Service Group Based Configuration of the Cisco cBR Router

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Service Group Profile Based Configuration

The DOCSIS Interface and Fiber Node Configuration guide describes the interface and fiber node configurations that are required to operationalize the Cisco cBR router. The steps described to accomplish the tasks involved in such configuration are complex.

To simplify and speed up the process of configuring the physical and logical interfaces required to deploy the Cisco cBR router quickly, a service group (SG) profile based approach is adopted. This document describes the simplified SG profile approach.

This approach provides the following advantages:

- Improves and simplifies the deployment of Cisco cBR router.
- Improves and simplifies the configuration of Cisco cBR Router by eliminating duplicate configurations.
- Improves and simplifies troubleshooting of Cisco cBR router.
- Supports faster Converged Cable Access Platform (CCAP) provisioning by using common and quick replication across nodes and regions.

To configure the interfaces and quickly operationalize the Cisco cBR router, a set of common profiles are created and are created and configured into global service group profiles. These global service group profiles may be applied to fiber node interfaces along with a mapping of the service group interfaces to the physical interfaces.

Common profiles are profiles which contain configurations for common service group (SG) interfaces like MAC domain, wideband-cable, and primary downstream

The common profiles and the global SG profiles may be independent of the topology of the network in which they are applied. The SG interface to physical interface mapping defines the behavior of the profiles in the topology that the SG profiles have been applied to.

Limitations:

- A common profile cannot be deleted if it is associated with the fiber nodes. It can be modified by entering the profile configuration mode using the **cable profile** command.
- A service-group profile cannot be deleted or modified if it is associated with the fiber nodes.
- To associate a new global SG profile to a fiber node, dissociate the currently associated global SG profile from the fiber node.
- To configure for a unique topology, use the full configuration approach provided in DOCSIS Interface and Fiber Node Configuration guide.
- When the secondary line card is in active mode, the following limitations apply:
  - A MAC domain, Wideband-Cable interface, downstream channel, and SG profile cannot be modified when they are associated with the fiber nodes.
  - SG profile cannot be dissociated from the fiber nodes.
  - A MAC domain, Wideband-Cable interface, downstream channel, and SG profile can be created but cannot be associated to the fiber node.
  - To enable the SG operation simplification feature, auto-reset feature must be enabled using the **cable wideband auto-reset** command.
- Do not support downgrade cBR-8 image from 16.7.x to previous image if the configuration includes mac domain split configuration.

Broadly, the following steps define and deploy the common profiles and the SG profiles:

1. Define and configure the Common profiles: The SG interface profiles or the common profiles contain configuration parameters common to a group of similar interfaces. For example, a profile may contain specific configuration parameters shared by multiple Wideband-Cable interfaces, associated across multiple line cards. A common profile is configured at the global or chassis level. All interfaces associated with a profile will inherit the configuration in the profile. Any common profile may be associated with any global SG profile. Use the **cable profile** *profile-type profile-name* command to define the following common profiles:
   - MAC Domain (MD) profile
   - Primary Downstream channel (DS) profile
   - Wideband-cable Interface (WB) profile
   - Global Service Group (SG) profile
2. Complete the following configurations to the fiber node interface using the **cable fiber-node** command:
   - Define the downstream and upstream ports. Map the appropriate interface-cable using the **downstream interface-cable** command. Map the appropriate upstream-cable interface using the **upstream upstream-cable** command.
   - Use the **downstream sg-channel** command to map the logical downstream SG channels to the physical RF channels and the **upstream sg-channel** command to map the logical upstream SG channels to the physical upstream channels.
   - Use the **service-group profile** to associate the global service group profile to the fiber node.

See the use case scenarios for configurations and examples.

Service Profile Configuration for 16x8 with One MAC Domain

This section describes the service group based configurations for a 16x8 service group with one MAC domain.

