innoQ

REST: I don't Think it Means What You Think it Does

Stefan Tilkov | @stilkov

REST: An architectural style defined by the constraints Client-Server, Stateless Communication, Caching, Uniform Interface, Layered System, and (optionally) Code-on-demand.

For details, see http://www.ics.uci.edu/~fielding/pubs/dissertation/top.htm

Thank you!

REST Intro

identification

of resources

identification

of resources

Universal identity

URIs

Link targets

Bookmarks

Entry points

resource manipulation
through representations

resource manipulation through representations

SoC data/identity/location

Multiple representations

Reduced dependency

Processing model

hypermedia as the engine of application state

hypermedia as the engine of application state

Links

Connections

Forms

Flow

Status

self-descriptive messages

self-descriptive messages

Standardization

Metadata

Provider independence

Intermediaries

Caching

What’s in the Web?

Lots of things with URLs …

… connected with hypermedia …

… governed by standard formats.

Common Misconceptions

REST is about nice URIs

What makes a URI “RESTful”?

1. http://example.com/customers/format?drive=c

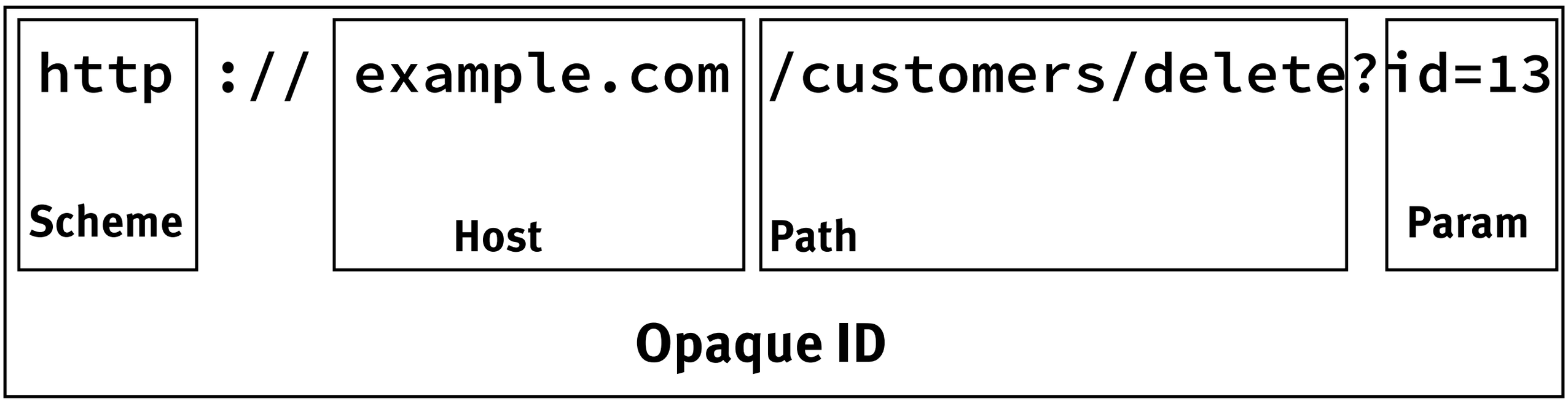
2. http://example.com/customers/getDetails?id=13

3. http://example.com/customers/delete?id=13

4. http://example.com/customers/13

5. http://example.com/customers/13/edit

There is no such thing as a “RESTful URI”



Why you shouldn’t care about URIs

```
<customer>
  <...>
  <orders href='http://example/customers/3/orders'>
</customer>
```

Hypermedia context

REST = URI patterns + GET, PUT, POST, DELETE

CLOSE, BUT NO

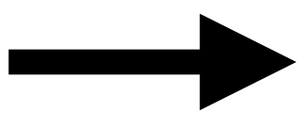
URI	Method	Meaning
`http://ex.org/v1/customers`	POST	create new customer
`http://ex.org/v1/customers/{id}`	GET	get customer details
`http://ex.org/v1/customers/{id}/orders`	GET	get list of customer's details
...	...	...

Documented URIs become APIs

Assumptions about server details become facts

Versions in URIs cause change for no good reason

Detour: Versioning



What are you “versioning”?

Data ✔

Documentation ✔

Formats ✔

APIs ✘

Versioning recommendations

Use different media types for different things

Use version numbers in URIs to version the resource itself

Create new resources

for new aspects

Reserve space for links

Version your docs

Wait, what?

