
Worldwide
Developers
Conference

I/O Technologies

Tali Tamir

Hardware Technologies Evangelist

Agenda

- FireWire Support Overview
- USB Support Overview
- Desktop PCI Update
- SCSI Update
- ATA Manager 4.0 Overview
- Memory Opportunities
- Q&A


FireWire
FireWire Support
Overview

FireWire Overview

- Why FireWire?
- Product Plans
- Market Overview
- SW Overview
- Developer Support

What Do Our Customers Want?

- **Simplification**
  - Single interconnect for all connections
  - No configuration, no setup
  - No extra power cables
- **Performance**
  - Full motion video
- **Low cost**
  - No extra cost beyond existing solutions

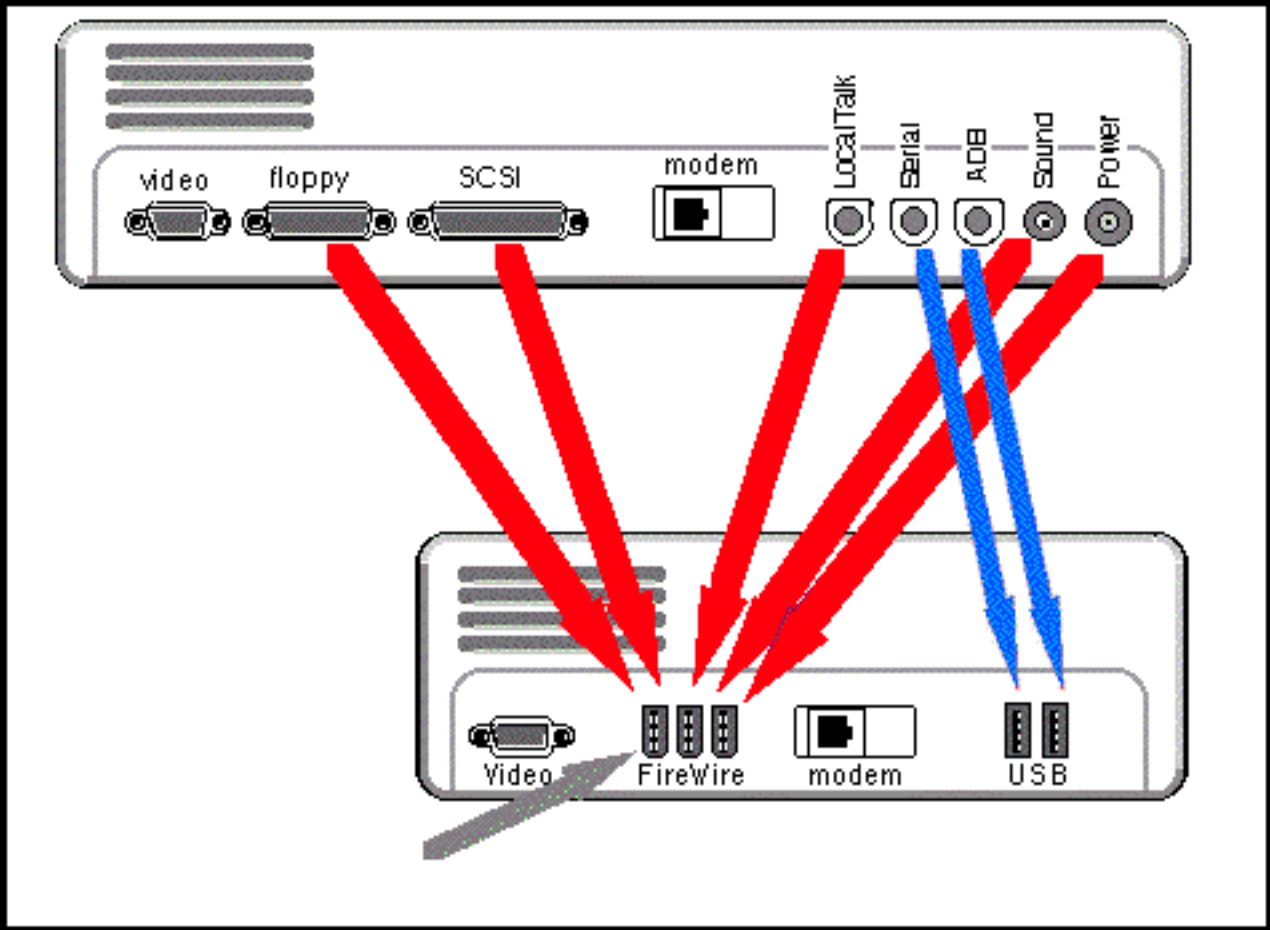
What Does Apple Want?

