Carnegie Mellon

17-356/17-766 SOFTWARE ENGINEERING FOR STARTUPS

institute for SOFTWARE RESEARCH | Carnegie Mellon University School of Computer Science

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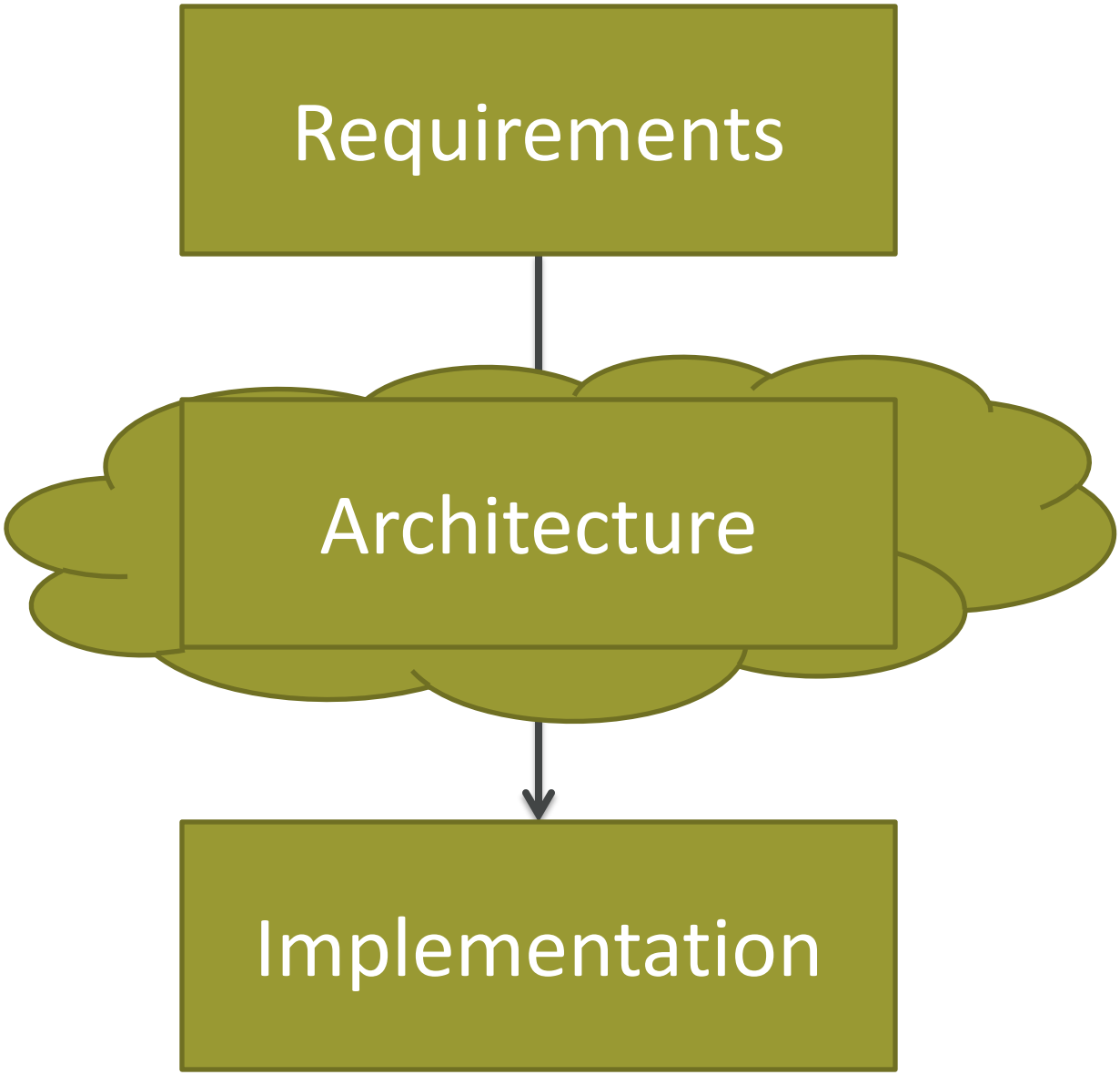
Administrativa

HW2: don't delay on deployment!

limit your backlog to 40 hours

"write a business-style email justifying your choice of framework to your investors."



Software Architecture

The software architecture of a program or computing system is the structure or structures of the system, which comprise software elements, the externally visible properties of those elements, and the relationships among them.

[Bass et al. 2003]

