**Spring Boot Token based Authentication with Spring Security & JWT**

[Last modified: December 14, 2021](https://www.bezkoder.com/spring-boot-jwt-authentication/)  [bezkoder](https://www.bezkoder.com/author/bezkoder/)  [Security](https://www.bezkoder.com/category/security/), [Spring](https://www.bezkoder.com/category/spring/)

In this tutorial, we’re gonna build a Spring Boot Application that supports Token based Authentication with JWT. You’ll know:

* Appropriate Flow for User Signup & User Login with JWT Authentication
* Spring Boot Application Architecture with Spring Security
* How to configure Spring Security to work with JWT
* How to define Data Models and association for Authentication and Authorization
* Way to use Spring Data JPA to interact with PostgreSQL/MySQL Database

Lots of interesting things ahead, let’s explore together.

– Related Posts:

* [Spring Boot Refresh Token with JWT example](https://bezkoder.com/spring-boot-refresh-token-jwt/)
* [Spring Boot, Spring Data JPA – Building Rest CRUD API example](https://bezkoder.com/spring-boot-jpa-crud-rest-api/)
* [Spring Boot File upload example with Multipart File](https://bezkoder.com/spring-boot-file-upload/)
* [@RestControllerAdvice example in Spring Boot](https://bezkoder.com/spring-boot-restcontrolleradvice/)
* [Spring Boot @ControllerAdvice & @ExceptionHandler example](https://bezkoder.com/spring-boot-controlleradvice-exceptionhandler/)
* [@DataJpaTest example for Spring Data Repositiory Unit Test](https://bezkoder.com/spring-boot-unit-test-jpa-repo-datajpatest/)

– Using MongoDB: [Spring Boot JWT Authentication with Spring Security and MongoDB](https://bezkoder.com/spring-boot-jwt-auth-mongodb/)

– Fullstack:

* [Spring Boot + Vuejs: JWT Authentication Example](https://bezkoder.com/spring-boot-vue-js-authentication-jwt-spring-security/)
* [Spring Boot + Angular 8: JWT Authentication Example](https://bezkoder.com/angular-spring-boot-jwt-auth/)
* [Spring Boot + Angular 10: JWT Authentication Example](https://bezkoder.com/angular-10-spring-boot-jwt-auth/)
* [Spring Boot + Angular 11: JWT Authentication Example](https://bezkoder.com/angular-11-spring-boot-jwt-auth/)
* [Spring Boot + Angular 12: JWT Authentication example](https://www.bezkoder.com/angular-12-spring-boot-jwt-auth/)
* [Spring Boot + React.js: JWT Authentication example](https://bezkoder.com/spring-boot-react-jwt-auth/)

Deployment:

* [Deploy Spring Boot App on AWS – Elastic Beanstalk](https://www.bezkoder.com/deploy-spring-boot-aws-eb/)
* [Docker Compose: Spring Boot and MySQL example](https://www.bezkoder.com/docker-compose-spring-boot-mysql/)

The example that [uses HttpOnly Cookies instead](https://www.bezkoder.com/spring-boot-login-example-mysql/).

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* [Overview of Spring Boot JWT Authentication example](https://www.bezkoder.com/spring-boot-jwt-authentication/#Overview_of_Spring_Boot_JWT_Authentication_example)
* [Spring Boot Signup & Login with JWT Authentication Flow](https://www.bezkoder.com/spring-boot-jwt-authentication/#Spring_Boot_Signup_038_Login_with_JWT_Authentication_Flow)
* [Spring Boot Server Architecture with Spring Security](https://www.bezkoder.com/spring-boot-jwt-authentication/#Spring_Boot_Server_Architecture_with_Spring_Security)
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* [Implement UserDetails & UserDetailsService](https://www.bezkoder.com/spring-boot-jwt-authentication/#Implement_UserDetails_038_UserDetailsService)
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* [Handle Authentication Exception](https://www.bezkoder.com/spring-boot-jwt-authentication/#Handle_Authentication_Exception)
* [Define payloads for Spring RestController](https://www.bezkoder.com/spring-boot-jwt-authentication/#Define_payloads_for_Spring_RestController)
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**Overview of Spring Boot JWT Authentication example**

We will build a Spring Boot application in that:

* User can signup new account, or login with username & password.
* By User’s role (admin, moderator, user), we authorize the User to access resources

This is our Spring Boot application demo running with MySQL database and test Rest Apis with Postman.

These are APIs that we need to provide:

| **Methods** | **Urls** | **Actions** |
| --- | --- | --- |
| POST | /api/auth/signup | signup new account |
| POST | /api/auth/signin | login an account |
| GET | /api/test/all | retrieve public content |
| GET | /api/test/user | access User’s content |
| GET | /api/test/mod | access Moderator’s content |
| GET | /api/test/admin | access Admin’s content |

The database we will use could be PostgreSQL or MySQL depending on the way we configure project dependency & datasource.

**Spring Boot Signup & Login with JWT Authentication Flow**

The diagram shows flow of how we implement User Registration, User Login and Authorization process.

A legal JWT must be added to HTTP Authorization Header if Client accesses protected resources.

You will need to implement Refresh Token:

More details at: [Spring Boot Refresh Token with JWT example](https://bezkoder.com/spring-boot-refresh-token-jwt/)

You can also visit The example that [uses HttpOnly Cookies instead](https://www.bezkoder.com/spring-boot-login-example-mysql/).

**Spring Boot Server Architecture with Spring Security**

You can have an overview of our Spring Boot Server with the diagram below:

Now I will explain it briefly.

