Simple Application with Angular 6 + Node.js & Express

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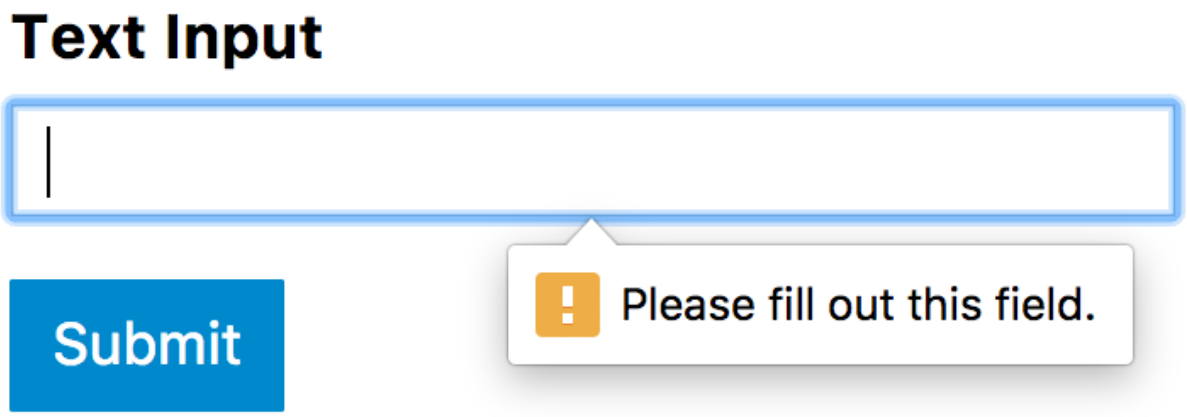

Let's create a very simple Angular form application that stores user information locally in memory on a server.

On submitting the form, we'll populate the data on the next page and add two additional elements to display the *guid* and customer *uid*.

Getting Started

First we'll need Node & NPM installed.

To check if you have node installed run this command in your terminal:

```
node -v
```

To confirm that you have npm installed you can run this command:

```
npm -v
```

If not, you can download & install **NodeJS** & **NPM** from https://nodejs.org/en/

. . .

Install the Angular CLI:

```
npm install -g @angular/cli
```

Generate a new Angular project:

```
ng new charts6
```

Navigate to http://localhost:4200/. At this point the application will automatically reload if you change any of the source files. The initial page should be the default Angular 6 page:

Welcome to charts6!

Here are some links to help you start:

- Tour of Heroes
- CLI Documentation
- Angular blog

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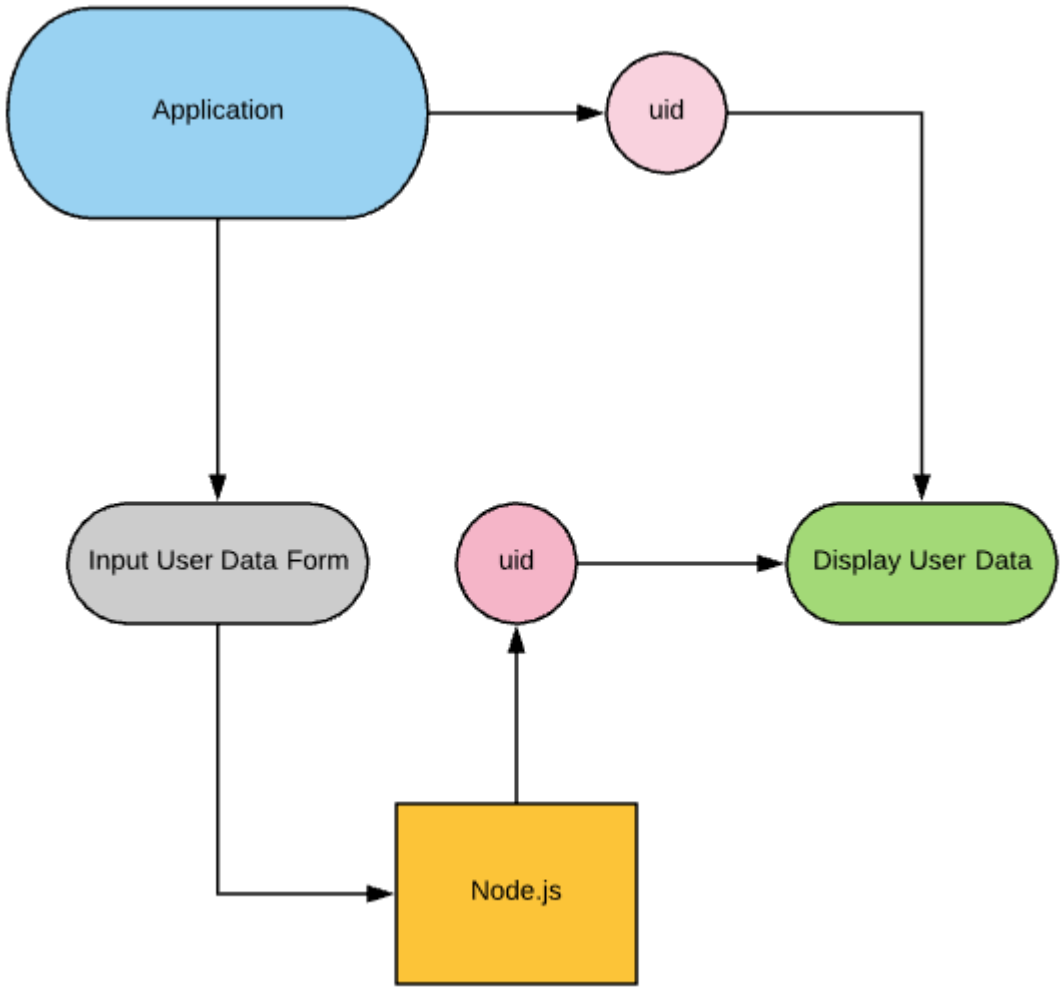
The main **Application** component will have a UI Router that initially shows the **Input User Data Form** component. On submitting the form**, Application** component will show the **Display User Data** component.

