802.1Qcc Configurable SR Classes

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Introduction

• Context for this presentation (from 802.1Qcc PAR): Configuration of the parameters of an SR class

• Agenda
  • Review AVB (Gen 1)
  • My assumptions for goals of 802.1Qcc
  • Proposal for 802.1Qcc
Review AVB (Gen 1)
Parameters of an SR Class

- **Priority**
  - Negotiated using Domain PDU

- **Measurement Interval**
  - Fixed: 125µs for class A, 250µs for class B

- **Transmission Selection Algorithm**
  - Fixed: All classes use credit-based shaper (ID 1 in Table 8-5)

- **VLAN ID? No**
  - Specified per-stream by Talker
  - Multiple VID are allowed for each class
  - Bridge declares default (mgmt) in Domain PDU: Informative
Domain Negotiation: End-station

- Use default priority on MAC_Operational
  - Priority 3 for class A, 2 for class B (Table 6-6)
- Declare (transmit) Domain PDU with my priority
- If register (receive) Domain PDU with non-default…
  - If (my priority == default) change to non-default, and declare
  - Else if (my priority == non-default) domain is agreed
    - SRPdomainBoundaryPort = false
  - Else if (my priority != non-default) domain is boundary
    - SRPdomainBoundaryPort = true
    - Talker Advertise → Talker Failed across boundary
- Key concept: Non-default overrides default
Domain Negotiation: Bridge (1 of 2)

- Decide domain boundary per-port, per-class
- Each port declares priority in Domain PDU
  - If no mgmt value, use default
- If register different priority, domain is boundary
  - SRPdomainBoundaryPort = true
  - Talker Advertise → Talker Failed across boundary
- No attribute propagation (MAP) for Domain
  - Register does not declare on other ports
Domain Negotiation: Bridge (2 of 2)

Figure 5-3—AVB domain boundaries created by different SR class A priorities
My Assumptions for Goals of 802.1Qcc
What is a Domain?

- Parameters for the entire SR class
  - Not stream-specific
- Negotiated agreement between contiguous devices
  - End-stations as well as bridges
- Purpose: Consistency for streams in the domain
  - Core benefit of TSN: Ability to know the timing of data
  - For that to work, need to know parameters that affect timing
  - Domain establishes agreement for those parameters
Qcc Goal: New Parameters in Domain

• Concept: Negotiate new parameters as we do priority

• This presentation focuses on methodology, not the specific parameters for domain

• Proposal uses two example parameters
  • Measurement Interval
    • Some apps need faster (e.g. 31.25\,\mu s), some slower (1000\,\mu s)
  • Transmission Selection Algorithm
    • Some apps need strict-priority (e.g. 802.1Qbv scheduling)
    • Need placeholder for future shapers

• Future presentations will cover what is / isn’t in domain
  • E.g. We may also want frame preemption (802.1Qbu)
Qcc Goal: Resolve Domain Issues

- Management parameter for priority is read-only
  - Priority Regeneration Override Table
    - Rows are per-port, per-class
  - Change ‘R’ to ‘RW’?

- Unspecified behavior for internal domain boundaries
  - If I manage my bridge as...
  - … with no boundaries (externally)...
  - … and Talker Advertise with priority 5 registers on bottom port...
  - … what do we propagate (declare) on right side?
Proposal for 802.1Qcc
MSRP Protocol\textnormal{ProtocolVersion} v0 \rightarrow v1

- In order to add parameters to Domain PDU, we must increment MSRP Protocol\textnormal{ProtocolVersion}
  - Applies to all MSRP attributes (e.g. Talker Advertise), but this proposal changes Domain only
- Backward compatibility is mandatory
  - 802.1Q-2011 10.8.3.5
- Benefits of v1 available to contiguous v1 devices
  - All others implement v0 (AVB Gen 1)
Add to Domain FirstValue (1 of 4)

<table>
<thead>
<tr>
<th>Octet #</th>
<th>Name</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SRclassID</td>
<td>Full octet; Table 35-7: A=6, B=5</td>
</tr>
<tr>
<td>2</td>
<td>SRclassPriority</td>
<td>Defaults in Table 6-6: A=3, B=2</td>
</tr>
<tr>
<td>3-4</td>
<td>SRclassVID</td>
<td>Default in Table 9-2: 2</td>
</tr>
<tr>
<td>5-8</td>
<td>SRclassMeasurementInterval</td>
<td>32-bit nanoseconds (1 ns to 4.3 sec)</td>
</tr>
<tr>
<td>9-12</td>
<td>SRclassTransmissionSelection</td>
<td>Table 8-5 (strict=0, credit=1, …)</td>
</tr>
</tbody>
</table>

