# Spring Security Architecture

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In terms of Authentication, Authorization, Web Security, Customizations, Method Security and Threads

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V1.0

**Berk Ekim Paşmakoğlu**

# Authentication and Authorization

## Authentication

- who are you?

## Authorization

- what are you allowed to do?

# Authentication Outline

- AuthenticationManager
- ProviderManager – I
- ProviderManager – II
- AuthenticationManagerBuilder
- Application that configures the **global** (parent) AuthenticationManager
- Application that configures the **local** AuthenticationManager

# AuthenticationManager

<<interface>>

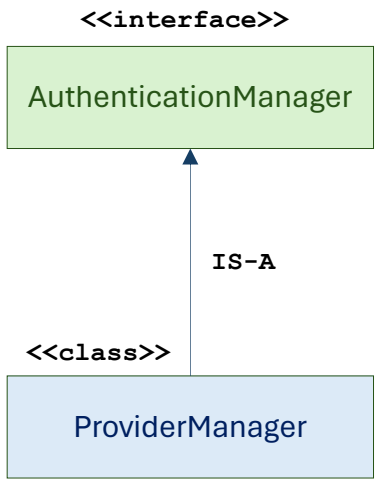
AuthenticationManager

```
public interface AuthenticationManager {
    Authentication authenticate(Authentication authentication)
    throws AuthenticationException;
}
```

- Returns an Authentication
  - (normally with authenticated=true) if it can verify that the input represents a valid principal.
- Throw an AuthenticationException if it believes that the input represents an invalid principal.
- Return null if it cannot decide.

- Spring Boot provides a **default global** AuthenticationManager (with only one user) unless you pre-empt it by providing your own bean of type AuthenticationManager.
- If you do any configuration that builds an AuthenticationManager, you can often ***do it locally to the resources that you are protecting*** and not worry about the **global default**.

# ProviderManager - I

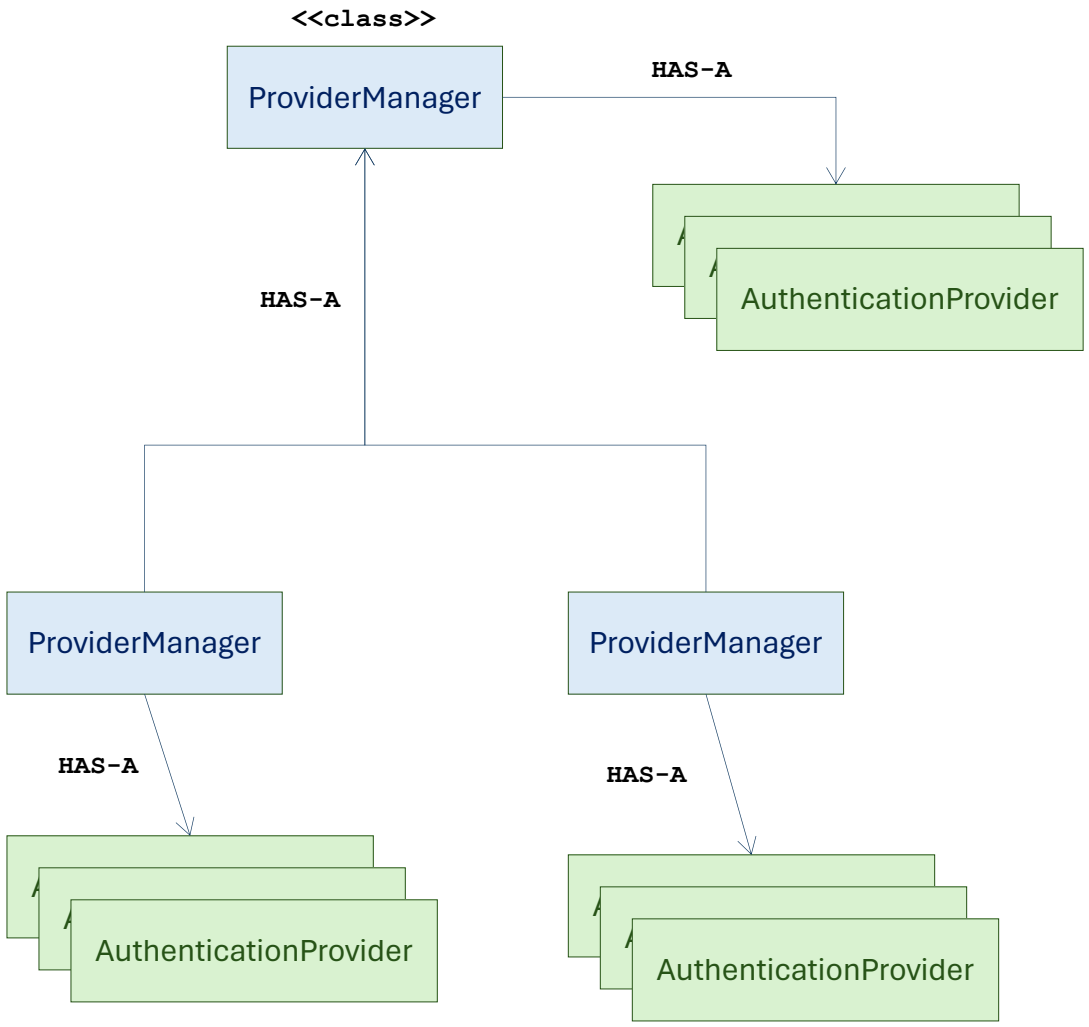



- delegates to a chain of AuthenticationProvider instances.
  - can support multiple different authentication mechanisms in the same application by delegating.
  - If it does not recognize a particular Authentication instance type, it is skipped.

- has an extra method to allow the caller to query whether it supports a given Authentication type.
- The Class<?> argument in the supports() method is really Class<? extends Authentication>.

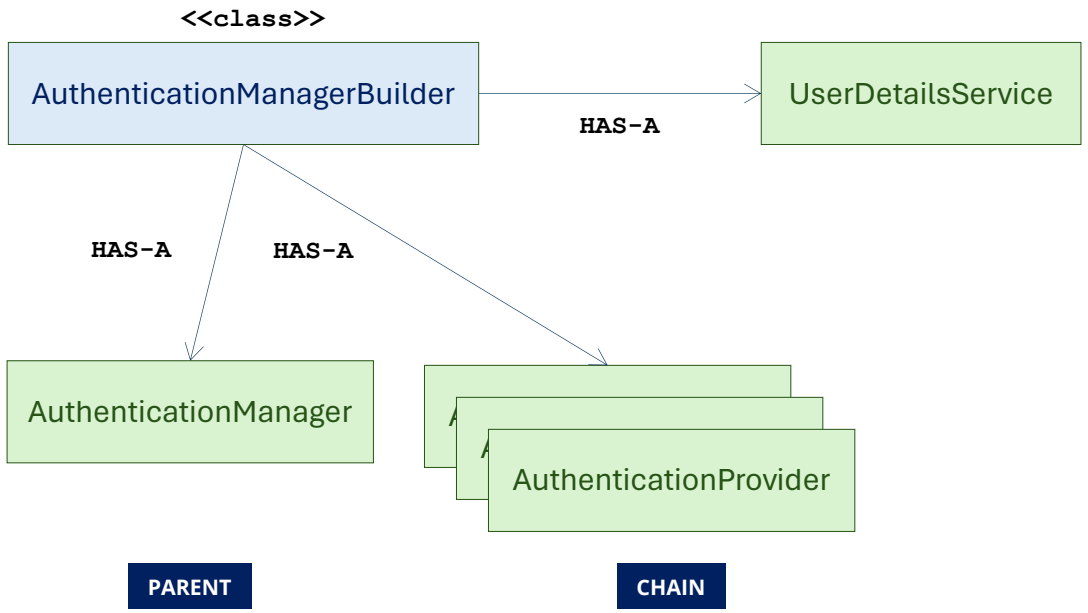
```
public interface AuthenticationProvider {
    Authentication authenticate(Authentication authentication) throws AuthenticationException;
    boolean supports(Class<?> authentication);
}
```

# ProviderManager – II




- delegates to a chain of AuthenticationProvider instances.
  - can support multiple different authentication mechanisms in the same application by delegating.
  - If it does not recognize a particular Authentication instance type, it is skipped.
- has an optional parent, which it can consult if all providers return null.
  - If the parent is not available, a null Authentication results in an AuthenticationException.
- Sometimes, an application has logical groups of protected resources
  - i.e., all web resources that match a path pattern, such as /api/**.
- Each group can have its own dedicated AuthenticationManager.
- Often, each of those is a ProviderManager, and they share a parent.
- The parent is then a kind of **global resource** acting as a fallback for all providers.

