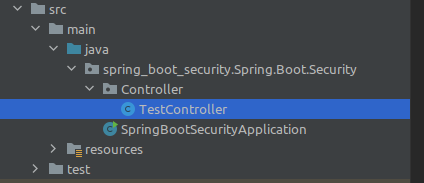
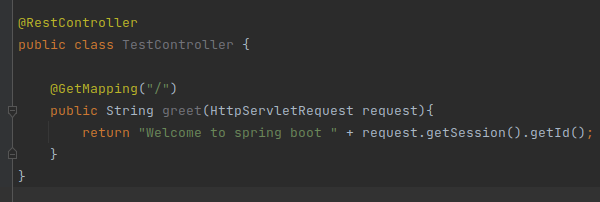
## **Introduction**

1. spring.io dependencies
2. <https://start.spring.io/>
   * Spring web
   * Spring security
   * Spring boot dev tools
   * postgreSQL driver
   * JPA

## **Test spring boot project**

1. Create dummy controller
   * Use annotations RestController for now
   * Use GetMapping
   * And return word for now “Welcome to Spring Boot”

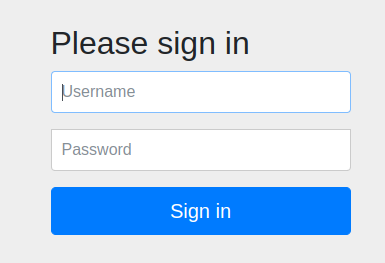




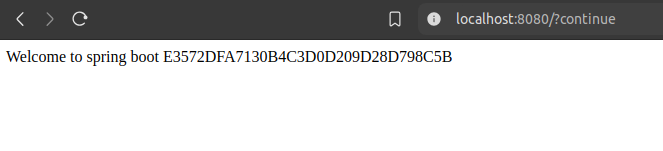
1. By default, it will show a login UI provided by Spring Boot

But if you comment out the Spring Boot security dependency, it will show the default page, which means our controller is not being guarded.

1. **Password** will appear on console, **username** = user.
2. Now run the project and test it



Note: we will not see this page if we disable security dependency on **pom.xml**

****

## **How are we seeing the login page when we request for the default page ?**

**Request Processing Flow:**

* When you access a controller in a web application, your request typically goes through:
  + **Filter Chain:** Filters intercept the request before it reaches the controller. These filters can perform tasks like authentication, logging, or request modification.
  + **Front Controller:** In frameworks like Spring MVC, the **Front Controller** is typically a DispatcherServlet. It serves as the central entry point for all incoming requests, delegating them to the appropriate controller.
* After the request is processed by the controller, the response follows the reverse path:
  + The response is processed by any filters (in reverse order) before being sent back to the client.

**Authentication and Validation:**

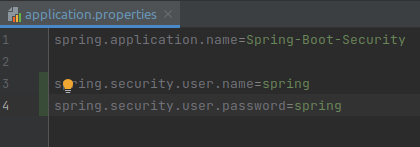
* If authentication or validation (e.g., checking the email and password) fails, the application (or filter) sends an appropriate response, such as an error message or a redirection to a login page. This can happen:
  + **In Filters:** If the filters are responsible for authentication, they might stop the request before it even reaches the controller.
  + **In the Controller:** If authentication or validation is done at the controller level, the controller will send the appropriate error message.

**Servlet and Tomcat:**

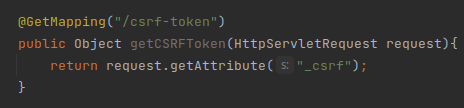
* These processes (filters, front controllers, and controllers) run within the **Servlet Container**, which is part of the **Tomcat Server**.
* Tomcat provides the runtime environment for Servlets and JSPs, handling tasks like managing threads, handling HTTP requests, and sending responses.

