Tech Note on Priority Transmit B2B Credits in MDS Switches

Contents

Introduction

This document describes the receive and transmit buffer-to-buffer (B2B) credits in different interfaces, which are useful when you troubleshoot performance issues in a Fibre Channel fabric.

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- Cisco Multilayer Data Switch (MDS)
- Fibre Channel protocol

Components Used

The information in this document is based on Cisco MDS 9000 Series Multilayer Switches.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Understand Priority Transmit B2B Credits in MDS Switch

When you troubleshoot the slow drain issue for Fibre Channel fabric network, an easy way to confirm the available credits for interface is the **show interface** command in the MDS switches.

The following explains the transmit B2B credits in an MDS interface.

For an Inter-Switch Link Protocol (ISL) Trunk Interface

Low priority credits are used for data traffic while the high priority credits are for inter-switch-link control traffic. This is just a logical division on sender side to limit itself so that it does not consume all the available Receive (Rx) credits on the receiver.

For example, switch MDS Tempest (receiver) tells switch MDS Maestro (sender) that it has 64 Rx credits.

Switch MDS Maestro marks 56 credits as low priority Transmit (Tx) credits and 8 as high priority Tx credits.

In case of congestion, MDS Maestro stops sending data traffic when none of the 56 low priority credits is available.

However, it can still send control traffic to MDS Tempest using the available 8 high priority credits.

There is no need for MDS Tempest to make a differentiation between low or high priority credits.

> **Note**: The number of high priority TX transmit credit depends on different hardware platforms.

This is the general concept: one out of eight TX transmit credit will be a high priority credit and the maximum is 15 - sufficient to handle the ELP or other ISL control messages.

This high/low priority differentiation is only for ISL links between E ports or TE ports and is not used in F ports.

MDS 9148S Platform Example:

For an E port interface:

```
Tempest# show int fc1/26 fc1/26 is trunking Hardware is Fibre Channel, SFP is short wave laser
w/o OFC (SN) Port WWN is 20:1a:00:2a:6a:b9:d2:30 Peer port WWN is 20:1a:00:2a:6a:56:f0:00 Admin
port mode is auto, trunk mode is on snmp link state traps are enabled Port mode is TE Port vsan
is 2 Admin Speed is auto Operating Speed is 4 Gbps Rate mode is dedicated Port flow-control is
R_RDY Transmit B2B Credit is 32 Receive B2B Credit is 64 B2B State Change Number is 14 Receive
data field Size is 2112 Beacon is turned off Logical type is core Trunk vsans (admin allowed and
active) (2) Trunk vsans (up) (2) Trunk vsans (isolated) () Trunk vsans (initializing) () 5
minutes input rate 160 bits/sec,20 bytes/sec, 0 frames/sec 5 minutes output rate 96 bits/sec,12
bytes/sec, 0 frames/sec 22464 frames input,1801536 bytes 0 discards,0 errors 0 invalid CRC/FCS,0
unknown class 0 too long,0 too short 22977 frames output,1318564 bytes 0 discards,0 errors 0
input OLS,0 LRR,0 NOS,2 loop inits 1 output OLS,2 LRR, 0 NOS, 1 loop inits 64 receive B2B credit
remaining 32 transmit B2B credit remaining
     28 low priority transmit B2B credit remaining
    Interface last changed at Thu Jul 20 15:40:32 2017

    Last clearing of "show interface" counters :  never

Tempest#
```

The orther end of the link shows total transmit credit is 64 and low priority is 56:

```
Maestro# show int fc1/26
fc1/26 is trunking
    Hardware is Fibre Channel, SFP is short wave laser w/o OFC (SN)
```

```
        Port WWN is 20:1a:00:2a:6a:56:f0:00
        Peer port WWN is 20:1a:00:2a:6a:b9:d2:30
        Admin port mode is auto, trunk mode is on
        snmp link state traps are enabled
        Port mode is TE
        Port vsan is 2
        Speed is 4 Gbps
        Rate mode is dedicated
        Transmit B2B Credit is 64
        Receive B2B Credit is 32
        B2B State Change Number is 14
        Receive data field Size is 2112
        Beacon is turned off
        admin fec state is down
        oper fec state is down
        Trunk vsans (admin allowed and active) (2)
        Trunk vsans (up)                        (2)
        Trunk vsans (isolated)                  ()
        Trunk vsans (initializing)              ()
        5 minutes input rate 160 bits/sec,20 bytes/sec, 0 frames/sec
        5 minutes output rate 216 bits/sec,27 bytes/sec, 0 frames/sec
          23189 frames input,1330368 bytes
            0 discards,0 errors
            0 invalid CRC/FCS,0 unknown class
            0 too long,0 too short
          22677 frames output,1818076 bytes
            0 discards,0 errors
          1 input OLS,2  LRR,0 NOS,3 loop inits
          1 output OLS,0 LRR, 0 NOS, 1 loop inits
          32 receive B2B credit remaining
          64 transmit B2B credit remaining
          56 low priority transmit B2B credit remaining
        Interface last changed at Wed Jul 19 16:39:58 2017

        Last clearing of "show interface" counters 1w 5d

Maestro#
```

For an F Port Interface:

In the case of an F port, this calculation does not apply since there is no control traffic between the MDS switch and the initiator/target device.

