Stream RANK and insufficient bandwidth

Craig Gunther (cgunther@harman.com)

18 June 2008

Problem statement

What happens when two or more Streams request bandwidth through a single port on a bridge or station and there is insufficient bandwidth available?

- SRP defines a stream Rank (D1.3 clause 29.3.2.8) to allow automatic resolution of this problem
  - Rank is not related to traffic Class
    - Note that a Class A Stream does not automatically have precedence over a Class B Stream
  - A 911 call will have higher Rank than a standard A/V Stream
  - Structure:
    - 32-bit importance value (0=most important) => 4 million possibilities
    - 64-bit 1588 formatted time-stamp of Talker's first registration
- How will this Rank affect the SRP/Qav reservation process?

Qav service primitives available to SRP

- What does Qav have to offer?

  Refer to P802.1Qav/D2.0 clauses 35.3 and 35.4

  - **LAC-ENQUIRE** is used by Talker Advertise processing to set Failed status (not discussed in this presentation) and calculate bandwidth requirements
  - **LAC-RESERVE** is used by Listener Ready processing to create bandwidth reservations
  - **LAC-RELEASE** is used by Listener Ready processing to remove bandwidth reservations
  - **LAC-FORCED-RELEASE** initiated by Qav to inform SRP of an exceptional event that caused a reservation to be removed (not discussed in this presentation)

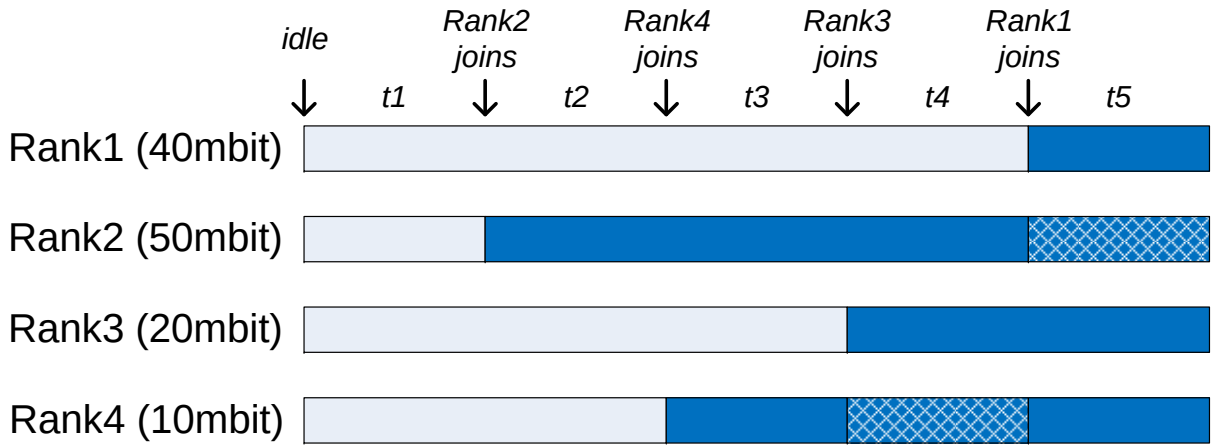
Example

- Assume a 100 Mbit link (75 Mbit available)
- Assume four Streams (named “Rank#”) exist as follows:
  - Rank1 – emergency Rank, 40 Mbit bandwidth
  - Rank2 – default Rank, 50 Mbit bandwidth
  - Rank3 – unimportant Rank, 20 Mbit bandwidth
  - Rank4 – very unimportant Rank, 10 Mbit bandwidth

Scenarios

- What happens when Rank2 (50 Mbit), then Rank4 (10 Mbit) request bandwidth reservations?
  - SRP issues a **LAC_RESERVE** for Rank2 and Qav allows it (50 Mbit)
  - SRP issues a **LAC_RESERVE** for Rank4 and Qav allows it (10+50 = 60 Mbit)
- Two scenarios are described next:
  - Scenario 1 allows lower ranking Streams to continue to reserve bandwidth when higher ranking Stream reservations fail
  - Scenario 2 does not allow any lower ranking Streams to reserve any bandwidth once a higher ranking Stream reservation fails

