



HAVi

Home Audio Video Interoperability

Agenda

- ◆ Introduction
 - What is HAVi?
 - Advantages
 - Why does the world need HAVi?
- ◆ Technology
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 - System Model
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 - Device Classification
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 - Home Network Configuration
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- ◆ Xilinx Value
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What is HAVi?

- ◆ A standard that will allow all manner of digital consumer electronics and home appliances to communicate with each other
- ◆ HAVi is a digital Audio Video networking initiative that provides a home networking software specification
 - It is for seamless interoperability among home entertainment products
- ◆ It has been designed to meet the particular demands of digital audio and video

What is HAVi?

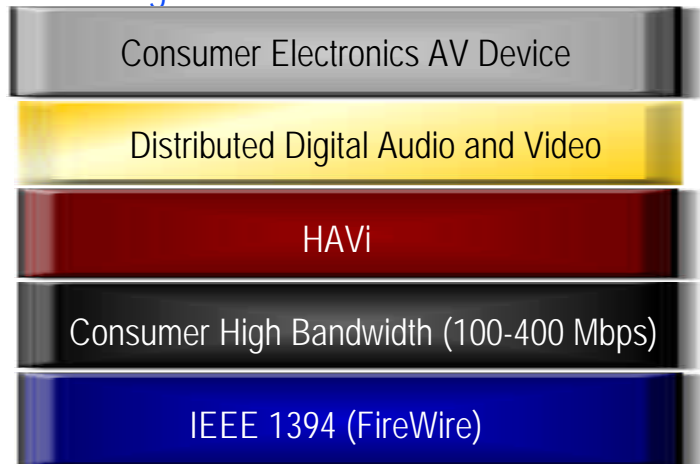
- ◆ It defines an operating-system-neutral middleware that manages:
 - Multi-directional AV streams
 - Event schedule
 - Registries
- ◆ HAVi software takes advantage of the powerful resources of chips built into modern audio and video appliances
 - It Provides the management function of a dedicated audio-video networking system
- ◆ IEEE 1394 (i.LINK® or FireWire®) has been chosen as the interconnection medium

What is HAVi?

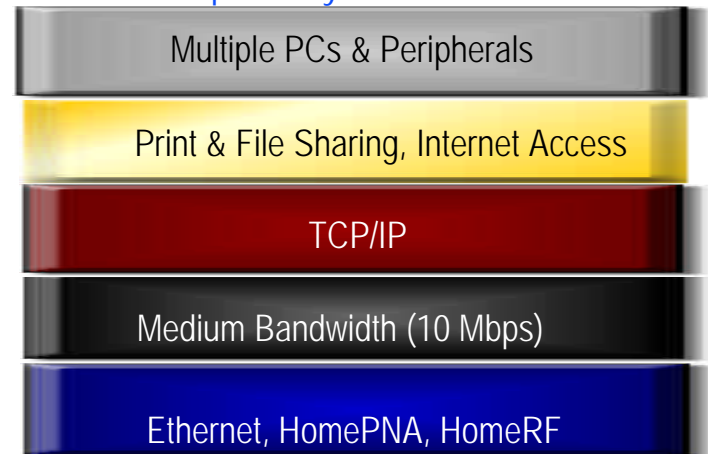
- ◆ IEEE 1394 network is capable of handling both commands and multiple digital audio/video streams
- ◆ IEEE 1394 is a standard which enjoys broad support from both the CE and IT industries
- ◆ IEEE 1394 currently provides a bandwidth of up to 400 Mb/s and is capable of Isochronous communication
 - Makes it suitable to simultaneously handle multiple real-time digital audio/video streams
- ◆ Longer transmission distances and faster data rate under the IEEE 1394 standard are near to completion

Different Home Networks

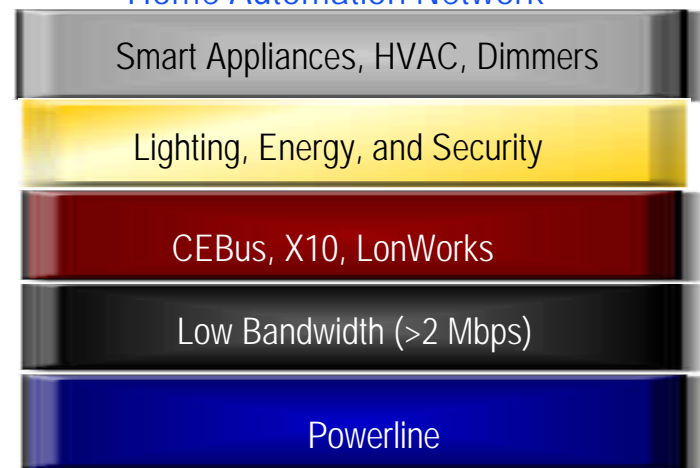
Digital Entertainment Network



Computer System Network



Home Automation Network



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Driving Forces For HAVi

- ◆ Digital Broadcasting
- ◆ The Internet
- ◆ Digitalization Of Modern Homes
- ◆ Entertainment & Video Appliances
- ◆ Digital Home Networking
- ◆ High Bandwidth Requirements For Transmission of Audio and Video Signals

Who Are The Main Players?

SONY

PHILIPS

HITACHI

SHARP

Panasonic®

THOMSON MULTI MEDIA

GRUNDIG

TOSHIBA

Advantages Of A HAVi Enabled Device

- ◆ Automatically detection of devices on the network
- ◆ Instant coordination of the functions of various devices
 - Each added appliance to the HAVi network is automatically registered so that other devices know what it is capable of
- ◆ Installation of applications and user interface software on each device
- ◆ Ensuring interoperability among devices regardless of the manufacturer

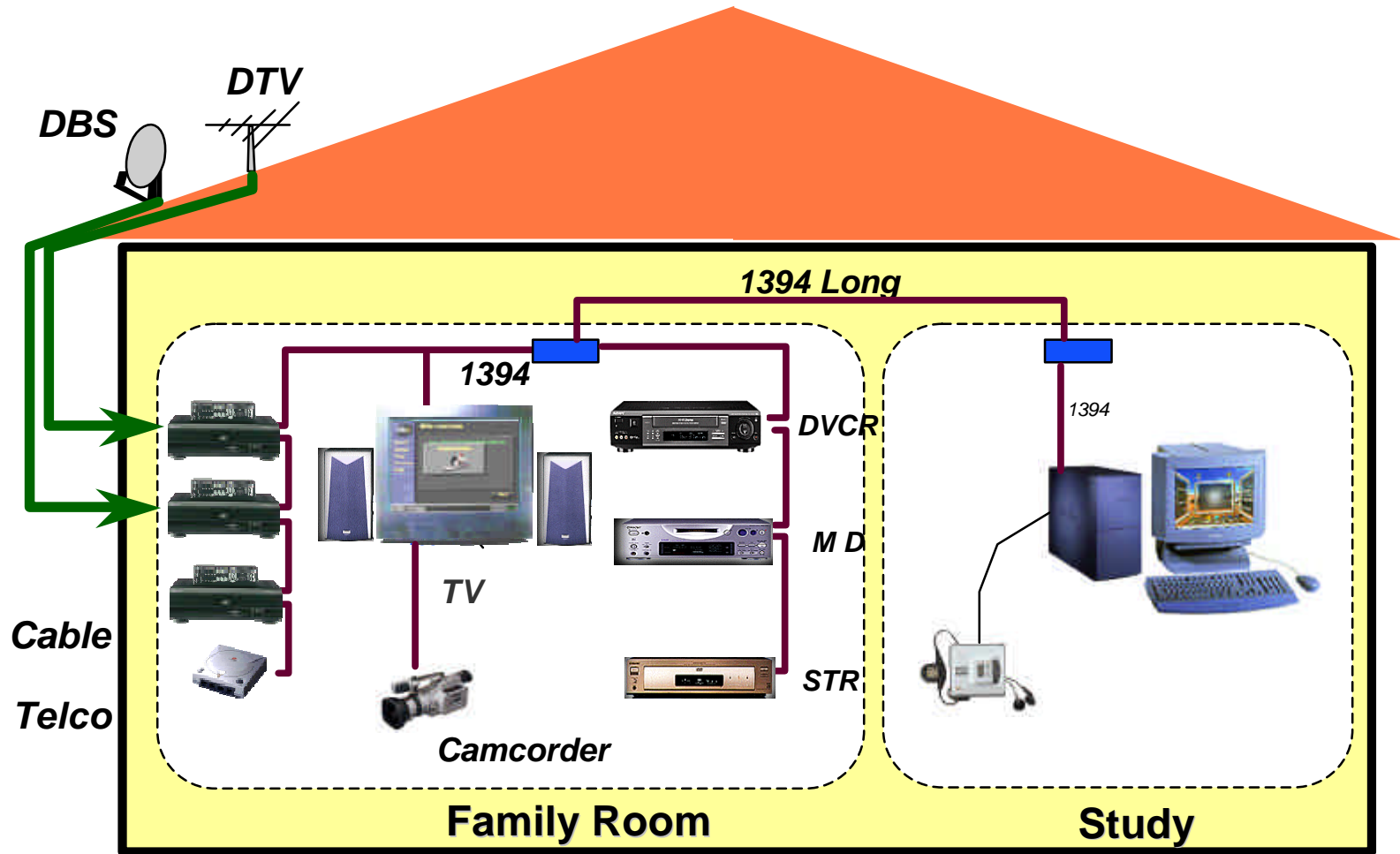
Why Does The World Need HAVi?

- ◆ Interpretability
 - Functions on a device within the HAVi networking system may be controlled from another device within the system
- ◆ Brand independence
 - Entertainment products from different manufacturers will communicate with each other when connected into a HAVi network
 - VCRs, DVD players, Set Top Boxes, and ...can be shown up on the TV and be controlled by one remote commander

Why Does The World Need HAVi?

- ◆ Hot Plug and Play
 - HAVi compliant devices automatically announce their presence and capabilities to every other device on the HAVi network
 - Simple installation and set up
 - No more complicated and difficult installation instructions
 - no configuration of network addresses or device drivers
- ◆ Upgradability
 - Most HAVi compliant devices will come with their own dynamic Device Control Modules
 - Updating functionality can be done by downloading/uploading new capabilities via the Internet

A HAVi Home!



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HAVi's Requirements

- ◆ Legacy Device Support
 - The HAVi Architecture supports legacy devices
 - It is important since the transition to networked devices is going to be gradual
 - Characterized by the degree to which they support 1394 and industry standard protocols for 1394 such as IEC 61883
 - Non-1394 devices(most existing CE devices)
 - 1394 devices not supporting the HAVi Architecture

HAVi's Requirements

- ◆ Future-Proof Support
 - Great concern of the CE industry since new products should work with existing products
 - The HAVi Architecture supports future devices and protocols
 - Done through several software-based mechanisms which includes:
 - Persistent device-resident information describing capabilities of devices
 - A write-once, run-everywhere language (Java) used for software extensions
 - A device independent representation of user interface elements

HAVi's Requirements

- Each HAVi-compliant device may contain persistent data(Java Byte code) concerning its user interface and device control capabilities
- As manufacturers introduce new models with new features they can modify the byte code shipped with the device
 - Similarly new user interface elements can be added to the stored UI representation on the device.

HAVi's Requirements

- ◆ Plug-And-Play Support
 - In the HAVi Architecture, a device configures itself, and integrates itself into the home network, without user intervention
 - Low-level communication services provide notification when a new device is identified on the network
- ◆ Flexibility
 - The HAVi Architecture allows devices to present multiple user interfaces, adapting to both the user's needs and the manufacturer's need for brand differentiation

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Control Model

- ◆ Devices may exchange control information and data in a peer-to-peer fashion
 - This ensures that, at the communication level, no one device is required to act as a master or controller for the system
- ◆ A controller is said to host a “Device Control Module” (DCM) for the controlled device
 - The control interface is exposed via the API of this DCM
- ◆ DCMs are a central concept to the HAVi architecture and the source of flexibility in accommodating new devices and features

Control Model

- ◆ DCMs can be distinguished as:
- ◆ Embedded DCM – A DCM that is part of the resident software on a controller
- ◆ Uploaded DCM – A DCM that is obtained from some source external to the controller and dynamically added to the software on the controller
- ◆ Native DCM – A DCM that is implemented for a specific platform, it may include machine code for a specific processor or access platform specific APIs

Control Model

- ◆ Bytecode DCM – A DCM that is implemented in Java bytecode
- ◆ Standard DCM – A DCM that provides the standard HAVI APIs
 - Such a DCM provides basic functionality but is able to control a wide range of devices

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HAVi Device Classes

Controller
Devices



Full AV device (FAV)

- Download and execute all HAVi applications
- Download and execute DCM

Intermediate AV device (IAV)

- Ability to communicate with other HAVi device
- Ability to execute limited applications
- Offers own control service
- Ability to host other known device

Base AV device (BAV)

- Offers own information in ROM

Legacy AV device (LAV)

- Conventional devices with NO HAVi SDD data (ROM)

Full AV Device

- ◆ Has a rich set of resources and is capable of supporting a complex software environment
- ◆ The primary distinguishing feature of an FAV is the presence of a runtime environment for Java bytecode
 - This allows an FAV to upload bytecode from other devices
 - It provides enhanced capabilities for their control
- ◆ Likely candidates for FAV devices:
 - STB
 - DTV,
 - General purpose home control devices
 - Home PC's

Intermediate AV Device

- ◆ IAV devices are generally lower in cost than FAV devices and more limited in resources
- ◆ They do not provide a runtime environment for Java bytecode
 - They cannot act as controllers for arbitrary devices within the home network
- ◆ IAV may provide native support for control of particular devices on the home network.

Base AV Device

- ◆ Devices that choose to implement future-proof behavior by providing uploadable Java bytecode
 - But do not host any of the software elements of the HAVi Architecture
- ◆ These devices can be controlled by an FAV device via the uploadable bytecode or from an IAV device via native code
- ◆ Communication between a FAV or IAV device and a BAV device requires that HAVi commands be translated to and from the command protocol used by the BAV device

Legacy AV Device

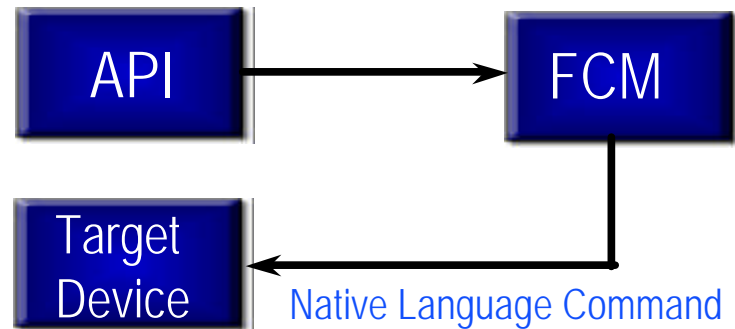
- ◆ LAV devices are not aware of the HAVi Architecture
- ◆ These devices use proprietary protocols for their control, and quite frequently have simple control-only protocols
- ◆ Such devices can work in the home network but require that FAV or IAV devices act as a gateway
- ◆ Communication between a FAV or IAV device and legacy device requires that HAVi commands be translated to and from the legacy command protocol

HAVi Compliance

- ◆ Each HAVi compliant device (FAV, IAV and BAV) shall:
 - Support one or more of: 1394-1995, 1394-a or 1394-b
 - Provide HAVi SDD data in a IEEE 1212 configuration ROM
 - If the device sources or sinks a stream type for which IEC 61883 transmission has been specified, then the device should support:
 - The PCR and CMP rules for isochronous connections as defined in IEC 61883.1
 - The CIP protocol as defined in IEC 61883.1
 - The CIP format specific definition in the corresponding part of IEC 61883

HAVi Functional Component Module (FCM)

- ◆ Tuner
- ◆ VCR
- ◆ Clock
- ◆ Camera
- ◆ AV Disc
- ◆ Amplifier
- ◆ Display
- ◆ AV Display
- ◆ Modem
- ◆ Web Proxy



