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## Step 01. Template-Driven Form

1. Создайте файл **app/models/user.ts**. Добавьте в него следующий фрагмент кода

```
export class User {  
  
  constructor(public firstName = '',  
               public lastName = '',  
               public email = '',  
               public sendProducts = false,  
               public addressType = 'home',  
               public street1?: string,  
               public street2?: string,  
               public country = '',  
               public city?: string,  
               public zip?: string) { }  
}
```

2. Внесите изменения в класс **SignupFormComponent**

```
import { Component, OnInit } from '@angular/core';  
import { NgForm } from '@angular/forms';  
import { User } from '../models/user';
```

3. Добавьте свойства

```
countries: Array<string> = ['Ukraine', 'Armenia', 'Belarus', 'Hungary', 'Kazakhstan',  
                             'Poland', 'Russia'];  
user: User = new User();
```

4. Добавьте метод

```
save(signupForm: NgForm) {  
  // Form model  
  console.log(signupForm.form);  
  // Form value  
  console.log(`Saved: ${JSON.stringify(signupForm.value)}`);  
}
```

5. Внесите изменения в шаблон компонента для формы

```
<form class="form-horizontal"  
      novalidate  
      #signupForm="ngForm"  
      (ngSubmit)="save(signupForm)">
```

6. Внесите изменения для поля ввода «First Name»

```
<div class="form-group"  
      [ngClass]="{'has-error': (firstNameVar.touched ||  
firstNameVar.dirty) && !firstNameVar.valid }">  
  
<input class="form-control"  
        id="firstNameId"  
        type="text"  
        placeholder="First Name (required)"  
        required  
        minlength="3"
```

```

        [(ngModel)]=user.firstName
        name="firstName"
        #firstNameVar="ngModel" />
<span class="help-block" *ngIf="(firstNameVar.touched || firstNameVar.dirty) &&
firstNameVar.errors">
    <span *ngIf="firstNameVar.errors.required">
        Please enter your first name.
    </span>
    <span *ngIf="firstNameVar.errors.minlength">
        The first name must be longer than 3 characters.
    </span>
</span>

```

#### 7. Внесите изменения для поля ввода «Last Name»

```

<div class="form-group"
    [ngClass]='{\'has-error\': (lastNameVar.touched || lastNameVar.dirty)
    && !lastNameVar.valid }">

    <input class="form-control"
        id="lastNameId"
        type="text"
        placeholder="Last Name (required)"
        required
        maxlength="50"
        [(ngModel)]=user.lastName
        name="lastName"
        #lastNameVar="ngModel" />

    <span class="help-block" *ngIf="(lastNameVar.touched || lastNameVar.dirty) &&
lastNameVar.errors">
        <span *ngIf="lastNameVar.errors.required">
            Please enter your last name.
        </span>
    </span>
</div>

```

#### 8. Внесите изменения для поля ввода «Email»

```

<div class="form-group"
    [ngClass]='{\'has-error\': (emailVar.touched || emailVar.dirty) && !emailVar.valid }">

    <input class="form-control"
        id="emailId"
        type="email"
        placeholder="Email (required)"
        required
        pattern="[a-z0-9._%+-]+@[a-z0-9.-]+"
        [(ngModel)]=user.email
        name="email"
        #emailVar="ngModel" />

    <span class="help-block" *ngIf="(emailVar.touched || emailVar.dirty) &&
emailVar.errors">
        <span *ngIf="emailVar.errors.required">
            Please enter your email address.
        </span>
    </span>
</div>

```

```

        <span *ngIf="emailVar.errors.pattern">
            Please enter a valid email address.
        </span>

        <!--
            This one does not work, because Angular doesn't support
            built-in email validator
        -->
        <span *ngIf="emailVar.errors.email">
            Please enter a valid email address.
        </span>
    </span>

```

9. Внесите изменения для чекбокса «Send me your products»

```

<input id="sendProductsId"
      type="checkbox"
      [(ngModel)]="user.sendProducts"
      name="sendProducts" >

```

10. Внесите изменения в элемент div

```

<div *ngIf="user.sendProducts">
    <div class="form-group" >
        <label class="col-md-2 control-label">Address Type</label>

```

11. Внесите изменения в элементы «Home», «Work», «Other»

```

<input type="radio" id="addressType1Id" value="home"
      [(ngModel)]="user.addressType"
      name="addressType">Home

<input type="radio" id="addressType1Id" value="work"
      [(ngModel)]="user.addressType"
      name="addressType">Work

<input type="radio" id="addressType1Id" value="other"
      [(ngModel)]="user.addressType"
      name="addressType">Other

```

12. Внесите изменения в элемент select

```

<select class="form-control"
      id="countryId"
      [(ngModel)]="user.country"
      name="country">
    <option value="">Select a Country...</option>
    <option *ngFor="let country of countries"
          value="{{country}}">{{country}}</option>
</select>

```

13. Внесите изменения в элементы «city», «zip code», «street address1», «street address2»

```

<input type="text"
      class="form-control"
      id="cityId"
      placeholder="City"
      [(ngModel)]="user.city"
      name="city">

<input type="number"
      class="form-control"
      id="zipId"
      placeholder="Zip Code"
      [(ngModel)]="user.zip"
      name="zip">

<input type="text"
      class="form-control"
      id="street1Id"
      placeholder="Street address"
      [(ngModel)]="user.street1"
      name="street1">

<input type="text"
      class="form-control"
      id="street2Id"
      placeholder="Street address (second line)"
      [(ngModel)]="user.street2"
      name="street2">

