

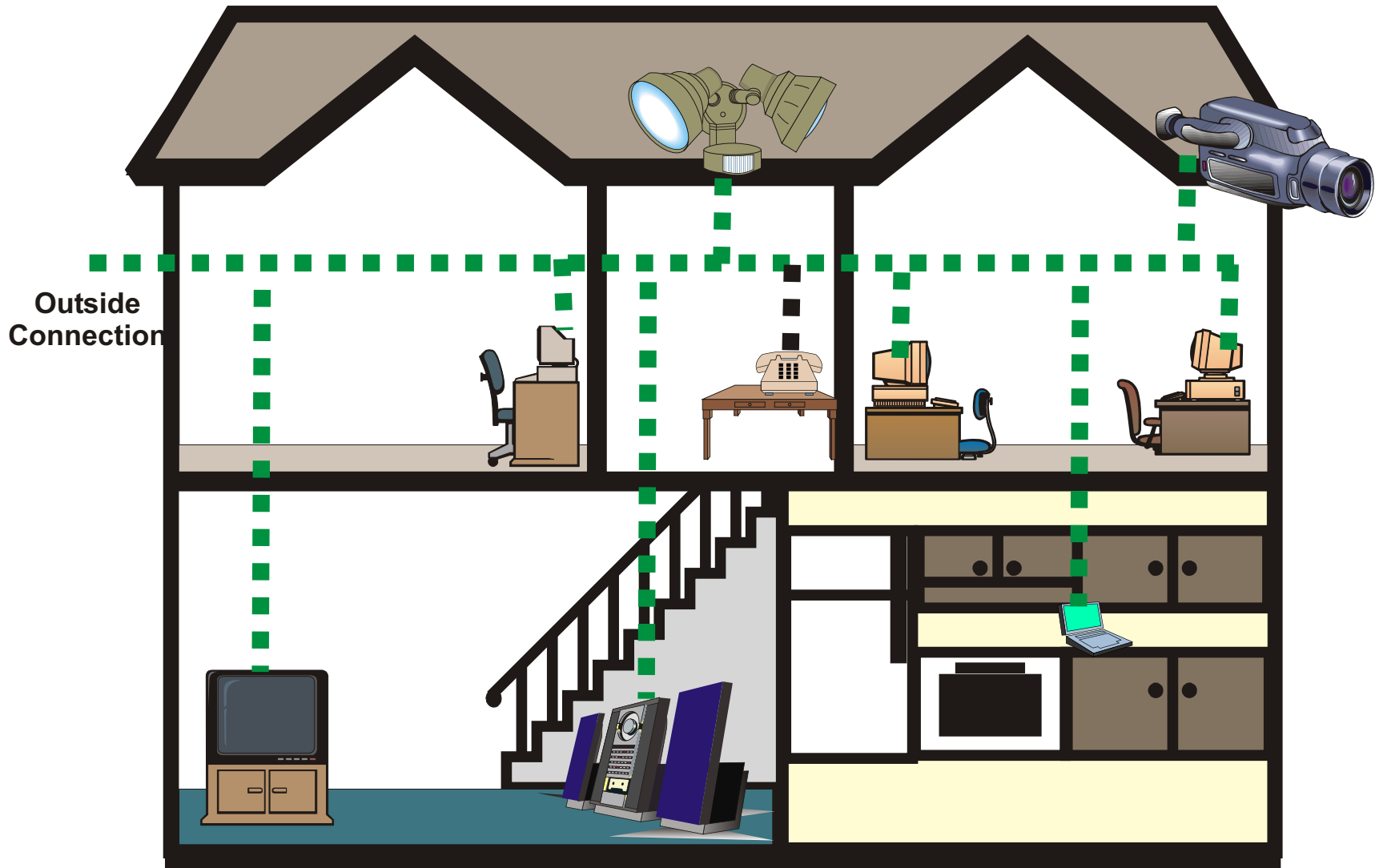
# *LANs for the Home and Small Office*



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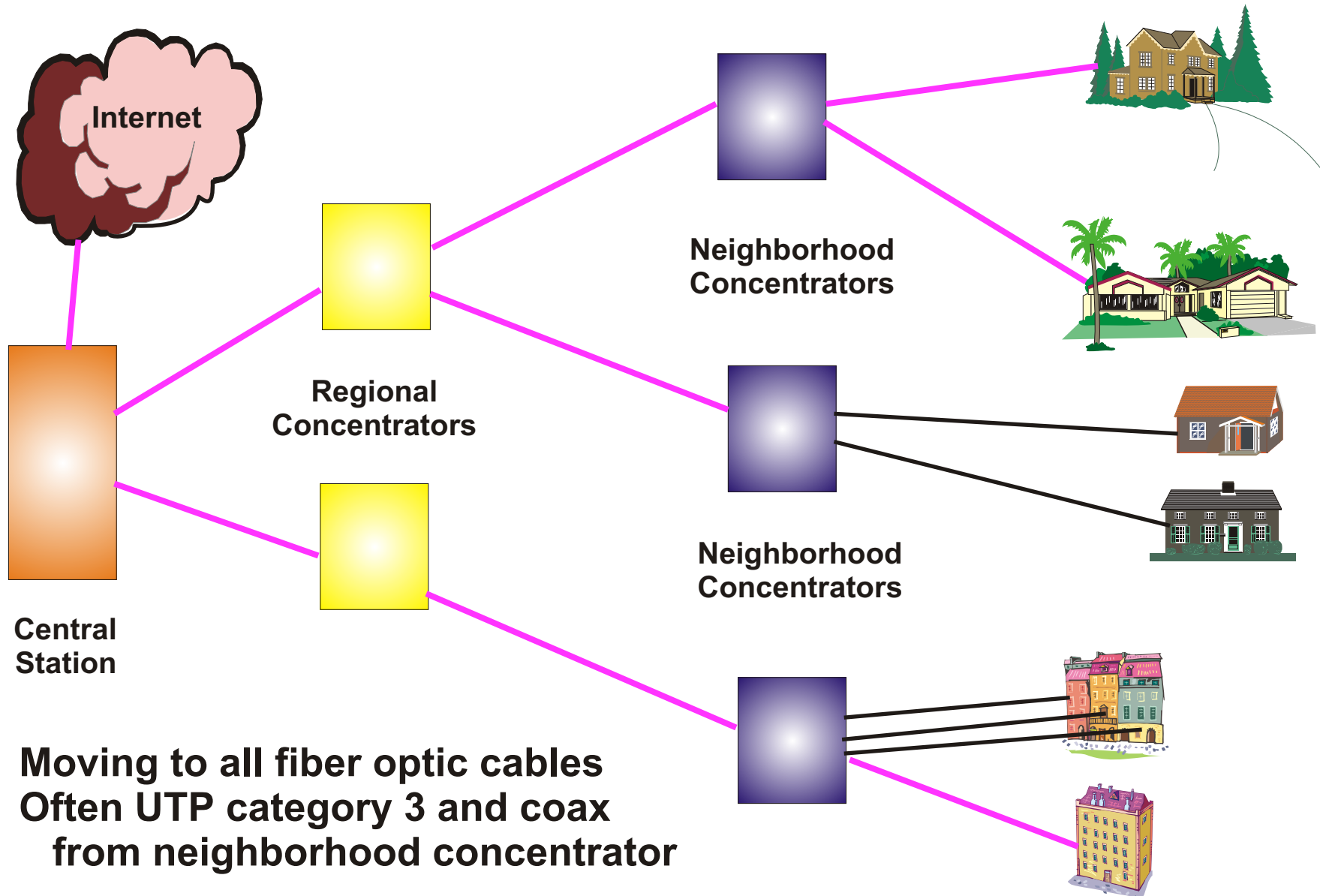
***[www.lauraknapp.com](http://www.lauraknapp.com)***

# *The Changing HomeScape*



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

# *New Residential Community Network*



Central Station

Regional Concentrators

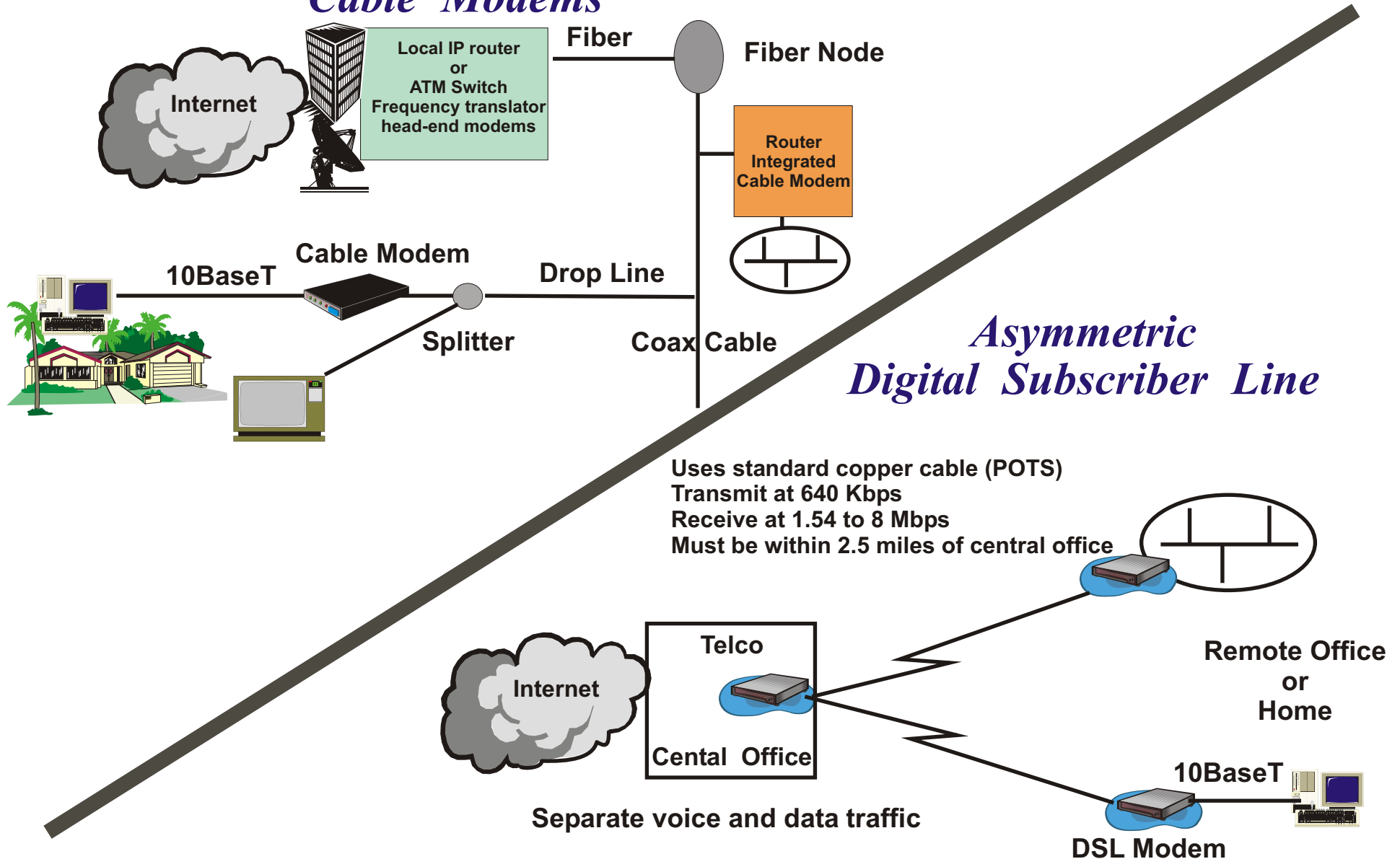
Neighborhood Concentrators

Neighborhood Concentrators

Moving to all fiber optic cables  
Often UTP category 3 and coax  
from neighborhood concentrator

