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Java Web Debelopment

Servlet Container, Servlets, JSPs

Trayan Iliev
tiliev@iproduct.org
http://iproduct.org

About me

Trayan Iliev

– CEO of IPT – Intellectual Products & Technologies

– Oracle® certified programmer 15+ Y

– end-to-end reactive fullstack apps with Java, ES6/7, TypeScript, Angular, React and Vue.js

– 12+ years IT trainer

– Voxxed Days, jPrime, jProfessionals, BGOUG, BGJUG, DEV.BG speaker

– Organizer RoboLearn hackathons and IoT enthusiast (http://robolearn.org)

Where to Find the Code?

Java Web Development projects and examples are available @ GitHub:

https://github.com/iproduct/course-java-web-development

Agenda for This Session

- *JavaScript* - main features
- *VS Code* and *VS Code* extensions. Linting with *ESLint*
- *JavaScript* basic language constructs and data types
- Object-oriented *JavaScript* – object literals, *new* with constructors, prototypes, *Object.create()*, using ***this.***
- Defining, enumerating and deleting properties
- *JavaScript Object Notation (JSON)*
- Arrays. Iterating arrays. Array methods.
- Function declaration and expressions. Invoking functions.
- Using *call(), apply(), bind()*. Closures and callbacks.
- Introduction to some ECMAScript – ES 6/7/8 new features

Brief History of JavaScript™

- JavaScript™ created by Brendan Eich from Netscape for less then 10 days!
- Initially was called Mocha, later LiveScript –

  Netscape Navigator 2.0 - 1995
- December 1995 Netscape® и Sun® agree to call the new language JavaScript™
- “JS had to 'look like Java' only less so, be Java's dumb kid brother or boy-hostage sidekick. Plus, I had to be done in ten days or something worse than JS would have happened.”

The Language of Web

- JavaScript™ success comes fast. Microsoft® create own implementation called JScript to overcome trademark problems. JScript was included in Internet Explorer 3.0, in August 1996.
- In November 1996 Netscape announced their proposal to Ecma International to standardize JavaScript → ECMAScript
- JavaScript – most popular client-side (in the browser) web programming language („de facto“ standard) and one of most popular programming languages in general.
- Highly efficient server-side platform called Node.js based on Google V8 JS engine, compiles JS to executable code Just In Time (JIT) during execution (used at the client-side also).

Object-Oriented JavaScript

Three standard ways to create objects in JavaScript:

- Using object literal:

```
var newObject = {};
```

- Using Object.create(prototype[, propertiesObject]) (prototypal)

```
var newObject = Object.create(Object.prototype);
```

- Using constructor function (pseudo-classical)

```
var newObject = new Object();
```

Object Properties

- Object-Oriented (OO) – object literals and constructor functions

- Objects can have named properites

Ex.: MyObject.name = 'Scene 1';

```
MyObject ['num-elements'] = 5;
MyObject.protopype.toString = function() {
    return “Name: “ + this.name + “: “ + this['num-elements'] }
```

- Configurable object properties – e.g. read only, get/set, etc.

Ex.: Object.defineProperty(newObject, "someKey", {

```
        value: "fine grained control on property's behavior",
        writable: true,  enumerable: true,  configurable: true
    });
```

JavaScript Features

- The state of objects could be changed using JS functions stored in object's prototype, called methods.
- Actually in JavaScript there were no real classes, - only objects and constructor functions before ES6 (ES 2015, Harmony).
- JS is dynamically typed language – new properties and methods can be added runtime.
- JS supports object inheritance using prototypes and mixins (adding dynamically new properies and methods).
- Prototypes are objects (which also can have their prototypes) → inhreritance = traversing prototype chain
- Main resource: Introduction to OO JS YouTube video https://www.youtube.com/watch?v=PMfcsYzj-9M

JavaScript Features

- Supports for ... in operator for iterating object's properties, including inherited ones from the prototype chain.
- Provides a number of predefined datatypes such as: Object, Number, String, Array, Function, Date etc.
- Dynamically typed – variables are universal conatainers, no variable type declaration.
- Allows dynamic script evaluation, parsing and execution using **eval() – discouraged as a bad practice**.