```

#### 14. Внесите изменения в элемент **button**

```

<button class="btn btn-primary"
        type="submit"
        [disabled]="!signupForm.valid">
  Save
</button>

```

#### 15. Добавьте в конце шаблона следующий фрагмент разметки

```

<br>Dirty: {{ signupForm.dirty }}
<br>Touched: {{ signupForm.touched }}
<br>Valid: {{ signupForm.valid }}
<br>Value: {{ signupForm.value | json }}

```

## Step 02. ReactiveComponent Class

1. Создайте компонент **SignupReactiveFormComponent** в папке **app/reactive-forms**. (ng g с signup-reactive-form)
2. Скопируйте в него содержание и темплейт компонента **SignupFormComponent**, исправьте пути к темплейту и стилям, измените селектор на app-signup-reactive-form, измените название класса
3. Внесите изменения в **app.component.html**

```
<div class="container">
  <app-signup-form></app-signup-form>
  <app-signup-reactive-form></app-signup-reactive-form>
</div>
```

4. Внесите изменения в класс компонента **SignupReactiveFormComponent**

```
import { NgForm, FormGroup, FormControl } from '@angular/forms';

userForm: FormGroup;

private createForm() {
  this.userForm = new FormGroup({
    firstName: new FormControl(),
    lastName: new FormControl(),
    email: new FormControl(),
    sendProducts: new FormControl(true)
  });
}

ngOnInit() {
  this.createForm();
}

save() {
  // Form model
  console.log(this.userForm);
  console.log(signupForm.form);
  // Form value
  console.log(`Saved: ${JSON.stringify(this.userForm.value)}`);
  console.log(`Saved: ${JSON.stringify(signupForm.value)}`);
}
```

5. Внесите изменения в **app.module.ts**

```
import { ReactiveFormsModule } from '@angular/forms';

imports: [
  BrowserModule,
  FormsModule,
  ReactiveFormsModule,
  HttpClientModule
],
```

## Step 03. formGroup, FormControlName directives

1. Внесите изменения в **signup-reactive-form.component.html**

```
<form class="form-horizontal"
  novalidate
  #signupForm="ngForm"
  (ngSubmit)="save(signupForm)"
  [formGroup]="userForm">

  <button class="btn btn-primary"
    type="submit"
    [disabled]="!signupForm.valid"
    [disabled]="!userForm.valid">
    Save
  </button>

  <br>Dirty: {{ signupForm.dirty }}
  <br>Touched: {{ signupForm.touched }}
  <br>Valid: {{ signupForm.valid }}
  <br>Value: {{ signupForm.value | json }}
  <br>Dirty: {{ userForm.dirty }}
  <br>Touched: {{ userForm.touched }}
  <br>Valid: {{ userForm.valid }}
  <br>Value: {{ userForm.value | json }}

  <input class="form-control"
    id="firstNameId"
    type="text"
    placeholder="First Name (required)"
    required
    minlength="3"
    [(ngModel)]=user.firstName
    name="firstName"
    #firstNameVar="ngModel"
    FormControlName="firstName"/>

  <input class="form-control"
    id="lastNameId"
    type="text"
    placeholder="Last Name (required)"
    required
    maxlength="50"
    [(ngModel)]=user.lastName
    name="lastName"
    #lastNameVar="ngModel"
    FormControlName="lastName"/>

  <input class="form-control"
    id="emailId"
    type="email"
    placeholder="Email (required)"
    required
```

```

        pattern="[a-z0-9._%+-]+@[a-z0-9.-]+"
        [(ngModel)]="user.email"
        name="email"
        #emailVar="ngModel"
        formControlName="email" />

<label>
  <input id="sendProductsId"
    type="checkbox"
    [(ngModel)]="user.sendProducts"
    name="sendProducts"
    formControlName="sendProducts">
    Send me your products
</label>

```

2. Закомментируйте часть разметки, которая начинается с элемента `<div *ngIf="user.sendProducts">` и до закрывающего тега
3. Внесите изменения в атрибут `[ngClass]`

Для firstName

```

[ngClass]="{'has-error': (firstNameVar.touched || firstNameVar.dirty) &&
!firstNameVar.valid }"

[ngClass]="{'has-error': (userForm.get('firstName').touched ||
userForm.get('firstName').dirty) && !userForm.get('firstName').valid }"

```

Для lastName

```

[ngClass]="{'has-error': (lastNameVar.touched || lastNameVar.dirty) &&
!lastNameVar.valid }"

[ngClass]="{'has-error': (userForm.get('lastName').touched ||
userForm.get('lastName').dirty) && !userForm.get('lastName').valid }"

```

Для email

```

[ngClass]="{'has-error': (emailVar.touched || emailVar.dirty) && !emailVar.valid }"

[ngClass]="{'has-error': (userForm.get('email').touched || userForm.get('email').dirty)
&& !userForm.get('email').valid }"

```

4. Внесите изменения в элемент `span` – блок вывода сообщений об ошибках валидации

Для firstName

```

<span class="help-block" *ngIf="(firstNameVar.touched || firstNameVar.dirty) &&
firstNameVar.errors">
  <span *ngIf="firstNameVar.errors.required">
    Please enter your first name.
  </span>
  <span *ngIf="firstNameVar.errors.minlength">
    The first name must be longer than 3 characters.
  </span>
</span>

<span class="help-block" *ngIf="(userForm.get('firstName').touched ||
userForm.get('firstName').dirty) && userForm.get('firstName').errors">