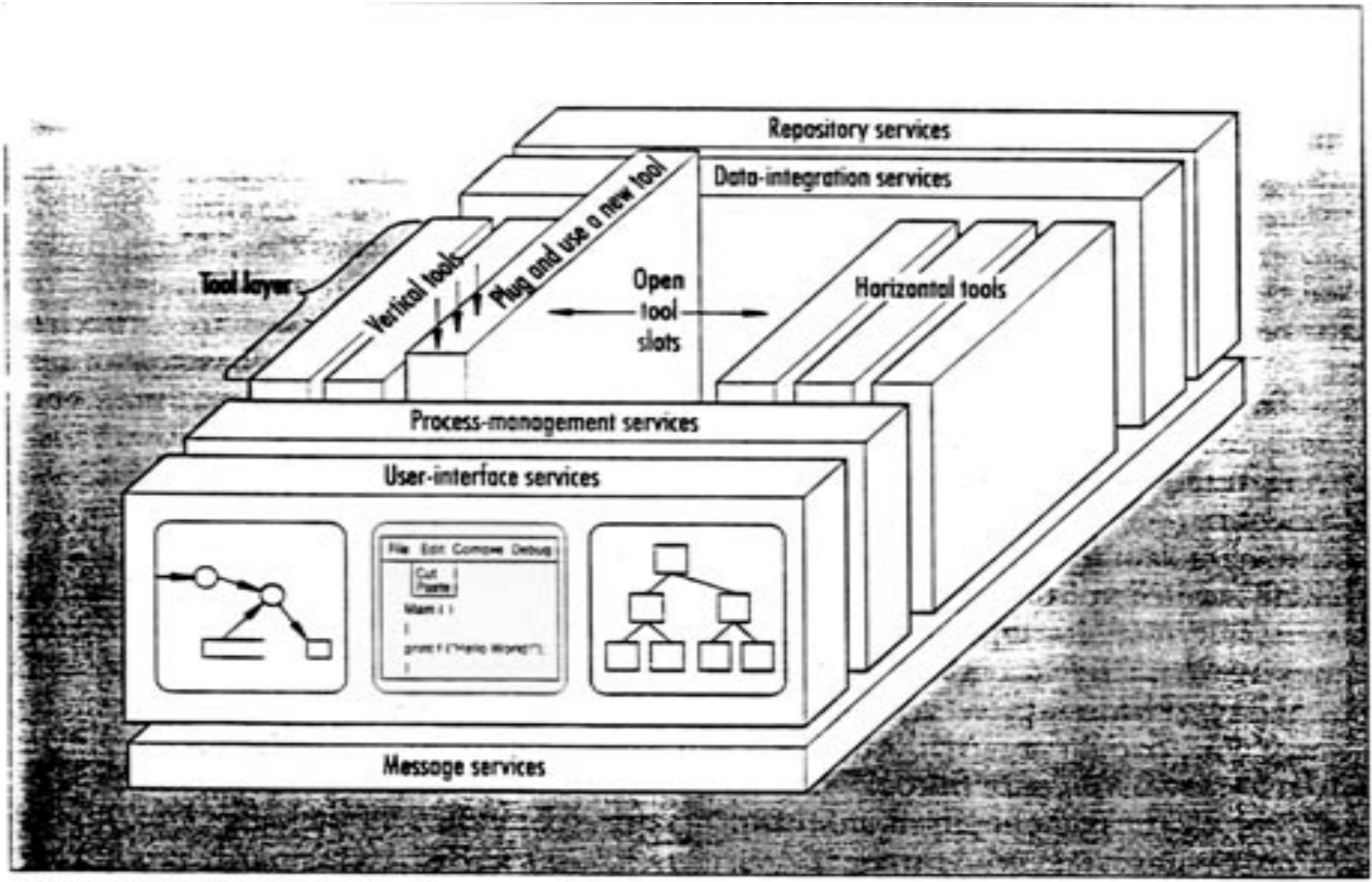


Figure 1. The NIST/ECMA reference model.

IN PRACTICE, IN MODERN DEVELOPMENT, ESPECIALLY WEB APPS, VERY LITTLE OF THAT MATTERS.

