CS 436 - Lab 1: ISP Networking Report

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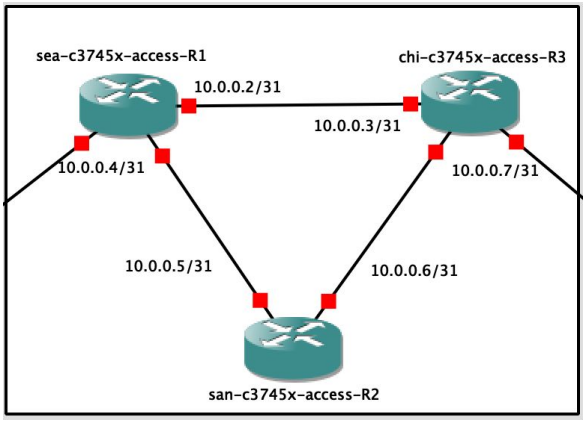
Designing the topology

Please take a few minutes to think about the issues below. Sit back and close your eyes. Pretend you really do want to start your own ISP. How would you design the topology? How specifically would you go about answering the questions above? Do a few google searches - can you uncover any information to help you take some first steps? Suppose you are meeting with your investors tomorrow and you need to tell them what moves you are making, you really have to tell them a plan. What topology would you make if you had to do it right now? Write a paragraph or so with your thoughts and include it in your report.

For this problem, we want to pitch our idea to the investors which used the least cost and the have biggest revenue. The first problem that arise in building an ISP is to know where to put the location of our POP's. The best places to put these systems are near towns or cities with a big population and high internet traffic. Preferably, upcoming housing markets that has not been tapped by other competitors. If i were to be given a choice, I would put one somewhere near Seattle - WA, Austin - TX and Denver - CO. These are upcoming tech hubs and have a large percentage of people under the age of 40. I started with a simple naive approach to build the system - make the simplest design by just having two POP nodes which is connected with each other and each of them is also connected with another ISP. This should work fine in an ideal world but we need to increase the reliability of our system and create redundancy to tolerate fault. I believe the best topology with limited amount of money is to do 3 nodes AP's each connected with each other.

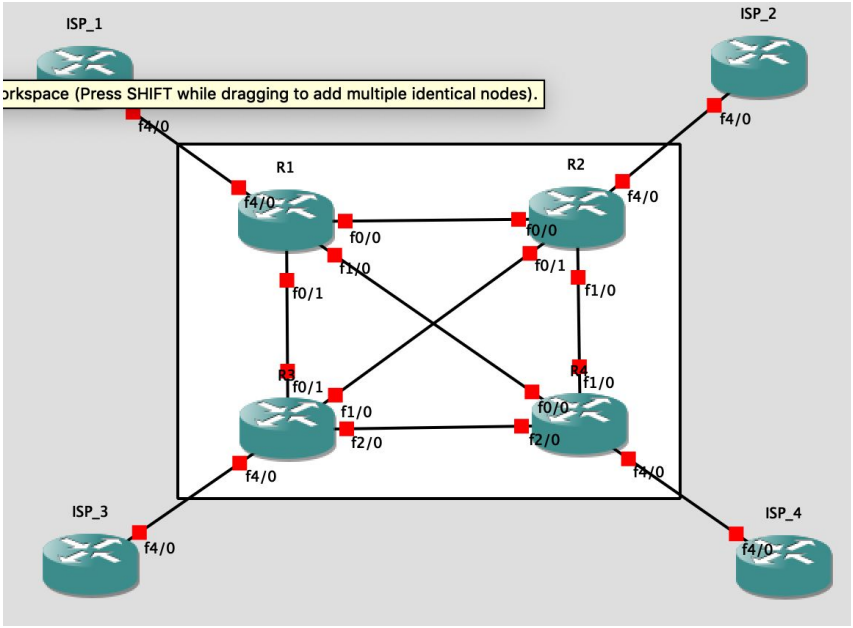


Hence if there is a failure somewhere in one of the line, it will still be functioning. Two of the nodes will be connected to two different AS that will connect our ISP topology with another ISP which means if our two of our line breaks, the data still could be transmitted through another ISP to reach our other nodes via eBGP.

Answer the following questions (in your lab writeup)

(a) What do you think about the topology, overall? Do you have any ideas to make it better?

