



L2 / L3 Switches

Link Layer Discovery Protocol (LLDP)

Configuration Guide

Revision 1.0

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Manual Revision 1.0

Release Date: October 30, 2013

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Printed in the United States of America

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1 LLDP Configuration Guide

This document describes the system features supported in Supermicro Layer 2 / Layer 3 switch products.

This document covers the system configurations for the below listed Supermicro switch products.

Top of Rack Switches

- SSE-G24-TG4
- SSE-G48-TG4
- SSE-X24S
- SSE-X3348S
- SSE-X3348T

Blade Switches

- SBM-GEM-X2C
- SBM-GEM-X2C+
- SBM-GEM-X3S+
- SBM-XEM-X10SM

The majority of this document applies to the above listed Supermicro switch products. In any particular subsection however, the contents might vary across these product models. In those sections, the differences are clearly identified with reference to a particular model(s). If any particular model is not referenced, the reader can safely assume that the content is applicable to all the above listed models.



Throughout this document, the common term “switch” refers to any of the above listed Supermicro switch models unless a particular model is noted.

1.1 LLDP Overview

LLDP is a neighbor discovery protocol that is used for network devices to advertise information about themselves to other devices on the network. This protocol runs over the data-link layer, which allows two systems running different network layer protocols to learn about each other.

Devices in a LAN maintain operations-related configuration information in management information bases (MIBs). LLDP helps avoid misconfiguration problems in LANs by enabling LAN devices to be aware of other devices' configuration information.

LLDP supports a set of attributes that it uses to discover neighbor devices. These attributes contain type, length, and value descriptions and are referred to as TLVs. LLDP supported devices can use TLVs to receive and send information to their neighbors. Details such as configuration information, device capabilities, and device identity can be advertised using LLDP.

Supermicro switches provide the following LLDP features:

- Support all mandatory TLVs (chassis identifier, port identifier and time-to-live).
- Support optional TLVs - port description, system name, system description, system capabilities and management address.
- Support organizationally specific optional TLVs - port VLAN identifier, port and protocol VLAN identifier, VLAN name, MAC or PHY configuration or status, link aggregation and maximum frame size.
- Provide support for notifications through traps.

1.2 LLDP Operation

An LLDP agent operates in any one of the following three modes:

1. Transmit-only mode: The agent can only transmit the information about the capabilities and the status of the local system.
2. Receive-only mode: The agent can only receive information about the capabilities and the status of the remote systems.
3. Transmit and receive mode: The agent can transmit the local system capabilities and status information and receive the capabilities and status information of remote systems.

The LLDP transmit only mode sends the local device's information at regular intervals in LLDP TLV's. Whenever the transmit mode is disabled, the device transmits an LLDP PDU with a time-to-live (TTL) TLV containing "0" in the information field. Upon reception of a PDU with TLV 0, remote devices are then enabled to remove the information associated with this local device from their databases.

The LLDP receive only mode receives a remote device's information and updates the remote system's LLDP MIB database. When new or updated information is received, the receive module initiates a timer for a valid duration indicated by the TTL TLV in the received LLDP PDU. The remote system's information is removed from the database when an LLDP PDU is received with TTL TLV containing "0" in its information field.

1.3 LLDP Configuration

1.3.1 Default Configuration

Parameter	Default Value
LLDP Status (global)	Disabled
LLDP Status (interface level)	Transmit and receive
TLV	None
Holdtime Multiplier	4
Message Transmit Interval	30
Reinitialization Delay	2
Transmit Delay	2
Trap Notification Interval	5
Chassis ID	Switch MAC address
Chasis ID Subtype	MAC address
Port ID Subtype	Interface name
System Capabilities	None
Notification	Disabled
Notification Type	Mis-configuration

1.3.2 Enabling LLDP

LLDP is disabled by default in Supermicro switches. Follow the steps below to enable LLDP.

Step	Command	Description
Step 1	configure terminal	Enters the configuration mode
Step 2	set lldp enable	Enables LLDP in the switch.
Step 3	end	Exits the configuration mode.
Step 4	show lldp	Displays the LLDP global configuration details



The “**set lldp disable**” command disables LLDP in the switch.

1.3.3 Configuring LLDP Parameters

Once LLDP is enabled globally, it is enabled on all supported interfaces by default. Supermicro switches provide a user configuration to place an interface in only send or only receive mode.

