

PDA-LLDP Powered Device LLDP Analyzer IEEE 802.3at Power over Ethernet

Product Overview

Sifes PSE LLDP Emulator																
PSA:	Test Slot				Test Port											
92.168.221.108	1				1		?									
Select PSA	Results															
Select PSA	pse_emul_pos	Merontrace: Sta	inting PSE LLD	P Emulation			<u> </u>									
PSE Config	Time				ower Port	PSE_MDI PSE_MDI Support State									-	
PSE Type Type-2	3 952	PD 0 2	PRIMARY	ity Requested A LOW 13.0	13.0 PSE	YES ON										
Pwr Source primary	3 PD 5 7 PD 5			LOW 13.0 LOW 23.2	13.0 PD 13.0 PD	N/A N/A N/A N/A								Salar and and and and		
Priority low	9 PSE 9 PD E			LOW 23.2 LOW 23.2	23.2 PSE 23.2 PD	YES ON N/A N/A							-			
et Pwr Aloc 25.5	Watts 15 PD F	SE 4 2	PSE	LON 23.2	23.2 PD	N/A N/A							SIFOS	S TECHNOLO	SIES	
	17 PD 5			LON 23.2 LON 23.2	23.2 PD 23.2 PSE	N/A N/A YES ON									JILO	
Behavior Grant_Reg	23 PD 1 27 PD 1	PSE 4 2	PSE	LOW 23.2 LOW 23.2	23.2 PD 23.2 PD	N/A N/A N/A N/A						- 1	LIN	K D	OM	LINK
Trace Len. 30 💌	31 PD 5	PSE 4 2	PSE	LON 23.2	23.2 PD 23.2 PD	N/A N/A N/A N/A								and the second		100
Power Up Trace	30 STOPPI	ING TRACE - spe	cified duration	on reached.												
Power Adjust Trace															-1	
Start Rx Capture													100	THRU TEST	11	THRU
oran Hx Capture															-	
														TEGI		
Check Link														1001	-	
Check Link												I		1201	-	
Check Link 20U Config	P Emulator Ti	race						_		l au					-	
Check Link PDU Config Tx Period 15: PSE LLDP	P Emulator Ti							_		Sifa	s	l				
Check Link PDU Config Tx Period 15s Resp. Delay Immeda December 22:		9:02 AM							version 4.1.00	Sifa		ļ				
Dreck Link 20U Config Tx Perod 15s Resp. Delay Immeda December 22	2014	9:02 AM							version 4.1.00			l				
Direck Link DUI Config Tis Period 15s Resp. Delay Immedia December 22	2014	9:02 AM 18	PD Class T	Type Sour	rce Priority	Requested	Allocated	Port Class	version 4.1.00	Technol		l				
Check Link DU Config Tr Period Tiss PSE LLDD December 22 PSA Add Sh	2014 ress: 192.168.221.10 From	9:02 AM 18 To F	PD Class T						MDI Support	MDI State		l				
Deck Link 20U Config Ts/Peod Ts Rep. Delay TTL 30e PSA Add Sy	2014 ress: 192.168.221.10	9:02 AM 18		2 PRIN	rce Priority MARY LC PSE LC	DW 13.0	13.0	Port Class PSE PD		Technol						
Dheck Link Ta Pendig Ta Pendig Ta Pendig December 22 PSA Add SH	2014 ress: 192.168.221.10 From 3.0 PSE 3.0 PD 7.0 PD	9:02 AM 18 To P PD PSE PSE	0 4 4	2 PRI 2 2	MARY LC PSE LC PSE LC	0W 130 0W 130 0W 233	13.0 13.0 13.0	PSE PD PD	MDISupport YES N/A N/A	MOI State ON N/A N/A						