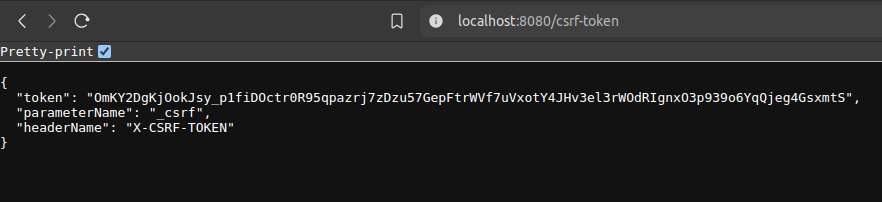
## **Change username and password & get CSRF token**

1. Go to src>main>java>resources>application.properties



1. To get CSRF token

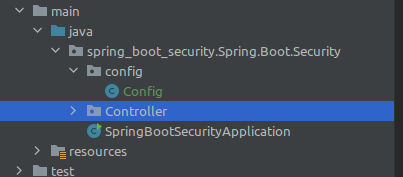




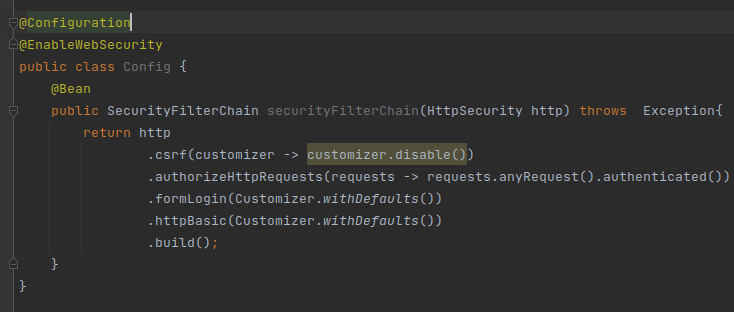
## **How do we change the way security filter chain works**

1. By default spring security provide us a lot of chain
2. But how to configure in our own way
   * We can do that creating **config class**
   * Create config class

src > main > java >package > new package (name it as config)

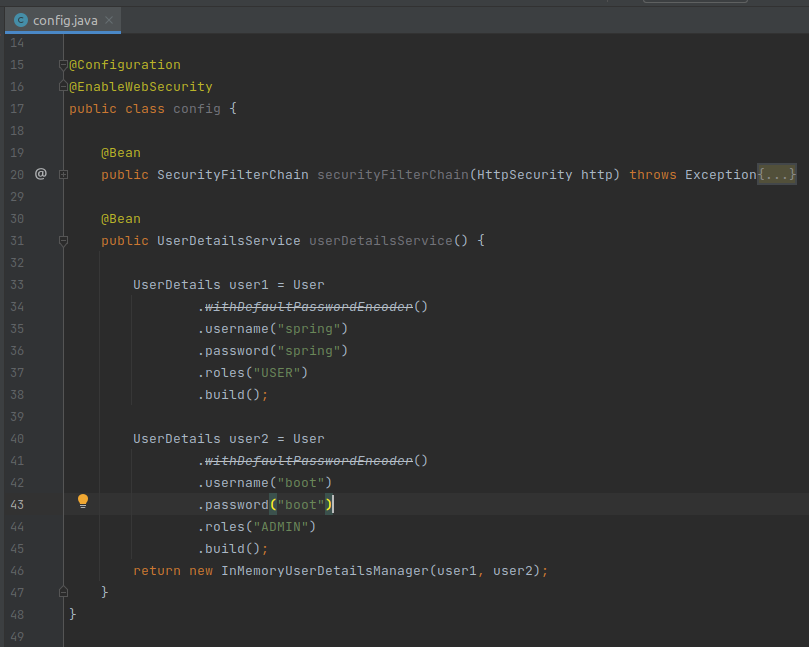


1. Code



**Who is working behind the scene for validation username and password (Not used in codebase, but provided here for demonstration purpose only)**

