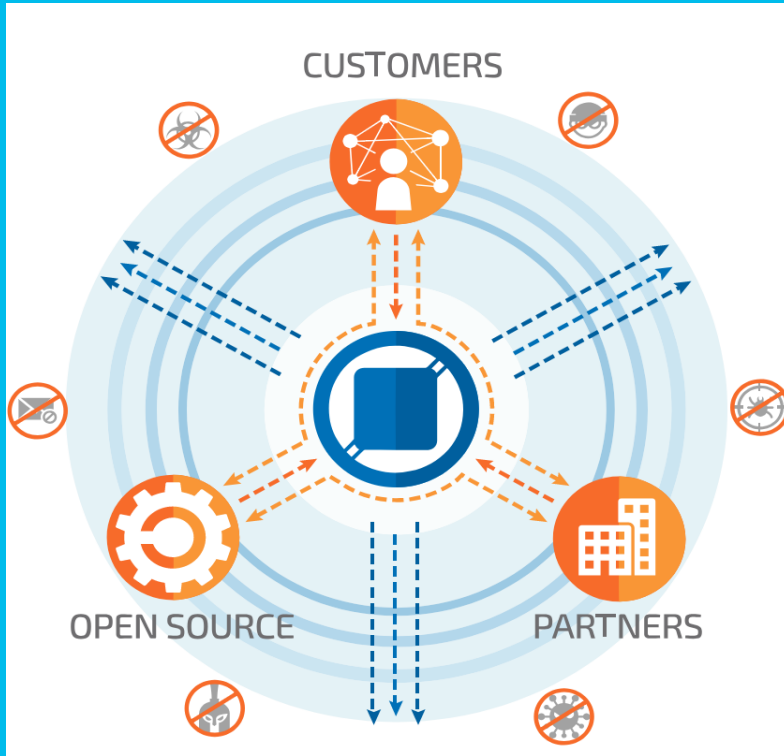
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Agenda

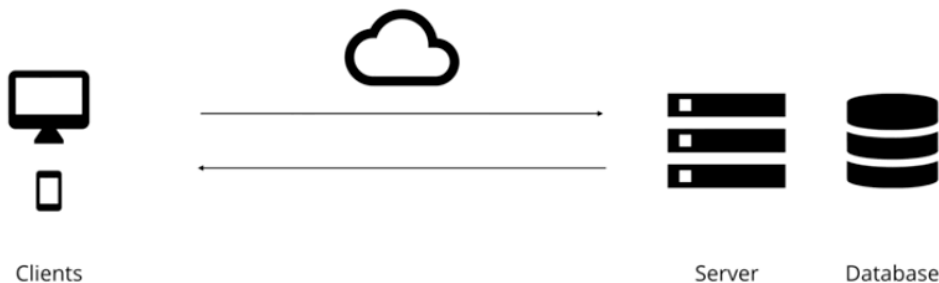


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What is GraphQL?

- New API standard that was invented and open-sourced by Facebook
- Enables declarative data fetching
- GraphQL server exposes single endpoint and responds to precise queries

A Query Language for APIs



A more efficient Alternative to REST

- REST has been a popular way to expose data from server
- But we need to consider 3 factors on how APIs are designed in the future:
 - 1) Increased mobile usage creates need for efficient data loading
 - 2) Variety of different frontend frameworks and platforms on the client, with GraphQL each client can access precisely the data it needs
 - 3) Fast development speed and expectation for rapid feature development

Important: GraphQL is great for frontend developers as **data fetching complexity is pushed to the server-side**, opportunities for new abstractions on the frontend

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 many different backend and frontend frameworks
- Already used in production by companies such as Github, Yelp, Shopify, Twitter, Coursera
- Conferences: GraphQL-Europe, GraphQL Summit in San Francisco

Beauty of GraphQL: You only get what you ask for, need to be precise and list the fields you need within the query

