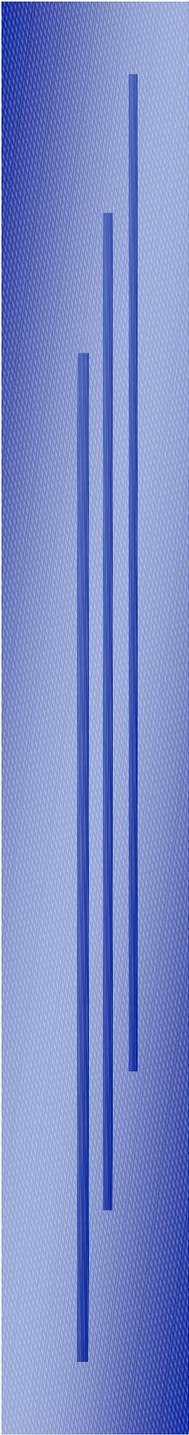


# The Industry Today

Products & Manufacturers  
(Silicon Vendors & Equipment OEMs )



# Silicon Vendors

# Broadcom Corporation

- ◆ Home networking powerhouse through Epigram acquisition in April 1999
  - Founding member of Home Phoneline Networking Alliance
  - Provides silicon for access termination, home networking pieces of the puzzle and consumer devices
  - Technology is being licensed by Lucent and other giants
- ◆ Supplies BCM4210/BCM4100 “iLine 10” chipsets
  - Complete host bus to phone wire solution for home networking
  - Each code a packet of data so that the receiver can properly decode it

# Broadcom Corporation

- ◆ BCM4210 MAC/PHY features
  - 10Mbps Ethernet controller for phoneline networks
  - Meets HPNA 2.0 proposed spec requirements
    - 16Mbps peak data rates
  - Integrated CSMA/CD Ethernet MAC with multi-level QoS
  - Integrated iLine10 digital PHY
  
- ◆ BCM4100 Integrated Analog Front End (IAFE) features
  - Custom IAFE for iLine10 controllers
  - Performs all required Analog Front End transmit & receive operations (PMD Function)
  - Transmit & receive filters
  - Analog to digital & digital to analog converters

# Broadcom Corporation

- ◆ BCM3300 single chip cable modem features
  - Supports up to 4 lines of voice
  - Can be paired with iLine 10 chipsets for a full RG silicon solution
  - Can be paired with iLine 10 chipsets & set-top box chipsets for customers like General Instruments/Motorola & Scientific Atlanta for a RG solution

# Conexant Systems

- ◆ Provides chipsets to enable broadband access and home phoneline networking
- ◆ ADSL modem
  - Uses DMT technology licensed from PairGain
  - Flexible & programmable ADSL transceiver
  - DSP based hardware
  - Supports G.Lite & full-rate ADSL

# Conexant Systems

- ◆ V.90/K56flex modem
  - 33.6Kbps, 31.2Kbps, V.34, V.32 support
  - V.42 LAPM, MNP 2-4 & MNP 10 error correction
  - V.42bis & MNP5 data compression
  - Fax modem send & receive rates up to 14.4Kbps
  - Data/fax/voice call discrimination
  
- ◆ Home phone line networking
  - 1Mbps data rates, scalable to higher speeds
  - Ethernet: standard 802.3 MAC, CSMA/CD
  - Uses existing phonelines - no new wires required
  - Supports up to 25 nodes across 500 feet
  - Compatible with existing services

