Subscriber Manager

Feature Summary and Revision History

Summary Data

Table 1: Summary Data

Applicable Product(s) or Functional Area	cnBNG
Applicable Platform(s)	SMI
Feature Default Setting	Disabled - Configuration Required
Related Changes in this Release	Not Applicable
Related Documentation	*Cloud Native BNG Control Plane Command Reference Guide*

Revision History

Table 2: Revision History

Revision Details	Release
First introduced.	2021.01.0

Feature Description

In the Subscriber Manager (SM) context, a subscriber is a binding between the cnBNG Control Plane (CP) and a single subscriber end device. The SM is designed to provide a generic mechanism to connect edge subscribers to services enabling features. Subscribers are identified, authenticated, authorized, and accounted for in the SM.

> **Note** The Subscriber Manager is also referred to as the Session Manager.

The following is a high-level list of the SM functionalities:

- Provides a generic mechanism for different Broadband Access Protocols such as DHCP and PPPoE.

- Provides an interface with off-box Radius servers using policy-plane to meet protocol and network provisioning requirements.

- Supports different subscriber lifecycle events such as CoA, idle timeout processing, and periodic reauthorization.

- Provides support for configuring subscriber lifecycle events that help customer define the subscriber behavior for the different subscriber lifecycle events.

- Derives per subscriber configuration from multiple sources.

- Maintains the subscriber state and subscriber configuration in a centralized session database.

- Interacts with the User Plane (UP) for subscriber session creation and subscriber feature configurations.

Subscriber features that are configured on cnBNG enable service providers to deploy certain specific functionalities like restricting the use of certain network resources, allowing Law Enforcement Agencies (LEAs) to conduct electronic surveillance, and so on.

Subscriber Features

The cnBNG supports the following subscriber features on the UP. For details, see the latest version of the Broadband Network Gateway Configuration Guide for Cisco ASR 9000 Series Routers listed here: https://www.cisco.com/c/en/us/support/routers/asr-9000-series-aggregation-services-routers/ products-installation-and-configuration-guides-list.html.

- IPv4 or IPv6
    - Maximum Transmission Unit (MTU)
    - Unicast Reverse Path Forwarding (URPF)
    - Internet Control Message Protocol (ICMP)

- Access Control List (ACL)
    - Input ACL (IPv4 or IPv6)
    - Output ACL (IPv4 or IPv6)

- QoS (Quality of Service)

  - Input (policing)

  - Output (policing, shaping)

  - Policy merging (up to 6 policy maps and 10 class maps, including the default)

- Policy-based Routing (PBR)

  - Input policy (HTTP redirect)

- Accounting

  - Session Accounting

    - Periodic accounting

  - Service Accounting

    - Periodic accounting

To configure subscriber features, see Configuring Subscriber Manager Features, on page 3.

How it Works

This section provides a brief about how the Subscriber Manager works.

The SM functionality is hosted in a SM pod having one container in it. The SM pod communicates with the BNG Ops Center, policy-plane, and PFCP-EP pods using the APP infrastructure inter-pod communication (IPC).

The Subscriber Microservices Infrastructure (SMI) instantiates the SM pod. There can be more than one SM pod in the cluster. Each SM pod instance is independent. The per subscriber data is stored in a centralized database such that any SM pod can access this data.

Configuring Subscriber Manager Features

This section describes how to configure Subscriber Manager features on the CP.

The configuration of the Subscriber Manager features involves the following procedures:

- Configuring the HTTPR Policy Name, on page 4

- Configuring IPv4 Options, on page 4

- Configuring IPv6 Options, on page 5

- Configuring QoS Parameters

- Configuring the VRF Name, on page 6

- Configuring a Subscriber Profile, on page 6

> **Note**
> • To configure PPP feature options, see Creating the PPP Feature Template
>
> • To configure service accounting, see Configuring Service Accounting, on page 10
>
> • To configure session accounting, see Configuring Session Accounting, on page 10

Configuring the HTTPR Policy Name

Use the following commands to configure the Policy Based Routing (PBR) HTTP Redirect (HTTPR) policy name.

```
config
  profile feature-template feature_template_name
  httpr-policy httpr_policy_name
  exit
```

NOTES:

- **profile feature-template** *feature_template_name*: Specifies the profile feature template name.

- **httpr-policy** *httpr_policy_name*: Specifies the PBR HTTPR policy name. The *httpr_policy_name* value can range from 1 to 128 characters.

