IT4409: Web Technologies and e-Services

Lec 11: AJAX

Objectives

❖ …

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Outline

1. **...**
   - ...

2. **...**

Characteristics of Conventional Web Application

❖ "Click, wait, and refresh" user interaction

 Page refreshes from the server needed for all events, data submissions, and navigation

 The user must wait for the response

❖ Synchronous "request/response" communication model

❖ Browser always initiates the request

Issues of Conventional Web Application

❖ Slow response

❖ Loss of operation context during refresh

❖ Excessive server load and bandwidth consumption

❖ Lack of two-way, real-time communication capability for server-initiated updates

☐ These are the reasons why Rich Internet Application (RIA) technologies were born.

Web 2.0 Applications
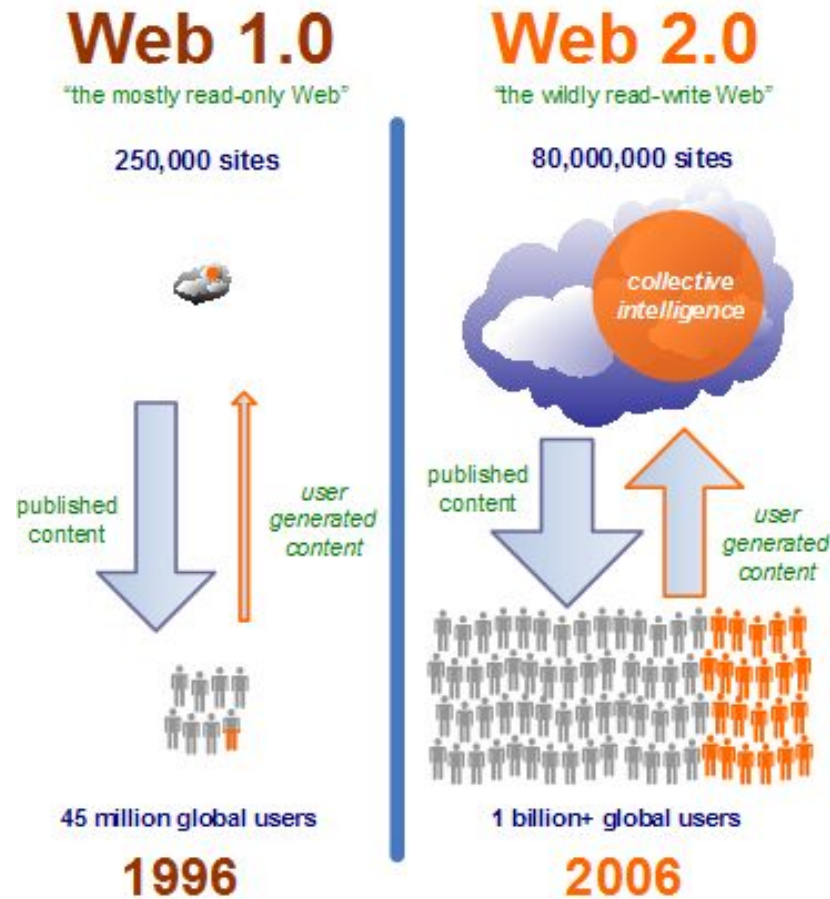
Web 2.0 Definition

Web 2.0 is the **network as platform**, spanning all connected devices; Web 2.0 applications are those that make the most of the intrinsic advantages of that platform: delivering software as a **continually-updated service** that gets better the more people use it, **consuming and remixing data** from multiple sources, including individual users, while providing their own data and services in a form that allows remixing by others, creating network effects through an "**architecture of participation**," and going beyond the page metaphor of Web 1.0 to deliver **rich user experiences**.

Tim O'Reilly, "Web 2.0: Compact Definition?"

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What Makes the Web 2.0 Different?