# High Speed Internet Access Driving Force

## Cable Modems

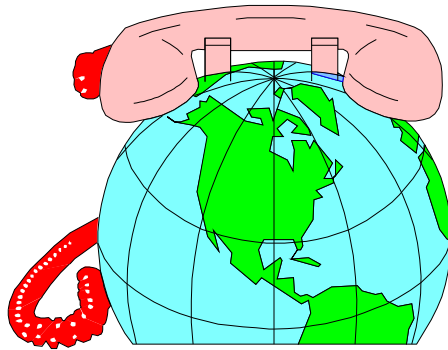


# Technology Options

**AC Power Line**

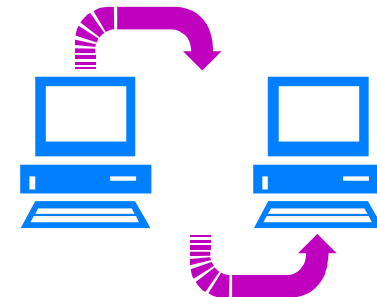


**Ethernet**



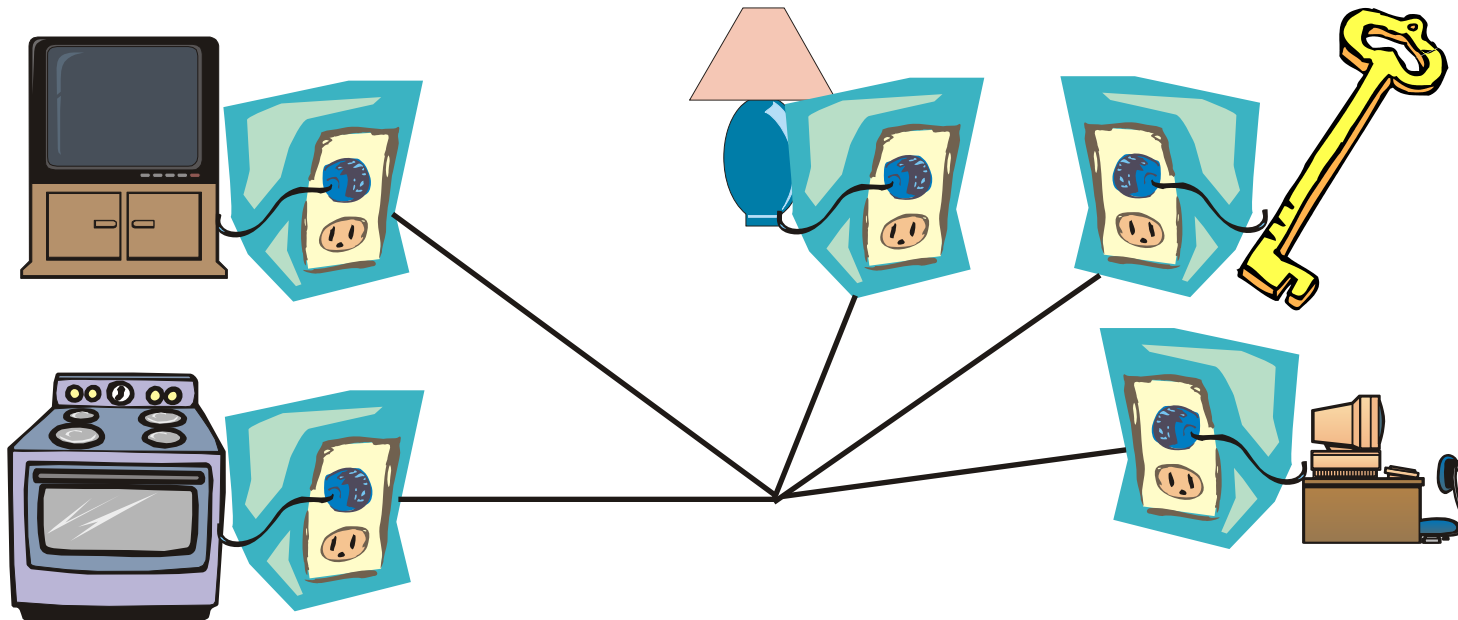
**Phone**

**Wireless  
including  
Bluetooth**



**Specialized**

# *AC Power Line Solutions*



Uses existing electrical outlets ([www.homeplug.com](http://www.homeplug.com))

Linksys, SMC, Netgear, Phoenix Broadband all have computer equipment

Few commercial appliances on the market ([www.margherita2000.com](http://www.margherita2000.com))

USB and Ethernet adapters and a paperback size adapter on the market

Cumbersome for notebooks

350 Kbps - 14 Mbps transfer rates

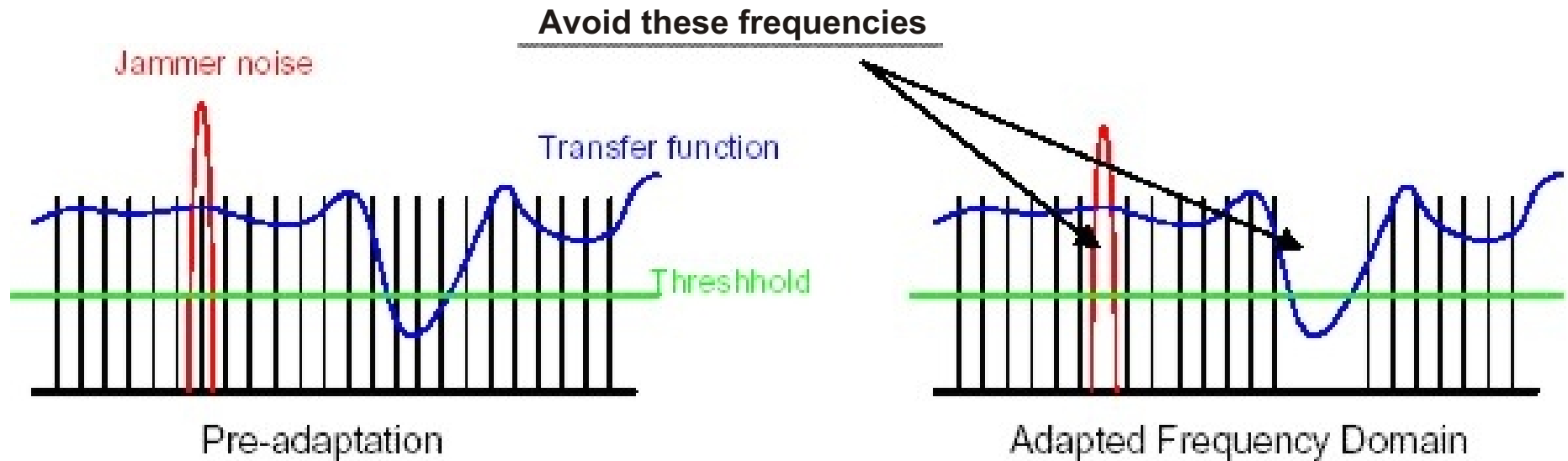
Most products suppress interference generated by other appliances

New technology - Orthogonal Frequency Division Multiplexing

Guarantees successful communication over frequently changing medium

DES Security built into many products today

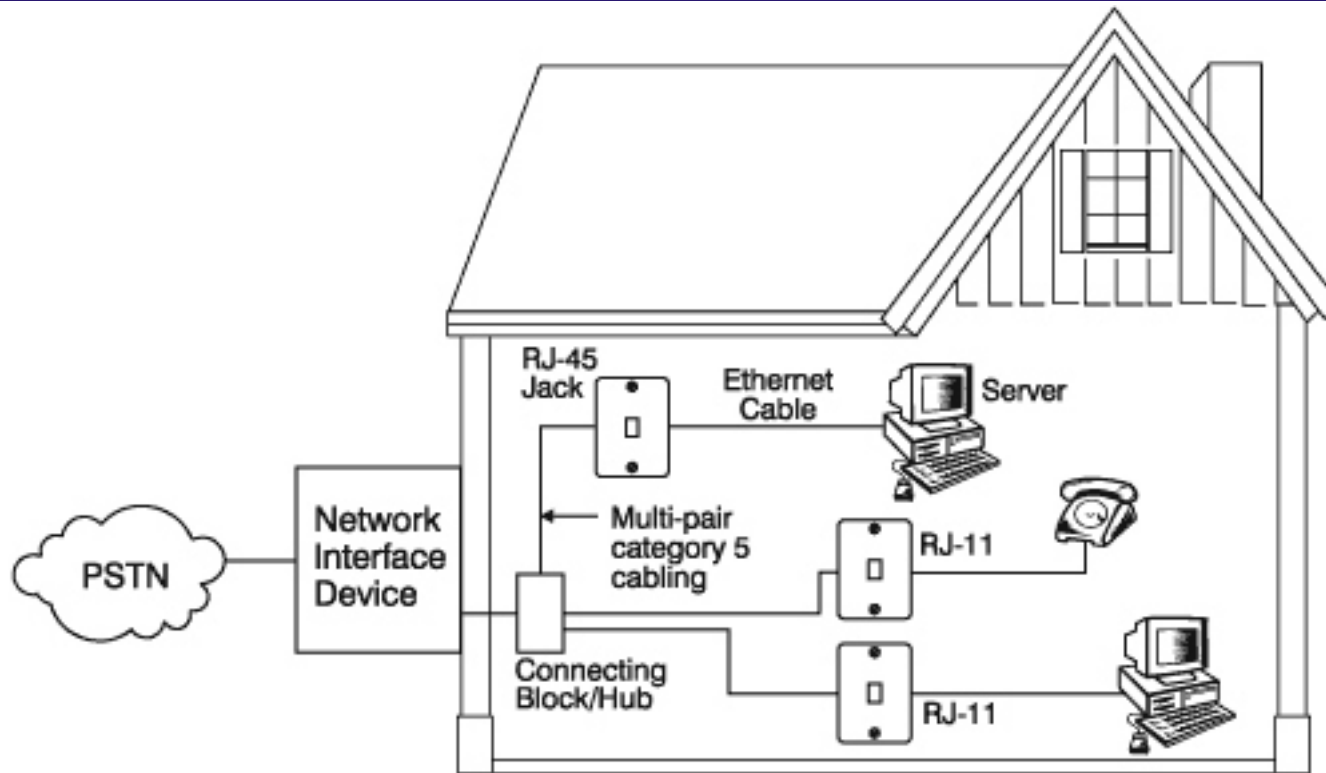
# Orthogonal Frequency-Division Multiplexing



