The Anatomy of a Secure Web Application Using Java

Introductions

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  - Software Architect

Agenda

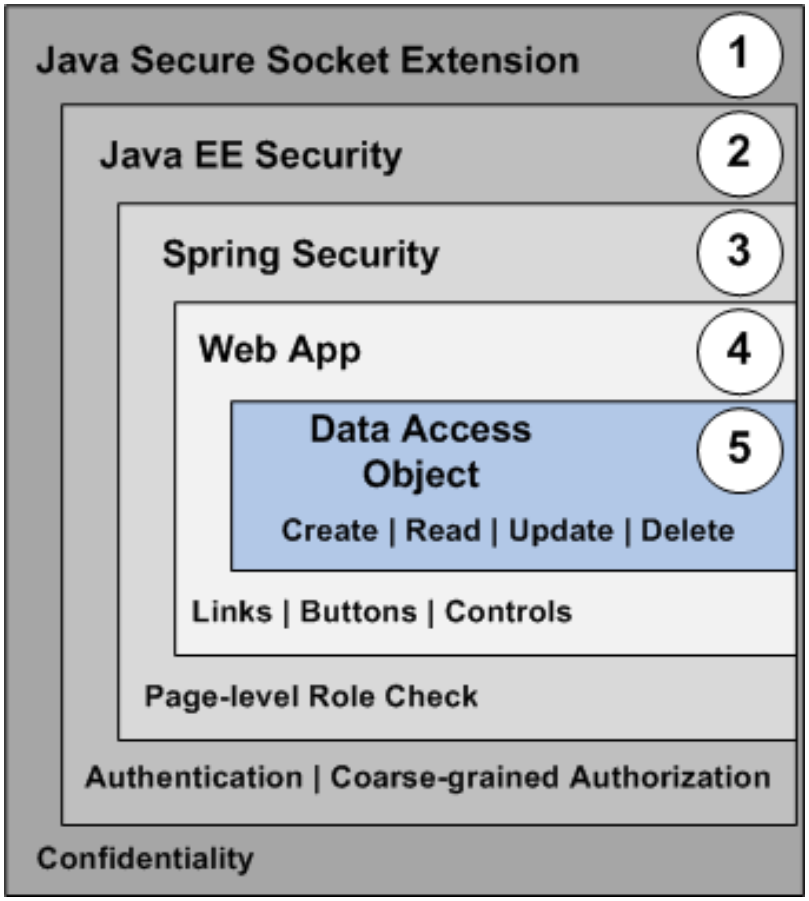
- Intro – Themes
- How to implement secure website
- Demo

Themes

- Simplicity
- Common Sense
- Household Analogy

The Five Security Layers of Java Web Applications

1. Java Secure Socket Extension
2. Java EE Security
3. Spring Security
4. Web App Framework
5. Database Functions



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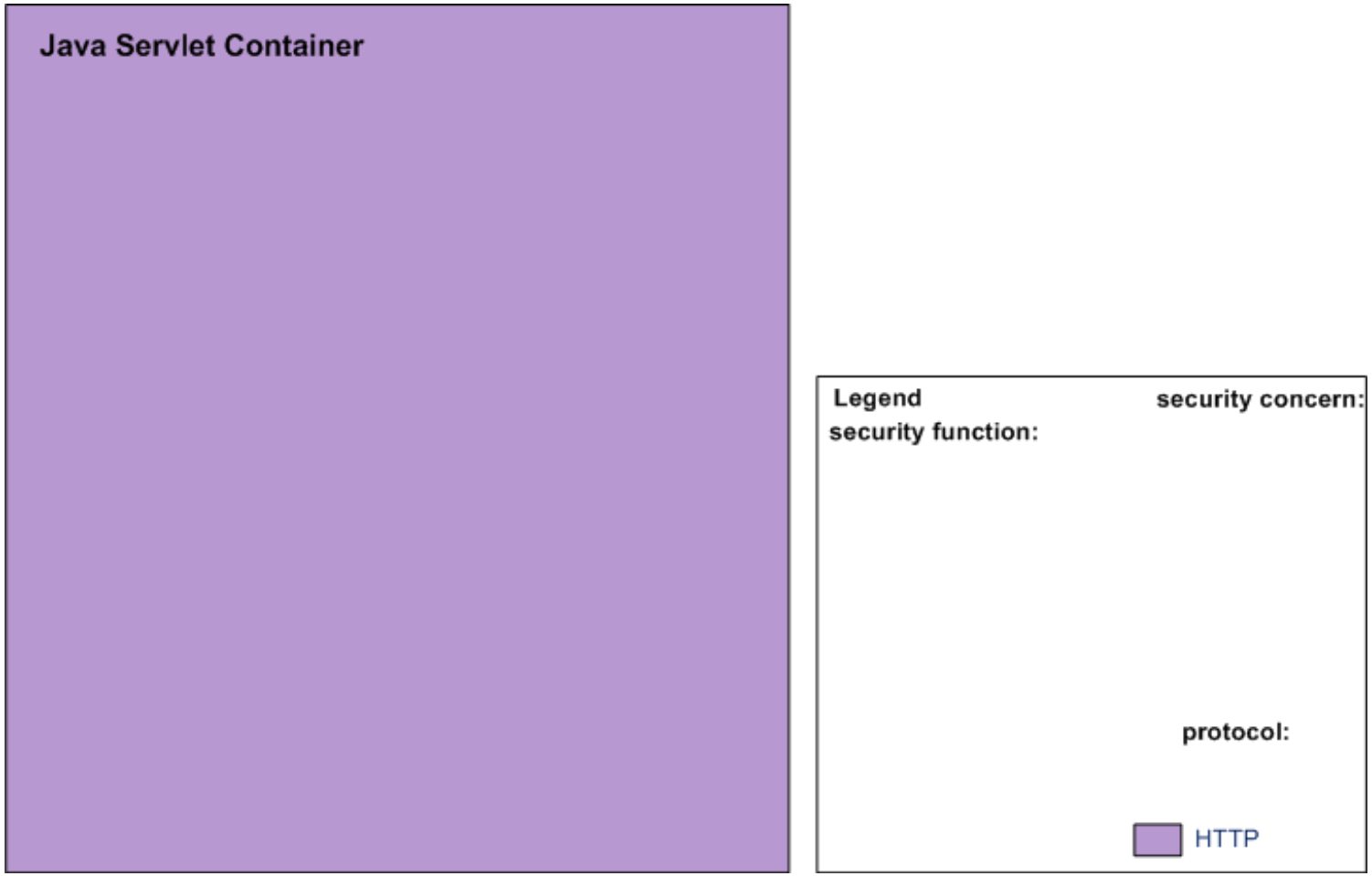
Tutorial

http://symas.com/kb/demonstrate-end-to-end-security-enforcement-using-open-source/