Step 1 **cable profile** *profile-type profile-name*

For MAC Domain profile, specify *profile-type* as **mac-domain**.

```
Router(config)#cable profile mac-domain MD1
Router(config-profile-md)#cable dynamic-secret mark
Router(config-profile-md)#cable shared-secret 0 cisco
Router(config-profile-md)#cable ip-init ipv4
Router(config-profile-md)#cable mtc-mode
Router(config-profile-md)#cable mrc-mode
Router(config-profile-md)#cable privacy mandatory
Router(config-profile-md)#cable privacy bpi-plus-policy
```

For Primary downstream profile, specify *profile-type* as **downstream**.

```
Router(config)#cable profile downstream DS1
Router(config-profile-ds)#cable rf-bandwidth-percent 20
Router(config-profile-ds)#cable attribute-mask 0x80000000
```

For wideband-cable interface profile, specify *profile-type* as **wideband-interface**.

```
Router(config)#cable profile wideband-interface BG1
Router(config-profile-wb)#cable downstream attribute-mask 0x80000000
```

For global service group profile, specify *profile-type* as service-group. In the service group profile, configure the cable bundle associated, mac-domain profile, and the wideband interface profile

```
Router(config)#cable profile service-group SG-16x8-1_1
Router(config-profile-sg)#cable bundle 71
Router(config-profile-sg)#mac-domain 0 profile md1
Router(config-profile-sg-md)#downstream sg-channel 0-7  profile ds1 upstream 0-3
Router(config-profile-sg-md)#upstream 0 sg-channel 0
Router(config-profile-sg-md)#upstream 1 sg-channel 1
Router(config-profile-sg-md)#upstream 2 sg-channel 2
Router(config-profile-sg-md)#upstream 3 sg-channel 3
Router(config-profile-sg-md)#upstream 4 sg-channel 4
Router(config-profile-sg-md)#upstream 5 sg-channel 5
Router(config-profile-sg-md)#upstream 6 sg-channel 6
Router(config-profile-sg-md)#upstream 7 sg-channel 7
Router(config-profile-sg-md)#us-bonding-group 1
Router(config-profile-sg-md-usbg)#upstream 0
Router(config-profile-sg-md-usbg)#upstream 1
Router(config-profile-sg-md-usbg)#upstream 2
Router(config-profile-sg-md-usbg)#upstream 3
Router(config-profile-sg-md-usbg)#upstream 4
Router(config-profile-sg-md-usbg)#upstream 5
Router(config-profile-sg-md-usbg)#upstream 6
```

```
Router(config-profile-sg-md-usbg)#upstream 7
Router(config-profile-sg-md-usbg)#attributes 8000000
Router(config-profile-sg-md-usbg)#exit
Router(config-profile-sg-md)#exit
Router(config-profile-sg)#

Router(config-profile-sg)#wideband-interface 1 profile BG1
Router(config-profile-sg-bg)#downstream sg-channel 0 15 rf-bandwidth-percent 10
Router(config-profile-sg-bg)#end
Router#
```

Step 2 **cable fiber-node**

Enter fiber-node configuration mode. Configure the following in fiber-node configuration mode:

- downstream port
- upstream port
- downstream sg-channels to rf-channels mapping
- upstream sg-channels to us-channels mapping
- global service group mapping
- managed MAC domain

```
Router(config)#cable fiber-node 1
Router(config-fiber-node)#downstream integrated-cable 3/0/0
Router(config-fiber-node)#upstream upstream-cable 3/0/0
Router(config-fiber-node)#downstream sg-channel 0 15 integrated-cable 3/0/0 rf-channel 0 15
Router(config-fiber-node)#upstream sg-channel 0 7 upstream-cable 3/0/0 us-channel 0 7
Router(config-fiber-node)#service-group profile SG-16X8-1_1
```

