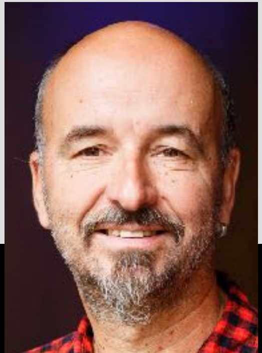
APACHECON @Home Sep 29 - Oct 1, 2020



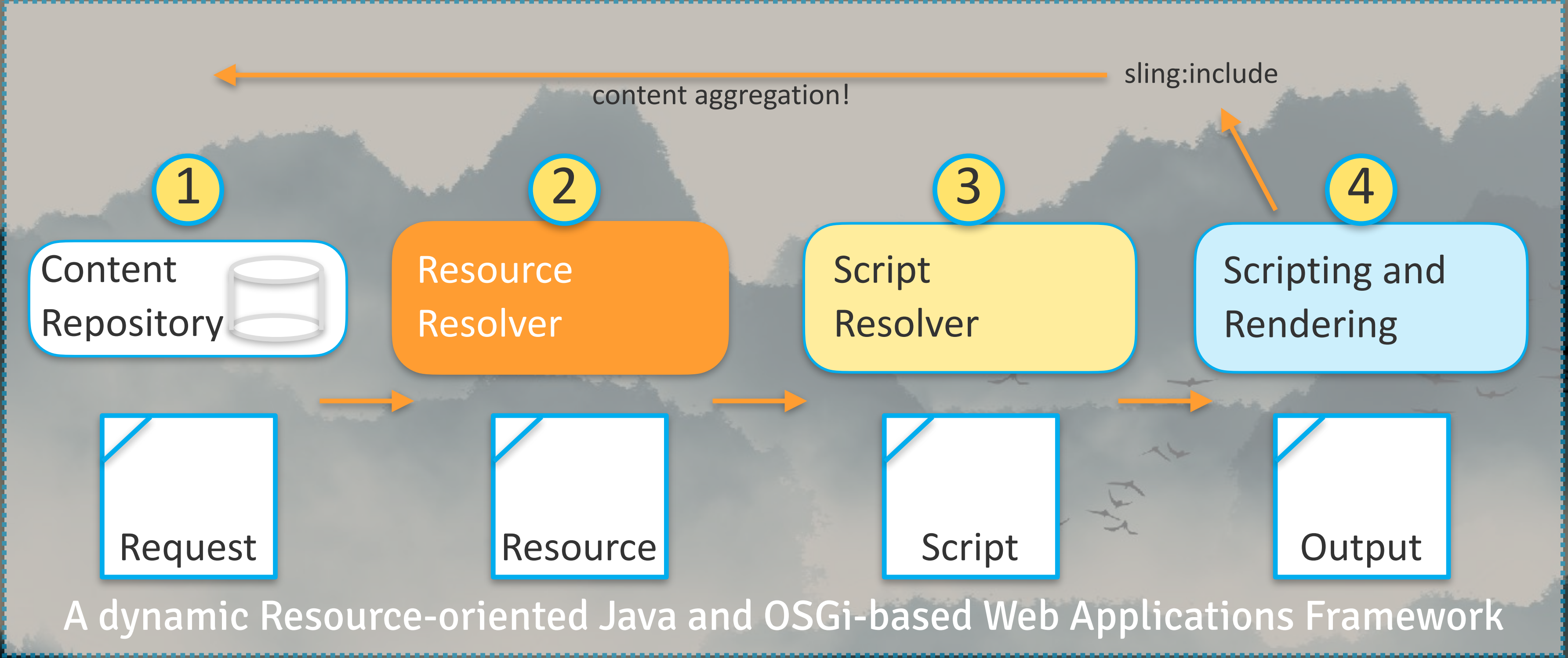
GraphQL in Apache Sling... but isn't it the opposite of REST?

Bertrand Delacrétaz :: Principal Scientist, Adobe
Board Member, Apache :: @bdelacretaz

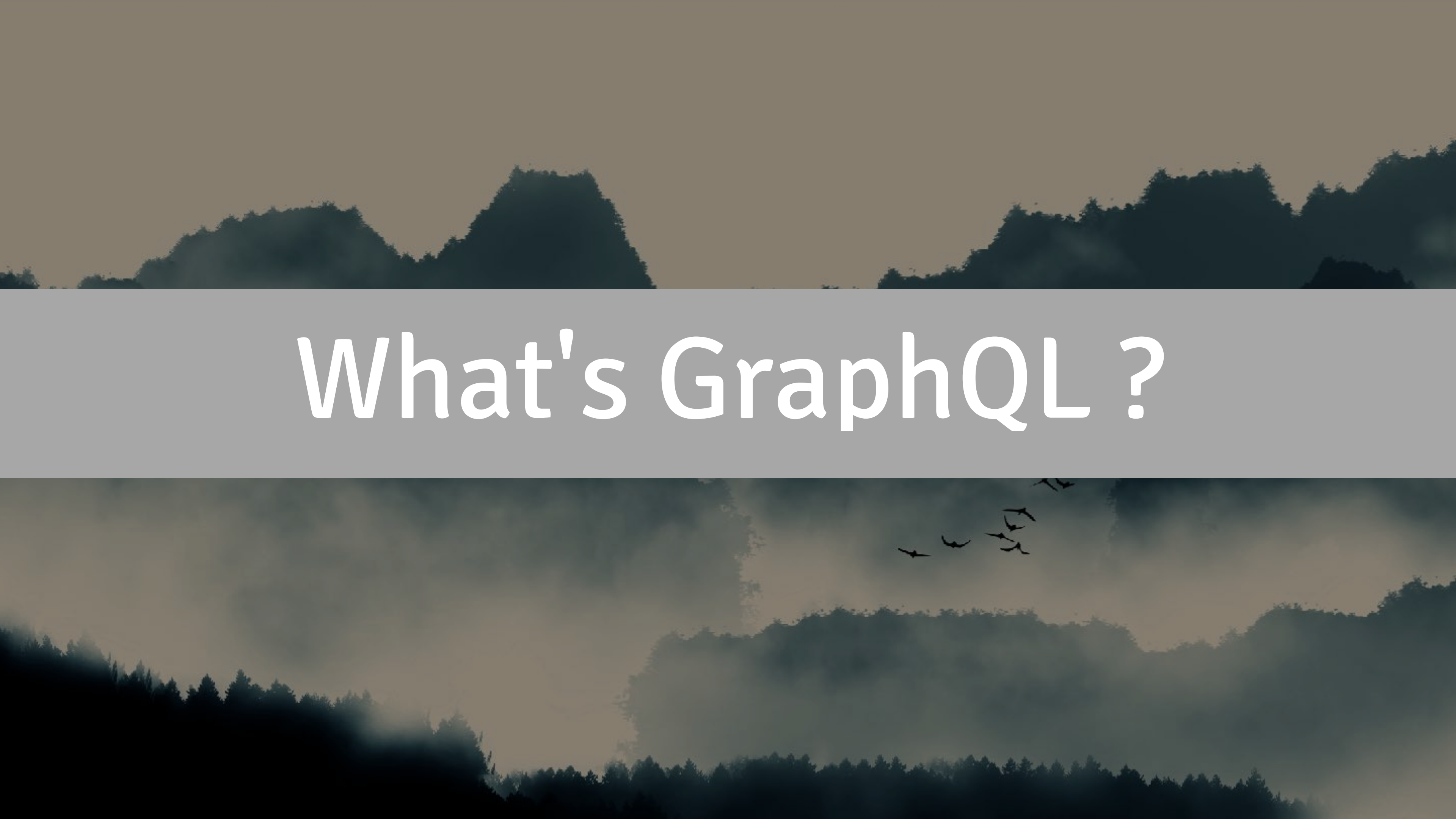
Images are from stock.adobe.com unless otherwise specified - slides revision: 2020-09-28

What's Apache Sling™ ?

