



Cloud Native BNG Control Plane Release Change Reference, Release 2021.04

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About this Guide



Note The documentation set for this product strives to use bias-free language. For purposes of this documentation set, bias-free is defined as language that does not imply discrimination based on age, disability, gender, racial identity, ethnic identity, sexual orientation, socioeconomic status, and intersectionality. While any existing biased terms are being substituted, exceptions may be present in the documentation due to language that is hardcoded in the user interfaces of the product software, language used based on RFP documentation, or language that is used by a referenced third-party product.

This Release Change Reference (RCR) describes new and modified feature and behavior change information for the applicable Cloud Native Broadband Network Gateway (cnBNG) Control Plane (CP) release.

- [Conventions Used, on page v](#)

Conventions Used

The following tables describe the conventions used throughout this documentation.

Notice Type	Description
Information Note	Provides information about important features or instructions.
Caution	Alerts you of potential damage to a program, device, or system.
Warning	Alerts you of potential personal injury or fatality. May also alert you of potential electrical hazards.

Typeface Conventions	Description
Text represented as a screen display	This typeface represents displays that appear on your terminal screen, for example: Login:

Typeface Conventions	Description
Text represented as commands	<p>This typeface represents commands that you enter, for example:</p> <p>show ip access-list</p> <p>This document always gives the full form of a command in lowercase letters. Commands are not case sensitive.</p>
Text represented as a command <i>variable</i>	<p>This typeface represents a variable that is part of a command, for example:</p> <p>show card <i>slot_number</i></p> <p><i>slot_number</i> is a variable representing the desired chassis slot number.</p>
Text represented as menu or sub-menu names	<p>This typeface represents menus and sub-menus that you access within a software application, for example:</p> <p>Click the File menu, then click New</p>



CHAPTER 1

Cloud Native BNG Release Change Reference

- [Features and Changes Quick Reference, on page 1](#)
- [Feature Defaults Quick Reference, on page 1](#)
- [End-to-End Flow Control, on page 2](#)
- [High Availability and CP Reconciliation, on page 3](#)
- [L2TP Subscriber Management, on page 4](#)
- [NSO Integration Support, on page 7](#)
- [Rolling Software Update, on page 8](#)

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
End-to-End Flow Control, on page 2	2021.04.0
High Availability and CP Reconciliation, on page 3	2021.04.0
L2TP Subscriber Management, on page 4	2021.04.0
NSO Integration Support, on page 7	2021.04.0
Rolling Software Update, on page 8	2021.04.0

Feature Defaults Quick Reference

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

Feature	Default
End-to-End Flow Control	Disabled – Configuration Required
High Availability and CP Reconciliation	Disabled – Configuration Required
L2TP Subscriber Management	Disabled – Configuration Required

Feature	Default
NSO Integration Support	Enabled – Always-on
Rolling Software Update	Disabled – Configuration Required

End-to-End Flow Control

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 Documentation	Not Applicable

Revision History

Table 2: Revision History

Revision Details	Release
First introduced.	2021.04.0

Feature Description



Note This feature is Network Services Orchestrator (NSO) integrated.

The Cloud Native Broadband Network Gateway (cnBNG) manages residential subscribers from different access planes in a centralized way. It accepts and identifies subscriber Control Plane (CP) traffic coming from multiple User Planes (UPs) associated with the CP. When the number of UPs scale, the amount of CP traffic coming from each UP, multiplies.

There are various scenarios where the traffic flow between the CP and UP must be regulated. This is to ensure that the CP attends all the service requests without service interruption. The scenarios that create burstiness or higher flow rates in the traffic flows are as follows:

- Power outage in a residential area
- Access network outage for a specific period

- UP catastrophic events like process crash, route processor reboots, chassis reload are some of the examples.

These scenarios generate sudden spike in traffic going to the CP. To handle these spikes in traffic, it is necessary to flow control and rate limit the CP ingress to ensure that service applications are not overwhelmed with these bursts. The End-to-End Flow Control feature optimizes flow control and rate limit of the traffic toward the CP ingres.

For more information, see the [Cloud Native BNG Control Plane Configuration Guide > End-to-End Flow Control](#) chapter.

High Availability and CP Reconciliation

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	Disabled - Configuration Required
Related Documentation	Not Applicable

Revision History

Table 4: Revision History

Revision Details	Release
First introduced.	2021.04.0

Feature Description

The High Availability (HA) and Control Plane (CP) Reconciliation feature support is available for all cnBNG specific service pods. HA has the following impact on pod services:

- CPU or memory spike can occur if there is a churn of sessions during pod restart. For example, if SM has two replicas, instance 1 and instance 2 and if instance 1 restarts, there will be spike in the CPU or memory in instance 2.
- Service pod IPCs can timeout if the destination service pod restarts before responding to the ongoing IPCs.
- CDL updates of ongoing sessions can fail and may result in desynchronization of the sessions between the pods.

