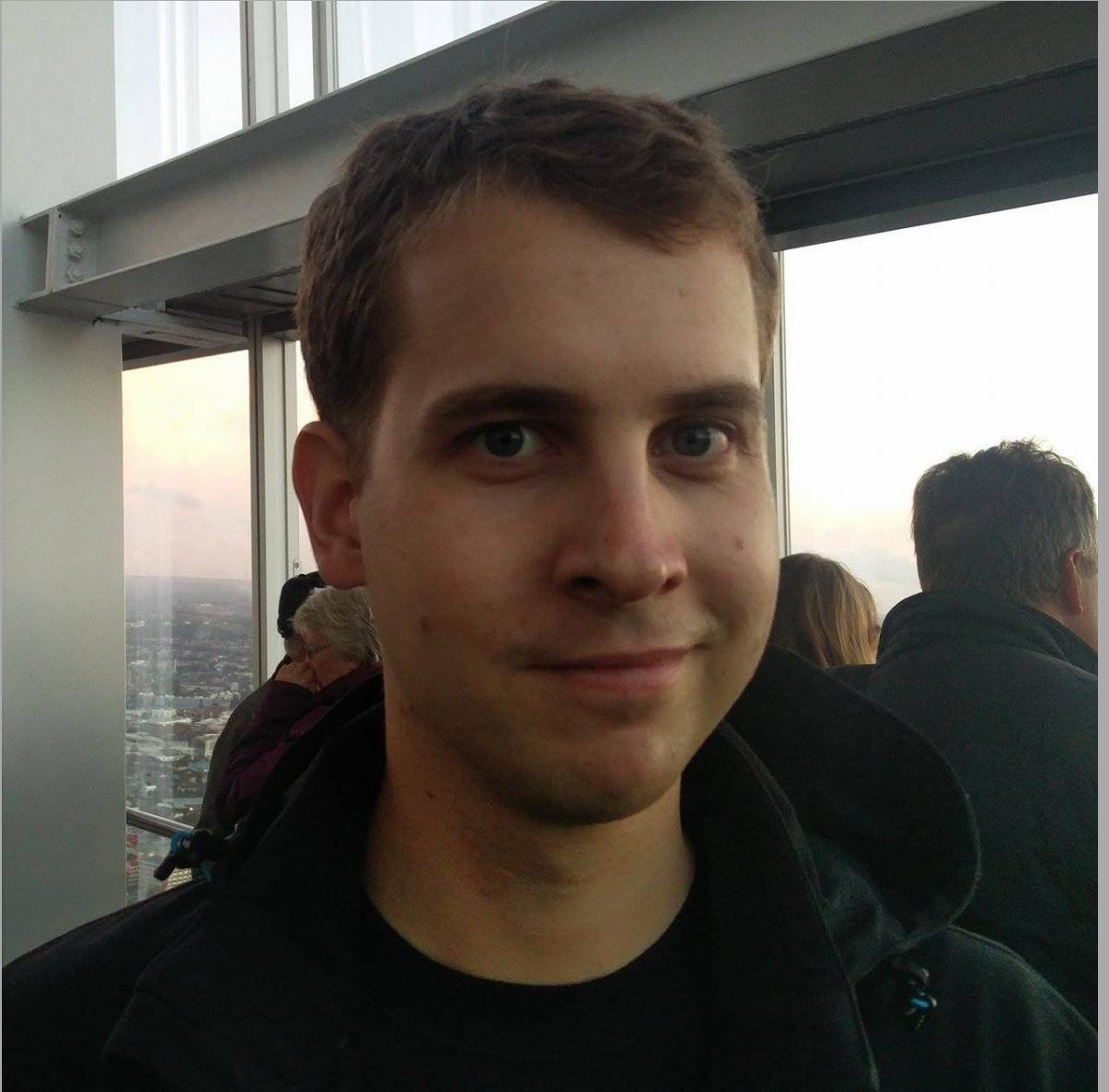


# Bringing hypermedia to the masses

# 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](http://restfest.org) and  @restfest



## Midwest US

May 31<sup>st</sup> - June 1<sup>st</sup>

Grand Rapids, MI USA

## Central EU

May 31<sup>st</sup> - June 1<sup>st</sup>

Wroclaw, Poland EU

## East US

September 25 + 26-28<sup>th</sup>

Greenville, SC USA

# Agenda

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

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 stands in the center-right. 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

Tomasz Pluskiewicz

What do you like?

