

# Cryptography and Network Security Chapter 1

Fourth Edition  
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Lecture slides by Lawrie Brown

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# Chapter 1 – Introduction

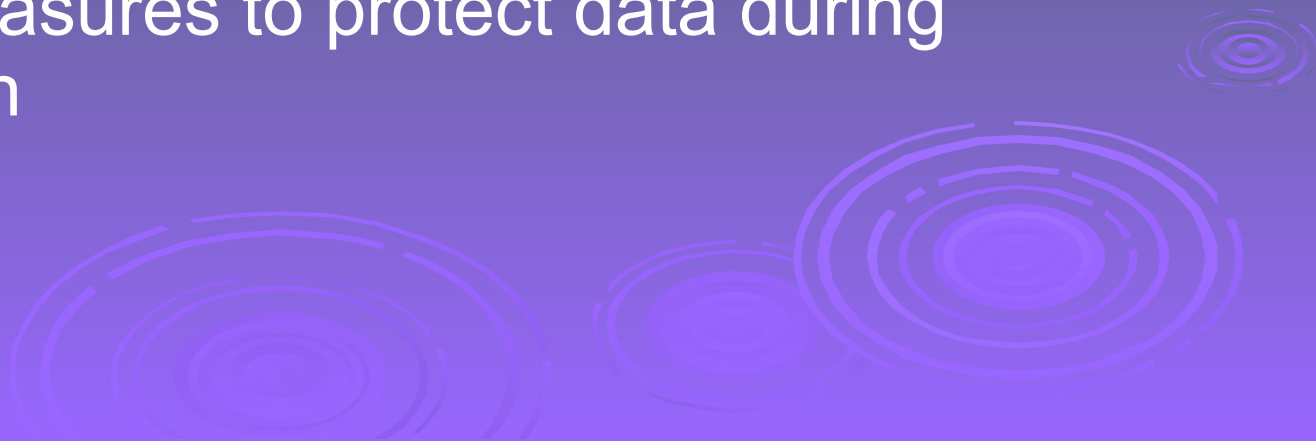
*The art of war teaches us to rely not on the likelihood of the enemy's not coming, but on our own readiness to receive him; not on the chance of his not attacking, but rather on the fact that we have made our position unassailable.*

**—The Art of War, Sun Tzu**



# Background

- ❑ Information Security requirements have changed in recent times
- ❑ traditionally provided by physical and administrative mechanisms
- ❑ computer use requires automated tools to protect files and other stored information
- ❑ use of networks and communications links requires measures to protect data during transmission



# Definitions

- ❑ **Computer Security** - generic name for the collection of tools designed to protect data and to thwart hackers
- ❑ **Network Security** - measures to protect data during their transmission
- ❑ **Internet Security** - measures to protect data during their transmission over a collection of interconnected networks

