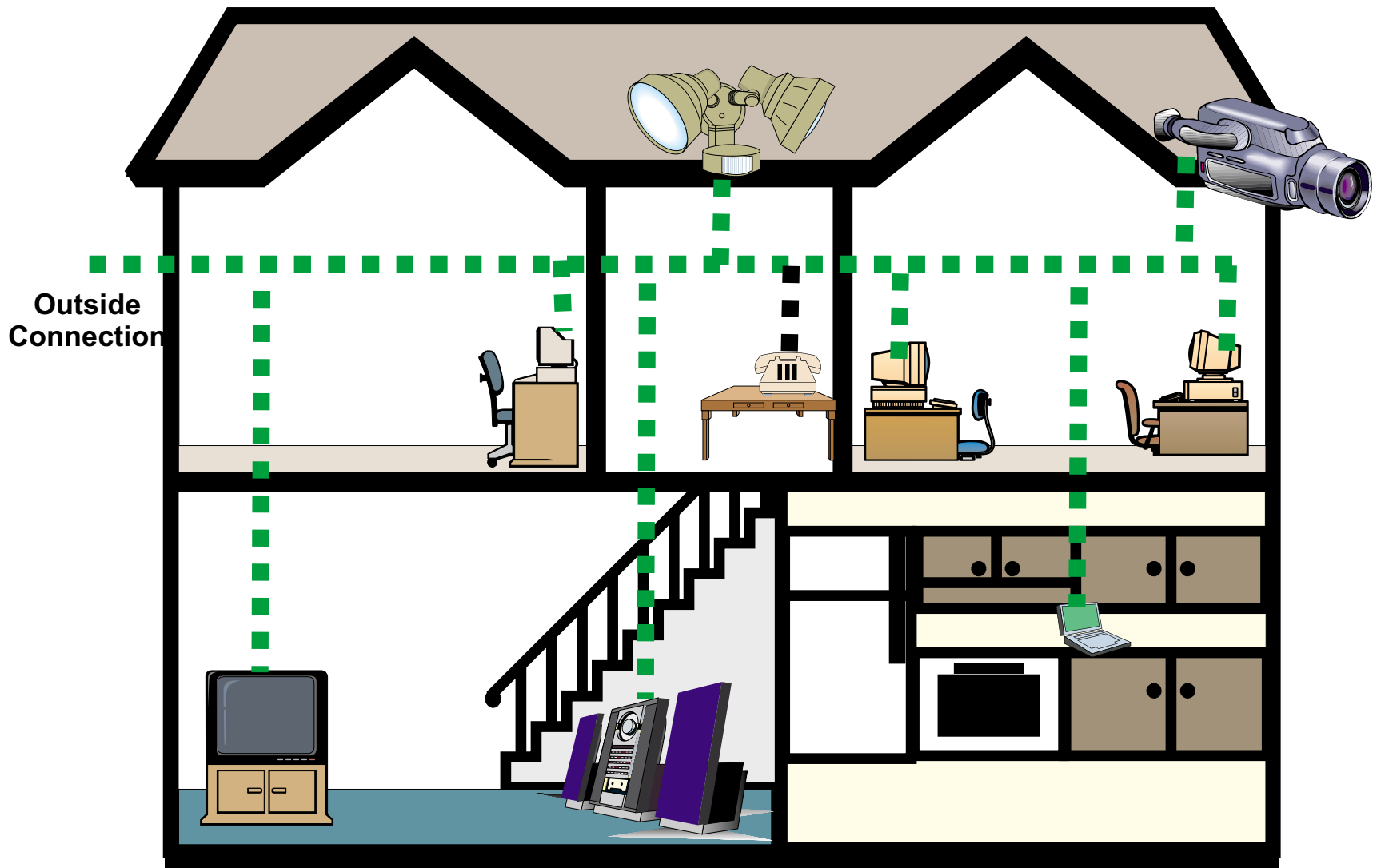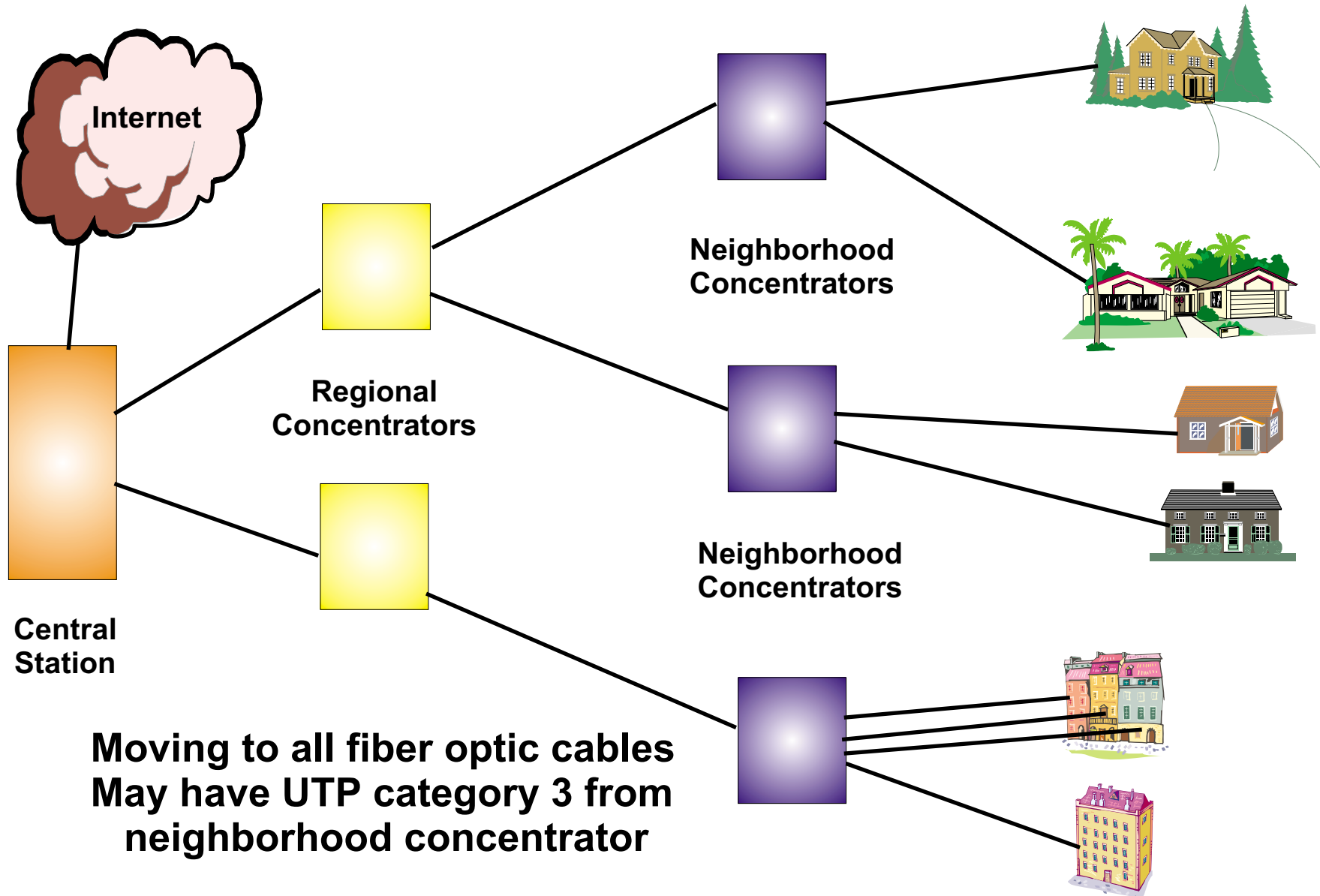# Home Networking:
Building an Ethernet LAN

Laura Jeanne Knapp
IBM/Tivoli Technical Evangelist
1-919-224-2205
Laura@lauraknapp.com
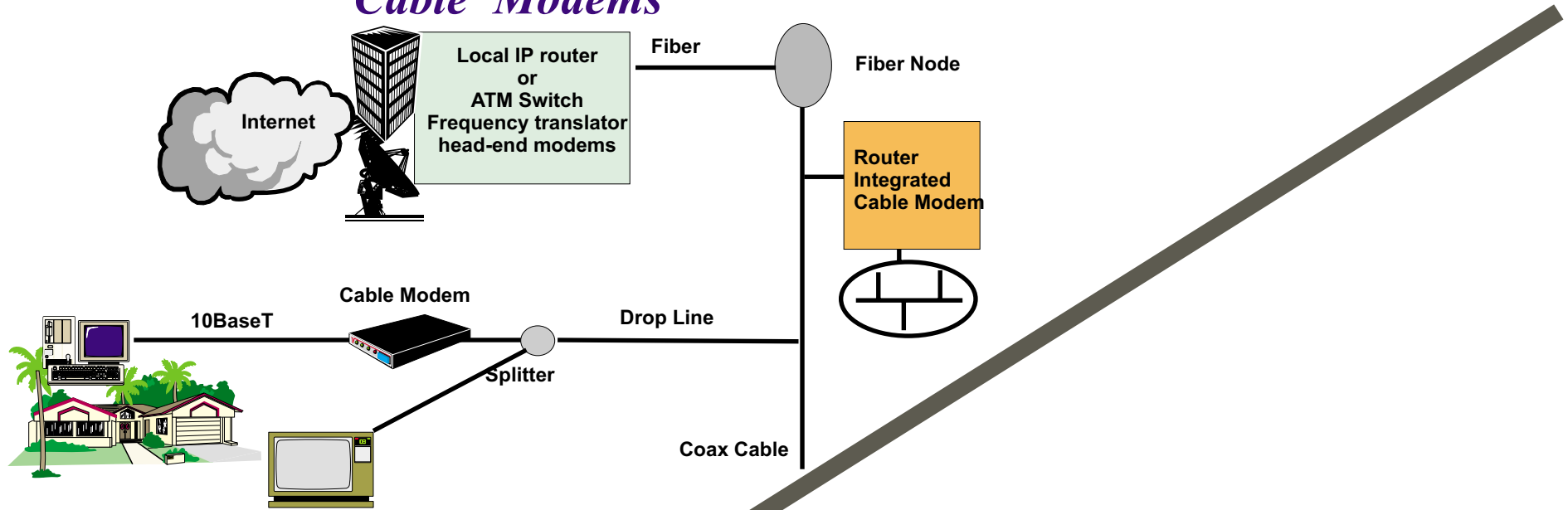**www.lauraknapp.com**

