Cloud Computing Lecture #7

Introduction to Ajax

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What is Cloud Computing?

1. Web-scale problems
2. Large data centers
3. Different models of computing
4. Highly-interactive Web applications

Source: Wikipedia

Ajax

- **Asynchronous JavaScript and XML:** an approach for building interactive Web applications
- Ajax refers to a number of technologies:
  - XHTML/CSS for presentation
  - XML for data exchange (or JSON)
  - XMLHttpRequest object for asynchronous communication
  - JavaScript to tie everything together

From "old-school" Web applications to Ajax…

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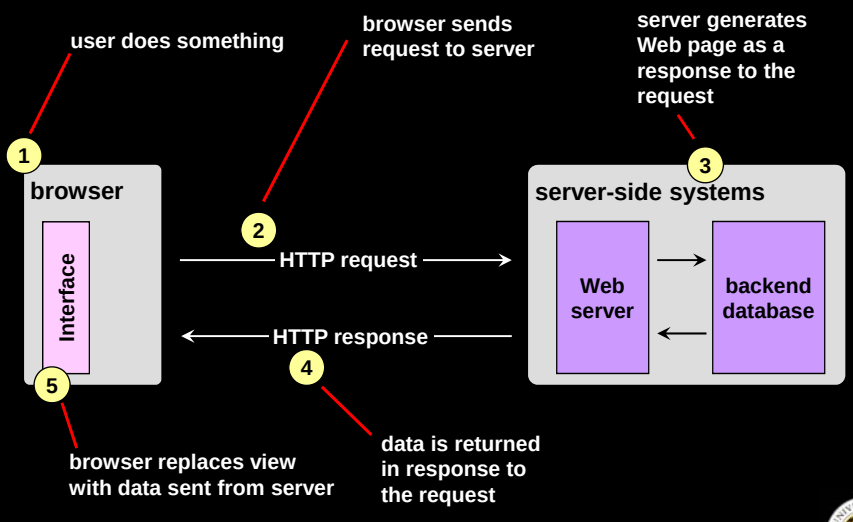
"Old-School" Web Applications



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Characteristics

- **User-driven:** Things only happen when the user does something (e.g., clicks on a link or button)
- **Views defined by URLs:** You can bookmark something and come back to it; use the forward/backward button
- **Simple user interaction model:** Not that many things you can do in browser
- **Synchronous Interaction:** System responses are synchronized with user-driven events

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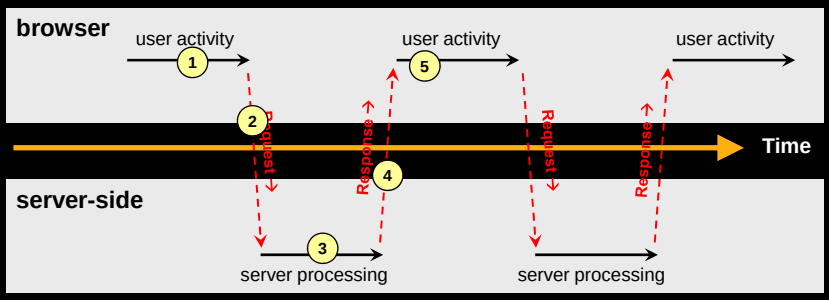
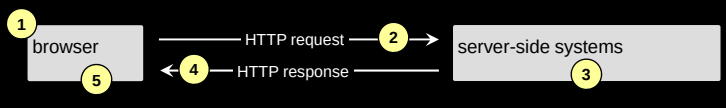
Synchronous Interactions





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So what do you run on the server side?

L Linux

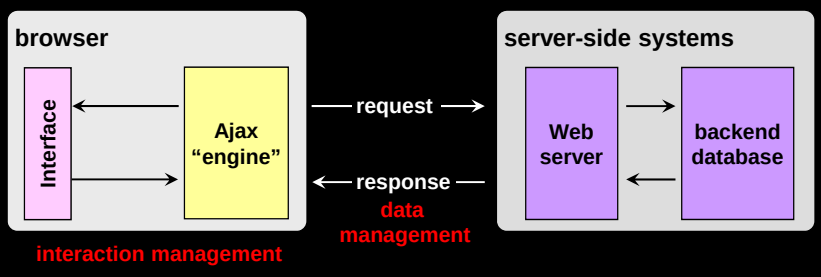
A Apache

M MySQL

P PHP/Python/Perl

From "Old-School" to Ajax

Ajax intermediates between the interface and the server.



