**ŽILINSKÁ UNIVERZITA V ŽILINE**

**Fakulta riadenia a informatiky**

**Projektovanie sietí 1**

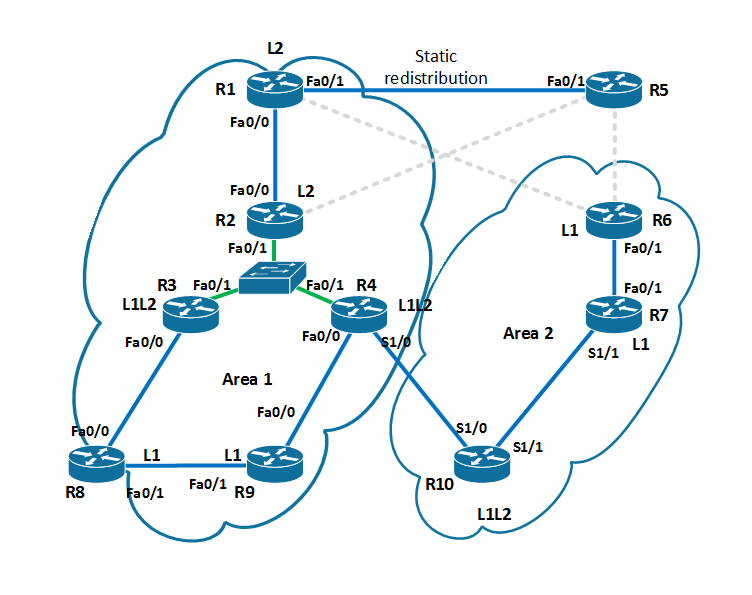
**Zadanie č. 2: IS-IS**

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**Zadanie**

Úlohou bolo na smerovačoch v už vytvorenej topológii nakonfigurovať správne fungujúci smerovací protokol IS-IS a overiť jeho funkčnosť a splnenie jednotlivých bodov zadania.

**Topológia**



**Adresovanie**

|  |  |  |  |
| --- | --- | --- | --- |
| **Smerovač** | **Interface** | **IP Adresa** | **Maska siete** |
| **R1** | l0 | 10.255.255.1 | 255.255.255.255 |
| fa0/0 | 10.0.12.1 | 255.255.255.0 |
| fa0/1 | 10.0.15.1 | 255.255.255.0 |
| **R2** | l0 | 10.255.255.2 | 255.255.255.255 |
| fa0/0 | 10.1.12.2 | 255.255.255.0 |
| fa0/1 | 10.1.234.1 | 255.255.255.0 |
| **R3** | l0 | 10.255.255.3 | 255.255.255.255 |
| fa0/0 | 10.1.38.1 | 255.255.255.0 |
| fa0/1 | 10.1.234.2 | 255.255.255.0 |
| **R4** | l0 | 10.255.255.4 | 255.255.255.255 |
| fa0/0 | 10.1.49.1 | 255.255.255.0 |
| fa0/1 | 10.1.234.3 | 255.255.255.0 |
| s1/0 | 10.10.40.1 | 255.255.255.0 |
| **R5** | l0 | 10.255.255.5 | 255.255.255.255 |
| fa0/1 | 10.10.15.2 | 255.255.255.0 |
| **R6** | l0 | 10.255.255.6 | 255.255.255.255 |
| fa0/1 | 10.2.67.1 | 255.255.255.0 |
| **R7** | l0 | 10.255.255.7 | 255.255.255.255 |
| fa0/1 | 10.2.67.2 | 255.255.255.0 |
| s1/1 | 10.2.70.1 | 255.255.255.0 |
| **R8** | l0 | 10.255.255.8 | 255.255.255.255 |
| fa0/0 | 10.1.38.2 | 255.255.255.0 |
| fa0/1 | 10.1.89.1 | 255.255.255.0 |
| **R9** | l0 | 10.255.255.9 | 255.255.255.255 |
| fa0/0 | 10.1.49.2 | 255.255.255.0 |
| fa0/1 | 10.1.89.2 | 255.255.255.0 |
| **R10** | l0 | 10.255.255.10 | 255.255.255.255 |
| s1/0 | 10.10.40.2 | 255.255.255.0 |
| s1/1 | 10.2.70.2 | 255.255.255.0 |