Other LLDP parameters that can be configured in Supermicro switches are Notification type, Chassis-ID Sub-type and Port-ID Sub-type.

Step	Command	Description
Step 1	configure terminal	Enters the configuration mode
Step 2	interface <interface-type><interface-id> or interface range <interface-type><interface-id>	<p>(Optional) Enters the interface configuration mode.</p> <p><i>interface-type</i> – may be any of the following: gigabit-ethernet – gi extreme-ethernet – ex qx-ethernet – qx port-channel – po</p> <p><i>interface-id</i> is in <i>slot/port</i> format for all physical interfaces.</p> <p>To configure multiple interfaces, use the “interface range ...” command. To provide a range use a hyphen (-) between the start and end interface numbers. E.g.: int range gi 0/1-10</p> <p>To provide multiple interfaces or ranges, separate with a comma (,). E.g.: int range gi 0/1-10, gi 0/20</p> <p>If multiple interfaces are provided, the next step will perform the particular configuration on all these interfaces.</p>
Step 3	lldp {transmit receive}	<p>(Optional) Sets LLDP admin status on an interface to Transmit or Receive</p>
Step 4	lldp notification [remote-table-chg][mis-configuration]	<p>(Optional) Enables LLDP trap notification on an interface.</p> <p>remote-table-chg - Trap notification for change in neighbor’s table.</p> <p>mis-configuration - Trap notification for mis-configuration.</p>
Step 5	lldp port-id-subtype { if-alias port-comp <string(255)> mac-addr if-name local	<p>(Optional) Configures LLDP port ID subtype and</p>

	<code><string(255)> }</code>	<p>port ID value</p> <p>if-alias - interface alias</p> <p>port-comp - port component</p> <p>mac-addr - MAC address</p> <p>if-name - interface name</p> <p>local - locally assigned</p> <p>The default value for the port-id-subtype is if-name. Note: The if-alias option can be used only for the interfaces which have a valid description configured.</p>
Step 6	Exit	Exits interface configuration mode.
Step 7	lldp chassis-id-subtype { chassis-comp <string(255)> if-alias port-comp <string(255)> mac-addr nw-addr if-name local <string(255)> }	<p>(Optional)</p> <p>Configures LLDP chassis ID subtype and chassis ID value.</p> <p>The chassis identifier value can only be set for the chassis-component and local system subtypes. For all other subtypes, the value is taken from the system automatically.</p> <p>chassis-comp - chassis component</p> <p>if-alias - management interface alias</p> <p>port-comp - port component</p> <p>mac-addr - MAC address</p> <p>nw-addr - network address</p> <p>if-name - interface name</p> <p>local - locally assigned</p> <p>The default value for chassi-id-subtype</p>

		is mac-addr. Note: To use the if-alias option, the management interface must have been configured with valid description.
Step 8	End	Exits the configuration mode.
Step 9	show lldp interface [<interface-type> <interface-id>] show lldp neighbors [chassis-id <string(255)> port-id <string(255)>] [<interface-type> <interface-id>][detail] show lldp traffic [<iftyp> <ifnum>] show lldp errors show lldp statistics	Displays LLDP configuration details on a particular interface or all interfaces Displays information about neighbors learned on an interface or all interfaces Displays LLDP counters, including the number of frames sent, received, discarded, etc. Displays information about errors such as memory allocation failures, queue overflows, table overflows, etc. Displays the LLDP remote table statistics information
Step 10	clear lldp counters	Clears LLDP transmit and receive statistics
Step 11	clear lldp table	Clears LLDP neighbors information



These commands reset the particular configuration to its default value.

lldp {transmit | receive}

no lldp notification

no lldp tlv-select basic-tlv { [port-descr] [sys-name] [sys-descr] [sys-capab] [mgmt-addr {all | ipv4 <uicast_addr> | ipv6 <ip6_addr>}]}

no lldp tlv-select dot1tlv {[port-vlan-id] [protocol-vlan-id {all | <vlan-id>}] [vlan-name {all | <vlan-id>}]}

no lldp tlv-select dot3TLV { [macphy-config] [link-aggregation] [max-framesize] }

1.3.3.1 Configuring LLDP TLV

Supermicro switches provide support for user configuration of LLDP TLV's. The TLV types supported by Supermicro switches are: Basic TLV, DOT1 TLV and DOT3 TLV. The figure below displays the TLV types and their content.

