# HTML5 SPA(rchitecture) Shift

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Keyhole Software

KC JUG Meeting: January 8, 2014

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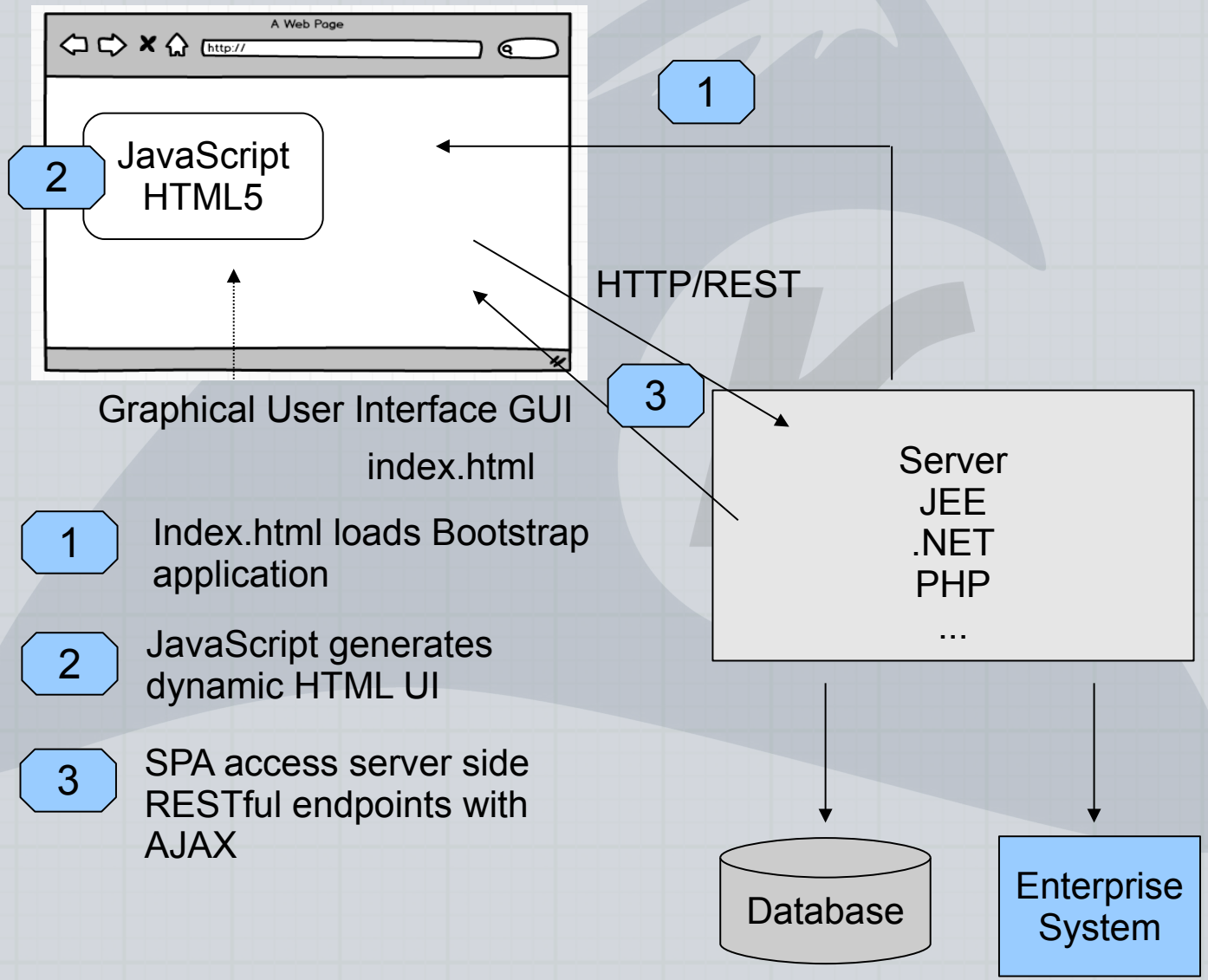
# SPA (JavaScript)




1 Index.html loads Bootstrap application

2 JavaScript generates dynamic HTML UI

3 SPA access server side RESTful endpoints with AJAX

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# Why?

