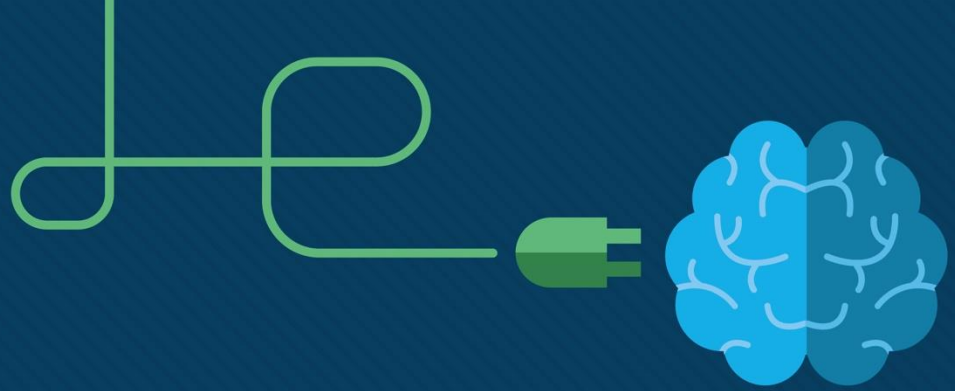


Chapter 4: Protecting the Organization

Introduction to Cybersecurity v2.1

Chapter 4 - Sections & Objectives

- 4.1 Firewalls
  - Explain techniques to protect organizations from cyber attacks.
    - Describe the various types of firewalls.
    - Describe different types of security appliances.
    - Describe different methods of detecting attacks in real time.
    - Describe methods of detecting malware.
    - Describe security best practices for organizations.
- 4.2 Behavior Approach to Cybersecurity
  - Explain the behavior-based approach to cybersecurity.
    - Define the term botnet.
    - Define the term kill chain.
    - Define behavior-based security.
    - Explain how NetFlow helps to defend against cyberattacks.

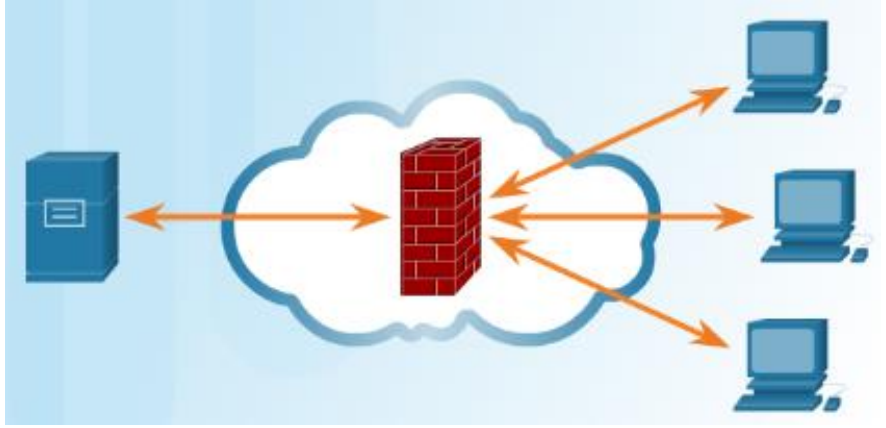
Chapter 4 - Sections & Objectives (Cont.)

- 4.3 Cisco's Approach to Cybersecurity
  - Explain the Cisco approach to providing cybersecurity.
    - Identify the function of CSIRT within Cisco.
    - Explain the purpose of a security playbook.
    - Identify tools used for incident prevention and detection.
    - Define IDS and IPS.

