Audio Video Bridging Gen 2 Assumptions

IEEE 802.1 AVB Plenary

Nov 2010 – Dallas, TX

Green Text = Agreed to at a Plenary (was Blue or Red)

Blue Text = Newly Agreed to (was Red at last Face 2 Face)

Black Text = Not Decided

Changes Marked with Red from last version

Don Pannell

Marvell Semiconductor

dpannell@marvell.com

Revision History

- avb-pannell-gen2-assumptions-1110-v2: Work done in Dallas
- avb-pannell-gen2-assumptions-0910-v1: 1st grouping of all STDs – stolen from below
- at-cgunther-srp-rev2-assumptions: First draft presented July 2010, San Diego, CA

Overview

This document is a collection of concepts and ideas for *possible* inclusion in the next versions of gPTP (802.1AS), SRP (802.1Qat) and/or the AVB Shaper (802.1Qav) or some new standard.

It should not be considered as a Work Item list yet. Each item needs contributions (i.e., presentations) before it can be agreed to and considered an item to be added to draft standard. These presentations are needed immediately.

gPTP Generation 2 Ideas

gPTP Possible New Work

- Support for Link Agg (IEEE 802.1AX)
- Security (need the requirements and level of needed security)
- Support for other media:
  - Support for IEEE 1901
  - WiFi Direct (if changes are needed)
  - Others?
- Alternate Timescales (e.g., transport time zone information)
- Time router (gPTP across a Layer 3 router)
- Mapping between NTP and AS (applicable to 1588)?
- No One Step support – but One Step Tolerant?
- Hardware Two Step (immediate follow up)
- Look at any potential issues with long chains of daisy chained time aware nodes (or long networks) that may be in a large ring

gPTP Possible New Work

- Redundancy
  - Short reconfiguration w/redundant paths when one path fails
  - Even Faster Grand Master change over
- Automatic measurement of link delay asymmetry
- Detect buffered repeaters on other than 802.3 copper links
  - Add in a variable latency in the link delay as an enhanced mechanism?
  - Need an alternate mechanism for long (fiber) links
- Reduce BMCA convergence time when a loop exists
  - See Mick Seaman's work on loop detection
- How to assess the synchronization performance of a node
  - For certification

SRP Generation 2 Ideas

SRP – Possible New Work

- Dynamic bandwidth reservations (modify 'on the fly')
  - Done by requesting the same Stream ID with a new T-Spec?
- Variable bit rate reservations (statistical averaging)
  - Currently a video stream must reserve the max it will use
  - Still want to be able to Guarantee all streams are delivered
- Dynamic changes to latency
  - Due to redundancy
  - Due to MGMT reconfiguration of a bridge
    - Change in Fan-in
    - Class % allocated
- Add the ability to get current worst case latency assuming no new reservations
  - Report Max size interfering frame that is smaller than 1522 if that is all a Talker node needs to Tx

SRP - Possible New Work

- Configurable Max Latency parameter that can prevent a reservation
  - On a per port and/or per bridge basis
- Add a Tear Down Rank bit
  - So a newer stream can stay when bandwidth is needed elsewhere
- Be able to create a reservation via MGMT
- Two-way reservations – decided no need to support
  - Must be handled at a higher layer
- Explicit path reservation – like Talker Advertise pruning to save network & CPU bandwidth by reducing flooding?
  - Needed for Redundancy?
  - Intent is to make things as simple as possible but built on SRP
  - Advertise Pruning on receipt Listener Ready

SRP - Possible New Work

- Link aggregation
  - With and without redundancy
- Redundancy
  - Spanning the range from no single points of failure to up to two completely independent paths with copied data (link to pres)
  - The redundant path may be statistically over subscribed?
  - Protocol neutral interface to layer 2 redundancy mechanisms
  - Need to be able to determine stream recovery times
- Energy Efficient Ethernet
  - Remove MMRP/MVRP periodic timers on EEE links (or all the links)
  - Rest may be solved in 802.1BA
- Unicast address Stream destination address
  - What is the real problem here? Makes Policing harder.
  - Streaming HTTP on top of TCP use unicast addresses
    - Can be detected and fixed? (i.e., make it a multicast on the AVB LAN)

SRP - Possible New Work

- Multiple Talkers per Stream (one streaming at a time)
  - Networked video switcher
    - Switch on a bit in a stream or switch at a specific time
    - Or do the Talkers to all the turning on or off (i.e., the MUX'ing)
      - Need the concept of a Group Reservation
- Multiple Talkers per Stream (time sliced approach)
  - Industrial control (http://www.ieee802.org/1/files/public/docs2010/at-goetz-AVB-lowlatency-part1-0510.pdf)
- More SR Classes
  - Some applications need better than 2mSec over 7 hops of FE
  - Allow 'moving' specific applications to specific performance levels?
    - i.e., have many SR Classes but by default only two PCP's can be in use at one time?
- Configurable SR class priorities and VIDs
  - Need service primitives (e.g. REGISTER_DOMAIN.request/indication), management (clause 12), or SNMP (clause 17) to do this currently

