Progressive Enhancement With GQuery and GWT

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Web Application Models

- Web 1.0, 1 Interaction = 1 Page Refresh
- Pure JS, No Navigation Away from Page
- Mixed Model, Page Reloads + AJAX

Web 2.0 era

- Return to simplicity (Rails, Django)
- HTML enhanced with client-side JS
- Page reloads gradually replaced with AJAX calls

Today's Applications

- Shift more logic to client UI
- Frameworks like jQuery growing
- End to end tool chain lacking maturity
  - Typically separate toolspace for client and backend (Rails, etc)

GWT

- Compiles Java code to optimized Javascript
- Produces incredibly fast code
- Reduces startup latency
- Integrates easily with Java language tools
- Increases productivity and decreases errors
- *May be a big leap for existing mature apps*

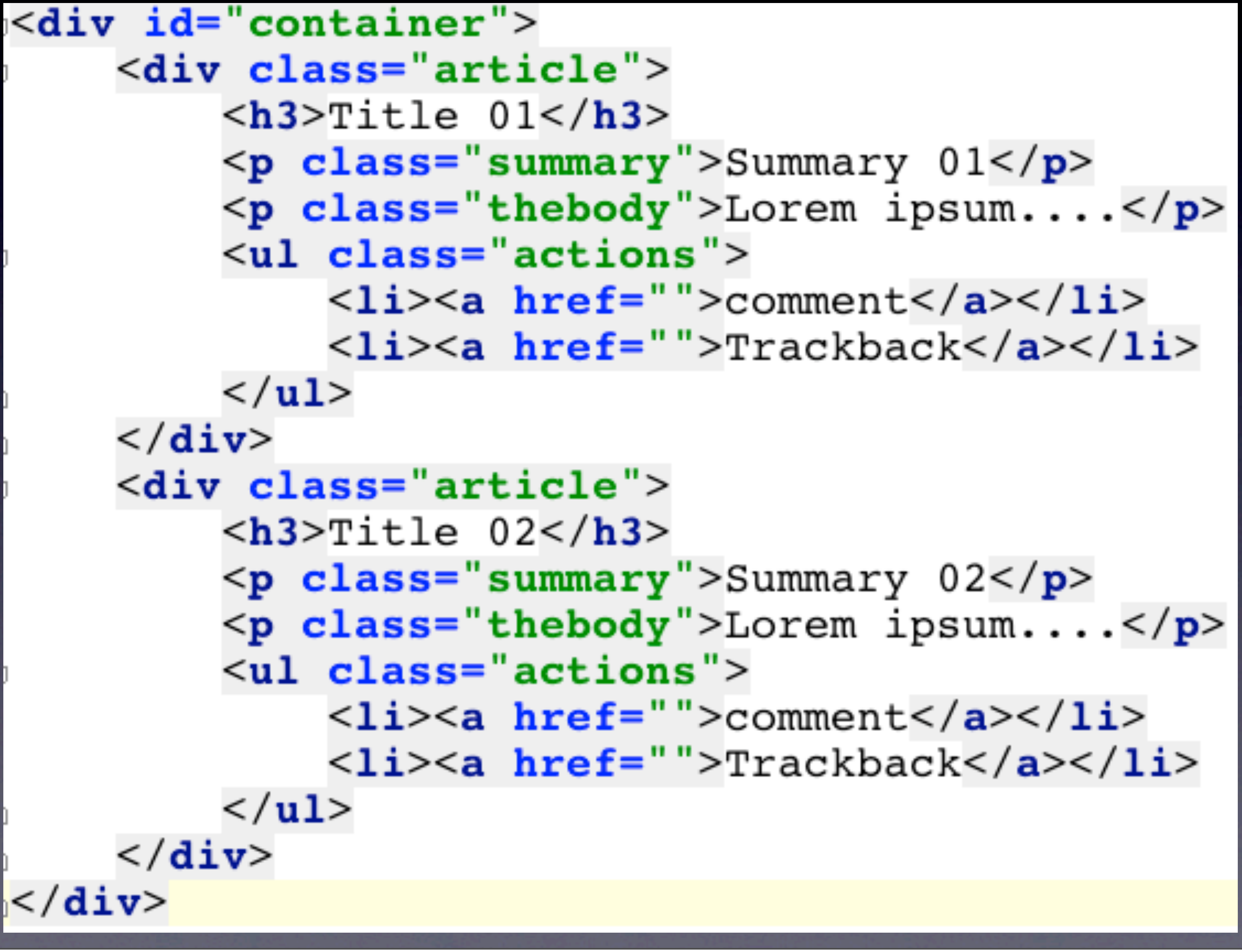
But...

- Currently encourages UI development using Widget abstraction
- Learning curve for UI designers wanting to integrate
- May conflict with existing design processes

Progressive Enhancement

- Many designers start with look
- Reify into server-side rendering using LAMP frameworks
- Layer Javascript on top to enhance UI
- Page can always degrade to working Web 1.0 app when Javascript is lacking
- Facilitates SEO and accessibility

Attaching Javascript



```
<div id="container">
    <div class="article">
        <h3>Title 01</h3>
        <p class="summary">Summary 01</p>
        <p class="thebody">Lorem ipsum....</p>
        <ul class="actions">
            <li><a href="">comment</a></li>
            <li><a href="">Trackback</a></li>
        </ul>
    </div>
    <div class="article">
        <h3>Title 02</h3>
        <p class="summary">Summary 02</p>
        <p class="thebody">Lorem ipsum....</p>
        <ul class="actions">
            <li><a href="">comment</a></li>
            <li><a href="">Trackback</a></li>
        </ul>
    </div>
</div>
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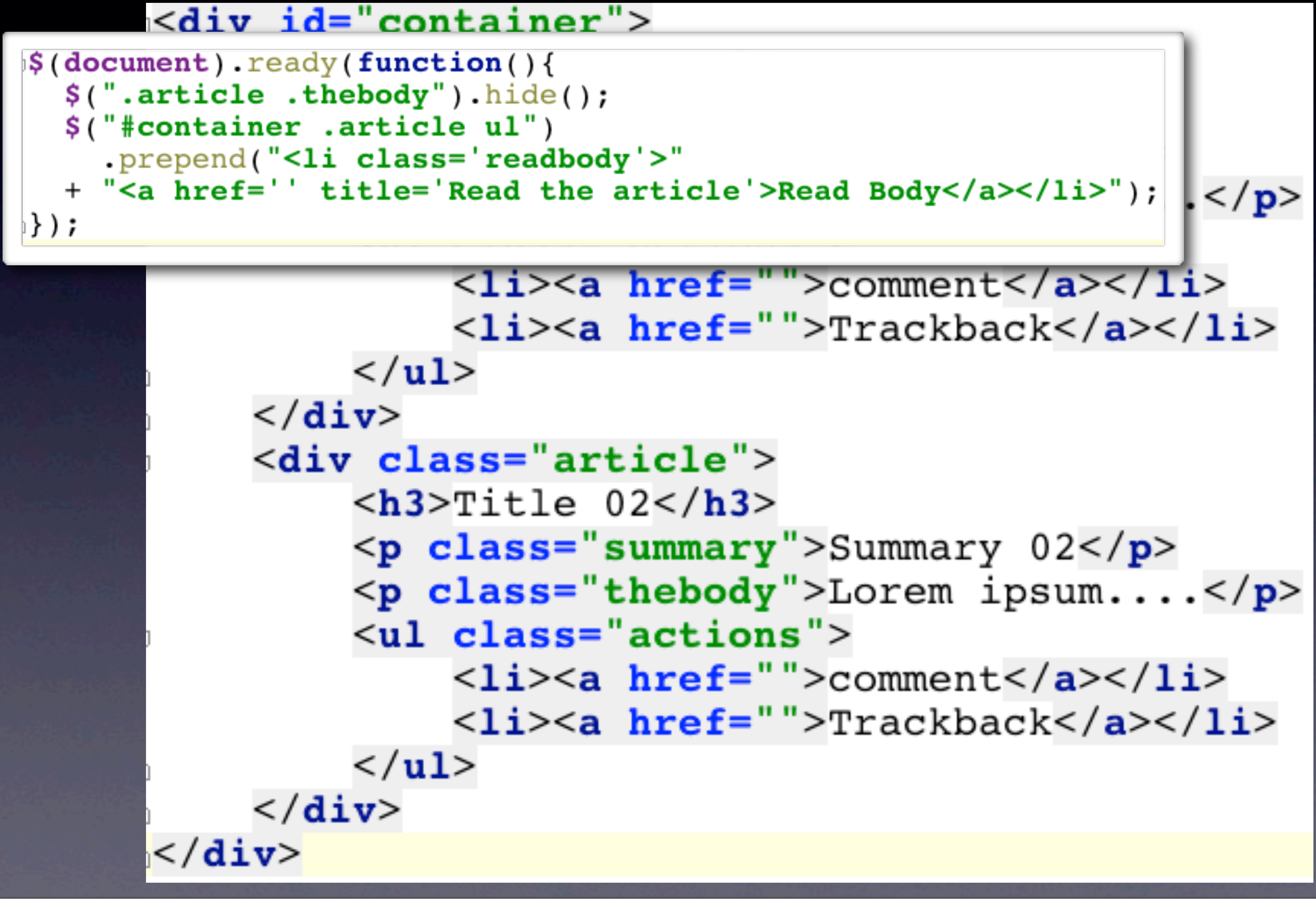

```
$(document).ready(function(){
  $(".article .thebody").hide();
  $("#container .article ul")
    .prepend("<li class='readbody'>"
  + "<a href='' title='Read the article'>Read Body</a></li>");
});
```