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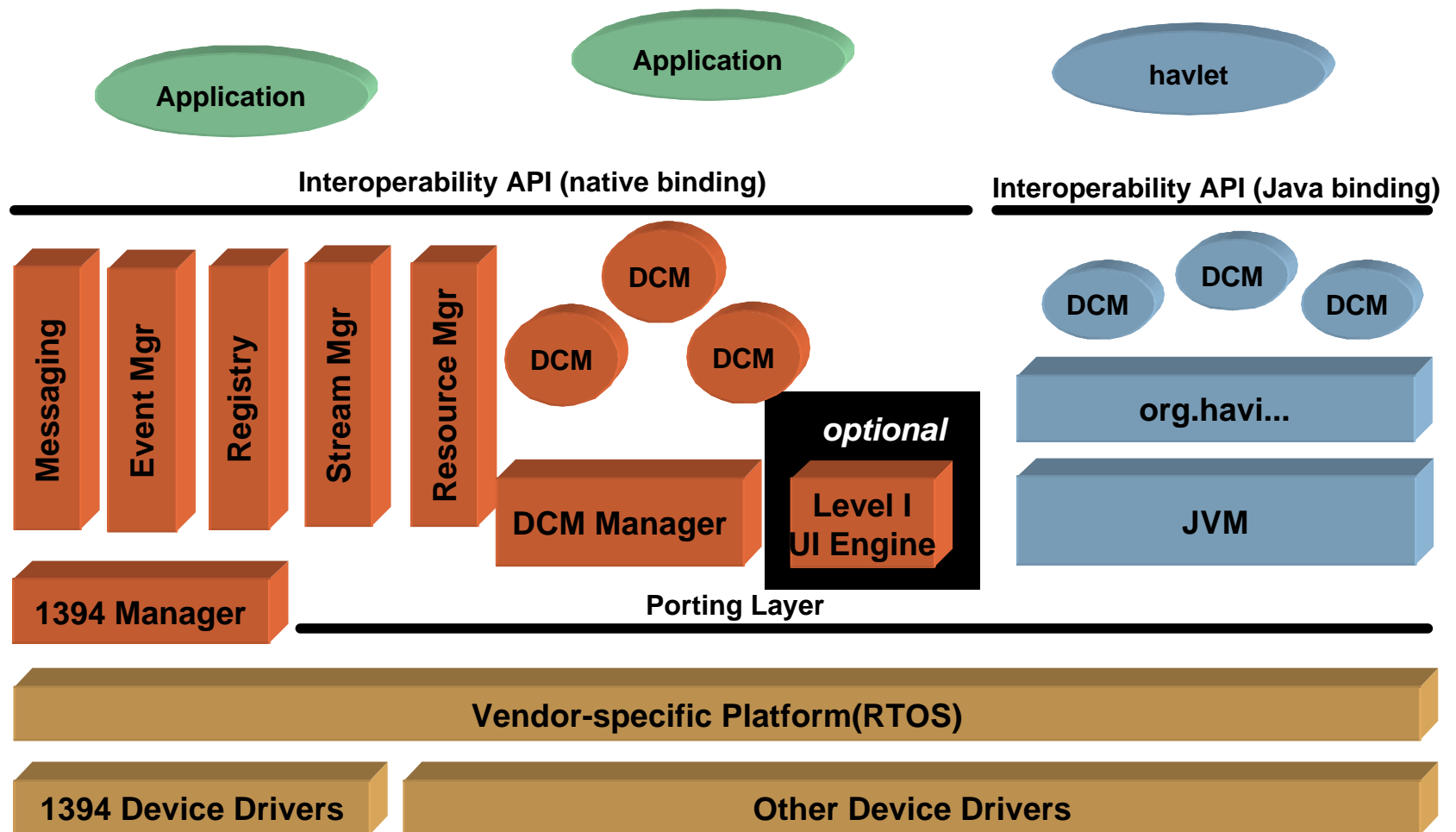
HAVi Architecture

- ◆ A set of software elements along with the protocols and APIs needed to achieve interoperability
- ◆ Device abstraction and device control models
- ◆ An addressing scheme and lookup service for devices and their resources
- ◆ An open execution environment supporting visual presentation and control of devices, and providing runtime support for third party applications

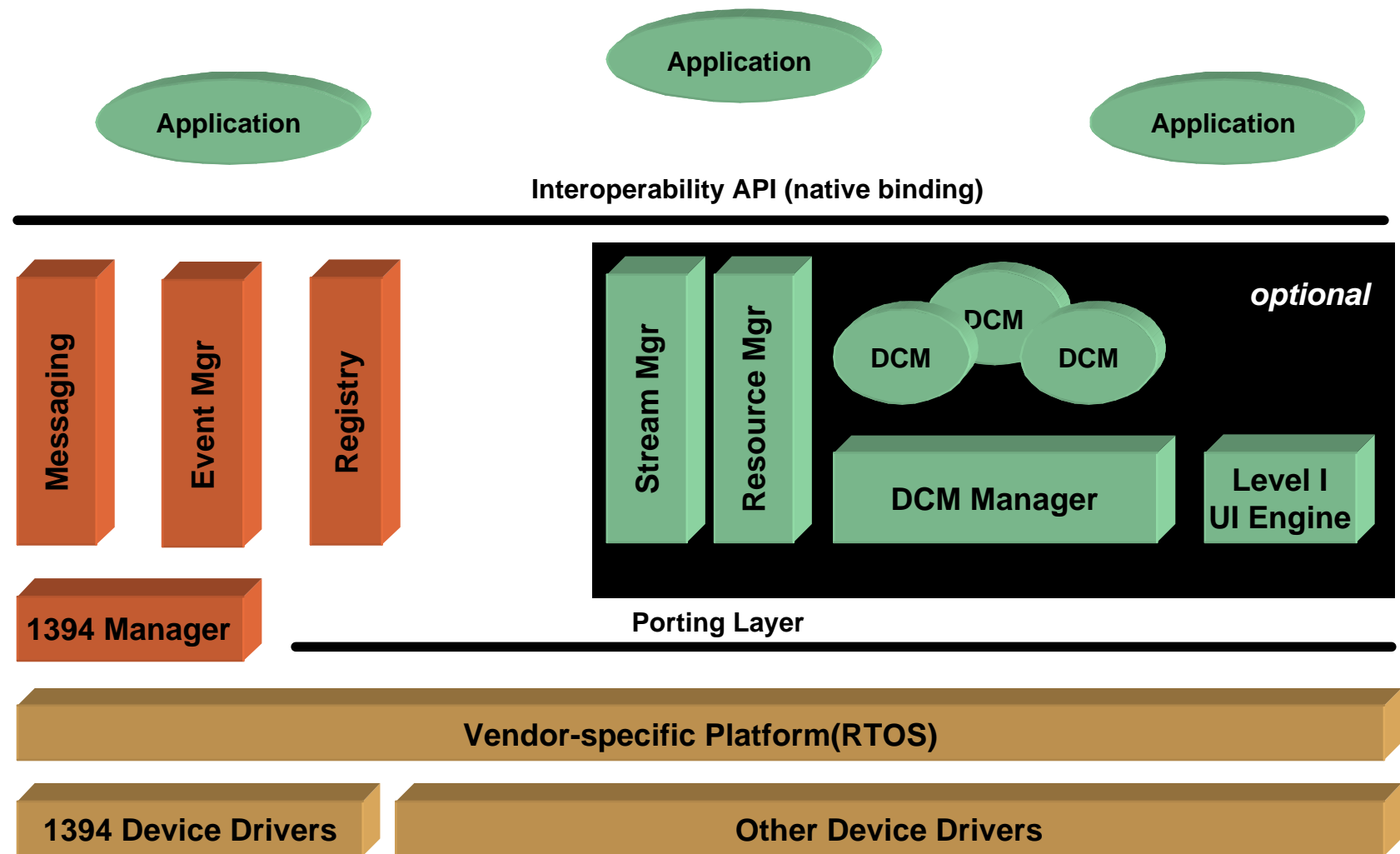
HAVi Architecture

- ◆ Communication mechanisms for extending the environment dynamically through plug-and-play capabilities
- ◆ The HAVi architecture is:
 - Open
 - Scaleable in implementation complexity
 - Platform-independent and language neutral
 - HAVi can be implemented in any programming language and on any CPU or real-time operating system

HAVi Architecture (FAV)



HAVi Architecture (IAV)



HAVi Architecture

- ◆ 1394 Communication Media Manager
 - Allows other software elements to perform asynchronous and isochronous communication over 1394
- ◆ Messaging System
 - Responsible for passing messages between software elements
- ◆ Registry
 - Serves as a directory service, allows any object to locate another object on the home network

HAVi Architecture

- ◆ Event Manager
 - Serves as an event delivery service
 - An event is the change in state of an object or of the home network
- ◆ Stream Manager
 - Responsible for managing real-time transfer of AV and other media between functional components
- ◆ Resource Manager
 - Facilitates sharing of resources and scheduling of actions

HAVi Architecture

- ◆ Device Control Module (DCM)
 - A software element used to control a device
 - DCMs are obtained from DCM code units
 - Within a DCM code unit are:
 - Code for the DCM itself
 - Code for Functional Component Modules (FCMs) for each functional component within the device
- ◆ DCM Manager
 - Responsible for installing and removing DCM code units on FAV and IAV devices

Content of Home Network HAVi Device

- ◆ Application Module
 - Is a software element that may provide a DDI(Data Driven Interaction) interface and/or a havlet
 - Havlet is a HAVi Java application that is uploaded on the request of a controller from a DCM or application module
- ◆ Self Describing Device (SDD) data
 - Contains descriptive information about the device and its capabilities
 - Follows the IEEE 1212 addressing scheme used for Configuration ROM
 - May include a DCM code unit and vendor-specific data for constructing user interface elements

Content of Home Network HAVi Device

- ◆ Java Runtime Environment
 - Provides an execution environment for uploaded DCMs and applications implemented using Java bytecode
- ◆ DDI Controller
 - A software element involved with user interaction
 - The DDI (Data Driven Interaction) Controller handles user input and interprets (renders) DDI elements

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User Interface Support

- ◆ Level 1 UI
 - Intended for IAVs and is called Data Driven Interaction(DDI)
 - DDI elements can be loaded from a DDI Target(typically DCM) and displayed by a DDI controller
- ◆ Level 2 UI
- ◆ Constructed by bytecode applications running on FAVs
 - Support for different pixel aspect ratios, screen aspect ratios and screen sizes
 - Support for alpha blending and video / image layering
 - Support for remote control input

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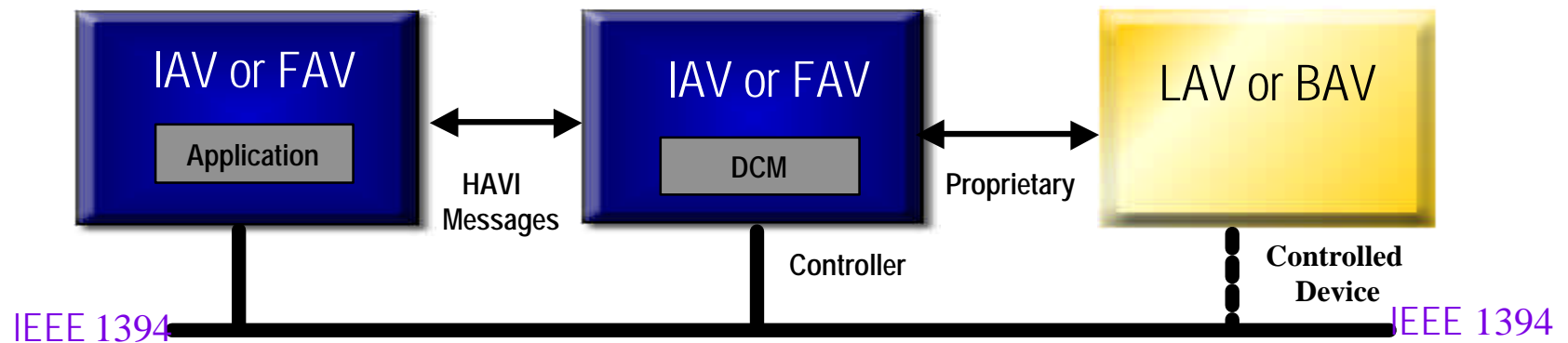
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Home Network Configurations

- ◆ It defines APIs and messaging protocols so that interoperability is assured
- ◆ It defines how future devices and services can be integrated into the architecture
- ◆ The HAVi Architecture makes no restrictions on what types of devices must be present in the home network
 - Networks without FAV devices
 - Networks with multiple FAV devices
 - Networks with LAV and BAV devices only

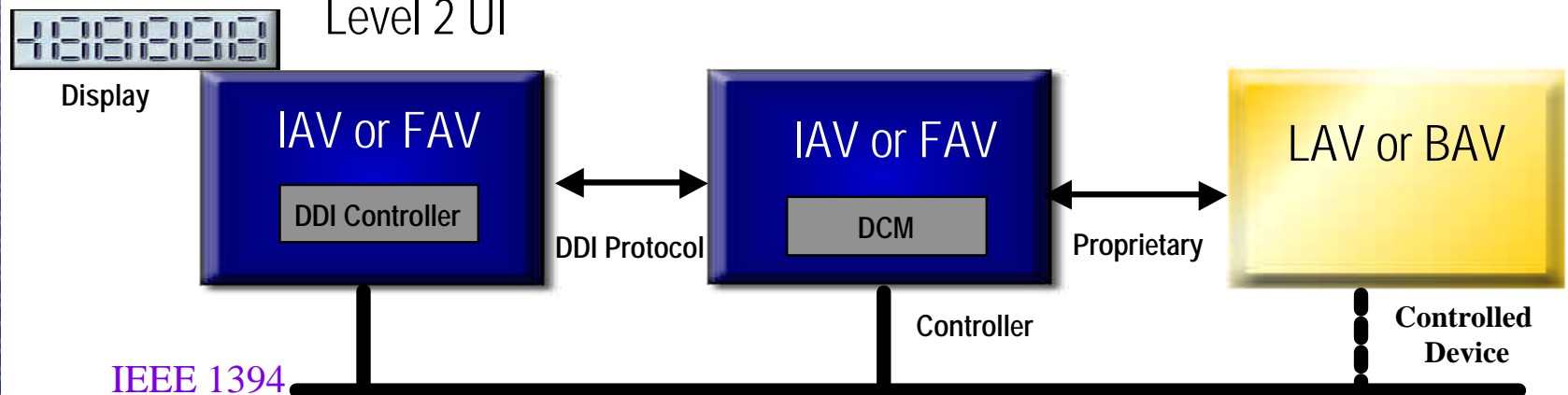
Home Network Configurations

- ◆ IAV or FAV as Controller
 - IAV and FAV devices act as controllers for the other device classes and provide a platform for the system services comprising the HAVi Architecture
 - FAVs may host Java bytecode DCMs
 - The primary role of a controller is to provide a runtime environment for DCMs



Home Network Configurations

- ◆ IAV or FAV as display
 - IAVs and FAVs will have an associated display device that is used for display of AV content and GUIs
 - Devices without display will cooperate with other IAV or FAV devices with display capability
 - A display capable IAV is required to support a DDI Controller
 - A display capable FAV is required to support a DDI Controller and a Level 2 UI



Home Network Configurations

- ◆ Peer-to-peer Architecture between FAVs & IAVs
 - If there are more than one FAV or IAV, each controller cooperates with other controllers to ensure that services are provided to the user
 - An example: a device without display capabilities uses a remote device to display DCM user interfaces
- ◆ IAVs as Controller and Display
 - Embedded DCMs can be implemented as native applications on the IAV device and can use native interfaces to access the IAV's display and other resources

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Interoperability

- ◆ The first and foremost goal of the HAVi Architecture is to support interoperability between AV equipment
- ◆ Level 1 Interoperability
 - Defines and uses a generic set of control messages (commands) that enable one device to talk to another device
 - Defines and uses a set of event messages that it should reasonably expect from the device

Interoperability (Level 1)

