FrOSCon
Free and Open Source Software Conference

How to deal with **REST** in practice?

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REST

Representational State Transfer

REST

Representational State Transfer

It's not hard:

REST

Representational State Transfer

It's not hard: like poker, or chess

@Todo:

- Quick REST recap
- Common “myths”
- Common “mistakes”
- How to do stuff

Quick REST recap

Are you doing REST?

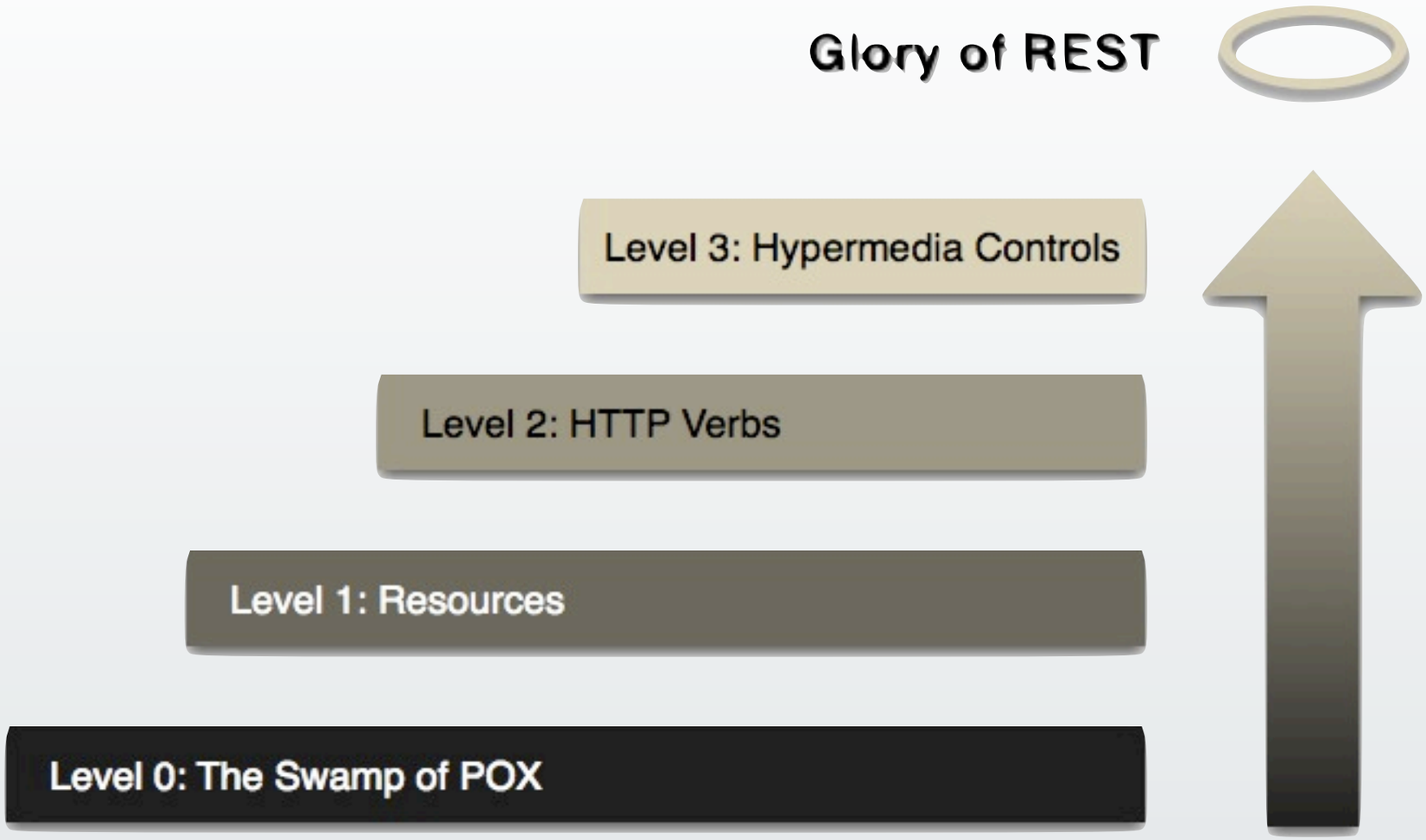
Restful constraints

- Client / Server
- Stateless
- Cacheable
- Layered system
- Code on demand (optional)
- Uniform interface

Uniform interface

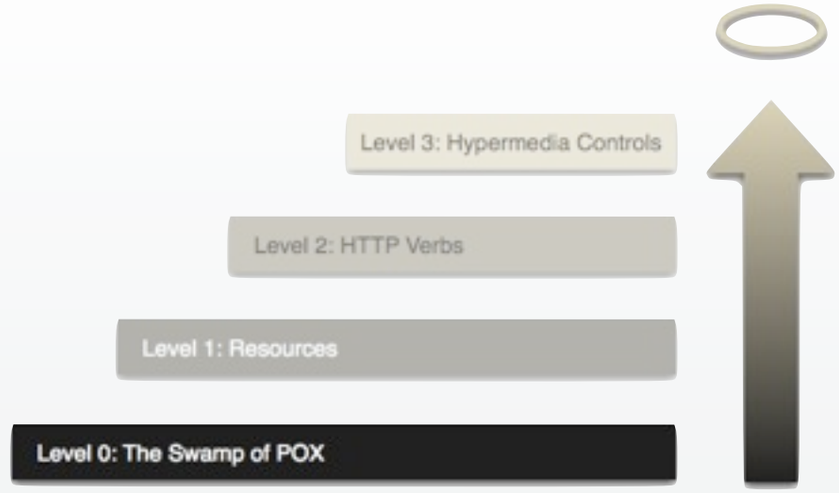
- Identification through representations of resources
- Manipulation through representations
- Self-descriptive messages
- Hypermedia as the engine of application state (HATEOAS)