- OFDM used in many technologies**
- 84 channels - 4 to 21 MHz**
- Analyze signal and avoid problem frequencies**
- Continuously monitors and adjusts**
- Channels can be locked out**
- Uses CSMA-CA collision avoidance**
- Forward error correction for spurious noise**

**Average home has 55 outlets**

# Phone Line Solutions



HomePNA Alliance ([www.homepna.org](http://www.homepna.org))

RJ11 connections, 1 and 10 Mbps products, use NDIS Ethernet drivers  
10,000 square foot home covered, frequencies chosen to avoid interference  
5.5 MHz to 9.5 MHz frequency (analog phones use 300 Hz to 3 KHz)

\$13 to 60 for 1 Mbps, \$40 to 80 for 10 Mbps, per node

HomePNA to Ethernet bridges on the market

Intel, Diamond Multimedia Systems, Cisco, Linksys, Netgear, D-Link



# 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.co

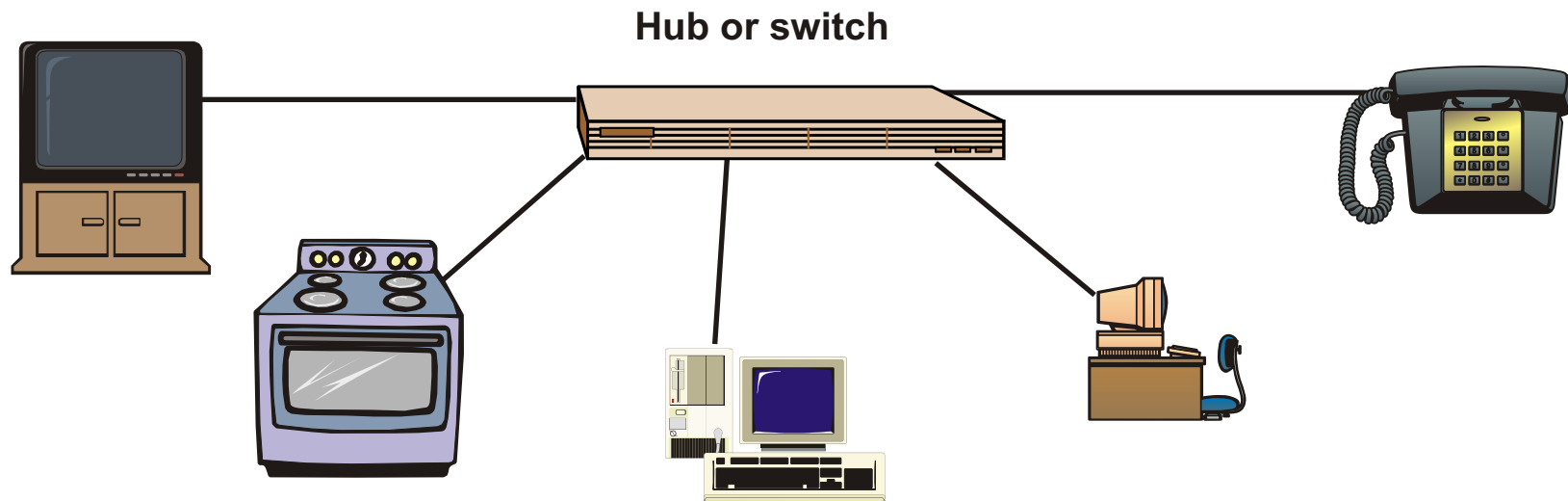


## FireWire™, i.Link™, IEEE 1394

100 Mbps to 1.2 Gbps connection  
Computer or peripherals  
(www.1394ta.org)



# *Ethernet LAN*



**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**

# HomeRF Solutions

## SWAP (Shared Wireless Access Protocol)

HomeRF Working Group ([www.homerf.org](http://www.homerf.org))  
Around \$100 per node, plus \$200 for gateway  
Spectrum hopping to overcome interference  
1-10 Mbps - relaxed 802.11 specification  
Uses 2.4 gigahertz (public, unlicensed band)  
Supports an average home and yard (150 ft)  
Integrated 56 bit encryption  
Less popular because of price drop for 802.11b

Release 2.0 ratified in April 2001

10 Mbps speed

September 2001 release of products

Focused on home networks of PCs, cordless phones, stereos, etc

Uses a hub called a home gateway that can connect to DSL or cable modem.

Overlap with 802.11 -- rapidly losing market share in 2002



# Wireless Solutions

## 802.11b (Wi-Fi) Wireless Networks

[www.wi-fi.org](http://www.wi-fi.org)

2.4 Ghz Direct-sequence,  
spread spectrum

Nodes \$75 to 270+ PC, PCI, USB

Access point \$120 to 1,100+

May include access router

11 Mbps standard, negotiates down

Multi-floor support

40, 64, or 128 bit WEP encryption

Bridges to wired Ethernet abound

Standard chip sets, many vendors

Uses up to 14 channels

(FCC lets US use 11, Europe 13, Japan 1)

