ROUTING

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Routing

- Simulate a “standard” browser navigation inside SPA
- A routing table describes the association between URLs and components
- Integrate with browser’s history buttons
- Navigation is done using links or code (imperatively)

Why bother changing the URL ?

- Keeping the same URL for all views means
  - F5 resets current view
  - Bookmarking is lost
  - Back/forward buttons are disabled
  - Cannot share URLs between different users
  - Not what the user expects

The Recipe

- base tag
- Install @angular/router and import it
- Define routes
- Define outlet
- Use links
- Use router state inside components/services

Base tag

- Application may be served using URL
  - http://domain/index.html
- Or
  - http://domain/app/index.html
  - A.K.A virtual directory
- The latter requires that Angular knows the base address of the application in order to generate correct URLs
- Use <base href="/app" /> inside index.html

angular/@router

- This is not the only available router for Angular
  - See ui-router
- yarn add angular/@router

```
@NgModule({
    imports: [
        BrowserModule,
        RouterModule.forRoot(routes)
    ],
    providers: [],
    bootstrap: [
        AppComponent,
    ],
    declarations: [
        AppComponent,
        HomeComponent,
    ]
})
export class AppModule {
}
```

Let angular know the routing table definition

Define routes

- Each route consists of
  - Url
  - Component
  - Additional options

```
export const routes: Routes = [
  {
    path: "",
    component: HomeComponent,
    pathMatch: 'full'
  },
  {
    path: '**',
    redirectTo: "",
  },
];
```

The root component is not part of the routing table

Routes

- Each route map a URL to a single component
- No leading slash
- The order does matter
- First matching route wins !!!
  - Specificity does not matter ☹
- Nested routes are supported

The outlet


```
<h1>Hello AngularJS</h1>

<router-outlet></router-outlet>
```

Inside app.component.html all components are injected after router-outlet

```
<my-app _nghost-c0="" ng-version="4.1.1">
  <h1 _ngcontent-c0="">Hello AngularJS</h1>
  <router-outlet _ngcontent-c0=""></router-outlet>
  <my-home _nghost-c1="">
    <h1 _ngcontent-c1="">Home</h1>
  </my-home>
</my-app>
```

DOM at runtime. my-home is injected after the outlet (not inside !!!)

Router links

- Don't use link with href since it causes full page reload

```
<div class="site-menu">
  <a href="">Home</a>
  <a href="about">About</a>
</div>
```

Causes full page reload

- Use link with routerLink attribute

A directive which takes control over the link and does not let it reload

```
<div class="site-menu">
  <a routerLink="">Home</a>
  <a routerLink="about">About</a>
</div>
```

RouterLinkActive directive

- Assume a site menu
- It contains multiple links. Each link navigates to different view
- Usually, you want to indicate which link is the active one

```
<div class="site-menu">
   <a routerLink="" routerLinkActive="x">Home</a>
   <a routerLink="about" routerLinkActive="y">About</a>
</div>
```

Will append a CSS class named "x" to the anchor element

Required Parameter

- Use : syntax inside route definition

```
{
   path: 'contact/:id',
   component: ContactComponent,
}
```

- Add id value to the link

```
<a [routerLink]="['contact', 1]">Contact</a>
```

- Or

```
<a routerLink="contact/1">Contact</a>
```

- But the following is not valid

```
<a [routerLink]="['contact', {id: 1}]">Contact</a>
```

Reading parameters

- Use ActivatedRoute provider
  - Most of its properties are Observable which means you can react to URL changes
  - More details later
- Use ActivatedRoute.snapshot for a simple read

```
export class ContactComponent {
   id: number;

   constructor(private activatedRoute: ActivatedRoute) {
      this.id = this.activatedRoute.snapshot.params.id;
   }
}
```

Optional Parameter

- Each route can have its own optional parameters
- The syntax is a bit weird

```
<a [routerLink]="['contact', 1, {more: true}]">Contact</a>
```

```
http://localhost:8080/contact/1;more=true
```

- Please note that query string parameters are considered global for all routes

Optional Parameters

- Are not preserved when navigating between routes
- Even when navigating to the same route
- Optional and required parameter may have the same name
  - In that case the optional parameter has higher precedence which reflects inside the ActivatedRoute.data field
  - See more details later

