2022/2023(2)
IF184504 Web Programming

Lecture #7

ASP.NET & RIA

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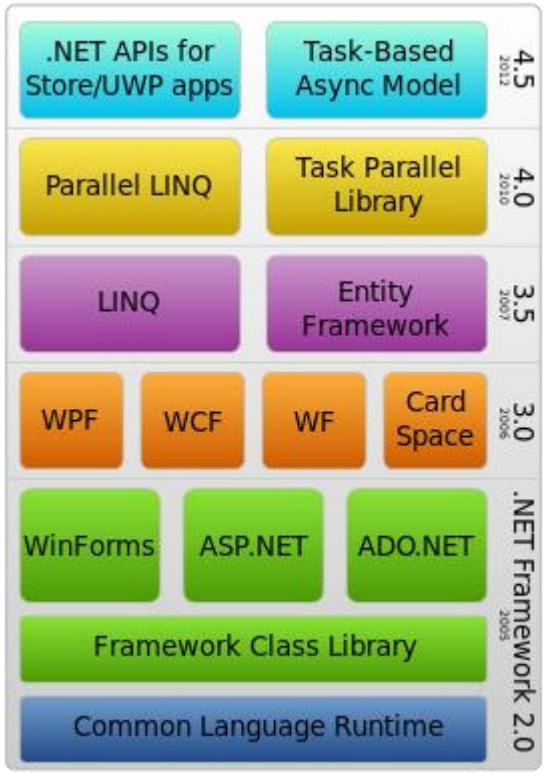
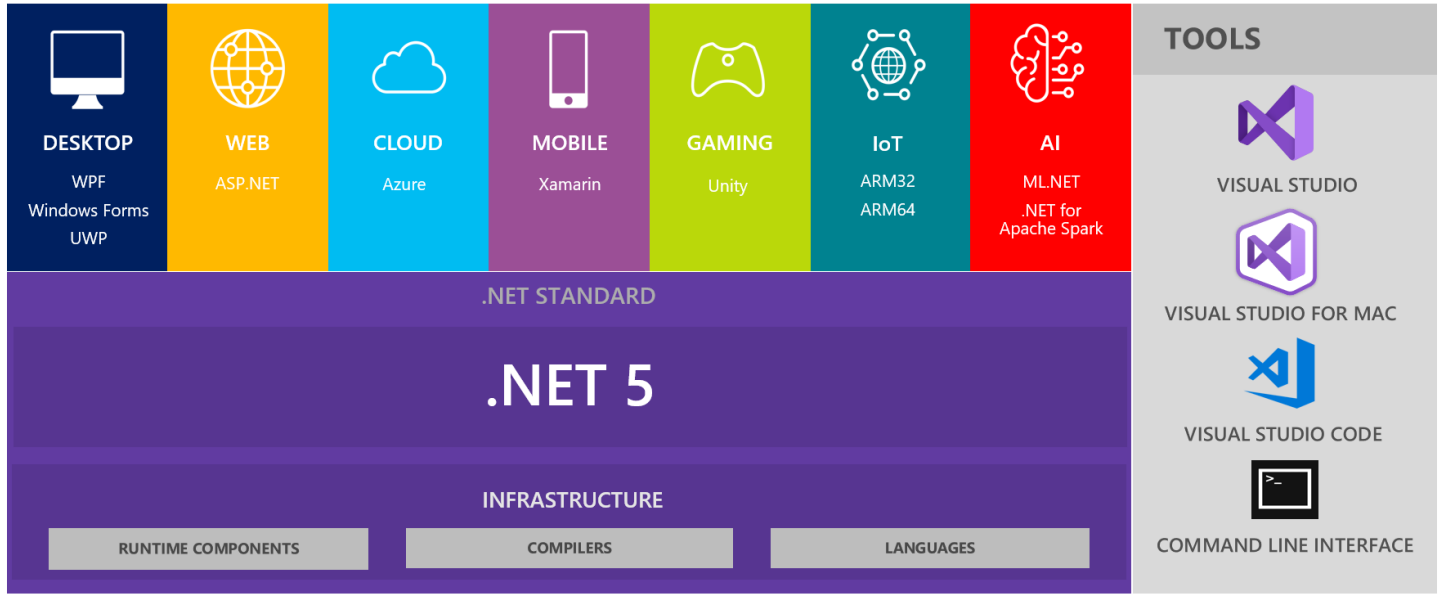
ASP.NET

- Introduction

.NET Framework



.NET – A unified platform



Web development world

- CGI (Common Gateway Interface)
  - Requires a lot of server resources
- ASP Classic
  - Interpreted and loosely-typed code
  - Mixes layout and logic code
  - Limited development and debugging tools
  - No real state management
- ASP.NET
  - Compiled languages support
  - .NET framework support
  - Code separation
  - Visual web development
  - State management
  - XML based configuration files

Advantages of ASP.NET

- *Object oriented programming* model
  - Event driven
  - Control based architecture
- Code in any supported languages
  - C#, VB.NET, and others
- *Faster* than ASP classic
- Rapid development style
- Multidevice and multibrowser
- Easy to deploy and configure

ASP.NET 2.0 features

- Rich controls
- Master pages
- Themes
- Security and membership
- Data source controls
- Web parts
- Profiles

ASP.NET 3.5 features

- LINQ (Language Integrated Query)
- ASP.NET AJAX (Asynchronous JavaScript And XML)
- ASP.NET MVC (different application architecture)

ASP.NET 4.0 features

- Focus:
  - improving the performance and Search-Engine Optimization (SEO)

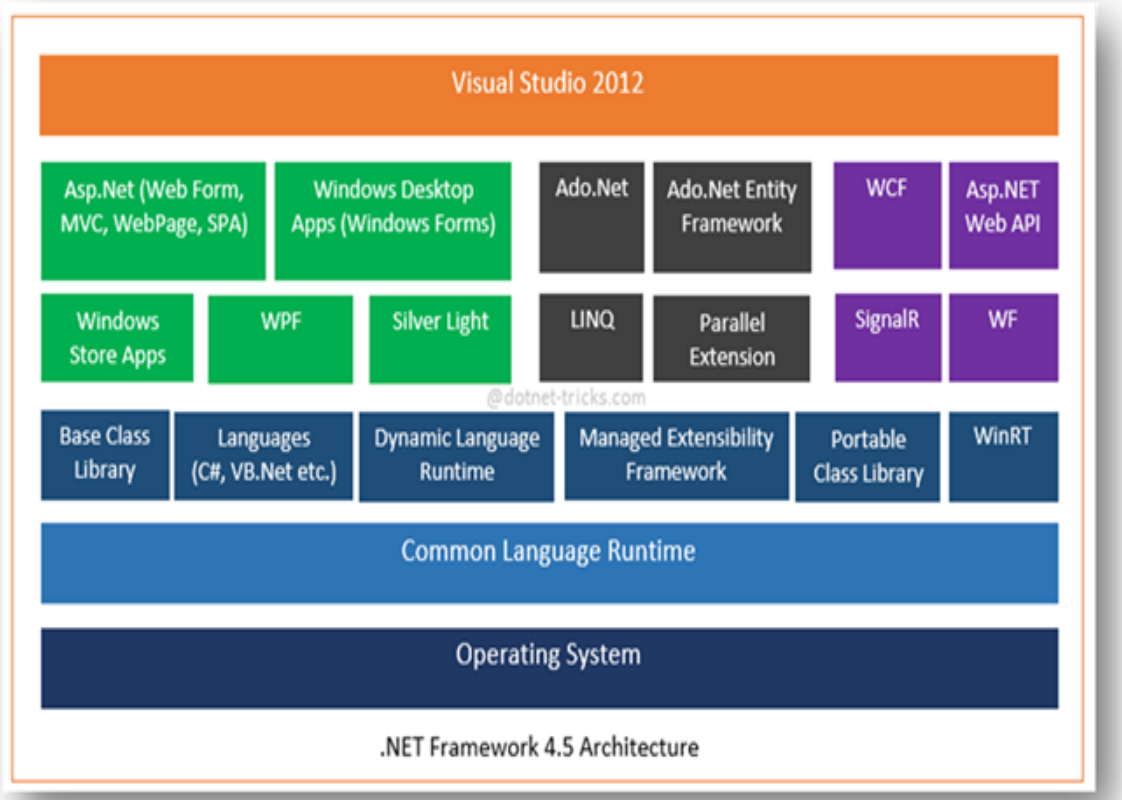
ASP.NET 4.0 features (continued)

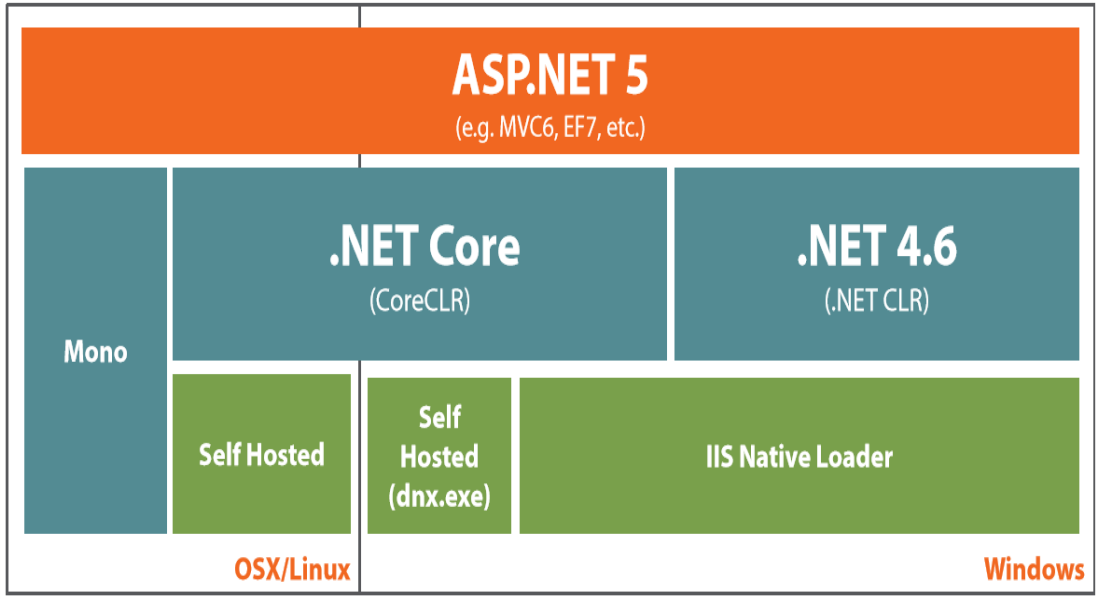
- Output cache extensibility
- Session state compression
- View state mode for individual control
- *Page.MetaKeyword* and *Page.MetaDescription* properties
- *Response.RedirectPermanent* method
- Routing in ASP.NET
- Increase the URL character length
- New syntax for HTML Encode
- Predictable Client IDs
- *Web.config* file refactoring
- Auto-Start ASP.NET applications
- Improvements on Microsoft Ajax Library

