# Securing Your App: TOTP Authentication with Spring Boot and Angular — Part One — Overview & Project Setup

Anbumani Mailathipathy · Follow
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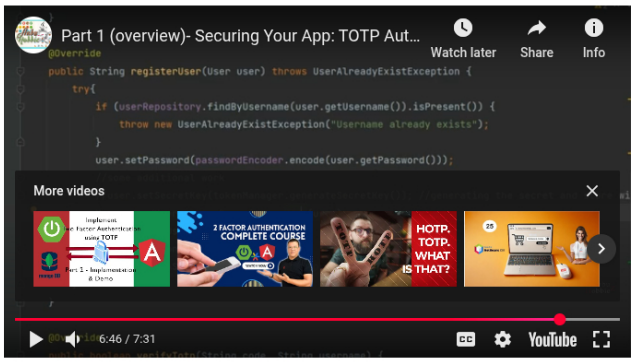
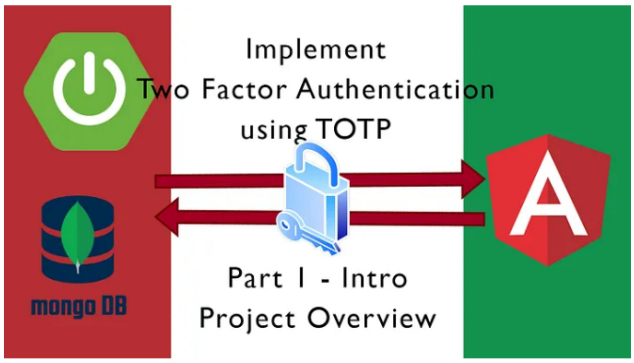



Title

### What is TOTP?

TOTP stands for **Time-based One-Time Passwords** and is a common form of two-factor authentication (2FA). Unique numeric passwords are generated with a standardized algorithm that uses the current time as an input. The time-based passwords are available offline and provide user-friendly, increased account security when used as a second factor.

TOTP is also known as app-based authentication, software tokens, or soft tokens. Authentication apps like Microsoft Authenticator and Google Authenticator support the TOTP standard.

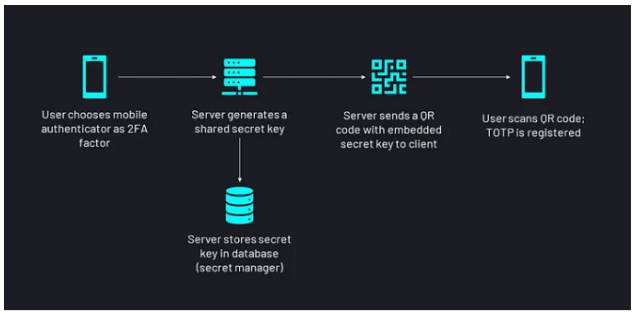
### When TOTP?

Imagine a secure system that combines something you know (like a password) with something you have (a device generating a one-time password). That's where TOTP comes in.

### How does TOTP work?

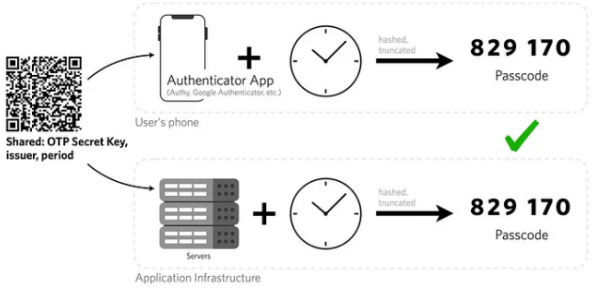
When the user registers into our application system will generate a secret key and that will be stored in DB. The system will generate a QR code that combines the Algorithm, number of digits, and period that will be used by the server to generate the TOTP.

## How TOTP Registration Works




How TOTP QR code generated and user registration

Upon login, the user will provide the credentials and validate. As a next step, they will be prompted for OTP. This will be generated by the authenticator application, this will be validated by the server using the time bucket the OTP is entered.




TOTP validation

**Project:**

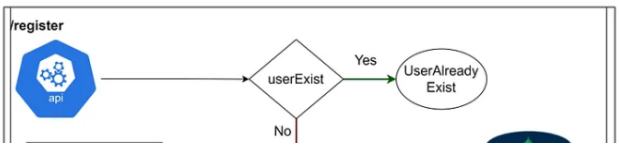
We will implement the Backend server in Spring Boot and Mongo DB as a Persistence layer. Angular 14 is our Front end which will connect to the backend over rest endpoints. We will be using "*dev.samstevens.totp*" to generate and verify TOTP.

