Case G GB tunnel routing test for sub-pool reroute based on bandwidth availability.

G6. Test Results

Step G4.1.6:

```
semtec#sh mpls traffic link-management advertisements
Flooding Status:        ready
Configured Areas:       1
IGP Area[1] ID::  ospf area 0
  System Information::
    Flooding Protocol:    OSPF
  Header Information::
    IGP System ID:        10.130.255.3
    MPLS TE Router ID:    10.130.255.3
    Flooded Links:        2
  Link ID::   0
    Link IP Address:      10.130.2.2
    IGP Neighbor:         ID 10.130.255.1, IP 10.130.2.1
    Admin. Weight:        1
    Physical Bandwidth:   622000 kbits/sec
    Res. Global BW:       124000 kbits/sec
    Res. Sub BW:          64000 kbits/sec
    Downstream::
                               Global Pool    Sub Pool
                               -----------    ----------
      Reservable Bandwidth[0]:      124000        64000 kbits/sec
      Reservable Bandwidth[1]:      124000        64000 kbits/sec
      Reservable Bandwidth[2]:      124000        64000 kbits/sec
      Reservable Bandwidth[3]:      105400        45400 kbits/sec
      Reservable Bandwidth[4]:      105400        45400 kbits/sec
      Reservable Bandwidth[5]:      105400        45400 kbits/sec
      Reservable Bandwidth[6]:      105400        45400 kbits/sec
      Reservable Bandwidth[7]:      105400        45400 kbits/sec
    Attribute Flags:      0x00000000
  Link ID::   1
    Link IP Address:      10.130.49.1
    IGP Neighbor:         ID 10.130.255.2, IP 10.130.49.2
    Admin. Weight:        1
    Physical Bandwidth:   622000 kbits/sec
    Res. Global BW:       124000 kbits/sec
    Res. Sub BW:          64000 kbits/sec
    Downstream::
                               Global Pool    Sub Pool
                               -----------    ----------
      Reservable Bandwidth[0]:      124000        64000 kbits/sec
      Reservable Bandwidth[1]:      124000        64000 kbits/sec
      Reservable Bandwidth[2]:      124000        64000 kbits/sec
      Reservable Bandwidth[3]:           0            0 kbits/sec
      Reservable Bandwidth[4]:           0            0 kbits/sec
      Reservable Bandwidth[5]:           0            0 kbits/sec
      Reservable Bandwidth[6]:           0            0 kbits/sec
      Reservable Bandwidth[7]:           0            0 kbits/sec
    Attribute Flags:      0x00000000
```

Verdict:

Pass. The administrative weights for both Link 0 and Link 1 are set to the default (1).

Comments:

Note that you must make certain that the proper amount of bandwidth is reserved on each link in the path when building tunnels. We had some configuration consternation because we only looked at the bandwidth available on the first link in the path.

