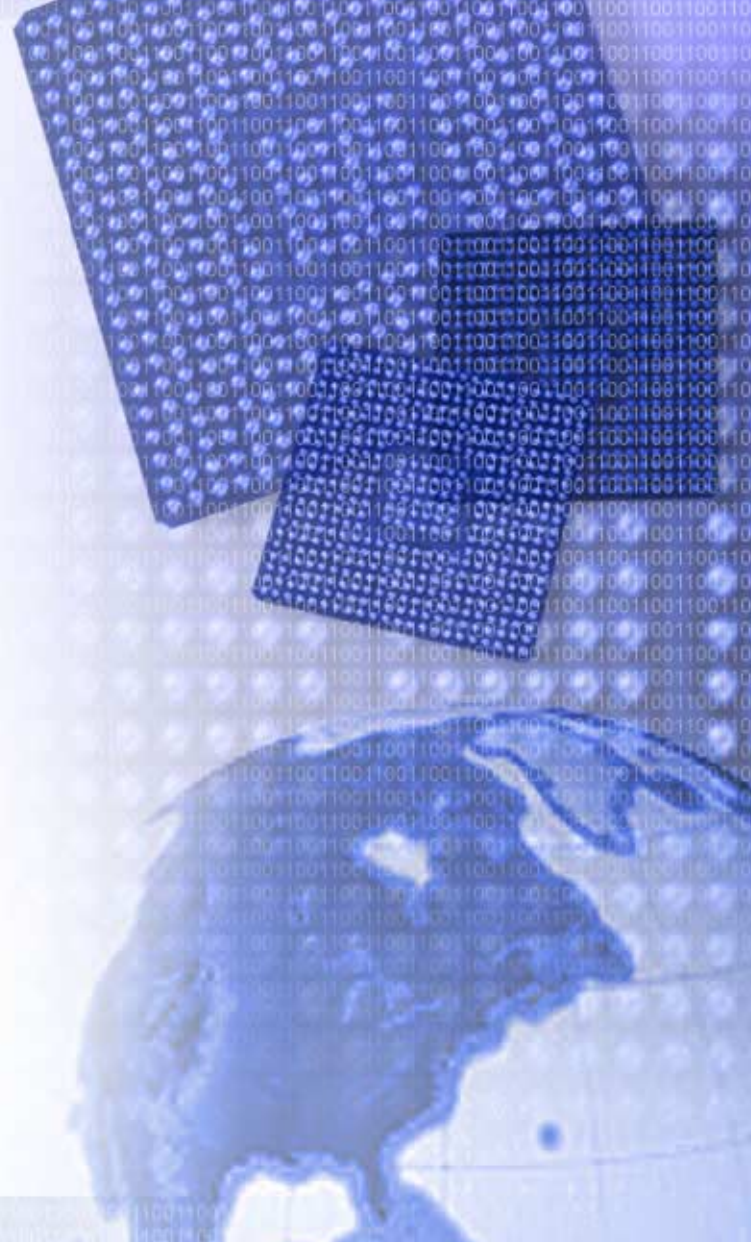




USB

Universal Serial Bus



USB – Universal Serial Bus



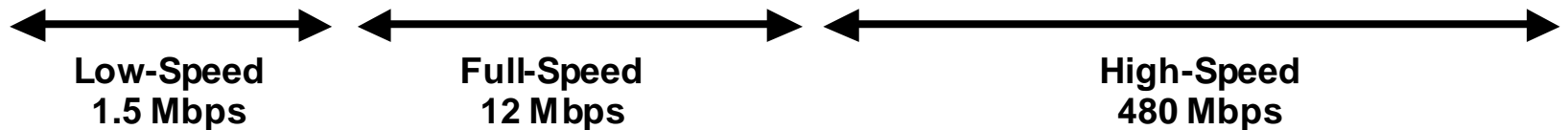
Mice
Keyboards
Joysticks
Gamepads



Modems
Digital Cameras
Printers
Scanners
Microphones
Legacy Conversion



Mass Storage
Broadband
Home Networking
Residential Gateways
Digital Video/Audio
Legacy Conversion



Courtesy: Cypress Semiconductor

Ease-of-Use Driving USB in PCs

PC circa 1999



- Long and confusing set-up
- Frequent PC crashes
- Cable spaghetti with device conflicts
- Inaccessible connectors
- Poor hot-plug support