- Decoupled UI (UI can become throwaway)
- Plug-ins eliminated
- Rich Responsive UI experience (Fine grained DOM manipulation/AJAX asynchronous)
- Exploit HTML5 Features
- Responsive to multiple devices
- Lower network bandwidth (helps with battery life)

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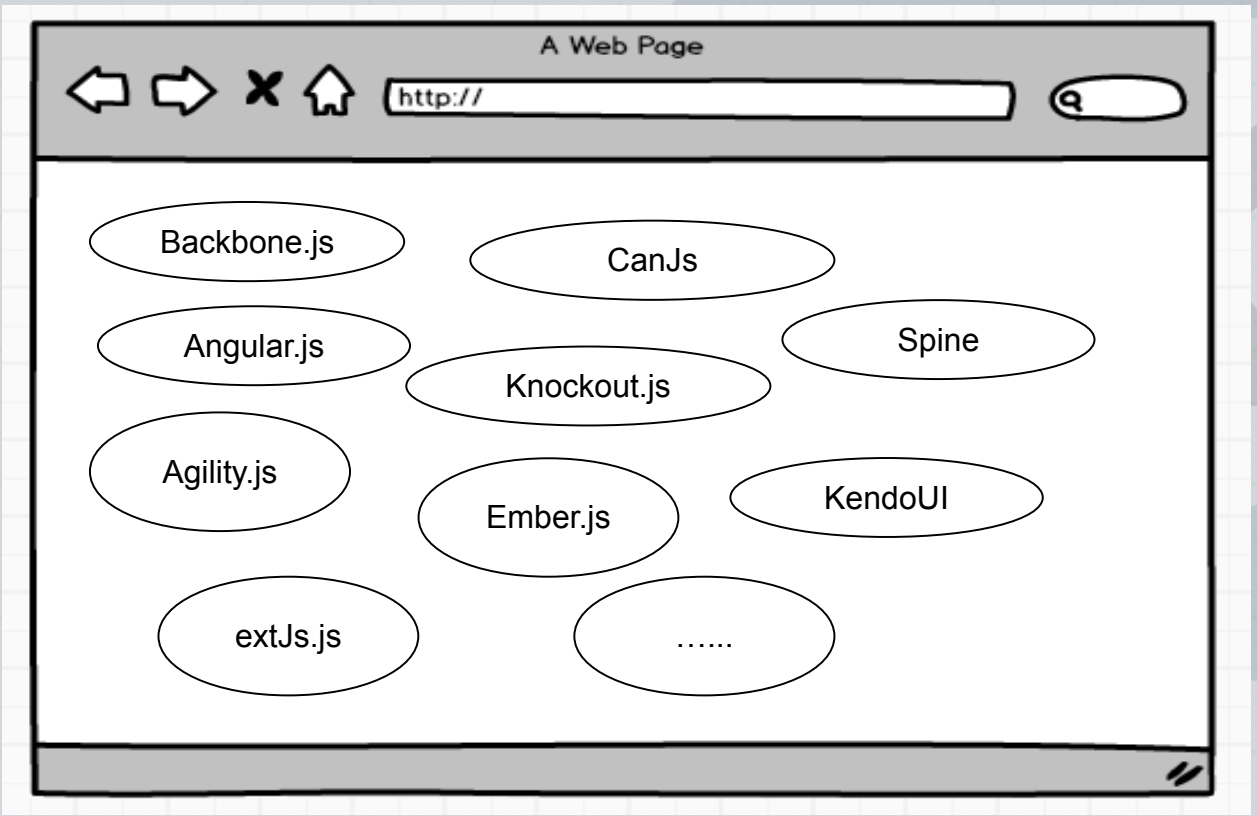
# Client Side

- JavaScript MVC Frameworks




*UI Elements are produced by 100% client side JavaScript code...*

Server side application data is accessed via asynchronous (AJAX) HTTP calls...

