SpringBoot Security - Part2 and Part3

Friday, 7 March 2025 3:48 PM

User Creation:

Before, we proceed with User Authentication and Authorization methods, we first need to see because that's the first step.

Authentication and Authorization of User will happen only after User is created.

Lets see, what will happen when we add below security dependency, as seen in previous *Arch* the server:

```
<dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-security</artifactId>
</dependency>
<dependency>
```

Provides cor
- A
- A
- S

Logs when server is started:

```
2025-03-08T15:09:16.356+05:30  INFO 44103 --- [          main] j.LocalContainerEntityManagerFactoryBean : Initialized JPA
2025-03-08T15:09:16.466+05:30  WARN 44103 --- [          main] JpaBaseConfiguration$JpaWebConfiguration : spring.jpa.open-
2025-03-08T15:09:16.500+05:30  WARN 44103 --- [          main] .s.s.UserDetailsServiceAutoConfiguration :

Using generated security password: b5341001-1e0d-4bad-9440-0f8b1c51cfa9

This generated password is for development use only. Your security configuration must be updated before running your applic
```

```
  main] r$InitializeUserDetailsManagerConfigurer : Global AuthenticationManager configured with UserDetailsSer
  main] o.s.b.w.embedded.tomcat.TomcatWebServer  : Tomcat started on port 8080 (http) with context path '/'
  main] c.c.l.SpringbootApplication              : Started SpringbootApplication in 1.751 seconds (process run
exec-1] o.a.c.c.C.[Tomcat].[localhost].[/]       : Initializing Spring DispatcherServlet 'dispatcherServlet'
exec-1] o.s.web.servlet.DispatcherServlet        : Initializing Servlet 'dispatcherServlet'
exec-1] o.s.web.servlet.DispatcherServlet        : Completed initialization in 1 ms
```

So, what exactly happened here?

- During server startup, user is created automatically with default username: "user"
- Random password is generated for testing.

- Each time, server is restarted, new random password will get generated.

SecurityProperties.java

```
public static class User {

/** Default user name */
private String name = "user";

/** Password for the default username */
Private String password = UUID.randomUUID().toString();

/** Granted roles for the default username */
private List<String> roles = new ArrayList<>();

private boolean passwordGenerated = true;
                .
                .
                //getters and setters
                .
}
```

@AutoConfiguration

UserDetailsServiceAu

```
@Bean
public InMemoryUserDetailsManager i
        ObjectProvider<PasswordEnco
    SecurityProperties.User user =
    List<String> roles = user.getRo
    return new InMemoryUserDetailsM
        .password(getOrDeducePasswo
        .roles(StringUtils.toString
        .build());
}
```

InMemory

```
private final Map <String, Mut
();
 public InMemoryUserDetailsMa
     for (UserDetails user :
         createUser(user);
     }
 }
```

```
@Override
public void createUser(UserDeta
    Assert.isTrue(!userExists(u
    this.users.put(user.getUser
}
```

How we can control the user creation logic?

1st: Using application.properties

(not recommended, only for development and testing)

application.properties

```
spring.security.user.name=my_username
spring.security.user.password=my_password
spring.security.user.roles=ADMIN
```

→ Internally
setUserN
method c
and over

**Now, during application startup, no default username and default p
created.**

```
45512 --- [           main] j.LocalContainerEntityManagerFactoryBean : Initialized JPA EntityManagerFactory for persistence u
45512 --- [           main] JpaBaseConfiguration$JpaWebConfiguration : spring.jpa.open-in-view is enabled by default. Therefo
45512 --- [           main] r$InitializeUserDetailsManagerConfigurer : Global AuthenticationManager configured with UserDetai
45512 --- [           main] o.s.b.w.embedded.tomcat.TomcatWebServer  : Tomcat started on port 8080 (http) with context path '
45512 --- [           main] c.c.l.SpringbootApplication              : Started SpringbootApplication in 1.701 seconds (proces
45512 --- [nio-8080-exec-1] o.a.c.c.C.[Tomcat].[localhost].[/]       : Initializing Spring DispatcherServlet 'dispatcherServl
45512 --- [nio-8080-exec-1] o.s.web.servlet.DispatcherServlet        : Initializing Servlet 'dispatcherServlet'
45512 --- [nio-8080-exec-1] o.s.web.servlet.DispatcherServlet        : Completed initialization in 0 ms
```

2nd: By creating custom InMemoryUserDetailsManager Bean
(not recommended, only for development and testing)

UserDetailsService

↓

UserDetailsManager

↓

InMemoryUserDetailsManager

```java
@Configuration
@EnableWebSecurity
public class SecurityConfig {

    @Bean
    public UserDetailsService userDetailsService() {
        UserDetails user1 = User.withUsername("my_username_1")
                .password("{noop}my_password_1") // {noop} means no encoding or hashing
                .roles("ADMIN")
                .build();

        UserDetails user2 = User.withUsername("my_username_2")
                .password("{noop}1234")  // {noop} means no encoding or hashing
```

```
                .roles("USER")
                .build();

        return new InMemoryUserDetailsManager(user1, user2);
    }
}
```

why we are appending {noop} here?

The default, format for storing the password is : *{id}encodedpassword*

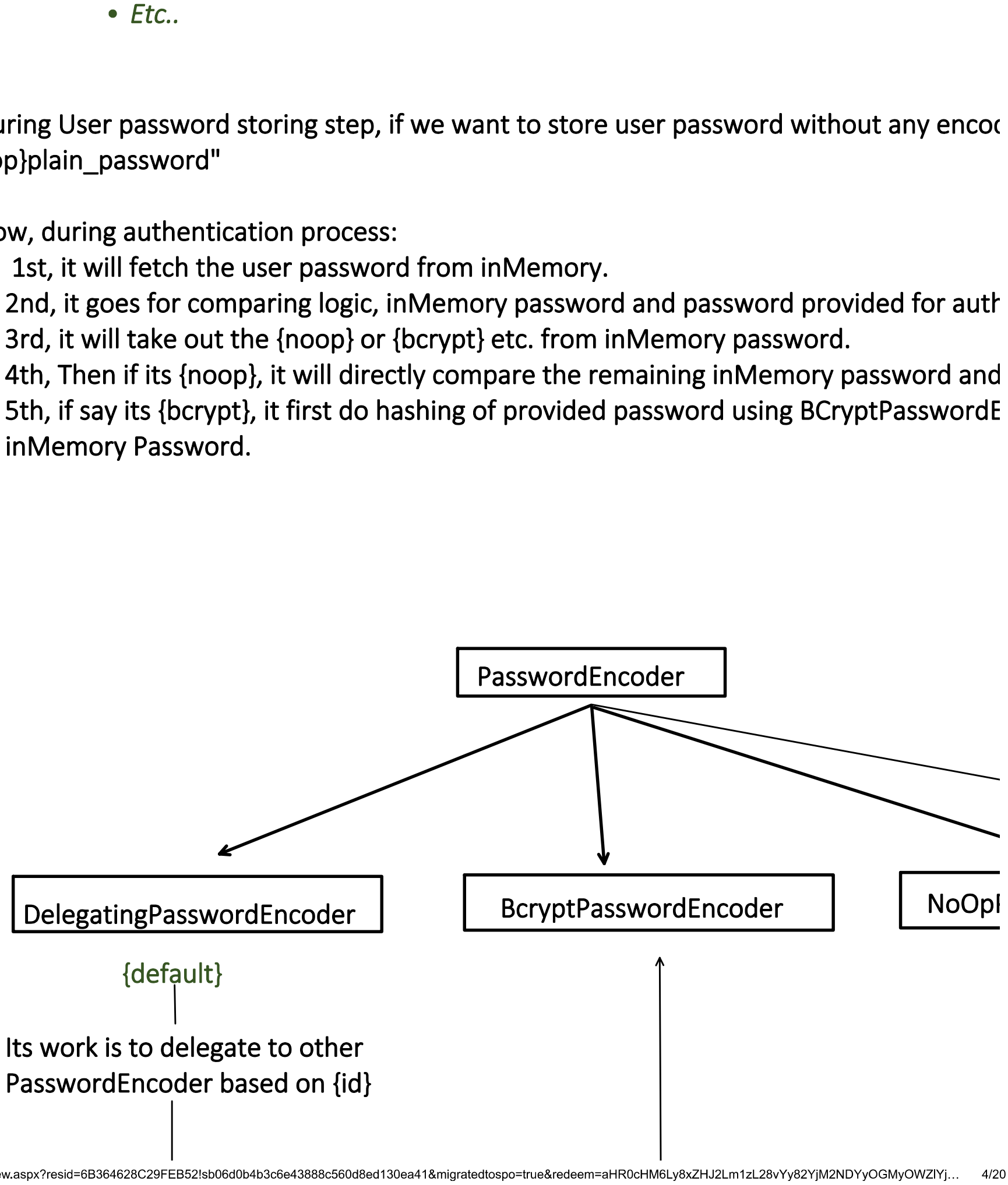
{id} can be either:

- *{noop}*
- *{bcrypt}*
- *{sha256}*
- *Etc..*

-- During User password storing step, if we want to store user password without any encoc
{noop}plain_password"

-- Now, during authentication process:

- 1st, it will fetch the user password from inMemory.
- 2nd, it goes for comparing logic, inMemory password and password provided for auth
- 3rd, it will take out the {noop} or {bcrypt} etc. from inMemory password.
- 4th, Then if its {noop}, it will directly compare the remaining inMemory password and
- 5th, if say its {bcrypt}, it first do hashing of provided password using BCryptPasswordE inMemory Password.

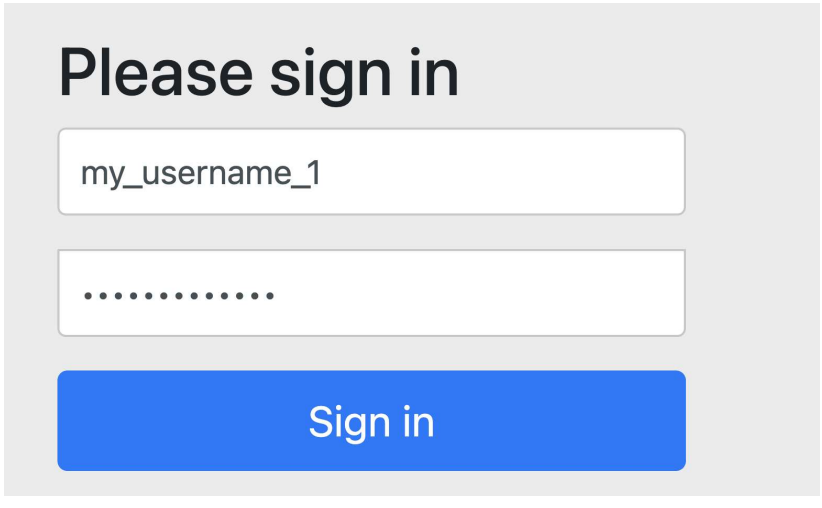


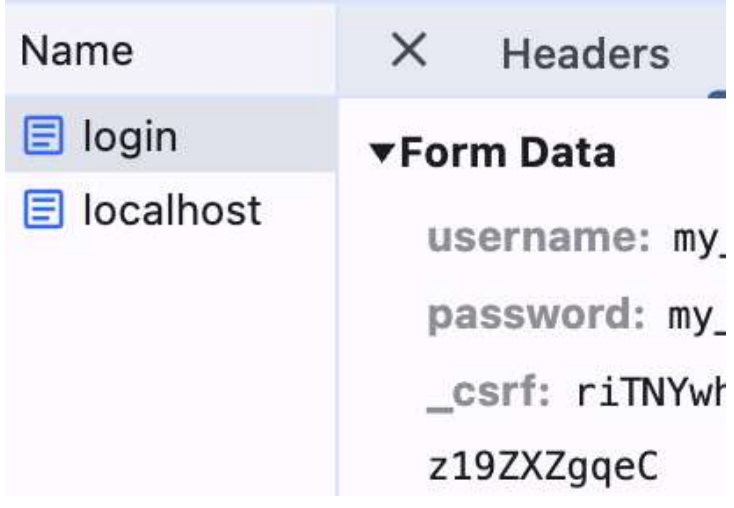
Lets say, if we want to store the hashed password (hashed using ***bcr***

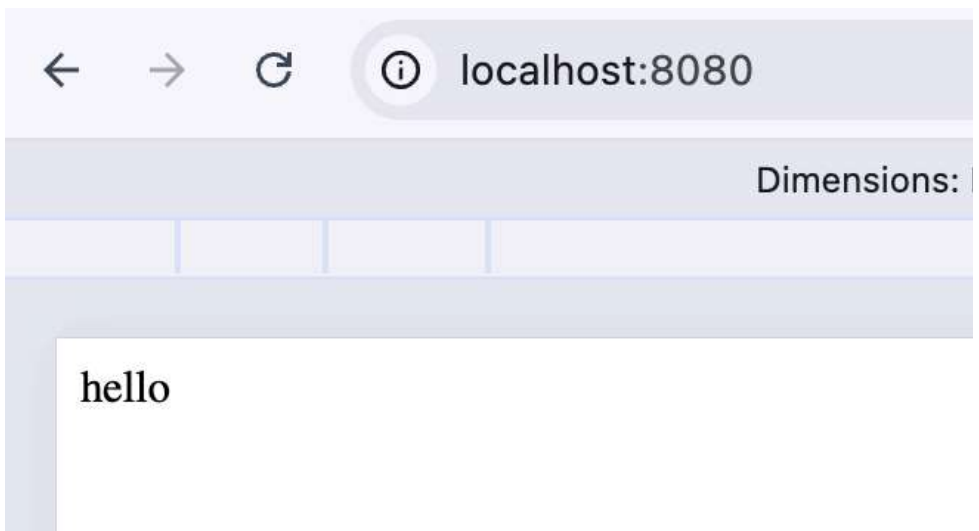
```java
@Configuration
@EnableWebSecurity
public class SecurityConfig {

    @Bean
    public UserDetailsService userDetailsService() {
        UserDetails user1 = User.withUsername("my_username_1")
                .password("{bcrypt}" + new BCryptPasswordEncoder().encode( ra
                .roles("ADMIN")
                .build();

        return new InMemoryUserDetailsManager(user1);
    }
}
```

InMemory, password is stored as : {bcrypt}hased_password
and during authentication, I am providing "my_password_1"

But still I am able to successfully authenticate because of **DelegationPasswordEncoder,** it firs
password {id} i.e. {bcrypt}, so it passes the incoming password to BcryptPasswordEncoder, ar
matching.