The Ease of Use Solution

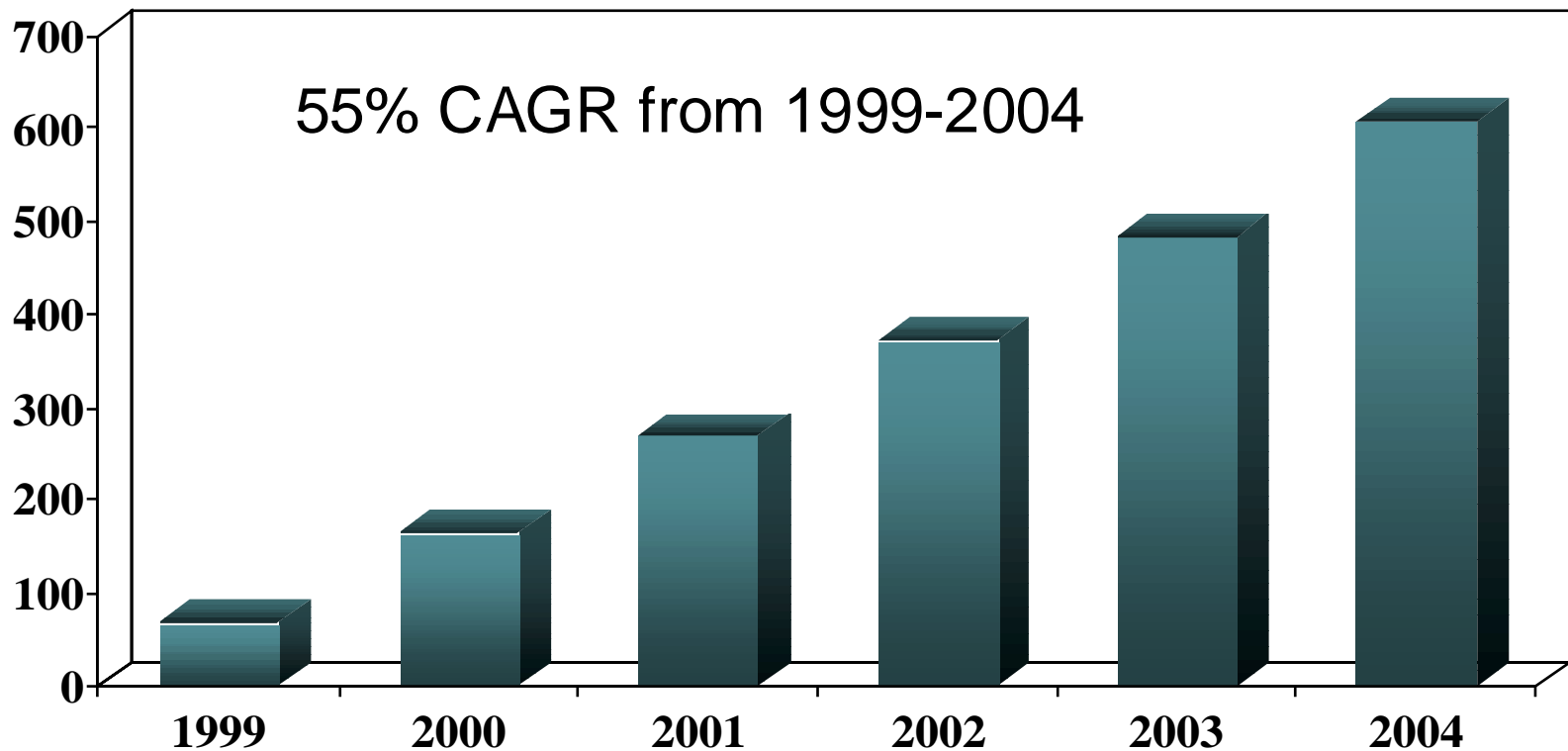


- Set-up is quick and easy
- Eliminate device conflicts
 - Replace legacy ports with USB
- Front panel USB connectors
 - Easy, anytime access
- Instantly Available PC / Fast Boot
 - Faster access, less noise

USB Peripheral Growth

Number of Peripherals Shipped per Year

Peripheral Volume (in Millions)



USB 2.0

- 40x faster than USB 1.1
 - 480Mbps vs. 12Mbps - high performance
- USB 2.0 is based on the same architecture as 1.1
 - Migrating USB peripherals to USB 2.0 is much easier
 - USB 2.0 is forward and backward compatible with current USB systems and peripherals
 - 2.0 spec uses the same cables & connectors as the 1.1 standard
 - Consumers have the benefit of using devices they already own

Where Is USB 2.0 Used?

- USB 2.0 used in consumer electronics products which require the high bandwidth it offers
 - Higher-resolution videoconferencing cameras
 - Digital image creation & web publishing
 - Multiple high-speed peripherals run simultaneously
 - Next generation scanners & printers
 - Faster broadband Internet connections
 - Internet appliances will leverage USB 2.0
- Fully compatible with today's USB
 - **Same** cables and connectors
 - **Same** full/low speed signaling and functionality
 - **Same** dynamic attach/detach detection model
 - **Same** power and power management features

USB 2.0 Supports High-Speed PC Peripherals

<i>Peripheral</i>	<i>Desired BW</i>	<i>Comments</i>
Conference Cameras	75-150Mbps	Allows up to MPEG-2 quality without compression
Scanners	50-100 Mbps+	Higher resolution, more colors
Printers	50-100 Mbps+	Higher resolutions, more colors. Or elimination of line/page buffers allows lower cost
External Storage	Up to 240Mbps	CD-RW, ZIP*, MO, Flash card reader, HDD, ...
Broadband Connection	10-100Mbps	Cable, DSL, Ethernet, HPNA, ...

