Configuring G350 dynamic-CAC for branch offices with a Cisco WAN router

Abstract

Call Admission Control (CAC) is the capability to avoid QoS degradation due to VoIP congestion on low bandwidth WAN links by blocking (or redirecting) calls when the WAN link bandwidth is exhausted. The Dynamic-CAC feature allows a converged gateway, to update the CAC process about the currently available bandwidth. It is useful, for example, when a backup WAN link has less bandwidth than the primary link. The converged-gateway router derives the currently available bandwidth figure from the state of its WAN links and is applicable when the gateway is also the branch office WAN router.

This application note presents a method for using dynamic-CAC when the branch office WAN interfaces are connected to a Cisco router rather than the gateway. The key is to use GRE tunnels with keepalives to let the gateway probe the WAN interfaces status.
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1. Overview

The example shown in Figure 1 presents a method for running dynamic Call Admission Control (CAC) in sites where the G350 is not the WAN router. The challenge in this configuration is to identify scenarios where the primary link fails, but connectivity remains via a low bandwidth/low QoS backup link that is inadequate for VoIP. For example, a 512 Kbps fractional T1 link and a 144 kbps sDSL with a VPN used as a backup.

The key is to establish a generic-routing encapsulation (GRE) tunnel between the G350 and the remote router and to configure static routes on the Cisco router to ensure that the GRE tunnel uses only the primary link. Dynamic CAC is configured on this tunnel, and the G350 uses GRE “keep-alives” to verify that the tunnel is up.

If dynamic CAC is defined on the GRE tunnel only, the media gateway reports a bandwidth value of zero when the GRE tunnel is down. When CAC bandwidth is zero, CM prevents the users from placing new calls over the backup link. For information on how to report a nonzero bandwidth value when the primary link is down, see Section 2.1.4, “Nonzero default dynamic-CAC bandwidth.”

In the example shown in Figure 1, the Open Shortest Path First (OSPF) routing protocol is configured between the headquarters (HQ) and the branch office (BO) routers and a virtual private network (VPN) appliance is used to create a secured tunnel over the DSL link (that is connected to the public internet). Since OSPF cannot run over IPSEC-VPN directly, a second GRE tunnel is configured over the backup link.

In theory, if a GRE tunnel remote peer interface is down, the GRE tunnel keepalives should not be answered and the tunnel should also be down. However, Cisco IOS behaves differently and the GRE tunnel remains up. For that reason, simply creating a GRE tunnel between the G350 and the primary WAN interface will not be sufficient. The solution is to establish the GRE tunnel between the G350 and the remote WAN router and to install a permanent static route at the branch office router that redirects the tunnel to the primary WAN interface, regardless of its state.
Notes:
- In this example, the dynamic-CAC VoIP bearer-bandwidth limit (BBL) is 400 Kbps, while the link bandwidth is 512 Kbps; the rest is reserved for data and signaling.
- The tunnel enumeration is a local property. However, in this example in this example we use the same enumeration on both ends.
- This Cisco router can also be connected via one of the power-over-Ethernet (PoE) ports.

2. G350 configuration

Below is the relevant section from G350 ‘startup-config’ file.

Notes:
- The GRE-tunnel destination IP is the remote interface of the HQ WAN router.
- To allow fast tunnel-failure detection, the GRE tunnel “keep-alive” rate is set to 1 second.
- Dynamic CAC is configured on the tunnel.
- The tunnel is not used to route traffic, so the GRE tunnel does not include an IP interface.
3. Branch-office router configuration

Below is the relevant section from the branch office WAN router ‘startup-config’ file.