- REST APIs
- Semantic Web
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Do you accept the T&C?

REGISTER



Your name  
Tomasz Pluskiewicz

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Your name  
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---

What do you like?

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---

Do you accept the T&C?

**REGISTER**



Your name  
Tomasz Pluskiewicz

---

What do you like?

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---

Do you accept the T&C?

**REGISTER**

Your name  
Tomasz Pluskiewicz

---

What do you like?

- REST APIs
- Semantic Web
- Web Components

---

Do you accept the T&C?

**REGISTER**



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**ACCEPT      DECLINE**

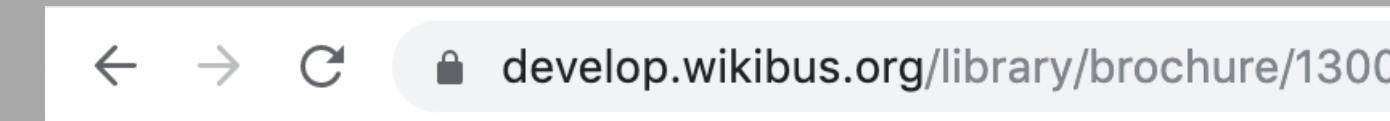
The background of the slide features a wide-angle photograph of a majestic mountain range. The mountains are covered in patches of white snow and rocky terrain. In the foreground, there's a lush field of green grass and small pink flowers, with a paved stone path leading from the bottom center towards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

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

# Hypermedia-driven web application

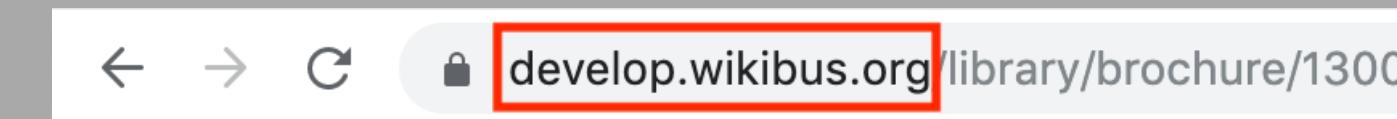
- Routing differently
- Rich media type
- Composing the visual elements

# "Routing"



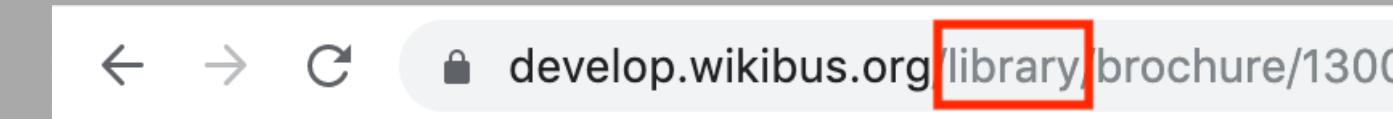
- Direct relation between browser URL and resource identifier

# "Routing"



- Plain Old Single-Page Application

# "Routing"



path

/library/

/home/

/vehicles/

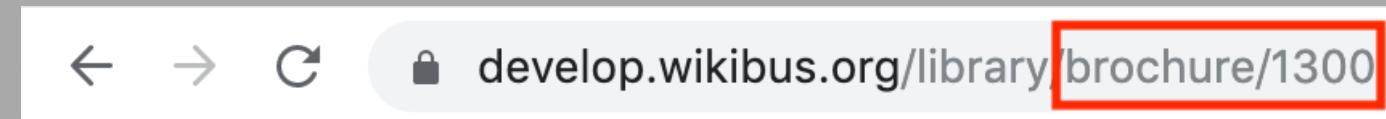
base API URL

sources.wikibus.org/

bff.wikibus.org/

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 complete<sup>1</sup> hypermedia media type