**Supports Multiple High-Speed Peripherals
Running Simultaneously**

USB 2.0

- USB Implementers Forum recognize need for USB2.0 to be more flexible than USB1.1
 - USB1.1 had no standard interface between transceiver and SIE (Serial Interface Engine)
 - Raw data transfer
 - UTMI (Universal Transceiver Macrocell Interface) for standard interface between USB2.0 transceiver and SIE
 - UTMI backed by Intel

USB 2.0 Beyond The PC

- USB2.0 ideal solution for emerging vertical markets that will utilize 480Mbps bandwidth
 - Applications utilizing 480Mbps need QoS (Quality of Service)
 - Home Networking
 - Residential Gateways, technology bridges, broadband access, real time video, audio and data, digital VCRs etc.

USB 2.0 Beyond The PC

- USB2.0 is an emerging standard and is still evolving
 - Handle different types of data streams
 - Isochronous audio and video,
 - Host versus Peripheral
 - USB 2.0 today is still master/slave configuration
 - Plug 'n' play but not plug 'n' go
 - USB Forum looking at peer-to-peer
 - FPGAs add significant value
 - Reconfigure FPGA SIE for either Host or Peripheral

USB 2.0: What Changed?

- Low level electricals for High Speed (HS) signaling
 - Much higher bit rate (480Mb/s) requires new transmitter/receiver
- Hub changes for backward compatibility
 - Features limit bandwidth impact of Full Speed (FS) and Low Speed (LS) devices on HS devices
 - FS/LS devices consume a bit-rate equivalent of HS bandwidth

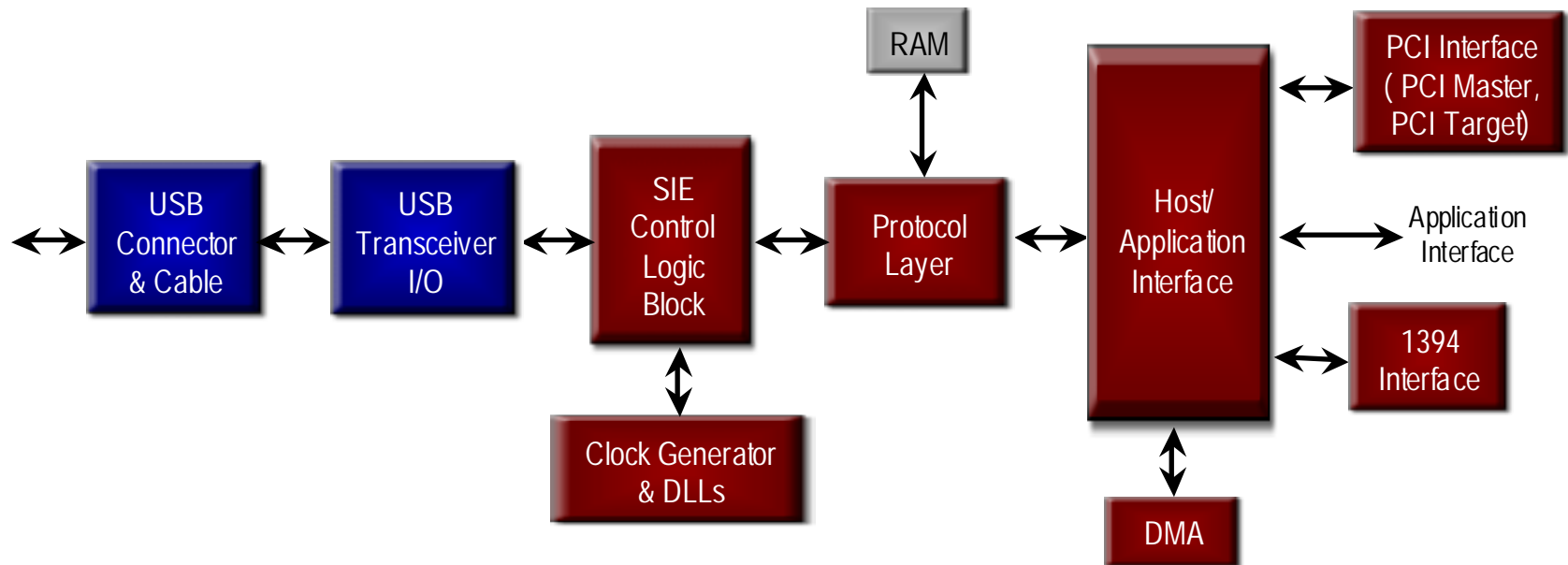
USB 2.0: What Didn't Change?