Yes, no versioning

Yes, no *explicit* versioning

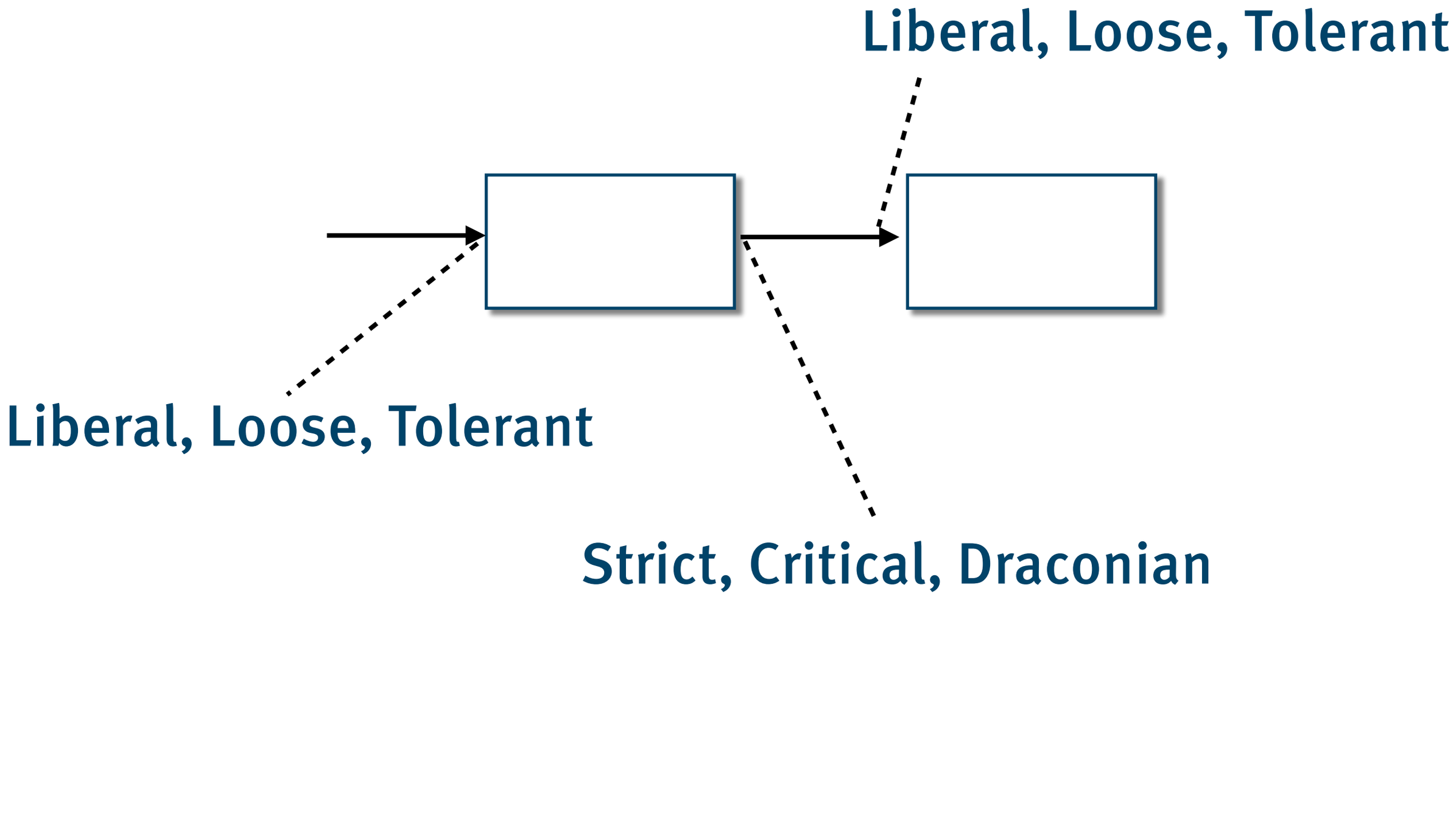
Postel's law

"TCP implementations should follow a general principle of robustness: Be conservative in what you do, be liberal in what you accept from others."

