Cloud Native BNG Control Plane Release Change Reference, Release 2021.03

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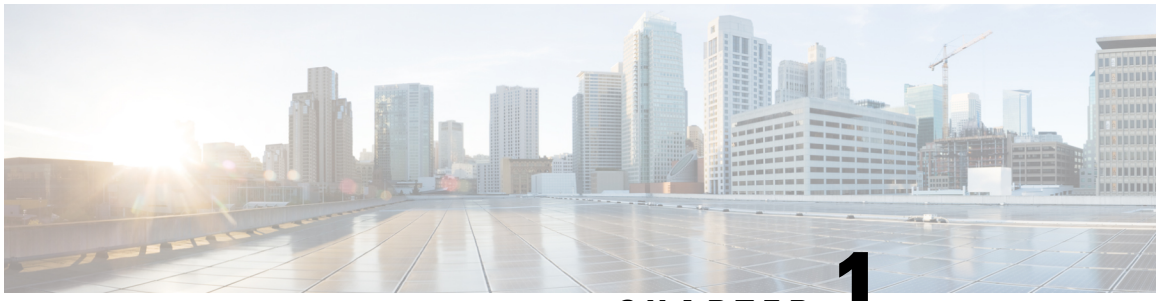

CHAPTER 1

Cloud Native BNG Release Change Reference

Features and Changes Quick Reference

The following table provides the list of Cloud Native BNG (cnBNG) Control Plane (CP) features and changes in this release.

Features / Behavior Changes	Release Introduced / Modified
Automatic Session Reconciliation, on page 3	2021.03.0
Charging Functionality Support in Subscriber Manager, on page 3	2021.03.0
Format-e Support for NAS-Port Format, on page 4	2021.03.0
Framed Route Support, on page 5	2021.03.0
IPAM Configuration Recommendations, on page 7	2021.03.0
IPAM Enhancements, on page 9	2021.03.0

Features / Behavior Changes	Release Introduced / Modified
Monitor Protocol and Subscriber, on page 9	2021.03.0
Multi-Action Change of Authorization, on page 10	2021.03.0
Multiple Replica Support for cnBNG Services, on page 11	2021.03.0
Static IP Support, on page 12	2021.03.0
Subscriber QoS Policy, on page 14	2021.03.0
User-Plane and Format-String Support for AAA Attribute Format, on page 15	2021.03.0
UP Session Disconnect Notification, on page 16	2021.03.0

Feature Defaults Quick Reference

The following table indicates what features are enabled or disabled by default.

Feature	Default
Automatic Session Reconciliation	Enabled – Always-on
Change in Subscriber Manager Architecture	Enabled – Always-on
Format-e Support for NAS-Port Format	Disabled – Configuration Required
Framed Route Support	Disabled – Configuration Required
IPAM Configuration Recommendations	Disabled – Configuration Required
IPAM Enhancements	Not Applicable
Monitor Protocol and Subscriber	Disabled – Configuration Required
Multi-Action Change of Authorization	Not Applicable
Multiple Replica Support for cnBNG Services	Disabled – Configuration Required
Static IP Support	Disabled – Configuration Required
Subscriber QoS Policy	Disabled – Configuration Required
User-Plane and Format-String Support forAAAAttribute Format	Disabled – Configuration Required
UP Session Disconnect Notification	Enabled – Always-on

Automatic Session Reconciliation

Feature Summary and Revision History

Summary Data

Table 1: Summary Data

Applicable Product(s) or FunctionalArea	cnBNG
Applicable Platform(s)	SMI
Feature Default Setting	Enabled - Always-on
Related Documentation	Not Applicable

Revision History

Table 2: Revision History

Revision Details	Release
First introduced.	2021.03.0

Feature Description

The Automatic Session Reconciliation feature enables reconciliation of sessions that are out of synchronization between the Control Plane (CP) and User Plane (UP).

Desynchronization of a session occurs when the transaction is successful in the UP but times out before receiving a response from the UP.

The existing transaction-id increments by 1 in every request initiated from the CP to the UP. The CDL record stores the transaction-id per session when the UP conveys a successful response to the CP. The UP also stores this transaction-id when the transaction is successful in the UP.

