RESTful HTTP on the JVM

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Intro

3 Programming Languages

3 Frameworks

2 Library Collections

60 Minutes

Showcase common tasks
Highlight strengths & weaknesses

Java / Scala

Full Stack

Async

Akka based

Java

JSR-339/JAX-RS 2.0 Implementation

Annotation-driven

Clojure

Ring, Clout, Compojure

It’s just functions, so no logo

Liberator (formerly “compojure-rest”)

Inspired by Webmachine (Erlang)

Status machine for correct HTTP

Scala

Library

Embedded HTTP server

Async, Akka-based

Internal routing DSL

Simple Path Matching

Map path and method to code

Map return value to response


```
@Path("/paths")
public class Paths {
     @GET
     @Produces(MediaType.TEXT_PLAIN)
     @Path("simple")
     public String simple() {
          return "Simple";
     }
}
```

```
# routes file
GET     /paths/simple     controllers.Paths.simple
```

```
object Paths extends Controller {
  def simple = Action {
    Ok ("Simple")
  }
}
```

(Ring + Clout)

```
(defn hello-world-app [req]
  {:status 200
   :headers {"Content-Type" "text/plain"}
   :body "Hello, World!"})

(hello-world-app {:uri "/foo"
                  :request-method :get})
> {...}
```

(Ring + Clout)

```
(defroutes
  (GET "/paths/simple" [] hello-world-app))

(defroutes
  (GET "/paths/simple" [] "Simple"))
```


```
class MyServiceActor extends HttpServiceActor
{
  def receive = runRoute(myRoute)

  def myRoute = pathPrefix("paths") {
    (path("simple")) {
      get {
        complete {
          "Simple"
        }
      }
    }
  }
}
```

Spray Route

Route = RequestContext => Unit

Directive = (o..n => Route) => Route

Bind dynamic path elements

Map path with Placeholder to code

/users/{id}


```
@Path("twice/{value}")
@GET
public int twice(@PathParam("value") int value){
  return value * 2;
}
```

```
GET /paths/twice/:id  Controllers.Paths.twice(id : Int)
```

```
def twice (i : Int)= Action {
  Ok((i*2).toString())
}
```

(Ring + Clout)

```
(defroutes binding-routes
  (GET ["/paths/twice/:value",
        :value #"[0-9]+"]
  [value]
    (str (* 2 (Integer/parseInt value)))))
```

```
path("twice" / IntNumber) { int =>
  get {
    complete {
      (int * 2).toString
    }
  }
}
```

Server-side link creation

Need to link to a resource

But should be DRY


```
// specific Resource
URI uri = UriBuilder.
  fromResource(Paths.class).
  path(Paths.class, "twice").
  resolveTemplate("value", 21).build();

// templated Link
URI uri = UriBuilder.
  fromResource(Paths.class).
  path(Paths.class, "twice").build();
```

```
# specific Resource
controllers.routes.Paths.twice(21).absoluteURL()

# Template
controllers.routes.Paths.twice(1234)
    .absoluteURL().toString
    .replaceAllLiterally("1234", "{value}")
```

(Route-one)

```
(defroute twice "/paths/twice/:value")

(defroutes binding-routes
  (compojure/GET [twice-template, :value #"[0-9]+"] [value]
                 (str (* 2 (Integer/parseInt value)))))

(defroutes link-routes
  (GET "/links/toTwice21" [:as r]
       (str (build-base-uri r) (twice-path {:value 21})))
  (GET "/links/toTwice" [:as r]
       (str (build-base-uri r)
            (route-pattern-to-uri-template twice-template))))
```

(Route-one)

```
(macroexpand-1 '(defroute twice "/paths/twice/:value"))
```

```
(do
  (def twice-template "/paths/twice/:value")
  (defn twice-path [& r]
    (path-for "/paths/twice/:value"
              (if (= 1 (count r)) (first r) (apply hash-map r))))
  (defn twice-url [& r]
    (url-for "/paths/twice/:value"
      (if (= 1 (count r)) (first r) (apply hash-map r)))))
```

```
(defn route-pattern-to-uri-template [pattern]
  (clojure.string/replace pattern #":([\w]*)" "{$1}"))
```