# AuthenticationManagerBuilder




- Spring Security provides some configuration helpers to quickly get common authentication manager features set up in your application.
- AuthenticationManagerBuilder
  - most used helper
  - great for setting up in-memory, JDBC, or LDAP user details or for adding a custom UserDetailsService.

# Application that configures the **global** (parent) AuthenticationManager

```
@Configuration
public class ApplicationSecurity extends WebSecurityConfigurerAdapter {
    ... // web stuff here

    @Autowired
    public void initialize(AuthenticationManagerBuilder builder, DataSource dataSource) {
        builder.jdbcAuthentication()
               .dataSource(dataSource)
               .withUser("dave")
               .password("secret")
               .roles("USER");
     }
}
```

- AuthenticationManagerBuilder is injected (or auto-wired) into a method in a @Bean.
- This method body builds the **global** (parent) AuthenticationManager.

# Application that configures the **local** AuthenticationManager

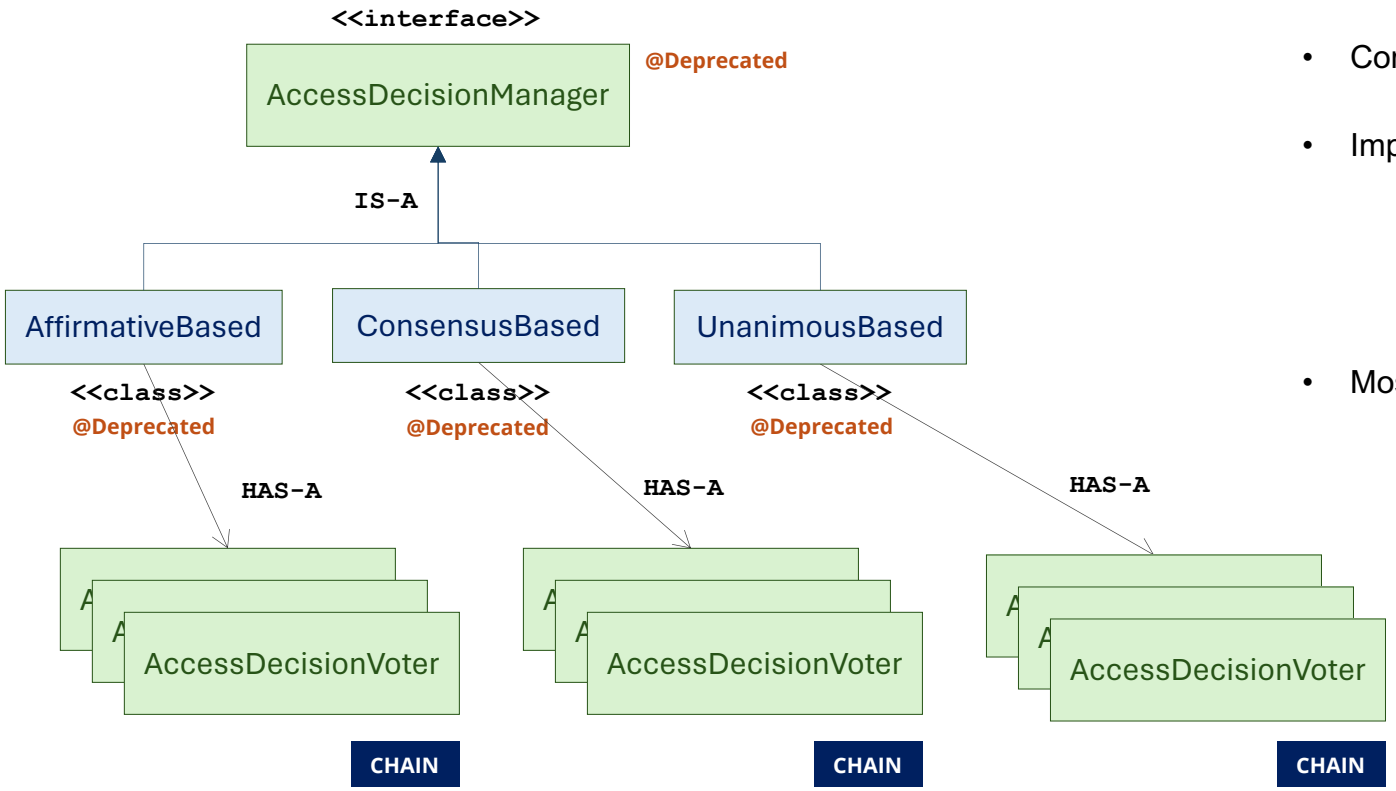
```
@Configuration
public class ApplicationSecurity extends WebSecurityConfigurerAdapter {
    @Autowired
    DataSource dataSource;

    ... // web stuff here

    @Override
    public void configure(AuthenticationManagerBuilder builder) {
        builder.jdbcAuthentication()
               .dataSource(dataSource)
               .withUser("dave")
               .password("secret")
               .roles("USER");
     }
}
```

- We overrode the configure() method in the configurer.
- AuthenticationManagerBuilder builds a **local** AuthenticationManager which would be a **child** of the **global** one.

# Authorization Outline

- AccessDecisionManager
- AccessDecisionVoter
- ConfigAttribute

# AccessDecisionManager




- Core strategy
- Implementations
  - AffirmativeBased, ConsensusBased and UnanimousBased.
  - All three delegate to a chain of AccessDecisionVoter instances
- Most people use AffirmativeBased as **default** AccessDecisionManager
  - access is granted if any voters return affirmatively

```
void decide(Authentication authentication, Object object, Collection<ConfigAttribute> configAttributes)
      throws AccessDeniedException, InsufficientAuthenticationException;

boolean supports(ConfigAttribute attribute);

boolean supports(Class<?> clazz);
```

# AccessDecisionVoter


- considers an Authentication (representing a principal) and a **secure** Object, which has been decorated with ConfigAttributes.

```
int vote(Authentication authentication, S object, Collection<ConfigAttribute> attributes);

boolean supports(ConfigAttribute attribute);

boolean supports(Class<?> clazz);
```

- Object is completely generic in the signatures of AccessDecisionManager and AccessDecisionVoter. It represents anything that a user might want to access:
  - i.e., a web resource or a method in a Java class.
- ConfigAttributes represent a decoration of the **secure** Object with some metadata that determines the ***level of permission required to access it***.

