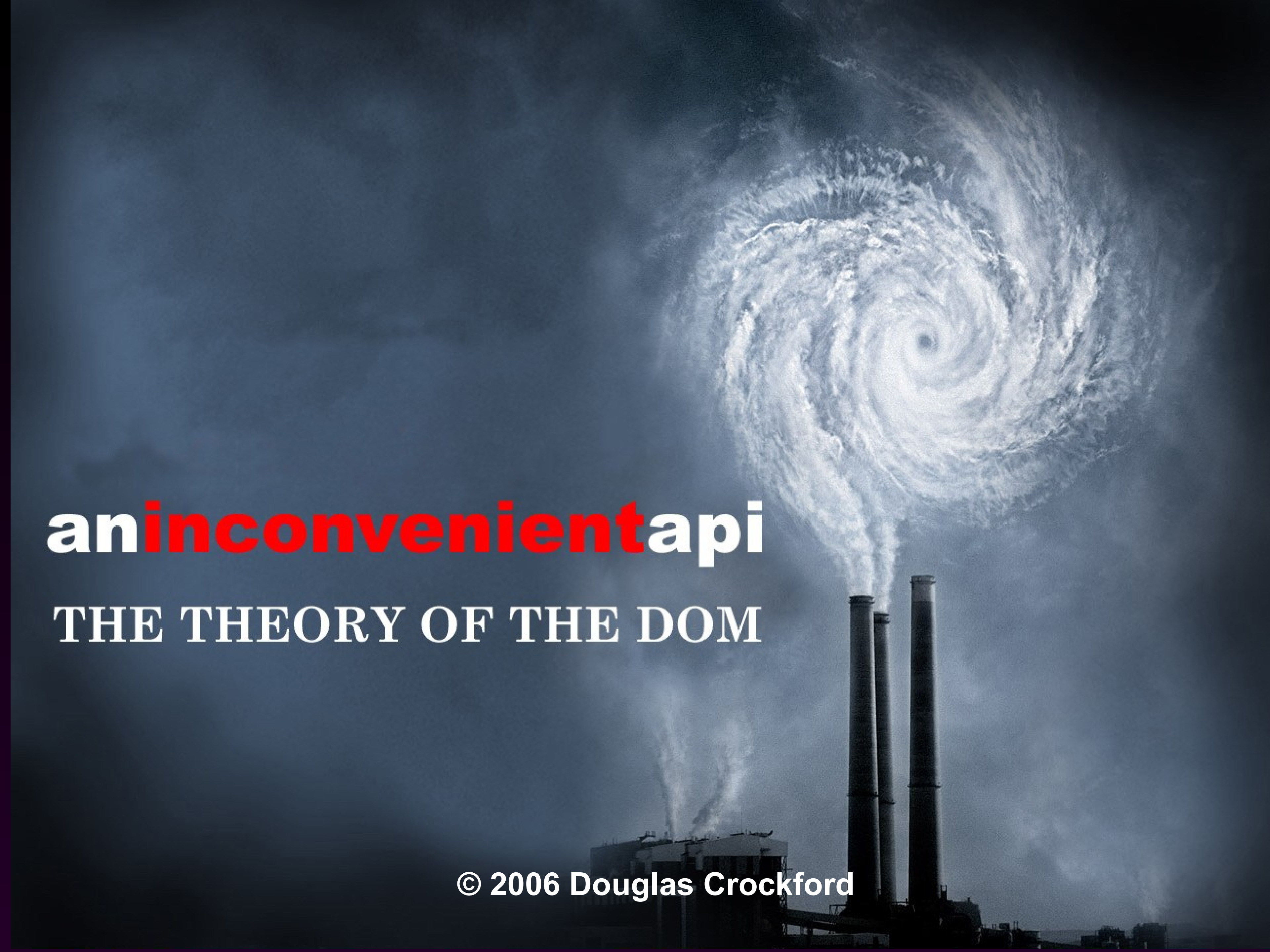


aninconvenientapi

THE THEORY OF THE DOM

The Misconceived Web

- The original vision of the WWW was as a hyperlinked document-retrieval system.
- It did not anticipate presentation, session, or interactivity.
- If the WWW were still consistent with TBL's original vision, Yahoo would still be two guys in a trailer.

How We Got Here

- Rule Breaking
- Corporate Warfare
- Extreme Time Pressure

The Miracle

- It works!
- Java didn't.
- Nor did a lot of other stuff.

The Scripted Browser

- Introduced in Netscape Navigator 2 (1995)
- Eclipsed by Java Applets
- Later Became the Frontline of the Browser War
- Dynamic HTML
- Document Object Model (DOM)

