

Agenda

◆ Introduction

- Market trend and application
 - 1394 Market Analysis Data
 - 1394 and industry
 - Applications

- 1394 Operation
- Bus Management
- Cable and Connection
- Architecture
- Topology

◆ Technology

- What is 1394?
- Why 1394?
- Applications
- 1394 Protocol
- PHY
- Link Layer
- Transaction Layer

◆ Other Technologies

- USB
- DVI

◆ 1394 In Home Networking

◆ Xilinx Value

◆ Alliances

◆ Summary

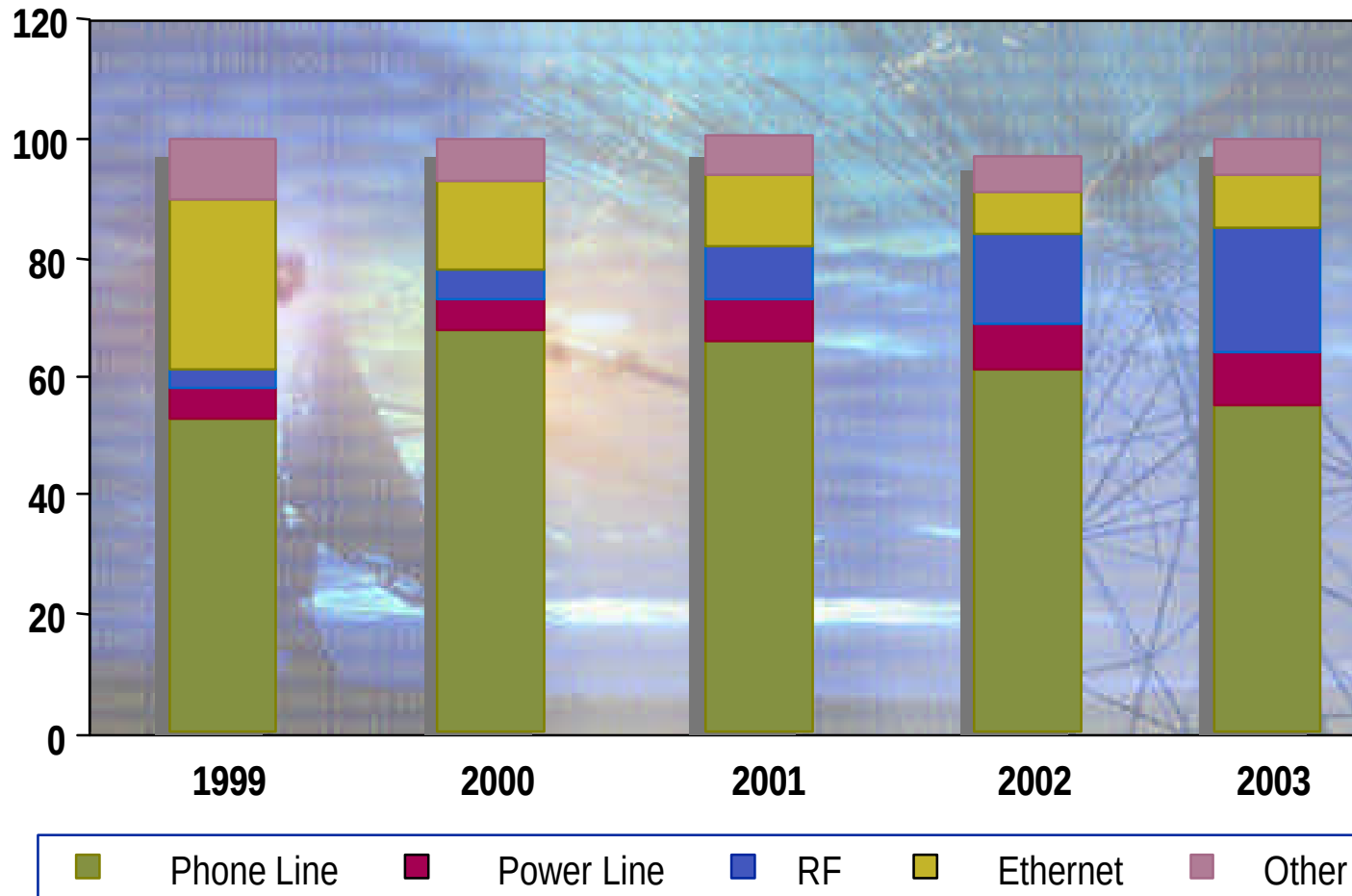
The Push for Home Networking

- ◆ Rapid growth in multiple-PC household penetration (Dataquest)
 - PC penetration exceeds 50% in US households
 - Multi-PC households growth: 15M (in 1998) to 26M (in 2003)
- ◆ Increasing Internet usage (Yankee Group)
 - Nearly 90% of PC households will be online by 2001
 - Online households growth: 20% (in 1997) to 47% (in 2001)
- ◆ Broadband Internet access (Forrester Research)
 - Broadband penetration growth: less than 1M (in 1998) to more than 15M (in 2002)
 - % Penetration of online households: increases from 2% (in 1998) to 26% (in 2002)

The Push for Home Networking

- ◆ More digital appliances are coming into the home
 - DSS, DVD, Digital TV
 - Web-Top boxes, set-top boxes
 - PDAs, mobile (cellular) phones
 - Digital cameras
 - Installed base of internet appliances will exceed 50M by 2001
(by IDC)
- ◆ More digital content entering the home
 - Published Content
 - CD-ROMs, DVDs, DVRs, digital photography
 - Networked Content
 - DTV, DBS, VoIP, MP3, movies-on-demand, streaming media

