Spring Security Overview

You will learn how to …

- Secure Spring MVC Web Apps
- Develop login pages (default and custom)
- Define users and roles with simple authentication
- Protect URLs based on role
- Use JSP tags to hide/show content based on role
- Store users, passwords and roles in DB (plain-text -> encrypted)

Practical Results

- Cover the most common Spring Security tasks that you will need on daily projects
- Not an A to Z reference … for that you can see **Spring Security Reference Manual**

http://www.luv2code.com/spring-security-reference-manual

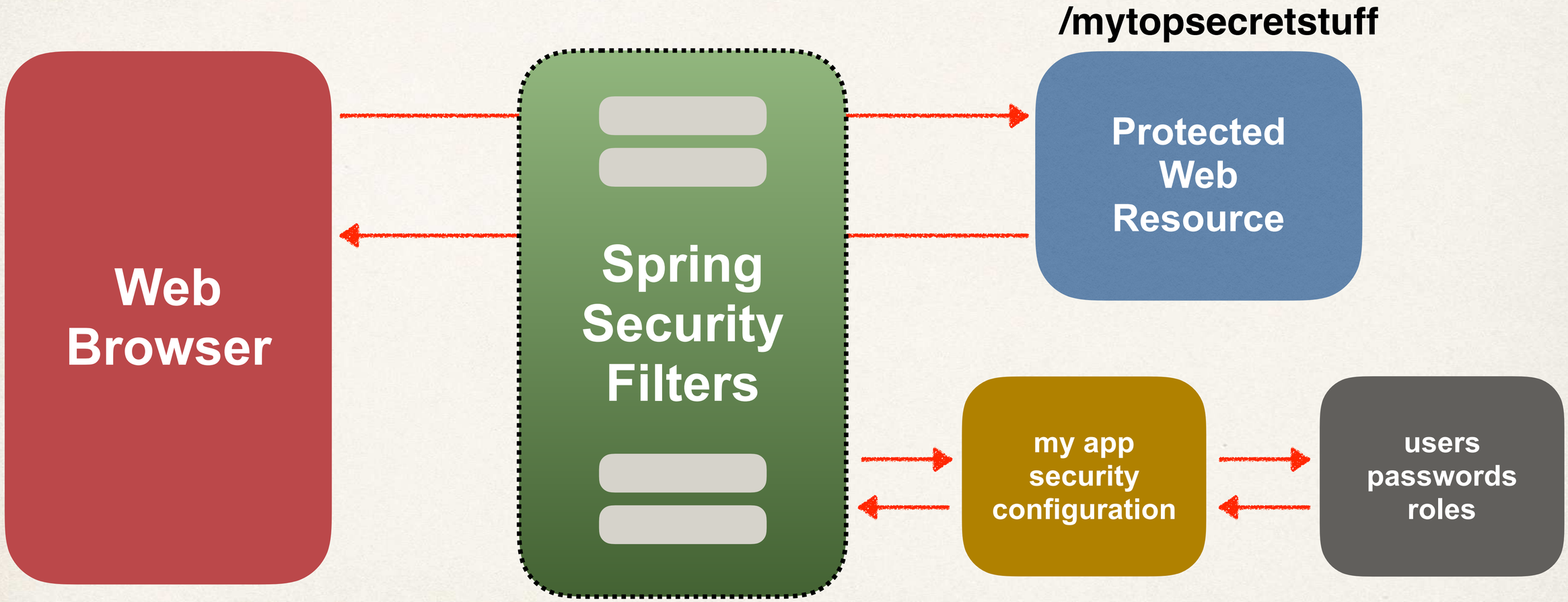
Spring Security Model

- Spring Security defines a framework for security
- Implemented using Servlet filters in the background
- Two methods of securing a Web app: declarative and programmatic

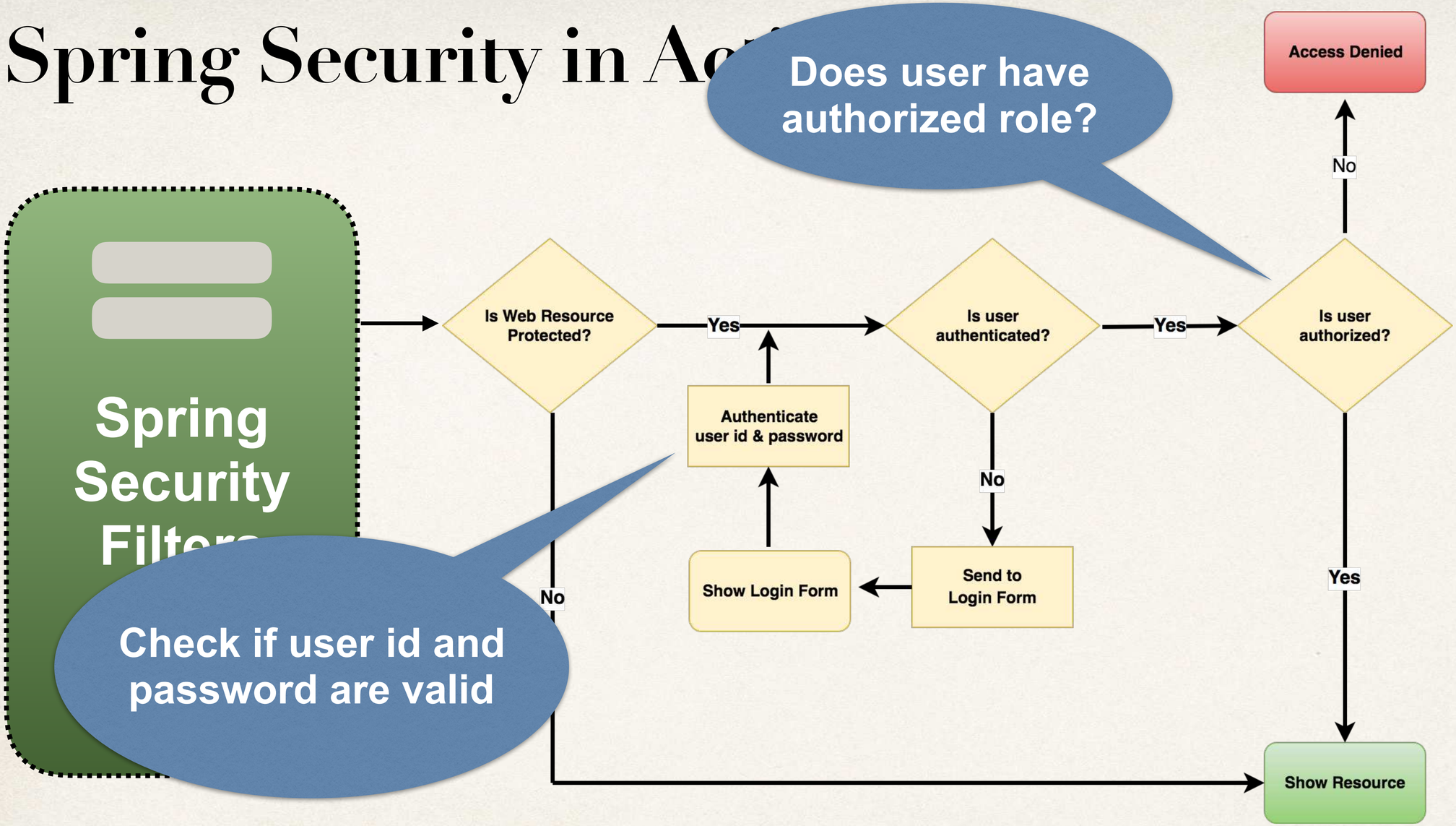
Spring Security with Servlet Filters

- Servlet Filters are used to pre-process / post-process web requests
- Servlet Filters can route web requests based on security logic
- Spring provides a bulk of security functionality with servlet filters

Spring Security Overview



Spring Security in Ac



Security Concepts

- Authentication
  - Check user id and password with credentials stored in app / db
- Authorization
  - Check to see if user has an authorized role

Declarative Security

- Define application's security constraints in configuration
  - All Java config (@Configuration, no xml)
  - or Spring XML config

- Provides separation of concerns between application code and security

Programmatic Security

- Spring Security provides an API for custom application coding
- Provides greater customization for specific app requirements

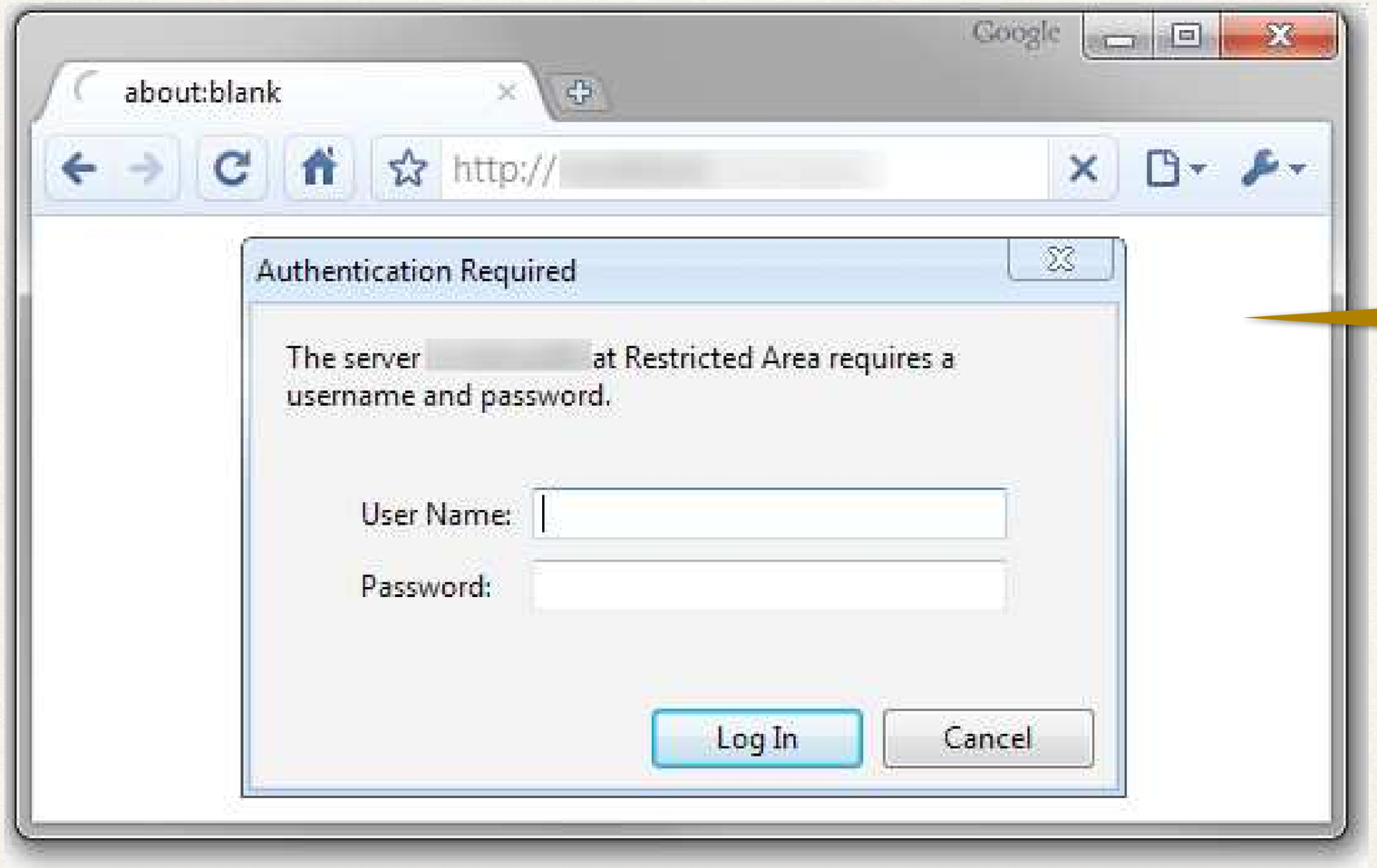
Different Login Methods

- HTTP Basic Authentication

- Default login form
  - Spring Security provides a default login form

- Custom login form
  - your own look-and-feel, HTML + CSS

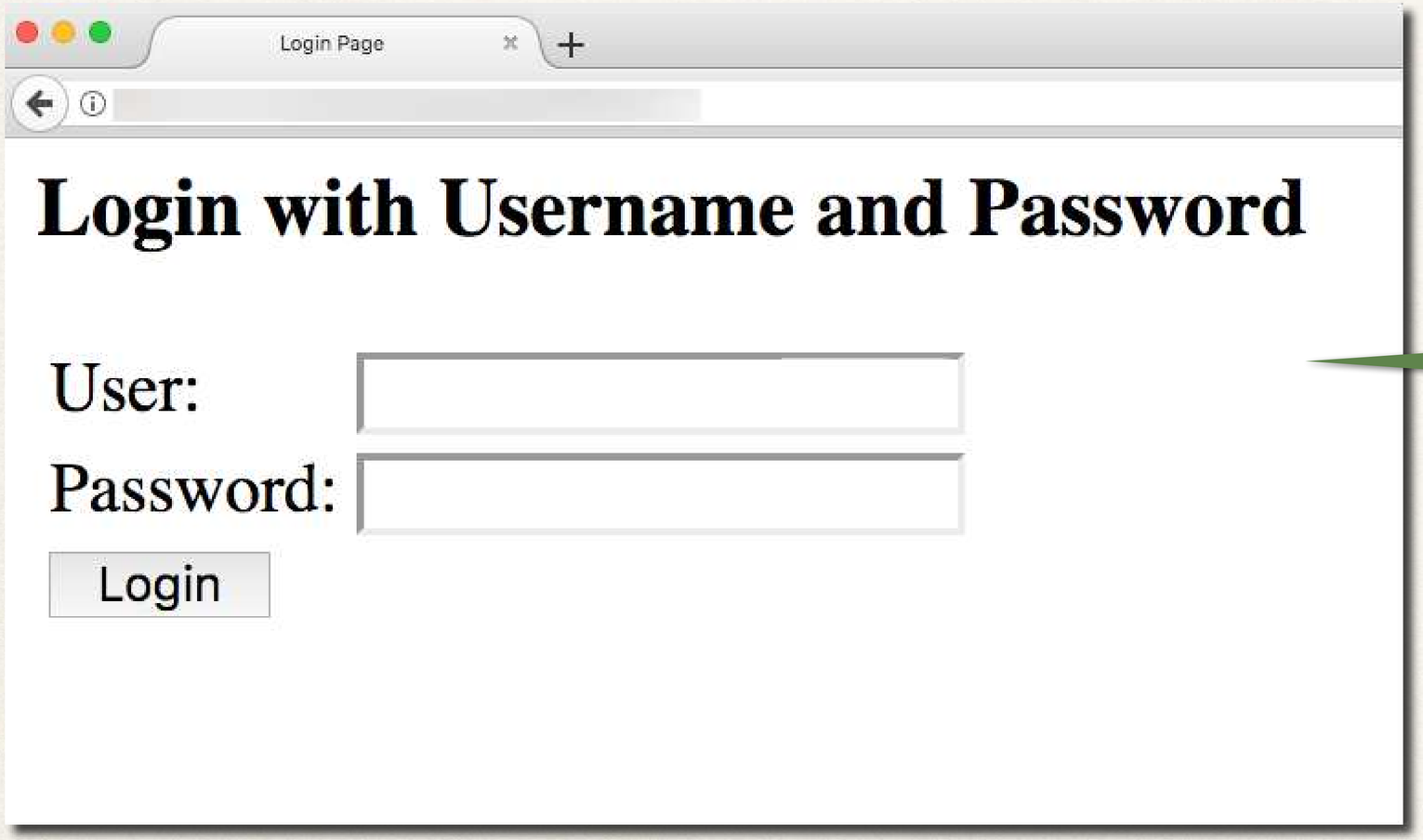
HTTP Basic Authentication



Built-in Dialog from browser

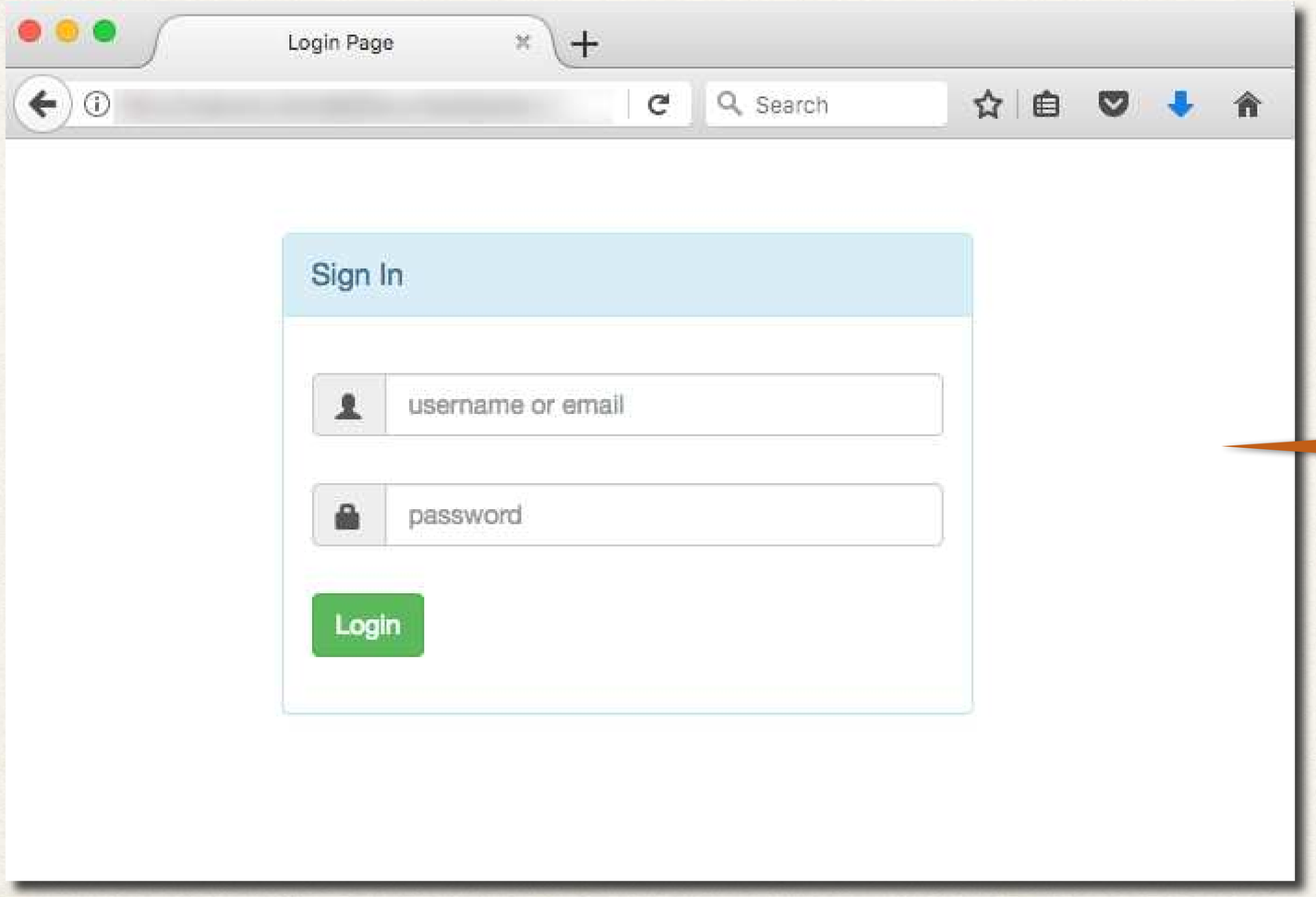
bleh!

Spring Security - Default Login Form



Good for quick start

Your Own Custom Login Form



Your own custom look-and-feel HTML + CSS

Authentication and Authorization

- In-memory
- JDBC
- LDAP
- Custom / Pluggable
- *others …*

users
passwords
roles

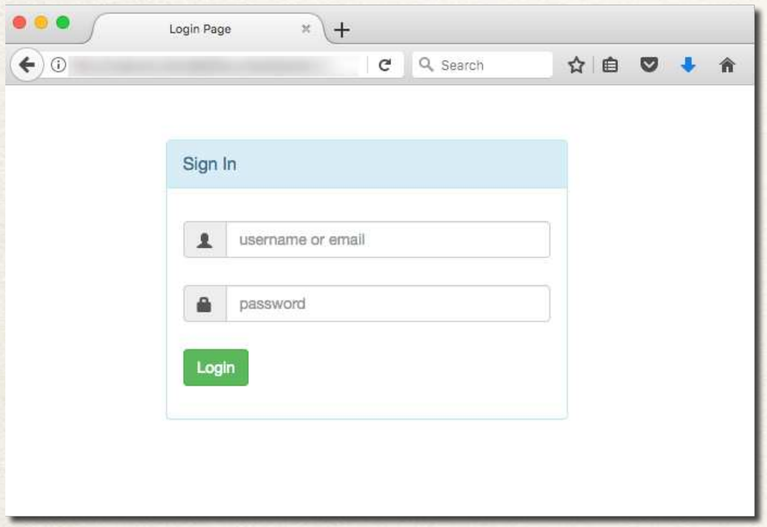
We will cover password storage in DB as plain-text AND encrypted

Spring Security Demo

Recap of our Game Plan

- Secure Spring MVC Web Apps
- Develop login pages (default and custom)
- Define users and roles with simple authentication
- Protect URLs based on role
- Use JSP tags to hide/show content based on role
- Store users, passwords and roles in DB (plain-text -> encrypted)

Our Example



/

Home Page

role: EMPLOYEE

/leaders

Leadership Retreat Page

role: MANAGER

/systems

Admin Holiday Cruise

role: ADMIN

Spring MVC App - Java Config

Java Configuration

Java Configuration

- Instead of configuring Spring MVC app using XML

Java Configuration

- Instead of configuring Spring MVC app using XML
  - web.xml

Java Configuration

- Instead of configuring Spring MVC app using XML
  - web.xml
  - spring-mvc-demo-servlet.xml

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- Configure the Spring MVC app with Java code

Java Configuration

- Instead of configuring Spring MVC app using XML
  - web.xml
  - spring-mvc-demo-servlet.xml

- Configure the Spring MVC app with Java code

No XML!

Development Process

Step-By-Step

Development Process

Step-By-Step

1. Add Maven dependencies for Spring MVC Web App

Development Process

Step-By-Step

1. Add Maven dependencies for Spring MVC Web App

2. Create Spring App Configuration (@Configuration)

Development Process

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1. Add Maven dependencies for Spring MVC Web App

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4. Develop our Spring controller

Development Process

Step-By-Step

1. Add Maven dependencies for Spring MVC Web App

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5. Develop our JSP view page

Step 1: Add Maven dependencies for Spring MVC Web App

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spring-

Step 1: Add Maven dependencies for Spring MVC Web App

spring-

jstl

Step 1: Add Maven dependencies for Spring MVC Web App

spring-

javax.servlet-api

jstl

Step 1: Add Maven dependencies for Spring MVC Web App

spring-

javax.servlet-api

jstl

javax.servlet.jsp-api

Step 1: Add Maven dependencies for Spring MVC Web App

File: pom.xml

```
<!-- Spring MVC support -->
<dependency>
    <groupId>org.springframework</groupId>
    <artifactId>spring-webmvc</artifactId>
    <version>...</version>
</dependency>
```

Step 1: Add Maven dependencies for Spring MVC Web App

File: pom.xml

```xml
<!-- Spring MVC support -->
<dependency>
    <groupId>org.springframework</groupId>
    <artifactId>spring-webmvc</artifactId>
    <version>...</version>
</dependency>
```

Will load all supporting dependencies: spring-core, logging etc …

Step 1: Add Maven dependencies for Spring MVC Web App

File: pom.xml

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Step 1: Add Maven dependencies for Spring MVC Web App

File: pom.xml

```
<!-- Spring MVC support -->
<dependency>
    <groupId>org.springframework</groupId>
    <artifactId>spring-webmvc</artifactId>
    <version>...</version>
</dependency>

<!-- Servlet, JSP and JSTL support -->
<dependency>
    <groupId>javax.servlet</groupId>
    <artifactId>javax.servlet-api</artifactId>
    <version>...</version>
</dependency>

<dependency>
    <groupId>javax.servlet.jsp</groupId>
    <artifactId>javax.servlet.jsp-api</artifactId>
    <version>...</version>
</dependency>

<dependency>
    <groupId>javax.servlet</groupId>
    <artifactId>jstl</artifactId>
    <version>...</version>
```

Add Servlet, JSP and JSTL support

Customize Maven Build

File: pom.xml

```
<build>

    <pluginManagement>
        <plugins>





        </plugins>
    </pluginManagement>
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Need to customize Maven build

Since we are not using web.xml

Customize Maven Build

File: pom.xml

```
<build>

    <pluginManagement>
        <plugins>

            <plugin>
                <!-- Add Maven coordinates (GAV) for: maven-war-plugin -->
                <groupId>org.apache.maven.plugins</groupId>
                <artifactId>maven-war-plugin</artifactId>
                <version>3.2.0</version>
            </plugin>

        </plugins>
    </pluginManagement>
```

Need to customize Maven build

Since we are not using web.xml

Customize Maven Build

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Need to customize Maven build

Since we are not using web.xml

Must add Maven WAR plugin

XML config to Java config

XML config to Java config

web.xml

spring-mvc-demo-servlet.xml

XML config to Java config

web.xml

spring-mvc-demo-servlet.xml

Java Config

Spring
@Configuration

Spring Dispatcher
Servlet Initializer

XML config to Java config

Java Config

Spring
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Spring Dispatcher
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XML config to Java config

Java Config

Spring
@Configuration

Spring Dispatcher
Servlet Initializer

No XML!

Flash Back to XML config (the old way)

File: spring-mvc-demo-servlet.xml

```
<beans>

</beans>
```

Flash Back to XML config (the old way)

File: spring-mvc-demo-servlet.xml

```
<beans>

</beans>
```

Just an FYI

Flash Back to XML config (the old way)

File: spring-mvc-demo-servlet.xml

```
<beans>

  <!-- Add support for component scanning -->
  <context:component-scan base-package="com.luv2code.springdemo" />

</beans>
```

Just an FYI

Flash Back to XML config (the old way)

File: spring-mvc-demo-servlet.xml

```
<beans>

    <!-- Add support for component scanning -->
    <context:component-scan base-package="com.luv2code.springdemo" />

    <!-- Add support for conversion, formatting and validation support -->
    <mvc:annotation-driven/>



</beans>
```

Just an FYI

Flash Back to XML config (the old way)

File: spring-mvc-demo-servlet.xml

```
<beans>

   <!-- Add support for component scanning -->
   <context:component-scan base-package="com.luv2code.springdemo" />

   <!-- Add support for conversion, formatting and validation support -->
   <mvc:annotation-driven/>

   <!-- Define Spring MVC view resolver -->
   <bean
      class="org.springframework.web.servlet.view.InternalResourceViewResolver">
      <property name="prefix" value="/WEB-INF/view/" />
      <property name="suffix" value=".jsp" />
   </bean>

</beans>
```

Just an FYI

Enabling the MVC Java Config

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```
@EnableWebMvc
```

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@EnableWebMvc

- Provides similar support to **<mvc:annotation-driven />** in XML.

Enabling the MVC Java Config

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- Adds conversion, formatting and validation support

Enabling the MVC Java Config

@EnableWebMvc

- Provides similar support to **<mvc:annotation-driven />** in XML.
- Adds conversion, formatting and validation support
- Processing of @Controller classes and @RequestMapping etc ... methods

Step 2: Create Spring App Configuration

File: DemoAppConfig.java

```
@Configuration
@EnableWebMvc
@ComponentScan(basePackages="com.luv2code.springsecurity.demo")
public class DemoAppConfig {

}
```

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    // define a bean for ViewResolver



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File: DemoAppConfig.java

```
@Configuration
@EnableWebMvc
@ComponentScan(basePackages="com.luv2code.springsecurity.demo")
public class DemoAppConfig {

    // define a bean for ViewResolver

    @Bean
    public ViewResolver viewResolver() {

        InternalResourceViewResolver viewResolver = new InternalResourceViewResolver();

        viewResolver.setPrefix("/WEB-INF/view/");
        viewResolver.setSuffix(".jsp");

        return viewResolver;
    }

}
```

View Resolver Configs - Explained

```
InternalResourceViewResolver viewResolver = new InternalResourceViewResolver();

viewResolver.setPrefix("/WEB-INF/view/");
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View Resolver Configs - Explained

```
InternalResourceViewResolver viewResolver = new InternalResourceViewResolver();

viewResolver.setPrefix("/WEB-INF/view/");
viewResolver.setSuffix(".jsp");
```

/WEB-INF/view/ show-student-list .jsp

View name

Flash Back to XML config (the old way)

File: web.xml

```
<web-app>

</web-app>
```

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```

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File: web.xml

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```
<web-app>

    <servlet>
        <servlet-name>dispatcher</servlet-name>
        <servlet-class>org.springframework.web.servlet.DispatcherServlet</servlet-class>

        <init-param>
            <param-name>contextConfigLocation</param-name>
            <param-value>/WEB-INF/spring-mvc-demo-servlet.xml</param-value>
        </init-param>

        <load-on-startup>1</load-on-startup>
    </servlet>





</web-app>
```

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File: web.xml

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    </servlet>

    <servlet-mapping>
        <servlet-name>dispatcher</servlet-name>
        <url-pattern>/</url-pattern>
    </servlet-mapping>

</web-app>
```

Web App Initializer

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- Spring MVC provides support for web app initialization

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- Makes sure your code is automatically detected

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AbstractAnnotationConfigDispatcherServletInitializer

Web App Initializer (more info)

AbstractAnnotationConfigDispatcherServletInitializer

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AbstractAnnotationConfigDispatcherServletInitializer

- Your TO DO list

Web App Initializer (more info)

AbstractAnnotationConfigDispatcherServletInitializer

- Your TO DO list
  - Extend this abstract base class

Web App Initializer (more info)

AbstractAnnotationConfigDispatcherServletInitializer

- Your TO DO list
  - Extend this abstract base class
  - Override required methods

Web App Initializer (more info)

AbstractAnnotationConfigDispatcherServletInitializer

- Your TO DO list
  - Extend this abstract base class
  - Override required methods
  - Specify servlet mapping and location of your app config

Step 3: Create Spring Dispatcher Servlet Initializer

File:MySpringMvcDispatcherServletInitializer.java

```
import org.springframework.web.servlet.support.AbstractAnnotationConfigDispatcherServletInitializer;

public class MySpringMvcDispatcherServletInitializer extends AbstractAnnotationConfigDispatcherServletInitializer {

}
```

Step 3: Create Spring Dispatcher Servlet Initializer

File:MySpringMvcDispatcherServletInitializer.java

```
import org.springframework.web.servlet.support.AbstractAnnotationConfigDispatcherServletInitializer;

public class MySpringMvcDispatcherServletInitializer extends AbstractAnnotationConfigDispatcherServletInitializer {

    @Override
    protected Class<?>[] getRootConfigClasses() {
        // TODO Auto-generated method stub
        return null;
    }

}
```

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    }



}
```

Our config class from Step 2

Step 3: Create Spring Dispatcher Servlet Initializer

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    protected Class<?>[] getServletConfigClasses() {
        return new Class[] { DemoAppConfig.class };
    }

    @Override
    protected String[] getServletMappings() {
        return new String[] { "/" };
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}
```

```xml
<servlet>
  <servlet-name>dispatcher</servlet-name>
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  <init-param>
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  </init-param>

  <load-on-startup>1</load-on-startup>
</servlet>

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Step 3: Create Spring Dispatcher Servlet Initializer

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```

Step 3: Create Spring Dispatcher Servlet Initializer

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</servlet>
```

```xml
<servlet-mapping>
  <servlet-name>dispatcher</servlet-name>
  <url-pattern>/</url-pattern>
</servlet-mapping>
```

Whew!!!!

Now for the easy stuff

Create Spring MVC Controller and view page

easy peazy ...

Step 4: Develop our Spring Controller

File: DemoController.java

```
@Controller
public class DemoController {



}
```

Step 4: Develop our Spring Controller

File: DemoController.java

```
@Controller
public class DemoController {

    @GetMapping("/")
    public String showHome() {

        return "home";
    }

}
```

Step 4: Develop our Spring Controller

File: DemoController.java

```
@Controller
public class DemoController {

    @GetMapping("/")
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}
```

/WEB-INF/view/ home .jsp

Step 4: Develop our Spring Controller

File: DemoController.java

```
@Controller
public class DemoController {

    @GetMapping("/")
    public String showHome() {

        return "home";
    }

}
```

View name

/WEB-INF/view/ home .jsp

Step 5: Develop our JSP view page

File: /WEB-INF/view/home.jsp

```
<html>

<body>

   Welcome to the luv2code company home page!

</body>

</html>
```

Step 5: Develop our JSP view page

File: /WEB-INF/view/home.jsp

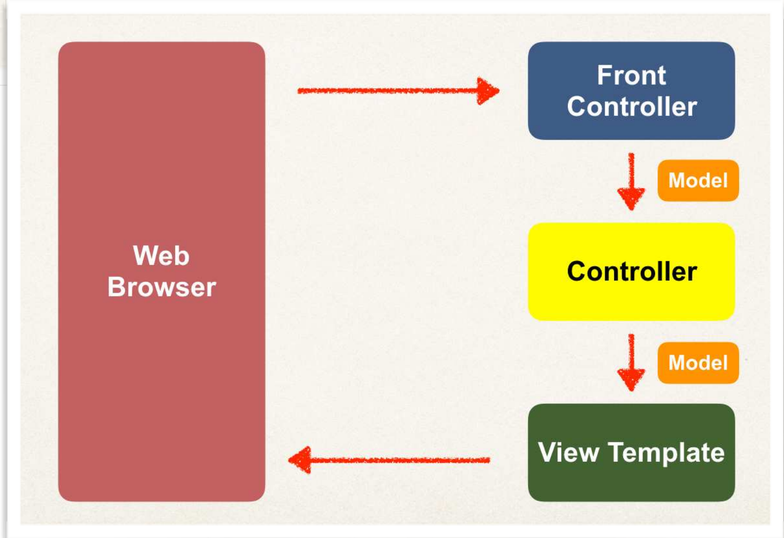
```
<html>

<body>

   Welcome to the luv2code company home page!

</body>

</html>
```



Step 5: Develop our JSP view page

File: /WEB-INF/view/home.jsp

```
<html>

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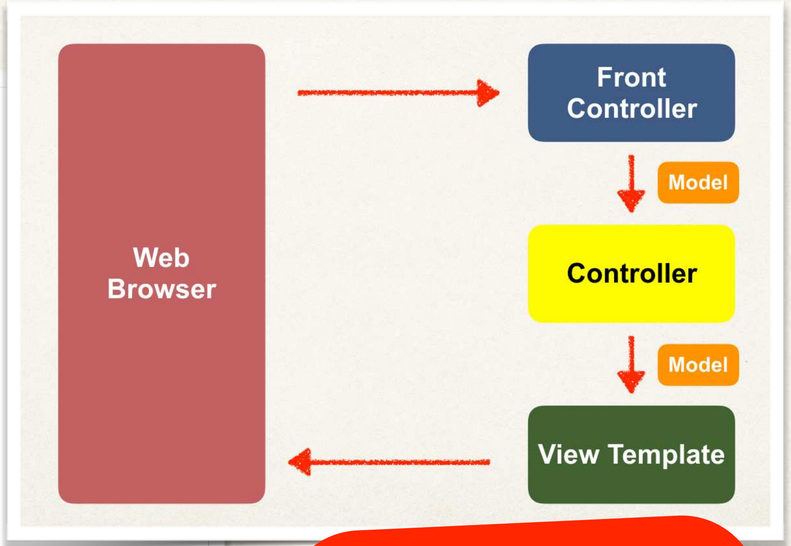
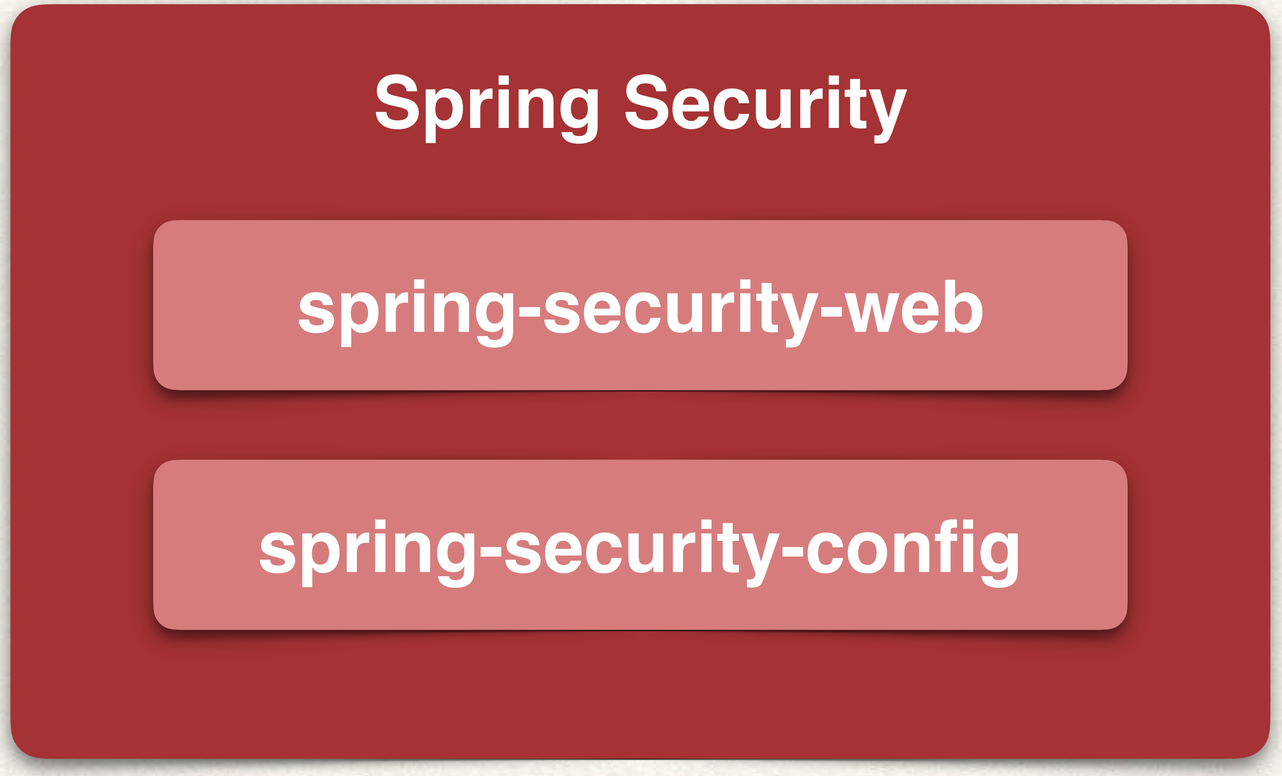


No XML!

Spring Security Project Setup

Add Maven dependencies for Spring Security

Add Maven dependencies for Spring Security



Spring Projects

Spring Projects

Spring Security

Spring Projects

Spring Security

Spring Framework (core, aop, mvc…)

Spring Projects

Spring Security

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Spring Security

Spring Framework (core, aop, mvc…)

- These are two <u>separate</u> projects

Spring Projects

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Spring Projects

Spring Security

Spring Framework (core, aop, mvc…)

- These are two separate projects
- The projects are on different release cycles
- Version numbers between projects are generally not in sync (sigh…)
  - Spring team is working to resolve this for future releases …

Spring Security

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Spring Framework
(core, aop, web…)

Spring Security

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Spring Framework (core, aop, web…)

- Common pitfall is using incompatible projects

Spring Security

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Spring Framework (core, aop, web…)

- Common pitfall is using incompatible projects
- Need to find compatible version

Finding Compatible version

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- Find desired version of Spring Security in Maven Central Repo
  - spring-security-web

Finding Compatible version

- Find desired version of Spring Security in Maven Central Repo
  - spring-security-web
- Look at the project POM file
  - Find supporting Spring Framework version

Finding Compatible version

Finding Compatible version

org.springframework.security : spring-security-web : 5.0.0.RELEASE

Click on a link above to browse the repository.

Project Information

GroupId:	org.springframework.security
ArtifactId:	spring-security-web
Version:	5.0.0.RELEASE

Dependency Information

Project Object Model (POM)

```
<dependency>
  <groupId>org.springframework</groupId>
  <artifactId>spring-context</artifactId>
  <scope>compile</scope>
  <version>5.0.2.RELEASE</version>
</dependency>
<dependency>
  <groupId>org.springframework</groupId>
  <artifactId>spring-core</artifactId>
  <scope>compile</scope>
```

Finding Compatible version

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Project Information

GroupId:	org.springframework.security
ArtifactId:	spring-security-web
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  <scope>compile</scope>
```

Spring Security version

Finding Compatible version

org.springframework.security : spring-security-web : 5.0.0.RELEASE

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Project Information

GroupId:	org.springframework.security
ArtifactId:	spring-security-web
Version:	5.0.0.RELEASE

Dependency Information

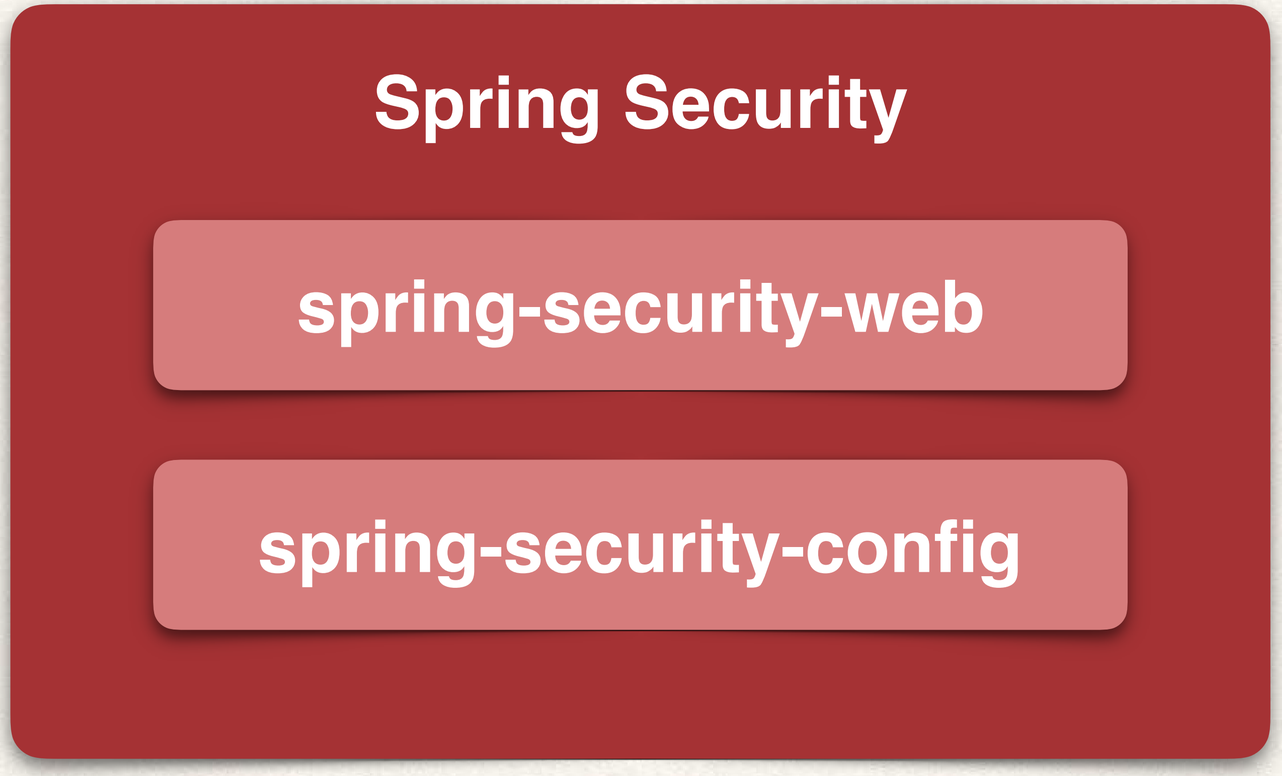
Project Object Model (POM)

```
<dependency>
  <groupId>org.springframework</groupId>
  <artifactId>spring-context</artifactId>
  <scope>compile</scope>
  <version>5.0.2.RELEASE</version>
</dependency>
<dependency>
  <groupId>org.springf
  <artifactId>spring-c
  <scope>compile</sc
```

Spring Security version

Spring Framework version

Add Maven dependencies for Spring Security



Add Maven dependencies for Spring Security

File: pom.xml

```
<properties>
    <springframework.version>5.0.2.RELEASE</springframework.version>
    <springsecurity.version>5.0.0.RELEASE</springsecurity.version>
</properties>

...
```

Add Maven dependencies for Spring Security

File: pom.xml

```
<properties>
    <springframework.version>5.0.2.RELEASE</springframework.version>
    <springsecurity.version>5.0.0.RELEASE</springsecurity.version>
</properties>

...

    <!-- Spring -->
    <dependency>
        <groupId>org.springframework</groupId>
        <artifactId>spring-webmvc</artifactId>
        <version>${springframework.version}</version>
    </dependency>
```

Add Maven dependencies for Spring Security

File: pom.xml

```
<properties>
    <springframework.version>5.0.2.RELEASE</springframework.version>
    <springsecurity.version>5.0.0.RELEASE</springsecurity.version>
</properties>

...

    <!-- Spring -->
    <dependency>
        <groupId>org.springframework</groupId>
        <artifactId>spring-webmvc</artifactId>
        <version>${springframework.version}</version>
    </dependency>

    <!-- Spring Security -->
    <dependency>
        <groupId>org.springframework.security</groupId>
        <artifactId>spring-security-web</artifactId>
        <version>${springsecurity.version}</version>
    </dependency>
```

Add Maven dependencies for Spring Security

File: pom.xml

```
<properties>
    <springframework.version>5.0.2.RELEASE</springframework.version>
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...

