Best Practices Guide for Cisco Network Converged Fronthaul Systems

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NOTE: This guide recommends best practices to deploy a Cisco Service Provider Packetized Converged Fronthaul system and is intended for an audience who is involved in the design or deployment of the Cisco NCS540-FH and Cisco N540-FH-AGG-SYS routers.

This guide is *not* intended to replace the Fronthaul configuration guide.

As the demand for Packet based Centralized RAN and Virtualized/Cloud RAN Architecture grows, migration to X-Haul (Fronthaul, Midhaul & Backhaul) Architecture is inevitable. Converged Packet-based Fronthaul extends to meet the needs of X-Haul for 4G and 5G Networks.

Market leader Cisco is not only helping provide secure, flexible, scalable, and proven solutions for Converged Fronthaul, but providing and recommending deployment options to optimize Converged Fronthaul implementations. Options that will improve user experience, provide better performance, reduce expenses and provide packet-based services to different generations of Mobile.

Terms	Recommendation
Capacity	CPRI Rate-7 and Rate-8 for Structure Agnostic Tunnelling (Type-0) needs more than TenG core Capacity,25G and above are recommended. Bundling is not supported.
CPRI	Common Public Radio Interference Apply values for CPRI Packet Length as recommended per rate for efficient bandwidth utilization, Custom header is based on availability of network clock. Set re-timer buffer to 0. CPRI Support for NCS540-FH is a bookended solution.
e-CPRI	Enhanced-CPRI e-CPRI traffic is plain L2 Ethernet either Tagged or QnQ, only recommendation is to ensure the right tagging Filters and MTUs.
e-RAN	Enterprise Radio Access Network Local Switching is deployed for Inter-DU communication across single hop e-RAN, EVPN is deployed for Multi Hop ERAN solution based on requirement.

Terms	Recommendation
EVPN	Ethernet VPN EVPN Virtual Private Wire Service (VPWS) Single Homing is recommended with Pseudo wire class having a preferred path to disable fall-back.
GTP	General Packet Radio Service (GPRS) Tunnelling Protocol GTP Load balancing mandates maximum of 3 MPLS Label Stack for Deep Lookup-Only for Midhaul.
L2VPN	Layer 2 Virtual Private Network Though not recommended but if used needs to have Pseudo wire class for preferred path with fall-back disable
MTU	Maximum Transmission Unit MTU of more than 9000 is recommended through the converged profile.
PM	Performance Measurement The challenge of quickly updating the Dynamic Latency changes to IGP Database (Opaque LSA's) is sorted by accelerating the advertisement of latency changes to IGP Database for Opaque LSAs
QoS	Quality of Service Low-Delay Settings is recommended, Access RoE Traffic is default mapped to Traffic-Class 7, ensure explicit Traffic-Class 7 marking to the incoming core Labelled Traffic.
SR-TE	Segment Routing-Traffic Engineering SR-TE policy without Flex-Algo is recommended to allow policy having constraint of both Affinity & bound Cumulative Latency.
Timing	Centralized Clock is recommended. Converged 4G/5G Networks using Network Clock has to consider the Internal GNSS restrictions on NCS540-FH and plan PTP/Sync-E flow accordingly.

Configuring CPRI

Best Practice	Example

Efficient throughput is achieved for CPRI Rate 3-5 with 8 Basic Frames.	`roe`
	`  profile 108`
	`  packet-length 8`

