Cyber Security Concepts

Lecture-2

Department of CSE, IUT

Cyber Security: Terminology

- **Cyber Space-** interconnected digital environment of networks, services, systems, and processes
- **Cyber incident-** cyber event that involves a loss of information security or impacts business operations
- **Cyber insurance:** insurance that covers or reduces financial loss to the insured caused by a cyber incident
- **Cyber-Physical Systems (CPS):** are systems composed of physical systems (hardware), software systems and potentially other types of systems (e.g., human systems). These are closely integrated and networked to deliver some global behaviour.

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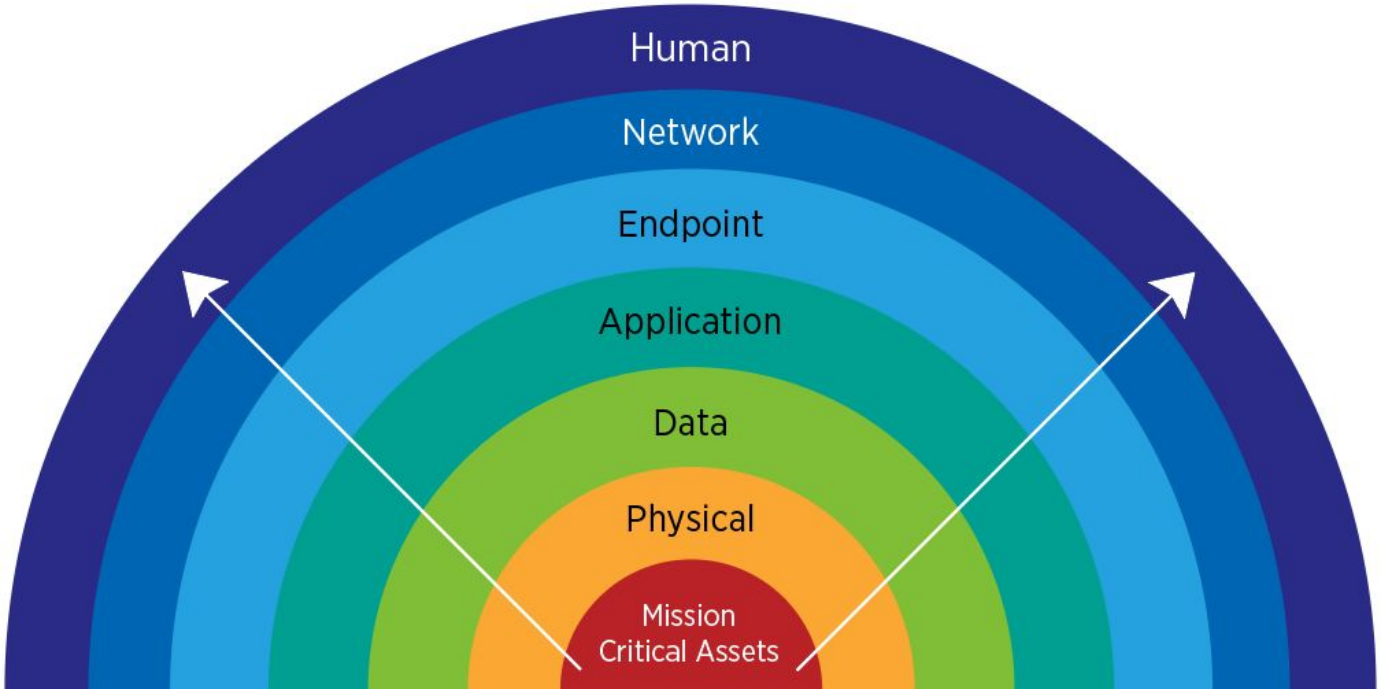
Cyber Security: Concept



Cyber Security: Concept

What is Software Security?