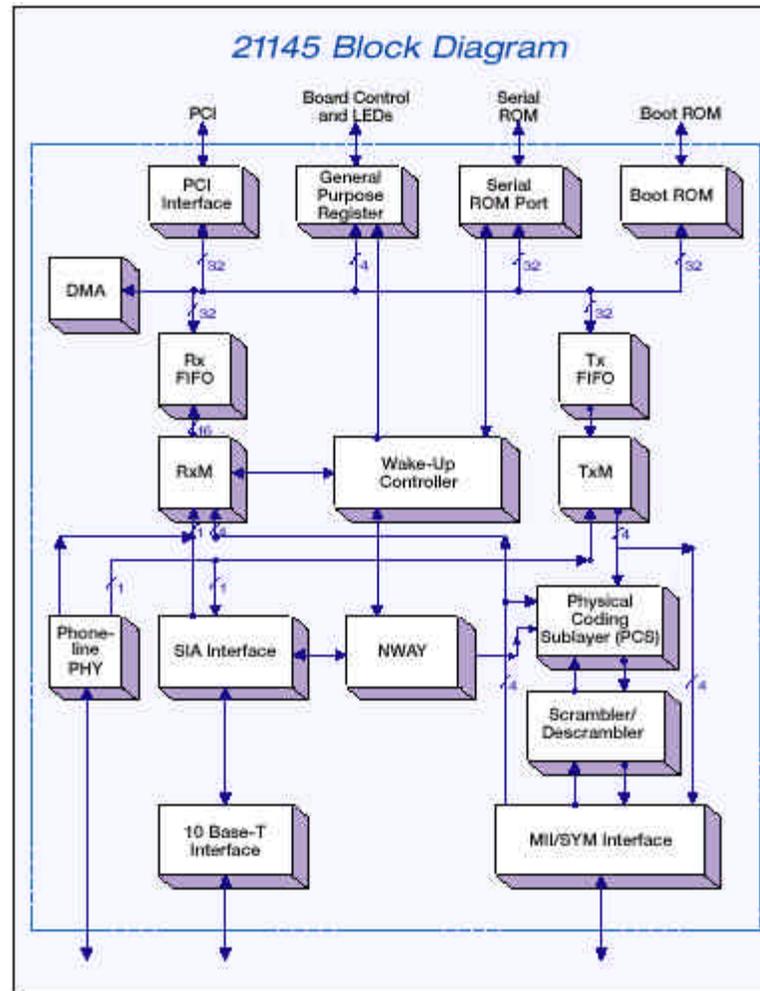
# Intel Corporation

- ◆ Believes that the existing phonenumber infrastructure in the home is an excellent basis for implementing home networks today
  - Founding member of HPNA
  - Develops chipsets for home phonenumber networking
  - Working with industry leaders to establish open spec for phonenumber-based home networking
  - Powerhouse in this area through own efforts & acquisition of Level One Communications

# Intel Corporation

- ◆ Intel 21145 Phonetline/Ethernet LAN Controller
  - Integrated single-chip silicon solution for 1Mbps phoneline & 10Mbps Ethernet connectivity
  - Provides foundation for implementing fully functional home phoneline network
  - Utilizes 21x4x MAC core for 10Base-T Ethernet network
  - Fully compatible with HPNA 1.0 spec
  - Fully compliant with the IEEE 802.3 & ANSI 802-3 Ethernet standards
  - PCI interface

