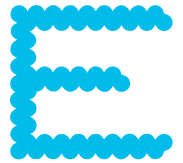
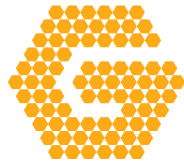
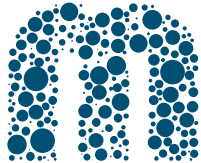


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January 28 - February 1, 2019 - Barcelona



INTUITIVE



BRKSPG-2501

# Troubleshooting DOCSIS 3.1, Converged Services, and R-PHY on cBR-8 CCAP Platform

BRKSPG-2501

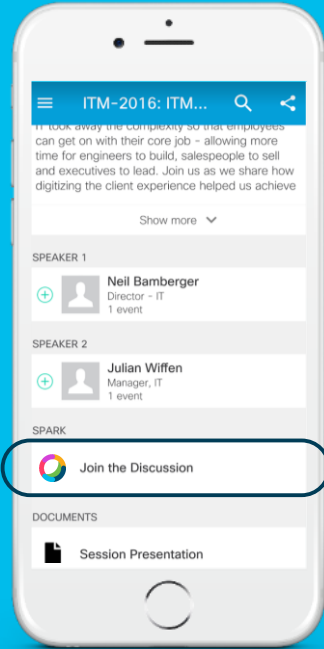
Tejal Patel – Customer Engagement Manager, CX Services



INTUITIVE

# Agenda

- CCAP Introduction
- Troubleshooting cBR-8 DOCSIS 3.x Services
- Troubleshooting cBR-8 Remote PHY Services
- cBR-8 Deployment And Operational Automation
- Troubleshooting cBR-8 Converged Video Services
- Summary
- Q & A



[cs.co/cicolivebot#BRKSPG-2501](https://cs.co/cicolivebot#BRKSPG-2501)

# Cisco Webex Teams

## Questions?

Use Cisco Webex Teams (formerly Cisco Spark) to chat with the speaker after the session

## How

- 1 Find this session in the Cisco Events Mobile App
- 2 Click “Join the Discussion”
- 3 Install Webex Teams or go directly to the team space
- 4 Enter messages/questions in the team space

# CCAP Introduction

# Converged Cable Access Platform

## Cisco CCAP/cBR-8 Highlights

- **Path to DOCSIS 3.1**

Enables FTTx Speeds – 2017 adds DOCSIS 3.1 Upstream

- **Remote PHY**

SG scaling & hub consolidation; full advantages of DOCSIS 3.1 –

- **CCAP video convergence**

CapEx/OpEx savings; potential for PICs with integration optics

- **CCAP Scaling**

250 Gbps of switching capacity, 6,144 DS channels and 768 US channels in 13 RU I-CCAP chassis with built-in HA

- **Service & Feature Velocity with SDN**

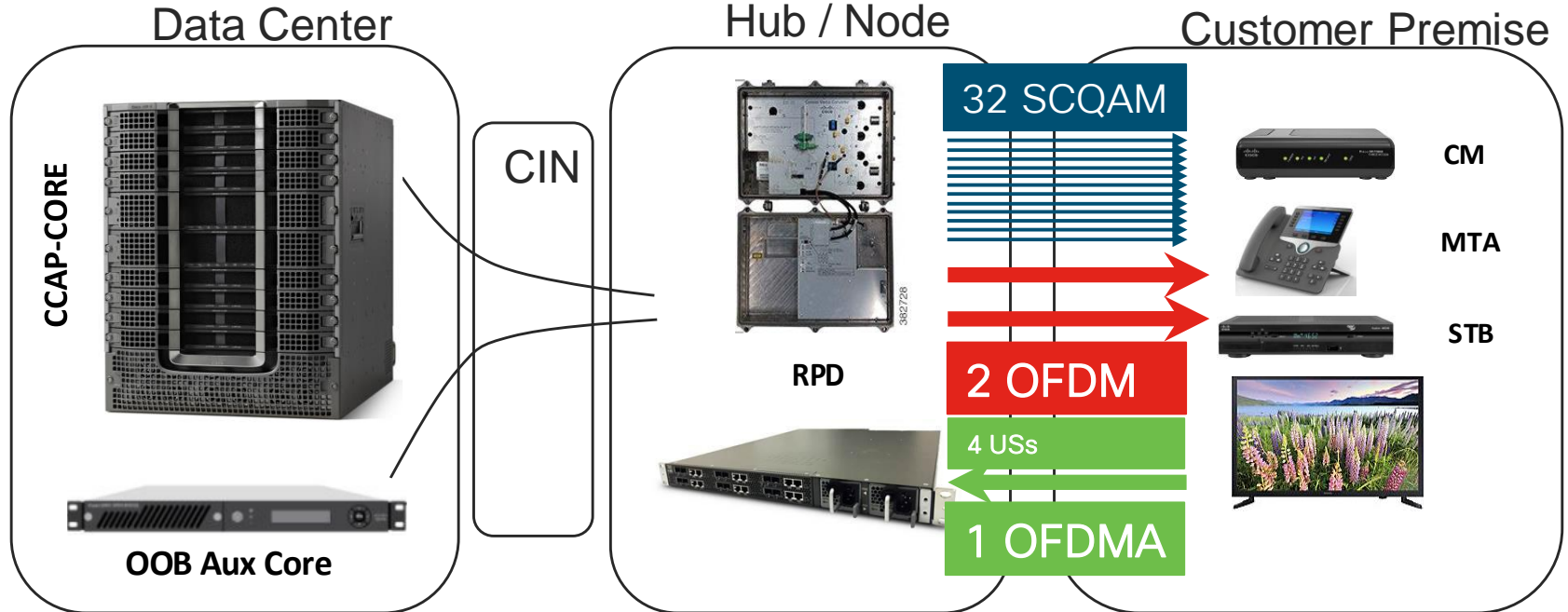
Faster feature implementation; customization



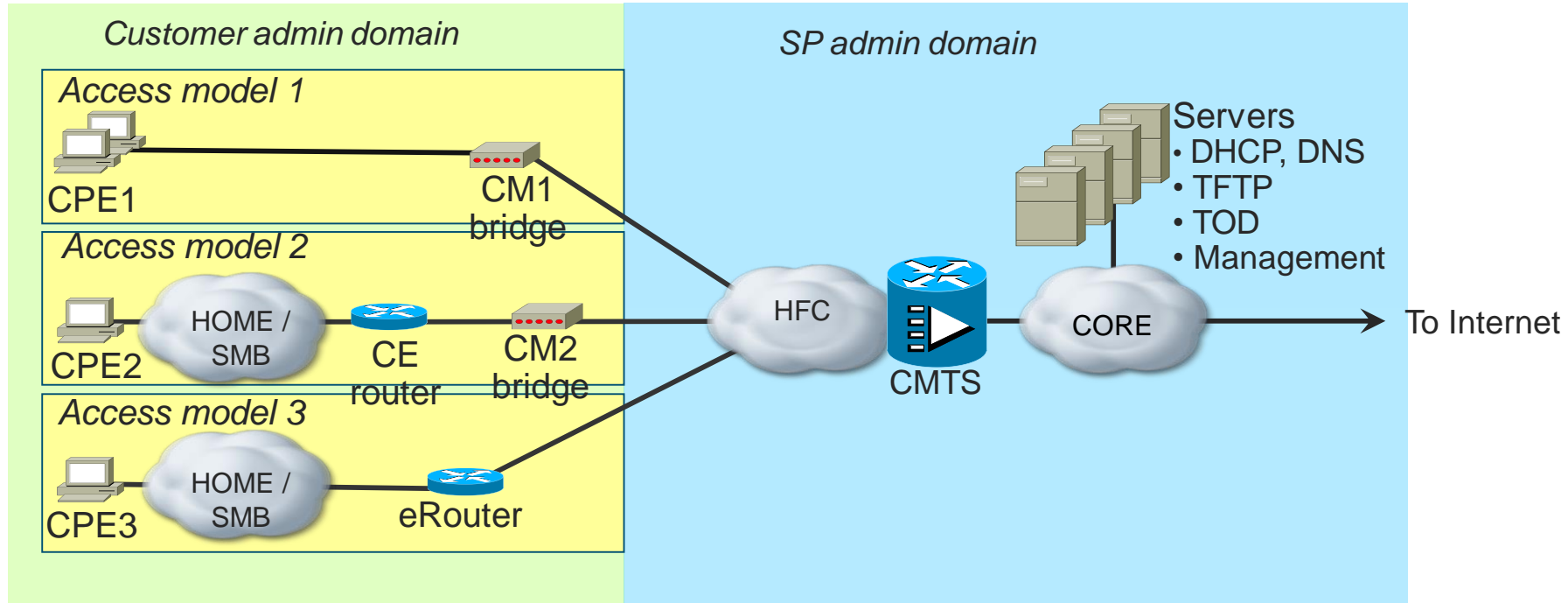
- DOCSIS 3.1 High Speed Data
- Video Aux Core
- Video OOB for DAVIC

# Reference Architecture

## CCAP with Remote PHY



# DOCSIS 3.0 IPv6 reference architecture



# Troubleshooting cBR-8 DOCSIS 3.x Services



# DOCSIS 3.1 Review

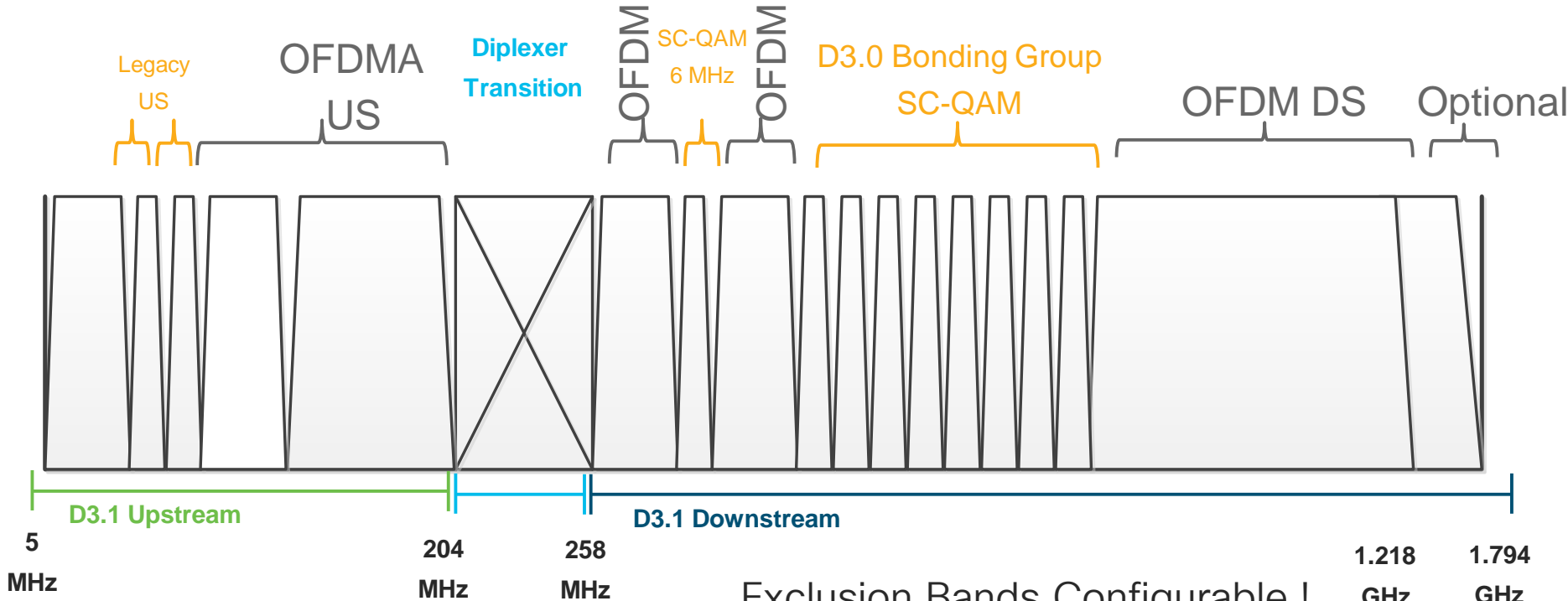
- OFDM (Orthogonal Frequency Division Multiplexing)
- OFDMA (Upstream - OFDMA)
- LDPC (Low Density Parity Check)
- Sub Carriers
  - Individual Profiles
- Profile Management
  - CM reports MER/SNR and receive power of each subcarrier
  - CM can test its ability to received unused profiles and report to CMTS

	DOCSIS 3.0	DOCSIS 3.1
Throughput	1 Gbps Down	10Gbps Down
	250 Mbps Up	1 Gbps
Channels	Annex B / 6MHz Channel	OFDM CH 192 MHz OFDMA CH 96 MHz
Multiplex	Time Division	Frequency Division
Modulation	QAM 64/256 DS	QAM 512 - 4096 / <b>16384</b>
Error Correction	Reed Solomon	Low Density Parity Check
Profiles	One Profile per QAM	Multiple Profiles per CM
Spectrum	204 to 1008 MHz	DS 258 MHz to 1.218 GHz / Opt 1.794 GHz
		US 5 - 204 MHz

# DOCSIS 3.1 Spectrum

**D3.1 Spec reports:** Docsis 3.1 CM/CMTS support at least 8 US SC-QAM and 2 OFDMA in TCS, 24 DS SC-QAMs and 2 OFDM in RCS

**TaFDM:** Allows D2.0 and D3.0 US to interop without exclusion bands!



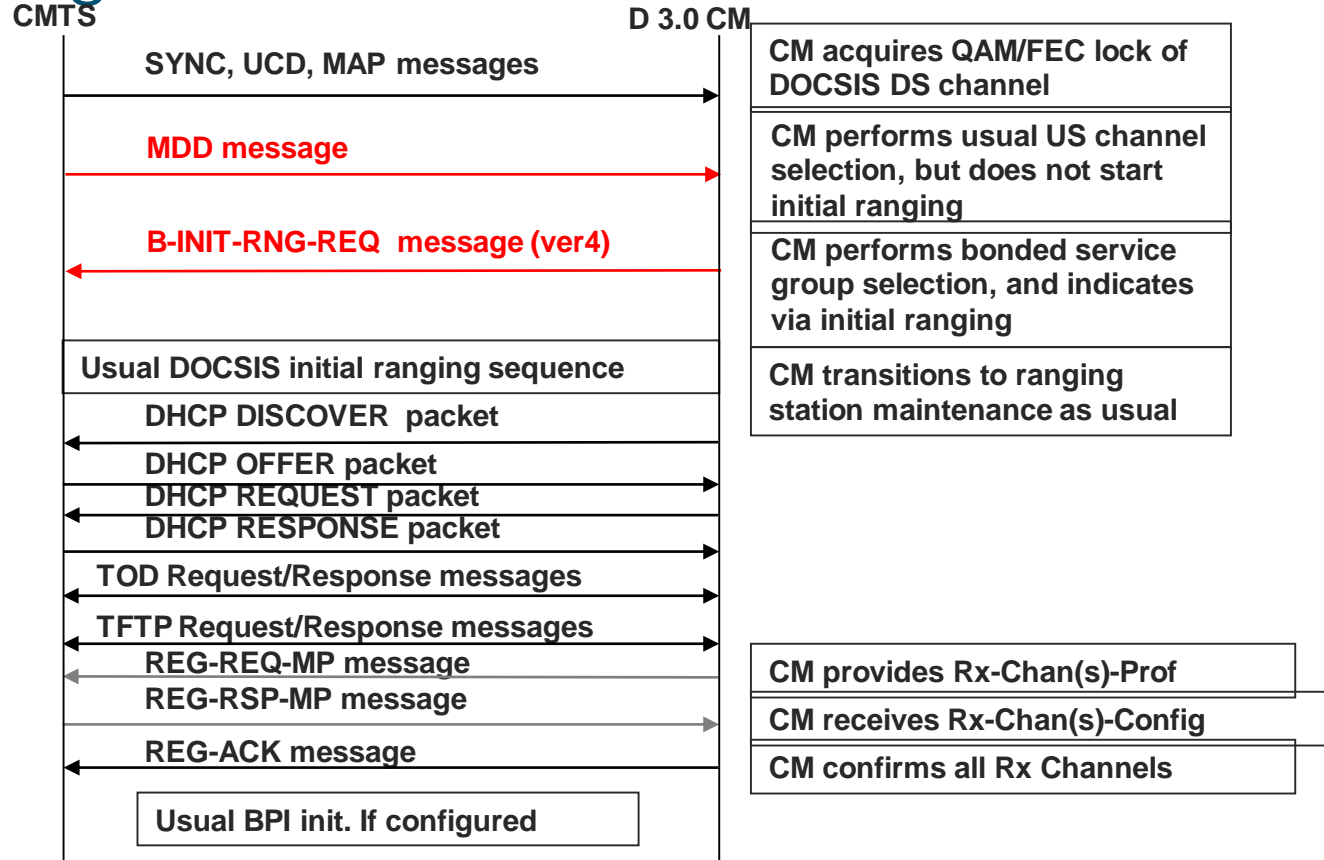
Exclusion Bands Configurable !

New Spectrum Range / TaFDM

# DOCSIS 3.0 Registration

## Comparison

- D3.0 Registration
- D3.1 Registration

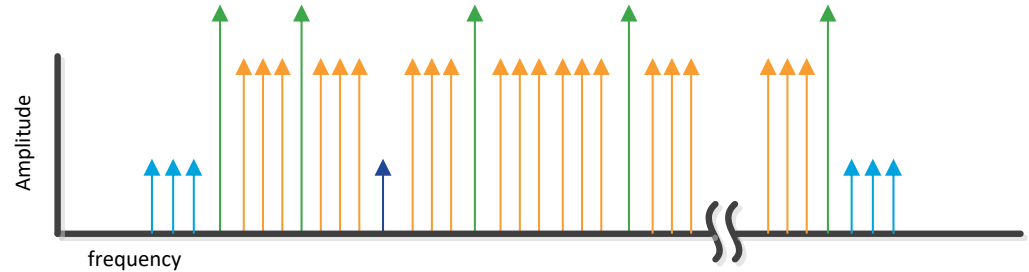


# DOCSIS 3.1 Registration

## CM Boot Procedure

Step	
1	Scan for OFDM DS upon cold boot
2	CM finds PLC via Pilot pattern and preamble
3	PLC contains OCD and DPD
4	CM connects to Profile
5	O-INIT-RNG-REQ sent in Initial Maintenance Region
6	CM declares sync complete
7	CM gets promoted to a working profile
	If no OFDM channel is deemed useable, scan for SC-QAM

## Pilots, PLC, DPD, and OCD in the OFDM Channel

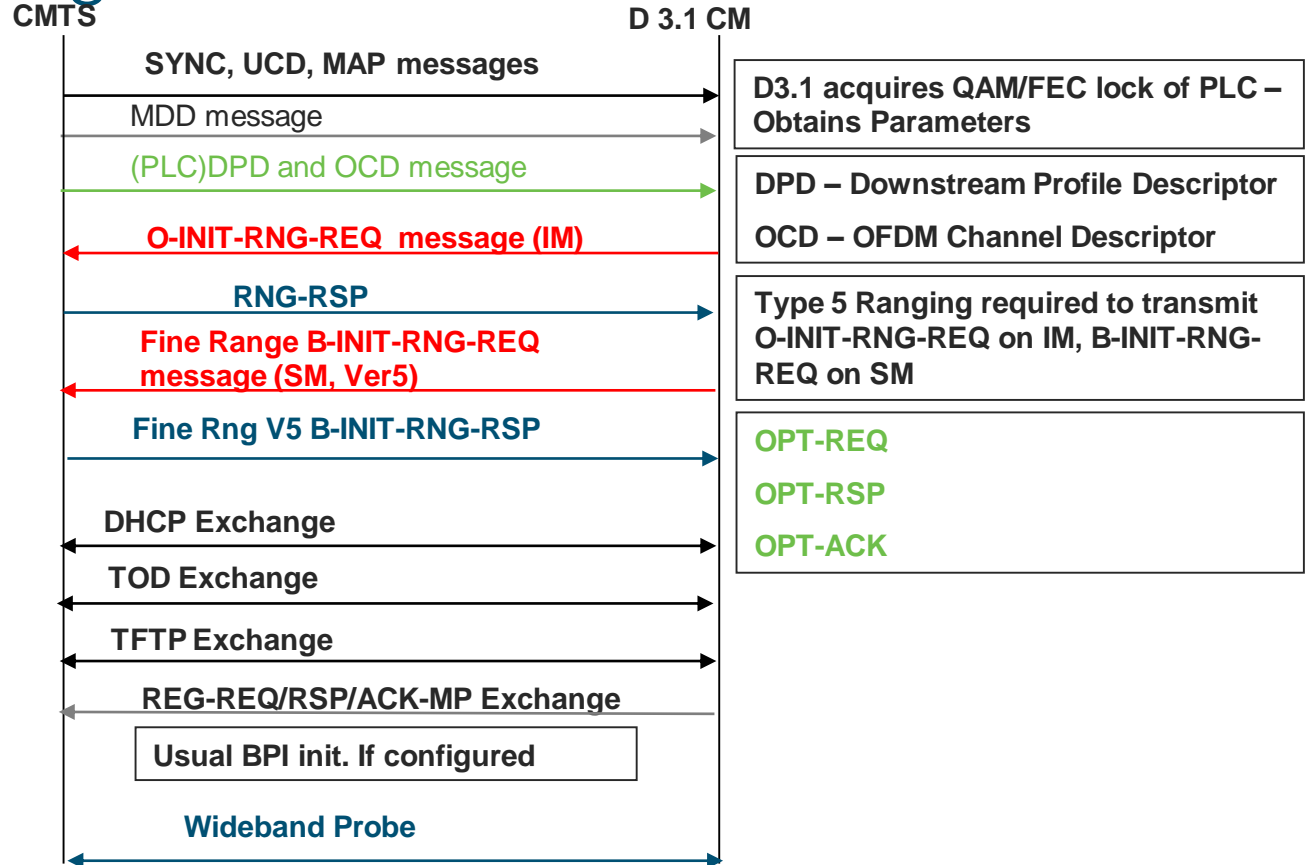


- Guard Sub Carriers
- Pilot Sub Carriers (For Channel Aqu, Adaptive Eq..etc)
- Data Sub Carriers
- PLC (Physical Link Channel )Start

# DOCSIS 3.1 Registration

## Comparison

- D3.0 Registration
- **D3.1 Registration**



# US DOCSIS 3.1 Ranging Debugs

\*Truncated

- debug cable mac-add *mac-address* verbose
- debug cable range [protocol]

Stage	What to look for
Initial Ranging	Received, Msg Type, Incoming Interface
Ranging Response	Type 5, Correct Upstream Channel ID. Timing, Frequency, and Power adjust
Bonding – Init Ranging Req	Station Maintenance B-INIT-RNG-REQ
CDMAN Ranging Success	Cable DOCSIS Manager Ranging Success and Station Maintenance

```

CLC 2/0: INIT-RNG [info] : RCV initialization RNG attempt for CM 14b7.f80e.3d94: Msg-Type 252, DCID-9,
RFID-8456, Interface Cable2/0/1/U4
CLC 2/0: Ranging request (252) from 14b7.f80e.3d94, SID 0 [0/9/8456] on Interface Cable2/0/1/U4 msg-ver 5

CLC 2/0: CM 14b7.f80e.3d94, RNG-RSP status CONTINUE (1)
CLC 2/0: CM 14b7.f80e.3d94 RNG-RSP version: 5 UCID 5
CLC 2/0: cmts_ranging_send_range_response_message: timing adj: 44352 / power adj: 5 / freq adj: 0

CLC 2/0: Ca2/0/1/U4: Send RNG-RSP (1) for 14b7.f80e.3d94, SID 3893, Ca2/0/1 DS RFID 8456
CLC 2/0: SM B-INIT from 14b7.f80e.3d94, SID 3893 [0xF35] on Interface Cable2/0/1/U4: MD-DS-SG-ID 9,
Cap flags 207
CLC 2/0: CM 14b7.f80e.3d94 RX rng-event from CDM: us 5 CM state 6 event 1 chan state 4
CLC 2/0: 14b7.f80e.3d94 is D3.1, SM P1.6r 0 IM P1.6r 0

CLC 2/0: CDMAN chan state (4) Ranging Success, Station Maintenance
CLC 2/0: CM 14b7.f80e.3d94 us 5 RX rng-status from CDM: t_off/t_adj/f_adj/p_adj/rxpwr/rpt_pwr
44352/0/0/0/0/139

CLC 2/0: 14b7.f80e.3d94 is D3.1, SM P1.6r 3475 IM P1.6r 0
CLC 2/0: IPC P1.6c 139, P1.6low 1700, P1.6load 1611
CLC 2/0: IPC Pmax 6500, P1.6hi 5086, Neq 26, P1.6load_min_set 64, P1.6low_multi 91

CLC 2/0: CDMAN chan state (4) Ranging Success, Station Maintenance
CLC 2/0: OFDMA-US: CM 14b7.f80e.3d94 chid 5 pwr_min_level 1700 phy_peak_level 5086 pwr_peak_level
5086 pwr_load 64
CLC 2/0: 14b7.f80e.3d94: Power ref 139 rx-ed 0 extra 0 offset 76 peak 203 mode 2
CLC 2/0: OFDMA-US: CM 14b7.f80e.3d94 chid 5 pwr_min_level 1700 phy_peak_level 5086 pwr_peak_level
5086 pwr_load 64
CLC 2/0: 14b7.f80e.3d94: max 64 min 64 new load 40
CLC 2/0: CM 14b7.f80e.3d94 ucid 5, OFDMA b/w: 42000000
    
```

# DOCSIS 3.0/3.1 CMs Reporting DS/US Performance Issues

## Possible Reasons

- 1. Improper configuration
  - 1.a - Docsis 3.1 support on cBR-8
  - 1.b - Verify Integrated controller and interface, WB interface, CGD and Fiber-node configuration and verification for D3.0 and D3.1
  - 1.c - MDD, DPD, OCD and Debugs verification
  - 1.d - Real time operational maintenance and show commands verification
- 2. CMs Throughput Troubleshooting
  - 2.a - DS Performance verification
    - - Requirement of DS Bonding Resiliency
  - 2.b - US Performance verification

# 1.a - DOCSIS 3.1 Support

## Hardware And Software Requirements

Hardware	Firmware
CBR-CCAP-LC-40G <i>"Cylon"</i>	Micro 30019 or later FPGA 4814b or later
CBR-D31-DS-MOD <i>"Gemini 2"</i>	
CBR-D31-US-MOD <i>"Leoben 3"</i>	
Cable Linecard ROMMON	2011.03.18
SUP ROMMON	16.5(1r)S

IOS-XE Software	Feature
16.6 Polaris	D3.1 Upstream OFDMA

# 1.a - DOCSIS 3.1 Support Hardware And Software Requirements

PID should have "D31"

```
cBR8-01# show inventory
NAME: "clc 0", DESCR: "Cisco cBR8 Line Card"
PID: CBR-CCAP-LC-40G , VID: V01 , SN: CAT1919E1RR
NAME: "CLC Downstream PHY Module 0/0", DESCR: "Cable PHY Module"
PID: CBR-D31-DS-MOD , VID: V01 , SN: CAT2025E0NK
NAME: "CLC Upstream PHY Module 0/2", DESCR: "Cable PHY Module"
PID: CBR-D31-US-MOD , VID: V01 , SN: CAT2024E13J
```

Hardware	Firmware
CBR-CCAP-LC-40G <i>"Cylon"</i>	Micro 30019 or later FPGA 4814b or later
CBR-D31-DS-MOD <i>"Gemini 2"</i>	
CBR-D31-US-MOD <i>"Leoben 3"</i>	
Cable Linecard ROMMON	2011.03.18
SUP ROMMON	16.5(1r)S

IOS-XE Software	Feature
16.6 Polaris	D3.1 Upstream OFDMA

# 1.a - DOCSIS 3.1 Support Hardware And Software Requirements

## Hardware

CBR-CCAP-LC-40G  
"Cylon"

CBR-D31-DS-MOD "Gemini 2"

CBR-D31-US-MOD "Leoben 3"

Cable Linecard ROMMON

SUP ROMMON

## Firmware

```

cBR8-01# show cable card 1/0 ds-phy display | i ver
img info: section 2, running ver 30019 (micro)
img info: section 1, running ver 4814b (fpga)
micro ver 30019, sector(1 base) 2, apollo ver 4814b,
sector(0 base) 1
cpld ver 7, sector(1 base) 1, psoc ver 40004, sector(1 base) 1
img info: section 2, running ver 30019 (micro)
img info: section 1, running ver 4814b (fpga)
micro ver 30019, sector(1 base) 2, apollo ver 4814b, sector(0 base) 1
cpld ver 7, sector(1 base) 1, psoc ver 40004, sector(1 base) 1
    
```

PID should have "D31"

30019 for "Micro" 4814b for "Apollo" (DS-PHY)

## IOS-XE Software

## Feature

16.6 Polaris

D3.1 Upstream  
OFDMA

# 1.a - DOCSIS 3.1 Support Hardware And Software Requirements

## Hardware

CBR-CCAP-LC-40G  
"Cylon"

CBR-D31-DS-MOD "Gemini 2"

CBR-D31-US-MOD "Leoben 3"

Cable Linecard ROMMON

SUP ROMMON

## IOS-XE Software

16.6 Polaris

## Feature

D3.1 Upstream  
OFDMA

PID should have "D31"

```
cBR8-01# show inventory
NAME: "clc 0", DESCR: "Cisco CBR-CCAP-LC-40G Cable Line Card"
PID: CBR-CCAP-LC-40G , VID: V01 , SN: CAT1919E1RR
NAME: "CLC Downstream PHY Module 0/0", DESCR: "Cable PHY Module"
PID: CBR-D31-DS-MOD , VID: V01 , SN: CAT2025E0NK
NAME: "CLC Upstream PHY Module 0/2", DESCR: "Cable PHY Module"
PID: CBR-D31-US-MOD , VID: V01 , SN: CAT2024E13J
```

## Firmware

```
cBR8-01# show cable card 1/0 ds-phy display | i ver
img info: section 2, running ver 30019 (micro)
img info: section 1, running ver 4814b (fpga)
micro ver 30019, sector(1 base) 2, apollo ver 4814b,
sector(0 base) 1
cpld ver 7, sector(1 base) 1, psoc ver 40004, sector(1 base) 1
img info: section 2, running ver 30019 (micro)
img info: section 1, running ver 4814b (fpga)
micro ver 30019, sector(1 base) 2, apollo ver 4814b, sector(0 base) 1
cpld ver 7, sector(1 base) 1, psoc ver 40004, sector(1 base) 1
```

30019 for "Micro" 4814b for "Apollo" (DS-PHY)

```
cBR8-01# show platform
Chassis type: CBR-8-CCAP-
1 CBR-CCAP-LC-40G ok 3w1d
1/1 CBR-RF-PIC ok 3w1d

Slot CPLD Version Rommon Version
-----
0 00000025 2011.03.18
1 00000025 2011.03.18
SUP0 16052011 16.5(1r)S
SUP1 16052011 16.5(1r)S
```

# 1.b - D3.0 Configuration

## Controller Configuration

```

controller Integrated-Cable 2/0/1
max-ofdm-spectrum 384000000
max-carrier 64
base-channel-power 35
rf-chan 0 31
type DOCSIS
frequency 591000000
rf-output NORMAL
power-adjust 0.0
gam-profile 1
docsis-channel-id 1

```

*DS Primary OFDM*

*32 SC RF Channels grouped*

*US BG Configuration*

## Interface Cable configuration

```

interface Cable2/0/1
downstream Integrated-Cable 2/0/1 rf-channel 8
downstream Integrated-Cable 2/0/1 rf-channel 158
upstream 0 Upstream-Cable 2/0/2 us-channel 0
<SNIP>
upstream 4 Upstream-Cable 2/0/2 us-channel 12
cable upstream balance-scheduling
cable upstream bonding-group 1
  upstream 0
  upstream 1
  upstream 2
  upstream 3
attributes 80000000
cable bundle 1

```

## Fiber-node configuration verification

```

cable fiber-node 40
downstream Integrated-Cable 2/0/1
upstream Upstream-Cable 2/0/2

Cbr8-01#Show cable fiber-node 40
Fiber-Node 40
Channel(s) : downstream Integrated-Cable 2/0/1: 0-31, 158
Channel ID(s): 1 2 3 4 5 6 7 8 9 10 11 12 13 14
               15 16 17 18 19 20 21 22 23 24 25 26 27 28
               29 30 31 32 159

Upstream-Cable 2/0/2
FN Config Status: Configured (status_flags = 0x01)
MDD Status: Valid

```

*Fiber Node with RF channels (DS Does not have to be unique)*

*US Controller 3/0 port 0 (connector)*

*MDD has to be valid*

## Wideband Interface Configuration

```

interface Wideband-Cable2/0/1:13
load-interval 30
cable bundle 1
cable rf-channels channel-list 0-31
bandwidth-percent 1

```

# 1.b Basic CMTS IPv6 configuration example

- Enable IPv6 globally

```
ipv6 unicast-routing  
no ipv6 source-route
```

- Configure IPv6 on WAN and Loopback interfaces

```
interface TenGigabitEthernet0/0/0  
  ipv6 address 2001:db8:1111:111D::1/127  
  ipv6 nd ra suppress  
  no ipv6 redirects  
  no ipv6 unreachable
```

```
interface Loopback0  
  ipv6 address 2001:db8:1111:FFFF::4/128
```

## Infrastructure links:

- Recommended to use a separate address block for infrastructure and customers
- GUA is recommended for infrastructure links. ULA can be used but have some limitations (ex. PMTUD)

## Point-to-point links:

- Current recommendation /64, /127
- Allocate /64 but configure /127.
- Some SP use /64

## Loopback:

- Allocate /64 but configure /128

# 1.b Basic CMTS Bundle interface config example

```
interface Bundle99
```

```
no cable nd  
cable ipv6 source-verify dhcp  
cable ipv6 source-verify leasequery-filter upstream 3 5
```

```
ipv6 address 2001:DB8:FFFF::1/64  
ipv6 address 2001:DB8:FFFE::1/64  
ipv6 address 2001:DB8:FFFF::1/64
```

```
ipv6 traffic-filter security in
```

```
ipv6 nd reachable-time 60000  
ipv6 nd dad attempts 0  
ipv6 nd prefix default no-advertise  
ipv6 nd managed-config-flag  
ipv6 nd other-config-flag  
ipv6 nd router-preference High  
ipv6 nd ra interval 20  
ipv6 nd ra lifetime 9000
```

```
no ipv6 redirects
```

```
no ipv6 unreachable
```

```
ipv6 verify unicast reverse-path
```

```
ipv6 dhcp relay destination 2001:db8:1111:20C:29FF:FEB8:68DF
```

```
ipv6 dhcp relay destination 2001:db8:1111:1111:250:56FF:FEB5:3D27
```

IPv6 ND configured on bundle interface by default

RA will not advertise any prefix since that is the only way to signal off-link to IPv6 hosts. BEST METHOD to prevent SLAAC

Traceroute tool will not work if IPv6 unreachable is disabled.

