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SRP Next Generation

(unrelated to IS-IS)

A New PAR?

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15Mar2013

SRP Past, Present and Future

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MRP-based protocols are likely to be the signaling protocol in the next version (IS-IS) of SRP. With that in mind there are some challenges to address and enhancements to consider in SRP that could be resolved while maintaining backwards compatibility with today's SRP.

The follow slide presents several enhancements that could be pursued in a revision to SRP. A subset of these items are grouped into the following categories later in this presentation:

- **Support More Streams**
- **Alternate SR Class Measurement Intervals**
- **Faster Startup Times**
- **Lower Latency**

Challenges and Possible Enhancements

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This list represents a collection of ideas that have been discussed for the next generation of SRP. This list is sorted by priority as proposed by the presenters. A subset of this list could be selected for a new PAR.

1. **Talker VLAN Pruning**
2. **Talker Pruning per port**
3. **Configurable SR class priorities and VIDs**
4. **Pre-configure reservations via MGMT/Flash**
5. **Define more SR Classes**
6. **Configure max latency (new way to say "no" to a reservation)**
7. **Lock down current latency**
8. Allow changes to latency based on network reconfigurations, etc
9. Timer negotiation
10. Multiple Talkers per Stream
11. Speed up make/break reservation time
12. Link aggregation
13. Configure new Qbv Time-Aware Shaper
14. Tear-Down rank bit
15. Two-way reservations
16. Energy Efficient Ethernet
17. Unicast address Stream DA
18. Lock down & report worst case latency based on current reservations

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NEED:

Support More Streams

SRP Stream Counts – One Challenge

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If the signaling protocol used in the next generation of SRP is still going to be based on MRP we need to solve the stream count issues inherent in SRP.

There is a 530 "worst-case" stream limit in SRP today*. Large installations are asking for ~20,000 streams (*not channels!*). There are some obvious ways to increase the 530 limit:

End stations can:

- Pack Talker messages better utilizing MRP AttributeEvent=MT
- Multi-stream Talker's assign consecutive StreamID/DAs
- Controllers intelligently assign StreamID/DA to Talkers

Bridges can:

- Lengthen MRP timers (Table 10-7)
- VLANS (use VLANs + forbidden VLAN configuration to create "domains")
  - Concern: MVRP/MRP limits?
  - Concern: Significant network configuration required
  - Talker VLAN Pruning is a better approach

*http://www.ieee802.org/1/files/public/docs2010/at-cgunther-mrp-timers-0310-v02.pdf

Extended Refresh (more MRP timers work)

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As the previous slide mentioned one of the culprits in stream scaling is the requirement that whenever a Leave All event is sent or received, all attributes need to be "refreshed" before the Leave Timer expires.

- **This issue has been pointed out in**
  - at-cgunther-mrp-timers-0310-v02.pdf
  - avb-dolsen-srp-limitations-v2.pdf
- **We could increase the LeaveTime from 600ms to a much larger value, BUT, that also increased the time it takes to intentionally tear down a stream.**
- **The Leave All serves as a garbage collection mechanism. Why does the refresh have to be so fast? Answer: It doesn't.**
- **Solutions:**
  - Add a longer "garbage collection" timer, or
  - Change the rules so that the refresh is only needed before the next Leave-All event.

1. Talker VLAN Pruning

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This new feature only affects propagation of individual Talker attributes, Listener attributes propagate as they always have.

Proposal: Add a new bridge parameter that defines a second type of Talker attribute propagation (Talker VLAN Pruning).

Q-2011 propagation rules:

- Egress port is in SRP Domain
- Stream VLAN-ID is not blocked on egress port

Proposed propagation rules:

- Egress port is in SRP Domain
- Egress port has joined Stream VLAN by either:
  - Static configuration via management interface
  - Dynamically via MVRP

Summary: Q-2011 floods Talker Advertisements on all non-blocked ports. Proposed enhancement is to only propagate Talker Advertisements on ports that have joined VLAN.

1. Talker VLAN Pruning (continued)

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Benefits:

- Bridges and end stations only receive/store TA's for VLANs they have joined
- Works with dynamically (MVRP) and statically configured VLANs
- Supports mixture of high-capacity bridges in network core with low-capacity bridges at edges
- No additional MRP-based attributes required (MSRP and MVRP are already implemented by AVB bridges and end stations)

Disadvantages:

- Stream count in a VLAN is limited to number of streams supported by lowest-capacity bridge in that VLAN (i.e.: network topology design required)
- Listeners don't receive Talker Advertisements unless they join the VLAN
  - Some other protocol (e.g.:IEEE1722.1) must tell Listener what VLAN to join or Bridge must be statically configured to join that VLAN on the egress port

2. Talker Pruning per port

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Talker Pruning behavior (35.2.4.3.1) is currently enabled/disabled for the entire Bridge.