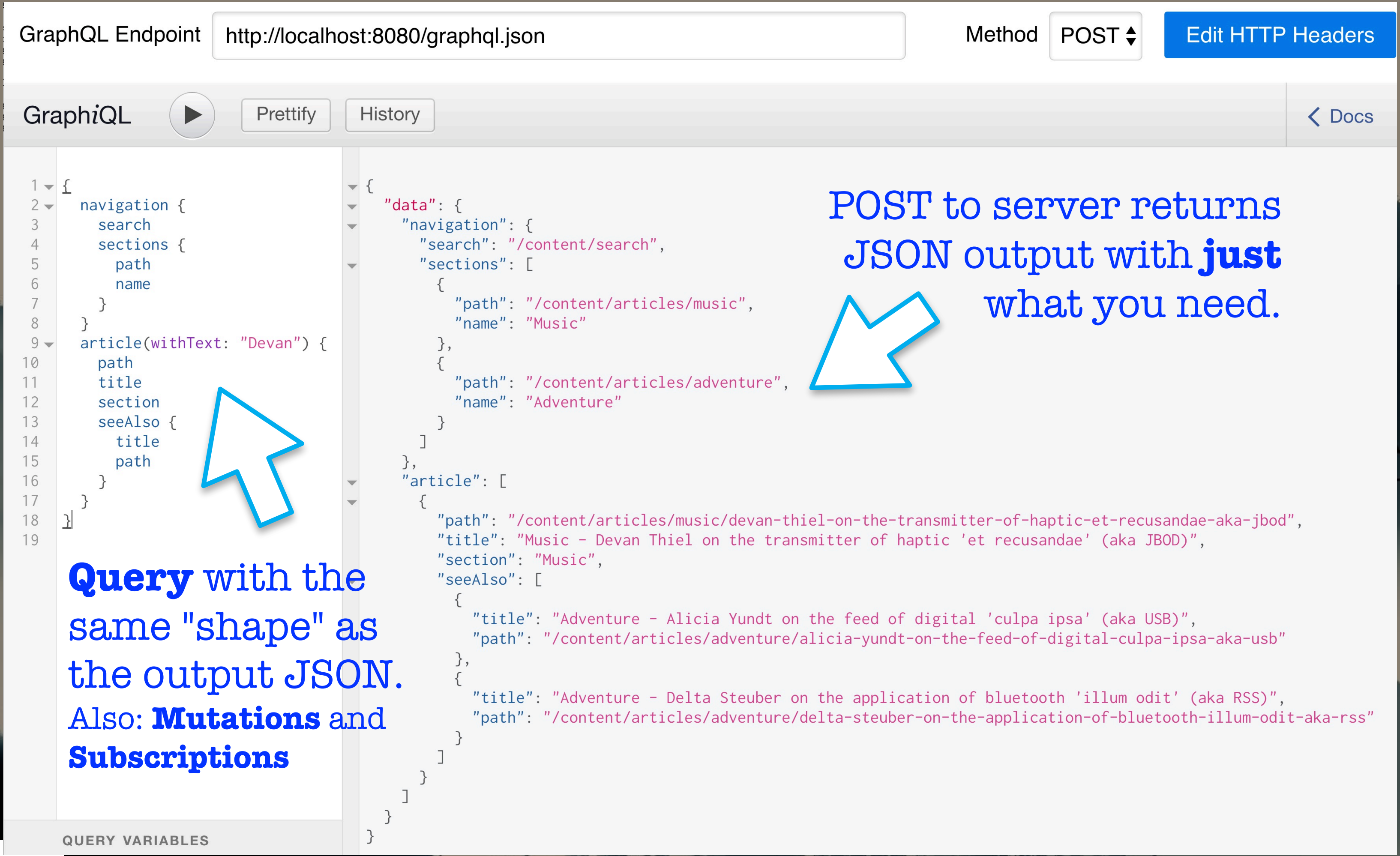
The Sling HTTP Request Processing Pipeline



A dynamic Resource-oriented Java and OSGi-based Web Applications Framework



What's GraphQL ?



GraphQL Endpoint: http://localhost:8080/graphql.json

Method: POST

```
{
  navigation {
    search
    sections {
      path
      name
    }
  }
  article(withText: "Devan") {
    path
    title
    section
    seeAlso {
      title
      path
    }
  }
}
```

```
{
  "data": {
    "navigation": {
      "search": "/content/search",
      "sections": [
        {
          "path": "/content/articles/music",
          "name": "Music"
        },
        {
          "path": "/content/articles/adventure",
          "name": "Adventure"
        }
      ]
    },
    "article": [
      {
        "path": "/content/articles/music/devan-thiel-on-the-transmitter-of-haptic-et-recusandae-aka-jbod",
        "title": "Music - Devan Thiel on the transmitter of haptic 'et recusandae' (aka JBOD)",
        "section": "Music",
        "seeAlso": [
          {
            "title": "Adventure - Alicia Yundt on the feed of digital 'culpa ipsa' (aka USB)",
            "path": "/content/articles/adventure/alicia-yundt-on-the-feed-of-digital-culpa-ipsa-aka-usb"
          },
          {
            "title": "Adventure - Delta Steuber on the application of bluetooth 'illum odit' (aka RSS)",
            "path": "/content/articles/adventure/delta-steuber-on-the-application-of-bluetooth-illum-odit-aka-rss"
          }
        ]
      }
    ]
  }
}
```

POST to server returns JSON output with **just** what you need.

Query with the same "shape" as the output JSON.

Also: **Mutations** and **Subscriptions**

GraphQL Schema

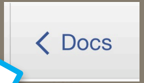
```
type Query {
  # The current content section
  section: Section @fetcher(name:"website/currentResource")
  navigation: Navigation @fetcher(name:"website/navigation")
}

type Navigation {
  # The root path of our website
  root: String

  # List of content sections
  sections: [Section]

  # Previous/next articles
  previous: String
  next: String

  # Search page
  search: String
}

...
```

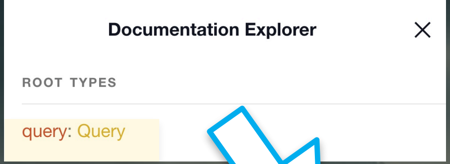
In our case, the schema is generated from an internal Sling request to

<resource>.GQLschema

So it can be specific to a given sling:resourceType

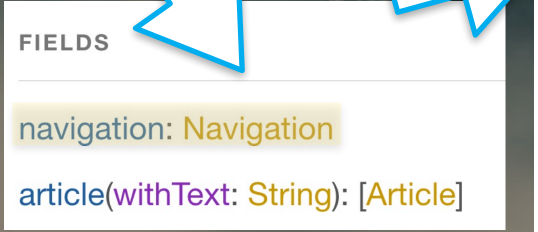
GraphQL Schema Introspection




Documentation Explorer ✕

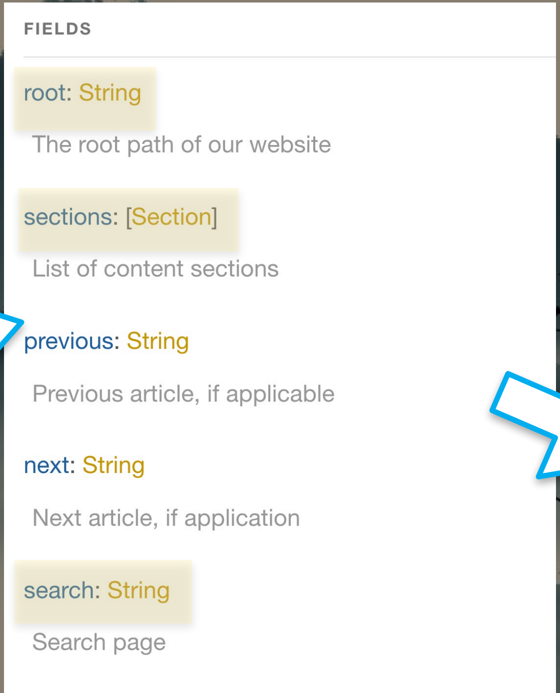
ROOT TYPES

query: Query


FIELDS

navigation: Navigation

article(withText: String): [Article]


FIELDS

root: String

The root path of our website

sections: [Section]