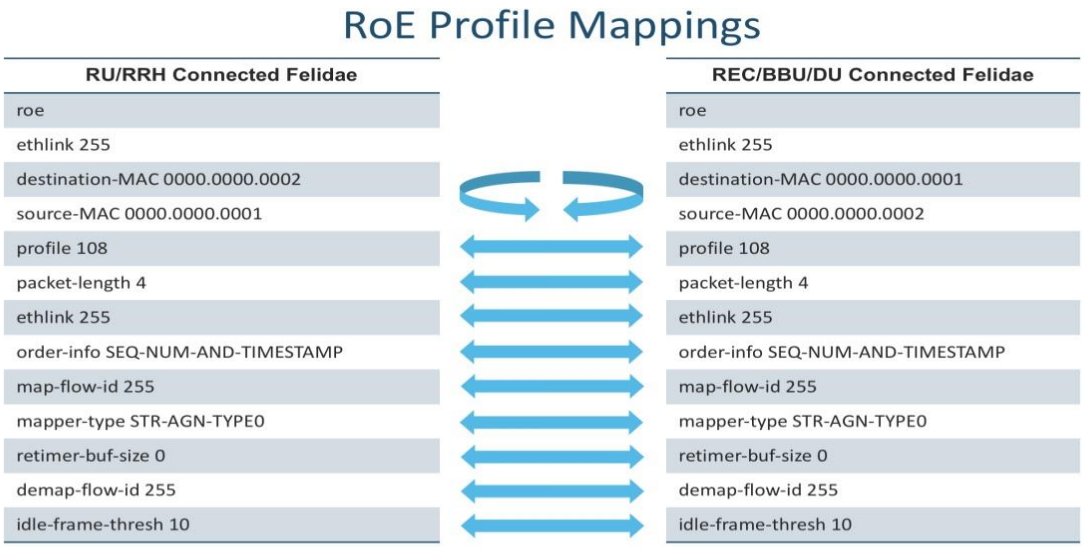
Efficient throughput is achieved for CPRI Rate 6-8 with 4 Basic Frames.	`roe`
	`  profile 108`
	`  packet-length 4`

Converged Packetized Fronthaul for 4G and 5G network, requires PTP (Network Clock) feed to 5G New Radio, henceforth a fronthaul network with PTP can have Sequence Number and Time Stamp both as Order Info for CPRI.	`roe`
	`  profile 108`
	`  order-info SEQ-NUM-AND-TIMESTAMP`

Retimer Buffer though available for Custom configuration is mandated to be 0 all the time for efficient de-jittering.	`roe`
	`  profile 108`
	`  retimer-buf-size 0`

Configuring Mapper and DeMapper Profiles

CPRI configurations need to match on Mapper and the De-Mapper to work, below is a graphical representation of which value to match and Mac values to reverse.



Configuring e-CPRI

Best Practice	Example

eCPRI 5G Traffic is Radio Agnostic to Front Haul Router and treated as an ethernet traffic either single tagged or QnQ. No special recommendation except for proper Tag Filtering and MTU (Covered in MTU Section).
 	
NOTE: eCPRI is not bookended and in this section only L2 Interface Configurations are considered which is a pre-requisite for EVPN covered in later sections.
	`interface TenGigE0/0/0/14.207 l2transport`
	` encapsulation dot1q 207`
	`  rewrite ingress tag pop 1 symmetric`

Configuring L2VPN VPWS

Best Practice	Example

L2VPN(VPWS) is not recommended but if used for P2P connections either with 5G or 4G Interfaces, Fall-back option has to be disabled with pseudo wire-class and Access interface MTU needs to be 9600.
 	
Configurations provided here consider SR-TE policy as the preferred path and hence SR-TE (Covered in later section) is a pre-requisite here,100G-Link is just a variable name signifying the 100G core link which is used here.
 	
Controller Optics and CPRI controller configurations with roe profile attached is a prerequisite for CPRIoE.
 	
NOTE Pseudo wire Grouping, Flow Label are not recommended for Radio Deployments.
	4G CPRI
	`interface CPRIoE0/0/0/6`
	`mtu 9600`
	`l2transport`
	
	`l2vpn`
	`pw-class 100G-Link`
	`encapsulation mpls`
	`preferred-path sr-te policy`
	`srte_c_109_ep_10.255.255.4 fallback disable`
	
	`xconnect group 108`
	`p2p 108`
	`interface CPRIoE0/0/0/6`
	`neighbor ipv4 108.108.108.1 pw-id 108`
	`pw-class 100G-Link`
	
	5G eCPRI
	`interface TenGigE0/0/0/6`
	`mtu 9600`
	`l2transport`
	
	`l2vpn`
	`pw-class 100G-Link`
	`encapsulation mpls`
	`preferred-path sr-te policy`
	`srte_c_109_ep_10.255.255.4 fallback disable`
	
	`xconnect group 109`
	`p2p 109`
	`interface TenGigE0/0/0/6`
	`neighbor ipv4 108.108.108.1 pw-id 109`
	`pw-class 100G-Link`

Configuring EVPN VPWS

Best Practice	Example

EVPN VPWS is the recommendation for Converged Packet Based Fronthaul deployments, Fall-back option has to be disabled with pseudo wire-class and Access interface MTU needs to be 9600.

