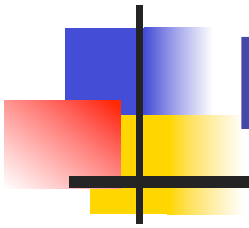


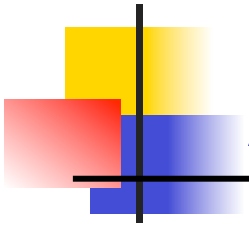
RESTful Web Apps

Facts vs Fiction

Subbu Allamaraju

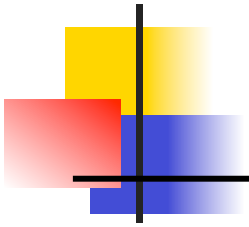
Yahoo! Inc || http://subbu.org

Colorado Software Summit



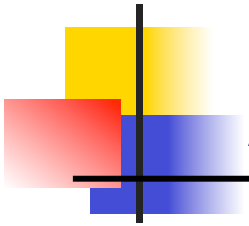
About

- Tech Yahoo!
  - Developing standards, patterns and practices for HTTP web APIs
- Past
  - Developer – web services and Java
  - Standards contributor at BEA
  - Wrote books on JEE web tier (so long ago)
- Current Passion
  - HTTP and REST



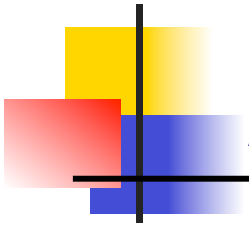
Disclaimer

All the opinions I express here are mine and do not necessarily represent those of my present or past employers.



A Confession

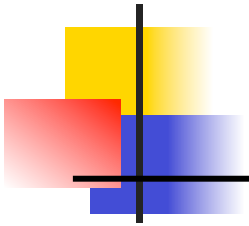
- Not a web developer
- Not directly interested in the internals of web frameworks
- Only interested in the visible aspects of web apps



Agenda

~~REST – The Architecture~~

About RESTfulness of Web Apps



Some History

1945 - Vannevar Bush

arbitrary linking between pieces of information

1965 – Ted Nelson (Xanadu fame)

hypertext and *hypermedia*

1990s – Tim Berners-Lee, Roy Fielding et. al.

