

# **SPRING SECURITY - I**

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# AUTHENTICATION

- Who are you?
- Verifies you are who you say you are.
- Methods:
  - Login Form
  - HTTP Authentication
  - HTTP Digest
  - Custom Authentication Method

# AUTHORIZATION

- What you can do.
- Decides if you have permission to access a resource.
- Methods:
  - Access Control for URLs
  - Secure Objects and Methods
  - Access Control Lists

## **SINGLE FACTOR AUTHENTICATION:**

- It requires a password to grant user access to a particular system.
- This is the simplest form.

## TWO FACTOR AUTHENTICATION:

- It requires two-step verification process which not only requires a password but also a piece of information only the user know.
- There are three main types of two-factor authentication:
  - Additional login credentials only the account holder should know. This includes things like security question answers and PIN numbers.
  - Devices the account holder owns that receive additional login credentials. This most commonly takes the form of a security token, mobile phone app, or tablet device app.
  - Biometric login credentials unique to the account owner. This includes retina scans and fingerprints.

# **MULTI-FACTOR AUTHENTICATION**

- This is the most advanced method which requires two or more levels of security from independent categories to grant user access to the system.

# ENCRYPTION

- Process of encoding information.
- Converts the original representation of the information into an alternative form known as ciphertext.
- Ideally, only authorized parties can decipher a ciphertext back to plaintext and access the original information.

# HASH FUNCTIONS

- It is a mathematical algorithm that maps data to a bit array of fixed size. (md5,sha1,sha2)
- This is a one-way function.
- It cannot be inverted.
- The only way to find a message that produces a given hash is to attempt a brute-force search of possible inputs.



# ENCODING

- Encoding is the process of putting a sequence of characters (letters, numbers, punctuation, and certain symbols) into a specialized format for efficient transmission or storage.

# BASE64

- Binary-to-text encoding schemas that represent binary data in an ASCII string format by translating it into a radix-64 representation.

# *JWT*

- JSON Web Tokens are an open, industry standard method for representing claims securely between two parties.
- JSON Web Token (JWT) is an open standard (RFC 7519) that defines a compact and self-contained way for securely transmitting information between parties as a JSON object.
- JWTs can be signed using a secret (with the HMAC algorithm) or a public/private key pair using RSA or ECDSA.

## JWT USE CASES -- AUTHORIZATION

- This is the most common scenario for using JWT.
- Once the user is logged in, each subsequent request will include the JWT, allowing the user to access routes, services, and resources that are permitted with that token.
- Single Sign On is a feature that widely uses JWT nowadays, because of its small overhead and its ability to be easily used across different domains.

## ***JWT USE CASES -- INFORMATION EXCHANGE***

- JSON Web Tokens are a good way of securely transmitting information between parties.
- Because JWTs can be signed—for example, using public/private key pairs—
- You can be sure the senders are who they say they are.
- Additionally, as the signature is calculated using the header and the payload, you can also verify that the content hasn't been tampered with.

# JWT BREAKDOWN

- 3 important parts of Structure.

HEADER

PAYLOAD

VERIFY  
SIGNATURE

JWT:  
aaaa.bbbbbb.ccccc

# JWT - HEADER

- The header *typically* consists of two parts.
  - The type of the token, which is JWT.
  - The signing algorithm being used, such as HMAC SHA256 or RSA.

```
{  
  "alg": "HS256",  
  "typ": "JWT"  
}
```

Then, this JSON is Base64Url encoded to form the first part of the JWT.

## JWT - PAYLOAD

- It contains the claims.
- Claims are statements about an entity (typically, the user) and additional data.

```
{  
  "sub": "1234567890",  
  "name": "John Doe",  
  "admin": true  
}
```

The payload is then **Base64Url** encoded to form the second part of the JSON Web Token.



## JWT - SIGNATURE

- To create the signature part you have to take the encoded header, the encoded payload, a secret, the algorithm specified in the header, and sign that.
- The signature is used to verify the message wasn't changed along the way, and, in the case of tokens signed with a private key, it can also verify that the sender of the JWT is who it says it is.

```
HMACSHA256( base64UrlEncode(header) + "." + base64UrlEncode(payload), secret)
```

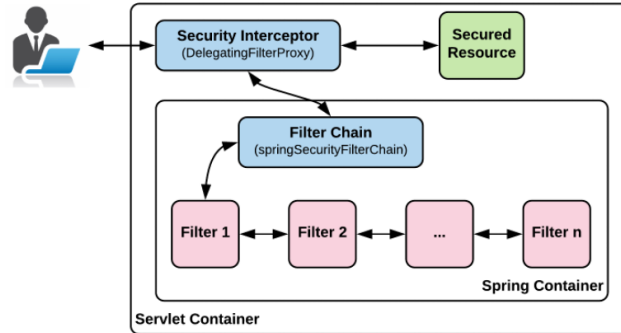
## **ADVANTAGES OF JWTs**

- No session to manage (stateless).
- Portable: A single token can be used with multiple backends.
- No cookies required, so it is very mobile friendly.
- Good performance.
- Decoupled / Decentralized.

# **SPRING SECURITY**

- Spring Security is a framework that focuses on providing both authentication and authorization (or “access-control”) to Java applications.
- It is built on top of Spring Framework.

