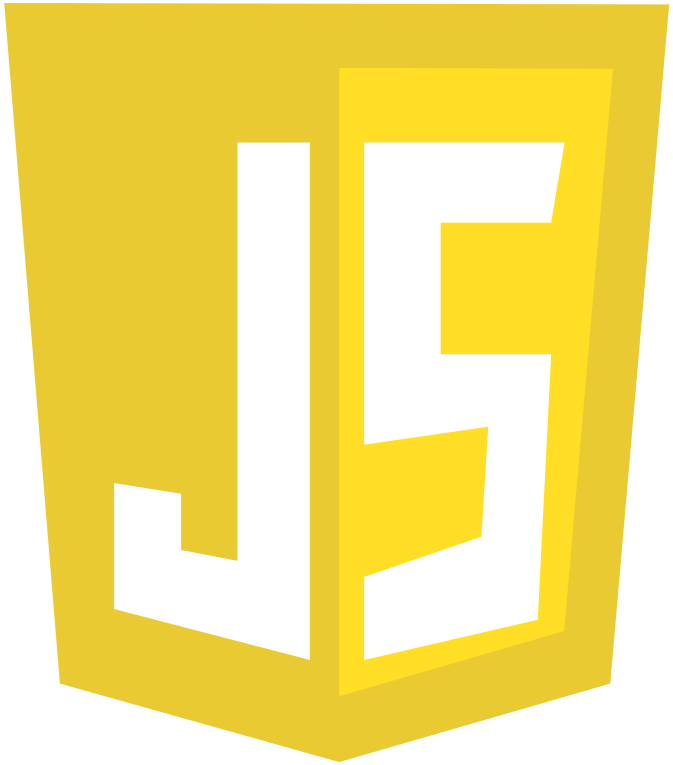
CSC336 – Web Technologies

Intro to Advanced JavaScript



JavaScript History

JavaScript History

Developed by Brendan Eich in 1995

JavaScript History

Originally called Mocha, then LiveScript

JavaScript History

Inspired By Scheme and Self

JavaScript History

Used C/Java Syntax

JavaScript History

Renamed JavaScript to Play off Java

JS Fun

not really a number

```
typeof NaN
//=> number
```

Topics

http://www.flickr.com/photos/arndalarm/354835622/sizes/l/in/photostream/

Topics

Concepts

Topics

Frameworks

Topics

Tools/Debugging

Topics

Testing

Concepts

Types

Primitives

```
var myFloat = 5;
var myFloat2 = 5.0;
var myString = 'String';
var myBoolean = true;
var myNull = null;
var myUndefined = undefined;
```

Wrappers

```
var wFloat = new Number(42.0);
var wString = new String('Hello');
var wBoolean = new Boolean(true);
```

Container Types

```
// Wrong Syntax
var myArray = new Array();
var myObject = new Object();

// Correct Syntax
var myArray = [];
var myObject = {};
```

Dynamic Typing

```
var pies = 3;

alert("We have " + pies + " pies");
// We have 3 pies
```

Dynamic Typing

```
var pies = '5';

// eat 2
pies = pies - 2;

alert('you have '+pies+' pies');
// you have 3 pies
```

Dynamic Typing

```
var pies = '5';

// bake 4
pies = pies + 4;

alert('you have '+pies+' pies');
// you have 54 pies
```

JS Fun

magically changing number

```
var a = 9999999999999999
console.log(a);
//=> 10000000000000000
```

Objects

```
var stateCapitals = {};
stateCapitals['Oregon'] = 'Salem';
stateCapitals['Montana'] = 'Helena';

stateCapitals['Montana']; // Helena
```

Objects

```
var stateCapitals = {};
stateCapitals.Oregon = 'Salem';
stateCapitals.Montana = 'Helena';

stateCapitals.Montana; // Helena
```

Objects

```
var stateCapitals = {
  'Oregon': 'Salem',
  'Montana': 'Helena'
};

stateCapitals['Montana']; // Helena
stateCapitals.Montana; // Helena
```

Objects (Hash Buckets)

```
var states = new Number(50);
states.Oregon = 'Salem';
states.Montana = 'Helena';

states.Montana; // Helena
console.log("We have "+states+" states");
// We have 50 states
```

Object Iteration

```
// Object Iteration
for (var state in states) {
  console.log(states[state] + ' is the\
  capital of ' + state);
}
// Helena is the capital of Montana
// ...
```

Object Iteration

```
// Object Iteration
for (var state in states) {
  if (states.hasOwnProperty(state)) {
    console.log(states[state] + ' is the\
    capital of ' + state);
  }
}
// Helena is the capital of Montana
```

Functions

- First Class
- Lexical Scope
- Prototypal
- Closure

Methods

Methods are just functions that are assigned to the property of an object.

Functions

```
function concat(stringsArray) {
  return stringsArray.join('');
}

concat(['Cat', 'Fish']); // CatFish
```

First Class

```
var concat = function(stringsArray) {
  return stringsArray.join('');
}

concat(['Cat', 'Fish']); // CatFish
```

Functions

```
sayHi(); // hi

function sayHi() {
  console.log('hi');
}

sayHi(); // hi
```

First Class

```
sayHi(); // ReferenceError: sayHi is
         // not defined

var sayHi = function() {
  console.log('hi');
}

sayHi(); // hi
```

Lexical Scope

```
function saySomething() {
  var message = 'Lexical Scoped';
  console.log(message);
}

saySomething(); // Lexical Scoped
console.log(message); //
ReferenceError: message is not
defined
```

Lexical Scope

```
function sayDirection(up) {
  if (up == true) {
    var direction = 'up';
  } else {
    var direction = 'down';
  }
  console.log(direction);
}
sayDirection(true); // up
sayDirection(false); // down
```

Methods

```
var Singleton = {
  setCount: function(count) {
    this.count = count;
  },
  increment: function() {
    this.count++;
  }
};

Singleton.setCount(5);
Singleton.count; // 5
Singleton.increment();
Singleton.count;// 6
```

Closures

A "closure" is an expression (typically a function) that can have free variables together with an environment that binds those variables (that "closes" the expression).

