

Real World **REST** &

Hands-On

Hypermedia

@dylanbeattie



Dylan Beattie



@dylanbeattie

- Systems architect at www.spotlight.com
- Building websites since 1992
- www.dylanbeattie.net

Slides & code:

www.github.com/dylanbeattie/RealWorldREST

я не говорю по-русски!

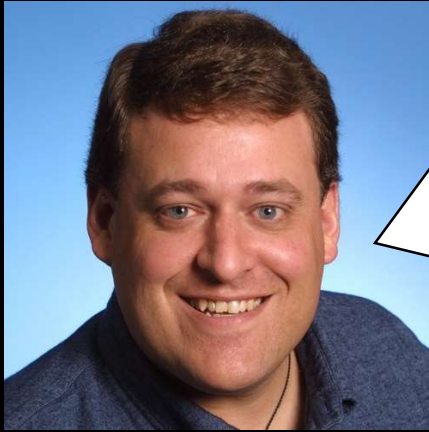


Roy T. Fielding



@fielding

- Senior Principal Scientist at Adobe
- co-founded Apache
- authored the REST architectural style



"When given **a name**, a
coordinated set of
**architectural
constraints**
becomes an
architectural style"



"REST is software design on
the **scale of decades**:
every detail is intended to promote
software longevity and
independent evolution."

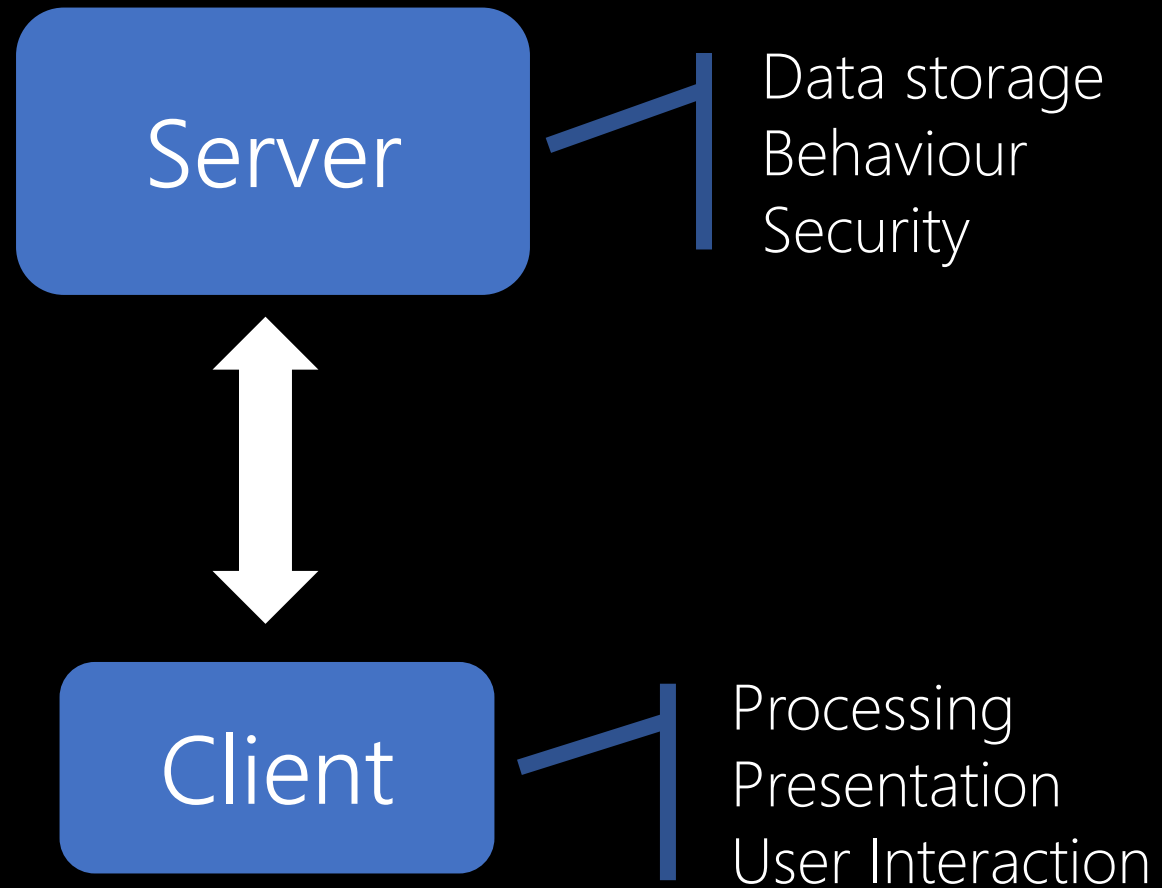
Many of the constraints are
directly opposed to
short-term efficiency."

Representational State Transfer (REST)

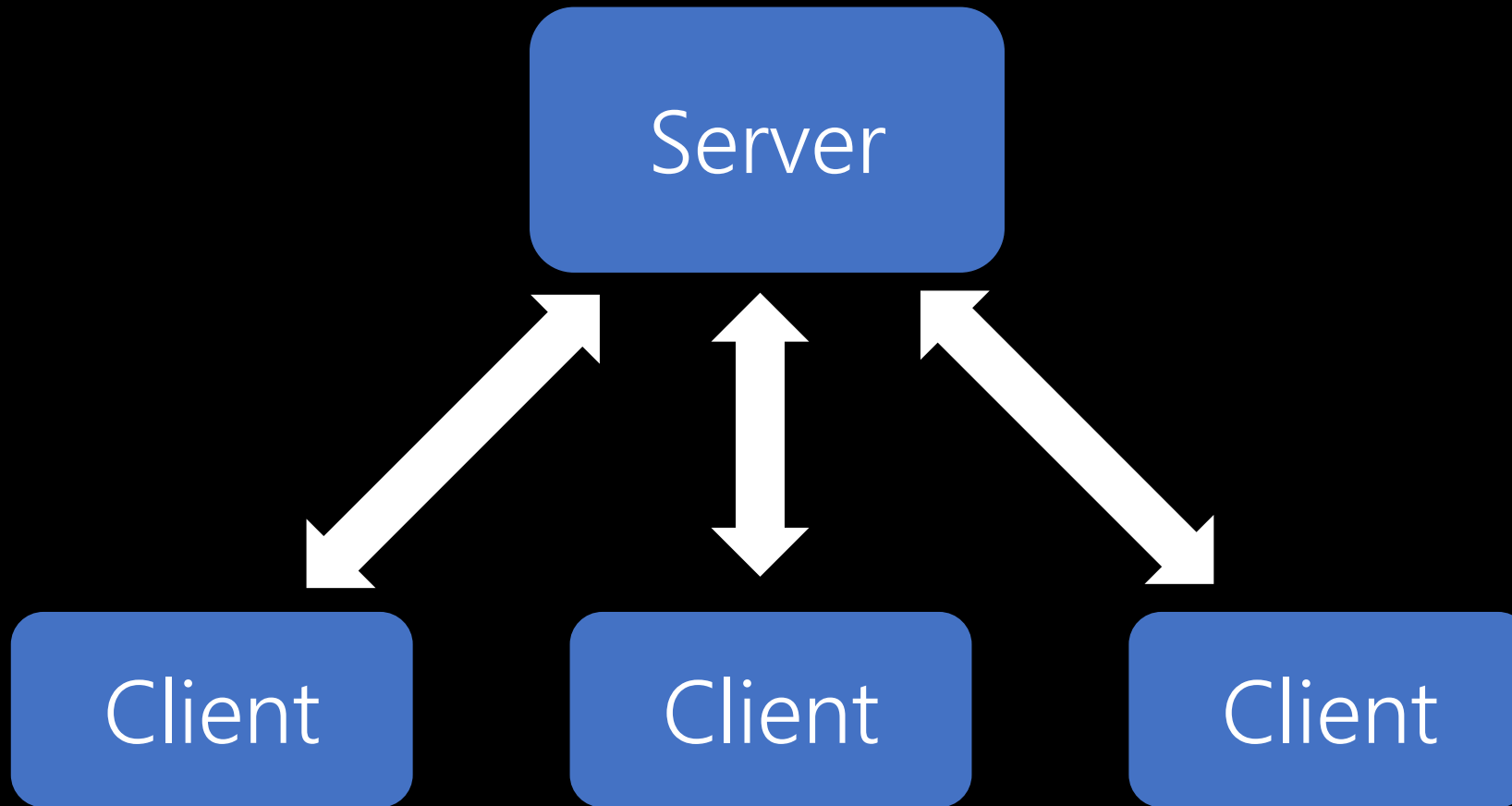
“a coordinated set of
architectural constraints...”