# SPRING WEB APPLICATION SECURITY SERVLET FILTER



```
<filter>
  <filter-name>springSecurityFilterChain</filter-name>
  <filter-class>org.springframework.web.filter.DelegatingFilterProxy</filter-class>
</filter>
<filter-mapping>
  <filter-name>springSecurityFilterChain</filter-name>
  <url-pattern>/*</url-pattern>
</filter-mapping>
```

```
public class SecurityWebApplicationInitializer extends AbstractSecurityWebApplicationInitializer {
}
```

# **SPRING SECURITY FUNDAMENTALS**

- Authentication
  - Confirming truth of credentials.
  - Who are you?
- Authorization
  - Define access policy for principal.
  - What can you do?

# **SPRING SECURITY FUNDAMENTALS**

- Principal
  - User that performs the task
  - Currently logged in User
- Authentication
  - Represents the principal in a Spring Security-specific manner.
- GrantedAuthority
  - Reflects the application-wide permissions granted to a principal.
- Roles
  - Coarse-grained permission

# **SPRING SECURITY FUNDAMENTALS**

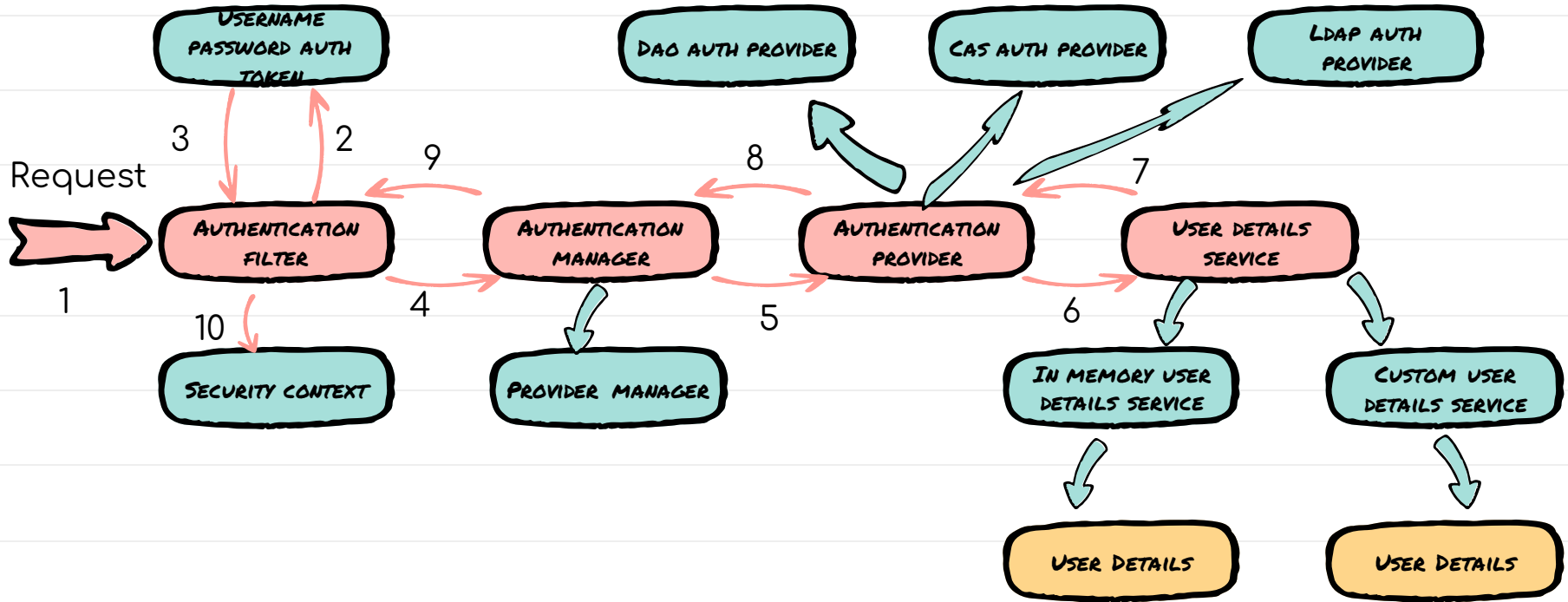
- SecurityContextHolder
  - Helper class to provide access to the SecurityContext.
- SecurityContext
  - Hold the authentication and other security information
- AuthenticationManager
  - is like a coordinator where you can register multiple providers, and based on the request type, it will deliver an authentication request to the correct provider.
- AuthenticationProvider
  - Interface that implements OAuth2AuthenticationProvider, which stores your user data.

# SPRING SECURITY FUNDAMENTALS

- Authentication Object
  - Object is created upon authentication, which holds the login credentials
- UserDetails
  - Provides the necessary information to build an Authentication object from your application's "custom" DAOs or other source of security data.
- UserDetailsService
  - loads & creates a "custom" UserDetails when passed in a String-based username.



# SPRING SECURITY ARCHITECTURE



## MAIN POINTS

- Spring Security allows for authentication and authorization of system users. It gives access to resources “appropriately”. It works as a stabilizing factor in the enterprise infrastructure
- Securing life at its basis - at the underlying field of Creative Intelligence – guarantees stability and success at all levels.