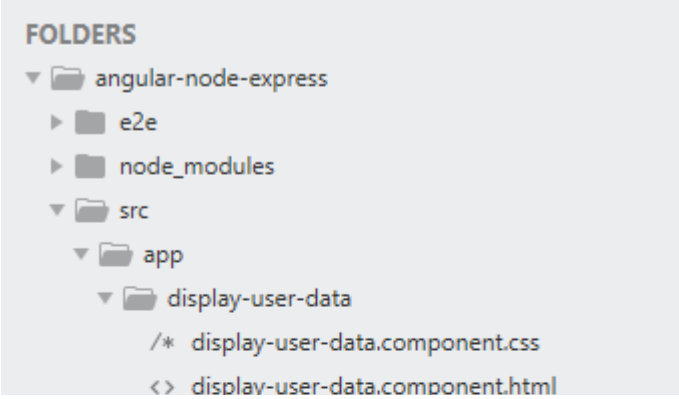
The Flow

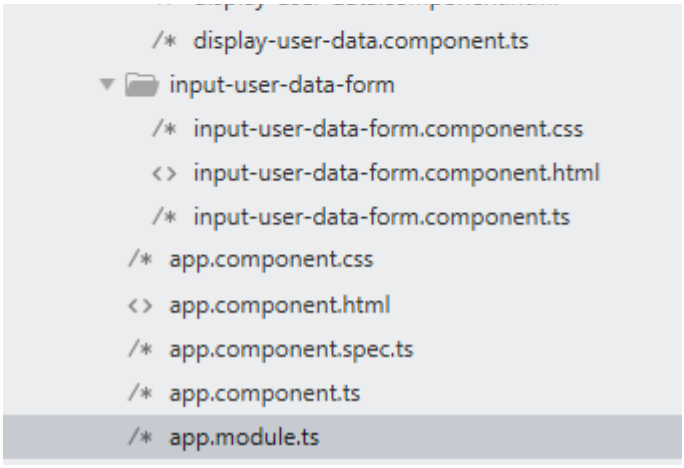


Create components with **ng cli**

```
ng new angular-node-express
cd angular-node-express
ng generate component input-user-data-form --spec false
```

The **CLI** will create all the appropriate files and place them into the app folder





It should also add **declarations** into the **app.module.ts**

app.module.ts

```
import { BrowserModule } from '@angular/platform-browser';
import { NgModule } from '@angular/core';

import { AppComponent } from './app.component';
import { InputUserDataFormComponent } from './input-user-data-form/input-user-data-form.component';
import { DisplayUserDataComponent } from './display-user-data/display-user-data.component';

@NgModule({
  declarations: [
    AppComponent,
    InputUserDataFormComponent,
    DisplayUserDataComponent
  ],
  imports: [
    BrowserModule
  ],
  providers: [],
  bootstrap: [AppComponent]
})
export class AppModule { }
```

Next, we'll **add bootstrap 3 CSS library into the project** to add styling.

```
npm install --save bootstrap@3
```

Afterwards add a path to "**styles**" array in the **angular.json**

```
"styles": [
              "node_modules/bootstrap/dist/css/bootstrap.min.css",
              "src/styles.css"
          ]
```

. . .

The Bootstrap grid system uses containers that hold rows and column. Rows and columns are percentage based. It is the container that changes responsively.

The container is used as a wrapper for the content.

We'll choose a *fluid container* whose width will always be the width of the device.

A grid **row** acts like a wrapper around the columns.

A **row** is created by adding the class `row` to an element inside the container.

Ideally, the number of columns equals 12 for every row. Different column class prefixes are used for different sized devices. Here 1 column takes up the size of 12 columns.

Change the **app.component.html** into the following:

. . .

Running the application in DEV mode

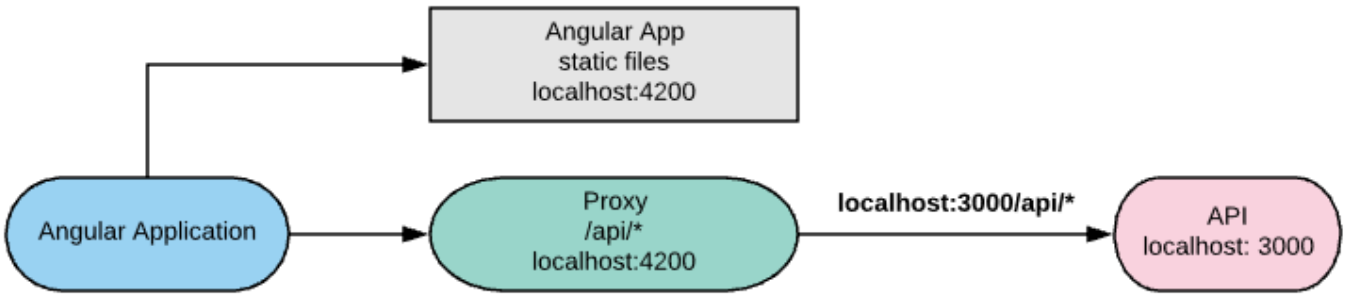
Angular CLI uses webpack underneath to run the application on port 4200.

We'll run our **Node.js API** endpoint on port ***3000***. But making an API call to another server (from port ***4200***) causes the **CORS browser exception**.

This is why we'll use a proxy as a workround to the *same-origin policy*. The Proxy will re-route our API calls to a Node.js server to avoid the CORS exceptions. CORS is a browser security issue and does not apply to "backend to backend" communication.

All requests made to `/api/...` from within our application will be forwarded to `http://localhost:3000/api/...`

With the proxy, our application diagram will look like this:



. . .

Create the **proxy.conf.json** in root folder

When starting Angular & Proxy servers use the following command:

```
ng serve --proxy-config proxy.conf.json
```

. . .