If, we don't want to store {bcrypt} or any other hashing algo {id} in front of password, t
PasswordEncoder to use.

Now, since we are always using 1 encoding/hashing algorithm, and control will not goe
"DelegationPasswordEncoder", and it will directly goes to specific Password Encoder, s
of password.

```java
@Configuration
@EnableWebSecurity
public class SecurityConfig {

    @Bean
    public PasswordEncoder passwordEncoder() {
        return new BCryptPasswordEncoder();
    }

    @Bean
    public UserDetailsService userDetailsService() {
        UserDetails user1 = User.withUsername("my_username_1")
                .password(new BCryptPasswordEncoder().encode( rawPassword: "my
                .roles("ADMIN")
                .build();

        return new InMemoryUserDetailsManager(user1);
    }
}
```

3rd: Storing UserName and Password (after hashed) in I
(recommended for production)

Implements UserDetails because,
During Authentication (form, basic, jwt etc..), secu
framework tries to fetch the user and return the ob

UserDetails only, if we don't implement it, then we do the mapping (from UserAuthEntity to UserDetai

UserAuthEntity.java

```java
@Entity
@Table(name = "user_auth")
public class UserAuthEntity implements UserDetails {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    @Column(unique = true, nullable = false)
    private String username;

    @Column(nullable = false)
    private String password;

    private String role;

    @Override
    public Collection<? extends GrantedAuthority> getAuthorities() {
        return List.of(new SimpleGrantedAuthority(role));
    }

    @Override
    public boolean isAccountNonExpired() { return true; }

    @Override
    public boolean isAccountNonLocked() { return true; }

    @Override
    public boolean isCredentialsNonExpired() { return true; }

    @Override
    public boolean isEnabled() { return true; }

    //getters and setters
    @Override
    public String getPassword() {
        return password;
    }

    @Override
    public String getUsername() {
        return username;
    }

    public void setPassword(String password) {
        this.password = password;
    }

    public String getRole() {
        return role;
    }

    public void setRole(String role) {
        this.role = role;
    }
}
```

```
}
```

Now, by-default in spring boot security, all the endpoints are AUTHENTICATED, username/password or JWT etc.. To access any API, so how we will access "***/au*** create user.

Yes, we have to relax the authentication for this API and its industry standard.

SecurityConfig.java

```java
@Configuration
@EnableWebSecurity
public class SecurityConfig {

    @Bean
    public PasswordEncoder passwordEncoder() {
        return new BCryptPasswordEncoder();
    }

    @Bean
    public SecurityFilterChain securityFilterChain(HttpSecurity http
        http
                .authorizeHttpRequests(auth -> auth
                        .requestMatchers( ...patterns: "/auth/register")
                        .anyRequest().authenticated()
                )
                .csrf(csrf -> csrf.disable())
                .httpBasic(Customizer.withDefaults());
        return http.build();
    }
}
```

POST localhost:8080/auth/register

Params • Authorization Headers (9) Body • Scripts Settings

none form-data x-www-form-urlencoded raw binary GraphQ

```
1  {
2      "username" : "my username",
```

```
3    "password" : "111abc",
4    "role" : "ROLE_USER"
5  }
```

Body Cookies (2) Headers (11) Test Results

Pretty Raw Preview Visualize Text

```
1  User registered successfully!
```

Run | Run Selected | Auto complete | Clear SQL statement:

```
SELECT * FROM USER_AUTH
```

SELECT * FROM USER_AUTH;

ID	PASSWORD	ROLE
1	$2a$10$euzihUhyp4exMejDkyDb0eK2q49sqTcG8EShOnT2GmaL7lxvIeOfO	ROLE_

(1 row, 3 ms)

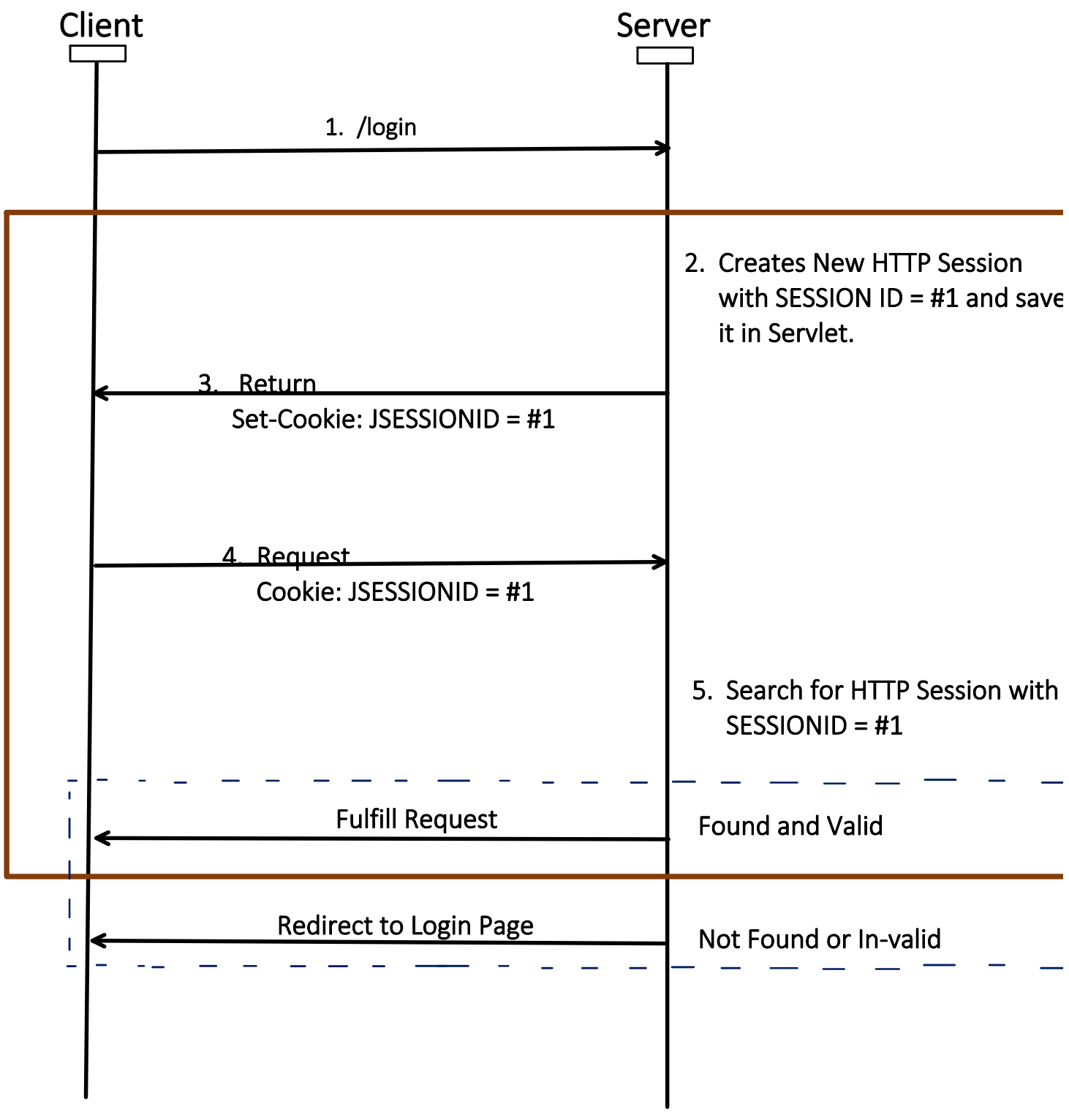
Edit

Form Login Authentication:

- It's a stateful authentication method.
  - Stateful authentication means, server maintains the user authentication state (aka Sess
  - So that user don't have to provide username/password every time with each request.
- User enters their credentials (i.e. username/password) in an HTML login form.
- On successful authentication, a session (JSESSIONID) is created to maintain the user authent different requests.
- Now, with subsequent request, client only passes JSESSIONID and not username/password. A with stored JSESSIONID.

