HTTPS and Secure Communication

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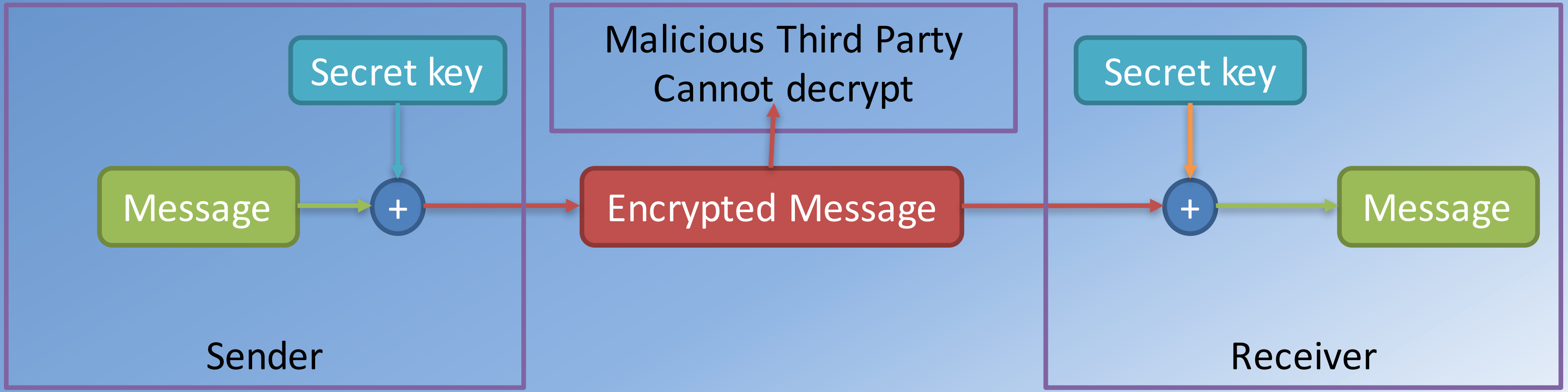
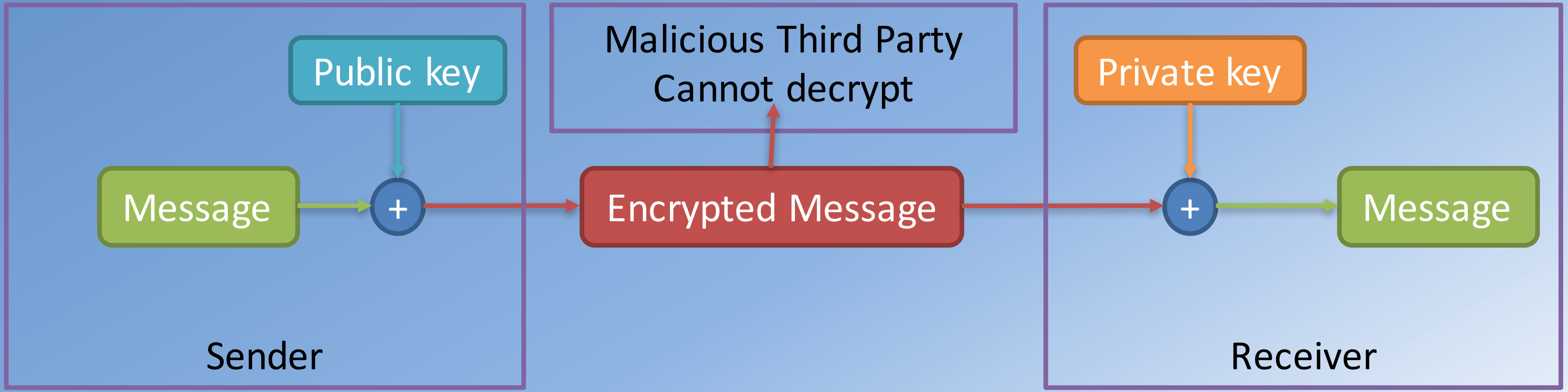
Symmetric Key Cryptography