WEB APPLICATION DEVELOPMENT CRASH COURSE

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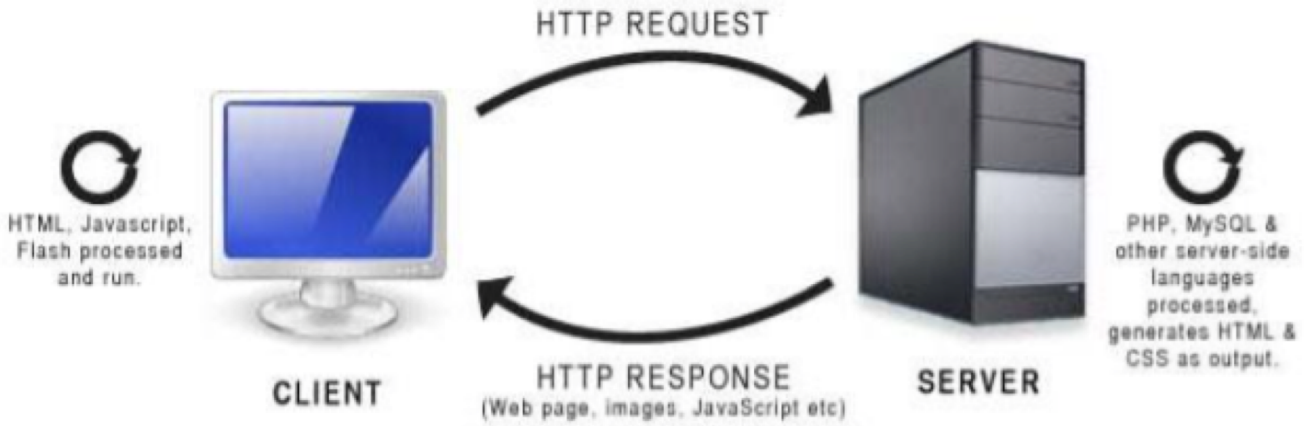
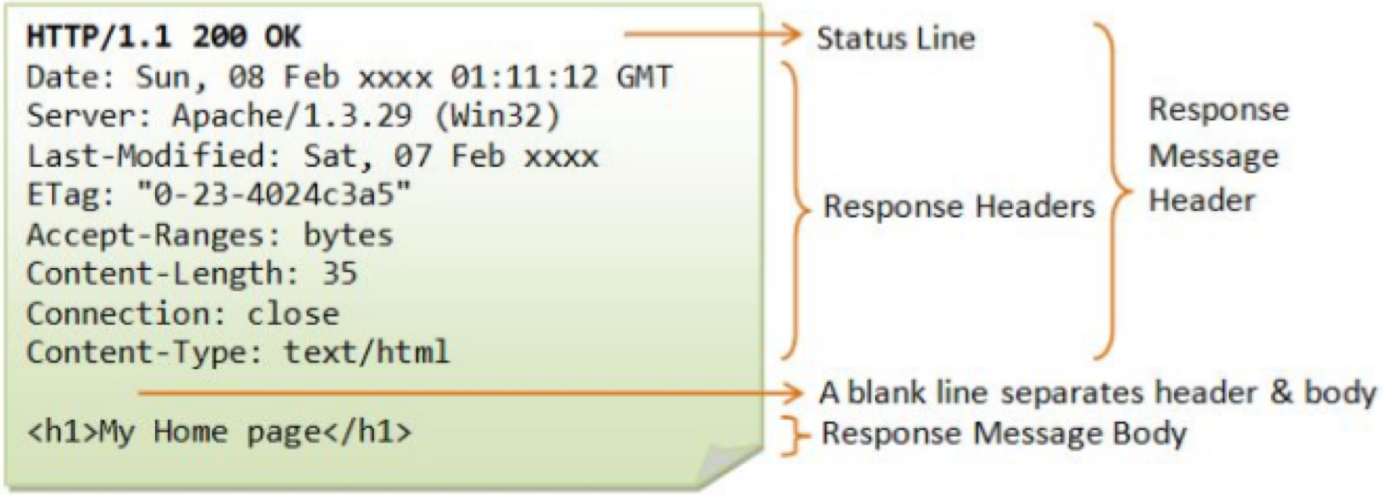
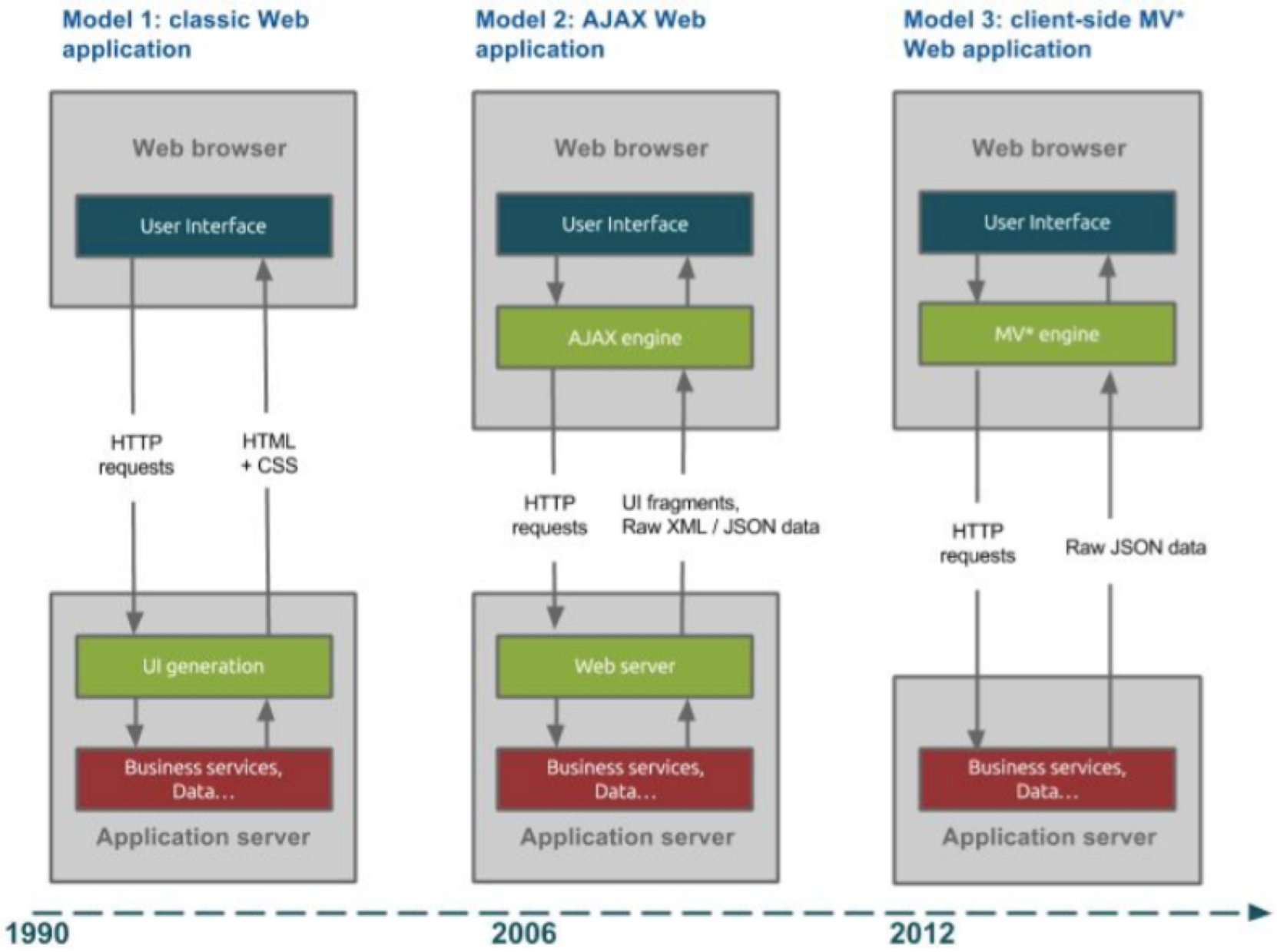