The Changing HomeScape

Outside Connection

Services
TV channels, movies, telephone, Internet, intranet, security, video, audio

New Residential Community Network

Internet

Regional
Concentrators

Neighborhood
Concentrators

Neighborhood
Concentrators

Central
Station

**Moving to all fiber optic cables
May have UTP category 3 from
neighborhood concentrator**

High Speed Internet Access Driving Force

Cable Modems

Internet

**Local IP router
or
ATM Switch
Frequency translator
head-end modems**

Fiber

Fiber Node

**Router
Integrated
Cable Modem**

Cable Modem

10BaseT

Splitter

Drop Line

Coax Cable

Asymmetric Digital Subscriber Line

**Uses standard copper cable (POTS)
Transmit at 640 Kbps
Receive at 1.54 to 8 Mbps
Must be within 2.5 miles of central office**

Internet

**Remote Office
or
Home**

10BaseT

**Internet or
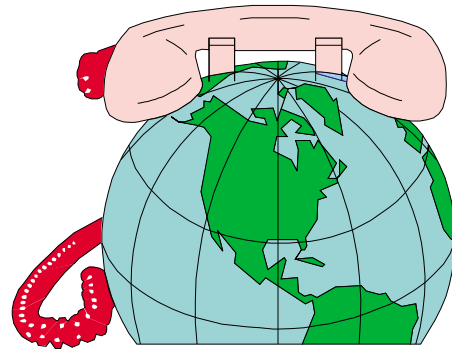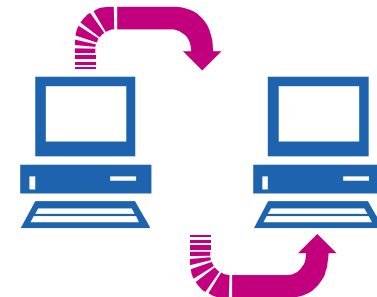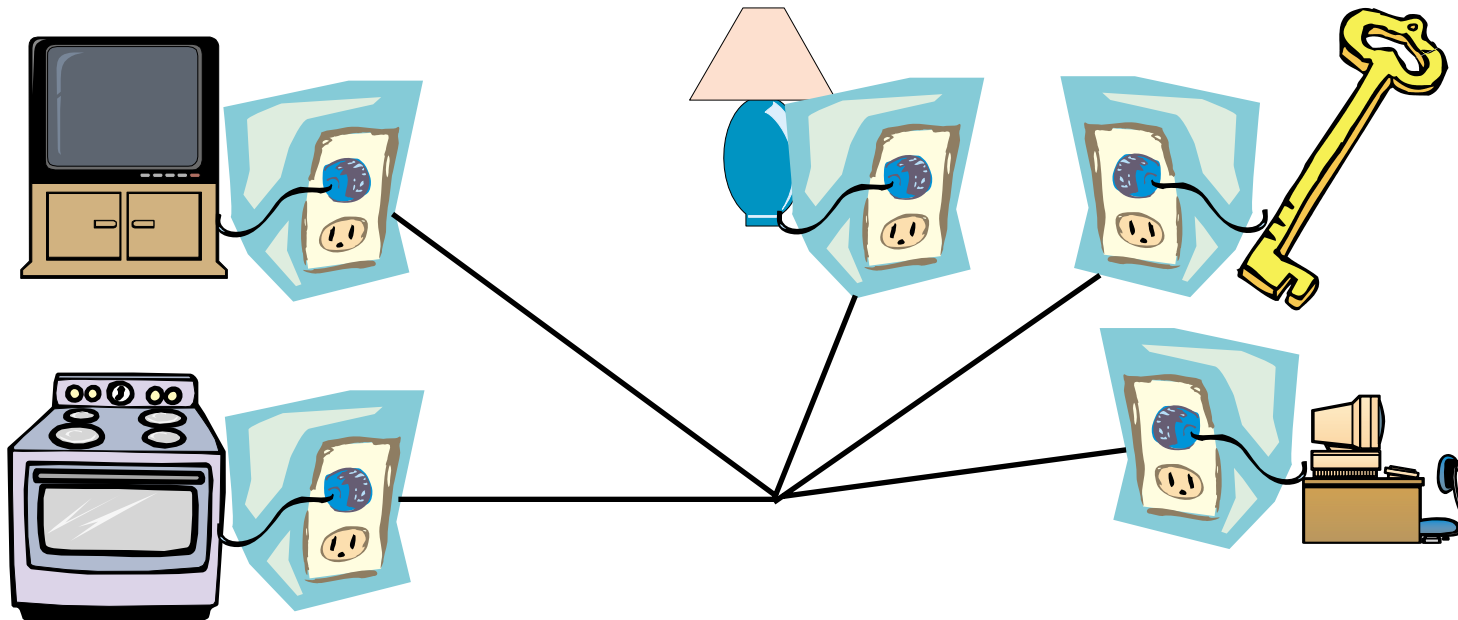corporate headquarters**
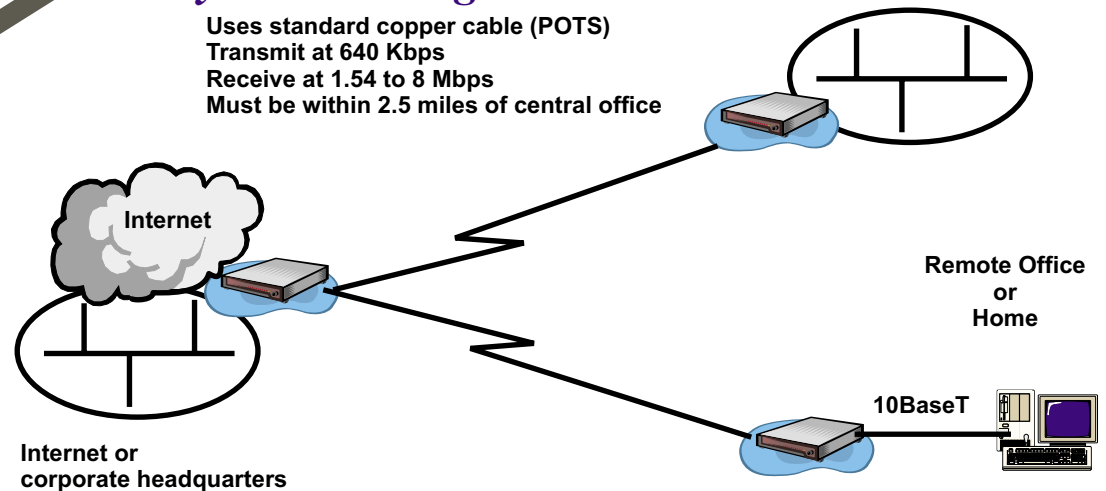
Technology Options

AC Power Line

Ethernet

Phone

Wireless including Bluetooth

Specialized

AC Power Line Solutions

Uses existing electrical outlets (www.intelogis.com)

350 kbps transfer rates

Surge-supressers will cause problems

Have seen interference from other electrical devices

May need line conditioners

Several products need manual configuration with Win95 and Win98

Wireless Solutions

SWAP (Shared Wireless Access Protocol)
  HomeRF Working Group (www.homerf.org)
  Around $150.00 per node
  Borrows from Ethernet with TCP/IP protocol
  1-10 Mbps - relaxed 802.11 specification
  PCs, telephones, other enabled devices
  Uses 2.4 gigahertz band (public, unlicensed band)
  Supports an average home and yard (150 ft)
  Integrated 56 bit encryption
  Spectrum hopping to prevent interference from adjacent homes
  IBM, Compaq, Intel, Proxim

802.11b (Wi-Fi) Wireless Networks
  Around $350 - 500 per node
  (www.networkcomputing.com/1006/1006r2.html)
  10-11 Mbps
  Multi-floor support
  Can bridge to wired Ethernet
  Nortel, Cabletron, Lucent, …