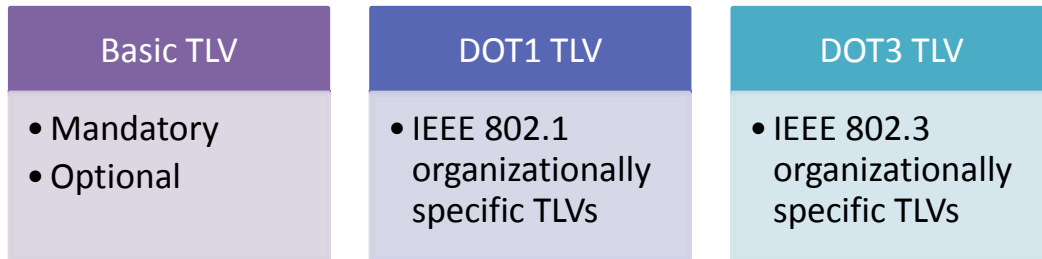


Figure LLDP-1: LLDP TLV Types

The content of the various TLVs supported by Supermicro switches are specified in the figure below.

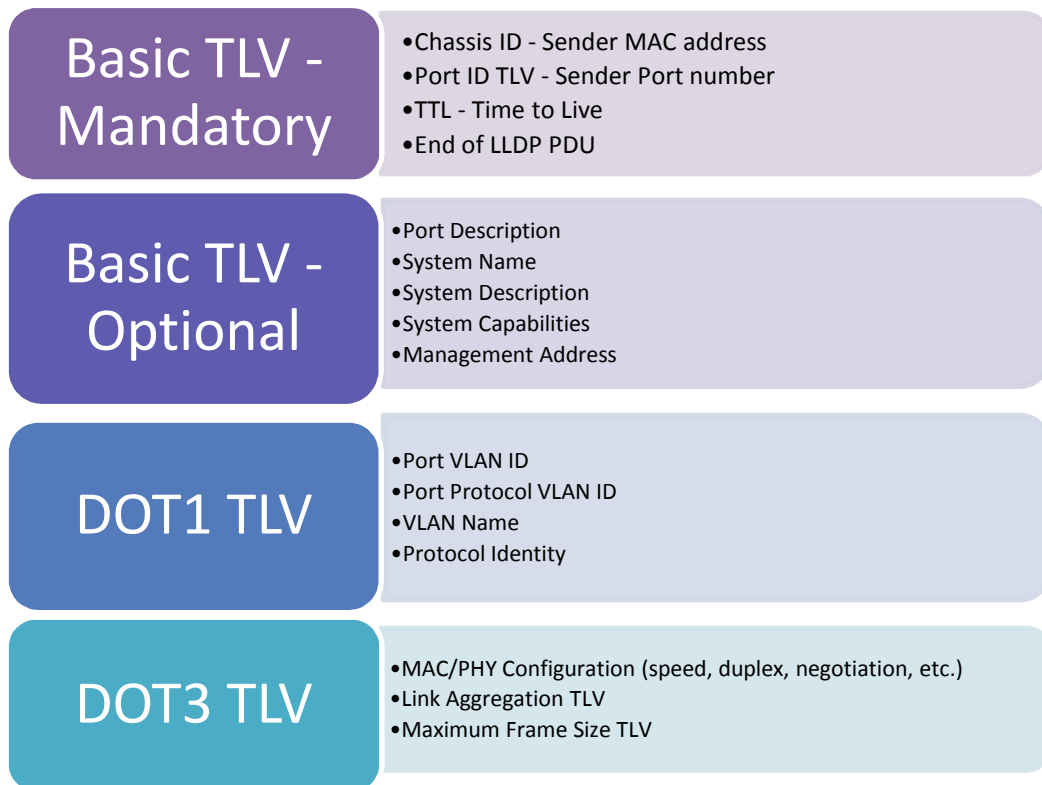


Figure LLDP-2: LLDP TLV Content

Step	Command	Description
Step 1	configure terminal	Enters the configuration mode
Step 2	interface <interface-type><interface-id> or interface range <interface-type><interface-id>	<p>(Optional) Enters the interface configuration mode.</p> <p><i>interface-type</i> – may be any of the following: gigabit-ethernet – gi extreme-ethernet – ex qx-ethernet – qx port-channel – po</p> <p><i>interface-id</i> is in <i>slot/port</i> format for all physical interfaces.</p> <p>To configure multiple interfaces, use the “interface range ...” command. To provide a range use a hyphen (-) between the start and end interface numbers. E.g.: int range gi 0/1-10</p> <p>To provide multiple interfaces or ranges, separate with a comma (,). E.g.: int range gi 0/1-10, gi 0/20</p> <p>If multiple interfaces are provided, the next step will perform the particular configuration on all these interfaces.</p>
Step 3	lldp tlv-select basic-tlv { [port-descr] [sys-name] [sys-descr] [sys-capab] [mgmt-addr {all ipv4 <uicast_addr> ipv6 <ip6_addr>}]}	<p>(Optional)</p> <p>Enables the basic TLV transmission on a given port</p> <p>port-descr - Port description TLV</p> <p>sys-name - System name TLV</p> <p>sys-descr- System description TLV</p> <p>sys-capab - System capabilities TLV</p> <p>mgmt-addr all- Enables the transmission of the management address on the current interface. If no</p>

		<p>management address is present or configured in the system, the switch's MAC address will be used for transmission.</p> <p>mgmt-addr ipv4 <i>ucast-addr</i> - Enables the transmission of a particular ipv4 address on the current interface.</p> <p>mgmt-addr ipv6 <i>ipv6-addr</i> - Enables the transmission of a particular ipv6 address on the current interface.</p>
Step 4	<pre>lldp tlv-select dot1tlv {[port-vlan-id] [protocol-vlan-id {all <vlan-id>}] [vlan-name {all <vlan-id>}]}</pre>	<p>(Optional) Configure dot1 TLV types to be transmitted on a port</p> <p>port-vlan-id - Port VLAN identifier TLV. The keyword port-vlan-id keyword is not supported.</p> <p>protocol-vlan-id - Protocol VLAN identifier TLV. The keyword protocol-vlan-id is not supported.</p> <p>vlan-name – VLAN name TLV</p> <p>NOTE: VLAN name must be configured prior to this LLDP configuration.</p>
