Conformance Class IEC/IEEE 60802

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Abstract

This document describes an example Conformance Class based on “60802-Steindl-ExampleSelections-0119-v02.pdf” as a starting point for feature alignment.
The parameters and values given in this document are presenting the ongoing discussions. Currently there is no agreement which attributes, parameters and values are mandatory within the profile.

Log

V0.1	Initial version
V0.5	Update with Example Selections “Y” and “Z”
V0.6	Update after discussion in IEC/IEEE 60802
V0.7	Update after discussion in IEC/IEEE 60802
V1.0	Initial public version for IEC/IEEE 60802
V1.1	Version created during Edinburgh meeting

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1 References

60802-industrial-use-cases-0918-v13.pdf

60802-Steindl-ExampleSelections-0119-v02.pdf

60802-Steindl-QuantityFigures-0519-v01.pdf

60802-Steindl-TimelinessUseCases-0718-v01.pdf

2 Terms and Definitions

2.1 Definitions

Conformance Class	A selection of IEC and IEEE features and quantities which allows to solve the required use cases.

2.2 IEEE802 terms

Priority regeneration	See IEEE 802.1Q-2018 clause 6.9.4 Regenerating priority
Ingress rate limiting	See IEEE 802.1Q-2018 clause 8.6.5 Flow classification and metering

3 TSN in Industrial Automation

3.1 General

Supporting a Conformance Classes shall allow interoperability for Bridges and End-Station as defined in the scope of IEC/IEEE 60802.

3.2 Conformance Class

3.2.1 Standard selection

3.2.1.1 General

A Conformance Class selects out of the following standards

IEEE802.3-2018 - IEEE Standard for Ethernet

IEEE802.1Q-2018 - Bridges and Bridged Networks

IEEE802.1AB-2016 - Station and Media Access Control Connectivity Discovery

IEEE802.1AS-2020[1] - Timing and Synchronization for Time-Sensitive Applications

IEEE802.1CB-2017 - Frame Replication and Elimination for Reliability

3.2.1.2 Terms

Supported:
This feature is used in any class of device

Support, but optional:
This feature is intended to be used in some class of device.
For silicon vendors, these topics may be “supported”, too.

Not used:
The used and thus the support of this feature is not intended

TBD / Ω:
Not provided until agreed release date for initial version

—:
No quantities, because the assigned feature is not supported

[1] Assumes that IEEE802.1AS will be updated in 2020

3.2.1.3 IEEE 802.3

Table 1 shows the selection.

Table 1: IEEE 802.3 selection

Attribute	Classification	Example Selection "SI"	Example Selection "TT"	Example Selection "RA"	Example Selection "AB"	Example Selection "MI"	Example Selection "YO"	Example Selection "BR"
MAU Types[2]								
Data rate								
10Mbps	Feature	Supported	Supported	Supported	Supported	Supported	Supported	Supported
100Mbps	Feature	Supported	Supported	Supported	Supported	Supported	Supported	Supported
1Gbps	Feature	Supported	Supported	Supported	Supported	Supported	Supported	Supported
2,5Gbps	Feature	Supported	Ω	Supported	Supported	Supported	Supported	Supported
5Gbps	Feature	Supported	Ω	Supported	Supported	Supported	Supported	Supported
10Gbps	Feature	Supported	Ω	Supported	Supported	Supported	Supported	Supported
Frame size	Quantity	1532	1532	1532	1532	2000	1532	1532
Link length	Information	At least 100m	Depends on media	Depends on media	Depends on media	Depends on media	Depends on media	Depends on media
Preemption	Feature							
10Mbps[3]	Feature	Supported	Supported but Optional	Supported but Optional	Supported but Optional	Supported but Optional	Not used	Supported
100Mbps	Feature	Supported	Supported but Optional	Supported but Optional	Supported but Optional	Supported but Optional	Not used	Supported
1Gbps	Feature	Supported	Supported but Optional	Supported but Optional	Supported but Optional	Supported but Optional	Not used	Supported
2,5Gbps	Feature	Supported	Supported but Optional	Supported but Optional	Supported but Optional	Supported but Optional	Not used	Supported
5Gbps	Feature	Not used	Supported but Optional	Supported but Optional	Supported but Optional	Supported but Optional	Not used	Supported
10Gbps	Feature	Not used	Supported but Optional	Supported but Optional	Supported but Optional	Supported but Optional	Not used	Supported

[2] Attributes like full duplex, IEEE 802.1AS support, IEEE 802.1AB support, auto polarity, auto negotiation, synchronization error budget are selection criteria for the MAU Types.
[3] Need to convince IEEE 802.3 to allow preemption for 10 Mbps also.