# ConfigAttribute

<<interface>>

ConfigAttribute

```
String getAttribute();
```

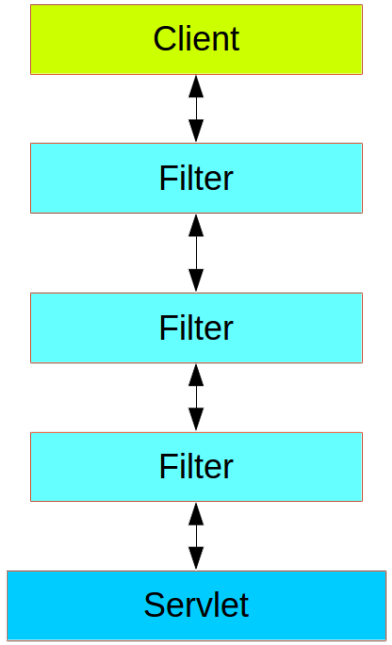
- Has only one API, getAttribute() which returns String.
- These strings encode the **intention of the owner of the resource**, expressing rules about who is allowed to access it:
  - A typical example is the name of a user role
    - i.e., **ROLE_ADMIN** or **ROLE_AUDIT**
  - represent **expressions** that need to be evaluated
    - Spring Expression Language (SpEL) expressions
    - isFullyAuthenticated() && hasRole('user')

# Servlet Filters and Chains Outline

- Servlet Filters
- Order of the Filter Chain - I
- Order of the Filter Chain – II
- FilterChainProxy – I
- FilterChainProxy – II
- FilterChainProxy – III
- DelegatingFilterProxy
- SecurityFilterChain

# Servlet Filters

**Spring Security** in the web tier is based on Servlet Filters.




Typical layering of the handlers for a **single** HTTP request.

The client sends a request to the application → The container decides which filters and which servlet apply to it based on the path of the request URI.

**At most**, one servlet can handle a single request, but ***filters form a chain***, so they are **ordered**. → In fact, a filter ***can veto the rest of the chain*** if it wants to handle the request itself.

A filter ***can also modify*** the request, or the response used in the downstream filters and servlet.

# Order of the Filter Chain - I

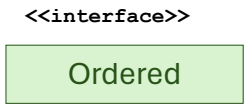
- The **order** of the filter chain is **very important**, and Spring Boot manages it through two mechanisms:

@Beans of type Filter can

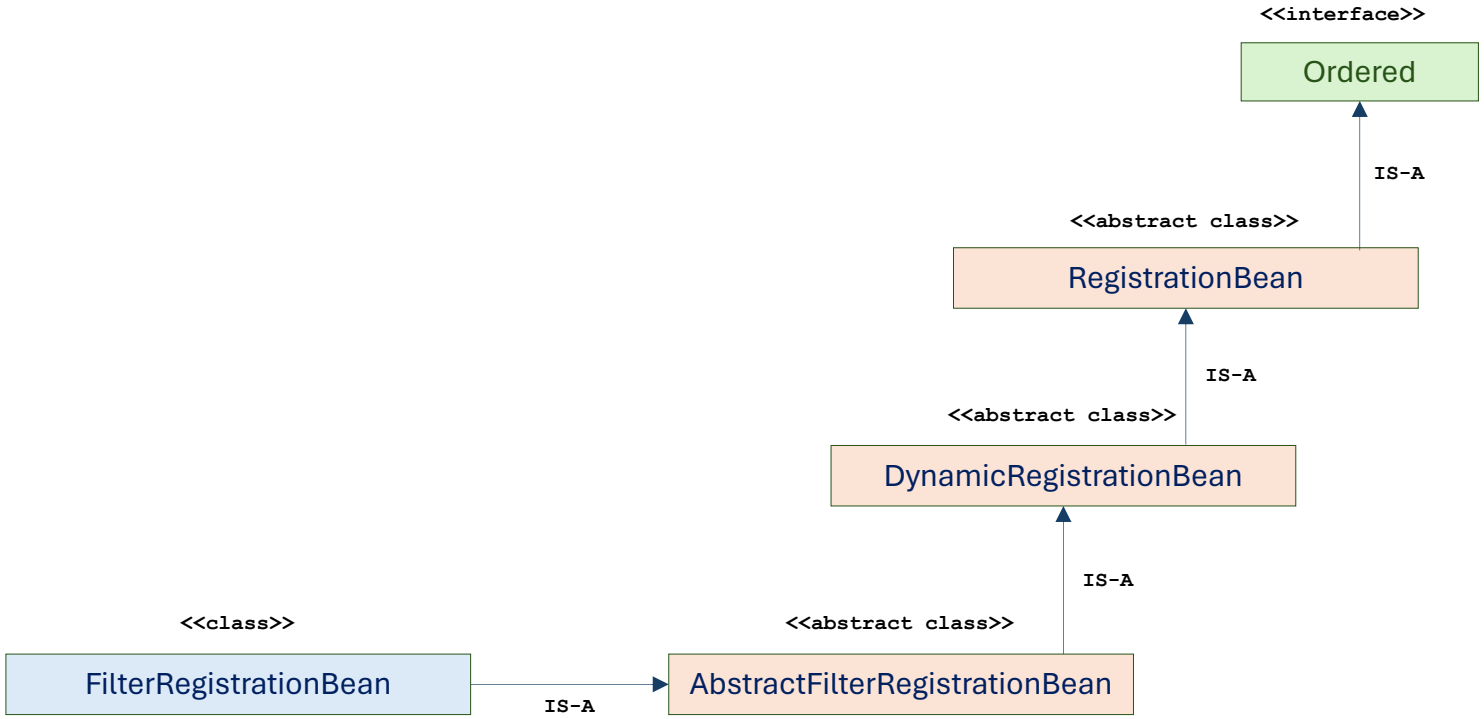
Be annotated by the @Order annotation

Implement the Ordered interface

Be part of a FilterRegistrationBean ***that itself has an order*** as part of its API




```java
public interface Ordered {
    int HIGHEST_PRECEDENCE = Integer.MIN_VALUE;
    int LOWEST_PRECEDENCE = Integer.MAX_VALUE;

    int getOrder();
}
```



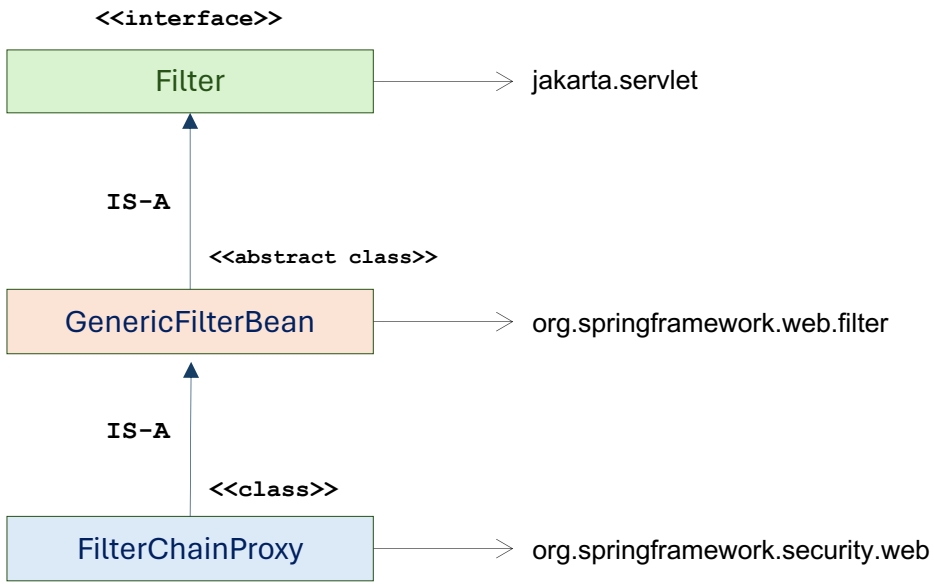
# Order of the Filter Chain - II

- Some **off-the-shelf** filters define their own constants to help signal what order they like to be in relative to each other:
  - SessionRepositoryFilter has a DEFAULT_ORDER of Integer.MIN_VALUE + 50,
  - which tells us it likes to be early in the chain, but it does not rule out other filters coming before it.


```
@Order(SessionRepositoryFilter.DEFAULT_ORDER)
public class SessionRepositoryFilter<S extends Session> extends OncePerRequestFilter {
    . . . // intentionally skipped

    public static final int DEFAULT_ORDER = Integer.MIN_VALUE + 50;

 . . . // intentionally skipped
}
```