“...intended to promote
software longevity and
independent evolution”

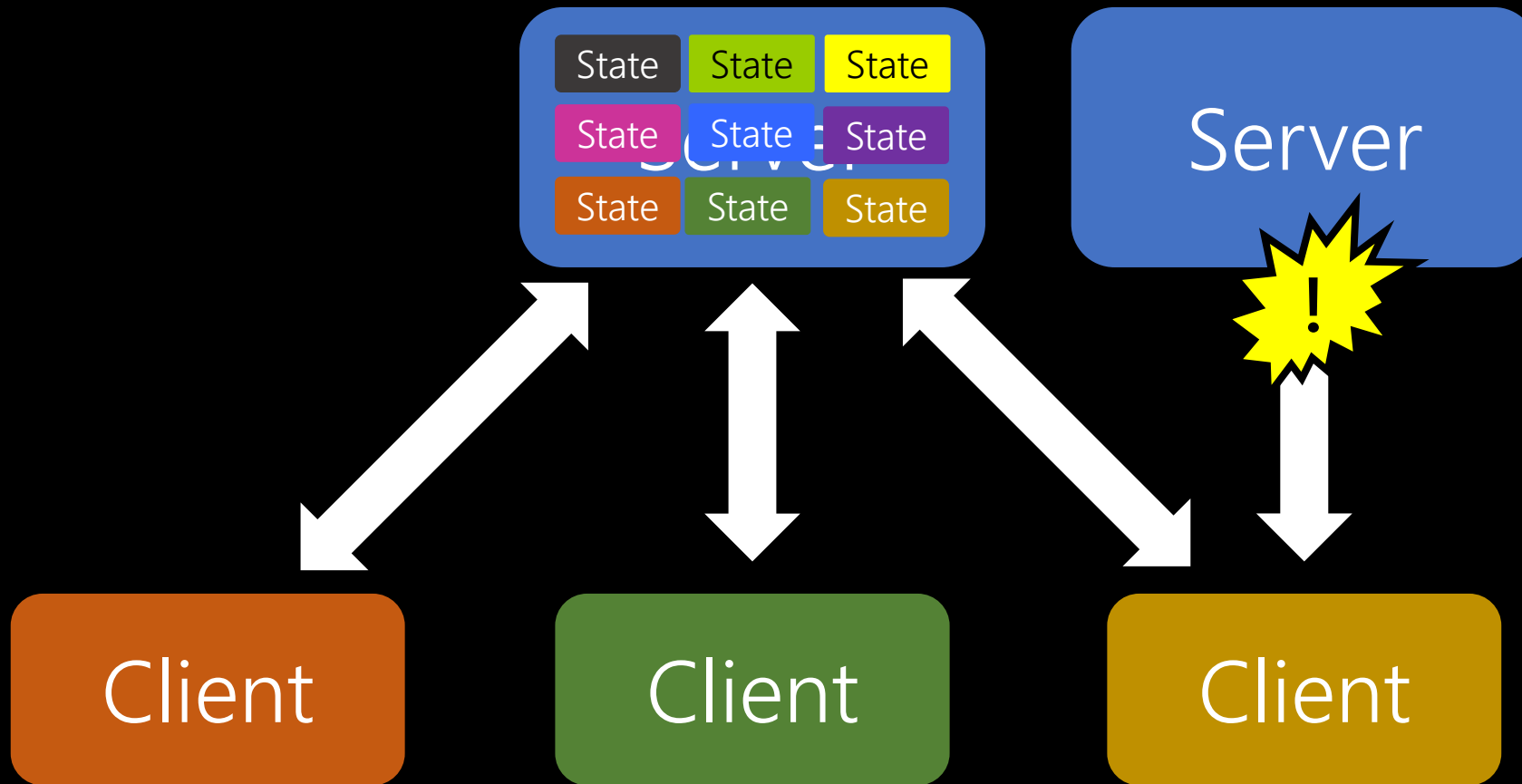
1. Client–Server



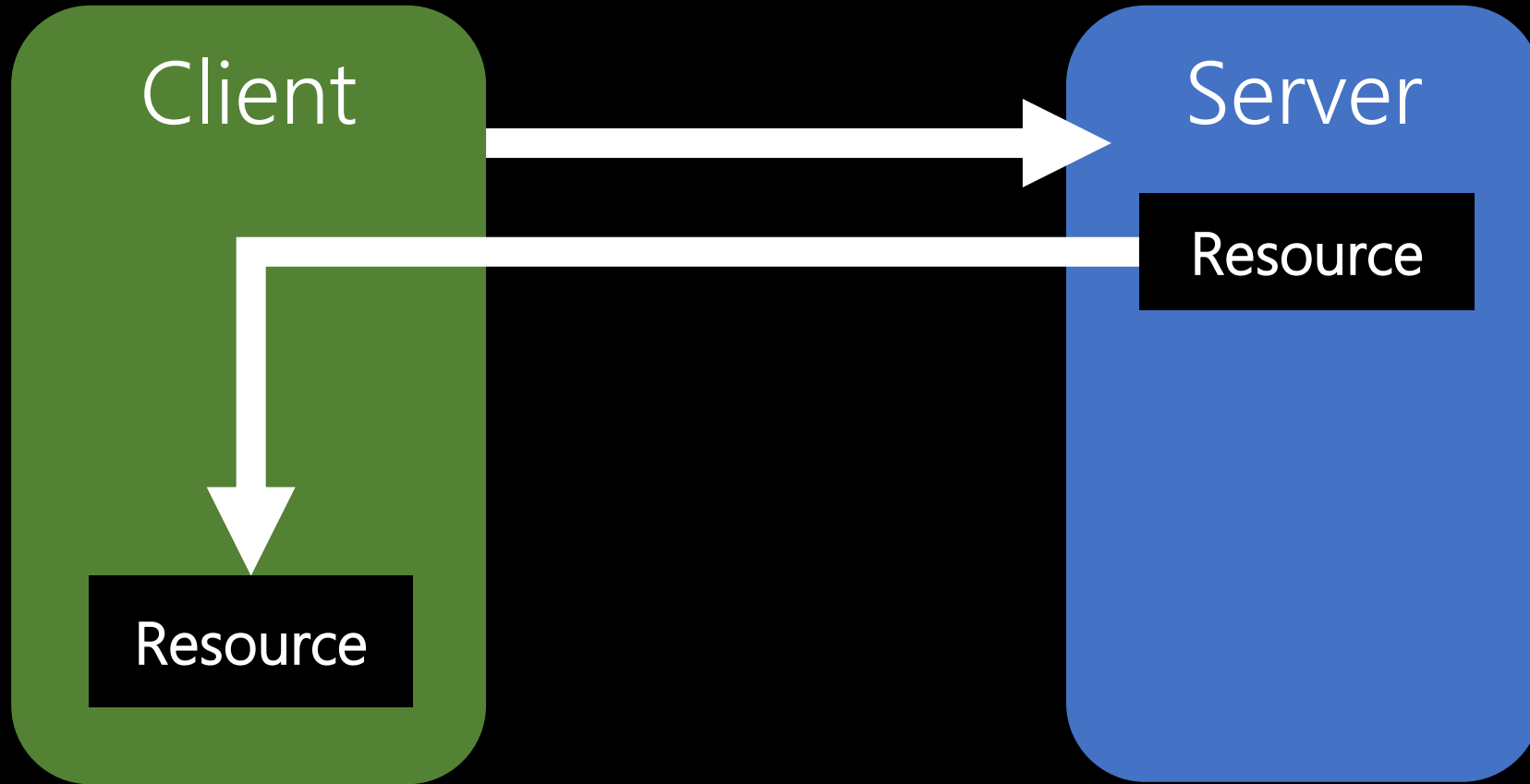
1. Client–Server



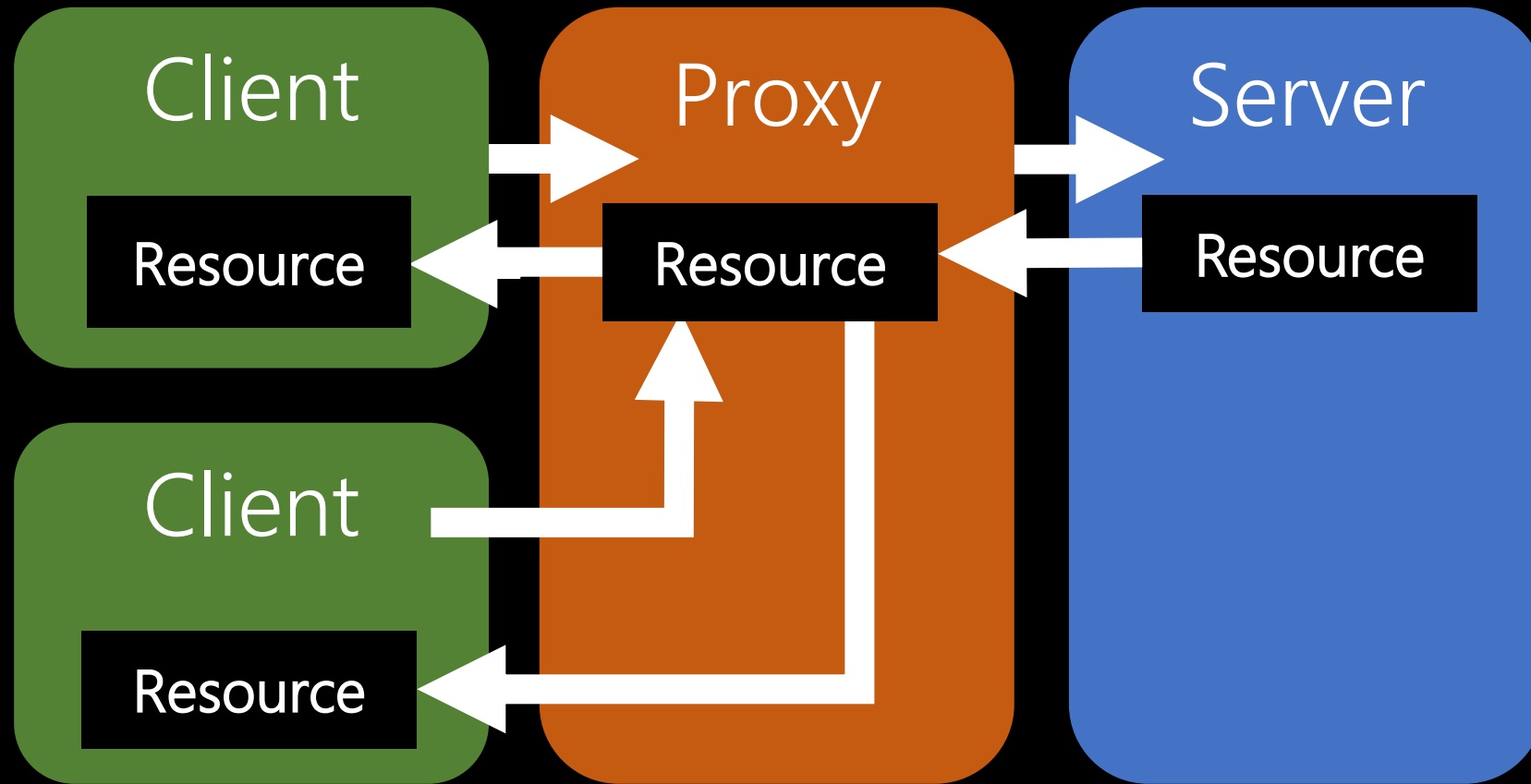
2. Stateless



3. Cacheable



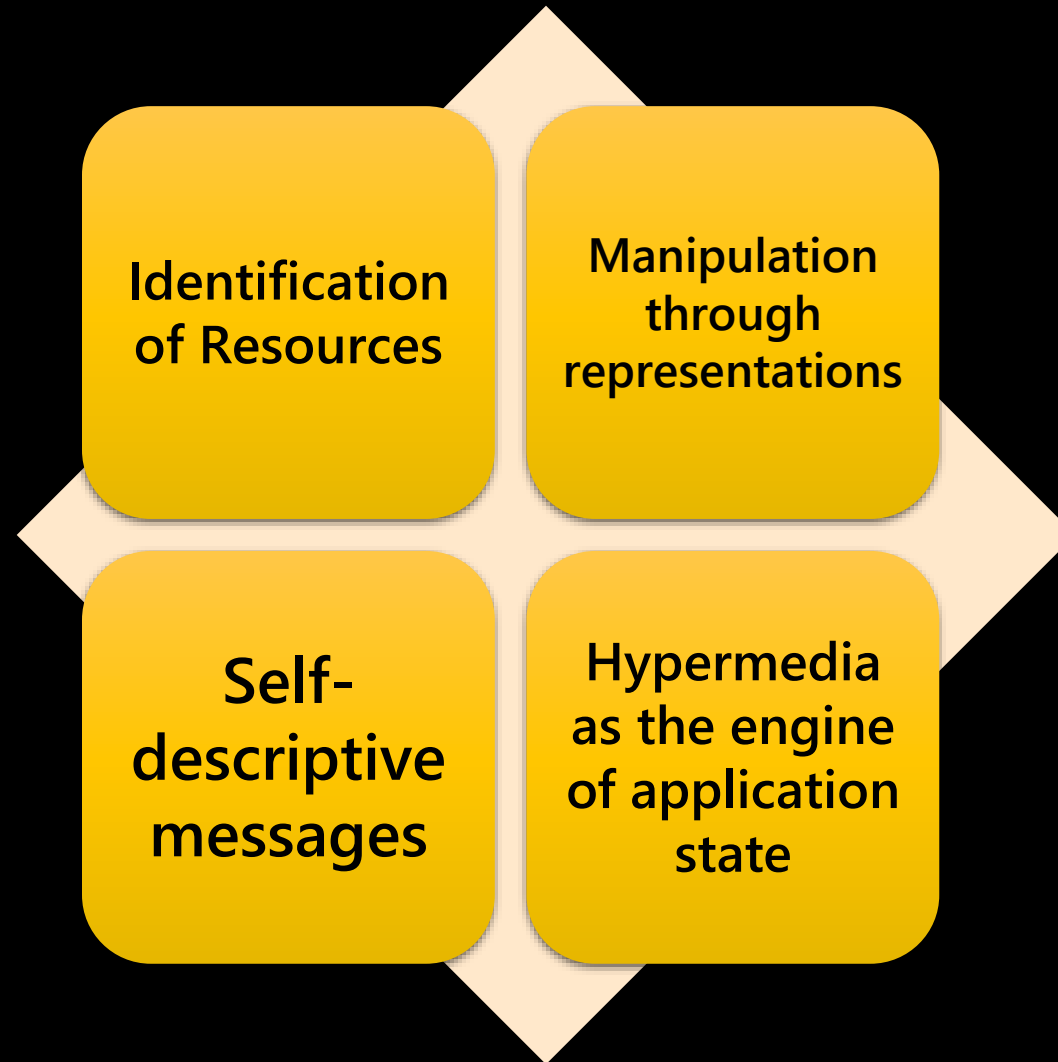
4. Layered System



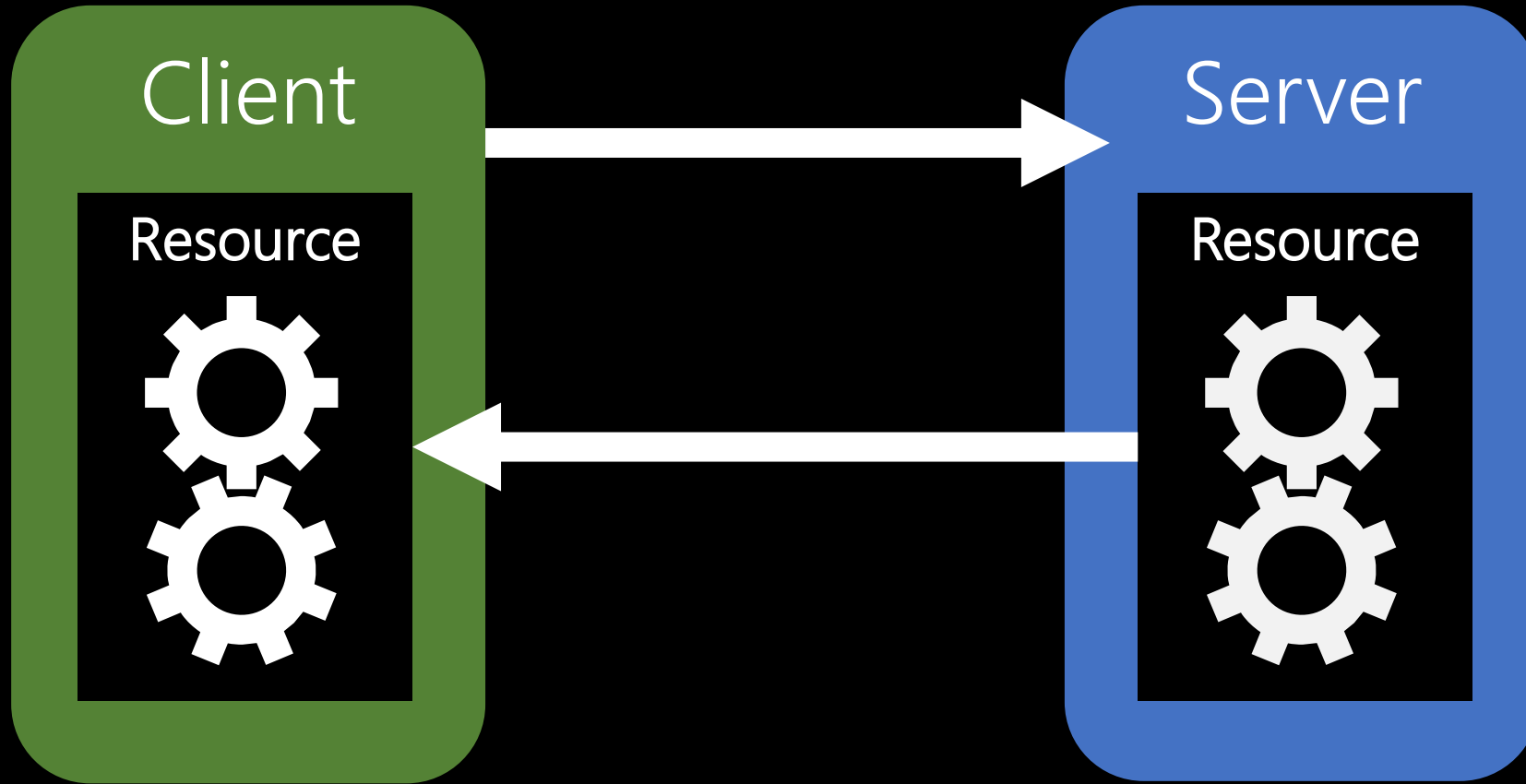
4. Layered System (continued)



5. Uniform Interface



6. Code on Demand



A Set of Architectural Constraints

1. Client-server
2. Stateless
3. Cacheable
4. Layered System
5. Uniformed Interface
6. Code-on-demand



OPTIONAL



GET / HTTP/1.1

200 OK

Content-Type: application/json

```
{  
  "message": "Welcome to Herobook!"  
}
```

GET /profiles HTTP/1.1

200 OK

Content-Type: application/json

```
[
  {
    "username": "ironman",
    "name": "Tony Stark",
  }
]
```

```
POST /profiles HTTP/1.1
```

```
{  
  "username" : "blackwidow"  
  "name": "Наташа Романова",  
}
```


```
201 Created
```

```
Location: http://api.herobook.local/profiles/blackwidow
```

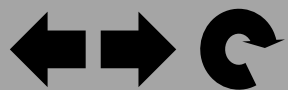
```
{  
  "username": "blackwidow",  
  "name": "Наташа Романова"  
}
```

An orange speech bubble with a white outline and a tail pointing towards the bottom-left.

"Hey- where's your
API documentation?"

A blue speech bubble with a white outline and a tail pointing towards the bottom-left.

"How do I register a
user on your new
system?"



