AJAX

Brief History of Web Applications

- Early days (pre-1996): static HTML files only
- Common Gateway Interface (CGI)
  - Some URLs map to executable programs
  - Program exits after the web page is sent to client
- Introduced the notion of stateless servers: each request is independent
- Perl was commonly used for writing CGI programs (also Python and other scripting languages).

First-generation web app frameworks

- Examples: PHP, ASP.net, Java servlets
- Templates: mix code and HTML
- Web-specific library packages:
  - URL handling
  - HTML generation
  - Sessions
  - Interfacing to databases

Second-generation frameworks

- Examples: Ruby on Rails, Django, Java Spring
- Model-view-controller: decomposition of applications
- Object-relational mapping (ORM) simplifies database access

Third-generation frameworks

- Examples: AngularJS, ReactJS
- JavaScript frameworks running in browser
  - Much more of the application runs in the browser
  - Interactive, responsive applications
- Frameworks not as dependent on particular server-side features
  - Server primary stores and serves data
- Many concepts of previous generations still apply

Ajax

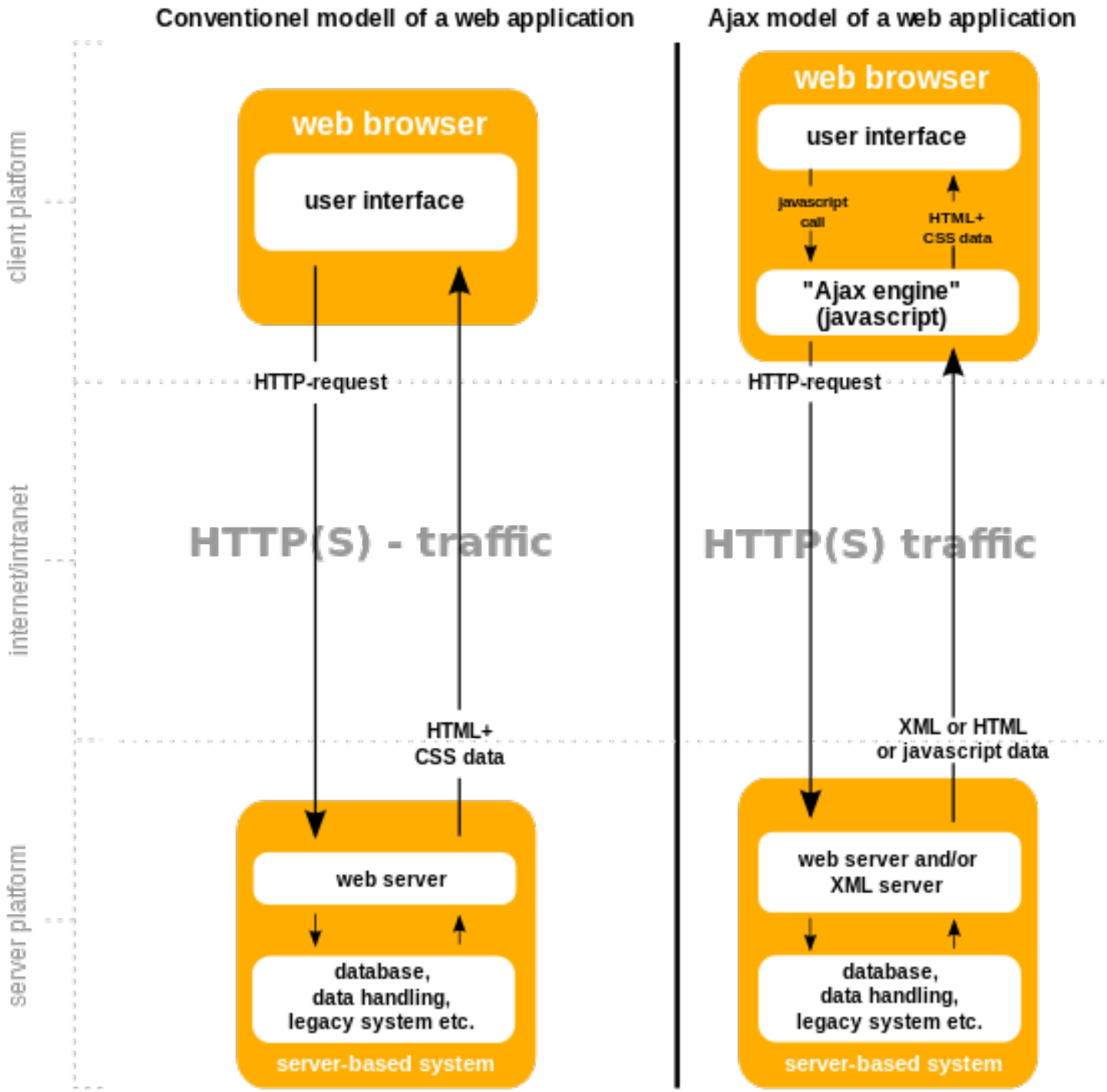
- **A**synchronous **J**avascript **a**nd **X**ML
- 1996, Microsoft used iframe tags to load data asynchronously
  - dynamically update news stories and stock quotes
- 1999 Microsoft created the `XMLHttpRequest` JavaScript object