List of content sections

previous: String

Previous article, if applicable

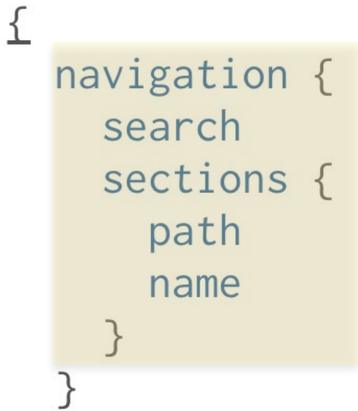
next: String

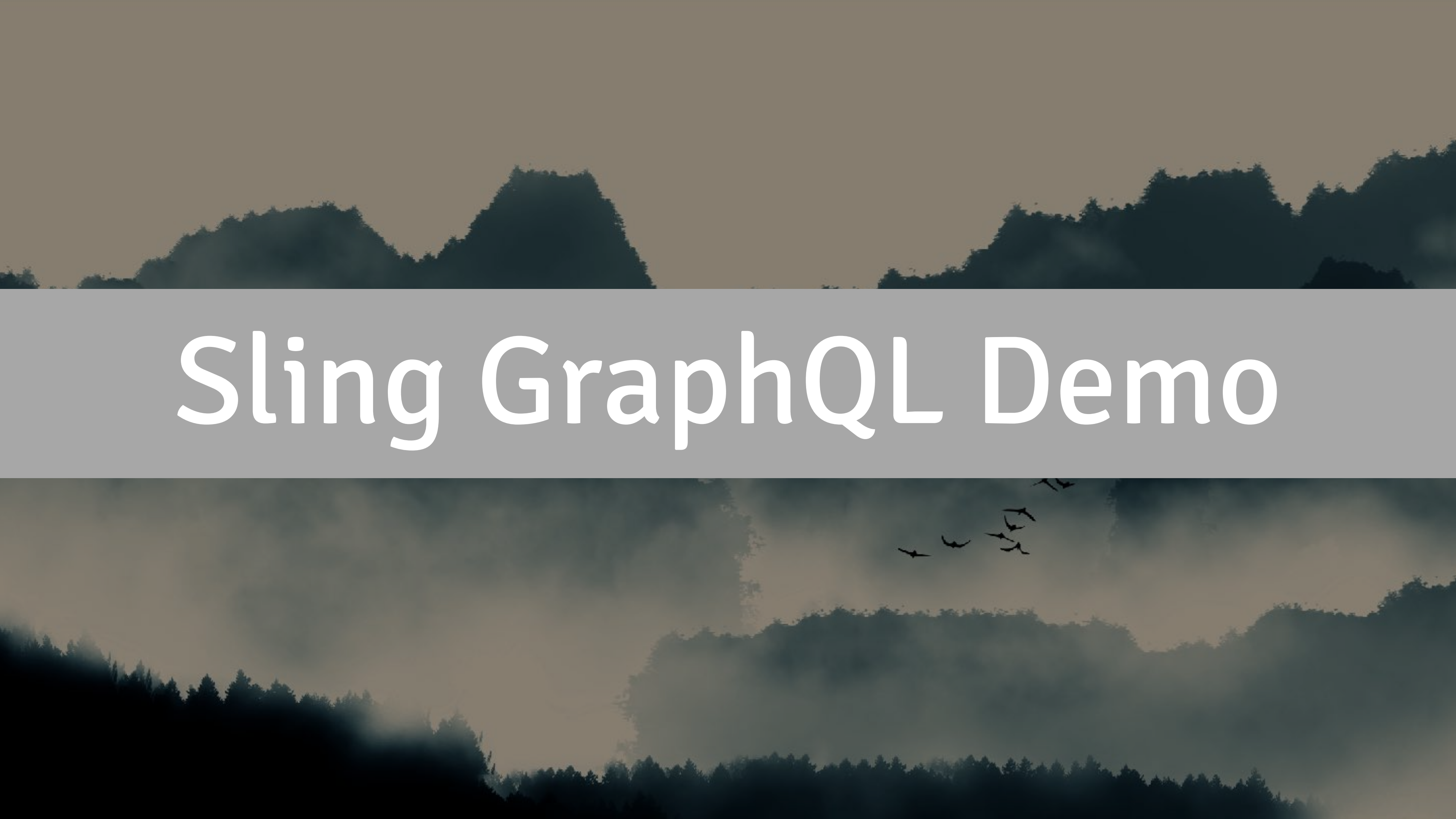
Next article, if application

search: String

Search page

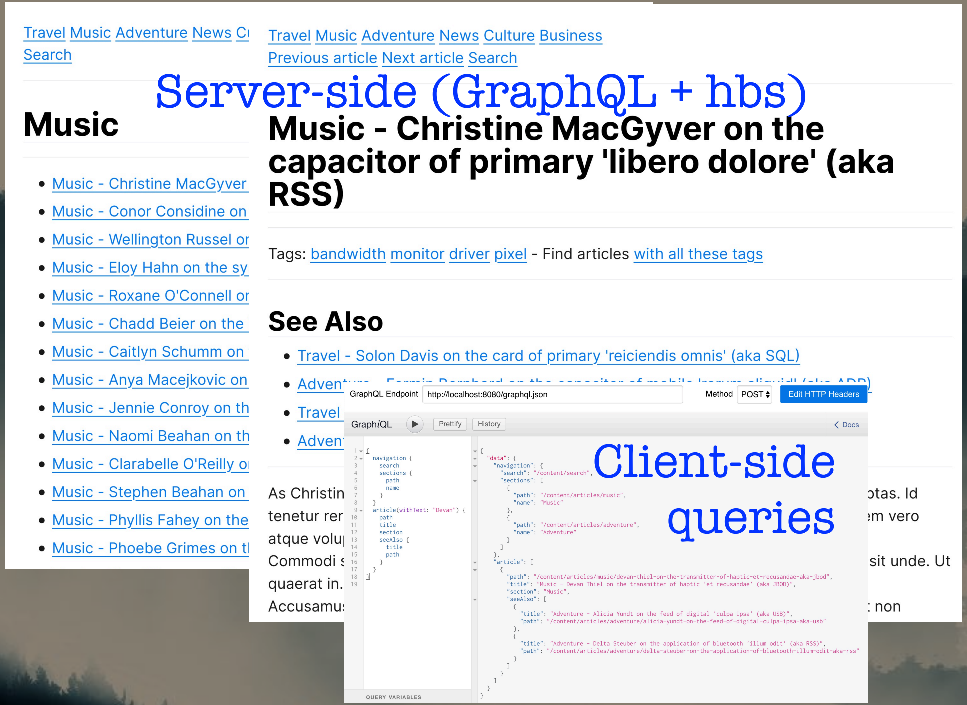
The schema information helps us build this query:


```
{
  navigation {
    search
    sections {
      path
      name
    }
  }
```



Sling GraphQL Demo

Sling-samples GraphQL website demo



Travel Music Adventure News Cu
Search

Music

- Music - Christine MacGyver
- Music - Conor Considine on
- Music - Wellington Russel or
- Music - Eloy Hahn on the sy
- Music - Roxane O'Connell or
- Music - Chadd Beier on the
- Music - Caitlyn Schumm on
- Music - Anya Macejkovic on
- Music - Jennie Conroy on th
- Music - Naomi Beahan on th
- Music - Clarabelle O'Reilly o
- Music - Stephen Beahan on
- Music - Phyllis Fahey on the
- Music - Phoebe Beahan on t

Travel Music Adventure News Culture Business
Previous article Next article Search

Server-side (GraphQL + hbs)

Music - Christine MacGyver on the capacitor of primary 'libero dolore' (aka RSS)

Tags: bandwidth monitor driver pixel - Find articles with all these tags

See Also

- Travel - Solon Davis on the card of primary 'reiciendis omnis' (aka SQL)
- Advent
- Travel
- Advent

As Christin … otas. Id tenetur rer … em vero atque volu … Commodi s … sit unde. Ut quaerat in. … Accusamu … t non