<https://readthedocs.org/herobook/>

HEROBOOK API DOCUMENTATION

GET /profiles

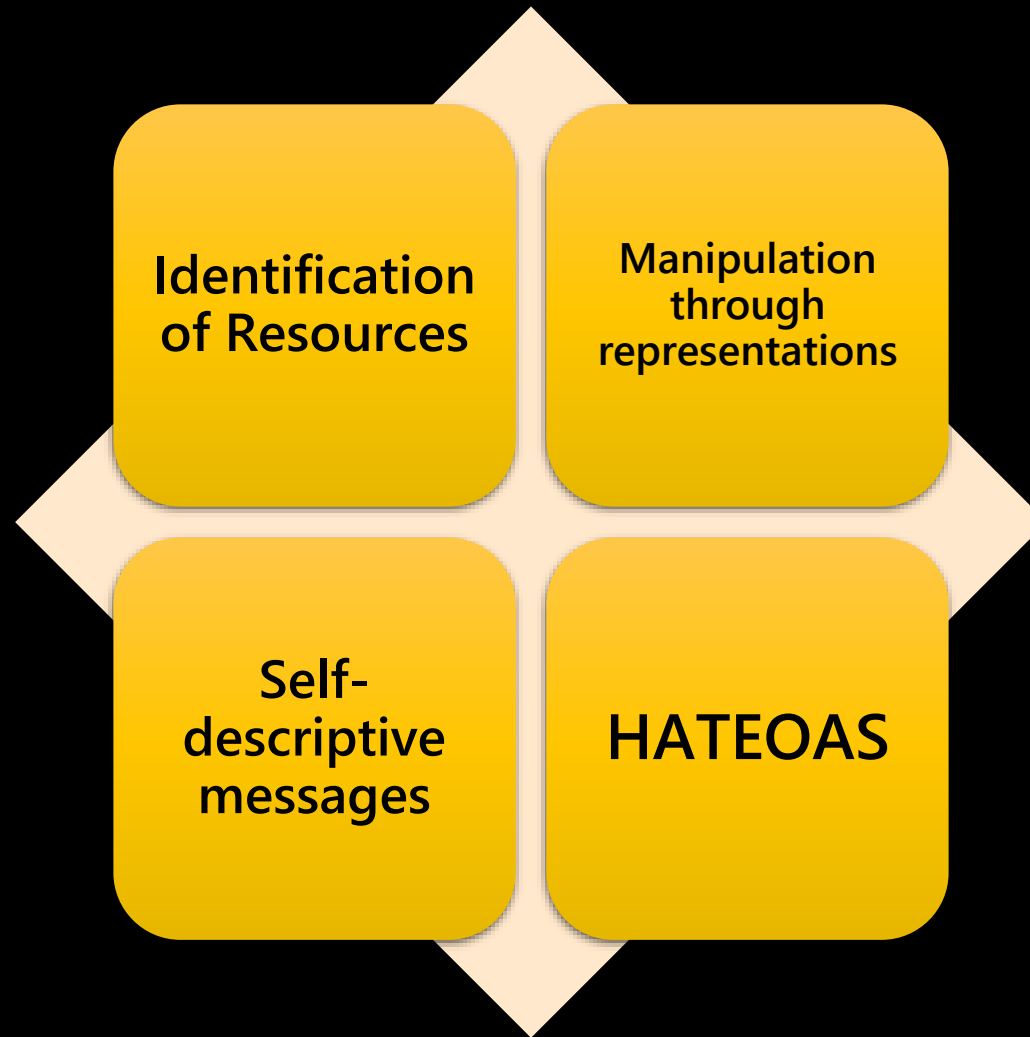