- Google made extensive use of standards-compliant cross browser Ajax in Gmail (2004).

- XMLHttpRequest allowed JavaScript inside web pages to do something they could never really do before: get more data. (http://www.aaronsw.com/weblog/ajaxhistory)

Ajax

1. User interaction invokes an **event** handler.
2. The event handler's code creates an **XMLHttpRequest** object.
3. The XMLHttpRequest object **requests a page** from the server.
4. The **server** retrieves appropriate data based on the page requested and sends it back.
5. The XMLHttpRequest object fires an event (a **callback**) when the data arrives, often a function.
6. The callback event handler processes the data and updates the DOM accordingly.



XML

- XML (eXtensible Markup Language) is a generic, platform-independent, “meta” format for encoding semantic, human- readable, self-describing documents.
- XML data is used on the web in many ways:
  - Web servers that store data as XML files.
  - Databases that return query results as XML.
  - Web services that use XML to communicate.

Example

```
<?xml version="1.0" encoding="UTF-8"?>
<note> <!-- root element -->

 <to>Tove</to>
 <from>Jani</from> <!-- element ("tag") -->

 <subject>Reminder</subject>

 <message language="english">

 Bring the xbox &amp; kinect! </message>

</note>
```

- The power of XML is as a universal format for the exchange of data.
- XML can use a schema or a DTD (Document Type Definition) to describe the structure/markup and content ... or not.
- Using one of these standardizes the data for integrity and interoperability purposes.

JSON

- JavaScript Object Notation is a language-independent convention for formatting data as a set of JS objects.
- Made up of a collection of name/value pairs (object) that can also include an ordered list of values (array).

Example

```
{
 "private": "true",
 "from": "Alice Smith (alice@example.com)",
 "to": [
    "Robert Jones (roberto@example.com)",
    "Charles Dodd (cdodd@example.com)"
    ],
 "subject": "Tomorrow's \"Birthday Bash\" event!",
 "message": {
    "language": "english",
    "text": "See you at my place!”
  }
}
```

Ajax and JSON

- If you're using Ajax to access a page that serves JSON-formatted data, you can use these JavaScript methods to parse and convert.

JSON.parse(string)

  - Converts the given string of JSON data into an equivalent JavaScript object and returns it.

JSON.stringify(object)

  - Converts the given object into a string of JSON data (the opposite of JSON.parse).

Ajax and JQuery

```
$.ajax({
    url: "/api/getWeather",
    data: {
        zipcode: 97201
    },
    success: function( data ) {
        $( “#weathertemp" ).html( "<strong>"
                + data + "</strong> degrees" );
    }
});
```

- You should tell jQuery AJAX what dataType you're expecting: text, html, xml, json ...

- Same-origin policy: Unless it's a **jsonp** type (from another domain), must come from same protocol (http or https), same port, and same domain as request page.