What to do next

Use the **show cable fiber-node** [*id*] **mapping** and the **show cable fiber-node** [*id*] **derived** commands to check the configuration of the interfaces.

```
Router#show cable fiber-node 1 mapping
Fiber-node 1:
Upstream:
Sg chan       Us-chan        Op state
0             3/0/0 0        Up
1             3/0/0 1        Up
2             3/0/0 2        Up
3             3/0/0 3        Up
4             3/0/0 4        Up
5             3/0/0 5        Up
6             3/0/0 6        Up
7             3/0/0 7        Up
Downstream:
Sg chan       Ds-rf-chan     Op state
0             3/0/0:0        Up
1             3/0/0:1        Up
2             3/0/0:2        Up
```

```
3             3/0/0:3        Up
4             3/0/0:4        Up
5             3/0/0:5        Up
6             3/0/0:6        Up
7             3/0/0:7        Up
8             3/0/0:8        Up
9             3/0/0:9        Up
10            3/0/0:10        Up
11            3/0/0:11        Up
12            3/0/0:12        Up
13            3/0/0:13        Up
14            3/0/0:14        Up
15            3/0/0:15        Up
```

```
Router#show cable fiber-node 1 derived
Fiber-node 1:
              interface                   Assoc successed
mac-domain 0   Cable3/0/0                  Y
Wideband 1     Wideband-Cable3/0/0:0       Y
Router#
```

Use the **show cable mac-domain fiber-node** command to verify the interface associations.

```
Router#show cable mac-domain fiber-node 1 md 0 downstream-service-group
Cable    MD-DS-SG              RF
IF       Id        Resource    Chan     Primary Chan
C3/0/0
Router#
```

```
Router#show cable mac-domain fiber-node 1 md 0 upstream-service-group
Cable MD 3/0/0
Router#
```

Service Profile Configuration for 16x8 with Two MAC Domains

This section describes the service group based configurations for a 16x8 service group with two MAC domains, split downstream and overlaid upstream channels.

Step 1 **cable profile** *profile-type profile-name*

For MAC Domain profile, specify *profile-type* as **mac-domain**.

```
Router(config)#cable profile mac-domain MD1
Router(config-profile-md)#cable dynamic-secret mark
Router(config-profile-md)#cable shared-secret 0 cisco
Router(config-profile-md)#cable ip-init ipv4
Router(config-profile-md)#cable mtc-mode
Router(config-profile-md)#cable mrc-mode
Router(config-profile-md)#cable privacy mandatory
Router(config-profile-md)#cable privacy bpi-plus-policy
```

For Primary downstream profile, specify *profile-type* as **downstream**.

```
Router(config)#cable profile downstream DS1
Router(config-profile-ds)#cable rf-bandwidth-percent 20
Router(config-profile-ds)#cable attribute-mask 0x80000000
```

For wideband-cable interface profile, specify *profile-type* as **wideband-interface**.

```
Router(config)#cable profile wideband-interface BG1
Router(config-profile-wb)#cable downstream attribute-mask  0x80000000
```

For global service group profile, specify *profile-type* as service-group. In the service group profile, configure the cable bundle associated, mac-domain profile, and the wideband interface profile

```
Router(config)#cable profile service-group SG-16x4-1_2
Router(config-profile-sg)#cable bundle 71
Router(config-profile-sg)#mac-domain 0 profile md1
Router(config-profile-sg-md)#downstream sg-channel 0-15  profile ds1 upstream 0-3
Router(config-profile-sg-md)#upstream 0 sg-channel 0
Router(config-profile-sg-md)#upstream 1 sg-channel 1
Router(config-profile-sg-md)#upstream 2 sg-channel 2
Router(config-profile-sg-md)#upstream 3 sg-channel 3
Router(config-profile-sg-md)#us-bonding-group 1
Router(config-profile-sg-md-usbg)#upstream 0
Router(config-profile-sg-md-usbg)#upstream 1
Router(config-profile-sg-md-usbg)#upstream 2
Router(config-profile-sg-md-usbg)#upstream 3
Router(config-profile-sg-md-usbg)#exit
Router(config-profile-sg-md)#exit
Router(config-profile-sg)#

Router(config-profile-sg)#wideband-interface 1 profile BG1
Router(config-profile-sg-bg)#downstream sg-channel 0 7 rf-bandwidth-percent 10
Router(config-profile-sg-bg)#exit
Router(config-profile-sg)#wideband-interface 2 profile BG1
Router(config-profile-sg-bg)#downstream sg-channel 8 15 rf-bandwidth-percent 10
Router#
```

