

Javascript, The Swiss Army Knife of Programming Languages

David Morcillo

23-11-2013

About me



- twitter.com/ultrayoshi
- github.com/ultrayoshi



Features

- Loosely typed language

Features

- Loosely typed language
- Object literal notation

Features

- Loosely typed language
- Object literal notation
- Prototypal inheritance

Features

- Loosely typed language
- Object literal notation
- Prototypal inheritance
- Global variables

Features

- Loosely typed language
- Object literal notation
- Prototypal inheritance
- Global variables
- Functions are first class objects

Features

ECMAScript

The standard that defines JavaScript is the third edition of *ECMAScript Programming Language*.

Hello World

index.html

```
<html>
  <head>
    <script>
      document.writeln("Hello, world!");
    </script>
  </head>
  <body>
    </body>
  </html>
```

Syntax

Comments

Block comments formed with `/* */` and line-ending comments starting with `//`. Example:

```
/*
  We are learning Javascript and comments are very important
*/
document.writeln('Hello World!'); // Output: Hello World!
```

Syntax

Comments

Block comments formed with `/* */` and line-ending comments starting with `//`. Example:

```
/*
  We are learning Javascript and comments are very important
*/
document.writeln('Hello World!'); // Output: Hello World!
```

Names

Starts with a letter or underscore and optionally followed by one or more letters, digits or underscores. Beware of some reserved words.

```
bullet          // valid      _mana          // valid
3force         // invalid    lucky42         // valid
rocket-launcher // invalid    grenade_launcher // valid
```

Syntax

Numbers

Single number type represented internally as 64-bit floating point.

```
42
3.141516
10e5
1/0 // Output: Infinity
0/0 // Output: NaN
```

Syntax

Numbers

Single number type represented internally as 64-bit floating point.

```
42
3.141516
10e5
1/0 // Output: Infinity
0/0 // Output: NaN
```

Strings

Can be wrapped in single quotes or double quotes. It can contains 0 or more characters. All characters in Javascript are 16 bits wide.

```
“Hello World”
'Hello World'
“‘This is\n a multiline string’”
‘You can write “ on single quotes string’
```

Syntax

Functions

```
function helloWorld (name) {  
    console.log('Hello ' + name + '!');  
}  
  
helloWorld('David'); // Output 'Hello David!'  
  
var myFunction = function () {  
    console.log('Hi there!');  
};  
  
myFunction(); // Output: 'Hi there!'
```

Syntax

Variables

Use the `var` keyword followed by a name to declare a variable. When used inside of a function, the `var` statement defines the function's private variables.

```
var player; // variable player declared on a global scope

function test() {
    var enemy; // Scoped to function test
}
```

Syntax

Strict (in)equality

```
10 == '10' // Output: true, auto type coercion
10 === '10' // Output: false strict equality
10 != '10' // Output: false, auto type coercion
10 !== '10' // Output: true strict inequality
```

Syntax

Strict (in)equality

```
10 == '10' // Output: true, auto type coercion
10 === '10' // Output: false strict equality
10 != '10' // Output: false, auto type coercion
10 !== '10' // Output: true strict inequality
```

null and undefined

```
console.log(mario); // Error: mario is not defined

function exists (mario) {
  console.log(mario);
}

exists(); // Output undefined

console.log(null == undefined) // Output: true
console.log(null === undefined) // Output: false
```

Syntax

if, else

```
var testOk = true;

if (testOk) {
    console.log("Captain obvious");
} else {
    console.log("I'm bored");
}
```

Here are the *falsy* values:

- false
- null
- undefined
- The empty string
- The number 0
- The number NaN

All other values are *truthy*.

Syntax

switch

```
var weapon = 'rocketlauncher';

switch(weapon) {
  case 'pistol':
    console.log('piu piu');
    break;
  case 'shotgun':
    console.log('paaam!');
    break;
  case 'rocketlauncher':
    console.log('BOOOOM!');
    break;
  default:
    console.log('falcon punch!');
    break;
}
```

Syntax

while, do while

```
var counter = 0;
while (counter < 10) { // Ends when counter is equal to 10
    console.log(counter);
    counter += 1;
}

do {
    console.log(counter);
    i -= 1;
} while(counter > 0); // Ends when counter is equal to 0
```

Syntax

while, do while

```
var counter = 0;
while (counter < 10) { // Ends when counter is equal to 10
    console.log(counter);
    counter += 1;
}

do {
    console.log(counter);
    i -= 1;
} while(counter > 0); // Ends when counter is equal to 0
```

for

```
var i;

for (i = 0; i < 10; i += 1)
    console.log(i);
}
```



Objects

- Objects in Javascript are mutable keyed collections.

