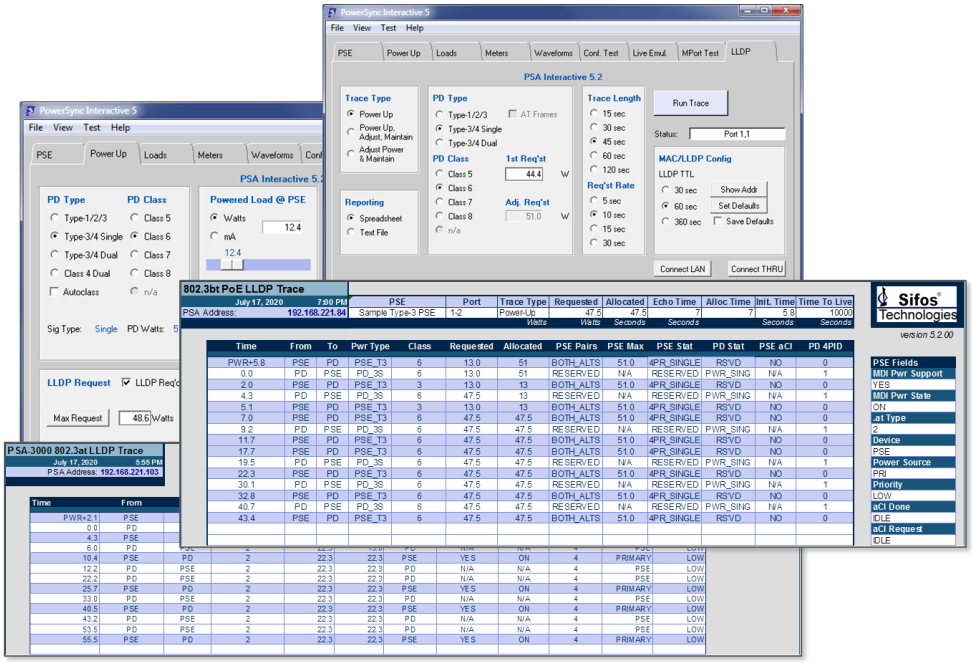
LLDP Emulation & Analysis

for the **PSA-3000 / PSL-3000**

IEEE 802.3 Power over Ethernet

Product Overview



Key Features

- **Integrated PoE LLDP and Load Emulation in a Single Instrument**
- **IEEE 802.3at and 802.3bt LLDP Compliance Analysis**
- **Independent, Per-Port 802.3at and 802.3bt LLDP Emulations**
- **Flexible Single and Dual Signature PD LLDP Emulations**
- **One-Click LLDP Protocol Capture and Analysis**
- **Pop-Up Excel Spreadsheet Reports Assess Protocol Content and Timing**
- **Enables One-Click Emulated Power-Ups and Standard Waveforms with LLDP Power Granting PSE's**
- **Enables 2-Pair and 4-Pair PSE Conformance Test Suites with LLDP Capable PSE's**
- **Enables 802.3at PSE Multi-Port Suite with LLDP PSE's**
- **Available for PSA-3000 and PSL-3000 Platforms**

Verification, *Simplified.*

One-Click Testing: PoE LLDP

One-Click Protocol Traces

Power-Up & Power Adjust Emulations

Protocol Sequencing

Protocol Timing

Protocol Content

Flexible 802.3 PD Emulation

802.3at and 802.3bt* LLDP Protocols

802.3bt Single and Dual Signature PD's

PD Classification

PD Power Requests

Pre and Post Negotiated Power Draw

Messaging Interval

Enhance Automated Test Suites

2-Pair PSE Conformance Test

4-Pair PSE Conformance Test

802.3at PSE Multi-Port Test

802.3at Live PD Emulation

Overview

The 802.3at and 802.3bt PoE standards describe a link layer protocol (LLDP) variant that is optionally available to PSE's that need to manage power allocations to each Powered Device (PD) with granularities as small as 0.1 watt. Both standards require that all PD's that draw more than 13 watts support the PoE LLDP protocol. PoE LLDP can be an essential tool to any midspan PSE that powers multiple PD's and must allocate a finite power supply budget across those PD's.

Unlike most forms of LLDP that merely convey information, PoE LLDP involves two-way protocol handshakes and protocol timing requirements on the link between PSE and PD. IEEE 802.3 clauses 33 and 145 describe these requirements for 802.3at and 802.3bt PSE's and PD's respectively. Compliant PD's, in many cases, are required to use LLDP to "negotiate" for power demands that exceed an initial power allocation established through classification during power-up.

IEEE 802.3 Clause 79 describes LLDP PDU formats and content that include the 12-octet PDU for 802.3at PSE's/PD's and the 29-octet PDU for 802.3bt PSE's/PD's. To maintain backward compatibility, 802.3bt PSE's that use PoE LLDP must generally support both PoE LLDP formats.