    <!-- Spring -->
    <dependency>
        <groupId>org.springframework</groupId>
        <artifactId>spring-webmvc</artifactId>
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    <!-- Spring Security -->
    <dependency>
        <groupId>org.springframework.security</groupId>
        <artifactId>spring-security-web</artifactId>
        <version>${springsecurity.version}</version>
    </dependency>

    <dependency>
        <groupId>org.springframework.security</groupId>
        <artifactId>spring-security-config</artifactId>
        <version>${springsecurity.version}</version>
    </dependency>
```

Configuring Basic Security

Development Process

Step-By-Step

Development Process

Step-By-Step

1. Create Spring Security Initializer

Development Process

Step-By-Step

1. Create Spring Security Initializer

2. Create Spring Security Configuration (@Configuration)

Development Process

Step-By-Step

1. Create Spring Security Initializer

2. Create Spring Security Configuration (@Configuration)

3. Add users, passwords and roles

Spring Security Web App Initializer

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- Spring Security provides support for security initialization

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AbstractSecurityWebApplicationInitializer

Spring Security Web App Initializer

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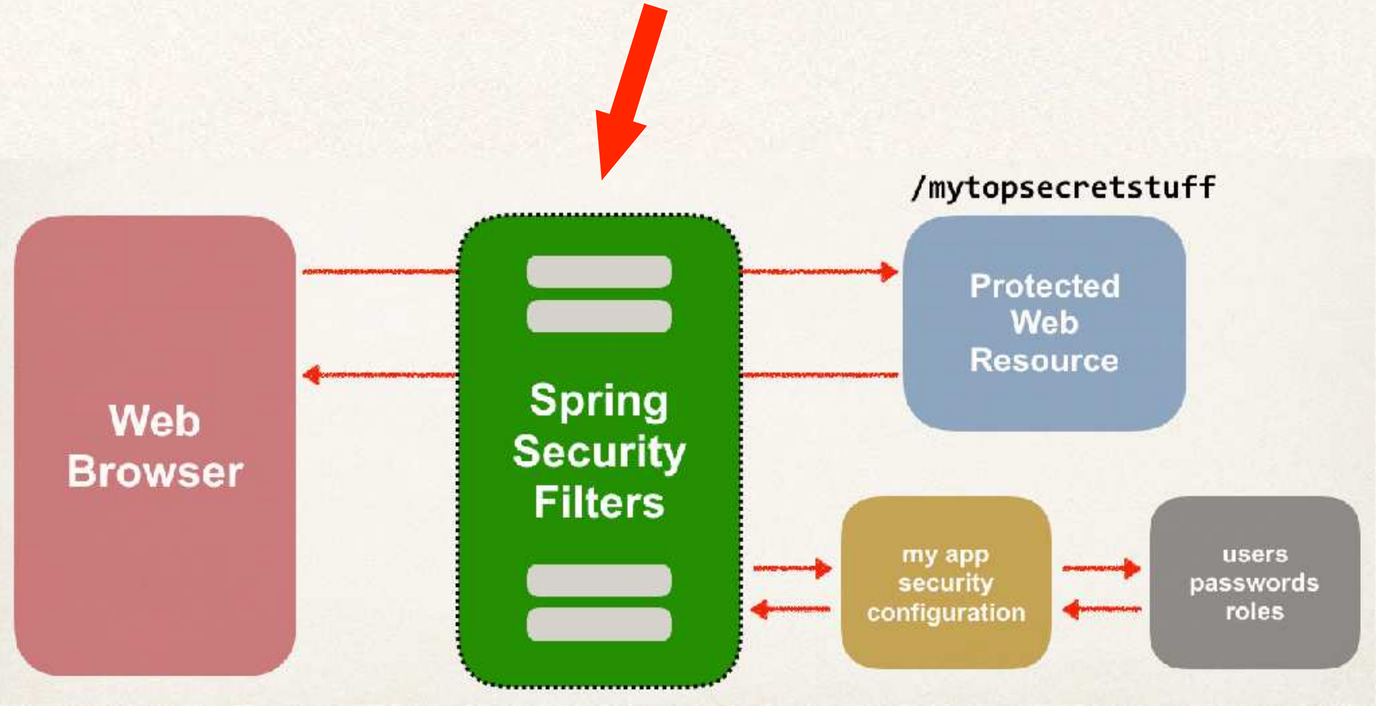
AbstractSecurityWebApplicationInitializer

- Special class to register the **Spring Security Filters**



Spring Security Web App Initializer (more info)

AbstractSecurityWebApplicationInitializer

Spring Security Web App Initializer (more info)

AbstractSecurityWebApplicationInitializer

- Your TO DO list

Spring Security Web App Initializer (more info)

AbstractSecurityWebApplicationInitializer

- Your TO DO list
  - Extend this abstract base class

Spring Security Web App Initializer (more info)

AbstractSecurityWebApplicationInitializer

- Your TO DO list
  - Extend this abstract base class
  - that's it!

Step 1: Create Spring Security Initializer

File: SecurityWebApplicationInitializer.java

```
import org.springframework.security.web.context.AbstractSecurityWebApplicationInitializer;

public class SecurityWebApplicationInitializer extends AbstractSecurityWebApplicationInitializer {

}
```

Step 2: Create Spring Security Configuration

File: DemoSecurityConfig.java

```
import org.springframework.context.annotation.Configuration;
import org.springframework.security.config.annotation.web.configuration.EnableWebSecurity;
import org.springframework.security.config.annotation.web.configuration.WebSecurityConfigurerAdapter;

@Configuration
@EnableWebSecurity
public class DemoSecurityConfig extends WebSecurityConfigurerAdapter {

}
```

Step 3: Add users, passwords and roles

File: DemoSecurityConfig.java

```
@Configuration
@EnableWebSecurity
public class DemoSecurityConfig extends WebSecurityConfigurerAdapter {

  @Override
  protected void configure(AuthenticationManagerBuilder auth) throws Exception {

    // add our users for in memory authentication









  }
```

Step 3: Add users, passwords and roles

File: DemoSecurityConfig.java

```
@Configuration
@EnableWebSecurity
public class DemoSecurityConfig extends WebSecurityConfigurerAdapter {

  @Override
  protected void configure(AuthenticationManagerBuilder auth) throws Exception {

    // add our users for in memory authentication

    UserBuilder users = User.withDefaultPasswordEncoder();

    auth.inMemoryAuthentication()
      .withUser(users.username("john").password("test123").roles("EMPLOYEE"))
      .withUser(users.username("mary").password("test123").roles("MANAGER"))
      .withUser(users.username("susan").password("test123").roles("ADMIN"));

  }
```

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  }
```

We will add DB support in later videos

(plaintext and encrypted)

Step 3: Add users, passwords and roles

File: DemoSecurityConfig.java

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```
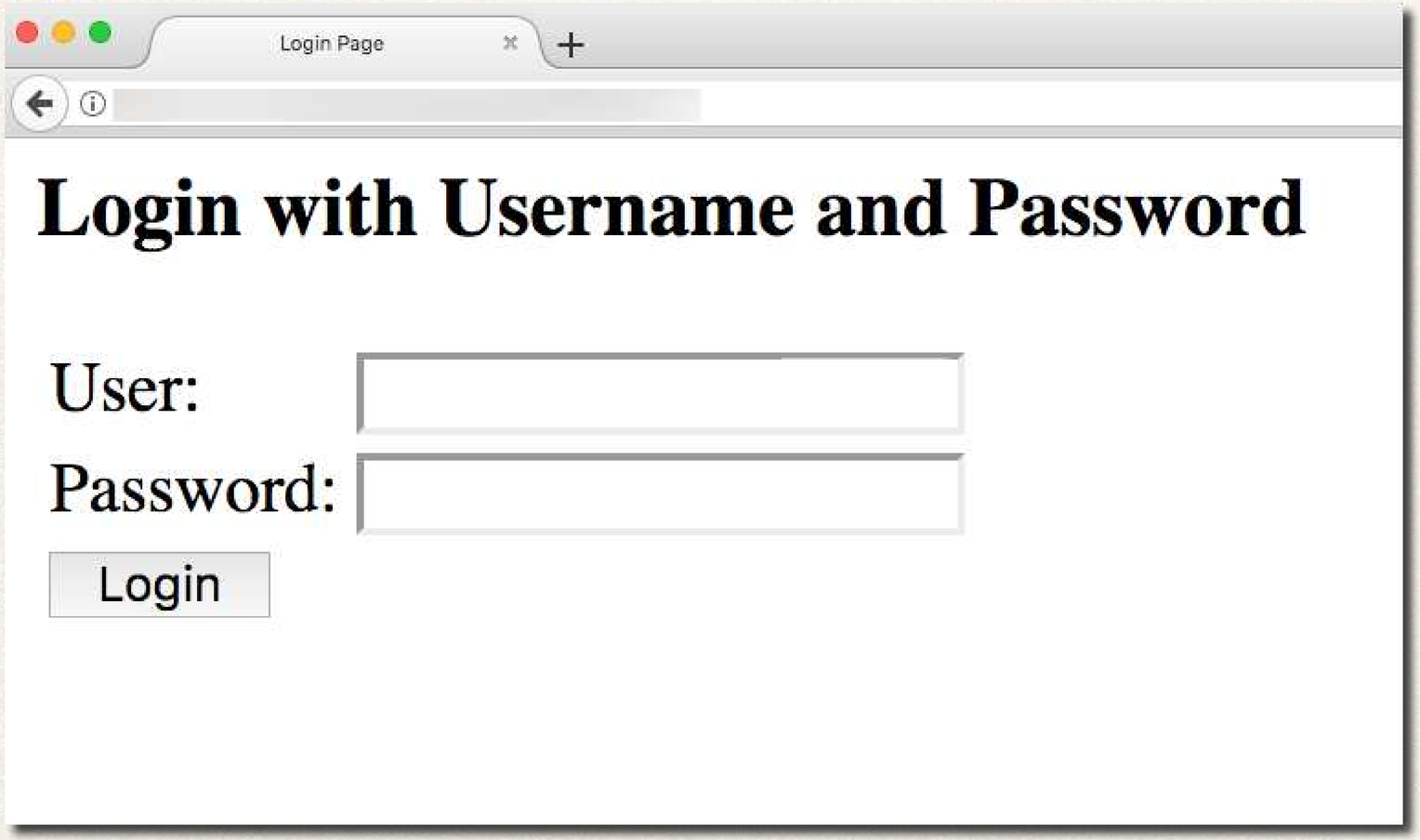
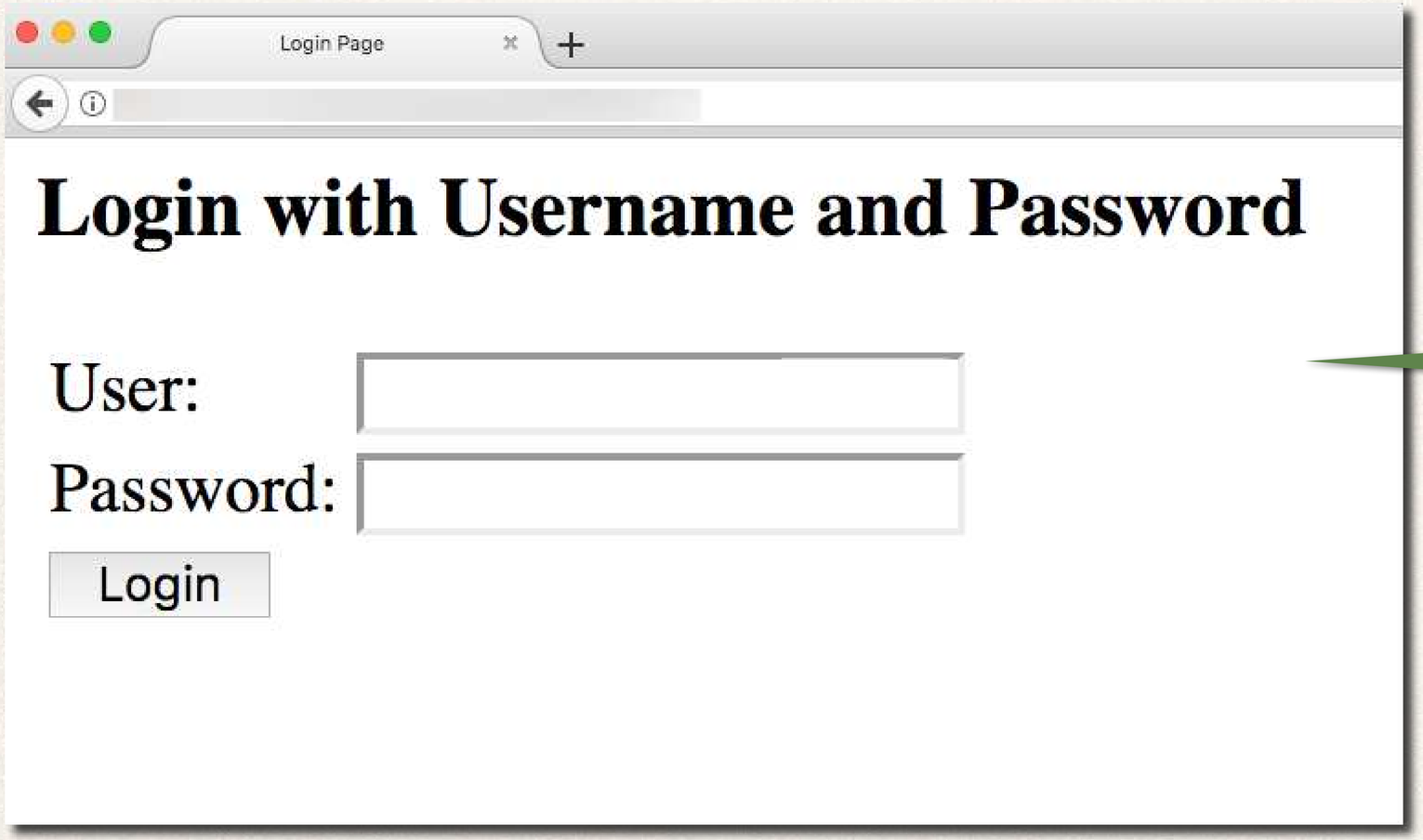

Spring Security - Custom Login Form

Spring Security - Default Login Form

Spring Security - Default Login Form



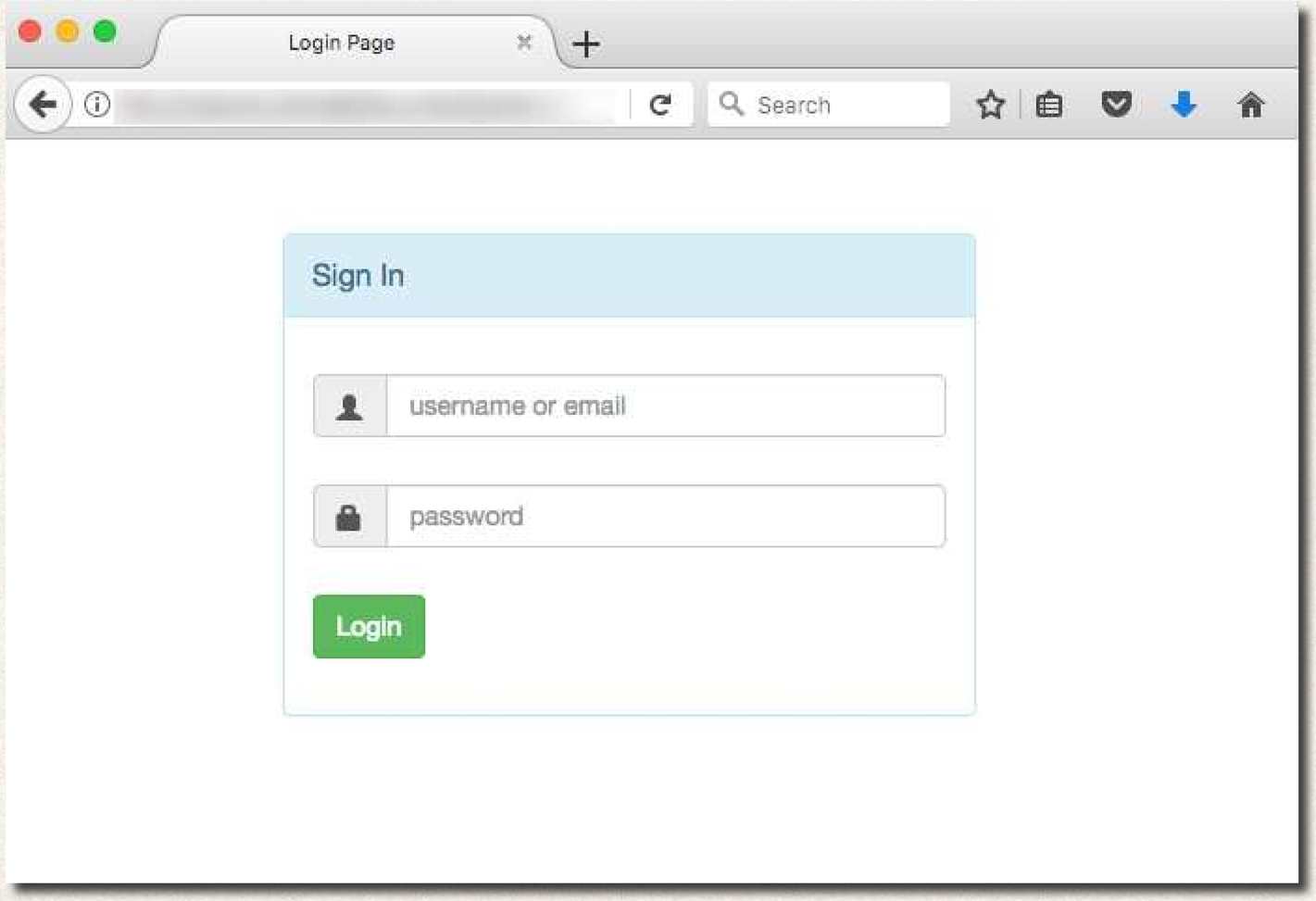
Spring Security - Default Login Form



Good for quick start

Your Own Custom Login Form

Your Own Custom Login Form



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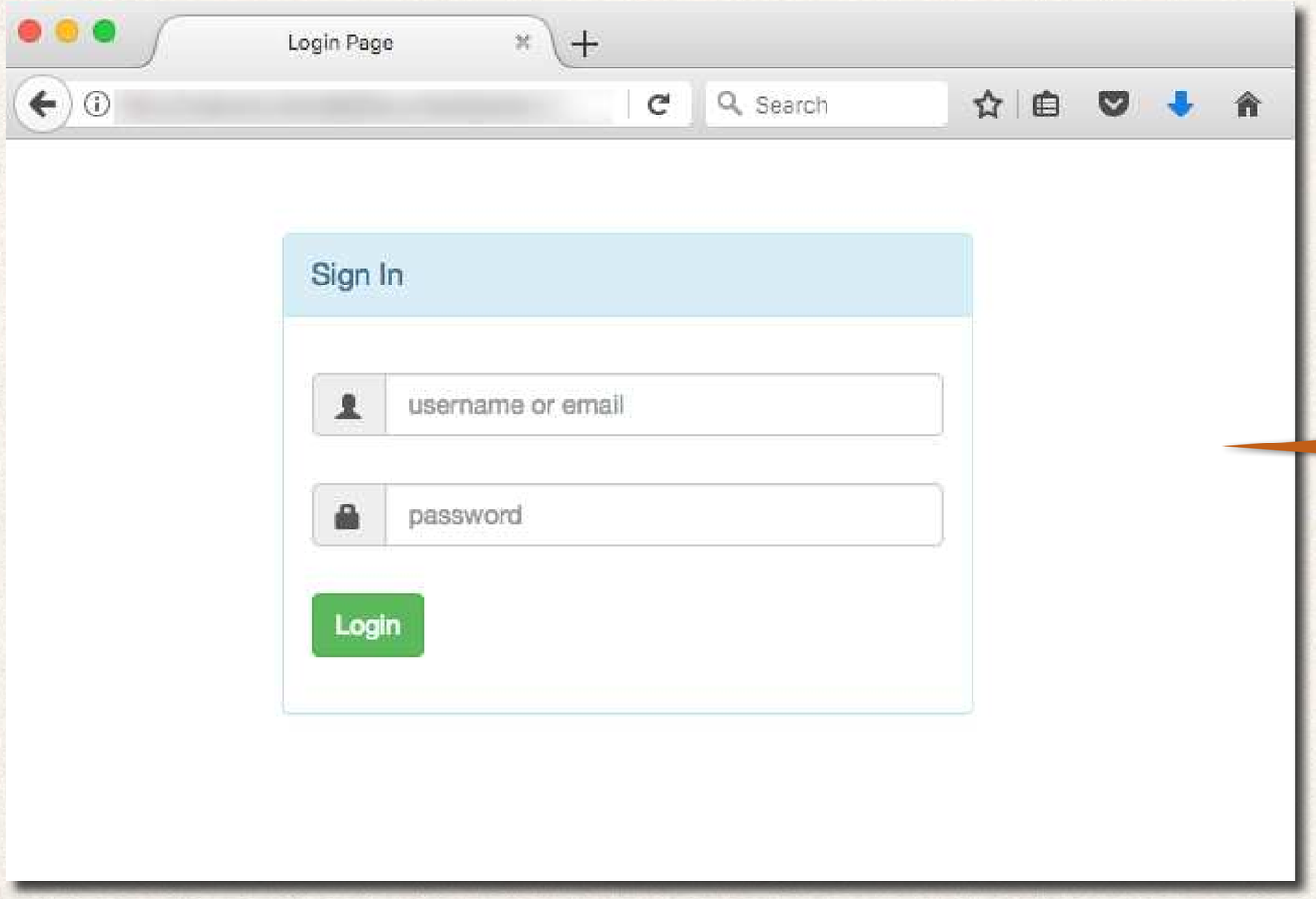


Your own custom look-and-feel HTML + CSS

Spring Security Overview

Spring Security Overview

Web
Browser

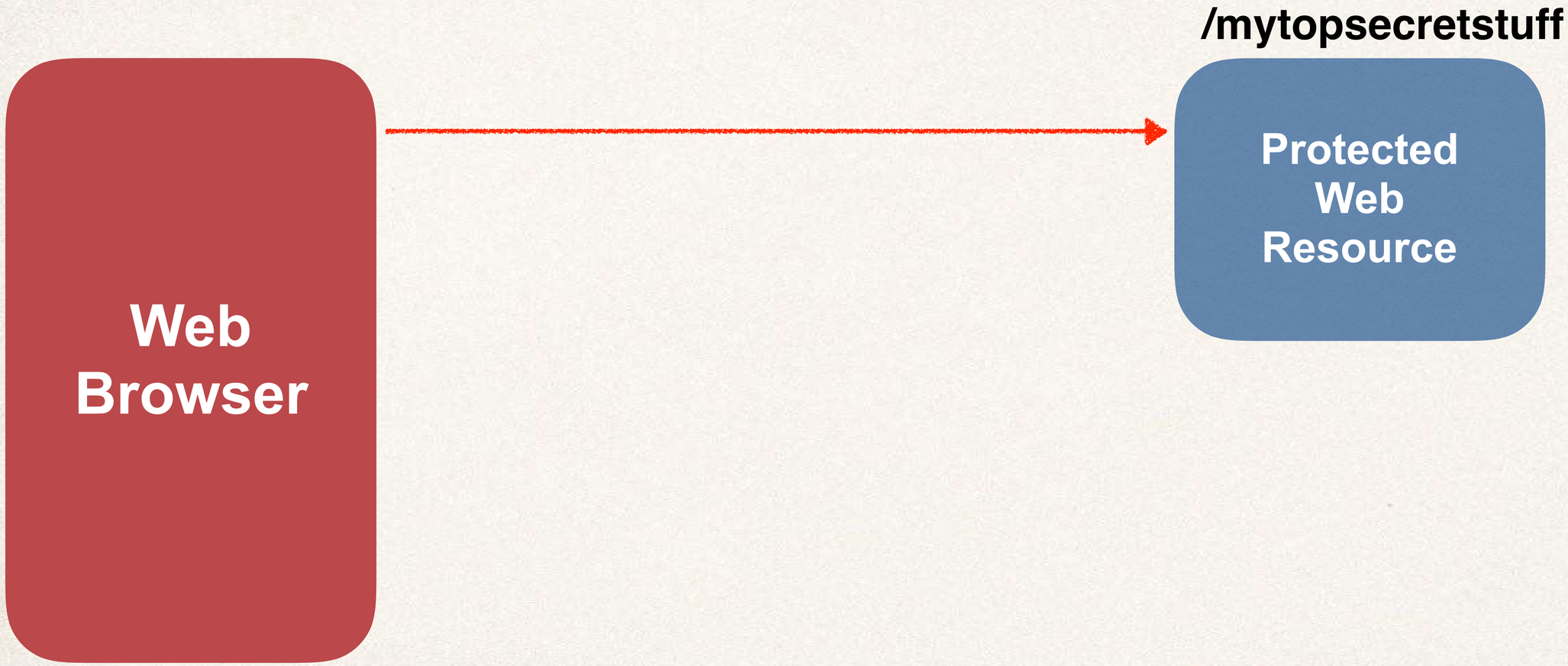
Spring Security Overview

/mytopsecretstuff

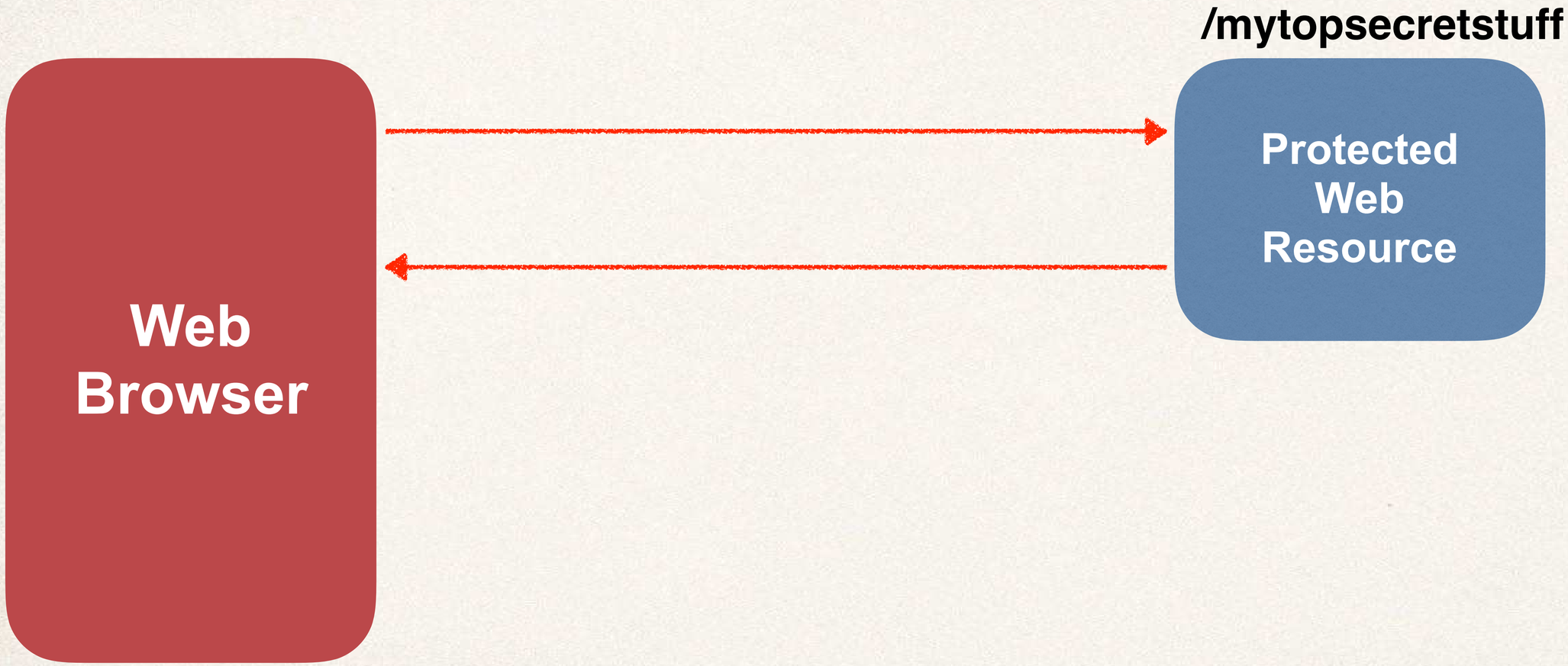
Web Browser

Protected Web Resource

Spring Security Overview



Spring Security Overview



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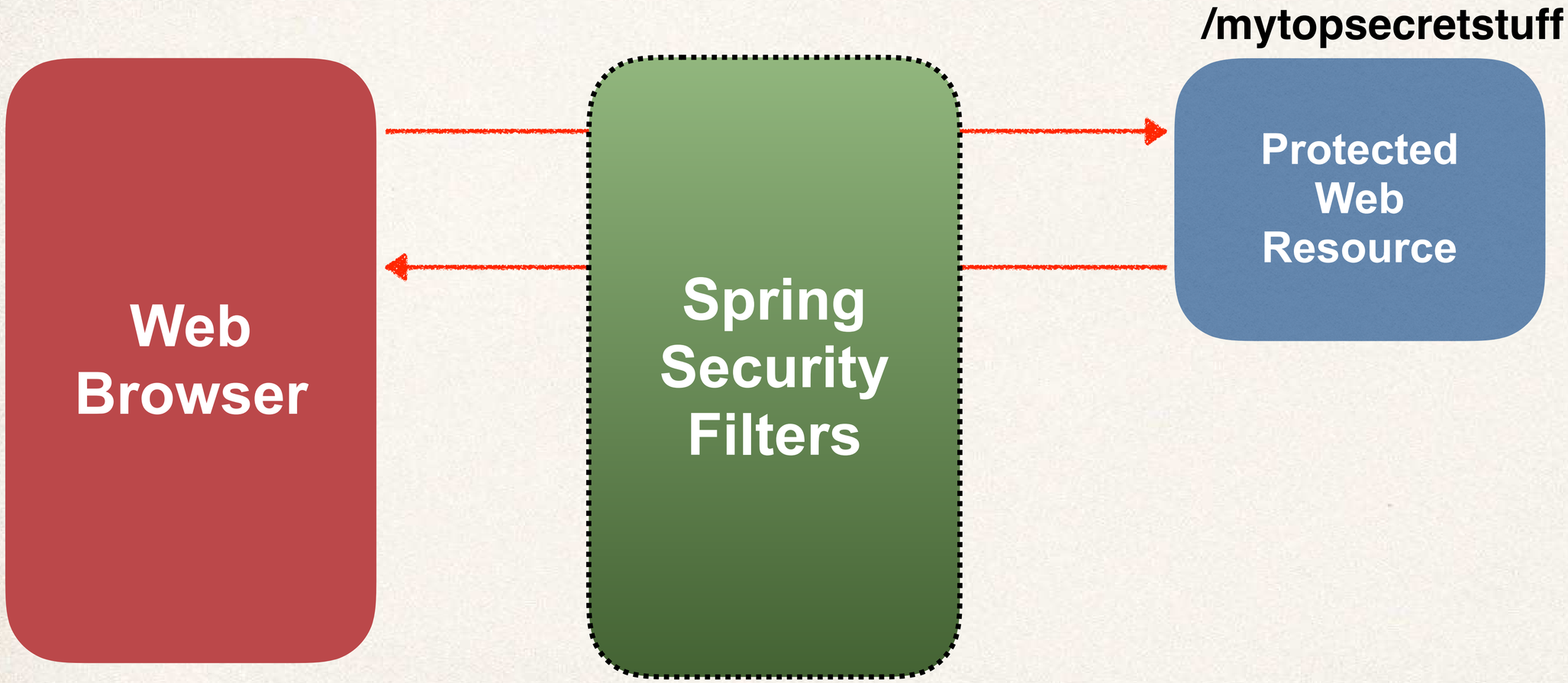

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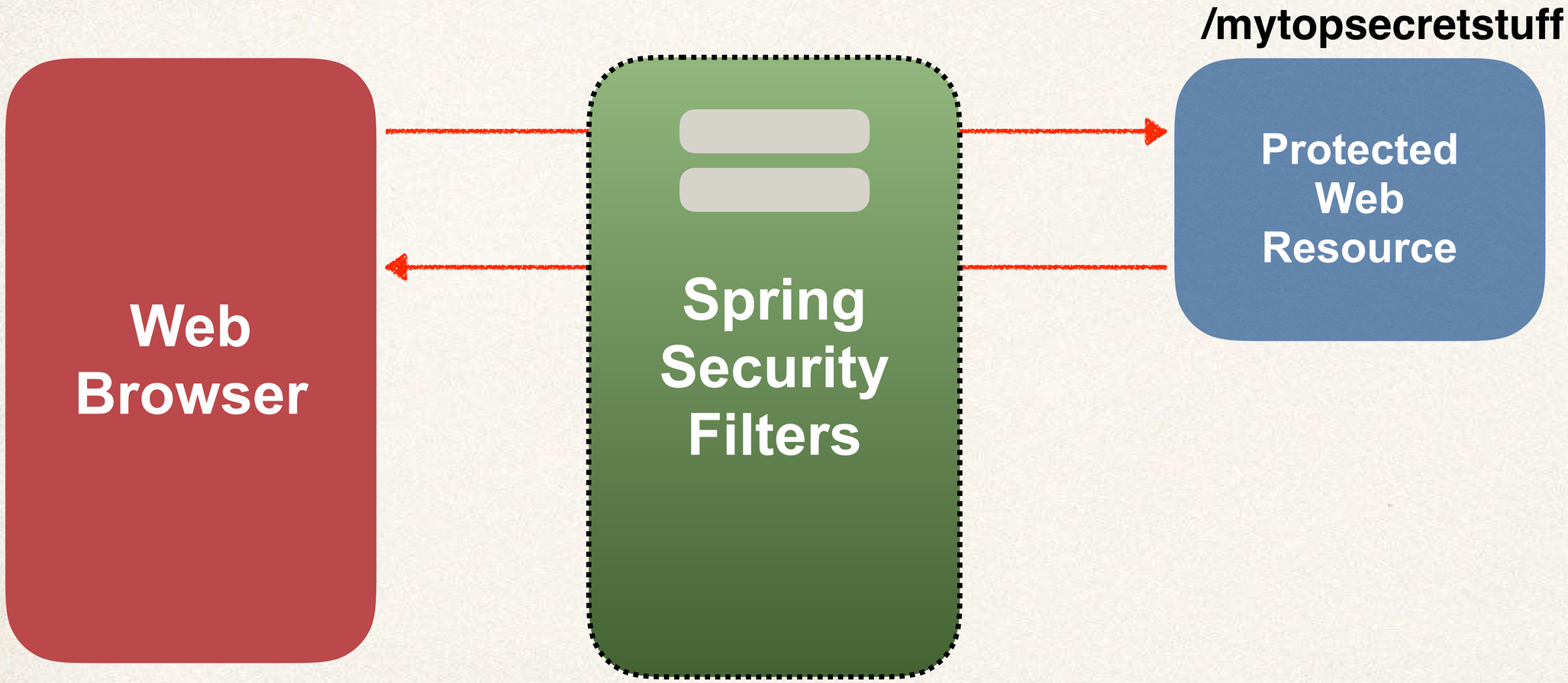

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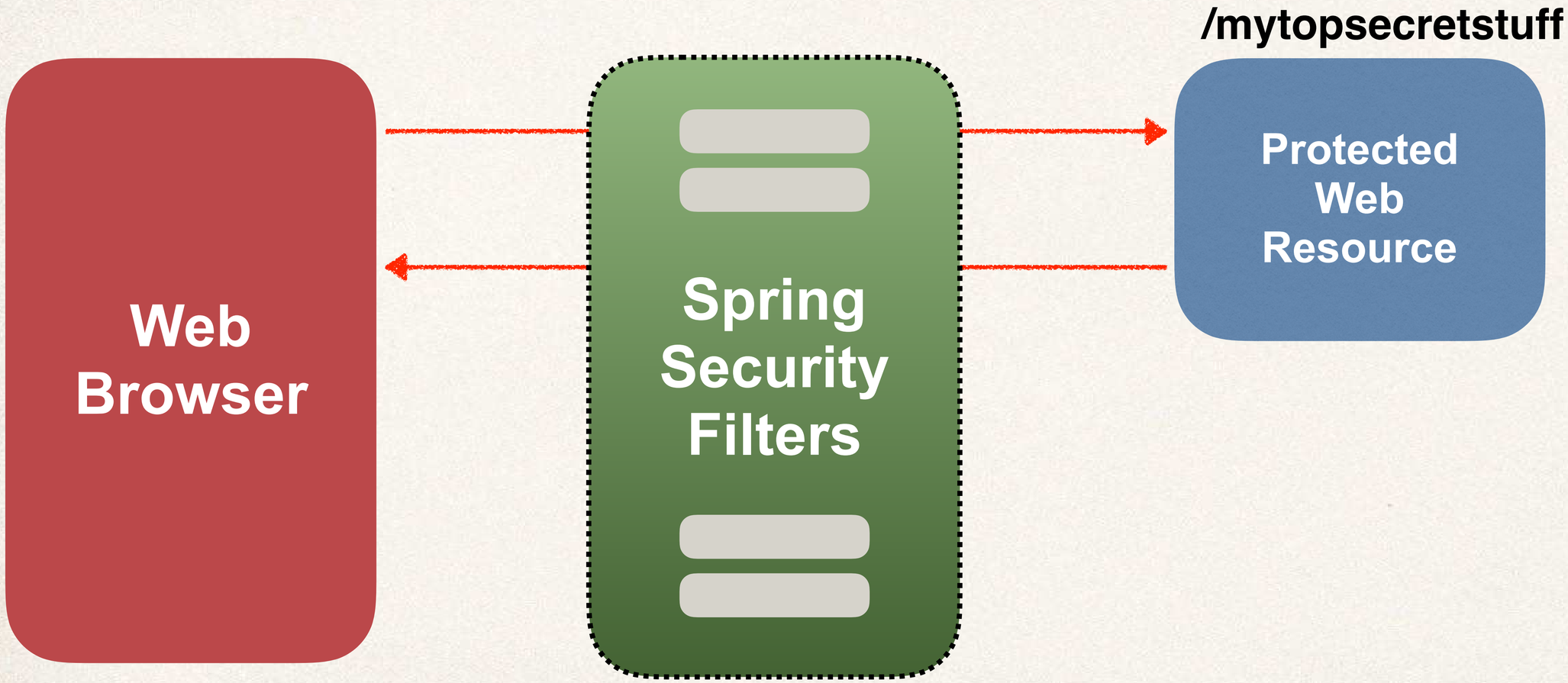
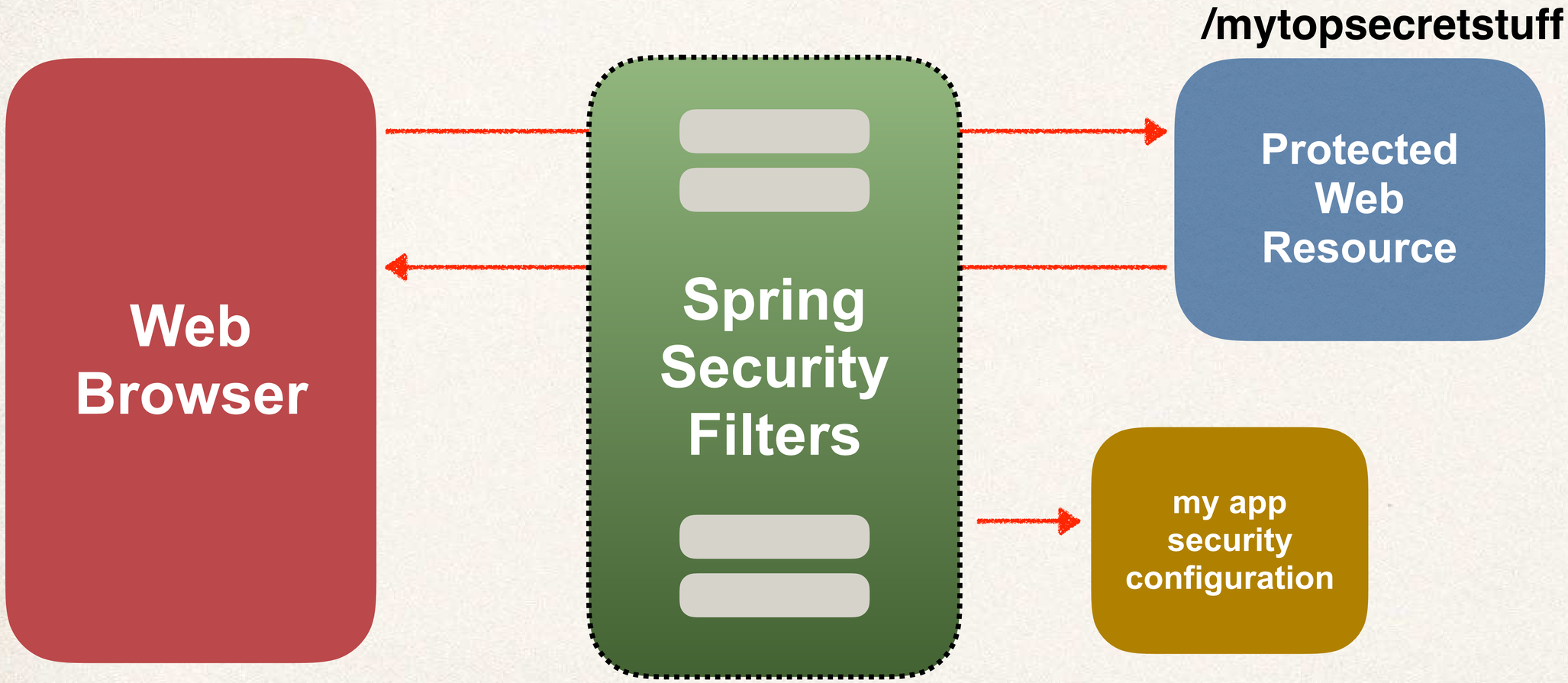


Spring Security Overview



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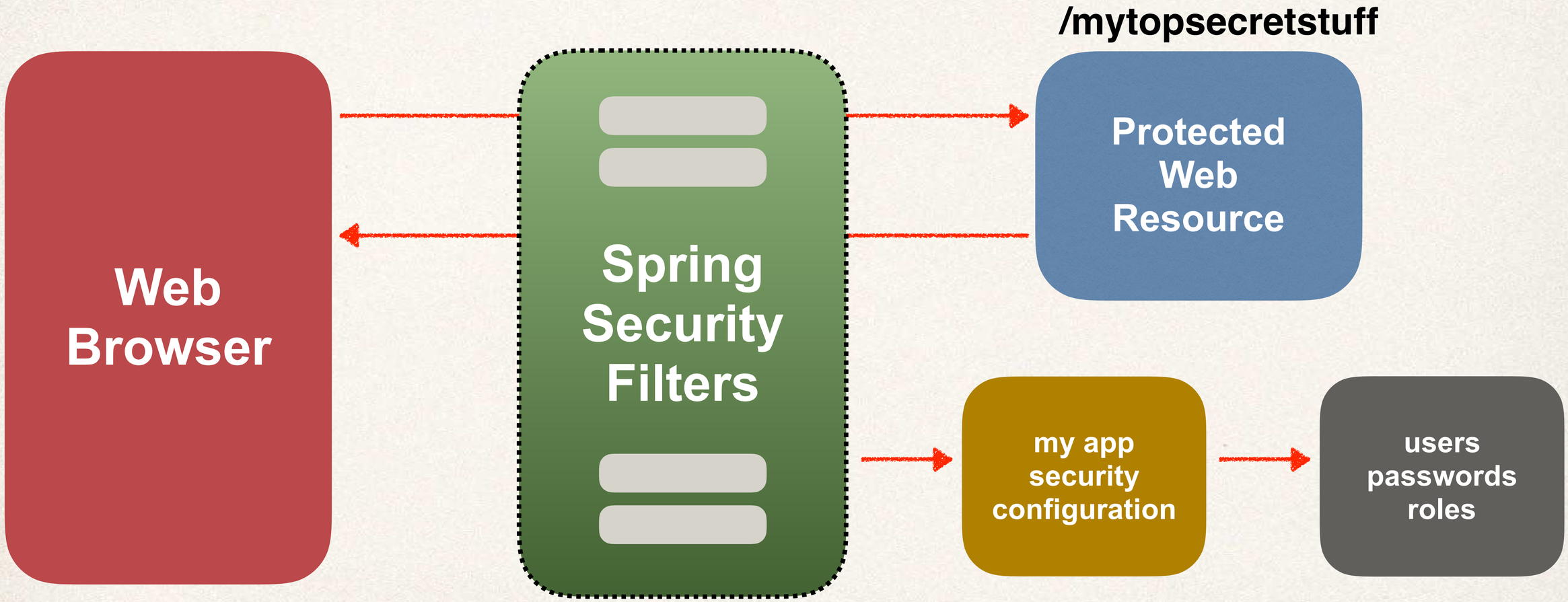

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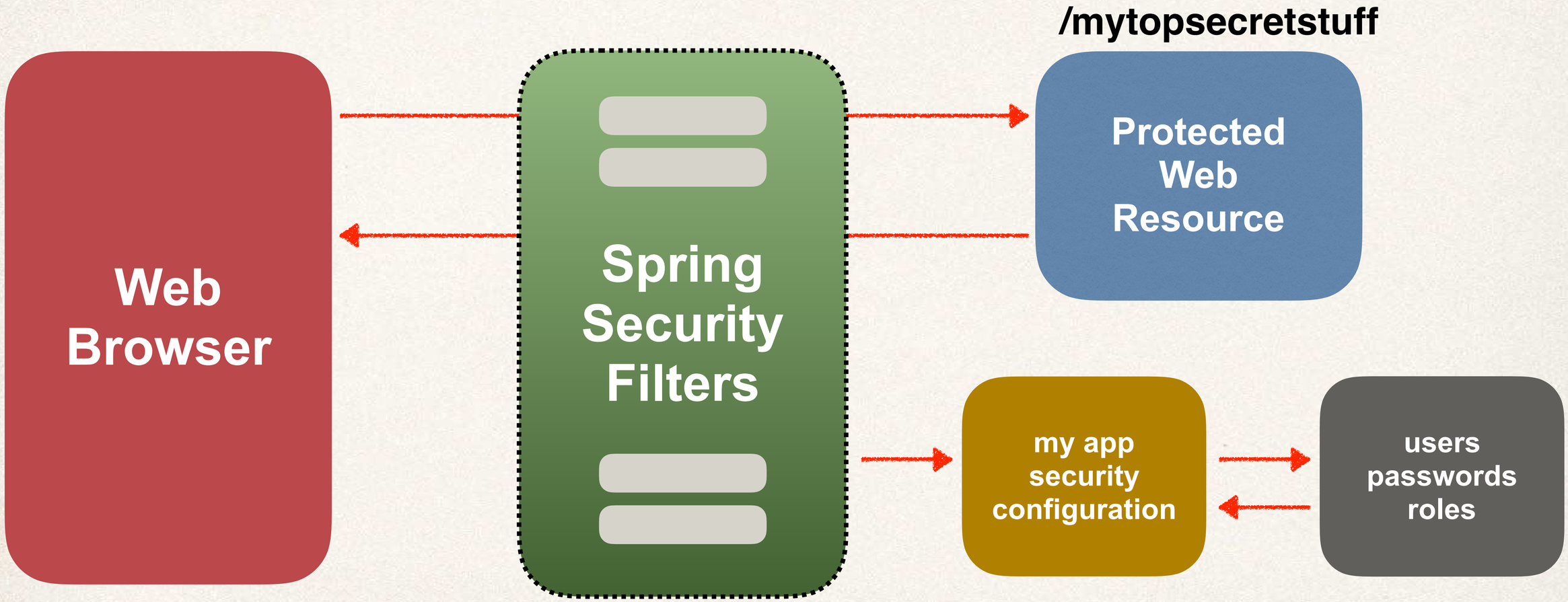