Configurations provided here consider SR-TE policy as the preferred path and hence SR-TE (Covered in later section) is a pre-requisite here,100G-Link is just a variable name signifying the 100G core link which is used here.

Controller Optics and CPRI controller configurations with roe profile attached is a prerequisite for CPRIoE.

NOTE Redundancy in RAN (N+1) is recommended via NSO.

Global Configurations for BGP

```
router bgp 108
 bgp router-id 10.255.255.5
 address-family l2vpn evpn
 !
 neighbor 10.255.255.4
  remote-as 108
  update-source Loopback0
  address-family l2vpn evpn
```

Global Configurations for EVPN

```
evpn
 evi 108
 !
evpn
 evi 109
 !
```

4G CPRI

```
interface CPRIoE0/0/0/6
 mtu 9600
l2transport

l2vpn
pw-class 100G-Link
  encapsulation mpls
   preferred-path sr-te policy
srte_c_109_ep_10.255.255.4 fallback disable

xconnect group evpn-vpws108
  p2p evpn108
   interface CPRIoE0/0/0/6
   neighbor evpn evi 108 service 108
    pw-class 100G-Link
   !
```

5G eCPRI

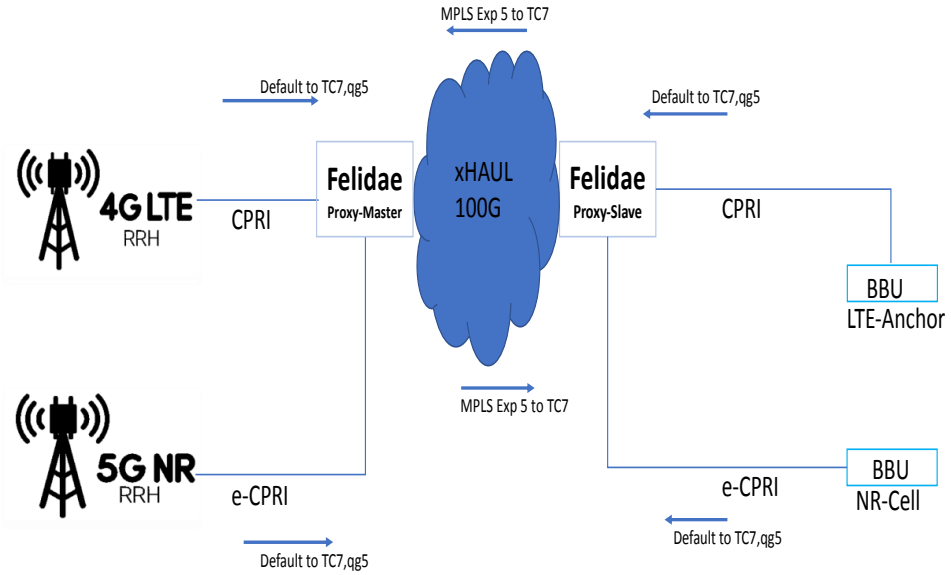
```
interface TenGigE0/0/0/6
 mtu 9600
l2transport

l2vpn
pw-class 100G-Link
  encapsulation mpls
   preferred-path sr-te policy
srte_c_109_ep_10.255.255.4 fallback disable

xconnect group evpn-vpws109
  p2p evpn109
  interface TenGigE0/0/0/6
   neighbor evpn evi 109 service 109
    pw-class 100G-Link
   !
```

Configuring QoS

Figure 1. Sample Topology



Best Practice	Example

For 4G Traffic i.e. CPRI, Low-Delay settings are default enabled on Access.
 	
5G Traffic i.e. eCPRI needs explicit marking for Low-Delay settings.
 	
From an end-to-end network perspective, both CPRI and eCPRI needs to be marked with appropriate MPLS Exp value for prioritization in the core network. This remarking disturbs Low-Delay settings for CPRI and henceforth setting Low-Delay for both CPRI and eCPRI is a best practice.
 	
Low-Delay settings need to be enabled on egress towards the RRU and RIU as well.
 	
