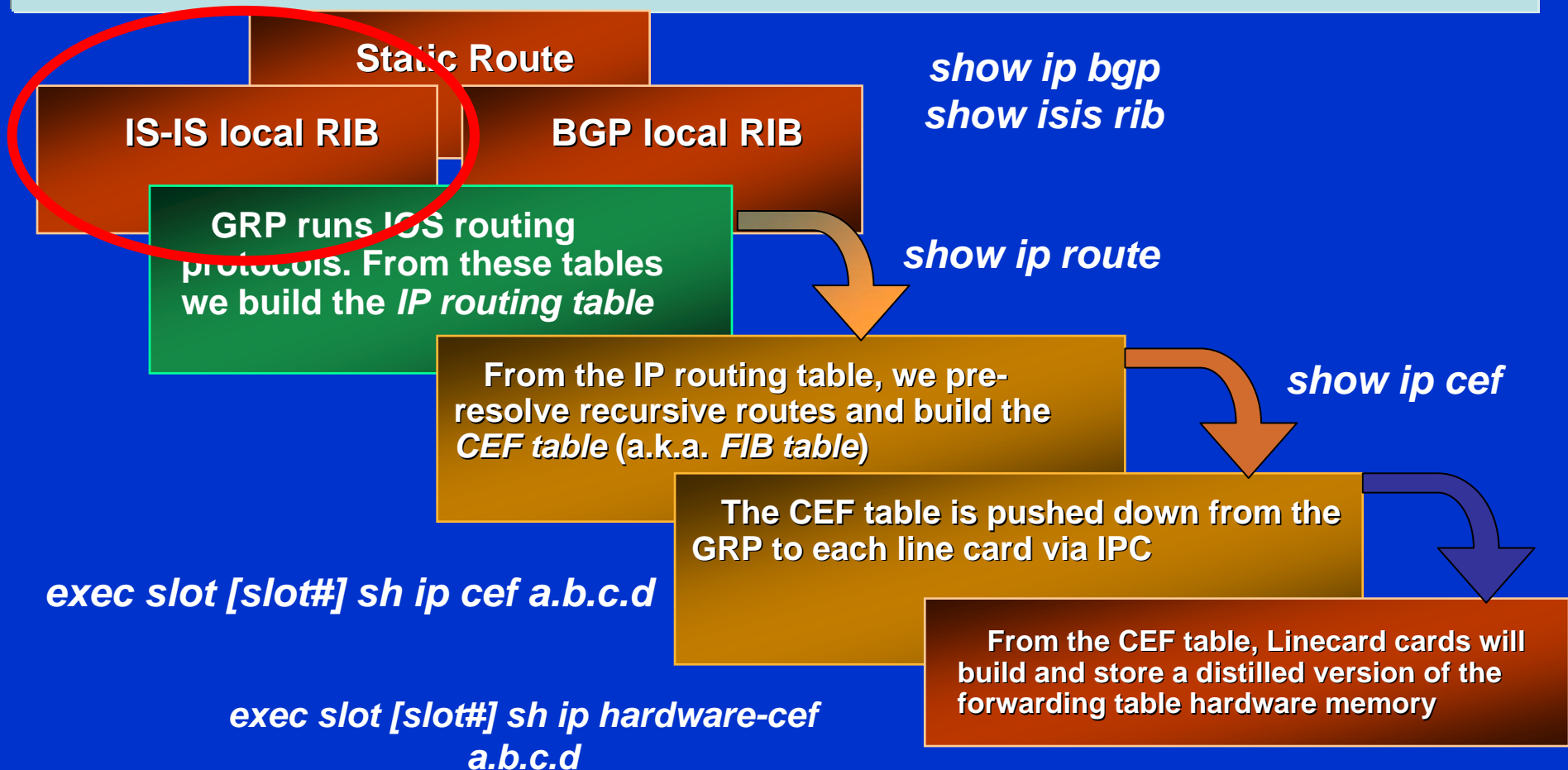


# IS-IS Trouble-shooting

# Big Picture



# Basic Concept

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## Recap:

- Link State Packets (LSP)
- IS-IS Database
- CLNS addressing

## Types of IS-IS problem:

- Adjacency Formation
- Route Installation

# IS-IS Adjacency Formation Issue

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Adjacency formation problems are common IS-IS failures. Result of router mis-configuration, hardware and software failures, interoperability problems between different IOS Software releases, and interoperability problems between routers from different vendors. Adjacency problems are easier to isolate than routing problems. The following list of adjacency problems are typically in IS-IS network:

- **Mismatched Level 1 and Level 2 interfaces**
- **Mis-configured NSAPs**
- **Duplicate system IDs**
- **Mismatched MTUs**
- **Mis-configured IP addresses and Subnets**

# IS-IS Route Installation Issue

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- IS-IS route advertisement problems
- IS-IS route installation problem
- Dis-contiguous Level 2 subdomain
- Route flaps
- LSP corruption storms
- Authentication problems
- IS-IS summarization and redistribution problems

# Troubleshooting

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- **show clns neighbor**: *Enables you to verify the status of adjacencies*
- **show clns interface**: *Enables you to verify the configuration of an active CLNS interface*
- **show isis database**: *Enables you to check for the presence of all expected LSPs*
- **show isis spf-log**: *Enables you to check how frequently the SPF process is being run and the associated triggers*

# CLNS neighbor

RT1#show clns protocol

IS-IS Router: <Null Tag>

← IS-IS instance name

System Id: 0000.0000.0001.00 IS-Type: level-1-2

Manual area address(es):

49.0001

Routing for area address(es):

49.0001

Interfaces supported by IS-IS:

Serial0/0 - IP

Ethernet0/0 - IP

← Check IS-IS Interface

Redistributing:

static

Distance: 110

RRR level: none

Generate narrow metrics: none

Accept narrow metrics: none

Generate wide metrics: level-1-2

Accept wide metrics: level-1-2

## CLNS neighbor (Cont')

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- **Verify the proper operation of IS-IS with respect to it's neighbor**
- **Shows the status of the IS-IS session with the respective neighbors**
- **The hold-time of each neighbor**
- **L2 Protocol: HDLC, PPP etc**
- **IS-IS Level 1/2**



# CLNS neighbor (Cont')

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**System ID:** System identifier of the neighbor

**Interface:** Physical interface where the neighbor is connected.

**SNPA (Subnetwork Point of Attachment):** This is the data-link type or address (HDLC or PPP for serial and MAC address for LANs).

**State:** State of the adjacency (up, down, or init).

**Holdtime:** This is the interval before the adjacency expires. The holdtime is the product of the hello interval and hello multiplier. The default values of the latter two parameters are 10 and 3, respectively. The holdtime is reset to the maximum value every time a hello packet is received and decreases until the next reset.

**Type:** The type of adjacency (Level 1, Level 2, or both).

**Protocol:** Routing protocol source (IS-IS or ISO IGRP).

# CLNS neighbor (Cont')

RT1#show clns neighbors

System Id	Interface	SNPA	State	Holdtime	Type	Proto
RT2	Se0/0	*HDLC*	Up	27	L2	IS-IS
RT5	E0/0	00d0.58eb.ff01	Up	25	L1	IS-IS

RT1#show clns neighbors detail

System Id	Interface	SNPA	State	Holdtime	Type	Proto
RT2	Se0/0	*HDLC*	Up	24	L2	IS-IS

Area Address(es): 49.0002

IP Address(es): 192.168.1.2\*

Uptime: 02:15:11

Observe the Uptime

RT5	E0/0	00d0.58eb.ff01	Up	23	L1	IS-IS
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Area Address(es): 49.0001

IP Address(es): 10.1.1.5\*

Uptime: 02:15:11

# CLNS Interface

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- Equivalent to “show ip interface”
- Provide protocol information regarding specific status and parameter settings.
- Information include MTU, encapsulation, circuit type, Metrics etc
- Without any option “show clns interface” display the IS-IS status of \*ALL\* the interfaces on the router