Notes:
- “Interface tunnel 3” is the GRE tunnel that enables OSPF over the VPN.
- A permanent, static route forces the dynamic-CAC GRE tunnel to use only the primary link.
- A permanent, static route forces the OSPF GRE tunnel to use only the backup link, even though the backup link has a higher OSPF than the primary link.
linecode ami
!
! This GRE tunnel enables OSPF over the VPN
! The tunnel may be omitted if only static routing are used
interface Tunnel3
  ip address 40.40.40.2 255.255.255.0
  keepalive 5 3
  tunnel source 30.0.2.2
  tunnel destination 30.0.2.1
!
! Branch office LAN
interface Ethernet0/0
  ip address 70.70.70.1 255.255.255.0
  half-duplex
!
! Primary WAN link (T1)
interface Serial0/0:1
  ip address 20.0.1.2 255.255.255.0
  encapsulation ppp
!
! This is the Ethernet interface connected to the external VPN
interface Ethernet0/1
  ip address 30.0.2.2 255.255.255.0
  half-duplex
!
router ospf 1
  log-adjacency-changes
  redistribute connected subnets
  ! enable OSPF on the WAN links
  network 20.0.1.0 0.0.0.255 area 0
  network 40.40.40.0 0.0.0.255 area 0
!
! enable CIDR
ip classless
!
! This static route mandates the GRE tunnel between the two
! Cisco routers to use only the Ethernet interface (to the VPN)
ip route 30.0.2.0 255.255.255.0 Ethernet0/1 permanent

! This static route force the GRE tunnel between the GRE and
! the remote WAN router to use only the primary link. The G350
! probes the tunnel status with GRE-keepalives and so when the
! primary link fail the GRE would be down.
ip route 20.0.1.0 255.255.255.0 Serial0/0:1 permanent
4. Headquarters router configuration

Below is the relevant section from the headquarters WAN router ‘startup-config’ file.

Note:
This configuration includes two GRE tunnels: One tunnel is for the G350 and one tunnel is for the branch-office (BO) router, to allow running of OSPF over the IPSEC-VPN.

```
! controller T1 1/0
   framing sf
   linecode ami
   channel-group 1 timeslots 1-8
!
controller T1 1/1
   framing sf
   linecode ami
!
! The GRE tunnel to the G350 – does not need an IP interface
interface Tunnel2
   no ip address
   tunnel source 20.0.1.1
   tunnel destination 70.70.70.2
!
! The tunnel to the BO WAN router (for OSPF over VPN)
interface Tunnel3
   ip address 40.40.40.1 255.255.255.0
   tunnel source 30.0.2.1
   tunnel destination 30.0.2.2
!
! LAN interface
interface FastEthernet0/0
   ip address 10.10.1.1 255.255.255.0
   duplex auto
   speed auto
!
! Ethernet connection to the VPN appliance
interface FastEthernet0/1
   ip address 30.0.2.1 255.255.255.0
   duplex auto
   speed auto
!
interface Serial1/0:1
   ip address 20.0.1.1 255.255.255.0
   encapsulation ppp
!
router ospf 1
   log-adjacency-changes
   redistribute connected subnets
   network 10.10.1.0 0.0.0.255 area 0
   network 20.0.1.0 0.0.0.255 area 0
```
5. Nonzero default dynamic-CAC bandwidth

When all the interfaces for which “dynamic CAC” is configured are down, the media gateway reports zero bandwidth to Avaya Communication Manager. If the G350 is also the WAN router, the user can configure “dynamic-CAC” as the bandwidth setting directly on the backup link. However, in our scenario, the backup link is connected to the Cisco router.

To overcome this problem, the user can define dynamic-CAC with low priority on an interface that is always up. The bandwidth configured on that interface will be reported to CM only if the primary dynamic-CAC interface is down.

Note that if both the primary and backup links are down, dynamic-CAC is not relevant as the gateway will not be registered with the remote CM (and Local Spare Process is configured not to use WAN links for VoIP).

Starting from version 2.2 (23) it is possible to configure ‘dynamic-CAC’ over VLAN interfaces, which makes it a natural candidate. The alternative for older versions was to use an additional GRE tunnel on the G350 without “keep-ALives.” Such a GRE tunnel is up as long as there is a route to its peer address.

Below is the relevant section from G350 ‘startup-config’ file:

```plaintext
interface Tunnel 5
! This GRE tunnel is always UP. It is used for configuring a default
! dynamic-cac bandwidth for cases where the tunnel that goes over
! primary WAN link is down.
! Note that the 'dynamic-cac’ priority on this link was set to
! its lowest value (1). In this case the backup link dynamic-CAC
! bandwidth is set to 100Kbps
dynamic-cac 100 1
  tunnel source 70.70.70.1
  ! The GRE tunnel is up as long as there is route to the destination
  ! network. To be on the safe side, the destination IP is a
  ! local network.
  ! No traffic is traveling over this tunnel so any IP on the local
  ! subnet will do
  tunnel destination 70.70.70.70
exit
```
6. Additional Material

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