The topology is a good start and will work functionally with some redundancies. It can withstand up to two faults in the line and still be functioning. I would add another nodes and each of the nodes will be connected with each other. Each nodes are also connected with another ISP namely (ISP_1,ISP_2,ISP_3,ISP_4). Hence in this format, we can 3 lines can be not functioning and have our network still running.



(b) What do you think about the resilience of this network? If a router fails, or a link fails, ar your customer well-protected?

I believe this network is very resilient. If we set up our policy correctly (OSPF,iBGP,eBGP) , the customer data will still be protected.

(c) There are no firewalls here. Only routers. Is that ok? Is that safe?
It is okay, but it is not perfectly safe. We could add another layer of firewall using CISCO IOS Firewall (https://www.cisco.com/en/US/products/sw/iosswrel/ps1835/products_configuration_guide_chapter09186a00800ca7c1.html) but for our case it is safe enough to not a firewall because we will set up policies to route our data such as eBGP,iBGP and OSPF.

(d) What would you do if there was a huge increase in traffic between AS 7000 and AS 9000? What bad things might happen? What are some of your options to mitigate the situation?

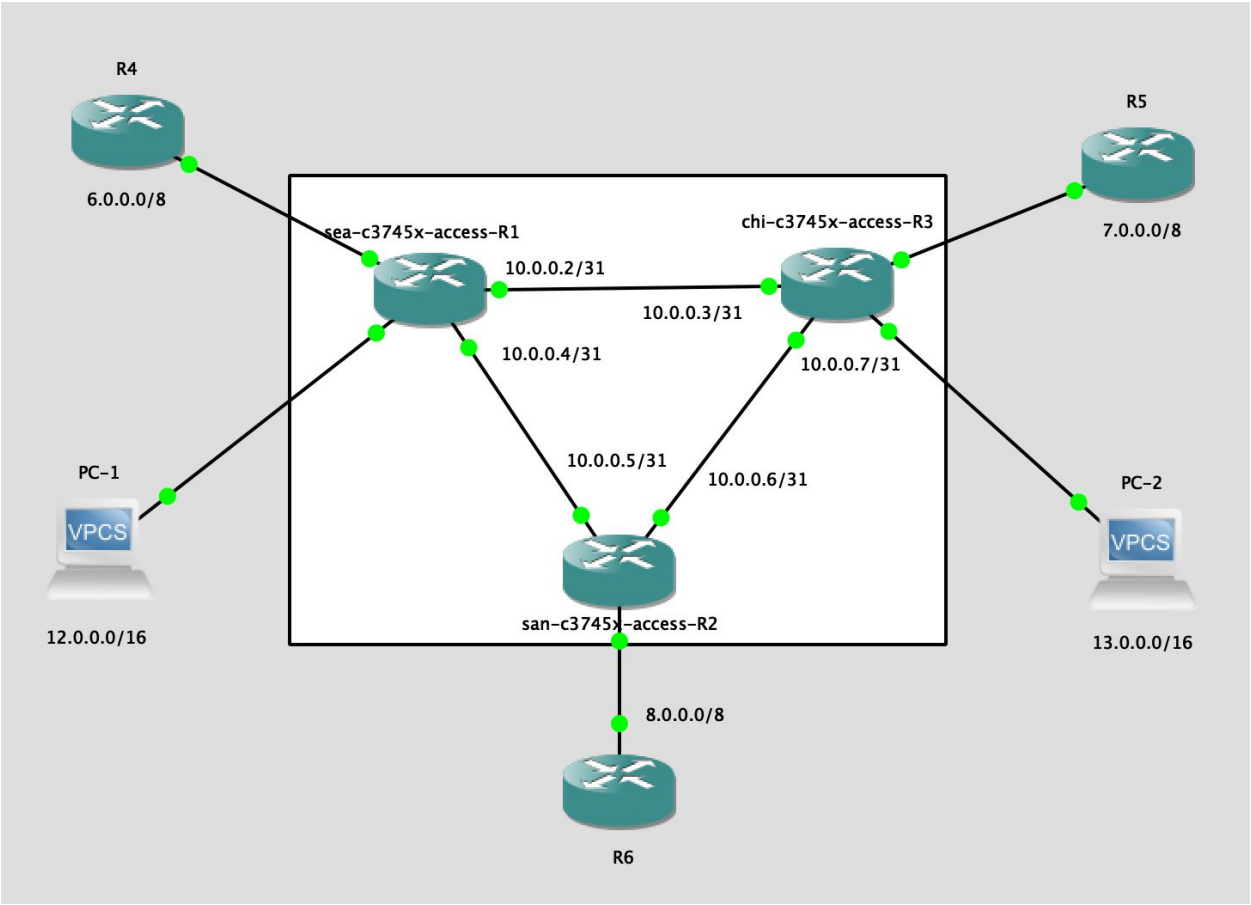
AS7000 and AS9000 could charge a lot per bit of data and it will increase our cost of to transfer data through these AS'es. Due to this fact, we have to transfer traffic through AS 8000. That being said, to mitigate this problem we could add other competitor AS to link with our routers essentially not use AS7000 and AS9000 to transfer our data. Having more AS also means that the price will be very competitive as these AS'es will fight to get us to use their AS'es to transfer our data.

