The Rest of

ReST

"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.**"

ReST: The Constraints

- **Client-server**
- **Stateless**
- **Cacheable**
- **Layered System**
- **Code-on-demand**
- **Uniform interface**
- **Hypermedia as the engine of application state**

ReST: The Constraints

- **Client-server**

- **Stateless**

- **Cacheable**

- **Layered System**

- **Code-on-demand**

- **Uniform interface**

- **Hypermedia as the engine of application state**

This bit is optional.

```
GET /profiles HTTP/1.1

200 OK
Content-Type: application/json
[
    {
        "id": "dbeat1",
        "name": "Dylan Beattie",
    }
]
```

```
POST /profiles HTTP/1.1
{
     "name": "Mark Rendle",
}


201 Created
Location:  http://friendc.demo/profiles/2
{
     "id": "markr",
     "name": "Mark Rendle"
}
```

```
GET /profiles HTTP/1.1
200 OK
[

        { "id": "dylan", "name": "Dylan Beattie" }

        { "id": "markr", "name": "Mark Rendle" },

        { "id": "benhall", "name": "Ben Hall" },

        .

        .

        /* (2 million users omitted for clarity) */

        .

        { "id": "serialseb", "name": "Seb Lambla" }

]
```

`GET /profiles` **?page=1** `HTTP/1.1`

```
200 OK
[
        { "id": "dbeat1", "name": "Dylan Beattie" }
        { "id": "markr", "name": "Mark Rendle" },
        { "id": "chrisod", "name": "Chris O'Dell" },
        .
        .
        .
        .
        { "id": "serialseb", "name": "Seb Lambla" }
]
```

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

ReST: The Constraints

- Client-server
- Stateless
- Cacheable
- Layered System
- Code-on-demand
- Uniform interface
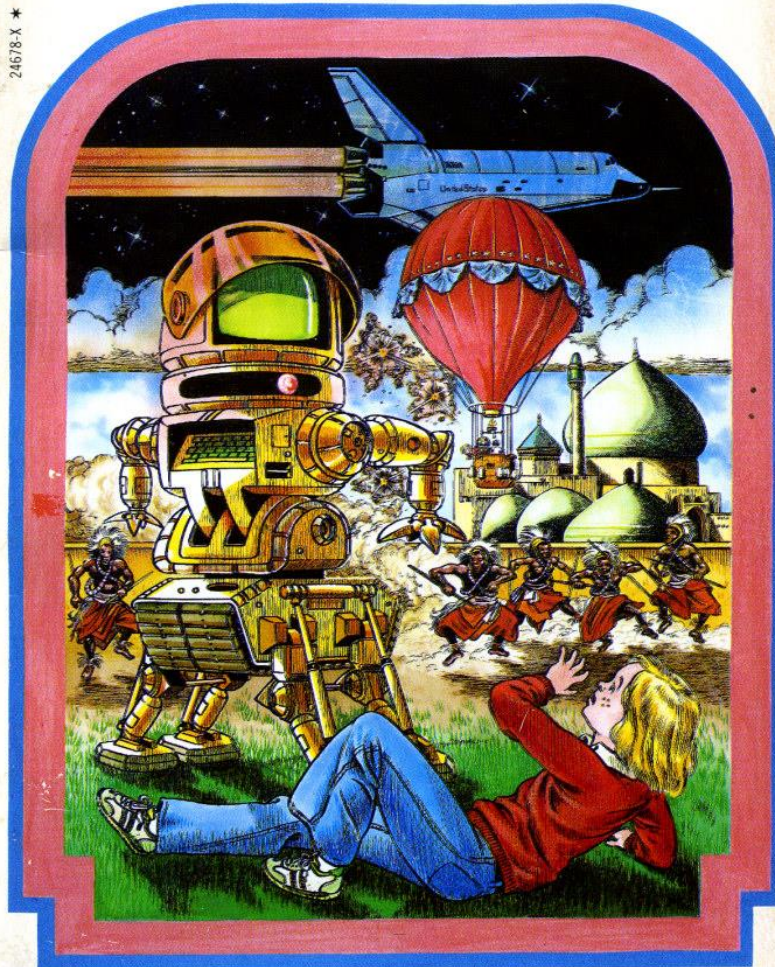- **Hypermedia as the engine of application state**

Choose Your Own Adventure: NDC London 2016

You've been at the NDC after-party for four hours. You've watched the band, you've had a couple of drinks and met some great people. Now the party is starting to wind down – but the hotel bar's open for another half-hour, and Greg Young's trying to get some people along to a poker club he knows in town...

