

CS 572 Modern Web Applications

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V1.1.0



JavaScript Full Stack Development



- MongoDB
 - NoSQL database (document store)
 - Stores JSON documents
- Express
 - JavaScript web framework
 - On top of Node
- Angular
 - JavaScript UI framework
 - Single Page Applications
- Node
 - JavaScript server-side platform
 - Single threaded, fast and scalable

Roadmap and Outcomes

- Node.js: write asynchronous (non-blocking) code. Understand node platform to start a project.
- Express: setup express and get requests and send back responses. REST API.
- MongoDB: what NoSQL DB looks like. Full API interacting with DB.
- AngularJS: Investigate AngularJS and architect it. A single page application.
- MEAN application: Learn by example. We will create a MEAN Games application.



Integrating MEAN

Setup

- Check endpoints working properly using REST browser plugin.
- Create angular-app folder in the application public folder.
- Add public/angular-app/app.js file (empty for now). This is angular app.
- Install AngularJS using npm (or any other way)
 - `npm i angular angular-route`
- Add the angular files as dependencies to project
 - `<script src="node_modules/angular/angular.js"></script>`
`<script src="node_modules/angular-route/angular-route.js"></script>`
- Include the angular application
 - `<script src="angular-app/app.js"></script>`
- Enable our node application to reach Angular (add app.use)
 - `app.use("/node_modules", express.static(path.join(__dirname, "node_modules")));`

MEAN

Title

Get List

Get One

Rating



Get the home page from Angular

Update index.html

```
...  
<html ng-app="meanGames">  
...  
<body>  
  <div ng-view></div>  
...  
  <script src="angular-app/game-list/game-list-  
    controller.js"></script>  
</body>  
}
```

MEAN

Title

Get List

Get One

Rating



```
Update angular-app/app.js
angular.module("meanGames", ["ngRoute"]).config(config);
function config($routeProvider) {
  $routeProvider.when("/", {
    templateUrl: "angular-app/game-list/games.html",
    controller: " GamesController",
    controllerAs: "vm"
  });
}
```

```
Add the controller angular-app/game-list/game-list-controller.js
angular.module("meanGames", ["ngRoute"])
.controller("GamesController", GamesController);
function GamesController() {
  const vm= this;
  vm.title= "Mean Games App";
}
```

```
Add the template angular-app/game-list/gmaes.html
<H1>{{vm.title}}</H1>
```

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Get List

Get One

Rating



Get the list of games from API

Update controller to make the request, public/angular-app/game-list/game-list-controller.js

```
function GamesController($http) {  
  const vm= this;  
  vm.title= "Mean Games App";  
  $http.get("/api/games").then(function(response) {  
    vm.games= response.data;  
  })  
}
```

Update the template angular-app/game-list/games.html

```
<H1>{{vm.title}}</H1>  
<ul>  
<li ng-repeat="game in vm.games">{{game.title}}</li>  
</ul>
```


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Date routing to display a game

Update public/angular-app/app.js

```
...  
function config($routeProvider, $locationProvier) {  
  $locationProvier.hashPrefix("");  
  ...  
  .when("/game/:id", {  
    templateUrl: "angular-app/game-display/game.html",  
    controller: "GameController",  
    controllerAs: "vm"  
  });  
}
```

Add controller to html page public/index.html

```
...  
<script src="angular-app/game-data-factory/game-data-  
factory.js"></script>  
<script src="angular-app/game-display/game-display-  
controller.js"></script>
```

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Create the data factory that calls the endpoints, and it used in our app.

