

Computer Science 100

Chapter 7

Introduction to Networking and Security:
Connecting Computers and Keeping Them Safe from
Hackers and Viruses

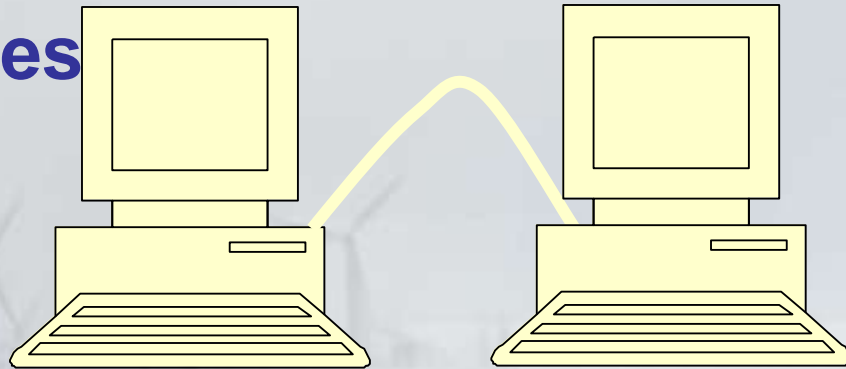


Topics

- Networking fundamentals
- Network architecture
- Network components
- Peer-to-peer networks
- Computer threats
- Computer safeguards
- Computer viruses

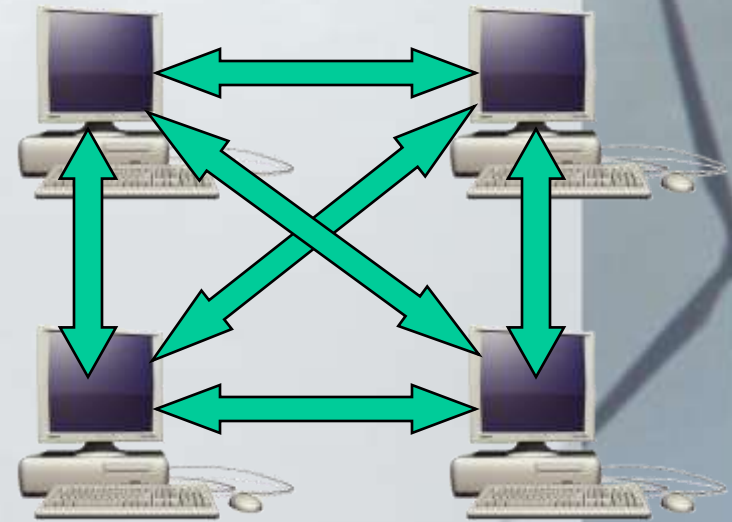
Networking Fundamentals

- **Computer network:**
 - Two or more computers connected together
 - Each is a Node
- **Benefits of a network:**
 - Sharing resources
 - Transferring files

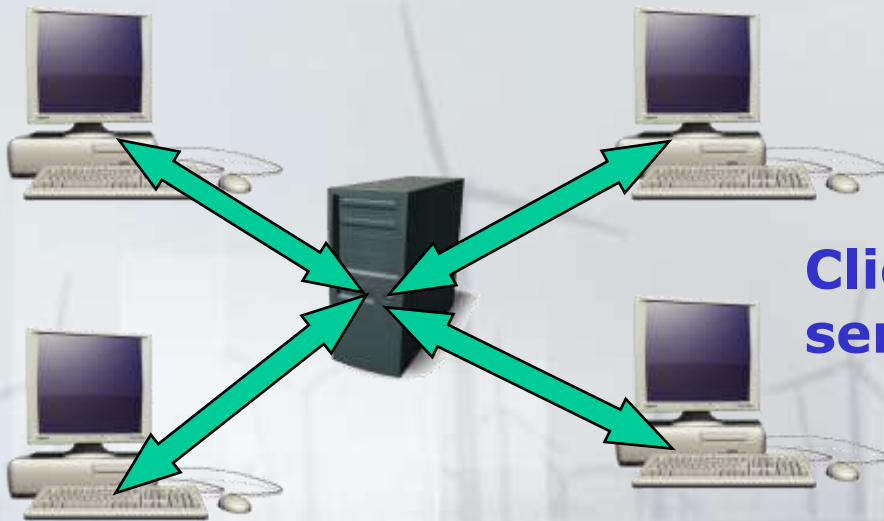


Network Architecture

- Network designs:
 - Individual PC controlled:
 - Peer-to-peer (P2P)
 - Centrally controlled:
 - Client/server