Step 5	<pre>lldp tlv-select dot3tlv { [macphy-config] [link-aggregation] [max-framesize] }</pre>	<p>(Optional) Configure dot3 TLV types to be transmitted on a port</p> <p>macphy-config - MAC or PHY TLV.</p> <p>link-aggregation - Link aggregation TLV.</p> <p>max-framesize - Maximum frame size TLV.</p>
Step 6	End	Exits the configuration mode.
Step 7	<pre>show lldp interface [<interface-type> <interface-id>]</pre> <pre>show lldp local {[<interface-type> <interface-id>] [mgmt-addr]}</pre>	<p>Displays LLDP configuration details on a particular interface or all interfaces</p> <p>Displays the current switch information that will be used to populate outbound LLDP advertisements for a specific</p>

	interface or all interfaces
--	-----------------------------

1.3.4 Configuring LLDP Timers

Supernano switches allow for user configuration of LLDP timers:

- Transmit Interval
- Holdtime Multiplier
- Reinitialization Delay
- Transmit Delay
- Notification Delay

1.3.4.1 Message Transmit Interval

The message transmit interval is the period between transmission of the periodic LLDP advertisements. The default message transmit interval is 30 seconds.

Supernano switches allow for user configuration of the message transmit interval. Follow the below steps to change the message transmit interval.

Step	Command	Description
Step 1	configure terminal	Enters the configuration mode
Step 2	lldp transmit-interval <seconds(5-32768)>	(Optional) Configures the message transmit interval, range of 5-32768.
Step 3	End	Exits the configuration mode.
Step 4	show lldp	Displays the LLDP global information



The “**no lldp transmit-interval**” command resets the message transmit interval to its default value.

1.3.4.2 Message Transmit Holdtime Multiplier

The Message Transmit Holdtime Multiplier is used to calculate the time-to-live (TTL) value sent in LLDP advertisements. The time-to-live informs the receiving LLDP agent of the time to retain remote LLDP information if LLDP advertisements are not received periodically.