- If v0 receives v1, ignore extra v1 parameters
- If v1 receives v0, interpret as v0
  - Assumes MeasInterval=125µs/250µs, TxSelection=credit
Add to Domain FirstValue (2 of 4)

• With this proposal thus far… we have a problem…
  1. v0 bridge port declares classID=A, Priority=3
  2. v1 bridge port declares classID=A, Priority=3, MeasInterval=500µs, TxSelection=strict
  3. v0 port receives v1 PDU and ignores new v1 params
  4. v0 port incorrectly sets SRPdomainBoundaryPort = false

• To resolve problem, use upper bit of v0 SRclassID
  • v1 port sets true if params are incompatible with v0
  • v0 port sees true as unsupported SRclassID, and sets boundary = true according to 802.1Q, 35.2.1.4.h.3
Add to Domain FirstValue (3 of 4)

<table>
<thead>
<tr>
<th>Octet #</th>
<th>Name</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, bit 7</td>
<td>SRclassIsExtended</td>
<td>Boolean (see formula below)</td>
</tr>
<tr>
<td>1, bits 0-6</td>
<td>SRclassID</td>
<td>Lower 7 bits; Table 35-7: A=6, B=5</td>
</tr>
<tr>
<td>2</td>
<td>SRclassPriority</td>
<td>Defaults in Table 6-6: A=3, B=2</td>
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</tr>
</tbody>
</table>

- If (declaring as v0) OR (SRclassID=A, MeasInterval=125µs, TxSelection=credit) OR (SRclassID=B, MeasInterval=250µs, TxSelection=credit) SRClassIsExtended = false
- Else SRClassIsExtended = true
Add to Domain FirstValue (4 of 4)

• What happens when we add more parameters in v2?
  • We don’t want to use yet-another bit of SRclassID

• Proposal: TLV for each parameter
  • E.g. SRclassMeasurementInterval uses Type=1, Length=4
  • Rule for v1 and higher:
    • If (receive an unknown Type) SRPdomainBoundaryPort = true

• Enables addition of new parameters to MSRP v1
  • We don’t necessarily need to go to MSRP v2 for domain alone
Negotiation: Check New Parameters

• End-station to neighbor
  • Fundamentally same as v0: Non-default overrides default
  • Add MeasInterval and TxSelection to check
    • 802.1Q, 35.2.2.9.3

• Bridge to neighbor
  • Fundamentally same as v0: Declare my mgmt params, compare to registered to set boundary as true/false
  • Add MeasInterval and TxSelection to check
    • 802.1Q, 35.2.1.4.h.2
Bridge Mgmt: Priority Read-write

• “Priority Regeneration Override Table”, 802.1Q(av), 12.20.3
  • Current purpose
    • Ingress on non-AVB port of SR class priority… regen another priority
    • “Received priority” is SR class priority… read-only (always 3 or 2)
  • New purpose (intended): SR class parameter management

• MIB for this table (17.2.12 and 17.7.12) uses
  • “ieee8021FqtssSrpRegenOverrideTable”
  • “ieee8021FqtssSrClassPriority” (not “Received priority”)

• Proposal (to be validated with Tony J and Craig G):
  • Change “Received Priority” from read-only to read-write
  • Change text name of “Received priority” to “SR class priority”
  • Leave table name as-is, but add Note for new purpose
Bridge Mgmt: New Parameters

• Proposal: Add Measurement Interval to Regen Table
  • Add each new parameter there as read-write

• Transmission Selection Algorithm Table (12.20.2)
  • Rows are per-port, per-class
  • “Transmission selection algorithm” already there as read-write
    • Not negotiated in v0, but will be negotiated in v1
  • No change required
Failure Code for External Boundary

- 802.1Q-2011 specifies how SRPdomainBoundaryPort is set… does not specify what to do when true
- 802.1BA-2011, 6.4.a.2: If asCapable false, set SRPdomainBoundaryPort true, and… propagate Talker Ad as Talker Failed across boundary
  - Failure Code 8: “Egress port not AVB capable”
- Proposal: Add similar text to 802.1Q, 35.2.4.3
  - For boundary due to any domain parameter mismatch, propagate Talker Ad as Talker Failed
  - Failure Code 19 exists: “SR class priority mismatch”
    - Change text to “SR class parameter mismatch”
Resolve Internal Boundary Issue

- Internal boundary for Talker Advertise (TA)
  - Ports managed differently, but not an external boundary
- Proposal: Consistent with external
  - Describe the scenario
  - Talker Ad propagates as Talker Failed, Failure Code 19
- Alternative for external/internal: Gateway
  - Convert SR class parameters (e.g. priority) rather than fail
  - If someone has a use-case for this, please present