Node Boot Camp

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Day One

- Modern JS
- CLI and REPL
- Node Servers
- File System
- Streams
- restify

Day Two

- JSON Web Tokens
- MySQL
- Socket IO
- Unit Testing
- Best Practices

Check Versions

app	command	my version
git	git —version	2.14.0
node.js	node -v	8.6.0
npm	npm —v	5.3.0

Introduction

Node.js

- *Node.js® is a platform built on Chrome's V8 JavaScript runtime for easily building fast, scalable network applications.*
- v8.7.0
- https://nodejs.org/

npm

npm

- The package manager for JavaScript
- npm requires a file, package.json, in the app root
- requires node.js because it is written in JavaScript
- doesn’t officially stand for anything
- https://www.npmjs.com/

package.json

- name - what this app is called, for npm it must be
- version - the current version number
- description - what this package is all about
- author - who wrote it
- repository - where it lives

package.json

- license - type of license granted to users of the package
- scripts - commands
- dependencies - packages for production
- devDependencies - packages for development

version definitions

- “^1.8.9"
- 1 - is the major number
- 8 - is the minor number
- 9 - is the patch number
- patch number is not required

version symbols

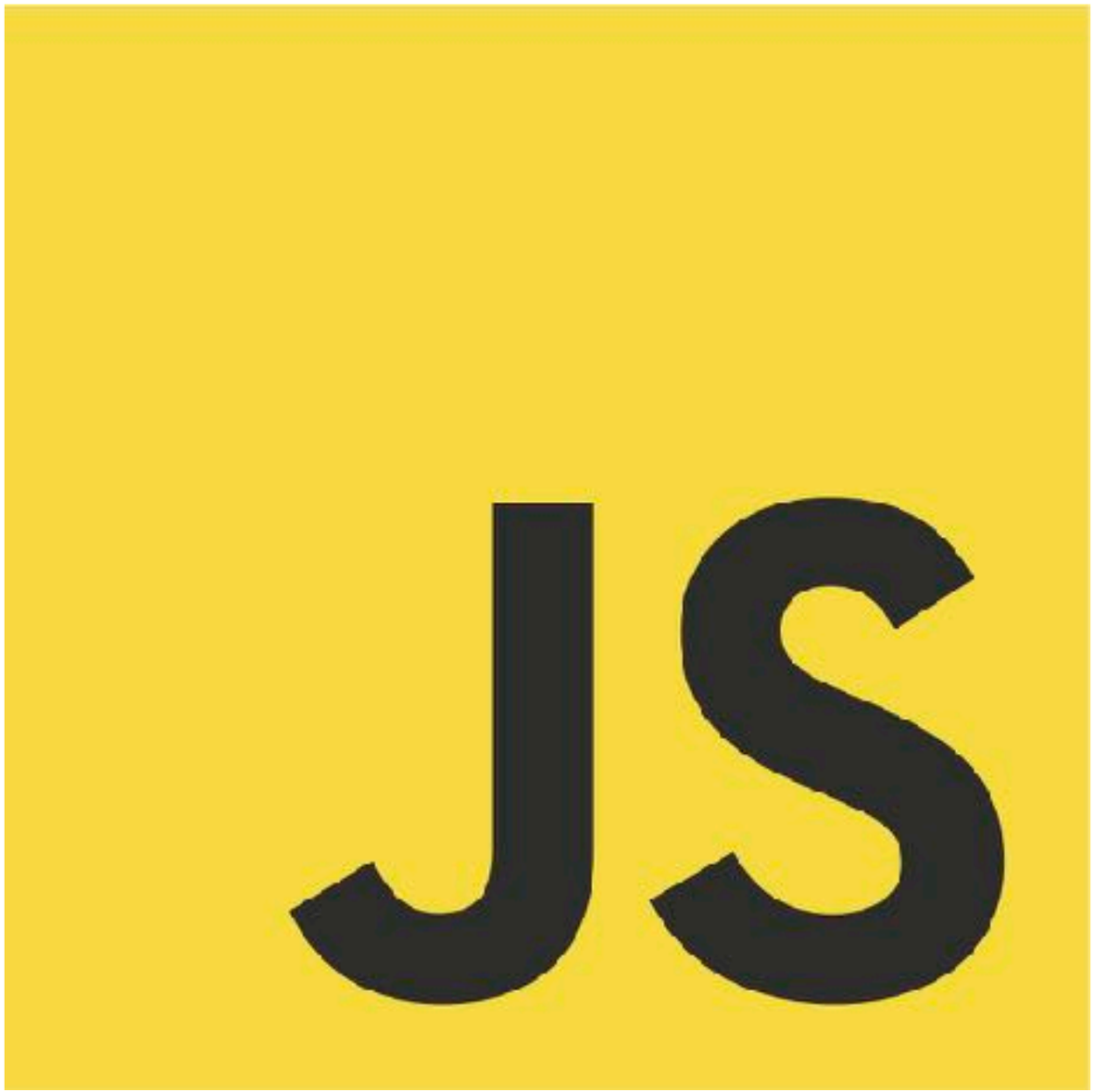
- "1.8.9" - must exactly match version
- ">1.8.9" - must be greater than version
- ">=1.8.9", "<1.8.9", "<=1.8.9"
- "^1.8.9"- allows changes to the minor & patch
- "~1.8.9" - allows changes to the patch
- "1.8.*" - a wild card which stands for any value here