Applications Driving Home Networking



Courtesy: Dataquest



www.xilinx.com

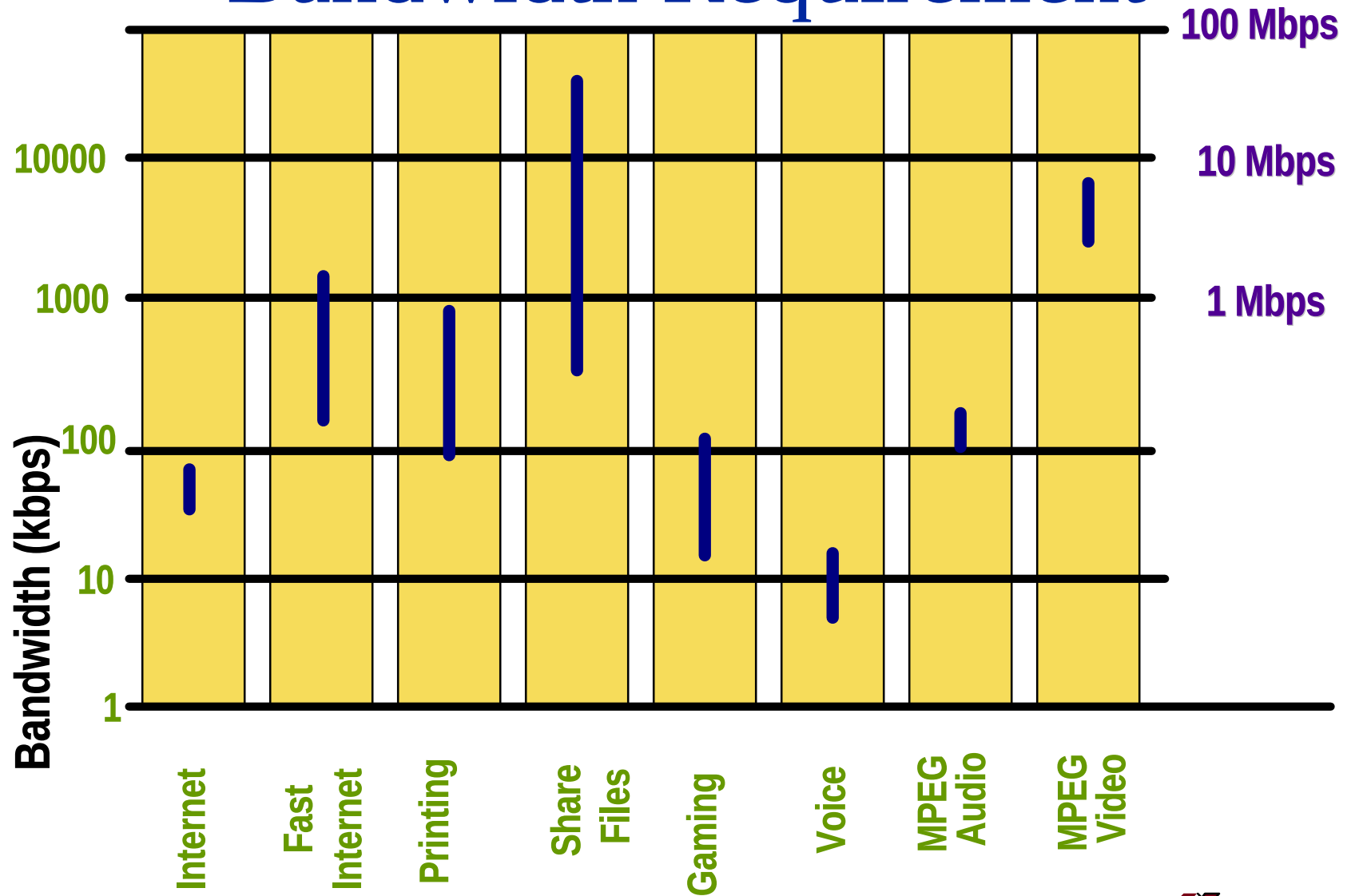


Different Strokes for Different Folks

	Home Automation	Entertainment	Information	Personal Communications	Communication
Devices	- Home appliances - Security/safety systems - Utility meters	- TV sets - Set-top boxes - DVD Players - Game consoles - VCRs - MP3 Players	- PCs - Screen phones - Printers - Modems - Routers - Hubs - Scanners	- Mobile phones - Smart phones - Handheld - Laptop - Pagers	- Corded/Cordless telephones - Fax machines
Content	Information on home processes, house environment, remote diagnostics and technical support	Rich multimedia content, electronic programming guides, impulse purchases	Discrete information