"Distinguished minimum latency traffic in a converged traffic environment" DMLT

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IEEE 802.3 Ethernet Working Group

IEEE 802.3 Closing Plenary, SG report
July, 18, 2013
Geneva, *Confoederatio Helvetica* (CH),
Schweizerische Eidgenossenschaft.

Logistics

- CFI information posted at page

  <http://www.ieee802.org/3/cfi/request_1112_1.html> with a link to the presentation - the presentation itself can be found at the link

  <http://www.ieee802.org/3/cfi/1112_1/CFI_01_1112.pdf>

- SG reflector

  stds-802-3-DMLT@listserv.ieee.org

- Study Group web page URL:

  http://www.ieee802.org/3/DMLT/

DMLT SG meeting in Geneva

- Met Tuesday and Wednesday morning;
- Met Wednesday from 09:00 to 10:00 with 802.1TSN.
- Revised draft PAR according to 802.11 comments.
- Created a comment resolution to 802.11 comments; and
- Finalized Objectives.

Status of SG

- SG drafted PAR, 5C and objectives and agreed unanimously to forward these to 802.3 for approval.
  - 20 objectives were unanimously approved
  - DRAFT PAR and 5C are adopted as draft of DMLT SG. PAR editorial improved based on the IEEE 802.11 comments.
    - PAR:http://www.ieee802.org/3/DMLT/8023-DMLT-SG-1305-Winkel-PAR-2013-07-17r2.pdf
    - 5C: http://www.ieee802.org/3/DMLT/8023-DMLT-SG-1305-Winkel-5C-2013-05-17r1.pdf
    - Objectives: http://www.ieee802.org/3/DMLT/8023-DMLT-SG-1305-Winkel-Objectives-2013-07-17r2.pdf
- IEEE P802.3br PAR selected designation

PAR title

- SG DMLT proposes a PAR title:

IEEE Standard for Ethernet

  Amendment Specification and Management Parameters for

Interspersing Express Traffic.

- Scope:
  - The scope of this project is to specify additions to and appropriate modifications of IEEE Std 802.3 to add a support for interspersed express traffic.

PAR rev1 changes

5.5 Need for the Project:

Adoption of Ethernet into new market areas~~, including but not limited to,~~ such as automotive, industrial automation, transportation (aircraft, railway and heavy trucks) has generated a need to converge low latency and best effort traffic streams.

5.6 Stakeholders for the Standard:

~~Stakeholders identified to date includes but are not limited to:~~ Users and producers of systems and components for the automotive, industrial automation, transportation (aircraft and rail) industries, professional Audio Video industries.

Broad Market Potential

a) - Specific to automotive in-vehicle environment
Streaming, Data, Control, over single LAN segment that supports, infotainment, driver assist and diagnostics within various functional LAN segments within a vehicular network. Control systems require lower-latency bridged networks for this convergence.

- Specific to Industrial network environment
Low Latency Sampling Data, (closed loop) Control, Image streaming (e.g. image processing) and data traffic, sampling data and closed loop control traffic have very demanding latency requirements. Image streaming and associated processing as a part of a control loop has greater requirements than best effort could provide in a converged network. Best effort traffic is not time-critical, but provides a constant source for interference traffic.

Broad Market Potential (2)

A standards project authorized by IEEE 802 LMSC shall have a broad market potential. Specifically, it shall have the potential for:
- a) **Broad sets of applicability**
- b) **Multiple vendors and numerous users**

b) Multiple vendors and numerous users

- At the Call for Interest, held in 2012 Nov Plenary, 23 individuals from 22 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 100's of millions ports/year for Ethernet in automotive by 2018~2022.

- By the end of the year 2012, Industrial Automation solutions amount to about 150 million installed Ethernet ports on the market, with a growth of about 40% in 2012. In addition to that, transition from non-Ethernet fieldbus communication networks to Ethernet is on the way and new applications in industrial automation are expected. The number of industrial Ethernet ports sold worldwide is 40 million per year in 2012. This is expected to grow to over 80 million ports per year in 2015. Additional market served with this standards are medical control systems (e.g. MRI), Energy automation (e.g. Power substation controllers and protection equipment), automation of traffic systems, other critical infrastructure and Avionics.

Compatibility

IEEE 802 LMSC defines a family of standards. **All standards should be in conformance : IEEE Std 802, IEEE 802.1D, and IEEE 802.1Q. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with IEEE 802.1 Working Group. In order to demonstrate compatibility with this criterion, the Five Criteria statement must answer the following questions. Each standard in the IEEE 802 family of standards shall include a definition of managed objects that are compatible with systems management standards. Each standard in the IEEE 802 family of standards shall include a definition of managed objects that are compatible with systems management standards.**

a) Does the PAR mandate that the standard shall comply with IEEE Std 802, IEEE Std 802.1D and IEEE Std 802.1Q?

b) If not, how will the Working Group ensure that the resulting draft standard

- **Compatibility with IEEE Std 802.3**
- **Conformance with the IEEE Std 802.3 MAC**
- **Managed object definitions compatible with SNMP**
- This standard will conform to the above architectures, and specifically 802.1Q bridge framework for forwarding and receiving compatibility at the ISS (Internal Sub-layer Service) . This guarantees that 802.1Q bridges can be added to a network of bridges and end stations that implements this standard to increment the network functionality.
- 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, including IEEE 802.1Qbu when it will be released.
- The proposed amendment will conform to the full-duplex point-to-point operating mode of the IEEE 802.3 MAC
- 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

Distinct Identity

Each IEEE 802 LMSC standard shall have a distinct identity. To achieve this, each authorized
project shall be:
   a) Substantially different from other IEEE 802 standards
   b) One unique solution per problem (not two solutions to a problem)
   c) Easy for the document reader to select the relevant specification
   d) Substantially different from other IEEE 802.3 specifications/solutions.

a) There is no existing 802 standard or approved project that provides lower-latency transmit and receive paths for interspersed express traffic.

b) There is no IEEE 802 based solution that significantly improves latency to be as close to zero as practically achievable on a converged network.

c) 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.

d) There is no IEEE 802.3 based solution that provides this service.