GraphQL Endpoint http://localhost:8080/graphql.json Method POST Edit HTTP Headers

```
{
  navigation {
    search
    sections {
      path
      name
    }
  }
  article(withText: "Devan") {
    path
    title
    section
    seeAlso {
      title
      path
    }
  }
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          }
        ]
      }
    ]
  }
}
```
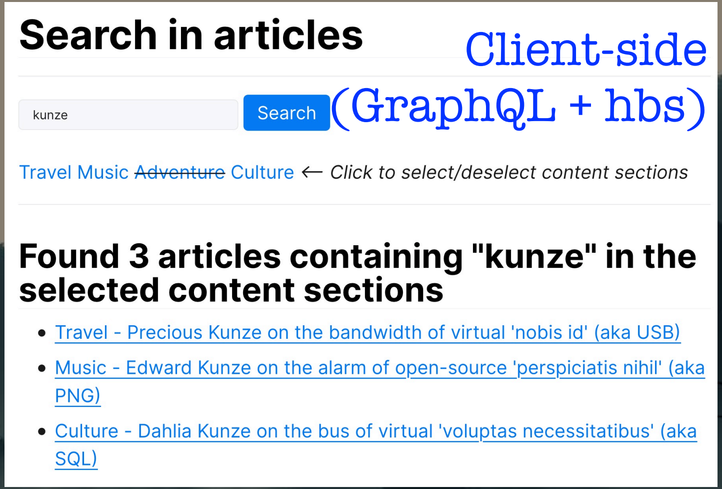

Client-side queries



Search in articles

Client-side (GraphQL + hbs)

kunze Search

Travel Music ~~Adventure~~ Culture ← *Click to select/deselect content sections*

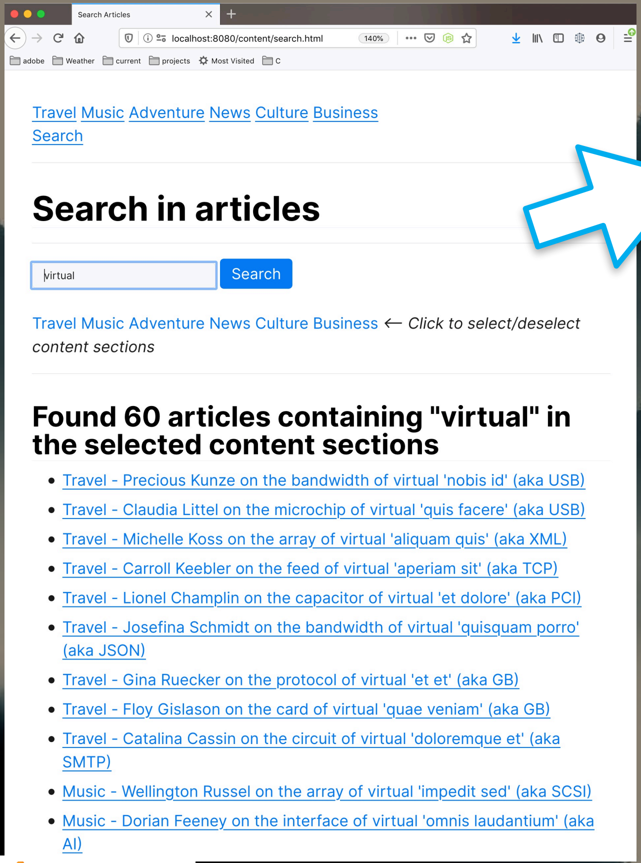
Found 3 articles containing "kunze" in the selected content sections

- Travel - Precious Kunze on the bandwidth of virtual 'nobis id' (aka USB)
- Music - Edward Kunze on the alarm of open-source 'perspiciatis nihil' (aka PNG)
- Culture - Dahlia Kunze on the bus of virtual 'voluptas necessitatibus' (aka SQL)

Both server-side and client-side rendering use GraphQL and Handlebars.
GraphiQL and similar clients supported out-of-the-box.
Clean JSON rendering available via GraphQL.

sling-samples/
org.apache.sling.graphql.samples.website

Client-side query + rendering



Travel Music Adventure News Culture Business
Search

Search in articles

virtual
Search

Travel Music Adventure News Culture Business ← *Click to select/deselect content sections*

Found 60 articles containing "virtual" in the selected content sections

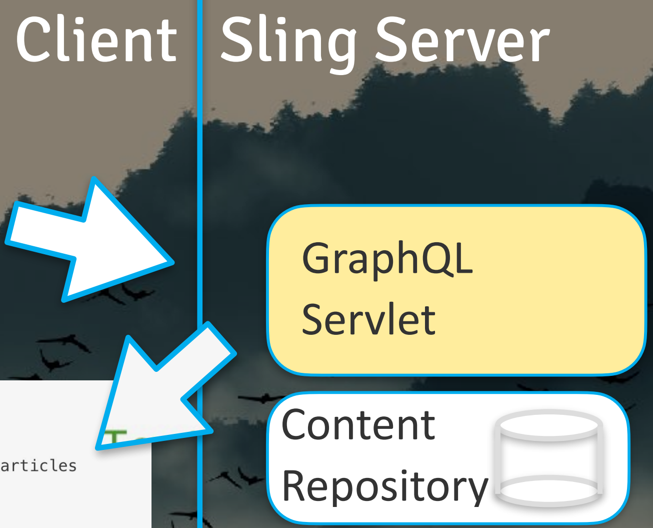
- Travel - Precious Kunze on the bandwidth of virtual 'nobis id' (aka USB)
- Travel - Claudia Littel on the microchip of virtual 'quis facere' (aka USB)
- Travel - Michelle Koss on the array of virtual 'aliquam quis' (aka XML)
- Travel - Carroll Keebler on the feed of virtual 'aperiam sit' (aka TCP)
- Travel - Lionel Champlin on the capacitor of virtual 'et dolore' (aka PCI)
- Travel - Josefina Schmidt on the bandwidth of virtual 'quisquam porro' (aka JSON)
- Travel - Gina Ruecker on the protocol of virtual 'et et' (aka GB)
- Travel - Floy Gislason on the card of virtual 'quae veniam' (aka GB)
- Travel - Catalina Cassin on the circuit of virtual 'doloremque et' (aka SMTP)
- Music - Wellington Russel on the array of virtual 'impedit sed' (aka SCSI)
- Music - Dorian Feeney on the interface of virtual 'omnis laudantium' (aka AI)

```
const query = `{
    navigation {
        search
        sections {
            path
            name
        }
    }
    article(withText: "${searchText}") {
        path
        title
        section
    }
}`;
```