Some overlap with adjacent channel's frequency range

Using channel 1 and 2 will degrade performance

Channel 1, 6 and 11 are far enough apart not to overlap

802.11a will increase speeds to 56 Mbps and use 5 GHz frequency

but will require more infrastructure because the cells are smaller

802.11g will increase speeds to 56 Mbps and use the 2.4 GHz frequency

Acceptance in corporations and homes - Over 90 vendors



# Wireless Solutions - Bluetooth

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

PCs, pagers, cell phones, PDAs, etc, use different standards

Need single standard for all devices

1 Mbps

10 meter distance

Technology

Point to point or multipoint

High and low power levels

Radio transmission technology

Voice and data in real time

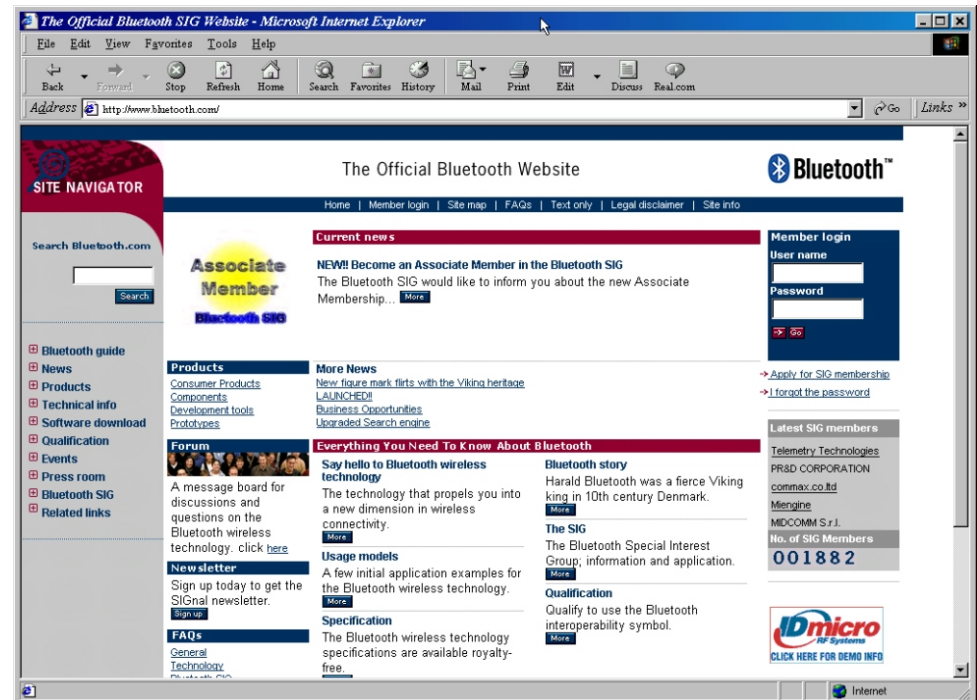
Microchip based

Many players -- as of Sept. 2001

over 350 qualified devices

Ericsson, Fujitsu, IBM, Intel,

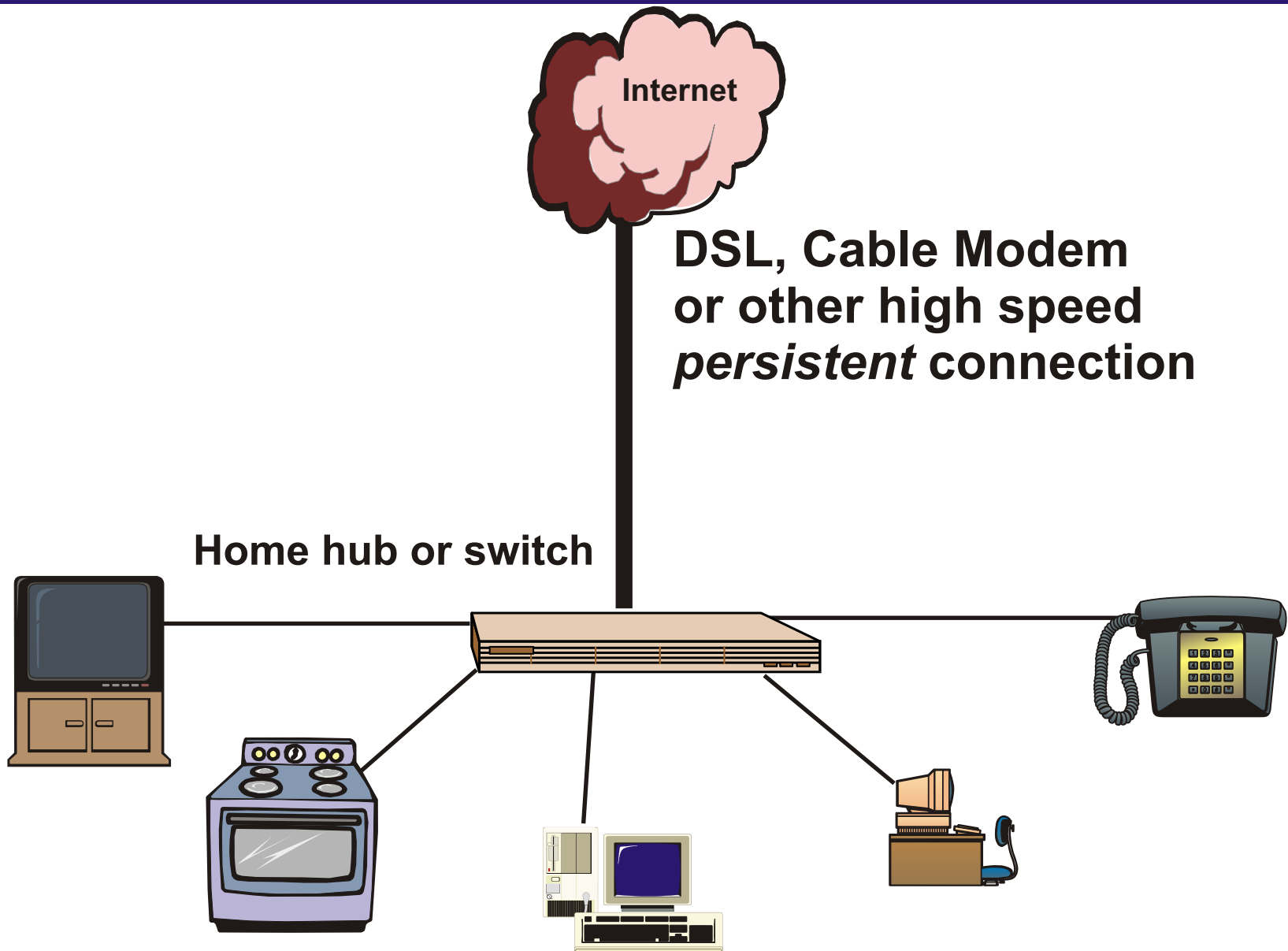
Lucent, Microsoft, Motorola, Nokia all involved –



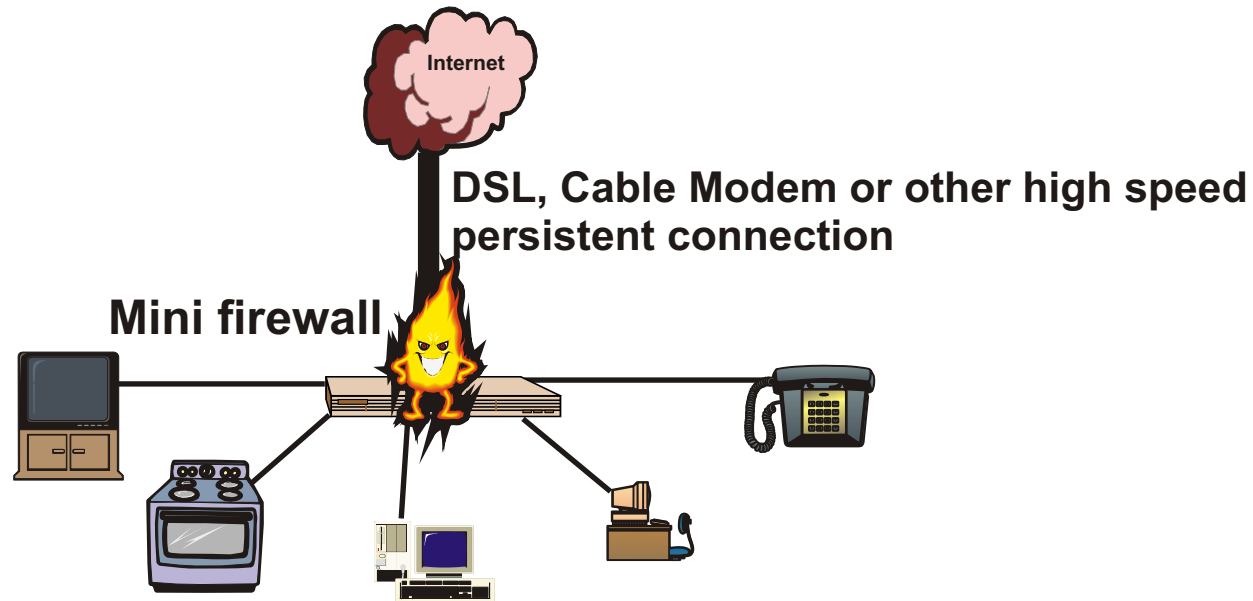
# Technology Summary

	Price	Speed	Pros	Cons
<b>Electric</b>	\$180 ?	1-10 Mbps	Installed wiring	New technology Previous solutions poor
<b>Phone Line</b>	\$30-60	1-10 Mbps	Installed wiring	Outlets Variable Internet sharing
<b>USB</b>	\$50-70	5-7 Mbps	Easy	Limited 2 systems Limited distance
<b>Wireless</b>	\$250-350	1-11 Mbps	No cables	Distance Coverage
<b>Ethernet</b>	\$0-70	10-100 Mbps	Mature Pervasive Interconnections	Need to wire

# *Persistent Connection Security*



# Home LAN 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 translation (use private IP addresses for home network)
- 2) Filter and don't allow any queries originating from outside (ingress/egress filtering)
- 3) Hardware -- Linksys, WatchGuard, Netgear, others  
or software -- ZoneAlarm, BlackICE Defender, WinGate Home,  
Norton Personal Firewall, Tiny Personal Firewall, McAfee Internet Guard
- 4) Check your logs often (if your firewall has them)



# *Planning for Your Home LAN*

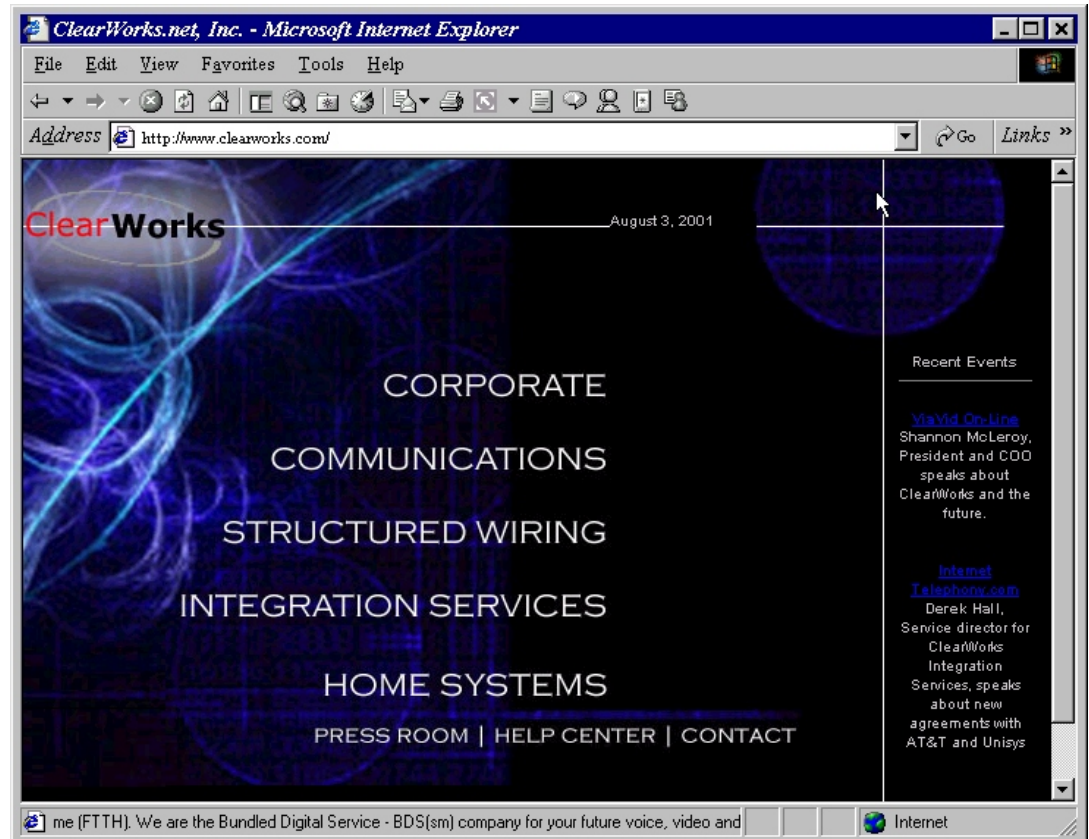


**Location of components**  
**Connections to outside**  
**Cables under carpets,**  
**through walls,**  
**between floors**  
**AC power**  
**Central area for hub**  
**What about future**  
**connections**

[www.johnscloset.net](http://www.johnscloset.net)