on external world, shopping for household goods	Information used on the move or requiring instant action: travel, weather, local services, stock market	Information on how to reach people in time and space
Usage Pattern	Communal	Communal	Individual Shared	Individual Personal	Communal or Individual Shared
Connection to Outside World	- Power line - POTS	- Cable - DBS	- Cable modem - ADSL - POTS, ISDN	- GSM - Infrared	- POTS
Practical Networking Technology	- CEBus - X-10 - LONWorks	- IEEE 1394 (Fire Wire)	- HomeRF - HomePNA - Ethernet	- Infrared - Bluetooth	- POTS - DECT - 900MHz, 2.4GHz

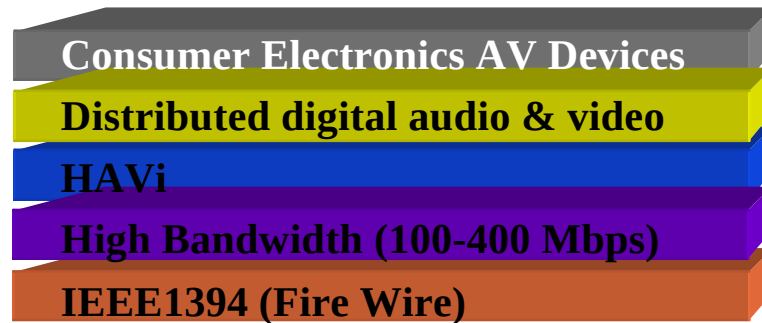
Home appliances have different content, functionality, application, and use different interconnection technologies