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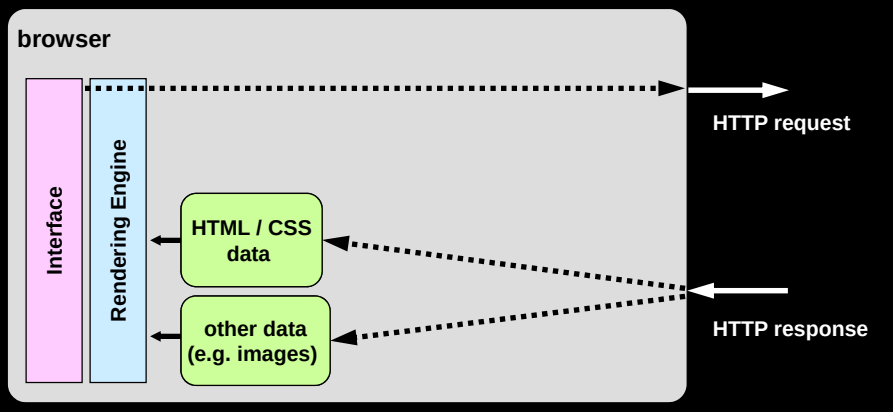
Inside the Browser



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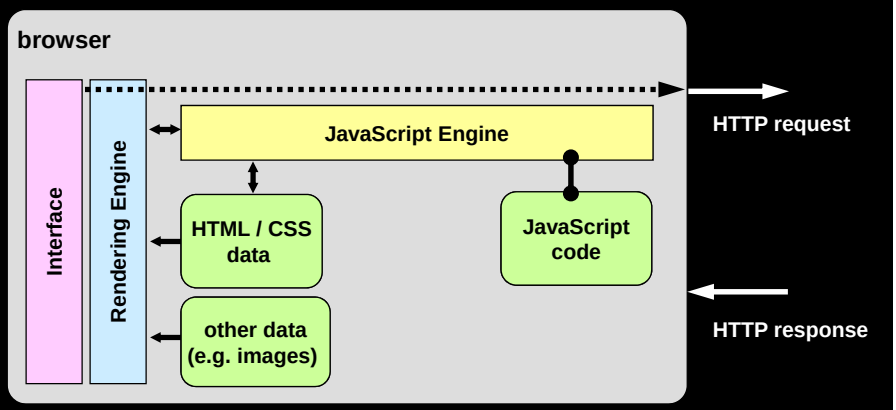
Enter JavaScript



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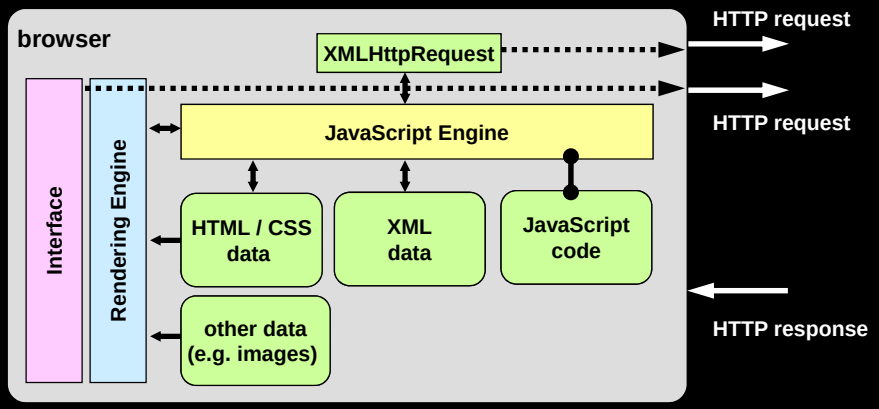
Enter Ajax



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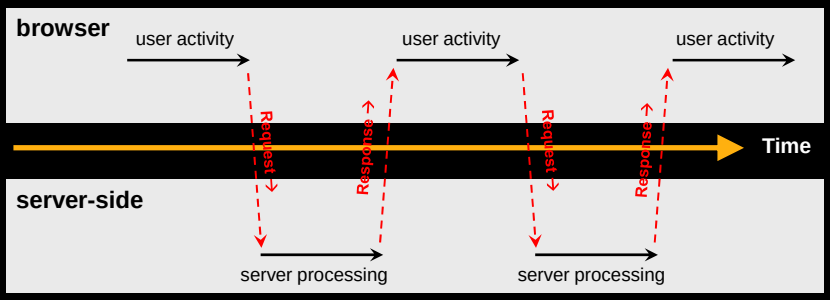
From Synchronous Interactions...