**Úlohy**

1. Nakonfigurovať IS-IS s dvomi oblasťami
2. R2, R3, R4 broadcast spojenia prostredníctvom L2 prepínača
3. zvyšok spojení P2P
4. R3 – R4 P2P, L2 only
5. Router id – ISO NSAP formát odvodený z loopback0 rozhrania
6. Statická redistribúcia smerovacích záznamov z R5
7. Kontrola LAN DIS
8. Kontrola IS-IS databáz a smerovacích tabuliek
9. Kontrola konektivity
10. Area 2 – redistribúcia L2 do L1
11. R8, R9 - R3 primárny smerovač pre všetky vnútorné adresy, R4 primárny smerovač len pre R5 smerovacie záznamy
12. Skrátenie hello a dead-interval časovačov, zistenie funkčnosti vytrhnutím jednej z liniek smerom ku L2 prepínaču
13. Status linky R4 – R10 ? L1L2 ?

Pozn.: Pre lepšiu prehľadnosť výpisov na smerovačoch sme z nich nepodstatné časti vymazali a dôležité časti zvýraznili hrubým písmom.

1. **Nakonfigurovať IS-IS s dvomi oblasťami**

Podľa zadania sme smerovače R1 – R4, R8 a R9 nakonfigurovali tak, aby ležali v IS-IS oblasti Area 1 a R6, R7 a R10 v oblasti Area 2.

**R10#**show clns neighbors detail

System Id Interface SNPA State Holdtime Type Protocol

R4 Se1/0 \*HDLC\* Up 31 L2 IS-IS

**Area Address(es): 49.0001**

R7 Se1/1 \*HDLC\* Up 25 L1 IS-IS

**Area Address(es): 49.0002**

**R4#**show clns neighbors detail

System Id Interface SNPA State Holdtime Type Protocol

R10 Se1/0 \*HDLC\* Up 17 L2 IS-IS

**Area Address(es): 49.0002**

R2 Fa0/1 c015.6127.0001 Up 29 L2 IS-IS

**Area Address(es): 49.0001**

R9 Fa0/0 c01c.6127.0000 Up 22 L1 IS-IS

**Area Address(es): 49.0001**

1. **R2, R3, R4 broadcast spojenia prostredníctvom L2 prepínača**

Na nasledujúcom výpise vidíme, že na sieti medzi R2, R3, R4 je zvolený DIS router, v našom prípade je to R2 – v stĺpci LSPID vidíme pri R2 hodnotu 02-00. Z toho vyplýva, že rozhrania sú nastavené ako broadcast.

**R2#**sh isis database l2

IS-IS Level-2 Link State Database:

LSPID LSP Seq Num LSP Checksum LSP Holdtime ATT/P/OL

R1.00-00 0x000000D6 0x2E67 632 0/0/0

R2.00-00 \* 0x000000D6 0x3AD6 888 0/0/0

**R2.02-00 \* 0x000000B1 0xFFCF 915 0/0/0**

R3.00-00 0x000000E2 0x906C 888 0/0/0

R4.00-00 0x000000E2 0xC59B 949 0/0/0

R10.00-00 0x000000D9 0x37D4 1026 0/0/0

**R3#**sh isis database l2

IS-IS Level-2 Link State Database:

LSPID LSP Seq Num LSP Checksum LSP Holdtime ATT/P/OL

R1.00-00 0x000000D6 0x2E67 609 0/0/0

R2.00-00 0x000000D6 0x3AD6 866 0/0/0

**R2.02-00 0x000000B1 0xFFCF 893 0/0/0**

R3.00-00 \* 0x000000E2 0x906C 869 0/0/0

R4.00-00 0x000000E2 0xC59B 929 0/0/0

R10.00-00 0x000000D9 0x37D4 1005 0/0/0

**R4#**sh isis database l2

IS-IS Level-2 Link State Database:

LSPID LSP Seq Num LSP Checksum LSP Holdtime ATT/P/OL

R1.00-00 0x000000D6 0x2E67 598 0/0/0

R2.00-00 0x000000D6 0x3AD6 854 0/0/0

**R2.02-00 0x000000B1 0xFFCF 881 0/0/0**

R3.00-00 0x000000E2 0x906C 856 0/0/0

R4.00-00 \* 0x000000E2 0xC59B 919 0/0/0

R10.00-00 0x000000D9 0x37D4 996 0/0/0

1. **Zvyšok spojení P2P**

Podobne ako v predchádzajúcom prípade. Ak na sieti nie je zvolený DIS router – v LSPID je všade 00-00, znamená to, že spojenie je typu P2P (nastavili sme ho príkazom *isis network point-to-point* na príslušných rozhraniach). Uvádzame len výpis z R6 a R7.