Create `public/game-data-factory/game-data-factory.js`

```
angular.module("meanGames").factory("GameDataFactory", GameDataFactory);
```

```
function GameDataFactory($http) {  
  return {  
    getAllGames: getAllGames,  
    getOneGame: getOneGame  
  };  
  function getAllGames() {  
    return $http.get("/api/games").then(complete).catch(failed);  
  }  
  function getOneGame(id) {  
    return $http.get("/api/games/" + id).then(complete).catch(failed);  
  }  
  function complete(response){  
    console.log(response.data);  
    return response.data;  
  }  
  function failed(error) {  
    return error.status.statusText;  
  }  
}
```

Update `game-list-controller.js` to use the factory

```
function GamesController(GameDataFactory) {  
  const vm= this;  
  vm.title= "Mean Games App";  
  GameDataFactory.getAllGames().then(function(response) {  
    vm.games= response;  
  });  
}
```

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GetOne

Rating



Get data about one game, add controller and template

Add controller public/angular-app/game-display/game-display-controller.js

```
angular.module("meanGames").controller("GameController", GameController);
function GameController(GameDataFactory, $routeParams) {
  const vm= this;
  const id= $routeParams.id;
  GameDataFactory.getOneGame(id).then(function(response) {
    vm.game= response;
  });
}
```

Add the template angular-app/game-display/game.html

```
<H1>Information about game: <p>{{vm.game.title}}</p></H1>
<p>
  Price: {{vm.game.price | currency}}<BR/>
  Minimum Players: {{vm.game.minPlayers}}<BR/>
  Maximum Players: {{vm.game.maxPlayers}}<BR/>
  Minimum Age: {{vm.game.minAge}}</BR>
  Publisher: {{vm.game.publisher.name}}
</p>
```

MEAN

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Get List

GetOne

Rating

Selecting a game from the list

Update public/angular-app/game-list/games.html

Display Ratings

- What is the best way to display ratings?
- Number :(
- Images :/
- Stars :)
- Custom directive



Custom Directives

MEAN

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Get List

GetOne

Rating



Update template public/game-display/game-display-controller.js

...

```
vm.rating= response.rate;
```

...

Update template public/game-display/game.html

```
<H1>Information about game: <p>{{vm.game.title}} -  
{{vm.rating}} </p></H1>
```

...

We would prefer to see stars according to this number

MEAN

Title

Get List

GetOne

Rating



Update template public/game-display/game.html

```
<H1>Information about game: <p>{{vm.game.title}} <game-rating  
stars={{vm.rating}}></game-rating> </p></H1>
```

Add to html file index.html

```
<link rel="stylesheet"  
href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.0/css/bootstrap.min.css">  
...  
<script src="angular-app/game-rating/game-rating-directive.js"></script>
```

Update controller to send an array instead of a number game-display-controller.js

```
...  
    vm.rating= _getStarRating(response.rate);  
    });  
}  
function _getStarRating(stars) {  
    return new Array(rate);  
}  
...
```


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Get List

GetOne

Rating



Create directive public/angular-app/game-rating/game-rating-directive.js

```
angular.module("meanGames").directive("gameRating".
GameRating);
function GameRating() {
  return {
    restrict: "E",
    templateUrl: "angular-app/game-rating/rating.html",
    bindToController: true,
    controller: "GameController",
    controllerAs: "vm",
    scope: {
      stars: "@"
    }
  }
}
```

Create template public/angular-app/game-rating/rating.html

```
<span ng-repeat="star in vm.rating track by $index"
class="glyphicon glyphicon-star"></span>
```

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Get List

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Rating



Use component instead public/angular-app/game-rating/game-rating-directive.js

```
angular.module("meanGames").component("gameRating",  
{  
  bindings: {  
    stars: "*"   
  },  
  templateUrl: "angular-app/game-rating/rating.html",  
  controller: "GameController",  
  controllerAs: "vm",  
});
```



Form Validation

Forms

Field Checking

Pattern Check

Check on

submit

Add Game



We will use JSBin for this part

WE can use HTML 5 form validation attributes (required, email number, url) also AngularJS form validation ng-minlength, ng-maxlength, ng-pattern

```
<form name="myForm">
  <input type="text" name="name" required ng-minlength="3"
    ng-maxlength="10" ng-model="name"></input>
</form>

<p>{{myForm.$pristine}}</p>
<p>{{myForm.$dirty}}</p>
<p>{{myForm.name.$pristine}}</p>
<p>{{myForm.name.$dirty}}</p>
<p>{{myForm.name.$valid}}</p>
<p>{{myForm.name.$invalid}}</p>
```

