

# IPv6 over Link-Local Discovery Protocol

draft-richardson-anima-ipv6-lldp

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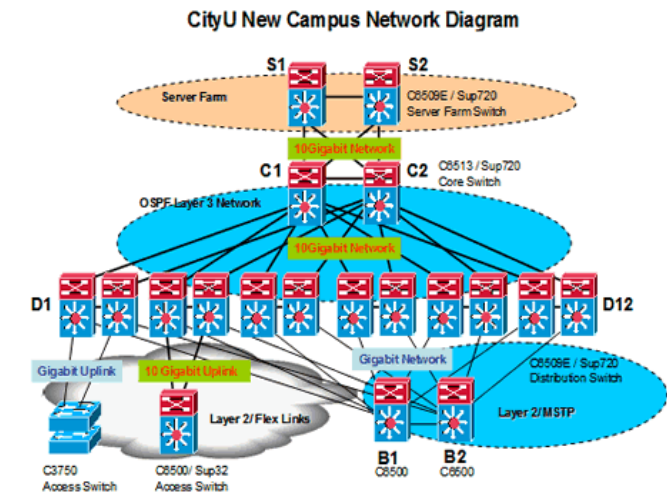
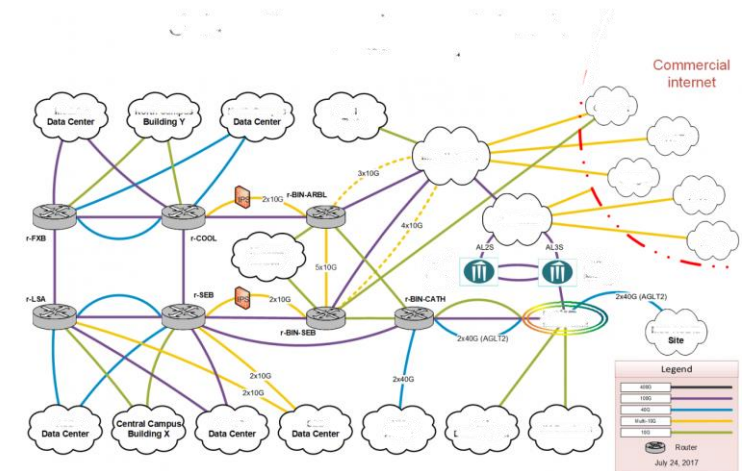
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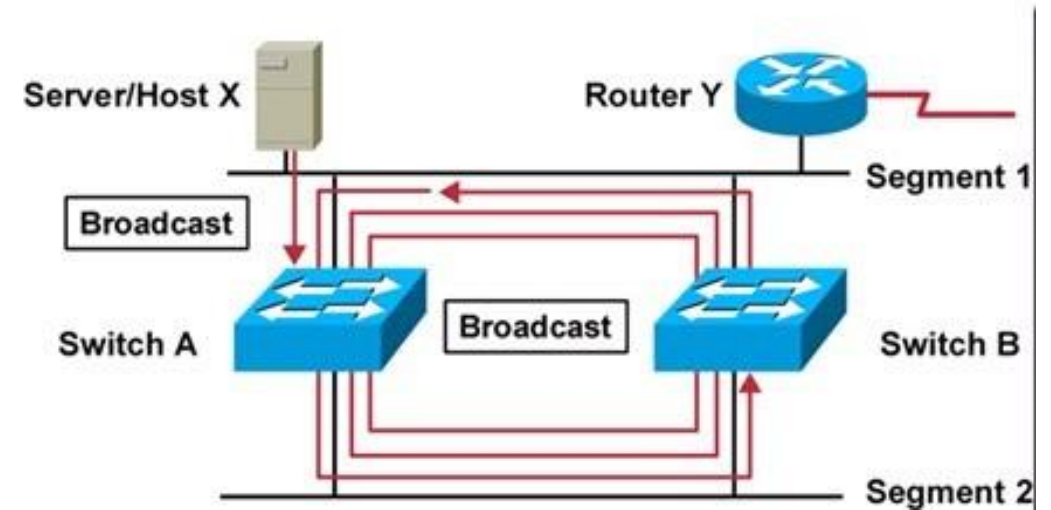
# Challenges in creating Autonomic Control Plane (ACP) in Layer-2 Software Defined Networks (SDN)

SDN managed Layer-2 networks  
have multiple, redundant links  
between routers.