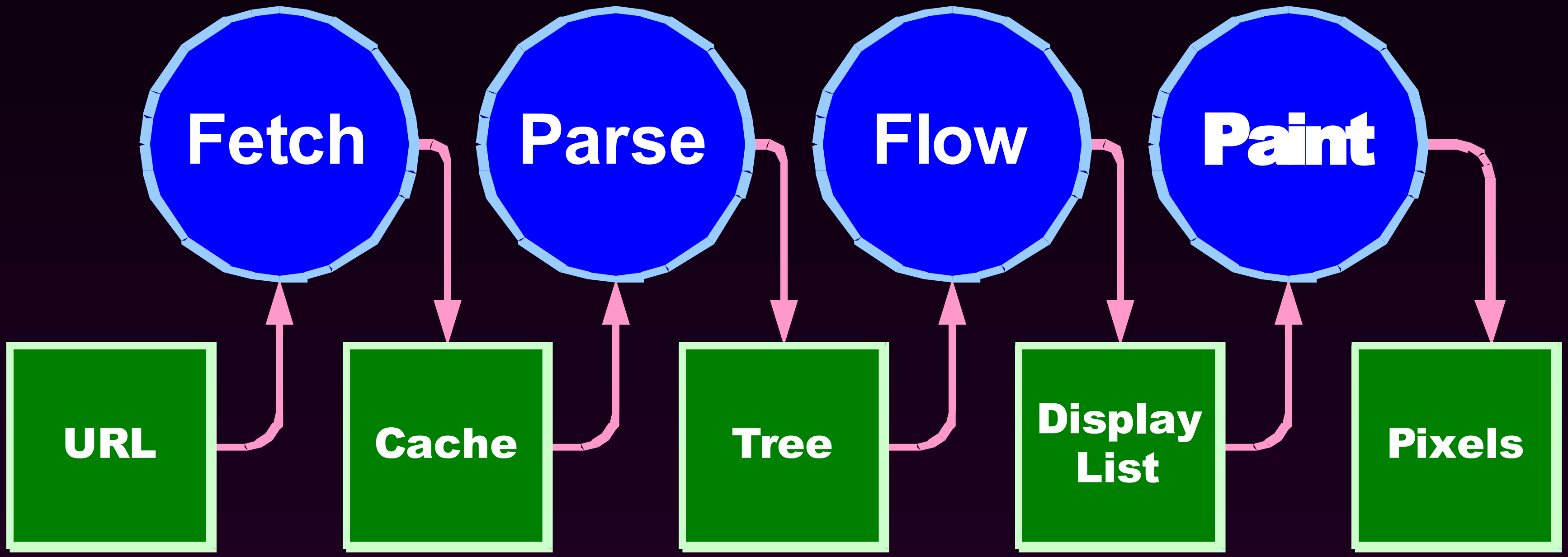
Proprietary Traps

- Netscape and LiveWire
- Microsoft and Internet Information Services
- Both server strategies frustrated by Apache
- Browser-dependent sites

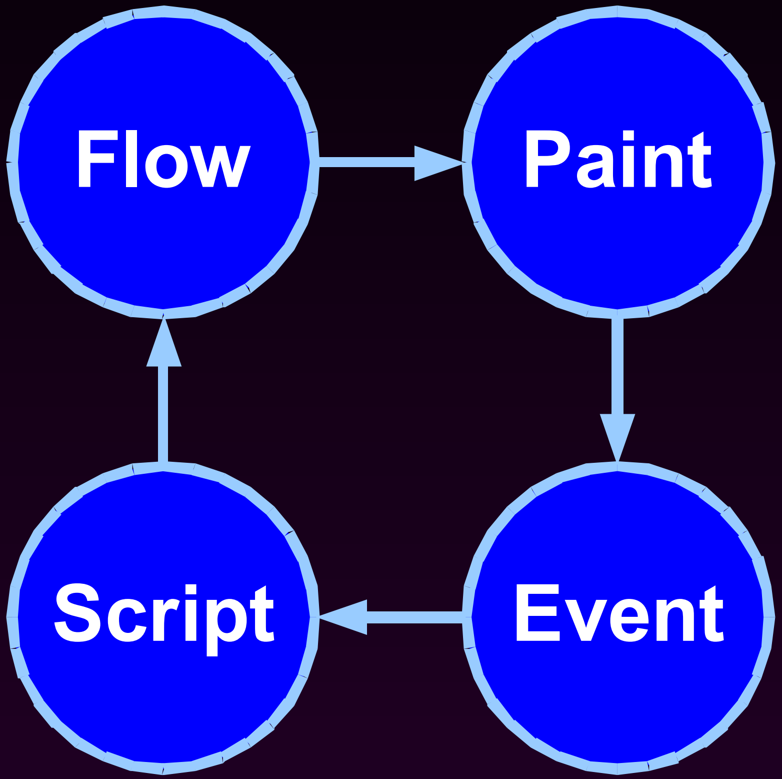
Pax Microsoft

- In the years since the end of the Browser War, the number of browser variations in significant use fell off significantly.
- W3C attempts to unify.
- Mozilla abandoned the Netscape `layer` model in favor of the W3C model.
- The browser platform becomes somewhat stable.
- DHTML becomes known as Ajax.

Browser



Scripted Browser


$$\begin{tikzcd}\text{Flow} \arrow[r] & \text{Paint} \arrow[d] \\ \text{Script} \arrow[u] & \text{Event} \arrow[l]\end{tikzcd}$$

The A List

- Firefox 1.5
- Firefox 2.0
- Safari 2
- IE 6
- IE 7
- Opera 9

- `http://developer.yahoo.com/yui/articles/gbs/gbs_browser-chart.html`

`<script></script>`

- `<!--  // -->`
  Hack for Mosaic and Navigator 1.0.

- `language=javascript`
  Deprecated.

- `src=`URL
  Highly recommended.
  Don't put code on pages.

- `type=text/javascript`
  Ignored.

`<script></script>`

- Script files can have a big impact on page loading time.

3. Place `<script src>` tags as close to the bottom of the body as possible. (Also, place CSS `<link>` as high in the head as possible.)

