CS ??? Computer Security Overview

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2010.2.22

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Course Syllabus

- Introduction
- Fundamentals
  - Symmetric Key Encryption
  - Hashing and Public Key Encryption
- Applications
  - Authentication Protocols
  - E-Mail Security
  - IP Security
  - Web Security
  - LAN Security
  - Intrusion Detection
  - Malicious Software
  - Firewalls

Course Philosophy

- Maximize practical sense
- Maximize field exposure
- Minimize complex mathematics

You need to USE Network Security Algorithms and Systems not to invent new ones.

Text Books

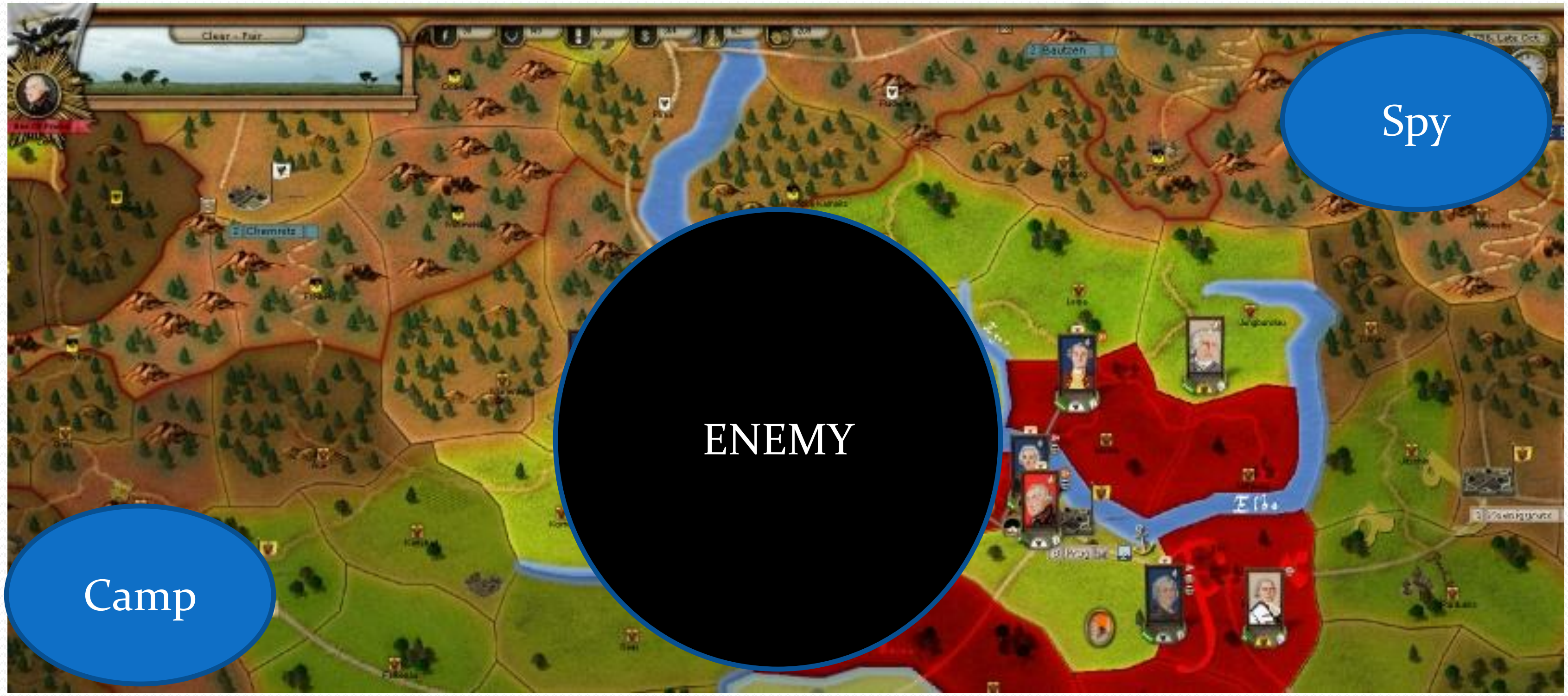
Main Text

- Network Security Essentials
  - William Stallings

Other References

- Cryptography and Network Security
  - William Stallings
- Network Security Fundamentals
  - Gert De Laet and Gert Schauwers
- Fundamentals of Network Security
  - John E. Canavan
- Applied Cryptography
  - Bruce Schneier

Let’s Play a Spy Game



Spy

ENEMY

Camp

- Spy knows that ENEMY will attack the CAMP at 6:00
- How can he tell the CAMP about that and know that they received the information.