WWW, HTML, HTTP and URI

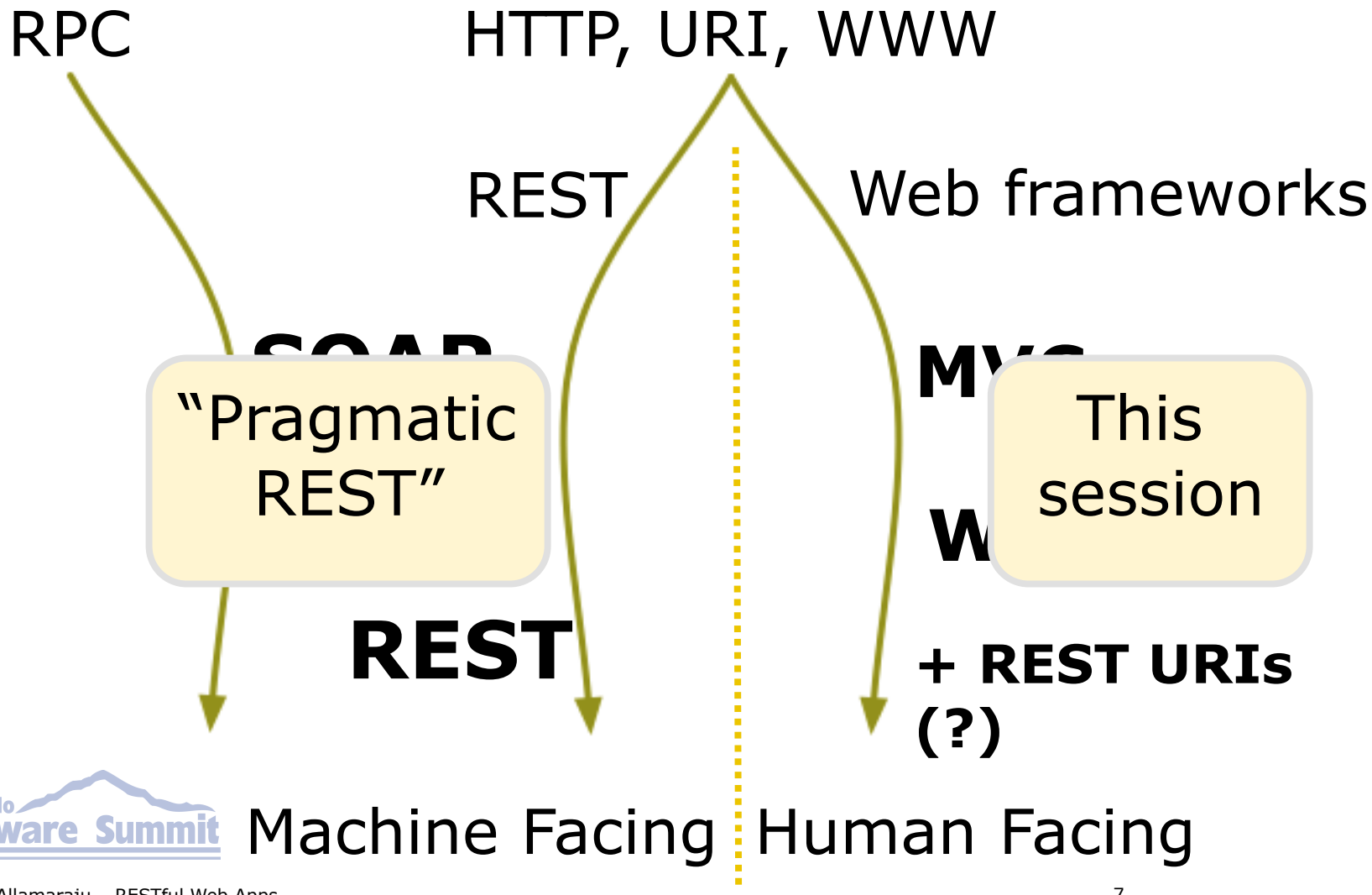
HTTP 1.1 - RFC 2616

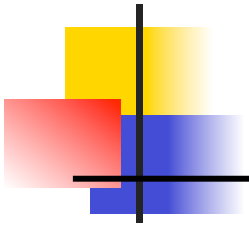
URI - RFC 2396 (superceded by 3986)

2000 – Roy Fielding

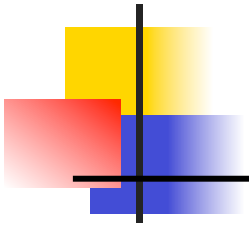
Representational State Transfer

Two Sides



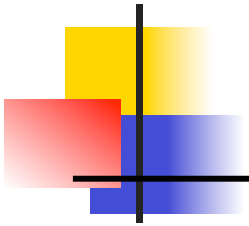


WEB IS MOSTLY RESTFUL



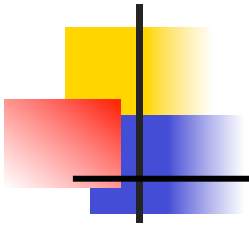
Being RESTful

- Resources
  - Named via URIs — Uniquely identify resources
  - Have representations — Mostly one/resource
    - Reflect the state of the app
    - Contain contextual links — HATEOAS
- Uniform interface — Generic, Client-Server
  - Idempotent, safe, cacheable …



Resources and URIs

- Resources and URIs
  - A blog post, an image, a catalog, a shopping cart
    - Some *personalized*, but most are not
    - Some depend on *sessions*, but most do not

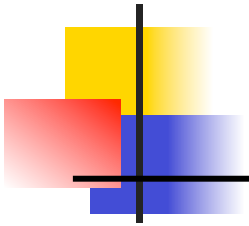


Cost of Personalized UI

http://my.example.org

vs

http://www.example.org/subbu

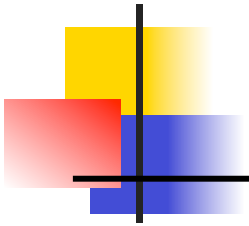


Representations

- Rich of representations
  - HTML, XML, JS, PDF, CSS, Flash, …

    - Poor content negotiation
    - A*gent-driven* negotiation + Poor negotiation headers
    - Media types on responses ignored sometimes

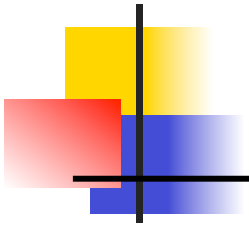
    - ```
      <a href="mydoc.pdf">Click</a>
      <a href="myfeed.rss">RSS Feed</a>
      <a href="myfeed.atom">Atom Feed</a>
      ```
      ```



Hypermedia and HATEOAS

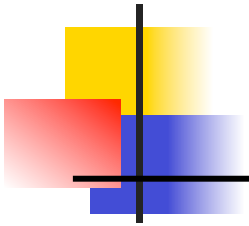
- Rich Hypermedia
  - Links and forms
  - Contextual
- Auto-discoverable
  - <link/>, microformats

- Except some new breed of Web Too Oh + REST goo



Uniform Interface

- Links and Forms
  - GET and POST
    - Still some misconceptions (e.g. POST is secure)
    - *Idempotency? Safety?*
    - GET URIs not always refreshable
    - Still fighting the back button

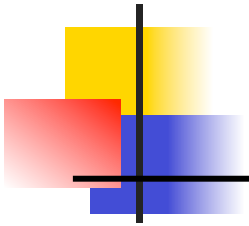


Back Button

```
Cache-Control: no-cache,no-store
```

Redirect after POST

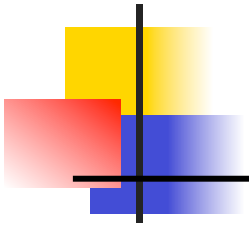
a.k.a. PRG (POST/redirect/GET)



Caching

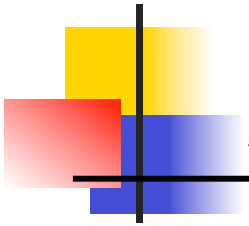
- Web is read-most
- Cacheable
- Widely discussed

  - Yet moderately ignored
  - Cache busting
  - Cache-ignorant frameworks
  - Frameworks that prefer backend caching over HTTP caching



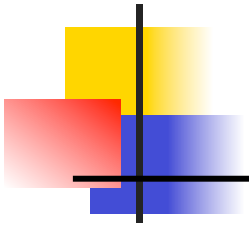
Caching Choices

- Back-end caching
  - Non-uniform interface
  - Need to explicitly program to it
- HTTP caching
  - Uniform interface
  - Pluggable