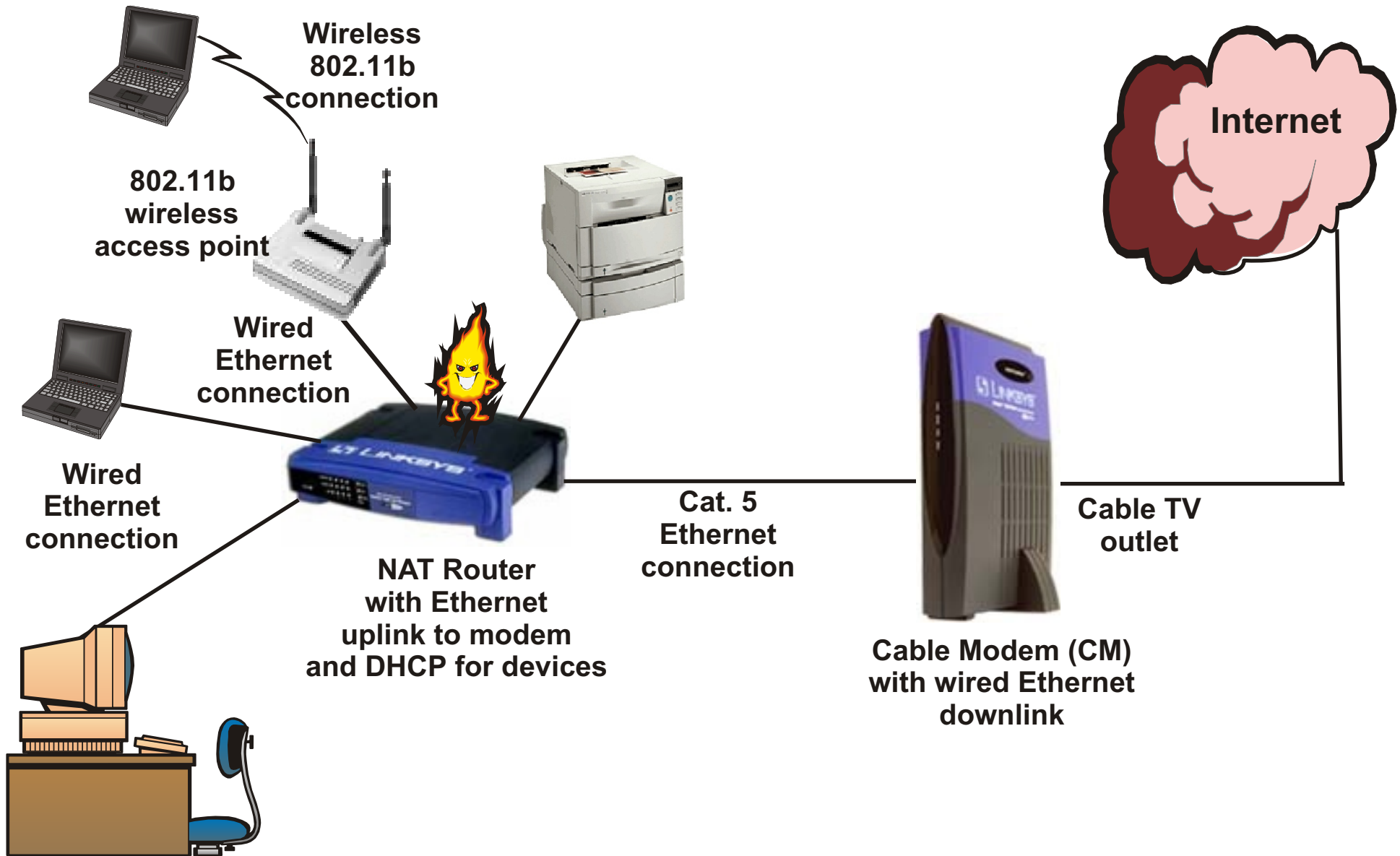
# Long-Term Cabling for Homes

**New home developments are pre-cabling 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**  
**Depending on options can run from \$5,000 to \$100,000**

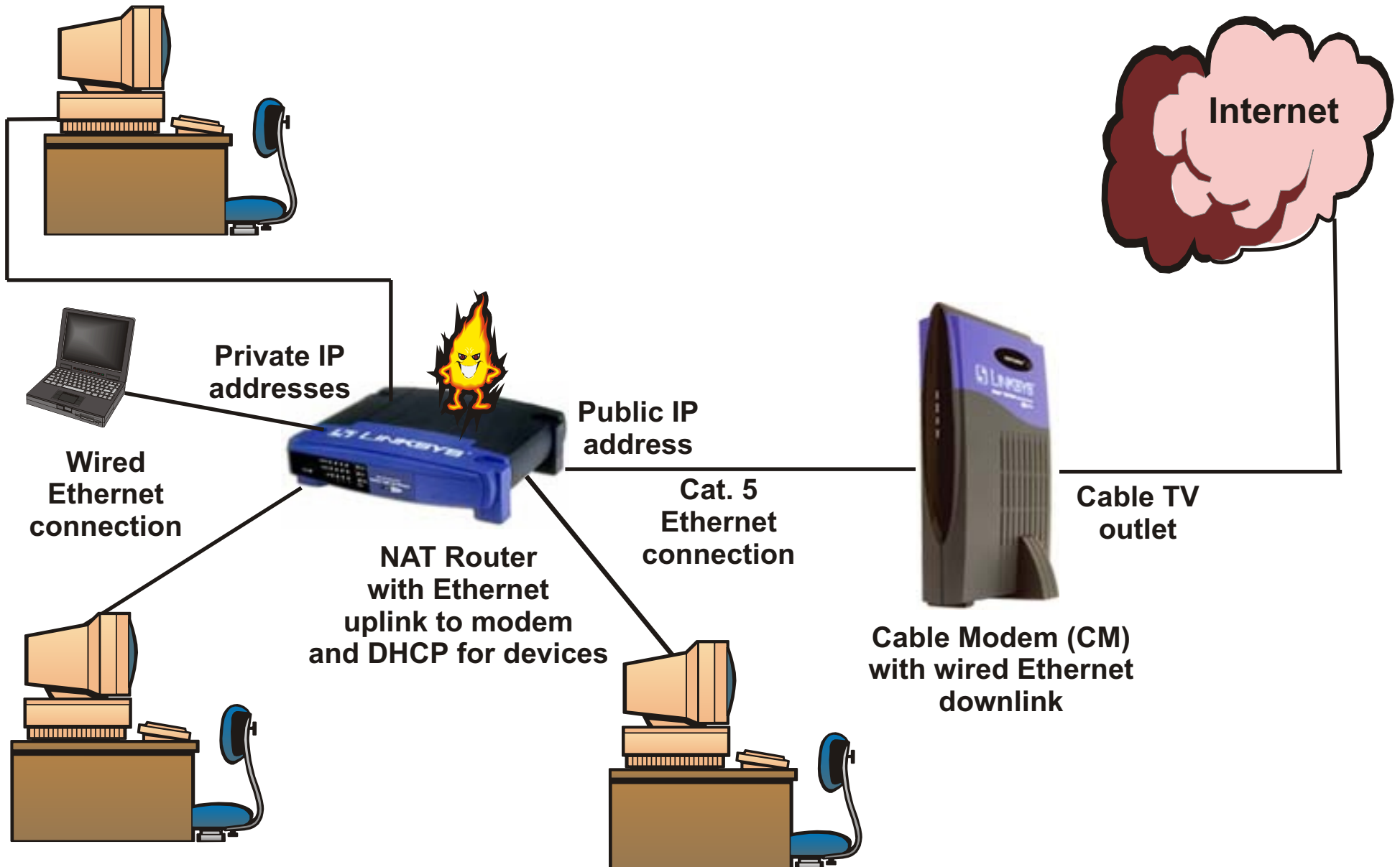


**Not all are successful. Home Director (spin-off from IBM) going through financial turmoil and reduction in staff!**

# Laura's Home Configuration



# Tom's Home Configuration



# Installing Network Interface Cards (NICs)

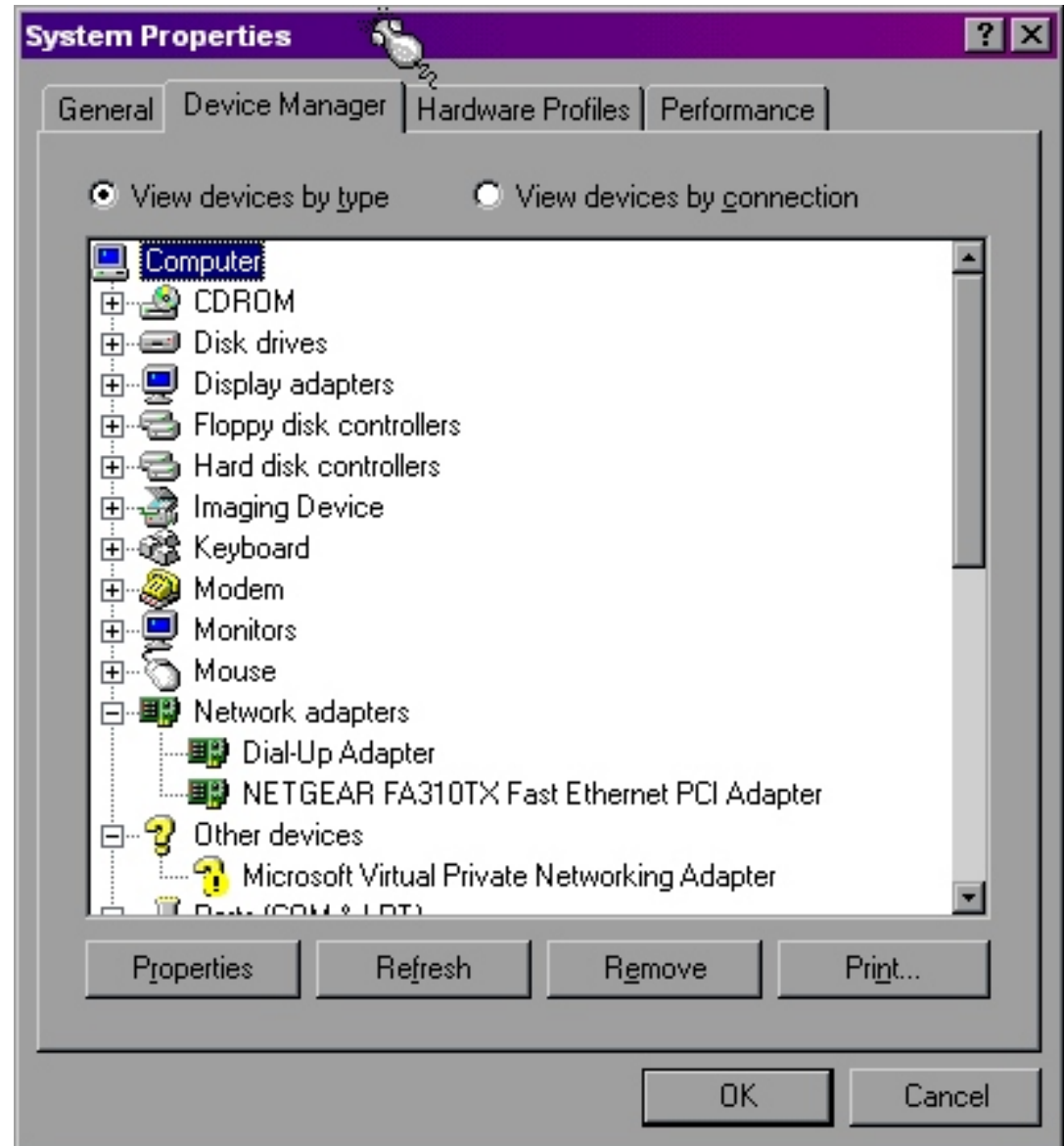
Internal adapters - desktops  
PCMCIA adapters - laptops  
USB - desktops and laptops

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.