Step G4.2.0.1:

```
semtec# sh mpls traffic tunnel

Name: semtec_t1                          (Tunnel1) Destination: 10.130.255.2
  Status:
    Admin: up         Oper: up      Path: valid       Signalling: connected

    path option 1, type dynamic (Basis for Setup, path weight 1)

  Config Parameters:
    Bandwidth: 24800     kbps (Global) Priority: 3  3   Affinity: 0x0/0xFFFF
    AutoRoute:  disabled  LockDown: disabled

  InLabel  :   -
  OutLabel : POS3/3, implicit-null
  RSVP Signalling Info:
      Src 10.130.255.3, Dst 10.130.255.2, Tun_Id 1, Tun_Instance 352
    RSVP Path Info:
      My Address: 10.130.255.3
      Explicit Route: 10.130.49.2 10.130.255.2
      Record   Route:   NONE
      Tspec: ave rate=24800 kbits, burst=1000 bytes, peak rate=24800 kbits
    RSVP Resv Info:
      Record   Route:   NONE
      Fspec: ave rate=24800 kbits, burst=1000 bytes, peak rate=Inf
  History:
    Current LSP:
      Uptime: 1 hours, 16 minutes
    Prior LSP:
      ID: path option 1 [351]
      Removal Trigger: tunnel shutdown
Name: semtec_t2                          (Tunnel2) Destination: 10.130.255.2
  Status:
    Admin: up         Oper: up      Path: valid       Signalling: connected

    path option 1, type dynamic (Basis for Setup, path weight 1)

  Config Parameters:
    Bandwidth: 12400     kbps (Sub) Priority: 3  3   Affinity: 0x0/0xFFFF
    AutoRoute:  disabled  LockDown: disabled

  InLabel  :   -
  OutLabel : POS3/3, implicit-null
  RSVP Signalling Info:
      Src 10.130.255.3, Dst 10.130.255.2, Tun_Id 2, Tun_Instance 197
    RSVP Path Info:
      My Address: 10.130.255.3
      Explicit Route: 10.130.49.2 10.130.255.2
      Record   Route:   NONE
      Tspec: ave rate=12400 kbits, burst=1000 bytes, peak rate=12400 kbits
    RSVP Resv Info:
      Record   Route:   NONE
      Fspec: ave rate=12400 kbits, burst=1000 bytes, peak rate=12400 kbits
  History:
    Current LSP:
      Uptime: 1 hours, 16 minutes
    Prior LSP:
      ID: path option 1 [196]
      Removal Trigger: tunnel shutdown
Name: semtec_t3                          (Tunnel3) Destination: 10.130.255.2
  Status:
    Admin: up         Oper: up      Path: valid       Signalling: connected

    path option 1, type dynamic (Basis for Setup, path weight 1)

  Config Parameters:
    Bandwidth: 12400     kbps (Sub) Priority: 3  3   Affinity: 0x0/0xFFFF
    AutoRoute:  disabled  LockDown: disabled

  InLabel  :   -
  OutLabel : POS3/3, implicit-null
  RSVP Signalling Info:
      Src 10.130.255.3, Dst 10.130.255.2, Tun_Id 3, Tun_Instance 4
    RSVP Path Info:
      My Address: 10.130.255.3
      Explicit Route: 10.130.49.2 10.130.255.2
      Record   Route:   NONE
      Tspec: ave rate=12400 kbits, burst=1000 bytes, peak rate=12400 kbits
```

```
       RSVP Resv Info:
         Record    Route:   NONE
         Fspec: ave rate=12400 kbits, burst=1000 bytes, peak rate=12400 kbits
     History:
       Current LSP:
         Uptime: 46 minutes, 34 seconds
         Selection: reoptimation
       Prior LSP:
         ID: path option 1 [3]
         Removal Trigger: path verification failed
Name: semtec_t4                             (Tunnel4) Destination: 10.130.255.2
   Status:
     Admin: up         Oper: up      Path: valid        Signalling: connected

     path option 1, type dynamic (Basis for Setup, path weight 1)

   Config Parameters:
     Bandwidth: 74400     kbps (Global) Priority: 3  3   Affinity: 0x0/0xFFFF
     AutoRoute:  disabled LockDown: disabled

   InLabel  :   -
   OutLabel : POS3/3, implicit-null
   RSVP Signalling Info:
       Src 10.130.255.3, Dst 10.130.255.2, Tun_Id 4, Tun_Instance 41
     RSVP Path Info:
       My Address: 10.130.255.3
       Explicit Route: 10.130.49.2 10.130.255.2
       Record    Route:   NONE
       Tspec: ave rate=74400 kbits, burst=1000 bytes, peak rate=74400 kbits
     RSVP Resv Info:
       Record    Route:   NONE
       Fspec: ave rate=74400 kbits, burst=1000 bytes, peak rate=Inf
   History:
     Current LSP:
       Uptime: 20 minutes, 29 seconds
     Prior LSP:
       ID: path option 1 [40]
       Removal Trigger: tunnel shutdown
Name: semtec_t5                             (Tunnel5) Destination: 10.130.255.2
   Status:
     Admin: up         Oper: up      Path: valid        Signalling: connected

     path option 1, type dynamic (Basis for Setup, path weight 2)

   Config Parameters:
     Bandwidth: 18600     kbps (Sub)  Priority: 3  3   Affinity: 0x0/0xFFFF
     AutoRoute:  disabled LockDown: disabled

   InLabel  :   -
   OutLabel : POS3/1, 16
   RSVP Signalling Info:
       Src 10.130.255.3, Dst 10.130.255.2, Tun_Id 5, Tun_Instance 1
     RSVP Path Info:
       My Address: 10.130.255.3
       Explicit Route: 10.130.2.1 10.130.1.2 10.130.255.2
       Record    Route:   NONE
       Tspec: ave rate=18600 kbits, burst=1000 bytes, peak rate=18600 kbits
     RSVP Resv Info:
       Record    Route:   NONE
       Fspec: ave rate=18600 kbits, burst=1000 bytes, peak rate=18600 kbits
   History:
     Current LSP:
       Uptime: 17 minutes, 39 seconds


semtec#sh mpls traffic link-management advertisements
Flooding Status:       ready
Configured Areas:      1
IGP Area[1] ID::  ospf area 0
   System Information::
     Flooding Protocol:    OSPF
   Header Information::
     IGP System ID:        10.130.255.3
     MPLS TE Router ID:    10.130.255.3
     Flooded Links:        2
   Link ID::  0
     Link IP Address:      10.130.2.2
     IGP Neighbor:         ID 10.130.255.1, IP 10.130.2.1
```

```
        Admin. Weight:          1
        Physical Bandwidth:     622000 kbits/sec
        Res. Global BW:         124000 kbits/sec
        Res. Sub BW:            64000 kbits/sec
        Downstream::
                                Global Pool    Sub Pool
                                -----------    ----------
          Reservable Bandwidth[0]:      124000         64000 kbits/sec
          Reservable Bandwidth[1]:      124000         64000 kbits/sec
          Reservable Bandwidth[2]:      124000         64000 kbits/sec
          Reservable Bandwidth[3]:      105400         45400 kbits/sec
          Reservable Bandwidth[4]:      105400         45400 kbits/sec
          Reservable Bandwidth[5]:      105400         45400 kbits/sec
          Reservable Bandwidth[6]:      105400         45400 kbits/sec
          Reservable Bandwidth[7]:      105400         45400 kbits/sec
        Attribute Flags:        0x00000000
      Link ID::   1
        Link IP Address:        10.130.49.1
        IGP Neighbor:           ID 10.130.255.2, IP 10.130.49.2
        Admin. Weight:          1
        Physical Bandwidth:     622000 kbits/sec
        Res. Global BW:         124000 kbits/sec
        Res. Sub BW:            64000 kbits/sec
        Downstream::
                                Global Pool    Sub Pool
                                -----------    ----------
          Reservable Bandwidth[0]:      124000         64000 kbits/sec
          Reservable Bandwidth[1]:      124000         64000 kbits/sec
          Reservable Bandwidth[2]:      124000         64000 kbits/sec
          Reservable Bandwidth[3]:           0             0 kbits/sec
          Reservable Bandwidth[4]:           0             0 kbits/sec
          Reservable Bandwidth[5]:           0             0 kbits/sec
          Reservable Bandwidth[6]:           0             0 kbits/sec
          Reservable Bandwidth[7]:           0             0 kbits/sec
        Attribute Flags:        0x00000000
```