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# JavaScript MVC

- Emulates Server Side MVC frameworks
  - JavaScript Objects (Models/server side access of JSON/API)
  - UI Components (event listeners)
  - HTML Templates (DOM manipulation)
  - Controllers (binds models to templates/UI, handles user actions/events)
  - Navigation
  - Modularity and Maintainability

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# Lots of Choices

- Essentially two types:
  - Opinionated (Angular.js, ExtJs...)
  - Non-opinionated (Backbone.js...)
- All have benefits, hard to say what is best
- Bottom line - become proficient in JavaScript programming

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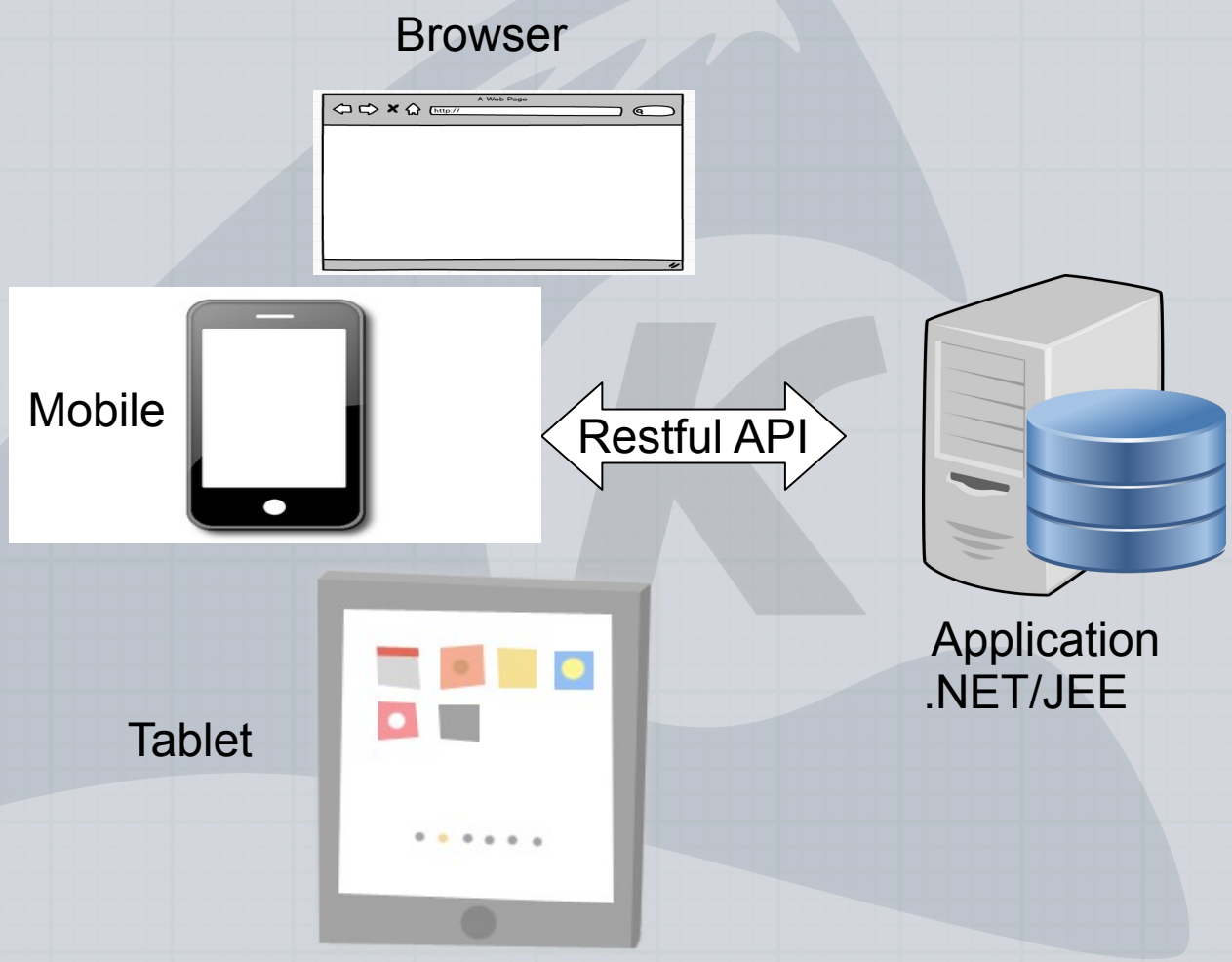
# JEE Server Side