PSA-3000 Family: LLDP Emulation and Analysis

PSA-3000 and PSL-3000 platforms offer a feature license that enables flexible emulation and analysis for both 802.3at and 802.3bt* PoE LLDP. This license may be purchased from Sifos and activated at any time.

LLDP Emulation involves modeling various characteristics of a PD as it uses LLDP to request and process power allocations from a PSE. Normally, such transactions are performed immediately after the PD receives power, though they may be ongoing with subsequent power adjustments induced by either the PD or the PSE. Modeled characteristics include **PD Type** and **Class**, PD **Power Request**(s), **PD Status** parameters, PDU interval timing, LLDP **time-to-live**, and layer 2 **MAC**.

LLDP Analysis involves capturing and analyzing bi-directional PoE-specific LLDP packets and associated packet timing during PD power-ups and during ongoing (post power-up) power adjustments.

The PSA-3000 and PSL-3000 platforms provide **flexible LLDP Emulation** and **robust LLDP Analysis** capabilities that are accessible from both PSA Interactive (GUI) and PowerShell PSA. LLDP power-up emulations to target power requests are performed in a single "button-click" in PSA Interactive or a single command in PowerShell PSA. LLDP Protocol Traces offer fully automated capture, display, and analysis of LLDP protocol sequences between a PSE port and a user-defined PD. Analysis is performed in colorful pop-up Excel spreadsheets that highlight protocol non-conformances or timing defects.

LLDP Enabling for Automated Test Suites

Flexible LLDP emulation and analysis is a mandatory component in any **PSE Conformance Test** of 802.3at or 802.3bt EndPoint PSE's that use LLDP for power management. With the LLDP emulation feature, the PSA-3000 is uniquely positioned to fulfill this requirement.

LLDP emulation also facilitates the **2-Pair Multi-Port Test Suite** for 2-Pair 802.3at and 802.3bt PSE's. This testing enables robust PSE system administrative and power management analyses without the need of any Powered Devices.

* 802.3bt LLDP emulation and analysis is not supported on PSA-3102, PSA-3002, and PSL-3102 hardware.

Verification, Simplified.

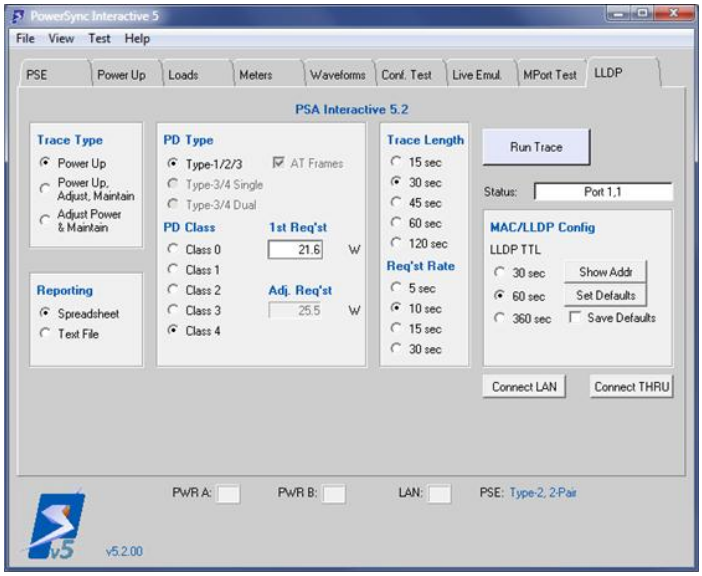
One-Click LLDP Protocol Traces

The LLDP Protocol trace is a simple way to describe a PD, then sequence a complete LLDP-negotiated power-up or power adjustment where PDU exchanges are viewed both in real time and in a post-processed pop-up Excel spreadsheet with colorful highlighting of PDU source, protocol violations, and timing problems.

LLDP Protocol Traces can be easily accessed from the **LLDP** tab menu in PSA Interactive software. LLDP Protocol traces can also be configured and monitored from PowerShell PSA using a single command.

The PoE LLDP protocol utilized for any protocol trace depends upon both PSE attributes (PSE Type) and the PD emulation configured as described in the following table.

PSE Type	PD Emulation	Protocol
Type-1 or Type-2	Class 0 - 4	802.3at (12 octet)
Type-3 (2-Pair or 4-Pair) or Type-4	Class 0 - 8	802.3bt (29 octet) *default*
	Class 0 - 4	802.3at (12 octet) *optional*
Type-3 4-Pair or Type-4 4-Pair	Dual Class 1 - 5	802.3bt (29 octet)



LLDP Traces Menu in PSA Interactive

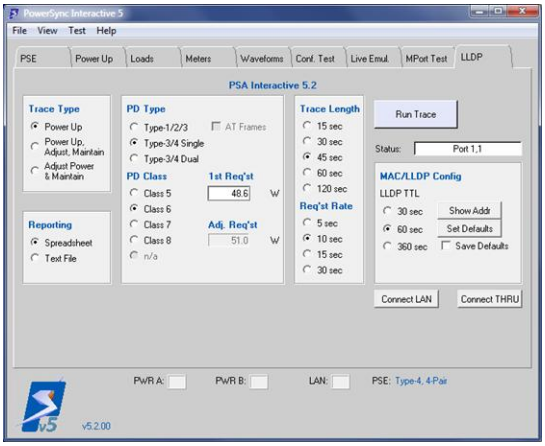
In PSA Interactive, the **PSE** tab menu is utilized to describe the **PSE Type** attribute and the **LLDP** tab menu is used to configure the **PD Type** and **PD Class** to be emulated. The PowerShell PSA command shell similarly provides resources to describe PSE attributes and to configure the LLDP trace PD emulation.