- Provide a new class of desktop services
  - Carry real-time data, e.g., audio and video
  - Support peer-to-peer transactions between peripherals
  - Support more devices and more types of devices
- Enhance existing I/O services
  - Let devices move their data without burdening the CPU
  - Simplify driver and controller software

What Do We All Want?

- **Enable system miniaturization and simplicity**
  - Consolidate most I/O functions into a single port
  - Permit attachment to small devices

Clean Up the Mess!



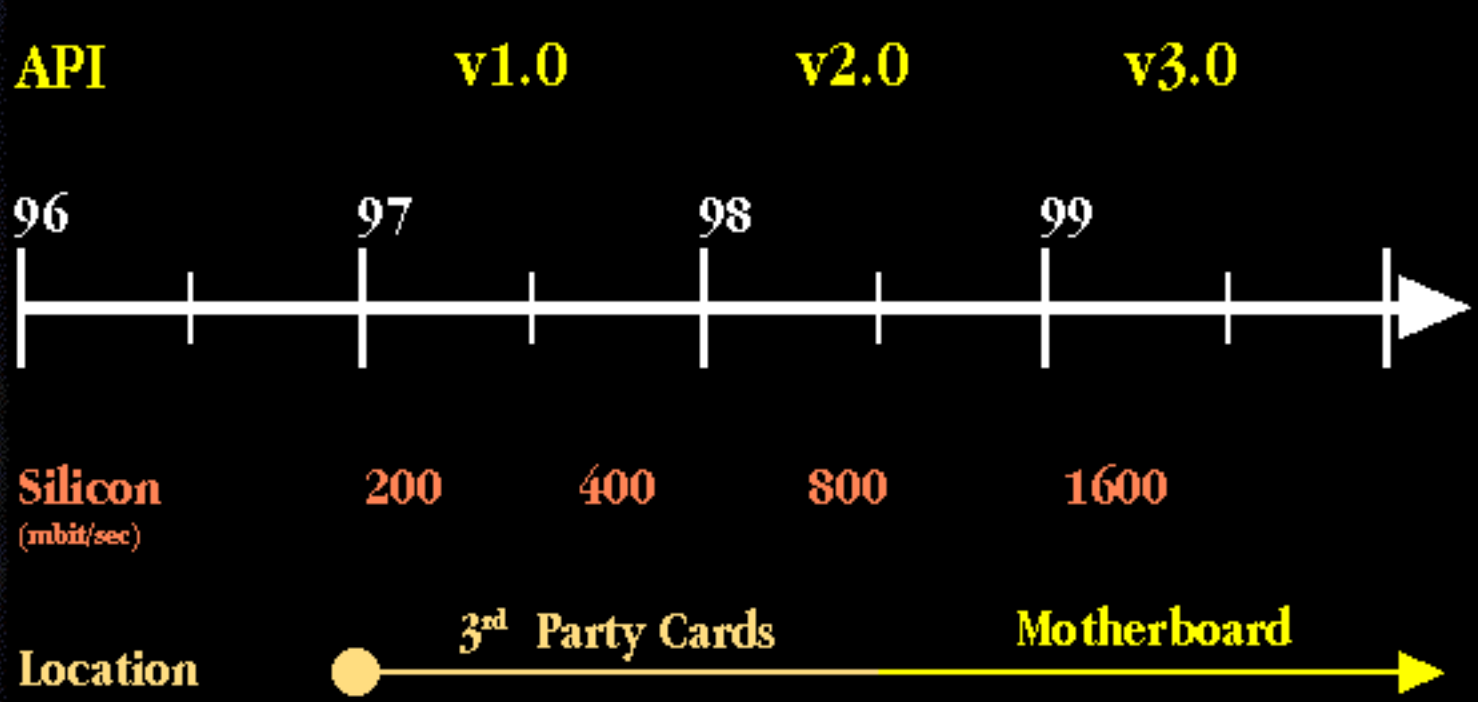
What Is FireWire?