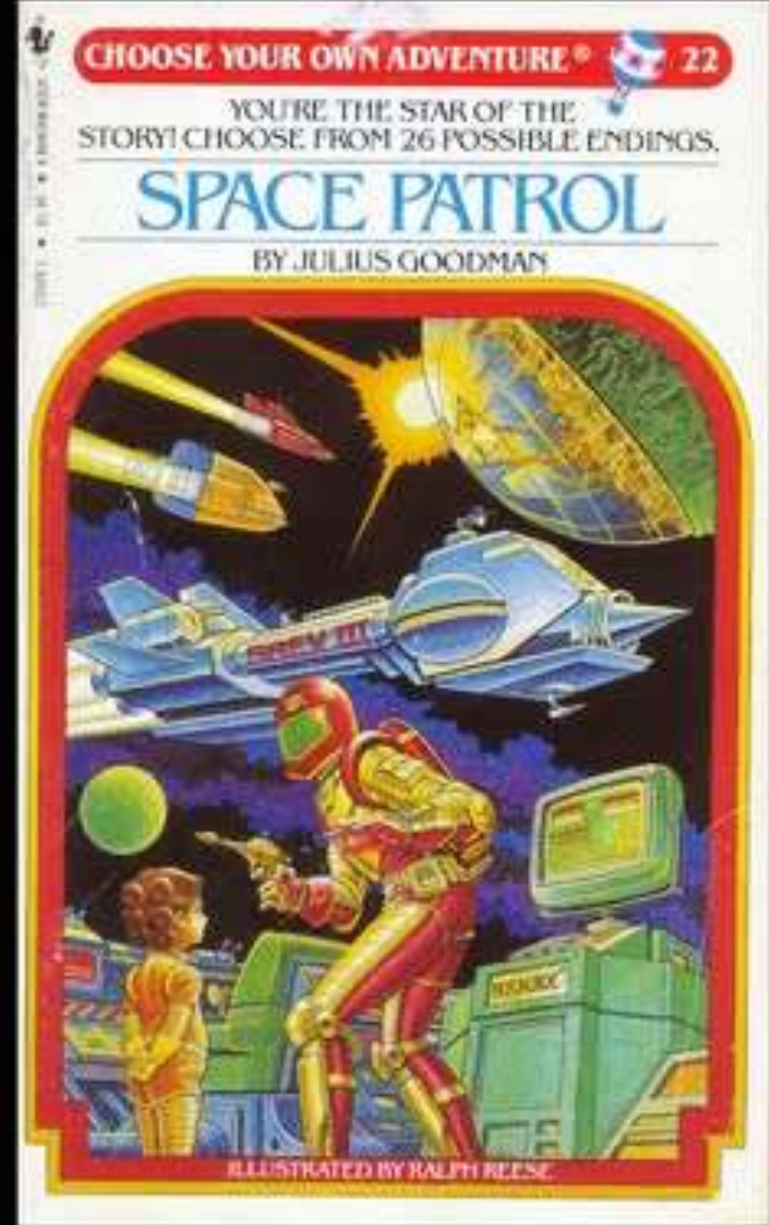
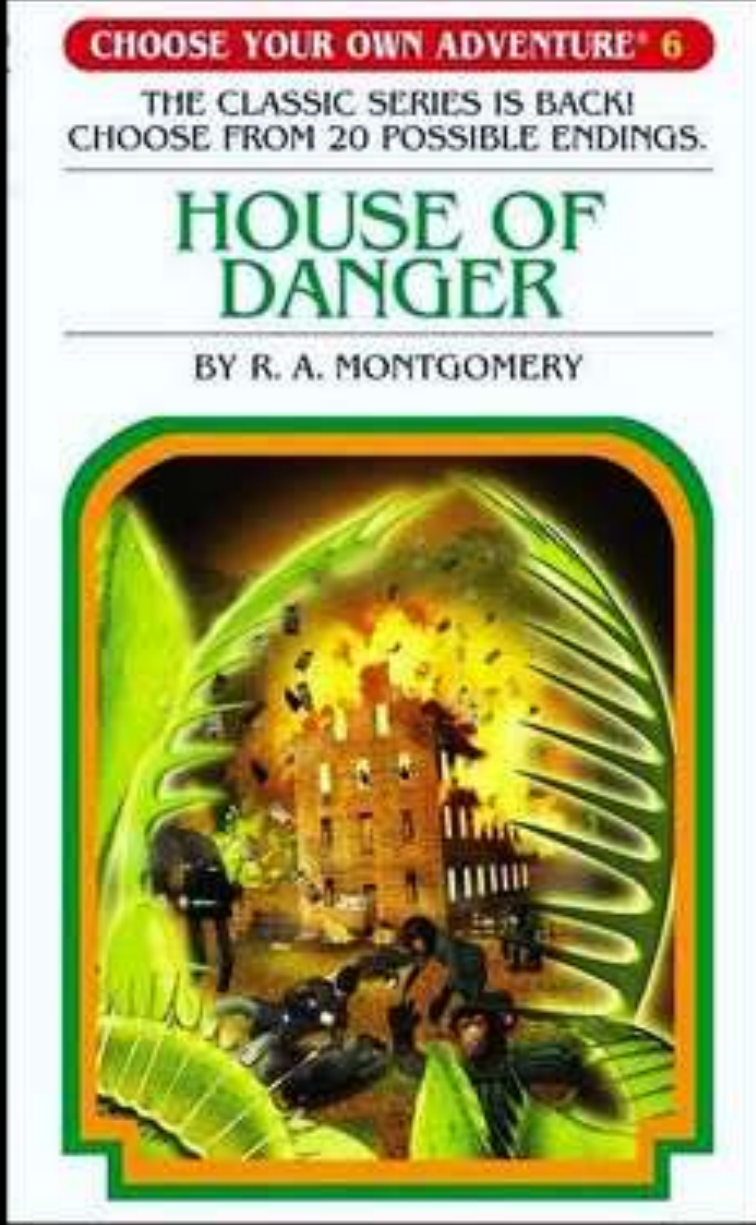
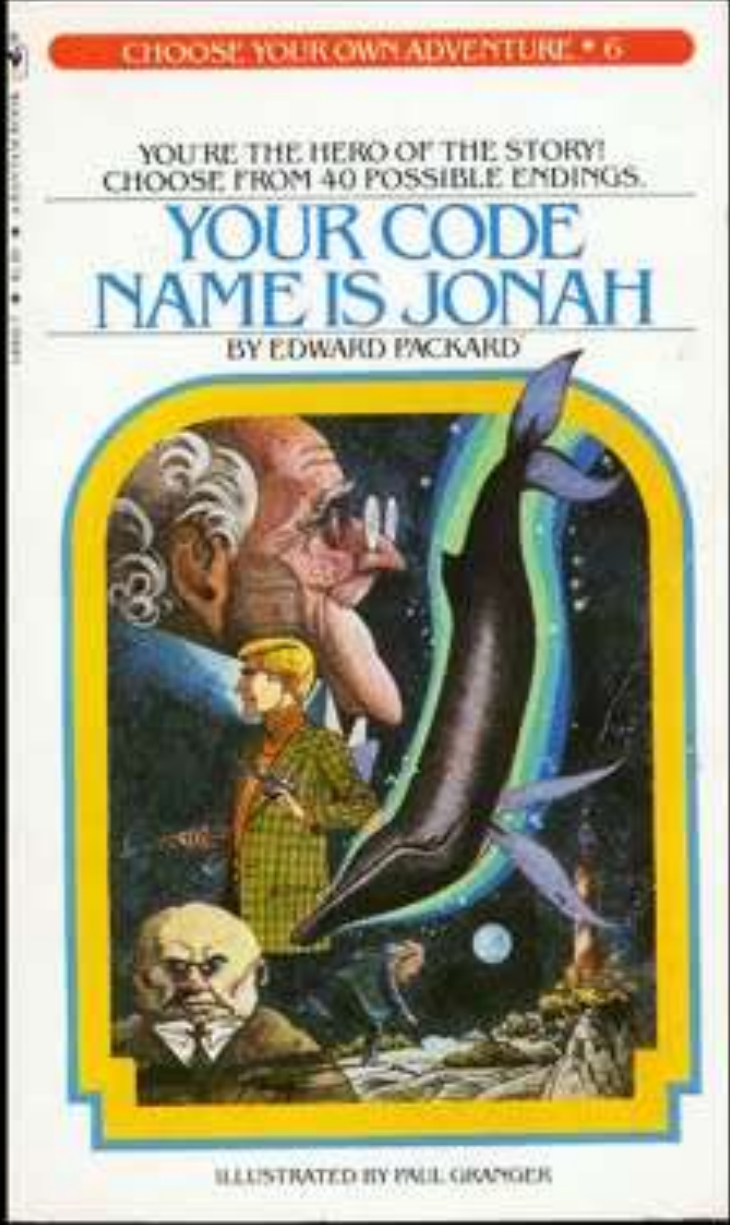
POST /profile