Security Types

- Physical and Administrative Security
- Computer Security
- Network Security
- Internet Security

ITU-T OSI X.800

- ITU-T=International Telecommunication Unit, Telecommunication Standardization Sector

- OSI=Open Systems Interconnectivity

- X.800= Security Architecture for OSI

Threats vs. Attacks

- **Threat**
  A possible danger that might exploit a vulnerability.

- **Attack**
  An assault on system security that derives from an intelligent threat.

- **Security mechanism**
  A process that is designed to detect, prevent, or recover from a security attack.

- **Security service**
  A processing or communication service that enhances the security of the data processing systems and the information transfers of an organization.

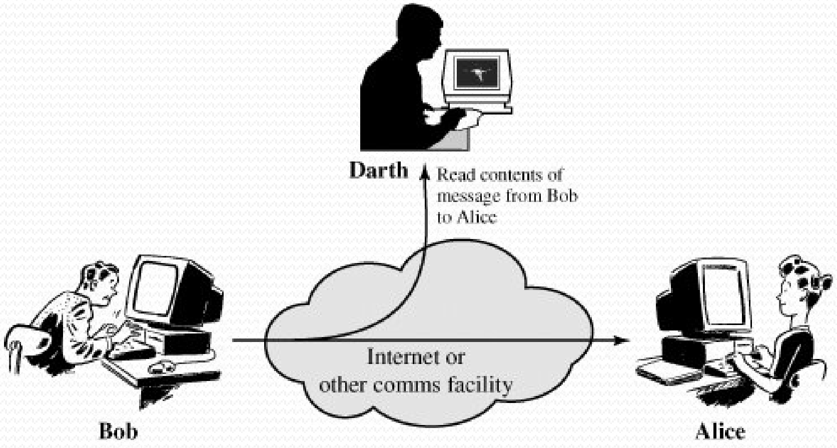
- **Relations Between them**
  The services are intended to counter security attacks, and they make use of one or more security mechanisms to provide the service.

Security Attacks in X.800

- Passive Attacks
- Active Attacks

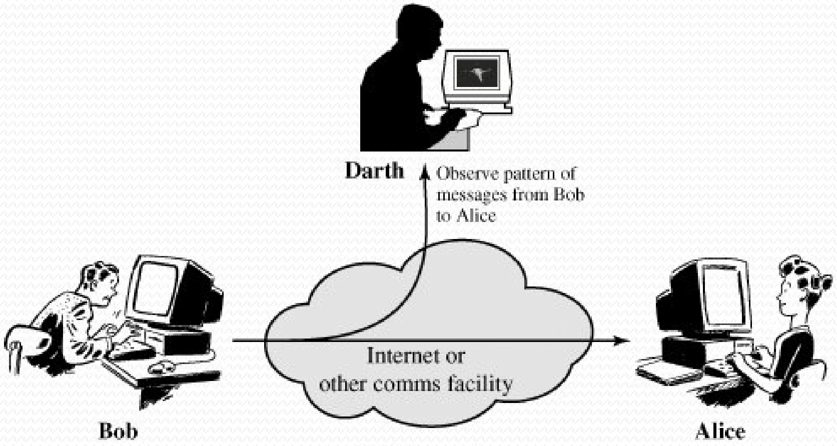
Passive Attacks

Release of Message Contents


Darth
Read contents of message from Bob to Alice
Internet or other comms facility
Bob
Alice