Persist Preferences

- Assume a component that supports a “show/hide more” button
- Each time the button is clicked the component can navigate to itself with a new “showMore” value

The property can be bound to the view thus it will be updated for each change

```
get showMore() {
   const showMore = this.activatedRoute.snapshot.params.showMore;
   return showMore==="true" || showMore===true;
}

async toggleMore() {
   this.router.navigate(
      [
         {showMore: !this.showMore}
      ],
      {
         relativeTo: this.activatedRoute
      });
}
```

Navigate to “self” and change the showMore settings

Persist Preferences

- Using URL to store preferences means the user can refresh the browser and keep current selection
- The state can be extracted during ngOnInit

```
ngOnInit() {
   this.contact = this.contactService.getById(this.id);
}

get id() {
   return this.activatedRoute.snapshot.params.id;
}
```

- But ngOnInit is executed only once during component lifetime
- How can we react to changes inside params.id ?

Reactive Route Parameters


```
constructor(private activatedRoute: ActivatedRoute, private router: Router, private contactService: ContactService) {
   this.id = this.activatedRoute.params.map(p => p.id);
   this.contact = this.id.map(id => contactService.getById(id));
   this.name = this.contact.map(c => c.name);
   this.showMore = this.activatedRoute.params.map(p => p.showMore);
   this.showMoreCaption = this.showMore.map(more => (more ? "Less" : "More"));
}
```

```
<h1>Contact Details {{name | async}}</h1>

<a [routerLink]="['/contact', 2]">Goto Parent</a>

<button (click)="toggleMore()">{{showMoreCaption | async}}</button>
```

Clicking the link causes a change inside activatedRoute.params and then all other observables are updated too

The async pipe tells Angular to subscribe to the observable

Nested Route

- A route may have children

```
<h1>Contacts</h1>

<div class="content">
  <div class="side-bar">
    <a routerLink="./all">All</a>
    <a routerLink="./top10">Top 10</a>
    <a routerLink="recent">Recent</a>
  </div>

  <div class="placeholder">
    <router-outlet></router-outlet>
  </div>
</div>
```

```
{
  path: 'contact',
  component: ContactsPageComponent,
  children: [
    {
      path: ':type',
      component: ContactListComponent,
    },
  ]
}
```

- Each route can have its own required and optional parameters

This is a relative path too !!!

contactsPage.component.html

An outlet which contains child component

Nested routes - Imperative navigation

- When navigating from code, path is considered absolute
- Use the relativeTo option to fix that

```
up() {
  this.router.navigate([".."], {relativeTo: this.activatedRoute});
}
```

Without relativeTo option the ".." will be resolved against the root path

Router instance is the same for all components

Named Outlet

- A component may contain multiple outlets
- Each outlet must have unique name
- The names are used when navigating

```
<h1>About</h1>

<router-outlet name="left"></router-outlet>

<router-outlet name="right"></router-outlet>
```

Named Outlet

- routerLink/navigate are now much more complex since you need to specify the content for each outlet

```
<a [routerLink]="['/about', 1, {name: 'xxx'}, {outlets: {left: ['address', {id: 123}], right: ['website']}}]">About</a>
```

```
this.router.navigate([
  '/about',
  1,
  {name: 'xxx'},
  {
    outlets: {
      left: [
        'address',
        {id: 123}
      ],
      right: [
        'website'
      ]
    }
  }
]);
```

Required parameter

Optional parameter

Optional parameter

Browser's URL

```
http://localhost:8080/about/1;name=xxx/(left:address;id=123//right:website)
```

Component Lifetime

- By default the router dispose the component of the previous route
- This is extremely important in order to free DOM resources
- However, component's state is lost when navigating back ☹

Sticky Routes

- Tell Angular to keep old route's component and reuse it when reactivating the route

```
export class CustomReuseStrategy implements RouteReuseStrategy {
  handlers: {[key: string]: DetachedRouteHandle} = {};

  shouldDetach(route: ActivatedRouteSnapshot): boolean {
    return true;
  }

  store(route: ActivatedRouteSnapshot, handle: DetachedRouteHandle): void {
    this.handlers[(<any>route).routeConfig.path] = handle;
  }

  shouldAttach(route: ActivatedRouteSnapshot): boolean {
    return !!route.routeConfig && !!this.handlers[(<any>route).routeConfig.path];
  }

  retrieve(route: ActivatedRouteSnapshot): DetachedRouteHandle | null {
    return this.handlers[(<any>route).routeConfig.path];
  }

  shouldReuseRoute(future: ActivatedRouteSnapshot, curr: ActivatedRouteSnapshot): boolean {
    return future.routeConfig === curr.routeConfig;
  }
}
```