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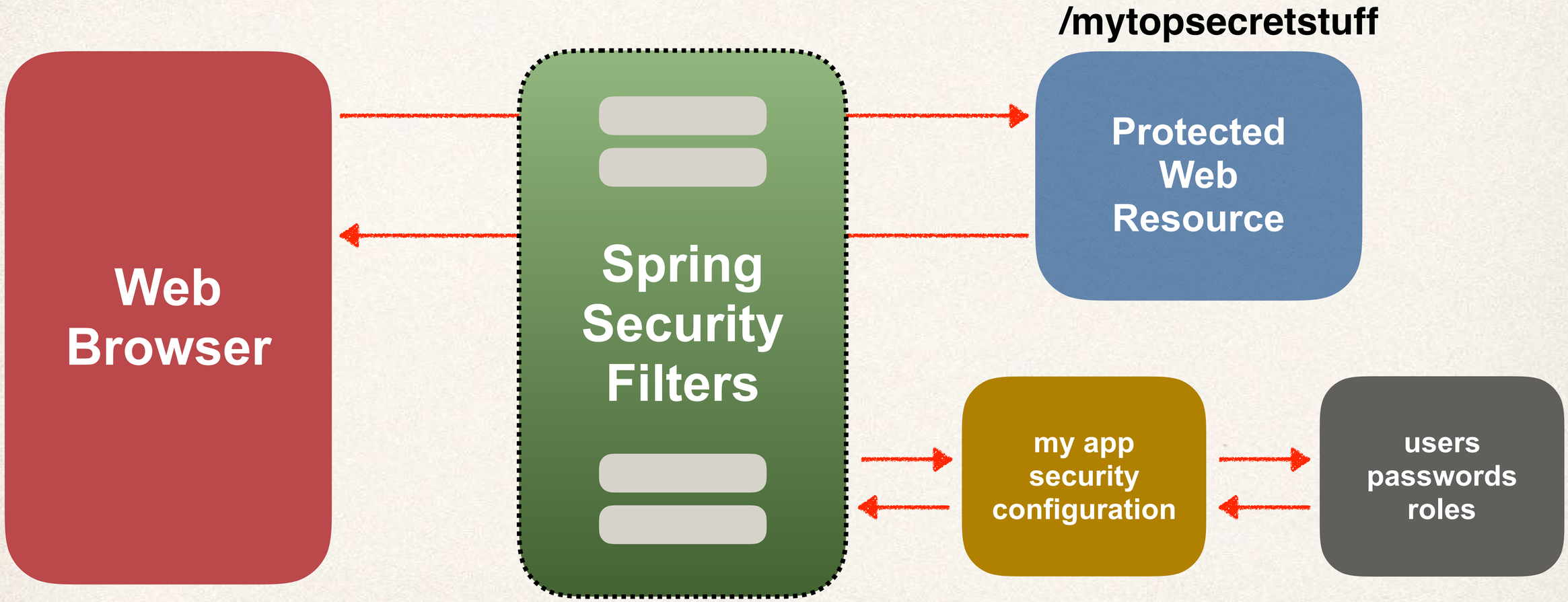
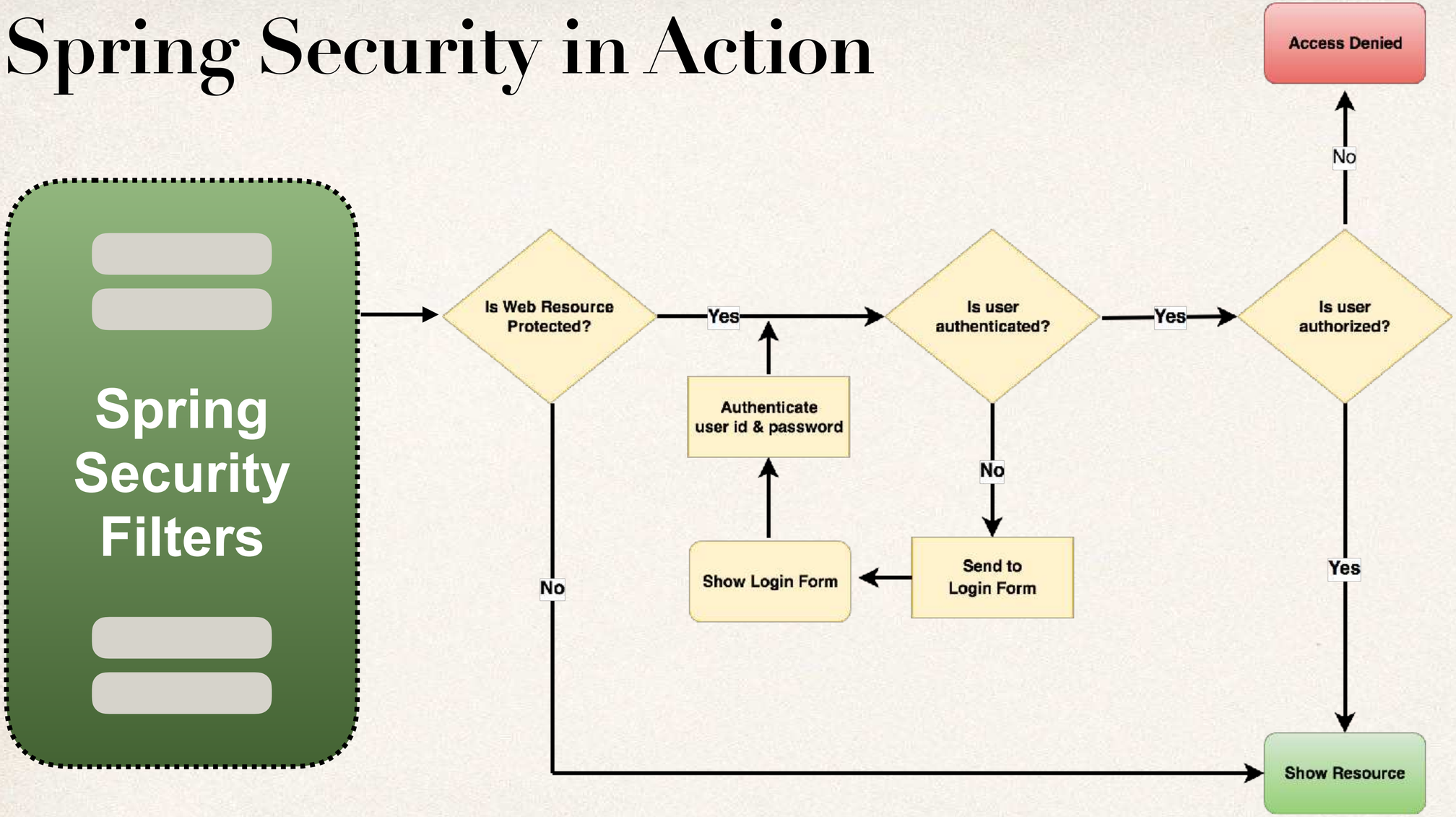


Spring Security in Action

Spring Security in Action



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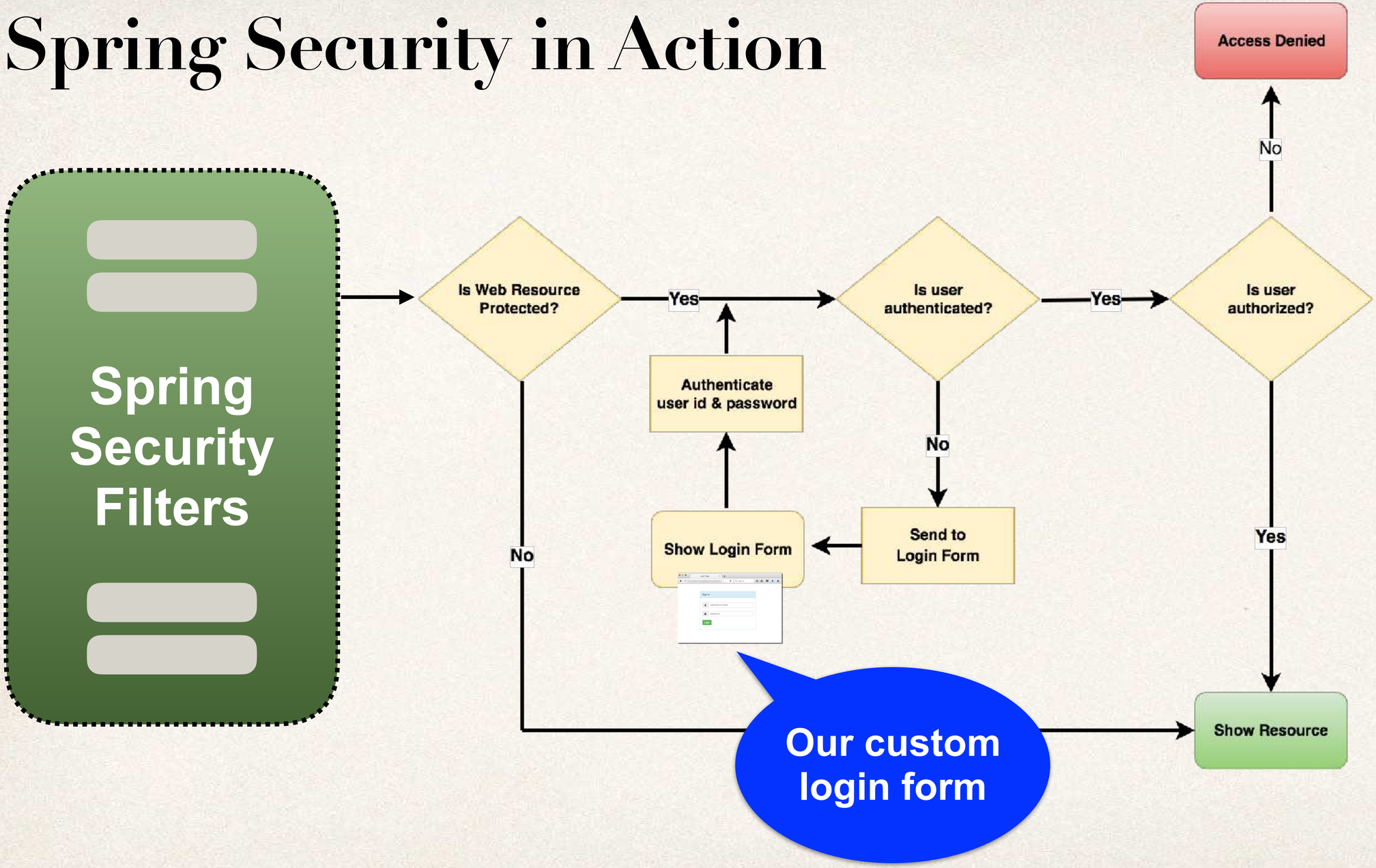

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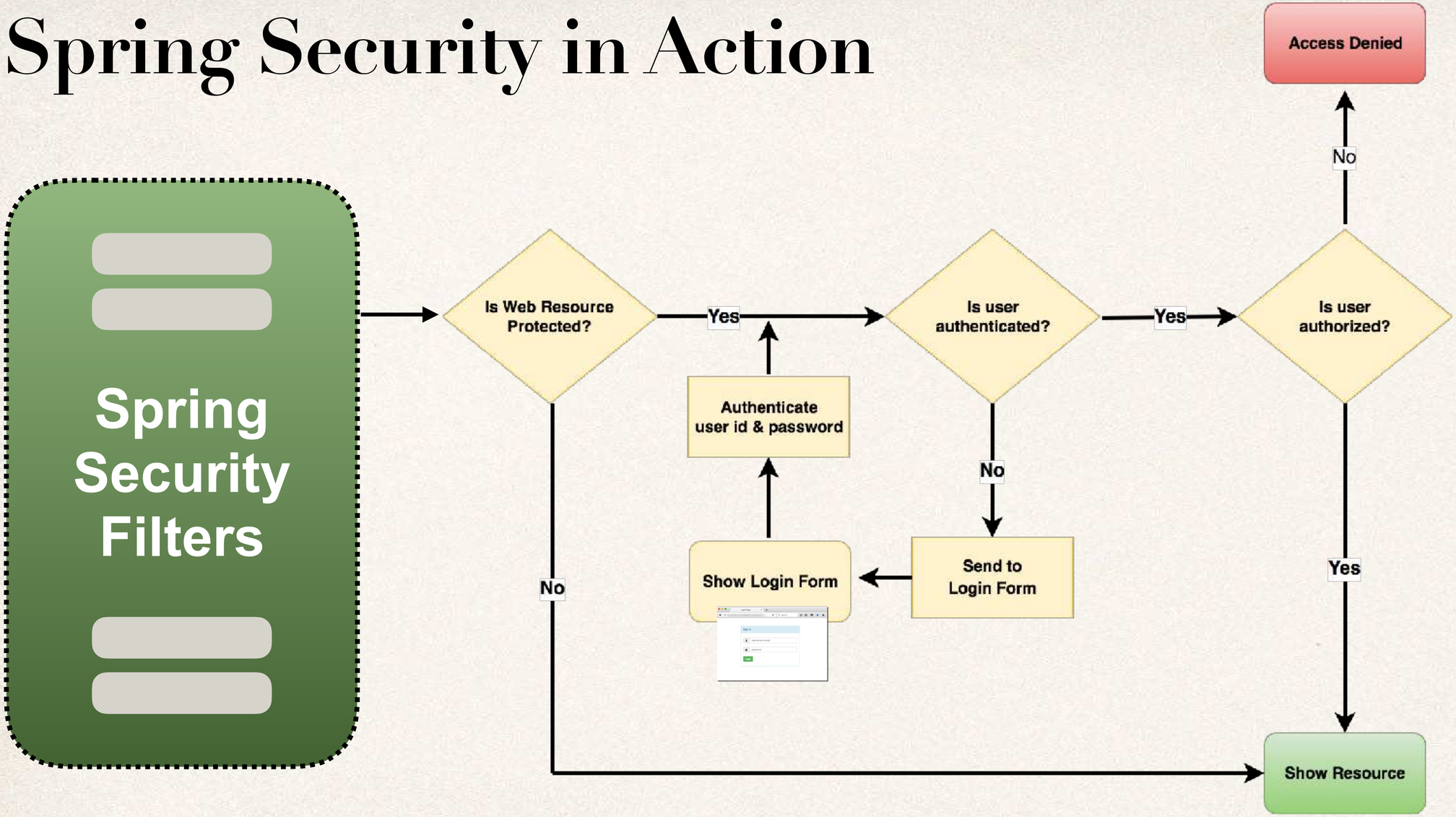

Development Process

Step-By-Step

Development Process

Step-By-Step

1. Modify Spring Security Configuration to reference custom login form

Development Process

Step-By-Step

1. Modify Spring Security Configuration to reference custom login form

2. Develop a Controller to show the custom login form

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Development Process

Step-By-Step

1. Modify Spring Security Configuration to reference custom login form

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3. Create custom login form
   - HTML (CSS optional)

Development Process

Step-By-Step

1. Modify Spring Security Configuration to reference custom login form

2. Develop a Controller to show the custom login form

3. Create custom login form
   - HTML (CSS optional)
   - Spring MVC form tag <form:form>

Step 1: Modify Spring Security Configuration

Step 1: Modify Spring Security Configuration

File: DemoSecurityConfig.java

```
@Configuration
@EnableWebSecurity
public class DemoSecurityConfig extends WebSecurityConfigurerAdapter {

  // override method to configure users for in-memory authentication …

}
```

Step 1: Modify Spring Security Configuration

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Method	Description

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```

Method	Description
`configure(AuthenticationManagerBuilder)`	Configure users (in memory, database, ldap, etc)

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Method	Description
`configure(AuthenticationManagerBuilder)`	Configure users (in memory, database, ldap, etc)
`configure(HttpSecurity)`	Configure security of web paths in application, login, logout etc

Step 1: Modify Spring Security Configuration

File: DemoSecurityConfig.java

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@Configuration
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   protected void configure(AuthenticationManagerBuilder auth) throws Exception {

      // add our users for in memory authentication
      …
   }









}
```

Step 1: Modify Spring Security Configuration

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@Configuration
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public class DemoSecurityConfig extends WebSecurityConfigurerAdapter {

   @Override
   protected void configure(AuthenticationManagerBuilder auth) throws Exception {

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      …
   }

   @Override
   protected void configure(HttpSecurity http) throws Exception {

      http.authorizeRequests()
            .anyRequest().authenticated()
          .and()
          .formLogin()
            .loginPage("/showMyLoginPage")
            .loginProcessingUrl("/authenticateTheUser")
            .permitAll();

   }
}
```

Step 1: Modify Spring Security Configuration

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```

Configure security of web paths in application, login, logout etc

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}
```

Restrict access based on the HttpServletRequest

Step 1: Modify Spring Security Configuration

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@Override
protected void configure(HttpSecurity http) throws Exception {

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        .anyRequest().authenticated()
      .and()
      .formLogin()
        .loginPage("/showMyLoginPage")
        .loginProcessingUrl("/authenticateTheUser")
        .permitAll();

}
```

Any request to the app must be authenticated (ie logged in)

Step 1: Modify Spring Security Configuration

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@Override
protected void configure(HttpSecurity http) throws Exception {

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        .anyRequest().authenticat
      .and()
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        .permitAll();

}
```

We are customizing the form login process

Step 1: Modify Spring Security Configuration

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        .permitAll();

}
```

Show our custom form at the request mapping

"/showMyLoginPage"

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        .permitAll();

}
```

Login form should POST data to this URL for processing

(check user id and password)

Step 1: Modify Spring Security Configuration

```
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protected void configure(HttpSecur

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        .anyRequest().authenticated
      .and()
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        .loginPage("/showMyLoginPage")
        .loginProcessingUrl("/authenticateTheUser")
        .permitAll();

}
```

You can give ANY values
for this configuration.

Just stay consistent in your app

Step 1: Modify Spring Security Configuration

```
@Override
protected void configure(HttpSecurity http) throws Exception {

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      .and()
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        .loginProcessingUrl("/authenticateTheUser")
        .permitAll();

}
```

Allow everyone to see login page.
No need to be logged in.

Step 1: Modify Spring Security Configuration

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protected void configure(HttpSecurity

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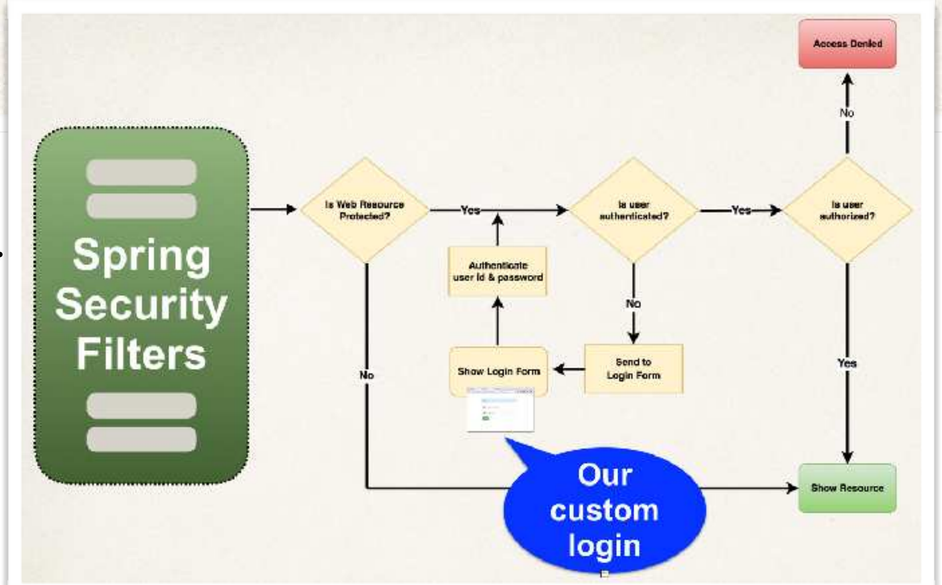

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}
```

TO DO
We need to create a controller for this request mapping

"/showMyLoginPage"

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}
```

TO DO
We need to create a controller for this request mapping

"/showMyLoginPage"

No Controller Request Mapping required for this.
We get this for free :-)

Step 2: Develop a Controller to show the custom login form

File: LoginController.java

```
@Controller
public class LoginController {





}
```

Step 2: Develop a Controller to show the custom login form

File: LoginController.java

```
@Controller
public class LoginController {

  @GetMapping("/showMyLoginPage")
  public String showMyLoginPage() {

    return "plain-login";

  }
}
```

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http.authorizeRequests()
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```

View name

/WEB-INF/view/plain-login.jsp

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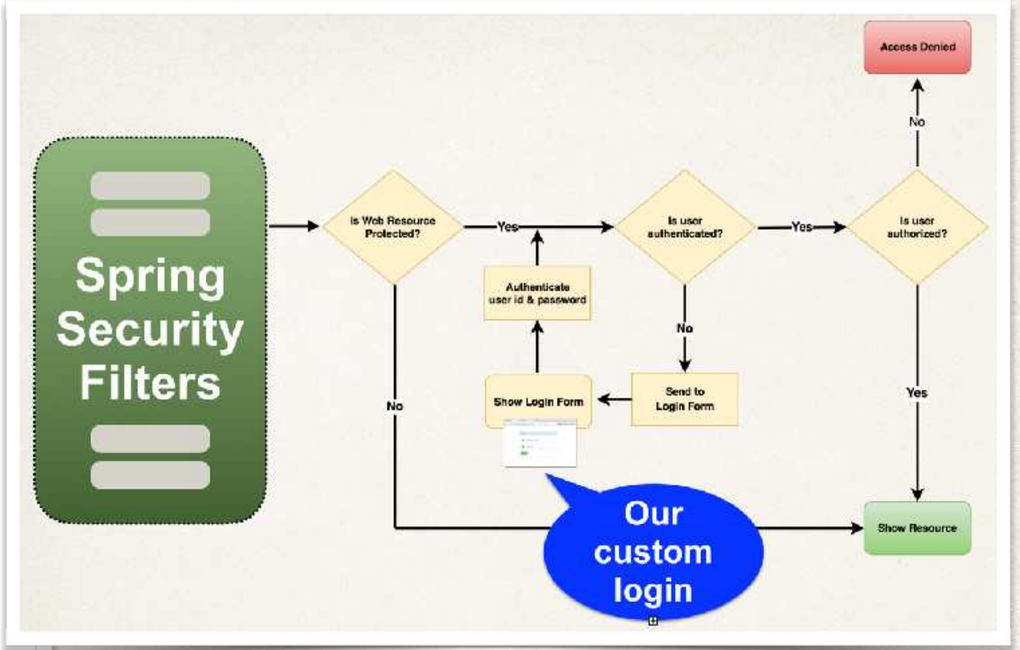

/WEB-INF/view/plain-login.jsp

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  }
}
```

/WEB-INF/view/plain-login.jsp

TO DO
We need to create this file

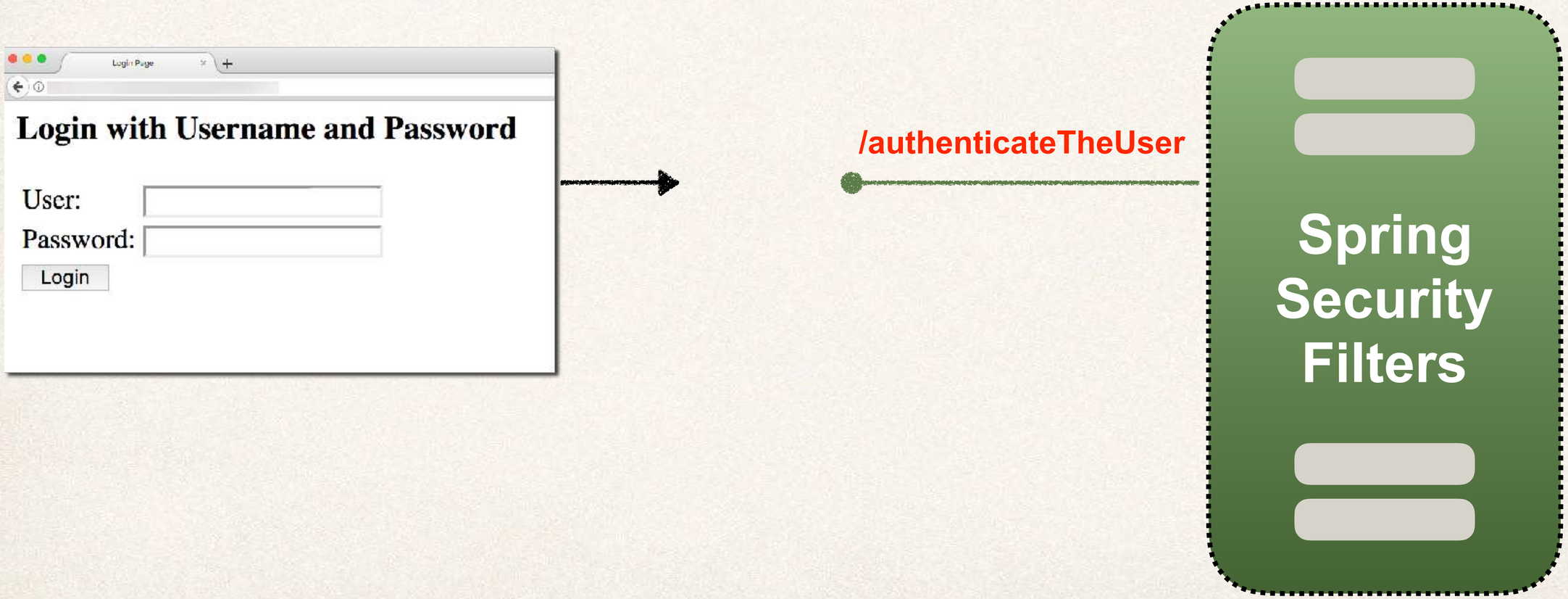
Step 3: Create custom login form

Step 3: Create custom login form

- Send data to login processing URL: **/authenticateTheUser**

Step 3: Create custom login form

- Send data to login processing URL: **/authenticateTheUser**



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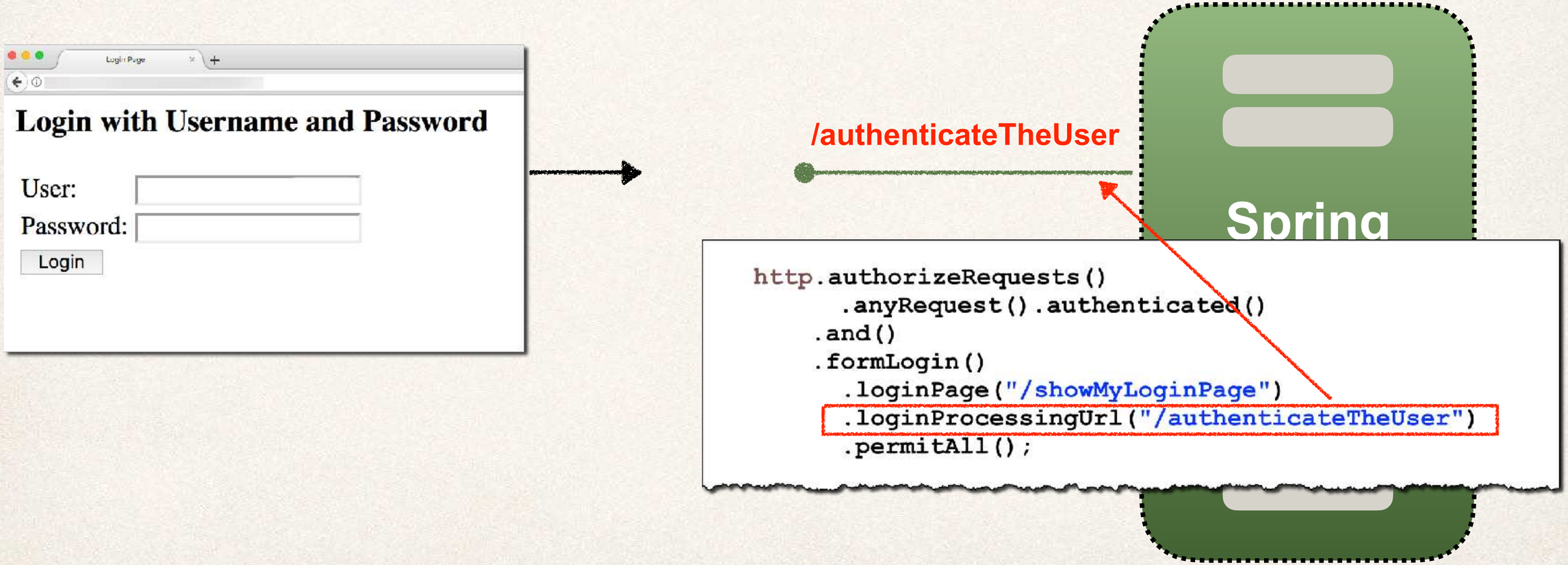

Step 3: Create custom login form

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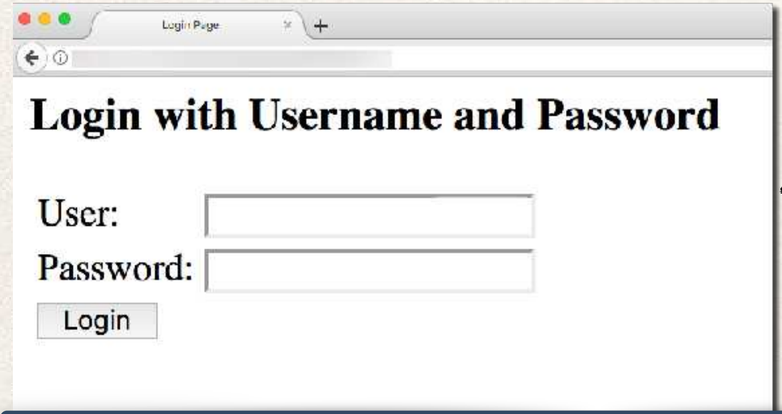

/authenticateTheUser

Spring

```
http.authorizeRequests()
      .anyRequest().authenticated()
    .and()
    .formLogin()
      .loginPage("/showMyLoginPage")
      .loginProcessingUrl("/authenticateTheUser")
      .permitAll();
```

You can give ANY values for this configuration.

Just stay consistent in your app

Step 3: Create custom login form

Step 3: Create custom login form

- Send data to login processing URL: **/authenticateTheUser**

Step 3: Create custom login form

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- You get it for free … no coding required

Step 3: Create custom login form

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- Login processing URL will be handled by Spring Security Filters
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This is
Spring Security magic …
LOL

Step 3: Create custom login form

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Step 3: Create custom login form

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```
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   …
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```

Step 3: Create custom login form

- Send data to login processing URL: **/authenticateTheUser**
  - Must **POST** the data

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```

Step 3: Create custom login form

- Send data to login processing URL: **/authenticateTheUser**
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Step 3: Create custom login form

Best Practice

Step 3: Create custom login form

Best Practice

- **Best practice** is to use the Spring MVC Form tag `<form:form>`

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  - Provides automatic support for security defenses *(more on this later)*

Step 3: Create custom login form

Best Practice

- **Best practice** is to use the Spring MVC Form tag `<form:form>`
  - Provides automatic support for security defenses (*more on this later*)

```
<form:form action="…" method="…" >
   …
</form:form>
```

Step 3: Create custom login form

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- Spring Security defines default names for login form fields

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- Spring Security defines default names for login form fields
  - User name field: `username`

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  - Password field: `password`

Step 3: Create custom login form

- Spring Security defines default names for login form fields
  - User name field: **`username`**
  - Password field: **`password`**

```
User name: <input type="text" name="username" />

Password: <input type="password" name="password" />
```

Step 3: Create custom login form

- Spring Security defines default names for login form fields
  - User name field: **`username`**
  - Password field: **`password`**

Spring Security Filters will read the form data and authenticate the user

```
User name: <input type="text" name="username" />

Password: <input type="password" name="password" />
```

Step 3: Create custom login form

Pull It All Together

File: WEB-INF/view/plain-login.jsp

```
<%@ taglib prefix="form" uri="http://www.springframework.org/tags/form" %>
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Step 3: Create custom login form

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</form:form>
…
```

Step 3: Create custom login form

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Step 3: Create custom login form

Pull It All Together

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<%@ taglib prefix="form" uri="http://www.springframework.org/tags/form" %>
…
<form:form action="${pageContext.request.contextPath}/authenticateTheUser"
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  <p>
    User name: <input type="text" name="username" />
  </p>

  <p>
    Password: <input type="password" name="password" />
  </p>

  <input type="submit" value="Login" />

</form:form>
…
```

Step 3: Create custom login form

Pull It All Together

File: WEB-INF/view/plain-login.jsp

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<%@ taglib prefix="form" uri="http://www.springframework.org/tags/form" %>
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    User name: <input type="text" name="username" />
  </p>

  <p>
    Password: <input type="password" name="password" />
  </p>

  <input type="submit" value="Login" />

</form:form>
…
```
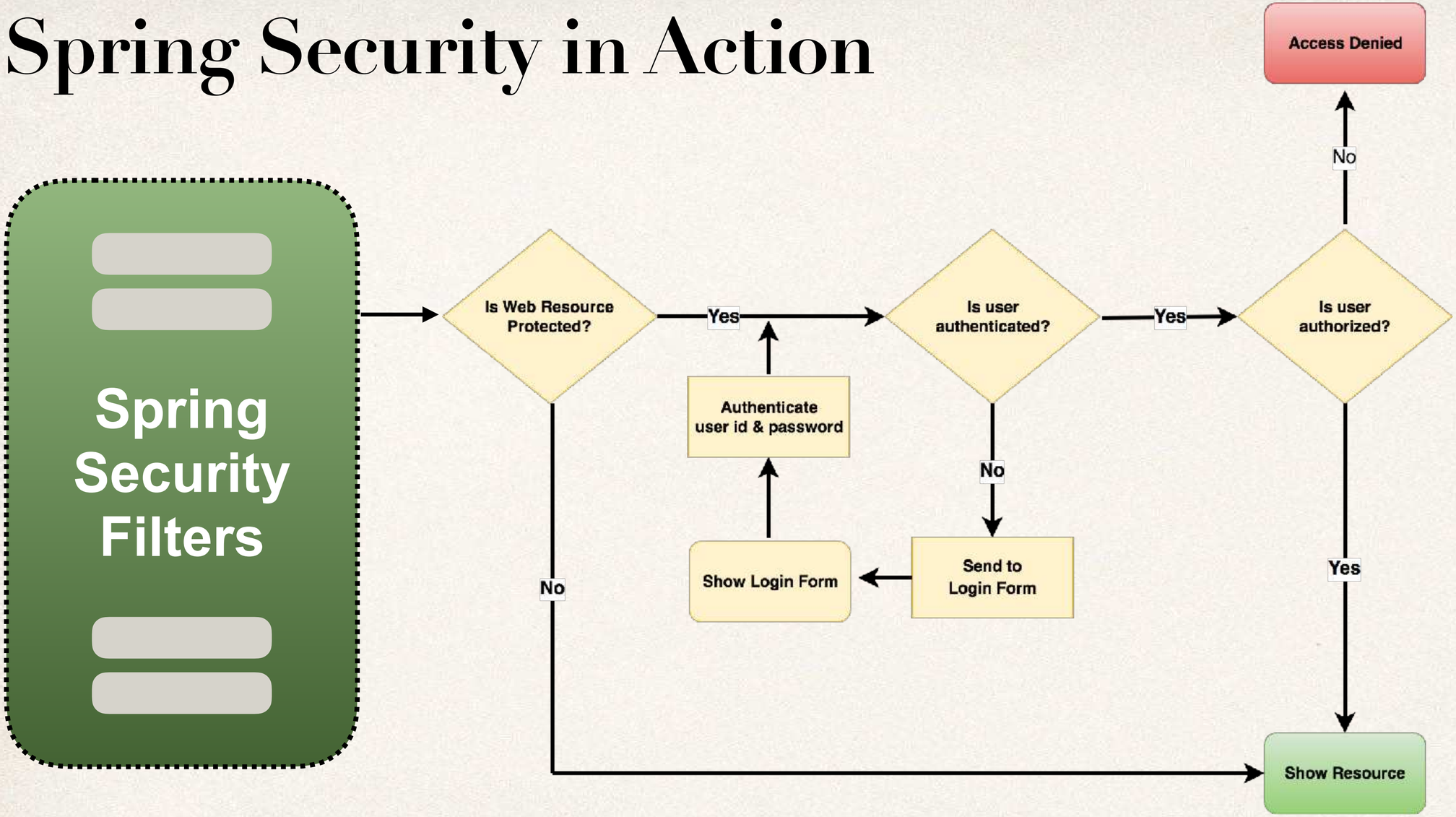

Spring Security in Action

Spring Security in Action



More Info on Context Path

More Info on Context Path

```
<form:form action="${pageContext.request.contextPath}/authenticateTheUser"
           method="POST">
   …
</form:form>
```

More Info on Context Path

What is this???

```
<form:form action="${pageContext.request.contextPath}/authenticateTheUser"
           method="POST">
   …
</form:form>
```

More Info on Context Path

More Info on Context Path

What is "Context Root"

The root path for your web application

Context Root: my-ecommerce-app

http://localhost:8080/my-ecommerce-app

More Info on Context Path

Context Path
is same thing as
Context Root

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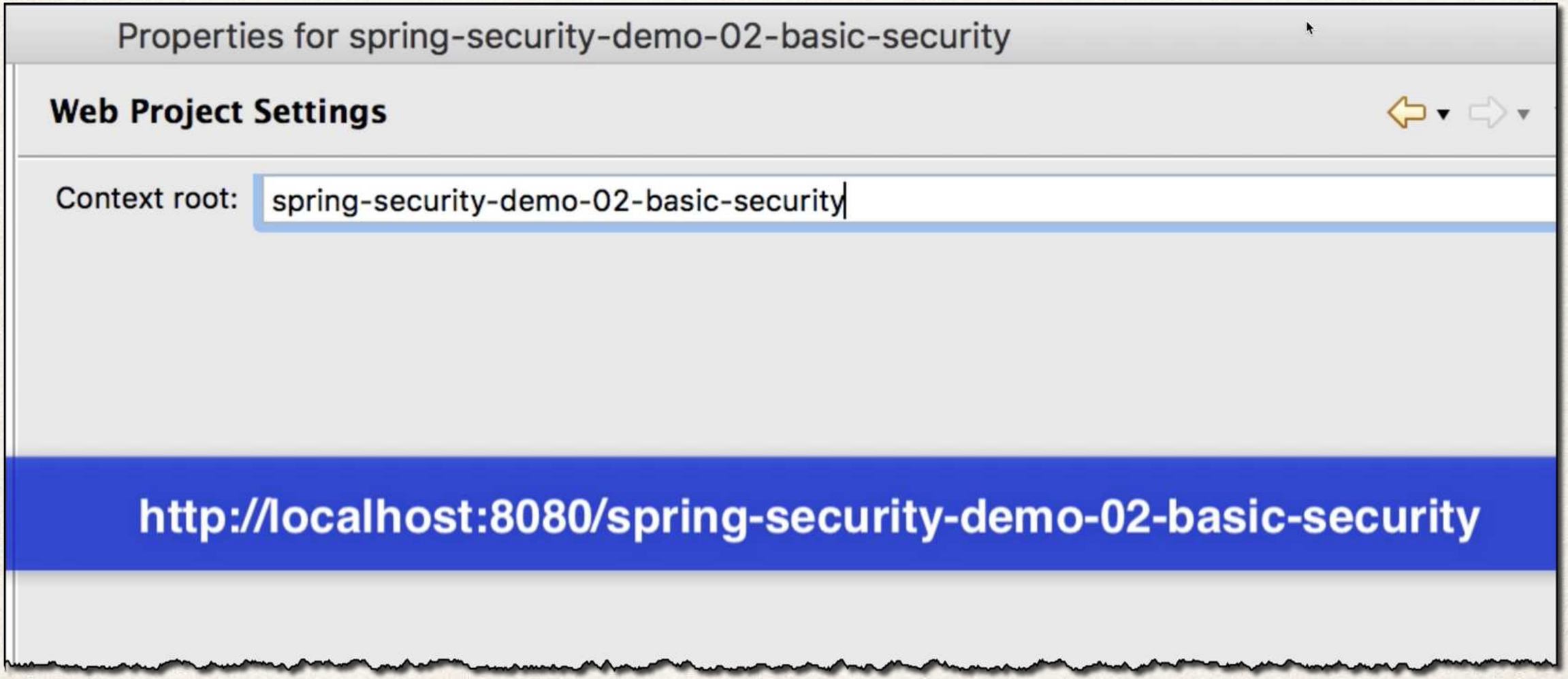
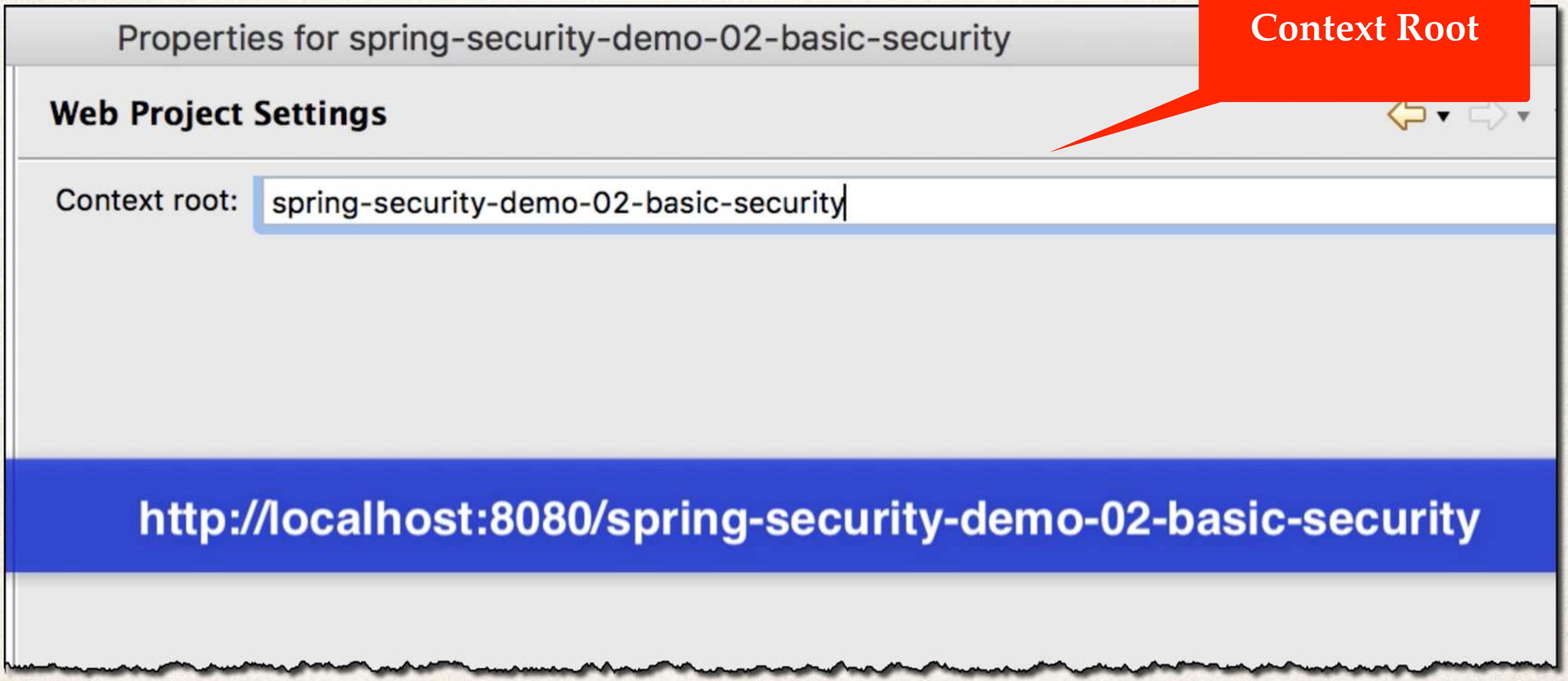


More Info on Context Path

Context Path
is same thing as
Context Root



More Info on Context Path

More Info on Context Path

```
<form:form action="${pageContext.request.contextPath}/authenticateTheUser"
           method="POST">
   …
</form:form>
```

More Info on Context Path

Gives us access to context path dynamically

```
<form:form action="${pageContext.request.contextPath}/authenticateTheUser"
           method="POST">
   …
</form:form>
```

Why use Context Path?

Best Practice

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Best Practice

- Allows us to dynamically reference context path of application

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- Helps to keep links relative to application context path

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- If you change context path of app, then links will still work

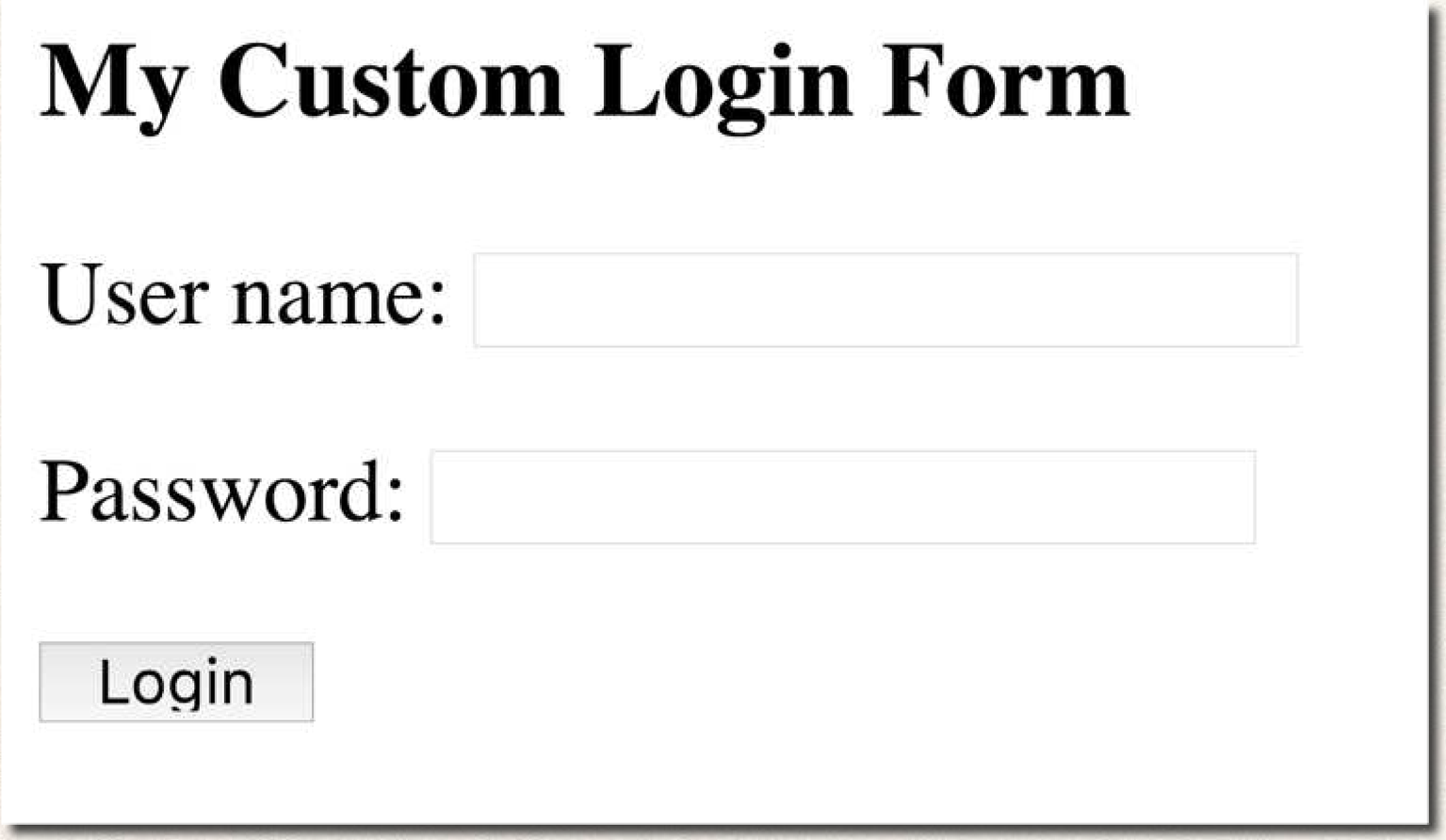
Why use Context Path?