Configuring IPv4 Options

Use the following commands to configure IPv4 options.

```
config
  profile feature-template feature_template_name
  ipv4
    disable-unreachables
    egress-acl string
    ingress-acl string
    mtu mtu_bytes
    verify-unicast-source reachable-via-rx
    exit
```

NOTES:

- **profile feature-template** *feature_template_name*: Specifies the profile feature template name.

- **ipv4**: Enters the IPv4 Configuration mode to configure the IPv4 features.

- **disable-unreachables**: Disables sending the Internet Control Message Protocol (ICMP) Unreachable messages.

- **egress-acl** *string*: Specifies the IPv4-based egress Access Control List (ACL) list. The supported length of the *string* ranges from 1 to 128 characters.

- **ingress-acl** *string*: Specifies the IPv4-based ingress ACL list. The supported length of the *string* ranges from 1 to 128 characters.

- **mtu** *mtu_bytes*: Specifies the maximum transmission unit (MTU). The supported *mtu_bytes* value can range from 68 to 65535 bytes.

- **verify-unicast-source reachable-via-rx**: Enables per packet validation for unicast. The source is reachable via the interface on which packet is received.

Configuring IPv6 Options

Use the following commands to configure IPv6 options.

```
config
  profile feature-template feature_template_name
  ipv6
    disable-unreachables
    egress-acl string
    ingress-acl string
    mtu mtu_bytes
    verify-unicast-source reachable-via-rx
    exit
```

NOTES:

- **profile feature-template** *feature_template_name*: Specifies the profile feature template name.

- **ipv6**: Enters the IPv6 Configuration mode to configure the IPv6 features.

- **disable-unreachables**: Disables sending the Internet Control Message Protocol (ICMP) Unreachable messages.

- **egress-acl** *string*: Specifies the IPv6-based egress Access Control List (ACL) list. The supported length of the *string* ranges from 1 to 128 characters.

- **ingress-acl** *string*: Specifies the IPv6-based ingress ACL list. The supported length of the *string* ranges from 1 to 128 characters.

- **mtu** *mtu_bytes*: Specifies the maximum transmission unit (MTU). The supported *mtu_bytes* value can range from 68 to 65535 bytes.

- **verify-unicast-source reachable-via-rx**: Enables per packet validation for unicast. The source is reachable via the interface on which packet is received.

Configuring QoS Parameters

Use the following commands to configure the Quality of Service (QoS) parameters.

```
config
  profile feature-template feature_template_name
  qos
    in-policy qos_input_policy_name
    merge-level integer
    out-policy qos_output_policy_name
    exit
```

NOTES:

- **profile feature-template** *feature_template_name*: Specifies the profile feature template name.

- **qos**: Enters the QoS Configuration mode to configure the parameters.

- **in-policy** *qos_input_policy_name*: Specifies the QoS input policy name. The supported length of the *qos_input_policy_name* ranges from 1 to 128 characters.

- **merge-level** *integer*: Enables or disables the merge level. A merge value of 0 disables the merge-level. Any value greater than 0, enables the merge level.

- **out-policy** *qos_output_policy_name*: Specifies the QoS output policy name. The supported length of the *qos_output_policy_name* ranges from 1 to 128 characters.

Configuring the VRF Name

Use the following commands to configure the virtual routing and forwarding (VRF) name.

```
config
  profile feature-template feature_template_name
  vrf-name vrf_name
  exit
```

NOTES:

- **profile feature-template** *feature_template_name*: Specifies the profile feature template name.

- **vrf-name** *vrf_name*: Specifies the VRF name. The supported length of the *vrf_name* ranges from 1 to 128 characters.

