Unconfirmed Minutes
IEEE 802.3AP - Backplane Ethernet
May 26 – 27th, 2004
Long Beach, CA

Prepared by: John D'Ambrosia

Meeting convened at 8:32 am, May 26, 2004.

Agenda / Housekeeping Issues

- Introductions
- Bob Grow, IEEE 802.3 Chair, formally appointed Adam Healey as Chair of 802.3AP Task Force
    - Request for Confirming Vote by Bob – Approved By Unanimous Vote
- Attendance and Membership Rules Explained
- July Meeting – 802.3 Hilton, all task force meetings will be at Embassy Suites
- Agenda
    - Motion to adopt – Joel Goergen
        - Second - Schelto van Doorn
    - Approved by voice vote without objection
- Adam Healey appointed John D'Ambrosia as Task Force Secretary
- Adam Healey appointed Schelto van Doorn as Task Force Editor
- Motion to approve minutes from March meeting that are posted on web
    - No corrections requested
    - Moved by – Schelto van Doorn
    - Second – Joel Goergen
    - Minutes were accepted by voice vote without objection
- Goals for meeting discussed
    - Development of Draft 1.0
    - Presentations
    - Backplane Channel Model
    - Auto-negotiation
- IEEE rules read to the body by Chair
- IEEE Patent policy read to the body by Chair
- Project Flow Discussed
- Project Details
    - Approved PAR - http://standards.ieee.org/board/nes/projects/802-3ap.pdf
    - 5 Criteria - http://ieee802.org/3/ap/802_3_ap_5criteria.pdf
    - Objectives - http://ieee802.org/3/ap/802_3_ap_objectives.pdf
- Project schedule discussed
    - See agenda_1_0504 for Project Timeline
- Request to add presentations by Joel Goergen ("Channel Data") and Zhi Wong ("Return Loss Simulations") by Chair
    - Approved by voice vote without objection

Presentation #1

Title – "Questions to Be Answered by the IEEE P802.3ap Task Force"
By – Adam Healey
See – healey_01_0504

Presentation #2

Title – "Structure and Clauses to Edit for Backplane Ethernet 802.3ap"
By – Schelto van Doorn
See Vandoorn_01_0504

Discussion

- In Clause 22 there are no spare registers, but the speed bits for gigabit are in Clause 22.

Presentation #3

Title – "A Telecom View"
By – Arne Alping
See alping_01_0504

Discussion

- Some way to extrapolate to 10^-15 for detected BER would be acceptable
  - Some are measuring to 10^-12, assuming Gaussian jitter, and then extrapolate to 10^-15
  - Need further input on this topic and requirements.
- But Arne Alping not prepared to state what the BER requirement is
- Discussion whether FCC Class B Vs CISPR Class A/B needs to be considered
- This is a backplane specification, not just a telecom specification
- For EMI specifications, IEEE development – "The Standard will not do anything that will prevent the user from meeting it"

Presentation #4

Title – "4-Lane 10G Ethernet Backplane Requirement"
By – Jeff Lynch
See lynch_01_0504

Discussion

- Next generation backplanes being designed to accommodate 1G, 4 lane 10G, and serial 10G
- 10G serial not cost effective yet
- Comments regarding "10G observations" made based on port density being normalized
- Interoperability a big concern as vendors implement proprietary solutions for 4-lane 10G over 1m of enhanced FR4
- Concern regarding impact of this effort onto overall BE project schedule, and what value would this added work be when the serial 10G comes out

- From a power perspective – The intersection of a 4 lane solution to a 1 lane solution is not in near term. Some disagreement about this from the group.
- Not building for a 1 lane or 4 lane approach. Building for both.
- Use a higher performance material for current XAUI implementation to provide future upgrade path.
- The market is seeing proprietary silicon solutions for XAUI that will result in interoperability issues.
    - Would want XAUI solution to be standardized across the Ad Hoc model., and then these backplanes would then be upgraded to 10G serial in future
- PHY solution not being called out by presenter

Break 10:30
Reconvened at 10:45

Presentation #5

Title – "ATCA™ Platform Considerations for Backplane Ethernet"
By – Aniruddha Kundu
See kundu_01_0504