POST
GraphQL query

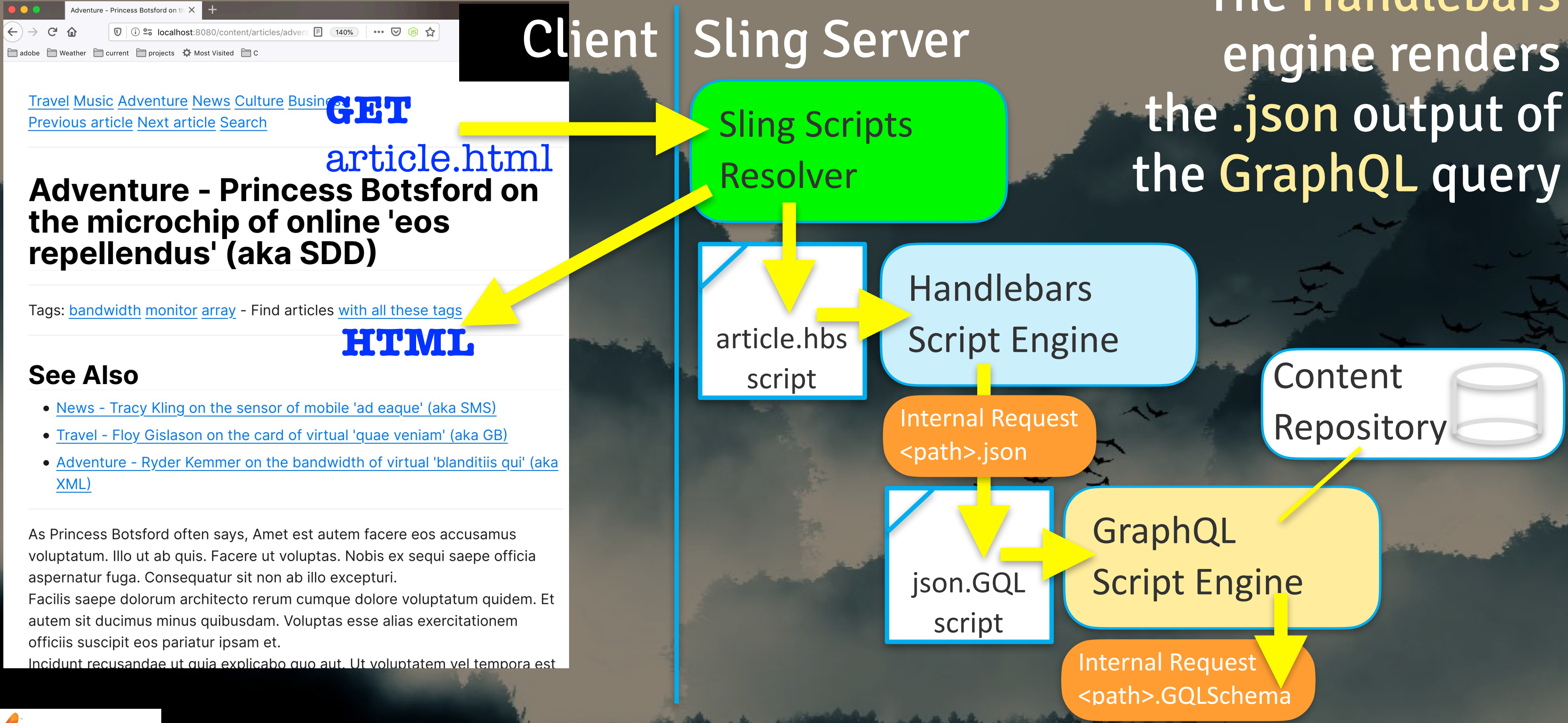
```
<div id="resultsTemplate">
    {{#if data.result.article}}
        <h2>
            Found {{data.result.article.length}} articles
            containing "{{data.info.searchText}}"
            in the selected content sections
        </h2>
        <ul>
        {{#each data.result.article}}
            <li class="articleLink">
                <a href="{{this.path}}.html">{{this.title}}</a>
            </li>
        {{/each}}
        </ul>
    {{else}}
    <div class="message">No articles found.</div>
    {{/if}}
</div>
```

JSON results
-> Handlebars



Server-side query + rendering

The Handlebars engine renders the .json output of the GraphQL query



Travel Music Adventure News Culture Busin
Previous article Next article Search

Adventure - Princess Botsford on the microchip of online 'eos repellendus' (aka SDD)

Tags: bandwidth monitor array - Find articles with all these tags

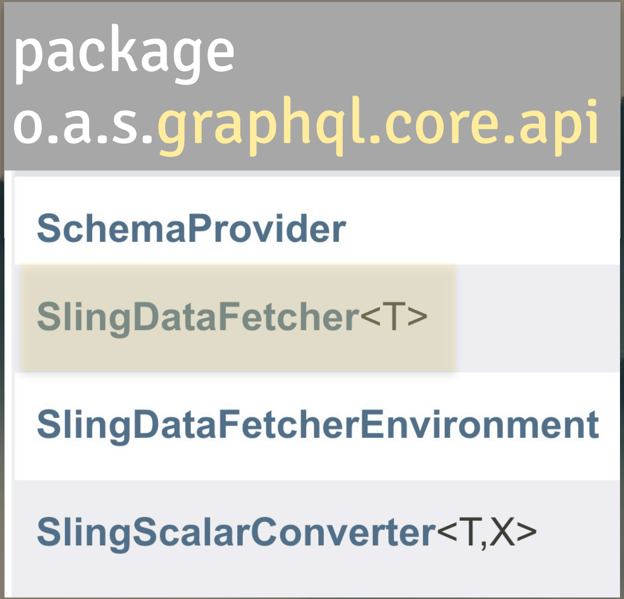
See Also

- News - Tracy Kling on the sensor of mobile 'ad eaque' (aka SMS)
- Travel - Floy Gislason on the card of virtual 'quae veniam' (aka GB)
- Adventure - Ryder Kemmer on the bandwidth of virtual 'blanditiis qui' (aka XML)

As Princess Botsford often says, Amet est autem facere eos accusamus voluptatum. Illo ut ab quis. Facere ut voluptas. Nobis ex sequi saepe officia aspernatur fuga. Consequatur sit non ab illo excepturi.
Facilis saepe dolorum architecto rerum cumque dolore voluptatum quidem. Et autem sit ducimus minus quibusdam. Voluptas esse alias exercitationem officiis suscipit eos pariatur ipsam et.
Incidunt recusandae ut quia explicabo quo aut. Ut voluptatem vel tempora est

Sling GraphQL Core

Sling GraphQL Core 0.0.4



package
o.a.s.graphql.core.api

SchemaProvider

SlingDataFetcher<T>

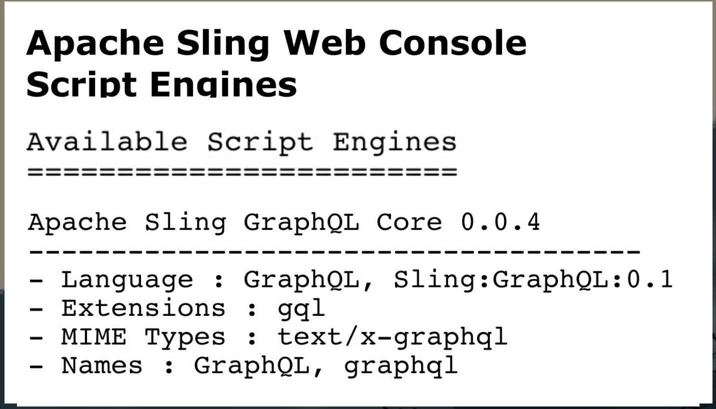
SlingDataFetcherEnvironment

SlingScalarConverter<T,X>

API

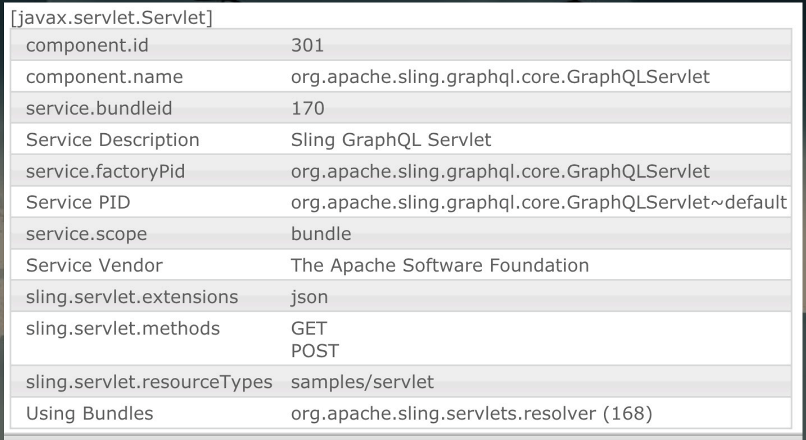
Script Engine

Servlet



Apache Sling Web Console
Script Engines

```
Available Script Engines
==========================

Apache Sling GraphQL Core 0.0.4
-------------------------------------
- Language : GraphQL, Sling:GraphQL:0.1
- Extensions : gql
- MIME Types : text/x-graphql
- Names : GraphQL, graphql
```



[javax.servlet.Servlet]

component.id	301
component.name	org.apache.sling.graphql.core.GraphQLServlet
service.bundleid	170
Service Description	Sling GraphQL Servlet
service.factoryPid	org.apache.sling.graphql.core.GraphQLServlet
Service PID	org.apache.sling.graphql.core.GraphQLServlet~default
service.scope	bundle
Service Vendor	The Apache Software Foundation
sling.servlet.extensions	json
sling.servlet.methods	GET POST
sling.servlet.resourceTypes	samples/servlet
Using Bundles	org.apache.sling.servlets.resolver (168)

