IK2215: Network Design Report

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1 General Information

ASN:124 **NETWORK:** 1.124.0.0/20

2 Network overview

This section contains an overview of network design.

2.1 Network diagram

The network design is illustrated in Figure 1 below.

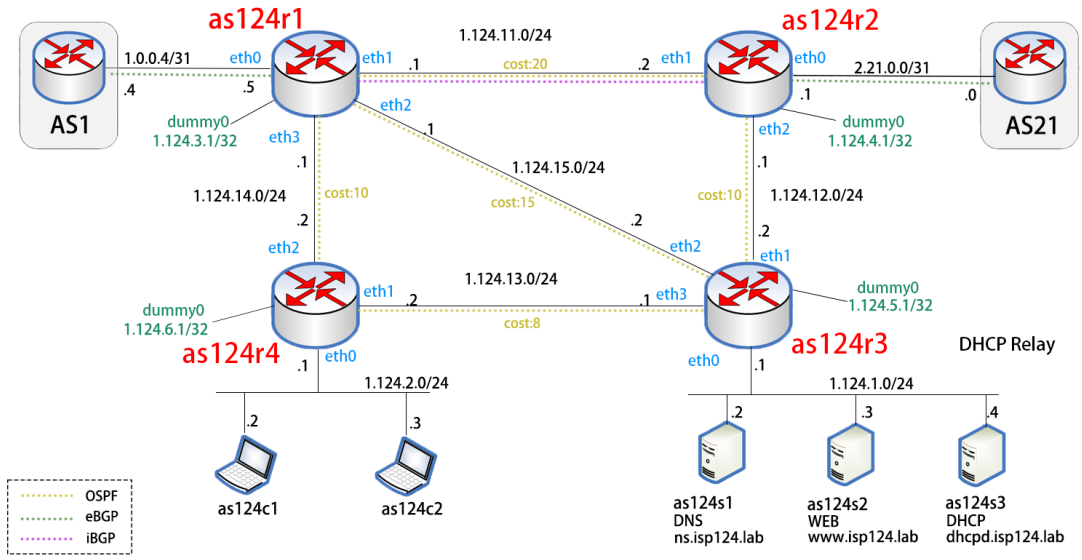

Figure 1: Network Diagram

2.2 IP address allocation

Device	Interface	IP address	Domain name
r1	eth0	1.0.0.5/31	r1eth0.isp124.lab
r1	eth1	1.124.11.1/24	r1eth1.isp124.lab
r1	eth2	1.124.15.1/24	r1eth2.isp124.lab
r1	eth3	1.124.14.1/24	r1eth3.isp124.lab
r1	dummy0	1.124.3.1/32	r1d0.isp124.lab
r2	eth0	2.21.0.1/31	r2eth0.isp124.lab
r2	eth1	1.124.11.2/24	r2eth1.isp124.lab
r2	eth2	1.124.12.1/24	r2eth2.isp124.lab
r2	dummy0	1.124.4.1/32	r2d0.isp124.lab
r3	eth0	1.124.1.1/24	r3eth0.isp124.lab
r3	eth1	1.124.12.2/24	r3eth1.isp124.lab
r3	eth2	1.124.15.2/24	r3eth2.isp124.lab
r3	eth3	1.124.13.1/24	r3eth3.isp124.lab
r3	dummy0	1.124.5.1/32	r3d0.isp124.lab
r4	eth0	1.124.2.1/24	r4eth0.isp124.lab
r4	eth1	1.124.13.2/24	r4eth1.isp124.lab
r4	eth2	1.124.14.2/24	r4eth2.isp124.lab
r4	dummy0	1.124.6.1/32	r4d0.isp124.lab
s1	eth0	1.124.1.2/24	ns.isp124.lab
s2	eth0	1.124.1.3/24	www.isp124.lab
s3	eth0	1.124.1.4/24	dhcpd.isp124.lab
c1	eth0	1.124.2.2/24	c1.isp124.lab
c2	eth0	1.124.2.3/24	c2.isp124.lab

3 Routing and service implementation

This section describes ISP implementation to realize routing and service requirements.

3.1 Routing

This section describes ISP implementation to fulfill routing requirements.

3.1.1 Intra-domain routing

In intra-domain routing, we choose to use OSPF due to its fast convergence and good loop prevention characteristics.
Since r1,r3 have three interfaces and r2,r4 have two interfaces, we interconnect r1,r3 on the basis of connecting all routers into a loop to provide more routes for the network. We use OSPF in the network and manually set the intra-router metric as Table 1 It can used to avoid equal-cost paths between two end-points. In this case, OSPF is able to automatically select the secondary path when the primary path fails.