Best Practice

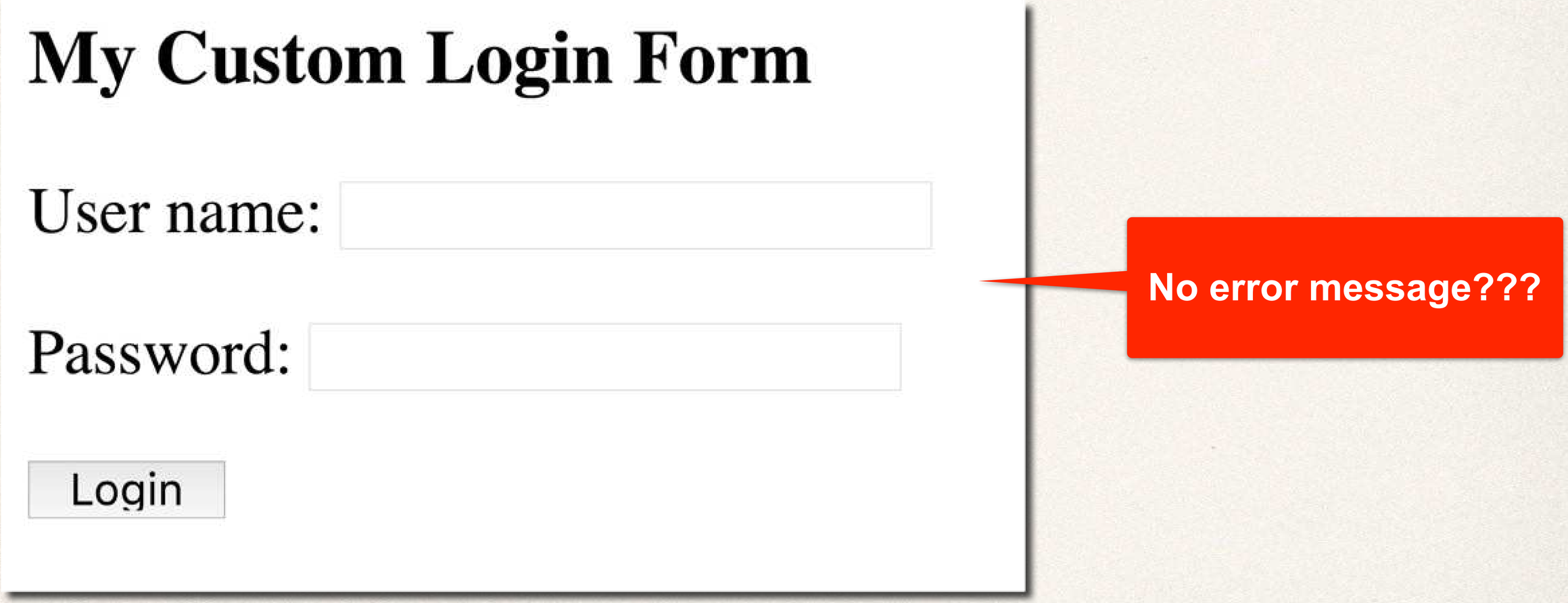
- Allows us to dynamically reference context path of application
- Helps to keep links relative to application context path
- If you change context path of app, then links will still work
- Much better than hard-coding context path …

Spring Security - Show Login Error

No error message for failed login - What???



No error message for failed login - What???



We need an error message … ASAP!!!

My Custom Login Form

Sorry! You entered invalid username/password.

User name:

Password:

Login

We need an error message … ASAP!!!

My Custom Login Form

Sorry! You entered invalid username/password.

User name:

Password:

Login

We'll add this support

Failed Login

Failed Login

- When login fails, by default Spring Security will …

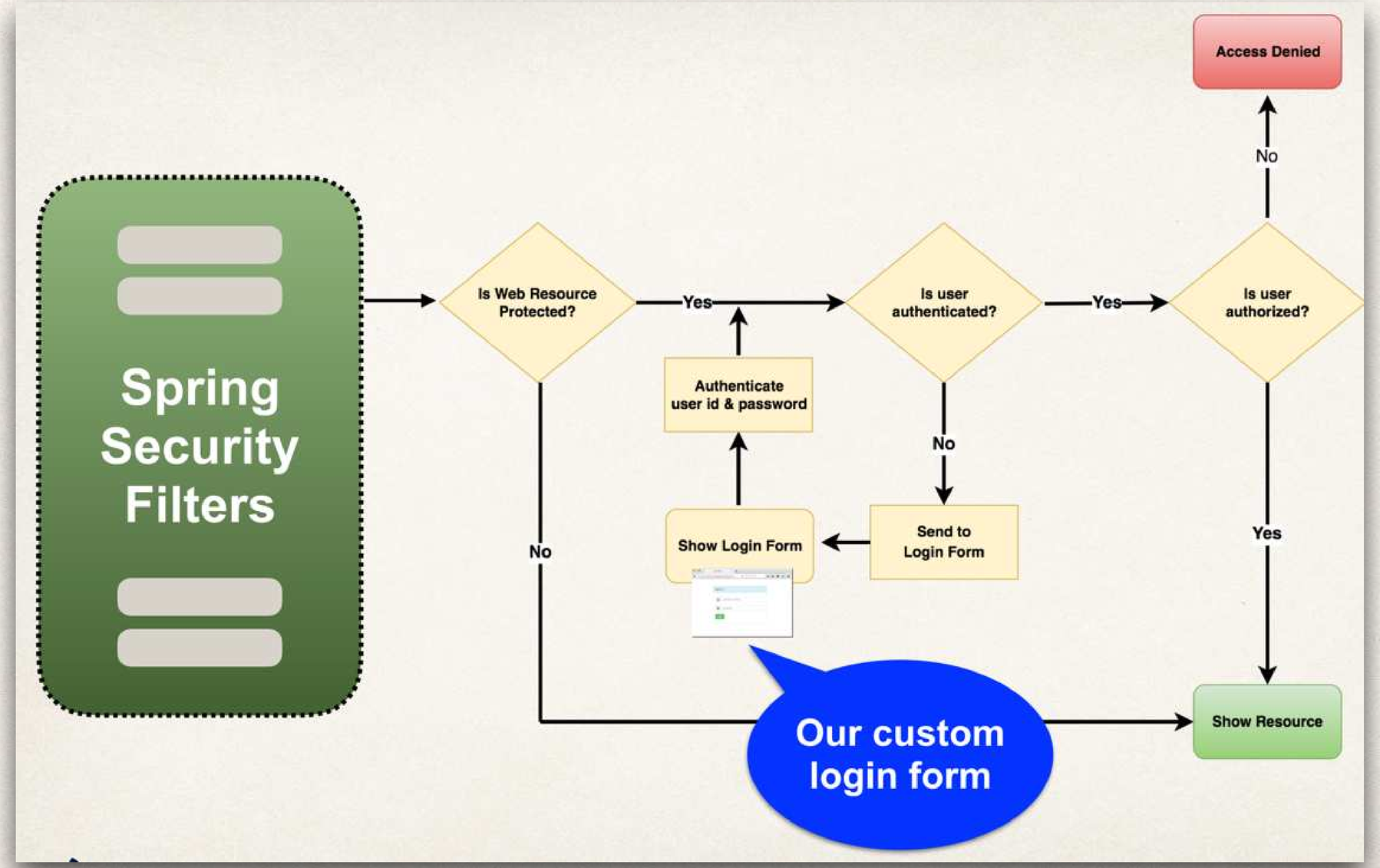
Failed Login

- When login fails, by default Spring Security will …
- Send user back to your login page

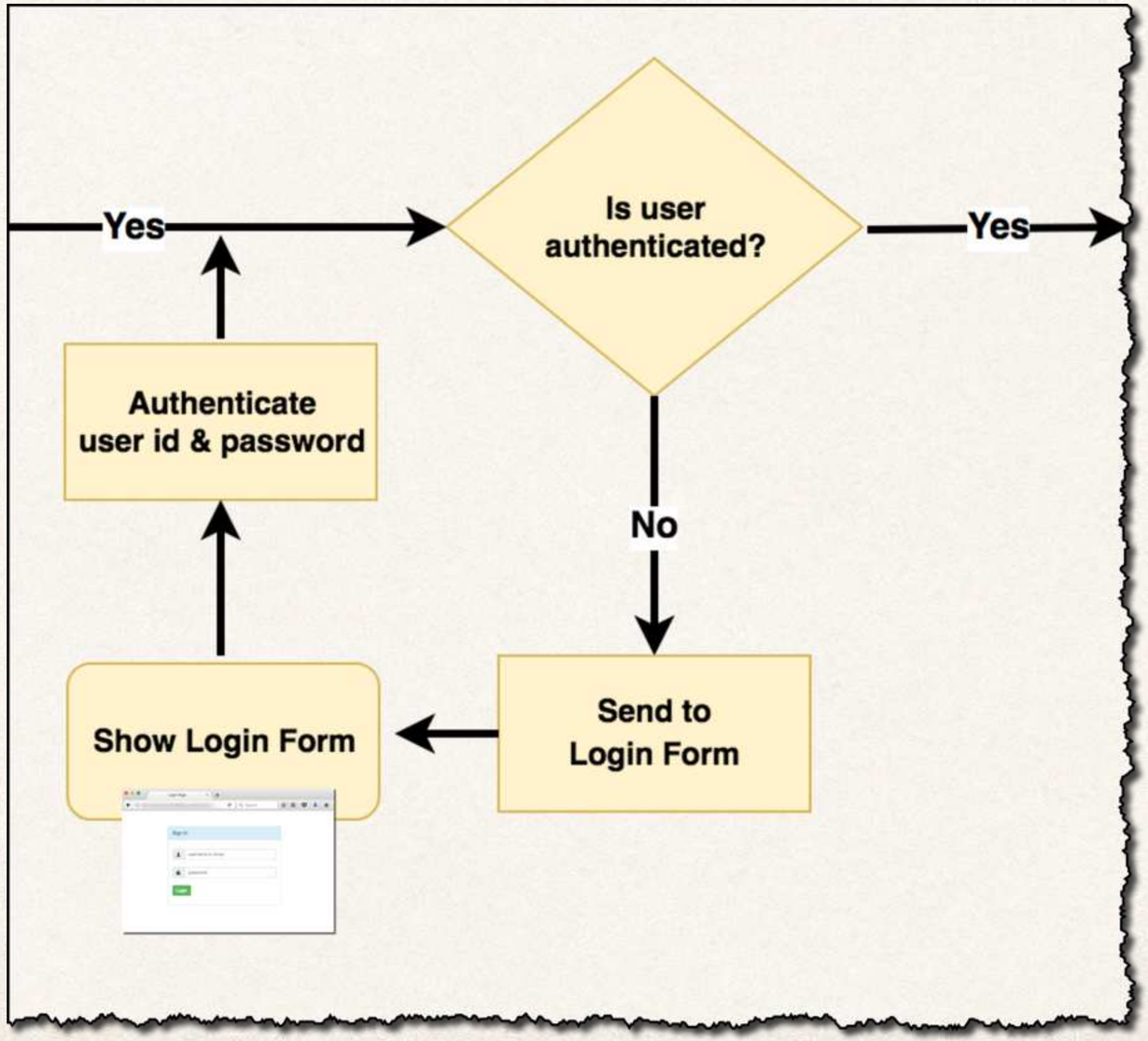
Failed Login

- When login fails, by default Spring Security will …
- Send user back to your login page
- Append an error parameter: **`?error`**

Failed Login



Failed Login



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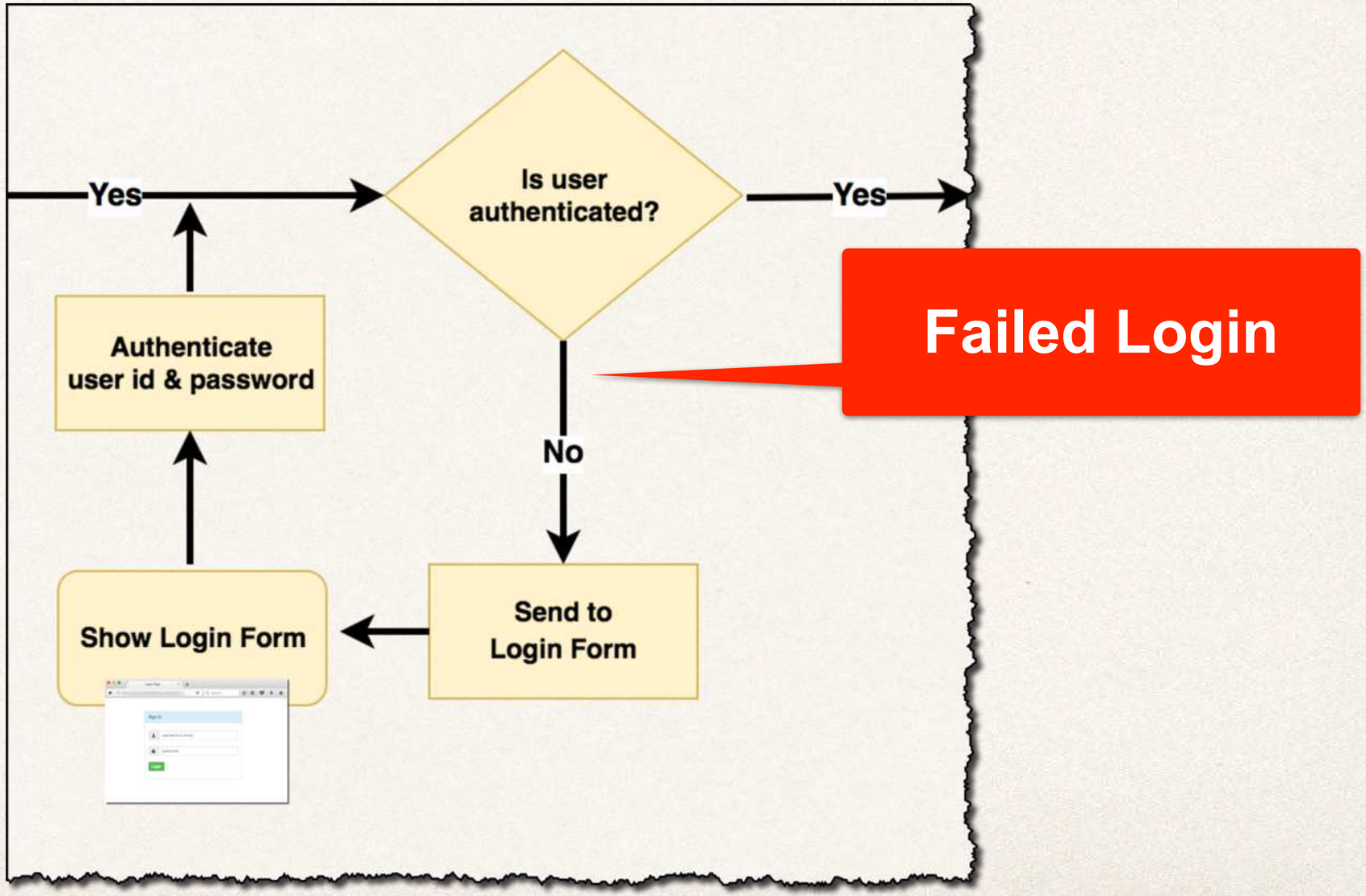

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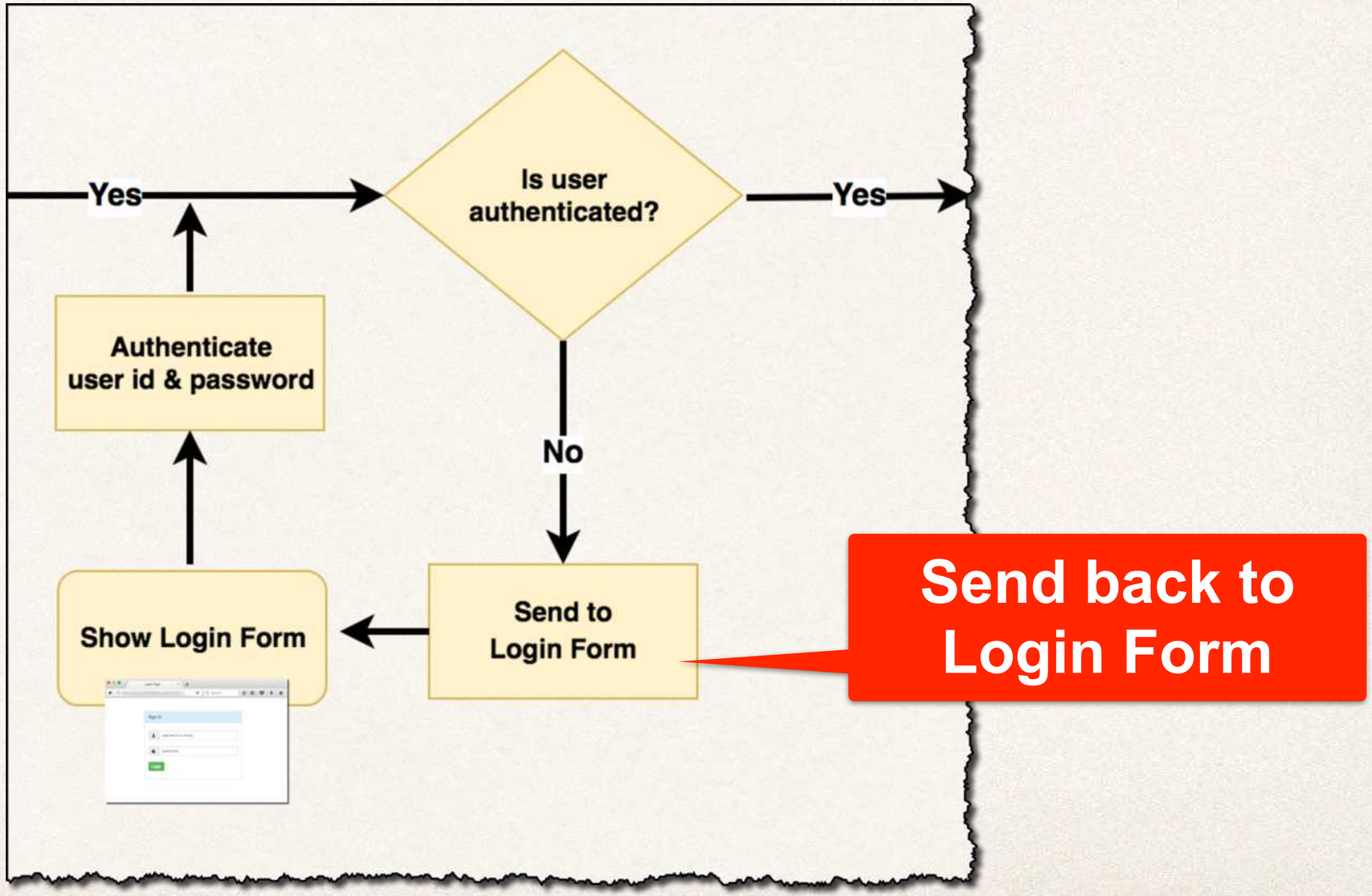

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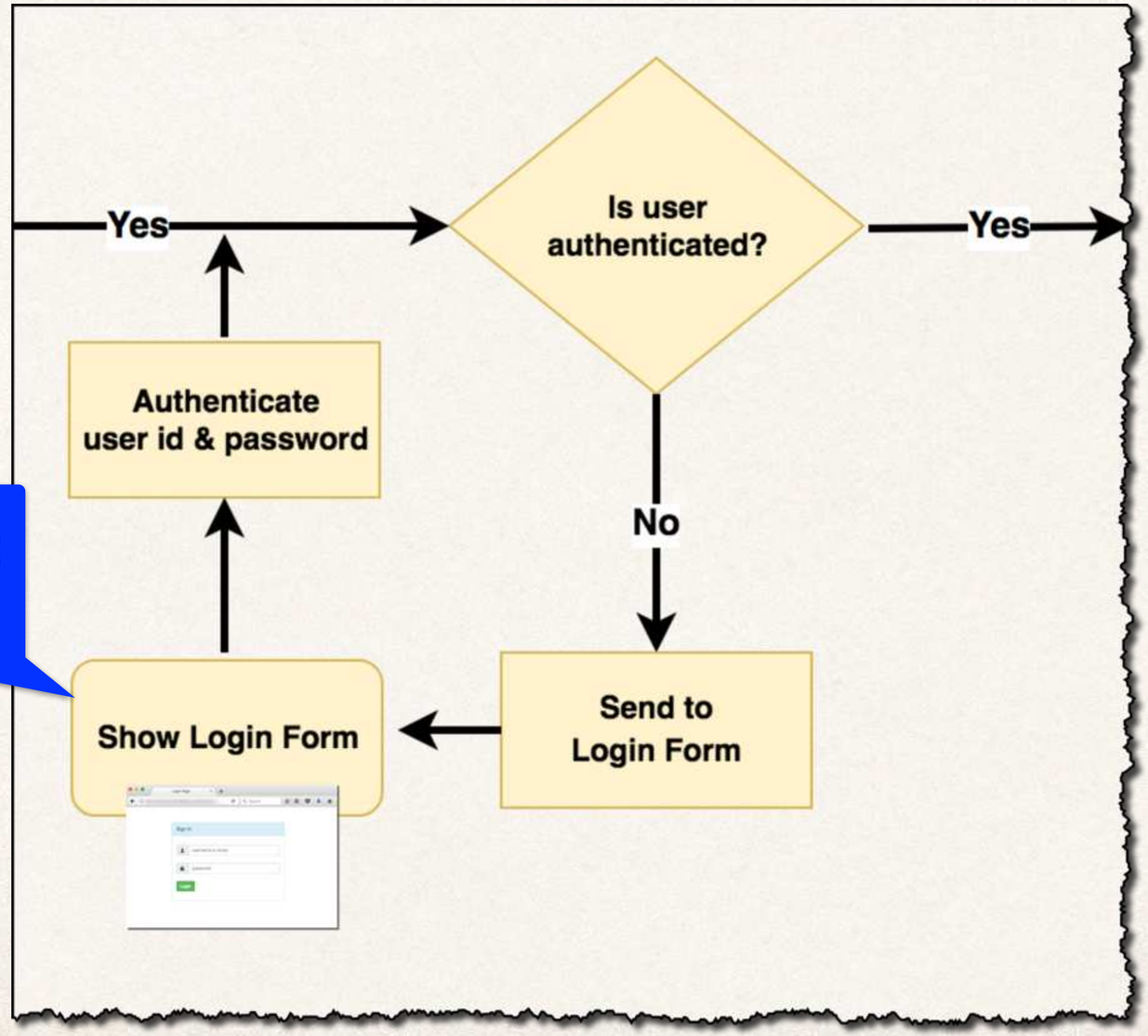
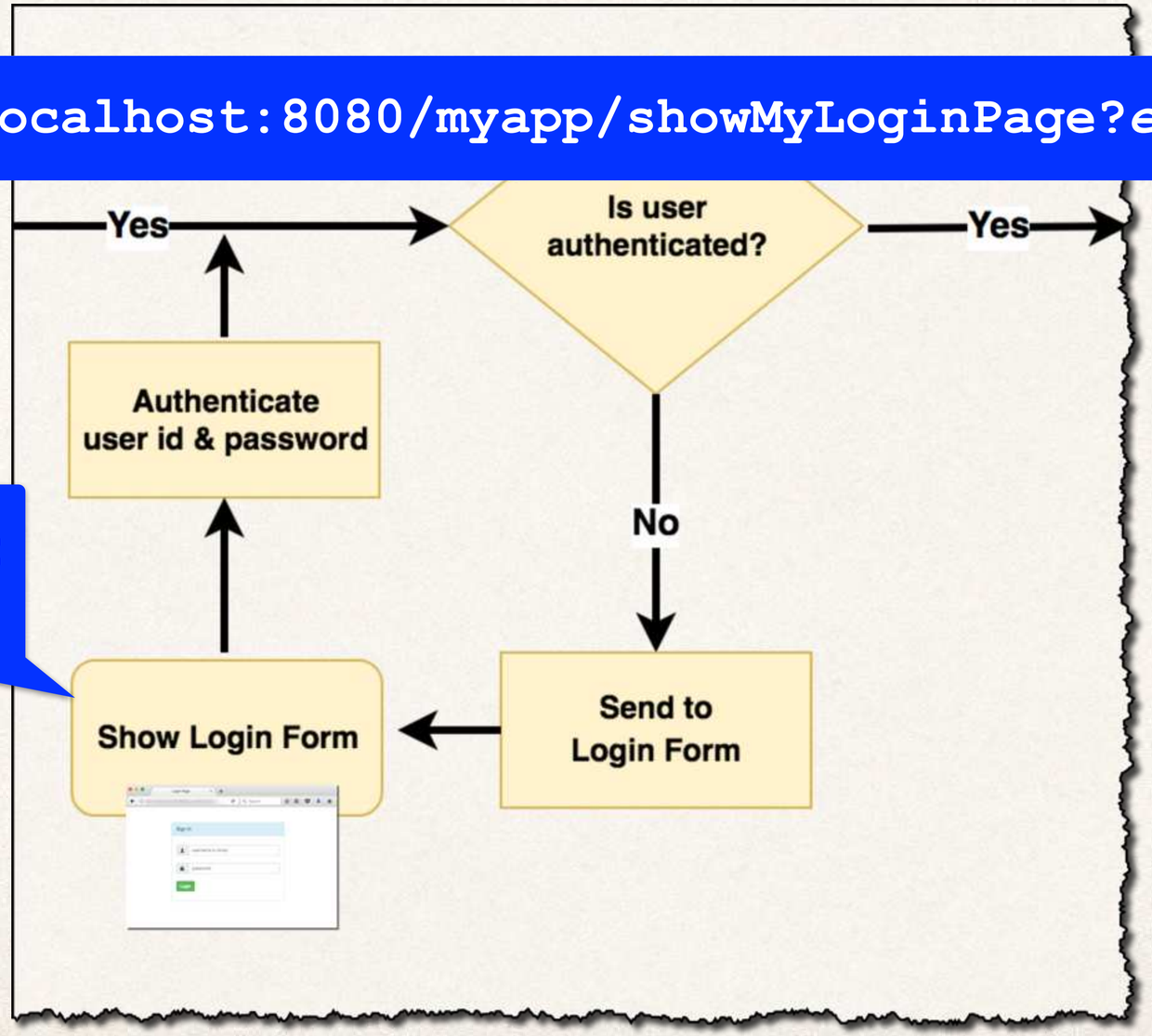


Append param to URL:
error

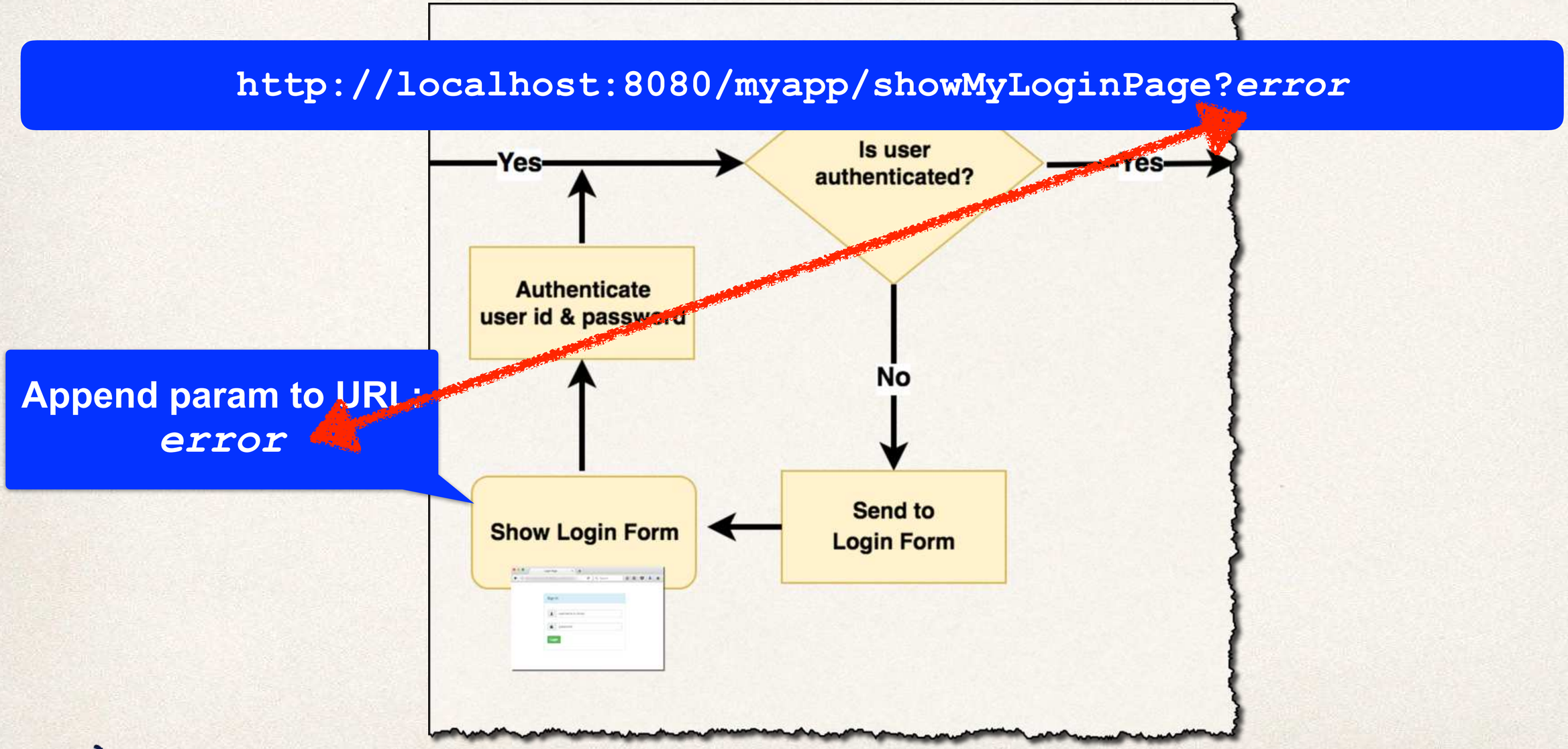
Failed Login

`http://localhost:8080/myapp/showMyLoginPage?error`



Append param to URL: *error*

Failed Login



Development Process

Step-By-Step

Development Process

Step-By-Step

1. Modify custom login form

Development Process

Step-By-Step

1. Modify custom login form
   1. Check the **error** parameter

Development Process

Step-By-Step

1. Modify custom login form
    1. Check the **error** parameter
    2. If **error** parameter exists, show an error message

Development Process

Step-By-Step

1. Modify custom login form

1. Check the **error** parameter
2. If **error** parameter exists, show an error message

JSTL can help with this :-)

Step 1: Modify form - check for error

File: WEB-INF/view/plain-login.jsp

```
<%@ taglib prefix="c" uri="http://java.sun.com/jsp/jstl/core"  %>

...
```

Step 1: Modify form - check for error

Use JSTL

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Use JSTL

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…
<form:form action="…" method="…">

  <c:if test="${param.error != null}”>

    <i>Sorry! You entered invalid username/password.</i>

  </c:if>

    User name: <input type="text" name="username" />
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Step 1: Modify form - check for error

Use JSTL

File: WEB-INF/view/plain-login.jsp

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If error param then show message

Step 1: Modify form - check for error

Use JSTL

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```

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http://localhost:8080/myapp/showMyLoginPage?*error*

…

Step 1: Modify form - check for error

Use JSTL

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If error param then show message

http://localhost:8080/myapp/showMyLoginPage?*error*

…

Spring Security - Bootstrap Login Page

Let's Make our Login Form Beautiful

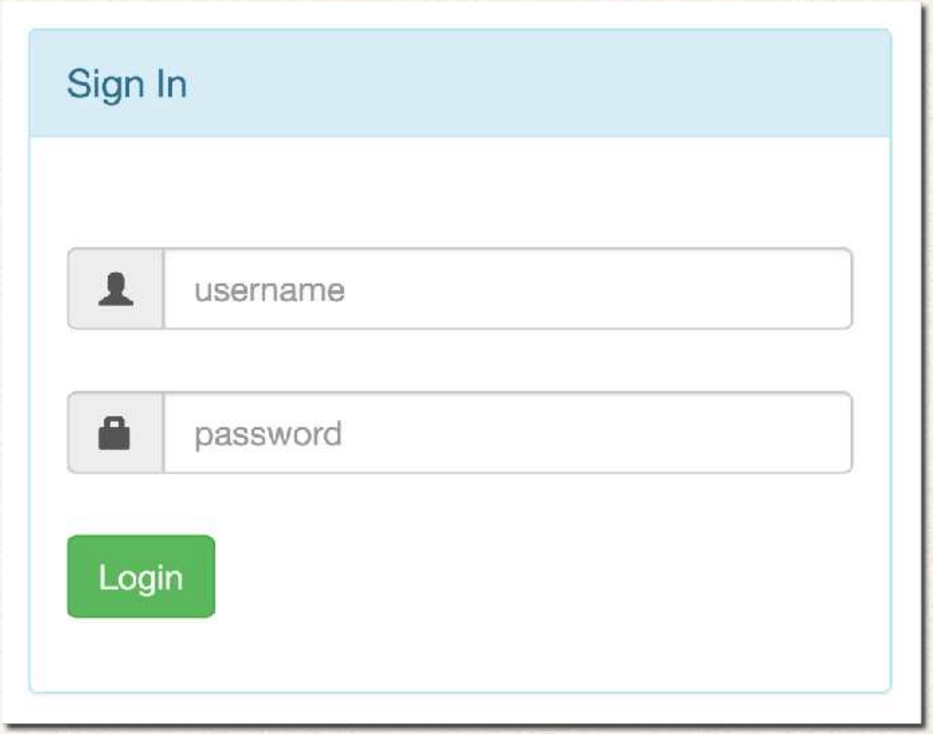
Let's Make our Login Form Beautiful

Before

Let's Make our Login Form Beautiful

Before

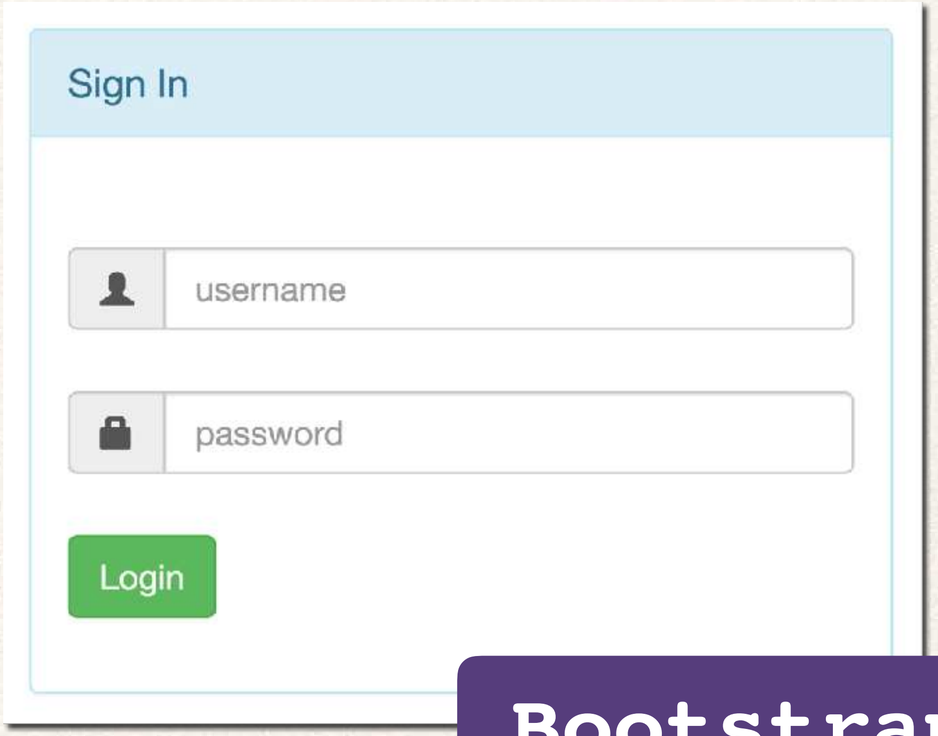
After



Let's Make our Login Form Beautiful

Before

After



Bootstrap

Bootstrap

Bootstrap

- Bootstrap is a web framework that includes CSS styles and JavaScript

Bootstrap

- Bootstrap is a web framework that includes CSS styles and JavaScript
- Focused on front-end UI

Bootstrap

- Bootstrap is a web framework that includes CSS styles and JavaScript
- Focused on front-end UI
- For our project, you do not need any experience with Bootstrap :-)

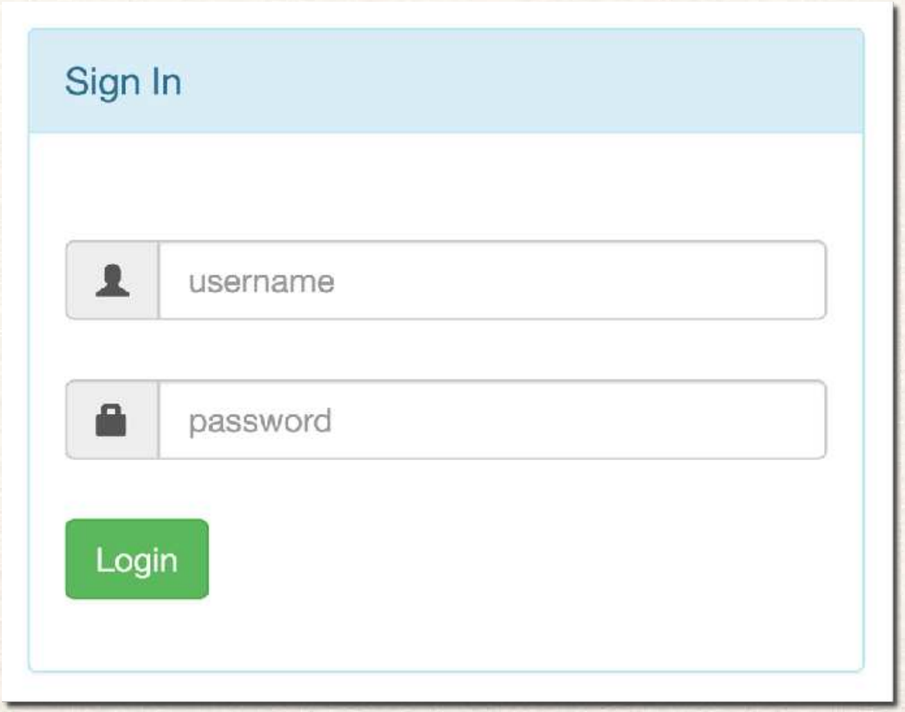
Our Game Plan

Our Game Plan

- My friend, Alan, has helped us out

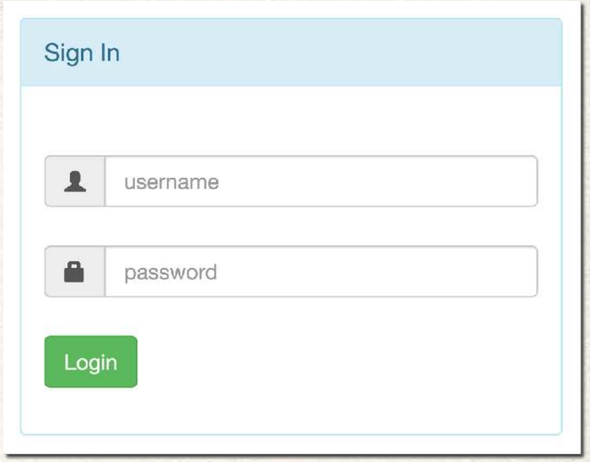
Our Game Plan

- My friend, Alan, has helped us out
  - He created an HTML login form using Bootstrap



Our Game Plan

- My friend, Alan, has helped us out
  - He created an HTML login form using Bootstrap



- We'll modify the form to use Spring Security for our project

Development Process

Step-By-Step

Development Process

Step-By-Step

1. Modify form and add support for Spring MVC form tags

Development Process

Step-By-Step

1. Modify form and add support for Spring MVC form tags

2. Update form to point to our login processing URL

Development Process

Step-By-Step

1. Modify form and add support for Spring MVC form tags

2. Update form to point to our login processing URL

3. Verify form fields for username and password

Development Process

Step-By-Step

1. Modify form and add support for Spring MVC form tags

2. Update form to point to our login processing URL

3. Verify form fields for username and password

4. Change our controller to use our new Bootstrap login form

Bootstrap Tutorials and Docs

Bootstrap Tutorials and Docs

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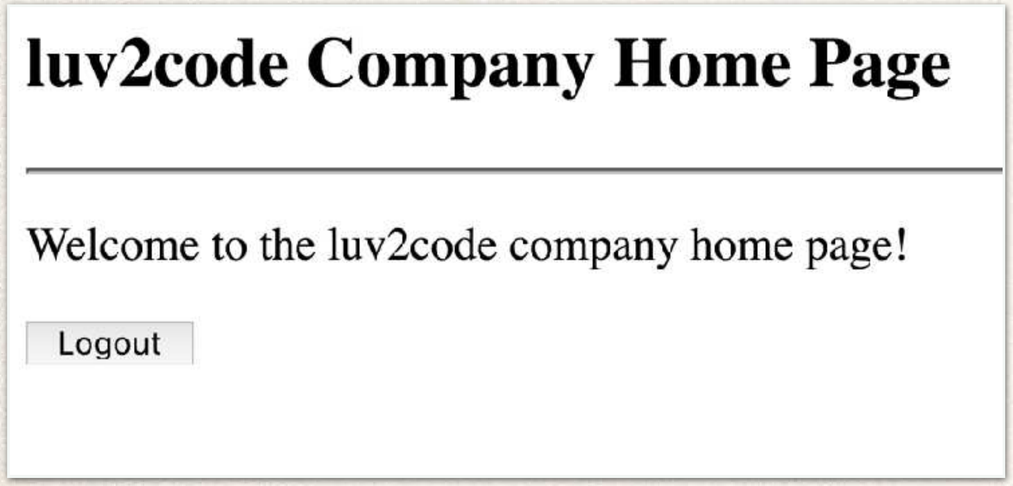
www.getbootstrap.com/docs

Spring Security - Logout

Logging Out

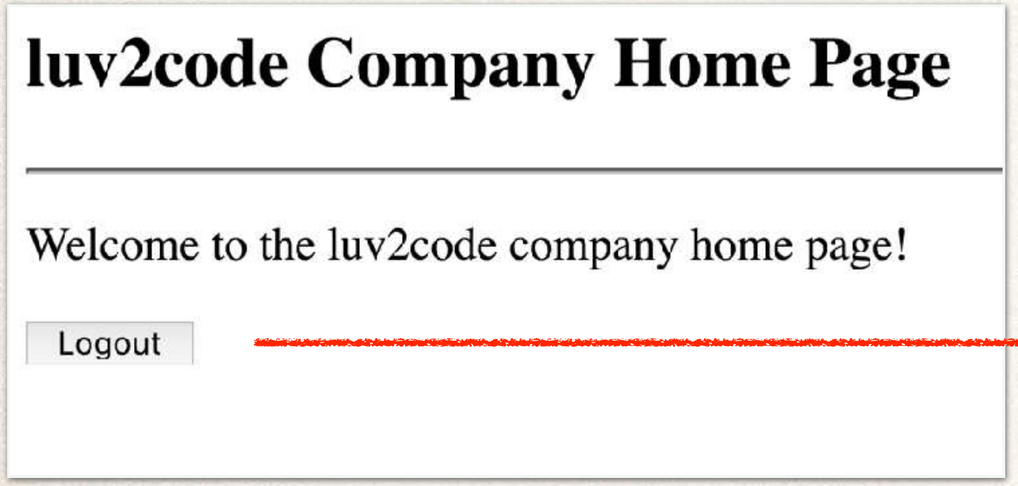
Logging Out


luv2code Company Home Page
Welcome to the luv2code company home page!
Logout

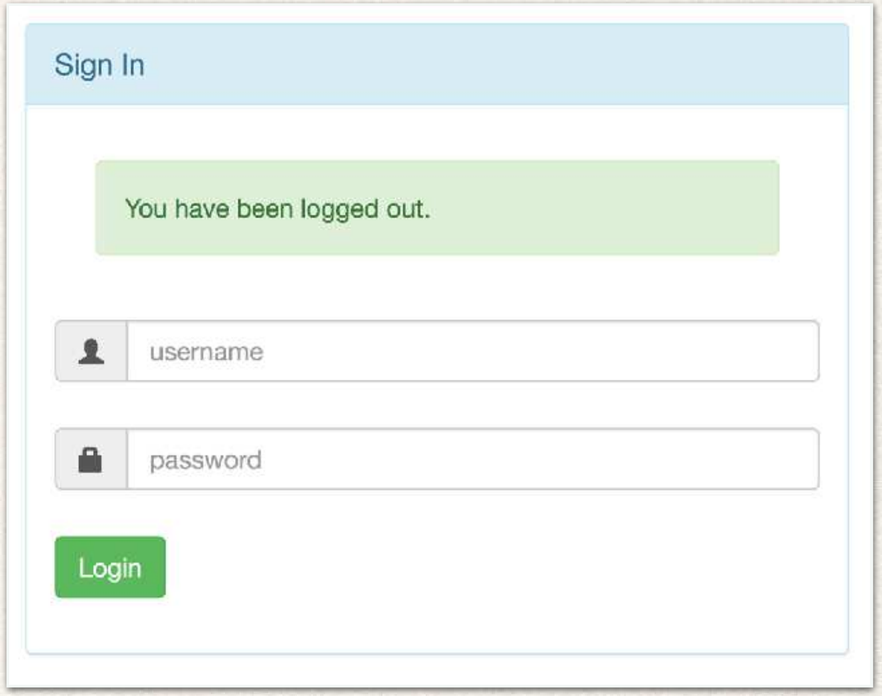
Logging Out

luv2code Company Home Page
Welcome to the luv2code company home page!
Logout
Clear user's session