Datatypes in JavaScript

- Primitive datatypes:
  - boolean – values true и false
  - number – floating point numbers (no real integers in JS)
  - string – strings (no char type –> string of 1 character)
- Abstract datatypes:
  - Object – predefined, used as default prototype for other objects (defines some common properties and methods for all objects: constructor, prototype; methods: toString(), valueOf(), hasOwnProperty(), propertyIsEnumerable(), isPrototypeOf();)
  - Array – array of data (really dictionary type, resizable)
  - Function – function or object method (defines some common properties: length, arguments, caller, callee, prototype)

Datatypes in JavaScript

- Special datatypes:
  - null – special values of object type that does not point anywhere
  - undefined – a value of variable or argument that have not been initialized
  - NaN – Not-a-Number – when the arithmetic operation should return numeric value, but result is not valid number
  - Infinity – special numeric value designating infinity ∞
- Operator **typeOf**

  Example: **typeOf myObject.toString** //-->'function'

Functional JavaScript

- Functional language – functions are "first class citizens"
- Functions can have own properties and methods, can be assigned to variables, pass as arguments and returned as a result of other function's execution.
- Can be called by reference using operator **()**.
- Functions can have embedded inner functions at arbitrary depth
- All arguments and variables of outer function are accessible to inner functions – even after call of outer function completes
- Outer function = enclosing context (Scope) for inner functions → **Closure**

Closures

Example:

```
function countWithClosure() {
        var count = 0;
        return function() {
                return count ++;
        }
}

var count = countWithClosure(); <-- Function call – returns innner
                                    function wich keeps reference to
                                    count variable from the outer
scope
console.log( count() );         <-- Prints 0;
console.log( count() );         <-- Prints 1;
console.log( count() );         <-- Prints 2;
```

Default Values & RegEx

- Functions can be called with different number of arguments. It is possible to define default values – Example:

```
function Polygon(strokeColor, fillColor) {
    this.strokeColor = strokeColor || "#000000";
    this.fillColor = fillColor || "#ff0000";
    this.points = [];
    for (i=2;i < arguments.length; i++) {
        this.points[i] = arguments[i];
}
```

- Regullar expressions – Example: **/a*/**.match(str)

Object Literals. Using **this**

- Object literals – example:

```
var point1 = { x: 50, y: 100 }
var rectangle1 = { x: 200, y: 100, width: 300, height: 200 }
```

- Using **this** calling a function /D. Crockford/ - „Method Call“:

```
var scene1 = {
    name: 'Scene 1',
    numElements: 5,
    toString: function() {
    return “Name: “ + this.name + “, Elements: “ + this['numElements']
    }
}
console.log(scene1.toString())   // --> 'Name: Scene 1, Elements: 5'
```

Referres to object and allows access to its properties and methods

Accessing **this** in Inner Functions

- Using **this** calling a function /D. Crockford/ - „Function Call“:

It's necessary to use additional variable, because ***this*** points to global object (window) *undefined* in strict mode

```
var scene1 = {
   ...
   log: function(str) {
      var self = this;
      var createMessage = function(message) {
         return “Log for '“ + self.name +“' („ + Date() + “): “
                              + message;
      }
      console.log( createMessage(str) );
}
```

„Classical“ Inheritance, call() apply() & bind()

- Pattern „Calling a function using special method“
  Function.prototype.apply(thisArg, [argsArray])
  Function.prototype.call(thisArg[, arg1, arg2, ...])
  Function.prototype.bind(thisArg[, arg1, arg2, ...])

```
function Point(x, y, color){
    Shape.apply(this, [x, y, 1, 1, color, color]);
}
extend(Point, Shape);

function extend(Child, Parent) {
    Child.prototype = new Parent;
    Child.prototype.constructor = Child;
    Child.prototype.supper = Parent.prototype;
}
```

