

Link Layer Discovery Protocol

Traffic Pattern Overview for 802.3da Single Pair Multidrop

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2021-03-10

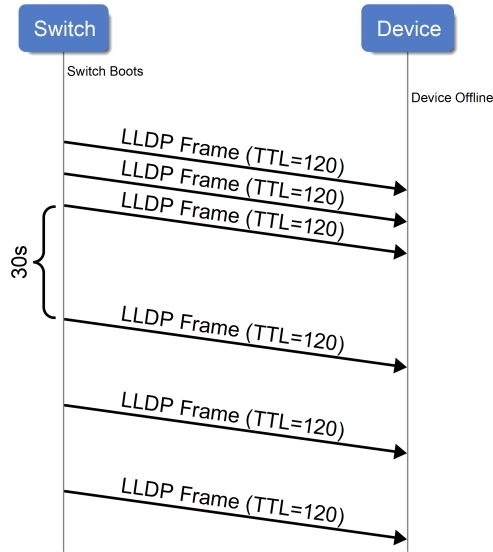
IEEE 802.1AB - Link Layer Discovery Protocol

- Device discovery in a multi-vendor network
- Live network topology
- Network inventory
- Network device capabilities
- Detection of incorrect configuration
- Flexible: vendor-specific data, org-specific data

LLDP Protocol Traffic Patterns

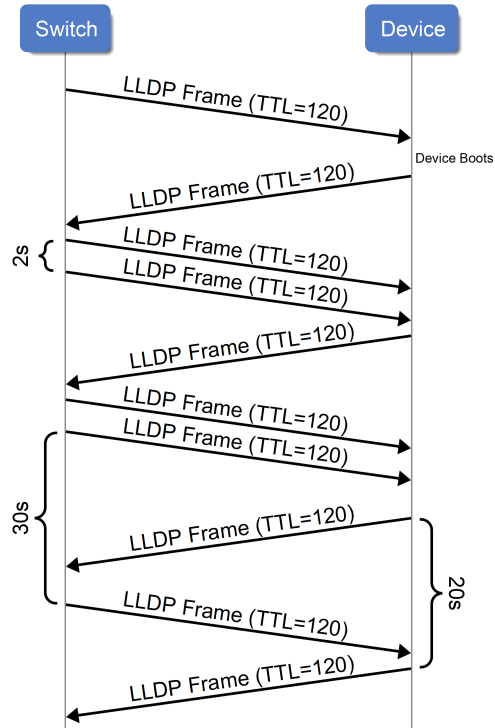
- LLDP **mandates** transmissions by neighbors
 - At boot
 - At a minimum background rate
 - Upon identifying a new neighbor is present
 - Upon change of a relevant local system MIB
- Transmission is Governed by the txTick timer
 - Counts down TTL values for data ageing
 - Has an **average** period of 1s
 - To minimize collisions on a shared media, the txTick timer must use an interval of 0.8s + a uniform random delay between 0.0s and 0.4s

LLDP Traffic Patterns – Switch Boot



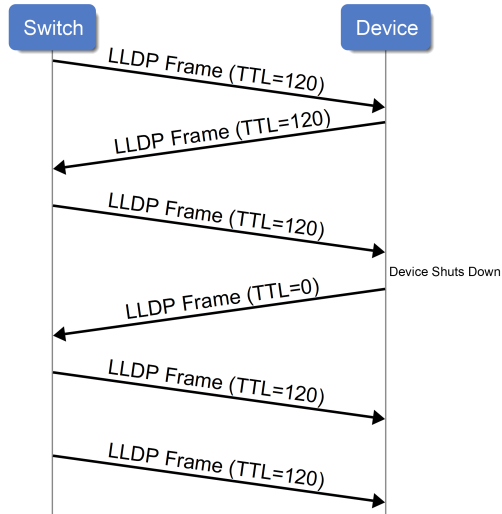
- All frames contain all TLVs supported by an endpoint
- On device startup, frames are sent at a higher rate as configuration stabilizes
- PoE enabled ports also send at a higher rate initially as power is negotiated
- In steady state, frames are identical and evenly spaced

LLDP Traffic Patterns – Device Boot



- When a new neighbor is found, switch transmits faster briefly
- Device also transmits faster as TLV data changes
- At steady state device and switch may use different intervals

LLDP Traffic Patterns – Device Shutdown



- Device signals graceful shutdown with TTL=0
- Switch assumes unexpected shutdown from non-receipt of frames and subsequent TTL expiry

Key Takeaways for SPMD

- LLDP forces transmissions at boot and new neighbor detection
 - PLCA node assignment can benefit from this compelled traffic as it causes the use of a Transmit Opportunity (TO)
 - The mere act of choosing a PLCA node ID compels a frame as the underlying PLCA Node ID MIB would have changed
 - LLDP mandates that all devices will transmit during their assigned TO within a few seconds of a new device coming online
 - Any device that fails to detect the new neighbor will typically transmit a frame within $TTL/4$ seconds
 - Overall, if LLDP is required by SPMD, a new node could determine within a few seconds which node IDs are available, both via LLDP TLVs received and TO usage to send those frames