- ◆ Following mechanisms are required:
- ◆ Device Discovery
 - Each device in the home network needs a well-defined method that allows it to advertise its capabilities to others
 - SDD data contains information about the device which can be accessed by other devices
 - The SDD data contains, as a minimum, enough information to allow instantiation of an embedded DCM
 - This results in registration of device capabilities with the HAVI Registry

Interoperability (Level 1)

◆ Communication

- A general communication facility is needed to access the capabilities of another device on the network
- This service is provided by the HAVI Messaging Systems and DCMs
- The application sends HAVI messages to DCMs, the DCM then engages in proprietary communication with the device

Interoperability (Level 1)

- ◆ HAVI Message Set
 - A well defined set of messages that must be supported by all devices of a particular class
 - This ensures that a device can work with existing, as well as future devices, irrespective of the manufacturer
 - The HAVI message set includes those messages used for the DDI protocol and so allows DCMs (and applications) to construct a UI on display-capable IAVs and FAVs

Interoperability(Level 2)

- ◆ Level 2 Interoperability
 - Allows a device to communicate to other devices any additional functionality not present in embedded DCMs
 - The HAVi Architecture allows uploaded DCMs as an alternative to embedded DCMs
 - To support non-standard features of existing products
 - To support future products
 - Level 2 only requires that one device provide a runtime environment for the uploaded DCM obtained from the new device

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IEEE 1394(FireWire)

- ◆ A hardware and software standard for transporting data at 100, 200, 400, or 800 megabits per second (Mbps)
- ◆ A digital interface - there is no need to convert digital data into analog and tolerate a loss of data integrity
- ◆ Physically small - the thin serial cable can replace larger and more expensive interfaces
- ◆ Easy to use - there is no need for terminators, device IDs, or elaborate setup

IEEE 1394 (FireWire)

- ◆ Hot pluggable - users can add or remove 1394 devices with the bus active
- ◆ Inexpensive - priced for consumer products
- ◆ Scaleable architecture - may mix 100, 200, and 400 Mbps devices on a bus
- ◆ Flexible topology - support of daisy chaining and branching for true peer-to-peer communication
- ◆ Non-proprietary - there is no licensing problem to use for products

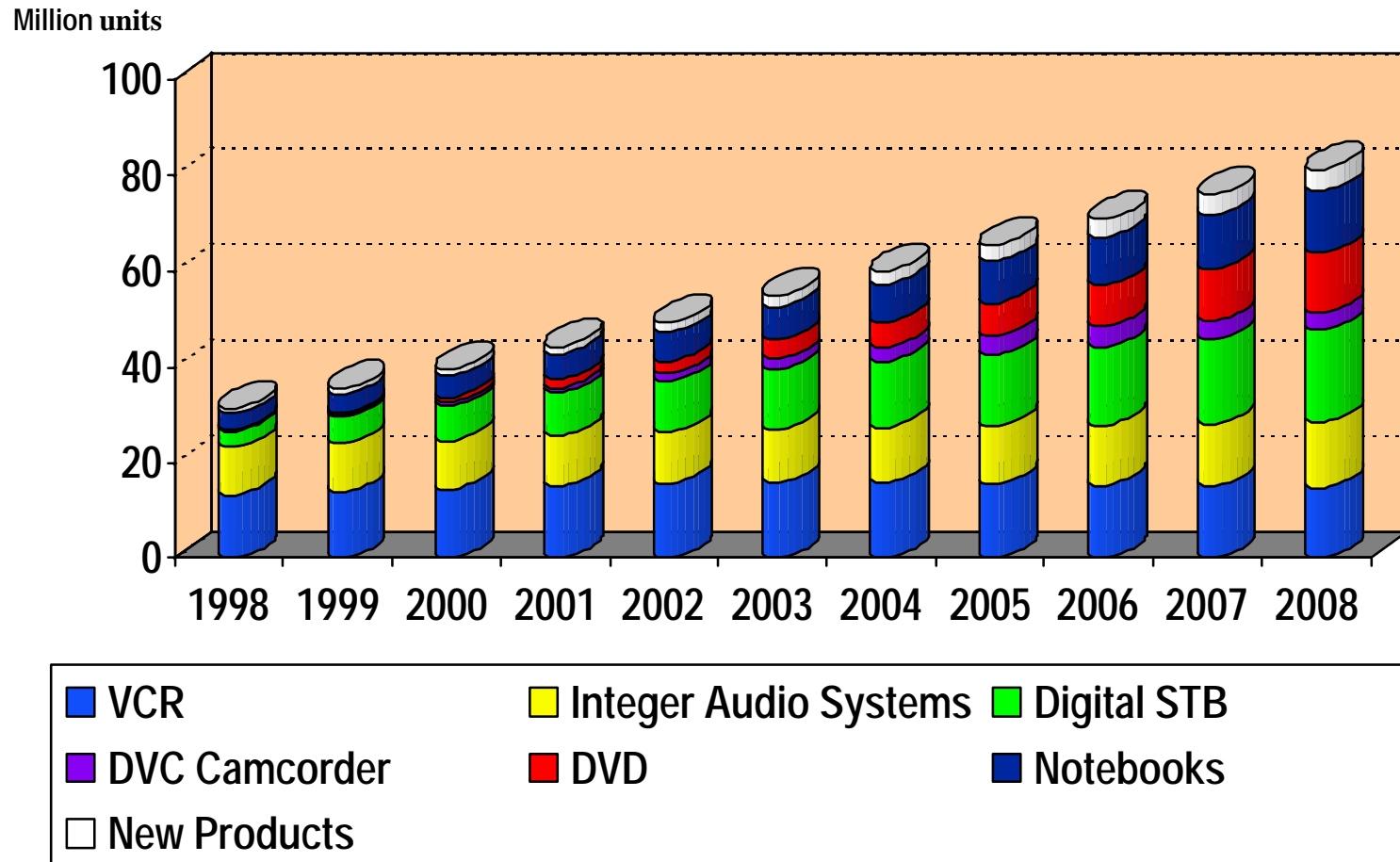
IEEE 1394 Data Transfer

- ◆ There are two types of IEEE 1394 data transfer:
- ◆ Asynchronous
 - Data is sent in one direction followed by acknowledgment to the requestor.
- ◆ Isochronous
 - Data channels provide guaranteed data transport at a pre-determined rate
 - This is especially important for time-critical multimedia data where just-in-time delivery eliminates the need for costly buffering

Multimedia Bandwidth Requirements

- ◆ High Quality Video
 - Digital Data = (30 frames / second) (640 x 480 Pixels) (24-bit color / pixel) = 221 Mbps
- ◆ Reduced Quality Video
 - Digital Data = (15 frames / second) (320 x 240 Pixels) (16-bit color / pixels) = 18 Mbps
- ◆ High Quality Audio
 - Digital Data = (44,100 audio samples / sec) (16-bit audio samples) (2 audio channels for stereo) = 1.4 Mbps
- ◆ Reduced Quality Audio
 - Digital Data = (11,050 audio samples / sec) (8-bit audio samples) (1 audio channel for monaural) = 0.1 Mbps

IEEE 1394 Usage & Growth



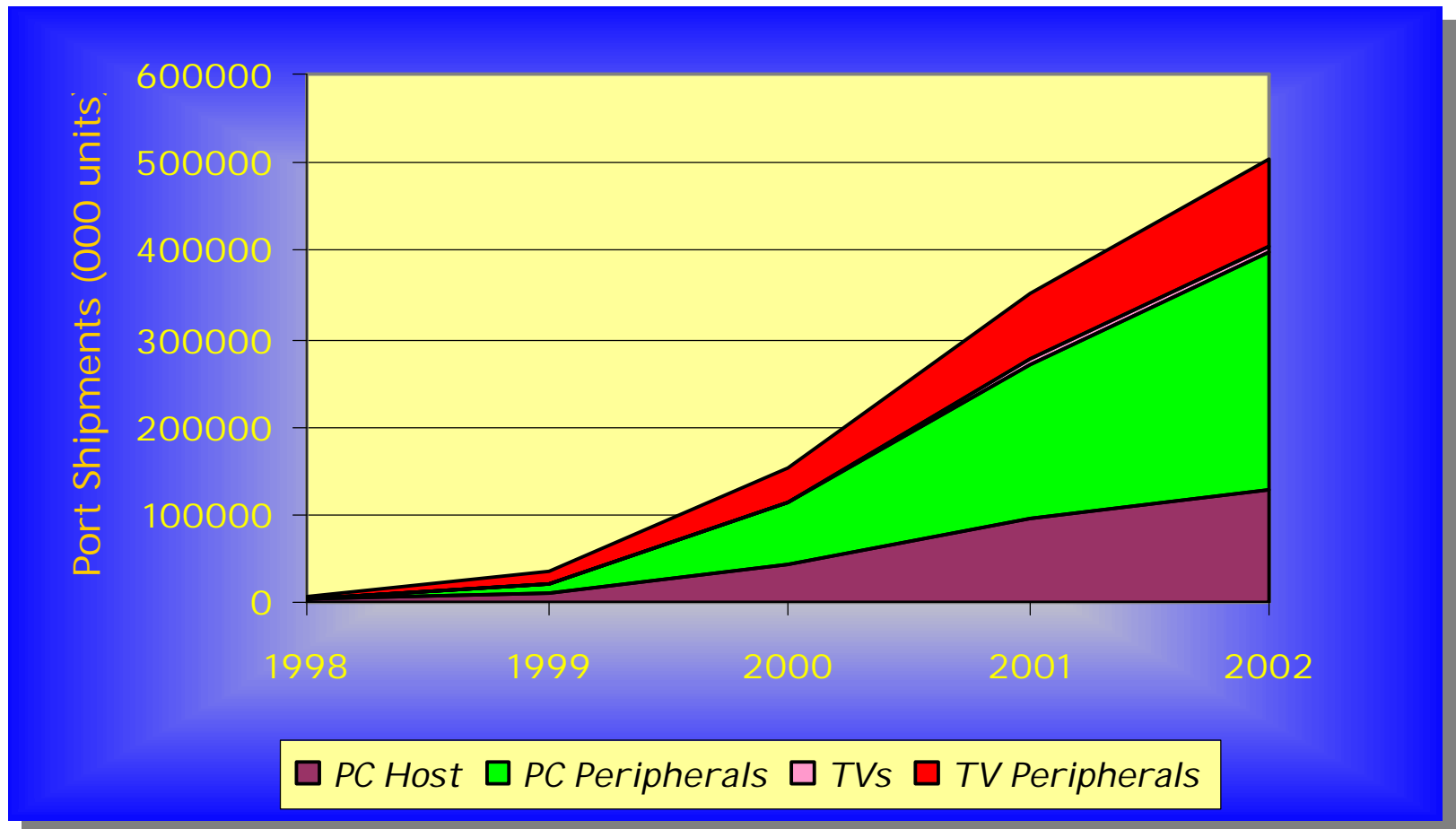
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1394 Market Forecast



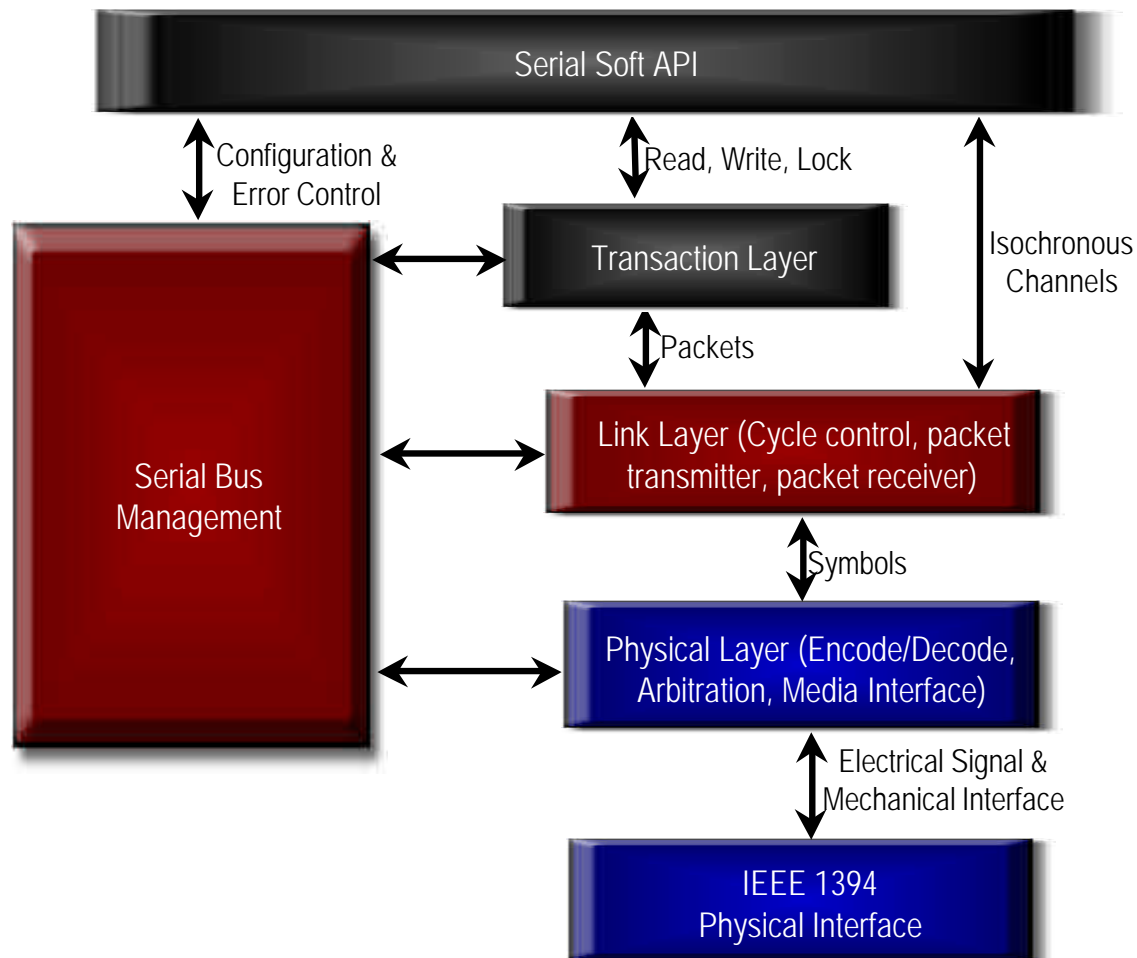
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IEEE 1394 Protocol Stack



IEEE 1394 Operation

- ◆ To transmit data, a 1394 device first requests control of the physical layer
- ◆ With asynchronous transport, the address of both the sender and the receiver is transmitted followed by the actual packet data
- ◆ Once the receiver accepts the packet, a packet acknowledgment is returned to the original sender
- ◆ To improve throughput, the sender may continue transmission until 64 transactions are outstanding

IEEE 1394 Operation

- ◆ With isochronous transport, the sender requests an isochronous channel with a specific bandwidth
- ◆ Isochronous channel IDs are transmitted followed by the packet data
- ◆ The receiver monitors the incoming data's channel ID and accepts only data with the specified ID

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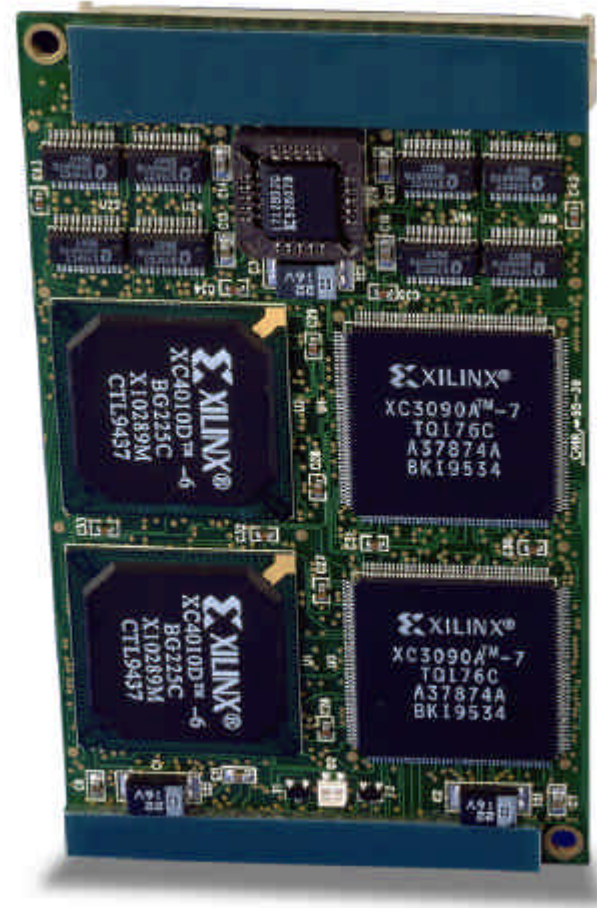
Introduction to Xilinx

