Implementing REST

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Just do it?!

A good answer if you already know

- HTTP coding
- JSON
- etc

Why use a framework?

- Routing
  - Separate logic for different verbs, paths, content-types
- Cacheing and content negotiation
- Data format manipulation
  - Translation to/from JSON
- Readability

REST frameworks
Too many to list

- Java
  - JAX-RS, Spring Boot, Dropwizard, Play, WSO2 MSF4J, etc
- Node
  - Express, Restify
- .NET Web API
- Erlang
  - Leptus, WebMachine
- Python
  - Eve

Why I propose JAX-RS for Java?

- Lots of implementations is good
- Pretty decent API
  - Clean looking code
- Fast and effective

Why I use Express in node.js?

- Simple
- Good routing logic
- Works well

ymmv

Introducing JAX-RS Model

- JAX-RS uses Java annotations to map an incoming HTTP request to a Java method.
- To use JAX-RS you annotate your class with the @Path annotation to indicate the relative URI path.
- Then annotate one or more of your class's methods with @GET, @POST, @PUT, @DELETE, or @HEAD to indicate which HTTP method you want dispatched to a particular method.

An Example

```
@Path("/accounts")
public class AccountEntryService
{
    @GET
    public String getAccounts()
{...}
}
```

Query Parameters

- getAccounts() method could return thousands of accounts in our system.
- To limit the size of the result set, the client could send a URI query parameter to specify how many results it wanted
    - http://somewhere.com/accounts?size=50.
- To extract this information from the HTTP request, JAX-RS has @QueryParam annotation:

Accessing Query Parameters

```
@Path("/accounts")
public class AccountEntryService {
    @GET
    public String getAccounts(
             @QueryParam("size")
                          @DefaultValue("50")
     int size)
     {
       ... method body ...
     }
}
```

Path Parameters

```
@Path("/accounts")
public class AccountEntryService {
   @GET
   @Path("/{id}")
   public String getAccount(
               @PathParam("id")  int
accountId) {
      ... method body ...
   }
}
```

More on Path Parameters

- The {id} string represents our path expression.
- The @PathParam annotation will pull in the info from the incoming URI and inject it into the accountId parameter.
  - For example, if our request is http://somewhere.com/accounts/111, accountId would get the value 111 injected into it.
- Complex path expressions are also supported. Use Java regular expressions as follows:
  - @Path("{id: \\d+}")

Handling Content Types

- The String passed back from getAccount() could be any mime type: plain text, HTML, XML, JSON, YAML.
- You can specify which mime type the method return type provides with the @Produces annotation. For example, let's say getAccounts() method actually returns an XML string.
- Also the @Consumes can direct different incoming content types to different methods

Response Content Type

```
@Path("/accounts")
public class AccountEntryService {
   @GET
   @Path("{id}")
   @Produces("application/xml")
   public String
 getAccount(@PathParm("id") int accountId)
   {
       ...
   }
}
```

Content Negotiation

- HTTP clients use the HTTP Accept header to specify a list of mime types they would prefer the server to return to them.
- Firefox browser sends this Accept header with every request:
  - Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
- JAX-RS understands the Accept header and will use it when dispatching to JAX-RS annotated methods.

Request Content Type

```
@Path("/accounts")
public class AccountEntryService {
   @GET
   @Path("{id}")
   @Produces("application/xml")
      public String getAccount(@PathParm("id") int
accountId) {...}

   @GET
   @Path("{id}")
   @Produces("text/html")
    public String getAccountHtml(@PathParm("id") int
accountId) {...}
}
```

The Response Body

```
return Response.ok().
  entity(response_body).build();
```

Content Marshalling

- JAX-RS allows you to write HTTP message body readers and writers that know how to marshall a specific Java type to and from a specific mime type.
- The JAX-RS specification has some required built-in marshallers. For instance, vendors are required to provide support for marshalling JAXB annotated classes.
- The details are beyond this course, but look up **@Provider**

Response Codes

- The HTTP specification defines what HTTP response codes should be on a successful request.
  - GET should return 200 OK
  - POST should return 201 Created
- You can expect JAX-RS to return the same default response codes.
- Sometimes, however, you need to specify your own response codes, or simply to add specific headers or cookies to your HTTP response. JAX-RS provides a Response class for this.