Objects

- Objects in Javascript are mutable keyed collections.
- Arrays, functions and regular expressions are objects.

Objects

- Objects in Javascript are mutable keyed collections.
- Arrays, functions and regular expressions are objects.
- A property name can be any string.

Objects

- Objects in Javascript are mutable keyed collections.
- Arrays, functions and regular expressions are objects.
- A property name can be any string.
- Objects can inherit properties of another through its prototype.

Objects

- Objects in Javascript are mutable keyed collections.
- Arrays, functions and regular expressions are objects.
- A property name can be any string.
- Objects can inherit properties of another through its prototype.

Prototype

All objects created from object literals are linked to `Object.prototype`.

Objects

- Objects in Javascript are mutable keyed collections.
- Arrays, functions and regular expressions are objects.
- A property name can be any string.
- Objects can inherit properties of another through its prototype.

Prototype

All objects created from object literals are linked to `Object.prototype`. If we try to retrieve a property value from an object, and if the object lacks the property name, then Javascript attempts to retrieve the property value from the prototype object.

Objects

Object.create

```
var soldier = {  
    hp: 10,  
    strength: 5,  
    weapon: 'Pistol'  
};  
  
var knight = Object.create(soldier);  
knight.weapon = 'Sword';  
knight.shield = true;  
  
console.log(knight.hp); // Output: 10  
console.log(knight['weapon']); // Output: 'Sword'  
console.log(knight.shield); // Output: true
```

Visit <http://www.objectplayground.com/> for a graphical explanation

Objects

hasOwnProperty

```
console.log(knight.hasOwnProperty('hp')); // Output: false
console.log(knight.hasOwnProperty('shield')); // Output: true
```

Objects

hasOwnProperty

```
console.log(knight.hasOwnProperty('hp')) // Output: false
console.log(knight.hasOwnProperty('shield')) // Output: true
```

for in

```
for (attr in knight) {
    if(knight.hasOwnProperty(attr)) {
        console.log('Knight property ' + attr + ' with value ' +
                    knight[attr]);
    }
}
// Knight property weapon with value 'Sword'
// Knight property shield with value true
```

Objects

hasOwnProperty

```
console.log(knight.hasOwnProperty('hp')) // Output: false
console.log(knight.hasOwnProperty('shield')) // Output: true
```

for in

```
for (attr in knight) {
    if(knight.hasOwnProperty(attr)) {
        console.log('Knight property ' + attr + ' with value ' +
                    knight[attr]);
    }
}
// Knight property weapon with value 'Sword'
// Knight property shield with value true
```

delete

```
console.log(knight.weapon) // Output: 'Sword'
delete knight.weapon;
console.log(knight.weapon) // Output: 'Pistol'
```

Functions

Functions are the **fundamental modular unit** of Javascript. They are used for code reuse, information hiding, and composition.
The thing that is special about functions is that they can be invoked.

Functions

Functions are the **fundamental modular unit** of Javascript. They are used for code reuse, information hiding, and composition.

The thing that is special about functions is that they can be invoked.

Function.prototype and constructor

Functions are objects linked to Function.prototype. Every function object is also created with a prototype property. Its value is an object with a constructor property whose value is the function.

Functions

Functions are the **fundamental modular unit** of Javascript. They are used for code reuse, information hiding, and composition.

The thing that is special about functions is that they can be invoked.

Function.prototype and constructor

Functions are objects linked to Function.prototype. Every function object is also created with a prototype property. Its value is an object with a constructor property whose value is the function.

Functions

Invoking a function suspends the execution of the current function, passing control and parameters to the new function. In addition to the declared parameters, every function receives two additional parameters: this and arguments.

Functions

Invoking a function suspends the execution of the current function, passing control and parameters to the new function. In addition to the declared parameters, every function receives two additional parameters: this and arguments.