Wireless Solutions - Bluetooth

Too many competing wireless standards (www.bluetooth.com)

PC's, cell phones, etc, use different standards

Need single standard for all devices

Technology
   Point-point or multipoint
   High and low power levels
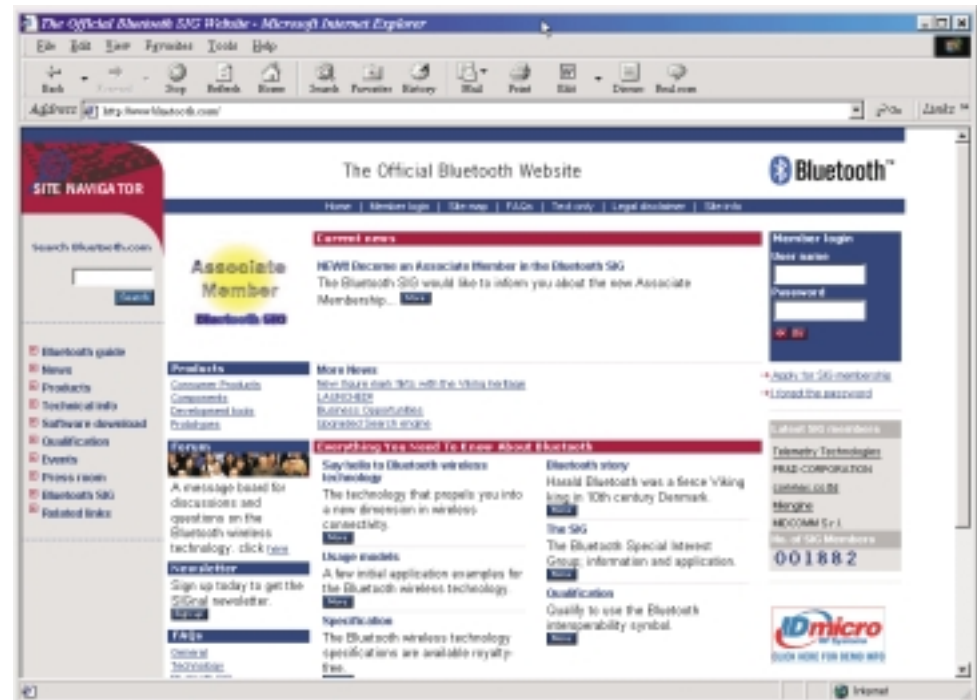   **Radio transmission technology**
   Voice and data in real time
   Microchip based

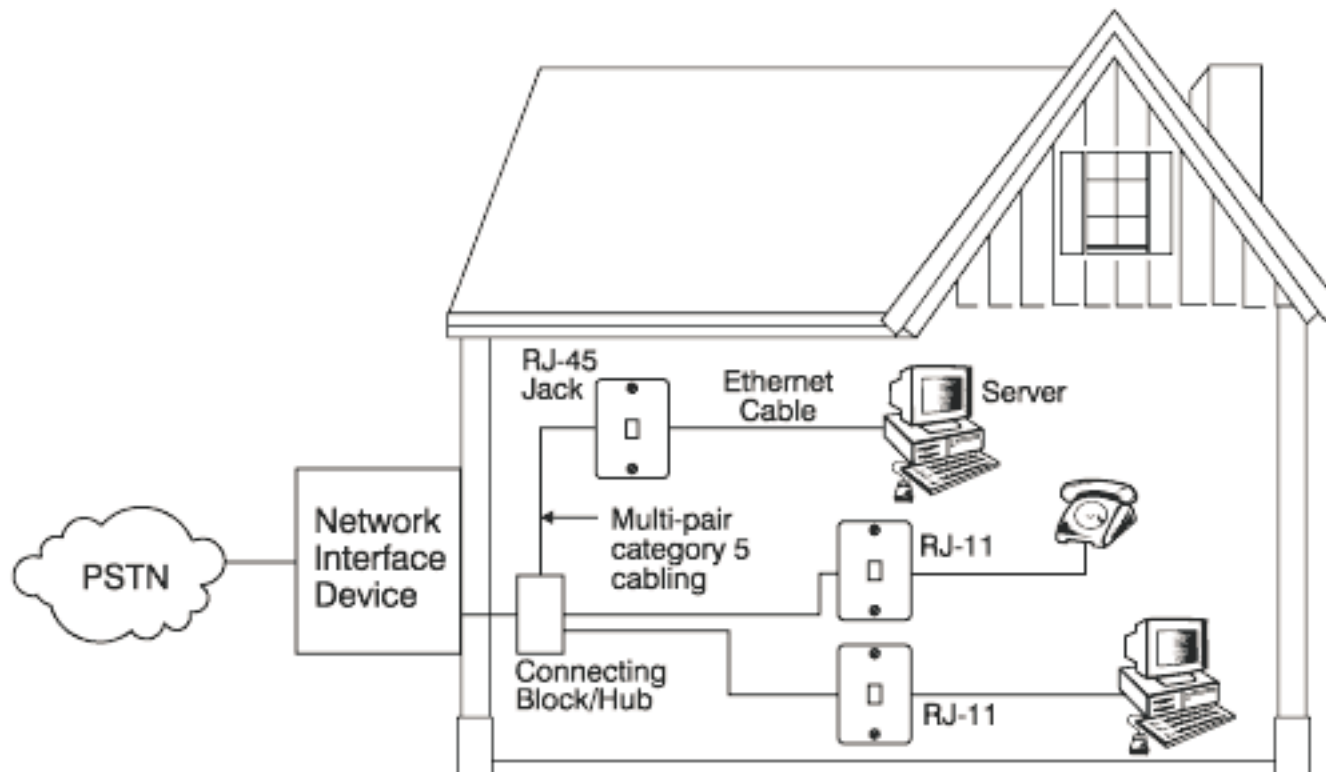**Many players in development...**
   Few products on market

Ericsson, IBM, Intel, Lucent, Microsoft, Motorola all involved

Phone Line Solutions

HomePNA Alliance (www.homepna.org)
$50-100 per node, RJ11 connections, 1-10 Mbps, uses NDIS Ethernet drivers
10,000 square foot home covered, frequencies chosen to avoid interference
Intel , Diamond Multimedia Systems, Cisco, NetGear

Specialized Solutions

Low cost USB networking

> **Network two Win98/Win2000 devices**
> **Driver directs network traffic through USB port**
> **Under $100.00**
> **Between 5 and 7 Mbps**
> **12 foot maximum distance between PCs**
> **Cannot co-exist with Ethernet**
> **Belkin (www.belkin.com), Entrega (www.entrega.com)**

Wideband Networking

> **Gigabit speeds**
> **WGNA (Wideband Gigabit Networking Alliance)**
> **Flow control, class of service supported**
> **No collisions as in Ethernet**
> **Buffered Packet Synchronization**
> **www.wgna.org**

Ethernet LAN

Hub or switch
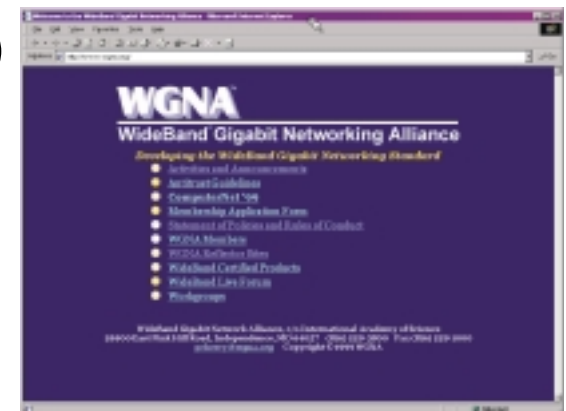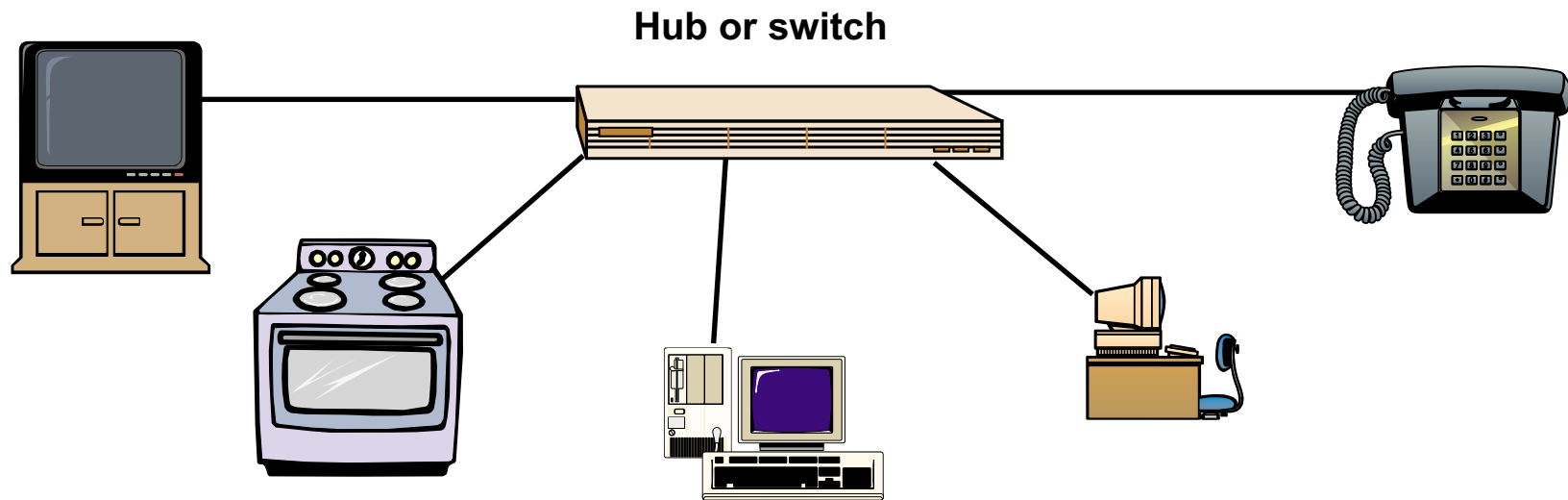
10, 100, and 1000 Mbps products
UTP Category 3 or 5 cable depending on speed
Mature
Inexpensive chips + volume = inexpensive products
Established support structure
Flexible