```
<div id="container">
                                                     .</p>
            <li><a href="">comment</a></li>
            <li><a href="">Trackback</a></li>
        </ul>
    </div>
    <div class="article">
        <h3>Title 02</h3>
        <p class="summary">Summary 02</p>
        <p class="thebody">Lorem ipsum....</p>
        <ul class="actions">
            <li><a href="">comment</a></li>
            <li><a href="">Trackback</a></li>
        </ul>
    </div>
</div>
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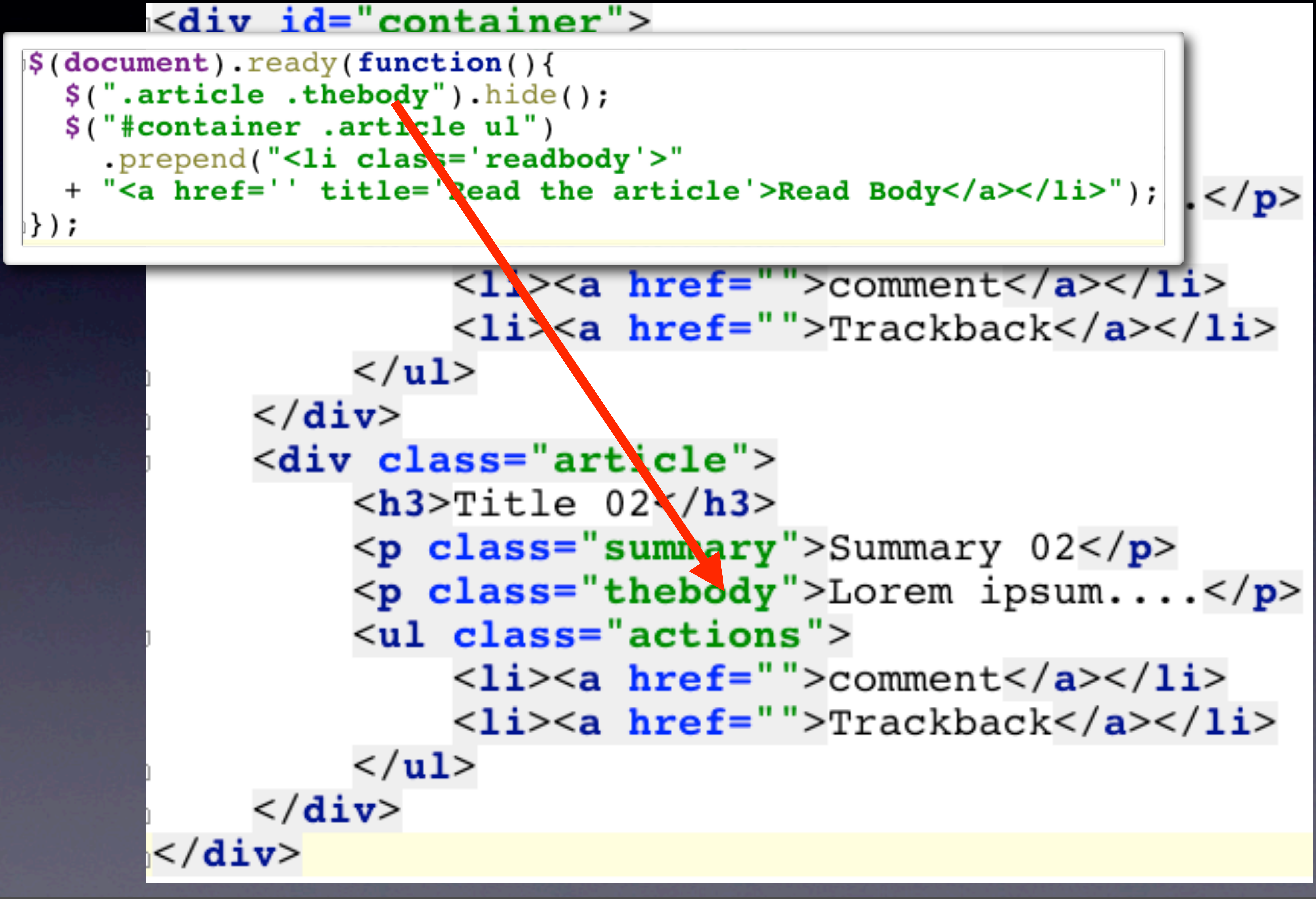
Attaching Javascript



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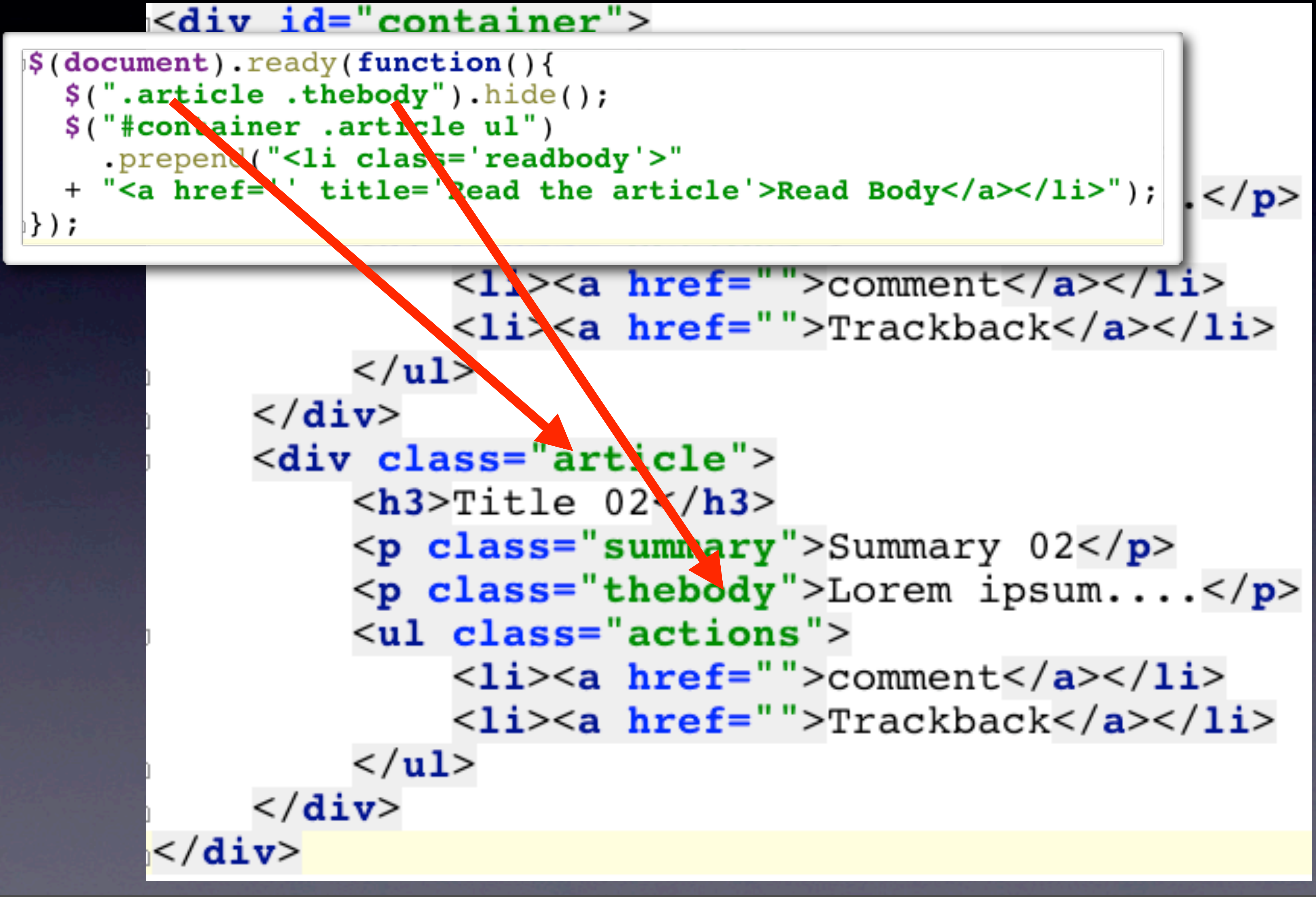
```
<div id="container">
                                                    .</p>
            <li><a href="">comment</a></li>
            <li><a href="">Trackback</a></li>
        </ul>
    </div>
    <div class="article">
        <h3>Title 02</h3>
        <p class="summary">Summary 02</p>
        <p class="thebody">Lorem ipsum....</p>
        <ul class="actions">
            <li><a href="">comment</a></li>
            <li><a href="">Trackback</a></li>
        </ul>
    </div>
</div>
```

Attaching Javascript



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                                                   .</p>
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                <li><a href="">Trackback</a></li>
            </ul>
        </div>
        <div class="article">
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            <p class="summary">Summary 02</p>
            <p class="thebody">Lorem ipsum....</p>
            <ul class="actions">
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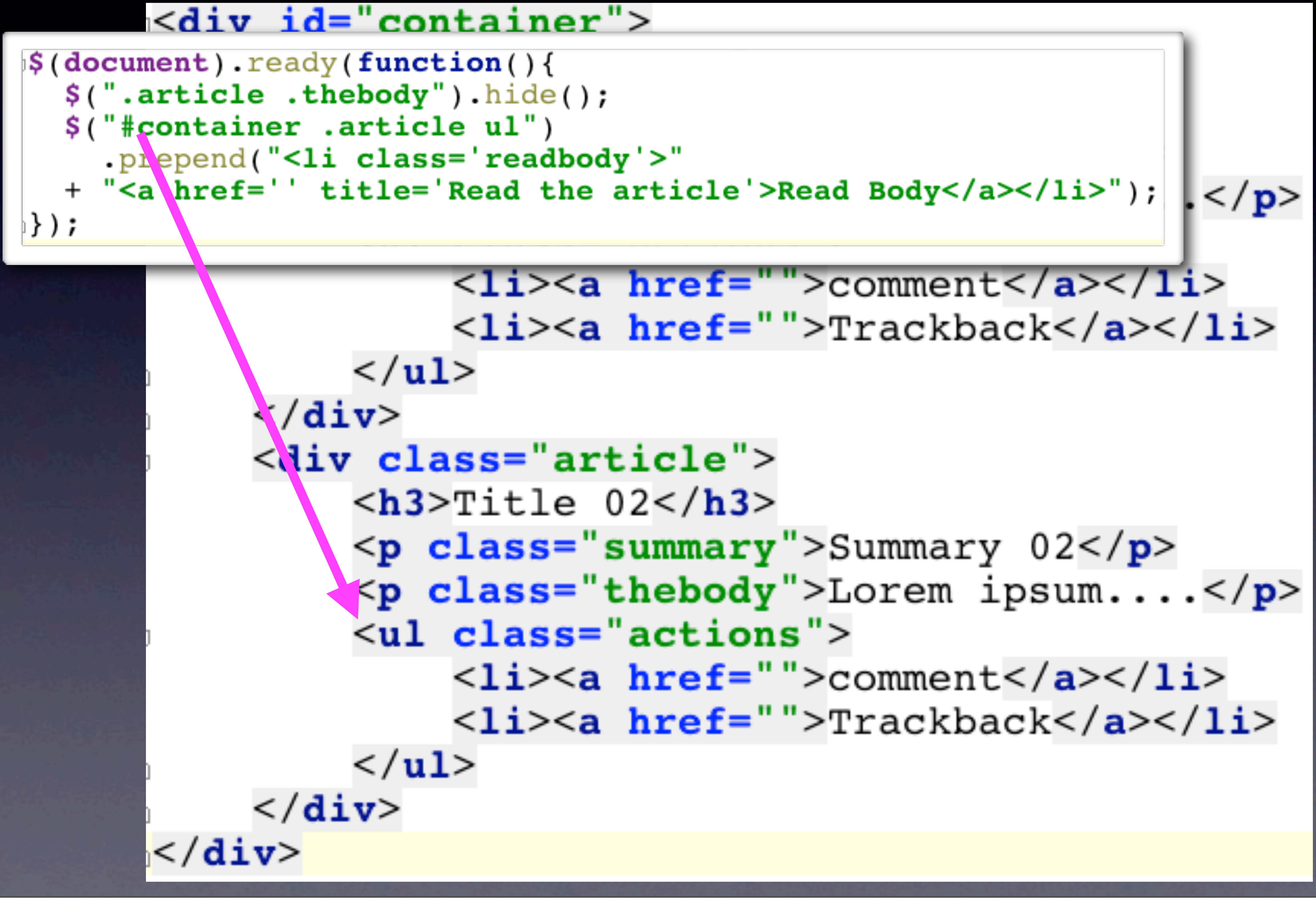
                <li><a href="">Trackback</a></li>
            </ul>
        </div>
</div>
```

Attaching Javascript



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```
<div id="container">
                                                         .</p>
                <li><a href="">comment</a></li>
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            </ul>
        </div>
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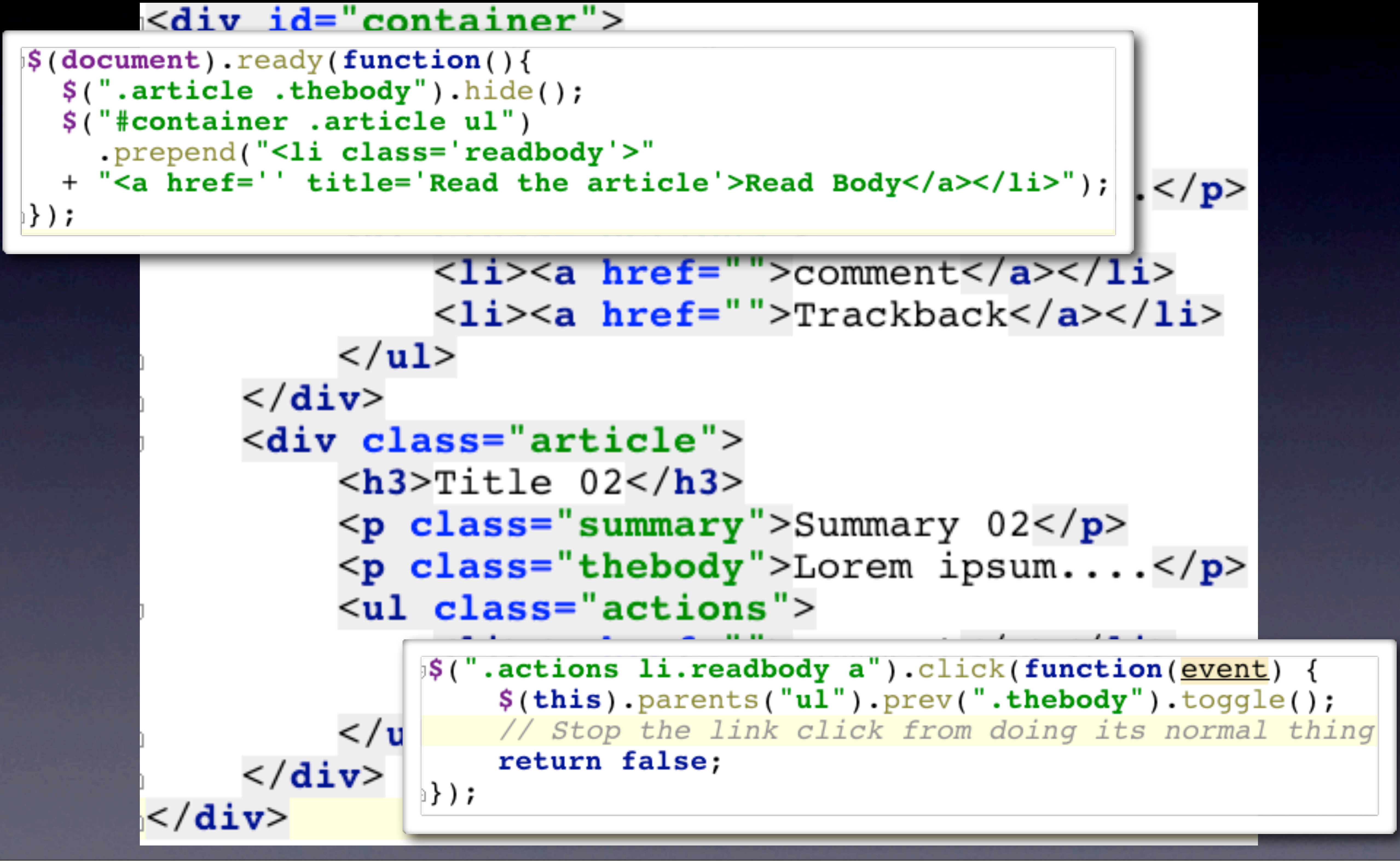
            </ul>
        </div>
</div>
```