(a) Release of message contents

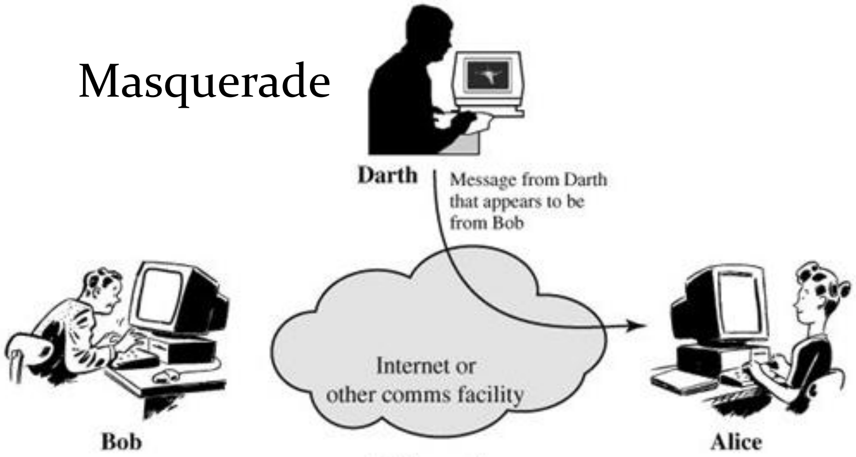
Traffic Analysis


Darth
Observe pattern of messages from Bob to Alice
Internet or other comms facility
Bob
Alice

(b) Traffic analysis

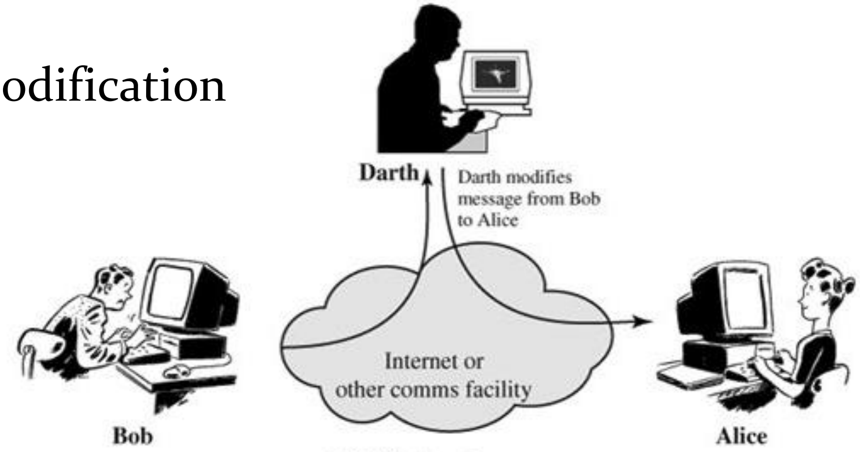
Active Attacks

Masquerade


Darth
Message from Darth that appears to be from Bob
Internet or other comms facility
Bob
Alice

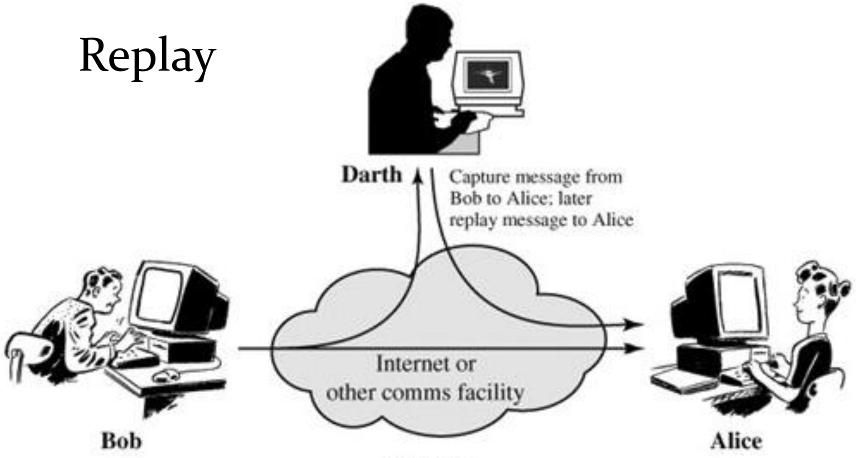
(a) Masquerade

Modification


Darth
Darth modifies message from Bob to Alice
Internet or other comms facility
Bob
Alice