# FilterChainProxy - I

- Spring Security is installed as a single Filter in the chain, and its concrete type is FilterChainProxy.




```
public interface Filter {
    default void init(FilterConfig filterConfig) throws ServletException {
    }

    void doFilter(ServletRequest request, ServletResponse response, FilterChain chain)
    throws IOException, ServletException;

    default void destroy() {
    }
}
```

```
package jakarta.servlet;

import java.io.IOException;

public interface FilterChain {
    void doFilter(ServletRequest request, ServletResponse response)
    throws IOException, ServletException;
}
```

# FilterChainProxy - II

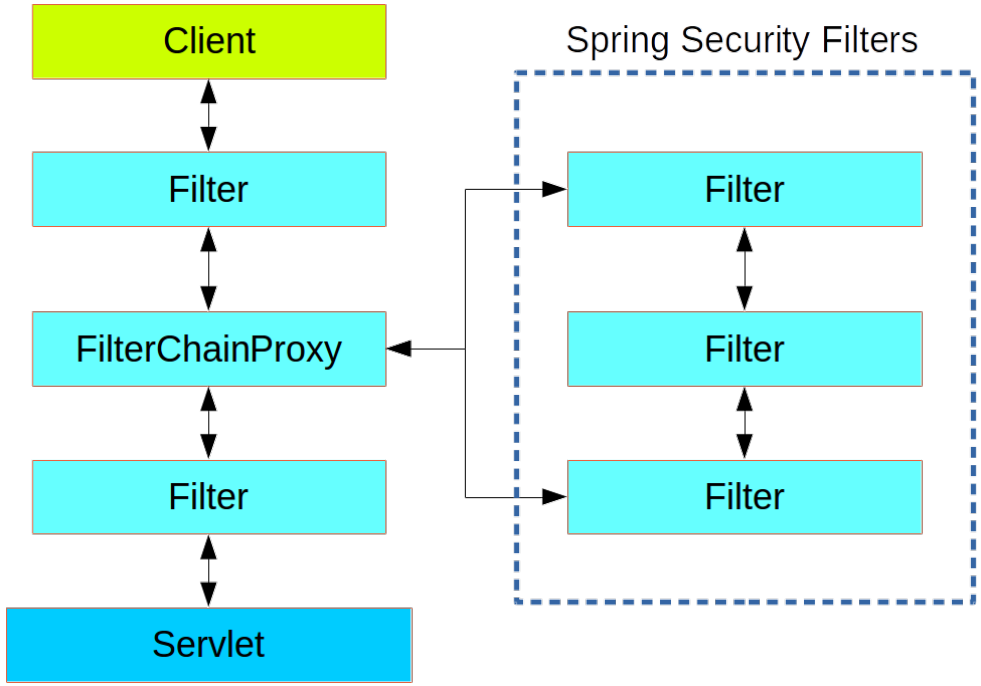
- In a Spring Boot application, the security filter is a @Bean in the ApplicationContext, and it is ***installed by default*** so that it is applied to every request.
    - It is **installed at a position** defined by SecurityProperties.**DEFAULT_FILTER_ORDER** which in turn is anchored by OrderedFilter.**REQUEST_WRAPPER_FILTER_MAX_ORDER**.
    - OrderedFilter.**REQUEST_WRAPPER_FILTER_MAX_ORDER** is the maximum order that a Spring Boot application expects filters to have if they wrap the request, modifying its behavior.

```
package org.springframework.boot.web.servlet.filter;

public interface OrderedFilter extends Filter, Ordered {
    int REQUEST_WRAPPER_FILTER_MAX_ORDER = 0;
}
```

```
package org.springframework.boot.autoconfigure.security;

public class SecurityProperties {
    . . . // intentionally skipped

    public static final int DEFAULT_FILTER_ORDER = OrderedFilter.REQUEST_WRAPPER_FILTER_MAX_ORDER -100;

    . . . // intentionally skipped
}
```

# FilterChainProxy - III

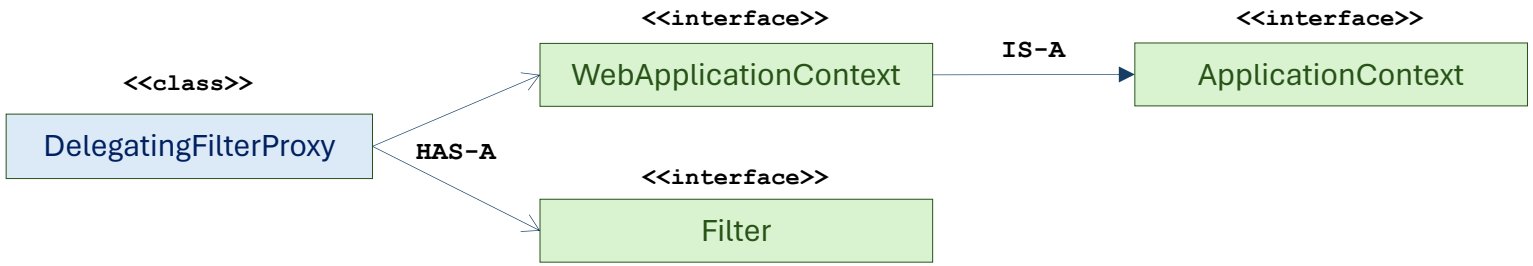
- From the point of view of the container, **Spring Security** is a single physical Filter, but, **inside of it**, there are additional filters, each playing a special role.
    - delegates **processing** to a chain of internal filters.

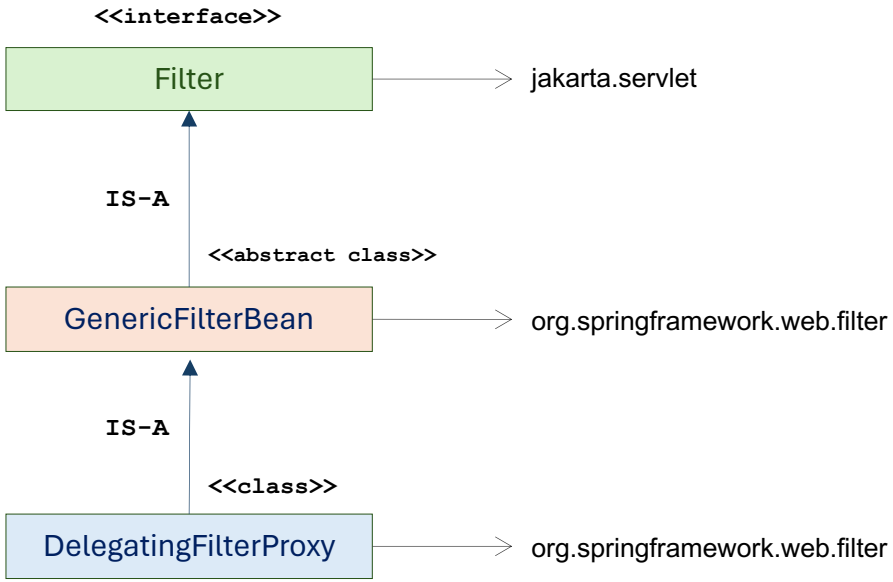



- It is the FilterChainProxy that **contains all the security logic** arranged internally as a **chain** (or chains) **of filters**.
    - All the filters have the **same API** since they all implement the Filter interface.
    - They all have the opportunity to **veto** the rest of the chain.

# DelegatingFilterProxy

- There is even one more **layer of indirection** in the security filter
  - usually installed in the container as a DelegatingFilterProxy, which **does not have** to be a Spring @Bean.
  - delegates to a FilterChainProxy, which is **always** a @Bean, usually with a fixed name of **springSecurityFilterChain**.