Attaching Javascript



```
<div id="container">
```

```
$(document).ready(function(){
  $(".article .thebody").hide();
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```

```
.</p>
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    </ul>
  </div>
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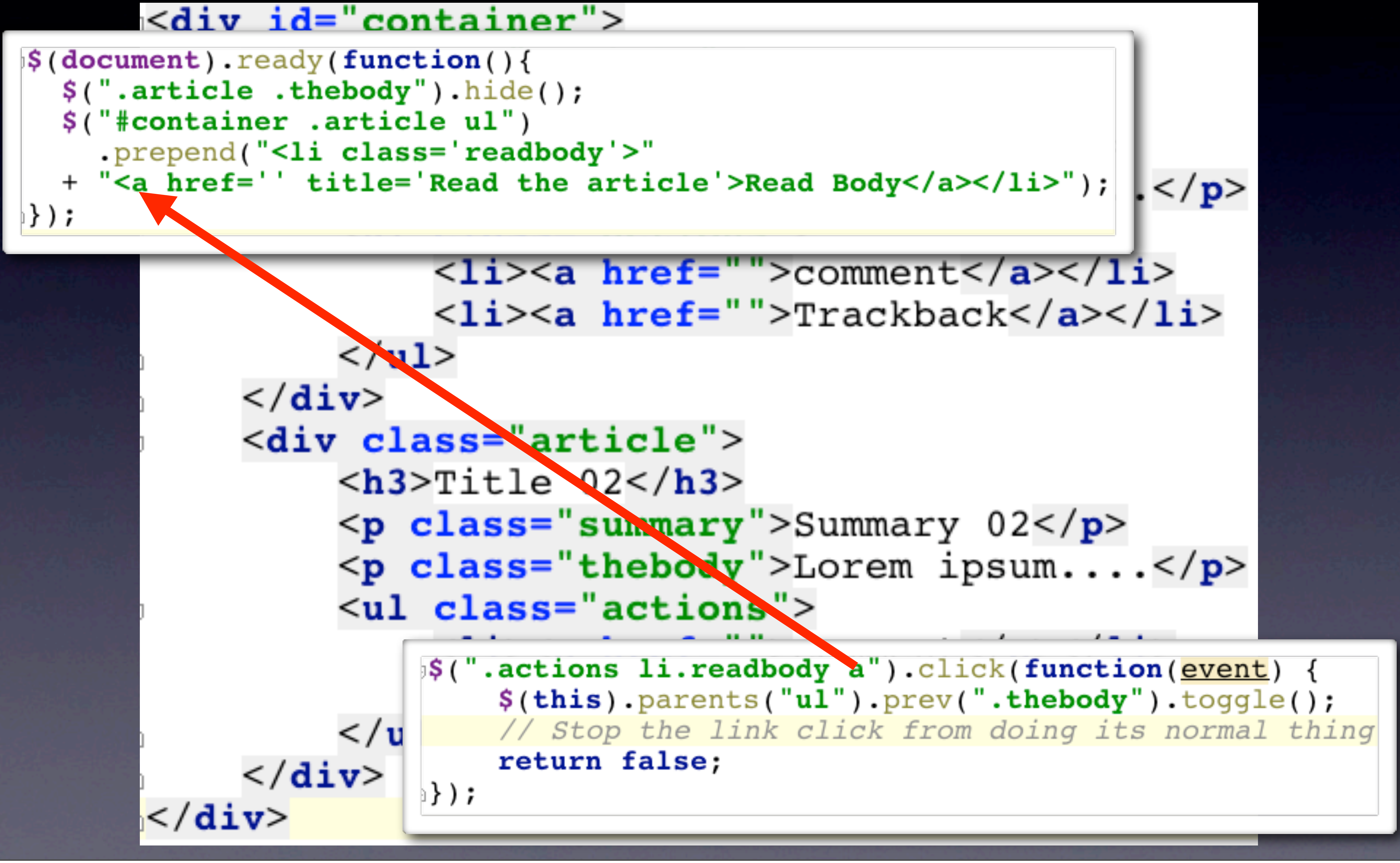
    <h3>Title 02</h3>
    <p class="summary">Summary 02</p>
    <p class="thebody">Lorem ipsum....</p>
    <ul class="actions">
```

```
    </u
  </div>
</div>
```

```
$(".actions li.readbody a").click(function(event) {
    $(this).parents("ul").prev(".thebody").toggle();
    // Stop the link click from doing its normal thing
    return false;
});
```

Attaching Javascript



```
$(document).ready(function(){
  $(".article .thebody").hide();
  $("#container .article ul")
    .prepend("<li class='readbody'>"
  + "<a href='' title='Read the article'>Read Body</a></li>");
});
```

```
<div id="container">
                                        .</p>
            <li><a href="">comment</a></li>
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        </ul>
    </div>
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        </u
    </div>
</div>
```

```
$(".actions li.readbody a").click(function(event) {
    $(this).parents("ul").prev(".thebody").toggle();
    // Stop the link click from doing its normal thing
    return false;
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```

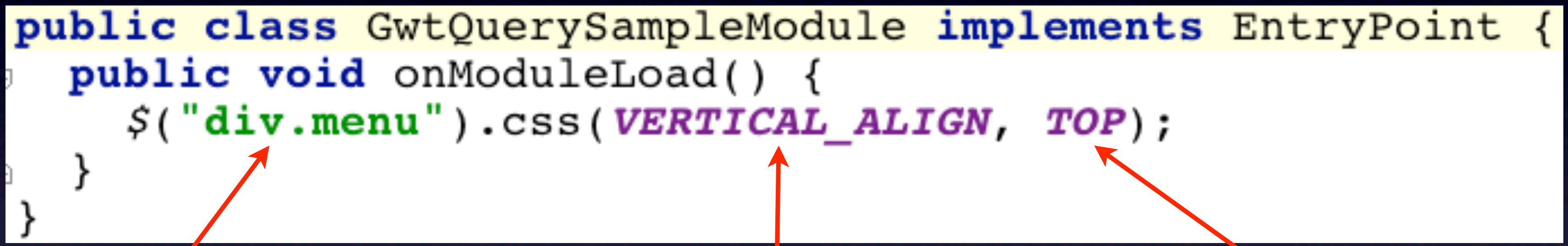
jQuery Core Concepts

- Querying
- Method Chaining
- Manipulation
- Attaching Data and Events
- Plugins

GQuery is

- jQuery clone written in GWT
- Designed to fit into design centric workflow
- Enable easy progressive enhancement of existing applications
- Be easy to learn for those using jQuery
- While delivering all of the productivity, efficiency, and safety benefits of GWT

This is legal Java code!



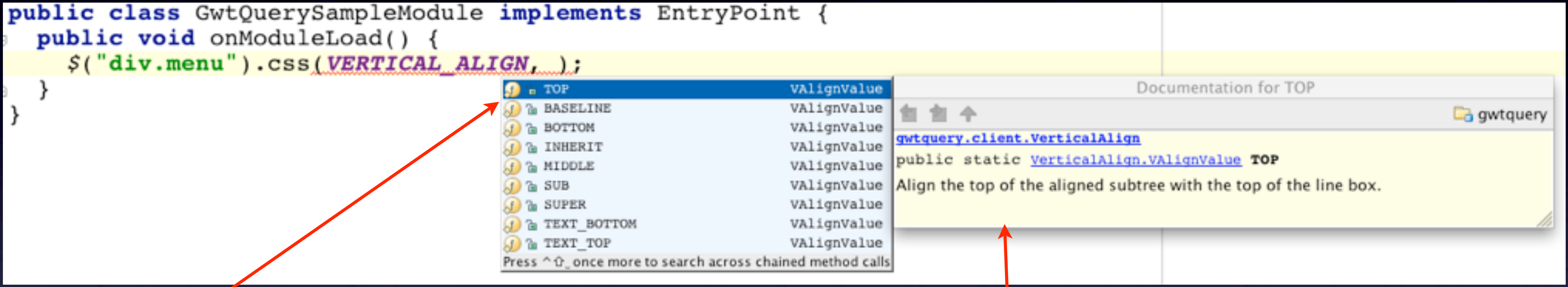
```
public class GwtQuerySampleModule implements EntryPoint {
  public void onModuleLoad() {
    $("div.menu").css(VERTICAL_ALIGN, TOP);
  }
}
```

CSS Selector

Strongly
Typed
Property Name

Typed CSS Value

Edit time



```
public class GwtQuerySampleModule implements EntryPoint {
  public void onModuleLoad() {
    $("div.menu").css(VERTICAL_ALIGN, );
  }
}
```

Press ^⇧ once more to search across chained method calls

gwtquery.client.VerticalAlign

public static VerticalAlign.VAlignValue TOP

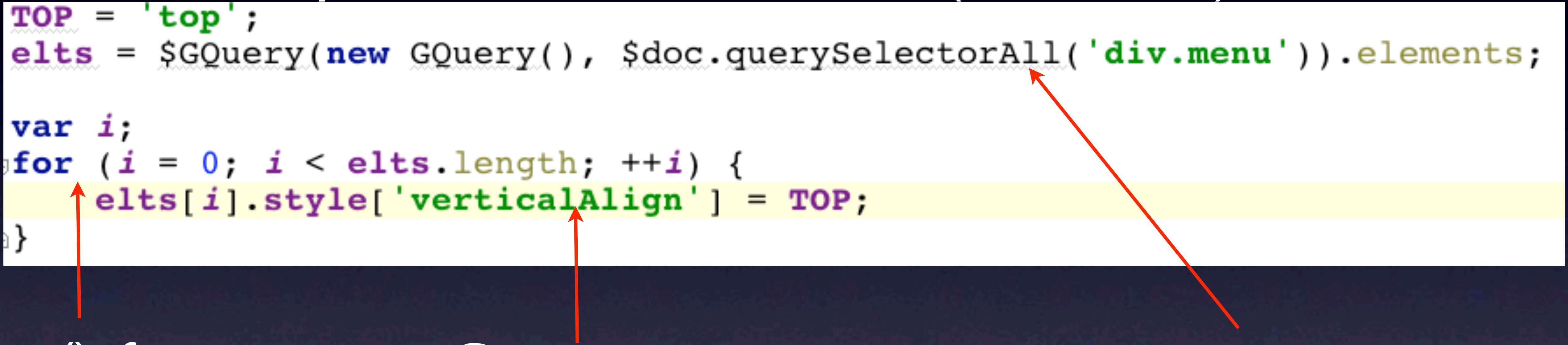
Align the top of the aligned subtree with the top of the line box.