Are you mature enough?
(according to Richardson)



http://martinfowler.com/articles/richardsonMaturityModel.html

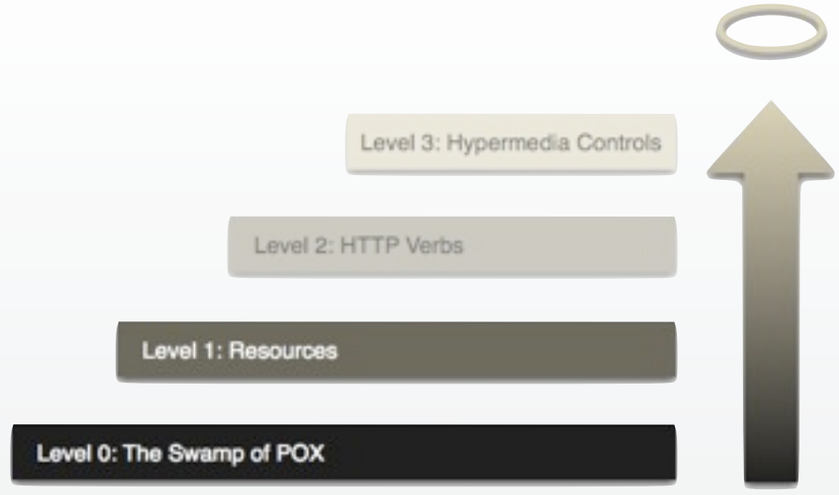
Level 0: Plain Old XML



- HTTP is tunnel protocol
- POST to single URL (or worse: GET)
- SOAP / XML-RPC

http://martinfowler.com/articles/richardsonMaturityModel.html

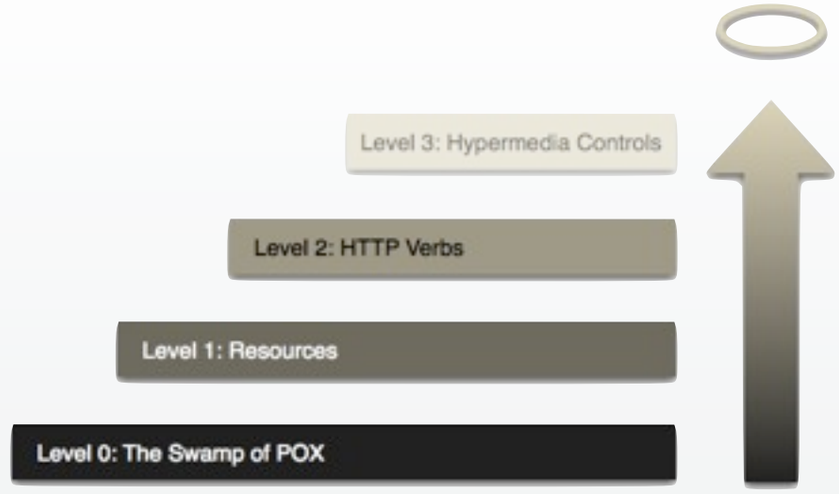
Level 1: Resources



- Entities are resources
- /user/jthijssen instead of /users
- /user/jthijssen/talks

http://martinfowler.com/articles/richardsonMaturityModel.html

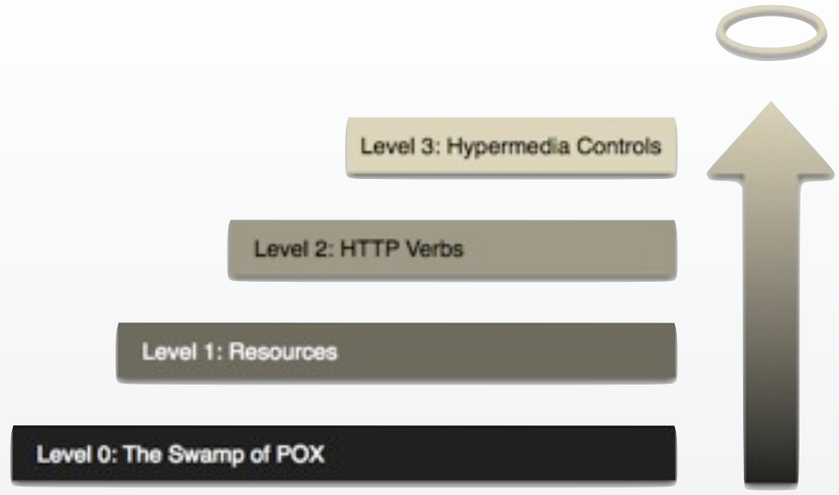
Level 2: HTTP Verbs



- POST or PUT for creations
- GET for retrievals
- POST or PUT for updates
- DELETE for deletions
- PATCH for partial updates

http://martinfowler.com/articles/richardsonMaturityModel.html

Level 3: Hypermedia controls



- HATEOAS
- Hypermedia as the engine of application state
- Using links to detect your next states
- One bookmark link to rule them all

http://martinfowler.com/articles/richardsonMaturityModel.html

Let’s go to DisneyLand!

Let's go to DisneyLand!

Wait, wut?

Are you (still) doing REST?