NOT REST

5. Uniform Interface





CHOOSE YOUR OWN ADVENTURE! #DOTNEXT1

YOU'RE THE STAR OF THE STORY!
CHOOSE FROM 21 POSSIBLE ENDINGS!

HANDS-ON HYPERMEDIA

ST. PETERSBURG



PLACEHOLDER SLIDE

FOR

“Choose Your
Own Adventure”

GET / HTTP/1.1

200 OK

Content-Type: application/json

{

"message": "Welcome to Herobook!"

}

GET / HTTP/1.1

200 OK

Content-Type: application/hal+json

{

"message": "Welcome to Herobook!"

}

GET / HTTP/1.1

200 OK

Content-Type: application/hal+json

```
{
  "_links": {
    "profiles" : {
      "href" : "/profiles"
    }
  },
  "message": "Welcome to Herobook!"
}
```

GET /profiles HTTP/1.1

200 OK

Content-Type: application/hal+json

{

```
"items" : [  
  { "username": "ironman", "name": "Tony Stark" },  
  { "username": "blackwidow", "name": "Наташа Романова" }  
]  
}
```

GET /profiles HTTP/1.1

200 OK

Content-Type: application/hal+json

```
{
  "_links" : {
    "create" : {
      "name": "Create a Profile",
      "type": "application/json",
      "href" : "/profiles",
      "method": "POST"
    }
  },
  "items" : [
    { "username": "ironman", "name": "Tony Stark" },
    { "username": "blackwidow", "name": "Наташа Романова" }
  ]
}
```

GET /profiles HTTP/1.1

200 OK

Content-Type: application/vnd.herobook.hal+json

```
{
  "_links" : {
    "create" : {
      "name": "Create a Profile",
      "type": "application/json",
      "href" : "/profiles",
      "method": "POST"
    }
  },
  "items" : [
    { "username": "ironman", "name": "Tony Stark" },
    { "username": "blackwidow", "name": "Наташа Романова" }
  ]
}
```


GET /profiles HTTP/1.1

200 OK

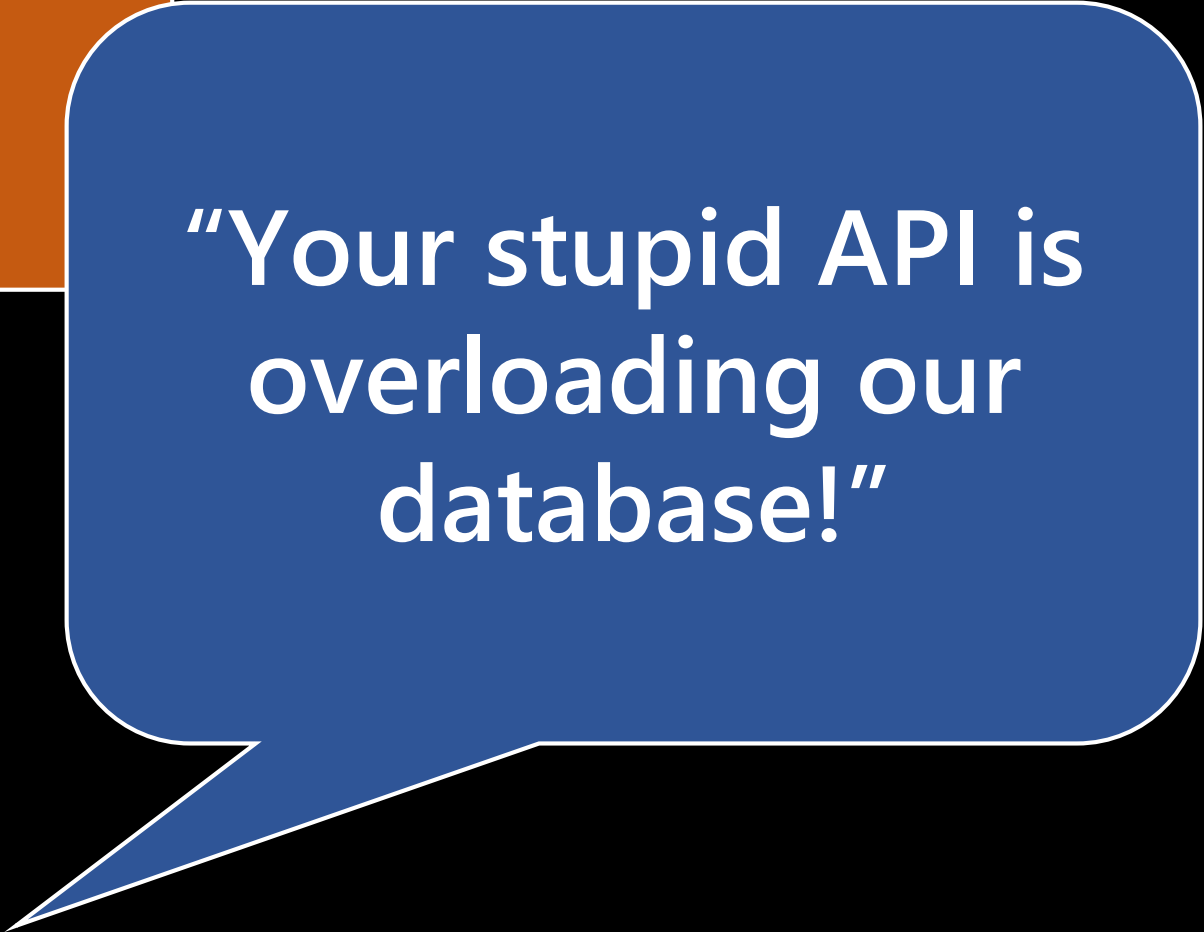
```
{
  "links" : { ... },
  "items" : {
    { "username": "ironman", "name": "Tony Stark" },
    { "username": "blackwidow", "name": "Наташа Романова" },
    { "username": "spidey", "name": "Peter Parker" },

    { /* +2 million users! Wow! */,

    { "username": "ducky", "name": "Howard the Duck" }
  }
}
```



**"Your API is using all
our bandwidth!"**



**"Your stupid API is
overloading our
database!"**

GET /profiles?page=1 HTTP/1.1

200 OK

```
{
  "_links" : { ... },
  "items" : [
    { "username": "ironman", "name": "Tony Stark" },
    { "username": "spidey", "name": "Peter Parker" },
    { "username": "blackwidow", "name": "Наташа Романова" },
    { "username": "cap", "name": "Steve Rogers" },
    { "username": "storm", "name": "Ororo Munroe" }
  ]
}
```