**Spring Security**

– [WebSecurityConfigurerAdapter](https://docs.spring.io/spring-security/site/docs/current/api/org/springframework/security/config/annotation/web/configuration/WebSecurityConfigurerAdapter.html) is the crux of our security implementation. It provides [HttpSecurity](https://docs.spring.io/spring-security/site/docs/current/reference/htmlsingle/#jc-httpsecurity) configurations to configure cors, csrf, session management, rules for protected resources. We can also extend and customize the default configuration that contains the elements below.

– [UserDetailsService](https://docs.spring.io/spring-security/site/docs/current/reference/htmlsingle/#tech-userdetailsservice) interface has a method to load User by *username* and returns a UserDetails object that Spring Security can use for authentication and validation.

– UserDetails contains necessary information (such as: username, password, authorities) to build an Authentication object.

– [UsernamePasswordAuthenticationToken](https://docs.spring.io/spring-security/site/docs/current/api/org/springframework/security/authentication/UsernamePasswordAuthenticationToken.html) gets {username, password} from login Request, AuthenticationManager will use it to authenticate a login account.

– [AuthenticationManager](https://docs.spring.io/spring-security/site/docs/current/reference/htmlsingle/#core-services-authentication-manager) has a DaoAuthenticationProvider (with help of UserDetailsService & PasswordEncoder) to validate UsernamePasswordAuthenticationToken object. If successful, AuthenticationManager returns a fully populated Authentication object (including granted authorities).

– [OncePerRequestFilter](https://docs.spring.io/spring-framework/docs/current/javadoc-api/org/springframework/web/filter/OncePerRequestFilter.html) makes a single execution for each request to our API. It provides a doFilterInternal() method that we will implement parsing & validating JWT, loading User details (using UserDetailsService), checking Authorizaion (using UsernamePasswordAuthenticationToken).

– [AuthenticationEntryPoint](https://docs.spring.io/spring-security/site/docs/current/api/org/springframework/security/web/AuthenticationEntryPoint.html) will catch authentication error.

**Repository** contains UserRepository & RoleRepository to work with Database, will be imported into **Controller**.

**Controller** receives and handles request after it was filtered by OncePerRequestFilter.

– AuthController handles signup/login requests

– TestController has accessing protected resource methods with role based validations.

Understand the architecture deeply and grasp the overview more easier:  
[Spring Boot Architecture for JWT with Spring Security](https://bezkoder.com/spring-boot-jwt-mysql-spring-security-architecture/)

**Technology**

* Java 8
* Spring Boot 2.6.1 (with Spring Security, Spring Web, Spring Data JPA)
* jjwt 0.9.1
* PostgreSQL/MySQL
* Maven 3.6.1

**Project Structure**

This is folders & files structure for our Spring Boot application:

**security**: we configure Spring Security & implement Security Objects here.

* WebSecurityConfig extends WebSecurityConfigurerAdapter
* UserDetailsServiceImpl implements UserDetailsService
* UserDetailsImpl implements UserDetails
* AuthEntryPointJwt implements AuthenticationEntryPoint
* AuthTokenFilter extends OncePerRequestFilter
* JwtUtils provides methods for generating, parsing, validating JWT

**controllers** handle signup/login requests & authorized requests.

* AuthController: @PostMapping(‘/signin’), @PostMapping(‘/signup’)
* TestController: @GetMapping(‘/api/test/all’), @GetMapping(‘/api/test/[role]’)

**repository** has intefaces that extend Spring Data JPA JpaRepository to interact with Database.

* UserRepository extends JpaRepository<User, Long>
* RoleRepository extends JpaRepository<Role, Long>

**models** defines two main models for Authentication (User) & Authorization (Role). They have many-to-many relationship.

* User: id, username, email, password, roles
* Role: id, name

**payload** defines classes for Request and Response objects

We also have **application.properties** for configuring Spring Datasource, Spring Data JPA and App properties (such as JWT Secret string or Token expiration time).

**Setup new Spring Boot project**

Use [Spring web tool](https://start.spring.io/) or your development tool ([Spring Tool Suite](https://spring.io/tools), Eclipse, [Intellij](https://www.jetbrains.com/idea/download/)) to create a Spring Boot project.

Then open **pom.xml** and add these dependencies:

<dependency>

<groupId>org.springframework.boot</groupId>

<artifactId>spring-boot-starter-data-jpa</artifactId>

</dependency>

<dependency>

<groupId>org.springframework.boot</groupId>

<artifactId>spring-boot-starter-security</artifactId>

</dependency>

<dependency>

<groupId>org.springframework.boot</groupId>

<artifactId>spring-boot-starter-web</artifactId>

</dependency>

<dependency>

<groupId>io.jsonwebtoken</groupId>

<artifactId>jjwt</artifactId>

<version>0.9.1</version>

</dependency>

We also need to add one more dependency.  
– If you want to use **PostgreSQL**:

<dependency>

<groupId>org.postgresql</groupId>

<artifactId>postgresql</artifactId>

<scope>runtime</scope>

</dependency>

– or **MySQL** is your choice:

<dependency>

<groupId>mysql</groupId>

<artifactId>mysql-connector-java</artifactId>

<scope>runtime</scope>

</dependency>

**Configure Spring Datasource, JPA, App properties**

Under *src/main/resources* folder, open *application.properties*, add some new lines.

