60802 Data Delivery Requirements

for Industrial Automation traffic types

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Available at http://www.ieee802.org/1/files/public/docs2021

Problem in IEC/IEEE 60802 Draft 1.3

Table 7 – Industrial automation traffic types summary

Traffic type name	Cyclic	Data delivery requirements	Time-triggered transmission	Traffic-type-category
Isochronous	Yes	Deadline	Yes	IA time-aware-stream
Cyclic-Synchronous	Yes	Latency	Yes	IA time-aware-stream
Cyclic-Asynchronous	Yes	Latency	No	IA stream
Alarms and Events	No	Latency	No	IA traffic engineered non-stream
Configuration & Diagnostics	No	Latency	No	IA traffic engineered non-stream
Network Control	Optional	Latency	No	IA traffic engineered non-stream
Best Effort	No	N/A	No	IA non-stream

	Description
	Denotes the delivery constraints for the traffic. Three options are specified: • latency: data delivery of a frame for a given Talker-Listener pair occurs within a predictable timespan. • Deadline: data delivery of a frame to a given Listener occurs at or before a specific time after the start of a gating cycle. • N/A: In the case of traffic types with no special data delivery requirements, the available option is "N/A" or not applicable.

Assuming that Configuration and Diagnostics is done mostly using protocols like TCP/IP (FTP, Netconf, …) the requirement for 'data delivery of a frame' seems to be not feasible **!**

Problem in IEC/IEEE 60802 Draft 1.3

Assuming that **Configuration and Diagnostics** is done mostly using protocols like TCP/IP (FTP, Netconf, …) the requirement for '*data delivery of a frame within a predictable timespan*' seems to be not feasible !

Why?

For **cyclic data** this definition is **suitable**, but we should have a closer look at this points:

- It is important that the predictable timespan applies to each single packet of this stream … for instance the delivery of each single packet may need up to (but shall not exceed) 2 milliseconds
- To allow for predictable scheduling the packet size should be in a certain range.

Both points are **not feasible for protocols like FTP, NETCONF**, or other TCP protocols because:

- If every single packet needs its maximum time (for instance 2ms), the transfer will take very long
- It is difficult to control the packet size for such protocols

Worst case is when the TCP stack decides to send the data in small packets (TCP segmentation) !

Problem in IEC/IEEE 60802 Draft 1.3

Definitions do not really fit to ‘Latency’:

- Constraints not based on single frames
- Traffic not based on Talker-Listener pairs

784 **4.7.4.5 Alarms and Events**

785 A type of IA traffic engineered non-stream. This type of traffic is transmitted acyclically. This
786 traffic expects bounded latency including time for retransmission in the range of milliseconds
787 to hundreds of milliseconds. The source of the alarm or event typically limits the bandwidth
788 allocated to this traffic. Frame size is not constrained. Retransmission to mitigate frame loss is
789 expected. The network is engineered to handle these frames, including bursts of frames, up to
790 a certain number of frames or data size over a defined period.

791 **4.7.4.6 Configuration and diagnostics**

792 A type of IA traffic engineered non-stream. This type of traffic is transmitted acyclically. This
793 traffic expects bounded latency, up to seconds, including time for retransmission. The source
794 of configuration or diagnostics frames typically limits the bandwidth allocated to this traffic.
795 Frame size is not constrained. Retransmission to mitigate frame loss is expected. The network
796 is engineered to handle these frames, including bursts of frames, up to a certain number of
797 frames or data size over a defined period.

798 **4.7.4.7 Network control**

799 A type of IA traffic engineered non-stream. This type of traffic can be transmitted cyclically or
800 acyclically. This traffic expects bounded latency including time for retransmission. Frame size
801 is not constrained. The network is engineered to handle these frames, including bursts of
802 frames, up to a certain number of frames or data size over a defined period. This type contains
803 network control frames. Examples include time synchronization, loop prevention, and topology
804 detection.

Proposed change

Add the option ‘Bandwidth’ to the Characteristic ‘Data delivery requirements’, and assign this option to ‘Configuration & Diagnostics’ (and maybe to others):

Description
Denotes the delivery constraints for the traffic. Three options are specified: • latency: data delivery of a frame for a given Talker-Listener pair occurs within a predictable timespan. • Deadline: data delivery of a frame to a given Listener occurs at or before a specific time after the start of a gating cycle. • N/A: In the case of traffic types with no special data delivery requirements, the available option is “N/A” or not applicable.

add the option ‘Bandwidth’
data delivery up to a certain number of frames or data size (including bursts of frames) over a defined period.

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Alarms and Events	No	Bandwidth ?	No	IA traffic engineered non-stream
Configuration & Diagnostics	No	**Bandwidth**	No	IA traffic engineered non-stream
Network Control	Optional	Latency	No	IA traffic engineered non-stream
Best Effort	No	N/A	No	IA non-stream

Proposed change

The option ‘Bandwidth’ also appears in the following contributions:

- https://www.ieee802.org/1/files/public/docs2019/60802-ademaj-traffic-type-introduction-0319-v03.pdf
- https://www.ieee802.org/1/files/public/docs2019/60802-ademaj-contribution-traffic-type-characteristics-0319-v03.pdf
- https://www.ieee802.org/1/files/public/docs2019/60802-Hotta-Traffic-Types-Mapping-to-TSN-Mechanism-0119-v01.pdf
- https://www.ieee802.org/1/files/public/docs2021/dp-Jabbar-Aerospace-TrafficTypes-Summary-0521-v02.pdf
  Contribution for Aerospace also suggesting the modes Deadline/Latency/Bandwidth/None

Thank you for your attention

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