Bandwidth Requirement

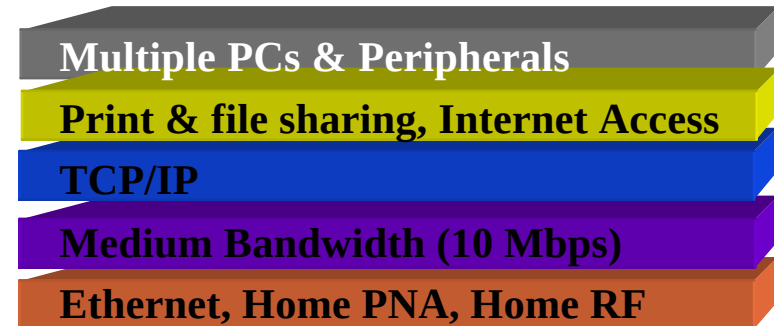


Different Home Networks

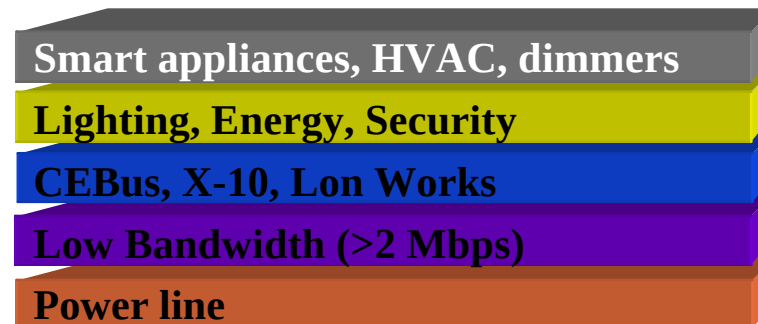
Digital Entertainment Network



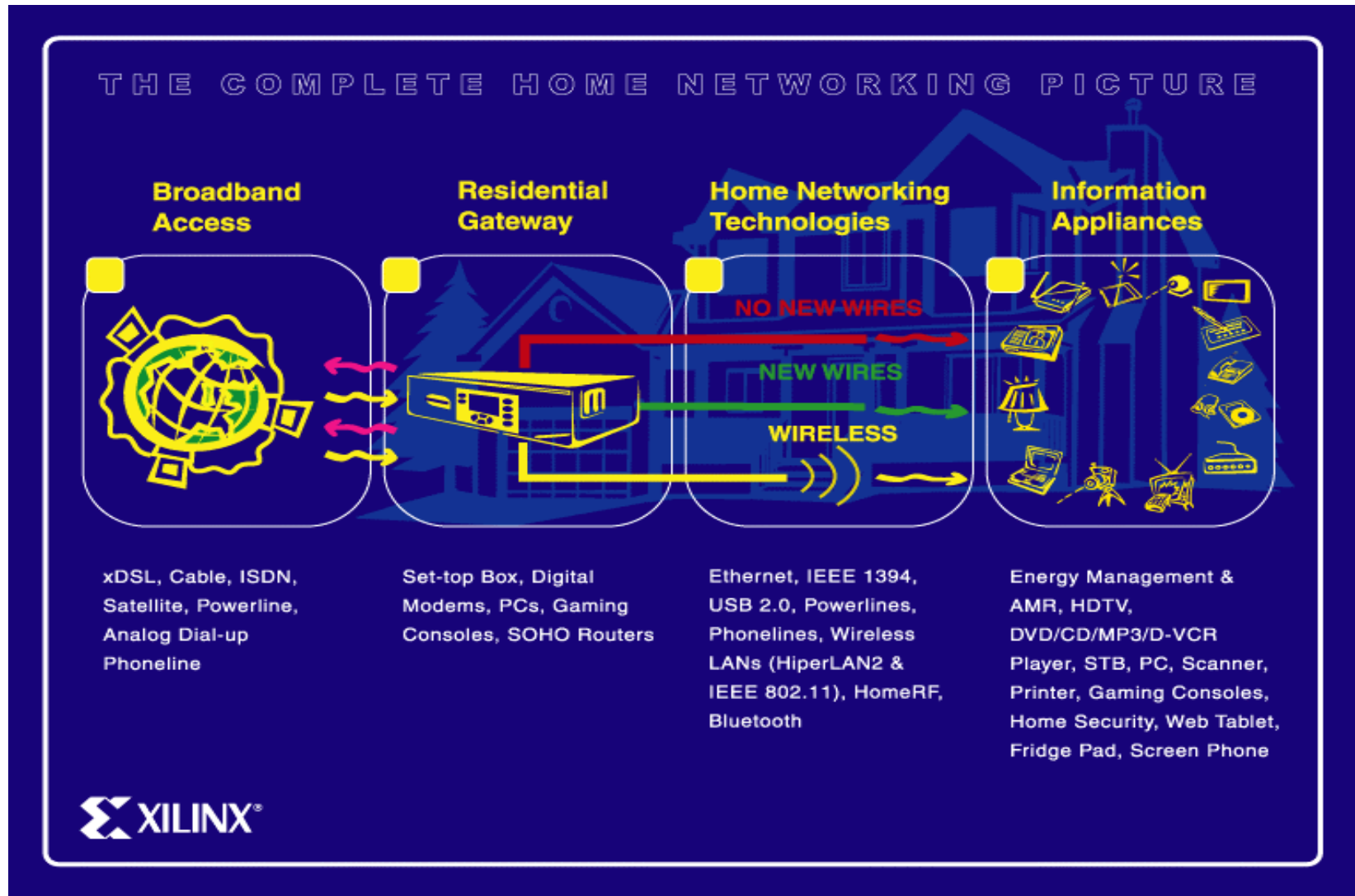
Computer System Network



Home Automation Network



Four Aspects to Home Networking



Bandwidth Requirements

	Application	Technique	Data Rate	Compression
Video	Video Conference Quality	H.261	0.1 Mbps	Yes
	Streaming Video	MPEG-4	5 Kbps ~10 Mbps	Yes
	VCR Quality	MPEG-1	1.2 Mbps	Yes
	Broadcast Quality	MPEG-2	2 ~ 4 Mbps	Yes
	Studio Quality Digital TV	ITU-R 601	166 Mbps	No
	DVD/ Studio Quality DTV	MPEG -2	3 ~6 Mbps	Yes
	HDTV	CD-DA	2000 Mbps	No
	HDTV	MPEG-2	25 ~ 34 Mbps	Yes
Audio	Streaming Audio	MPEG L3(MP3)	32~ 320 Kbps	
	Consumer CD-Audio	CD-DA	1441 Kbps	No
	Consumer CD-Audio	MPEG with FFT	192 ~256 Kbps	Yes
	Sound Studio Quality	MPEG with FFT	384 Kbps	Yes
	Dolby AC-3	5.1 Channels	640 Kbps	Yes
Telephone	Standard	G.711 PCM	64 Kbps	No
	Standard	G.721 ADPCM	32 Kbps	Yes
	Lower	GSM	13 Kbps	Yes
	Lower	CELP	5 ~7 Kbps	Yes
Broadband Internet Access	DSL	ADSL	1.5 ~9 Mbps	N/A
	Cable Modem	DOCSIS	2 Mbps	N/A

IEEE 1394 & Home Networking

- ◆ Distribution of Video for the entertainment applications requires larger bandwidth
 - MPEG 2 (used in HDTV) requires between 24 to 35Mbps
 - 1394 delivers video data at 400 Mbps
 - CD-DA (used in high quality HDTV) requires 2Gbps
 - Bit rates required for uncompressed high definition TV (HDTV)
 - $1920 \times 1080 = 2073600$ pixels in each frame, frame rate = 60 , bit rate > 2 Gbps
 - 1394b will deliver video data at 3.2 Gbps
- ◆ 1394 is capable of delivering video data at high speed
 - 1394 has the advantage of being adopted by consumer electronics manufacturers

IEEE 1394 & Home Networking

- ◆ Using 1394 for home networking does not require using a PC
- ◆ 1394 is easy to use
- ◆ 1394 is hot Pluggable
- ◆ 1394 has scalable architecture
- ◆ 1394 is a digital interface
- ◆ 1394 has physically small serial cables

