



Micro-Burst Monitoring

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Micro-Burst Monitoring

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.

Depending on the switch, you can enable the micro-burst detection per-queue or per-switch.

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 Cisco Nexus 9500 platform switches.
- Micro-burst monitoring and detection is supported on the following platforms:

Switches	Minimum Burst Interval	IO FPGA Version
Cisco Nexus 9200	86 µsec	0x16 or later
	96 µsec	0x10 or later
		0x15 or later
		0x6 or later
		0x14 or later
Cisco Nexus 9300	73 µsec	0x8 or later
	78 µsec	0x9 or later
Cisco Nexus 9300-EX		
Cisco Nexus 9300-FX		
Cisco Nexus 9300-FX2		
Cisco Nexus 9332C		
Cisco Nexus 9364C		

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. This is not supported for Cisco Nexus 9300-FX, 9300-FX2, and 9364C platform switches.



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

- **show** commands with the **internal** keyword are not supported.
- Micro-burst monitoring is available with 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.

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

Beginning with Cisco NX-OS Release 7.0(3)I5(1), micro-burst monitoring on Cisco Nexus 9200 or 9300-EX platform switches require the following IO FPGA versions:

Switch	IO FPGA Version
Cisco Nexus 92160YC-X	0x16 or later
Cisco Nexus 92304QC	0x10 or later
Cisco Nexus 9272Q	0x15 or later

Switch	IO FPGA Version
Cisco Nexus 9232C	0x6 or later
Cisco Nexus 9236C	0x14 or later
Cisco Nexus 93180YC-EX	0x8 or later
Cisco Nexus 93108TC-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 non-modular 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. This does not apply to Cisco Nexus 9300-FX, 9300-FX2, and 9364C platform switches.

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 Per-Queue

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



Note This procedure is for all Cisco Nexus 9000 Series switches that support per-queue thresholds.

You can enable independent micro-burst thresholds per queue on the following switches:

- Cisco Nexus 9300-EX/FX2 platform switches
- Cisco Nexus 9300-GX platform switches from Release 9.3(3)
- Cisco Nexus 9336C-FX switches
- Cisco Nexus 93360YC-FX2 and Cisco Nexus 93216TC-FX2 from Release 9.3(7)

The parameters are defined under the individual queues in the queuing policy-maps.

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**
6. **exit**
7. **interface ethernet *slot/port***
8. **service-policy type queuing output *policy-map-name***

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: <pre>switch# configure terminal switch(config) #</pre>	Enters global configuration mode.
Step 2	policy-map type queuing <i>policy-map-name</i> Example: <pre>switch(config)# policy-map type queuing xyz switch(config-pmap-que) #</pre>	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 <i>class-name</i> Example: <pre>switch(config-pmap-que) # class type queuing xyz switch(config-pmap-class) #</pre>	Configures the class map of type queuing and then enters policy-map class queuing mode.

	Command or Action	Purpose
	switch(config-pmap-que)# class type queuing c-out-def switch(config-pmap-c-que) #	
Step 4	burst-detect rise-threshold <i>rise-threshold-bytes</i> bytes fall-threshold <i>fall-threshold-bytes</i> 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.
Step 5	exit Example: switch(config-pmap-c-que)# exit switch(config-pmap-que) #	Exits policy-map queue mode.
Step 6	exit Example: switch(config-pmap-que)# exit switch(config) #	Exits policy-map queue mode.
Step 7	interface ethernet <i>slot/port</i> Example: switch(config)# interface ethernet 1/1 switch(config-if) #	Configures the interface.
Step 8	service-policy type queuing output <i>policy-map-name</i> Example: switch(config-if)# service-policy type queuing output custom-out-8q-uburst	Adds the policy map to the input or output packets of the system.

Configuring Micro-Burst Detection Per-Switch

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



Note This procedure is for all Cisco Nexus 9000 Series switches that support per-switch thresholds.

For the following switches, you have to enable thresholds per switch:

- Cisco Nexus 9300-FX switches
- Cisco Nexus 9332C switches
- Cisco Nexus 9364C switches

Configuring Micro-Burst Detection Per-Switch

Therefore, the threshold is defined globally and applied to any queues where micro-burst detection is enabled in the queuing policy.

