

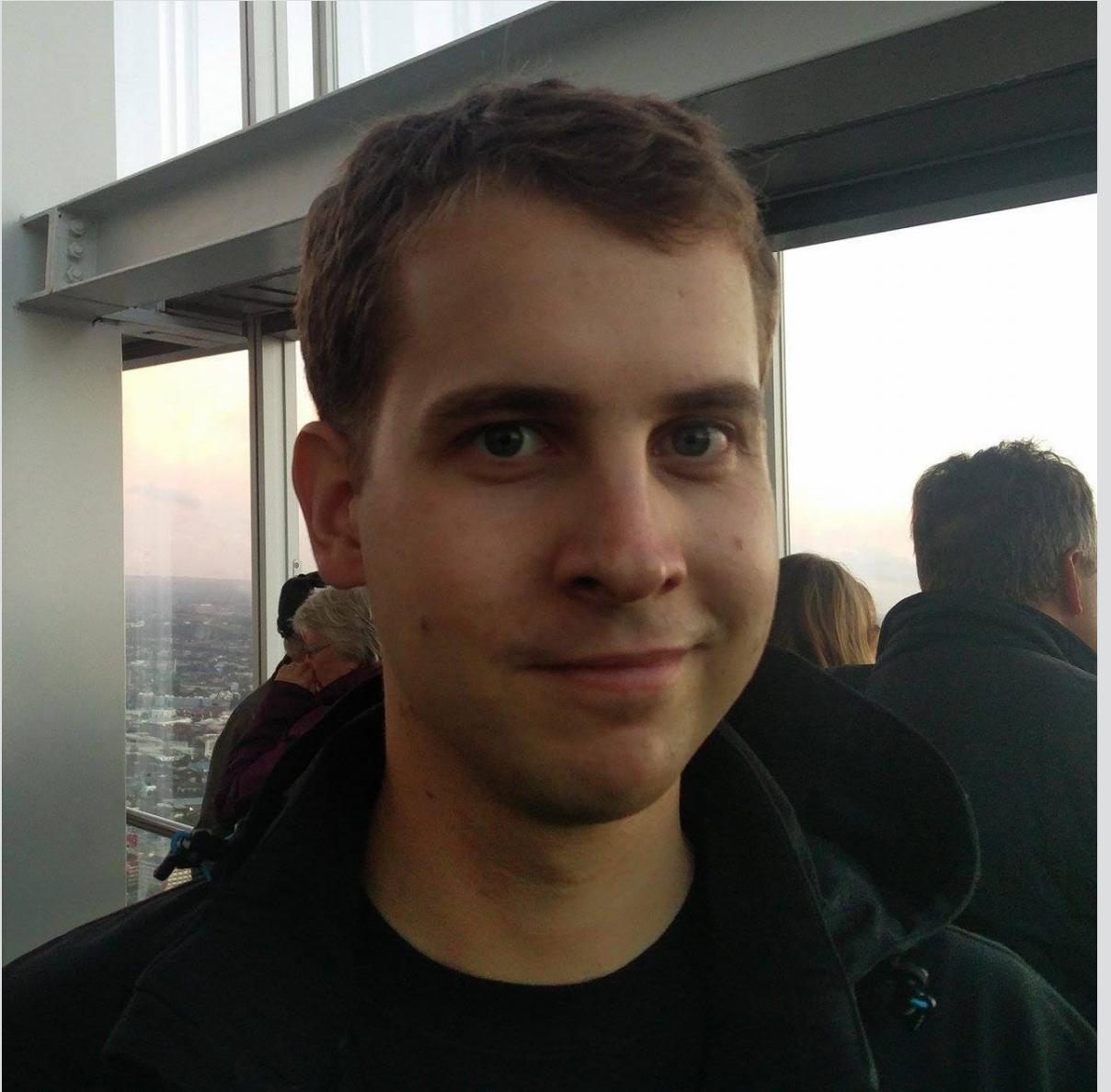
Bringing hypermedia to the masses

About me

- Tomasz Pluskiewicz
- Zazuko GmbH
- Interests
 - Semantic Web
 - REST APIs
 - Hydra CG