# Intel - 21145 Phonenumber/Ethernet LAN Controller



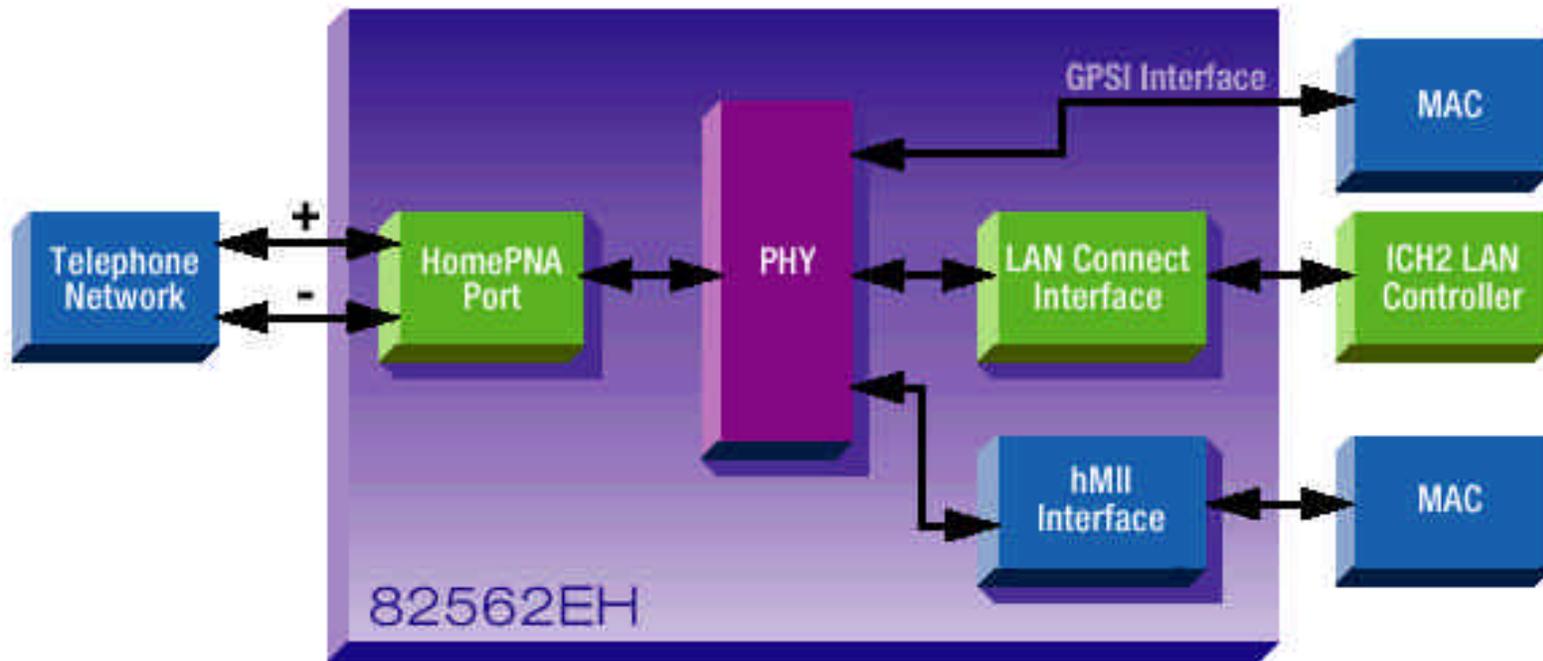
Source: Intel Corporation



# Intel

- ◆ Intel 82562EH - HomePNA LAN Connect Option
  - Highly-integrated, low cost, fully flexible network component ideal for use in a wide range of home networking designs
    - Fully compliant with HPNA 1.0 and includes a 1Mbps HomePNA port for connection to home telephone with three data interfaces
      - LAN Connect Interface for connecting Intel I/O Communications Hub2 (ICH2)
      - HomePNA Media Independent Interface (hMII)
      - General Purpose Serial Interface (GPSI)
  - Targeted for LAN-on-motherboard (LOM), Communication and Networking Riser Cards (CNR), set-top boxes, residential gateways or network information appliances
  - Supports Wake-On LAN
  - Low power consumption

# Intel - 82562EH HomePNA LAN Connect



Source: Intel Corporation



# Lucent

- ◆ Home Wire chipset products
  - Create inexpensive home networks using copper phone wires
  - Provide easy interface to communication products such as DSL modems & Ethernet
  - Data transmission rates from 1Mbps to 16Mbps
  - Compliant to HPNA 2.0 10 Mbps spec, backward compliant
  - Allows
    - Fast in-home Web surfing & high bandwidth file transfer
    - Download video & graphics
    - Connect more devices to home networks
    - Multimedia & real-time applications
      - In-home video distribution, voice compression & VoIP

# Lucent (contd.) - Products

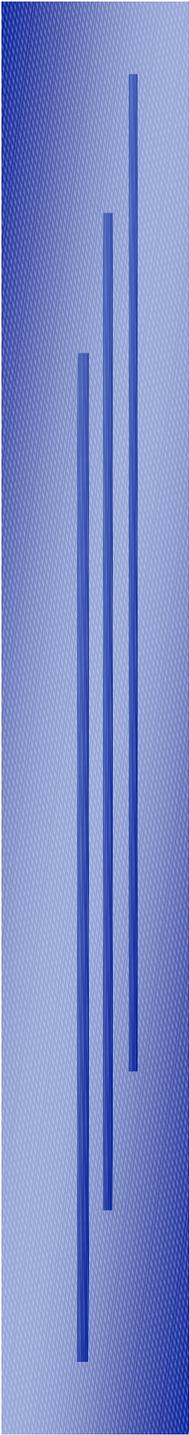
- ◆ HW3000S Home Wire MSI Controller
  - Integrated 1/10 Mbps device
  - 16 bit microprocessor slave interface
  - Glueless interface to analog front end
  - Interfaces to ADSL modem chip set
  - Ideal solution for broadband residential gateways (DSL, cable modem) & other in-home networking appliances

