

The Integrated ISIS for IPv6

Agenda

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- **Link-state protocol fundamentals**
- **Overview of IS-IS**
- **IS-IS IPv6 adaptation**
- **Areas and levels**
- **NSAPs and LSP identifiers**
- **LSP Flooding**
- **IP routing specifics**



Link-state protocol fundamentals

About link-state protocols

- **In a link-state protocol, the network can be viewed as a jigsaw puzzle**
- **Each jigsaw piece holds one router**
- **Each router creates a packet which represents its own jigsaw piece**

This packet is called a Link State PDU (LSP)

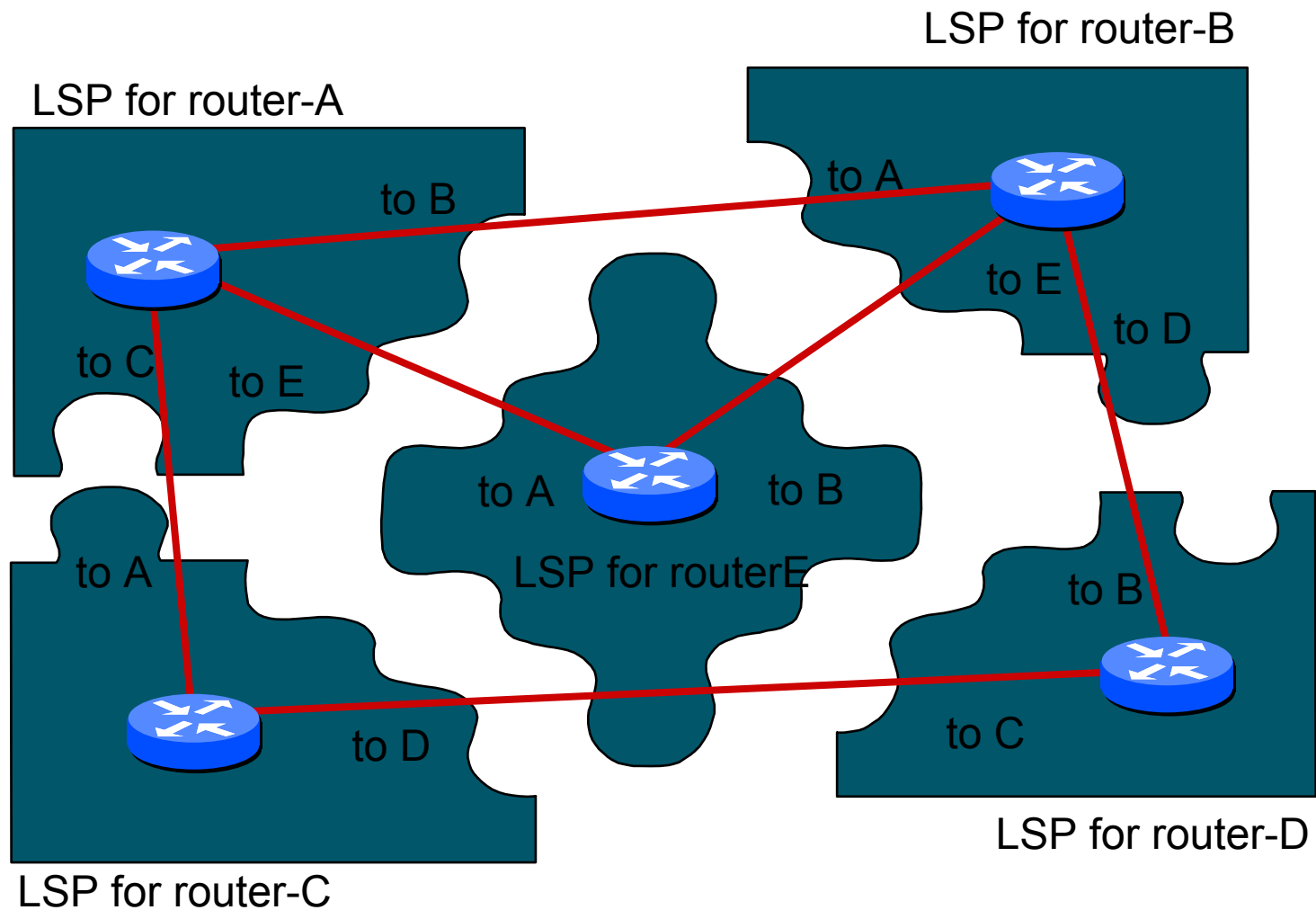
About link-state protocols

- **These packets are flooded everywhere**
- **Therefore each router receives all pieces of the jigsaw puzzle**
- **Each routers compute SPF algorithm to put the pieces together**

Input: all jigsaw puzzle pieces (LSPs)

**Output: Area or network topology tree
Shortest Path Tree**

The jigsaw puzzle



All routers have same view

- **All routers exchange all LSPs**
via a reliable flooding mechanism
- **All routers store all LSPs in a so-called link-state database (LSPDB)**
separate from the routing table (RIB)
all routers should have exactly the same LSPDB, but different RIBs

What to do with LSPs ?

- **Each router ‘composes the jigsaw puzzle’ by executing Dijkstra’s Shortest Path First algorithm (SPF)**

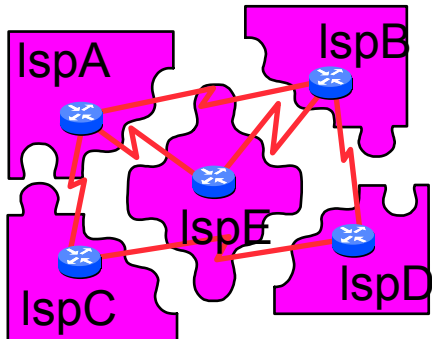
the topology is calculated as a Shortest Path Tree (SPT), with itself as root

each router computes a different SPT

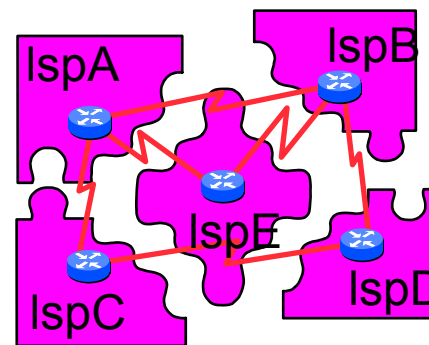
All routers have same LSPDB

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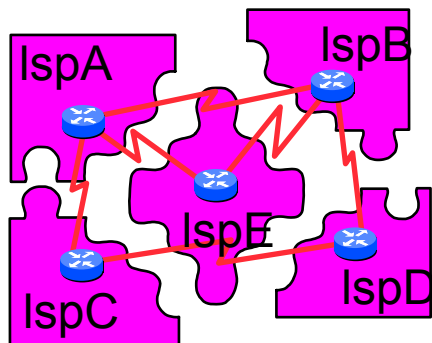
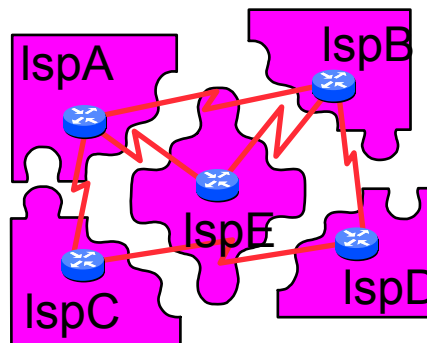
RouterA's LSPDB



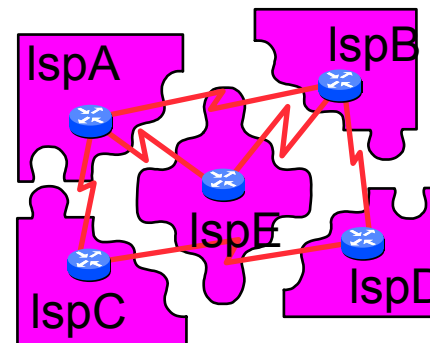
RouterB's LSPDB



RouterE's LSPDB



RouterC's LSPDB



RouterD's LSPDB

A man in a white shirt and tie is climbing a large, curved, metallic structure, possibly a cable or pipe, against a blue background. The man is positioned near the top of the curve, reaching up with his arms. The structure is dark and metallic, with a bright light source creating a strong lens flare effect on the left side of the image.

Brief overview of IS-IS

What is IS-IS ?