```



```

    <span *ngIf="userForm.get('firstName').errors.required">
      Please enter your first name.
    </span>
    <span *ngIf="userForm.get('firstName').errors.minlength">
      The first name must be longer than 3 characters.
    </span>
  </span>

```

Для lastName

```

<span class="help-block" *ngIf="(lastNameVar.touched || lastNameVar.dirty) && lastNameVar.errors">
  <span *ngIf="lastNameVar.errors.required">
    Please enter your last name.
  </span>
</span>
<span class="help-block" *ngIf="(userForm.get('lastName').touched || userForm.get('lastName').dirty) &&
userForm.get('lastName').errors">
  <span *ngIf="userForm.get('lastName').errors.required">
    Please enter your last name.
  </span>
</span>

```

Для email

```

<span class="help-block" *ngIf="(emailVar.touched || emailVar.dirty) &&
emailVar.errors">
  <span *ngIf="emailVar.errors.required">
    Please enter your email address.
  </span>
  <span *ngIf="emailVar.errors.pattern">
    Please enter a valid email address.
  </span>

  <!--
  This one does not work, because Angular doesn't support
  built-in email, phone, date validator
  -->
  <span *ngIf="emailVar.errors.email">
    Please enter a valid email address.
  </span>
</span>
<span class="help-block" *ngIf="(userForm.get('email').touched ||
userForm.get('email').dirty) && userForm.get('email').errors">
  <span *ngIf="userForm.get('email').errors.required">
    Please enter your email address.
  </span>
  <span *ngIf="userForm.get('email').errors.pattern">
    Please enter a valid email address.
  </span>

  <!--
  This one does not work, because Angular doesn't support
  built-in email, phone, date validator
  -->
  <span *ngIf="userForm.get('email').errors.email">

```

Please enter a valid email address.

## Step 04. setValue(), patchValue()

1. Внесите изменения в класс компонента **SignupReactiveFormComponent**

```
private setFormValues() {
  this.userForm.setValue({
    firstName: 'Vitaliy',
    lastName: 'Zhyrytskyy',
    email: 'vitaliy_zhyrytskyy@ukr.net',
    sendProducts: false
  });
}

private patchFormValues() {
  this.userForm.patchValue({
    firstName: 'Vitaliy',
    lastName: 'Zhyrytskyy'
  });
}

ngOnInit() {
  this.createForm();
  this.setFormValues();
  // this.patchFormValues();
}
```

2. Посмотрите результат, закомментируйте вызов метода **this.setFormValues();** и раскомментируйте вызов метода **// this.patchFormValues();** Посмотрите результат.

## Step 05. FormBuilder

1. Внесите изменения в класс компонента **SignupReactiveFormComponent**

```
import { FormGroup, FormControl, FormBuilder } from '@angular/forms';

constructor(
  private fb: FormBuilder
) { }

private buildForm() {
  this.userForm = this.fb.group({
    firstName: '',
    lastName: {value: 'Zhyrytskyy', disabled: true},
    email: [''],
    sendProducts: true
  });
}

ngOnInit() {
  this.createForm();
  this.buildForm();
  this.setFormValues();
  this.patchFormValues();
}
```

## Step 06. Setting Built-in Validators

1. Внесите изменения в компонент **SignupReactiveFormComponent**

```
import { FormGroup, FormControl, FormBuilder, Validators } from '@angular/forms';
```

2. Внесите изменения в метод **buildForm** компонента **SignupReactiveFormComponent**

```
private buildForm() {  
  this.userForm = this.fb.group({  
    firstName: '',  
    firstName: ['', [Validators.required, Validators.minLength(3)]],  
    lastName: {value: 'Zhyrytskyy', disabled: true},  
    email: ['',],  
    sendProducts: true  
  });  
}
```

3. Внесите изменения в разметку компонента **SignupReactiveFormComponent**

```
<input class="form-control"  
  id="firstNameId"  
  type="text"  
  placeholder="First Name (required)"  
  required  
  minlength="3"  
  FormControlName="firstName"/>
```

4. Проверьте работает ли валидация поля First Name
5. Внесите изменения в метод **buildForm** компонента **SignupReactiveFormComponent**

```
private buildForm() {  
  this.userForm = this.fb.group({  
    firstName: ['', [Validators.required, Validators.minLength(3)]],  
    lastName: {value: 'Zhyrytskyy', disabled: true},  
    lastName: [  
      { value: 'Zhyrytskyy', disabled: false },  
      [Validators.required, Validators.maxLength(50)]  
    ],  
    email: ['',],  
    email: [  
      '',  
      [Validators.required, Validators.pattern('[a-z0-9._%+-]+@[a-z0-9.-]+')]  
    ],  
    sendProducts: true  
  });  
}
```

6. Внесите изменения в разметку компонента **SignupReactiveFormComponent**

```
<input class="form-control"  
  id="lastNameId"  
  type="text"  
  placeholder="Last Name (required)"  
  required  
  maxlength="50"  
  FormControlName="lastName"/>
```

```
<input class="form-control"
      id="emailId"
      type="email"
      placeholder="Email (required)"
      required
      pattern="[a-z0-9._%+-]+@[a-z0-9.-]+"
      formControlName="email" />
```

