Reduced Twisted Pair Gigabit Ethernet

Official Meeting Minutes
- Day 1
  Tuesday
• Chair – Steve Carlson
• Recording Secretary – Koussalya Balasubramanian

• Meeting called to order at 9:04AM
• Number of People in room – 40
• Introductions went around the room
Agenda Approval

• Motion to approve or change the Agenda

Moved: Brad Booth
Second: Gary <>

Motion passes by voice vote and agenda is approved
Approval of Previous Minutes

• Motion to approve minutes from may 2012
  Moved: Jeff Heath
  Second: Darshan Yair

Motion passes by voice vote and previous minutes are approved
Press

• No press present in the room

Meeting Goals

• Meeting goals were presented by Steve Carlson <goals in his presentation>
Introduction

• Chair went through
  – Ground rules
  – Electronic Information
  – IEEE structure, project process, Attendance tools
  – Hard copy sheets were passed around to record in-room attendance

• 9:23AM – Patent policy was read out by the chair
  • Chair asked if any of the members want to identify any patent claim / patent applications that affects the standards – None
Action Items from May 2012

• Reports from ad hocs chartered at May meeting
• Vote on new draft PAR, 5C and objectives
Ad hoc Reports

- Ad hoc chairs were requested to come up and present their reports

RTPGE PoE Ad Hoc Report

- Presenter: Dave Dwelley
  - PPT used has copyright notice – Dave will remove it and upload a new one
  - Chartered to generate list of questions for automotive/industrial end uses about PoE needs in those industries
  - Draft of questions and responses posted to reflector
  - Dave Dwelley gave a Brief summary on Clause 33
  - Suggested RTPGE not preclude PoE and if appropriate consider a separate PoE CFI
Discussion on PoE Adhoc Report

- Should we consider including an objective to explore compatibility with clause 33 in RTPGE or Would it not be possible to add minor changes to clause 33
  - To be decided by team
  - Suggested we draft objectives in such a way that we go through the process without objectives getting changed

- Few people reinstated that the CFI done was for RTPGE and not PoE
- Channel is still getting defined so going PoE path can’t be determined ahead of that
- Some people suggested an objective “If a 2-pair solution is chosen then nothing be done that is not compatible with clause 33”
PoE Ad hoc - Summary

- There is interest in room on PoE
- PoE not in scope of RTPGE CFI
- Craft carefully worded objective to place PoE in correct context without breaking anything
Link Segments

Presenter – Chris Diminico

Purpose

- Link Segment Characteristics->Phy considerations
- Technical Feasibility
  1Gb/s full duplex operation over 3-connector link segments up to atleast 15meters using twisted copper cabling with less than 4-pairs and meet the BER objective of less than or equal to 10e-10

Discussion:
How to assume configuration – since the automobile connections are very complicated
-We can assume worst case possibility, pre-configure and test
-The way the connections are engineered will give us control over the parameters. We probably cant specify link segment physically but we can through performance.
- SI quality of harness – Automotive representative response “depends on who does the harness”
EEE Considerations for RTPGE

- Presenter – Michael Bennett

- Purpose
  - Requirements gathering for EEE in RTPGE

- Open Items/Questions to be addressed as part of Objective drafting

- Proposed text for objective “Define optional EEE operation for RTPGE”

Discussions:
Real time requirements should be met (eg low variability in timing specifications)
Automotive PoE requirements for RTPGE

• Presenter: Kirsten Matheus

• Summary
  – Power transmission over data line needs to be possible
  – Of interest for Smart sensors (<2W)
Discussion on Automotive PoE requirements for RTPGE

- Gauge is going to matter and this will control the line voltage
- We might have a mix of 12V and 48V in same car
- Line Voltage needed is not finalized by automobile industry
- Current wakeup mechanism is “separate wire” – when power is sent on it system wakes up – but industry wants to get away for this separate wire concept.
- Simple power on or off might not be all that is needed from EEE perspective.
- Today different wire gauges exists even within one system
- Minimum wire gauge today is 0.35mm² but 0.13mm² is in discussions
- The wires are Stranded
- Yair will send out his presentation on wire gauges to the reflector (the presentation came in late – so we wont be able to cover it in the plenary)
- Timing requirement on Power over data line?
  - Not considered yet
- Any Recommendation for minimum Wattage?
  - No
- Any technical preference between single conductor power (and use system ground) or balanced power (with its own return)
  - Point to keep in mind is some parts of the automobile are not connected to system ground
  - This needs to be clarified by the contributors
Daimler Answers to PoE and channel model Ad hoc

