Section 1.1.3 Computer Networks Fundamentals

HTTPS

{Hypertext Transfer Protocol Secure}

Cracking OSCP: Your Roadmap to Ethical Hacking Success

YouTube: HackProKP – Kailash Parshad

Socials: HackProKP

Github: https://github.com/at0m-b0mb/Cracking-OSCP-Your-Roadmap-to-Ethical-Hacking-Success

Complete Youtube Playlist:
https://www.youtube.com/watch?v=MvkNbn8i2so&list=PLyrv3TPh3ejYNZipa0OIUvkdjHeUTRJ3J&index=1&t=0s

WHAT IS HTTPS?

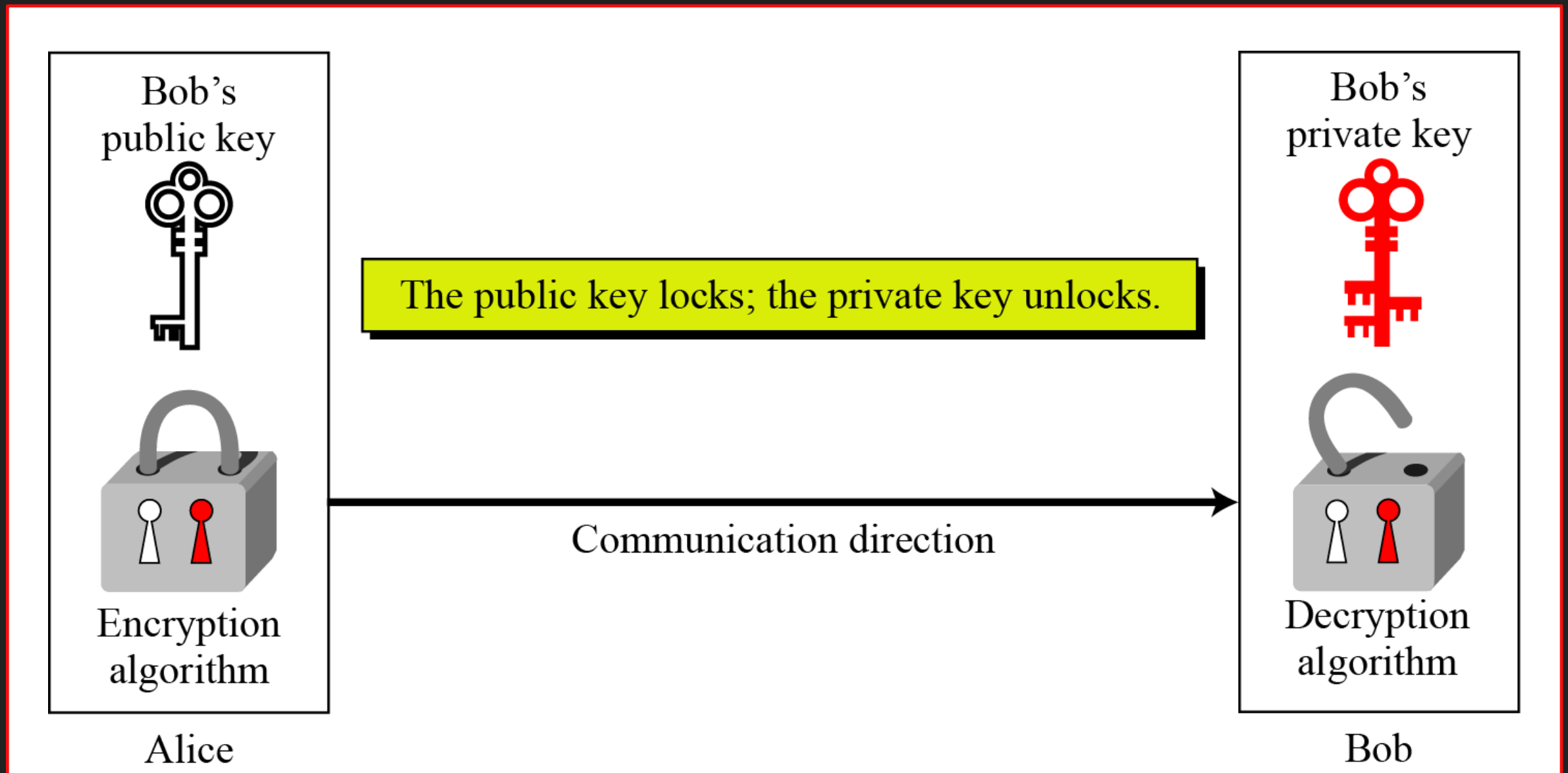
- HTTPS, or **Hypertext Transfer Protocol Secure**, is an extension of HTTP (**Hypertext Transfer Protocol**) designed to provide a secure communication channel over the Internet. It is widely used to ensure the **confidentiality** and **integrity** of data exchanged between a user's web browser and a website