http://tools.ietf.org/html/rfc761

Be kind to each other

Postel's Law


Liberal, Loose, Tolerant
Liberal, Loose, Tolerant
Strict, Critical, Draconian

Client rules

Don’t depend on URI structure

Support unknown links

Ignore unknown content

Server rules

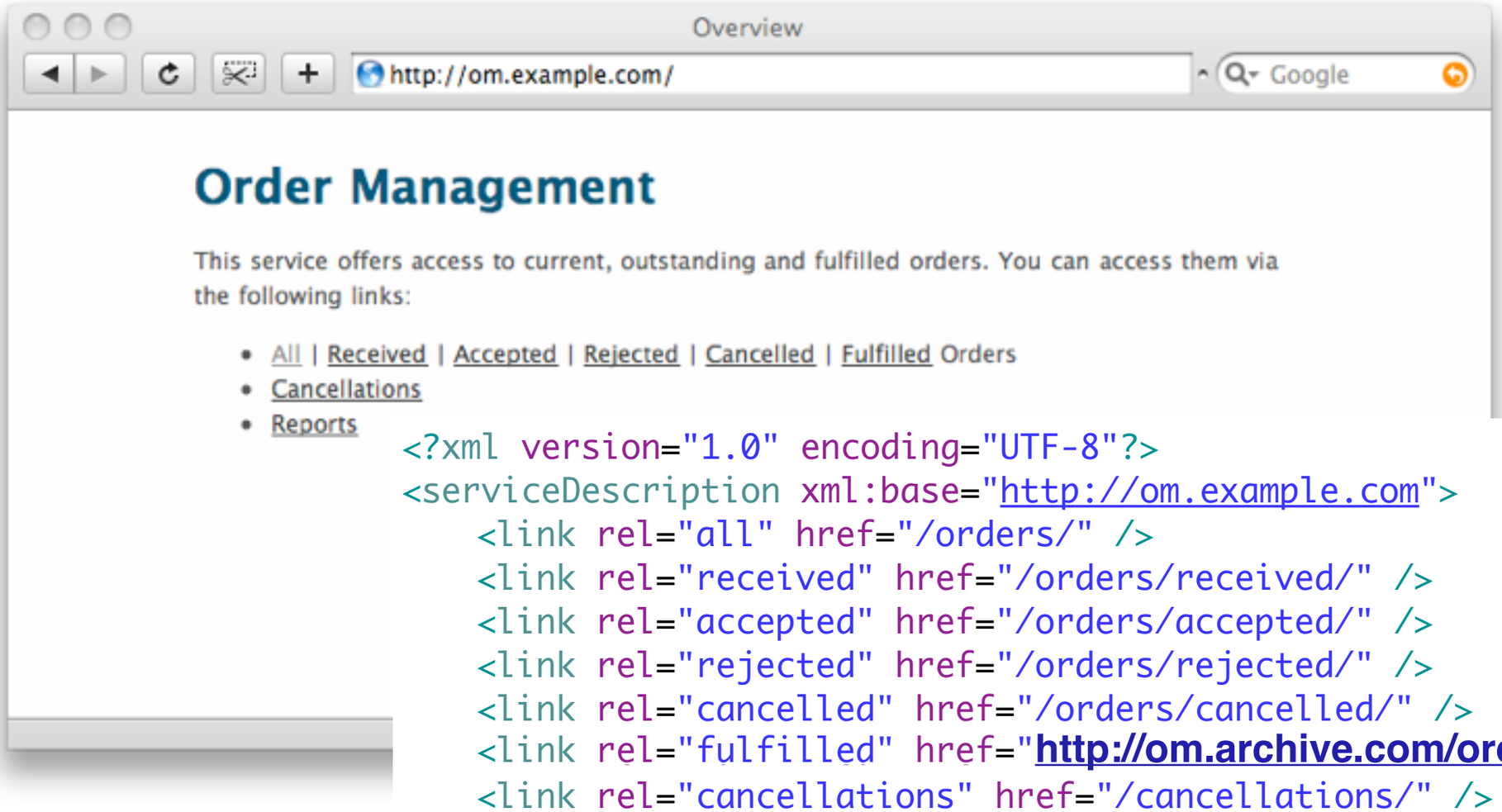
Don’t break URI structure unnecessarily

Evolve via additional resources

Support older formats

How to hypermedia-enable your service interfaces

Step 1: Service Documents




```xml
<?xml version="1.0" encoding="UTF-8"?>
<serviceDescription xml:base="http://om.example.com">
    <link rel="all" href="/orders/" />
    <link rel="received" href="/orders/received/" />
    <link rel="accepted" href="/orders/accepted/" />
    <link rel="rejected" href="/orders/rejected/" />
    <link rel="cancelled" href="/orders/cancelled/" />
    <link rel="fulfilled" href="http://om.archive.com/orders/" />
    <link rel="cancellations" href="/cancellations/" />
    <link rel="reports" href="/reports/" />
</serviceDescription>
```

```json
{ "serviceDescription" : {
  "base": "http://om.example.com",
  "links": [
    { "rel": "all", "href": "/orders/" },
    { "rel": "all", "href": "/orders/" },
    { "rel": "received", "href": "/orders/received/" },
    { "rel": "accepted", "href": "/orders/accepted/" },
    { "rel": "rejected", "href": "/orders/rejected/" },