SUMMARY STEPS

1. **configure terminal**
2. **hardware qos burst-detect rise-threshold *rise-threshold-bytes* bytes fall-threshold *fall-threshold-bytes* bytes**
3. **policy-map type queuing *policy-map-name***
4. **class type queuing *class-name***
5. **burst-detect enable**
6. **exit**
7. **exit**
8. **interface ethernet *slot/port***
9. **service-policy type queuing output *policy-map-name***

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: <code>switch# configure terminal</code>	Enters global configuration mode.
Step 2	hardware qos burst-detect rise-threshold <i>rise-threshold-bytes</i> bytes fall-threshold <i>fall-threshold-bytes</i> bytes Example: <code>switch(config)# hardware qos burst-detect rise-threshold 10000 bytes fall-threshold 2000 bytes</code>	Specifies the rise-threshold and the fall-threshold for micro-burst detection.
Step 3	policy-map type queuing <i>policy-map-name</i> Example: <code>switch(config)# policy-map type queuing custom-out-8q-uburst</code>	Configures the policy map of type queuing and then enters policy-map mode for the policy-map name you specify.
Step 4	class type queuing <i>class-name</i> Example: <code>switch(config-pmap-que)# class type queuing c-out-8q-q-default</code>	Configures the class map of type queuing and then enters policy-map class queuing mode.
Step 5	burst-detect enable Example: <code>switch(config-pmap-c-que)# burst-detect enable</code>	Enable micro-burst detection on the queue.
Step 6	exit Example:	Exits policy-map class queue mode.

	Command or Action	Purpose
	switch(config-pmap-c-que) # exit	
Step 7	exit Example: switch(config-pmap-que) # exit	Exits policy-map queue mode.
Step 8	interface ethernet slot/port Example: switch(config) # interface ethernet 1/1 switch(config-if) #	Configures the interface.
Step 9	service-policy type queuing output policy-map-name Example: switch(config-if) # service-policy type queuing output custom-out-8q-uburst	Adds the policy map to the input or output packets of the system.

Clearing Micro-Burst Detection

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



Note Even after removing the queuing policy from an interface, previous micro-burst statistics remain. Use the **clear queuing burst-detect** command to clear the remaining records.

Procedure

	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.

```
belv0# show queuing burst-detect detail
slot 1
=====
-----  

          Microburst Statistics  

-----  

Flags: E - Early start record, U - Unicast, M - Multicast  

-----  

Ethernets Queue Start Start Time Peak Peak Time End End Time Duration  

Intfc   |   | Depth |       |       | Depth |       | Depth | (bytes) |  

        |   | (bytes)|       |       | (bytes)|       | (bytes)|  

-----  

Eth1/36| U0 | 310128 | 2011/01/11 22:31:51:081728 | 310128 | 2011/01/11 22:31:51:081725 | 0 | 2011/01/11 22:31:51:081018 | 103.14 us  

Eth1/36| U0 | 311108 | 2011/01/11 22:31:51:181703 | 311108 | 2011/01/11 22:31:51:181703 | 0 | 2011/01/11 22:31:51:181059 | 103.00 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 | 103.03 us  

Eth1/36| U0 | 283712 | 2011/01/11 22:31:51:381802 | 283712 | 2011/01/11 22:31:51:381802 | 0 | 2011/01/11 22:31:51:382050 | 103.42 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 | 104.42 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 | 103.58 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 | 103.10 us  

Eth1/36| U0 | 190112 | 2011/01/11 22:31:51:782007 | 190112 | 2011/01/11 22:31:51:782007 | 18512 | 2011/01/11 22:31:51:782154 | 80.22 us  

Eth1/36| U0 | 70512 | 2011/01/11 22:31:51:882107 | 70512 | 2011/01/11 22:31:51:882107 | 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 | 103.00 us  

Eth1/36| U0 | 245856 | 2011/01/11 22:31:52:162158 | 245856 | 2011/01/11 22:31:52:162158 | 0 | 2011/01/11 22:31:52:162352 | 103.34 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 | 103.55 us  

Eth1/36| U0 | 136448 | 2011/01/11 22:31:52:482264 | 105312 | 2011/01/11 22:31:52:482348 | 0 | 2011/01/11 22:31:52:482342 | 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 22:31:52:582012 | 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 22:31:52:782380 | 192.04 us  

Eth1/36| U0 | 226512 | 2011/01/11 22:31:52:882402 | 226512 | 2011/01/11 22:31:52:882402 | 0 | 2011/01/11 22:31:52:882063 | 103.37 us
```