

Web Technologies

6.9.2010

Overview (60 min)

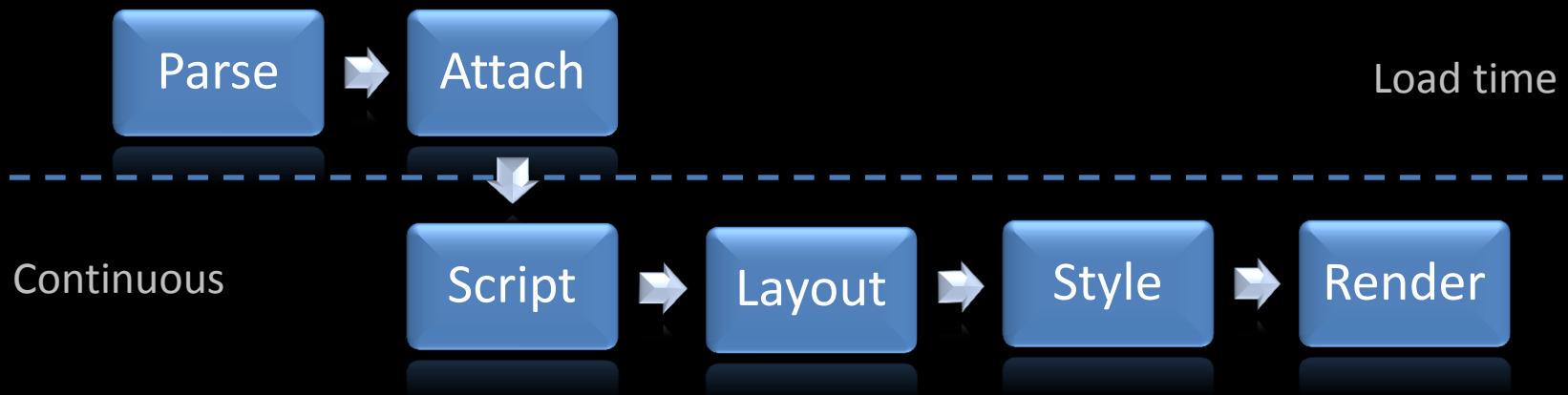
- Browser Engine Architecture (5 min)
- Hypertext Markup Language 5 (10 min)
- Cascading Style Sheets 3 (10 min)
- JavaScript (10 min)
- Asynchronous JavaScript and XML (5 min)
- Web Graphics Library (5 min)
- Scripted C# (5 min)
- Questions (10 min)

Browser

Modules

- HTML Layout (e.g. Trident, Gecko, WebKit)
- JavaScript engine (e.g. V8)
- CSS (fairly thin)
- Language support
- Network subsystem (e.g. urlmon)

High Level Process



HTML5

HTML5 Feature Set

Standard

Video tag (h.264)
Audio tag (mp3, aac)
Post Message
Local Storage
Geolocation
Drag'n'Drop
Bitmap Canvas
Frame/Tab Sandbox
Web Workers
Web Forms 2.0 (with EC)
Indexed Database API
Other New Tags

Extensions

Web Graphics Library
Web Audio Library
Web Sockets
Web SQL
Web Input
CSS 3D Transforms
CSS 3D Animation
Shared Objects

Conventions

- `<script></script>` *implies* JavaScript
- `<style></style>` *implies* CSS
- Strive to always use the most appropriate tag

Canvas Features

- Fully integrated into the document tree
 - Conforms to layout, receives messages, can be styled, JavaScript control
- Pixel plotting
- Text
- Transforms

Canvas Features (cont'd)

- Shapes:
 - Rectangles
 - Curves (bezier and quadratic)
 - Paths
 - Lines
- Effects:
 - Composition
 - Blending
 - Gradients
 - Shadows
 - Patterns
- Easily load images into and out of canvas