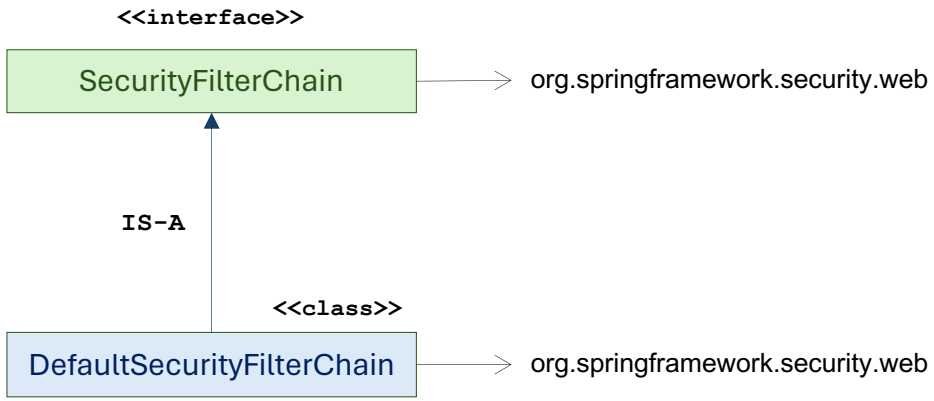


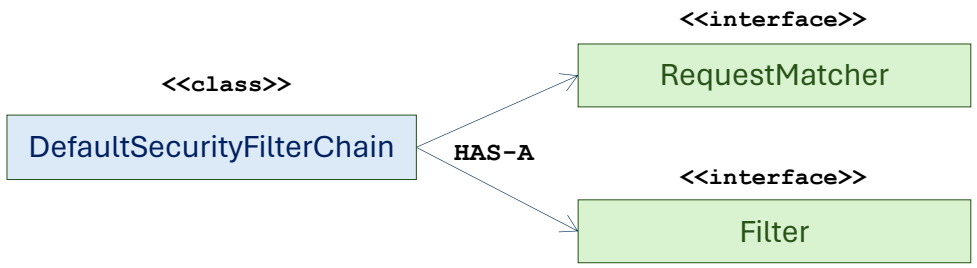




```
package org.springframework.boot.autoconfigure.security;

public class DelegatingFilterProxy extends GenericFilterBean {
    . . . // intentionally skipped

    private WebApplicationContext webApplicationContext;

    private volatile Filter delegate;

    . . . // intentionally skipped
}
```

# SecurityFilterChain

- Defines a **filter chain** which is capable of being matched against an HttpServletRequest to decide whether it applies to that request.
- Used to configure a FilterChainProxy.




```java
package org.springframework.security.web;

public interface SecurityFilterChain {
    boolean matches(HttpServletRequest request);

    List<Filter> getFilters();
}
```

```java
package org.springframework.security.web;

public interface DefaultSecurityFilterChain implements SecurityFilterChain {
    . . . // intentionally skipped

    private final RequestMatcher requestMatcher;

    private final List<Filter> filters;

    . . . // intentionally skipped
}
```

# Web Security Outline

- WebSecurityConfiguration
- WebSecurity – I
- WebSecurity – II
- WebSecurity – III
- WebSecurityConfigurerAdapter
- WebSecurityConfigurer
- SecurityConfigurer

# WebSecurityConfiguration

- Uses a WebSecurity to create the FilterChainProxy that performs the **web-based** security for Spring Security.
- **Customizations** can be made to WebSecurity
  - by implementing WebSecurityConfigurer and exposing it as a Configuration or
  - exposing a WebSecurityCustomizer bean.
- This configuration is imported when using EnableWebSecurity.

```
Creates the Spring Security Filter Chain

Returns: the Filter that represents the security filter chain

Throws: Exception

@Bean(name = AbstractSecurityWebApplicationInitializer.DEFAULT_FILTER_NAME)
public Filter springSecurityFilterChain() throws Exception {
    boolean hasFilterChain = !this.securityFilterChains.isEmpty();
    if (!hasFilterChain) {
        this.webSecurity.addSecurityFilterChainBuilder(() -> {
            this.httpSecurity.authorizeHttpRequests((authorize) -> authorize.anyRequest().authenticated());
            this.httpSecurity.formLogin(Customizer.withDefaults());
            this.httpSecurity.httpBasic(Customizer.withDefaults());
            return this.httpSecurity.build();
        });
    }
    for (SecurityFilterChain securityFilterChain : this.securityFilterChains) {
        this.webSecurity.addSecurityFilterChainBuilder(() -> securityFilterChain);
    }
    for (WebSecurityCustomizer customizer : this.webSecurityCustomizers) {
        customizer.customize(this.webSecurity);
    }
    return this.webSecurity.build();
}
```

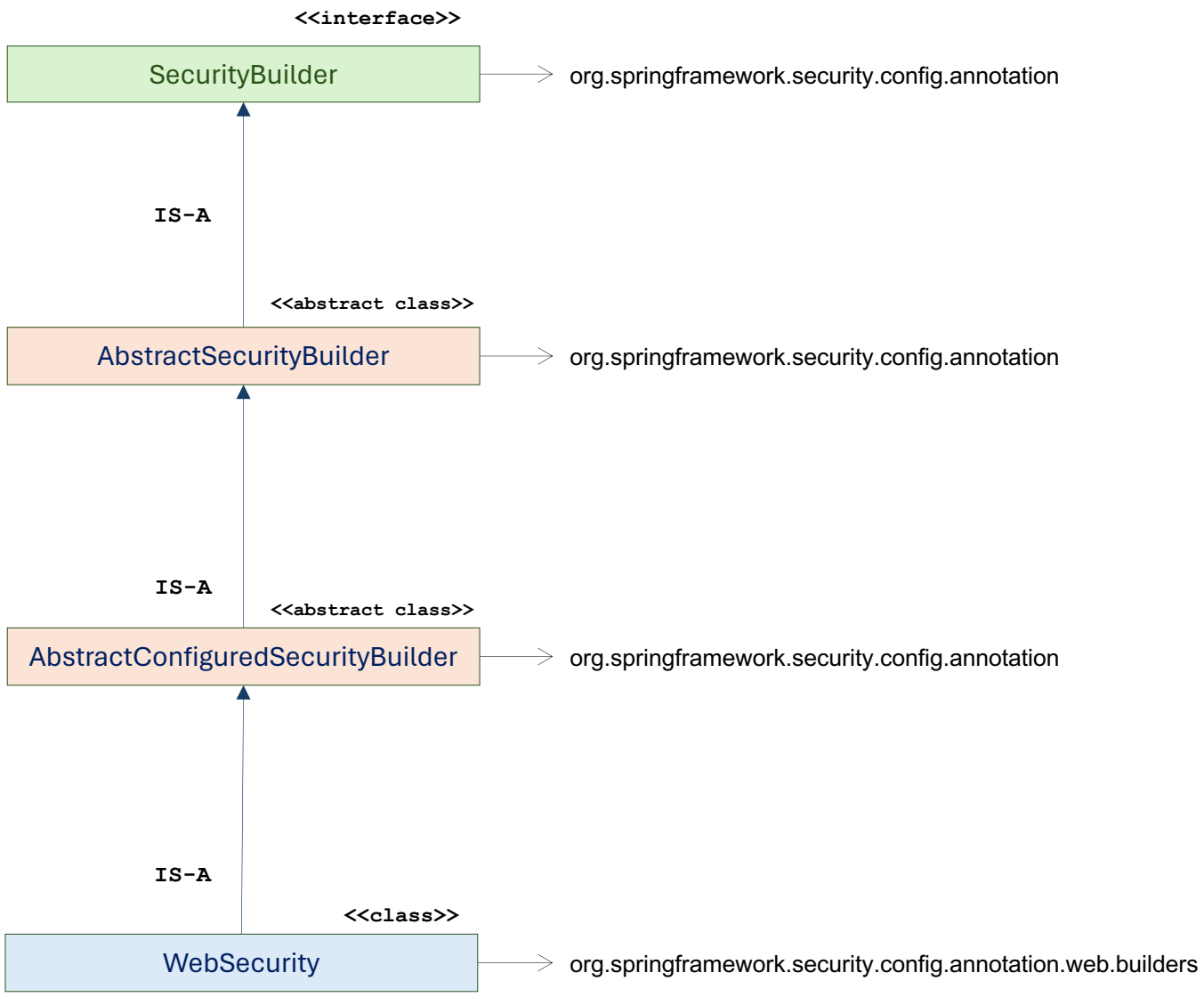
```
package org.springframework.security.config.annotation.web.configuration;

@Configuration(
    proxyBeanMethods = false
)
public interface WebSecurityConfiguration implements ImportAware, BeanClassLoaderAware {
    . . . // intentionally skipped

    private WebSecurity webSecurity;
    private HttpSecurity httpSecurity;

    private List<SecurityFilterChain> securityFilterChains = Collections.emptyList();

    . . . // intentionally skipped
}
```