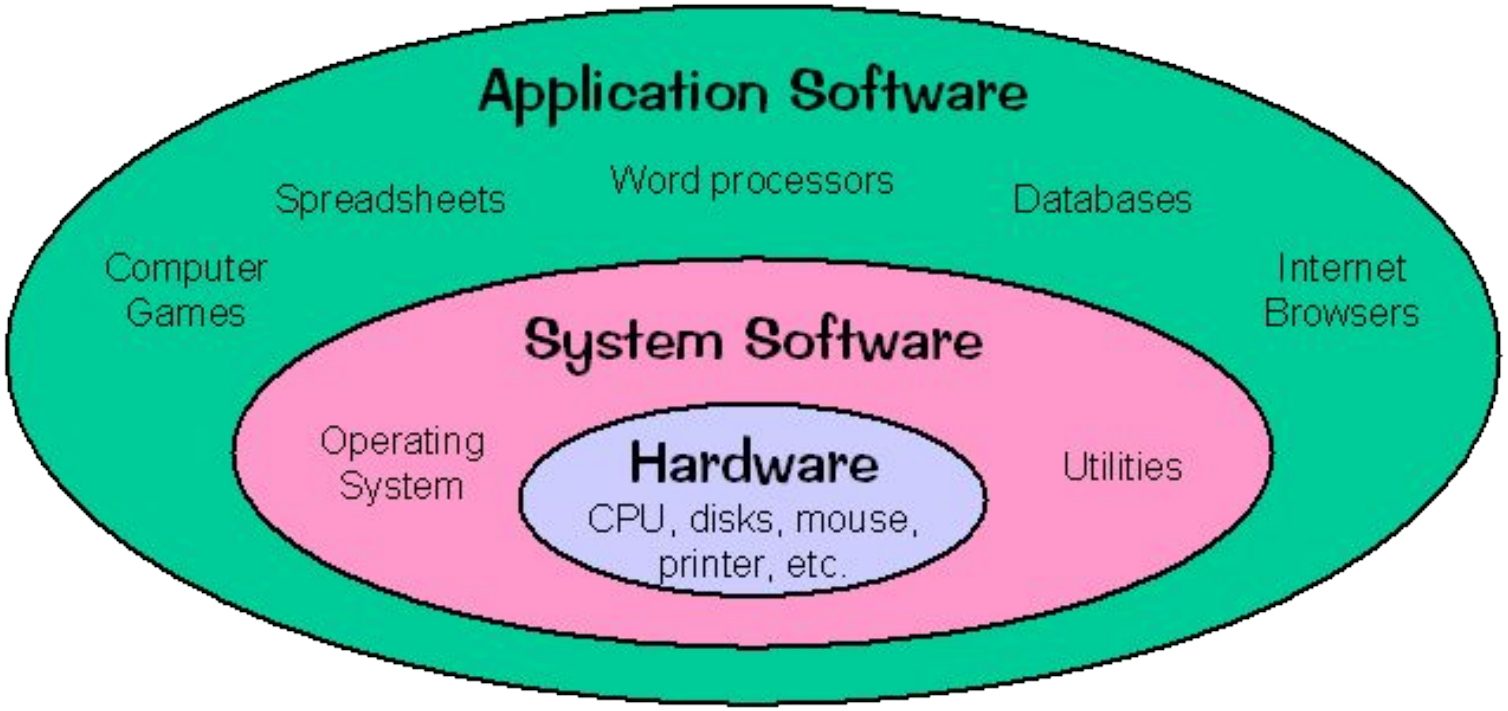
Software security is a kind of computer security that **focuses** on **the secure design and implementation of software.**

- Using the best language, tools, methods

- **Focus of study:**

  The Code

Software : Concepts



Software : Concepts

System Software	Application Software
• System software are mainly designed for managing system resources.	• Application software are designed to accomplish tasks for specific purposes.
• Programming of system software is complex.	• Programming of application software is comparatively easy.
• A computer cannot run without system software.	• A computer can easily run without application software.
• System software do not depend on application software.	• Application software depend on system software and cannot run without system software.

Software : Concepts

Software Security vs Application Security

Software Security	Application Security
Proactive Build security in Preventive costs	Reactive Build security around Corrective costs
• Design for security • Testing for security • Software security education	• Network centric approach • Protect software after development • Finding and fixing security issues

What is the most effective way to protect software?

What is Network Security?

- **Network security:**
  - Protection of the **underlying networking infrastructure** from unauthorized access and misuse.

What is Application Security?

- **Application security**
  - aims to protect **Software code, Software and hardware system, Data** against cyber threats.
  - introduce a secure software development life cycle to development teams.

What is Web Security?

- Process, technology or method for protecting
  - Web servers, web applications, and web services against different security threats that exploit vulnerabilities in an application's code.
  - Critical to the business continuity

The web and the use of DNS services specifically are part of 91% of all malware attacks

Email and web together are a key part for 99% of successful breaches.

- Commonly, prime target by the threat actors
  - Ease of execution

What is Mobile Application Security?

- Mobile app security is the practice of safeguarding **high-value mobile applications** and your digital identity from fraudulent attack in all its forms.

What is Information Security?

- Information security
  - Protecting information and information systems from unauthorized use, assess, modification or removal.
  - Two sub-categories
    - Physical environment by ensuring the premises is secure
    - No one can access information electronically
  - Concerned with making sure data in any form is kept secure and is a bit more broad than cybersecurity