7. Проверьте валидацию полей формы: FirtsName, LastName, Email

## Step 07. Adjusting Validation Rules in Runtime

1. Внесите изменения в метод **buildForm** компонента **SignupReactiveFormComponent**

```
private buildForm() {
  this.userForm = this.fb.group({
    firstName: ['', [Validators.required, Validators.minLength(3)]],
    lastName: [
      { value: 'Zhyrytskyy', disabled: false },
      [Validators.required, Validators.maxLength(50)]
    ],
    email: [
      '',
      [Validators.required, Validators.pattern('[a-z0-9._%+-]+@[a-z0-9.-]+')]
    ],
    phone: '',
    notification: 'email',
    sendProducts: true
  });
}
```

2. Внесите изменения в разметку компонента **SignupReactiveFormComponent** – после поля email, добавьте еще два элемента управления

```
<div class="form-group"
  [ngClass]="{'has-error': !userForm.get('phone').valid }">
  <label class="col-md-2 control-label"
    for="phoneId">Phone</label>

  <div class="col-md-8">
    <input class="form-control"
      id="phoneId"
      type="tel"
      placeholder="Phone"
      formControlName="phone" />
    <span class="help-block" *ngIf="userForm.get('phone').errors">
      <span *ngIf="userForm.get('phone').errors.required">
        Please enter your phone number.
      </span>
    </span>
  </div>
</div>

<div class="form-group">
  <label class="col-md-2 control-label">Send Notifications</label>
  <div class="col-md-8">
    <label class="radio-online">
      <input type="radio"
        value="email"
        formControlName="notification">Email
    </label>
    <label class="radio-online">
      <input type="radio"
        value="text"
        formControlName="notification">Text
    </label>
  </div>
</div>
```

</div>

3. Добавьте метод в класс компонента **SignupReactiveFormComponent**

```
setNotification(notifyVia: string) {  
  const phoneControl = this.userForm.get('phone');  
  const emailControl = this.userForm.get('email');  
  
  if (notifyVia === 'text') {  
    phoneControl.setValidators(Validators.required);  
    emailControl.clearValidators();  
  }  
  else {  
    emailControl.setValidators( [Validators.required, Validators.pattern('[a-z0-9._%+-]+@[a-z0-9.-]+')]);  
    phoneControl.clearValidators();  
  }  
  phoneControl.updateValueAndValidity();  
  emailControl.updateValueAndValidity();  
}
```

4. Внесите изменения в разметку компонента **SignupReactiveFormComponent**

```
<label class="radio-online">  
  <input type="radio"  
    value="email"  
    formControlName="notification"  
    (click)="setNotification('email')">Email  
</label>  
<label class="radio-online">  
  <input type="radio"  
    value="text"  
    formControlName="notification"  
    (click)="setNotification('text')">Text  
</label>
```



## Step 08. Custom Validator

1. Внесите изменения в метод **buildForm** компонента **SignupReactiveFormComponent**

```
private buildForm() {
  this.userForm = this.fb.group({
    firstName: ['', [Validators.required, Validators.minLength(3)]],
    lastName: [
      { value: 'Zhyrytskyy', disabled: false },
      [Validators.required, Validators.maxLength(50)]
    ],
    email: [
      '',
      [Validators.required, Validators.pattern('[a-z0-9._%+-]+@[a-z0-9.-]+')]
    ],
    phone: '',
    notification: 'email',
    serviceLevel: '',
    sendProducts: true
  });
}
```

2. Внесите изменения в разметку компонента **SignupReactiveFormComponent**. После блока `div` для элемента «Send Notifications» добавьте следующий фрагмент разметки

```
<div class="form-group"
  [ngClass]="{'has-error': (userForm.get('serviceLevel').touched ||
userForm.get('serviceLevel').dirty) && !userForm.get('serviceLevel').valid }">
  <label class="col-md-2 control-label"
    for="serviceLevelId">Service Level</label>

    <div class="col-md-8">
      <input class="form-control"
        id="serviceLevelId"
        type="number"
        formControlName="serviceLevel" />
      <span class="help-block"
        *ngIf="(userForm.get('serviceLevel').touched || userForm.get('serviceLevel').dirty) &&
userForm.get('serviceLevel').errors">
        <span
          *ngIf="userForm.get('serviceLevel').errors.serviceLevel">
            Please enter correct number from 1 to 5.
          </span>
        </span>
      </div>
    </div>
</div>
```

3. Создайте файл **app/validators/service-level.validator.ts**. Добавьте в него следующий фрагмент кода

```
import { AbstractControl } from '@angular/forms';

export class CustomValidators {
  static serviceLevel(c: AbstractControl): { [key: string]: boolean } | null {
    if (c.value !== undefined && (Number.isNaN(c.value) || c.value < 1 || c.value > 5)) {
```

```

    return {
      'serviceLevel': true
    };
  }
  return null;
}
}

```

4. Создайте файл **app/validators/index.ts**. Добавьте в него следующий фрагмент кода

```
export * from './service-level.validator';
```

5. Внесите изменения в компонент **SignupReactiveFormComponent**

```
import { CustomValidators } from './../../validators';
```

6. Внесите изменения в метод **buildForm** компонента **SignupReactiveFormComponent**

```

phone: '',
notification: 'email',
serviceLevel: '',
serviceLevel: ['', CustomValidators.serviceLevel],
sendProducts: true

```

## Step 09. Custom Validator w/ Parameters

1. Внесите изменения в файл **service-level.validator.ts**

```
import { AbstractControl, ValidatorFn } from '@angular/forms';
```