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# Java RESTful End Point Frameworks

- JBOSS EasyRest
- Jersey
- Apache CFX
- Spring MVC
- Provided with JEE7
- Roll own (Servlet, JSONMapper, etc.) Not recommended
- khsSherpa

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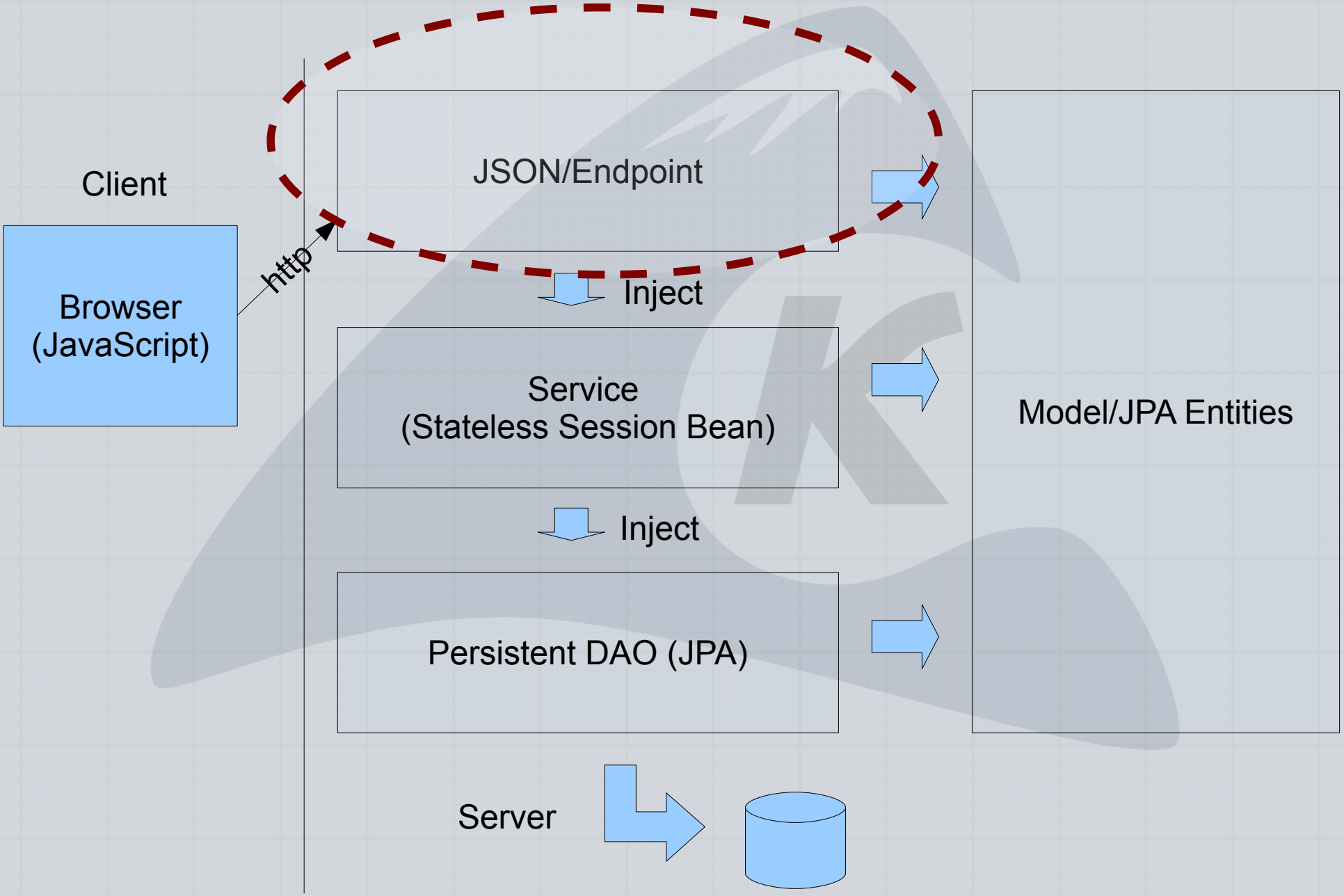
# JSON/API Place in EE/Spring

