SNMP Background Synchronization

The SNMP Background Synchronization features provides periodic background synchronization of DOCSIS MIB data from line card to Supervisor in order to improve the performance of the SNMP polling of these MIB tables.

Your software release may not support all the features that are documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. The Feature Information Table at the end of this document provides information about the documented features and lists the releases in which each feature is supported.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to http://tools.cisco.com/ITDIT/CFN/. An account on http://www.cisco.com/ is not required.

Contents

Information About SNMP Background Synchronization

Table 1: Feature History

Feature Name	Release Information	Feature Description
New MIB tables for SNMP background synchronization	Cisco IOS XE Dublin 17.12.1w	The following MIB tables are added to the SNMP background synchronization: • ccwbRFChannelEntry • docsIfUpstreamChannelEntry • cdxIfUpChannelExtEntry

To improve SNMP performance, SNMP background synchronization feature is introduced to synchronize the SNMP MIB information between the line card and the Supervisor. It is based on raw socket and uses TCP protocol. The benefits of the SNMP Background Synchronization include:

- Bundles small packets together before sending out, increases IPC channel utilization.
- Use pre-allocated static buffer to send/receive message, avoid buffer allocation at run time.
- In order not to burden CPU when the system is in high load, SNMP background synchronization receive process can sleep based on CPU utilization, so it will not compete with other priority processes.
- Significantly improve SNMP polling performance for supported MIB tables, and reduce the CPU utilization in both Supervisor and line card.
- Background synchronization sets up a separate socket connection between SUP and IOSd-CLC, and periodically syncs the SNMP data from IOSd-clc to SUP. When SNMP requests arrives, SUP returns the synced data directly to the SNMP client instead of using IPC to retrieve data from IOSd-CLC. Thus, the response time is reduced.

The following MIB tables are supported in SNMP background synchronization:

- docsQosParamSetEntry
- docsIetfQosParamSetEntry
- docsQos3ParamSetEntry
- docsIf3CmtsCmUsStatusEntry
- docsIfCmtsCmStatusEntry
- docsSubMgtCpeControlEntry
- docsSubMgtCmFilterEntry
- cdxCmtsCmStatusExtEntry
- docsLoadBalCmtsCmStatusEntry
- docsIf3CmtsCmRegStatusTable
- docsIfSignalQualityTable
- docsifCmtsServiceTable
- cdxCmtsServiceExtEntry
- ccwbRFChannelEntry
- docsIfUpstreamChannelEntry
- cdxIfUpChannelExtEntry

How to Configure SNMP Background Synchronization

Enabling SNMP Background Synchronization

Before you begin

To use the **cable bgsync** command, you must configure the **service internal** command in global configuration mode.

SNMP background synchronization is enabled by default, use **no cable bgsync active** to disable this feature, and use **cable bgsync active** to enable it again. The following procedure lists detailed steps to enable SNMP background synchronization:

```
enable
configure terminal
cable bgsync active
exit
```

Setting Data Interval

Before you begin

To use the **cable bgsync** command, you must configure the **service internal** command in global configuration mode. Use the **cable bgsync** command carefully as it can impact the CPU utilization.

To set the data intervals for the background synchronization of SNMP MIB data on the Cisco cBR routers, use the **cable bgsync** {**itime** *i-interval*|**ptime** *p-interval*} command in global configuration mode. To disable background synchronization, use the **no** form of this command. The following procedure lists detailed steps to set data interval:

```
enable
configure terminal
service internal
cable bgsync itime i-interval
cable bgsync ptime p-interval
exit
```

itime is the interval of synchronizing all related MIB tables from line card to Supervisor. The valid range is from 5 to 31536000. The default value is 86400. **ptime** is the interval of synchronizing the changed MIB content from line card to Supervisor.