Step 2 cable fiber-node

Enter fiber-node configuration mode. Configure the following in fiber-node configuration mode:

- downstream port
- upstream port
- downstream sg-channels to rf-channels mapping
- upstream sg-channels to us-channels mapping
- global service group mapping
- managed MAC domain

```
Router(config)#cable fiber-node 1
Router(config-fiber-node)#downstream integrated-cable 3/0/0
Router(config-fiber-node)#upstream upstream-cable 3/0/0
Router(config-fiber-node)#downstream sg-channel 0 7 integrated-cable 3/0/0 rf-channel 0 15
Router(config-fiber-node)#upstream sg-channel 0 3 upstream-cable 3/0/1 us-channel 0 3
```

```
Router(config-fiber-node)#service-group profile SG-16X4-1_2
Router(config-fiber-node)#exit
Router(config)#
```

```
Router(config)#cable fiber-node 2
Router(config-fiber-node)#downstream integrated-cable 3/0/0
Router(config-fiber-node)#upstream upstream-cable 3/0/1
Router(config-fiber-node)#downstream sg-channel 0 7 integrated-cable 3/0/0 rf-channel 8 15
Router(config-fiber-node)#downstream sg-channel 8 15 integrated-cable 3/0/0 rf-channel 0 7
Router(config-fiber-node)#upstream sg-channel 0 3 upstream-cable 3/0/1 us-channel 0 3
Router(config-fiber-node)#service-group profile SG-16X4-1_2
Router(config-fiber-node)#exit
Router(config)#
```

What to do next

Use the **show cable fiber-node** [*id*] **mapping** and the **show cable fiber-node** [*id*] **derived** commands to check the configuration of the interfaces.

MAC-Domain Split Configuration

This section describes the MAC-domain split configurations.

Note

- In MAC domain split scenario, we must configure upstream peer-node-us and managed MAC domain.
- After a fiber node managed MAC domain, we will reserve cable interface by **cable managed fiber-node** command.
- If a fiber-node has peer, we can not add managed MAC domain.
- If a fiber-node has peer, we can not modify the configuration of channel mapping and upstream peer-node-us
- If a fiber-node has managed MAC domain, we can not remove upstream peer-node-us.
- Only both two fiber-nodes are associated with service group profile, mac-domains and wideband interfaces will be generated.
- MAC domain and wideband interfaces will be removed as soon as one fiber-node is unassociated with service group profile.

Step 1 cable profile mac-domain

Define global common profiles for MAC-domain, bonding group, primary downstream.

```
Router(config)#cable profile mac-domain MD
```

```
Router(config-profile-md)#load-interval 30
Router(config-profile-md)#cable dynamic-secret mark
Router(config-profile-md)#cable shared-secret 0 cisco
Router(config-profile-md)#cable ip-init ipv4
Router(config-profile-md)#cable mtc-mode
Router(config-profile-md)#cable mrc-mode
Router(config-profile-md)#cable privacy mandatory
Router(config-profile-md)#cable privacy bpi-plus-policy
Router(config-profile-md)#cable privacy accept-self-signed-certificate
Router(config-profile-md)#cable privacy dsx-support
Router(config-profile-md)#cable privacy eae-policy capability-enforcement
Router(config-profile-md)#cable privacy kek life-time 300
Router(config-profile-md)#cable privacy retain-failed-certificates
Router(config-profile-md)#cable privacy skip-validity-period
Router(config-profile-md)#cable privacy tek life-time 180
Router(config-profile-md)#cable cm-status enable 3
Router(config-profile-md)#cable map-advance dynamic
Router(config-profile-md)#cable upstream 0 attribute-mask FFFFFFFF
Router(config-profile-md)#cable upstream 0 power-adjust continue 5
Router(config-profile-md)#cable upstream balance-scheduling
Router(config)#cable profile downstream DS
Router(config-profile-ds)#cable rf-bandwidth-percent 20
Router(config-profile-ds)#cable attribute-mask 0x80000000
Router(config)#cable profile wideband-interface BG
Router(config-profile-wb)#cable downstream attribute-mask 0x80000000
Router(config-profile-wb)#description BG
Router(config-profile-wb)#load-interval 30
```