Charging Functionality Support in Subscriber Manager

Feature Summary and Revision History

Summary Data

Table 3: Summary Data

Applicable Product(s) or Functional Area	cnBNG

Applicable Platform(s)	SMI
Feature Default Setting	Enabled - Always-on
Related Documentation	Not Applicable

Revision History

Table 4: Revision History

Revision Details	Release
Enhancement Introduced: The Subscriber Manager pod supports the charging functionality, that is, subscriber access and subscriber management.	2021.03.0
First introduced.	2021.01.0

Feature Description

The Charging functionality is now part of the Subscriber Manager (SM - also referred to as the "Session Manager"). This functionality is merged into the SM to reduce the number of transactions and number of CDL records. Therefore, the Subscriber pod now includes the Charging pod functionality, that is, subscriber access and subscriber management.

For more information, see the Cloud Native BNG Control Plane Configuration Guide > Pods and Services Reference chapter and Subscriber Manager chapter.

Format-e Support for NAS-Port Format

Feature Summary and Revision History

Summary Data

Table 5: Summary Data

Applicable Product(s) or Functional Area	cnBNG
Applicable Platform(s)	SMI
Feature Default Setting	Disabled - Configuration Required
Related Documentation	*Cloud Native BNG Control Plane Command Reference Guide*

Revision History

Revision Details	Release
Enhancement Introduced: The **profile radius accounting** and **profile radius attribute** commands now include the *nas_port* option and the **format-e** keywords.	2021.03.0
First introduced.	2021.01.0

Feature Description

The NAS-Port value can now be explicitly specified using the *nas_port* variable.

Also, to enable individual bits or group of bits in 32 bits of the NAS-Port (which represents or encodes various pieces that constitute port information), a new keyword, **format-e** is introduced.

The *nas_port* variable and **format-e** keyword are supported in the **profile radius accounting** and **profile radius attribute** commands

For more information, see the Cloud Native BNG Control Plane Configuration Guide > Authentication, Authorization, and Accounting Functions chapter.

Framed Route Support

Feature Summary and Revision History

Summary Data

Table 6: Summary Data

Applicable Product(s) or Functional Area	cnBNG
Applicable Platform(s)	SMI
Feature Default Setting	Disabled - Configuration Required
Related Documentation	Not Applicable

Revision History

Table 7: Revision History

Revision Details	Release
First introduced.	2021.03.0

Feature Description

The Framed Route Support on subscriber sessions enables framed (dynamic) routes to be added for individual subscribers. Framed route per subscriber support is provided through RADIUS or Change of Authorization (CoA).

A framed route is pushed from the Control Plane (CP) to the User Plane (UP) only when the IP address is allocated for the respective address family indicator (AFI). The UP withdraws the framed route when the respective AFI goes down (for example, when an IP address is deallocated).

The configuration format of the framed route is as follows:

- **IPv4**

```
Framed-Route = "[vrf <prefix VRF>] {<prefix>/<prefix_length>} [vrf <next hop vrf>]
                [<next hop prefix>] [<metric>] [tag <tag-value>] "
Framed-Route = "[vrf <vrf-name>] {<prefix> <netmask>} [vrf <next hop vrf>]
                [<next hop prefix>]
                [<metric>] [tag <tag-value>] "
```

```
cisco-avpair = "[vrf <prefix VRF>] {<prefix>/<prefix_length>} [vrf <next hop vrf>]
                [<next hop prefix>] [<metric>] [tag <tag-value>]
cisco-avpair = "[vrf <vrf-name>] {<prefix> <netmask>} [vrf <next hop vrf>]
                [<next hop prefix>]
                [<metric>] [tag <tag-value>] "
```

- **IPv6**

```
Framed-IPv6-Route = "[vrf <prefix VRF>] {<prefix>/<prefix_length>}
                     [vrf <next hop vrf>]
                     [<next-hop prefix>] [<metric>] [tag <tag-value>] "
cisco-avpair = "[vrf <prefix VRF>] {<prefix>/<prefix_length>} [vrf <next hop vrf>]
                [<next hop prefix>][<metric>] [tag <tag-value>] "
```

The description of the format of the framed route is as follows:

- **[vrf <prefix VRF>]**: This is an optional parameter. Specfies the virtual routing and forwarding (VRF) prefix.
- **{<prefix>/<prefix_length>} or {<prefix> <netmask>}**: This is a mandatory parameter. Specifies the prefix and prefix mask or prefix length for the destination.
- **[vrf <next hop vrf>]**: This is an optional parameter. Specifies the next hop VRF name.
- **[<next hop prefix>]**: This is an optional parameter. Specifies that when the next hop is specified as "0.0.0.0" for IPv4 or "::" for IPv6, the IP address of the session must be used as the next hop prefix.
- **[<metric>]**: This is an optional parameter. Specifies the route metric.
- **[tag <tag-value>]**: This is an optional parameter. Specifies a tag value that can be used as a match for controlling redistribution using route policies.