- Symmetric Encryption:
  - Shared secret key between the two parties



Public Key Cryptography

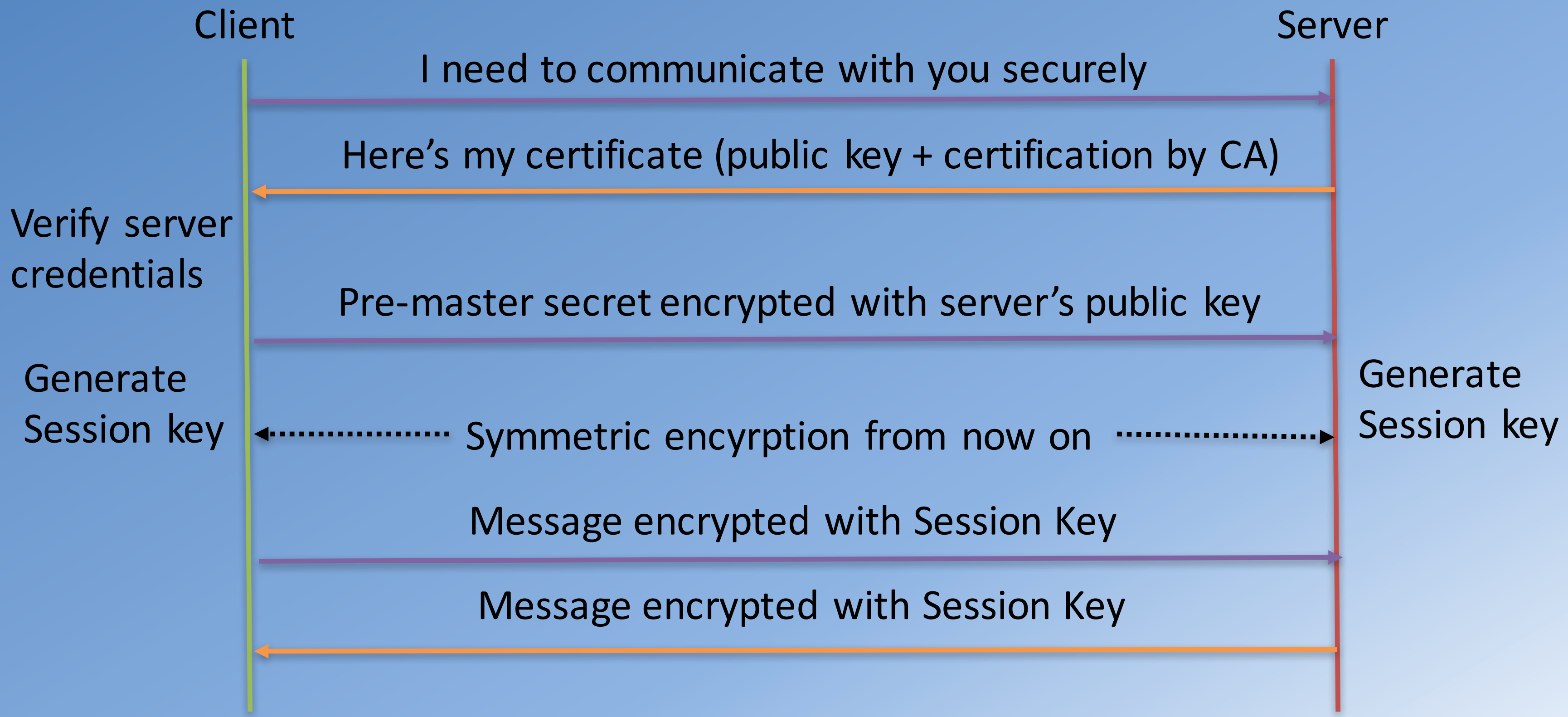
- Asymmetric Encryption:
  - Public key that can be widely distributed
  - Private key that is only known to the receiver



Secure Sockets Layer (SSL) / Transport Layer Security (TLS)