**For PostgreSQL**

spring.datasource.url= jdbc:postgresql://localhost:5432/testdb

spring.datasource.username= postgres

spring.datasource.password= 123

spring.jpa.properties.hibernate.jdbc.lob.non\_contextual\_creation= true

spring.jpa.properties.hibernate.dialect= org.hibernate.dialect.PostgreSQLDialect

# Hibernate ddl auto (create, create-drop, validate, update)

spring.jpa.hibernate.ddl-auto= update

# App Properties

bezkoder.app.jwtSecret= bezKoderSecretKey

bezkoder.app.jwtExpirationMs= 86400000

**For MySQL**

spring.datasource.url= jdbc:mysql://localhost:3306/testdb?useSSL=false

spring.datasource.username= root

spring.datasource.password= 123456

spring.jpa.properties.hibernate.dialect= org.hibernate.dialect.MySQL5InnoDBDialect

spring.jpa.hibernate.ddl-auto= update

# App Properties

bezkoder.app.jwtSecret= bezKoderSecretKey

bezkoder.app.jwtExpirationMs= 86400000

**Create the models**

We’re gonna have 3 tables in database: **users**, **roles** and **user\_roles** for many-to-many relationship.

Let’s define these models.  
In *models* package, create 3 files:

**ERole enum** in *ERole.java*.  
In this example, we have 3 roles corresponding to 3 enum.

package com.bezkoder.springjwt.models;

public enum ERole {

ROLE\_USER,

ROLE\_MODERATOR,

ROLE\_ADMIN

}

**Role model** in *Role.java*

package com.bezkoder.springjwt.models;

import javax.persistence.\*;

@Entity

@Table(name = "roles")

public class Role {

@Id

@GeneratedValue(strategy = GenerationType.IDENTITY)

private Integer id;

@Enumerated(EnumType.STRING)

@Column(length = 20)

private ERole name;

public Role() {

}

public Role(ERole name) {

this.name = name;

}

public Integer getId() {

return id;

}

public void setId(Integer id) {

this.id = id;

}

public ERole getName() {

return name;

}

public void setName(ERole name) {

this.name = name;

}

}

**User model** in *User.java*.  
It has 5 fields: id, username, email, password, roles.

package com.bezkoder.springjwt.models;

import java.util.HashSet;

import java.util.Set;

import javax.persistence.\*;

import javax.validation.constraints.Email;

import javax.validation.constraints.NotBlank;

import javax.validation.constraints.Size;

@Entity

@Table( name = "users",

uniqueConstraints = {

@UniqueConstraint(columnNames = "username"),

@UniqueConstraint(columnNames = "email")

})

public class User {

@Id

@GeneratedValue(strategy = GenerationType.IDENTITY)

private Long id;

@NotBlank

@Size(max = 20)

private String username;

@NotBlank

@Size(max = 50)

@Email

private String email;

@NotBlank

@Size(max = 120)

private String password;

@ManyToMany(fetch = FetchType.LAZY)

@JoinTable( name = "user\_roles",

joinColumns = @JoinColumn(name = "user\_id"),

inverseJoinColumns = @JoinColumn(name = "role\_id"))

private Set<Role> roles = new HashSet<>();

public User() {

}

public User(String username, String email, String password) {

this.username = username;

this.email = email;

this.password = password;

}

public Long getId() {

return id;

}

public void setId(Long id) {

this.id = id;

}

public String getUsername() {

return username;

}

public void setUsername(String username) {

this.username = username;

}

public String getEmail() {

return email;

}

public void setEmail(String email) {

this.email = email;

}

public String getPassword() {

return password;

}

public void setPassword(String password) {

this.password = password;

}

public Set<Role> getRoles() {

return roles;

}

public void setRoles(Set<Role> roles) {

this.roles = roles;

}

}

**Implement Repositories**

Now, each model above needs a repository for persisting and accessing data. In *repository* package, let’s create 2 repositories.

**UserRepository**

There are 3 necessary methods that JpaRepository supports.

package com.bezkoder.springjwt.repository;

import java.util.Optional;

import org.springframework.data.jpa.repository.JpaRepository;

import org.springframework.stereotype.Repository;

import com.bezkoder.springjwt.models.User;

@Repository

public interface UserRepository extends JpaRepository<User, Long> {

Optional<User> findByUsername(String username);

Boolean existsByUsername(String username);

Boolean existsByEmail(String email);

}

**RoleRepository**

This repository also extends JpaRepository and provides a finder method.

package com.bezkoder.springjwt.repository;

import java.util.Optional;

import org.springframework.data.jpa.repository.JpaRepository;

import org.springframework.stereotype.Repository;

import com.bezkoder.springjwt.models.ERole;

import com.bezkoder.springjwt.models.Role;

@Repository

public interface RoleRepository extends JpaRepository<Role, Long> {

Optional<Role> findByName(ERole name);

}

**Configure Spring Security**

In *security* package, create WebSecurityConfig class that extends WebSecurityConfigurerAdapter.

