Minutes of IEEE P1394c Working Group Meeting (1/19/2004)

The IEEE P1394c Working Group was held in Kona, Hawaii on Monday, Jan. 19, 2004. The attendees were:

Colin Whitby-Strevens	Apple	colinws@apple.com
Michael Johas Teener	Apple	teener@apple.com
Les Baxter	Avaya	les@baxter-enterprises.com
Bill Russell	Canon	bill.russell@canon.con
Pascal Lagrange	Canon Research France	pascal.lagrange@crf.canon.fr
Burke Henehan	TI	bhenehan@ti.com
Shiva Patibanda	VividLogic	shivap@vividlogic.com

The Broadcom contingent was unable to attend the meeting.

Agenda:

1) Welcome and introductions
2) IEEE Patent Policy – Chairman Michael Johas Teener reviewed the IEEE's patent policy.
3) Approval of Minutes from December meeting – approved by acclamation.
4) Review of old action items
5) S800-T Link Delay and Root Contention Values
6) Combined S800-T / S100-T ports
7) Next Meetings

Previous Action Items:

8) Colin – run the error simulation without the robust encoding and compare to the current results. – Simulation was run but the data is not fully analyzed yet. (Still open)

12) Colin – investigate issues involved with supporting combined S800-T / S100-T ports. (Closed – see discussion below.)

19) Kevin Brown– contact Bob Grow regarding establishing a technical liaison with 802.3. (Request was made, no response yet -- still open.)

20) Michael Johas Teener – schedule a P1394c tutorial presentation at March IEEE 802.3 plenary (Orlando, FL, March 14-19, 2004) (Sent an email request on 1/12/2004 to Bob Grow, Geoff Thompson, etc. – no response yet. Still open)

21) Richard Thousand – specify timing diagram and constraints regarding entering and exiting suspend mode. (Richard sent an email to Colin (see details below) – needs more discussion and a timing diagram. Still open.)

22) Walter Hurwitz – proceed with more details on the Alternate Pair C/D autonegotiation proposal. (Still open)

23) Michael Johas Teener – formally request the assignment of a 1394 selector field from 802.3. (Requested by email, see below. Still open.)

24) David James -- Send a note to the 802.3 maintenance group to clarify the bit-ordering of the OUI message. (Done.)

S800-T Link Delay and Root Contention Values

A 1394c link has about 1 microsecond of delay in each direction, yielding a round-trip delay of 2 microseconds. This exceeds the 1.6 microsecond limit that was specified in 1394b and can cause problems with the Tree ID and root contention processes. To resolve this issue, the following was proposed:

1) Have a Root Contention Timer per-port rather than per-PHY as in 1394b.
2) Allow the option of using a long Root Contention Timer (ROOT_CONTEND_FAST = 3.2 microseconds and ROOT_CONTEND_SLOW = 6.4 microseconds, or twice the 1394b values)
3) Add a software-controllable bit in the port register map (long_contend_timer bit) that controls the root contention timer value (1 = long, 0 = regular)
4) S800-T ports will always set the long_contend_timer bit (and therefore use the long timer value)
5) For other modes, the default is for the long_contend_timer bit to be off. It can be set via software control. This would normally be done only for ports which use a long fiber link.
6) Add a root contention counter to the Tree ID algorithm. This counter is cleared during bus reset and incremented when entering state T3. When the counter reaches a value of 16, the long_timer bit is set.

Combined S800-T / S100-T ports

The objective of a dual-mode port is to support the operation of both S800-T and S100-T on the same connector. When two dual-mode ports are connected together, they will perform 1394c (Ethernet-style) autonegotiation and will not try to use 1394b connection management or signaling. However, a number of issues arise when a dual-mode port is connected to a 1394b UTP port. To summarize briefly:

- The dual-mode port must be able to determine whether it is connected to another dual-mode port or a 1394b S100 UTP port. This implies that it must be possible to distinguish between 1394b toning and all types of Ethernet signaling (see action item 29 below.)
- If a dual-mode port is connected to another dual-mode port (or to a 1394c-only port), it will implement the full 1394c specification, including Ethernet-style autonegotiation, 802.3af powering, etc.
- If a dual-mode port is connected to a 1394b S100 UTP port, it will implement the full 1394b specification, including toning, 1394b powering, etc.

A discussion of these requirements lead to a number of more specific issues, which were recorded by Colin Whitby-Strevens and are included as Attachment 1 at the end of these notes.

Suspend Mode Timing

In response to action item 21 above, Richard Thousand sent the following information to Colin Whitby-Strevens:

> 1) It will take a maximum of ~24us (to stop transmitting 1000T) plus up to ~16 ms to transmit 10BT ALPs, when the gigabit PHY is commanded by the Firewire PHY into the suspend mode.
>
> 2) It will take a maximum of ~350ms (for slave)/~750 ms (for master) plus ~1.6 sec for the break link timer, when the gigabit PHY sees the removal of 1000T idle due to the link partner being commanded into suspend mode.

More discussion is needed to ensure that all the issues are understood and resolved (see action item 25 below.)

IEEE 802.3 Selector Field

Included below is a copy of an email sent by Mike Teener to request the allocation of an 802.3 selector field (see action items 20 and 23 above.)