**R6#**sh isis database

IS-IS Level-1 Link State Database:

LSPID LSP Seq Num LSP Checksum LSP Holdtime ATT/P/OL

R6.00-00 \* 0x000000D6 0xBC0E 803 0/0/0

R7.00-00 0x000000D7 0xBA9C 850 0/0/0

R10.00-00 0x000000D6 0x4B21 368 1/0/0

**R7#**sh isis database

IS-IS Level-1 Link State Database:

LSPID LSP Seq Num LSP Checksum LSP Holdtime ATT/P/OL

R6.00-00 0x000000D6 0xBC0E 761 0/0/0

R7.00-00 \* 0x000000D7 0xBA9C 811 0/0/0

R10.00-00 0x000000D7 0x4922 1158 1/0/0

1. **R3 – R4 L2 only**

Aby sme okruh linky medzi smerovačmi R3 a R4 nastavili na level-2 only, použijeme na daných rozhraniach medzi nimi príkaz *isis circuit-type level-2-only*. Správnosť overíme výpisom *show clns interface* na týchto rozhraniach.

**R3#**show clns interface fa0/1

FastEthernet0/1 is up, line protocol is up

Checksums enabled, MTU 1497, Encapsulation SAP

...

Routing Protocol: IS-IS

**Circuit Type: level-2**

Interface number 0x1, local circuit ID 0x2

Level-2 Metric: 10, Priority: 64, Circuit ID: R2.02

DR ID: R2.02

Level-2 IPv6 Metric: 10

Number of active level-2 adjacencies: 2

Next IS-IS LAN Level-2 Hello in 4 seconds

**R4#**sh clns interface fa0/1

FastEthernet0/1 is up, line protocol is up

Checksums enabled, MTU 1497, Encapsulation SAP

...

Routing Protocol: IS-IS

**Circuit Type: level-2**

Interface number 0x1, local circuit ID 0x2

Level-2 Metric: 10, Priority: 64, Circuit ID: R2.02

DR ID: R2.02

Level-2 IPv6 Metric: 10

Number of active level-2 adjacencies: 2

Next IS-IS LAN Level-2 Hello in 2 seconds

1. **Router id – ISO NSAP formát odvodený z loopback0 rozhrania**

Loopback0 na každom smerovači má nakonfigurovanú IP adresu v tvare 10.255.255.X, kde X je číslo smerovača. Na základe tejto adresy sme všetkým smerovačom priradili Router ID pomocou nasledovného algoritmu:

10.255.255.X → 010.255.255.00X → 0102.5525.500X

Väčšinu Router ID smerovačov sme nechali vypísať príkazom *show isis hostname* na R4.

**R4#**show isis hostname

Level System ID Dynamic Hostname (notag)

1 **0102.5525.5003** R3

2 **0102.5525.5002** R2

2 **0102.5525.5001** R1

\* **0102.5525.5004** R4

1 **0101.5525.5009** R9

1 **0102.5525.5008** R8

2 **0102.5525.5010** R10

1. **Statická redistribúcia smerovacích záznamov z R5**

Smerovač R5 má jediný prepoj s R1 a nepatrí do žiadnej oblasti v rámci IS-IS ani nemá nakonfigurovaný žiadny iný smerovací protokol. Preto bolo potrebné zo smerovača R1 nastaviť statickú cestu na loopoback R5, zo smerovača R5 default route na R1 a na R1 použiť príkaz *redistribute static ip*, aby danú statickú cestu preposielal do celej siete a tým zabezpečil konektivitu so smerovačom R5 aj ostatným smerovačom v topológii. Statický smerovací záznam vidíme na výpise *show ip route static* na R1.

**R1#**sh ip route static

10.0.0.0/8 is variably subnetted, 19 subnets, 2 masks

**S 10.255.255.5/32 [1/0] via 10.10.15.2, FastEthernet0/1**

1. **Kontrola LAN DIS**

Ako LAN DIS sme zvolili R2 tak, že sme mu nastavili prioritu na príslušnom rozhraní na 100, keďže ostatné majú prednastavené 64, R2 vyhrá voľbu. Na nasledujúcom výpise vidno, že predchádzajúcim DIS smerovačom bol R4, ktorý bol určený na základe najvyššej adresy, po zmene priority sa ním stal R2, ale časovač R4 ešte nevypršal - preto je tam ešte zobrazený aj on.

