

From REST to GraphQL in 90'

December 21st 2017



Agenda



Theory (P.De Martino, 30')

- Use Case: The Reservations Page
- REST solution(s)
 - Underfetching
 - Views & Overfetching
 - Multiple Views & Feature Flags
- GraphQL
 - Schema & Types System
 - Field Resolvers
 - Queries



Coding (F.S. Ferrara, 30')

- Implementation in GraphQL.js



Q&A



Beers & Networking

Why are you talking about GraphQL?



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Real use case: the reservations page

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Le mie prenotazioni

2 prenotazioni future (su 2 nel tuo account)

Mancano 4 giorni

Hotel San Marco
Gubbio, Italia

Arrivo sabato 8 luglio 2017 Partenza domenica 9 luglio 2017

Numero di conferma: 80948915111000

Mostra prenotazione Cancella prenotazione Modifica prenotazione

ibis Styles Budapest City
Budapest, Ungheria

Arrivo martedì 17 ottobre 2017 Partenza venerdì 20 ottobre 2017

Numero di conferma: 80968918060000
Dubbi? Invia un messaggio alla struttura

Mostra prenotazione Cancella prenotazione Modifica prenotazione

Non vedi la tua prenotazione in alto? Trova la tua prenotazione

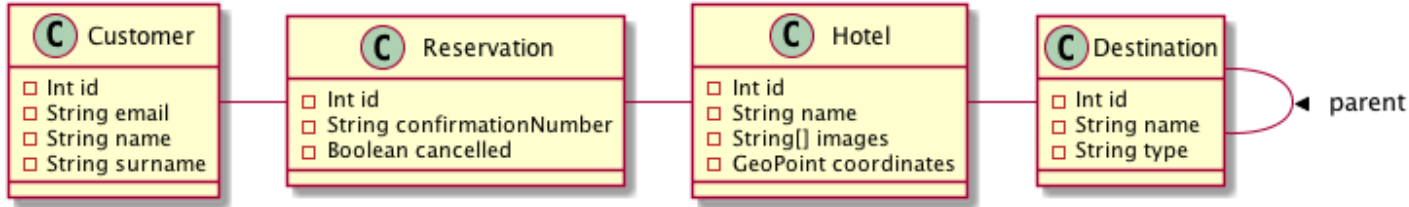
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Data

- Reservations list, for each item:
 - Confirmation number
 - Check In and Check Out
 - Hotel name
 - Hotel image
 - Link to the Hotel page
 - City and country
- Filters
 - Past & Previous (check in date)
 - Deleted

reservation ◦ hotel ◦ destination

REST solution(s)



