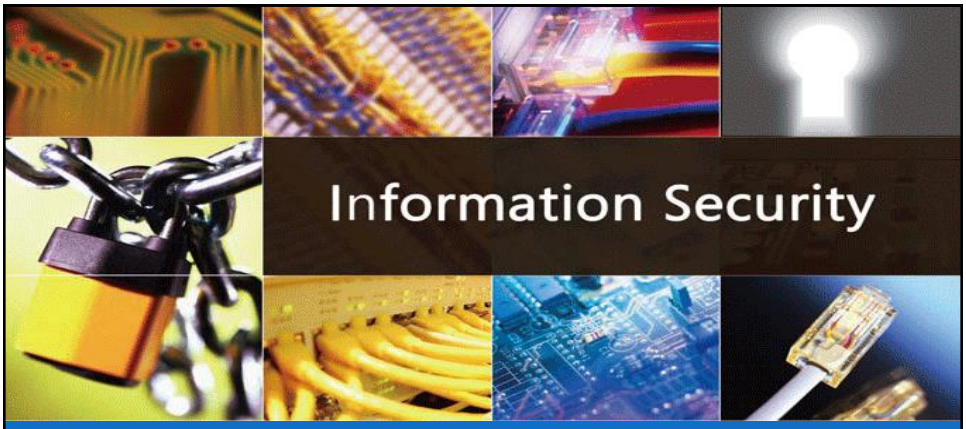


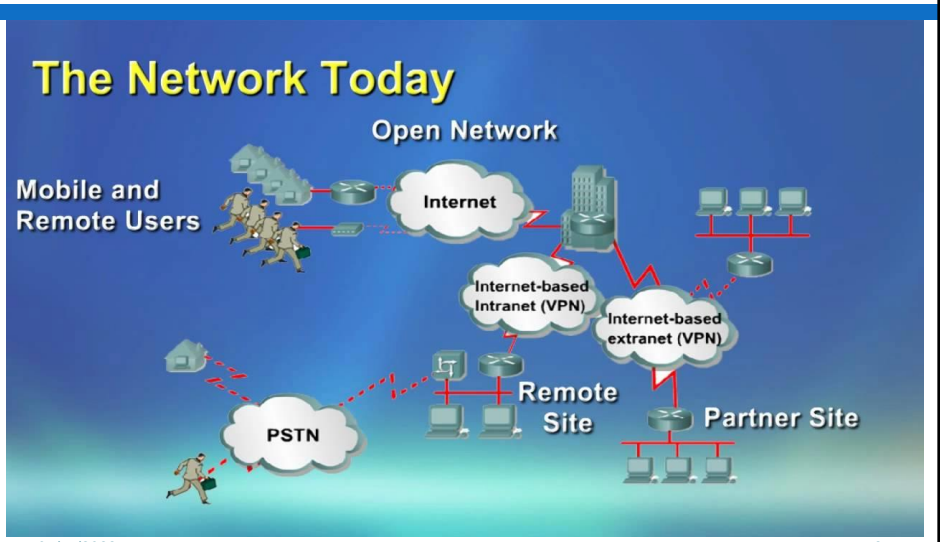
Cyber security

Lecturer: Nguyễn Thị Thanh Vân – FIT - HCMUTE

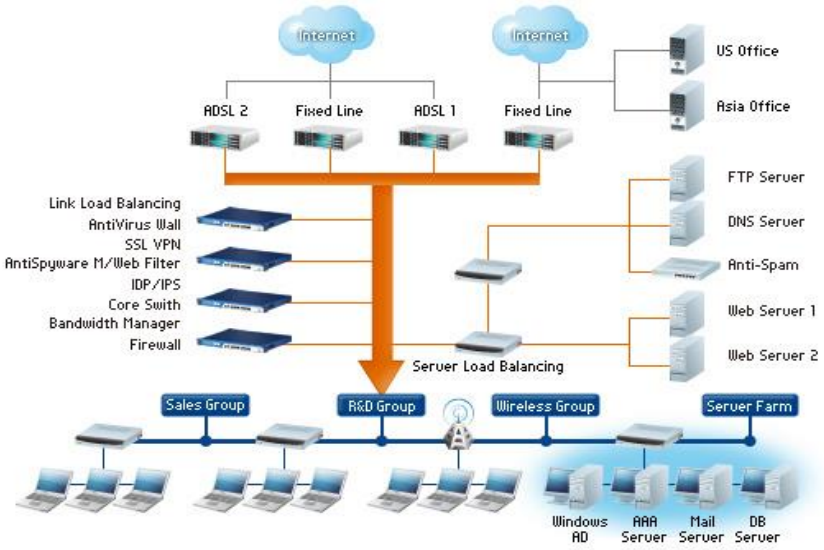
Objective

- Understand the network security

Network today



network security appliances



Define cyber crime

- Crime committed using a computer and the internet to steal data or information.
