Pipes, JWT and Interceptors

Authentication, Intercepting HTTP Requests

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Table of Contents

Pipes

Usage, Chaining, Creating Custom

What Are Pipes?

- Pipes in Angular are used to **transform data** in the template
- It takes integers, strings, arrays and date as input separated with **|** to be converted

```
{{ username | uppercase }}
```

- Pipes can also be **chained**

```
{{ username | lowercase | titlecase }}
```

Keep the order in mind

Parameterizing Pipes

- Some pipes in Angular take **parameters**

```
{{ data.creationDate | date: 'fullDate' }}
```

```
{{ data.creationDate | date: 'MM/dd/yyyy' }}
```

- More on pipes in the documentation
  - https://angular.dev/api?type=pipe

Creating Pipes

```
@Pipe({
  name: 'shorten'
})
export class ShortenPipe implements PipeTransform {
  transform(value: string) {
    if (value.length > 10) {
      return `${value.substr(0, 10)}...`;
    }

    return value;
  }
}
```

Import in declarations

```
{{ description | shorten }}
```

Creating Pipes

- Custom Pipes can also receive parameters

```
transform(value: string, limit: number) {
    if (value.length > limit) {
      return `${value.substr(0, limit)}...`;
    }

    return value;
}
```

```
{{ description | shorten:10 }}
```

Async Pipe - Example

- Execute asynchronous code (promises, observables) using the **async pipe**

```
text = new Promise((resolve, reject) => {
  setTimeout(() => {
    resolve('show some text');
  }, 3000)
})
```

```
<h1>{{ text | async }}</h1>
```

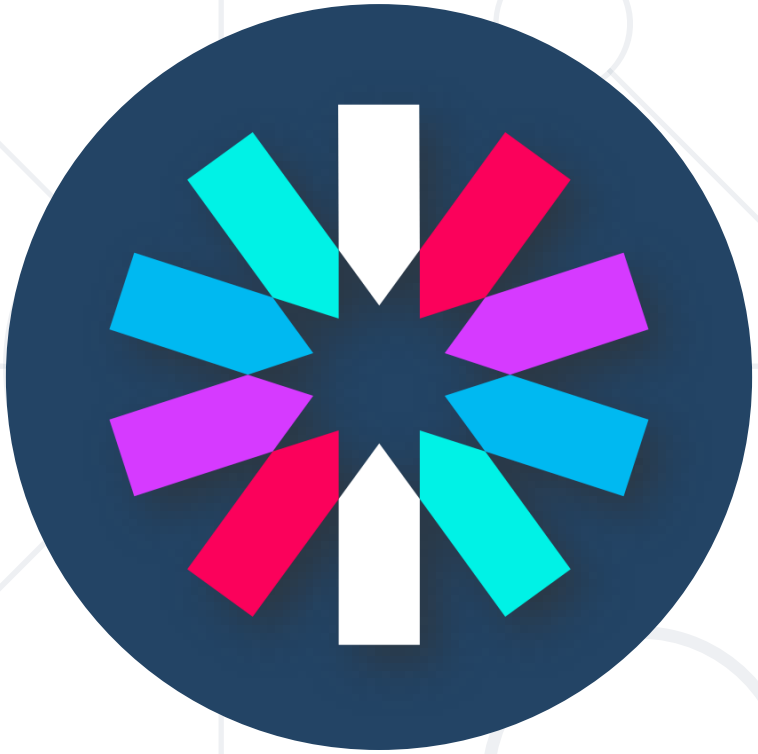
Async Pipe - Observables

- Async pipe takes care of **subscribing** and **unwrapping** the data
- As well as **unsubscribing** when the component is **destroyed**

```
export class PostsComponent implements OnInit {
  posts$ : Observable<Post[]>

  ngOnInit() {
    this.posts$ = this.postsService.getAllPosts();
  }
}
```

```
@for (let post of (posts$ | async)) {
  <div>…</div>
}
```

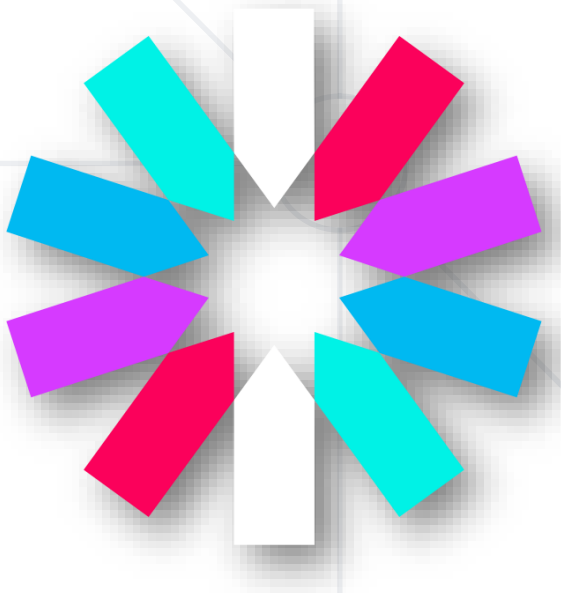


JWT

JSON Web Token

What is JWT?

