# UPF Ingress Interfaces

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# Feature Summary and Revision History

## Summary Data

***Table 1: Summary Data***

| | |
|---|---|
| Applicable Product(s) or Functional Area | 5G-UPF |
| Applicable Platform(s) | VPC-SI<br>SMI |
| Feature Default Setting | Disabled – Configuration Required |
| Related Changes in this Release | Not Applicable |
| Related Documentation | *UCC 5G UPF Configuration and Administration Guide* |

## Revision History

***Table 2: Revision History***

| **Revision Details** | **Release** |
|---|---|
| Added support for IP separation per interface to allow separate networks for N3 and N9 interfaces. | 2023.03.0<br>2023.02.0 |
| First introduced. | 2020.02.0 |

# Feature Description

UPF supports the GTP-U ingress interface to initiate the user plane service. The user plane service associates with the GTP-U service using the **associate gtpu-service** CLI command in User Plane Service configuration mode.

To enable the **upf-ingress** command, you must configure the **require upf** command on the UPF. You need the UPF license to enable the **require upf** command.

The UPF supports different GTP-U ingress interfaces to allow a separate network for N3 interface and N9, S5u, and S8u interfaces. The N9, S5u, and S8u interfaces share the same public IP.

**Note** UPF does not support multiple GTP-U service selection for single call.

The supported GTP-U ingress interfaces include:

- N3—N3 is the interface between gNodeB and UPF.
- N9—The N9 interface connects two UPFs. It is the interface between intermediate I-UPF and UPF session anchor connecting different PLMN.
- S5u—S5u is similar to the N9 interface that connects two UPFs. It is the interface between intermediate I-UPF and UPF session anchor.
- S8u—S8u is an inter-PLMN variant of the S5u interface.

# UPF Ingress Interface Type Configuration

## Configuring UPF Ingress Interface Type

To configure the UPF ingress interface type, use the following configuration:

To enable the **upf-ingress** command, you must configure the **require upf** command on the UPF. You need the UPF license to enable the **require upf** command.

```
configure
   context context_name
      user-plane-service service_name
         [ no ] associate gtpu-service gtpu_service_name upf-ingress
interface-type [ n9 | s5u | s8u | n3 | n9-s5u-s8u ]
         end
```

**NOTES:**

- **associate gtpu-service** *gtpu_service_name*: Associate the GTP-U service with the user plane service.
- **upf-ingress**: Configure the interface type as UPF ingress.
- **interface-type [ n9 | s5u | s8u | n3 | n9-s5u-s8u ]**: Configure the desired GTP-U ingress interface type.

- If the N3 GTP-U ingress service is not present, UPF uses the default interface.
- If the configuration for N9, S5u, or S8u interfaces is not present, UPF performs the following actions:
  - UPF looks to use the N9 interface first followed by the S5u and S8u interfaces.
  - If there is no GTP-U service, UPF uses the default interface.

## Configuration Example

The following is an example configuration:

```
associate gtpu-service n3-ingress upf-ingress
associate gtpu-service n3-ingress upf-ingress interface-type n3
associate gtpu-service n9-ingress upf-ingress interface-type n9
associate gtpu-service s5-ingress upf-ingress interface-type s5
associate gtpu-service s8-ingress upf-ingress interface-type s8
```

# Configuring Echo Response for N9 Interface

The echo response in a GTP-U service provides the availability of peer UPF.

The following is a sample echo response configuration for the N9 interface in hUPF:

```
gtpu-service n9-ingress
   echo-interval 60
   echo-retransmission-timeout 1
   bind ipv4-address 60.60.41.5 bearer-type all
   exit
```

The following is a sample echo response configuration for the N9 interface in vUPF:

```
gtpu-service n9-egress
   echo-interval 60
   echo-retransmission-timeout 1
   bind ipv4-address 60.60.42.5 bearer-type all
   exit
```