- **IS stands for Intermediate System**
- **IS is a router in ISO terms**
- **IS-IS is the Intermediate System to Intermediate System intra-domain routing protocol**
- **IS-IS was defined in 1992 in the ISO/IEC recommendation 10589**

IS-IS for IPv4 and IPv6 routing

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- **IS-IS was designed for OSI routing**
- **IS-IS is easily extendable**
- **Extensions for IPv4 routing in rfc1195 (Integrated IS-IS)**
- **Extensions for IPv6 routing in draft-ietf-isis-ipv6-05.txt**

Types of IS-IS packets (PDUs)

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- **Packets are called Protocol Data Units (PDU in ISO terms)**
- **IS-IS Hello packet (IIH)**
- **IS-IS LSP**
- **Sequence Number Packet (SNP)**

Common IS-IS PDU header fields

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Intradomain r.p. discriminator
Length indicator
Version/Protocol ID extension
ID length
{3 bytes reserved} PDU Type
Version
Reserved
Maximum Area Address
Additional Header Fields
TLV Fields

Type Length Value (TLV)

- **TLVs make ISIS easily extendable**
- **Each ISIS packet is formed from a header and a number of TLVs.**
- **TLV has 1 byte for T, 1 byte for L and L for V**

Some ISO IS-IS TLVs (ISO 10589)

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TLV	Type	Description
Area address	1	Area address of source node
IS neighbors	2	Neighboring Nodes and Pseudonodes
End System Neighbors	3	Connected workstations
Padding	8	Hello padding
LSP entries	9	Link-State information

Some RFC 1195 TLVs

TLV	Type	Description
IP internal reachability information	128	Intradomain IS-IS routes
Protocols supported	129	Protocol identifiers of Network Layer Protocols (e.g. IP, CLNP)
IP external reachability information	130	External routes
IP interface address	132	IP address of the outgoing interface
Authentication info	133	IS-IS packet authentication

IPv6 support TLVs

- **2 Tag/Length/Values added to introduce IPv6 routing**
- **IPv6 Reachability TLV 236 (0xEC)**
- **IPv6 Interface Address TLV 232 (0xE8)**
- **IPv6 NLPID (0x8E) is advertised by IPv6 enabled routers**

Cisco IOS IS-ISv6 support

- **I/IS-ISv6 is available on Cisco IOS 12.2(8)T, 12.0.21S and 12.0.19ST. Images are p and js as IPv6 & IS-IS are required**
- **A single SPF runs per level for OSI, IPv4 and IPv6**
All routers in an area must run the same set of protocols [IPv4-only, IPv6-only, IPv4-IPv6]

IS-IS Hello PDUs

- **Also called IIHs**
- **Used for maintaining adjacencies**
- **Different on p2p links and LANs**
- **Different from ISHs and ESHs (ESIS)**
- **IIHs are padded to full MTU size**

Link State PDUs

- **Called LSPs**
- **Contains all info about one router**
adjacencies, connected IP prefixes, OSI
endsystems, area addresses, etc.
- **One LSP per router (plus fragments)**
- **One LSP per LAN network**

Sequence Number PDUs

- **Partial (PSNP) and Complete (CSNP)**
- **Used when flooding the LSPDB**
- **CSNPs are used for LSPDB synchronization over LANs**
- **CSNP are also used to sync LSPDB over new p2p adjacencies**
- **PSNP are used to update few LSPs**

Pseudonodes

- **For SPF, the whole network must look like a collection of nodes and point-to-point links**

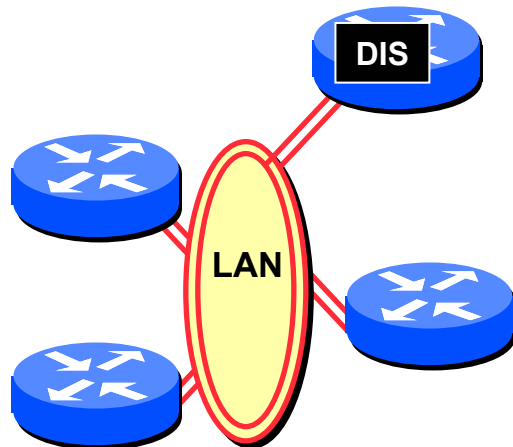
Multi-access networks are different

- **Assume a virtual node for the LAN**

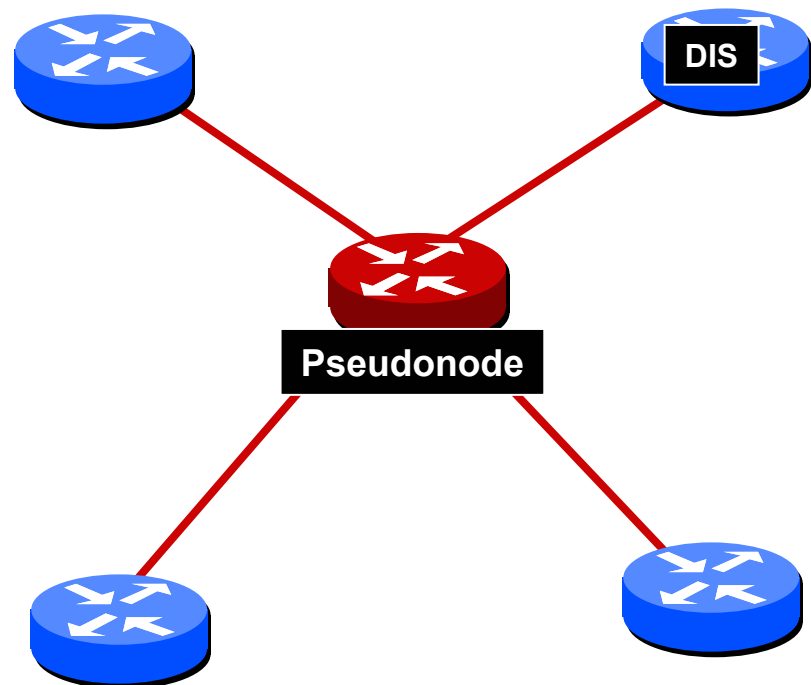
this virtual node is called pseudonode. It is not a real router, but just an extra LSP in the LSPDB

A pseudonode on a LAN

Physical view



Logical view



Who creates the pseudonode

- **Created by Designated Router (DIS)**
- **The DIS reports all LAN neighbors in the pseudonode LSP**
With metric 0
- **All LAN routers report connectivity to the pseudonode in their LSPs**

Identifying nodes

- **In IS-IS SystemIDs are 6 bytes. Nodes are identified by 7 bytes.**

A normal node (non-pseudonode) is identified by 6 bytes systemID plus a zero

A pseudonode is identified by the systemID of the DIS, plus 1 byte from the circuitID of the interface of the DIS



Areas and levels

- **IS-IS has 2 layers of hierarchy**
the backbone is called level-2
areas are called level-1
- **Same algorithms apply for L1 and L2**
- **A router can take part in L1 and L2**
inter-area routing (or inter-level routing)

Level-1 Routers

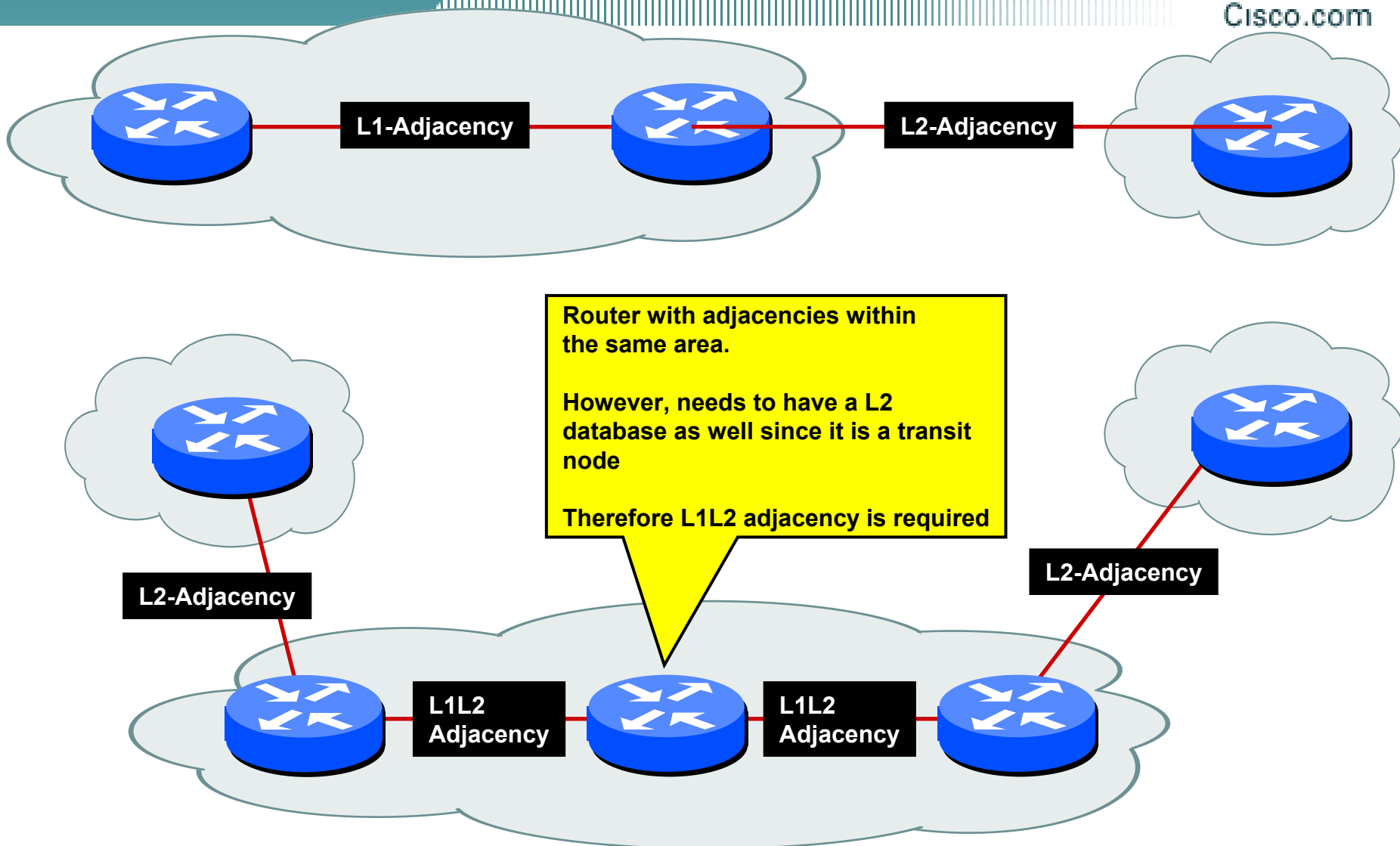
- **Neighbors only in the same area**
- **L1 has information about own area**
- **L1-only routers look at the attached-bit in L1 LSPs to find the closest L1L2 router**
- **L1-only routers install a default route to the closest L1L2 router in the area**