ASP.NET 5.0 features

- 2 huge changes
  - It's much leaner – e.g. no longer requires System.Web.dll.
  - It's modular – almost all features are implemented as NuGet packages
- NuGet → a free and open-source package manager designed for the Microsoft development platform

ASP.NET framework





ASP.NET page syntax

- `*.aspx` file extension
- Directive syntax
- Code declaration blocks
- Code render blocks
- Server side comments
- Custom server control
- Data-binding expression syntax
- Server-Side Object Tag Syntax
- Server-Side Include Directive Syntax

Directive syntax
<%@ %>

- @ Page
- @ Control
- @ Import
- @ Implements
- @ Register
- @ Assembly
- @ Master
- @ WebHandler
- …

```
<%@ Page Language="C#“ MasterPageFile="~/master“
ValidateRequest="false“ %>

<%@ Register Src="~/Workflow/Navigation.ascx"
TagName=“Navigation" TagPrefix="spg" %>
```

Code declaration block <script></script>

```
<script runat="server" language="codelanguage" Src="pathname">
            Code goes here.
 </script>
```

```
<html>
<script language="C#" runat="server">
      void EnterBtn_Click(Object Src, EventArgs E) {
                  Message.Text = "Hello " + Name.Text + ", welcome to ASP.NET!";
      }
</script>
</html>
```

Code render blocks
<%= %>

```
<% inline code %>
 <%=inline expression %>
```

```
<% for (int i=0; i<10; i++) { %>
      <font size="<%=i %>"> Hello World! </font>
<% } %>
```

Server side comments
<%-- --%>

```
<%-- this is block of comment --%>
Note: do not use comment inside <% %> block.
```

```
<%--
      <asp:button runat="server" id="MyButton" OnClick="MyButton_Click" />
--%>
```

Custom server control

```
<tagprefix:tagname id="OptionalID" attributename="value"
eventname="eventhandlermethod" runat="server" />
OR
<tagprefix:tagname id="OptionalID" runat="server" />
```

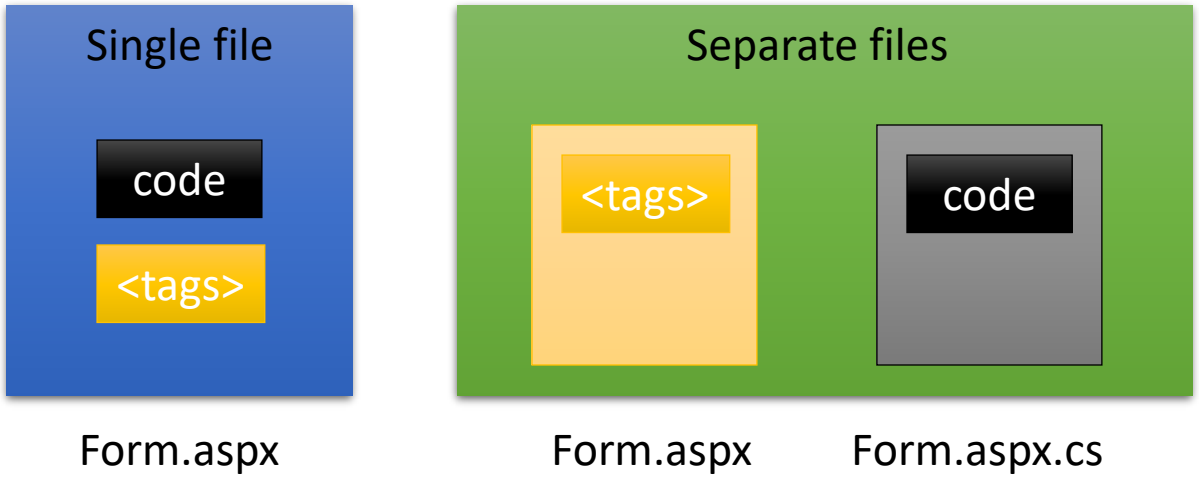
```
<%@ Register Src="~/Workflow/Navigation.ascx" TagName="Navigation"
TagPrefix="spg" %>

<spg:Navigation ID="controlNavigation" runat="server" />
```