*WebSecurityConfig.java*

package com.bezkoder.springjwt.security;

import org.springframework.beans.factory.annotation.Autowired;

import org.springframework.context.annotation.Bean;

import org.springframework.context.annotation.Configuration;

import org.springframework.security.authentication.AuthenticationManager;

import org.springframework.security.config.annotation.authentication.builders.AuthenticationManagerBuilder;

import org.springframework.security.config.annotation.method.configuration.EnableGlobalMethodSecurity;

import org.springframework.security.config.annotation.web.builders.HttpSecurity;

import org.springframework.security.config.annotation.web.configuration.EnableWebSecurity;

import org.springframework.security.config.annotation.web.configuration.WebSecurityConfigurerAdapter;

import org.springframework.security.config.http.SessionCreationPolicy;

import org.springframework.security.crypto.bcrypt.BCryptPasswordEncoder;

import org.springframework.security.crypto.password.PasswordEncoder;

import org.springframework.security.web.authentication.UsernamePasswordAuthenticationFilter;

import com.bezkoder.springjwt.security.jwt.AuthEntryPointJwt;

import com.bezkoder.springjwt.security.jwt.AuthTokenFilter;

import com.bezkoder.springjwt.security.services.UserDetailsServiceImpl;

@Configuration

@EnableWebSecurity

@EnableGlobalMethodSecurity(

// securedEnabled = true,

// jsr250Enabled = true,

prePostEnabled = true)

public class WebSecurityConfig extends WebSecurityConfigurerAdapter {

@Autowired

UserDetailsServiceImpl userDetailsService;

@Autowired

private AuthEntryPointJwt unauthorizedHandler;

@Bean

public AuthTokenFilter authenticationJwtTokenFilter() {

return new AuthTokenFilter();

}

@Override

public void configure(AuthenticationManagerBuilder authenticationManagerBuilder) throws Exception {

authenticationManagerBuilder.userDetailsService(userDetailsService).passwordEncoder(passwordEncoder());

}

@Bean

@Override

public AuthenticationManager authenticationManagerBean() throws Exception {

return super.authenticationManagerBean();

}

@Bean

public PasswordEncoder passwordEncoder() {

return new BCryptPasswordEncoder();

}

@Override

protected void configure(HttpSecurity http) throws Exception {

http.cors().and().csrf().disable()

.exceptionHandling().authenticationEntryPoint(unauthorizedHandler).and()

.sessionManagement().sessionCreationPolicy(SessionCreationPolicy.STATELESS).and()

.authorizeRequests().antMatchers("/api/auth/\*\*").permitAll()

.antMatchers("/api/test/\*\*").permitAll()

.anyRequest().authenticated();

http.addFilterBefore(authenticationJwtTokenFilter(), UsernamePasswordAuthenticationFilter.class);

}

}

Let me explain the code above.

– @EnableWebSecurity allows Spring to find and automatically apply the class to the global Web Security.

– @EnableGlobalMethodSecurity provides AOP security on methods. It enables @PreAuthorize, @PostAuthorize, it also supports [JSR-250](https://en.wikipedia.org/wiki/JSR_250). You can find more parameters in configuration in [Method Security Expressions](https://docs.spring.io/spring-security/site/docs/current/reference/htmlsingle/#method-security-expressions).

– We override the configure(HttpSecurity http) method from WebSecurityConfigurerAdapter interface. It tells Spring Security how we configure CORS and CSRF, when we want to require all users to be authenticated or not, which filter (AuthTokenFilter) and when we want it to work (filter before UsernamePasswordAuthenticationFilter), which Exception Handler is chosen (AuthEntryPointJwt).

– Spring Security will load User details to perform authentication & authorization. So it has UserDetailsService interface that we need to implement.

– The implementation of UserDetailsService will be used for configuring DaoAuthenticationProvider by AuthenticationManagerBuilder.userDetailsService() method.

– We also need a PasswordEncoder for the DaoAuthenticationProvider. If we don’t specify, it will use plain text.

**Implement UserDetails & UserDetailsService**

If the authentication process is successful, we can get User’s information such as username, password, authorities from an Authentication object.

Authentication authentication =

authenticationManager.authenticate(

new UsernamePasswordAuthenticationToken(username, password)

);

UserDetails userDetails = (UserDetails) authentication.getPrincipal();

// userDetails.getUsername()

// userDetails.getPassword()

// userDetails.getAuthorities()

If we want to get more data (id, email…), we can create an implementation of this UserDetails interface.

*security/services/UserDetailsImpl.java*

package com.bezkoder.springjwt.security.services;

import java.util.Collection;

import java.util.List;

import java.util.Objects;

import java.util.stream.Collectors;

import org.springframework.security.core.GrantedAuthority;

import org.springframework.security.core.authority.SimpleGrantedAuthority;

import org.springframework.security.core.userdetails.UserDetails;

import com.bezkoder.springjwt.models.User;

import com.fasterxml.jackson.annotation.JsonIgnore;

public class UserDetailsImpl implements UserDetails {

private static final long serialVersionUID = 1L;

private Long id;

private String username;

private String email;

@JsonIgnore

private String password;

private Collection<? extends GrantedAuthority> authorities;

public UserDetailsImpl(Long id, String username, String email, String password,

Collection<? extends GrantedAuthority> authorities) {

this.id = id;

this.username = username;

this.email = email;

this.password = password;

this.authorities = authorities;

}

public static UserDetailsImpl build(User user) {

List<GrantedAuthority> authorities = user.getRoles().stream()

.map(role -> new SimpleGrantedAuthority(role.getName().name()))

.collect(Collectors.toList());

return new UserDetailsImpl(

user.getId(),

user.getUsername(),

user.getEmail(),

user.getPassword(),

authorities);

}

@Override

public Collection<? extends GrantedAuthority> getAuthorities() {

return authorities;

}

public Long getId() {

return id;

}

public String getEmail() {

return email;

}

@Override

public String getPassword() {

return password;

}

@Override

public String getUsername() {

return username;

}

@Override

public boolean isAccountNonExpired() {

return true;

}

@Override

public boolean isAccountNonLocked() {

return true;

}

@Override

public boolean isCredentialsNonExpired() {

return true;

}

@Override

public boolean isEnabled() {

return true;

}

@Override

public boolean equals(Object o) {

if (this == o)

return true;

if (o == null || getClass() != o.getClass())

return false;

UserDetailsImpl user = (UserDetailsImpl) o;

return Objects.equals(id, user.id);

}

}

Look at the code above, you can notice that we convert Set<Role> into List<GrantedAuthority>. It is important to work with Spring Security and Authentication object later.