3.2.1.4 IEEE 802.1Q

Table 2, Table 3 and Table 4 show the selection.

Table 2: IEEE 802.1Q selection

Attribute	Classification	Example Selection “SI”	Example Selection “TT”	Example Selection “RA”	Example Selection “AB”	Example Selection “MI”	Example Selection “YO”	Example Selection “BR”
Queues 802.1Q 8.6.6	Quantity	Eight	Eight	Four	Eight	Eight	Four[4]	Eight
Preassigned PCPs	Quantity	Example: PCP:7 for network mgmt., PCP:6 for High streams, PCP:5 for Low stream, PCP:4-2 for in domain, and PCP:1-0 for inter domain	Example: PCP:7-2 for Isochronous streams, and PCP:1-0 for inter domain	3	Example: PCP:6 for High/Isochronous streams, PCP:5 for Low/cyclic stream	Example: PCP:7 High streams, PCP:0 for Low streams	Not used	TBD
VLAN Identification	Quantity	Up to 8 VIDs Four for streams, rest for non-stream	Up to 8 VIDs	TBD	Up to 8 VIDs Seven for streams, rest for non-stream	Up to 8 VIDs	Up to 8 VIDs	Up to 8 VIDs
VLANs used for streams (in FDB configuration) “Static trees”								
Learning disable	Feature	Supported	Supported	Supported	Supported	Supported but Optional	Supported but Optional	TBD
Individual VLAN learning (IVL)	Feature	Supported	Supported	Supported	Supported	Supported but Optional	Supported but Optional	TBD
Default forwarding rule	Feature	Drop	Drop	TDB	Drop	Flooding	Drop	TBD
VLANs used for non-stream (in FDB configuration)								
Learning enabled	Feature	Supported	Ω	Ω	Ω	Ω	Ω	Ω
Shared VLAN learning (SVL)	Feature	Supported	Ω	Ω	Ω	Ω	Ω	Ω
Default forwarding rule	Feature	Flooding	Ω	Ω	Ω	Ω	Ω	Ω
FDB size 802.1Q 8.8	Quantity							
Streams static MC entries used for streams	Quantity	8192[5]	512	4096	8192[6]	1	16384 entries – useable for	TDB

[4] Four for Line/Ring and Eight for Star topologies
[5] A minimum 2048 per VLAN
[6] A minimum 2048 per VLAN

