Cryptography and Network Security

Services, Mechanisms & Attacks

Session Meta Data

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Revision History

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		1.0

Agenda

- Learning objectives
- OSI Security architecture
- Services, mechanisms, attacks
  - Security services
  - Security mechanisms
  - Security attacks
- Summary
- Test your understanding
- References

Learning objectives

- Describe the key security requirements of confidentiality, integrity, and availability
- Describe X.800 security architecture for OSI
- Discuss the types of security threats and attacks

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OSI Security Architecture

- ITU-T (International Telecom Union – Telecom Standardization Sector recommends X.800Security Architecture for OSI, defines a systematic approach.
- This is useful for managers to organize the task of providing security.
- This focuses on security services, mechanisms and attacks.

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Services, Mechanisms, Attacks

- need systematic way to define requirements
- consider three aspects of information security:
  - **security attack**
  - **security mechanism**
  - **security service**
- consider in reverse order

Security Service

- is something that 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
- replicate functions normally associated with physical documents
  - eg have signatures, dates; need protection from disclosure, tampering, or destruction; be notarized or witnessed; be recorded or licensed

Security Mechanism

- a mechanism that is designed to detect, prevent, or recover from a security attack
- no single mechanism that will support all functions required
- however one particular element underlies many of the security mechanisms in use: **cryptographic techniques**

Security Attack

- any action that compromises the security of information owned by an organization
- information security is about how to prevent attacks, or failing that, to detect attacks on information-based systems
- have a wide range of attacks
- can focus of generic types of attacks
- note: often *threat* & *attack* mean same

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Security Services

- X.800 defines it as: a service provided by a protocol layer of communicating open systems, which ensures adequate security of the systems or of data transfers
- RFC 2828 defines it as: a processing or communication service provided by a system to give a specific kind of protection to system resources
- X.800 defines it in 5 major categories

Security Services (X.800)

- **Authentication** - assurance that the communicating entity is the one claimed
- **Access Control** - prevention of the unauthorized use of a resource
- **Data Confidentiality** –protection of data from unauthorized disclosure
- **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

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Security Mechanisms (X.800)

- specific security mechanisms:
  - encipherment, digital signatures, access controls, data integrity, authentication exchange, traffic padding, routing control, notarization
- pervasive security mechanisms:
  - trusted functionality, security labels, event detection, security audit trails, security recovery

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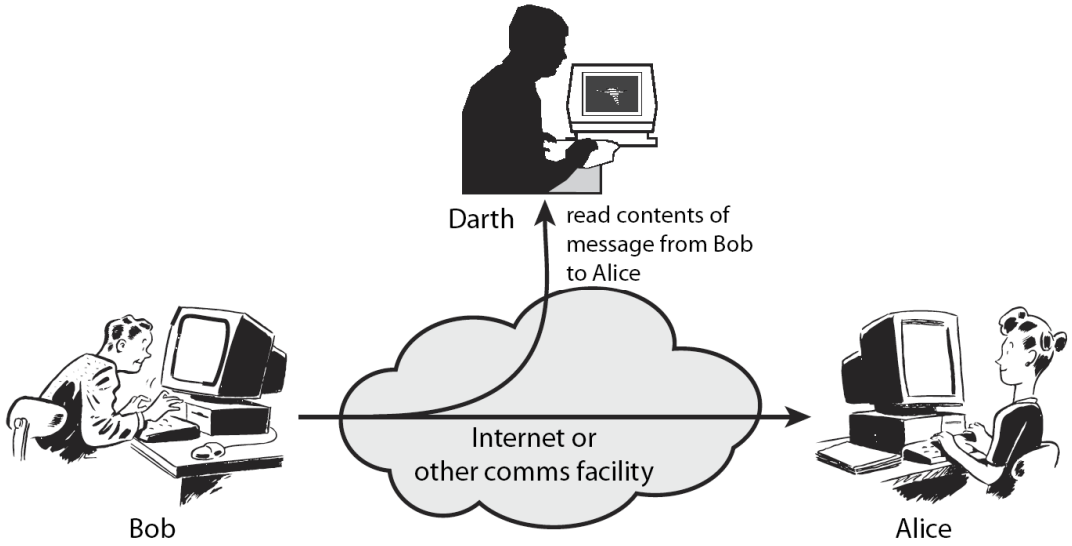
Classify Security Attacks as

- **passive attacks** - eavesdropping on, or monitoring of, transmissions to:
  - obtain message contents, or
  - monitor traffic flows
- **active attacks** – modification of data stream to:
  - masquerade of one entity as some other
  - replay previous messages
  - modify messages in transit
  - denial of service

Passive Attacks

- Reading contents of messages
- Also called eavesdropping
- Difficult to detect passive attacks
- Defense: to prevent their success