*To go back to your room and sleep, go to page **74***

*To stop by the hotel bar for a nightcap, go to page **23***

*To go into town and play poker with Greg, go to page **41***

Hypermedia support in JSON

JSON+Hypermedia Formats

- **JSON-LD**
  - Web Standard - http://www.w3.org/TR/json-ld/
- **JSONAPI**
  - http://jsonapi.org/
- **Collection+JSON**
  - http://amundsen.com/media-types/collection/
- **SIREN**
  - https://github.com/kevinswiber/siren
- **HAL**
  - http://stateless.co/hal_specification.html

JSON-LD

```
{

    "@context": "http://json-ld.org/contexts/person.jsonld",

    "@id":      "http://dbpedia.org/resource/John_Lennon",

    "name":     "John Lennon",

    "born":     "1940-10-09",

    "spouse":   "http://dbpedia.org/resource/Cynthia_Lennon"

}
```

Collection+JSON

```
{ "collection" :
   {
     "version" : "1.0",
     "href" : "http://example.org/friends/",

     "links" : [
       {"rel" : "feed", "href" : "http://example.org/friends/rss"},
       {"rel" : "queries", "href" : "http://example.org/friends/?queries"},
       {"rel" : "template", "href" : "http://example.org/friends/?template"}
     ],

     "items" : [
       {
         "href" : "http://example.org/friends/jdoe",
         "data" : [
           {"name" : "full-name", "value" : "J. Doe", "prompt" : "Full Name"},
           {"name" : "email", "value" : "jdoe@example.org", "prompt" : "Email"}
         ],
         "links" : [
           {"rel" : "blog", "href" : "http://examples.org/blogs/jdoe", "prompt" : "Blog"},
           {"rel" : "avatar", "href" : "http://examples.org/images/jdoe", "prompt" :
"Avatar", "render" : "image"}
         ]
       }
     ]
   }
}
```

JSONAPI

```json
{
  "links": {
    "self": "http://example.com/posts",
    "next": "http://example.com/posts?page[offset]=2",
    "last": "http://example.com/posts?page[offset]=10"
  },
  "data": [{
    "type": "posts",
    "id": "1",
    "attributes": { "title": "JSON API paints my bikeshed!" },
    "relationships": {
      "author": {
        "links": {
          "self": "http://example.com/posts/1/relationships/author",
          "related": "http://example.com/posts/1/author"
        },
        "data": { "type": "people", "id": "9" }
      },
      "comments": {
        "links": {
          "self": "http://example.com/posts/1/relationships/comments",
          "related": "http://example.com/posts/1/comments"
        },
        "data": [
          { "type": "comments", "id": "5" },
          { "type": "comments", "id": "12" }
        ]
      }
    },
    "links": { "self": "http://example.com/posts/1" }
  }]
```

SIREN

```json
{
    "class": [ "order" ],
    "properties": { "orderNumber": 42 },
    "entities": [
        { "class": [ "items", "collection" ], "rel": [ "http://x.io/rels/order-items" ],
          "href": "http://api.x.io/orders/42/items"
        },
        {
          "class": [ "info", "customer" ],
          "rel": [ "http://x.io/rels/customer" ],
          "properties": { "customerId": "pj123", "name": "Peter Joseph" },
          "links": [ { "rel": [ "self" ], "href": "http://api.x.io/customers/pj123" } ]
        }
    ],
    "actions": [
        { "name": "add-item",      "title": "Add Item",
          "method": "POST",        "href": "http://api.x.io/orders/42/items",
          "type": "application/x-www-form-urlencoded",
          "fields": [
              { "name": "orderNumber", "type": "hidden", "value": "42" },
              { "name": "productCode", "type": "text" },
              { "name": "quantity", "type": "number" }
          ]
        }
    ],
    "links": [
      { "rel": [ "self" ], "href": "http://api.x.io/orders/42" },
      { "rel": [ "previous" ], "href": "http://api.x.io/orders/41" },
      { "rel": [ "next" ], "href": "http://api.x.io/orders/43" }
    ]
}
```