install

- The install adds a package to your app
- npm install <package name> [—save | —save-dev]
- npm i <package name> [-d | -D]
- —save: saves info to dependencies
- —save-dev: saves info to devDependencies

run-script

- npm run-script <command> <args>
- or npm run <command> <args>
- to abort use control-c
- start and test commands don’t need “run”
- npm start OR npm test



Modern JavaScript

ECMAScript Versions

Version	Date
ES1	June 1997
ES2	June 1998
ES3	December 1999
ES4	DOA 2006
ES5	December 2009
ES2015 / ES6	June 2015
ES2016 / ES7	2016
ES2017	Async, Shared memory

Collection Operators

- .isArray()
- .every()
- .forEach()
- .indexOf()
- .lastIndexOf()
- .some()
- .map()
- .reduce()
- .filter()

map

```
let junk = [1, 2, 3, 4, 'Alpha', 5, {name: 'Jason'}];
let letters = ['A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J', 'K'];
let nums = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20];
console.log(nums);

// map iterates over all of the elements and returns a new array with the same
// number of elements
let nums2 = nums.map((elem) => elem * 2);
console.log(nums2);
/// [2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40]
```

filter

```
let junk = [1, 2, 3, 4, 'Alpha', 5, {name: 'Jason'}];
let letters = ['A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J', 'K'];
let nums = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20];
console.log(nums);

// filter iterates over the array and returns a new array with only the elements
// that pass the test
let nums3 = nums.filter((elem) => !!(elem % 2));
console.log(nums3);
/// [1, 3, 5, 7, 9, 11, 13, 15, 17, 19]
```

reduce

```
let junk = [1, 2, 3, 4, 'Alpha', 5, {name: 'Jason'}];
let letters = ['A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J', 'K'];
let nums = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20];
console.log(nums);

// reduce iterates over the array passing the previous value and the current
// element it is up to you what the reduction does, let's concatenate the strings
let letters2 = letters.reduce((previous, current) => previous + current);
console.log(letters2);
/// ABCDEFGHIJK

// reduceRight does the same but goes from right to left
let letters3 = letters.reduceRight((previous, current) => previous + current);
console.log(letters3);
/// KJIHGFEDCBA
```

let

- let allows us to create a block scoped variables
- they live and die within their curly braces
- var is considered deprecated
- best practice is to use let instead of var

let

```
// let allows us to create block scoped variables
// they live and die within the curly braces
let val = 2;
console.info(`val = ${val}`);
{
  let val = 59;
  console.info(`val = ${val}`);
}
console.info(`val = ${val}`);
```

const

- const creates a variable that can't be changed
- best practice is to make any variable that should not change a constant
- does not apply to object properties or array elements

const

```
const name = 'Troy';
console.info(`My name is ${name}`);
// the line below triggers a type error
name = 'Miles';
```