4.1 Firewalls

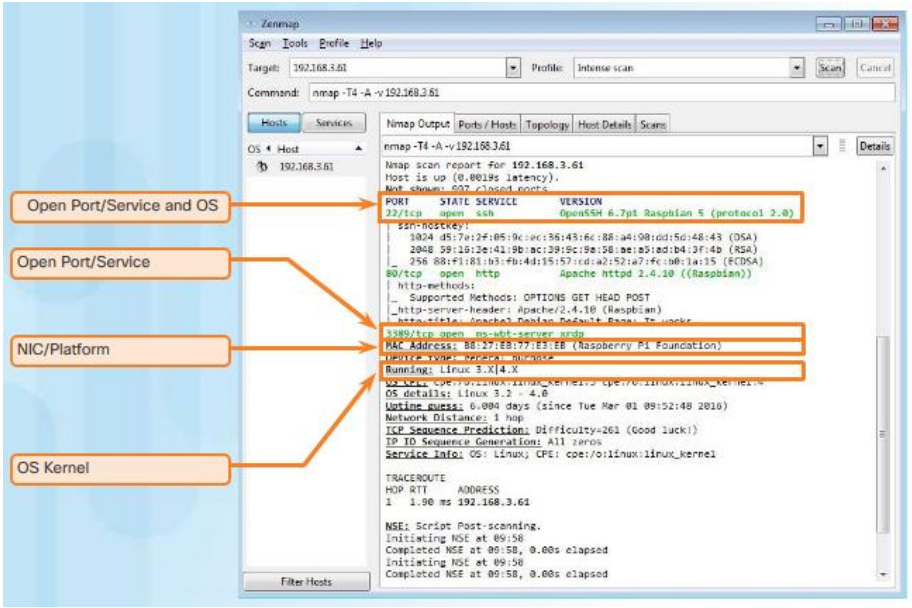
Firewall Types

- Control or filter incoming or outgoing communications on a network or device
- Common firewall types
  - **Network Layer Firewall** – source and destination IP addresses
  - **Transport Layer Firewall** – source and destination data ports, connection states
  - **Application Layer Firewall** – application, program or service
  - **Context Aware Application Firewall** – user, device, role, application type, and threat profile
  - **Proxy Server** –web content requests
  - **Reverse Proxy Server** – protect, hide, offload, and distribute access to web servers
  - **Network Address Translation (NAT) Firewall** – hides or masquerades the private addresses of network hosts
  - **Host-based Firewall** – filtering of ports and system service calls on a single computer operating system



Port Scanning

- Process of probing a computer, server or other network host for open ports
- Port numbers are assigned to each running application on a device.
- Reconnaissance tool to identify running OS and services
  - Nmap – A port scanning tool
- Common responses:
  - **Open or Accepted** - a service is listening on the port.
  - **Closed, Denied, or Not Listening** – connections will be denied to the port.
  - **Filtered, Dropped, or Blocked** – no reply from the host.

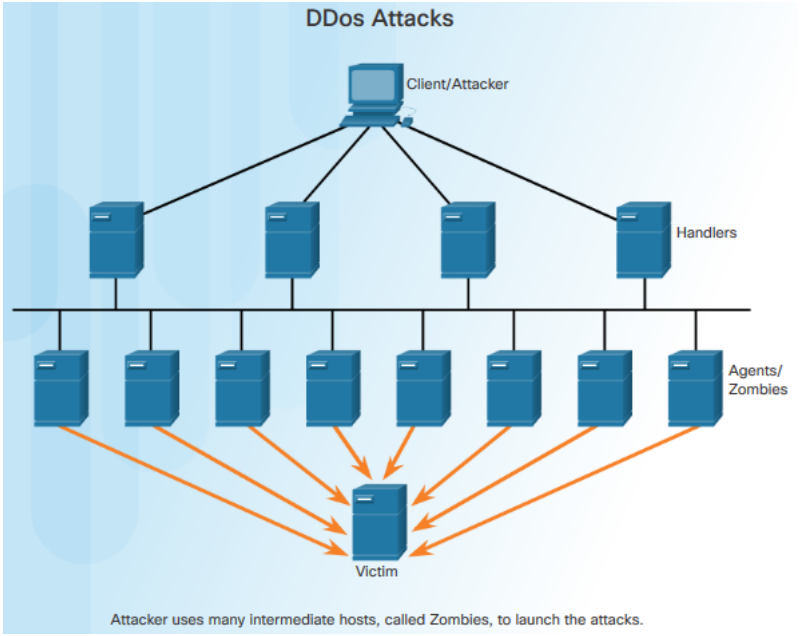


Security Appliances

- Security appliances fall into these general categories:
  - **Routers** - can have many firewall capabilities: traffic filtering, IPS, encryption, and VPN.
  - **Firewalls** – may also have router capability, advanced network management and analytics.
  - **IPS** - dedicated to intrusion prevention.
  - **VPN** - designed for secure encrypted tunneling.
  - **Malware/Antivirus** - Cisco Advanced Malware Protection (AMP) comes in next generation Cisco routers, firewalls, IPS devices, Web and Email Security Appliances and can also be installed as software in host computers.
  - **Other Security Devices** – includes web and email security appliances, decryption devices, client access control servers, and security management systems.