In short Low-Delay settings is required bi-directional for Radio traffic.
 	
Marking QoS-Group sets the required MPLS Exp Value, marking traffic-class 7 ensures Low-Delay Settings.
	Global Configurations for QoS
	`class-map match-any exp5`
	`  match mpls experimental topmost 5`
	`  end-class-map`
	`!`
	`policy-map Radio_Interface_Xhaul`
	`  class class-default`
	`   set traffic-class 7`
	`   set qos-group 5`
	`  !`
	`  end-policy-map`
	`!`
	`policy-map Core_Interface_Xhaul`
	`  class exp5`
	`   set traffic-class 7`
	`  !`
	`  end-policy-map`
	`!`
	
	4G CPRI Access Interface
	`interface CPRIoE0/0/0/0`
	`  mtu 9600`
	`  load-interval 30`
	`  !`
	`  l2transport`
	`   service-policy input Radio_Interface_Xhaul`
	`    !`
	
	5G eCPRI
	`interface TenGigE0/0/0/21`
	`  mtu 9600`
	`  service-policy input Radio_Interface_Xhaul`
	
	Xhaul Core Interfaces
	`interface HundredGigE0/0/0/26`
	`  mtu 9600`
	`  service-policy input Core_Interface_Xhaul`
	`  load-interval 30`
	`!`

Configuring SR-TE

Before you configure SR-TE, you must have already configured an IGP, either ISIS or OSPF with SR-MPLS and Distribute Link State enabled.

For latency-bound constraints in SR-TE, you must have dynamic link level Performance measurement. See the Configuring Performance Measurement section.

For more information, see the *Segment Routing Configuration Guide for Cisco NCS 540 series Routers*.

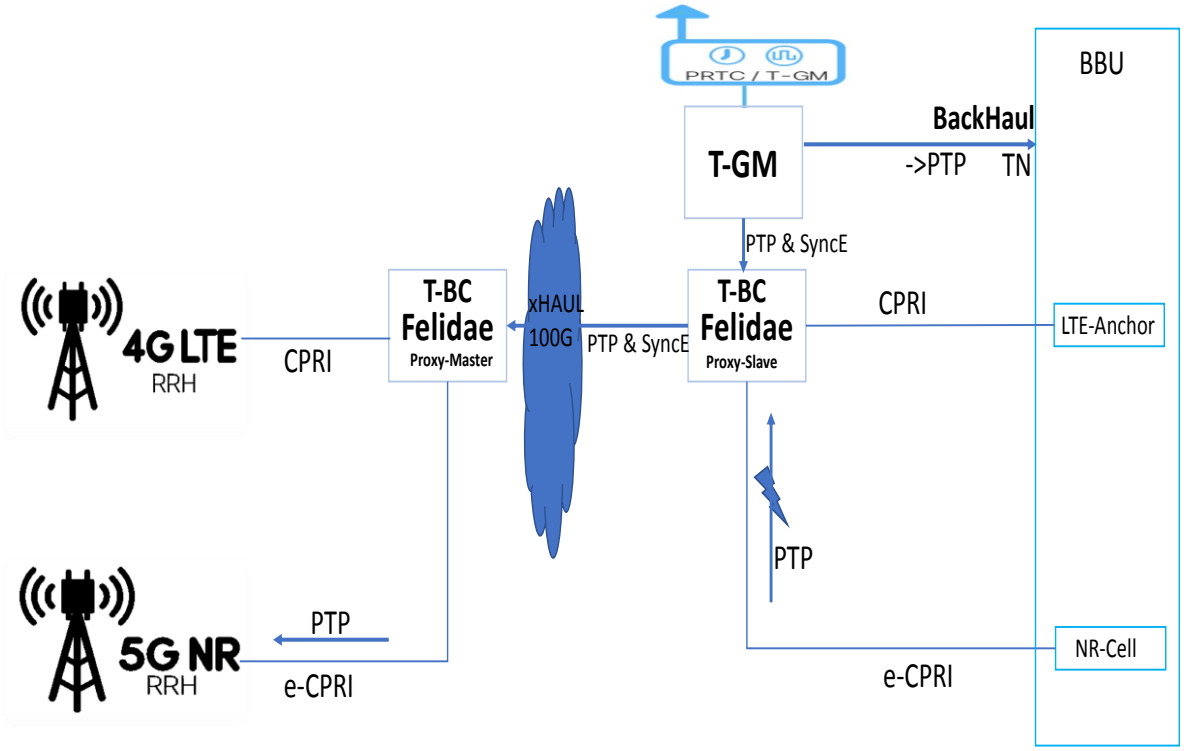
Best Practice	Example
SR-TE is best recommended for the Converged Fronthaul deployment due to the advantages of latency-based constraints. Flex-Algo does not support (&) operation of both Affinity and bound Cumulative latency. NOTE Latency constraint considered here is 150us, this can be customized.	segment-routing traffic-eng interface TenGigE0/0/0/19 affinity name XENA ! policy XENA color 1008 end-point ipv4 10.255.255.5 candidate-paths preference 100 dynamic metric type igp ! ! constraints bounds cumulative type latency 150 ! ! affinity include-all name XENA ! ! ! affinity-map name XENA bit-position 3 !