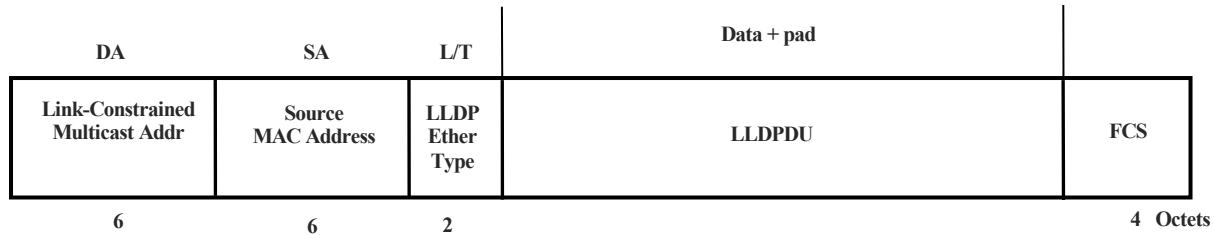
Key Takeaways for SPMD Continued

- LLDP has mechanisms to detect node exit from the mixing segment
 - These can be used to detect both graceful and unexpected exit
 - Can be correlated with changes in current draw to determine if a powered node's budget can be returned to the pool
- **Caveat:** LLDP does allow frame intervals to be as large as 60 minutes, though this configuration is rarely encountered in the field
 - More restrictive timing requirements would be required by SPMD

Backup

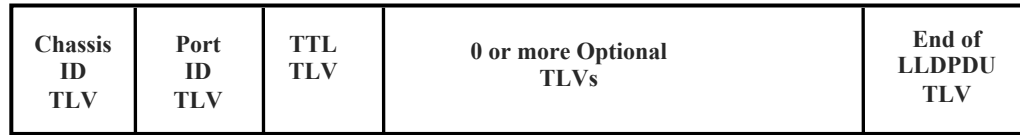
Adapted from a 2006 Slide Deck by Devadas Patil, Cisco

LLDP Frame



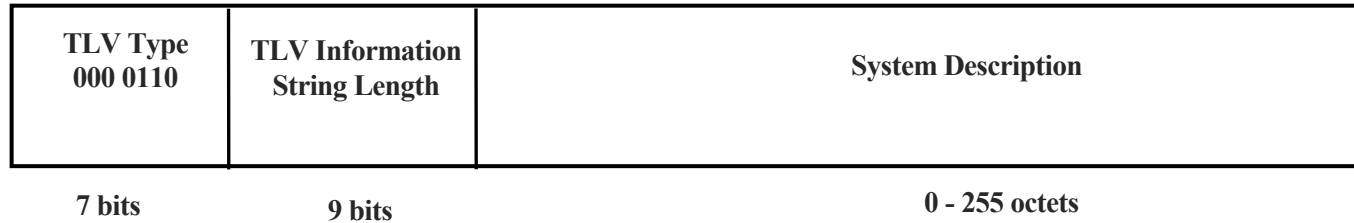
Multicast DA = 01-80-C2-00-00-02
Type/Length = 88-CC

LLDPDU



LLDP TLV Example

System Description

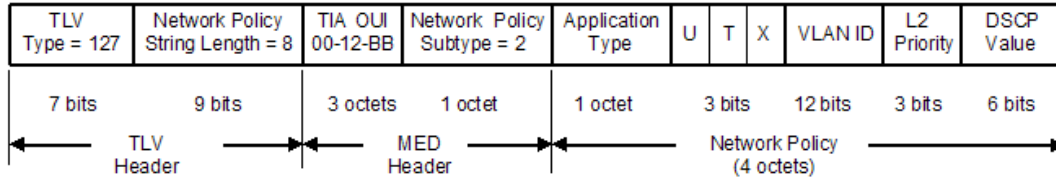


System Name Alphanumeric string, RFC 3418 sysDescr object

LLDP-MED

- MED – Media Endpoint Discovery
- Primarily for telephony needs
- Formalized by TIA (Telecommunications Industry Association)
- Operates as org-specific data

LLDP-MED TLV – Example of Extension TLV



LLDP-MED TLVs

LLDP-MED TLV Subtype	TLV Name
1	LLDP-MED Capabilities
2	Network Policy
3	Location Identification
4	Extended Power-via-MDI
5	Inventory - Hardware Revision
6	Inventory - Firmware Revision
7	Inventory - Software Revision
8	Inventory - Serial Number
9	Inventory - Manufacturer Name
10	Inventory - Model Name
11	Inventory - Asset ID
12 – 255	Reserved for future standardization

LLDP Mandatory TLV – Time to Live TLV



TTL = 0 signals imminent port shutdown