IoT E-business applications

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Abstract. *"Internet of things" (IoT) will develop soon an ecosystem of internet-connected things that facilitates the mobile commerce experiences and the client need to be informed all the time. It will be associated with a feeling of freedom and capacity of doing very easy what was considered difficult in the past.*

Nevertheless, these opportunities will not be capitalized upon without overcoming a series of obstacles, including addressing consumer privacy concerns, the long replacement cycles of durable goods and the standardization of operating platforms.

Modern E-business web applications are now developed using new technologies such as NodeJS, AngularJS and Bootstrap. The article identifies and solves practical issues regarding the JSON exchanged messages between NodeJS and AngularJS within SMEs E-business environment.

Keywords: IoT, JSON, AngularJS, NodeJS, E-Business, REST.

JEL Codes: *L17, M15*

1. Introduction

Iot became a reality in every single common activity and in the near future will be more present in our daily lives. "E-commerce therefore, would view competitiveness in organizations, practices and market-reach as factors affecting the productivity of an economy" [Umachandran, 2017].

Welcome Cross-border business-to-business (B2B) e-commerce portals offer important advantages for early-mover adopters. The advantages refer at amplifying the inverted U shape effect of early-mover [1]. After a scientific analysis, the authors recommend these platforms be developed in bootstrap technology with java functionalities, based on AngularJS and NodeJs.

Software developers enjoy modern technologies such as NodeJS, JSON (JavaScript Object Notation), AngularJS. In cross site scripting, they encounter some difficulties regarding the JSON middleware, using Angular/Node JavaScript on client-server architecture.

The authors noticed from practice that new technologies such as AngularJS and NodeJS are not fully documented, many design flows being neglected by the end users' perspective.

The authors embraced this JavaScript technology and tried to promote it making it suitable even in the most unfriendly environment, providing solutions for the encountered errors.

The result of the authors' research and their practical attempt was a dynamic web report with full AJAX search capabilities on a SMEs economical data structure.

After [2], AngularJS has some advantages, compared with JQuery:

− RESTfull API – we may create an AngularJS controller module that will consume a REST service, by using $http get service method.

− MVC Pattern Support – it provides the separation of application logic, data models, and views – a task that needed employment of big frameworks (ASP.NET, JavaEE with Tomcat, etc.) in the past.

− Templating – we may specify the html that will be appended or replaced when we define a custom directive by using an inline template.

− Two way data binding – we can use the ng-model directive on HTML controls to bind the model to the view that provides a two-way binding between the model and the view.

− Dependency management − we need to pass a list of dependencies, known as injectables when we declare a module.

− Deep-link routing − we can enable users to bookmark and share specific pages by using the $routeProvider

− Form validation, e.g.

```
$scope.fields = [
{placeholder: 'Username', isRequired: true},
{placeholder: 'Password', isRequired: true}];
```

− Integration test runner − it was designed to be testable during the loops of lifecycle software development, having even a unit test runner (Karma) and an end-to-end test framework (Protractor). With the Automated QUality Analysis (AQUA), AngularJS is very easy to be integrated in any step of the software lifecycle.

2. Case study – Filtering a Romanian SMEs data structure with AngularJS

NodeJS runtime environment had been used to feed a JSON response for a client AngularJS application:

Front End
(AngularJS)

Back End
(NodeJS)

URL: http://jedep.spiruharet.ro
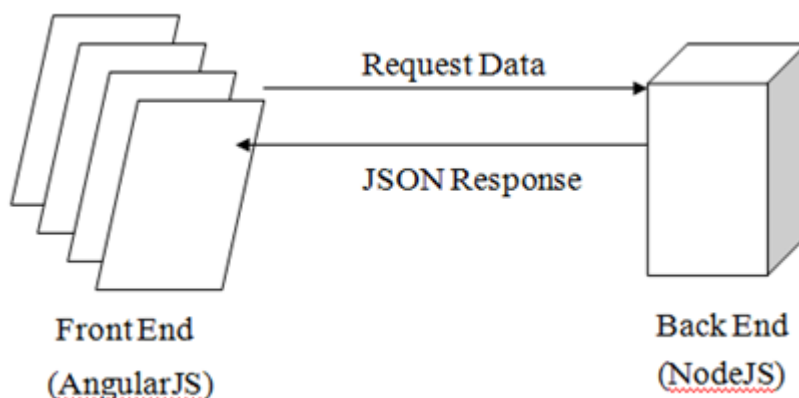
e-mail: office_jedep@spiruharet.ro

Fig. 1: Front End – Back End communication between NodeJS and AngularJS.