Where Does Xilinx Fit In the Electronics Industry

Key components of an electronics system:

- ◆ Processor
- ◆ Memory
- ◆ *Logic*

Xilinx is the Leading Innovator of Complete Programmable Logic Solutions



Strategic Business Model Ensures Focus

- ◆ “Fabless” strategy
 - Leading edge IC process technology
 - Wafer capacity at competitive prices
 - Fastest, lowest cost, densest parts
- ◆ Independent sales organization (Reps & Distributors)
 - Sales is a variable cost
 - Permits greater reach—over 20,000 Customers
 - Over 10,000 “Feet On The Street”
- ◆ Focus on key strengths
 - Product design
 - Marketing
 - Applications & Technical Support

Xilinx Product Portfolio

Advanced Products Group



High Performance
High Density

General Products Division



High Volume
Low Cost

CPLD Division



Low Power
Low Cost

Software Solutions



IP Center



Alliance
CORE



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Xilinx - Leader in Core Solutions

Base Level Functions	<ul style="list-style-type: none"> - 82xx, UARTs, DMA - 66MHz DRAM, SDRAM I/F - Memory blocks - 29xx - Proprietary RISC Processors 	<ul style="list-style-type: none"> - 8051 - IEEE 1284 - 200MHz SDRAM I/F - SGRAM, ZBTRAM I/F - Multi-channel DMA 	<ul style="list-style-type: none"> - JAVA - Adv 32-bit RISC Processors - 64-bit RISC - DDR/QDR RAM - 622 Mbps LVDS 	<ul style="list-style-type: none"> - 128-bit processors - Reconfigurable processors
Communication & Networking	<ul style="list-style-type: none"> - Cell assem/delin - CRC - T1 Framer - HDLC - Reed-Solomon - Viterbi - UTOPIA 	<ul style="list-style-type: none"> - 10/100 Ethernet - ATM/IP Over SONET - Cell scram/descram - SONET OC3/12 - ADPCM - IMA 	<ul style="list-style-type: none"> - Network processors - 1Gb Ethernet - SONET OC48/192 - CELP - VoIP - ADSL, HDSL, xDSL - UMTS, wCDMA 	<ul style="list-style-type: none"> - Software Radio - Modems - Neural networking - Emerging Telecom and Networking Standards
DSP Functions	<ul style="list-style-type: none"> - Basic Math - Correlators - Filters: FIR, Comb - Multipliers - FFT, DFT - Sin/Cos 	<ul style="list-style-type: none"> - DCT - Adaptive filters - Cordic - DES - DES - Divider - NCO - Satellite decoders 	<ul style="list-style-type: none"> - MP3 - QAM - JPEG - Speech Recognition - DSP Processor I/Fs - Wavelet 	<ul style="list-style-type: none"> - MPEG - DSP Functions > 200 MSPS - Programmable DSP Engines
Standard Bus Interfaces	<ul style="list-style-type: none"> - CAN - ISA PnP - I2C - PCI 32-bit - PCMCIA 	<ul style="list-style-type: none"> - CardBus - FireWire - PCI 64-bit/66MHz - Compact PCI Hot-Swap - PC104 - VME 	<ul style="list-style-type: none"> - AGP - PCI-X 133MHz 	<ul style="list-style-type: none"> - InfiniBand - Emerging High-Speed Standard Interfaces

1998

1999

2000

2002

2004

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Introducing the Spartan-II FPGA

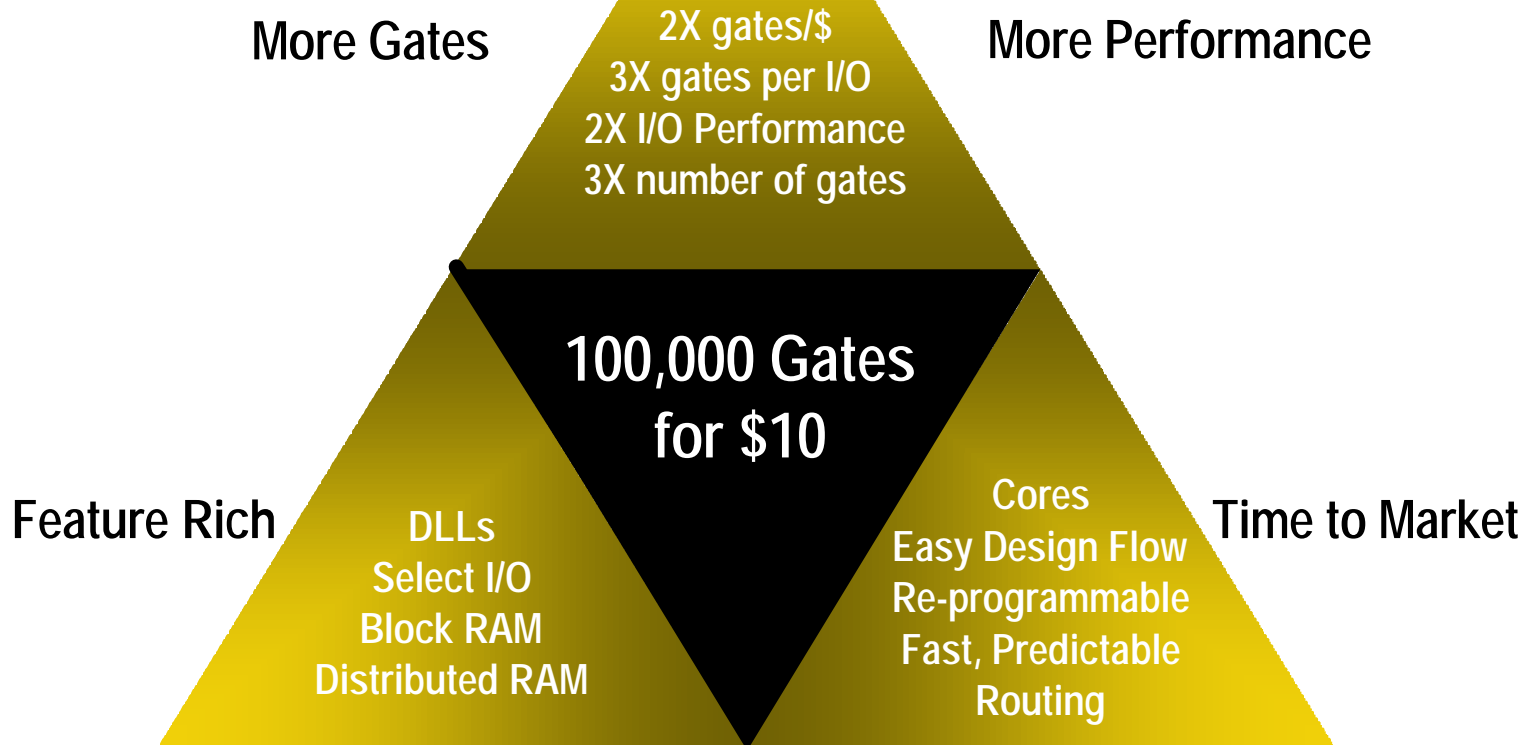


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Spartan-II: Extending the Spartan Series



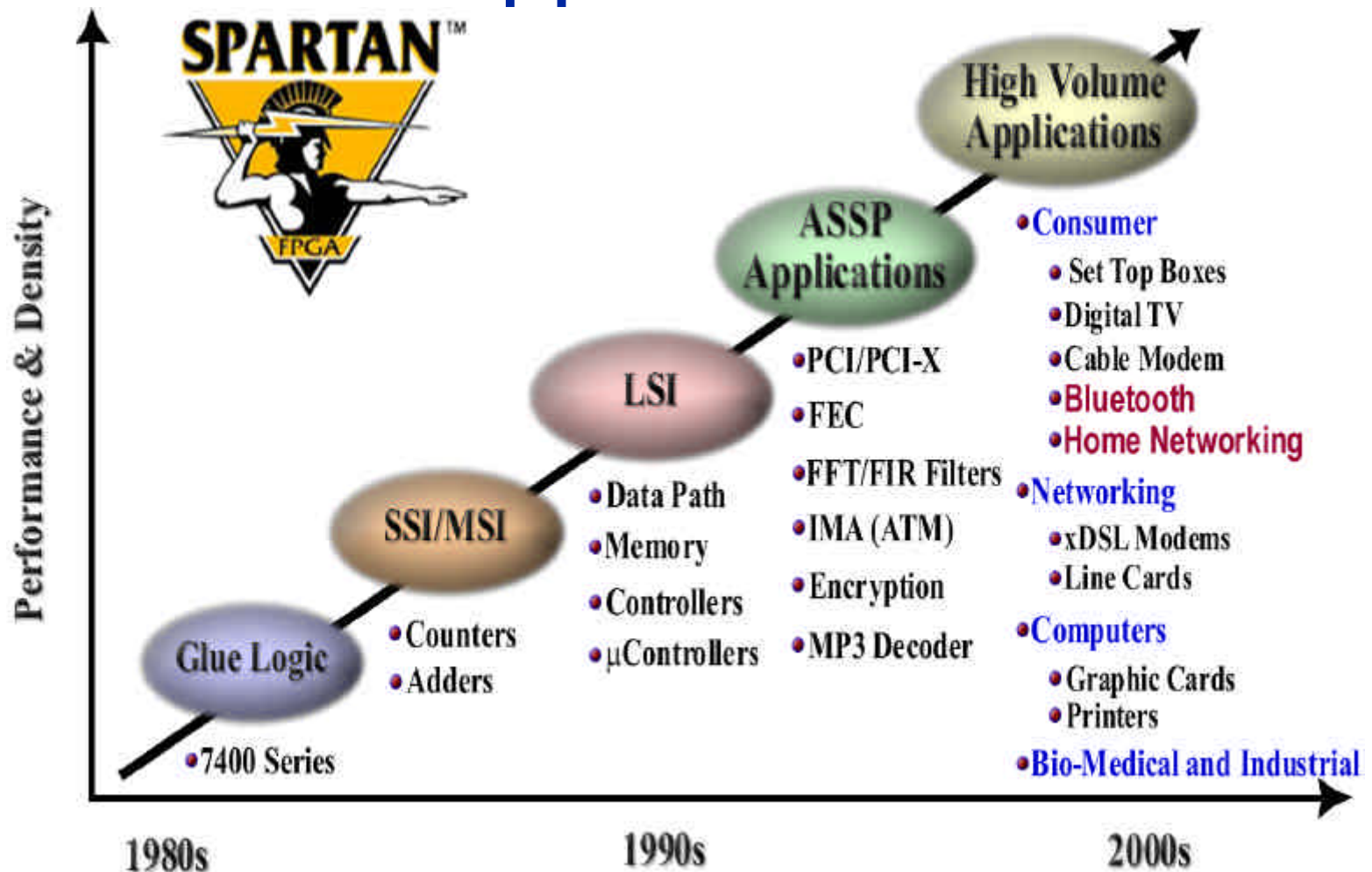
Programmable ASIC/ASSP Replacement!

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FPGA Application Trends



Programmable ASIC/ASSP Replacement!

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Spartan-II - Architecture Overview

Delay Locked Loop (DLL)

Clock Management:
Multiply clock
Divide clock
De-skew clock

Configurable Logic Blocks (CLB)

Configurable Logic Block Array and Distributed RAM

Block Memory

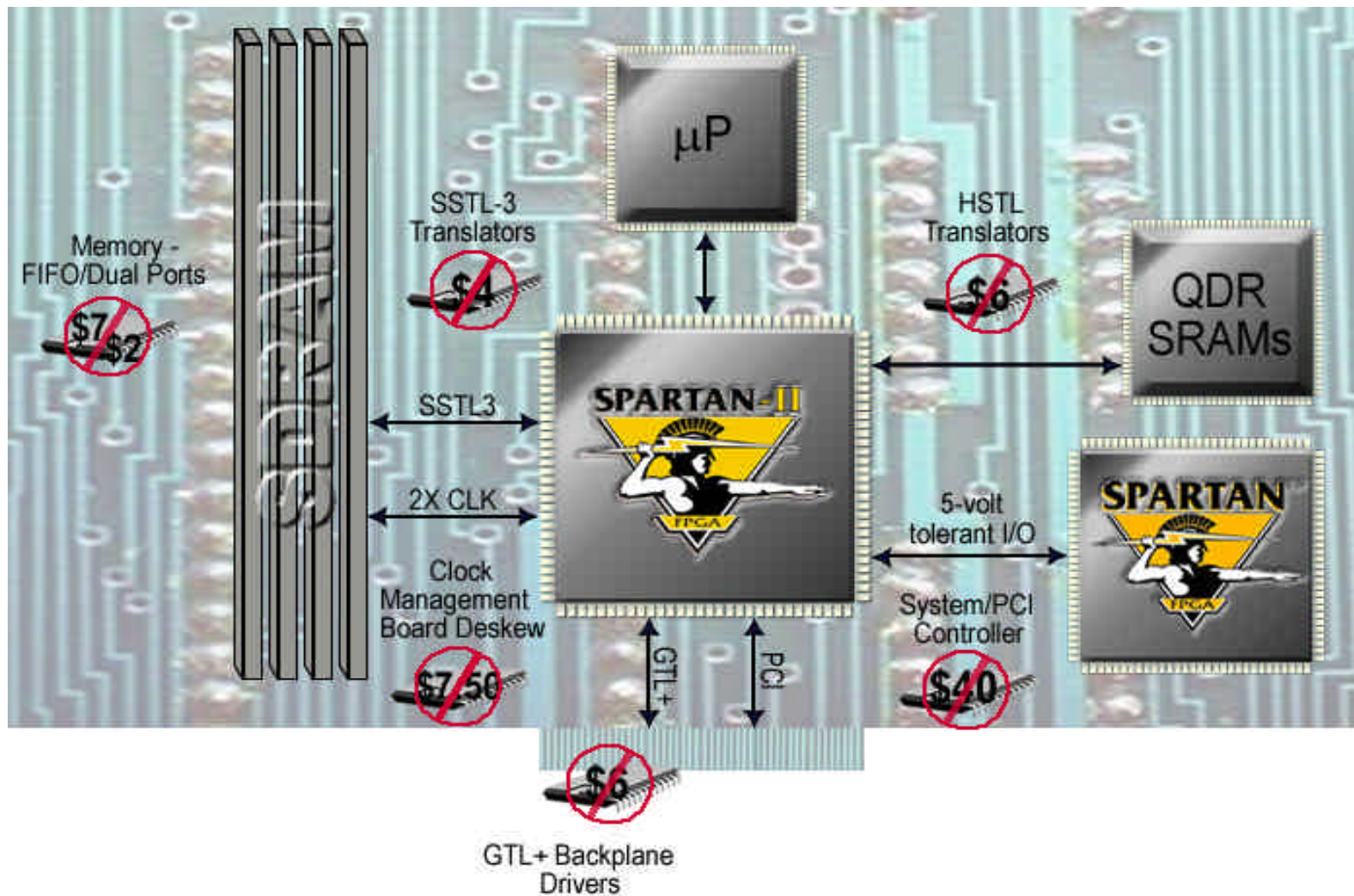
True Dual-Port™
4K bit RAM
4Kx1
2Kx2
1Kx4
512x8
256x16

Select I/O™ Technology

Chip to Backplane
PCI 33MHz 3.3V
PCI 33MHz 5.0V
PCI 66MHz 3.3V
GTL, GTL+, AGP
Chip to Memory
HSTL-I, HSTL-III
HSTL-IV
SSTL3-I, SSTL3-II
SSTL2-I, SSTL2-II
CTT
Chip to Chip
LVTTL, LVCMOS