# CLNS neighbors (Cont')

RT2#show clns interface Serial 0/0

- (1) Serial0/0 is up, line protocol is up
- (2) Checksums enabled, MTU 1500, Encapsulation HDLC
- (3) ERPDUs enabled, min. interval 10 msec.
- (4) RDPDUs enabled, min. interval 100 msec., Addr Mask enabled
- (5) Congestion Experienced bit set at 4 packets
- (6) CLNS fast switching enabled
- (7) CLNS SSE switching disabled
- (8) DEC compatibility mode OFF for this interface
- (9) Next ESH/ISH in 2 seconds
- (10) Routing Protocol: IS-IS
- (11) Circuit Type: level-1-2
- (12) Interface number 0x0, local circuit ID 0x100
- (13) Level-1 Metric: 10, Priority: 64, Circuit ID: RT2.00
- (14) Number of active level-1 adjacencies: 0
- (15) Level-2 Metric: 10, Priority: 64, Circuit ID: RT2.00
- (16) Number of active level-2 adjacencies: 1
- (17) Next IS-IS Hello in 4 seconds

← Check MTU

# CLNS interface (Cont')

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RT2#show clns interface ethernet0/0

- (1) Ethernet0/0 is up, line protocol is up
- (2) Checksums enabled, MTU 1497, Encapsulation SAP
- (3) ERPDUs enabled, min. interval 10 msec.
- (4) RDPDUs enabled, min. interval 100 msec., Addr Mask enabled
- (5) Congestion Experienced bit set at 4 packets
- (6) CLNS fast switching enabled
- (7) CLNS SSE switching disabled
- (8) DEC compatibility mode OFF for this interface
- (9) Next ESH/ISH in 4 seconds
- (10) Routing Protocol: IS-IS
- (11) Circuit Type: level-1-2
- (12) Interface number 0x2, local circuit ID 0x2
- (13) Level-1 Metric: 10, Priority: 64, Circuit ID: RT6.01
- (14) Number of active level-1 adjacencies: 1
- (15) Level-2 Metric: 10, Priority: 64, Circuit ID: RT6.01
- (16) Number of active level-2 adjacencies: 0
- (17) 1Next IS-IS LAN Level-1 Hello in 4 seconds
- (18) Next IS-IS LAN Level-2 Hello in 3 seconds

# CLNS interface (Cont')

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RT2#show clns interface FastEthernet1/0

- (1) FastEthernet1/0 is administratively down, line protocol is down
- (2) CLNS protocol processing disabled

**Is this the expected result?**

# IS-IS Database

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- Problem may be caused by:
  - Adjacency Formation
  - Route Installation
- IS-IS Data troubleshoot route installation problem
- Troubleshooting routing problems by checking the Level 1 and Level 2 Link-State databases for the presence of all expected LSPs
- Look for missing LSP
- Observe the hold time, overload bit
- Pseudo LSP (DIS)

# IS-IS Database (Cont')

RT1#show isis database

## IS-IS Level-1 Link State Database

LSPID	LSP Seq Num	LSP	Checksum	LSP Holdtime	ATT/P/OL
RT1.00-00	* 0x000000DD		0xE942	528	1/0/0
RT1.01-00	* 0x00000087		0xA810	1039	0/0/0
RT5.00-00	0x00000F6E		0xED30	1159	0/0/0

## IS-IS Level-2 Link State Database

LSPID	LSP Seq Num	LSP	Checksum	LSP Holdtime	ATT/P/OL
RT1.00-00	* 0x000000E5		0x7BFA	1041	0/0/0
RT2.00-00	0x00001C9C		0x5F3E	1135	0/0/0

Pseudonode



# IS-IS Database (Cont')

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- Database Detail list the content of the LSP
- Powerful troubleshooting technique
- Look at specific LSP generated by IS-IS speaker to verify the content of the LSP
- Content of LSP include routing prefixes and metrics of route