Closures

```
function makeAdder(aNum) {
  var addNumFunc = function(bNum) {
    return aNum + bNum;
  };

  return addNumFunc;
}

var addFive = makeAdder(5);
console.log(addFive(2)); // 7
console.log(addFive(10)); // 15
```

```
$(function() {
  var links = $('a');

  // loop through each link
  links.each(
    function(link, index) {

      // bind the click event
      $(link).click(
        function(event) {
          console.log('clicked link #'+index
          +' of ' + links.length);
        }
      );
    }
  );
});
```

```
$(function() {
  var links = $('a');

  // loop through each link
  links.each(
    function(link, index) {

      // bind the click event
      $(link).click(
        function(event) {
          console.log('clicked link #'+index
          +' of ' + links.length);
        }
      );
    }
  );
});
```

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$(function() {
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      // bind the click event
      $(link).click(
        function(event) {
          console.log('clicked link #'+index
          +' of ' + links.length);
        }
      );
    }
  );
});
```

```
$(function() {
  var links = $('a');

  // loop through each link
  links.each(
    function(link, index) {

      // bind the click event
      $(link).click(
        function(event) {
          console.log('clicked link #'+index
          +' of ' + links.length);
        }
      );
    }
  );
});
```

```
$(function() {
  var links = $('a');

  // loop through each link
  links.each(
    function(link, index) {

      // bind the click event
      $(link).click(
        function(event) {
          console.log('clicked link #' +index
          + ' of ' + links.length);
        }
      );
    }
  );
});
```

Closures

```
function addLinks() {
  for (var i=0, link; i<5; i++) {
    link = document.createElement("a");
    link.innerHTML = "Link " + i;
    link.onclick = function () {
      console.log(i);
    };
    document.body.appendChild(link);
  }
}
window.onload = addLinks;
```

Closures

```
function addLinks() {
  for (var i=0, link; i<5; i++) {
    link = document.createElement("a");
    link.innerHTML = "Link " + i;
    link.onclick = function (num) {
      return function () {
        alert(num);
      };
    }(i);
    document.body.appendChild(link);
  }
}
```

Private Variables

```
var person = function () {
  // Private
  var name = "Ryan";
  return {
    getName : function () {
      return name;
    },
    setName : function (newName) {
      name = newName;
    }
  };
}();
alert(person.name); // Undefined
alert(person.getName()); // "Ryan"
person.setName("Brendan Eich");
alert(person.getName()); // "Brendan Eich"
```

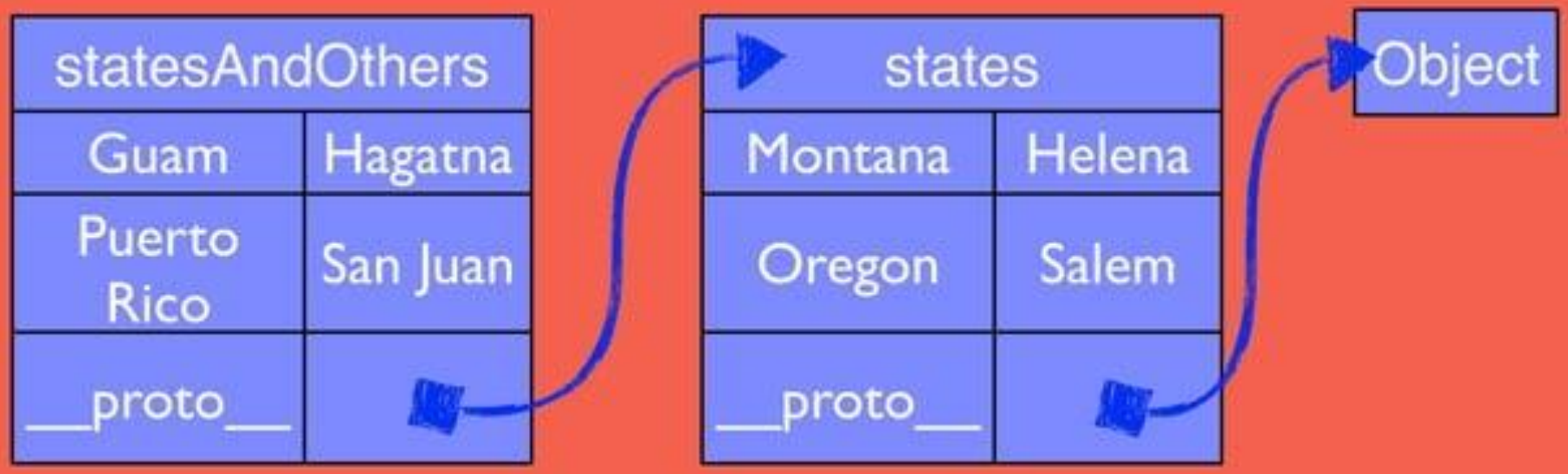
Prototyping __proto__

```
var states = {
  'Montana': 'Helena',
  'Oregon': 'Salem'
};

var statesAndOthers = {
  'Guam': 'Hagatna',
  'Puerto Rico': 'San Juan'
}

statesAndOthers['__proto__'] = states;
statesAndOthers['Montana']; // Helena
statesAndOthers['Puerto Rico']; // San Juan
```

Prototyping __proto_



One Problem