Detecting Attacks in Real Time

- Zero-day attack
  - A hacker exploits a flaw in a piece of software before the creator can fix it.
- **Real Time Scanning from Edge to Endpoint**
  - Actively scanning for attacks using firewall and IDS/IPS network device
  - detection with connections to online global threat centers
  - detect network anomalies using context-based analysis and behavior detection
- **DDoS Attacks and Real Time Response**
  - DDoS, one of the biggest attack threats, can cripple Internet servers and network availability.
  - DDoS originates from hundreds, or thousands of zombie hosts, and the attacks appear as legitimate traffic.



Protecting Against Malware

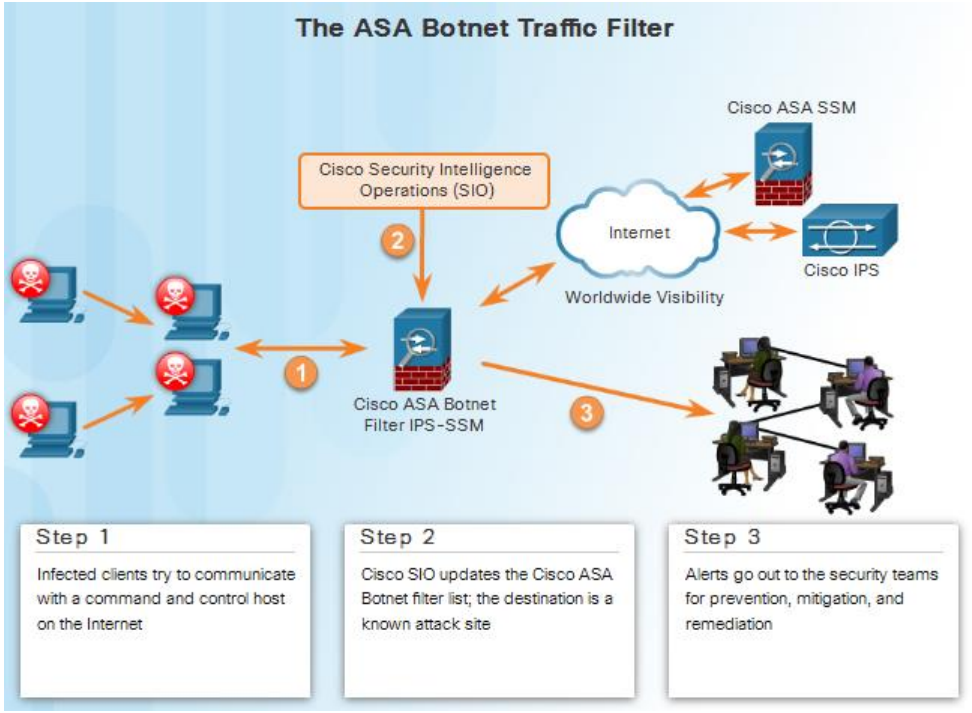
Security Best Practices

- **Some published Security Best Practices:**
  - **Perform Risk Assessment** – Knowing the value of what you are protecting will help in justifying security expenditures.
  - **Create a Security Policy** – Create a policy that clearly outlines company rules, job duties, and expectations.
  - **Physical Security Measures** – Restrict access to networking closets, server locations, as well as fire suppression.
  - **Human Resource Security Measures** – Employees should be properly researched with background checks.
  - **Perform and Test Backups** – Perform regular backups and test data recovery from backups.
  - **Maintain Security Patches and Updates** – Regularly update server, client, and network device operating systems and programs.
  - **Employ Access Controls** – Configure user roles and privilege levels as well as strong user authentication.
  - **Regularly Test Incident Response** – Employ an incident response team and test emergency response scenarios.
  - **Implement a Network Monitoring, Analytics and Management Tool** - Choose a security monitoring solution that integrates with other technologies.
  - **Implement Network Security Devices** – Use next generation routers, firewalls, and other security appliances.
  - **Implement a Comprehensive Endpoint Security Solution** – Use enterprise level antimalware and antivirus software.
  - **Educate Users** – Educate users and employees in secure procedures.
  - **Encrypt data** – Encrypt all sensitive company data including email.