Proposal: Implement Talker Pruning on a port-by-port basis.

Benefits:

- Bridges and end stations only receive/store TAs for StreamDAs they register
- Supports mixture of high-capacity bridges in network core with low-capacity bridges at edges
- Low-capacity bridges do not limit stream count of entire network

Disadvantages:

- Listeners don't receive Talker Advertisements unless they register StreamDA
  - Some other protocol (e.g.:IEEE1722.1) must tell Listener what StreamDA to register
- Support for MMRP must be implemented (rework lots of end station code)
- Bridges must now store MMRP attributes that are flooded across entire network
  - Note that MMRP attributes pack much more efficiently than MSRP attributes and are considerably smaller (6 bytes vs 34 bytes)

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NEED:

Alternate SR Class Measurement (a.k.a. Observation) Intervals

SR Class Measurement Intervals

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Q-2011 defines two SR classes: A=125 µs (8000pps), B=250 µs (4000 pps)

The Automotive environment*:

– 100 Mbps is only solution available today with low UTP “pair” count

– Desire for lots of AVB audio streams (7.1 and stereo)

– Desire for several AVB video streams (cameras and rear-seat entertainment)

– Small network topologies minimize latency concerns

– Time-sensitive control streams @ 30 to 100 packets per second

– Desire to run static reservations without SRP

Automotive concerns*:

– No practical way to reserve bandwidth for low bandwidth streams

– Bandwidth limitations mean we can’t waste bandwidth on big reservations for small streams

– Reduce processor load from 4000 or 8000 pps per stream for A/V content

– Can adjust the FQTSS Observation Interval with no meaningful loss of performance

*** http://www.ieee802.org/1/files/public/docs2012/avb-dolsen-alternate-fqtss-observation-intervals-1112.pdf**

3. Configurable SR Class Parameters

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SRP has a small number of classes and we are concerned about meeting a variety of future needs within those limitations.

Proposal: Allow configuration of attributes of SR classes A and B (and maybe C through G), however AVB would still be limited to only using two SR classes in a domain.

- SR Class A & B default to today's values (needed for Plug-n-Play support)
- SR Class A frames are always in a higher priority queue than SR Class B, however other parameters for each SR Class are modifiable:
  - PCP
  - Observation Interval (125 usec, 250 usec, 500 usec, 1000usec, etc)
  - Shaper selection (FQTSS, Qbv, enhanced FQTSS?, or none)

3. Configurable SR Class Parameters (continued)

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Benefits:

- Extremely flexible configuration
- Somewhat future proof

Disadvantages:

- Domain packets must be modified and class negotiation defined

5. Define More SR Classes

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SRP easily supports seven classes (A, B, C, …, G), however 802.1Q-2011 and 802.1BA-2011 only specifically define attributes of classes A and B.

Proposal: Define characteristics for at least one more SR class (C), however AVB would still be limited to only using two SR classes in a domain.

Benefits:

- No SRP modifications, just a “spec change”
- Maintains plug-and-play model
- Backwards compatible with current standard

Disadvantages:

- Only five available, so how do we decide on those class attributes
- Solves today’s problem, but what about tomorrow?

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NEED:

Faster Startup Times

4. Pre-configure Reservations via MGMT/Flash

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Automotive implementations have requirements for early audio that require reservations to be established as quickly as possible.

Proposal: Two options have been discussed: 1) Program initial reservations into non-volatile memory of the bridge with a third-party tool, 2) Add a new MSRP command that would take a snapshot of all current reservations and reload that snapshot on power-up.

Benefits:

- Don’t need to wait for initial Talker Advertise + Listener Ready handshake to create a reservation, however the Leave All mechanism would still be utilized

Disadvantages:

- May require a new command to take a snapshot

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NEED:

Lower Latency

6. Configure Maximum Latency

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Reservations are now limited by total bandwidth utilization. This option would allow a bridge to deny a reservation once maximum latency through a Bridge port has been reached.

Proposal: Add a new managed object that defines maximum allowed latency through a Bridge port.

Benefits:

- Management can control maximum reported latency through particular paths in the network

Disadvantages:

- Would require a new configuration parameter

7. Lock down current latency

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SRP allows for up to 75% of the link bandwidth to be utilized for reservations. Bridges report their latency based on the full 75% being filled with reservations regardless of how much actual bandwidth has been reserved.

Proposal: Add a new command that disallows further reservations and causes Bridges to recalculate latency of existing reservations knowing no more bandwidth will be requested.

Benefits:

- Latency will be lower when less than 75% bandwidth is reserved

Disadvantages:

- Stream usage must be pre-defined
- Currently SRP does not allow changes to reservations reported latency

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SUMMARY:

Pursue a separate PAR for this work or combine with 802.1Qca (Path Control and Reservation)?