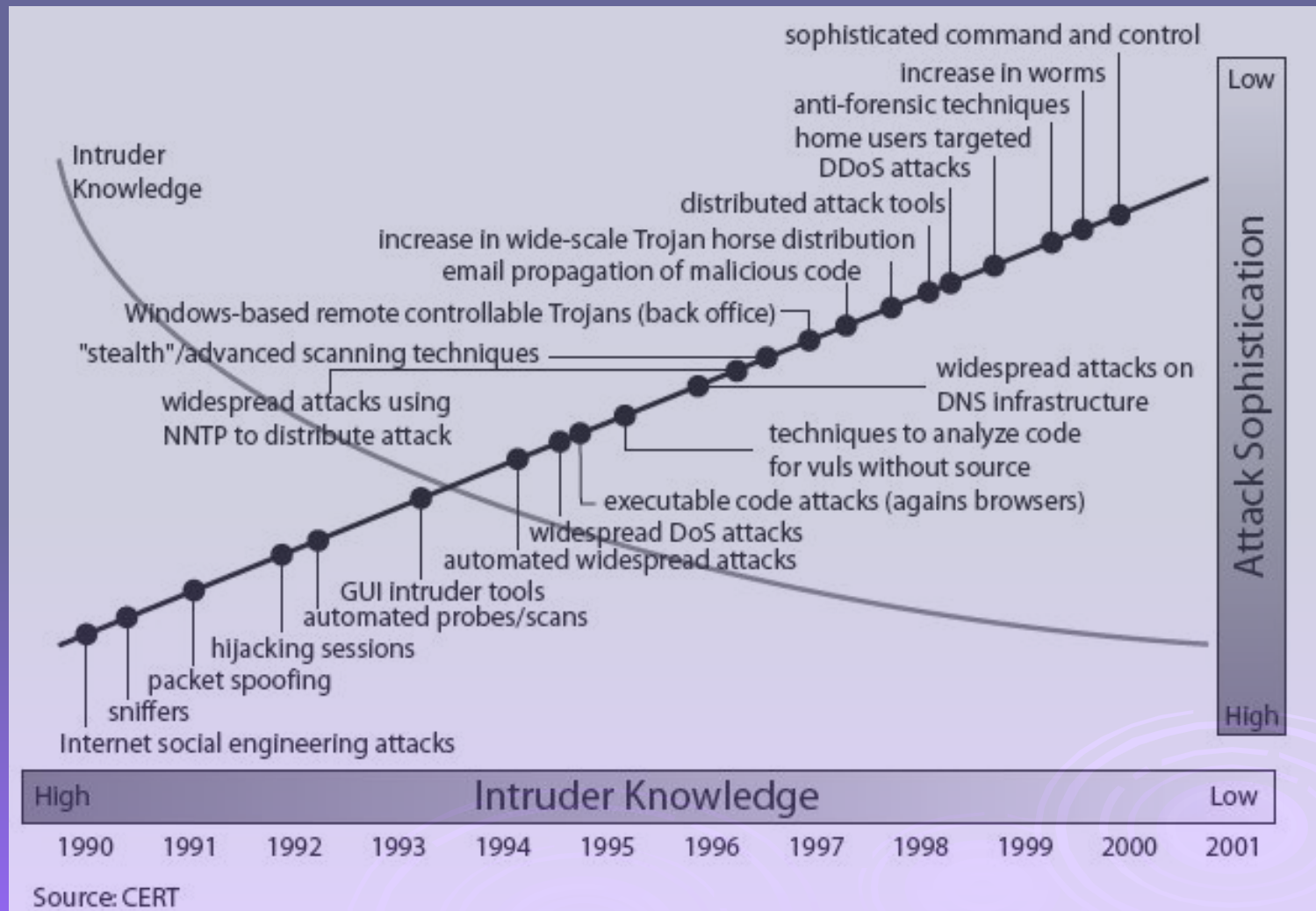


# Aim of Course

- our focus is on **Internet Security**
- which consists of measures to deter, prevent, detect, and correct security violations that involve the transmission & storage of information



# Security Trends



# OSI Security Architecture

- ❑ ITU-T X.800 “Security Architecture for OSI”
- ❑ defines a systematic way of defining and providing security requirements
- ❑ for us it provides a useful, if abstract, overview of concepts we will study



# Aspects of Security

- consider 3 aspects of information security:
  - **security attack**
  - **security mechanism**
  - **security service**