Level-2 routers

- **May have neighbors in other areas**
- **L2 has information about L2 topology**
- **L2 has information what L1 destinations are reachable and how to reach them via the L2 topology**
- **L2 routers often do also L1 routing**
so called L1L2 routers

Adjacency levels

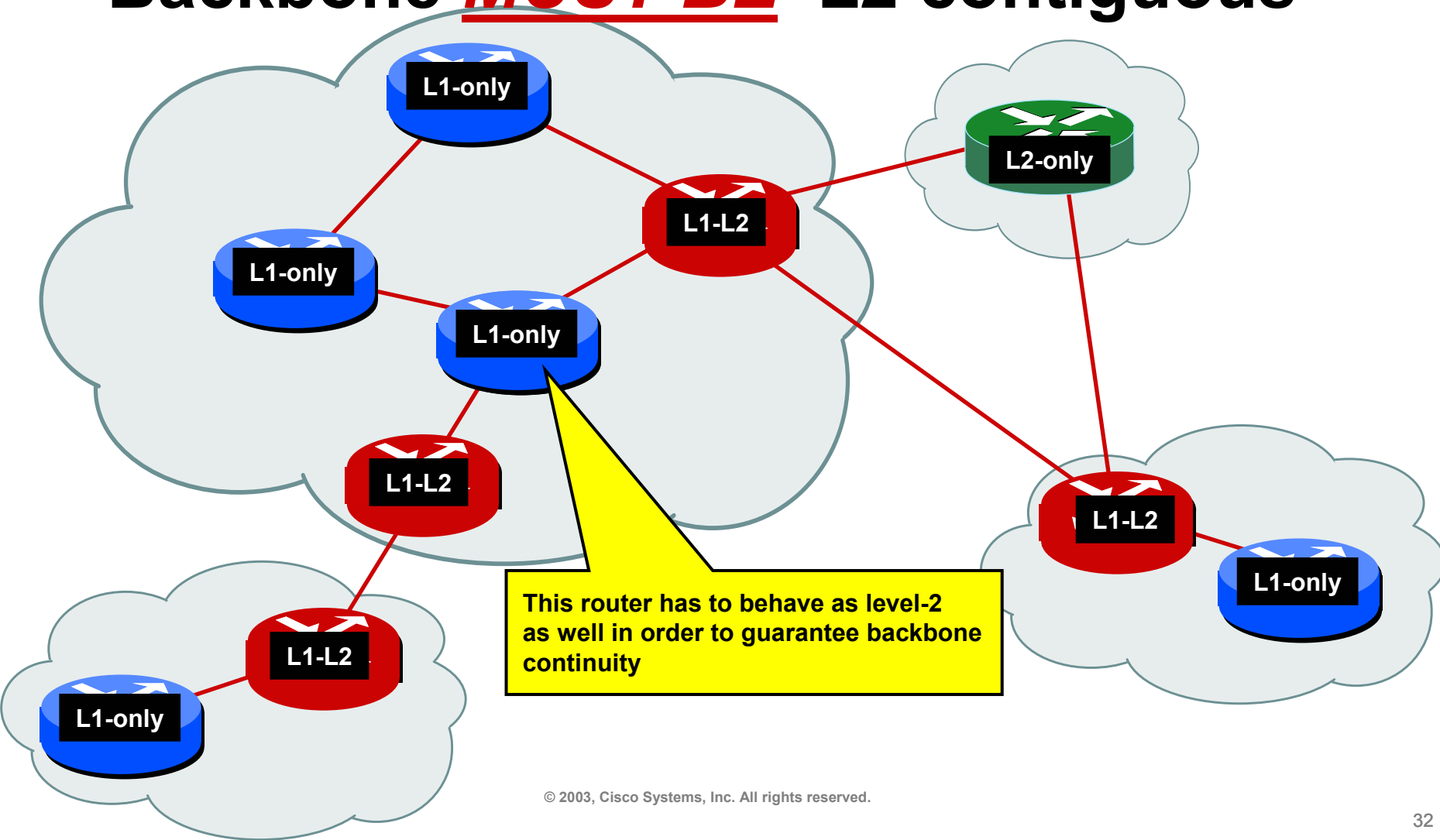
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Level-1, Level-2 & Level-1-2 Routers

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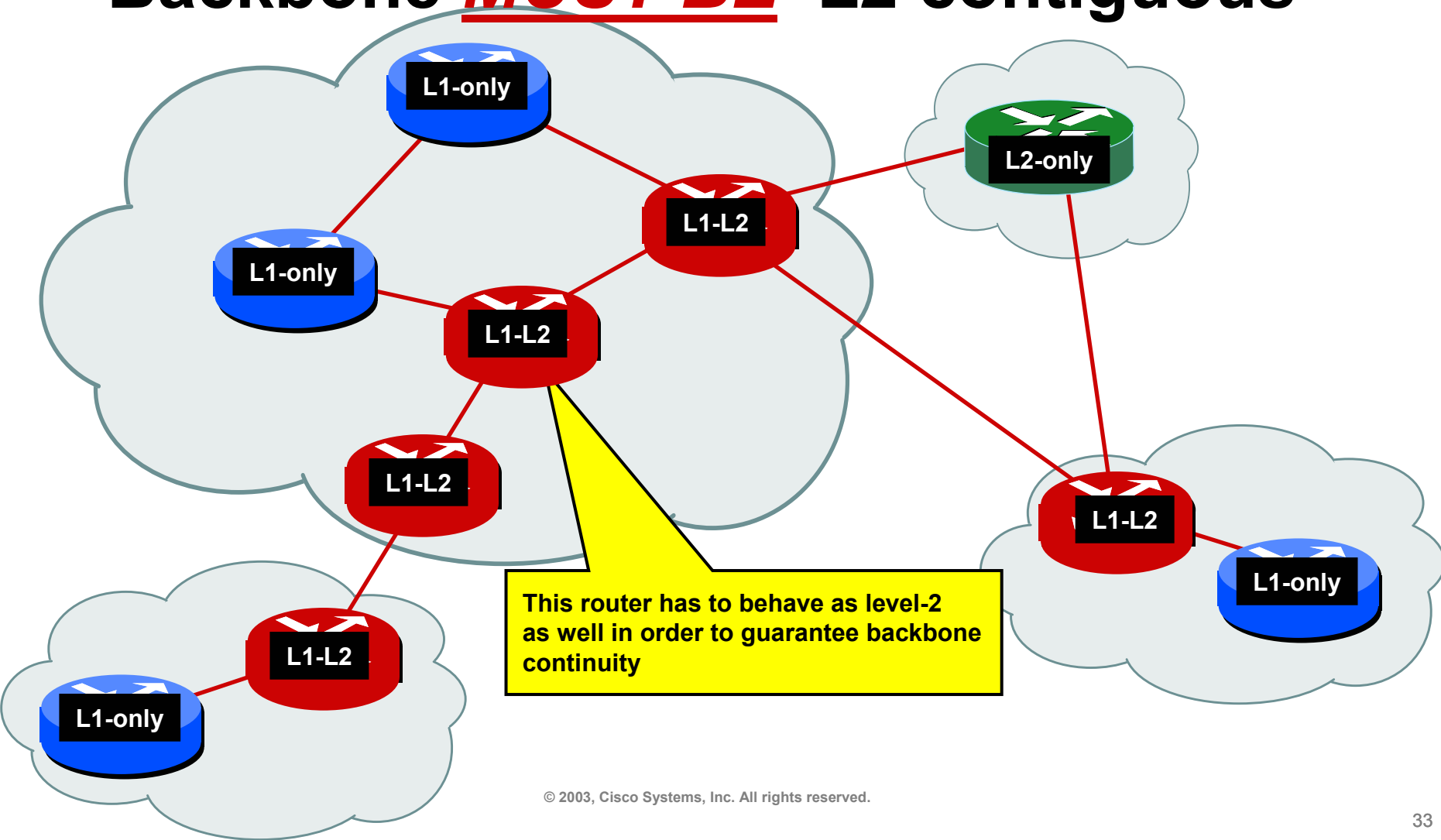
- Backbone **MUST BE** L2 contiguous