# 1.b Basic IPv6 configuration

## IPv6 parameters of bundle interface

Link local address is auto generated from MAC address (0012.001a.0b3f) of bundle interface

```
CMTS#show ipv6 interface bundle 99
Bundle99 is up, line protocol is up
  IPv6 is enabled, link-local address is FE80::212:FF:FE1A:B3F
  No Virtual link-local address(es).
  Global unicast address(es):
    2001:DB8:FFFE::1, subnet is 2001:DB8:FFFE::/64
    2001:DB8:FFFF::1, subnet is
  Joined group address(es):
    FF02::1
    FF02::2
    FF02::1:2
    FF02::1:FF00:1
    FF02::1:FF1A:B3F
  MTU is 1500 bytes
  ICMP error messages limited to one every 100 milliseconds
  ICMP redirects are disabled
  ICMP unreachable are disabled
  ...
```

CMTS is joining several IPv6 multicast groups

**FF02::1** – all-nodes on the local network

**FF02::2** – all routers on the local network

**FF02::1:2** - all DHCPv6 agents

**FF02::1:FF00:1** - solicited-node multicast for link global address

**FF02::1:FF1A:B3F** – solicited-node multicast for link local address

# 1.b Basic IPv6 configuration

## IPv6 parameters of bundle interface continued

```
.....
Input features: Verify Unicast Reverse-Path, Access List
IPv6 verify source reachable-via rx,
  0 verification drop(s) (process),
  0 suppressed verification drop(s)
Inbound access list security
ND DAD is disabled
ND reachable time is 600000 milliseconds
ND advertised reachable time is 600000 milliseconds
ND advertised retransmit interval is 0 milliseconds
ND router advertisements are sent every 20 seconds
ND router advertisements live for 9000 seconds
ND advertised default router preference is High
Hosts use DHCP to obtain routable addresses.
Hosts use DHCP to obtain other configuration.
```

**ipv6 nd dad attempts 0** - ND DAD is disabled  
**ipv6 nd reachable-time 600000** – 10 minutes  
**ipv6 nd ra interval 20** – RA is sent every 20 seconds  
**ipv6 nd ra lifetime 9000** – RA's lifetime is 9000 secs (2 ½ hrs)

**Hosts must use DHCPv6**  
**ipv6 nd managed-config-flag**  
**ipv6 nd other-config-flag**

# 1.b - D3.1 DS Configuration

- OFDM Channel Profile(s)
- OFDM Modulation Profile(s)
- Controller Integrated-Cable
- Interface Wideband

```
controller Integrated-Cable 2/0/1
max-ofdm-spectrum 384000000
max-carrier 64
base-channel-power 35
rf-chan 0 31
  type DOCSIS
  frequency 591000000
  rf-output NORMAL
  power-adjust 0
  qam-profile 1
  docsis-channel-id 1
rf-chan 158
  power-adjust 0.0
  docsis-channel-id 159
  ofdm channel-profile 103 start-frequency
258000000 width 192000000 plc 351000000
rf-chan 159
  power-adjust 0.0
  docsis-channel-id 160
  ofdm channel-profile 106 start-frequency
780000000 width 192000000 plc 873000000
```

**OFDM Starts @ 158**  
**Two OFDM chans 158 and 159**

**OFDM chan 159**

Profile ID	1	103/106
Cyclic Prefix	1024	192
Roll Off	128	128
FFT Khz	50	50
Intl Depth	16	16
Pilot Scale	48	48
Modulation Control	D:256	D:256
NCP	D:16	D:16
Data Profile 1-2-3-4-5	2048	1024
	1024	2048
		4096

```
cable downstream ofdm-chan-profile 103
cyclic-prefix 192
interleaver-depth 16
pilot-scaling 48
roll-off 128
subcarrier-spacing 50KHZ
profile-control modulation-default 256-QAM
profile-ncp modulation-default 16-QAM
profile-data 1 modulation-default 1024-QAM
profile-data 2 modulation-default 2048-QAM
profile-data 3 modulation-default 4096-QAM
```

```
interface Wideband-Cable2/0/1:13
cable bundle 1
cable rf-channels channel-list 0-31 158-159
bandwidth-percent 1
```

**OFDM ch 158 and 159 added**

**Diff data mod profile for range of sub-carriers**

```
cable downstream ofdm-modulation-profile 1
subcarrier-spacing 50KHZ
width 192000000
start-freq 642000000
assign modulation-default 1024-QAM assign modulation 512-QAM range-
subcarriers freq-abs 824000000 width 10000000
assign modulation 2048-QAM range-subcarriers freq-abs 644000000 width
16000000
assign modulation 2048-QAM range-subcarriers freq-abs 660000000 width
32000000
assign modulation 4096-QAM range-subcarriers freq-abs 692000000 width
30000000
```

# 1.b - D3.1 US Configuration

- OFDMA Channel Profile(s)
- OFDMA Modulation Profile(s)
- Controller Upstream-Cable
- Interface Cable

US-CH 12-15 OFDMA

```
controller Upstream-Cable 2/0/2
us-channel 0 frequency 17600000
us-channel 0 channel-width 1600000 1600000
us-channel 0 docsis-mode atdma us-channel 0
minislot-size 4
us-channel 0 modulation-profile 221
us-channel 0 equalization-coefficient
<snip>
us-channel 12 docsis-mode ofdma
us-channel 12 subcarrier-spacing 25KHz
us-channel 12 modulation-profile 424
us-channel 12 frequency-range 42000000 85000000
us-channel 12 cyclic-prefix 96 roll-off-period 0
us-channel 12 symbols-per-frame 9
no us-channel 12 shutdown
```

OFDMA channel with profile

Expanded to 7 IUCs (9 to 13)

```
cable mod-profile-ofdma 424
subcarrier-spacing 25KHz
initial-rng-subcarrier 64
fine-rng-subcarrier 128
data-iuc 12 modulation 1024-QAM pilot-pattern 8
data-iuc 13 modulation 256-QAM pilot-pattern 8
<snip>
```

```
interface Cable 2/0/1
load-interval 30
downstream Integrated-Cable 2/0/1 rf-channel 0
downstream Integrated-Cable 2/0/1 rf-channel 4
downstream Integrated-Cable 2/0/1 rf-channel 8
downstream Integrated-Cable 2/0/1 rf-channel 12
downstream Integrated-Cable 2/0/1 rf-channel 158
upstream 0 Upstream-Cable 2/0/2 us-channel 0
upstream 1 Upstream-Cable 2/0/2 us-channel 1
upstream 2 Upstream-Cable 2/0/2 us-channel 2
upstream 3 Upstream-Cable 2/0/2 us-channel 3
upstream 4 Upstream-Cable 2/0/2 us-channel 12
cable upstream bonding-group 1
upstream 0
upstream 1
upstream 2
upstream 3
upstream 4
attributes 80000000
cable bundle 1
```

OFDMA channel as a part of USBG



# 1.b – Downstream Controller verification

- Configuration Verification

show controller integrated-cable slot/subslot/port rf-channel group-list

Single Carrier  
QAM Parameters

```
cBR8-01#show controller integrated-Cable 2/0/1 rf-ch 0-159
```

Chan State Admin Frequency Type Annex Mod slots interleaver dcid power output

0 UP UP 591000000 DOCSIS B 256 5361 I32-J4 1 35.0 NORMAL

1 UP UP 597000000 DOCSIS B 256 5361 I32-J4 2 35.0 NORMAL

2 UP UP 603000000 DOCSIS B 256 5361 I32-J4 3 35.0 NORMAL

<SNIP>

31 UP UP 777000000 DOCSIS B 256 5361 I32-J4 32 35.0 NORMAL

32 UP UP 495000000 VIDEO B 256 5361 I128-J1 - 35.0 NORMAL

63 UP UP 489000000 VIDEO B 256 5361 I128-J1 - 35.0 NORMAL

Chan State Admin Mod-Type Start Frequency Width PLC Profile-ID dcid power output

158 UP UP OFDM 258000000 192000000 351000000 103 159 35.0 NORMAL

159 UP UP OFDM 780000000 192000000 873000000 106 160 35.0 NORMAL

OFDM  
Parameters

Parameter	Desired	What to look at
State and Admin	UP & UP	show controllers & urm / configuration
Frequency/Annex/Mod/Interleave	As configured	admin shut / controller IC configuration
Type	DOCSIS or VIDEO	controller IC configuration
Power	Linear or Tilted	controller IC configuration
Start Freq / PLC / Profile ID	As configured	DS OFDM Profile configuration & ctrl IC



# 1.b – Upstream Controller verification

show controller upstream-cable *slot/subslot/port* us-channel {12 – 15}

Parameter	What to look for
OFDMA Support	FULL
AdminState & OpState	UP & UP
SC QAM Frequency List	Single-Carrier QAMs as appropriate for your spectrum
OFDMA Frequency List & Range	Range matches D3.1 US
Minislot “Size”	Positive Integer
Modulation Profile and IUCs	As configured, variations to account for modulation profiles

```
cBR8-01# show controller upstream-cable 2/0/2 us-channel 12
USPHY OFDMA support: FULL
Controller SCQAM Freq List:
  17.600 MHz( 13.900, 20.799), 24.000 MHz(
20.800, 27.699), 31.000 MHz( 27.700, 34.299),
  37.500 MHz( 34.300, 41.199),
Controller OFDMA Freq List:
  ( 42.500 MHz, 84.500 MHz),
Controller 2/0/2 upstream 12 AdminState:UP OpState: UP
ofdma mode enabled
Channel Freq Range 42.500 MHz to 84.500 MHz
Channel Subcarrier Index Range Cfg: 148, 1827 Op: 148, 1827
Channel SC0 Freq Cfg: 38.800 MHz Op: 38.800 MHz
#Excl bands: 2
( 0, 147), (1828, 4095),
#Unused bands: 0
Cyclic Prefix Size 96, Rolloff Period Size 0
Subcarrier Spacing 25KHz, Symbols Per Frame 9 Subcarrier Per
Minislot: 16
Modulation Profile (ID 423, Subcarrier Spacing 25KHz)
  IUC type   Cfg  Act  Preamble Bit      Pilot
             subc subc Symbols Loading Pattern
  3 (IR)     64   64   4             -       -
  4 (FR)    128  128   1             -       -
  13 (data)  -    -    -            1024-QAM 8
Calculated Data burst profile:
IUC Group   Bit      Pilot Start Consec
             Loading Pattern Mslot Mslot
13  0        1024-QAM 8         0      104
```

# 1.b - DOCSIS 3.1 Chan-Profile Verification

## Configuration Verification

## Show Cable OFDM-chan-profile

### OFDM Profile

Profile ID	1	103/106
Cyclic Prefix	1024	192
Roll Off	128	128
FFT Khz	50	50
Intl Depth	16	16
Pilot Scale	48	48
Modulation Control	D:256	D:256
NCP	D:16	D:16
Data Profile 1-2-3-4-5	D1024	D1024
	D4096	D2048
		D4096

```

cBR8-01# show cable ofdm-chan-profile 1
Description: System Profile 1

Prof  Cycl  Roll  FFT  Intr  Pilot  Modulation (D-Default, P-Profile)
ID    Prfx  Off  KHz  Depth  Scale  Cntrl  NCP      Data Profiles (count = 2)
      1      2      3      4      5
1    1024  128  50   16    48    D:256  D:16    D:1024  D:4096  NA    NA    NA

cBR8-01# show cable ofdm-chan-profile 103
Prof  Cycl  Roll  FFT  Intr  Pilot  Modulation (D-Default, P-Profile)
ID    Prfx  Off  KHz  Depth  Scale  Cntrl  NCP      Data Profiles (count = 2)
      1      2      3      4      5
103   192  128  50   16    48    D:256  D:16    D:1024  D:2048  D:4096  NA    NA
**** OFDM Channel Profile Assigned Channels ****
Prof  Admin  Controller:channels
ID
103   Up      2/0/1:158                3/0/1:158

cBR8-01# show cable ofdm-chan-profile 106
Prof  Cycl  Roll  FFT  Intr  Pilot  Modulation (D-Default, P-Profile)
ID    Prfx  Off  KHz  Depth  Scale  Cntrl  NCP      Data Profiles (count = 2)
      1      2      3      4      5
106   192  128  50   16    48    D:256  D:16    D:1024  D:2048  D:4096  NA    NA
**** OFDM Channel Profile Assigned Channels ****
Prof  Admin  Controller:channels
ID
106   Up      2/0/1:159
    
```

Where this channel profile is active



# 1.c - DOCSIS MDD Verification

**show cable mac-domain cable slot/subslot/port mdd**

**debug interface cable slot/subslot/port**

**debug cable mdd**

Parameter	What to look for
MDD Message	MDD Headers: DA, SA, Config change count
Downstream Channel List	Entries match configured
Channel ID	Match DSID - Typically contiguous and unique
Frequency	Match configured
Modulation & Annex	256 QAM & Annex B
Primary Capable	Match configured

```
cBR8-01# show cable mac-domain cable 2/0/1 mdd
```

```
MDD: Mac-Domain(1) DCID(1)
```

```
MDD Header:
```

```
Configuration Change Count: 0x19
```

```
Number Of Fragments: 0x01
```

```
Fragment Sequence Number: 0x01
```

```
Current Channel DCID: 0x01
```

```
Frame Header:
```

```
Frame Control: 0xc2
```

```
MAC Parm: 0x00
```

```
Length: 0x0456
```

```
MAC Management Message Header:
```

```
Destination Address: 01e0.2f00.0001
```

```
Source Address: 54a2.740d.e95b
```

```
Length: 0x0444
```

```
DSAP, SSAP: 0, 0
```

```
control, version, type: 0x03, 0x04, 0x21
```

```
Downstream Active Channel List
```

```
Channel ID: 1
```

```
Frequency: 591000000Hz
```

```
Modulation Order/Annex: 256 QAM/Annex B
```

```
Primary Capable: Primary-Capable
```

```
CM-STATUS Event Bitmask:0x36
```

```
MDD Timeout
```

```
QAM FEC failure
```

```
MDD Recovery
```

```
QAM FEC recovery
```

```
MAP/UCD Transport Indicator: Can carry MAPs and UCDs
```

# 1.c - DOCSIS MDD Verification

Two OFDMs DS  
part of MDD

**show cable mac-domain cable  
slot/subslot/port mdd**

Parameter	What to look for
MD Downstream Service Group	Channels match
DS Ambiguity Resolution	Populated as needed
IP Initialization Parameters	IPv4 and/or IPv6
DOCSIS Version	Major 3 and Minor 1

```
MAC Domain Upstream active chan list
MD-US Chan ID/CM-STATUS: 1/0x0000
MD-US Chan ID/CM-STATUS: 5/0x0000
Upstream Ambiguity Resolution Channel List
MD-US Chan ID:      1 2 3 4 5
Upstream Frequency Range 1
Upstream Transmit Power Reporting: On
CM-STATUS non-channel-specific events
Seq out of range
Upstream Extended Transmit Power On
```

```
MAC Domain Downstream Service Group
MD-DS-SG ID:      9
Channel IDs:      1, 2, 3, 4, 5
                  <snip> 31, 32, 159, 160
Downstream Ambiguity Resolution Frequency List
Frequencies:      519000000Hz
                   543000000Hz
                   567000000Hz

IP Initialization Parameters
IP Provisioning Mode: IPv4
Receive Channel Profile Reporting Control
Center Freq spacing: 6 MHz
Verbose Reporting: No
Fragmented RCP accept: Yes
Early Authentication and Encryption (EAE)
Early Authentication: Disabled
Symbol Clock Locking Indicator
Locked to Master: Locked

CMTS DOCSIS Version
DOCSIS Major Version: 3
DOCSIS Minor Version: 1
CM Periodic Maintenance Timeout Indicator:
UNICAST_RANGING
DOCSIS v3.1 CM-STATUS non-channel-specific events
Downstream OFDM Profile Failure
NCP Profile Failure
Loss of FEC lock on PLC
NCP Profile Recovery
FEC Recovery on PLC
FEC Recovery on OFDM Profile
```

# 1.c - DOCSIS MDD Verification

OFDM DS as Primary Capable

show cable mac-domain cable slot/subslot/port mdd count

Parameters	What to look for
OFDM Channel	Contains OFDM PLC Parameters
MDD Transmit Count	Incrementing between shows
Last Timestamp	Incrementing between shows

```
cBR8-01# show cable mac-domain cable 2/0/1 mdd counts
Mac-Domain 1 MDD Counts:
  DCID:      MDD Tx Count:      MDD Update Count:      Last Update:
  1          29321             15                     19:08:09
  2          29320             10                     19:08:06
  3          29320             10                     19:08:06
  4          29319             9                      19:08:06
  5          29319             13                     19:08:09
  6          29318             7                      19:08:06
  7          29318             6                      19:08:06
  8          29318             6                      19:08:06
  32         29316             2                      19:08:06
  159        29313             21                     19:08:09
  160        43513             21                     19:08:09
```

```
cBR8-01# show cable mac-domain cable 2/0/1 mdd
MDD: Mac-Domain(1) DCID(1)
Downstream Active Channel List
Channel ID: 159
Frequency: 351000000Hz
Primary Capable: Primary-Capable
CM-STATUS Event Bitmask:0x36
MDD Timeout
QAM FEC failure
MDD Recovery
QAM FEC recovery
MAP/UCD Transport Indicator: Can carry MAPs and
UCDs
OFDM PLC Params Bitmask:
Tukey raised cosine window: 0.625
Cyclic Prefix: 0.9375
Sub carrier spacing: 50
Downstream Active Channel List
Channel ID: 160
Frequency: 873000000Hz
Primary Capable: Primary-Capable
CM-STATUS Event Bitmask:0x36
MDD Timeout
QAM FEC failure
MDD Recovery
QAM FEC recovery
```

Downstream Active Channel List  
Channel ID: 159  
Frequency: 351000000Hz  
Primary Capable: Primary-Capable

MDD count is increasing



# 1.c - DOCSIS 3.1 OCD Verification OFDM Channel Descriptor

## Configuration Verification

**show cable mac-domain  
cable slot/subslot/port ocd**

- DCID
- Spacing
- Rolloff
- Spectrum
- Interleave Depth
- Subcarrier Assignment for Pilots
- Exclude subcarriers
- PLC Subcarriers

```
cBR8-01# show cable mac-domain cable 2/0/1 ocd
DCID: 159 OFDM Controller:channel 2/0/1:158
OCD Message
MAC Header
  Frame Control          : 0xC2    (MAC specific, MAC msg, EHDR Off)
  MAC Parameters        : 0x0
  Length                : 135
  Header Check Sequence : 0xC60E (50702)
MAC Management Header
  Destination MAC ADDR  : 01e0.2f00.0001
  Source MAC ADDR       : 54a2.740d.e9cb
  Length                : 117
  Control               : 3
OCD fields
  DCID                  : 159
  CCC                   : 1
  TLV 0 Spacing         : 50 KHz
  TLV 1 Cyclic Prefix   : 192 samples
  TLV 2 Rolloff         : 128 samples
  TLV 3 Spectrum Location : 251600000 Hz
  TLV 4 Interleave Depth : 16
<snip>
DCID: 160 OFDM Controller:channel 2/0/1:160
OCD fields
  DCID                  : 160
  CCC                   : 1
  TLV 0 Spacing         : 50 KHz
  TLV 1 Cyclic Prefix   : 192 samples
  TLV 2 Rolloff         : 128 samples
  TLV 3 Spectrum Location : 773600000 Hz
  TLV 4 Interleave Depth : 16
<snip>
```

DCID for OFDM  
Channel

Confirm as per config

# 1.c - DOCSIS 3.1 DPD Verification Downstream Profile Descriptor

## Configuration Verification

### OFDM Profile

Profile ID	1	103/106
Cyclic Prefix	1024	192
Roll Off	128	128
FFT Khz	50	50
Intl Depth	16	16
Pilot Scale	48	48
Modulation Control	D:256	D:256
NCP	D:16	D:16
Data Profile 1-2-3-4-5	D1024	D1024
	D4096	D2048
		D4096

```

cBR8-01# show cable mac-domain cable 2/0/1 dpd
DPD Message
MAC Header
  Frame Control      : 0xC2      (MAC specific, MAC msg, EHDR Off)
  MAC Parameters    : 0x0
  Length            : 34
  Header Check Sequence : 0x61FC (25084)
MAC Management Header
  Destination MAC ADDR : 01e0.2f00.0001
  Source MAC ADDR     : 54a2.740d.e9cb
  Length              : 16
  Destination SAP     : 0
  Source SAP          : 0
  Control             : 3
  Version             : 5
  Type                : 50
  Multipart           : 0 (Sec... number 0, Fragments 0)
DPD fields
  DCID                : 159
  Profile ID          : 3
  CCC                 : 1
  TLV 5 Subcarrier Range/List
    Modulation        : Range (continuous)
                     : 4096 (default value)
                     : 0000 - 4095
DPD Message
DPD fields
  DCID                : 159
  Profile ID          : 255
  CCC                 : 1
  TLV 5 Subcarrier Range/List
    Modulation        : Range (continuous)
                     : 16 (default value)
                     : 0000 - 4095
    
```

Each MD will have several DPDs

This is the same as the Data Profile configured (either default OFDM Modulation or custom)

OFDM Modulation

4096 (default value)



# 1.c – Debugs Verification

- Debugs to verify MDD generation on CMTS
  - debug cable interface cable {slot/subslot/port} [verbose]
  - debug cable mdd
- Debugs needed for ranging and registration—For DSCB/USCB modem
  - debug cable mac-address {cable-modem-mac-address} verbose
  - debug cable mdd
  - debug cable ranging [initial | protocol]
  - debug cable registration
  - debug cable tlv
  - debug cable ipv6 dhcp
  - debug cable service-ds-selection
  - debug cable rcc
  - debug cable wbcmts
  - debug cable md-sg
  - debug cable ubg

# 1.d - DOCSIS 3.1 Operational Maintenance

34 DS Channels - 32 SC-QAMs + 2 OFDMs  
4 US+1 OFDMA

Operational Version 3.1

Number of OFDM Chans

## Identifying D3.1 Modems

- show cable modem docsis version d31 [operational|not-operational]

```
cBR8-01# show cable modem docsis version d31-capable
```

MAC Address	I/F	MAC State	Reg Ver	Oper Ver	DSxUS	DS OFDM	RCC ID	US OFDMA
14b7.f80e.3ee4	C3/0/1/UB	w-online (pt)	3.1	3.1	34x5	2	69	1
14b7.f80e.3ffc	C3/0/1/UB	w-online (pt)	3.1	3.1	34x5	2	69	1

## Show Cable Modem Docsis Version Summary Total

Total D3.1 modems per MD

Total D3.1 modems per chassis

Number of OFDMA Chans

```
CBR8-01# show cable modem docsis version summary total
```

Interface	On-line	DOCSIS Registered					US QoS			US Phy Mode			DOCSIS Mode		
		v3.1	v3.0	v2.0	v1.1	v1.0	v1.1	v1.0	ofdm	atdm	tdma	UP	WB	WP	NB
C2/0/1/UB	32	7	25	0	0	0	32	0	7	25	0	0	32	0	0
C2/0/0/UB	4	1	3	0	0	0	4	0	0	4	0	0	4	0	0
C3/0/0/UB	38	8	30	0	0	0	38	0	0	38	0	0	38	0	0
C3/0/1/UB	5	3	2	0	0	0	5	0	0	5	0	0	5	0	0
Total:	118	v3.1: 21		v3.0: 95		v1.1: 118			UP : 0			WB: 116			
		v2.0: 2		v1.0: 0			ofdm: 7			WP: 0			NB: 2		
		v1.1: 0					atdm: 111								
		v1.0: 0					tdma: 0								



# 1.d Maintaining ipv6 host & network database

## IPv6 CPE show commands

```
CMTS#show interface cab 6/0/0 modem ipv6
```

SID	Type	State	IPv6 Address	M MAC address
49	CM	w-online(pt)	2001:DB8:FFFF:0:7EB2:1BFF:FE2D:DAC0	D 7cb2.1b2d.dac0
49	CPE	unknown	2001:DB8:FFFE:0:95F6:33FA:6D0F:CBCE	D 0015.587e.9d30
<b>50</b>	<b>CM</b>	<b>w-online(pt)</b>	<b>2001:DB8:FFFF:0:7EB2:1BFF:FE0A:B464</b>	<b>D 7cb2.1b0a.b464</b>
50	CPE	unknown	2001:DB8:FFFE:0:F060:7945:20B2:188	D 406c.8f49.25c1

```
CMTS#show cable modem 7cb2.1b0a.b464 cpe
```

IP address	MAC address	Dual IP	Device Class
24.35.0.238	<b>406c.8f49.25c1</b>	<b>Y</b>	Host

```
CMTS#show cable modem 7cb2.1b0a.b464 ipv6 cpe
```

MAC Address	IP Address
406c.8f49.25c1	<b>2001:DB8:FFFE:0:F060:7945:20B2:188</b>

# 1.d Maintaining host & network database

## IPv6 neighbors show commands

```
CMTS#show ipv6 neighbors
```

IPv6 Address	Age	Link-layer Addr	State	Interface
FE80::426C:8FFF:FE49:25C1	35	406c.8f49.25c1	REACH	Bu99
2001:DB8:FFFE:0:95F6:33FA:6D0F:CBCE	14	0015.587e.9d30	REACH	Bu99
2001:DB8:FFFE:0:F060:7945:20B2:188	34	406c.8f49.25c1	REACH	Bu99
FE80::144C:B972:3F42:4971	142	001c.2512.a794	STALE	Bu99
FE80::215:58FF:FE7E:9D30	135	0015.587e.9d30	STALE	Bu99
2001:DB8:FFFE:0:3084:9310:46C9:3B20	21	001c.2512.a794	REACH	Bu99

```
CMTS#show ipv6 neighbors statistics
```

```
IPv6 ND Statistics
```

```
Entries 40, High-water 42, Gleaned 12, Scavenged 13, Static 38
```

```
Entry States
```

```
INCMP 0 REACH 40 STALE 0 GLEAN 0 DELAY 0 PROBE 0
```

```
Resolutions
```

```
Requested 4, timeouts 3, resolved 2, failed 1
```

```
In-progress 0, High-water 1, Throttled 0, Data discards 1
```

```
NUD
```

```
Requested 7966, timeouts 20, resolved 7968, failed 4
```

```
in-progress 1, high-water 3, throttled 0, current queue 0, queue high-water 0
```

# 1.d - Modem Verification

## Show Cable Modem Verbose

Parameters	What to look for
Modem Status	w-online(pt) Security=assign(tek)
Primary Channel(s)	SC-QAM + OFMDA
OFDM Profiles	In-use
	Downgrade
	Recommended
DOCSIS Versions	MAC Version 3.1
	Operational Version 3.1
	QoS Provisioned 1.1

```
cBR8-01# show cable modem 14b7.f80e.3ee4 verbose
Modem Status           : {Modem= w-online(pt) ,
Security=assign(tek) }

MAC Address             : 14b7.f80e.3ee4
IP Address              : 13.41.0.41
IPv6 Address            : ---

Dual IP                 : N
Prim Sid                : 23
Host Interface          : C2/0/1/UB
MD-DS-SG / MD-US-SG    : 9 / 61
MD-CM-SG                : 0x31093D
Primary Wideband Channel ID : 8459 (Wi2/0/1:13)
Primary Downstream      : In2/0/1:0 (RfId : 8448, SC-QAM)
Wideband Capable        : Y
DS Tuner Capability     : 32
Downstream Channel DCID RF Channel : 1      2/0/1:0 (SC-QAM)
Downstream Channel DCID RF Channel : 159    2/0/1:158 (OFDM)
Downstream Channel DCID RF Channel : 160    2/0/1:159 (OFDM)
Downstream OFDM DCID    : 159
  Downstream OFDM Profile (config)   : 0 1 2 3
  Downstream OFDM Profile (REG-RSP-MP) : 0 1 2 3
  Downstream OFDM Profile (DBC-REQ)  : N/A
  Downstream OFDM Profile (in-use)   : 3   [4096-QAM]
  Downstream OFDM Profile (dwngrd)   : 2
  Downstream OFDM Profile (recomm)   : 3
  Downstream OFDM Profile (unfit)    : N/A
sysDescr                : xxxxx
Downstream Power         : -0.30 dBmV (SNR = 47.60 dB)
MAC Version              : DOC3.1
Operational Version      : DOC3.1
QoS Provisioned Mode     : DOC1.1
OFDM MRC Support         : Max num of DS OFDM channels = 2
OFDMA MTC Support        : Max num of US OFDMA channels = 2
```

# 1.d - D3.1 Verification

## Modem Profile

### D3.1 All-Together

### OFDM Profile

Profile ID	1	103/106
Cyclic Prefix	1024	192
Roll Off	128	128
FFT Khz	50	50
Intl Depth	16	16
Pilot Scale	48	48
Modulation Control	D:256	D:256
NCP	D:16	D:16
Data Profile 1 - 2-3-4-5	D1024	D1024
	D4096	D2048
		D4096

### Controller

```
cBR8-01# show controller integrated-Cable 3/0/0 rf-ch 158
```

Chan	State	Admin	Mod-Type	Start	Width	PLC	Profile-ID	dcid	power	output
158	UP	UP	OFDM	258000000	19200000	351000000	103	159	35	NORMAL

```
cBR8-01# show cable modem 14b7.f80e.3ee4 verbose | inc OFDM
Downstream Channel DCID RF Channel : 159 2/0/1:158 (OFDM)
Downstream OFDM DCID : 159
Downstream OFDM Profile (in-use) : 3
Downstream OFDM Profile (dwngrd) : 1
Downstream OFDM Profile (recomm) : 3
Downstream OFDM Profile (unfit) : N/A
OFDMA Profile in Use : 13
```

OFDMA Profile and support

### Modem Service Flow

```
cBR8-01# show cable modem 14b7.f80e.3ee4 service-flow ds
BPI DS Index: 33
Jib4DS Show BPI: [Bufsz 8000]: idx:33 [0x21] seq_no: 0
AES
Said : 1
Seq_No : 1
Key : 254f9b4b511df36a dab7d52caf07fe80
SFID: 12 DS HW Flow Index: 2871 DSID: 393246
Valid : TRUE
DSID : 131102 [ 0x2001e]
Priority : 0
Bonding Group: 513 [ 0x201]
Channel : 65535 [ 0xffff]
DS-EH : 3 [ 0x3]
Profile 1 : 3 [ 0x3]
Profile 2 : 0 [ 0]
No Sniff Enabled.
```

Look for Up/Up

Described by ProfileID=100

Frequency, Width, Pilot



# 2 - CMs Throughput Troubleshooting

## Best Way To Troubleshoot Is

- 1. Look at overall interface numbers on cBR-8
  - rf-channel bandwidth sharing, DBS Vs Static
- 2. Per CM DS and US throughput verification
  - 2.a – Identify the subscriber's CM having a problem on DS/US (or in both direction)
    - Perform throughput test
    - Look at the real DS numbers on cBR-8
    - Install a test CM at headend on same US/DS interface, if possible
    - Perform FTP test from server behind cBR-8
  - 2.b – Verify US Throughput issues
    - SID tracker verification for US throughput issues (In Appendix)
    - Look at the real numbers on cBR-8
- 3. Configure DS Bonding Resiliency (In Appendix)
  - DS Bonding resiliency configuration and debugs

# 2.a - Per CM DS and US Throughput Verification

## Show Commands to be Used

- **Show cable modem** {*mac-address* | *ipaddress*} **wideband rcs-status**
  - Make sure CM is not in “Partial Service”
    - MAC state will be “**p-online(pt)**” for DS partial service

## Chan status for a CM

```
cBR8-01#show cable modem 14b7.f80e.3ee4 wideband rcs
```

CM	DS-CTRL	RF	CH	ID	STATUS	TYPE	PRIM-CHAN
14b7.f80e.3ee4	2/0/1	0	1		UP	SC-QAM	NO
		1	2		UP	SC-QAM	NO
		2	3		UP	SC-QAM	NO
		7	8		UP	SC-QAM	NO
		8	9		UP	SC-QAM	YES
		30	31		UP	SC-QAM	NO
		31	32		UP	SC-QAM	NO
		158	159		UP	OFDM	NO
		159	160		UP	OFDM	NO

All SC-QAMs are up

Both OFDMs are up too !!

# 2.a - DS Performance Verification Wideband interface stats

```
cBR8-01#show int wideband-Cable 2/0/1:13
Wideband-Cable3/0/0:14 is up, line protocol is up
  Hardware is CMTS WB interface, address is 54a2.740d.e9cb (bia
54a2.740d.e9cb)
  MTU 1500 bytes, BW 4547000 Kbit/sec, DIX 1000 usec
  reliability 255/255, txload 77/255, rxload 1/255
  Encapsulation MCNS, loopback not set
  Keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/375/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: Class-based queueing
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
  30 second input rate 0 bits/sec, 0 packets/sec
  30 second output rate 1406891000 bits/sec, 1150011 packets/sec
  0 packets input, 0 bytes, 0 no buffer
  Received 0 broadcasts (0 multicasts)
  0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  11671790713 packets output, 11370186729412 bytes, 0 underruns
  0 output errors, 0 collisions, 1 interface resets
  0 output buffer failures, 0 output buffers swapped
```

Total BW and current load of WB interface  
32+2 channels

No output drops

Current output rate

No Output Errors

# 2.a - D3.0 And D3.1 Channel Utilization

Primary channel SYNC and MAP verification

```
cBR8-01#show controllers integrated-Cable 2/0/1 counter ofdm-channel
```

Controller	Chan#	Profile/PLC	Packets	Bytes	MaxRate (Mbps)	Rate (Mbps)	Utilization (%)
2/0/1	158	Total	21215976761	20531535357096	-	1810.056926	100.0
2/0/1	158	0	178625333	254776976190	1216	0.004952	0.0
2/0/1	158	1	5290363	214635993	1518	0.001600	0.0
2/0/1	158	2	21015238174	20274362725057	1668	0.005271	0.0
2/0/1	158	3	59105	6451298	1819	1810.000000	100.0
2/0/1	158	PLC-MMM	157711114	1161805398		0.008840	
2/0/1	158	PLC-EM	0	0		0.000000	
2/0/1	158	PLC-TR	0	0		0.000000	

OFDM - Max and Current load on each channel

MAP/UCD/SYNC Generated by Cable line card

Packet Counter

Throughput Rate (~37.5 Max)

```
cBR8-01# show controllers integrated-Cable 2/0/1 counter rf-channel
```

Controller	RF Chan	MPEG Packets Tx	MPEG bps	MPEG Mbps	Sync Packets Tx	MAP/UCD Packets Tx	User Mbps
2/0/1	0	987308931	6931203	06.93	0	525995	06.20
2/0/1	1	900979271	6345766	06.34	0	525995	05.68
2/0/1	2	914382688	6443522	06.44	0	525995	05.76
2/0/1	3	984291945	6913607	06.91	0	525995	06.21
2/0/1	4	998100101	7010812	07.01	0	525995	06.30
2/0/1	5	913935967	6447382	06.44	0	525995	05.76
2/0/1	6	914746053	6436955	06.43	0	525995	05.78
2/0/1	7	981493724	6896462	06.89	0	525995	06.18
2/0/1	8	5928219913	34048422	34.04	105198435	2093325397	29.61
2/0/1	9	3751509182	31973723	31.97	0	525995	28.64

Current load on each SC-channel



# 2.a - DS Performance Verification

- Show cable modem <mac/ip-add> service-flow

No P-online(pt) or partial-service in Up mode

```

cBR8-01#show cable modem 14b7.f80e.3ee4 service-flow
MAC Address      IP Address      Host           MAC             Prim  Num Primary    DS
                  IP Address      Interface      State           Sid   CPE Downstream RfId
14b7.f80e.3ee4  13.41.0.34     C2/0/1/UB     w-online (pt)   7     8   In2/0/1:8    12296
Sfid  Dir  Curr  Sid  Sched  Prio  MaxSusRate  MaxBrst  MinRsvRate  Throughput
      State  Type
  11   US  act   7    BE    0    0           3044     0           19930223
  12   DS  act  N/A  N/A   0    0           3044     0           1899996040

DOWNSTREAM SERVICE FLOW DETAIL:
SFID  Flg  Policer          Scheduler
      Xmits  Drops  Xmits  Drops
  12   0     0      1726   0

UPSTREAM SERVICE FLOW DETAIL:
SFID  SID  Requests  Polls  Grants  Packets
  11   7    15569323  0      15569045  1565745
    
```

w-online (pt)

1899996040

Current DS throughput

FrwdIF  
Wi2/0/1:13

Wideband intf is for forwarding. Modular intf. Or Dynamic WC Intf For WB CM in partial service mode

Requests 15569323  
Grants 15569045

US Requests for Grants US BW



# 2.b - Upstream Performance Verification

US Not in Partial-Service

```
cBR8-01#show cable modem 14b7.f80e.3ee4
MAC Address      IP Address      I/F              MAC              Prim  RxPwr  Timing Num I
                  State           State            State            Sid   (dBmv) Offset CPE P
14b7.f80e.3ee4  13.41.0.34     C2/0/1/UB       w-online(pt)     7     0.00  2095  0    N
```

Only see this info if modem in Partial Service on US side

Parameter	What to look for
Partial-Mode Information	Failed TCS Bitmap LSB is highest US
Ranging Status	cnt = continue dr = down recovery sta = station maint (good)
Codewords	Good CW incrementing Corrected and Uncorr not
Tjming offset	Not changing much

```
cBR8-01#show cable modem 14b7.f80e.3ee4 verbose
Partial-Mode Information : reason 0x1 failed-tcs 0x2
MAC Address              : 14b7.f80e.3ee4
IP Address                : 13.41.0.34
IPv6 Address              : ---
Dual IP                  : N
Prim Sid                  : 7
Host Interface            : C2/0/1/UB
Upstream Channel          : US0          US1          US2          US3
Ranging Status           : sta          sta          sta          sta
Upstream SNR (dB)        : 42.4         42.4         39.8         38.12
Upstream Data SNR (dB)   : 40.0         39.8         39.8         35.56
Received Power (dBmV)    : 0.00        0.00        0.00        0.00
Data Burst resiliency suspended : N           N           N           N
Reported Transmit Power (dBmV) : 30.00       30.00       30.00       30.50
Commanded Transmit Power (dBmV) : 30.00       30.00       30.00       30.50
Good Codewords rx        : 888920      852219      882345      855338
Corrected Codewords rx   : 0            0            0            0
Uncorrectable Codewords rx : 7            0            0            0
Phy Operating Mode       : atdma*      atdma*      atdma*      atdma*
```

Good Codewords received..