Ethernet LAN Security

Internet

DSL, Cable Modem or other
 high speed
persistent connection

Home hub or switch

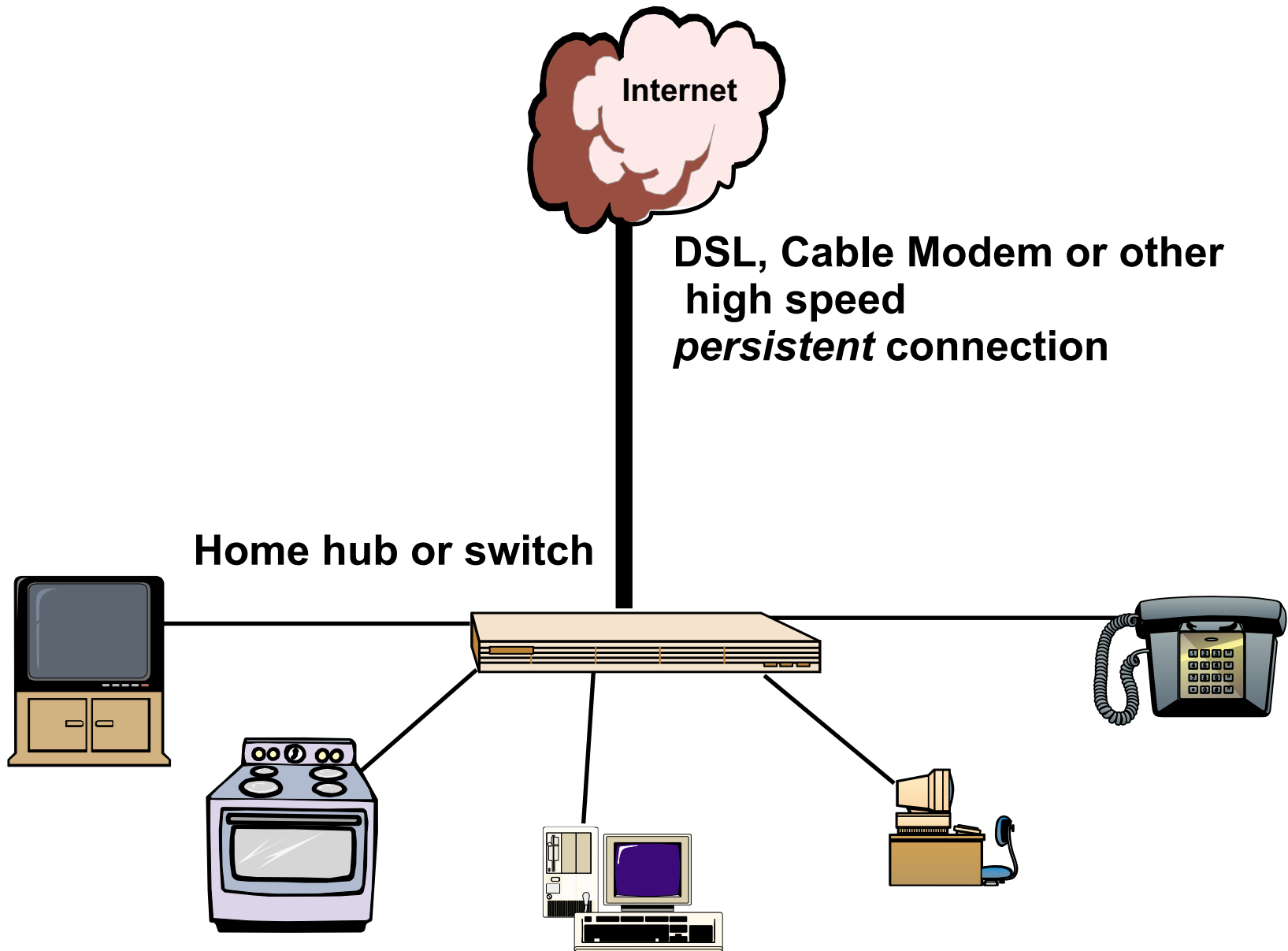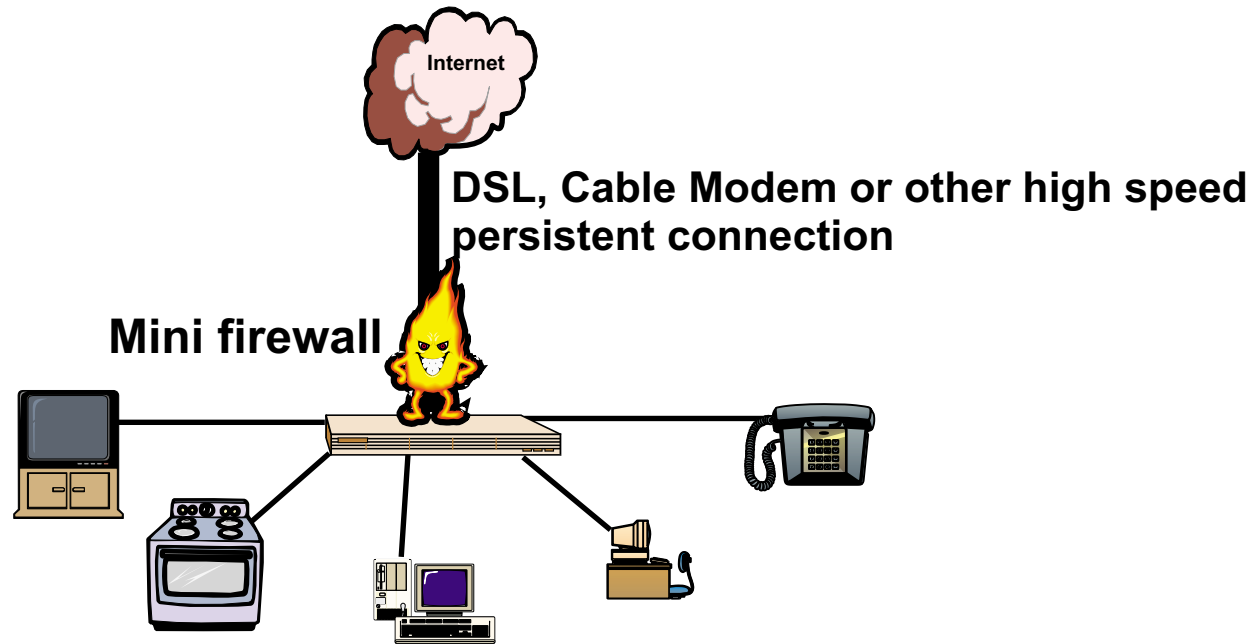# *Ethernet LAN Security*

Internet

DSL, Cable Modem or other high speed persistent connection

Mini firewall

Persistent connection allows hackers access to system
  (Some access vendors frequently change your IP address)

Protection similar to that of firewall at work

Mini firewall
  1) Network address tanslation (use private IP addresses for home network)
  2) Filter and don't allow any queries originating from outside
  3) Hardware or software based
        Linksys, Watchguard, Netgear have hardware
        BlackICE Defender, ZoneAlarm, Wingate Home are software
  4) Look for ingress and egress filtering

Technology Summary

	Price	Speed	Pros	Cons
Electric	$180	350 kbps	Installed wiring	Interference
				Poor Internet sharing
Phone Line	$100	1-2 Mbps	Installed wiring	Outlets
				Variable Internet sharing
USB	$50-70	5-7 Mbps	Easy	Limited 2 systems
				Limited distance
Wireless	$150-200	1-2 Mbps	No cables	Distance
				Coverage
Ethernet	$70	10-100 Mbps	Mature	Need to wire
			Pervasive	
			Interconnections	