Configuring Performance Measurement

Best Practice	Example
Latency Bound Traffic-Engineering with SR-TE is important for Converged Fronthaul deployment, Link level dynamic PM using TWAMP is enabled to achieve the same. Dynamic Latency changes to IGP Database (Opaque LSA's) in real time is important to ensure stringent Latency budgets under all conditions. In order to achieve the same, accelerate the advertisement of latency changes to IGP Database for Opaque LSA's.	performance-measurement interface TenGigE0/0/0/15 delay-measurement ! delay-profile interfaces advertisement accelerated minimum-change 1 ! ! probe measurement-mode two-way protocol twamp-light ! !
End to End transport delay measurement with Segment Routing as core can be achieved via SR-PM. SR-PM is Asymmetric 2-way Delay measurement. Use the `show performance-measurement sr-policy brief` command to display delay	Segment-Routing Traffic-Eng policy SRPM binding-sid mpls 9002 color 9002 end-point ipv4 10.255.255.4 candidate-paths preference 100 explicit segment-list JB-BT-MT-TT-JT ! performance-measurement delay-measurement reverse-path label 9002 ! delay-profile name SRPM Global Configuration performance-measurement delay-profile sr-policy name SRPM probe measurement-mode two-way protocol twamp-light !
For the CPRI delay measurement, use the `show controllers cpRI 0/0/0/0 roe-stats` command to display statistics. These statistics display one way delay measurement information that includes Packetizing Delay, Transport Delay and De-Jitter Buffer Delay.	<truncated output> Packet Delay Variation : max/min/avg = 444 / 79 / 80

Configuring Timing

Figure 2. Sample Topology



For Standalone 4G Networks, SyncE can be retrieved from CPRI on the Proxy-Slave from REC (DU/BBU) but centralized clock is recommended.

Converged 4G/5G Networks using Network Clock has to consider the Internal GNSS restrictions on NCS540-FH.

In a 5G Network, NR needs a PTP Feed via the Fronthaul Router, EVPN endpoints on FH Router towards 5G BBU loops PTP packet to NR and hence has to be dropped by making the interface as a PTP client.

Detail	Example

T-GM: NCS540-FH does not support Internal GNSS, henceforth Back Haul CSR can be T-GM driving network clock to Front Haul Routers. Or, any other router supporting internal GNSS can be used.	T-GM Global Configuration
	`ptp`
	` clock`
	`  domain 24`
	`  profile g.8275.1 clock-type T-GM`
	`  timescale PTP`
	`  time-source GPS`
	`  clock-class 6`
	` !`
	` profile slave`
	`  transport ethernet`
	`  sync frequency 16`
	`  announce frequency 8`
	`  delay-request frequency 16`
	` !`
	` profile master`
	`  multicast target-address ethernet 01-1B-19-00-00-00`
	`  transport ethernet`
	`  port state master-only`
	`  sync frequency 16`
	`  clock operation one-step`
	`  announce frequency 8`
	`  delay-request frequency 16`
	` !`
	` physical-layer-frequency`
	`!`
	
	On the T-GM:
	
	`gnss-receiver 0 location 0/RP0/CPU0`
	` constellation gps`
	` cable-delay compensation 1230`
	` frequency synchronization`
	`  selection input`
	`  wait-to-restore 0`
	`  time-of-day-priority 1`
	` !`
	`!`
	
	`frequency synchronization`
	`quality itu-t option 1`
	`clock-interface timing-mode system`

T-GM: Backhaul CSR router running internal GNSS is the Master providing clock to BBU.
 	