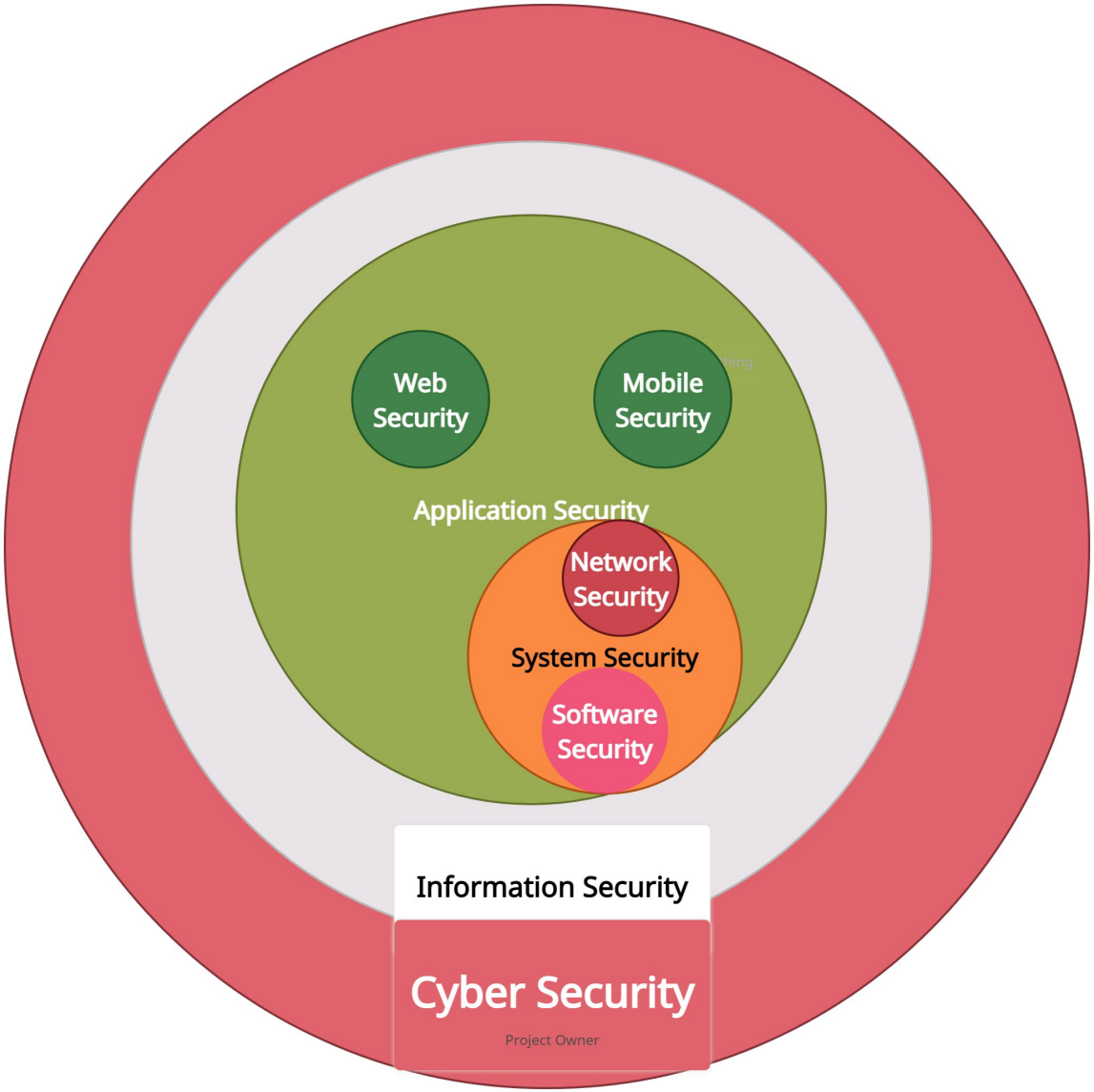
What is Cyber Security?

Cybersecurity = security of information systems, applications and networks in the face of attacks, accidents and failures with the goal of protecting operations and assets

availability, integrity and secrecy

- Protection of **internet-connected systems** such as hardware, software and data from cyberthreats

Cyber Security: Concept



Cyber Security: ?

Let's clarify the Network security in brief …

Network Security: Overview

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  - Protection of the **underlying networking infrastructure** from unauthorized access and misuse.