5. Minify and gzip script files.

7. Reduce the number of script files as much as possible.

`document.write`

- **Allows JavaScript to produce HTML text.**
- **Before onload: Inserts HTML text into the document.**
- **After onload: Uses HTML text to replace the current document.**
- **Not recommended.**

Collections

- `document.anchors`
- `document.applets`
- `document.embeds`
- `document.forms`
- `document.frames`
- `document.images`
- `document.plugins`
- `document.scripts`
- `document.stylesheets`

- **Avoid these.**

`name v id`

- `name=`

  Identifies values in form data

  Identifies a window/frame

- `id=`

  Uniquely identifies an element

- **They used to be interchangeable.**

`document.all`

- **Microsoft feature, rejected by W3C and most other browsers.**
- **It acts as a function or array for accessing elements by position, `name`, or `id`.**
- **Avoid it.**

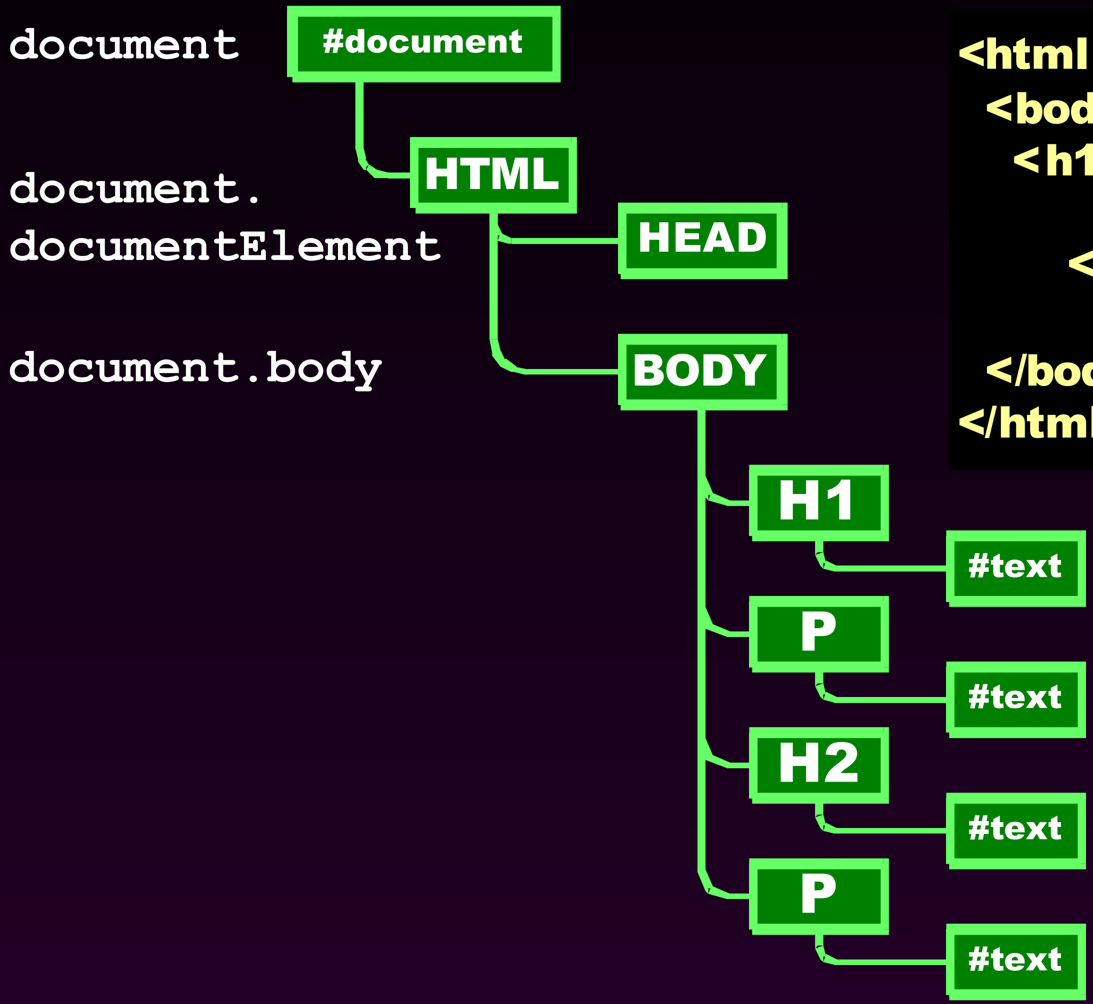
Retrieving Nodes

`document.getElementById(`*`id`*`)`

`document.getElementsByName(`*`name`*`)`

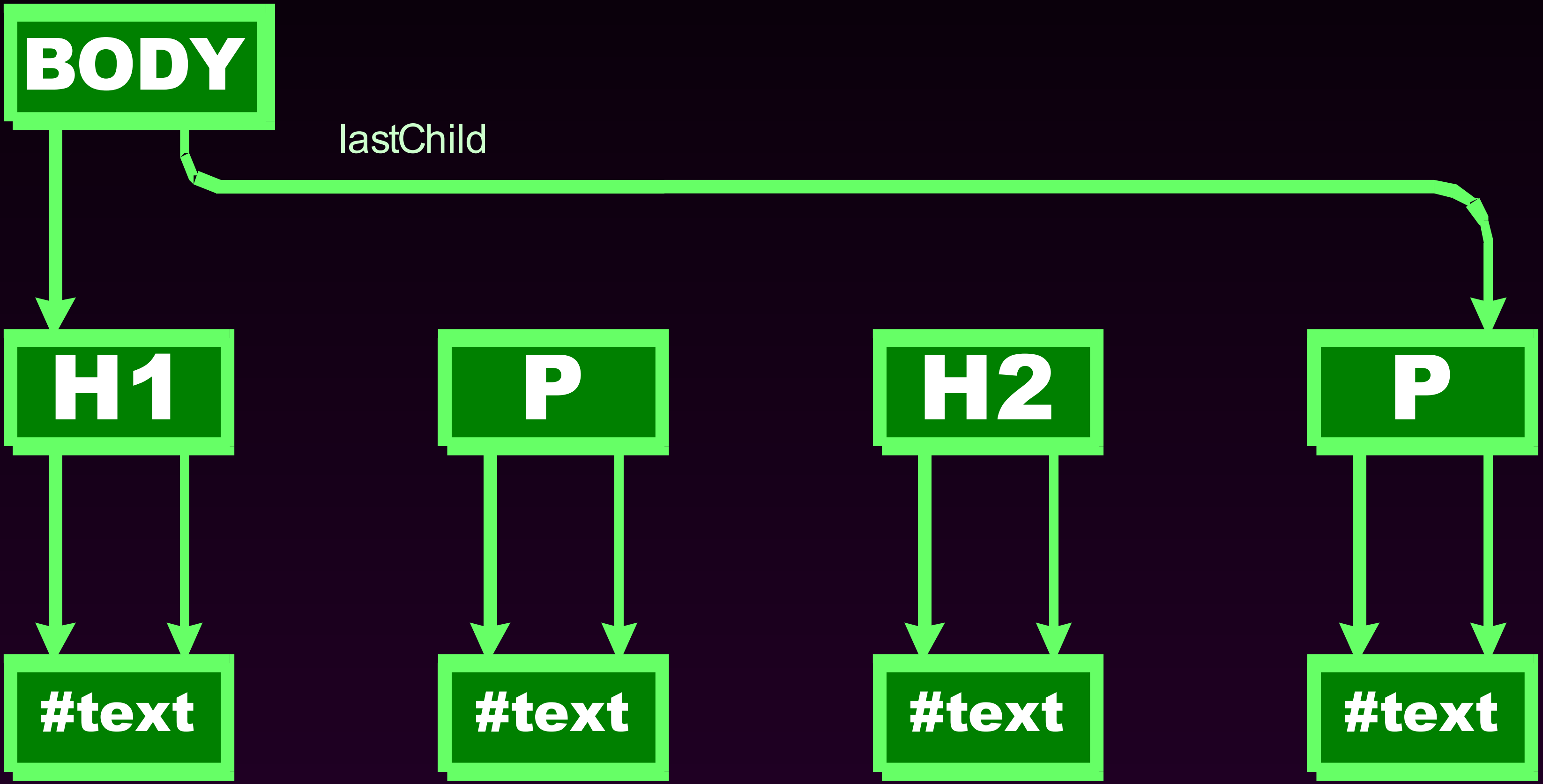
`node``.getElementsByTagName(`*`tagName`*`)`

Document Tree Structure

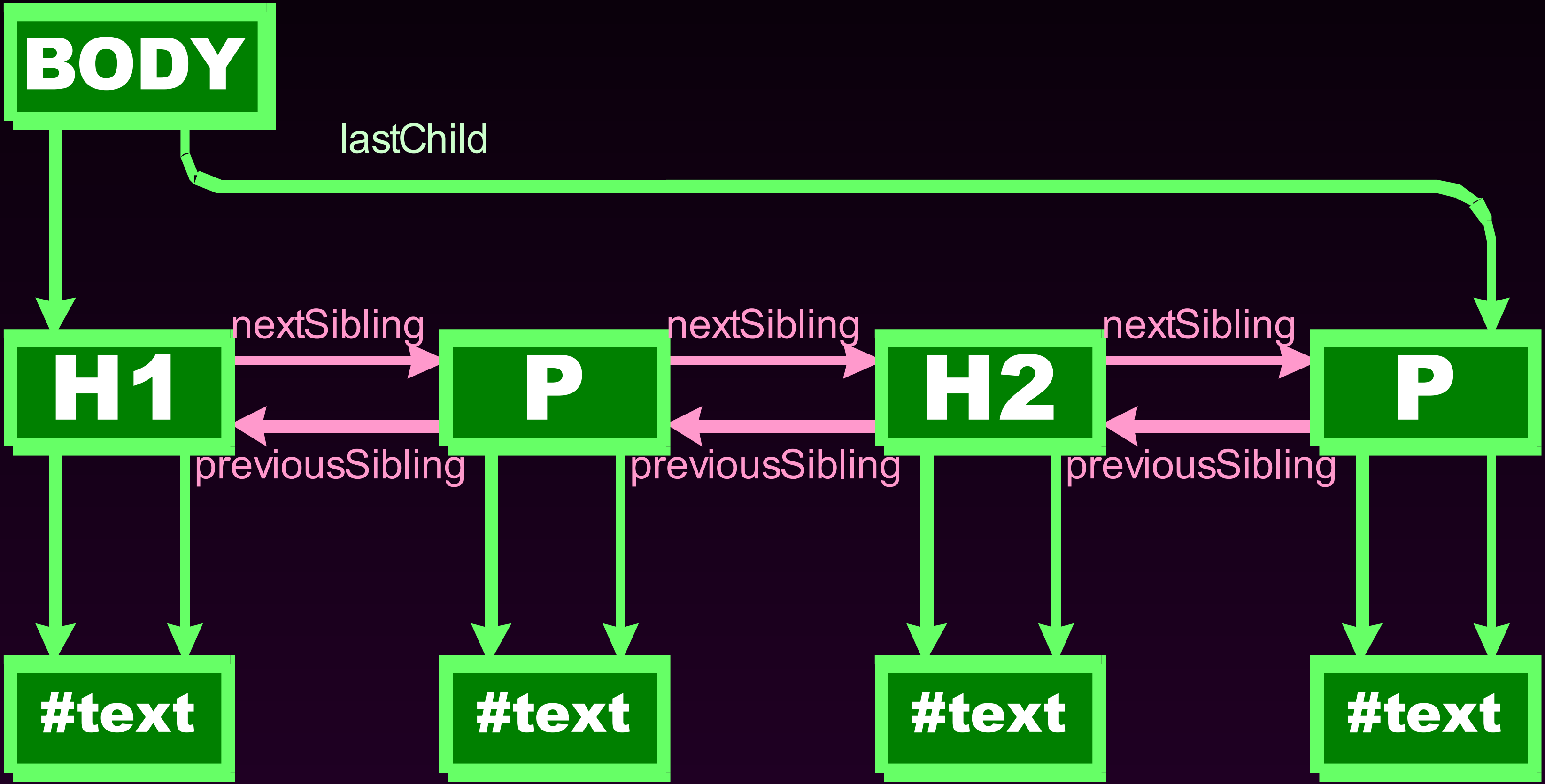


```
<html>
  <body>
    <h1>Heading 1</h1>
            < p>Paragraph.</p>
        <h2>Heading 2</h2>
            < p>Paragraph.</p>
  </body>
</html>
```