# Booting SDN depends upon ACP

- Stable SDN connection can be provided by RFC8368.
  - (RFC8368 : Using an Autonomic Control Plane for Stable Connectivity of Network Operations, Administration, and Maintenance (OAM))
- But before the connection, Broadcast in this Campus L2 systems, => Loop
  - Need additional mechanism for Loop-breaking
  - Like STP ...
    - But can't automatically configure during on-boarding process
    - May miss some devices
    - May discover untrusted devices!



# Background on LLDP

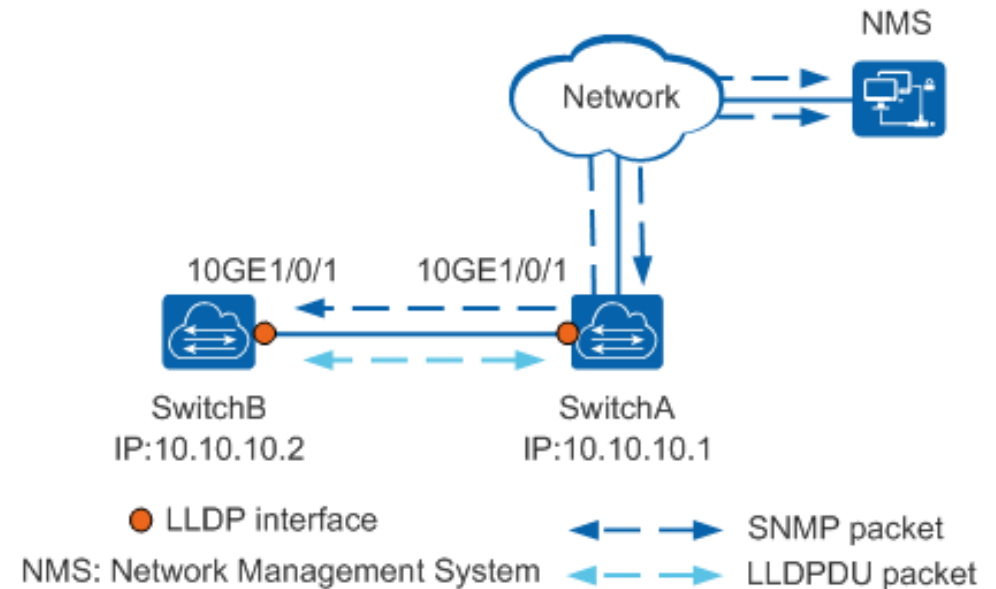
- LLDP(*Link Layer Discovery Protocol*)

## Description:

- Standard Layer-2 discovery protocol in IEEE 802.1ab, without Control Plane
- **Does not forward packets!**
  - that is : it discovers all compliant layer-2 devices in a network, even if they do not normally do any layer-3 processing
- No forwarding, means no loops

