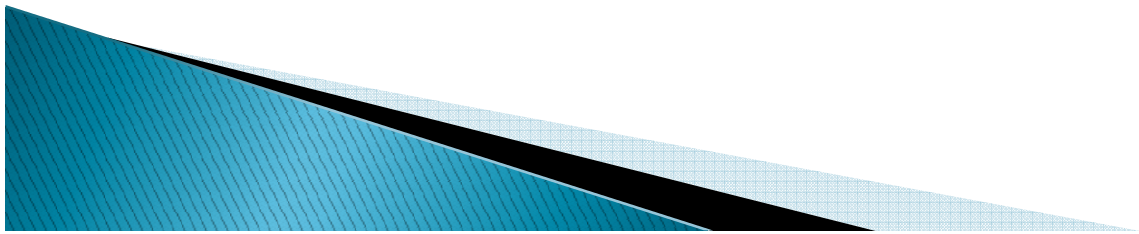
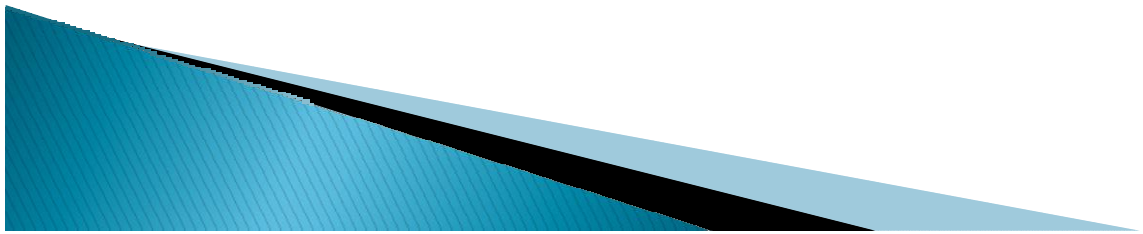
CS6701- CRYPTOGRAPHY AND NETWORK SECURITY

Adapted from 'Cryptography and Network Security' book
Presentations by William Stallings (Third Edition)



