Reduced Twisted Pair Gigabit Ethernet PHY

IEEE 802.3 Ethernet Working Group

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- Study Group web page URL:

  www.ieee802.org/3/RTPGE/index.html

RTPGE SG Meeting-September 2012

- Met in Geneva Thursday and Friday, September 27 and 28, 2012
- ~50 people in the room
- Continued to refine PAR, 5C and objectives
- Heard 7 presentations on objectives and technical feasibility
- Adopted final SG versions of PAR, 5c and objectives
- Conducted numerous straw polls and motions
- Probably learned more than we wanted about parliamentary procedures
- Special thanks to Mandeep Chadha, who acted as Recording Secretary
- Requested David Law, 802.3 WG Chair to pre-submit the PAR and 5C (and objectives) to the 802.3 WG and 802 EC
- Chartered the EMC ad hoc and dissolved the objectives ad hoc

Other work

- Held two teleconferences:
  - EMC ad hoc
  - Performance characteristics of the automotive lick segment ad hoc

Draft Objectives (1 of 2)

- **Preserve the IEEE 802.3/Ethernet frame format at the MAC client service interface.**
- **Preserve minimum and maximum frame size of the current IEEE 802.3 standard.**
- **Support full duplex operation only.**
- **Support a speed of 1 Gb/s at the MAC/PLS service interface.**
- **Maintain a bit error ratio (BER) of less than or equal to 10^-10 at the MAC/PLS service interface**
- **Support 1 Gb/s operation in automotive & industrial environments (e.g. EMC, temperature).**
- **Define optional Energy-Efficient Ethernet**

Draft Objectives (2 of 2)

- **Define the performance characteristics of an automotive link segment and a PHY to support point-to-point operation over this link segment with less than three twisted pairs supporting up to four inline connectors using balanced copper cabling for at least 15m for the automotive link segment.**
- **Define the performance characteristics of optional link segment(s) for the above PHY for industrial controls and/or automation, transportation (aircraft, railway, bus and heavy trucks) applications with a goal of at least 40m reach**
- **Define optional startup procedure which enables the time from power_on=FALSE to valid data to be less than 100ms**

Broad Market Potential

I. Broad sets of applicability
II. Multiple vendors and numerous users
III. Balanced costs (LAN versus attached stations)

Multiple vendors and numerous users

- At the Call for Interest, 65 individuals from 42 companies indicated they would support this project. These included automotive companies, automotive OEMs, silicon and cabling vendors, (among others)
  - In 2012 approximately 82 million cars and light trucks will be produced
  - 12 million premium segment cars and 45 million middle segment cars
  - The prediction for 2019 is 115 million total with 15 million premium and 60 million middle segment.
- Data presented indicates hundreds of millions ports/year for Ethernet in automotive by 2018-22.
- The Industrial Automation solutions currently have about 100 million installed Ethernet nodes on the market, with a growth of about 43% per year. A transition from fieldbus communication networks to Ethernet is on the way and new applications in industrial automation are expected.

Balanced Cost (LAN versus attached solutions)

- The Reduced Twisted Pair Gigabit Ethernet interface will maintain a favorable cost balance for in-vehicle applications operating over twisted pair copper cables.

Compatibility

IEEE 802 defines a family of standards. All standards should be in conformance with the IEEE 802.1 Architecture, Management, and Interworking documents as follows: IEEE 802. Overview and Architecture, IEEE 802.1D, IEEE 802.1Q, and parts of IEEE 802.1F. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with IEEE 802.1.

Each standard in the IEEE 802 family of standards shall include a definition of managed objects that are compatible with systems management standards.

I. Compatibility with IEEE Std 802.3
II. Conformance with the IEEE Std 802.3 MAC
III. Managed object definitions compatible with SNMP

- As an amendment to IEEE Std 802.3, the proposed project will remain in conformance with the IEEE 802 Overview and Architecture, the bridging standards IEEE Std 802.1D and IEEE Std 802.1Q.
- The proposed amendment will conform to the full-duplex operating mode of the IEEE 802.3 MAC.
- The proposed amendment will conform to the Gigabit Media Independent Interface (GMII).
- The project will include a protocol independent specification of managed objects with SNMP management capability to be provided in the future by an amendment to or revision of IEEE P802.3.1
- The PAR mandates the resulting standard will comply with IEEE Std 802, IEEE Std 802.1D, and IEEE Std 802.1Q.

Distinct Identity

I. Substantially different from other IEEE 802 standards
II. One unique solution per problem (not two solutions to a problem)
III. Easy for the document reader to select the relevant specification
IV. Substantially different from other IEEE 802.3 specifications/solutions.

- There is no standard that supports Ethernet over fewer than four twisted copper wire pairs at an operating speed of 1 Gb/s.
- The standard will define one PHY.
- The proposed amendment to the existing IEEE 802.3 standard will be formatted as a collection of new clauses, making it easy for the reader to select the relevant specification.

Technical Feasibility

I. Demonstrated System Feasibility
II. Proven Technology
III. Confidence in reliability

- The proposed project will build on the array of Ethernet component and system design experience, and the broad knowledge base of Ethernet network operation.
- Component vendors have presented data on the feasibility of the necessary components for this project. Proposals which leverage existing 1000BASE-T technologies have been provided.
- The reliability of Ethernet components and systems can be projected in the target environments with a high degree of confidence.

Economic Feasibility

I. Known cost factors, reliable data
II. Reasonable cost for performance
III. Consideration of installation costs

- The cost factors for Ethernet components and systems are well known. The proposed project may introduce new cost factors which can be quantified.
- Prior experience in the development of other twisted pair copper physical layer specifications for Ethernet indicates that the specifications developed by this project will entail a reasonable cost for the resulting performance.
- The reduction in the number of pairs and resulting weight reduction for the targeted markets will result in a significant drop in overall costs. The improved ease of installation will likely reduce costs.

Goals for the week

- Meet Tuesday, Wednesday 9:00AM – 6:00PM
- and Thursday morning (if needed
  - Automotive links segment ad hoc
  - EMC ad hoc
- Respond to questions from other 802 WG on PAR and 5C by Wednesday at 5PM
- Respond to questions on PAR, 5C and objectives from 802.3 WG
- Request Task Force status from 802.3 WG at closing plenary
- Request SG extension
- Plan for next meeting

Draft PAR (IEEE P802.3bp)

- http://ieee802.org/3/RTPGE/P802_3bp_PAR.pdf

Thank you!