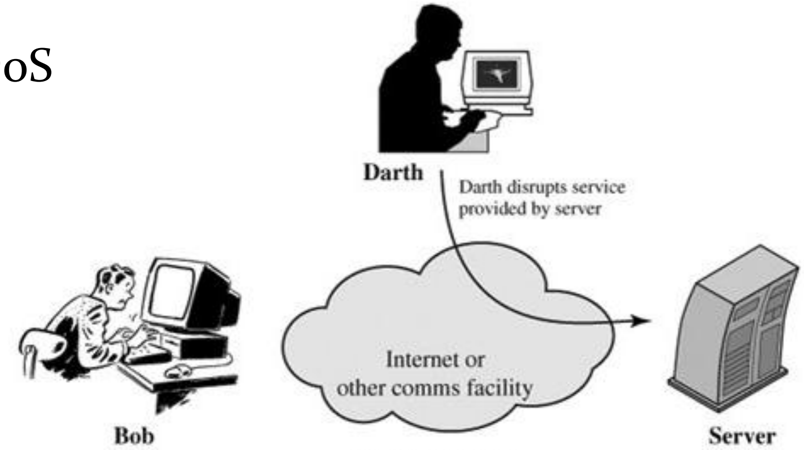
(c) Modification of messages

Replay


Darth
Capture message from Bob to Alice; later replay message to Alice
Internet or other comms facility
Bob
Alice

(b) Replay

DoS


Darth
Darth disrupts service provided by server
Internet or other comms facility
Bob
Server

(d) Denial of service

Security Services in X.800

1. Authentication
    - Pear entity authentication
    - Data origin authentication
2. Access Control
3. Data Confidentiality
4. Data Integrity
5. Nonrepudiation
6. Availability