GraphQL is more flexible than REST

- REST: stateless servers and structured access to resources
- BUT changing requirements on client-side don't go well with static nature of REST
- GraphQL was developed to cope with need for more flexibility and efficiency in client-server communication
- 1 single API endpoint, only send 1 single POST request and server will respond all information that is needed
- Minimizes over-fetching and under-fetching of data from server back to client

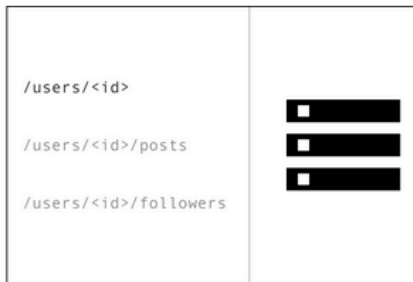
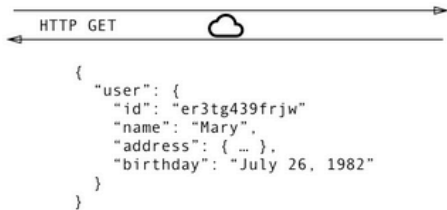
Over-fetching: Downloading unnecessary data

Under-fetching: An endpoint doesn't return enough of the right information, need to send multiple requests

- GraphQL is not a replacement for REST, just another tool to build applications
- Wrap REST APIs with GraphQL on top

With traditional REST...we gather data by accessing multiple endpoints.

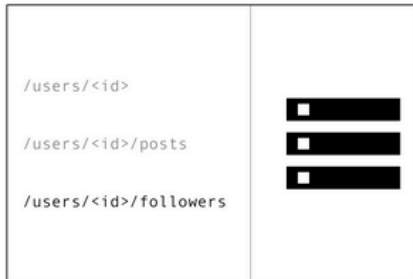
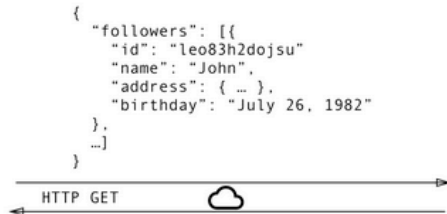
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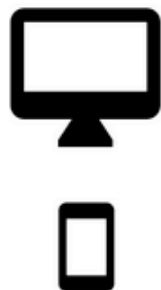


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With REST, you have to make three requests to different endpoints to fetch the required data. You're also *overfetching* since the endpoints return additional information that's not needed.

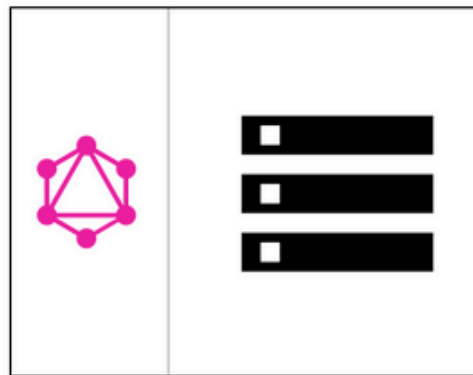
With GraphQL...we simply send a single query to the GraphQL server that includes the concrete data requirements. The server then responds with a JSON object where requirements are fulfilled.



```
query {  
  User(id: "er3tg439frjw") {  
    name  
    posts {  
      title  
    }  
    followers(last: 3) {  
      name  
    }  
  }  
}
```



```
{  
  "data": {  
    "User": {  
      "name": "Mary",  
      "posts": [  
        { title: "Learn GraphQL today" }  
      ],  
      "followers": [  
        { name: "John" },  
        { name: "Alice" },  
        { name: "Sarah" },  
      ]  
    }  
  }  
}
```



Using GraphQL, the client can specify exactly the data it needs in a *query*. Notice that the *structure* of the server's response follows precisely the nested structure defined in the query.