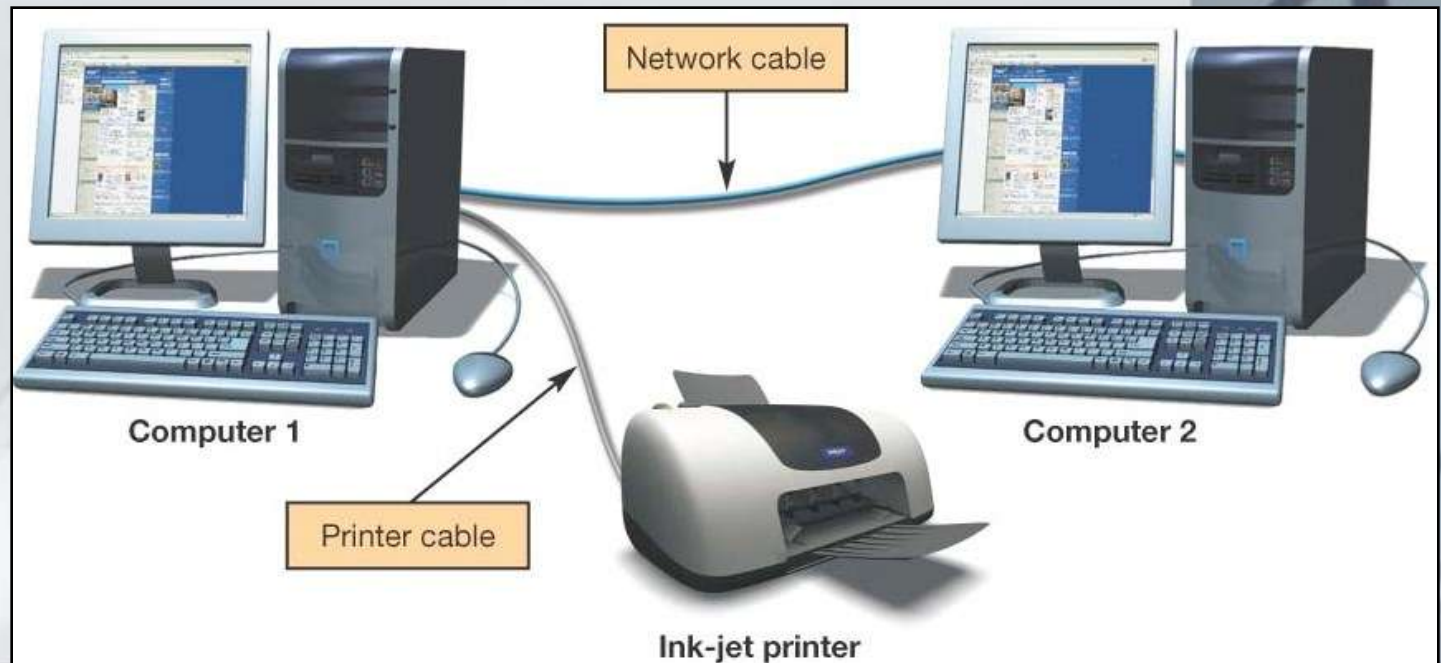
Peer-to-peer



**Client/
server**

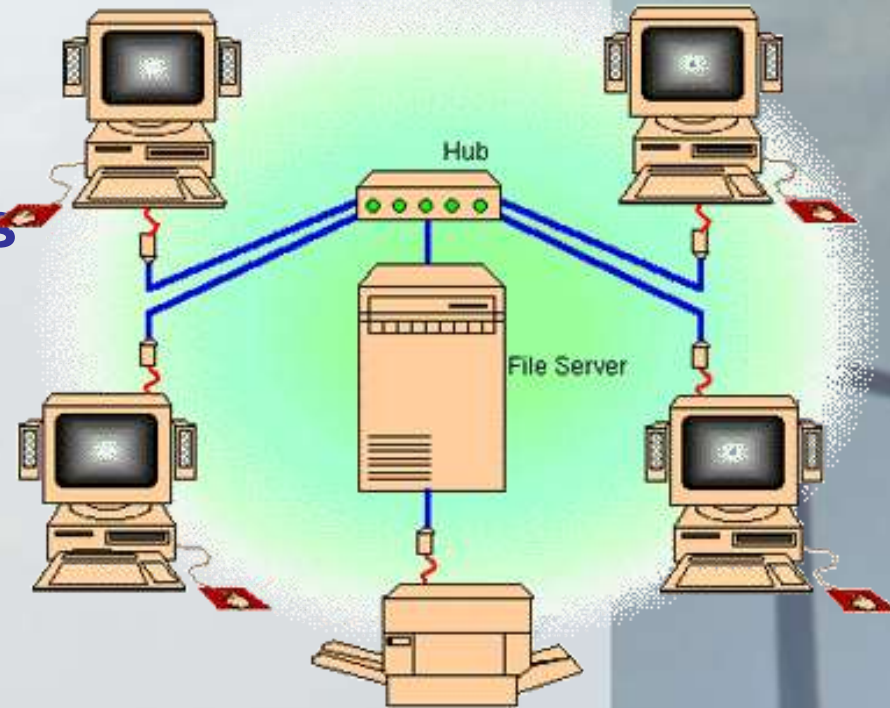
Peer-to-Peer Networks

- Computers communicate with each other:
 - Peers
- Share peripheral devices:
 - Printers
 - Scanners
- Home and small office networks



Client/Server Networks

- **Client computers:**
 - Users
- **Server computers:**
 - Provide resources to clients
 - Central network control
- **Internet**
 - A large, multi-server, multi-client network.