Traces are always run on a single PSE port and may be run under conditions where other PSE ports are either unpowered or powered to a user specified set of conditions.

The LLDP Power-Up Trace

The LLDP Power-Up Trace always starts from a power-down state and emulates the connection, PD classification, and LLDP post-power-up negotiation. Per the above table, the protocol utilized (802.at or 802.3bt) depends upon PSE attributes and PD emulation configured.

Before initiating a trace, the **PD Type** and **PD Class** are specified along with the **Power Request** (watts). Additionally, total duration of the trace and the time interval for PD Request message transmission are selected. In cases where a Type-3 or Type-4 PSE is powering a Class 0 – 4 PD, the option exists to specify which protocol to use, 802.3bt (default) or 802.3at. This allows examination of backward compatibility between 802.3bt PSE's and all PD's.

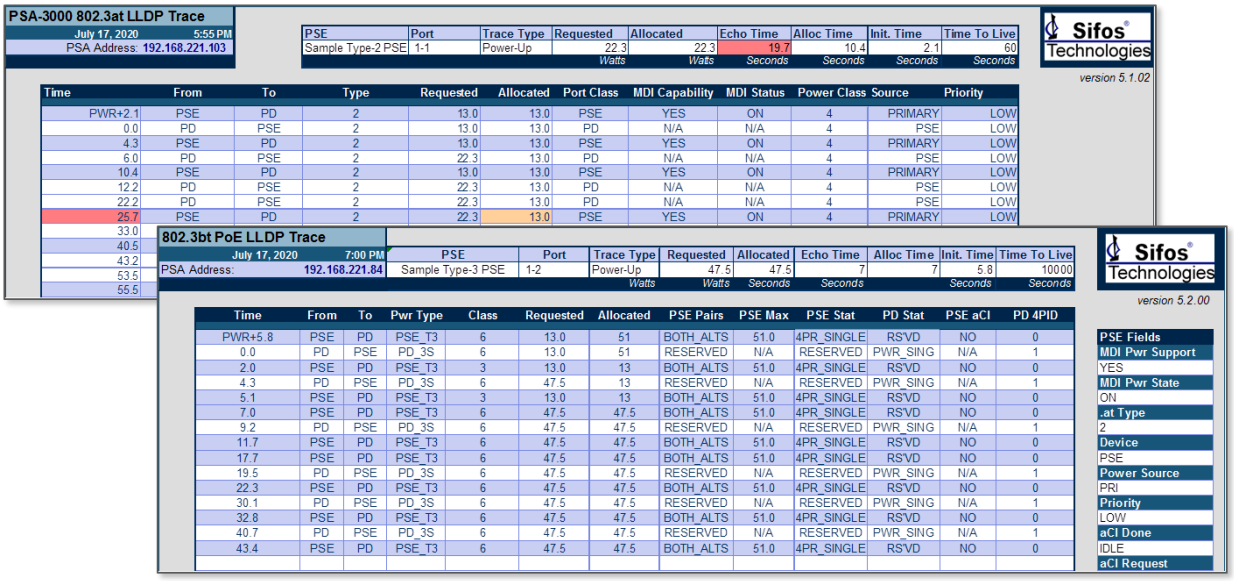


Emulated Class 6 Power-Up Trace Configuration

During the course of the trace, all packet contents and timing are captured in both directions until the trace completes. Information is displayed in real time and may optionally be routed to a pre-formatted pop-up Excel spreadsheet for protocol value and timing analysis.

Actual power draw is generally limited to 12.8 watts or less (Type-1 PD power). The trace never adjusts actual power draw following the negotiation to the PD Requested Power level because the sole purpose of the protocol trace is to observe the LLDP protocol that would *precede the PD power adjustment*.

Upon completion of the LLDP Power-Up Trace, power is always removed and the standard trace report opens.