All US in "sta" Station Maint. Mode with good SNR

For throughput >= 40M  
 2 sid clusters with 2 max request per sid  
 For fairly balanced utilization on US channels under one USBG per MD  
 Configure "cable upstream balance-scheduling" globally

# 2.b - OFDMA Upstream Verification

OFDMA Verification per Modem

`show cable modem mac-address verbose`

Parameter	What to look for
Upstream Channel	Sta - for Ranging Status of OFDMA Channel
OFDMA Timing Offset	Stable
Phy Operating Mode	OFDMA
OFDMA Profile in Use	Valid OFDMA defined IUC

*OFDMA US in "sta" Station Maint. Mode with good SNR*

```
cBR8-01# show cable modem 14b7.f80e.3ee4 verbose
US Frequency Range Capability      : Extended (5-85 MHz)
Extended Upstream Transmit Power  : 0dB
Max CM Transmit Power (dBmV)     : 65.00
Neq 1.6MHz Transmit Channels     : 26
US Power Display Bandwidth Units  : 1.6 MHz
Max Transmit Channel Power (dBmV) : 50.86
Multi-Transmit Channel Mode      : Y
Max US SC-QAMs Supported         : 8
Number of US in UBG              : 1
Minimum power load in DRW (dB)   : 16.25
Max Dynamic ranging window (dBmV) : 34.50
Min Dynamic ranging window (dBmV) : 22.50
Upstream Channel                : US4
Ranging Status                 : sta
Upstream SNR (dB)                 : -----
Upstream Data SNR (dB)            : 42.04
Received Power (dBmV)             : 0.00
Data Burst resiliency suspended  : N
Reported Transmit Power (dBmV)    : 34.50
Commanded Transmit Power (dBmV)   : 34.50
Minimum Transmit Power (dBmV)     : 17.00
Power Load (dB)                   : 16.36
Timing Offset (97.6 ns)           : 2207
OFDMA Timing Offset            : (4.88 ns): 44144
Initial Timing Offset             : 2207
Phy Operating Mode             : ofdma
OFDMA Profile in Use           : 13
```

# 2.b - Upstream Performance Verification

```
cBR8-01#sho cable modem 14b7.f80e.3ee4 service-flow 11
Sfid      : 11
Hfid      : 285
Mac Address : 14b7.f80e.3ee4
Type      : Primary
Direction  : Upstream
Current State : Active
Rate Limit Delayed Grants : 0
Rate Limit Dropped Grants : 0
Current Throughput : 16017517 bits/sec,2010 packets/sec
US Bonded : YES
Upstream Bonding Group : UBG-1
Sid Cluster : SC-0, Sid [ 7 7 7 7 ]
Sid Cluster : SC-1, Sid [ 11 11 11 11 ]
Upstream PCH : 12 13 14 15
Segments Valid : 10926917
Segments Discarded : 0
Segments Lost : 0
<snip>
Sid : 7
Request polls issued : 0
BWReqs {Cont,Pigg,RPoll,Other} : 189704, 10753203, 0, 0
Grants issued : 301850
Packets received : 137439110
Bytes received : 67873270485
Queue-indicator bit statistics : 0 set, 0 granted
Good Codewords rx : 30964862
```

UGS flow numbers

```
cBR8-01#sh cable admission-control int c2/0/1
Interface Cable2/0/1
Upstream # 0

Upstream Bit Rate (bits per second) = 30720000
Sched Table Rsv-state: Grants 0, Reqpolls 0
Sched Table Adm-state: Grants 0, Reqpolls 19, Util 0%
UGS : 11 SIDs, Reservation-level in bps 959365
UGS-AD : 0 SIDs, Reservation-level in bps 0
RTPS : 0 SIDs, Reservation-level in bps 0
NRTPS : 19 SIDs, Reservation-level in bps 318155
BE : 72 SIDs, Reservation-level in bps 0
Maximum AC reservable bandwidth is not configured
```

UGS : 11 SIDs, Reservation-level in bps 959365

NRTPS : 19 SIDs, Reservation-level in bps 318155

Two US SID Clusters

Per US sid numbers

NRTPS flow (Voice Signaling) numbers

# 2.b - Upstream Performance Verification

```
cBR8-01#sh int cable 2/0/1 mac-scheduler 1
DOCSIS 1.1 MAC scheduler for Cable2/0/1/U1 : rate 30720000
wfq:None
us_balance:ON
dpon_mode:OFF
fairness:OFF
Queue[Rng Polls] flows 0
Queue[CIR Grants] flows 0
Queue[BE(07) Grants] flows 0
Queue[BE(06) Grants] flows 0
<snip>
Queue[BE(00) Grants] flows 0
Req Slots 2056707696, Req/Data Slots 3567181
Init Mtn Slots 30204447, Stn Mtn Slots 68256
Short Grant Slots 0, Long Grant Slots 0
Adv Phy Short Grant Slots 159, Adv Phy Long Grant Slots 206682
Adv Phy UGS Grant Slots 220
Avg upstream channel utilization : 25%
Avg percent contention slots : 73%
Avg percent initial ranging slots : 1%
Avg percent minislots lost on late MAPs : 0%
MAP TSS: lch_state 10, init_retries 0
      late_initial_maps 0, late_ucd_maps 0
      mac-phy tss errors 0, missed ccc 0
```

```
cBR8-01#sh int cable 2/0/1 up bonding-
group
Cable2/0/1: Upstream Bonding Group 1
243836 packets input, 88930550 octets
input
Segments: 237793 valid, 0 discarded, 0
lost
Reserved Bandwidth Max : 0 bits/sec
Reserved Bandwidth      : 0 bits/sec
Available Bandwidth     : 122880000
bits/sec
Total Service Flows On This Bonding
Group: 116
```

Bonding Group BW Stats

No Lost Segments

US channel utilization

# DOCSIS 3.1 Demo





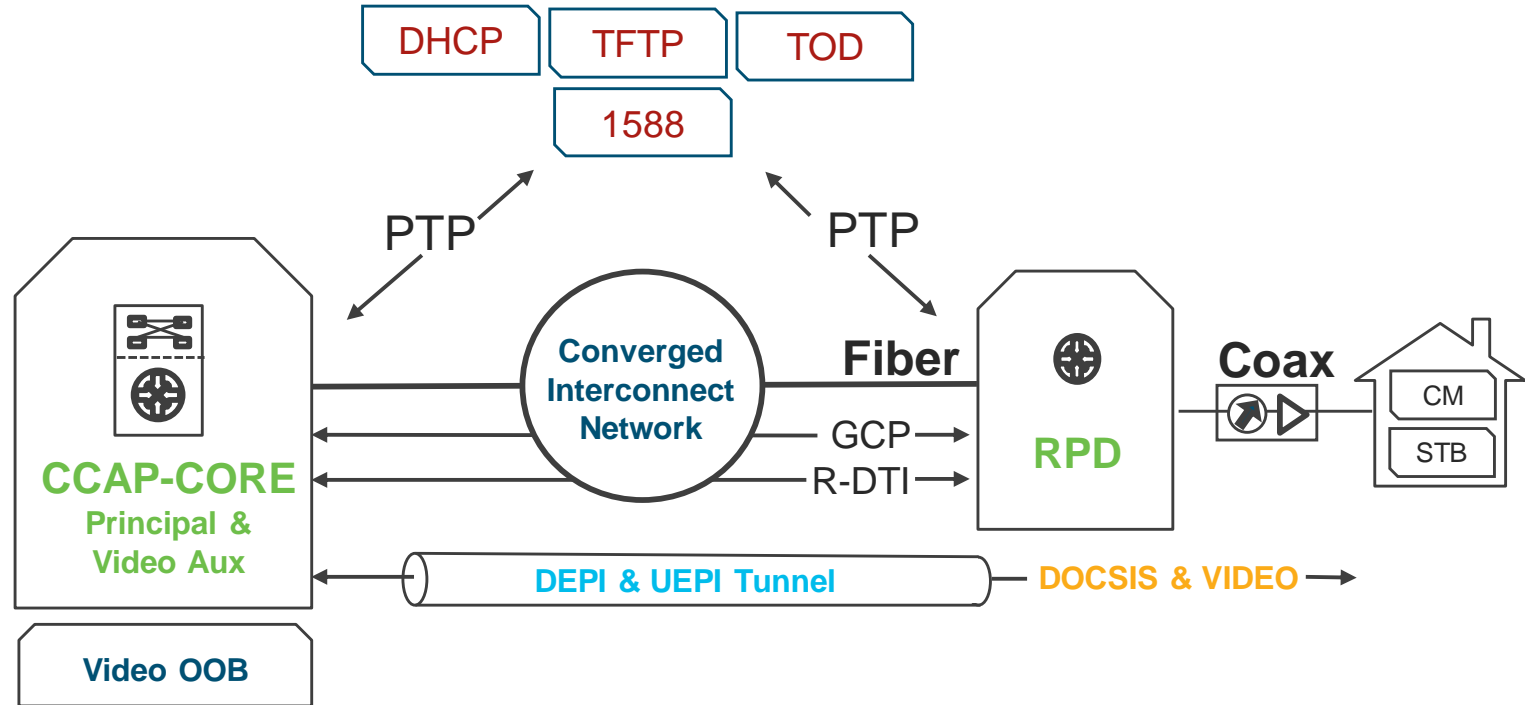
# Troubleshooting cBR-8 Remote PHY Services

# Remote PHY Troubleshooting Agenda

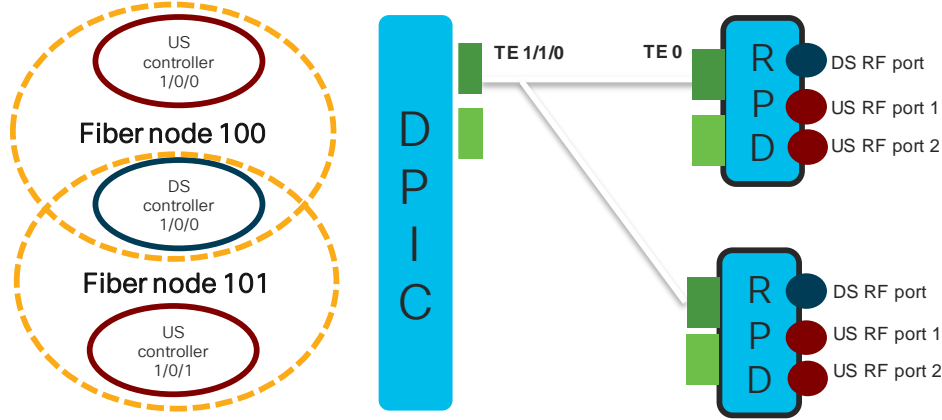
- Architecture
- Configuration
- Remote PHY Device
- PTP / Precision Timing Protocol
- GCP / Generic Control Protocol
- L2TP / DEPI and UEPI
- Video

# Architecture Overview

- Complies with CableLabs' MHA v2 standards



# 2 Configuration Reference



```
cable rpd NODE1-RTP
identifier aaaa.aaaa.aa01
core-interface Tel1/1/0
principal
  rpd-ds 0 downstream-cable 1/0/0 profile 30
  rpd-us 0 upstream-cable 1/0/0 profile 1

cable rpd NODE2-RTP
identifier aaaa.aaaa.aa02
core-interface Tel1/1/0
principal
  rpd-ds 0 downstream-cable 1/0/0 profile 30
  rpd-us 0 upstream-cable 1/0/1 profile 1
```

```
cable fiber-node 100
downstream Downstream-Cable 1/0/0
upstream Upstream-Cable 1/0/0
cable fiber-node 101
downstream Downstream-Cable 1/0/0
upstream Upstream-Cable 1/0/1
```

```
cable downstream controller-profile 30
rf-chan 0 31
  type DOCSIS
  frequency 405000000
  rf-output NORMAL
  qam-profile 1
  docsis-channel-id 1
rf-chan 32 39
  type VIDEO SYNC
  frequency 603000000
  rf-output NORMAL
  qam-profile 5
```

```
cable upstream controller-profile 1
us-channel 0 channel-width 6400000 6400000
us-channel 0 docsis-mode atdma
us-channel 0 equalization-coefficient
us-channel 0 frequency 17500000
us-channel 0 minislots-size 2
us-channel 0 modulation-profile 224
no us-channel 0 shutdown
...
us-channel 3 channel-width 6400000 6400000
us-channel 3 docsis-mode atdma
us-channel 3 modulation-profile 224
no us-channel 3 shutdown
```

```
interface Wideband-Cable1/0/0:0
cable bundle 1
cable rf-channels channel-list 0-31 bandwidth-percent 1
```

# 3d Downstream Controller Profiles

- show cable downstream controller-profile *number*

Parameter	What to look for ...
Being Used By	Expected Controllers
Admin State	UP
OFDM Spectrum	1 or more if doing OFDM D3.1
Max Carrier	AS expected / Affects power
DS Splitting	Yes: if Overlay & Mcast
Multicast Pool ID	ID: if Overlay & Mcast
OFDM Exclusion Band	As configured
Configured Channels	As configured
Admin	UP
Frequency	As configured
Type	DOCSIS VIDEO SYNC or ASYNC
Annex/Mod/Profile	B / 256

```

cBR8-01# show cable downstream controller-profile 30
Downstream controller-profile 30 is being used by controller Downstream-Cable:
 1/0/0, 1/0/5, 2/0/0, 2/0/5
Admin: UP
MaxOfdmSpectrum: 0
MaxCarrier: 158
Mode: normal
Frequency profile: unconfigured
DS Splitting: Yes
Multicast Pool ID: 1
OFDM frequency exclusion bands: None

Configured RF Channels:
Chan Admin Frequency Type Annex Mod srate Qam-profile dcid output
0 UP 405000000 DOCSIS B 256 5361 1 1 NORMAL
1 UP 411000000 DOCSIS B 256 5361 1 2 NORMAL
...
31 UP 591000000 DOCSIS B 256 5361 1 32 NORMAL
...
39 UP 639000000 VIDEO-SYNC B 256 5361 5 - NORMAL
    
```

# 3d Upstream Controller Profiles

- show cable upstream controller-profile *number*

Parameter	What to look for ...
Being Used By	Expected range of controllers
OFDMA Exclusion Unused	Exclusion = No D3.1 Carrier Unused = Still send pilots
Upstream Channel	For each upstream channel
Channel Width	As configured
DOCSIS Mode	As configured, (Mix-Mode, ATDMA, or OFDMA)
Frequency	As configured
Modulation Profile	As configured
Shutdown	False

```
cBR8-01# show cable upstream controller-profile 1
Upstream controller-profile 1 is being used by controller Upstream-
Cable:
1/0/5, 1/0/0, 1/0/1
Controller Upstream-Cable
  def-phy-burst           : 0
  ofdma-frequency-exclusion-band :
  ofdma-frequency-unused-band  :
  spectrum-group         :
Upstream-channel 0
  chan-class-id           : 0x0
  channel-width           : 6400000 6400000
  docsis-mode             : atdma
  equalization-coefficient : TRUE
  frequency               : 17500000
  hop-priority            : frequency modulation channel-wide
  maintain-psd            : OFF
  max-logical-chans       : 1
  minislot-size           : 2
  modulation-profile      : 224
  power-level             : 0
  rng-holdoff             : 0x0
  shutdown                : FALSE
  specsvl error-adaptive-profile : 1
  spectrum-group         :
  threshold cnr-profiles  : 25 13
```

# Remote PHY Device

1. RPD State Validation from cBR-8
2. RPD Provisioning Process
3. RPD CM and MAC-Domain associations from cBR-8
4. MD Association
5. Cable Modem Association

# 1 RPD State Validation from cBR-8

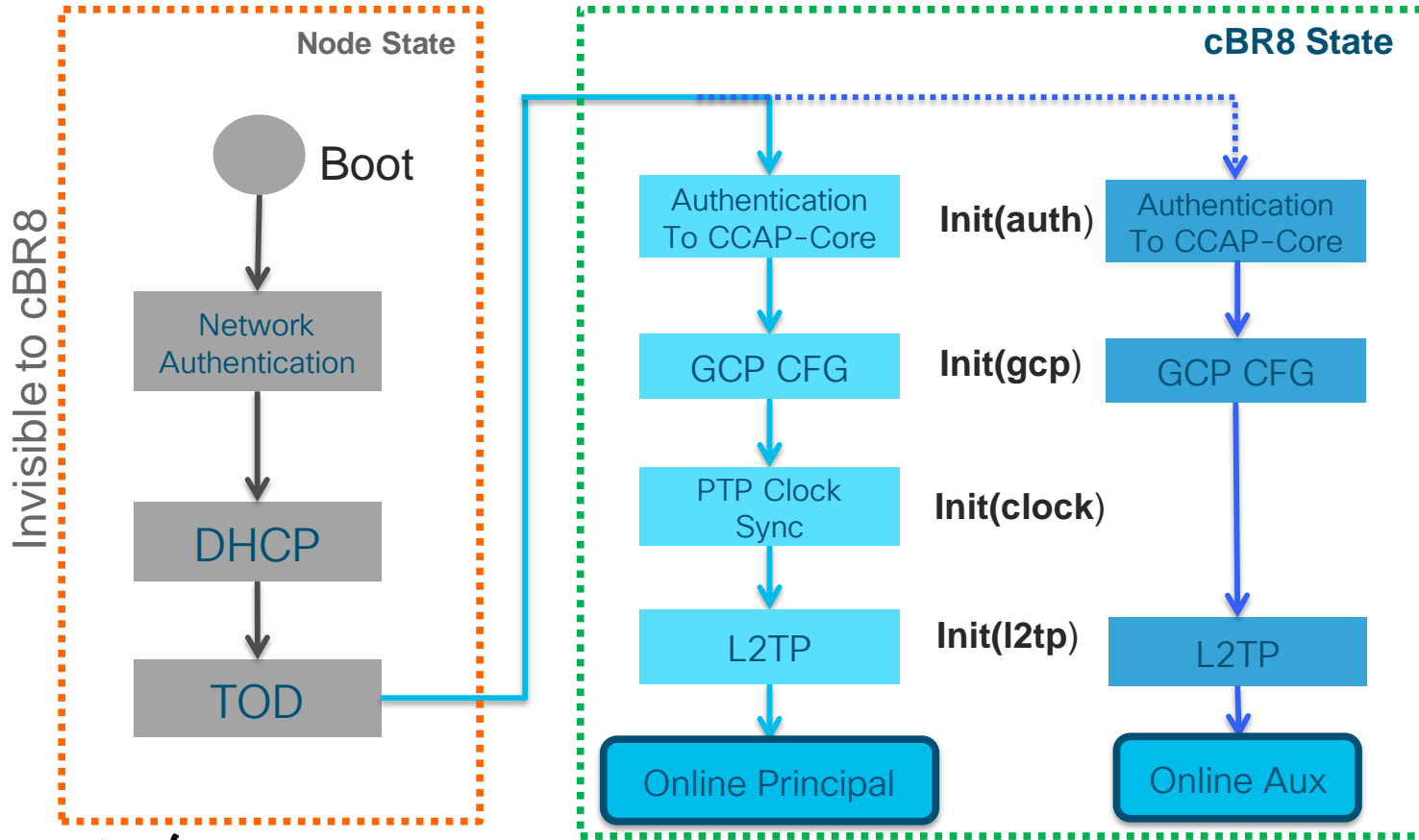
- show cable rpd

Parameter	What to look for...
<i>RPD even present?</i>	<i>Check RPD: DHCP, Dot1x, TOD</i>
<b>MAC Address</b>	<b>RPD's MAC Address</b>
IP Address	RPD's DHCP Assigned IP
Interface	DPIC Tengig link
<b>State</b>	<b>Online</b>
	Init (Auth, GCP, Clock, L2TP)
	<b>Offline</b>
<b>Role</b>	<b>Pri - Principal / One per RPD</b>
	Aux - Auxiliary: Video, DS Split, OOB
<b>High Availability</b>	Act - Active
	<b>Sby - Standby (lcha-cores)</b>
Name	Configured name

```
cBR8-01# show cable rpd
MAC Address      IP Address      I/F      State  Role HA  Name
0004.9f33.0449  13.52.0.3      Te1/1/0  online Pri  Act  P2Shelf_RTP
0004.9f33.0449  13.52.0.3      Te1/1/6  online Aux  Act  P2Shelf_RTP
badb.ad13.1452  13.52.0.19     Te1/1/0  online Pri  Act  GS7K_RTP
badb.ad13.1452  13.52.0.19     Te1/1/6  online Aux  Act  GS7K_RTP
badb.ad13.1476  10.90.148.232  Te1/1/2  online Pri  Act  GS7K-LWR
```

```
cBR8-01# show cable rpd lcha-cores
MAC Address      IP Address      I/F      State  Role HA  Name
0004.9f33.0449  13.52.0.3      Te0/1/0  online NA  Sby  P2Shelf_RTP
0004.9f33.0449  13.52.0.3      Te1/1/0  online Pri  Act  P2Shelf_RTP
0004.9f33.0449  13.52.0.3      Te0/1/6  online NA  Sby  P2Shelf_RTP
0004.9f33.0449  13.52.0.3      Te1/1/6  online Aux  Act  P2Shelf_RTP
badb.ad13.1452  13.52.0.19     Te0/1/0  online NA  Sby  GS7K_RTP
badb.ad13.1452  13.52.0.19     Te1/1/0  online Pri  Act  GS7K_RTP
badb.ad13.1452  13.52.0.19     Te0/1/6  online NA  Sby  GS7K_RTP
badb.ad13.1452  13.52.0.19     Te1/1/6  online Aux  Act  GS7K_RTP
badb.ad13.1476  10.90.148.232  Te0/1/2  online NA  Sby  GS7K-LWR
badb.ad13.1476  10.90.148.232  Te1/1/2  online Pri  Act  GS7K-LWR
```

# 2 RPD Provisioning Process



# 3 RPD Event Logging from cBR-8

- show cable rpd mac-address tengig slot/subslot/0 log
- show cable rpd mac-address event

RPD States	
1	Offline
2	Init(auth)
3	Init(gcp)
4	Init(clksync)
5	Init(l2tp)
6	Online

```
cBR8-01# show cable rpd badb.ad13.1452 ten1/1/0 log
RPD ID          I/F          Severity    Time          LOG INFORMATION
-----
badb.ad13.1452  Te1/1/0     DEBUG      13:04:43.869  RPD badb.ad13.1452 CoreTe 1/1/0 change MASTER STATE from offline to
badb.ad13.1452  Te1/1/0     DEBUG      13:04:43.869  RPD badb.ad13.1452 CoreTe 1/1/0 change MASTER STATE from init(auth)
badb.ad13.1452  Te1/1/0     DEBUG      13:04:43.869  RPD badb.ad13.1452 CoreTe 1/1/0 change GCP STATE from offline to init
badb.ad13.1452  Te1/1/0     DEBUG      13:04:43.950  RPD badb.ad13.1452 CoreTe 1/1/0 change GCP STATE from init to nego
badb.ad13.1452  Te1/1/0     DEBUG      13:04:43.972  RPD badb.ad13.1452 CoreTe 1/1/0 change GCP STATE from nego to nego
badb.ad13.1452  Te1/1/0     DEBUG      13:04:43.973  RPD badb.ad13.1452 CoreTe 1/1/0 change GCP STATE from nego to bulksync_cfg
badb.ad13.1452  Te1/1/0     DEBUG      13:04:45.159  RPD badb.ad13.1452 CoreTe 1/1/0 change GCP STATE from bulksync_cfg to ready
badb.ad13.1452  Te1/1/0     DEBUG      13:04:45.159  RPD badb.ad13.1452 CoreTe 1/1/0 change MASTER STATE from init(gcp) to init(clksync)
badb.ad13.1452  Te1/1/0     DEBUG      13:08:14.329  RPD badb.ad13.1452 CoreTe 1/1/0 change MASTER STATE from init(clksync) to
init(l2tp)
badb.ad13.1452  Te1/1/0     DEBUG      13:08:15.810  RPD badb.ad13.1452 CoreTe 1/1/0 change MASTER STATE from init(l2tp) to online
```

```
cBR8-01# show cable rpd badb.ad13.1452 event
RPD          EventId Level Count LastTime          Message
badb.ad13.1452  66070204 Error 1 May17 15:35:47 GCP Connection Failure CCAP-IP=13.13.0.218;RPD-ID=badb.ad13.1452;
badb.ad13.1452  2148074241 Error 1 May17 15:35:48 Session failed:closed by core side, @SLAVE: 13.52.0.19:None --> 13.13.0.218:8190;RPD-
ID=badb.ad13.1452;
badb.ad13.1452  66070204 Error 1 May17 15:35:49 GCP Connection Failure CCAP-IP=13.13.0.218;RPD-ID=badb.ad13.1452;
```

# 4,5 RPD Mac-Domain Association

- show cable rpd *mac-address* md-association
- show controller downstream-cable *slot/sub/port rf-channel group-list*
- show cable modem *mac verbose | inc RP*

```
cBR8-01# show cable rpd badb.ad13.1452 md-association
RPD ID: badb.ad13.1452
RPD Principal Core Tel/1/0:
  DS 0 controller: 1/0/0 (profile 30, DOCSIS + VIDEO)
  US 0 controller: 1/0/0 (profile 1, DOCSIS)
  US 1 controller: NA
  Mac Domain: Ca1/0/0
RPD Auxiliary Core Tel/1/6:
  DS 0 controller: 1/0/31 (profile 40, VIDEO)
  US 0 controller: NA
  US 1 controller: NA
  Mac Domain: NA
```

Parameter	What to look for...
Principal Core	Correct TenGig
DS Controller	Expected controller
	Expected profile ID
	Type(s)
US Controller	(same)
MAC Domain	Expected Cable Intf
Auxiliary Core	US : NA, MAC-Domain: NA

```
cBR8-01# show controller downstream-Cable 1/0/0 rf-channel 0-63
Chan State Admin Frequency Type Annex Mod srate Interleaver dcid output
0 UP UP 405000000 DOCSIS B 256 5361 I32-J4 1 NORMAL
30 UP UP 585000000 DOCSIS B 256 5361 I32-J4 31 NORMAL
31 UP UP 591000000 DOCSIS B 256 5361 I32-J4 32 NORMAL
32 UP UP 603000000 VIDEO-SYNC B 256 5361 I128-J1 - NORMAL
39 UP UP 645000000 VIDEO-SYNC B 256 5361 I128-J1 - NORMAL
```

```
cBR8-01# show controller downstream-Cable 1/0/31 rf-channel 0-63
Chan State Admin Frequency Type Annex Mod srate Interleaver dcid output
40 UP UP 597000000 VIDEO-SYNC B 256 5361 I128-J1 - NORMAL
41 UP UP 651000000 VIDEO-SYNC B 256 5361 I128-J1 - NORMAL
47 UP UP 687000000 VIDEO-SYNC B 256 5361 I128-J1 - NORMAL
```

```
cBR8-01# scm 1457.ab13.fbbe verbose | i RP
RPD ID : badb.ad13.1452
```



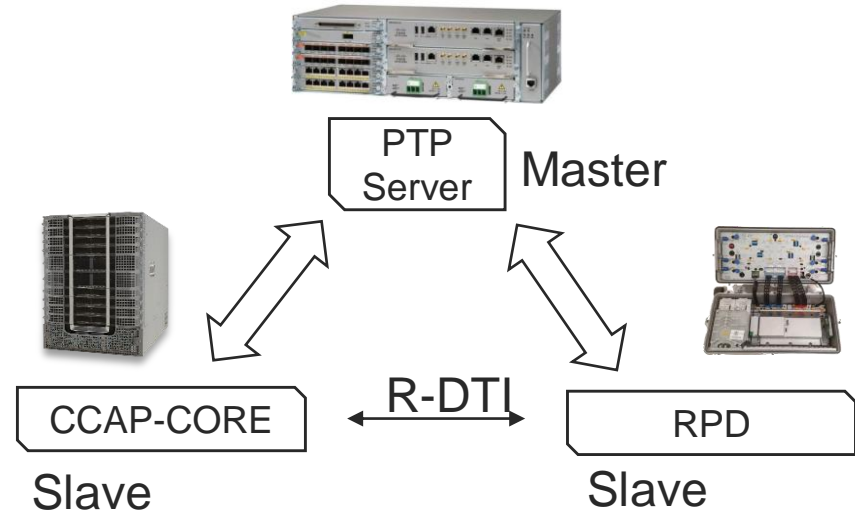
# Precision Timing Protocol & GCP

1. Overview PTP
2. PTP Validation on cBR-8
3. Overview GCP
4. GCP Validation on cBR-8

# 1 Precision Timing Protocol Overview

- Provides timing sync between CCAP-CORE and RPD
- PTP implements IEEE1588
- No need for DTI server next to device

Checklist	What to look for ...
IP Connectivity	PTP Master to CCAP-CORE
	PTP Master to RPD
	RPD and CCAP-CORE
Configuration	R-DTI Configurations on cBR8
	RPD should obtain PTP parameters from cBR8
	Only one Ordinary Domain



# 2 Validate Clock on cBR-8

- show ptp clock running [domain 0]

Parameter	What to look for ...
Clock State	PHASE_ALIGNED
Role	Slave
Port State	Listening
PTP Master	As configured (not alternate)
Packets In & Out	Incrementing
Errors In & Out	Stable or 0

```
cBR8-01# show ptp clock running domain 0

                PTP Ordinary Clock [Domain 0]
      State          Ports          Pkts sent      Pkts rcvd      Redundancy Mode
  PHASE_ALIGNED      1              35884823      108757275      Hot standby

PORT SUMMARY

Name          Tx Mode          Role    Transport    State          Sessions    PTP Master
slave-from-903 unicast         slave   Lo0          Listening        1           10.225.197.254

                SESSION INFORMATION
slave-from-903 [Lo0] [Sessions 1]
Peer addr          Pkts in    Pkts out    In Errs    Out Errs
10.225.197.254    108760134  35885432    0           0
```



```
...

                SESSION INFORMATION
slave-from-903 [Lo0] [Sessions 1]
Peer addr          Pkts in    Pkts out    In Errs    Out Errs
10.225.197.254    108760185  35885783    0           0
```

Clock States	
1	Free Run
2	Acquiring
3	Frequency Lock
4	Phase Aligned

Network Issues

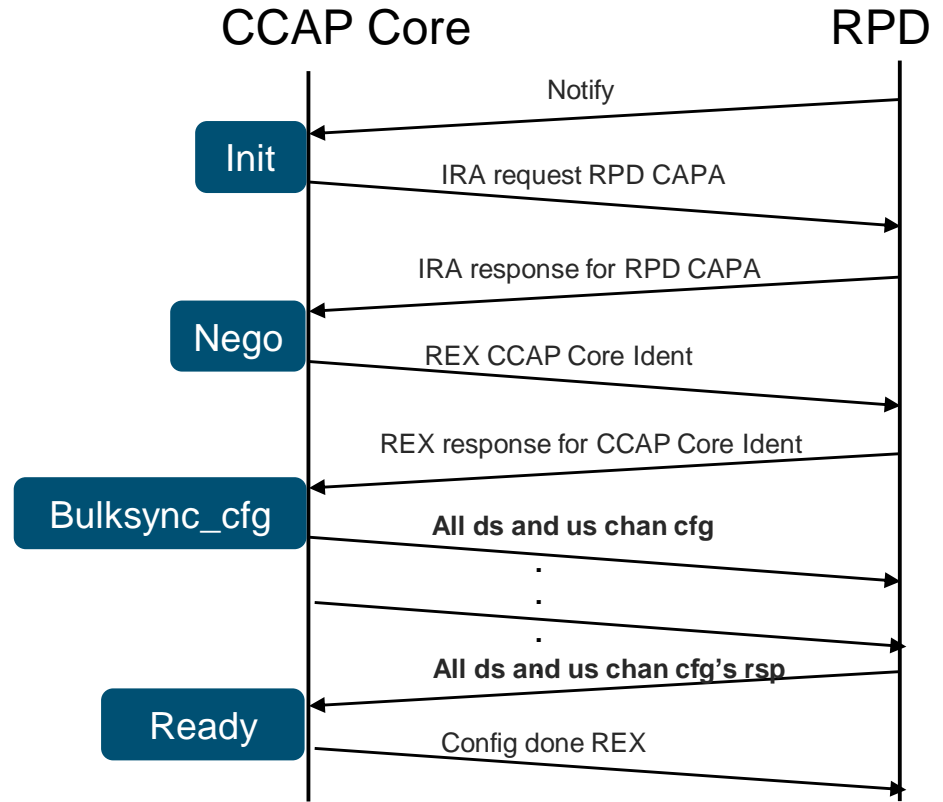


Holdover

# 3 GCP Overview

- Generic Control Plane Protocol
- RCP Remote PHY Control Protocol
- Used to send/update configuration to RPD
- Used to report events from RPD

GCP Negotiation Kickoff	
1	cBR-8 configured with RPD Identifier
2	RPD knows CCAP-CORE IP from DHCP
3	cBR8 Receives Notify Msg from RPD
Conditions to trigger GCP Message	
1	DS/US Controller Profile Change
2	Add DS/US Controller
3	Delete DS/US Controller
4	clear cable rpd mac reset
5	Remove RPD - "no cable rpd"



# 4 Validate GCP Sessions on cBR-8

- show cable rpd *mac-address* tengig slot/subslot/0 { gcp-state | gcp-session | gcp-transaction }

Parameter	What to look for...
State	Ready
	Init / Nego / bulkcfg_sync
RPD Address	RPD IP
Session State	Active
Packet Statistics	RX and TX incrementing
	RX and TX dropped holding
Message Statistics	RX and TX incrementing

State	
1	Init
2	Nego
3	Bulk_sync
4	Ready

```
cBR8-01# show cable rpd badb.ad13.1452 ten1/1/0 gcp-state
MAC Address      IP Address      I/F      State      Role HA  Name
badb.ad13.1452  13.52.0.19     Tel1/1/0  ready      Pri  Act  GS7K_RTP
```

```
cBR8-01# show cable rpd badb.ad13.1452 ten1/1/0 gcp-session
GCP Session ID : 12
Core Address   : 13.13.0.226:8190
RPD Address    : 13.52.0.19:56322
Next Hop MAC   : 008A.962F.C028
Session State  : Active
Packet Statistics:
=====
Rx             : 37666
Tx             : 37275
Rx Dropped    : 0
Tx Dropped    : 0
Message Statistics:
=====
Rx             : 43468
Tx             : 43088
```

```
cBR8-01# show cable rpd badb.ad13.1452 ten1/1/0 gcp-transaction
RPD ID      I/F      TRANS ID  GCP MSG TYPE      RCP MSG TYPE      TIMESTAMP
-----
badb.ad13.1452  Te1/1/0  25586    GCP_MSG_ID_EDS_RSP  TYPE_REX          2017-05-30 17:01:55.327
badb.ad13.1452  Te1/1/0  25586    GCP_MSG_ID_EDS      TYPE_REX          2017-05-30 17:01:55.305
badb.ad13.1452  Te1/1/0  25585    GCP_MSG_ID_EDS_RSP  TYPE_REX          2017-05-30 17:01:54.926
badb.ad13.1452  Te1/1/0  25585    GCP_MSG_ID_EDS      TYPE_REX          2017-05-30 17:01:54.905
...
```

# L2TP DEPI and UEPI

- Validate DEPI & UEPI on cBR-8
- Validate DEPI & UEPI on RPD

# Validating DEPI and UEPI on cBR-8

57 = 40 DS SC-QAM + 1 OFDM  
+ (4 x 4 US SC-QAM)

- show cable rpd *mac-address* tengig slot/subslot/0 depi [ tunnel | session ]

Parameter	What to look for ...
State	Est - Established
	Error State Tunnel - wsc(rp/rq)
Remote	Device - Matches MAC of RPD
	IP - Matches IP of RPD
Session Count	Sum DS Channels
	Sum USx4 Channels
Pseudowire	Downstream or Upstream + Ctrlr + Ch
	M - MAP / D- DATA / R - RngReq / S - SpecMgmt
Last Change	Not recent
Type	P - Primary
Mode	PSP for DOCSIS
	MPT for Video
Remote State	UP

```

cBR8-01# show cable rpd badb.ad13.1452 ten1/1/0 depi tunnel
LocTunID   RemTunID   Remote Device   State   Remote Address   Sessn L2TP Class
Count
338004174  4141291000 badb.ad13.1452 est     13.52.0.19      57      rphy-l2tp-gl...

cBR8-01# show cable rpd badb.ad13.1452 ten1/1/0 depi session
LocID      RemID      Pseudowire      State   Last Chg Uniq ID      Type  Mode  RemSt
0x00012027 0x80002028 DS1/0/0:38      est     04:46:15 698         P     MPT  UP
0x0001200B 0x8000200C DS1/0/0:10      est     04:46:15 944         P     PSP  UP
0x00012008 0x80002009 DS1/0/0:7       est     04:46:15 692         P     PSP  UP
0x41040014 0x00000B01 US1/0/0:1 (R)   est     04:46:15 977         P     PSP  UP
0x00012002 0x80002003 DS1/0/0:1       est     04:46:15 738         P     PSP  UP
0x41040010 0x00000B00 US1/0/0:0 (R)   est     04:46:15 703         P     PSP  UP
0x41000014 0x00000D01 US1/0/0:1 (M)   est     04:46:15 705         P     PSP  UP
0x00012021 0x80002022 DS1/0/0:32      est     04:46:15 966         P     MPT  UP
0x0001201F 0x80002020 DS1/0/0:30      est     04:46:15 964         P     PSP  UP
    
```

Type	
MPT	DOCSIS MPEG Transport for Video
PSP	Multichannel Packet Stream Protocol for Downstream
	Legacy Packet Stream Protocol for Upstream

# Validating DEPI and UEPI on cBR-8

- show controller downstream-cable *slot/sub/port* counter rf-channel

Parameter	What to look for...
User Mbps	Non-zero
MAP/UCD	Incrementing on Primary DS
Packets TX	Incrementing between caps

Sync = 0  
RPD generates SYNC

```
cBR8-01# show controller downstream-Cable 1/0/0 count rf-channel
```

Controller	RF Chan	RF chan type	MPEG/DEPI Packets Tx	MPEG/DEPI pps	MPEG/DEPI bytes	MPEG/DEPI bps	MPEG/DEPI Mbps	Sync Packets Tx	MAP/UCD Packets Tx	User Mbps
1/0/0	0	DOCSIS	391416788	3943	30514019112	2528233	02.52	0	391451923	00.00
1/0/0	1	DOCSIS	391410058	3942	30513032210	2528870	02.52	0	391123398	00.00
1/0/0	2	DOCSIS	74635	0	3121762	152	00.00	0	4	00.00
1/0/0	3	DOCSIS	75272	0	3192293	182	00.00	0	4	00.00
1/0/0	4				30514290014	2527130	02.52	0	391349092	00.00
1/0/0	5				30511172180	2529344	02.52	0	391123369	00.00
1/0/0	6	DOCSIS	74771	0	3135486	213	00.00	0	4	00.00
1/0/0	7	DOCSIS	75234	0	3186646	182	00.00	0	4	00.00
1/0/0	8	DOCSIS	398144928	3943	30511174512	2524532	02.52	0	381771208	00.00
1/0/0	9	DOCSIS	391343421	3942	30504926256	2529289	02.52	0	391121339	00.00
1/0/0	10	DOCSIS	76681	0	3352010	243	00.00	0	4	00.00
...										
1/0/0	31	DOCSIS	72761	0	2902421	152	00.00	0	4	00.00
1/0/0	32	VIDEO-SYNC	1772740011	12182	333275122068	18323090	18.32	0	0	17.73
1/0/0	33	VIDEO-SYNC	2601958	18	489168104	27072	00.02	0	0	00.02
1/0/0	34	VIDEO-SYNC	2601958	18	489168104	27072	00.02	0	0	00.02

Primary DS C1/0/0 & C1/0/1

Video QAMs

# Validating DEPI and UEPI on cBR-8

show controller downstream-cable slot/sub/port counter rf-channel verbose

High	Medium	Low
MAPs and UCDs	MDD, high QoS Data	Low / BE QoS Data

Parameter	What to look for...
PPS (Pkt Per Sec)	Non-zero
Bytes	Incrementing, multiple
BPS (Bits per Sec)	Non-zero

cBR8-01# show controller downstream-Cable 1/0/0 counter rf-channel verbose

RF	High	High	High	High	Medium	Medium	Medium	Medium	Low	Low	Low	Low
chan	Packets	pps	bytes	bps	Packets	pps	bytes	bps	Packets	pps	bytes	bps
0	1682045979	1971	128491847339	1257896	892038	1	489543751	4681	625604	0	124797012	1410
1	1699535710	1971	130525002317	1258805	1737176	1	623996566	5519	845811	0	160094847	1430
2	38	0	1292	0	852472	1	28984048	272	74026	0	8731859	0
3	38	0	1292	0	852472	1	28984048	272	83298	0	9893055	0
4	1682045492	1971	128490463417	1257938	877206	1	487481301	4560	616505	0	123892697	1410
5	1699571182	1971	130522511074	1258833	1338986	1	560960898	5052	685610	0	133211246	1503
6	38	0	1292	0	852472	1	28984048	272	74207	0	8751277	0
7	38	0	1292	0	852472	1	28984048	272	84024	0	9893302	0
8	1682025474	1971	128491265095	1257938	885800	1	488508395	4560	591732	0	120329224	1410
9	1699506654	1971	130521059945	1258846	1185741	1	540746066	4912	609931	0	125831865	1410
10	38	0	1292	0	852472	1	28984048	272	17310	0	1980114	0
...												
31	38	0	1292	0	852686	1	28991324	272	5449	0	614312	0
32	0	0	0	0	0	0	0	0	9889083384	12312	1859147675440	18518482
33	0	0	0	0	0	0	0	0	14866437	18	2794890156	27073
34	0	0	0	0	0	0	0	0	14866437	18	2794890156	27073
...												