Creating the Input User Data Component

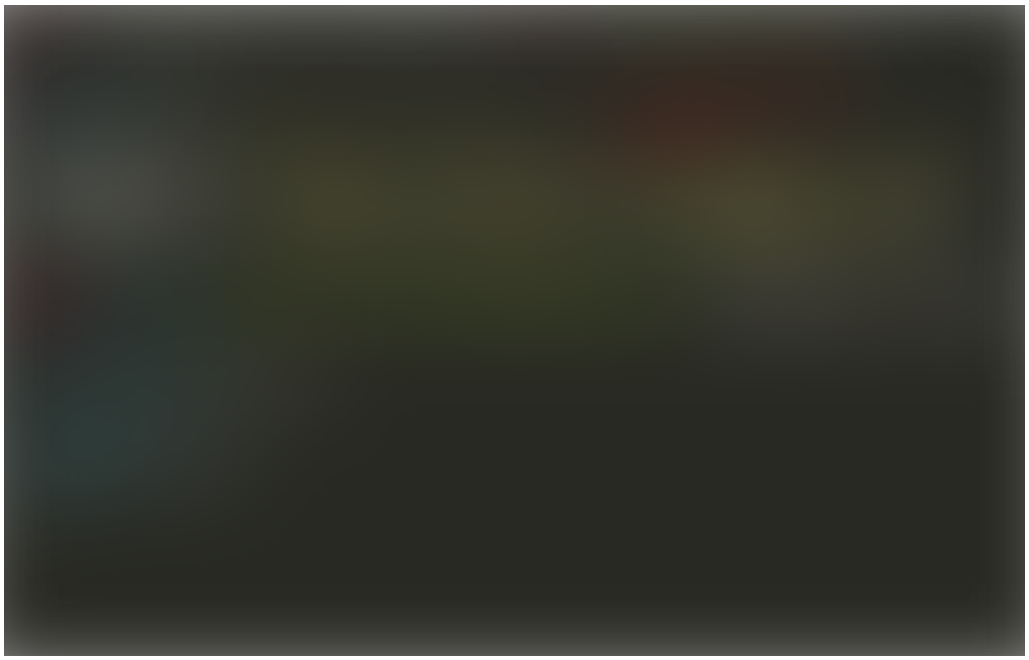
First let's focus on creating UI and work on API endpoints thereafter

There are 3 rules you must follow when making a Bootstrap form:

1. Every field must be wrapped in a **div** element
2. Every **<label>** should have **.control-label** class and its **for** value must match the corresponding <**input**>'s **id,** so when the label is clicked, the input becomes focused.
3. Every **<input>** should be given **.form-control**

Set the **input-user-data-form.component.html** to the following:

Change **selector** in the **input-user-data-form.component.ts** to **input-user-data-form**



And add it to **app.component.html**

Field Validation with Bootstrap

We are going to have to validate our fields prior to submitting the form to the backend. If a field is invalid, we can communicate it to the user by making the entire field red.

For each of the fields, we will:

Add the class `.has-error` to the `.form-group` div

And create a `<p>` with the class `.has-text` to explain the problem

Here is the form with errors added for every field:

. . .

Making a Reactive Form

A reactive form is a bit different from template-driven forms by providing more predictability with synchronous access to the data model, immutability with observable operators, and change tracking through observable streams.

To use the reactive form, we must import the **FormsModule & ReactiveFormsModule** from the **@angular/forms** package and add it to our **app.module.ts**

```
import { BrowserModule } from '@angular/platform-browser';
import { NgModule } from '@angular/core';
import { ReactiveFormsModule, FormsModule } from '@angular/forms';

import { AppComponent } from './app.component';
import { InputUserDataFormComponent } from './input-user-data-form/input-user-data-form.component';
import { DisplayUserDataComponent } from './display-user-data/display-user-data.component';

@NgModule({
  declarations: [
    AppComponent,
    InputUserDataFormComponent,
    DisplayUserDataComponent
  ],
  imports: [
    BrowserModule,
    FormsModule,
    ReactiveFormsModule
  ],
  providers: [],
  bootstrap: [AppComponent]
})
export class AppModule { }
```

. . .

Next, lets modify the **input-user-data-form.component**.

We'll inject the **formBuilder** into the component for use in the **ngOnInit** life cycle method. **FormBuilder** a service that helps making forms easier.

The **FormBuilder** will create a **FormGroup** ***userForm*** with **FormControls.** Each **FormControl** has a default value and a set of **Validators**.

Think of the **userForm** as a schema for the actual values. It holds validation rules for fields inside the form.

We'll add **registered** & **submitted** boolean flags to the **Component.** We'll use these to indicate the current form state**.**

Also, we'll create a validator function for every input, see **invalidFirstName**(), **invalidLastName**(), **invalidEmail**(), **invalidZipcode**(), **invalidPassword**().

A validator function will be used in markup to hide / show error messages for each field.

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In the **input-user-data-form.component.html**, and for every ***Reactive form*** we'll use a directive `[formGroup]` to bind to `userForm` variable we defined in the component