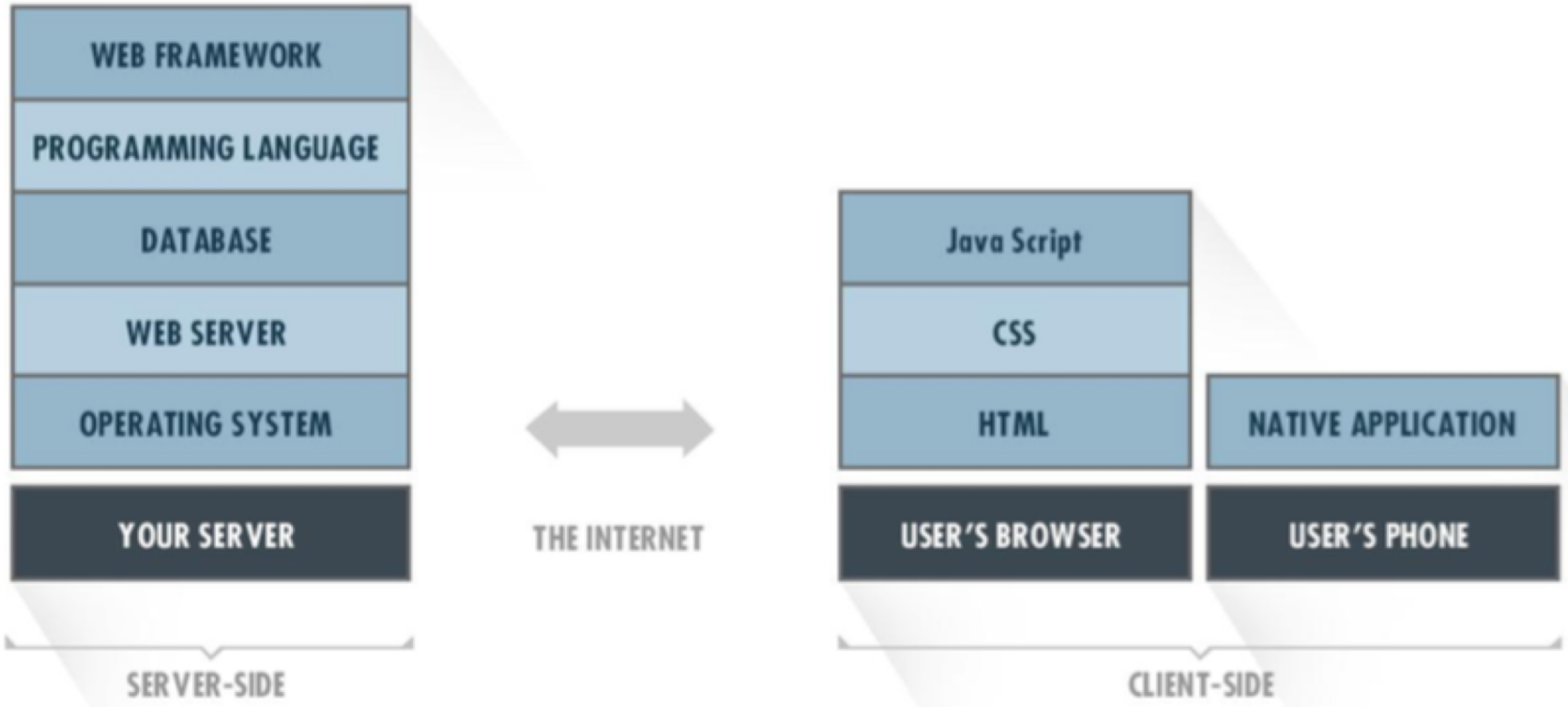


Slides borrowed wholesale and liberally from Alexey Zagalsky, Uvic
https://speakerdeck.com/alexeyza/web-development-overview-2016

https://www.thoughtworks.com/insights/blog/implications-tech-stack-complexity-executives



http://blog.octo.com/en/new-web-application-architectures-and-impacts-for-enterprises-1/



http://svsg.co/how-to-choose-your-tech-stack/

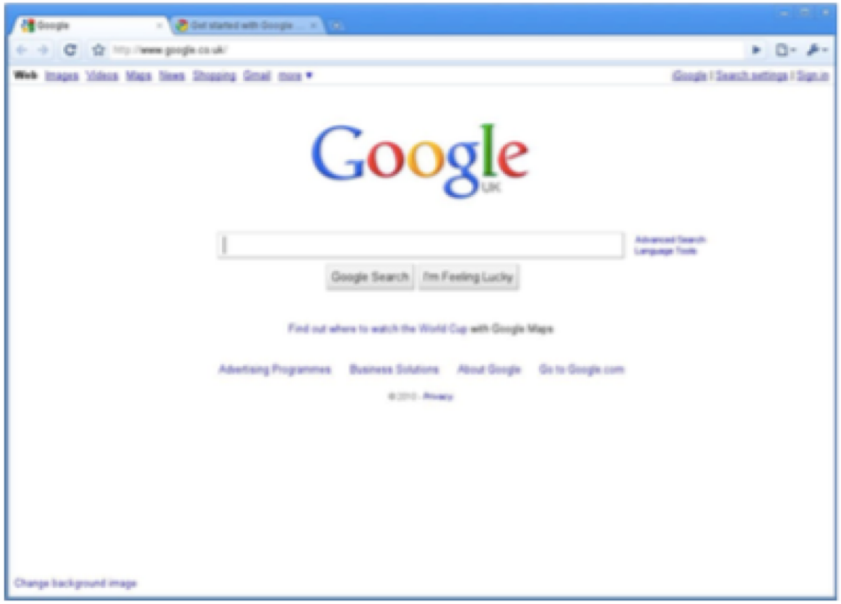
Web browser, native/iOS/Android/etc

CLIENT SIDE

Roles of the Browser

Networking

- HTTP



Rendering

- HTML
- CSS

Business Logic

- VM (Java, Silverlight, Flash)
- Javascript

HyperText Markup Language (HTML)

HTML is the standard **markup language** used to create web pages.