Logging Out



Clear user's session



Development Process

Step-By-Step

Development Process

Step-By-Step

1. Add logout support to Spring Security Configuration

Development Process

Step-By-Step

1. Add logout support to Spring Security Configuration

2. Add logout button to JSP page

Development Process

Step-By-Step

1. Add logout support to Spring Security Configuration

2. Add logout button to JSP page

3. Update login form to display “logged out” message

Step 1: Add Logout support to Spring Security Configuration

```
@Override
protected void configure(HttpSecurity http) throws Exception {

  http.authorizeRequests()
         .anyRequest().authenticated()
       .and()
       .formLogin()
         .loginPage("/showMyLoginPage")
         .loginProcessingUrl("/authenticateTheUser")
         .permitAll()


}
```

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}
```
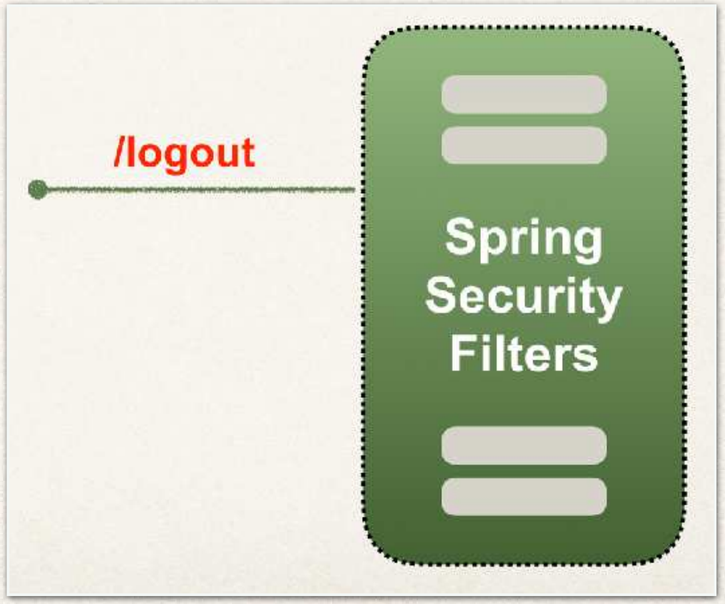

Add logout support for default URL `/logout`

Step 2: Add logout button

Step 2: Add logout button

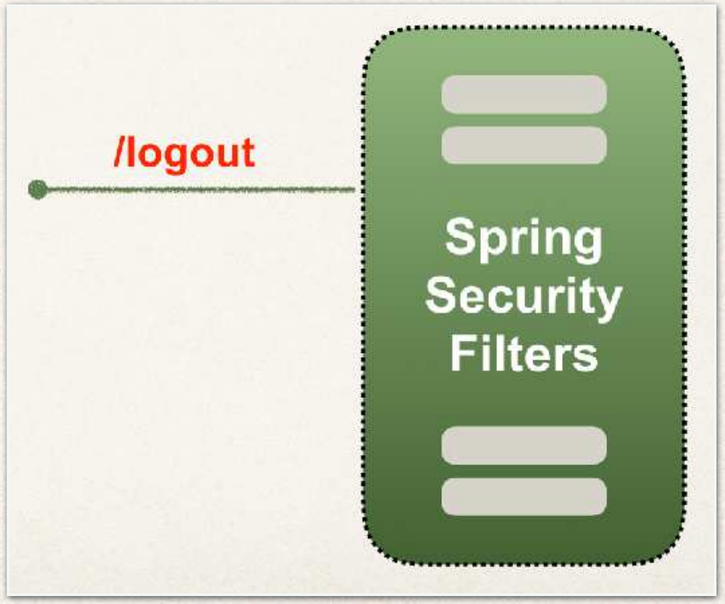
- Send data to default logout URL: **/logout**



Step 2: Add logout button

- Send data to default logout URL: **/logout**

- Logout URL will be handled by Spring Security Filters



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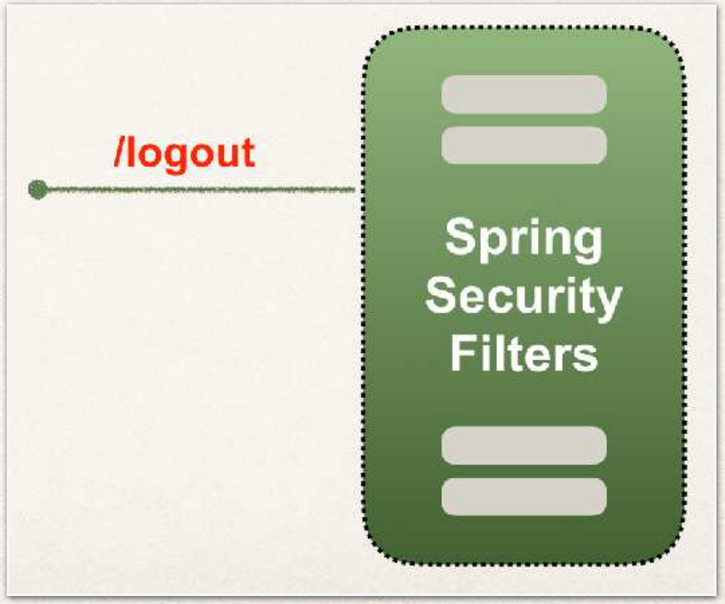

Step 2: Add logout button

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- Logout URL will be handled by Spring Security Filters
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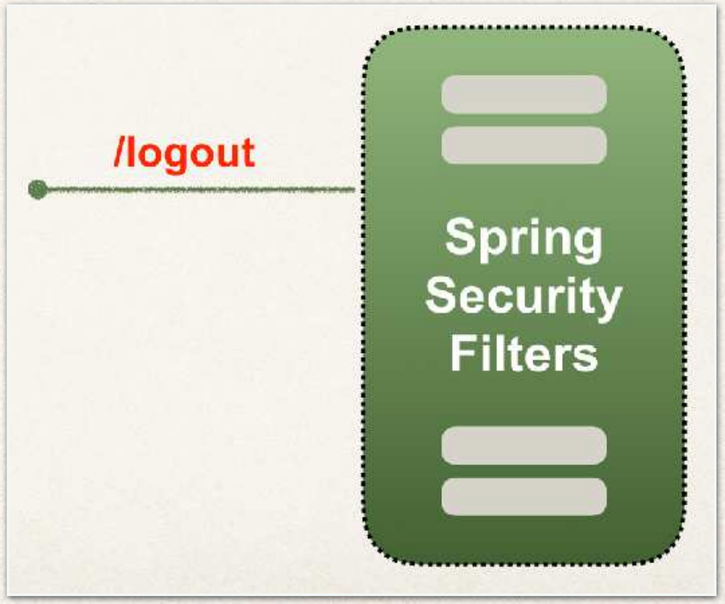
This is
Spring Security magic …
LOL



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```
<form:form action="${pageContext.request.contextPath}/logout"
           method="POST">

      <input type="submit" value="Logout" />

</form:form>
```

Step 2: Add logout button

- Send data to default logout URL: **/logout**
  - By default, must use **POST** method

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<form:form action="${pageContext.request.contextPath}/logout"
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```
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</form:form>
```

GET method is disabled by default

Logout process

Logout process

- When a logout is processed, by default Spring Security will …

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- Invalidate user's HTTP session and remove session cookies, etc

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Logout process

- When a logout is processed, by default Spring Security will …
- Invalidate user's HTTP session and remove session cookies, etc
- Send user back to your login page
- Append a logout parameter: **`?logout`**

Step 3: Update login form to display “logged out” message

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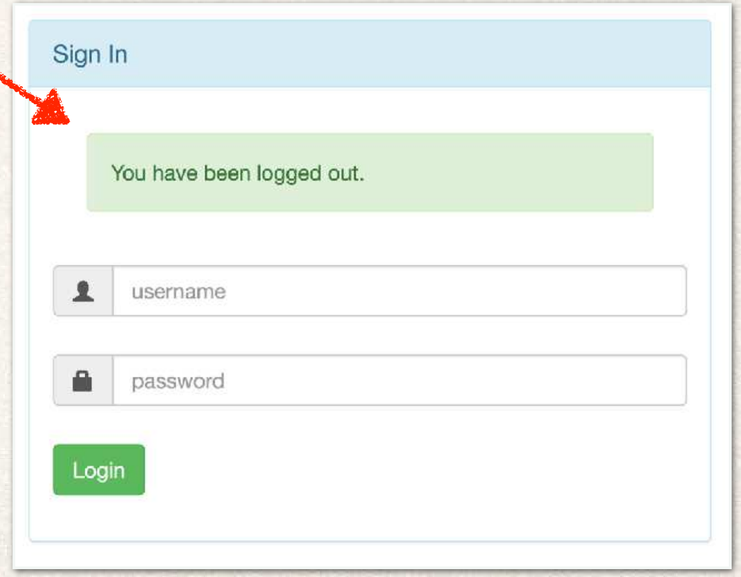

Step 3: Update login form to display "logged out" message

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1. Check the **logout** parameter
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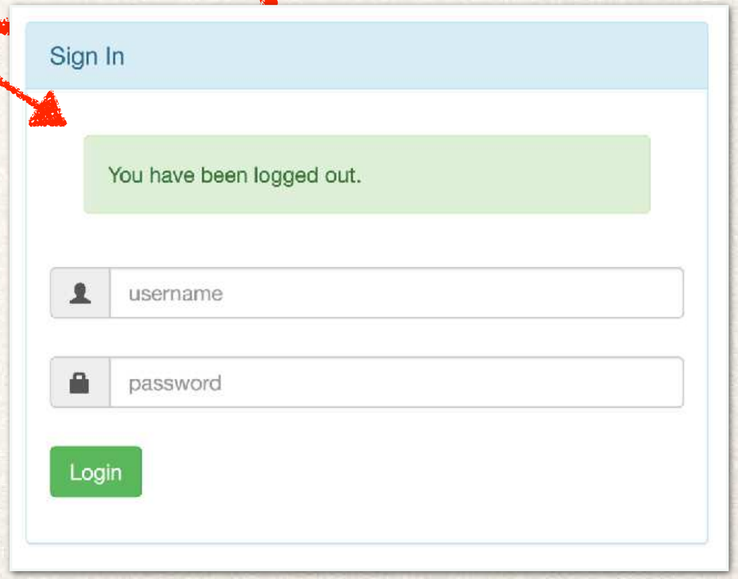
JSTL can help with this :-)



Modify Login form - check for "logout"

File: WEB-INF/view/plain-login.jsp

```
<%@ taglib prefix="c" uri="http://java.sun.com/jsp/jstl/core"  %>

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Modify Login form - check for "logout"

Use JSTL

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    <i>You have been logged out.</i>

  </c:if>

    User name: <input type="text" name="username" />
    Password: <input type="password" name="password" />


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http://localhost:8080/myapp/showMyLoginPage?logout

```
…
```

Cross Site Request Forgery (CSRF)

Earlier in the course …

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Step 3: Create custom login form

Best Practice

- **Best practice** is to use the Spring MVC Form tag `<form:form>`
  - Provides automatic support for security defenses *(more on this later)*

```
<form:form action="…" method="…" >
  …
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```

Earlier in the course …

Step 3: Create custom login form

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```
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Spring Security

Spring Security

- Spring Security protects against **Cross-Site Request Forgery (CSRF)**

What is CSRF?

What is CSRF?

A security attack where an evil website
tricks you into executing an action
on a web application
that you are currently logged in.

CSRF Examples

CSRF Examples

- You are logged into your banking app

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- You are logged into your banking app
  - tricked into sending money to another person

CSRF Examples

- You are logged into your banking app
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- You are logged into an e-commerce app

CSRF Examples

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- You are logged into an e-commerce app
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CSRF Protection

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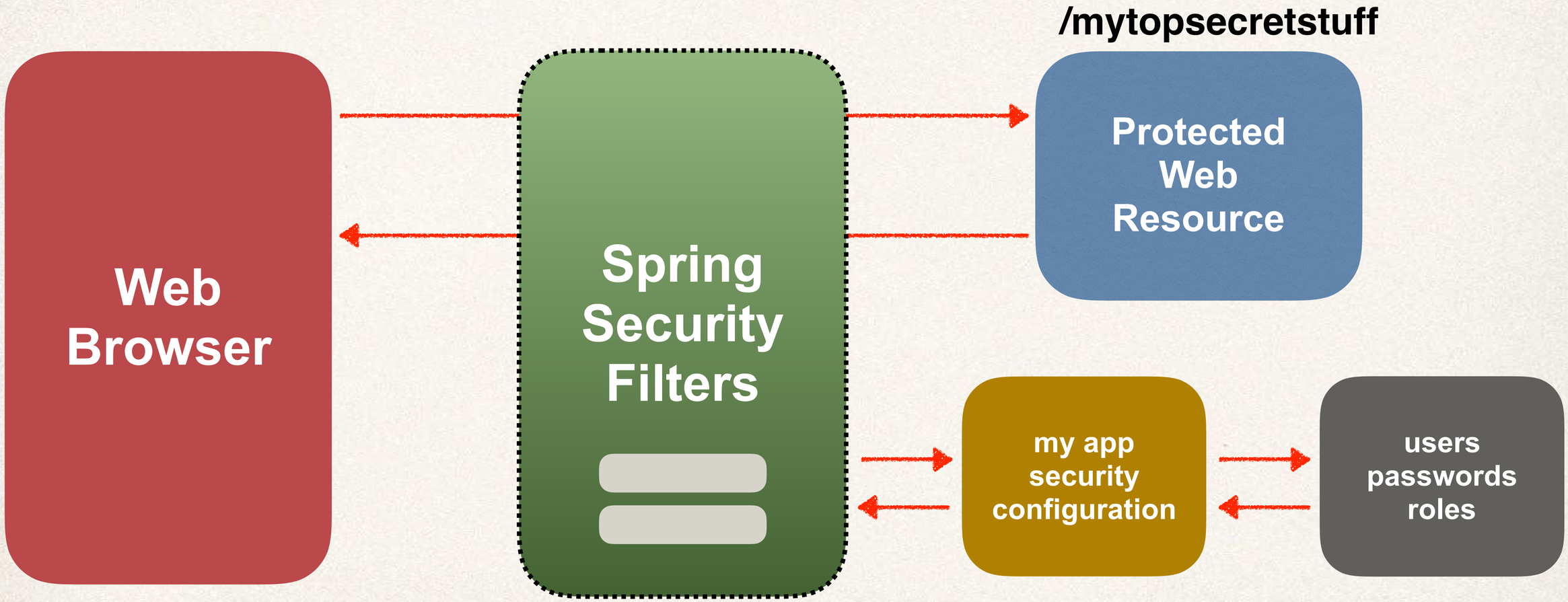
- Embed additional authentication data/token into all HTML forms

CSRF Protection

- To protect against CSRF attacks
- Embed additional authentication data/token into all HTML forms
- On subsequent requests, web app will verify token before processing

Spring Security Overview



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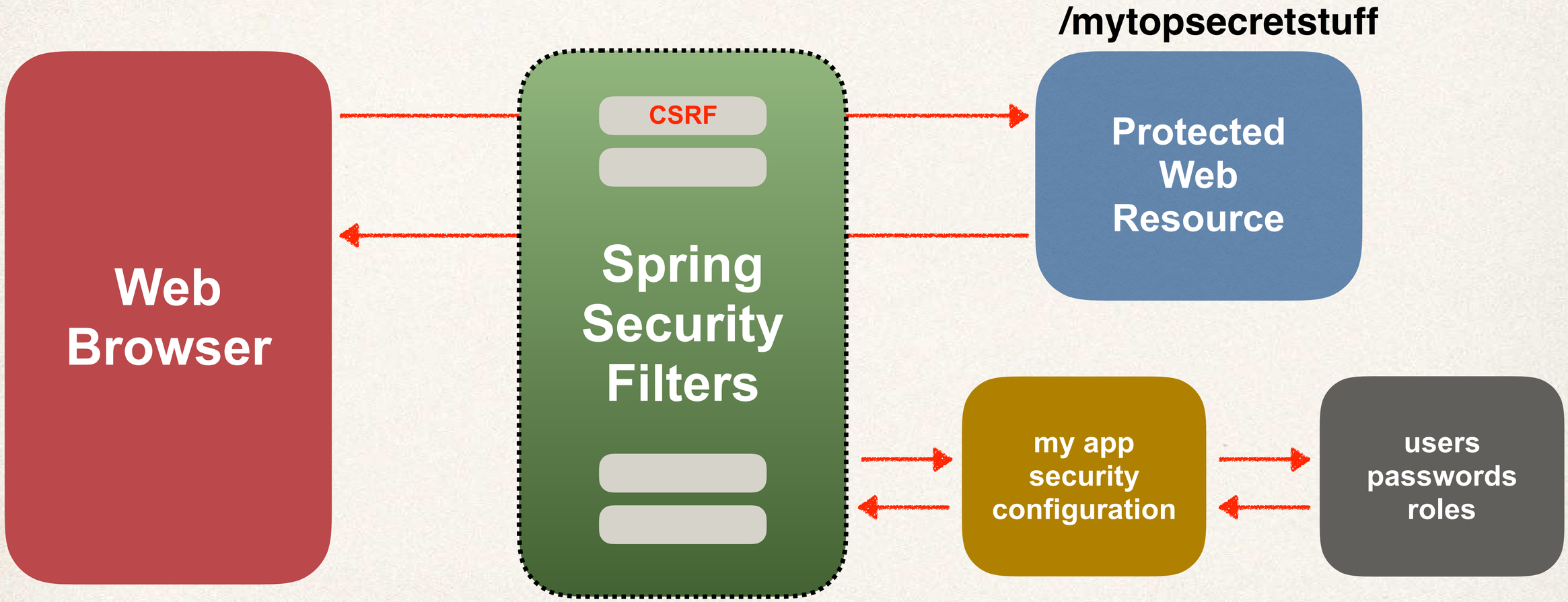

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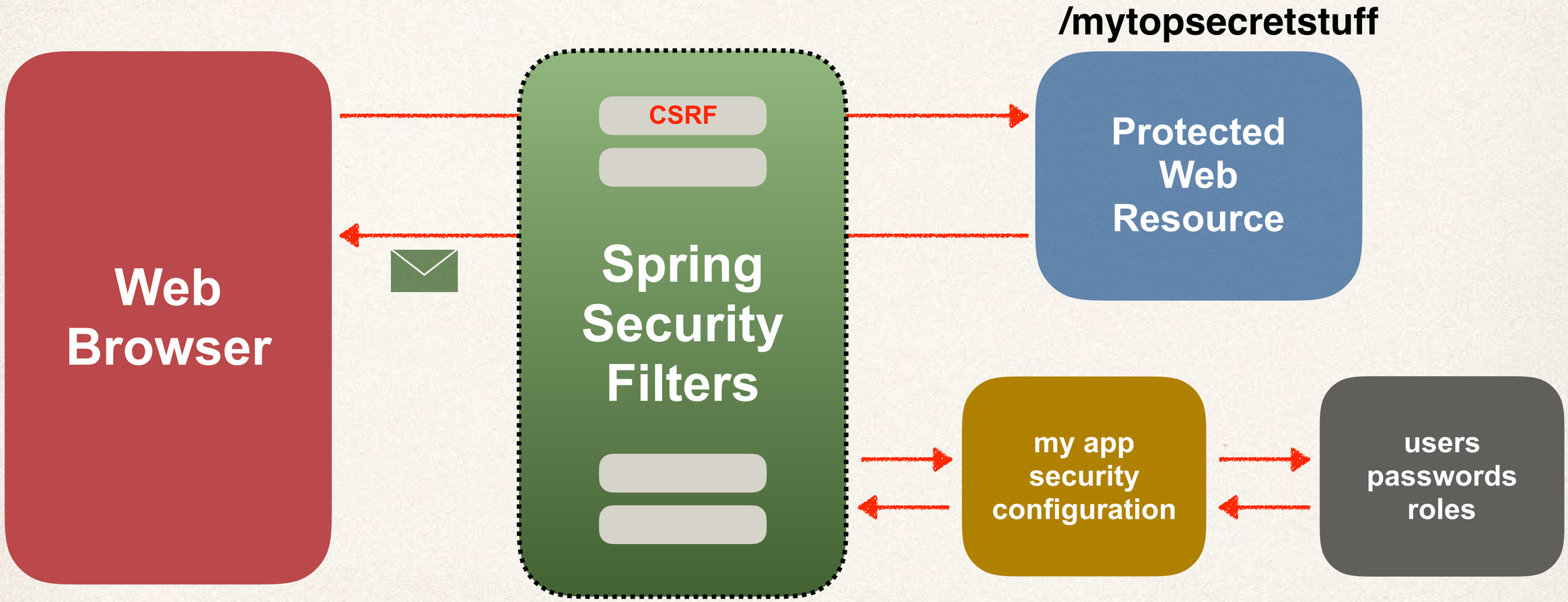

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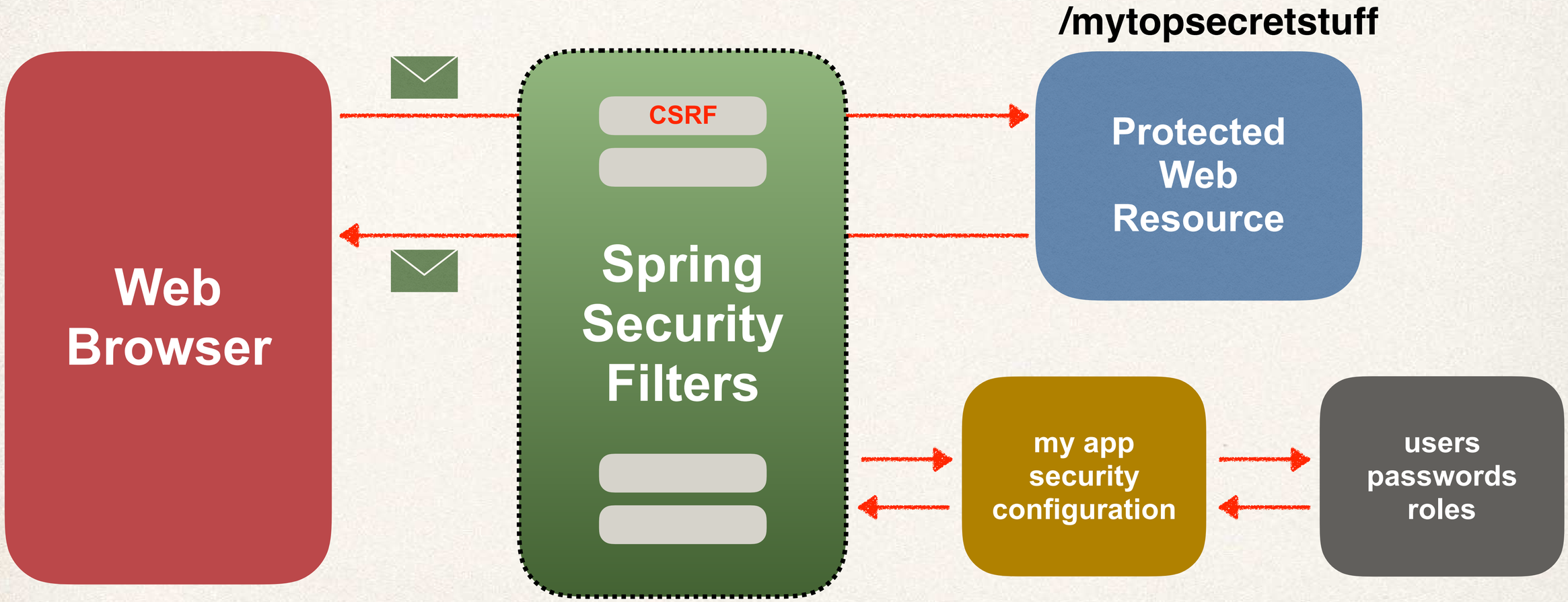

Spring Security's CSRF Protection

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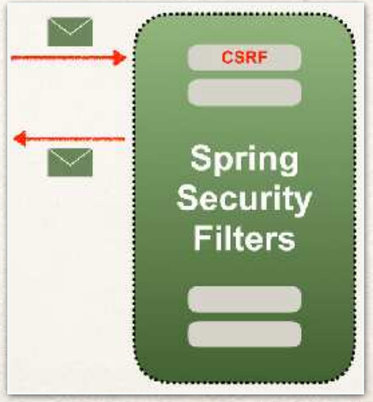

When to use CSRF Protection?

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When to use CSRF Protection?

- The Spring Security team recommends
- Use CSRF protection for any normal browser web requests
- If you are building a service for non-browser clients
  - you *may* want to disable CSRF protection (after careful review)

Use Spring Security CSRF Protection

Use Spring Security CSRF Protection

- For form submissions use POST instead of GET

Use Spring Security CSRF Protection

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- Include CSRF token in form submission

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- `<form:form>` automagically adds CSRF token

Best Practice

Use Spring Security CSRF Protection

- For form submissions use POST instead of GET
- Include CSRF token in form submission
- `<form:form>` automagically adds CSRF token

Best Practice

- If you don't use `<form:form>`, you must manually add CSRF token

Manually add CSRF token

```
<form action="..." method="POST">

        <input type="hidden"
               name="${_csrf.parameterName}"
              value="${_csrf.token}" />

</form>
```

What happens if you don't include CSRF token?

What happens if you don't include CSRF token?

Let's Break It!

What happens if you don't include CSRF token?

Let's Break It!

HTTP Status 403 – Forbidden

Type Status Report

Message Invalid CSRF Token 'null' was found on the request parameter '_csrf' or header 'X-CSRF-TOKEN'.

Description The server understood the request but refuses to authorize it.

What happens if you don't include CSRF token?

Let's Break It!

HTTP Status 403 – Forbidden

Type Status Report

Message Invalid CSRF Token 'null' was found on the request parameter '_csrf' or header 'X-CSRF-TOKEN'.

Description The server understood the request but refuses to authorize it.

Token was not included

CSRF Resources

- CSRF Security Reference
  - `https://www.owasp.org/index.php/Cross-Site_Request_Forgery_(CSRF)`
- Spring Security CSRF Support
  - `https://docs.spring.io/spring-security/site/docs/current/reference/htmlsingle/#csrf`

Display User ID and Roles

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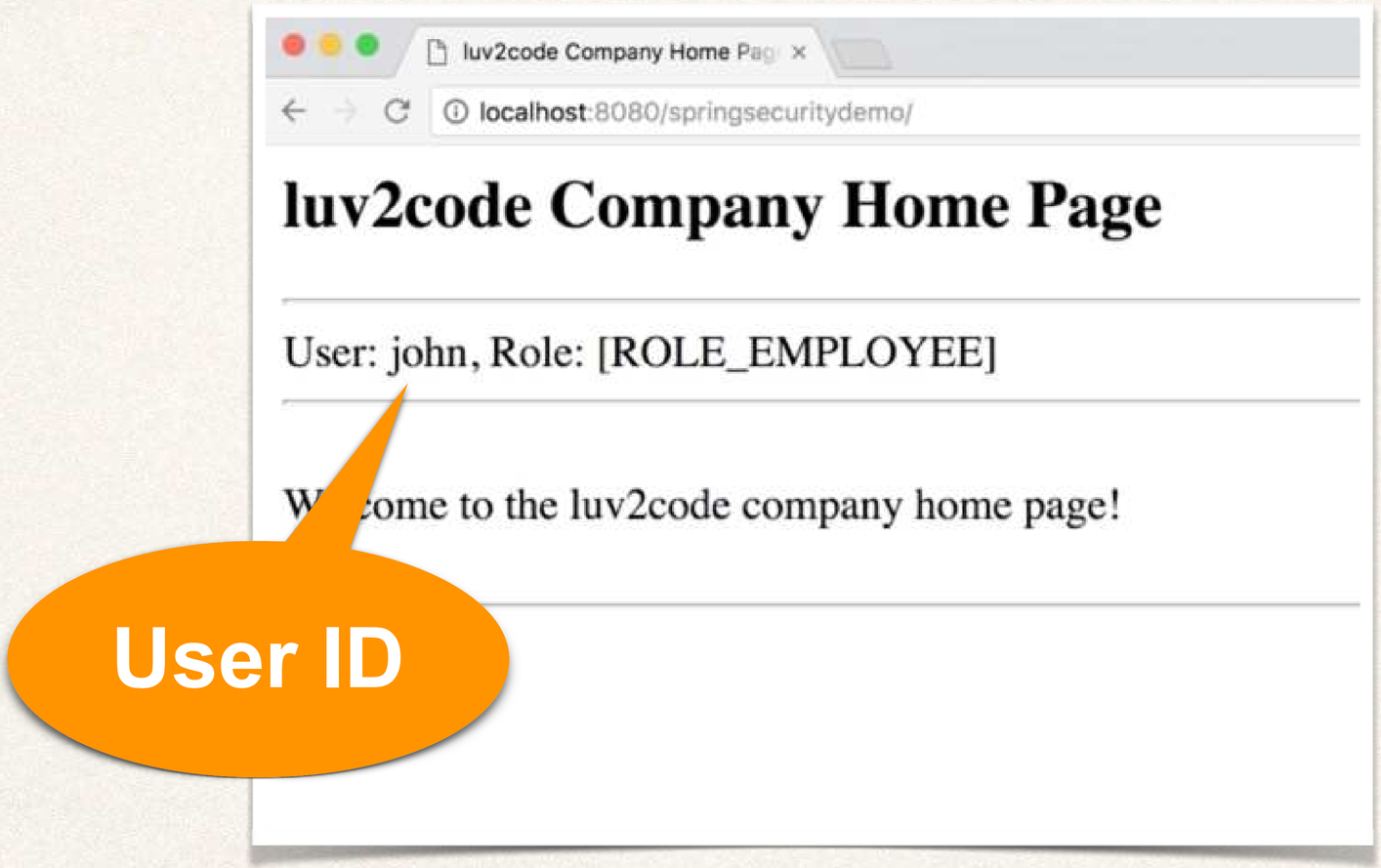
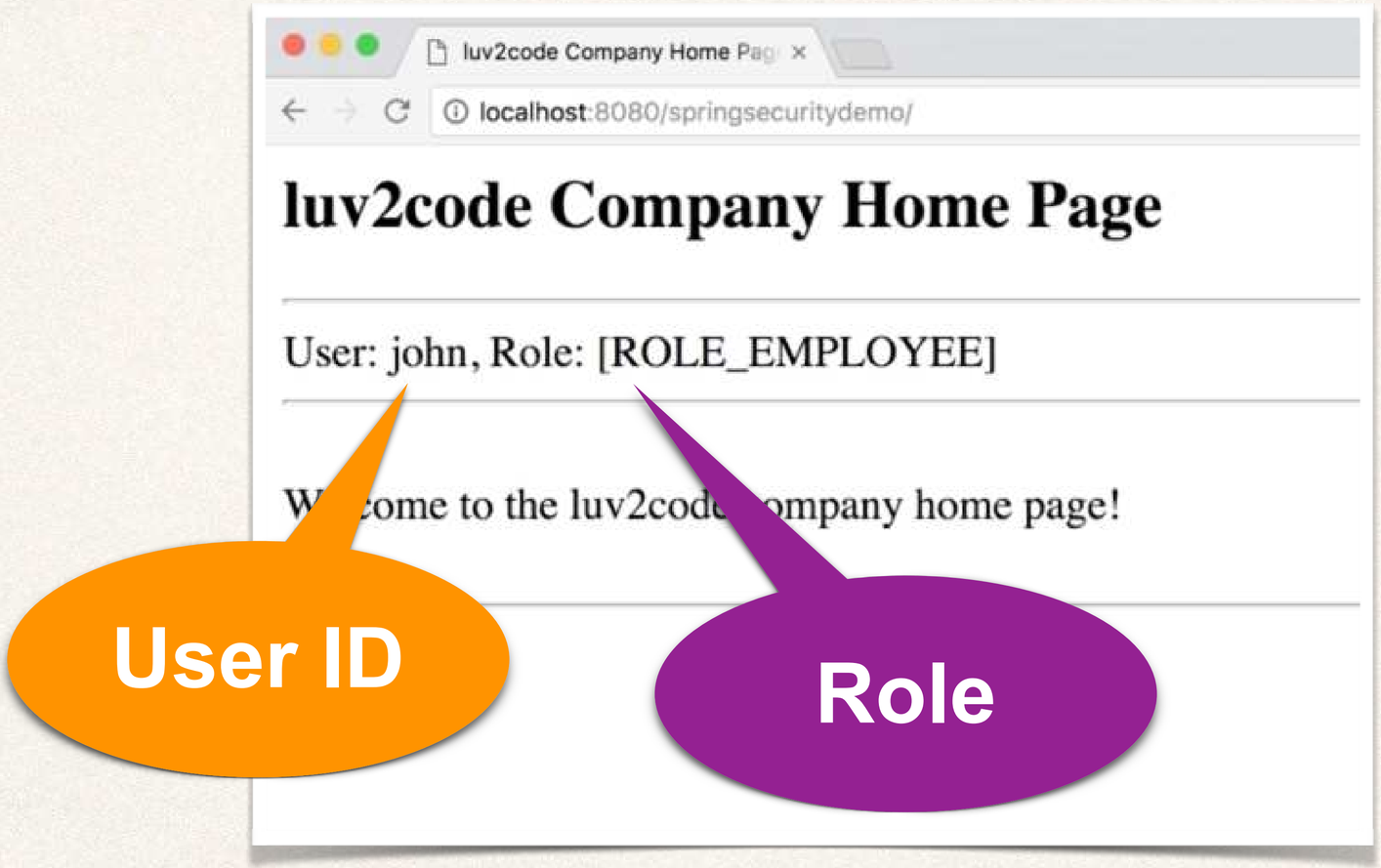


Display User ID and Roles



Spring Security

Spring Security

- Spring Security provides JSP custom tags for accessing user id and roles

Development Process

Step-By-Step

Development Process

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1. Update POM file for Spring Security JSP Tag Library

Development Process

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4. Display User Roles

Step 1: Update POM file for Spring Security JSP Tag Library

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File: pom.xml

```
<dependency>
    <groupId>org.springframework.security</groupId>
    <artifactId>spring-security-taglibs</artifactId>
    <version>${springsecurity.version}</version>
</dependency>
```

Step 1: Update POM file for Spring Security JSP Tag Library

File: pom.xml

```
<dependency>
    <groupId>org.springframework.security</groupId>
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```

Spring Security Taglibs

Step 2: Add Spring Security JSP Tag Library to JSP page

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```
<%@ taglib prefix="security"
           uri="http://www.springframework.org/security/tags" %>
```

Step 3: Display User ID

Step 3: Display User ID

File: home.jsp

```
<%@ taglib prefix="security"
            uri="http://www.springframework.org/security/tags" %>
…

User: <security:authentication property="principal.username" />
```

Step 3: Display User ID

File: home.jsp

```
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…

User: <security:authentication property="principal.username" />
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User ID

Step 4: Display User Roles

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File: home.jsp

```
<%@ taglib prefix="security"
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…

Role(s): <security:authentication property="principal.authorities" />
```

Step 4: Display User Roles

File: home.jsp

```
<%@ taglib prefix="security"
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…

Role(s): <security:authentication property="principal.authorities" />
```

User Roles

Restrict Access Based on Roles

Our Example

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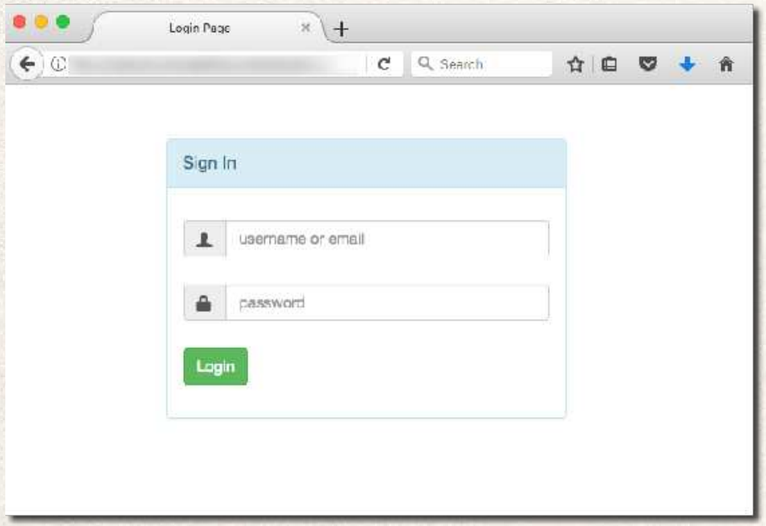

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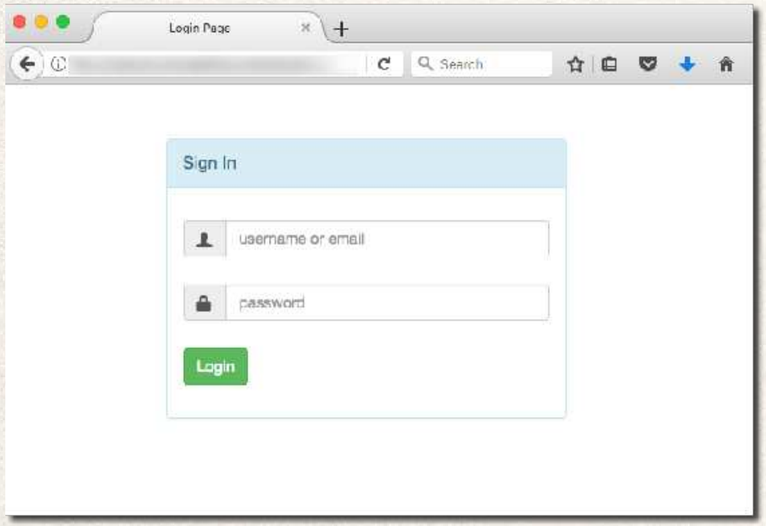
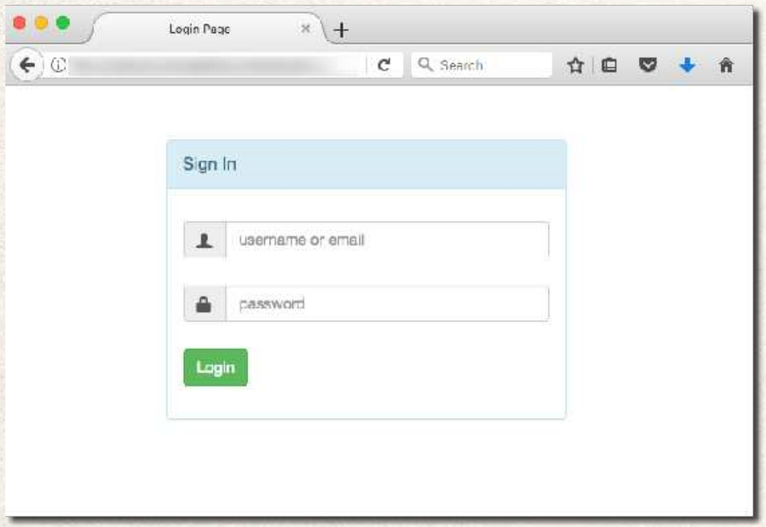


/

Home Page

role: EMPLOYEE

Our Example



/

Home Page

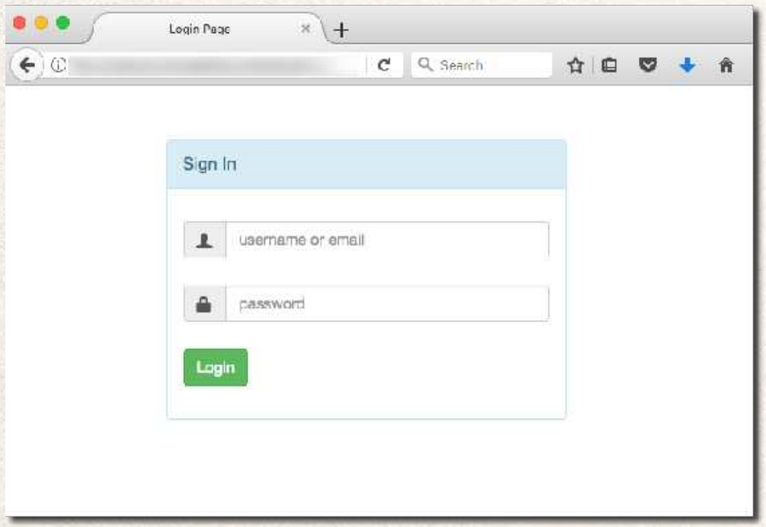
role: EMPLOYEE

/leaders

Leadership Retreat Page

role: MANAGER

Our Example



/

Home Page

role: EMPLOYEE

/leaders

Leadership Retreat Page

role: MANAGER

/systems

Admin Holiday Cruise

role: ADMIN

Development Process

Step-By-Step

Development Process

Step-By-Step

1. Create supporting controller code and view pages

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Step 1: Create Supporting Controller code and View Pages

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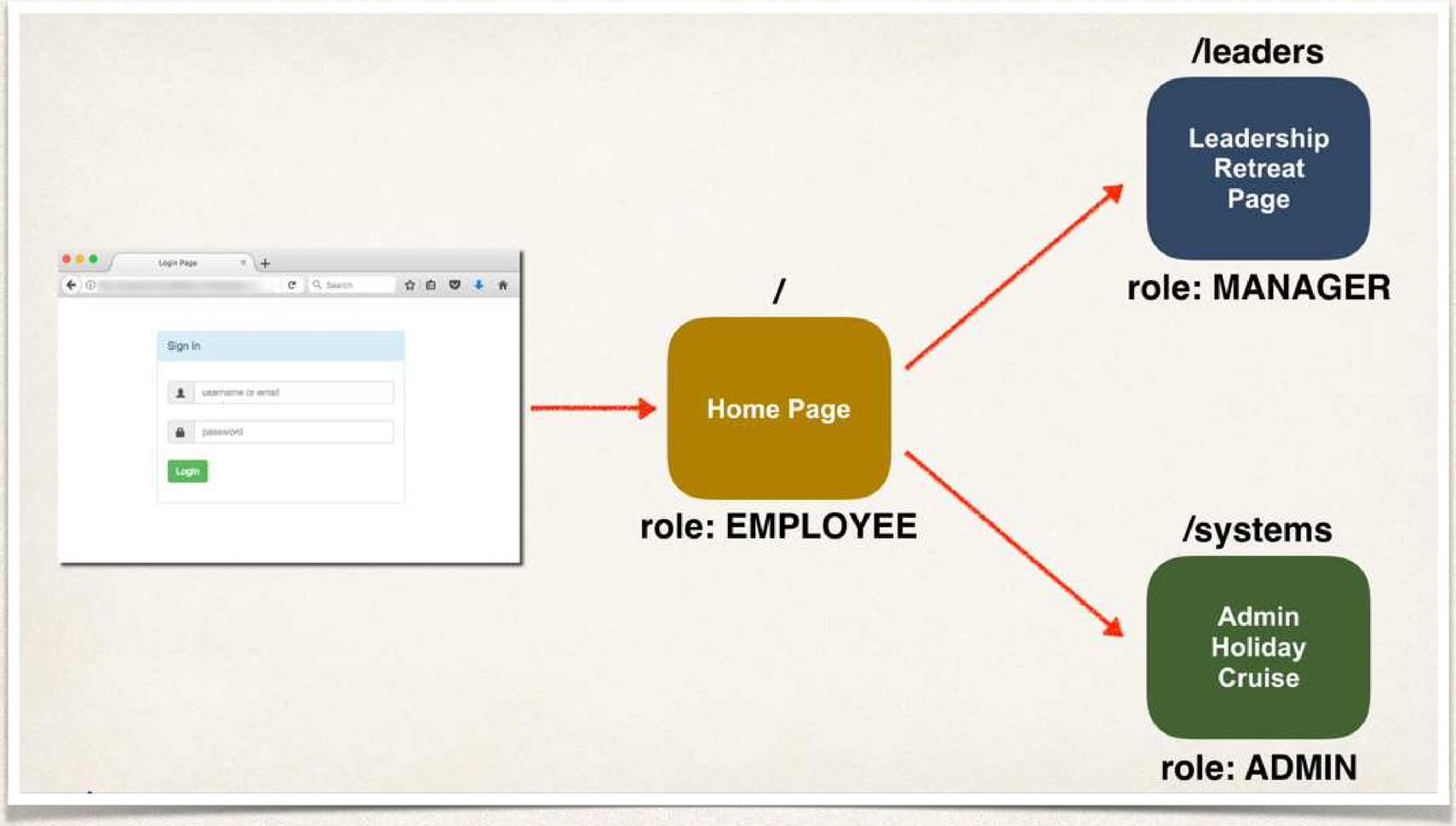
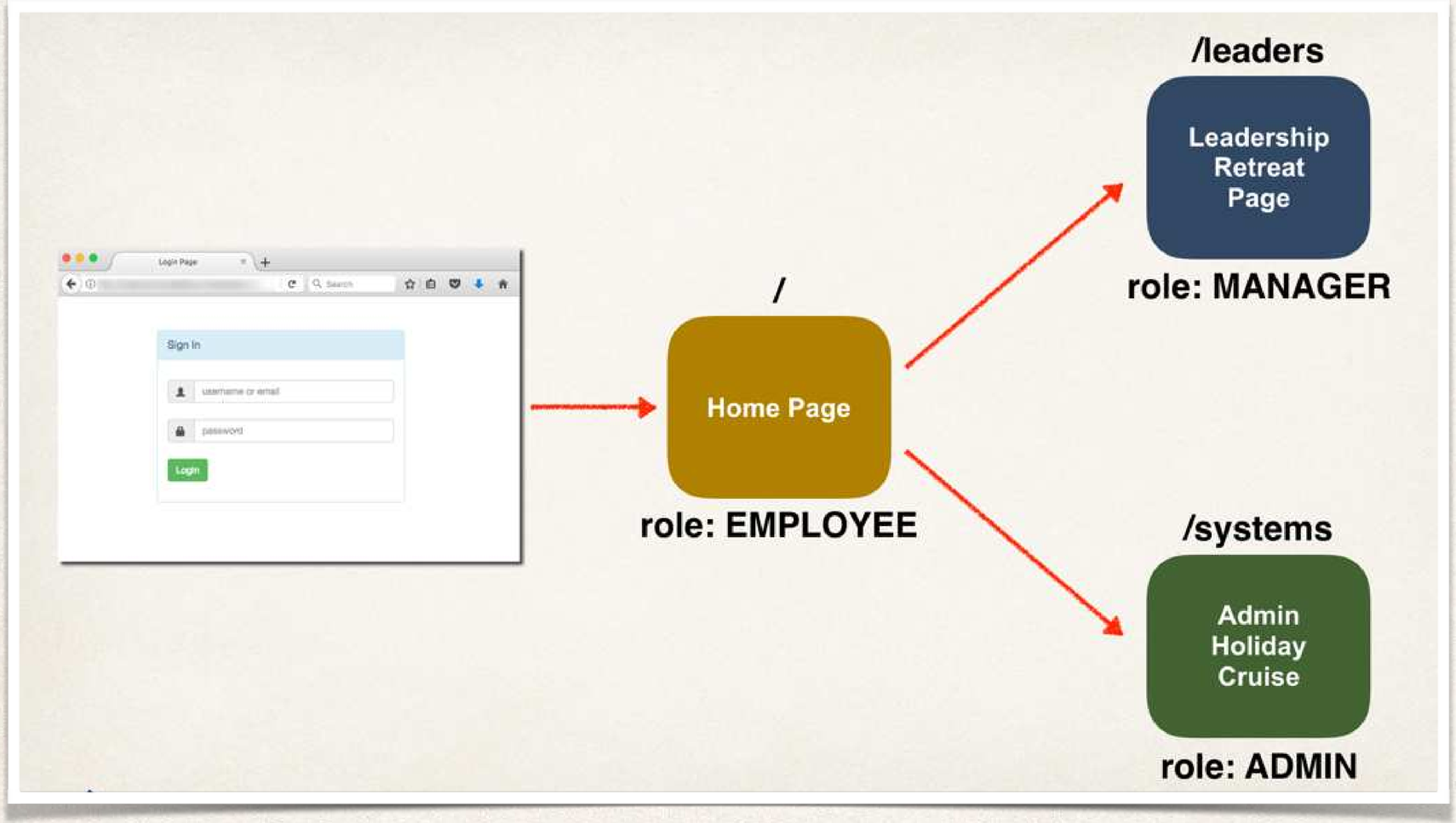