```
var states = {
  'Montana': 'Helena'
  'Oregon': 'Salem'
};

var statesAndOthers = {
  'Guam': 'Hagatna',
  'Puerto Rico': 'San Juan'
}

statesAndOthers['__proto__'] = states;
statesAndOthers['Montana']; // Helena
statesAndOthers['Puerto Rico']; // San Juan
```

Prototyping

```
function extendedObject(o) {
  var objFunc = function() {};
  objFunc.prototype = o;
  return new objFunc();
}

var states = {
  'Montana': 'Helena',
  'Oregon': 'Salem'
};

var statesAndOthers = extendedObject(states);
statesAndOthers['Guam'] = 'Hagatna';
statesAndOthers['Puerto Rico'] = 'San Juan';

statesAndOthers['Guam']; // Hagantan
statesAndOthers['Montana']; // Helena
```

Prototyping

```
// Constructor
function Animal(name) {
  this.name = name;
}

Animal.prototype.speak = function() {
  console.log("Hi, I'm " + this.name);
};

Animal.prototype.isAlive = function() {
  return true;
};

var bob = new Animal('Bob');
bob.speak(); // Hi, I'm Bob
bob.isAlive(); // true
```

Prototyping

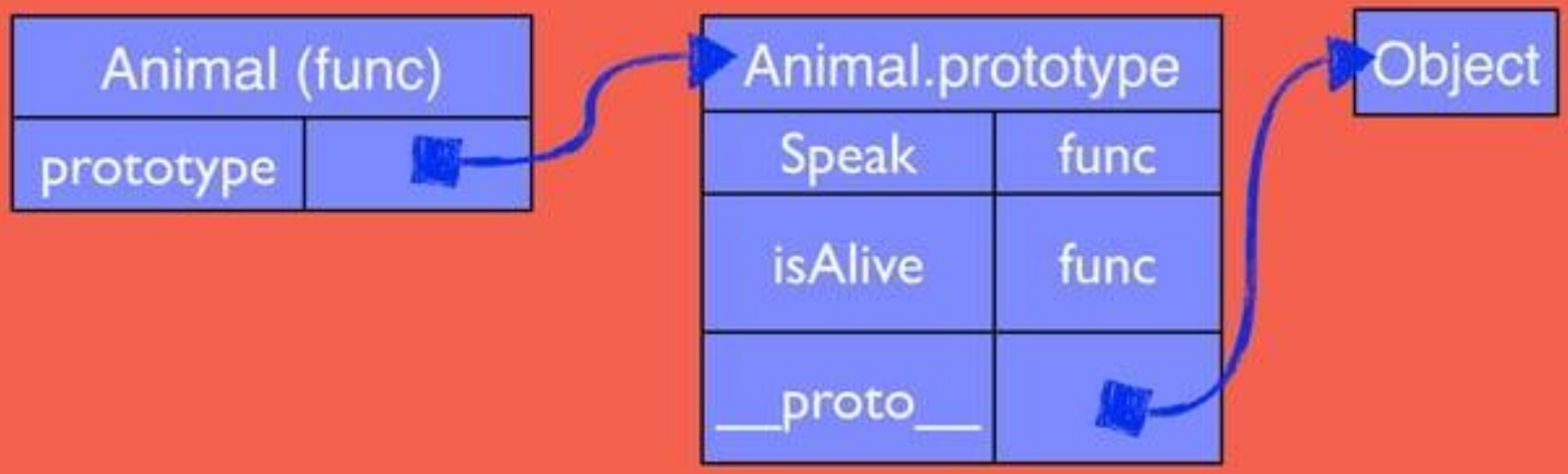
```
// Constructor
function Animal(name) {
  this.name = name;
}

Animal.prototype = {
  speak: function() {
    console.log("Hi, I'm " + this.name);
  },

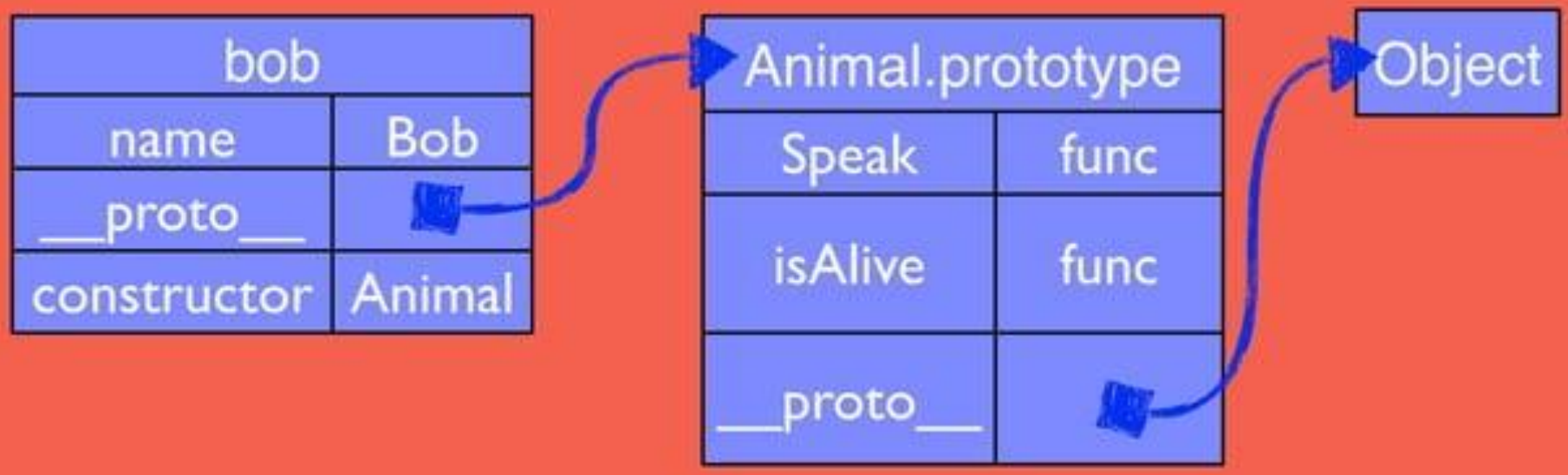
  isAlive: function() {
    return true;
  }
};

var bob = new Animal('Bob');
```

Animal Function Setup



Animal Instance Bob



Prototyping