HTML elements:

- Head: title, base, link, style, meta, script
- Body: titles, paragraphs, text style, lists, tables, images, links, forms

Every HTML element can be assigned with an **id attribute** to allow manipulation with JavaScript or CSS.

```
<html>
    <head>
        <title>Hello World!</title>
    </head>
    <body>
        <h1 id="greetings">Hi</h1>
        <p>Minimal <b>hello world</b> page.</p>
    </body>
</html>
```

Cascading Style Sheets (CSS)

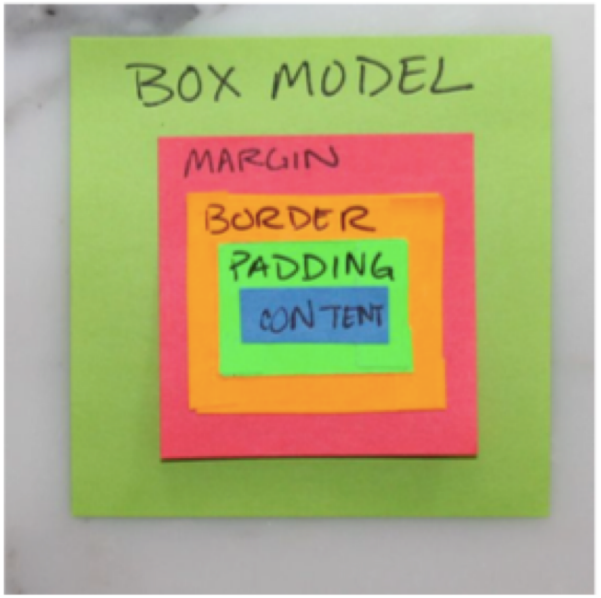
Semantic Tags vs. Design Tags

<p>, <h1> vs. **<font>, <b>**

No model-view separation

CSS Zen Garden (http://www.csszengarden.com/)

Preprocessors: **SCSS** vs **LESS**

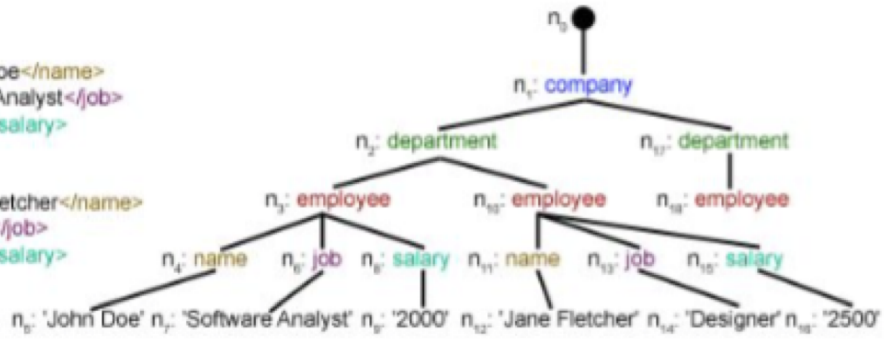


http://www.labnol.org/internet/learn-css/29126/

Extensible Markup Language (XML)

Labeled ordered **tree**

```
<company>
 <department>
  <employee>
   <name>John Doe</name>
   <job>Software Analyst</job>
   <salary>2000</salary>
  </employee>
  <employee>
   <name>Jane Fletcher</name>
   <job>Designer</job>
   <salary>2500</salary>
  </employee>
 </department>
 <department>
  <employee>
  </employee>
 </department>
</company>
```



Many available tools to:

generate, parse, transform, send

Mainly used for:

Configuration

Declarative (meta) programming

Platform independent data exchange (RSS feeds)

JavaScript "The programming language of the Web"

Prototype-based **scripting language** with dynamic typing

Fully fledged programming language: variables, arrays, objects, methods, conditional statements, loops, and **events**.

Simple and forgiving syntax:

Type declaration optional

Lambda notation

JSON

```
<html>
     <script>
          var x = 3;
          var y = 47;
          alert( " 3 x 47 = " + (x*y) );
     </script>
</html>
```

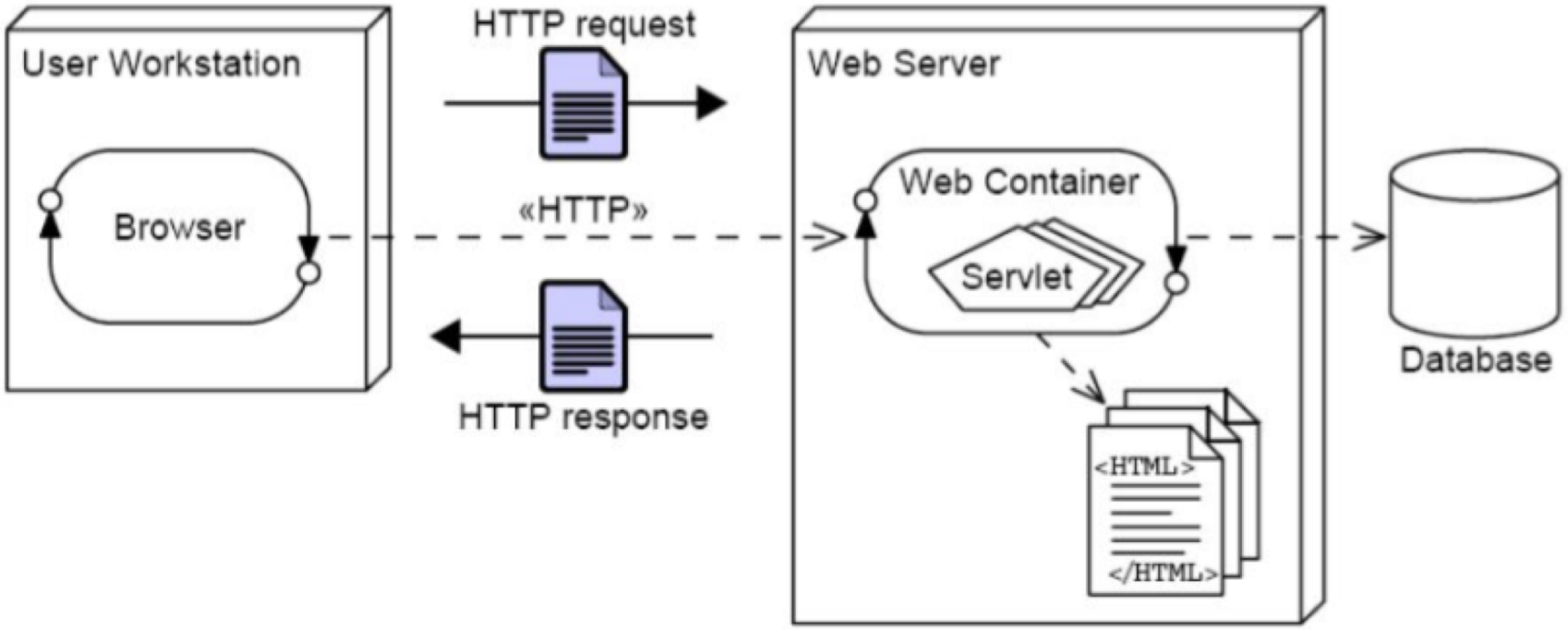
Compatibility issues between different browsers (JavaScript, JScript, ECMAScript)

```
<h1 onMouseOver="style.color='red';"onMouseOut="style.color='blue';">Hello </h1>
```