    { "rel": "cancelled", "href": "/orders/cancelled/" },
    { "rel": "fulfilled", "href": "/orders/fulfilled/" },
    { "rel": "cancellations", "href": "/cancellations/" },
    { "rel": "reports", "href": "/reports/" }
  ]
}
}
```

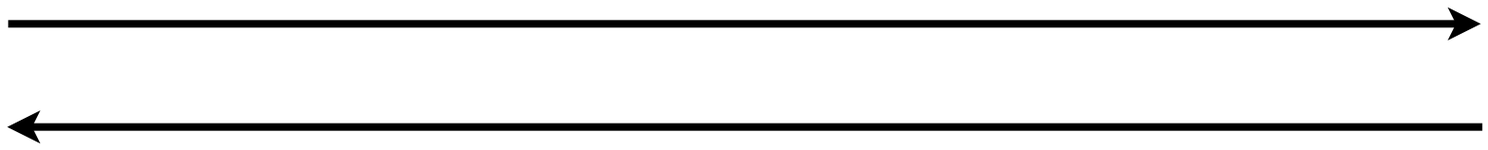
JSON Home

```
{
      "resources": {
        "http://example.org/rel/widgets": {
          "href": "/widgets/"
        },
        "http://example.org/rel/widget": {
          "href-template": "/widgets/{widget_id}",
          "href-vars": {
            "widget_id": "http://example.org/param/widget"
          },
          "hints": {
            "allow": ["GET", "PUT", "DELETE", "PATCH"],
            "representations": ["application/json"],
            "accept-patch": ["application/json-patch"],
            "accept-post": ["application/xml"],
            "accept-ranges": ["bytes"]
          }
        }
      }
    }
```

http://tools.ietf.org/html/draft-nottingham-json-home-03

Step 2: Resource Links

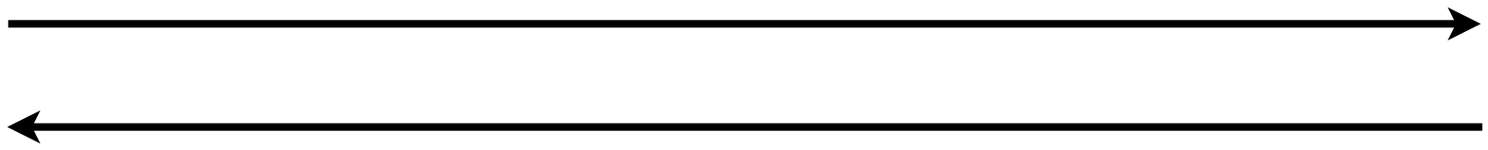
GET /order/123



```
{
 "order": {
    "date":  "2013-07-02",
    "total": 1240.02,
    "..."   : "...",
    "links" : [
      {"rel" : "self", "href" : "http://example.com/orders/123"},
      {"rel" : "contacts", "href" : "http://example.org/A3BEF1"},
          ...
    ]

  }
}
```

