OPEN SHORTEST PATH FIRST PROTOCOL

March 28, 2019

Open Shortest Path First (OSPF)

OSPF support in 128T was introduced version 3.2.7. This feature enables a dynamic and flexible integration of SVR in customer networks.

Open Shortest Path First (OSPF) is an interior gateway protocol (IGP) that is most often used to dynamically manage network routes in large enterprise network. It determines routes dynamically by obtaining information from other routers and advertising routes to other routers by way of Link State Advertisements (LSAs). The information gathered from the LSAs is used to construct a topology map of the network. This topology map is shared across routers in the network and used to populate the IP routing table with available routes.

Learning routes from OSPF simplifies enterprise configuration and integration with Secure Vector Routing

Prerequisites:

This section presumes that the reader has a running 128T system and wants to add configuration to support OSPF. The running 128T system includes configuration for basic platform functionality (e.g., router, node, device-interface, network-interface) and basic routing configuration (e.g., tenants, services, etc.). Refer to the 128T data model and the Configuration Guide for a better understanding about the 128T networking.

OSPF Configuration:

The OSPF configuration exists in the routing configuration container in the 128T data model. For any routing configuration, static or dynamic, a default routing instance called `default-instance`, must be defined in the 128T configuration template. Next, an OSPF instance, `ospf <>` is defined within the `default-instance`.

Within the OSPF instance, `ospf 1`, specify the `router-id <>`. The router-id uniquely identifies this OSPF router within the area to other OSPF routers. You can redistribute all the connected, static, service and/or BGP routes by specifying `redistribute <connected/static/service/bgp>` within the OSPF instance. Within each of these redistribute elements you can specify metrics, metric-type, and policies to apply to the redistributed routes.

Next, specify the area ID using, `area <ID>` in format x.x.x.x under the OSPF instance and place the desired interface (usually the WAN interface) in that area using `interface <node> <network interface>.`

```
admin@branchoffice1.seattlesite1# config auth
admin@branchoffice1.seattlesite1 (authority)# router seattlesite1
admin@branchoffice1.seattlesite1 (router[name=seattlesite1])# routing
default-instance
admin@branchoffice1.seattlesite1 (routing[type=default-instance])# ospf
1
admin@branchoffice1.seattlesite1 (ospf[instance=1])# router-id
192.168.7.93
admin@branchoffice1.seattlesite1 (ospf[instance=1])# redistribute
connected
admin@branchoffice1.seattlesite1 (redistribute[protocol=connected])#
protocol connected
admin@branchoffice1.seattlesite1 (redistribute[protocol=connected])# up
admin@branchoffice1.seattlesite1 (ospf[instance=1])# area 0.0.0.1
admin@branchoffice1.seattlesite1 (area[id=0.0.0.1])# interface
branchoffice1 wan1
admin@branchoffice1.seattlesite1
(interface[node=branchoffice1][interface=wan1])# exit
admin@branchoffice1.seattlesite1 (area[id=0.0.0.1])# exit
admin@branchoffice1.seattlesite1 (ospf[instance=1])# show

instance      1
router-id     192.168.7.93

redistribute  connected
    protocol  connected
exit

area          0.0.0.1
    id         0.0.0.1

    interface  branchoffice1 wan1
        node       branchoffice1
        interface  wan1
    exit
exit
```

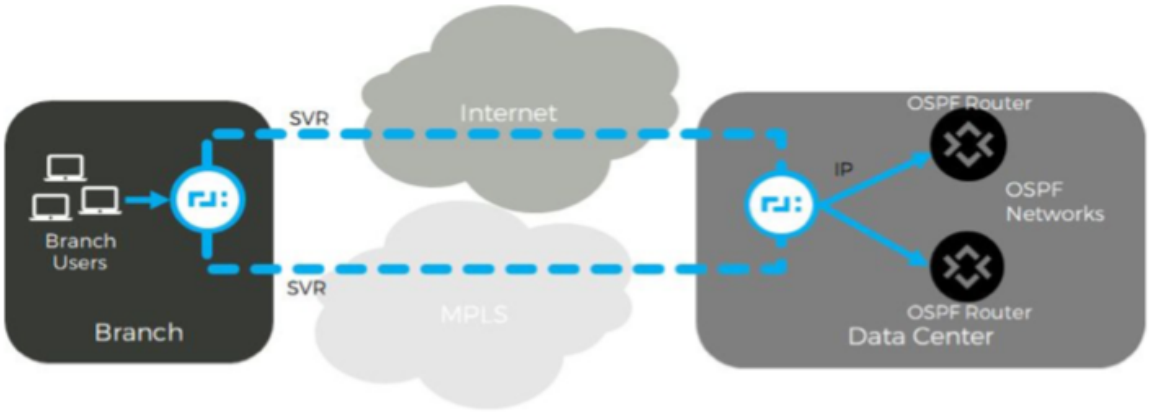
Note: *if adding an interface that is part of a highly available set (e.g., they share the same MAC address and global ID), it is important that you only add one of the interfaces into the area. This will be sufficient to achieve high availability, as the 128T software will map the "shared" interface into the area*.