# Validating DEPI & UEPI on RPD

- show l2tp tunnel
- show l2tp session

Parameter	What to look for...
Remote Name	cBR-8 Hostname
State	Est - Established
Local Address	RPD IP
Session Count	1x per DS, 4x per US

Did you know...	
DEPI	One PW for all MMM, Data, etc
UEPI	Every MAP Duplicated
	Four PW per US

CR	Msg	What does it mean...
→	SCCRQ	Start Control Channel Request
←	SCCRP	Start Control Channel Response
→	SCCCN	Start Control Channel Connected
	StopCCN	Used to initiate tunnel teardown
→	ICRQ	Incoming Call Request
←	ICRP	Incoming Call Reply
→	ICCN	Incoming Call Connected
	CDN	Used to initiate tunnel teardown

R-PHY# **show l2tp tunnel**

L2TP Tunnel Information Total tunnels 4 sessions 130

LocTunID	RemTunID	Remote Name	State	Remote Address	Local Address	Sessn Count
2884801b	56219e89	F241-36-05-cBR8-01	est	13.13.0.222	13.52.0.19	8
f6d715f8	142588ce	F241-36-05-cBR8-01	est	13.13.0.226	13.52.0.19	57
cb0f343e	961d6029	F241-36-05-cBR8-01	est	13.13.0.218	13.52.0.19	8
653234e3	409793d1	F241-36-05-cBR8-01	est	13.13.0.198	13.52.0.19	57

R-PHY# **show l2tp session**

L2TP Tunnel Information Total tunnels 4 sessions 130

LocSessID	RemSessID	LocTunID	RemTunID	State	Type	Last Chg
80002029	20012028	653234e3	409793d1	est	MPT_LEGACY	12:59:21 2017-05-17
00000d01	61000014	653234e3	409793d1	est	MAP_SCQ	12:59:23 2017-05-17
80002002	20012001	653234e3	409793d1	est	PSP_DEPI	12:59:23 2017-05-17
00000800	61020000	653234e3	409793d1	est	BW_SCQAM	12:59:21 2017-05-17
00000d03	6100001c	653234e3	409793d1	est	MAP_SCQ	12:59:21 2017-05-17
00000603	6101001c	653234e3	409793d1	est	UEPI_SCQAM	12:59:19 2017-05-17
80002005	20012004	653234e3	409793d1	est	PSP_DEPI	12:59:23 2017-05-17
00000b01	61040014	653234e3	409793d1	est	RNG_SCQ	12:59:23 2017-05-17
00000f00	61080010	653234e3	409793d1	est	SPECMAN	12:59:23 2017-05-17

# Video Core

- Video Validation in RPHY
  - Validate Video channel status
  - Validate Video throughput in RPD

# 1a Validating video status

- show controller downstream-cable *slot/sub/port rf-channel range*
- show cable rpd *rpd-mac tengig slot/sub/port depi session*
- (RPD) show l2tp session

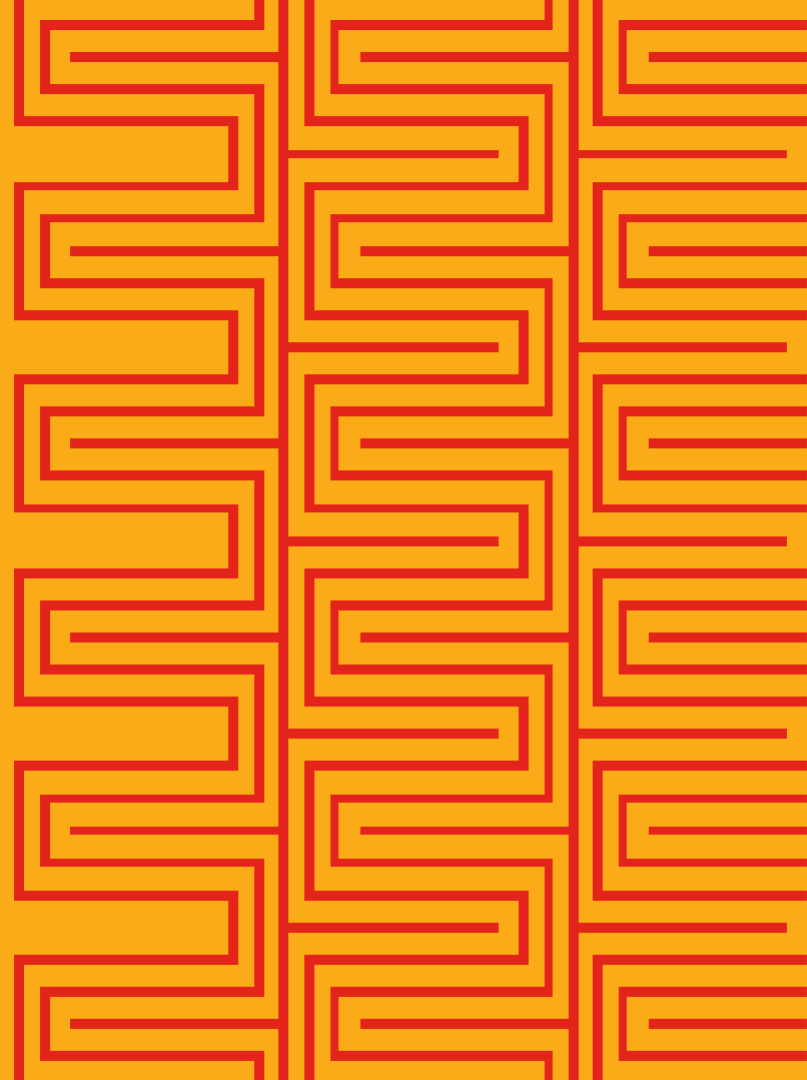
Parameter	What to look for...
State	UP
Admin State	UP
Type	VIDEO-SYNC
Phy Parameters	Annex, Mod, Interleave as expected
Tunnel / Session State	Est - Established
DEPI Mode	MPT
	MPT_Legacy

```
cBR8-01# show controller downstream-Cable 1/0/0 rf-channel 0-63
Chan State Admin Frequency Type Annex Mod srate Interleaver dcid output
...
32 UP UP 603000000 VIDEO-SYNC B 256 5361 I128-J1 - NORMAL
39 UP UP 645000000 VIDEO-SYNC B 256 5361 I128-J1 - NORMAL
```

```
cBR8-01# show cable rpd badb.ad13.1452 ten1/1/0 depi session
LocID RemID Pseudowire State Last Chg Uniq ID Type Mode RemSt
0x00012027 0x80002028 DS1/0/0:38 est 04:46:15 698 P MPT UP
0x00012021 0x80002022 DS1/0/0:32 est 04:46:15 966 P MPT UP
...
```

```
R-PHY# show l2tp sess
L2TP Tunnel Information Total tunnels 4 sessions 132
LocSessID RemSessID LocTunID RemTunID State Type Last Chg
80003f2a 20013f29 98e249ee 38450fe8 est MPT_LEGACY 13:00:03 2017-05-17
80003f2b 20013f2a 98e249ee 38450fe8 est MPT_LEGACY 13:00:03 2017-05-17
...
```

# Deployment And Operational Automation



# cBR8 Automation

What tools are available?

	Best for	Use Cases
Ansible	<ul style="list-style-type: none"><li>- Simple</li><li>- Little to no logic</li><li>- Repetitive and basic tasks</li></ul>	<ul style="list-style-type: none"><li>- IOS-XE Firmware Upgrades</li><li>- LCHA hitless restart of CLC(s)</li></ul>
NETCONF / YANG	<ul style="list-style-type: none"><li>- Services Orchestration</li><li>- Deployment</li></ul>	Routing – IP Scope additions DOCSIS – Service Group Creation (FN, Controller, IntC)
EEM	Embedded on IOS-XE <ul style="list-style-type: none"><li>- Reactive and immediate</li><li>- On-device monitoring</li></ul>	Monitor Video Health – Bitrate, Encryption, session Idle/Off threshold
Custom Scripts	Highly customized tasks	Any of the above, but added complexity and infrastructure

# Ansible

- Microservice container available from Cisco.com
- **Best Suited for:**
  - Simple and repetitive tasks that require little to no logic
- **Examples**
  - Upgrade/Downgrade of Firmware
  - LCHA Failover

Interested? Walkthrough in Appendix

# NETCONF / YANG

- Leveraged by Cisco Network Services Orchestrator
- Cisco cBR8 support for NETCONF in IOS-XE 16.7.1
- Custom CLI NED configurations possible today
- **Best Suited for:**
  - Dynamic application of services from orchestrator
- Examples
  - Changing IP scope under cable bundle
  - Creating and applying controller profiles / Bonding Groups / etc.
  - Creating L2TPV3 VPN tunnels



# Embedded Event Manager

- **Best Suited for:**
  - Reactive or proactive on-device monitoring and remedial action
  - Limited though functional logic
- Example
  - Video – Number of Idle and Off sessions past threshold
  - Video – Output PMT Table corrupt – Clear session
  - DOCSIS – Large numbers of modems offline or init state – Send trap

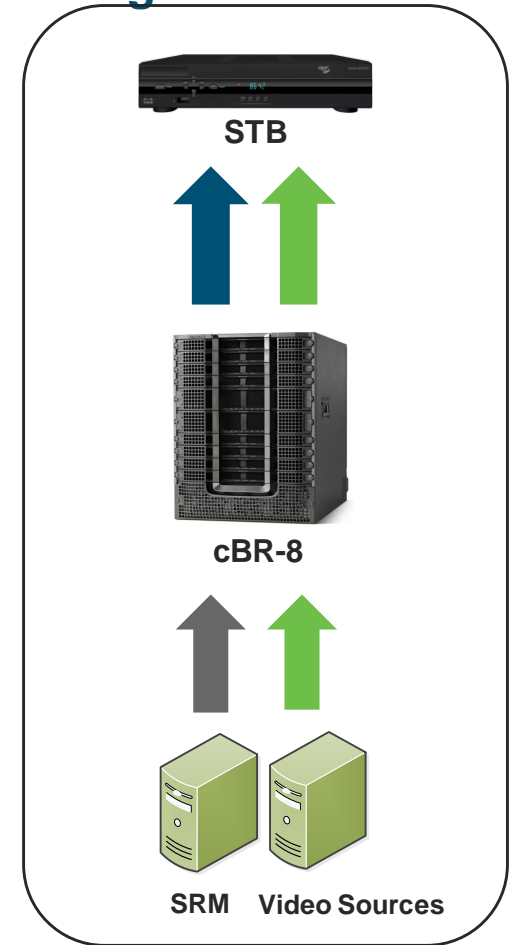
# Troubleshooting cBR-8 Converged Video Services

# Video Services Troubleshooting

## Common Problems

- 1. No Video
  - Video Configurations
  - Session Validations
  - ADSG Validations (in appendix)
- 2. Macro-blocking or Impaired Video
  - Throughput Rates
  - Dropped Packets
  - Reserved Session Rates

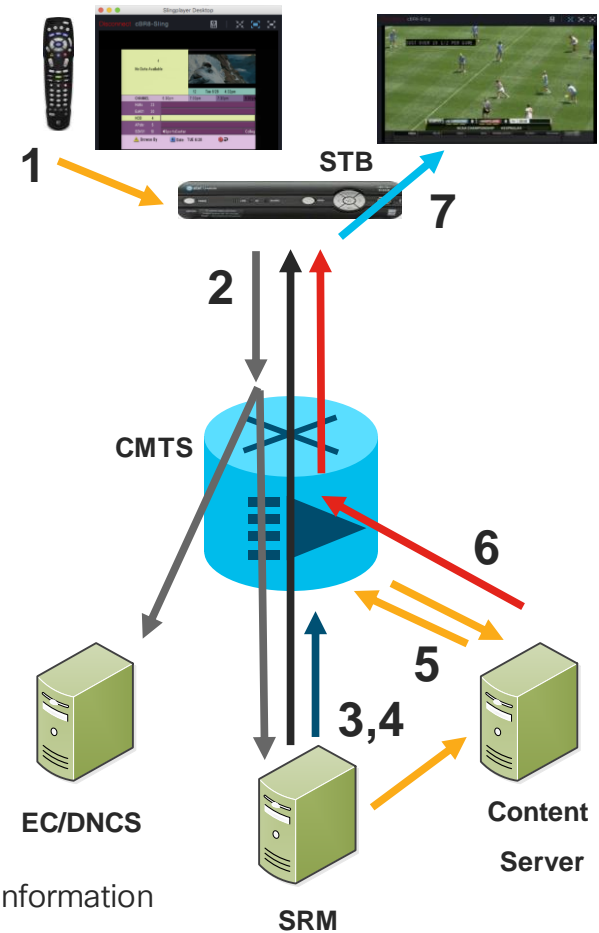
## High Level Video Flow



# Video Services

## Video Session Setup

- 1 **Customer STB selects programming**
- 2 STB communicates to EC/SRM to request content
- 3 **SRM requests session creation to cBR-8**
  - Source Specific Multicast or Unicast (VOD)
- 4 **SRM transmits to STB the session information**
- 5 **cBR-8 obtains content from Content Server**
  - Add Encryption if cBR-8 doing edge Encryption
  - cBR-8 initiates the SSM / SRM instructs source to start
- 6 **cBR-8 forwards content on the appropriate SG**
- 7 **Set Top tunes to appropriate QAM Carrier**
  - Decodes program with the provided encryption keys and program information



# Video Services Configuration

## Checklist

### cBR-8 Configuration Overview

- Logical Edge Device **LED**
- **Virtual Carrier Group VCG**
- **Service Distribution Group SDG**
- **Binding VCG and SDG**
- Interface Virtual Port Group **VPG**
- Subnet for **Virtual Edge Input VEI**
- Controller for Video QAMs
- IP Subnets for VPG and VEI(s)
- Chassis MAC Address
- Access-list(s) and Route-Map(s)

### Best Practices

- One LED Per Cable Line Card
- Unique Output Port Numbers for each LEDs and VCGs
- Uniform binding of VCGs and SDGs
- Uniform naming conventions
- Loopback for Management Interface(s)
- Separate Subnets of Virtual-Port Group and VEI

### IP Subnets Required

- Bundle – CPE / STB subnets
- Virtual Port Group 0 – Management Subnet
- Virtual Edge Interface - /32 Static Subnet

### IGP Routing Required

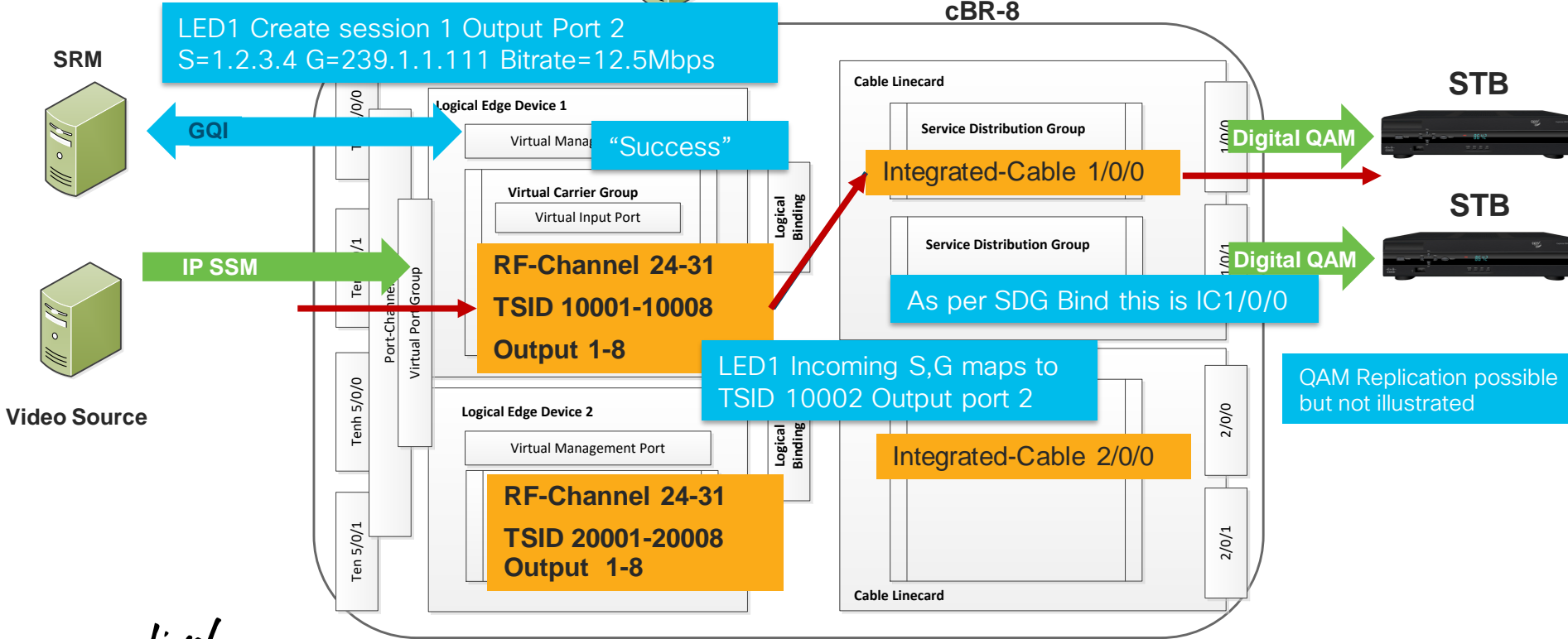
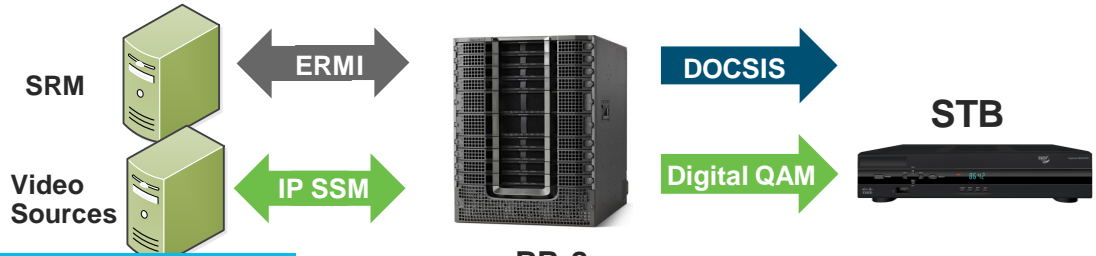
- Redistribute Connected Virtual Port Group
- Redistribute Static Virtual Edge Device IP(s)

### Access Lists Required

- Multicast Uplink ACL allowed

# Video Services

How it should work



# Video Services

## Configuration Verification and Status

- Show cable video logical-edge-device id *id-number*

```
CBR8-01# show cable video logical-edge-device id 1
```

```
Logical Edge Device: led-1
```

```
Id: 1
```

```
Protocol: GQI
```

```
Service State: Active
```

```
Discovery State: Disable
```

```
Management IP: 13.135.69.4
```

```
MAC Address: a46c.2ab0.2c01
```

```
Number of Servers: 1
```

```
Server 1: 10.225.198.88
```

```
Keepalive Interval: 10 Retry Count:3
```

```
Number of Virtual Carrier Groups: 1
```

```
Number of Share Virtual Edge Input: 1
```

```
Number of Physical Qams: 5
```

```
Number of Sessions: 8
```

```
Reserve PID Range: 256
```

```
Virtual Edge Input:
```

Input Port	VEI	Slot/Bay	Bundle	Gateway
ID	IP	ID	ID	IP
1	13.135.70.1	1/0	-	-

```
Virtual Carrier Group:
```

ID	Name	Total VEI	Total RF-channel	Service-Distribution-Group Name	Service-Distribution-Group ID	Integrated Cable	Physical QAM ID	Admin State	Operational State	TSID	ONID	Output Port	VCG ID	SDG ID	Encrypt Capable
1	VCG_SDV_10	0	8	SDG_SDV_10	1										
						1/0/0:24	288	ON	UP	33001	0	1	1	1	clear
						1/0/0:25	289	ON	UP	33002	0	2	1	1	clear

## Cable Video Configuration

```
cable video
```

```
reserve-pid-range 256
```

```
multicast-uplink Port-channel2 access-list
```

```
mgmt-intf VirtualPortGroup 0
```

```
service-distribution-group SDG_SDV_10 id 1
```

```
rpd downstream-cable 1/0/0
```

```
virtual-carrier-group VCG_SDV_10 id 1
```

```
service-type narrowcast
```

```
rf-channel 24-28 tsid 33001-33005
```

```
output-port-number 1-5
```

```
bind-vcg
```

```
vcg VCG_SDV_10 sdg SDG_SDV_10
```

```
logical-edge-device led-1 id 1
```

```
protocol gqi
```

```
mgmt-ip 13.135.69.4
```

```
mac-address a46c.2ab0.2c01
```

```
server 10.225.198.88
```

```
keepalive retry 3 interval 10
```

```
reset interval 8
```

```
virtual-edge-input-ip 13.135.70.1
```

```
input-port-number 1
```

```
vcg VCG_SDV_10
```

```
active
```

# Video Services

## Connection to the SRM/EC

- show cable video gqi connection

Parameter	What to look for...
Mgmt IP	VirtualPortGroup 0 Range
Service IP	SRM IP
Connection Status	Connected

## Show Cable Video GQI Connection

```
CBR8-01# show cable video gqi connection
```

LED ID	Management IP	Server IP	Connection Status	Protocol Version	Event Version	Event Pending	Reset Indication	Encryption Discovery
10	13.135.69.4	10.225.198.88	Connected	2	2	0	ACKED	ACKED
10	13.135.69.4	10.225.198.89	Disconnected	2	2	0	ACKED	ACKED

- debug cable video **gqi**
- set platform software trace {led-01} RP active { **vgqi-mgmt | vgqi-msg** } noise
- show platform software trace message {led-01} RP active

## Show Platform Software Trace

```
[vgqi-mgmt]:vgqi_msg_encode_query_sessions_response_v2 - Session ID Count on requested QAM: 1
[vgqi-mgmt]:vgqi_msg_encode_query_sessions_response_v2 - GQI Output Port 1 maps to physical QAM -> slot 1 port 0 channel 24
[vgqi-mgmt]:vgqi_allocate_response, Allocating GQI Response: GQI Server IP 10.225.198.88, LED Mgmt IP 13.135.69.2
[vgqi-msg]:vgqi_rpc_print_session_list_query_params -> Received GQI Query Sessions Request:
Transaction Header:
  Transaction ID: 00D30000
  Response Program Number: 30000082
  Output Port Number: 1
[vgqi-mgmt]:get_gqi_rpc_message_remote_local_ip, Received GQI Query Sessions V2 Request from 10.225.198.88 to 13.135.69.2
```

# Video Services

Parameter	What to look for...
S,G	Group Information
MPEG CC	Continuity Check
PCR	Clocking and Timing

## Dynamic Session Creation and Deletion

- show cable video sessions logical-edge-device id *id-number* session-id *sess-id*

## Show Cable Video Session Logical-Edge-Device *id* Session-id *id*

```
CBR8-01# show cable video session logical id 1 session-id 1048630
```

```
Session Name      : 0x005056B2504A0000015F
Session Id:       : 1048630
Creation Time:    : Tue Jun 28 18:44:04 2016
```

```
Output Port       : 1
TSID              : 33001
ONID              : 0
Number of Sources : 1
  Source IP       : 13.135.10.29
  Group IP        : 239.255.115.26
  UDP Port        : 0
Config Bitrate    : 18000000
Jitter            : 200 ms
Processing Type    : Remap
Stream Rate       : VBR
Program Number    : 60003
Idle Timeout      : 2000 msec
Init Timeout      : 2000 msec
Off Timeout       : 60 sec
Encryption Type   : CLEAR
Encryption Status : -
```

```
Input Session Stats:
```

```
=====
State: ACTIVE-PSI, Uptime: 0 days 16:03:05
IP Packets: In 14259628, RTP 0, Drop 0
TP Packets: In 98784050, PCR 1559389, PSI 1630026, Null 1033346
              Unreference 0, Discontinuity 20
Errors: Sync loss 0, CC error 3148, PCR Jump 0,
              Underflow 0, Overflow 0, Block 0
Bitrate: Measured 2551366 bps, PCR 1685460 bps
```

```
Output Session Stats:
```

```
=====
State: ON, Uptime: 0 days 16:03:05
TP Packets: In 99598918, PCR 1559387, PSI 1630024,
              Drop 815058, Forward 97153836, Insert 842042
Errors: Info Overrun 0, Info Error 0, Block 0, Overdue 0,
              Invalid Rate 0, Underflow 0, Overflow 0
Bitrate: Measured 2523604 bps
```

```
PAT Info:
```

```
=====
Version 1, TSID 1, len 16, section 0/0
Program 14: PMT 480
```

# Video Services

## Dynamic Session Creation and Deletion

- show cable video output-port *port*
- show cable video integrated-cable *slot/subslot/port* rf-channel *rf-ch*

## Show Cable Video Output-Port

```
CBR8-01# show cable video output-port 1
```

Integrated Cable	TSID	ONID	Output Port	Physical QAM ID	Admin State	Operational State	Virtual-Car-Grp Name	Service-Dist-Grp Name	Logical-Edge-Device Name	Enc Capable	Tot Sess
1/0/0:24	33001	0	1	24	ON	UP	VCG_SDV_10	SDG_SDV_10	led-1	clear	3
2/0/0:24	20024	0	1	88	ON	UP	VCG_SDV_20	SDG_SDV_20	led-2	clear	1

## Show Cable Video integrated-cable 1/0/0 rf-ch 24

```
CBR8-01# show cable video integrated-cable 1/0/0 rf-channel 24
Integrated-Cable: 1/0/0
RF Channel: 24
TSID: 33001
Physical QAM ID: 24
Admin State: ON
Operational State: UP
Virtual Carrier Group Name: VCG_SDV_10
Service Distribution Group Name: SDG_SDV_10
Logical Edge Device Name: led-1
Total Bandwidth: 38810700 bps
Available Bandwidth: 2746700 bps
Oversubscribed Bandwidth: 0 bps
Total Sessions: 3
```

# Video Services

## Summary – Rapid session assessment

show cable video sessions logical-edge-device id *id-number* summary

show cable video sessions all [summary]

```
cBR8-01# show cable video session log id 1 summary
Summary For Chassis:
Active      : 334          Init       : 0          Idle       : 0
Off         : 0           Blocked    : 0          PSI-Ready  : 334
UDP         : 6           ASM        : 0          SSM        : 328
Remap      : 134        Data       : 0          Passthru   : 200
Pending    : 0          Encrypted  : 6          Low Latency: 0
Total Sessions      : 334
Total Input Bitrate : 1202603436 BPS
Total Output Bitrate : 1197551556 BPS
```

```
cBR8-01 # show cable video session all summary
Video Session Summary For Chassis:
Active      : 334          Init       : 0          Idle       : 0
Off         : 0           Blocked    : 0          PSI-Ready  : 334
UDP         : 6           ASM        : 0          SSM        : 328
Remap      : 134        Data       : 0          Passthru   : 200
Pending    : 0          Encrypted  : 6          Low Latency: 0
Total Sessions      : 334
Total Input Bitrate : 1202603436 BPS
Total Output Bitrate : 1197551556 BPS
```

Parameter	What to look for...
Idle / Off	Few to None – Indicates ingress issue
Init	Transition state
Active	Positive number
Passthru	If running MC – Equal to number of Video QAMs

# Video Services

## Dynamic Session Creation and Deletion

show cable video sessions logical-edge-device id *id-number* [summary]

show cable video sessions all

(Truncated)

```
CBR8-01# show cable video sessions logical id 1
```

```
Total Sessions = 418
```

Session Encrypt Id	Output Port	Streaming Type	Session Type	Session Source Ucast	Session Source Dest IP/Mcast IP (S,G)	UDP Port	Output Program	Input State	Output State	Input Bitrate	Output Bitrate	Type
1106050	1	Passthru	SSM	172.17.181.31	239.200.82.9	0	-	ACTIVE-PSI ON	28771	22575	CLEAR	
1231002	1	Remap	SSM	172.17.96.2	239.202.1.74	0	1284	ACTIVE-PSI ON	9020865	8999644	CLEAR	
1233239	1	Remap	SSM	10.190.17.194	239.202.1.201	0	1397	ACTIVE-PSI ON	9255787	9234802	CLEAR	
1102175	2	Passthru	SSM	172.17.181.31	239.200.82.9	0	-	ACTIVE-PSI ON	28771	22501	CLEAR	
1230973	2	Remap	SSM	10.190.17.214	239.202.1.165	0	1157	ACTIVE-PSI ON	9386623	9366860	CLEAR	
1102557	3	Passthru	SSM	172.17.181.31	239.200.82.9	0	-	ACTIVE-PSI ON	28771	22424	CLEAR	
1106051	4	Passthru	SSM	172.17.181.31	239.200.82.9	0	-	ACTIVE-PSI ON	28771	22360	CLEAR	
1238930	4	Remap	SSM	172.17.68.14	239.202.81.217	0	1007	ACTIVE-PSI ON	8752553	8661576	CLEAR	
1081298	5	Remap	SSM	172.17.96.30	239.202.11.243	0	1111	ACTIVE-PSI ON	9430505	9384951	CLEAR	
1106054	5	Passthru	SSM	172.17.181.31	239.200.82.9	0	-	ACTIVE-PSI ON	28771	22289	CLEAR	

# Reference Sheets

Sheet is in color – careful about **bw** copy

**Impacting (!)** **debug (orange)**

*italicized-orange* note/instruction  
[ ] – optional special-LC contrance  
[ ] – required  
(c) – conditional debug  
(t) – trace debug  
(c) – cable linecard console  
(p) – on RP command

**PART IDs**

Chassis	CBR-8-CCAP-CHASS
Cable LC	CBR-CCAP-LC-40G
Prot PIC	CBR-RF-PROT-PIC
Supervisor	CBR-CCAP-SUP-160G
Optics	SFP+ 10GBASE-SR/LR
Fan	CBR-FAN-ASSEMBLY
Pwr Shelf	CBR-DC-PS, -AC-PS
Pwr Modul	CBR-PEM-DC-6M
Rhny CLC	CBR-CCAP-LC-40G-R
Rhny PIC	CBR-DPIC-8X10G

**Unix/Linux**

(create) tar -cuf name.tar qos path  
(extract) tar -xvf name.tar  
ls -l filename xyz source-files

**Core, Console, & Shell**

request plat software can attach *lc-01m*  
request plat software system shell  
[r]r[0]1[0-3-4-9]  
dir harddisk/core/  
dir stby-harddisk/core/  
archive tar t create name tar path-src  
request platform software trace slot t  
active archive target harddisk-all-traces  
Send (q) to all TTY send \*, msc, dtlsz

**Images and Copying**

Pushing from server: scp local-filename  
username@cbrr-hostname.path  
copy scp target-path  
copy ftp user:passwd@loc/dir filename  
verify path md5 md5-hash  
request platform software package expand  
file path to path [force] [wipe]

**IOS Upgrades ISSU and Consolidate**

conf 1 + no boot sys + boot sys path + exit  
+ write mem + show bootvar  
request platform software package install  
node file bootflash:/318SP/image-name  
reload cancel  
reload [at [hw,mgg,reason text-reason]  
in m-minute

**Firmware**

upgrade rom-monitor filename path  
(R)R(1)  
upgrade bw-programmable cable slot  
(t) (p) (c) (d) (e) (f) (g) (h) (i) (j) (k) (l) (m) (n) (o) (p) (q) (r) (s) (t) (u) (v) (w) (x) (y) (z) (AA) (AB) (AC) (AD) (AE) (AF) (AG) (AH) (AI) (AJ) (AK) (AL) (AM) (AN) (AO) (AP) (AQ) (AR) (AS) (AT) (AU) (AV) (AW) (AX) (AY) (AZ) (BA) (BB) (BC) (BD) (BE) (BF) (BG) (BH) (BI) (BJ) (BK) (BL) (BM) (BN) (BO) (BP) (BQ) (BR) (BS) (BT) (BU) (BV) (BW) (BX) (BY) (BZ) (CA) (CB) (CC) (CD) (CE) (CF) (CG) (CH) (CI) (CJ) (CK) (CL) (CM) (CN) (CO) (CP) (CQ) (CR) (CS) (CT) (CU) (CV) (CW) (CX) (CY) (CZ) (DA) (DB) (DC) (DD) (DE) (DF) (DG) (DH) (DI) (DJ) (DK) (DL) (DM) (DN) (DO) (DP) (DQ) (DR) (DS) (DT) (DU) (DV) (DW) (DX) (DY) (DZ) (EA) (EB) (EC) (ED) (EE) (EF) (EG) (EH) (EI) (EJ) (EK) (EL) (EM) (EN) (EO) (EP) (EQ) (ER) (ES) (ET) (EU) (EV) (EW) (EX) (EY) (EZ) (FA) (FB) (FC) (FD) (FE) (FF) (FG) (FH) (FI) (FJ) (FK) (FL) (FM) (FN) (FO) (FP) (FQ) (FR) (FS) (FT) (FU) (FV) (FW) (FX) (FY) (FZ) (GA) (GB) (GC) (GD) (GE) (GF) (GG) (GH) (GI) (GJ) (GK) (GL) (GM) (GN) (GO) (GP) (GQ) (GR) (GS) (GT) (GU) (GV) (GW) (GX) (GY) (GZ) (HA) (HB) (HC) (HD) (HE) (HF) (HG) (HH) (HI) (HJ) (HK) (HL) (HM) (HN) (HO) (HP) (HQ) (HR) (HS) (HT) (HU) (HV) (HW) (HX) (HY) (HZ) (IA) (IB) (IC) (ID) (IE) (IF) (IG) (IH) (II) (IJ) (IK) (IL) (IM) (IN) (IO) (IP) (IQ) (IR) (IS) (IT) (IU) (IV) (IW) (IX) (IY) (IZ) (JA) (JB) (JC) (JD) (JE) (JF) (JG) (JH) (JI) (JJ) (JK) (JL) (JM) (JN) (JO) (JP) (JQ) (JR) (JS) (JT) (JU) (JV) (JW) (JX) (JY) (JZ) (KA) (KB) (KC) (KD) (KE) (KF) (KG) (KH) (KI) (KJ) (KK) (KL) (KM) (KN) (KO) (KP) (KQ) (KR) (KS) (KT) (KU) (KV) (KW) (KX) (KY) (KZ) (LA) (LB) (LC) (LD) (LE) (LF) (LG) (LH) (LI) (LJ) (LK) (LL) (LM) (LN) (LO) (LP) (LQ) (LR) (LS) (LT) (LU) (LV) (LW) (LX) (LY) (LZ) (MA) (MB) (MC) (MD) (ME) (MF) (MG) (MH) (MI) (MJ) (MK) (ML) (MN) (MO) (MP) (MQ) (MR) (MS) (MT) (MU) (MV) (MW) (MX) (MY) (MZ) (NA) (NB) (NC) (ND) (NE) (NF) (NG) (NH) (NI) (NJ) (NK) (NL) (NM) (NO) (NP) (NQ) (NR) (NS) (NT) (NU) (NV) (NW) (NX) (NY) (NZ) (OA) (OB) (OC) (OD) (OE) (OF) (OG) (OH) (OI) (OJ) (OK) (OL) (OM) (ON) (OO) (OP) (OQ) (OR) (OS) (OT) (OU) (OV) (OW) (OX) (OY) (OZ) (PA) (PB) (PC) (PD) (PE) (PF) (PG) (PH) (PI) (PJ) (PK) (PL) (PM) (PN) (PO) (PP) (PQ) (PR) (PS) (PT) (PU) (PV) (PW) (PX) (PY) (PZ) (QA) (QB) (QC) (QD) (QE) (QF) (QG) (QH) (QI) (QJ) (QK) (QL) (QM) (QN) (QO) (QP) (QQ) (QR) (QS) (QT) (QU) (QV) (QW) (QX) (QY) (QZ) (RA) (RB) (RC) (RD) (RE) (RF) (RG) (RH) (RI) (RJ) (RK) (RL) (RM) (RN) (RO) (RP) (RQ) (RR) (RS) (RT) (RU) (RV) (RW) (RX) (RY) (RZ) (SA) (SB) (SC) (SD) (SE) (SF) (SG) (SH) (SI) (SJ) (SK) (SL) (SM) (SN) (SO) (SP) (SQ) (SR) (SS) (ST) (SU) (SV) (SW) (SX) (SY) (SZ) (TA) (TB) (TC) (TD) (TE) (TF) (TG) (TH) (TI) (TJ) (TK) (TL) (TM) (TN) (TO) (TP) (TQ) (TR) (TS) (TT) (TU) (TV) (TW) (TX) (TY) (TZ) (UA) (UB) (UC) (UD) (UE) (UF) (UG) (UH) (UI) (UJ) (UK) (UL) (UM) (UN) (UO) (UP) (UQ) (UR) (US) (UT) (UU) (UV) (UW) (UX) (UY) (UZ) (VA) (VB) (VC) (VD) (VE) (VF) (VG) (VH) (VI) (VJ) (VK) (VL) (VM) (VN) (VO) (VP) (VQ) (VR) (VS) (VT) (VU) (VV) (VW) (VX) (VY) (VZ) (WA) (WB) (WC) (WD) (WE) (WF) (WG) (WH) (WI) (WJ) (WK) (WL) (WM) (WN) (WO) (WP) (WQ) (WR) (WS) (WT) (WU) (WV) (WW) (WX) (WY) (WZ) (XA) (XB) (XC) (XD) (XE) (XF) (XG) (XH) (XI) (XJ) (XK) (XL) (XM) (XN) (XO) (XP) (XQ) (XR) (XS) (XT) (XU) (XV) (XW) (XZ) (YA) (YB) (YC) (YD) (YE) (YF) (YG) (YH) (YI) (YJ) (YK) (YL) (YM) (YN) (YO) (YP) (YQ) (YR) (YS) (YT) (YU) (YV) (YW) (YZ) (ZA) (ZB) (ZC) (ZD) (ZE) (ZF) (ZG) (ZH) (ZI) (ZJ) (ZK) (ZL) (ZM) (ZN) (ZO) (ZP) (ZQ) (ZR) (ZS) (ZT) (ZU) (ZV) (ZW) (ZX) (ZY) (ZZ)