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# Reference Application

Command Grok

localhost:8080/khs-command-ref/#

GrokOla | References | About | dpitt

GrokOla

Command and Code repository for (Version Control,Operating Systems, Languages, and more...)

How do I initialize a git repository?

Search | Or, why not add a code solution...

Your Recent Solutions and Commands

**on**
Invoke a callback function when an event is fired

**add**
This command updates the index using the current content found in the working tree, to

**push**
Push your new branches and data to a remote repository

**arrays**
Data structure that holds multiple data values. Accessed by index arrays,test

**while**
Execute a code block while a condition is true

**for**
Loop over arrays/objects

JavaScript CLIENT
(Backbone.js, Bootstrap)

→

SERVER -
Java/Spring

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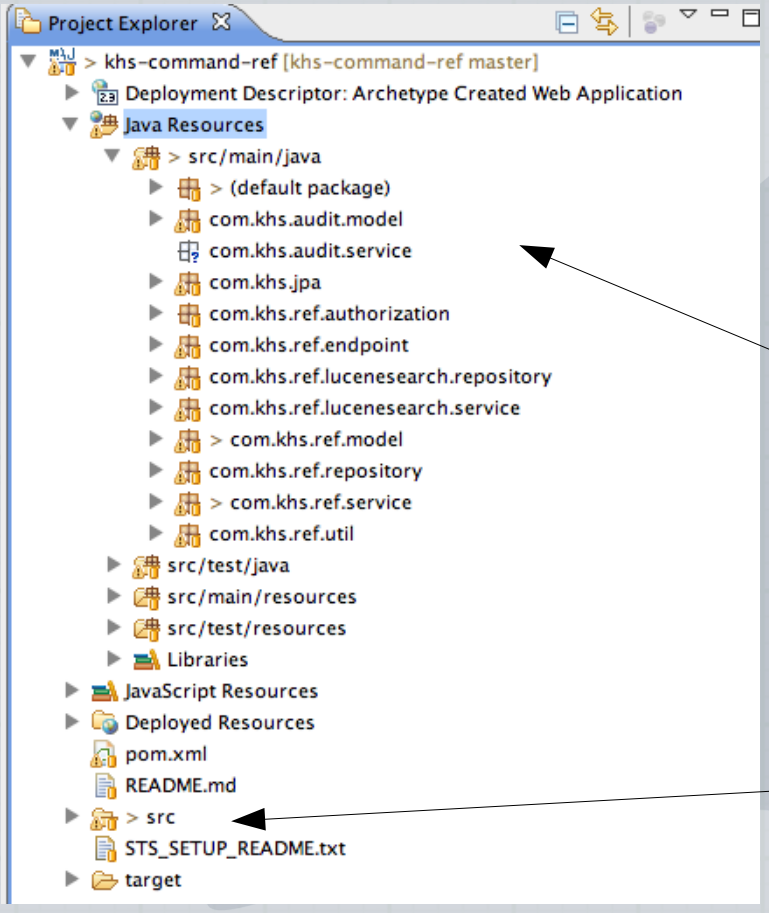
# Project Structure