# WebSecurity - I

- The WebSecurity is created by WebSecurityConfiguration to create the FilterChainProxy known as the **Spring Security Filter Chain** (**springSecurityFilterChain**).
  - The **springSecurityFilterChain** is the Filter that the DelegatingFilterProxy delegates to.
  - Customizations to the WebSecurity can be made by
    - ***creating*** a WebSecurityConfigurer or
    - ***exposing*** a WebSecurityCustomizer bean.

```
package org.springframework.security.config.annotation.web.builders;

public final class WebSecurity extends AbstractConfiguredSecurityBuilder<Filter, WebSecurity> implements SecurityBuilder<Filter>, ApplicationContextAware, ServletContextAware {

    . . . // intentionally skipped

    private final List<RequestMatcher> ignoredRequests;
    private final List<SecurityBuilder<? extends SecurityFilterChain>> securityFilterChainBuilders;
    private HttpFirewall httpFirewall;
    private ServletContext servletContext;

    . . . // intentionally skipped
}
```

# WebSecurity - II



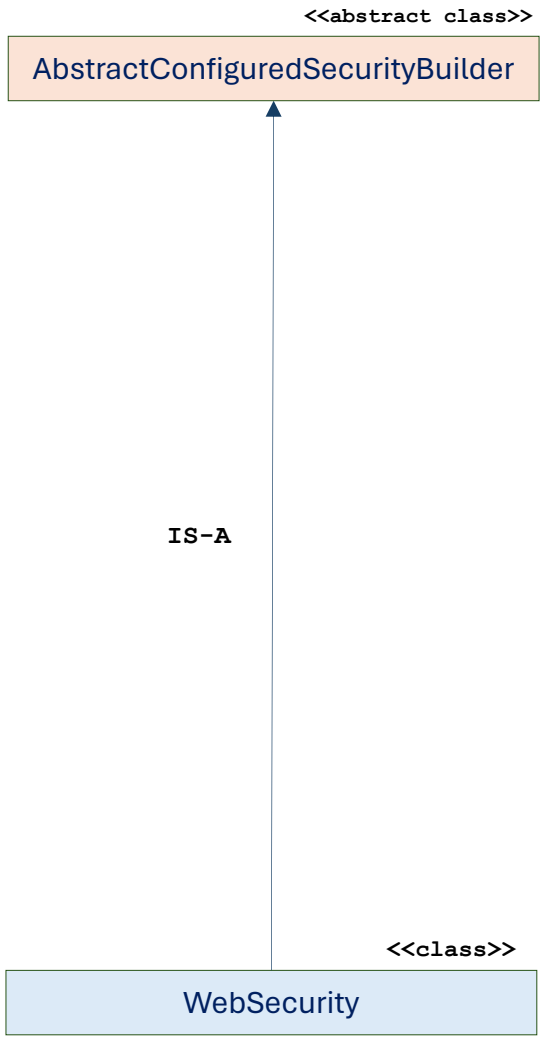

```java
package org.springframework.security.config.annotation;

public interface SecurityBuilder<O> {
    O build() throws Exception;
}
```

- Builds an Object.

```java
package org.springframework.security.config.annotation;

public abstract class AbstractSecurityBuilder<O> implements SecurityBuilder<O> {
    private AtomicBoolean building = new AtomicBoolean();
    private O object;

    @Override
    public final O build() throws Exception {
        if (this.building.compareAndSet(false, true)) {
            this.object = doBuild();
            return this.object;
        }
        throw new AlreadyBuiltException("This object has already been built");
    }

    public final O getObject() {
        if (!this.building.get()) {
            throw new IllegalStateException("This object has not been built");
        }
        return this.object;
    }

    protected abstract O doBuild() throws Exception;
}
```

- A base SecurityBuilder that ensures the object being built is only built one time.

# WebSecurity - III

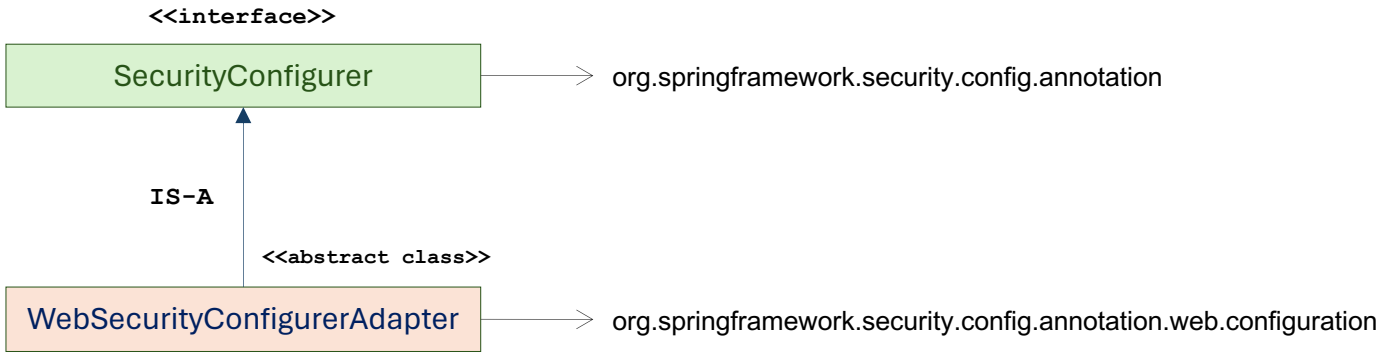



```java
package org.springframework.security.config.annotation;

public abstract class AbstractConfiguredSecurityBuilder<O, B extends SecurityBuilder<O>> extends
AbstractSecurityBuilder<O> {
    private final LinkedHashMap<Class<? extends SecurityConfigurer<O, B>>, List<SecurityConfigurer<O, B>>> configurers;
    private BuildState buildState = BuildState.UNBUILT;

    . . . // intentionally skipped

    @Override
    protected final O doBuild() throws Exception {
        synchronized (this.configurers) {
            this.buildState = BuildState.INITIALIZING;
            beforeInit();
            init();
            this.buildState = BuildState.CONFIGURING;
            beforeConfigure();
            configure();
            this.buildState = BuildState.BUILDING;
            O result = performBuild();
            this.buildState = BuildState.BUILT;
            return result;
        }
    }

    protected abstract O performBuild() throws Exception;

    . . . // intentionally skipped
}
```

- A base SecurityBuilder that allows SecurityConfigurer to be applied to it.
- This makes modifying the SecurityBuilder a strategy that can be customized and broken up into several SecurityConfigurer objects that have more specific goals than that of the SecurityBuilder.
    - For example, a SecurityBuilder may build an DelegatingFilterProxy, but a SecurityConfigurer might populate the SecurityBuilder with the filters necessary for **session management**, **form-based login**, **authorization**, etc.