Build it yourself

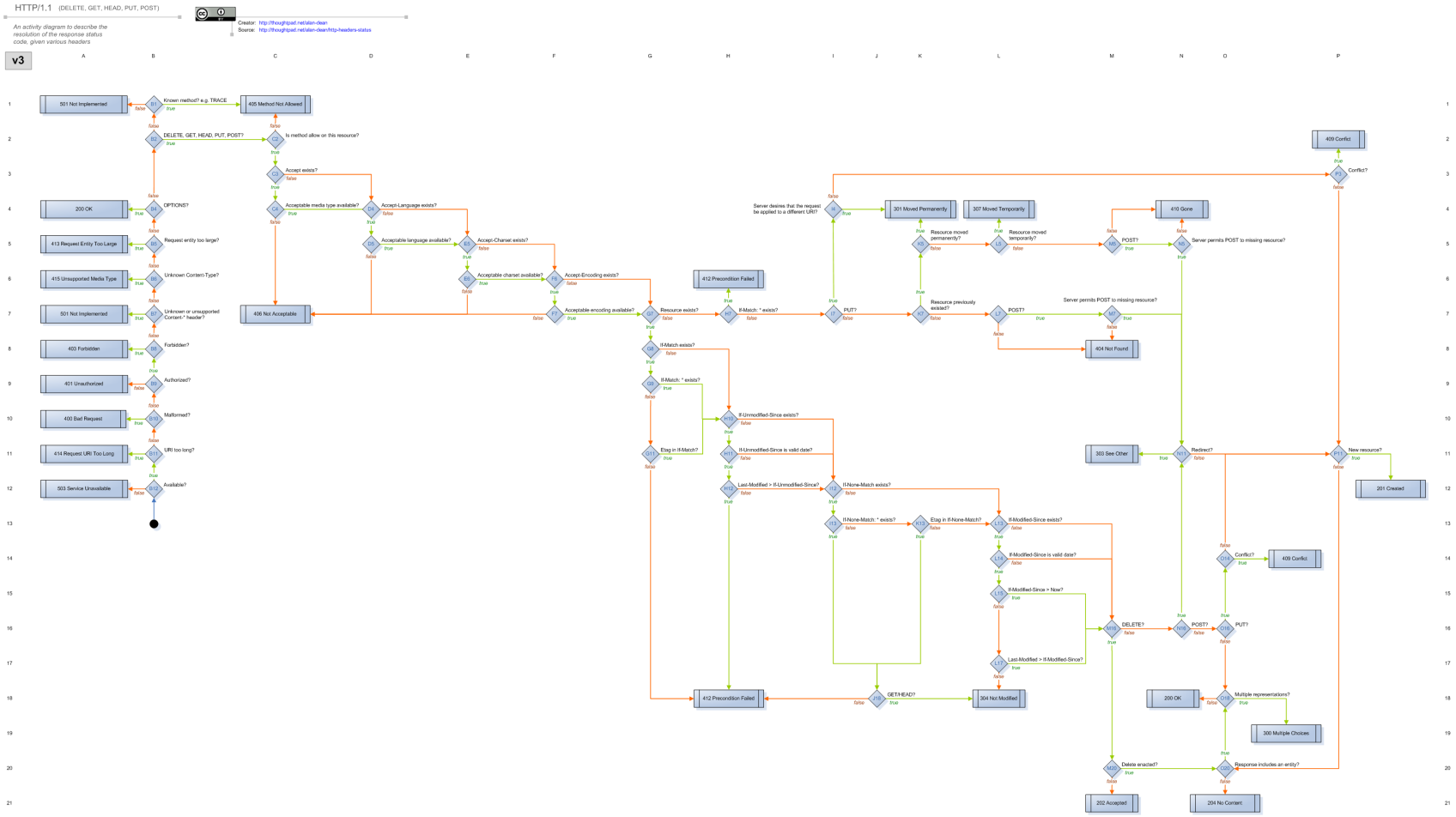
Manage conditional requests

Client may request with
“If-None-Match”


```
@Path ("etag")
@GET
public Response etag(@Context Request request) {
  String entity = "This is the entity.";
  EntityTag eTag = new EntityTag(entity);
  ResponseBuilder rb =
    request.evaluatePreconditions(eTag);
  if (rb != null) {
   return rb.build();
  }
  return Response.ok(entity).tag(eTag).build();
}
```