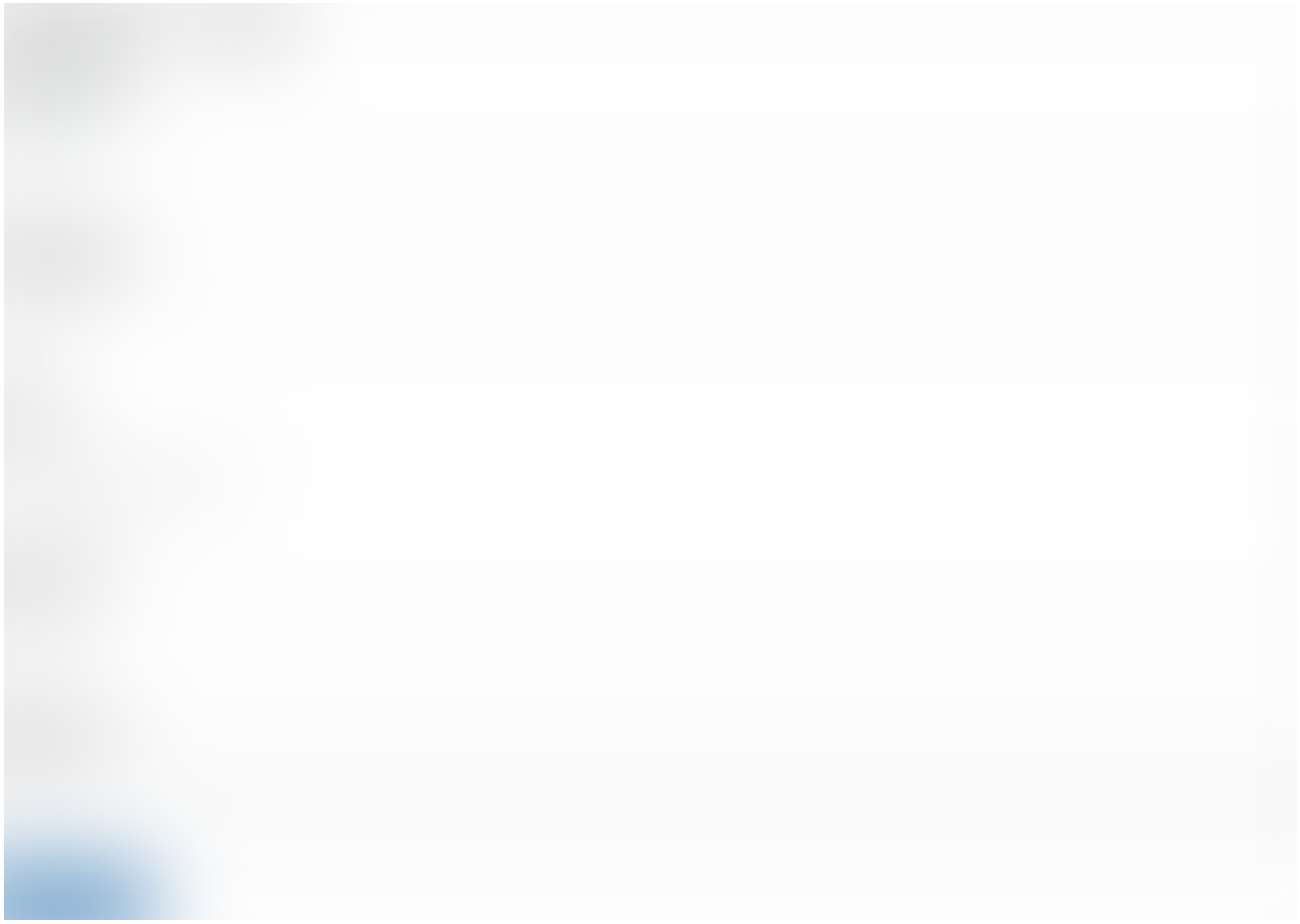
We'll bind the **onSubmit** handler via the `(ngSubmit)` directive.

To connect an HTML input element to a *Reactive form* we need to add `formControlName` attribute to each of the form inputs.

We'll use the ***ngIf** & **[ngClass]** directives to control error messages. The styles and validation markup will get displayed after user attempts to submit the form. This is controlled with `[submitted]` property of the component.

After submitting the form, it will be validated every time user changes the input value, causing errors to show & hide dynamically.

Here is what the form looks like initially:



And the form after filling out some fields with error:

Looks good so far! Lets continue with the next component.

Creating the Display User Data Component

The next Angular component will display user data. This will be a simple component that visualizes a data model passed into it.

Lets create a data model **UserInfoModel** in **app/models,** we'll make it deserialize an object when its passed into the constructor.

The view **display-user-data.component.html** binds to the model via interpolation {{…}} and displays the information.

And just for testing purposes, **DisplayUserDataComponent** class will assign some default values into the **UserInfoModel**

Both of the pages look great!

Now, lets connect the **Router** into the **AppComponent** to establish a page flow

Connecting Routes & RouterModule

Our goal with routing is to have the `InputUserDataFormComponent` rendered when the url is `/`, and `DisplayUserDataComponent` shown when the url is `/user/:uid`

First, lets setup the imports to **@angular/router**, then define an array **routes** of our paths and destination pages.

```
const routes: Routes = [
  {
    path: '',
    component: InputUserDataFormComponent
  },
  {
    path: 'user/:uid',
    component: DisplayUserDataComponent
  }
];
```

In the `imports` add `RouterModule.forRoot(routes)`

Place the `router-outlet` in the **app.component.html**

Now the initial "/" root page looks like this:

Type "/user/a01" in the address bar and you get the **User Information** page

All works as intended on the client! Now lets continue with creation of API endpoint.

Creating API endpoint in Node.js & Express

We'll use the **express-generator-api** to make a Node.js API quickly by generating a project.

Install express-generator:

```
npm install -g express-generator-api
```

Create the API:

```
express-api angular-node-express-api & cd angular-node-express-api
```

Install dependencies:

```
npm install
```

The file structure generated should be the following:

At this point all the basics of an API have been implemented by the generator.

For example, **body parser** & **cookie parser** are part of the ***app.js***. Here express will try identify any JSON data that comes into our application and parse it for us.

Next, we are going to make the following API endpoints.

`/customer` will insert a new customer and return auto-incremented customer.id

`/customer/:uid` will retrieve a single customer by customer uid

`/generate_guid` will generate a tracking_guide that Angular UI will use when creating a new customer

. . .