Other SRP/MRP Enhancements

- Gateway between conflicting SR Class domains
- Improve Latency
  - Bursting concerns
  - Configure the characteristics of each Class's Qav Shaper
- Automatic Talker pruning
  - Should be addressed by 'Explicit path reservation'
- The maximum time to make or break an SRP reservation in the absence of a topology change is:
  - This goal is defined per hop assuming a max of 7 hops
  - For consumer remote control applications this must not exceed 100 mSec?
  - For professional video applications this must not exceed 20 mSec?
  - This may need to be moved to 802.1BA
- Enhance MRP to use difference-based updates rather than complete database updates (reduces bridge CPU overhead and control bus bandwidth usage)
  - Another goals is to support a larger attribute set
  - May have periodic updates of a portion of the database

SRP - Other Ideas - 1

- Cloud diagnostics (devices along the path)
  - Perhaps 802.1ag?
- Ingress policing/monitoring
- 802.1AE (MACsec) environments
  - Any AVB Streams and PTP & SRP frames can be AE Tagged
  - Implementation detail… but we already want 802.3 to give us timing information!
  - Clean up the interface between the link and SRP
- PONs are currently not specifically supported
  - i.e., PON support is dependent on contributions from those that need it

SRP - Other Ideas - 2

- How will MSTP select an SRP path over a CM (Congestion Management) path or a non-SRP/non-CM path using 'out of the box' defaults?
  - For AVB with non-AVB devices: Use MSTP with at minimum one spanning tree instance and set AVB to AVB path costs low (match terms in capability vectors) and playing with root costs using MSTP's priority vector?
- SRP for Layer 3? IETF issue?
  - Need an Internet Draft how RSVP can use SRP (Subnet Bandwidth Manager – SBM)

AVB Shaper Generation 2 Ideas

Shaper Ideas

- Improve Latency

New Idea Here

- Data here

BACKUP SLIDES AND ADDITIONAL INFORMATION

Dynamic bandwidth reservations

- Application
  - Listener surfs from HD channel to SD channel and bandwidth requirements shrink
- Concerns
  - Bandwidth may not be there for SD to HD channel surf. How does Listener request change from Talker? TSpec has been removed from Listener.
- Solutions?
  -

Variable bit rate reservations

- Application
  - More video channels for a given medium since statistically not every channel will need full bandwidth at the same time
- Concerns
  - What happens when instantaneous requirements exceeds available bandwidth?
  - Also could affect Qav shaping
- Solutions?
  - Temporarily steal bandwidth from Best Effort traffic. Make sure variable bandwidth reservations don't exceed ?95%? of total link bandwidth?
  - Drop precedence?

Dynamic changes to latency

- Application
  - Management reconfigures the Class A % of bandwidth marker
  - Management reconfigures maximum latency in a bridge and prevents additional reservations if this limit is exceeded
  - Management activates more AVB ports
- Concerns
  - Listeners have already configured buffers
  - Increased latency could eliminate active Listeners
  - How to synchronize the change?
- Solutions
  -

Two-way reservations (VOIP phones)

- Application
  -
- Concerns
  -
- Solutions
  -

Link Aggregation

- Application
  - Increased bandwidth availability
- Concerns
  -
- Solutions
  -

Redundancy

- Application
  - Critical systems (e.g. life-safety)
- Concerns
  -
- Solutions
  -

Energy Efficient Ethernet

- Application
  -
- Concerns
  - Increased latency
- Solutions?
  - Disable Periodic timer – DONE IN D6.1

Unicast Stream destination address

- Application
  -
- Concerns
  -
- Solutions?
  -

Multiple Talkers per Stream (one streaming at a time)

- Application
  - Networked video switcher
- Concerns
  -
- Solutions?
  -

Multiple Talkers per Stream (time sliced approach)

- Application
  - Industrial control (http://www.ieee802.org/1/files/public/docs2010/at-goetz-AVB-lowlatency-part1-0510.pdf
- Concerns
  -
- Solutions?
  -

More SR classes

- Application
  - –
- Concerns
  - –
- Solutions
  - –

Configurable SR class priorities and VIDs

- Application
  -
- Concerns
  -
- Solutions?
  -

Gateway between conflicting SR class domains

- Application
  -
- Concerns
  - Increased latency
- Solutions?
  -

Latency calculation algorithm

- Application
  - Identical operation of multi-vendor solutions
- Concerns
  - Someone needs to derive the formula
- Solutions?
  - av-fuller-queue-delay-calculation-0809-v02.pdf

Automatic Talker pruning

- Application
  - Simplified set up
  - Automatic operation
- Concerns
  - All Listeners must be capable and involved
- Solutions?
  -

Maximum time to make or break an SRP Reservation

- Application
  –
- Concerns
  – For consumer remote control applications this must not exceed 100 mSec?
  – For professional video applications this must not exceed 20 mSec?
- Solutions?
  –

Enhance MRP to use diff based updates

- Application
  - Reduces bridge CPU overhead and control bus bandwidth utilization
- Concerns
  -
- Solutions?
  -

Cloud diagnostics

- Application
  - Topology discovery
- Concerns
  -
- Solutions
  - 802.1ag LinkTrace?
  - LLDP + SNMP (which MIBS?)

Add “time aware” shaper support for lowest latency

- Application
  -
- Concerns
  -
- Solutions
  -

Ingress Policing

- Application
  –
- Concerns
  – Stop errant Talkers from corrupting other streams in the Bridge
- Solutions
  –