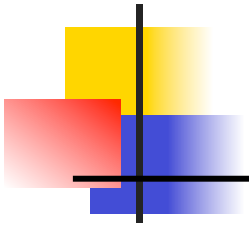
Ajax Apps

- More opportunities to be RESTful
  - Full support for the uniform interface
  - Content negotiation, optimistic concurrency, caching
  - HATEOAS
    - Can loosen this constraint as long as the client code is downloaded from the same server/app



Cross-Domain Hacks

- `script, iframe`
- Tunnel requests over GET



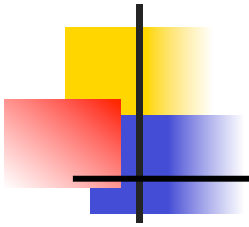
Web is Mostly RESTful

Take advantage of the web arch

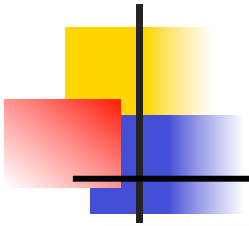
Breaking is EXPENSIVE

Breaking is CONFUSING

Breaking LOWERS expectations

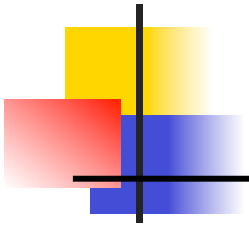


WEB FRAMEWORKS



State of Affairs

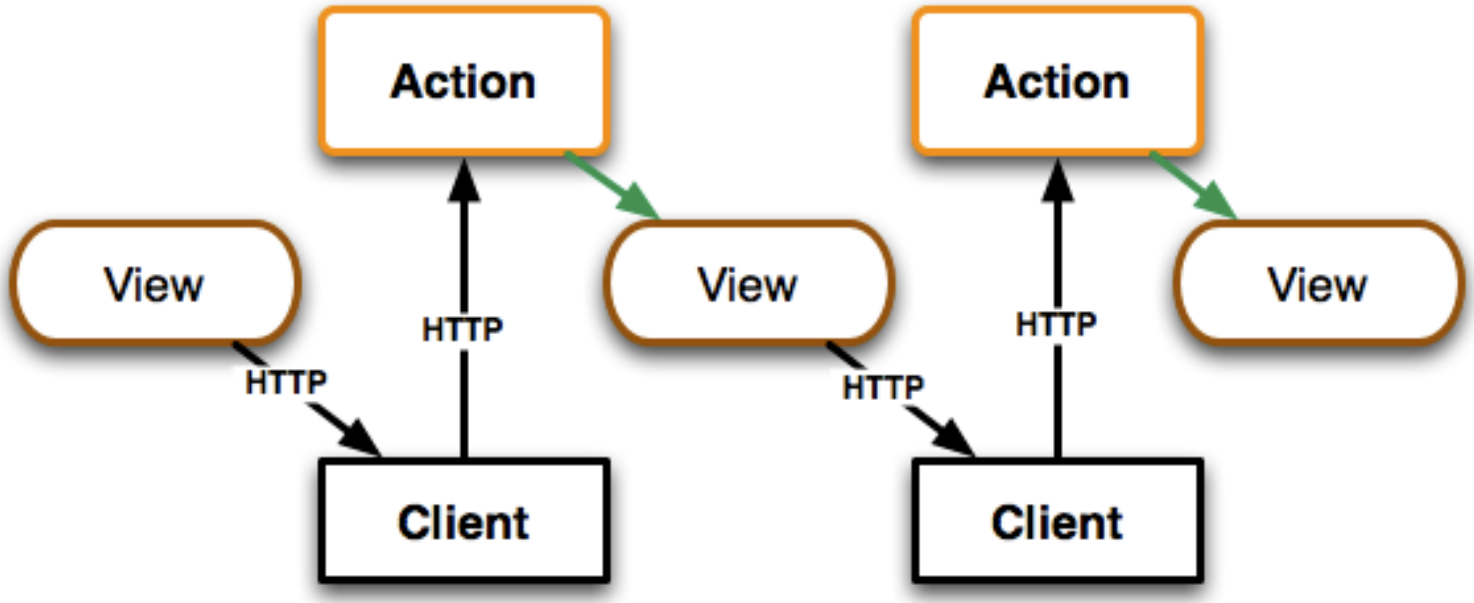
- Ease of programming
- Fragmentation and confusion
- Innovation vs Correctness



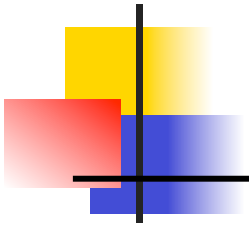
Circa 1997-

- There were servlets
- Basic plumbing, closely reflecting HTTP 1.1
- A poor programming model
- But allowed a lot of frameworks to be built on top

