



Version 1.17.0 - February 2024

Abstract

This application note describes all IEEE1588 profiles supported by the syn1588® PTP Stack. Furthermore, it gives an overview of syn1588® products that support the corresponding profiles as well as an overview of hardware and software requirements to comply with a particular PTP profile.

Note: The tables below lists the respective profile specifications, yet all parameters of the syn1588® PTP Stack cover to complete range defined in the IEEE1588-2008 and IEEE1588-2019 standards respectively.

This document is valid with the release of the syn1588® Software Suite depicted by the document version (i.e., v1.13.x is valid for syn1588® Software Suite v1.13).

PTP Profiles supported by syn1588® PTP Stack

Profile Name	PTP Stack profile switch	M/S	Standard	Transport Protocol	Communication	VLAN ID ¹
Default	default	Both	IEEE1588-2008 Annex J.3	IPv4, IPv6, Layer2	Multicast	N/A
Default Peer2Peer	default_p	Both	IEEE1588-2008 Annex J.4	IPv4, IPv6, Layer2	Multicast	N/A
Power ²	power	Both	C37.238 2011	Layer2	Multicast	N/A
Power ³	power_s	S	C37.238 2011	Layer2	Multicast	N/A
C37.238-2011	c37_238_2011	Both	C37.238 2011	Layer2	Multicast	0
C37.238-2011	c37_238_2011_s	S	C37.238 2011	Layer2	Multicast	0
Power2 ⁴	c37_238	Both	C37.238 2017	Layer2	Multicast	N/A
Power2 ⁵	c37_238_s	S	C37.238 2017	Layer2	Multicast	N/A
C37.238-2017	c37_238_2017	Both	C37.238 2017	Layer2	Multicast	N/A
C37.238-2017	c37_238_2017_s	S	C37.238 2017	Layer2	Multicast	N/A
Power3 ⁶	power3	S	IEC/IEEE61850-9-3	Layer2	Multicast	N/A

¹ The default network communication and VLAN ID supported by the respective profiles are listed here. One may override the profile settings by adding the appropriate parameters while invoking the syn1588® PTP Stack application.

² Deprecated option available for compatibility purpose only. Will be removed with the next releases. Please use c37_238_2011 option instead

³ Deprecated option available for compatibility purpose only. Will be removed with the next releases. Please use c37_238_2011_s option instead

⁴ Deprecated option available for compatibility purpose only. Will be removed with the next releases. Please use c37_238_2017 option instead

⁵ Deprecated option available for compatibility purpose only. Will be removed with the next releases. Please use c37_238_2017_s option instead

⁶ This profile is not implemented yet but considered to be implemented within one of the next releases

SMPTE⁷	smpte	Both	ST 2059-2	IPv4, IPv6	Multicast, mixed mode, Unicast	N/A
SMPTE⁸	smpte_s	S	ST 2059-2	IPv4, IPv6	Multicast, mixed mode, Unicast	N/A
Telecom⁹	telecom	M	G.8265.1	IPv4, IPv6	Unicast	N/A
G.8265.1	g8265_1	M	G.8265.1	IPv4, IPv6	Unicast	N/A
G.8275.1	g8275_1	M	G.8275.1 v2.1	Layer 2	Multicast	N/A
G.8275.1	g8275_1_s	S	G.8275.1 v2.1	Layer 2	Multicast	N/A
G.8275.2	g8275_2	M	G.8275.2 v1.1	IPv4	Unicast	N/A
G.8275.2	g8275_2_s	S	G.8275.2 v1.1	IPv4	Unicast	N/A
802.1as	802.1as	Both	IEEE 802.1as		Multicast	N/A
802.1as	802.1as_s	S	IEEE 802.1as		Multicast	N/A
Enterprise	Tbd	Both	IETF draft	IPv4, IPv6	Multicast, mixed mode	N/A