Encryption?

- **SSL/TLS Protocols**: HTTPS relies on SSL (**Secure Sockets Layer**) or its successor, TLS (**Transport Layer Security**), to encrypt data. These protocols ensure that the information exchanged between the user's browser and the server is secure.

Encryption?

- **Public Key Cryptography**: HTTPS uses public key cryptography to secure communication. The server has a **public key** and a **private key**. The public key is used for encryption, and the private key is **kept secret** and used for decryption. This **asymmetrical encryption** ensures that even if someone intercepts the communication, they cannot easily decipher it without the private key.


Bob's public key
Encryption algorithm
Alice
The public key locks; the private key unlocks.
Communication direction
Bob's private key
Decryption algorithm
Bob

Actual Public Key of my Website 😎

Certificate


```
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-----END CERTIFICATE-----
```

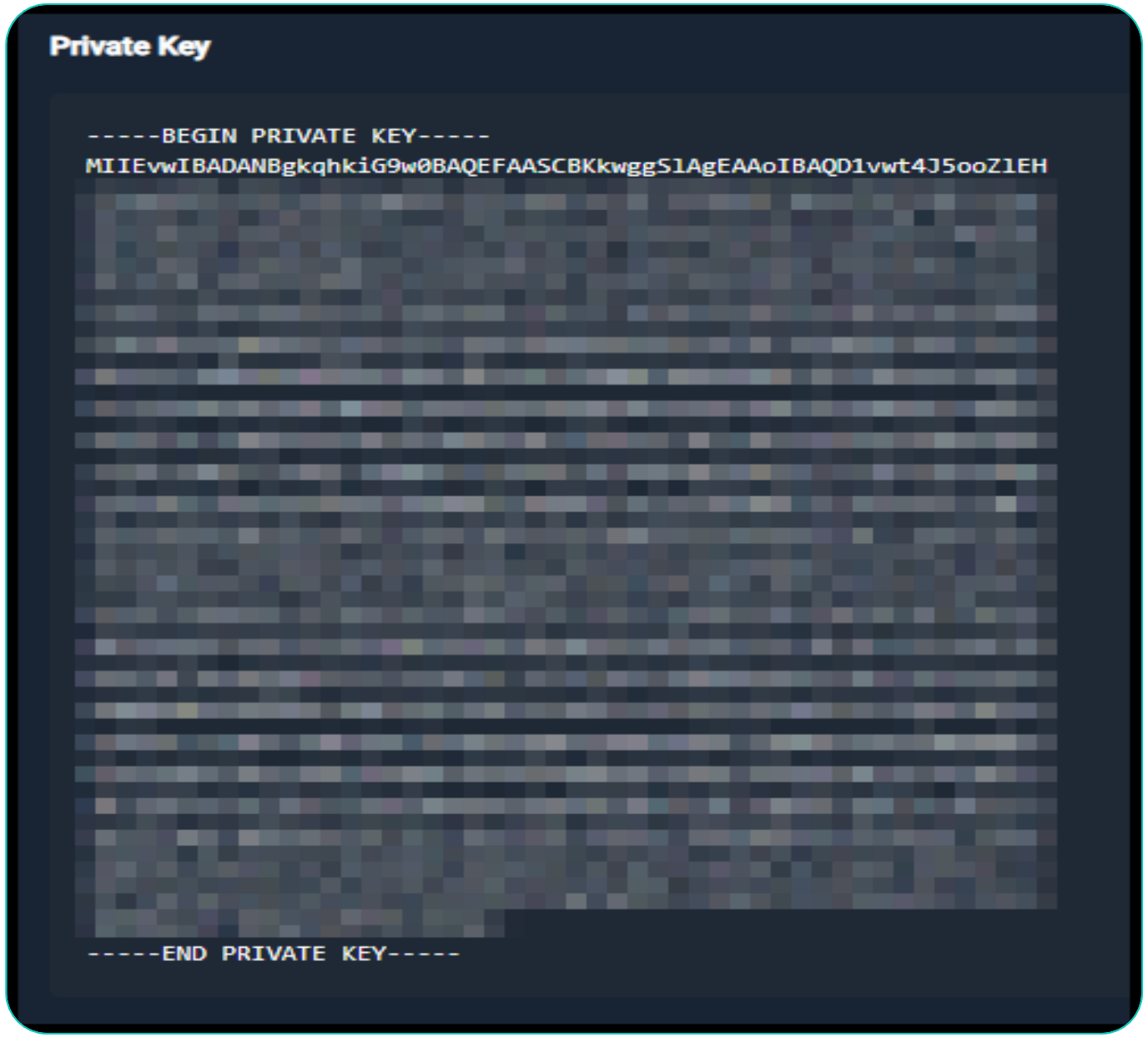

Public Key

Distribution: The public key is freely distributed and known by anyone who wants to communicate securely with the entity associated with that public key.

Encryption: When someone wants to send a secure message to the owner of the public key, they use it to encrypt the message

Authentication: Public keys are also used for authentication. Decrypting a message with the private key associated with a public key confirms its origin from the corresponding entity.

Private Key of my Website? 🔐



Private Key

Secrecy: The private key must be kept confidential and only known to the entity to which it belongs. It should never be shared with others.

Decryption: The private key is used to decrypt messages that were encrypted with the corresponding public key. Only the entity possessing the private key can decrypt these messages.

Digital Signatures: Private keys are also used to create digital signatures. A digital signature is a cryptographic way of proving the origin and integrity of a message or document.

Key Pair Relationship

- **Mathematical Relationship**: The public and private keys in a key pair are mathematically related, but it is computationally infeasible to derive one key from the other. This relationship forms the basis of the security provided by public key cryptography.
- **Key Generation:** When a user or system generates a key pair, the public and private keys are generated together in such a way that information encrypted with one key can only be decrypted with the other.

Use Cases:

- **Secure Communication:** Public key cryptography is commonly used for secure communication over untrusted networks, such as the internet. It ensures that only the intended recipient can decrypt and read the message.

Use Cases:

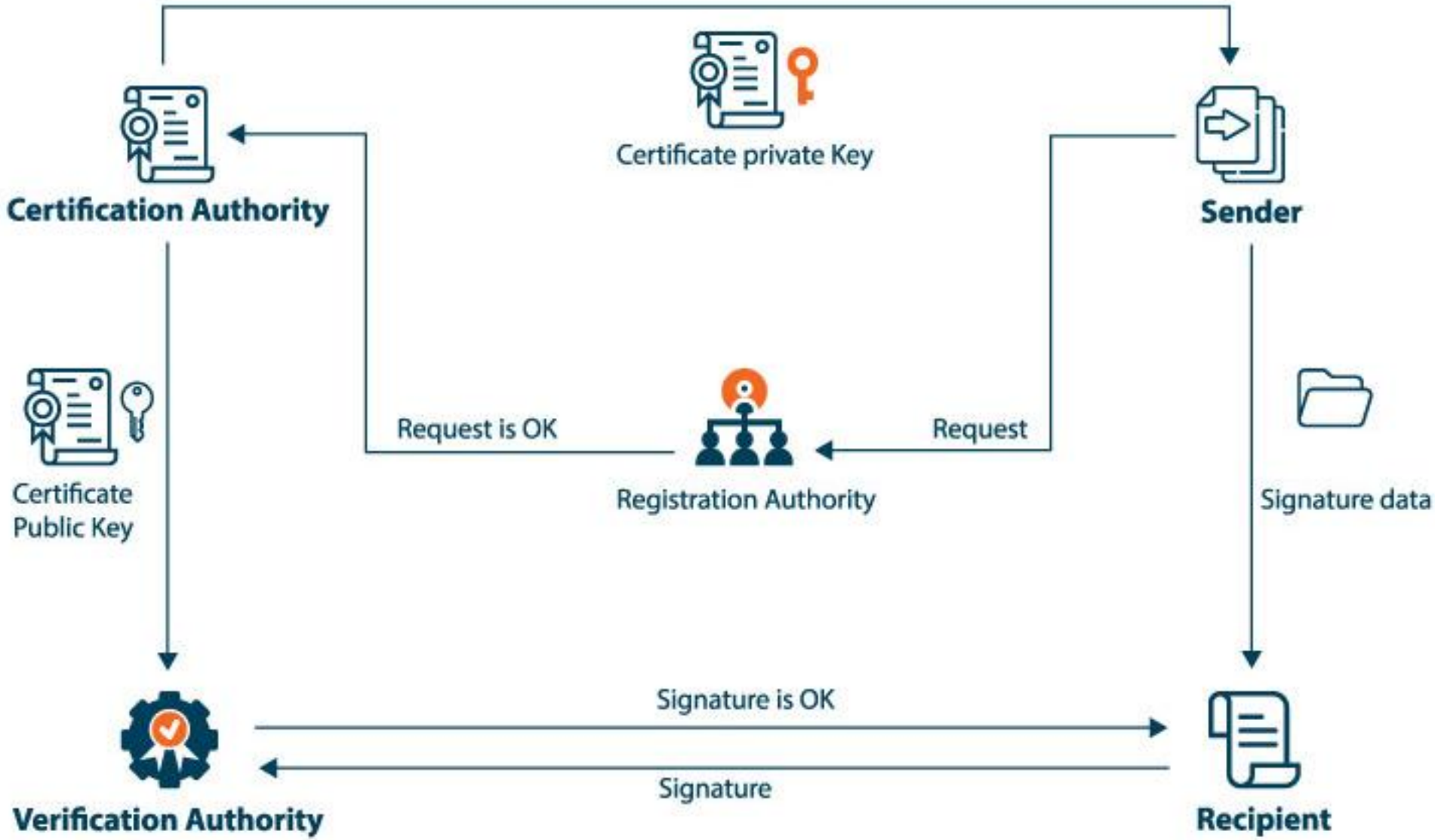
- **Digital Signatures:** Digital signatures verify the authenticity and integrity of a message, providing a way to ensure that a message has not been tampered with and was indeed sent by the claimed sender.

Use Cases:

- **Key Exchange:** Public key cryptography is also used in key exchange protocols, such as the Diffie-Hellman key exchange, to establish a shared secret key between two parties without needing a secure pre-existing channel.

Key Management:

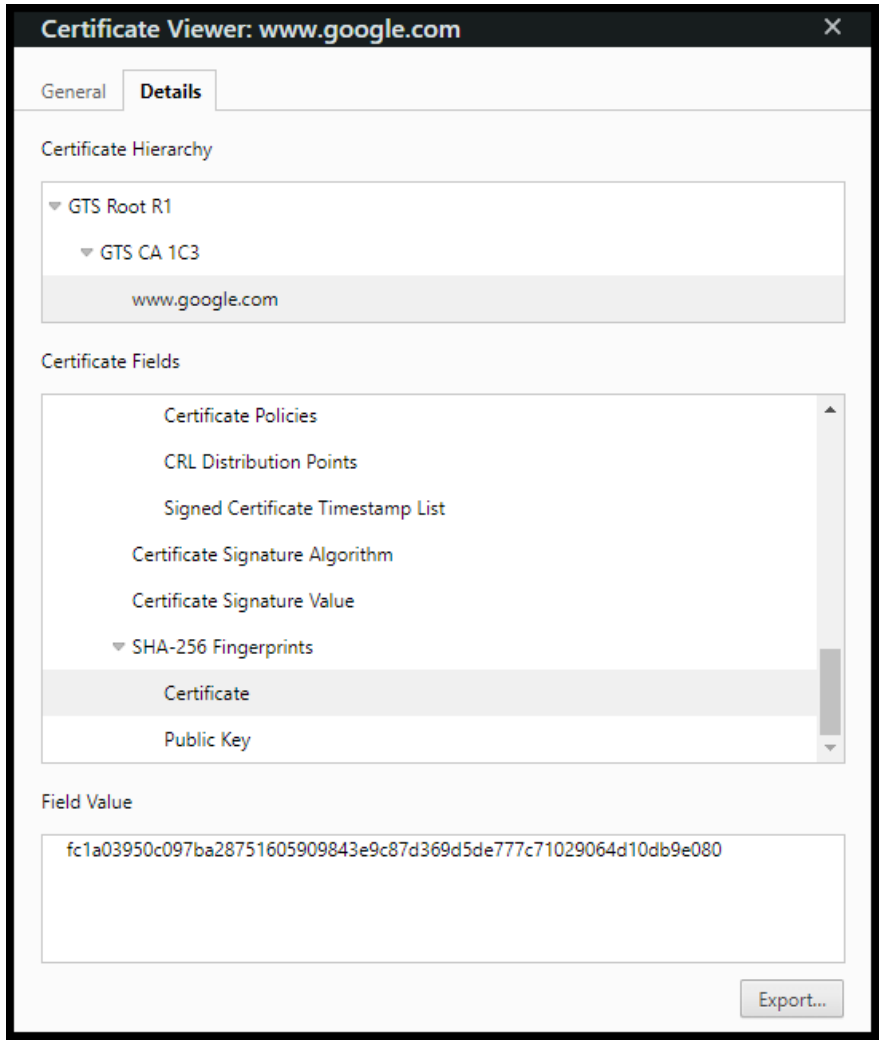
- **Secure Storage:** Private keys must be securely stored to prevent unauthorized access. This is crucial because anyone with the private key can decrypt messages or forge digital signatures.
- **Certificate Authorities (CAs):** In the context of SSL/TLS certificates, a Certificate Authority verifies the identity of an entity and issues a certificate containing the entity's public key. This helps users trust the authenticity of a public key.



https://cheapsslweb.com/blog/what-is-a-certificate-authority-in-pki

Certificate Authority

- A Certificate Authority **(CA)** is a trusted entity responsible for issuing digital certificates in public key infrastructure. CAs verify the authenticity of certificate requests using various methods, such as domain ownership confirmation, legal entity validation, or other agreed-upon processes. Once satisfied, the CA issues a digital certificate, including a public key, which is used to establish secure communication and assure users of a website's legitimacy.