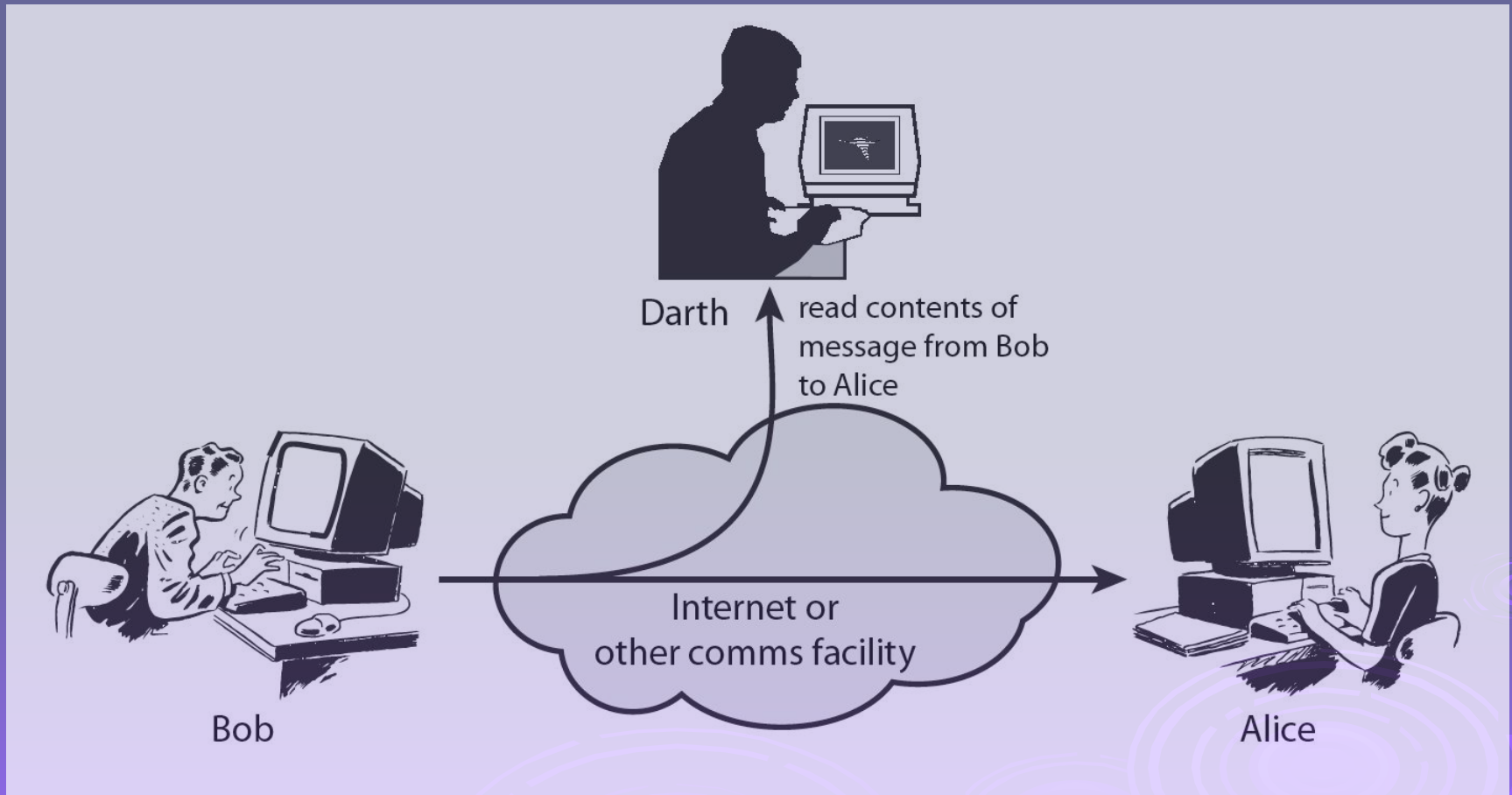


# Security Attack

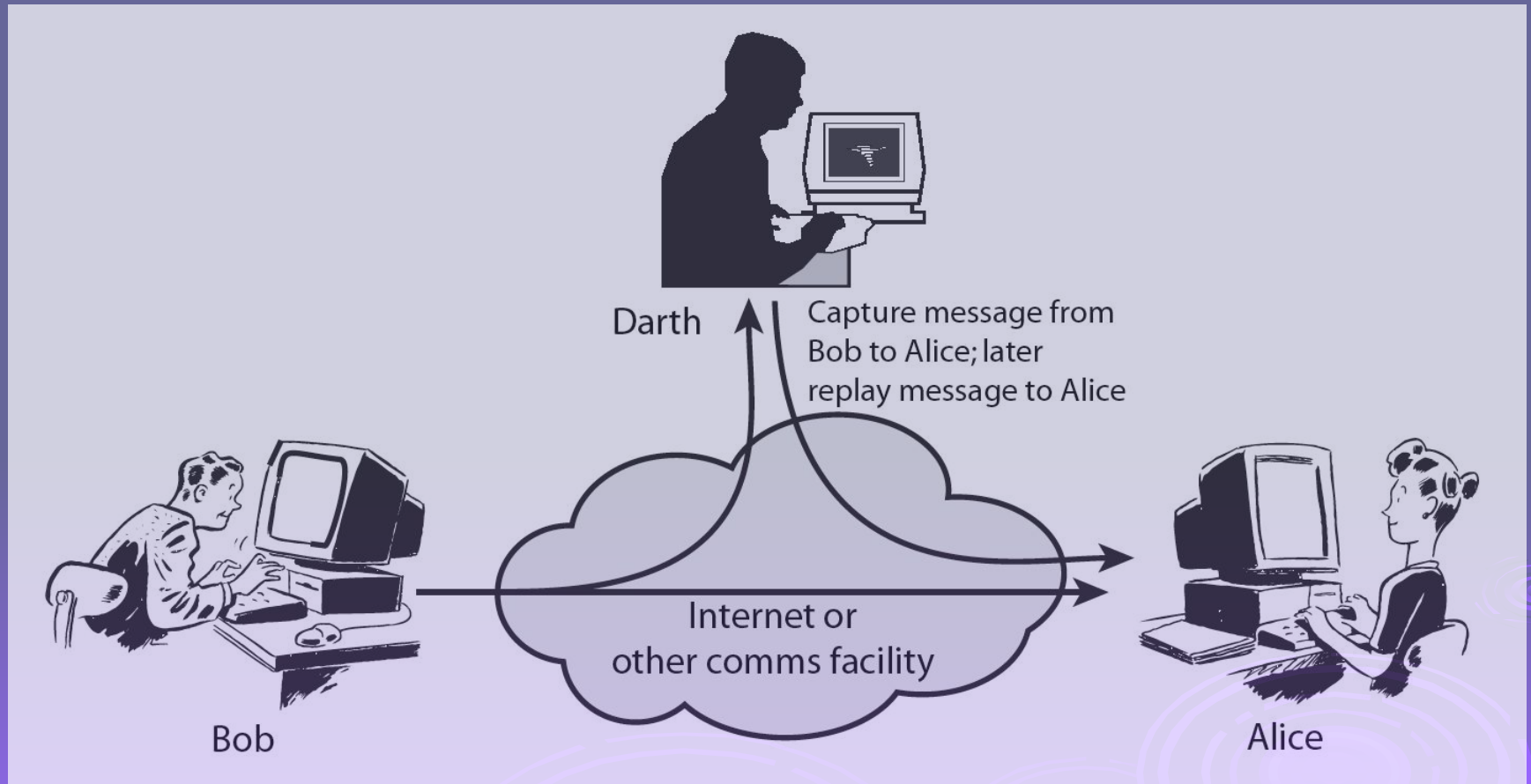
- ❑ any action that compromises the security of information owned by an organization
- ❑ information security is about how to prevent attacks, or failing that, to detect attacks on information-based systems
- ❑ often *threat* & *attack* used to mean same thing
- ❑ have a wide range of attacks
- ❑ can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



# Passive Attacks



# Active Attacks



# Security Service

- enhance security of data processing systems and information transfers of an organization