**R4#**sh isis database l2

IS-IS Level-2 Link State Database:

LSPID LSP Seq Num LSP Checksum LSP Holdtime ATT/P/OL

R1.00-00 0x00000026 0x8FB6 515 0/0/0

R2.00-00 0x00000027 0x9927 1178 0/0/0

**R2.02-00 0x00000001 0x611F 1179 0/0/0**

R3.00-00 0x00000034 0xEDBD 1178 0/0/0

R4.00-00 \* 0x00000034 0x23EC 1180 0/0/0

**R4.02-00 \* 0x00000017 0x9081 0 (1180) 0/0/0**

R10.00-00 0x00000029 0x9824 456 0/0/0

1. **Kontrola IS-IS databáz a smerovacích tabuliek**

Výpismi show ip route a show isis database na R4 a R10 overíme, či majú smerovače všetky potrebné informácie o smerovačoch a sieťach v topológii.

**R4#**sh ip route

10.0.0.0/8 is variably subnetted, 19 subnets, 2 masks

i L2 10.255.255.10/32 [115/10] via 10.10.40.2, Serial1/0

i L1 10.255.255.8/32 [115/510] via 10.1.49.2, FastEthernet0/0

i L1 10.255.255.9/32 [115/500] via 10.1.49.2, FastEthernet0/0

i L2 10.1.12.0/24 [115/20] via 10.1.234.1, FastEthernet0/1

i L2 10.255.255.2/32 [115/10] via 10.1.234.1, FastEthernet0/1

i L1 10.255.255.3/32 [115/520] via 10.1.49.2, FastEthernet0/0

i L2 10.255.255.1/32 [115/20] via 10.1.234.1, FastEthernet0/1

i L2 10.255.255.6/32 [115/30] via 10.10.40.2, Serial1/0

i L2 10.255.255.7/32 [115/20] via 10.10.40.2, Serial1/0

C 10.255.255.4/32 is directly connected, Loopback0

i L2 10.255.255.5/32 [115/20] via 10.1.234.1, FastEthernet0/1

i L2 10.10.15.0/24 [115/30] via 10.1.234.1, FastEthernet0/1

C 10.10.40.0/24 is directly connected, Serial1/0

i L1 10.1.38.0/24 [115/520] via 10.1.49.2, FastEthernet0/0

C 10.1.49.0/24 is directly connected, FastEthernet0/0

i L2 10.2.67.0/24 [115/30] via 10.10.40.2, Serial1/0

i L2 10.2.70.0/24 [115/20] via 10.10.40.2, Serial1/0

i L1 10.1.89.0/24 [115/510] via 10.1.49.2, FastEthernet0/0

C 10.1.234.0/24 is directly connected, FastEthernet0/1

**R4#**sh isis database

IS-IS Level-1 Link State Database:

LSPID LSP Seq Num LSP Checksum LSP Holdtime ATT/P/OL

R9.00-00 0x00000095 0x8343 653 0/0/0

R3.00-00 0x00000095 0x2705 659 1/0/0

R4.00-00 \* 0x00000098 0x6423 772 1/0/0

R8.00-00 0x00000097 0x2A81 1050 0/0/0

IS-IS Level-2 Link State Database:

LSPID LSP Seq Num LSP Checksum LSP Holdtime ATT/P/OL

R1.00-00 0x00000095 0xB026 583 0/0/0

R2.00-00 0x00000094 0xBE94 411 0/0/0

R2.02-00 0x0000006F 0x848D 1065 0/0/0

R3.00-00 0x000000A1 0x132B 1013 0/0/0

R4.00-00 \* 0x000000A1 0x485A 451 0/0/0

R10.00-00 0x00000097 0xBB92 974 0/0/0

**R10#**sh ip route

10.0.0.0/8 is variably subnetted, 19 subnets, 2 masks

C 10.255.255.10/32 is directly connected, Loopback0

i L2 10.255.255.8/32 [115/30] via 10.10.40.1, Serial1/0

i L2 10.255.255.9/32 [115/40] via 10.10.40.1, Serial1/0

i L2 10.1.12.0/24 [115/30] via 10.10.40.1, Serial1/0

i L2 10.255.255.2/32 [115/20] via 10.10.40.1, Serial1/0

i L2 10.255.255.3/32 [115/20] via 10.10.40.1, Serial1/0

i L2 10.255.255.1/32 [115/30] via 10.10.40.1, Serial1/0

i L1 10.255.255.6/32 [115/20] via 10.2.70.1, Serial1/1

i L1 10.255.255.7/32 [115/10] via 10.2.70.1, Serial1/1

i L2 10.255.255.4/32 [115/10] via 10.10.40.1, Serial1/0

i L2 10.255.255.5/32 [115/30] via 10.10.40.1, Serial1/0

i L2 10.10.15.0/24 [115/40] via 10.10.40.1, Serial1/0

C 10.10.40.0/24 is directly connected, Serial1/0

i L2 10.1.38.0/24 [115/30] via 10.10.40.1, Serial1/0

i L2 10.1.49.0/24 [115/510] via 10.10.40.1, Serial1/0

i L1 10.2.67.0/24 [115/20] via 10.2.70.1, Serial1/1

C 10.2.70.0/24 is directly connected, Serial1/1

i L2 10.1.89.0/24 [115/40] via 10.10.40.1, Serial1/0

i L2 10.1.234.0/24 [115/20] via 10.10.40.1, Serial1/0

**R10#**sh isis database

IS-IS Level-1 Link State Database:

LSPID LSP Seq Num LSP Checksum LSP Holdtime ATT/P/OL

R6.00-00 0x00000095 0x3FCC 877 0/0/0

R7.00-00 0x00000095 0x3F5A 793 0/0/0

R10.00-00 \* 0x00000096 0xCBE0 843 1/0/0

IS-IS Level-2 Link State Database:

LSPID LSP Seq Num LSP Checksum LSP Holdtime ATT/P/OL

R1.00-00 0x00000095 0xB026 543 0/0/0

R2.00-00 0x00000094 0xBE94 370 0/0/0

R2.02-00 0x0000006F 0x848D 1025 0/0/0

R3.00-00 0x000000A1 0x132B 972 0/0/0

R4.00-00 0x000000A2 0x465B 1185 0/0/0

R10.00-00 \* 0x00000097 0xBB92 937 0/0/0

1. **Kontrola konektivity**

Pomocou tcl skriptu sme spustili príkaz ping zo smerovača R6 na všetky známe IP adresy - všetky rozhrania všetkých smerovačov. Príkaz samotný a jeho výstup sú uvedené nižšie.