* + **UsernamePasswordAuthenticationFilter** 
    1. Takes the credentials and starts the authentication process
  + **UserDetailsService**
    1. Helper to load user details for example fetching from database
  + In config file
    1. Use Bean, because it will be in the spring container, and your spring security will pick it from there.
    2. Create bean of **UserDetailService**



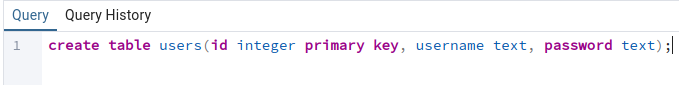
For demo we have create two user detail (but in real we get usually don't do that)

* + Now we can test it from POSTMAN

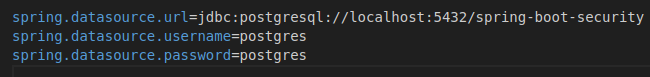
## **Connect with database**

1. When we pass a credential object (**Authentication Object,** still not authenticated) to the **Authentication Provider** (who will provide the service of checking it and validating it), it will provide an **Authentication Objec**t (Authenticated object).
2. First create database in PostgreSQL

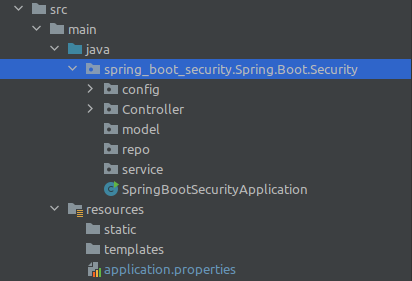
Then create table



1. Connect with database

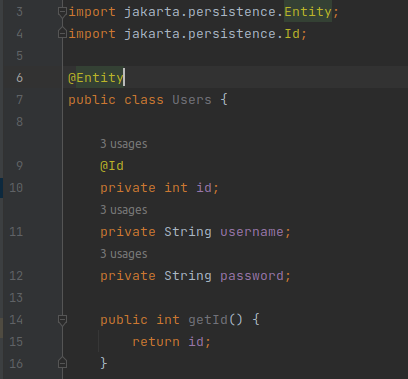


1. Folder structure

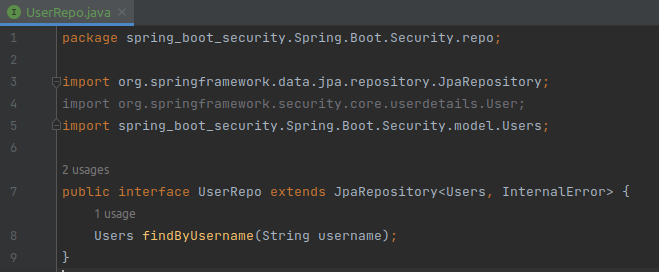


**NOTE :-** Controllers use services to handle business logic. Services interact with repositories to fetch or manipulate data, and repositories communicate with the database to perform these operations.

1. Create User class in model and create entity



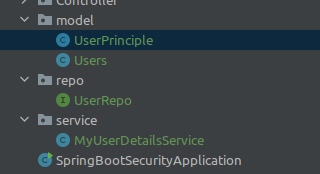
1. Create “useRepo” file (interface) inside the repo package
   * Extends JpaRepository with type of **Users** and **Integer**



1. Inside the service package
   * Create MyUserDetailsService



To return user object create UserPrinciple class inside the model package





1. Now go to config file then add authentication provider



## 

1. Add a record to the users table, then try to log in



## **What we have done so far**

1. Created a configuration file using annotations, so we are now using our own custom configuration
2. Changed the default username and password
3. Created a database and table, and also inserted one user detail
4. Created the Users model and UserPrinciple file
5. Then configured security config (**config package > config file**)
   1. By default it was using a authentication provider,
   2. But we have used out DaoAuthenticationProvider