Go up to the instance level and issue a `show` command to view the OSPF config prior to committing any changes. An ideal OSPF configuration must look like:

```
admin@branchoffice1.seattlesite1 (ospf[instance=1])# show
instance      1
router-id     192.168.7.93

redistribute  connected
    protocol  connected
exit

area          0.0.0.1
    id         0.0.0.1

    interface  branchoffice1 wan1
        node       branchoffice1
        interface  wan1
    exit
exit
```

To enable service routing (service-route elements) to leverage the learned routes that a 128T has exchanged via OSPF (or any routing protocol), the “use-learned-routes” selector should be enabled in the appropriate service-route configuration. You must create a service and then associate it with this service-route.

```
admin@branchoffice1.seattlesite1 (authority)# router seattlesite1
*admin@branchoffice1.seattlesite1 (router[name=seattlesite1])# service-route
rte_internet
*admin@branchoffice1.seattlesite1 (service-route[name=rte-internet])# use-
learned-routes
*admin@branchoffice1.seattlesite1 (service-route[name=rte-internet])# service-
name internet
*admin@branchoffice1.seattlesite1 (service-route[name=rte_internet])# show
name                  rte_internet
service-name          internet
use-learned-routes
```



OSPF Verification:

Issue the `show ospf` command on your 128T:

```
admin@branchoffice1.seattlesite1# show ospf
Wed 2019-02-20 00:23:14 UTC

Router          Router ID      ABR Type   ASBR Router   External LSA Count   Area ID   Area Type   Area Border Router
seattlesite1    192.168.7.93   unknown    true          18                   0.0.0.1   normal

Completed in 0.33 seconds
admin@branchoffice1.seattlesite1#
```

In addition to the `show ospf` branch of output, you will now see contributions to the RIB from OSPF in the output of `show rib`

```
admin@branchoffice1.seattlesite1# show rib
Wed 2019-02-20 00:26:22 UTC
Codes: K - kernel route, C - connected, S - static, R - RIP,
       O - OSPF, I - IS-IS, B - BGP, E - EIGRP, N - NHRP,
       T - Table, v - VNC, V - VNC-Direct, A - Babel, D - SHARP,
       F - PBR,
       > - selected route, * - FIB route

O   1.1.1.0/24 [110/10] is directly connected, g6, 5d20h47m
C>* 1.1.1.0/24 is directly connected, g6, 5d20h47m
C>* 10.0.128.0/31 is directly connected, g3, 5d20h47m
C>* 10.128.128.2/32 is directly connected, bgp-int-seattle, 5d20h47m
K   10.128.128.3/32 [254/0] is directly connected, g6, 2d03h32m
K * 10.128.128.3/32 [254/65535] unreachable (blackhole), 2d03h32m
K   128.128.128.1/32 [254/65535] unreachable (blackhole), 5d20h47m
K   128.128.128.128/32 [254/65535] unreachable (blackhole), 5d20h47m
C>* 169.254.127.126/31 is directly connected, g4294967294, 5d20h47m
K   172.16.128.2/32 [254/65535] unreachable (blackhole), 5d20h47m
K>* 172.26.128.2/32 [254/65535] unreachable (blackhole), 5d20h47m
O>* 192.168.7.0/24 [110/20] via 1.1.1.1, g6, 5d20h46m
C>* 192.168.64.0/24 is directly connected, g4, 5d20h47m


Completed in 0.41 seconds
```

OSPF Troubleshooting:
Issue the following commands to verify OSPF related information:

- Verify OSPF router information (`show ospf detail` or `show ospf summary`)
    - Check the area
    - Check for adjacency
- Verify OSPF interface (`show ospf interfaces`)
- Verify OSPF neighbors (`show ospf neighbors`)
    - Check state FULL for each neighbor
    - Verify which router is the designated router

```
admin@branchoffice1.seattlesite1# show ospf interfaces
Wed 2019-02-20 00:29:40 UTC

 Router Name   Device Interface   Network Interface   Status   IP Address     OSPF Type   Area ID   Area Type
 seattlesite1  wan1              wan1                up       1.1.1.128/24   Peer        0.0.0.1   normal

Completed in 0.38 seconds
admin@branchoffice1.seattlesite1# show ospf neighbors
Wed 2019-02-20 00:32:28 UTC

 Router Name   Neighbor Router ID   Priority   State   Dead Timer Due (s)   Interface Address   Interface State
 seattlesite1  192.168.7.101       1          Full    35.328               1.1.1.128           DR

Completed in 0.35 seconds
```

- Verify RIB (`show rib` or `show ospf routes`)
    - Routes beginning with O are OSPF routes
- Verify FIB (`show fib)`
    - FIB entry has the appropriate next hop