 [/tpluscode](https://github.com/tpluscode)

 [@tpluscode](https://twitter.com/tpluscode)



REST Fest

- 9th year in Greenville, SC
- Second time in Europe
- restfest.org and  @restfest



Midwest US

May 31st - June 1st

Grand Rapids, MI USA

Central EU

May 31st - June 1st

Wroclaw, Poland EU

East US

September 25 + 26-28th

Greenville, SC USA

Agenda

- Quo vadis web development?
- Hypermedia-driven UI
- Demo
- Testing API
- Questions

The background image shows a panoramic aerial view of the Stockholm city skyline. In the foreground, a large bridge spans a body of water, with several cars and a train visible on its lanes. The city behind is densely packed with buildings of various architectural styles, including some with red roofs and others with green or grey facades. A prominent church tower with a green dome is visible on the right side. The sky is clear with a few wispy clouds.

State of web development

AD 2016

State of web development AD 2016

- Brittle APIs
 - No links
 - No runtime-discoverability

State of web development AD 2016

- UI full of out-of-band knowledge
 - Routing in SPAs is the devil
 - Applications make presumptions about representations

What are the effects?

- Code generation
- Hard coding interactions
- Relying on specific URL structures

A photograph showing a person's lower legs and feet walking up a set of industrial-style metal stairs. The person is wearing light-colored trousers and bright orange-red lace-up sneakers with white soles. The stairs have a textured metal tread and a matching metal railing. The background shows more of the same staircase structure under a clear sky.

We can do better

Your name

Tomasz Pluskiewicz

What do you like?

- REST APIs
- Semantic Web
- Web Components

Do you accept the T&C?

REGISTER

Your name

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ACCEPT DECLINE



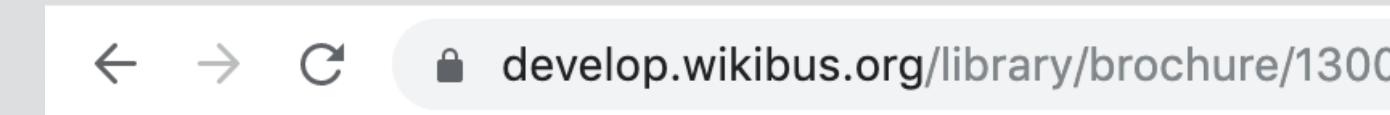
The background of the slide features a wide-angle photograph of a majestic mountain range. The mountains are covered in patches of white snow and rocky terrain. In the foreground, there's a lush field of green grass and small pink flowers, with a paved stone path leading from the bottom center towards the base of the mountains.

We can do better. . .
. . . with Hypermedia

Hypermedia-driven web application

- Routing differently
- Rich media type
- Composing the visual elements

"Routing"



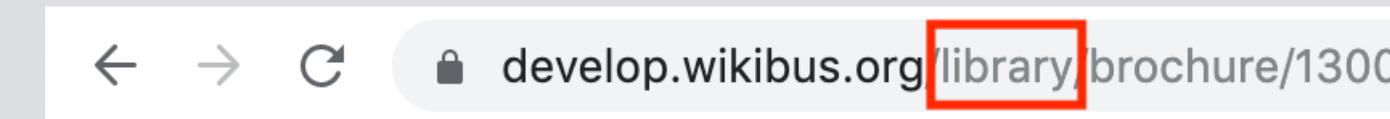
- Direct relation between browser URL and resource identifier

"Routing"