```
// Constructor
function Dog(name) {
  this.name = name;
}

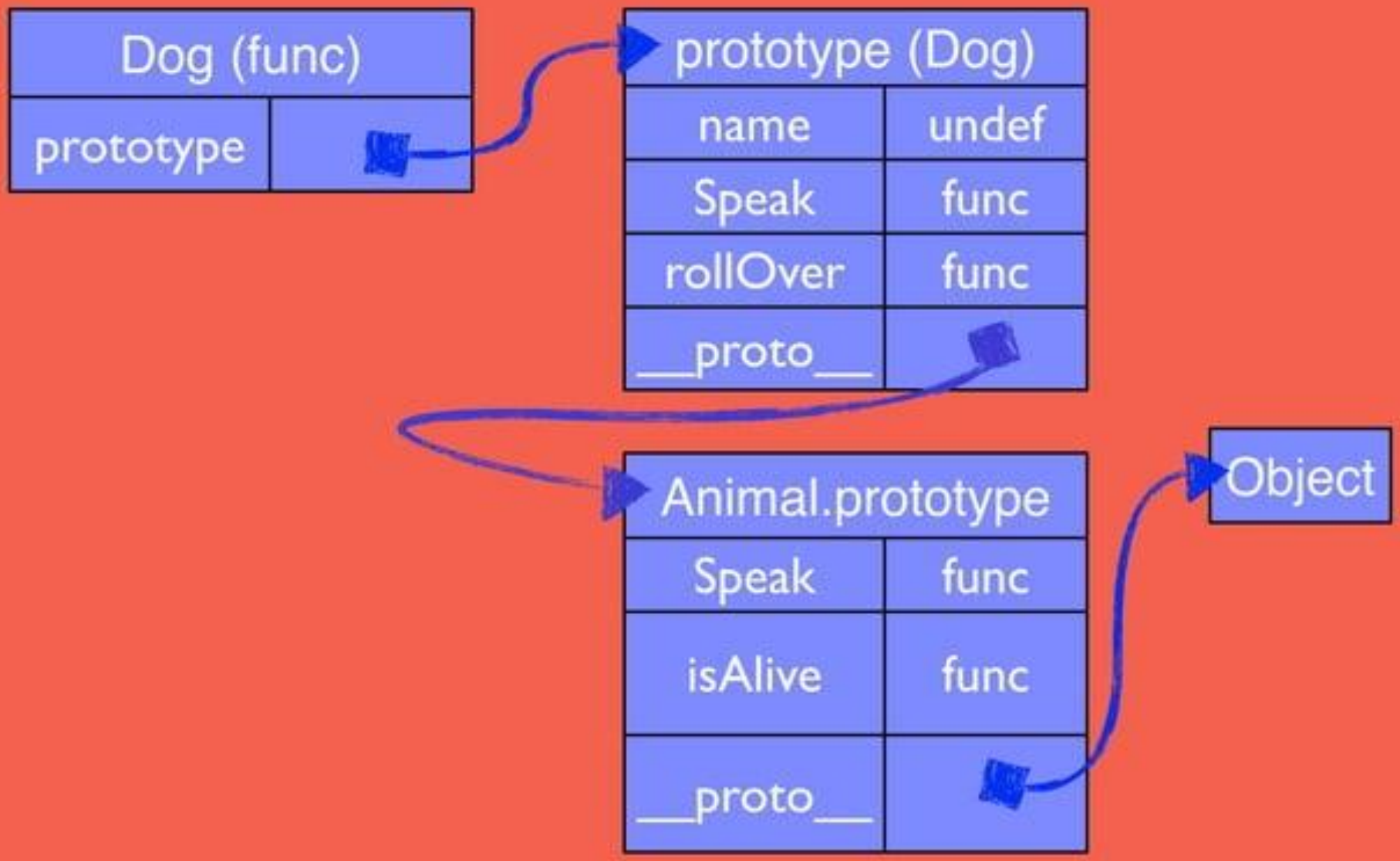
Dog.prototype = new Animal();

Dog.prototype.speak = function() {
  console.log("Bark");
};

