Automotive Requirements

- ## Lots of raw Audio >10 streams
  - 7.1 streams 44.1Khz 16 bit
  - Stereo streams 44.1Khz 16 bit

- ## Limited Bandwidth
  - Current automotive PHY technology limits to 100Mbps
  - AVB limit is 75Mbps

- ## Desire to use AVB Video
  - Backup Camera
  - Rear Seat Entertainment

- ## Latency is not critical in most applications
  - Small network topology reduces latency

Qav Observation Interval

- **Bandwidth is extremely limited in the Automotive environment**

- **Bandwidth can be conserved by adjusting the Qav Observation Interval with no meaningful loss of performance**

Bandwidth Calculations

AVB Audio Bandwidth Calculation Spreadsheet

The following constants and parameters for AVB Audio frames, and generally should not be changed.

Overhead Source	Bytes		802.1Qav Interval (us)
Inter-frame Gap	12		125
Preambles + SFD	8		
Ethernet Header	14	**Bytes per Sample**	
802.1Q VLAN tag	2		2
AVTPDU Header	24		
CIP Header	8	**Max Ethernet Frame**	
Ethernet FCS	4		1522
Total Overhead	72		

Enter the desired properties (in the grey cells) for each group of identical streams on a separate line:
A red-highlighted cell indicates a problem with the value or its inputs
All max sample rates are presumed to be referenced to the Qav interval; add some
margin if an integer relationship cannot be guaranteed (e.g. @ 32 / 48 / 96 / 192 KHz Fs)

Max Sample Rate (KHz)	# of Audio Channels	Samples per Packet	Bytes per Packet	Per-Stream BW (Mbps)	# of Streams	Total BW (Mbps)
44.100	8	6	168	10.752	1	10.752
44.100	2	6	96	6.144	1	6.144

					Total	16.896

Check against available link bandwidth here; highlighted color indicates whether streams can be supported

		100 Mbit Link	**1Gbit Link**
Legacy Reservation	25.00%	16.896	16.896

Bandwidth Utilization

125us

Max Sample Rate (KHz)	# of Audio Channels	Samples per Packet	Bytes per Packet	Per-Stream BW (Mbps)	# of Streams	Total BW (Mbps)
44.100	8	6	168	10.752	1	10.752
44.100	2	6	96	6.144	1	6.144

250us

Max Sample Rate (KHz)	# of Audio Channels	Samples per Packet	Bytes per Packet	Per-Stream BW (Mbps)	# of Streams	Total BW (Mbps)
44.100	8	12	264	8.448	1	8.448
44.100	2	12	120	3.840	1	3.84

500us

Max Sample Rate (KHz)	# of Audio Channels	Samples per Packet	Bytes per Packet	Per-Stream BW (Mbps)	# of Streams	Total BW (Mbps)
44.100	8	23	440	7.040	1	7.04
44.100	2	23	164	2.624	1	2.624

1000us

Max Sample Rate (KHz)	# of Audio Channels	Samples per Packet	Bytes per Packet	Per-Stream BW (Mbps)	# of Streams	Total BW (Mbps)
44.100	8	45	792	6.336	1	6.336
44.100	2	45	252	2.016	1	2.016

802.1Q-2011

- **34.6.1**

- For streams that make use of SR class A or SR class B, it is a requirement that the rate at which frames for any given stream are selected for placement in its per-stream queue does not exceed the bandwidth reserved for the stream, measured over the class measurement interval for the SR class (125 µs for SR class A, 250 µs for SR class B.) For some combinations of stream bandwidth requirement and transmission Port data rate, this can place a limit on the frame size that can be used when transmitting stream data.

802.1Q-2011 5.18

- An end station implementation that conforms to the provisions of this standard for forwarding and queuing for time-sensitive streams shall:

  a) Support a minimum of two traffic classes on all Ports, of which

    1) A minimum of one traffic class supports the strict priority algorithm for transmission selection (8.6.8.1), and

    2) One traffic class is an SR class.

  b) Support the operation of the credit-based shaper algorithm (8.6.8.2) as the transmission selection algorithm used for frames transmitted for each stream associated with the SR class.

  c) Support the operation of the credit-based shaper algorithm (8.6.8.2) on all Ports as the transmission selection algorithm used for the SR class.

  d) Use the default priority associated with SR class "B" as shown in Table 6-6 as the priority value carried in transmitted SR class "B" data frames.

- An end station implementation that conforms to the provisions of this standard for forwarding and queuing for time-sensitive streams may:

  e) Support two or more SR classes (a maximum of seven), and support the operation of the credit based shaper algorithm (8.6.8.2) on all Ports as the transmission selection algorithm used for those SR classes. The number of SR classes supported shall be stated in the PICS.

  f) Use the default priority associated with SR class "A" as shown in Table 6-6 as the priority value carried in transmitted SR class "A" data frames. If more than two SR classes are supported, the priority value carried in transmitted data frames for the additional SR classes shall be stated in the

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