Verifying SNMP Background Synchronization

- To display the current status of the SNMP background synchronization, use the **show cable bgsync** command as shown in the example below:

```
Router#show cable bgsync
Background Sync is active, uptime is 5 minutes, 14 seconds.
Background Sync last active time is 5 minutes, 14 seconds. ago.
I-packet interval time is 1 day,  P-packet interval time is 5 senconds.
Line Card with bg-sync: 3/0
Line Card working on I syncing:
```

```
Last clear cable bg sync counters Time:
Total bytes: 85864
Total background sync packets: 2109
  Ack packets: 0
  Run Ctrl Msg packets: 2
  Data packets: 0
Interval packets: 2002
  I Type packets: 230
  P Type packets: 1772
Bg sync data IPC lost packets: 0

Background Sync statistics for the last 00:07:34
================================================================
 ipc packets 0-30k:      105
 ipc packets 30-60k:     0
 ipc packets 60-100k:    0
 msg per packet average: 20
 msg per packet max:     113
 msg per packet min:     1
 msg per packet under 3: 60
================================================================
type       packets        cpu-total(ms)    avg(us)   max(us)
serv flow  904            3                3         1000
sflog      0              0                0         0
cm         17             0                0         0
cmtx       296            0                0         0
paramset   112            0                0         0
DXIF       298            0                0         0
sid        208            0                0         0
uschan     167            1                5         1000
----------------------------------------------------------------
IPC PKTs   105            4                0      ms 1      ms
================================================================================================
slot type       packets        bytes            pps        Bps        wrong_len_pkts
0    serv flow  0              0                0.0        0.0        0

0    sflog      0              0                0.0        0.0        0

0    cm         0              0                0.0        0.0        0

0    cmtx       0              0                0.0        0.0        0

0    paramset   0              0                0.0        0.0        0

0    DXIF       0              0                0.0        0.0        0

0    sid        0              0                0.0        0.0        0

0    uschan     0              0                0.0        0.0        0

1    serv flow  0              0                0.0        0.0        0

1    sflog      0              0                0.0        0.0        0

1    cm         0              0                0.0        0.0        0

1    cmtx       0              0                0.0        0.0        0

1    paramset   0              0                0.0        0.0        0

1    DXIF       0              0                0.0        0.0        0

1    sid        0              0                0.0        0.0        0
```

1	uschan	0	0	0.0	0.0	0
2	serv flow	0	0	0.0	0.0	0
2	sflog	0	0	0.0	0.0	0
2	cm	0	0	0.0	0.0	0
2	cmtx	0	0	0.0	0.0	0
2	paramset	48	7680	0.0	0.0	0
2	DXIF	0	0	0.0	0.0	0
2	sid	16	512	0.0	0.0	0
2	uschan	0	0	0.0	0.0	0
3	serv flow	904	25104	4.4	115.4	0
3	sflog	0	0	0.0	0.0	0
3	cm	17	981	0.0	2.0	0
3	cmtx	296	8607	0.7	20.6	0
3	paramset	64	8368	0.0	0.0	0
3	DXIF	298	21876	0.9	74.3	0
3	sid	192	4756	0.1	6.8	0
3	uschan	167	5832	0.3	10.7	0
6	serv flow	0	0	0.0	0.0	0
6	sflog	0	0	0.0	0.0	0
6	cm	0	0	0.0	0.0	0
6	cmtx	0	0	0.0	0.0	0
6	paramset	0	0	0.0	0.0	0
6	DXIF	0	0	0.0	0.0	0
6	sid	0	0	0.0	0.0	0
6	uschan	0	0	0.0	0.0	0
7	serv flow	0	0	0.0	0.0	0
7	sflog	0	0	0.0	0.0	0
7	cm	0	0	0.0	0.0	0
7	cmtx	0	0	0.0	0.0	0
7	paramset	0	0	0.0	0.0	0
7	DXIF	0	0	0.0	0.0	0
7	sid	0	0	0.0	0.0	0

```
7    uschan     0              0              0.0        0.0        0

8    serv flow  0              0              0.0        0.0        0

8    sflog      0              0              0.0        0.0        0

8    cm         0              0              0.0        0.0        0

8    cmtx       0              0              0.0        0.0        0

8    paramset   0              0              0.0        0.0        0

8    DXIF       0              0              0.0        0.0        0

8    sid        0              0              0.0        0.0        0

8    uschan     0              0              0.0        0.0        0

9    serv flow  0              0              0.0        0.0        0

9    sflog      0              0              0.0        0.0        0

9    cm         0              0              0.0        0.0        0

9    cmtx       0              0              0.0        0.0        0

9    paramset   0              0              0.0        0.0        0

9    DXIF       0              0              0.0        0.0        0

9    sid        0              0              0.0        0.0        0

9    uschan     0              0              0.0        0.0        0
```