- Simple, elegant I/O connection
  - Automatic configuration, power, true plug-and-play
  - Connectors/cables roughly ADB sized
- Industry standard
  - Developed and endorsed by industry leaders
- Provides expandability without slots
  - Up to 400 Mbit/sec
  - Future growth path to Gbit+
- Performance
  - Isochronous services

FireWire Product Plans

- FireWire 1.0 API is released
  - Tempo
  - Amendment to Software Distribution Agreement
- Radius PhotoDV
  - First shipping FireWire-based solution
  - Mac only
- Hardware Support
  - Apple is investigating bundling options
  - Motherboard solution is in development

FireWire Roadmap for Apple



FireWire Market Overview

- Today, FireWire means Digital Video…
  - Video Editing Solutions
    - Host adapter card, software, cable, CODEC (hardware and software based)
  - Digital Cameras
    - Still image, camcorder, and conference

FireWire Market Overview *(cont.)*

- **Tomorrow, FireWire means multimedia interconnection**
  - Conventional PC market
    - Host Adapter cards, chip sets, printers, scanners, storage, very local area network, docking, MIDI
  - Consumer Electronics
    - Stereos, DVD, D-VCR, digital satellite systems, set-top boxes, Home Network

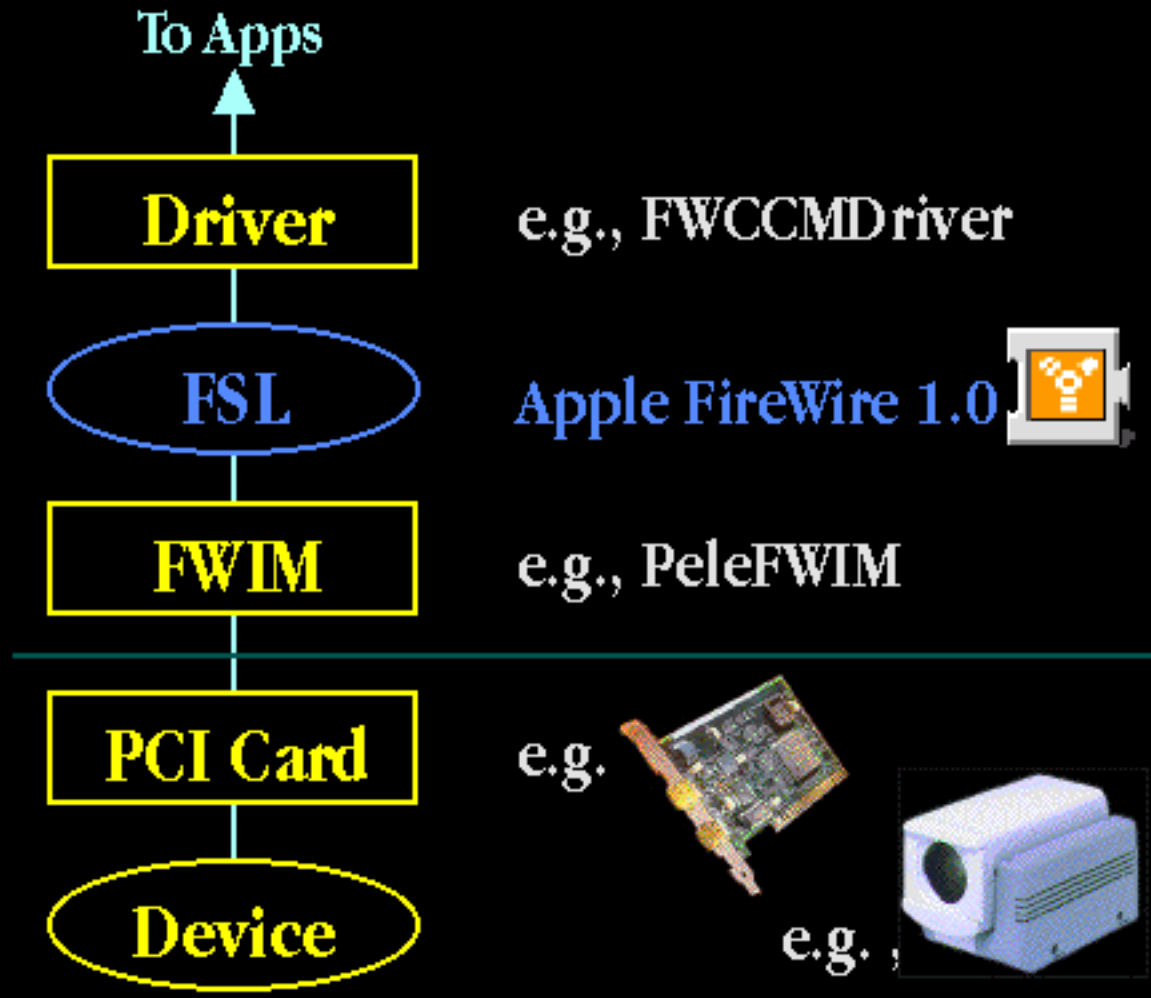

FireWire SW
Eric Anderson
Senior Engineer,
I/O Technology Software


Demo

Architecture Overview

- Requires System 7.6 and forward
  - Apple FW support on PowerPC and PCI only
- Borrows from SCSI Mgr Model
  - Pluggable HAL Architecture
- Implements Run-Time Driver loading
  - Required for Hot Plug-and-Play
- Asynchronous and Isochronous services

Architecture



FireWire Services

- Asynchronous
  - Read/Write/Lock with completion routines
  - Common atomic operations
  - Automatic Addr calculation and remapping
- Isochronous
  - Bandwidth and Channel # allocation
  - Synchronization of Channel clients
  - Sophisticated buffering with data handling

FireWire Services *(cont.)*

- CSR configuration ROM
  - Create Config ROM directory and entries
  - Config ROM searching facilities
- Plug and Play
  - Auto-Scanning of all devices
  - Auto-Scanning of all Config ROM Dirs
  - Auto-Loading of Drivers (using specID and swVersion)