  - Illegal imports.
  - Malicious programs

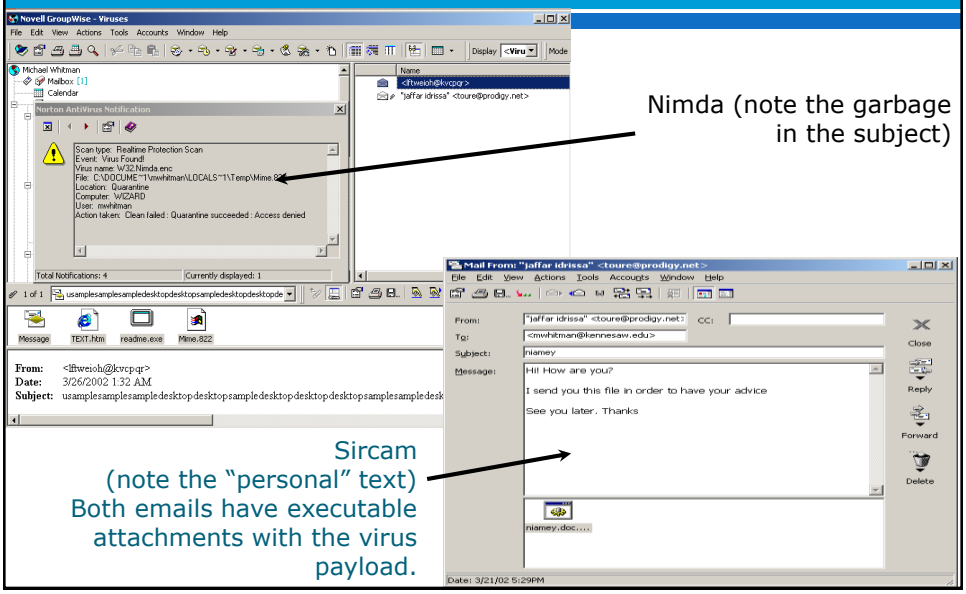
Types of cyber crime

- Categorization of cyber crime
  - The Computer as a Target
  - The computer as a weapon
- Types of cyber crime
  - Hacking
  - Denial of service attack
  - Virus Dissemination
  - Computer Vandalism
  - Cyber Violence
  - Software Piracy
- Fields