Suggests Legal Values

Documentation from CSS2 Spec

Typing has Other Benefits

Output Code from GWT (for Safari)



```
TOP = 'top';
elts = $GQuery(new GQuery(), $doc.querySelectorAll('div.menu')).elements;

var i;
for (i = 0; i < elts.length; ++i) {
    elts[i].style['verticalAlign'] = TOP;
}
```

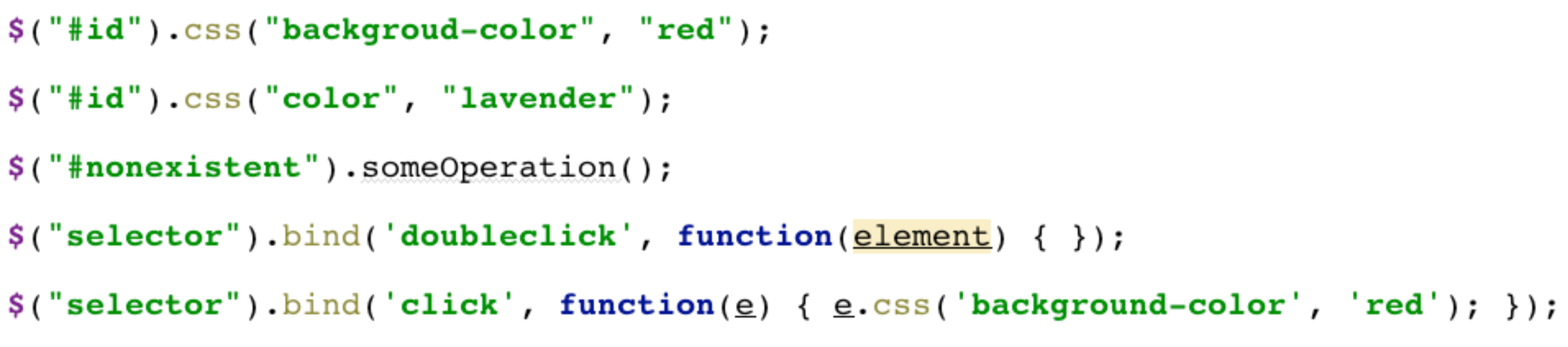
css() function inlined

Constant propagated

Inlined call to native querySelectorAll

Think about safety

See anything wrong?



```
$("#id").css("backgroud-color", "red");

$("#id").css("color", "lavender");

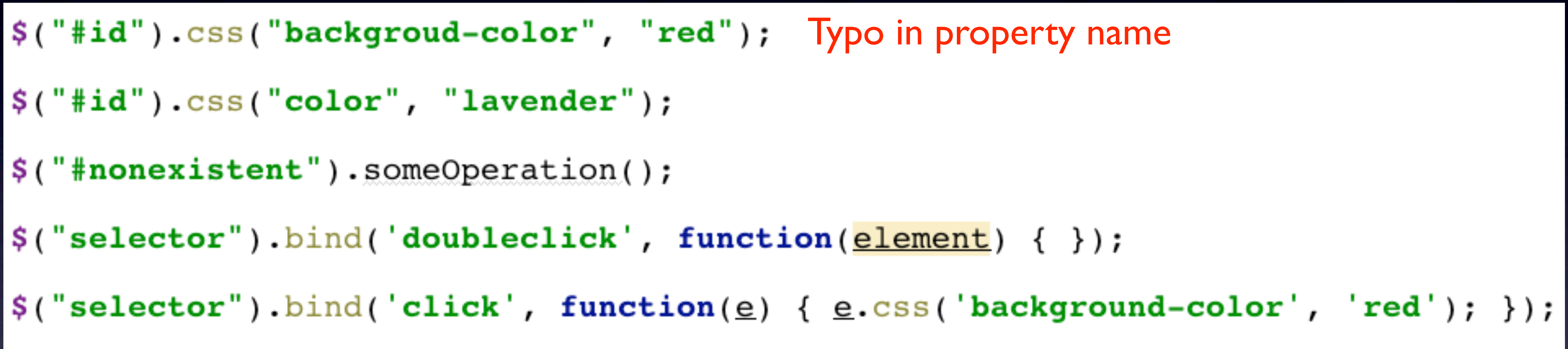
$("#nonexistent").someOperation();

$("selector").bind('doubleclick', function(element) { });

$("selector").bind('click', function(e) { e.css('background-color', 'red'); });
```

Think about safety

See anything wrong?



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Typo in property name

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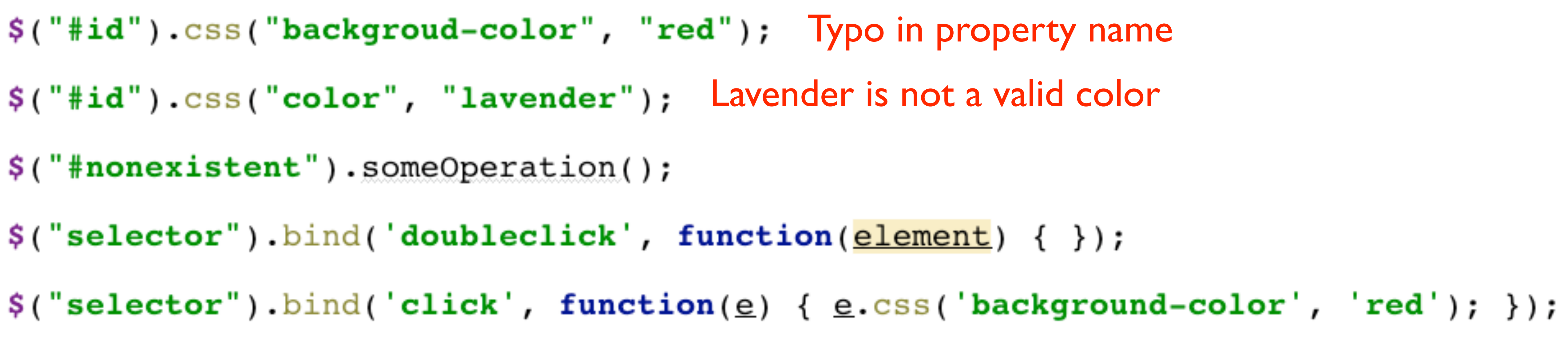

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Lavender is not a valid color

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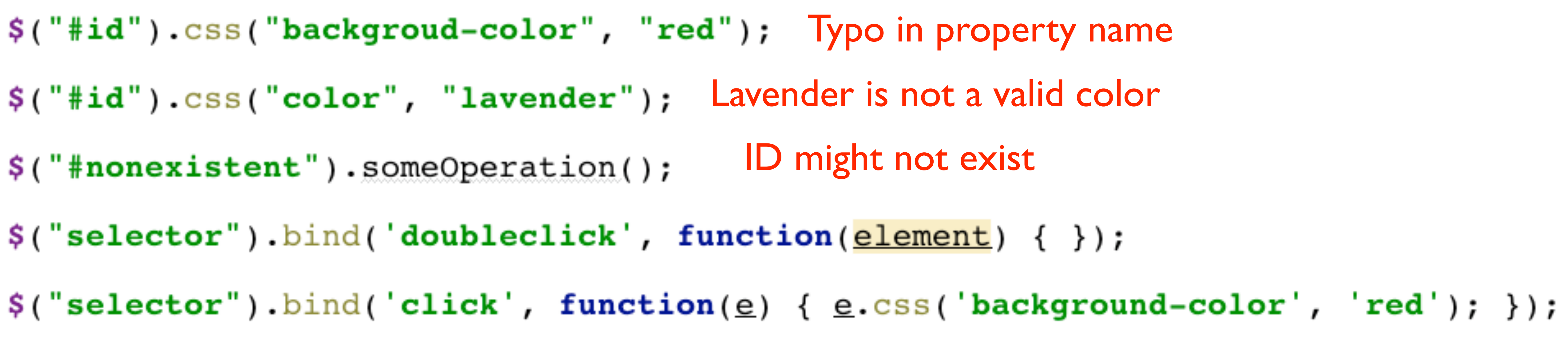

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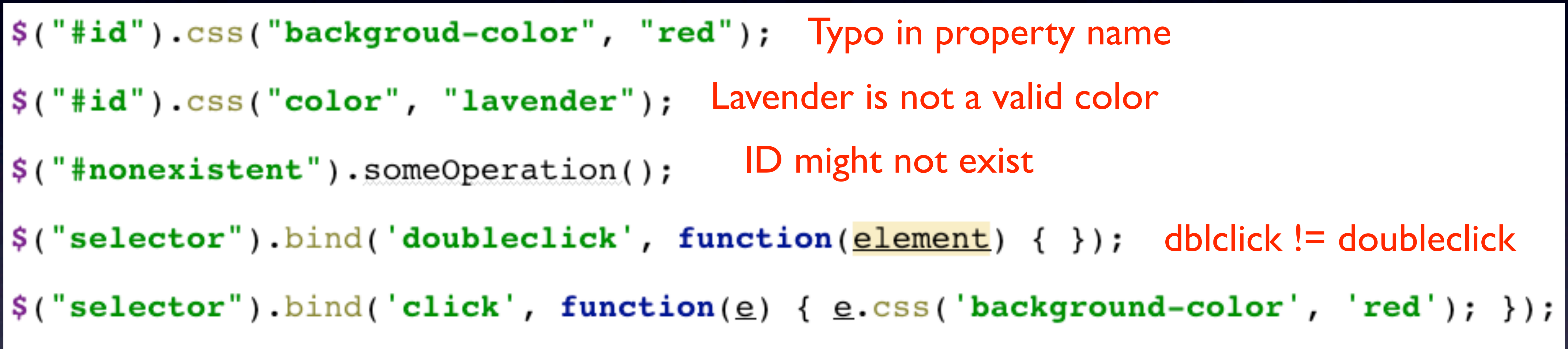