Certificate Viewer: www.google.com
General
Details
Certificate Hierarchy
GTS Root R1
GTS CA 1C3
www.google.com
Certificate Fields
Certificate Policies
CRL Distribution Points
Signed Certificate Timestamp List
Certificate Signature Algorithm
Certificate Signature Value
SHA-256 Fingerprints
Certificate
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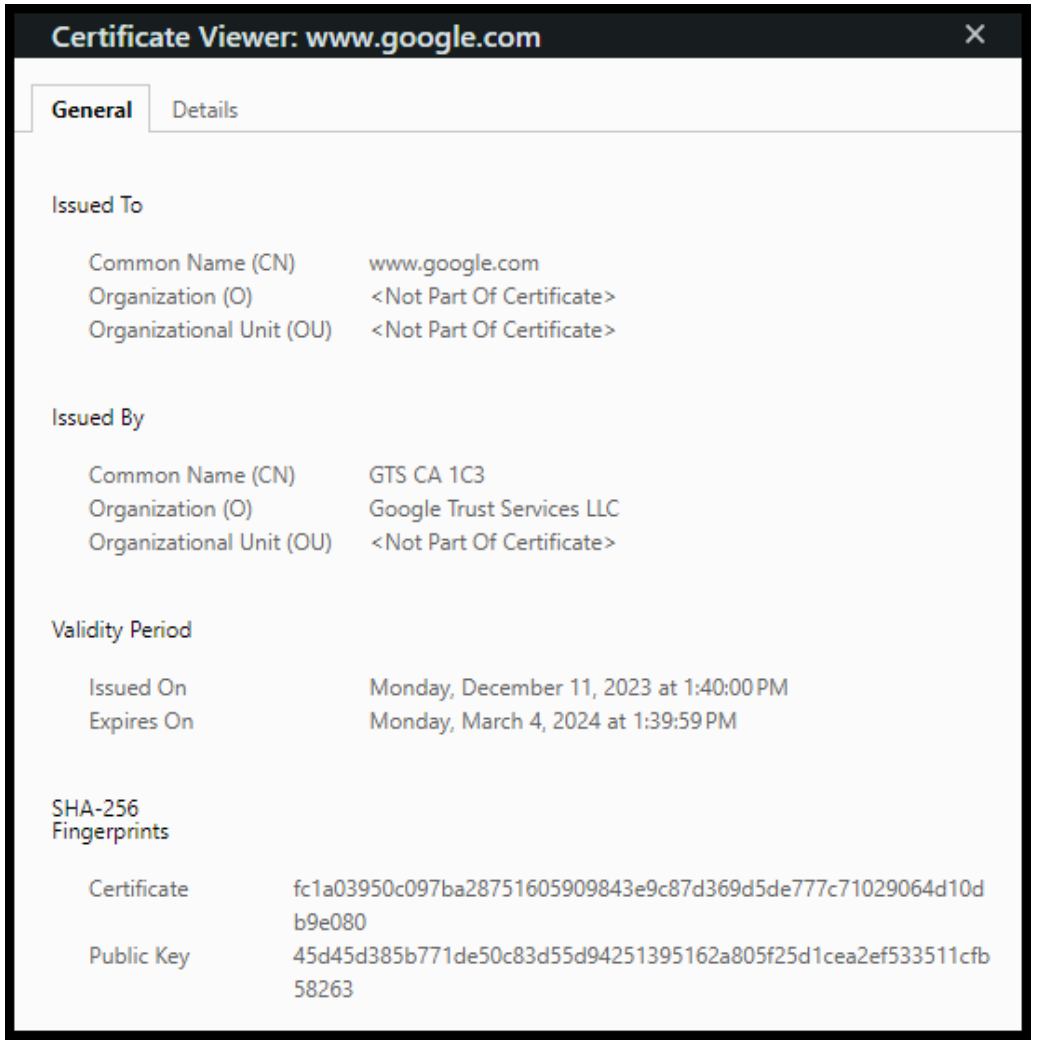
Certificate Viewer: www.google.com
General
Details
Issued To
Common Name (CN) www.google.com
