FROM ‘00s TO ‘20s:
FROM REST*ful* to gRPC

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WHAT THIS TALK IS ABOUT

BEFORE REST

Common Object Request Broker Architecture

Simple Object Access Protocol

REST: REpresentational State Transfer

REST PRINCIPLES

Extension of the web *resource* concept

Identification of resources with a *universal syntax*

Resource accessibility via a *universal interface*

REST ARCHITECTURAL ELEMENTS

DATA ELEMENTS

RESOURCES

URIs

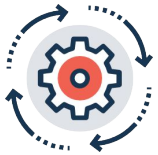
REPRESENTATIONS

CONNECTORS

COMPONENTS

REST CONSTRAINTS

Client - Server

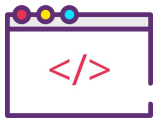


Stateless

Cacheability

Uniform Interface

Layered System



Code On Demand


SO, WHAT'S THE
PROBLEM WITH REST?

RELATIONSHIP BETWEEN URIs AND HTTP VERBS / 1

https://api.example.com/persons

GET

List of URIs (w/other details?) of all the person items in the database

PUT

Replace the entire persons dataset with a new one

PATCH

Not generally used
ok...

POST

Add a new person to the dataset

DELETE

Delete the entire persons dataset

RELATIONSHIP BETWEEN URIs AND HTTP VERBS / 2

https://api.example.com/persons/123

GET

Retrieve the person matching the given identifier “123”

PUT

Replace the addressed person with a new one

PATCH

Update the addressed person with the given fields

POST

Not generally used
uhm...

DELETE

Delete the addressed person from the dataset

REST*ful* IS EVIL

FULL LIST OF HTTP VERBS

OPTIONS

GET

HEAD

POST

PUT

DELETE

TRACE

CONNECT

¯_(ツ)_/¯

FULL LIST OF HTTP STATUS CODES / 1

INFORMATIONAL

100, 101, 102, 103

SUCCESS

200, 201, 203, 204, 205, 206, 207, 208, 226

REDIRECTION

300, 301, 302, 303, 304, 305, 306, 307, 308

FULL LIST OF HTTP STATUS CODES / 1

CLIENT ERRORS

400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, **418**, 421, 422, 423, 424, 426, 428, 429, 431, 451

SERVER ERRORS

500, 501, 502, 503, 504, 505, 506, 507, 508, 510, 511

UNOFFICIAL CODES

103, 218, 420, 450, 498, 499, 509, 530, 598, many more...


ERROR 418
I'm a Teapot

PROBLEMS OF RESTful APIs

#1
LITTLE AGREEMENT ON WHAT “RESTful” MEANS

HTTP/1.1 Status Codes 400 and 417, cannot choose which

3

I have been referred to here that it might be of better help, I've got a processing file which handles the user sent data, before that, however, it compares the input from client to the expected values to ensure no client-side data change.

I can say I don't know lot about HTTP status codes, but I have made up some research on it, and to choose which one is the best for unexpected input handling. So I came up with:

```
400 Bad Request: The request cannot be fulfilled due to bad syntax
```