Level-1, Level-2 & Level-1-2 Routers

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- Backbone **MUST BE** L2 contiguous



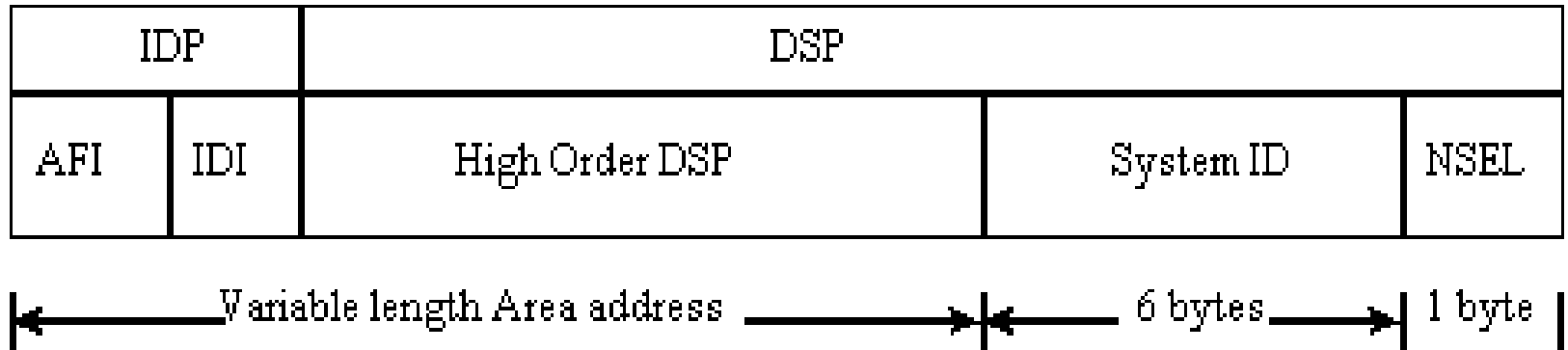


NSAPs and LSPids

NSAPs and Addressing

- **Network Service Access Point**
- **The NSAP is the network layer address for CLNS packets**
- **One NSAP per box, not per interface**
- **SNPA means SubNetwork Point of Attachment, which is the layer2 or MAC address**

How do I read an NSAP ?



- **An NSAP consists of 3 parts**
area-address, systemID and n-selector
- **Total length between 8 and 20 bytes**
example: 49.0001.0000.0000.0007.00

NETs versus NSAPs

- **A NET is an NSAP with n-selector 0**
- **A NET implies the routing layer of the IS itself (no transport layer)**
- **On routers we always deal with NETs**

We haven't implemented TP4 (or another transport layer)

Do I need an NSAP if I want to use IS-IS for IP routing ?

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- **Yes, still needed for IP routing only**
- **Area address is like OSPF area nr**
- **SystemID is like an OSPF routerID**
LSP identifier is derived from systemID

Creating unique systemIDs

- **SystemID is 6 bytes**
- **Start numbering 1, 2, 3, 4 etc**
- **Convert your loopback IP address**
192.31.231.16 -> 192.031.231.016 -> systemID
1920.3123.1016

Creating area addresses

- If you do CLNS routing, request an official NSAP prefix
- If you do just IP routing, use private address space
like network 10.0.0.0 in IP
- Just number your areas 49.0001...
49.0002....., 49.0003,... etc

LSP Identifier

- **LSP identifier consists of 3 parts**
 - **Source ID**
SystemID of router or DIS (if pseudonode)
 - **Pseudonode ID**
Router LSP = zero, Pseudonode LSP = non-zero
 - **LSP number**
Fragmentation number
- **Example: 00c0.0040.1234.02-00**





LSP flooding

Why do we need flooding

- **All routers generate an LSP**
- **All LSPs need to be flooded to all routers in the network**
 - if LSPDB is not synchronised, routing loops or blackholes might occur**
- **IS-IS' two components are the SPF computation and reliable flooding**

What triggers a new LSP ?

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- **When something changes ...**

Adjacency came up or went down

Interface up/down (connected IP prefix !)

Redistributed IP routes change

Inter-area IP routes change

An interface is assigned a new metric

Most other configuration changes

Periodic refresh

What to do with a new LSP ?

- **Create new LSP, install in your own LSPDB and mark it for flooding**
- **Send the new LSP to all neighbors**
- **Neighbors flood the LSP further**

Basic flooding rules

- **When receiving an LSP, compare with old version of LSP in LSPDB**
- **If newer:**
 - install it in the LSPDB**
 - Acknowledge the LSP with a PSNP**
 - Flood to all other neighbors**
 - Check if need to run SPF**

Basic flooding rules

- **If same age:**
Acknowledge the LSP with a PSNP
- **If older:**
Acknowledge the LSP with a PSNP
Send our version of the same LSP
Wait for PSNP

Sequence number

- **Each LSP (and LSP fragment) has its own sequence number**
- **When router boots, set seqnr to one**
- **When there is a change, the seqnr is incremented, a new version of the LSP is generated with the new seqnr**
- **Higher seqnr means newer LSP**

LSP Lifetime

- **Is 20 minutes**
- **Periodic refresh every 15 minutes**
- **When lifetime expires, the LSP is purged from the LSPDB**

The Designated IS

- **DIS is like the DR in OSPF**
- **DIS is only on LANs, not on p2p**
- **DIS has two tasks**
 - create/update pseudonode LSP**
 - conduct flooding over the LAN**
- **DIS sends persiodic CSNPs**
 - LSPid, SeqNr, Checksum, Lifetime of all LSPs present in the LSPDB**

A man in a white shirt and tie is climbing a large, curved, metallic structure, possibly a cable or pipe, against a blue background. The man is positioned near the top of the curve, reaching up with his arms. The structure is dark and metallic, with a bright light source creating a strong lens flare effect on the left side of the image. The overall scene is surreal and metaphorical, suggesting a journey or a climb towards a goal.

