Course Name- Software Security

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Suggested Readings

1. Computer Security : Principles and Practice by William Stallings and L. Browne
2. Software Security – Building Security In by Gary McGraw
3. Software Security – Principles, Policies and Protection by Mathias Payer
4. Computer and Internet Security – A hands-on Approach by Wenliang Du

AGENDA

- Overview of Network security
- Security Goals
- Security Mechanisms
- Security Services

NETWORK SECURITY

field of network security

- how bad guys can attack computer networks?
- how we can defend networks against attacks?
- how to design architectures that are immune to attacks?

Internet not originally designed with (much) security in mind

- *original vision:* "a group of mutually trusting users attached to a transparent network"
- Internet protocol designers playing "catch-up"
- security considerations in all layers!

INFORMATION SECURITY DEALS WITH

Security of end systems

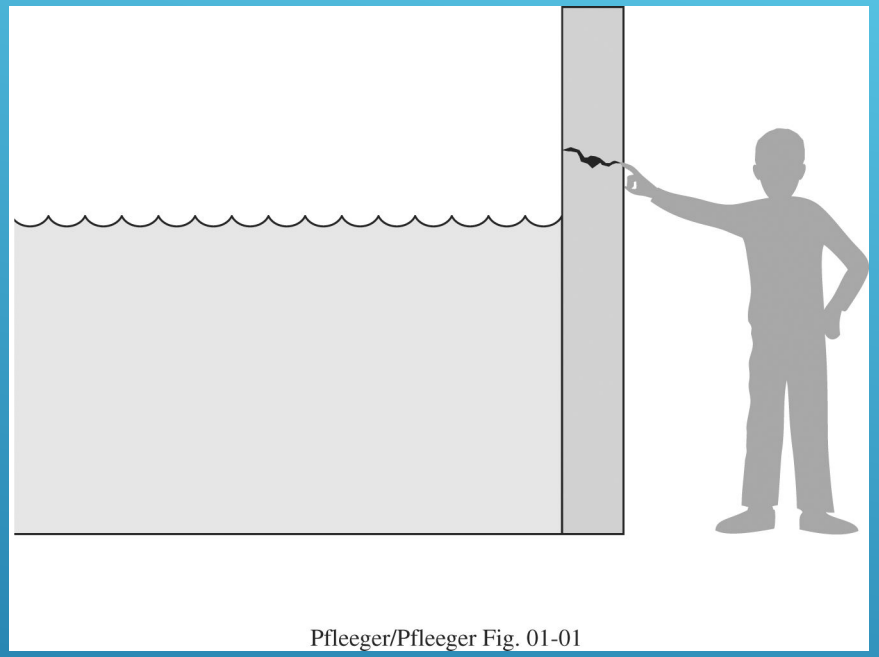
- Examples: Operating system, files in a host, databases, accounting information, logs, etc.

Security of information in transit over a network

- Examples: e-commerce transactions, online banking, confidential e-mails, file transfers, etc.

SOME TERMINOLOGIES

Threat	Set of circumstances that has the potential to cause loss or harm
Vulnerability	a weakness in the security system (in procedures, design and implementation)
Control	Some protective measures