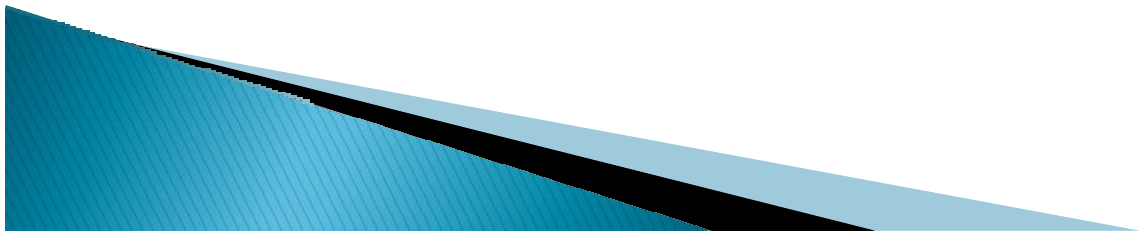
Background

- 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



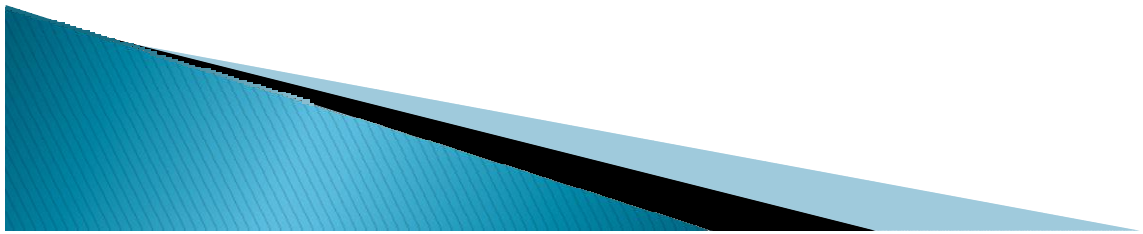
Definitions

- 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



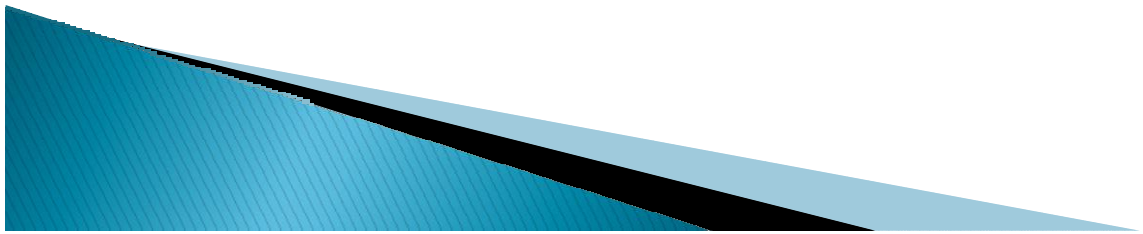
Services, Mechanisms, Attacks

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



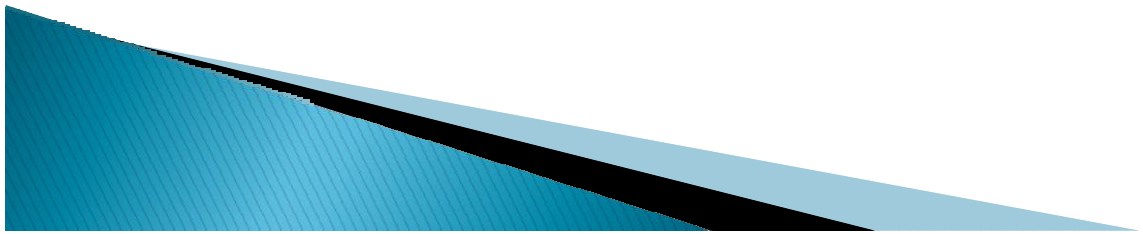
Security Service

- 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



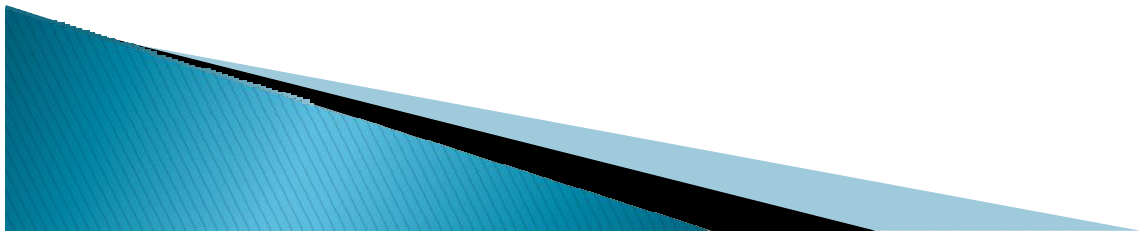
Security Mechanism

- 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



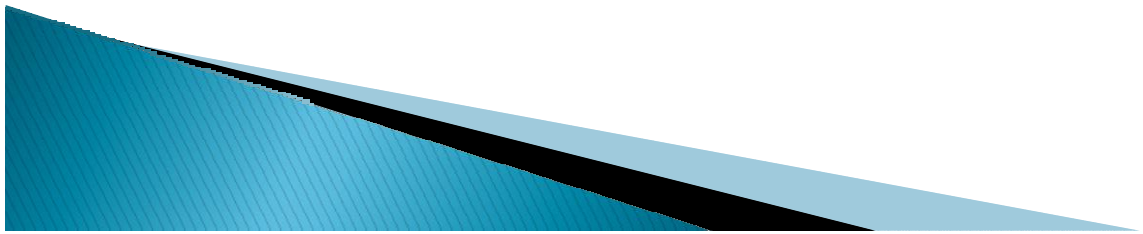
Security Attack

- 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 on generic types of attacks
- note: often threat & attack mean same