**Hardware & Facility**

show platform [diag]  
show env power  
show facility-alarm status  
show cable card slot/subslot ds-phy disp  
bw-module (slot/subslot) dsf  
(reloadstartslot)  
bw-module slot r[0]1 (reloadstartslot)

**Versions & Firmware**

show platform software patch info  
show platform & show platform diag  
show version  
show redundancy  
show bootvar  
show cable card slot/0 ds-phy display

**Redundancy & Failover**

show redundancy  
show redundancy linecard all  
show redundancy switchover history  
redundancy force switchover  
redundancy linecard switchover from  
origin-slot to target-slot  
test (c) (a) toggle config\_protect\_mode

**Linecard Health**

show platform diag  
show logging onboard slot slot message  
reverse  
show logging onboard slot slot uptime  
show logging onboard slot slot time  
test (c) (a) toggle config\_protect\_mode

**Licensing**

show license all  
license smart debug  
license smart (ea, (d), (t), (k), (g), (o), (n) token

**SNMP**

show snmp mib [mib, lindex]  
snmp set v2c ip community oid [integer,io,addstring]

**Plant Health**

show cable flap-list  
show cable flap-list [wb-rf-sort-timersort, interface/sort-flap]  
show cable resiliency  
show cable resiliency status  
show cable modem resiliency

**Service Flows**

show interface cable x/y/z service-flow qos  
[qs]us  
show interface cable x/y/z service-flow  
flow-id [counters] [qs] [verbose]  
show cable modem mac service-flow  
[verbose]  
(c) debug cable dxxs / debug cable  
tvs

**MAC-Domain RCC/UCC/MDD/ICGD**

show cable mac-domain cable x/y/z rcc [timeline]  
show cable mac-domain cable x/y/z mdd  
show controller cable x/y/x downstream  
show controller cable x/y/x upstream  
[upstream-icd]  
show controller integrated-cable x/y/z rf-channel 0-63 158-162  
show controller integrated-cable x/y/z  
counter rf-channel

show controller integrated-cable x/y/z  
counter wb-channel

**ADGS / PIM / IGMP / Video Mcast**  
show ip mroute & show ip mroute count  
show ip mrib & show ip mrib count  
show ip mroute group [count]  
show cable video routing multicast  
show cable dsq cfr  
show cable dsq static-group bundle  
bundleID

show interface cable x/y/z dsq  
downstream dcd  
show cable modem docsis-device | inc  
STB

**ARP & IP Routing**

show ip interface brief  
show ip pim neighbor  
show ip ospf neighbor  
show arp, & sh int cxy/z modem  
show ip bgp neighbor  
show ipv6 interface brief  
show ipv6 ospf neighbor  
show isis neighbors

**Bandwidth**

show interface tengig x/y/z  
show controller integrated-cable x/y/z  
counter rf-channel  
show controller integrated-cable x/y/z  
counter wb-channel  
show cable modem mac [qos]service-flow  
show interface cable x/y/z  
show interface cable x/y/z upstream  
bonding-group

**Modem States**

show cable modem [mac [timeline] verb]

	Init-State
R1,2	1: Init Rng recv, 2: Rng adjust
RC	Ranging Complete
D	DHCP Discover Recv
IO	DHCP Offer Recv
O	First TFTP Packet OR Bad Config File
S A R I	IPv6 S-Solicit, A-Advert, R-Request, I-Reply
O	First TFTP Packet OR Bad Config File

*	Symbol
*	Pre - Bpi-policy not satisfied
#	Online - CM /out TFTP dwnld
!	State – Dyn Secret violation Time – Exceeded Max Delay Rx Power – Max transmit
(PT)	BPI - TEK assigned
(PK)	BPI - KEK (Key exch) assigned
(d)	Network access CPE disallowd
(na)	Reject – CM no REG-ACK
(c)	Reject – Class of service issue

w-online/p	Upstream Partial
p-online/UB	Downstream Partial
w-online/UB	DS/US Bonded

IM/SM	Scm verbose Ranging
CNT	Waiting Init/Station, Maint
DR	Continuous Rng; Miss Rng or Rng Adjustment occurring
DT	Down Recovery: Down, CMTS send IM mg opor
DI	Down Interface: Inft shutdown
STA	Station Maint: Good State

**Modem Timeout Codes**

T4	Rcv Rsp to Broadcast Mnt Req, but no Ucast Mnt Ovr recv
T3	Rng Req retries exhausted
T2	No mnt Bcast for Rng
T1	No UCds

**Partial & Impaired States**

show cable mac-domain cable x/y/z us-impairment

**Reset & Delete**

clear cable modem mac-address delete  
clear cable modem mac-address reset  
clear cable modem interface cable x/y/z  
(all)offline/wideband  
clear cable modem device-class  
(STB)MTA(PS)RTR  
clear cable modem offline delete

**Status**

show cable modem [mac]IP  
show cable modem mac verbose  
show cable modem mac cpe  
show cable modem mac sysDescr

**PHY, RF, Ranging**

show cable modem mac flap  
show cable modem mac rhp  
show cable modem mac rhp-cdman  
show cable modem mac partial-service  
show cable modem mac verbose | inc  
Code  
(c) debug cable range [protocol]  
set platform software trace cdman  
sfo00 cdman\_docsis\_rng\_debug  
(c) test cable rng ums-cdman-rng-rsp  
mdm-mac us-ch timingoffset powerad

**IP & IPv6**

show cable modem mac ipv6  
show cable modem mac dhcp-status  
show cable modem mac dhcpv6-status

**Privacy & Encryption**

Show cable modem mac privacy [verbose]  
(c) debug cable privacy

**DOCSIS 3.0 General**

show cable modem wideband  
show cable modem mac wideband  
show cable modem mac wideband channel  
show cable modem mac wideband rcs-status  
show cable modem mac wideband primary-ch

**DOCSIS 3.1 Downstream**

show cable modem docsis version d31-capable  
show cable modem select \* where macver like "DOC3.1%"

**Batch**

show cable modem sql sql-query  
show cable modem summary total  
show cable modem primary summary total  
show cable modem docsis device-class summary [total]  
show cable modem docsis device-class withip

**SQL Show Cable Modem**

show cable modem sql sql-query

SQL Generic format:

select \* where \* [opt]  
condition: is, like, %, %, %

Traditional	SQL
scm doc ver d31	select ip, mac where macver like "DOC3.1"
scm cable xyz	select intf as hostinterface, count(mac) as number
summary	group by intf

**Debug – Modem Registration**

Term mon  
show logging  
debug cable mac-address mac verbose  
debug cable range  
debug cable reg  
debug cable dhcp  
debug cable tvs  
debug cable priv  
debug cable dyps  
debug cable video gqi  
debug cable video sessions  
debug cable video qam  
debug cable video led

**Debug – Tracing Setup & Remove**

set platform software trace led-name  
RP active trace-name debug  
show platform software trace level cdman  
linecard  
show platform software trace level led-name RP active  
show platform software trace message cdman linecard  
show platform software trace message led-name RP active  
show platform software trace level led-name RP active  
trace-id RP active all-modules notice  
show debugging  
(reset) undebug all

**Converged Video**

Input State	Meaning
Init	Pinned up, waiting traffic
Idle	No incoming traffic
Active(PSI)	Traffic started
Off	If traffic doesn't resume

Blocked	Error	Warning	PAT/PMT
Out	Out	Out	Out
On	On	On	On
Conflict	Conflict	Conflict	Conflict
Pending	Pending	Pending	Pending

show cable video gqi connections  
show cable video logical-edge-device id  
led-id [statistics]  
show cable video session logical-edge id  
led-id [session-id]  
clear cable video session logical-edge-device id id-number session-id session-id  
set platform software trace led-id rp active  
(vgqi-ngmt|vgqi-err) noise  
(c) debug cable video gqi  
(c) debug cable video led

**QFP Tracking:**

Use QFP when tracing CM packet flow  
test platform hardware qfp active feature  
docsis dtrack mac-address mac-address  
test platform hardware qfp active feature  
docsis dtrack packet-copy  
"reload the modem to reproduce the issue"  
show platform hardware qfp active feature  
docsis dtrack statistics clear  
test platform hardware qfp active feature  
docsis dtrack disable

**QFP Rate-Limiting:**

show platform hardware qfp active  
infrastructure punt sbrl  
show platform hardware qfp active  
infrastructure punt policer

**SID Tracker:**

Use SID Tracker for Mac mgmt, grants  
and MAPs per modem  
show cable modem mac service-flow  
(c) debug cable interface cable xyz sid  
nnn track  
(c) show int cable xyz up debug sid-  
tracking nnn clear  
(c) show int cable xyz up debug sid-  
tracking nnn 0 40000

**DOCSIS 3.1**

4	Registration Process
1	Scan for OFDM DS
2	CM find PLC via Pilot & Preamble
3	PLC contains OCD & DPD
4	CM uses learned profile
5	O-NIT-RNG-REQ sent by CM RNG-RSP v5 sent by CMTS B-NIT-RNG-REQ v5 Fine Rng
6	CM declares sync complete
7	CM promoted to working profile If no ODFM: Scan SC-OAM

**Downstream OFDM**

Configuration Checklist DS OFDM	
1	check diplexer ranges check modem capabilities & fw
1	Define Fiber Node
2	Controller Integrated-Cable xyz

Administration

Operational

Cable Modem

Trace & Debug

a	Max <code>ofdm</code> -spectrum <code>width</code> + max carrier + base-power
b	<code>rf</code> -channel 158 (to 162)
c	<code>ofdm</code> -channel-profile <code>num</code> start-frequency <code>freq</code> width <code>width</code> <code>pic</code> <code>pic</code> - <code>freq</code>

3	cable downstream <code>ofdm</code> -chan-profile <code>num</code>
A	Subcarrier-spacing (25 50)
B	Profile- <code>qpp</code> , Profile-data 1,2,3
4	Interface wideband-cable <code>xyz</code> / <code>u</code>
A	Cable bundle + <code>rf</code> -bandwidth-percent
5	Interface cable <code>xyz</code>
A	(primary DS) downstream integrated-cable <code>xyz</code> <code>rf</code> -channel (158-162)
6	Interface wideband-cable <code>xyz</code> / <code>num</code> cable <code>rf</code> -channels channel-list <code>list-of-ofdm_ch</code> bandwidth-percent 1

show cable mac-domain cable `xyz` `qcd`,  
show cable mac-domain cable `xyz` `dod`,  
show cable `ofdm`-chan-profile `prof`/`num`,  
show cable `ofdm`-modulation-profile `prof`/`num`,  
show cable `ofdm`-modulation-profile configuration  
show interface cable `xyz` controller | | \[OCSD  
show controllers Integrated-Cable `xyz` `rf`-  
channel (158-162) [verbose]  
show controllers Integrated-Cable `xyz` `rf`-  
channel 158 `prof-order`  
show controllers integrated-Cable `xyz`  
counter `ofdm`-channel

#### Upstream OFDMA

show controllers upstream-cable `x/y/z` us-  
channel (12-15) [`adm-ump`]  
show cable card `x/0` us-phy `ofdma`-channel  
`cw-error`  
show cable card `x/0` us-phy `ofdma`-channel  
(`loc-stat` | `map-stats`) `phy-dov`-instance  
`ofdma-ch-num`  
show cable modulation-profile `ofdma`  
`profile-number`

#### Configuration Checklist US OFDMA

	check diplexer ranges check modem capabilities & fw
1	Configure OFDM Downstream
2	Define Fiber Node
3	US OFDMA Profile (or default)
4	Controller Upstream-Cable <code>xyz</code>
a	Us-channel (12-15) <code>docsis-mode</code> <code>ofdma</code>
b	Us-channel (12-15) <code>docsis-mode</code> frequency-start <code>start-freq</code> <code>end-freq</code>
c	no us-channel (12-15) shutdown
5	Interface cable <code>xyz</code>
a	Upstream 4 us-channel (12-15)
b	Upstream bonding-group <code>number</code>
c	Upstream 4 + desired

#### CM Profile Management

show cable modem `mac` phy `ofdm`-profile {  
downstream | upstream }  
show cable modem `mac` `prof`-`mgmt`

#### Remote PHY

#### RPD

show cable rpd	
Int State	Meaning
Auth	Dot1x Auth
DHCP	Obtain IP for vbh0
ToD	Obtain Time of Day
cBR8 State	Meaning
offline	RPD offline, no comm
Init(auth)	CORE and RPD Auth
Init(gcp)	Control Protocol exch
Init(clicsync)	Timing sync, Skip if Aux Cor
Init(I2tp)	DEPI/UEPI
Online	RPD fwding / recv

show cable rpd  
show cable rpd `rpm-id`  
show cable rpd slot `slot`  
show cable rpd `tengig x/y/0`  
show cable rpd { `ip` | `mac` } [`teng x/y/0`]  
show cable rpd `id` `id`  
show cable rpd name `name`  
show cable rpd `mac-add` | principal | aux |  
show cable rpd `mac-add` `lcha-cores` [  
active | standby ]  
show cable rpd [`slot slot` | `ten x/y/0`]  
summary

show cable downstream controller-profile  
show cable upstream controller-profile

(rpd) show dot1x detail  
(rpd) show dhcp  
(rpd) show tod

clear cable rpd { `all` | `ip-add` | `slot slot` |  
`ten ssp` } [ `reset` | `delete` ]  
clear cable rpd { `same-above` } modem {  
`reset` | `delete` }  
clear cable rpd { `same-above` } `powercycle`

#### Logging & Event

show cable rpd `mac` `tengig x/y/0` log  
show cable rpd `mac` event  
(rpd) logging provision-archive `scp server-  
ip user-id dst_loc`  
(rpd) show env sensor [`sensor-id`]  
(rpd) show env table `sensor-id`

#### Generic Control Protocol

Purpose: CCAP-Core to control RPD  
configuration, event report, & query  
show cable rpd `mac` `ten xyz` `gcp`-  
`transaction` [verbose]

show cable rpd <code>mac</code> <code>ten xyz</code>   <code>gcp-session</code>   <code>gcp-state</code> }	
State	Meaning
init	Recv RPD Notify Sent req RPD Capab
nego	Recv RPD Capability Sent CCAPCore Ident
Bulksync	DS/US Ch cfg & rsp
Ready	Configs done

(rpd) show provision { `all` | history }  
(rpd) show `gcp` session  
debug cable rpd  
(tr) set platform trace `phyman rp`  
`rphy gcp infra noise`  
(tr) set platform trace `phyman rp`  
`rphy gcp tiv noise`

#### PTP Timing

Purpose: Timing sync for MAC Mgmt

cBR8 State	RPD State
Free Run	Ref Failed
Acquiring	Acquiring
Freq Lock	Freq lock
Phase Aligned	Phase Lock
Holdover	Holdover

show ptp clock running  
show platform software ptp slot stream  
(0|1)  
(rpd) show ptp clock 0 config  
(rpd) show ptp clock 0 state

#### DEPI & UEPI

Purpose: Encap DOCSIS or Video DS and  
US traffic to RPD

show controllers downstream-cable <code>xyz</code> counter <code>rf-channel</code> [verbose]	
Field	Meaning
High	UCDs, MAPs
Medium	MMM, High QoS Data
Low	Low QoS Data
MPEG	MPEG increment for video
DEPI	DEPI Incr: MMM, Data, Overhd
MAP UCD	Increment for DEPI Primary DS
SYNC	0 - RPD handles SYNC

show cable rpd <code>mac</code> <code>depi</code>   <code>tunnel</code>   <code>session</code>			
M:	MAP	D:	Data
R:	RngRq	S:	SpcM
MPT	MPT: MPEG Transport	PSP	Pkt Stream Proto : DOCSIS
C	R	Message	Meaning
→	SCCRQ	Start Ctrl Ch Request	
←	SCCRP	Start Ctrl Ch Response	
→	SCCCN	Start Ctrl Ch Connected	
→	StopCCN	Initiate teardown	
→	ICRP	Incoming Call Request	
←	ICRP	Incoming Call Reply	
→	ICCN	Incoming Call Connected	
	CDN	Initiate session teardown	

show cable `depi` multicast pool  
show cable `depi` multicast ip `all`  
(rpd) show downstream `depi` config  
(rpd) show upstream `uepi` config  
(rpd) show downstream channel config  
(rpd) show upstream channel config  
(rpd) show I2tp { `tunnel` | `session` }  
debug cable rpd `r-depi`  
debug I2tp `all`

#### Access & Security

Default is SSH `admin/admin`  
Remove Admin conf: `ssh password off`  
Add SSH Pubkey: `conf: ssh pubkey add`  
Disable auto reboot - set reboot hold

Enable auto reboot - clear reboot hold  
(rpd) show `ssh` session  
(rpd) show `ssh` nms-pubkey

#### Video RPD

(rpd) show downstream channel counter [ <code>tpmi</code>   <code>dpmi</code>   <code>dps</code> ]	
Type	Meaning
DPS	Transmitted Packets
DPMI	Rx Matching L2TPv3 Session ID and Sequence Number Checking
TPMI	Rx Match Destination MAC, IP, and L2TPv3 Session ID

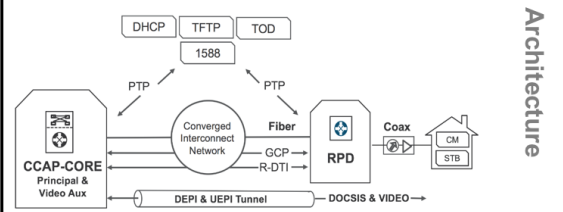
(rpd) show `fpga` video statistics `start-rf-ch`  
`end-r-chf`  
(rpd) show `fpga` video interrupt

Slot 0 (RF Linearcd)	
Slot 1 (RF Linearcd)	
Slot2 (RF Linearcd)	
Slot 3 (RF Linearcd)	
Slot 4 (SUP)	
Slot 5 (SUP)	
Slot 6 (RF Linearcd)	
Slot 7 (RF Linearcd)	
Slot 8 (RF Linearcd)	
Slot 9 (RF Linearcd)	

PEM0	PEM1	PEM2
PEM3	PEM4	PEM5

Slot 0 (PIC)	FAN0
Slot 1 (PIC)	
Slot 2 (PIC)	
Slot 3 (PIC)	
Slot 4 (SUPPIC)	FAN2
Slot 5 (SUPPIC)	
Slot 6 (PIC)	FAN3
Slot 7 (PIC)	
Slot 8 (PIC)	
Slot 9 (PIC)	FAN4

Power Shelf  
(PowerSwitch, Power Plugs)



cable rpd `RPD_NAME`  
description `sample_RPD_1`  
identifier 0000.aaaa.bbbb  
core-interface Te `x/1/z`  
principal  
rpd-ds 0 downstream-cable `xyz` profile 30  
rpd-us 0 upstream-cable `abc` profile 1  
network-delay dim 10  
core-interface Te `x/1/z`  
rpd-ds 0 downstream-cable `x1/y1z1` profile 40  
r-dt 1  
rpd-event profile 5

interface Cable `xyz`  
downstream Downstream-Cable `xyz` `rf-channel` `n`  
upstream `m` Upstream-Cable `abc` `us-channel` `p`  
cable bundle `bundle_id`

ptp clock ordinary domain 0  
servo tracking-type R-DTI  
clock-port `name-of-server` slave  
delay-req interval -4  
sync interval -5  
sync one-step  
transport ipv4 unicast interface `Lo`  
negotiation  
clock source `master-ptp-server-IP`

cable `depi` multicast pool `pool_id`  
ip address 225.225.225.0 255.255.255.0

cable fiber-node `node_number`  
downstream Downstream-Cable `xyz`  
upstream Upstream-Cable `xyz`

ptp r-dt 1  
ptp-domain 0  
clock-port 1  
clock source ip `master-ptp-serverIP`

Architecture

Sample RPHY Configuration

Notes



# BRK-SPG2501 2019 v2

## cBR8 Video Cheat Sheet

Tejal Patel

Sheet is in color – careful about **bg** copy  
**Impacting(!)** **debug (orange)**  
italicized – *qam*  
[] – optional  
{} – required,  
|-or  
(cd) – conditional debug  
(t) – trace debug  
(c) – cable *lmgmt* console

### MPG2 Glossary

Term	Meaning
CC	Continuity Check
PSI	Program Specific Information
PAT	Program Association Table
PMT	Program Map Table
Null	Null <i>pkt</i> padding <i>cnst</i> -bit-rate
PID	Packet Identifier
PCR	Program Clock reference
Null Packets	For constant bit-rate
TSID	Transport Stream ID

### General Glossary

Term	Meaning
CBR8 LED	Logical Edge Device – e.g. a virtual RFGW-1 per line-card on cBR8
RFGW-10 QP	QAM Partition – RFGW-10's virtual edge device (Same as LED for cBR8)
DSG	DOCSIS Set-Top-Gateway – Protocol on cBR8 to forward IB to STBs
EC	Explorer Controller, originally DNCS
ERM	Edge Resource Manager
VSM	VOD Session Manager
RCAS	Remote Conditional Access Server – VOD CA
Netcrypt	Encryption for SDV
Powerkey	Edge encryption used by cBR8 and RFGW-10 for VOD and NOT SDV
PME	Privacy Mode Encryption – Edge encryption used in Detroit
Mini-Carousel	Carousel information generated by VSRM and sent by cBR8 down every SDV-capable downstream
GQI	Generic QAM Interface – Protocol used to control <i>edgeQAM</i> for SRMs. Similar protocol <i>include</i> ERM1.
BFS	Broadcast file system – Carousel forwarded QPSK MOD OOB, RFGW-1, and DSG IB Tunnels.

### Unix/Linux

(create) *tar -cvf name.tar src-path*  
(extract) *tar -xvf name.tar*  
*scp filename.zip source-files*  
*scp username@from\_host:file:dst/path*

### Core, Console, & Shell

request plat software con attach *ls -l /usr*  
request plat software system shell *[pr]r[0-3,4-9]* (Need challenge response)  
*dir harddisk:/core/*  
*dir stby-harddisk:/core/*  
archive *tar create name tar path -src*  
request platform software trace slot *tr* active archive target *harddisk:/traces*  
Send *usage* to all TTY: send \* *..msg . ctrlz*

### Images and Copying

Pushing from server: *scp local-filename username@cbr8-hostname:path*  
copy *scp target-path*  
copy *ftp user:passwd@loc:dir filename*  
verify path *md5 md5-hash*

**cBR8 Failover**  
**redundancy lmgmt, switchover from slot slot-*num*, redundancy force-failover**

### cBR8 Video Checklist:

Command	Look for:
VSRM	show cable video <i>gqi</i> connection Connected/Disconnected pair + Reset and Encryption ACKED Pingable from cBR8 <i>src</i> VPG0 to VSRM
LED	show cable video logical id <i>slot</i> Each QAM is Admin and <i>QAM</i> UP TSIDs are <i>correct</i> , Output Port correct Active and <i>Mgmt</i> IP correct
Sessions	show cable video sessions logical id <i>slot</i> [session-id <i>sess-id</i> ] One Mini-C per RF-port SDV and VOD exist – IP flow coming in and <i>txd</i> Session parameters correct
Mini-Carousels	show cable video sessions logical id <i>slot</i> Each Video QAM (Output Port) has a Mini-C session with no errors and correct bit-rate IP Mroute SSM correct and forwarding
DSG	show cable dsg cfr show interface cable xyz dsg downstream <i>cd</i> Stats incrementing – DCD, MDD, and Tunnel
STB	SG discovery / 2 way / Ping VSRM Ping-able to VSRM from STB or from cBR8 bundle. In-Band (DSG) functioning or OOB (DAVIC) functioning. Mini-Carousels present.
Multicast Routes	show ip mfb [count] show ip mroute [count] DSG Tunnels S,G present Mini-C S,G present PIM joins function correct ECMP or share tree path correct

### Common cBR8 Video Symptoms:

Symptom	Task
Black Screen	Too vague: Attempt to gain distinctions (!) Check: STB 2-way and ping to VSRM, STB has proper guide and correct SG discovery, cBR8 connect to VSRM, does channel change from STB seen at VSRM, does session creation and teardown function correctly at VSRM and cBR8. Is multicast routing correct, is RF plant clean, is the transport functional.
STB not reaching 2-way	Check STB diagnostic screen Check return path via traceroute/ping If DOCSIS mode – simulate by traceroute source STB/CPE subnet ping Check cBR8 DSG statistics and health If DAVIC mode – check DSG functionality (STB should prefer IB over OOB).
STB SG Discovery Failure	Video VSRM – Did zone mapping change and is MiniC Server working. cBR8 – Make sure unique TSID is configured correctly for your SG, make sure IB and OOB functional. Make sure Mini-C is healthy.
STB No Guide	Check STB is 2-way and cBR8 DSG (IB) is functioning correctly. Also check MOD/DEMODO QPSK for OOB to STB
cBR8 Sessions NOT ACTIVE-PSI	See which state session stuck – most common are OFF, INIT, or IDLE Consider debug (see tracing section) though easier to do from VSRM IDLE – Session timed out or output port shutdown or muted INIT – Transition state, okay if it does not say here.
Macro-blocking	Establish scope – which channels, which SGs, which EdgeQAMs, etc. RF-impairment – Check plant and STB corr/uncorr stats Bandwidth allocation – Check cBR8 output/input BW sufficient CC-error check along path (at cBR8 and towards source) Multiple source(s) – Change ECMP or cost out certain paths to see if changes
Stale Sessions	Determine “Stale” session – capture its state – Trace the session and check its verbose session output Set trace and debug
Jittery Video	Intervals may give a clue – 7 to 20 seconds may be Netcrypt. Check session MPEG-CC counters and trace towards source. Ensure no drops at multicast, session, or interface layers.

### cBR8 “Workaround” Impact Matrix: (ASSUMING IT IS AN EDGEQAM ISSUE!)

Action	Effect
cBR8 LED to “No Active”	Sessions persist, but no new sessions nor torn down sessions VSRM will report this QAM/LED in alarm(!), this stops any new sessions or session deletions Forces handshake with VSRM when you reactivate with “active” Impact: Existing sessions persist / No new sessions / Stale sessions persist

cBR8 LED Remove and Reconfigure	When to use: Suspect VSRM cBR8 communications issue and want to bounce that control plane Completely clear away both sessions and previous memory structures Most complete reset but highest impact Impact: Every session is removed / All sessions must be rebuilt after reconfiguration When to use: Clean slate restart – no persistence on cBR8, VSRM queries a completely cleared cBR8
cBR8 SUP Fallover	Sessions persist, connection to VSRM maintained Impact: None, sessions and session control plane should continue to work When to use: Suspect cBR8 SUP bug & will briefly shutdown an uplink forcing a different Multicast Path
cBR8 CLC Fallover	Sessions persist, connection to VSRM maintained Impact: None, sessions and session control plane should continue to work When to use: Suspect cable line card bug or hardware failure / RF-port and RF related issue
VSRM set Out-of-Service and back In-Service	Sessions supposed to persist on cBR8 but no new sessions nor teardowns. Lab indicates VSRM deletes cBR8 sessions after ~45 seconds Impact: Similar to “no active” but may clear VSRM issue. May lose existing sessions (mini-c and built VOD/SDV). No new sessions until back In-Service. When to use: Misconfiguration, Suspect out-of-sync between EdgeQAM and VSRM. VSRM-side test, RPC issues
VSRM set Release and back In-Service	Same as above but sessions are immediately deleted. VSRM is then in Out-of-Service and you will need to restore In-Service Impact: All sessions removed. When to use: Misconfiguration, Suspect out-of-sync between EdgeQAM and VSRM. VSRM-side test, RPC issues.

### cBR8 Interfaces relevant to Video

cBR8	Description
Interface VirtualPortGroup 0	Logical interface used as Management source IP of LED(s) to VSRM. Route learned by redistribute connected in cBR8. VSRM should be able to ping VPG0's IP address – NOT pingable to the LED Mgmt IP.
Virtual Edge Input IP in LED Configuration	Destination IP of VOD content configured in the VSRM Route learned by redistribute status in cBR8. No ping test – check routing table entries
Interface Bundle 1 / CPE Subnet	CPE Bundle is IP secondary on interface Bundle. Should be able to source ping from the Bundle IP to VSRM
Interface TenGig 4/1/0-2 Interface TenGig 5/1/0-2	Uplinks, Data and Video. Check for PIM neighbor, IGP cost, interface drops, connectivity.

### VSRM and cBR8 Expected Behavior Matrix

Change	Description
VSRM to Out-of-Service	LED should retain sessions and GQI connection Sessions Shouldn't drop on LED but in lab they do after ~45 seconds.
VSRM to Release	LED should delete all sessions and GQI connection retained Same as Out-of-service but with immediate session deletion
VSRM to In-Service	LED should be audited by VSRM and report all sessions existing. VSRM should create/delete sessions to sync
cBR8 LED to “No Active”	VSRM alarms – LED sessions retained, GQI Connection down. No new sessions built or deleted.
cBR8 LED clear session	VSRM does not know – So VSRM goes to delete it will error, it goes to audit, it will attempt to re-pin up.

### + cBR8 and VSRM Triage

Step	Description
Collect cBR8 Show tech + show cable video logical id <i>slot</i>	Establish baseline
Set cBR8 Trace and Debug	Allows us to see where audit is failing between VSRM
(VSRM) Set topdump for pkts to cBR8	Allows us to see exactly what is sent to cBR8
(VSRM) Set logging level to max	Allows logs to be more granular
(VSRM) Ensure Logs are saved	Save logs for post-analysis
If able to narrow down to particular session: Show cable video session logical id <i>slot</i> session-id <i>sess-id</i>	Session specific details

Use platform software trace message led-xx	Records the debug + trace
no active reverse	
undo debug all	Restores to non-debugging settings
(VSRM) Set logging level to normal	Prevents over-logging VSRM

cBR8 Debugs and Trace  
led-xx = xx is slot, e.g. Slot 1 is led-01

**Set the trace:**

- (g) set platform software trace led-xx no active vsm,vsm debug
- (g) set platform software trace led-xx no active vsm,vsm,erm debug
- (g) set platform software trace led-xx no active vsm,vsm,erm debug
- (g) set platform software trace led-xx no active vsm,vsm,erm debug

**Verifying the trace:**

show platform software trace level led-xx no active

**Enable Debugs:**

- (cd) debug cable video ggi
- (cd) debug cable video led

**Display the capture:**

show platform software trace message led-xx no active [reverse]

**Alternative – Requires Shell Access:**

dir /harddisk/tracelogs/  
bidecode /harddisk/tracelogs/tracelog.oamr.bip

**cBR8 Multicast Video and DSG**

- show ip route [ count ] active
- show ip rfb, & show ip rfb count
- show ip route group [count]
- show cable video routing multicast
- show cable dsg cf
- show cable dsg static-group bundle budioid
- show interface cable x/y/z dsg downstream dcd
- show cable modem dcsis device-class i inc STB

**cBR8 10K DSG Deep dive**

- Locate the SI and CA tunnel configuration
- Validate SI and CA hub-ID and validate throughput
- Recall Hub-ID is assigned by EC to the QPSK – the Hub-ID must be in the SI tunnel

- show cable multicast
- show cable multicast dsg
- (g) test cable lib3ds sf show 0xStatindex 1, 1, Statindex from da-dsg-dh convert dec-to-hex
- (g) test cable lib3ds show errors all
- debug cable dsg
- debug cable multicast
- debug cable multicast dsg
- debug cable multicast qos.statistics

**cBR8 Video Sessions**

- show cable video ggi connection
- show cable video logical id slot
- show cable video session logical id slot
- show cable video session logical id slot session-id sess-id
- show cable video session logical id slot summary

**Video Infrastructure**

This is a QAM-sharing model  
ERM=VSRM, VSM=USRM, VOD BO=VOD Back office, CA Mgr=RCAS

**SDV Setup Flow**

If program already exists on this SG – Just first and last steps needed, else:

From	To	Action
STB	ERM	STB Client SelReq over IP
ERM	n/a	ERM allocates resources (see request in vsm/lockall)
ERM	EdgeQAM	ERM sends GQI message to create session
EdgeQAM	n/a	EdgeQAM allocates resources
EdgeQAM	ERM	EQAM create session response
EdgeQAM	n/a	PIM joins SSM Group and builds shared-tree / Forwards out video QAM output port.
ERM	STB	ERM responds Client SelConf (Freq, Param Number)

**VOD Setup Flow**

From	To	Action
STB	VSM	STB Client SelReq over IP
VSM	VOD BO	Server indicator
VOD BO	VSM	Server AddResourceReq
VSM	ERM	Allocate Resources
ERM	CA Mgr	GetCA
CA Mgr	ERM	GotCA
ERM	EdgeQAM	ERM send GQI to create session
EdgeQAM	n/a	EdgeQAM allocates resources
EdgeQAM	ERM	EQAM create session response
ERM	VSM	Resource allocated
VSM	STB	ClientSessionConf

Content comes from VOD Pump to EdgeQAM as unicast UDP which is forwarded out a particular LED Video QAM Output port.