- Same host/device model
 - Host is in charge
 - Devices are inexpensive
- Same basic protocol
 - Token, data, handshake
- Same device framework
 - Descriptors
- Same software interfaces

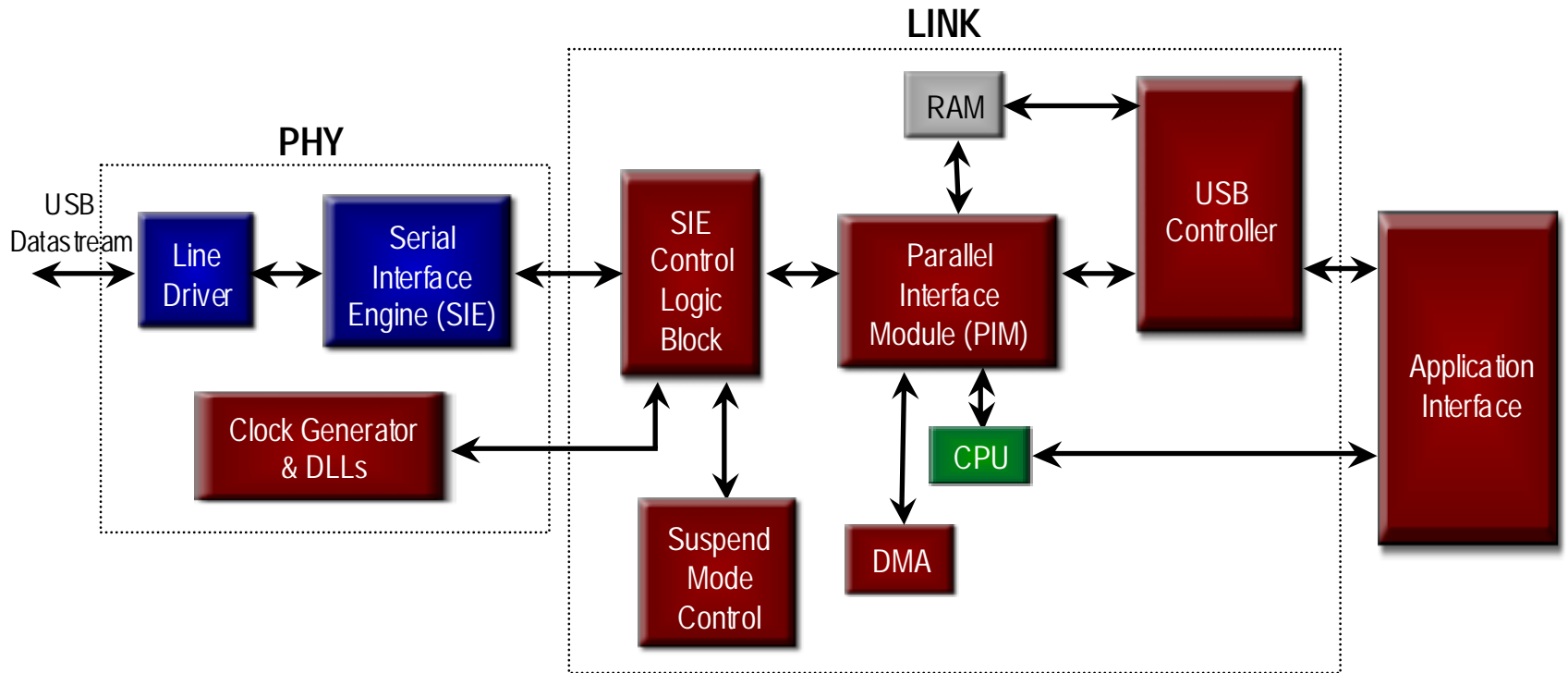
USB 2.0: What Didn't Change?

- Same power distribution and consumption
 - 500ua suspend, 100ma unconfigured, 500ma configured
- Same power management features
 - Suspend/resume model unchanged
- Same topology management
 - Hub features to handle connect, disconnect, enable, disable
- Same cables and connectors