HAL

```
GET /profiles HTTP/1.1

200 OK

Content-Type: application/hal+json

{

  "_links" : {

    "self" : { "href" : "http://my.api/profiles?page=1" },

    "next" : { "href" : "http://my.api/profiles?page=2" },

    "last" : { "href" : "http://my.api/profiles?page=214" }

  },

  "items:" [

      { "id": "dbeat1", "name": "Dylan Beattie" }

      { "id": "markr", "name": "Mark Rendle" },

      { "id": "benhall", "name": "Ben Hall", },
      .
      .
      { "id": "serialseb", "name": "Seb Lambla" }

  ]

}
```

```
GET /profiles/1 HTTP/1.1


200 OK

Content-Type: application/json


{
  "id": 1,
  "name": "Dylan Beattie",
  "twitter": "@dylanbeattie",
  "friends" : [
    { "id": 5, "name": "Mark Rendle", "twitter" : "@markrendle" },
    { "id": 6, "name": "Seb Lambla", "twitter" : "@serialseb" },
    // another 500 friends here...
  ]
}
```

```
GET /profiles/1 HTTP/1.1


200 OK

Content-Type: application/json


{
  "id": 1,
  "name": "Dylan Beattie",
  "twitter": "@dylanbeattie",
  "friends" : [
    { "id": 5, "name": "Mark Rendle", "twitter" : "@markrendle" },
    { "id": 6, "name": "Seb Lambla", "twitter" : "@serialseb" },
    // another 500 friends here...    // another 500 friends here...
  ],

 "updates" : [
   { "id" : 2792676,
     "message": "On my way to ExCeL to speak at NDC",
     "date" : "2016-01-14T07:45:43.511Z" },
   { "id" : 2978967,
     "message": "YAY! I got the front seat on the DLR!",
     "date" : "2016-01-14T08:42:43.511Z" },
   { "id" : 2982341, "message":
     "HEY EVERYONE! I JUST MET SCOTT HANSELMAN!",
     "date" : "2016-01-14T13:21:43.511Z" }
  ]

}
```

@dylanbeattie   #ndclondon

```
GET /profiles/1 HTTP/1.1


200 OK

Content-Type: application/json


{
  "id": 1,
  "name": "Dylan Beattie",
  "twitter": "@dylanbeattie",
  "friends" : [
    { "id": 5, "name": "Mark Rendle", "twitter" : "@markrendle",
      "updates" : [
        { "id" : 2792676, "message": "Installed DNX beta 7 on my fridge", "date": "2015-04-23T18:25:43.511Z"},
      ]
    },
    { "id": 6, "name": "Ben Hall", "twitter" : "@benhall"
      "updates" : [
        { "id" : 2792676, "message": "On a train to NDC London", "date" : "2015-04-23T18:25:43.511Z" },
        { "id" : 2978967, "message": "Preparing my workshop on Docker", "date" : "2015-05-23T18:25:43.511Z" },
      ]
    },
    { "id": 9, "name": "Seb Lambla", "twitter", "@serialseb"
      "updates" : [
        { "id" : 2792676, "message": "Oops. Tequila.", "date" : "2012-04-23T18:25:43.511Z" },
        { "id" : 2978967, "message": "DLR hangovers are the worst", "date" : "2012-04-23T18:25:43.511Z" },
      ]
    },
  ],
  "updates" : [
    { "id": 2792676, "message": "On my way to ExCeL to speak at NDC", "date": "2016-01-14T07:45:43.511Z"},
    { "id": 2978967, "message": "YAY! I got the front seat on the DLR!", "date": "2016-01-14T08:42:43.511Z"},
    { "id": 2982341, "message": "HEY EVERYONE! I JUST MET SCOTT HANSELMAN!", "date":"2016-01-14T13:21:43.511Z"}
  ]
}
```