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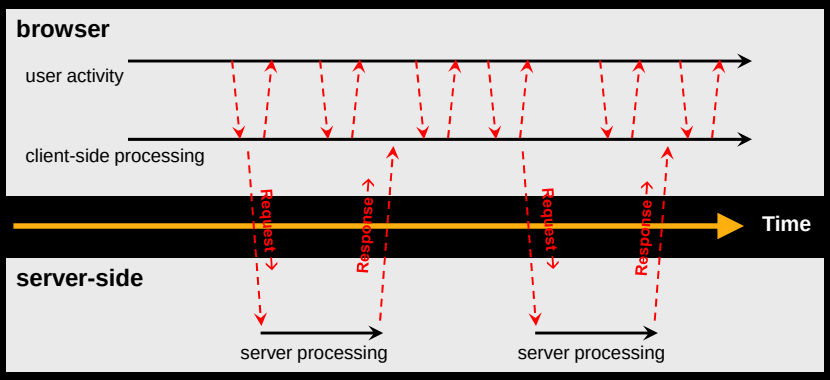
To asynchronous Interactions



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Components of an Ajax Interaction

1. A client event occurs (captured by JavaScript event handlers)
2. An XMLHttpRequest object is created and configured
3. An asynchronous request is made to the server via the XMLHttpRequest object
4. Server processes request and returns data, executing a callback in the XMLHttpRequest object
5. The HTML DOM is updated based on response data

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DOM

- **Document Object Model:** platform- and language-independent way to represent XML
  - Adopts a tree-based representation
  - W3C standard, supported by modern browsers
- JavaScript uses DOM to manipulate content
  - To process user events
  - To process server responses (via XMLHttpRequest)

Ajax: Things to watch out for!

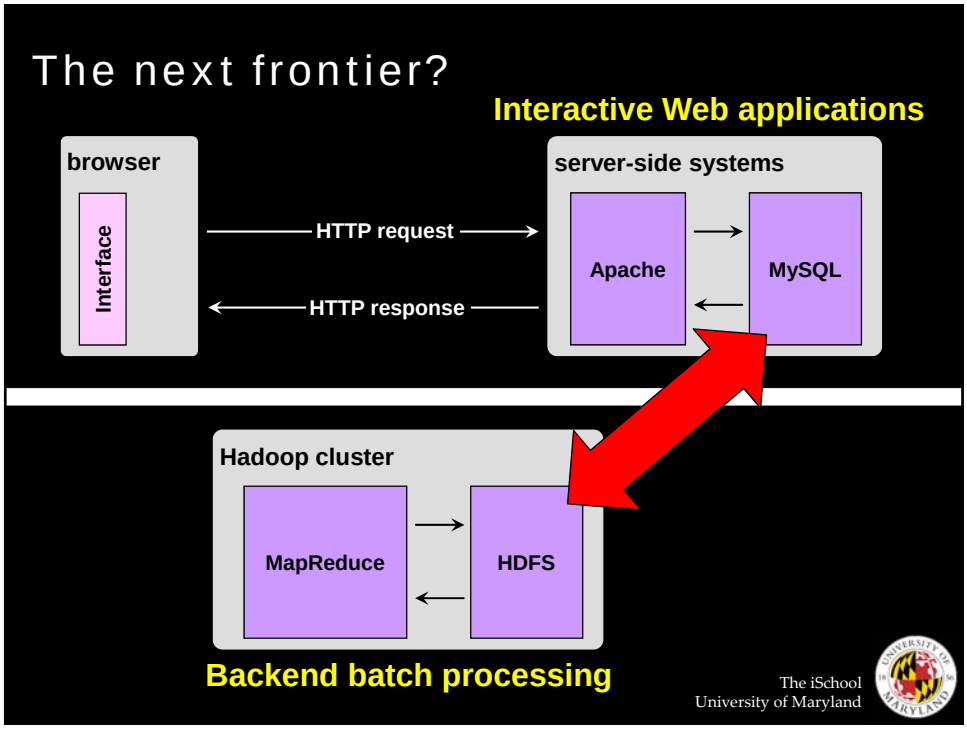
- Hype
  - Best thing since sliced bread?
- Application development/maintenance cost
  - Brower incompatibilities
  - Many different approaches and tools
  - For many things, lack of agreed-on best practices
- Behavior is not 'Web-like'
  - Standard things often don't work correctly (e.g., browser 'back' button, bookmarks)
  - Usability issues for users with disabilities
- Security issues
  - Whole new class of cross-site scripting (XSS) exploits