- Subscriber sessions can desynchronize across all the pods in the CP due to mismatch of session count or session data. The solution is to run reconciliation (that is, CP audit) for sessions across pods.
 - Reconciliation between SM and DHCP for IPoE sessions
 - Reconciliation between SM, DHCP, and PPP for PTA and LNS sessions
 - Reconciliation between SM and PPP for LAC sessions.
 - Reconciliation between Node Manager (NM) and FSOLs for all session types



Note High availability and CP reconciliation is available only for IPOE and PTA session types. LAC and LNS session types are not supported.

- Subscriber sessions can desynchronize between the CP and UP. The solution for this is to run CP to UP reconciliation for sessions between the CP and UP.
- IP address leaks can occur in IPAM. To address this, run the IPAM reconciliation CLI command, **reconcile ipam**.
- ID leaks (CP SubscriberID and PPPoE Session ID) can occur in the NM.
- Grafana metrics can reset for the restarted pods.

For more information, see the [Cloud Native BNG Control Plane Configuration Guide > High Availability and Control Plane Reconciliation](#) chapter.

L2TP Subscriber Management

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	Not Applicable

Revision History

Table 6: Revision History

Revision Details	Release
First introduced.	2021.04.0

Feature Description

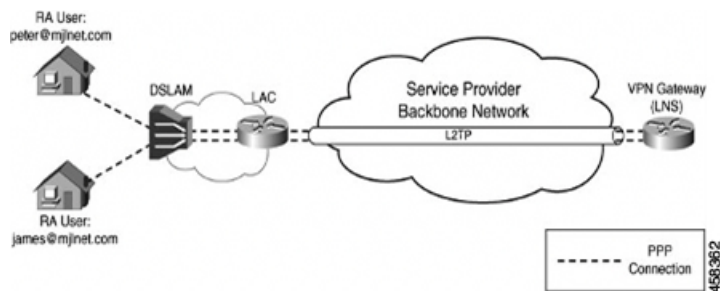
Majority of the digital subscriber line (DSL) broadband deployments use PPPoE sessions to provide Subscriber services. These sessions terminate the PPP link and provide all the features, service, and billing on the same node. These sessions are called PPP Terminated (PTA) sessions .

There are some wireline subscriber deployments are in wholesale-retail model where some ISPs work with others to provide the access and core services separately. In such cases, the subscribers are tunneled between wholesale and retail ISPs using the Layer 2 Tunneling Protocol (L2TP) protocol.

In cnBNG, the L2TP performs the hand-off task of the subscriber traffic to the Internet service provider (ISP). To do this, L2TP uses two network components:

- L2TP Access Concentrator (LAC)—The L2TP enables subscribers to dial into the L2TP access concentrator (LAC), which extends the PPP session to the LNS. cnBNG provides LAC.
- L2TP Network Server—The L2TP extends PPP sessions over an arbitrary network to a remote network server that is, the L2TP network server (LNS). The ISP provides LNS.

The overall network deployment architecture is also known as VPDN (Virtual Private Dial up Network). The overall topology of LAC and LNS is depicted as follows:



The CP for LAC and LNS depend on the L2TP session termination. Developing these two control planes in a single cnBNG microservice has the following benefits:

Simplified Single L2TP Control Plane

- Enables a single Control Plane (CP) to handle both LAC and LNS services
- Reduces the configuration complexity of the current XR L2TP vpdn-groups, vpdn-templates, l2tp-class and so on are simplified.
- Supports LC subscriber (not supported on the physical BNG)
- Avoids Ns/Nr checkpointing issues of pBNG to support RPFO

Collocated LAC and LNS

- Supports LAC and LNS in the same cnBNG CP, with different User Plane (UPs)
- Enables sharing of the same AAA and Policy Plane
- Simplifies management and troubleshooting

Flexible Deployment Options

The integration of LAC and LNS into a centralized cnBNG CP provides highly flexible deployments options to suit different customer use-cases and needs. For example, the cnBNG CP can host the CP functionality either for a LAC or LNS UP. Also, the same CP cluster can act as a CP for both LAC and LNS UPs from different data centers (or even from the same user-plane, if the user-plane supports it) except for the same session at the same time.

For more information, see the [Cloud Native BNG Control Plane Configuration Guide > PPPoE and L2TP Subscriber Management](#) chapter.