- Presenter: Kirsten Matheus (presenting for Stefan Buntz, Thilo Streichert)

- Summary
  - Power levels stated are different from Bosch requirements
  - Power surges are “unlikely” as opposed to Bosch response of “likely”
  - Power fault action -> Switch to safe state (Bosch response : shutdown)
  - If there is cost advantage, PoE can be treated differently from non-PoE lines
Update on Required Cable Length

• Presenter: Kirsten (presenting for Stefan Bunzt, Thilo Streichert)
• Summary
  – Examples of long haul (15m, 20m, 30m) within Daimler were presented
  – Long Haul market potential was presented as well
  – Market for 40m is significantly smaller compared to 15m -> cost efficient solution needed for 15m (UTP), better cabling (eg., shielded, lower loss) can be considered for 40m
Discussion on Cable length

• In terms of accessories – is there data on what accessories are needed on different type of automobiles (bus, trucks, cars, vans)
  – Cameras were shown in the presentation (more cameras on bus as opposed to Vans), as for other accessories – need input from Daimler

• Are buses the only use case for 40m
  – No – Buses and trucks

• Is it possible to have a intermediary intelligence system in between for the 40m long haul
  – No
Intermission

• 12PM – Team departed for lunch
• 1:30PM – Team reconvened
Wake up for Automotive Communication Networks

• Presenter: Thomas Hogenmuller
• Summary
  – Different Terminal control (eg on/off, on/sleep mode etc.,)
  – Sleep mode current consumption considerations
  – Wake up requirements based on back over avoidance
  – Need for Fast wake-up mechanism to guarantee 100ms link acquisition time
  – Need for Reliable wake up
  – Need for power efficient sleep mode
  – Need to solve automotive power voltage issue (12V)
Tutorial on Lifetime Requirements and Physical Testing for Automotive ECUs

• Presenter – Thomas Hagenmuller

• Summary
  - Typical ECU requirements for ECUs used in engine compartment (Presentation is not a complete summary of requirements)

• Discussions
  – ECU to subdevices has no isolation, there are some ESD requirements though
  – Is the bus connection star or a single bus with multiple drops on it (this might define the requirement on multi-drop PoE)
    • It is single bus with multiple drops on it
Technical feasibility of Gigabit transmission on one or two pair cabling based on category 6a technology

• Presenter : Richard Mei
• Chair asked for permission to present updated presentation on “Technical feasibility of Gigabit transmission on one or two pair cabling based on category 6a technology” - None
• Summary
  – Test results were presented {Test results covered 1-pair/2-pair:8m,3 connectors; 12m, 5 connectors;40m,5 connectors}
  – PHY feasibility study
  – Mode conversion data presented
  – Both 1 pair and 2 pair systems are technically feasible, this data suggests that number of pairs will be determined by other parameters
• Discussion
  – Connector used is not automovite connector {Coming up with the connector is not part of RTPGE SG}
  – Feasibility of physically solving the problem, because the worst case scenario of aggressors (6 around 1) where all aggressors are same type, might be corner case {aggressors might be of different type}
  – Twisted pairs in cable should be kept together
  – Jacketed twisted pairs were investigated – bare twisted pairs were not (for 6 around 1 testing)
  – Measured impedance of the differential pair is ~103Ohms
  – Aging, mechanical reliability not considered in testing – commerically available cat6a cables were used for testing
PHY Feasibility study for one or two pairs RTPGE

- Presenter: Joseph Chou, Benson Huang
- Few backup slides are new – chair asked if the team has opposition against Realtek using this in the presentation if need be – None
- Realtek will upload new slide set with these backup slides
- Summary
  - Cable model from Commscope
  - Salz SNR for performance Evaluation
  - Alien crosstalk dominates overall noise
  - Bidirectional signal on each twisted pair assumed for comparison purposes
  - 1pair Vs 2pair comparison at PAM-4 and no NEXT/FEXT cancellation was shown
    - 2-pair has better SNR margin compared to 1-pair without alien NEXT/FEXT
    - 1-pair solution requires further study on channel coding to enhance SNR margin
  - Complexity comparison between 802.3ab, 2 pair RTPGE and 1 pair RTPGE presented
    - 1 pair is comparable to 2 pair
  - Both 1 and 2 pairs are technically feasible
  - 1 pair 40 meter deserves further study of performance impact caused by environment
Discussions on PHY Feasibility Study from Realtek