# IS-IS Database (Cont')

RT1#show isis database level-1 RT2.00-00 detail

IS-IS Level-2 LSP RT2.00-00

LSPID	LSP Seq Num	LSP Checksum	LSP Holdtime	ATT/P/OL
RT2.00-00	0x00001C9C	0x5F3E	1015	0/0/0

Area Address: 49.0002

NLPID: 0xCC

Hostname: RT2

IP Address: 11.1.1.2

Metric: 10 IS-Extended RT1.00

Metric: 10 IP 10.1.2.0/24

Metric: 0 IP 11.1.1.2/32

Metric: 10 IP 11.1.1.6/32

Metric: 10 IP 192.168.1.0/30

# IS-IS topology

- Preview of the relative location of all known routers in both the local area and the backbone.

RT1#show isis topology

IS-IS paths to level-1 routers

System Id	Metric	Next-Hop	Interface	SNPA
RT1	--			
RT5	10	RT5	Et0/0	00d0.58eb.ff01

IS-IS paths to level-2 routers

System Id	Metric	Next-Hop	Interface	SNPA
RT1	--			
RT2	10	RT2	Se0/0	*HDLC*
RT6	20	RT2	Se0/0	*HDLC*

# IS-IS SPF log

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- Invaluable command for troubleshooting
- Need to understand the topology and changes for effective isolation of problem
- logs events related to the SPF process providing information such as **triggers** and duration of events
- Locate churn on the IS-IS routing domain
- Used for localizing High CPU problem or spikes

# IS-IS SPF log

RT1#show isis spf-log

## Level 1 SPF log

When	Duration	Nodes	Count	Last trigger LSP	Triggers
03:40:08	0	3	1	PERIODIC	
03:25:08	0	3	1	PERIODIC	
03:10:07	0	3	1	PERIODIC	
02:55:07	0	3	1	PERIODIC	
02:40:07	0	3	1	PERIODIC	
02:25:06	0	3	1	PERIODIC	
02:10:06	0	3	1	PERIODIC	
01:56:08	0	2	1	RT1.01-00	TLVCONTENT
01:55:06	0	2	1	PERIODIC	
01:40:06	0	2	1	PERIODIC	
01:36:31	0	2	1	RT5.00-00	LSPEXPIRED
01:28:31	0	2	2	RT1.01-00	NEWADJ TLVCONTENT
01:28:25	0	3	1	RT5.00-00	NEWLSP
01:25:06	0	3	1	PERIODIC	
01:10:06	0	3	1	PERIODIC	

# IS-IS SPF triggers

Trigger Code	Description
AREASET	Area change
ATTACHFLAG	Attached bit setting change
CLEAR	Manual clear
CONFIG	Configuration change
DELADJ	Adjacency deletion
DIS	DIS election
ES	End system information change
HIPPITY LSPDB	Overload bit state change
IP_DEF_ORIG	Default information change
IPDOWN	Connected IP prefix down
IP_EXTERNAL	Route redistribution change
IPIA	Interarea route change
IPUP	Connected IP prefix up
NEWADJ	New neighbor adjacency up
NEWLEVEL	IS-IS process level changed
NEWMETRIC	New metric assigned to an interface
NEWSYSID	New system ID assigned
PERIODIC	Periodic SPF process (LSPDB refresh interval)
TLVCODE	LSP with a new TLV code field received
TLVCONTENT	LSP with changed TLV contents received

# Other useful command

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- **clear isis \***
- **show isis rib a.b.c.d**
- **show ip protocol**
- **show ip route summary**
- **show ip traffic**

## Turning on external overload signalling

- **Disable Dcef cause IS-IS to cease working**
- **Fate sharing between IS-IS and CEF**

## Turning on ignore-lsp-error

- **LSP storm**
- **Bad LSP**

# Debugging

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- **debug isis adj-packets**
  - Debug adjacency problem
  - Observe Hello packets
- **debug isis spf-events**
  - Verify the SPF process
  - More detail SPF-log
- **debug isis update-packets**
  - Confirm the correctness of update packets
  - Verify LSP



## Other useful tools

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- CLNS ping
- CLNS traceroute

**Troubleshoot CLNS routing issue**