Must register the custom strategy

```
providers: [
  {
    provide: RouteReuseStrategy,
    useClass: CustomReuseStrategy
  }
]
```

Lazy Loading

- The router is capable of loading a module before navigating to one of its component

```
{
  path: 'admin',
  loadChildren: "app/admin/admin.module#AdminModule"
}
```

```
<a [routerLink]="['/admin']">Admin</a>
```

```
export const routes: Routes = [
  {
    path: '',
    component: AdminHomeComponent,
    pathMatch: 'full'
  },
];
```

```
@NgModule({
  imports: [
    CommonModule,
    RouterModule.forChild(routes)
  ],
  providers: [
  ],
  declarations: [
    AdminHomeComponent,
  ]
})
export class AdminModule {
}
```

Lazy Loading

- @angular/core defines a token named NgModuleFactoryLoader
- @angular/router register SystemJsNgModuleLoader as the implementation

Uses SystemJS to load the file from the server

```
SystemJsNgModuleLoader.prototype.loadAndCompile = function (path) {
    var _this = this;
    var _a = path.split(_SEPARATOR), module = _a[0], exportName = _a[1];
    if (exportName === undefined) {
        exportName = 'default';
    }
    return System.import(module)
        .then(function (module) { return module[exportName]; })
        .then(function (type) { return checkNotEmpty(type, module, exportName); })
        .then(function (type) { return _this._compiler.compileModuleAsync(type); });
};
```

The module is expected to export an NgModule under the correct name (AdminModule)

Lazy Loading

- But @angular/cli uses Webpack
- Loading Webpack chunk with SystemJS is problematic
- @angular/cli provides special Webpack plugin named AotPlugin
  - Parses the AST syntax looking for loadChildren
  - Creates chunk for every module
  - Fixes Webpack's asyncContext to allow async loading of the chunk, based on the module name

Lazy Loading - Webpack

SystemJS is removed

```
SystemJsNgModuleLoader.prototype.loadAndCompile = function (path) {
    var _this = this;
    var _a = path.split(_SEPARATOR), module = _a[0], exportName = _a[1];
    if (exportName === undefined) {
        exportName = 'default';
    }
    return __webpack_require__(85)(module)
        .then(function (module) { return module[exportName]; })
        .then(function (type) { return checkNotEmpty(type, module, exportName); })
        .then(function (type) { return _this._compiler.compileModuleAsync(type); });
};
```

