MIT WORLD PEACE UNIVERSITY

Information and Cybersecurity
Second Year B. Tech, Semester 1

SECURED WEB APPLICATIONS

LAB ASSIGNMENT 9

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1 Aim

Demonstration of secured web applications system using SSL certificates and its deployment in Apache tomcat server

2 Objectives

To learn different vulnerability scanning.

3 Theory

3.1 SSL Certificate

An SSL (Secure Sockets Layer) certificate is a digital certificate that verifies the authenticity of a website and encrypts data transmitted between the website and the user's web browser. SSL certificates ensure that all sensitive information, such as usernames, passwords, and credit card numbers, are transmitted securely over the internet.

3.2 How does an SSL certificate work?

When a user visits a website that has an SSL certificate, the website's server sends the user's web browser a copy of the certificate. The browser then verifies the certificate with the Certificate Authority (CA) that issued it. If the certificate is valid, the browser establishes a secure connection with the website using SSL/TLS encryption.

3.3 Types of SSL certificates

There are different types of SSL certificates based on the number of domains or subdomains they cover, the level of validation, and the warranty offered by the Certificate Authority (CA). Some common types of SSL certificates include:

1. Domain Validated (DV) SSL Certificate: This type of SSL certificate only validates the domain name of the website, ensuring that it belongs to the entity requesting the certificate. DV SSL certificates are the most common type of SSL certificate and are suitable for personal websites or blogs.

2. Organization Validated (OV) SSL Certificate: This type of SSL certificate validates both the domain name and the identity of the organization or business requesting the certificate. OV SSL certificates are suitable for e-commerce websites and other online businesses.

3. Extended Validation (EV) SSL Certificate: This type of SSL certificate provides the highest level of validation and requires extensive documentation to prove the identity of the organization requesting the certificate. EV SSL certificates are suitable for large businesses and financial institutions.

4. Wildcard SSL Certificate: This type of SSL certificate covers multiple subdomains of a single domain name. For example, a wildcard SSL certificate for the domain example.com would cover subdomains such as blog.example.com and shop.example.com.

3.4 Benefits of SSL certificates

There are several benefits of using an SSL certificate for a website, including:

1. Data encryption: SSL certificates encrypt all data transmitted between the website and the user's web browser, ensuring that sensitive information is secure.
2. Authentication: SSL certificates provide authentication, verifying that the website is legitimate and belongs to the entity requesting the certificate.
3. Trust and credibility: SSL certificates display trust indicators, such as the padlock icon in the web browser's address bar, which can increase a website's credibility and reputation.
4. SEO benefits: SSL certificates can improve a website's search engine ranking, as search engines prefer secure websites.
5.

3.5 Example

Suppose you want to create an e-commerce website where users can purchase products and enter their personal information, such as name, address, and credit card details. To ensure that the website is secure and trustworthy, you decide to obtain an SSL certificate.