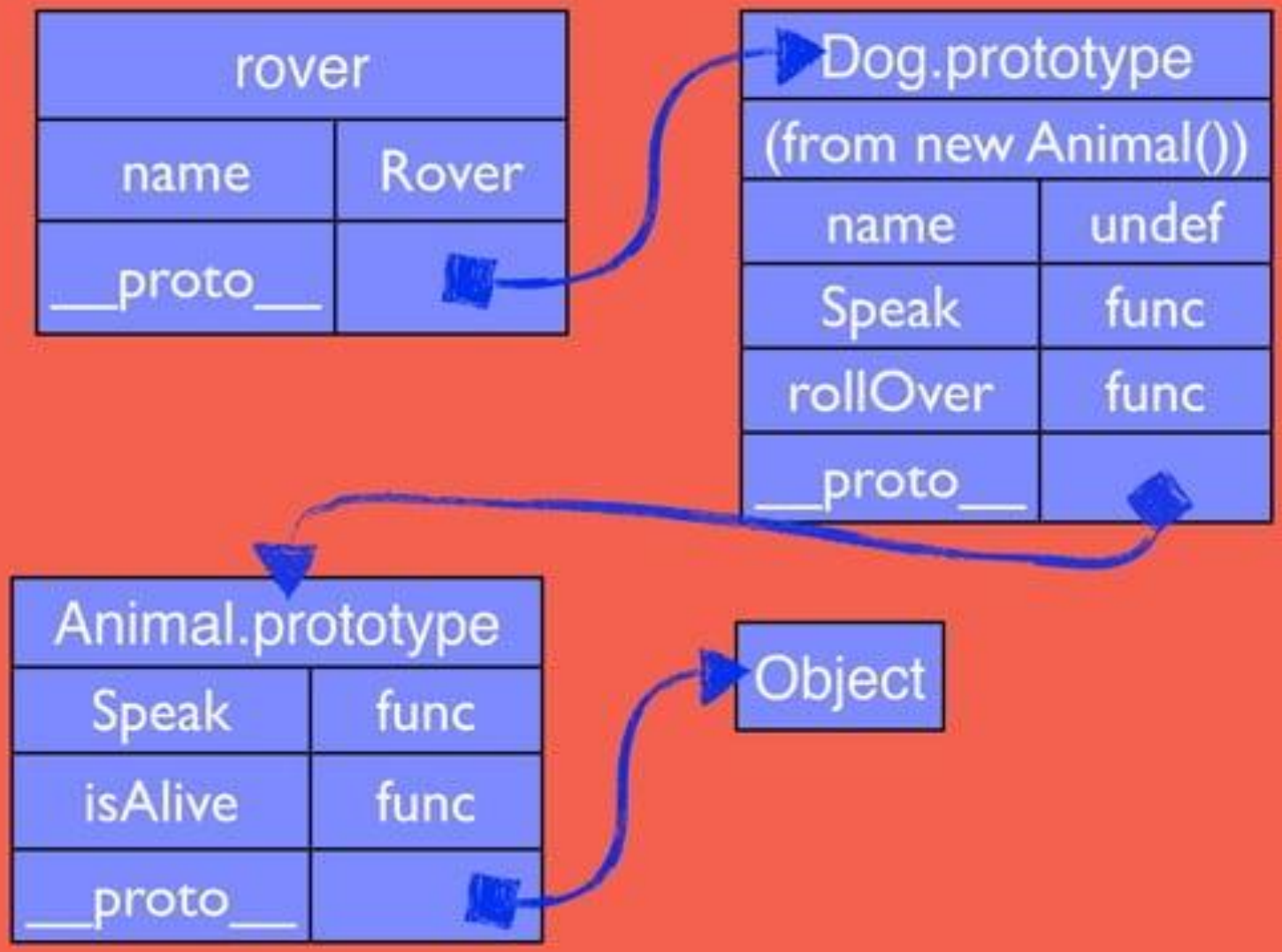
Dog.prototype.rollOver = function() {
  console.log('rolling over...');
};

var rover = new Dog('Rover');
rover.speak(); // Bark
rover.isAlive(); // true
```

Dog Class


Dog (func)
prototype
prototype (Dog)
name
undef
Speak
func
rollOver
func
__proto__
Animal.prototype
Speak
func
isAlive
func
__proto__
Object

Rover


rover
name
Rover
__proto__
Dog.prototype
(from new Animal())
name
undef
Speak
func
rollOver
func
__proto__
Animal.prototype
Speak
func
isAlive
func
__proto__
Object

this

Calling from *this*

```
var EventTracker = {
  count: 0,
  sayCount: function() {
    console.log(this.count, ' times');
  },

  track: function() {
    this.count += 1;
    this.sayCount();
  }
};

EventTracker.track(); // 1 times
EventTracker.track(); // 2 times
```

More Closure

```
var EventTracker = {
count: 0,
track: function() {
  var that = this;
  $.get('/track', function(data) {
    that.count += 1;
    console.log(that.count, ' times');
  });
}
};
```

Setting this

```
var obj1 = {
  name: 'Object 1'
  sayName: function(before, after) {
    console.log(before + this.name + after);
  }
};

var obj2 = {
  name: 'Object 2'
};

obj1.sayName('hi ', '.'); // hi Object1.
obj1.sayName.call(obj2, 'hi', '.'); // hi Object2
obj1.sayName.apply(obj2, ['hi', '.']); // hi Object2
```

More Closure

```
var EventTracker = {
  count: 0,
  callBack: function(data) {
    this.count += 1;
    console.log(this.count, ' times');
  },

  track: function() {
    var that = this;
    $.get('/track', function() { that.callBack() });
  }
};
```

More Closure

```
var EventTracker = {
count: 0,
callBack: function(data) {
  this.count += 1;
  console.log(this.count, ' times');
},

track: function() {
  var that = this;
  $.get('/track', this.callback.bind(this));
}
};
```

Bind Function

```
  if (!Function.prototype.bind) {
  Function.prototype.bind = function(scope) {
    var func = this;

    return function() {
      return func.apply(scope, arguments);
    };
  };
}
```

JS Fun

length of what

```
console.log((!+[]+[]+![]).length);
//=> 9
```

Tools

http://www.flickr.com/photos/lenore-m/2515800654/sizes/o/

Compression

Compression

JSMin

Compression

Yahoo Compressor

Compression

Google Compressor

Debugging

Firebug - Console

ExceptionHub | JavaScript Error Tracking

http://www.exceptionhub.com/

ExceptionHub | JavaScript Error Tr...

ExceptionHub

Tracking Every Error. No Exceptions

Console HTML CSS Script DOM Net

Clear Persist Profile All Errors Warnings Info Debug Info

```
>>> console.log('firebug');
firebug
undefined
>>>
```

Done

Firebug - HTML

ExceptionHub | JavaScript Error Tracking

http://www.exceptionhub.com/

Google

ExceptionHub | JavaScript Error Tr...

Javascript Error Tracking

be sure your site runs correctly everywhere

ExceptionHub

Projects

All Unresolved Erro

Help & Sup

Console | HTML | CSS | Script | DOM | Net

Edit | div#content < div#container < body < html