Circa 2001-



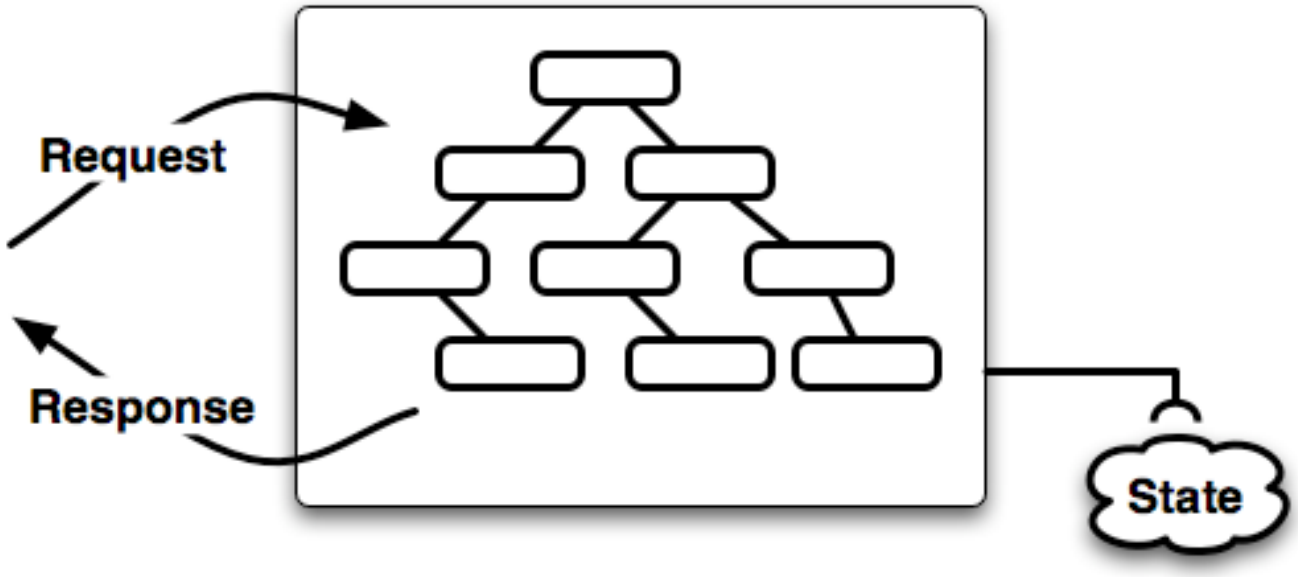
Action Oriented



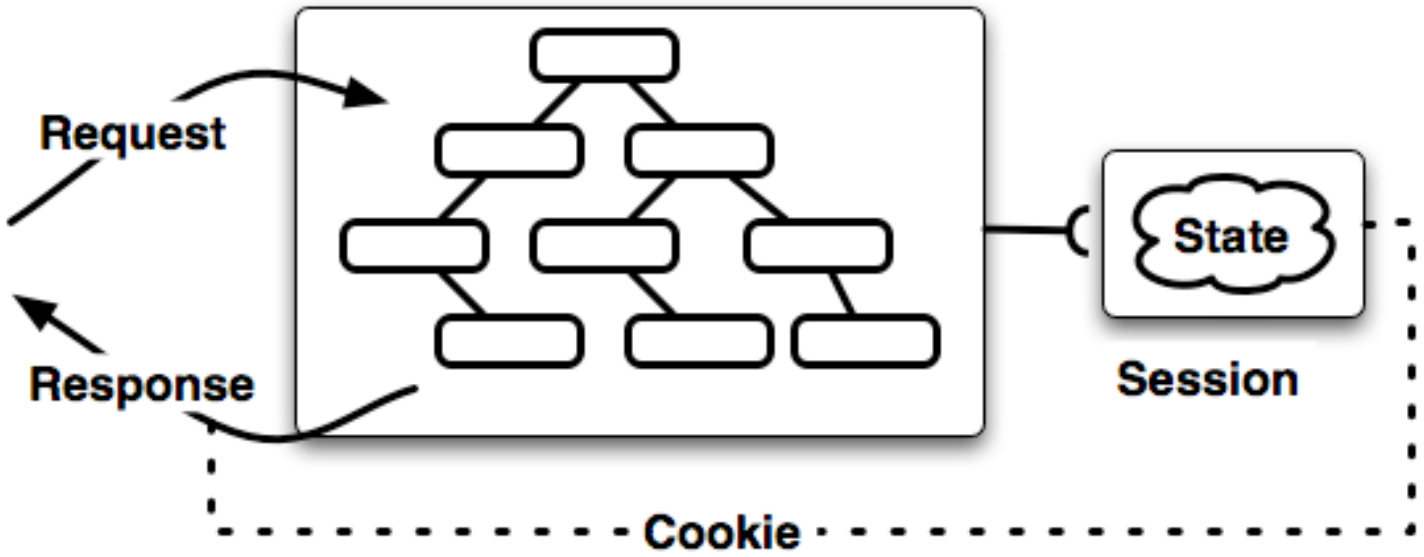
Circa 2004-

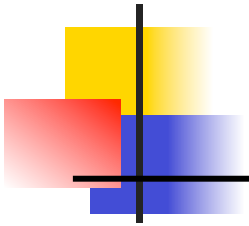
- Enter JSF & Co.
  - A component based UI framework
- With known limitations
  - Complex
  - Slow
  - Uses POST for almost everything
  - And so on…
- Third-party patches