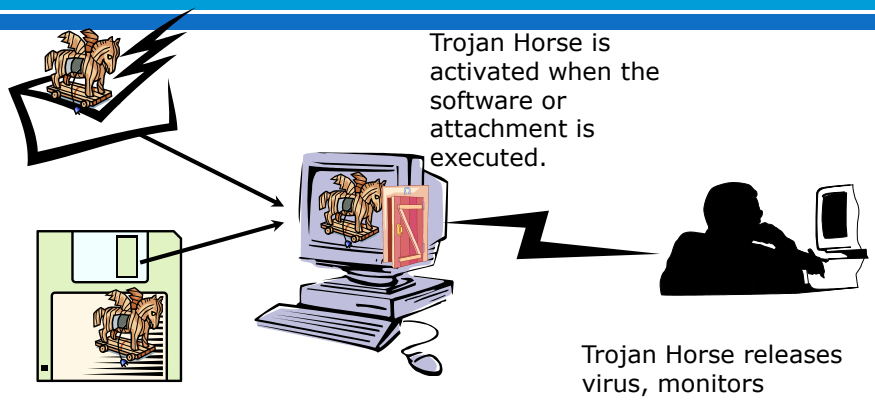
Clean up cost of Cyber-attacks

- **SirCam: 2.3 million computers affected**
  - –Clean-up: $460 million
  - –Lost productivity: $757 million
- **Code Red: 1 million computers affected**
  - –Clean-up: $1.1 billion
  - –Lost productivity: $1.5 billion
- **Love Bug: 50 variants, 40 million computers affected**
  - –$8.7 billion for clean-up and lost productivity
- **Nimda**

Virus Profiles



Trojan Horse Attack



Trojan Horse is activated when the software or attachment is executed.

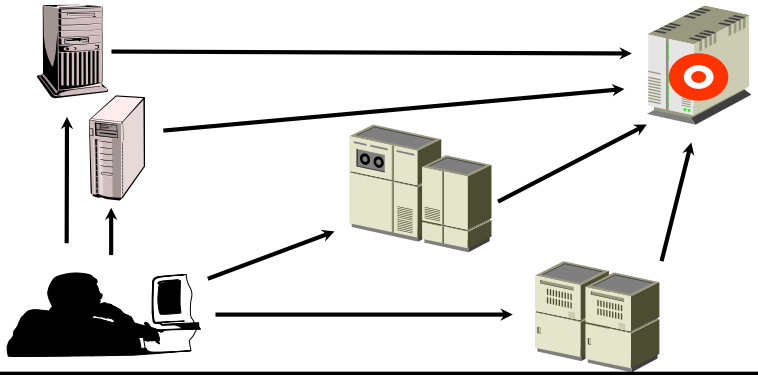
Trojan Horse releases virus, monitors computer activity, installs backdoor, or transmits information to hacker.

Trojan Horse arrives via email or software like free games.

Denial of Service Attacks

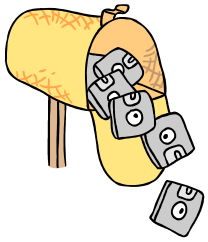
a hacker compromises a system and uses that system to attack the target computer, flooding it with more requests for services than the target can handle.

hundreds of computers (known as a zombies) are compromised, loaded with DOS attack software and then remotely activated by the hacker.



Spamming Attacks

- Sending out e-mail messages in bulk. It's electronic "junk mail."
- Spamming can leave the information system vulnerable to overload.
- Less destructive, used extensively for e-marketing purposes.