Common “myths”

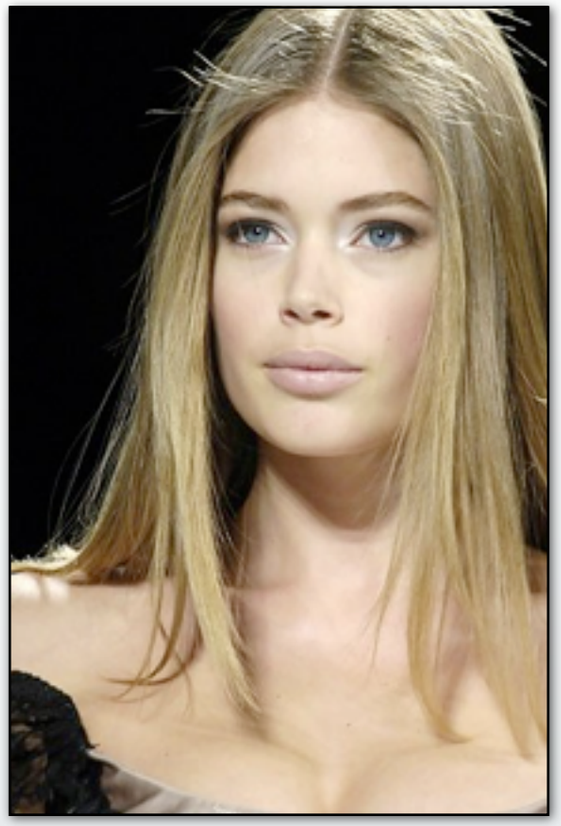
REST == HTTP

REST == CRUD

URL's are important

REST scales

COOKIES are EVIL



I've never have eaten a cookie in my life...

Gimme moar cookies! Om nom nom!

Application state

vs

Resource state

Resource state

- User has got multiple addresses
- Entity X/Y/Z is set to 42

Resource state

- User has got multiple addresses
- Entity X/Y/Z is set to 42

Resource state never changes through GET
(or other safe) methods!

Application state

- Which "stage" is the user in the checkout process?
- Which page is the user currently browsing
- Is the user currently logged in?
- Depends....

"Per client" state should be saved by the client,
not on the server.

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not on the server.

It's called Representational STATE TRANSFER

Common “mistakes”

PUT or POST?

PUT or POST?

PUT when the resource URI is known

PUT /user/jthijssen/talk/123

PUT or POST?

PUT when the resource URI is known

PUT /user/jthijssen/talk/123

POST when it's not (server decides)

POST /user/jthijssen/talks

PUT = idempotent, POST is not!

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PUT /user/jthijssen/talk/123
PUT /user/jthijssen/talk/123
PUT /user/jthijssen/talk/123

PUT = idempotent, POST is not!

PUT /user/jthijssen/talk/123
PUT /user/jthijssen/talk/123
PUT /user/jthijssen/talk/123

POST /user/jthijssen/talks
POST /user/jthijssen/talks
POST /user/jthijssen/talks

PUT = idempotent, POST is not!

PUT /user/jthijssen/talk/123
PUT /user/jthijssen/talk/123
PUT /user/jthijssen/talk/123

POST /user/jthijssen/talks
POST /user/jthijssen/talks
POST /user/jthijssen/talks

POST is the worst option for caching / scalability,
but use it if you don't know what to do.

If you need to “construct” an URI, you are doing it wrong

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```
url = MAIN_URL + “/” + user_id + “/talks”;
rc = HTTP.post(url, data);
```

If you need to “construct” an URI, you are doing it wrong

```
url = MAIN_URL + “/” + user_id + “/talks”;
rc = HTTP.post(url, data);
```

```
url = data.link_rel(“talks”, user_id);
rc = HTTP.post(url, data);
```

If you need to “construct” an URI, you are doing it wrong

```
url = MAIN_URL + “/” + user_id + “/talks”;
rc = HTTP.post(url, data);
```

```
url = data.link_rel(“talks”, user_id);
rc = HTTP.post(url, data);
```

Uri can change: server, uri, protocol, port etc..

Composite resources

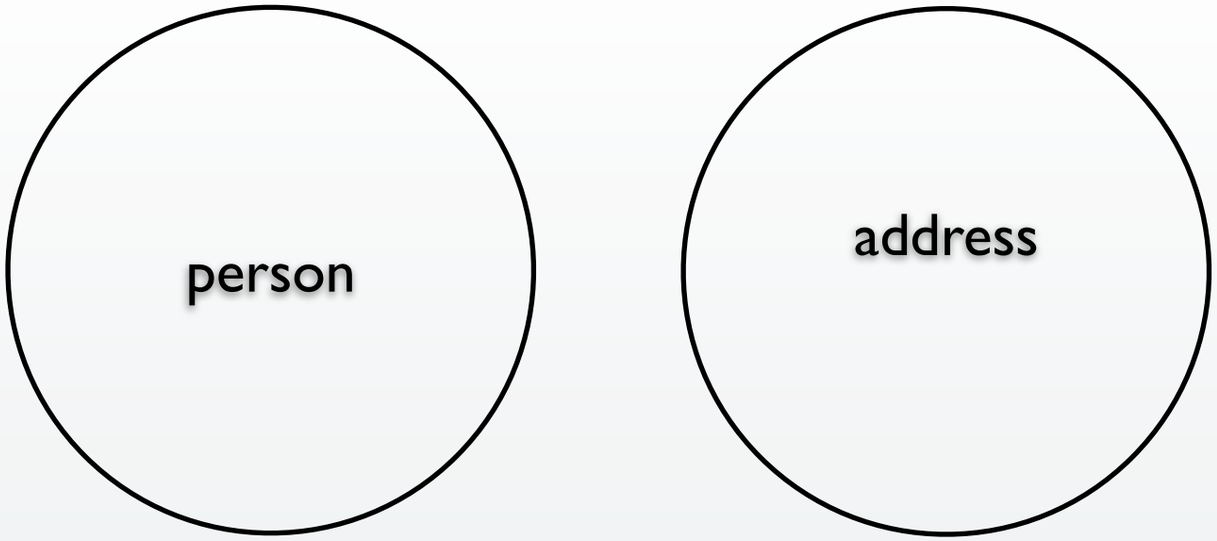
Watch out with visibility