/customers/<customer-id>/reservations

/hotels/<hotel-id>

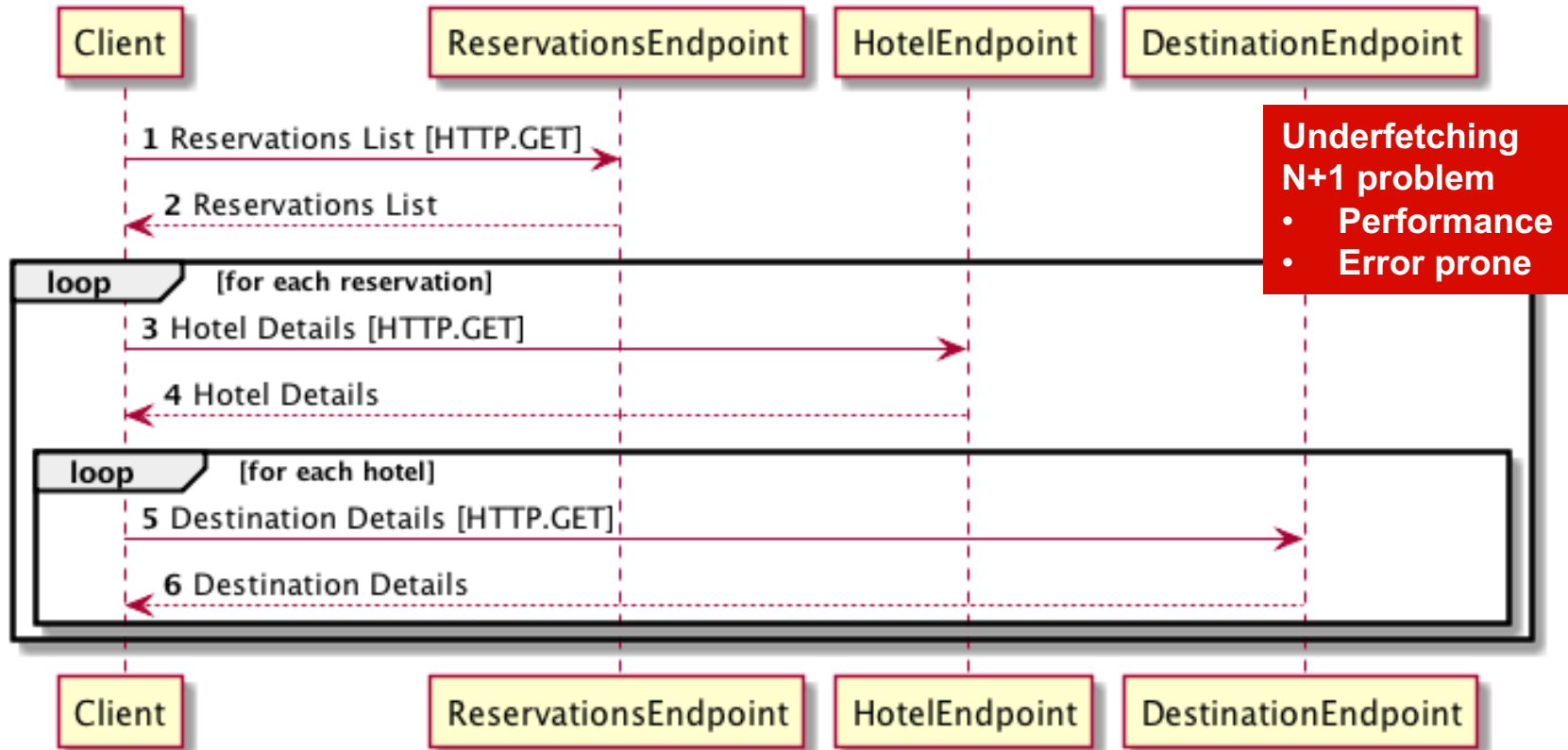
/destinations/<destination-id>

```
[
  {
    "confirmationCode": "89048915111000",
    "checkIn": "2017-07-08UTC+1",
    "checkOut": "2017-07-09UTC+1",
    "hotel": 101984,
    "cancelled": false,
    "links": [
      {
        "rel": "hotelDetails",
        "href": "/hotels/101984"
      }
    ]
  },
  {
    "confirmationCode": "809689180600000",
    "checkIn": "2017-10-17UTC+1",
    "checkOut": "2017-10-20UTC+1",
    "hotel": 101983,
    "cancelled": false,
    "links": [
      {
        "rel": "hotelDetails",
        "href": "/hotels/101983"
      }
    ]
  }
]
```

```
{
  "id": 101984,
  "name": "Hotel San Marco",
  "destination": 201984,
  "coordinates": {
    "lat": 43.3503607,
    "lon": 12.574941
  },
  "images": [
    "http://expcdn.com/hotel-images/101984/room.png",
    "http://expcdn.com/hotel-images/101984/hall.png",
    "http://expcdn.com/hotel-images/101984/bathroom.png",
    "http://expcdn.com/hotel-images/101984/restaurant.png"
  ],
  "links": [
    {
      "rel": "destination",
      "href": "/destinations/201984"
    }
  ],
  ...
}
```

```
{
  "id": 201984,
  "type": "city",
  "name": "Gubbio",
  "parent": {
    "id": 301984,
    "type": "country",
    "name": "Italia"
  },
  ...
}
```

REST solution(s) - underfetching



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REST solution(s) – views & overfetching

```
[
  {
    "confirmationCode": "89048915111000",
    "checkIn": "2017-07-08UTC+1",
    "checkOut": "2017-07-09UTC+1",
    "hotel": 101984,
    "cancelled": false,
    "hotel": {
      "id": 101984,
      "name": "Hotel San Marco",
      "image": "http://expcdn.com/hotel-images/101984/room.png",
      "destination": {
        "id": 201984,
        "type": "city",
        "name": "Gubbio",
        "parent": {
          "id": 301984,
          "type": "country",
          "name": "Italia"
        }
      }
    }
  },
  ...
]
```