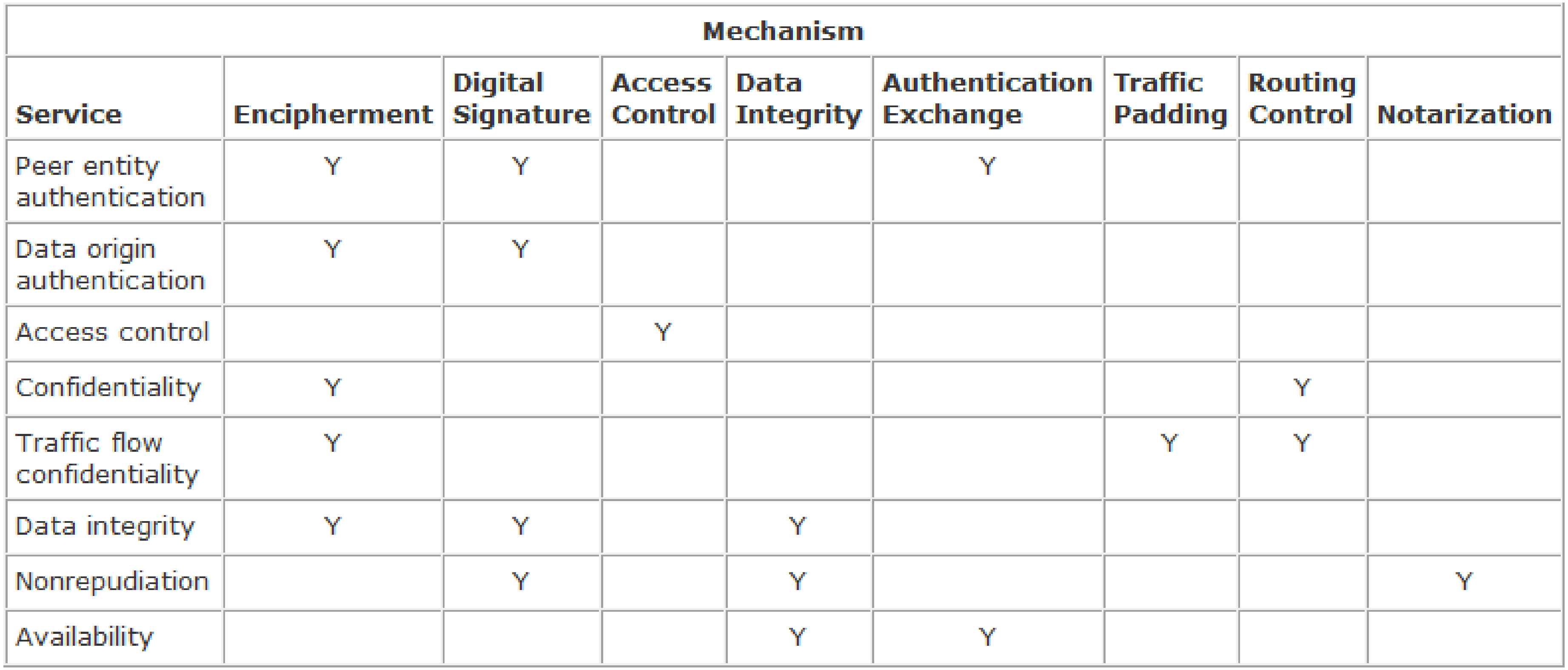
Security Mechanisms in X.800

- Specific Security Mechanisms
  - Encipherment
  - Digital Signature
  - Access Control
  - Data Integrity
  - Authentication Exchange
  - Traffic Padding
  - Routing Control
  - Notarization

Security Mechanisms in X.800

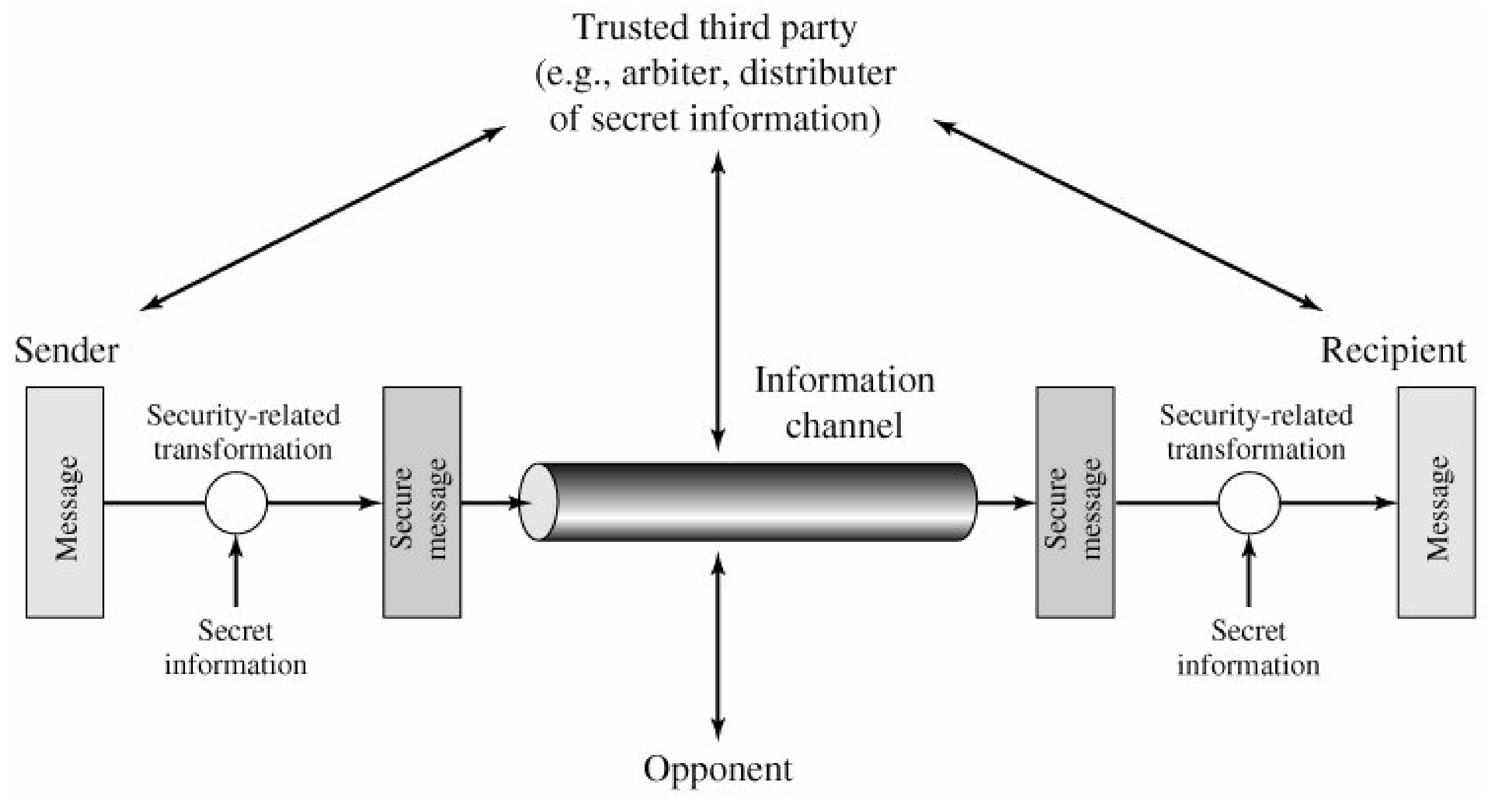
- Pervasive Security Mechanisms
  - Trusted Functionality
  - Security Label
  - Event Detection
  - Security Audit Trail
  - Security Recovery