Examples of creating Responses

200 OK:

```
return Response.ok().build();
```

201 Created

```
return Response.created(
 URI.create
 ("orders/" + uuid)).build();
```

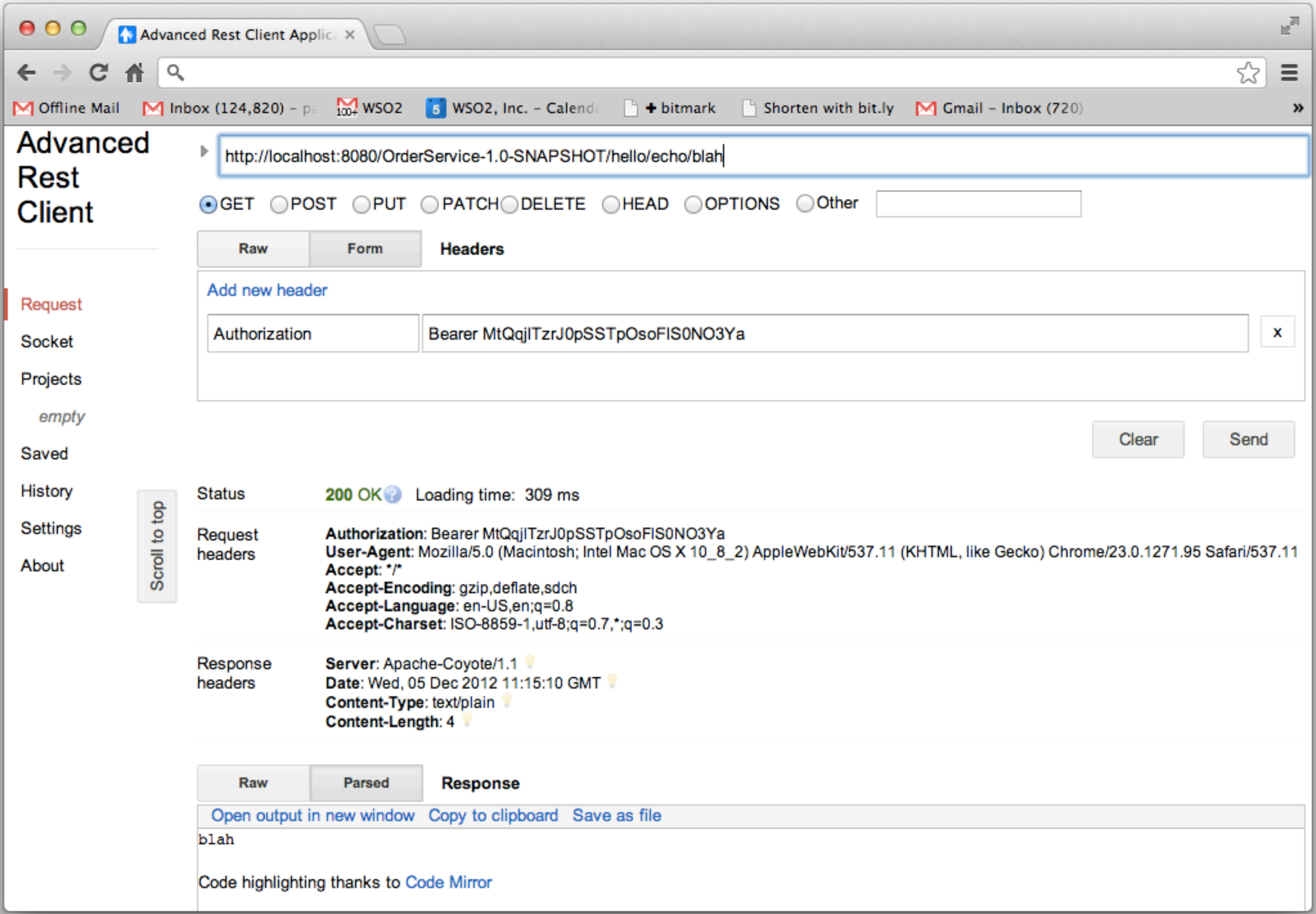
404 Not Found

```
return
Response.status(Status.NOT_FOUND).
build();
```