4.2 Behavior Approach to Cybersecurity

Botnet

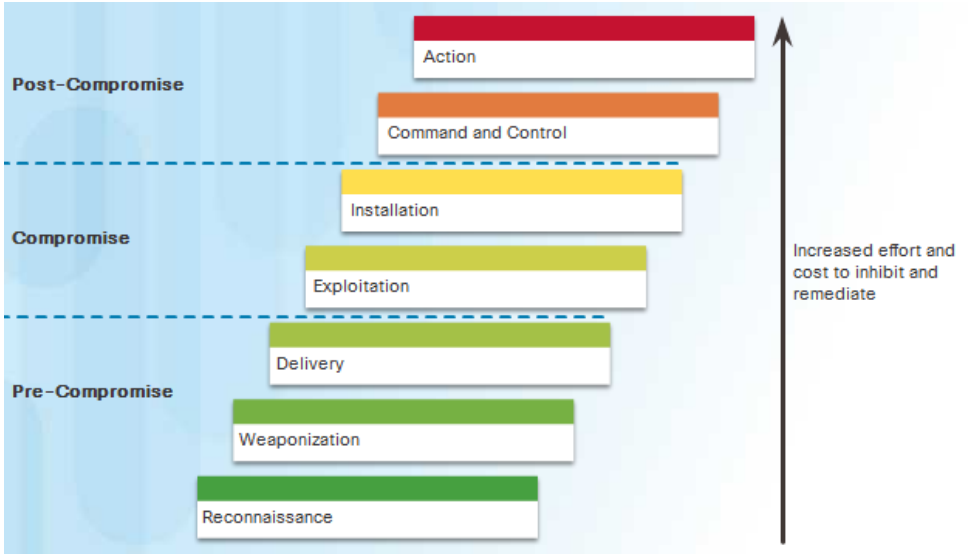
- Botnet
  - A group of bots connect through the Internet
  - Controlled by malicious individuals or groups
- Bot
  - Typically infected by visiting a website, opening an email attachment, or opening an infected media file



The Kill Chain in Cyberdefense

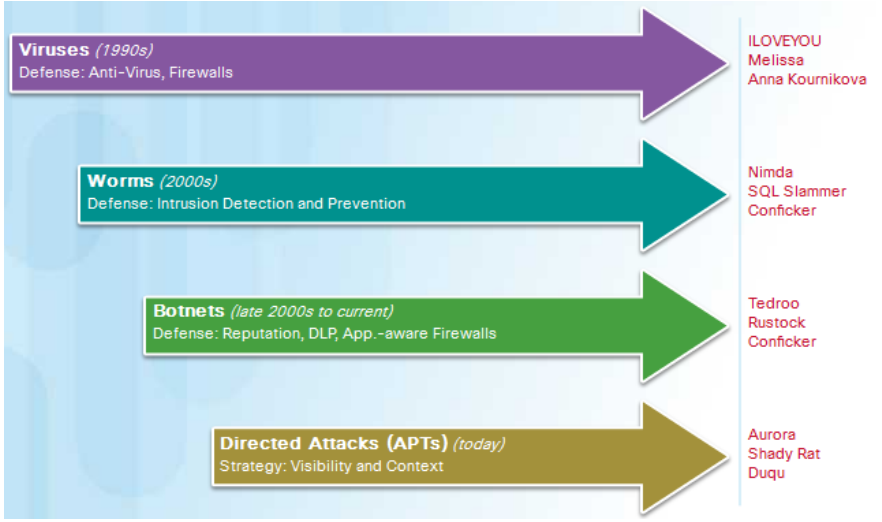
Kill Chain is the stages of an information systems attack.