As I have said before, we need UserDetailsService for getting UserDetails object. You can look at UserDetailsService interface that has only one method:

public interface UserDetailsService {

UserDetails loadUserByUsername(String username) throws UsernameNotFoundException;

}

So we implement it and override loadUserByUsername() method.

*security/services/UserDetailsServiceImpl.java*

package com.bezkoder.springjwt.security.services;

import org.springframework.beans.factory.annotation.Autowired;

import org.springframework.security.core.userdetails.UserDetails;

import org.springframework.security.core.userdetails.UserDetailsService;

import org.springframework.security.core.userdetails.UsernameNotFoundException;

import org.springframework.stereotype.Service;

import org.springframework.transaction.annotation.Transactional;

import com.bezkoder.springjwt.models.User;

import com.bezkoder.springjwt.repository.UserRepository;

@Service

public class UserDetailsServiceImpl implements UserDetailsService {

@Autowired

UserRepository userRepository;

@Override

@Transactional

public UserDetails loadUserByUsername(String username) throws UsernameNotFoundException {

User user = userRepository.findByUsername(username)

.orElseThrow(() -> new UsernameNotFoundException("User Not Found with username: " + username));

return UserDetailsImpl.build(user);

}

}

In the code above, we get full custom User object using UserRepository, then we build a UserDetails object using static build() method.

**Filter the Requests**

Let’s define a filter that executes once per request. So we create AuthTokenFilter class that extends OncePerRequestFilter and override doFilterInternal() method.

*security/jwt/AuthTokenFilter.java*

package com.bezkoder.springjwt.security.jwt;

import java.io.IOException;

import javax.servlet.FilterChain;

import javax.servlet.ServletException;

import javax.servlet.http.HttpServletRequest;

import javax.servlet.http.HttpServletResponse;

import org.slf4j.Logger;

import org.slf4j.LoggerFactory;

import org.springframework.beans.factory.annotation.Autowired;

import org.springframework.security.authentication.UsernamePasswordAuthenticationToken;

import org.springframework.security.core.context.SecurityContextHolder;

import org.springframework.security.core.userdetails.UserDetails;

import org.springframework.security.web.authentication.WebAuthenticationDetailsSource;

import org.springframework.util.StringUtils;

import org.springframework.web.filter.OncePerRequestFilter;

import com.bezkoder.springjwt.security.services.UserDetailsServiceImpl;

public class AuthTokenFilter extends OncePerRequestFilter {

@Autowired

private JwtUtils jwtUtils;

@Autowired

private UserDetailsServiceImpl userDetailsService;

private static final Logger logger = LoggerFactory.getLogger(AuthTokenFilter.class);

@Override

protected void doFilterInternal(HttpServletRequest request, HttpServletResponse response, FilterChain filterChain)

throws ServletException, IOException {

try {

String jwt = parseJwt(request);

if (jwt != null && jwtUtils.validateJwtToken(jwt)) {

String username = jwtUtils.getUserNameFromJwtToken(jwt);

UserDetails userDetails = userDetailsService.loadUserByUsername(username);

UsernamePasswordAuthenticationToken authentication = new UsernamePasswordAuthenticationToken(

userDetails, null, userDetails.getAuthorities());

authentication.setDetails(new WebAuthenticationDetailsSource().buildDetails(request));

SecurityContextHolder.getContext().setAuthentication(authentication);

}

} catch (Exception e) {

logger.error("Cannot set user authentication: {}", e);

}

filterChain.doFilter(request, response);

}

private String parseJwt(HttpServletRequest request) {

String headerAuth = request.getHeader("Authorization");

if (StringUtils.hasText(headerAuth) && headerAuth.startsWith("Bearer ")) {

return headerAuth.substring(7, headerAuth.length());

}

return null;

}

}

What we do inside doFilterInternal():  
– get JWT from the Authorization header (by removing Bearer prefix)  
– if the request has JWT, validate it, parse username from it  
– from username, get UserDetails to create an Authentication object  
– set the current UserDetails in [SecurityContext](https://docs.spring.io/spring-security/site/docs/current/reference/htmlsingle/#securitycontextholder-securitycontext-and-authentication-objects) using setAuthentication(authentication) method.