- To display all the SNMP background sync data on Supervisor side or line card side, use the **show cable bgsync sync-info cable** command as shown in the example below:

```
Router#show cable bgsync sync-info cable 9/0/1
 part1 for srv template:
srv_tmp_id   min_rate    max_rate    max_burst
0           0           0           0
1           0           64000       0
2           0           1000000     0
3           0           1000000     3044
4           0           0           3044
5           0           110000000   30000
6           0           0           3044
7           0           2000000000  5000000
8           0           0           3044
 part2 for srv flow:
sfid     prov_qos   adm_qos    act_qos    wb_mode    octets    pkts    delay_pkts
drop_pkts    gate_id    create_time    total_active_time
1        0          0          0          0          0         0          0
0          0              0              0
2        0          0          0          0          0         0          0
0          0              0              0
3        0          0          0          0          0         0          0
0          0              0              0
4        0          0          0          0          0         0          0
0          0              0              0
5        0          0          0          0          0         0          0
0          0              0              0
```

```
6       0       0       0       0       0       0       0
0       0       0       0
7       0       0       0       0       0       0       0
0       0       0       0
8       0       0       0       0       0       0       0
0       0       0       0
9       0       0       0       0       0       0       0
0       0       0       0
10      0       0       0       0       0       0       0
0       0       0       0
11      0       0       0       0       0       0       0
0       0       0       0
12      0       0       0       0       0       0       0
0       0       0       0
13      0       0       0       0       0       0       0
0       0       0       0
14      0       0       0       0       0       0       0
0       0       0       0
15      3       3       3       0       0       0       0
0       0       3600    179
16      3       3       3       0       0       0       0
0       0       3600    179
17      3       3       3       0       0       0       0
0       0       3600    179
18      3       3       3       0       0       0       0
0       0       3600    179
19      3       3       3       0       0       0       0
0       0       3600    179
20      3       3       3       0       0       0       0
0       0       3600    179
21      3       3       3       0       0       0       0
0       0       3600    179
22      3       3       3       0       0       0       0
0       0       3600    179
23      3       3       3       0       0       0       0
0       0       3600    179
24      3       3       3       0       0       0       0
0       0       3600    179
25      3       3       3       0       0       0       0
0       0       3600    179
26      3       3       3       0       0       0       0
0       0       3600    179
27      4       5       5       0       8925    42      0
0       0       12700   88
28      6       7       7       3       0       0       0
0       0       12700   88
29      4       5       5       3       3855    21      0
0       0       11500   100
30      6       7       7       3       0       0       0
0       0       11500   100
31      8       8       8       3       222     3       0
0       0       11500   100
32      4       5       5       3       1277    11      0
0       0       12100   94
33      6       7       7       0       0       0       0
0       0       12100   94
34      4       5       5       0       3851    21      0
0       0       12300   92
35      6       7       7       3       0       0       0
0       0       12300   92
36      8       8       8       0       148     2       0
0       0       12100   94
37      4       5       5       0       3855    21      0
0       0       12700   88
```

```
38       6          7          7          3          0          0          0
0          0             12700          88
39       8          8          8          3          222        3          0
0          0             12300          92
40       4          5          5          3          3281       20         0
0          0             13100          84
41       6          7          7          3          0          0          0
0          0             13100          84
42       8          8          8          3          222        3          0
0          0             12700          88
43       8          8          8          3          222        3          0
0          0             12700          88
44       4          5          5          3          3308       21         0
0          0             13100          84