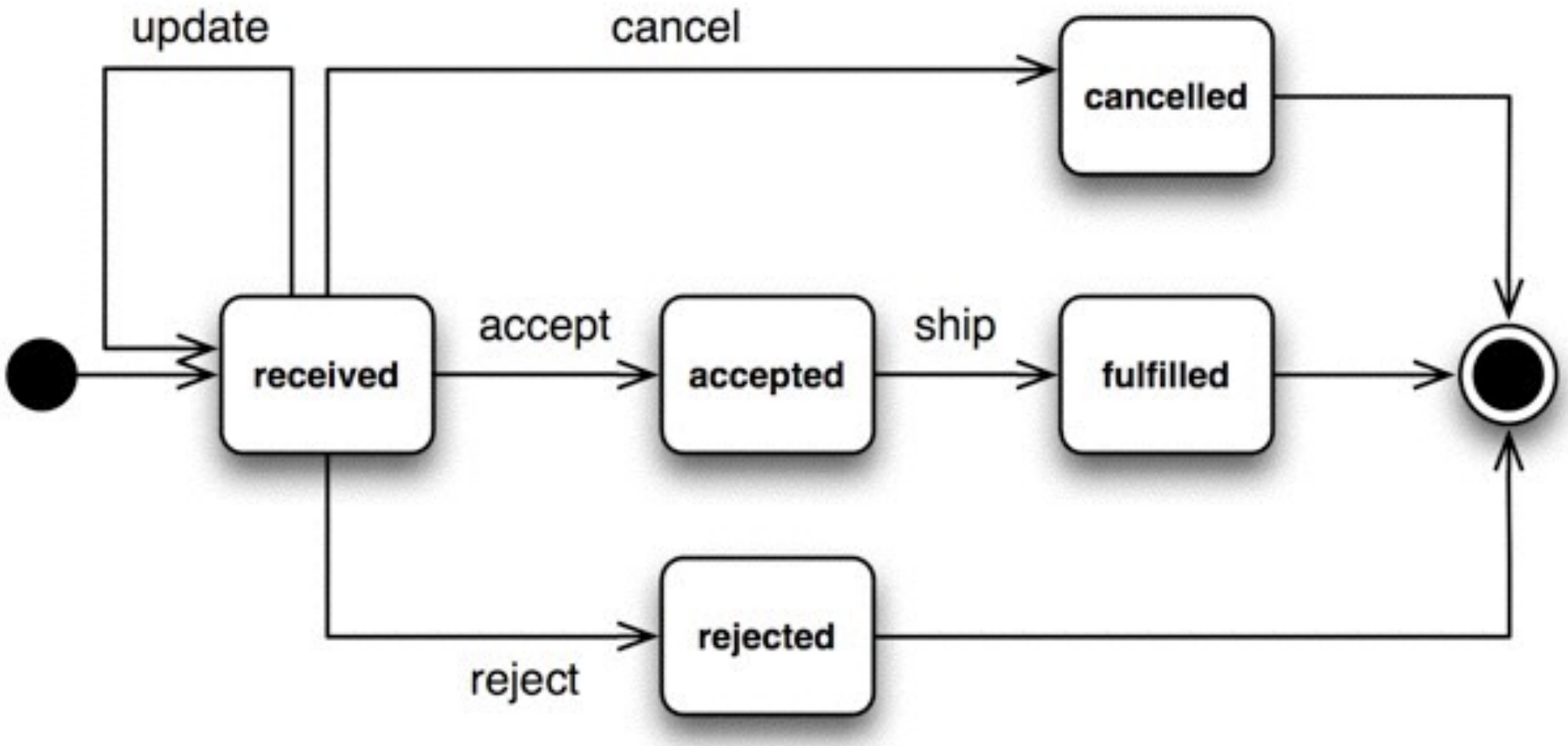
GET /order/123




```
{
 "order": {
    "date":  "2013-07-02",
    "total": 1240.02,
    "..."   : "...",
    "links" : {
       "self": "http://example.com/orders/123",
       "contacts": "http://example.org/A3BEF1",
       ...
    }
  }
}
```

Your future extensions

Step 3: State Transition Links




```
{
 "order": {
    "state"  : "received",
     "..."   : "...",
     "links" : [
       {"rel" : "cancel", "href" : "http://..."},
       {"rel" : "accept", "href" : "http://..."},
       {"rel" : "reject", "href" : "http://..."},
       ...
     ]

 }
}
```

Hypermedia APIs = Responses with Links

NOT ONLY

Rule #1: Don't have clients build URIs using string concatenation

…instead: provide recipes

```
<form action='http://example.com/search' method='GET'>
  Search for: <input type='text' name='query'>
              <input type='submit'>
</form>
```

