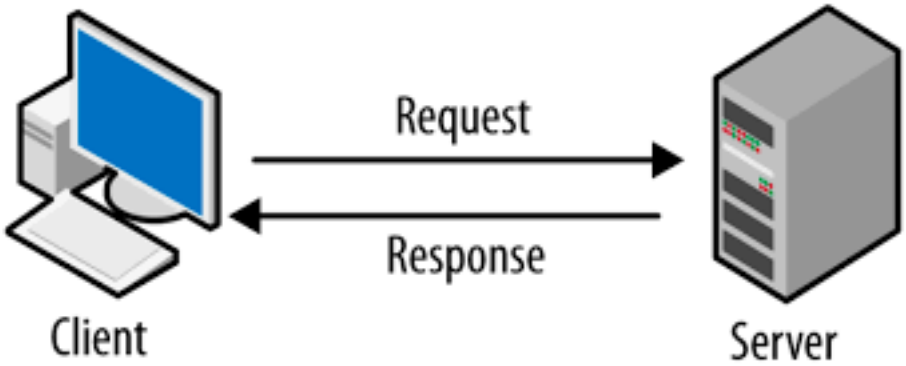
SOA
Restful Web services

Plan

Client/server basics

* Client : asks for a ressource at URI
* Server : return ressource at URI with content



Client/server basics

URIs (Unique ressource identifier)

* Identify ressources
* Are format independant

Ressources

* /books/thesecondagemachine
* /books/lessformore

Collection

* /books

Client/server basics

Request :

* URI
* HTTP verb (or method) describing the action
* Some headers describing requirements
* A body (data)

POST /books/book_manage HTTP/1.1
Host: iut.ca.fr

name1=value1&name2=value2

Client/server basics

HTTP verbs:

* POST -> add
* PUT –> modify
* GET l-> read
* DELETE -> ?

Client/server basics

Response

* Status code
* Some headers
* Content

```
HTTP/1.x 200 OK
Transfer-Encoding: chunked
Date: Sat, 28 Nov 2019 04:36:25 GMT
Server: iut.ca.fr
Connection: close
Pragma: public
Expires: Sat, 28 Nov 2009 05:36:25 GMT
Cache-Control: max-age=3600, public
Content-Type: text/html; charset=UTF-8
Last-Modified: Sat, 28 Nov 2019 03:50:37 GMT
Content-Encoding: gzip
Vary: Accept-Encoding, Cookie, User-Agent

<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
"https://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html;
charset=utf-8" />
<title>Top 20+ MySQL Best Practices - Nettuts+</title>
<!-- ... rest of the html ... -->
```

Web service

a server running on a computer device, listening for requests at a particular port over a network, serving web documents (HTML, JSON, XML, images). Wikipedia

Evolution of distributed systems-> SOA (Service Oriented Architecture)

Technology introduced by IBM and Microsoft, then formulated by W3C

Web API : web service with REST (see later)

Web service

Why Web service ?

Over HTTP, HTTP servers are everywhere

Can be used from web apps. Mobile apps. Other web services.

Allow parallelism more easily

launch X instances (via vm, docker, etc.)

paradigm : parallelism through message passing between instances

microservice architecture (1 action -> 1 service)

Web service

2 main architectures

- *SOAP*
  - *Stateful ; Stateful*
  - *Protocol based upon XML*
  - *More powerful ; integrates several security protocols*
  - *More difficult to code ; more heavy*
  - *Specialised to business transactions*

- *Rest*
  - *See now*

API

API (application Programming Interface) definitions :

* « *A set of subroutine definitions, protocols, and tools for building application software* » Wikipedia

* *Une API est une interface logicielle qui permet de « connecter » un logiciel ou un service à un autre logiciel ou service afin d'échanger des données et des fonctionnalités.* CNIL

Rest

REST is the underlying architectural principle of the web, formalized as a set of constraints, described in **Roy Fielding's dissertation**.

An API that adheres to the principles of REST does not require the client to know anything about the structure of this API.

Rather, the server needs to provide whatever information the client needs to interact with the service.

The key abstraction of information in REST is a resource. Any information that can be named can be a resource, and is identified by a URI.