The TTL is calculated as: the minimum of ((Transmission Interval * Holdtime Multiplier), or 65536)

The default holdtime multiplier is 4 seconds. The default TTL is: 4*30 = 120 seconds. Supernano switches allow for the user configuration of the message transmit holdtime multiplier. Follow the steps below to change the message transmit holdtime multiplier.

Step	Command	Description
Step 1	configure terminal	Enters the configuration mode
Step 2	lldp holdtime-multiplier <value(2-10)>	(Optional) Configures the message transmit holdtime multiplier, range of 2-10.
Step 3	End	Exits the configuration mode.
Step 4	show lldp	Displays the LLDP global information



The “no lldp holdtime-multiplier” command resets the message transmit holdtime multiplier to its default value.

1.3.4.3 Reinitialization Delay

When LLDP ports are disabled or the link goes down, LLDP is reinitialized on a port. The delay between the port going down and the reinitialization is called the reinitialization delay. When LLDP is reinitialized on a port, all information in the remote systems LLDP MIB associated with this port is deleted.

Supermicro switches allow user configuration of the reinitialization delay. Follow the steps below to change the reinitialization delay.

Step	Command	Description
Step 1	configure terminal	Enters the configuration mode
Step 2	lldp reinitialization-delay <seconds(1-10)>	(Optional) Configures the reinitialization delay, range of 1-10.
Step 3	End	Exits the configuration mode.
Step 4	show lldp	Displays the LLDP global information



The “no lldp reinitialization-delay” command resets the reinitialization delay to its default value.

1.3.4.4 Transmit Delay

Any change in local LLDP MIB variables initiates the transmission of LLDP advertisements. The delay between the successive transmissions of such advertisements is called the Transmit Delay. The transmit delay helps prevent unnecessary LLDP transmissions when rapid changes occur in local LLDP MIB objects.

Supermicro switches allow for user configuration of the message transmit delay. Follow the steps below to change the message transmit delay.

Step	Command	Description
Step 1	configure terminal	Enters the configuration mode
Step 2	lldp tx-delay <seconds(1-8192)>	(Optional) Configures the message transmit delay, range of 1-8192. NOTE: The Tx delay should be less than 0.25 * message Tx interval
Step 3	End	Exits the configuration mode.
Step 4	show lldp	Displays the LLDP global information



The “**no lldp tx-delay**” command resets the message transmit delay to its default value.

1.3.4.5 Notification Interval

The Notification Interval is the time interval between successive periodic SNMP notifications about LLDP MIB changes. Any change in LLDP neighbors that occurs between SNMP notifications is not transmitted; only state changes that exist at the expiry of the notification interval are included in the transmission.

Supermicro switches allow for user configuration of the notification interval. Follow the steps below to change the the notification interval.

Step	Command	Description
Step 1	configure terminal	Enters the configuration mode
Step 2	lldp notification-interval <seconds(5-3600)>	(Optional) Configures the notification interval, range of 5-3600.
Step 3	End	Exits the configuration mode.
Step 4	show lldp	Displays the LLDP global information



The “**no lldp notification-interval**” command resets the notification interval to its default value.



1.3.5 LLDP Configuration Example

The example below shows the commands used to configure LLDP by connecting two switches: Switch A and Switch B.

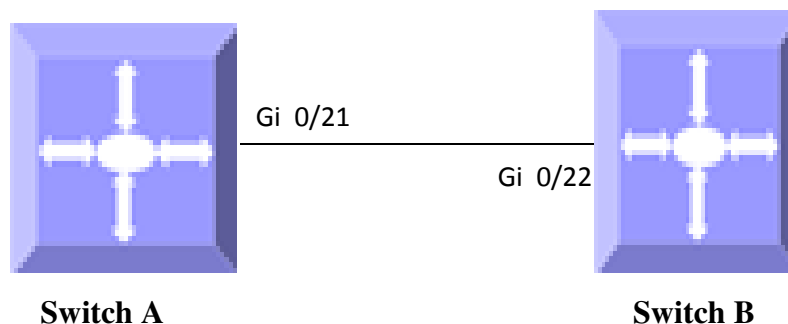


Figure LLDP-3: LLDP Configuration Example

Switch A

```
SMIS# configure terminal
SMIS(config)# set lldp enable
SMIS(config)# end
```

