KTH CSC

IS-IS lab

Juniper version

Group Nr	
Name1	
Name2	
Name3	
Name4	
Name5	
Date	
Grade	
Instructor's Signature	

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1 Goals

The goal with this lab is to introduce you to the link-state Intermediate System – to Intermediate System (ISIS) routing protocol.

2 Preparations

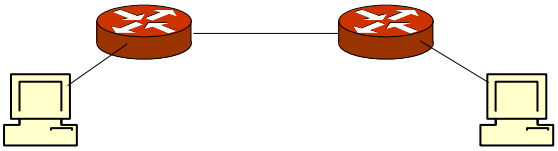
Before you begin this lab, please consult documents [1] and [2]. Ensure that you have the network map of topology 1 [4]. You should also have read the lecture notes about ISIS. Also review IPv6 addressing (earlier course).

Complete the following assignments before you come to the lab:

1. Write your router's ISO-NET address system-id according to Section 3 below
2. Explain each part of the ISO-NET address. RFC 1069 can be a good start.
3. Write down the IPv6 sub-nets in your topology according to Section 8 below.
4. Explain the major differences between IPv4 and IPv6 addresses
5. Explain the major differences between IS-IS Levels and OSPF Areas.
6. Explain how IPv6 stateless auto-configuration works. What is the purpose of the router? How does this differ from DHCPv6?
7. How do you set an OSI/CLNS address on an interface?

Milestone 1: Preparations.
Signature: _____

3 Introduction – Pairs



First start working in pairs, RTX1 with RTX4 and RTX2 with RTX3. According to the topology map:

- Configure the network between host and router. Set up necessary static routes on the host.
- Configure the network between the two routers.
- Ensure that you can ping the router from the host, and that the routers can ping each other.

Tip: If it is more convenient, re-use the labconf configuration from earlier labs and make adjustments.

- Enable OSI (CLNS) on the interfaces that will run ISIS (recognise OSI PDUs on that interface).
- Specify active and passive ISIS-interfaces.

You shall also declare an ISO NET-address on interface lo0. This address shall be unique per router. It is common practice to assign the NET address according to the following table:

AFI	***AREA***	***SYSTEMID***	***SEL***
49	AREA	SYSTEMID	00

In the table, AREA and SYSTEMID are variables. AREA is assigned as follows :

AREA = *XY*,
X = 10 for group A, 20 for group B, etc.
Y = 10 RTX1 and RTX4; 20 for RTX2 and RTX3.

The *SYSTEMID* is formed from one of your IP addresses – use your router-id, for example. Take the four numbers from your IP address and prepend zeros to each number so that they all have three digits. Remove the three period separators and replace them with two periods, like in the following example:

- Your IP address: 192.10.1.50
- Your SYSTEMID: 1920.1000.1050

Example: if your router is RTF1, and the IP number is 192.10.1.50, your NET will be:

```
49.6010.1920.1000.1050.00
```

For the time being, disable level 1 routing on all interfaces. What does this mean?

_____
_____

Verify that ping and traceroute works to all interfaces.

Look at the ISIS database.

- How many LSP:s do you see?
- What is the purpose of each LSP?
- Which LSP:s are there?
- Explain the database details for each LSP.

_____
_____
_____
_____
_____
_____

Configure the link between your two routers to behave as a point-to-point network.
Now look at the database again, what differs?

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_____
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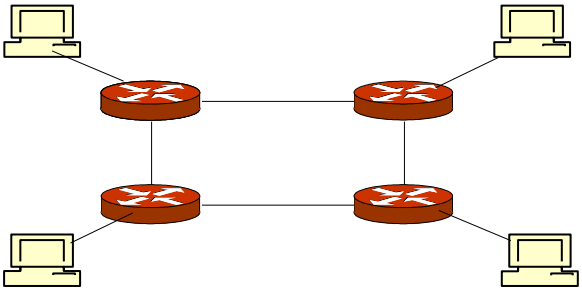
Milestone 2: Pair in IS-IS.
Signature: _____

4 Square and static routes



Connect all four routers into a square so that ping and traceroute works to all interfaces. Configure all of the four links as point-to-point links.

Study the link-state database. What are the differences compared to the pair case?

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_____
_____

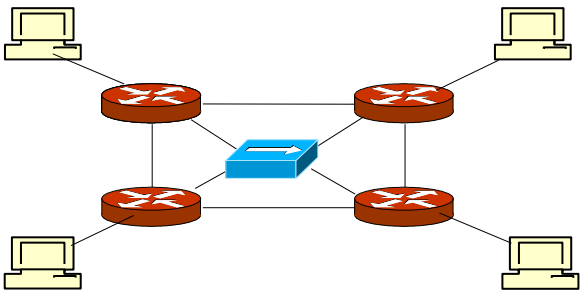
Now add the three static routes and the and export them into ISIS by writing a policy.

Also add the first valid address of each static route to the loopback interface (`lo0`).

Set your router-id to the first of these loopback addresses.

Ensure that you can ping the loopback addresses from the other routers.

