Lecture 2

Outline

- Review
- OSI Security Architecture
  - Attack model

Review

- Security requirements
    - Integrity
    - Availability
    - Confidentiality
    - Authenticity
    - Accountability

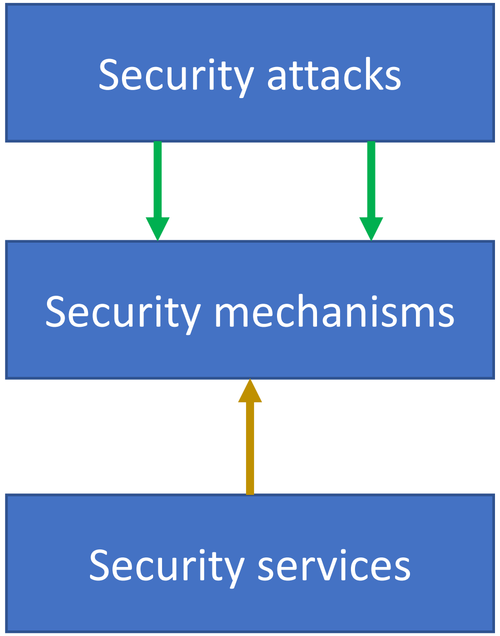
Challenges to achieve a secure system

- The mechanisms used to meet those requirements can be quite complex, and understanding them may evolve rather subtle reasoning
- When developing security mechanisms, must always consider potential attacks
- Sometimes, security mechanisms are counterintuitive
- Where to use them?
- Involve more than a particular algorithm or protocol
- No agreement on security for complex and heterogeneous systems i.e. trusts on data in different countries
- etc.

OSI Security Architecture

OSI Security Architecture

- International Telecommunication Union – Telecommunication (ITU-T) recommends X.800
- Security Architecture for Open Systems Interconnection (OSI)
  - Defines a systematic way of defining and providing security requirements
  - Used by IT managers and vendors in their products



a process (or a device incorporating such a process) to detect, prevent, or recover from an attack

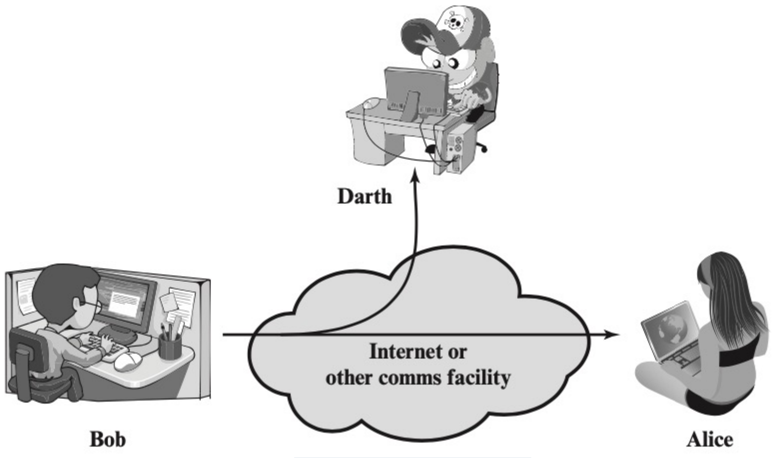
enhances the security of the data processing systems and the information transfers, such as policies

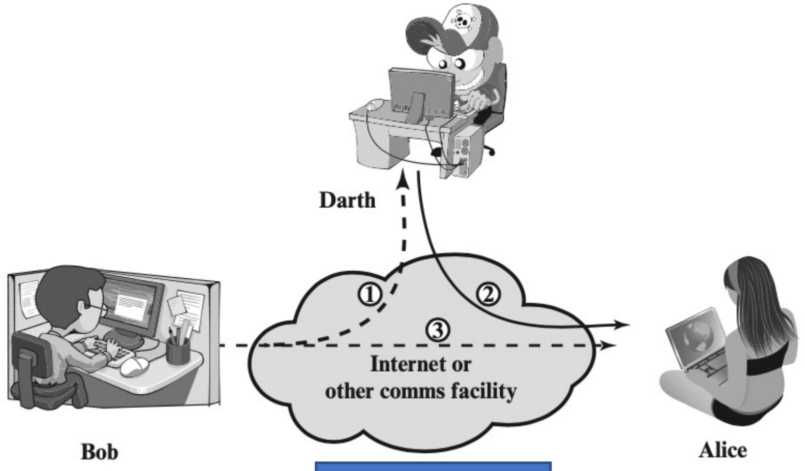
Other Security Architectures

- OWASP - Open Web Application Security Project
    - web application security
    - OWASP foundation
- NIST, Cybersecurity Framework
    - https://www.nist.gov/cyberframework
    - VIRTUAL WORKSHOP #2 | February 15, 2023 (9:00 AM – 5:30 PM EST). Join us to discuss potential significant updates to the CSF as outlined in the soon-to-be-released CSF Concept Paper.
    - https://www.nist.gov/news-events/events/2023/02/journey-nist-cybersecurity-framework-csf-20-workshop-2