Hello World

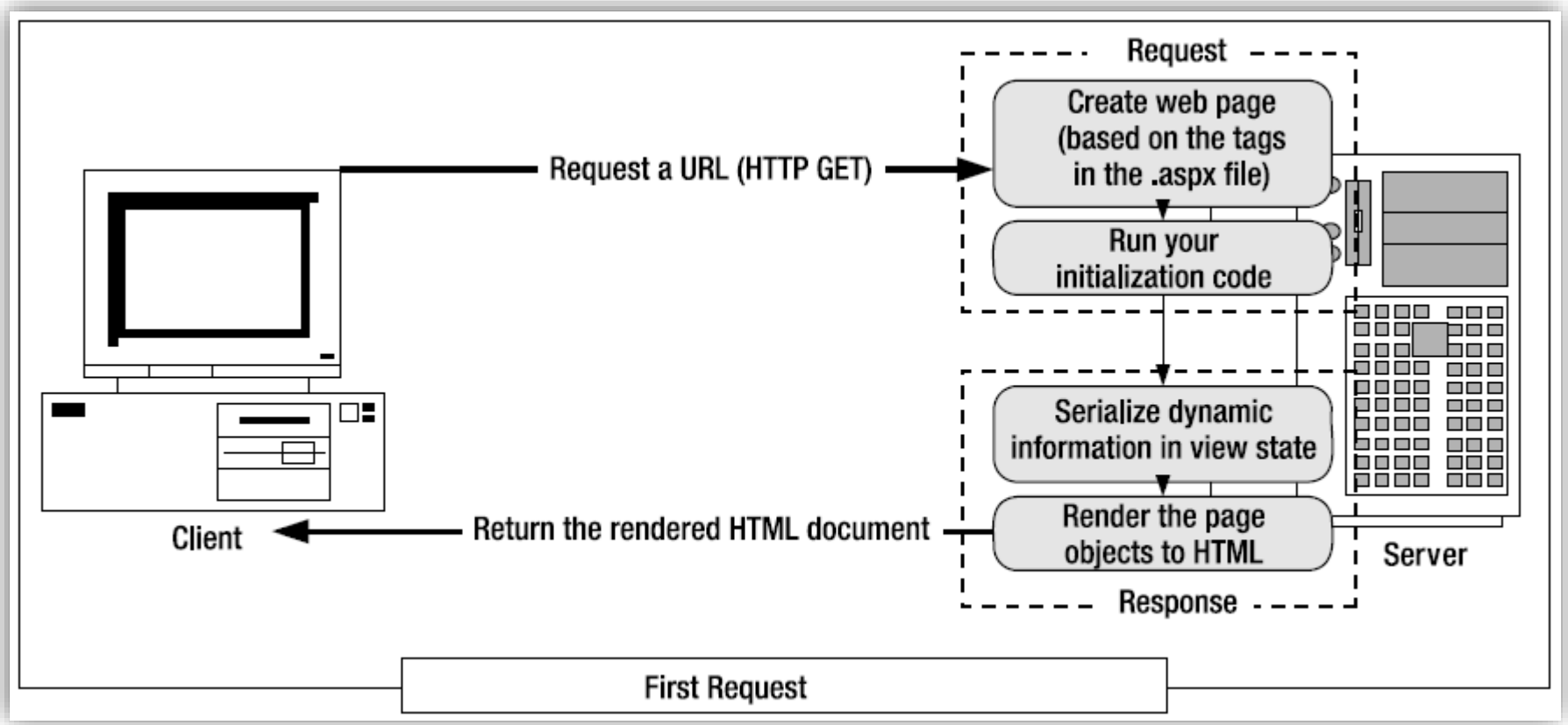
- The steps

Web forms

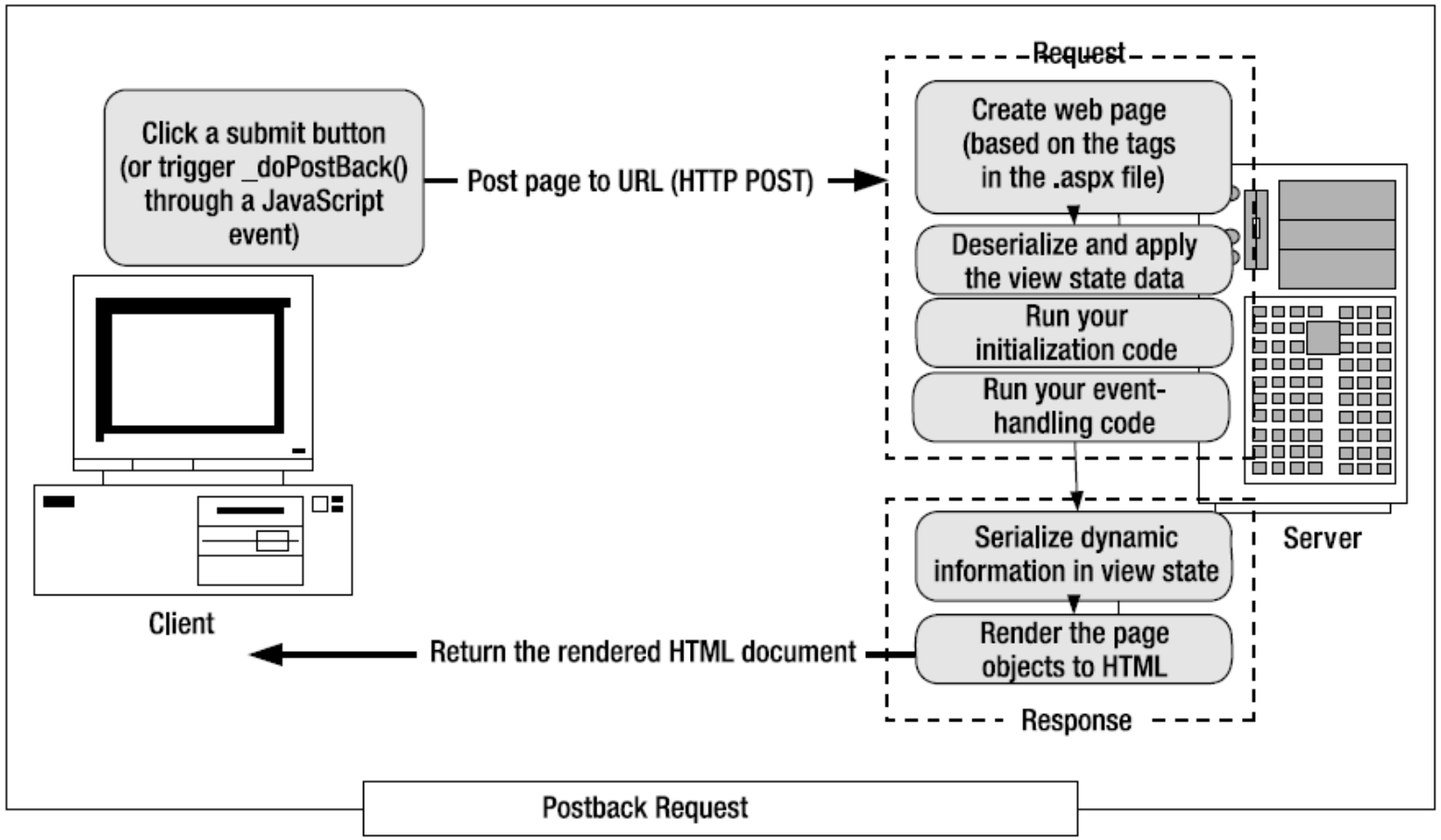
- Web form combines declarative tags (HTML, ASP.NET directives, server controls, static text) with code.
- Code separation is encouraged.



Page request



Page request (continued)



Page class

- Session
- Application
- Cache
- Request
- Response
- Server
- User
- Trace

Validation control

- RequiredFieldValidator
- RangeValidator
- RegularExpressionValidator
- CompareValidator
- CustomValidator
- ValidationSummary

ASP.NET learning site

- https://dotnet.microsoft.com/apps/aspnet
- https://docs.microsoft.com/

Rich Internet Application (RIA) → Rich Web Application (RWA)

- Web-based applications → characteristics of graphical desktop applications.
- Built with powerful development tools → run faster and be more engaging.

RIA/RWA: the definition

- A web application that has many of the characteristics of desktop application software.
- The concept is closely related to a single-page application, and may allow the user interactive features such as drag and drop, background menu, WYSIWYG editing, etc.
- HTML5 is a current standard for delivering rich web applications, supported by all major browsers.

RIA/RWA: the example

- Revenue: US$15 billion (2019), US$19.8 billion (2020), US$28.8 billion (2021), US$29.24 billion (2022)
- Parent: Google LLC (2006–present)
- Written in Python (core/API), C (through CPython), C++, Java (through Guice platform), Go, JavaScript (UI)

RIA: case study of YouTube

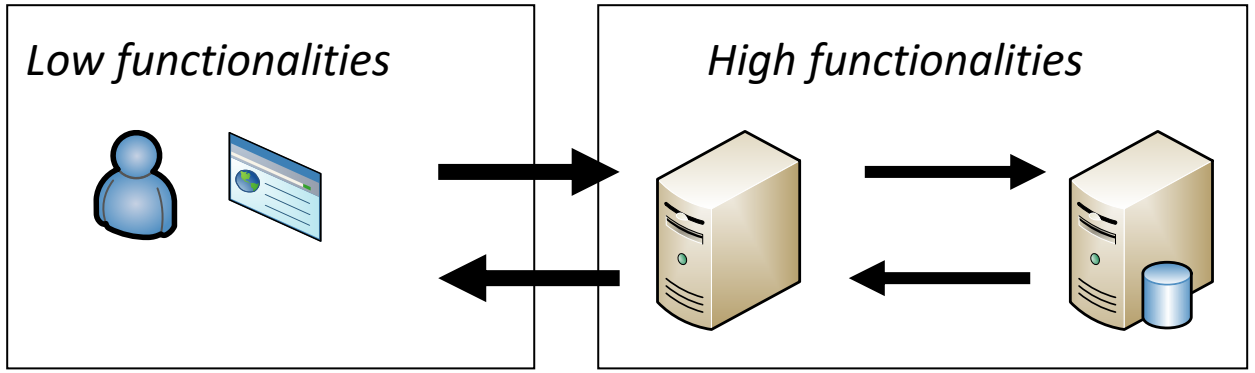
- 2010, the mobile version of the site was relaunched based on HTML5, avoiding the need to use Adobe Flash Player and optimized for use with touch screen controls → an app for the Android platform
- 2011, an HTML5 version of the YouTube player began supporting side-by-side 3D footage that is compatible with NVidia 3D Vision.
- 2015, YouTube announced that HTML5 would be the default playback method on supported browsers.
  - YouTube used to employ Adobe Dynamic Streaming for Flash, but with the switch to HTML5 video now streams video using Dynamic Adaptive Streaming over HTTP (MPEG-DASH), an adaptive bit-rate HTTP-based streaming solution optimizing the bitrate and quality for the available network.

RIA: the characteristic

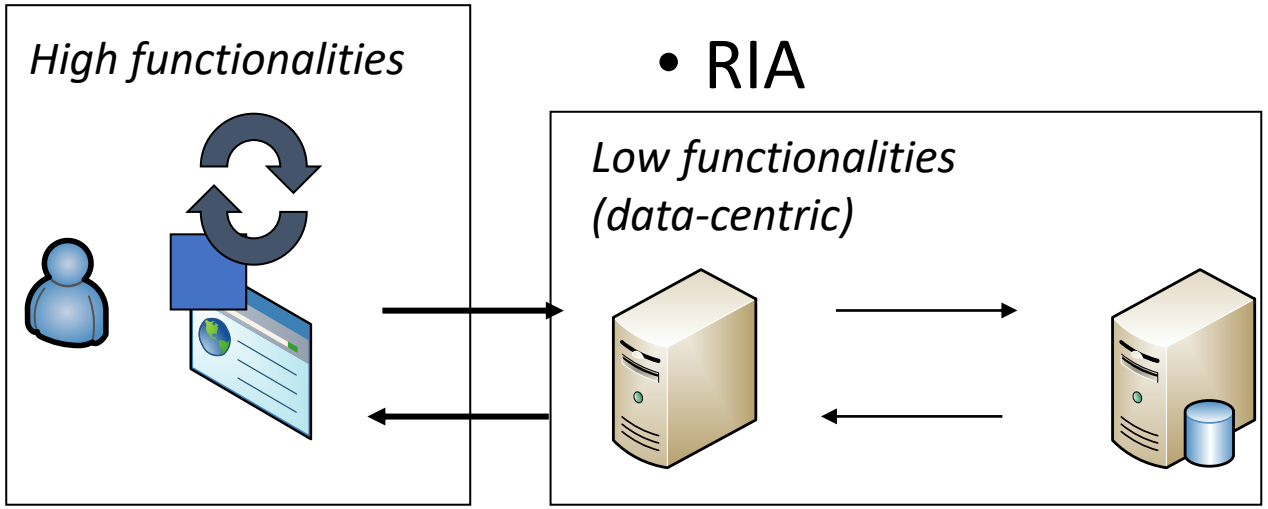
- *Dynamic download*: RIA's are typically downloaded using an on-demand model.
- *Sandboxed* : RIA's typically 'live' within a sealed sandbox, with no access to the host O/S.
- *Asynchronous communications*: event or user-based transactions with the remote server, breaking the page-based reload paradigm.
- *Highly dynamic and flexible user interfaces*: menus, tabs, multimedia, rich editing, generally funky goodies.
- *Client-side functionality*: many functions can now live at the client, even have the ability to host mini client-side databases.
- *Created using bespoke scripting languages*: in many cases, often with a good dose of AJAX thrown in.

RIA: the comparison

- Traditional web



- A lot of E2E transactions
- Server's workload high



- RIA

- A few E2E transactions
- Server's workload low

RIA: the technologies (before HTML5)

- Adobe Flash → Apache Flex
  - Flash → closed source | Flex → open source
  - Client runtime on Mac, Windows, Linux
  - Flex used “ActionScript”, MXML, Flex Class Library
  - Interface development uses Flash IDE
  - Flex: plugin for Eclipse
  - Companies used:
    - BBC iPlayer, ChessCube, HBO Go, CareCloud, VMware

RIA: the technologies (before HTML5)

- AIR (Adobe Integrated Runtime) → by using Adobe Animate, ActionScript & Flex
  - eBay Desktop, Pandora One desktop, TweetDeck, Angry Birds, Machinarum

RIA: the technologies (before HTML5) – cont.

- Java applet → faster than JavaScript
  - Deprecated

RIA: the technologies (before HTML5) – cont.