2. Внесите изменения в класс **CustomValidators**, добавьте следующий фрагмент кода

```
static serviceLevelRange(min: number, max: number): ValidatorFn {  
  return (c: AbstractControl): { [key: string]: boolean } | null => {  
    if (c.value !== undefined && (Number.isNaN(c.value) || c.value < min || c.value >  
max)) {  
      return {  
        'serviceLevel': true  
      };  
    }  
    return null;  
  }  
}
```

3. Внесите изменения в метод **buildForm** компонента **SignupReactiveFormComponent**

```
serviceLevel: ['', CustomValidators.serviceLevel],  
serviceLevel: ['', CustomValidators.serviceLevelRange(1,3)],
```

4. Внесите изменения в разметку компонента **SignupReactiveFormComponent**

```
Please enter correct number from 1 to 5.  
Please enter correct number from 1 to 3.
```

## Step 10. Custom Validator Directive

1. Создайте файл **app/validators/service-level.directive.ts** используя следующий фрагмент кода

```
import { Directive } from '@angular/core';
import { Validator, AbstractControl, NG_VALIDATORS } from '@angular/forms';

@Directive({
  selector: '[appServiceLevelValidator]',
  providers: [{
    provide: NG_VALIDATORS,
    useExisting: ServiceLevelDirective,
    multi: true
  }]
})
export class ServiceLevelDirective implements Validator {

  validate(c: AbstractControl): { [key: string]: boolean } | null {
    if (c.value !== undefined && (Number.isNaN(c.value) || c.value < 1 || c.value > 3))
    {
      return {
        'serviceLevel': true
      };
    }
    return null;
  }
}
```

2. Внесите изменения в файл **app/validators/index.ts**

```
export * from './service-level.validator';
export * from './service-level.directive';
```

5. Внесите изменения в **app.module.ts** используя следующий фрагмент кода

```
import { ServiceLevelDirective } from './validators/service-level.directive';

declarations: [
  AppComponent,
  SignupFormComponent,
  SignupReactiveFormComponent,
  ServiceLevelDirective
],
```

6. Внесите изменения в **buildForm** компонента **SignupReactiveFormComponent**

```
serviceLevel: ['', CustomValidators.serviceLevelRange(1,3)],
serviceLevel: [''],
```

7. Внесите изменения в темплейт компонента **SignupReactiveFormComponent**

```
<input class="form-control"
  id="serviceLevelId"
  type="number"
  formControlName="serviceLevel"
  appServiceLevelValidator />
```

## Step 11. Custom Validator Directive w/ Parameters

1. Внесите изменения в директиву **ServiceLevelDirective**

```
import { Directive, Input } from '@angular/core';

export class ServiceLevelDirective implements Validator {
  @Input() rMin = 1;
  @Input() rMax = 3;

  validate(c: AbstractControl): { [key: string]: boolean } | null {
    console.log(c.value);
    if (c.value !== undefined && (Number.isNaN(c.value) || c.value < 1this.rMin ||
c.value > 3this.rMax)) {
      return {
        'serviceLevel': true
      };
    }
    return null;
  }
}
```

2. Внесите изменения в разметку компонента **SignupReactiveFormComponent**

```
<input class="form-control"
  id="serviceLevelId"
  type="number"
  formControlName="serviceLevel"
  appServiceLevelValidator rMin="1" rMax="4" #serviceLevelVar />
```

```
Please enter correct number from 1 to 3.
Please enter correct number from
{{serviceLevelVar.getAttribute('rMin') || 1}} to
{{serviceLevelVar.getAttribute('rMax') || 3}}.
```

## Step 12. Cross-Field Validation

1. Внесите изменения в разметку компонента **SignupReactiveFormComponent**. Добавьте следующий фрагмент разметки после блока email.

```
<div class="form-group"
  [ngClass]="{'has-error': (userForm.get('confirmEmail').touched ||
    userForm.get('confirmEmail').dirty) &&
    !userForm.get('confirmEmail').valid }">
  <label class="col-md-2 control-label"
    for="confirmEmailId">Confirm Email</label>

  <div class="col-md-8">
    <input class="form-control"
      id="confirmEmailId"
      type="email"
      placeholder="Confirm Email (required)"
      formControlName="confirmEmail" />
    <span class="help-block" *ngIf="(userForm.get('confirmEmail').touched ||
      userForm.get('confirmEmail').dirty) &&
      userForm.get('confirmEmail').errors">
      <span *ngIf="userForm.get('confirmEmail').errors.required">
        Please confirm your email address.
      </span>
    </span>
  </div>
</div>
```

2. Внесите изменения в **buildForm** компонента **SignupReactiveFormComponent**. Проверьте работает ли валидация добавленная к полю confirmEmail.

```
email: ['',
  [Validators.required, Validators.pattern('[a-z0-9._%+-]+@[a-z0-9.-]+')]
],
confirmEmail: ['', Validators.required],
```

3. Внесите изменения в разметку компонента **SignupReactiveFormComponent**. Перед блоком email добавьте следующий фрагмент разметки и перенесите в него блоки для email и confirmEmail

```
<div formGroupName="emailGroup">
  <!-- Сюда перенести блоки для email и confirmEmail -->
</div>
```