Verdict:

Pass. The tunnels 1-5 have been successfully created. Bandwidth reservations are configured as in the table in section G4.2.0

Comments:

Note that sub-pool tunnel 5 was routed across Link 3 (Explicit Route: 10.130.2.1 10.130.1.2 10.130.255.2) since there was insufficient bandwidth available via Link L4, and that this sub-pool tunnel took a different route than its' global tunnel 4 (Explicit Route: 10.130.49.2 10.130.255.2).

Step G2.0.2:

Smartbits Output:

Name	Frame	Load (%)	Sent	Received	Lost	Loss (%)
Total		50	2533780	2533780	0	0
Tunnel 1	128	50	506756	506756	0	0
Tunnel 2	128	50	506756	506756	0	0
Tunnel 3	128	50	506756	506756	0	0
Tunnel 4	128	50	506756	506756	0	0
Tunnel 5	128	50	506756	506756	0	0

Tunnel 2	128	95	962837	962837	0	0
Tunnel 3	128	95	962837	962837	0	0
Tunnel 4	128	95	962837	962837	0	0
Tunnel 5	128	95	962837	962837	0	0

Verdict:
Pass. Note that there is no loss associated with the test traffic sent over Tunnels 2 and 3, even though the amount of test traffic (see comment below) exceeded the reserved bandwidth for the tunnels. In the case where bandwidth is available on the link, and there is no other QoS mechanism configured (CAR, etc.), then the traffic will be allowed to exceed the reserved bandwidth for a tunnel.

Comments:
The approximate amount of bandwidth sent on each stream is: (Tester interface bandwidth * Utilization percentage) / number of streams   In the case of a 100 Mbps Fast Ethernet interface on the tester running at 95% utilization with 5 streams, the amount of traffic per stream is approximately 19 Mbps.

Step G4.3.0:
None.

Observation:
We initially did have some problems configuring the tunnels. Note that you must make certain that the proper amount of bandwidth is reserved on each link in the path when building tunnels. We had some configuration consternation because we only looked at the bandwidth available on the first link in the path.

Comments:
None.