@dylanbeattie   #ndclondon
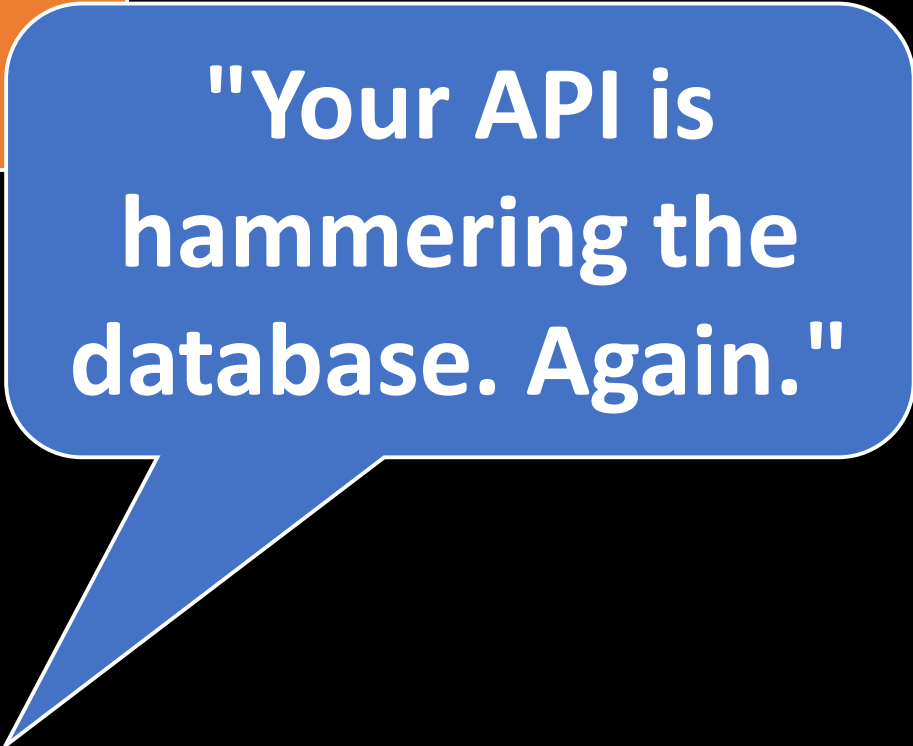
```
GET /profiles/1 HTTP/1.1


200 OK

Content-Type: application/json


{
  "id": 1,
  "name": "Dylan Beattie",
  "twitter": "@dylanbeattie",
  "friends" : [
    { "id": 5, "name": "Ian Cooper", "twitter" : "@icooper",
      "updates" : [
        { "id" : 2792676, "message": "NDC is awesome!", "date" : "2012-04-23T18:25:43.511Z" },
        { "id" : 2978967, "message": "Heading back to London", "date" : "2012-04-23T18:25:43.511Z" },
      ],
      "friends" : [
        { "id": 6, "name": "Toby Henderson", "twitter" : "@holytshirt"
          "updates" : [
            { "id" : 2792676, "message": "NDC is awesome!", "date" : "2012-04-23T18:25:43.511Z" }, { "id" : 2978967, "message": "Heading back to London", "date" : "2012-04-23T18:25:43.511Z" },
          ]
        },
        { "id": 9, "name": "Liam Westley", "twitter", "@westleyl"
          "updates" : [
            { "id" : 2792676, "message": "NDC is awesome!", "date" : "2012-04-23T18:25:43.511Z" }, { "id" : 2978967, "message": "Heading back to London", "date" : "2012-04-23T18:25:43.511Z" },
          ]
        },
      ],
    },
    { "id": 6, "name": "Toby Henderson", "twitter" : "@holytshirt"
      "updates" : [
        { "id" : 2792676, "message": "NDC is awesome!", "date" : "2012-04-23T18:25:43.511Z" },
        { "id" : 2978967, "message": "Heading back to London", "date" : "2012-04-23T18:25:43.511Z" },
      ],
      "friends" : [
        { "id": 6, "name": "Toby Henderson", "twitter" : "@holytshirt"
          "updates" : [
            { "id" : 2792676, "message": "NDC is awesome!", "date" : "2012-04-23T18:25:43.511Z" }, { "id" : 2978967, "message": "Heading back to London", "date" : "2012-04-23T18:25:43.511Z" },
          ]
        },
        { "id": 9, "name": "Liam Westley", "twitter", "@westleyl"
          "updates" : [
            { "id" : 2792676, "message": "NDC is awesome!", "date" : "2012-04-23T18:25:43.511Z" }, { "id" : 2978967, "message": "Heading back to London", "date" : "2012-04-23T18:25:43.511Z" },
          ]
        },
      ],
    },
    { "id": 9, "name": "Liam Westley", "twitter", "@westleyl"
      "updates" : [
        { "id" : 2792676, "message": "NDC is awesome!", "date" : "2012-04-23T18:25:43.511Z" },
        { "id" : 2978967, "message": "Heading back to London", "date" : "2012-04-23T18:25:43.511Z" },
      ]
    },
  ],
  "updates" : [
    { "id" : 2792676, "message": "Having a great time at NDC!", "date" : "2012-04-23T18:25:43.511Z" },
    { "id" : 2978967, "message": "Wow - Oslo is still light at 11pm", "date" : "2012-04-23T18:25:43.511Z" },