- intended to counter security attacks
- using one or more security mechanisms
- often replicates functions normally associated with physical documents
  - which, for example, have signatures, dates; need protection from disclosure, tampering, or destruction; be notarized or witnessed; be recorded or licensed

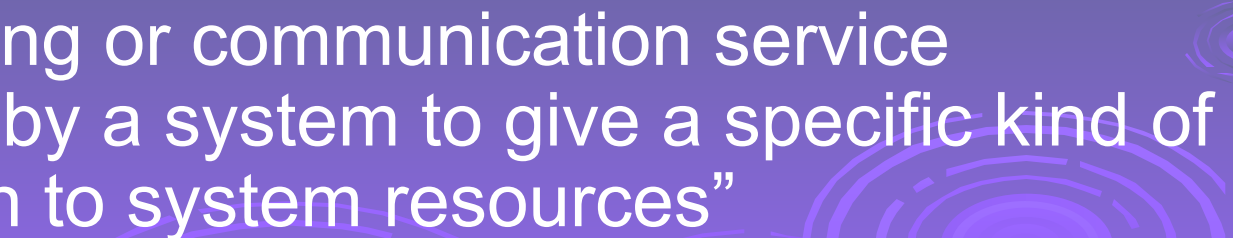
# Security Services

## □ X.800:


“a service provided by a protocol layer of communicating open systems, which ensures adequate security of the systems or of data transfers”