PSA-3000 802.3at LLDP Trace
July 17, 2020 5:55 PM
PSA Address: 192.168.221.103

PSE	Port	Trace Type	Requested	Allocated	Echo Time	Alloc Time	Init. Time	Time To Live
Sample Type-2 PSE	1-1	Power-Up	22.3 Watts	22.3 Watts	19.7 Seconds	10.4 Seconds	2.1 Seconds	60 Seconds

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Time	From	To	Type	Requested	Allocated	Port Class	MDI Capability	MDI Status	Power Class	Source	Priority
PWR+2.1	PSE	PD	2	13.0	13.0	PSE	YES	ON	4	PRIMARY	LOW
0.0	PD	PSE	2	13.0	13.0	PD	N/A	N/A	4	PSE	LOW
4.3	PSE	PD	2	13.0	13.0	PSE	YES	ON	4	PRIMARY	LOW
6.0	PD	PSE	2	22.3	13.0	PD	N/A	N/A	4	PSE	LOW
10.4	PSE	PD	2	13.0	13.0	PSE	YES	ON	4	PRIMARY	LOW
12.2	PD	PSE	2	22.3	13.0	PD	N/A	N/A	4	PSE	LOW
22.2	PD	PSE	2	22.3	13.0	PD	N/A	N/A	4	PSE	LOW
25.7	PSE	PD	2	22.3	13.0	PSE	YES	ON	4	PRIMARY	LOW
33.0											
40.5											
43.2											
53.5											
55.5											

802.3bt PoE LLDP Trace
July 17, 2020 7:00 PM
PSA Address: 192.168.221.84

PSE	Port	Trace Type	Requested	Allocated	Echo Time	Alloc Time	Init. Time	Time To Live
Sample Type-3 PSE	1-2	Power-Up	47.5 Watts	47.5 Watts	7 Seconds	7 Seconds	5.8 Seconds	10000 Seconds

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version 5.2.00

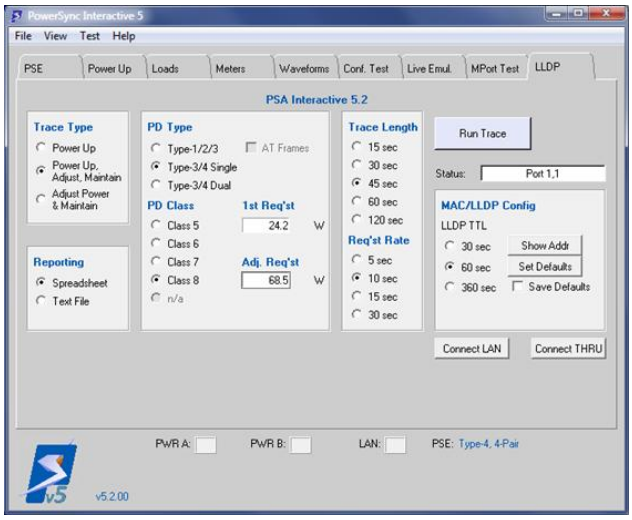
Time	From	To	Pwr Type	Class	Requested	Allocated	PSE Pairs	PSE Max	PSE Stat	PD Stat	PSE aCI	PD 4PID
PWR+5.8	PSE	PD	PSE_T3	6	13.0	51	BOTH_ALTS	51.0	4PR_SINGLE	RSVD	NO	0
0.0	PD	PSE	PD_3S	6	13.0	51	RESERVED	N/A	RESERVED	PWR_SING	N/A	1
2.0	PSE	PD	PSE_T3	3	13.0	13	BOTH_ALTS	51.0	4PR_SINGLE	RSVD	NO	0
4.3	PD	PSE	PD_3S	6	47.5	13	RESERVED	N/A	RESERVED	PWR_SING	N/A	1
5.1	PSE	PD	PSE_T3	3	13.0	13	BOTH_ALTS	51.0	4PR_SINGLE	RSVD	NO	0
7.0	PSE	PD	PSE_T3	6	47.5	47.5	BOTH_ALTS	51.0	4PR_SINGLE	RSVD	NO	0
9.2	PD	PSE	PD_3S	6	47.5	47.5	RESERVED	N/A	RESERVED	PWR_SING	N/A	1
11.7	PSE	PD	PSE_T3	6	47.5	47.5	BOTH_ALTS	51.0	4PR_SINGLE	RSVD	NO	0
17.7	PSE	PD	PSE_T3	6	47.5	47.5	BOTH_ALTS	51.0	4PR_SINGLE	RSVD	NO	0
19.5	PD	PSE	PD_3S	6	47.5	47.5	RESERVED	N/A	RESERVED	PWR_SING	N/A	1
22.3	PSE	PD	PSE_T3	6	47.5	47.5	BOTH_ALTS	51.0	4PR_SINGLE	RSVD	NO	0
30.1	PD	PSE	PD_3S	6	47.5	47.5	RESERVED	N/A	RESERVED	PWR_SING	N/A	1
32.8	PSE	PD	PSE_T3	6	47.5	47.5	BOTH_ALTS	51.0	4PR_SINGLE	RSVD	NO	0
40.7	PD	PSE	PD_3S	6	47.5	47.5	RESERVED	N/A	RESERVED	PWR_SING	N/A	1
43.4	PSE	PD	PSE_T3	6	47.5	47.5	BOTH_ALTS	51.0	4PR_SINGLE	RSVD	NO	0

PSE Fields
MDI Pwr Support
YES
MDI Pwr State
ON
.at Type
2
Device
PSE
Power Source
PRI
Priority
LOW
aCI Done
IDLE
aCI Request

LLDP Power-Up Trace Reports: 802.3at Class 4 and 802.3bt Class 6 Emulations

LLDP Power-Adjust Protocol Trace

The Power-Adjust Protocol Trace can start from either an power-down state or an already-powered state. This trace tracks the protocol sequencing associated with a PD initiated Power Change Request. These requests can work in either direction – adjusting power up or down.

