




Lecture 1



Introduction

- In early days, not much emphasis was given to security.
- The security of information was completely under the control of an organization.
- Information security was not a major issue.

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- Growing computer use requires automated tools to protect information.
 - Use of networks requires measures to protect data during transmission.
 - Information security gained more prominence.
 - Computer security
 - Internet and network security




Security Goals

- Confidentiality
- Integrity
- Availability



Key Aspects

- Security Attack
- Security Services
- Security Mechanisms

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- **Security attack** – Any action that compromises the security of information owned by an organization.
 - **Security service** – A process that enhances the security of information transfer of an organization.
 - **Security mechanism** – A process that is designed to detect or recover from a security attack.

Security attacks

- Classified into two:
 - Passive attack
 - Active attack

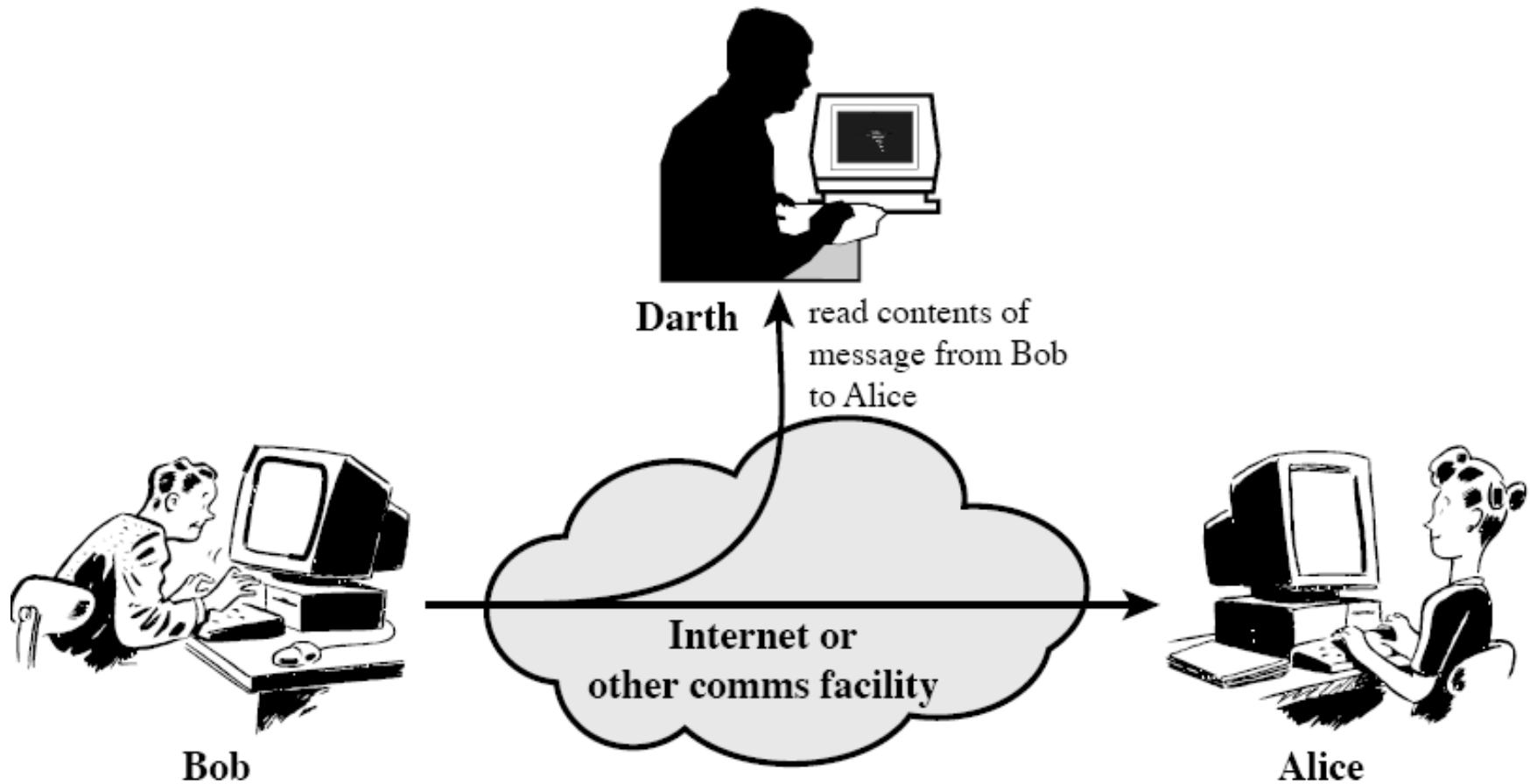
Passive attack

- Attempts to learn or make use of information that is in transit, but does not attempt to make any modification to the information.
- Harder to detect.
- Emphasis is on prevention, rather than detection or correction.