❖ Personalized

❖ User oriented

❖ Easy to Use

❖ Get you to the information you want

❖ Useful

❖ You can add more…

Rich Internet Application (RIA) Technologies
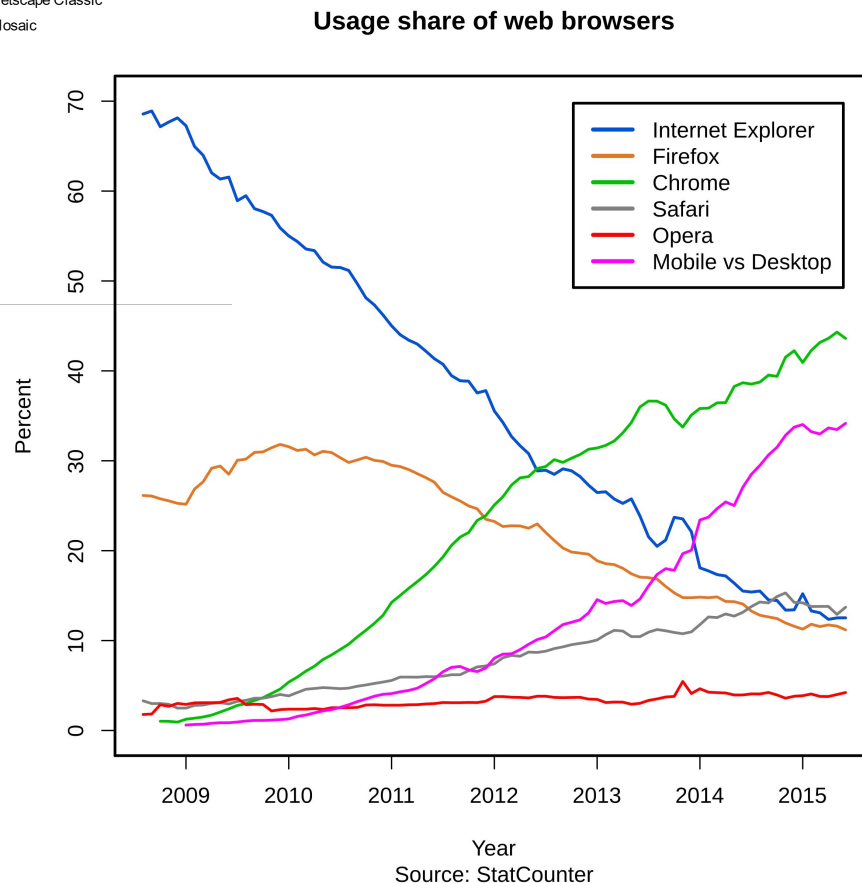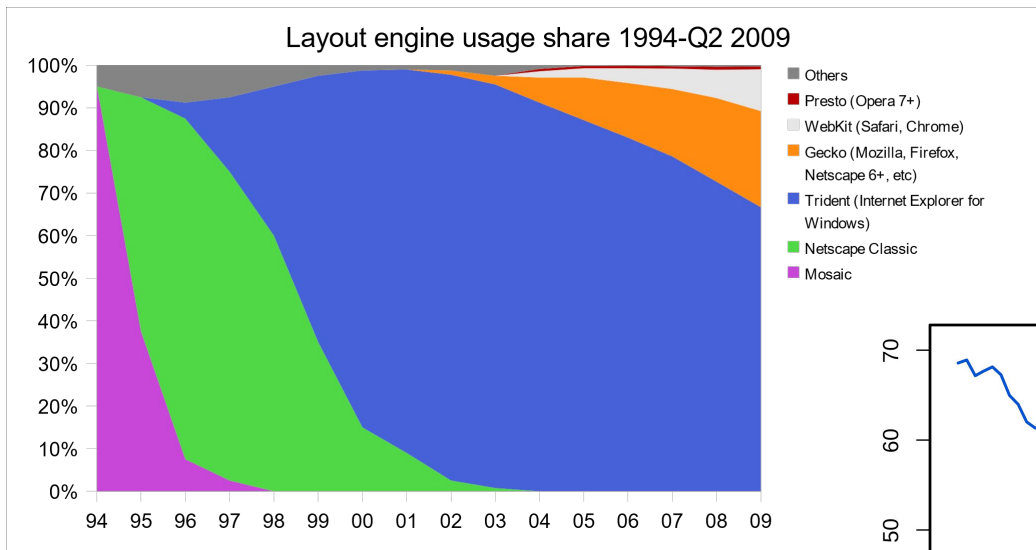
❖ Macromedia Flash

❖ Java Web Start

❖ Dynamic HTML (JavaScript + DOM + CSS)