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```

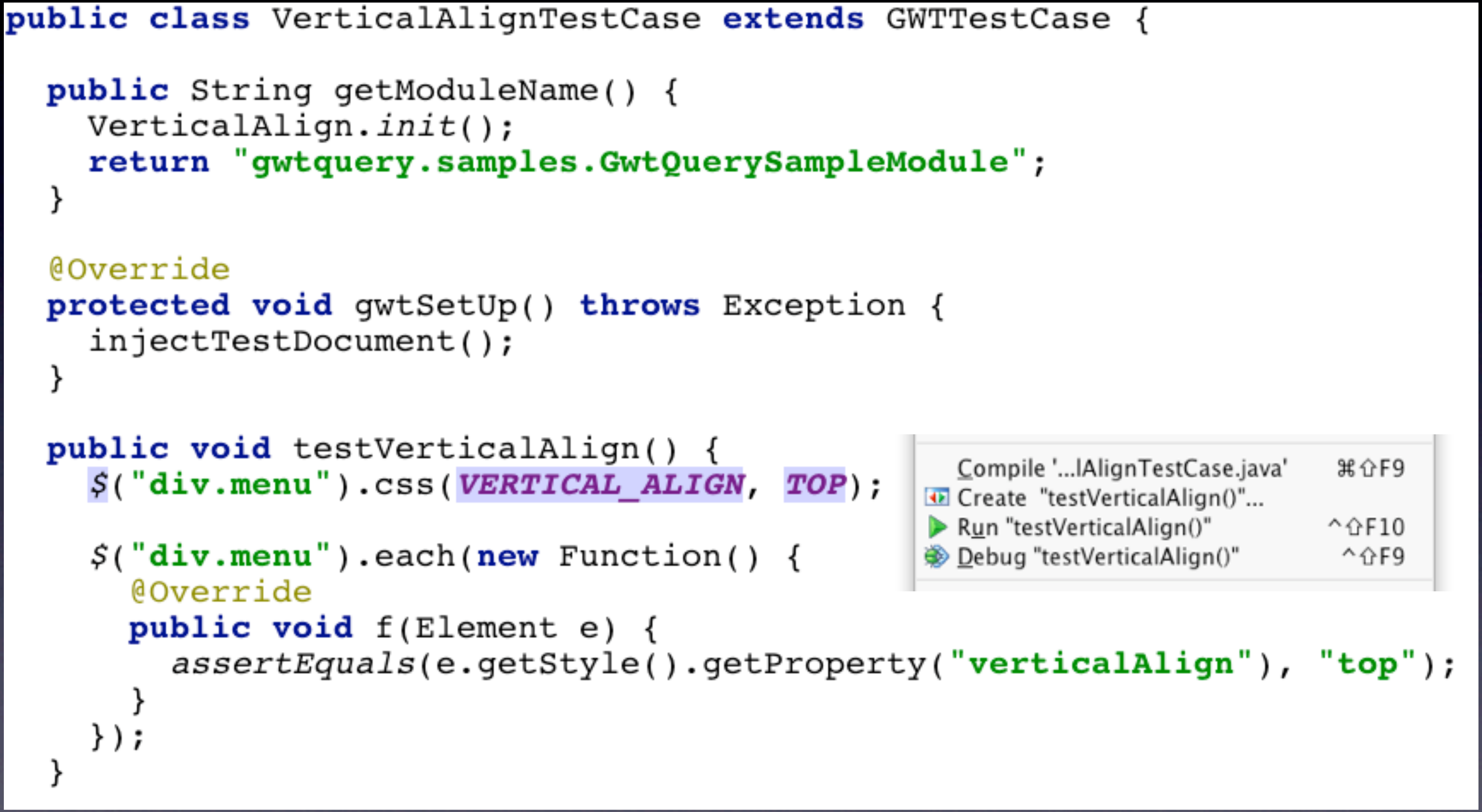
Typo in property name

Lavender is not a valid color

ID might not exist

dblclick != doubleclick

Unit Testing



```java
public class VerticalAlignTestCase extends GWTTestCase {

  public String getModuleName() {
    VerticalAlign.init();
    return "gwtquery.samples.GwtQuerySampleModule";
  }

  @Override
  protected void gwtSetUp() throws Exception {
    injectTestDocument();
  }

  public void testVerticalAlign() {
    $("div.menu").css(VERTICAL_ALIGN, TOP);

    $("div.menu").each(new Function() {
      @Override
      public void f(Element e) {
        assertEquals(e.getStyle().getProperty("verticalAlign"), "top");
      }
    });
  }
```

Compile '...lAlignTestCase.java' ⌘⇧F9
Create "testVerticalAlign()"...
Run "testVerticalAlign()" ^⇧F10
Debug "testVerticalAlign()" ^⇧F9

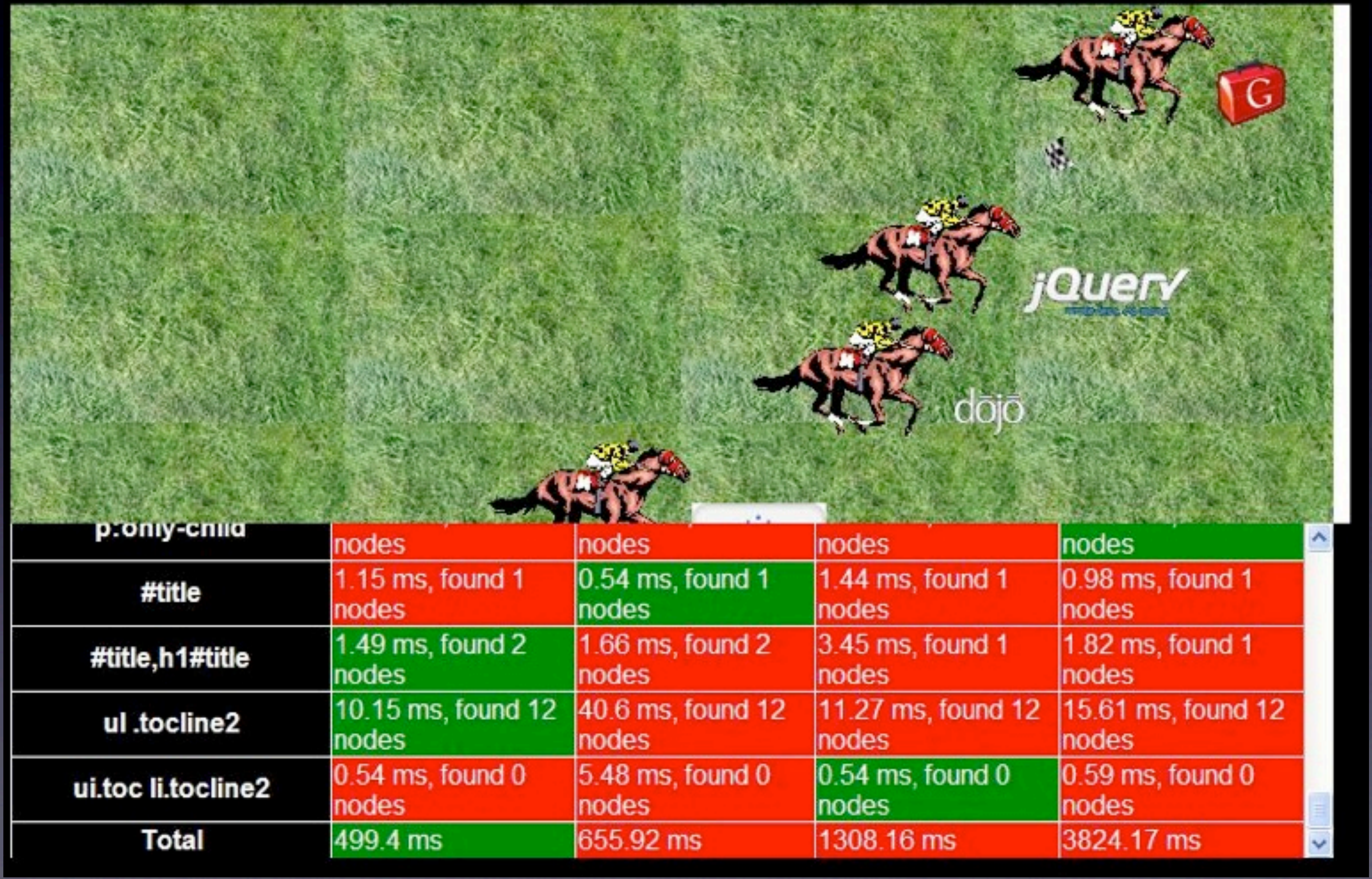
GQuery Demo

Hosted Mode Magic

- Hosted Mode is like GreaseMonkey, but injects Java code instead of Javascript!

Performance

Performance (Dreaded IE6)



p:only-child	nodes	nodes	nodes	nodes
#title	1.15 ms, found 1 nodes	0.54 ms, found 1 nodes	1.44 ms, found 1 nodes	0.98 ms, found 1 nodes
#title,h1#title	1.49 ms, found 2 nodes	1.66 ms, found 2 nodes	3.45 ms, found 1 nodes	1.82 ms, found 1 nodes
ul .tocline2	10.15 ms, found 12 nodes	40.6 ms, found 12 nodes	11.27 ms, found 12 nodes	15.61 ms, found 12 nodes
ui.toc li.tocline2	0.54 ms, found 0 nodes	5.48 ms, found 0 nodes	0.54 ms, found 0 nodes	0.59 ms, found 0 nodes
Total	499.4 ms	655.92 ms	1308.16 ms	3824.17 ms

Compactness

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- $(“div.note”).text(“Hello Google I/O”);

Compactness

- $(“div.note”).text(“Hello Google I/O”);
- ~10,000 lines of Java code

Compactness

- $(“div.note”).text(“Hello Google I/O”);
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- 300kbytes on disk

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- $(“div.note”).text(“Hello Google I/O”);
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- How big is the compiled output?

Compactness

- $(“div.note”).text(“Hello Google I/O”);
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    - 15kb or larger? (size of JQuery 1.2)

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  - How about 7kb, a 50% reduction?

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  - Actual answer: 760 bytes (Safari)