# Separating N3 and N9 BGP Routes

The following is a sample configuration to separate the N3 and N9 BGP routes for hUPF.

```
 config
  context SAEGW
    ip vrf mpls-vrf-1
    #exit
    ip vrf mpls-vrf-2
    #exit
    mpls bgp forwarding
    bfd-protocol
    #exit
    ip prefix-list name up seq 15 permit 50.50.17.4/32
    ip prefix-list name up seq 20 permit 50.50.17.5/32
    ip prefix-list name up seq 25 permit 50.50.17.6/32
    ip prefix-list name up seq 40 permit 50.50.17.7/32
    ip prefix-list name n9-up1 seq 50 permit 60.60.17.5/32
    ip prefix-list name n9-up1 seq 55 permit 60.60.17.6/32
    route-map up_routes1 permit 10
      match ip address prefix-list n9-up1
```

```
#exit
route-map up_routes permit 10
  match ip address prefix-list up
#exit
router bgp 61435
  maximum-paths ebgp 4
  neighbor 20.14.35.100 remote-as 65000
  neighbor 20.14.35.100 ebgp-multihop
  neighbor 20.14.35.100 update-source 20.14.35.98
  neighbor 2001:4888:121:1435::1 remote-as 65000
  neighbor 2001:4888:121:1435::1 ebgp-multihop
  neighbor 2001:4888:121:1435::1 update-source 2001:4888:121:1435::2
  neighbor 20.14.40.100 remote-as 65000
  neighbor 20.14.40.100 ebgp-multihop
  neighbor 20.14.40.100 update-source 20.14.40.98
  address-family ipv4
    neighbor 20.14.35.100 max-prefix 8192 threshold 50
    neighbor 20.14.35.100 route-map up_routes out
    neighbor 20.14.35.100 send-community extended
    neighbor 20.14.40.100 max-prefix 8192
    neighbor 20.14.40.100 route-map up_routes1 out
    neighbor 20.14.40.100 send-community extended
    redistribute connected
    redistribute static
  #exit
  address-family ipv6
    neighbor 2001:4888:121:1435::1 activate
    redistribute connected
    redistribute static
  #exit
#exit
interface SxC loopback
  ip address 50.50.17.4 255.255.255.255
#exit
interface SxC-ipv6 loopback
  ipv6 address 2001:4888:50:50::17/128
#exit
interface gn-1
  ip address 20.14.35.98 255.255.255.0
  ipv6 address 2001:4888:121:1435::2/64 secondary
#exit
interface gn-2
  ip address 20.14.36.98 255.255.255.0
  ipv6 address 2001:4888:121:1436::2/64 secondary
#exit
interface gn-n9-ingress
  ip address 20.14.40.98 255.255.255.0
#exit
interface n9-ingress-hupf loopback
  ip address 60.60.17.5 255.255.255.255
#exit
interface pgw-gtpu loopback
  ip address 50.50.17.5 255.255.255.255
#exit
interface sgw-gtpu-egress loopback
  ip address 50.50.17.6 255.255.255.255
#exit
interface sgw-gtpu-ingress-phazr loopback
  ip address 60.60.17.6 255.255.255.255
#exit
subscriber default
exit
aaa group default
#exit
```

```
    gtpp group default
      gtpp limit-secondary-rat-usage 32
    #exit
    gtpu-service SxC
      echo-interval 60
      echo-retransmission-timeout 1
      bind ipv4-address 50.50.17.4 ipv6-address 2001:4888:50:50::17 bearer-type all
    exit
    gtpu-service n9-ingress
      bind ipv4-address 60.60.17.5 bearer-type all
    exit
    gtpu-service pgw-gtpu
      bind ipv4-address 50.50.17.5 bearer-type all
    exit
    gtpu-service sgw-gtpu-egress
      bind ipv4-address 50.50.17.6 bearer-type all
    exit
    gtpu-service sgw-gtpu-ingress-phazr
      echo-interval 60
      echo-retransmission-timeout 1
      bind ipv4-address 60.60.17.6 bearer-type all
    exit
    sx-service sx-svc
      instance-type userplane
      bind ipv4-address 50.50.17.4 ipv6-address 2001:4888:50:50::17
      sxa max-retransmissions 5
      sxa retransmission-timeout-ms 1000
      sxb max-retransmissions 5
      sxb retransmission-timeout-ms 1000
      sxab max-retransmissions 5
      sxab retransmission-timeout-ms 1000
      sx-protocol heartbeat retransmission-timeout 15
      sx-protocol heartbeat max-retransmissions 3
      sx-protocol association debug-mode debug-reattempt-timeout 1
      no sx-protocol compression
    exit
    user-plane-service user_plane_svc
      associate gtpu-service pgw-gtpu upf-ingress
      associate gtpu-service n9-ingress upf-ingress interface-type n9
      associate gtpu-service sgw-gtpu-ingress-phazr sgw-ingress
      associate gtpu-service sgw-gtpu-egress sgw-egress
      associate gtpu-service SxC cp-tunnel
      associate sx-service sx-svc
      associate fast-path service
      associate control-plane-group SAEGW
      associate userplane-load-control-profile LCP
      associate userplane-overload-control-profile OLCP
    exit
```