Invocation (1/4): Method invocation pattern

```
var enemy = {  
    hp: 5,  
    rage: 0,  
    attack: function () {  
        this.rage += 1;  
    }  
};  
  
enemy.attack();  
console.log(enemy.rage); // Output: 1
```

Functions

Invocation (2/4): Function invocation pattern

```
// part of code omitted
physicsManager.collisionsDetected = 0;
physicsManager.checkCollision = function (entity1, entity2) {
    var bbCollision = function (bb1, bb2) {
        // Collision code omitted
        var collision = true;
        if (collision) {
            // WARNING: 'this' is the global object and not 'physicsManager'
            this.collisionsDetected += 1;
        }
        return collision;
    };
    bbCollision(entity1.getBB(), entity2.getBB());
};

if (physicsManager.checkCollision(enemy, player)) {
    player.takeDamage(enemy.strength);
}

console.log(physicsManager.collisionsDetected); // Output: 0
```

Functions

Invocation (2/4): Function invocation pattern (workaround)

```
physicsManager.collisionsDetected = 0;

physicsManager.checkCollision = function (entity1, entity2) {
    var that = this;

    var bbCollision = function (bb1, bb2) {
        // Collision code omitted
        var collision = true;
        if (collision) {
            that.collisionsDetected += 1;
        }
        return collision;
    };

    bbCollision(entity1.getBB(), entity2.getBB());
};

if (physicsManager.checkCollision(enemy, player)) {
    player.takeDamage(enemy.strength);
}
```

Functions

Invocation (3/4): Constructor invocation pattern

```
var Player = function (name) {  
    this.name = name;  
    this.lives = 3;  
};  
  
Player.prototype.sayMyName = function () {  
    console.log('My name is ' + this.name);  
};  
  
var david = new Player('David');  
david.sayMyName(); // Output: 'My name is David'
```

Functions

Invocation (3/4): Constructor invocation pattern (without new)

```
var Player = function (name) {
    this.name = name;
    this.lives = 3;
};

Player.prototype.sayMyName = function () {
    console.log('My name is ' + this.name);
};

var manfred = Player('Manfred'); // oops
try {
    manfred.sayMyName(); // raise an error because manfred is undefined
} catch (e) {
    console.log('[' + e.name + '] ' + e.message);
}

// Global variables feast
console.log(name); // Output: 'Manfred'
console.log(lives); // Output: 3
```

Functions

Invocation (4/4): Apply invocation pattern

```
var enemy = {  
    rage: 0,  
    attack: function () {  
        this.rage += 1;  
    }  
};  
  
var anotherEnemy = {  
    rage: 10  
};  
  
enemy.attack.apply(anotherEnemy, []);  
  
console.log(anotherEnemy.rage); // Output: 11
```

Functions

Arguments

```
function doActions() {  
    var i, l;  
  
    // WARNING: arguments is an Array-like object  
    for (i = 0, l = arguments.length; i < l; i += 1) {  
        console.log('Doing action ' + arguments[i]);  
    }  
  
    doActions('jump', 'attack');  
/*  
Output:  
'Doing action jump'  
'Doing action attack'  
*/
```

Functions

Closure

Javascript does have function scope. That means that the parameters and variables defined in a function are not visible outside of the function, and that a variable defined anywhere within a function is visible everywhere within the function.

```
var player = new Player();

function isGameOver() {
    var enemy = new Enemy();

    function checkHit() {
        return enemy.hit(player);
    }

    return checkHit();
}

isGameOver();
```

Functions

Module pattern

```
var physicsModule = (function () { // IIFE pattern
    var detectedCollisions = 0;

    function checkBBCollision(bb1, bb2) {
        var collision = false;
        // collision code skipped
        if (collision) {
            detectedCollisions += 1;
        }
        return collision;
    }

    function checkCollision(entity1, entity2) {
        checkBBCollision(entity1.getBB(), entity2.getBB());
    }

    return {
        checkCollision: checkCollision
    };
}());

console.log(physicsModule.detectedCollisions); // Output: undefined
console.log(physicsModule.checkBBCollision); // Output: undefined
console.log(typeof physicsModule.checkCollision); // Output: 'function'
```

Inheritance

Javascript provides a much richer set of code reuse patterns. It can ape the classical pattern, but it also supports other patterns that are more expressive.

Inheritance

Javascript provides a much richer set of code reuse patterns. It can ape the classical pattern, but it also supports other patterns that are more expressive.

Javascript is a class-free language

In classical languages, objects are instances of classes, and a class can inherit from another class. Javascript is a prototypal language, which means that objects inherit directly from other objects.