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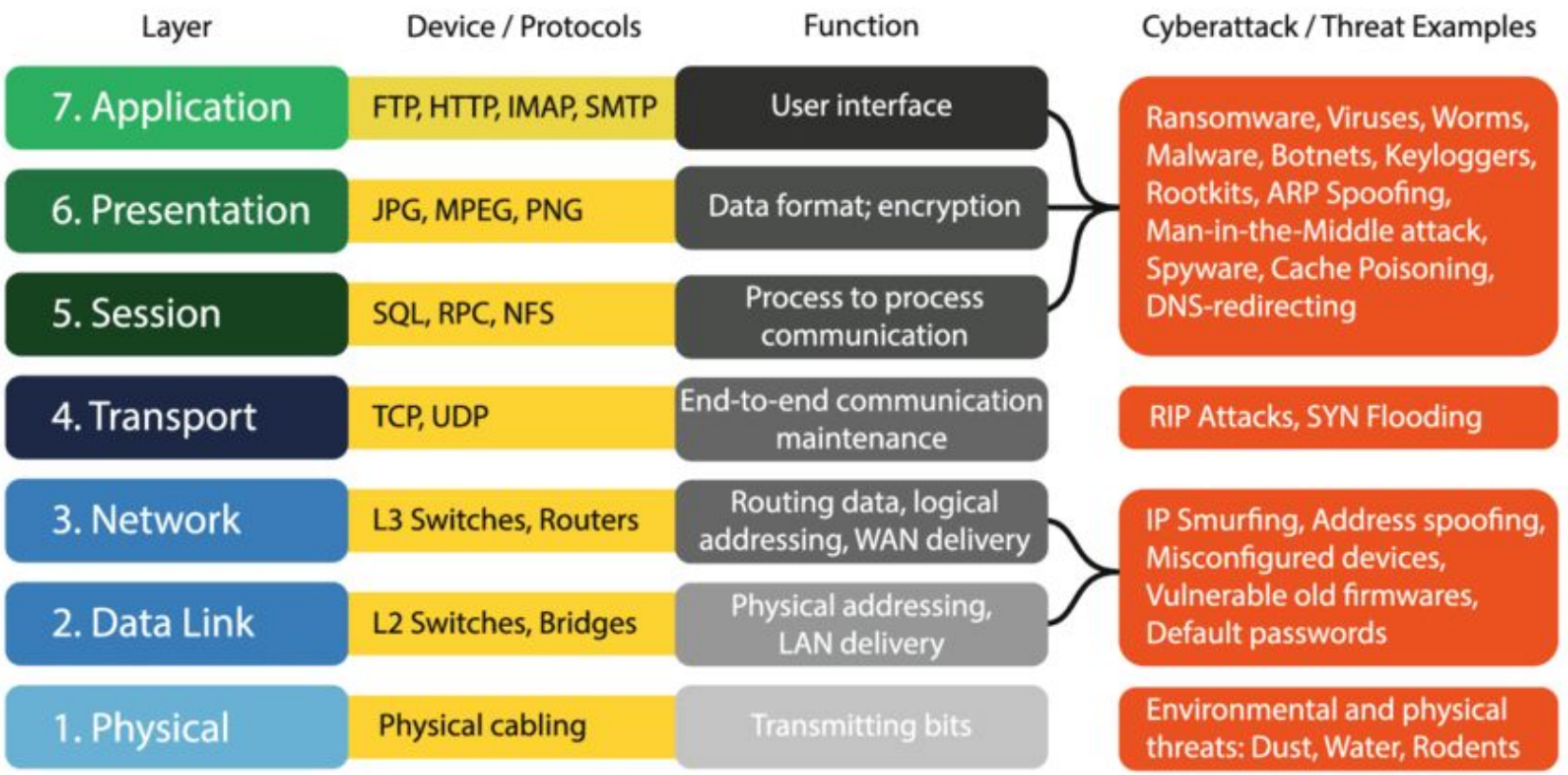
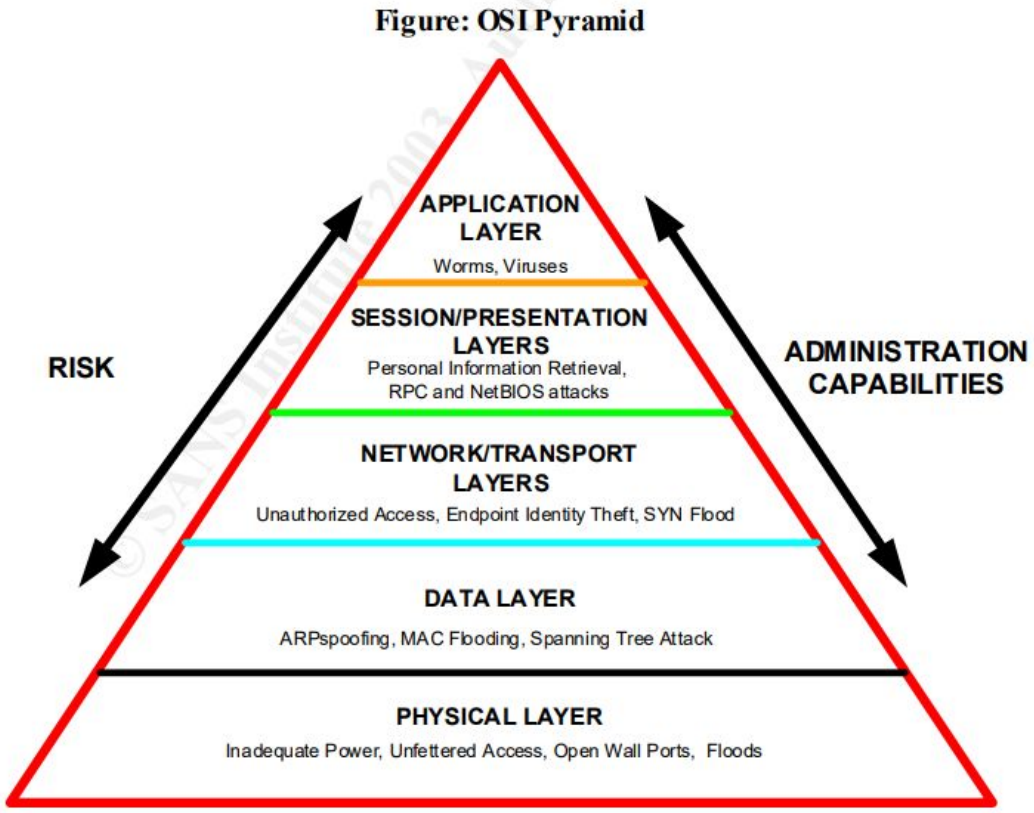
Network Security: Overview