The following is a sample configuration to separate the N3 and N9 BGP routes for vUPF.

```
context SAEGW
    router bgp 61441
      neighbor 20.14.41.100 remote-as 65000
      neighbor 20.14.41.100 ebgp-multihop
      neighbor 20.14.41.100 update-source 20.14.41.98
      neighbor 2001:4888:121:1441::1 remote-as 65000
      neighbor 2001:4888:121:1441::1 ebgp-multihop
      neighbor 2001:4888:121:1441::1 update-source 2001:4888:121:1441::2
      address-family ipv4
        redistribute connected
        redistribute static
      #exit
      address-family ipv6
        neighbor 2001:4888:121:1441::1 activate
    redistribute connected
    redistribute static
  #exit
#exit
interface SxC loopback
  ip address 50.50.18.4 255.255.255.255
#exit
interface SxC-ipv6 loopback
  ipv6 address 2001:4888:50:50::18/128
#exit
interface gn-1
  ip address 20.14.41.98 255.255.255.0
  ipv6 address 2001:4888:121:1441::2/64 secondary
#exit
interface gn-2
  ip address 20.14.42.98 255.255.255.0
  ipv6 address 2001:4888:121:1442::2/64 secondary
#exit
interface n9-egress loopback
  ip address 50.50.18.8 255.255.255.255
#exit
interface pgw-gtpu loopback
  ip address 50.50.18.5 255.255.255.255
#exit
interface pgw-gtpu-ipv6 loopback
  ipv6 address 2001:4888:50:50::18:5/128
#exit
interface sgw-gtpu-egress loopback
  ip address 50.50.18.6 255.255.255.255
#exit
interface sgw-gtpu-egress-ipv6 loopback
  ipv6 address 2001:4888:50:50::18:6/128
#exit
interface sgw-gtpu-ingress-phazr loopback
  ip address 50.50.18.7 255.255.255.255
#exit
interface sgw-gtpu-ingress-phazr-ipv6 loopback
  ipv6 address 2001:4888:50:50::18:7/128
#exit
subscriber default
exit
aaa group default
#exit
gtpp group default
  gtpp limit-secondary-rat-usage 32
#exit
gtpu-service SxC
  echo-interval 60
  echo-retransmission-timeout 1
  bind ipv4-address 50.50.18.4 ipv6-address 2001:4888:50:50::18 bearer-type all
exit
gtpu-service n9-egress
  bind ipv4-address 50.50.18.8 bearer-type all
exit
gtpu-service pgw-gtpu
  bind ipv4-address 50.50.18.5 ipv6-address 2001:4888:50:50::18:5 bearer-type all
exit
gtpu-service sgw-gtpu-egress
  bind ipv4-address 50.50.18.6 ipv6-address 2001:4888:50:50::18:6 bearer-type all
exit
gtpu-service sgw-gtpu-ingress-phazr
  echo-interval 60
  echo-retransmission-timeout 1
  bind ipv4-address 50.50.18.7 ipv6-address 2001:4888:50:50::18:7 bearer-type all
```

```
    exit
    sx-service sx-svc
      instance-type userplane
      bind ipv4-address 50.50.18.4 ipv6-address 2001:4888:50:50::18
      sxa max-retransmissions 5
      sxa retransmission-timeout-ms 1000
      sxb max-retransmissions 5
      sxb retransmission-timeout-ms 1000
      sxab max-retransmissions 5
      sxab retransmission-timeout-ms 1000
      sx-protocol heartbeat retransmission-timeout 15
      sx-protocol heartbeat max-retransmissions 3
      sx-protocol association debug-mode debug-reattempt-timeout 1
      no sx-protocol compression
    exit
    user-plane-service user_plane_svc
      associate gtpu-service pgw-gtpu upf-ingress
      associate gtpu-service n9-egress upf-egress
      associate gtpu-service sgw-gtpu-ingress-phazr sgw-ingress
      associate gtpu-service sgw-gtpu-egress sgw-egress
      associate gtpu-service SxC cp-tunnel
      associate sx-service sx-svc
      associate fast-path service
      associate control-plane-group SAEGW
      associate userplane-load-control-profile LCP
      associate userplane-overload-control-profile OLCP
    exit
    ip route 0.0.0.0 0.0.0.0 20.14.41.100 gn-1
    ip igmp profile default
    #exit
  #exit
```

**Note** For RCM UPF, add all the IP prefix-lists in day 0.5 configuration.

# Verifying the UPF Ingress Interface Type Configuration

To verify the configuration, use the following command:

- show user-plane-service all, on page 7

## show user-plane-service all

The **show user-plane-service all** command displays user-plane service information.

The following is a sample output of this command:

```
show user-plane-service all
Service name                        : user-plane-service
  Service-Id                        : 7
  Context                           : EPC2-UP
  Status                            : NOT STARTED
  UPF Ingress GTPU Service          : sx-gtpu-service
  UPF Ingress N3 Interface Type GTPU Service: n3-ingress
  UPF Ingress N9 Interface Type GTPU Service: n9-ingress
  UPF Ingress S5U Interface Type GTPU Service: s5u-ingress
  UPF Ingress S8U Interface Type GTPU Service: s8u-ingress
  UPF Egress GTPU Service           : Not defined
  SGW Ingress GTPU Service          : SGW-Ingress
SGW Egress GTPU Service            : SGW-Egress
Control Plane Tunnel GTPU Service : control_gtpu
Sx Service                         : sxu
Control Plane Group                : g1
Fast-Path service                  : Disabled
```

**NOTES:**

- The UPF configures only one of the interface types, **pgw-ingress** or **upf-ingress** in a single user plane service.