Inheritance

Pseudoclassical pattern

```
var Alien = function (name) {
  this.name = name;
};

Alien.prototype.talk = function () {
  console.log('>?saf? ' + this.name);
};

var SmartAlien = function (name) {
  this.name = name;
};

SmartAlien.prototype = new Alien();

SmartAlien.prototype.speech = function () {
  this.talk();
  console.log('...I mean, my name is ' + this.name);
};

var enemy = new SmartAlien('Roger');
enemy.speech();
// Output: '?saf? Roger
//           ...I mean, my name is Roger'
```

Inheritance

Prototypal pattern

```
var alien = {  
    name: '%?&789',  
    talk: function () {  
        console.log('%?saf? ' + this.name);  
    }  
};  
  
var smartAlien = Object.create(alien);  
smartAlien.speech = function () {  
    this.talk();  
    console.log('...I mean, my name is ' + this.name);  
};  
  
var enemy = Object.create(smartAlien);  
enemy.name = 'Roger';  
enemy.speech();  
// Output: '%?saf? Roger  
//           ...I mean, my name is Roger'
```

Inheritance

Functional pattern

```
var alien = function (spec) {
  var that = {};

  var killHumans = function () { // Private access
    console.log('*Using ' + spec.weapon + '*');
  };

  that.talk = function () {
    console.log('%&78 ' + spec.name);
    if (spec.weapon) {
      killHumans();
    }
  };

  return that;
};

var enemy = smartAlien({ name: 'Roger' });
enemy.speech();
// Output: ??saf? Roger
//          *Using Pistol*
//          ...I mean, my name is Roger'
```

```
var smartAlien = function (spec) {
  spec.weapon = 'Pistol'; // Private access
  var that = alien(spec);

  that.speech = function () {
    that.talk();
    console.log('...I mean, my name is ' +
      spec.name);
  };
  return that;
};
```

Arrays

Arrays doesn't exist

Javascript provides an object that has some array-like characteristics. It converts array subscripts into strings that are used to make properties.

Arrays

Arrays doesn't exist

Javascript provides an object that has some array-like characteristics. It converts array subscripts into strings that are used to make properties.

Arrays literals

```
var enemies = [];  
  
console.log(enemies[9999]); // Output: undefined  
  
enemies[0] = 'Sigma';  
console.log(enemies[0]); // Output: 'Sigma'  
  
enemies[1] = 9000; // We can mix different types  
console.log(enemies[1]); // Output: 9000
```

Arrays

Remove elements

```
var enemies = ['Grassman', 'Bowser', 'Sephirot'],  
    players = ['David', 'Manfred', 'Joanmi'];  
  
delete enemies[1]; // Bad idea  
console.log(enemies[1]); // Output: undefined  
console.log(enemies.length); // Output: 3  
  
players.splice(1, 1); // Yeah!  
console.log(players[1]); // Output: 'Joanmi'  
console.log(players.length); // Output: 2
```



What is Node.js?

Website definition

Node.js is a platform built on Chrome's JavaScript runtime for easily building fast, scalable network applications. Node.js uses an event-driven, non-blocking I/O model that makes it lightweight and efficient, perfect for data-intensive real-time applications that run across distributed devices.



Installation

From source-code or pre-built installer

Visit <http://nodejs.org/download/> and choose the package for your platform.

Installation

From source-code or pre-built installer

Visit <http://nodejs.org/download/> and choose the package for your platform.

Using nvm (UNIX environments)

Visit <https://github.com/creationix/nvm> and follow instructions.

Installation

From source-code or pre-built installer

Visit <http://nodejs.org/download/> and choose the package for your platform.

Using nvm (UNIX environments)

Visit <https://github.com/creationix/nvm> and follow instructions.

Check installation

```
$ node -v  
v0.8.21  
$ npm -v  
1.2.11
```

Node packages

Node.js has a lot of packages that can be installed using npm. You can publish your own code as a node package and it will be available through npm.

Node packages

Node.js has a lot of packages that can be installed using npm. You can publish your own code as a node package and it will be available through npm.

Installing packages

```
$ npm install <package_name>
```



What is Bower?

Website definition

Bower is a package manager for the web. It offers a generic, unopinionated solution to the problem of front-end package management, while exposing the package dependency model via an API that can be consumed by a more opinionated build stack.