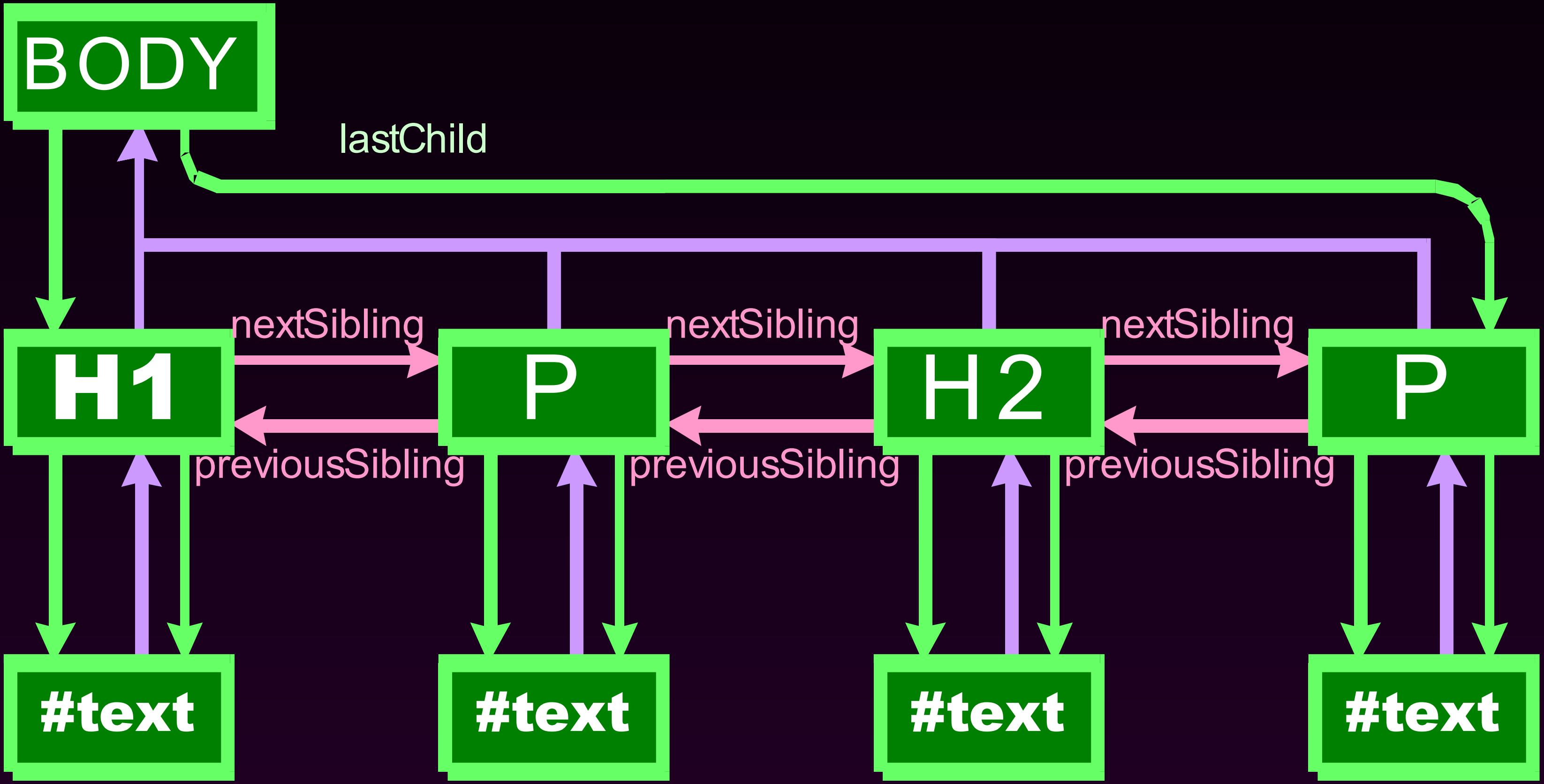
child, sibling, parent



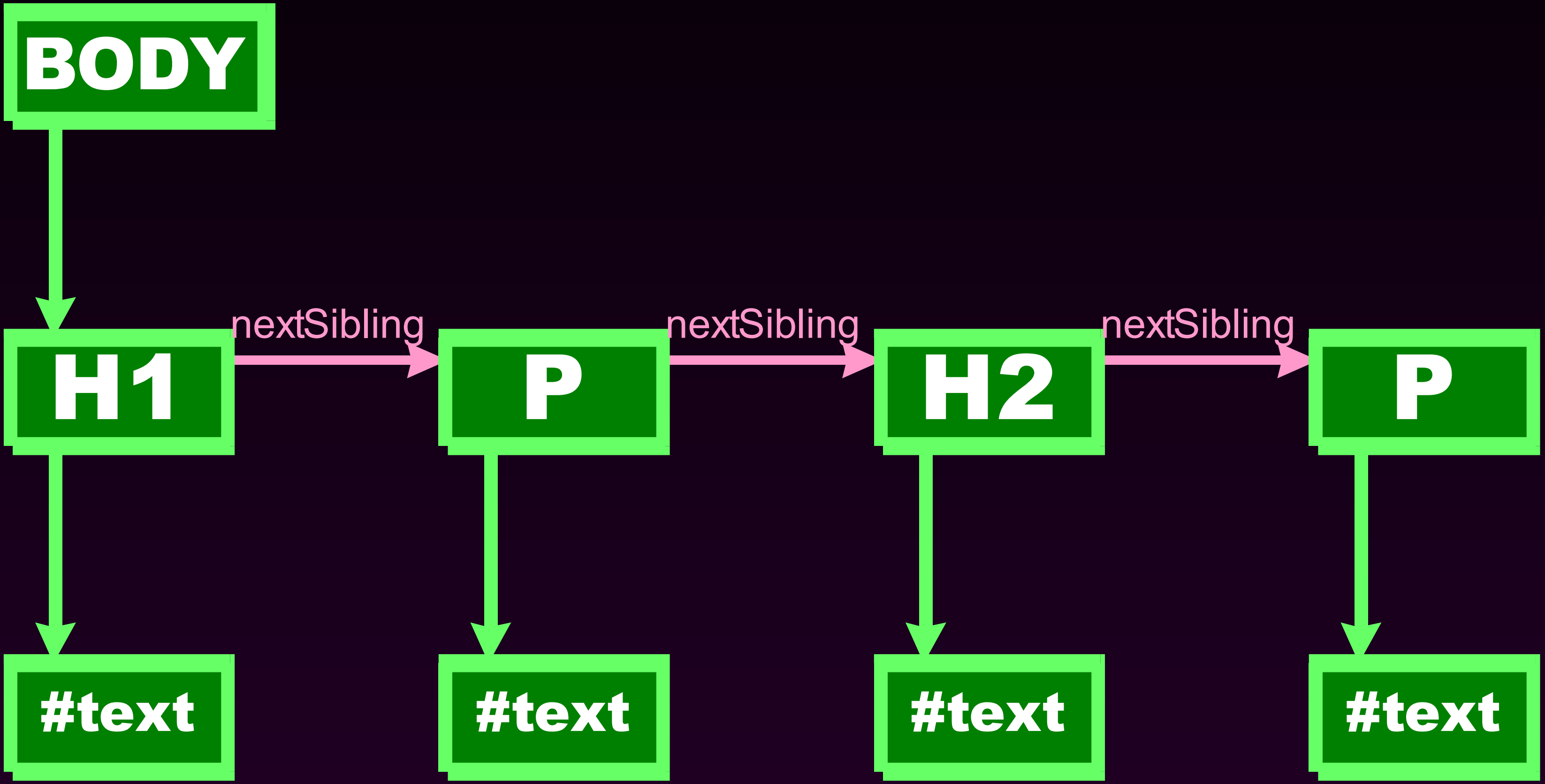
child, sibling, parent



child, sibling, parent



child, sibling, parent



Walk the DOM

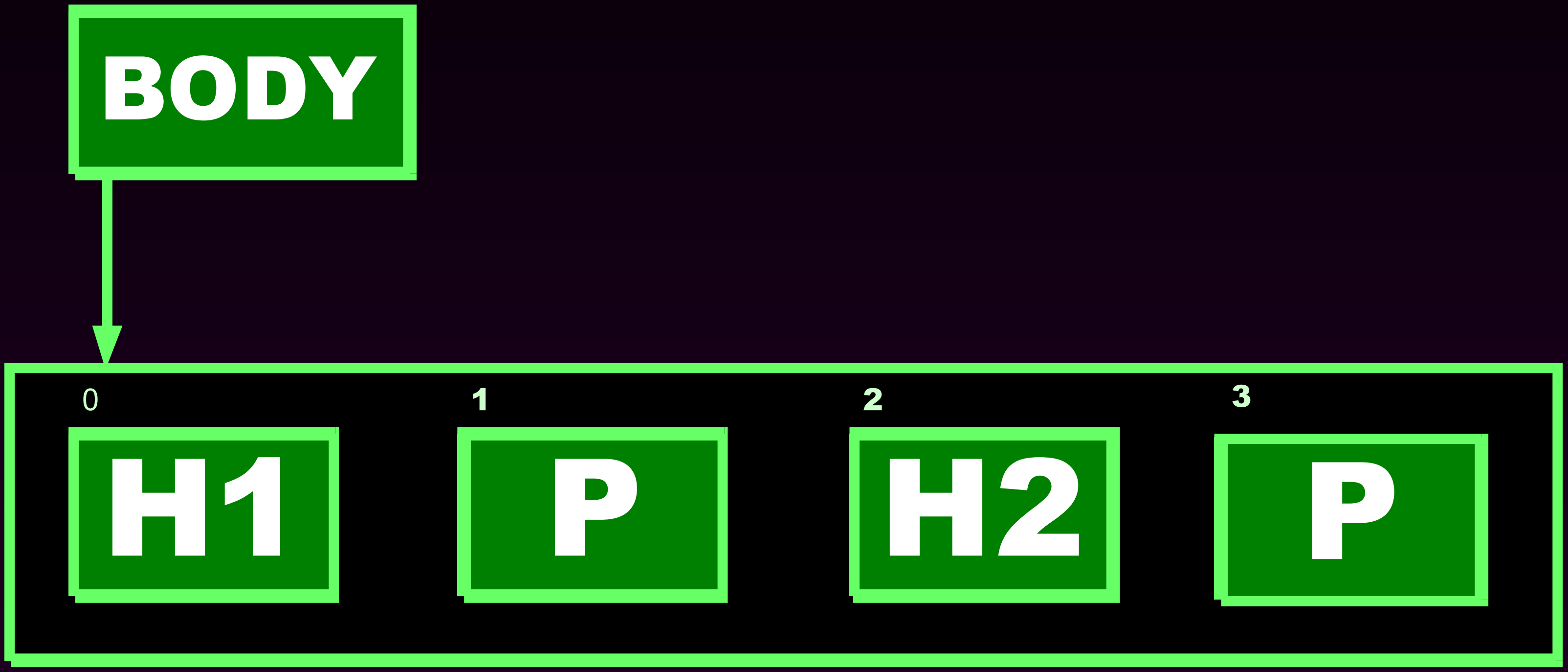
- **Using recursion, follow the `firstChild` node, and then the `nextSibling` nodes.**

```
function walkTheDOM(node, func) {
    func(node);
    node = node.firstChild;
    while (node) {
        walkTheDOM(node, func);
        node = node.nextSibling;
    }
}
```

getElementsByClassName

```
function getElementsByClassName(className) {
    var results = [];
    walkTheDOM(document.body, function (node) {
        var a, c = node.className, i;
        if (c) {
            a = c.split(' ');
            for (i = 0; i < a.length; i += 1) {
                if (a[i] === className) {
                    results.push(node);
                    break;
                }
            }
        }
    });
    return results;
}
```

childNodes



Manipulating Elements

`IMG` **has these properties:**

`align`	`'none', 'top', 'left',` **…**
`alt`	**string**
`border`	**integer (pixels)**
`height`	**integer (pixels)**
`hspace`	**integer (pixels)**
`id`	**string**
`isMap`	**boolean**
`src`	**url**
`useMap`	**url**
`vspace`	**integer (pixels)**
`width`	**integer (pixels)**

