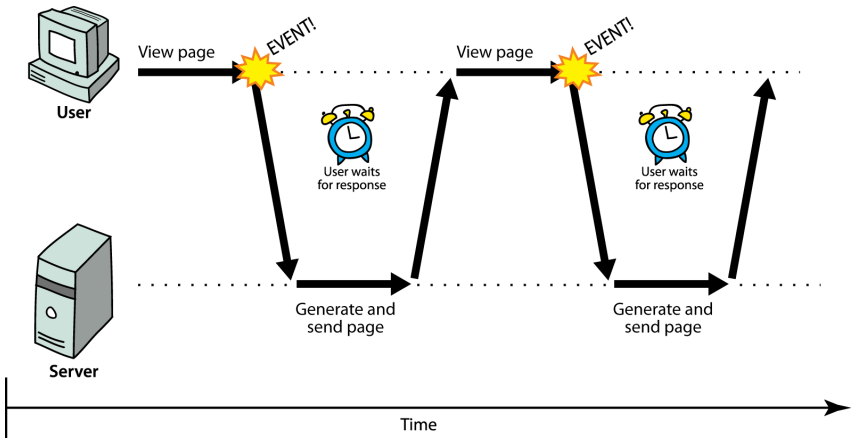
Web Programming Step by Step

Lecture 19
Ajax
Reading: 10.1 - 10.2

Synchronous web communication (10.1)

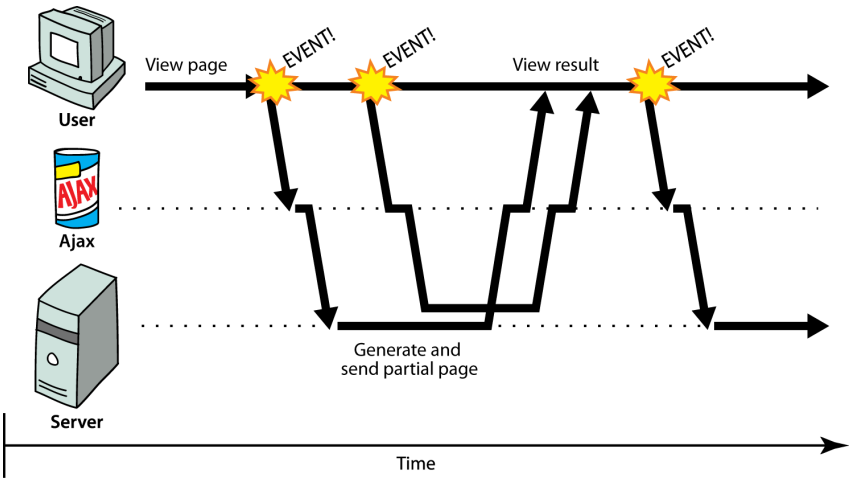


- **synchronous**: user must wait while new pages load
  - the typical communication pattern used in web pages (click, wait, refresh)

Web applications and Ajax

- **web application**: a dynamic web site that mimics the feel of a desktop app
  - presents a continuous user experience rather than disjoint pages
  - examples: Gmail, Google Maps, Google Docs and Spreadsheets, Flickr, A9
- **Ajax**: Asynchronous JavaScript and XML
  - not a programming language; a particular way of using JavaScript
  - downloads data from a server in the background
  - allows dynamically updating a page without making the user wait
  - avoids the "click-wait-refresh" pattern
  - examples: UW's CSE 14x Diff Tool, Practice-It; Google Suggest

Asynchronous web communication



- **asynchronous**: user can keep interacting with page while data loads
  - communication pattern made possible by Ajax

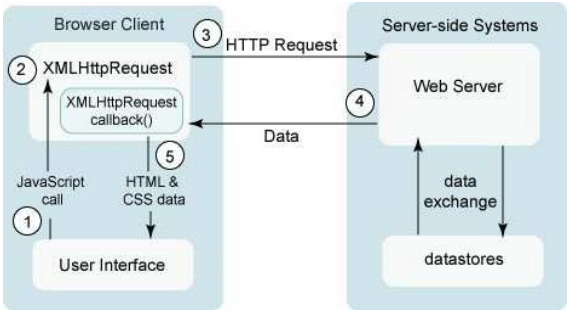
`XMLHttpRequest` (and why we won't use it)