Centralized Clock to the entire RAN network is via this Backhaul CSR.
	T-GM TN Ports to Backhaul
	`interface TenGigE0/0/0/22`
	` description To_BBU(TN)`
	` mtu 9010`
	` ptp`
	`  profile master`
	`  multicast target-address ethernet 01-1B-19-00-00-00`
	`  transport ethernet`
	`  port state master-only`
	`  sync frequency 16`
	`  local-priority 10`
	`  clock operation one-step`
	`  announce frequency 8`
	`  delay-request frequency 16`
	` !`
	`frequency synchronization`
	`  wait-to-restore 0`
	` !`

T-GM: Centralized Clock to the entire RAN network is via this Backhaul CSR, here it serves as Master to the Fronthaul CSR.	T-GM Ports to Fronthaul
	`interface HundredGigE0/0/1/2`
	` description To_FrontHaul_Router`
	` ptp`
	`  profile master`
	`  multicast target-address ethernet 01-1B-19-00-00-00`
	`  transport ethernet`
	`  port state master-only`
	`  sync frequency 16`
	`  local-priority 10`
	`  clock operation one-step`
	`  announce frequency 8`
	`  delay-request frequency 16`
	`!`
	` frequency synchronization`
	`  wait-to-restore 0`
	`!`

T-BC (Proxy-Slave): NCS540-FH here is the Endpoint towards BBU for Converged 4G(CPRI) and 5G(e-CPRI) Fronthaul packet-based solution.
 	
8275.1 T-BC profile is used here.
 	
This Endpoint is Proxy-Slave connecting to 4G BBU(LTE).
 	
In this converged profile, this same node is the endpoint for 5G BBU(NR-Cell).
 	
Note:8275.1 requires Sync-E to be locked as well for Phase Lock.
	T-BC Proxy-Slave Global
	`ptp`
	`clock`
	`domain 24`
	`profile g.8275.1 clock-type T-BC`
	`time-source PTP`
	`!`
	`profile slave`
	`transport ethernet`
	`sync frequency 16`
	`announce interval 8`
	`delay-request frequency 16`
	`!`
	`profile master`
	`multicast target-address ethernet 01-1B-19-00-00-00`
	`transport ethernet`
	`port state master-only`
	`sync frequency 16`
	`clock operation one-step`
	`announce interval 8`
	`delay-request frequency 16`
	`!`
	`physical-layer-frequency`
	`!`

T-BC (Proxy-Slave): As part of the Converged Fronthaul profile, EVPN for e-CPRI traffic is established between the endpoints.
 	
This endpoint connecting to BBU receives PTP packets from BBU and transparently switches over EVPN to the remote end causing PTP failure.
 	
Henceforth recommendation is to make this interface connected to BBU as PTP client to discard PTP frames.
	T-BC e-CPRI from 5G BBU (Discard PTP)
	`interface TenGigE0/0/0/21`
	`description Dummy-PTP-Client-eCPRI`
	`ptp`
	`profile master`
	`multicast target-address ethernet 01-1B-19-00-00-00`
	`transport ethernet`
	`port state master-only`
	`sync frequency 16`
	`local-priority 10`
	`clock operation one-step`
	`announce frequency 8`
	`delay-request frequency 16`
	`!`
	`frequency synchronization`
	`wait-to-restore 0`
	`!`

T-BC(Proxy-Slave): For the 4G LTE traffic, Sync-E is derived from a common clock source(T-GM) driving BBU.
 	
For the 5G Traffic PTP is derived from a common clock source(T-GM) driving BBU.
 	
NOTE 8275.1 requires Sync-E to be locked as well for Phase Lock.
	T-BC Proxy-Slave connecting T-GM
	`interface HundredGigE0/0/0/26`
	`description From_T-GM`
	`ptp`
	`profile slave`
	`multicast target-address ethernet 01-1B-19-00-00-00`
	`transport ethernet`
	`port state slave-only`
	`local-priority 10`
	`!`
	`frequency synchronization`
	`selection input`
	`priority 1`
	`wait-to-restore 0`
	`ssm disable`
	`quality receive exact itu-t option 1 PRC`
	`!`
	`!`

T-BC(Proxy-Slave): This NCS540-FH has to relay PTP per hop to the downstream neighbours all the way up to the NCS540-FH(Proxy-Master) for the 5G NR.
 	