Step 2 cable profile service-group

In the service group profile, configure the cable bundle associated, mac-domain profile, and the wideband interface profile.

```
Router(config)#cable profile service-group MD_SPLIT
Router(config-profile-sg)#cable bundle 1
Router(config-profile-sg)#mac-domain 0 profile MD
Router(config-profile-sg-md)#downstream sg-channel 0-15 profile DS
Router(config-profile-sg-md)#upstream 0 sg-channel 0
Router(config-profile-sg-md)#upstream 1 sg-channel 1
Router(config-profile-sg-md)#upstream 2 sg-channel 2
Router(config-profile-sg-md)#upstream 3 sg-channel 3
Router(config-profile-sg-md)#upstream 4 sg-channel 4
Router(config-profile-sg-md)#upstream 5 sg-channel 5
Router(config-profile-sg-md)#upstream 6 sg-channel 6
Router(config-profile-sg-md)#upstream 7 sg-channel 7
Router(config-profile-sg-md)#us-bonding-group 1
Router(config-profile-sg-md-usbg)#upstream 0
Router(config-profile-sg-md-usbg)#upstream 1
Router(config-profile-sg-md-usbg)#upstream 2
Router(config-profile-sg-md-usbg)#upstream 3
Router(config-profile-sg-md-usbg)#attributes 8000000
Router(config-profile-sg-md-usbg)#exit
Router(config-profile-sg-md)#us-bonding-group 2
Router(config-profile-sg-md-usbg)#upstream 4
Router(config-profile-sg-md-usbg)#upstream 5
Router(config-profile-sg-md-usbg)#upstream 6
Router(config-profile-sg-md-usbg)#upstream 7
Router(config-profile-sg-md-usbg)#attributes 8000000
Router(config-profile-sg-md-usbg)#exit
Router(config-profile-sg-md)#exit
Router(config-profile-sg)#wideband-interface 0 profile WB
Router(config-profile-sg-bg)#downstream sg-channel 0 7 rf-bandwidth-percent 1
Router(config-profile-sg-bg)#exit
Router(config-profile-sg)#wideband-interface 1 profile WB
```

```
Router(config-profile-sg-bg)#downstream sg-channel 8 15 rf-bandwidth-percent 1
```

Step 3 **cable fiber-node**

Enter fiber-node configuration mode. Configure the following in fiber-node configuration mode:

- downstream port
- upstream port
- downstream sg-channels to rf-channels mapping
- upstream sg-channels to us-channels mapping
- abstract upstream channel
- managed MAC domain
- global service group mapping

```
Router(config)#cable fiber-node 67
Router(config-fiber-node)#downstream integrated-cable 6/0/6
Router(config-fiber-node)#upstream upstream-cable 6/0/6
Router(config-fiber-node)#downstream sg-channel 0 15 integrated-cable 6/0/6 rf-channel 0
15
Router(config-fiber-node)#upstream sg-channel 0 3 upstream-cable 6/0/6 us-channel 0 3
Router(config-fiber-node)#upstream sg-channel 4 7 peer-node-us
Router(config-fiber-node)#service-group managed md 0 cable6/0/6
Router(config-fiber-node)#service-group profile MD_SPLIT

Router(config)#cable fiber-node 69
Router(config-fiber-node)#downstream integrated-cable 6/0/6
Router(config-fiber-node)#upstream upstream-cable 6/0/1
Router(config-fiber-node)#downstream sg-channel 0 15 integrated-cable 6/0/6 rf-channel 0
15
Router(config-fiber-node)#upstream sg-channel 4 7 upstream-cable 6/0/1 us-channel 0 3
Router(config-fiber-node)#upstream sg-channel 0 3 peer-node-us
Router(config-fiber-node)#service-group managed md 0 cable6/0/6
Router(config-fiber-node)#service-group profile MD_SPLIT
```