IEEE 802.1 Qbv DRAFT 5C's for Time Aware Shaper enhancement to 802.1Q

Version 2,

Edited by Don Pannell@ Marvell

The 5 Critters

Broad Market Potential

Compatibility

Distinct Identity

Technical Feasibility

Economic Feasibility

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 link 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.

Specific to Industrial network environment.
Low Latency Sampling Data, (Closed Loop) Control, Data Streaming (e.g. image processing) and supervision data traffic.
Sampling Data and Closed Loop Control traffic have very demanding latency requirements,
Data streaming (e.g. image processing) is less demanding than control, but higher than best effort. Supervision Data traffic is not time-critical, but provides a constant source for interference traffic.

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 existing Ethernet Switch ports is ~400 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 medical 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.

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 802.1Q bridge framework for forwarding and receiving compatibility at the ISS . This guarantees that 802.1Q bridges can be added to a network of bridge and an end stations 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 through the use of Time Aware Shapers for Scheduled traffic.

b) There is no IEEE 802 based solution that improves latency for engineered networks by removing all interfering frames in the path at the time the Scheduled traffic is to be transmitted. For those networks that need the lowest possible latency, the network must be engineered and Scheduled traffic with Time Aware Shapers must be used.

c) This standard enhances QoS 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) All AVB Generation 1 Bridges and End Nodes are locked in time by IEEE 802.1AS. It has been demonstrated that multiple End Nodes can use IEEE 802.1AS as a time base to synchronize events with sufficient accuracy. AVB Bridges support the propagation of time across the network but does not use that time. This enhancement connects bridges to this proven common time base. Many non-IEEE 802 networks that require very low latency use similar concepts. This enhancement allows them to work with existing IEEE 802 systems and standards.

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 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. The extra performance gain of this enhancement adds new markets that otherwise could not be addressed.

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