Here we have to pass one password encoder and UserDetailsService

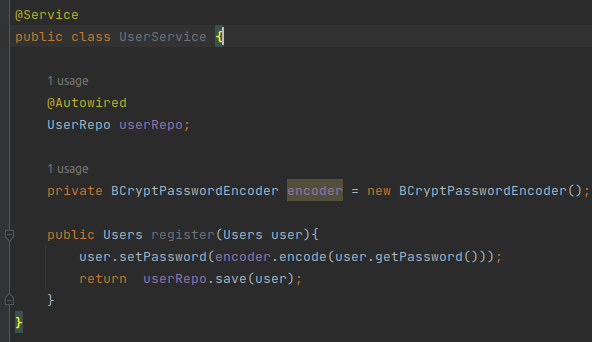
1. Since we want our own we have to create out own class (**service package > MyUserDetailsService**)
   1. To work with we have to implement one method which is **loadUserByUsername**
   2. To work with we have to work with repo (repo package > UserRepo)

Repo will do the database connectivity

* 1. **loadUserByUsername** return user object so created UserPrinciple (which will give us current user details)

## **Encrypt password**

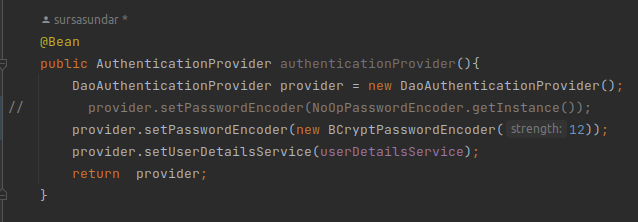
1. We need encryption two times while we are storgin password, and while validating our credentials
   * src > main > java >package > Service> UserService (new service)>



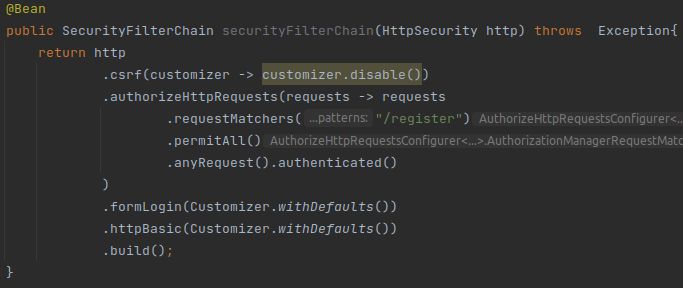
1. Now go to controller and add method to controller
   * src > main > java > controller > TestController >



1. Now in config file update this



1. Then update this too



1. Now test it: register using Postman and try to log in from the browser. Plain text passwords will no longer work because we are now using encrypted passwords.

## **JOT**

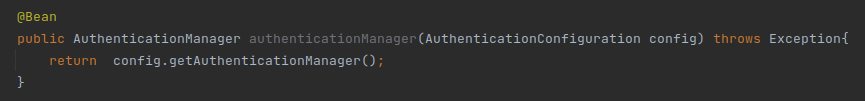
### Introduction

1. **JWT** = JSON web token, in short term we called it JOT
2. In early days XML was used as token but it was bulky
3. **JSON** = JavaSCript Object Notation
   1. It can represent your data in small format
   2. We can also encode it to become a smaller
   3. It is very easy to carry between server and client
   4. JWTs are not created directly from plain JSON; they follow a specific structure
      1. Header (metadata like algorithm and type)
      2. Payload (JSON data, typically claims)
      3. Signature (ensures data integrity and authenticity)
4. The main reason using JWT is for **accountability** not security

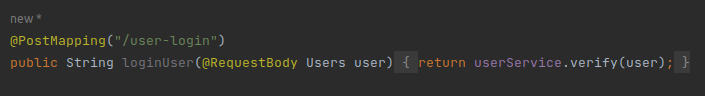
### **Create JOT**

1. When you want to use the JOT we have to use the one more layer (**AuthenticationManager)**
   * When we send a request to the server, that object of authentication to **AuthenticationManager**.
   * AuthenticationManager called the AuthenticationProvider.
2. So let’s add three more dependencies
   * jjwt api
   * jjwt imp
   * jjwt jackson
   * Load maven it will download dependencies
3. Then create function (src > main > java >package > config> )