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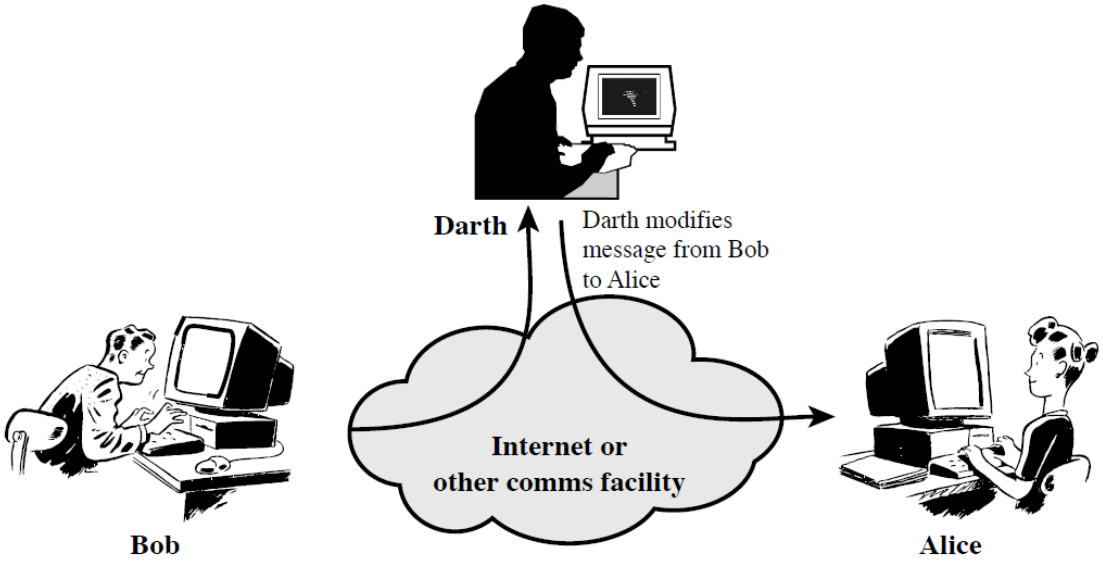
Active Attacks

- Modification or creation of messages (by attackers)
- Four categories: modification of messages, replay, masquerade, denial of service
- Easy to detect but difficult to prevent
- Defense: detect attacks and recover from damages



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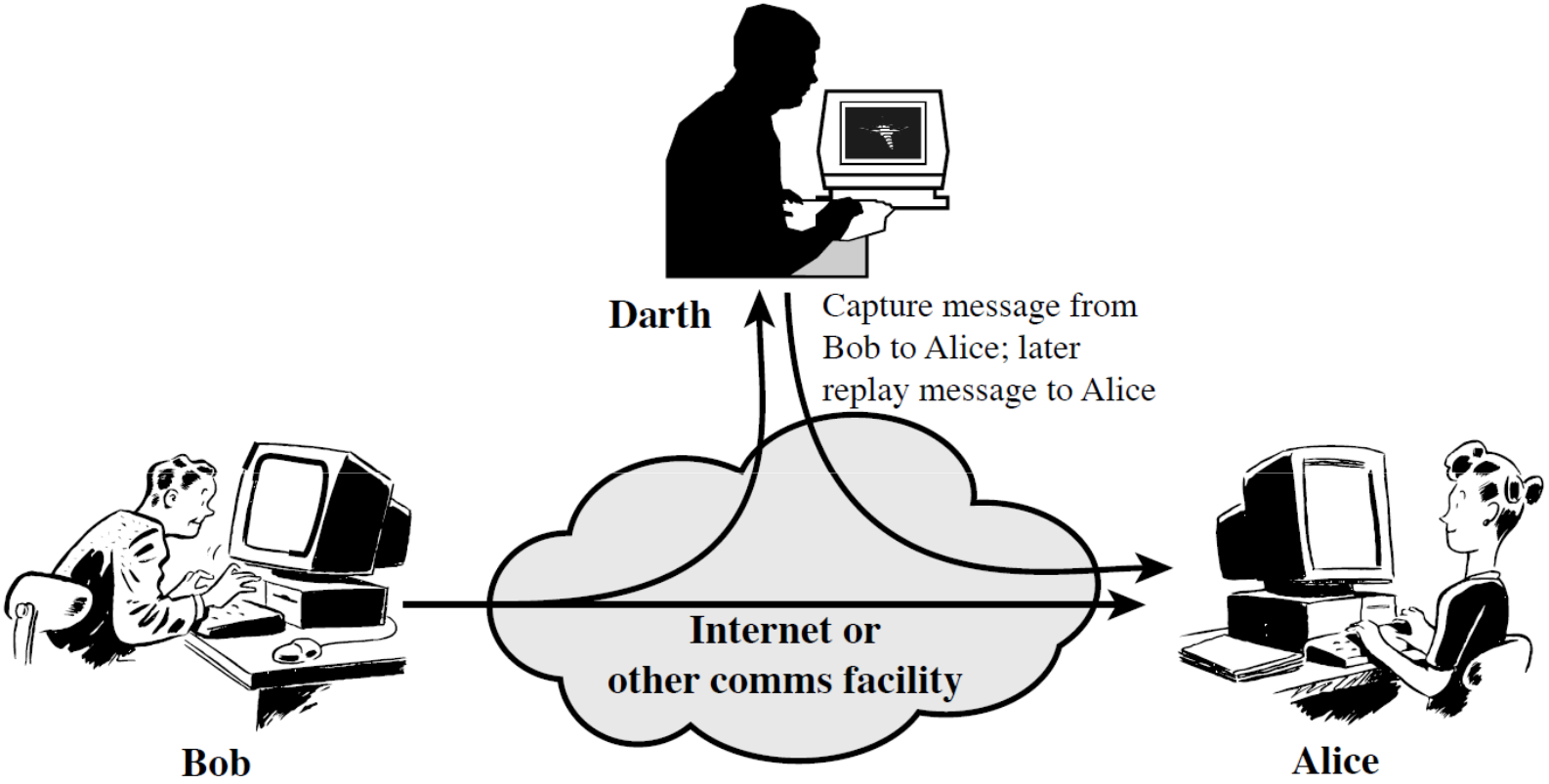
Replay