**cBR8 Session States – SHOW CABLE VIDEO SESSIONS LOGICAL ID slot**

Input State	Meaning
ACTIVE-PSI	Active and forwarding with Program Specific Info – This is good
ACTIVE	Active – attempt to snoop PSI or no PSI exists
INIT	Initializing – Session is created and resources allocated – transition state
IDLE	Waiting for incoming packet stream

Output State	Meaning
ON	Forwarding traffic out this Video QAM Output Port
OFF	Similar to IDLE, but after timeout goes to OFF. Also possible if output port is muted or shutdown
BLOCK	Error when parsing the PAT/PMT
CONFLICT	PID conflict detected when processing PMT/PAT
PENDING	PMT is withheld due to missing CA info

**cBR8 Session Parameters – SHOW CABLE VIDEO SESSIONS LOGICAL ID slot**

Parameter	Check
Does it exist?	Trace GQI on VSRM or cBR8 against session creation
Streaming Type	SDV=Remap, VOD=Remap, SDV Mini-C=Passthru
Session Type	SDV=SSM, VOD=UDP
UDP Port	SDV=0, UDP=Port-in-port-range
Output Param	Program Number matching the VSM/ERM Program ID
Input State	ACTIVE-PSI Desirable – see above for other states
Output State	ON Desirable – see above for other states
Encrypt	SDV=Clear, VOD=Powerkey and Encrypted
Session Name	Hex value that can be matched within the VSM/ERM

**cBR8 Session Summary – SHOW CABLE VIDEO SESSION LOGICAL ID slot summary**

Parameter	Check
Active/PSI	Should be large integer relative to Init and Idle. PSI should equal Active
gqi	Initial state, not necessarily bad: high counts and persistent may be issue
idle	Possible issue if high – should be single digits at best – see Idle meaning
Input/Output bps	Should be roughly equal

**cBR8 Session Encryption**

State	Meaning
CLEAR	No encryption applied – This does not necessarily mean the session is unencrypted – just not edge encrypted. Look for CA PID. Example: SDV sessions are CLEAR despite having <b>Not encrypt</b> . Some VOD sessions are CLEAR by design.
POWERKEY	Edge Encryption applied with <b>Powerkey</b> and status "Encrypted"

PME	Edge Encryption applied with PME
-----	----------------------------------

**cBR8 SDV Session Checklist**

Check	Meaning
Mini-Carousel	One on each Video QAM Output Port / <b>Passhru</b> sessions / State ON ACTIVE-PSI / Correct bitrates in out / Session Type SSM / Same bitrates
IP Mroute	Mroute health for Mini-C and for S.G of SDV session
Session Creation	Validate GQI and session creation of new SDV sessions, same checks as above Remap, ON ACTIVE-PSI, Bitrates, SSM, and PIM SSM routing
Session State	Session specific deep dive – look for drops, MPEG-CC, errors
Encryption	Sessions contains a CA PID
ECMP	Check multicast path and load-balancing / Alter shared tree path

**cBR8 VOD Checklist**

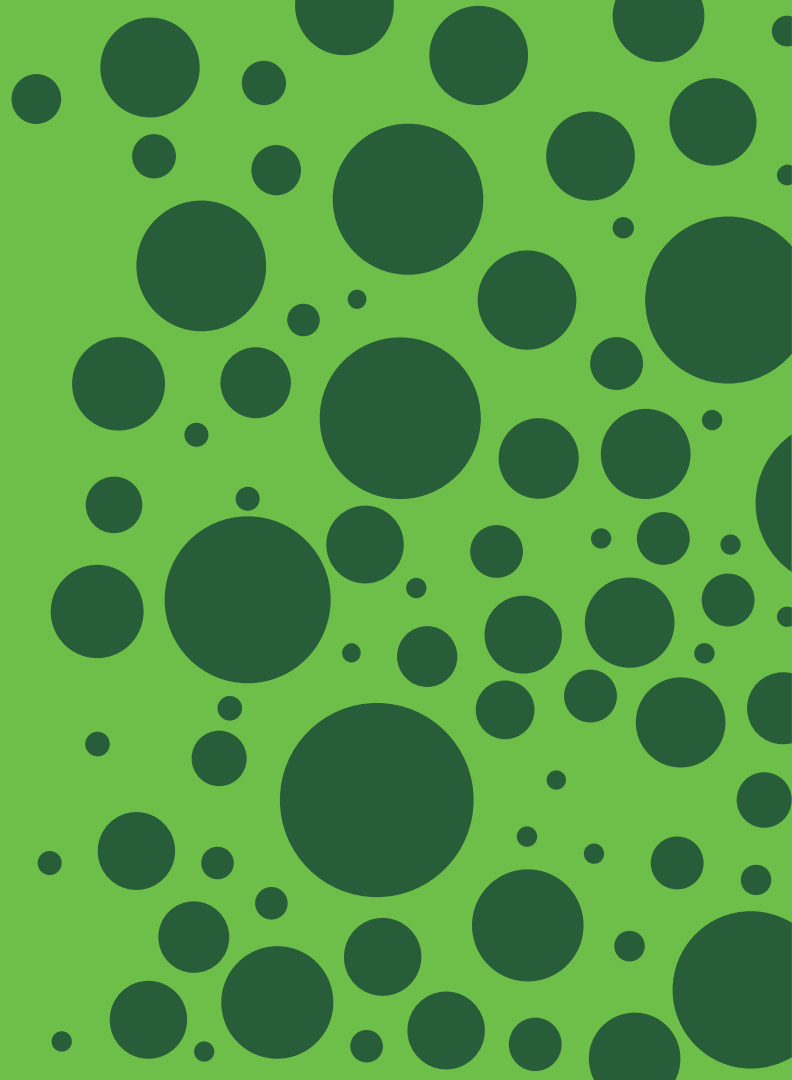
Check	Meaning
Session	Creation from ERM is correct
Session State	Correct Video QAM Output Port / Remap sessions / State ON ACTIVE-PSI / Correct bitrates in and out / Session Type is UDP / Unicast IP
IP and Routing	Ensure incoming bit-rate, if not, check reachability of VOD Pump and cBR8 virtual edge input configuration and routing redistribution
Encryption	Type should be Powerkey and Status Encrypted – if black screen, possibly edge encryption issue.

**cBR8 Session Deep Dive – SHOW CABLE VIDEO SESSIONS LOGICAL ID slot session sess,**

Parameter	Check
Number of Sources	At least two. Consider source switching as a troubleshooting tool
Ingress State	Prefer ACTIVE-PSI – otherwise troubleshoot session setup
Ingress IP Packets	Incrementing, no RTPs, no or at least not incrementing Drops
Ingress TP Packets	Incrementing, Unref and Discontinuity should be stable
Ingress Errors	Should be stable, prefer 0. CC error increment indicates issue before cBR8 or at cBR8 ingress.
Ingress Bit-rate	Matches expected bitrate for the programming
Egress State	Prefer ON, otherwise troubleshoot output. OFF means idle timeout or port is shutdown
Egress TP Packets	All incrementing except Drop
Egress Errors	All stable or zero and non-incrementing
PAT info	Exists and has at least one PMT
Input PMT	One program, Typically at least two PIDs, one CA-SYS and two lang
Output PMT	Same as Input PMT but different PIDs
Output PID Map	Exists, and matches the input and output PMT information



# Summary



# Summary

- Troubleshooting cBR-8 DOCSIS 3.x Services
- Troubleshooting cBR-8 Remote PHY Services
- cBR-8 Deployment And Operational Automation
- Troubleshooting cBR-8 Converged Video Service
- Troubleshooting cBR-8 Voice services (In appendix)
- Downstream Bonding Resiliency (in appendix)
- Troubleshooting ADSG Services (in appendix)

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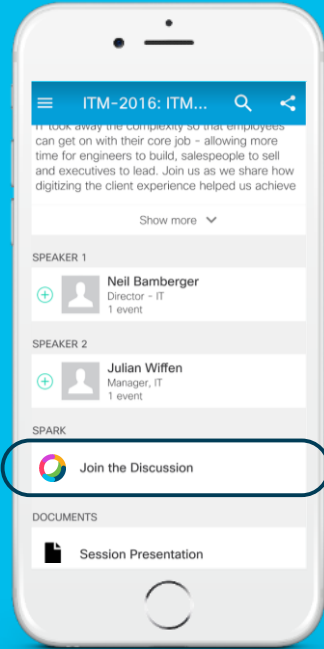
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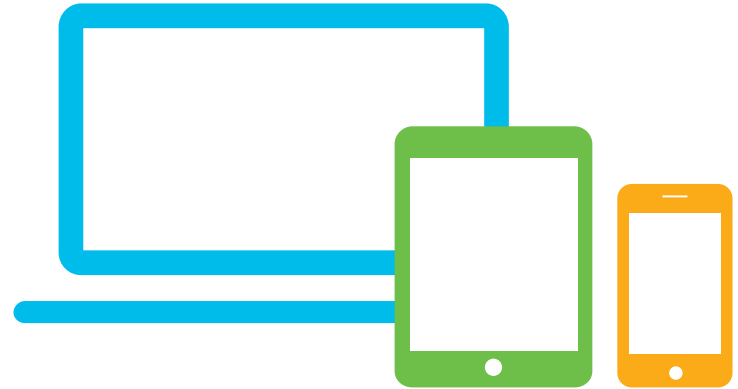
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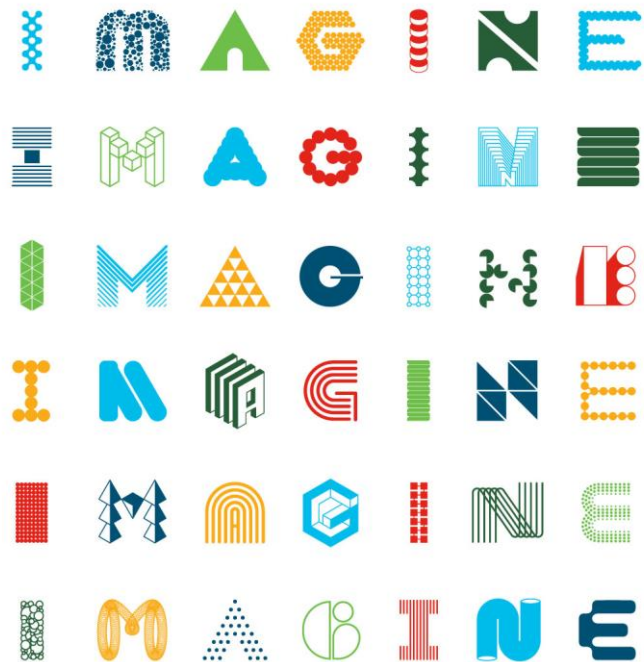
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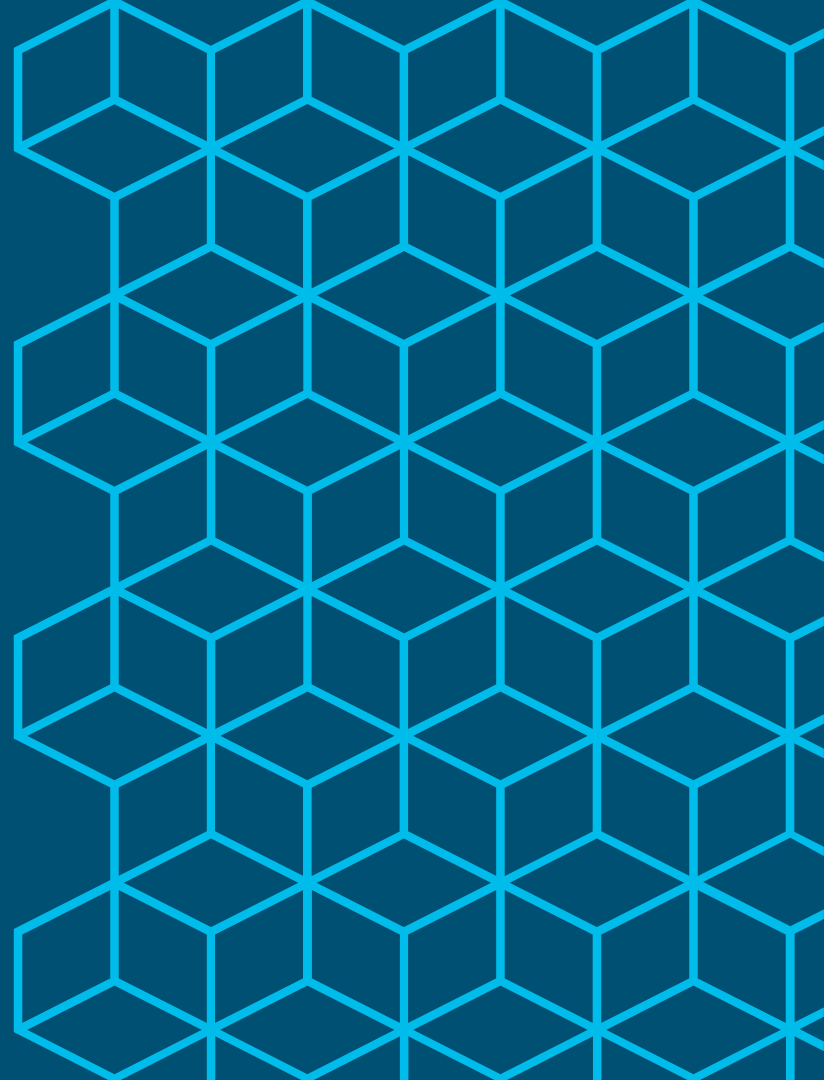
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# Bonus Slides

# Remote PHY



# Configuration Overview

1. Hardware & Software Requirements
2. Configuration Reference
3. Configuration Validation
  - a. Downstream and Upstream Controller(s)
  - b. RPD
  - c. Interface Cable & Fiber Node(s)
  - d. Controller Profile(s)

# 1 Hardware & Software Requirements

- Remote PHY Support

Part ID	Component
CBR-CCAP-LC-40G-R	CCAP-CORE, Cable LC
CBR-DPIC-8X10G	CCAP-CORE, DPIC
RPD-1x2	RPD
IOS-XE Software	Feature
16.5 Polaris & Later	R-PHY Support
16.5(1r)S	SUP ROMMON
2011.03.18	Cable Linecard ROMMON

```
cBR-8# show run | include card
card 0/0 cBR-CCAP-LC-40G r-phy
card 2/0 cBR-CCAP-LC-40G r-phy
```

```
cBR8-01# show inventory
NAME: "clc 0", DESCR: "Cisco cBR CCAP Line Card"
PID: CBR-CCAP-LC-40G , VID: V01 , SN: CAT1919E1RR
NAME: "CLC Downstream PHY Module 0/0", DESCR: "Cable PHY Module"
NAME: "ATO clc 2", DESCR: "Cisco cBR CCAP Line Card"
PID: CBR-CCAP-LC-40G-R , VID: V01 , SN: CAT2040E03T
NAME: "clc 2", DESCR: "Cisco cBR CCAP Line Card"
PID: CBR-CCAP-LC-40G-R , VID: V01 , SN: CAT2040E03T
NAME: "digi-pic 2/1", DESCR: "Cisco cBR CCAP Line Card Digital PIC"
PID: CBR-DPIC-8X10G , VID: V01 , SN: CAT2113E003
```

```
cBR8-01# show platform
Chassis type: CBR-8-CCAP-CHASS
Slot      Type                State                Insert time (ago)
-----
0         CBR-CCAP-LC-40G    ok                   2w4d
0/1      CBR-DPIC-8X10G    ok                   2w4d
2         CBR-CCAP-LC-40G-R ok                   2w4d
2/1      CBR-DPIC-8X10G    ok                   1w0d
SUP0     CBR-CCAP-SUP-160G inserted            2w4d

Slot      CPLD Version        Rommon Version
-----
0         00000025           2011.03.18
2         00000025           2011.03.18
SUP0     16052011           16.5(1r)S
```

# 3a DS and US Controllers

- cable downstream controller-profile *number*
- cable upstream controller-profile *number*

Downstream Profile
Multicast Pool (Optional)
RF Channel Range
Type
Frequency
RF-Output
QAM Profile
Shutdown
Cable DEPI Multicast pool <i>id</i>
Power Profile

```
cable downstream controller-profile 30
multicast-pool 1
rf-chan 0 31
  type DOCSIS
  frequency 405000000
  rf-output NORMAL
  qam-profile 1
  docsis-channel-id 1
rf-chan 33 39
  type VIDEO SYNC
  frequency 603000000
  rf-output NORMAL
  qam-profile 5
```

```
cable depi multicast pool 1
ip address 225.225.225.0 255.255.255.0
```

**\*Base channel power and adjust moved to cable rpd configuration**

Upstream Profile
US-channel(s) / US Channel Width
DOCSIS Mode
Pre-Equalization
Frequency
Modulation Profile
Minislot Size
Shutdown

```
cable upstream controller-profile 1
us-channel 0 channel-width 6400000 6400000
us-channel 0 docsis-mode atdma
us-channel 0 equalization-coefficient
us-channel 0 frequency 17500000
us-channel 0 minislot-size 2
us-channel 0 modulation-profile 224
no us-channel 0 shutdown
...
us-channel 3 channel-width 6400000 6400000
us-channel 3 docsis-mode atdma
us-channel 3 equalization-coefficient
us-channel 3 frequency 37500000
us-channel 3 minislot-size 2
us-channel 3 modulation-profile 224
no us-channel 3 shutdown
```

# 3b Remote PHY Device

- cable rpd *name*

Parameter	Purpose
Identifier	Mac-address of the RPD
Core interface	Interface of the DPIC TenGig
Principal & Auxiliary	Each RPD must have exactly one Principal
RPD-DS	Downstream-Cable Controller + Profile
RPD-US	Upstream-Cable Controller + Profile
RPD Base Power	Set the base power
DLM	DEPI Latency Management
R-DTI	Timing
RPD Event Profile	GCP Event Reporting

```

cable rpd P2Shelf_RTP
description P2 1RU in AS Lab RTP
identifier 0004.9f33.0449
core-interface Te1/1/0
principal
  rpd-ds 0 downstream-cable 1/0/0 profile 30
  rpd-us 0 upstream-cable 1/0/0 profile 1
network-delay dlm 10
core-interface Te1/1/6
  rpd-ds 0 downstream-cable 1/0/31 profile 40
r-dti 1
rpd-event profile 5

```

## Pitfalls

controller profile(s)	Cannot change an specific instantiation of the profile without entire editing profile
	Removing last downstream-cable controller from RPD requires removing all in-use channel(s) – .e.g Video Binding

# 3c Interface Cable & downstream-Cable, Fiber Node

- interface cable *slot/subslot/port*
- interface downstream-cable *slot/subslot/port:channel*
- cable fiber node *number*

Parameter	Purpose
Primary interface DS Cable	For each Primary RF -> Interface DC
	Downstream-Cable for RPHY
Downstream-Cable Controller	Forwarding controller
Upstream-Cable Controller	Return controller
Upstream Bonding Group(s)	Define USBG(s)

Parameter	Purpose
Bundle	(Inherited) Associates Primary RF to L3
RF-Bandwidth Percent	ACFE - Default 1%

```
interface Cable1/0/0
  downstream Downstream-Cable 1/0/0 rf-channel 0
  downstream Downstream-Cable 1/0/0 rf-channel 4
  downstream Downstream-Cable 1/0/0 rf-channel 8
  downstream Downstream-Cable 1/0/0 rf-channel 12
  downstream Downstream-Cable 1/0/0 rf-channel 16
  downstream Downstream-Cable 1/0/0 rf-channel 24
  upstream 0 Upstream-Cable 1/0/0 us-channel 0
  upstream 1 Upstream-Cable 1/0/0 us-channel 1
  upstream 2 Upstream-Cable 1/0/0 us-channel 2
  upstream 3 Upstream-Cable 1/0/0 us-channel 3
  cable bundle 1
```

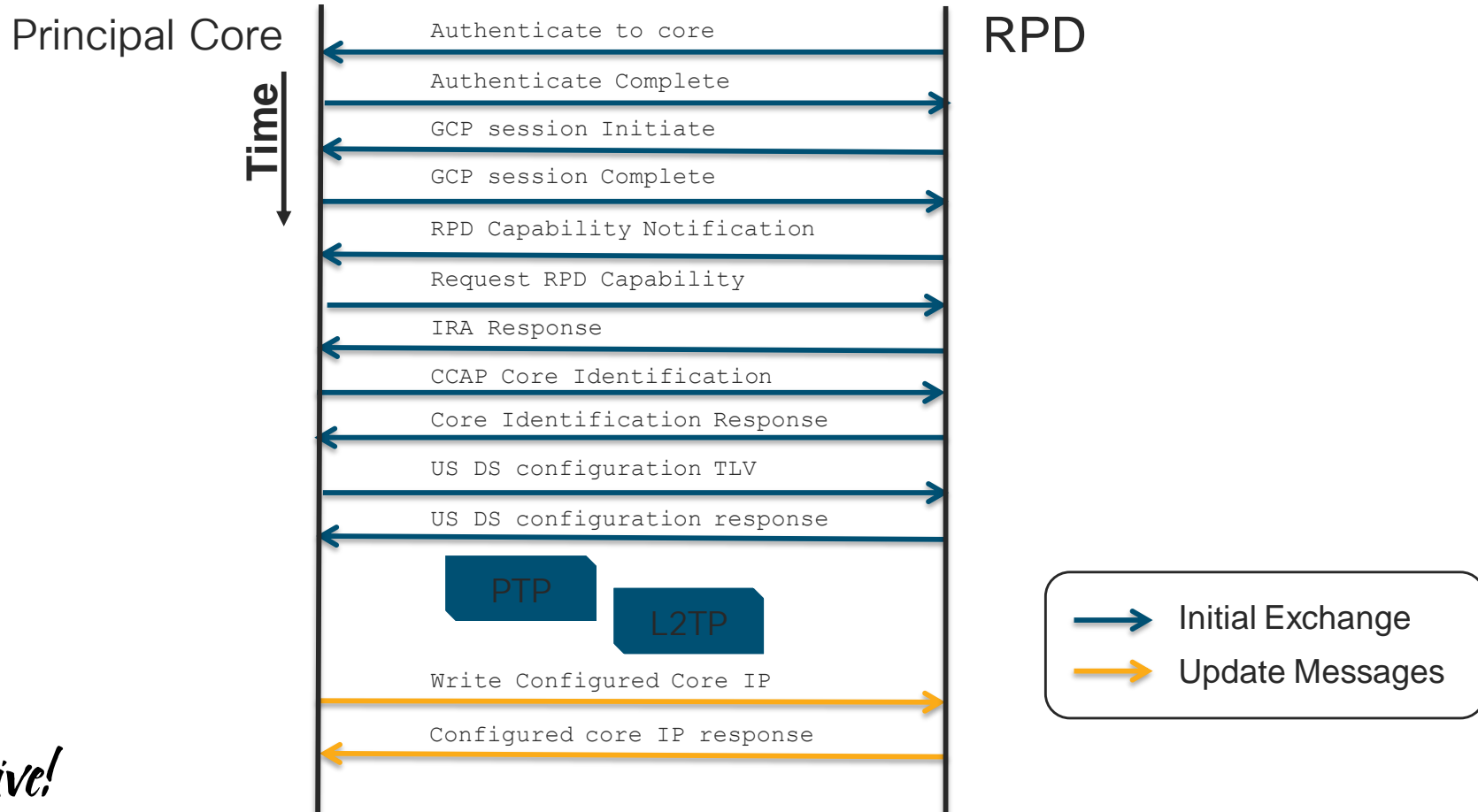
```
interface Downstream-Cable1/0/0:0
  cable bundle 1
  rf-bandwidth-percent 1
```

```
interface Downstream-Cable1/0/0:3
  cable bundle 1
  rf-bandwidth-percent 1
```

```
cable fiber-node 100
  downstream Downstream-Cable 1/0/0
  upstream Upstream-Cable 1/0/0
```

```
cable fiber-node 101
  downstream Downstream-Cable 1/0/0
  upstream Upstream-Cable 1/0/1
```

## 2 RPD and CCAP-CORE Exchange



# 2 Validate Configuration

- Precision Timing Protocol

Parameter	Purpose
IP reachability	cBR8 must be able to reach clock source IP
PTP Clock Domain	Define your PTP parameters use by R-DTI
Clock-Port	Slave clock, transport, source
Transport	Specify IPv4 / Unicast / Source Intf
Clock source	Match to master 1588 interface
PTP R-DTI {0-64}	Defines the R-DTI for RPD
PTP Domain {0-127}	Associates R-DTI to domain parameters

Pitfalls	
Transport	IPv4 only , no Port-Channel(s), support coming
R-DTI Config	Requires reboot of RPD to take effect
PTP Source	Can only use SUP-PIC TE 4/1/x and 5/1/x

```
interface Loopback0
 ip address 13.10.0.207 255.255.255.255
```

```
ip route 10.225.197.254 255.255.255.255
TenGigabitEthernet4/1/7 13.13.0.210
```

```
ptp clock ordinary domain 0
 servo tracking-type R-DTI
 clock-port slave-from-903 slave
 delay-req interval -4
 sync interval -5
 sync one-step
 transport ipv4 unicast interface Lo0 negotiation
 clock source 10.225.197.254
```

```
ptp r-dti 1
 ptp-domain 0
 clock-port 1
 clock source ip 10.225.197.254
```



# 5b RPD DHCP, TOD, and Dot1x

- show dhcp
- show tod
- show dot1x detail

```
R-PHY# show dhcp
Interface          IP-Address          Subnet-Mask
vbh0                13.52.0.19          255.255.255.240

Details:
-----
Interface:          vbh0
TimeServers:        172.18.98.116, 172.18.98.117
TimeOffset:         -18000
LogServers:         172.18.98.57, 172.18.98.59
CCAPCores:          13.13.0.226, 13.13.0.198
```

```
R-PHY# show tod
Server              TimeOffset  Time              Status
172.18.98.116, 172.18.98.117  -18000      2017 May 18 06:57:01  OK
```

```
R-PHY# show dot1x detail
Interface          Core-id            EAP_Received      Status
vbh0                CORE-586853802     False              UP
bssid=01:80:c2:00:00:03
freq=0
ssid=
id=0
mode=station
pairwise_cipher=NONE
group_cipher=NONE
key_mgmt=IEEE 802.1X (no WPA)
wpa_state=ASSOCIATED
ip_address=13.52.0.19
address=ba:db:ad:13:14:52
Supplicant PAE state=HELD
suppPortStatus=Unauthorized
EAP state=FAILURE
uuid=e9432baa-15c6-5a12-8976-d505ba50cd25
```

Parameter	What to look for...
Interface	vbh0
IP Address	As expected
Mask	As expected
Time Servers	As expected
CCAPCores	cBR8 DPIC IP
Time Servers	As expected

# 4 Validate Clock on RPD

- show ptp clock 0 config
- show ptp clock 0 state

Parameter	What to look for ...
APR State	PHASE_LOCK
Domain/Mode	Slave
Master IP	Server IP
Stream State	PHASE_LOCK

Clock States	
1	Ref Failed
2	Acquiring
3	Frequency Lock
4	Phase Lock

Network Issues



Holdover

```
R-PHY# show ptp clock 0 state
apr state      : PHASE_LOCK
clock state    : SUB_SYNC
current tod    : 3595870      Wed Feb 11 14:51:10 1970
active stream  : 0
==stream 0    :
port id       : 0
master ip     : 10.225.197.254
stream state  : PHASE_LOCK
Master offset  : 659
Path delay    : -4022
Forward delay : -3919
Reverse delay : -4125
Freq offset   : -82699
1Hz offset   : 389

R-PHY# show ptp clock 0 config
Domain/Mode   : 0/OC_SLAVE
Priority 1/2/local : 128/255/128
Profile       : 001b19000100-000000 E2E
Total Ports/Streams : 1 /1
--PTP Port 1, Enet Port 1 ----
Port local Address :13.52.0.19
Unicast Duration :300 Sync Interval : -4
Announce Interval : 0 Timeout : 11
Delay-Req Intreval : -4 Pdelay-req : -4
Priority local :128 COS: 6 DSCP: 47
==Stream 0 : Port 1 Master IP: 10.225.197.254
```

# 1b Validating video throughput on RPD

- show downstream channel counter { dps | tpmi | dpmi }

What is it		What does it tell us
DPS	Transmitted Packets	What packets are tx on the carrier
TPMI	Rx Match Destination MAC, IP, and L2TPv3 Session ID	If incrementing : valid tuple received for channel
DPMI	Rx Match L2TPv3 Session ID and Sequence Number Checking	If incrementing : valid sequencing received If SeqErr-Pkt : Out of sequence packets received

```
R-PHY# show downstream channel counter dps
Chan Tx-packets Tx-octets Drop-pkts Tx-sum-pkts Tx-sum-octs Drop-sum-pkts
```

```
46 1412715444 3597499732 0 1412715444 3597499732 0
47 1412733756 3600941072 0 1412733756 3600941072 0
158 719767 47391972 0 719767 47391972 0
```

```
R-PHY# show downstream channel counter dps
Chan Tx-packets Tx-octets Drop-pkts Tx-sum-pkts Tx-sum-octs Drop-sum-pkts
```

```
46 55300 10396400 0 1412770744 3607896132 0
47 55293 10396400 0 1412789049 3611337472 0
158 31 1979 0 719798 47393951 0
```

```
R-PHY# show downstream channel counter tpmi
```

```
Level Rx-pkts Rx-sum-pkts
Node Rcv 182177630 182177630
Depi Pkt 2382390178 2382390178
```

```
Port Chan Rx-pkts Rx-sum-pkts
```

```
DS_0 39 778328859 778328859
```

```
...
```

```
DS_0 44 460223051 460223051
```

```
DS_0 45 460211632 460211632
```

```
DS_0 46 460221125 460221125
```

```
DS_0 47 460344092 460344092
```

```
Port Rx-pkts Rx-sum-pkts Drop-pkts Drop-sum-pkts
```

```
DS_0 3863639261 3863639261 0 0
```

```
US_0 485970657 485970657 0 0
```

```
US_1 2244 2244 0 0
```

```
R-PHY# show downstream channel count dpmi
```

```
Field Pkts Sum-pkts
```

```
Dpmi Ingress 2203906685 2203906685
```

```
Pkt Delete 0 0
```

```
Data Len Err 0 0
```

```
Chan Flow_id Octs Sum-octs SeqErr-pkts SeqErr-sum-pkts
```

```
47 0 3887236816 3887236816 5 5
```

```
47 1 0 0 0 0
```

```
47 2 0 0 0 0
```

```
47 3 0 0 0 0
```

Tx Rx clears on multiple show

# RxMER to Bit Loading Mapping

DOCSIS 3.1 PHY Spec - Table 7-41

RxMER (in ¼ dB)	RxMER (in dB)	QAM	Bit Loading
60	15	16	4
84	21	64	6
96	24	128	7
108	27	256	8
122	30.5	512	9
136	34	1024	10
148	37	2048	11
164	41	4096	12
184	46	8192	13
208	51	16384	14

Note: On cBR-8 use the CLI: `show cable ofdm-rxmer-qam-bl-table`

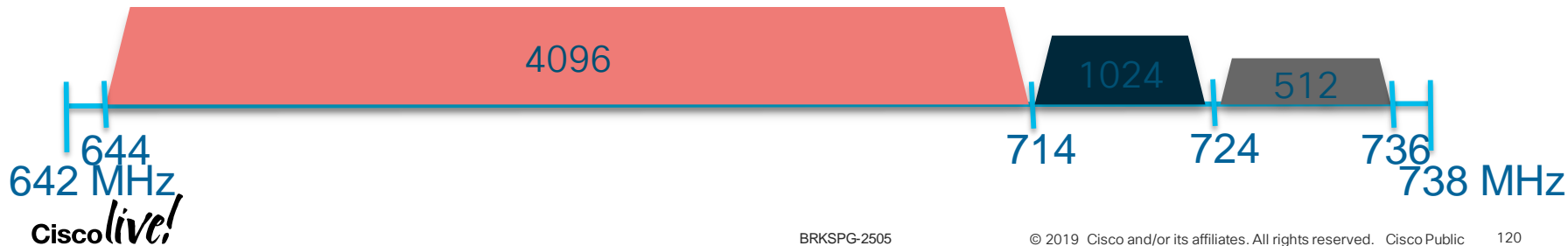
1

# OFDM Mixed Modulation Profiles

- Can be used for control or data profiles
- Each supports up to 5 ranges
- Define absolute or relative frequencies

```
cable downstream ofdm-chan-profile 100
<snip>
profile-data 1 modulation-profile 96
```

```
cable downstream ofdm-modulation-profile 96
subcarrier-spacing 50KHZ
width 96000000
start-freq 642000000
assign modulation-default 1024-QAM
assign modulation 512-QAM range-subcarriers freq-abs 724050000 width 12000000
assign modulation 4096-QAM range-subcarriers freq-abs 644000000 width 70000000
```

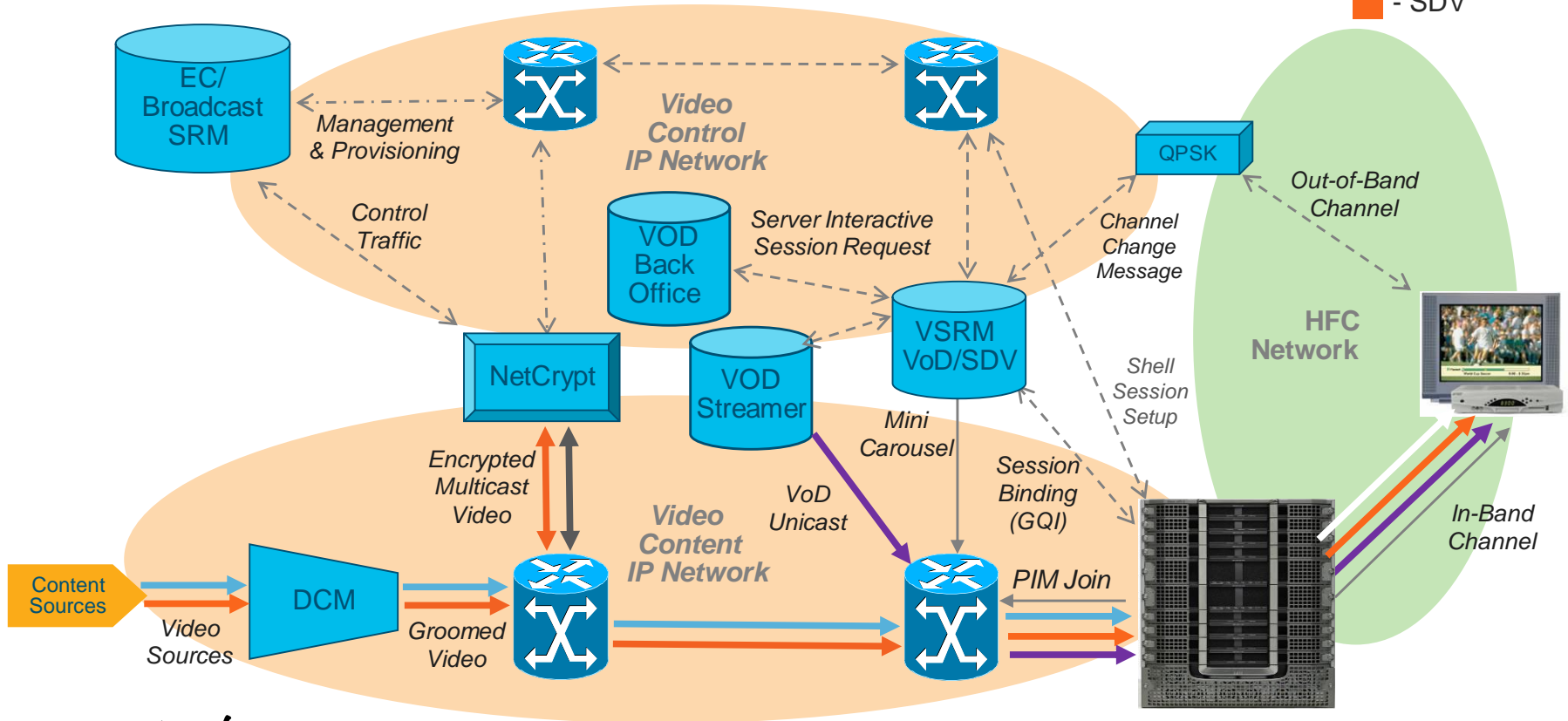


Video

# Video Architecture

Source: 2017  
BRKSPG-2505

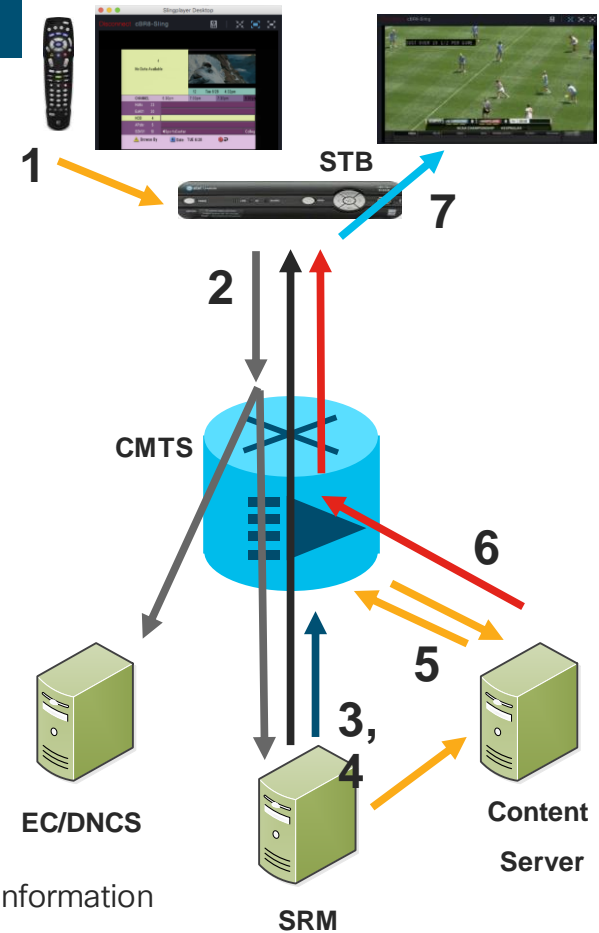
- - Broadcast
- - VoD
- - SDV



# Video Services

## Video Session Setup (Cisco/SA)

- 1 **Customer STB selects programming**
- 2 STB communicates to EC/SRM to request content
- 3 **SRM requests session creation to RFGW-10**
  - Source Specific Multicast (SDV) or Unicast (VOD)
- 4 SRM transmits to STB the session information
- 5 **RFGW-10 obtains content from Content Server**
  - Add Encryption if RFGW-10 assigned edge encryption (VOD)
  - RFGW-10 initiates the SSM / SRM instructs source to start
- 6 **RFGW-10 forwards content on the appropriate SG**
- 7 **Set Top tunes to appropriate QAM Carrier**
  - Decodes program with the provided encryption keys and program information



# Video Services

## Session states

- Disconnect/Connect and interactions with SRM

	LED “Active”	LED “No Active”	LED De-Configured
SRM Functional and “In Service” State	Normal operations	LED continues to pin up existing sessions. No new sessions.	All sessions destroyed.
SRM Unresponsive	LED continues to pin up existing sessions. No new sessions.	LED continues to pin up existing sessions. No new sessions.	All sessions destroyed
SRM “Release” or “Out Of Service” and then “In Service”	LED instructed to remove all sessions and rebuild	LED never gets the order and continues sessions.	All sessions destroyed

# How does cBR8 fit in your Video architecture?

Mid level by Function

A bit more details now...