- Plain Old Single-Page Application

"Routing"



path

/library/

base API URL

sources.wikibus.org/

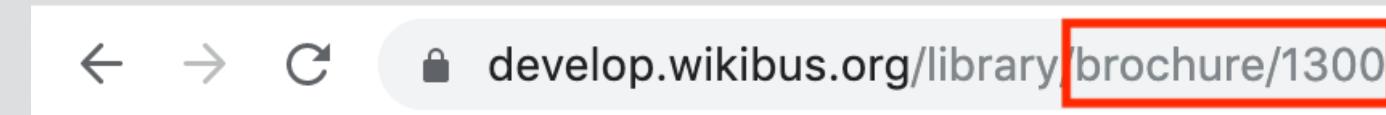
/home/

bff.wikibus.org/

/vehicles/

vehicles.wikibus.org/

"Routing"



GET /brochure/1300 HTTP/1.1

Host: sources.wikibus.org

Runtime resource discovery

Hydra

- Based on JSON-LD (RDF)
 - web-first design
- IMO the most complete¹ hypermedia media type

¹ or at least most promising

Hydra

Resource representation

```
{  
  "@context": "https://wikibus.org/_context/book",  
  "@id": "https://sources.wikibus.org/book/414",  
  "@type": "Book",  
  "schema:title": "Volvo 75 years 1972-2002",  
  "schema:isbn": "3907153251",  
  "hydra:operation": {  
    "@type": "schema:UpdateAction",  
    "hydra:method": "PUT",  
    "hydra:expects": "Book"  
  }  
}
```

Hydra

Link: </doc>; rel="hydra:ApiDocumentation"

```
{  
  "@type": "hydra:ApiDocumentation",  
  "hydra:supportedClass": [ {  
    "@id": "Book",  
    "hydra:supportedProperty": [ {  
      "rdf:property": { "@id": "schema:isbn" }  
    }, {  
      "hydra:property": {  
        "@id": "author", "@type": "hydra:Link"  
      }  
    } ]  
  } ]  
}
```

Hydra Collection

```
{  
  "@context": "https://wikibus.org/_context/book_collection",  
  "@id": "https://sources.wikibus.org/books",  
  "@type": "hydra:Collection",  
  "hydra:manages": {  
    "hydra:property": "rdf:type",  
    "hydra:object": "Book"  
  },  
  "hydra:search": {  
    "hydra:template": "/books{/page}{?title,author,language}"  
  }  
}
```

Uniform interface constraint

REST's uniform interface constraints is not only about the protocol (HTTP).

One must also consider the media type and possibly app-specific semantics.

— Tomasz Pluskiewicz

wikibus.org library

Here you can explore the private collection of books and other physical and electronic media about public transport.



BROCHURES

Brochures and other promotional publications



BOOKS

Books about public transport history and manufacturers, etc.



MAGAZINES

Periodicals such as weekly/monthly magazines as well as yearly catalogs

wikibus.org library

Here you can explore the private collection of books and other physical and electronic media about public transport.



BROCHURES

Brochures and other promotional publications



BOOKS

Books about public transport history and manufacturers, etc.



MAGAZINES

Periodicals such as weekly/monthly magazines as well as yearly catalogs



hydra:title **wikibus.org library**

Here you can explore the private collection of books and other physical and electronic media about public transport.

hydra:Link



hydra:title **BROCHURES**

Brochures and other promotional publications

hydra:description



BOOKS

Books about public transport history and manufacturers, etc.



MAGAZINES

Periodicals such as weekly/monthly magazines as well as yearly catalogs

PUBLIC TRANSPORT BROCHURE COLLECTION

SEARCH

TITLE

LANGUAGE

FILTER

CLEAR



Alexander Dennis E...

Alexander Dennis E...

Alexander Dennis E...

Alexander Dennis E...

Next page...

PUBLIC TRANSPORT BROCHURE COLLECTION

hydra:search

SEARCH

TITLE

LANGUAGE

FILTER

CLEAR



Alexander Dennis E...

Alexander Dennis E...

Alexander Dennis E...

Alexander Dennis E...

Brochure

??

Next page...

hydra:next

SCANIA B86/DELTAPLAN



About this brochure

languages:	English
pages:	2
year:	1979
month:	3
title:	Scania B86/Deltaplan
code:	SBK E 1611- 2130/03.79/1000

SCANIA B86/DELTAPLAN

schema:image



About this brochure

languages:	English
pages:	2
year:	1979
month:	3
title:	Scania B86/Deltaplan
code:	SBK E 1611- 2130/03.79/1000

hydra:supportedProperty

??