4. Внесите изменения в **buildForm** компонента **SignupReactiveFormComponent**.

```
email: [
  '',
  [Validators.required, Validators.pattern('[a-z0-9._%+-]+@[a-z0-9.-]+')]
],
confirmEmail: ['', Validators.required],
emailGroup: this.fb.group({
```

```

    email: ['',
      [Validators.required, Validators.pattern('[a-z0-9._%+-]+@[a-z0-9.-]+')]
    ],
    confirmEmail: ['', Validators.required],
  })),
});

```

##### 5. Внесите изменения в разметку компонента **SignupReactiveFormComponent**

```

<div class="form-group"
  [ngClass]="{'has-error': (userForm.
get('email').controls.emailGroup.controls.email.touched ||
  userForm.get('emailGroup.email').dirty) &&
  !userForm.get('emailGroup.email').valid }">

  <label class="col-md-2 control-label"
    for="emailId">Email</label>

  <div class="col-md-8">
    <input class="form-control"
      id="emailId"
      type="email"
      placeholder="Email (required)"
      formControlName="email" />
    <span class="help-block"
      *ngIf="(userForm.get('emailGroup.email').touched ||
        userForm.get('emailGroup.email').dirty) &&
        userForm.get('emailGroup.email').errors">
      <span
        *ngIf="userForm.get('emailGroup.email').errors.required">
        Please enter your email address.
      </span>
      <span
        *ngIf="userForm.get('emailGroup.email').errors.pattern">
        Please enter a valid email address.
      </span>

      <!--
        This one does not work, because Angular doesn't support
        built-in email, phone, date validator
      -->
      <!--<span *ngIf="userForm.get('email').errors.email">
        Please enter a valid email address.
      </span>-->
    </span>
  </div>
</div>

<div class="form-group"
  [ngClass]="{'has-error':
(userForm.get('emailGroup.confirmEmail').touched ||
userForm.get('emailGroup.confirmEmail').dirty) &&
!userForm.get('emailGroup.confirmEmail').valid }">
  <label class="col-md-2 control-label"
    for="confirmEmailId">Confirm Email</label>

```

```

        <div class="col-md-8">
            <input class="form-control"
                id="confirmEmailId"
                type="email"
                placeholder="Confirm Email (required)"
                formControlName="confirmEmail" />
            <span class="help-block"
                *ngIf="(userForm.get('emailGroup.confirmEmail').touched ||
                    userForm.get('emailGroup.confirmEmail').dirty) &&
                    userForm.get('emailGroup.confirmEmail').errors">
                <span
                    *ngIf="userForm.get('emailGroup.confirmEmail').errors.required">
                        Please confirm your email address.
                    </span>
                </span>
            </div>
        </div>
    </div>

```

6. Переименуйте файл **service-level.validator.ts** в **custom.validators.ts**

7. Внесите изменения в файл **validators/index.ts**

```

export * from './service-level.validator';
export * from './custom.validators';

```

8. Внесите изменения в файл **custom.validators.ts**. Добавьте следующий фрагмент кода

```

static emailMatcher(c: AbstractControl): { [key: string]: boolean } | null {
    const emailControl = c.get('email');
    const emailConfirmControl = c.get('confirmEmail');

    if (emailControl.pristine || emailConfirmControl.pristine) {
        return null;
    }

    if (emailControl.value === emailConfirmControl.value) {
        return null;
    }

    return { 'emailMatch': true };
}

```

9. Внесите изменения в метод **buildForm** компонента **SignupReactiveFormComponent**

```

emailGroup: this.fb.group({
    email: ['',
        [Validators.required, Validators.pattern('[a-z0-9._%+-]+@[a-z0-9.-]+')]],
    confirmEmail: ['', Validators.required],
}, {validator: CustomValidators.emailMatcher}),

```

10. Внесите изменения в разметку компонента **SignupReactiveFormComponent**

```

<div formGroupName="emailGroup"
    [ngClass]="{'has-error': userForm.get('emailGroup').errors}">

```



```

<span class="help-block" *ngIf="(userForm.get('emailGroup.confirmEmail').touched ||
                                userForm.get('emailGroup.confirmEmail').dirty) &&
                                userForm.get('emailGroup.confirmEmail').errors">
  <span *ngIf="userForm.get('emailGroup.confirmEmail').errors.required">
    Please confirm your email address.
  </span>
</span>
<span class="help-block" *ngIf="(userForm.get('emailGroup.confirmEmail').touched ||
                                userForm.get('emailGroup.confirmEmail').dirty) &&
                                (userForm.get('emailGroup.confirmEmail').errors ||
                                userForm.get('emailGroup').errors) ">
  <span *ngIf="userForm.get('emailGroup.confirmEmail').errors?.required">
    Please confirm your email address.
  </span>
  <span *ngIf="userForm.get('emailGroup').errors?.emailMatch">
    The confirmation does not match the email address.
  </span>
</span>

```

#### 11. Внесите изменения в метод setNotification

```
const emailControl = this.userForm.get('emailGroup.email');
```

## Step 13. Adjusting Validation Rules

1. Внесите изменения в компонент **SignupReactiveFormComponent** используя следующий фрагмент кода

```
// 1
import { Component, OnInit, OnDestroy } from '@angular/core';
import { Subscription } from 'rxjs/Subscription';

// 2
export class SignupReactiveFormComponent implements OnInit, OnDestroy
```

2. Добавьте новое приватное свойство для компонента **SignupReactiveFormComponent** используя следующий фрагмент кода

```
private sub: Subscription[] = [];
```