Technical Feasibility

For a project to be authorized, it shall be able to show its technical feasibility. At a minimum, the proposed project shall show:

  a) Demonstrated system feasibility.

  b) Proven technology, reasonable testing.

  c) Confidence in reliability.

a) The proposed project will build on the array of Ethernet component and system design experience, and the broad knowledge base of Ethernet network operation.

b) System and component vendors have proven related technologies in many proprietary and segment-specific standards in providing similar technologies in production systems.

c) The reliability of Ethernet components and systems can be projected in the target environments with a high degree of confidence.

Economic Feasibility

> **For a project to be authorized, it shall be able to show economic feasibility (so far as can reasonably be estimated) for its intended applications. At a minimum, the proposed project shall show:**
> - **a) Known cost factors, reliable data.**
> - **b) Reasonable cost for performance.**
> - **c) Consideration of installation costs.**

a) The cost factors for Ethernet components and systems are well known. The proposed project may introduce new cost factors . It is expected that this standard would add small and contained incremental cost to Ethernet bridge and end station implementations.

b) Reasonable cost for performance, widely accepted today in IT segment, will be consistent in this standard. In addition, this standard would help convergence of low-latency control application over Time Sensitive Networking (802.1 TSN TG) and virtual LAN (802.1Q) bridging, thereby helping to replace overlay LANs .

c) Installation cost is expected to be not different than installation cost of existing Ethernet bridges and end stations. Installation cost is expected to be lower compared to installation cost of overlay LANs and parallel point-to-point links.

Objectives (1) – Approved in SG

1. Preserve the IEEE 802.3 Ethernet frame format at the MAC client service interface.

2. Preserve minimum and maximum MAC frame size of the current IEEE 802.3 standard.

3. Use the Clause 4/4a MAC without alteration.

4. Support full duplex point-to-point operation only.

5. Support a speed of 100 Mb/s and above at the MAC/PLS service interface.

6. Preserve relevant MAC/PLS service interface.

7. Does not degrade (increase) undetected bit error ratio (BER)) at the MAC/PLS service interface.

Objectives (2) – Approved in SG

8. Provide affirmative assurance that both end of the link have this capability before operating in this mode.

9. Provide a mechanism for reduced access latency where the reduced access latency is significantly less than one maximum packet transmit time.

10. Maximum latency for DMLT frame transmission (ahead of the non-DMLT frame) will be as close to the minimum packet size + IPG (1st and last) as practically possible.

11. Quantify the maximum access latency of the DMLT transmit path.

12. Provide two MAC service interfaces at each end of the DMLT link, as the means to distinguish between the DMLT and the ordinary traffic.

    – Optional MAC Control sub-layer shall be confined to the ordinary MAC Service Interface.

Objectives (3) – Approved in SG

13. Address the impact between Energy-Efficient Ethernet and DMLT operation.

14. This project will be media independent.

15. Require no changes to existing Point-To-Point full-duplex PHYs.

16. Consider providing, at the MAC Client Service interface, a primitive that holds the transmit path in the express position.

17. "M-Frame in the wild" will ~~should~~ be constructed such that it shall ~~will~~ not be ~~forwarded by~~ recognized as a valid frame by a non-DMLT-capable device.

    – Buffer repeater e.g. legacy TPMR would be " in the wild".

Objectives (4) – Approved in SG

1. ~~Preserve [Clause 3~~4~~/4a] frame format on the respective physical medium.~~ (Editor Note: This is covered by #17 on page (3) and #19 on this page)

18. Support of the Point to Multipoint (P2MP) is not a goal.
    – Downstream Support presents fewer challenges.

19. Fragment size greater than or equal to 64 Bytes.

20. The frame delivered at the receiving MAC service interface shall be identical to the frame sent at the transmitting MAC service interface.

Motion

Approve the IEEE P802.3br project Objectives

M: L.Winkel

S:

Technical (>=75%)

Y: N: A:

Motion

Approve the IEEE P802.3br project response to the Broad Market Potential criterion

M: L.Winkel

S:

Technical (>=75%)

Y: N: A:

Motion

Approve the IEEE P802.3br project response to the Compatibility criterion

M: L.Winkel

S:

Technical (>=75%)

Y: N: A:

Motion

Approve the IEEE P802.3br project response to the Distinct Identity criterion

M: L.Winkel

S:

Technical (>=75%)

Y: N: A:

Motion

Approve the IEEE P802.3br project response to the Technical Feasibility criterion

M: L.Winkel

S:

Technical (>=75%)

Y: N: A:

Motion

Approve the IEEE P802.3br project response to the Economic Feasibility criterion

M: L.Winkel

S:

Technical (>=75%)

Y: N: A:

Motion

Approve the IEEE P802.3br PAR

Interspersing express traffic

M: L.Winkel

S:

Technical (>=75%)

Y: N: A:

Motion

Extend the DMLT Study Group until the next plenary session.

Moved by L.Winkel on behalf of the Study Group

(>50%)

Y: N: A:

Next Steps

- Meet at York interim meeting Sept 2013.

- Hold a joint IEEE 802.1 TSN meeting.

- Continue work on interspersed express traffic.