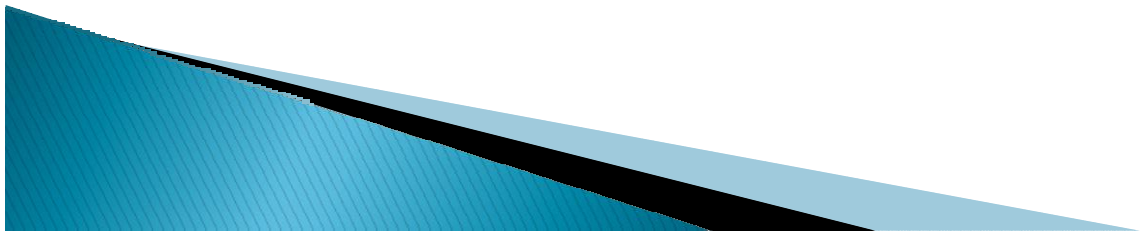
OSI Security Architecture

- 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



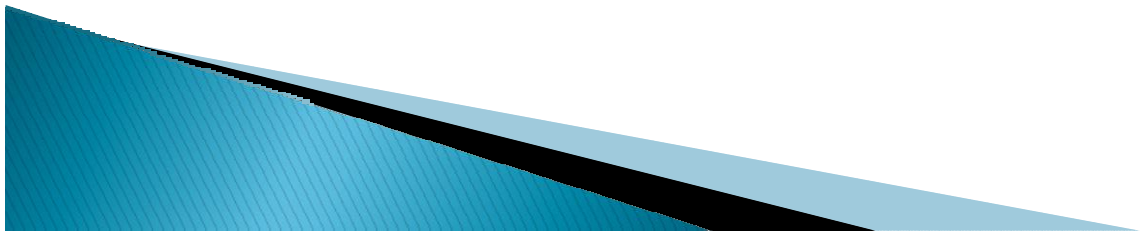
Security Services

- 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



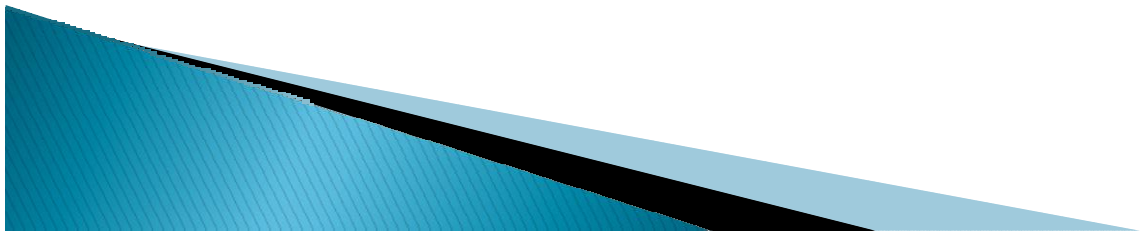
Security Services (X.800)

- 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



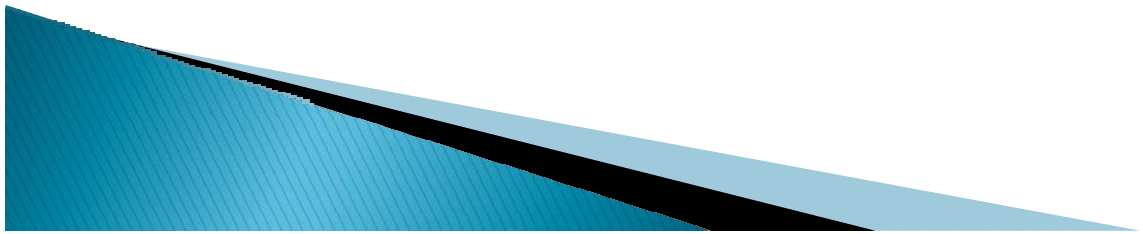
Security Mechanisms (X.800)