Start with Tomcat Servlet Container



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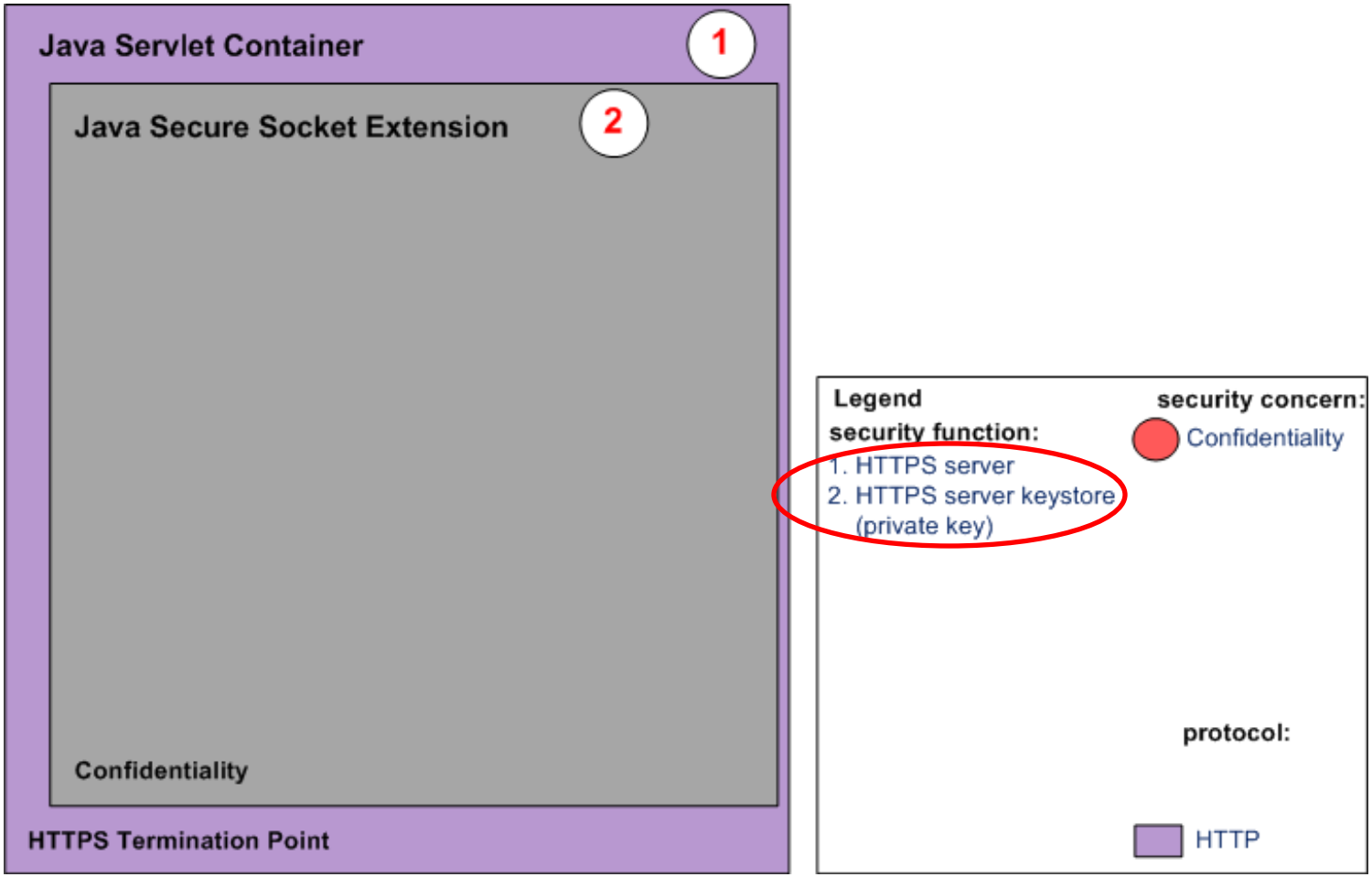
Enable HTTPS



Enable Tomcat SSL

1. Generate keystore with private key (Steps 1 - 5):

https://symas.com/javadocs/fortressdemo2/doc-files/II-keys.html

2. Add the following to **server.xml**:

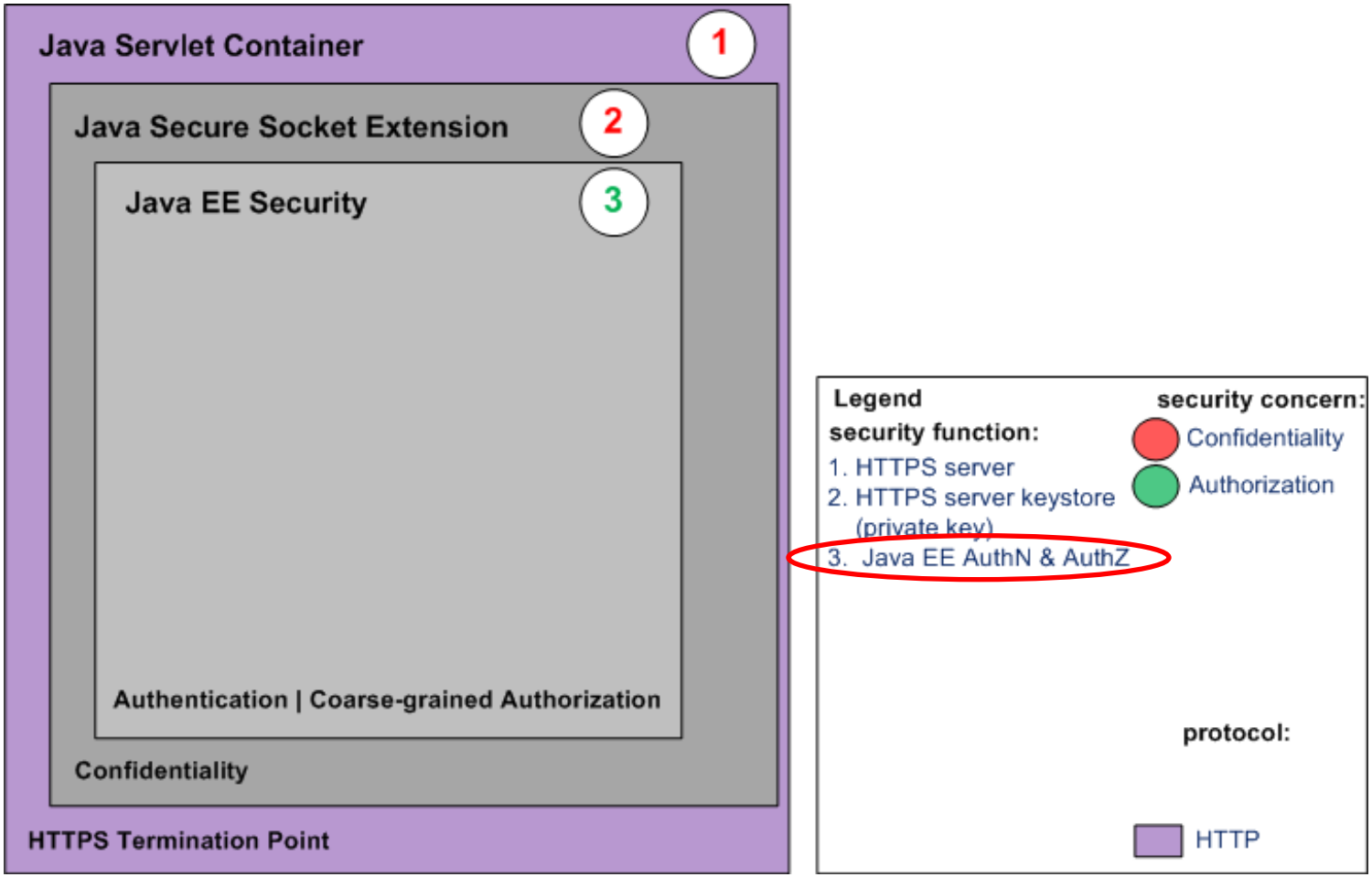
```
<Connector port="8443" maxThreads="200"
    scheme="https" secure="true"
    SSLEnabled="true“
    keystoreFile= “/path/mykeystore”
    keystorePass= “changeit”
    clientAuth="false" sslProtocol="TLS"/>
```