***node*`.`*property* `=` *expression*`;`**

Manipulating Elements

- **Old School**

```
if (my_image.complete) {
    my_image.src = superurl;
}
```

- **New School**

```
if (my_image.getAttribute('complete')) {
    my_image.setAttribute('src', superurl);
}
```

Style

```
node.className

node.style.stylename

node.currentStyle.stylename    Only IE

document.defaultView().
    getComputedStyle(node, "").
    getPropertyValue(stylename);
```

Style Names

CSS	JavaScript
`background-color`	`backgroundColor`
`border-radius`	`borderRadius`
`font-size`	`fontSize`
`list-style-type`	`listStyleType`
`word-spacing`	`wordSpacing`
`z-index`	`zIndex`

Making Elements

`document.createElement(`*`tagName`*`)`

`document.createTextNode(`*`text`*`)`

`node``.cloneNode()`

Clone an individual element.

`node``.cloneNode(true)`

Clone an element and all of its descendents.

- **The new nodes are not connected to the document.**

Linking Elements

```
node.appendChild(new)

node.insertBefore(new, sibling)

node.replaceChild(new, old)

old.parentNode.replaceChild(new, old)
```

Removing Elements

`node.removeChild(old)`

It returns the node.

Be sure to remove any event handlers.

`old.parentNode.removeChild(old)`

innerHTML

Parse

- The W3C standard does not provide access to the HTML parser.
- All A browsers implement Microsoft's `innerHTML` property.

Which Way Is Better?

- It is better to build or clone elements and append them to the document?
- Or is it better to compile an HTML text and use innerHTML to realize it?
- Favor clean code and easy maintenance.
- Favor performance only in extreme cases.

Events

Event

- The browser has an event-driven, single-threaded, asynchronous programming model.
- Events are targeted to particular nodes.
- Events cause the invocation of event handler functions.

Mouse Events

- The target is the topmost (z-index) node containing the cursor.

- click
- dblclick
- mousedown
- mousemove
- mouseout
- mouseover
- mouseup

Input Events

- The target is the node having focus.

- blur
- change
- focus
- keydown
- keypress
- keyup
- reset
- submit

Event Handlers

- **Classic**

```
node["on" + type] = f;
```

- **Microsoft**

```
node.attachEvent("on" + type, f);
```

- **W3C**

```
node.addEventListener(type, f, false);
```

Event Handlers

- The handler takes an optional event parameter.
  - Microsoft does not send an event parameter, use the global `event` object instead.

Event Handlers

```
function (e) {
    e = e || event;
    var target =
        e.target || e.srcElement;
    ...
}
```

Trickling and Bubbling

- Trickling is an event capturing pattern which provides compatibility with the Netscape 4 model. Avoid it.