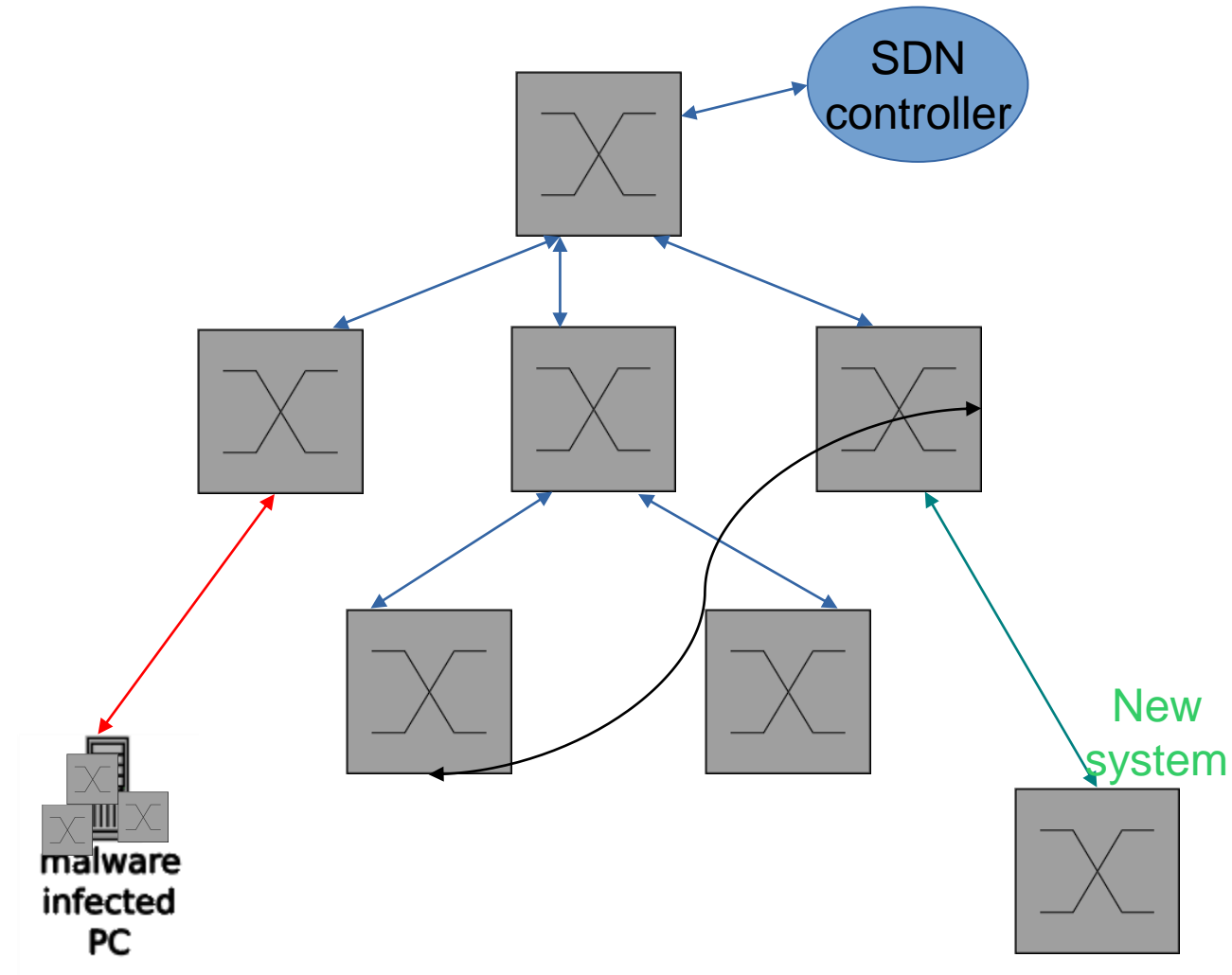
## About LLDP frames:

- Forwarding plane already sends LLDP to control plane CPU.
- exactly the desired behaviour for ACP: all traffic goes to the control plane processor!



