JavaScript
Lecture 1

Waterford Institute of Technology

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Javascript

Extent of this course

- A condensed basic JavaScript course
- All necessary materials provided as presentations and labs
- Not using frameworks
- One or more external JavaScript files
- Focus on client-side usage
- Introduces the popular jQuery JavaScript library
- Explores the Document Object Model (DOM)
- Introduces Ajax
  - update specific parts of web page
  - avoids complete page refresh
- Code developed on WebStorm IDE using Airbnb styling

JavaScript Introduction

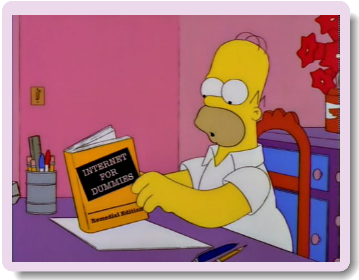
Topics discussed this presentation

- Brief introduction to and history of language
- Roles of the language
- Its data types
- JavaScript Object Notation (JSON)
- Simple program employing JavaScript

Javascript

Overview

- Originally a small language
- Not anymore - now enormous
- Flawed but powerful
- Not **Java**
- Not a subset of Java
  - Very different languages
- Shares C-family syntax
- Similarities Scheme & Self
- Scores of *badly written books aimed at the dummies and amateur market*



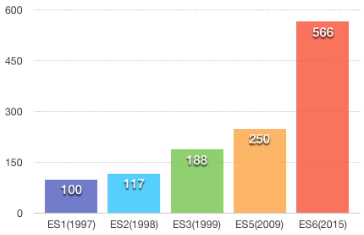
Javascript

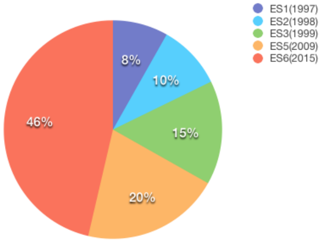
Language specification growth

ECMAScript, Growth in language complexity as measured by increase in successive specification versions.

Standard ECMA-262

VERSION	SPECIFICATION PAGES
ES1(1997)	100
ES2(1998)	117
ES3(1999)	188
ES5(2009)	250
ES6(2015)	566

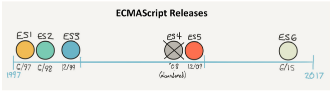




Ecma International

ECMAScript - the language of the web

- ECMAScript: standardization body
- Several popular implementations:
  - JavaScript
  - JScript
  - ActionScript
- Edition 6 (ES6) published June 2015
  - Course applies ES6



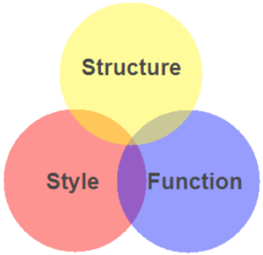
JavaScript

Several frameworks available

- Client-side
  - Angular
  - Backbone
  - Ember
- Server-side
  - node.js
  - io.js
  - hapi.js
- MEAN stack collection:
  - MongoDB
  - Express.js
  - Angular
  - Node.js

Nature of JavaScript

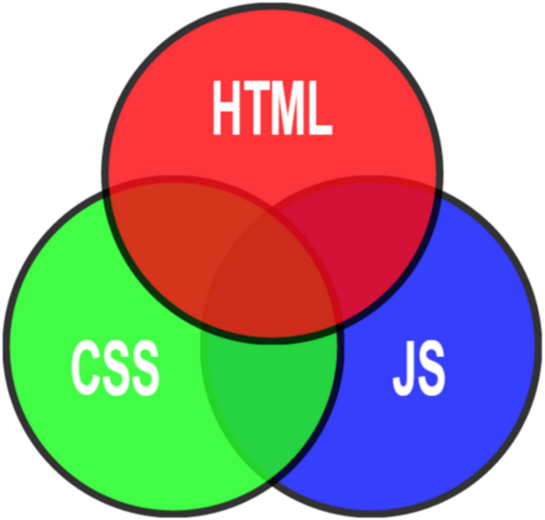
Structure Client-Side Web



- Markup (HTML)
  - Structure
  - Content
- Style (CSS)
  - Style
  - Presentation
  - Appearance
- Function (Javascript)
  - Actions
  - Manipulations

Nature of JavaScript

Structure Client-Side Web



Nature of JavaScript

The Language

Although not Java, has:

- Similar syntax & keywords
- Similar standard library naming conventions

Object oriented but does not have classes in classical sense.