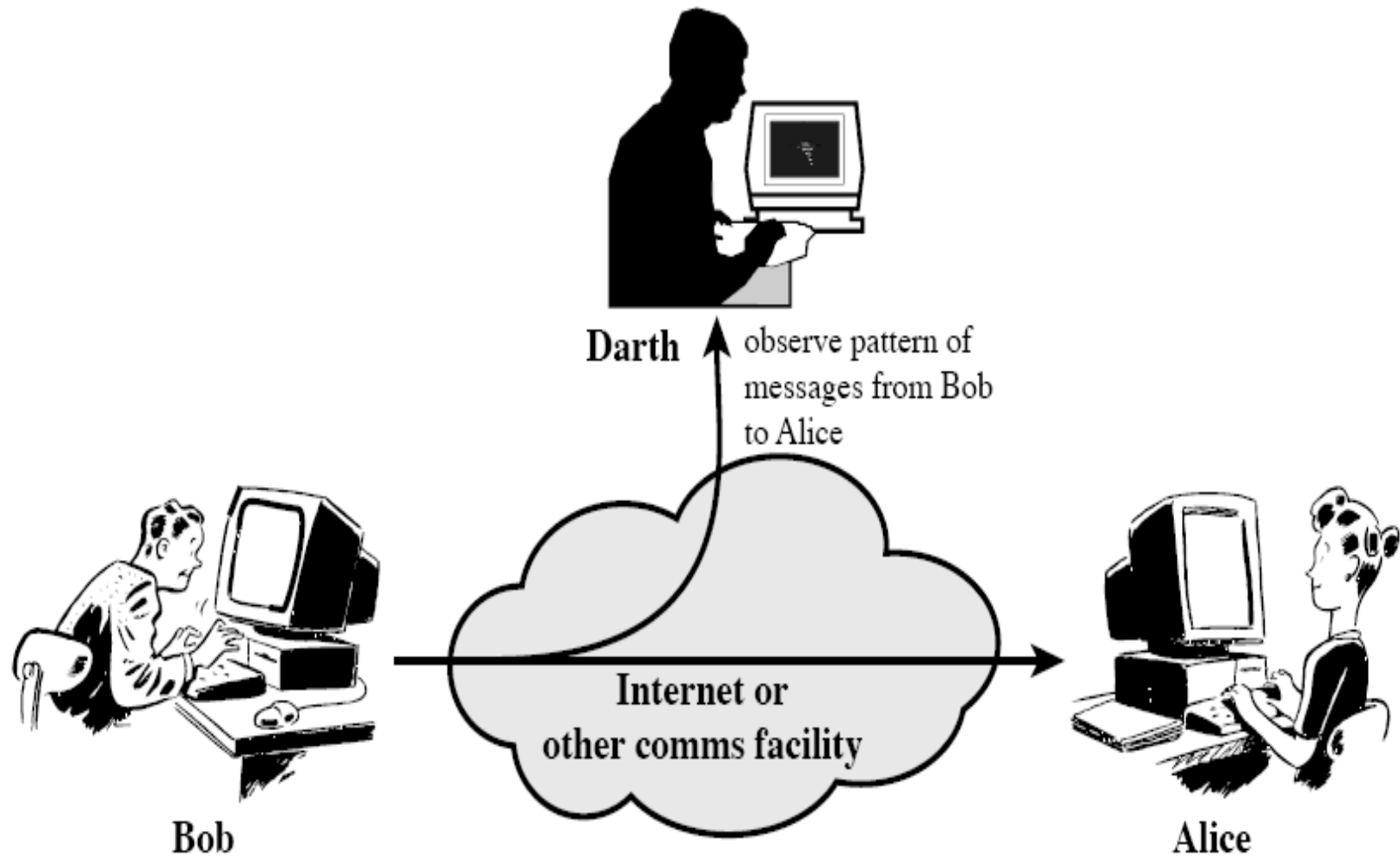
Passive attack

- ☐ Snooping
- ☐ Traffic analysis
- ☐ These two attacks threaten confidentiality

Snooping



Traffic analysis



Active attack