> Email from MJT to 802.3
> Subject: Selector field for p1394
> Date: Monday, January 12, 2004 3:24 PM
> From: Michael Johas Teener <teener@apple.com>
> To: Bob Grow <bob.grow@ieee.org>
> Cc: Bob Davis <bob@scsi.com>, Kevin Brown <kbrown@broadcom.com>, Geoff Thompson <gthompso@nortelnetworks.com>, Everett Rigsbe <everett.o.rigsbee@boeing.com>, Paul Nikolich <p.nikolich@ieee.org>, David James <dvj@alum.mit.edu>

Bob,

As chair of the p1394c WG, I'd like to formally request that 802.3 allocate a selector field for use by the IEEE 1394 family of interconnects. There are already systems being deployed using IEEE Std 1394b-2002 that use cat-5 wiring, and these have no capability of recognizing that a device using an alternate protocol is on the other end of the wire. Naturally, this can cause usability problems for the user (particularly since the old 1394b startup protocol may ... Or may not ... Cause confusion on the part of an 802.3 device). We'd like to rectify this potential problem, and allow for future enhancements that will not create additional difficulties for 802.3 devices. After talking to a number of people in both the 802.3 and 1394 communities we believe that using a new selector field would be safest. Since, as you noted, there are only a total of 32 selector fields and 3 are already allocated, we intend to ensure that the new selector field could be used by any organization that has an OUI, removing the need for further registration authorities.

The p1394c WG would like to proceed on this in a cooperative way, but with all reasonable speed. Can you put this on the agenda for the next 802.3 plenary and advise Kevin Brown (as our designated contact to 802.3) of any requests you may have for additional information?

We would also like to suggest a 90 minute 1394 Summary (including the proposed p1394c) tutorial sometime shortly before the selector field discussion comes up. Perhaps Tuesday or Wednesday evening?
Michael D. Johas Teener

New Action Items:

25) Colin – schedule a conference call with Broadcom to resolve connection/disconnection and low-power services issues.

26) Colin – update the C-code and service specifications to match the new services model to correspond to item 25 above.

27) Burke – review the new root contention proposal.

28) Colin – run a simulation of the new root contention algorithm

29) Kevin – determine if 1394b toning can be distinguished from all possible types of Ethernet signaling.

30) Mike – add language to the 1394c draft to specify that IEEE 802.3af powering will be used with S800-T ports.

Next Meetings

The schedule for the next 2 meetings was confirmed.

- Tuesday, Feb. 17, 2004, 10:30 – 3:30, hosted by Panasonic (550 Winchester, San Jose CA)
- Tuesday, March 23, 1004, 10:30 – 3:00, hosted by Apple (Cupertino, CA)

It was decided not to have a 1394c working group meeting at the next 1394 TA meeting in Shanghai (March 29 – April 1, 2004). An informative presentation will be given at that meeting and a working group meeting will be scheduled for later in April in the USA.

Prepared by:
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Attachment 1: Dual-mode ports – S800T port and 1394b S100-UTP

Brain-storm results from 1394c Meeting on 1/19/2004 in Waikoloa.
Objective: to allow an implementation to support both modes on the same physical connection.
Assumption:- A dual mode port connected to another dual mode port will perform autonegotiation as defined elsewhere in this standard, and will not try to use the 1394b connection management or normal operation signaling. So we need to concern ourselves only with the scenario of a dual mode port connected to a 1394b-only (S100) port.

1394b UTP transmits on pair 1/2, and receives on pair 3/6 (was 7/8) using binary NRZ signaling. But see also "crossover" below.
Issues:

- Connection management – toning vs T-port autonegotiation
- Normal operation issues

Connection Management

Toning – on a new connection on a T port – we may find incoming 1394b tones on pair 3/6.

We'd like to recognize these as being from a 1394b S100 port, complete 1394b negotiation and start 1394b S100 operation.

Question – are 1394b tones on 3/6 distinguishable from any other type of Ethernet signaling? How easily?

Need to be able to distinguish 1394b tones from any other type of Ethernet signaling. Open issue.

The Ethernet port needs to report this detection to the 1394b side of the port, and not attempts 1394c autonegotiation as defined elsewhere in this standard.

A dual mode port never initiates 1394b negotiation, it only responds to detecting it.

Given that 1394b tones are distinguishable from any other type of Ethernet signaling, then we need a mechanism in the Ethernet PHY for signal_detect on pair 3/6 and tone transmission on pair 1/2 under control of the existing 1394b connection management algorithm – just as if this port was a 1394b S100 UTP port.

What about twists/crossovers (or lack thereof)?

This implies that the tones may be received on pins 1/2 rather than 3/6. So the above mechanisms need to be capable of operating on both pairs. The current 1394b algorithm implements crossover detection, and instructs the port to "crossover" if necessary.

On detection of a disconnection (lack of tones for 84ms), then the 1394b connection management logic instructs the Ethernet port reverts back to detecting the connection type on the next connection.

Normal Operation

The 1394b part of the port needs to implement 8B10B encode/decode and scrambling as specified in 1394b. The port needs to be able to switch between using these and 1394c depending on the results of the negotiation (see above)

For specification purposes, we keep the 1394b specification that shows the 1394b port performing the serializing and deserializing at S100. The 1394b port will supply/receive the corresponding bit stream to/from the Ethernet port. The Ethernet port needs to be able to transmit/receive the bit stream through its drivers onto the RJ45 connector. Implementations may, or course, chose to perform the serialization/deserialization in either the 1394b port or in the Ethernet port.

The Ethernet PHY needs to be capable of operating at the 1394b signaling levels, including adaptive equalization.