Installation

Using npm

```
$ npm install -g bower
```

Installation

Using npm

```
$ npm install -g bower
```

Verify installation

```
$ bower -v  
1.2.7
```

Commands

bower init

Creates a bower.json file for including our application dependencies. Also, it's mandatory in order to register our application as a bower package or used on our internal projects through bower.

```
$ bower init
// Press ENTER for default answers
$ cat bower.json
{
  "name": "js-workshop-code",
  "version": "0.0.0",
  "homepage": "https://github.com/ultrayoshi/js-workshop-code",
  "authors": [
    "ultrayoshi <david@imesmes.com>"
  ],
  "license": "MIT",
  "ignore": [
    "**/.*",
    "node_modules",
    "bower_components",
    "test",
    "tests"
  ]
}
```

Commands

bower search

Find all packages or a specific package

```
$ bower search jquery
Search results:
jquery git://github.com/components/jquery.git
jquery-ui git://github.com/components/jqueryui
jquery.cookie git://github.com/carhartl/jquery-cookie.git
jquery-placeholder git://github.com/mathiasbynens/jquery-placeholder.git
jquery-file-upload git://github.com/blueimp/jQuery-File-Upload.git
jasmine-jquery git://github.com/velesin/jasmine-jquery
jquery.ui git://github.com/jquery/jquery-ui.git
jquery.scrollTo git://github.com/flesler/jquery.scrollTo.git
jquery-migrate git://github.com/appleboy/jquery-migrate.git
jquery-waypoints git://github.com/makewebthings/jquery-waypoints.git
...
```

Commands

bower search

Find all packages or a specific package

```
$ bower search jquery
Search results:
jquery git://github.com/components/jquery.git
jquery-ui git://github.com/components/jqueryui
jquery.cookie git://github.com/carhartl/jquery-cookie.git
jquery-placeholder git://github.com/mathiasbynens/jquery-placeholder.git
jquery-file-upload git://github.com/blueimp/jQuery-File-Upload.git
jasmine-jquery git://github.com/velesin/jasmine-jquery
jquery.ui git://github.com/jquery/jquery-ui.git
jquery.scrollTo git://github.com/flesler/jquery.scrollTo.git
jquery-migrate git://github.com/appleboy/jquery-migrate.git
jquery-waypoints git://github.com/makewebthings/jquery-waypoints.git
...
```

bower home <package>

Opens a package homepage into your favorite browser

```
$ bower home jquery
```

Commands

`bower install [package]`

Install a package locally

```
$ bower install jquery --save-dev
bower jquery#*           cached git://github.com/components/jquery.git#2.0.3
bower jquery#*           validate 2.0.3 against git://github.com/components/jquery.git#*
bower jquery#~2.0.3      install jquery#2.0.3

jquery#2.0.3 bower_components/jquery
```

--save-dev option add the package as a dependency of your application.
Leave package name blank in order to install all your dependencies.

Commands

`bower install [package]`

Install a package locally

```
$ bower install jquery --save-dev
bower jquery#*           cached git://github.com/components/jquery.git#2.0.3
bower jquery#*           validate 2.0.3 against git://github.com/components/jquery.git#*
bower jquery#~2.0.3      install jquery#2.0.3

jquery#2.0.3 bower_components/jquery
```

--save-dev option add the package as a dependency of your application.
Leave package name blank in order to install all your dependencies.

`bower list`

List local packages

```
$ bower list
bower check-new    Checking for new versions of the project dependencies..
js-workshop-code#0.0.0 /home/david/code/js-workshop-code
jquery#2.0.3
```



Simple exercise using jQuery

Exercise

- Start with the sample code on tag `boss_stage_1`
- Remember to install your dependencies using bower
- Create a function for creating character objects
- Create another function for creating player objects inheriting from characters
- Create another function for creating enemy objects inheriting from characters
- Use the jQuery sample code and complete 'Attack' and 'Drink potion' actions.
- Use `console.log` to debug your actions



What is Grunt?

Definition

Grunt is a Javascript Task Runner. Simplify your life automating tedious tasks like minification, compilation, unit testing, etc. There are a lot of available Grunt plugins, take a look to the plugin directory at <http://gruntjs.com/plugins>.