1. **Reconnaissance** – Gathers information
2. **Weaponization** - Creates targeted exploit and malicious payload
3. **Delivery** - Sends the exploit and malicious payload to the target
4. **Exploitation** – Executes the exploit
5. **Installation** - Installs malware and backdoors
6. **Command and Control** - Remote control from a command and control channel or server.
7. **Action** – Performs malicious actions or additional attacks on other devices



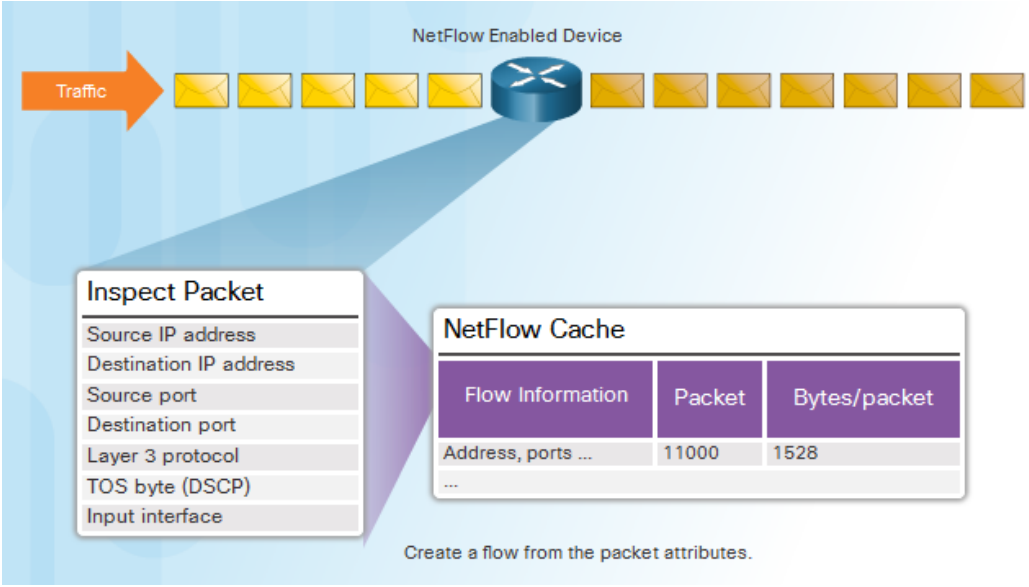
Behavior-Based Security

- Honeypots
  - Lures the attacker by appealing to the attackers' predictable behavior
  - Captures, logs and analyze the attackers' behavior
  - Administrator can gain more knowledge and build better defense
- Cisco's Cyber Threat Defense Solution Architecture
  - Uses behavior-based detection and indicators
  - Provide greater visibility, context and control



Netflow

- Gather information about data flowing through a network
- Important components in behavior-based detection and analysis
- Establish baseline behaviors



4.3 Cisco's Approach to Cybersecurity

CSIRT

- Computer Security Incident Response Team
  - help ensure company, system, and data preservation by performing comprehensive investigations into computer security incidents
  - provides proactive threat assessment, mitigation planning, incident trend analysis, and security architecture review