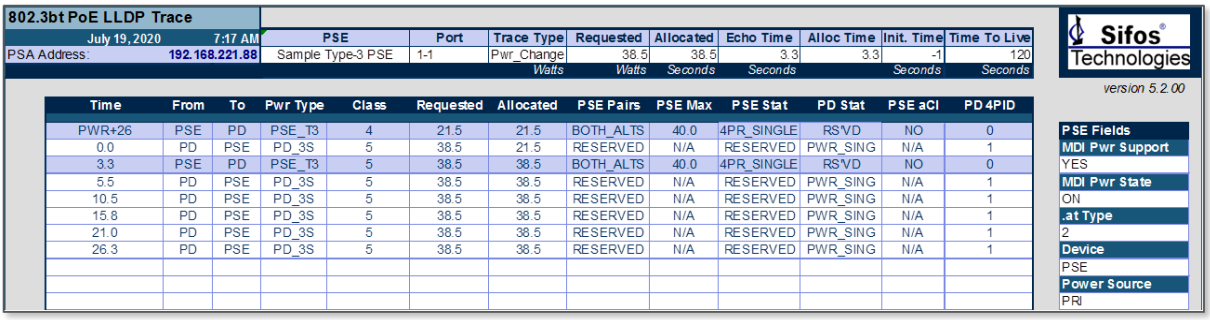


Emulated Class 8 Power Adjust Trace Configuration

A **Power-Up, Adjust, and Maintain** LLDP trace starts from a power-down state, negotiates for a user-specified intial power request, then upon allocation of the initial power request, captures protocol associated with a user-specified second PD power request. As with the Power-Up trace, **PD Type** and **PD Class** are specified along with trace duration and PD message interval. Upon trace completion, the emulated PD remains connected and the PSE remains powered.

An **Adjust Power & Maintain** trace would follow a **Power-Up, Adjust, and Maintain** LLDP trace with another updated PD power request and the associated LLDP negotiation. This trace assumes that the PSE is already powered and has attempted to negotiate an earlier user-specified power request. Before running this trace, a newly altered PD power request is as a power adjust request.

Upon completion of the **Power-Up, Adjust, and Maintain** LLDP trace, power is always maintained. Similar to the Power-Up Trace, the Power Adjust traces keep actual power draw very low since the primary purpose of the protocol trace is to analyze LLDP protocol as opposed to testing PSE power limiting behavior.



802.3bt PoE LLDP Trace
July 19, 2020 7:17 AM
PSA Address: 192.168.221.88

PSE	Port	Trace Type	Requested	Allocated	Echo Time	Alloc Time	Init. Time	Time To Live
Sample Type-3 PSE	1-1	Pwr_Change	38.5 Watts	38.5 Watts	3.3 Seconds	3.3 Seconds	-1 Seconds	120 Seconds

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version 5.2.00

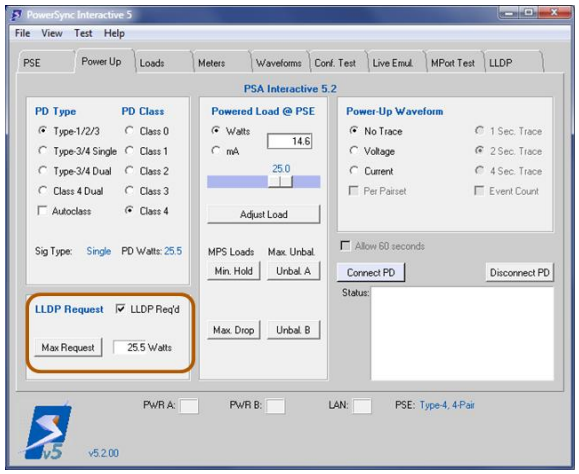
Time	From	To	Pwr Type	Class	Requested	Allocated	PSE Pairs	PSE Max	PSE Stat	PD Stat	PSE aCI	PD 4PID
PWR+26	PSE	PD	PSE_T3	4	21.5	21.5	BOTH_ALTS	40.0	4PR_SINGLE	RSVD	NO	0
0.0	PD	PSE	PD_3S	5	38.5	21.5	RESERVED	N/A	RESERVED	PWR_SING	N/A	1
3.3	PSE	PD	PSE_T3	5	38.5	38.5	BOTH_ALTS	40.0	4PR_SINGLE	RSVD	NO	0
5.5	PD	PSE	PD_3S	5	38.5	38.5	RESERVED	N/A	RESERVED	PWR_SING	N/A	1
10.5	PD	PSE	PD_3S	5	38.5	38.5	RESERVED	N/A	RESERVED	PWR_SING	N/A	1
15.8	PD	PSE	PD_3S	5	38.5	38.5	RESERVED	N/A	RESERVED	PWR_SING	N/A	1
21.0	PD	PSE	PD_3S	5	38.5	38.5	RESERVED	N/A	RESERVED	PWR_SING	N/A	1
26.3	PD	PSE	PD_3S	5	38.5	38.5	RESERVED	N/A	RESERVED	PWR_SING	N/A	1