Enable Tomcat SSL

Step 7:

http://symas.com/javadocs/fortressdemo2/doc-files/VI-tomcat.html

Enable Java EE Security

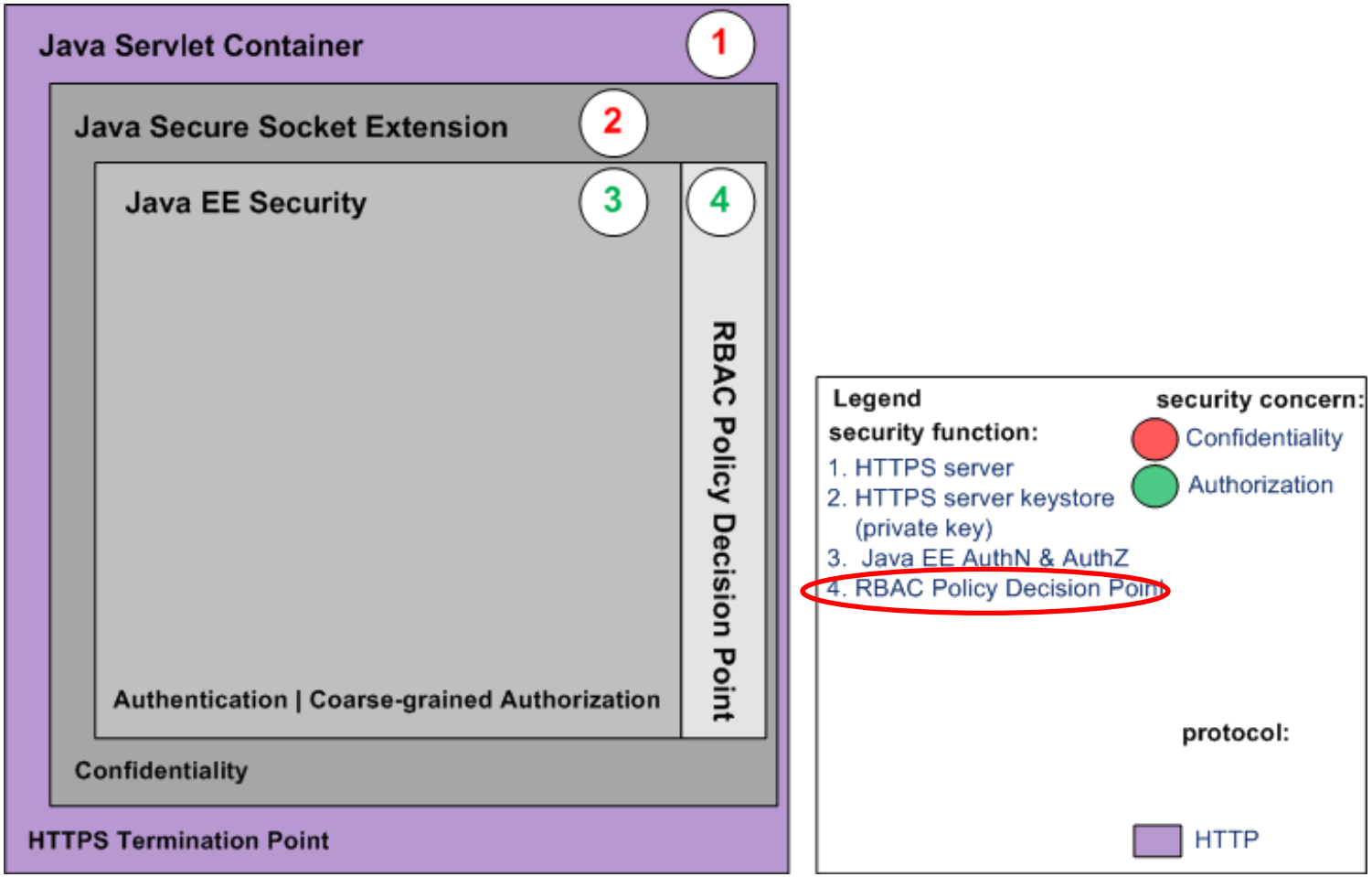


Add to web.xml

```
<security-constraint>
    <display-name>My Security Constraint</display-name>
    <web-resource-collection>
        <web-resource-name>Protected Area</web-resource-name>
        <url-pattern>/secured/*</url-pattern>
    </web-resource-collection>
    <auth-constraint>
        <role-name>ROLE_DEMO_USER</role-name>
    </auth-constraint>
</security-constraint>
<login-config>
    <auth-method>FORM</auth-method>
    <realm-name>MySecurityRealm</realm-name>
    <form-login-config>
        <form-login-page>/login/login.html</form-login-page>
        <form-error-page>/login/error.html</form-error-page>
    </form-login-config>
</login-config>
```

coarse-grained authorization (declarative)