Multiple clients

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ANDROID APP ON
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```
"destination": {
  "id": 201984,
  "type": "city",
  "name": "Gubbio",
  "parent": {
    "id": 301984,
    "type": "country",
    "name": "Italia"
  }
}
```

Overfetching

- Bandwidth waste
- Back-end overhead

REST solution(s) – multiple views & feature flags

Multiple views

/customers/<customer-id>/reservations

/customers/<customer-id>/reservations-views/web

/customers/<customer-id>/reservations-views/android

/customers/<customer-id>/reservations-views/ios

/customers/<customer-id>/reservations-views/. . .

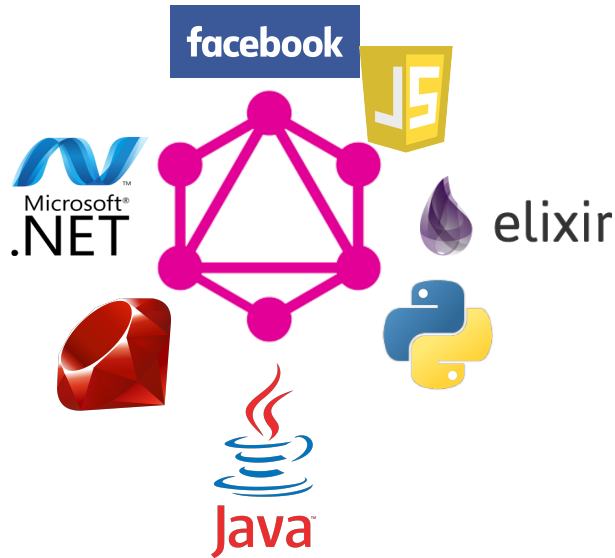
Feature Flags

/customers/<customer-id>/reservations?feature
hotelDetails,
hotelCoordinates,
destinationDetails,
starRating,
. . .

Not Scalable!

- Too many views to maintain
- Each new version will be duplicated all over the views
- QA
 - Too many feature flags combination
 - Each view is like a different API

GraphQL: it's a Query Language!



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.

(graphql.org)

It allows clients to define the structure of the data required, and exactly the same structure of the data is returned from the server.

(Wikipedia)

GraphQL – API Components



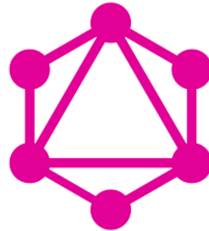
SUBSCRIPTION



S C H E M A



Q U E R Y



M U T A T I O N

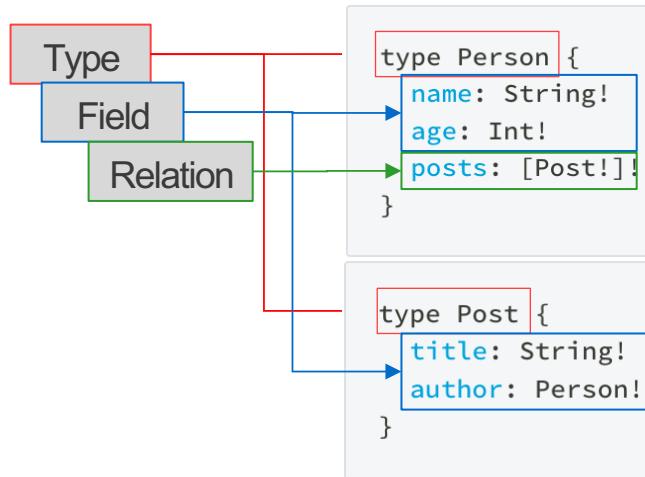


{JSON}

GraphQL – How to define an API

API Definition

- Define your schema
 - Draw your graph
 - Write it down in SDL
- Implement the fields resolvers



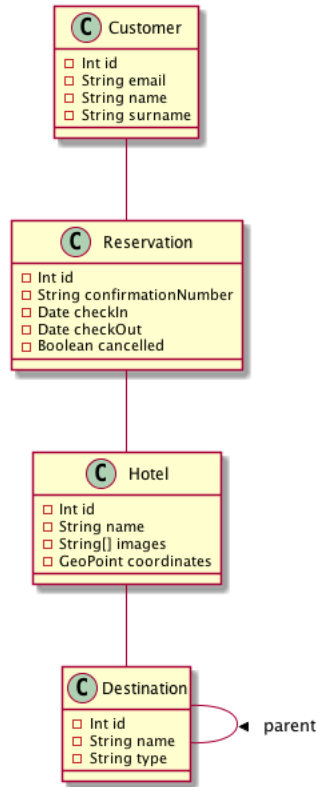
Scalar types:

- Int: 32-bit integer
- Float: Signed, double precision
- String
- Boolean
- ID (serialized as String)
- Date

Other types:

- Enum
- [List]
- Non-Null!
- Interfaces
- Union
- Input

GraphQL solution – the schema



```
type Customer {
  id: ID!
  email: String!
  name: String!
  surname: String!
  reservations: [Reservation!]
}
```