- JavaFX → part of OpenJDK: OpenJFX project
  - Version 1.0 by using JRE (Java Runtime Environment)
  - Available for Windows, Linux, Mac
  - Open source, GPL
  - IDE: NetBeans
  - Companies used:

RIA: the technologies (before HTML5) – cont.

- Microsoft Silverlight
  - .NET based
  - Browser plugin on WPF (Windows Presentation Foundation)
  - Available for Mac and Windows
  - IDE: Visual Studio
  - Terminate on Internet Explorer 11 (12 October, 2021)
  - Companies used:
    - Magnet Media Inc.
    - Creative Mettle
    - Treliant Risk Adviors LLC
    - Zeta Interactive
    - Kaseya Limited

RIA: the technologies (before HTML5) – cont.

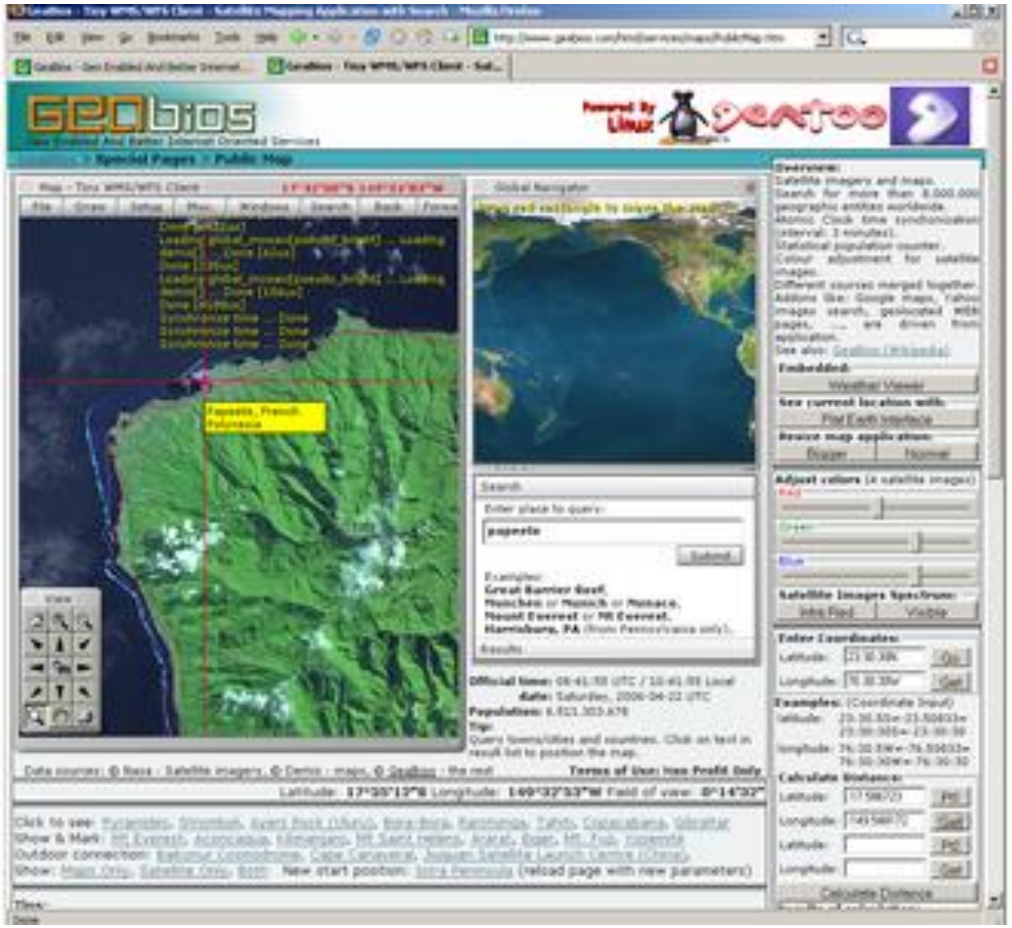
- XForms → next generation HTML/XHTML forms
  - Declarative XML-based programming language.
  - W3C standard, and in use in companies around the world.

RIA: the technologies (before HTML5) – cont.

- Open Laszlo
  - Discontinued open-source platform for the development and delivery of RIA
  - Released under the Open Source Initiative certified Common Public License (CPL).
  - Consists of the LZX programming language and the OpenLaszlo Server.
  - LZX is an XML and JavaScript description language similar in spirit to XUL, MXML, and Extensible Application Markup Language (XAML).
  - LZX enables a declarative, text-based development process that supports rapid prototyping and software development best practices → to be familiar to traditional web application developers who are familiar with HTML and JavaScript.

RIA: the technologies (before HTML5) – cont.

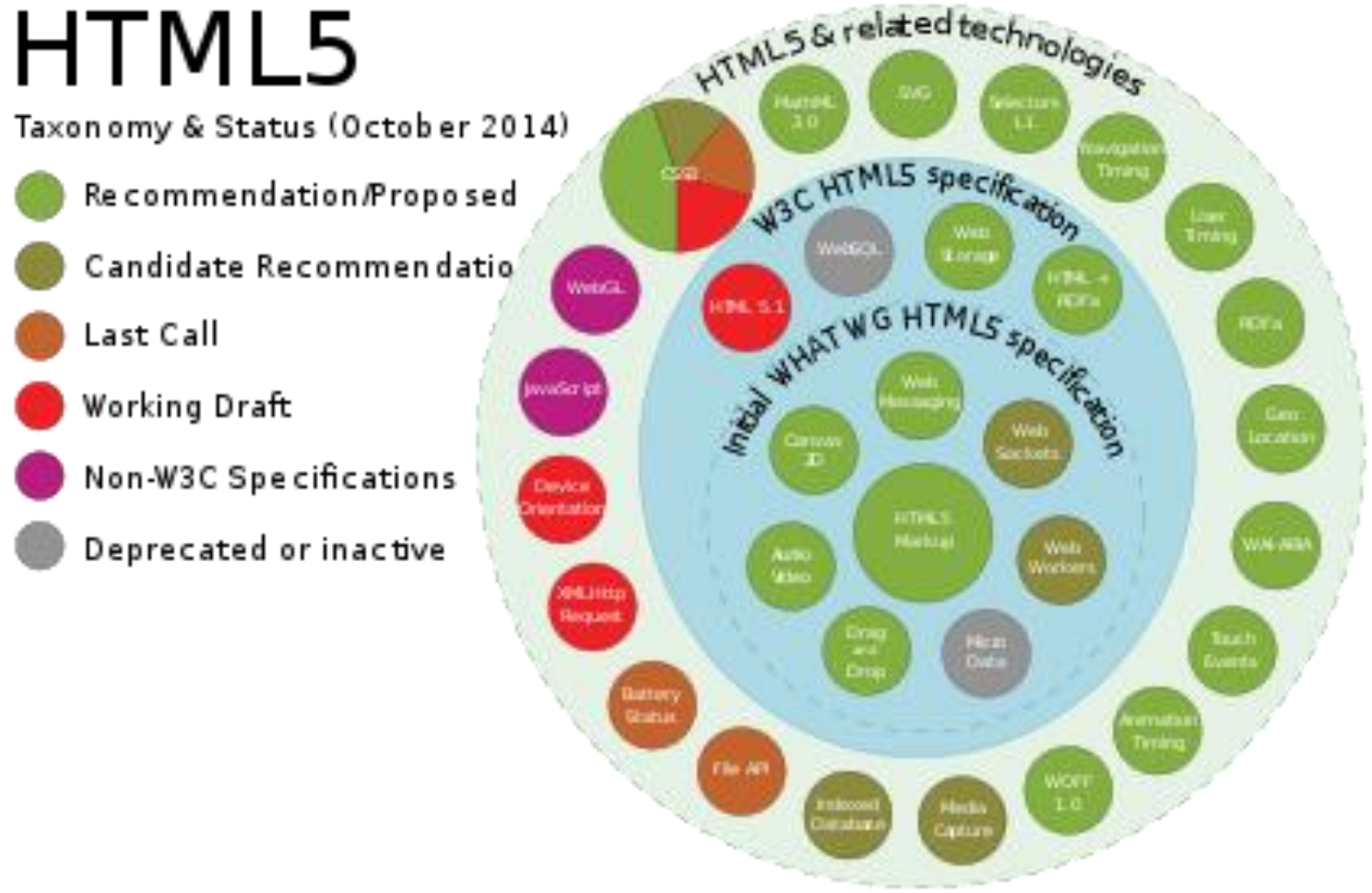
- Open Laszlo (continued)



RIA: HTML5 technology

- 5th and latest major version of HTML that is a World Wide Web Consortium (W3C) recommendation.
- The current specification is known as the HTML Living Standard and is maintained by a consortium of the major browser vendors (Apple, Google, Mozilla, and Microsoft), the Web Hypertext Application Technology Working Group (WHATWG).
- Intended to subsume not only HTML 4 but also XHTML 1 and DOM Level 2 HTML.
- HTML5.3 (2017)

RIA: HTML5 technology (continued)



Silverlight: Hello World

- Needs 3 things
  - HTML file
  - Silverlight.js provided in SDK
  - XAML file in Silverlight XAML for defining canvas
- Hello World in Silverlight

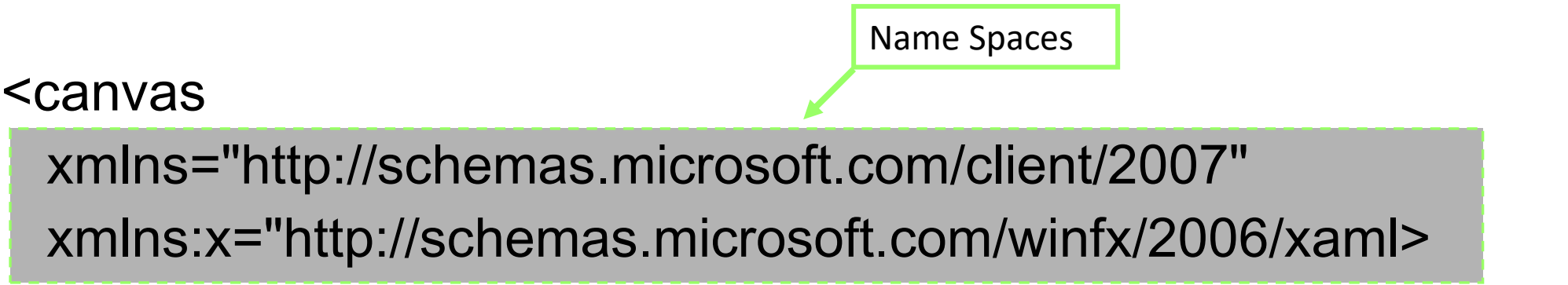
Silverlight: Hello World (continued)