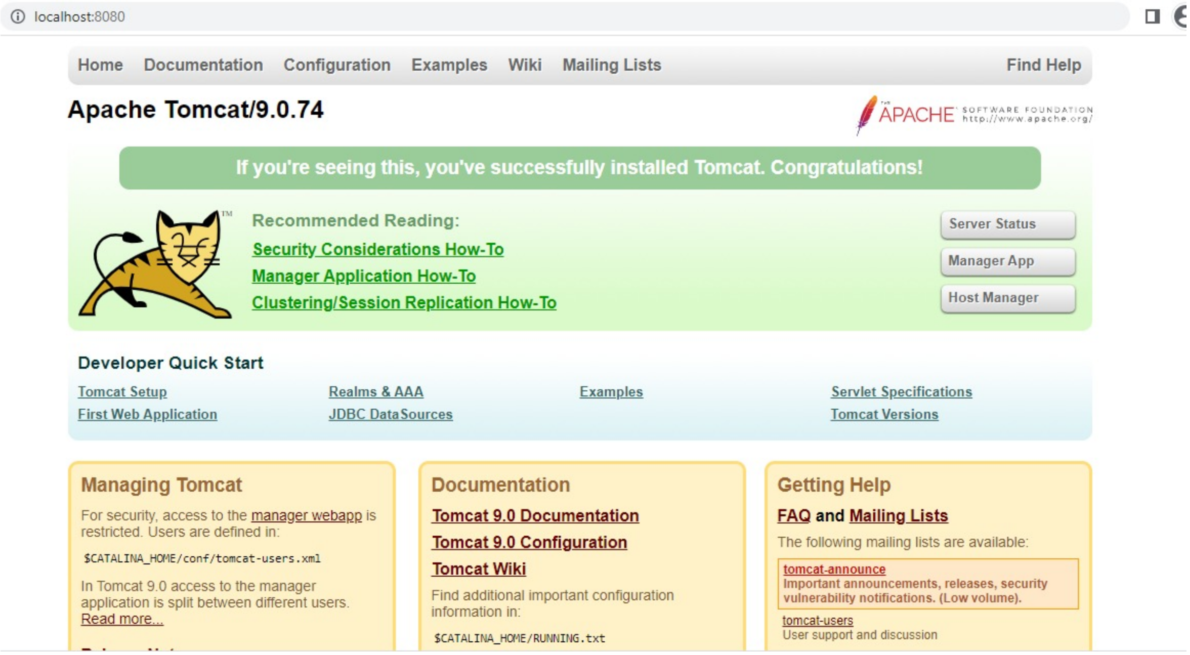
You choose to purchase an OV SSL certificate, which will validate your domain name and your business's identity. You submit your company's legal documents and undergo a validation process to prove your identity.

Once the CA verifies your documents and identity, they issue the SSL certificate, which you install on your website's server. Now, when users visit your website, their web browsers will establish a secure connection using SSL/TLS encryption, ensuring that their personal information is protected.

4 Platform

Operating System: Arch Linux x86-64
IDEs or Text Editors Used: Visual Studio Code

5 Input and Output



Apache Tomcat/9.0.74

If you're seeing this, you've successfully installed Tomcat. Congratulations!

Recommended Reading:

Security Considerations How-To

Manager Application How-To

Clustering/Session Replication How-To

Developer Quick Start

Tomcat Setup

First Web Application

Realms & AAA

JDBC DataSources

Examples

Servlet Specifications

Tomcat Versions

Managing Tomcat

For security, access to the manager webapp is restricted. Users are defined in:

```
$CATALINA_HOME/conf/tomcat-users.xml
```

In Tomcat 9.0 access to the manager application is split between different users. Read more...

Documentation

Tomcat 9.0 Documentation

Tomcat 9.0 Configuration

Tomcat Wiki

Find additional important configuration information in:

```
$CATALINA_HOME/RUNNING.txt
```