Unlike in the case of XML, JSON files are a convenient option for storing data – JSON files being less cluttered and easy-to-read, making information easily to be accessed by the SON users, and can either be represented as a hash of properties and values (Object), for e.g. [3].

```
var app = angular.module('myApp', [])
.controller('LocController', function($scope) {
$scope.people = [
{name: "Radu", city: "Bucuresti"},
{name: "Emil", city: "Braila"} ]; })
```

or as a list of values (Array), for e.g. [4].

```
var app = angular.module('myApp', [])
.controller('SelectController', function($scope) {
$scope.countries = ["Romania", "Belgium", "Washington"]; })
```

The server script is inspired from [5] and adapted to the SMEs data structure.

```
// load the http module and store the returned HTTP instance into an http variable
var http = require("http");
```

// create a server instance and then bind it to port 8089 using the listen method associated with the server instance

```
http.createServer(function (request, res) {
// Send the HTTP header
 // HTTP Status: 200: OK
 // Content Type: text/plain
 // Website you wish to allow to connect
res.setHeader('Access-Control-Allow-Origin', 'http://localhost:8089');
// Request methods you wish to allow
res.setHeader('Access-Control-Allow-Methods', 'GET, POST, OPTIONS, PUT, PATCH, DELETE');
// Request headers you wish to allow
res.setHeader('Access-Control-Allow-Headers', 'X-Requested-With,content-type');
```

// Set to true if you need the website to include cookies in the requests sent to the API (e.g. in case you use sessions)

```
res.setHeader('Access-Control-Allow-Credentials', true);

res.setHeader('Content-Type', 'application/json');

res.end(JSON.stringify({ "records":[
```

{"Name":"AXEL COMPANY SRL","City":"ABRUD","TotalAssets": "3023661", "KT":"774274","BP":"272622", "YEAR":"2013","CAEN":"5152"},

{"Name":"DORA LACT SRL","City":"AIUD","TotalAssets": "170245", "KT": "72446","BP":"86814", "YEAR":"2013", "CAEN":"1725"},

{"Name":"BIOTERRA SRL", "City":"DOSTAT", "TotalAssets":"18935884", "KT": "677489","BP":"102852", "YEAR":"2013"," CAEN":"1725"},

{"Name":"AGRA OARDA SRL","City":"OARDA","TotalAssets": "562319", "KT":"241077","BP":"48852", "YEAR":"2013","CAEN":"1713"},

{"Name":"AXEL COMPANY SRL","City":"ABRUD","TotalAssets": "2554304", "KT":"671730","BP":"162494", "YEAR":"2012","CAEN":"5152"},

{"Name":"DORA LACT SRL","City":"AIUD","TotalAssets": "87328", "KT":"9368","BP":"8655", "YEAR":"2012","CAEN":"1725"},

{"Name":"DANI SRL", "City":"TOTOI", "TotalAssets":"44286", "KT":"4873", "BP": "30915","YEAR":"2012", "CAEN":"1725"},

{"Name":"BIOTERRA SRL","City":"DOSTAT","TotalAssets": "18401875", "KT":"604291","BP":"255751", "YEAR":"2012","CAEN":"1725"},

{"Name":"AGRA OARDA SRL","City":"OARDA","TotalAssets": "518773", "KT":"202300","BP":"92680", "YEAR":"2012","CAEN":"1713"},

{"Name":"AGRO ITAL SRL","City":"OIEJDEA","TotalAssets": "893389", "KT":"2451288","BP":"636", "YEAR":"2012","CAEN":"1713"},

{"Name":"DORA LACT SRL","City":"AIUD","TotalAssets": "155971", "KT":"714","BP":"26500", "YEAR":"2011", "CAEN":"1725"},

{"Name":"BIOTERRA SRL","City":"DOSTAT","TotalAssets": "17283508", "KT":"866152","BP":"90092", "YEAR":"2011","CAEN":"1725"},

{"Name":"AGRO ITAL SRL","City":"OIEJDEA","TotalAssets": "891254", "KT":"2451923","BP":"14114", "YEAR":"2011","CAEN":"1713"},

{"Name":"GLADIOLA COMPROD SRL","City":"BLANDIANA", "Total Assets":"50624","KT":"20091", "BP":"4777","YEAR":"2011","CAEN":"1713"},

{"Name":"BIO CAMELOT SRL","City":"OARDA","TotalAssets": "1422", "KT":"-12659","BP":"0", "YEAR":"2010","CAEN":"9302"},