PSE Fields
MDI Pwr Support
YES
MDI Pwr State
ON
.at Type
2
Device
PSE
Power Source
PRI

LLDP Power Adjust Report: 802.3bt Class 5 PD Emulation

One-Click Emulated LLDP Power-Ups and Standard Waveforms

The LLDP feature option enables additional capabilities within the PSA Interactive **Power-Up** and **Waveforms** tabs.



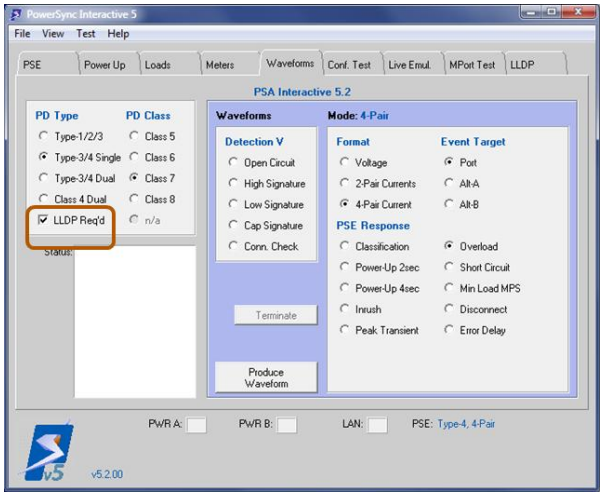
Power-Up Tab Menu with LLDP Feature Option

Working with the **Power-Up** tab menu, PD's of any type and class can be powered to user-specified power (or current) loads following a user-configured LLDP negotiation. The LLDP power request is provided in watts with the option to simply press a button to request the maximum allowed power request for the user-selected PD Type and PD Class.

Unlike the LLDP traces, this feature will actually draw power from the PSE port in accordance with the Powered Load value entered. This allows for efficient inspection of the PSE power allocation validity.

The one-click **Waveforms** menu allows users to specify **LLDP Req'd**. This option is essential for obtaining POWER_ON state waveforms from PSE's that require LLDP negotiation to allocate power to the user-specified class level. These waveforms include **Peak Transient**, **Overload**, **Short Circuit**, **Min Load MPS**, and **Error Delay**. For example, a Type-4 PSE that power demotes to Class 3 power at power-up will require an LLDP negotiation to allocate class 7 or class 8 power levels to an emulated class 7 or class 8 PD.

The **LLDP Req'd** option always initiates an LLDP negotiation for the maximum allowed power to the user-selected PD Type and PD Class. This way, the LLDP granting PSE is treated the identically to PSE's that grant maximum power levels using physical classification at power-up.



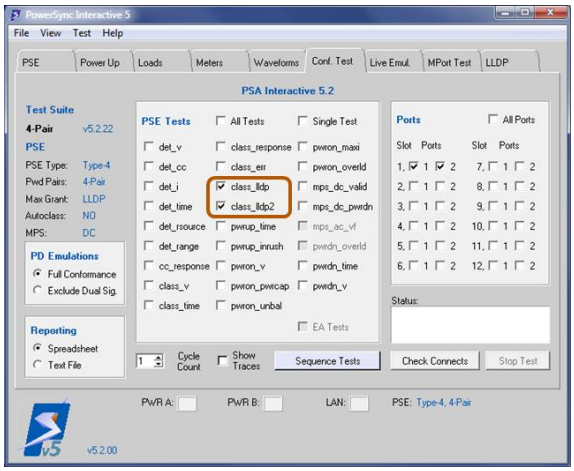
Waveforms Tab Menu with LLDP Feature Option

Conformance Testing of LLDP Capable PSE's

LLDP Capable PSE's fall into one of two categories:

LLDP Granting: The PSE requires LLDP negotiation in order to allocate the maximum available PSE port power to PD.

PHY+LLDP Granting: The PSE does not require LLDP to allocate maximum available PSE port power but does expect to use LLDP to refine power allocations per port downward so that a PD's needs are met while the PSE de-allocates that portion of the initially allocated power that is not needed by the PD.



PSE Conformance Tests for LLDP Capable PSE's

For **LLDP** Granting PSE's, the LLDP feature option is essential to running many of the PSE conformance tests because those tests require the PSE support maximum available power. For both **LLDP** and **PHY+LLDP** granting PSE's, the PSE Conformance Test Suite will elect to run the specific LLDP protocol tests **class_lldp** and where applicable to 4-Pair PSE's, **class_lldp2**.