⁷ AES67 is supported fully by the syn1588[®] PTP Stack as well. Yet, there is no specific identifier to select the default values for this profile. It has sufficient overlap with SMPTE 2059-2 with respect to parameter ranges. The default values of all parameters have been harmonized for SMPTE 2059-2 and AES67 Please refer to the respective standard report for further details: AES-R16-2016: AES Standards Report - PTP parameters for AES67 and SMPTE ST 2059-2 interoperability.
<https://www.aes.org/tmpFiles/aessc/20210518/aes-r16-2016-i.pdf>

⁸ AES67 is supported fully by the syn1588[®] PTP Stack as well. Yet, there is no specific identifier to select the default values for this profile. It has sufficient overlap with SMPTE 2059-2 with respect to parameter ranges. The default values of all parameters have been harmonized for SMPTE 2059-2 and AES67 Please refer to the respective standard report for further details: AES-R16-2016: AES Standards Report - PTP parameters for AES67 and SMPTE ST 2059-2 interoperability.
<https://www.aes.org/tmpFiles/aessc/20210518/aes-r16-2016-i.pdf>

⁹ Deprecated option available for compatibility purpose only. Will be removed with the next releases. Please use G8265_1 option instead

Profile Requirements in Detail

E2E Default Profile

Features	Modes/Range/Description
Standard	IEEE1588-2008 Annex J.3
Profile identifier	00-1B-19-00-01-00
Network Protocol	Layer3 IPv4 and IPv6
Network Communication Mode	Multicast
Timestamp Mode	1-step and 2-step
Delay Mechanism	End-End (Delay Request- Response)
PTP Domain	0
Message Intervals	Sync Rate 1/s, Delay Request rate 1/s Announce Rate 0.5/s, Announce Receipt Timeout 3
Other Settings	N/A
Oregano Systems Product Support	syn1588® PTP Stack syn1588® PCIe NIC syn1588® VIP syn1588® Gbit Switch
syn1588® PTP Stack	Master and Slave mode supported OS: Windows & Linux
Special features	
Comments	

P2P Default Profile

This is Peer to Peer Path Delay variant of the Default Profile

Features	Modes/Range/Description
Standard	IEEE1588-2008 Annex J.4
Profile identifier	00-1B-19-00-02-00
Network Protocol	Layer3 IPv4 and IPv6
Network Communication Mode	Multicast
Timestamp Mode	1-step and 2-step
Delay Mechanism	Peer-Peer (Path delay mechanism)
PTP Domain	0
Message Intervals	Sync Rate 1/s, Peer Delay Request rate 1/s Announce Rate 0.5/s, Announce Receipt Timeout 3
Other Settings	N/A
Oregano Systems Product Support	syn1588® PTP Stack syn1588® PCIe NIC syn1588® VIP syn1588® Gbit Switch
syn1588® PTP Stack	Master and Slave mode supported OS: Windows & Linux
Special features	
Comments	All network devices should support PTP.

C37.238-2011 Profile

Features	Modes/Range/Description
Standard	IEEE C37.238.2011
Profile identifier	1C-12-9D-00-00-00
Network Protocol	Layer2 + optional or enforced VLAN (*)
VLAN ID	Default: disabled or 0 (*)
Network Communication Mode	Multicast
Timestamp Mode	1-step and 2-step
Delay Mechanism	Peer-Peer (Path delay mechanism, P2P)
PTP Domain	Default: 0, 0 ... 127
Message Intervals	Sync Rate 1/s, Peer Delay Request rate 1/s Announce Rate 1/s Announce Receipt Timeout 2 for preferred GM clocks, 3 for other GM capable devices
Other Settings	GrandmasterID grandmasterTimeInaccuracy networkTimeInaccuracy
Oregano Systems Product Support	syn1588® PTP Stack syn1588® PCIe NIC
syn1588® PTP Stack	Master and Slave mode supported OS: Linux (Windows not supported)
Special features	
Comments	All network devices have to support PTP only P2P TCs and BCs are allowed.

(*) The deprecated power profile switch ("power" or "power_s") differs in the default VLAN ID settings to the power profile switch ("c37_238_2011" and "c37_238_2011_s"). The deprecated switch does not activate VLAN by default, the new switch will enable VLAN by default (VlanID = 0) according to the C37_238:2011 standard.