in Network Protocol layers



Network Security: Overview

in Network Protocol layers

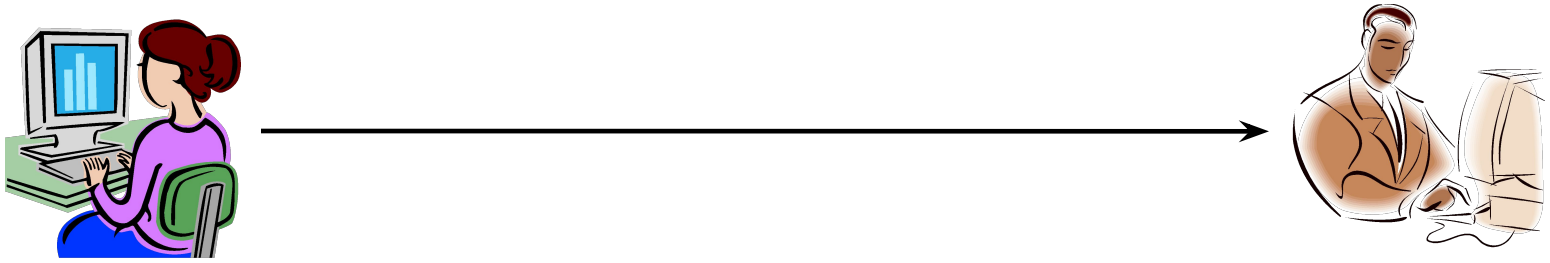


Network Security:
Commonly used placeholders in Security

- **Alice and Bob**: Alice wants to send a message to Bob

Alice

Bob



- **Eve:** an *eavesdropper*, is usually a passive attacker
- **Mallory:** a *malicious attacker;* unlike Eve, Mallory can modify messages, substitute her own messages, replay old messages, and so on

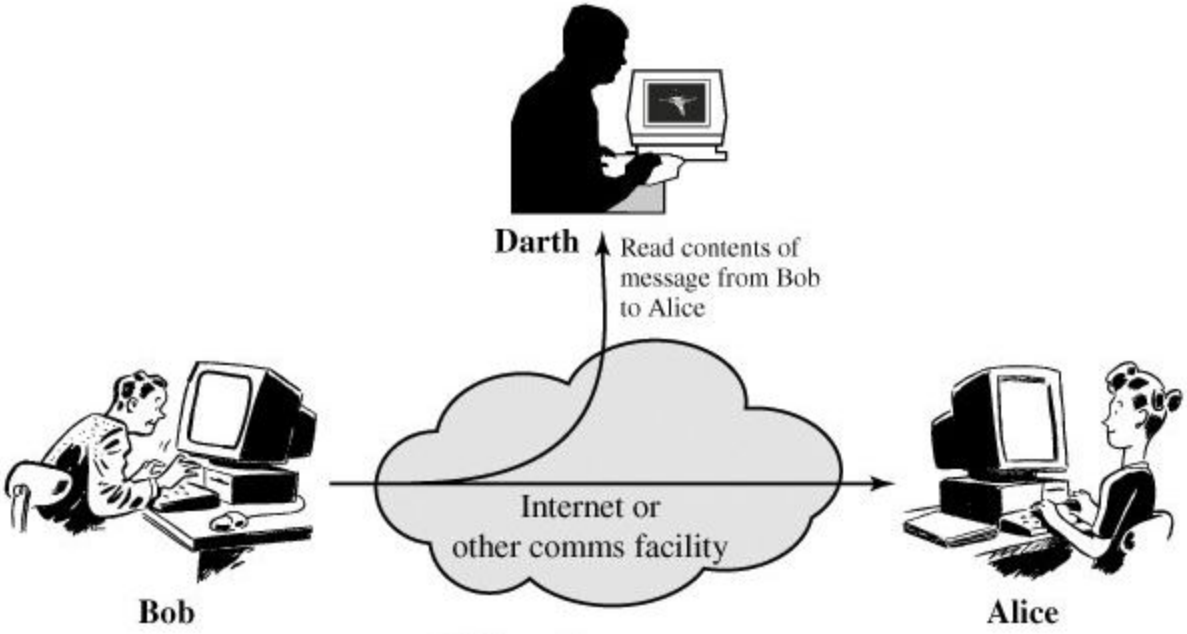
Network Security: Overview

Issues

- A sends a file to B: E intercepts it and reads it
  - How to send a file that looks gibberish to all but the intended receiver?
- A send a file to B: M intercepts it, modifies it, and then forwards it to B
  - How to make sure that the document has been received in exactly the form it has been sent
- M sends a file to B pretending it is from A
  - How to make sure your communication partner is really who (s)he claims to be
- A sends a message to B: M is able to delay the message for a while
  - How to detect old messages
- A sends a message to B. Later A (or B) denies having sent (received) the message
  - How to deal with electronic contracts
- E learns which user accesses which information although the information itself remains secure
- M prevents communication between A and B: B will reject any message from A because they look unauthentic