IP routing specifics

L1 advertised into L2

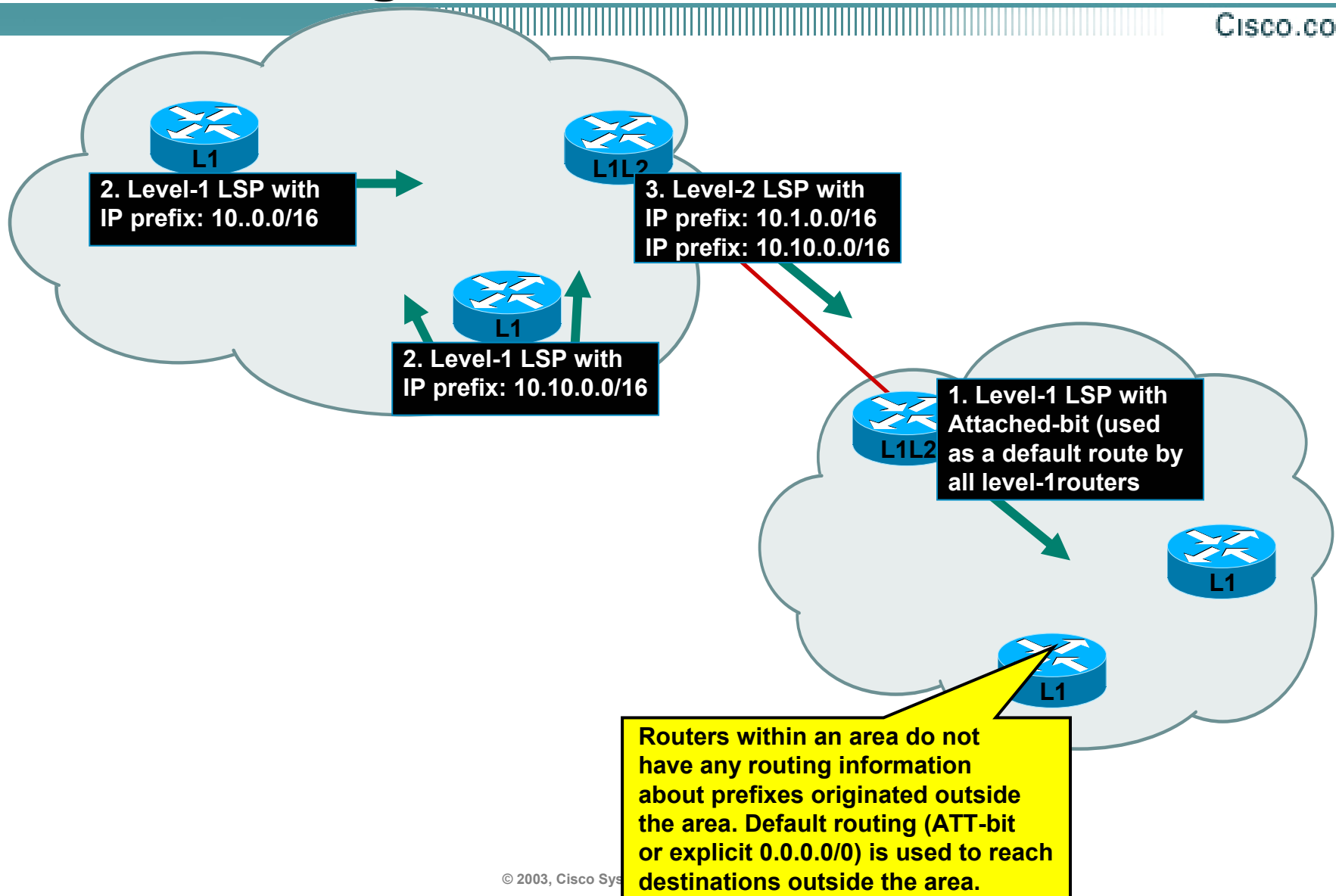
- **All L1L2 routers advertise all the IP prefixes they learn via L1 into L2**
- **Only advertise routes you use**
(inter-level routing goes via the RIB)
- **Summarization possible**
At L1->L2 or when redistributing

L1 advertised into L2

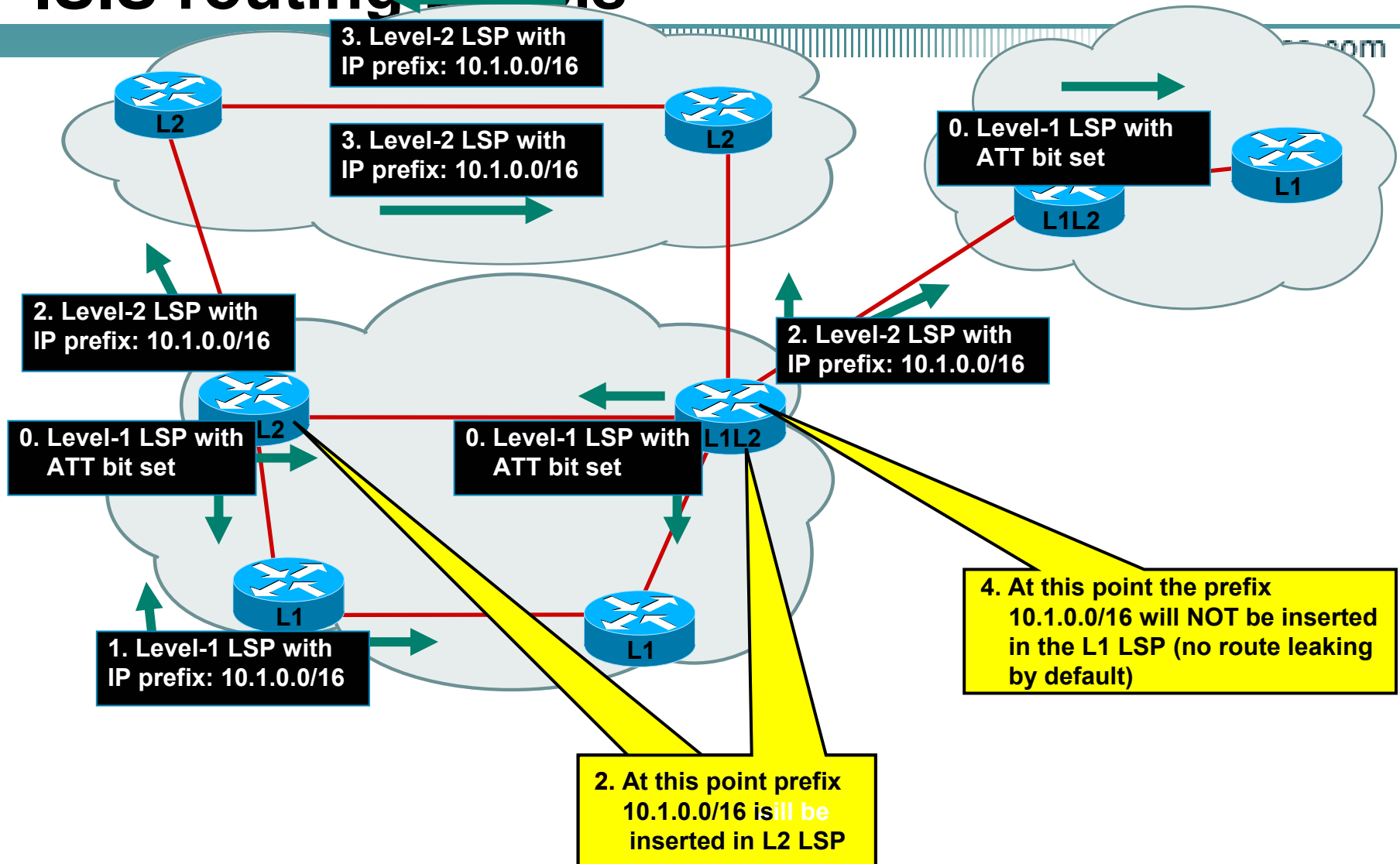
- **In some topologies, same prefix may arrive to L1L2 router via both L1 and L2 path**
- **Level-1 preferred over Level-2**
In case of SAME routes (same prefix and same mask)