However, you can see all the transmit credits in an F port which are marked as low priority for data traffic.

For example, total transmit credit is 3 and low priority is 3 in the following output:

```
switch# show int fc1/47
fc1/47 is up
    Hardware is Fibre Channel, SFP is short wave laser w/o OFC (SN)
    Port WWN is 20:2f:00:2a:6a:56:f0:00
    Admin port mode is F, trunk mode is on
    snmp link state traps are enabled
    Port mode is F, FCID is 0x570f00
    Port vsan is 2
    Speed is 4 Gbps
    Rate mode is dedicated
    Transmit B2B Credit is 3
    Receive B2B Credit is 32
```

```
        Receive data field Size is 2112
        Beacon is turned off
        admin fec state is down
        oper fec state is down
        5 minutes input rate 0 bits/sec,0 bytes/sec, 0 frames/sec
        5 minutes output rate 16 bits/sec,2 bytes/sec, 0 frames/sec
          1220 frames input,74256 bytes
            0 discards,0 errors
            0 invalid CRC/FCS,0 unknown class
            0 too long,0 too short
          2231 frames output,220056 bytes
            0 discards,0 errors
          1 input OLS,1  LRR,0 NOS,0 loop inits
          1 output OLS,0 LRR, 1 NOS, 0 loop inits
          32 receive B2B credit remaining
          3 transmit B2B credit remaining
          3 low priority transmit B2B credit remaining
        Interface last changed at Wed Jul 19 15:56:15 2017

        Last clearing of "show interface" counters 1w 5d

switch#
```

MDS 9710 switch example:

There are no high priority Tx transmit credits in MDS97xx switches. However, this can be changed by the command **system default tx-credit double-queue**.

The maximum Tx transmit credits can also be seen from the interface of the connected switch.

Topology: MDS 9710 Leonard fc3/14 is connected to MDS 9148S Tempest fc1/13 back to back via an E port.

Default setting:

By default, MDS 9710 DS-X9448-768K9 line cards do not have high priority credits, all 64 transmit credits are deemed low priority.

```
Leonard(config-if)# show int fc3/14 counter
fc3/14
    5 minutes input rate 320 bits/sec, 40 bytes/sec, 3 frames/sec
    5 minutes output rate 2688 bits/sec, 336 bytes/sec, 3 frames/sec
    1416819 frames input, 77233324 bytes
      0 discards, 0 errors, 0 CRC/FCS
      0 unknown class, 0 too long, 0 too short
    1416813 frames output, 138598368 bytes
      0 discards, 0 errors
    0 timeout discards, 0 credit loss
    53 input OLS, 85 LRR, 119 NOS, 0 loop inits
    77 output OLS, 7 LRR, 93 NOS, 0 loop inits
    14 link failures, 37 sync losses, 2 signal losses
     140 Transmit B2B credit transitions to zero
     92 Receive B2B credit transitions to zero
      0 2.5us TxWait due to lack of transmit credits
      Percentage Tx credits not available for last 1s/1m/1h/72h: 0%/0%/0%/0%
      500 receive B2B credit remaining
      64 transmit B2B credit remaining
      64 low priority transmit B2B credit remaining
```

```
     Last clearing of "show interface" counters : never
Leonard(config-if)#
```

Using tx-credit double-queue:

After issuing the command on switch Leonard **system default tx-credit double-queue**

(Need to reset the interface by shut/no shut)

```
Leonard(config-if)# show int fc3/14 counter
fc3/14
    5 minutes input rate 320 bits/sec, 40 bytes/sec, 3 frames/sec
    5 minutes output rate 2688 bits/sec, 336 bytes/sec, 3 frames/sec
    1416819 frames input, 77233324 bytes
      0 discards, 0 errors, 0 CRC/FCS
      0 unknown class, 0 too long, 0 too short
    1416813 frames output, 138598368 bytes
      0 discards, 0 errors
    0 timeout discards, 0 credit loss
    53 input OLS, 85 LRR, 119 NOS, 0 loop inits
    77 output OLS, 7 LRR, 93 NOS, 0 loop inits
    14 link failures, 37 sync losses, 2 signal losses
     140 Transmit B2B credit transitions to zero
     92 Receive B2B credit transitions to zero
      0 2.5us TxWait due to lack of transmit credits
      Percentage Tx credits not available for last 1s/1m/1h/72h: 0%/0%/0%/0%
      500 receive B2B credit remaining
      64 transmit B2B credit remaining
      64 low priority transmit B2B credit remaining
    Last clearing of "show interface" counters : never
Leonard(config-if)#
```