---

<sup>1</sup> 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",  
    "method": "PUT",  
    "expects": "Book"  
  }  
}
```

# Hydra

## API Documentation

```
{  
  "@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



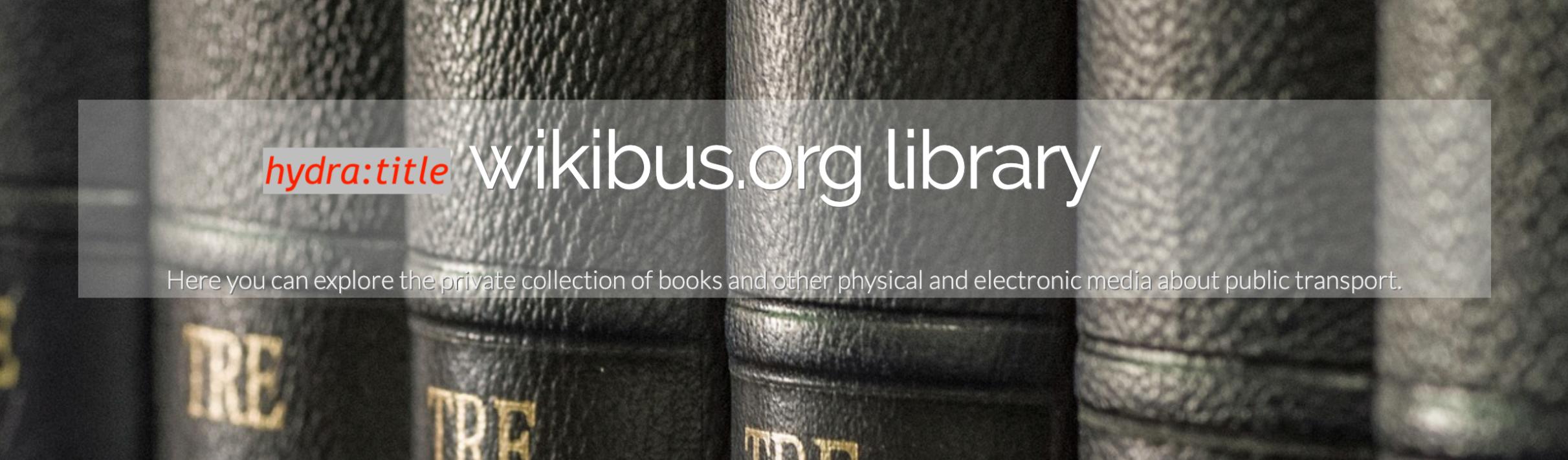
## BOOKS

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

Previous page... *hydra:previous*



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

```
<li><a href="index.html">Home</a></li>
<li><a href="home-events.html">Home Events</a></li>
<li class="has-children"> <a href="#" class="current">Header Options</a>
    <ul>
        <li><a href="tall-button-header.html">Tall Button Headers</a></li>
        <li><a href="image-logo.html">Image Logo</a></li>
        <li class="active"><a href="tall-logo.html">Tall Logo Images</a>
    </ul>
</li>
<li class="has-children"> <a href="#">Carousels</a>
    <ul>
        <li><a href="variable-width-slider.html">Variable Image Wi...
        <li><a href="testimonial-slider.html">Testimonial Slider<...
        <li><a href="featured-work-slider.html">Featured Work Sli...
        <li><a href="equal-column-slider.html">Equal Column Slid...
        <li><a href="video-slider.html">Video Slider</a></li>
        <li><a href="mini-bootstrap-carousel.html">Mini Slider</li>
    </ul>
</li>
```