Web server, databases, authentication, etc…

SERVER SIDE

Web Containers / Web Frameworks



Roles of web container:

Networking, Thread management, Servlet management, HTTP protocol management

GET vs. POST

The **HTTP GET** method is used when:

- The processing of the request is idempotent
- The amount of form data is small
- You want to allow the request to be bookmarked

The **HTTP POST** method is used when:

- The processing of the request changes the state of the server, such as data in a database
- The amount of form data is large
- The contents of the data should not be visible in the URL (e.g. passwords)

Web Template System

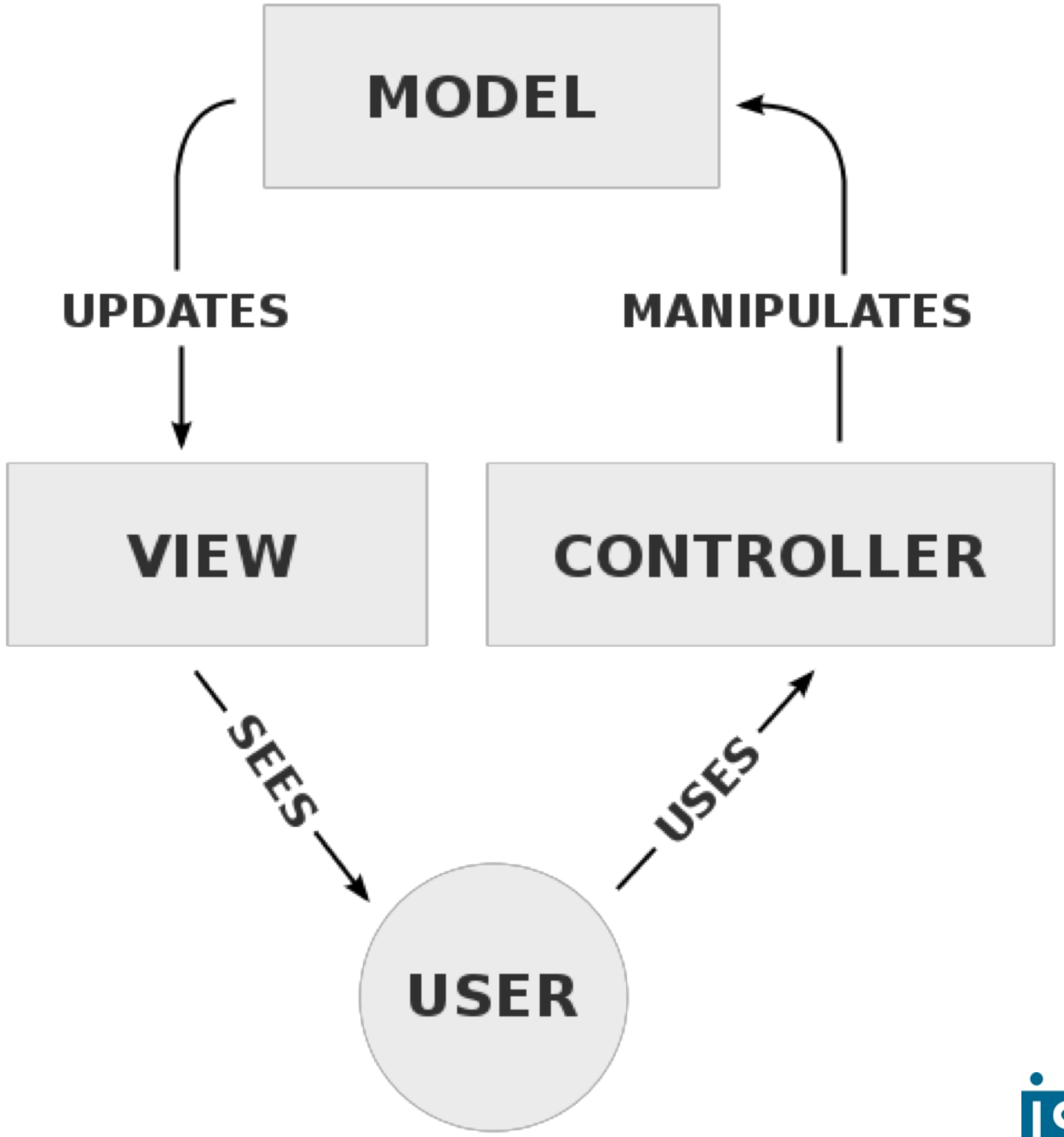
A web template system is composed of:

- A template engine (EJS, DJango)
- Content resource (DB)
- Template resource (JSP, PHP)

Benefits:

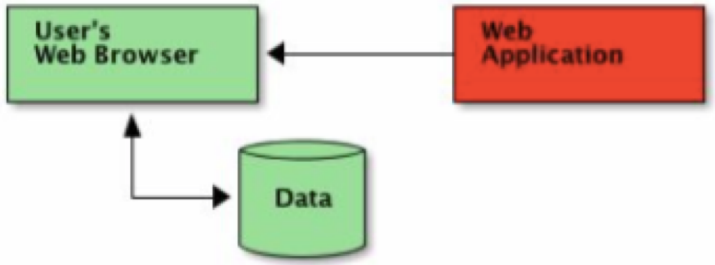
- Separation of concerns (Model/View)
- Mass production of content
- Flexible presentation
- Reusability
- Style standardization

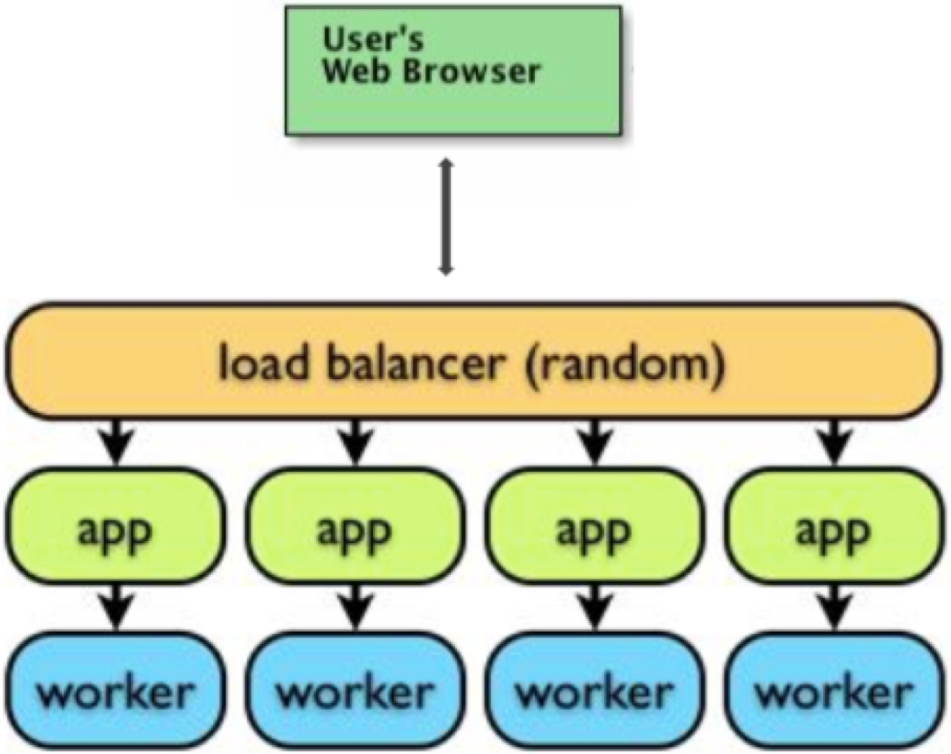
```
</script>
</head>
<body bgcolor="#ffffff">

<h1>Office Locations</h1>
<table border="1">
  <tr>
    <th>Location ID</th>
    <th>Street Address</th>
    <th>City</th>
  </tr>
  {% for loc in locations %}
  <tr>
    <td><a href="http://this_link_goes_nowhere/"
        onClick="makeRequest{{{loc.location_id}}}); retu
        {{loc.location_id}}<a></td>
    <td>{{loc.street_address}}</td>
    <td>{{loc.city}}</td>
  </tr>
  {% endfor %}
</table>

<p>
<div id="outputNode"></div>
</p>

</body>
</html>
```