Services and Mechanisms



Mechanism								
Service	**Encipherment**	**Digital Signature**	**Access Control**	**Data Integrity**	**Authentication Exchange**	**Traffic Padding**	**Routing Control**	**Notarization**
Peer entity authentication	Y	Y			Y			
Data origin authentication	Y	Y						
Access control			Y					
Confidentiality	Y						Y	
Traffic flow confidentiality	Y					Y	Y	
Data integrity	Y	Y		Y				
Nonrepudiation		Y		Y				Y
Availability				Y	Y			

Model For Network Security



Security Techniques

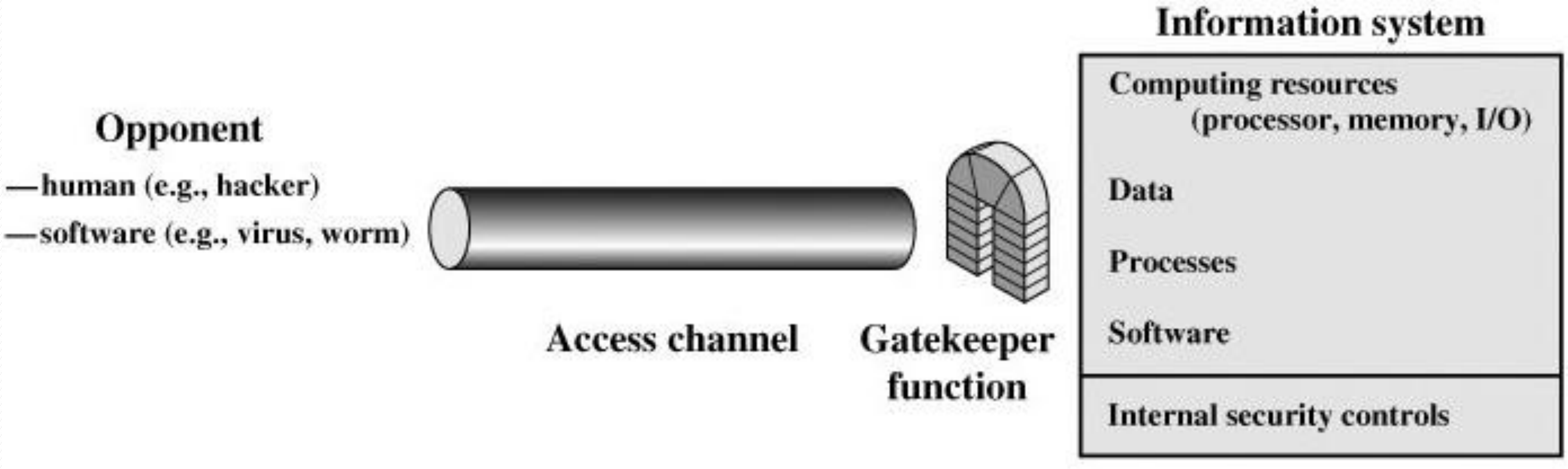
- Data Transformation
  - Encryption
  - Hashing
  - Padding