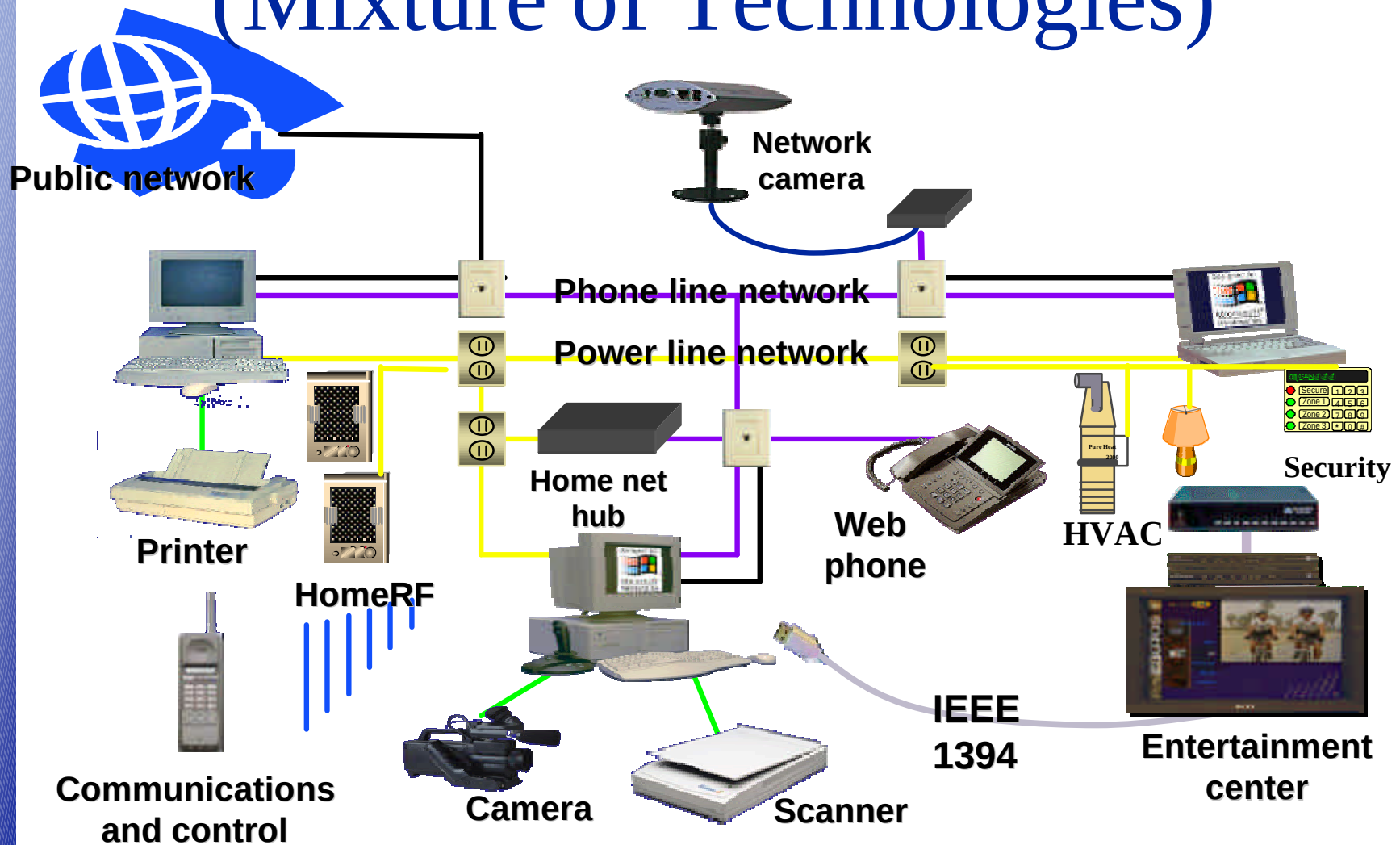
Home Networking Applications

- ◆ IEEE 1394 is an enabling technology for connecting devices such as:
 - Digital Camcorders and VCRs
 - Direct-to-Home (DTH) satellite audio/video
 - Cable TV and MMDS (microwave) set-top boxes
 - DVD Players
 - Video Games
 - Home Theater
 - Musical synthesizers/samplers with MIDI and digital audio capabilities
 - Digital audio tape (DAT) recorders, mixers, hard-disk recorders, video editors, etc.

Home Networking Applications

- Digital Video (DV) applications (including security cameras)
- Fixed and removable PC disk drives
- PC-to-PC networking and PC peripheral component sharing
- Printers for video and computer data

A Networked home (Mixture of Technologies)



A 1394 Networked Home