- uses *syntactic sugar* to simulate classes
- prototypal: objects inherit from objects

Dynamic typing

- Variable may be reference to object of any type

Javascript Styling

Our choice from several available Style Guides and IDEs

- *Airbnb JavaScript Style Guide*
- *WebStorm JavaScript IDE*

Airbnb JavaScript Style Guide

A mostly reasonable approach to JavaScript

The smartest JavaScript IDE

Lightweight yet powerful IDE, perfectly equipped for complex client-side development and server-side development with Node.js

Nature of JavaScript

The Language

- Provides access to main components web page:
  - Cascade Style Sheet (CSS) properties
  - Markup content (e.g.: div, img, p)
  - Forms (Communication to server)
- Most often used client-side
- Growing use server-side (node.js)
- Weakly typed with first-class functions
  - function: block reusable code (more on this later)
  - functions are objects
  - may be passed as parameters

Javascript

Primitive Data Types

- Six primitive types
  - **boolean**
  - **number**
  - **string**
  - **null**
  - **undefined**
  - **symbol** (ES6)
- All other types are **object**s

```
console.log('This is a string');
console.log('true is a boolean');
console.log('10.5 is a number');
```

Javascript

Primitive Wrapper Data Types

- Four wrapper types
  - **Boolean**
  - **Number**
  - **String**
  - **Symbol**

```
// Wrapper's valueOf returns primitive value.
const b = Boolean(true); // b => true.
```

var, const and let

A necessary preview

var, **const** and **let** used to store values and object references:

- **var** exists since ES1.
- **const** & **let** introduced ES6.
- Significant behavioural differences.
- Preference given henceforth to use of **const**, then **let**.
- **var** usage should be avoided.

```
var x = 10; // Avoid future use
let y = 20; // Use where reassign likely
const z = 30; // Not garbage collected
```

Data types
boolean

- boolean can be
  - true
  - false

```
// Output: b is true
const b = true;
if (b) {
  console.log('b is true');
};
```

```
// Ouput: b is true
const b = true;
if (b) {
  console.log('b is ', Boolean(b));
};
```

Data types

number

- *number* 64-bit floating point
  - Similar to Java's *double*
  - No integer type
  - *number* type includes
    - NaN
    - Infinity
  - Problematic in finance
    - $0.1 + 0.2 == 0.3$
    - This expression *false*

```
// Output is 3.3333333333333335
const val = 10 / 3;
console.log(val);
```

```
// Output: true. val is not a number
const val = '2005/12/12';
console.log(isNaN(val)); // true
// Output: string
console.log(typeof val);
```

```
const val = 10 / 0;
console.log(val); // Infinity
console.log(typeof val); // number
```

Data types

string

- *string* sequence of zero or more Unicode characters.
  - Similar to Java *String*.
  - No *char* type as in Java.
  - Literals use ' or " to enclose characters
    - Either quote type may be used in pairs.
    - Illegal to mix.
  - **Important:** Use only single quotes to comply with style guide.

```
'This is a string.'
```

```
"This is also a string but we will not use
        double quotes."
```

```
"This is not a legal string'
```

Data types

string

- Internal quotes
- Use escape sequence \

```
const s = 'What\'s a \"celeb\" famous for?';

// What's a "celeb" famous for?
console.log(s);
```

Data types

null & undefined

- Variable not assigned a value is of type **undefined**
- **null** indicates the absence of a value
  - Value *null* is a literal
  - *typeof null* returns *object*
  - This is an error in the language
- Some experienced developers no longer use *null*.

```
var planes; // => undefined
// A language error in ES5, fixed ES6
console.log(typeof planes); // => object in ES5
```

```
const planes;
// Uncaught SyntaxError: Missing initializer in const declaration
```

Data types

symbol

Associated wrapper class **Symbol**

- Introduced in ES6
- Can generate unique property keys
- Eliminates risk collision

```
let uniqueKey = Symbol();
obj = {};
obj[uniqueKey] = 'unique';
console.log(obj[uniqueKey]); // => unique
console.log(uniqueKey); // => Symbol()
console.log(typeof (uniqueKey)); // => symbol
```

Data types

Object

Object literal

- comma-separated list of colon-separated name:value pairs in curly braces.

```
const book = {
  title: 'Java',
  author: 'Chapman',
  ISBN: 'ISBN-10 03219804333',
  edition: 4,
  isInPrint: true,
};
```

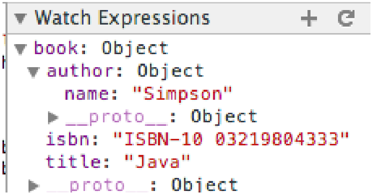
```
book.isInPrint // => true
```

Data types

Object

Container comprising

- name-value pairs
- value may be object
- may add new properties anytime



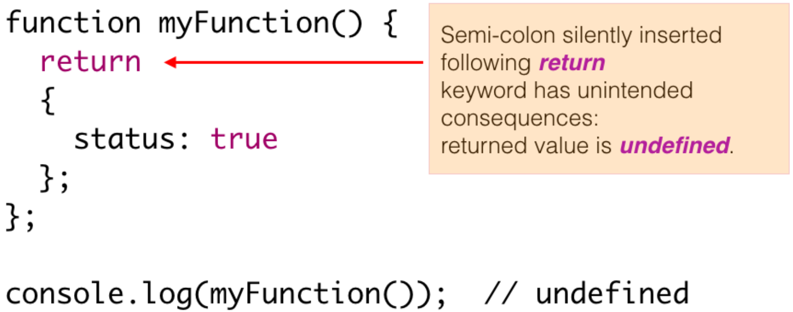
```
▼ book: Object
  ▼ author: Object
      name: "Simpson"
    ▶ __proto__: Object
    isbn: "ISBN-10 03219804333"
    title: "Java"
  ▶ __proto__: Object
```

```
const book = {
  title: 'Java',
  author: {
    name: 'Simpson',
  }
};
console.log(book.title); // => Java
```

```
// Add new property (name−value pair)
book.isbn = 'ISBN−10 03219804333';
```