„Classical“ Inheritance, call() apply() & bind()

```
Point.prototype.toString = function() {
    return "Point [" + this.supper.toString.call( this ) + "]";
}

Point.prototype.draw = function(ctx) {
    ctx.fillStyle = this.fillColor;
    ctx.fillRect(this.x, this.y, 1, 1);
}

point1 = new Point(200,150, „blue“);
console.log(point1.toString() );
```

„Classical“ Inheritance, call() apply() & bind()

```
Point.prototype.toString = function() {
    return "Point [" + this.supper.toString.apply( this, [] ) + "]";
}

Point.prototype.draw = function(ctx) {
    ctx.fillStyle = this.fillColor;
    ctx.fillRect(this.x, this.y, 1, 1);
}

point1 = new Point(200,150, „blue“);
console.log(point1.toString() );
```

EcmaScript 6 – ES 2015, Harmony [https://github.com/lukehoban/es6features]

A lot of new features:

- arrows
- classes
- enhanced object literals
- template strings
- destructuring
- default + rest + spread
- let + const
- iterators + for..of
- Generators
- unicode
- Modules + module loaders
- map + set + weakmap + weakset
- proxies
- symbols
- subclassable built-ins
- Promises
- math + number + string + array + object APIs
- binary and octal literals
- reflect api
- tail calls

ES6 Classes [http://es6-features.org/]

```
class Shape {
    constructor (id, x, y)
{
        this.id = id
        this.move(x, y)
    }
    move (x, y) {
        this.x = x
        this.y = y
    }
}
```

```
class Rectangle extends Shape
{
    constructor (id, x, y, width,
height) {
        super(id, x, y)
        this.width  = width
        this.height = height
    }
}
class Circle extends Shape {
    constructor (id, x, y, radius) {
        super(id, x, y)
        this.radius = radius
    }
}
```

Block Scope Vars: let [http://es6-features.org/]

```
for (let i = 0; i < a.length; i++) {
    let x = a[i]
    …
}

for (let i = 0; i < b.length; i++) {
    let y = b[i]
    …
}
```

```
const callbacks = []
for (let i = 0; i <= 2; i++) {
    callbacks[i] =
        function () { return i * 2 }
}

callbacks[0]() === 0
callbacks[1]() === 2
callbacks[2]() === 4
```

ES6 Arrow Functions and this

- ECMAScript 6:

```
this.nums.forEach((v) => {
    if (v % 5 === 0)
        this.fives.push(v)
})
```

- ECMAScript 5:

```
var self = this;
this.nums.forEach(function (v) {
    if (v % 5 === 0)
        self.fives.push(v);
});
```