## □ RFC 2828:

“a processing or communication service provided by a system to give a specific kind of protection to system resources”

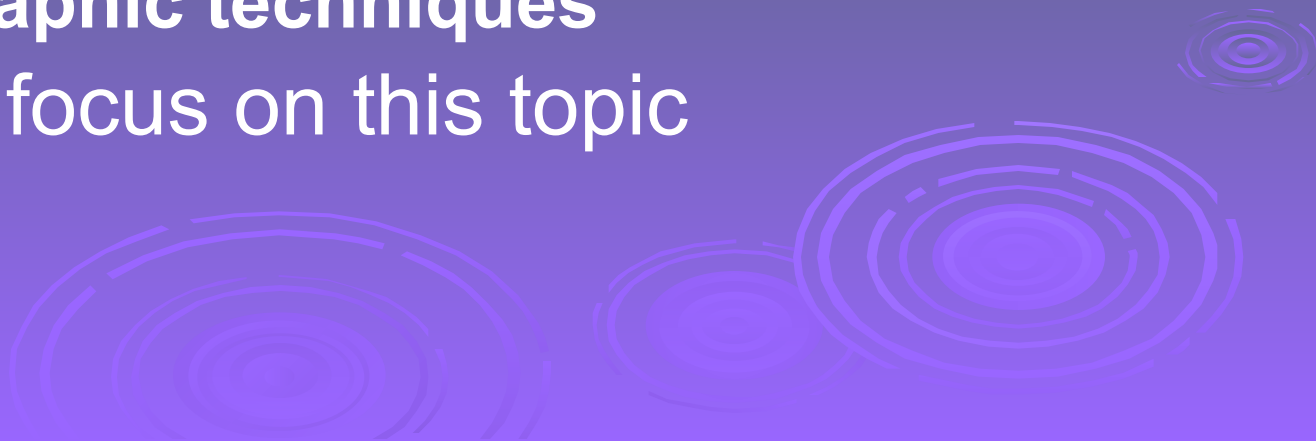
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# Security Services (X.800)

- ❑ **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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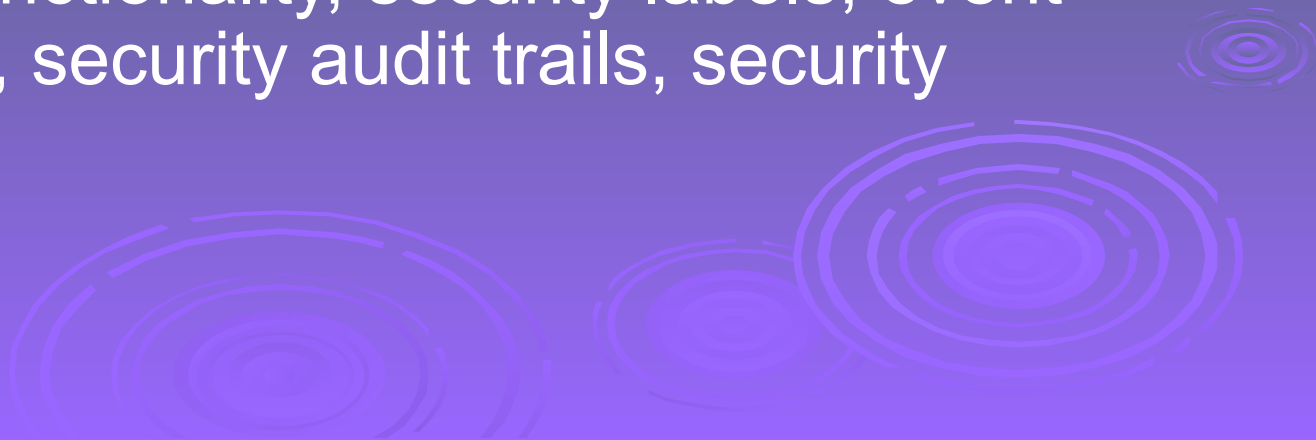
# Security Mechanism