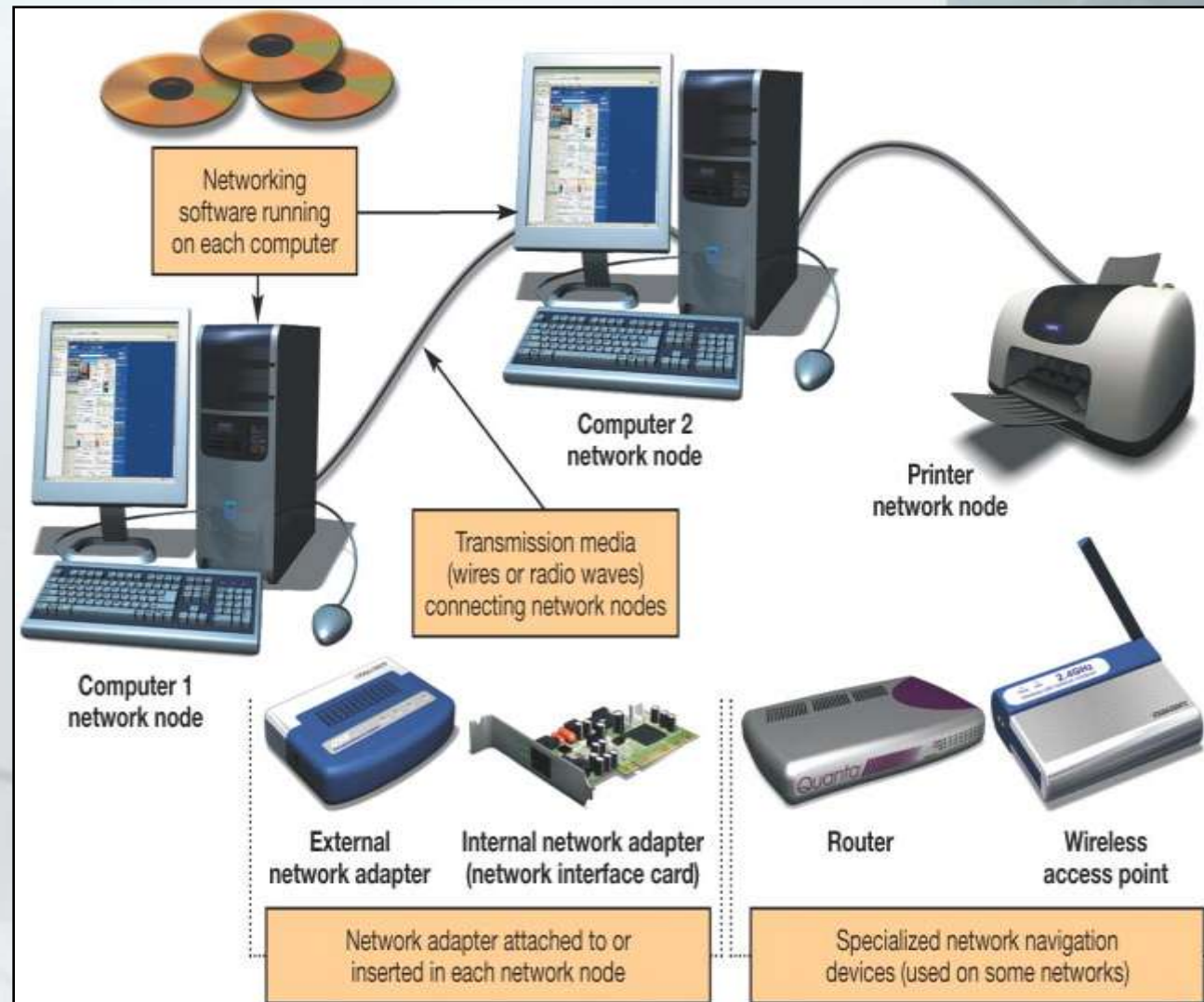


LANs and WANs

- **Local area network (LAN):**
 - Nodes are within a small geographic region:
 - Homes
 - Schools
 - Small businesses
- **Wide area network (WAN):**
 - LANs connected over long distances:
 - A few miles to thousands of miles
 - Use telecommunications lines

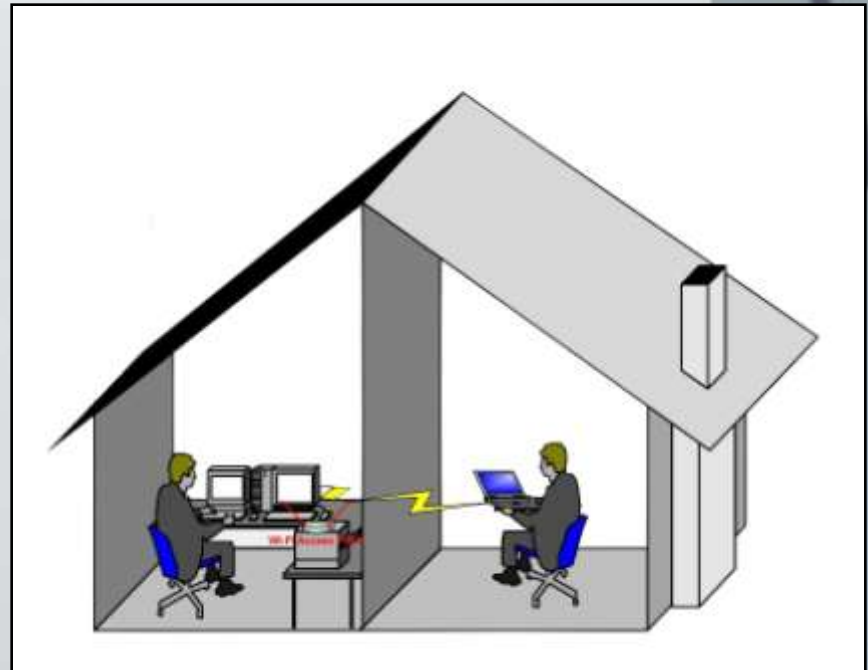
Network Components

- Transmission media
- Network adapters
- Navigation devices
- Network software



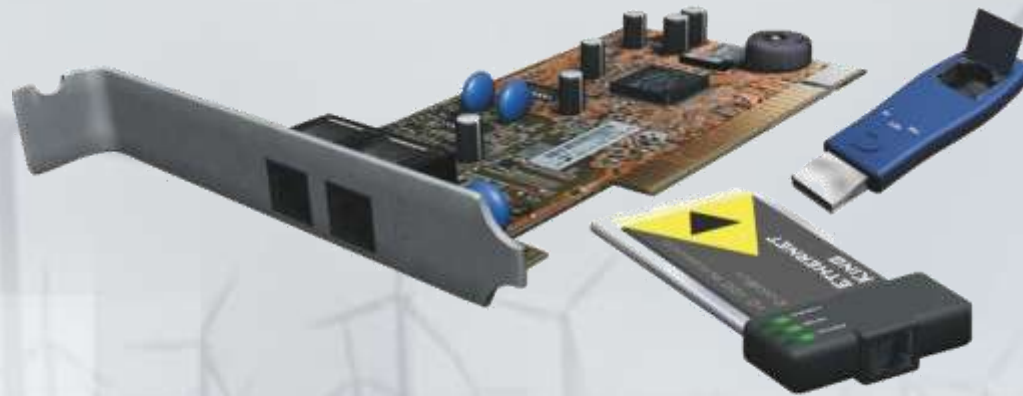
Transmission Media

- Provides communications channel between nodes
- Forms of media:
 - Telephone wire:
 - Twisted pair
 - Coaxial cable
 - Fiber-optic cable
 - Radio waves:
 - Wireless
- Bandwidth:
 - Data transfer rate
 - Throughput



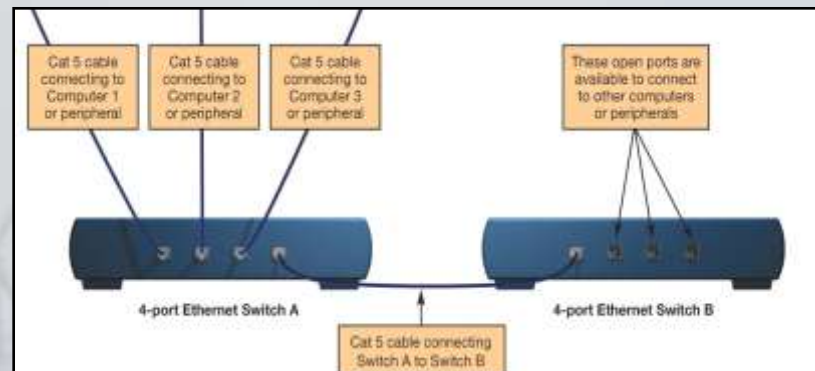
Network Adapters

- **Devices connected to or installed in nodes:**
 - Network interface cards (NIC)
 - External network adapter
- **Enable communication between nodes**



Network Navigation Devices

- Devices that help make data flow possible
- Routers:
 - Route data between networks
- Switches:
 - Receive data and retransmit it to nodes on the network