NOTE In this Design we are considering back-to-back nodes for simplicity, it can be more than a hop if within the latency budgets.
	T-BC Proxy-Slave Towards Proxy-Master
	`interface HundredGigE0/0/0/27`
	`description To_T-BC Felidae Proxy-Master`
	`ptp`
	`profile master`
	`multicast target-address ethernet 01-1B-19-00-00-00`
	`transport ethernet`
	`port state master-only`
	`sync frequency 64`
	`clock operation one-step`
	`announce frequency 16`
	`delay-request frequency 64`
	`!`
	`frequency synchronization`
	`wait-to-restore 0`

T-BC(Proxy-Master): NCS540-FH here is the Endpoint towards RRH for Converged 4G(CPRI) and 5G(e-CPRI) Fronthaul packet-based solution.
 	
8275.1 T-BC profile is used here.
 	
This Endpoint is Proxy-Master connecting to 4G LTE RRH.
 	
In this converged profile, this same node is the endpoint for 5G NR.
 	
NOTE 8275.1 requires Sync-E to be locked as well for Phase Lock.
	T-BC Proxy-Master Global Configuration
	`ptp`
	`clock`
	`domain 24`
	`profile g.8275.1 clock-type T-BC`
	`time-source PTP`
	`!`
	`profile slave`
	`transport ethernet`
	`sync frequency 16`
	`announce interval 8`
	`delay-request frequency 16`
	`!`
	`profile master`
	`multicast target-address ethernet 01-1B-19-00-00-00`
	`transport ethernet`
	`port state master-only`
	`sync frequency 16`
	`clock operation one-step`
	`announce interval 8`
	`delay-request frequency 16`
	`!`
	`physical-layer-frequency`
	`!`

T-BC(Proxy-Master): For the 4G LTE traffic, Sync-E is derived all the way from upstream nodes getting a common clock source from T-GM feeding BBU.
 	
For the 5G Traffic PTP is derived all the way from upstream nodes getting a common clock source from T-GM feeding BBU.
 	
NOTE 8275.1 requires Sync-E to be locked as well for Phase Lock
	T-BC Proxy-Master from Proxy-Slave
	`interface HundredGigE0/0/0/27`
	`description From_ T-BC Felidae Proxy-slave`
	`ptp`
	`profile slave`
	`multicast target-address ethernet 01-1B-19-00-00-00`
	`transport ethernet`
	`port state slave-only`
	`local-priority 10`
	`!`
	`frequency synchronization`
	`selection input`
	`priority 1`
	`wait-to-restore 0`
	`ssm disable`
	`quality receive exact itu-t option 1 PRC`
	`!`
	`!`

T-BC (Proxy-Master): For the 5G Traffic PTP needs to be delivered to 5G NR, This interface is already part of the EVPN Circuit for e-CPRI traffic and PTP profile for Master is executed.
 	
T-BC (Proxy-Master): For the 5G Traffic PTP needs to be delivered to 5G NR. This interface is already part of the EVPN Circuit for e-CPRI traffic and PTP profile for Master is executed.
	T-BC Proxy-Master to 5G NR
	`interface TenGigE0/0/0/18`
	`description <<< ECPRI-To-5G-NR >>`
	`ptp`
	`profile master`
	`multicast target-address ethernet 01-1B-19-00-00-00`
	`transport ethernet`
	`port state master-only`
	`sync frequency 64`
	`clock operation one-step`
	`announce frequency 16`
	`delay-request frequency 64`
	`!`
	`frequency synchronization`
	`wait-to-restore 0`
	`!`

Configuring e-RAN

Best Practice	Example

Local Switching is deployed for Inter-DU communication across single hop e-RAN.
 	