"The Spartan-II family, in our opinion, may be the closest that any FPGA has come to being at a low-enough price to compete against an ASIC"
--Dan Niles, Industry Analyst

Spartan-II - System Integration



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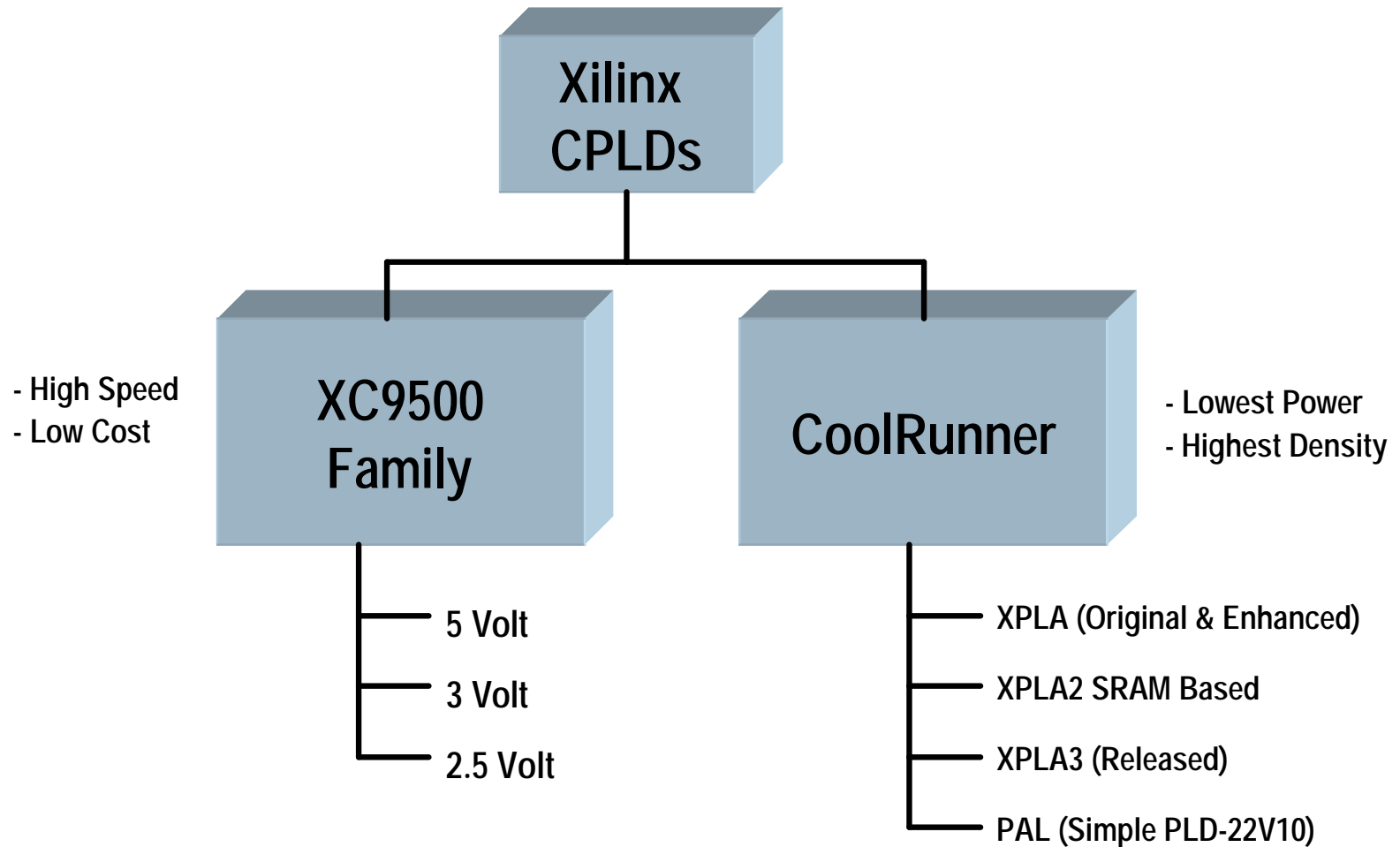
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 **XILINX**®

Spartan-II Core Support

- ◆ On-chip memory & storage
 - Distributed, BlockRAM, FIFOs
- ◆ Bus products
 - PCI (64- & 32-bit, 33/66MHz), Arbiter, CAN bus interface
- ◆ DSP Functions (FIR filter)
- ◆ Error correction
 - Reed-Solomon, Viterbi
- ◆ Encryption (DES & triple DES)
- ◆ Microprocessor
 - ARC 32-bit configurable RISC, 8-bit 8051 microcontroller
- ◆ Memory controllers (10+)
 - SDRAM, QDR SRAM
- ◆ Communications
 - ATM (IMA, UTOPIA), Fast Ethernet (MAC)
- ◆ Telecom
 - CDMA matched filter, HDLC, DVB satellite, ADPCM speech codec
- ◆ Video & image processing
 - JPEG codec, DCT/IDCT, color space converter
- ◆ UARTs

Xilinx CPLD Families



Spartan-II End Applications

- ◆ Consumer
 - Set Top Boxes/Digital VCRs
 - DTV/HDTV
 - Digital Modems
 - xDSL, Cable, Satellite
 - Home Networking products
 - Bluetooth appliances
 - LCD/Flat-Panel Displays
- ◆ Networking
 - Telecom linecards
 - DSLAMs
 - LAN Hubs/Switches
 - SOHO Routers
 - Cellular base stations
- ◆ Computer/Storage
 - Printer/Scanner
 - Multi-function office equipment
 - Storage devices
 - Home servers
 - Audio/Video add-in cards
- ◆ Industrial/Medical
 - Medical Imaging
 - Industrial automation/control
 - Data acquisition
 - Video capture/editing
 - Automated test equipment
 - Automotive Info-tainment systems

CoolRunner Technology

- ◆ Full density range 32 to 960 macrocells
- ◆ World's only TotalCMOS CPLD
 - Bipolar style sense amps eliminated
 - Virtually no static power dissipation
- ◆ Advanced PLA Architecture
 - Product term sharing (no redundant logic)
 - No wasted product terms
- ◆ 3.3v and 5.0v devices
- ◆ ISP/JTAG compatible & full software support

The CoolRunner Advantage



- ◆ Industry's lowest power CPLDs
 - Standby current $< 100\mu\text{A}$
 - High speed TPD = 6 ns
 - Revolutionary XPLA architecture
 - Exceptional routability & pin-locking
 - Fast, predictable timing
 - Small form factor packaging
 - New 0.5mm 56-pin MicroBGA

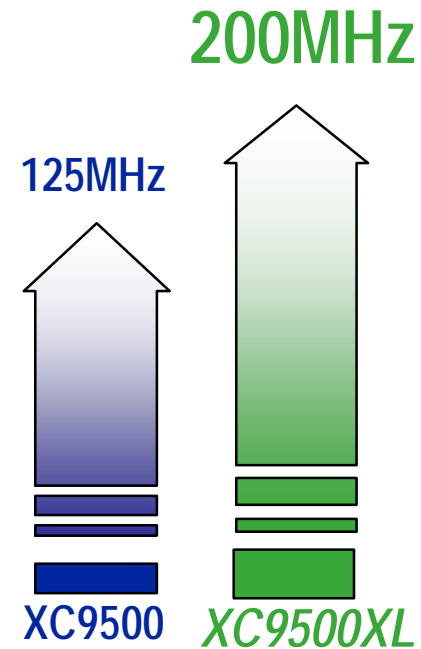


- ◆ No Speed / Power tradeoffs in scaling
 - Can build very large / very fast devices
 - 960 macrocell device @ 7.5 nsec t_{PD}



XC9500XL Key Features

- ◆ High performance
 - $t_{PD} = 5ns$, $f_{SYS} = 178MHz$
- ◆ 36 to 288 macrocell densities
- ◆ Lowest price, best value CPLD
- ◆ Highest programming reliability
- ◆ Most complete IEEE 1149.1 JTAG
- ◆ Space-efficient packaging, including chip scale pkg.



Lowest Price
Per Macrocell

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 XILINX®

XC9500XL/XV System Features

- ◆ I/O Flexibility
 - XL:5V tolerant; direct interface to 3.3V & 2.5V
 - XV:5V tolerant; direct interface to 3.3V, 2.5V & 1.8V
- ◆ Input hysteresis on all pins
- ◆ User programmable grounds
- ◆ Bus hold circuitry for simple bus interface
- ◆ Easy ATE integration for ISP & JTAG
 - Fast, concurrent programming times