# WebSecurityConfigurerAdapter

- Provides a **convenient base class** for creating a WebSecurityConfigurer instance.
  - The implementation allows **customization** by overriding methods.




```
package org.springframework.security.config.annotation.web.configuration;

public abstract class WebSecurityConfigurerAdapter extends SecurityConfigurer<Filter, WebSecurity> {
    private final AuthenticationManagerBuilder authenticationBuilder;
    private final AuthenticationManagerBuilder parentAuthenticationBuilder;

    . . . // intentionally skipped

    private AuthenticationManager authenticationManager;
    private HttpSecurity http;

    . . . // intentionally skipped
}
```

- Configures the SecurityBuilder instance, *i.e.*, WebSecurity.

# WebSecurityConfigurer

- Allows customization to the WebSecurity.
- In most instances users will use EnableWebSecurity and create a Configuration that exposes a SecurityFilterChain bean.
    - This will automatically be applied to the WebSecurity by the EnableWebSecurity annotation.

```
package org.springframework.security.config.annotation.web;

public interface WebSecurityConfigurer<T extends SecurityBuilder<Filter>> extends SecurityConfigurer<Filter, T> {
}
```

# SecurityConfigurer

- Allows for configuring a SecurityBuilder.
    - All SecurityConfigurer first have their **init**(SecurityBuilder) method invoked.
    - After all **init**(SecurityBuilder) methods have been invoked, each **configure**(SecurityBuilder) method is invoked.

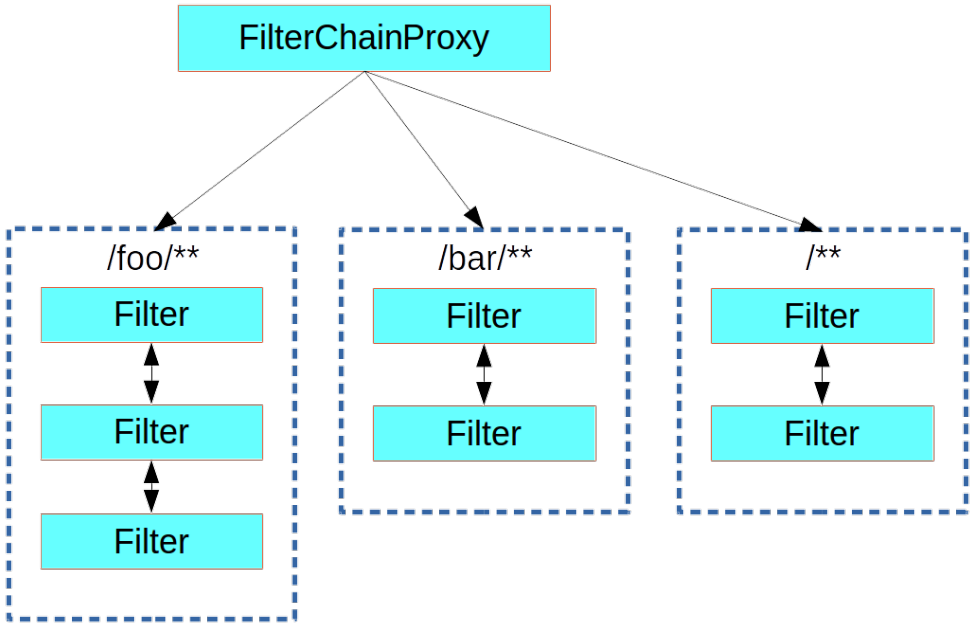
```
package org.springframework.security.config.annotation.web.configuration;

// Type parameters:
//     <O> – The object being built by the SecurityBuilder B
//     <B> – The SecurityBuilder that builds objects of type O.
//           This is also the SecurityBuilder that is being configured.
public interface SecurityConfigurer<O, B extends SecurityBuilder<O>> {

    void init(B builder) throws Exception;
    void configure(B builder) throws Exception;

}
```

# Customizations Outline

- Dispatching Requests to the First Chain That Matches
- Configuration of Filter Chains
- Creating and Customizing Filter Chains - I
- Creating and Customizing Filter Chains – II
- Request Matching for Dispatch and Authorization
- Combining Application Security Rules with Actuator Rules

# Dispatching Requests to the First Chain That Matches

- There can be **multiple filter chains** all managed by **Spring Security** in the same top level FilterChainProxy and all are unknown to the container.
- The Spring Security filter contains a **list of filter chains** and ***dispatches a request to the first chain that matches it***.
- The **most important feature** of this dispatch process is that ***only one chain ever handles a request***.




- The **dispatch** happening based on matching the request path
  - **/foo/**** matches before **/****.

# Configuration of Filter Chains

- A **vanilla Spring Boot application** with no custom security configuration has a several (call it n) filter chains, where usually **n=6**.
- The first (n-1) chains are there just to **ignore** static resource **patterns**, like /css/** and /images/**, and the error view: /error.
- The last chain matches the **catch-all** path (/**) and is more active, containing logic for authentication, authorization, exception handling, session handling, header writing, and so on.
- There are **a total of** 11 filters in this chain by default.
    - Users **don't have to** concern themselves with which filters are used and when.

---

- All filters internal to Spring Security are **unknown to the container** is important, especially in a Spring Boot application, where, by default, all @Beans of type Filter are **registered automatically with the container**.
- If you want to add a **custom filter** to the security chain, you need to either
    - **not make** it be a @Bean or
    - wrap it in a FilterRegistrationBean that explicitly disables the container registration.

# Creating and Customizing Filter Chains - I

- The **default** fallback filter chain in a Spring Boot application (the one with the /** request matcher) has a **predefined order** of SecurityProperties.BASIC_AUTH_ORDER.
  - Order applied to the SecurityFilterChain that is used to configure **basic authentication** for application endpoints.
- The **actual order** can be interpreted as prioritization, with the first object (with the **lowest order value**) having the **highest priority**.

```
package org.springframework.boot.autoconfigure.security;

public class SecurityProperties {
    . . . // intentionally skipped

    public static final int BASIC_AUTH_ORDER = Ordered.LOWEST_PRECEDENCE - 5;

    public static final int IGNORED_ORDER = Ordered.HIGHEST_PRECEDENCE;

    . . . // intentionally skipped
}
```

- SecurityProperties.IGNORED_ORDER is applied to the WebSecurityCustomizer that ignores standard **static resource paths**.

# Creating and Customizing Filter Chains - II

- You can switch it off completely by setting security.basic.enabled = false, or
- You can use it as a fallback and define other rules **with a lower order**.
  - Add a @Bean of type WebSecurityConfigurer and
  - Decorate the class with @Order:

```
@Configuration
@Order(SecurityProperties.BASIC_AUTH_ORDER - 10)
public class ApplicationConfigurerAdapter extends WebSecurityConfigurerAdapter {

    @Override
    protected void configure(HttpSecurity http) throws Exception {
        http.antMatcher("/match1/**")
        ...;
    }
}
```

- This bean causes **Spring Security** to add a new filter chain and order it before the **fallback**.

# Request Matching for Dispatch and Authorization

- A **security filter chain** (or, equivalently, a WebSecurityConfigurerAdapter) has a **request matcher** that is used to decide whether to apply it to an **HTTP request**.
- Once the decision is made to apply a particular filter chain, no others are applied.
- However, within a filter chain, you can have more **fine-grained control of authorization** by setting additional matchers in the HttpSecurity configurer, as follows:

```
@Configuration
@Order(SecurityProperties.BASIC_AUTH_ORDER - 10)
public class ApplicationConfigurerAdapter extends WebSecurityConfigurerAdapter {

    @Override
    protected void configure(HttpSecurity http) throws Exception {
        http.antMatcher("/match1/**").authorizeRequests()    // this one is a request matcher for the whole filter chain
            .antMatchers("/match1/user").hasRole("USER")     // this one is only to choose the access rule to apply
            .antMatchers("/match1/spam").hasRole("SPAM")
            .anyRequest().isAuthenticated();
    }
}
```

# Combining Application Security Rules with Actuator Rules

- If you use the **Spring Boot Actuator** for management endpoints, you probably want them to be **secure**, and, by default, **they are**.
- In fact, as soon as you add the **Actuator** to a secure application, **you get an additional filter chain** that applies only to the actuator endpoints.
  - It is defined with a **request matcher** that matches only actuator endpoints and
  - it has an order of ManagementServerProperties.**BASIC_AUTH_ORDER**, which is 5 fewer than the default SecurityProperties fallback filter, so it is consulted before the fallback.

```
@Configuration
@Order(ManagementServerProperties.BASIC_AUTH_ORDER + 1)
public class ApplicationConfigurerAdapter extends WebSecurityConfigurerAdapter {

    @Override
    protected void configure(HttpSecurity http) throws Exception {
        http.antMatcher("/foo/**")
        . . .;
    }
}
```

**Applying Custom Application Security Rules to the Actuator Endpoints:**

- Add a filter chain that
  - is ordered earlier than the actuator one and
  - has a request matcher that includes all actuator endpoints.