Template strings

- Defined by using opening & closing back ticks
- Templates defined by ${JavaScript value}
- The value can be any simple JavaScript expression
- Allows multi-line strings (return is pass thru)

Template strings

```
let state = 'California';
let city = 'Long Beach';
console.info(`This weekend's workshop is in ${city}, ${state}.`);

// template strings can run simple expressions like addition
let cup_coffee = 4.5;
  let cup_tea = 2.5;
  console.info(`coffee: $${cup_coffee} + tea: $${cup_tea} = $$
{cup_coffee + cup_tea}.`);

  // they can allow us to create multi-line strings
  console.info(`This is line #1.
this is line #2.`);
```

Arrow functions

- Succinct syntax
- Doesn’t bind its own *this*, *arguments*, or *super*
- Facilitate a more functional style of coding
- Can’t be used as constructors

Arrow functions

- When only one parameter, parenthesis optional

- When zero or more than one parameter, parenthesis required

Arrow function

```
let anon_func = function (num1, num2) {
  return num1 + num2;
};
console.info(`Anonymous func: ${anon_func(1, 2)}`);
```

```
let arrow_func = (num1, num2) => num1 + num2;
console.info(`Arrow func: ${arrow_func(3, 4)}`);
```

this

- this is handled different in arrow functions
- In anonymous function this is bound to the global object
- In arrow function this is what it was in the outer scope

Destructuring

- Maps the data on the right side of the equals sign to the variables on the left
- The data type decides the way values are mapped
- It is either object or array destructuring

Object Destructuring

```
16// this is a demo of the power of destructuring
17// we have two objects with the same 3 properties
18 const binary = {kb: 1024, mb: 1048576, gb: 1073741824};
19 const digital = {kb: 1000, mb: 1000000, gb: 1000000000};
20// We use a ternary statement to choose which object
21// assign properties based on their property names
22 const {kb, mb, gb} = (useBinary) ? binary : digital;
```

Array Destructuring

```
5
6     let [param1, bob, key] = ['first', 'second', '3rd'];
7     console.info(`param1 = ${param1}, bob = ${bob}, key = ${key}`);
8     // param1 = first, bob = second, key = 3rd
```

Spread syntax

- Expands an expression in places where multiple arguments, elements, or variables are expected

The spread operator

```
11
12  // the spread operator
13  const myArray = ['Bob', 'Sue', 'Fido'];
14  function printFamily(person1, person2, pet) {
15    console.info(`Person 1: ${person1}, Person 2: ${person2}, and their pet: ${pet}`);
16  }
17  printFamily(...myArray);
18  // Person 1: Bob, Person 2: Sue, and their pet: Fido
19
```

Class

- Syntactic sugar over JavaScript use of function constructors
- JavaScript uses proto-typical inheritance
- If a class **extends** another, it must include **super()** as first instruction in its **constructor**
- Only create a constructor if it does something

Class

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Class

```
class App extends Component {
  constructor () {
    super();
    this.state = {
      type: 'All'
    };
    this.setType = this.setType.bind(this)
  }

  setType (type) {
    this.setState({ type })
  }
}
```

CLI and REPL

CLI

Purpose	Short	Long
version	-v	—version
help	-h	—help
evaluate script	-e	—eval
syntax check	-c	—check
require	-r	—require

HTTP & Web Servers

Using Environment Vars

- process.env object holds environment vars
- Reading: var dbConnect = process.env.dbConnect;
- Writing: process.env.mode = ‘test’;

Kill Runaway Port

- sudo lsof -i:8080
- (list the processes using the port and their PIDs)
- kill -9 <PID>

Encodings

- ascii - The ASCII character set
- utf8 - variable width, can represent Unicode chars.
- base64 - represents binary data in ASCII strings