Getting Help

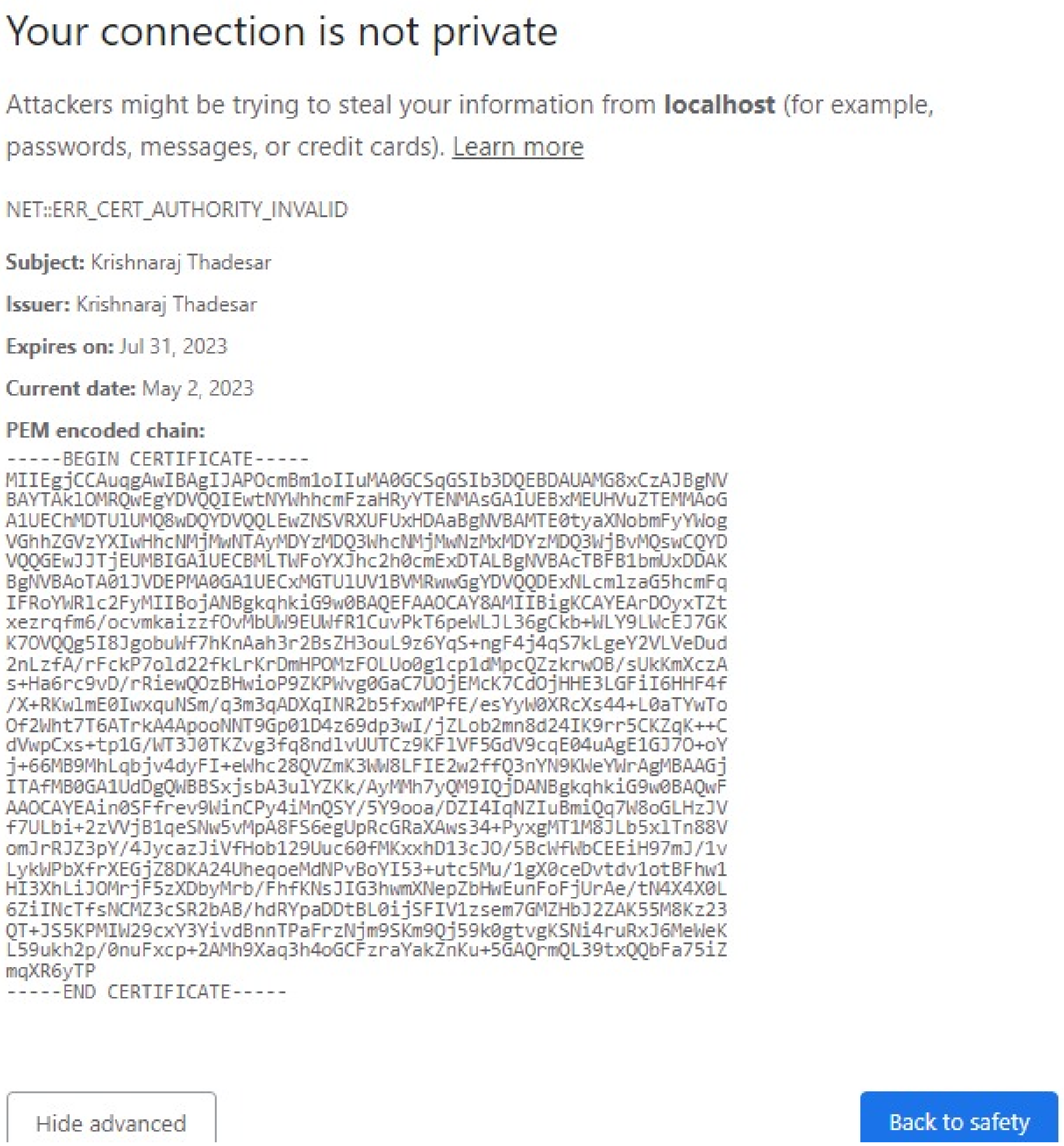
FAQ and Mailing Lists

The following mailing lists are available:

tomcat-announce
Important announcements, releases, security vulnerability notifications. (Low volume).

tomcat-users
User support and discussion

Figure 1:



Your connection is not private

Attackers might be trying to steal your information from **localhost** (for example, passwords, messages, or credit cards). Learn more