SMIS# show lldp

```
LLDP is enabled
Transmit Interval   : 30
Holdtime Multiplier : 4
Reinitialization Delay : 2
Tx Delay           : 2
Notification Interval : 5
Chassis Id SubType  : Mac Address
Chassis Id          : 00:30:48:e3:04:75
```

SMIS# show lldp neighbors

```
Capability Codes :
(R) Router, (B) Bridge, (T) Telephone, (C) DOCSIS Cable Device,
(W) WLAN Access Point, (P) Repeater, (S) Station, (O) Other
```

Chassis ID	Local Intf	Hold-time	Capability	Port Id
00:30:48:e3:70:bc	Gi0/21	120		Gi0/22

```
Total Entries Displayed : 1
```

```
SMIS(config)# lldp chassis-id-subtype if-name
SMIS(config)# lldp holdtime-multiplier 7
SMIS(config)# lldp notification-interval 100
SMIS(config)# lldp reinitialization-delay 5
SMIS(config)# lldp reinitialization-delay 9
SMIS(config)# lldp reinitialization-delay 10
SMIS(config)# lldp transmit-interval 100
SMIS(config)# lldp transmit-interval 10
SMIS(config)# end
```

```
SMIS(config)# interface Gi 0/21
SMIS(config-if)# lldp notification remote-table-chg
SMIS(config-if)# lldp port-id-subtype if-name
SMIS(config-if)# lldp tlv-select basic-tlv port-descr mgmt-addr all
SMIS(config-if)# exit
```

```
SMIS(config)# vlan 1
SMIS(config-vlan)# name vlan1
SMIS(config-vlan)# exit
```

```
SMIS(config)# interface Gi 0/21
SMIS(config-if)# lldp tlv-select dot1tlv vlan-name 1
SMIS(config-if)# lldp tlv-select dot3tlv macphy-config
SMIS(config-if)# end
```

```
SMIS# show lldp
```

```
LLDP is enabled
Transmit Interval    : 10
Holdtime Multiplier  : 7
Reinitialization Delay : 10
Tx Delay             : 2
Notification Interval : 100
Chassis Id SubType   : Interface Name
Chassis Id           : eth0
SMIS# show lldp neighbors
```

```
Capability Codes :
(R) Router, (B) Bridge, (T) Telephone, (C) DOCSIS Cable Device,
(W) WLAN Access Point, (P) Repeater, (S) Station, (O) Other
```

Chassis ID	Local Intf	Hold-time	Capability	Port Id
00:30:48:e3:70:bc	Gi0/21	120		Gi0/22

```
Total Entries Displayed : 1
```

SMIS# show lldp errors

Total Memory Allocation Failures : 0
Total Input Queue Overflows : 0
Total Table Overflows : 0

SMIS# show lldp traffic

Total Frames Out : 71
Total Entries Aged : 0
Total Frames In : 28
Total Frames Received In Error : 0
Total Frames Discarded : 0
Total TLVS Unrecognized : 0
Total TLVs Discarded : 0

SMIS# show lldp interface Gi 0/21

Gi0/21:
Tx State : Enabled
Rx State : Enabled
Tx SEM State : IDLE
Rx SEM State : WAIT FOR FRAME
Notification Status : Enabled
Notification Type : Remote Table Change

SMIS# show lld statistics

Remote Table Last Change Time : 217700
Remote Table Inserts : 1
Remote Table Deletes : 0
Remote Table Drops : 0
Remote Table Ageouts : 0
Remote Table Updates : 0

SMIS# show lldp local Gi 0/21

Port Id SubType : Interface Name
Port Id : Slot0/21
Port Description :
Enabled Tx Tlvs : Port Description, Management Address, Mac Phy

Extended 802.3 TLV Info

-MAC PHY Configuration & Status
Auto-Neg Support & Status : Supported, Enabled
Advertised Capability Bits : 6c11
10base-T(HD)
10base-T(FD)
100base-TX(HD)
100base-TX(FD)

```

Asym and Symm PAUSE(FD)
1000base-T(FD)
Operational MAU Type      : 30
-Link Aggregation
Capability & Status      : Not Capable, Not In Aggregation
Aggregated Port Id      : 21
-Maximum Frame Size     : 1500