- JavaScript includes an `XMLHttpRequest` object that can fetch files from a web server
  - supported in IE5+, Safari, Firefox, Opera, Chrome, etc. (with minor compatibilities)
- it can do this **asynchronously** (in the background, transparent to user)
- the contents of the fetched file can be put into current web page using the DOM

- sounds great!...
- ... but it is clunky to use, and has various browser incompatibilities
- Prototype provides a better wrapper for Ajax, so we will use that instead

A typical Ajax request

1. user clicks, invoking an event handler
2. handler's code creates an `XMLHttpRequest` object
3. `XMLHttpRequest` object requests page from server
4. server retrieves appropriate data, sends it back
5. `XMLHttpRequest` fires an event when data arrives
   - this is often called a **callback**
   - you can attach a handler function to this event
6. your callback event handler processes the data and displays it



Prototype's Ajax model (10.2.4)

```
new Ajax.Request("url",
  {
    option : value,
    option : value,
    ...
    option : value
  }
);
```
JS

- construct a Prototype `Ajax.Request` object to request a page from a server using Ajax
- constructor accepts 2 parameters:
  1. the **URL** to fetch, as a String,
  2. a set of **options**, as an array of *key* : *value* pairs in { } braces (an anonymous JS object)
- hides icky details from the raw `XMLHttpRequest`; works well in all browsers

Prototype Ajax methods and properties

option	description
`method`	how to fetch the request from the server (default `"post"`)
`parameters`	query parameters to pass to the server, if any
`asynchronous` (default `true`), `contentType`, `encoding`, `requestHeaders`	

options that can be passed to the `Ajax.Request` constructor

event	description
`onSuccess`	request completed successfully
`onFailure`	request was unsuccessful
`onException`	request has a syntax error, security error, etc.
`onCreate`, `onComplete`, `on###` (for HTTP error code ###)	

events in the `Ajax.Request` object that you can handle

Basic Prototype Ajax template

```
  new Ajax.Request("url",
    {
      method: "get",
      onSuccess: functionName
    }
  );
  ...

function functionName(ajax) {
  do something with ajax.responseText;
}
```
JS

- most Ajax requests we'll do in this course are GET requests
- attach a handler to the request's `onSuccess` event
- the handler takes an Ajax response object, which we'll name `ajax`, as a parameter

