Micro-Burst Monitoring

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The micro-burst monitoring feature allows you to monitor traffic to detect unexpected data bursts within a very small time window (microseconds). This allows you to detect traffic in the network that are at risk for data loss and for network congestion.

A micro-burst is detected when the buffer utilization in an egress queue rises above the configured rise-threshold (measured in bytes). The burst for the queue ends when the queue buffer utilization falls below the configured fall-threshold (measured in bytes).

The feature provides timestamp and instantaneous buffer utilization information about the various queues where micro-burst monitoring is enabled

Guidelines and Limitations for Micro-Burst Monitoring

The following are the guidelines and limitations for micro-burst monitoring:

- Micro-burst monitoring is not supported on the Cisco Nexus 9508 switch (NX-OS 7.0(3)F3(3).

- Micro-burst monitoring and detection is supported on Cisco Nexus 9300-FX, Cisco Nexus 9300-FX2, and Cisco Nexus N9K-C9364C switches.

- **show** commands with the **internal** keyword are not supported.

- Micro-burst monitoring is available with TOR switches that contain the Network Forwarding Engine (NFE2). The minimum micro-burst that can be detected is 0.64 microseconds for 1 - 3 queues.

  On these switches, micro-burst monitoring is supported on unicast egress queues. It is not supported on multicast, CPU, or span queues.

- Beginning with NX-OS 7.0(3)I5(1), micro-burst monitoring is available on the following TOR switches that contain an Application Spine Engine (ASE2, ASE3) or a Leaf Spine Engine (LSE):

TOR Switch	Measurable Minimum Burst Duration
N9K-C92160YC-X	86 μsec
N9K-C92304QC	96 μsec
N9K-C9272Q	96 μsec
N9K-C9232C	96 μsec
N9K-C9236C	96 μsec
N9K-C93180YC-EX	73 μsec
N9K-C93108TC-EX	78 μsec

On these switches, micro-burst monitoring is supported on both unicast and multicast egress queues.

In addition, early detection of long bursts is supported. For bursts lasting more than 5 seconds, an early burst start record is displayed after 5 seconds from the start of the burst and is updated when the burst actually ends.

Note On these switches, micro-burst duration is not affected by the number of queues configured.

- On TOR switches that contain a Network Forwarding Engine (NFE2), micro-burst monitoring requires IO FPGA version 0x9 or later.

Beginning with NX-OS 7.0(3)I5(1), micro-burst monitoring on TOR switches that contain an Application Spine Engine (ASE2, ASE3) or a Leaf Spine Engine (LSE) require the following IO FPGA versions:

TOR Switch	IO FPGA Version
N9K-C92160YC-X	0x16 or later
N9K-C92304QC	0x10 or later
N9K-C9272Q	0x15 or later
N9K-C9232C	0x6 or later
N9K-C9236C	0x14 or later
N9K-C93180YC-EX	0x8 or later
N9K-C93108TC-EX	0x9 or later

For more information about EPLD programming to upgrade the FPGA, see the *Cisco Nexus 9000 Series FPGA/EPLD Upgrade Release Notes*.

- The following are guidelines for micro-burst duration on TOR switches that contain a Network Forwarding Engine (NFE2):

Note Micro-burst duration is the duration of the burst that can be detected. For example, when micro-burst monitoring is configured for 1 - 3 queues, micro-bursts that exceed 0.64 microseconds are detected. Increasing the number of queues that are configured for micro-burst monitoring increases the duration of the burst that can be detected.

1 - 3 queues	0.64 microsecond duration
8 queues with 10 ports each	9.0 microsecond duration
10 queues with 132 ports each	140 microsecond (0.14 millisecond) duration

- By default, the switch stores a maximum of 1000 burst records. The maximum number of records is configurable within a range of 200 - 2000 records.

  - At least, 20 burst records are stored for each queue even when the maximum number of burst records has been reached.

  - When the maximum number of burst records has been reached, the oldest record is deleted to allow the storage of a new record.

  - You can use the **hardware qos burst-detect max-records** *number-of-records* command to configure the maximum number of burst records to store.

  - You can use the **show hardware qos burst-detect max-records** command to display the maximum number of burst records that can be stored.

- Too many back to back burst records while traffic is being drained from queues might result in jitter.

  To avoid jitter, configure the fall-threshold to be less than the rise-threshold. As a best practice, configure the fall-threshold to be approximately 20% of the rise-threshold value (bytes).

Configuring Micro-Burst Detection

You can enable micro-burst detection for all interfaces on the device.

SUMMARY STEPS

1. **configure terminal**
2. **policy-map type queuing** *policy-map-name*
3. **class type queuing** *class-name*
4. **burst-detect rise-threshold** *rise-threshold-bytes* **bytes fall-threshold** *fall-threshold-bytes* **bytes**
5. **exit**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	
	Example:
	
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**policy-map type queuing** *policy-map-name*
	
	Example:
	
	`switch(config)# policy-map type queuing xyz`
	`switch(config-pmap-que)#`
		Configures the policy map of type queuing and then enters policy-map mode for the policy-map name you specify.

Step 3	**class type queuing** *class-name*
	
	Example:
	
	`switch(config-pmap-que)# class type queuing`
	`c-out-def`
	`switch(config-pmap-c-que)#`
		Configures the class map of type queuing and then enters policy-map class queuing mode.

Step 4	**burst-detect rise-threshold** *rise-threshold-bytes* **bytes** **fall-threshold** *fall-threshold-bytes* **bytes**
	
	Example:
	
	`switch(config-pmap-c-que)# burst-detect`
	`rise-threshold 208 bytes fall-threshold 208 bytes`
		Specifies the rise-threshold and the fall-threshold for micro-burst detection.
		