Step 1: Create Supporting Controller code and View Pages



Cover these steps in the video

Step 2: Update Our User Roles

Step 2: Update Our User Roles

User ID	Password	Roles

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User ID	Password	Roles
`john`	`test123`	`EMPLOYEE`

Step 2: Update Our User Roles

User ID	Password	Roles
john	test123	EMPLOYEE
mary	test123	EMPLOYEE, MANAGER

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Step 2: Update Our User Roles

User ID	Password	Roles
john	test123	EMPLOYEE
mary	test123	EMPLOYEE, MANAGER
susan	test123	EMPLOYEE, ADMIN

We can give ANY names for user roles

Step 2: Update Our User Roles

File: DemoSecurityConfig.java

```
@Override
protected void configure(AuthenticationManagerBuilder auth) throws Exception {

  // add our users for in memory authentication





}
```

Step 2: Update Our User Roles

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File: DemoSecurityConfig.java

```
@Override
protected void configure(AuthenticationManagerBuilder auth) throws Exception {

  // add our users for in memory authentication

  UserBuilder users = User.withDefaultPasswordEncoder();

  auth.inMemoryAuthentication()
    .withUser(users.username("john").password("test123").roles("EMPLOYEE"))
    .withUser(users.username("mary").password("test123").roles("EMPLOYEE", "MANAGER"))
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Step 2: Update Our User Roles

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```

Step 3: Restricting Access to Roles

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- Update your Spring Security Java configuration file (.java)

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Restrict access to a given path "/systems/"**

Step 3: Restricting Access to Roles

- Update your Spring Security Java configuration file (.java)
- General Syntax

Single role

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Restrict access to a given path "/systems/**"

Step 3: Restricting Access to Roles

- Update your Spring Security Java configuration file (.java)
- General Syntax

Single role

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antMatchers(<< add path to match on >>).hasRole(<< authorized role >>)
```

Restrict access to a given path "/systems/**"

"ADMIN"

Step 3: Restricting Access to Roles

Step 3: Restricting Access to Roles

```
antMatchers(<< add path to match on >>).hasAnyRole(<< list of authorized roles >>)
```

Step 3: Restricting Access to Roles

Any role in the list, comma-delimited list

```
antMatchers(<< add path to match on >>).hasAnyRole(<< list of authorized roles >>)
```

Step 3: Restricting Access to Roles

Any role in the list, comma-delimited list

```
antMatchers(<< add path to match on >>).hasAnyRole(<< list of authorized roles >>)
```

“ADMIN”, “DEVELOPER”, “VIP”, “PLATINUM”

Restrict Path to EMPLOYEE

Restrict Path to EMPLOYEE

```
antMatchers("/").hasRole("EMPLOYEE")
```

Restrict Path to EMPLOYEE

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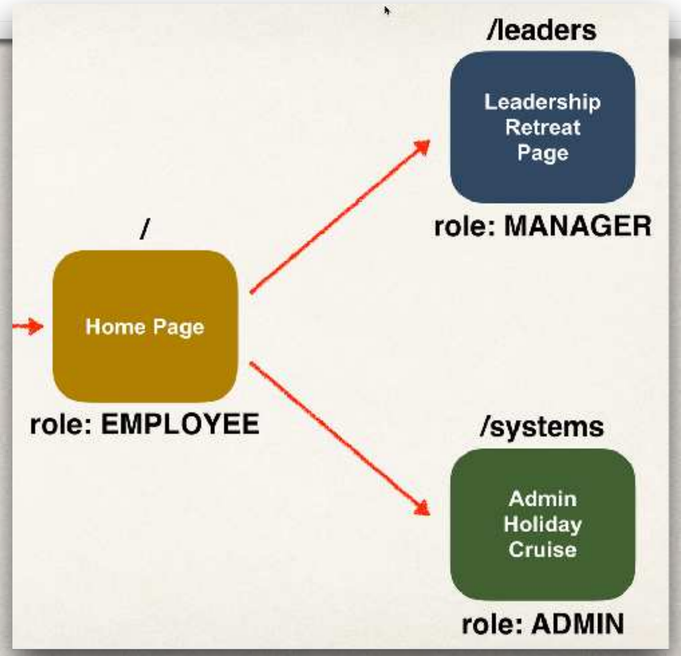

Restrict Path to EMPLOYEE

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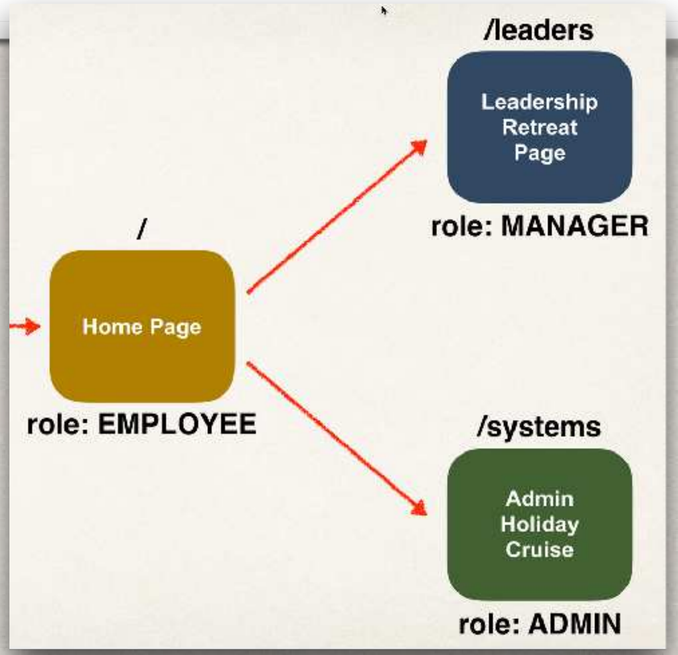
```

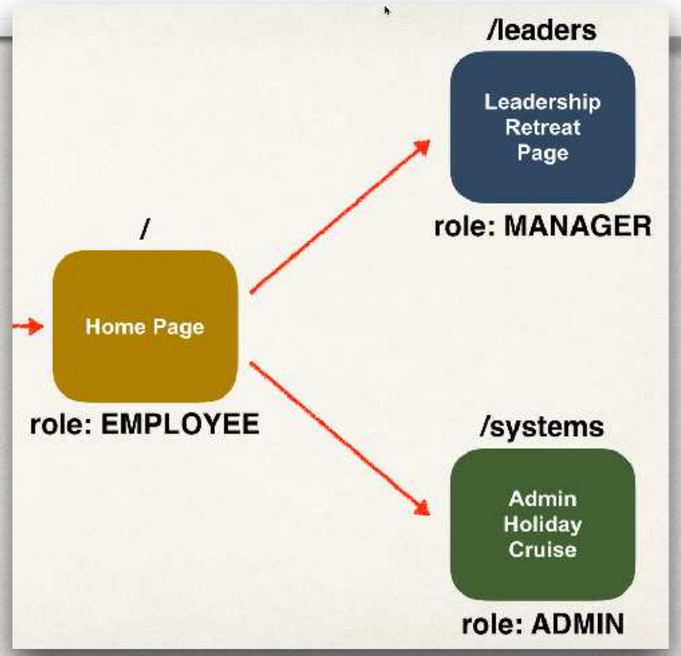
Match on root path: /



Restrict Path /leaders to MANAGER

Restrict Path /leaders to MANAGER

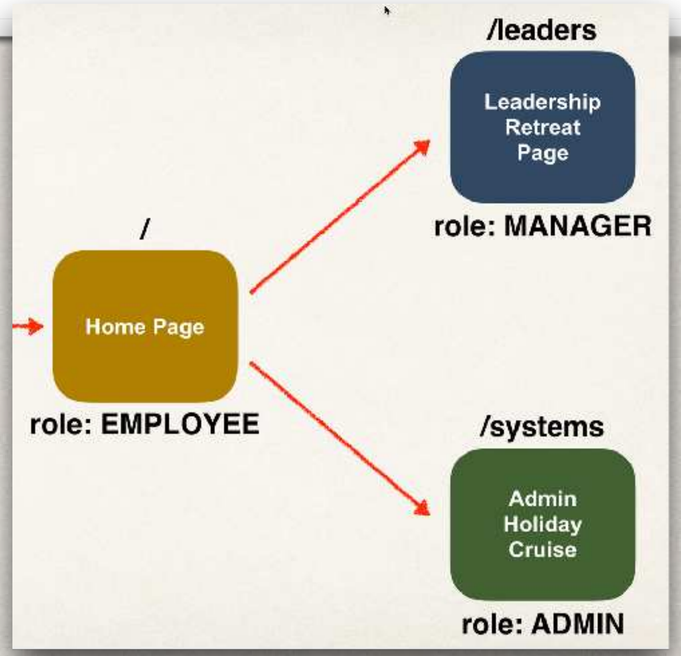
```
antMatchers("/leaders/**").hasRole("MANAGER")
```



Restrict Path /leaders to MANAGER

```
antMatchers("/leaders/**").hasRole("MANAGER")
```

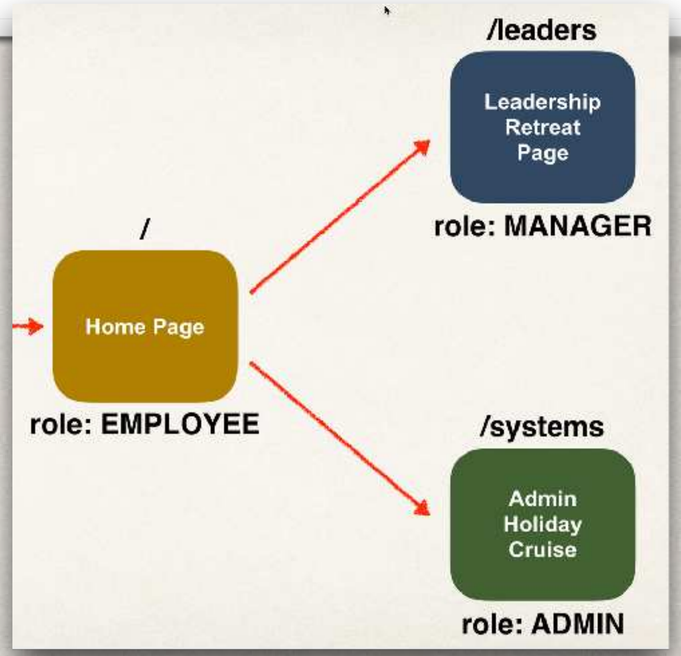
Match on path: /leaders
And all sub-directories (**)



Restrict Path /systems to ADMIN

Restrict Path /systems to ADMIN

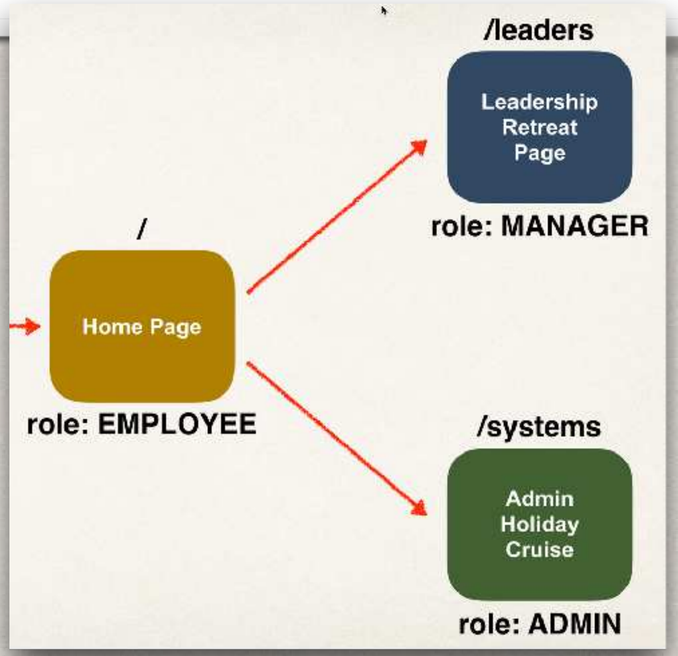
```
antMatchers("/systems/**").hasRole("ADMIN")
```



Restrict Path /systems to ADMIN

```
antMatchers("/systems/**").hasRole("ADMIN")
```

Match on path: /systems
And all sub-directories (**)

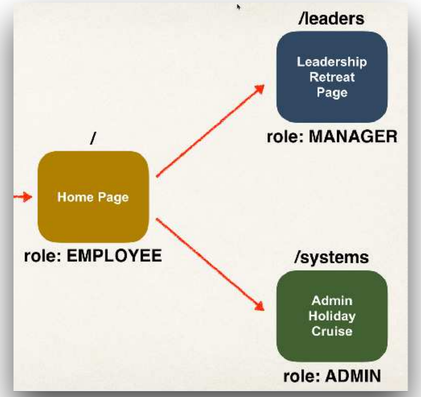


Pull It Together

Pull It Together

```
@Override
protected void configure(HttpSecurity http) throws Exception {

  http.authorizeRequests()
    .antMatchers("/").hasRole("EMPLOYEE")
    .antMatchers("/leaders/**").hasRole("MANAGER")
    .antMatchers("/systems/**").hasRole("ADMIN")
    .and()
    .formLogin()
   …
}
```



Pull It Together

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@Override
protected void configure(HttpSecurity http) throws Exception {

  http.authorizeRequests()
    .antMatchers("/").hasRole("EMPLOYEE")
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    .and()
    .formLogin()
   ...
}
```

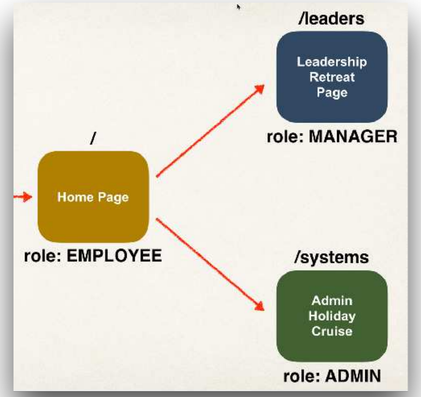


```
auth.inMemoryAuthentication()
  .withUser(users.username("john").password("test123").roles("EMPLOYEE"))
  .withUser(users.username("mary").password("test123").roles("EMPLOYEE", "MANAGER"))
  .withUser(users.username("susan").password("test123").roles("EMPLOYEE", "ADMIN"));
```

Custom Access Denied Page

Default Access Denied Page

Default Access Denied Page

HTTP Status 403 – Forbidden

Type Status Report

Message Forbidden

Description The server understood the request but refuses to authorize it.

Custom Access Denied Page

Custom Access Denied Page

Access Denied - You are not authorized to access this resource.

Back to Home Page

Custom Access Denied Page

Access Denied - You are not authorized to access this resource.

Back to Home Page

You can customize this page

HTML + CSS

Development Process

Step-By-Step

Development Process

Step-By-Step

1. Configure custom page for access denied

Development Process

Step-By-Step

1. Configure custom page for access denied

2. Create supporting controller code and view page

Step 1: Configure custom page access denied

Step 1: Configure custom page access denied

```
@Override
protected void configure(HttpSecurity http) throws Exception {

  …
  .exceptionHandling()
    .accessDeniedPage("/access-denied");

}
```

Step 1: Configure custom page access denied

```
@Override
protected void configure(HttpSecurity http) throws Exception {

  …
  .exceptionHandling()
    .accessDeniedPage("/access-denied");

}
```

Our request mapping path

Step 2: Create Supporting Controller code and View Page

Step 2: Create Supporting Controller code and View Page

Cover these steps in the video

Display Content Based on Roles

Why Show These Links?

User: john

Role(s): [ROLE_EMPLOYEE]

Leadership Meeting (Only for Manager peeps)

IT Systems Meeting (Only for Admin peeps)

Logout

Why Show These Links?

User: john

Role(s): [ROLE_EMPLOYEE]

Leadership Meeting (Only for Manager peeps)

IT Systems Meeting (Only for Admin peeps)

Logout

Since John is an employee,

he shouldn't be able to see this content / links

Display Content Based on Roles

User: mary

Role(s): [ROLE_EMPLOYEE, ROLE_MANAGER]

Leadership Meeting (Only for Manager peeps)

Logout

Display Content Based on Roles

Logged in as Mary

User: mary

Role(s): [ROLE_EMPLOYEE, ROLE_MANAGER]

Leadership Meeting (Only for Manager peeps)

Logout

Display Content Based on Roles

Logged in as Mary

User: mary

Role(s): [ROLE_EMPLOYEE, ROLE_MANAGER]

Leadership Meeting (Only for Manager peeps)

Logout

Mary can see MANAGER content

Spring Security JSP Tags

User: mary

Role(s): [ROLE_EMPLOYEE, ROLE_MANAGER]

Leadership Meeting (Only for Manager peeps)

Spring Security JSP Tags

```
…
<security:authorize access="hasRole('MANAGER')">

  <p>
      <a href="${pageContext.request.contextPath}/leaders">
        Leadership Meeting
      </a>
      (Only for Manager peeps)
  </p>

 </security:authorize>
```

User: mary

Role(s): [ROLE_EMPLOYEE, ROLE_MANAGER]

Leadership Meeting (Only for Manager peeps)

Spring Security JSP Tags

Only show this section for users with MANAGER role

```
...
<security:authorize access="hasRole('MANAGER')">

  <p>
     <a href="${pageContext.request.contextPath}/leaders">
       Leadership Meeting
     </a>
     (Only for Manager peeps)
  </p>

 </security:authorize>
```

User: mary

Role(s): [ROLE_EMPLOYEE, ROLE_MANAGER]

Leadership Meeting (Only for Manager peeps)

Display Content Based on Roles

User: susan

Role(s): [ROLE_ADMIN, ROLE_EMPLOYEE]

IT Systems Meeting (Only for Admin peeps)

Display Content Based on Roles

Logged in as Susan

User: susan

Role(s): [ROLE_ADMIN, ROLE_EMPLOYEE]

IT Systems Meeting (Only for Admin peeps)

Display Content Based on Roles

Logged in as Susan

User: susan

Role(s): [ROLE_ADMIN, ROLE_EMPLOYEE]

IT Systems Meeting (Only for Admin peeps)

Susan can see ADMIN content

Spring Security JSP Tags

User: susan

Role(s): [ROLE_ADMIN, ROLE_EMPLOYEE]

IT Systems Meeting (Only for Admin peeps)

Spring Security JSP Tags

```
…
<security:authorize access="hasRole('ADMIN')">

  <p>
     <a href="${pageContext.request.contextPath}/systems">
       IT Systems Meeting
     </a>
    (Only for Admin peeps)
  </p>

 </security:authorize>
```

User: susan

Role(s): [ROLE_ADMIN, ROLE_EMPLOYEE]

IT Systems Meeting (Only for Admin peeps)

Spring Security JSP Tags

Only show this section for users with ADMIN role

```
...
<security:authorize access="hasRole('ADMIN')">

  <p>
     <a href="${pageContext.request.contextPath}/systems">
       IT Systems Meeting
     </a>
    (Only for Admin peeps)
  </p>

 </security:authorize>
```

User: susan

Role(s): [ROLE_ADMIN, ROLE_EMPLOYEE]

IT Systems Meeting (Only for Admin peeps)

Spring Security
User Accounts Stored in Database

Database Access

Database Access

- So far, our user accounts were hard coded in Java source code

Database Access

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- We want to add database access

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Advanced

Recall Our User Roles

Recall Our User Roles

User ID	Password	Roles

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User ID	Password	Roles
`john`	`test123`	`EMPLOYEE`

Recall Our User Roles

User ID	Password	Roles
john	test123	EMPLOYEE
mary	test123	EMPLOYEE, MANAGER

Recall Our User Roles

User ID	Password	Roles
john	test123	EMPLOYEE
mary	test123	EMPLOYEE, MANAGER
susan	test123	EMPLOYEE, ADMIN

Database Support in Spring Security

Out-of-the-box

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- Spring Security can read user account info from database

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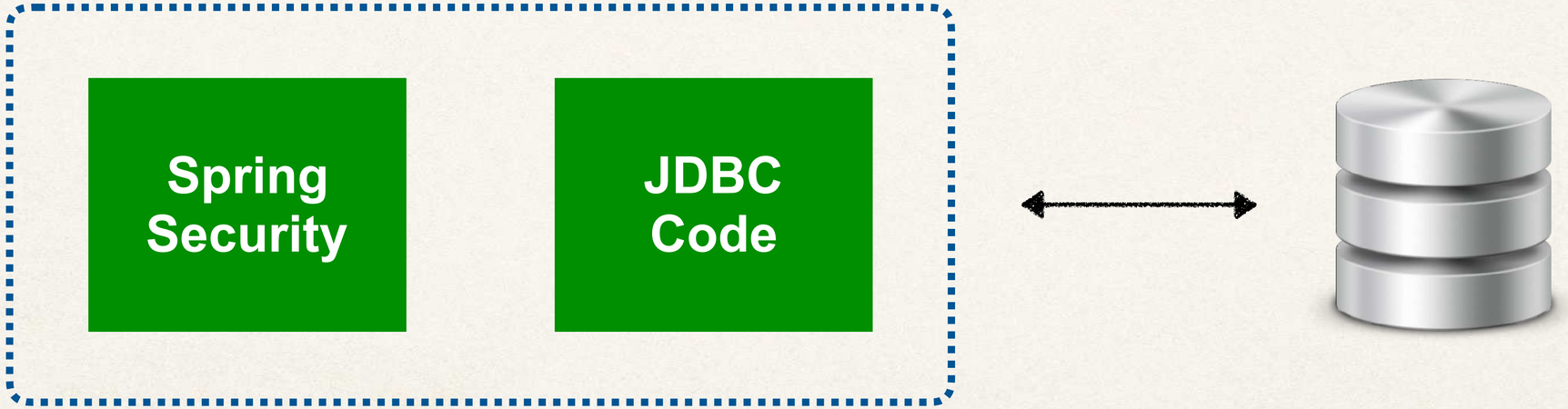

Customize Database Access with Spring Security

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  - JDBC, Hibernate etc …

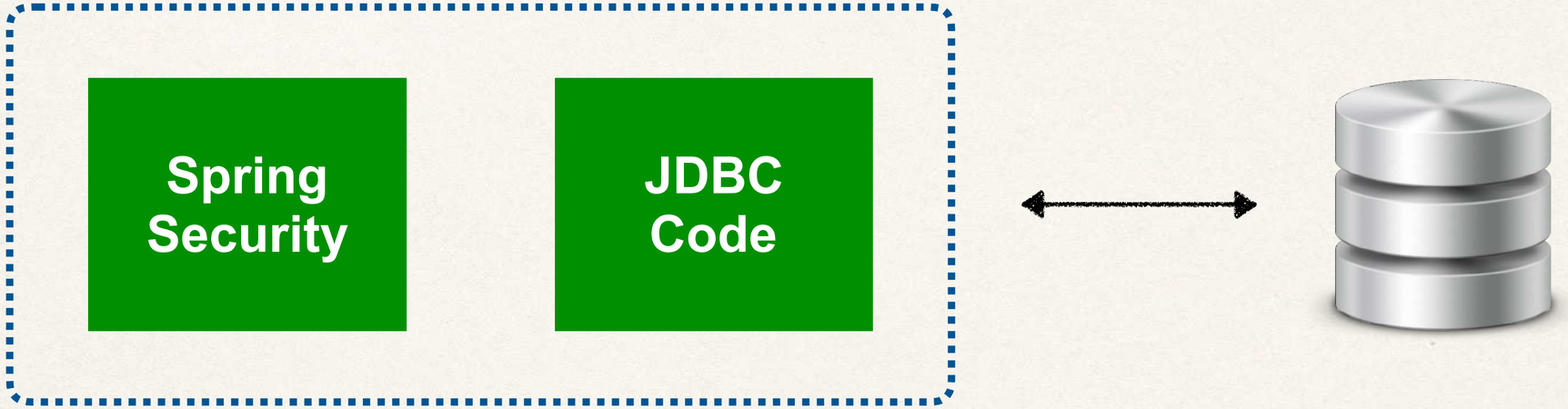
Database Support in Spring Security

Out-of-the-box

Database Support in Spring Security

Out-of-the-box

- Follow Spring Security's predefined table schemas



Development Process

Step-By-Step

Development Process

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1. Develop SQL Script to set up database tables

Development Process

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2. Add database support to Maven POM file

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Development Process

Step-By-Step

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4. Define DataSource in Spring Configuration

Development Process

Step-By-Step

1. Develop SQL Script to set up database tables

2. Add database support to Maven POM file

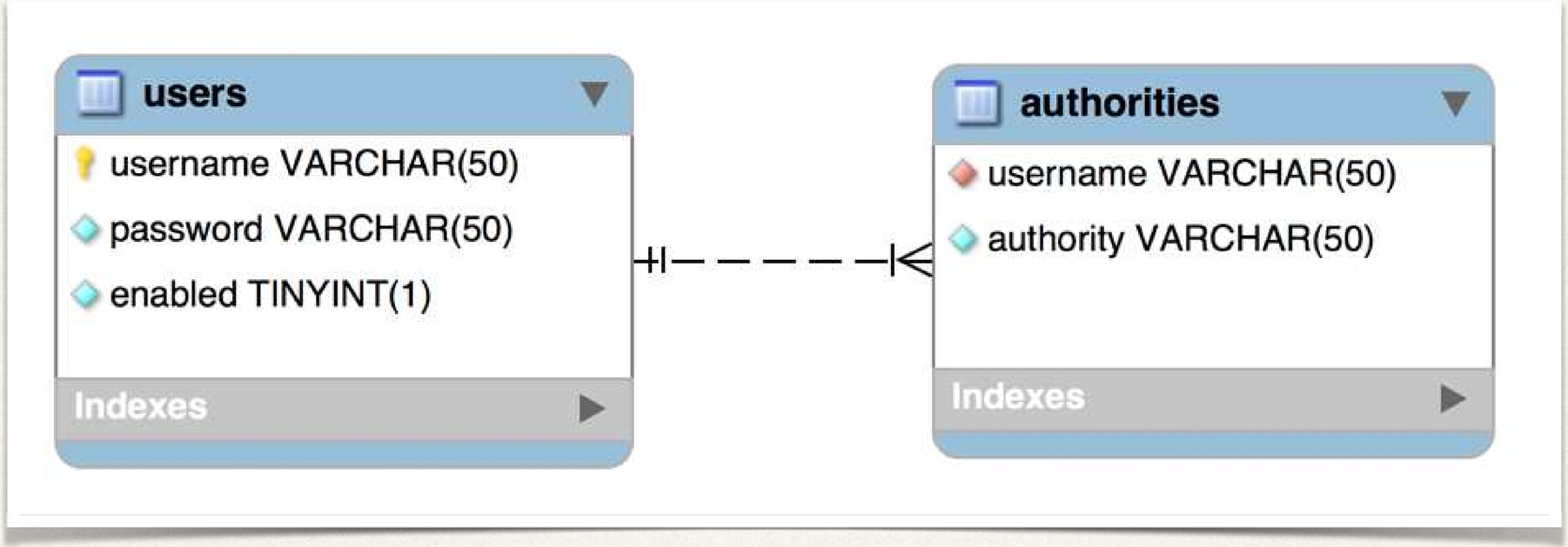
3. Create JDBC properties file

4. Define DataSource in Spring Configuration

5. Update Spring Security Configuration to use JDBC

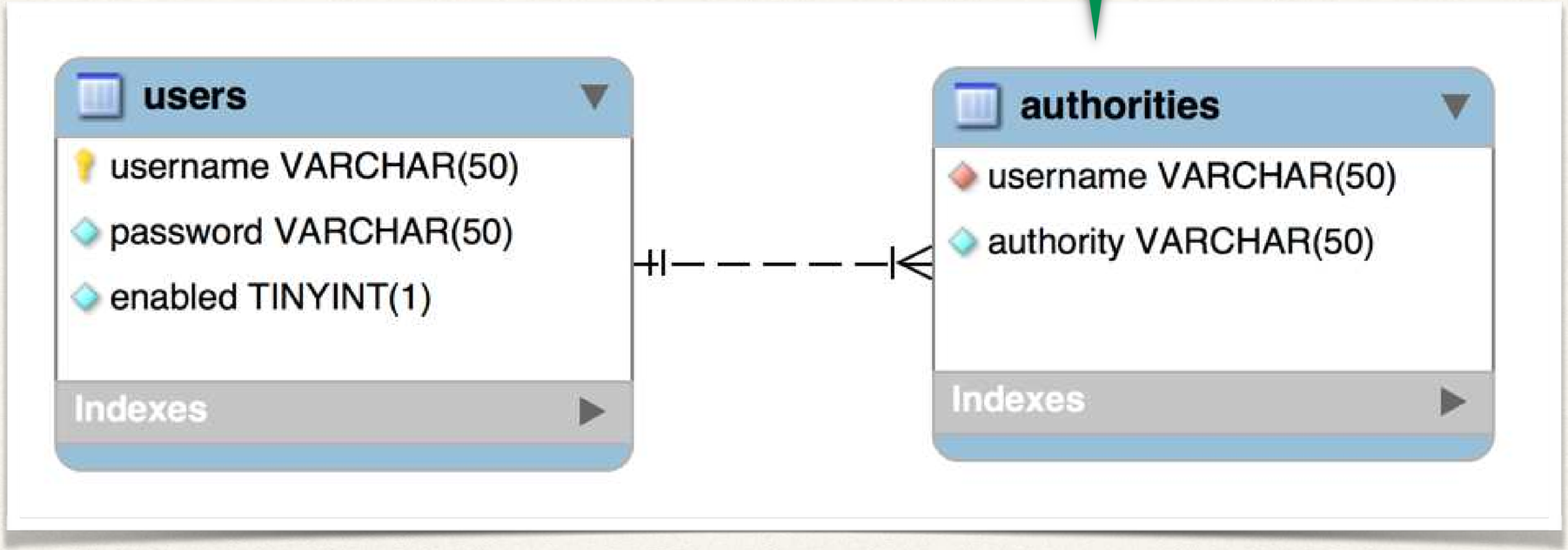
Default Spring Security Database Schema

Default Spring Security Database Schema



Default Spring Security Database Schema

"authorities" same as "roles"



Step 1: Develop SQL Script to setup database tables

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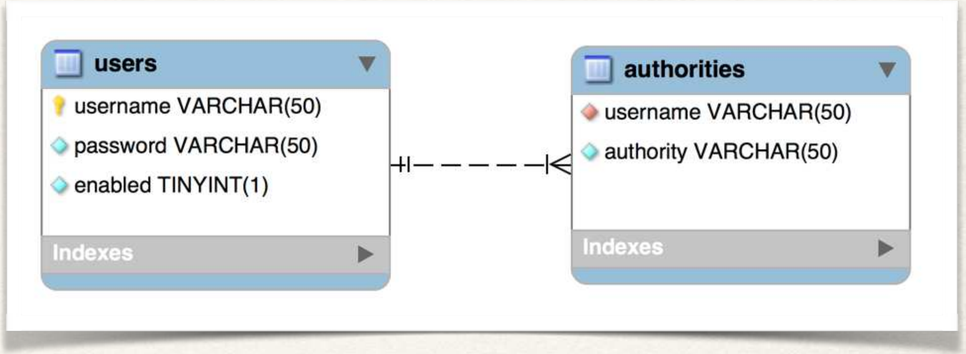
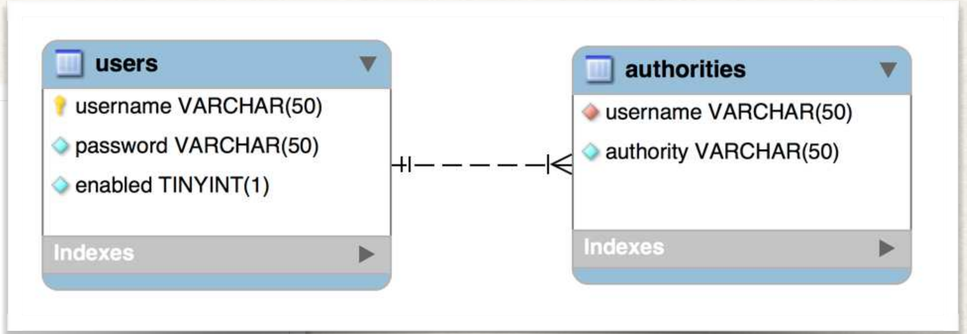


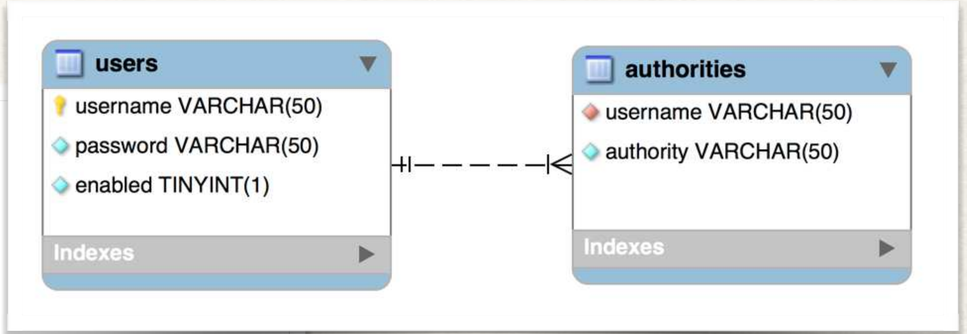
Step 1: Develop SQL Script to setup database tables

```
CREATE TABLE `users` (
```



Step 1: Develop SQL Script to setup database tables

```sql
CREATE TABLE `users` (
  `username` varchar(50) NOT NULL,
```



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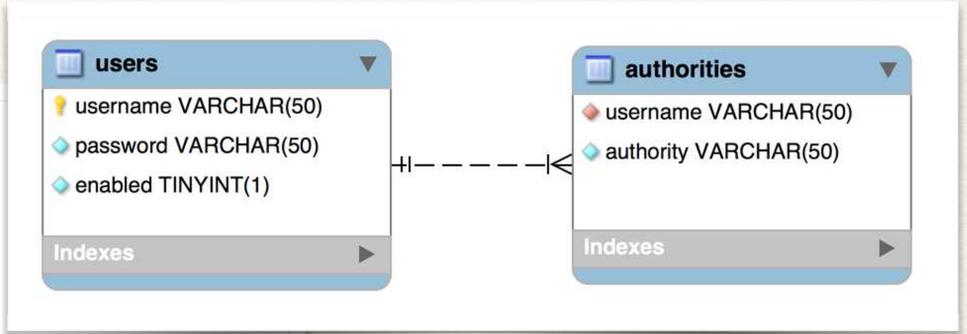

Step 1: Develop SQL Script to setup database tables

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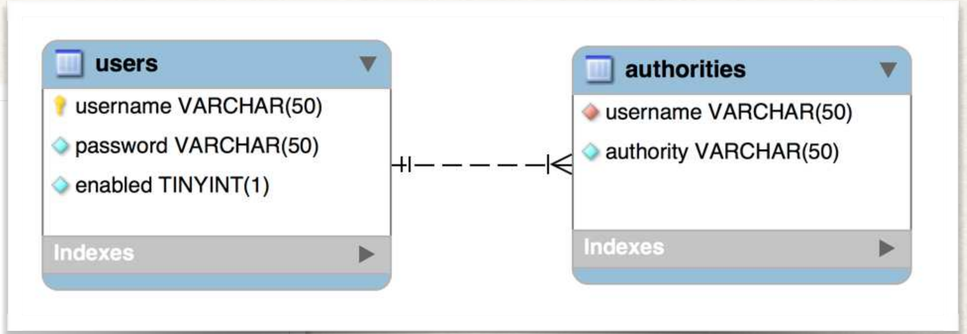
```



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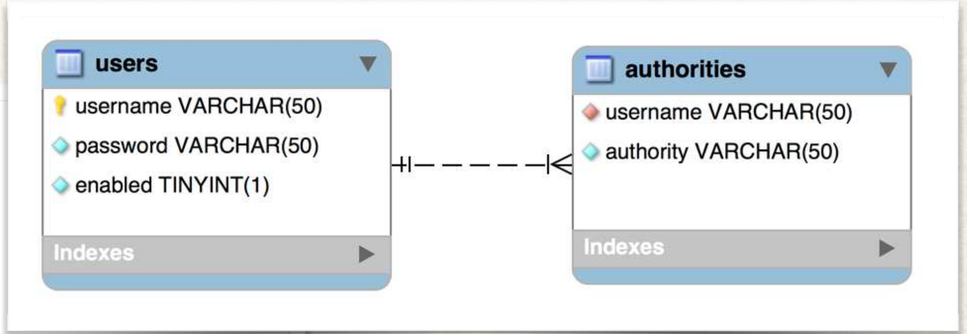

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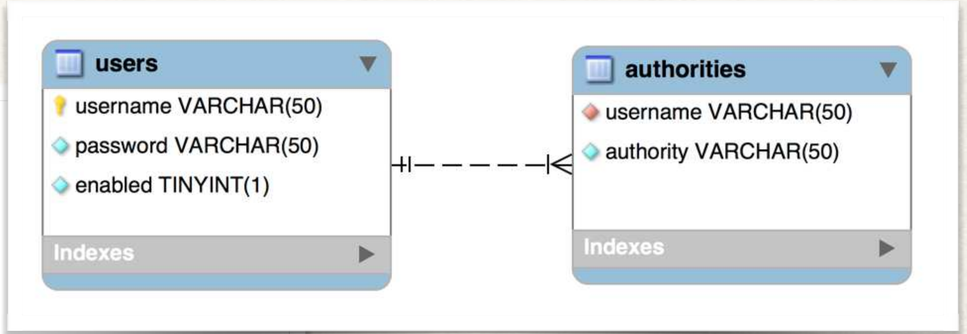

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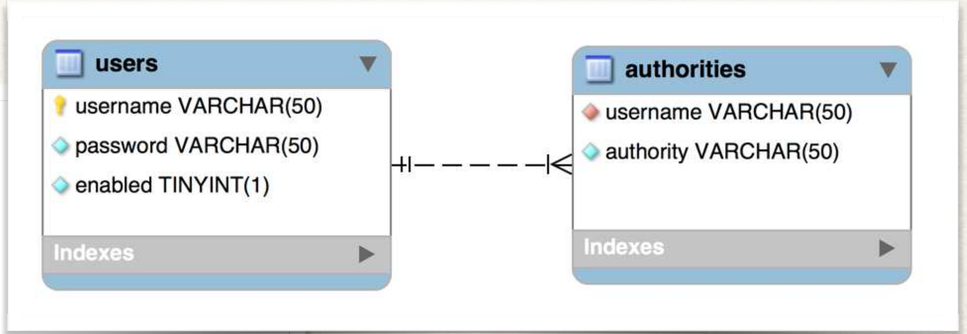

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```sql
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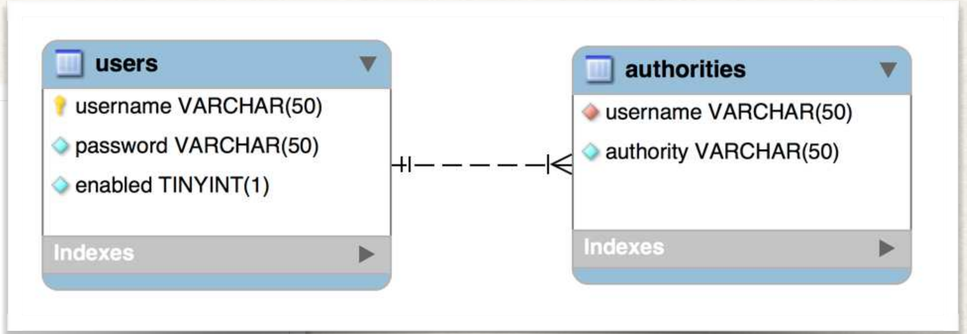
) ENGINE=InnoDB DEFAULT CHARSET=latin1;
```



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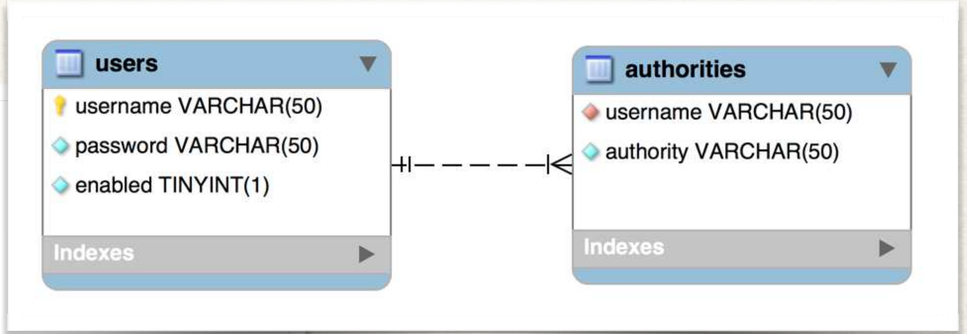
  PRIMARY KEY (`username`)