ISIS routing Levels

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ISIS routing Levels



ISIS router configuration

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router isis

net 49.0001.0000.0000.000a.00

log-adjacency-changes

is-type level-2-only

passive-interface loopback0

ISIS interface configuration

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```
interface POS2/0  
ip unnumbered loopback0  
ip router isis  
isis circuit-type level-2
```

Configuring IS-ISv6 on Cisco IOS

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- **Configure generic IS-IS interface attributes**
Eg., circuit type, priority, etc
- **Configure I/IS-ISv6 on interfaces**
Interface must be IPv6 enabled, eg. IPv6 address set
- **Configure IS-IS router mode attributes**
Some router-mode commands have no effect on IPv6, eg. Metric-style, mpls, traffic-share,...
- **Configure I/IS-ISv6 specific attributes**
IPv6 attributes are configured via the IPv6 address-family sub-mode of router-mode.

Cisco IOS IS-ISv6 Specific Attributes

- Entering address-family sub-mode

[no] address-family ipv6

- IPv6 address-family sub-mode.

[no] adjacency-check

Enables or disables adjacency IPv6 protocol-support checks. If checking is enabled (default condition when IS-IS IPv6 is configured) then the router will not form an adjacency with a neighbor not supporting IS-IS IPv6.

[no] distance <1-254>

Sets the administrative distance of IS-IS IPv6. Note that the administrative distance is applied to routes in the IPv6 routing table only.

[no] maximum-paths <1-4>

Sets the maximum number of paths allowed for a route learnt via IS-IS IPv6. Note that this applies to the IPv6 routing table only.

[no] default-information originate [route-map <name>]

Configures origination of the IPv6 default route (::) by IS-IS. Used in the same manner as the existing IPv4 "default-information" command.

Cisco IOS IS-ISv6 Specific Attributes

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[no] summary-prefix <prefix> [level-1|level-2|level-1-2]

Configures IPv6 summary prefixes. Command is used in same manner as the existing IPv4 "summary-prefix" command.

[no] redistribute <protocol> [metric <value>] [metric-type {internal|external}] [level-1|level-1-2|level-2] [route-map <name>]

Configures redistribution of routes learnt from other IPv6 sources into IS-IS. Command is used in same manner as existing IPv4 "redistribute" command.

[no] redistribute isis {level-1|level-2} into {level-1|level-2} distribute-list <prefix-list-name>

Configures IS-IS inter-area redistribution of IPv6 routes. Command is used in same manner as existing IPv4 "redistribute isis" command.

- Leaving address-family sub-mode

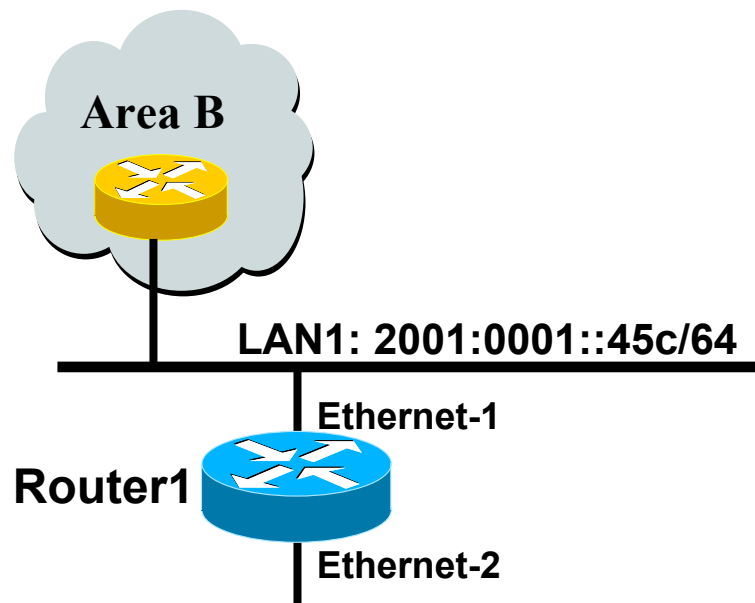
exit-address-family

- Showing the I/IS-ISv6 configuration

Show ipv6 protocols [summary]

Cisco IOS IS-IS for IPv6-only configuration example

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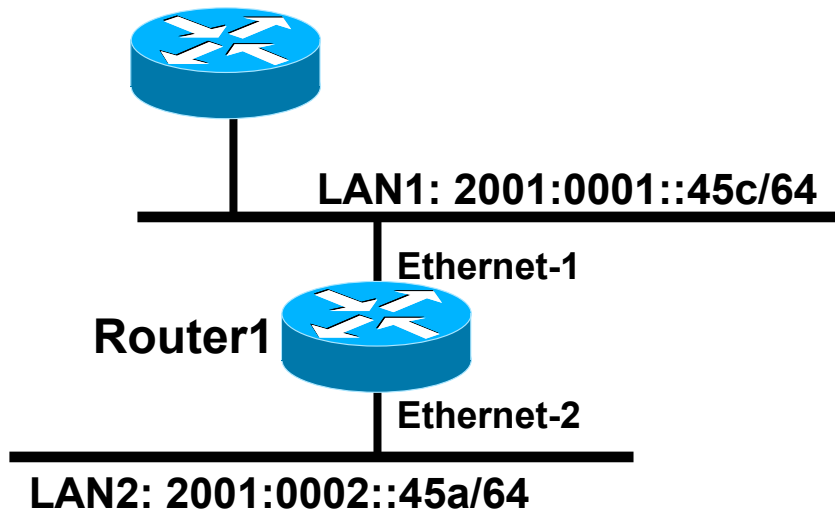


**IPv6-only configuration.
Redistributing IPv6 static routes.**

```
Router1#  
  interface ethernet-1  
    ipv6 address 2001:0001::45c/64  
    ipv6 router isis  
    isis circuit-type level-2-only  
  
  interface ethernet-2  
    ipv6 address 2001:0002::45a/64  
    ipv6 router isis  
  
  router isis  
    address-family ipv6  
    redistribute static  
    exit-address-family  
    net 42.0001.0000.0000.072c.00
```

Cisco IOS I/IS-IS dual IP configuration

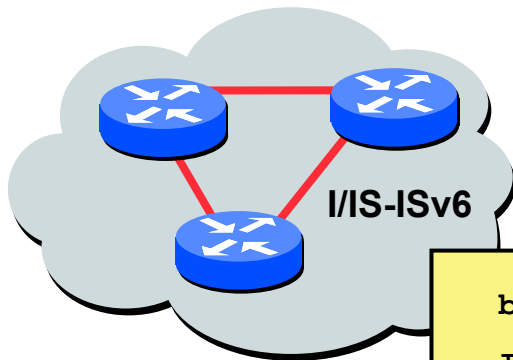
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**Dual IPv4/IPv6 configuration.
Redistributing both IPv6 static routes
and IPv4 static routes.**

```
Router1#  
interface ethernet-1  
  ip address 10.1.1.1 255.255.255.0  
  ipv6 address 2001:0001::45c/64  
  ip router isis  
  ipv6 router isis  
  
interface ethernet-2  
  ip address 10.2.1.1 255.255.255.0  
  ipv6 address 2001:0002::45a/64  
  ip router isis  
  ipv6 router isis  
  
router isis  
  address-family ipv6  
  redistribute static  
  exit-address-family  
  net 42.0001.0000.0000.072c.00  
  redistribute static
```

Cisco IOS I/IS-IS Display (1)



```
brum-45c#sho ipv6 rou is-is
IPv6 Routing Table - 14 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea
Timers: Uptime/Expires

I1  2001:45A:1000::/64 [115/20]
    via FE80::210:7BFF:FEC2:ACCC, Ethernet1, 00:10:12/never
I1  2001:72B:2000::/64 [115/10]
    via FE80::210:7BFF:FEC2:ACCC, Ethernet1, 00:05:19/never
I1  2002:49::/64 [115/10]
    via FE80::210:7BFF:FEC2:ACCC, Ethernet1, 00:05:19/never
```

Cisco IOS I/IS-IS Display (2)

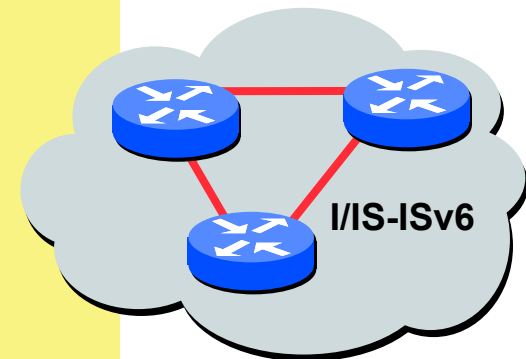
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```
brum-45c#sho clns is-neigh detail
```

System Id	Interface	State	Type	Priority	Circuit Id	Format
brum-45a	Et1	Up	L1	64	brum-45c.01	Phase V
Area Address(es): 47.0023.0001.0000.0001.0002.0001						
IPv6 Address(es): FE80::210:7BFF:FEC2:ACCC						
Uptime: 00:06:56						

IS-IS Level-1 Link State Database:

LSPID	LSP Seq Num	LSP Checksum	LSP Holdtime	ATT/P/OL
brum-45c.00-00	* 0x00000003	0xA745	732	0/0/0
Area Address: 47.0023.0001.0000.0001.0002.0001				
NLPID: 0x8E				
Hostname: brum-45c				
IPv6 Address: 3F02::45C				
IPv6 Address: 2001:45C:2000::45C				
Metric: 10 IPv6 2001:45C:1000::/64				
Metric: 10 IPv6 3F02::/64				
Metric: 10 IPv6 2001:45C:2000::/64				
Metric: 10 IS brum-45c.02				
Metric: 10 IS brum-45c.01				
brum-45c.01-00	* 0x00000001	0x96DB	733	0/0/0
Metric: 0 IS brum-45c.00				
Metric: 0 IS brum-45a.00				
brum-45a.00-00	0x00000005	0xDDBA	1027	0/0/0
Area Address: 47.0023.0001.0000.0001.0002.0001				
NLPID: 0x8E				
Hostname: brum-45a				
IPv6 Address: 2001:45A:1000::45A				
Metric: 10 IPv6 2001:45A:1000::/64				
Metric: 10 IS brum-45c.01				
Metric: 0 IPv6-Ext 2001:72B:2000::/64				
Metric: 0 IPv6-Ext 2002:49::/64				