Router /generate_uid

Lets copy **users.js** to **generate_uid.js** just to have a basic router. We'll modify this router to return a random uid

Install **uid-safe**, which generates a **uid** safe for cookies

```
npm install uid-safe
```

Include it in **generate_uid.js**

```
var uid = require('uid-safe')
```

And return it with the response

We'll need to hook up the generate_uid router in the *app.js*

```
app.use('/api/v1/generate_uid', generate_uid);
```

The route returns a JSON with the GUID. Great!

```
{"guid":"K7VPC3I9kxIJ4Ct2_2ZR7Xb1"}
```

Router /customer

For every API service I usually have a ***model*** for the data and a ***service*** that performs all CRUD operations with it; that way there is a level of abstraction between the API request, storage & validation, but also a good way to access the service from anywhere in the application.

In this example, we'll simply store customer data in memory.

The service will increment a customer UID every time a new customer is created.

We'll use that customer UID to retrieve the customer data as well.

. . .

Create the **models** directory and add the following **model.customer.js** in there.

. . .

Then, create **services** directory and add a **service.customer.js** in there.

CustomerService implements all the CRUD operations create, read, update and delete the **CustomerModel**. It uses the **counter** to increment the customer **uid**; and stores all the customers into the **customers** object.

. . .

It's important to validate our data on the server as well as the client. I usually keep validation as part of the service object, which is either a separate method or part of the *CRUD operation*.

We'll implement the validation using the **fastest-validator** library.

Install **fastest-validator** library:

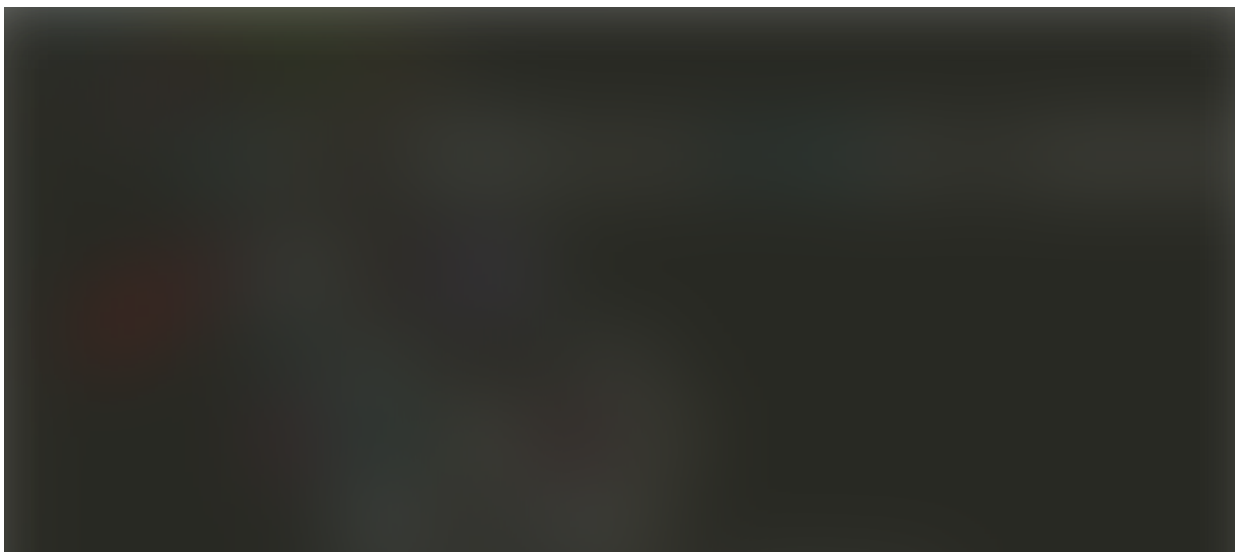
```
npm install fastest-validator --save
```

Import it in the **CustomerService** service object and create an instance of the **Validator** with custom schema.

```
var validator = require('fastest-validator');
```

The **Schema** object contains all validation rules, which is then used by the **Validator** instance to validate data against it.

Then, we'll need to notify UI if validation fails on the server. If that happens, the **create** operation will throw an **Error** with list of errors for every failed validation.



services\service.customer.js

The list of errors will propagate into the response, which will be handled by Angular to communicate an error.

. . .

Lets connect the **CustomerService** to express router.

We'll be using the async / await, which is a better way to write asynchronous code. Previous options are callbacks and promises, in fact async/await is built on top of promises; but async / await make the code behave & read a little more like synchronous code.

In the following router we implement all the CRUD operations using the **CustomerService** singleton.

Take a look at the ***create*** operation, where we submit user data and how errors are propagated into the response via try / catch block. The code is easy to read.

```
12  router.post('/', async (req, res, next) =>
13  {
14      const body = req.body;
15
16      try
17      {
18          const customer = await CustomerService.create(body);
19
20          if(body.guid != null)
21          {
22              customer.guid = body.guid;
23          }
24
25          res.cookie('guid', customer.guid, { maxAge: 900000, httpOnly: true });
26
27          // created the customer!
28          return res.status(201).json({ customer: customer });
29      }
30      catch(err)
31      {
32          if (err.name === 'ValidationError')
33          {
34              return res.status(400).json({ error: err.message });
35          }
36
37          // unexpected error
38          return next(err);
39      }
40  });
```

routes\customer.js

. . .