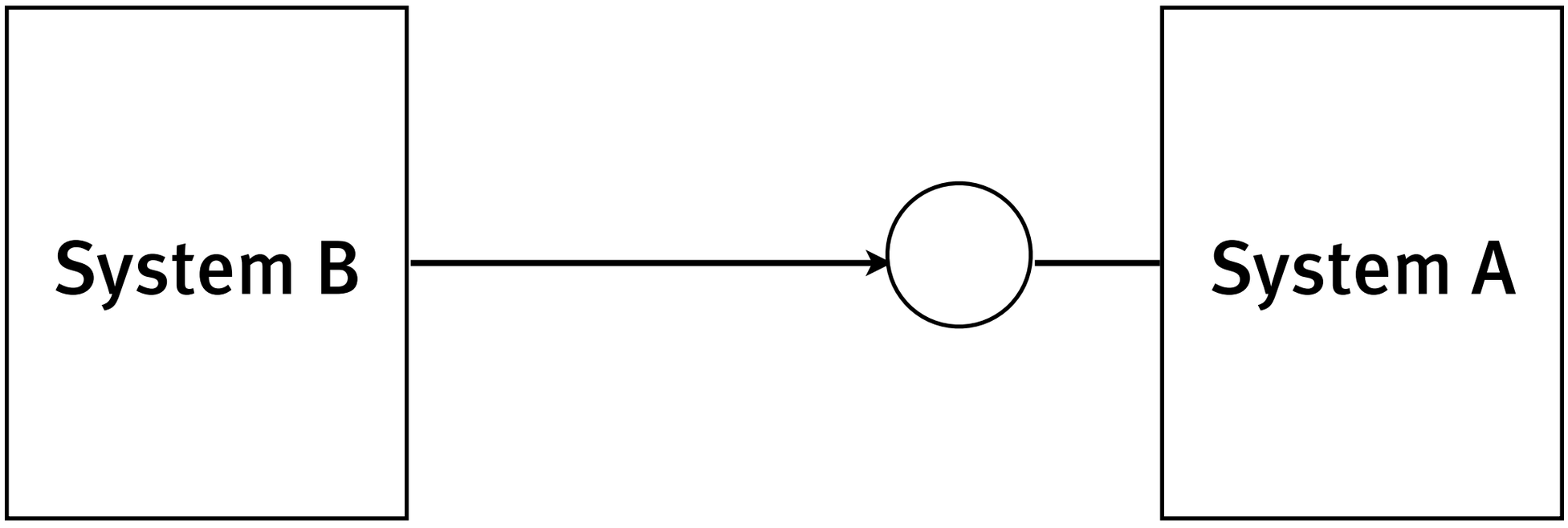
```
{
  "rel": "search",
  "template": "http://example.com/search?q={query}"
}
```

```
<form action='http://example.com/add' method='POST'>
  First:    <input type='text' name='first'>
  Last:     <input type='text' name='last'>
  Birthday: <input type='date' name='bdate'>
            <input type='submit'>
</form>
```