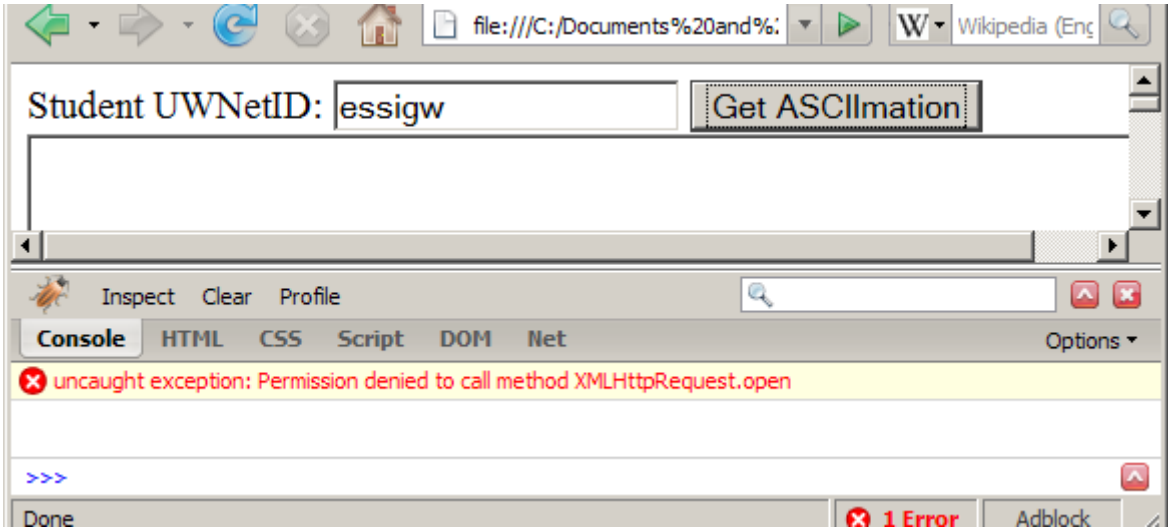
The Ajax response object

property	description
`status`	the request's HTTP error code (200 = OK, etc.)
`statusText`	HTTP error code text
`responseText`	the entire text of the fetched page, as a `String`
`responseXML`	the entire contents of the fetched page, as an XML DOM tree (seen later)

```
function handleRequest(ajax) {
  alert(ajax.responseText);
}
```
JS

- most commonly property is `responseText`, to access the fetched page

`XMLHttpRequest` security restrictions



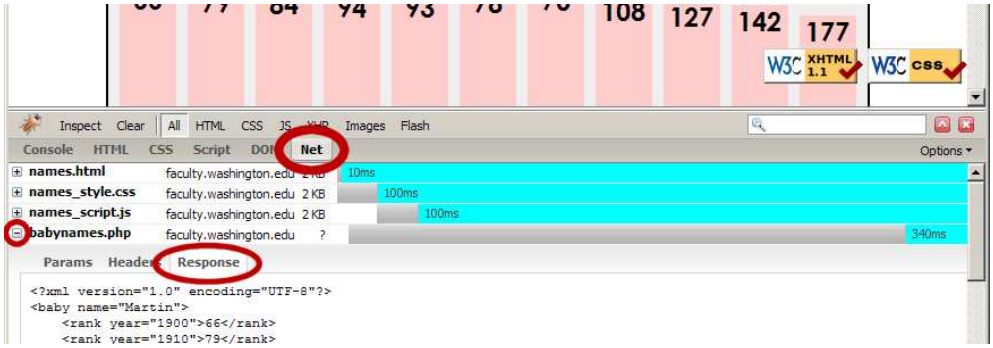
- cannot be run from a web page stored on your hard drive
- can only be run on a web page stored on a web server
- can only fetch files from the same site that the page is on
    - `www.foo.com/a/b/c.html` can only fetch from `www.foo.com`

Handling Ajax errors

```
  new Ajax.Request("url",
    {
      method: "get",
      onSuccess: functionName,
      onFailure: ajaxFailure,
      onException: ajaxFailure
    }
  );
  ...
function ajaxFailure(ajax, exception) {
  alert("Error making Ajax request:" +
        "\n\nServer status:\n" + ajax.status + " " + ajax.statusText +
        "\n\nServer response text:\n" + ajax.responseText);
  if (exception) {
    throw exception;
  }
}
```
JS

- for user's (and developer's) benefit, show an error message if a request fails

Debugging Ajax code



- **Net** tab shows each request, its parameters, response, any errors
- expand a request with + and look at **Response** tab to see Ajax result

Creating a `POST` request

```
new Ajax.Request("url",
  {
    method: "post",    // optional
    parameters: { name: value, name: value, ..., name: value },
    onSuccess: functionName,
    onFailure: functionName,
    onException: functionName
  }
);
```
JS

- `Ajax.Request` can also be used to post data to a web server
- `method` should be changed to `"post"` (or omitted; `post` is default)
- any query parameters should be passed as a `parameters` parameter
  - written between { } braces as a set of *name* : *value* pairs (another anonymous object)
  - `get` request parameters can also be passed this way, if you like

Prototype's Ajax Updater

```JS
new Ajax.Updater(
  "id",
  "url",
  {
    method: "get"
  }
);
```

- `Ajax.Updater` fetches a file and injects its content into an element as `innerHTML`
- additional (1st) parameter specifies the `id` of element to inject into