Introduction

Course Overview

Welcome

Course objectives:

- Learn how crypto primitives work
- Learn how to use them correctly and reason about security

My recommendations:

- Take notes
- Pause video frequently to think about the material
- Answer the in-video questions

Cryptography is everywhere

Secure communication:

- web traffic: HTTPS
- wireless traffic: 802.11i WPA2 (and WEP), GSM, Bluetooth

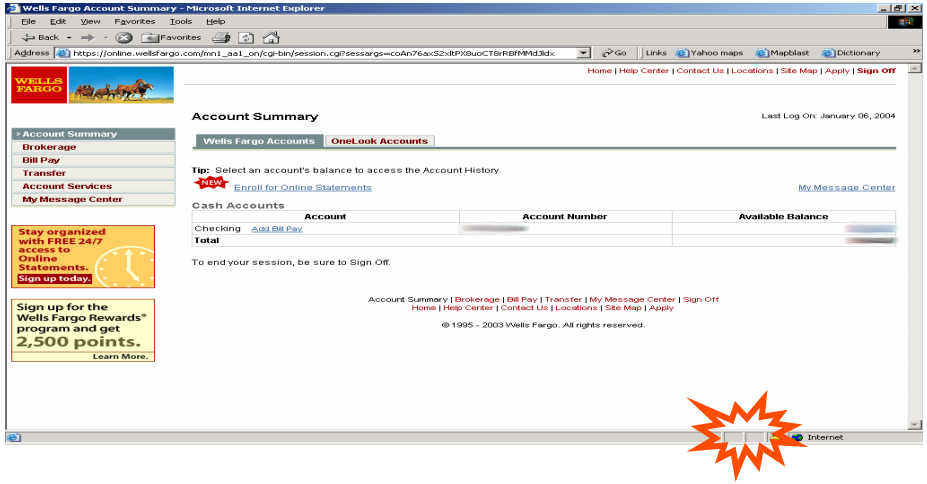
Encrypting files on disk: EFS, TrueCrypt

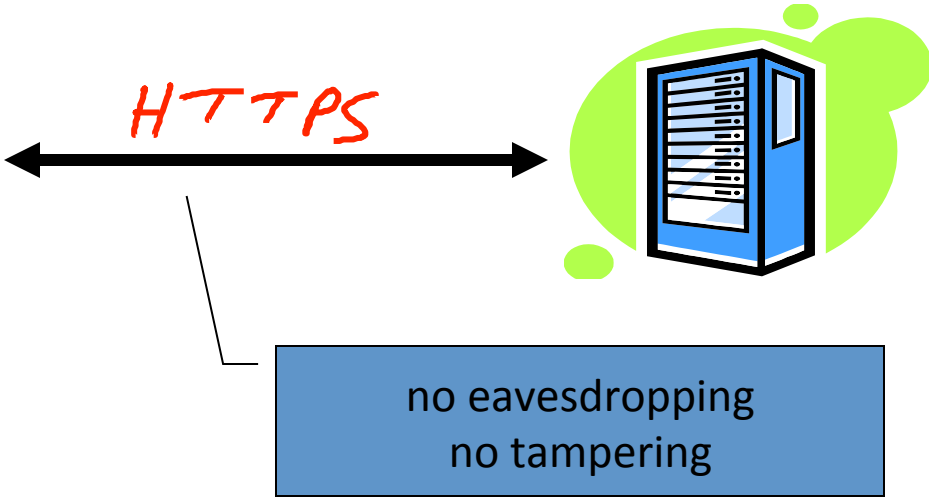
Content protection (e.g. DVD, Blu-ray): CSS, AACS