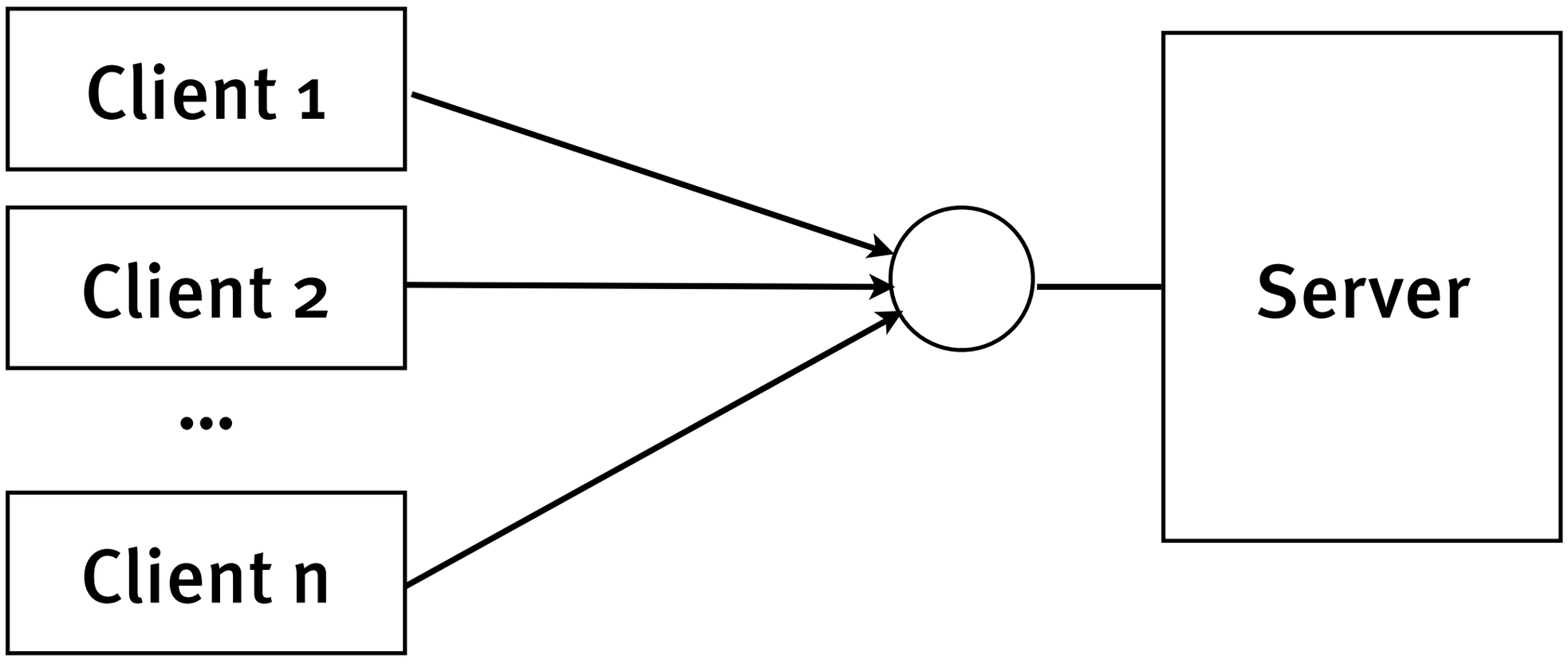
```
{"target": "http://example.com/add",
  "rel": "add",
  "template": {
    "first": "...",
    "last": "...",
    "bdate": "..."
  }
}
```