Attribute	Classification	Example Selection “SI”	Example Selection “TT”	Example Selection “RA”	Example Selection “AB”	Example Selection “MI”	Example Selection “YO”	Example Selection “BR”
Non-stream static/dynamic entries for remaining VLAN(s)	Quantity	2048	128	1024	TDB	TDB	streams and default VLAN(s)	TBD
Spanning tree 802.1Q 13								
For stream VLANs	Feature							
RSTP	Feature	Not used	Ω	Ω	Ω	Ω	Ω	Ω
MSTP	Feature	Not used	Ω	Ω	Ω	Ω	Ω	Ω
For non-stream VLANs	Feature							
RSTP	Feature	Supported but Optional	Ω	Ω	Ω	Ω	Ω	Ω
MSTP	Feature	Supported but Optional	Ω	Ω	Ω	Ω	Ω	Ω
Transmission selection control 802.1Q 8.6.8								
Strict priority	Feature	Supported	Supported	Supported	Supported	Supported	Supported	Supported
Credit based shaper	Feature	Not used	Supported	Not used	Supported, but Optional	Not used	Supported, but Optional	Supported
Scheduled traffic 802.1Q 8.6.9, 8.6.8.4								
Time aware shaper	Feature							
10Mbps	Feature	Supported	Supported	Supported	Supported	Supported	Supported	Supported
100Mbps	Feature	Supported	Supported	Supported	Supported	Supported	Supported	Supported
1Gbps	Feature	Supported but optional	Supported	Supported	Supported	Supported	Supported	Supported
2,5Gbps	Feature	Not used	Ω	Supported	Supported	Supported	Supported	Supported
5Gbps	Feature	Not used	Ω	Supported	Supported	Supported	Supported	Supported
10Gbps	Feature	Not used	Ω	Supported	Supported	Supported	Supported	Supported
Cyclic queuing and forwarding	Feature	Not used	Not used	Not used	Supported, but Optional	Not used	Not used	Not used
Gate Control List entries 802.1Q 8.6.8.4	Quantity	3	At least 256	At least 3	256	At most 8	At least 3	At least 256
Tick granularity 802.1Q 8.6.8.4	Quantity	10ns	100ns	10ns	10ns	16ns	=< 100ns	TBD
Admin Cycle Time range 802.1Q 8.6.8.4	Quantity	—	62,5µs to 10ms	250µs to 1ms	20µs to 20ms	31,25µs to 1s	1ms	20µs to 10ms
100Mbps	Quantity	250µs to 1ms	—	—	—	—	—	—
>=1Gbps	Quantity	31,25µs to 1ms	—	—	—	—	—	—
Timing points for scheduled traffic	Quantity	10ns	10ns	10ns	10ns	16ns	=< 100ns	TBD

Attribute	Classification	Example Selection “SI”	Example Selection “TT”	Example Selection “RA”	Example Selection “AB”	Example Selection “MI”	Example Selection “YO”	Example Selection “BR”
802.1Q 12.29.2[7]								
Maximum gap for transmission of consecutive frames[8]	Quantity	IPG	IPG	IPG	IPG	IPG	IPG	TBD
Ingress rate limiter / Flow classification and metering 802.1Q 8.6.5 (MEF 10.3)								
Unicast	Feature	Supported	Not Used	Supported but Optional	Supported but Optional	Supported but Optional	Supported but Optional	TBD
Multicast / Broadcast	Feature	Supported	Not Used	Supported but Optional	Supported but Optional	Supported but Optional	Supported but Optional	TBD
Ingress filtering and policing (Qci) 802.1Q 8.6.5.1								
Number of streams	Quantity	—	TBD	TBD	TBD	At least 8	8000	TBD
Stream Gates 802.1Q 8.6.5.1.2	Feature	Not Used	Supported but Optional	Supported but Optional	Supported but Optional	Supported but Optional	Not used	Supported
Number of stream gates	Quantity	—	TBD	TBD	8	At least 8	—	TBD
Flow Meters 802.1Q 8.6.5.1.3	Feature	Not Used	Supported but Optional	Supported but Optional	Supported but Optional	Supported but Optional	Supported but Optional	Supported
Number of flow meters	Quantity	—	TBD	TBD	8	At least 8	TBD	TBD
Stream Filter 802.1Q 8.6.5.1.1	Feature	Not Used	Supported but Optional	Supported but Optional	Supported but Optional	Supported but Optional	Supported but Optional	TBD
Ingress and egress frame modification								
Priority regeneration (PCP) 802.1Q 6.9.4	Feature	Supported	Supported	Supported	Supported but Optional	Supported but Optional	Supported	TBD
VLAN stripping and adding 802.1Q 6.9 and 8.8.2	Feature	Supported	Supported	Supported	Supported	Supported but Optional	Supported	Supported
Preemption 802.1Q 6.7.2	Feature	Supported	Supported but Optional	Supported but Optional	Supported but Optional	Supported but Optional	Not Used	Supported
First fragment size	Quantity	128	64	TBD	TBD	64	—	128
Number of Hold & Release events 802.1Q 12.30.1	Quantity	2	256	TBD	TBD	6	—	TBD

[7] Minimum and maximum for the delay before the first frame is transmitted after gate open
[8] Getting the value for calculating window sizes