```
type Reservation {
  id: ID!
  checkIn: String!
  checkOut: String!
  confirmationNumber: String!
  cancelled: Boolean
  hotel: Hotel!
}
```

```
type Hotel {
  id: ID!
  name: String!
  images: [String]
  coordinates: GeoPoint
  destination: Destination
}
```

```
type Destination {
  id: ID!
  name: String!
  type: String!
  parent: Destination
}
```

```
type GeoPoint {
  latitude: Float
  longitude: Float
}
```

```
schema {
  query: Query
}

type Query {
  customer(id: ID!): Customer!
}
```

GraphQL solution – fields & resolvers

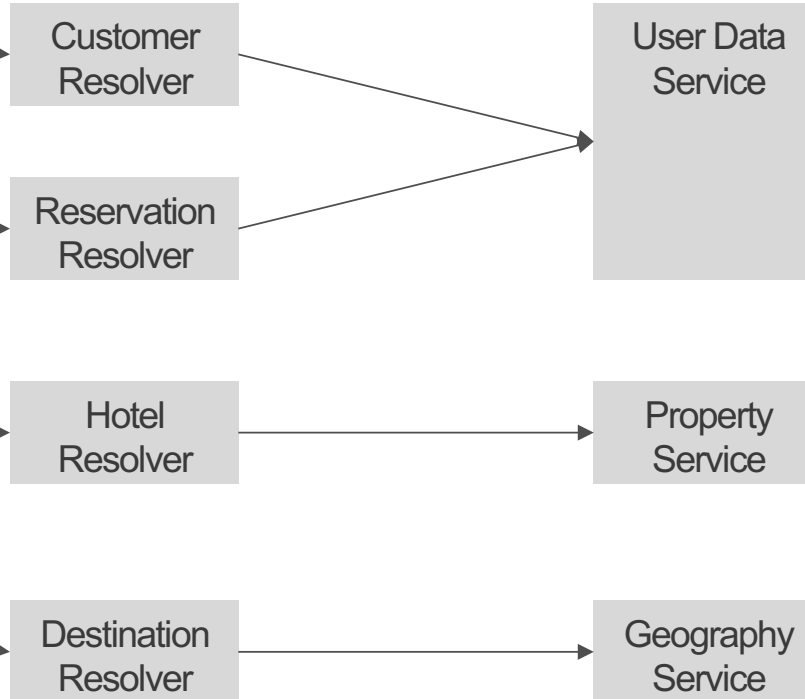
```
type Query {  
  customer(id: ID!): Customer!  
}
```

```
type Customer {  
  id: ID!  
  email: String!  
  name: String!  
  surname: String!  
  reservations: [Reservation]!  
}
```

```
type Reservation {  
  id: ID!  
  checkIn: String!  
  checkOut: String!  
  confirmationNumber: String!  
  cancelled: Boolean  
  hotel: Hotel!  
}
```

```
type Hotel {  
  id: ID!  
  name: String!  
  images: [String]  
  coordinates: GeoPoint  
  destination: Destination  
}
```

