TLS vs MTLS

TLS (Transport Layer Security)

- TLS is like a secure tunnel between a client and server
- It provides:
    i. Encryption: Data transmitted is encrypted, preventing eavesdropping
    ii. Data Integrity: Ensures data hasn't been tampered with during transmission
    iii. Server Authentication: The server proves its identity to the client using a certificate
- In standard TLS, only the server has a certificate, and only the server is verified

mTLS (Mutual TLS)

- mTLS adds client authentication to standard TLS
- Both parties must present certificates and verify each other
- It provides:
    i. Everything TLS provides (encryption, integrity, server authentication)
    ii. Plus Client Authentication: The client must also prove its identity with a certificate
- Perfect for microservices architecture because ->
    - **Service-to-Service Authentication**: Each service can verify the identity of other services
    - **Zero Trust Security**: Every request must be authenticated, regardless of source

MTLS Workflow used below

1. Client presents its certificate
2. Server validates client certificate
3. Client validates server certificate
4. Secure, encrypted communication established

Setup

1. **Generating the server.p12 file using keytool**

```
keytool -genkeypair -alias server -keyalg RSA -keysize 4096 -validity 365 -dname "CN=Server,OU=S
```

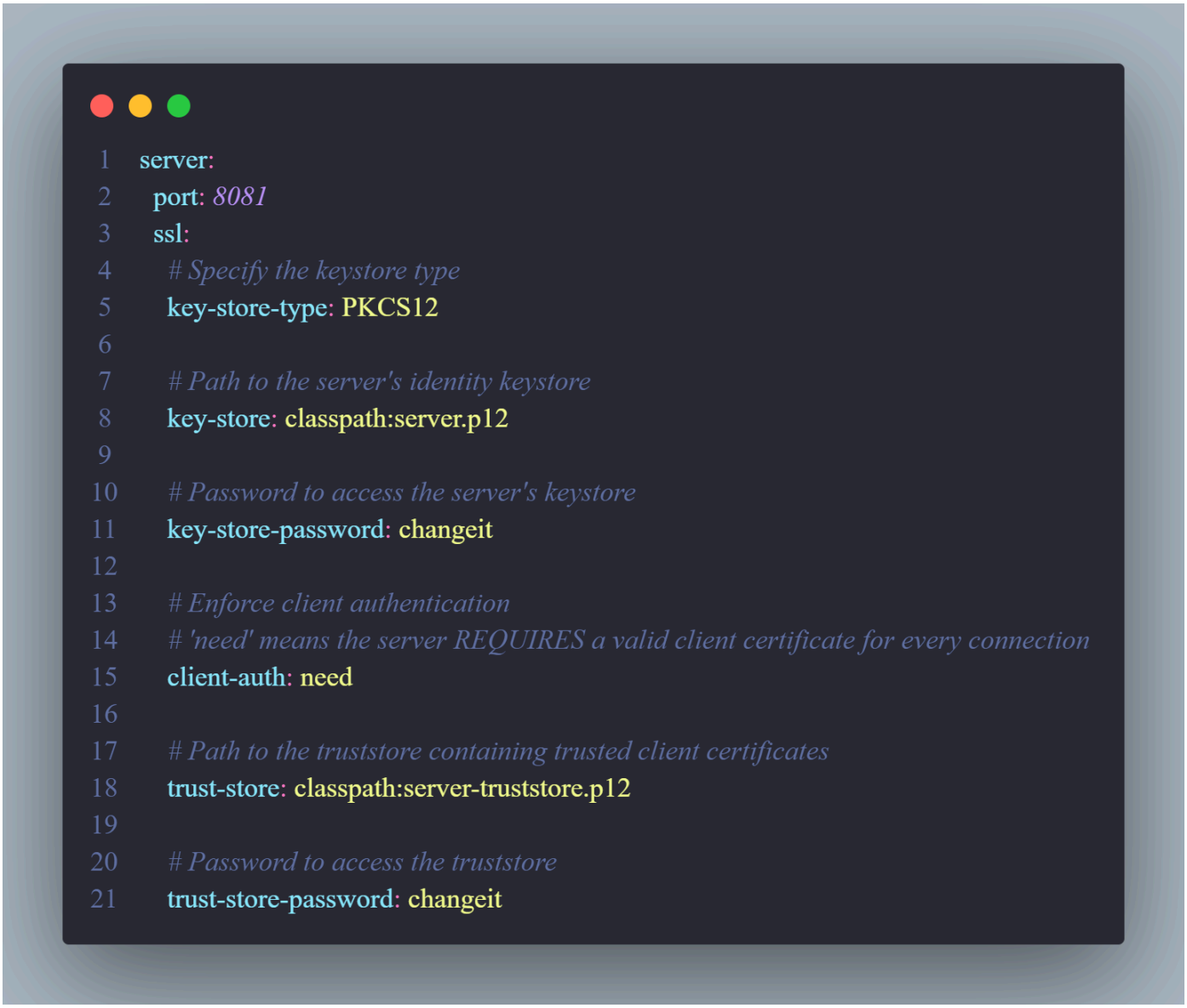
2 **Client Setup**

```
# Generated client's identity
keytool -genkeypair -alias client -keystore client.p12
# Exported client's public cert
keytool -export -alias client -file client.cer
```

3. **Trust Setup**

```
# Created server's truststore with client's cert
keytool -import -alias client -file client.cer -keystore server-truststore.p12
```

4. **Configuration done in application.properties file**



```
server:
  port: 8081
  ssl:
    # Specify the keystore type
    key-store-type: PKCS12

    # Path to the server's identity keystore
    key-store: classpath:server.p12

    # Password to access the server's keystore
    key-store-password: changeit

    # Enforce client authentication
    # 'need' means the server REQUIRES a valid client certificate for every connection
    client-auth: need

    # Path to the truststore containing trusted client certificates
    trust-store: classpath:server-truststore.p12

    # Password to access the truststore
    trust-store-password: changeit
```

Demo

- Command used ->

```
curl -k -v --cert-type P12 --cert client.p12:changeit https://localhost:8081/api/v1/user/1
```