Deck Link 00 Config The Proded Tiss PSE LLDD Decenter 22 PSA Add Store I IIII	2014 ress 192.168.221.10 From 3.0 PSE 3.0 PD 7.0 PD 9.0 PSE	9:02 AM 18 To PD PSE PSE PD	0 4 4 4	2 PRIM 2 2 2 PRIM	MARY LC PSE LC PSE LC MARY LC	0W 13.0 0W 13.0 0W 23.3 0W 23.3	13.0 13.0 13.0 23.2	PSE PD PD PSE	MDI Support YES N/A N/A YES	MOI State ON N/A N/A ON						
Decklast U Credity Thered Ifs PSE ALLDI PSA Add Star S	2014 ress: 192.168.221.10 From 3.0 PSE 3.0 PD 7.0 PD 9.0 PSE 9.0 PD	9:02 AM 18 PD PSE PSE PD PSE	0 4 4 4 4 4	2 PRII. 2 2 2 PRII. 2	ARY LC PSE LC PSE LC ARY LC PSE LC	0W 13.0 0W 13.0 0W 23.3 0W 23.3 0W 23.3 0W 23.3 0W 23.3	13.0 13.0 13.0 23.2 23.2	PSE PD PD PSE PD	MDI Support YES N/A N/A YES N/A	MDI State ON N/A N/A ON N/A						
Decl.Lik.	2014 ress 192.168.221.10 From 3.0 PSE 3.0 PD 7.0 PD 9.0 PSE 9.0 PD 15.0 PD	9:02 AM 18 To P PD PSE PSE PD PSE PSE PSE PSE	0 4 4 4 4 4 4 4	2 PRI 2 2 2 PRI 2 PRI	ARY LC PSE LC PSE LC ARY LC PSE LC PSE LC	W 13.0 W 13.0 W 23.0 W 23.0 W 23.0 W 23.0 W 23.0 W 23.0	13.0 13.0 13.0 23.2 23.2 23.2 23.2	PSE PD PD PSE PD PD	MDI Support YES N/A N/A YES N/A N/A	MOI State ON N/A N/A ON N/A N/A		l				
Decisión 17.Pead (15. 17.Pead (2014 ress 192.168.221.10 From 3.0 PSE 3.0 PD 7.0 PD 9.0 PSE 9.0 PD 15.0 PD 15.0 PD 17.0 PD	902 AM 8 To F PSE PSE PSE PSE PSE PSE	0 4 4 4 4 4 4 4 4	2 PRII. 2 2 2 PRII. 2 2 2 2 2 2	MARY LC PSE LC PSE LC MARY LC PSE LC PSE LC PSE LC	DW 13.0 DW 13.0 DW 23.3	13.0 13.0 23.2 23.2 23.2 23.2 23.2 23.2	PSE PD PD PSE PD PD PD PD	MDI Support YES N/A N/A YES N/A N/A N/A	MOI State MOI State ON NA NA NA NA NA NA		l				
Deck Lisk	2014 ress 192.168.221.10 From 3.0 PSE 3.0 PD 7.0 PD 9.0 PSE 9.0 PD 15.0 PD 15.0 PD 17.0 PD 17.0 PD	902 AM 8 PD PSE PSE PSE PSE PSE PSE PD	0 4 4 4 4 4 4 4 4 4 4	2 PRII. 2 2 2 PRII. 2 2 2 2 2 2 2 PRII.	IARY LC PSE LC PSE LC IARY LC PSE LC PSE LC PSE LC IARY LC	W 13. W 13. W 23. W	13.0 13.0 23.2 23.2 23.2 23.2 23.2 23.2 23.2	PSE PD PD PSE PD PD PD PD PSE	MDI Support YES N/A N/A YES N/A N/A N/A N/A N/A YES	MOI State ON NA NA ON NA NA NA NA ON						
Deci Lia 1x-Pord 1/s PSU Code Tx-Pord 1/s PSE ELDD PSE ELDD PSE LAD PSE LAD PSE LAD PSE A03 State	2014 ress 192.168.221.10 From 3.0 PSE 3.0 PD 7.0 PD 9.0 PSE 9.0 PD 15.0 PD 15.0 PD 17.0 PD	902 AM 8 To F PSE PSE PSE PSE PSE PSE	0 4 4 4 4 4 4 4 4 4 4 4	2 PRII. 2 2 2 PRII. 2 2 2 2 2 2 2 2 2 PRII. 2 2 PRII. 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	MARY LC PSE LC PSE LC MARY LC PSE LC PSE LC PSE LC	W 13. W 13. W 23.	13.0 13.0 13.0 23.2 23.2 23.2 23.2 23.2 23.2 23.2 2	PSE PD PD PSE PD PD PD PD	MDI Support YES N/A N/A YES N/A N/A N/A	MOI State MOI State ON NA NA NA NA NA NA						