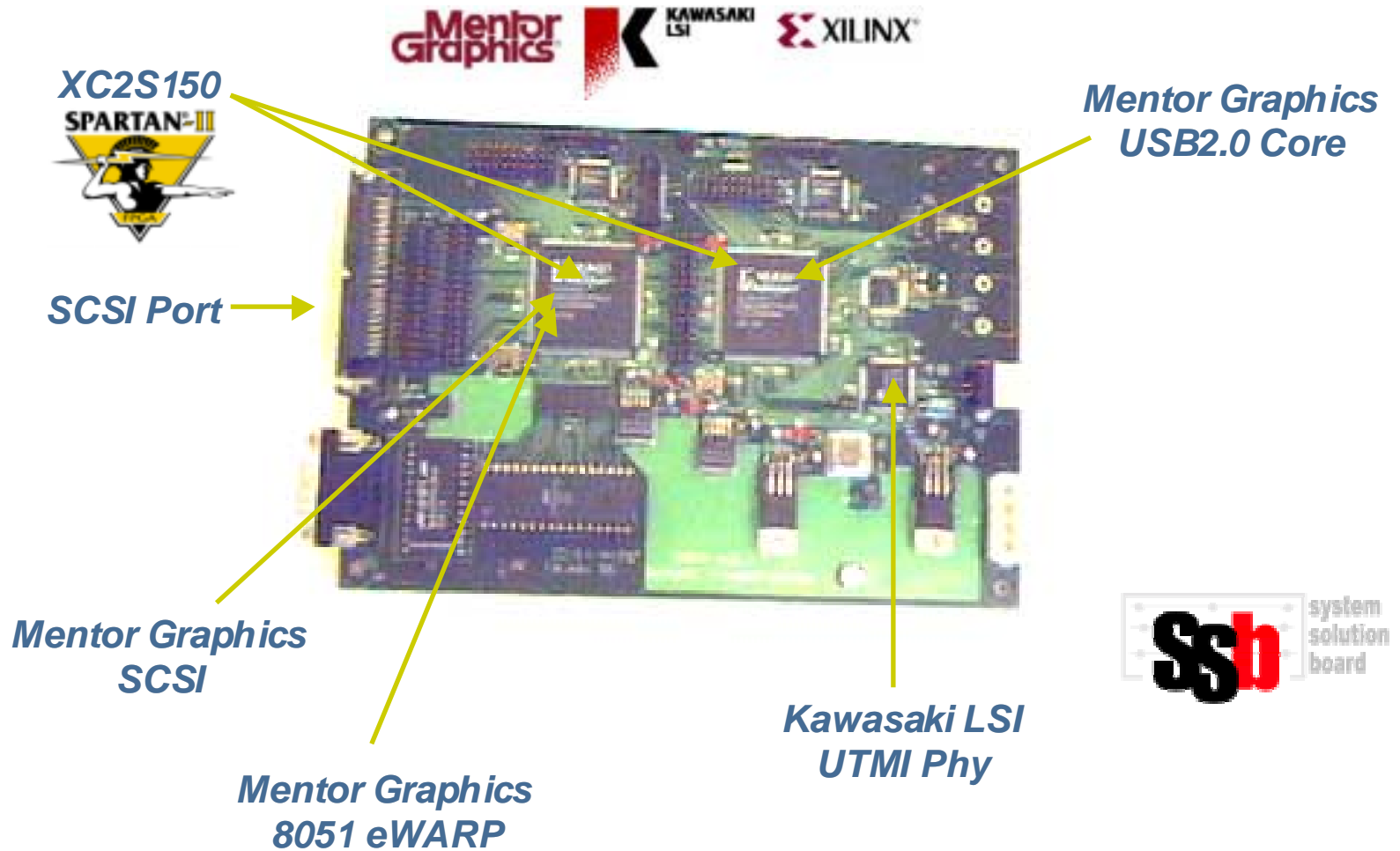
USB 1.1 IP Core



USB 2.0 IP Core



Xilinx USB 2.0 Solution

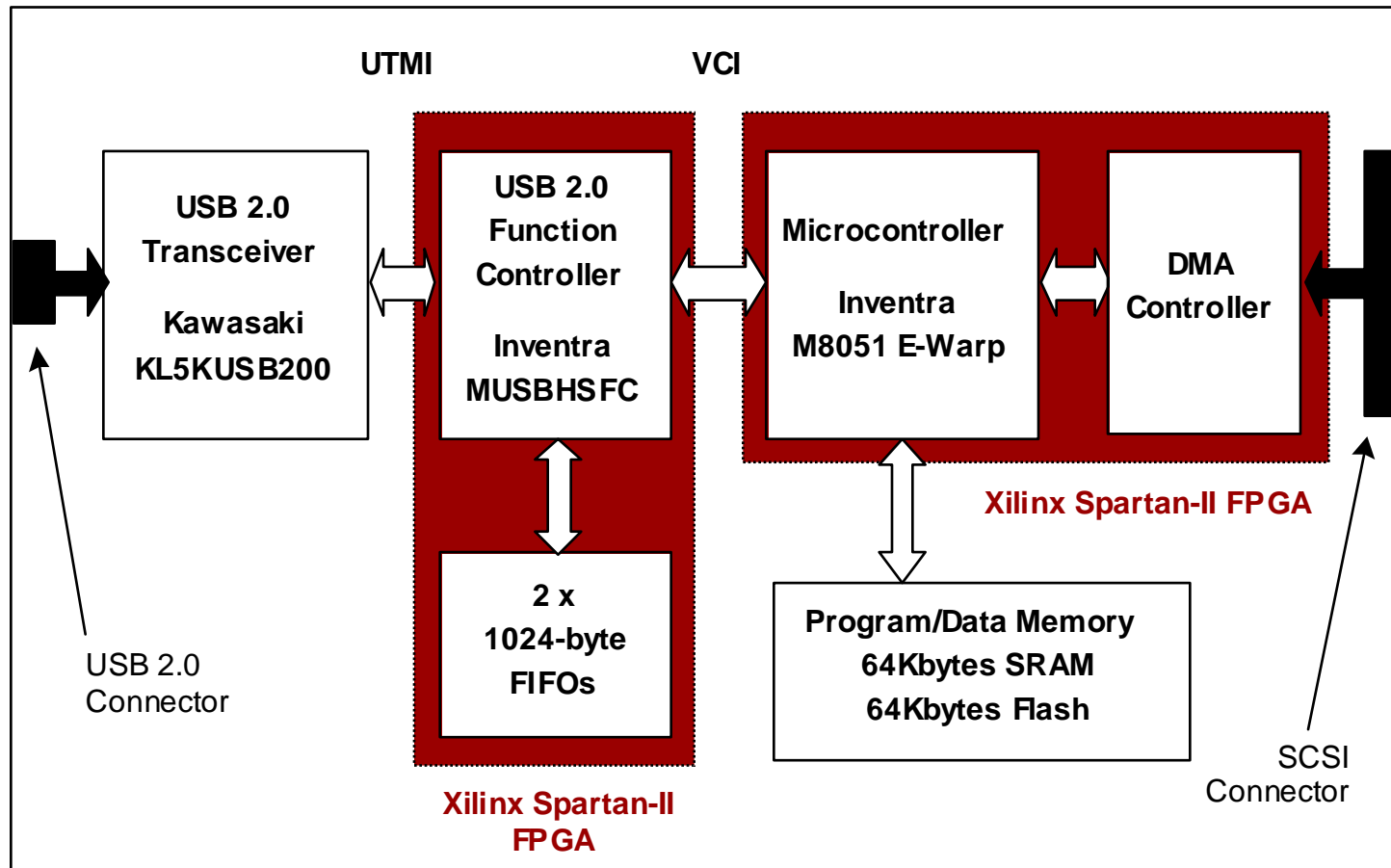


Xilinx USB 2.0 Solution

- Kawasaki LSI, Mentor Graphics and Xilinx have partnered and developed the industry's first UTMI-compliant USB 2.0 upgradeable reference design