Planning for Your Home Ethernet LAN
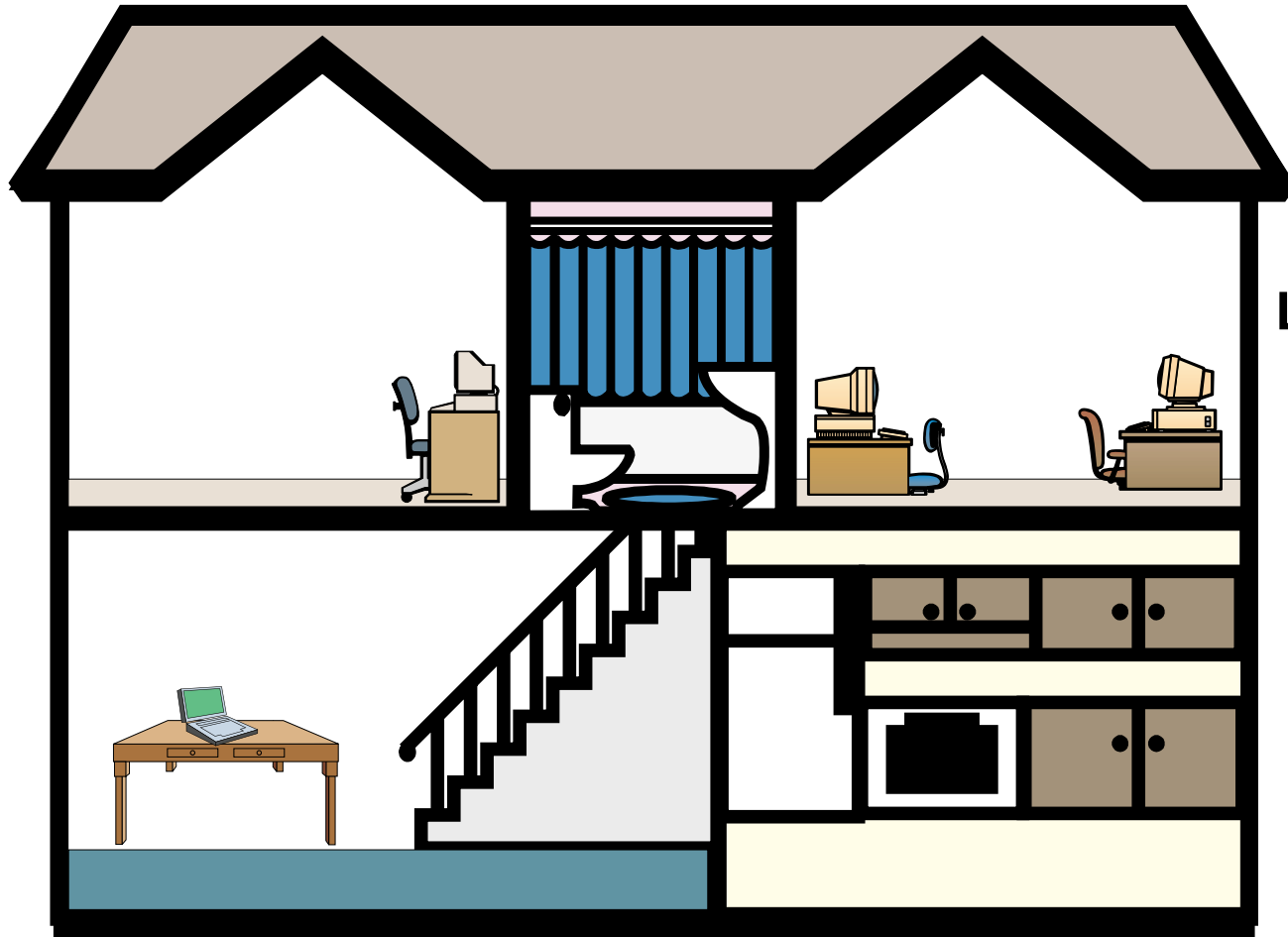
Location of components
  Connections to outside
  Cables under carpets,
    through walls,
    between floors
AC power
Central area for hub
What about future
  connections

Long-Term Cabling for Homes

New home developments are pre-cabling homes for home LANs

Fiber cable to each home

Phone, video (video on demand for $3 per movie),
   and Internet services (100 Mbps to each home at $20 per month)

Cabling costs around $2,000 per home compared to $300 for conventional wiring

Category 5 UTP, Ethernet HUB used in the home

Home Director delivers home automation features
      Depending on options can run from $5,000 to $100,000
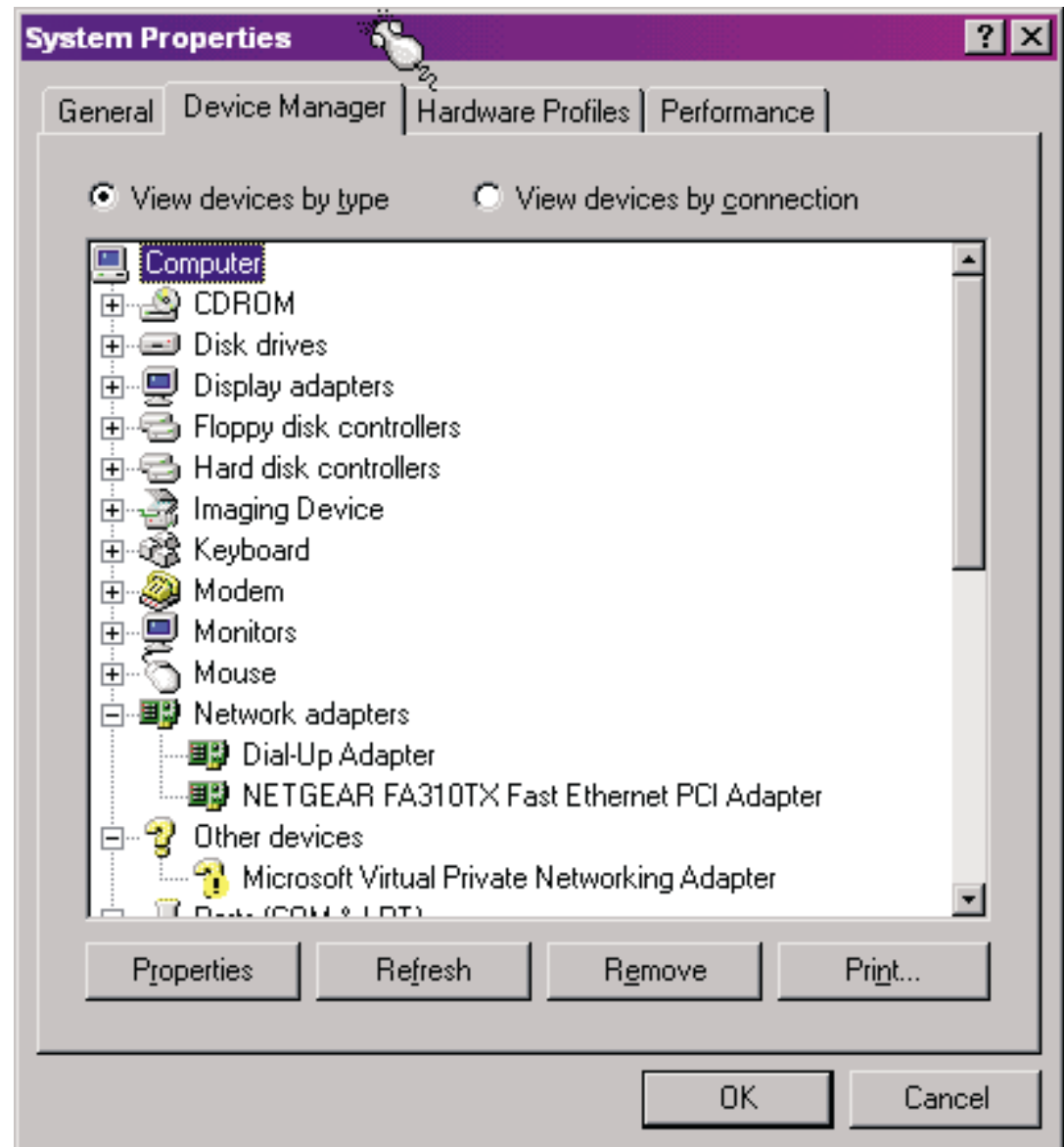
Installing Network Interface Cards (NICs)

Internal adapters - desktops
PCMCIA adapters - laptops
USB - desktops and laptops

Win98 will automatically detect if a new card has been installed, prompt you for the device driver disk (provided with adapter), and for the Windows installation disk.

You will be prompted to reboot your system

To see if your adapter is properly installed right click on My Computer, select Properties, select Device Manager

Select Network Adapters
  You should see the just installed adapter with no red arrows or yellow exclamations

System Properties

General | Device Manager | Hardware Profiles | Performance

○ View devices by type   ○ View devices by connection

Computer
  ⊞ CDROM
  ⊞ Disk drives
  ⊞ Display adapters
  ⊞ Floppy disk controllers
  ⊞ Hard disk controllers
  ⊞ Imaging Device
  ⊞ Keyboard
  ⊞ Modem
  ⊞ Monitors
  ⊞ Mouse
  ⊟ Network adapters
      Dial-Up Adapter
      NETGEAR FA310TX Fast Ethernet PCI Adapter
  ⊟ Other devices
      Microsoft Virtual Private Networking Adapter

Properties | Refresh | Remove | Print...