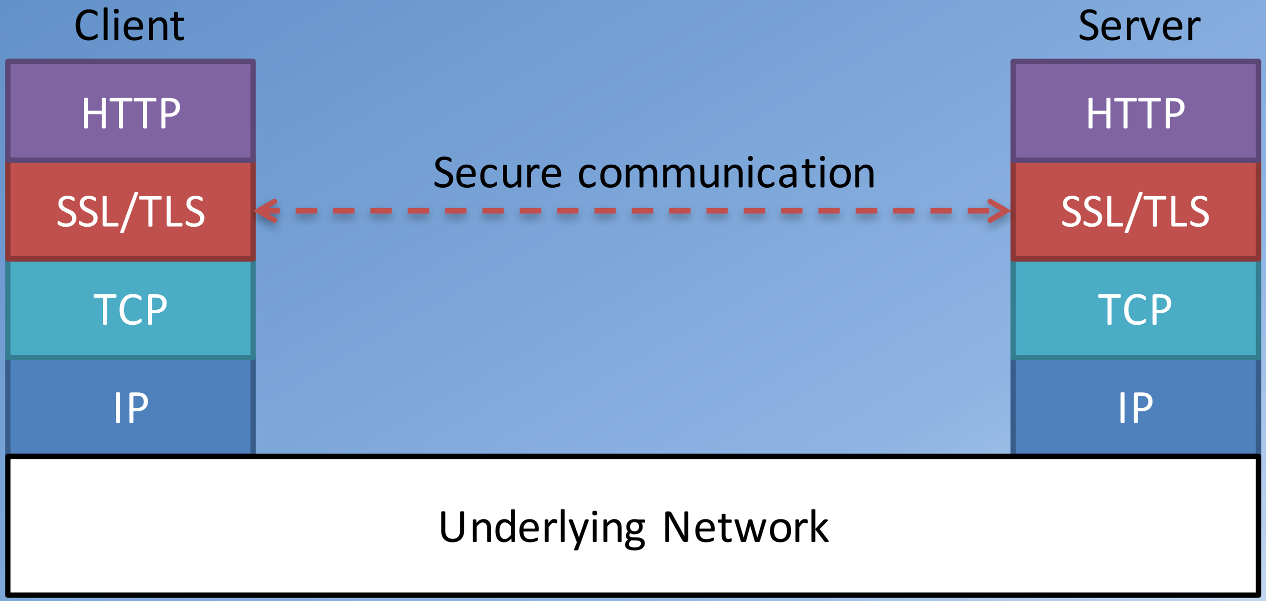
- Cryptographic protocols that enable secure communication over an insecure network like the Internet
- Privacy and Integrity of the communication protected
  - Uses a combination of public-key crytography and symmetric cryptography

SSL/TLS Handshake



Client
Server
I need to communicate with you securely
Here’s my certificate (public key + certification by CA)
Verify server credentials
Pre-master secret encrypted with server’s public key
Generate Session key
Symmetric encyrption from now on
Generate Session key
Message encrypted with Session Key
Message encrypted with Session Key

HTTPS


Client
Server
HTTP
SSL/TLS
TCP
IP
HTTP
SSL/TLS
TCP
IP
Secure communication
Underlying Network

Generating Keys

- Use openssl for generating keys for testing

```
openssl genrsa 1024 > private.key
openssl req -new -key private.key -out cert.csr
openssl x509 -req -in cert.csr  -signkey private.key -out certificate.pem
```

- For production environment / deploying to a production server you need to get the keys and certificate from a certification authority (CA) e.g., Verisign, Thawte

Node HTTPS Module

- HTTPS core module in Node:

```
var https = require('https');
var fs = require('fs');

var options = {
  key: fs.readFileSync(__dirname+'/private.key'),
  cert: fs.readFileSync(__dirname+'/certificate.pem')
};

var secureServer = https.createServer(options,app);
```

Exercise: HTTPS and Secure Communication

- Configure a secure server in Node using the core HTTPS module
- Generate the private key and public certificate and configure the HTTPS server
- Redirect traffic from the insecure HTTP server to a secure HTTPS server