Array and Object Destructuring

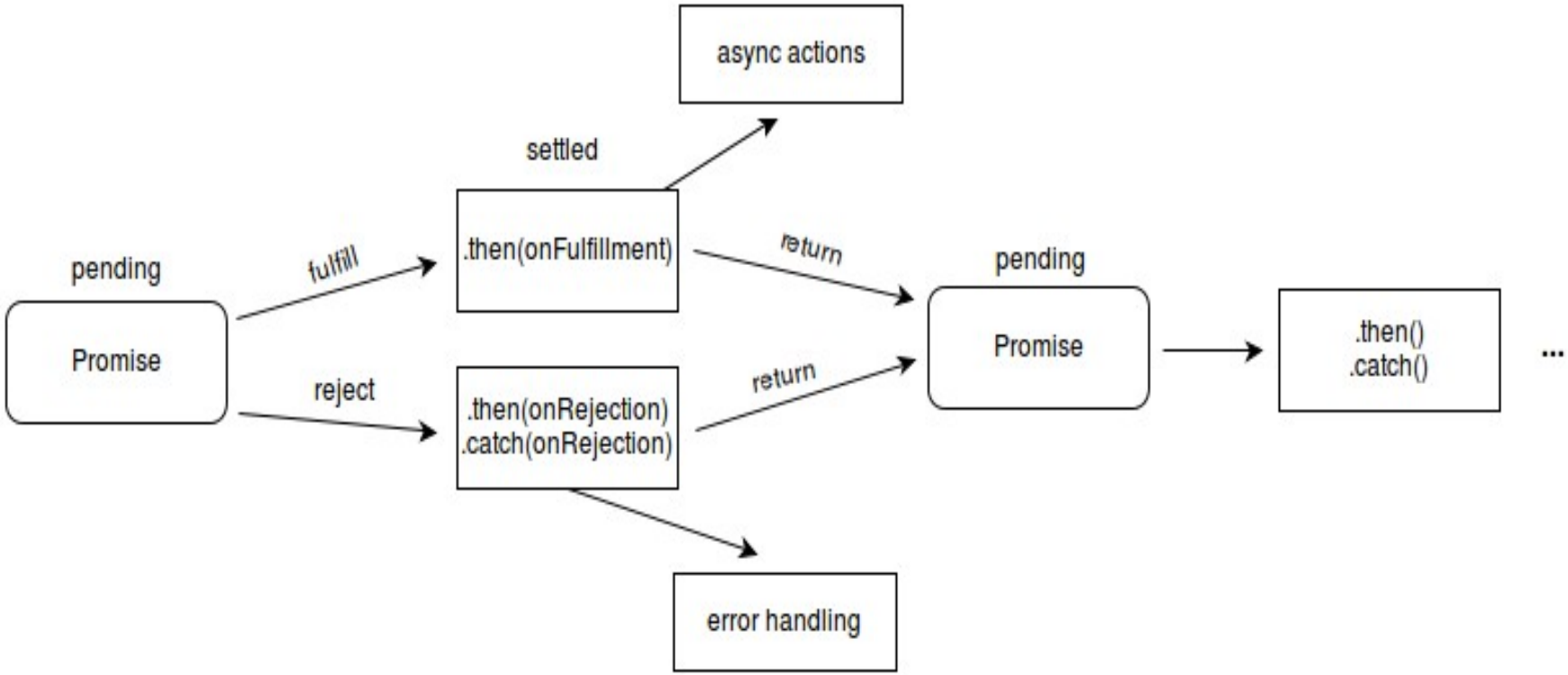
```
let persons = [
  { name: 'Michael Harrison',
    parents: {
      mother: 'Melinda Harrison',
      father: 'Simon Harrison',
    }, age: 35},
  { name: 'Robert Moore',
    parents: {
      mother: 'Sheila Moore',
      father: 'John Moore',
    }, age: 25}];

for (let {name: n, parents: { father: f }, age } of
persons) {
  console.log(`Name: ${n}, Father: ${f}, age: ${age}`);
}
```

ES6 Promises [http://es6-features.org/]

```
function msgAfterTimeout (msg, who, timeout) {
    return new Promise((resolve, reject) => {
        setTimeout(() => resolve(`${msg} Hello ${who}!`),
timeout)
    })
}
msgAfterTimeout("", "Foo", 1000).then((msg) => {
    console.log(`done after 1000ms:${msg}`);
    return msgAfterTimeout(msg, "Bar", 2000);
}).then((msg) => {
    console.log(`done after 3000ms:${msg}`)
})
```

ES6 Promises



https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Promise

Combining ES6 Promises

```
function fetchAsync (url, timeout, onData, onError) { … }
fetchPromised = (url, timeout) => {
    return new Promise((resolve, reject) => {
        fetchAsync(url, timeout, resolve, reject)
    })
}
Promise.all([
    fetchPromised("http://backend/foo.txt", 500),
    fetchPromised("http://backend/bar.txt", 500)
]).then( (data) => {
    let [ foo, bar ] = data
    console.log(`success: foo=${foo} bar=${bar}`)
}).catch( (err) => {
    console.log(`error: ${err}`)
})
```