 - Provides a USB 2.0 to SCSI technology bridge, and can be used to provide end-to-end high-bandwidth data storage
 - For hard disk drives, CD writers, DVD ROMs, etc.
 - Flexible and upgradeable USB 2.0 technology bridge to multiple home networking standards
 - Such as HomePNA, HomePlug, HomeRF, IEEE1394, IEEE802.11b



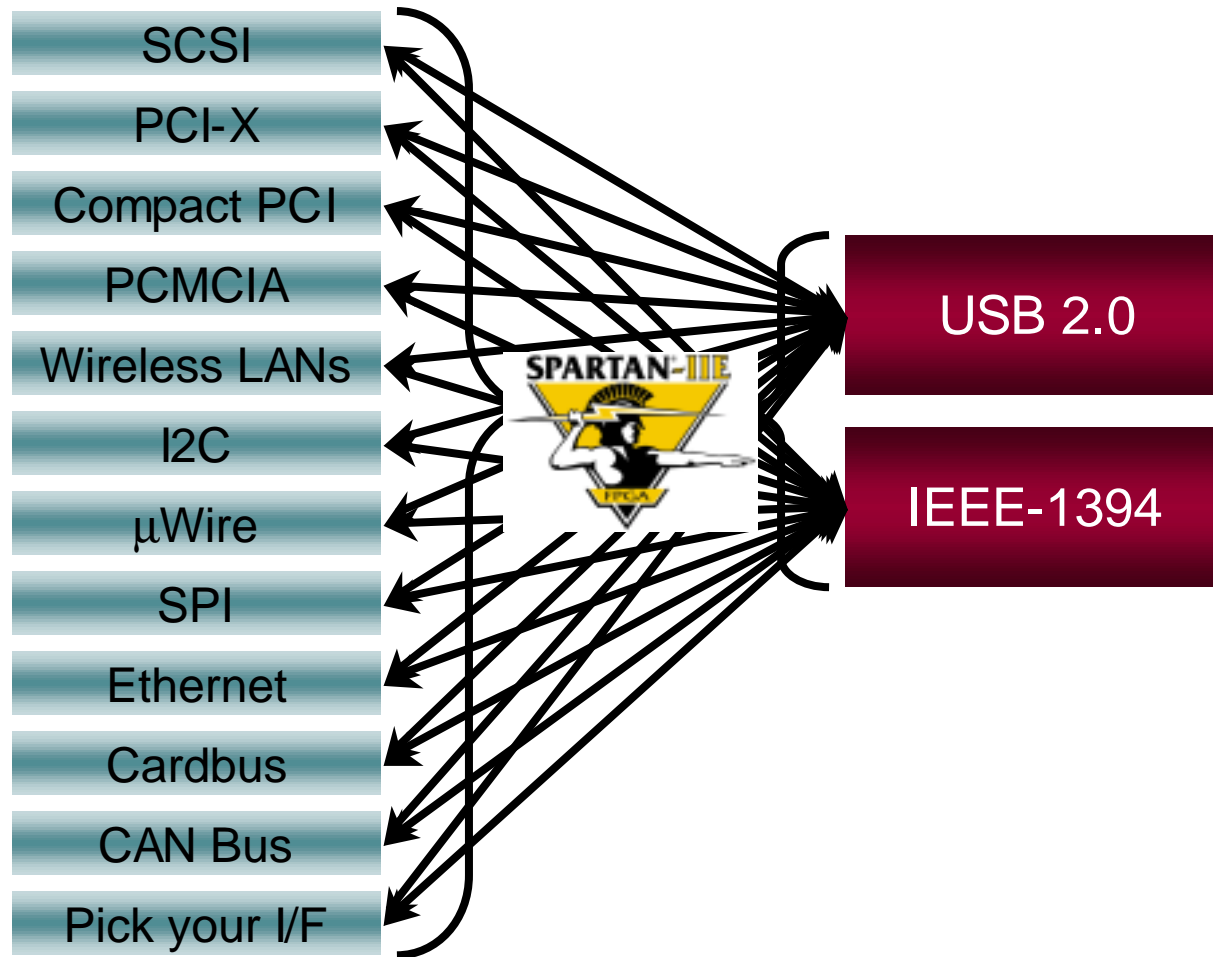
USB 2.0 Mass Storage Reference Design Details