- It's a Default Authentication Method of Springboot Security.

- Default Login URL: /login
- Default Logout URL: /logout



- By default, Time to live for the HTTP Session is 30mins (depends on servlet container).
- Yes, we can store the HTTP Session in DB too.

application.properties

```
server.servlet.session.timeout=1m
```

- Now, after 1 minute of inactivity, makes the session expires.

  Note: if user activity keeps on happening, it will keep on re-authenticating and after 1 min s

We can also store the session in the DB

Add below dependency in Pom.xml

```xml
<dependency>
    <groupId>org.springframework.session</groupId>
    <artifactId>spring-session-jdbc</artifactId>
</dependency>
```

Add below config in application.properties

```
spring.session.store-type=jdbc
spring.session.jdbc.initialize-schema=always
server.servlet.session.timeout=5m
```

- SpringBoot, will automatically create and manage "SPRING_SESSION" table for us

Run | Run Selected | Auto complete | Clear | SQL statement:

```
SELECT * FROM SPRING_SESSION
```

SELECT * FROM SPRING_SESSION;

PRIMARY_ID	SESSION_ID	CREATION_TIME	LAST_ACCESS_TIME	MAX_INACTIVE_INTERV
308bfed3-98fe-4d29-8745-b8df60b71fdc	a3d2b136-57c8-4211-983e-8cd8871385f8	1742579548528	1742579548542	300

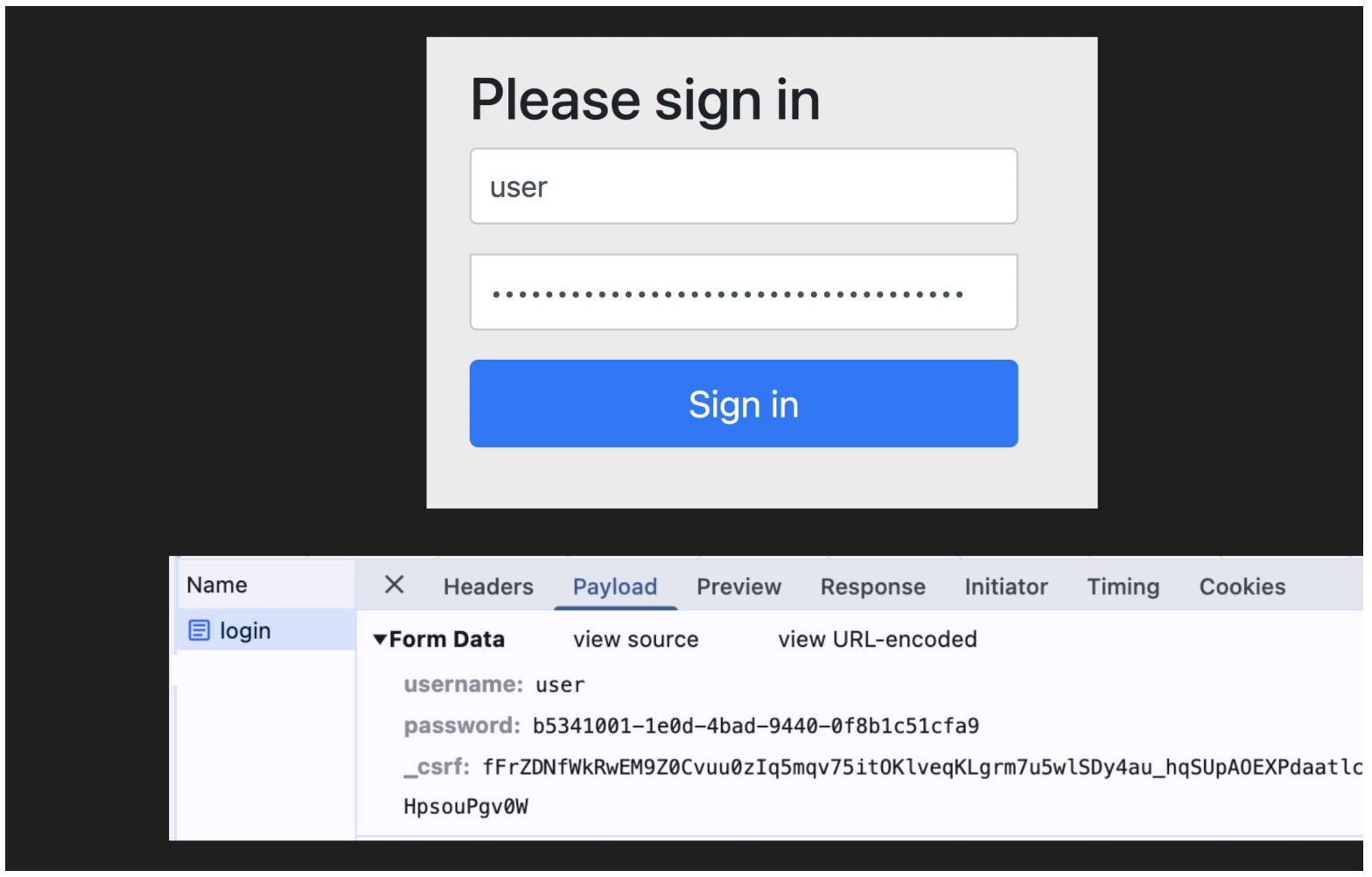
(1 row, 5 ms)