JavaScript include

```
<html><head> <title>Hello World</title>
    <script src="js/Silverlight.js" type="text/javascript"></script>
</head><body>
   <div id="Ag1Host" style="background:#FFFFFF">
        <script type="text/javascript">
          var pe1 = document.getElementById("Ag1Host");
        </script></div>
<script>
Silverlight.createObjectEx({source: 'xaml/MyFirstSilverlightPage.xml',
   parentElement:pe1, id:'Ag1', properties:{width:'300', height:'100',
   background:'#00FFFFFF', isWindowless:'true', framerate:'24', version:'0.90.0'},
   events:{onError:null, onLoad:null}, context:null});
</script></body></html>
```

Silverlight: Hello World (continued)

- XAML file:




```
<canvas
  xmlns="http://schemas.microsoft.com/client/2007"
  xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml>

    <TextBlock FontSize="36" Canvas.Left="17" Canvas.Top="10"
  Foreground="Blue">Hello World</TextBlock>

</canvas>
```

JavaFX: Hello World

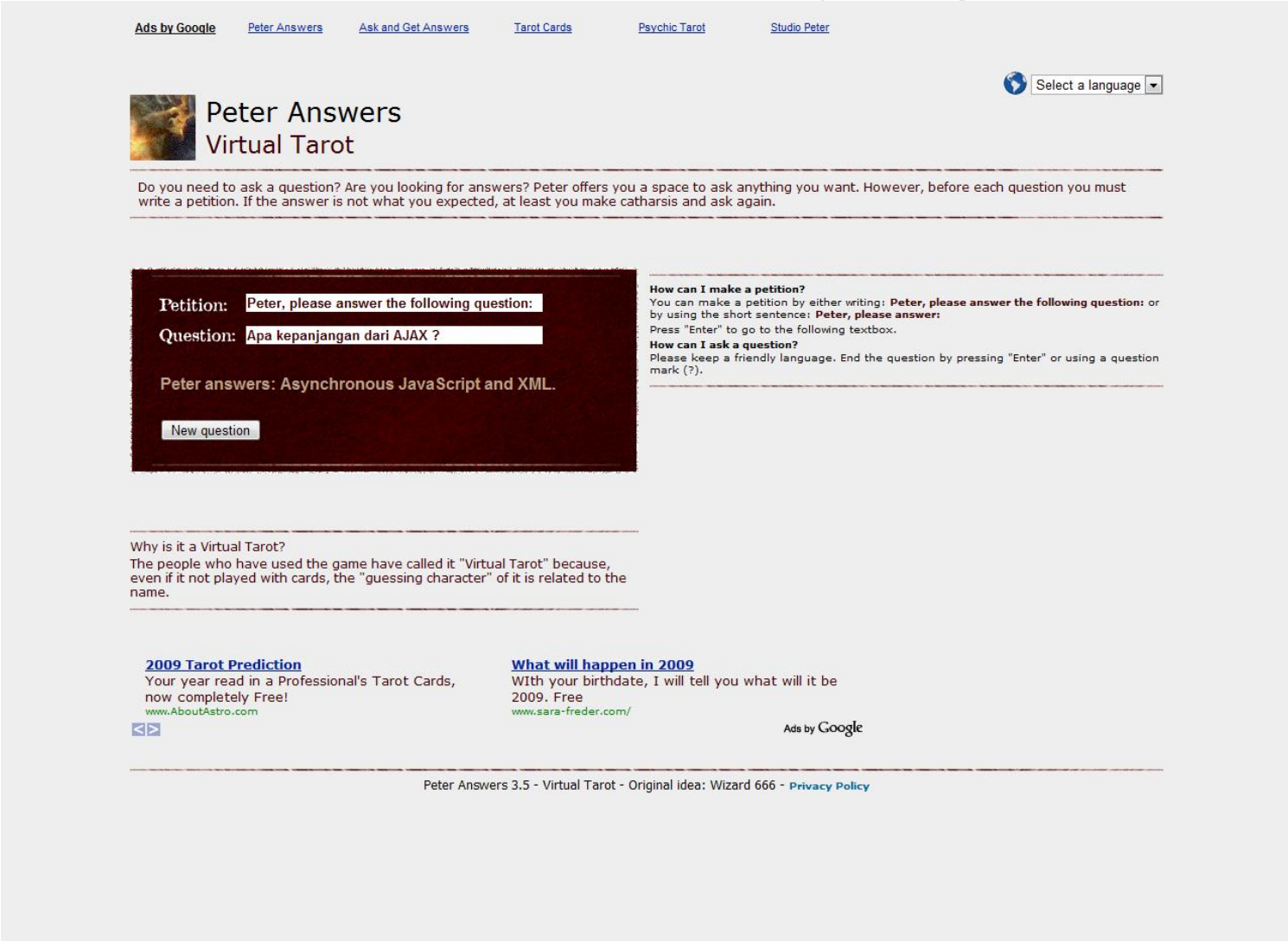
```
import javafx.ui.*;
    Frame {
        title: "Hello World JavaFX"
        width: 200
        height: 50
        content: Label {
            text: "Hello World"
        }
        visible: true
    }
```

Running on IDE

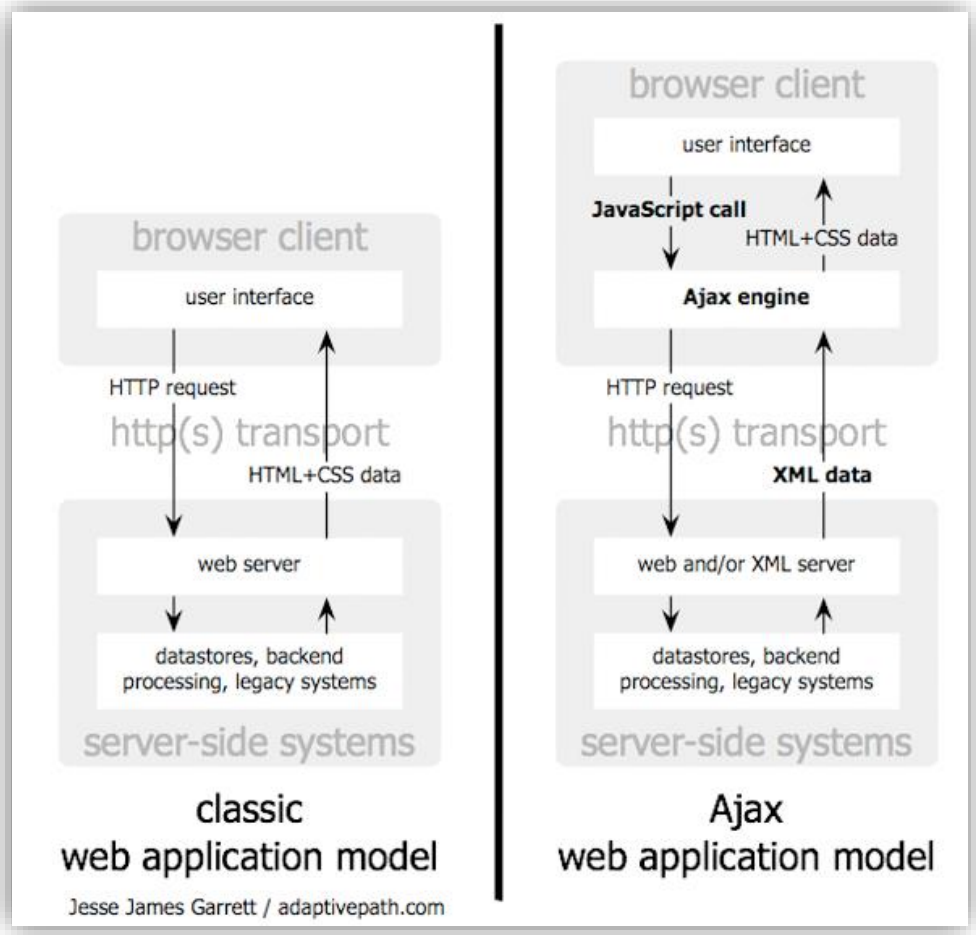
An advantage: declared object instantiation → throw away the impractical thing about swing

- For command line development see
  http://jfx.wikia.com/wiki/A_command_line_development_of_HelloWorld.fx