Since we want our own login system we need this function to layer, it communicate with AuthenticationProvider behind the



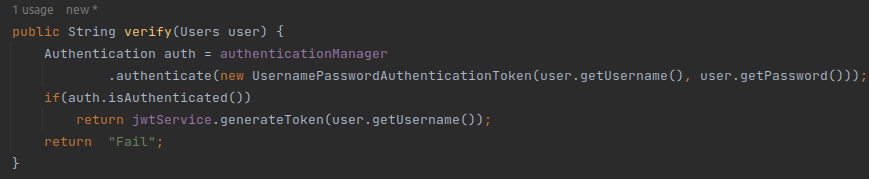
1. Add user-login controller



allow the “user-login” endpoint. (config > SecutifyFilterChain)

1. Now go to UserService, create function to verify the user’s detail, if the user is authenticated then return token

Need to inject the service (JwtService)



### **Generate Token**

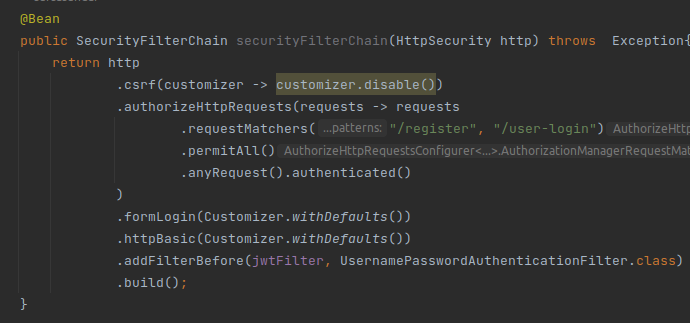
1. We need encryption two times while we are storing passwords, and while validating our credentials.
   1. src > main > java >package > Service> JwtService (new service)



Now test it

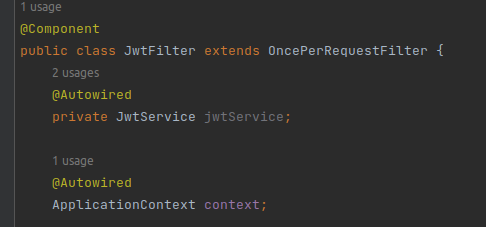
### **Validate Token**

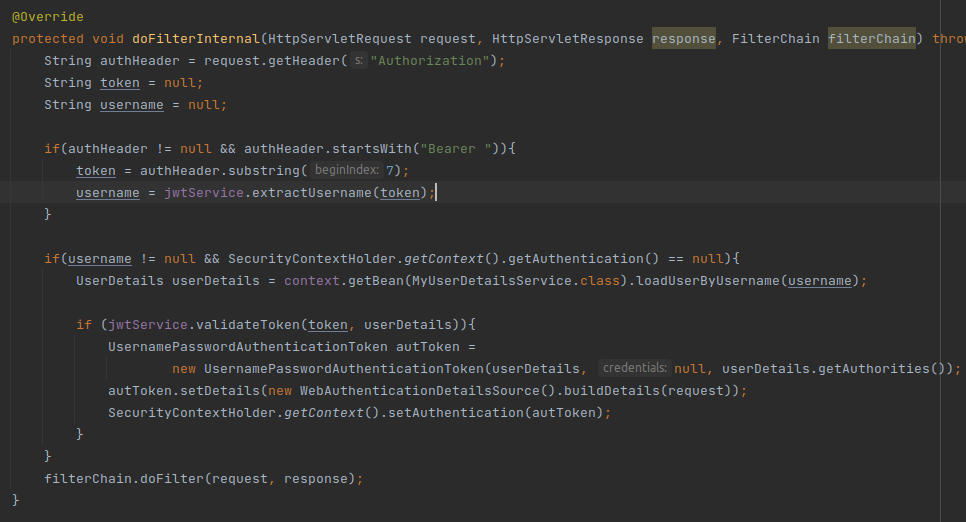
1. By default our current code follows user password authentication, but we have to modify it toauthenticationManager
   * Now we will modify filter chain at first when we make a request it will goes to **JWT** filer
   * Then it will goes to the **UPAF** (User password authentication filter)
   * Now when we make the request JWT service will verify the token and it will pass to the UPAF (User password authentication filter)
   * Go to config file then update filter chain