GET /profiles?page=2 HTTP/1.1

200 OK

GET /profiles?page=3 HTTP/1.1

200 OK

GET /profiles?page=4 HTTP/1.1

200 OK

GET /profiles?page=5 HTTP/1.1

204 No Content

NOT REST

GET /profiles HTTP/1.1

200 OK

Content-Type: application/hal+json

```
{
  "_links" : {

  },
  "count" : 5,
  "index" : 0,
  "total" : 223,
  "items:" [
    { "username":"ironman", "name":"Tony Stark" },
    { "username":"spidey", "name":"Peter Parker" },
    { "username":"blackwidow", "name":"Натáша Романов" },
    { "username":"pepper", "name":"Pepper Potts" },
    { "username":"storm", "name":"Ororo Munroe" }
  ]
}
```

GET /profiles HTTP/1.1

200 OK

Content-Type: application/hal+json

```
{
  "_links" : {
    "self" : { "href" : "http://herobook/profiles?index=0" },
    "next" : { "href" : "http://herobook/profiles?index=5" },
    "last" : { "href" : "http://herobook/profiles?index=220" }
  },
  "count" : 5,
  "index" : 0,
  "total" : 223,
  "items:" [
    { "username":"ironman", "name":"Tony Stark" },
    { "username":"spidey", "name":"Peter Parker" },
    { "username":"blackwidow", "name":"Натáша Романов" },
    { "username":"pepper", "name":"Pepper Potts" },
    { "username":"storm", "name":"Ororo Munroe" }
  ]
}
```

GET /profiles HTTP/1.1

200 OK

Content-Type: application/hal+json

```
{
  "_links" : {
    "self" : { "href" : "http://herobook/profiles?index=0" },
    "next" : { "href" : "http://herobook/profiles?index=5" },
    "last" : { "href" : "http://herobook/profiles?index=220" }
  },
  "count" : 5,
  "index" : 0,
  "total" : 223,
  "items:" [
    { "username":"ironman", "name":"Tony Stark" },
    { "username":"spidey", "name":"Peter Parker" },
    { "username":"blackwidow", "name":"Натáша Романов" },
    { "username":"pepper", "name":"Pepper Potts" },
    { "username":"storm", "name":"Ororo Munroe" }
  ]
}
```

Enough talk already...
SHOW ME THE

CODE!

<https://github.com/tonsky/FiraCode>

$==$

$=$

\neq

\neq

\Rightarrow

\Rightarrow

\dots

\dots

\leq

\leq

\geq

\geq

Enough talk already...
SHOW ME THE

CODE!

GET /profiles/ironman HTTP/1.1

200 OK

Content-Type: application/json

```
{
  "username": "ironman",
  "name": "Tony Stark",
  "friends" : [
    { "username":"ironman", "name":"Tony Stark" },
    { "username":"spidey", "name":"Peter Parker" },
    { "username":"blackwidow", "name":"Натáша Романов" },
    /* another 500 friends here ... */
  ]
}
```

GET /profiles/ironman HTTP/1.1

200 OK

Content-Type: application/json

```
{
  "username": "ironman",
  "name": "Tony Stark",
  "friends" : [
    { "username": "hulk", "name": "Bruce Banner" },
    { "username": "spidey", "name": "Peter Parker" },
    { "username": "blackwidow", "name": "Натáша Романов" },
    /* another 500 friends here ... */
  ],
  "updates" : [

]
}
```

GET /profiles/ironman HTTP/1.1

200 OK

Content-Type: application/json

```
{
  "username": "ironman",
  "name": "Tony Stark",
  "friends" : [
    { "username": "hulk", "name": "Bruce Banner" },
    { "username": "spidey", "name": "Peter Parker" },
    { "username": "blackwidow", "name": "Натáша Романов" },
    /* another 500 friends here... */
  ],
  "updates" : [
    {
      "update" : "New suit's gonna have a selfie stick! Oh yeah!",
      "posted" : "2016-04-16T18:25:43.511Z"
    },
  ]
}
```

GET /profiles/ironman HTTP/1.1

200 OK

Content-Type: application/json

```
{
  "username": "ironman",
  "name": "Tony Stark",
  "friends" : [
    { "username": "hulk", "name": "Bruce Banner" },
    { "username": "spidey", "name": "Peter Parker" },
    { "username": "blackwidow", "name": "Натáша Романов" },
    /* another 500 friends here ... */
  ],
  "updates" : [
    {
      "update" : "New suit's gonna have a selfie stick! Oh yeah!",
      "posted" : "2016-04-16T18:25:43.511Z"
    },
    {
      "update" : "Selfie stick broke. Oh well. Back to the drawing board",
      "posted" : "2016-04-17T08:26:13.511Z"
    }
  ]
}
```

GET /profiles/ironman HTTP/1.1

200 OK

Content-Type: application/json

```
{
  "username": "ironman",
  "name": "Tony Stark",
  "friends" : [
    { "username": "hulk", "name": "Bruce Banner" },
    { "username": "spidey", "name": "Peter Parker" },
    { "username": "blackwidow", "name": "Натáша Романов" },
    /* another 500 friends here ... */
  ],
  "updates" : [
    { "id" : 1234,
      "update" : "Working a new Iron Man suit!",
      "posted" : "2016-02-23T18:25:43.511Z"
    },
    { "id" : 1543,
      "update" : "New suit's gonna have a selfie stick! Oh yeah!",
      "posted" : "2016-04-16T18:25:43.511Z"
    },
    { "id" : 1782,
      "update" : "Selfie stick broke. Oh well. Back to the drawing board",
      "posted" : "2016-04-17T08:26:13.511Z"
    }
  ]
}
```

GET /profiles/ironman HTTP/1.1

200 OK

Content-Type: application/json

```
{
  "username": "ironman",
  "name": "Tony Stark",
  "friends" : [
    { "username":"hulk", "name":"Bruce Banner",          "updates" : [ { . . . }, { . . . }, { . . . } ] },
    { "username":"spidey", "name":"Peter Parker",        "updates" : [ { . . . }, { . . . }, { . . . } ] },
    { "username":"blackwidow", "name":"Натáша Романов",  "updates" : [ { . . . }, { . . . }, { . . . } ] },
    /* another 500 friends here ... */
  ],
  "updates" : [
    { "id" : 1234,
      "update" : "Working a new Iron Man suit!",
      "posted" : "2016-02-23T18:25:43.511Z"
    },
    { "id" : 1543,
      "update" : "New suit's gonna have a selfie stick! Oh yeah!",
      "posted" : "2016-04-16T18:25:43.511Z"
    },
    { "id" : 1782,
      "update" : "Selfie stick broke. Oh well. Back to the drawing board",
      "posted" : "2016-04-17T08:26:13.511Z"
    }
  ]
}
```


GET /profiles/ironman HTTP/1.1

200 OK

Content-Type: application/json

```
{
  "username": "ironman",
  "name": "Tony Stark",
  "friends" : [
    { "username":"hulk", "name":"Bruce Banner", "updates" : [ { . . . },    { . . . }, { . . . } ],
      "friends" : [ { . . . },    { . . . }, { . . . } ],
    },
    { "username":"spidey", "name":"Peter Parker", "updates" : [ { . . . },    { . . . }, { . . . } ]
      "friends" : [ { . . . },    { . . . }, { . . . } ],
    },
    { "username":"blackwidow", "name":"Натáша Ромáнов", "updates" : [ { . . . },    { . . . }, { . . . } ]
      "friends" : [ { . . . },    { . . . }, { . . . } ],
    },
    /* another 500 friends here... */
  ],
  "updates" : [
    { "id" : 1234,
      "update" : "Working a new Iron Man suit!",
      "posted" : "2016-02-23T18:25:43.511Z"
    },
    { "id" : 1543,
      "update" : "New suit's gonna have a selfie stick! Oh yeah!",
      "posted" : "2016-04-16T18:25:43.511Z"
    },
    { "id" : 1782,
      "update" : "Selfie stick broke. Oh well. Back to the drawing board",
      "posted" : "2016-04-17T08:26:13.511Z"
    }
  ]
}
```