(b) Replay

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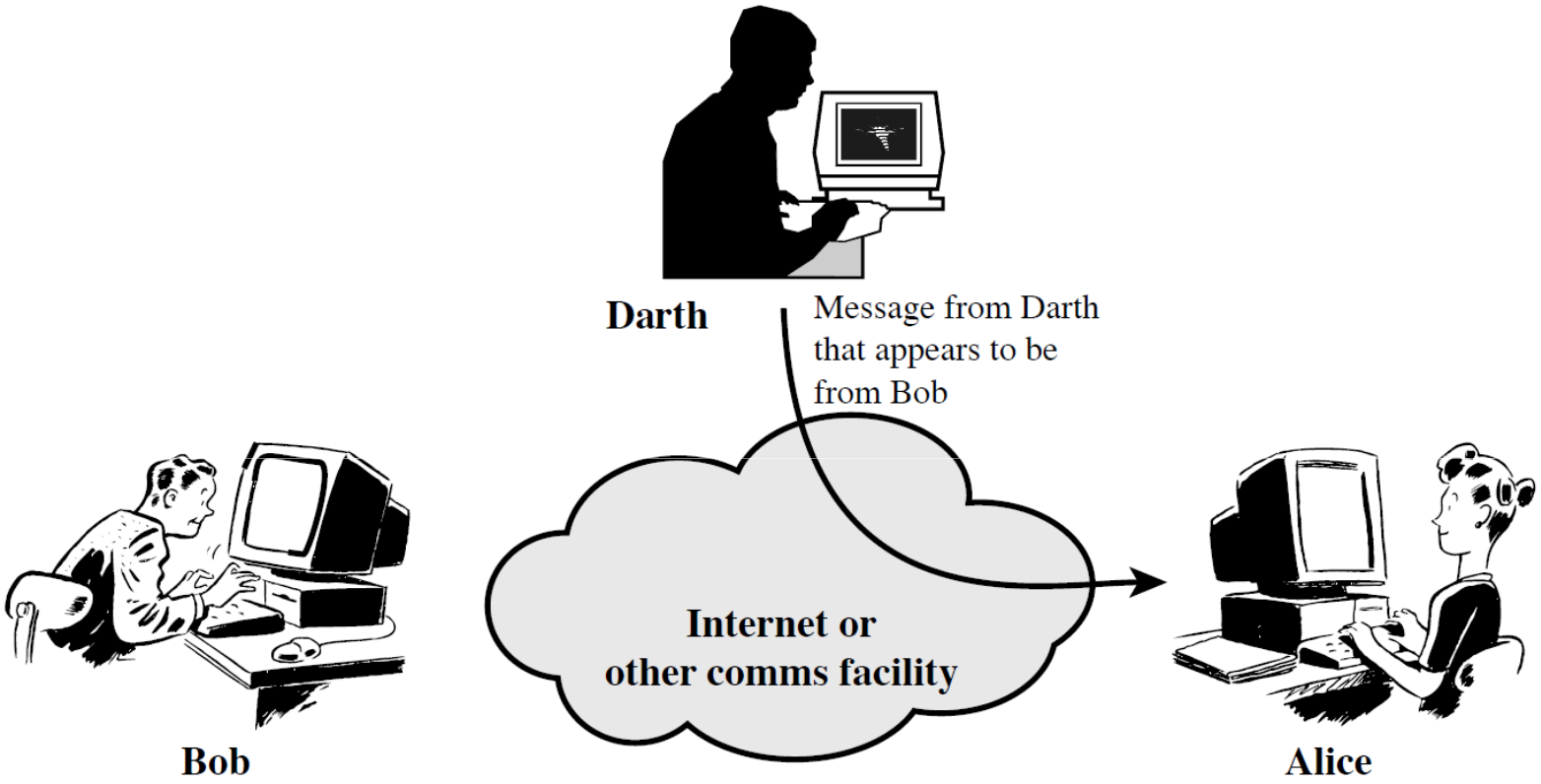
Masquerade