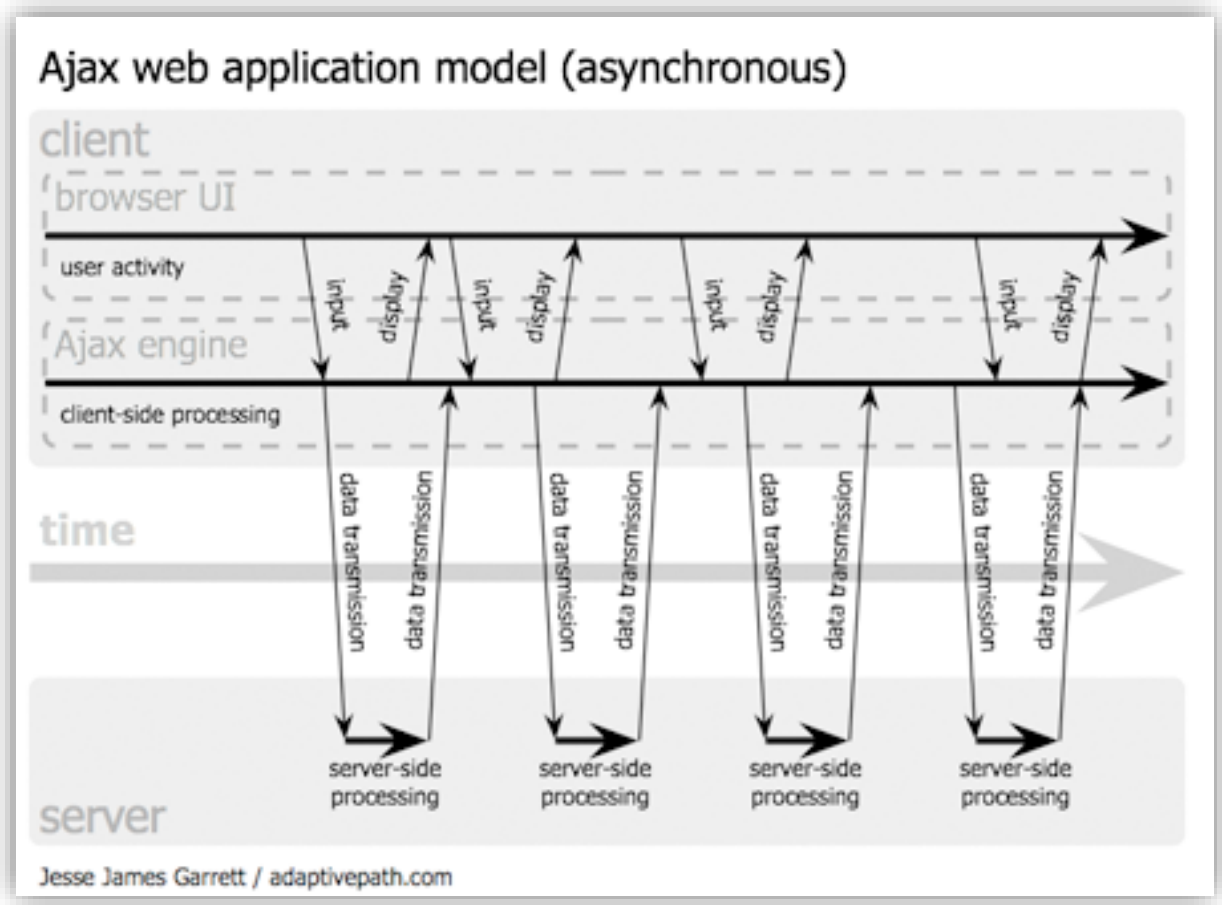
AJAX: RIA without browser plugin



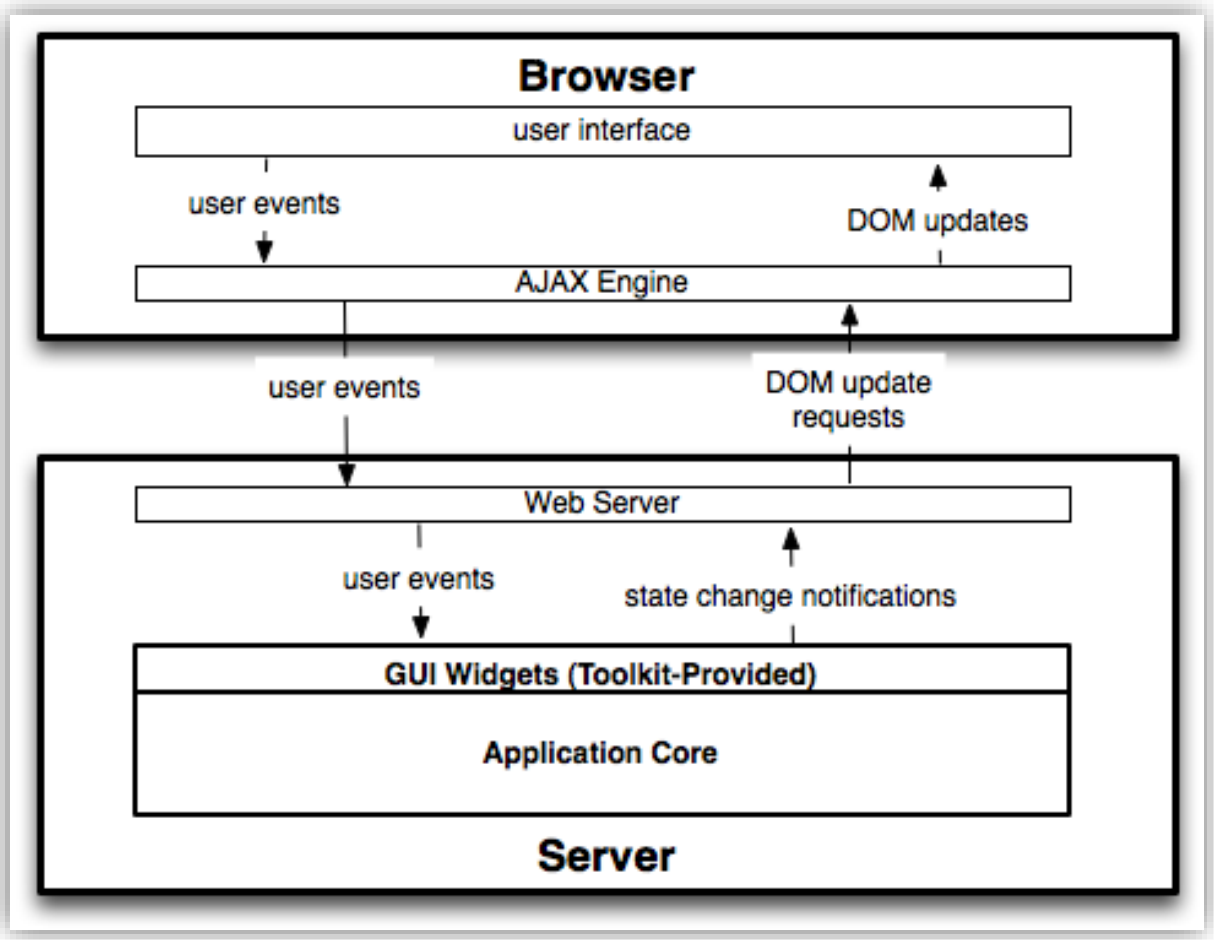
AJAX: what is that?



AJAX: event handling



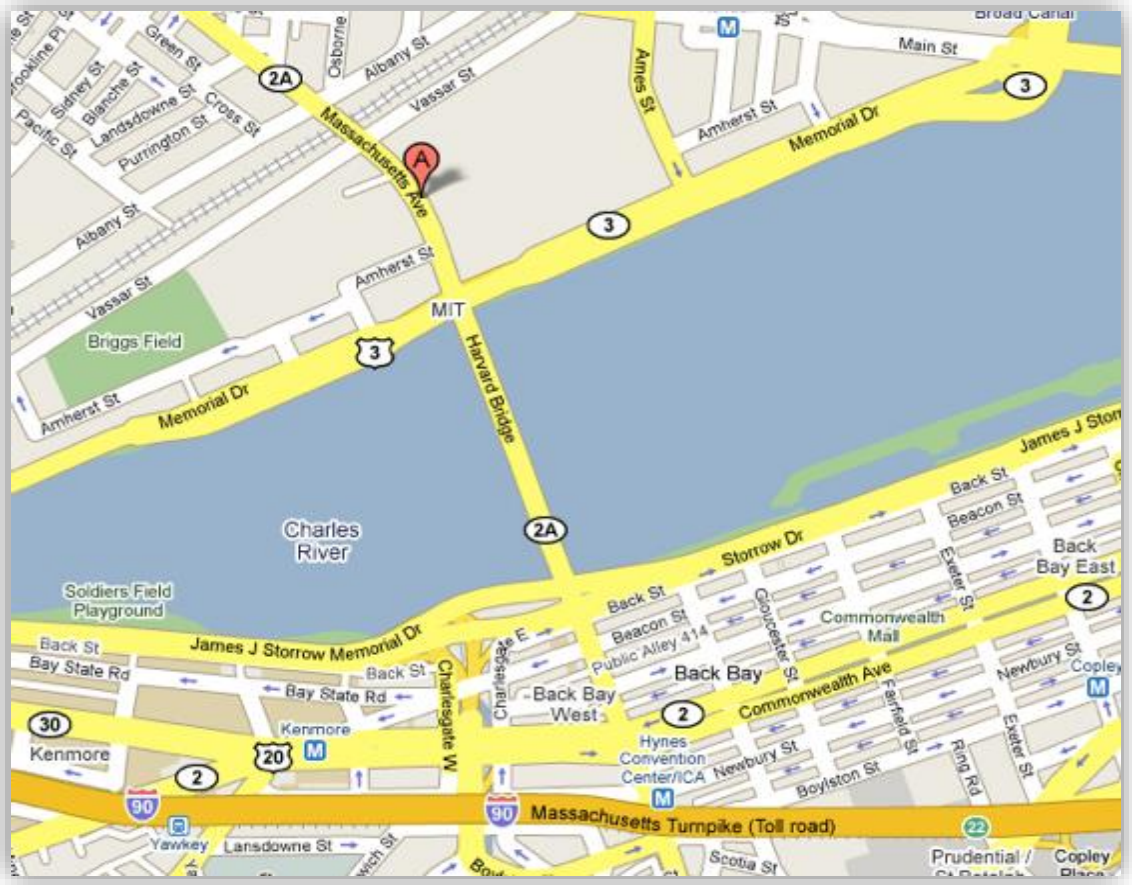
AJAX: thin client approach



- You write your application in the application core. Network-agnostic server application
- You manipulate your widgets on the server side.
- Widgets translate state changes into DOM updates
- Stateful server: All the interesting stuff in the “Application Core”
- You’re basically writing something that runs entirely in the server.