Attribute		Classification	Example Selection “SI”	Example Selection “TT”	Example Selection “RA”	Example Selection “AB”	Example Selection “MI”	Example Selection “YO”	Example Selection “BR”
	10Mbps	Feature	Supported	Supported	Supported but Optional	Supported but Optional	Supported but Optional	Not Used	Supported
	100Mbps	Feature	Supported	Supported	Supported but Optional	Supported but Optional	Supported but Optional	Not Used	Supported
	1Gbps	Feature	Supported	Supported	Supported but Optional	Supported but Optional	Supported but Optional	Not Used	Supported
	2,5Gbps	Feature	Supported but optional	Ω	Supported but Optional	Supported but Optional	Supported but Optional	Not Used	Supported
	5Gbps	Feature	Not used	Ω	Supported but Optional	Supported but Optional	Supported but Optional	Not Used	Supported
	10Gbps	Feature	Not used	Ω	Supported but Optional	Supported but Optional	Supported but Optional	Not Used	Supported
Synchronized network access									
	Start of cycle trigger[9]	Feature	Supported	Supported	Supported but Optional	Supported but Optional	Supported	Supported	Supported
	Per stream trigger 802.1Qcc 46.6.2.5.3.5	Feature	Not Used	Supported	Not Used	Supported but Optional	Not used	Not used	Supported
	Maximum gap for transmission of consecutive frames[10]	Quantity	IPG	IPG	IPG	IPG	20 Octet times	IPG	TBD
Bridge / Forwarding resources[11]		Specify attributes for the resource management. Ensure buffering of non-stream traffic during stream transmission							
	Real-Time traffic Stream High in-class interference								
	>= 1Gbps	Quantity	Up to 200µs for a 1ms Admin Cycle time	TBD	TBD	TBD	TBD	TBD	TBD
	<= 100Mbps	Quantity	Up to 500µs for a 1ms Admin Cycle time	TBD	TBD	TBD	TBD	TBD	TBD
	Real-Time traffic Stream Low intra- and in-class interference								

[9] Specified as a special case of the per stream trigger by using “time aware offset = 0” for all streams
[10] Getting the value for network calculus and calculating window sizes
[11] Model for resource calculation needed due to implementation dependency. What needs to be achieved? What is the goal?

Attribute	Classification	Example Selection “SI”	Example Selection “TT”	Example Selection “RA”	Example Selection “AB”	Example Selection “MI”	Example Selection “YO”	Example Selection “BR”
>= 1Gbps	Quantity	Up to 200µs for a 1ms Admin Cycle time	TBD	TBD	TBD	TBD	TBD	TBD
<= 100Mbps	Quantity	Up to 500µs for a 1ms Admin Cycle time	TBD	TBD	TBD	TBD	TBD	TBD
Real-Time traffic								
>= 1Gbps	Quantity	Minimum of 25 Kbytes per port	Minimum of 16k per port	Minimum of 16k per port	Minimum of 16 Kbytes per port	Minimum of 2k per port	Minimum of 25 Kbytes per port	TBD
<= 100Mbps	Quantity	Minimum of 6,5 Kbytes per port	Minimum of 16k per port	Minimum of 16k per port	Minimum of 3,25 Kbytes per port	Minimum of 2k per port	Minimum of 5 Kbytes per port	TBD
Non real-time traffic								
>= 1Gbps	Quantity	Minimum of 25 Kbytes per port	Minimum of 16k per port	Minimum of 16k per port	Minimum of 16 Kbytes per port	Minimum of 2k per port	Minimum of 25 Kbytes per port	TBD
<= 100Mbps	Quantity	Minimum of 6,5 Kbytes per port	Minimum of 16k per port	Minimum of 16k per port	Minimum of 3,25 Kbytes per port	Minimum of 2k per port	Minimum of 5 Kbytes per port	TBD

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Table 3: IEEE 802.1 configuration