# Lucent (contd.) - Products

- ◆ HW3130 Home Wire PCI/Cardbus HPNA/LAN/Modem Controller
  - Integrated 1/10 Mbps device with a dual speed 10/100 Mbps LAN Controller
  - Interfaces to 10/100 Mbps Ethernet PHY
  - Ideal solution for triple-function PC add-in card
- ◆ HW3100 Home Wire PCI/Cardbus HPNA/Modem Controller
  - Integrated 1/10 Mbps device
  - Support for 56 Kbps modem
  - Ideal solution for dual-function PC add-in card

# Lucent (contd.) - Products

- ◆ HW3000M Home Wire MII PHY
  - Integrated 1/10 Mbps HPNA PHY device
  - Media Independent Interface to an external 10/100 Mbps Ethernet MAC
  - Ideal solution for PC and Embedded motherboard applications
- ◆ HW2000 Home Wire Analog Front End
  - Fully integrated analog front end transceiver for HPNA 2.0 10 Mbps home networking



# Equipment OEMs

# 2Wire

- ◆ Specializes in ADSL and HomePNA based RGs
- ◆ HomePortal products
  - Dubbed as the “Intelligent ADSL Residential Gateway”
  - Fully integrated ADSL & home networking platform providing high-speed data, telephony, & digital video services over standard phone lines
    - Combines DSL modem, home networking hub, router, Web server & firewall security in a single package
    - Compatible with 10/100 Ethernet, USB, HomePNA 2.0
  - Teamed up with Proxim, Inc. to offer Proxim’s HomeRF wireless technology for use with HomePortal
    - Provides wireless connectivity in the house

# 3Com

- ◆ 3Com RG
  - Integrates DSL & cable modems and home networking functionality
    - Ethernet, HPNA &/or RF functionality
- ◆ Bridges
  - Products connecting to a digital modem & through RF or phonelines to the home networking
  - Bridge between Internet (PC/modem) to home networking (intermediary device) without tying all the functionality into one device

# Arris/Nortel

- ◆ Arris is a joint venture between Nortel Networks & ANTEC
- ◆ Arris Cornerstone product line
  - Delivers voice & data over cable networks for cable telephony
  - Tested and deployed by AT&T/TCI
  - Voice Port
    - Includes both indoor & outdoor devices with 2 ports on up
    - Switched voice capability only
  - Packet Port products
    - Support packetized data & voice over IP on a HFC network
    - Will support life line phone & service such as 911

# Cayman Systems

- ◆ DSL specialist
- ◆ ADSL 3220H products - Internet Gateway
  - Will incorporate Proxim's SWAP/Open Air add in module to its ADSL 3220 router
    - Termination of DSL service
    - HomeRF connectivity for data & voice applications
- ◆ Developed relationship with Pacific Bell to supply ADSL routers & Internet Gateways

# Cisco Systems

- ◆ Wide range of consume initiatives working with a number of partners to put Cisco technology into consumers' homes
- ◆ Will NOT sell home networking equipment to end consumers and will focus on
  - Working with service providers to seed high-speed Internet access services for customers
  - Licensing Cisco technology for cable & DSL modems to consumer electronics manufacturers
  - Forming partnerships with other consumer electronics & Internet companies

# Cisco Systems

- ◆ Cisco uBR924 Universal Broadband Router
  - Will provide telephony, data and video services
  - DOCSIS compliant CPE device
  - 2 voice ports, 4 data ports & a cable port for telephony, built in Ethernet hub & IPsec support for VPNs
  - Will support multiple services
- ◆ Cisco has formed
  - Partnerships with ShareWave & Echelon
  - Alliances with GTE & Sun Microsystems to test Internet-enabled home products & services

# Cisco System's iHG

- ◆ iHG - Internet Home Gateway family of devices provide
  - High-speed
    - Termination for DSL service
  - Data, voice & video communication over a single, always-on broadband connection (HomePNA networking)
  - Represents the new focal point of home communications providing
    - Infrastructure control
    - Simple
    - Intelligent networking services
    - Seamless integration of data, voice & video to deliver new services to the home

# Cisco - iHG

- ◆ Flexible architecture
  - Incorporates open standards to interoperate with other standards-compliant products
- ◆ Provides QoS
  - Seamless support for data voice & video without configuration requirements
- ◆ Intelligent packet filtering
  - Certain traffic is permitted or denied by addresses or application types