Networking Software

- **Peer-to-peer Software:**
 - Built into operating systems that support networking
 - Windows
 - Mac OS
- **Client/server Software**
 - Network operating system (NOS) software
 - Windows XP Professional
 - Windows Server 2003
 - Novell Netware

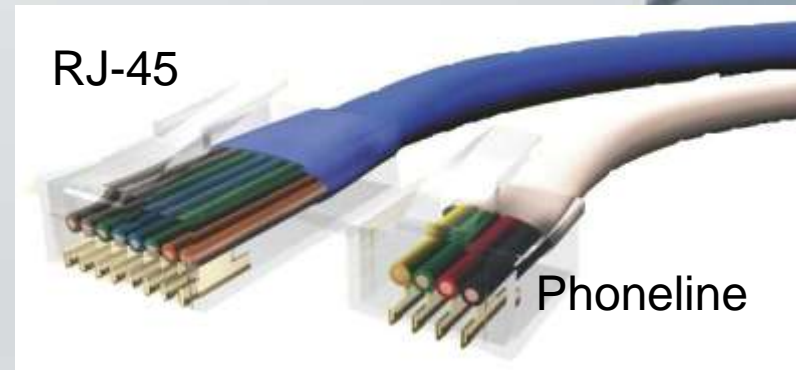
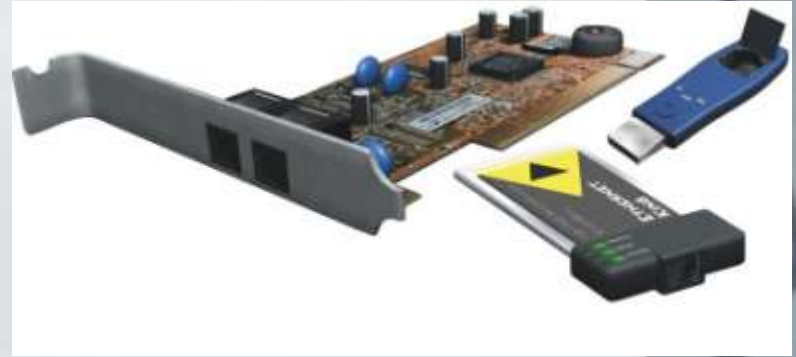
Types of Peer-to-Peer Networks

- **Power line**
- **Phone line**
- **Ethernet**
- **Wireless**



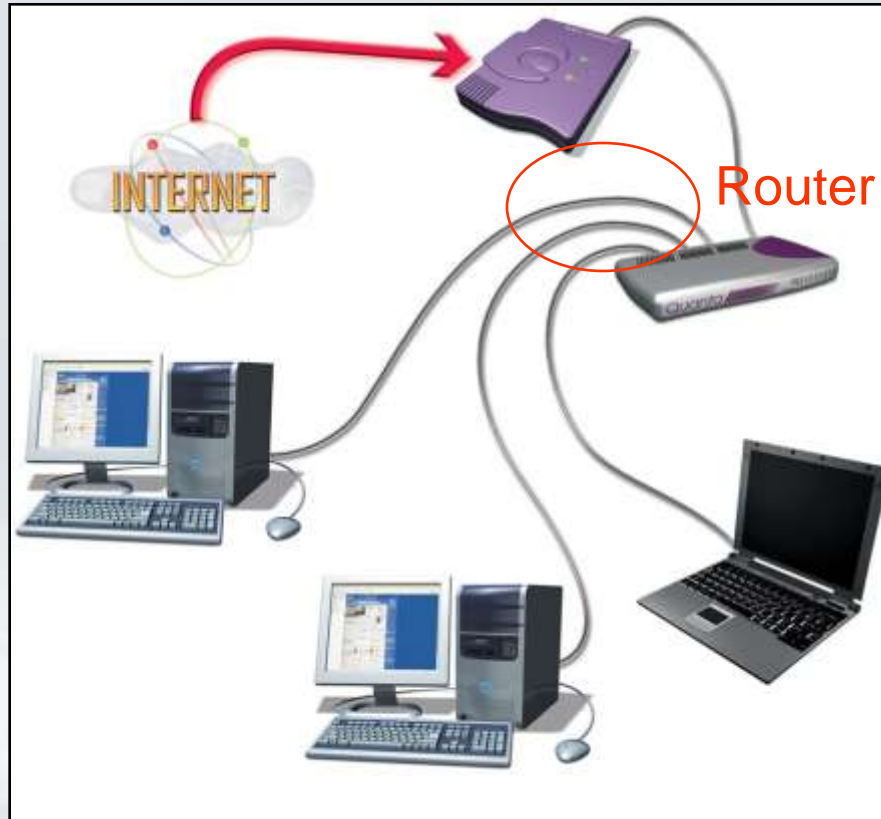
Ethernet Networks

- Ethernet network adapters are used to connect nodes
 - NIC card
 - PC Card
 - USB adapter
- Computers are connected to each other using unshielded twisted pair cable



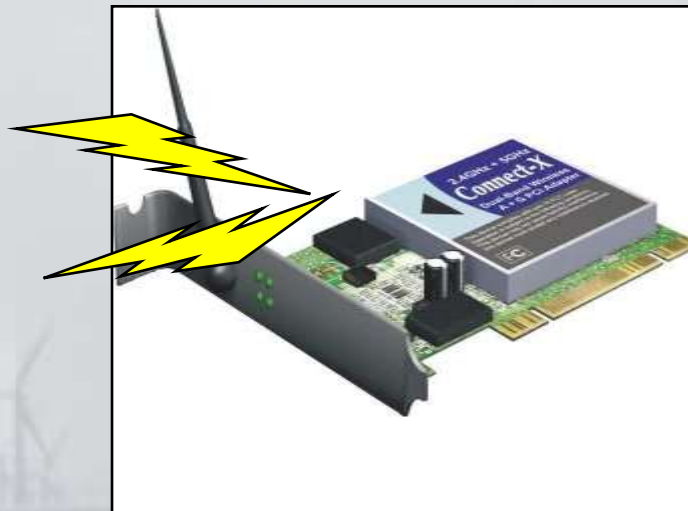
Ethernet Routers

- Transfer packets from one network to another
- Home Internet routers transfer data from the Internet to the home network.