Configuration-Centralized									
	Class based scheduling	Feature	Supported	Not used	Supported	Supported	Supported	Supported	Not used
	Stream based scheduling	Feature	Not used	Supported	Not used	Supported	Not used	Not used	Supported
	path computation	Feature	Supported	Supported	Supported	Supported but Optional	Supported	Supported	Supported
	network calculus	Feature	Supported	Supported	Supported	Supported but Optional	Supported	Supported	Supported
	topology discovery	Feature	Supported	Supported	Supported	Supported	Supported	Supported	Supported
	device network feature discovery	Feature	Supported	Supported	Supported	TBD	Supported	Supported	Supported
	management protocol	Feature							
	SNMP (if YANG Models are still missing)	Feature	Supported	Supported	Not used	Supported	Supported	Not used	Not used
	NETCONF	Feature	Supported	Supported	Supported	Supported	Supported	Supported	Supported
	SSH	Feature	Supported but optional	Supported	Ω	Ω	Ω	Ω	Ω
	TLS	Feature	Supported but optional	Supported but optional	Ω	Ω	Ω	Ω	Ω
	CNC Election (making sure there is only one active CNC per domain)	Feature	Supported	Supported	Supported	TBD	Supported	Supported	Supported
	Dynamic configuration	Feature	Supported	Supported	Supported	TBD	Supported but Optional	Supported	Supported
	Standardized stream reservation request from end-stations	Feature	Supported	Supported	Supported	Supported	Supported but Optional	Supported	Supported
	Number of supported streams	Quantity	8192	512	TBD	TBD	TBD	TBD	TBD
	Number of devices (bridges and end-stations) per TSN domain	Quantity	1000	200	1000	TBD	256	2000	TBD
Configuration-Distributed (M2M communication) LRP/RAP									
	path computation	Feature	Supported	Not Used	Supported	Supported but Optional	Supported	Supported	Not used
	Standardized stream reservation	Feature	Supported	Not Used	Supported	Supported but Optional	Supported but Optional	Supported	Not used

	request from end-stations								
	Number of supported streams	Quantity	256	—	256	TBD	TBD	256	—
	Number of devices (bridges and end-stations) per TSN domain	Quantity	TBD	—	TBD	TBD	TBD	TBD	—

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125 **Table 4: IEC/IEEE 60802 definitions selection**

Attribute		Classification	Example Selection “SI”	Example Selection “TT”	Example Selection “RA”	Example Selection “AB”	Example Selection “MI”	Example Selection “YO”	Example Selection “BR”
Cut through forwarding		Forwarding latency optimization							
	Delayed Cut-through[12]	Feature	Supported	Not Used	Supported	Supported but Optional	Supported	Not Used	Supported but Optional
	Direct Cut-through	Feature	Supported	Supported	Supported	Supported but Optional	Not used	Not Used	Supported
	Number of queues supporting it	Quantity	8	1 Isochronous queue only	8	TBD	8	—	TBD

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[12] Not limited to port being free on receive. Packet is forward to the DST port as soon as the port is free. No need to wait for the complete packet reception

3.2.1.5 IEEE 802.1AB

Table 5 shows the selection.