# Cisco - iHG

- ◆ Designed to enhance the online experience
  - Enabling services to the home
    - Unlike modems which are simple access devices
    - Unlike small routers designed for business applications
  - Provides the ability to network smart appliances
    - PCs, telephones, fax machines, DVD players, digital cameras, security systems, climate controllers, lights, utility meters & kitchen appliances
  - Requires no management from the user
  - Remotely manageable by a service provider
    - Easily provisioned
    - Remotely configured, monitored & tested by a service provider with no user intervention
      - Minimizes costly truck rolls

# emWare & Invensys

- ◆ Funded by AT&T
- ◆ Invensys provides embedded chips
- ◆ emWare provides communications software solutions for networking e-smart devices
  - End-to-end solutions such as emGateway, emAccess
- ◆ Together provide a product: ControlServer
  - Contains emWare's device-networking software
  - Low cost control for home systems & appliances

# Emerald Gateway International

- ◆ Product: Energy Service Gateway
- ◆ Metering, load control, home security, home control functions (CEBus based)

# Ericsson

- ◆ Most active in the home networking & RG market
  - Founding member of the OSGi
  - Pushing the e-services concept
    - Market where network operators use a RG such as the e-box
    - Then allow different vertical service providers use the CPE equipment to distribute their services on the network operators infrastructure
- ◆ Developed an RG called the e-box
  - Positioned as an 'Open Services Gateway'
- ◆ Also sells e-manager 901 Service & Management Center
  - Hardware & software targeted at network operators that provisions services & Internet access to end user

# Ericsson e-box Architecture

- ◆ PC based architecture
- ◆ 32 bit CPU
- ◆ 8, 16 or 32 MB of DRAM memory
- ◆ 4, 8 or 16 MB of Flash memory
- ◆ 128 Kb of SRAM, battery backed
- ◆ LONWorks interface for home control functions
- ◆ Two I/O slots for PCMCIA cards
- ◆ RS232C Port



Source: Ericsson

# Ericsson e-box

- ◆ PC architecture with no moving parts
- ◆ Has a Java Virtual Machine
  - Intended to allow for software downloads via the access network
- ◆ Currently supports Ethernet & LONWorks for home networking interfaces
- ◆ Will support Bluetooth, HomePNA, SWAP
- ◆ Targeted for \$400-500

# General Instrument/Motorola

- ◆ Working on a 'Communications Gateway'
  - Will connect to the network via a HFC feed & then offer 4 basic lines of telephony service
  - Will be network powered
- ◆ Owns 80% stake in Next Level Communications
  - Investment into RG pie

# Global Converging Technologies

- ◆ Product - Cendis

- Scaled down PBX that supports up to 4 voice lines
- Limited data support
- System consists of a RF base station plus two cordless phones
  - RF channels run over a 900 MHz spread spectrum on technology provided by Butterfly Communications
- Currently supports control protocols such as CEBus & LONWorks, but in future will support higher speed data networking protocols such as HPNA and HomeRF

- ◆ Product - Netdisplay

- Web pad

# IBM

- ◆ Developed deals with system integrators such as Ameritech
- ◆ Cofounder of OSGi
- ◆ Home Director home network connection center
  - In-home hub for different types of media such as Cat 5, copper wiring, coax & POTS wiring
- ◆ Intelligent Gateway
  - PC based architecture
  - 486 processor, 4Mb of flash, 16Mb of RAM
  - Control is based on CEBus, HPNA, HomeRF

# Intel

- ◆ AnyPoint brand of home networking products
  - HomePNA and HomeRF based home networking

# Motorola

- ◆ Leading cable modem vendor
  - Owned 39.1% of the cable modem market share
- ◆ Bought leading set-top box - General Instrument
- ◆ Purchased 2-3% (\$10 million) stake in Proxim
  - Co-development of HomeRF based cable modem products
- ◆ Actively developing RG products - "Broadband Gateways"
  - Comes in two flavors
    - DOCSIS cable modem with HPNA based home phoneline LAN interface
    - DOCSIS cable modem with HomeRF LAN interface
  - Will deliver more intelligent services