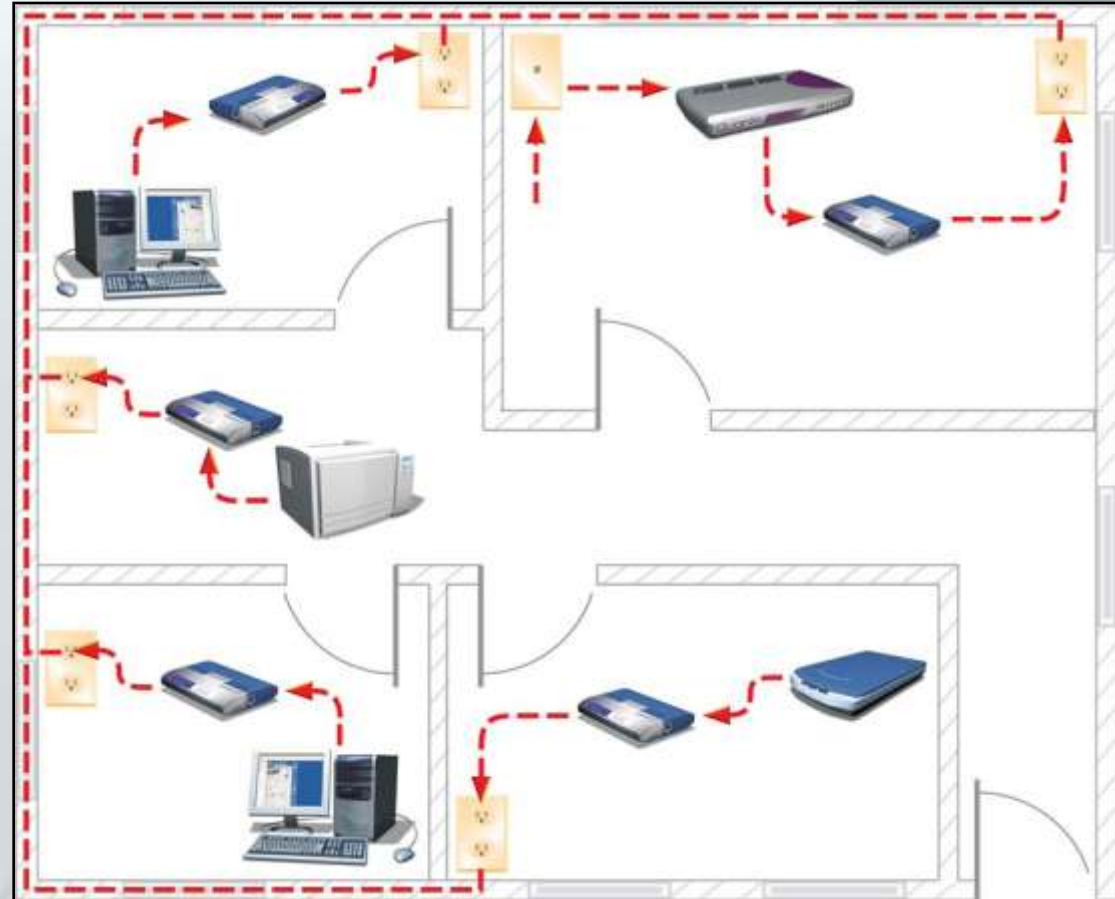
Wireless Networks

- Use radio waves to connect nodes
- Basically an Ethernet network that uses radio waves instead of wires
- Each node requires a wireless network adapter:
 - Transceiver



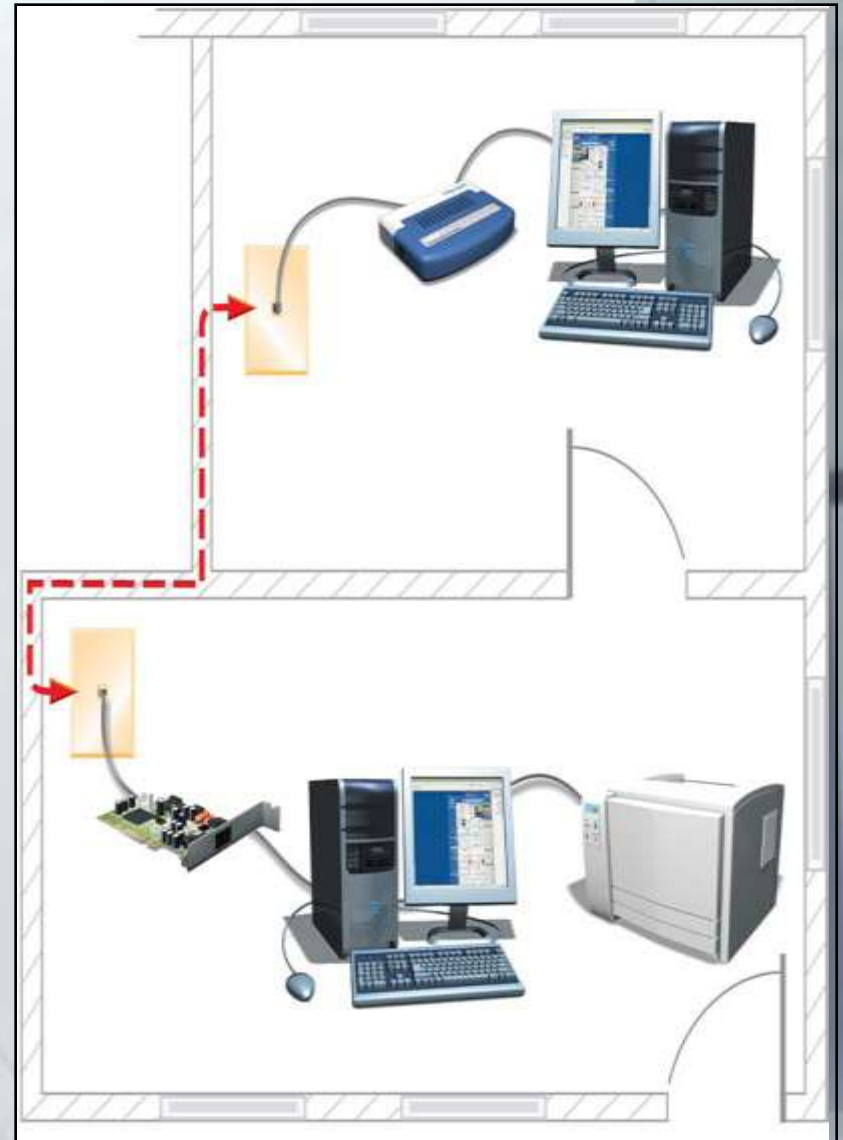
Power Line Networks

- Computers are connected to a house's electrical wiring to create a network
- Power line network adapter is used to connect nodes to electrical outlets