Enable Policy Decision Point

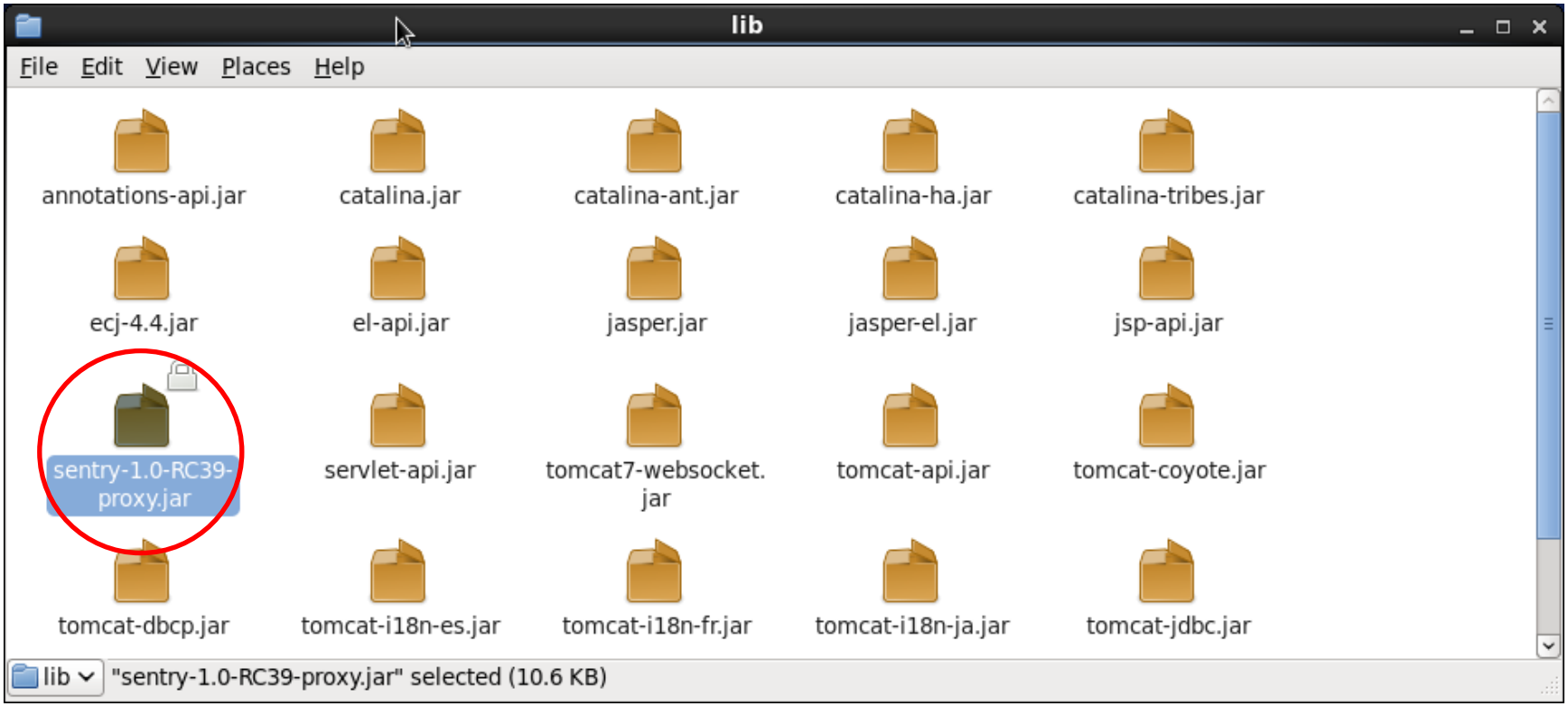


Enable Policy Decision Point

Add context.xml to web project's META-INF folder:

```
<Context reloadable="true">
    < Realm className=
      "org.openldap.sentry.tomcat.Tc7AccessMgrProxy"
      debug="0"
       resourceName="UserDatabase"
       defaultRoles="ROLE_DEMO2_SUPER_USER,
      DEMO2_ALL_PAGES, ROLE_PAGE1, ROLE_PAGE2,
      ROLE_PAGE3"
       containerType="TomcatContext"
       realmClasspath=""
    />
</Context>
```

Drop the Sentry proxy jar in Tomcat's system classpath



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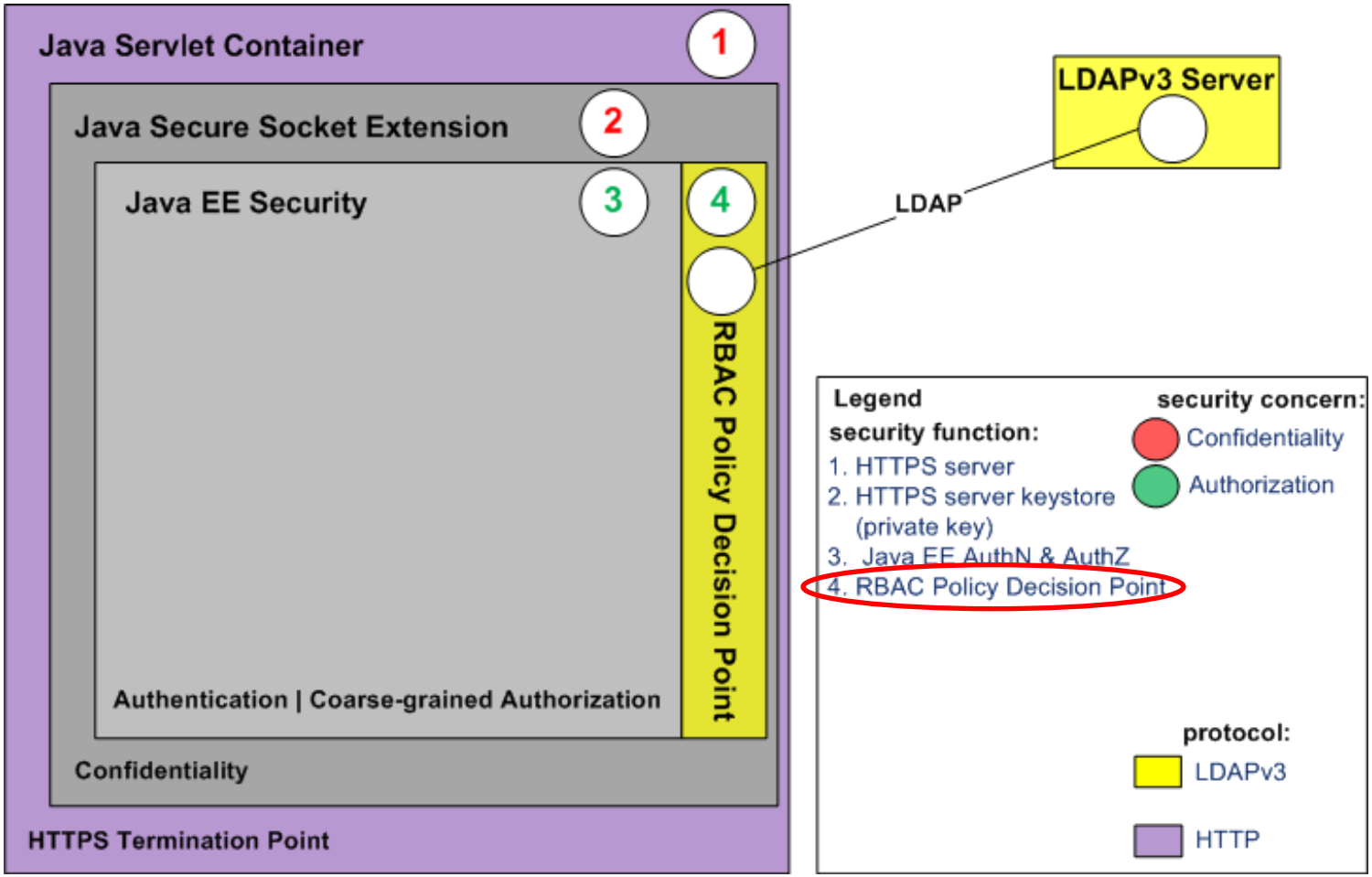
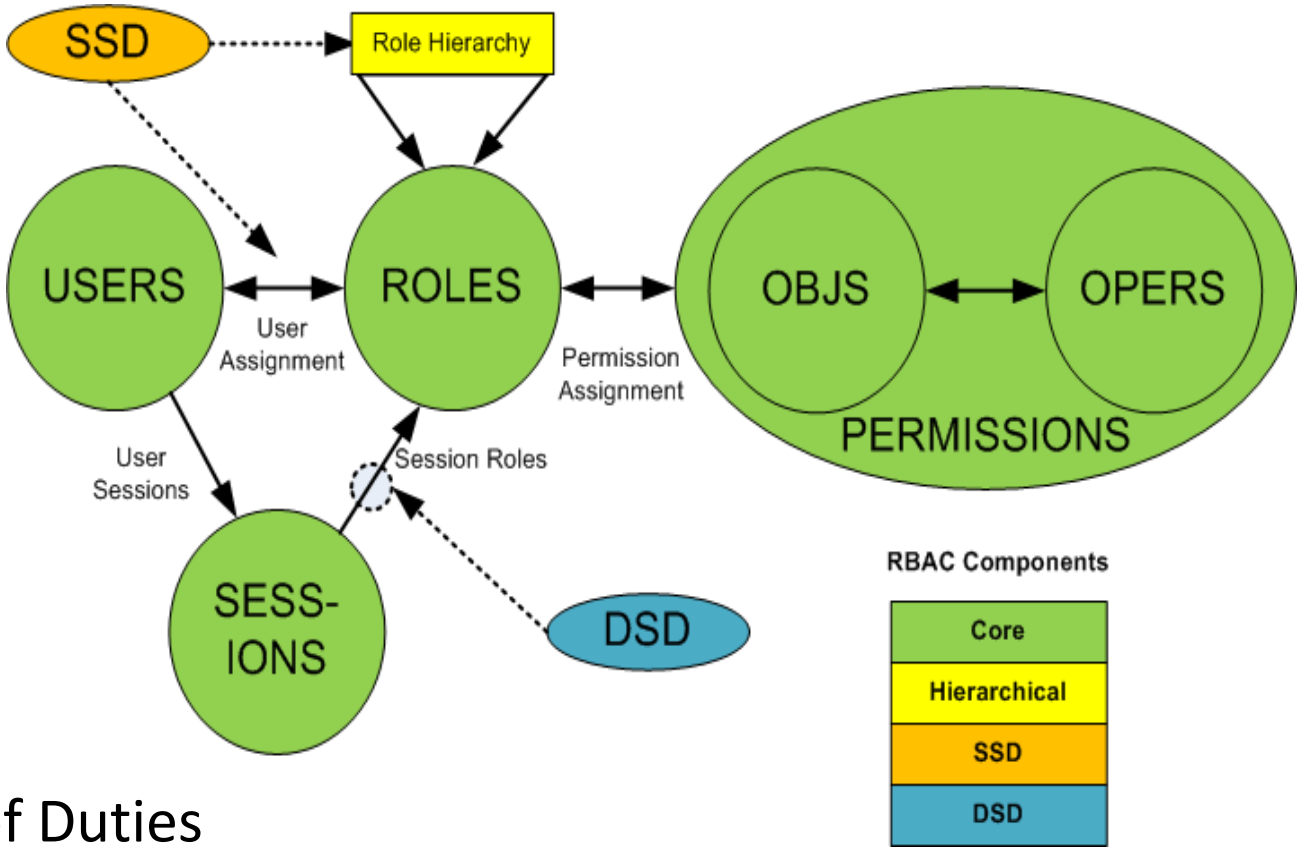
Configure Sentry RBAC PDP