GET /profiles/ironman HTTP/1.1


200 OK

Content-Type: application/json


```
{
  "username": "ironman",
  "name": "Tony Stark",
  "friends" : [
    { "username": "hulk", "name": "Bruce Banner",
      "updates" : [ { . . . }, { . . . }, { . . . } ],
      "friends" : [
        { "updates" : { . . . } },
        { "updates" : { . . . } },
        { "updates" : { . . . } }
      ]
    },
    { "username": "spidey", "name": "Peter Parker",
      "updates" : [ { . . . }, { . . . }, { . . . } ],
      "friends" : [
        { "updates" : { . . . } },
        { "updates" : { . . . } },
        { "updates" : { . . . } }
      ]
    },
    { "username": "blackwidow", "name": "Наташа Романов",
      "updates" : [ { . . . }, { . . . }, { . . . } ],
      "friends" : [
        { "updates" : { . . . } },
        { "updates" : { . . . } },
        { "updates" : { . . . } }
      ]
    },
    /* another 500 friends here... */
  ],
  "updates" : [
    { "id" : 1234,
      "update" : "Working a new Iron Man suit!",
      "posted" : "2016-02-23T18:25:43.511Z"
    },
    { "id" : 1543,
      "update" : "New suit's gonna have a selfie stick! Oh yeah!",
      "posted" : "2016-04-16T18:25:43.511Z"
    },
    { "id" : 1782,
      "update" : "Selfie stick broke. Oh well. Back to the drawing board",
      "posted" : "2016-04-17T08:26:13.511Z"
    }
  ]
}
```



BIG DATA!



"Your API is using
all our
bandwidth...
AGAIN!"



"Your API is
overloading the
database. Again.

...I told you we
should have just
stuck with PHP..."

GET /profiles/ironman HTTP/1.1

200 OK

Content-Type: application/hal+json

```
{
  "_links": {
    "self": { "href" : "/profiles/ironman" },
    "friends": { "href" : "/profiles/ironman/friends" },
    "photos": { "href" : "/profiles/ironman/photos" },
    "updates": { "href" : "/profiles/ironman/updates" }
  },
  "username" : "ironman",
  "name" : "Tony Stark"
}
```

GET /profiles/ironman HTTP/1.1

200 OK

GET /profiles/ironman/friends HTTP/1.1

200 OK

GET /profiles/ironman/updates HTTP/1.1

200 OK

GET /profiles/ironman/photos HTTP/1.1

200 OK

GET /profiles/ironman/photos/1234 HTTP/1.1

200 OK

GET /profiles/ironman/photos/1234/comments HTTP/1.1

200 OK

GET /profiles/ironman/photos/1345 HTTP/1.1

200 OK

GET /profiles/ironman/photos/1345/comments HTTP/1.1

200 OK

GET /profiles/ironman/photos/1456 HTTP/1.1

200 OK

GET /profiles/ironman/photos/1456/comments HTTP/1.1

200 OK



"I need to make 50
API calls just to draw
one web page!"



"Our web server
crashed because the
IIS logs filled up the
C: drive!
We never had this problem
with PHP..."

GET /profiles/ironman

HTTP/1.1

200 OK

Content-Type: application/json

```
{
  "_links": {
    "self" : "http://api.herobook.local/profiles/ironman",
    "friends" : "http://api.herobook.local/profiles/ironman/friends",
    "photos" : "http://api.herobook.local/profiles/ironman/photos",
    "updates" : "http://api.herobook.local/profiles/ironman/updates"
  },
  "username" : "ironman",
  "name" : "Tony Stark"
}
```

GET /profiles/ironman?expand=updates HTTP/1.1

200 OK

Content-Type: application/json

```
{
  "_links": {
    "self" : "http://api.herobook.local/profiles/ironman",
    "friends" : "http://api.herobook.local/profiles/ironman/friends",
    "photos" : "http://api.herobook.local/profiles/ironman/photos",
    "updates" : "http://api.herobook.local/profiles/ironman/updates"
  },
  "username" : "ironman",
  "name" : "Tony Stark"
  "_embedded" : {

}
}
```


GET /profiles/ironman?expand=updates HTTP/1.1

200 OK

Content-Type: application/json

```
{
  "_links": {
    "self" : "http://api.herobook.local/profiles/ironman",
    "friends" : "http://api.herobook.local/profiles/ironman/friends",
    "photos" : "http://api.herobook.local/profiles/ironman/photos",
    "updates" : "http://api.herobook.local/profiles/ironman/updates"
  },
  "username" : "ironman",
  "name" : "Tony Stark"
  "_embedded" : {
    "updates" : [
      {
        "update" : "Working a new Iron Man suit – with a built-in selfie stick!",
        "posted" : "2016-02-23T18:25:43.511Z"
      },
      {
        "update" : "Selfie stick broke. Oh well. Back to the drawing board",
        "posted" : "2016-04-17T08:26:13.511Z"
      }
    ]
  }
}
```

DEMO #2

Resource Expansion

GET /profiles/ironman HTTP/1.1

200 OK

Content-Type: application/json


```
{
  "_links": {
    "self" : "http://api.herobook.local/profiles/ironman",
    "friends" : "http://api.herobook.local/profiles/ironman/friends",
    "photos" : "http://api.herobook.local/profiles/ironman/photos",
    "updates" : "http://api.herobook.local/profiles/ironman/updates"
  },
  "name": "Tony Stark",
  "username": "ironman",
  "height": 192,
  "weight": 85,
  "location": { "latitude": 59.93, "longitude": 30.33 },
  "status": "Out saving the world. Again.",
  "hometown": "Malibu, USA",
  "email": "tony@stark.com",
  "website": "www.ironman.com",
  "last_modified" : "2015-08-12T19:45:43.511Z"
}
```

PUT /profiles/ironman HTTP/1.1


Content-Type: application/json

```
{
  "name": "Tony Stark",
  "username": "ironman",
  "height": 192,
  "weight": 85,
  "location": { "lat": 34.02, "lon": -118.77 },
  "status" : "Just got back from saving the world. Again.",
  "hometown": "Malibu, USA",
  "email": "tony@stark.com",
  "website": "www.ironman.com",
  "birthdate": "1972-01-24"
}
```

409 Conflict



"Why do I need to
PUT the entire
profile just to
update location?"



"My updates
keep failing
with a 409
Conflict! Help!"

```
PUT /profiles/ironman HTTP/1.1
```

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

```
{
```

```
  "status" : "Thinking about a disco Iron Man suit."
```

```
  /* note JSON doesn't include ANY other fields */
```

```
}
```

```
204 No Content
```

PUT /profiles/ironman/status HTTP/1.1

"Finished saving the world. I need a drink."

204 No Content

The **PATCH** method requests that
a set of changes

described in the request entity be applied
to the **resource identified by the Request URI**.

**The set of changes is represented in a format called
a "patch document" identified by a media type.**


```
PATCH /file.txt HTTP/1.1
Host: www.example.com
Content-Type: application/example
If-Match: "e0023aa4e"
Content-Length: 100
```

[description of changes]

"PATCH Method for HTTP" - <http://tools.ietf.org/html/rfc5789>

```
PATCH /file.txt HTTP/1.1
Host: www.api.herobook.local
Content-Type: application/example
If-Match: "e0023aa4e"
Content-Length: 100
```

[description of changes]

"PATCH Method for HTTP" - <http://tools.ietf.org/html/rfc5789>

PATCH /profiles/ironman HTTP/1.1

Content-Type: application/x-unix-diff

11c11

<

"status": "Just got home from saving the world.",

>

"status": "World saved. I need a drink.",

200 OK

PATCH /profiles/ironman HTTP/1.1

Content-Type: application/**json-patch**+json

If-Match: "abc123"

```
[  
  {  
    "op": "replace",  
    "path": "/status",  
    "value": "Finished saving the world. I need a drink."  
  }, {  
    "op": "move",  
    "from": "/friends/hulk",  
    "path": "/friends[0]"  
  }  
]
```

200 OK

PATCH /profiles/1 HTTP/1.1

Content-Type: image/nickcage+png



202 Accepted

Спасибо!

Slides & code:

www.github.com/dylanbeattie/RealWorldREST

@dylanbeattie