Cost	r1	r2	r3	r4
r1	X	20	15	10
r2	20	X	10	-
r3	15	10	X	8
r4	10	-	8	X

Table 1: Direct path cost from row to column. X represents a path to itself, - represents no direct link between the two routers.

Table 2 and Table 3 below show the primary and secondary routing paths respectively.

Path	r1	r2	servers	clients
r1	X	-	r3	r4
r2	-	X	r3	r3 r4
servers	r3	r3	X	r3 r4
clients	r4	r4 r3	r4 r3	X

Table 2: Intermediate nodes in the primary routing path from row to column. X represents a path to itself, - represents a direct link without any intermediate node.

Path	r1	r2	servers	clients
r1	X	r3	r4 r3	r3 r4
r2	r3	X	r1 r3	r1 r4
servers	r3 r4	r3 r1	X	r3 r1 r4
clients	r4 r3	r4 r1	r4 r1 r3	X

Table 3: Intermediate nodes in the secondary routing path from row to column (when the primary routing path fails). X represents a path to itself, - represents a direct link without any intermediate node.

3.1.2 Inter-domain routing

We set up a iBGP connection which contains r1, r2 in AS124. r1 will be the DR and r2 will be the BDR. We use dummy0 (logical IP address) for iBGP and use ip address for eBGP.

Outbound Traffic Policy:

Both r1 and r2 prefer to send traffic destined for AS21 through AS21 because they prepend the AS path when heading to AS21. r1 is the preferred router for all other ASes because it sets a higher local preference (200) for other traffic.

Inbound Traffic Policy:

r1 sets a lower local preference (20) for traffic coming from AS21, making it not preferred for traffic from AS21. r2 sets a higher local preference (200) for traffic from AS21, making AS21's traffic more inclined to enter AS124 through r2. Other traffic is more inclined to enter AS124 through r1 because r1 sets a higher local preference for this traffic.

This strategy allows r1 and r2 to control the flow of traffic by influencing BGP path selection, ensuring network stability and efficient traffic transmission. These configurations also ensure that during normal operations, traffic to AS21 goes through the direct path (r2), while other traffic is prioritized through r1. Simultaneously, alternative paths are available to ensure network connectivity in cases where certain links fail.

Our BGP policy setup in AS124r1 and AS124r2 is shown below:

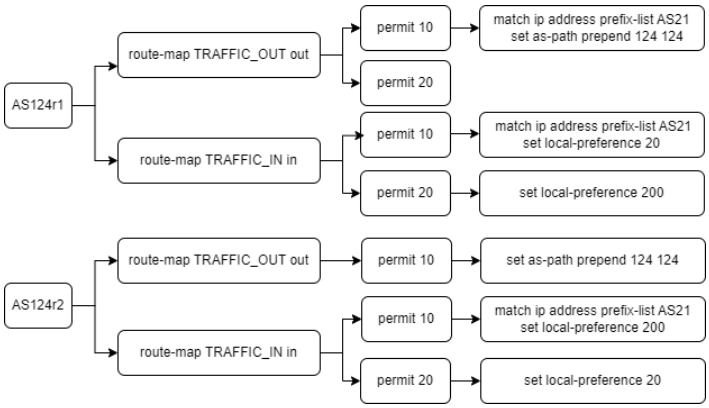

Figure 2: BGP setting in AS124r1 and AS124r2

3.2 Internet service

This section describes ISP implementation to fulfil service requirements.

3.2.1 DNS

s1 is used as the web server and IP address 1.124.1.2/24 is assigned to it.Each host within tour AS will be assigned with the domain "isp124.lab". BIND 9 is used to set up the DNS service in order to create and maintain a distributed host name and address database for computers on the network. We will configure it first and use it to ensure the DNS service works as expected. The as124s1 is named ns.isp124.lab, as124s2 is named www.isp124.lab and as124s3 is named dhcpd.isp124.lab.The DNS ip address and default gateway will be assigned to the hosts when they receive the ip address from DHCP server.

3.2.2 Web

as124s2 is used as the Web server. IP address is 1.124.1.3. Name is web.isp124.lab.The web server main page should be a simple text-based page named index.html and contain the following information:

- ASN: 124
- NETWORK: 1.124.0.0/20
- NAME1: <Yezhan Sun>
- EMAIL1: <yezhan@kth.se>
- NAME2: <Tianyi Wang>
- EMAIL2: <tiwang@kth.se>

3.2.3 DHCP

s3 is used as DHCP server and r4 is the DHCP relay. The ip address allocated to the DHCP is 1.124.1.4 and named as dhcpd.isp124lab. We initiate isc-dhcp service on as124s3 and initiate isc-dhcp-relay service on as124r4. The subnet which dhcp server service for is 1.124.2.0 and ip address assingned to the clients are 1.124.2.2 and 1.124.2.3.