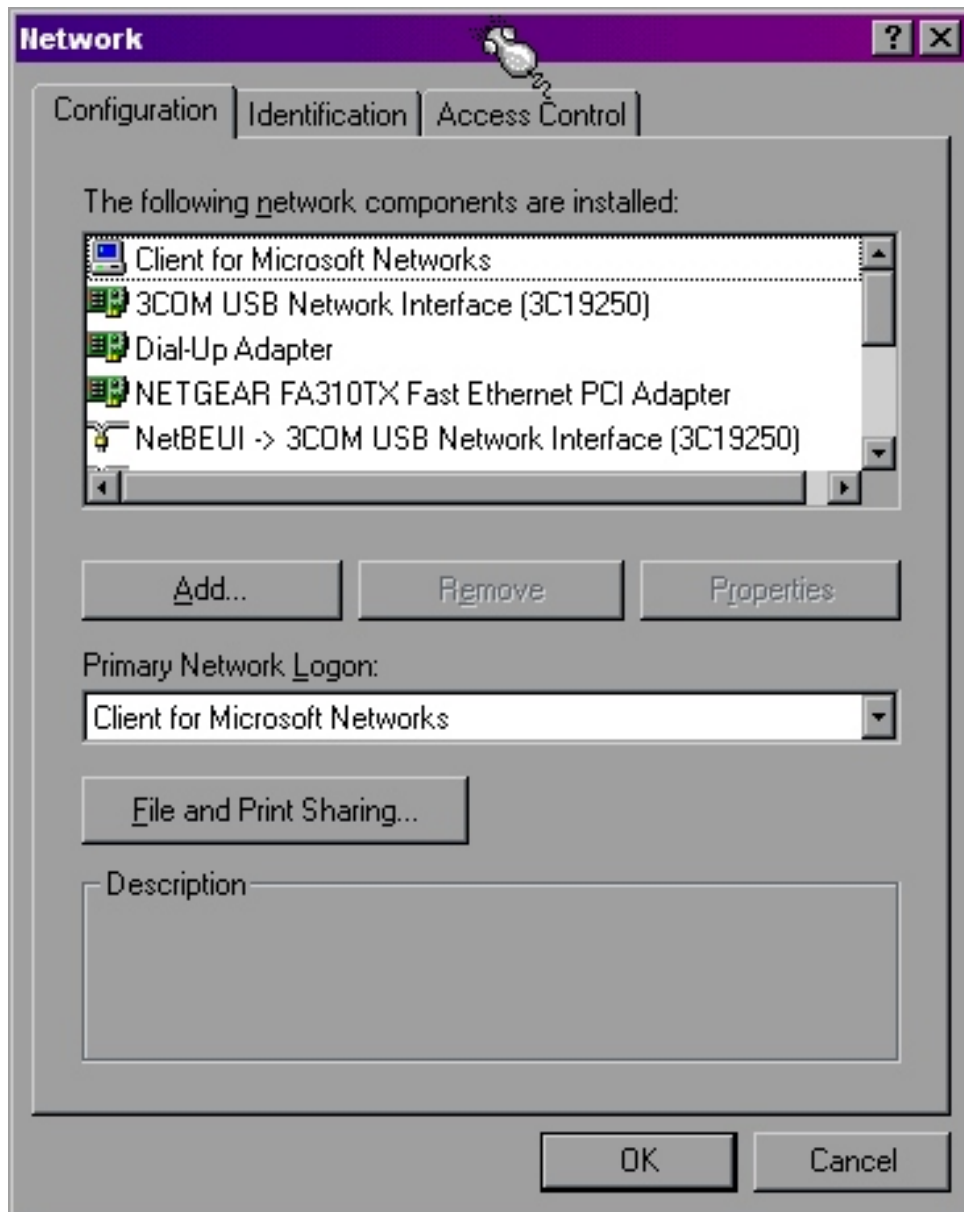
You will be prompted to reboot your system

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



# Configuring Your PC



Open **My Computer, Control Panel, Network**

Installed adapters, protocols, and services are shown

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

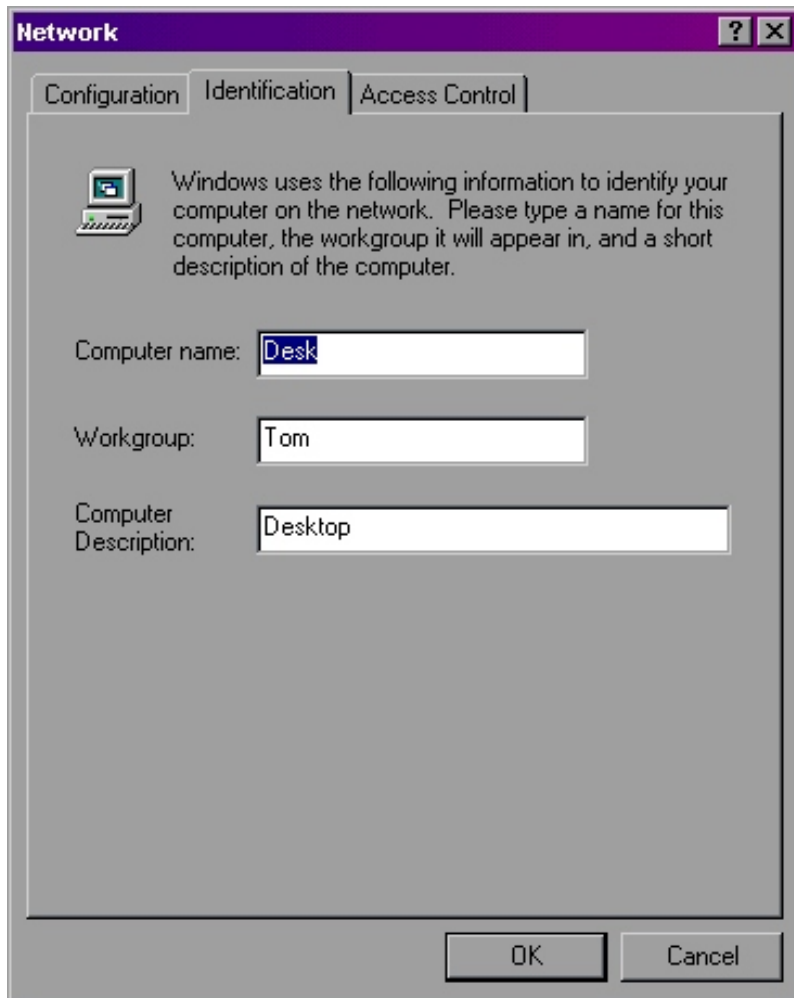
Select **Client for Microsoft Networks** as your primary Logon

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**



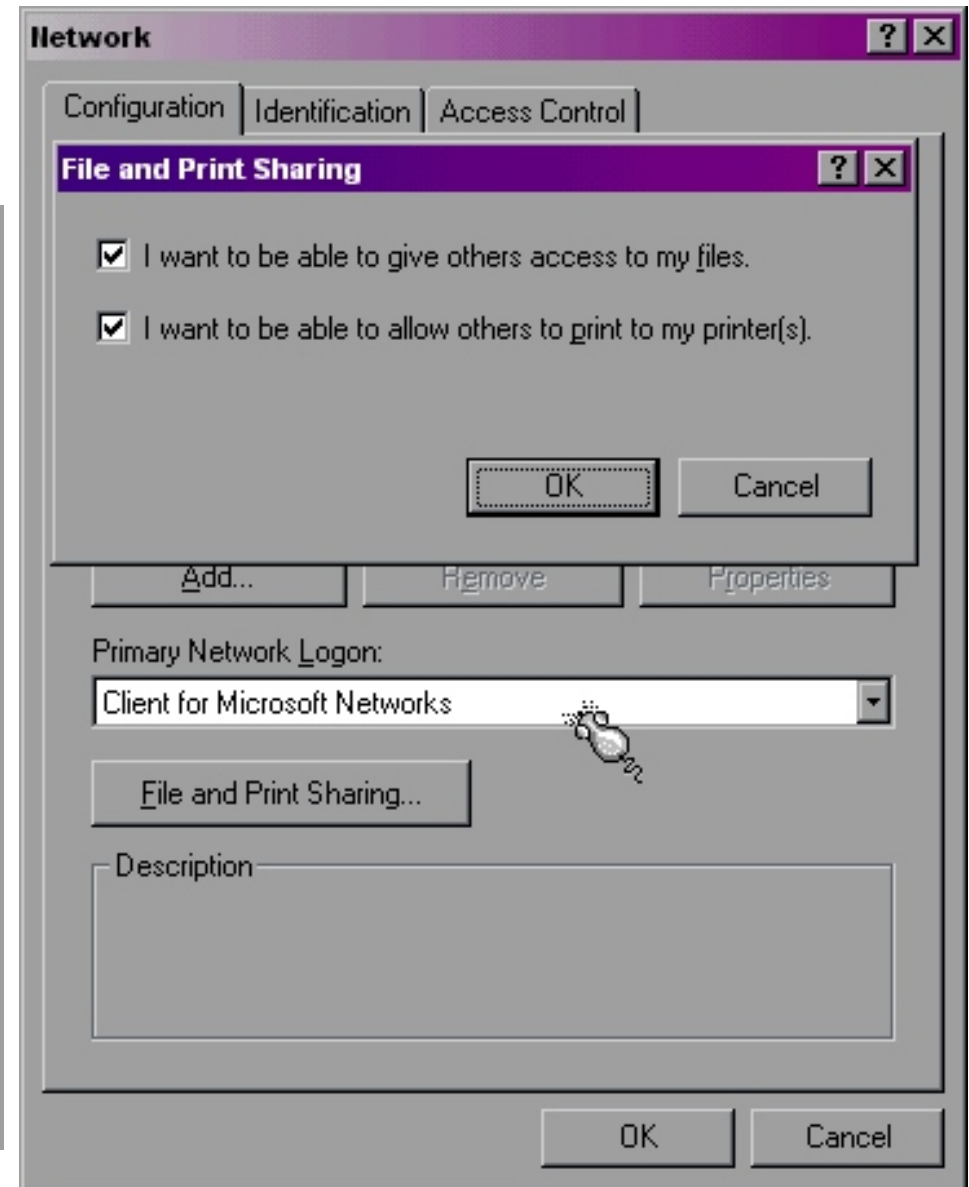
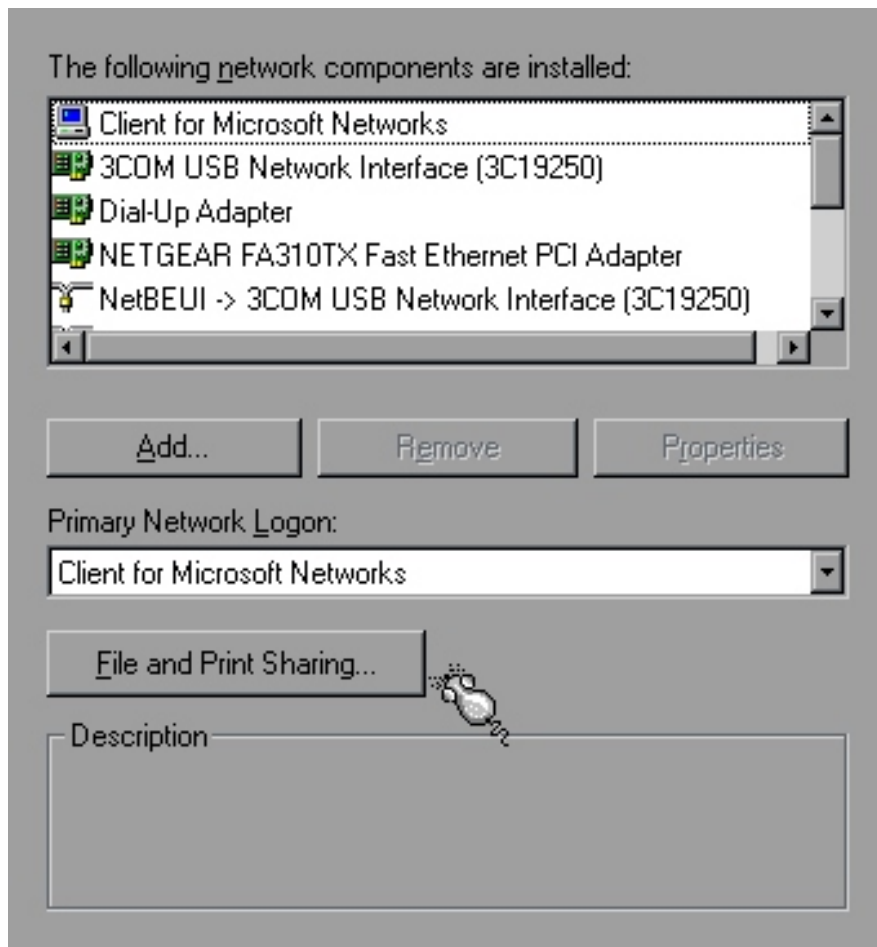
**Computer Name:**  
Make sure this is **UNIQUE**  
on all systems