The **class_lldp** test for 2-Pair PSE's is described in the Sifos datasheet **PSE 2-Pair Conformance Test Suite Overview**. The **class_lldp** and **class_lldp2** tests for 4-Pair PSE's are described in the Sifos datasheet **PSE 4-Pair Conformance Test Suite Overview**.

LLDP & Multi-Port Live PD Emulation

LLDP Emulation enables the **2-Pair Multi-Port Suite** to support **Type-2** and **2-Pair Type-3** PSE's that use LLDP to negotiate Class 4 power. An important part of that is enabling Multi-Port **Live PD Emulation** to support LLDP negotiated power-ups. This in turn allows one or more (up to eight) PSA-3000 instruments to simultaneously emulate up to 192 PD's that all use PoE LLDP for Class 4 power allocations.

For further information, see Sifos datasheets **Multi-Port Live PD Emulation Overview** and **PSE Multi-Port 2 Test Suite Overview**.

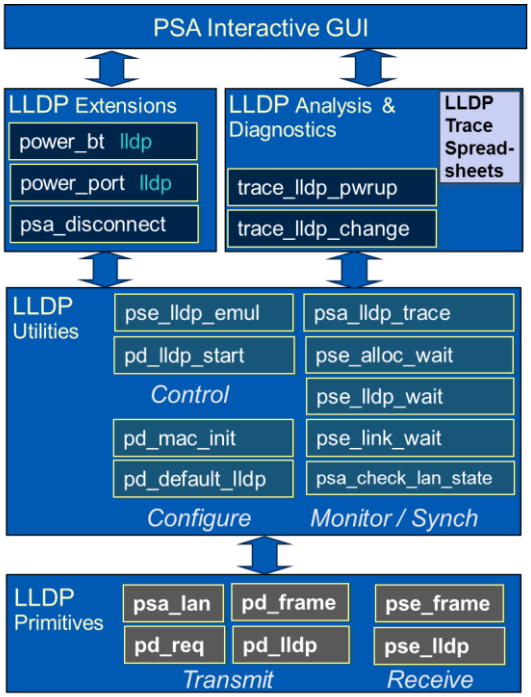
In-Depth LLDP Emulation Control from PowerShell PSA

Using PowerShell PSA, even greater control of LLDP emulations and associated LLDP testing is made possible through a full set of PowerShell PSA commands. Some examples of this include:

- Received PSE PDU's may be analyzed for "raw" LLDP content and lower level protocol issues.
- PD Request PDU's can be more flexibly configured than PSA Interactive allows. For example, an **802.3bt Dual Signature** PD Request can include different classifications and power requests for the Alt-A and Alt-B pairsets.
- More control of low level features such as TTL and echoed allocation behavior is also provided.
- PD Request PDU timing relative to incoming PSE PDU's can be more precisely controlled.

PowerShell PSA LLDP commands are organized into primitives, utilities, LLDP command extensions, and LLDP trace diagnostics. The **LLDP Primitives** provide test port level configurations and queries of LLDP resources on each test port. This includes link connection, emulated PD LLDP framing characteristics, PoE TLV values, packet transmission characteristics, PSE frame capture and buffer, TLV parsing, raw frame display, and frame counting.

The **LLDP Utilities** use primitives to perform higher level configurations or queries such as assigning default MAC addresses, waiting for link, waiting for Power Request echo, and waiting for Power Request allocation. Primitives and utilities are all built to work with both the 802.3at and the 802.3bt PoE LLDP protocol versions.



PSA LLDP Software Hierarchy

The **LLDP Extensions** involve enhancements to other PowerShell PSA commands such as **power_bt** and **power_port** for PD LLDP power-up emulations.

The **LLDP Analysis and Diagnostics** are the application layer commands that configure, capture, display in real time, and report LLDP protocol traces. These too are configurable through command options to emulate PD's using either the 802.3at or 802.3bt LLDP protocols.