Solution – Features

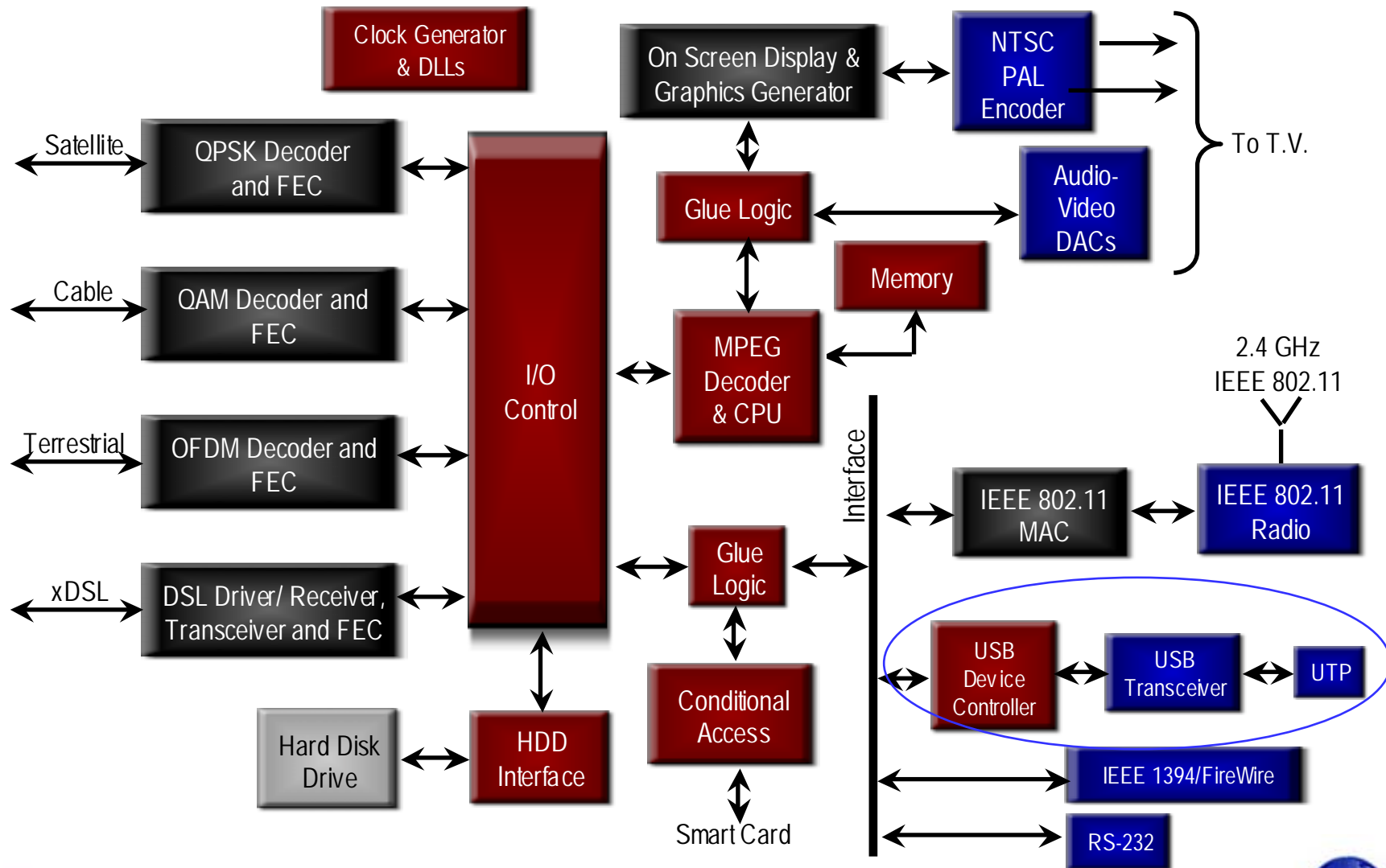
- USB 2.0 Transceiver Macrocell Interface (UTMI) compliant Physical layer from Kawasaki LSI
- High-speed (480Mbps) USB 2.0 functionality
- Mentor Graphics MUSBHSFC Fully Synthesizable Core Optimized for low-cost Spartan-II FPGAs
- Backward compatible with full-speed USB 1.1
- Future-proof, reprogrammable SIE
- Low-cost home networking solution