    { "id" : 2982341, "message": "About to give my talk on REST", "date" : "2012-04-23T18:25:43.511Z" }
```

```
GET /profiles/1 HTTP/1.1

200 OK

Content-Type: application/hal+json

{

    "_links": {
      "self" : "http://my.api/profiles/1",
      "friends" : "http://my.api/profiles/1/friends",
      "photos" : "http://my.api/profiles/1/photos",
      "updates" : "http://my.api/profiles/1/updates"
    },
    "id": 1,
    "name"      : "Dylan Beattie",
    "twitter"   : "@dylanbeattie",
}
```

```
GET /profiles/1 HTTP/1.1
200 OK

GET /profiles/1/friends HTTP/1.1
200 OK

GET /profiles/1/updates HTTP/1.1
200 OK

GET /profiles/1/photos HTTP/1.1
200 OK

GET /profiles/1/photos/1234 HTTP/1.1
200 OK

GET /profiles/1/photos/1234/comments HTTP/1.1
200 OK

GET /profiles/1/photos/1345 HTTP/1.1
200 OK

GET /profiles/1/photos/1345/comments HTTP/1.1
200 OK

GET /profiles/1/photos/1456 HTTP/1.1
200 OK

GET /profiles/1/photos/1456/comments HTTP/1.1
200 OK
```

```
GET /profiles/1?expand=updates HTTP/1.1


200 OK
Content-Type: application/json

{

    "_links": {
        "self" : "http://my.api/profiles/1",
        "friends" : "http://my.api/profiles/1/friends",
        "photos" : "http://my.api/profiles/1/photos",
        "updates" : "http://my.api/profiles/1/updates"
    },
    "id": 1,
    "name"      : "Dylan Beattie",
    "twitter"   : "@dylanbeattie"

  "_embedded" : {
    "updates" : [
        { "id" : 2792676, "message": "On the DLR, en route to NDC",
        "date" : "2016-01-14T16:25:43.511Z" },
        { "id" : 2978967, "message": "Coffee. Wi-fi. Happy.",
        "date" : "2016-01-14T17:55:43.511Z" },
        { "id" : 2982341, "message": "Listening to @petemounce DOSing himself",
        "date" : "2016-01-14T18:25:43.511Z" }
        ]
    }
```

```
GET /profiles/1 HTTP/1.1


200 OK
Content-Type: application/json

{

    "_links": {
        "self"    : "http://my.api/profiles/1",
        "friends" : "http://my.api/profiles/1/friends",
        "photos"  : "http://my.api/profiles/1/photos",
        "updates" : "http://my.api/profiles/1/updates"
    },
    "id": 1,
    "name"      : "Dylan Beattie",
    "twitter"   : "@dylanbeattie",
    "height"    : 180,
    "weight"    : 95,
    "location"  : { "lat": 59.912854, "lon": 10.7536 },
    "status"    : "Talking about REST at Cambridge DDD Night",
    "hometown"  : "London, GB"
    "email"     : "dylan@dylanbeattie.net",
    "website"   : "www.dylanbeattie.net",
    "birthdate" : "1978-08-22",
    "last_modified": "2015-08-12T19:45:43.511Z"

}
```