- 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

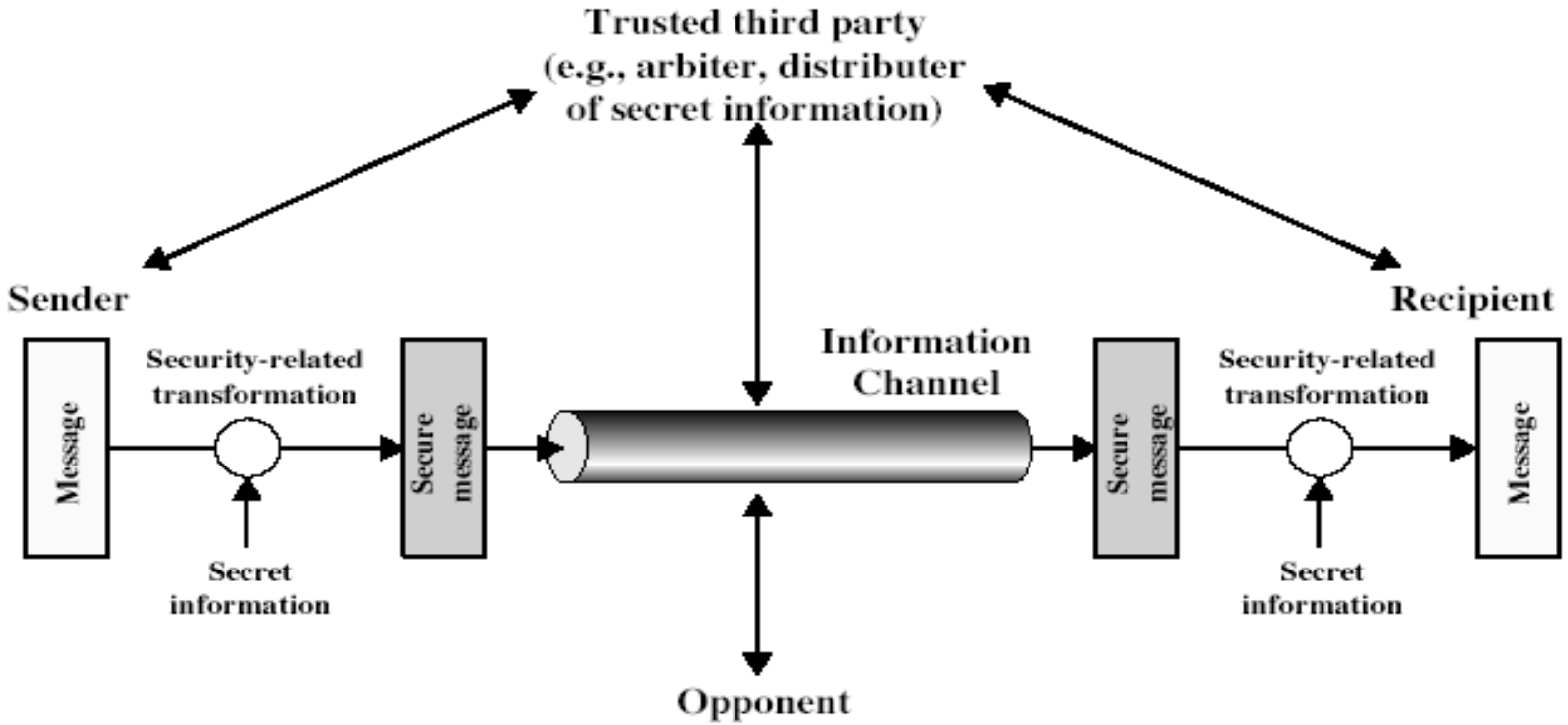


Classify Security Attacks as

- 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

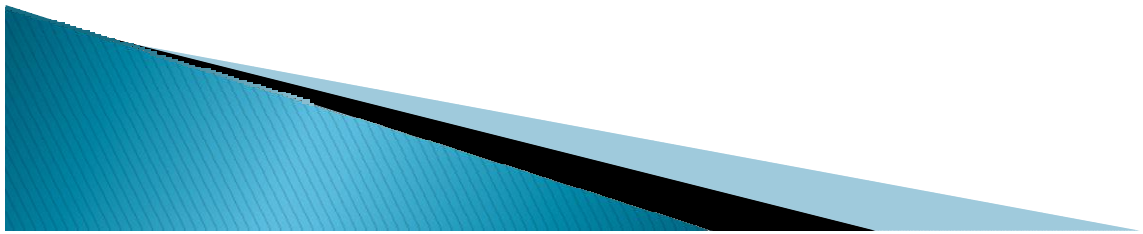


Model for Network Security