**Workgroup:**  
Make sure this is the **SAME**  
on all systems  
Don't pick an obvious name

**Computer Description:**  
This is for information only

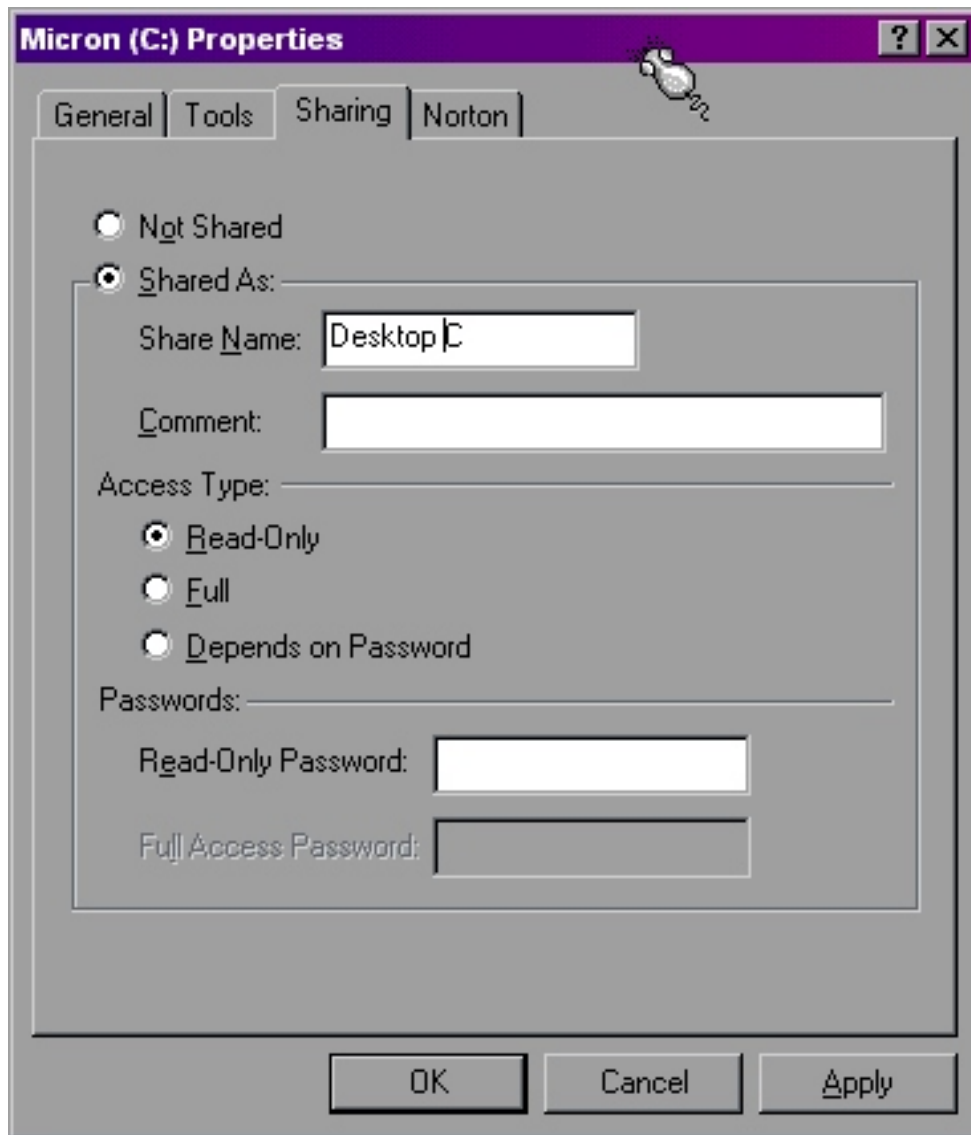
# Windows File and Print Sharing

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





# Enabling File and Print Sharing



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

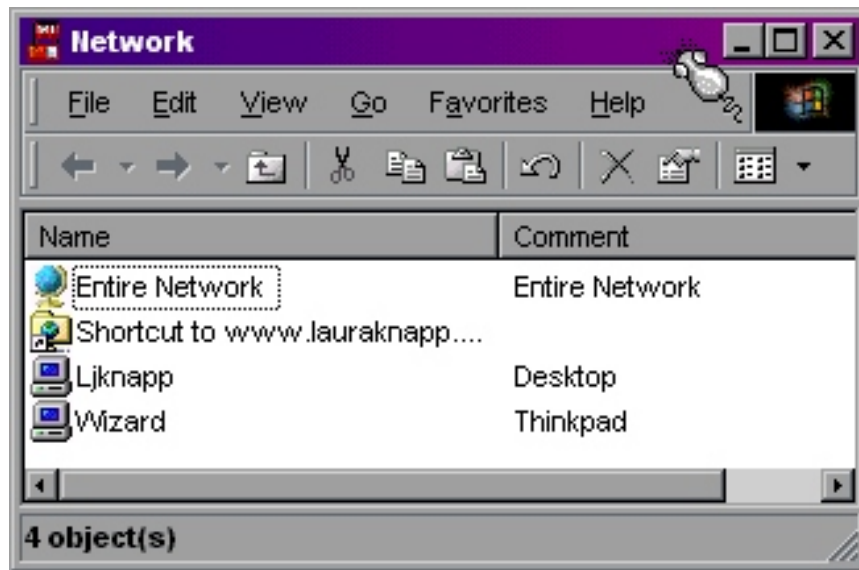
Define the access levels

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

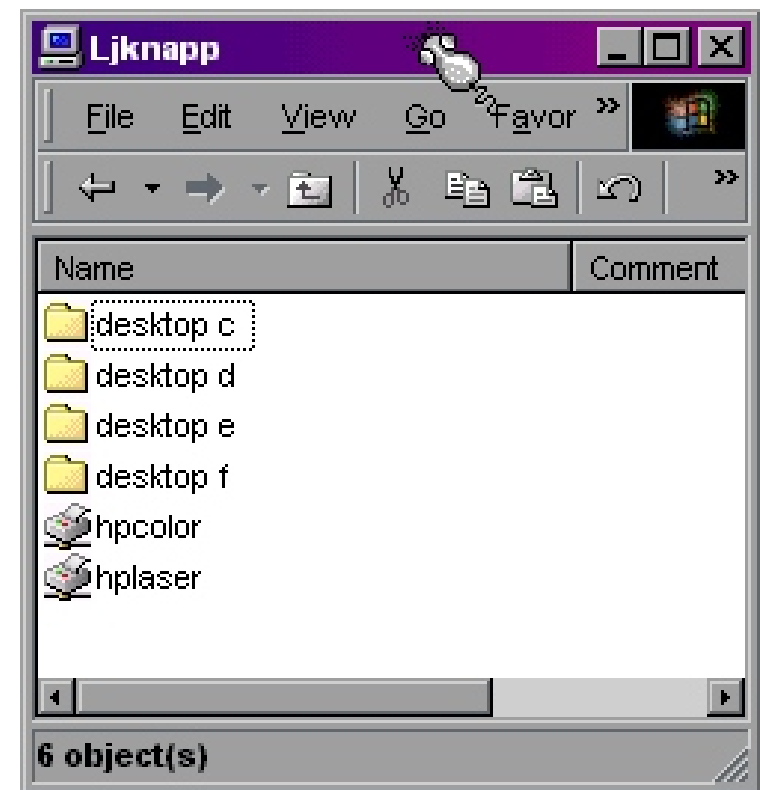
## Open Network Neighborhood



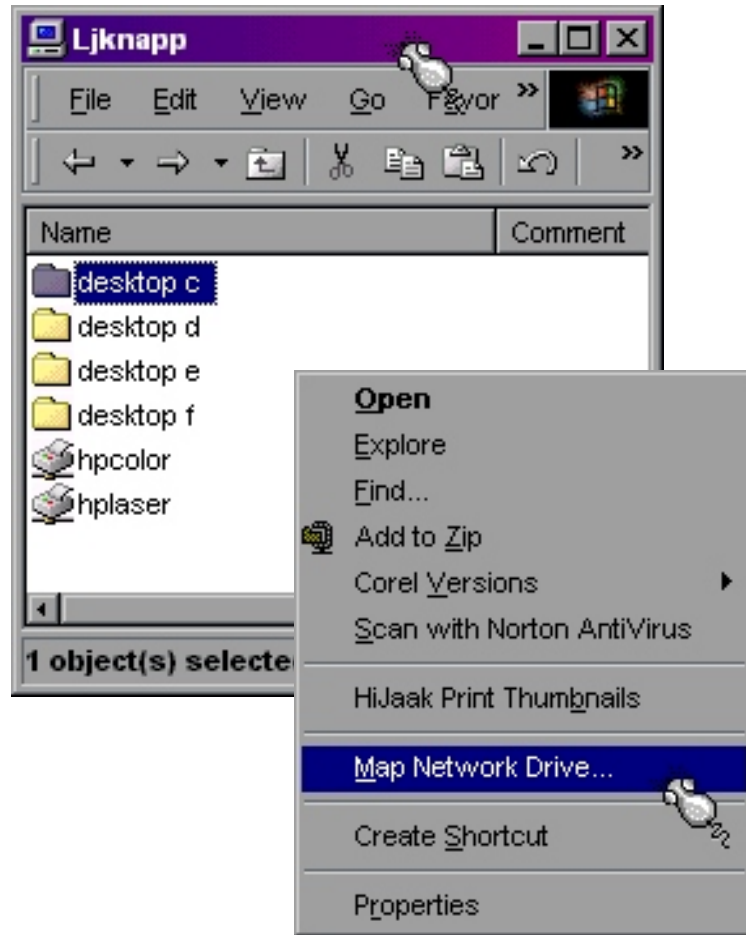
Shows everything in your network

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

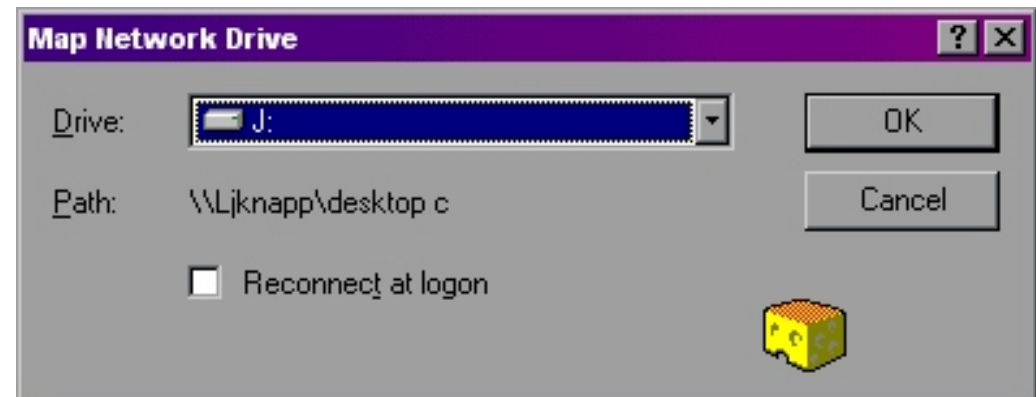
Open **Network Neighborhood**

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

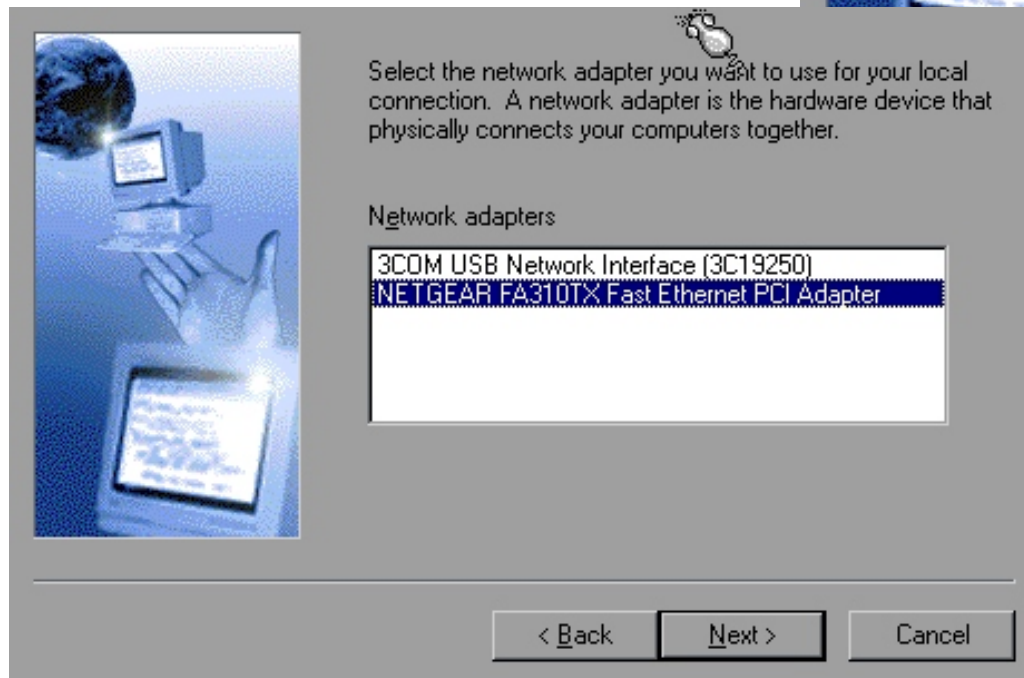


# Internet Connection Sharing (ICS)

Check to see if ICS is installed  
Control Panel  
Add/Remove Programs  
Windows Setup tab  
Internet Tools - Details

Run ICS from IE5 tools menu  
or Control Panel Connections tab

Builds client enablement disk

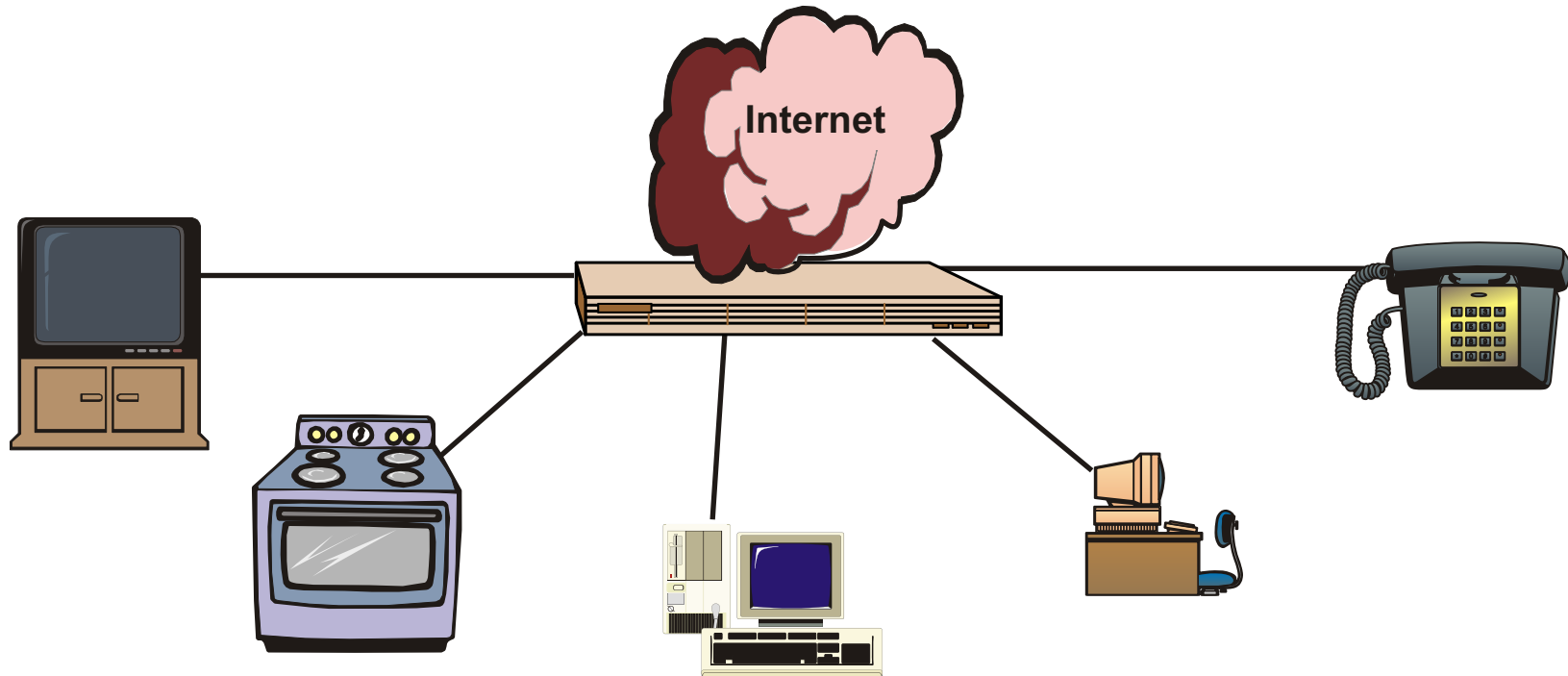


**Specify Internet connection type**

**Specify local connection type**

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

# *Issues Connecting to the Internet*



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