User authentication

… and much much more

Secure communication





Secure Sockets Layer / TLS

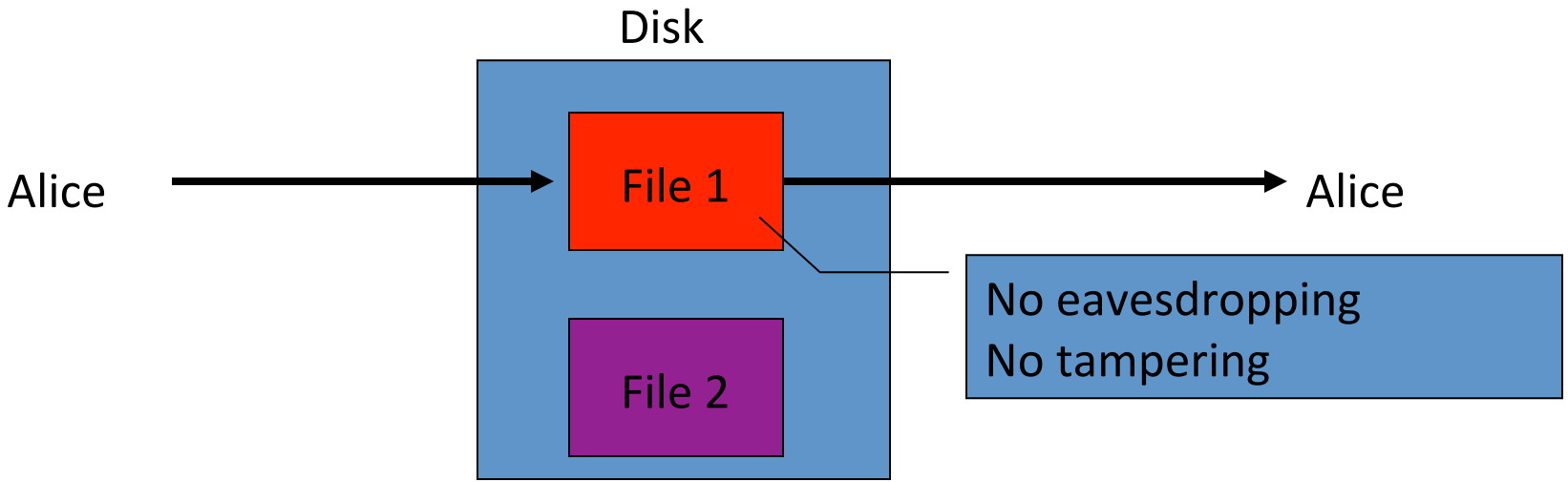
Two main parts

1. Handshake Protocol: **Establish shared secret key using public-key cryptography** (2nd part of course)

2. Record Layer: **Transmit data using shared secret key**

   Ensure confidentiality and integrity (1st part of course)

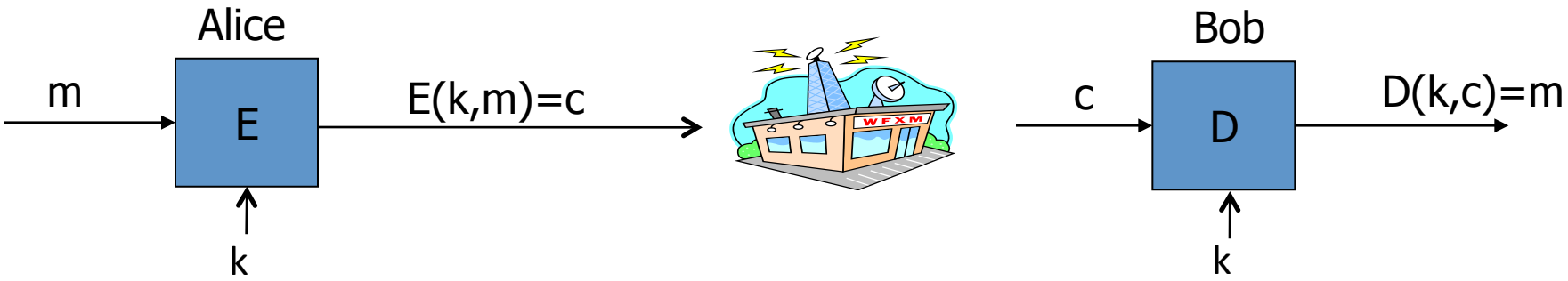
Protected files on disk



Analogous to secure communication:

Alice today sends a message to Alice tomorrow

Building block: sym. encryption



E, D: cipher k: secret key (e.g. 128 bits)

m, c: plaintext, ciphertext

Encryption algorithm is publicly known

- Never use a proprietary cipher

Use Cases

Single use key: (one time key)

- Key is only used to encrypt one message
  - encrypted email: new key generated for every email

Multi use key: (many time key)

- Key used to encrypt multiple messages
  - encrypted files: same key used to encrypt many files
- Need more machinery than for one-time key

Things to remember

Cryptography is:

- A tremendous tool
- The basis for many security mechanisms

Cryptography is not:

- The solution to all security problems
- Reliable unless implemented and used properly
- Something you should try to invent yourself
  - many many examples of broken ad-hoc designs

End of Segment