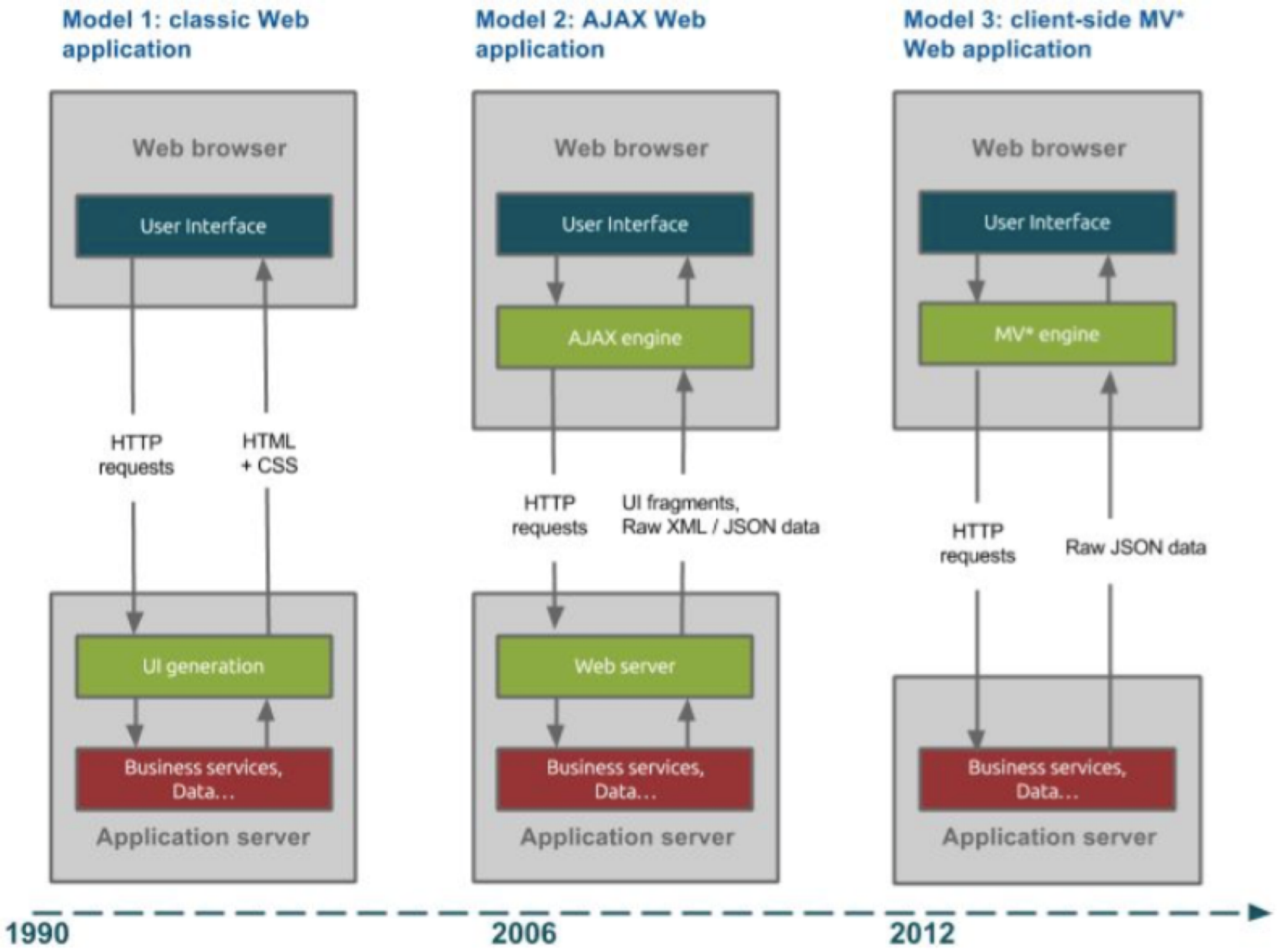


Typical LAMP hosted webapp

Serverless webapp







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Wait, so what should we use?

Frontend

HTML, CSS, JavaScript, jQuery...

Backend

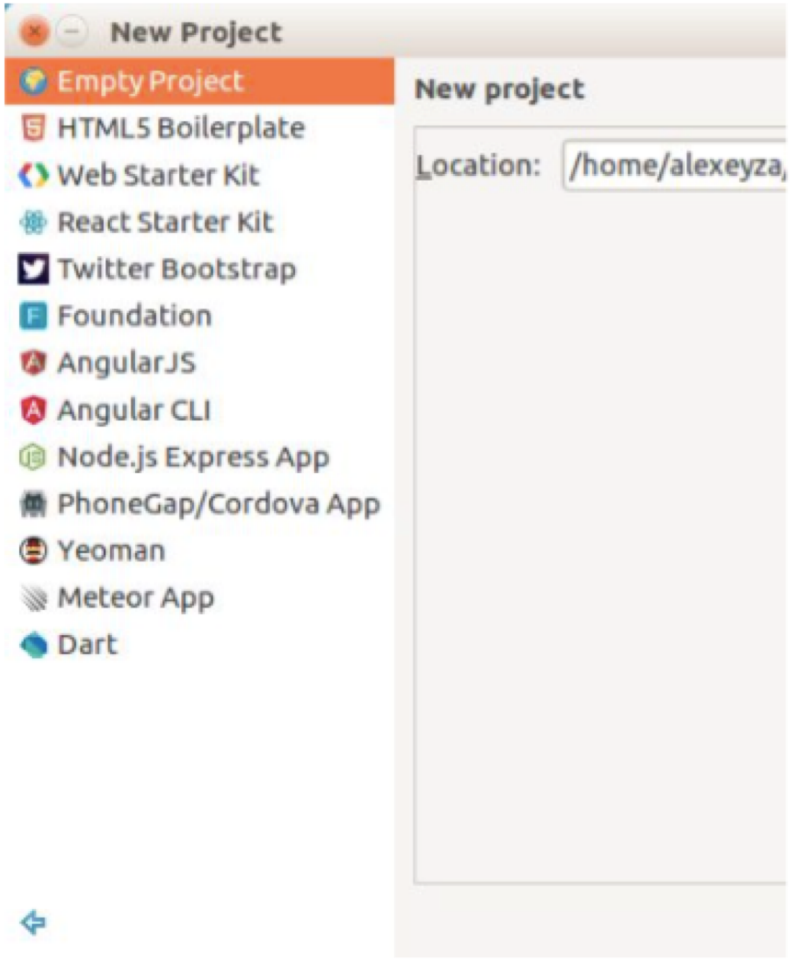
Java, Python, Node.js, Go, Ruby on Rails...

Hosting

Google App Engine, Heroku, AWS...

IDE / Text Editor

Eclipse, Webstorm, SublimeText...



"A starting architecture, with supporting libraries, to support a general programming goal, typically using inverted control."

WHAT IS A FRAMEWORK?

Examples? And how do we choose between them?

- <I'd have made a list, but I bet we can just name a bunch, eh?>

Sorry/Not Sorry

HONESTY TIME: WE'RE BOXING YOU IN

PATH TO PROTOTYPES

Product

MVP

Prototype

Prototyping a web app

- Front end (View): Paper prototypes
- Back end (Database): Data Model
- “Middle end”: API, endpoints

PROTOTYPE TO ITERATE OVER AND REFINE IDEAS…SO WHERE DO IDEAS COME FROM?

tl;dr: Geniuses don't have better ideas, they have more of them.

Creativity can be cultivated through practice.

- –Creativity style (innovative versus adaptive) doesn't correlate with how many ideas people generate.
- We are most creative when we turn off evaluations and restrictions.
- –Warning re: startup!

Alternate between exploring problems in depth versus laterally.

Accept bad ideas – "yes and" them – point out the good point of an idea if you can find one and mention how it could be improved with the and statement.

Guidelines:

- –Defer judgment
- –Generate as many options as possible (more is better)– ask what else
- –Seek novelty
- –Then, converge on the best ideas (spend about as much time on this as generating ideas)

ACTIVITY: BRAINSTORM SNOW PLOWING FUNCTIONALITY