Security attack

- **Definition**: any action that compromises the security of information owned by an organization
- Two types of security attacks
  - Passive attack
  - Active attack





Passive attack

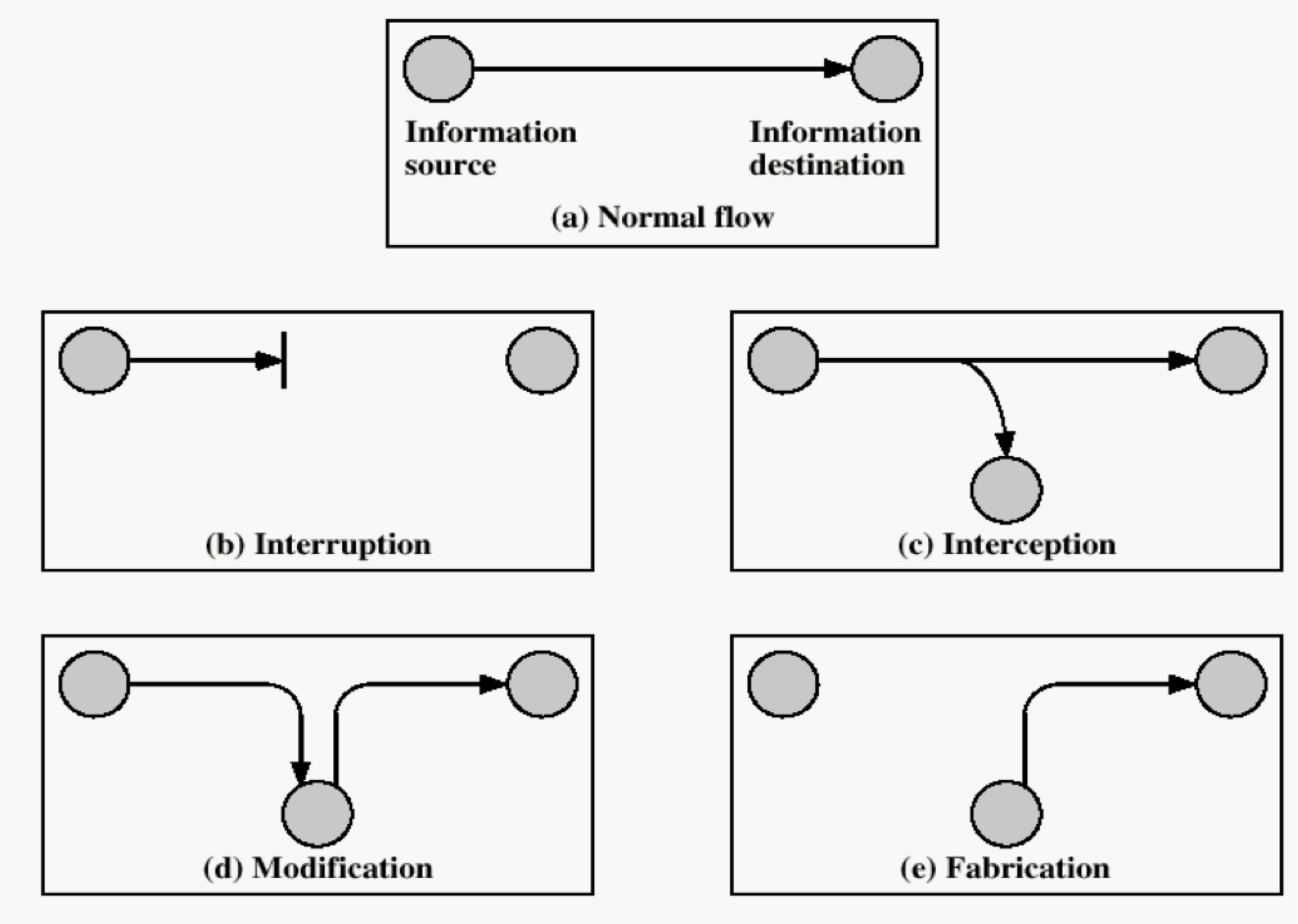
- i.e. eavesdropping on or monitoring of transmissions
- Goal: obtain information being transmitted
  - release of message contents
  - traffic analysis – a promiscuous sniffer
- Very difficult to detect – no alteration of the data
- But easy to prevent, why?