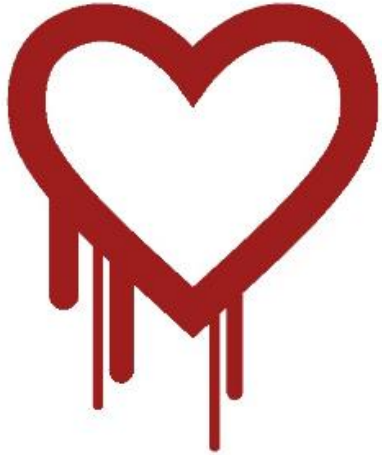
US-CERT
UNITED STATES COMPUTER EMERGENCY READINESS TEAM

APCERT

FIRST
Improving Security Together

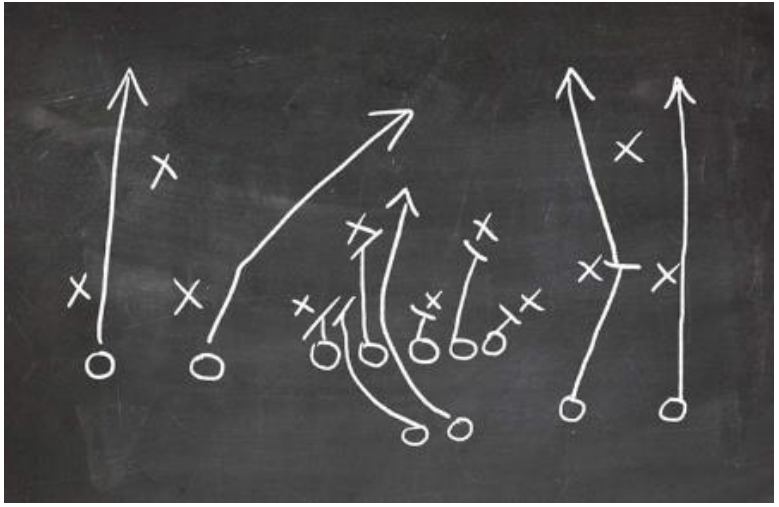
computer emergency response team CERT-EU
for the EU institutions, bodies and agencies

Software Engineering Institute | Carnegie Mellon University



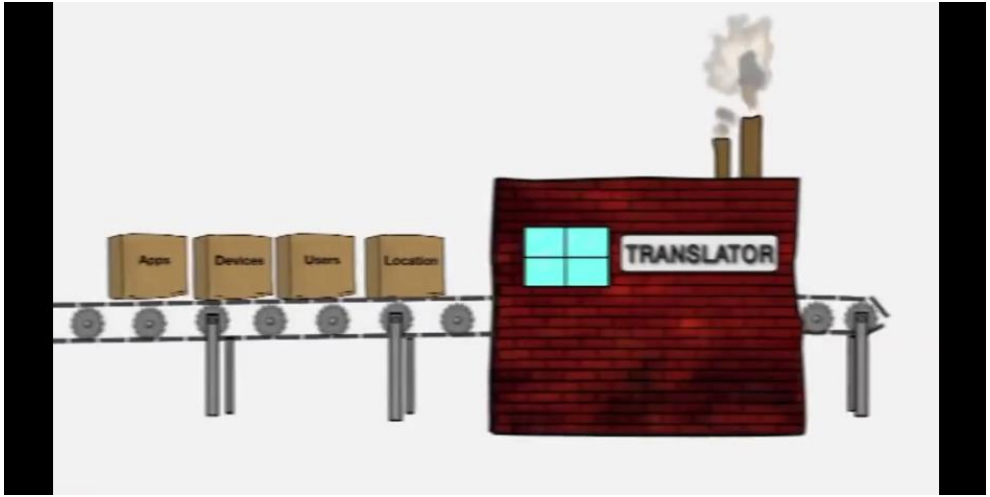
Security Playbook

- Collection of repeatable queries against security event data sources that lead to incident detection and response
- What does it need to accomplish?
  - Detect malware infected machines.
  - Detect suspicious network activity.
  - Detect irregular authentication attempts.
  - Describe and understand inbound and outbound traffic.
  - Provide summary information including trends, statistics, and counts.
  - Provide usable and quick access to statistics and metrics.
  - Correlate events across all relevant data sources.



Tools for Incident Prevention and Detection

- SIEM – Security Information and Event Management
  - Software that collects and analyzes security alerts, logs and other real time and historical data from security devices on the network
- DLP – Data Loss Prevention
  - Stops sensitive data from being stolen or escaped from the network
  - Designs to monitor and protect data in three different states
- Cisco Identity Services Engine (Cisco ISE) and TrustSec
  - Uses role-based access control policies



IDS and IPS

- IDS – Intrusion Detection System
  - Usually placed offline
  - Does not prevent attacks
  - Detect, log, and report
- IPS – Intrusion Prevention System
  - Ability to block or deny traffic based on a positive rule or signature match
- IDS/IPS system
  - Snort
  - Sourcefire (Cisco)

4.4 Chapter Summary

Chapter Summary

- Describe the various types of firewalls and security appliances.
- Describe different methods of detecting malware and attacks in real time.
- Describe security best practices for organizations.
- Define botnet, kill chain, and behavior-based security.
- Explain how Netflow can help defend against cyberattacks.
- Identify the function of CSIRT within Cisco.
- Explain the purpose of a security playbook.
- Identify tools used for incident prevention and detection.
- Define IDS and IPS.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