Technical Data: LLDP Emulation and Analysis

PD LLDP Emulation

Parameter	Value
LLDP Support	PSA-3202 and PSA-3102* Test Blades PSL-3202 and PSL-3102* Load Blades * *PSA-3102 and PSL-3102 do not support 802.3bt LLDP protocol.*
Test Port Connections	"**through**" to THRU *n* port or "**connect**" to LLDP Resources
PHY Layer: PSA/PSL-3102 Hardware Ver. 1-6	10BaseT Half-Duplex, MDI (no Auto-Neg.)
PHY Layer: PSA/PSL-3202, PSA/PSL-3102 Ver. 8	10/100BaseTx Full-Duplex, Auto-MDI
PD LLDP Framing Configuration per Test Port	**MAC Destination** (*default 0180c20000*) **LLDP Chassis ID Type and Value** (*default 4, MAC Address*) **LLDP Port ID Type and Value** (*default 3, MAC Address*) **LLDP Time-To-Live** (*1 – 65535 seconds, default 120*) **VLAN Tagging** (*Enable / Disable, PCP (1-7), CFI (0-1), VID(0-4094), default Disable)*)
PoE LLDP Elemental Framing Field Configuration (802.3at and 802.3bt PD frames)	**MAC Source Address** (*any 12-character Hex String*, *default= 0004A3000*** where *** is test port specific*) **802.3at PD Type** (*Type-1 or Type-2, Type-2 for all 802.3bt PD's)* **Power_Source** (*PSE, local, both, unknown default= PSE*) **Priority** (*Low, High, Critical, Unknown default= Low*) **PSE_Alloc_Pwr** (*Echo PSE or Fixed Value, default= Echo*)
PoE LLDP Elemental Framing Field Configuration (802.3bt PD frames only)	**PSE_Alloc_Pwr_Alt_A** (*Dual Signature Alt-A Echo PSE or Fixed Value, default= Echo*) **PSE_Alloc_Pwr_Alt_B** (*Dual Signature Alt-B Echo PSE or Fixed Value, default= Echo*)
PoE LLDP Message Content Configuration (802.3at PD frames)	**802.3at PD Class** (0, 1, 2, 3, or 4) **Power Request** (*0 – 25.5 watts*)
PoE LLDP Message Content Configuration (802.3bt PD frames)	**Single Signature Class** (*1 – 8*) **Dual Signature Alt-A Class** (*1 – 5*) **Dual Signature Alt-B Class** (*1 – 5*) **Single Signature Power Request** (*0 – 99.9 watts*) **Dual Signature Alt-A Power Request** (*0 to 49.9 watts*) **Dual Signature Alt-B Power Request** (*0 to 49.9 watts*) **Autoclass** (*now or end to initiate or terminate autoclass meas.*) **Power_Down** *(request power removal by PSE*) **Power_Down_Duration** (*0 to 2 62143 seconds*) **Dual_Signature_Load_Type** (*independent or shared*)
Message Timing and Trigger Configuration (802.3at and 802.3bt frames)	**PD Frame Interval** (*1 – 90 seconds, default= 30 sec*) **PD Message Count** (*0 – 64 messages where 0= Continuous messaging. Default= 0*) **Tx Trigger Mode** (*immediate, trig1, ext, rx default= immediate*) **Initialize** (*force PSE allocated echo to PD request power*)

PSE LLDP Frame Acquisition

Parameter	Value
Capture State	LAN_NOT_CONNECTED, LINK_DOWN, IDLE, RUNNING
PSE Frame Buffer Depth	1 (most recent) Packet
PoE LLDP Receive Parameters (802.3at and 802.3bt frames)	**Receive Packet Count** (*since last 'clear'*) **802.3at Power Class** (*always Class 4 for 802.3bt frames*) **802.3at Power Type** (*always Type-2 for 802.3bt frames*) **Power Source** **Priority** **Source MAC Address** MDI **Power (PD) Class** MDI **Power Support Field** MDI **PSE Powered Pair Field**

Parameter	Value
PoE LLDP Receive Parameters (802.3at frames) *Most Recent Message Only*	**Allocated Power** **Echoed Power Request**
PoE LLDP Receive Parameters (802.3bt frames) *Most Recent Message Only*	**Single Signature Allocated Power** (= *0 for Dual Signature*) **Dual Signature Alt-A Allocated Power** (= *0 for Single Signature*) **Dual Signature Alt-B Allocated Power** (= *0 for Single Signature*) **Dual Signature Alt-A Echoed Request** (= *0 for Single Signature*) **Dual Signature Alt-B Echoed Request** (= *0 for Single Signature*) **PSE_Powering_Status** **PSE_Powered_Pairs** **PSE Power Type** **Single Signature Assigned Class from PSE** **Dual Signature Alt-A Assigned Class from PSE** **Dual Signature Alt-B Assigned Class from PSE** **PSE Max Power Available** **PSE Autoclass Support** **PSE Autoclass Completed**
LLDP Elemental Frame Parameters (802.3at and 802.3bt frames)	**Receive Status** (*IDLE or RUNNING*) **Receive Frame Count** (*since last clear*) **LLDP Destination Address** **Ethernet Type** **Chassis ID Type and Value** **Port ID Type and Value** **Time-To-Live** **VLAN State**

Ordering Information

PSA-LLDP, LLDP Emulation and Analysis for one **PSA-3000** Address (Up to 24 Test Ports*****)
PSL-LLDP, LLDP Emulation and Analysis for one **PSL-3000** Address (Up to 24 Load Ports*****)

***** LLDP Emulation and Analysis for **802.3at** PSE testing is supported on PSA-3102, PSA-3202, PSL-3102, or PSL-3202 test blades and also on PSA-3402 and PSA-3002 Compact PSA's. LLDP Emulation and Analysis for **802.3bt** PSE testing is supported on PSA-3202 and PSL-3202 test blades and also on the PSA-3402 Compact PSA. A PSA-3248 RackPack PSA would require quantity (2) PSA-LLDP licenses.

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