Key Features

- □ Enables Powered Device Verification to IEEE 802.3 Clauses 33 and 79
- □ Flexible PSE LLDP Modeling and Configuration
- One-Button LLDP Protocol Capture and Analysis
- □ Enables Flexible Emulation of 802.3at Type-2 LLDP PSE's when combined with a Sifos PDA-300
- **Compact, Portable 2-Port Emulation**
- □ Overcomes Coverage Limitations of End-Span & Mid-Span PSE's
- **PSA Interactive Graphical User Interface**
- PowerShell PSA Automation Scripting
- □ Pop-Up Excel Spreadsheet Protocol Trace Reports
- □ Available on any PSA-3000 or PSL-3000 Enabled for LLDP



802.3at PD's

All Type-2 PD's Type-1 PD's with LLDP Support

Flexible PSE Emulation

PSE Type, Source, & Priority Max Power Allocation Grant Logic LLDP Period, TTL Request Response Delay

One-Button Protocol Analysis

Bi-Directional Analysis Message Content Message Timing Colorized Spreadsheet Report

Cost Effective

Less Expensive than Many Type-2 PSE's

Less Expensive than Programmable Packet Generators

No Programming Necessary

Overview

With the 802.3at standard, PoE has moved in the direction of augmenting layer 1 Powered Device (PD) classification with a MAC (or Link) Layer PD classification that offers significantly improved power management accuracy and enables dynamic negotiation of power levels between PSE and PD.

The link layer scheme uses a PoE-specific Link Layer Discovery Protocol (LLDP) as specified in Clause 79 of IEEE 802.3 with additional protocol rules defined in Clause 33 (IEEE 802.3at). LLDP is a link (point-to-point) MAC protocol historically used to allow switches and routers to automatically "discover" connected equipment and to populate and maintain a MIB that can be used for viewing and managing a network topology. Under IEEE 802.3at, LLDP is extended to perform a link configuration function related to power negotiation between a PSE and a PD.

LLDP PSE Emulation and Analysis

IEEE 802.3at allows PSE's that deploy LLDP for PoE power management considerable latitude in how they implement LLDP protocol. Since PSE's are the master of this protocol, PD's must work within the constraints established by a PSE.

PSE LLDP Emulation involves modeling various IEEE 802.3at-compliant PSE LLDP behaviors in the interest of assessing Powered Device responses. Characteristics that may be modeled are **PSE Power Allocation** decisions, **periodicity** of packet transmission, **timing** of responses to power requests, PSE initiated **Power Allocation Changes**, LLDP **time-to-live**, and the content of various TLV fields that communicate **device status** and **information**.

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.

Why Not Use PSE's or Packet Analyzers ?

End-span PSE's that support LLDP, when available, typically don't offer much in the way of configuration and control for LLDP PoE protocol. So while they can power a PD, they will only present one of many possible LLDP protocol and timing scenarios while restricting user intervention into power management decisions. Type-2 (high power) mid-span PSE's and non-LLDP end-span PSE's can power a PD but when doing so, must offer 2-event classification that will automatically grant full power to a Type-2 PD before any LLDP negotiation could ever start, thus corrupting the model of an LLDP power-up. Older Type-1 mid-span PSE's won't power PD's beyond 15.4 watts.