3. Создайте приватный метод **watchValueChanges** используя следующий фрагмент кода

```
private watchValueChanges() {
  const sub = this.userForm.get('notification').valueChanges
    .subscribe(value => console.log(value));
  this.sub.push(sub);
}
```

4. Внесите изменения в метод **ngOnInit** используя следующий фрагмент кода

```
ngOnInit() {
  this.buildForm();
  this.watchValueChanges();
}
```

5. Добавьте метод **ngOnDestroy**

```
ngOnDestroy() {
  this.sub.forEach(sub => sub.unsubscribe());
}
```

6. Удалите обработчик **setNotification** события click.

```
<div class="form-group">
  <label class="col-md-2 control-label">Send Notifications</label>
  <div class="col-md-8">
    <label class="radio-online">
      <input type="radio"
        value="email"
        formControlName="notification"
        (click)="setNotification('email')">Email
    </label>
    <label class="radio-online">
      <input type="radio"
        value="text"
        formControlName="notification"
        (click)="setNotification('text')">Text
    </label>
  </div>
</div>
```

7. Внесите изменения в метод **watchValueChanges**

```
private watchValueChanges() {  
    const sub = this.userForm.get('notification').valueChanges  
        .subscribe(value => console.log(value));  
        .subscribe(value => this.setNotification(value));  
    this.sub.push(sub);  
}
```

8. Внесите изменения в метод **setNotification**

```
private setNotification(notifyVia: string) {
```

## Step 14. Displaying Validation Messages

1. Внесите изменения в класс компонента **SignupReactiveFormComponent** используя следующий фрагмент кода

```
// 1
import { FormGroup, FormControl, FormBuilder, Validators, AbstractControl } from
 '@angular/forms';

// 2
userForm: FormGroup;
emailMessage: string;

// 3
private sub: Subscription[] = [];
private validationMessages = {
  required: 'Please enter your email address.',
  pattern: 'Please enter a valid email address.'
};
```

2. Добавьте метод **setMessage** используя следующий фрагмент кода

```
private setMessage(c: AbstractControl) {
  this.emailMessage = '';
  if ((c.touched || c.dirty) && c.errors) {
    this.emailMessage = Object
      .keys(c.errors)
      .map(key => this.validationMessages[key])
      .join(' ');
  }
}
```

3. Внесите изменения в метод **watchValueChanges**

```
private watchValueChanges() {
  const sub1 = this.userForm.get('notification').valueChanges
    .subscribe(value => this.setNotification(value));
  this.sub.push(sub1);

  const emailControl = this.userForm.get('emailGroup.email');
  const sub2 = emailControl.valueChanges
    .subscribe(value => this.setMessage(emailControl));
  this.sub.push(sub2);
}
```

4. Внесите изменения в темплейт компонента

```
<div class="form-group"
      [ngClass]="{'has-error':
        (userForm.controls.emailGroup.controls.email.touched ||
        userForm.get('emailGroup.email').dirty)
        &&
        !userForm.get('emailGroup.email').valid
      }">
  [ngClass]="{'has-error': emailMessage}">
```

```

<label class="col-md-2 control-label"
  for="emailId">Email</label>

<div class="col-md-8">
  <input class="form-control"
    id="emailId"
    type="email"
    placeholder="Email (required)"
    formControlName="email" />
    <span class="help-block"
*ngIf="(userForm.get('emailGroup.email').touched ||
userForm.get('emailGroup.email').dirty) &&
userForm.get('emailGroup.email').errors">
      <span
*ngIf="userForm.get('emailGroup.email').errors.required">
        Please enter your email address.
      </span>
      <span
*ngIf="userForm.get('emailGroup.email').errors.pattern">
        Please enter a valid email address.
      </span>

      <!--
        This one does not work, because Angular doesn't support
        built-in email, phone, date validator
      -->
      <!--<span *ngIf="userForm.get('email').errors.email">
        Please enter a valid email address.
      </span>-->
    </span>
<span class="help-block" *ngIf="emailMessage">
  {{emailMessage}}
</span>
</div>
</div>

```

## Step 15. Reactive Transformations

1. Внесите изменения в компонент **SignupReactiveFormComponent**

```
import { Subscription } from 'rxjs/Subscription';  
import 'rxjs/add/operator/debounceTime';
```

2. Внесите изменения в метод **watchValueChanges**

```
private watchValueChanges() {  
  const sub1 = this.userForm.get('notification').valueChanges  
    .subscribe(value => this.setNotification(value));  
  this.sub.push(sub1);  
  
  const emailControl = this.userForm.get('emailGroup.email');  
  const sub2 = emailControl.valueChanges  
    .debounceTime(1000)  
    .subscribe(value => this.setMessage(emailControl));  
  this.sub.push(sub2);  
}
```

## Step 16. Define the input element(s) to duplicate

1. Внесите изменения в метод **buildForm** используя следующий фрагмент разметки

```
sendProducts: true,  
addressType: 'home',  
country: '',  
city: '',  
zip: '',  
street1: '',  
street2: ''
```

2. Раскомментируйте фрагмент разметки компонента **SignupReactiveFormComponent**, который начинается с

```
<!--<div *ngIf="user.sendProducts">
```

3. Внесите изменение в выражение для директивы **\*ngIf**

```
<div *ngIf="user.sendProducts">  
<div *ngIf="userForm.get('sendProducts').value">
```

4. Внесите изменения для полей **Home, Work, Other**

```
[(ngModel)]="user.addressType"  
name="addressType"  
formControlName="addressType"
```