Configuring a Subscriber Profile

Use the following commands to create a subscriber profile.

```
config
  profile subscriber subscriber_profile
    aaa { authenticate aaa_profile_for_authentication
        | authorize aaa_profile_for_authorization }
    activate-feature-template feature_template_name
    apply-all-class
    class class_name
      aaa aaa_profile_for_authentication | authorize aaa_profile_for_authorization
      activate-feature-template feature_template_name
      matches
        match { protocol { dhcp | ppp } } | username
        { ascii ascii_string |
        regex reg-exp string } |
        source-mac { ascii ascii_string |
        regex reg-exp string } |
        circuit-id { ascii  ascii_string |
        regex reg-exp string } |
        remote-id { ascii ascii_string |
        regex reg-exp string }
        match-type { all match { protocol | username | source-mac |
```

```
                circuit-id | remote-id } | any match { protocol | username |
                source-mac | circuit-id | remote-id } }
                exit
            dhcp-profile dhcp_profile_name
            event event_name
            pppoe-profile pppoe_profile_name
            session-type { ipv4 | ipv4v6 | ipv6 }
            exit

configure
   profile subscriber subscriber_profile
      aaa { authenticate aaa_profile_for_authentication |
         authorize aaa_profile_for_authorization }
      activate-feature-template feature_template_name
      apply-all-class
      class class_name
         aaa aaa_profile_for_authentication | authorize aaa_profile_for_authorization
         activate-feature-template  feature_template_name
         matches
           match { protocol { dhcp | ppp } } | username { ascii
                   ascii_string  | regex reg-exp string}
                   | source-mac { ascii ascii_string
                   | regex reg-exp string } |
                   circuit-id { ascii  ascii_string
                   | regex reg-exp string } |
                   remote-id { ascii ascii_string
                   | regex reg-exp string }
                   match-type { all match { protocol | username |
                   source-mac | circuit-id | remote-id } | any match {
                   protocol | username | source-mac | circuit-id
                   | remote-id } }
              exit
         dhcp-profile  dhcp_profile_name
         event session-activate { aaa { authenticate | authorize } |
                              activate-feature-templates
                              feature_templates_list
                              | apply-all-class | class class_name
                              | deactivate-feature-templates
                              feature_templates_list
         pppoe-profile pppoe_profile_name
         session-type { ipv4 | ipv4v6 | ipv6 }
         exit
```

NOTES:

- **profile subscriber** *subscriber_profile_name*: Specifies the profile subscriber name and enters the Profile Subscriber Configuraton mode.

- **aaa { authenticate** *aaa_profile_for_authentication* **| authorize** *aaa_profile_for_authorization* **}**: Specifies the AAA profile to associate for authentication and authorization.

- **activate-feature-templates** *feature_template_name*: Specifies the list of feature-templates in sequence for activation.

- **apply-all-class**: Applies all classes that are enabled.

- **class** *class_name* : Specifies the subscriber class name.

- **matches**: Enters the matches Configuration sub-mode to specify the match values.

  - **match { protocol { dhcp | ppp } | username { ascii** *ascii_string* **| regex** *reg-exp string* **} | source-mac { ascii** *ascii_string* **| regex** *reg-exp string* **} | { circuit-id { ascii** *ascii_string* **| regex** *reg-exp string* **} | remote-id { ascii** *ascii_string* **| regex** *reg-exp string* **} }**: Specifies the list of match values.

    - **match { protocol { dhcp | ppp }**: Specifies the match protocol as DHCP or PPP.

    - **username { ascii** *ascii_string* **| regex** *reg-exp string* **}**: Specifies the username in ascii format or regular express (reg-exp) string.

    - **source-mac { ascii** *ascii_string* **| regex** *reg-exp string* **}**: Specifies the source MAC address in ascii format or regular express (reg-exp) string.

    - **remote-id { ascii** *ascii_string* **| regex** *reg-exp string* **}**: Specifies the remote identifier in ascii format or regular express (reg-exp) string.

    - **circuit-id { ascii** *ascii_string* **| regex** *reg-exp string* **}**: Specifies the circuit identifier in ascii format or regular express (reg-exp) string.

    - **match-type { all match { protocol | username | source-mac | circuit-id | remote-id } | any match { protocol | username | source-mac | circuit-id | remote-id } }**: Specifies the match key and value for matching any or all of the options: protocol, username, source-mac, circuit-id, and remote-id.

- **dhcp-profile** *dhcp_profile_name*: Associates the DHCP first sign of life (FSOL) profile.

- **event** *event_list_name*: Specifies the event name.

- **pppoe-profile** *pppoe_profile_name*: Associates the PPPoE FSOL profile.

- **session-type { ipv4 | ipv4v6 | ipv6 }**: Specifies the allowed session-types as IPv4, IPv4v6, and IPv6.

Subscriber Accounting Functions

Feature Description

The Accounting Manager handles the Subscriber Accounting functions in the cnBNG CP. The Accounting function includes features that track traffic either in volume or duration. It provides accounting information for subscribers on a session or per service. The Accounting function determines the length and duration of a given service that a subscriber has used. Certain regulations require service providers to account for services they provide to the subscriber.

The following figure illustrates the Accounting Manager external interfaces.

