



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 the Cisco Nexus 9508 switch (Cisco NX-OS Release NX-OS 7.0(3)F3(3)).
- Micro-burst monitoring and detection is supported on Cisco Nexus 9300-FX platform switches, Cisco Nexus 9300-FX2 platform switches, and Cisco Nexus 9364C switches.
- **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.

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

Switch	Measurable Minimum Burst Duration
Cisco Nexus 92160YC-X	86 μ sec
Cisco Nexus 92304QC	96 μ sec
Cisco Nexus 9272Q	96 μ sec
Cisco Nexus 9232C	96 μ sec
Cisco Nexus 9236C	96 μ sec
Cisco Nexus 93180YC-EX	73 μ sec
Cisco Nexus 93108TC-EX	78 μ sec

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 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 switches that contain an Application Spine Engine (ASE2, ASE3) or a Leaf Spine Engine (LSE) 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
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 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 Per-Queue

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

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 c-out-def switch(config-pmap-c-que)#</pre>	Configures the class map of type queuing and then enters policy-map class queuing mode.
Step 4	burst-detect rise-threshold <i>rise-threshold-bytes</i> bytes fall-threshold <i>fall-threshold-bytes</i> bytes Example: <pre>switch(config-pmap-c-que)# burst-detect rise-threshold 208 bytes fall-threshold 208 bytes</pre>	Specifies the rise-threshold and the fall-threshold for micro-burst detection.
Step 5	exit Example: <pre>switch(config-pmap-c-que)# exit switch(config-pmap-que)#</pre>	Exits policy-map queue mode.

	Command or Action	Purpose
Step 6	exit Example: <pre>switch(config-pmap-que)# exit switch(config)#</pre>	Exits policy-map queue mode.
Step 7	interface ethernet slot/port Example: <pre>switch(config)# interface ethernet 1/1 switch(config-if)#</pre>	Configures the interface.
Step 8	service-policy type queuing output policy-map-name Example: <pre>switch(config-if)# service-policy type queuing output custom-out-8q-uburst</pre>	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
<code>show queuing burst-detect</code>	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 22:31:51:081018|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 22:31:51:181059|193.00 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|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|18312|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|193312|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
```

Example of `show queuing burst-detect nir detail` command:

```
config# show queuing burst-detect nir

slot 1
=====
-----
Microburst Statistics
Flags: E - Early start record, U - Unicast, M - Multicast
```

Ethernet Interface	Queue	Start Depth	End Depth	Start Time	End Time	Duration	Peak Depth	Peak Time
		(bytes)	(bytes)				(bytes)	
Eth1/6	U6	416	416	2023/06/28 13:11:45:005625	2023/06/28 13:11:45:005627	1.11 us	3120	2023/06/28 13:11:45:005627
Eth1/6	U6	416	416	2023/06/28 13:11:45:005057	2023/06/28 13:11:45:005059	1.44 us	3120	2023/06/28 13:11:45:005059

Example of telemetry configuration on the switch to receive micro-burst data:

```
telemetry
destination-group 1
ip address receiver_ip_address port receiver_port protocol grpc encoding GPB-compact
sensor-group 1
data-source native
path microburst
subscription 1
dst-grp 1
snsr-grp 1 sample-interval 0
```