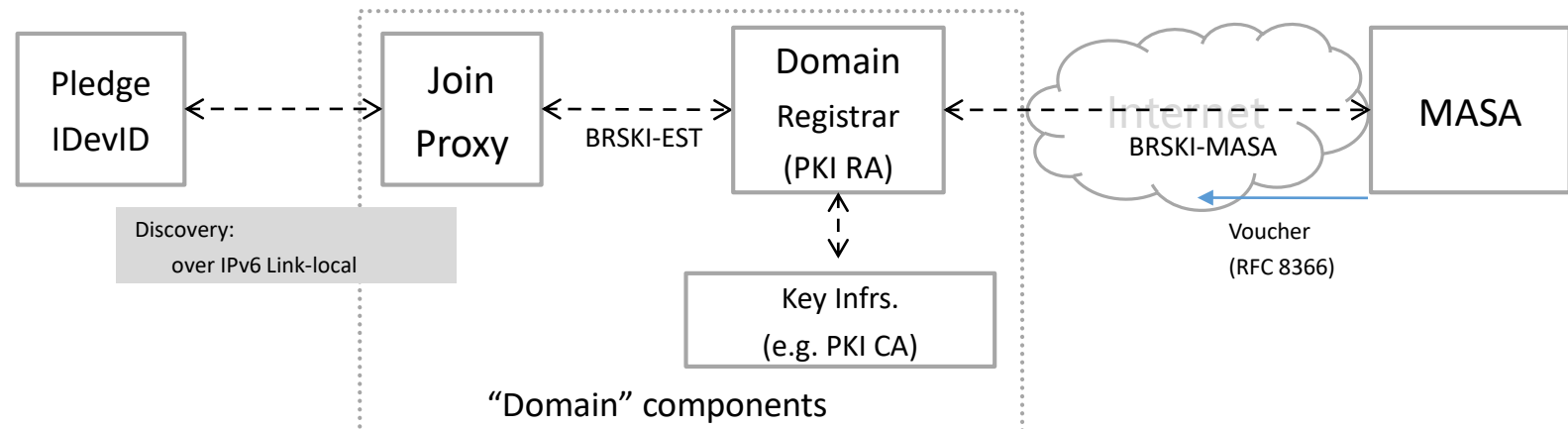
# Other needs for SDN based Layer 2

- Must discover every legitimate switch
  - Through multiple layers of L2 connectivity
- Must avoid including end systems (desktops, compute servers) into topology
  - **Malware on such systems could pretend to be a router**
- Discovery must run at power on, and **continuously whenever** a link change occurs



# Do all discovery with ACP inside LLDP

- Encapsulate IPv6 in LLDP's Type-Value-Length (TLV) system
- Build ACP using LLDP packets, which authenticates each end
- ACP adjacency table, becomes adjacency table for L2
- Onboard new switches using BRSKI, with Join Proxy help.



# LLDP Protocol Encapsulation and issues

## LLDP Frame Formats

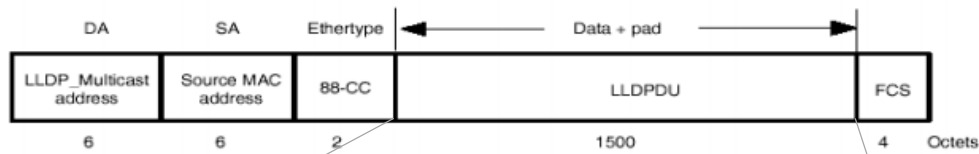


Figure D-1—IEEE 802.3 LLDP frame format

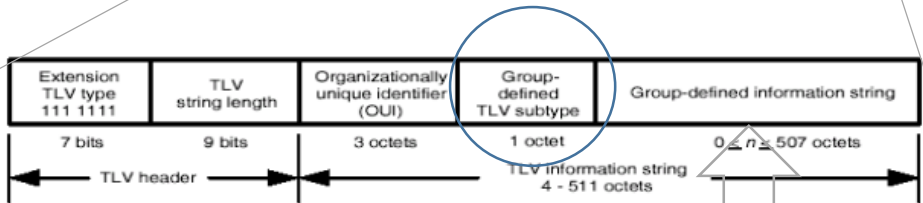


Figure 9-12—Basic format for organizationally-defined extension TLVs

- About 508 octets limit of vendor-specific frame:
- And the minimum MTU in IPv6 protocol : 1280
- So LLDP IPv6 fragment contain **more than one** TLV, accommodate up to 1500bytes(often larger...) in Ethernet network

Vendor-specific TLV : 127

IANA  
unique

TBD

IPv6 fragment : up to 507 octets

# LLDP issues

## Issue 1 : Subtype TLV values, which better?

- Option-1: Multiple different subtype values
- Option-2: Repeatedly same subtype TLV values,

How to keep the correct order?

## Issue 2 : Content payload, which option?

- Option-1: entire IPv6 packet, including Ipv6 header
- Option-2: elided IPv6 packet
- Option-3: compressed packet, RFC8138 or others?



# Thank You!