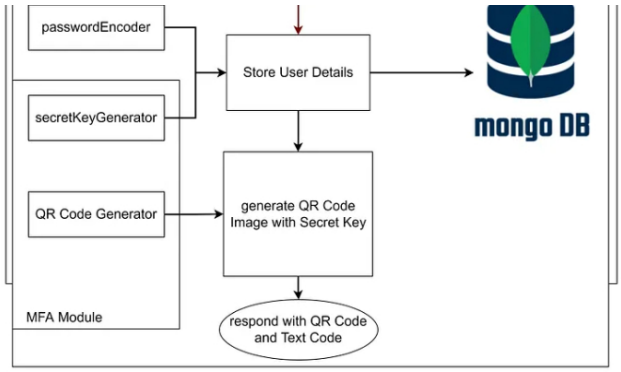

Arch High-level

## End-Point Implementation Overview:

### /register

register endpoint will accept the registration details including the username and password as payload. It will check for user existence, if the user already exists then respond with a UserAlreadyExist exception, else Generate the Secret key, encode the password received, and persist the user details. Further, generate the QR code and add it to the response.

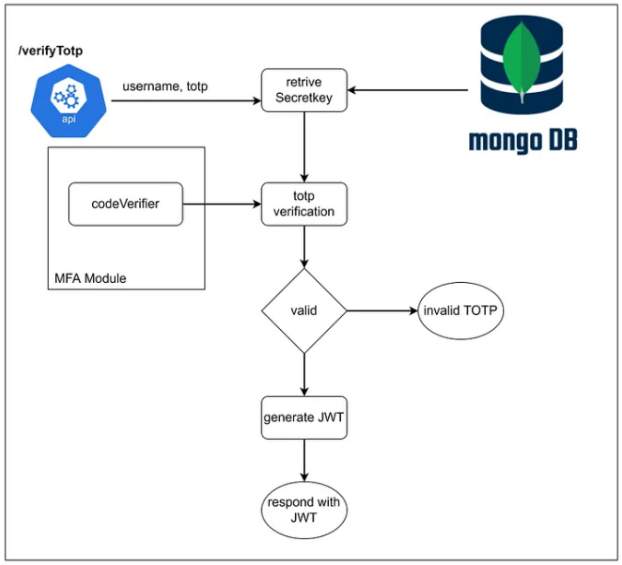





/register workflow

**/verifyTotp**

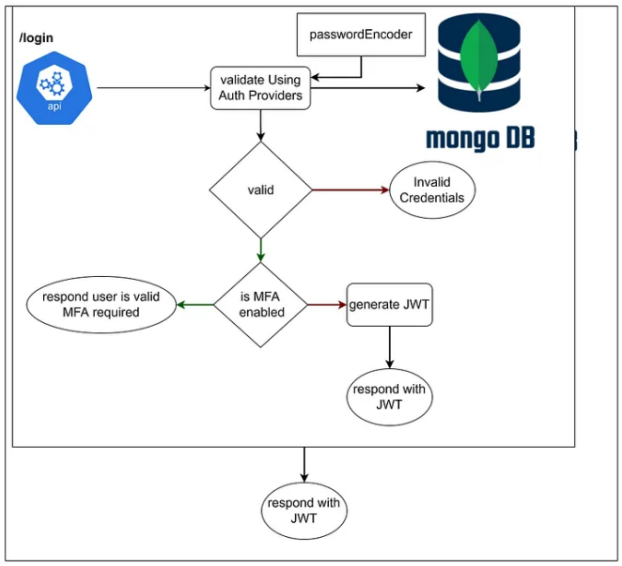
This endpoint accepts username and TOTP as payload. It will fetch the secret key with the username provided and pass it to the verify method of "dev.samstevens.totp" code verifier. If the code is valid then it will generate the JWT and respond. Else it will respond as an Invalid Token.




/verifyTotp workflow

**/login**

This endpoint will get the username and password as payload and validate with the AuthProvider. If the credentials are valid and the user opted for MFA then respond with MFA Required. Else generate the JWT.