System Block Diagrams for 1394 Solutions

Block Diagram Template / Index



Xilinx Solution



Or



Peripheral Components



Memory



Mixed Signal / RF / Analog Component

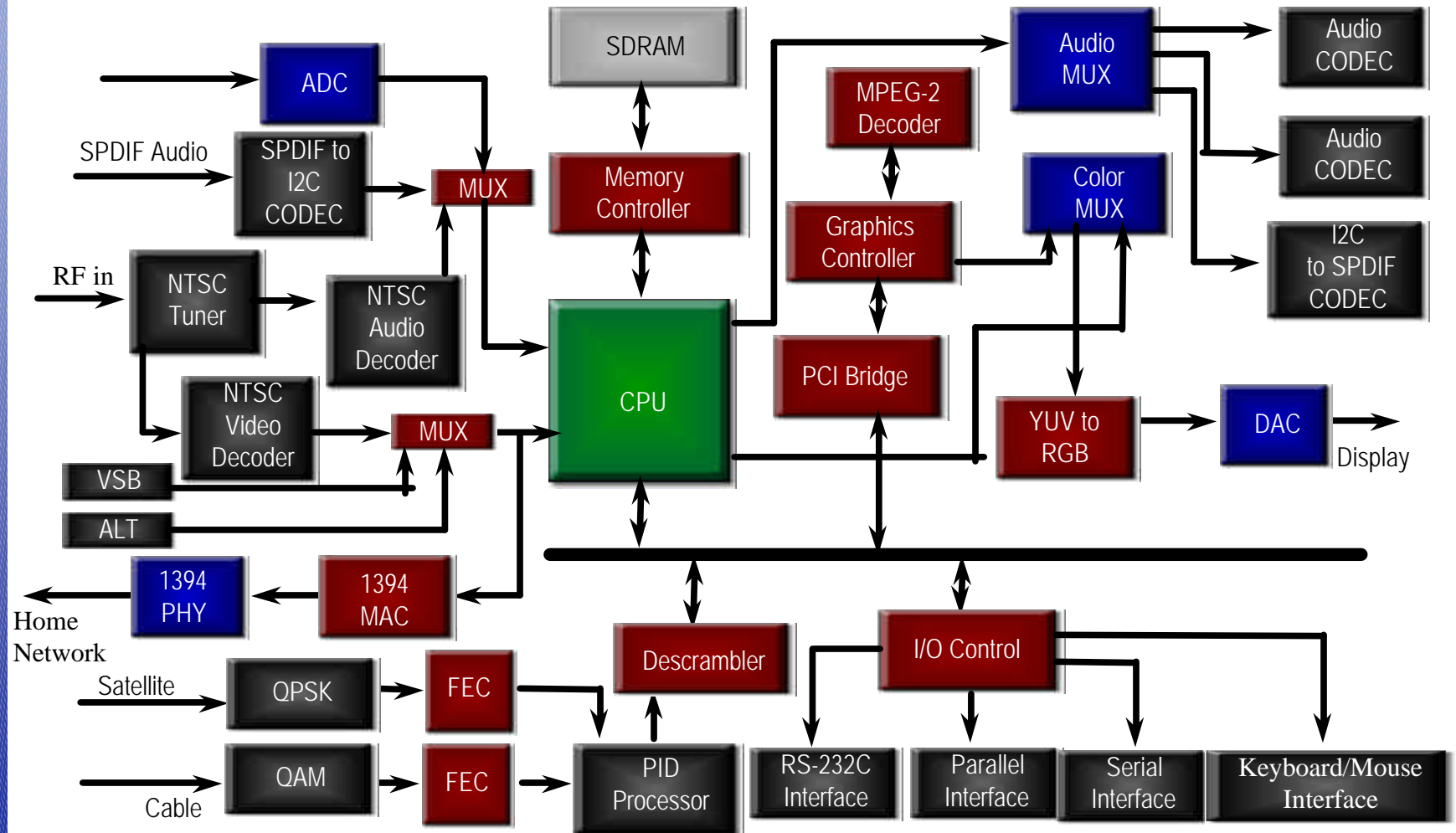


mP/ mC



Embedded Chip/ ASSP

HA Vi-based Digital TV

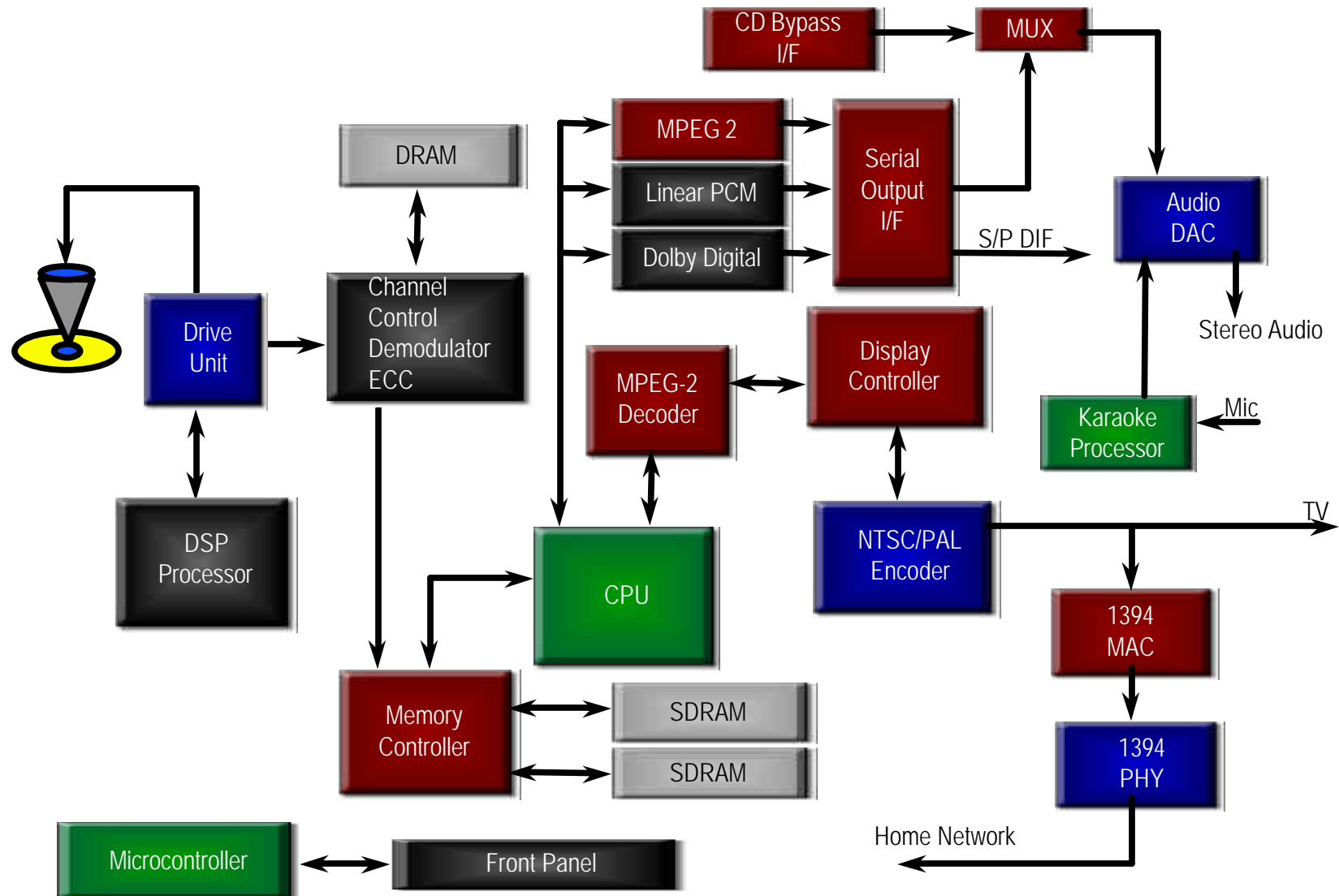


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HA Vi-based DVD Player

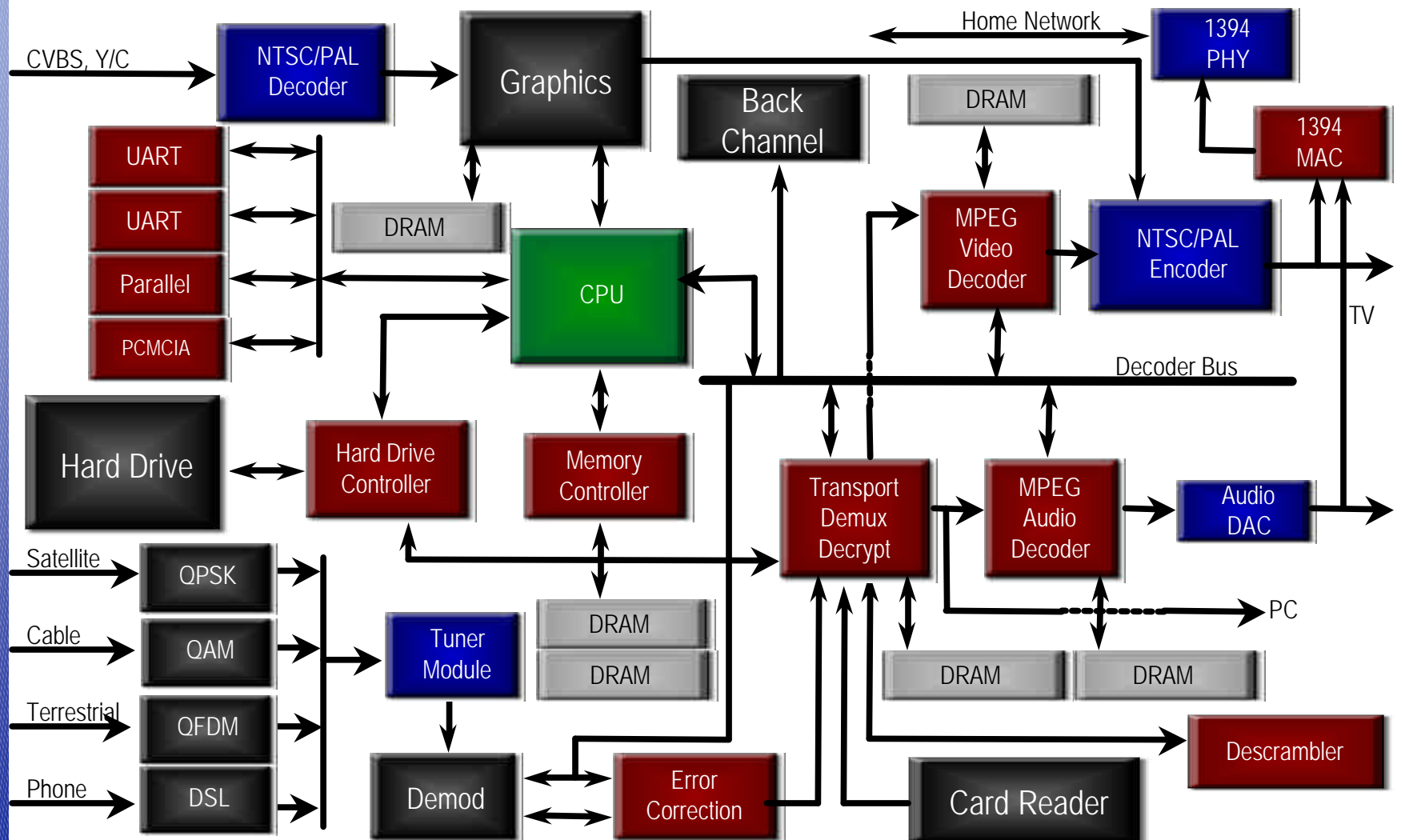


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HA Vi-based Set Top Box

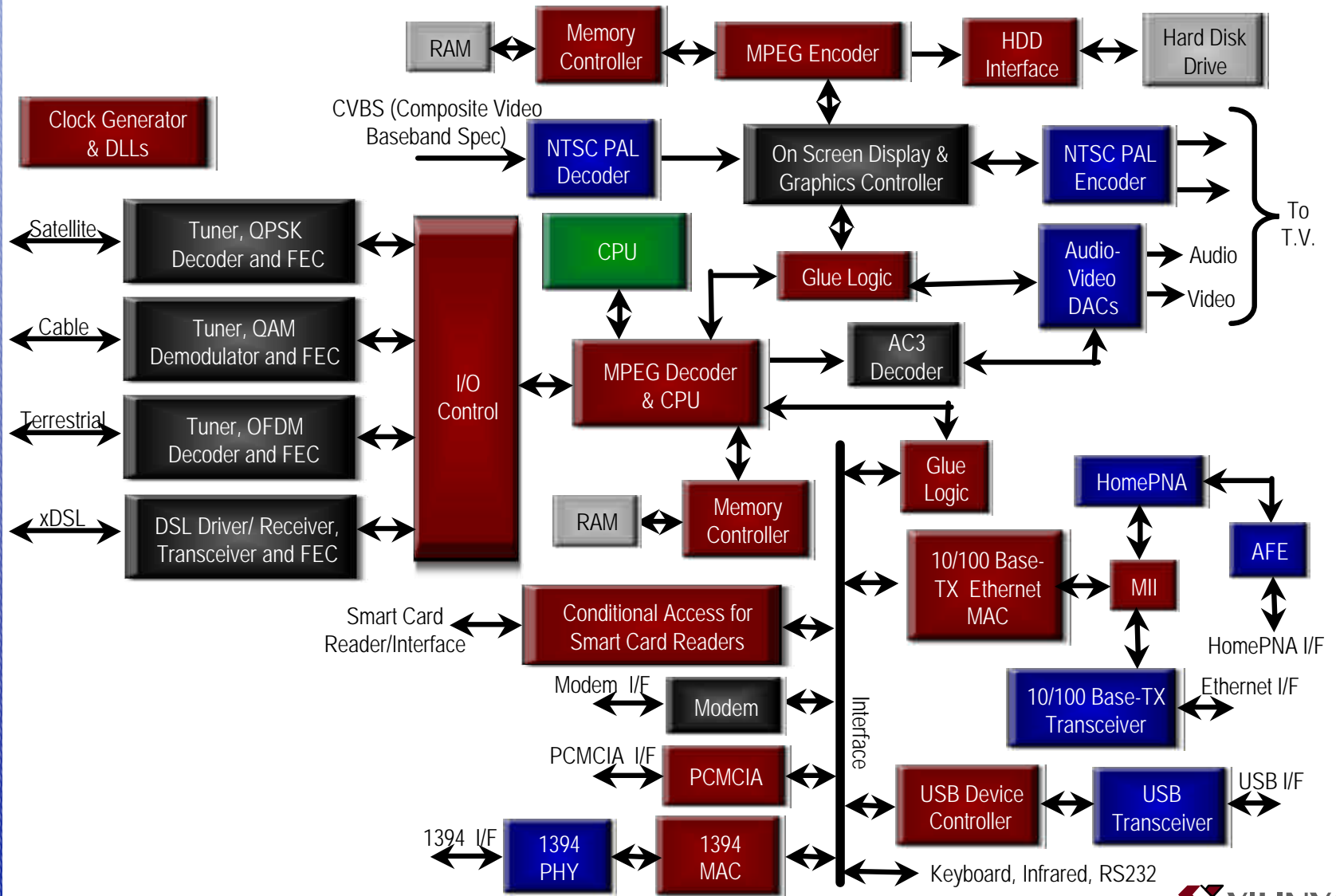


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HA Vi-based DVCR Set-Top Box

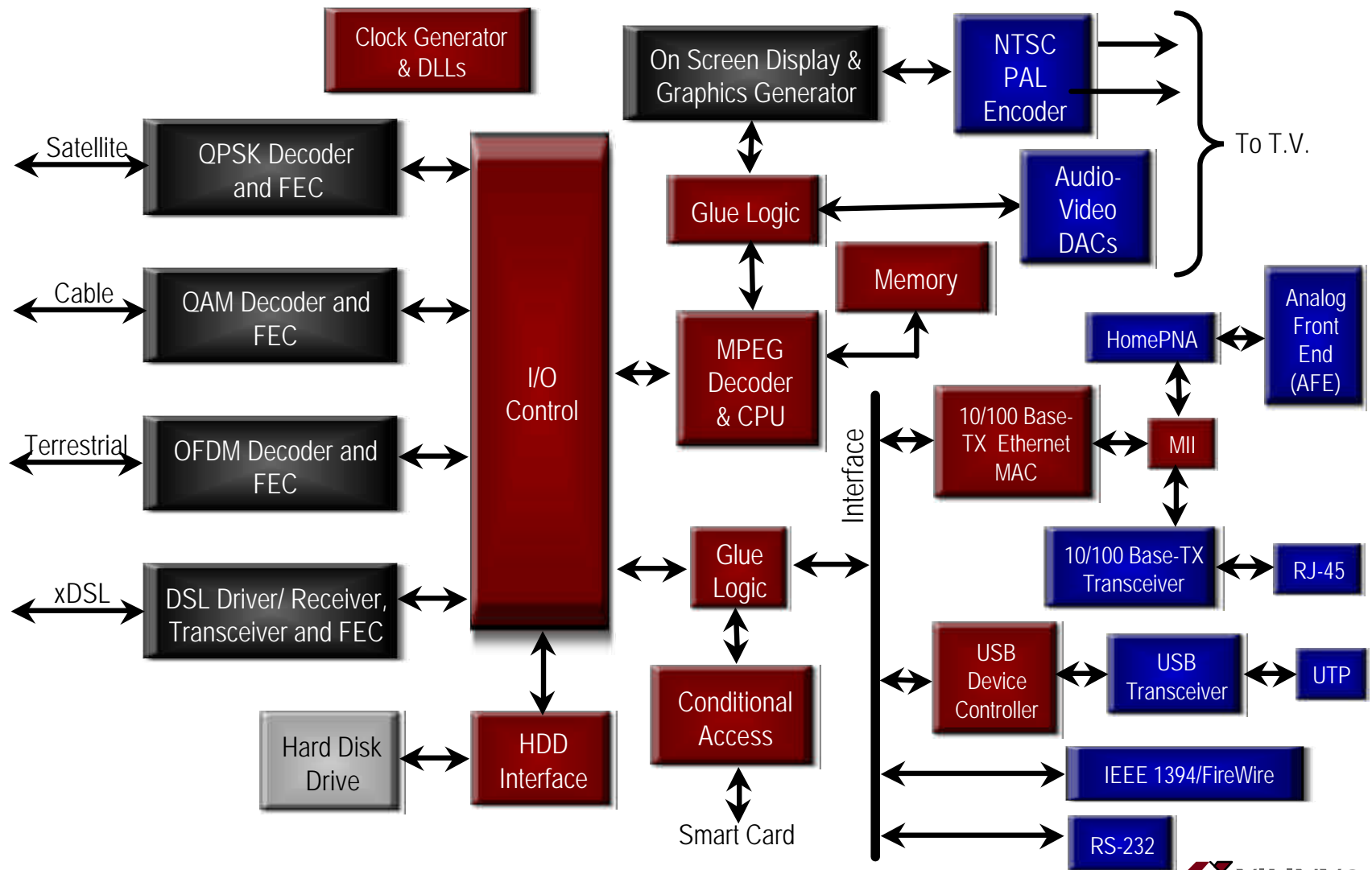


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HA Vi-based Residential Gateway (STB)