Maven WAR/WebApp Archetype

Server Side Java Elements

Client side JavaScript resources, CSS etc... define in src/main/webapp

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# RESTful Architectural Style

- Representational State Transfer
- Introduced in 2000 by Roy Fielding doctoral dissertation
- Goals:
  - Performance
  - Scalability
  - Simplicity
  - Portability
  - Reliability
- Common data representations (HTML, XML, JSON), also text , image, or ??

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# Restful Style API With JSON

All Categories API

http:<<server>>/api/service/categories


```
[
{"id":1,"description":"Operating System","name":"Operating System","imageUrl":""},
{"id":2,"description":"Version Control","name":"Version Control","imageUrl":""},
{"id":3,"description":"Relational Database","name":"Relational Database","imageUrl":""},
{"id":118,"description":"Language","name":"Language","imageUrl":""},
{"id":163,"description":"Testing","name":"Test Category","imageUrl":""},
{"id":168,"description":"","name":"Return Codes","imageUrl":""},
{"id":169,"description":"test 2 for request changes","name":"test 2","imageUrl":""},

  …....

]
```


JSON

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# RESTful API

Categories by Id...

http:<server>/api/service/category/100

POST update... { description: "Language",id: 118,imageUrl: ""name: "Language"}

http:<server>/api/service/category/100

PUT insert... { description: "Language",imageUrl: ""name: "Language"}

http:<server>/api/service/category

DELETE...

http:<server>/api/service/category/100

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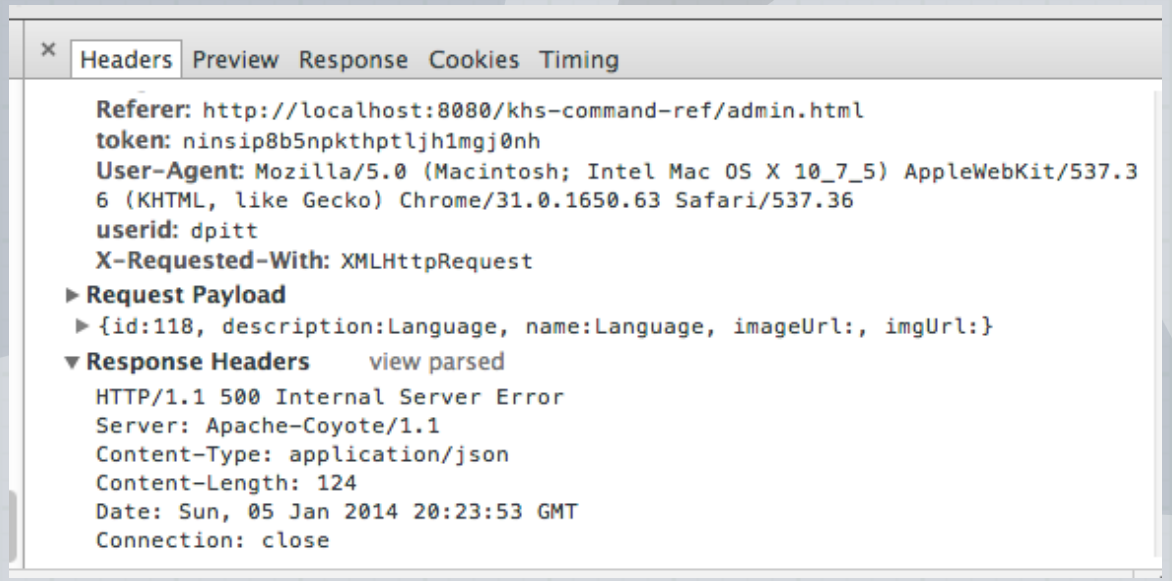
# Exceptions/Errors

- Server returns HTTP Error Codes
- Response contains exception information (Stack trace, etc.)