- Secret Information
  - Keys
  - Algorithms

Steps of any security techniques

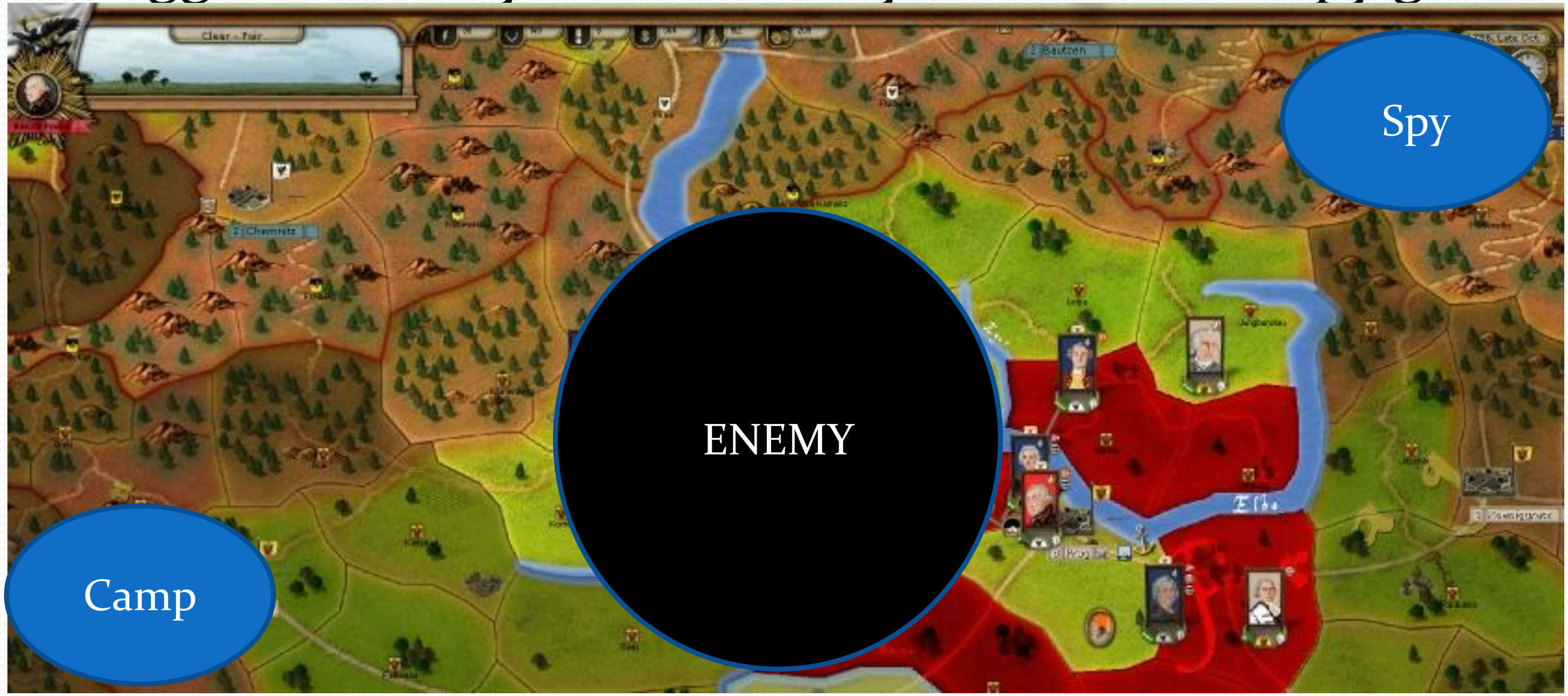
- Algorithm Design
- [Optional] Secret Information Generation
- [Optional] Secret Information Distribution
- Protocol Specification

Network Access Model



First Assignment

- Self Read: Section 1.6 of ‘Network Security Essentials’ about Standards and Internet Society
- Suggest as many solutions as you can to the Spy game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