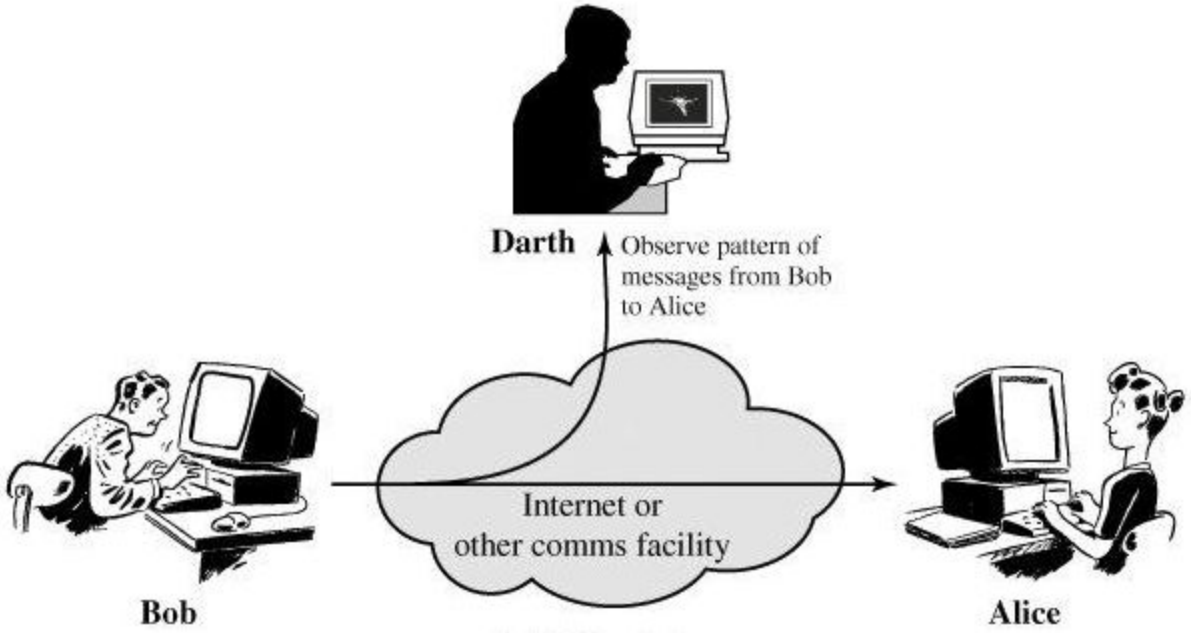
Network Security: Security Attacks

- Snooping or Eavesdropping:
  - Threat against confidentiality



Network Security: Security Attacks

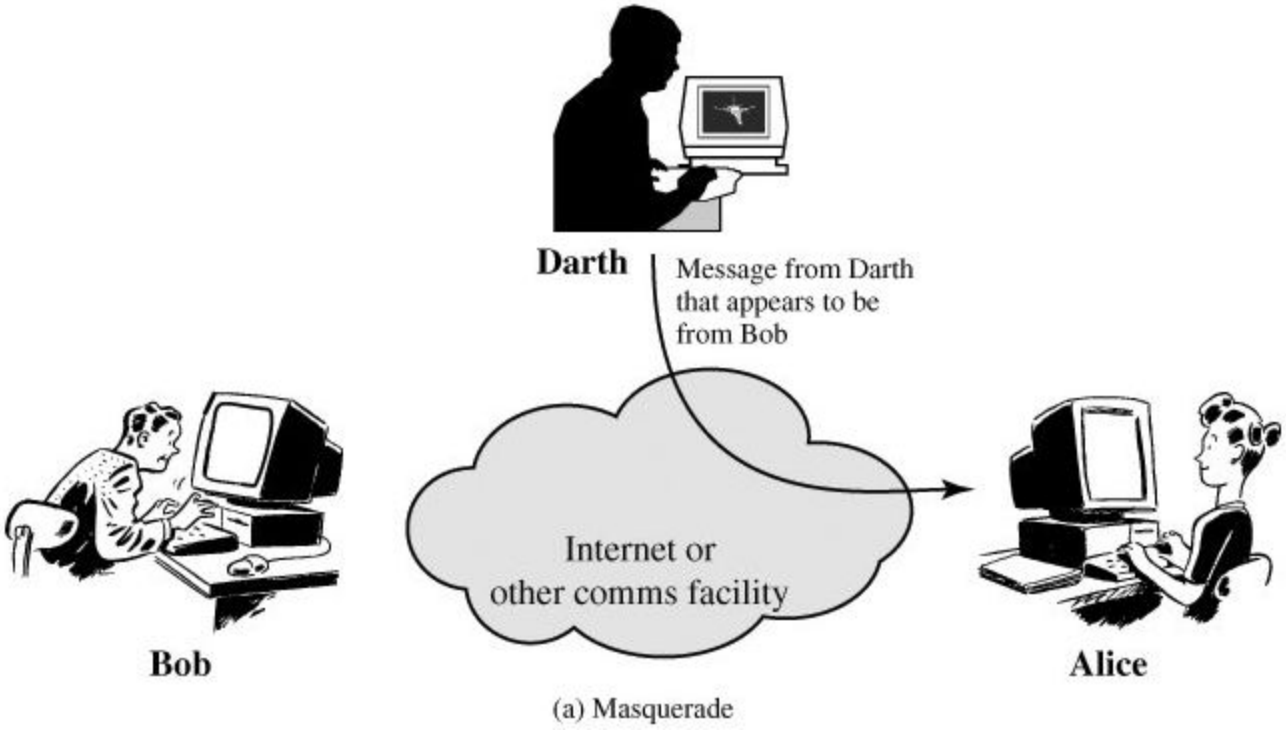
- Traffic analysis:
  - Threat against confidentiality