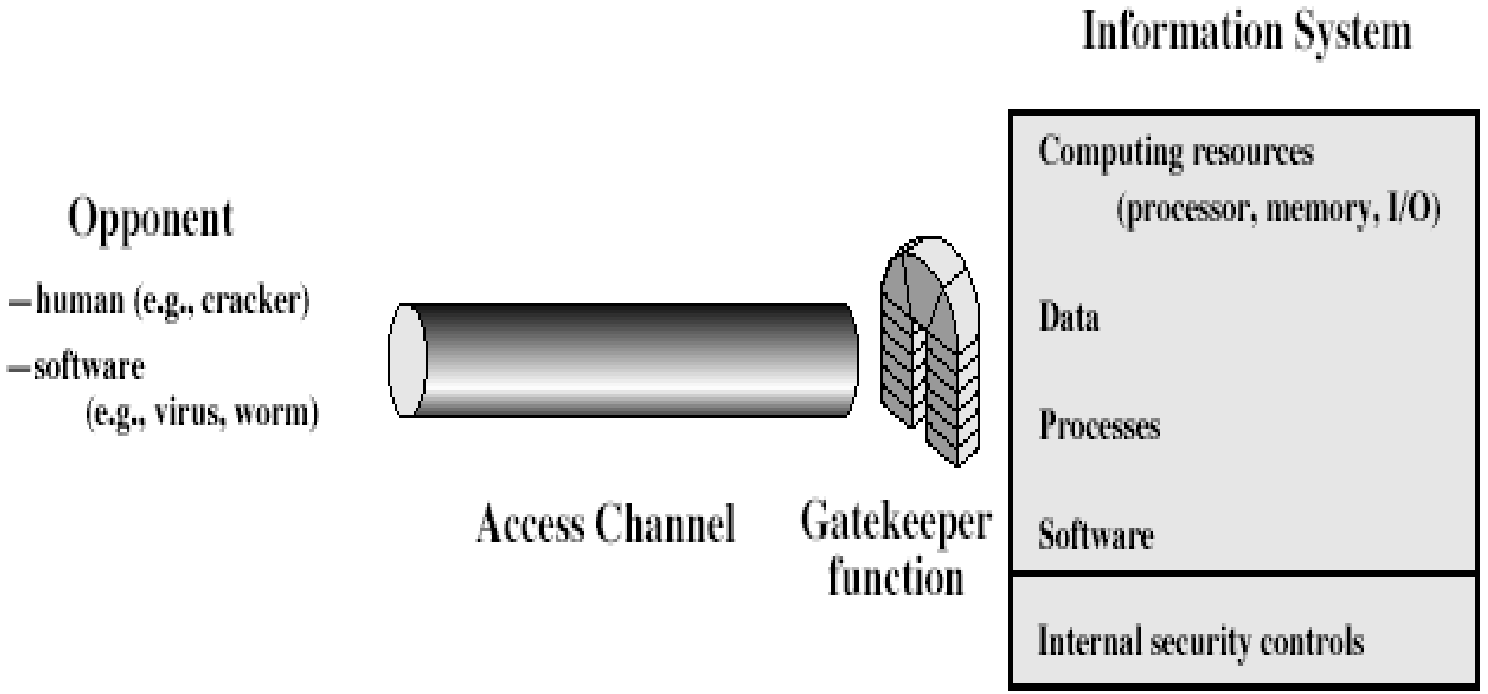


Model for Network Security

- 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

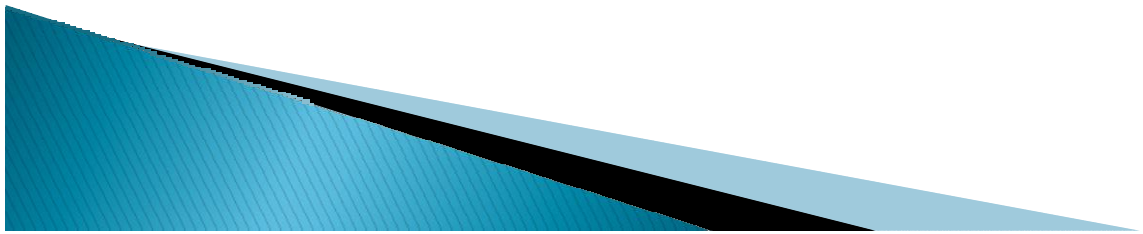


Model for Network Access Security



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