FireWire Services *(cont.)*

- **Hot Plugging**
  - Automatic detection of new devices
- **Notification mechanism to higher SW**
- **Addressing**
  - Allocation of local FireWire Addr ranges
  - Automatic memory mapped or notification mechanism

FireWire Services *(cont.)*

- Automatic handling of all required Bus management responsibilities (Isochronous Resource Manager)
- Protocol drivers
  - No device needed (e.g., AppleTalk, TCP/IP)
- FCP (Function Control Protocol)
  - Support for AV/C Control Protocol
  - Extensible to support future protocols

What's New in FireWire SW

- Pele FWIM sample code (soon)
  - Async and Isoch, including DV
- FireBug analyzer/snooper (PCI Lynx)
  - Examine packets in real time
  - Running totals, filters, self-ID, etc.
- Improved DV transmit (29.97 fps)
  - Includes dynamic recovery from cycle loss

Future FireWire Services—Plan

- Serial Bus Protocol 2 (SBP-2)
  - Suitable for disk drives, printers, and more
- Lightweight, efficient, simple
  ftp://ftp.symbios.com/pub/standards/io/x3t10/drafts/sbp2/
- TCP/IP
  - For home networking, etc.
  - Industry interest is high, progress is low

Future FireWire Services—Plan

- **Multi-driver matching**
  - One driver, multiple FireWire devices
- **OpenHCI**
  - Sample FWIM and standard driver
  - New services (e.g., tag filter, Physical DMA)

ftp://www.austin.ibm.com/pub/
chrptech/1394ohci/

Future FireWire Services—Plan

- Rhapsody
  - FireWire services planned for Rhapsody
  - Some driver modification required
  - Schedule has not been announced


FireWire
Developer
Support
Tali Tamir
Hardware Technologies
Evangelist

Developer Support

- FireWire 1.0 DDK is available today
- DDK includes:
  - Apple FireWire 1.0 (FireWire Support Extension)
  - Extensive documentation of API
  - Sample code for:
    - Lynx FWIM
    - (Pele FWIM—to be included in next release)
    - Sample drivers for Sony DV camcorders and CCM digital camera
    - Sample code for Open Transport/AppleTalk

Developer Support *(cont.)*

- **FireBug 1.0d1**
  - Available to seeded developers
- **Kitchens**
  - U.S.: May 17
  - Japan: late June—early July
  - Europe: close to EDF
  - Additional to be scheduled, as needed