Discussion

- Group questioned whether power from processor grouping could be given back
- More bandwidth required on same card

Presentation #6

Title – "FR4 Definition Update"
By – Joel Goergen
See - goergen_01_0504

Discussion

- UL data to be released in June timeframe regarding FR4 classification. Will be provided to the group when available
- Could constrain what materials could be used
- Concern regarding that chip solutions based on proposed ad-hoc model will preclude use of recent or near-in-future deployment of backplanes
- This issue needs to be addressed in the industry (UL)
- May be relationship between dk / df relation and flammability

Lunchbreak @ noon
Reconvened at 1:20pm

Presentation #7

Title "Channel Model Ad Hoc Report"
By Joel Goergen
See goergen_01_0504

Presentation #8

Title – "Channel Comparisons to Proposed Channel Model"
By – John D'Ambrosia
See – dambrosia_02_0504

Discussion

- Daughtercard can negatively influence forward channel performance
  - Function of length distribution and material selection
  - Going to better board materials could exasperate crosstalk and return loss
  - What is cost limitations on board materials for daughtercards

Presentation #9

Title – "Channel Model Requirements for Ethernet Backplane in Blade Servers "
By – Koenen
See - koenen_01_0504

Discussion

- Concern expressed over changing specification calling out number of connectors
  - Number of connectors is really informative and provides a placeholder for building channel model
  - 3 connector model could alter performance of channel, especially from crosstalk
  - meeting the channel model winds up being the issue
  - channel data for 3 connector / 33" channel should be available in 5 – 6 weeks
- Feedback from a system developer was that for 10G serial operation, volume should make cost concerns related to "improved FR-4" for daughtercards a non-issue

Presentation #10

Title – "Channel Proposal"
By – Brian Seemann
See – seemann_01_0504

Discussion

- Question to room – backdrilling is becoming more acceptable. From system developer - people will backdrill daughtercards when connector pins are short enough to permit it.
- Observation that low frequency real channel data is below proposed channel model and may want to adjust b1 and b2 values.

- Group delay is good to specify but needs some work
- Should crosstalk be treated as bounded or random?
- 1000BASE-T did things with crosstalk that the group might want to consider and use
- Contract for group is that interoperability will be ensured at channels near or slightly below the proposed model

Presentation #11

Title – "Proposal for Auto-Negotiation"
By – Llango Ganga
See – ganga_01_0504

Discussion

- There are good reasons to use existing work, but also good reasons not to use it
- Out-of-band management bus could be used for auto-negotiation
  - Management database with input from different vendors in an open-system could be difficult
  - Options
    - Some sort of auto-negotiation
      - Only 1 form that supports multiple speeds, Clause 28 right now
    - Shared Ethernet across the bus
    - Controlled bus – steal electricals from elsewhere
- Future proofing will be needed
- One bused communication channel across backplane for managing box is typical. Would make sense to standardize.

Break – 3:25pm
Reconvened at 3:45pm

Presentation #12

Title – "Pass-Downs from PICMG 3.1 "
By – Schelto van Doorn
See - vandoorn_02_0504

Discussion

- Nelco 6000 was recommended by PICMG initially, not 5000 as stated in presentation
- It might be preferred for the +/- 10% Termination at device to be loosened up.

Presentation #13

Title – "PAM-4 Link Analysis"
By – John D'Ambrosia

See – dambrosia_01_0504

Discussion

- Approximation numbers could be impacted by choice of bypass capacitor
  - Presentation on impact of bypass capacitors on channel measurements would be useful
- Care needs to be taken during simulations so impact of bypass cap to device is included
- Ad Hoc needs to address the issue raised of impact of coupling cap and device packaging on channel

Presentation #14

Title – "10G Serial Signaling Techniques"
By – Majid Barazande-Pour, Glen Koziuk, John Khoury
See – barazande-pour_01_0504

Discussion

- Crosstalk sensitivity – what are the aggressors and their behavior that we need to address
- Channel as part of the equalizer, residuals could be addressed by DFE
- Request for follow up presentation with
  - duobinary in presence of crosstalk since launching 10G signal
  - Jitter tolerance analysis
- Other PAM-4 implementations weren't included in trying to provide a fair comparison across the different technologies
- Jitter-limited systems is an important topic to address as too much focus on vertical eye-opening
- Pre-coding would need to be important to prevent error propagation