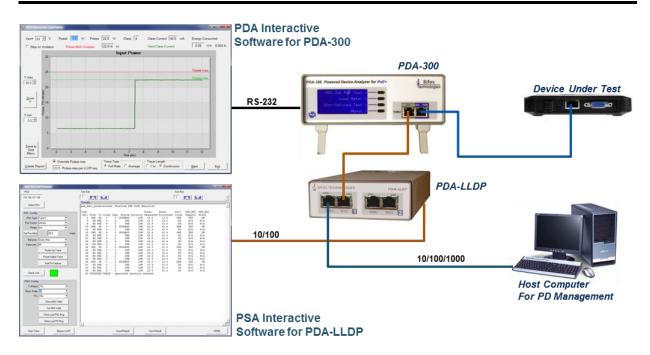
Packet analyzers must be programmed to implement PoE LLDP including ability to handshake and echo incoming fields in real time. While this might be feasible, it requires creation of custom software tools. These tools must then be combined with and synchronized to a PD (DC) powering device that will forward LLDP traffic without providing 2-event classification grants.

Hardware Support for PSE LLDP Emulation

The PDA-LLDP is a low cost, dedicated platform for PSE LLDP emulation. In combination with the Sifos PDA-300 PD Analyzer, PD developers have all the tools required to assess Power Device performance under the 802.3at specification. Flexible PSE LLPD emulation and modeling is also freely available to those who already own PSA-3000, PSA-3002, and/or PSL-3000 platforms with LLDP features enabled.



Test Configuration



The **PDA-LLDP** is used to assess PoE LLDP protocol from a Powered Device (PD). It is readily used in tandem with a **PDA-300** that provides power to the PD and monitors (or charts) it's real-time power loading, including load state changes that might be resultant from PoE LLDP negotiation and power adjusts. For further information regarding the PDA-300 from Sifos, see the **PDA-300 Product Overview** available at www.sifos.com.

LLDP protocol transactions and protocol traces are easily configured and initiated by PSA Interactive software. Captured protocol traces can be loaded to Microsoft Excel with a single click.

The PDA-LLDP offers two independent test ports. Each port can be configured to flow through traffic from another network destination to the PD either prior to or following LLDP protocol transactions associated with PD power-ups.

One-Button LLDP Protocol Traces

The LLDP Power On Trace

The LLDP Power On Trace allows the behavior of a PD starting from a power-down state to be evaluated, showing the LLDP post-power-up negotiation. Users can specify the PSE **Allocated Power** level, the **trace duration**, and the **response delay** of the PSE to PD transmitted Power Request packets. 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 be exported to a pre-formatted pop-up Excel spreadsheet for protocol value and timing analysis.