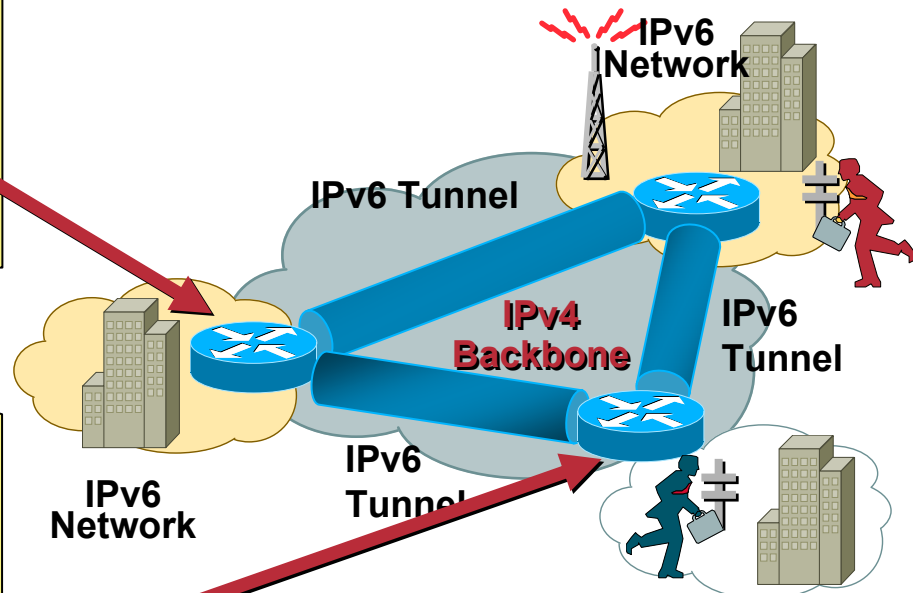


IS-ISv6 on IPv6 Tunnels over IPv4

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```
interface Tunnel0
no ip address
ipv6 address 2001:0001::45A/64
ipv6 address FE80::10:7BC2:ACC9:10 link-local
ipv6 router isis
tunnel source Ethernet1
tunnel destination 10.42.2.1
!
router isis
passive-interface Ethernet2
net 42.0001.0000.0000.045a.00
```