Plan for tomorrow -

- 2 presentations (Goergen, Wong)
- 4 Items for discussion
  - Channel Model
  - 3 connector topology
  - 4 lanes proposal
  - auto-negotiation
- Working Session

Meeting adjourned for day 5pm

Thursday, May 27, 2004
Meeting reconvened 8:35am

Presentation #15

Title – "Channel Compliance to Ad Hoc"
By – Joel Goergen
See – goergen_03_0504

Discussion

- Absence of test equipment vendors is noted.
- Nulls and low S/N seem to relate to group delay discrepancies observed when varying launch power
- Ad Hoc needs to review launch power / calibration issues / group delay discrepancies

Presentation #16

Title – "10G Serial Signaling Techniques"
By – Zhi Wong
See – wong_01_0504

Discussion

- Concern regarding proposed values and what do chip packaging people think.
- Intent of presentation started from a typical case and went towards a worst case based on impedance variation
- Analysis needs to go out to 20 GHz.

Open Discussion Regarding Channel Ad Hoc

- Support for work
    - Ad Hoc needs to be given latitude to adjust model as more data is received
    - Need to consider data from production backplanes being introduced recently
    - Blade Server Group wants to make sure that 3 connector model is addressed
- Work also provides basis for chip vendors to evaluate different modulation / equalization schemes
- Issues still a concern
    - AC coupling cap and accounting for it
    - Market size of blade server group is significant and work should not preclude 3 connector scenario
    - Do 40 inch channels fit the mask?
    - Material selection on daughtercards limited by cost? To what degree?
    - Test and measurement
    - Use of stub removal techniques, i.e. counterboring, blind / buried vias
    - Development of a "golden channel" that is representative of the limit line?
        - Test procedures and plans are critical, and we need to consider their impact
    - Blade Server Group needs to provide insight and details into 3 connector topology

        - Test data is needed
            - Forward channel less of concern
            - But crosstalk is a concern
    - "Calibration board" (different lengths) would have uses
    - Need to search for a body defining backplane environment

Straw Poll #1 **Adopt channel model mask set presented in goergen_02_0504 as the basis for future work of the channel model Ad Hoc and basis for simulation of signaling proposals**

Results: All Yes – 39 No – 0 Abstain - 2

Straw Poll #2 **Adopt Dk / Df values presented in goergen_01_0504 (Reference Slide #15) as a working definition for "improved FR-4" for future channel modeling in Ad Hoc Group**

Results: All Yes – 29 No – 1 Abstain - 8

Discussion

- Concern regarding values cited and whether data being received by board material venders is per same test methodology
    - Manufacturers are required to test per parallel plate method per IPC test specification. Variability will be in design of boards. Dk / Df values need to be set to evaluate channel model development efforts.
- Some concern that it might be too early and further data may be necessary.
- Material selection getting more restrictive (taking into account temperature, humidity, and resin content). Estimate approximately 65% of "improved FR-4" material still useable.
- Analog bandwidth is not known yet.
- We need a model for simulations.
- Presentation that shows Joel's selection process would be useful and educational
- Objective is 1m with "improved FR-4". Shorter distances with different materials are permissible.
- How do we build test fixturing without knowing what materials are permissible to use?
- This is not a binding motion. It is intended for guidance.

Break at 10:05 am
Reconvened at 10:26 am

Open Discussion regarding 4 Channel Approach

- Proposed model doesn't differ from XAUI.
- Dual compliance points at either Tx or Rx are causing interoperability issues
- One view – support 4 lanes and ensure interoperability
- Provides 40G upgrade path
- Nothing in the specification that allows vendors to be accountable due to dual compliance points
- Do we need to fix XAUI – specification may be broken, but industry fixed it
    - Should it be done as maintenance to Clause 47?
        - Clause 47 is not for backplanes
        - Maintenance has not addressed because a request was not put in
    - XAUI does not ensure interoperability
    - For a closed system where both sides of the cards are controlled interoperability is most likely less an issue, as vendors have made it work
    - For open systems where both sides of cards are not controlled, interoperability will be a bigger concern
    - We are learning from issues discovered in XAUI
    - The request is more than XAUI, it is running Ethernet over a backplane
    - Fixing XAUI as a project would require running it through 802.3
        - Adding a new port type would be an objectives change and get approved by 802.3

Motion # 1 General Session Motion

Description: Move to augment the existing 802.3ap objectives to include defining a 4 lane 10 Gb/s PHY for operation over the 802.3ap channel model.