EVPN is deployed for Multi Hop ERAN solution based on requirement
	EVPN
	`evpn`
	`evi 1000`
	`advertise-mac`
	`!`
	`l2vpn`
	`bridge group ERAN`
	`bridge-domain ERAN-A1`
	`interface TenGigE0/0/0/16.1000`
	`!`
	`interface TenGigE0/0/0/18.1000`
	`!`
	`evi 1000`
	`!`
	Local Switching
	`l2vpn`
	`xconnect group 20`
	`p2p 20`
	`interface TenGigE0/0/0/16`
	`interface TenGigE0/0/0/18`

Configuring GTP for Midhaul

Best Practice	Example
Load balancing based on GTP in Labelled core network helps avoid polarization of traffic in the Midhaul GTP Load balancing mandates maximum of 3 MPLS Label Stack for Deep Lookup.	hw-module profile load-balance algorithm gtp-mpls

Configuring MTU

Best Practice	Example
For 5G eCPRI, TCP based OAM are exchanged on the wire between RU and BBU, so the minimum size required is 1522.This may increase with additional transport over-heads. For 4G CPRI, increased number of basic Frames adds to the Frame Size. Henceforth as a best Practice MTU 9600 is recommended on Access and Core in the entire network.	5G eCPRI Access Interface interface TenGigE0/0/0/17 mtu 9600 4G CPRI Access Interface interface CPRIoE0/0/0/0 mtu 9600 Core Interface. interface HundredGigE0/0/0/26 mtu 9600

Planning Capacity

Best Practice	Example
CPRI Rate 3-6 in Structure Agnostic Tunnelling mode with Ethernet and Transport overhead, requires less than 10G Bandwidth. But CPRI Rate 7 and 8 in Structure Agnostic Tunnelling mode with Ethernet and Transport overhead, requires more than 10G Bandwidth. Bundle is not supported/recommended for CPRI bandwidth Aggregation in Core Network.	Individual CPRI Rate 3-6 in Type-0 10G Core Interface Individual CPRI Rate 7-8 in Type-0 25G/100G Core Interface Individual CPRI Rate 3-7 in Type-1 10G Core Interface Individual CPRI Rate 8 in Type-1 25G/100G Core Interface

Frequently Asked Questions

1. CPRI is supported on Ports 0-11; Ports 8-11 are universal ports and can function as Ethernet and CPRI both.
2. CPRI Rate 3-8 are supported, however, 7A is not supported.
3. Two TSN ports are supported in 10G and 25G mode.
4. 8*1/10G, 4*10/25G and 2*100G Ethernet ports are supported.

Question	Answer
Do we support Type-1 in CPRI?	Yes, we support both Structure Agnostic Tunneling(Type-0) and Line Code Aware (Type-1) over Ethernet/IP as per CPRI Specifications 1914.1 and 1914.3.
Do we support Custom Header?	Yes, if PTP is configured Time Stamping and Sequencing both (1914.3a) are supported.
Do we handle the PDV introduced due to packet based network in Fronthaul?	Yes, NCS540-FH will do the de-jitter of data before doing bit stream on CPRI.
Does Inter-op work on NCS540-FH for CPRI?	No, CPRI is a book-ended solution on NCS540-FH and does not support Inter-Op with different vendor FHR.
Is NCS540-FH Class-C compliant?	Yes
Do we support GNSS Receiver on NCS540-FH?	Internal GNSS is not supported, only external GNSS is supported.
Is EVPN Multi-Homing for CPRI supported?	No
Is TSN supported on NCS540-FH?	Yes. Supported from Cisco IOS XR 7.3.2
Is Hot Standby Supported for CPRI?	No
Is Structure Aware mode supported for CPRI?	No
Is CPRI over SRv6 Supported?	No
Is Auto-Negotiation for CPRI Supported?	No
Will Load-Sharing over bundle for CPRI work?	This will not work and is not recommended for Radio Deployments.
How do I achieve Radio Redundancy if Multi-Homing & Hot Standby is not supported?	Through NSO
Do we support underrun and overrun counters for CPRI?	No
Do we support Statistics for ROE packets?	Rate is not supported in bits per second, packets per second is supported.

Do we support Alarm Statistics?	No

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see *What's New in Cisco Product Documentation*.

To receive new and revised Cisco technical content directly to your desktop, you can subscribe to the What's New in Cisco Product Documentation RSS feed. The RSS feeds are a free service.

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