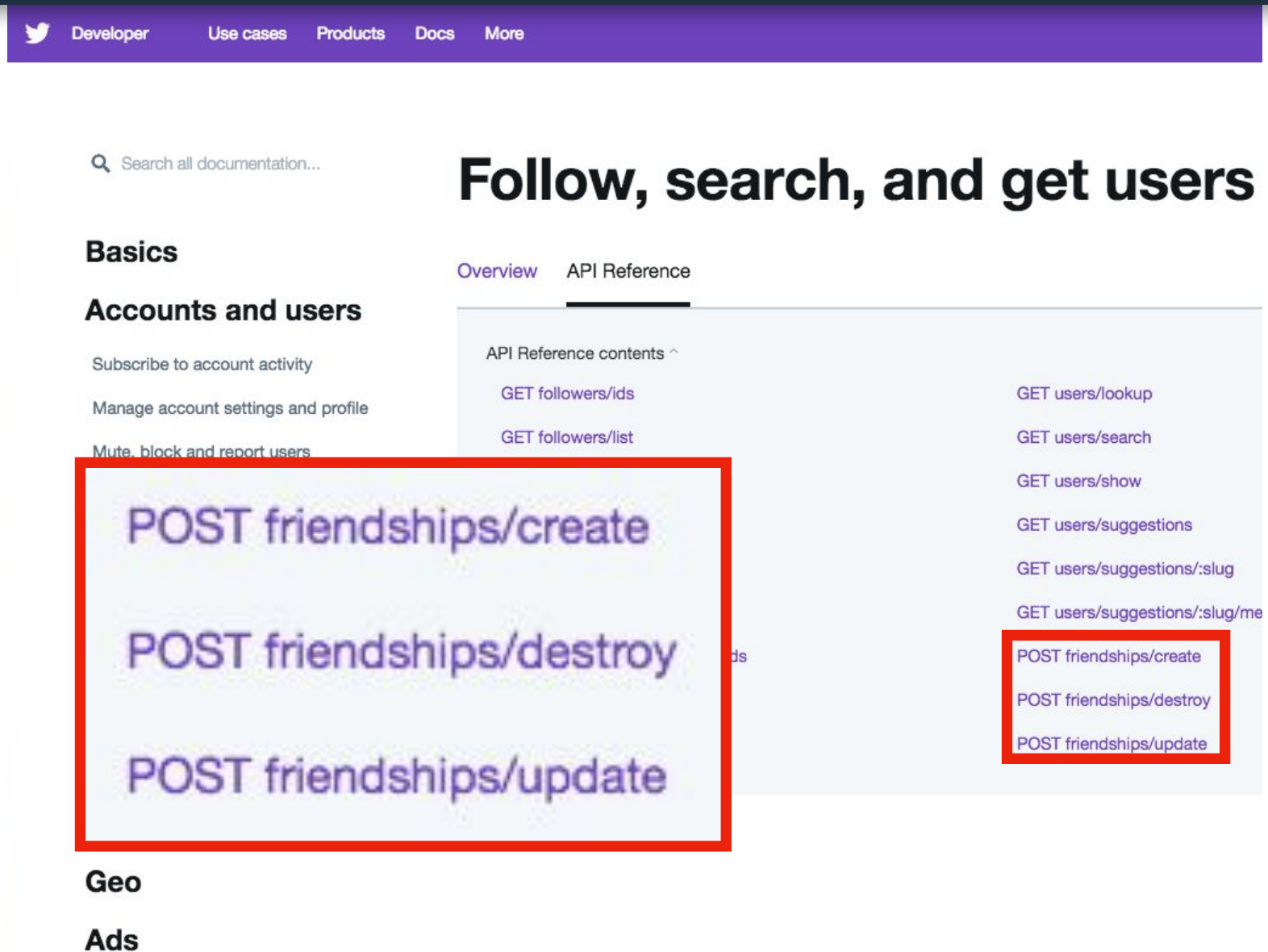
```
417 Expectation Failed: The server cannot meet the requirements of the Expect request-header field
```

Now, I cannot be really sure which one to use, I have seen 400 Bad Request being used alot, however, whatI get from explanation is that the error is due to an unexistent request rather than an illegal input.

On the other side 417 Expectation Failed seems to just fit for my use, however, I have never seen or experimented this header status before.