{"Name":"BLUE COMPANY SRL","City":"ALBA IULIA","TotalAssets": "116089","KT":"-100292","BP":"-82481", "YEAR":"2010","CAEN":"9271"},

{"Name":"BEST SOUND RADIO ENERGY","City":"CUGIR","TotalAssets": "17897","KT":"-33769","BP":"5310", "YEAR":"2010","CAEN":"9220"},

```
{"Name":"BIOS  SRL","City":"ALBA  IULIA","TotalAssets":"7157","KT":"-31544","BP":"3260",  "YEAR":"2010",
"CAEN":"8514"}.....................................................................................
            ] }));

            }).listen(8089);
```

The case study is based on data regarding Romanian SME's, and contains the company names, the city and the financial data (total assets, total capital, gross profit, and CAEN – classification of national economic activities), available online at http://www.smesonline.eu/indexen.html [6]. In figure 2, there is a sample of Romanian SMEs. It was also implemented a filter on this specific data structure that can be applied to any available field.

Fig. 2: Filter on Company name on Romanian SMEs data

AngularJS makes developing web application easy even for those not accustomed with JavaScript or JQuery, providing the separation of application logic, data models, and views (MVC).

There are two ways of updating the scope when the view modifies it, being sure that the view will immediately update when the scope changes, by using expressions {{…}} or by using ng-bind directive, for e.g. <p>{{language}}</p> instead of <p ng-bind="language"></p>

Filters can be applied in view using binding curly braces or in controller by using filter service. E.g.:

```
var app = app.controller('NameController', ['$scope', '$filter', function($scope, $filter) { $scope.name =
$filter('lowercase')('Radu'); }]);
```

We decided to use the first alternative, as may be seen in the client code bellow, adapted after [7].

```
<!DOCTYPE html>

<html>

<script src="https://ajax.googleapis.com/ajax/libs/angularjs/1.4.8/angular.min.js"> </script>

<body>

<div ng-app="myApp" ng-controller="customersCtrl">
```

```
<label>Search: <input ng-model="searchText"></label>

<table>

<tr><th>Name</th><th>City</th><th>TotalAssets</th><th>KT</th><th>BP</th><th>YEAR</th><th>CAEN</th></tr>

<tr ng-repeat="x in myData | filter:searchText""> <td>{{x.Name}}</td><td>{{x.City}}</td><td>{{x.TotalAssets}}</td><td>{{x.KT}}</td><td>{{x.BP}}</td><td>{{x.YEAR}}</td><td>{{x.CAEN}}</td>

</tr></table></div>

<script>

var app = angular.module('myApp', []);

app.controller('customersCtrl', function($scope, $http) {

 $http.get("http://localhost:8089/").then(function (response) {

    $scope.myData = response.data.records;

 });

});

</script></body></html>
```

The $http service is a core Angular service that facilitates communication with the remote HTTP servers via the browser's XMLHttpRequest object or via JSONP. The $http service is a function that takes an URL used to generate an HTTP request and returns a response object with data and status properties [8].

Comments - Errors that may appear in RESTfull applications:

2.1.   Error: Access to restricted URI denied

Motive: A resource makes a cross-origin HTTP request when it requests a resource from a different domain than the one which the first resource itself serves.

Solution: The Cross-Origin Resource Sharing standard works by adding new HTTP headers that allow servers to describe the set of origins that are permitted to read that information using a web browser [9].

```
    // Website you wish to allow to connect

 res.setHeader('Access-Control-Allow-Origin', 'http://localhost:8089');

    // Request methods you wish to allow

res.setHeader('Access-Control-Allow-Methods', 'GET, POST, OPTIONS, PUT, PATCH, DELETE');

    // Request headers you wish to allow

res.setHeader('Access-Control-Allow-Headers', 'X-Requested-With,content-type');
```

    // Set to true if you need the website to include cookies in the requests sent to the API (e.g. in case you use sessions)

```
res.setHeader('Access-Control-Allow-Credentials', true);
```

URL: http://jedep.spiruharet.ro
e-mail: office_jedep@spiruharet.ro

2.2. Error: CORS header 'Access-Control-Allow-Origin' does not match 'http://localhost:8089

Motive: Firefox and Chrome require exact domain specification in Access-Control-Allow-Origin header. For servers with authentication, these browsers do not allow "*" in this header [10].

Solution: Use IE instead.

3. Conclusions

This paper aims to demonstrate the advantages of the new wave of web technologies and the facilities brought by IoT. It provides some practical solutions to avoid errors in cross site scripting. The article reveals the advantages of using these technologies for cross-border business-to-business (B2B) e-commerce portals.

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