(a) Masquerade

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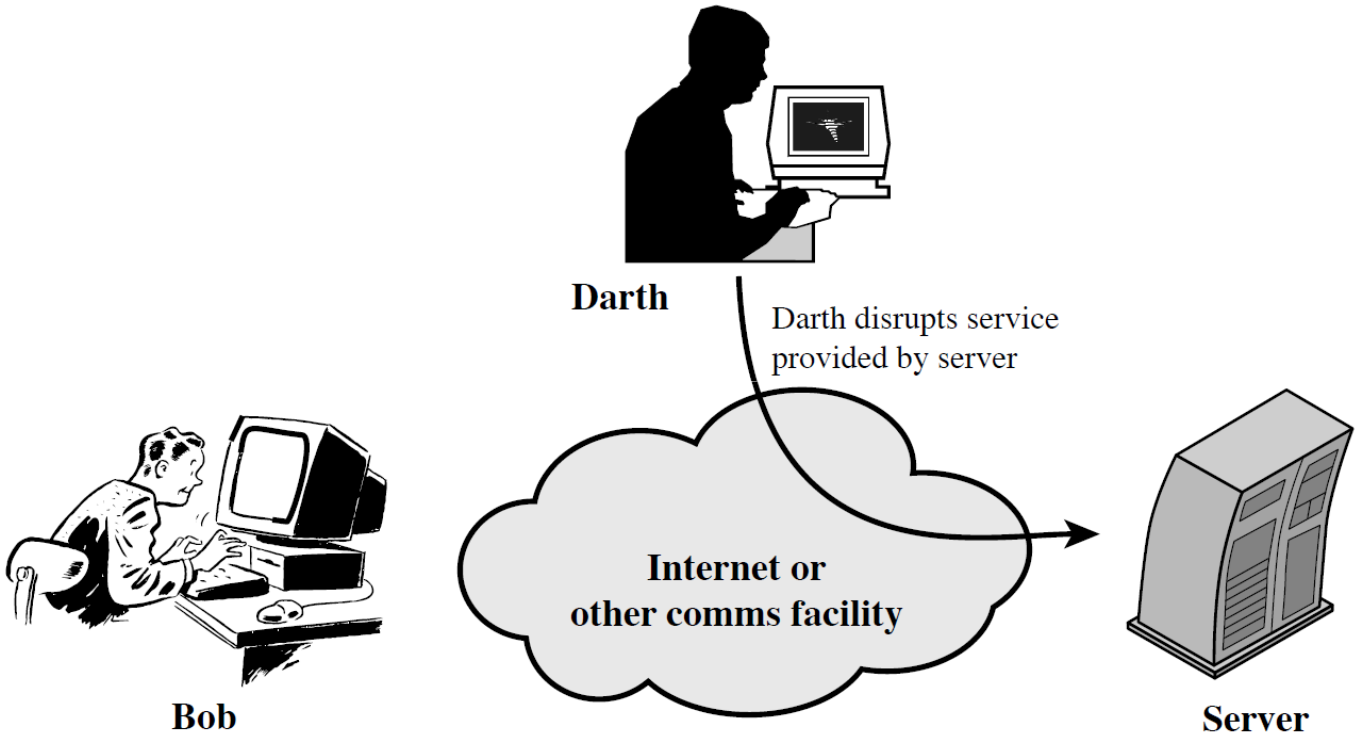
Denial of service



(d) Denial of service

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Summary

- Studied the key security requirements
- Discussed X.800 security architecture
- Discuss security services, mechanisms and attacks

Test your understanding

1. What is the OSI security architecture?
2. List and briefly define the categories of passive and active attacks.
3. Consider the following and define the type of security attack:
    1. Albert gives a cheque of Rs.50,00/- to the shopkeeper to buy a book. Later he finds that the cheque was cashed for Rs.50,000/-
    2. A student breaks into university examination office to get a copy of exam paper to be held on the next day.
    3. A person sends hundreds of emails everyday to another person using a phony return email address.

References

1. William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, “Network Security”, Prentice Hall of India, 2002.