• 40nm technology or shrink more?
  – 40nm is used because it is existing technology
• Automotive industry expects to use the current technology available when a solution is decided on
• Complexity is per unit time (how many operations per unit time)
• Aging and EMC effects have to be understood
• AWGN number used (-140dBm/Hz) is what the industry uses
• No coding gain used—what is the overhead because of coding gain.
  - May be 25%- but that shouldn’t affect the technical feasibility
RTPGE Feasibility Considerations on EMC

• Presenter: Shaoan Dai, Dance Wu, Kok-Wui Cheong, David Tsui
• Summary
  – Electromagnetic Susceptibility
  – Electromagnetic Interference
  – Conductor asymmetry discussed
  – Immunity
    • Due to strong interference, high power Tx signal or wide BW are required
    • However high symbol rate requires better insertion loss performance
  – Emission
    • Stringent emission requirements limit the power that can be used to improve the SNR with strong interference
Discussion on EMC Considerations

• Automotive environment is harsh (25Kv transient etc.,) we should test in that environment
• Where does the 39dBm come from
  – Chosen from IEC standard
• What Simulation parameters were used to arrive at the Interference Frequency response
  – Discussion on transformer imbalance and the impact it might have on the response – something the team needs to include as next phase?
• DPI(Direct Power Injection) test method – how much is it related to differential mode to common mode conversion
  – IEC standard for evaluation ICs used as first step
  – If this can be extended for given channel that will be very useful
Update on EMC Requirements

• Presenter: Kirsten (presenting for Stefan Buntz, Thilo Streichert)
• Summary:
  – 3 different EMC levels (Vehicle, ECU, Component/chip)
  – Presentation listed all known EMC requirements
  – All EMC requirements on component level must be fulfilled with ECUs equipped with RTPGE connections.
• Discussion
  – Performance criteria might be the best way forward?
  – A specification comparison (between German specification and other national/international specifications) effort might still be worth
  – German specifications might be the toughest – as long as that is met other specifications most likely might get met
Slightly Beyond RTPGE

• Presenter: Geoff Thompson
• Summary
  – Wye-PHY vs current Eye-PHY
  – Eye-PHY
    • One port up to MAC and one port down to MDI
  – Wye – PHY
    • 2 ports up and one port down to MDI
  – All current 802.3 PHYs are Eye-PHY configuration
  – 802.9 (Broadband ISDN) did a Wye-PHY (std 802.9a-1995)
  – The Wye-PHY configuration could have advantages in automotive environment and has potential of assisting EEE
  – Wye-PHY development at a later point might not be complex
Discussions on Beyond RTPGE

• Wye-PHY is like muxing between 2 networks?
  – It is an alternative to going into MAC and adding a preemptive mechanism

• Ratio between 2 MACs? And the effect on throughput as perceived by each MAC

• If process control and Gig side are the 2 up streams, the process control might be awake all the time and can be utilized for wake up call.
  – Its LPI from Gig point of view but process control is always up
  – It is slowing down the timescale of activity but activity is still there – not really LPI
Requirements Update

• Presenter: Kirsten Matheus
• Summary
  – Additional or update on requirements presented
  – BER 10e-10 after equalization and decoding
  – Crystal Accuracy in automotive environment
    • Tradeoff between costs and start-up time should be taken into account
  – Requirements list update (includes feedback from Japanese car industry players)
  – Reach 15m/40m
  – PoE
  – Wake-up
  – 10uA Quiscent current
  – EMC
Day I - Meeting adjourned at 5:05PM
Day II

Meeting called for order at 10:45AM
Low latency discussion

• Request for tutorial to understand terminology of 802.1
• What is distinguished packet
  – A tag to distinguish time critical packet from normal packet
• MAC is part of 802.3 specification
  – MAC or below 802.3 owns it
• 802.1 is responsible for bridging
  – Above MAC is 802.1’s charter
• It is a bad Idea to Crack open MAC to take care of low latency traffic
SG-Plan of Action

• Chair went through the goal again – “To draft PAR and 5C. The draft from this meeting will not be final”
• At next Geneva Interim-Any proposed changes will be presented and voted upon. Team to adopt a final PAR, 5C and objectives out of Geneva interim. The same will be submitted to 802.3 WG chair
• San Antonio Plenary – PAR, 5C and objectives to be presented and voted upon by WG during closing plenary.
• Post San Antonio Plenary – PAR and 5C will be forwarded to EC for approval, then sent to NesCom and finally the SASB.
• Request from Team to favor reflector for discussions over teleconference – so people who are travelling a lot don’t miss out.
Motion #1