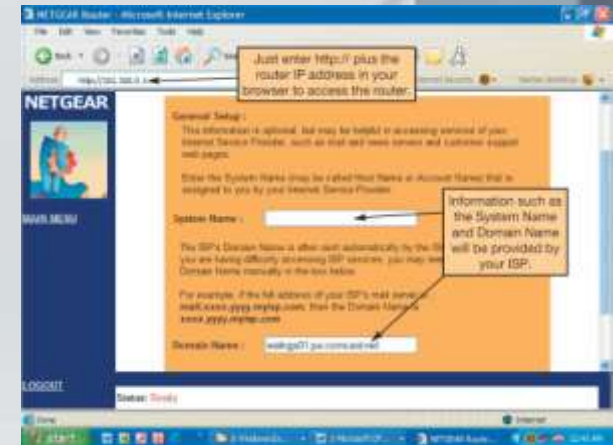
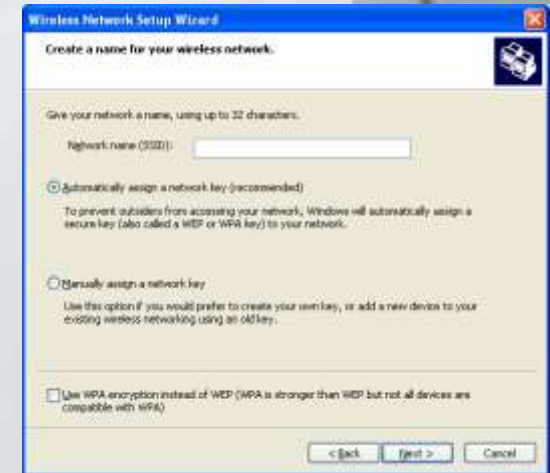
Phone Line Networks

- Computers are connected to a house's telephone wiring to create a network
- Home phone line network adapter is used to connect nodes to phone jacks



Configuring Software for a Home Network

- Windows operating system:
 - Windows XP:
 - Network setup wizard
 - Wired or wireless
 - Windows ME:
 - Network setup wizard
 - Windows 98:
 - Configure manually
 - Help has a clear instructions



Computer Threats

- **Cyber-crimes are criminal acts conducted through the use of computers by Cyber-criminals.**



What Hackers Do

- **Steal information from computers:**
 - Credit card numbers
 - Bank account numbers
- **Internet packet sniffing**
- **Commit identity theft**



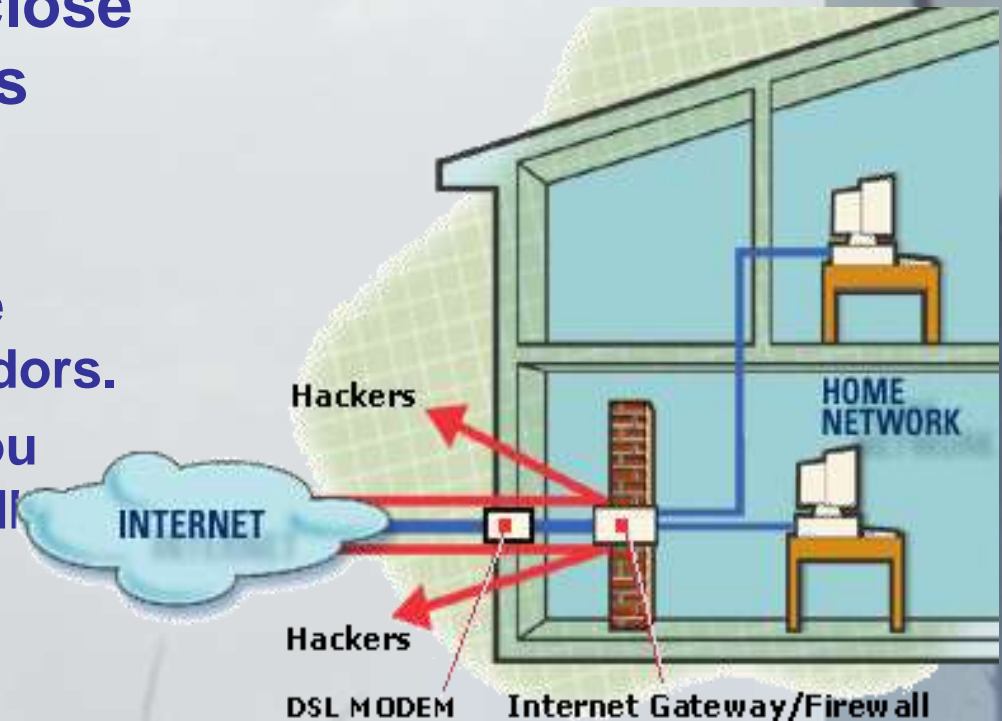
How Hackers Gain Access

- **Direct access:**
 - Hacking software through the network connections
- **Indirect access:**
 - Internet connection
 - Logical ports through the browser



Computer Safeguards: Firewalls

- Software programs or hardware designed to close logical ports to invaders
 - A firewall is built into Windows XP
 - More robust firewalls are available from other vendors.
 - Firewalls are critical if you have an always-on broadband connection.