Installation

Using npm

```
$ npm install -g grunt-cli
```

Installation

Using npm

```
$ npm install -g grunt-cli
```

Gruntfile.js and package.json

Grunt needs a `Gruntfile.js` on your project's directory in order to work. Also, we need a `package.json` (similar to our `bower.json` but for our server-side dependencies) to add our Grunt plugins as a dependencies for our project.

```
$ npm init
// Default answers
$ npm install grunt --save-dev
```

Gruntfile.js

Basic Gruntfile.js

```
module.exports = function (grunt) {  
  grunt.registerTask('default', []);  
};
```

Gruntfile.js

Basic Gruntfile.js

```
module.exports = function (grunt) {  
  grunt.registerTask('default', []);  
};
```

Run default task

```
$ grunt  
Done, without errors
```

JSHint

JSHint is a tool that helps to detect errors and potential problems in your Javascript code.

JSHint

JSHint is a tool that helps to detect errors and potential problems in your Javascript code.

grunt-contrib-jshint

```
$ npm install grunt-contrib-jshint --save-dev
```

JSHint

Gruntfile.js

```
module.exports = function (grunt) {
  grunt.initConfig({
    jshint: {
      all: {
        options: {
          jshintrc: '.jshintrc'
        },
        files: {
          src: ['Gruntfile.js', 'js/**/*.js']
        }
      }
    }
  });
  grunt.loadNpmTasks('grunt-contrib-jshint');
  grunt.registerTask('default', ['jshint']);
};
```

JSHint

.jshintrc

```
{  
  "curly": true,  
  "eqeqeq": true,  
  "immed": true,  
  "latedef": true,  
  "newcap": true,  
  "noarg": true,  
  "sub": true,  
  "undef": true,  
  "unused": true,  
  "boss": true,  
  "eqnull": true,  
  "browser": true,  
  "node": true,  
  "expr": true,  
  "globals": {  
  }  
}
```

JSHint

Running task

```
$ grunt jshint:all
Running "jshint:all" (jshint) task
Linting js/main.js ...ERROR
[L1:C1] W117: '$' is not defined.
$(function ( {
[L29:C18] W117: '$' is not defined.
  var el = $($('#' + character.id));
[L50:C18] W117: '$' is not defined.
  var el = $("#" + character.id);

Warning: Task "jshint:all" failed. Use --force to continue.
Aborted due to warnings.
$ grunt jshint
// Same output
$ grunt
// Same output
```

Watch

Running `grunt` or `grunt jshint` command manually is a bit painful. We can automate this process using another `grunt` plugin.

Watch

Running grunt or grunt jshint command manually is a bit painful. We can automate this process using another grunt plugin.

grunt-contrib-watch

```
$ npm install grunt-contrib-watch --save-dev
```

Watch

Gruntfile.js

```
module.exports = function (grunt) {
  grunt.initConfig({
    // other plugin configurations omitted
    watch: {
      jshint: {
        files: ['js/**/*.js'],
        tasks: ['jshint']
      }
    }
  });

  // other loading npm tasks omitted
  grunt.loadNpmTasks('grunt-contrib-watch');

  grunt.registerTask('default', ['jshint']);
};
```

Watch

Running task

```
$ grunt watch
Running "watch" task
Waiting...OK
>> File "js/main.js" changed.

Running "jshint:all" (jshint) task
Linting js/main.js ...ERROR
[L1:C1] W117: '$' is not defined.
$(function ( {
[L29:C18] W117: '$' is not defined.
  var el = $( '#' + character.id);
[L50:C18] W117: '$' is not defined.
  var el = $( '#' + character.id);

Warning: Task "jshint:all" failed. Use --force to continue.

Aborted due to warnings.
Completed in 0.646s at Sun Nov 17 2013 17:23:21 GMT+0100 (CET) - Waiting...
```

Concat

You can concat your scripts file using grunt in order to make fewer HTTP requests.

Concat

You can concat your scripts file using grunt in order to make fewer HTTP requests.

grunt-contrib-concat

```
$ npm install grunt-contrib-concat --save-dev
```

Concat

Gruntfile.js

```
module.exports = function (grunt) {
  grunt.initConfig({
    // other plugin configurations omitted
    concat: {
      options: {
        separator: ';'
      },
      dist: {
        src: ['bower_components/jquery/jquery.js', 'js/main.js'],
        dest: 'build/built.js'
      }
    }
  });

  // other loading npm tasks omitted
  grunt.loadNpmTasks('grunt-contrib-concat');

  grunt.registerTask('default', ['jshint', 'concat']);
};
```

Concat

Running task

```
$ grunt concat
Running "concat:dist" (concat) task
File "dist/built.js" created.
```

Done, without errors.

Uglify

You can optimize your scripts using grunt in order to minimize its size. Combine with concat for better results.