Internally uses
https://github.com/graphql-java/graphql-java

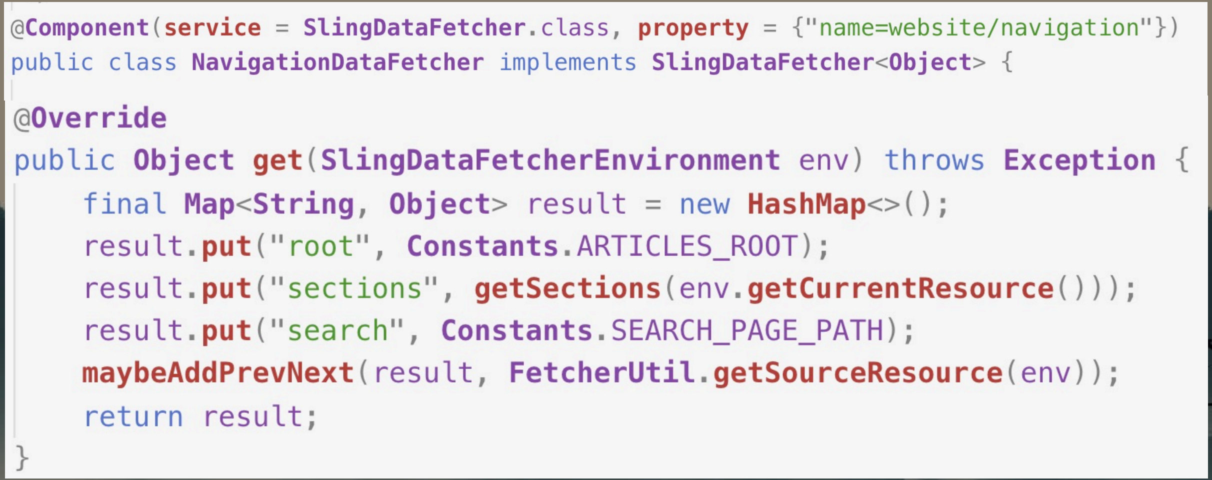
Default SchemaProvider

```
$ curl http://localhost:8080/content/articles/culture.GQLschema

type Query {
 section: Section @fetcher(name:"website/currentResource")
 navigation: Navigation @fetcher(name:"website/navigation")
}

type Navigation {
 root: String
 sections: [Section]
 previous: String
 next: String
 search: String
}
...
```

Full power of the Sling rendering pipeline for resource-specific schemas.

The @fetcher directive points to SlingDataFetcher services.

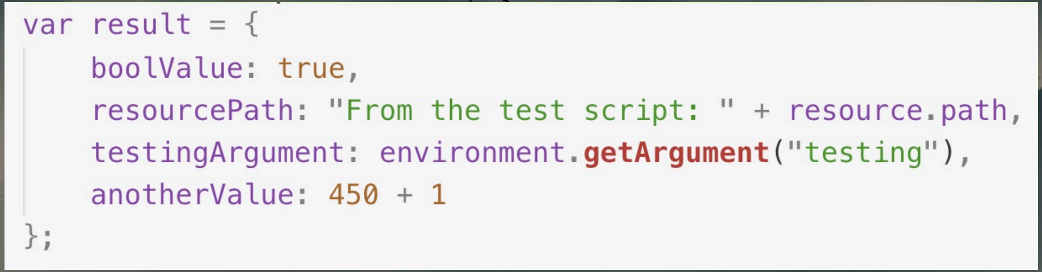
SlingDataFetcher



```
@Component(service = SlingDataFetcher.class, property = {"name=website/navigation"})
public class NavigationDataFetcher implements SlingDataFetcher<Object> {

@Override
public Object get(SlingDataFetcherEnvironment env) throws Exception {
    final Map<String, Object> result = new HashMap<>();
    result.put("root", Constants.ARTICLES_ROOT);
    result.put("sections", getSections(env.getCurrentResource()));
    result.put("search", Constants.SEARCH_PAGE_PATH);
    maybeAddPrevNext(result, FetcherUtil.getSourceResource(env));
    return result;
}
```

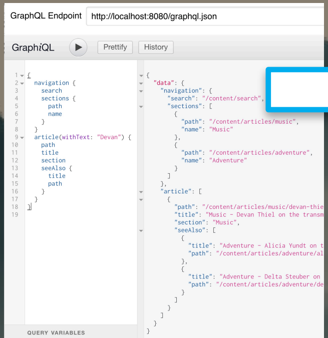
Java:
SlingDataFetcher OSGi service, returns a Map or POJO

Server-side script:
selected by fetcher name, returns a Map



```
var result = {
    boolValue: true,
    resourcePath: "From the test script: " + resource.path,
    testingArgument: environment.getArgument("testing"),
    anotherValue: 450 + 1
};
```

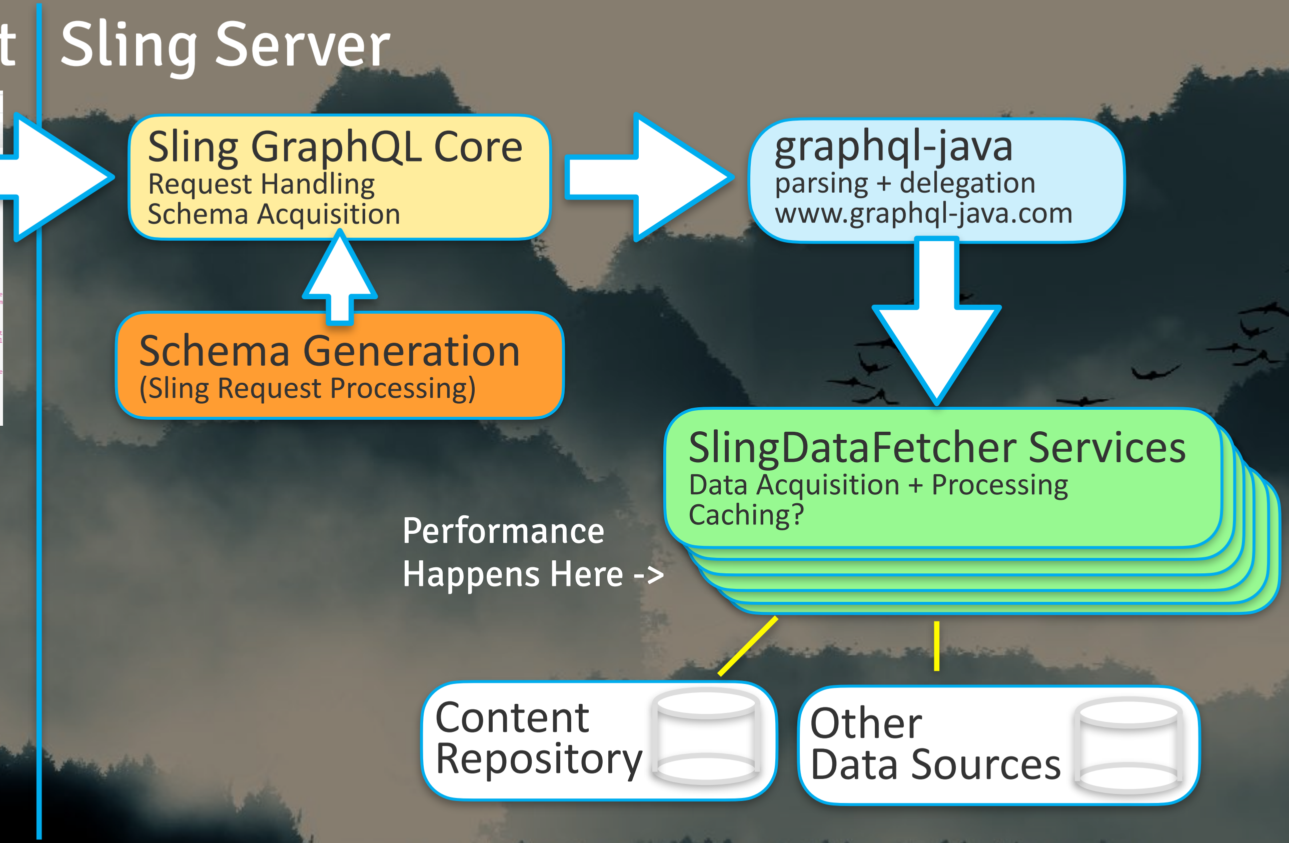
Under the hood: performance?