- **JSON Web Token** (**JWT**) is an open standard that defines a compact and self-contained way for securely transmitting information between parties as a JSON object
- This information can be verified and trusted because it is digitally signed
- JWTs can be signed using a secret or a public / private key pair using **RSA** or **ECDSA**



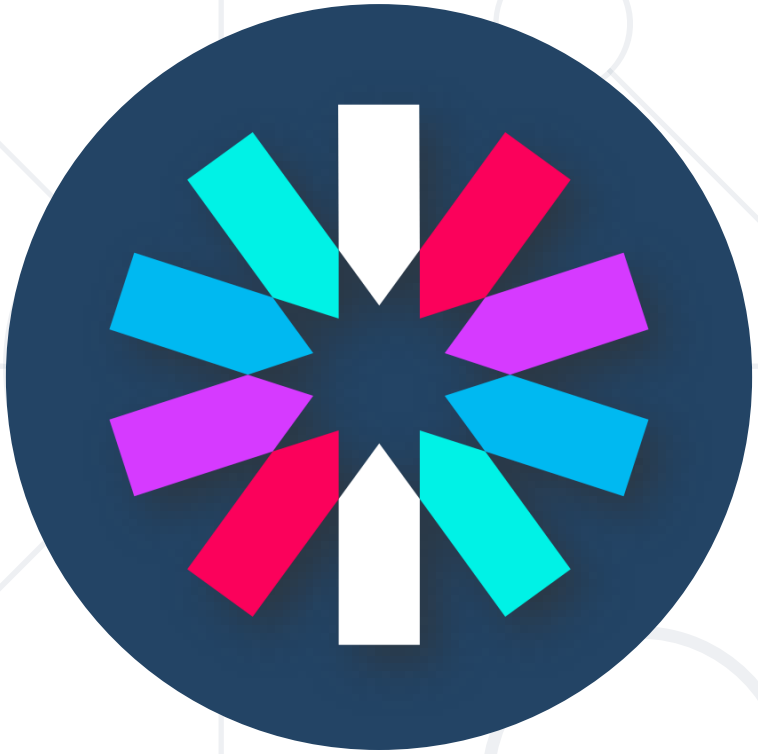
When Should you use JWT?

- JSON Web Tokens are useful for
  - **Authorization** (most common scenario)
    - Once the user is logged in, each subsequent request will include JWT, allowing the user to access routes, services and resources that are permitted with that token
  - **Information Exchange**
    - JSON Web Tokens are good way of securely transmitting information between parties
      - Signed digitally

JWT Structure

- In its compact form, JSON Web Tokens consist of three parts separated by dots (.)
  - **Header**
  - **Payload**
  - **Signature**

```
eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.
eyJzdWIiOiIxMjM0NTY3ODkwIiwibmFtZSI6IkpvaG4
gRG9lIiwiaXNTb2NpYWwiOnRydWV9.
4pcPyMD09olPSyXnrXCjTwXyr4BsezdI1AVTmud2fU4
```



HTTP Interceptors

Attaching Tokens, Error Handling

Interceptors Overview

- Automatically **attach** authentication information to **requests**
- Often involves attaching **tokens**
  - JSON Web Token (JWT)
  - Other form of access tokens
- Implemented since **Angular 4** using **`HttpInterceptor`**

Create HTTP Interceptor

- Import the following

```
import {
  HttpResponse,
  HttpRequest,
  HttpHandler,
  HttpEvent,
  HttpInterceptor
} from '@angular/common/http'
```

- All interceptors that we create are **injectables** and **implement** the **HttpInterceptor** interface

```
export class TokenInterceptor implements HttpInterceptor
```

Intercepting Requests

- The interface gives us an **intercept** method

```
intercept(request: HttpRequest<any>, next: HttpHandler):
Observable<HttpEvent<any>> {

  request = request.clone({
    setHeaders: {
      Authorization: `Bearer ${this.authService.token}`,
      Content-Type: 'application/json'
    }
  });

  return next.handle(request);
}
```

To make changes **clone** the **original** request

Passing control to **next interceptor** in the **chain**

Provide the Interceptor

- The interceptor needs to be added to the **HTTP_INTERCEPTORS** array (in **app.module.ts**)

```
import { HTTP_INTERCEPTORS } from '@angular/common/http'
```