CLIENTS

First try it out

- Chrome Advanced REST Client is a good start
- SOAPUI also provides test capabilities
- curl should be your friend too!



http://localhost:8080/OrderService-1.0-SNAPSHOT/hello/echo/blah

[✓ GET] POST PUT PATCH DELETE HEAD OPTIONS Other

Authorization	Bearer MtQqjITzrJ0pSSTpOsoFIS0NO3Ya

Status 200 OK Loading time: 309 ms

Request headers

```
Authorization: Bearer MtQqjITzrJ0pSSTpOsoFIS0NO3Ya
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_8_2) AppleWebKit/537.11 (KHTML, like Gecko) Chrome/23.0.1271.95 Safari/537.11
Accept: */*
Accept-Encoding: gzip,deflate,sdch
Accept-Language: en-US,en;q=0.8
Accept-Charset: ISO-8859-1,utf-8;q=0.7,*;q=0.3
```

Response headers

```
Server: Apache-Coyote/1.1
Date: Wed, 05 Dec 2012 11:15:10 GMT
Content-Type: text/plain
Content-Length: 4
```

```
blah
```

Code highlighting thanks to Code Mirror

curl

```
curl -v http://localhost:8080/OrderService-1.0-SNAPSHOT/hello/echo/blah
* About to connect() to localhost port 8080 (#0)
*   Trying ::1...
* connected
* Connected to localhost (::1) port 8080 (#0)
> GET /OrderService-1.0-SNAPSHOT/hello/echo/blah HTTP/1.1
> User-Agent: curl/7.24.0 (x86_64-apple-darwin12.0) libcurl/7.24.0 OpenSSL/
0.9.8r zlib/1.2.5
> Host: localhost:8080
> Accept: */*
>
< HTTP/1.1 200 OK
< Server: Apache-Coyote/1.1
< Date: Wed, 05 Dec 2012 11:20:17 GMT
< Content-Type: text/plain
< Content-Length: 4
<
* Connection #0 to host localhost left intact
blah* Closing connection #0
```

JAXRS 2.0 Client API

- Similar to CXF client
- Aiming to be much higher level than standard HTTP clients
- Not a bad idea, but don't give up on "loose coupling"
  - The client and the service are independent
  - Technology choice of one shouldn't influence the technology choice of the other

Example JAX-RS Client Code

```
Client client =
ClientBuilder.newBuilder().newClient();
WebTarget target = client.target("http://
localhost:8080/rs");
target =
target.path("service").queryParam("a",
"avalue");

Invocation.Builder builder =
target.request();
Response response = builder.get();
Book book = builder.get(Book.class);
```

Example HTTPClient code

```
HttpClient client = new DefaultHttpClient();
{
    HttpGet request = new HttpGet(url);
    HttpResponse response = client.execute(request);
    System.out.println("Response status:" + response.getStatusLine());
    System.out.println("Response data:");
    HttpEntity entity = response.getEntity();
    if (entity != null) {

        BufferedReader br = new BufferedReader(new
    InputStreamReader(
                (entity.getContent())));
        String output;
        while ((output = br.readLine()) != null) {
            System.out.println(output);
        }
    }
}
```

Example Python Code

```
h = httplib2.Http();
       resp, content = h.request("http://
api.openweathermap.org/data/2.5/weather?q="+city)

try:
       response=json.loads(content)

       main = response['main']
       temp = round(main['temp'] - 273.15,2)
       humidity = main['humidity']
       pressure = main['pressure']
       wind = response['wind']
       windspeed = wind['speed']
       winddirection = wind['deg']
       country = response['sys']['country']
       city = response['name']
```

Example Node code

```
var post_req = http.request(post_options, function(r) {
       var body = "”
       r.on('data', function (chunk) {
           body += chunk;
       });
       r.on('end', function() {
         try {
           console.log(body);
           var response = JSON.parse(body);
         } catch (e) {}

         if (response) {
           callback(response);
         }
         else
         {
           callback(null);
         }
       });
   });
```

Questions?