5 Cross



For this assignment each group will have their own network with prefix 192.168.10X.Y/24, where X is group number (A=1, B=2, etc.) and Y is the router number (1 to 4). Set the address on fe-2/0/0.
Examples: RTA1 → 192.168.101.1
RTE3 → 192.168.105.3

For this exercise, you shall start monitoring with for instance the flags *route* and *packets*.

Ensure that ping and traceroute works to all interfaces.

Disable an interface towards the shared network and study the output on the monitor. How is the neighbour adjacencies reformed? Which messages are sent?

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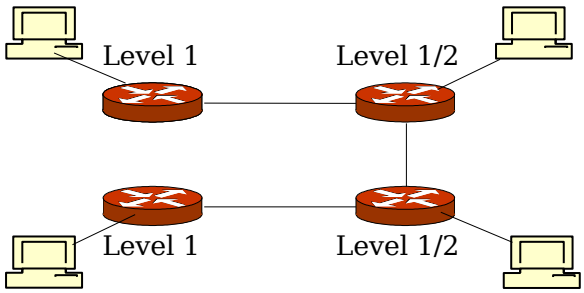
_____
_____

Milestone 3: Square and cross in ISIS.
Signature: _____

6 ISIS levels



You shall now work with ISIS areas (or levels as they are really called in ISIS).

Configure your network into a “U” shape according to the figure. Disable interfaces between RTX1 and RTX2 and disable the fe-2/0/0 interface as well. Enable level 1 on all routers and disable level 2 on RTX1 and RTX2.

Try to ping all interfaces, especially between RTX1 and RTX2.

Study the link-state databases. What does it show with respect to levels?

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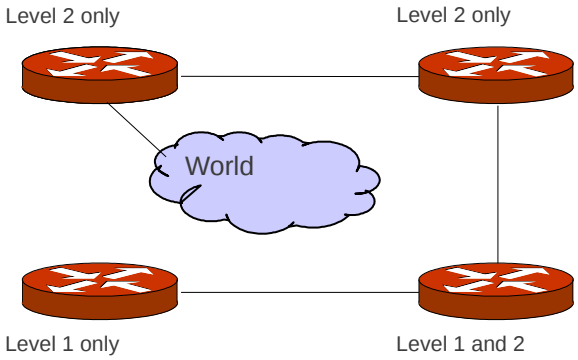
_____
_____

7 ISIS backbone[1]



Connect your network according to the topology above. Connect RTX1 to the shared 192.168.15.0/24 network. Can you ping and traceroute the hosts of the the other groups?

Explain the link-state databases.

Milestone 4: Levels in IS-IS.
Signature: _____

8 ISIS and IPv6

An advantage with IS-IS is that it can easily handle different address classes, while OSPF (OSPF v2) can only handle IPv4.

In this lab, you should set up an IPv6 network using IS-IS. This assignment is mostly an assignment in address handling.

Start by configuring the IS-IS network into a square as in Section 4 above. Configure only one area. That is, disable level 1 on all interfaces.

Define IPv6 subnets on all interfaces (fe-0/0/0, fe-1/0/0, fe-1/0/1) where you have IPv4 addresses. You can assign IPv6 addresses in many ways. Our proposal is to proceed as follows:

1. IPv4 network 192.168.X.Y is mapped to IPv6 network FEC0:168:X:Y::/64.
2. An IPv4 address 192.168.X.Z on network 192.168.X.Y is mapped to FEC0:168:X:Y::Z/64.

Examples:

10.2.4.0/24 → FEC0:2:4:0::/64
192.168.8.129/27 → FEC0:168:8:128::129/64
10.3.8.1/24 → FEC0:3:8:0::1/64

1 If you have to wait for other groups, you can start doing Section 8, and then go back to this part.

Use the regular ping and traceroute commands on the routers to debug the configuration.

View the IS-IS database. How do the IPv6 prefixes appear?

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_____
_____

Look at the routing table. Which IPv6 routes have appeared?

_____
_____
_____

You shall also configure IPv6 to work on your hosts. The nicest way to do this is to use IPv6 autoconfiguration[1]. You do this by configuring the router to send out router-advertisements on fe-0/0/0. Use the *protocols router-advertisement* command. The host should receive the advertisements and create new IPv6 addresses from the prefix that the router advertises.

You may have to enable the host to accept router advertisements from the router. Use the following commands:

```
echo "1" > /proc/sys/net/ipv6/conf/eth0/accept_ra
echo "1" > /proc/sys/net/ipv6/conf/eth0/autoconf
```

On the host, try to ping the router using the `ping6` application. If this works, try to ping the other routers, or the other hosts.

If this does not work, you may have to add/change a default IPv6 route on your host.

Milestone 5: Show an IPv6 network in IS-IS.
Signature: _____

9 Clean-up

Reset the configuration by loading (using override) the /root/labconf configuration.
Also do not forget to log out from your hosts.

10 References

[1] KTH/CSC Router lab Introduction - Juniper version
[2] KTH/CSC Router lab Reference - Juniper version
[3] KTH/CSC Router lab OSPF - Juniper version
[4] KTH/CSC Router lab Netmap - Topology 1

1 It is also possible to configure IPv6 statically on the hosts.