(b) Traffic analysis

Network Security: Security Attacks

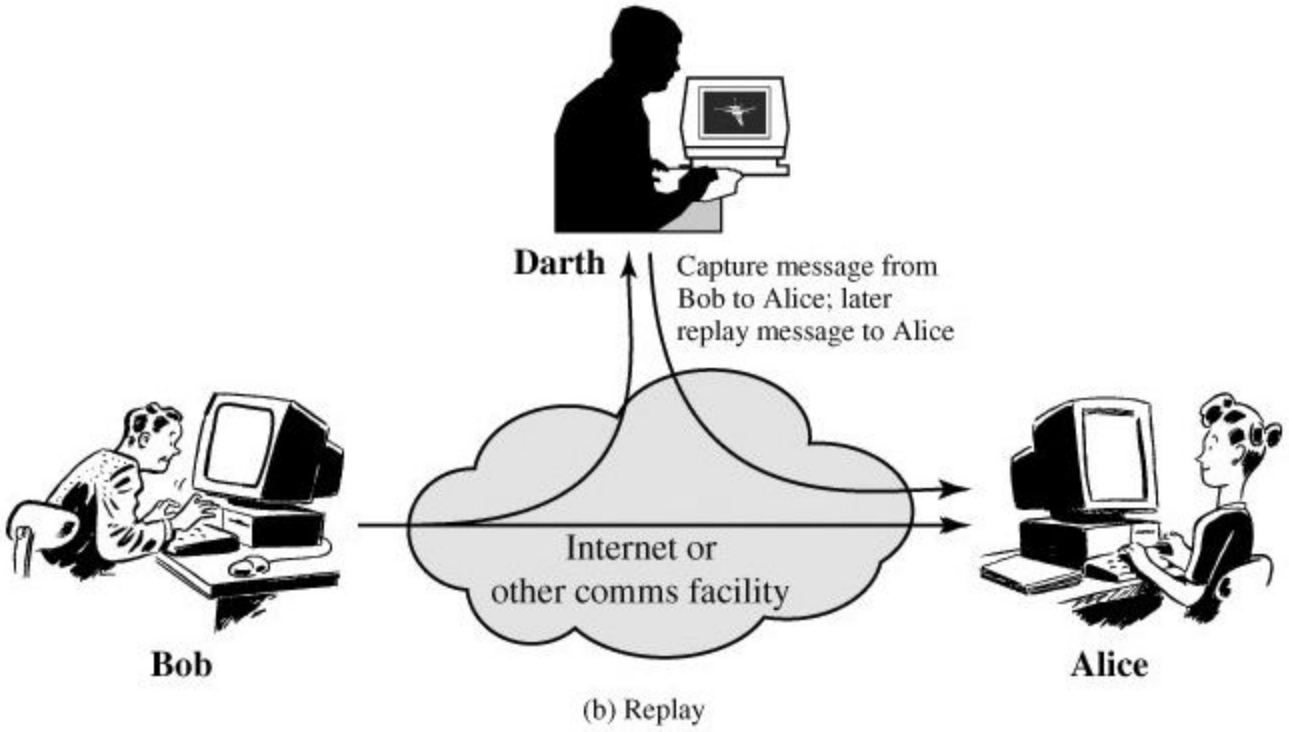
- Masquerade:
  - Threat against Integrity