**Default Security Settings for the Actuator Endpoints**

- Add your own filter
  - **later than the actuator one**,
  - but **earlier than the fallback**,

    *i.e.*, ManagementServerProperties.**BASIC_AUTH_ORDER** + 1

# Method Security Outline

- Method Security

# Method Security

- **Spring Security** offers support for applying access rules to Java method executions.
- Access rules are declared using the same format of ConfigAttribute strings.

```
@SpringBootApplication
@EnableGlobalMethodSecurity(securedEnabled = true)
public class SampleSecureApplication {
}
```

```
@Service
public class MyService {

    @Secured("ROLE_USER")
    public String secure() {
        return "Hello Security";
    }
}
```

- Spring creates a @Bean of this type, it is proxied and callers must go through a **security interceptor** before the method is executed.
- If access is denied, the caller gets an AccessDeniedException instead of the actual method result.

# Working with Threads Outline

- SecurityContext – I
- SecurityContext – II
- AuthenticationPrincipal
- Authentication
- Principal
- Processing Secure Methods Asynchronously
- AyncConfigurerSupport
- AyncConfigurer

# SecurityContext - I

- Spring Security is fundamentally **thread-bound** because it needs to make the current **authenticated principal** available to a wide variety of downstream consumers.
- SecurityContext contains an Authentication.

- You can access and manipulate the SecurityContext through static convenience methods in SecurityContextHolder, which, in turn, manipulate a ThreadLocal.

```
SecurityContext context = SecurityContextHolder.getContext();
Authentication authentication = context.getAuthentication();
assert(authentication.isAuthenticated);
```

- If you need access to the **currently authenticated user** in a web endpoint, you can use a method parameter in a @RequestMapping, annotated by @AuthenticationPrincipal.
    - pulls the current Authentication out of the SecurityContext and calls the getPrincipal() method on it to yield the method parameter.

```
@RequestMapping("/foo")
public String foo(@AuthenticationPrincipal User user) {
    // do stuff with user
}
```

# SecurityContext - II

- The type of the Principal in an Authentication is dependent on the AuthenticationManager used to validate the authentication, so this can be a useful little trick to get a **type-safe** reference to user data.

- If Spring Security is in use, the Principal from the HttpServletRequest is of type Authentication, so you can also use that directly.

```
@RequestMapping(“/foo”)
public String foo(Principal principal) {
    Authentication authentication = (Authentication) principal;
    User = (User) authentication.getPrincipal();
    // do stuff with user
}
```

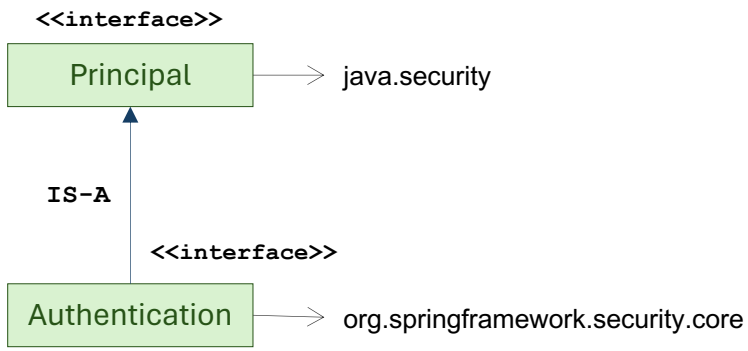
# AuthenticationPrincipal

- Annotation that is used to resolve Authentication.**getPrincipal**() to a method argument.

```java
package org.springframework.security.core.annotation;

@Target({ElementType.PARAMETER, ElementType.ANNOTATION_TYPE})
@Retention(RetentionPolicy.RUNTIME)
@Documented
public @interface AuthenticationPrincipal {
    // True if a ClassCastException should be thrown when
    // the current Authentication.getPrincipal() is the incorrect type.
    boolean errorOnInvalidType() default false;
    String expression() default "";
}
```

# Authentication

- Represents the **token** for an **authentication request** or for an **authenticated principal** once the request has been processed by the AuthenticationManager.**authenticate**(Authentication) method.
- Once the request has been authenticated, the Authentication will usually be stored in a **thread-local** SecurityContext managed by the SecurityContextHolder by the authentication mechanism which is being used.




```java
package org.springframework.security.core;

public interface Authentication extends Principal, Serializable {
    // returns the Principal being authenticated or the authenticated principal after authentication.
    //
    // In the case of an authentication request with username and password, this would be the username.
    //
    // The AuthenticationManager implementation will often return an Authentication containing richer
    // information as the principal for use by the application.
    //
    // Many of the authentication providers will create a UserDetails object as the principal.
    Object getPrincipal();

    // other APIs were intentionally skipped

    Collection<? extends GrantedAuthority> getAuthorities();
    boolean isAuthenticated();
}
```

# Principal

- Interface represents the abstract notion of a Principal, which can be used to represent any entity, such as an individual, a corporation, and a login id.

```
package java.security;

public interface Principal {
    boolean equals(Object another);
    String toString();
    int hashCode();
    String getName();
}
```

# Processing Secure Methods Asynchronously

- Since the SecurityContext is **thread-bound**, if you want to do any background processing that calls secure methods, i.e., with @Async, you need to ensure that the context is propagated.
    - This boils down to **wrapping** the SecurityContext with the task (Runnable, Callable, and so on) that is executed in the background.
- To propagate the SecurityContext to @Async methods, you need to supply an AsyncConfigurer and ensure the Executor is of the correct type

```
@Configuration
public class ApplicationConfiguration extends AsyncConfigurerSupport {
    @Override
    public Executor getAsyncExecutor() {
        return new DelegatingSecurityContextExecutorService(Executors.newFixedThreadPool(5));
    }
}
```

# AyncConfigurerSupport

- A convenience AsyncConfigurer that implements all methods so that the defaults are used.
  - Provides a **backward compatible alternative** of implementing AsyncConfigurer directly.
- Deprecated
  - as of 6.0 in favor of implementing AsyncConfigurer directly.

```
package org.springframework.scheduling.annotation;

@Deprecated(since = “6.0”)
public class AsyncConfigurerSupport implements AsyncConfigurer {
    @Override
    public Executor getAsyncExecutor() {
         return null;
    }

    @Override
    public AsyncUncaughtExceptionHandler getAsyncUncaughtExceptionHandler() {
        return null;
    }
}
```

# AyncConfigurer

- Interface to be implemented by classes annotated with @EnableAsync and @Configuration that wish to customize
  - the Executor instance used when **processing async method invocations** or
  - the AsyncUncaughtExceptionHandler instance used to process **exceptions thrown from async method** with void return type.

```
package org.springframework.scheduling.annotation;

public interface AsyncConfigurer {

    default Executor getAsyncExecutor() {
        return null;
    }

    default AsyncUncaughtExceptionHandler getAsyncUncaughtExceptionHandler() {
        return null;
    }
}
```