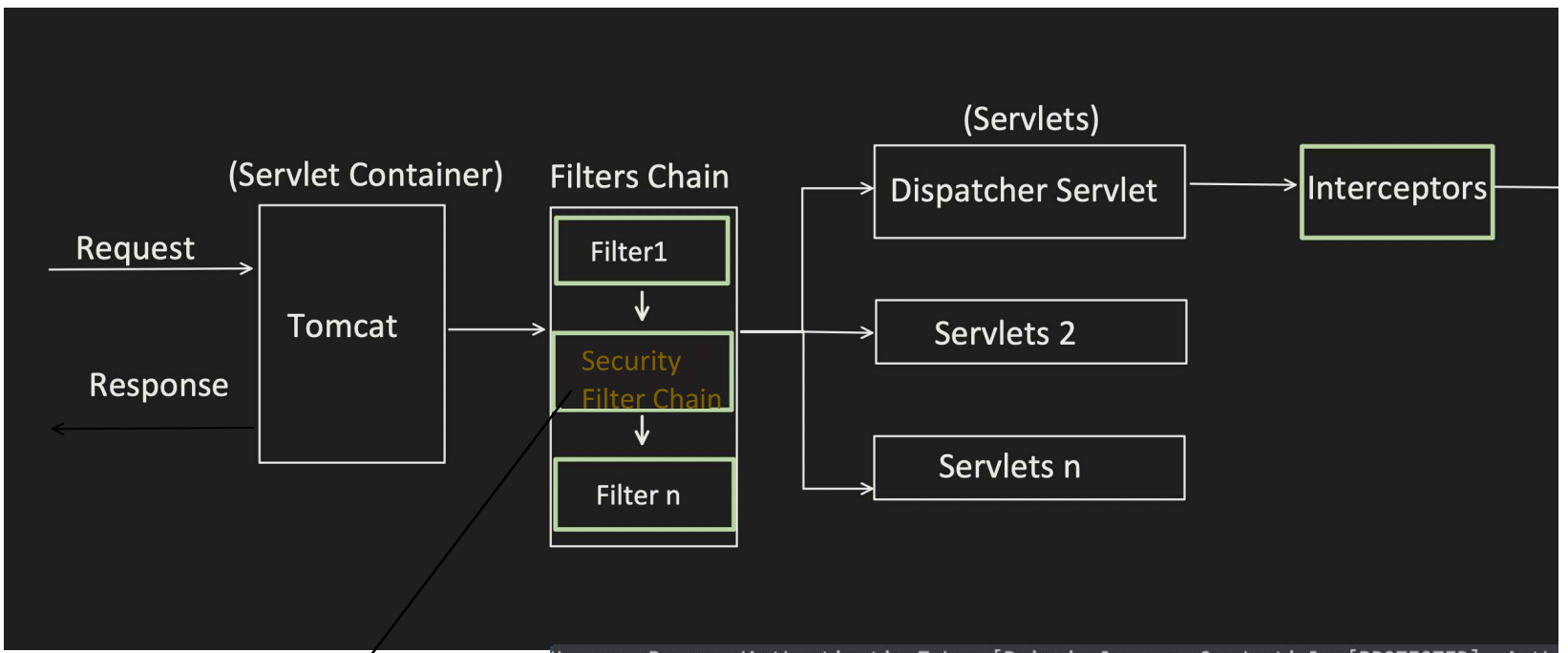
This expiry time, will kee
if user keep on sending r

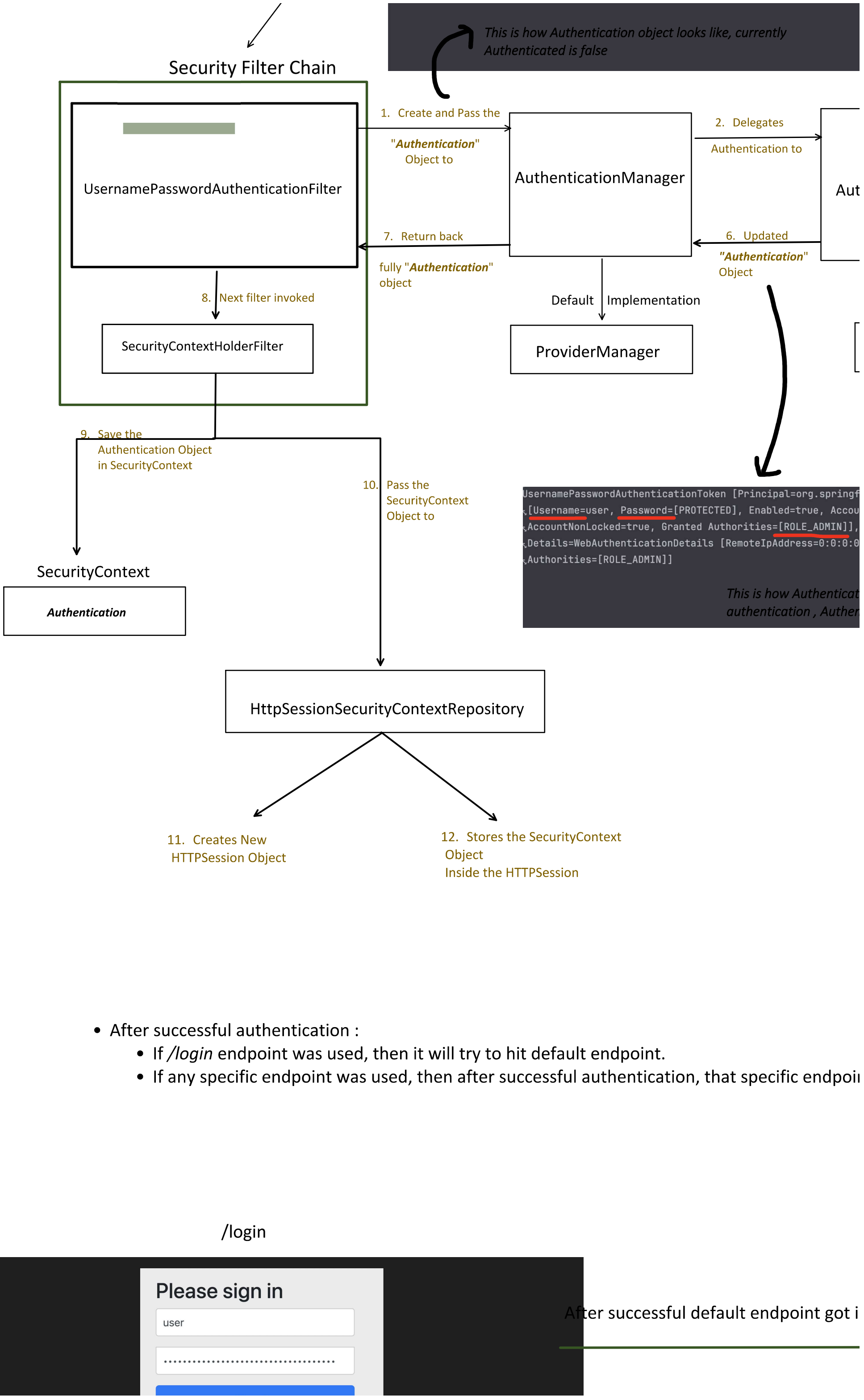
Flow diagram for Form based Authentication Method:

1. User is log-in for the first time, means Session does not exist at this point of ti

"/login" api is invoked



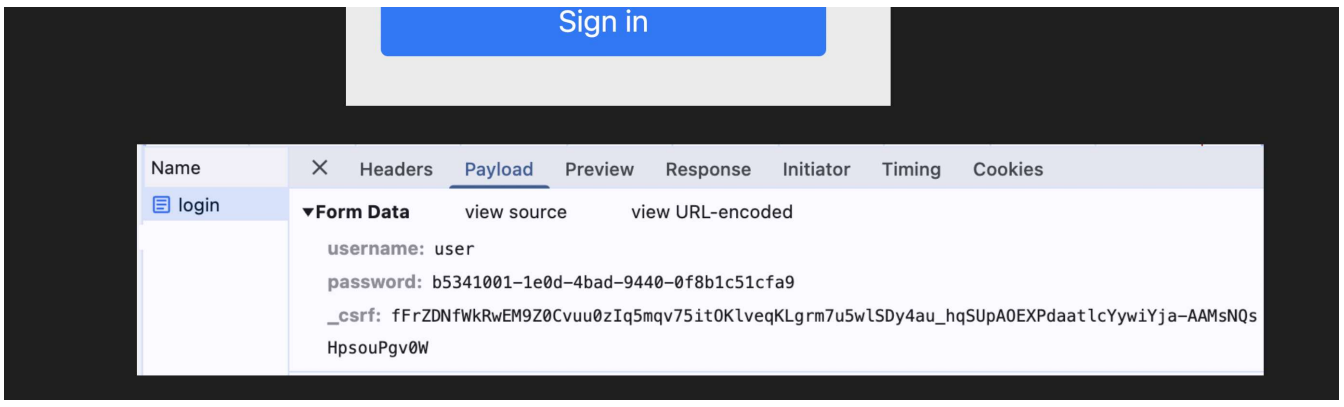




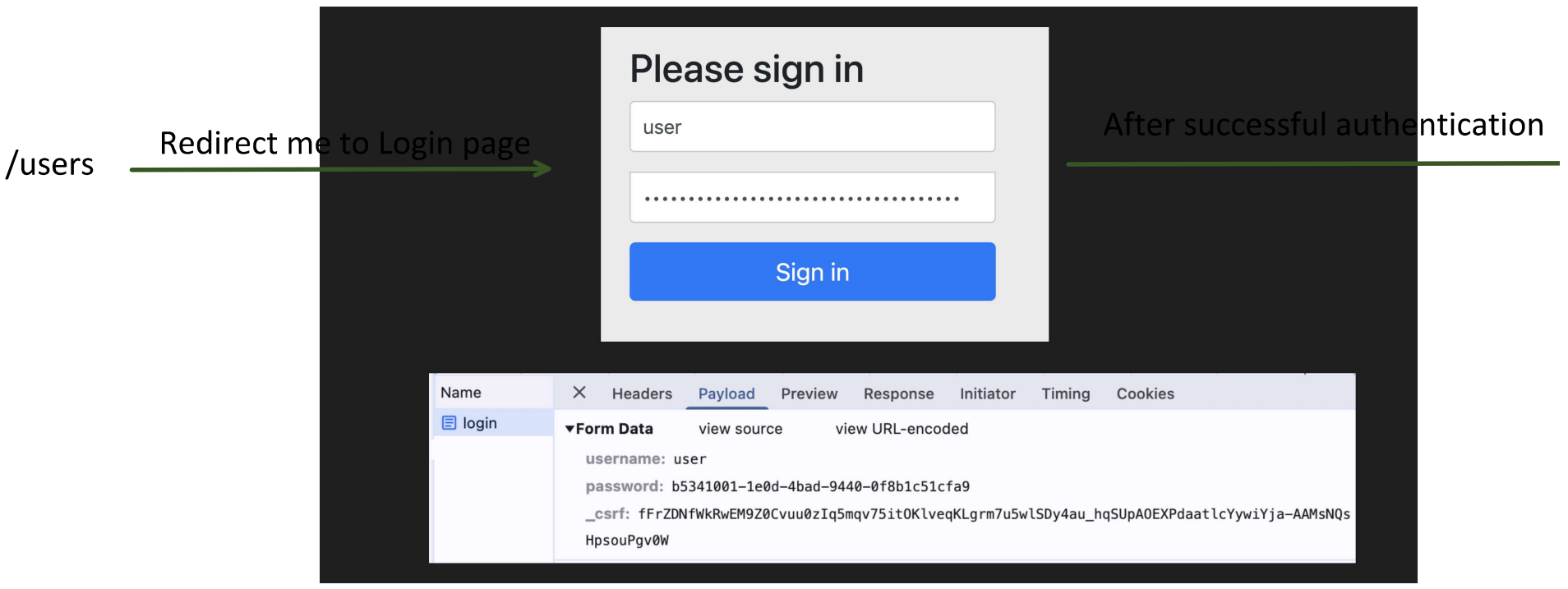
- After successful authentication :
  - If */login* endpoint was used, then it will try to hit default endpoint.
  - If any specific endpoint was used, then after successful authentication, that specific endpoi