# *Resources*

**[www.80211-planet.com](http://www.80211-planet.com) - General 802.11 information**  
**[www.wi-fi.org](http://www.wi-fi.org) - Home page for 802.11 interoperability**  
**[80211b.weblogger.com](http://80211b.weblogger.com) - Resources on 802.11**  
**[www.bluetooth.org](http://www.bluetooth.org) - Bluetooth information**  
**[www.palowireless.com](http://www.palowireless.com) - Wireless resource center**  
**[bluetooth.weblogs.com](http://bluetooth.weblogs.com) - Detailed information on Bluetooth**  
**[www.inari.com](http://www.inari.com) - Early power wiring solutions**  
**[www.homeplug.com](http://www.homeplug.com) - HomePlug product information**  
**[www.homepna.com](http://www.homepna.com) - Home phone system project**  
**[www.wired.com](http://www.wired.com) - General information**  
**[www.zdnet.com](http://www.zdnet.com) - General information**  
**[www.cnet.com](http://www.cnet.com) - General information**  
**[searchnetworking.techtarget.com](http://searchnetworking.techtarget.com) - General information**  
**[www.johnscloset.net](http://www.johnscloset.net) - How to wire your home**  
**[www.cisco.com](http://www.cisco.com) - Player in many of these technologies**  
**[www.linksys.com](http://www.linksys.com) - Products in most of these areas**  
**[www.dlink.com](http://www.dlink.com) - Products in most of these areas**  
**[www.netgear.com](http://www.netgear.com) - Products in most of these areas**  
**[www.2wire.com](http://www.2wire.com) - Products for phone system LANs**  
**[www.homedirector.com](http://www.homedirector.com) - Pre-wiring homes**