```
<xml version="1.0" encoding="utf-8">
<persons>
  <person>
    <name>Joshua Thijssen</name>
    <phone type="cell">0612345678</phone>
    <link rel="address" href="/users/jthijssen/address">
  </person>
  ...
<persons>
```

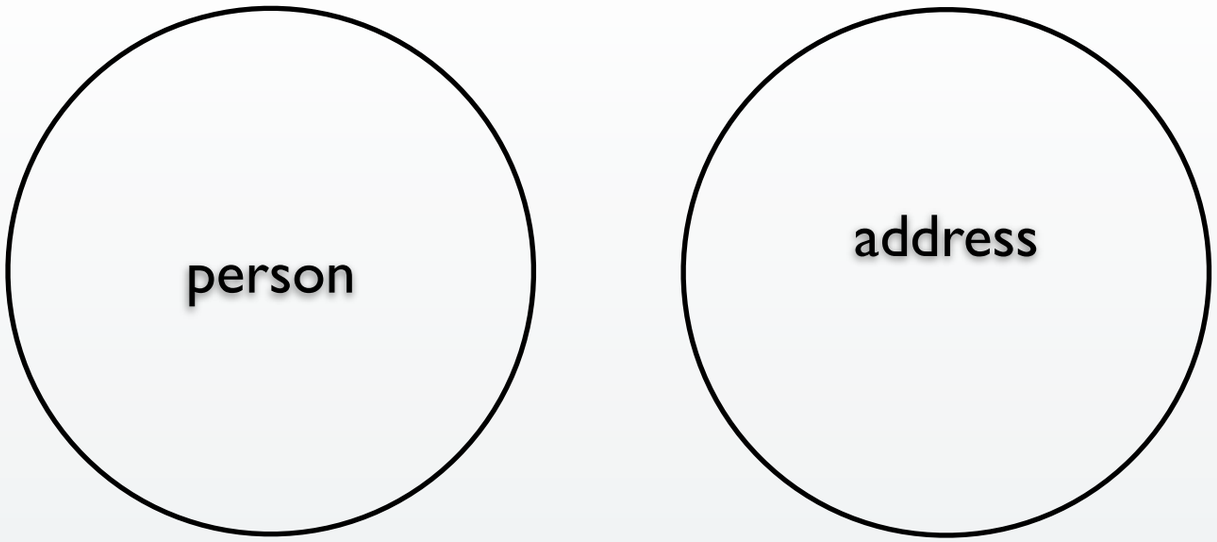
Watch out with visibility

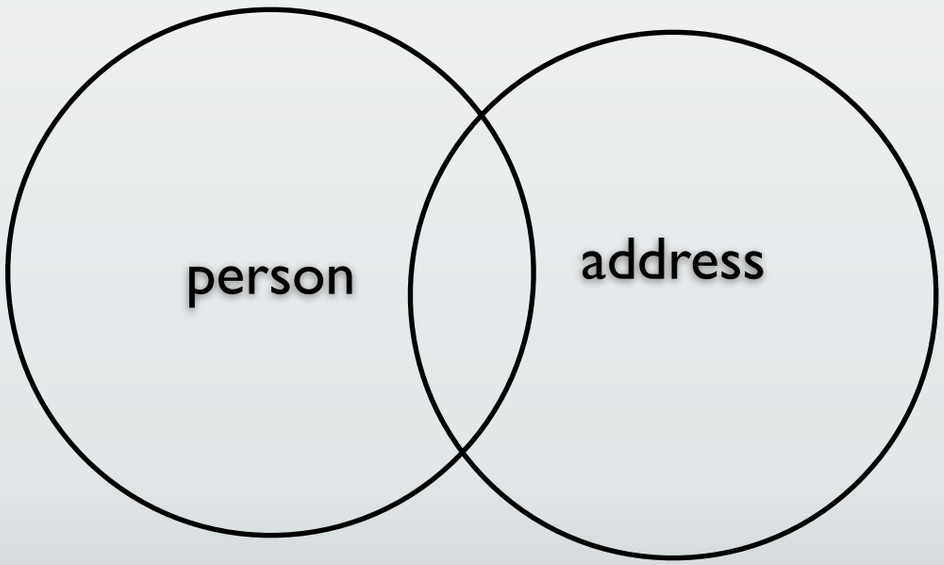
```
<xml version="1.0" encoding="utf-8">
<persons>
  <person>
    <name>Joshua Thijssen</name>
    <phone type="cell">0612345678</phone>
    <address>
      <street>Mainstreet 1234</street>
      <postalcode>1234AB</postalcode>
      <city>Amsterdam</city>
      <country>Netherlands</country>
    </address>