ANSI RBAC INCITS 359

RBAC0:
Users, Roles,
Perms, Sessions
RBAC1:
Hierarchical Roles
RBAC2:
Static Separation
of Duties
RBAC3:
Dynamic Separation of Duties



ANSI RBAC Object Model

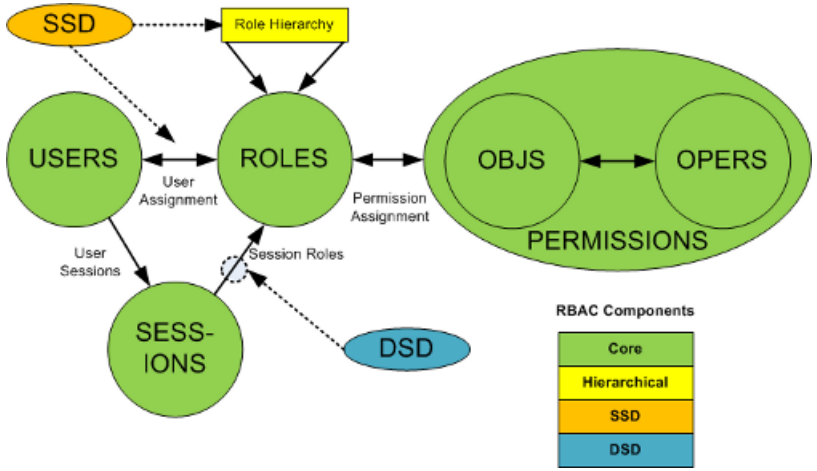
Six basic elements:

1. User – human or machine entity
2. Role – a job function within an organization
3. Object – maps to system resources
4. Operation – executable image of program
5. Permission – approval to perform an Operation on one or more Objects
6. Session – contains set of activated roles for User

ANSI RBAC Functional Model

Three standard interfaces:

1. Administrative – CRUD
2. Review – policy interrogation
3. System – policy enforcement



Configure Sentry RBAC PDP

ANSI RBAC Policy Decision Point

http://symas.com/javadocs/fortress/org/openldap/fortress/AccessMgr.html

1. createSession
2. checkAccess
3. sessionPermissions
4. sessionRoles
5. getUser
6. addActiveRole
7. dropActiveRole

Configure Sentry RBAC PDP

Install OpenLDAP Fortress QUICKSTART:

http://symas.com/javadocs/fortressdemo2/doc-files/IV-fortress.html

Configure Sentry RBAC PDP

Add Sentry Dependency to web app's pom.xml:

```
<dependency>
   <groupId> org.openldap </groupId>
   <artifactId> sentry </artifactId>
   <version> 1.0-RC39 </version>
</dependency>
```

Configure Sentry RBAC PDP

Add Spring's context file to web app's web.xml file:

```
<context-param>
   <param-name>
      contextConfigLocation
   </param-name>
   <param-value>
classpath:applicationContext.xml
   </param-value>
</context-param>
```

Configure Sentry RBAC PDP

Enable Sentry RBAC Spring Bean in applicationContext.xml:

```
<bean id="accessMgr"
   class="org.openldap.fortress.AccessMgrFactory"
   scope="prototype"
   factory-method="createInstance">
   <constructor-arg value="HOME"/>
</bean>
```