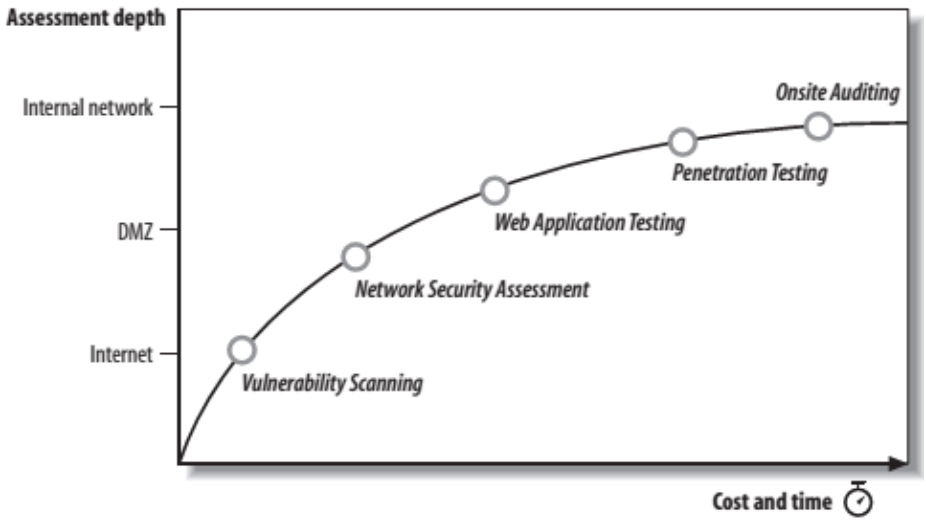
Safety tips for cyber crime

- Use antivirus software's.
- Insert firewalls.
- Uninstall unnecessary software
- Maintain backup.
- Check security settings.
- Stay anonymous - choose a genderless screen name.
- Never give your full name or address to strangers.
- Learn more about Internet privacy.

Network Security Assessment goal

- Network security Assessment: (goal)
  - to identify and categorize your risks.
  - is an integral part of any security life cycle
  - understand the security techniques of the network, to execute security policy and incident response procedures.
  - To protect networks and data from determined attacks,

Security assessment services



Network Security Assessment

Footprinting

- whois,
- dig,
- traceroute,
- nslookup

Scanning Networks

- Nmap
- Nessus
- Commercial Network
- Web Application Testing

Report

Steps of Footprinting

- Footprinting generally needs the following steps to ensure proper information retrieval:

1. Collect information about a target: host and network

2. Determine the OS of web server and web application data.

3. Query such as Whois, DNS, network, and organizational

4. Locate existing or potential vulnerabilities or exploits that exist in the current infrastructure

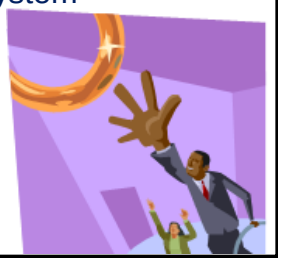
=> helpful to launching later attacks.

Footprinting Tools

- Whois
- NSLookup,
- Search engines,
- Social Networking Site
- ARIN
- Neo Trace
- VisualRoute Trace
- SmartWhois
- eMailTrackerPro
- Website watcher
- Google Earth
- GEO Spider
- HTTrack Web Copier
- E-mail Spider

Objectives of Scanning

- To detect the live systems running on the network
- To discover which ports are active/running
- To discover the operating system running on the target system (fingerprinting)
- To discover the services running/listening on the target system
- To discover the IP address of the target system



Types of Scanning

- Port Scanning
  - A series of messages sent by someone attempting to break into a computer to learn about the computer's network services
- Network Scanning
  - A procedure for identifying active hosts on a network
- Vulnerability Scanning
  - The automated process of proactively identifying vulnerabilities of computing systems present in a network

Checking for Live Systems

- Some common ways to perform these types of scans are:
  - **Pinging (ICMP Scanning)**
  - Port scanning

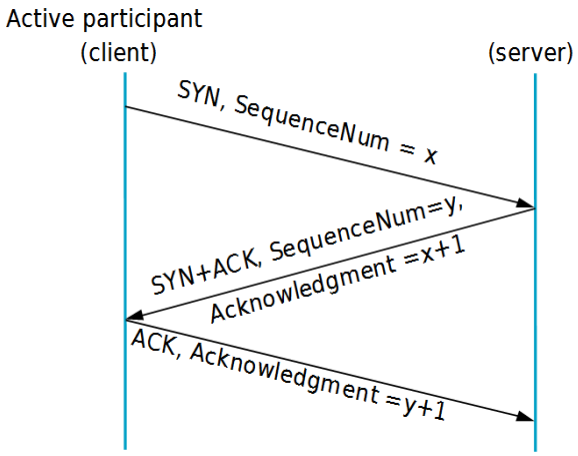
Pinging

- it is found out which hosts are up in a network by pinging them all
- It can be run parallel so that it can run fast
- It can also be helpful to tweak the ping timeout value with the –t option
- Tools:
  - Ping <target> [option]
  - Angry IP: for Windows
  - Hping2
  - Ping Sweep
  -