## Application/Servers

## Access Edge

## Customer Premise

Session Manager

Edge Resource Manger

Netcrypt / DCM

SDV Sources

VOD Pump

CCAP

QPSK

BFS

Set-Top-Boxes

Core

RF Plant

Recall, BFS, QPSK, all can be converge

- ← ADSG Tunnels IB(SI, EAS, CA, APP)
- ← ADSG Tunnels Multicast SSM
- ← STB Return IP (2-way)
- ← STB Return DAVIC & OOB
- ← DAVIC RPC and BOOTP
- ← Mini-Carousel
- ← SDV Multicast SSM
- ← VOD Unicast
- ← ERM GQI Messages

# How does cBR8 fit in your Video architecture?

High level by Function

## Application/Servers

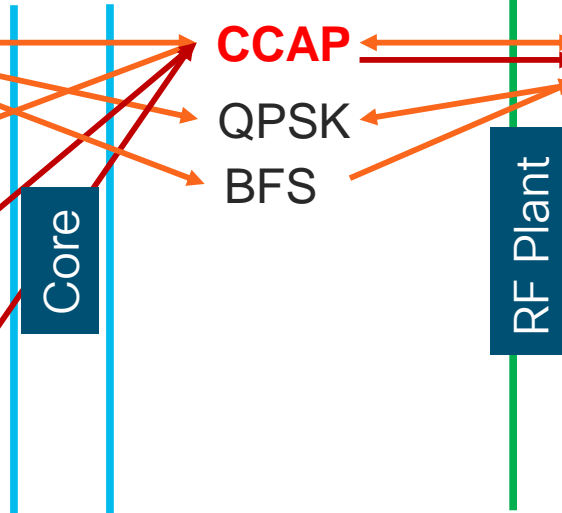
Session Manager  
Edge Resource Manger  
VOD Session Manger  
CA Manager  
RCAS  
SDV Sources  
VOD Back Office  
VOD Pump

## Access Edge

**CCAP**  
QPSK  
BFS

## Customer Premise

Set-Top-Boxes



# What is the cBR8 Responsible for?

- For VIDEO services:
  - **Advanced DOCSIS Set-Top Gateway (ADSG)**
    - cBR8 forwards DSG tunnel traffic from your controller to each Video SG
    - DSG tunnel data is used for STB control: System Information (SI), Emergency Messaging (EAS), Conditional Access (CA), and additional In-Band data such as BFS carousel and application data
  - **Set-Top-Box Return Path (part of 2-way)**
    - DOCSIS STB signals the VSRM over IP and the first “hop” is the cBR8 Bundle
    - *DAVIC STB signals the QPSK (MOD/DEMODO)*
  - **Switch Digital Video (SDV)**
    - Responsible for pinning up and tearing down sessions as required by the VSRM
    - Multicast PIM Join towards the multicast source and then forwards it out the Video QAM(s)
  - **Video on Demand (VOD)**
    - Similar to SDV but with unicast sources
    - **Edge Encryption** with PME or PowerKey

# What is the cBR8 Responsible for?

- Continued
  - **Broadcast Video / Linear Content**
    - Table Based Sessions
    - Can be done by RFGW-1s
  - **Broadcast File System (BFS)**
    - Table Based
    - If EC is Version 8 or later – GQI sessions for BFS
    - IOS-XE 16.7.1 and later

# cBR8 Configuration and VSRM

- Each cBR8 Logical Edge Device associates to an VSRM “QAM”
  - TSID and Output port range - Virtual Carrier Groups
  - Source Mac-address of the LED
  - Server IP of ERM - Two standard, three possible
  - Management IP - cBR8 LED’s IP
  - Virtual Edge Input - Destination IP for VOD
  - Activate or no activate

```
jayu2 — jayu2@Jayu2-VM-Ubuntu: ~ — ssh 10
logical-edge-device LED_6 id 6
logical-edge-device LED_1_GQI id 10 ←
protocol gqi
  mgmt-ip 13.135.69.4
  mac-address a46c.2ab0.2c02
  server 10.225.198.88
  keepalive retry 3 interval 10
  virtual-edge-input-ip 13.135.70.10 input-port-number 1
  vcg vcg_gqi_1-0
  active
```

F241-36-04-LC01-cBR8.Chassis	
ProductType	cBR8
Name	F241-36-04-LC01-cBR8
EdgeDeviceName	F241-36-04-cBR8-01
EdgeDeviceNameStatus	Ok
NumOutputPorts	8
NumChansPerPort	100
AlarmThreshold	1
FailThreshold	1
Protection	Manual
CtrlIpAddress	13.135.69.4
Cost	0
AdminState	InService
State	OK
OperationalState	InService
InterfaceStatus	OK
TransactionTimeout	5000 ms
Commands	149
CommandFailures	33
MaxCmdResponseTime	69.0 milliseconds
MaxCmdTimestamp	2018/03/15 14:17:01
AllocatedBandwidth	0.875
ActiveSessions	7

# ADSG Troubleshooting

## Check Client-id and tunnel association

```
CBR8-01# show cable dsg tunnel 2200 client
tunnel client client client client
id listId id id type address vendor
-----
2200 22 1 CA System ID 0x0E00
      2 MAC Addr 000a.000a.000a
```

## Check cable intf. Tunnel association

```
CBR8-01# show cable dsg tunnel 2200
tunnel TG cfr tunnel rule client service
id state mac-addr id id state I/F id state listId class
-----
2200 en 0100.0000.0022 60 2200 en C1/0/0 3 en 22
      C2/0/0 3 en
      C3/0/0 3 en
```

## Check tunnel cfrs configuration for all tunnels

```
CBR8-01# show cable dsg tunnel 2200 cfrs
tunnel cfr cfr cfr destination ip source ip srcPre d_port d_port
id id state pri address address length start end
-----
2200 2200 en 1 232.10.10.1 13.135.8.104 32 2200 13821
```

*Check your interface is listed*

## Check DSG tunnel counters for all tunnels

```
CBR8-01# show cable dsg tunnel 2200 statistics
tunnel cfr cfr destination ip source ip total total
id id state address address forwarded received
-----
2200 2200 en 232.10.10.1 13.135.8.104 120355774 120355774
```

*Make sure incrementing*

*Multicast Group is correct*

# ADSG Troubleshooting

## Verifications

- Tunnel Groups
- Classifiers
- Client List
- MDD
- DCD
- Timers
- IP Multicast

### Show interface cable *slot/subslot/port* dsg downstream

```
CBR8-01#show interface cable 1/0/0 dsg downstream
chan  chan  chan timer  init      oper      twoWay oneWay num  num    num  num    num
list  index  freq index  timeout  timeout  timer   timer  rule tunnel cfr  client vsp
-----
                1      2      150     10      150     3      3      3      3      3      0
```

### Show interface cable *slot/subslot/port* dsg downstream tunnel

```
CBR8-01#show interface cable 1/0/0 dsg downstream tunnel
tunnel          TG      cfr      rule  client service
id  state mac-addr      id  id  state id state listId class
-----
200  en 0100.0000.0002 20  200  en 1      en 2
1200 en 0100.0000.0012 40  1200 en 2      en 12
2200 en 0100.0000.0022 60  2200 en 3      en 22
```

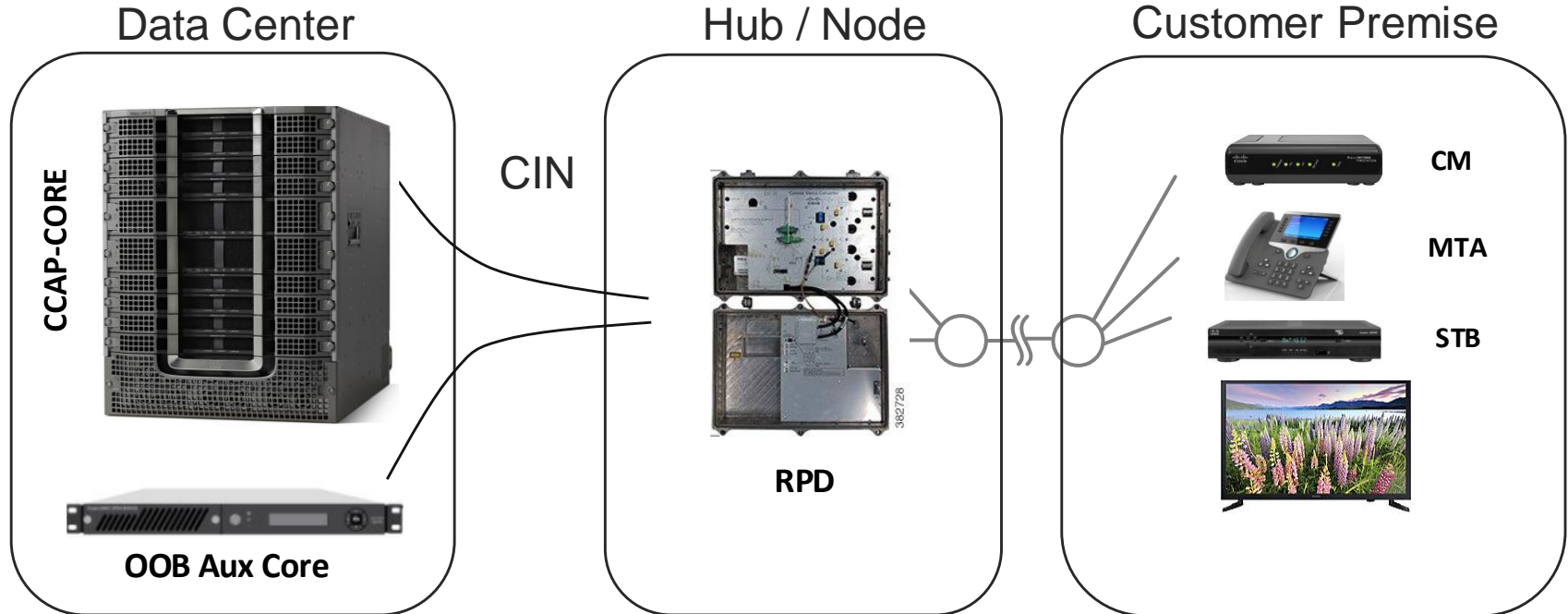
### Show interface cable *slot/subslot/port* dsg downstream tg

```
CBR8-01#show interface cable 1/0/0 dsg downstream tg
TG: 20  Chan: 100  State: en  Pri: 0  Vendor:      UCID:
      rule      tunnel
      id state id  state mac-addr      id  state dest-ip      In  clients
      id state id  state mac-addr      id  state dest-ip      DCD listId
-----
1      en 200  en 0100.0000.0002 200  en 232.10.10.2  yes 2
TG: 40  Chan: 100  State: en  Pri: 0  Vendor:      UCID:
2      en 1200 en 0100.0000.0012 1200 en 232.10.10.3  yes 12
TG: 60  Chan: 100  State: en  Pri: 0  Vendor:      UCID:
3      en 2200 en 0100.0000.0022 2200 en 232.10.10.1  yes 22
```

# Reference Architecture

## CCAP with Remote PHY

- DOCSIS 3.1 High Speed Data
- Video Aux Core
- Video OOB for DAVIC



# Video Services with RPHY

## Considerations

- Controller(s) are now “Downstream-Cable”
- Controllers instantiate profile(s): “cable downstream controller-profile”
- Controller RF-channel Type “Video” are now “Video Sync” or “Video Async”
- Video RF-Channels are either part of an Auxiliary core or part of the Principal core
- cBR8 IOS-XE must be 16.8 and later / RPD version must be 4.1 and later
- Cable Video largely unchanged – Only SDG controllers need to be updated to “rpd downstream-cable”

# Video Services with RPHY

## Auxiliary Core and Principal Core

- Option 1 – Set up Video within the Principal Core:

### Controller Configuration

```
cable downstream controller-profile 36
multicast-pool 2
max-ofdm-spectrum 192000000
rf-chan 0 31
  type DOCSIS
  qam-profile 1
  frequency 405000000
  rf-output NORMAL
  docsis-channel-id 1
rf-chan 32 39
  type VIDEO SYNC
  qam-profile 5
  frequency 111000000
  rf-output NORMAL
rf-chan 158
  docsis-channel-id 159
  ofdm channel-profile 7
  start-frequency 690000000 width 192000000 plc 783000000

cable depi multicast pool 2 ip address 225.225.225.0 255.255.255.0
```

Controller-Profile

Instantiation now automatic depending on RPD assignment

Type Video Sync / Async

### RPD Configuration

```
cable rpd RPD_1
description LAB-RPD
identifier 0000.aabb.ccdd
core-interface Te1/1/0
principal
  rpd-ds 0 downstream-cable 1/0/0 profile 36
  rpd-us 0 upstream-cable 1/0/0 profile 1
  rpd-us 1 upstream-cable 1/0/1 profile 1
  network-delay dlm 10
  core-interface Te1/1/6
  rpd-ds 0 downstream-cable 1/0/31 profile 41
  r-dti 6
  rpd-event profile 5
```

Controller Profile 36 under Principal

Aux-Core here – not our profile

Multicast Pool – DEPI-UEPI

# Video Services with RPHY

## Auxiliary Core and Principal Core

- Option 2 – Set up Video in an Auxiliary Core

### Controller Configuration

```
cable downstream controller-profile 20  
multicast-pool 1  
rf-chan 32 39  
type VIDEO SYNC  
qam-profile 5  
frequency 111000000  
rf-output NORMAL
```

### RPD Configuration

```
cable rpd RPD_1  
identifier 0000.abcd.1234  
core-interface Te1/1/0  
principal  
rpd-ds 0 downstream-cable 1/0/0 profile 10  
rpd-us 0 upstream-cable 1/0/0 profile 1  
core-interface Te9/1/6  
rpd-ds 0 downstream-cable 9/0/31 profile 20  
r-dti 1  
rpd-event profile 5
```

Notice here the Profile 20 is under the non-principal (Aux) core

# Automation – Ansible for LCHA Failovers

## Walkthrough

- **Objective:** Leverage Ansible to incrementally LCHA failover defined Cable Line Cards one-by-one and fail back
- **Use-Case:** DDTS which may require Linecard reinitialization unavailable by LCPR. For example, FPGA DDTS requiring FPGA reinitialization.
- **Value:** Typically an operator doing this manually will spend 12-15 minutes per CLC and is extremely tedious.

We will take Cisco.com's Firmware upgrade Ansible script for 16.7.1 and hack it to fit our needs !

# Automation – Ansible for LCHA Failovers

## Walkthrough

- **Step 1:** Obtain the container for 16.7.1a Firmware Package upgrade on Cisco.com
- **Step 2:** Start the docker container
  - Example: `docker run -it ansible1671 /bin/bash`
- **Step 3:** Edit the necessary control files within `/opt/cbr-8_upgrade_ansible_16.5_or_16.6_to_16.7.1`
  - **hosts** : Define the chassis IP you wish to perform this on
  - **secrets.yaml** : Define authentication credentials – keep secure
  - **upgrade\_vars.yaml** : Set parameters for upgrade – set your `src_dir` to harddisk and define your `slot_to_upgrade` parameters (range of CLCs to do this on)
- **Step 4:** Copy the `mop_upgrade.yaml` to a different filename `automate-LCHA-Failovers.yaml`

# Automation – Ansible for LCHA Failovers

## Walkthrough

- **Step 5:** Edit your new `automate-LCHA-Failovers.yaml`

- **Comment out the following sections:**

- # - include: tasks/get\_target\_file.yaml
- # - include: tasks/check\_md5.yaml
- # - set\_fact: script\_start\_time
- # - debug: var=script\_start\_time
- # - include: tasks/no\_secondary\_lc.yaml
- # - include: tasks/sup\_cpld\_upgrade.yaml
- # - include: tasks/wait\_slot\_ok.yaml
- # - name: wait slot {{slot\_standby}} status ok
- # - include: tasks/change\_global\_var.yaml
- # - include: tasks/lc\_cpld\_upgrade\_inter.yaml
- # - include: tasks/gemini\_upgrade\_auto\_inter\_sub.yaml

# Automation – Ansible for LCHA

## Walkthrough

- **Step 6:** Edit your new `automate-LCHA-Failovers.yaml`
  - Immediately after the comment out of the Gemini upgrade, add
    - `# - include: tasks/gemini_upgrade_auto_inter_sub.yaml`
    - `- debug: msg="Start LCHA Failover Tasks"`
    - `- include: tasks/lc_failover_reload_inter.yaml when: "{{slot_standby}} >= 0"`
    - `- debug: msg="LCHA Failover complete"`
    - `- include: tasks/wait_slot_ok.yaml slot_num={{item}} with_items: "{{slot_list}}" when: "{{slot_standby}} < 0"`
  - Continue then to comment out the following sections
    - `# - include: tasks/recover_secondary_lc.yaml`
    - `# - include: tasks/save_config.yaml`
    - `# - include: tasks/check_result.yaml`
    - `# - debug: msg="slot{{item}} state is wrong, didn't perform upgrade, please fix it and try again!"`

# Automation – Ansible for LCHA

## Walkthrough

- **Step 7:** Change your working directory to `tasks/`
- **Step 8:** Copy `wait_slot_to_stdbby_warm.yaml` to `wait_slot_to_stdbby_hot.yaml`
- **Step 9:** Edit `wait_slot_to_stdbby_hot.yaml`
  - Change the **register** to `register: platform_status_end2`
  - Change `platform_status_end` to `platform_status_end2`
  - Change the `find` to “**Stdbby Hot**” `platform_status_end2.stdout[0].find("Stdbby Hot") != -1`
- **Step 10:** Create file `lc_failover_reload_inter.yaml`
  - Edit it to contain
    - ```
- include: tasks/lc_failover_reload_inter_step1.yaml slot_num={{item}} with_items:
  "{{slot_list}}"
```

# Automation – Ansible for LCHA

## Step 11: Create file lc\_failover\_reload\_inter\_step1.yaml

```
- debug: msg="Debug in LC reload Step1 , slot number is {{ slot_num }}, slot_list is {{ slot_list }}"
- include: tasks/wait_slot_to_stdby_warm.yaml
  with_items: "{{slot_list}}"
  when: "{{slot_standby}} >= 0"
- debug: msg="Debug in LC 0 is ready, proceed to failover"
- name: switchover to slot {{slot_num}}
  ios_command:
  provider: "{{ provider }}"
  timeout: 300
  commands:
    - redundancy linecard switchover from slot {{slot_num}}
- name: wait 60s
  command: sleep 60
- debug: msg="Debug Post failover, wait for original working to come back ready, proceed to failover"
- include: tasks/wait_slot_to_stdby_hot.yaml
  with_items: "{{slot_num}}"
  when: "{{slot_standby}} >= 0"
- debug: msg="Debug Post failback, proceeding"
- name: switchover back to slot {{slot_num}}
  ios_command:
  provider: "{{ provider }}"
  timeout: 300
  commands:
    - redundancy linecard switchover from slot 0
- debug: msg="Debug Failedback"
- name: wait 300s
  command: sleep 300
```

# Automation – Ansible for LCHA

## Walkthrough

- **Step 12:** Return to the parent directory `/opt/cbr-8_upgrade_ansible_16.5_or_16.6_to_16.7.1`
- **Step 13:** Execute the ansible playbook when desired
  - `ansible-playbook -i hosts automate-LCHA-Failovers.yaml`

# 1.d - Show Modem "select" Information

```

cBR8-01#scm select ipv6 where dsxus is "33x4"
ipv6
=====
2001:DB8:FFFF:C:21D:D4FF:FED3:31D2
2001:DB8:FFFF:C:21D:D4FF:FED3:3122
2001:DB8:FFFF:C:2273:55FF:FEC6:35BB
cBR8-01#show cable modem select ip where dsxus is
"33x5"
ip
=====
13.42.0.64
13.42.0.25
13.42.1.119
13.42.0.24
cBR8-01#show cable modem select mac where dsxus is "33x5"
mac
=====
14b7.f80e.3ffc
14b7.f80e.3ee4
6477.7d90.43f2
14b7.f80e.3d2c
    
```

| Show Cable Modem               | SQL                                                             |
|--------------------------------|-----------------------------------------------------------------|
| show cable modem               | select *                                                        |
| scm docsis version d31-capable | select mac where macver like "DOC3.1%"                          |
| scm wideband                   | show cable modem select mac,ip,intf where st is "w-online(pt)"  |
| scm primary                    | Show cable modem select mac,ip,intf,primds order by primds desc |

```

cBR8-01#scm 14b7.f80e.3f10 phy

MAC Address      I/F          Sid  USPwr  USMER  Timing  DSPwr  DSMER  Mode  DOCSIS
                (dBmV)      (SNR)  Offset (dBmV)  (SNR)  (dB)   (dB)   (dB)   Prov
14b7.f80e.3f10  C2/0/1/U4   345   52.75  ----- 2391  - 9.20  41.60  ofdma  1.1
    
```



# cBR-8 Operational Maintenance

# cBR-8 Exec and Filesystem

## Navigating and Tools

- IOS-D has some Unix-like Commands
- pwd/cd/dir (but no ls)
- **Regex Arguments**
- Pipe ( | ) options

```
CBR8-01# cd XE318
CBR8-01# dir
Directory of bootflash:/XE318/

177761  -rw-          28685264  Mar 30 2016
13:24:57 -04:00  cbrsup-
cciomdsup.03.18.00.S.156-2.S-std.SPA.pkg
7804653568 bytes total (2629476352 bytes free)
```

```
CBR8-01# pwd
bootflash:/
CBR8-01# del *
```

Delete filename [\*]?  
Delete bootflash:/lost+found?  
[confirm]n  
Delete of bootflash:/lost+found  
aborted!

```
CBR8-01#sh run | section controller
Integrated-Cable 1/0/0
controller Integrated-Cable 1/0/0
max-carrier 96
rf-chan 0 15
type DOCSIS
rf-chan 16 31
type VIDEO
```

```
CBR8-01#show cable modem docsis de | count RTR|MTA
Number of lines which match regexp = 82
CBR8-01#show cable modem docsis de | count MTA
Number of lines which match regexp = 31
CBR8-01#show cable modem docsis de | count RTR
Number of lines which match regexp = 81
```

| Char          | Meaning                                                                            |
|---------------|------------------------------------------------------------------------------------|
| .             | Matches any single character, including white space                                |
| *             | Matches 0 or more sequences of the pattern                                         |
| +             | Matches 1 or more sequences of the pattern                                         |
| ?             | Matches 0 or 1 occurrences of the pattern                                          |
| ^             | Matches the beginning of the string                                                |
| \$            | Matches the end of the string                                                      |
| -             | Matches , { } ( ), the beginning of the string, the end of the string, or a space. |
| \             | Delimiter above characters                                                         |
| Argument      | Use Case                                                                           |
| section       | Section indented after match                                                       |
| count         | Regex count                                                                        |
| begin         | Show line and all lines after match                                                |
| include       | Show only matching line                                                            |
| redirect path | Redirect to output file                                                            |

# cBR-8 High Availability

## Route Processor

- When and How to use it
- What to expect
  - Time may take up to 30 seconds
  - Modems should not drop offline
  - Uplinks on both SUPs remain functional

## Redundancy Switchover History

```
CBR8-01# show redundancy switchover history
```

| Index | Previous active | Current active | Switchover reason   | Switchover time  |
|-------|-----------------|----------------|---------------------|------------------|
| 1     | 48              | 49             | active unit removed | 10:30:07 edt Mon |
| 2     | 49              | 48             | user forced         | 15:35:42 edt Wed |

## Initiating a SUP Failover

```
CBR8-01# redundancy force-switchover
```

```
Proceed with switchover to standby RP? [confirm]  
Manual Swact = enabled  
Connection to 13.42.0.1 closed by remote host.  
Connection to 13.42.0.1 closed.
```

## Show Redundancy

```
CBR8-01# show redundancy
```

```
Redundant System Information :
```

```
-----  
Available system uptime = 1 week, 4 days, 21 hours, 44  
minutes
```

```
Switchovers system experienced = 2
```

```
Standby failures = 0
```

```
Last switchover reason = user forced
```

```
Hardware Mode = Duplex
```

```
Configured Redundancy Mode = sso
```

```
Operating Redundancy Mode = sso
```

```
Maintenance Mode = Disabled
```

```
Communications = Up
```

```
Current Processor Information :
```

```
Active Location = slot 4
```

```
Current Software state = ACTIVE
```

```
Uptime in current state = 7 minutes
```

```
Image Version = Cisco IOS Software, cBR  
Software (X86_64_LINUX_IOSD-UNIVERSALK9-M), Version  
15.6(2)S0a, RELEASE SOFTWARE (fc1)
```

```
BOOT = bootflash:/XE318/packages.conf,12;
```

```
CONFIG_FILE =
```

```
Configuration register = 0x2102
```

```
Peer Processor Information :
```

```
Standby Location = slot 5
```

```
Current Software state = STANDBY HOT
```

```
Uptime in current state = 0 minutes
```

```
Image Version = Cisco IOS Software, cBR  
Software (X86_64_LINUX_IOSD-UNIVERSALK9-M), Version  
15.6(2)S0a, RELEASE SOFTWARE (fc1)
```

```
BOOT = bootflash:/XE318/packages.conf,12;
```

```
CONFIG_FILE =
```

```
Configuration register = 0x2102
```

# cBR-8 High Availability Cable Linecard

- When and How to use it
- Revertive Timer
  - Default is 120 seconds
- What to expect
  - Time may take up to 30 seconds
  - Modems should not drop offline
  - Modems now reporting on Slot 0

## Basic Configuration

```

CBR8-01#sh run | sec redund
redundancy
mode sso
linecard-group 0 internal-switch
class 1:N
member slot 1 primary
member slot 2 primary
member slot 0 secondary
revertive 120
    
```

## Check Redundancy State

```

CBR8-01#show redundancy linecard all

```

| Slot | Subslot | Group | LC | My State | Peer State | Peer Slot | Peer Subslot | Role    | Mode      |
|------|---------|-------|----|----------|------------|-----------|--------------|---------|-----------|
| 1    | -       | 0     |    | Active   | Stdby Warm | 0         | -            | Active  | Primary   |
| 2    | -       | 0     |    | Active   | Stdby Warm | 0         | -            | Active  | Primary   |
| 0    | -       | 0     |    | -        | -          | Multiple  | None         | Standby | Secondary |

## Initiate a Failover

```

CBR8-01# redundancy linecard-group switchover from slot 1
Bringing 1:N Secondary slot (0) to Hot Standby for manual switchover.
    
```

## Check Redundancy State Post Failover

```

CBR8-01#sh redundancy line all
Load for five secs: 19%/2%; one minute: 12%; five minutes: 16%
Time source is NTP, 15:43:57.635 edt Wed May 4 2016

```

| Slot | Subslot | Group | LC | My State | Peer State | Peer Slot | Peer Subslot | Role   | Mode      |
|------|---------|-------|----|----------|------------|-----------|--------------|--------|-----------|
| 1    | -       | 0     |    | Init     | Active     | 0         | -            | None   | Primary   |
| 2    | -       | 0     |    | Active   | Unavail    | 0         | -            | Active | Primary   |
| 0    | -       | 0     |    | Active   | Init       | 1         | -            | Active | Secondary |

## Post-Failover Mac-Domains

```

CBR8-01#show cable modem summary total

```

| Interface | Description | Total | Reg | Oper | Unreg | Offline | Wideband | initRC | initD | initIO |
|-----------|-------------|-------|-----|------|-------|---------|----------|--------|-------|--------|
| init0     |             |       |     |      |       |         |          |        |       |        |
| C0/0/0/UB |             | 5     | 5   | 5    | 0     | 0       | 5        | 0      | 0     | 0      |
| C0/0/0/U1 |             | 1     | 1   | 1    | 0     | 0       | 0        | 0      | 0     | 0      |
| C0/0/1/UB |             | 29    | 29  | 29   | 0     | 0       | 29       | 0      | 0     | 0      |

# cBR-8 Linecard Health

## Platform

| Command                                               | When to Use                          |
|-------------------------------------------------------|--------------------------------------|
| show platform [diag]                                  | Monitoring card states               |
| show env power                                        | Monitoring power budgets             |
| show facility-alarm status                            | Monitoring critical alarms           |
| show cable card slot/subslot ds-phy display   inc ver | Monitoring correct firmware versions |
| hw-module slot {0-9,R0,R1} {reload start stop}        | Resetting hardware                   |

## Show Platform Diag

```
CBR8-01# show platform diag
Chassis type: CBR-8-CCAP-CHASS
Slot: 0, CBR-CCAP-LC-40G
    Running state           : ok
    Internal state          : online
    Internal operational state : ok
    Physical insert detect time : 00:01:18 (2d05h ago)
    Software declared up time  : 00:38:48 (2d04h ago)
    CPLD version             : 00000021
    Rommon version           : 2011.03.13
    PSOC 0 version           : v4.6
Pic: 0/1, CBR-RF-PROT-PIC
    Internal state          : inserted
    Physical insert detect time : 00:02:43 (2d05h ago)
    Firmware version:       : 0000071E
```

## Show Platform

```
CBR8-01# show platform
Chassis type: CBR-8-CCAP-CHASS
Slot      Type                State      Insert
time (ago)
-----
-----
0         CBR-CCAP-LC-40G             ok         2d05h
0/1      CBR-RF-PROT-PIC            ok         2d05h
1       CBR-CCAP-LC-40G           booting   2d05h
1/1      CBR-RF-PIC                  ok         2d05h
2        CBR-CCAP-LC-40G             ok         2d05h
2/1      CBR-RF-PIC                  ok         2d05h
SUP0     CBR-CCAP-SUP-160G       inserted  2d05h
  R0     ok, standby
  F0     ok, standby
  4      ok, standby
  4/1    CBR-SUP-8X10G-PIC          ok         2d05h
SUP1     CBR-CCAP-SUP-160G         inserted   2d05h
  R1     ok, active
  F1     ok, active
  5      ok, active
  5/1    CBR-SUP-8X10G-PIC          ok         2d05h
P0       CBR-AC-PS                  ok         2d05h
<SNIP>
P14     CBR-FAN-ASSEMBLY           ok         2d05h

Slot      CPLD Version                Rommon Version
-----
0         00000021                    2011.03.13
1         00000021                    2011.03.13
2         00000021                    2011.03.13
SUP0    15091511                    15.5 (3r) S
SUP1    15091511                    15.5 (3r) S
```

# IOS-XE Upgrade and Installation

## Consolidated Mode

- Traditional Model
- Mimics Traditional IOS
- IOS-XE automatically extracts and links appropriate packages
- One-Shot Upgrade

## Verify MD5

```
CBR8-01#verify /md5 bootflash:cbrsup-universalk9.03.18.00a.S.156-2.S0a-ext.SPA.bin aceclf32a0b8898ecee0f7f31ee5797
.....Done!
Verified (bootflash:cbrsup-universalk9.03.18.00a.S.156-2.S0a-ext.SPA.bin) =
aceclf32a0b8898ecee0f7f31ee5797
```

## Point Bootvar to Image

```
CBR8-01(config)# no boot system
CBR8-01(config)# boot system bootflash:cbrsup-universalk9.03.18.00a.S.156-2.S0a-ext.SPA.bin
CBR8-01# copy run start
```

## Verify Bootvar

```
CBR8-01#show bootvar

BOOT variable = bootflash:cbrsup-universalk9.03.18.00a.S.156-2.S0a-ext.SPA.bin,12;

Standby BOOT variable = cbrsup-universalk9.03.18.00a.S.156-2.S0a-ext.SPA.bin,12;
```

## Reload

```
CBR8-01# reload
```

# IOS-XE Upgrade and Installation

## Sub-Package Mode

- IOS-XE loads individual packages
- Activate and Install only the Packages you want
- Allows ISSU Patch Application

### Make Directory (Optional)

```
CBR8-01#mkdir bootflash:/XE318
Create directory filename [XE318]?
Created dir bootflash:/XE318
CBR8-01#cd XE318
CBR8-01#pwd
bootflash:/XE318/
```

### Extract Image Packages to directory

Do this for Stby-bootflash too

```
CBR8-01# request platform software package expand file
bootflash:16.32_johuynh.SSA.bin to bootflash:/XE318SP_ECE1 force
Thu May 5 16:35:11 edt 2016 Verifying parameters
Thu May 5 16:35:11 edt 2016 Validating package type
Thu May 5 16:36:00 edt 2016 Copying package files
Thu May 5 16:37:37 edt 2016 SUCCESS: Finished expanding all-in-one software
package.
```

### Verify

```
CBR8-01#dir bootflash:/XE318/
Directory of bootflash:/XE318/
565602  -rw-          12856   May 5 2016 16:42:13 -04:00  cbrsup-packages-universalk9.2016-04-
22_16.32_johuynh.conf
565603  -rw-          35972052   May 5 2016 16:42:17 -04:00  cbrsup-rp-firmware.2016-04-22_16.32_johuynh.SSA.pkg
129284  -rw-          13697    May 5 2016 16:43:24 -04:00  packages.conf
```

You can use the <image-name>.conf as well!

### Update Bootvar

```
CBR8-01(config)#boot sys bootflash:/XE318/packages.conf
```

# In Service Software Upgrade (ISSU)

## Hitless IOS-XE Upgrade

- request platform software package install node file *path*
- Requires SUP Switchover
- If LC Firmware Upgrade – Requires CLC reset

### Requirements

Dual SUP  
Standby SUP is Standby HOT  
Auto-boot Enabled  
At least 700MB free on Bootflash  
Only between same IOS Trains  
IOS-XE 3.18.0S and later

## Copy Target IOS-XE Bin to the packages directory

```
CBR8-01# copy ftp:<image> bootflash:XE318/<image>
```

## Initiate Upgrade

```
CBR8-01# request platform software package install node file  
bootflash:XE318/cbrsup-universalk9.2016-03-28_08.17_johuyh.SSA.bin  
--- Starting initial file path checking ---  
--- Starting config-register verification ---  
--- Starting image file expansion ---  
STAGE 1: Installing software on standby RP =====  
--- Starting local lock acquisition on R0 ---  
--- Starting installation state synchronization ---  
--- Starting ISSU compatibility verification ---  
--- Starting commit of software changes ---  
SUCCESS: Software provisioned. New software will load on reboot.  
STAGE 2: Restarting standby RP =====  
--- Starting standby reload ---  
--- Starting wait for Standby RP to reach terminal redundancy state ---  
STAGE 3: Installing software on active RP =====  
--- Starting local lock acquisition on R0 ---  
--- Starting installation state synchronization ---  
--- Starting list of software package changes ---  
--- Starting commit of software changes ---  
SUCCESS: Software provisioned. New software will load on reboot.  
Write failed: Broken pipe
```

Due to SUP Failover – Re-login here

# Smart Software Licensing

## Registering the cBR-8

### Configuration

- 
- license smart register idtoken *IDToken*

### Verification and Debugging

- show license status [all]
- show license show-tech
- debug smart\_lic {all|error|info}
- debug crypto pki {validation|trans}

## Register

```
CBR8-01#license smart deregister
CBR8-01# license smart register idtoken
YzUyOTIzZWYtOTA2OS00ZjQ1LWFhNzMtMGMxZWQxNmIOMTdhdhLTEONjYwMTA$
Registration process is in progress. Use the 'show license
status' command to check the progress and result
```

## Configuration

```
CBR8-01# sh run | sec call-home
call-home
  profile "CiscoTAC-1"
    reporting smart-licensing-data
  destination
  https://10.225.198.29:443/Transportgateway/services/DeviceRequest
  tHandler
  no destination
  https://10.225.198.29:443/Transportgateway/services/DeviceRequest
  snmp-server
```

## Status

```
CBR8-01# show call-home profile CiscoTAC-1
Profile Name: CiscoTAC-1
Profile status: ACTIVE
Profile mode: Full Reporting
Reporting Data: Smart Licensing
Preferred Message Format: xml
Message Size Limit: 3145728 Bytes
Transport Method: http
Email address(es): callhome@cisco.com
HTTP address(es):
https://10.225.198.29:443/Transportgateway/services/DeviceRequest
tHandler
```

# Smart Software Licensing

**TIP:** You can force a re-reg on-demand by license smart register idToken command

## Common Issues

- **cBR-8 Registration Failure**
  - ip http client source-interface *interface*
  - ip domain-name {lookup|source-int *intf*}
  - ip domain-name *name*
  - crypto pki trustpoint SLA-TrustPoint
  - revocation {crl|none}
  - aaa-authorization username "callhome"
- **Operating Models**
  - Direct connect to Cisco cloud
  - Satellite
  - Offline Mode
- **Call-Home Best Practices**

## Registration Status

```
CBR8-01# show license status
Smart Licensing is ENABLED
Registration:
  Status: REGISTERING - REGISTRATION IN PROGRESS
  Export-Controlled Functionality: Not Allowed
  Initial Registration: FAILED on May 16 18:30:07 2016 edt
  Next Registration Attempt: May 16 19:34:41 2016 edt
License Authorization:
  Status: EVAL MODE
  Evaluation Period Remaining: 37 days, 11 hours, 54 minutes, 37 seconds
```

## Source and Domain Name

```
CBR8-01# sh run | i ip http client source|ip domain-name
ip domain-name cisco
ip http client source-interface Loopback0
```

## Crypto