Scenario 1: Allow reservations for lower Ranks

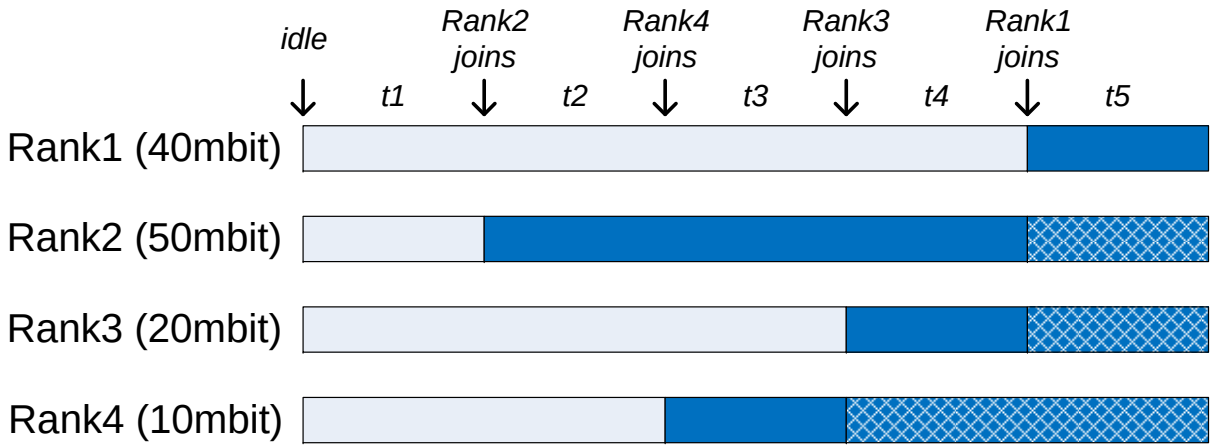


- What happens when Rank3 and then Rank1 request bandwidth?
  - At the start of *t4*, when Rank3 joins, it will force Rank4 to release its resources
  - At the start of *t5* when Rank1 joins, it will force Rank2 to release its resources, which has a side effect of making bandwidth available for Rank4

Scenario 1: SRP/Qav interaction

- From the previous slide:
  - *At the start of t4, when Rank3 joins, it will force Rank4 to release its resources*
    - SRP issues a **LAC-RESERVE** for Rank3 (20 Mbit), and since there is only 15 Mbit available Qav responds with a **Failure-insufficientBandwidth**
    - SRP reevaluates all outstanding requests (Qav Stream reservation database?)
    - SRP issues a **LAC-RELEASE** for Rank4 (10 Mbit)
    - SRP issues a **LAC-RESERVE** for Rank3 (20Mbit)
  - *At the start of t5 when Rank1 joins, it will force Rank2 to release its resources, which has a side effect of making bandwidth available for Rank4*
    - SRP issues a **LAC-RESERVE** for Rank1 (40 Mbit), and since there is only 5 Mbit available Qav responds with a **Failure-insufficientBandwidth**
    - SRP reevaluates all outstanding requests (Qav Stream reservation database?)
    - SRP issues a **LAC-RELEASE** for Rank2 (50 Mbit)
    - SRP issues a **LAC_RESERVE** for Rank1 (40 Mbit)
    - SRP issues a **LAC_RESERVE** for Rank4 (10 Mbit)

Scenario 2: Don’t allow reservations for lower Ranks



- What happens when Rank3 and then Rank1 request bandwidth?
  - At the start of *t4*, when Rank3 joins it will force Rank4 to release its resources
  - At the start of *t5* when Rank1 joins it will force Rank2, and therefore all lower Ranks, to release their resources

Questions and concerns

1. What is the customers impression of Scenario 1 vs Scenario 2?

Scenario 1 may cause lower ranking Streams to appear to flap on and off.

Scenario 2 encourages bandwidth under utilization. It is possible to create a situation where a high ranking, low bandwidth Stream stops a 75 Mbit middle ranked Stream from allocating bandwidth. This in turn stops all low ranking Streams from running, no matter how small their bandwidth requirements.

Mysterious results can also occur simply by requesting the middle ranked Stream and then removing the request. The middle ranked Stream will never be allowed any bandwidth in this example, and lower ranked Streams will flap.

Conclusion: support Scenario 1

Questions and concerns

2. What if don't support Rank, but only allow for an emergency reservation?

   This works for 911 and Fire Emergency announcements, but…

   Assume you are using AVB in your home for A/V distribution and VoIP. You are watching a TV program that uses almost all the available bandwidth (i.e. not enough bandwidth is available for a telephone call). If someone is trying to call you, should the telephone ring? Yes. If you answer the phone should you expect to be able to carry on a conversation? Yes. This means that SRP must have performed some type of algorithm to drop the A/V Stream while you answered the phone. Certainly a regular phone call should not use the Emergency ranking. This is what multiple Ranks are designed for.

   But, how do we encourage multiple vendors to work together to decide which of the 4 million values their products should assign to the Rank? Certainly my companies products are more "Rank worthy" than other companies products ☺

Conclusion: support current ranking scheme

Requests for Qav enhancements

- Clause 35.6.1 Stream reservation records

  SRP needs direct access to these records when recalculating bandwidth allocation among Streams.

  Also store bandwidth requirements associated with Tspec.

  Expand reservationPortMap to include a flag that says a Listener attached to the port *desires* the Stream but there is not sufficient bandwidth available on that port for the Stream's Rank.

- **LAC-RELEASE** needs an option that says "temporarily release the bandwidth reservation" (i.e. "*desires*" flag in reservation PortMap)

Thanks