# Motorola (General Instrument)

- ◆ GI used to be the largest set-top box manufacturer
- ◆ 1998 had revenues of \$2 Billion & shipped ~5.7 million set-top boxes
- ◆ Partnered with Cisco Systems for the AT&T/TCI network
- ◆ GI is trying to focus its DCT-5000+ digital set-top box as a residential gateway incorporating
  - Cable modem technology
  - Broadband Telephony Interface (BTI)

# Next Level Communications (NLC)

- ◆ Limited partnership between Spencer Trask Company & General Instrument (GI is now part of Motorola)
  - GI is a limited partner with an 80% equity stake in NLC
- ◆ Field trials are on with US West-Quest in Phoenix, AZ
  - Providing voice, video, data services over one line as part of US West's TeleChoice Digital TV and on-line services
- ◆ Partnered with Proxim to integrate Proxim's HomeRF technology into NLC's ultra high-speed RG
  - Distribution of toll-quality cordless voice & shared broadband Internet access wirelessly in and around the home

# Next Level Communications (NLC)

- ◆ N3 - In-home RG
  - Access point for VDSL over twisted pair copper
  - Set-top box incorporating several MPEG decoders
    - Handles multiple concurrent MPEG streams at one time & can tune up to 3 TVs concurrently
  - Has a 10Base-T Ethernet hub & S-Video output
  - Uses a Motorola 860 RISC based processor
  - Uses VX Works from Wind River Systems as its RTOS
  - No hard drive disk currently
    - Next generation will incorporate a HDD

# Nokia

- ◆ Released first Home Gateway product - Nokia MW 1122
  - Provides high-speed, wireless Internet connectivity & access to multiple device within the home & SOHO environment
  - Combines wireless LAN & ADSL
  - Simplifies access to data services by providing multi-megabit wireless connectivity for several interoperable devices
  - Precursor to a number of sophisticated Home Gateway networking solutions

# Pace Micro Technology

- ◆ World's largest dedicated manufacturer of set-top boxes
- ◆ Model: Set-top Box evolves into a RG
  - Phase one: Set-top box - Broadcast TV into the home
  - Phase two: Creating the home gateway - High speed two way data access into the home
  - Phase three: The networked home - Home gateway delivering information around the home
- ◆ Believes that the TV remains fundamental to the consumer proposition
  - Interactive services offer incremental revenues

# Panja

- ◆ New name for the company formerly known as AMX
- ◆ Wholly owned subsidiary of PHAST
  - Specializes in the design & manufacture of industrial & residential control & automation systems
- ◆ Internet Home “Entertainment Gateway” - Panja 1000
  - Complete entertainment system controller
- ◆ Panja 2000 - “home control and information gateway”
- ◆ Coupling hardware with suite of software & services that enable the delivery of Internet content

# Panja

- ◆ “Entertainment Gateway” - Panja 1000
  - Connect the Internet directly to stereos, TVs, VCRs
  - Delivery of IP content is enabled through a cobranded Cisco cable modem
  - Uses Motorola Coldfire processor operating at 70MIPS
  - home networking interfaces include Ethernet port, HPNA & HomeRF
  - Has a DCP server to handle IP subnet allocation
  - User interface is a handheld touch panel operating at 2.4GHz spread spectrum channel
  - Price: \$1000-2495
  - Located in the entertainment closet

# Panja

- ◆ EP3 (Entertainment Processing Level 3) - Software
  - Selects and decodes MP3, MPEG, Real Audio, Real Video & other encoding schemes
  - Offered in conjunction with its Panja 1000 & 2000 gateways
- ◆ Partnered with Infoseek/Go Network which will offer content as the basis of entertainment oriented Broadband Blast service

# Panja

## ◆ Services

- Broadband blast
  - Multimedia service tailored for delivering MP3, MPEG video & other multimedia content to non-PC devices such as TV, stereo
- IControl
  - Internet based home control service that allows subscribers to access their homes remotely for control & security
- PanjaCast
  - Personalized information delivery service to Internet appliances such as webpads

# Philips (Royal Philips Electronics)

- ◆ No. 2 position in worldwide set-top box market
- ◆ Central Gateway home server
  - Concept
  - Integrates a broadband receiver, home network system, a variety of storage systems in one box
  - Capacity to perform multiple tasks using the home networking in different rooms
    - Wireless IP telephony; watch, record & playback video programs; Bluetooth-based wireless download of MP3 files, remotely record MP3 files on a CD, simultaneous Web surfing on a web tablet