PUT /profiles/1 HTTP/1.1

Content-Type: application/json

```
{
    "name"          : "Dylan Beattie",
    "twitter"       : "@dylanbeattie",
    "height"        : 180,
    "weight"        : 95,
    "location"      : { "lat": 59.912854, "lon": 10.7536 },
    "status"        : "Talking about HTTP PUT",
    "hometown"      : "London, GB"
    "email"         : "dylan@dylanbeattie.net",
    "website"       : "www.dylanbeattie.net",
    "birthdate"     : "1978-08-22",
}
```

409 Conflict

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

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

@dylanbeattie

#ndclondon

PUT **/profiles/1/status** HTTP/1.1

"Talking about HTTP PUT"

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 #ndclondon

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

[description of changes]

```
PATCH /profiles/1 HTTP/1.1
Content-Type: application/x-unix-diff


11c11
<
"status": "Talking about REST at NDC London",
---
>
"status": "Showing how to use diff and HTTP
PATCH",


200 OK
```

```
PATCH /profiles/1 HTTP/1.1

Content-Type: application/json-patch+json

If-Match: "abc123"

[

    {
      "op": "test",
      "path": "/last-modified",
      "value": "2015-06-18T15:25:43.511Z"
    },

    {
      "op": "replace",
      "path": "/status",
      "value": "Talking about json-patch at NDC London"
    },

]
```

200 OK

PATCH /profiles/1 HTTP/1.1
Content-Type: image/nickcage+png

202 Accepted

"We need to expose forenames and surname separately"

"We're replacing hometown with an ISO3166 country code"

@dylanbeattie   #ndclondon

```
GET /profiles/1 HTTP/1.1

200 OK
Content-Type: application/hal+json

{

    "_links": { ... },
    "id": 1,
    "forename"      : "Dylan",
    "surname"       : "Beattie",
    "twitter"       : "@dylanbeattie",
    "height"        : 180,
    "weight"        : 102,
    "location"      : { "lat": 59.912854, "lon": 10.7536 },
    "status"        : "Talking about REST at NDC London 2016",
    "hometown"      : { "city" : "London", "country": "GB" }
    "email"         : "dylan@dylanbeattie.net",
    "website"       : "www.dylanbeattie.net",
    "birthdate"     : "1978-08-22",
    "last_modified" : "2015-06-18T15:25:43.511Z"

}
```

Oops.

- The easiest thing to do is
  ...**never break anything!**

- **...but : "REST** is **software design** on

  the **scale of**
  decades"

API Versioning Done Wrong

(with thanks to **@troyhunt**)

```
GET /v2/profiles/1
Accept: application/json




200 OK
{ ... }
```

```
GET /profiles/1
Accept: application/vnd.myapi.v2+json




200 OK
{ ... }
```
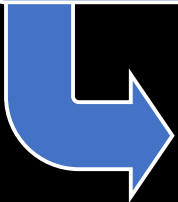
```
GET /profiles/1
Accept: application/json
X-MyApi-Version: 2



200 OK
{ ... }
```

…and on the server?

Branch the codebase for separate versions?

One codebase, many versions?

```
[VersionedRoute("api/profiles/{name}", 2)]
[Route("api/v2/profiles/{name}")]
public Profile GetV2(string name) {

    /* write your program here! */


}
```

Login Page

Username + password

[data]

Hey! Here's your web page!