- Move that “IEEE 802.3 extend the Reduced Twisted Pair Gigabit Ethernet study group”

M: Jeff Heath
S: Darshan Yair
Taken by Voice
Procedural, 50%

Passed unanimously by voice.
Intermission – Day II

Team Adjourned for lunch at 11:05AM
Team reconvened at 1:07PM
PAR Drafting

• Scope, Project need were defined
• No questions were raised
• No comments were given
Motion #2

- Move to Adopt PARDrafttext_01_0712

Moved: Jeff Heath
Second: Mehmet Tazebay
(technical-75%)

Yes: 29
No: 0
Abstain: 0

Motion passes
Compatibility

• Compatibility was discussed
• Compatibility with auto-negotiation was raised and discussed
  – The automotive/industrial requirements are break away from current legacy approach
  – Structure it into objectives
  – Compatibility information doesn’t preclude auto-negotiation
Motion #3

• Motion to “Accept compatibility response from 5C_new_form_RTPGE_01_0712”

Moved: Mehmet Tazebay
Second: Darshan Yair
(Technical-75%)
Discussion: None

Yes:26
No:0
Abstain:0

Motion passes
Motion #4

• Motion to “Accept Distinct Identity response from 5C_new_form_RTPGE_01_0712”

Moved: Richard
Second: Darshan Yair
(Technical-75%)
Discussion: None

Yes:32
No:0
Abstain:0

Motion passes
Technical Feasibility

• Discussion on re-ordering the points
• Reference to 10GBaseT was removed
Motion #5

- Motion to “Accept Technical Feasibility response from 5C_new_form_RTPGE_01_0712”

Moved: Geoffrey Thompson
Second: Mandeep Chadha
(Technical-75%)
Discussion: None

Yes:38
No:0
Abstain:0

Motion passes
Motion #6

- Motion to “Accept Economic Feasibility response from 5C_new_form_RTPGE_01_0712”

Moved: George Zimmerman
Second: Mike Bennett
(Technical-75%)
Discussion: None

Yes:36
No:0
Abstain:0

Motion passes
Motion #7

- Motion to “Accept Broad Market Potential response from 5C_new_form_RTPGE_01_0712”

Moved: Thomas Hogenmuller
Second: Darshan Yair
(Technical-75%)
Discussion: None

Yes:37
No:0
Abstain:0

Motion passes
Motion #8

• Define optional Energy Efficient Ethernet operation for Reduced Twisted Pair Gigabit Ethernet (Objective G in) RTPGE_objectives_07182012

Moved: Mike Bennett
Second: Wael Diab
(Technical-75%)
Discussion: (Around the possibility of EEE solution taking longer duration to come up with) Done

Yes: 37
No: 0
Abstain: 2

Motion passes
Day III

Meeting called for Order – 9:16AM
Motion #9

- Motion to accept objectives d,e,f and g as specified in document RTPGE_objectives_07192012.pdf

Moved: Mehmet Tazebay
Second: George Zimmerman
(Technical-75%)
Discussion: None

Yes:31
No:0
Abstain:0

Motion passes
Motion #10

- Motion to adopt “Select Line code that allows for future additional functionality” as draft objective

Moved: Dave Dwelley
Second: Jeff Heath
Discussions: Team felt there is no need for it for multiple reasons (reserved control codes already exists in standard, we can’t include future outlooks – future projects are supposed to be backward compatible)

(Technical-75%)
Yes:0
No:26
Abstain:7

Motion fails
Motion #11

- Motion to “Support optional auto-negotiation capability”

Moved: Joseph Chou
Second: Albert
Discussion:
- The CFI was for 1G so why need an auto-negotiation
- Automobile industry doesn’t seem to need it
- Though automobile industry doesn’t need it – it might be useful to anybody who wants to utilize RTPGE
- The motion is for “Optional” capability
- Objective means we will do that work and if need be 802.3 allows objectives to be added at a later time
- Channel is not defined yet and the channel can be completely different from already existing ones – though objective is optional we still have to write it in the specification and only implementation is optional

(Technical 75%)
Yes: 9
No: 12
Abstain: 15

Motion fails
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