After this, everytime you want to get UserDetails, just use SecurityContext like this:

UserDetails userDetails =

(UserDetails) SecurityContextHolder.getContext().getAuthentication().getPrincipal();

// userDetails.getUsername()

// userDetails.getPassword()

// userDetails.getAuthorities()

**Create JWT Utility class**

This class has 3 funtions:

* generate a JWT from username, date, expiration, secret
* get username from JWT
* validate a JWT

*security/jwt/JwtUtils.java*

package com.bezkoder.springjwt.security.jwt;

import java.util.Date;

import org.slf4j.Logger;

import org.slf4j.LoggerFactory;

import org.springframework.beans.factory.annotation.Value;

import org.springframework.security.core.Authentication;

import org.springframework.stereotype.Component;

import com.bezkoder.springjwt.security.services.UserDetailsImpl;

import io.jsonwebtoken.\*;

@Component

public class JwtUtils {

private static final Logger logger = LoggerFactory.getLogger(JwtUtils.class);

@Value("${bezkoder.app.jwtSecret}")

private String jwtSecret;

@Value("${bezkoder.app.jwtExpirationMs}")

private int jwtExpirationMs;

public String generateJwtToken(Authentication authentication) {

UserDetailsImpl userPrincipal = (UserDetailsImpl) authentication.getPrincipal();

return Jwts.builder()

.setSubject((userPrincipal.getUsername()))

.setIssuedAt(new Date())

.setExpiration(new Date((new Date()).getTime() + jwtExpirationMs))

.signWith(SignatureAlgorithm.HS512, jwtSecret)

.compact();

}

public String getUserNameFromJwtToken(String token) {

return Jwts.parser().setSigningKey(jwtSecret).parseClaimsJws(token).getBody().getSubject();

}

public boolean validateJwtToken(String authToken) {

try {

Jwts.parser().setSigningKey(jwtSecret).parseClaimsJws(authToken);

return true;

} catch (SignatureException e) {

logger.error("Invalid JWT signature: {}", e.getMessage());

} catch (MalformedJwtException e) {

logger.error("Invalid JWT token: {}", e.getMessage());

} catch (ExpiredJwtException e) {

logger.error("JWT token is expired: {}", e.getMessage());

} catch (UnsupportedJwtException e) {

logger.error("JWT token is unsupported: {}", e.getMessage());

} catch (IllegalArgumentException e) {

logger.error("JWT claims string is empty: {}", e.getMessage());

}

return false;

}

}

Remember that we’ve added bezkoder.app.jwtSecret and bezkoder.app.jwtExpirationMs properties in application.properties file.

**Handle Authentication Exception**

Now we create AuthEntryPointJwt class that implements AuthenticationEntryPoint interface. Then we override the commence() method. This method will be triggerd anytime unauthenticated User requests a secured HTTP resource and an AuthenticationException is thrown.

*security/jwt/AuthEntryPointJwt.java*

package com.bezkoder.springjwt.security.jwt;

import java.io.IOException;

import javax.servlet.ServletException;

import javax.servlet.http.HttpServletRequest;

import javax.servlet.http.HttpServletResponse;

import org.slf4j.Logger;

import org.slf4j.LoggerFactory;

import org.springframework.security.core.AuthenticationException;

import org.springframework.security.web.AuthenticationEntryPoint;

import org.springframework.stereotype.Component;

@Component

public class AuthEntryPointJwt implements AuthenticationEntryPoint {

private static final Logger logger = LoggerFactory.getLogger(AuthEntryPointJwt.class);

@Override

public void commence(HttpServletRequest request, HttpServletResponse response,

AuthenticationException authException) throws IOException, ServletException {

logger.error("Unauthorized error: {}", authException.getMessage());

response.sendError(HttpServletResponse.SC\_UNAUTHORIZED, "Error: Unauthorized");

}

}

HttpServletResponse.SC\_UNAUTHORIZED is the **401** Status code. It indicates that the request requires HTTP authentication.

We’ve already built all things for Spring Security. The next sections of this tutorial will show you how to implement Controllers for our RestAPIs.

**Define payloads for Spring RestController**

Let me summarize the payloads for our RestAPIs:  
– Requests:

* LoginRequest: { username, password }
* SignupRequest: { username, email, password }

– Responses:

* JwtResponse: { token, type, id, username, email, roles }
* MessageResponse: { message }

To keep the tutorial not so long, I don’t show these POJOs here.  
You can find details for payload classes in source code of the project on [Github](https://github.com/bezkoder/spring-boot-spring-security-jwt-authentication).

**Create Spring RestAPIs Controllers**

**Controller for Authentication**

This controller provides APIs for register and login actions.

– /api/auth/signup

* check existing username/email
* create new User (with ROLE\_USER if not specifying role)
* save User to database using UserRepository

– /api/auth/signin

* authenticate { username, pasword }
* update SecurityContext using Authentication object
* generate JWT
* get UserDetails from Authentication object
* response contains JWT and UserDetails data

*controllers/AuthController.java*

package com.bezkoder.springjwt.controllers;

import java.util.HashSet;

import java.util.List;

import java.util.Set;

import java.util.stream.Collectors;

import javax.validation.Valid;

import org.springframework.beans.factory.annotation.Autowired;

import org.springframework.http.ResponseEntity;

import org.springframework.security.authentication.AuthenticationManager;

import org.springframework.security.authentication.UsernamePasswordAuthenticationToken;

import org.springframework.security.core.Authentication;

import org.springframework.security.core.context.SecurityContextHolder;

import org.springframework.security.crypto.password.PasswordEncoder;

import org.springframework.web.bind.annotation.CrossOrigin;

import org.springframework.web.bind.annotation.PostMapping;

import org.springframework.web.bind.annotation.RequestBody;

import org.springframework.web.bind.annotation.RequestMapping;

import org.springframework.web.bind.annotation.RestController;

import com.bezkoder.springjwt.models.ERole;

import com.bezkoder.springjwt.models.Role;

import com.bezkoder.springjwt.models.User;

import com.bezkoder.springjwt.payload.request.LoginRequest;

import com.bezkoder.springjwt.payload.request.SignupRequest;

import com.bezkoder.springjwt.payload.response.JwtResponse;

import com.bezkoder.springjwt.payload.response.MessageResponse;

import com.bezkoder.springjwt.repository.RoleRepository;

import com.bezkoder.springjwt.repository.UserRepository;

import com.bezkoder.springjwt.security.jwt.JwtUtils;

import com.bezkoder.springjwt.security.services.UserDetailsImpl;