		Note
		
		TOR switches with Network Forwarding Engine (NFE2) — Range for rise-threshold bytes: 208 - 4194304. Range for fall-threshold bytes: 208 - 4194304.
		
		TOR switches with Application Spine Engine (ASE2, ASE3) or Leaf Spine Engine (LSE) — Range for rise-threshold bytes: 208 - 13319072. Range for fall-threshold bytes: 208 - 13319072.

Step 5	**exit**
	
	Example:
	
	`switch(config-pmap-c-que)# exit`
	`switch(config)#`
		Exits policy-map queue mode.

Clearing Micro-Burst Detection

You can clear micro-burst detection for all interfaces or a selected interface.

SUMMARY STEPS

1. **clear queuing burst-detect** [*slot*] [**interface** *port* [**queue** *queue-id*]]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**clear queuing burst-detect** [*slot*] [**interface** *port* [**queue** *queue-id*]] **Example:**	Clears micro-burst information from all interfaces or the specified interface.

Example

• Example for an interface:

```
clear queuing burst-detect interface Eth1/2
```

• Example for a queue:

```
clear queuing burst-detect interface Eth1/2 queue 7
```

Verifying Micro-Burst Detection

The following displays micro-burst monitoring information:

Command	Purpose
show queuing burst-detect	Displays micro-burst counters information for all interfaces.

• Example for an interface:

```
show queuing burst-detect interface Eth 1/2
```

• Example for a queue:

```
show queuing burst-detect interface Eth 1/2 queue 7
```

Example of Micro-Burst Detection Output

Example output of TOR switch.

```
belv6# show queuing burst-detect detail
slot  1
=======
------------------------------------------------------------------------------------------------------------------
            Microburst Statistics

Flags: E - Early start record, U - Unicast, M - Multicast
------------------------------------------------------------------------------------------------------------------
Ethernet|Queue| Start |      Start Time      | Peak  |     Peak Time       | End   |      End Time      |Duration
Intfc   |     | Depth |                      | Depth |                     | Depth |                    |
        |     |(bytes)|                      |(bytes)|                     |(bytes)|                    |
------------------------------------------------------------------------------------------------------------------
Eth1/36| U0 | 310128 |2011/01/11 22:31:51:081725|310128|2011/01/11 22:31:51:081725|     0|2011/01/11 22:31:51:081918|193.14 us
Eth1/36| U0 | 311168 |2011/01/11 22:31:51:181765|311168|2011/01/11 22:31:51:181765|     0|2011/01/11 22:31:51:181959|193.90 us
Eth1/36| U0 | 283712 |2011/01/11 22:31:51:281825|283712|2011/01/11 22:31:51:281825|     0|2011/01/11 22:31:51:282018|193.63 us
Eth1/36| U0 | 283712 |2011/01/11 22:31:51:381862|283712|2011/01/11 22:31:51:381862|     0|2011/01/11 22:31:51:382056|193.42 us
Eth1/36| U0 | 312000 |2011/01/11 22:31:51:481885|312000|2011/01/11 22:31:51:481885|     0|2011/01/11 22:31:51:482080|194.42 us
Eth1/36| U0 | 221312 |2011/01/11 22:31:51:581974|221312|2011/01/11 22:31:51:581974|     0|2011/01/11 22:31:51:582168|193.58 us
Eth1/36| U0 | 291616 |2011/01/11 22:31:51:681964|291616|2011/01/11 22:31:51:681964|     0|2011/01/11 22:31:51:682157|193.10 us
Eth1/36| U0 | 190112 |2011/01/11 22:31:51:782067|190112|2011/01/11 22:31:51:782067|18512|2011/01/11 22:31:51:782154| 86.22 us
Eth1/36| U0 |  70512 |2011/01/11 22:31:51:882167| 70512|2011/01/11 22:31:51:882167|     0|2011/01/11 22:31:51:882253| 85.74 us
Eth1/36| U0 | 185328 |2011/01/11 22:31:52:082111|185328|2011/01/11 22:31:52:082111|     0|2011/01/11 22:31:52:082304|193.09 us
Eth1/36| U0 | 245856 |2011/01/11 22:31:52:182158|245856|2011/01/11 22:31:52:182158|     0|2011/01/11 22:31:52:182352|193.34 us
Eth1/36| U0 | 138112 |2011/01/11 22:31:52:282293|138112|2011/01/11 22:31:52:282293|     0|2011/01/11 22:31:52:282380| 86.53 us
Eth1/36| U0 | 242112 |2011/01/11 22:31:52:382284|242112|2011/01/11 22:31:52:382284|     0|2011/01/11 22:31:52:382478|193.55 us
Eth1/36| U0 | 136448 |2011/01/11 22:31:52:482264|195312|2011/01/11 22:31:52:482348|     0|2011/01/11 22:31:52:482542|278.16 us
Eth1/36| U0 | 299312 |2011/01/11 22:31:52:582334|299312|2011/01/11 22:31:52:582334|     0|2011/01/11 22:31:52:582612|278.12 us
Eth1/36| U0 | 184912 |2011/01/11 22:31:52:682432|184912|2011/01/11 22:31:52:682432|13312|2011/01/11 22:31:52:682517| 85.42 us
Eth1/36| U0 | 148304 |2011/01/11 22:31:52:782387|148304|2011/01/11 22:31:52:782387|     0|2011/01/11 22:31:52:782580|192.94 us
Eth1/36| U0 | 226512 |2011/01/11 22:31:52:882492|226512|2011/01/11 22:31:52:882492|     0|2011/01/11 22:31:52:882685|193.37 us
```