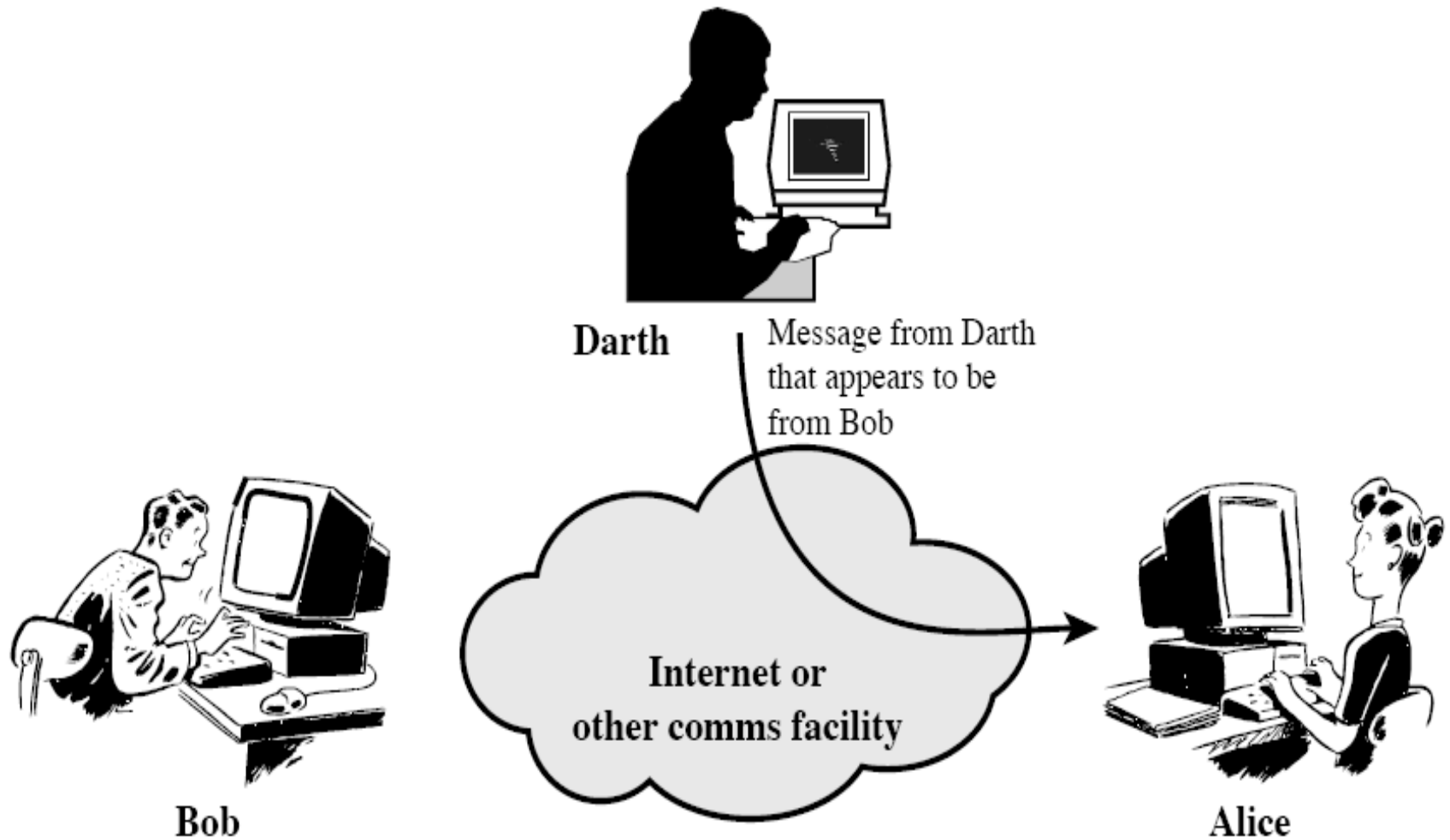
- Attempts to alter the information that is transmitted.
- Cannot be prevented easily.
- Can be detected with some effort & attempts can be made to recover from the attack .