(a) Masquerade

Network Security: Security Attacks

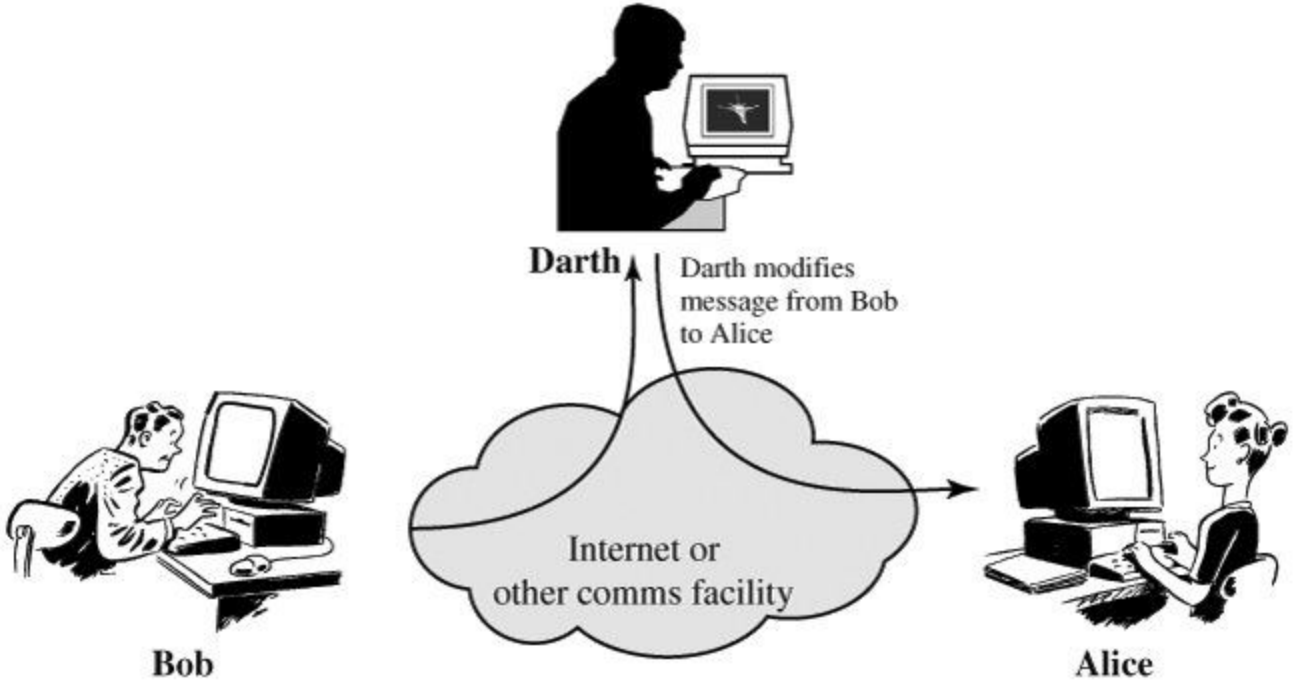
- Replay:
  - Threat against Integrity



(b) Replay

Network Security: Security Attacks

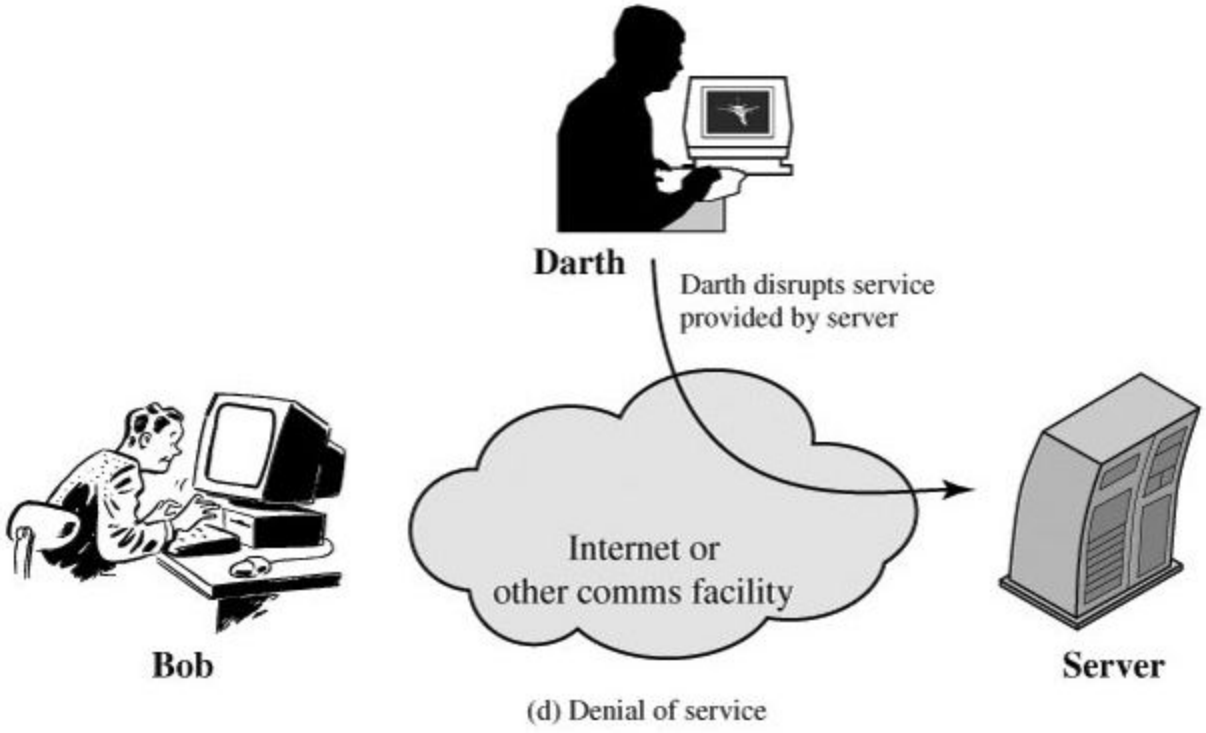
- Modification of message:
  - Threat against Integrity



(c) Modification of messages

Network Security: Security Attacks

- Denial of service (DoS):
  - Threat against Availability



(d) Denial of service

References

- Chapter -1: Cryptography and Network Security Principles and Practices, Fourth Edition. By William Stallings.