Uniform interface

- Vocabulary reuse
- Representation patterns
- Matryoshka UI

Matryoshka UI

@lit-any/views

```
import { html } from 'lit-html'

export default {
  template: (state, next) => html`  
    ${next(state.core.resource, 'page-title')}  
    <section id="content">  
      <div class="content-wrap">  
        ${next(state.core.resource, 'main-content')}  
      </div>  
    </section>`  
}
```

Matryoshka UI

```
import { html } from 'lit-html'
import resourceIs from './matchers.js'

export default {
  scope: 'page-title',
  valueMatcher: resourceIs('api:Entrypoint')),
  template: (state, next) => html`  

    <canvas-emphasis-title  

      ?hidden="${state.pageTitle.hidden}"  

      background-image="${state.pageTitle.background}"  

      .heading="${state.core.resource.title}"  

      .lead="${state.core.resource.description}"  

    ></canvas-emphasis-title>
}
```

Generated forms

@lit-any/forms

- Generates HTML forms from an abstract description of fields
 - agnostic of media-type
 - integration with Hydra as an extension
- Look & feel customizable through component sets

Demo

Coding time

Hypermedia-driven testing

```
With Class ex:Employee {  
    Expect Property ex:salary  
    Expect Link ex:manager  
  
    Expect Property ex:contract {  
        Expect Operation api:TerminateContract {  
            Invoke {  
                Expect Status 204  
            }  
        }  
    }  
}  
  
With Link ex:manager {  
    Expect Link api:subordinates  
}  
  
testing.hypermedia.app
```