```
type Destination {  
  id: ID!  
  name: String!  
  type: String!  
  parent: Destination  
}
```



GraphQL solution – query

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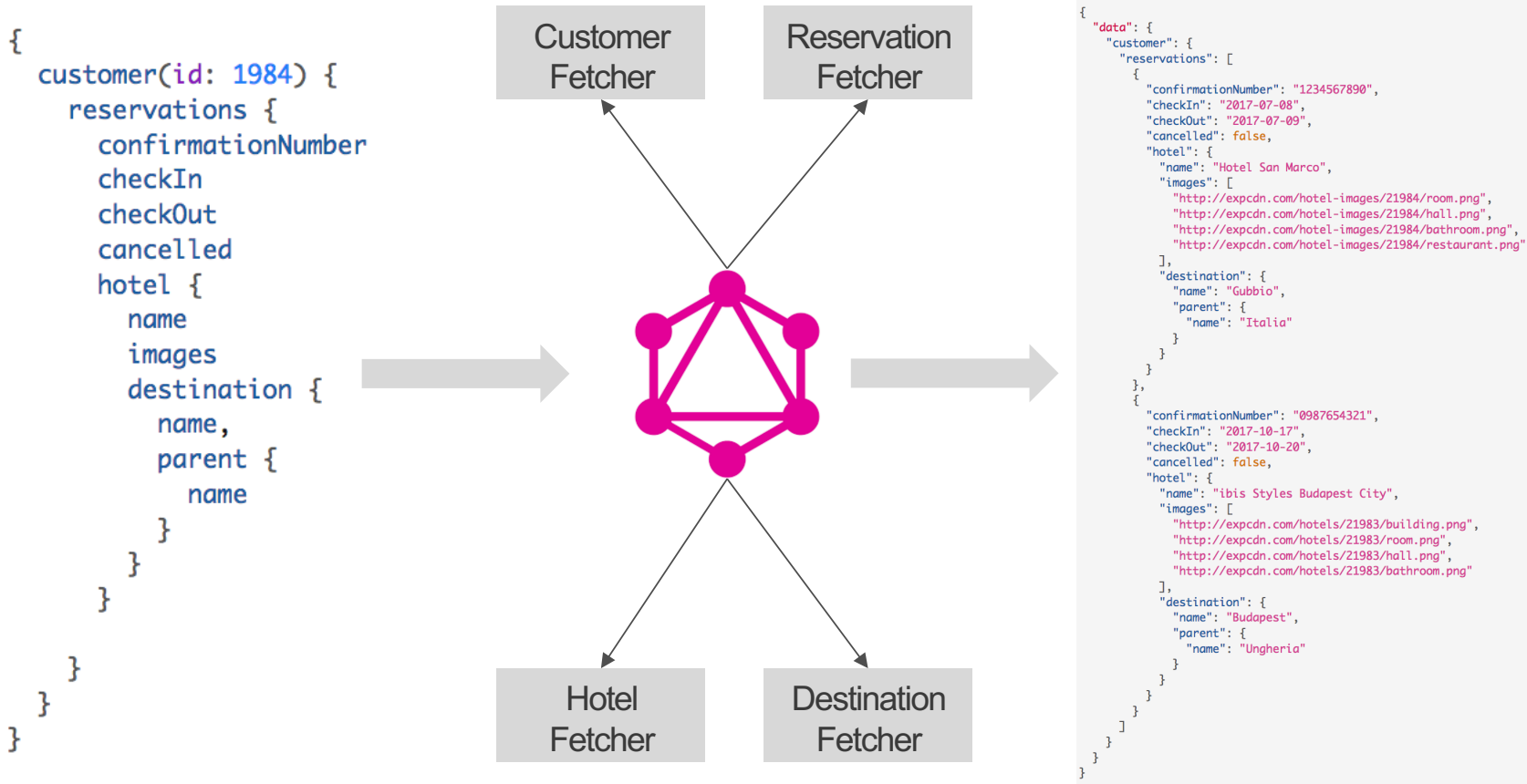
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```
{
  customer(id: 1984) {
    reservations {
      confirmationNumber
      checkIn
      checkOut
      cancelled
      hotel {
        name
        images
        destination {
          name,
          parent {
            name
          }
        }
      }
    }
  }
}
```

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GraphQL solution – query execution



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GraphQL - Problems solved

- No more Underfetching
 - The client specifies all the information it needs in its request
- No more “n+1 problem”
 - Any needed network request is performed server-side
- No more Overfetching
 - You get just the information you need
- Easier versioning
 - You know exactly which response’s attributes are used
 - The response is more flexible

GraphQL - Drawbacks

- Caching
 - Server-side / CDN caching becomes difficult
 - All the caching has to be implemented on the client
- Security
 - Huge number of possible requests may arrive
 - High level of nesting causes server-side overhead
 - Approaches:
 - Execution Timeout
 - Max Query Depth
 - Max Query Complexity
 - ...
- Instrumentation

GraphQL: Coding...

```
>git clone https://github.com/dfserrara/from-rest-to-graphql-meetup.git
Cloning into 'from-rest-to-graphql-meetup'...
remote: Counting objects: 36, done.
remote: Compressing objects: 100% (32/32), done.
remote: Total 36 (delta 5), reused 30 (delta 3), pack-reused 0
Unpacking objects: 100% (36/36), done.
>cd from-rest-to-graphql-meetup/
>git tag -l
0.0.1
0.0.2
0.0.3
>git checkout 0.0.1
Note: checking out '0.0.1'.
```

You are in 'detached HEAD' state. You can look around, make experimental changes and commit them, and you can discard any commits you make in this state without impacting any branches by performing another checkout.

If you want to create a new branch to retain commits you create, you may do so (now or later) by using `-b` with the checkout command again. Example:

```
git checkout -b <new-branch-name>
```

HEAD is now at 740022f... simple graphql endpoint with one resolver

```
>ls
LICENSE                README.md              install-tools.sh      package-lock.json    package.json          src
>
```

Q&A



From REST to GraphQL in 90'

Thank you!