45       6          7          7          3          0          0          0
0          0             13100          84
46       8          8          8          3          296        4          0
0          0             13100          84
47       8          8          8          3          296        4          0
0          0             13100          84
48       4          5          5          3          73         2          0
0          0             14500          70
49       6          7          7          3          0          0          0
0          0             14500          70
50       8          8          8          3          74         1          0
0          0             14500          70
 part3 for sid
 sid_entry[1] sid 1 service_class 2 create_time 127 total_octets 8925
 sid_entry[2] sid 2 service_class 2 create_time 115 total_octets 3855
 sid_entry[3] sid 3 service_class 2 create_time 121 total_octets 1277
 sid_entry[4] sid 4 service_class 2 create_time 123 total_octets 3851
 sid_entry[5] sid 5 service_class 2 create_time 127 total_octets 3855
 sid_entry[6] sid 6 service_class 2 create_time 131 total_octets 3281
 sid_entry[7] sid 7 service_class 2 create_time 131 total_octets 3308
 sid_entry[8] sid 8 service_class 2 create_time 145 total_octets 73
 part4 for cm and cmtx
 cm_mac: 68ee.9633.0699, tcsbmp: 0x1, admin_status 1, md_sg_id 0x1510505, rcc_status_id
 0x4, rcs_id 0x1520005, tcs_id 0x1 last_reg_time 1444372688, RCP ID:00 10 00 00 10
 usch 1, modulation_type 2, rx_power -5, signal_noise 390, time_offset 2085
 cm_mac: e448.c70c.96e7, tcsbmp: 0x4, admin_status 1, md_sg_id 0x1510505, rcc_status_id
 0x4, rcs_id 0x1520005, tcs_id 0x3 last_reg_time 1444372678, RCP ID:00 10 00 00 08
 usch 3, modulation_type 2, rx_power -15, signal_noise 381, time_offset 1785
 cm_mac: 0019.474a.c126, tcsbmp: 0x1, admin_status 1, md_sg_id 0x1510505, rcc_status_id
 0x0, rcs_id 0x22, tcs_id 0x1 last_reg_time 1444372682, RCP ID:00 00 00 00 00
 usch 1, modulation_type 2, rx_power -15, signal_noise 390, time_offset 1792
 cm_mac: e448.c70c.982b, tcsbmp: 0x1, admin_status 1, md_sg_id 0x1510505, rcc_status_id
 0x4, rcs_id 0x1520005, tcs_id 0x1 last_reg_time 1444372685, RCP ID:00 10 00 00 08
 usch 1, modulation_type 2, rx_power -10, signal_noise 390, time_offset 1786
 cm_mac: e448.c70c.96d5, tcsbmp: 0x2, admin_status 1, md_sg_id 0x1510505, rcc_status_id
 0x4, rcs_id 0x1520005, tcs_id 0x2 last_reg_time 1444372688, RCP ID:00 10 00 00 08
 usch 2, modulation_type 2, rx_power -15, signal_noise 381, time_offset 1786
 cm_mac: e448.c70c.9819, tcsbmp: 0x1, admin_status 1, md_sg_id 0x1510505, rcc_status_id
 0x4, rcs_id 0x1520005, tcs_id 0x1 last_reg_time 1444372692, RCP ID:00 10 00 00 08
 usch 1, modulation_type 2, rx_power -10, signal_noise 390, time_offset 1789
 cm_mac: e448.c70c.980d, tcsbmp: 0x4, admin_status 1, md_sg_id 0x1510505, rcc_status_id
 0x4, rcs_id 0x1520005, tcs_id 0x3 last_reg_time 1444372695, RCP ID:00 10 00 00 08
 usch 3, modulation_type 2, rx_power -10, signal_noise 390, time_offset 1783
 cm_mac: e448.c70c.96f3, tcsbmp: 0x1, admin_status 1, md_sg_id 0x1510505, rcc_status_id
 0x4, rcs_id 0x1520005, tcs_id 0x1 last_reg_time 1444372723, RCP ID:00 10 00 00 04
 usch 1, modulation_type 2, rx_power 0, signal_noise 420, time_offset 1798
 part5 for dxif info ifnum 1
 basedata[1][1]: cmstatusindex 2375681, cm_mac 68ee.9633.0699, cm_ip 0x5011961F, cm_ds_if
 59881, cm_us_if 204952
 cmregmode 2, cmmodultype 2, cmdocmode 2
```

```
 basedata[1][2]: cmstatusindex 2375682, cm_mac e448.c70c.96e7, cm_ip 0x5011961D, cm_ds_if
 59882, cm_us_if 204954
 cmregmode 2, cmmodultype 2, cmdocmode 2
 basedata[1][3]: cmstatusindex 2375683, cm_mac 0019.474a.c126, cm_ip 0x50119602, cm_ds_if
 59914, cm_us_if 204952
 cmregmode 2, cmmodultype 2, cmdocmode 2
 basedata[1][4]: cmstatusindex 2375684, cm_mac e448.c70c.982b, cm_ip 0x50119612, cm_ds_if
 59881, cm_us_if 204952
 cmregmode 2, cmmodultype 2, cmdocmode 2
 basedata[1][5]: cmstatusindex 2375685, cm_mac e448.c70c.96d5, cm_ip 0x5011960D, cm_ds_if
 59881, cm_us_if 204953
 cmregmode 2, cmmodultype 2, cmdocmode 2
 basedata[1][6]: cmstatusindex 2375686, cm_mac e448.c70c.9819, cm_ip 0x5011961E, cm_ds_if
 59881, cm_us_if 204952
 cmregmode 2, cmmodultype 2, cmdocmode 2
 basedata[1][7]: cmstatusindex 2375687, cm_mac e448.c70c.980d, cm_ip 0x5011961A, cm_ds_if
 59882, cm_us_if 204954
 cmregmode 2, cmmodultype 2, cmdocmode 2
 basedata[1][8]: cmstatusindex 2375688, cm_mac e448.c70c.96f3, cm_ip 0x5011960E, cm_ds_if
 59882, cm_us_if 204952
 cmregmode 2, cmmodultype 2, cmdocmode 2
 part6 uschan for ifnum 1
usport 1 micro_reflections 0 us_snr 390 snmp_sigq_unerroreds 0 snmp_sigq_correcteds 0
 snmp_sigq_uncorrectables 0
usport 2 micro_reflections 0 us_snr 381 snmp_sigq_unerroreds 0 snmp_sigq_correcteds 0
 snmp_sigq_uncorrectables 0
usport 3 micro_reflections 0 us_snr 390 snmp_sigq_unerroreds 0 snmp_sigq_correcteds 0
 snmp_sigq_uncorrectables 0
usport 4 micro_reflections 0 us_snr 0 snmp_sigq_unerroreds 0 snmp_sigq_correcteds 0
snmp_sigq_uncorrectables 0
```