# Philips

- ◆ Central gateway
  - Advanced home server system code named “Rooster”
  - Runs on 2 TriMedia processors
  - Sports 3 V tunes to watch, send & record video, 16MB of RAM, DVD player/recorder, CD recorder, 27GB HDD
  - Provides connections to the Internet, wireless IP telephony, full infrared and Bluetooth based home networking
  - Voice operated
  - Offers profile-based service
    - Fingerprint recognition system embedded in its small touch screen-based remote control unit communicates the fingerprint information to the home server, which can then identify the user
    - Sorts out user’s preferred music & video selections to make navigation easier

# Proxim

- ◆ Leading supplier of
  - Spread spectrum wireless LANs (IEEE-802.11) products
  - HomeRF products for interoperable cordless consumer devices - home networking
  
- ◆ Harmony software products
  - Provide interoperability with both HomeRF & IEEE802.11 stds.
  - Will include PC card, USB card & a cordless design-in module for radio integration within OEM products
  - Add in module is a contributing technology for a RG
    - Enables an access termination device to then connect other connected devices that support HomeRF protocol
    - Has a radio and MAC on the module
    - 2/3rd the size of a business card

# Proxim

- ◆ Motorola & Intel have each purchased minority shares to leverage Proxim's expertise in wireless networking
  - Both companies have announced RGs with Proxim card
- ◆ Teamed up with 2Wire to offer HomeRF technology for use with ADSL-HomePNA RG
  - Provides wireless connectivity in the house
- ◆ Teamed up with Next Level Communications (NLC)
  - Integration of Proxim's HomeRF wireless networking technology with NLCs Nlevel3 Unified Access Platform
- ◆ Cayman Systems will use a Proxim add in module in its ADSL RG-modem

# Sage Systems

- ◆ Product: Aladn Energy Management Suite
  - Proprietary PLC technology for energy management
  - More than 1 million AMR devices sold to China

# Scientific Atlanta

- ◆ Second largest manufacturer of set-top boxes behind General Instrument
  - \$1.16 Billion in revenues & ~3.3 million set-top boxes shipped in 1998
- ◆ Sold off Maingate control systems division
  - Maingate Customer Communications System is a low data rate system targeted for utilities for tasks such as AMR
- ◆ Will focus on broadband RG market
  - Expand & have its digital set-top box, the Explorer 2000 take on added RG functionality

# Scientific Atlanta

- ◆ Explorer 2000
  - Currently has a TCP/IP stack & DAVIC MAC layer functionality
  - The box uses the powerful Micro Sparc 2 processor which can handle TCP/IP protocol processing
  
- ◆ Future developments
  - Explorer 6000 with more processing power
  - Will include features such as disk drive interface for local caching
  - Convert the box into a true entertainment 'edge server'
  - Development will be based on OSGi & H.323 standards

# ShareGate

- ◆ Formerly called Utel
- ◆ RG product called 'Universal Communicator'
  - Generate ring voltages, dial tones & handle multiplexing of different simultaneous phone conversations
  - Remote software addition would turn the device into a small PBX that supports caller ID, intercom & other features
  - Support multiple LAN interfaces such as HomeRF, HPNA & CEBus
  - Will have a Java Virtual Machine for running applications & supporting OSGi software stack
  - Include a RISC processor, some RAM & flash memory
- ◆ Product: ISIS & Jupiter Gateways

# ShareGate

- ◆ ShareGate DSL 2000 Residential Gateway
  - Distributes broadband services in home/small office enabling two-way, high-speed Internet, voice & video communications
  - Multiple digital phone lines
    - Provides up to 4 VoDSL lines, plus the standard existing telephone line & data line within one small box
    - Provides simultaneous operation of all lines
  - High speed Internet access using existing phone wires within the house to multiple PCs
  - Home Web Portal - Securely access home PCs from remote location via standard Web browser
  - Gateway management software for remote provisioning, service management, diagnostics, service upgrades
  - Security - Firewall protection

# Sony

- ◆ PlayStation gaming platform turned into 'mobile gateway'
  - New model of Playstation - named PlayStation 2 PSone
  - Support broadband network services for mobile applications
  - 4-inch TFT display attachment
  - Can be carried from room-to-room and into the car
  - Bigger than a portable CD player
  - Not battery operated