Add the following bullet to the objectives:

- **Define a 4-lane 10 Gb/s PHY for operation over the 802.3ap channel model.**

Motion Type: Technical 75 % required
Moved By: Jeff Lynch
Seconded By: David Koenen

Results:	All	Yes – 32	No – 10	Abstain - 3
	802.3	Yes – 11	No – 1	Abstain - 1
P/F	**Motion Passes**			

Discussion

Views on auto-negotiation

- CX4 does not include auto-negotiation.
- There has to be space in the signaling scheme to accommodate auto-negotiation
- Using out-of-band auto-negotiation would be acceptable.
- No maintenance request has been submitted to fix XAUI (for 50cm (20 inches only)).
- Maintenance would not deal with a new item, such as XAUI going 1 m.
- CX4 is a PHY based on supporting cabling, not FR-4

Motion # 2 Motion to amend
Description: Reword Motion #1 as below.

Move to augment the existing 802.3ap objectives to include characterization of 10GBase-CX4 operation over the 802.3ap channel model.

Add the following bullet to the objectives:

- **Characterize 4-lane 10GBase-CX4 operation over the 802.3ap channel model.**

Motion Type: Technical 75 % required
Moved By: Geoff Thompson
Seconded By: Charles Moore
Results: All Yes – 8 No – 23 Abstain - 16
P/F **Motion Fails**

Discussion

- This would prevent opening up CX-4 for modification.

Break for lunch 11:42 am
Reconvened at 1:15 pm

Open Discussion on Auto-Negotiation

Straw Poll #3 Use Clause 45 Registers to manage backplane PHY's (1G, 10G 1 lane, 10G 4 lane)
Results: All Yes – 21 No – 0 Abstain - 10

Discussion

- 802.3ah defines a way to get through Clause 45 addressing and specified electricals
- Clause 22 access is bit, register, and electrically limited
- Need proposal in July

Straw Poll #4 Define feature / capability negotiation for:

- **1G / 10G speeds (1G, 10G 1 lane, 10G over 4 lanes)**
- **Allow negotiation of new technology capabilities for Backplane Ethernet**
- **Define arbitration for capability resolution**

Results: All Yes – 18 No – 0 Abstain - 13

Discussion

- Forcing one thing and indicating capability of one thing are two different items
- Issues caused by people turning off auto-negotation
    - Capabilities are bypassed that are intended to restrict
    - Don't advertise capabilities you don't want to do
    - Needs to be forward-looking

Straw Poll #5 Use Clause 28 to exchange Negotiation parameters (in-band)
Results: All Yes – 5 No – 4 Abstain - 23

Straw Poll #6 Should exchange of negotiation parameters be in-band?
Results: All Yes – 19 No – 3 Abstain - 12

Discussion

- Why in-band? Signal count, pin count, backplane routability, complexity
- The group thinks there should be in-band negotiation, but there appears to be related to use of FLP to do so.
- Call for presentations for other proposals.

Meeting in July, group is encouraged to get rooms at Embassy Suites.

Presentations / proposals needed for next meeting:

- Update from channel model ad hoc
    - how to handle AC-coupling caps?
    - support 3 connector topology
    - comparison to measured data from backplanes
    - per straw poll, use models proposed in goergen_02_0504.pdf as a basis
- Specification proposals for 1Gb/s serial, and 4x3.125Gb/s (10Gb/s) PHYs
- Proposal for 10Gb/s serial signaling schemes (using model in goergen_02_0504 as a basis for performance evaluation):
- Proposals for schemes for the in-band exchange of parameters for feature negotiation
    - more on FLP based schemes
    - alternate proposals

Motion to adjourn – Approved by voice vote without objection
Meeting adjourned 2:30 pm