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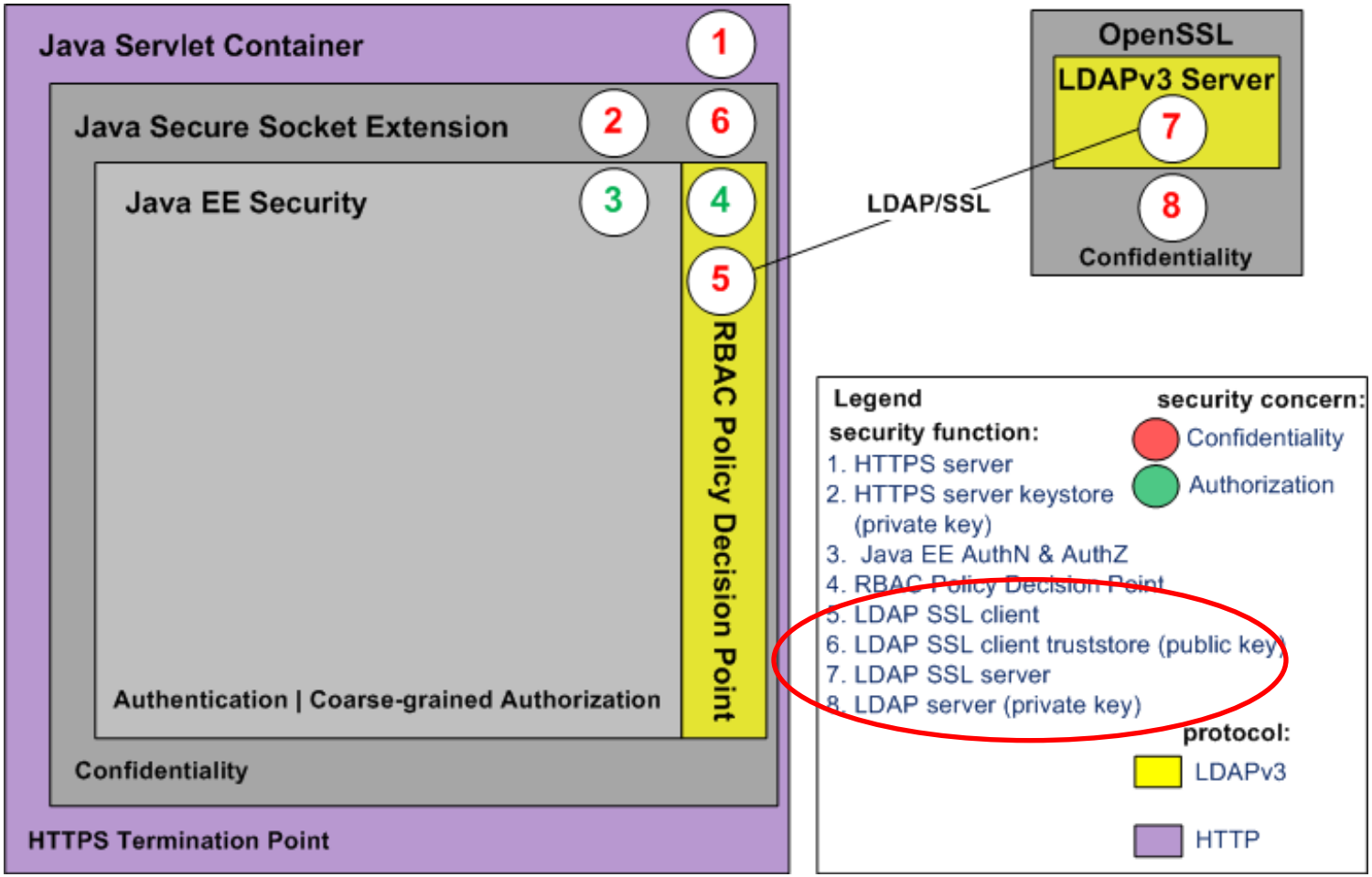
Enable LDAP SSL



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Enable OpenLDAP SSL Server

1. Patch Heartbleed:
http://symas.com/javadocs/fortressdemo2/doc-files/I-openssllheartbleed.html

2. Use OpenSSL to generate keys and certs:
http://symas.com/javadocs/fortressdemo2/doc-files/II-keys.html

3. Add generated artifacts to OpenLDAP slapd.conf:

```
TLSCACertificateFile /path/ca-cert.pem
TLSCertificateFile /path/server-cert.pem
TLSCertificateKeyFile /path/server-key.pem
```

4. Add ldaps to OpenLDAP startup params:

```
slapd … -h "ldaps://hostname:636"
```

Enable LDAP SSL Client

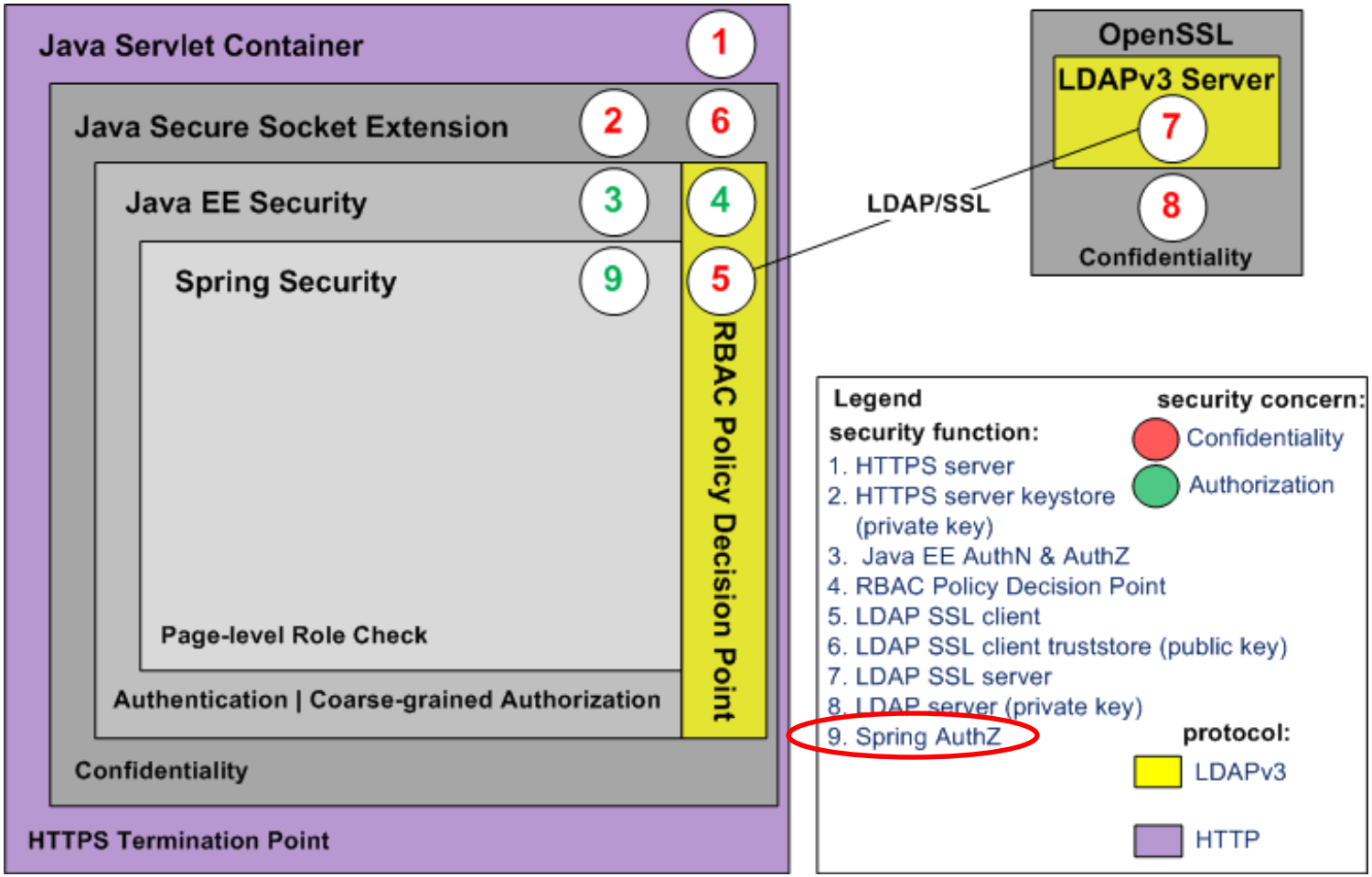
1. Import public key to java truststore (Step 6):

http://symas.com/javadocs/fortressdemo2/doc-files/II-keys.html

2. Add to fortress.properties of Web application:

```
host=ldap-server-domain-name.com
port=636
enable.ldap.ssl=true
trust.store=/path/mytruststore
trust.store.password=changeit
```

Enable Spring Security



Enable Spring Security

Add Spring Dependencies to web app's pom.xml:

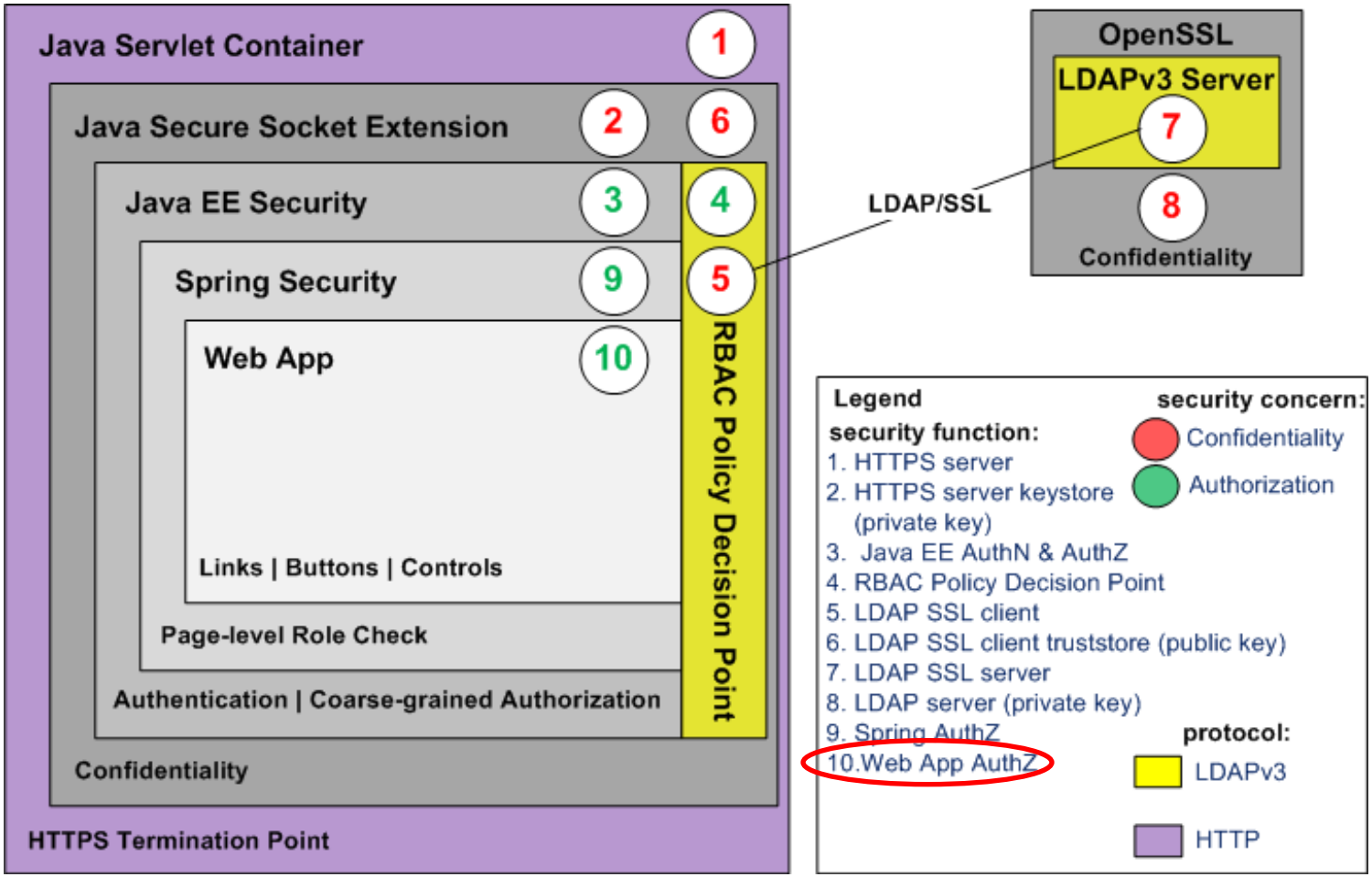
```
<dependency>
  <groupId>org.springframework.security</groupId>
  <artifactId> spring-security-core </artifactId>
  <version>${spring.security.version}</version>
</dependency>
<dependency>
  <groupId>org.springframework.security</groupId>
  <artifactId> spring-security-config </artifactId>
  <version>${spring.security.version}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

Enable Spring Security

```
<bean id="fsi" class=
   "org.springframework.security.web.access.intercept.FilterSecurityInter
   ceptor">
  <property name="authenticationManager" ref="authenticationManager"/>
  <property name="accessDecisionManager"
   ref="httpRequestAccessDecisionManager"/>
  <property name="securityMetadataSource">
    <sec:filter-invocation-definition-source>
      <sec:intercept-url pattern=
        "/com.mycompany.page1"
        access="ROLE_PAGE1"
      />
</sec:filter-invocation-definition-source>
  </property>
</bean>
```

page-level authorization (declarative)

Add Security Aware Web Framework Components



Add Security Aware Web Framework Components

```
add(
   new SecureIndicatingAjaxButton( "Page1", "Add" ) {
   @Override
   protected void onSubmit( ... )
   {
      if( checkAccess( customerNumber ) )
      {
         // do something here:
      }
      else
      {
         target.appendJavaScript( ";alert('Unauthorized');" );
      }
   }
   });
```

fine-grained authorization (programmatic)

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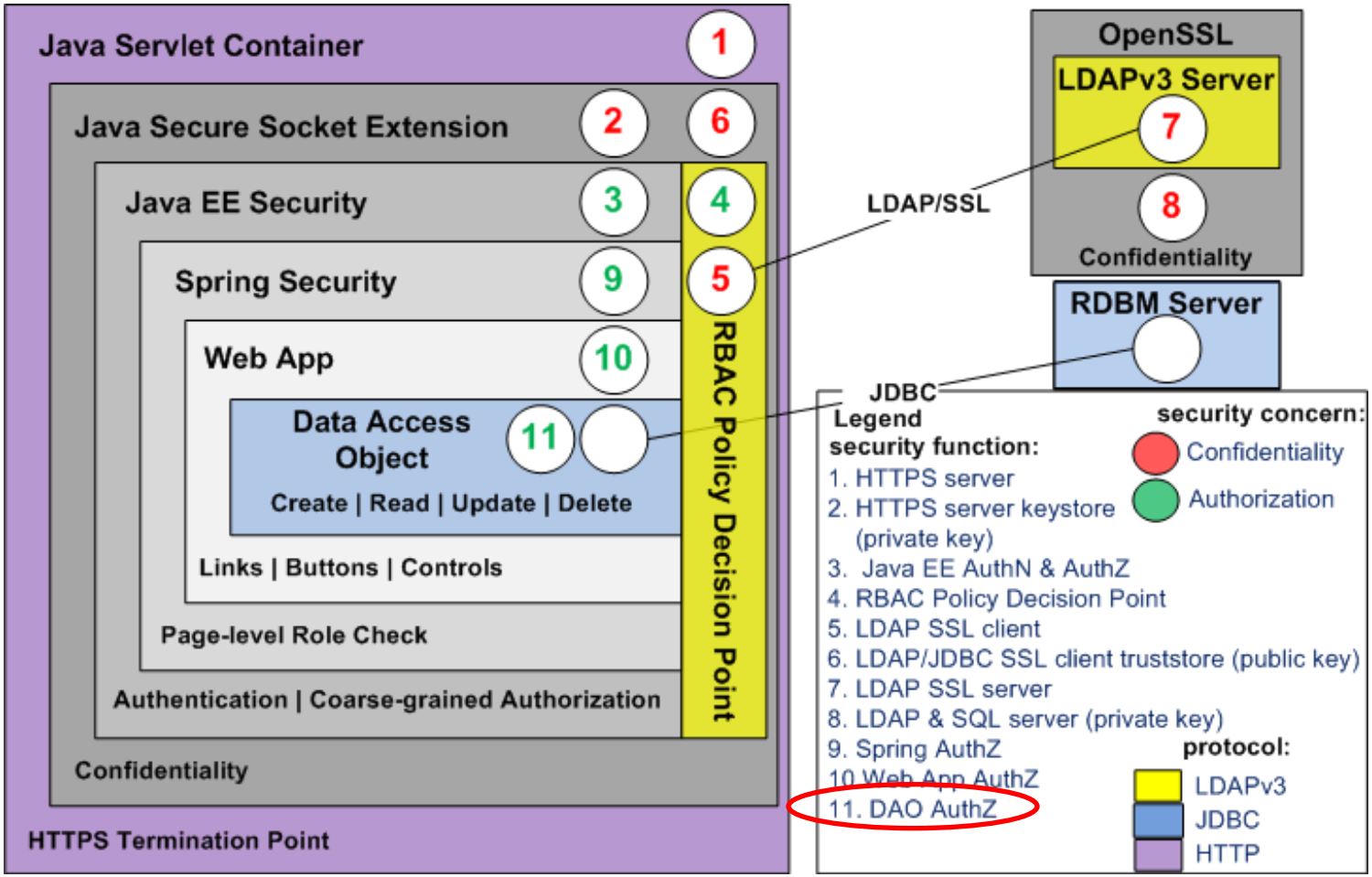
Add Security Aware DAO components



Add Security Aware DAO components