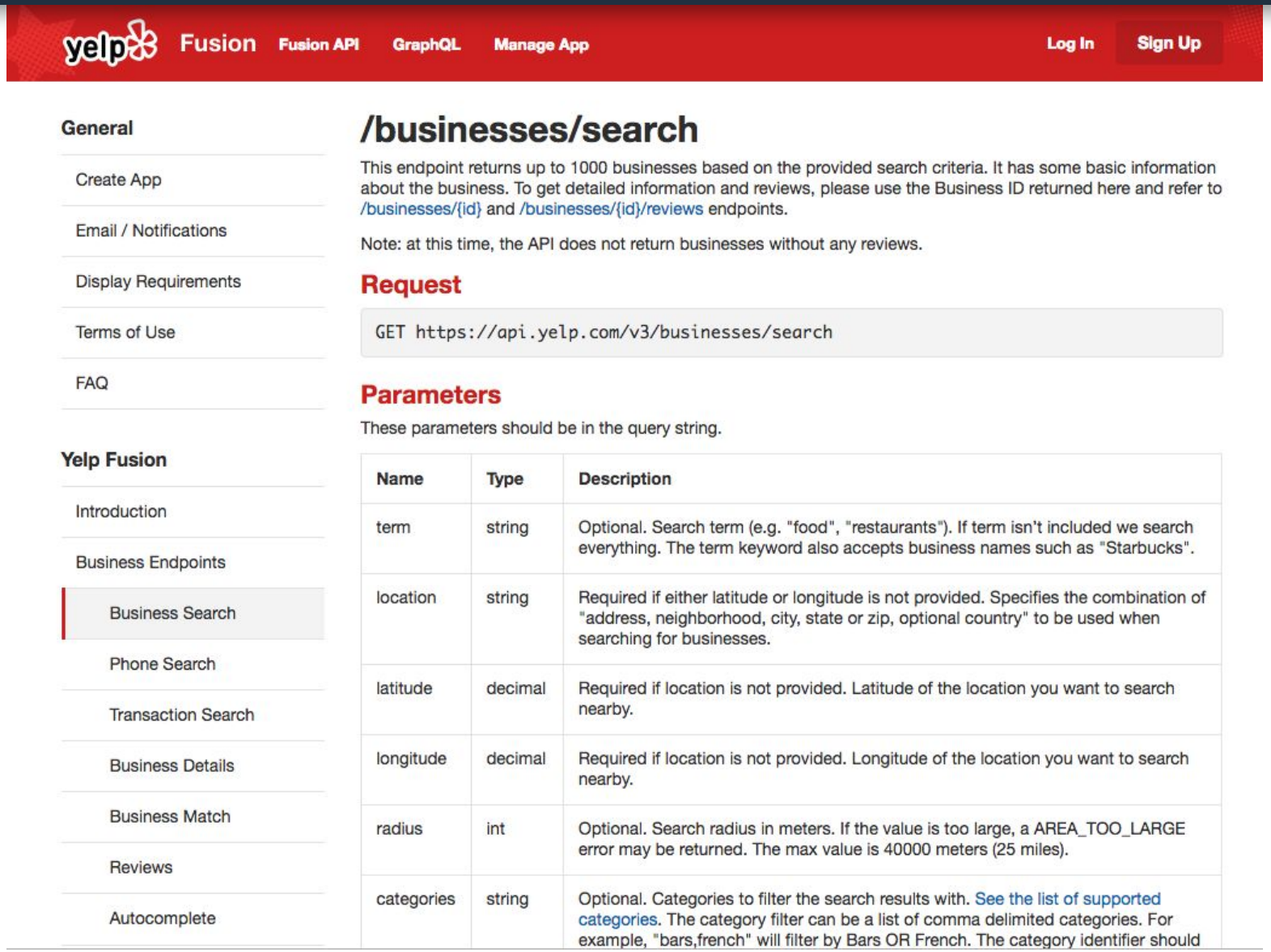
I need your experience and opinions, thanks alot!

#2
REST VOCABULARY IS NOT *FULLY* SUPPORTED

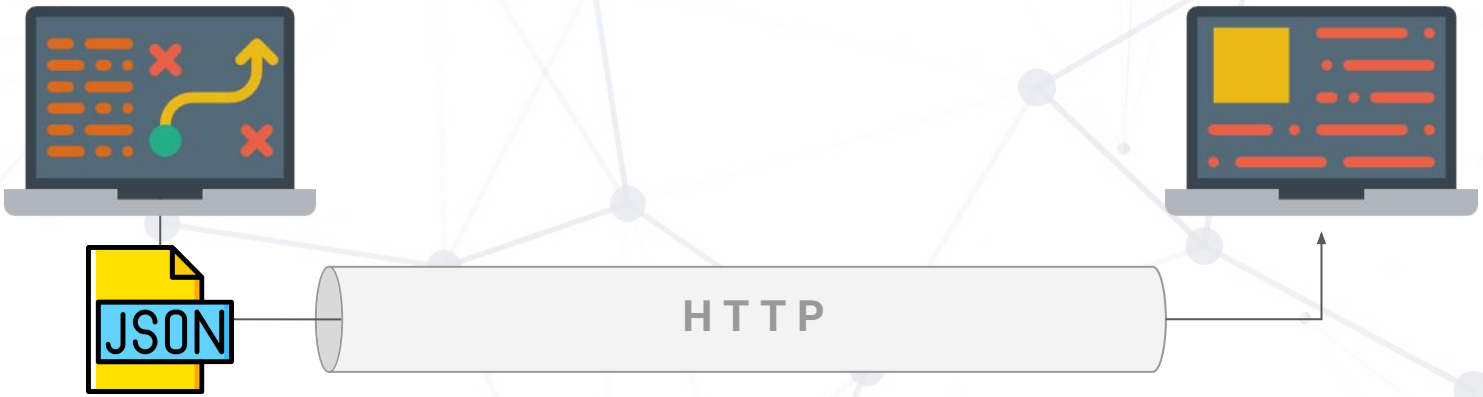


#3

REST VOCABULARY IS NOT RICH ENOUGH FOR A COMPLETE API

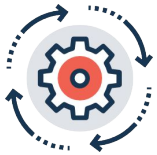


#4
RESTful APIs ARE TIED TO HTTP



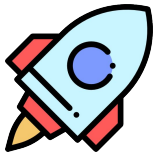
MOVING FORWARD

JSON - RPC

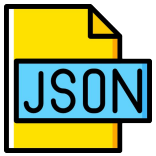


STATELESS

LIGHTWEIGHT



TRANSPORT AGNOSTIC



USES JSON AS DATA FORMAT

SUPPORTS NOTIFICATION REQUEST

JSON - RPC : REQUEST

```
{
    "jsonrpc": "2.0",
    "method": "DemoRPCService.CreatePerson",
    "params": {
        "name": "Gianfranco",
        "surname": "Reppucci",
        "age": 36
    },
    "id": 1234567
}
```

