Bridging IEEE-1394 and Ethernet AV

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IEEE-1394 / Ethernet AV bridging Overview

• Topics Covered:
  • What is it?
  • Why use IEEE-1394?
  • How does it work?
  • When?
What is it?

• Bridging Ethernet AV and IEEE-1394 allows using existing shipping devices with new media friendly Ethernet technology

• Leverages investment in existing hardware and software

• Co-exists with new devices going forward
Problems with IEEE-1394

- Limited to 63 devices per bus
- Limited distances
- Incompatible devices on same bus
Some solutions

- Long Haul Repeaters
- IEEE-1394 over Cat5
- Optical
- IEEE 1394.1
  - More devices
- IEEE-1394 over coax
- AVC over IP
- Multiple interface cards
Why Bridge 1394 to Ethernet AV?

- Apple is a big supporter of High Speed Serial Audio interfaces
- Support for existing IEEE-1394 devices
- Use Ethernet AVB for long haul and IEEE-1394 for the last meter (or two)
- Increase the number of connected devices
IEEE-1394/ Ethernet AV Bridging Technology

- IEEE-1394.1 (concepts)
- 1394 UWB over coax Part 3: FCP and CMP over IPv4 Specification
- Ethernet AV
- Bonjour (Zero Config)
- IEEE-1394 Proxy
- AVC Controller
IEEE-P1722

- CIP based packet format
- Added Ethernet header
- Presentation time in nanoseconds
- Supports 61883-X formats
- Added a Quadlet for bridging
- Can be extended for other formats
IEEE-1394.1 bridging

- Allows more devices
- Can extend the network by adding bridges
- AVC not bridge friendly
Apple Typography Guidelines

December 2005

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Use of silver

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1394.1 Diagram

Bus 1

1394.1 Portal

Bus 2
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The Apple Logo

PANTONE 4
C = 0
M = 0
Y = 0
K = 40
R = 161
G = 165
B = 169
Black

C = 0
M = 0
Y = 0
K = 100
White

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IEEE Std 1394.1-2004 IEEE STANDARD FOR HIGH PERFORMANCE SERIAL BUS BRIDGES

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4. Bridge model (informative)
A Serial Bus bridge consists of two bridge portals (each with its associated PHY and link), queues (FIFOs) for asynchronous and isochronous subactions (which collectively form an implementation-dependent fabric between the two portals), cycle timers, route maps, and configuration ROM. Figure 4-1 illustrates this model.

Each bridge portal is a separate Serial Bus node, with a different EUI-64 and its own address space on the bus to which it is connected. A bridge portal responds to Serial Bus read, write, and lock requests from its connected bus as described in this standard. A bridge portal also monitors all Serial Bus subactions, asynchronous and isochronous, and uses route maps to determine which subactions, if any, are to be routed through the bridge's fabric to the co-portal.

The bridge portals are interconnected by means of a fabric that is capable of transferring any Serial Bus subaction from one portal to its co-portal. The fabric is conceptualized as a set of FIFOs (shown enclosed with dashed lines in Figure 4-1) that support bidirectional, non-blocking transfer of asynchronous request subactions, asynchronous response subactions, and isochronous subactions. Although this standard mandates some behavior for these queues, the details of the fabric implementation are not addressed by this standard. The fabric could be modest in geographical extent, as when both of the bridge portals and fabric are located within a single enclosure. Conversely, the fabric could be physically extensive, as could be the case if a bridge's portals were located in separate rooms. In both cases, the model remains the same.

Each portal has a cycle timer driven by a 24.576 MHz oscillator. The propagation of cycle time from one bridge portal to the other is implementation-dependent and beyond the scope of this standard.

The route maps contain information that permits the selective forwarding of both asynchronous and isochronous subactions through the fabric to the co-portal.

Figure 4-1 — Bridge model
TRAN
LINK
ROUTING
Isochronous FIFO
Isochronous FIFO
Request FIFO
Request FIFO
Response FIFO
Response FIFO
TRAN
LINK
ROUTING
Configuration
ROM
Route Maps
Portal Control
Configuration
ROM
Route Maps
Portal Control

1394.1 Portal Expanded
Split the FIFO across Ethernet AV
IEEE-1394 UWB over Coax

- Started by wireless working group (1394ta)
- Relay agents help AVC clients
- Needs lots of bridges
- Part 3: FCP and CMP over IPv4 Specification
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- 802.1 AS
- 802.1 Qav
- 802.1 Qat
- IEEE-P1722 Annex B
Bonjour

- Device Discovery
- Device Enumeration
- Zero Config
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AVC Controller

• Discovers devices
• Enumerates devices
• Connects devices
• Plug and Play
• Manages latencies
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Demo Setup
Technology used in Demo

- AVC Device Discovery
- Bonjour based
- AVC over IP
- Device Proxying
- FireWire / Ethernet Bridging
When?

• We hope to have System Software available when 3rd party hardware is ready
• Will likely be implemented in stages
• Absolute Plug and Play
• It just works™
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PANTONE 429C
C = 0
M = 0
Y = 0
K = 40
R = 161
G = 165
B = 169

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Q & A
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Thank You

Questions: email to mxmora@apple.com