IEEE 802.1 DRAFT PAR and 5C for pre-emption and fragmentation enhancement to 802.1Q

Version 2,

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2.1 Project Title

IEEE Standard for Local and Metropolitan Area Networks - Virtual Bridged Local Area Networks: <n> Amendment: Enhanced Low-Latency Bridging.

Other PAR Fields (1)

4.1 Type of Ballot: Individual

4.2 Expected Date of submission of draft to the IEEE-SA for Initial Sponsor Ballot: ? 04/2013 ?

4.3 Projected Completion Date for Submittal to RevCom: ? 11/2013 ?

5.1 Approximate number of people expected to be actively involved in the development of this project: ? 20 ?

5.3 Is the completion of this standard dependent upon the completion of another standard:
DISCUSS: 802.1Qat-Rev may be relevant, but does not depend on it. i.e. this standard could be used over existing 802.1Q bridging. 802.3 PAR did not start yet. This PAR could be implemented without 802.3 enhancement but that is deemed sub-optimal.

5.6 Stakeholders for the Standard: Developers, providers, and users of networking services and equipment for Industrial Automation, In-vehicle networking, and other systems requiring low latency virtual LAN bridges, including networking IC developers, bridge and NIC vendors, and users.

5.2 Scope

This standard specifies protocols, procedures, and managed objects that:

- Provide for low-latency class of service in a Virtual Local Area Network MAC Bridge.
- Defines bridge to bridge dynamic fragmentation and its reassembly ("Preemption") for point-to-point links
- Defines class of service for low-latency frames and the bridge transmitter to selectively suspend frame-in-transmit and allow for the low-latency frame to be transmitted, then the suspended frame to resume. This suspend-and-resume may occur multiple times for a given non-low-latency frame.
- Provide for discovery, configuration, and control of preemption service for a bridge port [Discuss: Bridge only or Bridge & End-point for this and next two]
- Define the requirements for, and operation of, a bridge transmitter behavior that supports preemption.
- Define the requirements for, and operation of, a bridge receiver behavior that supports preemption.
- [Discuss: "Multi-level" preemption possibility]
- [Discuss: "Other augmentation that would improve Preemption method].

5.4 Purpose

- The purpose of this standard is to allow shortest practically possible bridging latency for urgent class frames in low-latency applications between conformant bridges.

5.5 Need for the Standard

- A maximum sized frame may be ahead of low-latency frame on a given egress port. This provides the lower bound of bridge relay latency. For many control applications in industrial control and automotive, lower latency than this lower bound is required to converge such control applications onto bridged LAN.
- In industrial control, higher link speed with a significantly greater than 7 bridge hop requires support of low-latency bridging.
- In automotive, lower latency over smaller number of bridge hop requires support of low-latency bridging.
- Multiple additional uses of this standard extends to medical (e.g. MRI controllers) and Energy sub-station real-time power control systems.

Other PAR Fields (2)

6.1 Intellectual Property

6.1.a. Is the Sponsor aware of any copyright permissions needed for this project?: No

6.1.b. Is the Sponsor aware of possible registration activity related to this project?: No

7.1 Are there other standards or projects with a similar scope?: No

7.2 International Activities

a. Adoption

Is there potential for this standard (in part or in whole) to be adopted by another national, regional or international organization?: No

b. Joint Development

Is it the intent to develop this document jointly with another organization?: No

c. Harmonization

Are you aware of another organization that may be interested in portions of this document in their standardization development efforts?: No

8.1 Additional Explanatory Notes (Item Number and Explanation):

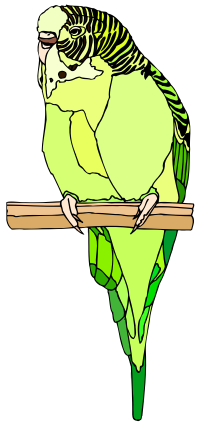
The 5 Critters

Broad Market Potential

Compatibility

Distinct Identity

Technical Feasibility



Economic Feasibility

[IEEE] 5C Guidelines for responses

- Be prepared to defend every word of the responses
- Responses must be specific
- Responses must be succinct
- Responses must be honest
- A project must satisfy all 5 of the criteria simultaneously

Broad Market Potential

a) Broad sets of applicability

b) Multiple vendors and numerous users

c) Balanced costs (LAN versus attached stations)*

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

b) 60 million in 2010 (56~70 million per annum from 1960's till now) cars and light-trucks/SUVs sold per year. In-vehicle networking is expected to reach >15% in 2011 and grow. With a assumption of @ 5 Ethernet nodes/vehicle, Assuming 60 million vehicles/year, potential vehicle market served at 15% adoption would yield 45+ million nodes (plus 45+ million Switch ports). The number of Ethernet Switch ports is ~300 million/yr, split 35%:60%:5% FE/GE/10+GE in 2011.
Thus potential for 15% Ethernet market expansion as adoption occurs in automotive.

Industrial Automation – ["The number of industrial Ethernet ports sold worldwide is 24 million per year in 2010. This is expected to grow to 40 million per year in 2014.] Additional market served with this standards are medial control systems (e.g. MRI), and Energy (e.g. Power substation power controllers), and Avionics.

c) This project does not materially alter the existing cost structure of bridged networks. Attached stations would not be aware of the operations by transit bridges [**DISCUSS** – End-points/Routers? DCB would want this as well.]

*Note: "attached stations" used mean point-to-point versus LAN (networked) connections.

Compatibility

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

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

a) The standard will conform to the above architectures, and specifically 802.1Qxx bridge framework for forwarding and receiving compatibility at the ISS . This guarantees that 802.1Qxx bridges can be added to a network of bridges that implements this standard to increment the network functionality.

b) Such a definition will be included.

Distinct Identity

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

a) There is no existing 802 standard or approved project that provides lower-latency bridging through preemption.

b) There is no IEEE 802.1 based solution that improves latency to be better than transmit of urgent frame after store-and-forward of a maximum sized frame (e.g. “Head of Line Blocking”).

c) This standard is to be placed in relevant sections of 802.1Q.

Technical Feasibility

a) Demonstrated system feasibility
b) Proven technology, reasonable testing
c) Confidence in reliability
d) Coexistence of 802 wireless standards specifying devices for unlicensed operation.

a) General fragmentation and on-demand fragmentation has been used in other networking and dedicated links in the past and today in both software and hardware based systems.

b) This standard is based on mature virtual LAN bridging and transmit selection and scheduling.

c) The technology re-use, and other augmented methods are deemed proven for their reliability.

d) Not Applicable

Economic Feasibility

a) Known cost factors, reliable data
b) Reasonable cost for performance
c) Consideration of installation costs

a) The standard would add small and contained incremental cost to the existing 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 supported by AV Bridging and virtual LAN bridging that exist today, thereby helping to replace a) overlay LANs, b) multiple dedicated point-to-point wires.

c) Installation cost is expected to be not different than installation cost of exist VLAN bridges and end station.