Active attack

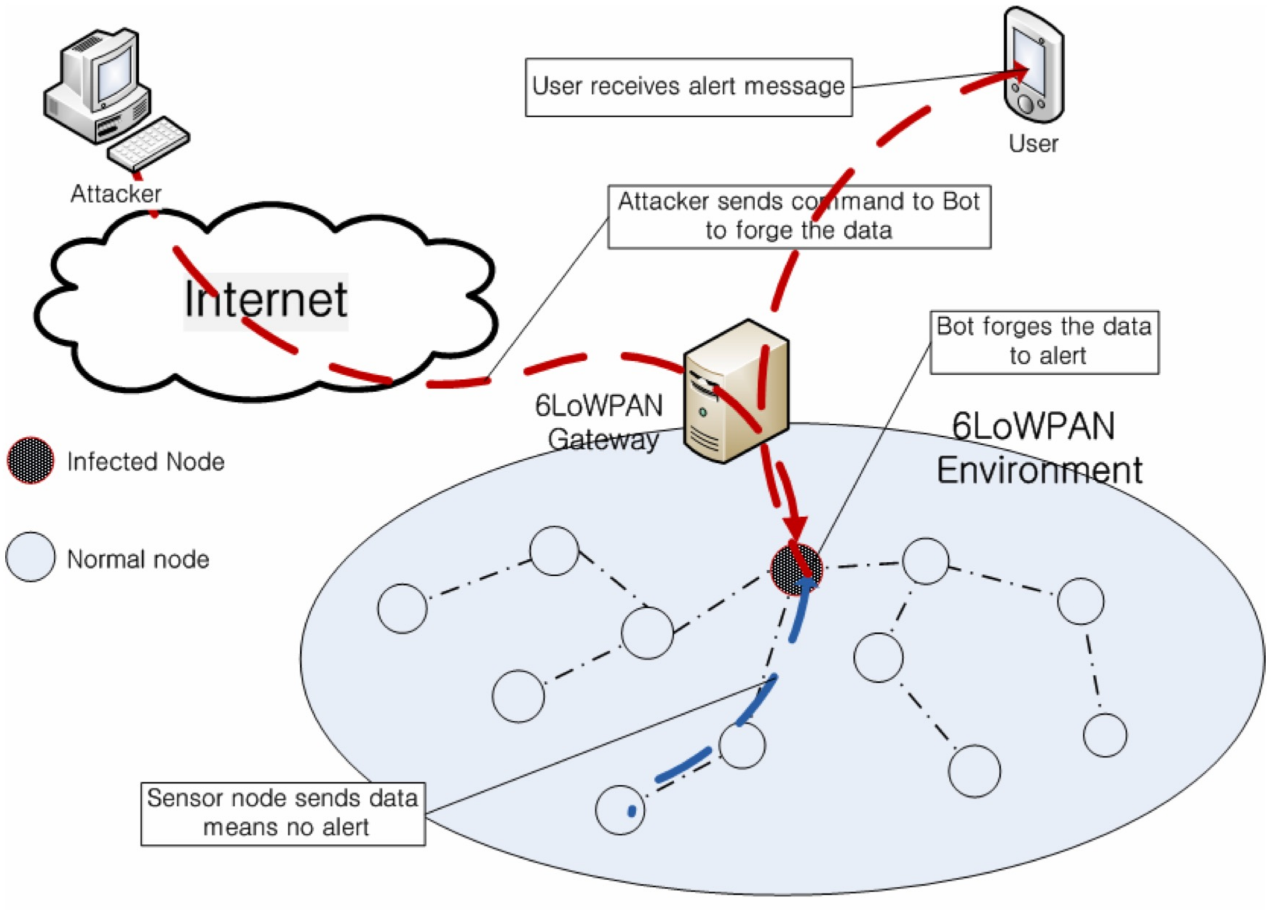
- active attack includes:
    - replay
    - Modification of messages
    - Denial of service
    - Masquerade