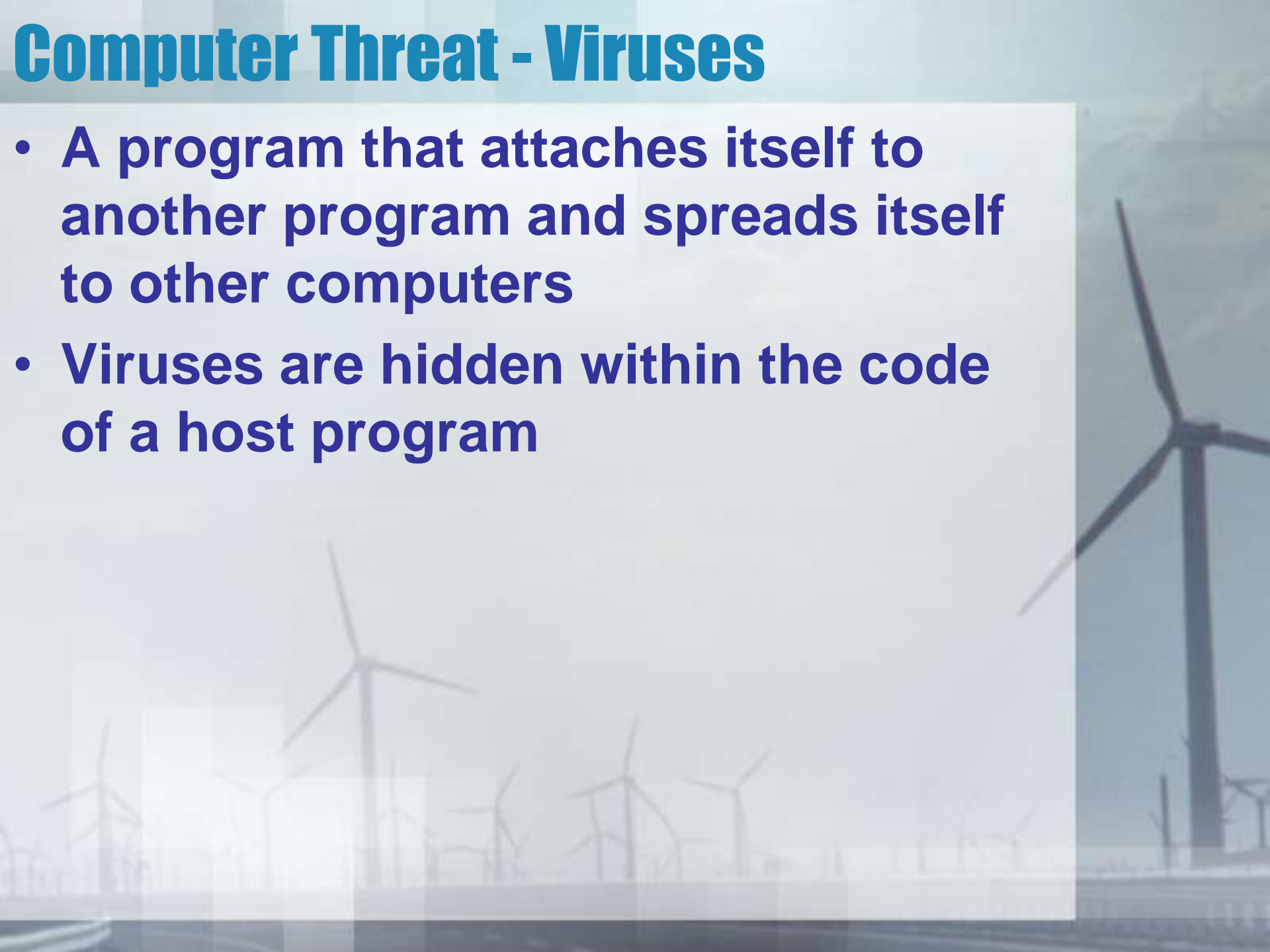


Protecting a Wireless Network

- Wireless network range doesn't stop at the property line.
- Do not broadcast your SSID. This identifies your network to all who listen...
- Make sure to use a strong encryption key when you install your wireless router. I will show you how.
- Use the MAC address of the computers you want to connect to your network....only those machines will be able to connect! This is called MAC filtering and wireless routers have this capability built in.

Computer Threat - Viruses

- A program that attaches itself to another program and spreads itself to other computers
- Viruses are hidden within the code of a host program



How Does a Computer Catch a Virus?

STEP 1: A hacker writes a Trojan horse program disguised as a screensaver and posts it to a popular newsgroup



Hacker's computer



Newsgroup server

STEP 2: Unsuspecting Bill downloads the "screensaver" and infects his computer



Bill's computer

STEP 3: Bill sends his cousin Fred an e-mail with the infected "screensaver" and contaminates Fred's computer



Fred's work computer



Fred's home computer

STEP 4: Fred saves the screensaver to a disk and then installs the "screensaver" on his computer at work and infects that machine as well



Coworker's computer



Coworker's computer

STEP 5: Everyone who copies files from Fred's infected computer at work is at risk to spread the infection