- Bubbling means that the event is given to the target, and then its parent, and then its parent, and so on until the event is canceled.

Why Bubble?

- Suppose you have 100 draggable objects.
- You could attach 100 sets of event handlers to those objects.
- Or you could attach one set of event handlers to the container of the 100 objects.

Cancel Bubbling

- **Cancel bubbling to keep the parent nodes from seeing the event.**

```
e.cancelBubble = true;
if (e.stopPropagation) {
    e.stopPropagation();
}
```

- **Or you can use YUI's `cancelBubble` method.**

Prevent Default Action

- An event handler can prevent a browser action associated with the event (such as submitting a form).

```
e.returnValue = false;
if (e.preventDefault) {
    e.preventDefault();
}
return false;
```

- Or you can use YUI's `preventDefault` method.

Memory Leaks

- Memory management is automatic.
- It is possible to hang on to too much state, preventing it from being garbage collected.

Memory Leaks on IE 6

- Explicitly remove all of your event handlers from nodes before you discard them.
- The IE6 DOM uses a reference counting garbage collector.
- Reference counting is not able to reclaim cyclical structures.
- You must break the cycles yourself.

Memory Leaks on IE 6

- That was not an issue for page view-driven applications.
- It is a showstopper for Ajax applications.
- It will be fixed in IE7.

Memory Leaks on IE 6

- Remove all event handlers from deleted DOM nodes.
- It must be done on nodes before `removeChild` or `replaceChild`.
- It must be done on nodes before they are replaced by changing `innerHTML`.

Breaking Links in the DOM

```
function purgeEventHandlers(node) {
    walkTheDOM(node, function (e) {
        for (var n in e) {
            if (typeof e[n] ===
                    'function') {
                e[n] = null;
            }
        }
    });
}
```

- Or you can use YUI's `purgeElement` method.

JavaScript

- `alert(`*`text`*`)`
- `confirm(`*`text`*`)`
- `prompt(`*`text, default`*`)`

  These functions break the asynchronous model.

  Avoid these in Ajax applications.

- `setTimeout(`*`func, msec`*`)`
- `setInterval(`*`func, msec`*`)`

`window`

- **The `window` object is also the JavaScript global object.**
- **Every window, frame, and iframe has its own unique `window` object.**
- **aka `self`. And sometimes `parent` and `top`.**

Inter-window

• `frames[]`	**Child frames and iframes**
• `name`	**Text name of window**
• `opener`	**Reference to** `open`
• `parent`	**Reference to parent**
• `self`	**Reference to this window**
• `top`	**Reference to outermost**
• `window`	**Reference to this window**
• `open()`	**Open new window**

Inter-window

- **A script can access another window if**

  It can get a reference to it.

  ```
  document.domain ===
    otherwindow.document.domain
  ```

- **Same Origin Policy**

Cross Browser

- Weak standards result in significant vendor-specific differences between browsers.

- Browser Detection.
- Feature Detection.
- Platform Libraries.

Browser Detection

- Determine what kind of browser that page is running in.
- Execute conditionally.
- The browsers lie.

```
    navigator.userAgent Mozilla/4.0
```

- Brittle. Not recommended.
- `http://www.mozilla.org/docs/web-developer/sniffer/browser_type.html`

Feature Detection

- Using reflection, ask if desired features are present.
- Execute conditionally.

```
function addEventHandler(node, type, f) {
    if (node.addEventListener) {
        node.addEventListener(type, f, false);
    } else if (node.attachEvent) {
        node.attachEvent("on" + type, f);
    } else {
        node["on" + type] = f;
    }
}
```

Feature Detection

- Using reflection, ask if desired features are present.
- Execute conditionally.

```
function addEventHandler(node, type, f) {
    node["on" + type] = f;
}
```

```
YAHOO.util.Event.addListener(node, type, f);
```

- Support for custom events, and for adding events to object that don't exist yet, and for purging event handlers from objects.

Use a Platform Library

- A platform library insulates the application from the poisonous browsers.
- YUI is highly recommended.
- `http://developer.yahoo.com/yui/`

The Cracks of DOM

- The DOM buglist includes all of the bugs in the browser.
- The DOM buglist includes all of the bugs in all supported browsers.
- No DOM completely implements the standards.
- Much of the DOM is not described in any standard.

Coping

1. Do what works.

3. Do what is common.

5. Do what is standard.

The Wall

- Browsers are now being push to their limits.
- Be prepared to back off.
- Reduce your memory requirements.
- Balance of client and server.

The Hole

- The browser was not designed to be a general purpose application platform.
- Lacks a compositing model.
- Accessibility suffers.
- Lacks support for cooperation under mutual suspicion.

The Peace is ending.

WWW War II

- Microsoft has awoken. They are beginning to innovate again.
- There are now 4 major browser makers.
- They will be flooding the web with bugs.

We Will Prevail

- We must use our clout to keep the browser makers in line.
- We must be players, not pawns.
- We must set the standards.

References

- **The Document Object Model in Mozilla**

  http://www.mozilla.org/docs/dom/
- **MSDN HTML and DHTML Reference**

  http://msdn.microsoft.com/workshop/author/dhtml/reference/dhtml_reference_entry.asp
- **Introduction to Safari JavaScript Programming Topics**

  http://developer.apple.com/documentation/AppleApplications/Conceptual/SafariJSProgTopics/index.html
- **Document Object Model (DOM) Level 2 Core Specification**

  http://www.w3.org/TR/DOM-Level-2-Core/