Example: two points communication

- Generic types of attacks



Example of modification attack in 6LoWPAN



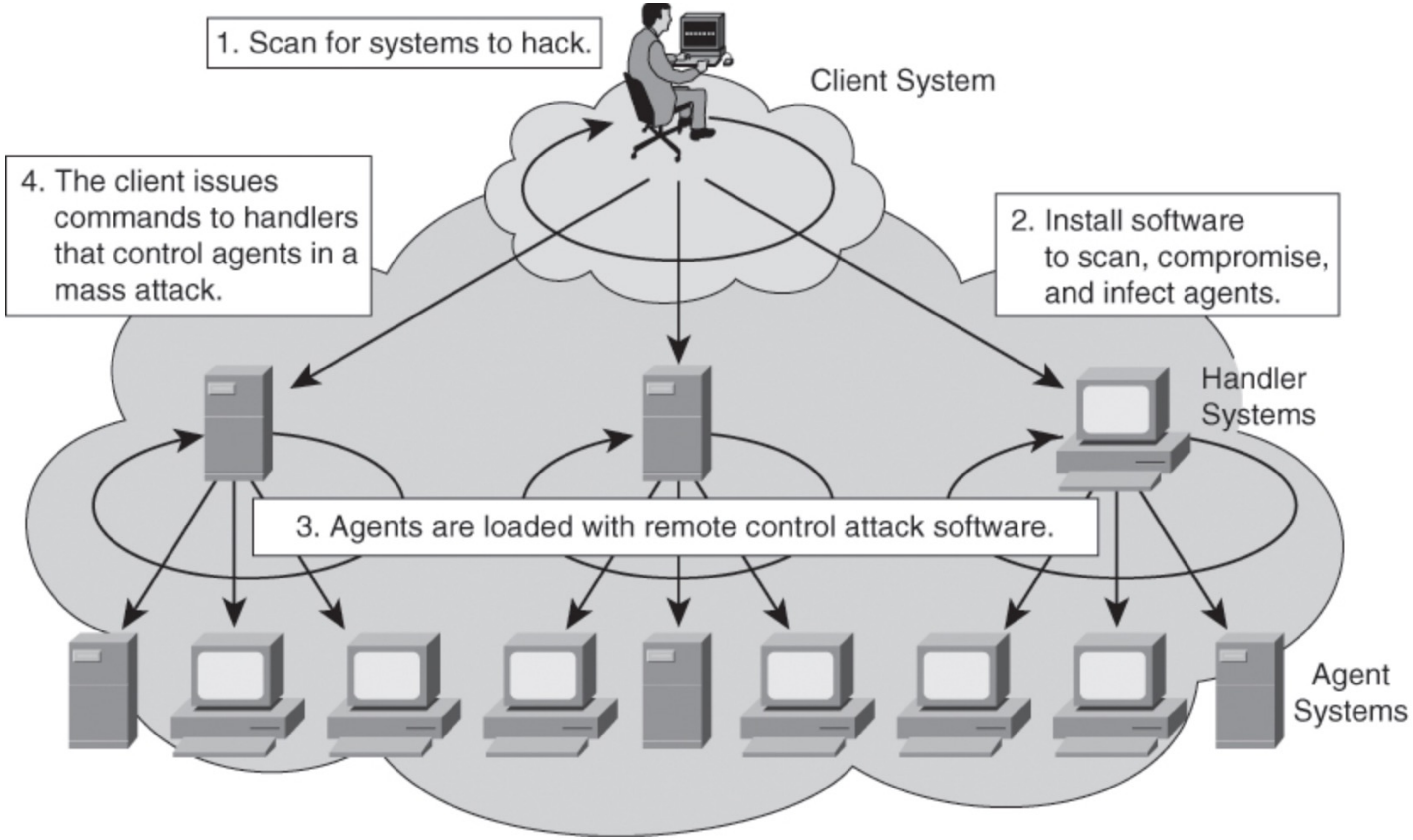
User receives alert message

Attacker sends command to Bot to forge the data

Bot forges the data to alert

Sensor node sends data means no alert

Example: a group of attackers



1. Scan for systems to hack.

2. Install software to scan, compromise, and infect agents.

3. Agents are loaded with remote control attack software.

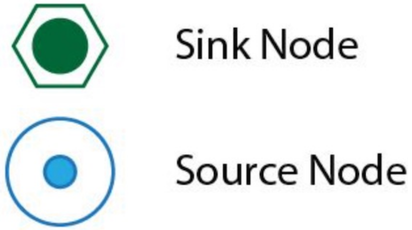
4. The client issues commands to handlers that control agents in a mass attack.

Know Your Threat Model

- **Threat model:** A model of who your attacker is and what resources they have
- One of the best ways to counter an attacker is to attack their reasons

Example: adversary model

- “The adversary is assumed to be intelligent and has limited number of resources. Before capturing the nodes, it exploits the various vulnerabilities of the networks. It knows the topology of the network, routing information. It aims to capture the sink node so as to disrupt the whole traffic. If it is not able to capture the sink node, it will capture the nearby nodes of the sink. It tries to disrupt the whole traffic of the network with minimum number of captured nodes. It is also assumed that the adversary tends to attack more on the nodes closer to the data sink than nodes that are far away”


Sink Node
Source Node