Design Choice

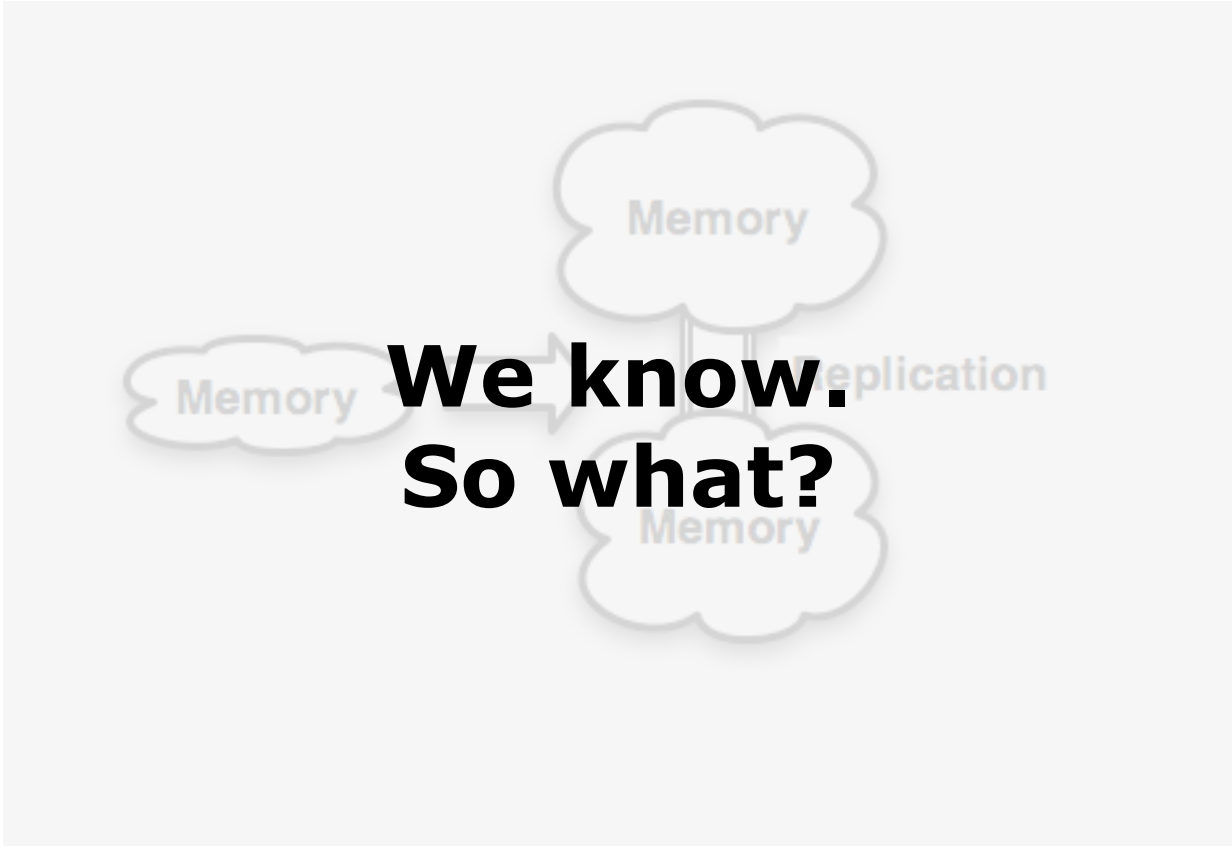


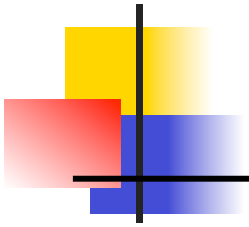
Where to keep this stuff?



