System Complexity Leads to Insecurity

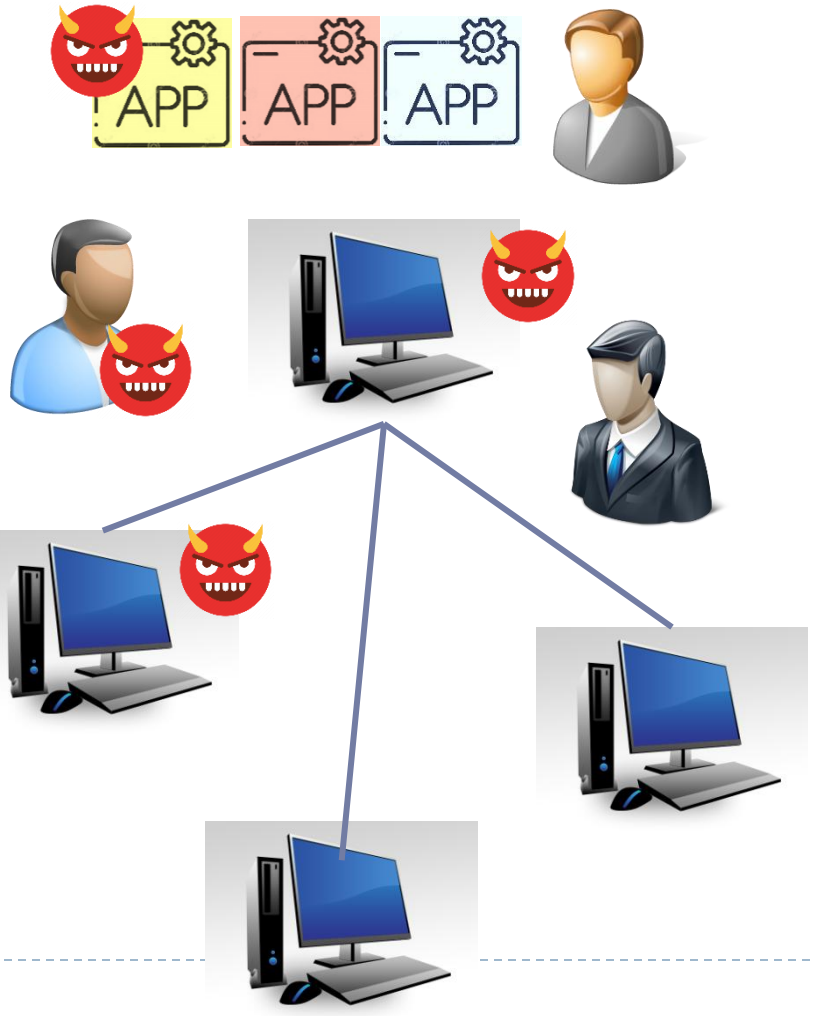
Provide a protected environment for data and their processing

Standalone computer single user monoprogram

- Physical security

Standalone computer single user multiprogram

- Physical security
- Process protection



Standalone computer multiple user

- Physical security
- Process protection
- Data protection
- User authentication

Networked computer

- Physical security
- Process protection
- Data protection
- User authentication
- Communication protection

Human Factors Lead to Insecurity

System Users

- Security features are not used correctly, e.g., misconfiguration.
- Users like convenience and may try to disable some security configurations that are not inconvenient

System Developers

- Security features are not designed correctly; security components are not implemented correctly
- Developers are humans, and humans can make mistakes.

External Parties

- Individual's trust can be manipulated for profit, e.g., social engineering

Basics of Cyber Security

Threat Model

- Trusted Computing Base (TCB)
- Attacker's assumption
- Security properties

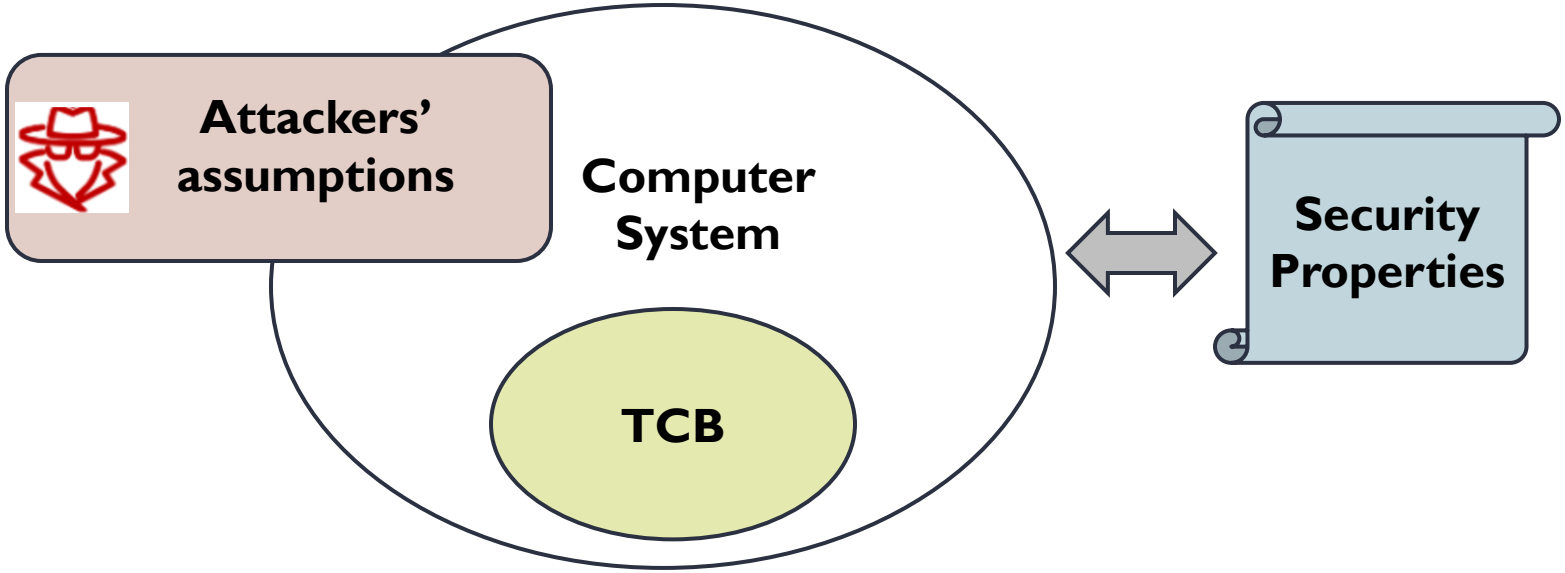
- **Security Strategies**

- **Design Principles of Computer Security**

Threat Model

Describe the adversaries and threats in consideration

- What is trusted and what is not trusted (TCB).
- For the untrusted entities, what resources, capabilities and knowledge they have; what actions they can perform.
- What security properties the system aim to achieve.



Trust

The degree to which an entity is expected to behave:

- What the entity is expected to do:
  - Anti-malware can detect malicious programs;
  - System can prevent illegal account login, etc.
- What the entity is expected not to do:
  - The website will not expose your private data to third parties;
  - An application will not inject virus into your system.

Security cannot be established in a cyber system if no entities are trusted.

It is important to make clear what should be trusted. Otherwise, the designed security solutions may fail in practice.