Uglify

You can optimize your scripts using grunt in order to minimize its size. Combine with concat for better results.

grunt-contrib-uglify

```
$ npm install grunt-contrib-uglify --save-dev
```

Uglify

Gruntfile.js

```
module.exports = function (grunt) {
  grunt.initConfig({
    // other plugin configurations omitted
    uglify: {
      build: {
        files: {
          'dist/built.min.js': 'dist/built.js'
        }
      }
    }
  });

  // other loading npm tasks omitted
  grunt.loadNpmTasks('grunt-contrib-uglify');

  grunt.registerTask('default', ['jshint', 'concat', 'uglify']);
};
```

Uglify

Running task

```
$ grunt uglify
Running "uglify:build" (uglify) task
File "dist/built.min.js" created.
```

Done, without errors.

```
$ ls -l dist
total 328
-rw-rw-r-- 1 david david 247260 Nov 17 18:05 built.js
-rw-rw-r-- 1 david david 84949 Nov 17 18:12 built.min.js
```



Grunt's playground

Exercise

- Start with the sample code on tag `boss_stage_2`
- Remember to install your front-end dependencies using `bower install`
- Remember to install your back-end dependencies using `bower install`
- Run `grunt watch`
- Fix all js lint errors
- Add a `reset.css` and a basic stylesheet to the application
- Install `grunt-contrib-csslint` and `grunt-contrib-cssmin`
- Concat css files and optimize them
- Run default task for creating a built and check the result



Game design

We are going to create a simple game in the following stages using Javascript. The game will be a tiny MOBA (Multiplayer Online Battle Arena) and it will have the following features:

Game design

We are going to create a simple game in the following stages using Javascript. The game will be a tiny MOBA (Multiplayer Online Battle Arena) and it will have the following features:

Game design

We are going to create a simple game in the following stages using Javascript. The game will be a tiny MOBA (Multiplayer Online Battle Arena) and it will have the following features:

- Player choose a team: red or blue

Game design

We are going to create a simple game in the following stages using Javascript. The game will be a tiny MOBA (Multiplayer Online Battle Arena) and it will have the following features:

- Player choose a team: red or blue
- Player choose between 3 classes:
 - Soldier: low hp, ranged weapon, medium damage
 - Knight: medium hp, melee weapon, high damage
 - Protector: high hp, no weapon, can block enemy's attacks

Game design

We are going to create a simple game in the following stages using Javascript. The game will be a tiny MOBA (Multiplayer Online Battle Arena) and it will have the following features:

- Player choose a team: red or blue
- Player choose between 3 classes:
 - Soldier: low hp, ranged weapon, medium damage
 - Knight: medium hp, melee weapon, high damage
 - Protector: high hp, no weapon, can block enemy's attacks
- **Objective:** Destroy other's team base

Game loop

...

HTML5

First of all, HTML5 is not a programming language, neither an API. It's the 5th revision of HTML but also an umbrella term about 100 specifications for the next generation web applications. Visit <http://platform.html5.org/> to have a global view about it.

HTML5

First of all, HTML5 is not a programming language, neither an API. It's the 5th revision of HTML but also an umbrella term about 100 specifications for the next generation web applications. Visit <http://platform.html5.org/> to have a global view about it. We are going to use a small subset of these new APIs:

HTML5

First of all, HTML5 is not a programming language, neither an API. It's the 5th revision of HTML but also an umbrella term about 100 specifications for the next generation web applications. Visit <http://platform.html5.org/> to have a global view about it. We are going to use a small subset of these new APIs:

- **Canvas:** Drawing graphics in 2D.

HTML5

First of all, HTML5 is not a programming language, neither an API. It's the 5th revision of HTML but also an umbrella term about 100 specifications for the next generation web applications. Visit <http://platform.html5.org/> to have a global view about it. We are going to use a small subset of these new APIs:

- **Canvas:** Drawing graphics in 2D.
- **requestAnimationFrame:** Handling animations timings.

HTML5

First of all, HTML5 is not a programming language, neither an API. It's the 5th revision of HTML but also an umbrella term about 100 specifications for the next generation web applications. Visit <http://platform.html5.org/> to have a global view about it. We are going to use a small subset of these new APIs:

- **Canvas:** Drawing graphics in 2D.
- **requestAnimationFrame:** Handling animations timings.
- **Websockets:** Two-way communication between browser and server.