For information about the framed-route attributes, see Table 1 and Table 2 in the Cloud Native BNG Control Plane Configuration Guide > RADIUS Attributes chapter.

Implementing the framed (dynamic) route support depends on the UP. Therfore, check the *UP Cloud Native BNG User Plane Configuration Guide for Cisco ASR 9000 Series Router* for the following before enabling the framed route.

- IPv4 and IPv6 framed route support for PPP Termination and Aggregation (PTA) and IPoE
- VRF and next hop VRF support for PTA and IPoE
- CoA support for framed route for PTA and IPoE
- Maximum routes supported per subscriber per AFI for PTA and IPoE

IPAM Configuration Recommendations

Feature Summary and Revision History

Summary Data

Table 8: Summary Data

Applicable Product(s) or Functional Area	cnBNG
Applicable Platform(s)	SMI
Feature Default Setting	Disabled - Configuration Required
Related Documentation	*Cloud Native BNG Control Plane Command Reference Guide*

Revision History

Table 9: Revision History

Revision Details	Release
First introduced.	2021.03.0

Feature Description

This section provides the following configuration recommendations.

Pool-Size Configuration

While configuring the pool-size, the recommendation is to keep additional buffer of IPs for undisturbed subscriber churn. Consider the following recommendations:

- Released IPs become part of the quarantine queue depending on the quarantine configuration. These IPs cannot be reused until they are free.
- Due to the threshold logic, the CP automatically reserves additional chunks to the User Plane function (UPF) when requried. It based on a first-come-first-server basis.

In a multiple UPF sharing a pool use case, whichever UPF hits the threshold first is given a chunk. Therefore, free chunks may not be available for other UPFs. That is, 100% pool utilization may not occur for a given pool in certain conditions. In this scenario, configure additional IPs accordingly or split into multiple pools per UPF.

Split-Size Configuration

While configuring the split-size of a dynamic pool, consider the following recommendations:

- Number of IPs in the pool.
- Total number of subscribers—The number of IPs versus the percentage of the number of sessions.
- Number of UPFs sharing the pool.
- Number of sessions per UPF—The number of sessions versus the percentage of the number of UPFs.
- Quarantine time of the pool.
- Churn rate—The CPS of IP allocation, CPS of IP release.
- Maximum routes a UPF can support (example: ASR9k supports 32 routes per loopback in Release 7.4.x/7.5.x).

Each Node Manager (nodemgr) uses per-cache as the split-size of the chunk.

Each UPF is assigned per-dp as the split-size of chunk.

Each Node Manager reserves chunks of per-cache size and further splits (if-applicable) and assigns them to a UPF.

A chunk can be in one of the following states:

- <upf-name>—The chunk assigned to an UPF.
- Free:CP—It is free in the cache-pod, any Node Manager can use it.
- Free:NM0— It is free in the Node Manager instance-0. Only this Node Manager can use it.
- Free:NM1— It is free in the Node Manager instance-1. Only this Node Manager can use it.
- QT:NM0— It is in quarantine in the Node Manage instance-0. This is moved to free after quarantine timer expiry.
- QT:NM1—It is in quarantine the Node Manage instance-1. This is moved to free after quarantine timer expiry.

Threshold Configuration

Changing threshold configuration on-the-fly takes effect only after the next event, such as address-allocation or address-delete. On an idle-system, there may not be any immediate action.

IPAM Enhancements

Feature Summary and Revision History

Summary Data

Table 10: Summary Data

Applicable Product(s) or Functional Area	cnBNG
Applicable Platform(s)	SMI
Feature Default Setting	Not Applicable
Related Documentation	*Cloud Native BNG Control Plane Command Reference Guide*

Revision History

Table 11: Revision History

Revision Details	Release
First introduced.	2021.03.0

Feature Description

This release supports IPAM enhancements that include updates to the IPAM quaratine timer, address-range level quarantine, pool and User Plane function (UPF) threhsold monitoring, and multiple replica handling

For more information, see the Cloud Native BNG Control Plane Configuration Guide > IP Address Management chapter.

Monitor Protocol and Subscriber

Feature Summary and Revision History

Summary Data

Table 12: Summary Data

Applicable Product(s) or Functional Area	cnBNG
Applicable Platform(s)	SMI
Feature Default Setting	Disabled - Configuration Required

Related Documentation	*Cloud Native BNG Control Plane Command Reference Guide*

Revision History

Table 13: Revision History

Revision Details	Release
First introduced.	2021.03.0

Feature Description

The Monitor Subscriber and Protocol feature supports the debugging functionality.