OK | Cancel

Configuring Your PC

Network

Configuration | Identification | Access Control

The following network components are installed:

- Client for Microsoft Networks
- 3COM USB Network Interface (3C19250)
- Dial-Up Adapter
- NETGEAR FA310TX Fast Ethernet PCI Adapter
- NetBEUI -> 3COM USB Network Interface (3C19250)

Add...   Remove   Properties

Primary Network Logon:

Client for Microsoft Networks

File and Print Sharing...

Description

OK   Cancel

Open My Computer, Control Panel, Network

Installed adapters, protocols, and services are shown

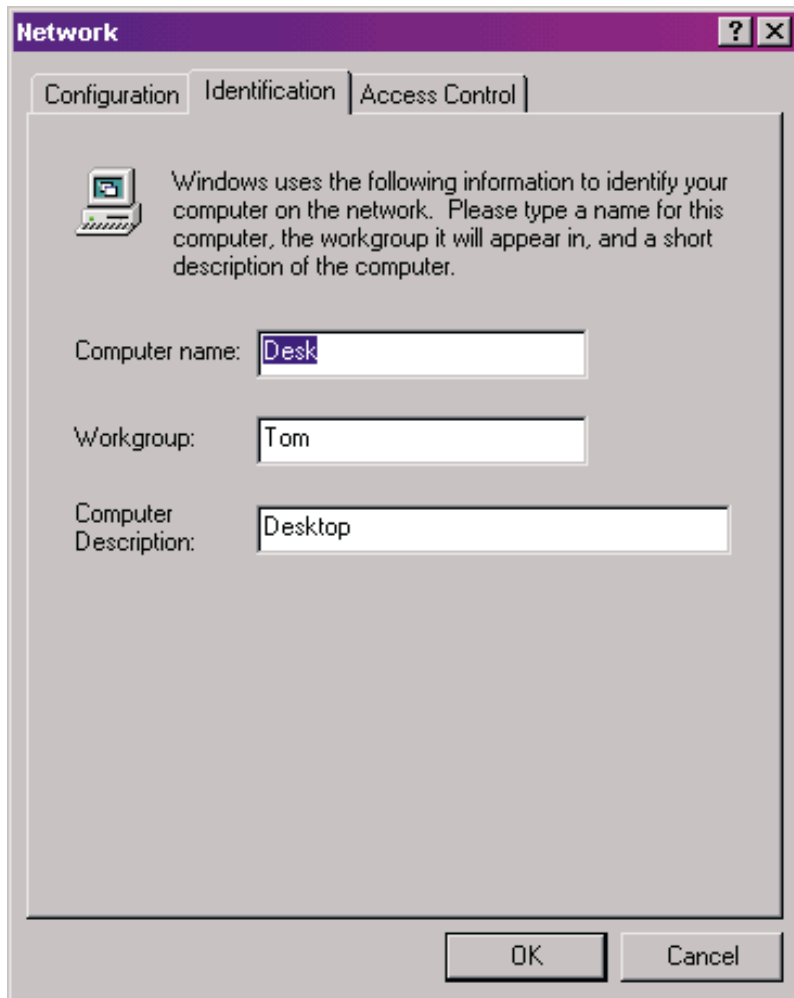**Make sure your adapter, NetBEUI and TCP/IP are installed**

Select Client for Microsoft Networks as your pimary Logon

For simple peer-peer networking no configuration for NetBEUI or TCP/IP is required

Setting up Windows LAN Peering

On all systems
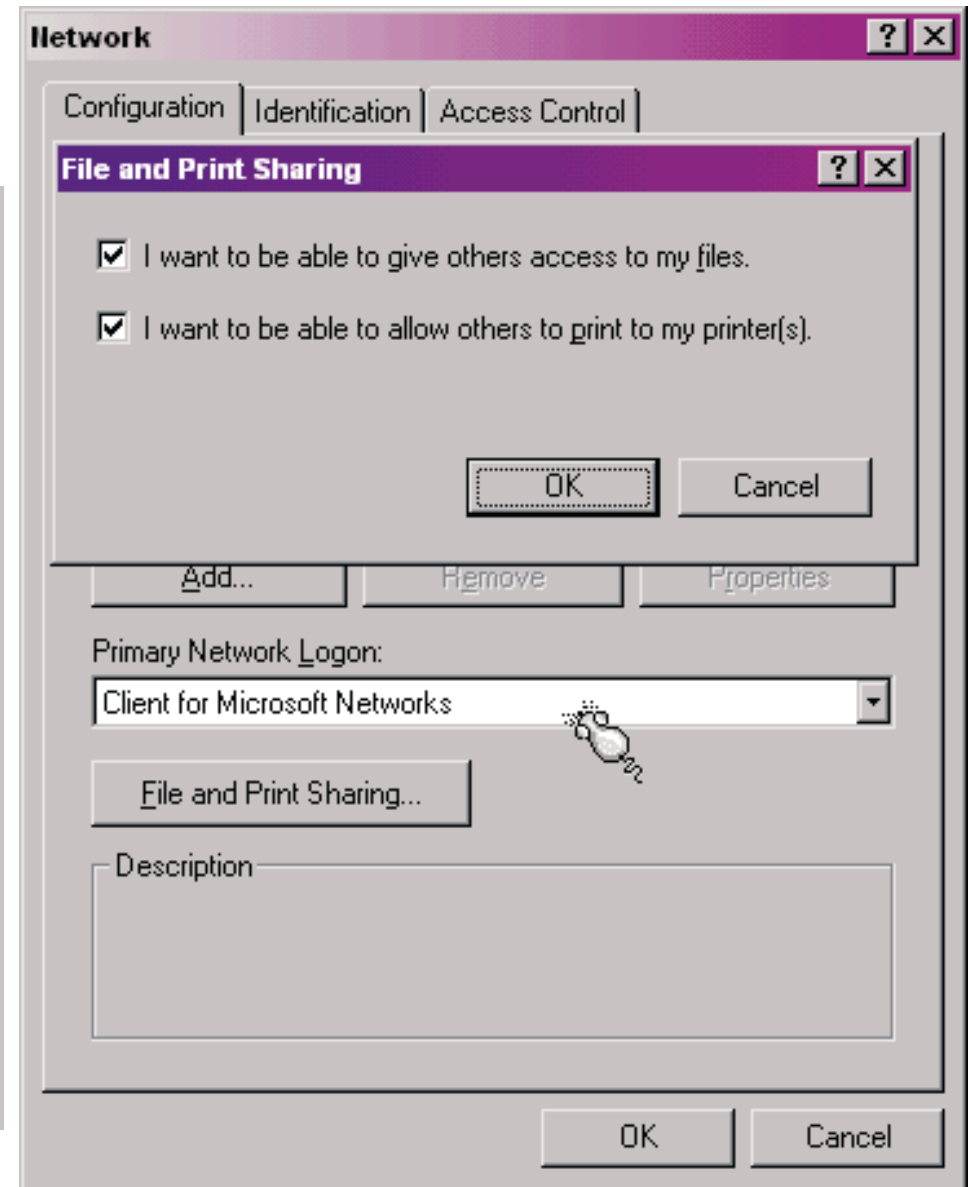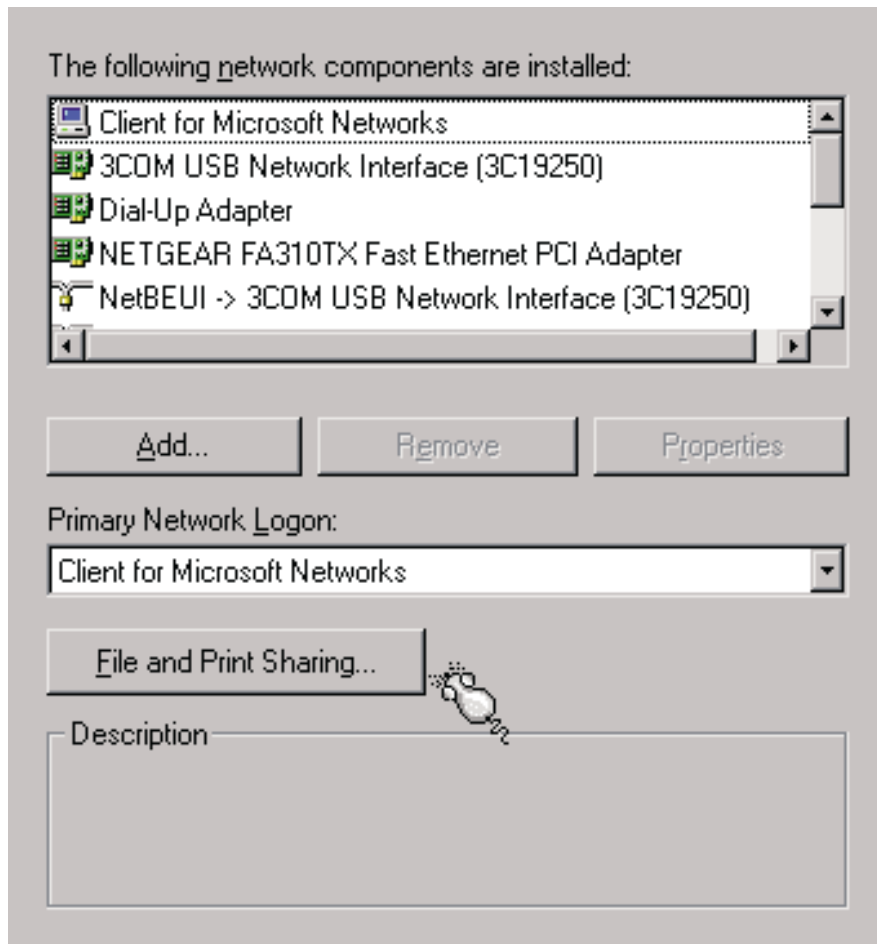   **Go to My Computer, Control Panel, Network, Identification**