Forms

Field Checking

Pattern Check

Check on

submit

Add Game



```
<form name="myForm">
```

```
<input type="text" name="name" required ng-  
minlength="3" ng-maxlength="10" ng-  
model="name"></input>
```

```
<span ng-show="myForm.name.$dirty &&  
myForm.name.$invalid">
```

This feild requires 3-10 characters.

```
</span>
```

```
</form>
```

Forms

Field Checking

Pattern Check

Check on

submit

Add Game



```
<form name="myForm">
```

```
<input type="text" name="name" required ng-  
pattern="^[0-9]{2,3}$" ng-model="name"></input>
```

```
<span ng-show="myForm.name.$dirty &&  
myForm.name.$invalid">
```

This feild requires 2 or 3 digits.

```
</span>
```

```
</form>
```

Forms

Field Checking

Pattern Check

Check on

submit

Add Game



```
<script>
angular.module("myApp", []).controller("MyController", MyController);
function MyController() {
  const vm= this;
  vm.message= "hello";
  vm.isSubmitted= false;
  vm.add= function() {
    if (vm.myForm.$valid) {
      console.log("Add to database...");
    } else {
      vm.isSubmitted= true;
    }
  }
}
</script>
```

```
...
<form name="vm.myForm" ng-submit="vm.add()">
  Please enter age greater than 9: <input type="text" name="name"
required ng-pattern="^[0-9]{2,3}$" ng-model="name"></input>
  <span ng-show="vm.myForm.name.$dirty &&
vm.myForm.name.$invalid && vm.isSubmitted">
    This feild requires 2 or 3 digits.
  </span>
  <button type="submit">Add data</button>
</form>
```

Forms

Field Checking

Pattern Check

Check on

submit

Add Game



Add Game form to public/angular-app/game-list/games.html

```
<form name="vm.gameForm" ng-submit="vm.addGame()" >
  To add a new game please fill in all the fields below:<BR/>
  Title: <input type="text" name="title" required ng-model="vm.newGameTitle"
style="color:black"/><BR/>
  Price: <input type="text" name="price" required ng-
model="vm.newGamePrice" style="color:black"/><BR/>
  Year of Publication: <input type="text" name="year" required ng-
model="vm.newGameYear" style="color:black"/><BR/>
  Rating: <input type="text" name="rating" required ng-
model="vm.newGameRating" style="color:black"/><BR/>
  Minimum Number of Players: <input type="text" name="minPlayers" required
ng-model="vm.newGameMinPlayers" style="color:black"/>
  <span ng-show="vm.gameForm.minPlayers.$dirty &&
vm.gameForm.minPlayers.$invalid && vm.gameForm.isSubmitted"
style="color:black">Minimum players must be at least 1.</span>
  <BR/>
  Maximum Number of Players: <input type="text" name="maxPlayers" required
ng-model="vm.newGameMaxPlayers" style="color:black"/><BR/>
  Minimum Recommended Player Age: <input type="text" name="minAge"
required ng-model="vm.newGameMinAge" style="color:black"/><BR/>
  Designer name: <input type="text" name="designer" required ng-
model="vm.newGameDesigner" style="color:black"/><BR/>
  <button type="submit" class="btn-success">Add Game</button><BR/>
</form>
```


Forms

Field Checking

Pattern Check

Check on

submit

Add Game



Add controller functionality for submitting. Update public/angular-app/game-list/game-list-controller.js

```
function GamesController(GameDataFactory) {
  const vm= this;
  vm.title= "Mean Games App";
  vm.isSubmitted= false;
  GameDataFactory.getAllGames().then(function(response) {
    // console.log(response);
    vm.games= response;
  });
  vm.addGame= function(){
    const postData= {
      title: vm.newGameTitle,
      price: vm.newGamePrice,
      rate: vm.newGameRating,
      year: vm.newGameYear,
      rating: vm.newGameRating,
      minPlayers: vm.newGameMinPlayers,
      maxPlayers: vm.newGameMaxPlayers,
      minAge: vm.newGameMinAge,
      designers: vm.newGameDesigner,
    };
    if (vm.gameForm.$valid) {
      GameDataFactory.postGame(postData).then(function(response){
        console.log("Game saved");
        //
      }).catch(function(error) {
        console.log(error);
      });
    } else {
      vm.isSubmitted= true;
    }
  };
}
```