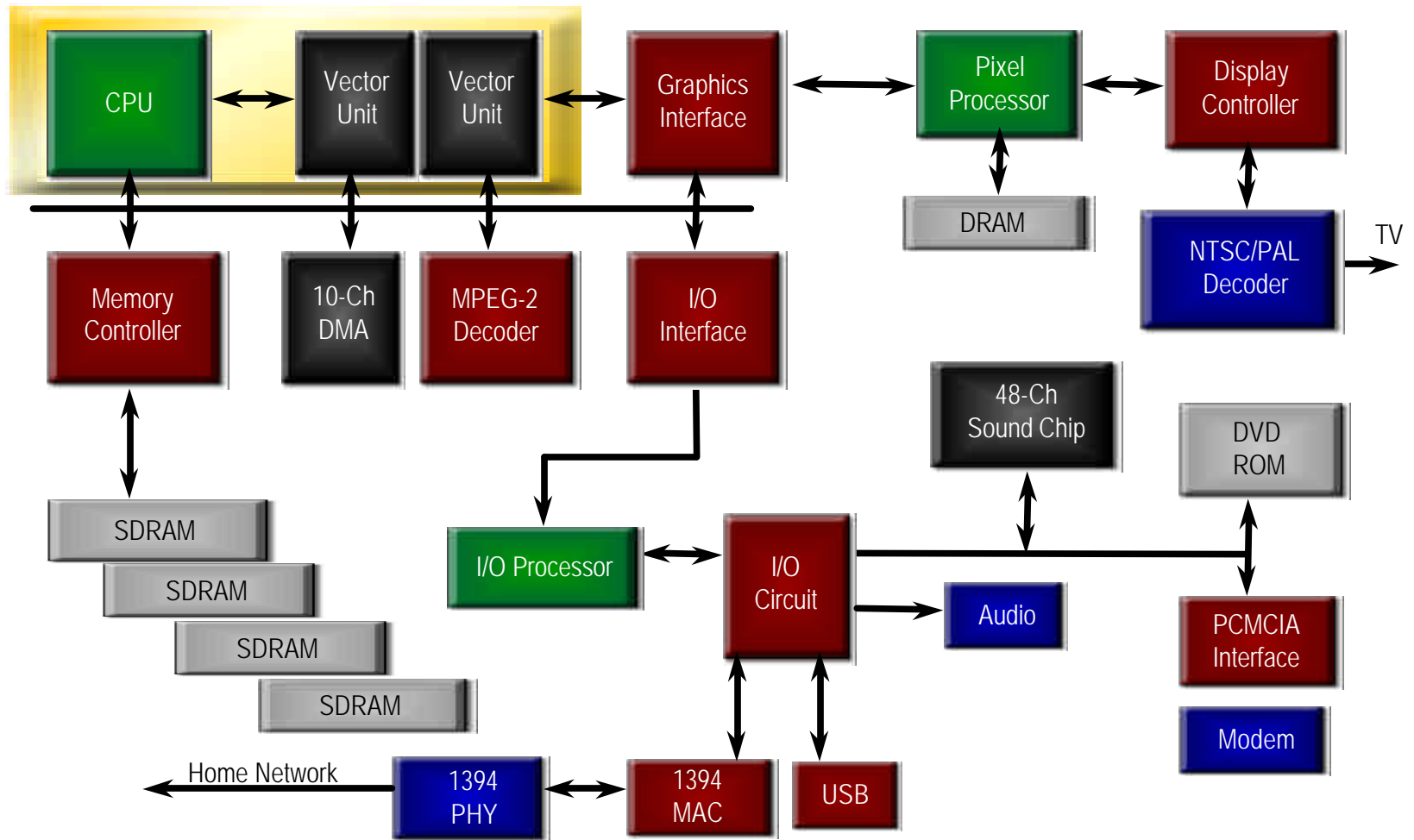


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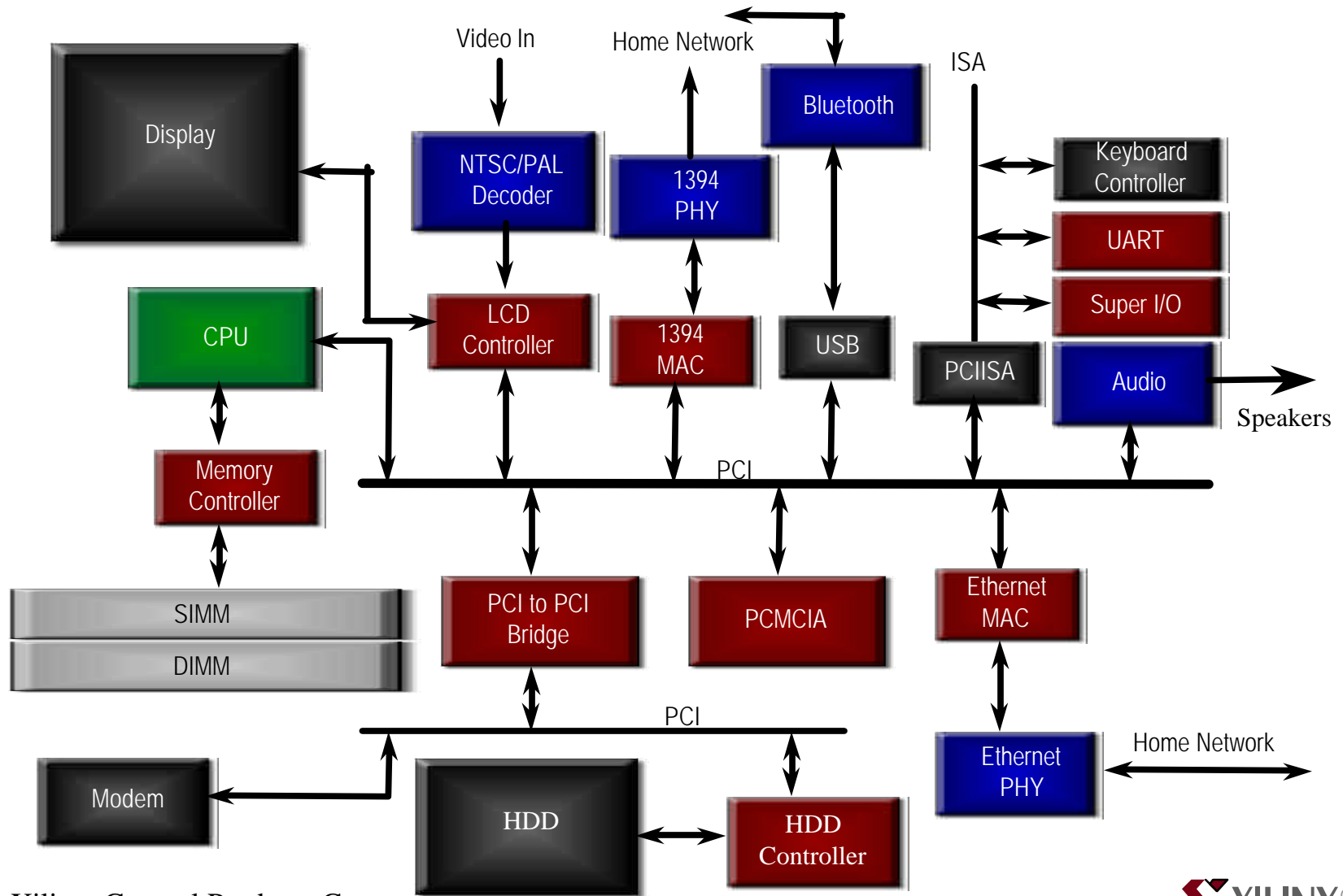
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HA Vi-based Gaming Station



HA Vi-based Desktop PC

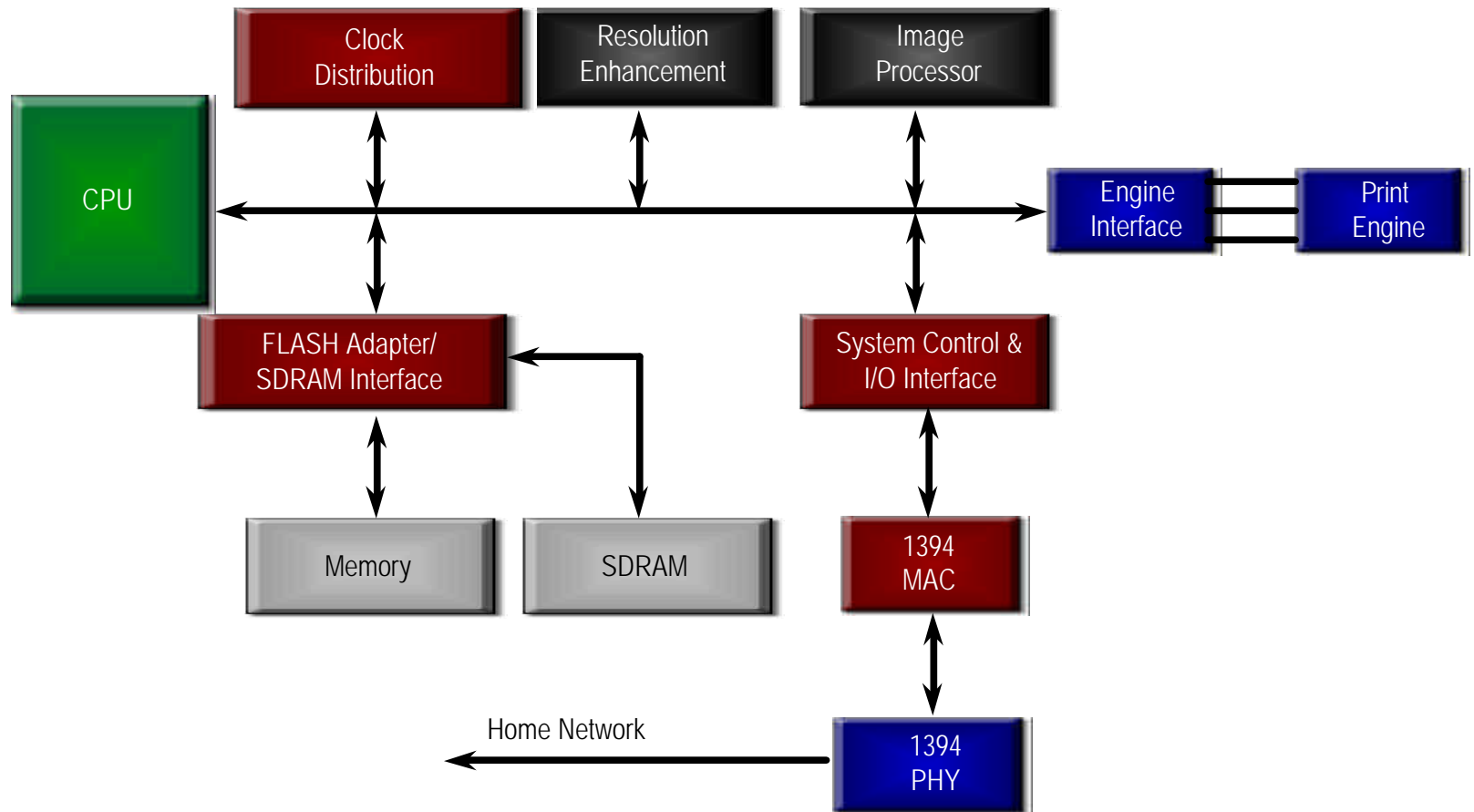


Xilinx General Products Group

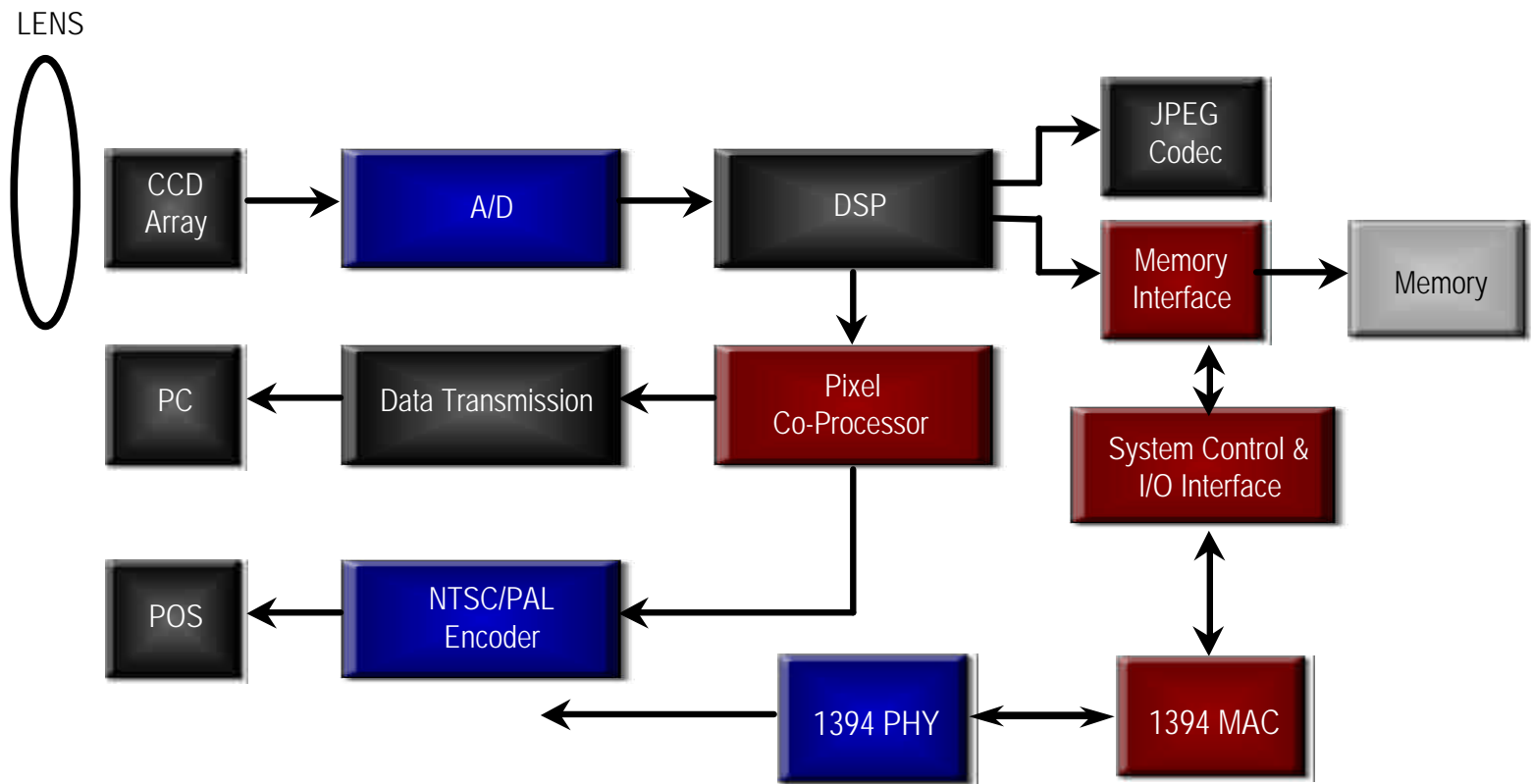
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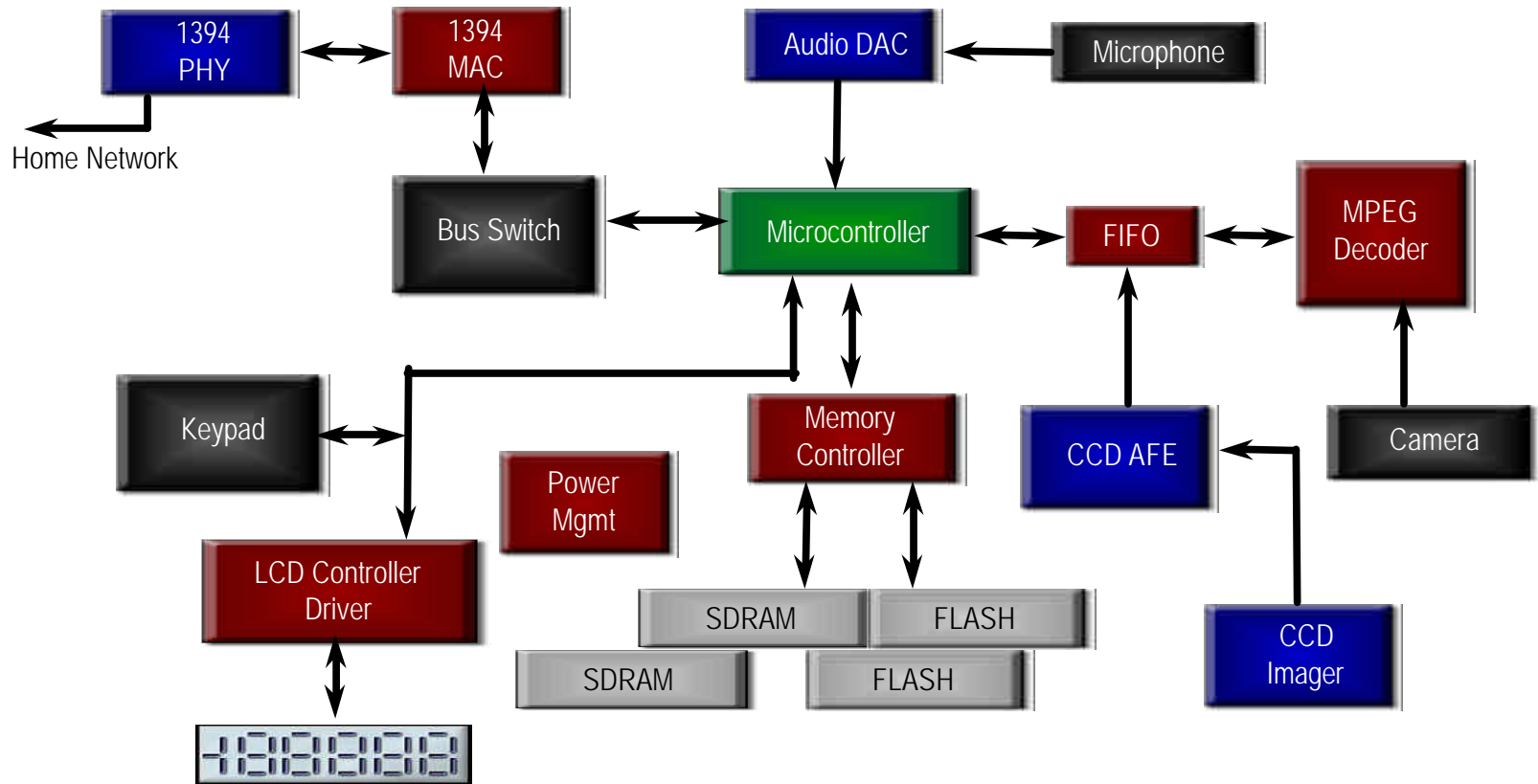
HA Vi-based Printer