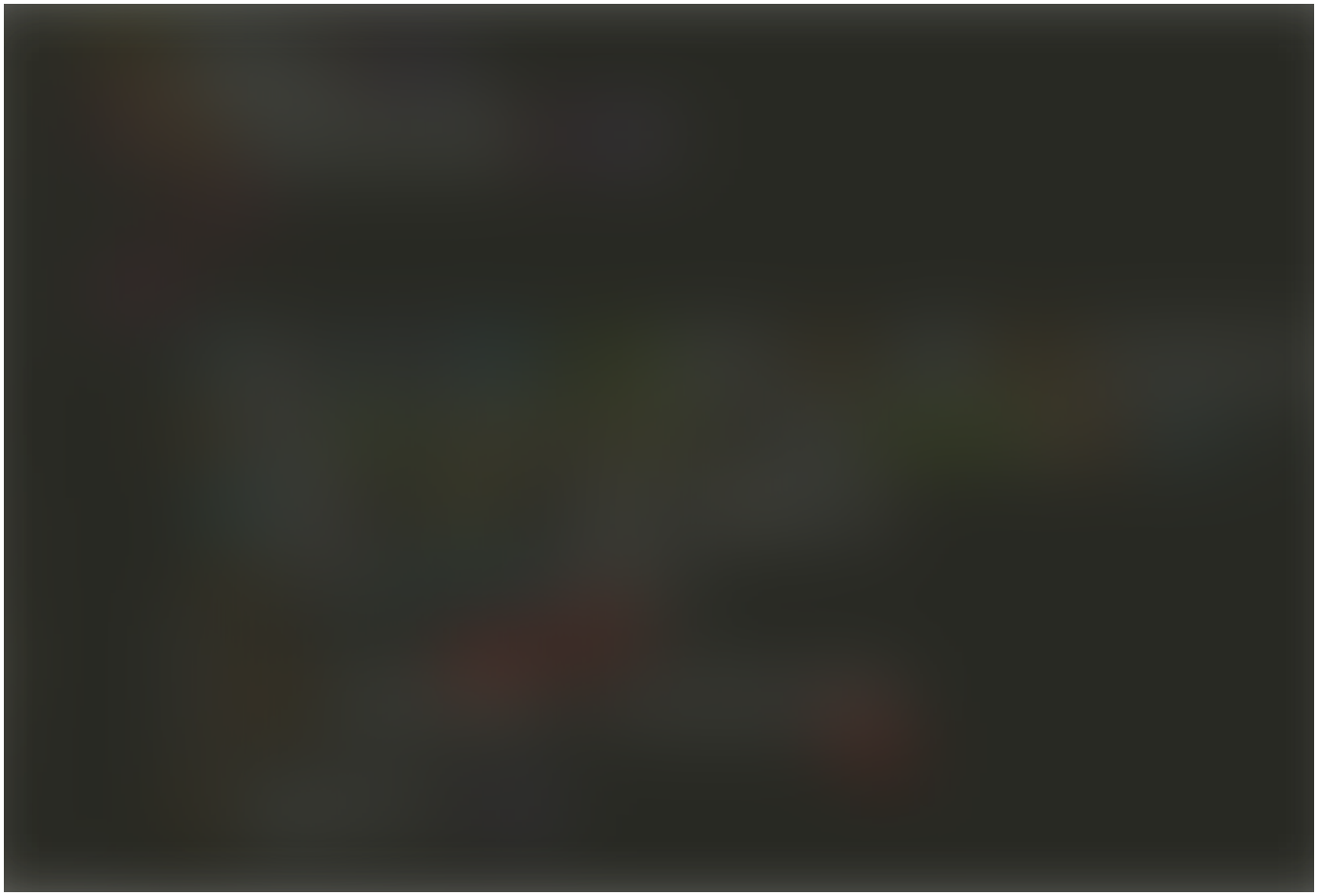
Next, we'll need to modify the **input-user-data-form.component** & its ***template*** to support showing the server side errors, in case the validation fails on the server.

In the **InputUserDataFormComponent** we'll add the ***serviceErrors*** object, which will contain all the server side errors for each fields. And add to the ***validator methods*** to check if the error message for that field exists, like so:

```
invalidFirstName()
{
  return (this.submitted && (this.serviceErrors.first_name != null || this.userForm.controls.first_name.errors != null
}

invalidLastName()
{
  return (this.submitted && (this.serviceErrors.last_name != null || this.userForm.controls.last_name.errors != null))
}

invalidEmail()
{
  return (this.submitted && (this.serviceErrors.email != null || this.userForm.controls.email.errors != null));
}

invalidZipcode()
{
  return (this.submitted && (this.serviceErrors.zipcode != null || this.userForm.controls.zipcode.errors != null));
}

invalidPassword()
{
  return (this.submitted && (this.serviceErrors.password != null || this.userForm.controls.password.errors != null));
}
```