Table 5: IEEE 802.1AB selection

Attribute		Classification	Example Selection “SI”	Example Selection “TT”	Example Selection “RA”	Example Selection “AB”	Example Selection “MI”	Example Selection “YO”	Example Selection “BR”
TSN Domain TLV (IEEE802.1Q TLV or IEC/IEEE60802 TLV)		Feature	Supported	Supported	Supported	Supported	Supported	Supported	Supported
802.3 extension		Feature	Supported	TBD	Not used	Supported but Optional	Not used	Not used	TBD
	MAC/PHY Configuration/Status	Feature	Supported	Ω	Ω	Ω	Ω	Ω	Ω
	Power Via Medium Dependent Interface (MDI)	Feature	Supported but Optional	Ω	Ω	Ω	Ω	Ω	Ω
	Maximum Frame Size	Feature	Supported	Ω	Ω	Ω	Ω	Ω	Ω
	Additional Ethernet Capabilities (Preemption)	Feature	Supported	Supported	Supported but Optional	Supported but Optional	Supported but Optional	Not used	Supported
802.1 extension		Feature	Supported	TBD	Not used	Supported but Optional	Not used	Not used	TBD
	Port VLAN ID	Feature	Supported but Optional	Ω	Ω	Ω	Ω	Ω	Ω
	Port And Protocol VLAN ID	Feature	Supported but Optional	Ω	Ω	Ω	Ω	Ω	Ω
	VLAN Name	Feature	Supported but Optional	Ω	Ω	Ω	Ω	Ω	Ω
	Protocol Identity	Feature	Supported but Optional	Ω	Ω	Ω	Ω	Ω	Ω
	VID Usage Digest	Feature	Supported but Optional	Ω	Ω	Ω	Ω	Ω	Ω
	Management VID	Feature	Supported but Optional	Ω	Ω	Ω	Ω	Ω	Ω
802.1AB “Transmit on data change” (9.2.5.20 defined variable txNow := TRUE)		Feature	Supported	Supported	Supported but Optional	TBD	TBD	Supported	TBD
802.1AB “Topology Discovery”		Feature	Supported	Supported	Supported	Supported	Supported	Supported	Supported

133 ### *3.2.1.6 IEEE 802.1AS*

134 Table 6 shows the selection.

135 **Table 6: IEEE 802.1AS selection**

Attribute		Classification	Example Selection “SI”	Example Selection “TT”	Example Selection “RA”	Example Selection “AB”	Example Selection “MI”	Example Selection “YO”	Example Selection “BR”
Grandmaster		Feature	Supported but Optional	Supported but Optional	Supported but Optional	Supported	Supported but Optional	Supported but Optional	Supported
PTP end instance		Feature	Supported	Supported	Supported	Supported	Supported	Supported	Supported
Sync send interval									
	Working Clock send interval	Quantity	31,25 ms	31,25 ms	Ω	Ω	Ω	Ω	Ω
	Global Time send interval	Quantity	125 ms	125 ms	Ω	Ω	Ω	Ω	Ω
gPTP Domains									
	Working Clock	Quantity	1	1	TBD	1	1	1	1
	Global Time	Quantity	1	1	TBD	1	1	1	1
Seamless redundancy – Hot Standby		Feature	Supported but Optional	Supported but Optional	Not used	Supported but Optional	Supported but Optional	Supported but Optional	Supported but Optional
	Working Clock	Quantity	1	1	—	1	1	1	1
	Global Time	Quantity	1	1	—	1	1	1	1
BMCA Redundancy – Cold Standby		Feature	Not Used	Supported	Supported but Optional	Supported but Optional	Supported but Optional	Supported but Optional	Supported
Externally Managed Sync Trees (YANG/MIB)		Feature	Supported	Supported but Optional	Not Used	Not used	TBD	Not Used	Supported
802.1AS “Announce”		Feature	Not Used	Supported	Supported	Supported	Supported	Supported	Supported
802.1AS “Signal”		Feature	Not Used	Supported but Optional	Supported	Supported	Supported	Supported	Supported

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3.2.1.7 IEEE 802.1CB

Table 7 shows the selection.

Table 7: IEEE 802.1CB selection

Attribute	Classification	Example Selection "SI"	Example Selection "TT"	Example Selection "RA"	Example Selection "AB"	Example Selection "MI"	Example Selection "YO"	Example Selection "BR"
Stream identification	Selection out of a list within 802.1CB							
Null Stream (DMAC + TCI.VID based)	Feature	Supported	Supported	Supported	Supported	Supported	Supported	Supported
IP stream	Feature	Not Used	Not Used	Supported	Supported but Optional	Not used	Supported	Supported but Optional
1CB (Frame replication and elimination for reliability)	Feature	Not used	Supported	Supported but Optional	Supported but Optional	Supported but Optional	Supported but Optional	Supported
1CB TAG supported	Feature	Not used	Supported	Supported but Optional	Supported but Optional	TBD	Supported	Supported
HSR TAG supported	Feature	Not used	Supported but Optional	Not used	Supported but Optional	TBD	Not used	TBD
PRP Trailer supported	Feature	Not used	Supported but Optional	Supported but Optional	Supported but Optional	TBD	Not used	TBD
Vendor specific trailer supported FRER in end-stations only	Feature	Supported	Not used	Not used	Not Used	TBD	Not Used	Not used
Number of streams	Quantity	4096	128	4096	TBD	TBD	8000	TBD
Stream translation	Selection out of a list within 802.1CB							
Active DMAC and VLAN identification								
Ingress Port	Feature	Supported	Supported	Ω	Ω	Ω	Ω	Ω
Number of streams	Quantity	64 streams	—	—	—	—	—	—
Egress Port	Feature	Not used	Ω	Ω	Ω	Ω	Ω	Ω
Number of streams	Quantity	—	—	—	—	—	—	—