Accounting Manager POD Layout
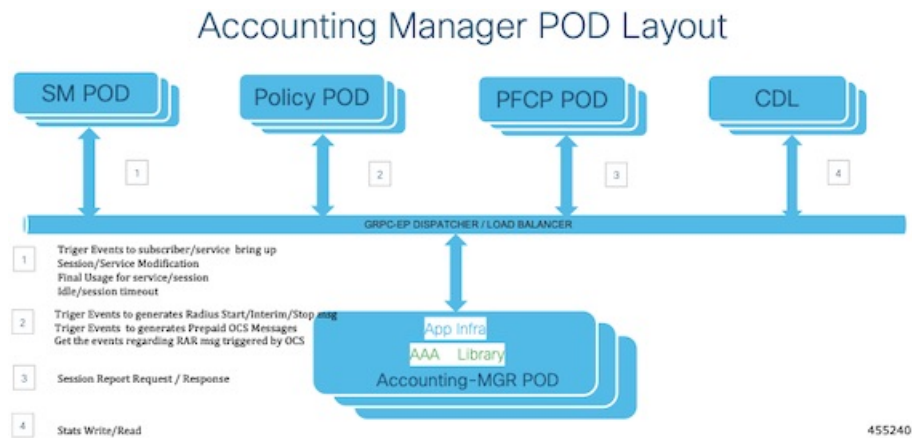
The Accounting Manager in cnBNG supports the following forms of accounting:

Service Accounting

ISPs can offer different tiered services to their subscribers with the ability to move between different tiers. Different tiers could correspond to different bandwidths offered to the subscriber. A subscriber can enable a new service that corresponds to temporarily moving from one tier of service to another. ISPs need to keep track of when a new service is enabled and how long it is active for each subscriber. Often there might be a need to count the number of packets and bytes associated with a service. Both of these forms of accountng are referred to as service accounting. When service accounting is enabled, BNG sends a Service-Start request when service is activated and a Service-Stop request when the service is deactivated. A timestamp is sent with both the actions. Service-Stop can also contain statistics associated with the service.

To configure Service Accounting, see Configuring Service Accounting, on page 10.

Session Accounting

When Session Accounting is activated, an Accounting-Start request is sent to AAA when the session is started. When the session is terminated, an Accounting-Stop request is sent. The Accounting-Stop request contains the final session accounting statistics (packets, bytes in, bytes out). An "interim" session accounting can be optionally activated that sends Interim-Updates periodically while the session is active. These updates provide the current session statistics accumulated since the start of the session.

Session Accounting is configured directly on the template.

To configure Session Accounting, see Configuring Session Accounting, on page 10.

Limitations and Restrictions

The Subscriber Accounting Function has the following limitation in this release:

- An interim Interval of zero is not supported.

- AAA profile change at service level is not supported.

- Service-level attributes changes are not supported after service bring-up.

- Session accounting is mandatory to enable Service accounting due to User Plane (UP) (asr9k) limitation.

- Session and Service Accounting enable or disable is not supported after session or service is up because of UP limitations. Session Accounting must be enabled only during session bring-up.

Configuring Subscriber Accounting Functions

This section describes how to configure the Subscriber Accounting Functions.

The configuration of the Subscriber Accounting Functions involve the following procedures:

- Configuring Service Accounting
- Configuring Session Accounting

Configuring Service Accounting

Use the following commands to configure service accounting.

```
config
  profile feature-template feature-template
  service accounting
    aaa-profile aaa_profile_name
    enable
    periodic-interval interval_in_seconds
    exit
```

NOTES:

- **profile feature-template** *feature-template*: Specifies the profile feature template name and enters Feature-Template Configuration mode.

- **service accounting**: Enters the Service Configuration mode to configure service accounting for a AAA profile.

- **aaa-profile** *aaa_profile_name*: Specifies the AAA profile to use for service accounting.

- **enable**: Enables service accounting for the specified AAA profile.

- **periodic-interval** *interval_in_seconds*: Specifies the interim interval in seconds. The valid values range from 60 to 4320000 seconds.

Configuring Session Accounting

Use the following commands to configure session accounting.

```
config
  profile feature-template feature-template
  session accounting
    aaa-profile aaa_profile_name
    dual-stack-delay delay_in_seconds
    enable
    periodic-interval interval_in_seconds
    exit
```

NOTES:

- **profile feature-template** *feature-template*: Specifies the profile feature template name and enters Feature-Template Configuration mode.

- **session accounting**: Enters the Session Configuration mode to configure session accounting for a AAA profile.

- **aaa-profile** *aaa_profile_name*: Specifies the AAA profile to use for session accounting.

- **dual-stack-delay** *delay_in_seconds*: Specifies the dual stack set delay time in seconds. The valid values range from 1 to 30 seconds.

- **enable**: Enables session accounting for the specified AAA profile.

- **periodic-interval** *interval_in_seconds*: Specifies the interim interval in seconds. The valid values range from 60 to 4320000 seconds.