Forms

Field Checking

Pattern Check

Check on

submit

Add Game



Update the Factory public/angular-app/game-data-factory/game-data-factory.js

```
function GameDataFactory($http) {  
    return {  
        getAllGames: getAllGames,  
        getOneGame: getOneGame,  
        postGame: postGame  
    };  
};
```

...

```
function postGame(game) {  
    return $http.post("/api/games/",  
game).then(complete).catch(failed);  
}
```

Forms

Field Checking
Pattern Check
Check on
submit
Add Game



Enable JSON processing. Update app05.js

...

```
app.use(express.urlencoded({extended : false}));
```

```
app.use(express.json());
```

...

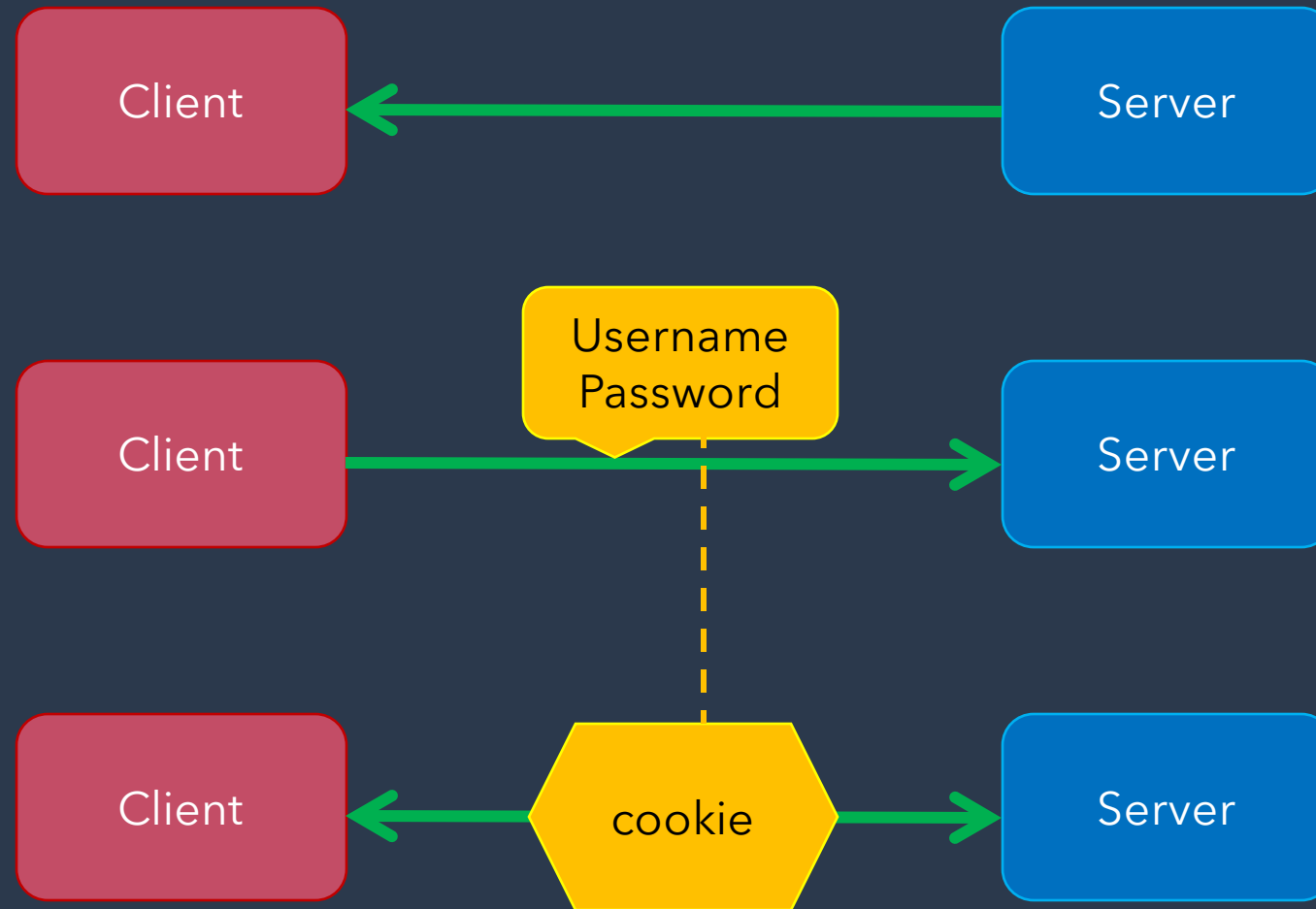


Authentication

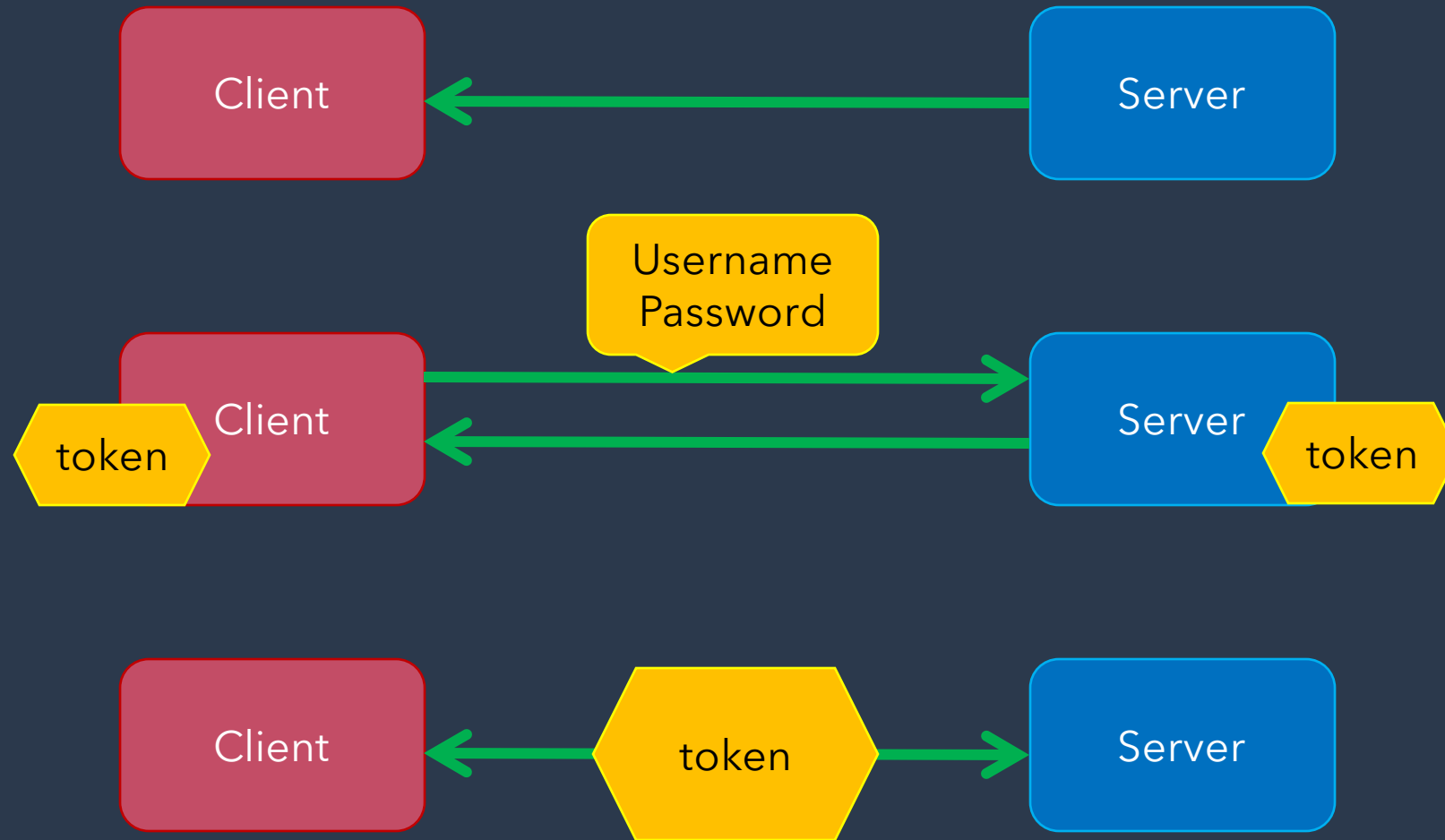
What is Authentication and Authorization