Monitor Subscriber

The Monitor Subscriber feature captures all the transactional logs for a given subscriber over a specified period of time across all the Kubernetes pods. It also supports the simultaneous monitoring of multiple subscribers on a given cluster. This information allows to track all the events that had occurred for a given subscriber when the subscriber was coming up or going down.

Monitor Protocol

The Monitor Protocol feature replicates the packets from different protocol endpoints of cnBNG and sends it to the OAM pod. There two levels of packet replication that occur:

- First replication dumps only the basic packet information
- Second replication dumps the full packet with details like headers, keys of subscriber, and so on.

This feature captures all ingress and egress packets on the cnBNG protocol pods.

For configuring the Monitor Subscriber and Protocol feature, see the Cloud Native BNG Control Plane Configuration Guide >Monitor Protocol and Subscriber chapter.

Multi-Action Change of Authorization

Feature Summary and Revision History

Summary Data

Table 14: Summary Data

Applicable Product(s) or Functional Area	cnBNG
Applicable Platform(s)	SMI
Feature Default Setting	Not Applicable

Related Documentation	*Cloud Native BNG Control Plane Command Reference Guide*

Revision History

Table 15: Revision History

Revision Details	Release
First introduced.	2021.03.0

Feature Description

The Cloud Native BNG (cnBNG) supports multi-action Change of Authorization (CoA) wherein service providers can activate and deactivate multiple services using a single CoA request. Multi-action CoA is supported for **Service-Activate** and **Service-Deactivate** commands.

During the multi-action CoA request, if any of the COA requests fail to activate or deactivate, then any of the services which have been activated or deactivated as part of that CoA request is rolled back to its previous state. The session restores back to the its pre-MA-CoA state upon failure to activation or deactivation.

For more information, see the Cloud Native BNG Control Plane Configuration Guide > Authentication, Authorization, and Accounting Functions chapter.

Multiple Replica Support for cnBNG Services

Feature Summary and Revision History

Summary Data

Table 16: Summary Data

Applicable Product(s) or Functional Area	cnBNG
Applicable Platform(s)	SMI
Feature Default Setting	Disabled - Configuration Required
Related Documentation	*Cloud Native BNG Control Plane Command Reference Guide*

Revision History

Table 17: Revision History

Revision Details	Release
First introduced.	2021.03.0

Feature Description

The Multiple Replica Support for cnBNG Services is designed to support multiple instances of the cnBNG services and load balance the session transactions to address the following requirements:

- Higher scalability
- Calls per Second (CPS) [CEPS - Call Events per Second (CEPS), TPS - Transactions per Second (TPS)]
- Redundancy

The following services must be configured to support multiple instances for load-balancing the session transactions.

- bng-dhcp
- bng-pppoe
- bng-sm
- bng-n4-protocol
- radius-ep
- udp-proxy
- bng-node-manager

To configure Multiple Replica Support, see the Cloud Native BNG Control Plane Configuration Guide > Multiple Replica Support for cnBNG Services chapter.

Static IP Support

Feature Summary and Revision History

Summary Data

Table 18: Summary Data

Applicable Product(s) or Functional Area	cnBNG
Applicable Platform(s)	SMI
Feature Default Setting	Disabled - Configuration Required
Related Documentation	*Cloud Native BNG Control Plane Command Reference Guide*

Revision History

Table 19: Revision History

Revision Details	Release
First introduced.	2021.03.0

Feature Description

IPAM is the core component of the subscriber management system. Traditional IPAM functionalities prove insufficient in the Cloud Native network deployments. Therefore, IPAM requires additional functionalities to work with the Cloud Native subscriber management system.

The Static IP Support provides more functionalities on the cnBNG using IPAM. These functionalities are as follows:

- Supports addition of a new static-pool or static-addr-range dynamically when system is running.
  - Send routes when User Plane function (UPF) is already associated.
- Supports removal of a new static-pool or static-addr-range dynamically when system is running
  - Mark the static-pool or static-addr-range offline.
  - Clear subscribers, manually.
  - Delete the configuration. IPAM sends the route-delete command to the UPF if it is already associated.

Note Changing the UPF name directly in the static IP pool is not supported. To change the UPF name, gracefully delete the static IP pool and readd the new UPF.