http://localhost:8080/graphql.json

```
{
  navigation {
    search
    sections {
      path
      name
    }
  }
  article(withText: "Devan") {
    path
    title
    section
    seeAlso {
      title
      path
    }
  }
}
```

```
{
  "data": {
    "navigation": {
      "search": "/content/search",
      "sections": [
        {
          "path": "/content/articles/music",
          "name": "Music"
        },
        {
          "path": "/content/articles/adventure",
          "name": "Adventure"
        }
      ]
    },
    "article": [
      {
        "path": "/content/articles/music/devan-thie
        "title": "Music - Devan Thiel on the transm
        "section": "Music",
        "seeAlso": [
          {
            "title": "Adventure - Alicia Yundt on t
            "path": "/content/articles/adventure/al
          },
          {
            "title": "Adventure - Delta Steuber on
            "path": "/content/articles/adventure/de
          }
        ]
      }
    ]
  }
}
```



Client

Sling Server

Sling GraphQL Core
Request Handling
Schema Acquisition

graphql-java
parsing + delegation
www.graphql-java.com

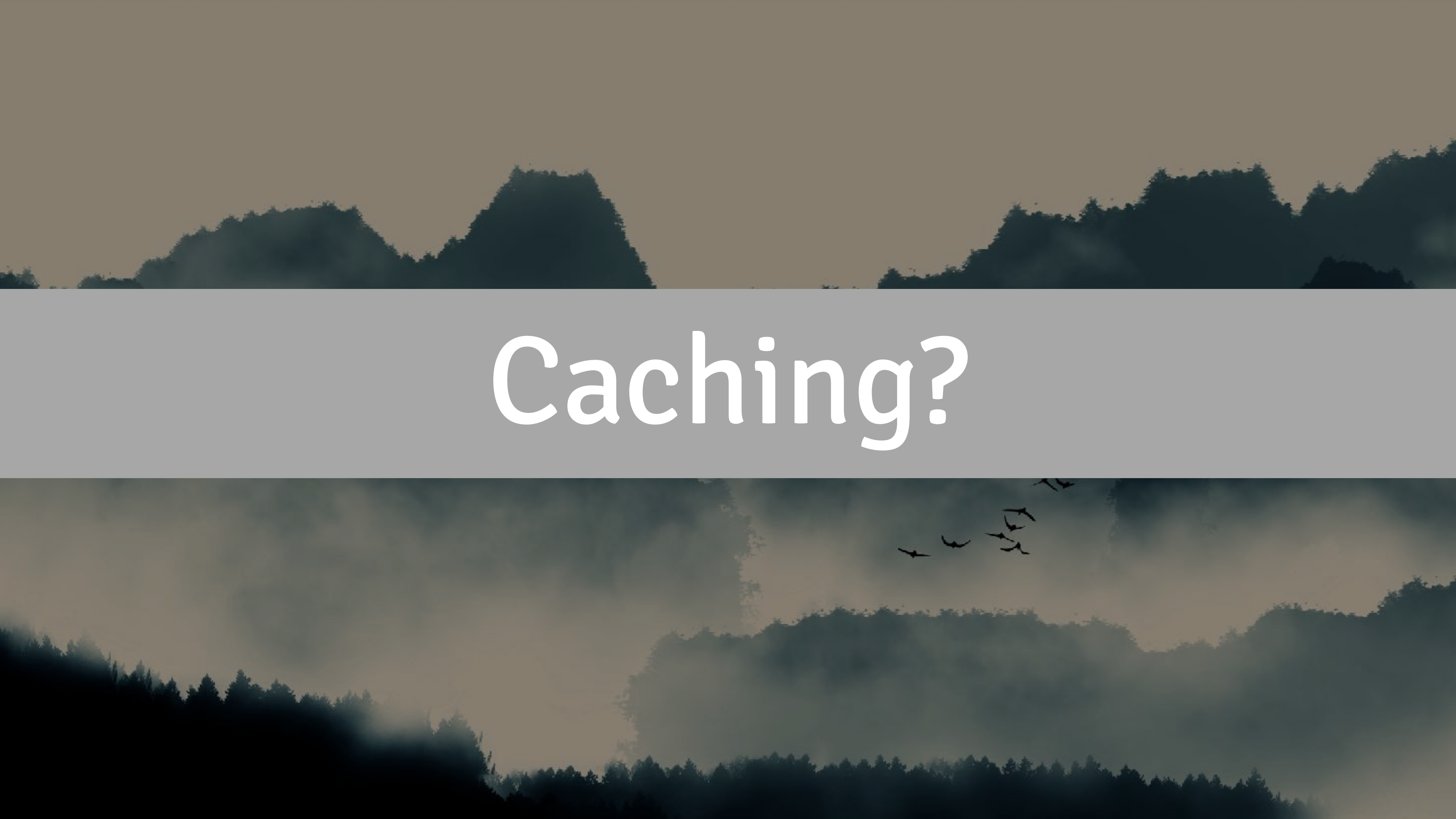
Schema Generation
(Sling Request Processing)

SlingDataFetcher Services
Data Acquisition + Processing
Caching?