- ❑ feature designed to detect, prevent, or recover from a security attack
- ❑ no single mechanism that will support all services required
- ❑ however one particular element underlies many of the security mechanisms in use:
  - **cryptographic techniques**
- ❑ hence our focus on this topic



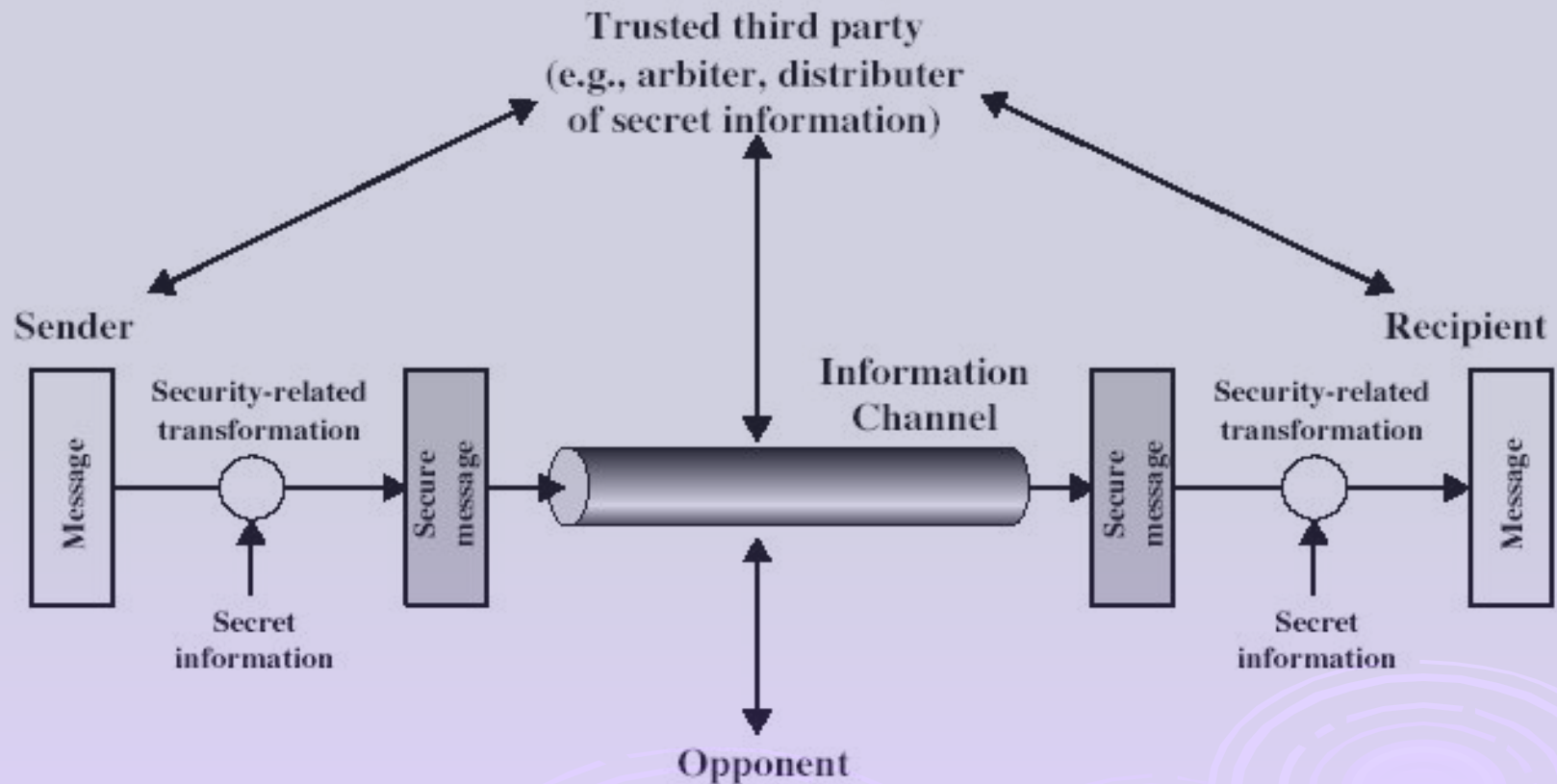
# Security Mechanisms (X.800)