```
interface Tunnel0
no ip address
ipv6 address 2001:0001::45C/64
ipv6 address FE80::10:7BC2:B280:11 link-local
ipv6 router isis
tunnel source Ethernet2
tunnel destination 10.42.1.1
!
router isis
net 42.0001.0000.0000.045c.00
```



IS-ISv6 on an IPv6 Tunnel requires GRE Tunnel, it can't work with IPv6 configured tunnel as IS-IS runs directly over the data link layer

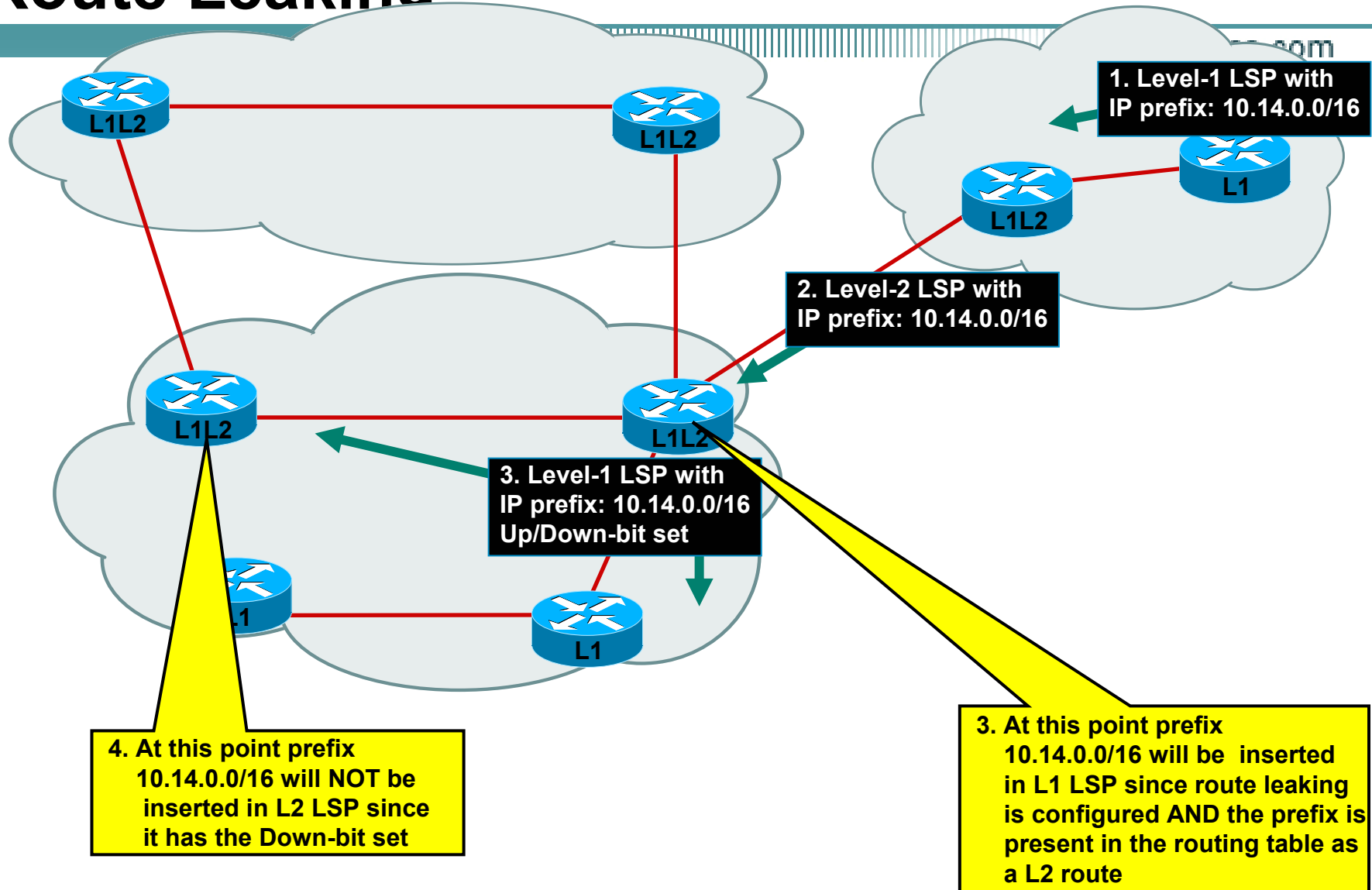
Current Cisco IOS IS-ISv6 Restrictions

- **I/IS-IS uses the same SPF for both IPv4 and IPv6. Therefore:**
- **Not really suitable for an existing IPv4 IS-IS network where customer wants to turn on scattered IPv6 support.**
- **If using I/IS-IS for both IPv4 and IPv6 then the IPv4 and IPv6 topologies **MUST** match exactly. Cannot run IS-IS IPv6 on some interfaces, IS-IS IPv4 on others.**
- **Will only form adjacencies with similarly-configured routers. E.g. An IS-IS IPv6-only router will not form an adjacency with an IS-IS IPv4/IPv6 router. (Exception is over L2-only interface)**
- **Cannot join two IPv6 areas via an IPv4-only area. L2 adjacencies will form OK but IPv6 traffic will black-hole in the IPv4 area.**

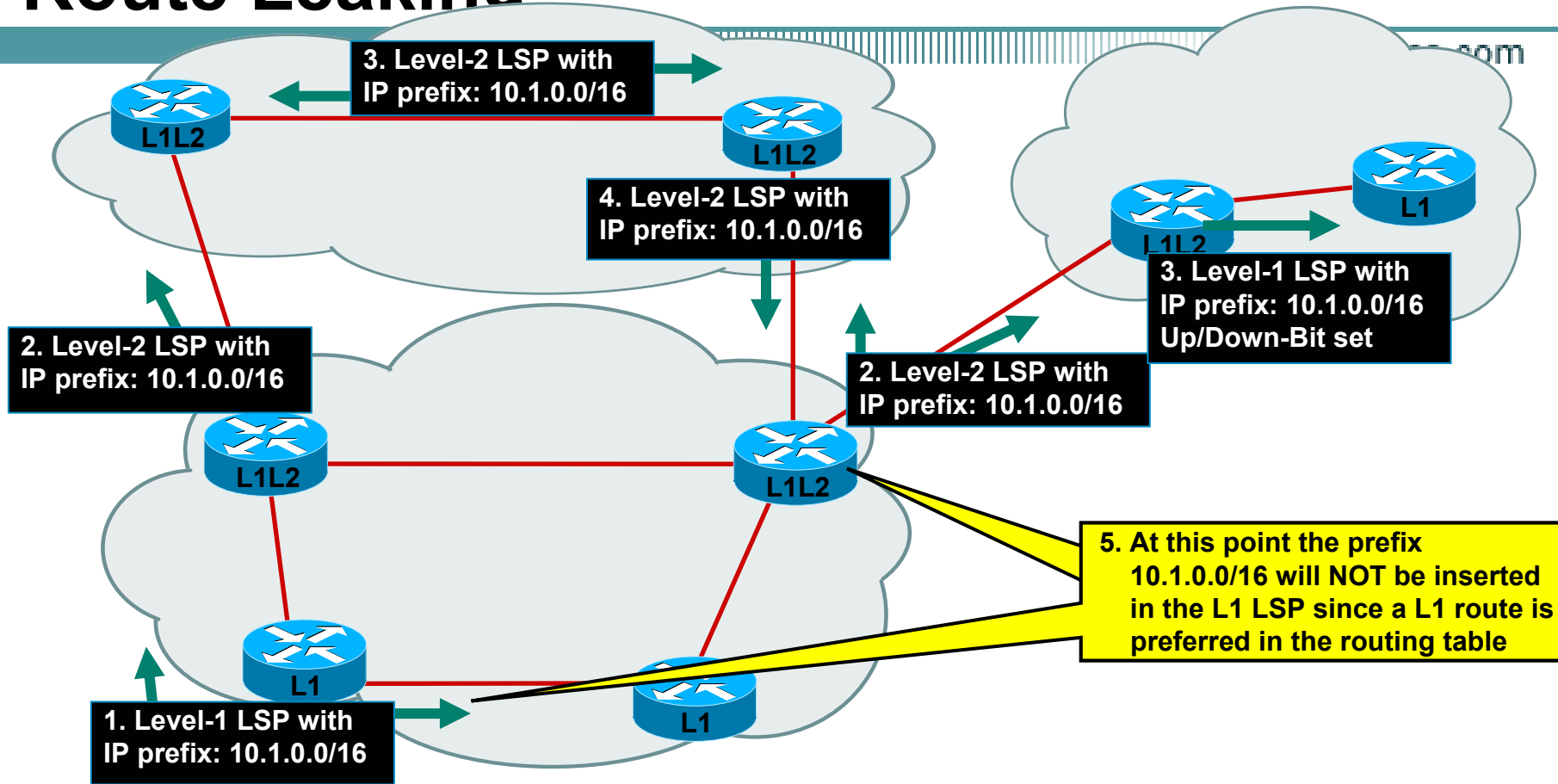
Route Leaking

- **New ISIS feature/capability described in draft-ietf-isis-domain-wide**
- **Allows L1L2 routers to insert in their L1 LSP IP prefixes learned from L2 database if also present in the routing table**
- **ISIS areas are not stubby anymore**

Route Leaking



Route Leaking



Route Leaking

- **For IP only**
- **Prefixes MUST be present in the routing table as ISIS level-2 routes**

Otherwise no leaking occurs

Same criteria than L1 to L2

Inter-area routing is done through the routing table

- **Solution for several issues:**
- **optimal inter-area routing**
- **BGP shortest path to AS exit point**
- **MPLS-VPN (PEs loopback reachability)**

Route Leaking

- **When leaking routes from L2 backbone into L1 areas a loop protection mechanism need to be used in order to prevent leaked routes to be re-injected into the backbone**

- **UP/Down bit**

Extended IP Reachability TLV (135) contains Up/Down bit

Described in draft-ietf-isis-traffic

- **UP/Down bit is set each time a prefix is leaked into a lower level**
- **Prefixes with Up/Down bit set are NEVER propagated to a upper level**

Route Leaking

- **TVLs 128 and 130 have a metric field that consists of 4 TOS metrics**

The first metric, the so-called "default metric", has the high-order bit reserved (bit 8) Routers must set this bit to zero on transmission, and ignore it on receipt

- **The high-order bit in the default metric field in TLVs 128 and 130 becomes the Up/Down bit**

- **Recommendation:
use wide Metric TLV (TLV 135)**
- **Configured with:**

*Router isis
metric-style wide*

Route Leaking Config

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IPv4:

***redistribute isis ip level-2 into level-1 distribute-list
<100-199>***

IPv6:

***address-family ipv6
redistribute level-2 into level-1 distribute-list
<prefix-list-name>***

Summarization is possible

- From L1 areas into the L2 backbone,
- From L2 leaking down into L1 areas,
- When redistributing into L2 or L1

router isis

summary address 192.1.0.0 255.255.0.0

Cisco IOS IS-ISv6 Specific Attributes

- **Not much different from existing IS-IS:**
Adjacency info via **show clns neighbor detail** . If no adjacency then output from **debug isis adj-packet** on **Both** routers.
- **Contents of LSPs via **show isis data detail****
- **Contents of IPv6 RIB via **show ipv6 rout isis****
- **IS-IS debug now reports IPv6 information.**

Wider Metric Support

Cisco.com

- **Default metric used is cost (default is set to 10 on all interfaces)**
- **The interface metric was limited to 6 bits wide (range 0 to 63)**
- **The total path metric was limited to 10 bits wide (maximum of 1023)**

Wider Metric Support

Cisco.com

- **The interface metric was increased to 24 bits wide (range 0 to 16777215)**
- **The total path metric was increased to 4294967296 (32-bits) from 1023**
- **Can configure the old or new metrics**
- **Default is old style metrics**

Wider Metric Support

Cisco.com

- **Configuration:**

Rtr-A(config)#router isis

Rtr-A(config-router)#metric-style ?

narrow Use old style of TLVs with narrow metric

wide Use new style of TLVs to carry wider metric

Rtr-A(config-router)#metric-style wide ?

level-1 Level-1 only

level-1-2 Level-1-2

level-2 Level-2 only

Hello padding

- Large hello packets waste bandwidth
- Can now be suppressed selectively

All interfaces

Per interface

no hello padding

Default routing

- **ISIS uses the Attached-bit to discover the exit point of an area**
- **ATT bit is set into the L1 LSP by the router who is also a L2 router**
- **All L1 routers will use that L2 router as default exit point for the area**

Default routing

- **ATT may not be optimal**
- **Use explicit IP default route**
router isis
default-information originate
address-family ipv6
default-information originate
- **IP default route ALWAYS preferred over the ATT bit**

Redistribution

- **Is possible any type of router (L1 or L2 or L1L2)**
- **Summarisation possible in the redistributing router**
- **Summarisation always possible in the L1L2 router for routes redistributed by another L1 router**

Summarisation

- **Summarisation**
- **Used with area routing**
- **Used from level-1 area to level-2 backbone**
- **Used from level-2 backbone to level-1 area when using route leaking**
- **Always a good practice**

Troubleshooting

Cisco IOS IS-ISv6 Troubleshooting

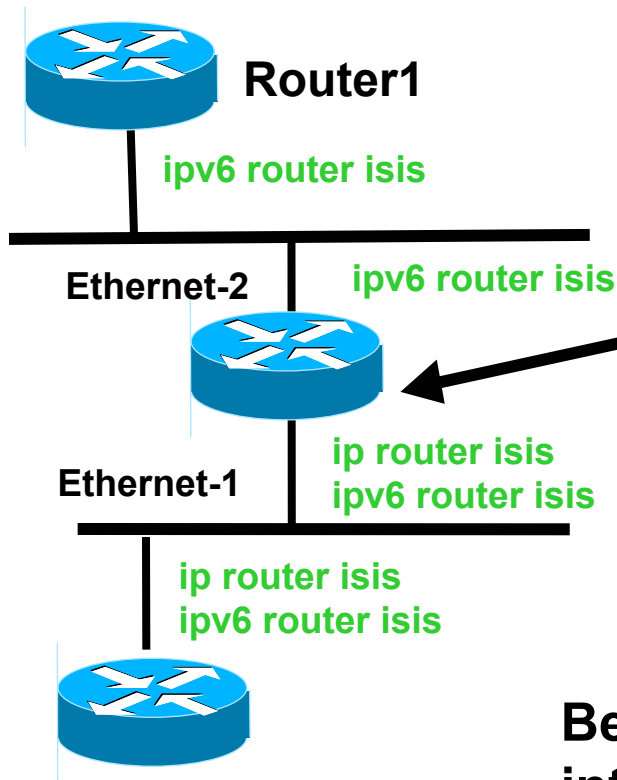
- Should be almost identical to troubleshooting IS-ISv4 since IPv6 support is an add-on to the existing IS-IS protocol.
- Requirement that IPv4 and IPv6 must use same topology may produce some misconfigurations. E.g. IS-IS IPv4 on some interfaces, IS-IS IPv6 on others
- Symptom of this misconfiguration is failure to establish adjacencies.
- Use debug isis adj-packet to pick these up. Will see messages:

ISIS-Adj: No usable IP interface addresses in LAN IIH from Ethernet

ISIS-Adj: No usable IPv6 interface addresses in LAN IIH from Ethernet

Cisco IOS IS-ISv6 Troubleshooting

Cisco.com



- No adjacency forms between Router1 and Router2.
- Use **debug isis adj-packets** to see why.

```
00:01:08: ISIS-Adj: Rec L1 IIH from 0010.7bc2.b286 (Ethernet2), cir type L1, cir id 0440.1239.1101.01, length 1497
00:01:08: ISIS-Adj: No usable IP interface addresses in LAN IIH from Ethernet2
```

Because Router2 is running IPv4 IS-IS on one interface it expects to see IP addresses in IIHs on all interfaces. Therefore adjacency to Router1 (which is IPv6-only) will not be established.

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