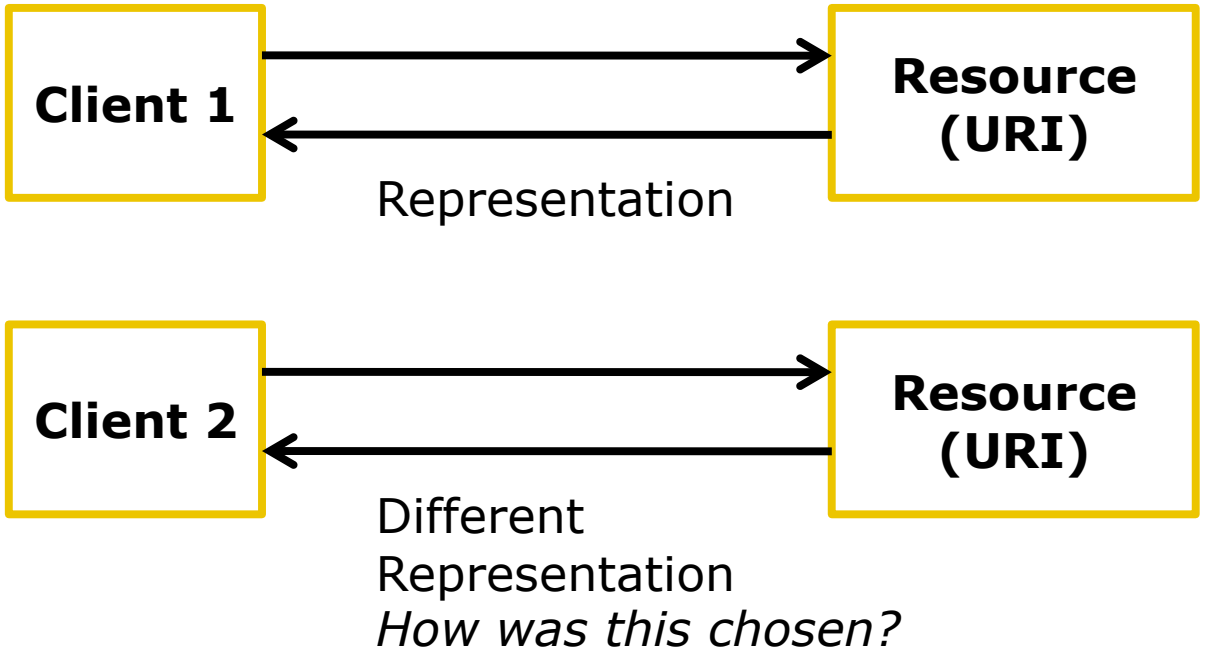


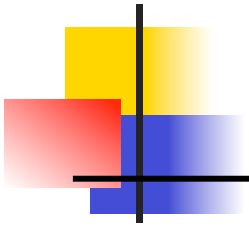
Consequence





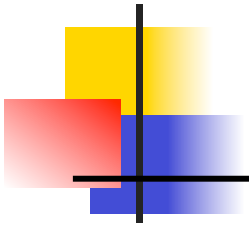
URI Overloading





URI Overloading

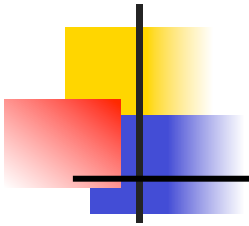
- One URI – multiple representations
  - No way to tell how a representation was chosen
  - Can get wrong content from a cache
- HTTP does allow URI overloading
  - Content negotiation aka “conneg”



Content Negotiation

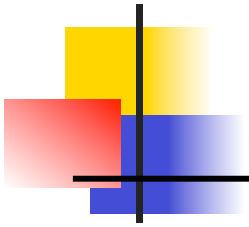
```
Accept: application/atom+xml;q=1.0,text/html;q=0.1
Accept-Charset: UTF-8
Accept-Language: fr;q=1.0,en=0.8
Accept-Encoding: gzip,deflate
```

```
Content-Type: application/atom+xml;charset=UTF-8
Content-Encoding: deflate
Vary: Accept,Accept-Encoding
```



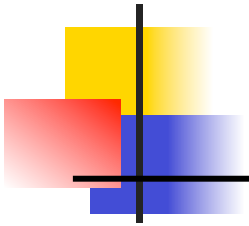
Some Options

- Vary by cookie
  - Not always recognized by caches
  - Complex given the parameters in a cookie
    - Domain, path, life time etc
- URLEncode
  - Encode session ID into URIs
    - ;jsessionid=d8sdasg7312
- `Cache-control: no-cache,no-store`



JSF Compromise

```
<context-param>
    <param-name>
        javax.faces.STATE_SAVING_METHOD
    </param-name>
    <param-value>
        client
    </param-value>
</context-param>
```



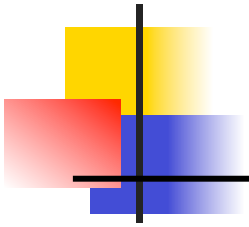
Implementation

Every request must be a POST

```
<form method="POST" action="…"
    enctype="…">
    <input type="hidden"
        name="javax.faces.ViewState”
        value="H4s…zogsAAA==" />

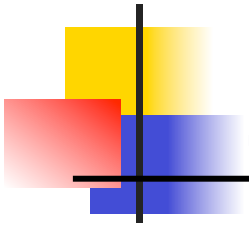
    …
</form>
```

State stuffed into forms as a hidden field



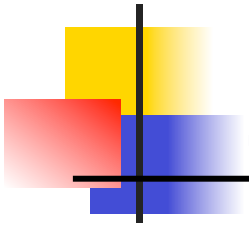
Consequence

Breaks the uniform interface



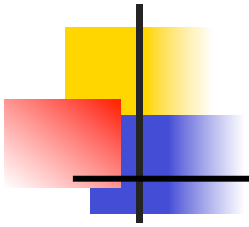
JSF vs REST

- Caught between two extremes
  - URIs no longer sufficient to identify a resource
  - Interactions assume existence of session state – i.e. no longer stateless
  - Uniform interface limited to POST
  - Interactions not idempotent
  - Representations not cacheable

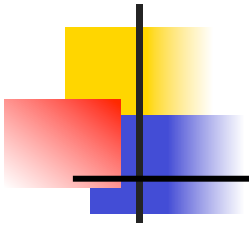


JSF – Takeaway

- Focused heavily on a UI component model (AWT for the Web)
- Misinterpreted the web architecture
- Made some fundamental questionable choices
- You can patch, but can not fix
  - 15+ Ajax patches!

