

A red and white buoy is lying on a pebbly beach. The ocean is in the background under a blue sky with light clouds. The text is overlaid on the image.

# GraphQL, REST or RPC? Making the choice!

Rob Allen  
October 2024



*APIs can be realised in any style  
but, which makes the most sense?*



# RPC APIs





# RPC APIs

- Call a function on a remote server



# RPC APIs

- Call a function on a remote server
- Common implementations: JSON-RPC, SOAP, gRPC, tRPC



# RPC APIs

- Call a function on a remote server
- Common implementations: JSON-RPC, SOAP, gRPC, tRPC
- Tends to require a schema (OpenRPC, WSDL, Protocol Buffer)



# JSON-RPC

## Request:

POST / HTTP/1.1

Host: localhost:8545

```
{  
  "jsonrpc": "2.0",  
  "id": 1,  
  "method": "createUser",  
  "params": {"name": "Rob Allen", "email": "rob@akrabat.com"}  
}
```



# JSON-RPC

Response:

```
{  
  "jsonrpc": "2.0",  
  "id": 1,  
  "result": {"id": 1234}  
}
```





# RESTful APIs



# RESTful APIs

- Operate on a representation of the state of a resource



# RESTful APIs

- Operate on a representation of the state of a resource
- HTTP native



# RESTful APIs

- Operate on a representation of the state of a resource
- HTTP native
- Hypermedia controls



# RESTful APIs: Request

```
POST /users/
```

```
Content-Type: application/json
```

```
Accept: application/json
```

```
{  
  "name": "Rob Allen"  
  "email": "rob@akrabat.com"  
}
```



# RESTful APIs: Response

HTTP/1.1 201 Created

Content-Type: application/hal+json

ETag: dfb9f2ab35fe4d17bde2fb2b1cee88c1

```
{  
  "name": "Rob Allen"  
  "email": "rob@akrabat.com",  
  "_links": {  
    "self": "https://api.example.com/user/1234"  
  }  
}
```



# GraphQL APIs





# GraphQL APIs

- Retrieve only the data you need on consumer side



# GraphQL APIs

- Retrieve only the data you need on consumer side
- Reduce the number of calls to retrieve data with embedded resources



# GraphQL APIs

- Retrieve only the data you need on consumer side
- Reduce the number of calls to retrieve data with embedded resources
- Self-describing, typed schema



# Queries

```
query {  
  author(name: "Anne McCaffrey") {  
    id, name  
    books(first: 5) {  
      totalCount  
      edges {  
        node {  
          id, title  
        }  
      }  
    }  
  }  
}
```



# Queries

```
query {  
  author(name: "Anne McCaffrey") {  
    id, name  
    books(first: 5) {  
      totalCount  
      edges {  
        node {  
          id, title  
        }  
      }  
    }  
  }  
}
```



# Queries

```
query {  
  author(name: "Anne McCaffrey") {  
    id, name  
    books(first: 5) {  
      totalCount  
      edges {  
        node {  
          id, title  
        }  
      }  
    }  
  }  
}
```



# Queries: Result

```
"data": {
  "author": {
    "id": "MXxBdXRob3J8ZjA",
    "name": "Anne McCaffrey",
    "books": {
      "totalCount": 6,
      "edges": [
        {
          "node": {
            "id": "MXxCb29rfGYwNzU",
            "title": "Dragonflight"
          }
        }
      ],
    },
  },
},
```





# Queries: Result

```
"data": {
  "author": {
    "id": "MXxBdXRob3J8ZjA",
    "name": "Anne McCaffrey",
    "books": {
      "totalCount": 6,
      "edges": [
        {
          "node": {
            "id": "MXxCb29rfGYwNzU",
            "title": "Dragonflight"
          }
        }
      ],
    },
  },
}
```



# Queries: Result

```
"data": {
  "author": {
    "id": "MXxBdXRob3J8ZjA",
    "name": "Anne McCaffrey",
    "books": {
      "totalCount": 6,
      "edges": [
        {
          "node": {
            "id": "MXxCb29rfGYwNzU",
            "title": "Dragonflight"
          }
        }
      ],
    },
  },
},
```





Which to pick?



# Lamborghini or Ferrari?







# Lamborghini or Truck?



# Considerations

- What is it to be used for?
- Response customisation requirements
- HTTP interoperability requirements



# What is it to be used for?

- Do you control both server and client?
- How many users are expected?
- What is the skill level of your integrators?





# Response customisation

- GraphQL is a query-first language
- REST tends towards less customisation
- With RPC you get what you're given!



# Response customisation

- GraphQL is a query-first language
- REST tends towards less customisation
- With RPC you get what you're given!

(Your data layer's ability to efficiently retrieve the data is still key!)



# Performance

- REST and RPC puts server performance first
- GraphQL puts client performance first



# Caching

- RPC, REST and GraphQL can all cache in application layer
- REST can *additionally* cache at HTTP layer



# Errors

- RPC: Returned payload contains an error object of some form
- REST: HTTP semantics; status code
- GraphQL: Top level error object for Request errors and Field errors



# REST Errors

HTTP/1.1 503 Service Unavailable

Content-Type: application/problem+json

Content-Language: en

```
{  
  "status": 503,  
  "type": "https://example.com/service-unavailable",  
  "title": "Could not authorise user.",  
  "detail": "Auth service is down for maintenance.",  
  "instance": "https://example.com/maintenance/2023-05-12",  
  "error_code": "AUTHSERVICE_UNAVAILABLE"  
}
```



# GraphQL Errors

```
"errors": [  
  {  
    "message": "Name for character with ID 7 could not be fetched.",  
    "path": ["friends", 1, "name"]  
  }  
],  
"data": {  
  "friends": [  
    { "id": "3", "name": "F'lar", "species": "human" },  
    { "id": "7", "name": null, "species": "dragon" },  
    { "id": "9", "name": "Mnementh", "species": "dragon" },  
  ]  
}
```





# Versioning

- RPC, GraphQL and REST can all version via evolution as easily as each other



# Versioning

- RPC, GraphQL and REST can all version via evolution as easily as each other
- GraphQL is very good for deprecation of specific fields



# Design considerations

It's *always* hard!



# Design considerations

It's *always* hard!



# It's your choice



*If you suck at providing a REST API,  
you will suck at providing a GraphQL API*

Arnaud Lauret, API Handyman





Thank you!

# Photo credits

- Choose Pill: <https://www.flickr.com/photos/eclib/4905907267>
- Lamborghini & Ferrari: <https://akrab.at/3w0yFmg>
- Lamborghini & Truck: <https://akrab.at/3F4kAZk>