- 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





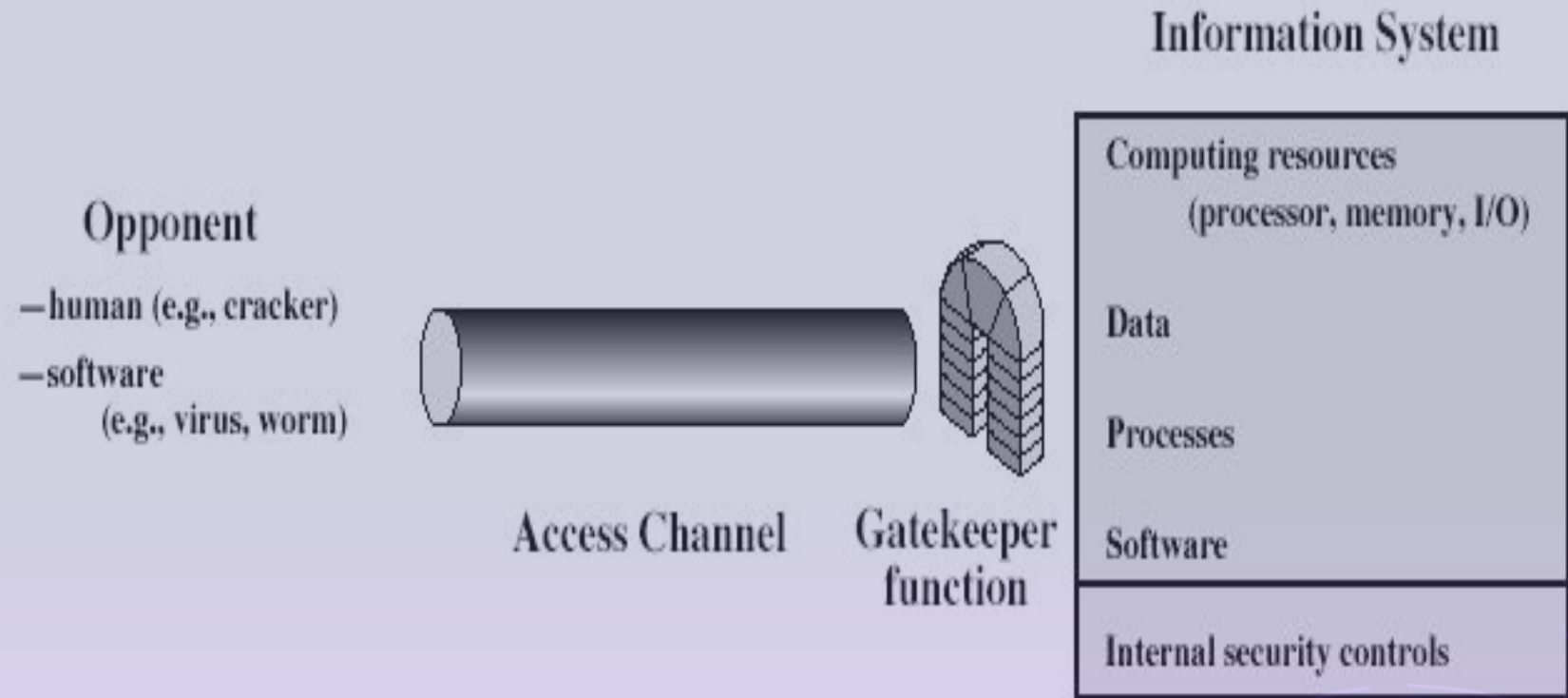
# Model for Network Security



# Model for Network Security

- using this model requires us to:
  1. design a suitable algorithm for the security transformation
  2. generate the secret information (keys) used by the algorithm
  3. develop methods to distribute and share the secret information
  4. specify a protocol enabling the principals to use the transformation and secret information for a security service

# Model for Network Access Security



# Model for Network Access Security

- using this model requires us to:
  1. select appropriate gatekeeper functions to identify users
  2. implement security controls to ensure only authorised users access designated information or resources
- trusted computer systems may be useful to help implement this model



# Summary

- have considered:
  - definitions for:
    - computer, network, internet security
- X.800 standard
- security attacks, services, mechanisms
- models for network (access) security