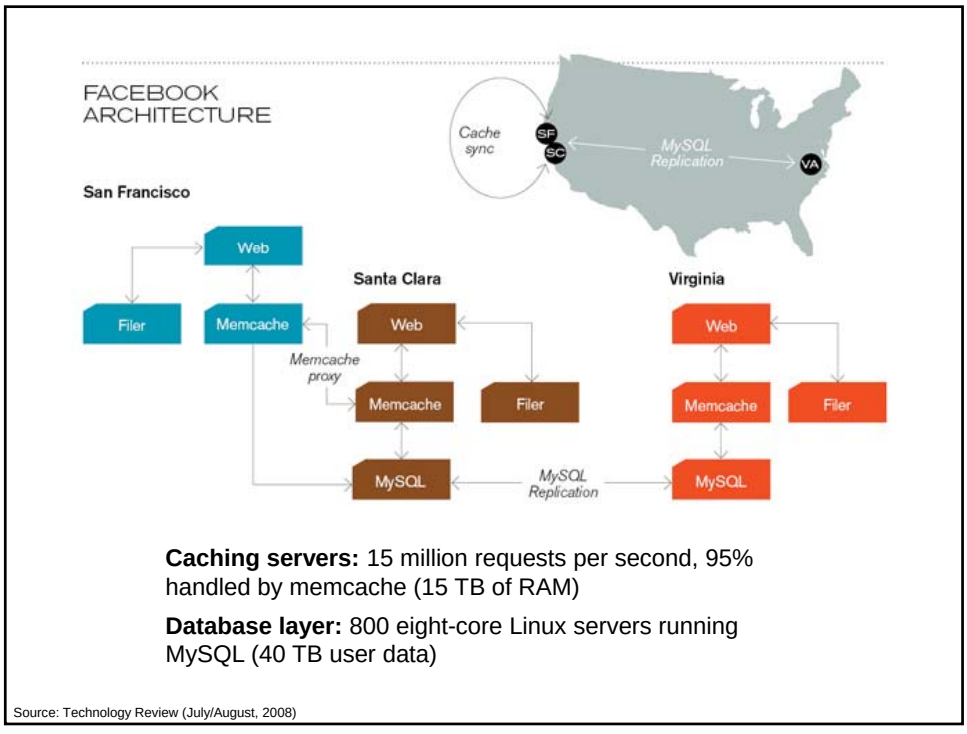
Making your life easier...

- **Dojo:** really cool set of interface widgets
  http://www.dojotoolkit.org/
- **Direct Web Remoting:** RPC library for calling server-side Java from client-side JavaScript.
  http://directwebremoting.org/
- **jQuery:** supports chaining of expressions for more concise code.
  http://jquery.com/
- **Prototype:** provides support for more traditional object-oriented programming
  http://www.prototypejs.org/

Learning Ajax

- Bewildering options:
  - PHP vs. Python vs. Perl vs. ASP vs. JSP …
  - XML vs. JSON
  - Countless toolkits, frameworks, libraries, etc.
- Amazing amount of information online:
  - Numerous Web tutorials
  - Learn by example
  - Learn by building





Caching servers: 15 million requests per second, 95% handled by memcache (15 TB of RAM)

Database layer: 800 eight-core Linux servers running MySQL (40 TB user data)

Source: Technology Review (July/August, 2008)