**R6#**tclsh

R6(tcl)#

foreach address {

10.255.255.1

10.255.255.2

10.255.255.3

10.255.255.4

10.255.255.5

10.255.255.6

10.255.255.7

10.255.255.8

10.255.255.9

10.255.255.10

10.10.15.1

10.10.15.2

10.10.40.1

10.10.40.2

10.1.12.1

10.1.12.2

10.1.234.1

10.1.234.2

10.1.234.3

10.1.38.1

10.1.38.2

10.1.49.1

10.1.49.2

10.1.89.1

10.1.89.2

10.2.70.1

10.2.70.2

10.2.67.1

10.2.67.2

} {

ping $address }

Sending 5, 100-byte ICMP Echos to 10.255.255.1, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 88/98/104 ms  
Sending 5, 100-byte ICMP Echos to 10.255.255.2, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 64/76/84 ms  
Sending 5, 100-byte ICMP Echos to 10.255.255.3, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 84/98/112 ms  
Sending 5, 100-byte ICMP Echos to 10.255.255.4, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 44/57/72 ms  
Sending 5, 100-byte ICMP Echos to 10.255.255.5, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 100/119/136 ms  
Sending 5, 100-byte ICMP Echos to 10.255.255.6, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms  
Sending 5, 100-byte ICMP Echos to 10.255.255.7, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/17/24 ms  
Sending 5, 100-byte ICMP Echos to 10.255.255.8, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 84/96/100 ms  
Sending 5, 100-byte ICMP Echos to 10.255.255.9, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 80/96/104 ms  
Sending 5, 100-byte ICMP Echos to 10.255.255.10, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/36/40 ms  
Sending 5, 100-byte ICMP Echos to 10.10.15.1, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 84/100/116 ms  
Sending 5, 100-byte ICMP Echos to 10.10.15.2, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 108/120/132 ms  
Sending 5, 100-byte ICMP Echos to 10.10.40.1, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 44/58/72 ms  
Sending 5, 100-byte ICMP Echos to 10.10.40.2, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/35/40 ms  
Sending 5, 100-byte ICMP Echos to 10.1.12.1, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 88/98/116 ms  
Sending 5, 100-byte ICMP Echos to 10.1.12.2, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 64/73/80 ms  
Sending 5, 100-byte ICMP Echos to 10.1.234.1, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 68/74/80 ms  
Sending 5, 100-byte ICMP Echos to 10.1.234.2, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 60/73/84 ms  
Sending 5, 100-byte ICMP Echos to 10.1.234.3, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 44/59/68 ms  
Sending 5, 100-byte ICMP Echos to 10.1.38.1, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 88/96/112 ms  
Sending 5, 100-byte ICMP Echos to 10.1.38.2, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 84/97/112 ms  
Sending 5, 100-byte ICMP Echos to 10.1.49.1, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 44/57/68 ms  
Sending 5, 100-byte ICMP Echos to 10.1.49.2, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 84/96/116 ms  
Sending 5, 100-byte ICMP Echos to 10.1.89.1, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 80/96/112 ms  
Sending 5, 100-byte ICMP Echos to 10.1.89.2, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 84/98/112 ms  
Sending 5, 100-byte ICMP Echos to 10.2.70.1, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/16/20 ms  
Sending 5, 100-byte ICMP Echos to 10.2.70.2, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 24/36/40 ms  
Sending 5, 100-byte ICMP Echos to 10.2.67.1, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms  
Sending 5, 100-byte ICMP Echos to 10.2.67.2, timeout is 2 seconds:!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/17/24 ms

1. **Area 2 – redistribúcia L2 do L1**

V rámci jednej oblasti si smerovače vymieňajú informácie úrovne Level1, medzi oblasťami je to smerovanie Level2. Na smerovači R10 sme nastavili, aby preposielal informácie z oblasti Area 1 do Area 2 – redistribuoval L2 do L1. V smerovacích záznamoch na R6 vidíme, že má vďaka tomu informácie aj o sieťach z Area 1.

**R6#**sh ip route

10.0.0.0/8 is variably subnetted, 19 subnets, 2 masks

i L1 10.255.255.10/32 [115/20] via 10.2.67.2, FastEthernet0/1

i ia 10.255.255.8/32 [115/50] via 10.2.67.2, FastEthernet0/1

i ia 10.255.255.9/32 [115/60] via 10.2.67.2, FastEthernet0/1

i ia 10.1.12.0/24 [115/50] via 10.2.67.2, FastEthernet0/1

i ia 10.255.255.2/32 [115/40] via 10.2.67.2, FastEthernet0/1

i ia 10.255.255.3/32 [115/40] via 10.2.67.2, FastEthernet0/1

i ia 10.255.255.1/32 [115/50] via 10.2.67.2, FastEthernet0/1

C 10.255.255.6/32 is directly connected, Loopback0

i L1 10.255.255.7/32 [115/10] via 10.2.67.2, FastEthernet0/1

i ia 10.255.255.4/32 [115/30] via 10.2.67.2, FastEthernet0/1

i ia 10.255.255.5/32 [115/50] via 10.2.67.2, FastEthernet0/1

i ia 10.10.15.0/24 [115/60] via 10.2.67.2, FastEthernet0/1

i L1 10.10.40.0/24 [115/30] via 10.2.67.2, FastEthernet0/1

i ia 10.1.38.0/24 [115/50] via 10.2.67.2, FastEthernet0/1

i ia 10.1.49.0/24 [115/530] via 10.2.67.2, FastEthernet0/1

C 10.2.67.0/24 is directly connected, FastEthernet0/1

i L1 10.2.70.0/24 [115/20] via 10.2.67.2, FastEthernet0/1

i ia 10.1.89.0/24 [115/60] via 10.2.67.2, FastEthernet0/1

i ia 10.1.234.0/24 [115/40] via 10.2.67.2, FastEthernet0/1

i\*L1 0.0.0.0/0 [115/20] via 10.2.67.2, FastEthernet0/1

1. **R8, R9 - R3 primárny smerovač pre všetky vnútorné adresy**

To sme docielili tým, že sme znehodnotili cestu medzi R9 a R4, jej hodnotu sme nastavili na 500. Aby nevznikali slučky, nastavili sme ju obojstranne na R4 aj R9. Overenie funkčnosti sme urobili pomocou príkazu tracertoute na loopback smerovača R2.