AJAX: thin client approach – the example

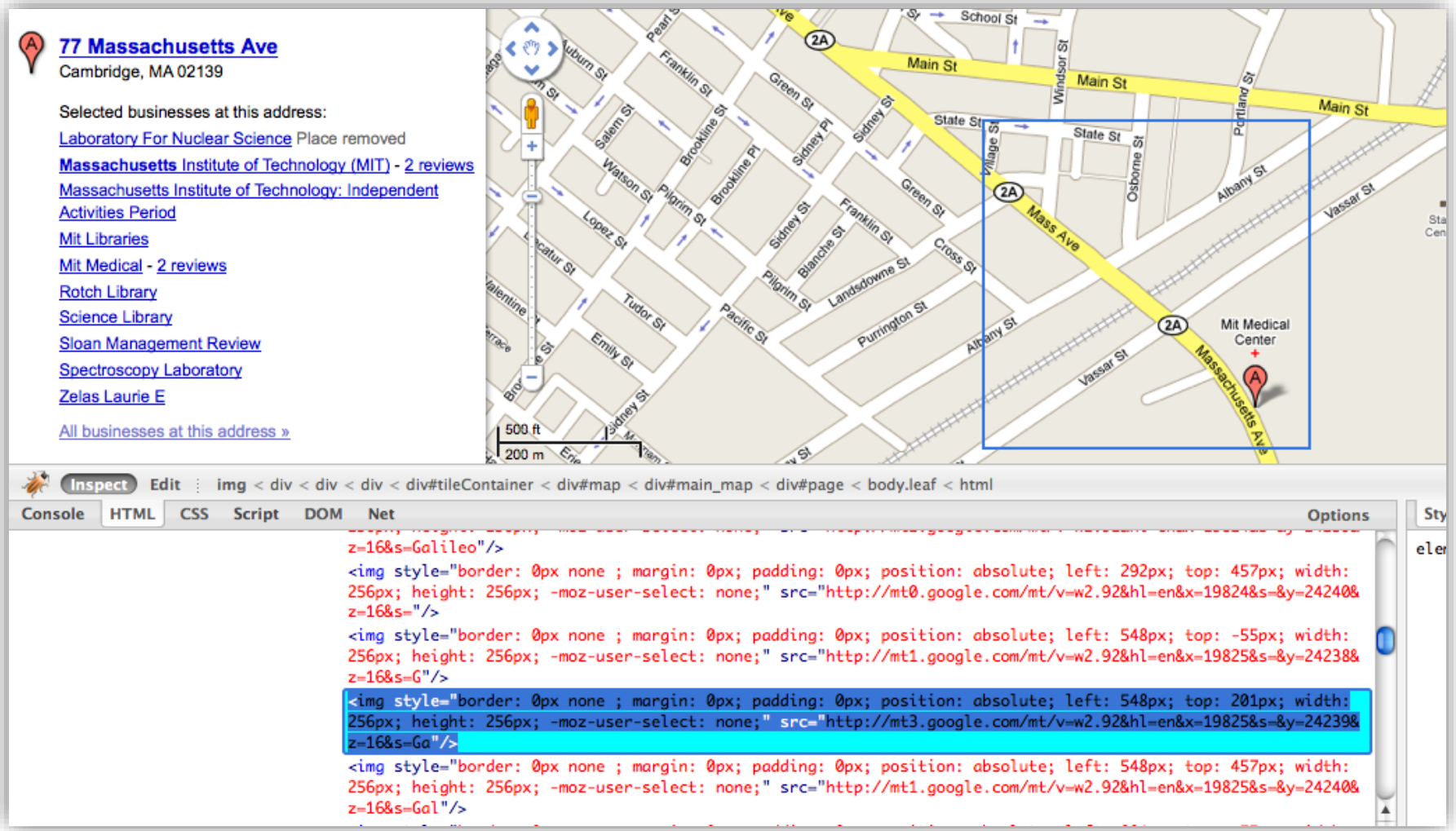
- Google maps → pretending that it's a thin client app



- Google Maps is NOT implemented with a thin client approach, but let's pretend that it was.

AJAX: thin client approach – the example (continued)

- A grid of images



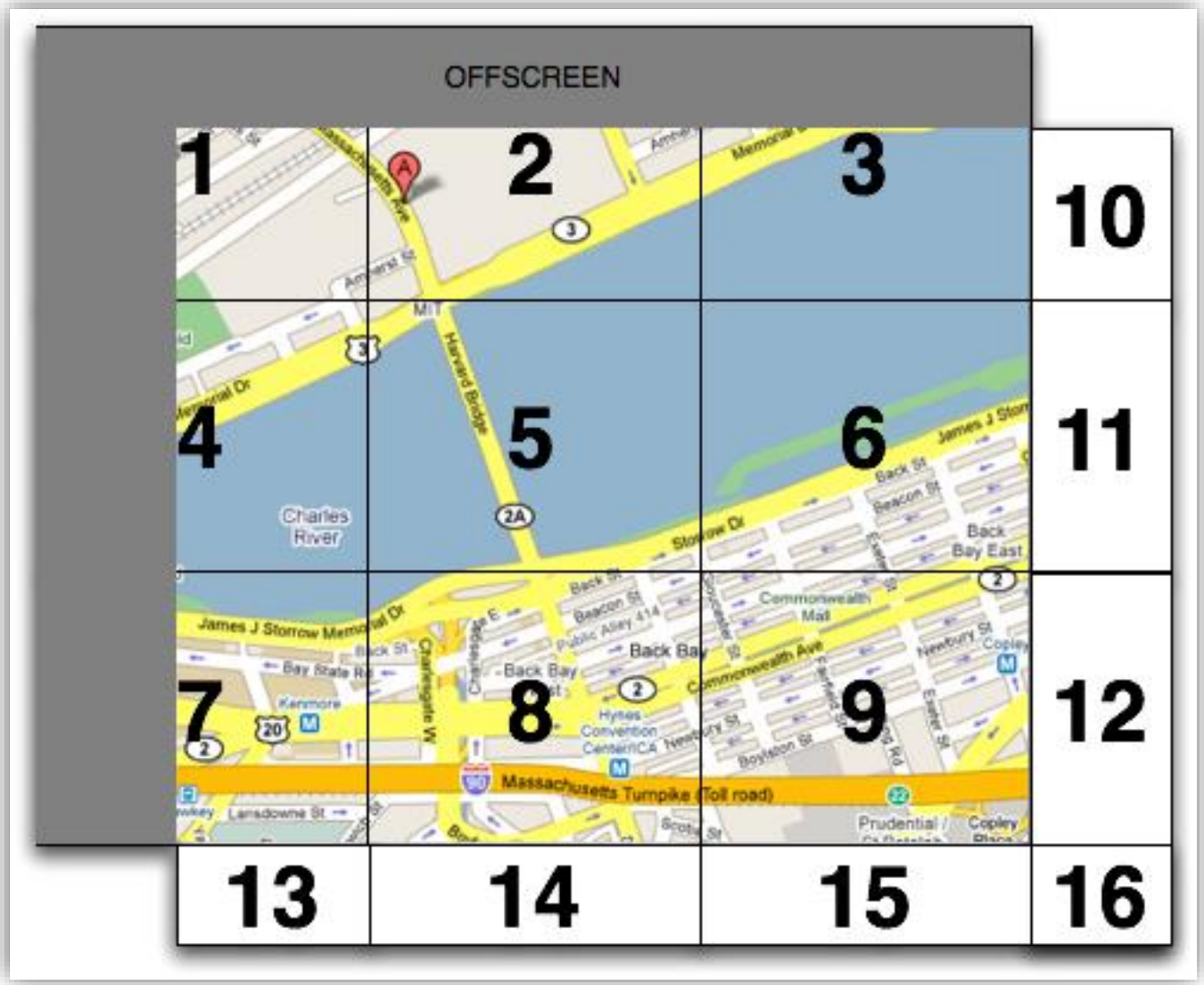
AJAX: thin client approach – the example (continued)

- Google maps

- Let’s suppose something fairly simplistic – a 3x3 grid of images.
- What happens if you drag the map up and to the left?

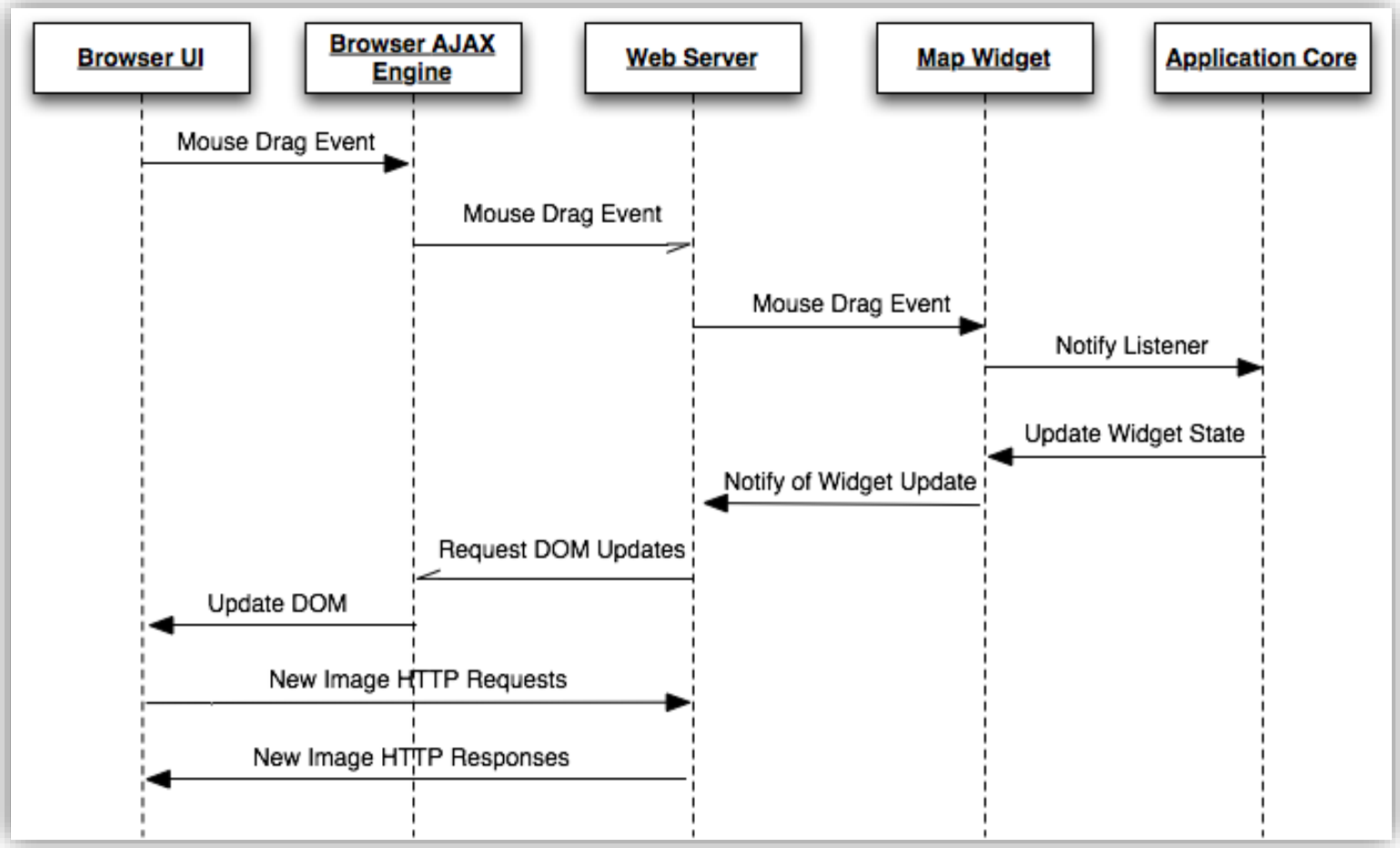
AJAX: thin client approach – the example (continued)