REST = A different approach to service interfaces

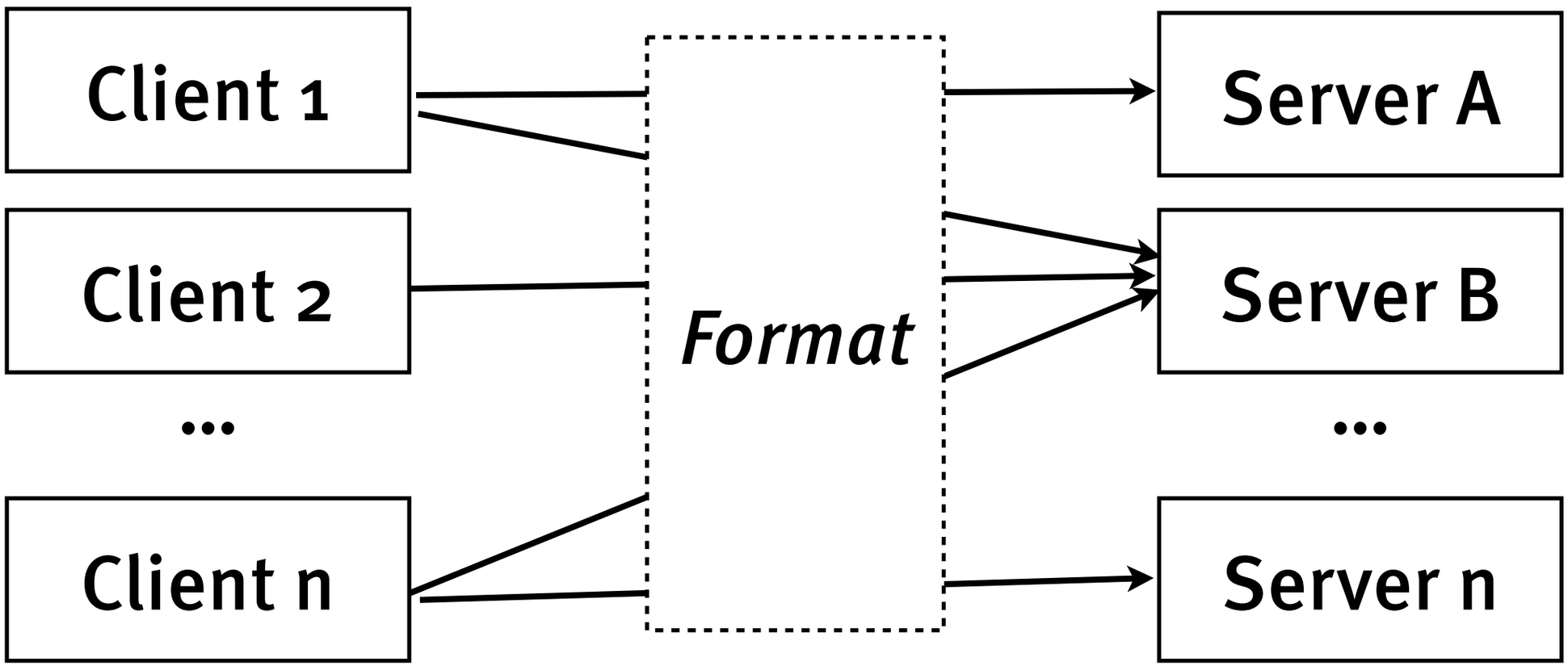
Point-to-point integration



Service interfaces



Hypermedia types



application/atom+xml

application/opensearchdescription+xml

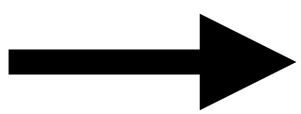
application/vnd.collection+json

application/hal+json

application/vnd.siren+json

text/html

Detour: HTML



```
<order>
    <shippingAddress>Paris, France</shippingAddress>
    <items>
      <item>
        <productDescription>iPad</productDescription>
        <quantity>1</quantity>
        <price>699</price>
      </item>
    </items>
    <link href="http://om.example.com/cancellations"
          rel="cancel" />
    <link href="https://om.example.com/orders/123/
payment"
          rel="payment" />
</order>
```

```
<html xmlns="http://www.w3.org/1999/xhtml">
   <body>
   <div class="order">
      <p class="shippingAddress">Paris, France</p>
      <ul class="items">
         <li class="item">
            <p class="productDescription">iPad</p>
            <p class="quantity">1</p>
            <p class="price">699</p>
         </li>
      </ul>
      <a href="http://om.example.com/cancellations"
            rel="cancel">cancel</a>
      <a href="https://om.example.com/orders/123/payment"
            rel="payment">payment</a>
   </div>
   </body>
   </html>
```

Benefits of Using HTML as Your Hypermedia Format

Ubiquity

Well-known, well supported HM controls

A pretty good standard client

Lots of programming tools

UIs as a side-effect

Summary

Link context over **pretty URIs**

Hypermedia over **URI APIs**

Hypermedia flows over **static links**

Generalized formats over **services**

Q&A

Stefan Tilkov, @stilkov

stefan.tilkov@innoq.com

Phone: +49 170 471 2625

innoQ

www.innoq.com

innoQ Deutschland GmbH

Krischerstr. 100
40789 Monheim am Rhein
Germany
Phone: +49 2173 3366-0

Ohlauer Straße 43
10999 Berlin
Germany
Phone: +49 2173 3366-0

Robert-Bosch-Straße 7
64293 Darmstadt
Germany
Phone: +49 2173 3366-0

Radlkoferstraße 2
D-81373 München
Telefon +49 (0) 89 741185-270

innoQ Schweiz GmbH

Gewerbestr. 11
CH-6330 Cham
Switzerland
Phone: +41 41 743 0116

info@innoq.com

Bonus misconception:

REST is for services only

REST as the Web's Architectural Style

1991	HTTP 0.9
1996	HTTP 1.0
1997	HTTP 1.1 (RFC 2068)
1999	HTTP 1.1 (RFC 2616)
2000	REST
2000	SOAP/1.1

Browsers

Command line clients

Crawlers

Proxies

Servers

(Resource-oriented Client Architecture)

Web-centric web UIs

Server-side components	Avoid HTML, JS, CSS Trade Familiarity for Complexity Session-centric
ROCA	Server-side POSH Client-side components Web-centric
Single Page Apps	Advanced Client Frameworks Server-side REST APIs

Make your HTML semantic

Use Javascript *unobtrusively*

Use URIs to identify a *single* meaningful concept

Don’t *disable* Browser Features – *use them*

ROCA

http://roca-style.org/