Semicolon insertion

Example where positioning of curly brace matters



```
function myFunction() {
  return
  {
    status: true
  };
};

console.log(myFunction());  // undefined
```

Semi-colon silently inserted following ***return*** keyword has unintended consequences: returned value is ***undefined***.

Semicolon insertion

Example where positioning of curly brace matters

```
function myFunction() {
  return {
    status: true
  };
};

console.log(myFunction());  // Object{status:true}
```

K&R style, put the { at the end of a line instead of the front,because *it avoids a horrible design blunder in JavaScript's return statement. (Crockford)*

JavaScript

Run Program - Simple Example

```
/**
 * A Web Page with HTML & reference to external JavaScript file
 */
<!DOCTYPE html>
<html>
  <head>
    <meta charset="UTF-8">
  </head>
  <body>
    <h1 id="hello">Hello ICTSkills</h1>
    <script src="js/foo.js"></script>
  </body>
</html>
```

JavaScript

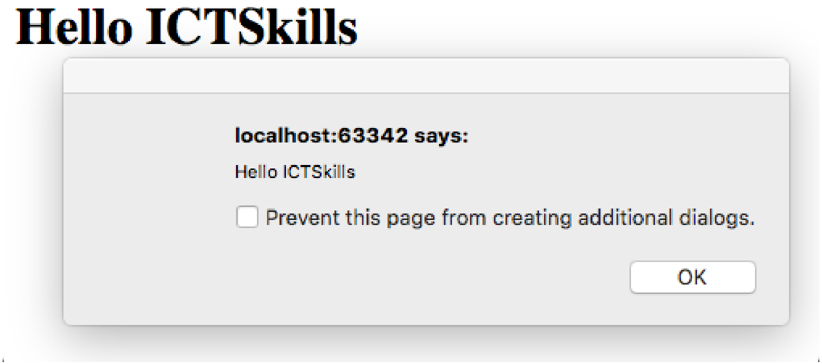
Run Program - Simple Example

```
/**
 * Demo JavaScript code
 */
alert('Hello ICTSkills');
function foo() {
  const size = 3;
  for (let i = 0; i < size; i += 1) {
    console.log(i);
  }
}

foo();
```

JavaScript

Run Program - Simple Example



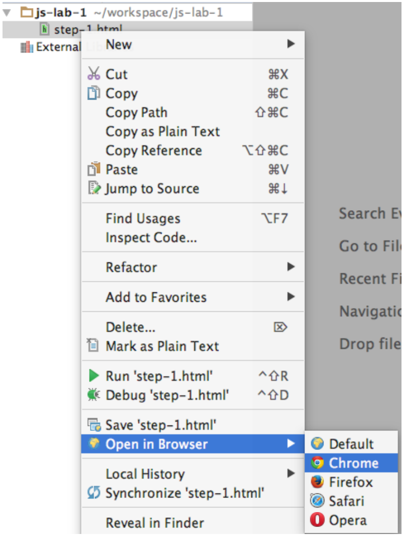
Hello ICTSkills

localhost:63342 says:

Hello ICTSkills

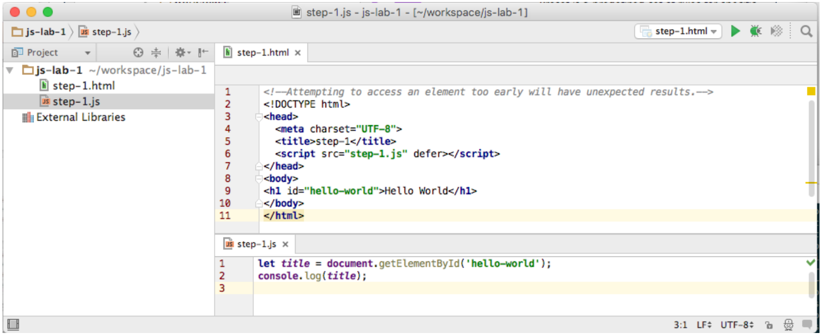
JavaScript

Run Program - Simple Example



JavaScript

Run Program - Simple Example



```
<!--Attempting to access an element too early will have unexpected results.-->
<!DOCTYPE html>
<head>
  <meta charset="UTF-8">
  <title>step-1</title>
  <script src="step-1.js" defer></script>
</head>
<body>
<h1 id="hello-world">Hello World</h1>
</body>
</html>
```

```
let title = document.getElementById('hello-world');
console.log(title);
```