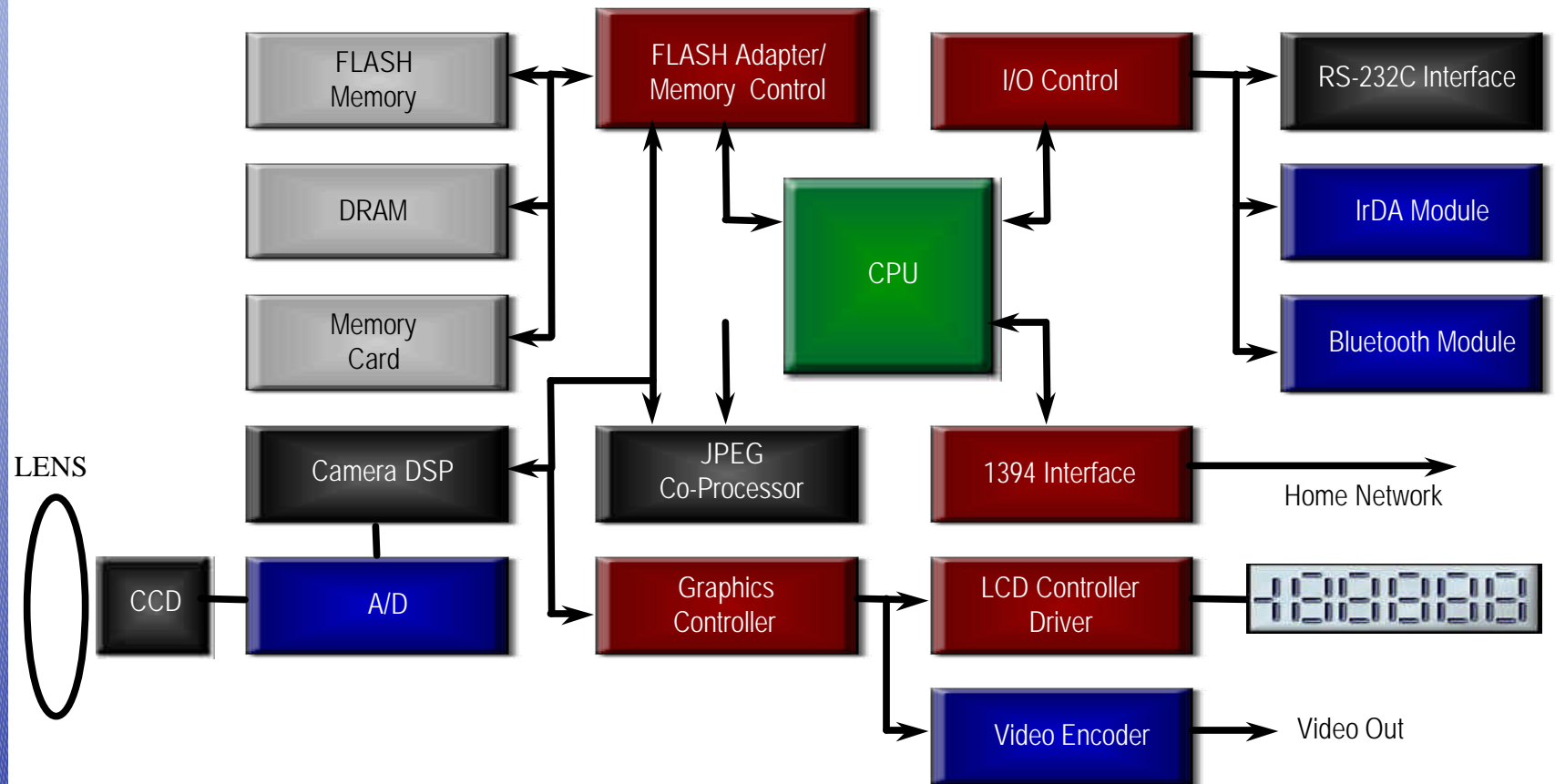
HA Vi-based Scanner



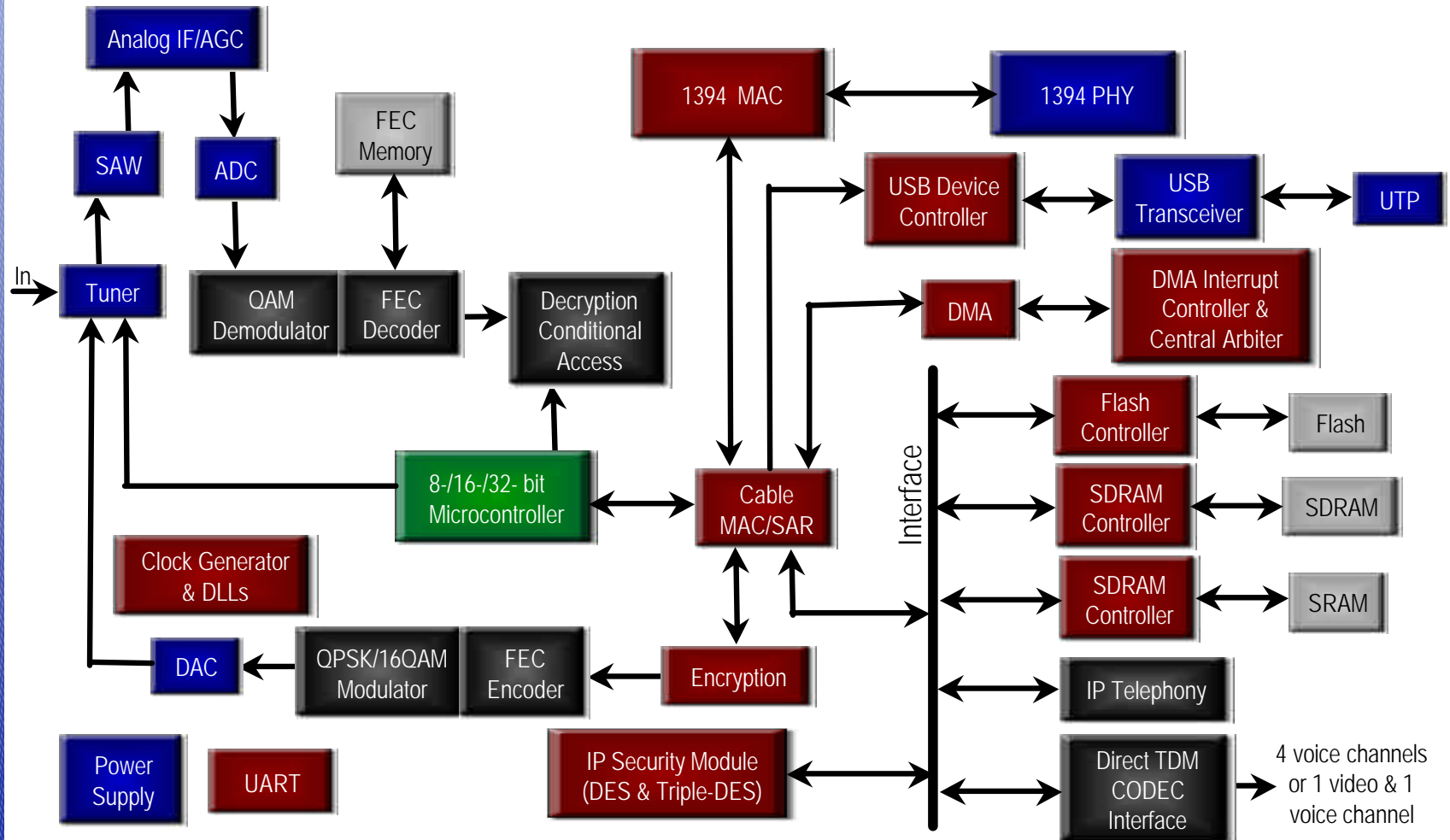
HA Vi-based Home Security



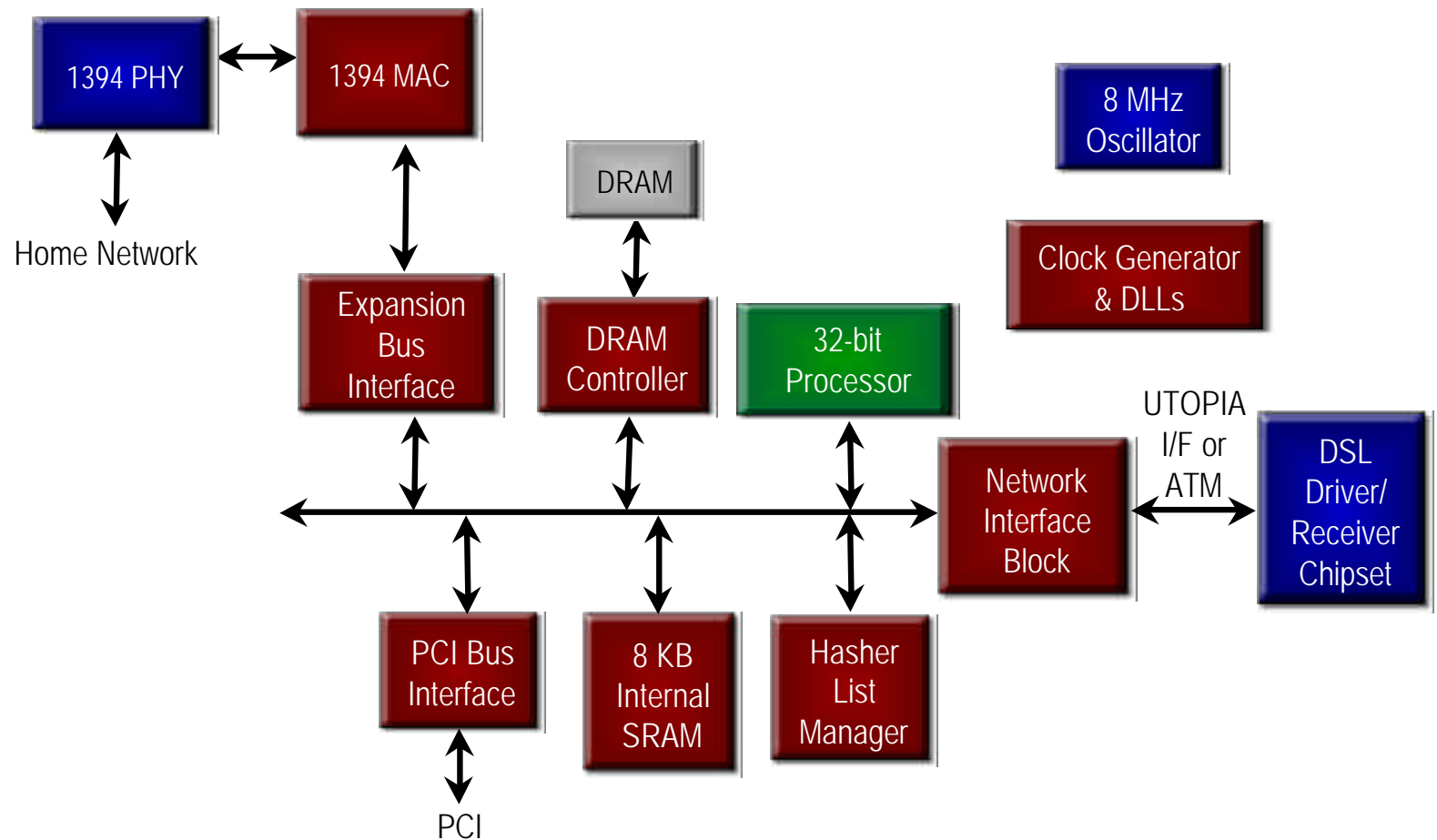
HA Vi-based Digital Camera



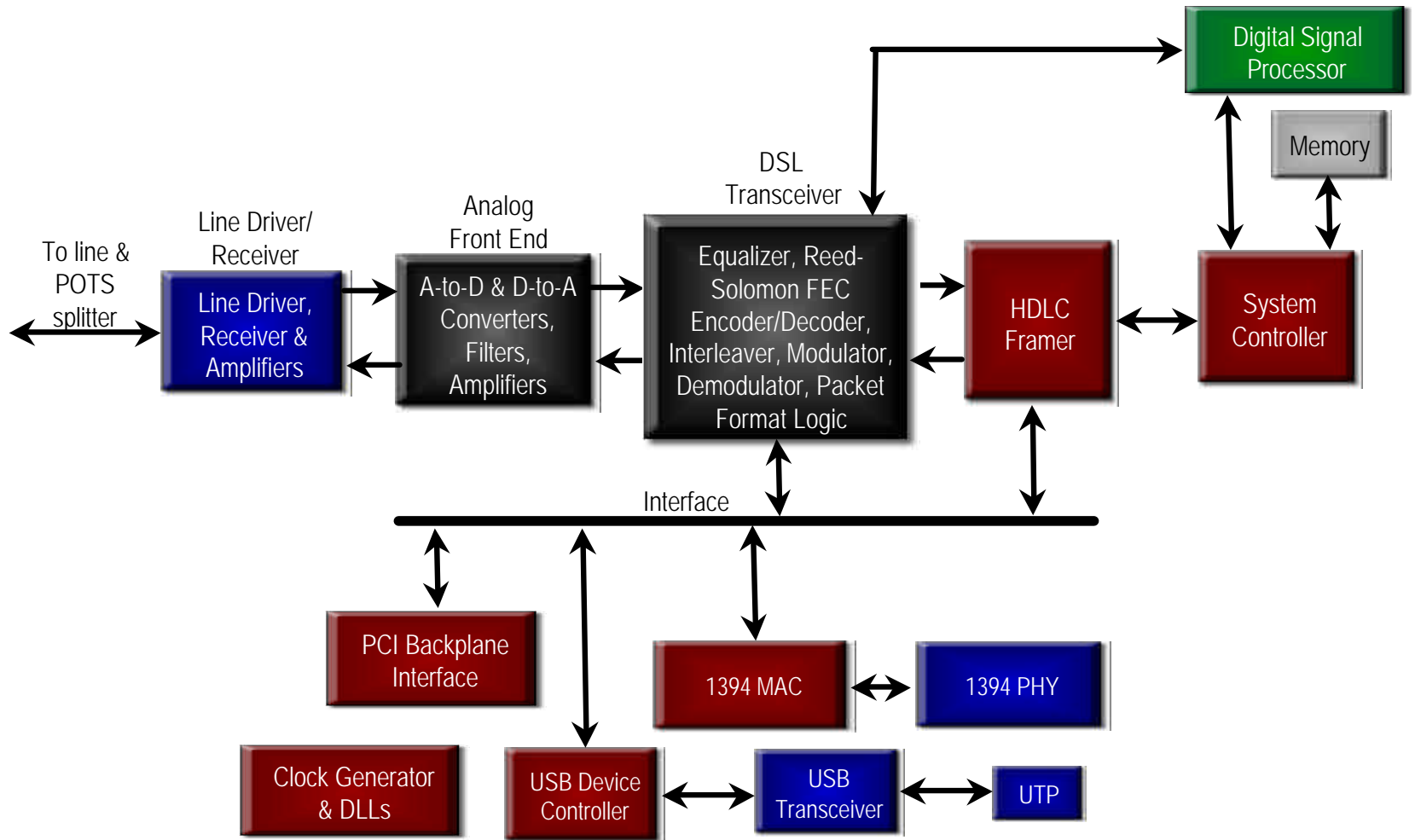
HAVi-based Cable Modem Residential Gateway



HA Vi-based DSL Modem Home Gateway



HAVi-based DSL CPE (Customer Premise Equipment)



Agenda

- ◆ Introduction
 - What is HAVi?
 - Advantages
 - Why does the world need HAVi?
- ◆ Technology
 - Requirements
 - System Model
 - Control Model
 - Device Classification
 - FAV
 - IAV
 - BAV
 - LAV
 - HAVi Compliance
 - Software Architecture
 - User Interface
 - Level 1
 - Level 2
 - Home Network Configuration
 - Interoperability
 - Level 1
 - Level 2
 - IEEE 1394(FireWire)
- ◆ Xilinx Value
- ◆ Summary

Advantages of HAVi in Home Networking

- ◆ Ensuring interoperability among devices regardless of the manufacturer
- ◆ Automatically detection of devices on the network
 - Maximize the usage of device resources
- ◆ Instant coordination of the functions of various devices
 - Each added appliance to the HAVi network is automatically registered so that other devices know what it is capable of
- ◆ Installation of applications and user interface software on each device

HAVi/1394 In Your Home

- ◆ Digital broadcasting, the Internet, digitalization of modern homes, entertainment & video appliances are driving demand for 1394-based products
- ◆ Supports data transfer rates @ 100, 200, 400 Mbps
- ◆ 1394 benefits
 - No need for terminators, device IDs, or elaborate setup
 - 1394 is Hot pluggable
 - 1394 has scaleable architecture
 - May mix 100, 200, and 400 Mbps devices on a bus
 - 1394 has flexible topology
 - Support of daisy chaining and branching without CPU

Summary

- ◆ Various HAVi-based products are being developed
 - Residential gateways: DSL, cable, satellite modem
 - Technology bridges: Ethernet-to-HAVi, HAVi-to-HomePNA, HAVi-to-wireless LANs
 - HAVi enabled information appliances: digital TV, DVD player, Internet screen phones, PCs, printers, etc.
- ◆ Spartan-II FPGAs, CoolRunner & 9500 CPLDs provide system interconnectivity in HAVi/1394/Firewire based products