C37.238-2017 Profile

Features	Modes/Range/Description
Standard	IEEE C37.238.2017
Profile identifier	1C-12-9D-00-00-00
Network Protocol	Layer2
VLAN ID	Default: disabled, Optional: 1 ... 4094
Network Communication Mode	Multicast
Timestamp Mode	1-step and 2-step
Delay Mechanism	Peer-Peer (Path delay mechanism, P2P)
PTP Domain	Default: 254, 0 ... 127
Message Intervals	Sync Rate 1/s, Peer Delay Request rate 1/s Announce Rate 1/s Announce Receipt Timeout 2 for preferred GM clocks, 3 for other GM capable devices
Other Settings	GrandmasterID totalTimeInaccuracy
Oregano Systems Product Support	syn1588® PTP Stack syn1588® PCIe NIC
syn1588® PTP Stack	Master and Slave mode supported OS: Linux (Windows not supported)
Special features	
Comments	All network devices have to support PTP only P2P TCs and BCs are allowed.

The deprecated power profile switch (“c37_238” and “c37_238_s”) will still enable this profile but will be removed in the upcoming releases. Instead, use the power profile switch “c37_238_2017” or “c37_238_2017_s”.

Power Profile 3 (61850-9-3)

Features	Modes/Range/Description
Standard	IEC/IEEE 61850-9-3
Profile identifier	00-0C-CD-00-01-x0 x = 0 for single attached clock x = 1 for PRP redundancy x = 2 for HSR redundancy x = 3 for both HSP and PRP redundancy
Network Protocol	Layer2
VLAN ID	N/A
Network Communication Mode	Multicast
Timestamp Mode	1-step and 2-step
Delay Mechanism	Peer-Peer (Path delay mechanism)
PTP Domain	0 (default)
Message Intervals	Sync Rate 1/s, Peer Delay Request rate 1/s Announce Rate 1/s Announce Receipt Timeout 8 s
Other Settings	N/A
Oregano Systems Product Support	syn1588® PTP Stack
syn1588® PTP Stack	Slave mode supported OS: Linux
Special features	Double-attached nodes shall support at least one of the management mechanism specified in IEC 62439-3:2016 Annex E, IEC TR 61850-90-4:2013 19.3 & 19.4 or manufacturer specific solution. All network devices have to support PTP
Comments	All network devices have to support PTP only P2P TCs and BCs are allowed.

SMPTE Profile (2059-2)

Features	Modes/Range/Description
Standard	SMPTE 2059-2
Profile identifier	68-97-E8-00-01-00
Network Protocol	Layer3: IPv4, IPv6
Network Communication Mode	Multicast, Unicast mixed mode (multicast sync + unicast delay)
Timestamp Mode	1-step and 2-step
Delay Mechanism	End-End
PTP Domain	127
Message Intervals	Sync Rate 2/s ... 128/s, default: 8/s Delay Request rate 2/s ... 128/s, default: 8/s Announce Rate 1/s ... 8/s, default: 4/s Announce Receipt Timeout 2 ... 10, default: 3
Other Settings	SMPTE Synchronization Metadata information
Oregano Systems Product Support	syn1588® PTP Stack syn1588® PCIe NIC
syn1588® PTP Stack	Master and Slave mode supported OS: Windows & Linux
Special features	Mixed mode for PTP Management message. Synchronization Metadata information is distributed to all devices 1/s via PTP management messages. PTP acknowledge message must not be sent for these messages. Network topology is arbitrary with respect to PTP support in switches, all device are allowed, partial TC support in the network is allowed.
Comments	IPv6 had not been tested in interop tests as of yet. Default message rate have been streamlined with AES67

G.8265.1 Profile

Features	Modes/Range/Description
Standard	T-REC-G.8265.1-201604
Profile identifier	00-19-A7-00-01-02
Network Protocol	Layer3 IPv4
Network Communication Mode	Unicast with negotiation
Timestamp Mode	1-step and 2-step
Delay Mechanism	End-End
PTP Domain	[4 ... 23] 4 is default
Message Intervals	Full range as specified by IEEE1588-2008 Default Sync Rate 16/s, Default Delay Request rate 16/s, Default Announce Rate 0.5/s
Other Settings	N/A
Oregano Systems Product Support	syn1588® PTP Stack syn1588® PCIe NIC
syn1588® PTP Stack	Master mode only OS: Windows & Linux
Special features	Single clock domain Alternate BMCA (different for master & slave) Complex master selection rules for Slaves
Comments	