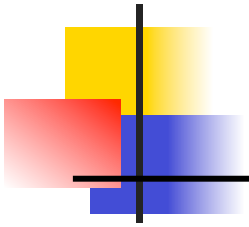


WEB 2.0 MOTIVATED



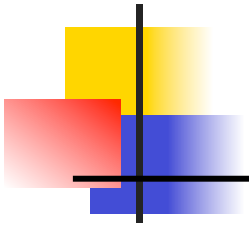
GWT

- A cross-compilation based framework
  - Write Java – generate JavaScript
  - Mashes up client and server code into single source
  - These layers communicate using GWT-RPC
- Typical RPC concern does not apply
  - Coupling due to code generation
  - Client downloaded from the same app



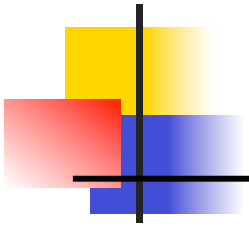
GWT-RPC

```
Object result = someServ.doIt(new MyCallback());
public class MyCallback extends AsyncCallback()
{
   public void onsuccess(Object result)
   {
     ...
   }
}
```



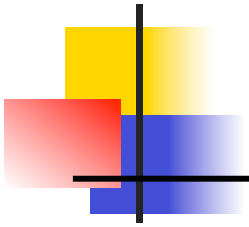
GWT-RPC over HTTP

▶ POST http://www.contactoffice.com/gwt *(321ms)*	ECF1349473B6B07F9... (line 9754)
▶ POST http://www.contactoffice.com/gwt *(197ms)*	ECF1349473B6B07F9... (line 9754)
▶ POST http://www.contactoffice.com/gwt *(308ms)*	ECF1349473B6B07F9... (line 9754)
▶ POST http://www.contactoffice.com/gwt *(243ms)*	ECF1349473B6B07F9... (line 9754)
▶ POST http://www.contactoffice.com/gwt *(292ms)*	ECF1349473B6B07F9... (line 9754)
▶ POST http://www.contactoffice.com/gwt *(702ms)*	ECF1349473B6B07F9... (line 9754)
▶ POST http://www.contactoffice.com/gwt *(640ms)*	ECF1349473B6B07F9... (line 9754)
▶ POST http://www.contactoffice.com/gwt *(488ms)*	ECF1349473B6B07F9... (line 9754)



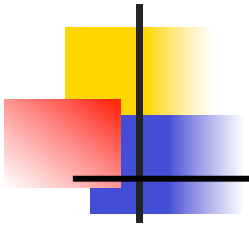
GWT-RPC over HTTP

- Method calls POSTed to the server
  - Transport object graphs
  - Uses HTTP like a transport layer
- Non uniform interface



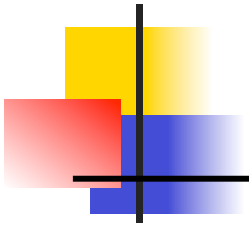
GWT – Request Builder

```
String url = "...";
RequestBuilder builder =
                new RequestBuilder(RequestBuilder.GET,
                                   URL.encode(url));
builder.sendRequest(data, callback);
```



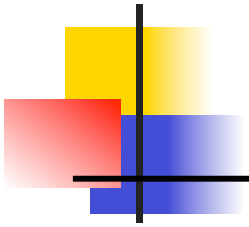
RequestBuilder over HTTP

- More control over HTTP requests
- Supports GET and POST
- Allows so-called RESTful layers
  - GWT-REST
  - GWT-Restlet



GWT Takeway

- Focused heavily on ease of use
  - Javascript agnostic
- Modeled after RPC
  - Breaks uniform interface
  - Backend caching over HTTP caching
- Fixable



Fixing GWT?

