Simple Clos

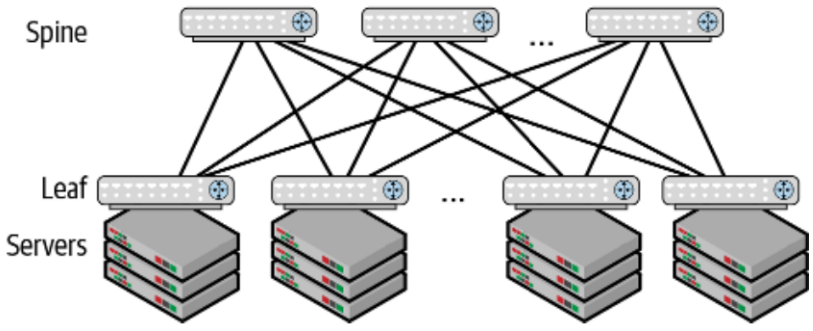
Created	@Apr 5, 2021 2:54 PM
Tags	

Simple Clos Network Using Kathara

What is Kathara?

a container-based framework to deploy virtual networks featuring NFV, SDN and traditional routing protocols (https://www.kathara.org/). for this lab, I used FRR image from kathar (https://frrouting.org/)

What is Clos?



- two layers of switches, one called the spine and the other called the leaf. Hence, the layout is also commonly called a leaf-spine topology.
- Every leaf is connected to every spine node.
- The spines connect the leaves to one another, and the leaves connect the servers to the network.

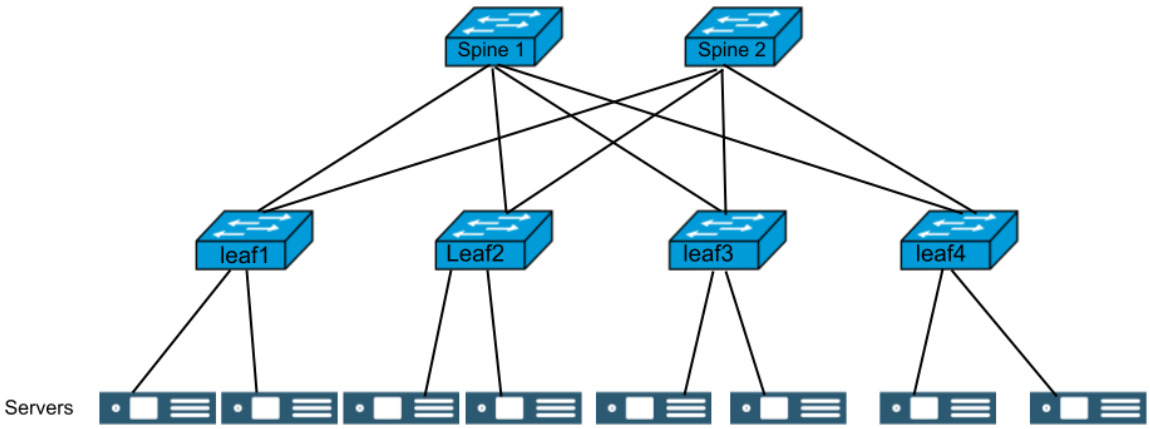
- It is common practice to put the servers and the leaf switch in a single hardware rack with the switch at the top of the rack(ToR)
- both the spine and the leaf can be the same type of device.
- there are more than two paths between any two servers.
- to increase bandwidths, add more spines
- The spines serve a single purpose: to connect the different leaves
- Compute endpoints are never attached to spines.
- to increase the amount of work supported by the network, add more leaves and servers.
- The spines are then used only to scale the available bandwidth between the edges
- In Clos, all functionality except interconnection is pushed out to the edges(For example, the spines are not responsible for responding to the Address Resolution Protocol (ARP) requests of the end stations)
- In leaves, downlinks are the server-facing links, and uplinks are the spine-facing links.
- In packet-switched networks, oversubscription of a switch is defined as the ratio of downlink to uplink bandwidth.
- most data centers ensure that higher tiers in the Clos network have a 1:1 oversubscription ratio. only leaves doesn't ave 1:1 ratio
- A 1:1 oversubscribed network is also called a nonblocking network
- Assuming we're using n-port switches for both leaf and spine, and assuming a 1:1 oversubscription, the maximum number of servers that can be connected in the Clos topology is $n^2/2$.
- The total number of switches needed in a fully built-out two-tier Clos topology with n port switches is $n + n/2$.

Pros and Cons

- With more than two spines, the loss of a single link or a spine node is not catastrophic
- In contrast to losing a spine or a link to a spine, the loss of a leaf affects all the servers connected to it.

- Systemic control-plane failures can affect the entire network
-

Topology



- Each switch has 4 ports
- In total 8 server(n^2/2)
- 6 switches (n+n/2)
- 1:1 oversubscription ratio