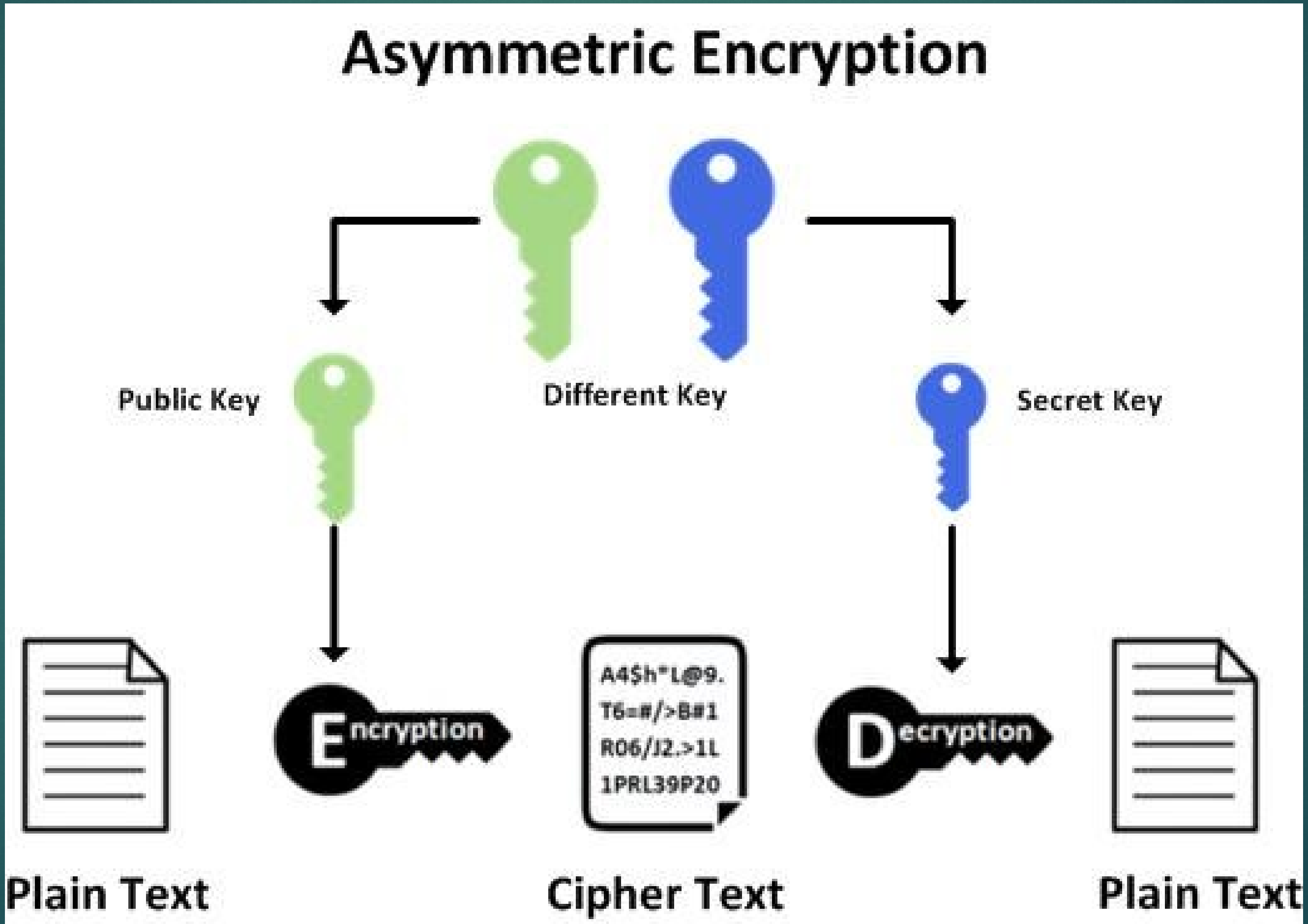
Network Security Laboratory – Lecture 3

SSL AND TLS

Asymmetric Cryptography



Secure Socket Layer (SSL) and Transport Layer Security (TLS)

- Cryptographic protocols designed to provide security over network
- TLS: provides privacy and data integrity between hosts
- The connection is **SECURE** since data are encrypted with symmetric cryptography
- The **IDENTITY** of hosts is authenticated with public key cryptography
- The connection is **RELIABLE** since messages includes a message integrity check using a Message Authentication Code to prevent manipulation during transmission

Certificates

- Is an electronic document used to verify the owner's identity
- It includes information about owner identity, the public key and the signature of the entity who verified the certificate's content
- In a common Public Key Infrastructure (PKI), certificates are released by a Certificate Authority (CA)
- Based on X509 protocol

Certificate Validation

- When a connection is setup, the server sends to the client its certificate and the client checks if it is valid

- In order to do that, the client has to check if:

1. The subject of the certificate matches the hostname (i.e., domain name) to which the client is trying to connect
2. The certificate is signed by a trusted certificate authority

- A TLS server may be configured with a self-signed certificate
- In this case clients will generally be unable to verify the certificate thus, communication will end (unless the certificate checking is disabled)

Self Signed Certificates

- We could generate self-signed certificates
- In order to create a self-signed certificate we must create a custom Certificate Authority
- This type of certificate could be used only for testing purposes
- They are seen as not valid because other hosts consider our CA as “NOT TRUSTED”

Simple SSL/TLS Stream

- In order to create a simple connection between 2 hosts using SSL/TLS protocol, we could use openssl
- Server Side: openssl s_server –key [key] –cert [cert] -accept <<port>>
- Client side: openssl s_client <<host>>:<<port>>
- On wireshark we could see handshake and how message are encrypted

Build a Web Server with certificate

- Let’s now build your own web server
- Install a new self-signed certificate on your server
- Follow the steps on the course material

Letsencrypt certificates

- Letsencrypt it’s a free Certificate Authority
- Try to obtain a valid certificate using letsencrypt

Configure Web Server with Letsencrypt certificate

- Change the configuration of Apache in order to use letsencrypt certificate

- Connect with a browser

- There are any differences on browser between selfsigned and valid certificates?