Canvas Example

JavaScript

```
var canvas = document.getElementById( 'surface' ); // acquire surface
var context = canvas.getContext( '2d' ); // acquire 2d context
context.fillStyle = '#00f'; // set the fill color to blue
context.fillRect (20, 20, 180, 90); // perform the fill
```

HTML

```
<canvas id="surface" width="200" height="110">
You lack canvas support!
</canvas>
```

Webpage



Video Features

- Fully integrated into the document tree
 - Conforms to layout, receives messages, can be styled
- JavaScript control with per-frame granularity
- Use default control UI, or build your own
- Placeholder image
- Can be rendered in a canvas object
- Keyboard accessibility
- Codec selection
- Caveats:
 - Streaming or protected content
 - Codec wars

Video Example

JavaScript

```
var video= document.getElementsByTagName( 'video' ); // acquire video
```

HTML

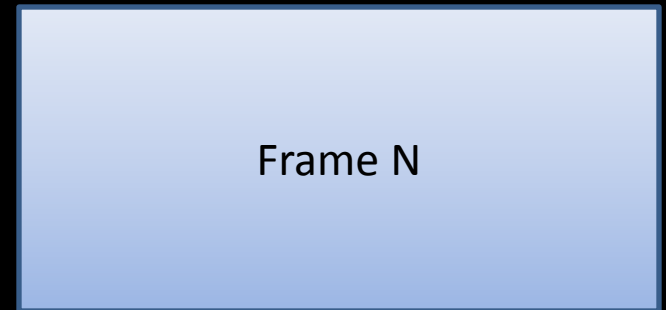
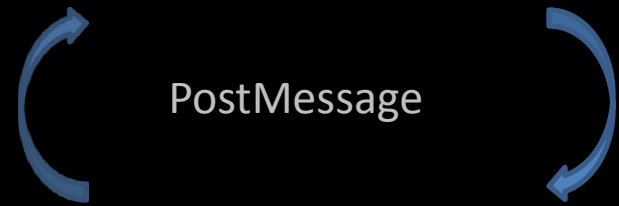
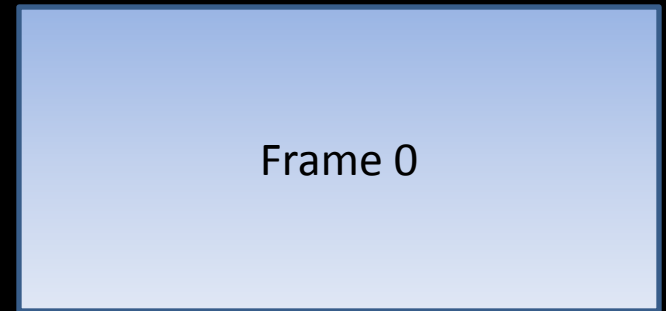
```
<video src="video.avi" width="100%" height="100%" controls>  
  <source src="video.ogv" type="video/ogg">  
  <source src="video.xmv" type="video/xmv">  
You lack video support!  
</video>
```

Webpage



Post Message

```
<html>
  ...
  <iframe id="frame-0" >
    ...
    dest.postMessage( msg );
    ...
  </iframe>
  <iframe id="frame-n">
    ...
    addEventListener( ... );
    ...
  </iframe>
  ...
</html>
```



CSS 3.0

CSS Features

- Centralized and reusable style definitions
- Cascading impact on document elements
- Specifies *ephemeral* rendering characteristics

Style Sheet Examples

- tag { } // <tag>
- .class { } // class="class"
- tag.class { } // <tag class="class">
- #id { } // <tag id="id">
- @at { } // encapsulation
- tag.class, tag2, .class { } // redundancy
- tag:pseudo { } // specialization
- tag > child { } // direct hierarchy
- tag descendent { } // hierarchy