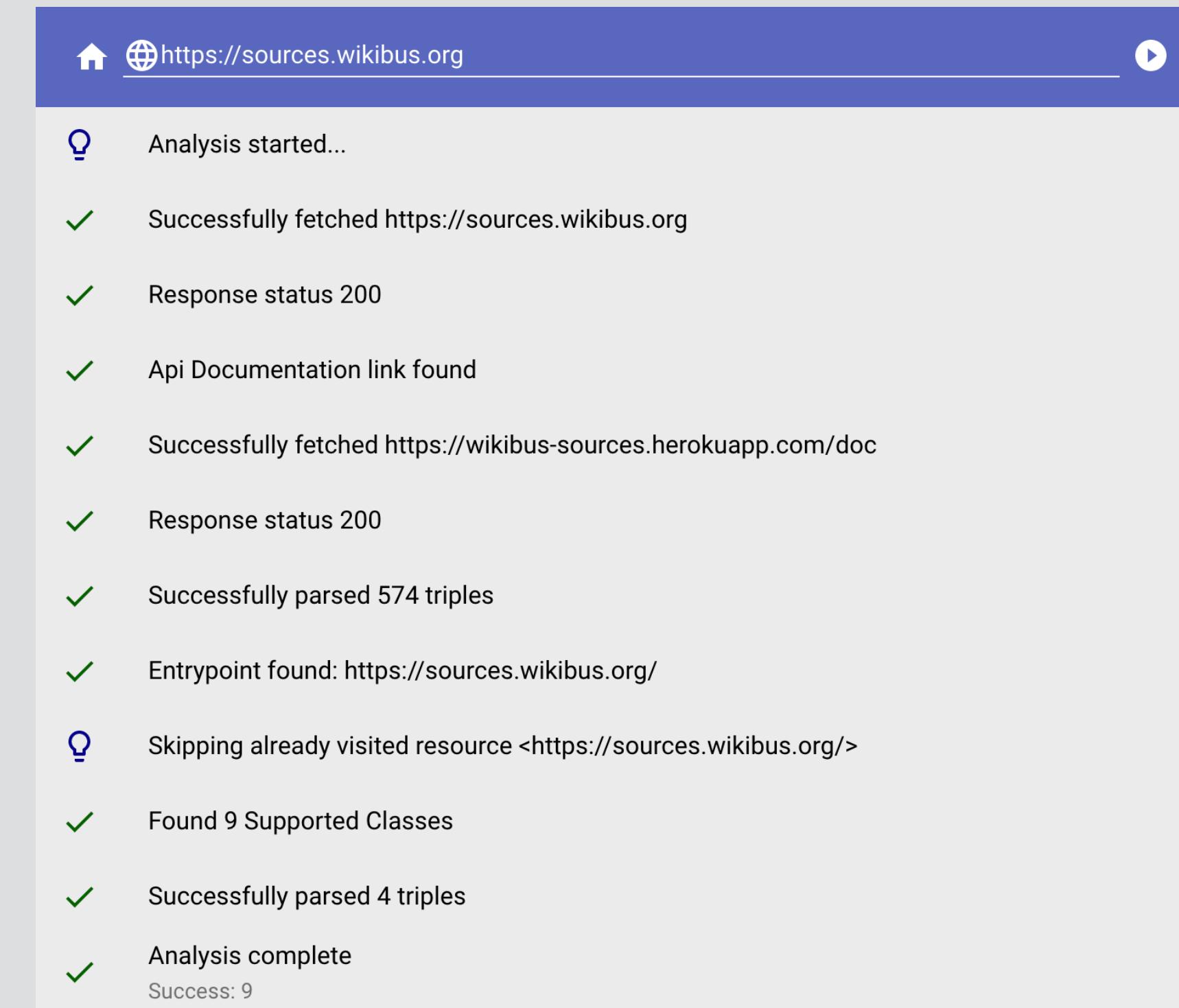
```
1 {  
2     "@id": "/tomasz",  
3     "@type": "ex:Employee",  
4     "ex:salary": "NaN",  
5     "ex:manager": "/adrian",  
6     "ex:contract": {  
7         "@id": "/contract/foo",  
8         "hydra:operation": {  
9             "@type": "api:TerminateContract"  
10        }  
11    }  
12 }  
13  
14 {  
15     "@id": "/adrian",  
16     "@type": "ex:Person",  
17     "api:subordinates": {  
18         "@id": "/adrian/subordinates"  
19     }  
20 }
```

Hydra static analysis

Checks contents of API's

hydra:ApiDocumentation for potential mistakes

- online on analyse.hypermedia.app
- also a [CLI tool](#)



The screenshot shows a web-based static analysis tool for Hydra. At the top, there is a blue header bar with a house icon and the URL <https://sources.wikibus.org>. Below the header, a large list of analysis steps is displayed, each with an icon indicating its status:

- 💡 Analysis started...
- ✓ Successfully fetched https://sources.wikibus.org
- ✓ Response status 200
- ✓ Api Documentation link found
- ✓ Successfully fetched https://wikibus-sources.herokuapp.com/doc
- ✓ Response status 200
- ✓ Successfully parsed 574 triples
- ✓ Entrypoint found: https://sources.wikibus.org/
- 💡 Skipping already visited resource <https://sources.wikibus.org/>
- ✓ Found 9 Supported Classes
- ✓ Successfully parsed 4 triples
- ✓ Analysis complete
Success: 9

Summary

What works and what doesn't?

- Routing
 - What about non-resource views?
 - State is more than just representations

Future work

- (UI) Code on demand
- Identifying and documenting functional and non-functional patterns
 - [building.hypermedia.app](#)
 - [generic.hypermedia.app](#)

Links

- **ld-navigation** (routing)
 - github.com/tpluscode/ld-navigation
- **@lit-any**
 - github.com/hypermedia.app/lit-any-views
 - github.com/hypermedia.app/lit-any-forms
 - lit-any.hypermedia.app
- Alcaeus (Hydra client)
 - alcaeus.hydra.how

Links

- [building.hypermedia.app](#)
- [testing.hypermedia.app](#)
- Generic Hydra browser
 - [generic.hypermedia.app](#)

Thank
you!