) ENGINE=InnoDB DEFAULT CHARSET=latin1;
```



Spring Security Password Storage

- In Spring Security 5, passwords are stored using a specific format

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{id}encodedPassword
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…	…

Step 1: Develop SQL Script to setup database tables

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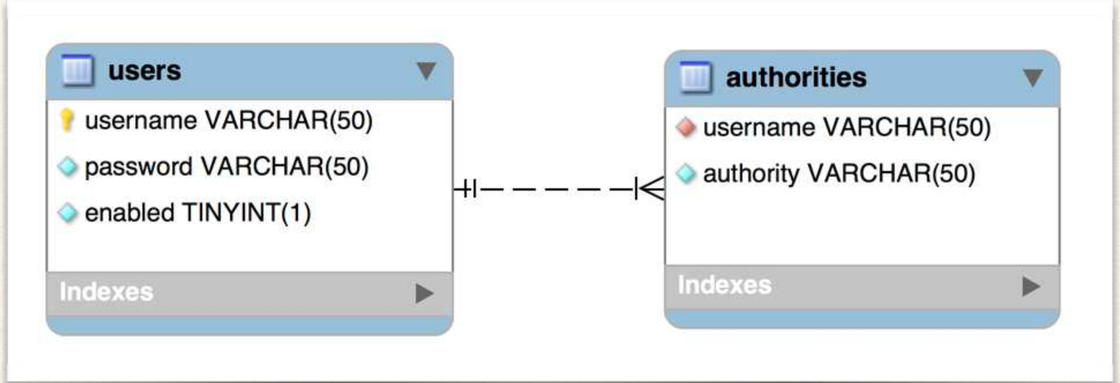

Step 1: Develop SQL Script to setup database tables

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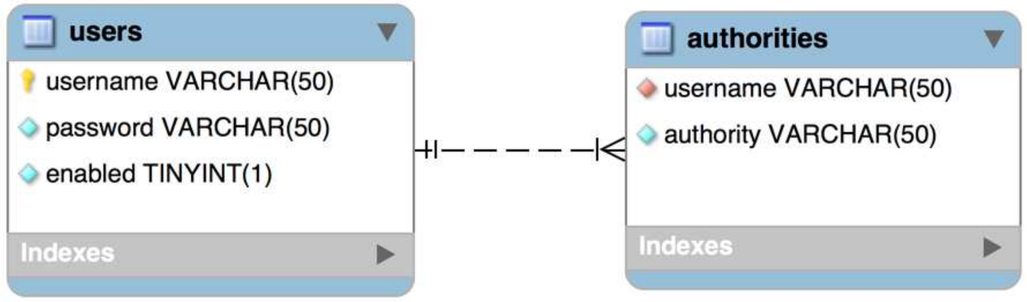

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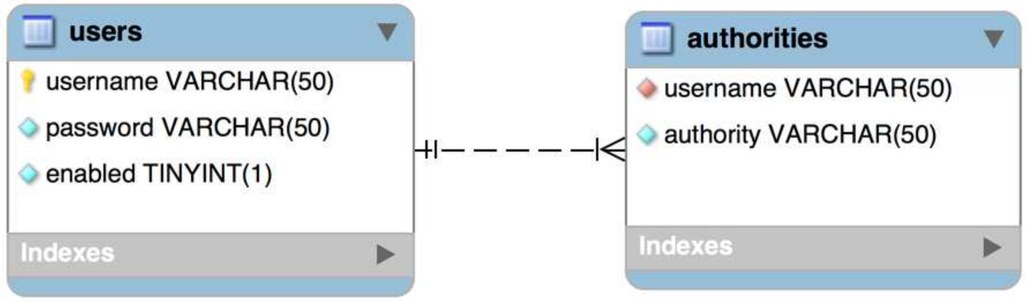

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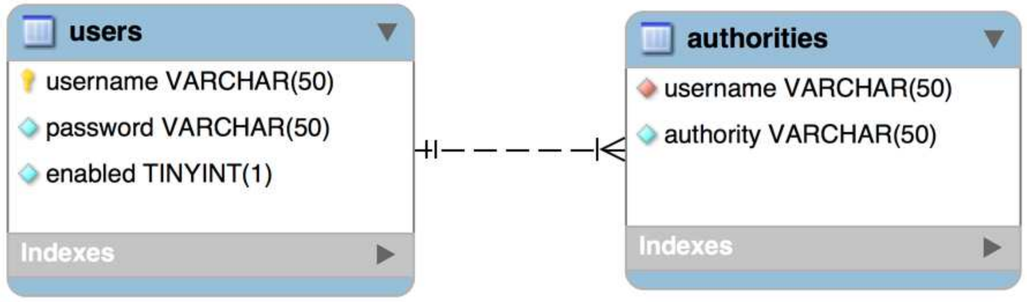

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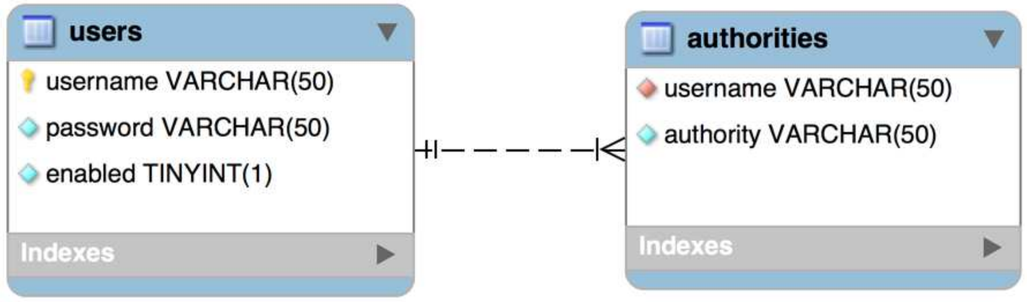

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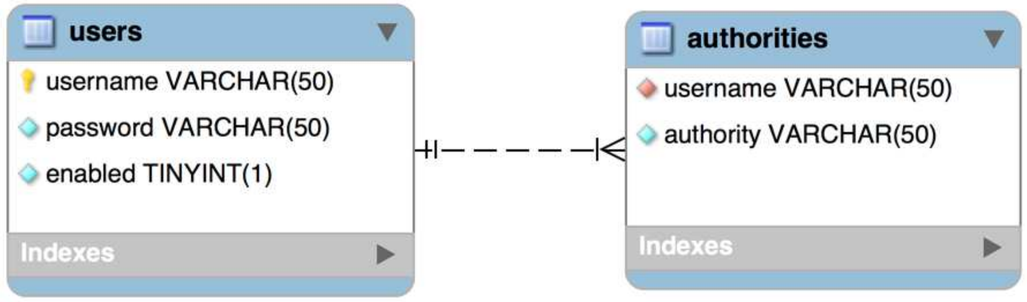
Let's Spring Security know the passwords are stored as plain text (noop)



Step 1: Develop SQL Script to setup database tables

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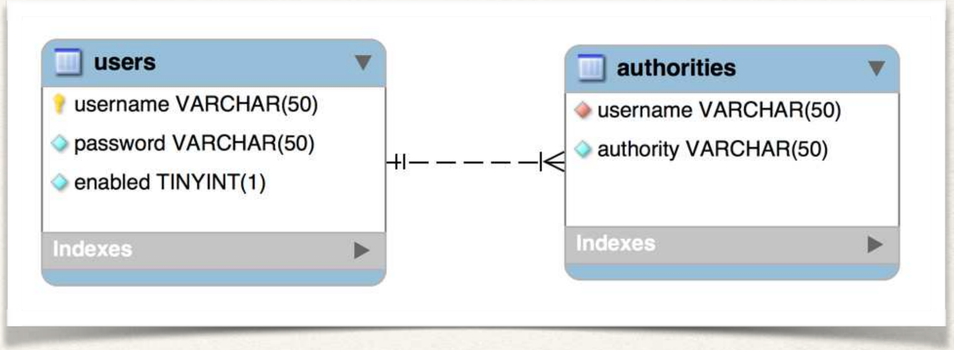

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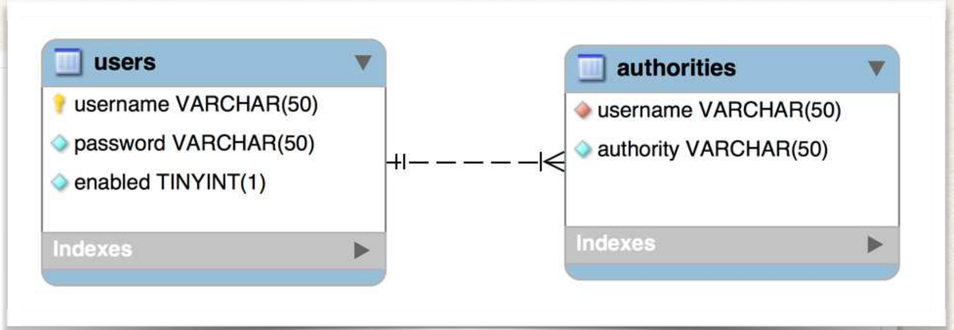

Step 1: Develop SQL Script to setup database tables

```sql
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  `username` varchar(50) NOT NULL,
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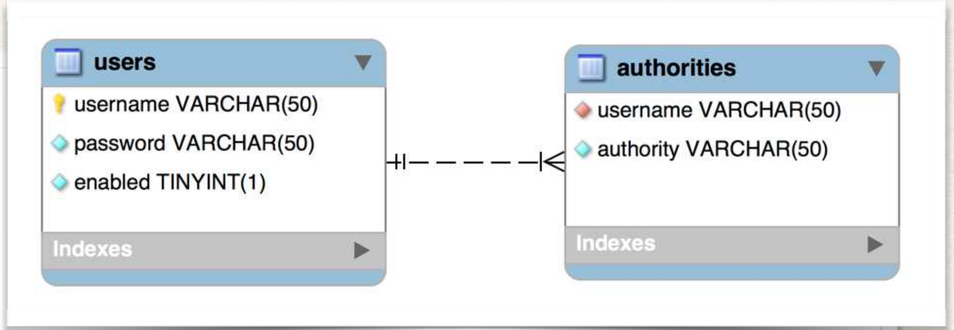

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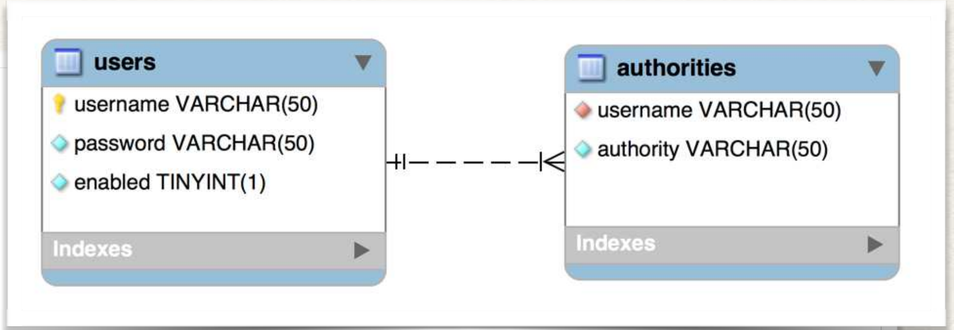

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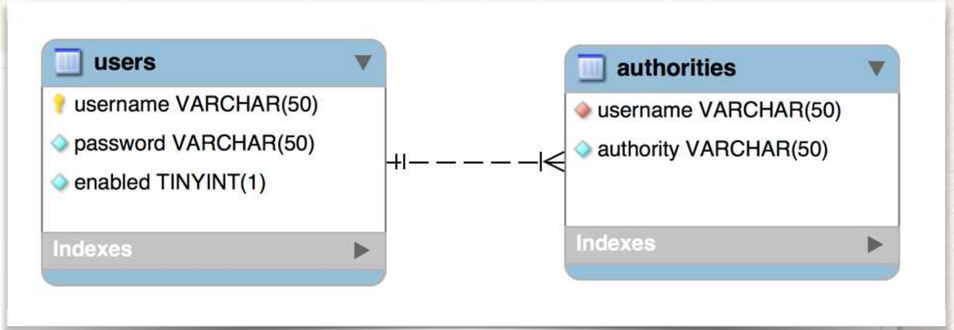

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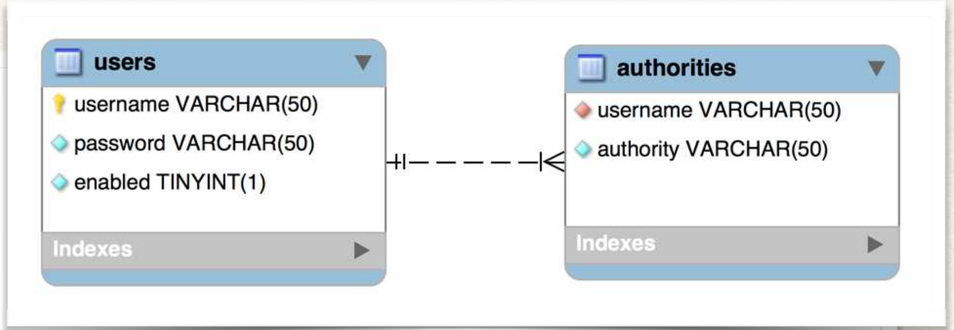


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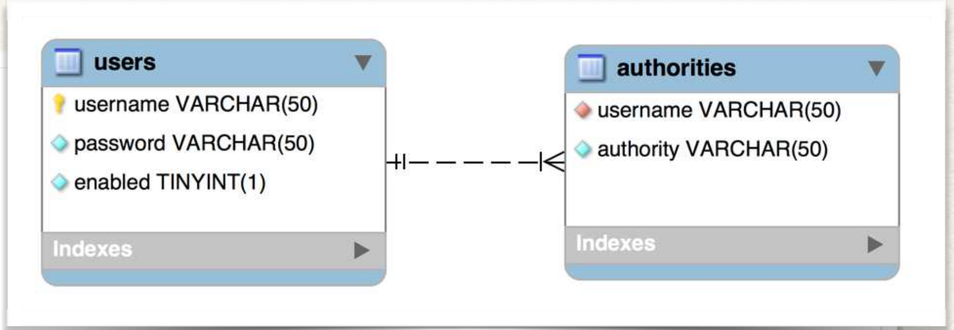


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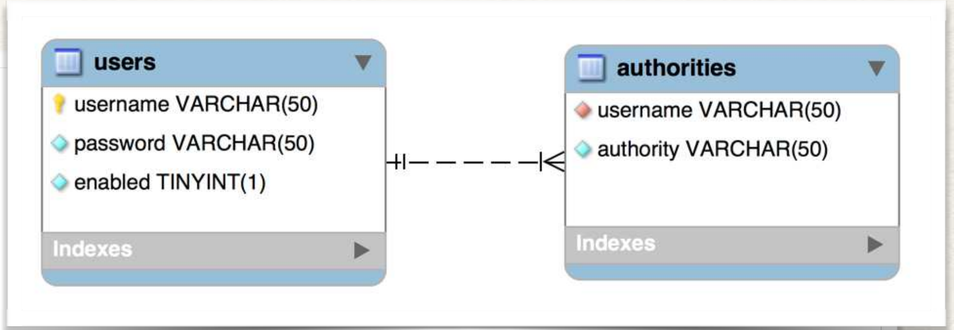


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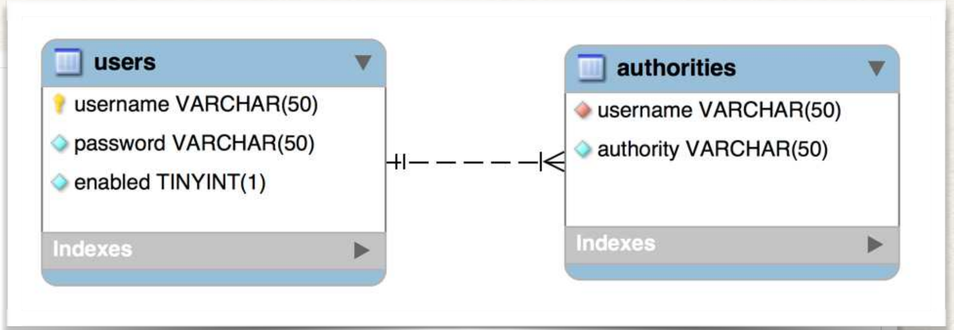


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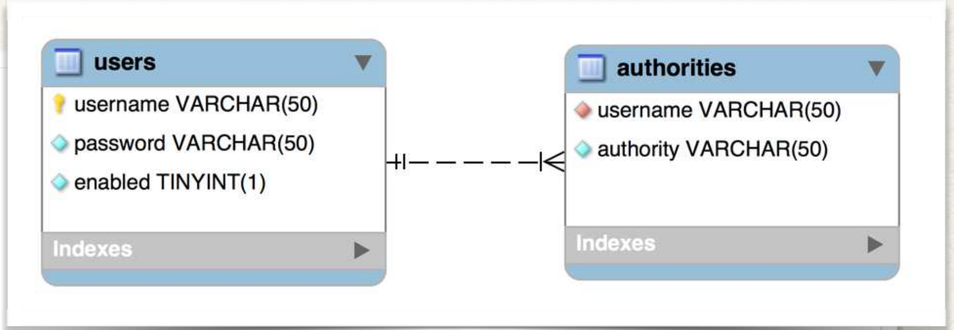


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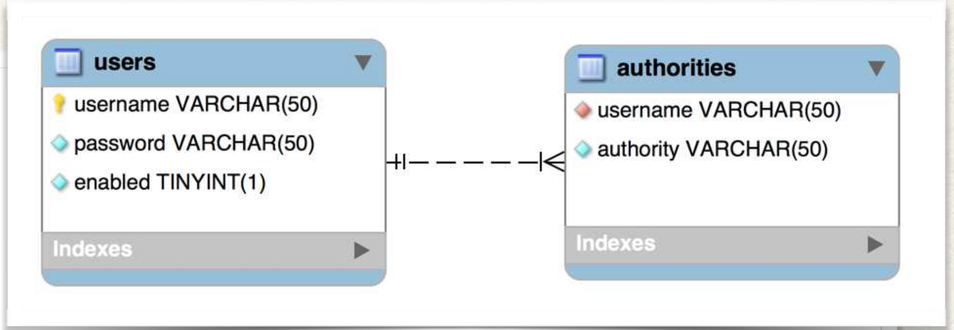


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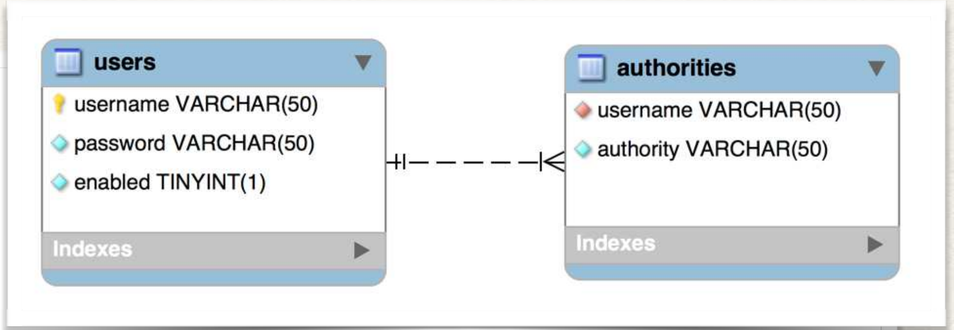


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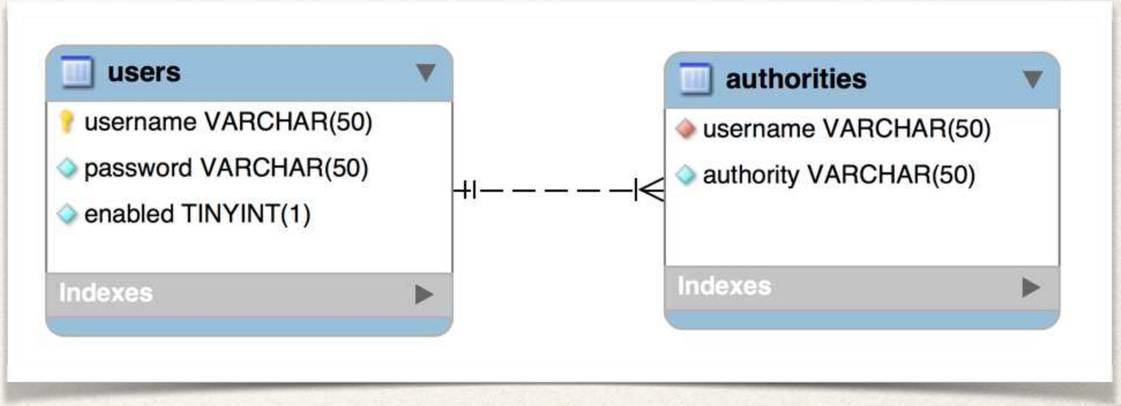

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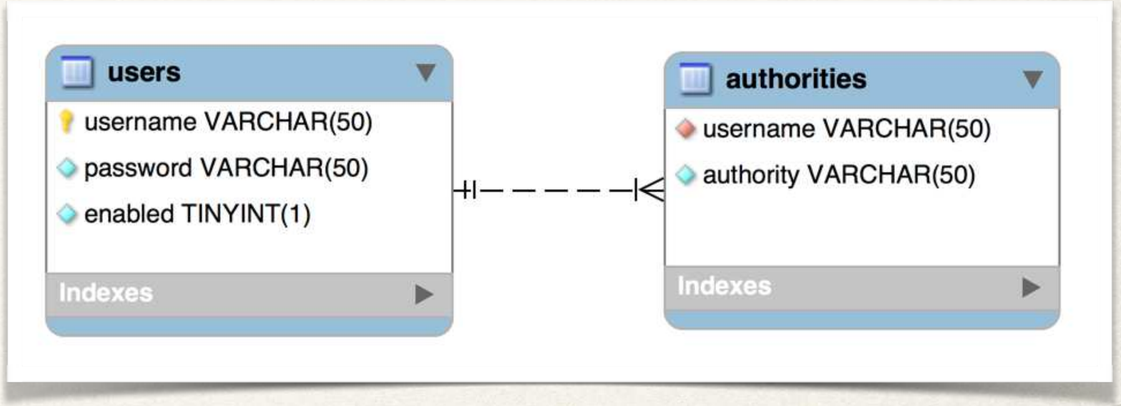

Step 1: Dev etup database tables

"authorities" same as "roles"

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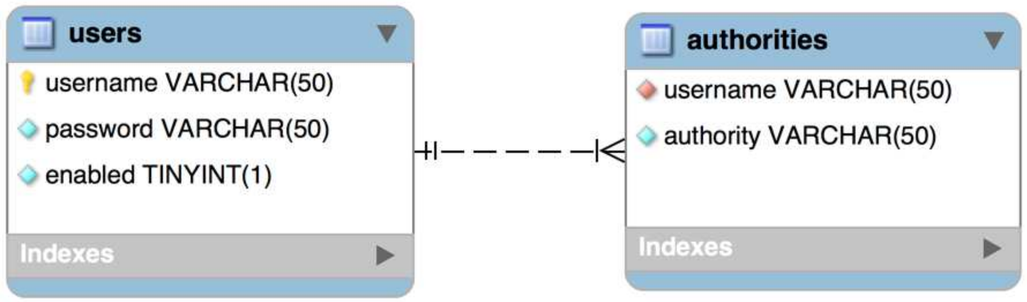

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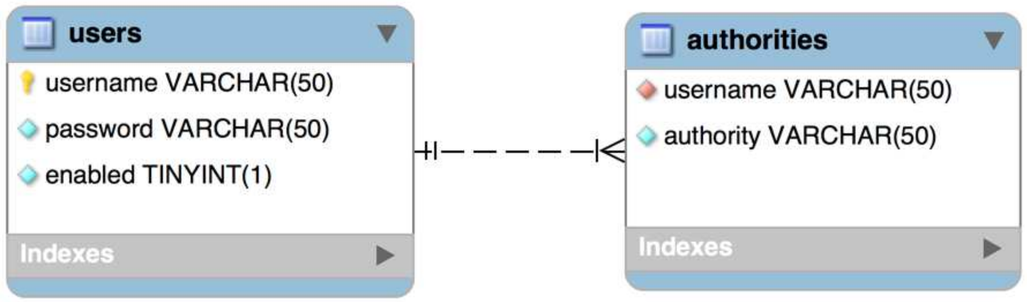

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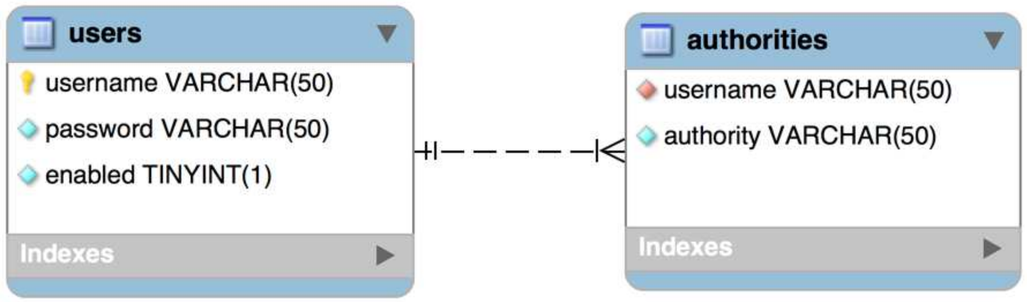

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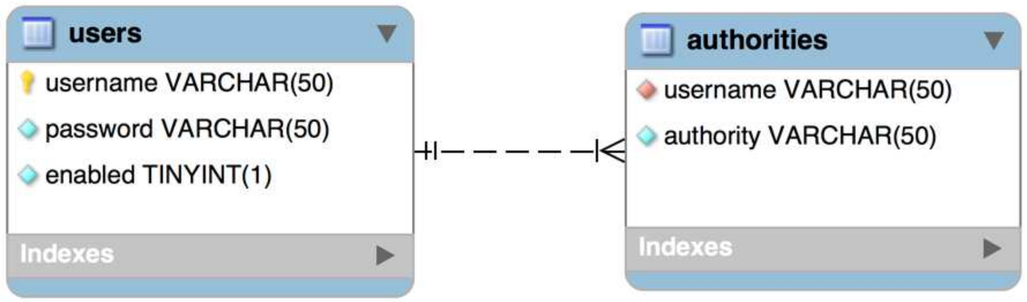

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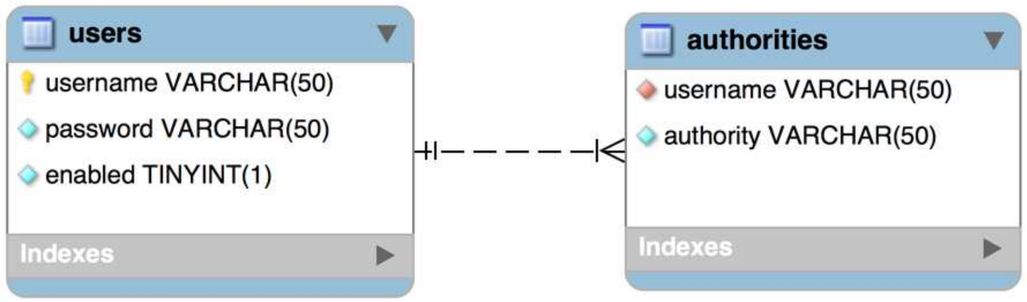

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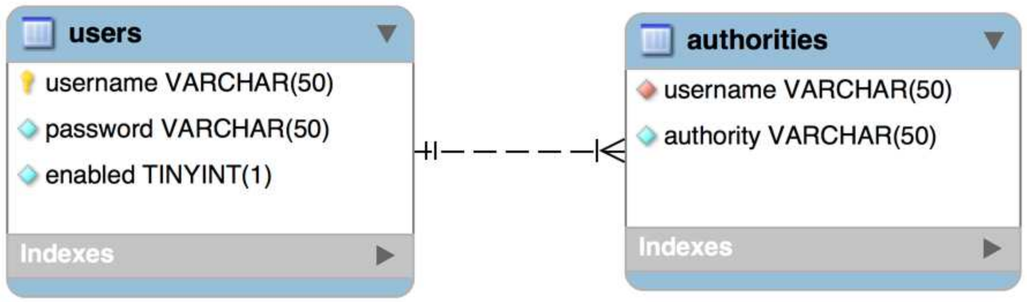

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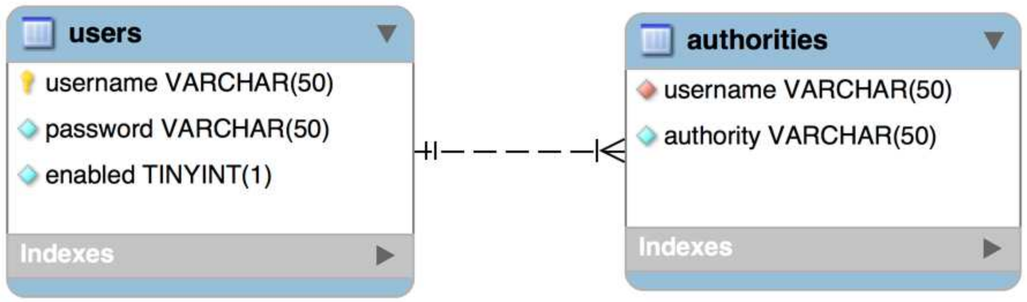

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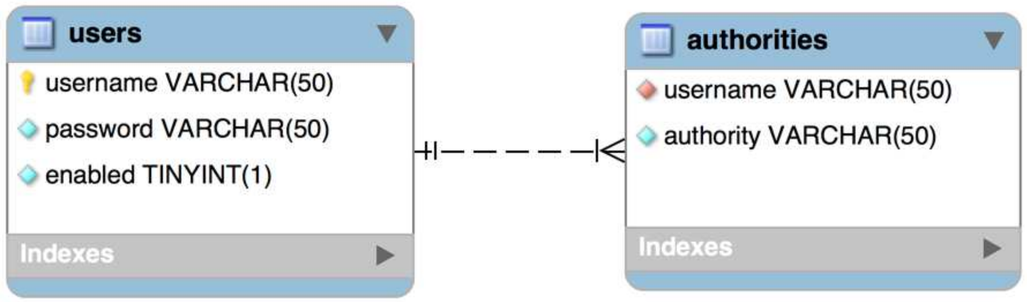

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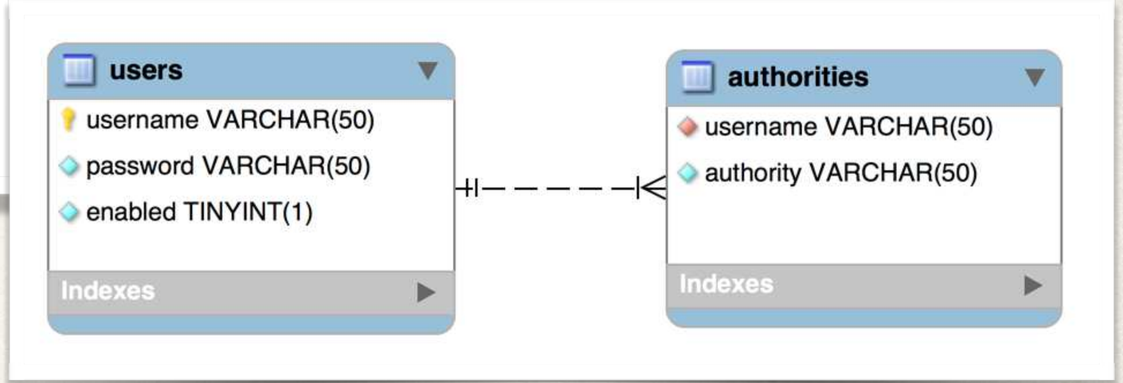

Internally Spring Security uses "ROLE_" prefix

Step 2: Add Database Support to Maven POM file

```
<!-- MySQL -->
<dependency>
  <groupId>mysql</groupId>
  <artifactId>mysql-connector-java</artifactId>
  <version>5.1.45</version>
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JDBC Driver

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<!-- C3PO -->
<dependency>
 <groupId>com.mchange</groupId>
 <artifactId>c3p0</artifactId>
 <version>0.9.5.2</version>
</dependency>
```

JDBC Driver

DB Connection Pool

Step 3: Create JDBC Properties File

File: src/main/resources/persistence-mysql.properties

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```
#
# JDBC connection properties
#
jdbc.driver=com.mysql.jdbc.Driver
jdbc.url=jdbc:mysql://localhost:3306/spring_security_demo?useSSL=false
jdbc.user=springstudent
jdbc.password=springstudent
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File: src/main/resources/persistence-mysql.properties

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jdbc.url=jdbc:mysql://localhost:3306/spring_security_demo?useSSL=false
jdbc.user=springstudent
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#
# Connection pool properties
#
connection.pool.initialPoolSize=5
connection.pool.minPoolSize=5
connection.pool.maxPoolSize=20
connection.pool.maxIdleTime=3000
```

Step 4: Define DataSource in Spring Configuration

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File: DemoAppConfig.java

```
@Configuration
@EnableWebMvc
@ComponentScan(basePackages = "com.luv2code.springsecurity.demo")
@PropertySource("classpath:persistence-mysql.properties")
public class DemoAppConfig {

  …

}
```

Step 4: Define DataSource in Spring Configuration

File: DemoAppConfig.java

```
@Configuration
@EnableWebMvc
@ComponentScan(basePackages = "com.luv2code.springsecurity.demo")
@PropertySource("classpath:persistence-mysql.properties")
public class DemoAppConfig {

  ...

}
```

Will read the props file

`src/main/resources`
files are automatically
copied to classpath during Maven build

Step 4: Define DataSource in Spring Configuration

```
…
public class DemoAppConfig {

  @Autowired
  private Environment env;





}
```

Step 4: Define DataSource in Spring Configuration

```
…
public class DemoAppConfig {

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  private Environment env;



}
```

Will hold data read from properties files

Step 4: Define DataSource in Spring Configuration

```
…
public class DemoAppConfig {

  @Autowired
  private Environment env;

  @Bean
  public DataSource securityDataSource() {

    // create connection pool

    // set the jdbc driver

    // set database connection props

    return securityDataSource;
  }

}
```

Will hold data read from properties files

Need to define DataSource object

Step 4: Define DataSource in Spring Configuration

Step 4: Define DataSource in Spring Configuration

```
@Autowired
```

Step 4: Define DataSource in Spring Configuration

```
@Autowired
private Environment env;
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```
@Autowired
private Environment env;

private Logger logger = Logger.getLogger(getClass().getName());
```

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Step 4: Define DataSource in Spring Configuration

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@Bean
public DataSource securityDataSource() {
```

Step 4: Define DataSource in Spring Configuration

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Step 4: Define DataSource in Spring Configuration

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@Bean
public DataSource securityDataSource() {

  // create connection pool
```

Step 4: Define DataSource in Spring Configuration

```
@Autowired
private Environment env;

private Logger logger = Logger.getLogger(getClass().getName());

@Bean
public DataSource securityDataSource() {

  // create connection pool
  ComboPooledDataSource securityDataSource = new ComboPooledDataSource();
```

Step 4: Define DataSource in Spring Configuration

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Step 4: Define DataSource in Spring Configuration

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@Bean
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  ComboPooledDataSource securityDataSource = new ComboPooledDataSource();

  // set the jdbc driver
```

Step 4: Define DataSource in Spring Configuration

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  // set the jdbc driver
  try {
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  // set the jdbc driver
  try {
    securityDataSource.setDriverClass(env.getProperty("jdbc.driver"));
```

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Read db configs

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```

Read db configs

```
#
# JDBC connection properties
#
jdbc.driver=com.mysql.jdbc.Driver
jdbc.url=jdbc:mysql://localhost:3306/spring_security_demo?useSSL=false
jdbc.user=springstudent
jdbc.password=springstudent
```

Step 4: Define DataSource in Spring Configuration

```java
@Autowired
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  }
  catch (PropertyVetoException exc) {
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    throw new RuntimeException(exc);
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Read db configs

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Read db configs

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Read db configs

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```

Step 4: Define DataSource in Spring Configuration

Step 4: Define DataSource in Spring Configuration

Step 4: Define DataSource in Spring Configuration

...

Step 4: Define DataSource in Spring Configuration

```
…

// for sanity's sake, let's log url and user ... just to make sure we are reading the data
```

Step 4: Define DataSource in Spring Configuration

```
…

// for sanity's sake, let's log url and user ... just to make sure we are reading the data
logger.info(">>>> jdbc.url=" + env.getProperty("jdbc.url"));
```

Step 4: Define DataSource in Spring Configuration

```
…

// for sanity's sake, let's log url and user ... just to make sure we are reading the data
logger.info(">>>> jdbc.url=" + env.getProperty("jdbc.url"));
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```

Step 4: Define DataSource in guration

Read db configs

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Read db configs

```
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logger.info(">>>> jdbc.url=" + env.getProperty("jdbc.url"));
logger.info(">>>> jdbc.user=" + env.getProperty("jdbc.user"));

// set database connection props
securityDataSource.setJdbcUrl(env.getProperty("jdbc.url"));
```

```
#
# JDBC connection properties
#
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jdbc.url=jdbc:mysql://localhost:3306/spring_security_demo?useSSL=false
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// set database connection props
securityDataSource.setJdbcUrl(env.getProperty("jdbc.url"));
securityDataSource.setUser(env.getProperty("jdbc.user"));
securityDataSource.setPassword(env.getProperty("jdbc.password"));

// set connection pool props
```

```
#
# Connection pool properties
#
connection.pool.initialPoolSize=5
connection.pool.minPoolSize=5
connection.pool.maxPoolSize=20
connection.pool.maxIdleTime=3000
```

Step 4: Define DataSource in Spring Configuration

```
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// for sanity's sake, let's log url and user ... just to make sure w
logger.info(">>>> jdbc.url=" + env.getProperty("jdbc.url"));
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// set database connection props
securityDataSource.setJdbcUrl(env.getProperty("jdbc.url"));
securityDataSource.setUser(env.getProperty("jdbc.user"));
securityDataSource.setPassword(env.getProperty("jdbc.password"));

// set connection pool props
securityDataSource.setInitialPoolSize(Integer.parseInt(env.getProperty("connection.pool.initialPoolSize")));
```

```
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# Connection pool properties
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// set connection pool props
securityDataSource.setInitialPoolSize(Integer.parseInt(env.getProperty("connection.pool.initialPoolSize")));
securityDataSource.setMinPoolSize(Integer.parseInt(env.getProperty("connection.pool.minPoolSize")));
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return securityDataSource;
```

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Step 4: Define DataSource in Spring Configuration

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Step 5: Update Spring Security to use JDBC

```
@Configuration
@EnableWebSecurity
public class DemoSecurityConfig extends WebSecurityConfigurerAdapter {

   @Autowired
   private DataSource securityDataSource;









}
```

Step 5: Update Spring Security to use JDBC

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Inject our data source that we just configured

Step 5: Update Spring Security to use JDBC

```
@Configuration
@EnableWebSecurity
public class DemoSecurityConfig extends WebSecurityConfigurerAdapter {

   @Autowired
   private DataSource securityDataSource;

   @Override
   protected void configure(AuthenticationManagerBuilder auth) throws Exception {

      auth.jdbcAuthentication().dataSource(securityDataSource);

   }

   …

}
```

Inject our data source that we just configured

Step 5: Update Spring Security to use JDBC

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Inject our data source that we just configured

Tell Spring Security to use JDBC authentication with our data source

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   protected void configure(AuthenticationManagerBuilder auth) throws Exception {

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   }

   ...

}
```

Inject our data source that we just configured

No longer hard-coding users :-)

Tell Spring Security to use JDBC authentication with our data source

Spring Security
Password Encryption

Password Storage

Password Storage

- So far, our user passwords are stored in plaintext … yikes!

username	password	enabled
john	{noop}test123	1
mary	{noop}test123	1
susan	{noop}test123	1

Password Storage

- So far, our user passwords are stored in plaintext … yikes!

username	password	enabled
john	{noop}test123	1
mary	{noop}test123	1
susan	{noop}test123	1

- Ok for getting started … but not for production / real-time project :-(

Password Storage - Best Practice

Best Practice

Password Storage - Best Practice

Best Practice

- The best practice is store passwords in an encrypted format

Password Storage - Best Practice

Best Practice

- The best practice is store passwords in an encrypted format

username	password	enabled
john	{bcrypt}$2a$04$eFytJDGtjbThXa80FyOOBuFdK2IwjyWefYkMpiBEFlpBwDH.5PM0K	1
mary	{bcrypt}$2a$04$eFytJDGtjbThXa80FyOOBuFdK2IwjyWefYkMpiBEFlpBwDH.5PM0K	1
susan	{bcrypt}$2a$04$eFytJDGtjbThXa80FyOOBuFdK2IwjyWefYkMpiBEFlpBwDH.5PM0K	1

Password Storage - Best Practice

Best Practice

- The best practice is store passwords in an encrypted format

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susan	{bcrypt}$2a$04$eFytJDGtjbThXa80FyOOBuFdK2IwjyWefYkMpiBEFlpBwDH.5PM0K	1

Encrypted version of password

Spring Security Team Recommendation

Spring Security Team Recommendation

- Spring Security recommends using the popular **bcrypt** algorithm

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- Spring Security recommends using the popular **bcrypt** algorithm

- bcrypt

Spring Security Team Recommendation

- Spring Security recommends using the popular **bcrypt** algorithm

- bcrypt
  - Performs one-way encrypted hashing

Spring Security Team Recommendation

- Spring Security recommends using the popular **bcrypt** algorithm

- bcrypt
  - Performs one-way encrypted hashing
  - Adds a random salt to the password for additional protection

Spring Security Team Recommendation

- Spring Security recommends using the popular **bcrypt** algorithm

- bcrypt
  - Performs one-way encrypted hashing
  - Adds a random salt to the password for additional protection
  - Includes support to defeat brute force attacks

Bcrypt Additional Information

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- Why you should use bcrypt to hash passwords

www.luv2code.com/why-bcrypt

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- Password hashing - Best Practices

  `www.luv2code.com/password-hashing-best-practices`

How to Get a Bcrypt password

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You have a plaintext password and you want to encrypt using bcrypt

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- Option 1: Use a website utility to perform the encryption

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You have a plaintext password and you want to encrypt using bcrypt

- Option 1: Use a website utility to perform the encryption
- Option 2: Write Java code to perform the encryption

How to Get a Bcrypt password - Website

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- Visit: **`www.luv2code.com/generate-bcrypt-password`**

How to Get a Bcrypt password - Website

- Visit: **`www.luv2code.com/generate-bcrypt-password`**

- Enter your plaintext password

How to Get a Bcrypt password - Website

- Visit: **`www.luv2code.com/generate-bcrypt-password`**
- Enter your plaintext password
- The website will generate a bcrypt password for you

DEMO

Development Process

Step-By-Step

Development Process

Step-By-Step

1. Run SQL Script that contains encrypted passwords

Development Process

Step-By-Step

1. Run SQL Script that contains encrypted passwords

   A. Modify DDL for password field, length should be 68

Development Process

Step-By-Step

1. Run SQL Script that contains encrypted passwords

   A. Modify DDL for password field, length should be 68

2. Modify database properties file to point to new database schema

Development Process

Step-By-Step

1. Run SQL Script that contains encrypted passwords

   A. Modify DDL for password field, length should be 68

2. Modify database properties file to point to new database schema

THAT'S IT … no need to change Java source code :-)

Spring Security Password Storage

- In Spring Security 5, passwords are stored using a specific format

```
{id}encodedPassword
```

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noop	Plain text passwords

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Spring Security Password Storage

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ID	Description
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…	…

Spring Security Password Storage

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```

username	password	enabled
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mary	{bcrypt}$2a$04$eFytJDGtjbThXa80FyOOBuFdK2IwjyWefYkMpiBEFlpBwDH.5PM0K	1
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Spring Security Password Storage

- In Spring Security 5, passwords are stored using a specific format

```
{bcrypt}encodedPassword
```

Password column must be at least 68 chars wide

{bcrypt} - 8 chars
***encodedPassword* - 60 chars**

username	password	enabled
john	{bcrypt}$2a$04$eFytJDGtjbThXa80FyOOBuFdK2IwjyWefYkMpiBEFlpBwDH.5PM0K	1
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Modify DDL for Password Field

```
CREATE TABLE `users` (
  `username` varchar(50) NOT NULL,
  `password`     char(68) NOT NULL,
  `enabled` tinyint(1) NOT NULL,

  PRIMARY KEY (`username`)

) ENGINE=InnoDB DEFAULT CHARSET=latin1;
```

Modify DDL for Password Field

```
CREATE TABLE `users` (
  `username` varchar(50) NOT NULL,
  `password`     char(68) NOT NULL,
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```

Password column must be at least 68 chars wide

{bcrypt} - 8 chars
***encodedPassword* - 60 chars**

Step 1: Develop SQL Script to setup database tables

```sql
INSERT INTO `users`
VALUES
('john','{bcrypt}$2a$04$eFytJDGtjbThXa80FyOOBuFdK2IwjyWefYkMpiBEFlpBwDH.5PM0K',1),
```

Step 1: Develop SQL Script to setup database tables

The encrypted password: fun123

```
INSERT INTO `users`
VALUES
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Step 1: Develop SQL Script to setup database tables

The encoding algorithm id

The encrypted password: fun123

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INSERT INTO `users`
VALUES
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Step 1: Develop SQL Script to setup database tables

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```

Let's Spring Security know the passwords are stored as encrypted passwords: bcrypt

Step 1: Develop SQL Script to setup database tables

The encoding algorithm id

The encrypted password: fun123

```
INSERT INTO `users`
VALUES
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```

Step 2: Point to New Database Schema

File: src/main/resources/persistence-mysql.properties

```
#
# JDBC connection properties
#
jdbc.driver=com.mysql.jdbc.Driver
jdbc.url=jdbc:mysql://localhost:3306/spring_security_demo_bcrypt?useSSL=false
jdbc.user=springstudent
jdbc.password=springstudent

#
# Connection pool properties
#
connection.pool.initialPoolSize=5
connection.pool.minPoolSize=5
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Step 2: Point to New Database Schema

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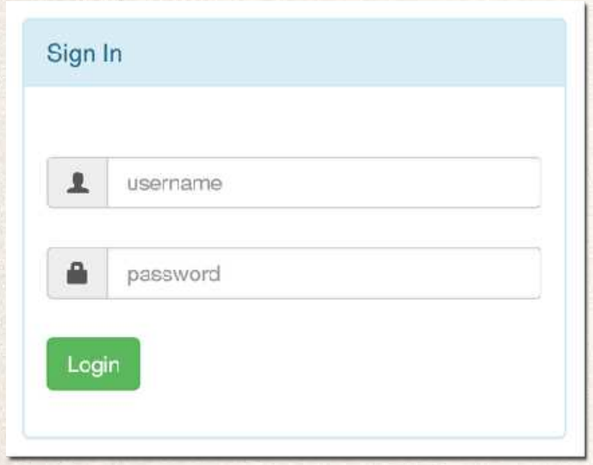
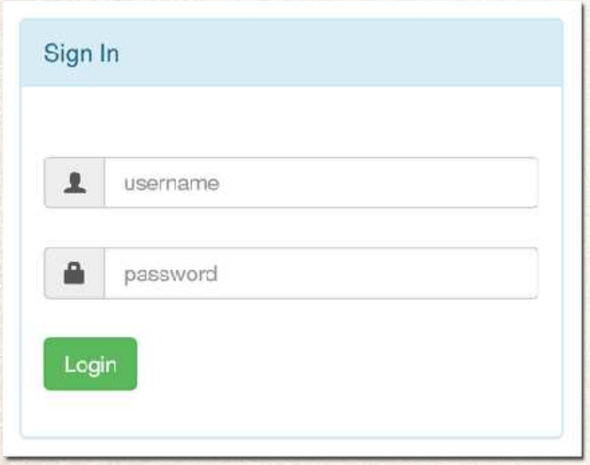
Spring Security Login Process

Spring Security Login Process



Spring Security Login Process



username	password	enabled
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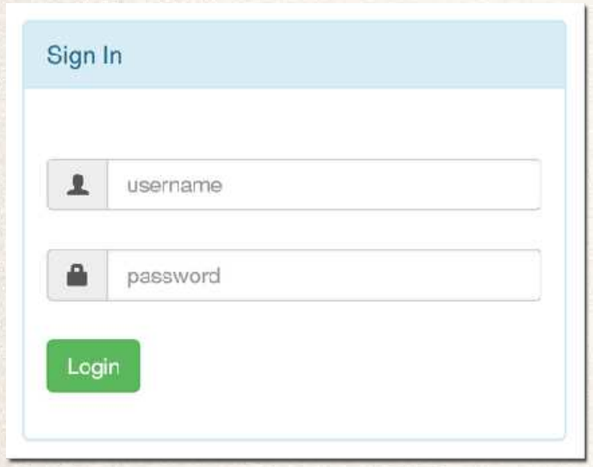
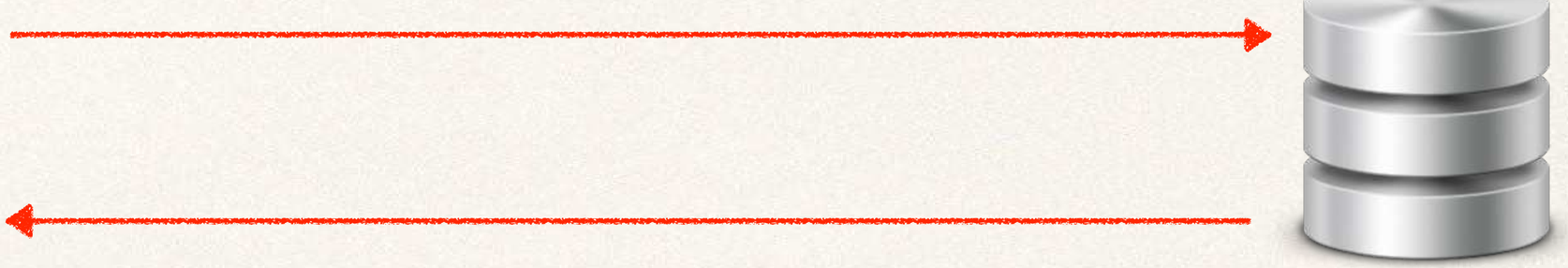
Spring Security Login Process