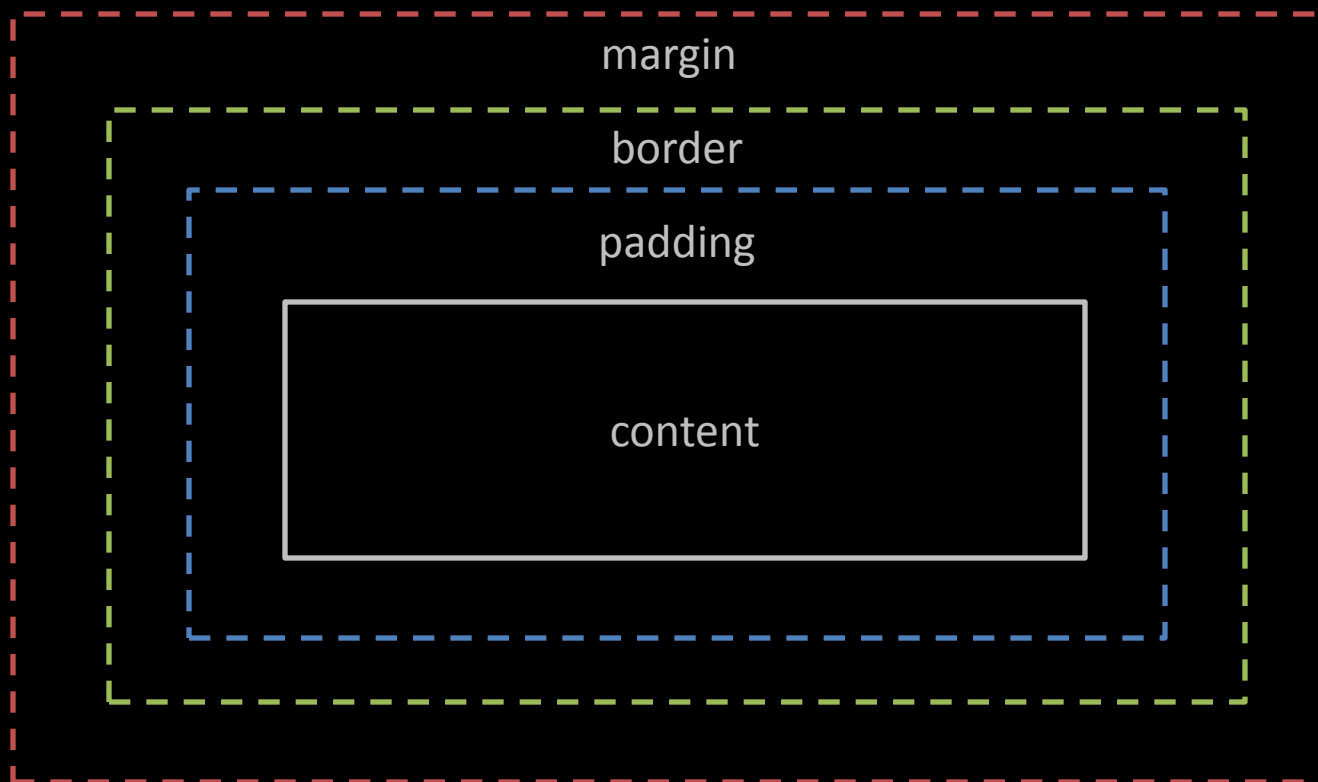
Properties

```
tag.class  
{  
    property: value;  
}
```

Position

- **Static:** default, layout controlled
- **Relative:** offset from the layout position
- **Absolute:** position fixed according to parent*
- **Fixed:** position fixed according to window
- **Z-index:** depth layer order

Box Model



Simple Example

CSS Styles

```
body
{
  color: red;
  background: black;
}

h1
{
  color: #00ff00;
}

p.special
{
  color: rgb(0,0,255);
}
```

HTML

```
<body>
<h1> some text </h1>
<p> no-class paragraph</p>
<p class="special">classy</p>
```