Lay Physical Backhaul

1. Pretend you want to connect your PoP in Dallas, TX with your PoP in St Louis, MO. Go on google and figure out what your options are. Feel free to call sales departments at any businesses that can help. Write down in your lab report what you figure out. What business can you purchase from, what plans do they have, what info do they need from you to set it up? Write a paragraph or so on what you figure out and include it in your report (if we ever ask you to write anything, include it in your report).

The only viable way to connect our POP in Dallas to St Louis is via AT&T. The plans varies through how much quota are we using and we could get a real number on how much the cost is as it ranges from a 800-900 to couple of thousands. We didn't go through the process of negotiating the lease but we believe we could decrease the price if we did. There is also guaranteed and non guaranteed speed, where in the first the network is slower than the later but it is guaranteed that the we would get the speed that they promise and if they do not comply, we wouldn't have to pay for the service for that month but non-guaranteed speed are 10x faster with the same cost.

Final Topology for our Lab 1



R1

BGP table version is 5, local router ID is 12.0.0.2

Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,

r RIB-failure, S Stale

Origin codes: i - IGP, e - EGP, ? - incomplete

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 12.0.0.0/16	0.0.0.0	0		32768	i
r>i13.0.0.0/16	10.0.0.3	0	100	0	i

R2

BGP table version is 5, local router ID is 10.0.0.6

Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,

r RIB-failure, S Stale

Origin codes: i - IGP, e - EGP, ? - incomplete

Network	Next Hop	Metric	LocPrf	Weight	Path
r>i12.0.0.0/16	10.0.0.4	0	100	0	i
r>i13.0.0.0/16	10.0.0.7	0	100	0	i

R3

chi-c3745x-access-R3#show ip bgp

BGP table version is 5, local router ID is 13.0.0.2

Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,

r RIB-failure, S Stale

Origin codes: i - IGP, e - EGP, ? - incomplete

Network	Next Hop	Metric	LocPrf	Weight	Path
r>i12.0.0.0/16	10.0.0.2	0	100	0	i
*> 13.0.0.0/16	0.0.0.0	0		32768	i

(a) If router R4 advertises a route, which routers should receive that route? What about if router R5 advertises a route? What about if router R6 advertises a route?

R4 advertise - R1,R2,R3,R6

R5 advertise - R1,R2,R3,R6

R6 advertise - R1,R2,R3

(b) Print your configuration files as well as the terminal output of "show ip bgp", and attach them to your writeup.

Attached with this folder is the configuration files for R1, R2, R3,R4,R5,R6

Extra Questions

1. **Your upstream provider is Sprint. You maintain a BGP peering with Sprint at two separate PoPs. You wake up on Friday and your users can't send traffic to the Internet. How would you debug the issue? Please give details.**

   First check our AS if it is at fault. Hence we want to check our iBGP settings if its correct and interface settings if its fine. In this case, show ip bgp , show ip bgp neighbors , show ip bgp summary is your friend. If that does not find the problem, we could check the TCP connectivity and routing to check if the data is routing properly. We should trace our BGP data through next hop to check if we are at fault in this issue. Also check the routing table

2. **How do you protect your servers from this attack?**

   Configure the router in our network to have TCP intercept, basically i will deny a specific IP if it sends to much data through our router.

3. **You have too much traffic going over one of your links. Describe in detail how you would get traffic to shift to the other PoP (both inbound and outbound).**

   The easiest method is to use bgp traffic management by having a local preference for the traffic inside our network or iBGP. If we know the data we are sending, and we know that delay is not our concern, we could shift the traffic to somewhere else so that we could get less traffic in some of the lines inside our network. Moreover, we could do bgp

path selection for specific services from our client. By adjusting this selection criteria allows a network to shape which paths traffic primarily goes through.