Checking for open ports

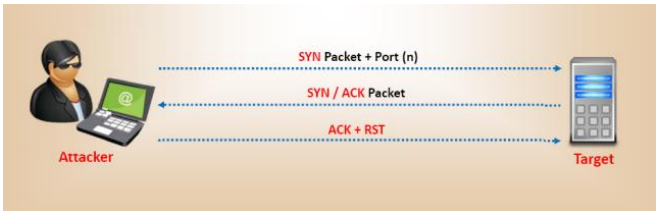
- Three Way Handshake, TCP flags
- Types of Scans
  - Full Open Scan
  - Stealth Scan, or Half-open Scan
  - Xmas Tree Scan
  - FIN Scan
  - NULL Scan
  - ACK Scanning
  - UDP Scanning

Three Way Handshake

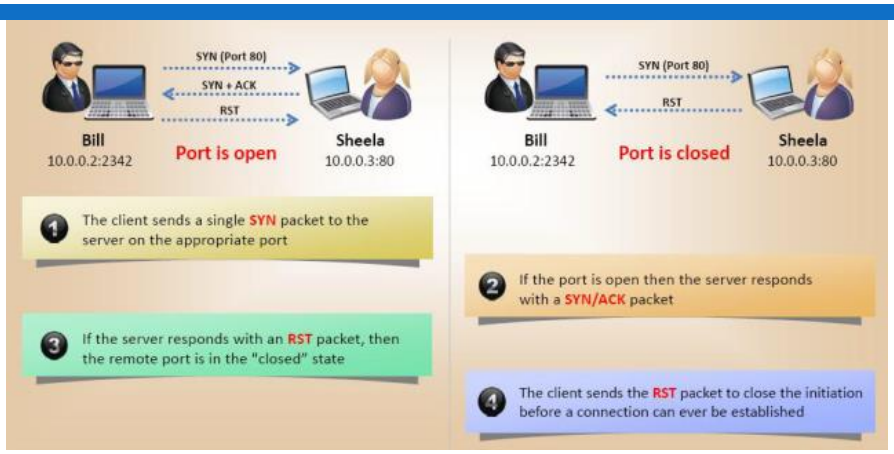


Full Open Scan

- the systems involved initiated and completed the three-way handshake.
- The advantage
  - you have positive feedback that the host is up and the connection is complete.
- Downside (disadvantage):
  - since you complete the three-way handshake you have confirmed that you as the scanning party are there.



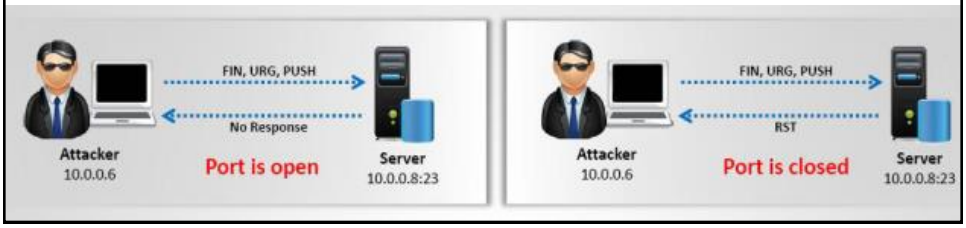
Stealth Scan, or Half-open Scan



- it does not open a full TCP connection
- The key advantage is that fewer sites log this scan

Xmas Tree Scan

- Having all the flags set creates an illogical or illegal combination, and the receiving system has to determine what to do:
  - Drop (old sys)
  - Respond: port is open
  - RST packet: port is closed
- NMAP: `NMAP -sX -v <target IP>`



FIN Scan

- The attacker sends frames to the victim with the FIN flag set.
- The victim's response depends on whether the port is open or closed.
  - if an FIN is sent to an open port there is no response,
  - but if the port is closed the victim returns an RST.