Introduction to the Canvas API

HTML5 introduces a new tag called canvas. Using Javascript we can interact with this element in order to draw 2D graphics in real time.

Canvas element and 2d context

```
<canvas id='gameArea' width='200' height='200'></canvas>
<script>
var canvas = document.getElementById('gameArea'),
    ctx = canvas.getContext('2d');
</script>
```

Introduction to the Canvas API

Drawing lines

```
ctx.fillStyle = 'black';
```

```
ctx.beginPath();
ctx.moveTo(10, 10);
ctx.lineTo(100, 10);
ctx.stroke();
```

```
ctx.beginPath();
ctx.moveTo(10, 20);
ctx.lineTo(100, 20);
ctx.stroke();
```

```
ctx.beginPath();
ctx.moveTo(10, 30);
ctx.lineTo(100, 30);
ctx.stroke();
```

Introduction to the Canvas API

Drawing rects

```
ctx.fillStyle = "blue";
ctx.strokeStyle = "red";
ctx.fillRect(100, 100, 50, 50);
ctx.strokeRect(165, 165, 25, 25);
```

Introduction to the Canvas API

Drawing rects

```
ctx.fillStyle = "blue";
ctx.strokeStyle = "red";
ctx.fillRect(100, 100, 50, 50);
ctx.strokeRect(165, 165, 25, 25);
```

Drawing arcs

```
ctx.beginPath();
ctx.fillStyle = "green";
ctx.strokeStyle = "orange";
ctx.arc(150, 50, 5, 0, 2 * Math.PI);
```

Introduction to the Canvas API

Drawing images

```
var crate = new Image();
crate.src = 'images/crate.png';
/*
 * onload callback function. Called when the
 * image is ready to be drawn.
 */
crate.onload = function () {
    ctx.drawImage(crate, 100, 100);
};
```

Introduction to the Canvas API

scale

```
// Draw crate 2x bigger
ctx.scale(2, 2);
ctx.drawImage(crate, 100, 100);
```

Introduction to the Canvas API

scale

```
// Draw crate 2x bigger
ctx.scale(2, 2);
ctx.drawImage(crate, 100, 100);
```

translate

```
// Same as ctx.drawImage(crate, 100, 100);
ctx.translate(100, 100);
ctx.drawImage(crate, 0, 0);
```

Introduction to the Canvas API

scale

```
// Draw crate 2x bigger
ctx.scale(2, 2);
ctx.drawImage(crate, 100, 100);
```

translate

```
// Same as ctx.drawImage(crate, 100, 100);
ctx.translate(100, 100);
ctx.drawImage(crate, 0, 0);
```

rotate

```
ctx.rotate(45 * (Math.PI * 180));
ctx.drawImage(crate, 0, 0);
```

Introduction to the Canvas API

save and restore

```
ctx.save();
ctx.translate(100, 100);
ctx.translate(crate.width / 2, crate.height / 2);
ctx.rotate(45 * (Math.PI / 180));
ctx.translate(-crate.width / 2, -crate.height / 2);
ctx.drawImage(crate, 0, 0);
ctx.restore();

ctx.drawImage(create, 0, 0);
```

requestAnimationFrame

Our game must run on 60 fps (frames per second) in order to be smoothly. It means, we must execute the game loop 60 times each second or 1 time each $1000 / 60$ milliseconds.

requestAnimationFrame

Our game must run on 60 fps (frames per second) in order to be smoothly. It means, we must execute the game loop 60 times each second or 1 time each $1000 / 60$ milliseconds.

Using setInterval

```
setInterval(function () {  
    console.log('Game loop!');  
}, 1000 / 60);
```

requestAnimationFrame

Our game must run on 60 fps (frames per second) in order to be smoothly. It means, we must execute the game loop 60 times each second or 1 time each $1000 / 60$ milliseconds.

Using setInterval

```
setInterval(function () {  
    console.log('Game loop!');  
}, 1000 / 60);
```

Using requestAnimationFrame

```
function gameLoop() {  
    requestAnimationFrame(gameLoop);  
    console.log('Game loop!');  
}  
  
gameLoop();
```



Hello world game!

Exercise

- Start with the sample code on tag `boss_stage_2`
- Remember to install your front-end dependencies using `bower install`
- Remember to install your back-end dependencies using `bower install`
- Run `grunt watch`
- Finish implementation of game module
- Finish implementation of entity constructor function
- Finish implementation of player constructor function
- Finish implementation of crate constructor function
- Complete main file