Organization (O) <Not Part Of Certificate>
Organizational Unit (OU) <Not Part Of Certificate>
Issued By
Common Name (CN) GTS CA 1C3
Organization (O) Google Trust Services LLC
Organizational Unit (OU) <Not Part Of Certificate>
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Expires On Monday, March 4, 2024 at 1:39:59 PM
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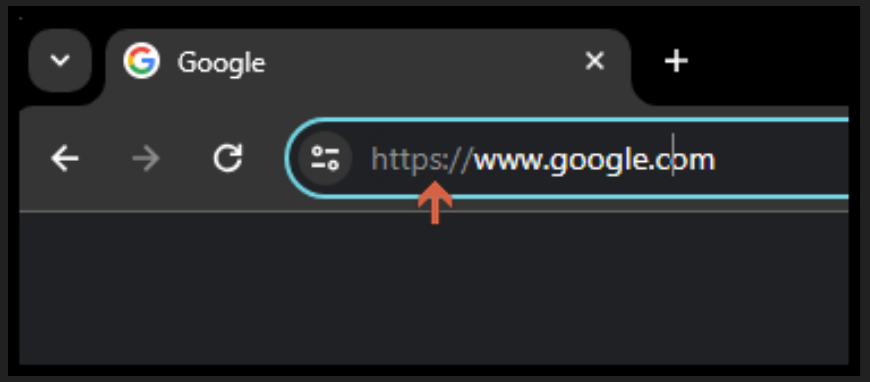
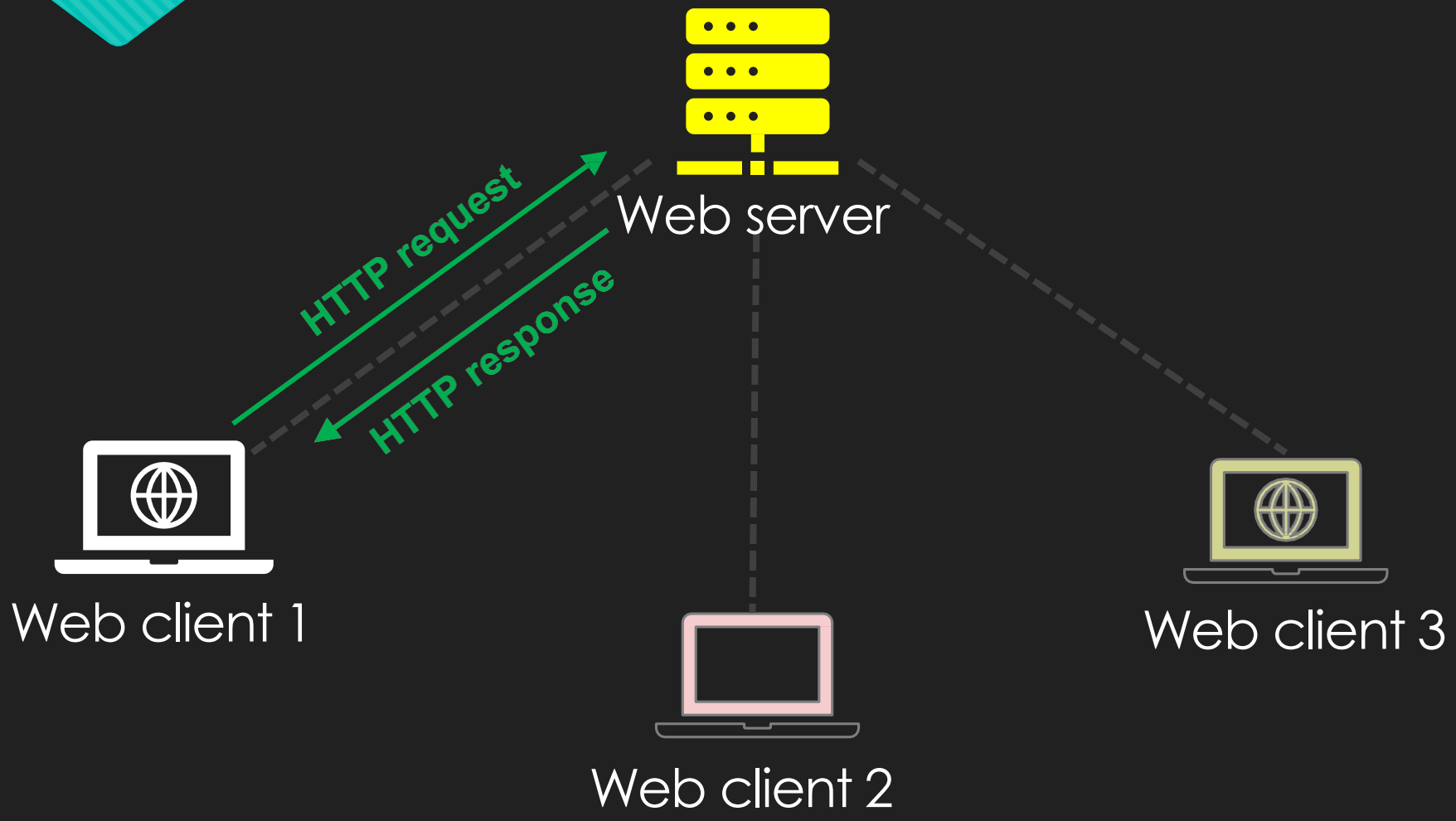
URL (Uniform Resource Locator):