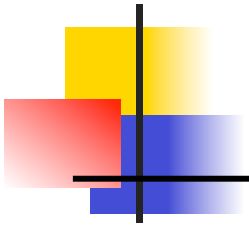
```
Object result = someServ.doGet(new MyCallback());

Object result = someServ.doPost(new MyCallback());

Object result = someServ.doPut(new MyCallback());

Object result = someServ.doDelete(new MyCallback());

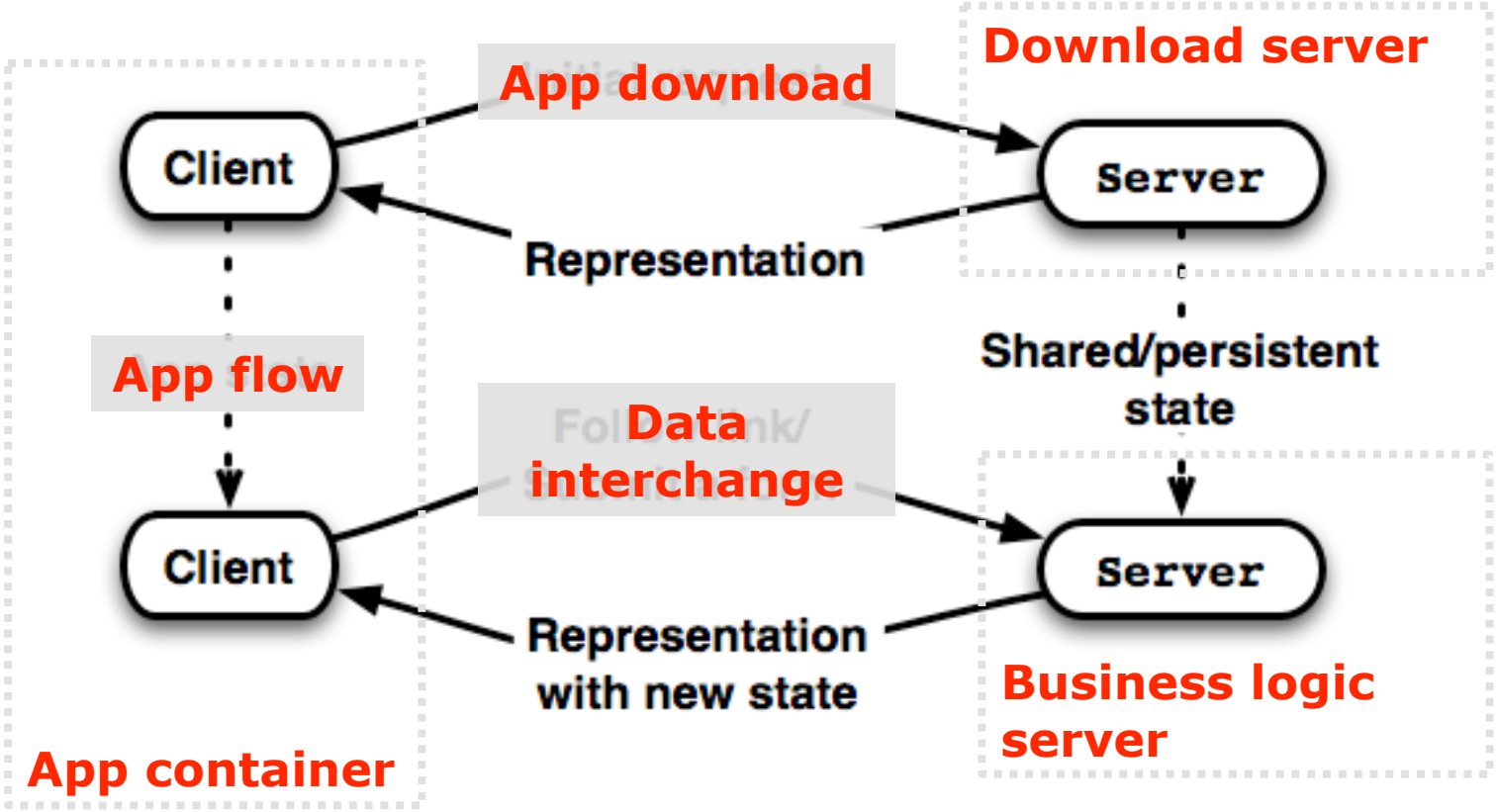
Object result = someServ.doHead(new MyCallback());
```

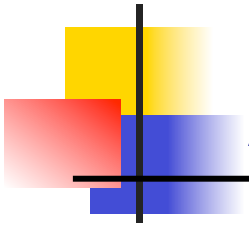


SOFEA

- Central premise – SOA
  - Business logic as reusable services
    - Change less often
  - Presentation app calling those services
    - Change more often
  - Separation of concerns and Loose coupling
- Misinterprets HATEOAS

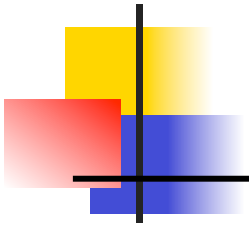
HATEOAS vs SOFEA





Appcelerator

- A SOFEA style framework with RoR like usability
  - Attend Matt Riable's session on "Building Rich Internet Applications with Appcelerator"
- SOAP/HTTP style
  - Message passing
  - POST to a single URI



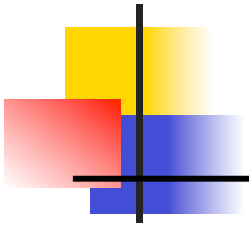
XML over POST

POST http://www.skyblox.com/servicebroker?maxwait=0&instanceid=4377-832&a

POST http://www.skyblox.com/servicebroker?maxwait=0&instanceid=4377-832&a

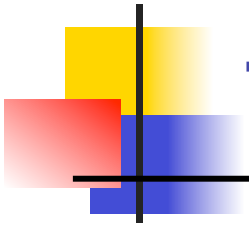
Params Headers Post Response


```
<?xml version="1.0" encoding="UTF-8"?><messages version='1.0' sessionid=
%0ASGFzaHsABjoKQHVzZWR7AA%3D%3D--423c023e18027a2f15a8e24acceb702d99ca478
='OUTGOING' datatype='JSON' type='portal.get.bloxlist.response' scope='c
:{"location":"180 Walker St SW, 30313","id":131},"count":20,"date":"10\/
:true,"non_customers":[{"location":"177 Peters St, 30313","id":137},{"lc
,"id":126},{"location":"253 Peters St, 30313","id":264},{"location":"281
,{"location":"144 Walker St, 30313","id":138},{"location":"322 Peters St
:"274 Walker St SW, 30313","id":133},{"location":"261 Walker Street SW,
:"291 Peters St SW, 30313","id":128},{"location":"180 Walker Street SW S
:"263 Walker St SW, 30313","id":129},{"location":"244 Peters Street SW,
:"264 Peters Street SW, 30313","id":135},{"location":"263 Peters St, 303
 Peters Street, 30313","id":130},{"location":"144 Walker Street, 30313",
```



Interesting … but

- Loosens HATEOAS
  - Hypermedia to Code + Data
- Introduces a different kind of coupling
  - Clients deal with POX and not links
  - Breaks URI opacity
- Examples
  - Appcelerator – SOAP like
  - http://www.applebox.com.au - uses SOAP/POST
  - http://www.contactoffice.com - uses XML/POST



Thanks

- Don’t fight the architecture
  - Innovate, enhance
  - Don’t break
  - Or break judiciously