5. Внесите изменения для полей **Country, City, Zip Code, Street Address 1, Street Address 2**

```
// Country  
[(ngModel)]="user.country"  
name="country"  
formControlName="country"
```

```
// City  
[(ngModel)]="user.city"  
name="city"  
formControlName="city"
```

```
// Zip Code  
[(ngModel)]="user.zip"  
name="zip"  
formControlName="zip"
```

```
// Street Address 1  
[(ngModel)]="user.street1"  
name="street1"  
formControlName="street1"
```

```
// Street Address 2  
[(ngModel)]="user.street2"  
name="street2"  
formControlName="street2"
```

## Step 17. Define a FormGroup

1. Внесите изменения в метод **buildForm**, используя следующий фрагмент кода

```
addressType: 'home',  
country: '',  
city: '',  
zip: '',  
street1: '',  
street2: ''  
addresses: this.fb.group({  
  addressType: 'home',  
  country: '',  
  city: '',  
  zip: '',  
  street1: '',  
  street2: ''  
})
```

2. Обверните 4 div блока, которые находятся в блоке  
<div \*ngIf="userForm.get('sendProducts').value"> и содержат поля ввода для адреса в  
следующую конструкцию

```
<div formGroupName="addresses">...</div>
```



## Step 18. Refactor to Make Copies

1. Добавьте приватный метод **buildAddress** в класс компонента `SignupReactiveFormComponent` используя следующий фрагмент кода

```
private buildAddress(): FormGroup {  
    return this.fb.group({  
        addressType: 'home',  
        country: '',  
        city: '',  
        zip: '',  
        street1: '',  
        street2: ''  
    });  
}
```

2. Внесите изменения в метод **buildForm** используя следующий фрагмент кода

```
addresses: this.buildAddress()  
addresses: this.fb.group({  
    addressType: 'home',  
    country: '',  
    city: '',  
    zip: '',  
    street1: '',  
    street2: ''  
}))
```

## Step 19. Create a FormArray

1. Внесите изменения в компонент **SignupReactiveFormComponent** используя следующий фрагмент кода

```
import { FormGroup, FormControl, FormArray, FormBuilder, Validators, AbstractControl }  
from '@angular/forms';
```

2. Внесите изменения в метод **buildForm** используя следующий фрагмент кода

```
addresses: this.buildAddress()  
addresses: this.fb.array([this.buildAddress()])
```

3. Добавьте геттер **addresses** для получения FormArray используя следующий фрагмент кода

```
get addresses():FormArray {  
  return <FormArray>this.userForm.get('addresses');  
}
```

4. Внесите изменения в темплейт компонента **SignupReactiveFormComponent**, создайте обертку для блока `<div formGroupName="addresses">` используя следующий фрагмент разметки

```
<div formArrayName="addresses">  
</div>
```

5. Внесите изменения в значение атрибута `formGroupName="addresses"` используя следующий фрагмент разметки

```
<div formGroupName="addresses">  
  <div formGroupName="">
```

## Step 20. Loop through the FormArray

1. Внесите изменения в разметку компонента **SignupReactiveFormComponent** используя следующий фрагмент разметки

```
<div formArrayName="addresses">
  <div formGroupName="0">
<div formArrayName="addresses"
  *ngFor="let address of addresses.controls; let i = index">
  <div [formGroupName]="i">
```

2. Внесите изменения в значение атрибута **id** для элементов **Home, Work, Other** используя следующий фрагмент разметки

```
id="addressType1Id"
id="{{ 'addressType1Id' + i }}"
```

3. Внесите изменения в значение атрибута **for** для элементов label для «Country, City, Zip Code», «Street Address 1», «Street Address 2»

```
// Country, City, Zip Code
for="cityId"
attr.for="{{ 'countryId' + i }}"
```

```
// Street Address 1
for="street1Id"
attr.for="{{ 'street1Id' + i }}"
```

```
// Street Address 2
for="street2Id"
attr.for="{{ 'street2Id' + i }}"
```

4. Внесите изменения в значение атрибута **id** для элементов ввода Country, City, Zip Code, Street Address 1, Street Address 2

```
// Country
id="countryId"
id="{{ 'countryId' + i }}"
```

```
// City
id="cityId"
id="{{ 'cityId' + i }}"
```

```
// Zip Code
id="zipId"
id="{{ 'zipId' + i }}"
```

```
// Street Address 1
id="street1Id"
id="{{ 'street1Id' + i }}"
```

```
// Street Address 2
id="street2Id"
id="{{ 'street2Id' + i }}"
```

## Step 21. Duplicate the Input Elements

1. Добавьте новый метод для компонента **SignupReactiveFormComponent** используя следующий фрагмент кода

```
addAddress(): void {  
    this.addresses.push(this.buildAddress());  
}
```

2. Внесите изменения в разметку компонента **SignupReactiveFormComponent** используя следующий фрагмент разметки

```
// 1  
<div *ngIf="userForm.get('sendProducts').value">  
    <div class="form-group">  
        <div class="col-md-4 col-md-offset-2">  
            <button class="btn btn-primary"  
                type="button"  
                (click)="addAddress()">  
                Add Another Address  
            </button>  
        </div>  
    </div>  
  
// 2  
<br>userForm.get('emailGroup').errors {{userForm.get('emailGroup').errors | json}}  
<br>Street: {{addresses.get('0.street1')?.value}}
```