- To display raw socket interprocess communication (IPC) infrastructure statistics for specified field replaceable unit (FRU), use the **show platform software ios** *slot-id* **socket statistics** command as shown in the example below:

```
Router#show platform software ios R0 socket statistics 0
-------------------------------------------

Session Slot             : 2
Socket FD                : 93
Client ID                : 0
Message Receive Count    : 0
Message Receive Bytes    : 0

-------------------------------------------

Session Slot             : 2
Socket FD                : 93
Client ID                : 1
Message Receive Count    : 30155
Message Receive Bytes    : 1326820

-------------------------------------------

Session Slot             : 3
Socket FD                : 86
Client ID                : 0
Message Receive Count    : 0
Message Receive Bytes    : 0

-------------------------------------------

Session Slot             : 3
```

```
Socket FD               : 86
Client ID               : 1
Message Receive Count   : 29611
Message Receive Bytes   : 69782901
```

Configuring Example for SNMP Background Synchronization

The following example shows how to configure SNMP background synchronization:

```
enable
configure terminal
cable bgsync active
service internal
cable bgsync itime 200
cable bgsync ptime 500
exit
```

Channel Utilization Consistency

Table 2: Feature History

Feature Name	Release Information	Feature Description
Channel Utilization Consistency	Cisco IOS XE Dublin 17.12.1y	We have enhanced **docsIf31CmtsDsOfdmChanUtilization** and **docsIfCmtsChannelUtUtilization** MIBS to calculate a rolling average utilization. The utilization calculation window is specified by the operator using the **cable util-interval** command. With this release, you can observe consistency in the Upstream and Downstream SCQAM/OFDMA Channel utilization and MIB data. We have also updated the output of the **show controllers downstream-cable** *slot/subslot/port* **[counter rf-channel | counter ofdm-channel] snmp-rolling-avg** command to include the rolling average values.

In releases prior to Cisco IOS XE Dublin 17.12.1y, the Downstream SCQAM/OFDM Channel utilization calculation and MIB data was inconsistent with Upstream SCQAM/OFDMA Channels. Upstream SCQAM/OFDMA utilization calculation computes the rolling average for Channel utilization. But the Downstream SCQAM utilization calculation did not compute rolling average for Channel utilization.