- Provide it the following way

```
providers: [
  {
    provide: HTTP_INTERCEPTORS,
    useClass: TokenInterceptor,
    multi: true
  }
]
```

Handle Responses

- Handle responses using the **pipe** and **tap** operators

```
import { tap } from 'rxjs/operators'
```

```
return next.handle(req)
  .pipe(tap((event : HttpEvent<any>) => {
    if (event instanceof HttpResponse
        && req.url.endsWith('login')) {
      this.saveToken(event);
    }
})
```

Handle Server Errors

- Handle server errors with **catchError** and **throwError** operators

```
import { catchError } from 'rxjs/operators'
import { throwError } from 'rxjs'
```

```
return next.handle(req)
  .pipe(catchError((err: HttpErrorResponse) => {
    if (err.status === 401) {
      // Log the errors
      this.router.navigate([ '/login' ])
    }
    return throwError(err);
  }
));
```

Lazy Loading

Asynchronous Loading

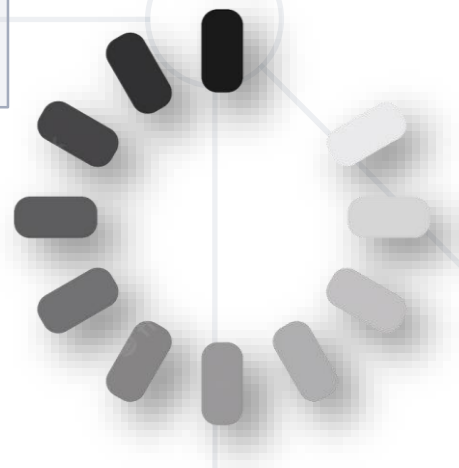
What is Lazy Loading?

- Loading **everything** in a big bundle could be **slow**
- Lazy Loading helps us to download web pages in smaller, on-demand **chunks**
- In **Angular**, we split the application into separate **feature modules** for efficient loading
- Feature modules are only loaded when the user navigates to the specific **route**

Preparing for Lazy Loading

- Create a Feature Module - **Furniture Module**
  - Components – FurnitureAll, FurnitureDetails, FurnitureEdit
- Create a **separate** routing module

```
const furnitureRoutes: Routes = [
  { path: '', component: FurnitureAllComponent,
children: [ /* other routes */ ] }
];
```



Load Children

- Use `loadChildren` for Lazy Loading

```
const routes: Routes = [
  { path: 'signin', component: SigninComponent },
  { path: 'signup', component: SignupComponent },
  {
    path: 'furniture',
    loadChildren: () => import('./furniture/furniture.module')
    .then(m => m.FurnitureModule) // Lazy loaded feature module
  }
];
```

Protect Module with CanLoad

- To protect lazy loaded modules, use a **canLoad guard**
  - AuthGuard should implement the **CanLoad interface**

```
{
  path: 'furniture',
  loadChildren: () =>
import('./furniture/furniture.module')
    .then(m => m.FurnitureModule),
  canLoad: [ AuthGuard ] // Protect lazy loaded modules
}
```

Subjects

Observer and Observable

What is a Subject?

- An RxJS Subject is a **special type** of Observable
- It allows values to be **multicasted** to many **Observers**
- Subjects are like **Event Emitters**
  - They maintain a registry of many listeners
- Every Subject is an **Observable** - has `subscribe()`
- Every Subject is an **Observer** - has methods `next()`, `error()` and `complete()`

Subjects - Example

- Subject is an Observer – provide it to the **subscribe**

```
let subject = new Subject();
subject.subscribe({
  next: (v) => console.log(`observerA: ${v}`)
});
subject.subscribe({
  next: (v) => console.log(`observerB: ${v}`)
});
let observable = from([1, 2, 3]);
observable.subscribe(subject);
```

```
observerA: 1
observerB: 1
observerA: 2
observerB: 2
observerA: 3
observerB: 3
```

Behavior Subject

- One of the variants is the **BehaviorSubject**
  - has the notion of "**the current value**"
- Stores the **latest value** emitted to its consumers
- Whenever a new Observer subscribes - it receives the current value from the BehaviorSubject

BehaviorSubjects are useful for representing "values over time". For instance, an event stream of birthdays is a Subject, but the stream of a person's age would be a BehaviorSubject

Behavior Subject - Example

- Behavior Subject **initialized** with a value of **0**

```
let subject = new BehaviorSubject(0);
subject.subscribe({
  next: (v) => console.log(`observerA: ${v}`)
});
subject.next(1);
subject.next(2);
subject.subscribe({
  next: (v) => console.log(`observerB: ${v}`)
});
subject.next(3);
```

```
observerA: 0
observerA: 1
observerA: 2
observerB: 2
observerA: 3
observerB: 3
```