1. Create JwtFilter

src > main > java >package > config > create filter class (JwtFilter)





1. Steps
   * From the request header get the Authorization
   * Declare other two variables **token** and **username**
   * If the **autheHeader** is not null and if it starts with **Bearer**
     1. Then get the token
     2. Extract username (create function in **JwtService** to extract token)
   * If the username is not null and SecurityContextHolder is empty then we will proceed further
     1. Get userDetails from **MyUserDetailsService**.
   * If the token is validate (Create this function in **JwtService**)
     1. If the token is valid then we have to use another filter which is **UsernamePasswordAuthenticationToken**

This token asked you for three things

**Principle**, **credential**, **authorities**

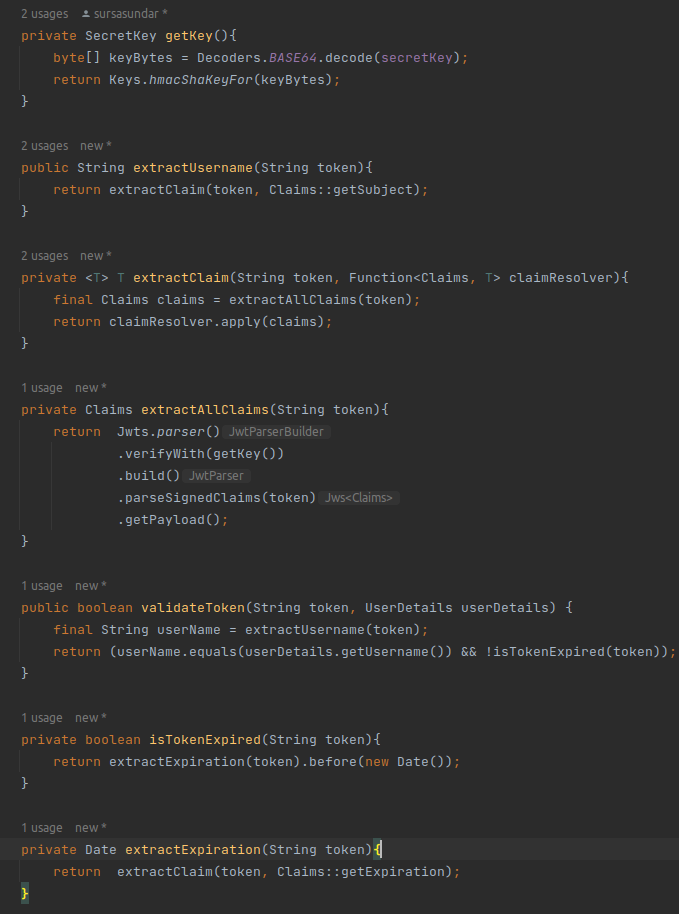
* + 1. **UsernamePasswordAuthenticationToken o**bject know about the userDetails but it does not know about the request so we have pass it (**request**) using the **buildDetails** of **WebAuthenticationDetailsSource**
    2. After that we have to just set to the context

By doing this we are adding it to the token

* + 1. Once we do this we simply pass the request

1. Now in JwtService we have to validate and extract the username
   * we have decode the token, fetch claims then extract username

( For Token validation we have to check for expiration time )



1. Now in JwtService we have to validate and extract the username
   * we have decode the token, fetch claims then extract username