Computer Name:
   Make sure this is UNIQUE
   on all systems

Workgroup:
   Make sure this is the SAME
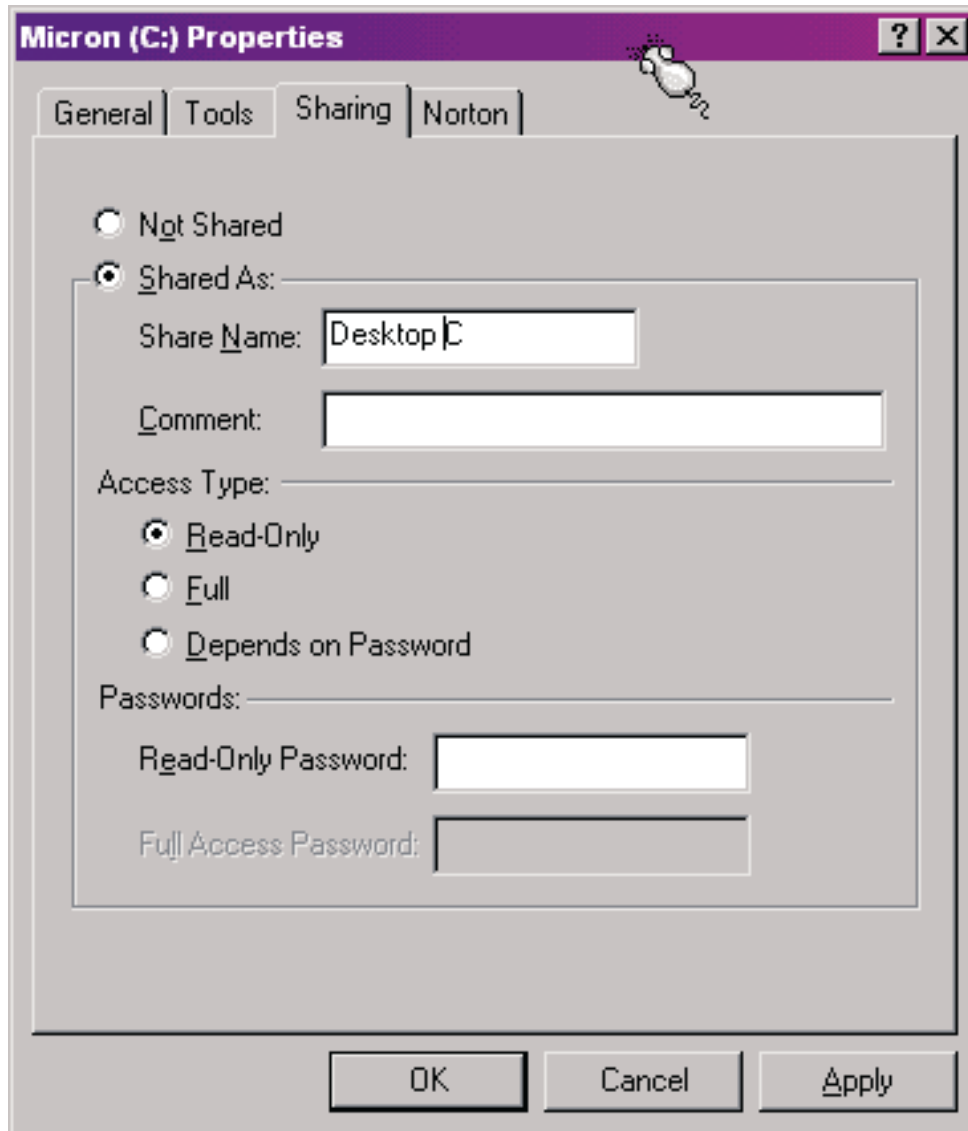   **on all systems**

Computer Description:
   This is for information only

Windows File and Print Sharing

The system with resources you want to share, must have File and Print Sharing activated

The following network components are installed:

- Client for Microsoft Networks
- 3COM USB Network Interface (3C19250)
- Dial-Up Adapter
- NETGEAR FA310TX Fast Ethernet PCI Adapter
- NetBEUI -> 3COM USB Network Interface (3C19250)

Add...   Remove   Properties

Primary Network Logon:

Client for Microsoft Networks

File and Print Sharing...

Description

Network   ? X

Configuration | Identification | Access Control

File and Print Sharing   ? X

- ☑ I want to be able to give others access to my files.
- ☑ I want to be able to allow others to print to my printer(s).

OK   Cancel

Add...   Remove   Properties

Primary Network Logon:

Client for Microsoft Networks

File and Print Sharing...

Description

OK   Cancel

Enabling File and Print Sharing

Open My Computer

Right click on each drive and printer you want to share
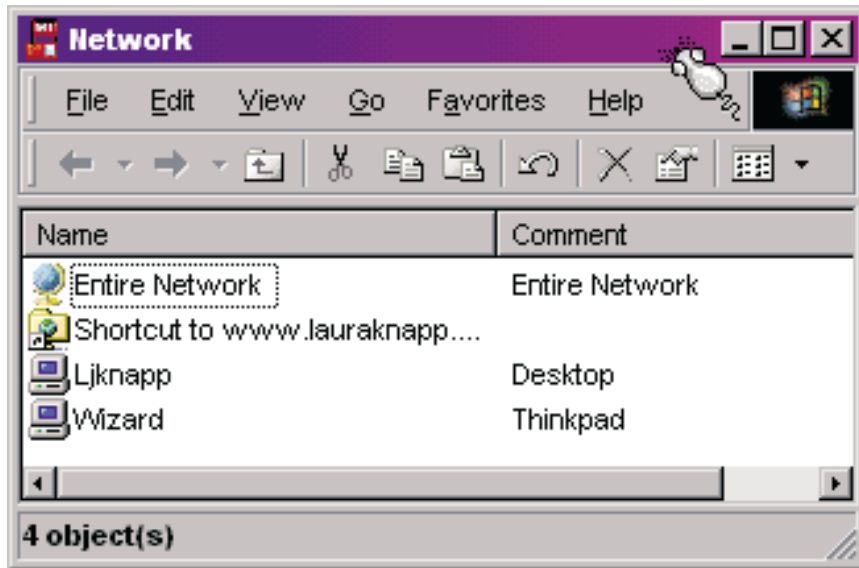
Fill in the sharing information

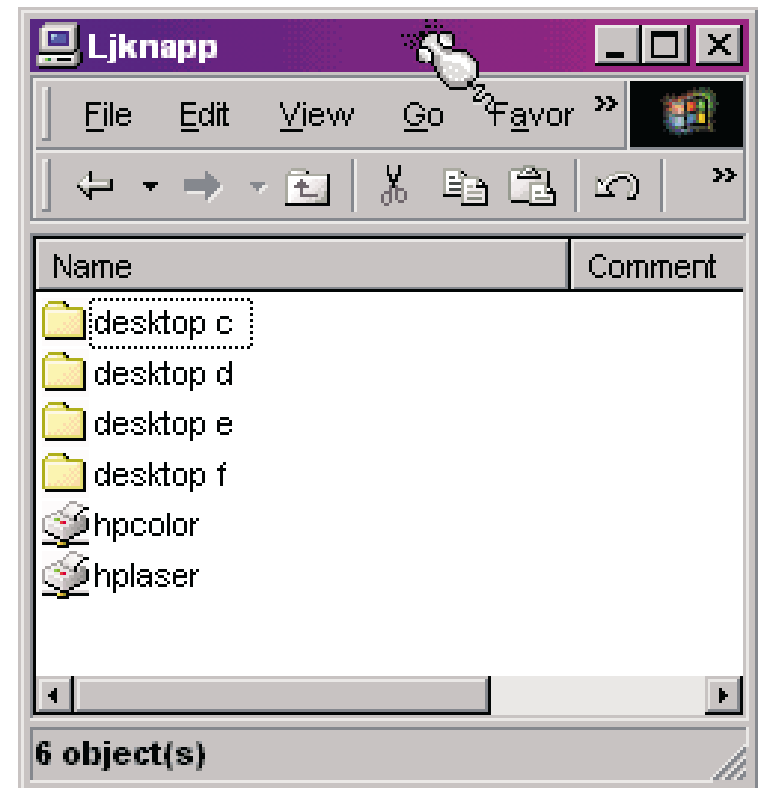**Define the access levels**

Assign passwords if needed

If you don't see the sharing option, then go back to the Network panel and enable file and print sharing