# Hypermedia-driven testing

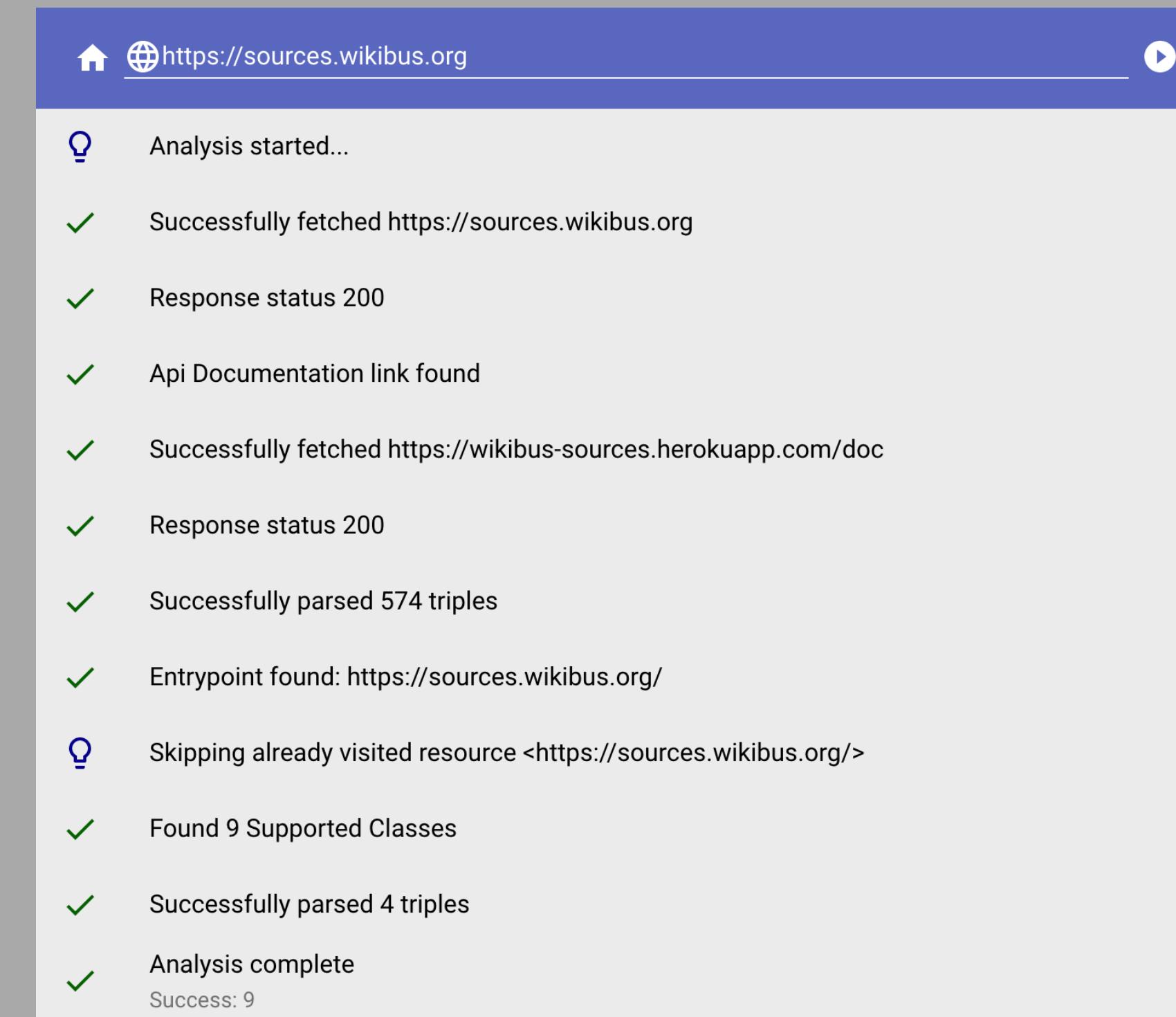
```
With Class ex:Employee {  
    Expect Property ex:salary  
    Expect Link ex:manager  
  
    Expect Property ex:contract {  
        Expect Operation api:TerminateContract {  
            Invoke {  
                Expect Status 204  
            }  
        }  
    }  
}  
  
With Link ex:manager {  
    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](https://analyse.hypermedia.app)
- also a [CLI tool](#)



The screenshot shows a web-based static analysis tool for Hydra. At the top, there is a header bar with a home icon and the URL <https://sources.wikibus.org>. Below the header, a blue navigation bar contains icons for back, forward, and search. The main content area is a log of analysis steps:

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

# Links

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

Thank  
you!