Combining ES6 Promises

```
function fetchAsync (url, timeout, onData, onError) { … }
fetchPromised = (url, timeout) => {
    return new Promise((resolve, reject) => {
        fetchAsync(url, timeout, resolve, reject)
    })
}
Promise.all([
    fetchPromised("http://backend/foo.txt", 500),
    fetchPromised("http://backend/bar.txt", 500)
]).then( (data) => {
    let [ foo, bar ] = data
    console.log(`success: foo=${foo} bar=${bar}`)
}, (err) => {
    console.log(`error: ${err}`)
})
```

Async – Await – Try – Catch

```
async function init() {
  try {
    const userResult = await fetch("user.json");
    const user = await userResult.json();
    const gitResp = await fetch(
                        `http://api.github.com/users/${user.name}`);
    const githubUser = await gitResp.json();
    const img = document.createElement("img");
    img.src = githubUser.avatar_url;
    document.body.appendChild(img);
    await new Promise((resolve, reject) => setTimeout(resolve,
6000));
    img.remove();
    console.log("Demo finished.");
  } catch (err) {
    console.log(err);
  }
```

JavaScript Module Systems – ES6

- // lib/math.js
```
export function sum (x, y) { return x + y }
export var pi = 3.141593
```
- // someApp.js
```
import * as math from "./lib/math"
console.log("2π = " + math.sum(math.pi, math.pi))
```
- // otherApp.js
```
import { sum, pi } from "./lib/math"
console.log("2π = " + sum(pi, pi))
```
- // default export from hello.js and import
```
export default () => ( <div>Hello from React!</div>);
import Hello from "./hello";
```

Visual Studio Code

login-controller.ts - ts-demo-03-lab - Visual Studio Code

File Edit Selection View Go Help

EXTENSIONS

Search Extensions in Marketplace

Add jsdoc comments 0.0.8
Adds jsdoc @param and @return tags for s...
stevencl

Angular 2 TypeScript Test Snippets 0.7.3
Angular 2 TypeScript test snippets (updated...
Marinho Brandao

Angular 2, 4 and upcoming latest TypeScrip
Angular 2, 4 and upcoming latest Typescript...
Balram Chavan

Angular v2 TypeScript Snippets 2.0.3
Angular with TypeScript snippets. This exten...
johnpapa

Autolinting for Javascript 1.3.0
Automatically activate the correct Javascript...
t-sauer

Debugger for Chrome 2.7.1
Debug your JavaScript code in the Chrome ...
Microsoft

Document This 0.4.3
Automatically generates detailed JSDoc co...
Joel Day

ESLint 1.2.8
Integrates ESLint into VS Code.
Dirk Baeumer

exports autocomplete 0.4.6
autocompletes javascript module exports fr...
capaj

File Peek 1.0.1

login-controller.ts | *Extension: Angular v2 TypeScript Snippets* | user-repository.ts | index.ts

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Angular with TypeScript snippets. This extension upports Angular v2 or greater.

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Details Contributions Changelog Dependencies

Angular TypeScript Snippets for VS Code

Now Updated for Angular 2.4 release

This extension for Visual Studio Code adds snippets for Angular for TypeScript and HTML.

villain.component.ts - angular-event-view-cli

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL 1: cmd.exe

```
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation.  All rights reserv
Copyright (c) 2009 Microsoft Corporation.  All rights reserv
Copyright (c) 2009 Microsoft Corporation.  All rights reserv

C:\CourseAngular2\git\course-angular2\ts-demo-03-lab>
```

master* TSLint 0 2 [TypeScript Importer]: Symbols: 15 321

Start EN 11:57 PM 3/25/2017

Thank's for Your Attention!

Trayan Iliev

CEO of IPT – Intellectual Products & Technologies

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