Getting Information

- Apple's FireWire Home Page
  - http://firewire.apple.com/
  - Information on FireWire at Apple, links to related sites on the web
- 1394 Trade Association
  - http://www.1394ta.org/
  - Information on the FireWire industry and the members of the Trade Association
- Additional questions?
  - firewire@apple.com


Universal Serial
Bus (USB)
Support Overview

USB Overview

- Market Overview
- Apple's Plans
- SW Overview
- Developer Support

Market Overview

- USB will provide Macintosh users access to a wide array of low cost peripheral devices
  - Keyboards, mice, joysticks
- USB promises to bring new communications and telephony capabilities
- The introduction of USB based devices is only beginning…

Apple USB Development

- USB support development is already underway
- Apple intends to introduce USB ports on selected Power Macintosh configurations in the first half of 1998
- Apple plans to provide:
  - Human Interface Device (HID) class driver
    - Also input sprockets support
  - OpenHCI driver

Universal Serial Bus (USB) SW

Eric Anderson

Senior Engineer, I/O Technology Software


Demo

Universal Serial Bus SW Plans

- Requires System 8.0 and forward
  - Apple supports PowerPC and PCI only
- Borrows from FireWire Model
  - Pluggable HAL Architecture
- Implements Run-Time Driver loading
  - Required for Hot Plug and Play
- Asynchronous and Isochronous services

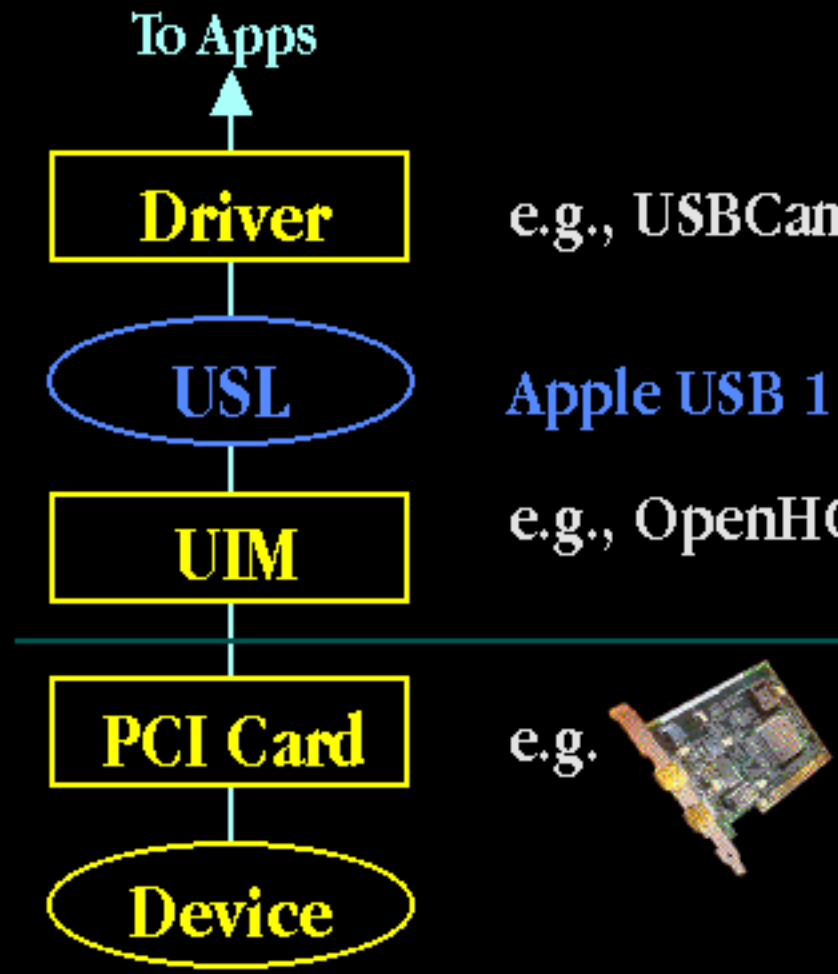
Universal Serial Bus SW Plans

- Initial push for game controllers and input
  - Many game controllers, few with ADB
  - SW support through Input Sprockets
  - Keyboard and Mouse via standard drivers
- Ultimately, full support
  - As determined by market
  - Cameras, scanners, modems, printers, etc.