## Project Setup:

### Create a Spring Boot Project with the following dependencies,

```
<dependency>
   <groupId>org.springframework.boot</groupId>
   <artifactId>spring-boot-starter-data-mongodb</artifactId>
  </dependency>
  <dependency>
   <groupId>org.springframework.boot</groupId>
   <artifactId>spring-boot-starter-mail</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>dev.samstevens.totp</groupId>
   <artifactId>totp</artifactId>
   <version>1.7.1</version>
  </dependency>
  <dependency>
   <groupId>org.springframework.boot</groupId>
   <artifactId>spring-boot-starter-validation</artifactId>
  </dependency>
  <dependency>
   <groupId>org.springframework.boot</groupId>
   <artifactId>spring-boot-devtools</artifactId>
   <scope>runtime</scope>
   <optional>true</optional>
  </dependency>
  <dependency>
   <groupId>org.projectlombok</groupId>
   <artifactId>lombok</artifactId>
   <optional>true</optional>
  </dependency>
```

```
spring:
  application:
    name: mfa-server
  data:
    mongodb:
      host: localhost
      port: 27017
      database: mfa-server
```

Create a web security configuration class for all endpoints. Also, create a bean if BCryptPasswordEncoder.

```
@EnableWebSecurity
@Configuration
public class AppSecurityConfig {

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

    @Bean
    public SecurityFilterChain defaultFilterChain(HttpSecurity httpSecurity) thr
        return httpSecurity
                .cors(cors-> cors.disable())
                .csrf(csrf-> csrf.disable())
                .sessionManagement(session-> session.sessionCreationPolicy(Sessi
                .authorizeHttpRequests(auth-> auth
                        .requestMatchers("/error**","/register**","/login**","/v
                        .anyRequest().authenticated()
                )
               .build();
    }
}
```

Create User Entity. This stores the user details, credentials and roles.

```
@Document(collection = "users")
@NoArgsConstructor
@AllArgsConstructor
@Data
public class User {
    @Id
    private String id;
    @Indexed
    @NotBlank
```

```
    private String username;
    private String password;
    boolean mfaEnabled;
    @JsonIgnore
    private String secretKey;
    private String firstName;
    private String lastName;
    private boolean active;
    @DBRef
    private Set<Role> roles = new HashSet<>();
}
```

Create UserRepository.

```
@Repository
public interface UserRepository extends MongoRepository<User, Long> {
    Optional<User> findByUsername(String username);
}
```

Create a Service that Helps us Register and Verify Totp

```
public interface UserService {
    MfaTokenData registerUser(User user) throws UserAlreadyExistException, QrGen
    boolean verifyTotp(final String code,String username);
}
```

Create a Controller exposing the endpoints for /register, /login, and /verifyTotp.

> *We will look into the Implementation in our next blog.*

https://medium.com/@anbuathypathy/securing-your-app-totp-authentication-with-spring-boot-and-angular-part-two-implementation-1df9dae570a4

### Angular Project Setup

Create an angular project and include Bootstrap.

```
"styles": [
"node_modules/bootstrap/scss/bootstrap.scss" ,
"src/styles.scss"
],
"scripts": [
"node_modules/bootstrap/dist/js/bootstrap.bundle.js"
]
```

Create a client service that connects with the backend over the rest endpoints.

```
@Injectable({
  providedI
})
export class AuthClientService {

  constructor(private http: HttpClient) { }

  public login(payload: string): Observable<MfaVerificationResponse> {
    const httpOptions = {
      headers: new HttpHeaders({
        'Content-Type':  'application/json'
      })
    };
    return this.http.post<MfaVerificationResponse>(
      environment.apiUrl + '/login', payload, httpOptions
    );
  }

  public verifyTotp(payload: MfaVerificationRequest): Observable<MfaVerification
    return this.http.post<MfaVerificationResponse>(
      environment.apiUrl + '/verifyTotp', payload
    );
  }

  public register(
    payload: string
  ): Observable<string> {
    return this.http.post(
```

```
        environment.apiUrl + '/register',payload,
        { responseType: 'text' }
      );
    }
  }
```

Create a Login, Register components as per your wish, and connect them with the client. You can refer to my implementation from below GitHub.

**GitHub - amaialth/MFAApplication: Angular Application to demo MFA. Login Page, Register, MFA QR...**

Angular Application to demo MFA. Login Page, Register, MFA QR code page - GitHub - amaialth/MFAApplication: Angular...

github.com

Check out the complete code implementation here

**Securing Your App: TOTP Authentication with Spring Boot and Angular — Part Two— Implementation &...**

This is continuation of Part 1 — Overview and Project Setup. Please go through if you have not.

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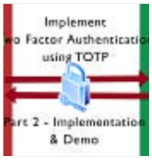


Totp Spring Boot Angular Security MFA

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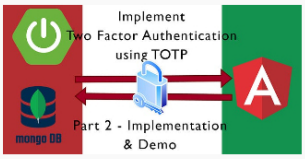


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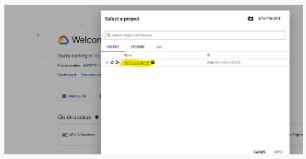

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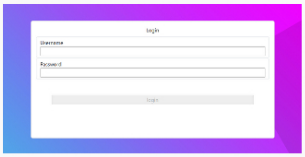

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