@CrossOrigin(origins = "\*", maxAge = 3600)

@RestController

@RequestMapping("/api/auth")

public class AuthController {

@Autowired

AuthenticationManager authenticationManager;

@Autowired

UserRepository userRepository;

@Autowired

RoleRepository roleRepository;

@Autowired

PasswordEncoder encoder;

@Autowired

JwtUtils jwtUtils;

@PostMapping("/signin")

public ResponseEntity<?> authenticateUser(@Valid @RequestBody LoginRequest loginRequest) {

Authentication authentication = authenticationManager.authenticate(

new UsernamePasswordAuthenticationToken(loginRequest.getUsername(), loginRequest.getPassword()));

SecurityContextHolder.getContext().setAuthentication(authentication);

String jwt = jwtUtils.generateJwtToken(authentication);

UserDetailsImpl userDetails = (UserDetailsImpl) authentication.getPrincipal();

List<String> roles = userDetails.getAuthorities().stream()

.map(item -> item.getAuthority())

.collect(Collectors.toList());

return ResponseEntity.ok(new JwtResponse(jwt,

userDetails.getId(),

userDetails.getUsername(),

userDetails.getEmail(),

roles));

}

@PostMapping("/signup")

public ResponseEntity<?> registerUser(@Valid @RequestBody SignupRequest signUpRequest) {

if (userRepository.existsByUsername(signUpRequest.getUsername())) {

return ResponseEntity

.badRequest()

.body(new MessageResponse("Error: Username is already taken!"));

}

if (userRepository.existsByEmail(signUpRequest.getEmail())) {

return ResponseEntity

.badRequest()

.body(new MessageResponse("Error: Email is already in use!"));

}

// Create new user's account

User user = new User(signUpRequest.getUsername(),

signUpRequest.getEmail(),

encoder.encode(signUpRequest.getPassword()));

Set<String> strRoles = signUpRequest.getRole();

Set<Role> roles = new HashSet<>();

if (strRoles == null) {

Role userRole = roleRepository.findByName(ERole.ROLE\_USER)

.orElseThrow(() -> new RuntimeException("Error: Role is not found."));

roles.add(userRole);

} else {

strRoles.forEach(role -> {

switch (role) {

case "admin":

Role adminRole = roleRepository.findByName(ERole.ROLE\_ADMIN)

.orElseThrow(() -> new RuntimeException("Error: Role is not found."));

roles.add(adminRole);

break;

case "mod":

Role modRole = roleRepository.findByName(ERole.ROLE\_MODERATOR)

.orElseThrow(() -> new RuntimeException("Error: Role is not found."));

roles.add(modRole);

break;

default:

Role userRole = roleRepository.findByName(ERole.ROLE\_USER)

.orElseThrow(() -> new RuntimeException("Error: Role is not found."));

roles.add(userRole);

}

});

}

user.setRoles(roles);

userRepository.save(user);

return ResponseEntity.ok(new MessageResponse("User registered successfully!"));

}

}

**Controller for testing Authorization**

There are 4 APIs:  
– /api/test/all for public access  
– /api/test/user for users has ROLE\_USER or ROLE\_MODERATOR or ROLE\_ADMIN  
– /api/test/mod for users has ROLE\_MODERATOR  
– /api/test/admin for users has ROLE\_ADMIN

Do you remember that we used @EnableGlobalMethodSecurity(prePostEnabled = true) for WebSecurityConfig class?

@Configuration

@EnableWebSecurity

@EnableGlobalMethodSecurity(prePostEnabled = true)

public class WebSecurityConfig extends WebSecurityConfigurerAdapter { ... }

Now we can secure methods in our Apis with @PreAuthorize annotation easily.

*controllers/TestController.java*

package com.bezkoder.springjwt.controllers;

import org.springframework.security.access.prepost.PreAuthorize;

import org.springframework.web.bind.annotation.CrossOrigin;

import org.springframework.web.bind.annotation.GetMapping;

import org.springframework.web.bind.annotation.RequestMapping;

import org.springframework.web.bind.annotation.RestController;

@CrossOrigin(origins = "\*", maxAge = 3600)

@RestController

@RequestMapping("/api/test")

public class TestController {

@GetMapping("/all")

public String allAccess() {

return "Public Content.";

}

@GetMapping("/user")

@PreAuthorize("hasRole('USER') or hasRole('MODERATOR') or hasRole('ADMIN')")

public String userAccess() {

return "User Content.";

}

@GetMapping("/mod")

@PreAuthorize("hasRole('MODERATOR')")

public String moderatorAccess() {

return "Moderator Board.";

}

@GetMapping("/admin")

@PreAuthorize("hasRole('ADMIN')")

public String adminAccess() {

return "Admin Board.";

}

}

**Run & Test**

Run Spring Boot application with command: mvn spring-boot:run

Tables that we define in *models* package will be automatically generated in Database.  
If you check MySQL database for example, you can see things like this:

mysql> describe users;