143 ### *3.2.1.8 IEC 62439*

144 Table 8 shows the selection.

145 **Table 8: IEC 62439 selection**

Attribute		Classification	Example Selection “SI”	Example Selection “TT”	Example Selection “RA”	Example Selection “AB”	Example Selection “MI”	Example Selection “YO”	Example Selection “BR”
IEC 62439-2 “MRP”									
	MRP manager	Feature	Supported but Optional	Not used	Ω	Ω	Ω	Ω	Ω
	MRP client	Feature	Supported but Optional	Not used	Ω	Ω	Ω	Ω	Ω
IEC 62439-3 “PRP” and “HSR”									
	PRP	Feature	Not used	Not used	Ω	Ω	Ω	Ω	Ω
	HSR	Feature	Not used	Not used	Ω	Ω	Ω	Ω	Ω

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Literature and related Contributions

Literature:

[1] “Cyber Physical Systems: Design Challenges”, E. A. Lee, Technical Report No. UCB/EECS-2008-8; http://www.eecs.berkeley.edu/Pubs/TechRpts/2008/EECS-2008-8.html

[2] Beckers, K. (2015). Pattern and Security Requirements: Engineering-Based Establishment of Security Standards; Springer; ISBN 9783319166643

[3] PI: Isochronous Mode – Guideline for PROFINET IO; V1.0; June 2016; available at http://www.ieee802.org/1/files/private/liaisons

Related contributions:

[4] LNI traffic patterns for TSN: http://www.ieee802.org/1/files/public/docs2018/new-Bruckner-LNI-traffic-patterns-for-TSN-0118.pdf

[5] Multivendor Motion Control: http://ieee802.org/1/files/public/docs2018/new-industrial-enzinger-multivendor-motion-control-0318-v01.pdf

[6] Hierarchical Domain based Network: http://www.ieee802.org/1/files/public/docs2018/60802-harima-industrial-use-case-0518-v04.pdf

[7] Process Automation System Quantities: http://www.ieee802.org/1/files/public/docs2018/60802-sato-pa-system-quantities-0718-v01.pdf

[8] TSN Interdomain Communications: http://www.ieee802.org/1/files/public/docs2018/60802-Hantel-TSN-Interdomain-Communications-0718.pdf

[9] Cycle Timing Models: http://www.ieee802.org/1/files/public/docs2018/60802-enzinger-cycle-timing-models-0718-v04.pdf

[10] Isochronous Drive Synchronization: http://www.ieee802.org/1/files/public/docs2018/60802-enzinger-use-case-isochronous-drive-synchronization-0718-v01.pdf

[11] Machine Internal and Machine to Cell Controller (M2C) Embedded Communication: http://www.ieee802.org/1/files/public/docs2018/60802-essler-additional-use-case-0718-v01.pdf

[12] Coexistence & Convergence in TSN-based Industrial Automation Networks: http://www.ieee802.org/1/files/public/docs2018/60802-stanica-convergence-coexistence-0718-v03.pptx

[13] Flexible Manufacturing System (FMS) for Small Batch Customized Production: http://www.ieee802.org/1/files/public/docs2018/60802-Bai-small-batch-customized-production-0718-v01.pdf

[14] Multi-traffic transmission in industrial backbone network: http://www.ieee802.org/1/files/public/docs2018/60802-chen-multi-traffic-transmission-on-backbone-0918.pdf