it can be seen that there are 8 high priority Tx transmit B2B credits and 56 low priority credits:

```
Leonard(config-if)# show int fc3/14 counter
fc3/14
    5 minutes input rate 320 bits/sec, 40 bytes/sec, 2 frames/sec
    5 minutes output rate 256 bits/sec, 32 bytes/sec, 2 frames/sec
    1420613 frames input, 77459300 bytes
      0 discards, 0 errors, 0 CRC/FCS
      0 unknown class, 0 too long, 0 too short
    1420607 frames output, 138968464 bytes
      0 discards, 0 errors
    0 timeout discards, 0 credit loss
    54 input OLS, 87 LRR, 122 NOS, 0 loop inits
    79 output OLS, 7 LRR, 95 NOS, 0 loop inits
    14 link failures, 38 sync losses, 2 signal losses
     143 Transmit B2B credit transitions to zero
     94 Receive B2B credit transitions to zero
      0 2.5us TxWait due to lack of transmit credits
      Percentage Tx credits not available for last 1s/1m/1h/72h: 0%/0%/0%/0%
      500 receive B2B credit remaining
      64 transmit B2B credit remaining
      56 low priority transmit B2B credit remaining
    Last clearing of "show interface" counters : never
Leonard(config-if)#
```

Maximum RX transmit credit is 15 from switch MDS 9148S Tempest:

From the connected MDS 9148S,Tempest, it can be seen the maximum Tx transmit B2B credits is 15.

MDS9710 switch Leonard has 500 receive credits by default hence MDS9148S switch Tempest will also have 500 Tx transmit B2B credits remaining but 15 credits (the maximum) is allocated as high priority (500 - 485 = 15).

```
Tempest# show int fc1/13 counter
fc1/13
    5 minutes input rate 2624 bits/sec, 328 bytes/sec, 3 frames/sec
    5 minutes output rate 1504 bits/sec, 188 bytes/sec, 3 frames/sec
    1343331 frames input, 131489464 bytes
      0 discards, 0 errors, 0 CRC/FCS
      0 unknown class, 0 too long, 0 too short
    1343332 frames output, 72878124 bytes
      0 discards, 0 errors
    0 timeout discards, 0 credit loss
    9 input OLS, 2 LRR, 0 NOS, 0 loop inits
    12 output OLS, 20 LRR, 9 NOS, 0 loop inits
    9 link failures, 0 sync losses, 0 signal losses
     66 Transmit B2B credit transitions to zero
     24 Receive B2B credit transitions to zero
      0 2.5us TxWait due to lack of transmit credits
      Percentage Tx credits not available for last 1s/1m/1h/72h: 0%/0%/0%/0%
      64 receive B2B credit remaining
      500 transmit B2B credit remaining
      485 low priority transmit B2B credit remaining
    Last clearing of "show interface" counters  :never
Tempest#
```

When the receive credits from MDS 9710 Leonard is changed to lower than 120, then one out of eight Tx credits will be marked as high priority:

```
Tempest# show int fc1/13 counter
fc1/13
    5 minutes input rate 2624 bits/sec, 328 bytes/sec, 3 frames/sec
    5 minutes output rate 1504 bits/sec, 188 bytes/sec, 3 frames/sec
    1343331 frames input, 131489464 bytes
      0 discards, 0 errors, 0 CRC/FCS
      0 unknown class, 0 too long, 0 too short
    1343332 frames output, 72878124 bytes
      0 discards, 0 errors
    0 timeout discards, 0 credit loss
    9 input OLS, 2 LRR, 0 NOS, 0 loop inits
    12 output OLS, 20 LRR, 9 NOS, 0 loop inits
    9 link failures, 0 sync losses, 0 signal losses
     66 Transmit B2B credit transitions to zero
     24 Receive B2B credit transitions to zero
      0 2.5us TxWait due to lack of transmit credits
      Percentage Tx credits not available for last 1s/1m/1h/72h: 0%/0%/0%/0%
      64 receive B2B credit remaining
      500 transmit B2B credit remaining
      485 low priority transmit B2B credit remaining
    Last clearing of "show interface" counters  :never
Tempest#


Tempest# show int fc1/13 count
```

```
fc1/13
    5 minutes input rate 1024 bits/sec, 128 bytes/sec, 3 frames/sec
    5 minutes output rate 1536 bits/sec, 192 bytes/sec, 3 frames/sec
    1360026 frames input, 133105756 bytes
      0 discards, 0 errors, 0 CRC/FCS
      0 unknown class, 0 too long, 0 too short
    1360027 frames output, 73885304 bytes
      0 discards, 0 errors
    0 timeout discards, 0 credit loss
    14 input OLS, 2 LRR, 0 NOS, 0 loop inits
    17 output OLS, 30 LRR, 14 NOS, 0 loop inits
    14 link failures, 0 sync losses, 0 signal losses
     91 Transmit B2B credit transitions to zero
     34 Receive B2B credit transitions to zero
      0 2.5us TxWait due to lack of transmit credits
      Percentage Tx credits not available for last 1s/1m/1h/72h: 0%/0%/0%/0%
      64 receive B2B credit remaining
      112 transmit B2B credit remaining
      98 low priority transmit B2B credit remaining
    Last clearing of "show interface" counters  :never
Tempest#
```