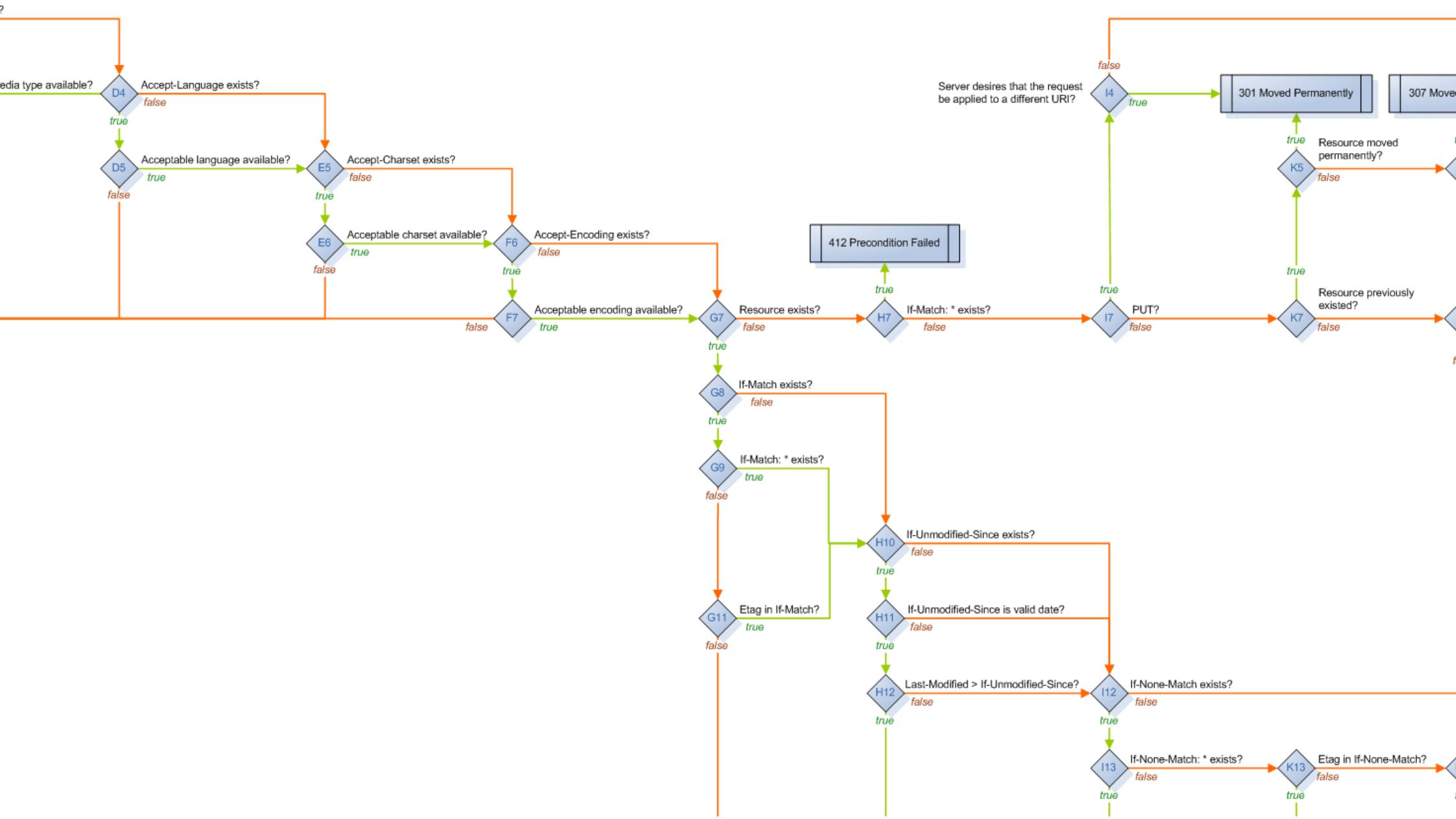
Nada

```
(defroutes caching-routes
  (ANY caching "/caching/etag" []
       (let [result "Some business entity"]
         (resource :available-media-types ["text/plain"]
                   :etag (md5 result)
                   :handle-ok {:data result}))))
```