Webpage

```
some text
no-class paragraph
classy
```

3D Example

CSS Styles

```
div#camera
```

```
{
```

```
  -webkit-transform-style: preserve-3d;
```

```
  -webkit-transition-property: -webkit-transform;
```

```
  -webkit-transition-duration: 0s;
```

```
}
```

```
div#dolly
```

```
{
```

```
  -webkit-transform-style: preserve-3d;
```

```
  -webkit-transition-property: -webkit-transform;
```

```
  -webkit-transition-duration: 500ms;
```

```
  -webkit-transition-timing-function: cubic-bezier(0.2, 0.6, 0.6, 0.9);
```

```
  -webkit-transform: translate3d( 0.0px, 0.0px, 0.0px );
```

```
}
```

JavaScript

Language Characteristics

- Is *not* Java
 - formally known as European Computer Manufacturers Association, hence ECMAScript
 - Currently on version 5
- Primary driver of the web (and our demos)
- Extremely flexible language (to a fault)
- Single threaded execution model for now

JavaScript at a glance

- Classes, structs, arrays, functions, delegates
- Variant type (no type checking)
 - Everything is 8 bytes
 - bool, decimal, string are concrete and value based, everything else is reference based
 - Everything derives from Object (including functions)
- Closures
- Garbage collection
- Event Model
- Dynamic Code

Web Features

- Document Object
- Global Window Object
- Ability to alter style of a particular object, or the style definition itself
- Control when/how scripts are loaded and run

Notes

- ‘ and “ are identical, but must be used homogeneously
- Local function definitions
- Class definition syntax
- 100% virtual member functions
- No deinitialization
- Profile, profile, profile

AJAX

AJAX Example

```
JavaScript | var g_RequestObj;  
  
function geInitializeFileSystem()  
{  
    g_RequestObj = new XMLHttpRequest();  
}  
  
function geLoadFile( url )  
{  
    g_RequestObj.open( "GET", url, false );  
    g_RequestObj.send(null);  
  
    return g_RequestObj.responseText;  
}
```

WebGL

WGL: Brief Introduction

- OpenGL ES 2.0 interface through JavaScript
- Thin and fast translation layer
- Present in Safari, Chrome, Firefox, Opera
- Supported in some form on iOS*, Windows, Mac OSX, Linux, Android, and more...
- Be careful about feature sets available per platform (particularly in shaders)

Script#

S#: Brief Introduction

- Created by an architect at Microsoft
- Provides compilation of C# to JavaScript
- Improves development with stronger type checking and compile time error checking
- Often produces fairly clean JavaScript code

<http://projects.nikhilk.net/ScriptSharp>

Questions

Appendix

Browser Support (circa 2010)

	Firefox	T-Bird	Safari	Minefield	IE	Chrome	IE OSX	Opera
Layout Engine	Gecko	Gecko	WebKit	Gecko	Trident	WebKit	Tasman	WebKit
Owner	Mozilla	Mozilla	Apple	Mozilla	Microsoft	Google	Microsoft	Opera FF
Latest Version	3.6	3.0.4	4.0.5	3.7	9	4.1.1059	n/a	10.51
HTML5	No	No	Yes	Yes	Yes	Yes	No	Yes
WebGL	No	No	Yes	Yes	No	Yes	No	Yes
H.264	No	No	Yes	No	Yes	Yes	No	No
Theora	No	No	No	Yes	No	Yes	No	Yes
Ogg	No	No	No	Yes	No	Yes	No	Yes
WebSock	No	No	Yes	Yes	No	Yes	No	Yes
CSS3.0 3D	No	No	Yes (OSX)	Not Yet	No	Not Yet	No	Not Yet

Demos

- <http://editor.pixastic.com/>
- <http://canvaspaint.org/>
- <http://joncom.be/experiments/thrust/play/>
- <http://www.wiicade.com/playJSGame.aspx?gameID=1317&gameName=Coverfire>
- <http://jsspeccy.zxdemo.org/>
- **<http://www.benjoffe.com/code/demos/canvascape/textures>**
- <http://www.nihilogic.dk/labs/mariokart/>
- <http://upsideownturtle.com/boredboredbored/>
- **http://www.nihilogic.dk/labs/mario/mario_large_nomusic.htm**

HTML5 vs. SilverLight

