Introduction

19CSE311 Computer Security

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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

Definitions

- Cryptography
  - Cryptography, a word with Greek origins, means “secret writing.”
  - Refer to the science and art of transforming messages to make them secure and immune to attacks.
  - Cryptography referred only to the encryption and decryption of messages using secret keys,
  - Categories :
    - symmetric-key encipherment,
    - asymmetric-key encipherment and
    - hashing.

Definitions

- Steganography
  - Origin in Greek, means “covered writing,” in contrast with cryptography, which means “secret writing.”
  - Cryptography means concealing the contents of a message by enciphering;
  - Steganography means concealing the message itself by covering it with something else

Definitions

- Cryptanalysis
  - **Study of methods for obtaining the meaning of encrypted information, without access to the secret information that is typically required to do so**.
  - Involves knowing how the system works and finding a secret key.
  - Cryptanalysis is also referred to as codebreaking or cracking the code

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**
- hence our focus on this area

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

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

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

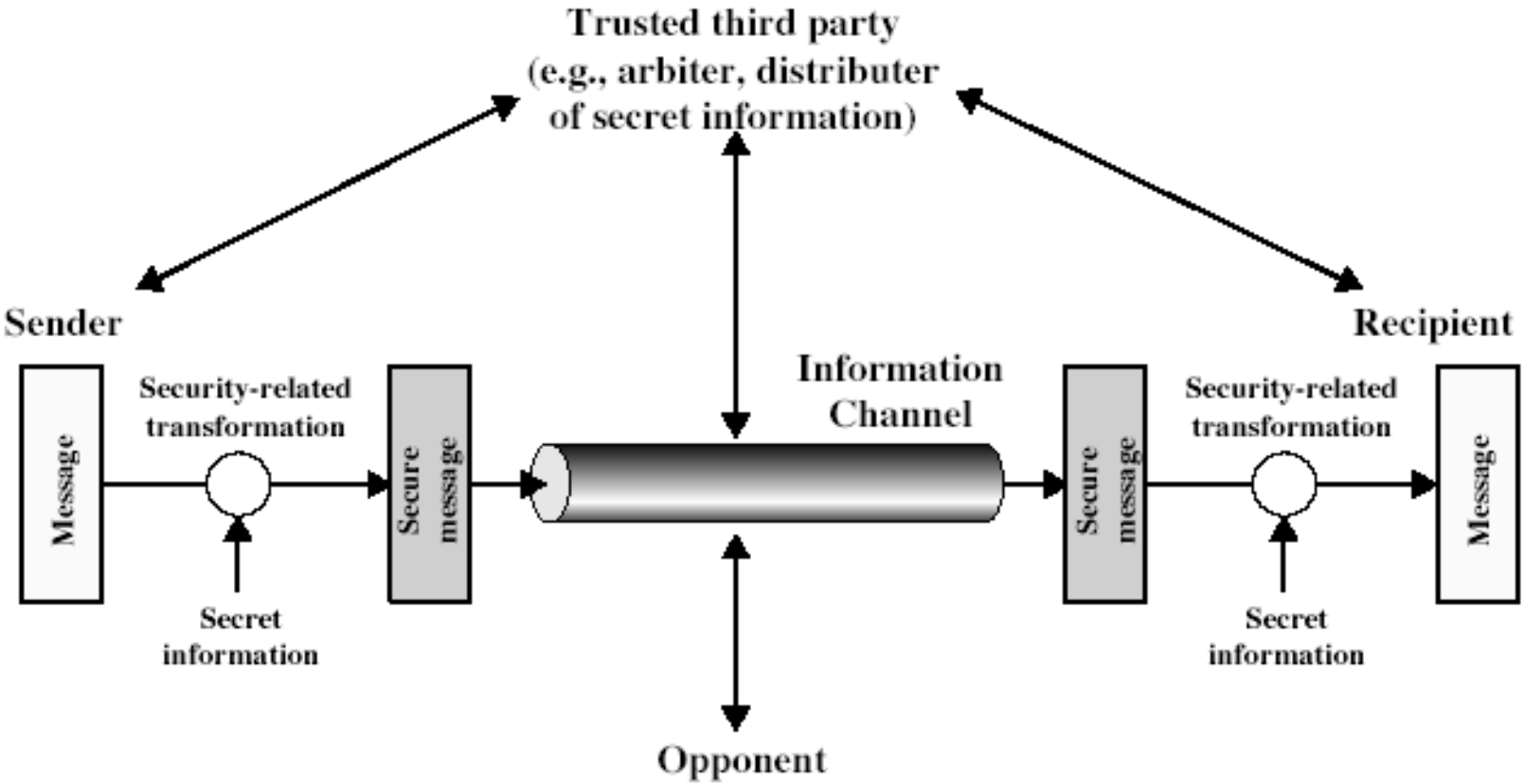
Security Mechanisms (X.800)