- Google maps



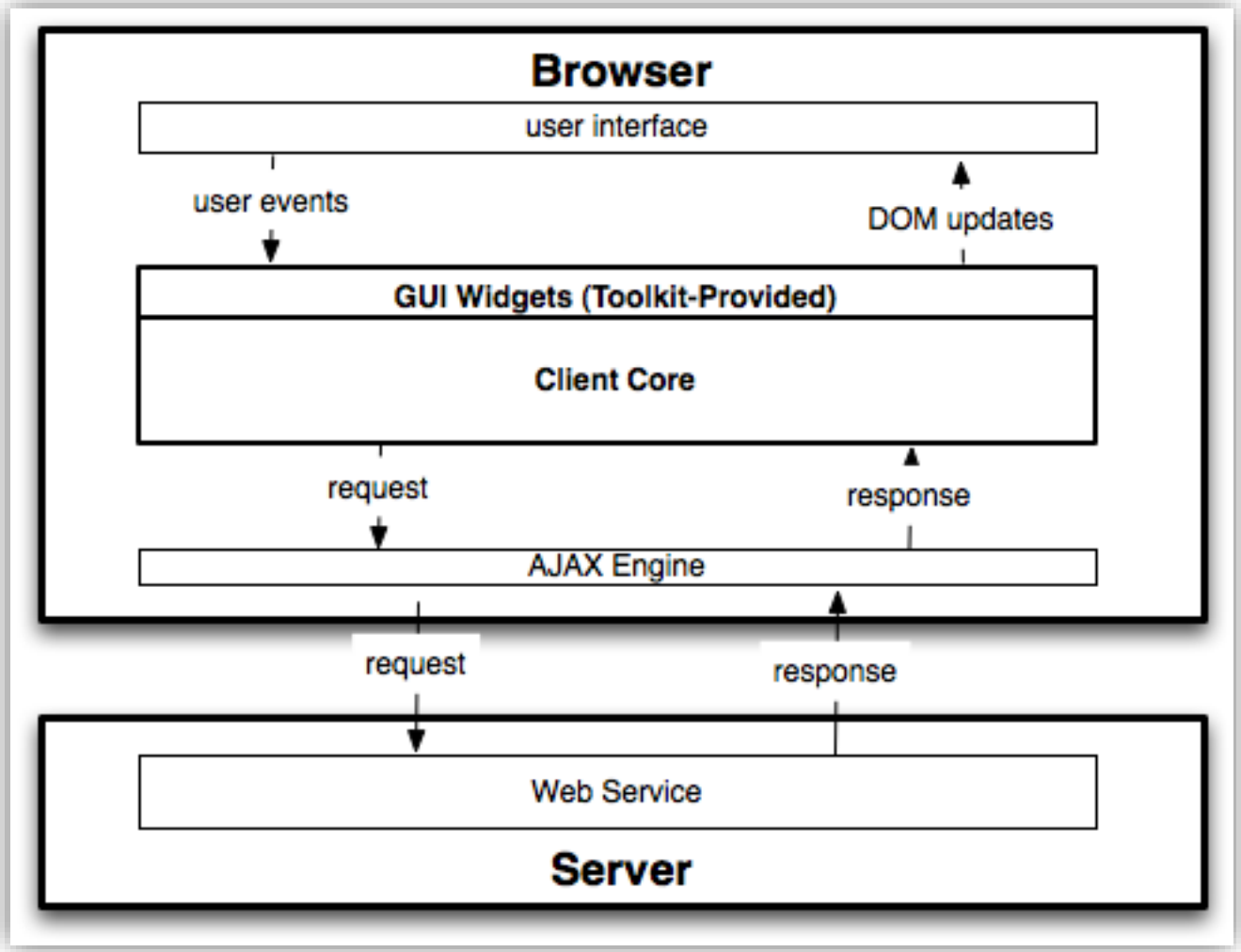
- 1) Top left of your original map goes off screen.
- 2) Shift existing images up and left.
- 3) Place images 10-16 on the screen.
- 4) Download those images. (Separate from previous step)

AJAX: thin client approach – the sequence



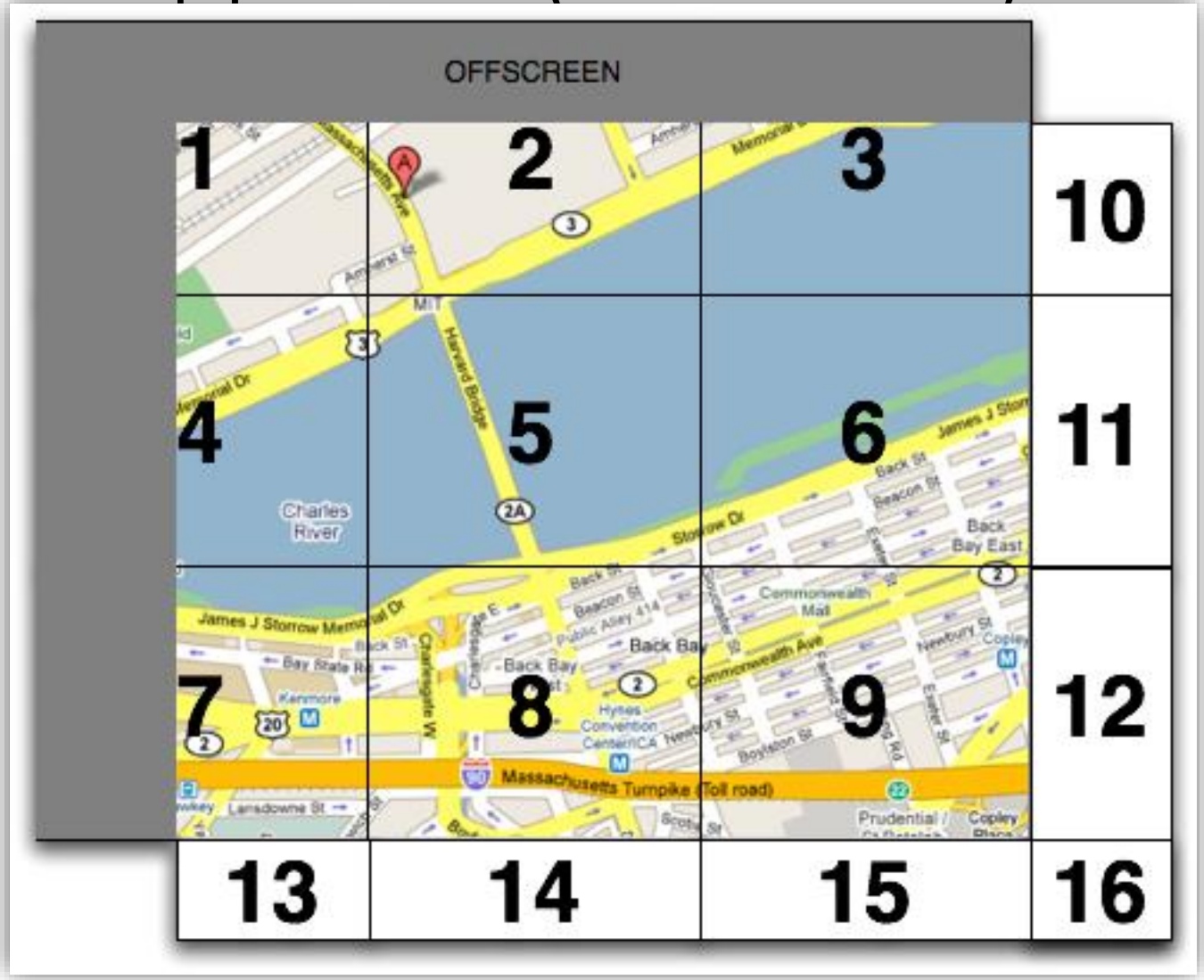
- "Update widget state" to include new images, new positions
- Note async and sync calls
- The first several requests just have to do with repositioning the DOM.
- Note that the images themselves will be fetched in a separate HTTP request

AJAX: fat client approach



- You write your application in the client core.
- You manipulate your widgets on the client side.
- Network-aware client application: If you need something from the server, you make a service call.
- Stateless server. It might just be a web service (or several web services)

AJAX: fat client approach (continued)



- Shift existing images.
- Download images 10-16 and place them on the screen.

AJAX: fat client approach – the sequence