```
CBR8-01# sh run | sec crypto pki trustpoint SLA-TrustPoint
crypto pki trustpoint SLA-TrustPoint
  enrollment terminal
  revocation-check crl
```

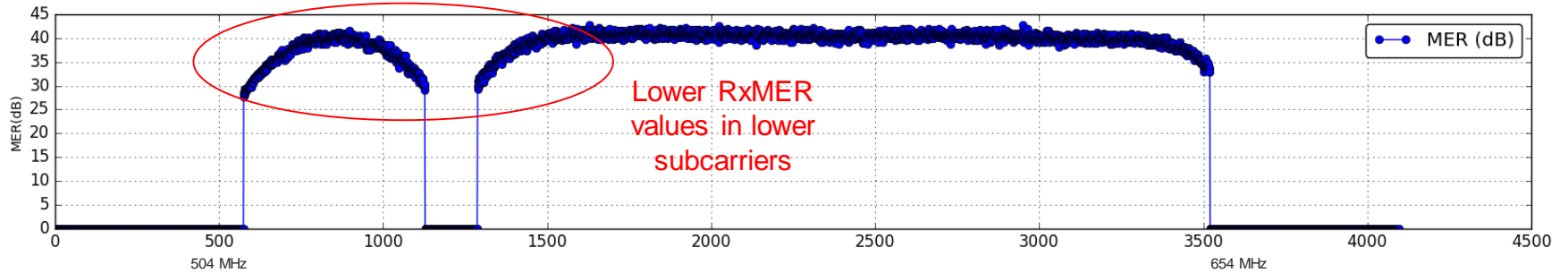
# OFDM and OFDMA Optimization

# Max Carrier/OFDM to Base Channel Power

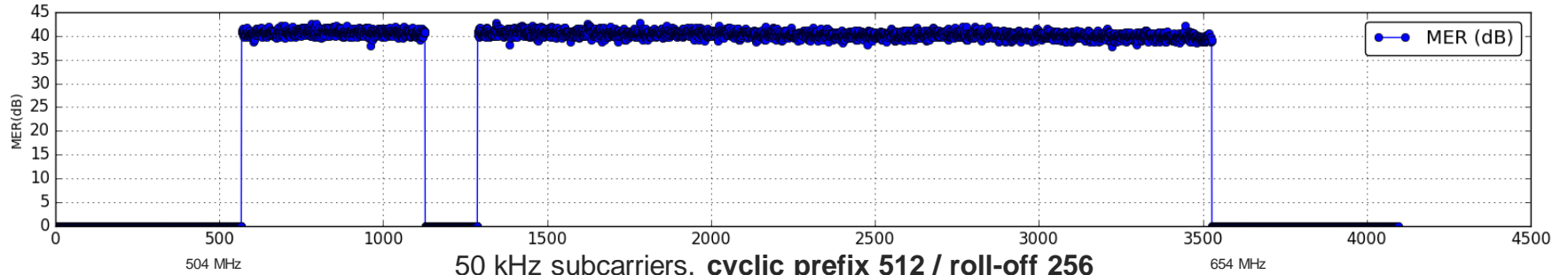
Example Supported Ranges in dBmV

| Max Carrier | No OFDM | 24 MHz OFDM | 48 MHz OFDM | 96 MHz OFDM | 144 MHz OFDM | 192 MHz OFDM | 384 MHz OFDM |
|-------------|---------|-------------|-------------|-------------|--------------|--------------|--------------|
| 8           | 41 - 50 | 39 - 48     | 37 - 46     | 35 - 44     | 34 - 43      | 32 - 41      | 29 - 38      |
| 16          | 37 - 46 | 36 - 45     | 35 - 44     | 34 - 43     | 32 - 41      | 31 - 40      | 29 - 38      |
| 24          | 35 - 44 | 34 - 43     | 34 - 43     | 32 - 41     | 31 - 40      | 31 - 40      | 28 - 37      |
| 32          | 34 - 43 | 33 - 42     | 32 - 41     | 31 - 40     | 31 - 40      | 30 - 39      | 28 - 37      |
| 48          | 31 - 40 | 31 - 40     | 31 - 40     | 30 - 39     | 29 - 38      | 29 - 38      | 27 - 36      |
| 64          | 30 - 39 | 30 - 39     | 29 - 38     | 29 - 38     | 28 - 37      | 28 - 37      | 26 - 35      |
| 96          | 28 - 37 | 28 - 37     | 27 - 36     | 27 - 36     | 27 - 36      | 26 - 35      | 25 - 34      |
| 128         | 26 - 35 | 26 - 35     | 26 - 35     | 26 - 35     | 25 - 34      | 25 - 34      | 24 - 33      |
| 158         | 25 - 34 | 25 - 34     | 25 - 34     | 25 - 34     | 24 - 33      | 24 - 33      | - NA -       |

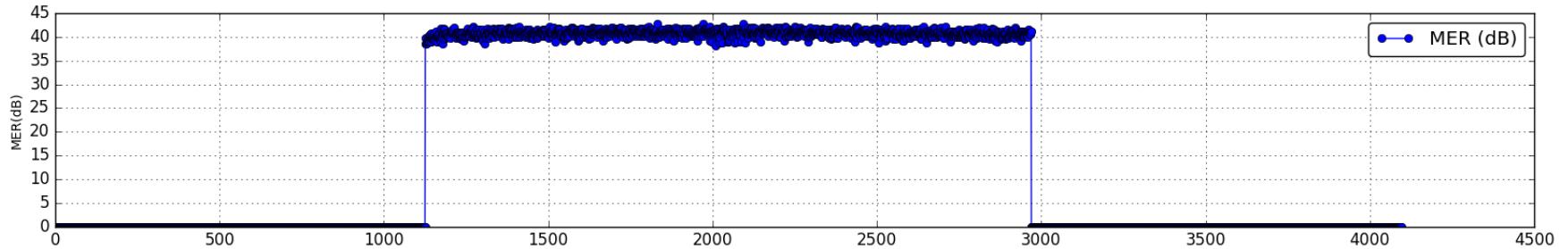
150 MHz OFDM channel 504 MHz – 654 MHz with node plus 5 amplifiers



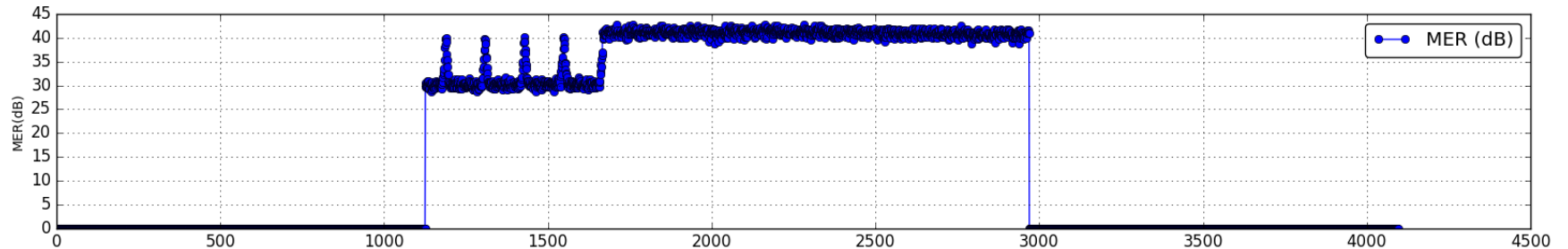
50 kHz subcarriers, **cyclic prefix 192 / roll-off 128**  
Channel speed 1342 Mbps @ 4096-QAM (1230 Mbps @ 2048-QAM)



## LDPC and frequency interleaving in D3.1 makes channel very robust to impairments



96 MHz OFDM channel running 4096-QAM no uncorrectable FEC codewords  
(cBR8 would recommend 2048-QAM profile by default)



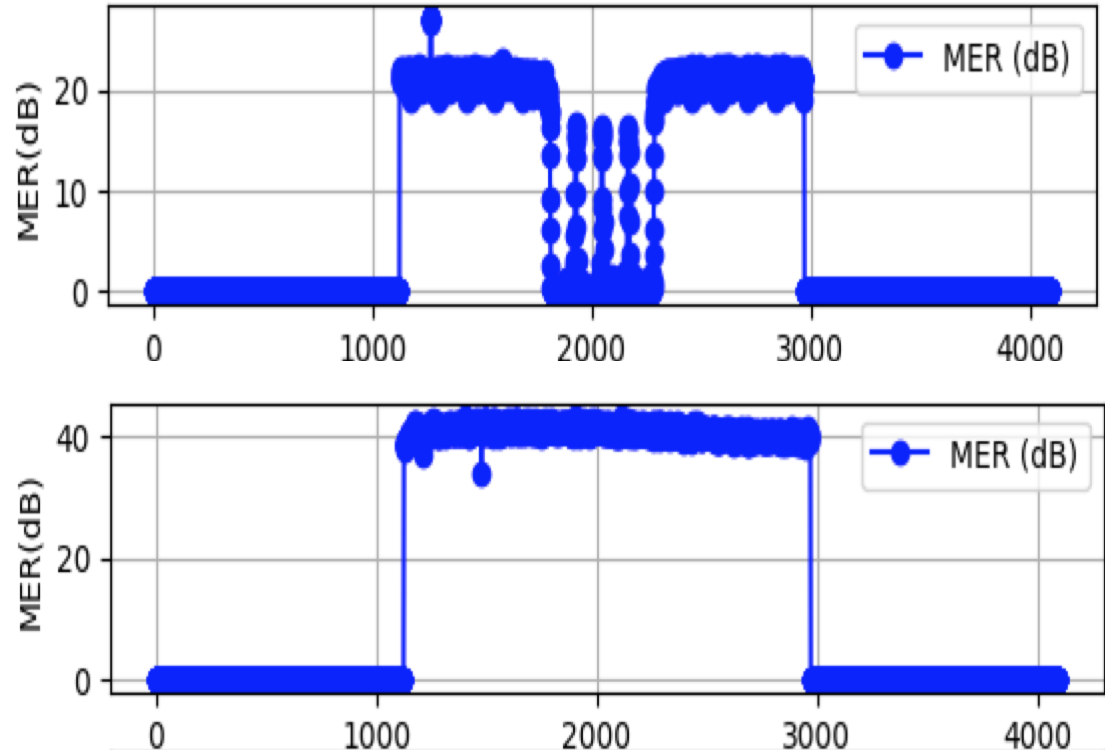
Same 96 MHz OFDM channel (now with 30 MHz interference) still running 4096-QAM no uncorrectable FEC codewords  
(cBR8 would recommend 256-QAM profile by default)

# Usefulness of RxMER data

RxMER data collection can be very useful in pinpointing plant problems

In this example it was found that some equipment was running tests from over a year ago across 4 channels and was never disabled

In the top diagram you can see the MER for the entire OFDM spectrum is degraded; the bottom diagram shows the spectrum after removing the interfering carriers



# OFDM Settings To Maximize Speeds

- **cyclic-prefix 192**
  - For larger channels ( $\geq 96$  MHz(50),  $\geq 144$  (25)) use lowest value (192)
  - For smaller channels ( $< 96$  MHz(50),  $< 144$  (25)) use 256 to allow larger roll-off
- **pilot-scaling 48**
  - Keep at lowest setting – default is 48
- **roll-off 128**
  - Make as large as possible but must be less than cyclic prefix value
- **subcarrier-spacing 25KHZ**
  - Less overhead for 25 kHz
- **profile-data 1 modulation-default 1024-QAM**
  - Make data profile as high as HFC plant will support
- **profile-ncp modulation-default 64-QAM**
  - Make NCP as high as plant will support

# OFDM Profile Management Settings

- `cable downstream ofdm-prof-mgmt prof-dwngrd-auto`
  - Allow automatic profile downgrades after a profile declared unfit (default on)
- `cable downstream ofdm-prof-mgmt rxmer-poll-interval`
  - Period of RxMER polling (default 60 mins)
- `cable downstream ofdm-prof-mgmt exempt-sc-pct`
  - Percentage of sub-carriers allowed to be below the MER margin (default 2%)
- `cable downstream ofdm-prof-mgmt recommend-profile-age`
  - How long to cache recommended profile (default 120 mins)
- `cable downstream ofdm-prof-mgmt unfit-profile-age`
  - How long to cache unfit profile (default 60 mins)
- `cable downstream ofdm-prof-mgmt mer-margin-qdb`
  - Offset in 1/4 dB for MER margin determination

# OFDMA Profile Management Settings

- `cable upstream ofdma-prof-mgmt prof-upgrade-auto`
  - Allow automatic profile upgrade (default off\*) – default to change in later code
- `cable upstream ofdma-prof-mgmt rxmer-poll-interval`
  - Period of RxMER polling (default 60 mins)
- `cable upstream ofdma-prof-mgmt exempt-mslot-pct`
  - Percentage of minislots allowed to be below the MER margin (default 2%) )
- `cable upstream ofdma-prof-mgmt mer-margin-qdb`
  - Offset in 1/4 dB for MER margin determination
- `cable upstream ofdma-prof-mgmt active-scs-threshold-pct`
  - Percentage of active subcarriers allowed to be below the MER margin (default 2%) )

# OFDMA Recommendations (June 2019)

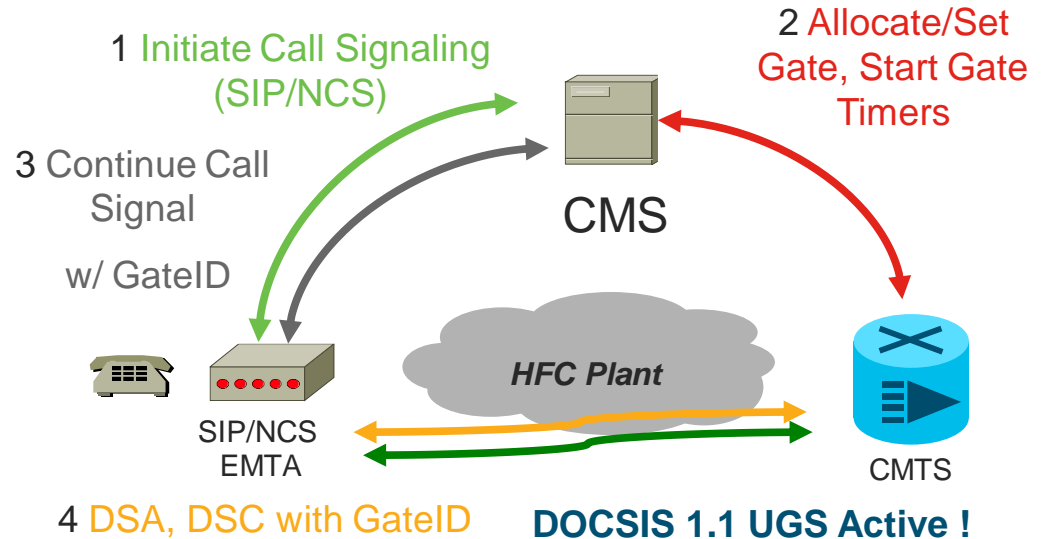
- Use range **40-85 MHz**
- Avoid exclusion bands if possible
  - modem interop because of **dynamic modulation change on SC-QAM**, throughput issues
- When creating USBGs -create at least one SC-QAM (UGS scheduled flow) in USBG **and no more than 4 SC-QAMs in the USBG (4+1)**
- Interface Cable, being with Upstream 6 for the OFDMA upstream
  - Reserve 4 and 5 for D2.0 US later
- Use 25 Khz subcarrier
- Use 64.5 MHz Initial Ranging and subcarrier 256 fine-ranging
- Avoid using more than 45 Mhz spectrum because of current linecard USPHY rate limit settings.
- Modulations 4096 and 2048 QAM Removed
  - Can re-enable for demo purposes
- Go with larger cyclic prefix rollout, testing works better with modem interop issues
- Use LCHA and not LCPR in general

# Troubleshooting cBR-8 Voice Services

# Voice Services

## Common Problems

- 1. No Voice
- 2. Voice Quality
  - Choppy / Jittery / Robotic
- 3. Unable to Make a Call



# Voice Services

## Commands

- show cable upstream service-flow summary
- show cable modem voice
- show cable modem *mac-address* service-flow [verbose]
- show interface cable *slot/subslot/port* service-flow qos us | include UGS
- show interface cable *slot/subslot/port* service-flow *sflow-id* verbose
- show interface cable *slot/subslot/port* dynamic-service statistics
- show cable admission-control interface *slot/subslot/port* {bonding-group all | upstream *us-number*}
- debug cable dynsrv
- debug cable qos

# Voice Services

## Dynamic Service Flow

### Debug cable dynsrv & Debug cable tlvs

```
Mar 9 19:28:49.792: DSA-REQ-RECD: OrgMac->0013.1050.3801 OrgId->89
Mar 9 19:28:49.792: DSA-STATE-CREATED: OrgMac->0013.1050.3801 OrgId->89
Mar 9 19:28:49.796: Found Upstream Service Flow TLV
Mar 9 19:28:49.796:     Service Flow Reference : 1
Mar 9 19:28:49.796:     QoS Parameter Set Type : 0x2
Mar 9 19:28:49.796:     Scheduling Type : 6
Mar 9 19:28:49.796:     Request/Transmission Policy : 0x17F
Mar 9 19:28:49.796:     Unsolicited Grant Size : 232
Mar 9 19:28:49.796:     Nominal Grant Interval : 20000
Mar 9 19:28:49.796:     Tolerated Grant Jitter : 800
Mar 9 19:28:49.796:     Grants Per Interval : 1
Mar 9 19:28:49.796: Found Upstream Packet Classifier TLV
Mar 9 19:28:49.796:     Classifier Reference : 1
Mar 9 19:28:49.796:     Service-Flow Reference : 1
Mar 9 19:28:49.796:     Rule Priority : 128
Mar 9 19:28:49.796:     Activation State : 0
Mar 9 19:28:49.796: Found IP Packet Classifier Sub-TLV
Mar 9 19:28:49.796:     Protocol : 17
Mar 9 19:28:49.796:     Source Address : 24.34.240.235
Mar 9 19:28:49.796:     Destination Address : 24.34.240.247
Mar 9 19:28:49.796:     Source Port Start : 53456
Mar 9 19:28:49.796:     Source Port End : 53456
Mar 9 19:28:49.796:     Destination Port Start : 53456
Mar 9 19:28:49.796:     Destination Port End : 53456
```

Mac-add of CM

DSA REQ Received

Admit Service Flow only

US Scheduling type UGS

Std. UGS size for G.711/20ms

20 ms grant interval

Classifier not active yet

RTP port numbers

# Voice Services

## Debug cable dynsrv & Debug cable tlvs

```
Mar 9 19:28:49.796: Found Downstream Service Flow TLV
Mar 9 19:28:49.796:   Service Flow Reference : 2
Mar 9 19:28:49.796:   QoS Parameter Set Type : 0x2
Mar 9 19:28:49.796:   Traffic Priority : 5
Mar 9 19:28:49.796:   Maximum Sustained Traffic Rate : 87200
Mar 9 19:28:49.796:   Maximum Traffic Burst : 1522
Mar 9 19:28:49.796:   Minimum Reserved Traffic Rate : 87200
Mar 9 19:28:49.796:   Minimum Reserved Rate Packet Size : 218
Mar 9 19:28:49.796: Found Downstream Packet Classifier TLV
Mar 9 19:28:49.796:   Classifier Reference : 2
Mar 9 19:28:49.796:   Service-Flow Reference : 2
Mar 9 19:28:49.796:   Rule Priority : 128
Mar 9 19:28:49.796:   Activation State : 0
Mar 9 19:28:49.796: Found IP Packet Classifier Sub-TLV
Mar 9 19:28:49.796:   Protocol : 17
Mar 9 19:28:49.796:   Source Address : 24.34.240.247
Mar 9 19:28:49.796:   Destination Address : 24.34.240.235
Mar 9 19:28:49.796: Auth Block:
Mar 9 19:28:49.796: 0x0000: 01 06 01 04 00 00 14 3E
Mar 9 19:28:49.796: Sfref = 1, SFID = 103 <- Service Flow IDs assigned by CMTS
Mar 9 19:28:49.796: Sfref = 2, SFID = 104
Mar 9 19:28:49.796: Cfr-ref = 1, CFID = 33, SF-ref 1, SFID 103
Mar 9 19:28:49.796: Cfr-ref = 2, CFID = 34, SF-ref 2, SFID 104
Mar 9 19:28:49.796: DSA-RSP-SENT: CM->0013.1050.3801 TranscId->89 ConfCode->0
Mar 9 19:28:49.896: DSA-ACK-RECD: OrgMac->0013.1050.3801 OrgId->89 ConfCode->0
Mar 9 19:28:50.196: DSA-REQ End : Transaction over-T8 timer expired. OrgMac->0013.1050.3801 OrgId->89
Mar 9 19:28:50.196: DYN-SRV-STATE-DESTROYED : OrgMac->0013.1050.3801 OrgId->89
```

*Admit Service Flow only*

*DS service flow with high priority*

*DQOS Gate ID contained here*

*SFID assigned for US and DS*

*DSA Response sent and ACK received*

# Voice Services

## Service Flow Verification

### Dynamic Service Flow

```
CBR8-01# show cable modem 0000.cad6.eeb6 service-flow verbose
```

```
Sfid : 143
Mac Address : 0000.cad6.eeb6
Type : Secondary (Dynamic)
Direction : Downstream
Current State : Active
Current QoS Indexes [Prov, Adm, Act] : [0, 11, 11]
Active Time : 24:02
Sid : N/A
Traffic Priority : 5
Minimum Reserved Rate : 87200 bits/sec
Admitted QoS Timeout : 200 seconds
Current Throughput : 87254 bits/sec, 50 packets/sec
Application Priority : 3
Classifiers:
Classifier Id : 79
Service Flow Id : 143
CM Mac Address : 0000.cad6.eeb6
Direction : downstream
Activation State : active
Classifier Matching Priority : 128
PHSI : 0
Number of matches : 72112
IP Classification Parameters:
IP Source Address : 14.80.82.7
Source IP Address Mask : 255.255.255.255
Destination IP Address : 14.80.82.141
Destination IP Address Mask : 255.255.255.255
```

Alternative: Show interface cable slot/subslot/port service-flow sfid verbose

DS dynamic service flow

DS Service Flow

High Priority for DS flow

Min Reserve rate

Current throughput

Source IP of DS flow

Destination IP of DS flow

# Voice Troubleshooting

## Dynamic Service Flow

- show interfaces c1/0/0 dynamic-service statistics
- show cable admission-control interface cable slot/sub/port upstream up-number

Can specify bonding-group too

### Dynamic Service Flow Statistics

```
CBR8-01# show interfaces c1/0/0 dynamic-service statistics
```

|         | Upstream | Downstream |
|---------|----------|------------|
| DSA REQ | 6647     | 0          |
| DSA RSP | 0        | 6865       |
| DSA ACK | 6823     | 0          |
| DSC REQ | 12014    | 0          |
| DSC RSP | 0        | 12028      |
| DSC ACK | 12025    | 0          |
| DSD REQ | 6627     | 37         |
| DSD RSP | 20       | 6627       |

Retransmission counts

|         | Upstream | Downstream |
|---------|----------|------------|
| DSA REQ | 9        | 0          |
| DSA RSP | 0        | 227        |
| DSA ACK | 154      | 0          |
| DSC REQ | 0        | 0          |
| DSC RSP | 0        | 14         |
| DSC ACK | 10       | 0          |
| DSD REQ | 6        | 23         |
| DSD RSP | 2        | 6          |

REQ and RES should be similar (pairing)

Retransmissions are normal, but make sure it's not excessive

### Service Flow Reservations and Statistics

```
CBR8-01# show cable admission-control int c1/0/0 up 0
```

Interface Cable1/0/0  
Upstream # 0

Upstream Bit Rate (bits per second) = 30720000  
Sched Table Rsv-state: Grants 0, Reqpolls 0  
Sched Table Adm-state: Grants 0, Reqpolls 18, Util 0%

**UGS** : 12 SIDs, Reservation-level in bps 0  
UGS-AD : 0 SIDs, Reservation-level in bps 0  
RTPS : 0 SIDs, Reservation-level in bps 0  
**NRTPS** : 18 SIDs, Reservation-level in bps 301410  
**BE** : 70 SIDs, Reservation-level in bps 0

Maximum AC reservable bandwidth is not configured

Use this to check number of Sflows

# DS Bonding Resiliency

# DS Bonding Resiliency

- Bonded CM operation without resiliency
- DOCSIS 3.0 allows CMTS to transmit on Primary and NP RF channels
- If CM lose connectivity to Primary RF, CM goes offline
- If CM lose connectivity to NP RF, there will be data loss
- CM informs NP RF failure/recovery via CM-STATUS message
- CMTS/CM behavior with DS Bonding Resiliency
- RBG contains all RFs of original BG except the failed RFs
- Move primary DS Service Flow for CM to its dynamic RBG with 2 or more RFs
- Secondary SFs to dynamic RBG if configured with “Cable rf-change-trigger secondary” command
- CM remains in p-online state for tracking

# Config and Debugs for DS-Bonding Resiliency

## DS Resiliency Configuration

*Rf-change-trigger % and count of CM*

```
cable rf-change-trigger percent 75 count 10
```

```
! cable resiliency ds-bonding
```

*Global Configuration  
Required*

```
interface Wideband-Cable8/1/1:0
```

```
cable bundle 1
```

```
cable rf-channel 0 bandwidth-percent 1
```

```
cable rf-channel 1 bandwidth-percent 1
```

```
cable rf-channel 2 bandwidth-percent 1
```

```
cable rf-channel 3 bandwidth-percent 1
```

```
<SNIP>
```

```
cable rf-channel 15 bandwidth-percent 1
```

*Static Bonding Group  
(Not the DS Bonding  
Resiliency BG)*

```
interface Wideband-Cable8/1/1:8
```

```
cable ds-resiliency
```

```
!
```

```
interface Wideband-Cable8/1/1:9
```

```
cable ds-resiliency
```

```
!
```

```
interface Wideband-Cable8/1/1:10
```

```
cable ds-resiliency
```

*DS Bonding resiliency  
enabled under BG*

## Debugs Used

*Debugs for wideband resiliency*

```
debug cable wbcmts resiliency
```

```
debug cable interface c8/1/1 mac-address 001d.d4d3.3122
```

## All channels are up in BG

```
SLOT 8/1: Mar 26 16:40:06.183 EDT: CM 001d.d4d3.3122 n_rfch 15 CM_RFID 5215
```

```
SLOT 8/1: Mar 26 16:40:06.183 EDT:
```

```
  r 0 state UP[11] rfid 5208
```

```
SLOT 8/1: Mar 26 16:40:06.183 EDT:
```

```
  r 1 state UP[11] rfid 5209
```

```
SLOT 8/1: Mar 26 16:40:06.183 EDT:
```

```
  r 2 state UP[11] rfid 5210
```

```
<SNIP>
```

```
SLOT 8/1: Mar 26 16:40:06.183 EDT:
```

```
  r 14 state UP[11] rfid 5223
```

```
SLOT 8/1: Mar 26 16:40:06.183 EDT:
```

```
  r 15 state UP[11] rfid 5224
```

*Debug shows all RF-Channels are UP at the  
moment*

# DS Bonding Resiliency Debugs

## One DS Channel down

```
SLOT 8/1: Mar 26 16:40:13.203 EDT: handle_wb_rf_resil_event: 001d.d4d3.3122 n_rfch 15, event 2 n_ds_chid 1
SLOT 8/1: Mar 26 16:40:13.203 EDT: ds_chid 200 mc_info channel_id 200
SLOT 8/1: Mar 26 16:40:13.203 EDT: send_docsis_resil_event_trap: now sending docsis_resil event trap.
SLOT 8/1: Mar 26 16:40:13.203 EDT: no permit, bit=80, bitmap=0
SLOT 8/1: Mar 26 16:40:16.191 EDT: CM 001d.d4d3.3122 n_rfch 15 CM RFID 5215
SLOT 8/1: Mar 26 16:40:16.191 EDT: r 0 state DOWN_PENDING[41] rfid 5208
<SNIP>
SLOT 8/1: Mar 26 16:40:16.191 EDT: r 14 state UP[11] rfid 5223
SLOT 8/1: Mar 26 16:40:16.191 EDT: r 15 state UP[11] rfid 5224
```

Channel went down for CM because of impairments

## RBG comes up with remaining channels

```
018110: Mar 26 16:41:26.343 EDT: RESIL-IPC-RP: 001d.d4d3.3122, receiving 757 bytes
018111: Mar 26 16:41:26.343 EDT: RESIL-RP: message type 1
018112: Mar 26 16:41:26.343 EDT: RESIL-RP: tlv_len 740, RESIL-RP: bitmask down: 24
018113: Mar 26 16:41:26.343 EDT: RESIL-RP: current_interface 6952
018114: Mar 26 16:41:26.343 EDT: RP GOT REQUEST TO MOVE CM
<SNIP>
```

Modem Resiliency move necessary

```
Original active RF members: 24-39
Needed RF members: 25-39
Down RF members: 24
Avail RF members: 25-39
```

RP to look for RBG for Wi 8/1/1:0

```
018139: Mar 26 16:41:26.347 EDT: Find Best DBG: for 8/1/1:0 needed RF member: 25-39
018140: Mar 26 16:41:26.347 EDT: cmts_rf_resil_rp_dbg_get_unused(): WB Index checking match 8/1/1:8
018141: Mar 26 16:41:26.347 EDT: cmts_rf_resil_rp_dbg_get_unused(): WB Index was found to be free 8/1/1:8
Found free DBG to use,requesting create RF member: 25-39
```

Dynamic WB intf. Created for RBG

```
018142: Mar 26 16:41:26.347 EDT: Creating Dyn WB interface 8/1/1:8 with bundle 1
Needed RF: 25-39
<SNIP>
```

WB RBG with remaining chans. Comes up

```
018157: Mar 26 16:41:26.351 EDT: WB msg type 169 sent to LC 8/1
018158: Mar 26 16:41:26.351 EDT: %SNMP-5-LINK_UP: LinkUp:Interface Wideband-Cable8/1/1:8 changed state to up
```

# DS Bonding Resiliency Show Commands

## Show cable rf-status

Logical RF	Suspend Status	Suspend Status	Flap Fails	Flap Count	Time
8/1/1 0	DOWN	N/A	0	22	Mar 24 19:15:57
1	UP	N/A	0	3	Mar 24 19:15:57
2	UP	N/A	0	0	
<SNIP>					
15	UP	N/A	0	0	

*1st Channel went down*

*Flap Fail and Count*

## Resiliency WB running config

```
interface Wideband-Cable8/1/1:8
cable bundle 1
cable ds-resiliency
cable rf-channel 1 bandwidth-percent 1
cable rf-channel 2 bandwidth-percent 1
<SNIP>
cable rf-channel 15 bandwidth-percent 1
```

```
interface Wideband-Cable8/1/1:9
cable bundle 1
cable ds-resiliency
cable rf-channel 0 bandwidth-percent 1
cable rf-channel 2 bandwidth-percent 1
<SNIP>
cable rf-channel 15 banddith-percent 1
```

## Show cable resiliency

F241-38-05-uBR10K-01#show cable resiliency

Resil BG I/F	BG ID	Resil State	Count	Time	RF Ctrl	Num
Wi8/1/1:8	6953	Assigned	3	Mar 26 16:41:26	1	2
...						
Wi8/1/1:9	6954	Assigned	1	Mar 26 17:11:32	1	0

*Current chans in a RBG, 15 channel (no rf-ch 0)*

## Show cable modem partial-service

```
F241-38-05-uBR10K-01#show cable modem partial-service
MAC Address IP Address I/F MAC DSxUS
Impaired Impaired State State DS US
001d.d4d3.3122 --- C8/1/1/UB p-online (pt) 15x4
001d.d4d3.31d2 --- C8/1/1/UB p-online (pt) 15x4
```

## Show cable modem resiliency

F241-38-05-uBR10K-01#show cable modem resiliency

I/F	MAC Address	Orig BG		Curr BG		RFs
		ID	I/F	ID	I/F	
C8/1/1	001d.d4d3.3122	6952	Wi8/1/1:0	16	6953 Wi8/1/1:8	15
C8/1/1	001d.d4d3.31d2	6952	Wi8/1/1:1	16	6954 Wi8/1/1:9	15

*Channels in old and new BG for a CM*

# ADSG Troubleshooting

## Advanced DOCSIS Set Top Gateway Introduction

Purpose: Use the CMTS to send control data to Set-Top-Box

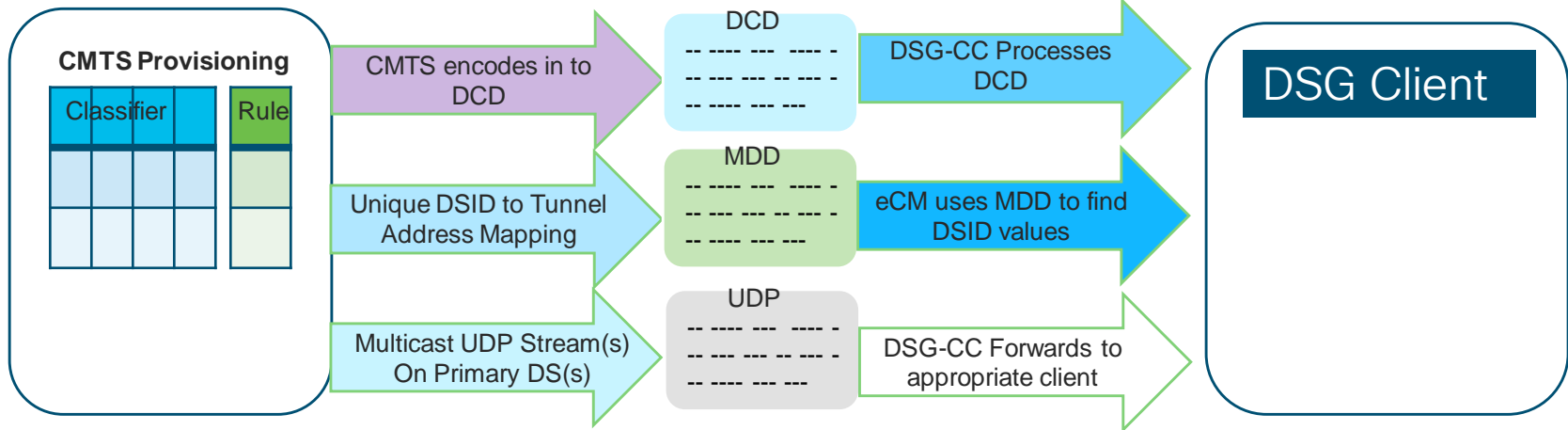
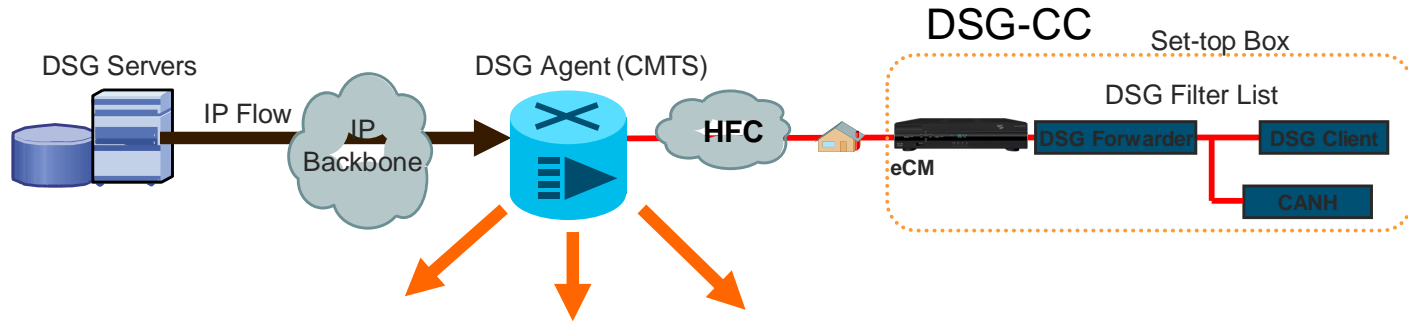
- Provides tunnel data to Set Top Boxes through the DOCSIS Forward
- Includes SI, CAS, OOB, etc.

### DSG Issues:

- DOCSIS STB not coming online
  - Stuck in one-way mode
- DOCSIS STB not able to get control data
  - System Information (SI) / CA Information / Emergency Alert System / Out-of-band
  - Interactive Programming Guide Data
  - Encryption Keys (EMMs)

# ADSG Troubleshooting

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# ADSG Troubleshooting

## Verification – MDD and DCD

Do this multiple times

Show cable mac-domain cable *slot/sub/port* mdd

Show interface cable *slot/sub/port* dsd downstream dcd

```
CBR8-01# show cable mac-domain cable 1/0/0 mdd
MDD: Mac-Domain(0) DCID(1)
Configuration Change Count: 0x1c
Number Of Fragments: 0x01
Fragment Sequence Number: 0x01
Current Channel DCID: 0x01
<SNIP>
  Upstream Frequency Range 1
    Upstream Transmit Power Reporting: On
    DSG DA-to-DSID Association Entry
      MAC DA: 0x010000000002
      DSID: 244087
    DSG DA-to-DSID Association Entry
      MAC DA: 0x010000000012
      DSID: 244095
  DSG DA-to-DSID Association Entry
    MAC DA: 0x010000000022
    DSID: 244103
  CM-STATUS non-channel-specific events
<SNIP>
```

Each Primary DS Listed here

Map to Multicast MAC to a DSID

```
CBR8-01# show interface cable 1/0/0 dsd downstream dcd
IF          dcd   dcd   dsd   num of dcd   num of dcd   num of dcd   numof
Name        state Tx   fwd   sent          fail          change cnt   frag
-----
In1/0/0:0   en    on    en    2004081      0             3             1
In1/0/0:4   en    on    en    2004081      0             3             1
In1/0/0:8   en    on    en    2004081      0             3             1
In1/0/0:12  en    on    en    2004081      0             3             1
In1/0/0:16  en    on    en    1375044      0             3             1
In1/0/0:20  en    on    en    1375042      0             3             1
```

Make sure incrementing

Timer change, classifier change, etc.

# ADSG Troubleshooting

## Advanced Database Comparison and Validation

- show cable multicast db [detail]
- show cable dsg da-dsid-db
- show cable interdb dsg

Checklist	What to look for...
Multicast DB entry count	Expected count of DSID aggregate entries
Multicast DB mappings	Present on Primary Downstreams and in the expected number of DSIDs
Multicast DB Parameters	Correct multicast MAC + S,G

```
cBR8-01# show cable dsg da-dsid-db
Fwd I/F      Bundle I/F      DSID  Tunnel DA      Group      Source
In1/0/0:0    Bu1             98ECF  0100.5e0a.0d04  232.1.2.3  10.225.198.87
In1/0/0:0    Bu1             98EB7  0100.5e0a.0c04  232.1.2.4  10.225.198.87
In1/0/0:0    Bu1             98E9F  0100.5e48.061a  233.2.2.1  10.225.198.88
In1/0/0:0    Bu1             98E6F  0100.5e48.0618  233.2.2.2  10.225.198.88
In1/0/0:0    Bu1             98E57  0100.e80a.0b05  232.1.2.5  10.225.198.87
In1/0/0:0    Bu1             98E3F  0100.e80a.0b04  232.1.2.6  10.225.198.87
In1/0/0:0    Bu1             98E27  0100.e80a.0b00  232.1.2.7  10.225.198.87
In1/0/0:0    Bu1             98E0F  0100.e80a.0a05  232.1.2.8  10.225.198.87
<SNIP>
```

*Use pipe (|) count regex to sum total entries*



INTUITIVE