Note the following guidelines while configuring a static IP pool:

- An address pool is marked as "static" during configuration. A given address pool can be either configured as "dynamic" or "static" mode only. It cannot be modified while the system is running.
- Each static pool is associated to an Use Plane function (UPF). The IPAM configures all the address-ranges as routes on the UPF. The recommendation is to use the "no-split" configuration to avoid having too many splits and routes.
- The IPV4 address ranges must be configured with the "default-gateway" value, because unlike dynamic address-range, IPAM cannot assign "default-gateway" on its own. Also, the static address-ranges must not be split further. Therefore, use the "no-split" configuration.

For more information, see the Cloud Native BNG Control Plane Configuration Guide > IP Address Management chapter.

Subscriber QoS Policy

Feature Summary and Revision History

Summary Data

Table 20: Summary Data

Applicable Product(s) or Functional Area	cnBNG
Applicable Platform(s)	SMI
Feature Default Setting	Disabled - Configuration Required
Related Documentation	Not Applicable

Revision History

Table 21: Revision History

Revision Details	Release
First introduced.	2021.03.0

Feature Description

The Subscriber Quality of Service (QoS) Policy feature uses the following Cisco AVPs to apply the subscriber QOS policy through RADIUS.

```
cisco-avpair = "subscriber:sub-qos-policy-in=<ingress qos policy name>"
cisco-avpair = "subscriber:sub-qos-policy-out=<egress qos policy name>",
```

Example:

```
radius profile
cisco-avpair = "subscriber:sub-qos-policy-in=qos_in_100mbps",
cisco-avpair = "subscriber:sub-qos-policy-out=qos_out_100mbps",
```

"qos_in_100mbps" and "qos_out_100mbps" are the QoS policy maps that are configured in the User Plane (UP). The merge-level and accounting features are not supported through RADIUS. If unsupported features are passed from RADIUS, behaviour is undefined.

Applying QoS from profile feature-template and through RADIUS using sub-qos-policy-in or sub-qos-policy-out is not supporetd for the same subscriber. When applied, behaviour is undefined.

For information about the sub-qos-policy-in or sub-qos-policy-out attributes, see Table 2 in the Cloud Native BNG Control Plane Configuration Guide > RADIUS Attributeschapter.

User-Plane and Format-String Support for AAA Attribute Format

Feature Summary and Revision History

Summary Data

Table 22: Summary Data

Applicable Product(s) or Functional Area	cnBNG
Applicable Platform(s)	SMI
Feature Default Setting	Disabled - Configuration Required
Related Documentation	*Cloud Native BNG Control Plane Command Reference Guide*

Revision History

Table 23: Revision History

Revision Details	Release
Enhancement Introduced: The **profile attribute-format** command now includes the **userplane** option and the **format-string** keyword.	2021.03.0

Feature Description

The Control Plane supports multiple User Planes (UPs). Therefore, to apply AAA attributes to a specific User Plane (UP), the **profile attribute-format** command now includes the **user-plane** keyword in the format-order value.

Also, to provide flexibility in specifiying an attribute string as a AAA attribute, the **profile attribute-format** command now includes the **format-string** keyword.

For more information, see the Cloud Native BNG Control Plane Configuration Guide > Authentication, Authorization, and Accounting Functions chapter.

UP Session Disconnect Notification

Feature Summary and Revision History

Summary Data

Table 24: Summary Data

Applicable Product(s) or Functional Area	cnBNG
Applicable Platform(s)	SMI
Feature Default Setting	Enabled - Always-on
Related Documentation	Not Applicable

Revision History

Table 25: Revision History

Revision Details	Release
UP Session Disconnect Notification support added.	2021.03.0
First introduced.	2021.03.0
First introduced.	2021.01.0

Feature Description

The User Plane (UP) Session Disconnect Notification feature enables the UP to send a session disconnect notification to the Control Plane (CP) in the following scenario:

When the UP deletes a session locally following any local event (for example, mark and sweep).

For a list of scenarios that trigger a session disconnect notification, see the *Broadband Network Gateway Configuration Guide for Cisco ASR 9000 Series Routers* here: https://www.cisco.com/c/en/us/support/routers/asr-9000-series-aggregation-services-routers/products-installation-and-configuration-guides-list.html.

This notification carries the final statistics for the session and for all services, if accounting is enabled.

The CP initiates the session disconnect for this session only in the CP. The CP then deletes this session. If the session accounting is enabled for this session, the CP sends an accounting "stop record" message to RADIUS.

The UP deletes the session after initiating the session disconnect request to the CP. Therefore, the CP doesn’t send a session release Packet Forwarding Control Protocol (PFCP) message to the UP.