NET::ERR_CERT_AUTHORITY_INVALID

Subject: Krishnaraj Thadesar

Issuer: Krishnaraj Thadesar

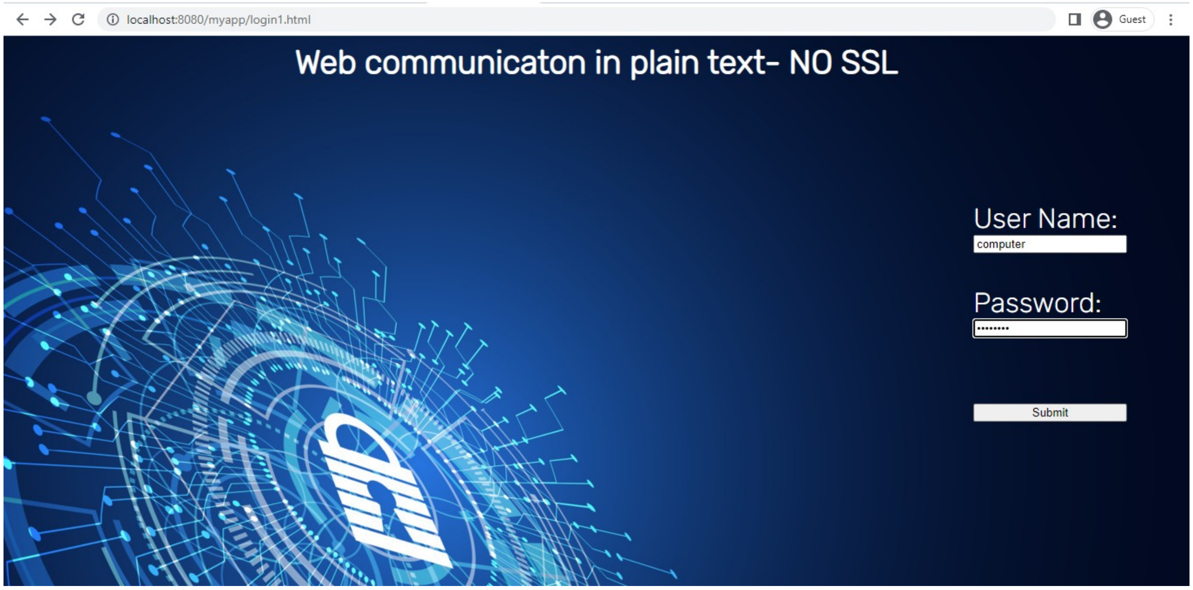
Expires on: Jul 31, 2023

Current date: May 2, 2023

PEM encoded chain:

```
-----BEGIN CERTIFICATE-----
MIIEgjCCAuqgAwIBAgIJAPOcmBm1oIIuMA0GCSqGSIb3DQEBDAUAMG8xCzAJBgNV
BAYTAklOMRQwEgYDVQQIEwtNYWhhcmFzaHRyYTENMAsGA1UEBxMEUHVuZTEMMAoG
A1UEChMDTU1UMQ8wDQYDVQQLEwZNSVRXUFUxHDAaBgNVBAMTE0tyaXNobmFyYWog
VGhhZGVzYXIwHhcNMjMwNTAyMDYzMDQ3WhcNMjMwNzMxMDYzMDQ3WjBvMQswCQYD
VQQGEwJJTjEUMBIGA1UECBMLTWFoYXJhc2h0cmExDTALBgNVBAcTBFB1bmUxDDAK
BgNVBAoTA01JVDEPMA0GA1UECxMGTU1UV1BVMRwwGgYDVQQDExNLcmlzaG5hcmFq
IFRoYWRlc2FyMIIBojANBgkqhkiG9w0BAQEFAAOCAY8AMIIBigKCAYEArDOyxTZt
xezrqfm6/ocvmkaizzfOvMbUW9EUWfR1CuvPkT6peWLJL36gCkb+WLY9LWcEJ7GK
K7OVQQg5I8JgobuWf7hKnAah3r2BsZH3ouL9z6YqS+ngF4j4qS7kLgeY2VLVeDud
2nLzfA/rFckP7old22fkLrKrDmHPOMzFOLUo0g1cp1dMpcQZzkrwOB/sUkKmXczA
s+Ha6rc9vD/rRiewQOzBHwioP9ZKPWvg0GaC7UOjEMcK7CdOjHHE3LGFiI6HHF4f
/X+RKwlmE0IwxquNSm/q3m3qADXqINR2b5fxwMPfE/esYyW0XRcXs44+L0aTYwTo
Of2Wht7T6ATrkA4ApooNNT9Gp01D4z69dp3wI/jZLob2mn8d24IK9rr5CKZqK++C
dVwpCxs+tp1G/WT3J0TKZvg3fq8nd1vUUTCz9KF1VF5GdV9cqE04uAgE1GJ7O+oY
j+66MB9MhLqbjv4dyFI+eWhc28QVZmK3WW8LFIE2w2ffQ3nYN9KWeYWrAgMBAAGj
ITAfMB0GA1UdDgQWBBSxjsbA3ulYZKk/AyMMh7yQM9IQjDANBgkqhkiG9w0BAQwF
AAOCAYEAin0SFfrev9WinCPy4iMnQSY/5Y9ooa/DZI4IqNZIuBmiQq7W8oGLHzJV
f7ULbi+2zVVjB1qeSNw5vMpA8FS6egUpRcGRaXAws34+PyxgMT1M8JLb5xlTn88V
omJrRJZ3pY/4JycazJiVfHob129Uuc60fMKxxhD13cJO/5BcWfWbCEEiH97mJ/1v
LykWPbXfrXEGjZ8DKA24UheqoeMdNPvBoYI53+utc5Mu/1gX0ceDvtdv1otBFhw1
HI3XhLiJOMrjF5zXDbyMrb/FhfKNsJIG3hwmXNepZbHwEunFoFjUrAe/tN4X4X0L
6ZiINcTfsNCMZ3cSR2bAB/hdRYpaDDtBL0ijSFIV1zsem7GMZHbJ2ZAK55M8Kz23
QT+JS5KPMIW29cxY3YivdBnnTPaFrzNjm9SKm9Qj59k0gtvgKSNi4ruRxJ6MeWeK
L59ukh2p/0nuFxcp+2AMh9Xaq3h4oGCFzraYakZnKu+5GAQrmQL39txQQbFa75iZ
mqXR6yTP
-----END CERTIFICATE-----
```