Performance
Happens Here ->

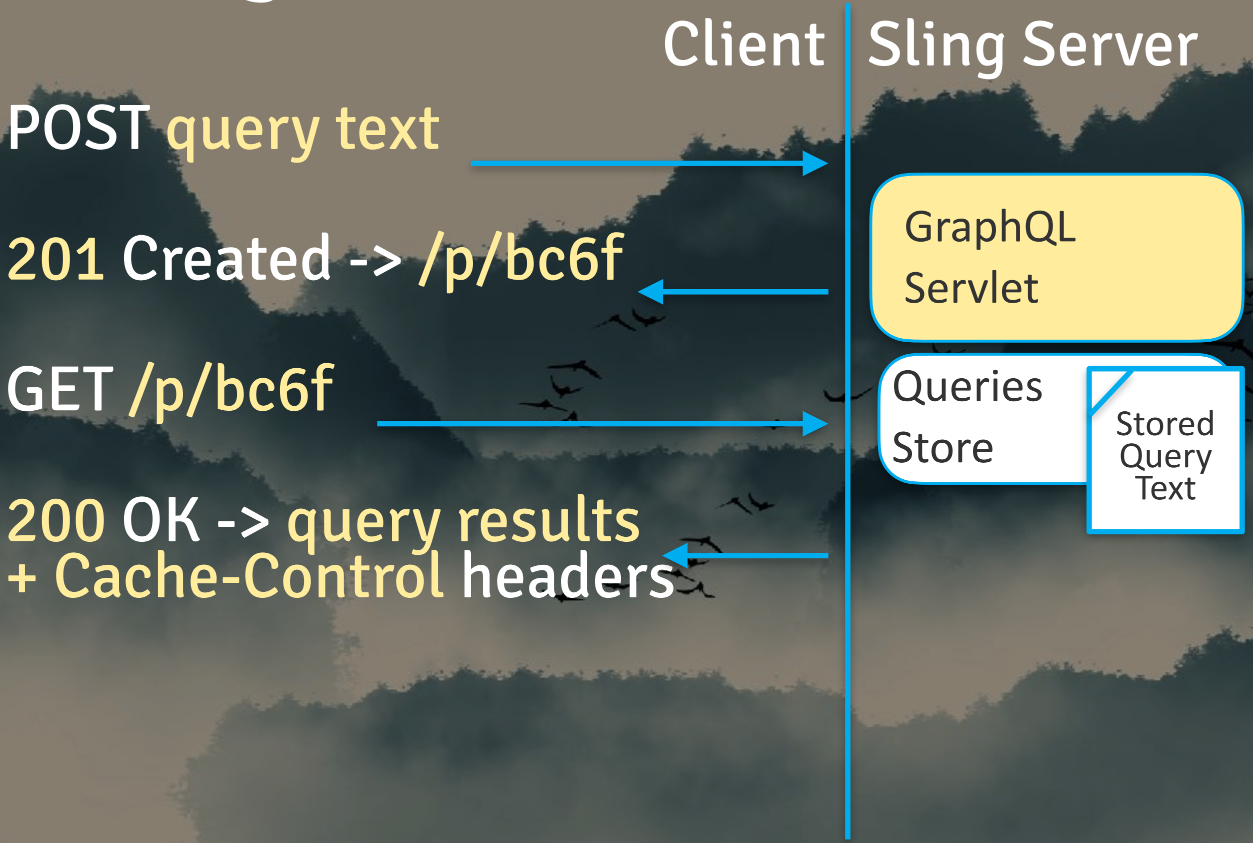
Content
Repository

Other
Data Sources

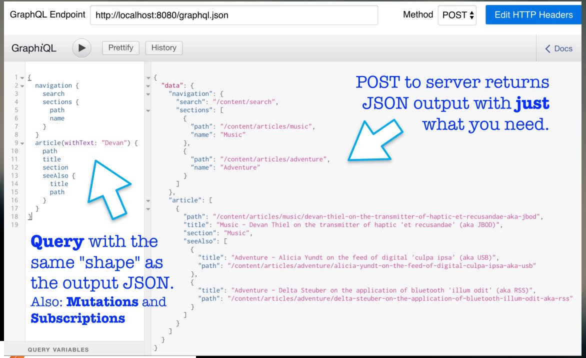


Caching?

HTTP-friendly caching?



Default POST-based interaction is generally not cacheable.



http://localhost:8080/graphql.json

POST

```
{
  navigation {
    search
    sections {
      path
      name
    }
  }
  article(withText: "Devan") {
    path
    title
    section
    seeAlso {
      title
      path
    }
  }
}
```

```
{
  "data": {
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      "sections": [
        {
          "path": "/content/articles/music",
          "name": "Music"
        },
        {
          "path": "/content/articles/adventure",
          "name": "Adventure"
        }
      ]
    },
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      {
        "path": "/content/articles/music/devan-thiel-on-the-transmitter-of-haptic-et-recusandae-aka-jbod",
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          }
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      }
    ]
  }
}
```

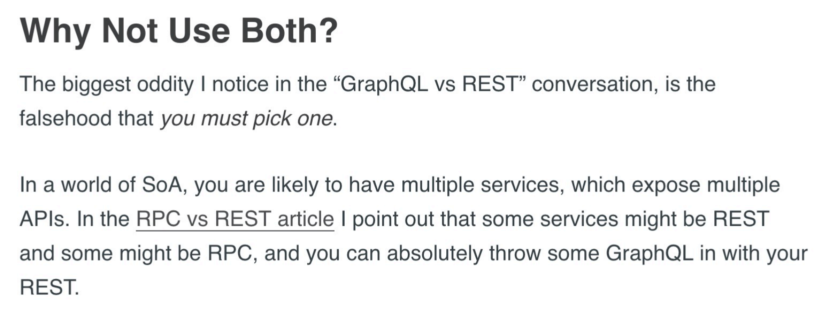
POST to server returns JSON output with **just** what you need.

Query with the same "shape" as the output JSON. Also: **Mutations** and **Subscriptions**

GraphQL and REST, BFFs ?

GraphQL and REST (+ RPC?)

Quoting Phil Sturgeon, builder of API design tools,
https://phil.tech/2017/graphql-vs-rest-overview/



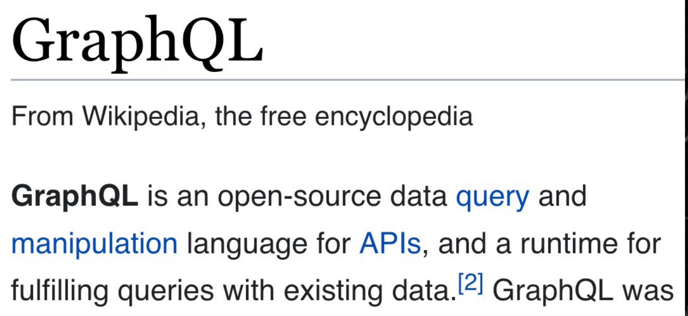
Why Not Use Both?

The biggest oddity I notice in the “GraphQL vs REST” conversation, is the falsehood that *you must pick one*.

In a world of SoA, you are likely to have multiple services, which expose multiple APIs. In the RPC vs REST article I point out that some services might be REST and some might be RPC, and you can absolutely throw some GraphQL in with your REST.

We do need queries, but also caching, hypertext, scalability.

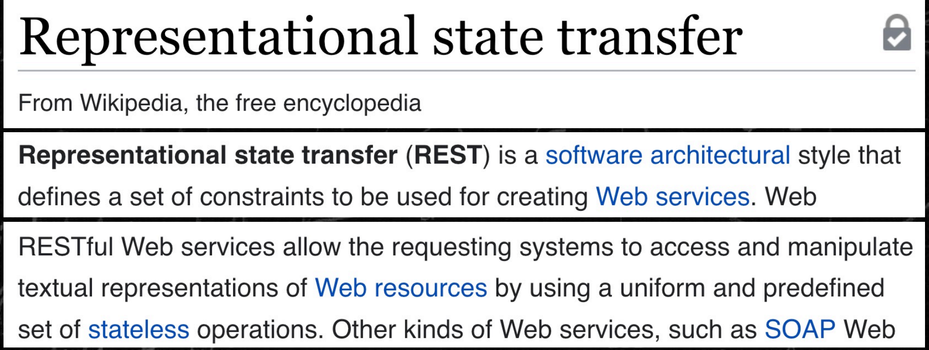
GraphQL is certainly better than a badly designed so-called REST API...and it's a great query API.



GraphQL

From Wikipedia, the free encyclopedia

GraphQL is an open-source data query and manipulation language for APIs, and a runtime for fulfilling queries with existing data.[2] GraphQL was



Representational state transfer

From Wikipedia, the free encyclopedia

Representational state transfer (**REST**) is a software architectural style that defines a set of constraints to be used for creating Web services. Web

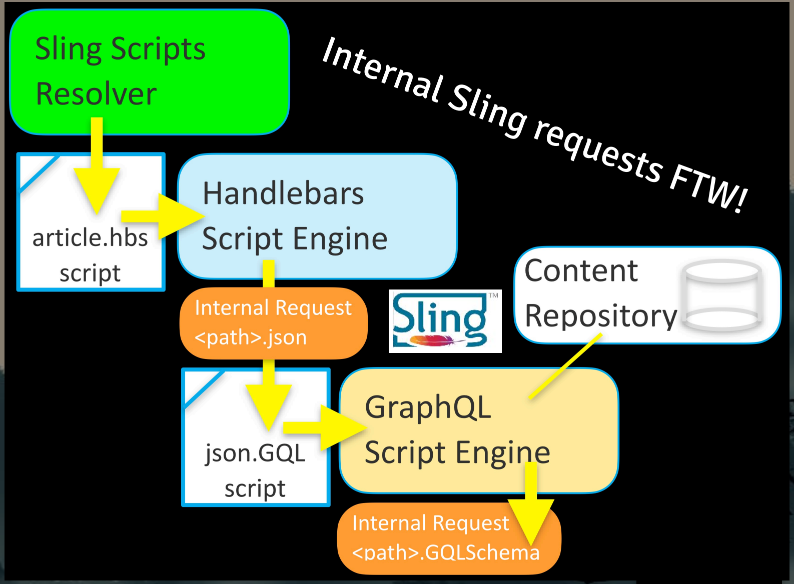
RESTful Web services allow the requesting systems to access and manipulate textual representations of Web resources by using a uniform and predefined set of stateless operations. Other kinds of Web services, such as SOAP Web

CODA

CODA

GraphQL is a very nice query language that also looks useful on the server-side.

It's not better or worse than REST: different animals that can play well together!



Internal Sling requests FTW!

The Sling GraphQL Core is V0.0.4: patches welcome!

I'm @bdelacretaz - thank you!
Code at https://github.com/apache/sling-org-apache-sling-graphql-core/
Fun text by https://github.com/apache/sling-whiteboard/tree/master/fake-content-generator