Universal Serial Bus SW Plans

- **Standardized OpenHCI driver**
  - Suitable for PCI or motherboard
- **Standardized HID driver**
  - Should support any mouse/keyboard
- **Other standardized class drivers**
  - As determined by marketplace
- **Custom drivers**

Architecture



USB Developer Support

Tali Tamir

Hardware Technologies Evangelist

Developer Support

- Apple plans to provide:
  - Human Interface Device (HID) class driver
    - Also input sprockets support
  - OpenHCI driver
  - Custom driver support
- Custom driver support DDK?
  - Need developer feedback
- Apple plans to develop additional class drivers, as needed

Desktop PCI Update

Steve MacKenzie

Engineering Manager,
High End Desktop Systems

Topics Today

- Midrange Desktop PCI
- High End Desktop PCI
- High End Enhancements
- Future Directions

Midrange PCI

- PCI 2.1 compliant
- 33 Mhz/32-bit
- 5v signal environment
- 3 slot

High End PCI

- PCI 2.1 compliant
- 33 Mhz/32-bit
- 5v signal environment
- 6 slot

High End Enhancements

- 2x size of PCI master buffers for reads/writes
- No disconnect of PCI masters at cache line boundaries
- Write accumulate
- Translates 32-byte aligned memory writes to burst writes on ARBus

High End Enhancements

- MRL and MRM commands generate ARBus reads
- Data prefetch
- Memory Read aliasing

Enhancements—Power

- Power budget for 6 slots

  +5v, +3.3v @ 100 W shared
  +12v @ 36 W

Enhancements—Product Design

- Easy access
- Locking mechanism
- Metal rear panel
- Improved cooling
- PCI fence fastener

Performance Measurements

- 80MB/sec PCI writes
- 80MB/sec PCI reads

Future Directions

- Support higher bandwidth devices
- Industry-standard implementations
  - PCI 2.1
  - AGP

SCSI Update

Tali Tamir

Hardware Technologies Evangelist

SCSI Update

- SCSI remains the high performance HD interface for the near future
- Apple intends to support
  - Internal—Wide, ULTRA SCSI (40MBs)
  - External—SCSI @ 5MBs, for near term
- Higher performance SCSI
  - Will be evaluated as it develops
- Ride the Plug and Play wave
- SCSI will not disappear from the backplane, until…


ATA Manager
4.0 Overview

ATA Manager 4.0

- API backwards compatible
- Fully Native
- Separate HALs
- OpenFirmware/Name Registry
- Third Party bootable hardware

ATA Manager 4.0

- Shipped on PowerBook 3400
- Will ship on future desktops
- Technote to be available soon
  - Updated ATA Driver Reference


Memory
Opportunities

PowerBook Memory Opportunities

- PowerBook
  - New memory controllers are coming
    - Technotes are being developed—send msg to DevSupport@apple.com with "For Peter Baum" in subject
  - 2400c
    - 3.3V EDO SO-DIMMs up to 1.5"
    - Industry standard SO-DIMMs (w/16 Mb)
    - Non-standard config required for 64 Mb
      - Developer Note to be posted soon

PowerBook Memory Opportunities *(cont.)*

- PowerBook
  - Platform 98 PowerBook Architecture
  - 3.3V SDRAM SO-DIMMs up to 2"
  - New memory controller
  - Technote in development

Desktop Memory Opportunities

- Entry—Mid space 2nd half 97
  - New memory controller
    - Developer Note under development
    - 3.3 V SDRAM DIMM
- High-end space 1st half 98
  - New memory controller
    - Developer Note being developed
- Cache
  - No opportunities
- Video RAM
  - 2 and 4 MB SGRAM SO-DIMM Card


Q&A

We Want Your Input!

- Come to the I/O Technologies Feedback Forum and tell us what you think!
  - Session 591
  - Room J1
  - Thursday 4:30–5:30 PM
- Or E-mail your questions and comments to:
  - FireWire@apple.com
  - usb@apple.com
  - pci@apple.com
  - All other inquiries:
    - tali@apple.com


Worldwide
Developers
Conference