



# Remote Cable MSO Links Solution Overview

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## Overview

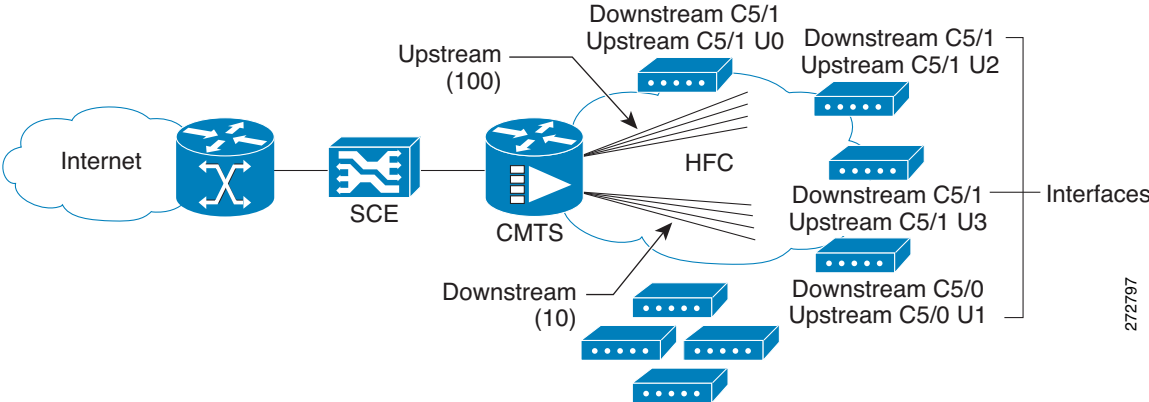
In cable multiple service operator (MSO) networks, the Cisco SCE is inserted in a location upstream of the cable modem termination system (CMTS), which is the first IP hop in the MSO network. In this location, the Cisco SCE is often used to implement fair use policies (FUP) and perform congestion mitigation. MSOs work to ensure that the existing network infrastructure is used optimally by using the Cisco SCE to enforce fairness between the different subscribers when the network is in a state of congestion.

The bandwidth of the radio frequency interfaces of the CMTS ranges from several megabits per second (Mb/s) to tens of Mb/s. The CMTS aggregates these interfaces into higher bandwidth upstream links, typically 1 gigabit per second (Gb/s), where the Cisco SCE is connected.

Cable modems which are connected to the hybrid fiber-coaxial (HFC) cable downstream connection of the CMTS are associated with CMTS interfaces. The CMTS interfaces can be termed upstream or downstream upon bootup or dynamically (depending on the direction of traffic flow) when you use some load balancing algorithms.

Figure 1-1 shows a typical deployment topology of an Cisco SCE in an MSO network.

**Figure 1-1 Cisco SCE Deployed in MSO Network**



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# Solution Overview

As part of the Remote Cable MSO Links solution, the Virtual Link Manager (VLM) makes the Cisco SCE aware of the interface association of subscribers (cable modems) and accounts for and controls aggregate traffic in the context of a physical interface (CMTS upstream or downstream). This awareness allows the Cisco SCE to perform congestion mitigation at the level of the CMTS physical interface.

The solution is required to manage a large number of subscribers, each of which is connected to the CMTS and through it to the Cisco SCE. Within the CMTS, subscribers are connected to shared radio frequency interfaces, where they use the Data-Over-Cable Service Interface Specifications (DOCSIS) MAC layer to transport their traffic. The shared radio frequency interfaces are termed upstream and downstream.

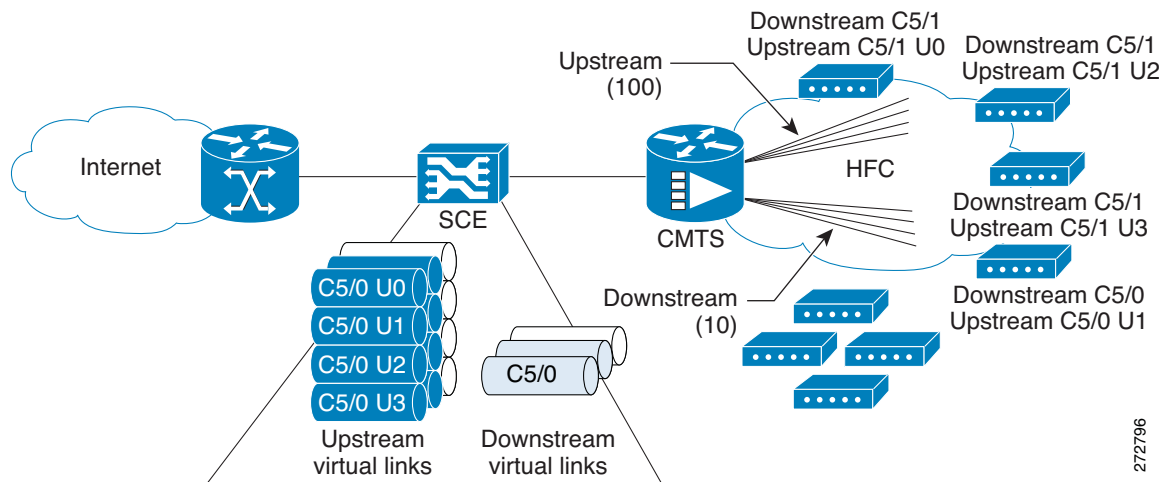
CMTS upstream and downstream interfaces are aggregated through the CMTS interface toward the core of the network, and eventually end in one or several physical interfaces that are connected to the Cisco SCE, which monitors and controls traffic.

MSOs use the Cisco SCE to prioritize traffic within each of the CMTS radio frequency interfaces when traffic is congested. Cisco Service Control provides a virtual link concept that allows MSOs to monitor and control traffic for each interface.

Although it is possible to prioritize traffic by allocating packages to pairs of interfaces, this process is time consuming. The virtual links approach simplifies the model. Each virtual link is monitored and controlled separately within the Cisco Service Control solution, while virtual link provisioning is performed through the Cisco SCE CLI. The policy remains simple, and reflects only per-subscriber tiering.

Figure 1-2 shows traffic traveling through the Cisco SCE that is mapped into Cisco SCE virtual links, which reflect the CMTS physical interfaces. Monitoring and control are performed in the context of the virtual links.

**Figure 1-2 Traffic Traversing Cisco SCE that Is Mapped to Cisco SCE Virtual Links**



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The Cisco Service Control solution provides the VLM to automate many of the configuration actions that the network administrator ordinarily performs, including:

- Provisioning virtual-link maps for each Cisco SCE based on the interface maps of the CMTSs that provide network access.
- Configuring bandwidth values for the virtual links based on the CMTS interface speed values. These values tend to change regularly as part of cable plant maintenance, or automatically as part of spectrum management. These changes must be traced and acted upon by the network administrator.
- Building the Subscriber Manager virtual-link mapping configuration.

The virtual-link mapping configuration defines the mapping between the following:

- DHCP options that define the subscribers interface associations that are extracted from the DHCP acknowledge message
- From IPDR message the subscriber interface associations are retrieved by using CM-STATUS and SAMIS TYPE-1 templates.
- Corresponding virtual links ID

