ECS 235B Module 13 Security Policies

Security Policy

- Policy partitions system states into:
  - Authorized (secure)
    - These are states the system can enter
  - Unauthorized (nonsecure)
    - If the system enters any of these states, it's a security violation
- Secure system
  - Starts in authorized state
  - Never enters unauthorized state

Confidentiality

- *X* set of entities, *I* information
- *I* has the *confidentiality* property with respect to *X* if no $x \in X$ can obtain information from *I*
- *I* can be disclosed to others
- Example:
  - *X* set of students
  - *I* final exam answer key
  - *I* is confidential with respect to *X* if students cannot obtain final exam answer key

Integrity

- *X* set of entities, *I* information
- *I* has the *integrity* property with respect to *X* if all $x \in X$ trust information in *I*
- Types of integrity:
  - Trust *I*, its conveyance and protection (data integrity)
  - *I* information about origin of something or an identity (origin integrity, authentication)
  - *I* resource: means resource functions as it should (assurance)

Availability

- *X* set of entities, *I* resource
- *I* has the *availability* property with respect to *X* if all $x \in X$ can access *I*
- Types of availability:
  - Traditional: *x* gets access or not
  - Quality of service: promised a level of access (for example, a specific level of bandwidth); *x* meets it or not, even though some access is achieved

Policy Models

- Abstract description of a policy or class of policies
- Focus on points of interest in policies
  - Security levels in multilevel security models
  - Separation of duty in Clark-Wilson model
  - Conflict of interest in Chinese Wall model

Mechanisms

- Entity or procedure that enforces some part of the security policy
  - Access controls (like bits to prevent someone from reading a homework file)
  - Disallowing people from bringing CDs and floppy disks into a computer facility to control what is placed on systems

Question

- Policy disallows cheating
  - Includes copying homework, with or without permission
- CS class has students do homework on computer
- Anne forgets to read-protect her homework file
- Bill copies it
- Who breached security?
  - Anne, Bill, or both?

Answer Part 1

- Bill clearly breached security
  - Policy forbids copying homework assignment
  - Bill did it
  - System entered unauthorized state (Bill having a copy of Anne's assignment)
- If not explicit in computer security policy, certainly implicit
  - Not credible that a unit of the university allows something that the university as a whole forbids, unless the unit explicitly says so

Answer Part 2

- Anne didn't protect her homework
  - Not required by security policy
- She didn't breach security
- If policy said students had to read-protect homework files, then Anne did breach security
  - She didn't do this

Types of Security Policies

- Military (governmental) security policy
  - Policy primarily protecting confidentiality
- Commercial security policy
  - Policy primarily protecting integrity
- Confidentiality policy
  - Policy protecting only confidentiality
- Integrity policy
  - Policy protecting only integrity

Integrity and Transactions

- Begin in consistent state
  - "Consistent" defined by specification
- Perform series of actions (*transaction*)
  - Actions cannot be interrupted
  - If actions complete, system in consistent state
  - If actions do not complete, system reverts to a consistent state

Types of Access Control

- Discretionary Access Control (DAC, IBAC)
  - Individual user sets access control mechanism to allow or deny access to an object
- Mandatory Access Control (MAC)
  - System mechanism controls access to object, and individual cannot alter that access
- Originator Controlled Access Control (ORCON, ORGCON)
  - Originator (creator) of information controls who can access information

Quiz

The “vanilla” file permission mechanism in Linux/UNIX is the one that has read, write, execute permission for the user and group of the file, and the same permissions for everyone else. Is the vanilla file permission mechanism in Linux/UNIX discretionary or mandatory?