- Are you who you say you are?
- Do you have the authority (privilege) to access this?
- Authentic: Original.
- Authroized: Allowed to do this.

Classic Server Based Authentication



Token Based Authentication



JWT

- JSON Web Token
- "Header", "Payload", "Signature"
- Payload:
 - Any data, username, roles, ...
- Authentication, and encryption methods.

Authentication

Users DB

Encryption

Token

Authentication



Before we can authenticate, we need to have a credentials DB. A DB of users with a first names, usernames, and passwords.

Create api/data/users-model.js

```
var mongoose= require("mongoose");
var userSchema= new mongoose.Schema({
  username: {
    type: String,
    unique: true,
    required: true
  },
  name: {type: String},
  password: {type: String, required: true}
});
mongoose.model("User", userSchema);
```

Authentication

Users DB

Encryption

Token

Authentication



Make sure we bring in the Schema and module for the application. Update users/api/data/db.js

...

```
require("../users.model");
```

Add the authentication routes to api/routes/index.js

...

```
var controllerUsers=
```

```
require("../controllers/users.controller.js");
```

...

```
router.route("/users/register")
```

```
    .post(controllerUsers.register);
```

```
router.route("/users/login").post(controllerUsers.login);
```

```
module.exports= router;
```

Authentication

Users DB

Encryption

Token

Authentication



```
Add a new controller. Create api/controllers/users.controller.js
var mongoose= require("mongoose");
var User= mongoose.model("User");
module.exports.register= function(req, res) {
  console.log("Registering user");
  var username= req.body.username;
  var name= req.body.name || null;
  var password= req.body.password;
  User.create({username: username, name: name, password: password},
function(err, user) {
  if (err) { console.log(err); res.status(400).json(err);}
  else {console.log("user created", user); res.status(200).json(user);}
  });
};
module.exports.login= function(req, res) {
  console.log("Logging in user");
  var username= req.body.username;
  var password= req.body.password;
  User.findOne({username: username}).exec(function(err, user) {
    if (err) { console.log(err); res.status(400).json(err);}
    if (user) { console.log("user found", user); res.status(200).json(user);}
    else {console.log("user not found", user); res.status(400).json("Unauthorized");}
  });
};
```

Authentication

Users DB

Encryption

Token

Authentication



Install the encryption package bcrypt-nodejs
`npm i bcrypt-nodejs`

Modify controller to use encryption. Update api/controllers/users-controller.js

```
var mongoose= require("mongoose");
var User= mongoose.model("User");
var bcrypt= require("bcrypt-nodejs");
module.exports.register= function(req, res){
  console.log("Registering user");
  var username= req.body.username;
  var name= req.body.name || null;
  var password= bcrypt.hashSync(req.body.password, bcrypt.genSaltSync(10));
  User.create({username: username, name: name, password: password}, function(err, user){
    if(err) { console.log(err); res.status(400).json(err);}
    else {console.log("user created", user); res.status(200).json(user);}
  });
};
module.exports.login= function(req, res) {
  console.log("Logging in user");
  var username= req.body.username;
  var password= req.body.password;
  User.findOne({username: username}).exec(function(err, user) {
    if(err) { console.log(err); res.status(400).json(err);}
    if(user) {
      if(bcrypt.compareSync(password, user.password)){
        console.log("user found", user); res.status(200).json(user);
      }else { res.status(401).json("Unauthorized");}
    }else {console.log("user not found", user); res.status(400).json("Unauthorized");}});
};
```