/login

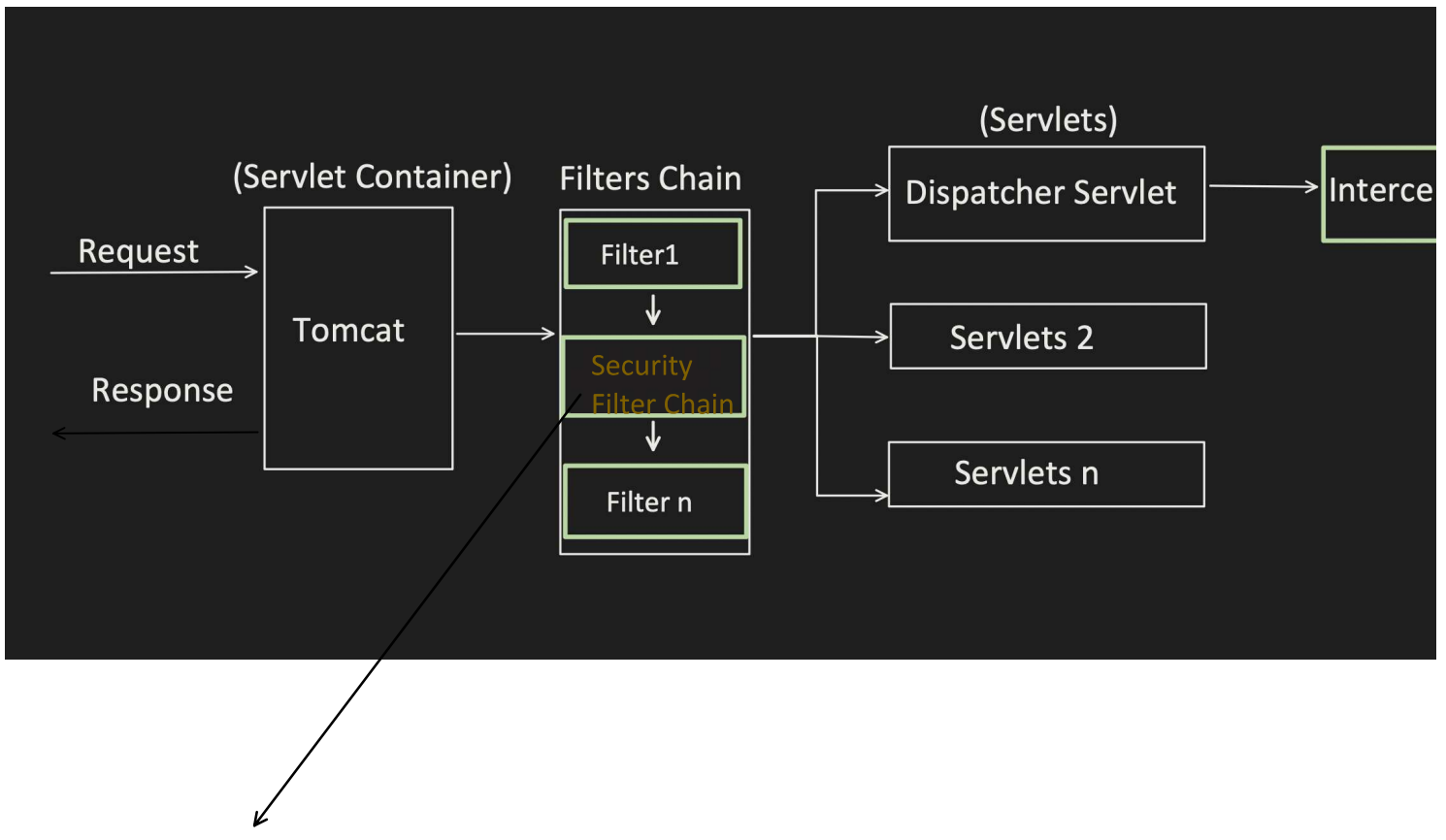
After successful default endpoint got i

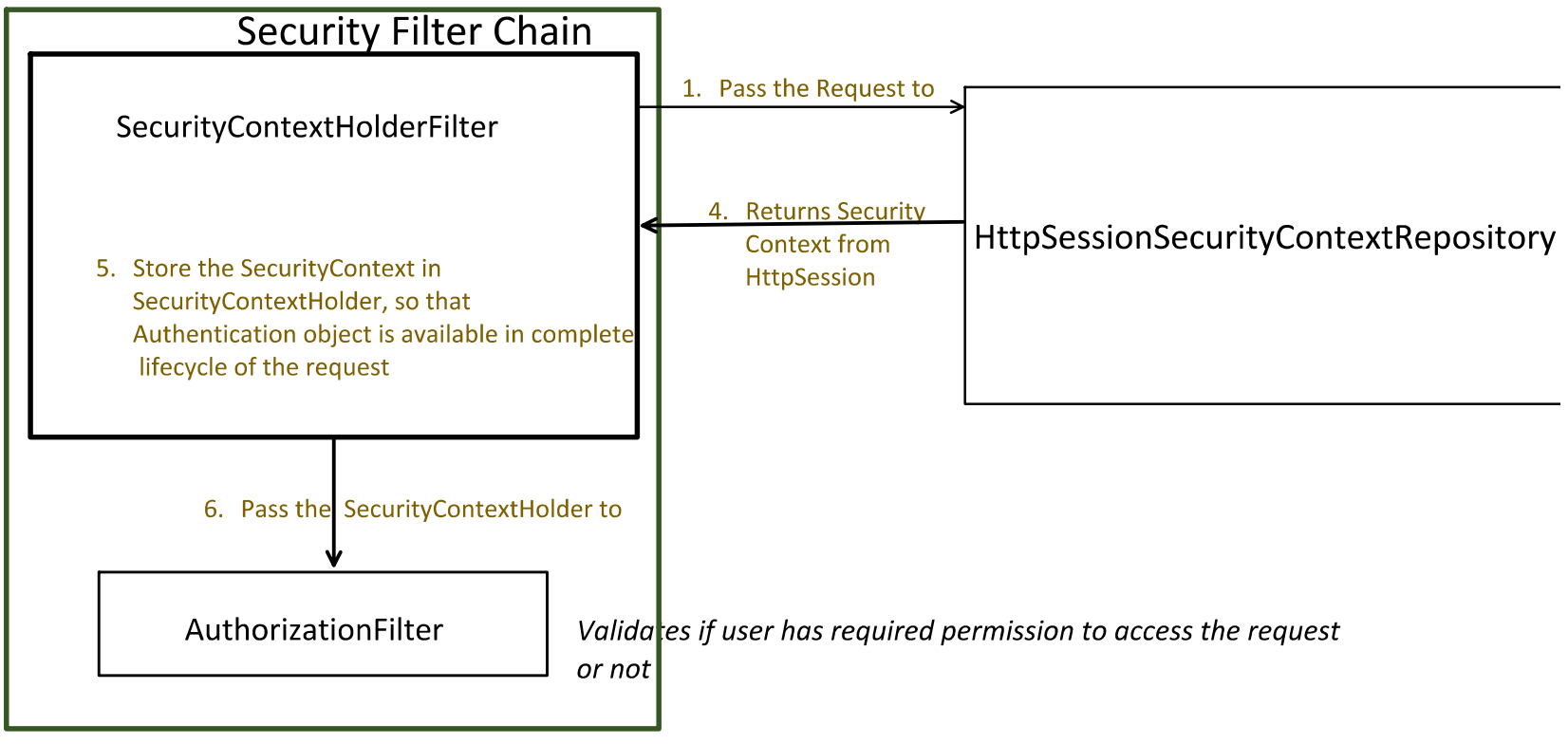



```
@GetMapping("/")
Public String hello() {
        return"hello";
  }
```



2. After Authentication, User is invoking any subsequent APIs





If we just see, we don't have to write a single line of code, its all handled via frame
As it's a default authentication method of Springboot security.

SpringBootWebSecurityConfiguration

```
@Bean
@Order(SecurityProperties.BASIC_AUTH_ORDER)
SecurityFilterChain defaultSecurityFilterChain(HttpSecurity http) throws Exceptio
    http.authorizeHttpRequests((requests) -> requests.anyRequest().authenticated(
    http.formLogin(withDefaults());
    http.httpBasic(withDefaults());
    return http.build();
}
```

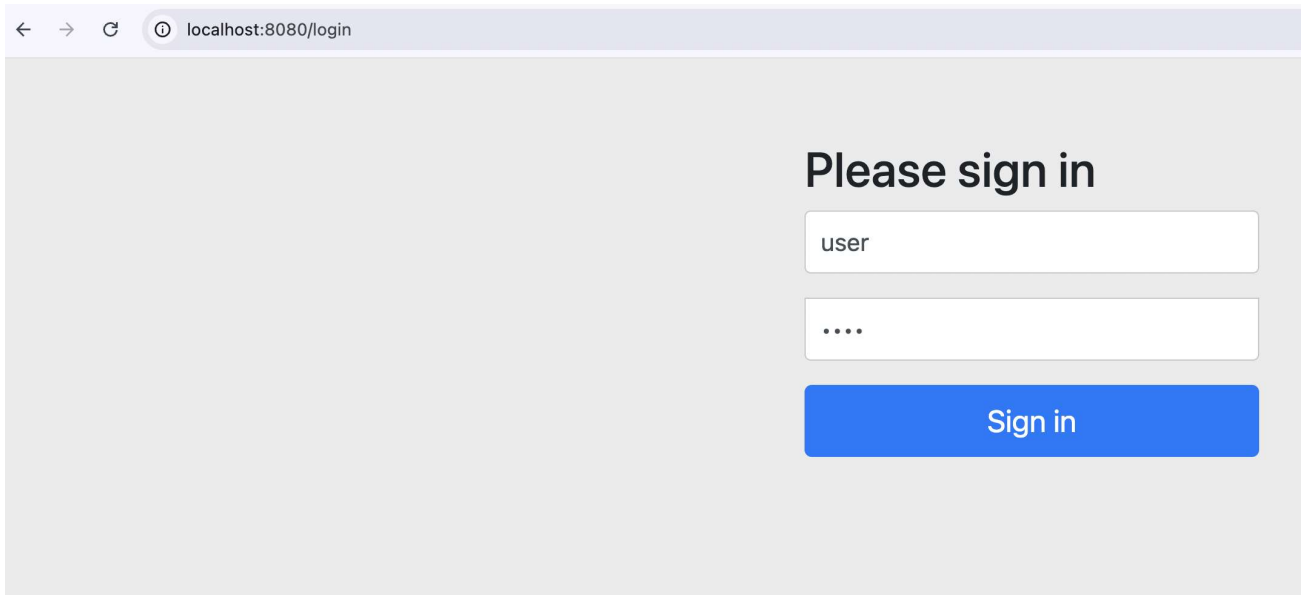
All I have added is dependency and config.