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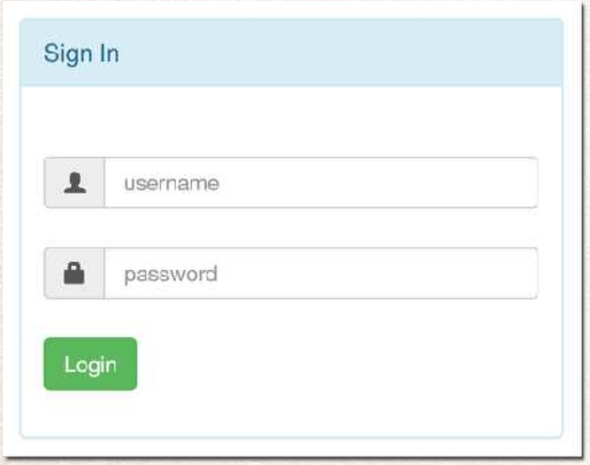
Spring Security Login Process



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Spring Security Login Process

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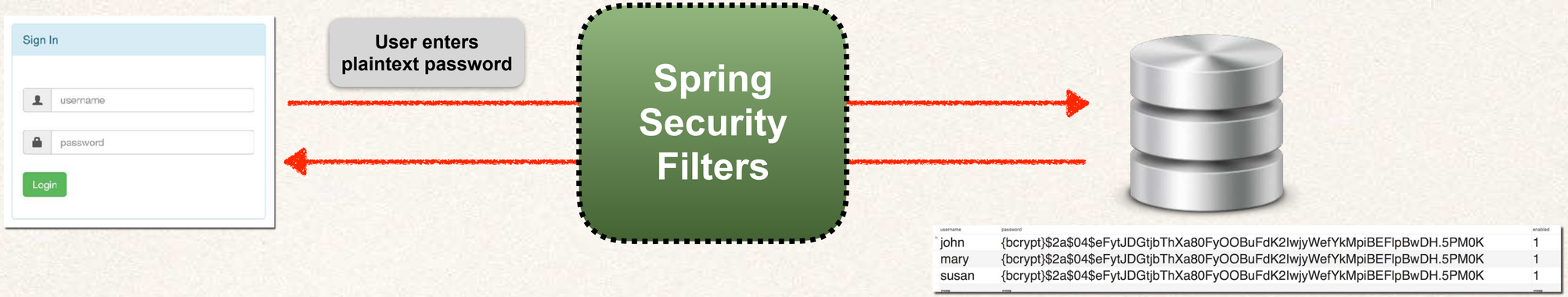
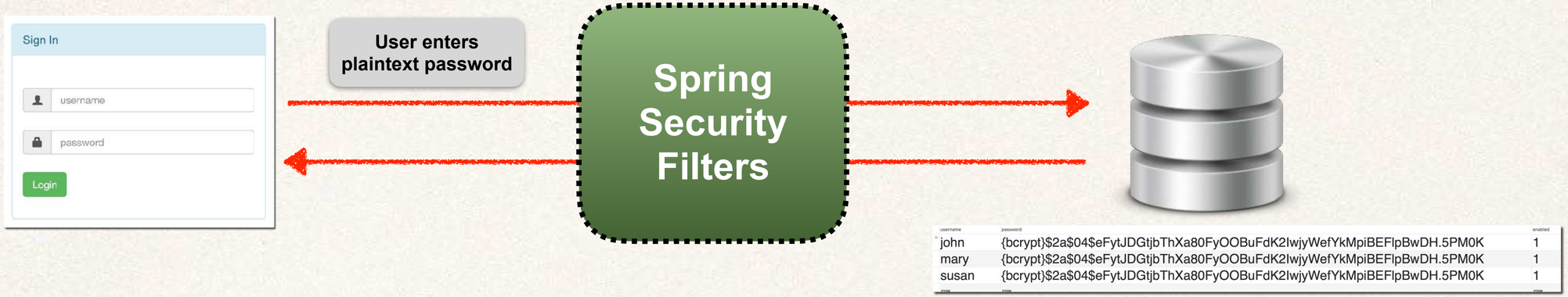
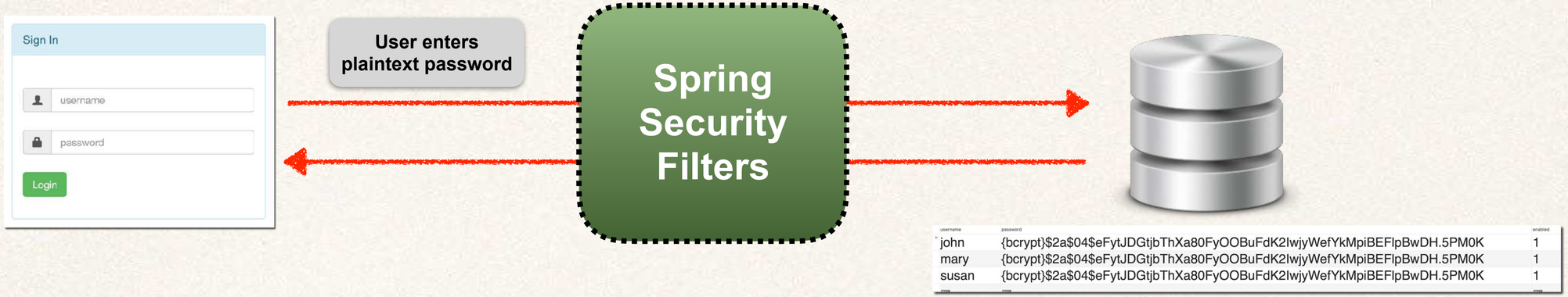


Spring Security Login Process



1. Retrieve password from db for the user

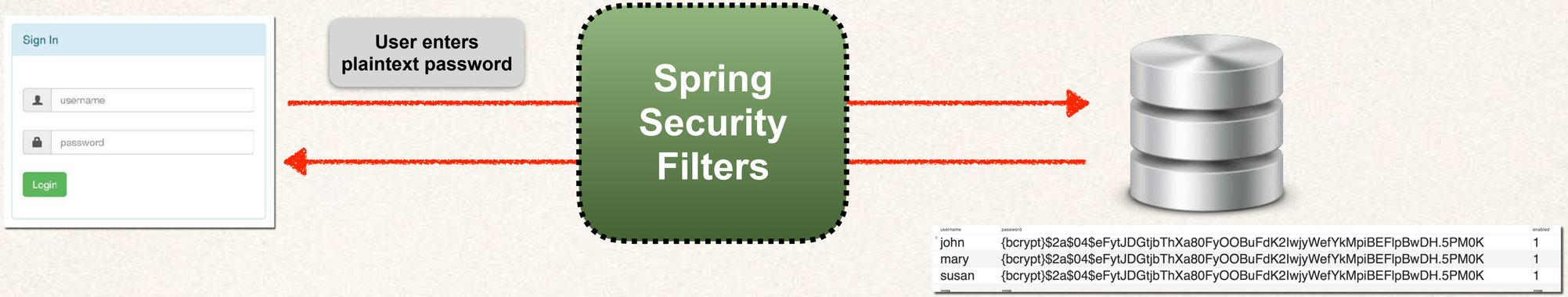
Spring Security Login Process



1. Retrieve password from db for the user

2. Read the encoding algorithm id (bcrypt etc)

Spring Security Login Process

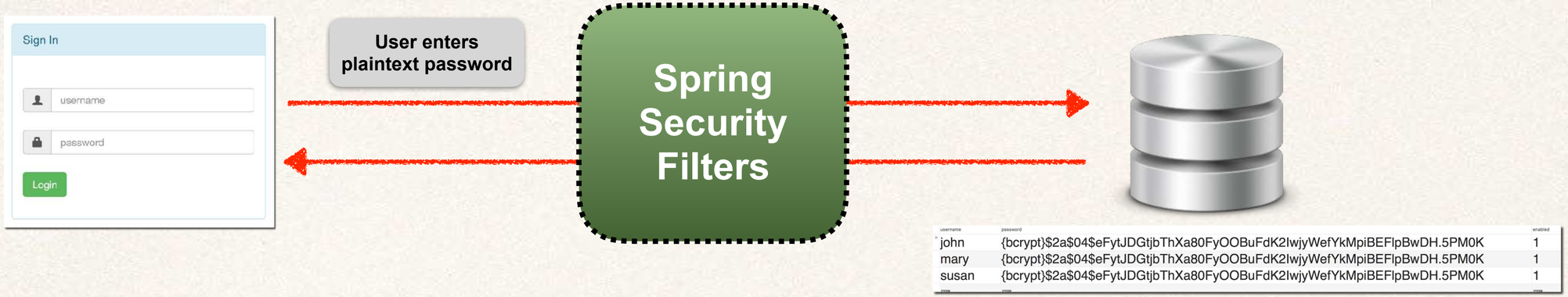


1. Retrieve password from db for the user

2. Read the encoding algorithm id (bcrypt etc)

3. For case of bcrypt, encrypt plaintext password from login form (using salt from db password)

Spring Security Login Process



1. Retrieve password from db for the user
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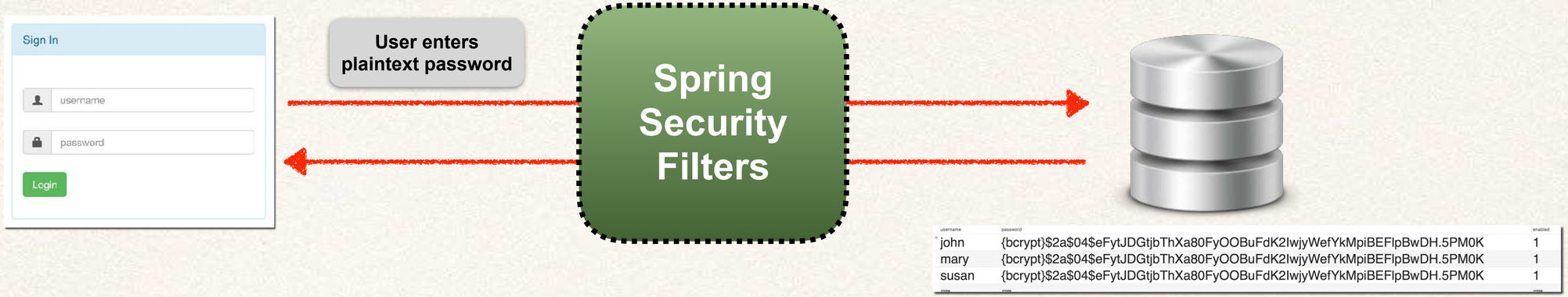
4. Compare encrypted password from login form WITH encrypted password from db

Spring Security Login Process



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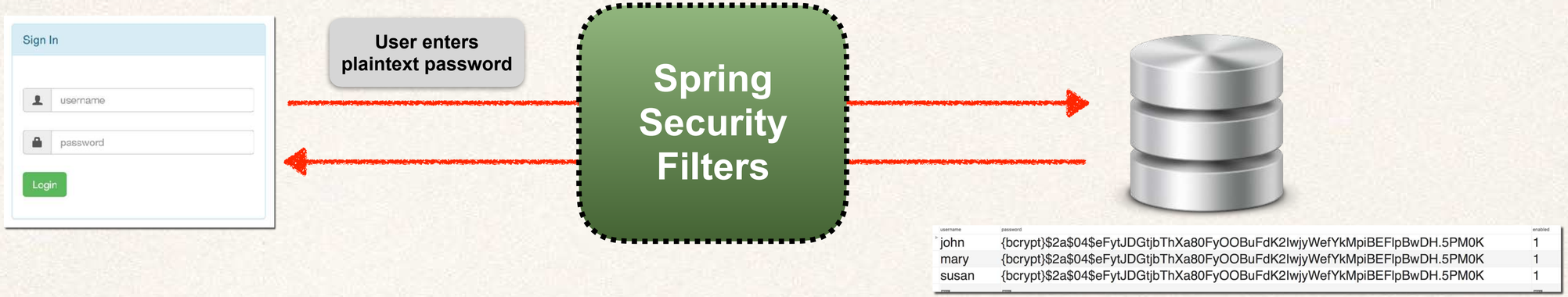
5. If there is a match, login successful

Spring Security Login Process



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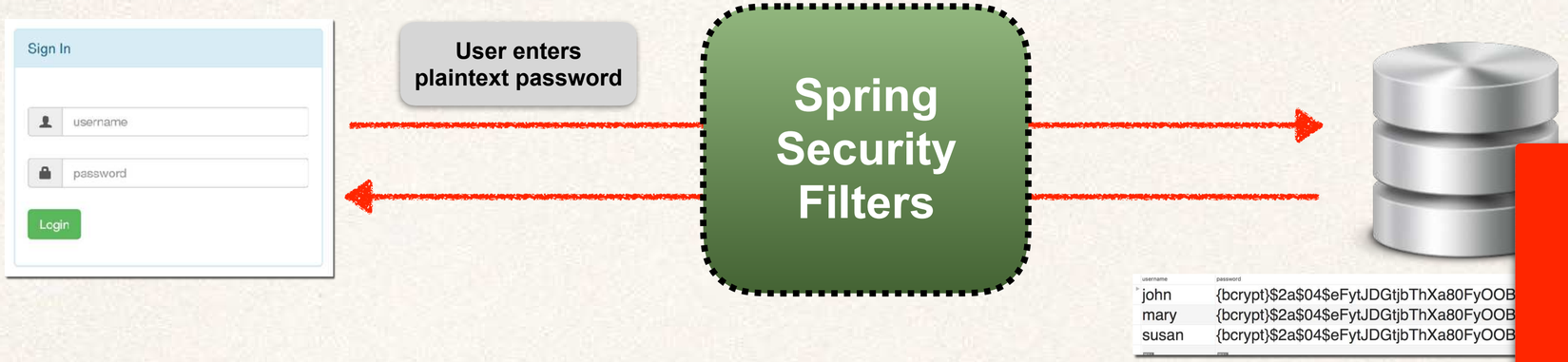
Spring Security Login Process



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Note:
The password from db is NEVER decrypted

Because bcrypt is a one-way encryption algorithm

Spring Security
bcrypt Password Variants

Spring Security Password Storage

- There are different algorithms / variants for bcrypt passwords:
  - Passwords starting with: **`$2a$, $2b$, $2y$, …`**

Spring Security 5 only supports bcrypt passwords starting with <u>$2a$</u>

username	password	enabled
john	{bcrypt}$2a$04$eFytJDGtjbThXa80FyOOBuFdK2IwjyWefYkMpiBEFlpBwDH.5PM0K	1
mary	{bcrypt}$2a$04$eFytJDGtjbThXa80FyOOBuFdK2IwjyWefYkMpiBEFlpBwDH.5PM0K	1
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Spring Security Password Storage

- Currently, Spring Security 5 only supports bcrypt passwords starting with **`$2a$`**

Be sure to use `$2a$`

- If you use a different variant starting with **`$2b$, $2y$, …`**
  - The <u>login will FAIL</u> and you will get this dreaded error message in server logs

```
WARNING: Encoded password does not look like BCrypt
```

Common pitfall

BCrypt Variants

- FAQ: What are all of the bcrypt variants?

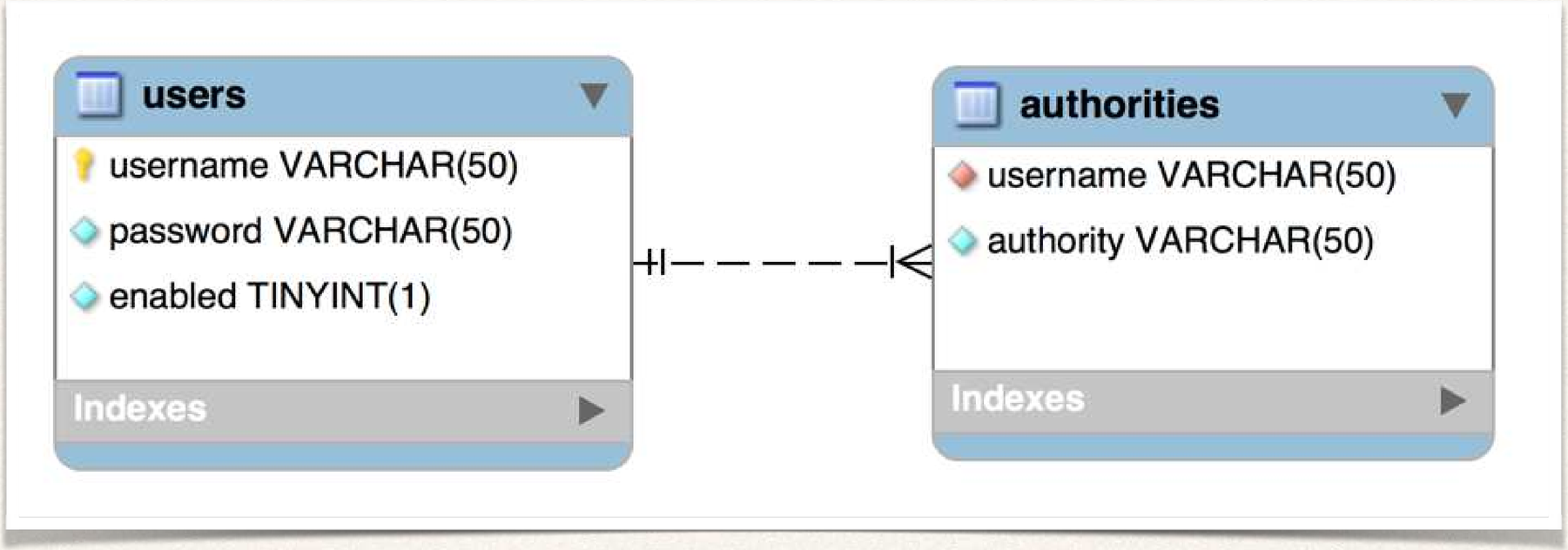
- Here is a good discussion of the BCrypt variants: **`$2a$, $2b$, $2y$, …`**

`www.luv2code.com/bcrypt-variants`

Spring Security
Custom Tables

Default Spring Security Database Schema

Default Spring Security Database Schema



Custom Tables

Custom Tables

- What if we have our own custom tables?

Custom Tables

- What if we have our own custom tables?
- Our own custom column names?

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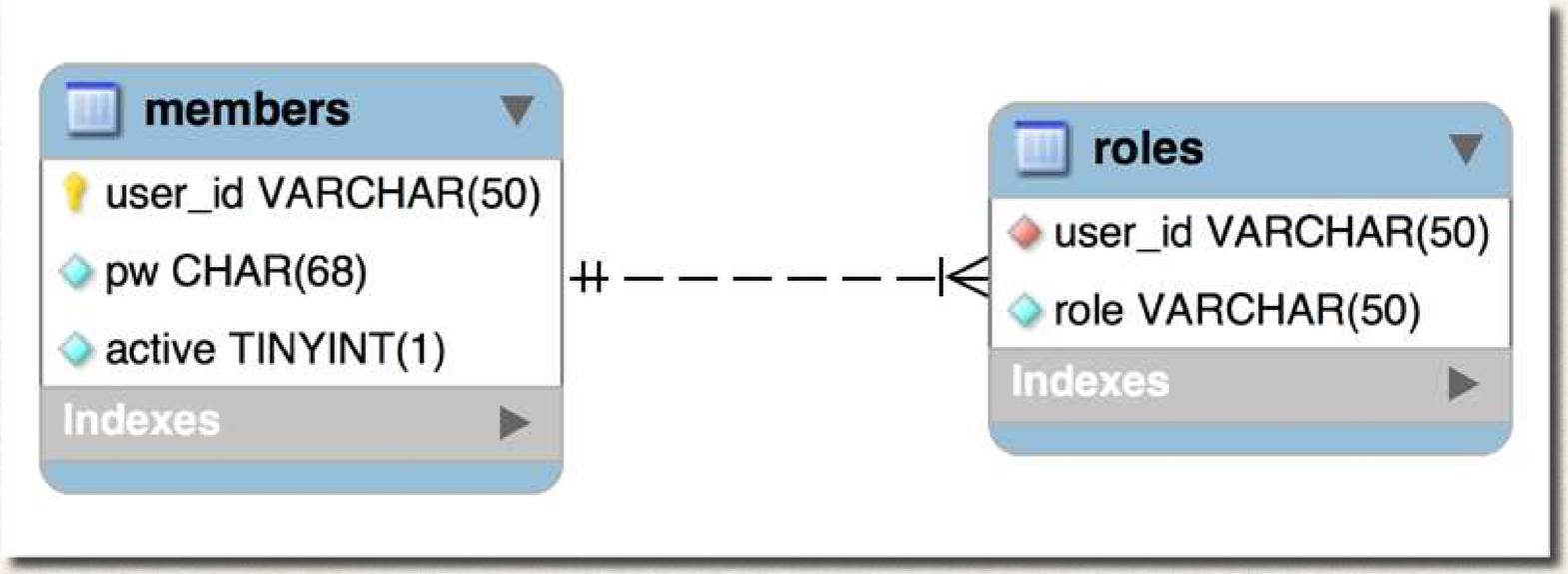


For Security Schema Customization

- Tell Spring how to query your custom tables
- Provide query to find user by user name
- Provide query to find authorities / roles by user name

Development Process

Step-By-Step

Development Process

Step-By-Step

1. Create our custom tables with SQL

Development Process

Step-By-Step

1. Create our custom tables with SQL

2. Update JDBC properties file to point to new database schema

Development Process

Step-By-Step

1. Create our custom tables with SQL

2. Update JDBC properties file to point to new database schema

3. Update Spring Security Configuration

Development Process

Step-By-Step

1. Create our custom tables with SQL

2. Update JDBC properties file to point to new database schema

3. Update Spring Security Configuration

    - Provide query to find user by user name

Development Process

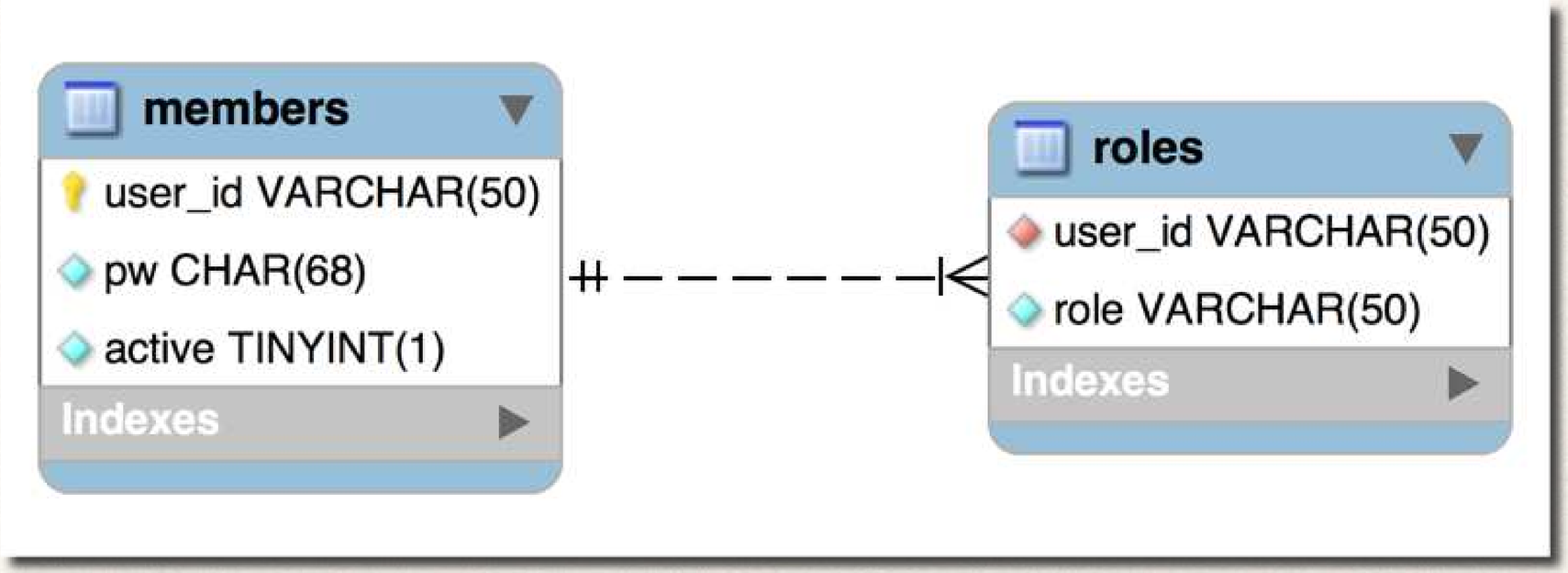
Step-By-Step

1. Create our custom tables with SQL

2. Update JDBC properties file to point to new database schema

3. Update Spring Security Configuration
   - Provide query to find user by user name
   - Provide query to find authorities / roles by user name

Step 1: Create our custom tables with SQL



Step 2: Update JDBC properties file to point to new database schema

File: src/main/resources/persistence-mysql.properties

```
#
# JDBC connection properties
#
jdbc.driver=com.mysql.jdbc.Driver
jdbc.url=jdbc:mysql://localhost:3306/spring_security_demo_bcrypt_custom?useSSL=false
jdbc.user=springstudent
jdbc.password=springstudent

#
# Connection pool properties
#
connection.pool.initialPoolSize=5
connection.pool.minPoolSize=5
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Step 3: Update Spring Security Configuration

```
@Configuration
@EnableWebSecurity
public class DemoSecurityConfig extends WebSecurityConfigurerAdapter {

   @Autowired
   private DataSource securityDataSource;

   @Override
   protected void configure(AuthenticationManagerBuilder auth) throws Exception {

      auth.jdbcAuthentication().dataSource(securityDataSource)



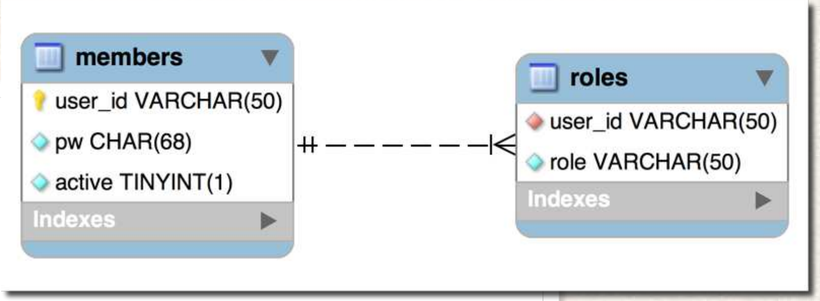


   }

   …

}
```

Step 3: Update Spring Security Configuration

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           .usersByUsernameQuery("select user_id, pw, active from members where user_id=?")



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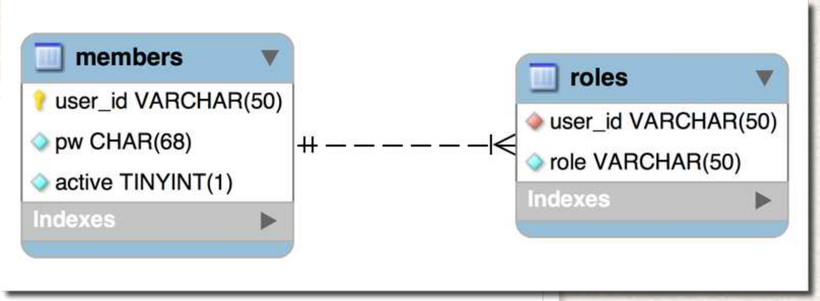
   …

}
```



How to find users

Step 3: Update Spring Security Configuration

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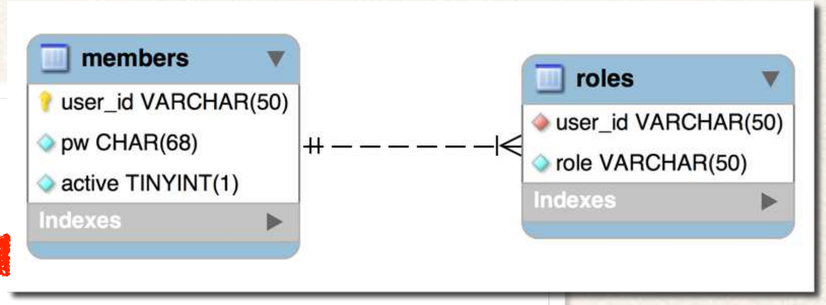
   }

   ...

}
```



How to find users

Step 3: Update Spring Security Configuration

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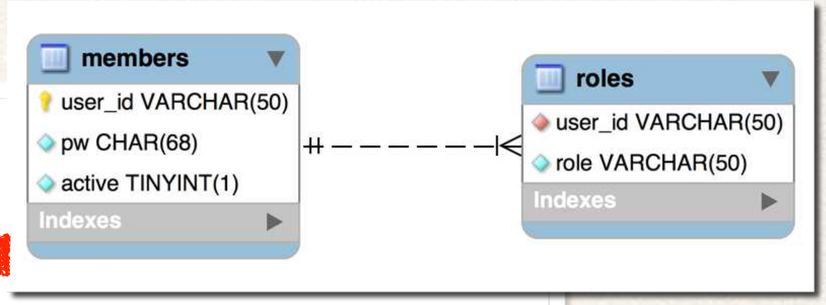

How to find users

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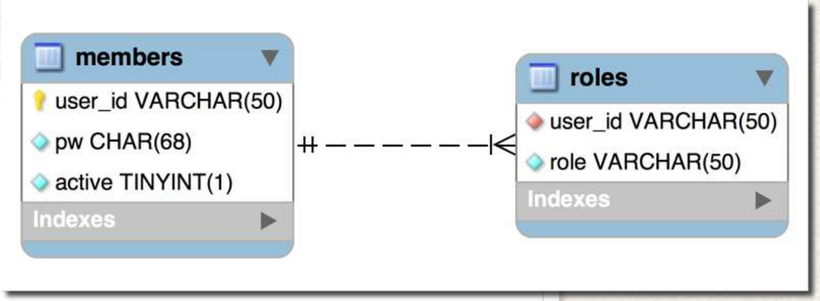
Step 3: Update Spring Security Configuration

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How to find roles

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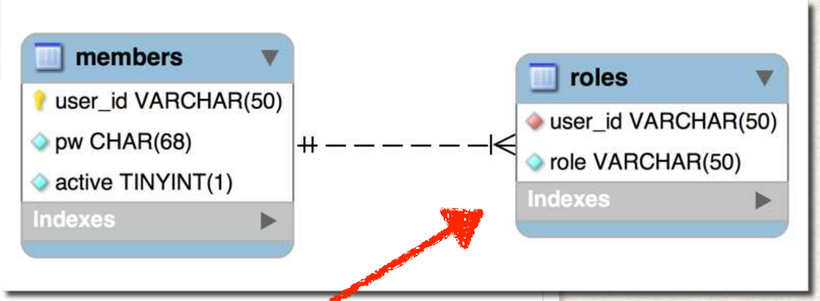

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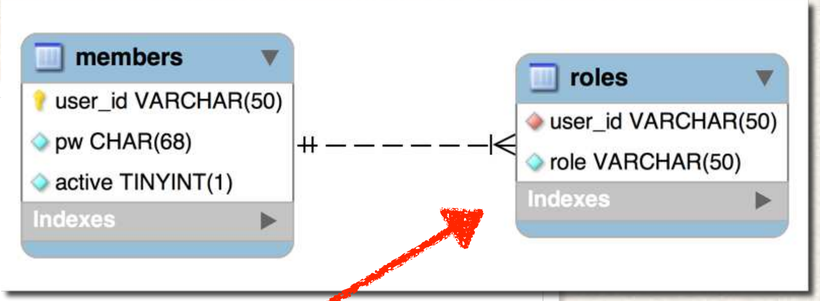

How to find roles

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Spring Security
Custom Tables

Default Spring Security Database Schema

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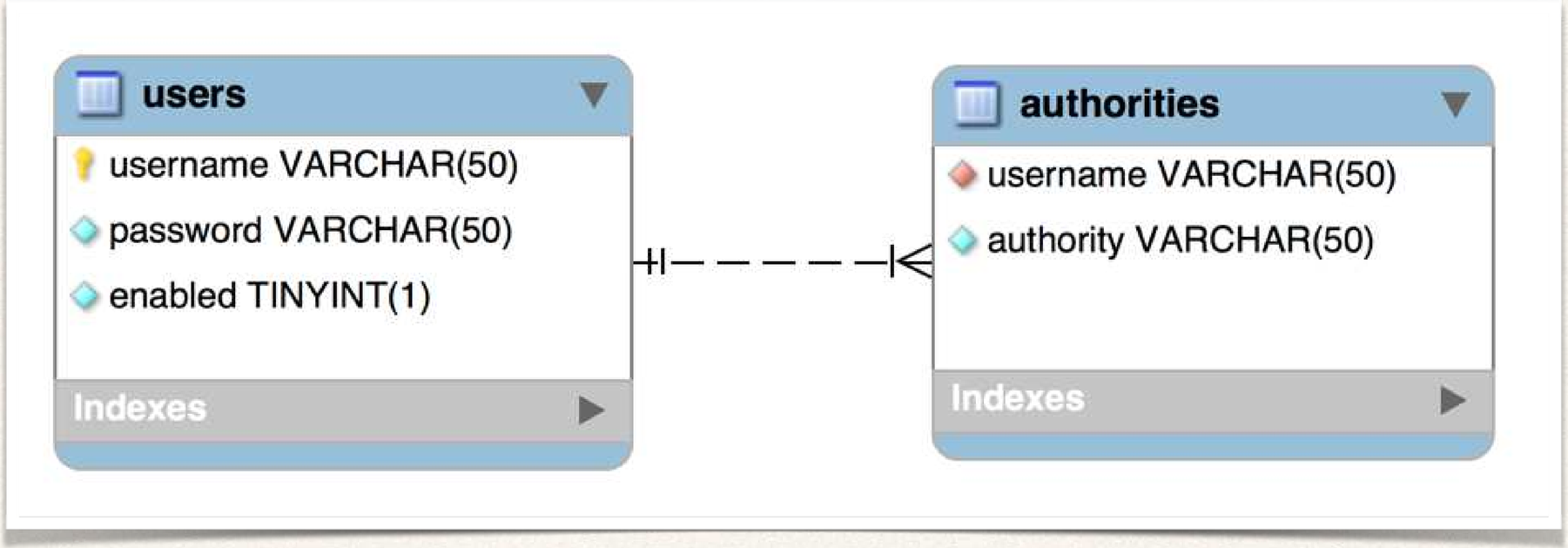

Custom Tables

Custom Tables

- What if we have our own custom tables?

Custom Tables

- What if we have our own custom tables?
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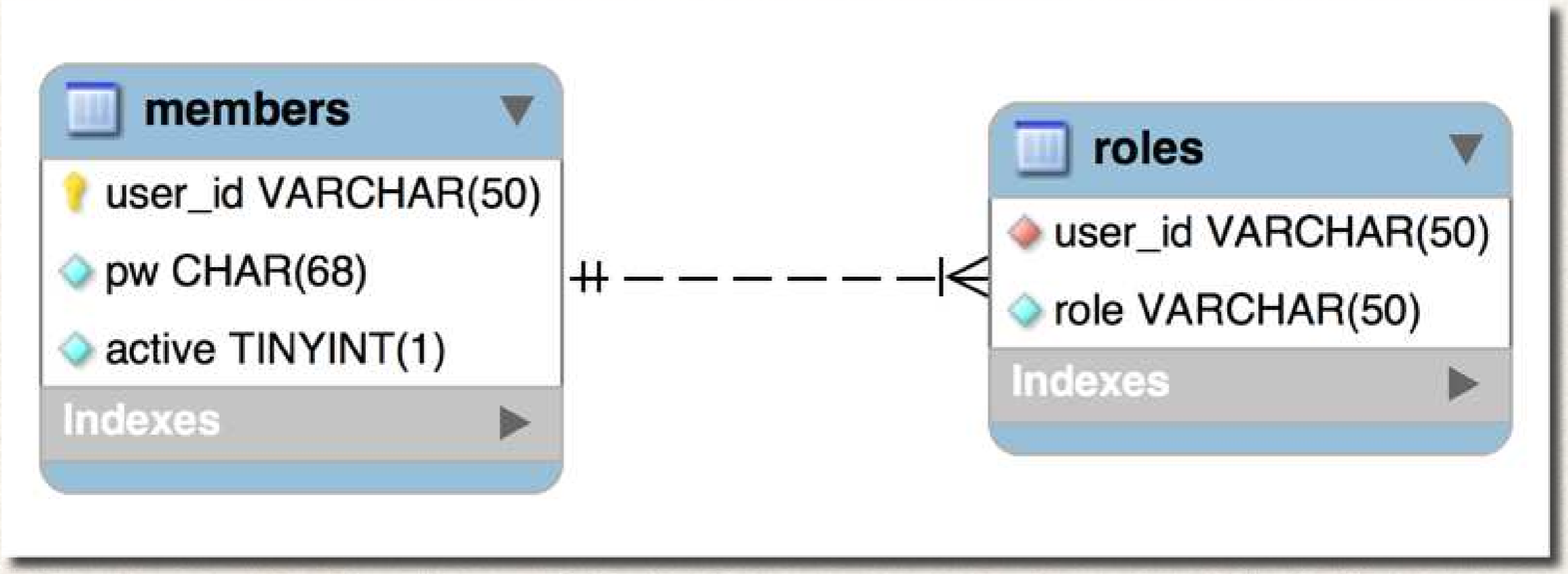

For Security Schema Customization

- Tell Spring how to query your custom tables
- Provide query to find user by user name
- Provide query to find authorities / roles by user name

Development Process

Step-By-Step

Development Process

Step-By-Step

1. Create our custom tables with SQL

Development Process

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2. Update JDBC properties file to point to new database schema

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    - Provide query to find user by user name

Development Process

Step-By-Step

1. Create our custom tables with SQL

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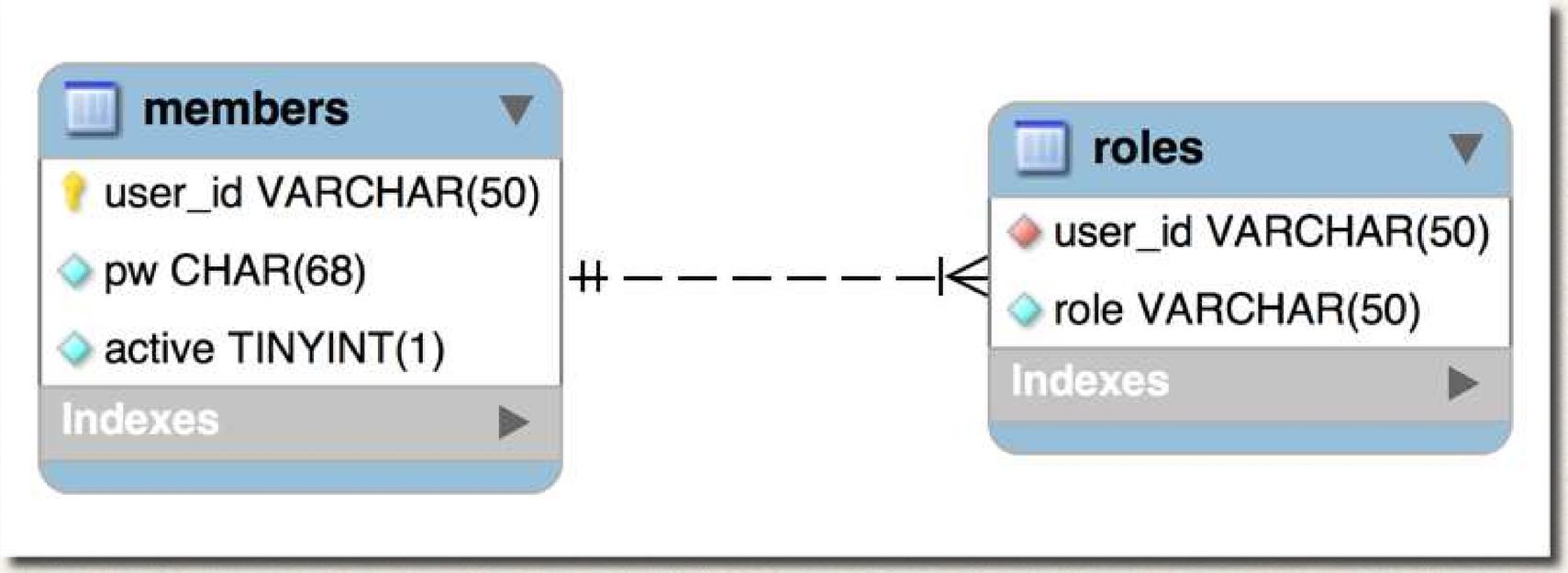
   - Provide query to find user by user name
   - Provide query to find authorities / roles by user name

Step 1: Create our custom tables with SQL



Step 2: Update JDBC properties file to point to new database schema

File: src/main/resources/persistence-mysql.properties

```
#
# JDBC connection properties
#
jdbc.driver=com.mysql.jdbc.Driver
jdbc.url=jdbc:mysql://localhost:3306/spring_security_demo_bcrypt_custom?useSSL=false
jdbc.user=springstudent
jdbc.password=springstudent

#
# Connection pool properties
#
connection.pool.initialPoolSize=5
connection.pool.minPoolSize=5
connection.pool.maxPoolSize=20
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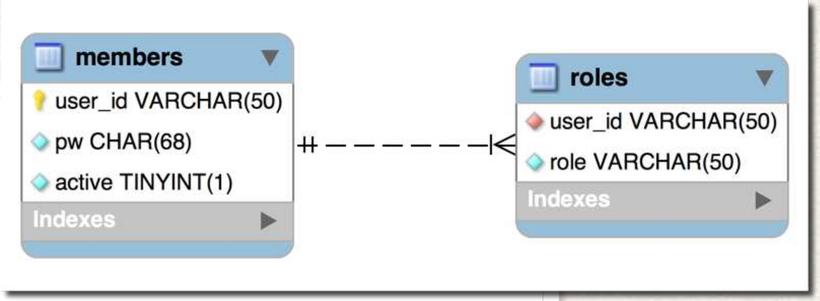


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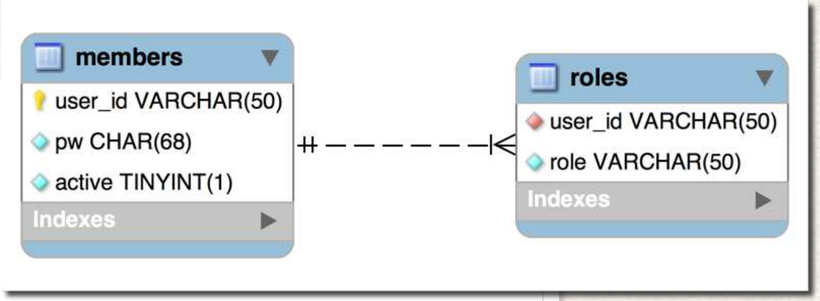

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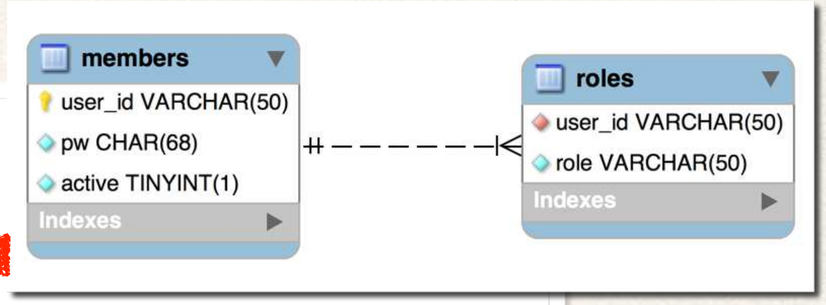

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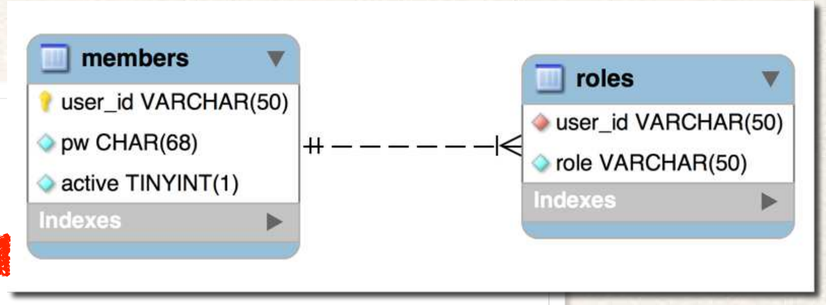

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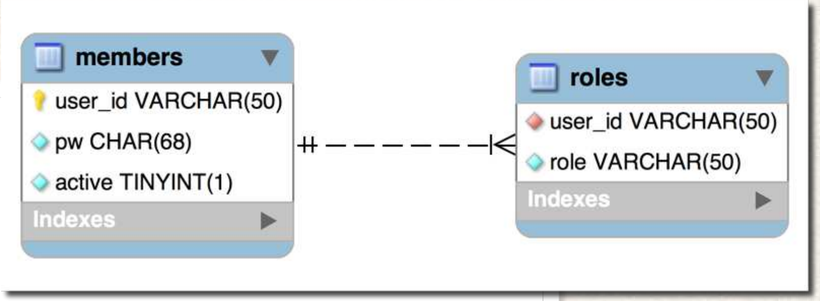


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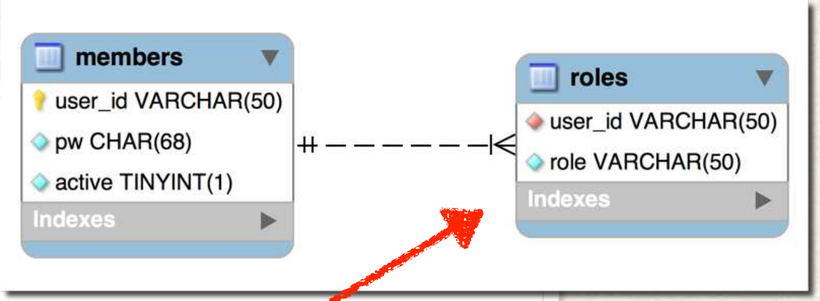

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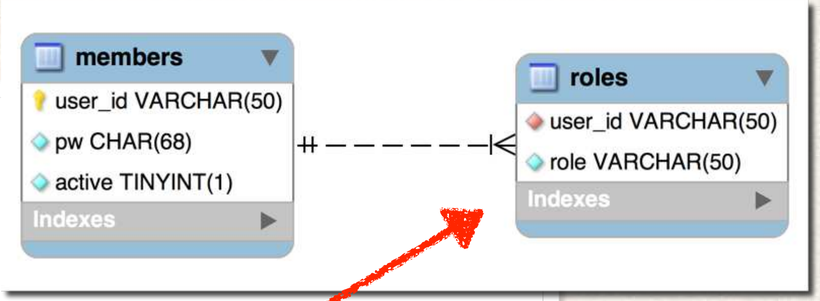

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