- 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

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

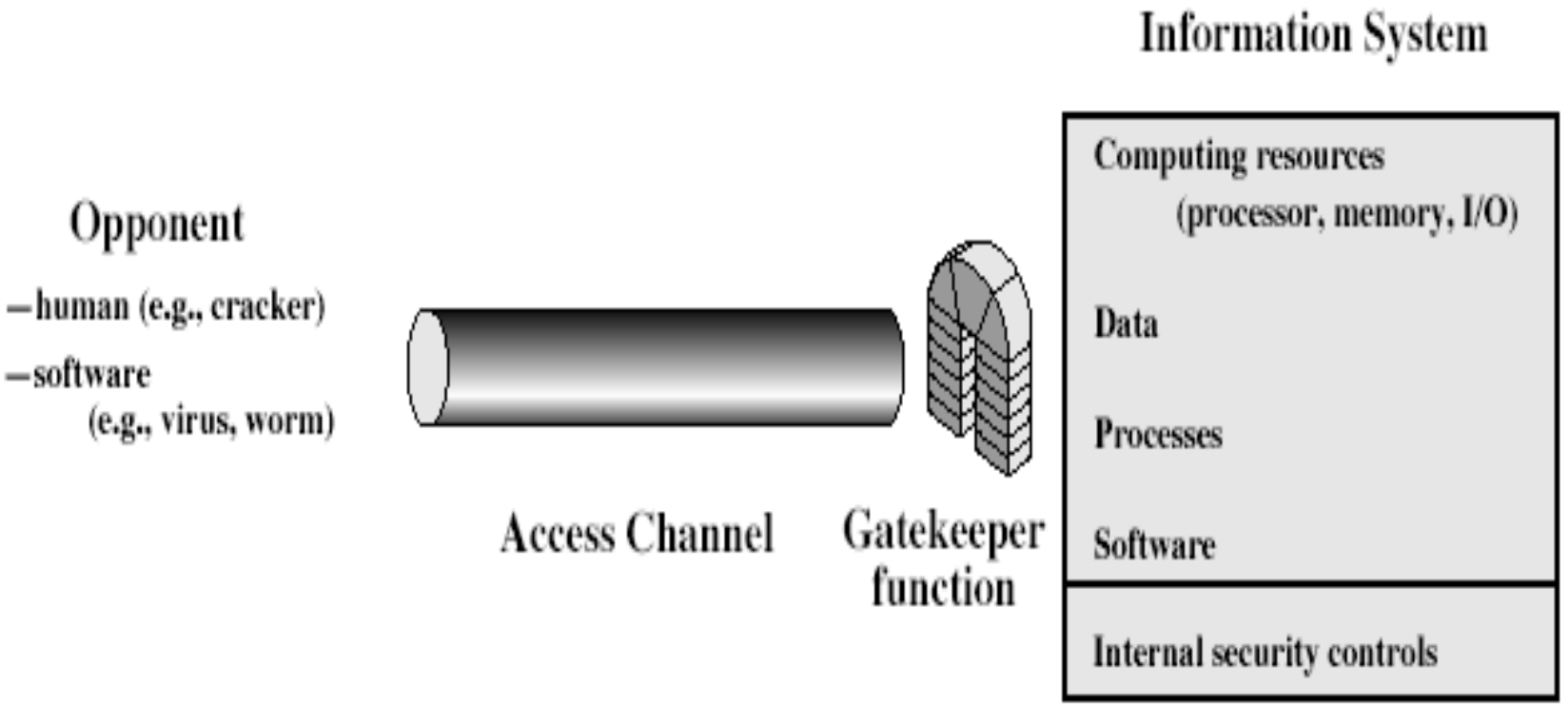
Model for Network Security



Model for Network Security

- using this model requires us to:
  - design a suitable algorithm for the security transformation
  - generate the secret information (keys) used by the algorithm
  - develop methods to distribute and share the secret information
  - 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:
  - select appropriate gatekeeper functions to identify users
  - implement security controls to ensure only authorised users access designated information or resources
- trusted computer systems can be used to implement this model

Summary

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