	Time (sec) 5 5 10	From PSE PD PSE	To PD PSE PD	Class 4 4 4	Type 2 2 2	Source PRIMARY PSE PRIMARY	Priority LOW LOW LOW	Power Requested 15.2 15.2 15.2	Power Allocated 13.0 13.0 15.2	Port Class PSE PD PSE	PSE_MDI Support YES N/A YES	PSE_MDI State ON N/A ON	ſ		
	13	PD	PSE	4	2	PSE	LOW	15.2	13.0	PD	N/A	N/A			
	15	PD	PSE	4	2	PSE	LOW	15.2	13.0	PD	N/A	N/A			
	20	PSE	PD	4	2	PRIMARY	LOW	15.2	15.2	PSE	YES	ON			
	23	PD	PSE	4	2	PSE	LOW	15.2	13.0	PD	N/A	N/A			
	28	PD	PSE	4	PSE LL	DP Emulat	or Trace								Sifo:
	31	DOP	-												
Ļ	51	PSE	PD	4		17, 2015 Address: 192, 168	2:24 P .221.105		e Type: Powe	er-Up				version 4.1.01	Technolo
Ļ		PSE	PD	4		Address: 192.168	.221.105	Trac		er-Up Priority	Requested	Allocated	Port Class		Technolo
Ļ		PSE	PD	4	PSA A	Address: 192.168 Fro 5.0 PS		Trac	ype Source 2 PRIMARY	Priority LOW	13.0	13.0	PSE	MDI Support YES	Technolo MDI State ON
Ļ		PSE	PD	4	PSA A	Address: 192, 168 Fro 5.0 PS 8.0 PC	.221.105 m To E PD D PSE	Trac	ype Source 2 PRIMARY 2 PSE	Priority LOW LOW	13.0 15.2	13.0 13.0	PSE PD	MDI Support YES N/A	MDI State
Ļ		PSE		4	PSA A	address: 192.168 Fro 5.0 PS 8.0 PC 10.0 PS	.221.105 m To E PD D PSE E PD	Trac	ype Source 2 PRIMARY 2 PSE 2 PRIMARY	Priority LOW LOW LOW	13.0 15.2 15.2	13.0 13.0 15.2	PSE PD PSE	MDISupport YES N/A YES	MDI State ON N/A ON
L		PSE		4	PSA A	Address: 192.168 Fro 5.0 PS 8.0 PC 10.0 PS 13.0 PC	E PD PSE PSE PSE	Trac	ype Source 2 PRIMARY 2 PSE 2 PRIMARY 2 PSE	Priority LOW LOW LOW LOW	13.0 15.2 15.2 15.2	13.0 13.0 15.2 13.0	PSE PD PSE PD	MDI Support YES N/A YES N/A	MDI State ON N/A ON N/A
L		PSE		4	PSA A	address: 192.168 Fro 5.0 PS 8.0 PC 10.0 PS	.221.105 m To E PD PSE E PD PSE PSE PSE	Trac	ype Source 2 PRIMARY 2 PSE 2 PRIMARY	Priority LOW LOW LOW	13.0 15.2 15.2	13.0 13.0 15.2	PSE PD PSE	MDISupport YES N/A YES	MDI State ON N/A ON
Ļ		PSE	PD	4	PSA A	Address: 192.168 Fro 5.0 PS 8.0 PC 10.0 PS 13.0 PC 15.0 PC 20.0 PS 23.0 PC	To To E PD PSE PD O PSE D PSE E PD O PSE E PD O PSE E PD O PSE	Trac	ype Source 2 PRIMARY 2 PSE 2 PRIMARY 2 PSE 2 PSE 2 PRIMARY 2 PSE 2 PRIMARY	Priority LOW LOW LOW LOW LOW LOW	13.0 15.2 15.2 15.2 15.2 15.2 15.2 15.2 15.2	13.0 13.0 15.2 13.0 13.0 15.2 15.2 13.0	PSE PD PSE PD PD PSE PD	MDI Support YES N/A YES N/A N/A YES N/A	MDI State ON N/A ON N/A ON N/A
L		PSE	PD	4	PSA A	Address: 192.168 5.0 PS 8.0 PC 10.0 PS 13.0 PC 15.0 PC 20.0 PS	To E PD D PSE E PD O PSE D PSE	Trac	ype Source 2 PRIMARY 2 PSE 2 PRIMARY 2 PSE 2 PSE 2 PRIMARY	Priority LOW LOW LOW LOW LOW	13.0 15.2 15.2 15.2 15.2 15.2 15.2	13.0 13.0 15.2 13.0 13.0 13.0 15.2	PSE PD PSE PD PD PSE	MDI Support YES N/A YES N/A N/A YES	MDI State ON N/A ON N/A N/A ON

Power-Up LLDP Protocol Trace with Export to Excel for Analysis

LLDP Power Modification Protocol Trace

The LLDP Power Modification Trace allows the behavior of a PD to be assessed starting from an already-powered state. This trace tracks the protocol sequencing associated with a PSE initiated Power Change Request, or if the PD is capable of altering advertised power load, a PD initiated Power Change Request.