End User   LinkBait.com   www.us.com   api.us.com

http://bit.ly/1Kcat0f

NGrok

https://ngrok.com/
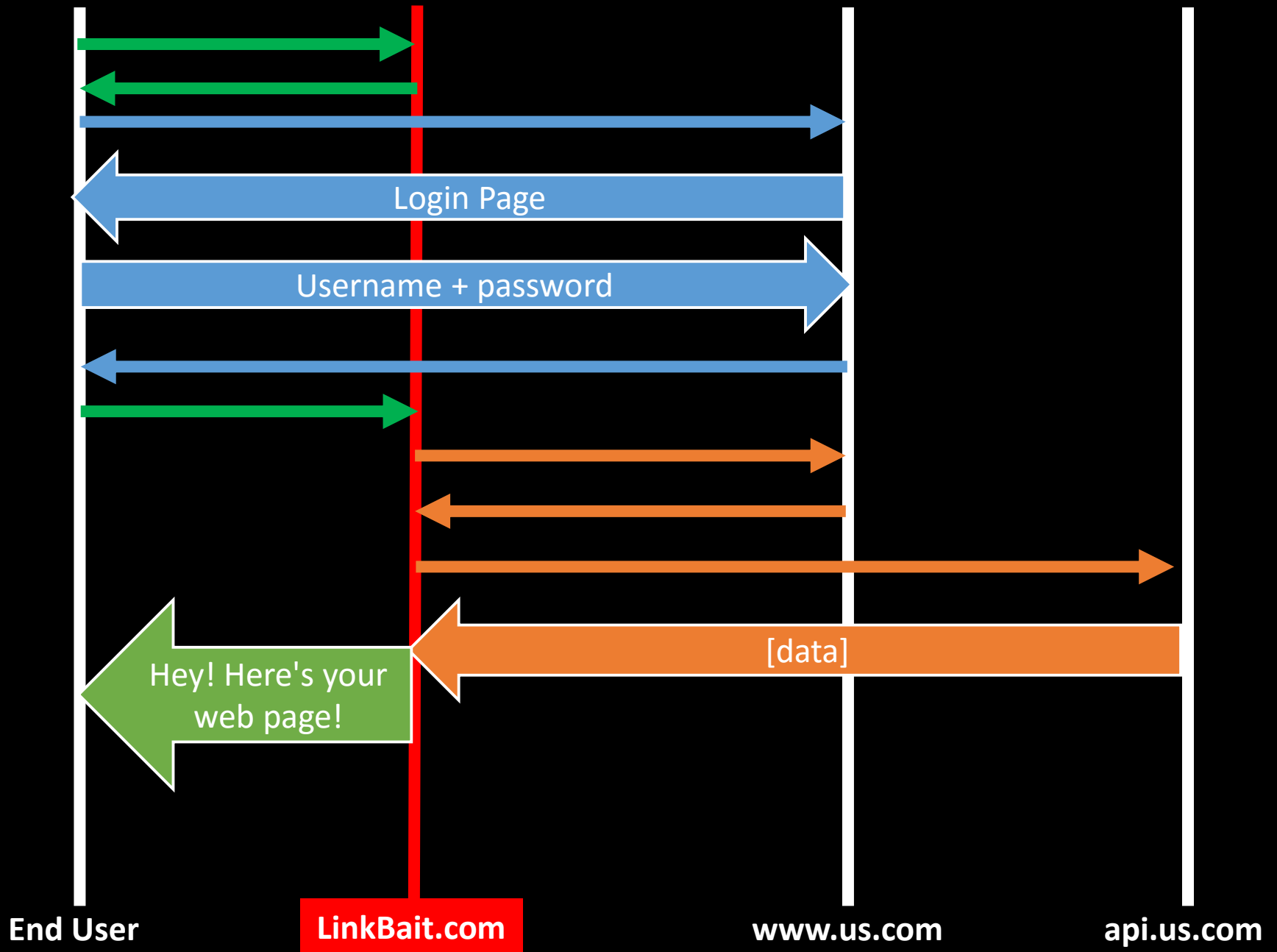
Secure tunnels from the web to localhost