Pfleeger/Pfleeger Fig. 01-01

A *THREAT* IS BLOCKED BY *CONTROL* OF *VULNERABILITIES*

TYPES OF THREATS

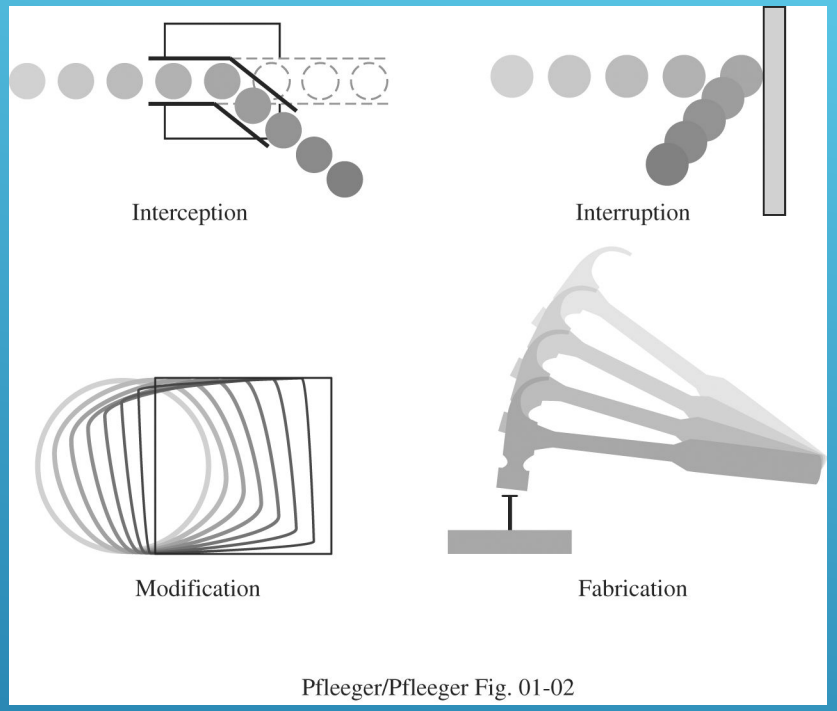
Interception

- Un-authorized party gained access to an asset.
- Illegal copying of program or data.
- Example: Wiretapping to obtain data in a network.

Interruption

- an asset of the system become lost, unavailable or unusable.
- Hardware failure
- Operating system malfunction
- Example Erasure of a program or data file

TYPES OF THREATS (CONT.)



Pfleeger/Pfleeger Fig. 01-02

TYPES OF THREATS (CONT.)