L2TP Features

The cnBNG supports the following Layer 2 Tunneling Protocol (L2TP) features:

- Tunnel authentication
- L2TP congestion control
- AVP encryption
- Tunnel Hello interval
- IP ToS value for tunneled traffic
- IPv4 don't fragment bit
- DSL line information attributes
- IPv4 tunnel source address
- IPv4 tunnel destination address
- IPv4 destination load balancing
- Tunnel mode
- MTU for LCP negotiation
- TCP maximum support
- Start-Control-Connection-Request (SCCRQ) timeout
- SCCRQ retries
- Control packet retransmission
- Control packet retransmission retries
- Receive window size for control channel
- Rx and Tx connect speed

- Tunnel VRF
- Tunnel session limit
- Weighed and Equal Loadbalancing
- Tunnel password for authentication
- Domain name and tunnel assignment
- LCP and Authentication renegotiation
- LAC hostnames for tunnelling requests

NSO Integration Support

Feature Summary and Revision History

Summary Data

Table 7: 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 8: Revision History

Revision Details	Release
First introduced.	2021.04.0

Feature Description

The following features are Network Services Orchestrator (NSO) integrated:

- Cisco Common Data Layer
- Authentication, Authorization, and Accounting
- IPoE (DHCP)
- IPAM
- Monitor Subscriber and Protocol

- Multiple Replica Support for cnBNG Services
- PPPoE and L2TP
- Subscriber Manager

For more information, see the respective chapters in the [Cloud Native BNG Control Plane Configuration Guide](#).

Rolling Software Update

Feature Summary and Revision History

Summary Data

Table 9: Summary Data

Applicable Product(s) or Functional Area	cnBNG
Applicable Platform(s)	SMI
Feature Default Setting	Disabled - Configuration Required
Related Documentation	<ul style="list-style-type: none"> • Multiple Replica Support for cnBNG Services • High Availability and CP Reconciliation

Revision History

Table 10: Revision History

Revision Details	Release
First introduced.	2021.04.0

Feature Description

The cnBNG Rolling Software Update feature enables incremental update of pod instances with minimal downtime. In Kubernetes, this implementation is possible only with rolling updates.

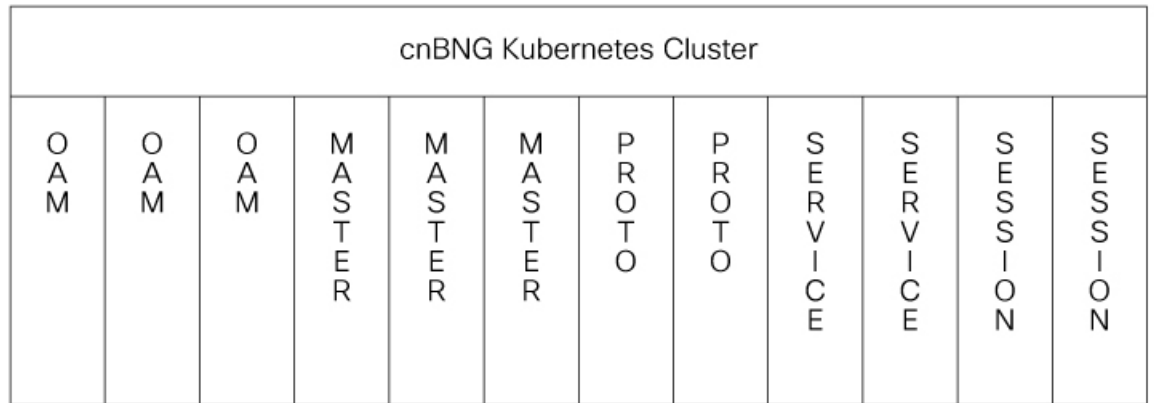
Subscriber Microservices Infrastructure (SMI) platform supports rolling software upgrade for cnBNG pods. The “Pod Restart and Reconciliation” and “Multiple Replica Support for cnBNG Services” features depend on this feature. For more information, see [Multiple Replica Support for cnBNG Services](#) and [High Availability and CP Reconciliation](#).

The cnBNG has a three-tier architecture consisting of Protocol, Service, and Session tiers. Each tier includes a set of microservices (pods) for a specific functionality. Within these tiers, there exists a Kubernetes Cluster comprising of Kubernetes (K8s) master and worker nodes (including Operation and Management nodes).

For high availability (HA) and fault tolerance, a minimum of two K8s worker nodes are required for each tier. Each worker node can have multiple replicas. Kubernetes orchestrates the pods using the StatefulSets controller. The pods require a minimum of two replicas for fault tolerance.

The following figure depicts the cnBNG K8s Cluster with 12 nodes – three Master nodes, three Operations and Management (OAM) worker nodes, two Protocol worker nodes, two Service worker nodes, and two Session (data store) worker nodes.

Figure 1: cnBNG Kubernetes Cluster



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Note

- OAM worker nodes: These nodes host the Ops Center pods for configuration management and metrics pods for statistics and Key Performance Indicators (KPIs).
- Protocol worker nodes: These nodes host the cnBNG protocol related pods for UDP based interfaces like N4, RADIUS, and GTP.
- Service worker nodes: These nodes host the cnBNG application related pods that perform session and FSOL management.
- Session worker nodes: These nodes host the database-related pods that store subscriber session data.

For more information, see the [Cloud Native BNG Control Plane Configuration Guide > Rolling Software Update](#) chapter.