RunScope

https://www.runscope.com/
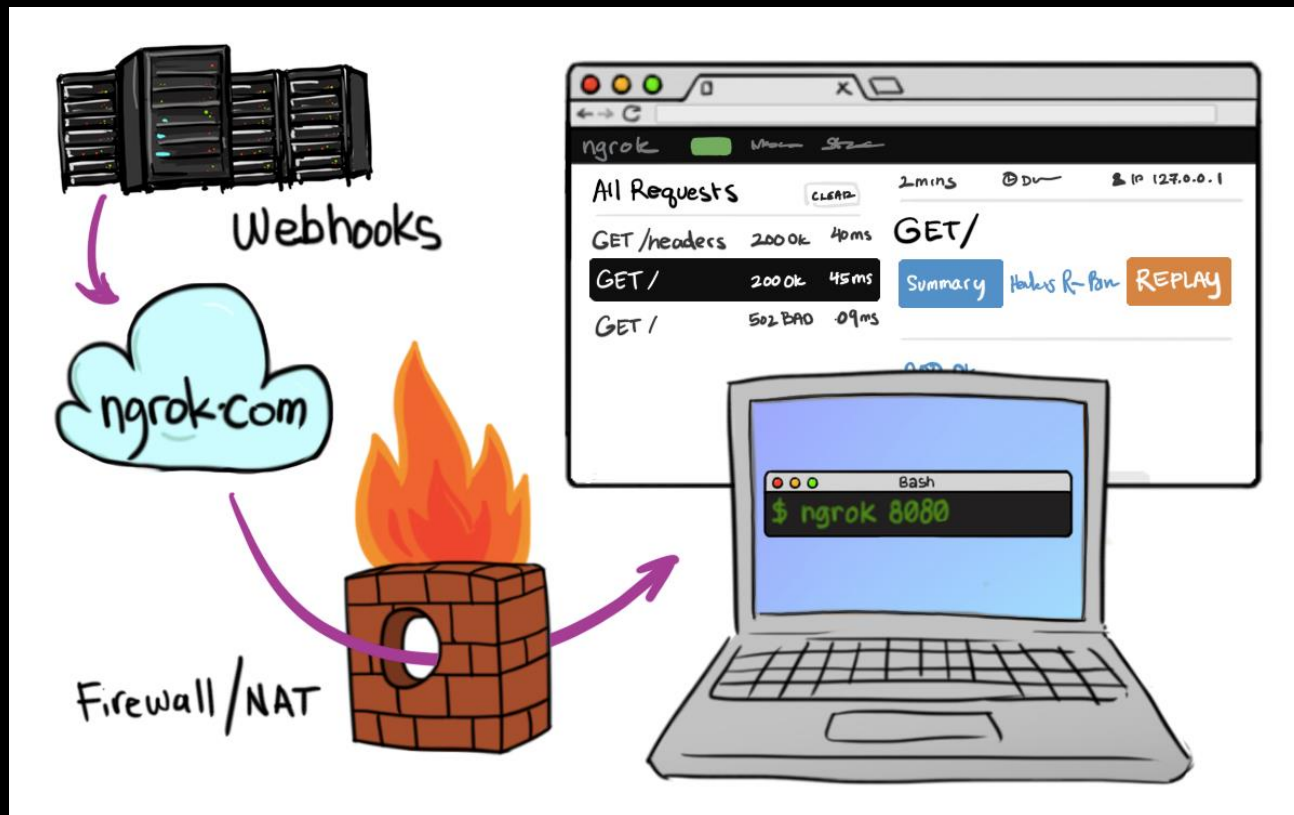
Monitoring and debugging for web APIs
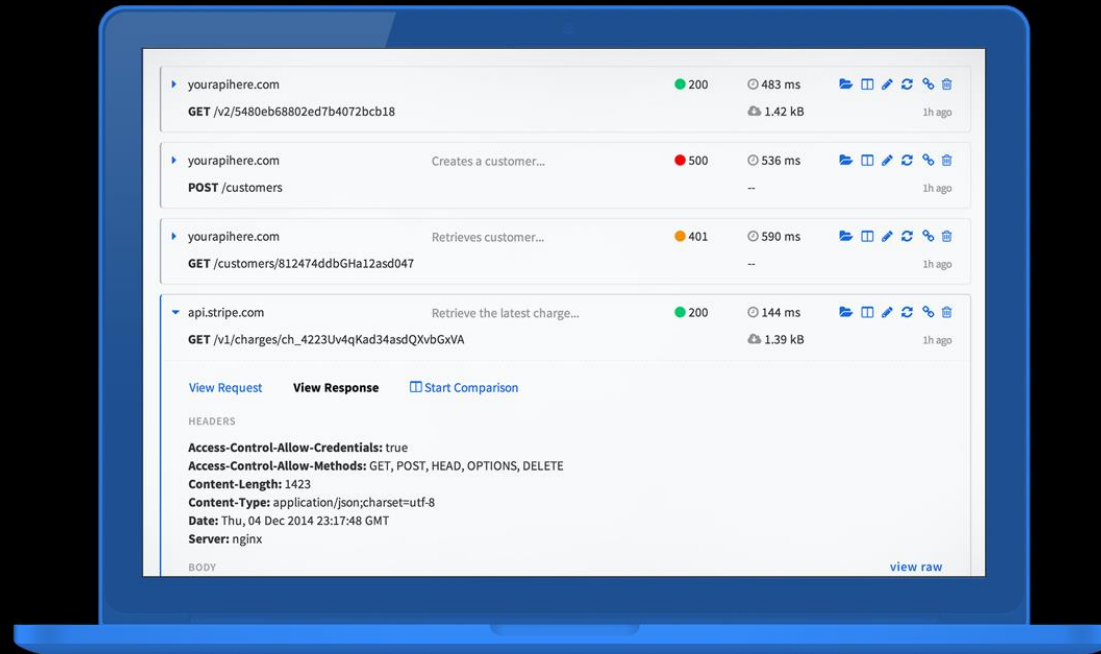
Thank you!

@dylanbeattie

#ndclondon