Replay Subject

- A `ReplaySubject` is like a BehaviorSubject in that it can send **old values** to **new subscribers**
- It can also record a part of the Observable execution

> *A ReplaySubject records multiple values from the Observable execution and replays them to new subscribers.*

Replay Subject - Example

- When creating a **ReplaySubject**, you can specify **how many values** to replay

```
let subject = new ReplaySubject(2);
subject.subscribe({ // TODO: same code });
subject.next(1);
subject.next(2);
subject.next(3);
subject.subscribe({ // TODO: same code });
subject.next(4);
```

```
observerA: 1
observerA: 2
observerA: 3
observerB: 2
observerB: 3
observerA: 4
observerB: 4
```

Async Subject

- The `AsyncSubject` is a variant where only the **last value** of the Observable execution is sent to its observers
- It is sent only when the **execution completes**
- AsyncSubject can still be used to multicast just like you would with a normal Subject

Async Subject - Example

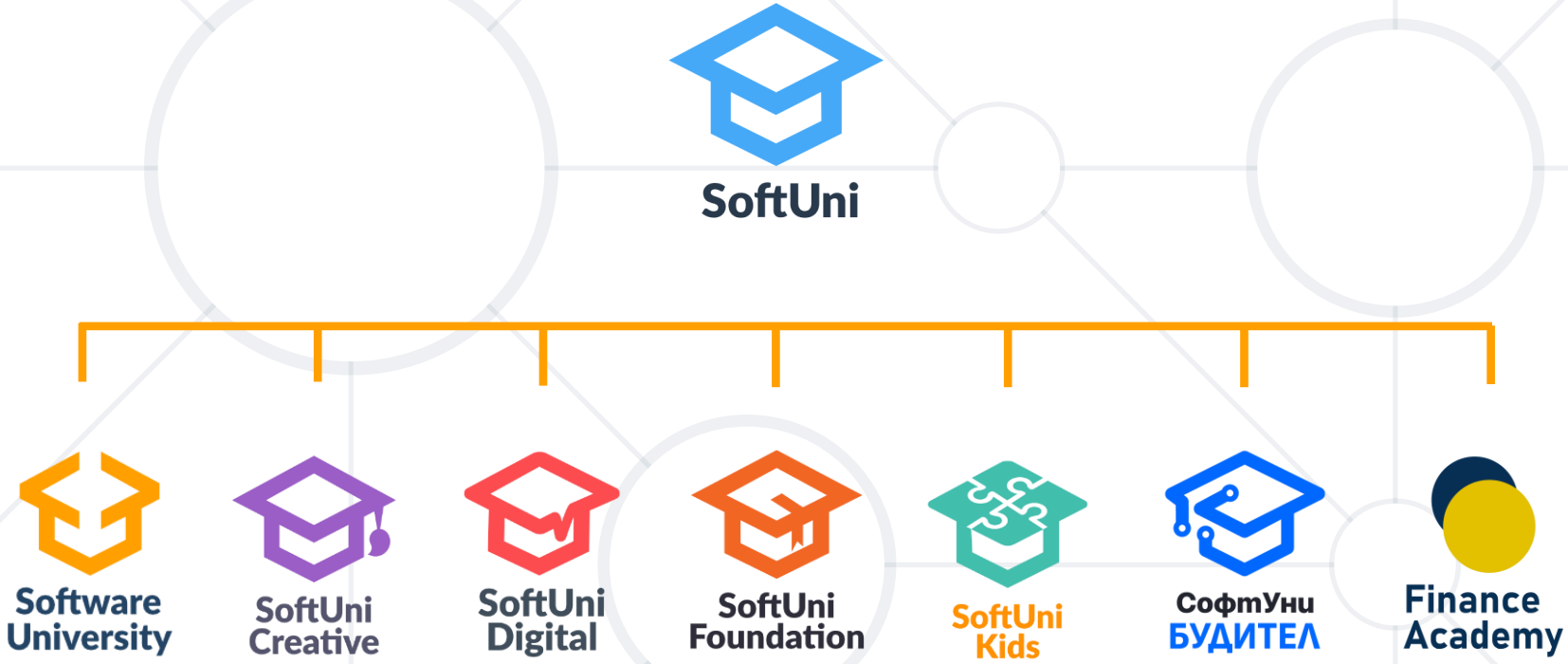
```
let subject = new AsyncSubject();
subject.subscribe({ // TODO: same code });
subject.next(1);
subject.next(2);
subject.next(3);
subject.subscribe({ // TODO: same code });
subject.next(5);
subject.complete();
```

```
observerA: 5
observerB: 5
```

Summary

- Pipes transform data
- Authentication with JWT
- HTTP Interceptors can modify headers
- Lazy loading help us to download the web pages in chunks
- Subject is a special type of Observable

Questions?



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