Rest heavily relies on the HTTP protocol: RFC 2616

Rest

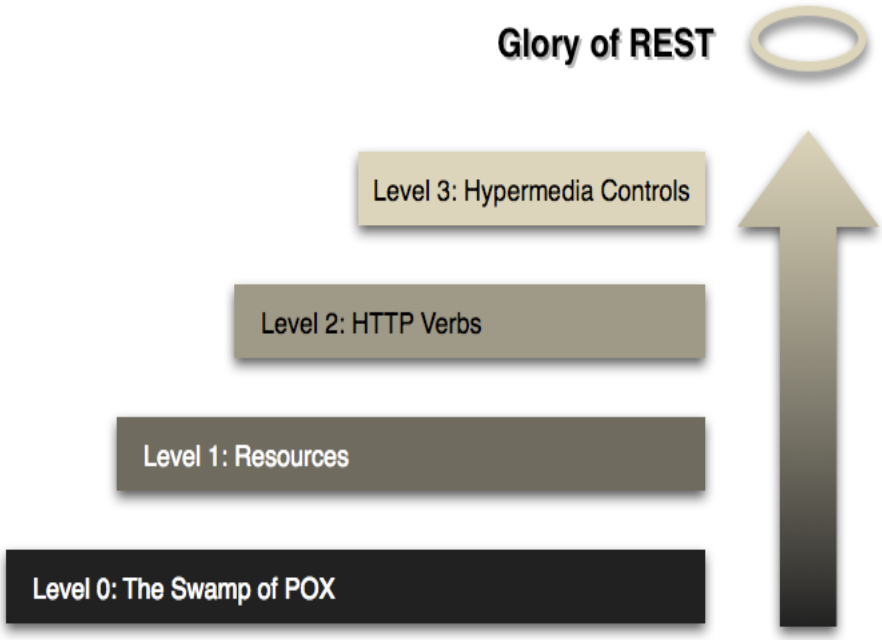
Richardson maturity model

Level 0:

HTTP as a transport system

HTTP as a tunneling mechanism

Using headers content



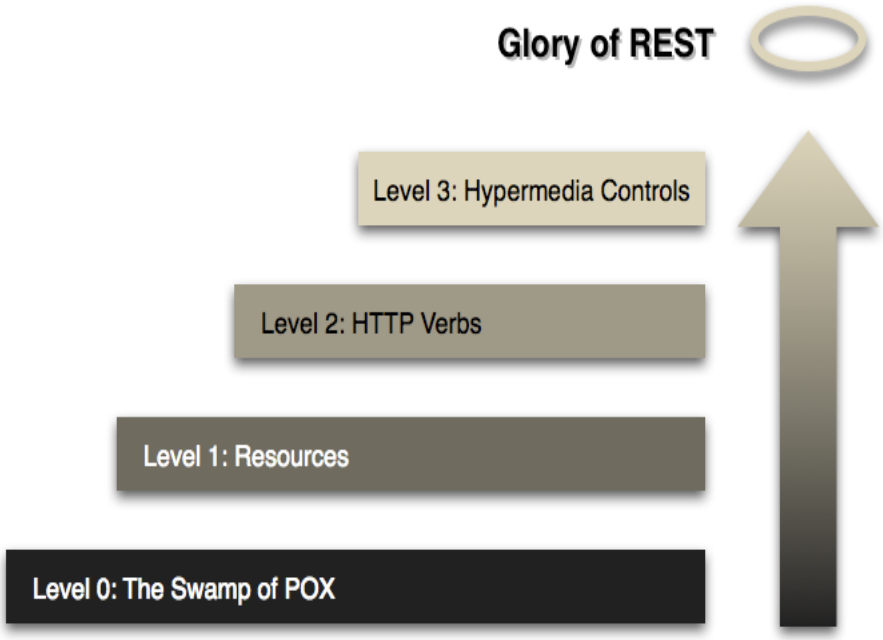
Rest

Richardson maturity model

Level 1:

start talking to individual resources.

POST /slots/1234 HTTP/1.1
[various other headers]



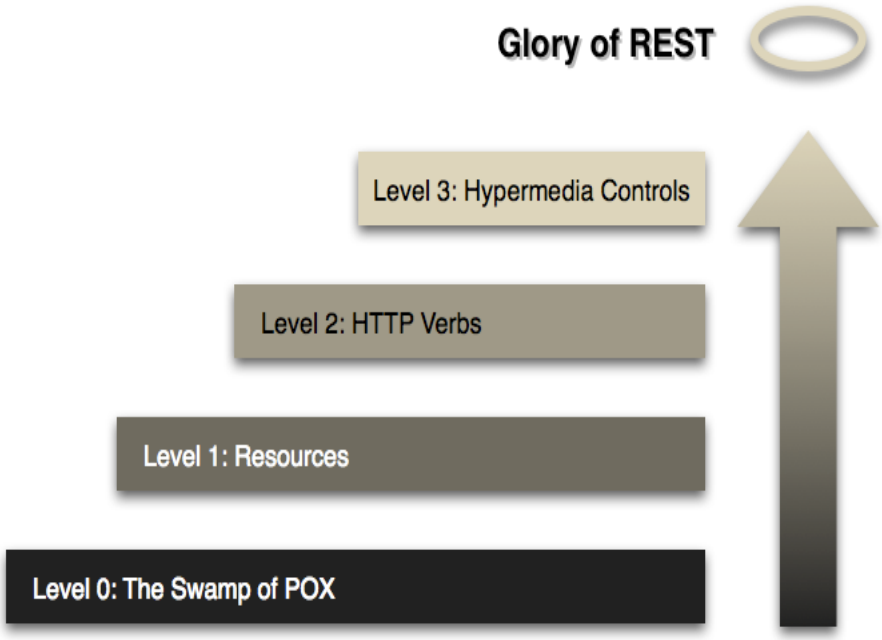
Rest

Richardson maturity model

Level 2:

Client uses HTTP verbs

Servers uses HTTP status



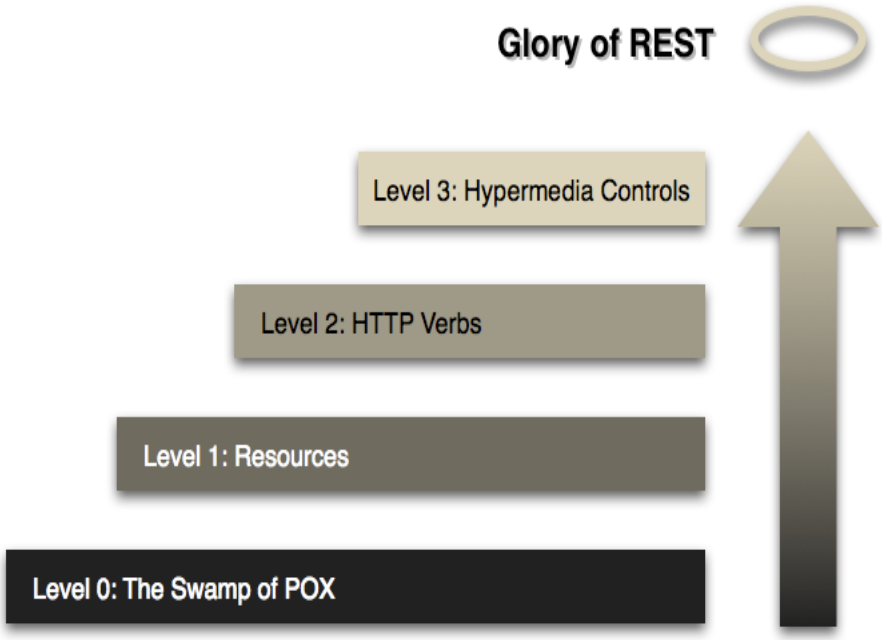
Rest

Richardson maturity model

Level3:
Use of HATEOAS (Hypertext As The Engine Of Application State).

Service discovery

Hypermedia requests and responses



HATEOAS

Media types
Media type is a format of a request or response body data.
RFC 6838 :

1. application/json
2. application/xml
3. application/x-www-form-urlencoded
4. text/plain; charset=utf-8
5. text/html

Hypermedia
Adds links into media types
Ex: application/hal+jon : add links into json data

HATEOAS

It means that hypertext should be used to find your way through the API

~ application is a kind of state machine

HATEOAS

GET /account/12345 HTTP/1.1
Host: somebank.org
Accept: application/xml
...

HTTP/1.1 200 OK
Content-Type: application/xml
Content-Length: ...

<?xml version="1.0"?>
<account>

<account_number>12345</account_number>
<balance currency="usd">100.00</balance>
<link rel="deposit" href="/account/12345/deposit" />
<link rel="withdraw" href="/account/12345/withdraw" />
<link rel="transfer" href="/account/12345/transfer" />
<link rel="close" href="/account/12345/close" />
</account>

Plus tard…

* HTTP/1.1 200 OK
* Content-Type: application/xml
* Content-Length: ...
*
* <?xml version="1.0"?>
* <account>
*

<account_number>12345</account_number>

* <balance currency="usd">-25.00</balance>
* <link rel="deposit" href="/account/12345/deposit" />
* </account>

HATEOAS


```
isbn:       1
name:       "book"
author:     "Bauer"
▼ _links:
  ▼ self:
      href:   "http://localhost:8080/books2/1"
  ▼ books:
      href:   "http://localhost:8080/books"
```

REST API

(RE) State Transfer

* Server doesn't keep state related to the client session
* Server is stateless (can serve any client any time)
* Client transfers the state

* Stateless -> how HTTP is designed, how web is designed in general

REST API

(RE) State Transfer

* Some principles :

1. *Give every "thing" an ID*
2. *Link things together*
3. *Use standard verbs*
4. *Resources with multiple representations*
5. *Communicate statelessly*

Source https://www.infoq.com/articles/rest-introduction/