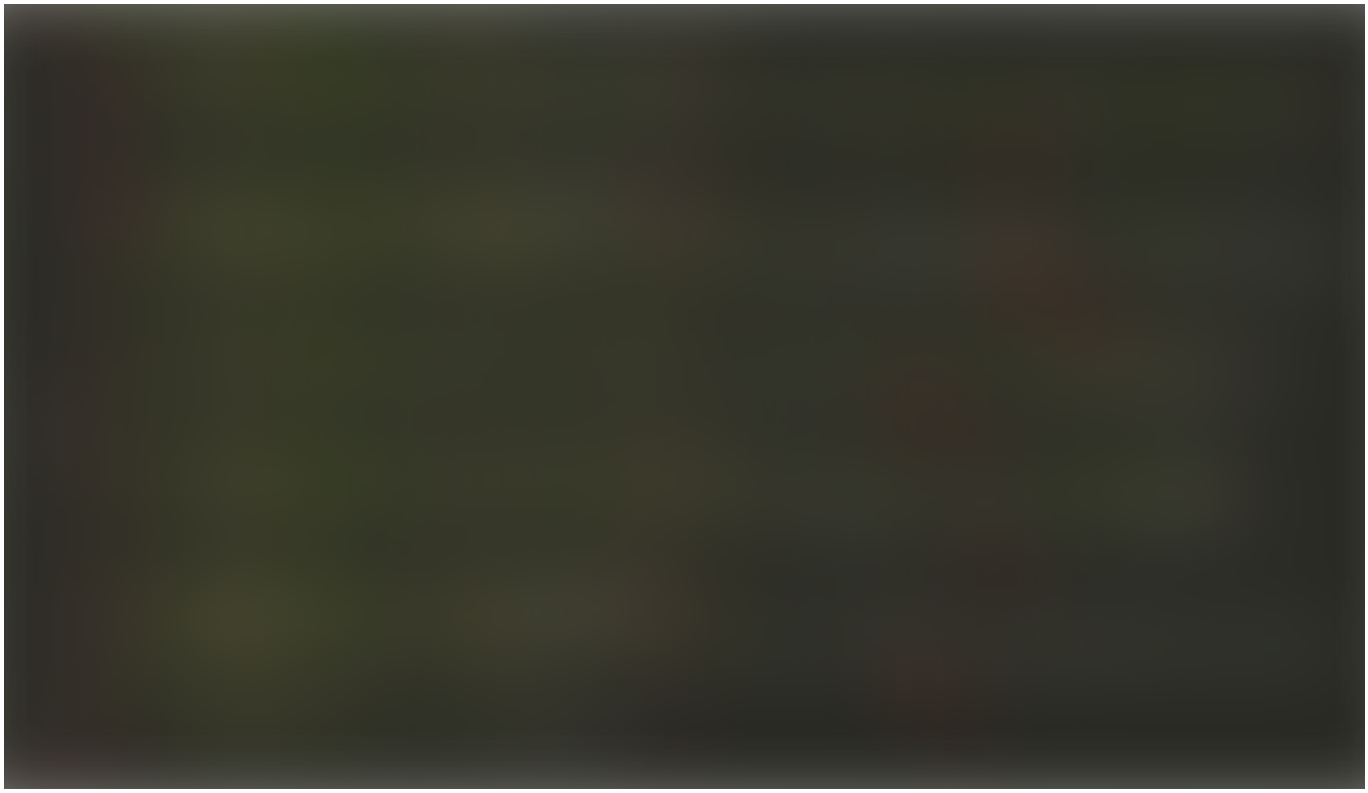
app\input-user-data-form.component.ts

We'll also modify the **onSubmit** method, and add an error handler to our request which will simply set **serviceErrors** object.



app\input-user-data-form\input-user-data-form.component.ts

Next we'll add a reference to server side errors in the **input-user-data-form.component.html** template to display a server side error in case it exists:



app\input-user-data-form\input-user-data-form.component.html

Now, we'll know if validation fails on the server, since messages are going to be propagated to Angular UI.

. . .

Everything looks good, lets connect our routers in the **app.js**

```
16  app.use('/api/v1/customer', customer);
17  app.use('/api/v1/generate_uid', generate_uid);
18
```

. . .

We are almost there!

We are done creating the application, now a couple of minor details.

We are using a proxy in order to go around the ***CORS browser issue*** by having the Webpack on port 4200 communicate with Node.js server on port 3000. This is a good solution for the development environment, but we'll need to have a better implementation when moving to production.

The API server will need to either enable the API for all origins or white list our access point.

For now, lets just enable CORS for all origins

To enable our API for all is easy, just add the following code to **app.js**

. . .

Uncaught Exceptions

Another minor detail we haven't covered is handling of ***Uncaught Exceptions***

Because Node.js runs on a single processor uncaught exceptions are an issue to be aware of when developing applications.

When your application throws an ***uncaught exception*** you should consider that your application is now running in an unclean state. You can't reliably continue your program at this point because you don't really know what got affected by the error.

The best way to handle a crash is to collect as much data about it, send the errors to an external crash service or log it; and restart the server.

For our simple application, we'll implement the appropriate functions, just place these in the beginning of your app.js

I'll keep the **reporter** method empty, which we will connect in a later article to an external crash service

. . .

Finally! To start the API server:

```
npm start
```

Try hitting the http://localhost:3000/api/v1/generate_uid

or http://localhost:3000/api/v1/customer

And you should see some JSON data.

. . .

Integrating services into the Angular application

To quickly integrate the Angular application we are going to:

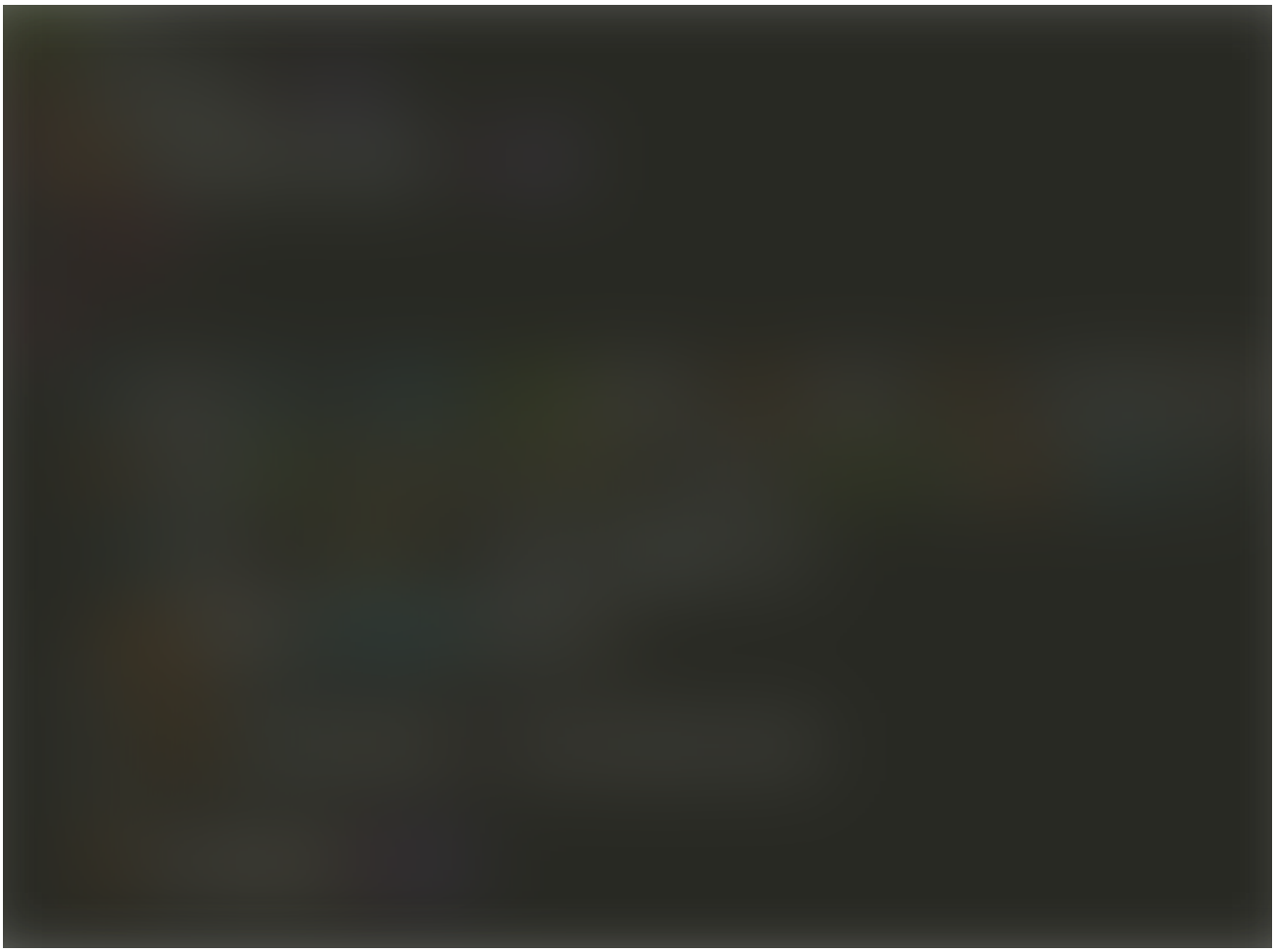
Import & Inject **HttpClient** & **Router** into the **InputUserDataFormComponent**

```
import { HttpClient } from "@angular/common/http";
import { Router } from "@angular/router";
```