G.8275.1 Profile

Features	Modes/Range/Description
Standard	G.8275.1/Y.1369.1 (2016) Amendment 1 (08/17)
Profile identifier	00-19-A7-01-02-01
Network Protocol	Layer 2
Network Communication Mode	Multicast
Timestamp Mode	1-step and 2-step
Delay Mechanism	End-End
PTP Domain	[24 ... 43] 24 is default
Message Intervals	Sync Rate 16/s, Delay Request rate 16/s, Announce Rate 8/s
Other Settings	priority1 = 128, priority1 is ignored by alternate BMCA default_local_priority port_local_priority masterOnly
Oregano Systems Product Support	syn1588® PTP Stack syn1588® PCIe NIC
syn1588® PTP Stack	Master and Slave mode supported OS: Linux only
Special features	Alternate BMCA is used Peer delay must not be used P2P TC are prohibited
Comments	

G.8275.2 Profile

Features	Modes/Range/Description
Standard	G.8275.2/Y.1369.2 (2016) Amendment 1 (08/17)
Profile identifier	00-19-A7-02-01-00
Network Protocol	IPv4, IPv6
Network Communication Mode	Unicast
Timestamp Mode	1-step and 2-step
Delay Mechanism	End2End (two-way) and No Delay (one-way)
PTP Domain	[44 ... 63] 44 is default
Message Intervals	Sync Rate 1/s ... 128/s, default: 16/s Delay Request rate 1/s ... 128/s, default: 16/s Announce Rate 1/s ... 8/s, default: 8/s
Other Settings	priority1 = 128, priority1 is ignored by alternate BMCA default_local_priority port_local_priority masterOnly
Oregano Systems Product Support	syn1588® PTP Stack syn1588® PCIe NIC
syn1588® PTP Stack	Master and Slave mode supported
Special features	Alternate BMCA is used Peer delay must not be used
Comments	

802.1AS Profile

Features	Modes/Range/Description
Standard	IEEE 802.1AS-2011
Profile identifier	00-80-C2-00-01-00
Network Protocol	Layer2
Network Communication Mode	Multicast
Timestamp Mode	2-step only
Delay Mechanism	Peer-Peer
PTP Domain	0 is default
Message Intervals	Sync Rate 8/s Peer Delay Request rate 1/s Announce Rate 1/s
Other Settings	N/A
Oregano Systems Product Support	syn1588® PTP Stack syn1588® PCIe NIC
syn1588® PTP Stack	Master and Slave mode supported OS: Linux only
Special features	<p>Main clocks used for gathering timestamps are left free running, adjacent nodes exchange information about frequency offset (via TLVs) allowing every node to calculate absolute time.</p> <p>Enhance requirements on quality of local oscillator. A node is only admitted to a 802.1AS network if it local oscillator meet certain requirements, while the first set of messages is exchanged. See concept of 802-1AS capable.</p> <p>Slightly different BMCA</p>
Comments	Is now integral part of TSN (Time Sensitive Networks)

Enterprise Profile

Features	Modes/Range/Description
Standard	draft-ietf-tictoc-ntp-enterprise-profile-15
Profile identifier	00-00-5E-00-01-00
Network Protocol	Layer3 IPv4, IPv6
Network Communication Mode	Mixed mode (multicast downstream, unicast upstream)
Timestamp Mode	1-step and 2-step
Delay Mechanism	End-End
PTP Domain	0
Message Intervals	Sync Rate 1/s, Peer Delay Request rate 1/s and Announce Rate 1/s
Other Settings	N/A
Oregano Systems Product Support	syn1588® PTP Stack syn1588® PCIe NIC
syn1588® PTP Stack	Master and Slave mode supported OS: Windows & Linux
Special features	
Comments	Optional PTP support in the network