Compactness

- $(“div.note”).text(“Hello Google I/O”);
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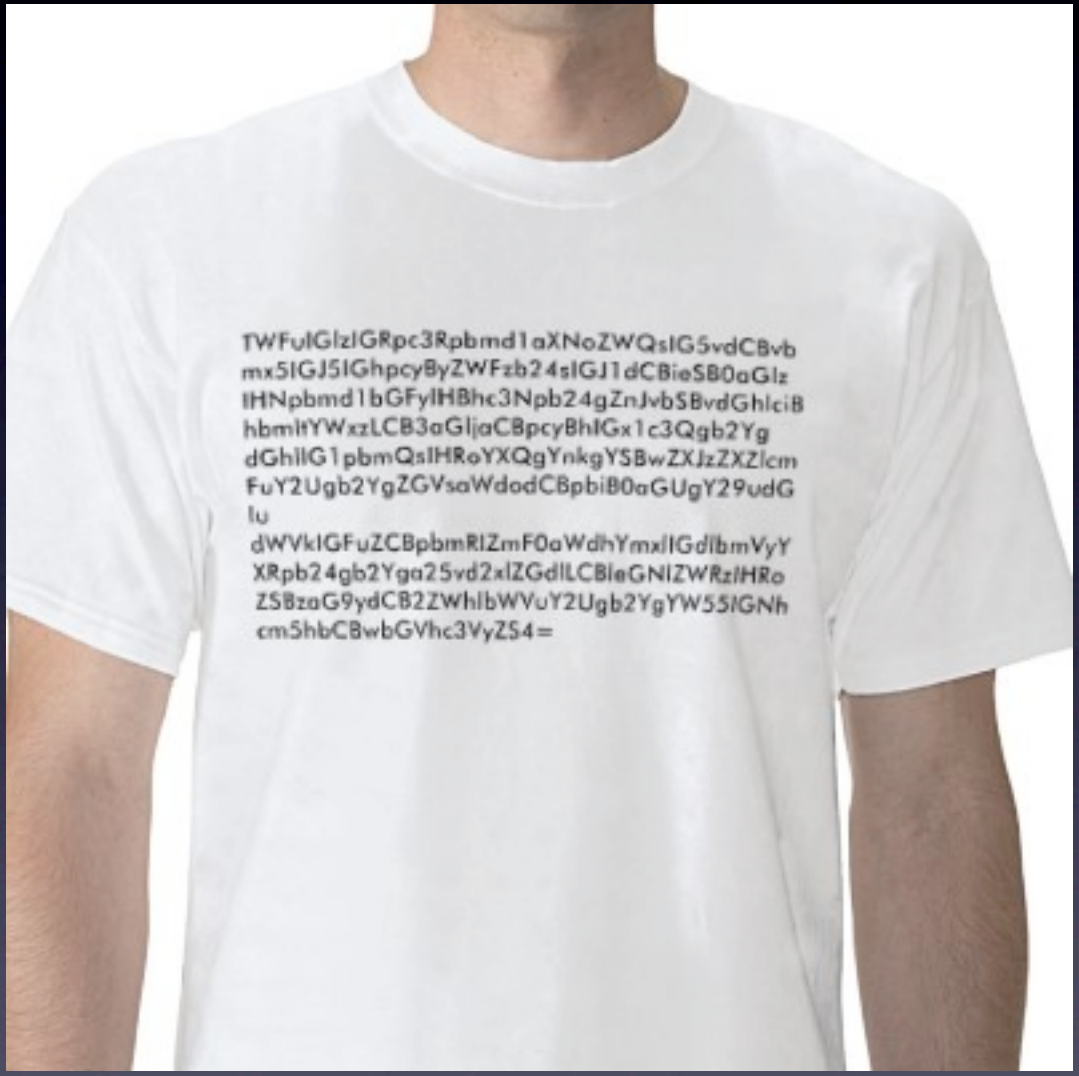
- 300kbytes on disk
- How big is the compiled output?
    - 15kb or larger? (size of JQuery 1.2)
    - How about 7kb, a 50% reduction?
    - Actual answer: 760 bytes (Safari)
    - Smaller than HTTP headers used to fetch

Compactness


TWFuIGlzIGRpc3Rpbmd1aXNoZWQsIG5vdCBvb
mx5IGJ5IGhpcyByZWFzb24sIGJ1dCBieSB0aGlz
IHNpbmd1bGFyIHBhc3Npb24gZnJvbSBvdGhlciB
hbmltYWxzLCB3aGljaCBpcyBhIGx1c3Qgb2Yg
dGhlIG1pbmQsIHRoYXQgYnkgYSBwZXJzZXZlcm
FuY2Ugb2YgZGVsaWdodCBpbiB0aGUgY29udG
lu
dWVkIGFuZCBpbmRlZmF0aWdhYmxlIGdlbmVyY
XRpb24gb2Yga25vd2xlZGdlLCBleGNlZWRzIHRo
ZSBzaG9ydCB2ZWhlbWVuY2Ugb2YgYW55IGNh
cm5hbCBwbGVhc3VyZS4=

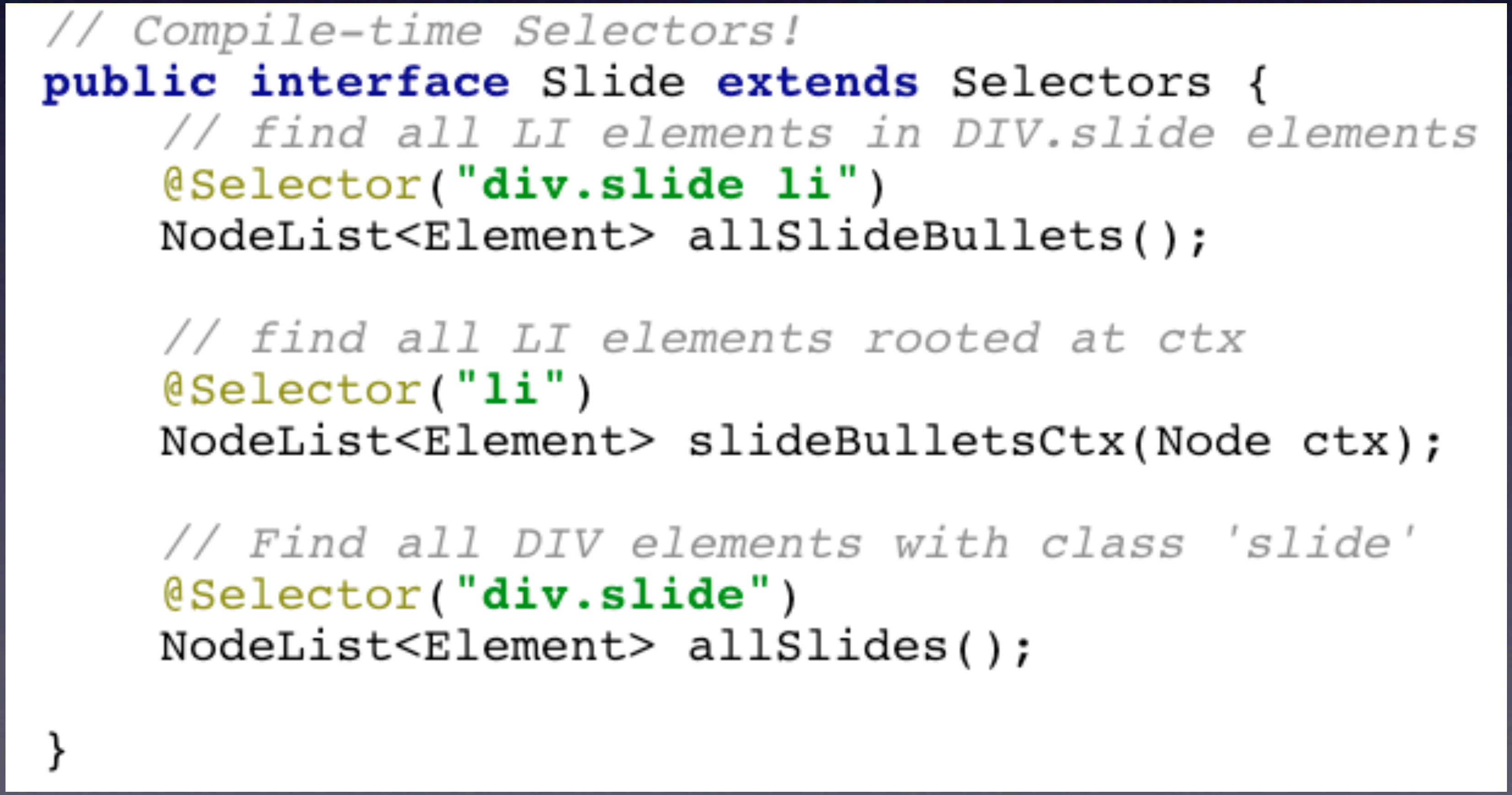
Performance Explained

- GQuery can parse, optimize, and compile selectors at **compile time**
- Inlining and other optimizations help
- Only fields and methods references are included in output, reducing size

Compile Time vs Runtime

$(“query expression”) - Runtime

GWT.create(Slide.class) - Compile Time



```
// Compile-time Selectors!
public interface Slide extends Selectors {
    // find all LI elements in DIV.slide elements
    @Selector("div.slide li")
    NodeList<Element> allSlideBullets();

    // find all LI elements rooted at ctx
    @Selector("li")
    NodeList<Element> slideBulletsCtx(Node ctx);

    // Find all DIV elements with class 'slide'
    @Selector("div.slide")
    NodeList<Element> allSlides();

}
```

$(selector)

- On HTML5, document.querySelectorAll()
- On Firefox2, older Safari, Opera
  - document.evaluate(xpath)
- Everyone else, lots of RegExp and DOM calls.
- Note: each browser gets own separately compiled version

Compile Time Selector (HTML5)

- Statically short-circuited to
    - querySelectorAll
    - getElementsByClassName for $(“.foo”)
    - getElementById for $(“#foo”)

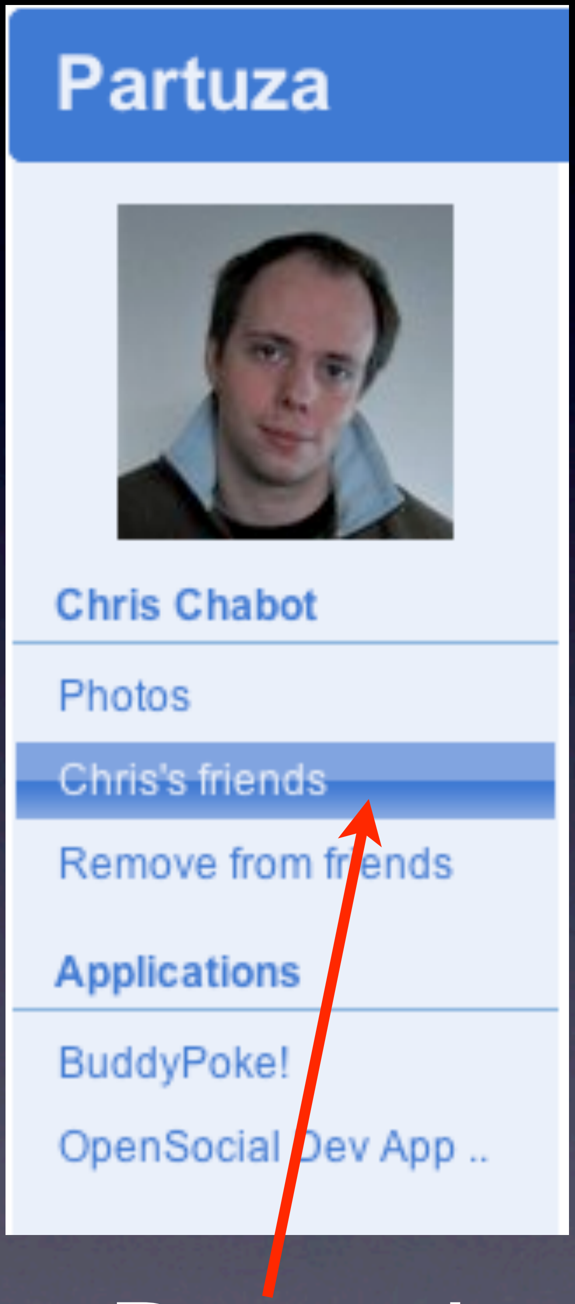
Compile Time Selectors (Firefox2, Safari2, etc)

- On XPath capable browsers
  - CSS selector translated to XPath query
  - document.evaluate() invoked
  - otherwise, short-circuited to getElementById e.g. for $(“#foo”)