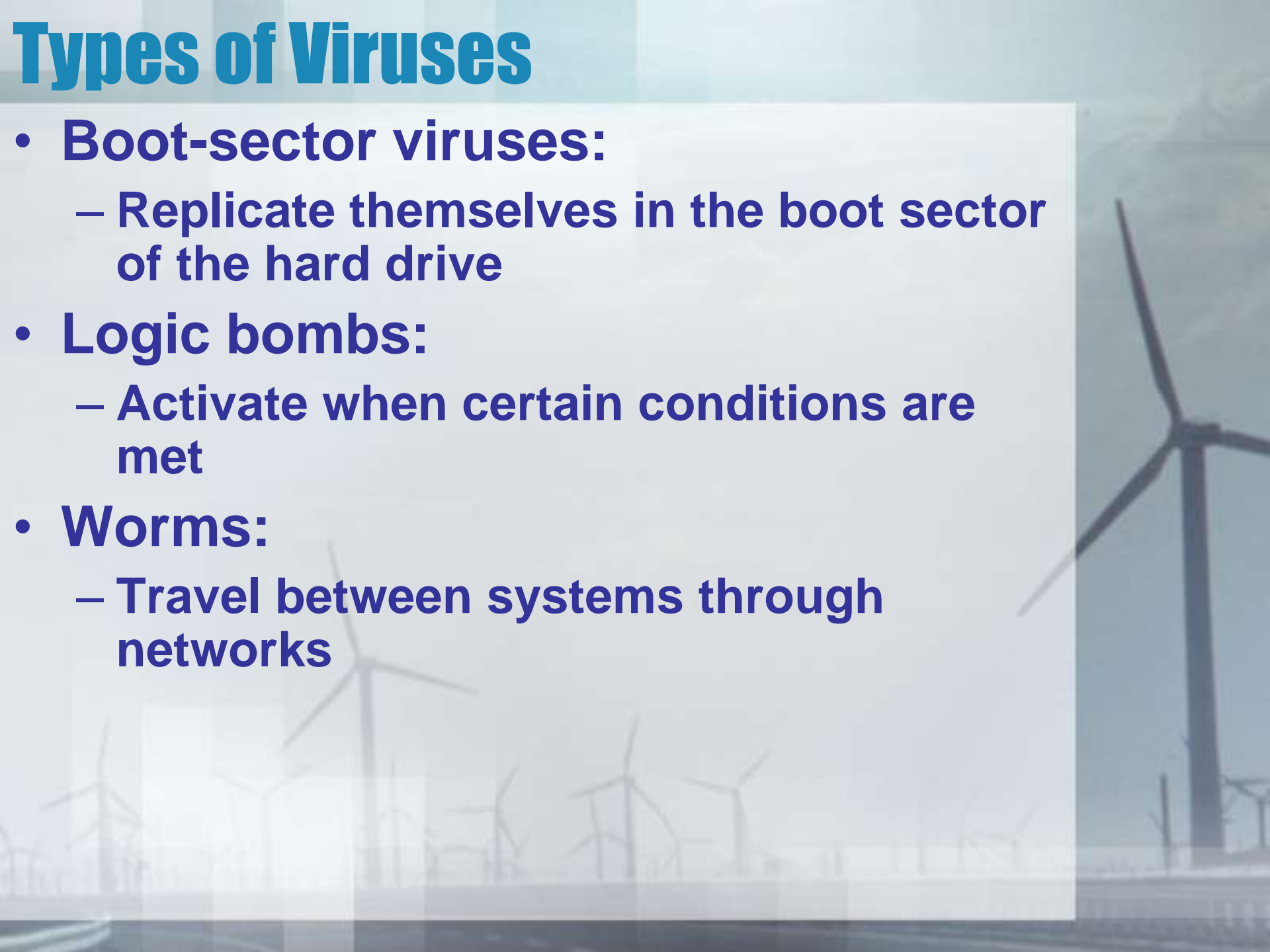


What Viruses Do

- **Replicate themselves:**
 - Slow down networks
- **Secondary objectives:**
 - Annoying messages
 - Delete files on the hard drive
 - Change computer settings

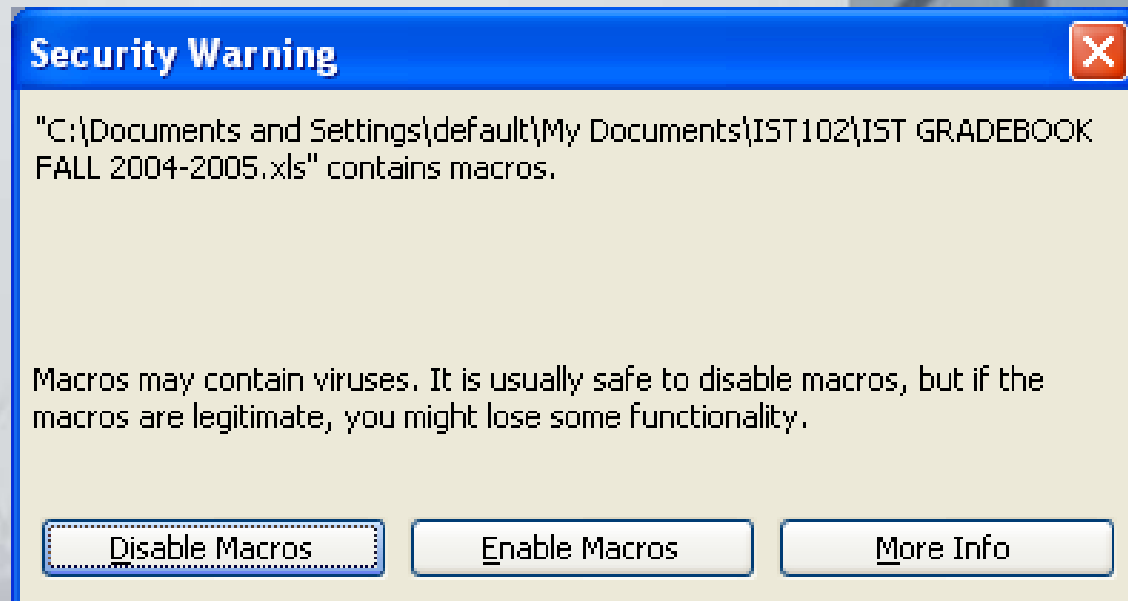
Types of Viruses

- **Boot-sector viruses:**
 - Replicate themselves in the boot sector of the hard drive
- **Logic bombs:**
 - Activate when certain conditions are met
- **Worms:**
 - Travel between systems through networks



Types of Viruses

- Script viruses:
 - Hidden on Web pages
 - Mini programs
- Macro viruses:
 - Attached to documents like MS Word
 - Series of commands
- Trojan horses:
 - Backdoor programs
 - Control remote computers



Antivirus Software

- Programs designed to detect viruses:
 - Scan files looking for virus signatures (unique code)
 - Provides options for deleting or fixing infected files
- Detect known viruses
- Antivirus programs need to be updated frequently

The image shows two overlapping windows from Norton Internet Security. The left window is titled "Norton Internet Security" and displays the "Scan for Viruses" section. It lists several scan options: "Scan my computer", "Scan all removable drives", "Scan all floppy disks", "Scan drives", "Scan folders", and "Scan files". Three callout boxes point to these options: "Click this to scan your hard drive for viruses." points to "Scan my computer", "Click this to launch the scheduling window." points to "Scan my computer", and "You can set up automatic scans to run at times when you don't use your computer." points to the "Scan my computer" icon. The right window is titled "Norton AntiVirus - Scan my computer - Alan Evans" and shows the "Schedule" dialog. It displays a current schedule of "At 8:00 PM every Fri of every week, starting 2/19/2005". Below this, it shows "Schedule Task: Weekly" and "Start time: 8:00 PM". The "Schedule Task Weekly" section has a table of days with checkboxes: Mon, Tue, Wed, Thu, Fri (checked), Sat, Sun. There are "OK" and "Cancel" buttons at the bottom.

Norton Internet Security

Block Traffic LiveUpdate Options Help & Support

Norton Internet Security

Norton AntiVirus

Status

Scan for Viruses

Reports

Norton AntiSpam

Scan for Viruses

Click an item to launch a scan

- Scan my computer
- Scan all removable drives
- Scan all floppy disks
- Scan drives
- Scan folders
- Scan files

Click this to scan your hard drive for viruses.

Click this to launch the scheduling window.

You can set up automatic scans to run at times when you don't use your computer.

Norton AntiVirus - Scan my computer - Alan Evans

Schedule

At 8:00 PM every Fri of every week, starting 2/19/2005

Schedule Task: Start time: 8:00 PM Advanced...

Weekly

Schedule Task Weekly

Every 1 week(s) on:

<input type="checkbox"/>	Mon	<input type="checkbox"/>	Sat
<input type="checkbox"/>	Tue	<input type="checkbox"/>	Sun
<input type="checkbox"/>	Wed	<input type="checkbox"/>	
<input type="checkbox"/>	Thu	<input checked="" type="checkbox"/>	Fri

Show multiple schedules.

OK Cancel

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