Our main bundle now contains a map of all lazy loaded modules

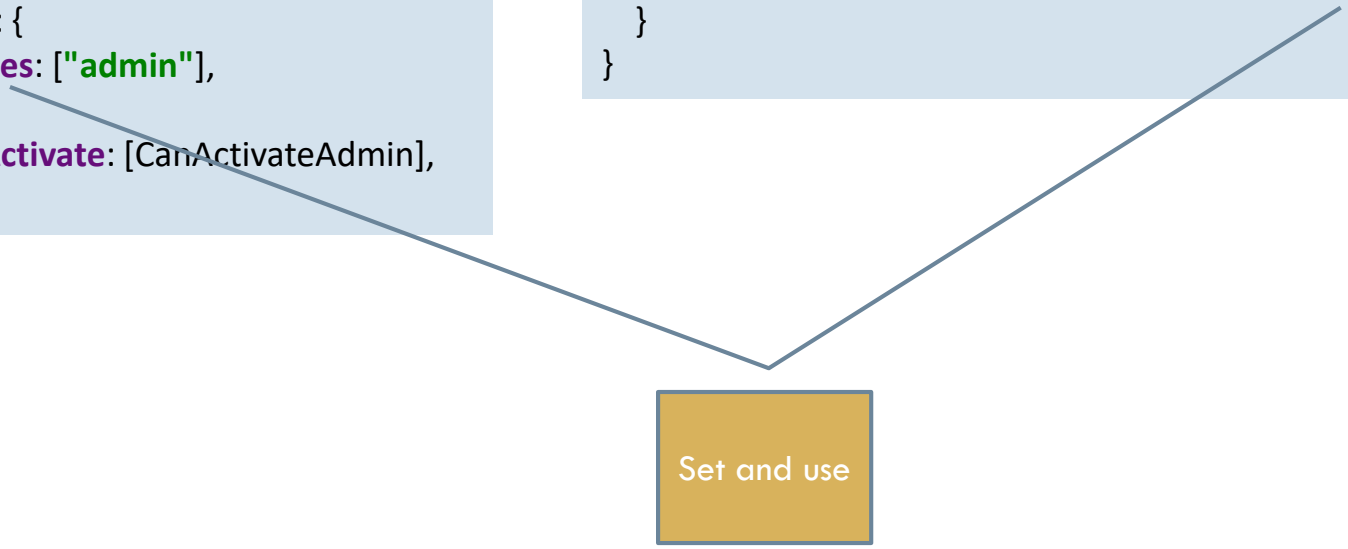
```
var map = {
  "./admin/admin.module": [
   190,
   0
  ]
};
function webpackAsyncContext(req) {
 var ids = map[req];  if(!ids)
  return Promise.reject(new Error("Cannot find module '" + req + "'."));
 return __webpack_require__.e(ids[1]).then(function() {
  return __webpack_require__(ids[0]);
 });
};
```

route.data

- Use it to store static metadata for a route
- Later the metadata can be used to implement application aspects like Authorization

```
{
   path: 'admin',
   component: AdminComponent,
   data: {
      roles: ["admin"],
   },
   canActivate: [CanActivateAdmin],
}
```

```
export class AdminComponent {
   constructor(activatedRoute: ActivatedRoute) {
      console.log(activatedRoute.snapshot.data.roles);
   }
}
```



Implementing Aspects

- An aspect is usually marinated outside of the component → Use route guard

```
@Injectable()
export class CanActivateAdmin implements CanActivate {
   constructor(private authService: AuthService) {
   }

   canActivate(route: ActivatedRouteSnapshot, state: RouterStateSnapshot) {
      return this.authService.isInRole(route.data.roles);
   }
}
```

```
{
   path: 'admin',
   component: AdminComponent,
   data: {
      roles: ["admin"],
   },
   canActivate: [CanActivateAdmin],
}
```

Associating multiple routes with the same guard

- Use component-less route to group multiple routes with the same configuration

Component -less route

Is executed for every descendent

```
export const routes: Routes = [
  {
    path: "",
    canActivate: [AuthorizeGuard],
    canActivateChild: [AuthorizeGuard],
    children: [
      {
        path: "", redirectTo: "home", pathMatch: "full",
      },
      {
        path: "home", component: HomeComponent, data: {roles: ["user"]},
      },
      {
        path: "admin", component: AdminComponent, data: {roles: ["admin"]},
      },
    ]
  },
];
```

Is executed only for the host route

Route Guard


```
@Injectable()
export class AuthorizeGuard implements CanActivate, CanActivateChild {
  constructor(private authService: AuthService) {
  }

  canActivate(route: ActivatedRouteSnapshot, state: RouterStateSnapshot) {
    console.log("canActivate", route);

    return this.authService.isInRole(route.data.roles);
  }

  canActivateChild(route: ActivatedRouteSnapshot, state: RouterStateSnapshot) {
    console.log("canActivateChild", route);

    return this.authService.isInRole(route.data.roles);
  }
}
```

Async Route Guard

- A route guard may return a promise
- Combined with root component-less route you can simulate async application initialization

```
export class InitAppGuard implements CanActivate {
   canActivate(route: ActivatedRouteSnapshot, state: RouterStateSnapshot) {
      return new Promise(function(resolve, reject) {
         setTimeout(function() {
            resolve(true);
         }, 3000);
      });
   }
}
```

```
export const routes: Routes = [
   {
      path: "",
      canActivate: [InitAppGuard],
      children: [
      ]
   },
];
```

Summary

- Adding routing to Angular is easy
- Integrating with Redux is challenging
  - Who's the boss?
- Keep state outside of component so you can restore it easily when navigating back