```

```

Extended 802.1 TLV Info
-Port VLAN Id           : 1
-Port & Protocol VLAN Id
Protocol VLAN Id   Support   Protocol VLAN Status   TxStatus
-----
0                 Supported Disabled                Disabled
-Vlan Name
Vlan Id   Vlan Name           TxStatus
-----
1         vlan1              Enabled
-----

```

SMIS# show running-config

```

Building configuration...
Switch ID   Hardware Version   Firmware Version
0          SBM-GEM-X3S+ (B4-01)  1.0.14-3

```

```

vlan 1
 ports gi 0/1-24 untagged
 ports ex 0/1-3 untagged
 name vlan1
 exit

```

```

set lldp enable
lldp transmit-interval 10
lldp holdtime-multiplier 7
lldp reinitialization-delay 10
lldp notification-interval 100
lldp chassis-id-subtype if-name

```

```

interface Gi 0/21
 lldp notification remote-table-chg
 lldp tlv-select basic-tlv port-descr mgmt-addr all
 lldp tlv-select dot3tlv macphy-config
 lldp tlv-select dot1tlv vlan-name 1

```

```

exit

```

Switch B

```
SMIS# configure terminal
SMIS(config)# set lldp enable
SMIS(config)# end
```

SMIS# show lldp

```
LLDP is enabled
Transmit Interval   : 30
Holdtime Multiplier : 4
Reinitialization Delay : 2
Tx Delay           : 2
Notification Interval : 5
Chassis Id SubType  : Mac Address
Chassis Id          : 00:30:48:e3:70:bc
```

SMIS# show lldp neighbors

```
Capability Codes :
(R) Router, (B) Bridge, (T) Telephone, (C) DOCSIS Cable Device,
(W) WLAN Access Point, (P) Repeater, (S) Station, (O) Other
```

Chassis ID	Local Intf	Hold-time	Capability	Port Id
-----	-----	-----	-----	-----
00:30:48:e3:04:75	Gi0/22	120		Gi0/21

Total Entries Displayed : 1

SMIS# show lldp statistics

```
Remote Table Last Change Time : 80900
Remote Table Inserts          : 4
Remote Table Deletes          : 3
Remote Table Drops            : 0
Remote Table Ageouts          : 3
Remote Table Updates          : 7
SMIS(config)# show lldp traffic
Total Frames Out              : 52
Total Entries Aged            : 3
Total Frames In               : 144
Total Frames Received In Error : 0
Total Frames Discarded        : 0
Total TLVS Unrecognized       : 0
Total TLVs Discarded          : 0
SMIS(config)# show lldp errors
Total Memory Allocation Failures : 0
```

```

Total Input Queue Overflows : 0
Total Table Overflows : 0
SMIS(config)# show lldp interface Gi 0/22
Gi0/22:
Tx State : Enabled
Rx State : Enabled
Tx SEM State : IDLE
Rx SEM State : WAIT FOR FRAME
Notification Status : Disabled
Notification Type : Mis-configuration

```

SMIS# show lldp local Gi 0/22

```

Port Id SubType : Interface Alias
Port Id : Gi0/22
Port Description :
Enabled Tx Tlvs :

```

Extended 802.3 TLV Info

```

-MAC PHY Configuration & Status
Auto-Neg Support & Status : Supported, Enabled
Advertised Capability Bits : 6c11
10base-T(HD)
10base-T(FD)
100base-TX(HD)
100base-TX(FD)
Asym and Symm PAUSE(FD)
1000base-T(FD)
Operational MAU Type : 30
-Link Aggregation
Capability & Status : Not Capable, Not In Aggregation
Aggregated Port Id : 22
-Maximum Frame Size : 1500

```

Extended 802.1 TLV Info

```

-Port VLAN Id : 1
-Port & Protocol VLAN Id
Protocol VLAN Id Support Protocol VLAN Status TxStatus
-----
0 Supported Enabled Disabled
-Vlan Name
Vlan Id Vlan Name TxStatus
-----
1 Disabled

```

SMIS# show running-config

Building configuration...

Switch ID	Hardware Version	Firmware Version
0	SBM-GEM-X3S+ (B4-01)	1.0.14-3

vlan 1

ports gi 0/1-24 untagged

ports ex 0/1-3 untagged

exit

set lldp enable