How to Find What's Available

Open Network Neighborhood

Shows everything in your network

By opening system "Ljknapp" you can see the items available for sharing

....all four disk drives and two printers identified by "Description"

How to Map Shared Drives to Local Drives

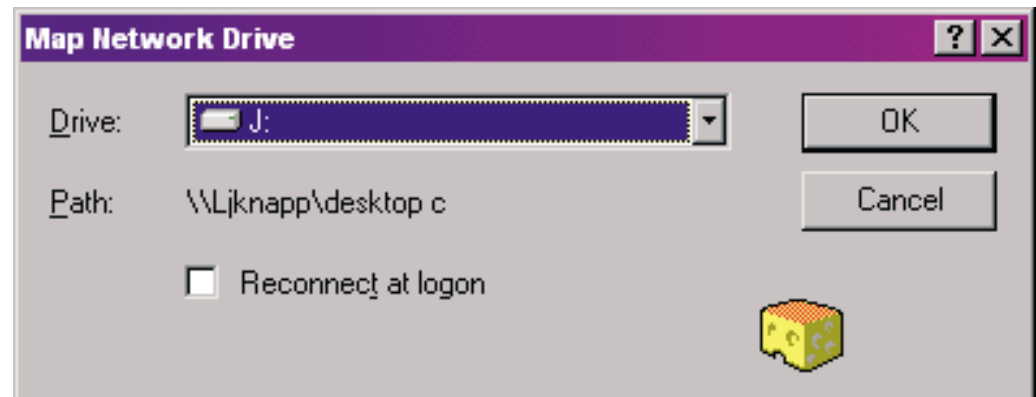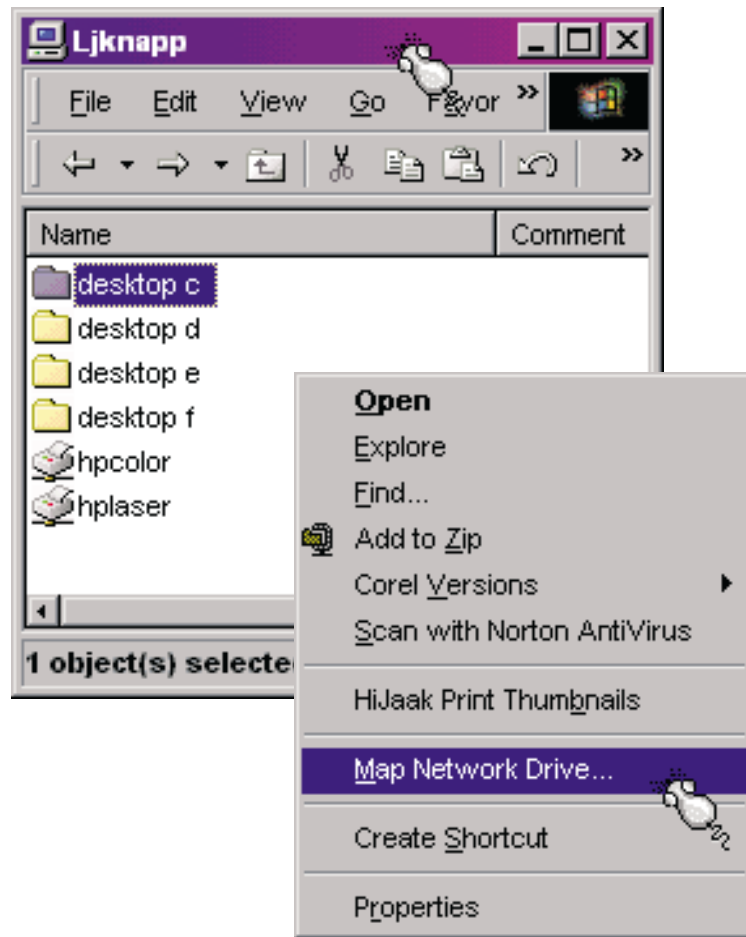If you want to map the shared device to a local drive

Open **Network Neighborhood**

Right mouse click on the shared device

Select **Map Network Drive**

Assign to a local drive letter
   Check **Reconnect at logon** if you want this process done each time you boot

Internet Connection Sharing Wizard (ICWS)

Check to see if ICWS is installed
  Control Panel
  Add/Remove Programs
  Windows setup tab
  Internet tools

Run ICWS from IE5 tools menu
  or Control Panel Connections tab

Builds client enablement disk

Welcome to the Internet Connection Sharing Wizard.

This wizard helps you to set up your computer to share an internet connection with other computers in your home network, allowing them to simultaneously access the Internet.

Use an Internet connection you've already set up and your Internet Service Provider account.

Run the Internet Connection Sharing Wizard only on the computer your network uses to connect to the Internet.

Click Next to continue or Cancel to exit the wizard.

< Back   Next >   Cancel

Select the network adapter you want to use for your local connection. A network adapter is the hardware device that physically connects your computers together.

Network adapters

3COM USB Network Interface (3C19250)
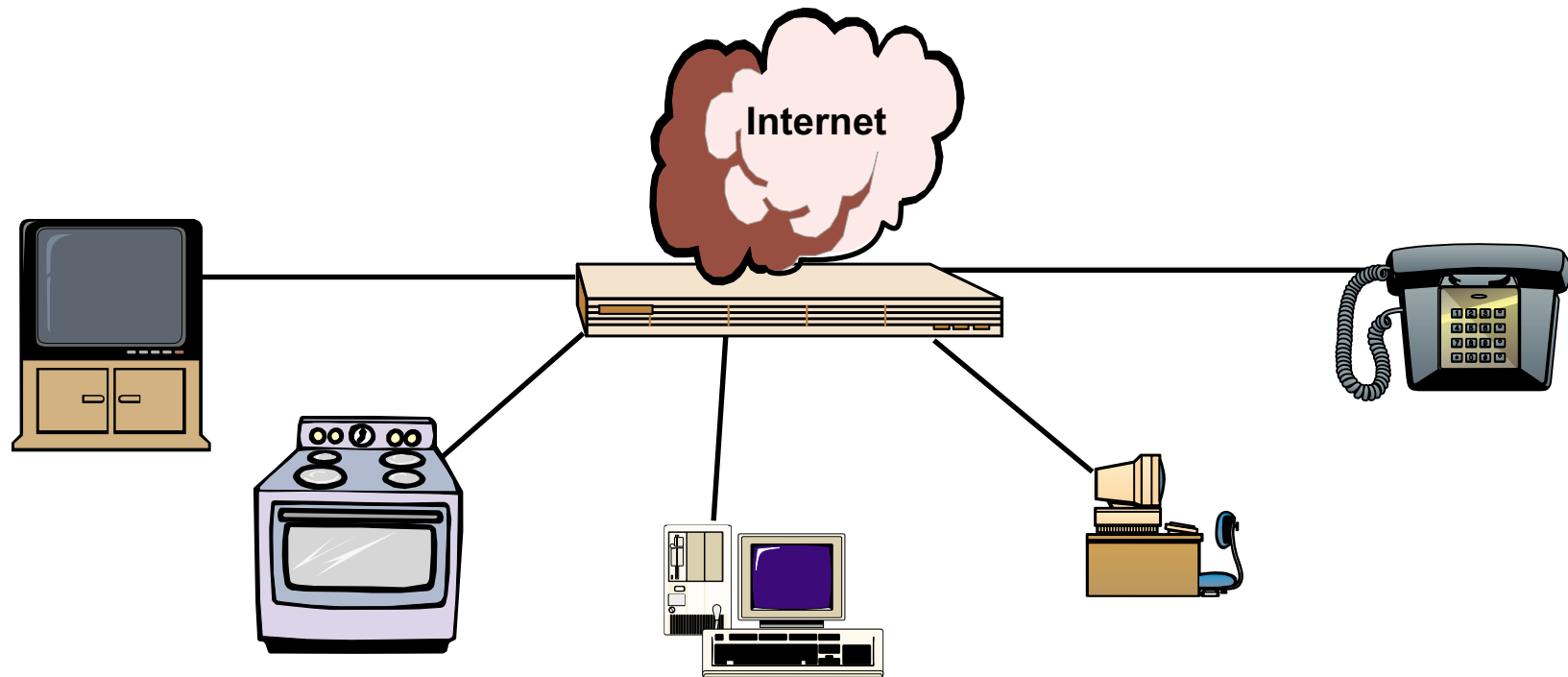NETGEAR FA310TX Fast Ethernet PCI Adapter

Specify Internet connection type

Specify local connection type

Will provide mini DHCP services setting addresses in the range 192.168.0.n

< Back   Next >   Cancel

Issues Connecting to the Internet

Potential for public access to your systems
Need filtering software (proxy servers, firewall, NAT)
Several cable modems and ADSL boxes have integrated security
Be careful with dial-up modems
   Don't use obvious name for workgroup name

Conclusion

Safety in Numbers

Choose the most popular solution

If you are wrong, many others will also be wrong

This creates a large, anxious market

Invention can minimize the effect of your error

Corollary

Dangerous to be wrong and in the minority

Being in the minority may make it wrong