Callback Pattern

```
4       // the Callback Pattern calls a user function once the operation completes
5       // the first value is a potential error
6       fs.readFile('../assets/declaration.txt', (err, content) => {
7         if (err) {
8           console.error(err);
9           throw err;
10        }
11        console.log(`file content`, content.toString());
12      });
```

Event Emitter Pattern

```
3   // the Event Emitter Pattern - consist of two main parts
4   // the event emitter which in this case is the server
5   // and one ore more event listener
6   // here we have two listeners 'data' and 'end'
7   http.createServer((request, response) => {
8     if (request.method === 'POST' && request.url === '/echo') {
9       let body = [];
10      request.on('data', (chunk) => {
11        body.push(chunk);
12      }).on('end', () => {
13        body = Buffer.concat(body).toString();
14        response.end(body);
15      });
16    } else {
17      response.statusCode = 404;
18      response.end();
19    }
20  }).listen(8080);
```

File System

Streams

Express

Express

What is Express?

- Node.js is cumbersome
- Express simplifies it
- It sits in-between the user and Node.js
- For this reason it is called middleware

Express & RESTful

- Express makes creating a RESTful API easy

Heroku

Heroku

Heroku

- Platform-as-a-Service (PaaS)
- Bought by Salesforce.com 2010
- Runs on top of AWS
- Supports Java, Node.js, Scala, Python, PHP, and Go
- *heroku = heroic + haiku*

Installation

- Create a free heroku account at:
- https://www.heroku.com
- Download + install heroku toolbelt at:
- https://toolbelt.heroku.com/
- (the account is free, no credit card necessary)

Deploy to Heroku

- heroku login
- heroku create <app-name>
- (must be unique)
- git push heroku master
- heroku open

Authentication & Authorization

RESTful API

- Makes use of HTTP methodologies defined by RFC 2616 protocol
- Preferred over SOAP since it uses less bandwidth
- Breaks down a transaction into a series of HTTP methods
- Stateless by design

GET Method

GET /resource	
Request has body	No
Successful response has body	Yes
Safe	Yes
Idempotent	Yes
Cacheable	Yes

HEAD Method

HEAD /resource (HEAD *)	
Request has body	No
Successful response has body	No
Safe	Yes
Idempotent	Yes
Cacheable	Yes

POST Method

POST /resource	
Request has body	Yes
Successful response has body	Yes
Safe	No
Idempotent	No
Cacheable	No*

PUT Method

PUT /new-resource	
Request has body	Yes
Successful response has body	No
Safe	No
Idempotent	Yes
Cacheable	No

PATCH Method

PATCH /resource	
Request has body	Yes
Successful response has body	No
Safe	No
Idempotent	No
Cacheable	No

DELETE Method

DELETE /resource	
Request has body	No
Successful response has body	No
Safe	No
Idempotent	Yes
Cacheable	No

OPTIONS Method

OPTIONS /resource	
Request has body	No
Successful response has body	Yes
Safe	Yes
Idempotent	No
Cacheable	No

MongoDB & Mongoose

Top DB Engines

1. Oracle
2. MySQL
3. MS SQL Server
4. PostgreSQL
5. **MongoDB**
6. DB2
7. MS Access
8. Cassandra
9. Redis
10. Elasticsearch

Who Uses It?

- Craigslist
- eBay
- Foursquare
- SourceForge
- Viacom
- Expedia
- LinkedIn
- Medtronic
- eHarmony
- CERN
- and more

When to Use Mongo?

- Document Database
- High Performance
- High Availability
- Easy Scalability
- Geospatial Data

What is a Document?