GraphQL provides insightful analytics



Fine-grained info
about what data is
read by clients



Enables evolving API
and deprecating
unneeded data



Client specifies exactly
what information it is
interested in



Strong type system to
define capabilities of
an API using a **schema**

Schema Definition Language

Adding a relation

```
type Person {  
  name: String!  
  age: Int!  
  posts: [Post!]!  
}
```

```
type Post {  
  title: String!  
  author: Person!  
}
```



GraphQL Core Concepts

1) Fetching data with Queries

2) Writing Data with Mutations

3 kinds: creating new data, updating existing data and deleting existing data

3) Realtime updates with Subscriptions

When a client subscribes to an event(i.e when a new user gets created), it will initiate and hold a steady connection to the server, when that event happens, server will push corresponding data to the client

Note: Can think of subscription as a stream of data sent over to the client

```
type Query {  
  allPersons(last: Int!): [Person!]!  
  allPosts(last: Int!): [Post!]!  
}
```

```
type Mutation {  
  createPerson(name: String!, age: String!): Person!  
  updatePerson(id: ID!, name: String!, age: String!): Person!  
  deletePerson(id: ID!): Person!  
  createPost(title: String!): Post!  
  updatePost(id: ID!, title: String!): Post!  
  deletePost(id: ID!): Post!  
}
```

```
type Subscription {  
  newPerson: Person!  
  updatedPerson: Person!  
  deletedPerson: Person!  
  newPost: Post!  
  updatedPost: Post!  
  deletedPost: Post!  
}
```

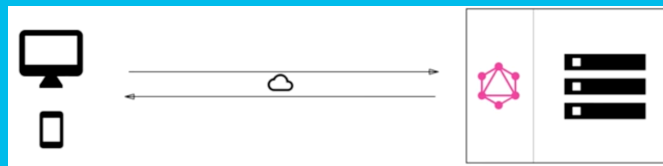
```
type Person {  
  id: ID!  
  name: String!  
  age: Int!  
  posts: [Post!]!  
}
```

```
type Post {  
  id: ID!  
  title: String!  
  author: Person!  
}
```

3 Architectural Use Cases for GraphQL

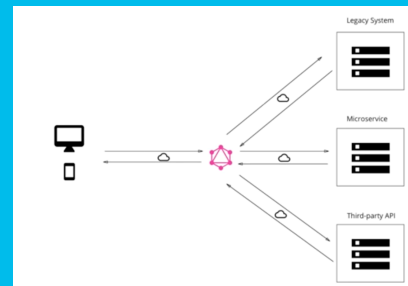
1) GraphQL server with a connected database

- Often used for greenfield projects
- Uses single web server that implements GraphQL
- Server resolves queries and constructs response with data that it gets from the database

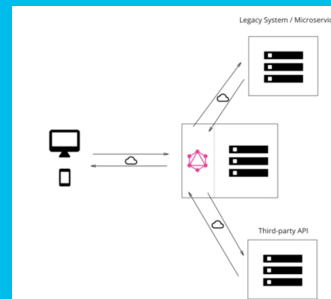


2) GraphQL Server to integrate existing system without connected database

- For companies with legacy infrastructure and many different APIs
- Used to unify existing systems and hide complexity of data fetching on the backend
- GraphQL web server doesn't need to care about data sources



3) Hybrid approach with a connected database and integration of existing system



Important Concept: Resolver functions



Recall that queries/mutations consists of set of fields



GraphQL has 1 resolver function per field



Purpose of each resolver function is to fetch the data for its corresponding field

Important Concept: Resolver functions (example)

```
query {  
  User(id: "er3txsa9frju") {  
    name  
    friends(first: 5) {  
      name  
      age  
    }  
  }  
}
```



Resolvers



```
User(id: String!): User  
name(user: User!): String!  
age(user: User!): Int!  
friends(first: Int, user: User!): [User!]!
```

With GraphQL, there is a positive shift from imperative to declarative data fetching on the client side

Imperative data fetching:

- 1) Construct and send HTTP request (i.e fetch in JS)
- 2) Receive and parse server response
- 3) Store data locally
- 4) Display information in UI



Declarative data fetching:

- 1) Describe data requirements
- 2) Display information in UI

What's next?

- Will apply GraphQL in Cisco's B2B for pricing catalogs, promotions, orders, invoices
- Stay tuned!

References

<https://www.howtographql.com>