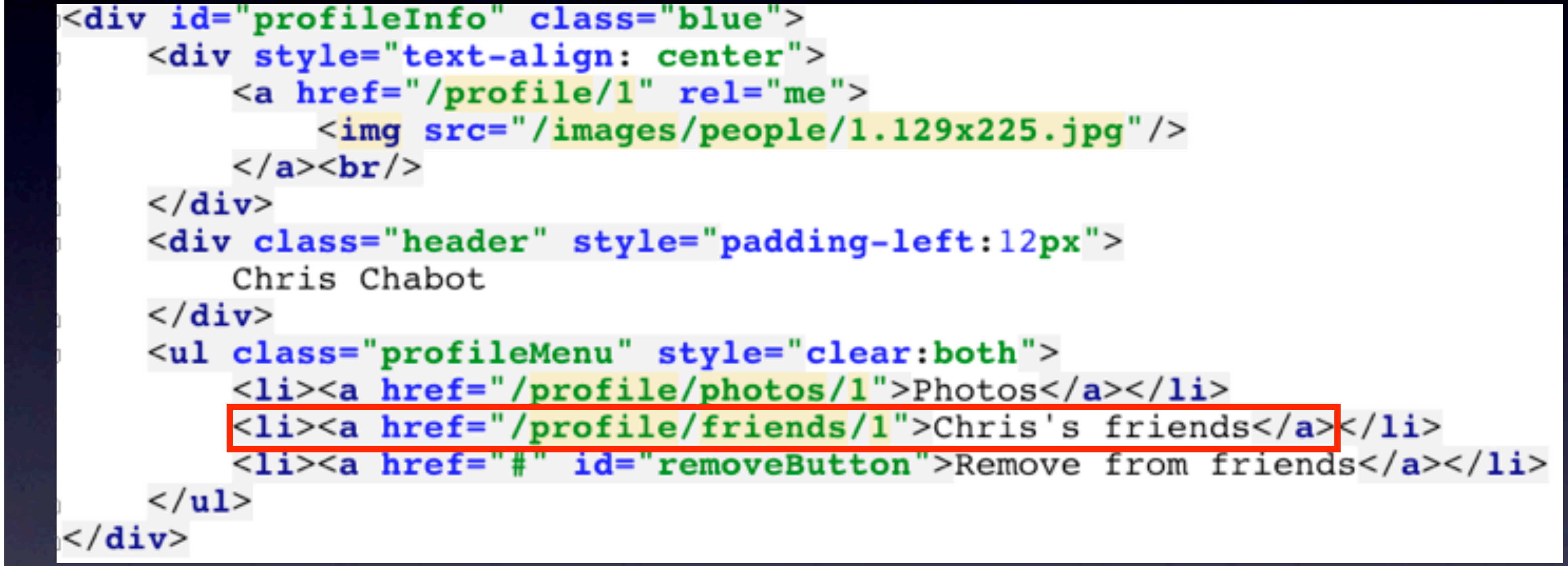
Compile Time Selectors (Dreaded IE6)

- Generate inlined calls to runtime selector engine (JS)
- Possible to short-circuit or eliminate some cases
- Parsing step still avoided.

Workflow



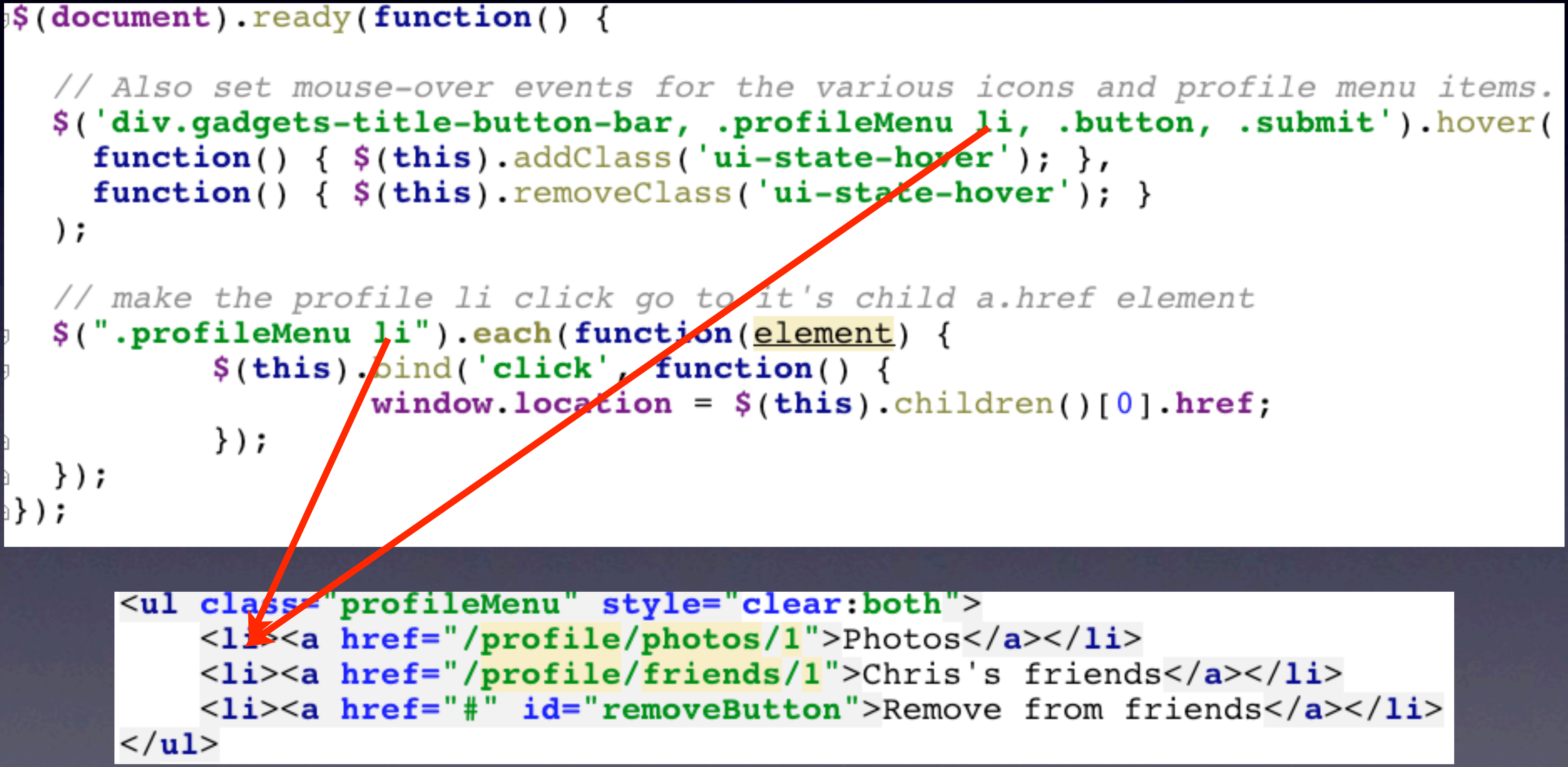
Desired



```
<div id="profileInfo" class="blue">
    <div style="text-align: center">
        <a href="/profile/1" rel="me">
            <img src="/images/people/1.129x225.jpg"/>
        </a><br/>
    </div>
    <div class="header" style="padding-left:12px">
        Chris Chabot
    </div>
    <ul class="profileMenu" style="clear:both">
        <li><a href="/profile/photos/1">Photos</a></li>
        <li><a href="/profile/friends/1">Chris's friends</a></li>
        <li><a href="#" id="removeButton">Remove from friends</a></li>
    </ul>
</div>
```

Starting HTML

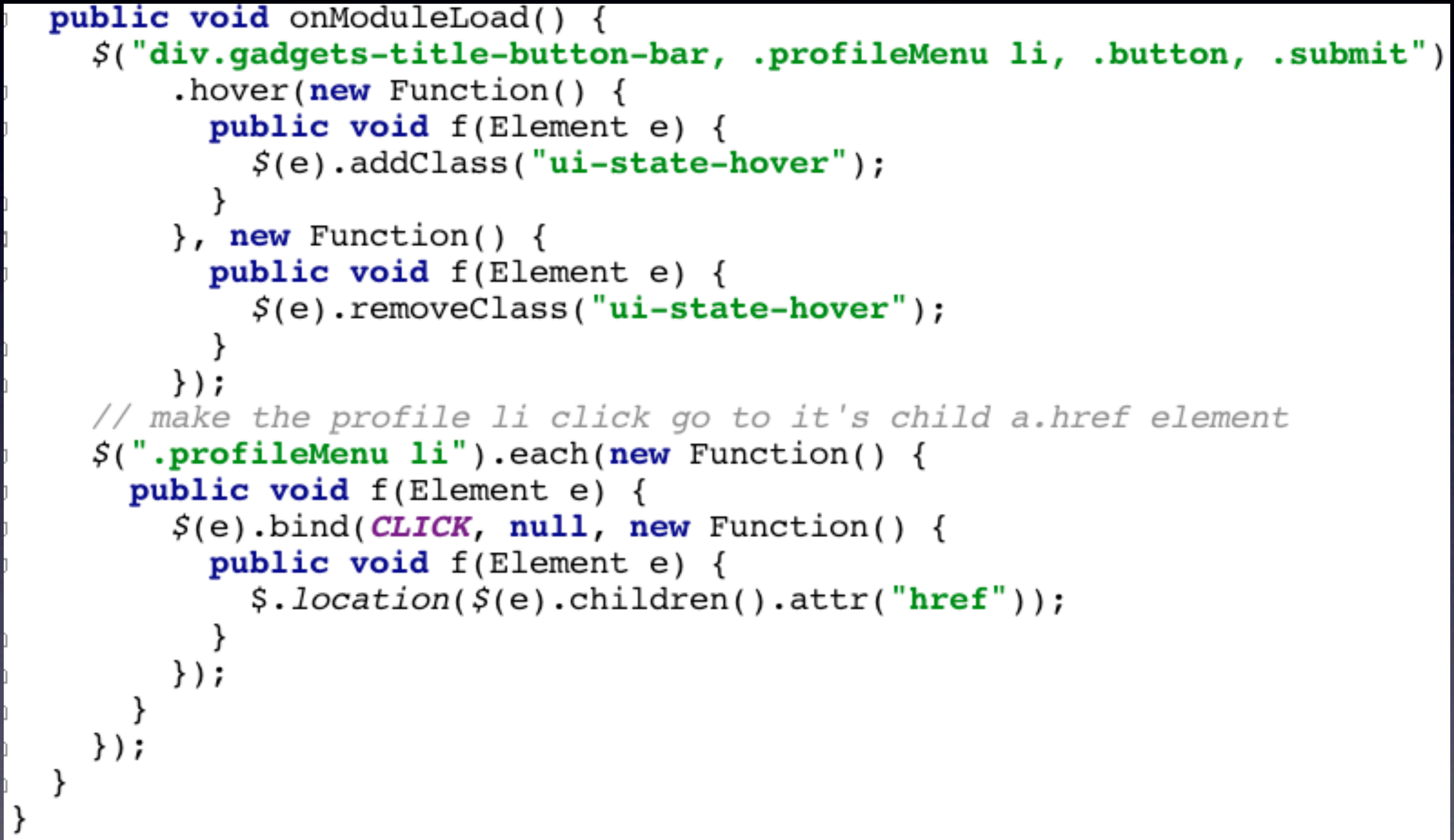
jQuery enhancement



```
$(document).ready(function() {

  // Also set mouse-over events for the various icons and profile menu items.
  $('div.gadgets-title-button-bar, .profileMenu li, .button, .submit').hover(
    function() { $(this).addClass('ui-state-hover'); },
    function() { $(this).removeClass('ui-state-hover'); }
  );

  // make the profile li click go to it's child a.href element
  $(".profileMenu li").each(function(element) {
          $(this).bind('click', function() {
                  window.location = $(this).children()[0].href;
          });
  });
});
```