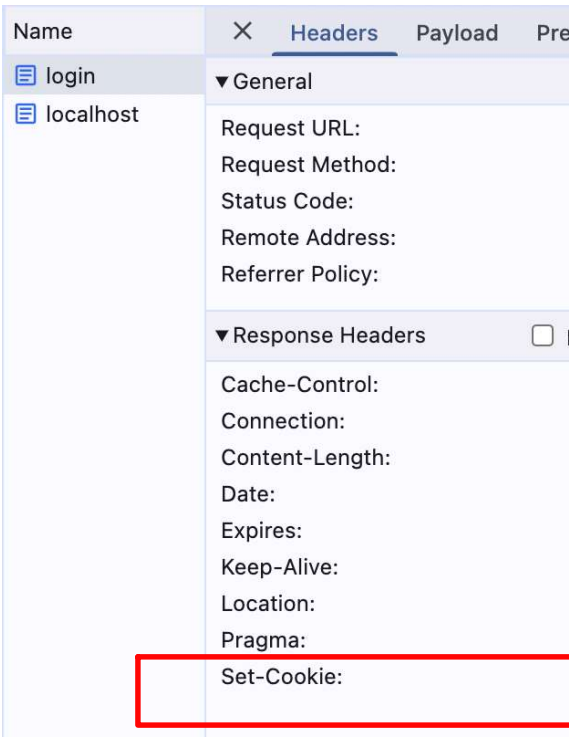
Pom.xml

```
<dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-security</artifactId>
</dependency>
<dependency>
    <groupId>org.springframework.session</groupId>
    <artifactId>spring-session-jdbc</artifactId>
</dependency>
```

Application.pr

```
spring.security.user.na
spring.security.user.pa
spring.session.store-ty
spring.session.jdbc.ini
server.servlet.session.
```





Now, lets say, I want to change few things like:

- Default login and logout page
- Need to relax authentication on few endpoints
  Etc..

  Then we can override above default SecurityFilterChain method

```
@Configuration
@EnableWebSecurity
public class SecurityConfig {

    @Bean
    public SecurityFilterChain securityFilterChain(HttpSecurity http) throws Exceptio
        http
                .authorizeHttpRequests(auth -> auth
                        .requestMatchers( ...patterns: "/users").permitAll()
                        .anyRequest().authenticated()
                )
```

```
                .formLogin(Customizer.withDefaults());
        return http.build();
    }
}
```

Now, form based Authentication is clear, but still one thing is left i.e. Author

- Once the user is Authenticated, and when user is trying to access any resource, authorization
- It is done to make sure, User has the permission to access it.
- By-default, SpringBoot Security do not put any restriction on any resource, we have to do it m

Authorization has 2 phases

Authorization check as part of SecurityFilter

Authorizati
the Securit
Controller.
{this we will c
different autl
Form Based,

```
@Configuration
@EnableWebSecurity
public class SecurityConfig {

    @Bean
    public SecurityFilterChain securityFilterChain(HttpSecurity http) throws Exception {
        http
                .authorizeHttpRequests(auth -> auth
                        .requestMatchers( ...patterns: "/users").hasRole("USER")
                        .anyRequest().authenticated()
                )
                .formLogin(Customizer.withDefaults());
        return http.build();
    }
}
```

```
#creating use
spring.securi
spring.securi
spring.securi

#just for sto
spring.sessio
spring.sessio
server.servle
```

- Now I am manually restricting that any user trying to access *"/users"* endpoint, sh have "ROLE_USER" role.
- While using hasRole, we don't need to add "ROLE_" it get appended automaticall
- Now in AuthorizationFilter, it will validate does endpoint has any restriction (i.e. u should have any specific role), if Yes, then it matches the role present in SecurityC and what is required for the endpoint.

  If required role is missing, it will throw FORBIDDEN exception.

Sat Mar 22 16:48:44 IST 2025
There was an unexpected error (type=Forbidden, status=403).

- Generally, we can give any name to the Role like ADMIN, USER , ANONYMOUS As its just a String. But should follow the proper meaning.
- Also more than 1 roles can be assigned to a User.

```java
@Configuration
@EnableWebSecurity
public class SecurityConfig {

    @Bean
    public SecurityFilterChain securityFilterChain(HttpSecurity http) throws Exception {
        http
                .authorizeHttpRequests(auth -> auth
                        .requestMatchers( ...patterns: "/users").hasAnyRole( ...roles: "USER", "ADMIN")
                        .anyRequest().authenticated()
                )
                .formLogin(Customizer.withDefaults());
        return http.build();
    }
}
```

```
#creating
spring.sec
spring.sec
spring.sec

#just for
spring.ses
spring.ses
server.ser
```

How to control the Sessions per user?

- 1 user can keep on login in different browsers, so how to restrict per user session limit.

```java
@Configuration
@EnableWebSecurity
public class SecurityConfig {
```

```
    @Bean
    public SecurityFilterChain securityFilterChain(HttpSecurity http) throws Exception {
        http
                .authorizeHttpRequests(auth -> auth
                        .requestMatchers( ...patterns: "/users").hasRole("USER")
                        .anyRequest().authenticated()
                )
                .sessionManagement(session -> session
                        .maximumSessions(1)
                    .maxSessionsPreventsLogin(true))
                .formLogin(Customizer.withDefaults());
        return http.build();
    }
}
```

What are Session Creation Policies?

```
@Configuration
@EnableWebSecurity
public class SecurityConfig {

    @Bean
    public SecurityFilterChain securityFilterChain(HttpSecurity http) throws Exception {
        http
                .authorizeHttpRequests(auth -> auth
                        .requestMatchers( ...patterns: "/users").hasRole("USER")
                        .anyRequest().authenticated()
                )
                .sessionManagement(session -> session
                        .sessionCreationPolicy(SessionCreationPolicy.IF_REQUIRED))
                .formLogin(Customizer.withDefaults());
        return http.build();
    }
}
```

IF_REQUIRED	HttpSession is only created when needed(DEFAULT). *For example:* *public api for which authentication is not required, H* *created if this policy will be chosen.*
ALWAYS	HttpSession is always created. If already present ther *For example:* *even for public api for which authentication is not rec* *will be created if this policy will be chosen.*
NEVER	Do not creates a Session, but use if present.
STATELESS	No Session is created, used for Stateless applications

Disadvantages of Form based authentication:

1. Vulnerable to Security issues like CSRF and Session hijacking :
Be default, CSRF is enabled for form based login and we should not disable it.

```java
@Configuration
@EnableWebSecurity
public class SecurityConfig {

    @Bean
    public SecurityFilterChain securityFilterChain(HttpSecurity http) throws Exception {
        http
                .authorizeHttpRequests(auth -> auth
                        .anyRequest().authenticated()
                )
                .csrf(csrf -> csrf.disable()) //we should not do this for form based authentication
                .formLogin(Customizer.withDefaults());
        return http.build();
    }
}
```

2. Session Management is big overhead and in case of distributed system it can lead t

3. Database load: if their are multiple servers then we might need to store the sessio
which again required memory and lookup time. Which can cause latency issue.