❖ DHTML: No asynchronous communication
   ☐ full page refresh still required

❖ AJAX
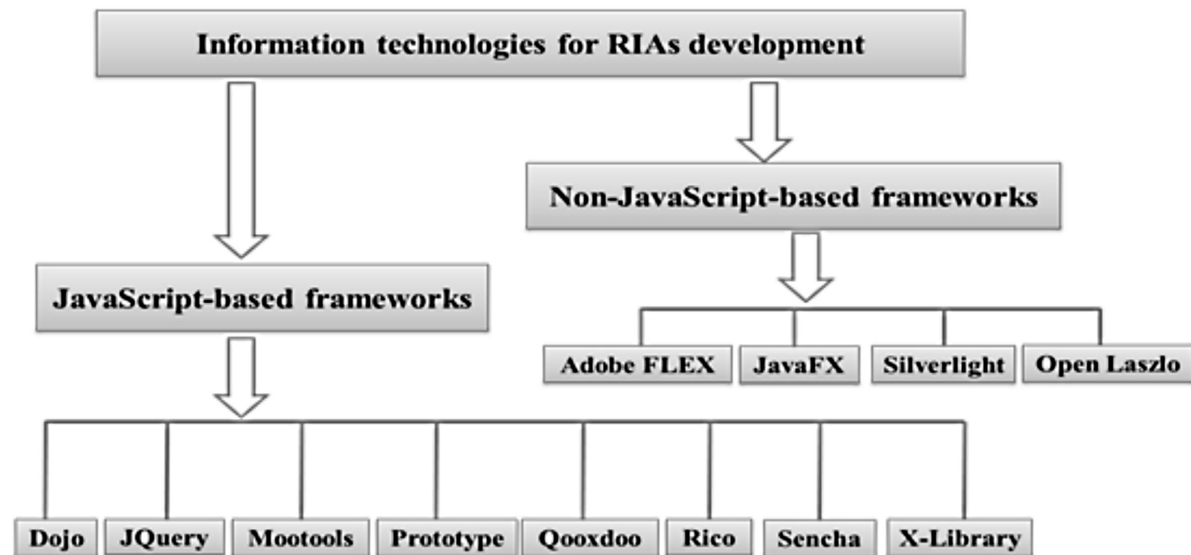
Browser wars

❖ https://en.wikipedia.org/wiki/Browser_wars

❖ competition for dominance in the usage share of web browsers.

❖ The "First Browser War" during the late 1990s pitted Microsoft's Internet
Explorer against Netscape's Navigator.

❖ Browser wars continued with the decline of Internet Explorer's market share and the popularity of other browsers
including Firefox, Google Chrome, Safari, and Opera.

 Diversity in Web application script languages

Browser wars: market data

Layout engine usage share 1994-Q2 2009

Legend:
- Others
- Presto (Opera 7+)
- WebKit (Safari, Chrome)
- Gecko (Mozilla, Firefox, Netscape 6+, etc)
- Trident (Internet Explorer for Windows)
- Netscape Classic
- Mosaic

Usage share of web browsers

Legend:
- Internet Explorer
- Firefox
- Chrome
- Safari
- Opera
- Mobile vs Desktop

Year
Source: StatCounter

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History of Ajax

- 199x: Techniques for the asynchronous loading of content is introduced with Java applets

- 1996, Internet Explorer introduced the IFrame element to HTML, which also enables this to be achieved.

- 1999, Microsoft created the XMLHTTP ActiveX control in Internet Explorer 5 using the native XMLHttpRequest object.

- However, this feature only became widely known after being used by Gmail (2004) and Google Maps (2005).

- The term "Ajax" itself was coined in 2005

AJAX Introduction

❖ **AJAX = Asynchronous JavaScript and XML**

❖ AJAX is not a new programming language, but a technique for creating better, faster, and more interactive web applications.

❖ With AJAX, your JavaScript can communicate directly with the server, using the JavaScript **XMLHttpRequest** object. With this object, your JavaScript can trade data with a web server, without reloading the page.

❖ AJAX uses asynchronous data transfer (HTTP requests) between the browser and the web server, allowing web pages to request small bits of information from the server instead of whole pages.

❖ The AJAX technique makes Web applications smaller, faster and more user-friendly.