- NMAP: **`NMAP -sF <target IP address>`**

Null Scan

- The attacker sends frames to the victim with no flag set.
- The victim's response depends on whether the port is open or closed:
  - if an FIN is sent to an open port there is no response,
  - if the port is closed the victim returns an RST

- NAMP: **`NMAP -sN <target IP address>`**

Scanning Tools

- **Nmap**
- IPSec
- NetScan
- SuperScan
- IPScanner
- MegaPing
- Global Network Inventory Scanner
- Net Tools Suite Pack
- Floppy Scan

Nmap: Scan Methods

- Some of the scan methods used by Nmap:
  - Xmas tree: The attacker checks for TCP services by sending "Xmas-tree" packets
  - SYN Stealth: It is referred to as "half open" scanning, as a full TCP connection is not opened
  - Null Scan: It's an advanced scan that may be able to pass through firewalls unmolested
  - Windows scan: It is similar to the ACK scan and can also detect open ports
  - ACK Scan: Used to map out firewall rule set

Nmap: Scan Methods

- -sT (TcpConnect)
- -sS (SYN scan)
- -sF (Fin Scan)
- -sX (Xmas Scan)
- -sN (Null Scan)
- -sP (Ping Scan)
- -sU (UDP scans)
- -sO (Protocol Scan)
- -sI (Idle Scan)
- -sA (Ack Scan)
- -sW (Window Scan)
- -sR (RPC scan)
- -sL (List/Dns Scan)
- -P0 (don't ping)
- -PT (TCP ping)
- -PS (SYN ping)
- -PI (ICMP ping)
- -PB (= PT + PI)
- -PP (ICMP timestamp)
- -PM (ICMP netmask)

Security Planning

- **What needs to be secured?**
- Who is responsible for it?
- What technical/non-technical controls should be deployed?
- How are people supported to do what they need to do?
- **What if something goes wrong?**
  - Response and recovery
  - Accountability and consequences

Assets and Threats

- **What Needs to be Secured?**
  - **Hardware, software and services**
    - Servers, routers, switches, laptops and mobile devices
    - OS, databases, services and applications
    - Data stored in databases or files
  - **From whom?**
    - Remote hackers?
    - Insiders?

Security Planning: Controls

- **Identity and access management (IAM)**
  - Credentialing, account creation and deletion
  - Password policies
- **Network and host defenses**
  - Firewalls, IDS, IPS
  - Anti-virus
- **VPN and BYOD**
- Vulnerability patching
- **User awareness and education**
  - Phishing attack awareness (Phishme)

Security Planning: Security Policy

- **High level articulation of security objectives and goals**
  - Legal, business or regulatory rationale
  - **Do's and don'ts for users**
    - Password length
    - Web and email policies
    - Response to security events
  - Address prevention, detection, response and remediation as it concerns/impacts users

Cyber Risk Assessment

- Investments in cyber security are driven by risk and how certain controls may reduce it
- **Some risk will always remain**
- How can risk be assessed?

Quantifying Cyber Risk

Risk exposure = Prob. [Adverse security event] * Impact [adverse event]

$$\text{Risk Leverage} = \frac{\text{Risk exposure before/without a certain control} - \text{Risk exposure after the control}}{\text{Cost of control}}$$

Risk leverage > 1 for the control to make sense

Managing Cyber Risk

How do we assess and reduce cyber risk?

- **Impact**
  - Expected loss (reputational, recovery and response, legal, loss of business etc.)
- **Risk management**
  - Accept, transfer (insurance) and reduce
  - Reduction via technology solutions, education and awareness training

Practice

- Prepare a small LAN: 1 server, 1 workstation
- Install and configure tools to assess network security
  - Footprinting
  - Scan ports using Nmap