http://www.abc.com/path/test.txt

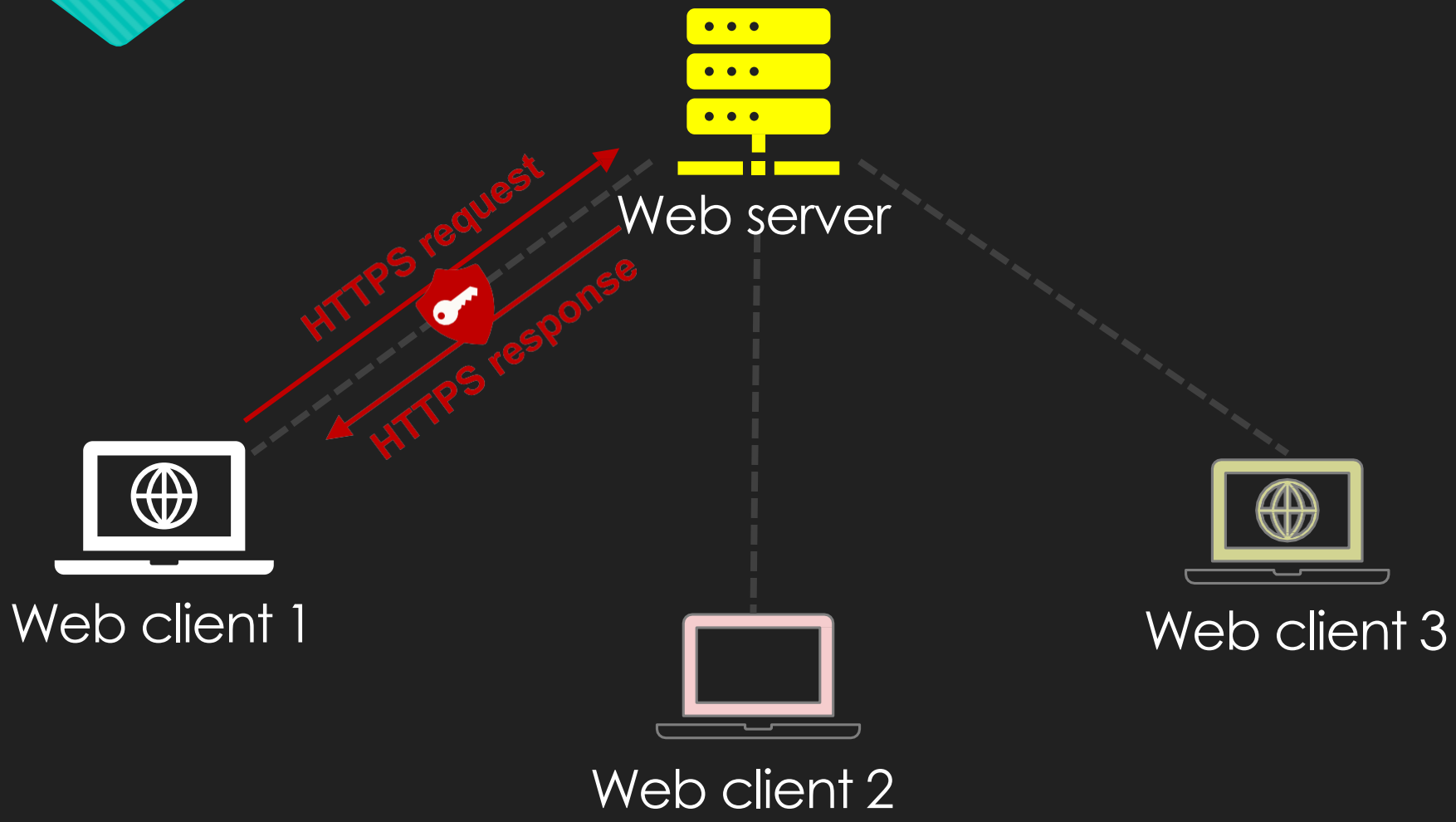
https://www.abc.com/path/test.txt



HOW DOES IT WORK? HTTP!



HOW DOES IT WORK? HTTPS!



Thank You!

😊 ❤️

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