These requests can work in either direction - adjusting power up or down. During the course of the trace, all packet

Time							Power	Power	Port	PSE_MDI	PSE_MDI
(sec)	From	То	Class	Туре	Source	Priority	Requested	Allocated	Class	Support	State
3	PD	PSE	4	2	PSE	LOW	25.5	25.5	PD	N/A	N/A
8	PSE	PD	4	2	PRIMARY	LOW	25.5	25.5	PSE	YES	ON
8	PD	PSE	4	2	PSE	LOW	25.5	25.5	PD	N/A	N/A
12	PD	PSE	4	2	PSE	LOW	18.0	25.5	PD	N/A	N/A
15	PSE	PD	4	2	PRIMARY	LOW	25.5	25.5	PSE	YES	ON
18	PSE	PD	4	2	PRIMARY	LOW	18.0	18.0	PSE	YES	ON
18	PD	PSE	4	2	PSE	LOW	18.0	18.0	PD	N/A	N/A
27	PD	PSE	4	2	PSE	LOW	22.3	18.0	PD	N/A	N/A
30	PSE	PD	4	2	PRIMARY	LOW	18.0	18.0	PSE	YES	ON
32	PSE	PD	4	2	PRIMARY	LOW	22.3	22.3	PSE	YES	ON
32	PD	PSE	4	2	PSE	LOW	22.3	18.0	PD	N/A	N/A
40	PD	PSE	4	2	PSE	LOW	22.3	22.3	PD	N/A	N/A
46	PSE	PD	4	2	PRIMARY	LOW	22.3	22.3	PSE	YES	ON

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.

Power-Modification LLDP Protocol Trace with Export to Excel

Technical Data: LLDP Emulation and Analysis

PSE LLDP Emulation	
Parameter	Value
Supported Platforms	PDA-LLDP, PSA-3102 Test Blade, PSL-3102 Load Blade, PSA-3002
Test Port Connection	"connect" or "bypass" LLDP Termination
LLDP Physical Layer	10BaseT Half-Duplex, MDI (no Auto-Neg.)
PSE LLDP Framing Control	MAC Address
	LLDP Channel ID Type and Value: 4, MAC Address
	LLDP Port ID Type and Value: 3, MAC Address
	LLDP Time-To-Live: 1 – 65535 seconds
PSE PoE TLV	MDI Capability: Port Class, PSE Power Support, Power State, Pair Control
	PoE Plus Type: PSE Type 1 & PSE Type 2
	PoE Plus Source: Primary, Backup & Unknown
	PoE Plus Priority: Low, High, Critical & Unknown
	PoE Plus Power Allocation Field: Grant exact PD request or Fixed Value

PD LLDP Frame Acquisition

Parameter	Value
Capture State	LAN_NOT_CONNECTED, LINK_DOWN, IDLE, RUNNING
PoE LLDP Receive Parameters	Buffer Depth: 1 packet (Trace Depth: Duration Dependent)
Most Recent Message Only	Receive Packet Count (since last 'clear')
	Power Request, Echoed Power Allocation
	Power Type, Power Source, Priority
	Source MAC Address
	MDI Power (PD) Class
LLDP Frame Parameters	LLDP Destination Address
	Ethernet Type
	Chassis ID Type and Value
	Port ID Type and Value
	Time-To-Live
	VLAN State (PCP, CFI, VID values if VLAN enabled)

Ordering Information

PDA-LLDP, Powered Device LLDP Analyzer, PSA Interactive Software, PowerShell PSA Scripting Software

Sifos Technologies, Inc. 1061 East Street Tewksbury, MA 01876 +1 (978) 640-4900 www.sifos.com sales@sifos.com