```
HTML PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN" "http://www.w
iv id="container">
 <div id="top">
 <div id="content">
   <style>
   <script>
   <div>
```

Style | Computed | Layout | DOM

```
#content {                    www.ex...hub.com #3 (line 45)
    padding-top: 0;
}
#content {                    base.c...8986893 (line 227)
    min-height: 300px;
    padding-top: 15px;
}
Inherited from body
body {                        base.c...8986893 (line 183)
    font-family: Verdana,Helvetica,Arial;
```

Done

Firebug - CSS

ExceptionHub | JavaScript Error Tracking

http://www.exceptionhub.com/

ExceptionHub | JavaScript Error Tr...

Javascript Error Tracking

be sure your site runs correctly everywhere

Console HTML CSS Script DOM Net

Edit base.css?1288986893

```
form.formtastic, form.formtastic ul, form.formtastic ol, form.formtastic li,
form.formtastic fieldset, form.formtastic legend, form.formtastic input,
form.formtastic textarea, form.formtastic select, form.formtastic p {
    margin: 0;
    padding: 0;
}

form.formtastic fieldset {
    border: 0 none;
}

form.formtastic em, form.formtastic strong {
```

Done

Firebug - Script

ExceptionHub | JavaScript Error Tracking

http://www.exceptionhub.com/

ExceptionHub | JavaScript Error Tr...

- Provides a stack trace to find the cause in all browsers
- Groups errors by cause
- Development and Production modes
- RSS feeds for errors

* Opera coming soon

What People are Saying

Console HTML CSS Script DOM Net

all facebox.js

```
215
216     if (settings) $.extend($.facebox.settings, settings)
217     $('body').append($.facebox.settings.faceboxHtml)
218
219     var preload = [ new Image(), new Image() ]
220     preload[0].src = $.facebox.settings.closeImage
221     preload[1].src = $.facebox.settings.loadingImage
222
223     $('#facebox').find('.b:first, .bl, .br, .tl, .tr').each(func
224       preload.push(new Image())
225       preload.slice(-1).src = $(this).css('background-image').re
```

Watch Stack Breakpoi...

New watch expression...

Done

Firebug - DOM

ExceptionHub | JavaScript Error Tracking

http://www.exceptionhub.com/

ExceptionHub | JavaScript Error Tr...

- Provides a stack trace to find the cause in all browsers
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- RSS feeds for errors

* Opera coming soon

What People are Saying

Console HTML CSS Script DOM Net

window

_gaq	Object { }
_gat	Object { Ma=false, vb={…}, Gc=1 }
gaGlobal	Object { hid=708698219 }
gaJsHost	"http://www."
pageTracker	Object { o="-0", q=1292189923, more… }
$	function()
jQuery	function()
screencast	screencast()
Components	nsXPCComponents { interfaces=nsXPCComponents_Interfaces, interfacesByID=nsXPCComponents_InterfacesByID }

Done

Firebug - Net

ExceptionHub | JavaScript Error Tracking

http://www.exceptionhub.com/

ExceptionHub | JavaScript Error Tr...

- Provides a stack trace to find the cause in all browsers
- Groups errors by cause
- Development and Production modes
- RSS feeds for errors

* Opera coming soon

What People are Saying

Console HTML CSS Script DOM Net

Clear Persist All HTML CSS JS XHR Images Flash Media

URL	Status	Domain	Size	Timeline
GET www.excep	304 Not Modified	exceptionhub.com	2.1 KB	227ms
GET jquery.min,	304 Not Modified	exceptionhub.com	20.9 KB	94ms
GET application	304 Not Modified	exceptionhub.com	216 B	217ms
GET base.css?1	304 Not Modified	exceptionhub.com	4.2 KB	215ms
GET jquery.min,	304 Not Modified	exceptionhub.com	20.9 KB	216ms
GET facebox.js	304 Not Modified	exceptionhub.com	3.9 KB	215ms
GET facebox.css	304 Not Modified	exceptionhub.com	684 B	214ms
GET tender_wid	304 Not Modified	exceptionhub.tenderapp.com	1.8 KB	520ms
GET logo2.png	304 Not Modified	exceptionhub.com	6.1 KB	99ms

Done

Google Chrome

Google

www.google.com

Gmail Agile FB Reader Offerpal CJ Analytics Twitter RockYou iAd » Other Bookmarks

div#gac_scont [822×0] Maps News Shopping Gmail more ▼ ryanstout@gmail.com | iGoogle | Settings ▼ | Sign out

Google

Elements Resources Scripts Timeline Profiles Storage Audits Console Search Elements