+----------+--------------+------+-----+---------+----------------+

| Field | Type | Null | Key | Default | Extra |

+----------+--------------+------+-----+---------+----------------+

| id | bigint(20) | NO | PRI | NULL | auto\_increment |

| email | varchar(50) | YES | UNI | NULL | |

| password | varchar(120) | YES | | NULL | |

| username | varchar(20) | YES | UNI | NULL | |

+----------+--------------+------+-----+---------+----------------+

4 rows in set (0.00 sec)

mysql> describe roles;

+-------+-------------+------+-----+---------+----------------+

| Field | Type | Null | Key | Default | Extra |

+-------+-------------+------+-----+---------+----------------+

| id | int(11) | NO | PRI | NULL | auto\_increment |

| name | varchar(20) | YES | | NULL | |

+-------+-------------+------+-----+---------+----------------+

2 rows in set (0.00 sec)

mysql> describe user\_roles;

+---------+------------+------+-----+---------+-------+

| Field | Type | Null | Key | Default | Extra |

+---------+------------+------+-----+---------+-------+

| user\_id | bigint(20) | NO | PRI | NULL | |

| role\_id | int(11) | NO | PRI | NULL | |

+---------+------------+------+-----+---------+-------+

2 rows in set (0.00 sec)

We also need to add some rows into **roles** table before assigning any role to User.  
Run following SQL insert statements:

INSERT INTO roles(name) VALUES('ROLE\_USER');

INSERT INTO roles(name) VALUES('ROLE\_MODERATOR');

INSERT INTO roles(name) VALUES('ROLE\_ADMIN');

Then check the tables:

mysql> select \* from roles;

+----+----------------+

| id | name |

+----+----------------+

| 1 | ROLE\_USER |

| 2 | ROLE\_MODERATOR |

| 3 | ROLE\_ADMIN |

+----+----------------+

3 rows in set (0.00 sec)

Register some users with /signup API:

* **admin** with ROLE\_ADMIN
* **mod** with ROLE\_MODERATOR and ROLE\_USER
* **zkoder** with ROLE\_USER

Our tables after signup could look like this.

mysql> select \* from users;

+----+--------------------+--------------------------------------------------------------+----------+

| id | email | password | username |

+----+--------------------+--------------------------------------------------------------+----------+

| 1 | admin@bezkoder.com | $2a$10$mR4MU5esBbUd6JWuwWKTA.tRy.jo4d4XRkgnamcOJfw5pJ8Ao/RDS | admin |

| 2 | mod@bezkoder.com | $2a$10$VcdzH8Q.o4KEo6df.XesdOmXdXQwT5ugNQvu1Pl0390rmfOeA1bhS | mod |

| 3 | user@bezkoder.com | $2a$10$c/cAdrKfiLLCDcnXvdI6MumFMthIxVCDcWjp2XcRqkRfdzba5P5.. | user |

+----+--------------------+--------------------------------------------------------------+----------+

3 rows in set (0.00 sec)

mysql> select \* from roles;

+----+----------------+

| id | name |

+----+----------------+

| 1 | ROLE\_USER |

| 2 | ROLE\_MODERATOR |

| 3 | ROLE\_ADMIN |

+----+----------------+

3 rows in set (0.00 sec)

mysql> select \* from user\_roles;

+---------+---------+

| user\_id | role\_id |

+---------+---------+

| 2 | 1 |

| 3 | 1 |

| 2 | 2 |

| 1 | 3 |

+---------+---------+

4 rows in set (0.00 sec)

**Access public resource:** GET /api/test/all

**Access protected resource:** GET /api/test/user

**Login an account:** POST /api/auth/signin

**Access ROLE\_USER resource:** GET /api/test/user

**Access ROLE\_MODERATOR resource:** GET /api/test/mod

**Access ROLE\_ADMIN resource:** GET /api/test/admin

**Solve Problem: javax.validation cannot be resolved**

For Spring Boot **2.3** and later, you can see the compile error:  
The import javax.validation cannot be resolved

It is because Validation Starter no longer included in web starters. So you need to add the starter yourself.  
– For Maven:

<dependency>

<groupId>org.springframework.boot</groupId>

<artifactId>spring-boot-starter-validation</artifactId>

</dependency>

– For Gradle:

dependencies {

...

implementation 'org.springframework.boot:spring-boot-starter-validation'

}

**Solve Problem with JDK 14**

If you run this Spring Boot App with JDK 14 and get following error when trying to authenticate:

FilterChain java.lang.NoClassDefFoundError: javax/xml/bind/DatatypeConverter

Just add following dependency to *pom.xml*:

<dependency>

<groupId>jakarta.xml.bind</groupId>

<artifactId>jakarta.xml.bind-api</artifactId>

<version>2.3.2</version>

</dependency>

Everything’s gonna work fine.

**Conclusion**

Congratulation!

Today we’ve learned so many interesting things about Spring Security and JWT Token based Authentication in just a Spring Boot example.  
Despite we wrote a lot of code, I hope you will understand the overall architecture of the application, and apply it in your project at ease.

For understanding the architecture deeply and grasp the overview more easier:  
[Spring Boot Architecture for JWT with Spring Security](https://bezkoder.com/spring-boot-jwt-mysql-spring-security-architecture/)

You should continue to know how to implement Refresh Token:  
[Spring Boot Refresh Token with JWT example](https://bezkoder.com/spring-boot-refresh-token-jwt/)

Or visit The example that [uses HttpOnly Cookies instead](https://www.bezkoder.com/spring-boot-login-example-mysql/).

You can also know how to deploy Spring Boot App on AWS (for free) with [this tutorial](https://bezkoder.com/deploy-spring-boot-aws-eb/).

Happy learning! See you again.