```
public Page1EO updatePage1( Page1EO entity )
{
   ...
 if(checkAccess(“Page1”,“Update”,entity.getCust()))
{
   // Call DAO.update method...
}
else
 throw new RuntimeException("Unauthorized”);
...
return entity;
}
```

fine-grained authorization (programmatic)

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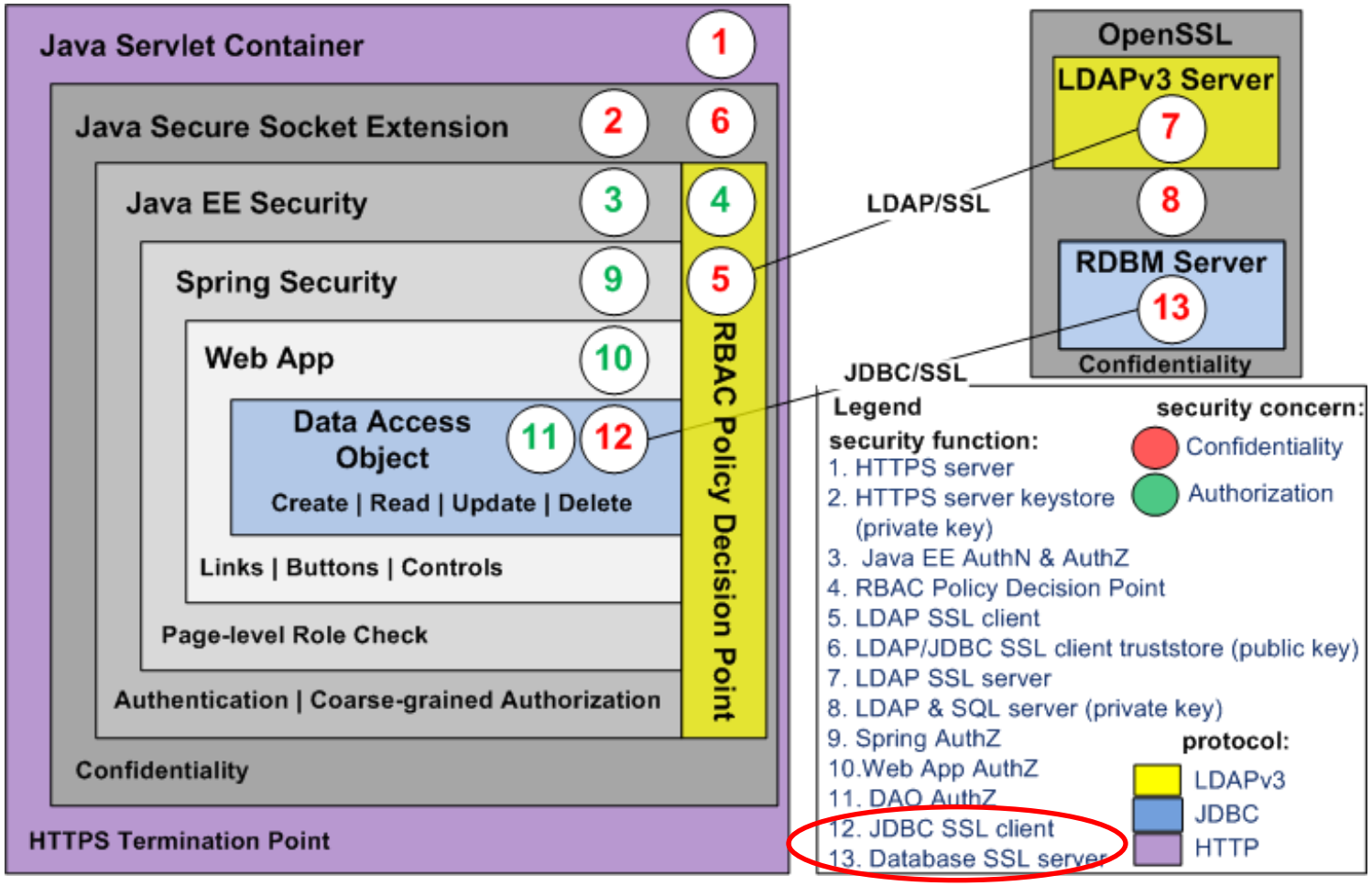
Enable DB SSL



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Enable MySQL SSL Server

Add to MySQL my.cnf file:

1. Instruct listener to use host name in certificate:

```
bind-address = db-domain-name.com
```

2. Add generated OpenSSL artifacts:

```
ssl-ca=/path/ca-cert.pem
ssl-cert=/path/server-cert.pem
ssl-key=/path/server-key.pem
```

Enable MySQL SSL Server

Step 7:

http://symas.com/javadocs/fortressdemo2/doc-files/V-mysql.html

Enable MySQL SSL Client

Add to fortress.properties of Web application:

```
# Sets trust.store params as
  System.property to be used by JDBC
  driver:
trust.store.set.prop=true


# These are the JDBC configuration params
  for MyBatis DAO connect to MySQL database
  example:
database.driver=com.mysql.jdbc.Driver
database.url= db-domain-name.com:3306/
  jdbc:mysql://demoDB
  ?useSSL=true&amp;requireSSL=true
```

Demo

- https://symas.com/javadocs/fortressdemo2/
- https://github.com/shawnmckinney/fortressdemo2
- https://symas.com/javadocs/fortressdemo2/doc-files/VIII-demo.html

Thank You