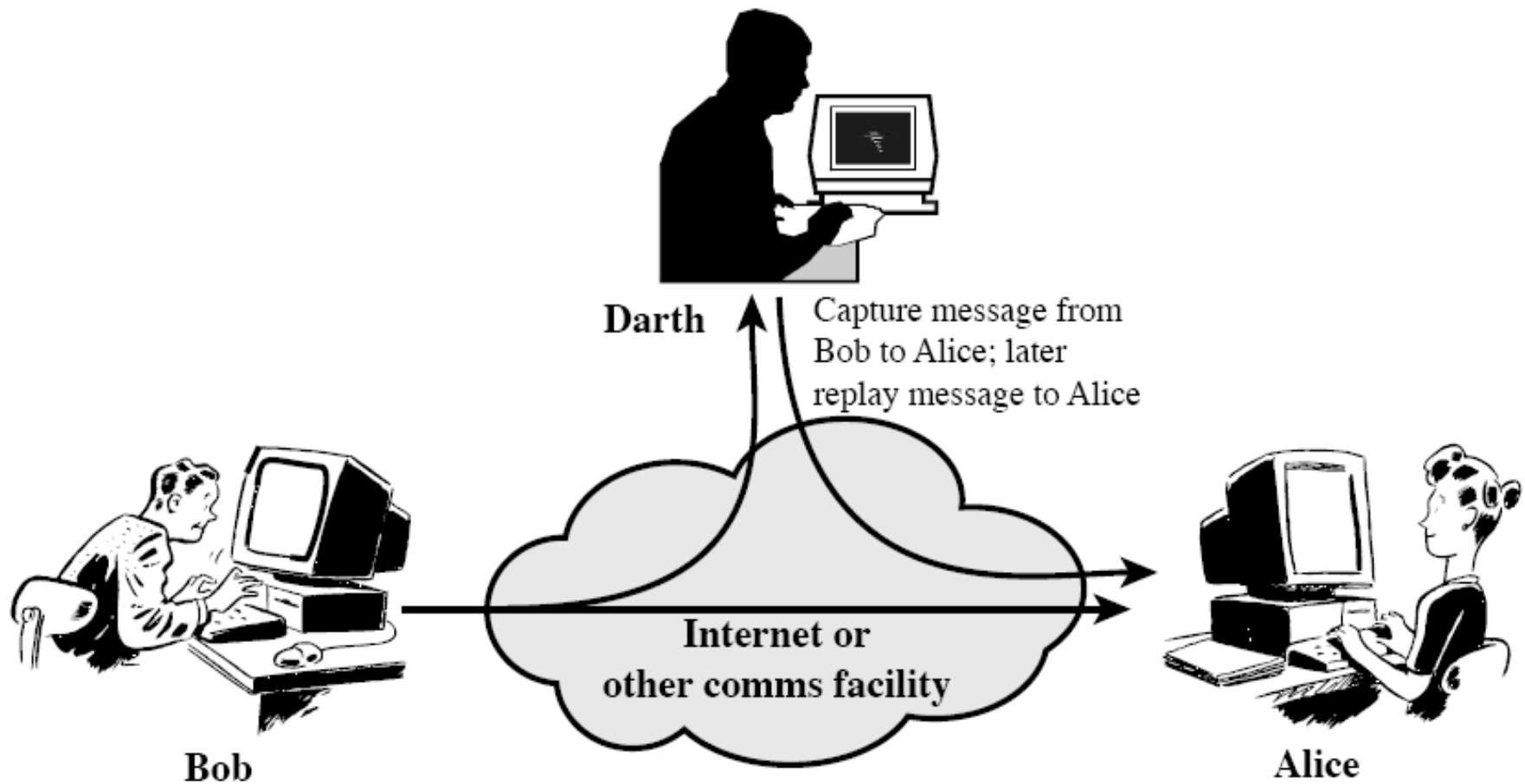
Active attack

- ☐ Masquerade
- ☐ Replay
- ☐ Modification of messages
- ☐ Repudiation
- ☐ Denial of Service