Universal System Interface

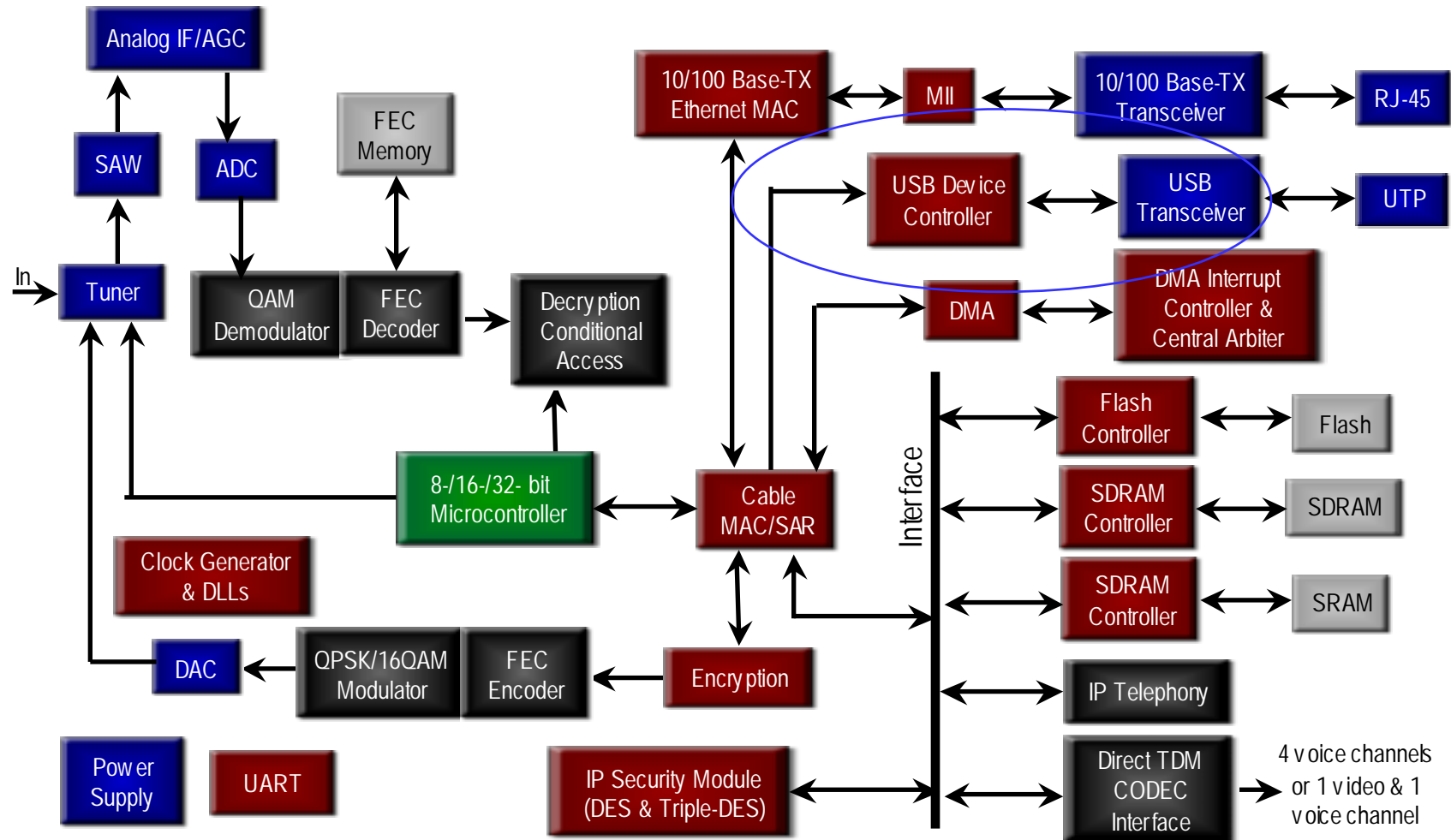


Bridging Disparate Protocols

Set-Top Box/RG – USB 2.0



Cable Modem – USB/USB 2.0



USB Summary

- USB 2.0 is leveraging the success of USB 1.1
 - Co-exists with IEEE-1394
 - Enables USB systems to handle high-bandwidth video
- PC-centric appliances are becoming USB 2.0 enabled
 - Time-to-market pressures are still very high
- Products bridging USB 2.0 to disparate protocols are critical
 - USB 2.0 to 1394, USB 2.0 to PCI, USB 2.0 to FireWire, etc.
- Spartan-IIIE FPGAs offer traditional FPGA benefits to the cost sensitive USB 2.0 market
 - Flexibility, risk aversion, low-cost, and product differentiation



Questions?

espteam@xilinx.com