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# Authentication/Authorization

- Basic HTTP Authentication
- TOKEN-based
- Session-based (Roll Your Own, yes another Login user story) use a servlet filter
- Container Supported JAAS (form authentication)
- Spring Security
- OAuth2

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# Role-based Access Permissions

- Spring Security
- JEE Container Supported  (JAAS)
- Applied at API layer

```
@RolesAllowed({"admin"})
public Department create(@Param("number") int number,@Param("name")String name) {
    Department dept = new Department();
    dept.number = number;
    dept.name = name;
    return dept;
}
```

Applied to endpoint implementation...

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# Versioning

- Lots and lots of debate...

Version number in the URL.....

*/api/v1/categories*

*/api/categories/v1/categories*

Version number in the Header using Accept Header....

Debate revolves around what is really RESTful (ie. HATEOAS would use header information), Version number in URL is easier to use.

**Only matters if you plan on decoupling UI from server side API...**

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# JAX-RS API

- JSR 339 – REST Architecture Style, Java API for RESTful Web Services

**Packages**

| Package | Description |
|---|---|
| javax.ws.rs | High-level interfaces and annotations used to create RESTful service resources. |
| javax.ws.rs.client | The JAX-RS client API |
| javax.ws.rs.container | Container-specific JAX-RS API. |
| javax.ws.rs.core | Low-level interfaces and annotations used to create RESTful service resources. |
| javax.ws.rs.ext | APIs that provide extensions to the types supported by the JAX-RS API. |

POJO-Based – Annotation Driven

Currently Version 2.0

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# Jersey Endpoint Example

```
@Path(“/service/category”)
public class Categories {

  private CategoryRepository categoryRepo;

  @Get
  @Consumes({Mediatype.APPLICATION_JSON,”application/x-javascript})
  @Path(“/categoryId”)
  public Category getCategory(@PathParam(“categoryId”) final long
categoryId)

        return categoryRepo.findForId(categoryId);

  }
}
```

***JAX-RS Compliant***

https://jersey.java.net

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# JBOSS RestEasy

```
@Path("/message")
public class MessageRestService {

@GET
@Path("/{param}")
public Response printMessage(@PathParam("param")
integer id) {

 Category category = repo.findForId(id);

return
Response.status(200).entity(category).build();

}

}
```

***JAX-RS Compliant***

http://www.jboss.org/resteasy

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# Sherpa Endpoint Example

```
@Endpoint(authenticated=false)
public class CategoryEndpoint {

@Autowired
CategoryService service;

@Action (mapping = "/service/categories", method = MethodRequest.GET)
public List<Category> categories() {
return service.findAll();
}

@Action (mapping = "/service/category/{categoryId}", method =
MethodRequest.GET)
    public Category getCategory(@Param("categoryId") Long categoryId) {
        Category cat =  service.findById(categoryId);
        return cat;
    }

}
```

https://github.com/organizations/in-the-keyhole

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# Spring MVC Example

```
@RequestMapping("/category/{categoryId}",
method=RequestMethod.GET)
public String findOwner(@PathVariable long catergoryId,
Model model) {
  Category cat = catergoryService.findOwner(ownerId);
  model.addAttribute("category", owner);
  return "displayCategory";
}
```

*POJO are serialized to JSON using a View Resolver*

http://docs.spring.io/spring/docs/current/spring-framework-reference/html/mvc.html