```
<textarea id="csi" style="display:none"></textarea>
<textarea id="hcache" style="display:none"></textarea>
▶<div id="searchform">…</div>
▼<div id="gac_scont">
  ▶<table cellpadding="0" cellspacing="0" class="gac_su" style=
    "visibility: hidden; left: 181px; top: 288px; width: 378px;
    ">…</table>
</div>
▶<span id="main">…</span>
▶<script>…</script>
▶<script>…</script>
▶<div id="xjsd">…</div>
▶<div id="xjsi">…</div>
▶<script>…</script>
```

▶ Computed Style — Show inherited

▼ Styles

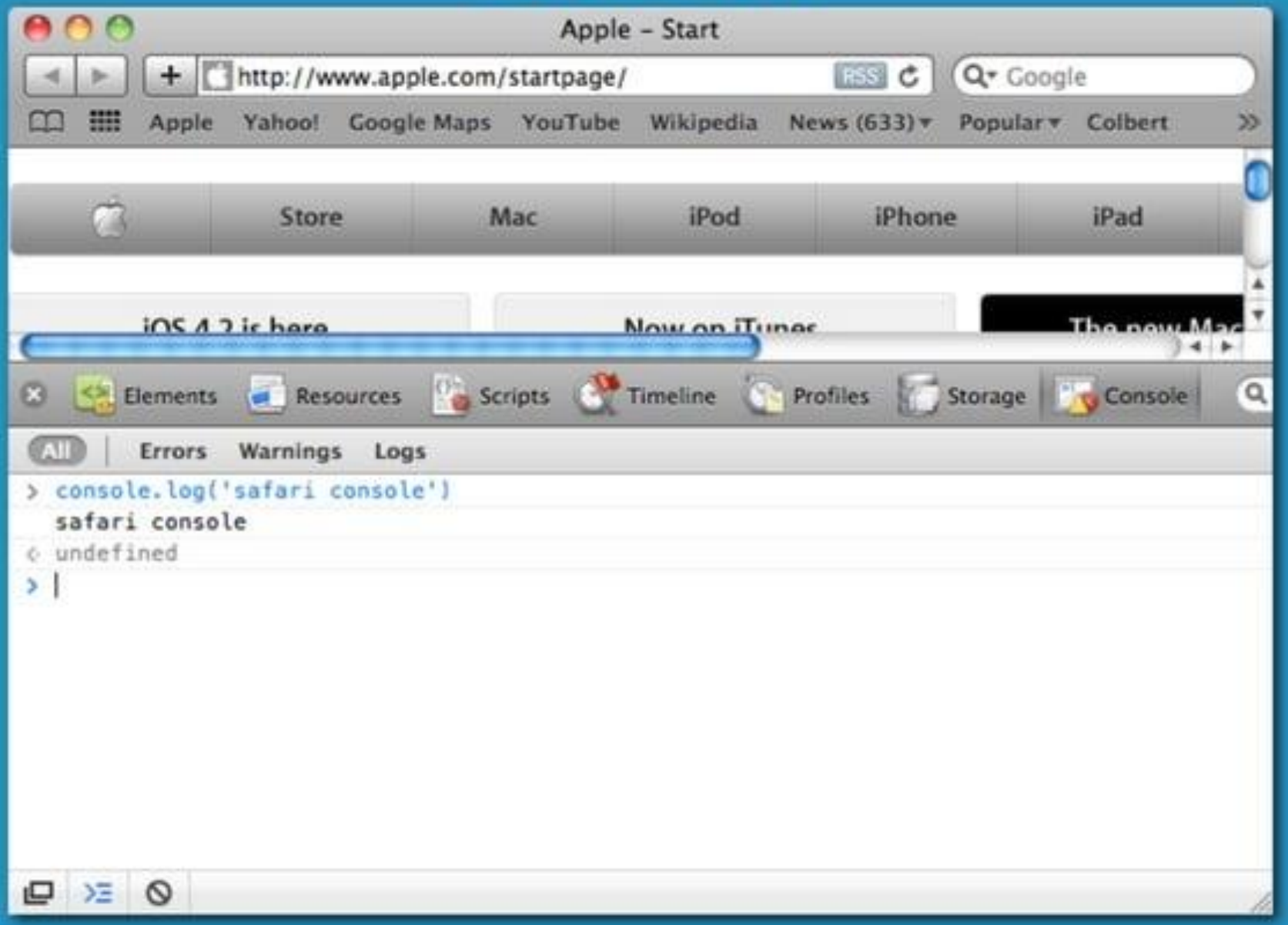
```
table[cellspacing=0] {
  ▶ border-spacing: 0px 0px;
}

element.style {
   left: 181px;
   top: 288px;
   visibility: hidden;
   width: 378px;
}
```

Matched CSS Rules

html body div#gac_scont table.gac_su ⚠1

Safari


Apple – Start
http://www.apple.com/startpage/
RSS
Google
Apple
Yahoo!
Google Maps
YouTube
Wikipedia
News (633)
Popular
Colbert
Store
Mac
iPod
iPhone
iPad
Elements
Resources
Scripts
Timeline
Profiles
Storage
Console
All
Errors
Warnings
Logs
> console.log('safari console')
safari console
undefined
>

Opera Dragonfly

IE - Developer Toolbar

collapsible panel inside gridview and bind to its column : ajax, asp.net - Developer Tools

File Find Disable View Outline Images Cache Tools Validate | Browser Mode: IE8 Document Mode: IE8 Standards

HTML CSS Script Profiler

Search HTML