    <link rel="address" href="/users/jthijssen/address">
  </person>
  ...
</persons>
```

Watch out with visibility



Watch out with visibility





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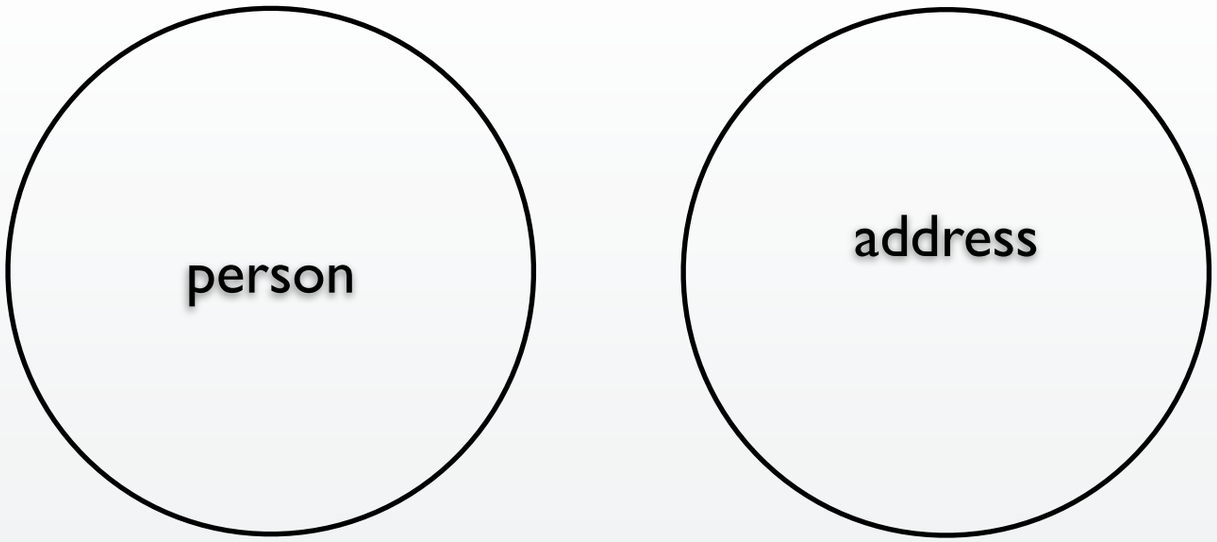
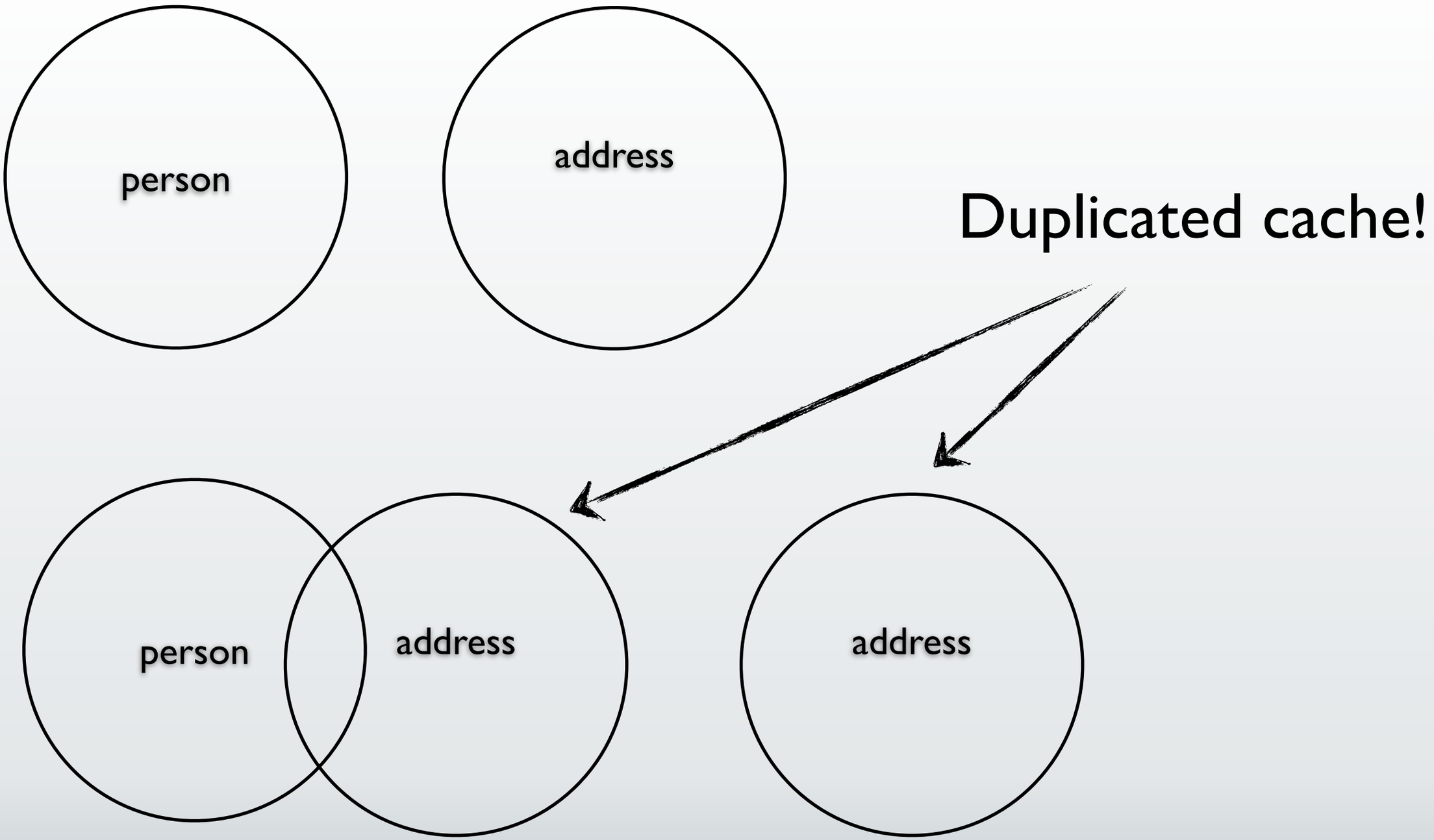
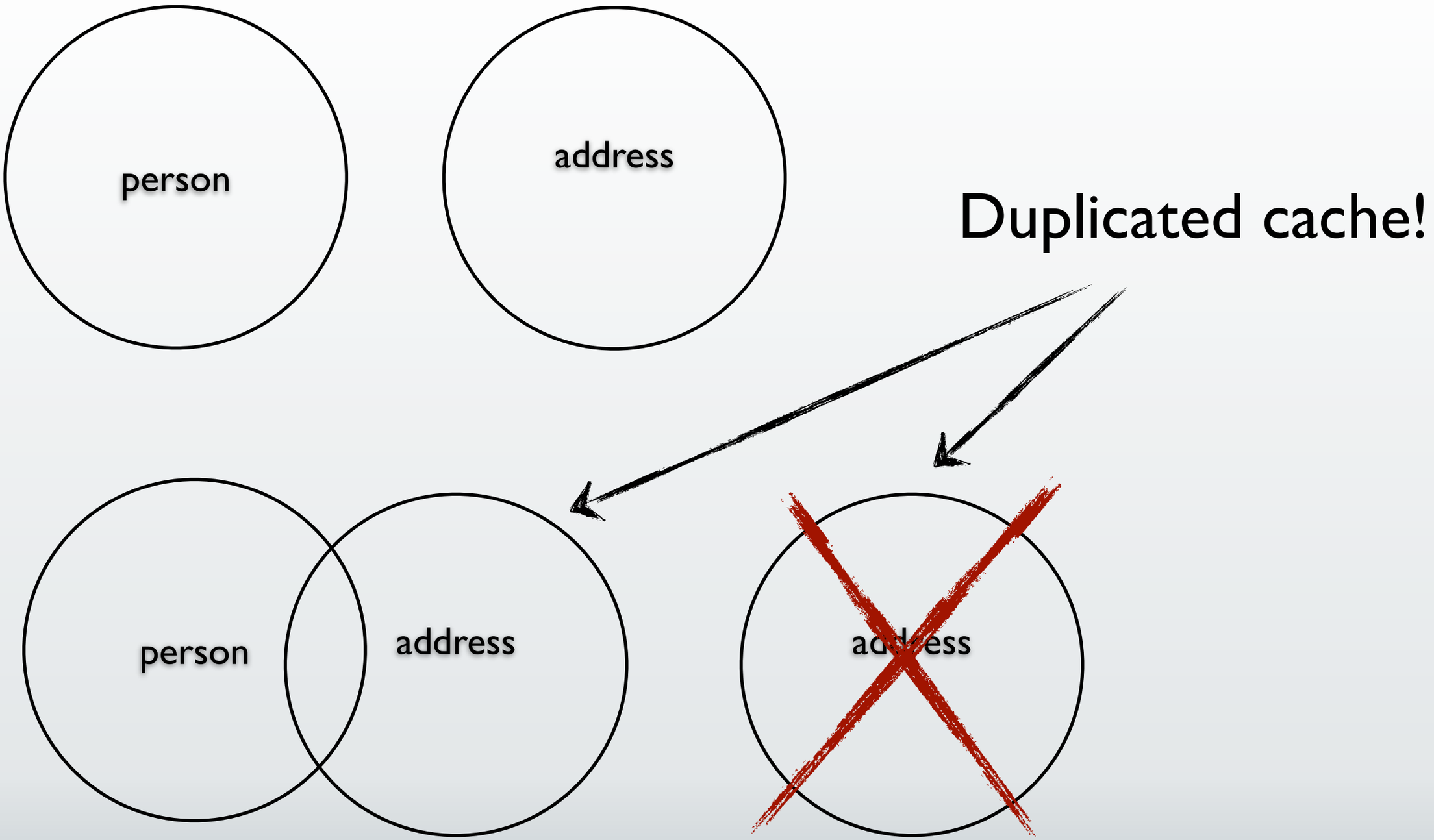


Watch out with visibility



Watch out with visibility



- Degrades resource visibility since they contain overlapping data
- Use caching proxies! (maybe ESI???)
- Each client needs a different composite.

It sounded like a good idea at the time...

- Use HTTP (verbs) wisely

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- Etags / If-(not-)modified

NOX LOGIC

- Use HTTP (verbs) wisely
- Etags / If-(not-)modified
- HTTP codes

NOX LOGIC

- HTTP 1xx : Do I got info for you!

- HTTP 1xx : Do I got info for you!
- HTTP 2xx : We're cool..

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- HTTP 3xx : Take a look there..

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- HTTP 3xx : Take a look there..
- HTTP 4xx : your bad!

- HTTP 1xx : Do I got info for you!
- HTTP 2xx : We're cool..
- HTTP 3xx : Take a look there..
- HTTP 4xx : your bad!
- HTTP 5xx : my bad!

- Sometimes hard:
  - 405 Method not allowed
  - 501 Not implemented
  - Who is to blame? (tip: blame client!)

Don’t return OK when it’s not:

```
HTTP/1.1 200 Ok

<xml>
  <errorcode>my-superduper-code-nobody-understands<errorcode>
  <error>This action is forbidden</error>
</xml>
```

- Use a hypermedia format (xhtml / atom)

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- JSON is NOT a hypermedia format

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- JSON-LD http://json-ld.org/

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- JSON is NOT a hypermedia format
- JSON-LD http://json-ld.org/
- HAL http://stateless.co/hal_specification.html

How to do stuff

How do I login into my API?

You don't

Client

Cookie
PHPSESSID: 1234ABCD

Server

PHPSESSID: 1234ABCD
LoggedIn: true
User: 52
IsAdmin: false

Client

Server

Cookie
Loggedin: true
User: 52
IsAdmin:false

Client

Server

Cookie
Loggedin: true
User: 52
IsAdmin: true

Client

Server

Cookie:
0xEncryptedData

- Authenticate / Authorize per request.
- Caching is possible, just don't rely on it.
- If you need state, make sure it's resource state, not session/application state.

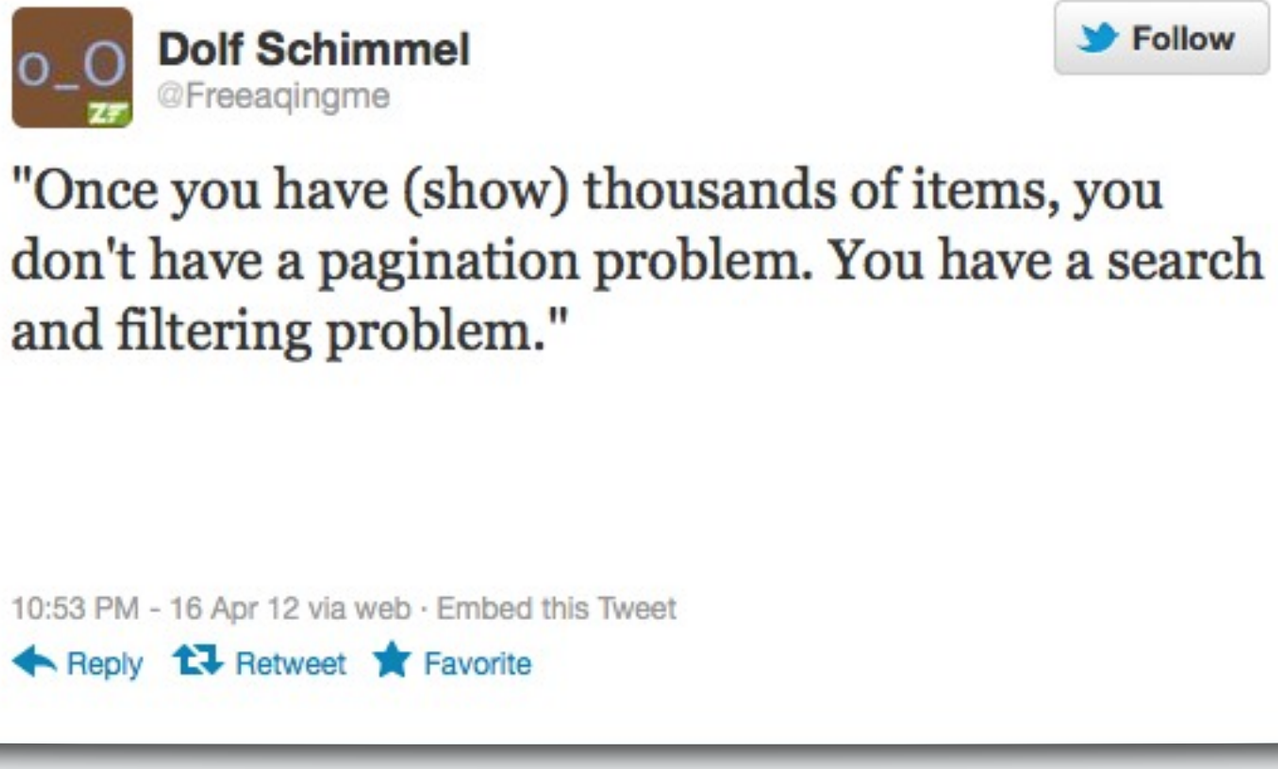
Querying for data

```
/entities/search?
what=restaurants&type=italian&postalcode=1234AB&radius=5000&sor
t=rating&order=desc
```

```
/entities/search?
what=restaurants&type=italian&postalcode=1234AB&radius=5000&sor
t=rating&order=desc
```

```
/restaurants/italian/top10?postalcode=1234AB&radius=5000
```

Pagination


o_O
Dolf Schimmel
@Freeaqingme
Follow
"Once you have (show) thousands of items, you don't have a pagination problem. You have a search and filtering problem."
10:53 PM - 16 Apr 12 via web · Embed this Tweet
Reply
Retweet
Favorite

```
/restaurants?page=5
```

```
/restaurants?page=635
```

```
/restaurants/top1000?page=5
```

```
<xml version="1.0" encoding="utf-8">
<restaurants>
  <restaurant>...</restaurant>
  <restaurant>...</restaurant>

  <link rel="first" href="/restaurants/top10?page=1">
  <link rel="self" href="/restaurants/top10?page=5">
  <link rel="previous" href="/restaurants/top10?page=4">
  <link rel="next" href="/restaurants/top10?page=6">
  <link rel="last" href="/restaurants/top10?page=25">
</restaurants>
```

Applying hierarchy

Not everything implies an hierarchy:

```
/directions/brussels/amsterdam
```

Parameters, order does matter:

```
/directions/brussels,amsterdam
```

```
/directions/amsterdam,brussels
```

```
/directions?from=brussels&to=amsterdam
```

```
/directions?from=amsterdam&to=brussels
```

Parameters, order does not matter:

```
/distance/amsterdam;brussels
```

```
/distance/brussels;amsterdam
```

One cache system:

```
HTTP/1.1 303 See other
Location: /distance/amsterdam;brussels
```

Asynchronous updates

Synchronous updates

```
POST /blogs HTTP/1.1
Content-type: application/vnd.myblog.article+xml ; version=1.0

<?xml version="1.0" encoding="UTF-8" ?>
<article>
  <title>My blogpost</title>
  <author>John Doe</author>
  <content>This is the content for my blog article</content>
</article>
```

Synchronous updates

```
POST /blogs HTTP/1.1
Content-type: application/vnd.myblog.article+xml ; version=1.0

<?xml version="1.0" encoding="UTF-8" ?>
<article>
  <title>My blogpost</title>
  <author>John Doe</author>
  <content>This is the content for my blog article</content>
</article>
```

```
HTTP/1.1 201 Created
Location: /blog/20010101-myblogpost
```

Asynchronous updates

```
POST /blogs HTTP/1.1
Content-type: application/vnd.myblog.article+xml ; version=1.0

<?xml version="1.0" encoding="UTF-8" ?>
<article>
  <title>My blogpost</title>
  <author>John Doe</author>
  <content>This is the content for my blog article</content>
</article>
```

Asynchronous updates

```
POST /blogs HTTP/1.1
Content-type: application/vnd.myblog.article+xml ; version=1.0

<?xml version="1.0" encoding="UTF-8" ?>
<article>
  <title>My blogpost</title>
  <author>John Doe</author>
  <content>This is the content for my blog article</content>
</article>
```

```
HTTP/1.1 202 Accepted
Location: /queue/621252
```

Asynchronous updates - waiting in queue

```
GET /queue/621252 HTTP/1.1
```

Asynchronous updates - waiting in queue

```
GET /queue/621252 HTTP/1.1
```

```
HTTP/1.1 200 OK

<?xml version="1.0" encoding="UTF-8" ?>
<queue>
  <status>Pending</status>
  <eta>10 minutes</eta>
  <link rel="cancel" href="/queue/621252"/>
</queue>
```

Asynchronous updates - in progress

```
GET /queue/621252 HTTP/1.1
```

Asynchronous updates - in progress

```
GET /queue/621252 HTTP/1.1
```

```
HTTP/1.1 200 OK

<?xml version="1.0" encoding="UTF-8" ?>
<queue>
  <status>In progress</status>
  <eta>3 minutes, 25 seconds</eta>
</queue>
```

Asynchronous updates - done

```
GET /queue/621252 HTTP/1.1
```

Asynchronous updates - done

```
GET /queue/621252 HTTP/1.1
```

```
 HTTP/1.1 303 See Other
Location: /blog/20010101-myblogarticle
```

Transactions

Don’t make transactions
through multiple resources.

Breaks the state constraint

(plus the rest of the the internet)

```
POST /account/1234?amount=-100
TransIDX: 55A50611FE
```

```
POST /account/1234?amount=-100
TransIDX: 55A50611FE
```

```
HTTP/1.1 202 Accepted
```

```
POST /account/1234?amount=-100
TransIDX: 55A50611FE
```

```
HTTP/1.1 202 Accepted
```

```
POST /account/4567?amount=+100
TransIDX: 55A50611FE
```

```
POST /account/1234?amount=-100
TransIDX: 55A50611FE
```

```
HTTP/1.1 202 Accepted
```

```
POST /account/4567?amount=+100
TransIDX: 55A50611FE
```

```
HTTP/1.1 202 Accepted
```

```
POST /account/1234?amount=-100
TransIDX: 55A50611FE
```

```
HTTP/1.1 202 Accepted
```

```
POST /account/4567?amount=+100
TransIDX: 55A50611FE
```

```
HTTP/1.1 202 Accepted
```

```
POST /commit
TransIDX: 55A50611FE
```

```
POST /account/1234?amount=-100
TransIDX: 55A50611FE
```

```
HTTP/1.1 202 Accepted
```

```
POST /account/4567?amount=+100
TransIDX: 55A50611FE
```

```
HTTP/1.1 202 Accepted
```

```
POST /commit
TransIDX: 55A50611FE
```

Nope! This is state!

Your API is not a RDBMS.

The internet does not need more ACID.

A transaction can been as a resource

Another attempt:

Create a new transaction

```
POST /transactions
201 Created
Location: /transactions/55A50611FE
```

```
POST /transactions/55A50611FE
POST /transactions/55A50611FE/commit
POST /transactions/55A50611FE/rollback
POST /transactions/55A50611FE/snapshot
POST /transactions/55A50611FE/rollback/1
```

But now we are back to XML-RPC or worse..

So, define services:

```
POST /booking
<xml>
  <amount currency=”USD”>10.000.000</amount>
  <from_account>12.34.56.789, my bank</from_account>
  <to_account>X5252P25, Cayman Islands</to_account>
</xml>
```

This stuff is hard!

- If you do REST, don't break the constraints.
- Be realistic about the constraints
- XML-RPC, HTTP-services (even SOAP) are valid for their uses.

NOX LOGIC

- Take into account that you probably are not building the next Twitter API.
- If you follow the REST constraints, at least your API can scale.

Questions?

Thank you

Find me on twitter: @jaytaph

Find me on email: jthijssen@noxlogic.nl

Find me for blogs: www.adayinthelifeof.nl

Find me for development or training: www.noxlogic.nl