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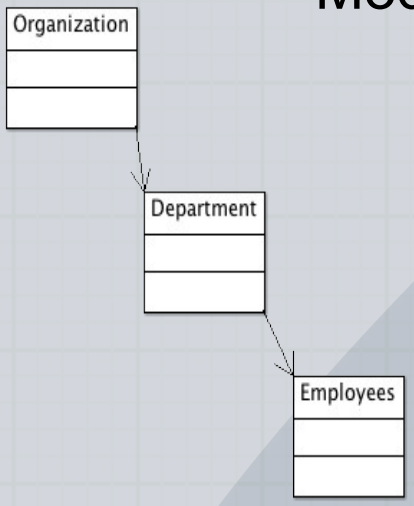
# API Design

Model

- Fine Grained (keep object models succinct)
- Limited Object Navigation (1. to Many)




Model traversed through API calls

**Organization** 100

/api/organization/100

**Departments** for organization 100

/api/departments/organization/100

**Employees** for department 200

/api/employees/dept/200

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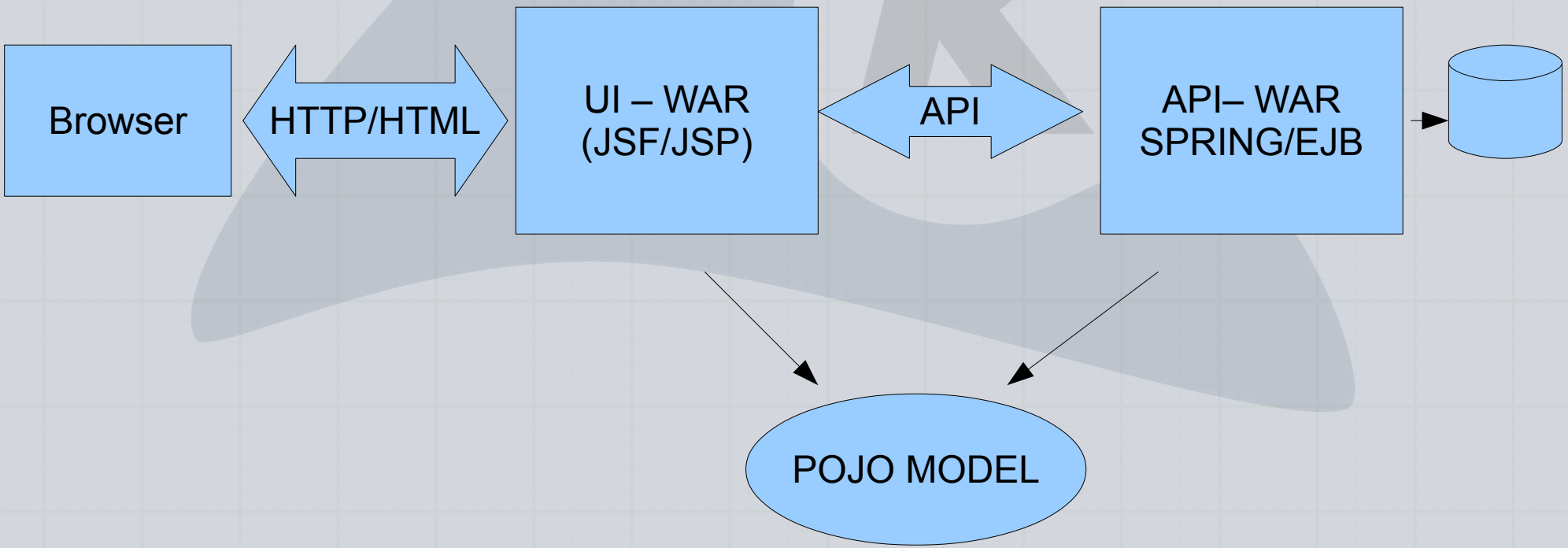
# Positioning for SPA

- Learn JavaScript, really learn JavaScript
- Introduce API style programming to existing Dynamic Java HTML application architecture

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# Fin...

Any questions?

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