```
<!-- DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN" "http://www.w3.org/TR
<html xmlns="http://www.w3.org/1999/xhtml">
  <head>
  <body class="IE8" style="height: 100%;" onload="" onunload="">
    <div id="winWidth"/>
    <div class="outerBodyWrap viewQuestion3DP">
    <script type="text/javascript">eeAdsLoaded = 0;</script>
    <script src="http://images.experts-exchange.com/00182/timer/timer1.js" type=
    <script src="http://images.experts-exchange.com/00182/timer/timer2.js" type=
    <script src="http://images.experts-exchange.com/00182/timer/timer3.js" type=
    <script src="http://images.experts-exchange.com/00182/timer/timer4.js" type=
    <img onload="endEETimer()" src="/timer/timer1.gif" complete="complete"/>
    Text - Empty Text Node
    <img onload="endEETimer()" src="/timer/timer2.gif" complete="complete"/>
    Text - Empty Text Node
    <img onload="endEETimer()" src="/timer/timer3.gif" complete="complete"/>
    Text - Empty Text Node
    <img onload="endEETimer()" src="/timer/timer4.gif" complete="complete"/>
    Text - Empty Text Node
    <img onload="endEETimer()" src="/timer/timer5.gif" complete="complete"/>
    Text - Empty Text Node
    <img onload="endEETimer()" src="/timer/timer6.gif" complete="complete"/>
    <script type="text/javascript">// -JDF The IE7 test was previously comment
    Text - Empty Text Node
    <!-- SiteCatalyst code version: H.7.Copyright 1997-2008 Omniture, Inc. More
    <script language="JavaScript">//<!-- /* You may give each page an identifying
    <img name="s_i_eexchangeprod" width="1" height="1" alt="" src="http://metri
    <script language="JavaScript">//<!-- if(navigator.appVersion.indexOf('MSIE')>=
    Text - Empty Text Node
    <!-- <noscript><imgsrc="http://metrics.experts-exchange.com/b/ss/eexchangepr
    <!-- End SiteCatalyst code version: H.7. -->
    <script language="JavaScript">function getOmnitureFunction()  {  var
    <script type="text/javascript">// <![CDATA[ addCookie('EECC_0', 'CLOAD=2&U
    <script type="text/javascript">var fakeLocations = new Array();  var realL
    <!-- www2.experts-exchange.com:80 -->
    <img src="/pageLoaded.jsp?url=http%3A%2F/www.experts-exchange.com/Programmi
```

Style Trace Styles Layout Attributes

```
inherited - body
  BODY                                                    getCSS
    text-align : center
    ~~font-family : arial, helvetica, sans-serif~~
    ~~font-size : 0.8em~~
  BODY                                                    getCSS
    font-family : verdana, helvetica, sans-serif
    font-size : 12px
  inline style
    ~~height : 100%~~
*                                                         getCSS
  padding-bottom : 0px
  margin : 0px
  padding-left : 0px
  padding-right : 0px
  padding-top : 0px
.IE8 *                                                    getCSS
  word-wrap : break-word
```

Other IE Tools

Visual Studio
Microsoft Script Editor (Office)
Microsoft Script Debugger (Free)

Testing

http://stopbuyingrotas.wordpress.com/2008/10/

JSpec

R.I.P.

Jasmine

The New Hotness

http://pivotal.github.com/jasmine/

Jasmine

Behavior Driven Development

Runs in the Browser

Ruby Gem to Automate Tests

Jasmine

```
describe("javascript", function() {
  it('should increment a variable', function () {
    var foo = 0;
    foo++;

    expect(foo).toEqual(1);
  });
});
```

Jasmine

```
describe("spy behavior", function() {
  it('should spy on an instance method', function() {
    var obj = new Klass();
    spyOn(obj, 'method');
    obj.method('foo argument');

    expect(obj.method).toHaveBeenCalledWith('foo \
    argument');

    var obj2 = new Klass();
    spyOn(obj2, 'method');
    expect(obj2.method).not.toHaveBeenCalled();
  });
});
```

JS Fun

bad math

```
console.log(0.1 + 0.2)
//=> 0.30000000000000004
```

Frameworks

http://jinja.apsara.org/travels/2005_03_battambang/phnom_sampow.htm

Frameworks

The bad news is JavaScript is broken, the good news is we can fix it with JavaScript

- anonymous

JQuey

- DOM Wrapper
- Event Binding
- Ajax (XMLHttpRequest)

Underscore.js

List comprehension library

Underscore.js

Map

```
_.map([1, 2, 3], function(n){ return n * 2; });
_([1, 2, 3]).map(function(n){ return n * 2; });
// [2, 4, 6]
```

Underscore.js

Each

```
_.each([1, 2, 3], function(num) { alert(num); });
// alerts each number in turn...
_.each({one : 1, two : 2, three : 3},
  function(num, key){ alert(num); }
);
// alerts each number in turn...
```

Underscore.js

Reject

```
_.reject([1, 2, 3, 4, 5, 6], function(num) {
    return num % 2 == 0;
});
=> [1, 3, 5]
```

Underscore.js

- Also
  - include, any, max, min, first, select, indexOf, etc...
  - very useful

Reading


Unearthing the excellence in JavaScript
JavaScript:
The Good Parts
O'REILLY
YAHOO! PRESS
Douglas Crockford

One More Thing

CoffeeScript

http://www.flickr.com/photos/swarmoeskerken/3382771943/sizes/l/

CoffeeScript

```
# Assignment:
number   = 42
opposite = true

# Conditions:
number = -42 if opposite

# Functions:
square = (x) -> x * x

# Arrays:
list = [1, 2, 3, 4, 5]
```

```
var list, number,
opposite, square;

number = 42;
opposite = true;
if (opposite) {
  number = -42;
}
square = function(x) {
  return x * x;
};
list = [1, 2, 3, 4, 5];
```

CoffeeScript

```
# Objects:
math =
  root:   Math.sqrt
  square: square
  cube:   (x) -> x * square x
```

```
var square;
math = {
  root: Math.sqrt,
  square: square,
  cube: function(x) {
    return x * square(x);
  }
};
```

```
# Splats:
race = (winner, runners...) ->
  print winner, runners

# Existence:
alert "I knew it!" if elvis?
```

Coffee Script

```
race = function() {
  var runners, winner;
  winner = arguments[0], runners = 2 <=
arguments.length ? __slice.call(arguments, 1) : [];
  return print(winner, runners);
};
if (typeof elvis != "undefined" && elvis !== null) {
  alert("I knew it!");
}
```

CoffeeScript

```
# Array comprehensions:
cubes = (math.cube num for num in list)
```

```
cubes = (function() {
  _results = [];
  for (_i = 0, _len = list.length; _i < _len; _i++) {
    num = list[_i];
    _results.push(math.cube(num));
  }
  return _results;
}());
```

JS Fun

confused >

```
3 > 2 > 1 // false
```

Questions

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