Figure 2:

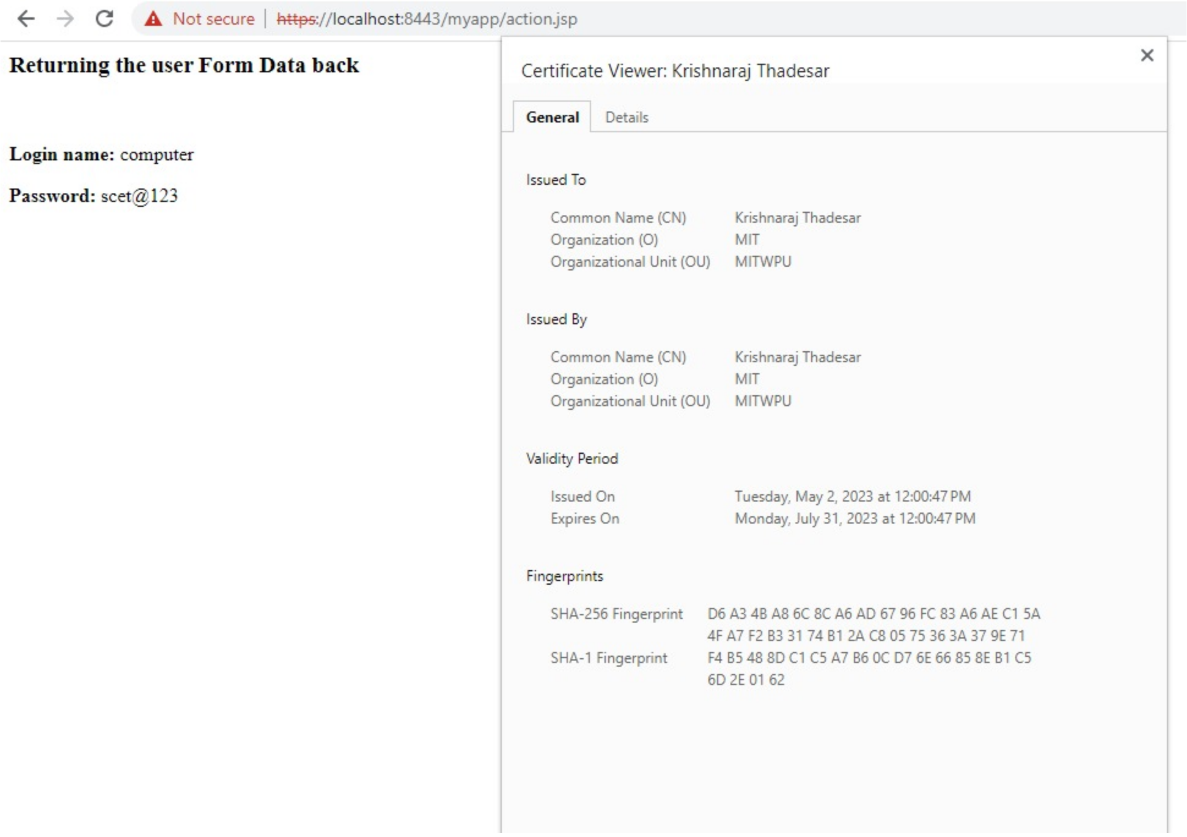


Web communicaton in plain text- NO SSL

User Name: computer

Password: ••••••••

Figure 3:



Returning the user Form Data back

Login name: computer

Password: scet@123

Certificate Viewer: Krishnaraj Thadesar

Issued To

Common Name (CN)	Krishnaraj Thadesar
Organization (O)	MIT
Organizational Unit (OU)	MITWPU

Issued By

Common Name (CN)	Krishnaraj Thadesar
Organization (O)	MIT
Organizational Unit (OU)	MITWPU

Validity Period

Issued On	Tuesday, May 2, 2023 at 12:00:47 PM
Expires On	Monday, July 31, 2023 at 12:00:47 PM

Fingerprints

SHA-256 Fingerprint	D6 A3 4B A8 6C 8C A6 AD 67 96 FC 83 A6 AE C1 5A 4F A7 F2 B3 31 74 B1 2A C8 05 75 36 3A 37 9E 71
SHA-1 Fingerprint	F4 B5 48 8D C1 C5 A7 B6 0C D7 6E 66 85 8E B1 C5 6D 2E 01 62

Figure 4:

```
The Given Signature is Valid
```

6 Conclusion

Thus, we have successfully implemented

7 FAQ

1. **What type of encryption does SSL use?**

   Secure Socket Layer (SSL) uses a combination of symmetric and asymmetric encryption to secure data transmitted over a network. SSL uses asymmetric encryption during the initial handshake process, where the client and server exchange public keys to establish a secure communication channel. Once the secure channel is established, SSL uses symmetric encryption to encrypt the data being transmitted between the client and server.

   Symmetric encryption uses a single secret key to encrypt and decrypt data, while asymmetric encryption uses a pair of keys, one private and one public. The public key can be freely shared, while the private key is kept secret. In SSL, the public key is used to encrypt the data, and the private key is used to decrypt the data.

   SSL supports a variety of symmetric encryption algorithms, including AES, DES, and 3DES. It also supports a variety of asymmetric encryption algorithms, including RSA, DSA, and ECDSA.

2. **How safe is SSL?**

   SSL is generally considered to be a secure protocol for transmitting sensitive data over a network. SSL has undergone multiple revisions over the years, with the latest version being Transport Layer Security (TLS). TLS version 1.3 is the latest and most secure version of SSL/TLS, which has been designed to provide strong encryption and better security features.

   However, SSL can be vulnerable to various types of attacks, such as Man-in-the-Middle (MITM) attacks, where an attacker intercepts the communication between the client and server and eavesdrops on the conversation or alters the data being transmitted. SSL is also vulnerable to attacks that exploit weaknesses in the encryption algorithms or the SSL protocol itself.

   To mitigate these risks, SSL implementations must be properly configured and maintained to ensure they are up-to-date with the latest security patches and best practices. It is also recommended to use SSL/TLS certificates from trusted Certificate Authorities (CA) and to use strong passwords and multi-factor authentication to protect the private keys used for encryption.

3. **What are the benefits of SSL?**

   The benefits of SSL include:

   (a) Data encryption: SSL encrypts the data transmitted between the client and server, which helps to protect the data from unauthorized access and eavesdropping.

   (b) Authentication: SSL uses digital certificates to authenticate the identity of the server and ensure that the client is communicating with the intended server.

   (c) Trust: SSL/TLS certificates are issued by trusted Certificate Authorities (CA) that verify the identity of the server and ensure that the SSL/TLS certificate is valid.

(d) Compliance: SSL is required by many industry regulations and compliance standards, such as the Payment Card Industry Data Security Standard (PCI DSS).

(e) Improved search engine ranking: Google has confirmed that HTTPS is a ranking factor, and using SSL/TLS can help to improve search engine rankings.