JSON - RESPONSE


```
{
    "jsonrpc": "2.0",
    "result": {
        "id": "bcjsuge8t5ekk4rj6b4g",
        "name": "Gianfranco",
        "surname": "Reppucci",
        "age": 36
    },
    "id": 1234567
}
```

JSON - RPC : NOTIFICATION

```
{
    "jsonrpc": "2.0",
    "method": "DemoRPCService.CheckForNewPersons"
}
```

JSON - RPC : ERROR

```
{
    "jsonrpc": "2.0",
    "error": {
        "code": -32000,
        "message": "person: invalid name or surname
given",
        "data": null
    },
    "id": 1234567
}
```

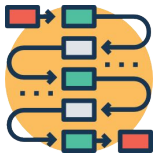
BATCH REQUESTS

Useful to aggregate multiple requests

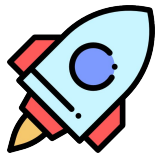
Server is obliged to respond to every non-Notification request

JSON-RPC ADVANTAGES

Readability



Ease of encoding / decoding



Separation from transport protocol

JSON-RPC DISADVANTAGES

No binary encoding

Ease to mess up method names

github.com/giefferre/jsonrpc-usage-example

MOVING *FAST* FORWARD

gRPC

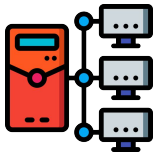
Open Source Remote Procedure Call protocol

Developed initially at Google

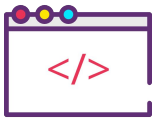
Uses HTTP/2 for transport

Protocol Buffers as Interface Description Language

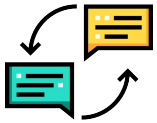
gRPC: PRINCIPLES



Services, not Objects
Messages, not
References



Built-in support for 10
languages across multiple
environments



(Bidirectional)
Streaming

Blocking /
Non Blocking

Cancellation &
Timeout

Flow
Control

Standardized
Status Codes

DEFINITION OF A SAMPLE SERVICE / 1

```
message Person {
    string id = 1; // Unique ID for this person.
    string name = 2;
    string surname = 3;
    uint32 age = 4;
}
```

DEFINITION OF A SAMPLE SERVICE / 2

```
message CreatePersonArgs {
    string name = 1;
    string surname = 2;
    uint32 age = 3;
}

message ReadPersonArgs {
    string id = 1;
}
```

DEFINITION OF A SAMPLE SERVICE / 3

```
service DemoRPCService {
    rpc CreatePerson (CreatePersonArgs) returns (Person) {}
    rpc ReadPerson (ReadPersonArgs) returns (Person) {}
}
```

WRITING A SERVER IN GO / 1

```
type demoRPCServer struct {
    ...
}

func (s *demoRPCServer) CreatePerson
    (ctx context.Context, args *CreatePersonArgs) (*Person, error) {
    ...
}

func (s *demoRPCServer) ReadPerson
    (ctx context.Context, args *ReadPersonArgs) (*Person, error) {
    ...
}
```

WRITING A SERVER IN GO / 2

```
func main() {
    listener, err := net.Listen("tcp", ":1234")

    if err != nil {
        log.Fatalf("failed to listen: %v", err)
    }

    grpcServer := grpc.NewServer()
    RegisterDemoRPCServiceServer(grpcServer, &demoRPCServer{})

    grpcServer.Serve(listener)
}
```

WRITING A CLIENT IN PYTHON

```
channel = grpc.insecure_channel('localhost:6000')
client = rpcservice.DemoRPCServiceStub(channel)

new_person = client.CreatePerson(
    pb.CreatePersonArgs(
        name='John',
        surname='Doe',
        age=36,
    )
)
```

github.com/giefferre/grpc-usage-example

CONCLUSIONS

REST concepts are solid, REST*ful* implementations aren't

*RPC alternatives are valid

You can take advantages of some REST concepts when developing *RPC services

JSON-RPC and gRPC are modern and they can be pretty powerful

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THANK YOU

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