**R4#**sh isis topology l1

IS-IS paths to level-1 routers

System Id Metric Next-Hop Interface SNPA

**R9 500 R9 Fa0/0 c026.612d.0000**

R3 520 R9 Fa0/0 c026.612d.0000

R4 --

R8 510 R9 Fa0/0 c026.612d.0000

**R9#**traceroute 10.255.255.2

Tracing the route to 10.255.255.2

**1 10.1.89.1 20 msec 16 msec 12 msec** - preferovaná linka R8-R9

2 10.1.38.1 36 msec 36 msec 40 msec

3 10.1.234.1 48 msec \* 76 msec

**R8, R9 - R4 primárny smerovač len pre R5 smerovacie záznamy**

Na R4 sme vytvorili ACL, ktorý povolí iba IP 10.255.255.5 a následne redistribuovali L2 záznamy do L1 pomocou tohoto ACL. Overenie funkčnosti pomocou traceroute na R5 a R1   
z routra R9.

**R9#**traceroute 10.255.255.5

Tracing the route to 10.255.255.5

**1 10.1.49.1 24 msec 16 msec 16 msec** - preferovaná linka R4-R9

2 10.1.234.1 28 msec 36 msec 36 msec

3 10.1.12.1 68 msec 48 msec 68 msec

4 10.10.15.2 56 msec \* 80 msec

**R9#**traceroute 10.255.255.1

Tracing the route to 10.255.255.1

**1 10.1.89.1 12 msec 16 msec 16 msec** - preferovaná linka R8-R9

2 10.1.38.1 28 msec 40 msec 40 msec

3 10.1.234.1 68 msec 40 msec 72 msec

4 10.1.12.1 56 msec \* 52 msec

1. **Skrátenie hello a dead-interval časovačov, zistenie funkčnosti vytrhnutím jednej z liniek smerom ku L2 prepínaču**

Hello-interval sme skrátili na 5 sekúnd, čo vidno na časoch príchodov hello paketov.

**R2#**debug isis adj-packets

IS-IS Adjacency related packets debugging is on

...

\*Mar 2 **01:03:31.485**: ISIS-Adj: Rec serial IIH from c01e.612d.0000 (FastEthernet0/0), cir type L2, cir id 01, length 1496

...

\*Mar 2 **01:03:35.957**: ISIS-Adj: Rec serial IIH from c01e.612d.0000 (FastEthernet0/0), cir type L2, cir id 01, length 1496

...

\*Mar 2 **01:03:40.481**: ISIS-Adj: Rec serial IIH from c01e.612d.0000 (FastEthernet0/0), cir type L2, cir id 01, length 1496

...

\*Mar 2 **01:03:44.965**: ISIS-Adj: Rec serial IIH from c01e.612d.0000 (FastEthernet0/0), cir type L2, cir id 01, length 1496

\*...

1. **Status linky R4 – R10 ? L1L2 ?**

Status tejto linky (typ okruhu) overíme príkazom *show clns interface s1/0* na smerovačoch R4 a R10.

**R4#**sh clns interface s1/0

Serial1/0 is up, line protocol is up

...

Routing Protocol: IS-IS

**Circuit Type: level-1-2**

Interface number 0x2, local circuit ID 0x100

Neighbor System-ID: R10

Level-1 Metric: 10, Priority: 64, Circuit ID: R10.00

Level-1 IPv6 Metric: 10

Number of active level-1 adjacencies: 0

Level-2 Metric: 10, Priority: 64, Circuit ID: R4.00

Level-2 IPv6 Metric: 10

Number of active level-2 adjacencies: 1

Next IS-IS Hello in 672 milliseconds

if state UP

**R10#**sh clns interface s1/0

Serial1/0 is up, line protocol is up

...

Routing Protocol: IS-IS

**Circuit Type: level-1-2**

Interface number 0x0, local circuit ID 0x100

Neighbor System-ID: R4

Level-1 Metric: 10, Priority: 64, Circuit ID: R10.00

Level-1 IPv6 Metric: 10

Number of active level-1 adjacencies: 0

Level-2 Metric: 10, Priority: 64, Circuit ID: R10.00

Level-2 IPv6 Metric: 10

Number of active level-2 adjacencies: 1

Next IS-IS Hello in 2 seconds

if state UP