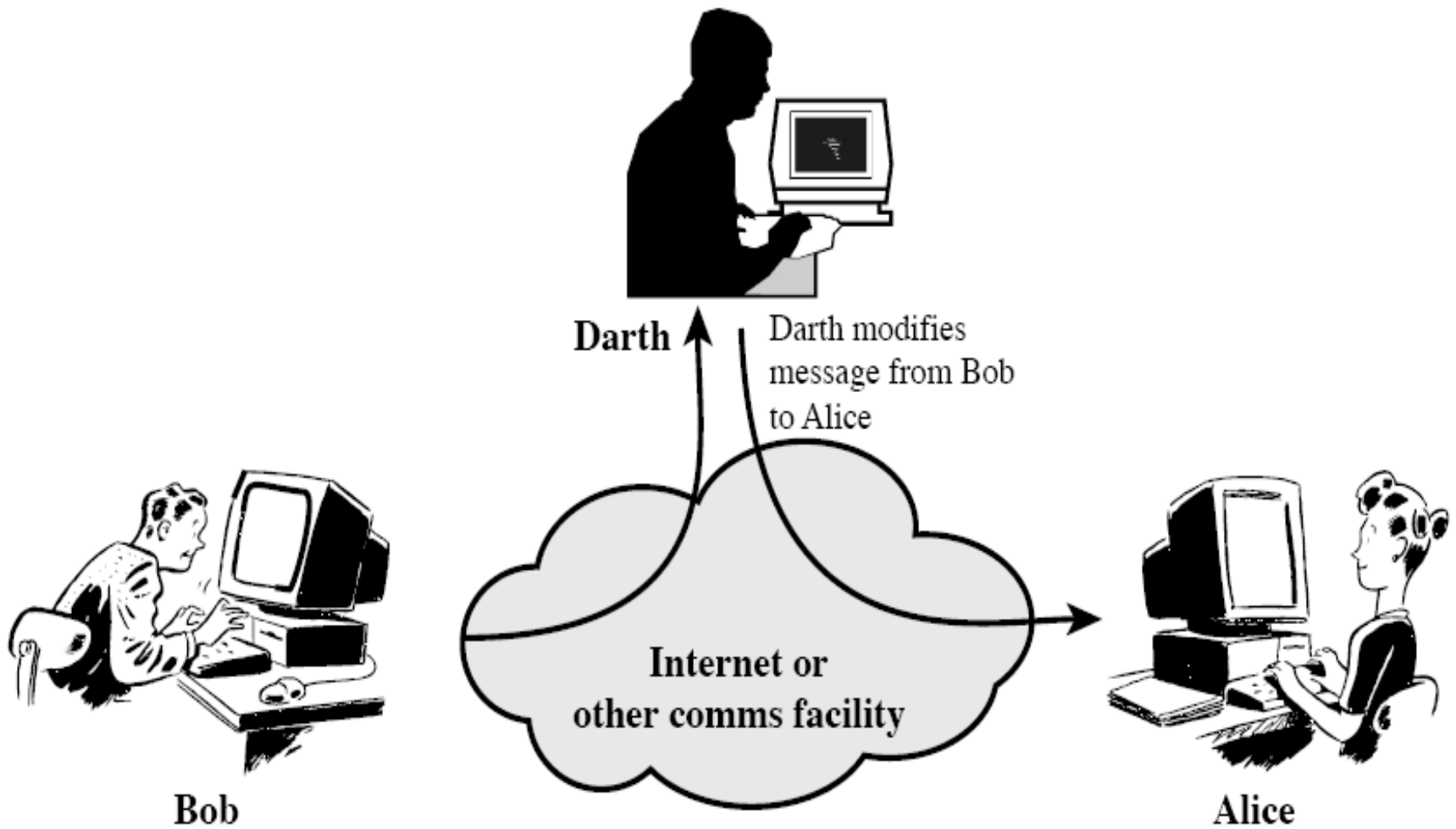
Masquerade



Replay



Modification of messages



Denial of service



Darth

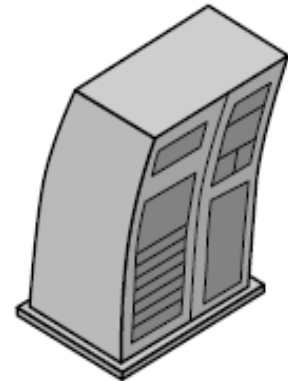
Darth disrupts service
provided by server



Bob



Internet or
other comms facility



Server




Security Services


- **Data Confidentiality** – It is designed to protect data from disclosure attack.
- **Data Integrity** – It is designed to protect data from modification, insertion, deletion, and replaying.
- **Authentication** – Ensures that the communicating entity is the one that it claims to be.

- **Non-repudiation** – Ensures protection against denial by one of the parties in a communication.
- **Access control** – Ensures prevention of unauthorized use of a resource. It determines *who* should be able to access *what*.

Security Mechanisms

- **Encipherment** – Use of mathematical algorithms to transform data into a form that is not readily intelligible.
- **Digital signature** – Sender can digitally sign the information and a receiver can verify it.
- **Traffic padding** – Insertion of bits into gaps in a data stream to frustrate traffic analysis attempts.

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- **Access control** – Variety of mechanisms that enforce access rights to resources.
 - **Data integrity** – Variety of mechanisms used to assure the integrity of a data unit.
 - **Notarization** – Use of a trusted third party to control the communication between two entities.

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- **Authentication Exchange** – Two parties can exchange information to prove each other that they are communicating.
 - **Routing Control** – Enables selection or change of available communication channel .