About AJAX

❖ **AJAX is based on the following web standards:**
  - JavaScript
  - XML
  - HTML
  - CSS
  - DOM

❖ **The web standards used in AJAX are well defined now and supported by all major browsers. AJAX applications are browser and platform independent.**

DOM

- The **Document Object Model** (**DOM**)
  - platform- and language-independent
  - standard object model for representing HTML or XML documents
- DOM provides an API for querying, traversing and manipulating such documents
- It defines the logical structure of documents and the way a document is accessed and manipulated.
  - programmers can build documents, navigate their structure, and add, modify, or delete elements and content of HTML and XML
  - DOM uses objects to model elements of documents.
- XML presents data as documents, and the DOM may be used to manage this data.
- DOM is a model and is implemented in different language: Javascript, VBscript, Java…
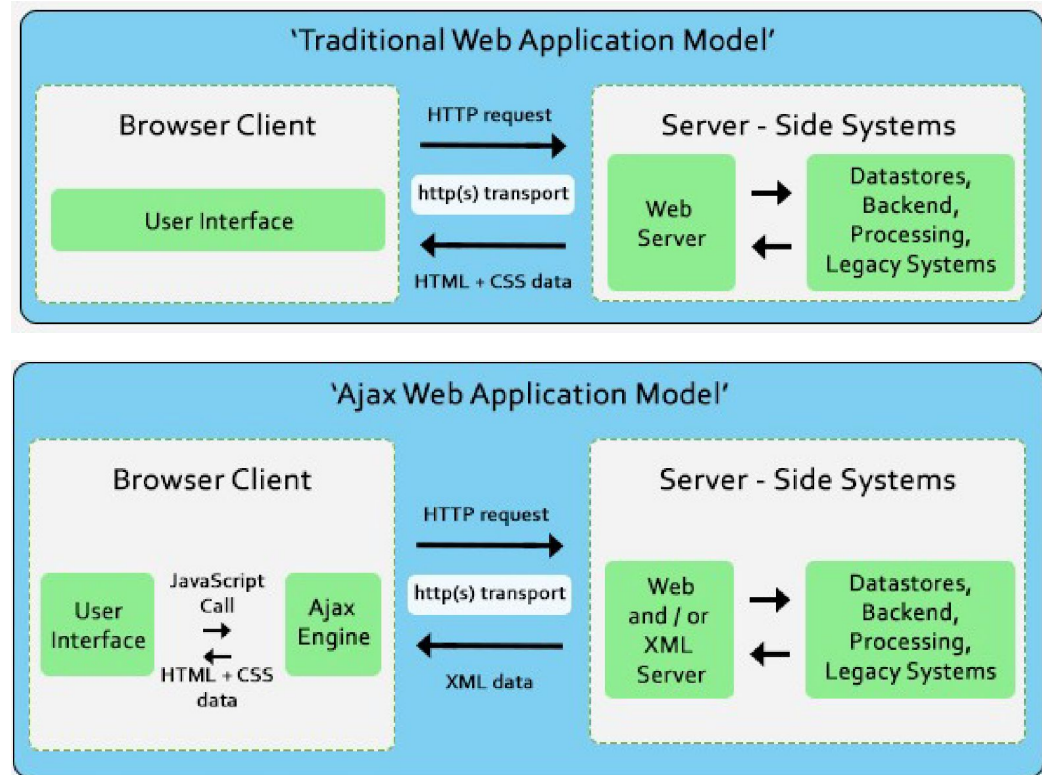
DOM (cont.)

```
<TABLE>
 <TBODY>
    <TR>
        <TD>Shady Grove</TD>
        <TD>Aeolian</TD>
    </TR>
    <TR>
        <TD>Over the River, Charlie</TD>
        <TD>Dorian</TD>
    </TR>
</TBODY>
</TABLE>
```
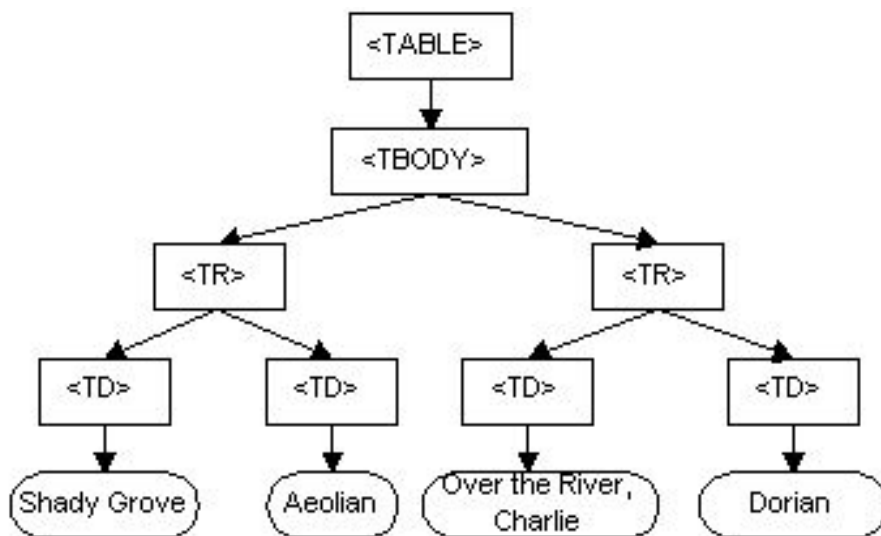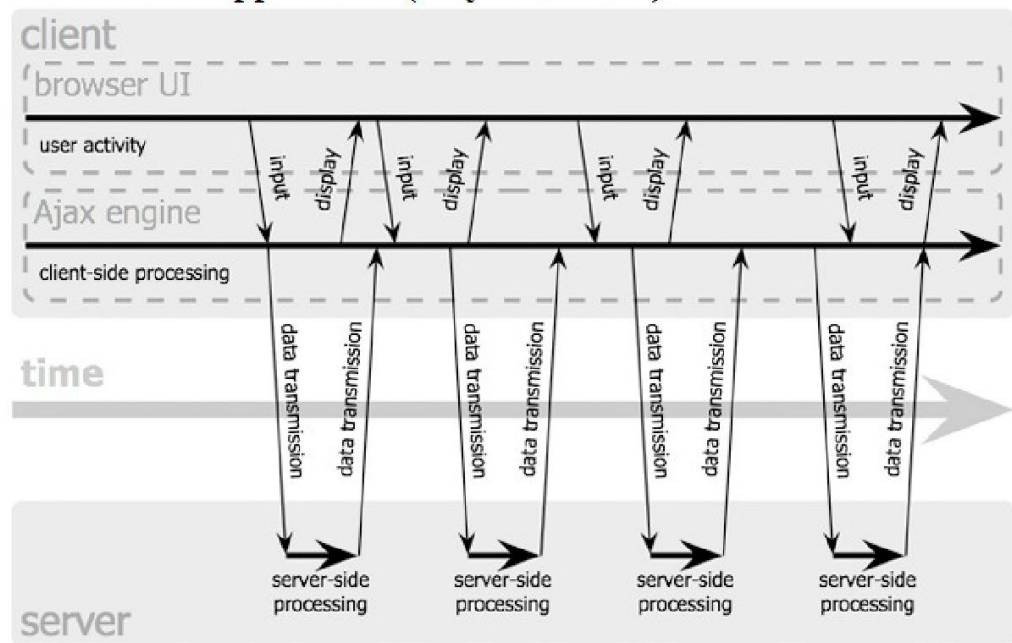

DOM representation

AJAX Architecture

❖ Ajax application eliminates the start-stop-start-stop nature of interaction on the Web by introducing an intermediary - an Ajax engine - between the user and the server

❖ Instead of loading a webpage, at the start of the session, the browser loads an Ajax engine.

❖ AJAX engine is responsible for both rendering the interface the user sees and communicating with the server on the user's behalf.

'Traditional Web Application Model'

Browser Client
User Interface

HTTP request
http(s) transport
HTML + CSS data

Server - Side Systems
Web Server → Datastores, Backend, Processing, Legacy Systems

'Ajax Web Application Model'

Browser Client
User Interface → JavaScript Call → Ajax Engine
HTML + CSS data

HTTP request
http(s) transport
XML data

Server - Side Systems
Web and / or XML Server → Datastores, Backend, Processing, Legacy Systems

AJAX Asynchronous Communication

❖ The Ajax engine allows the user's interaction with the application to happen asynchronously - independent of communication with the server.

❖ Every user action that normally would generate an HTTP request takes the form of a JavaScript call to the Ajax engine instead.

❖ If the engine needs something from the server in order to respond to the browser, the engine makes those requests asynchronously using java script XMLHttpRequest.

AJAX Web Application (Asynchronous)

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AJAX tutorial by samples