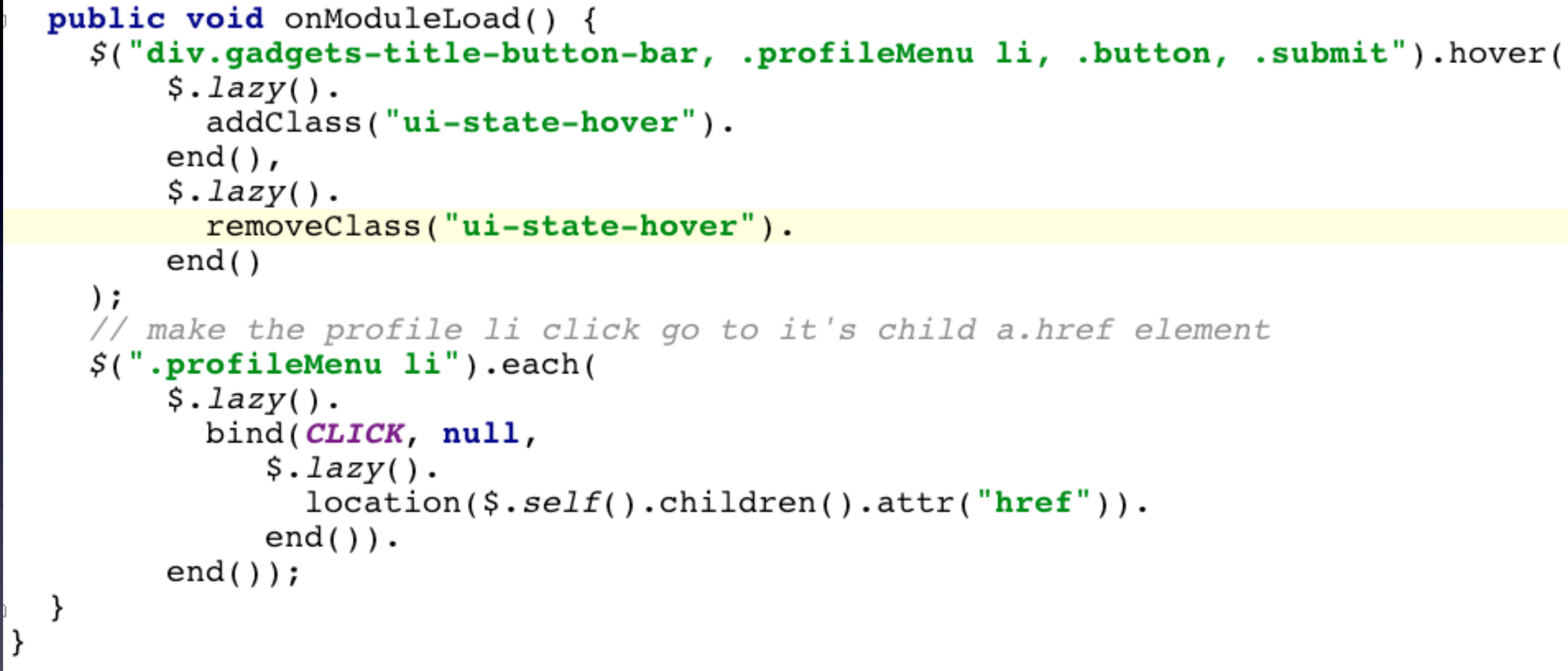
```
<ul class="profileMenu" style="clear:both">
    <li><a href="/profile/photos/1">Photos</a></li>
    <li><a href="/profile/friends/1">Chris's friends</a></li>
    <li><a href="#" id="removeButton">Remove from friends</a></li>
</ul>
```

GQuery (Inner Class)



```
  public void onModuleLoad() {
    $("div.gadgets-title-button-bar, .profileMenu li, .button, .submit")
        .hover(new Function() {
          public void f(Element e) {
            $(e).addClass("ui-state-hover");
          }
        }, new Function() {
          public void f(Element e) {
            $(e).removeClass("ui-state-hover");
          }
        });
    // make the profile li click go to it's child a.href element
    $(".profileMenu li").each(new Function() {
      public void f(Element e) {
        $(e).bind(CLICK, null, new Function() {
          public void f(Element e) {
            $.location($(e).children().attr("href"));
          }
        });
      }
    });
  }
}
```

GQuery Lazy



```
  public void onModuleLoad() {
    $("div.gadgets-title-button-bar, .profileMenu li, .button, .submit").hover(
        $.lazy().
          addClass("ui-state-hover").
        end(),
        $.lazy().
          removeClass("ui-state-hover").
        end()
    );
    // make the profile li click go to it's child a.href element
    $(".profileMenu li").each(
        $.lazy().
          bind(CLICK, null,
             $.lazy().
               location($.self().children().attr("href")).
             end()).
        end());
  }
}
```

$.lazy() = function() {

.end() = }

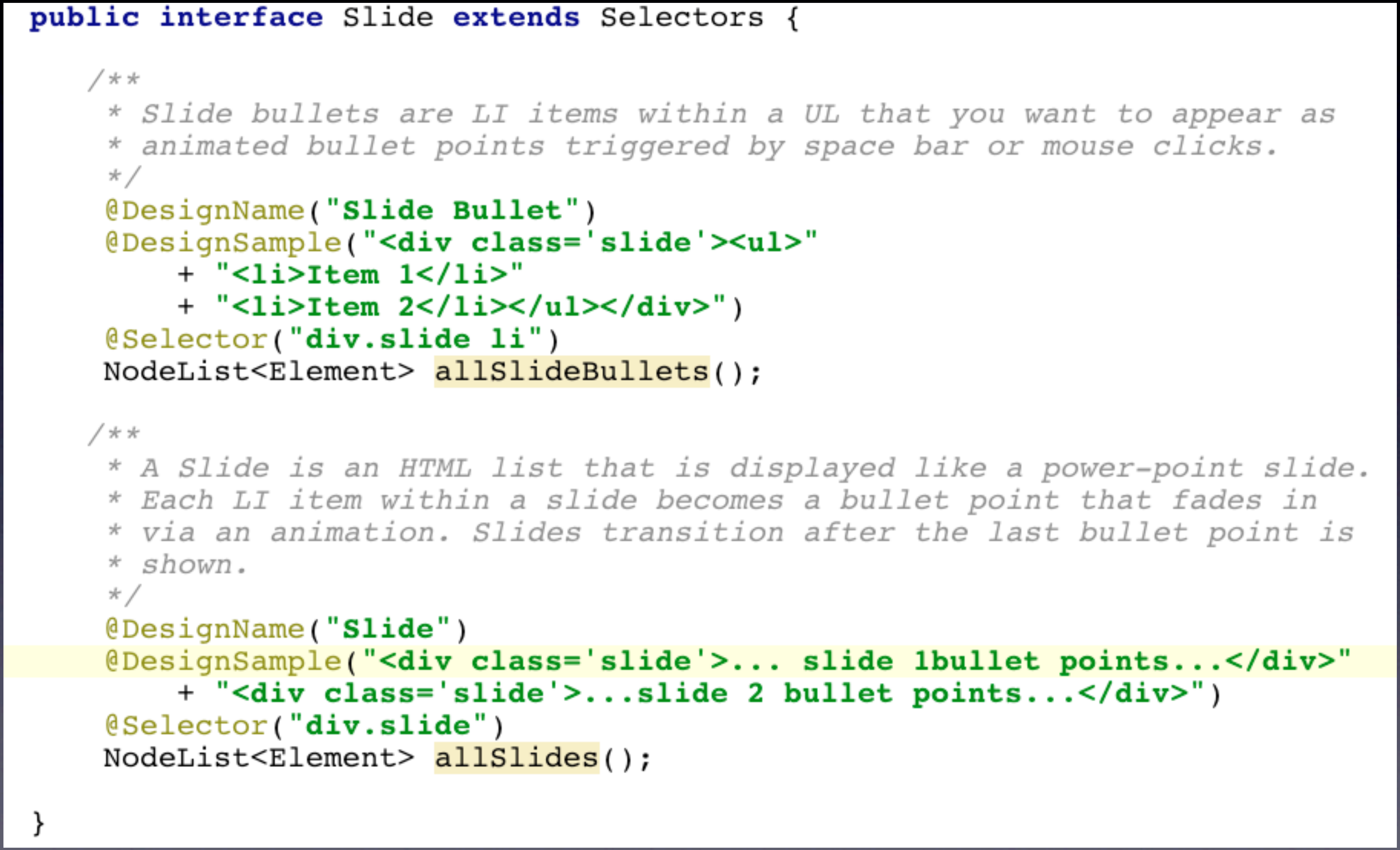
GQuery for Designers

- Provide reusable components
- Auto-generate documentation
- Leverages compile-time selectors

Design Time Docs

- GQuery produces Javadoc-like documentation for designers
- Each selector can have extra metadata associated
    - Name of Design Element 'Menu Item'
    - Sample Usage
    - Selector/CSS Classes used

Design Time Selectors

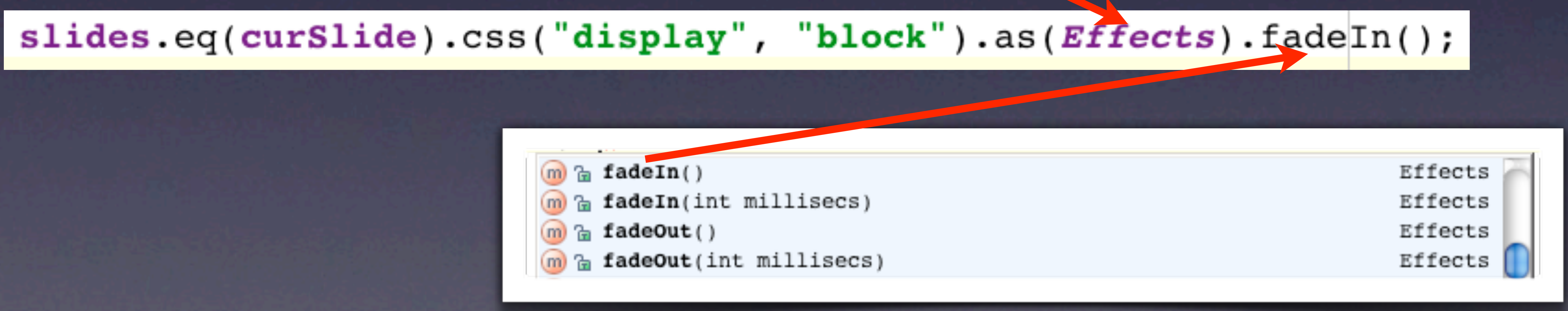


```
public interface Slide extends Selectors {

    /**
     * Slide bullets are LI items within a UL that you want to appear as
     * animated bullet points triggered by space bar or mouse clicks.
     */
     @DesignName("Slide Bullet")
     @DesignSample("<div class='slide'><ul>"
         + "<li>Item 1</li>"
         + "<li>Item 2</li></ul></div>")
     @Selector("div.slide li")
     NodeList<Element> allSlideBullets();

    /**
     * A Slide is an HTML list that is displayed like a power-point slide.
     * Each LI item within a slide becomes a bullet point that fades in
     * via an animation. Slides transition after the last bullet point is
     * shown.
     */
     @DesignName("Slide")
     @DesignSample("<div class='slide'>... slide 1bullet points...</div>"
         + "<div class='slide'>...slide 2 bullet points...</div>")
     @Selector("div.slide")
     NodeList<Element> allSlides();

}
```

Example GQuery Doc

GQuery Extension

- jQuery-like plugin mechanism
- Type-safe chained calls
- Extremely simple to write
- Zero overhead unless invoked by developer



```
slides.eq(curSlide).css("display", "block").as(Effects).fadeIn();
```

```
fadeIn()                      Effects
fadeIn(int millisecs)         Effects
fadeOut()                     Effects
fadeOut(int millisecs)        Effects
```

Example: Star Ratings

Anatomy of a Plugin

- Foo extends GQuery
- Implement Plugin<Foo> interface
- In static initializer, invoke GQuery.registerPlugin()
- Declare static Class<Foo> Foo = Foo.class

License

- Open Source Apache License
- Available **now** at http://gwtquery.com
- Come contribute to the core, or write plugins!
- Thanks to Manuel Carrasco for unit tests and patches.
- More info at timepedia.blogspot.com

Questions?