- Though the Downstream OFDM utilization calculation computes a rolling average, it displays only one sample value of the channel utilization when **docsIf31CmtsDsOfdmChanUtilization** MIB object is queried.
- The MIB data refresh rate is not 30 seconds. After changing the **cable-util-interval** value, Downstream OFDM samples data are not cleared.

- Hence, to be consistent with the upstream Channels Computation, rolling average calculation is implemented for Downstream SCQAM/OFDM Channels in Cisco IOS XE Dublin 17.12.1y.

The benefit of maintaining consistentency between Upstream and Downstream Channel utilization and MIB data is that you don't observe different behaviors in Upstream and Downstream utilization.

Rolling Average Calculation for Downstream OFDM and SCQAM Channel Utilization

In previous releases, the rolling average for Downstream OFDM Channel Utilization can be configured using the window size (total number of channel utilization samples). The window size is calculated using the configured value of the cable util-interval command or SNMP manager. This configuration stores sample values for **all** the OFDM channels. The max window size supported was 1000 seconds. All OFDM channel (1000 sec /5 interval) 200 sample data memory was allocated.

Starting with Cisco IOS XE Dublin 17.12.1y, values are only stored for the configured OFDM channels. The **cable-util-interval** command value is used to compute the rolling average value. To reduce memory usage, we are allocating memory dynamically for configured channels only. For example, if **cable-util-interval** is 300 sec then (300 / 5), then only 60 sample data memory is allocated.

In addition to configuring the value using the MIB object **docsIfCmtsChannelUtilizationInterval**, you can also configure the command via CLI. A fixed 5-seconds interval (Sample size or Sample Interval) is used to collect Channel utilization samples. A window size (Number of channel utilization samples) is calculated based on the **cable-util-interval** value as follows:

Window Size = cable-util-interval / Sample-Interval

The following example shows how the rolling average is calculated:

```
cable util-interval: 100 seconds
Sample-Interval  or Sample size (Interval at which channel utilization samples are collected):
 5 seconds
Window size (Total number of channel utilization samples) = cable util-interval/sample size
 = 100/5 = 20
```

Each 5-second sample is stored in an array and the rolling average is computed using the samples that are collected.

In the preceding example if we consider the first 5 samples that are collected are 10%, 20%, 30%, 30% and 10%, then the rolling average computed would be as below:

At the 5th second interval: 10 / 20 = **0.5** - rounded of to **0**.

At the 10th second interval: (10+20) / 20 = **1.5** - rounded of to **1**.

At the 15th second interval: (10+20+30) / 20 = **3**

At the 20th second interval: (10+20+30+30) / 20 = **4.5** - rounded of to **4**.

At the 25th second interval: (10+20+30+30+10) /20 = **5.0**

Note In Cisco IOS XE Dublin 17.12.1y and later,

- The maximum supported value is 2000 seconds. If you configure a value greater than 2000 seconds, it is still considered as 2000 seconds. This is because the maximum supported value for the utilization interval of **downstream** channels is 2000. (Maximum supported value for the utilization interval for **upstream** channels remains to be 86400 seconds).
- The **docsIf31CmtsDsOfdmChanUtilization** and **docsIfCmtsChannelUtUtilization** MIBs refresh rate is 30 seconds. If the interval value is less than 30 seconds, then the **docsIfCmtsChannelUtUtilization** MIB value is updated as per the configured **cable util interval**. For example if **cable util interval** is configured as 10 seconds, then the MIB is updated every 10 seconds.

Feature Information for SNMP Background Synchronization

Use Cisco Feature Navigator to find information about the platform support and software image support. Cisco Feature Navigator enables you to determine which software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to the https://cfnng.cisco.com/ link. An account on the Cisco.com page is not required.

Note The following table lists the software release in which a given feature is introduced. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Table 3: Feature Information for SNMP Background Synchronization

Feature Name	Releases	Feature Information
SNMP Background Synchronization	Cisco IOS XE Everest 16.6.1	This feature was integrated into Cisco IOS XE Everest 16.6.1 on theCisco cBR Series Converged Broadband Routers.