- An ordered set of keys and values
- Like JavaScript objects
- No duplicate keys allowed
- Type and case sensitive
- Field order is not important nor guaranteed

A Contact Manager

- first name
- last name
- home address
- work address
- mobile phone
- home phone

In SQL

- Person table
- Address table
- Phone number table
- Joins necessary to retrieve complete record

In Mongo

- One collection holds it all
- Including the arrays
- No joins necessary

SQL to MongoDB

SQL	MongoDB
column	field
row	document
table	collection
database	database
joins	none
transactions	none

MongoDB commands

- show dbs
- use <database name>
- show collections
- db.<collection name>.drop()

CRUD

- Create: insert()
- Read: find()
- Update: update()
- Delete: remove(<query>)

Queries

- db.<collection name>.find(<query>)
- skip()
- limit()
- sort()
- pretty()

mLab

- Database as a Service (DaaS) provider
- Supports AWS, Azure, App Engine
- Used by Fox, New York Times, Lyft, Toyota, SAP

Sandbox Plan

- mLab provides a free sandbox plan
- No credit card needed
- 0.5 GB memory limit
- Shared instance
- Forever free

Socket I/O

Unit Testing

Jasmine

Jasmine

- Created by Pivotal Labs in 2010
- Current version 2.5.3
- JavaScript testing framework
- The default unit test for Angular
- Can test client and server code

describe() - Test Suite

- describe() is a global Jasmine function
- Takes to parameters
  - name of the test suite (string)
  - implementation of the suite (function)
- Can be nested

describe()

```
describe('App: Quizzer', () => {
  beforeEach(() => {
    TestBed.configureTestingModule({
      declarations: [
        AppComponent
      ],
      imports: [
        RouterTestingModule
      ]
    });
  });
});
```

it() - Test Spec

- it() is a global Jasmine function
- Takes two parameters
  - name of the spec (string)
  - implementation of the spec (function)

it()

```
it(`should have as title 'Quizzer'`, async(() => {
  let fixture = TestBed.createComponent(AppComponent);
  let app = fixture.debugElement.componentInstance;
  expect(app.title).toEqual('Quizzer');
}));
```

expect() - Expectation

- expect() is a global Jasmine function
- Jasmine's version of assert()
- Takes one parameter
  - The actual - value generated by code under test
- Is chained to a Matcher

Matcher

- Takes the output of the expect() function
- Takes one parameter
  - The expected value
- Compares the expect and actual value using the logic of the matcher

expect()

```
let app = fixture.debugElement.componentInstance;
expect(app).toBeTruthy();
expect(app).not.toBeUndefined();
expect(app.title).toEqual('Quizzer');
```

Matchers (part 1)

Matcher	Comparison
toBe()	compares using ===
toEqual()	works for literal variables and objects
toMatch()	for regular expressions
toBeDefined()	compares against 'undefined'
toBeUndefined()	also compares against ‘undefined'

Matchers (part 2)

Matcher	Comparison
toBeNull()	compares against null
toBeTruthy()	truthy boolean casting
toBeFalsy()	falsy boolean casting
toContain()	finds an item in array

Matchers (part 3)

Matcher	Comparison
toBeLessThan()	mathematical comparison
toBeGreaterThan()	mathematical comparison
toBeCloseTo()	precision math comparison
toThrow()	should throw an exception

Custom Matchers

```
var customMatchers = {
  toBeGoofy: function (util, customEqualityTesters) {
    return {
      compare: function (actual, expected) {
        if (expected === undefined) {
          expected = '';
        }
        var result = {};
        result.pass = util.equals(actual.hyuk, "gawrsh" + expected,
customEqualityTesters);
        result.message = result.pass ?
        "Expected " + actual + " not to be quite so goofy" :
        "Expected " + actual + " to be goofy, but it was not very goofy";
        return result;
      }
    };
  }
};
```

beforeEach()

- Setup function
- Called before each spec is executed
- A good place to add customer matchers

beforeEach()

```
beforeEach(function() {
    jasmine.addMatchers(customMatchers);
});
```

this

- beforeEach sets the *this* construct to any empty object

- It is passed to each it() and afterEach()

- The modified *this* doesn't flow thru from one it() to the next

afterEach()

- Teardown function

- Called after each spec is executed

Disabling suites & specs

- prepend an ‘x’
- to disable a suite change describe() to xdescribe()
- to disable a spec change it() to xit()
- They are not execute but appear in reporting

Best Practices

Wrapping Up