Next, we'll retrieve the **GUID** from the '**/api/v1/generate_uid**' API service in the constructor of the **InputUserDataFormComponent** and set the **guid** variable

constructor of InputUserDataFormComponent

In the **onSubmit** method of the **InputUserDataFormComponent** we'll post the data into the '**/api/v1/customer**' service & navigate the Angular Router to the next page **/user/:id**



app\input-user-data-form\input-user-data-form.component.ts

The full source code:

. . .

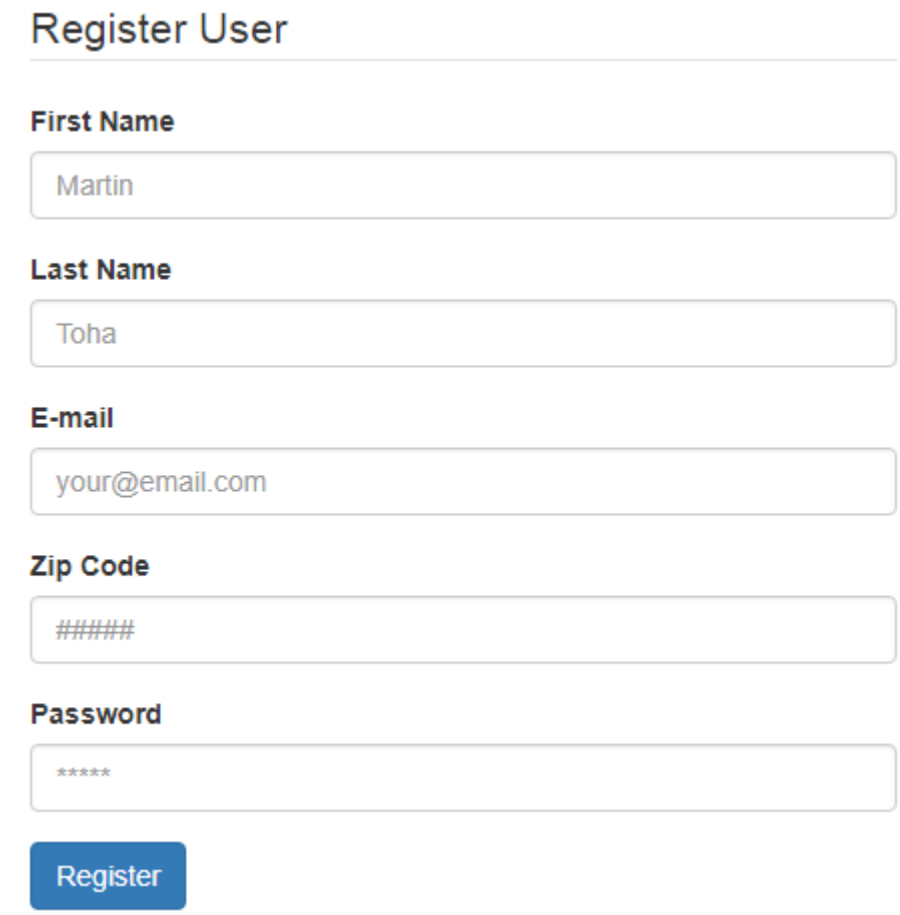
Then lets Import & Inject **HttpClient** & **ActivatedRoute** into the **DisplayUserDataComponent**

```
import { HttpClient } from "@angular/common/http";
import { ActivatedRoute } from '@angular/router';
```

Retrieve customer data from the '**/api/v1/customer/:id**' API and populate the **UserInfoModel** with new data, and have **DisplayUserDataComponent** view redraw itself with new data via interpolation {{…}}

. . .

The initial page of the application '/':



Fill in the form and press Register:

Next page, the user information is displayed.

After creating a customer, you can also type in the customer url followed by customer uid to retrieve customer data:

http://localhost:3000/api/v1/customer/c0


```
{"customer":
{"first_name":"John","last_name":"Doe","email":"john.doe@gmail.com","
zipcode":"12345","password":"Udsakln12dsa","uid":"c0","guid":"gCnqJdp
3saMNPpJfXPj6DORy"}}
```


Source Code is accessible at Github bellow:

Angular UI:
https://github.com/jsmuster/angular-node-express

Node.js + Express API:
https://github.com/jsmuster/angular-node-express-api

Check out my open source framework QQ:

https://github.com/jsmuster/qq

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