# BCA CPE

## Rogue ONU Detection

**Application Note**

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# 1 Rogue ONU Detection

This document presents ONU-based rogue behavior detection support.

This content applies to ITU PON and to ONU SoCs BCM6858XX, BCM6878X, BCM6856X, BCM6836X, BCM6846X, BCM6838X, BCM6848X, and the BCM63158.

In a PON network, the optical physical medium is shared between all ONUs. Therefore, access to the medium is managed by the OLT that sends a bandwidth map specifying transmission times and durations for each ONU. It is important that each ONU transmits precisely at the allocated time, otherwise the transmission will interfere with that of other ONUs, and neither will be received correctly by the OLT. The PON MAC in the ONU receives and processes these maps to determine when transmissions from this ONU may occur.

# 2 Rogue ONU Detection Feature

The PON MAC includes a circuit to detect rogue ONU behavior, in order to take appropriate action without OLT intervention. The MAC asserts the transmit burst signal to the optical transceiver in order to turn ON the transmitter, and compares this signal with an input from the optical transceiver that reflects the actual state of the transmitter. If the transmitter is ON while the transmit burst signal is OFF for longer than a preset threshold, an interrupt is generated.

The rogue detection can be enabled in one of two ways:

- Compare the overall transmission time to a maximum allowed duration.
- Verify the actual transmitted signal and the requested one are within a permitted time window.

# 3 Requirements

The allocated transmission window is determined by the PON MAC from bandwidth maps received from the OLT as part of regular operation. The actual transmitter state is read by the PON MAC via a GPIO pin. This GPIO pin should be routed through the PCB from the optical module Tx_SD signal. Also, the optical module must indicate the transmitter state through the Tx_SD pin.

# 4 Configuration and Examples

The GPIO input pin that is used to read the state of the laser burst transmitter is specified in the board parameters file. Refer to each device data sheet for the list of GPIO pins that can be used for this purpose.

**Example:**

```
{bp_usRogueOnuEn, .u.us = BP_GPIO_56_AH},
```

found in the file, shared/opensource/boardparms/bcm963xx/boardparms_6858.c

The optical transceiver Tx_SD support and its polarity are specified in the transceiver database.

**Example:**

```
.tx_sd_supported       = TRX_SIGNAL_SUPPORTED,
.tx_sd_polarity        = TRX_ACTIVE_HIGH,
```

in file bcmdrivers/opensource/char/opticaldet/impl1/trx_descr_gen.h

The feature is configured and enabled by using either of the following APIs:

- gpon_attr_rogue_onu_write()
- rogue_onu_detect_cfg()

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# 5 Interrupts

Interrupts are enabled/disabled by using **gpon_cfg_rogue_onu_interrupts()** or **ngpon_cfg_rogue_onu_interrupts()**.

They are manually configured and enabled through CLI.

**Example:** To trigger an interrupt upon a transmission longer than 100000 bit times, or a transmission exceeding the allocated window by more than 100 bit times, respectively.

```
# bs /b/c gpon rogue_onu={enable=yes,mode=tx_fault,clock_cycle=1000000}      (Default on boot)
# bs /b/c gpon rogue_onu={enable=yes,mode=tx_monitor,clock_cycle=100}
```

The above clock_cycle parameters are empirical and are the recommended values.

The clock_cycle range for tx_fault is up to 0xFFFFFFFF==4294967295, and for tx_monitor up to 0x3FF==1023.

If, at the time the feature is configured, the optical transceiver is absent (or does not support Tx_SD), the device registers are configured but rogue interrupts are masked. If, and when, a transceiver is inserted that supports Tx_SD while enable==yes, the interrupt for the configured mode will be unmasked (enabled). Conversely, rogue interrupts are masked when the optical transceiver is removed.

The interrupt associated with tx_fault is *rogue_onu_level*. The interrupt associated with tx_monitor is rogue_onu_diff. Both are TX interrupts and they are handled in **gpon_isr()** for GPON and in **tx_int_handler()** for XGPON/XGS/NGPON2. The interrupt handler action (such as disabling the ONU or moving to O7) is customer/operator-specific and is outside the scope of this document. The default interrupt handler displays a notice on the serial console and disables the feature, to avoid continuous interrupts.

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# Revision History

## CPE-AN4100; 29 January, 2020

- Initial release

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