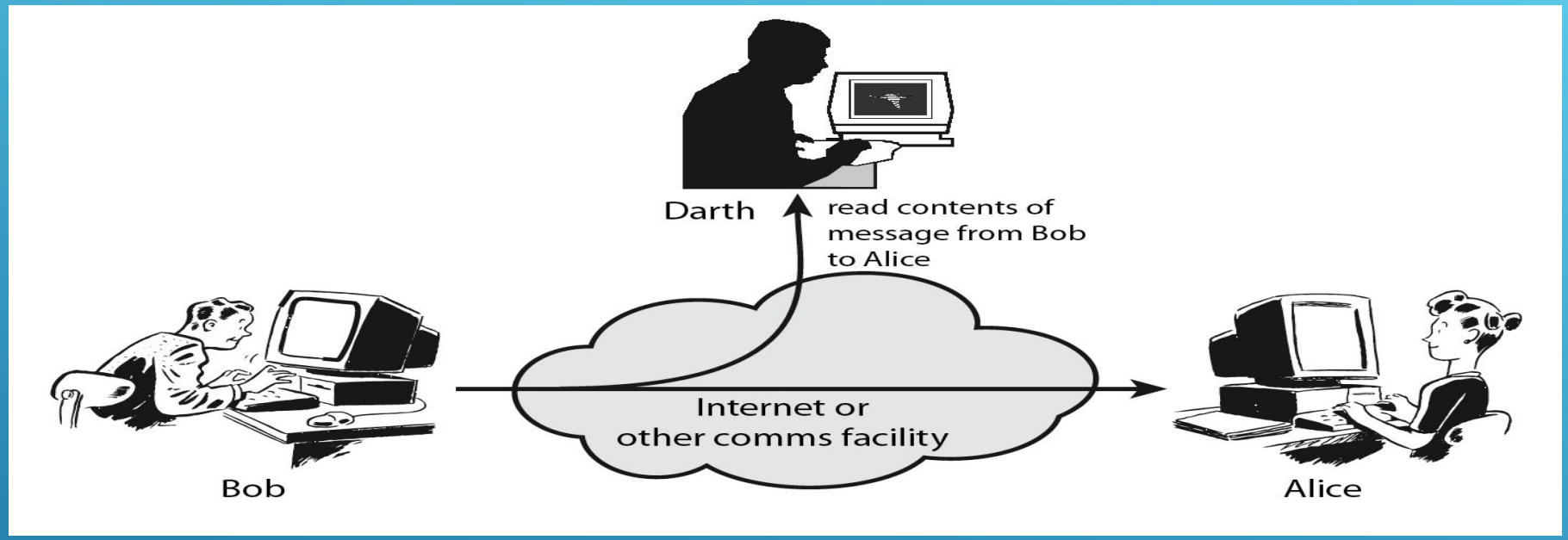
Modification

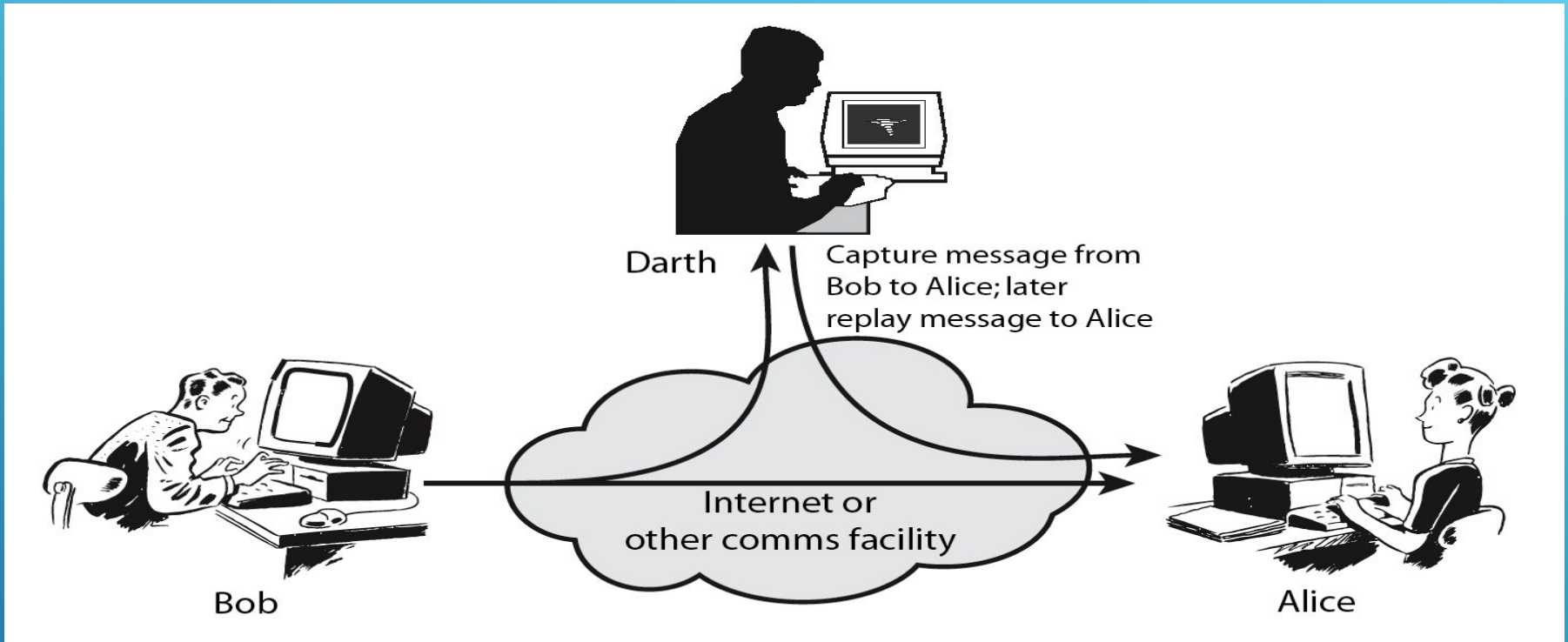
- Not only an-authorized access, but tampers with an asset.
- Example: Alteration of data

Fabrication

- Addition of imaginary information to a system by an un authorized party.
- Example: addition of a record to an existing database

PASSIVE ATTACK





ACTIVE ATTACKS

SECURITY GOALS (CIA)

Confidentiality

- Keeping data and resources secret or hidden.(secrecy or privacy)
- Only authorized party can access information.
- access does not mean write but allows to read, view or print information.

Integrity

- Assets can be modified only by authorized parties or only in authorized ways.
- Modification writing, deleting, creating, changing etc.

Availability

- Ensuring authorized access to data and resources when desired

SECURITY SERVICES AND MECHANISMS

Services

- enhances the security of the data processing systems and the information transfers of an organization.
- intended to counter security attacks
- make use of one or more security mechanisms to provide the service.

Mechanisms

- A mechanism that is designed to detect, prevent, or recover from a security attack

SECURITY SERVICES

Authentication	• assurance that communicating entity is the one claimed • have both peer-entity & data origin authentication
Access Control	• prevention of the unauthorized use of a resource
Data Confidentiality	• protection of data from unauthorized disclosure

SECURITY SERVICES

Data Integrity	• assurance that data received is as sent by an authorized entity
Non-Repudiation	• protection against denial by one of the parties in a communication
Availability	• resource accessible/usable

SECURITY MECHANISMS

Enchipherment	•The use of mathematical algorithms to transform data into a form that is not readily intelligible. • Symmetric and public key encryption mechanisms. •DES, 3DES, AES, RSA, etc
Digital Signature	•Data appended to, or a cryptographic transformation of, a data unit that allows a recipient of the data unit to prove the source and integrity of the data unit and protect against forgery (e.g., by the recipient). •Digital Signature Standard (DSS) or RSA based algorithms.
Access Control	•A variety of mechanisms that enforce access rights to resources. •Discretionary Access Control (DAC) , Role Based Access Control (RBAC) etc.
Data Integrity	•A variety of mechanisms used to assure the integrity of a data unit or stream of data units •MD5. SHA etc.

CONCLUSION

Discussed about

- Information security
- Security requirements and threats
- Security services and mechanisms
- Malicious programs