https://code.google.com/p/http-headers-status/

https://github.com/for-GET/http-decision-diagram


edia type available?
D4
Accept-Language exists?
false
true
D5
Acceptable language available?
true
false
E5
Accept-Charset exists?
false
true
E6
Acceptable charset available?
true
false
F6
Accept-Encoding exists?
false
true
F7
Acceptable encoding available?
false
true
G7
Resource exists?
true
false
412 Precondition Failed
H7
If-Match: * exists?
true
false
G8
If-Match exists?
true
false
G9
If-Match: * exists?
true
false
G11
Etag in If-Match?
true
false
H10
If-Unmodified-Since exists?
false
true
H11
If-Unmodified-Since is valid date?
false
true
H12
Last-Modified > If-Unmodified-Since?
false
true
I4
Server desires that the request be applied to a different URI?
false
true
301 Moved Permanently
I7
PUT?
true
false
K5
Resource moved permanently?
true
false
K7
Resource previously existed?
true
false
I12
If-None-Match exists?
false
true
I13
If-None-Match: * exists?
false
true
K13
Etag in If-None-Match?
false
true

```
((path("etag") & get) {
  val entity = "This is the entity."
  val etag = EntityTag(entity)
  conditional(etag, changeDate) {
    complete { entity }
  }
}
```

Recursive routing

"eat" first segment of a path and pump rest back into the routing engine


```
// In some  Controller
@Path("tree")
public SubResource tree() {
  // Could pass parameters here
   return new SubResource();
}

public class SubResource {
  @GET public String done() {...}

     // Recursion!
  @Path("{element}")
  public SubResource sub(@PathParam("element") String name) {
    // Perhaps do something with "name" or pass it ..
     return new SubResource();
  }
}
```

(Ring + Clout)

```
(defroutes path-routes
 (GET dynamic "/paths/tree/*" [& more]
   (str "Content of /paths/tree/" (:* more))))
```

Sub resource possible with additional routes file

no recursion

one could implement the “Routes” trait

```
pathPrefix("tree") {
  subResource("/tree")
}

def subResource(name: String): Route = {
  pathEndOrSingleSlash {
    get {
     complete {
       s"Content of ${name}"
     }
   } ~
   pathPrefix(Segment) { seg =>
     subResource(s"${name}/${seg}")
   }
}
```

Content negotiation and marshalling

Return correct Content based on accept header

Create response from domain object


```
@GET
@Produces({MediaType.APPLICATION_JSON,
MediaType.APPLICATION_XML})
public Data getData() {
  Data data = new Data();
  data.data = "Hello World";
  return data;
}

@XmlRootElement
public class Data {
  @XmlValue
  public String data;
}
```

```
(defmethod representation/render-map-generic "application/xml"
  [data context]
  (emit-str
    (map (fn [k] (element k {} (get data k))) (keys data))))
```

```
(defroutes contneg-routes
  (ANY contneg "/contneg" []
       (resource :available-media-types ["application/json"
                                         "application/xml"]
                 :handle-ok {:data "Hello World"})))
```

```
def get = Action { implicit request =>
  render {
    case Accepts.Xml() =>
      Ok(<data>Hello World</data>)
    case Accepts.Json() =>
      Ok(Json.obj("data" -> "Hello World"))
  }
}
```

```
(path("conneg")) {
  get {
    complete { Data("Hello World") }
  }
}

object Data {
  ...
  implicit val marshaller =
    Marshaller[Data] { (data, ctx) =>
      ctx.tryAccept(supportedContentTypes) match {
        // Delegate
        case Some(Json) => jsonMarshaller(data, ctx)
        case Some(Xml) => xmlMarshaller(data, ctx)
  case _ =>  ctx.rejectMarshalling(supportedContentTypes)
      }
    }
}
```

Summary

Code generation

Reflection

Functions & Composition

Type Classes

Macros

Decision FSM

Thank you!
Questions?
Comments?

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