Micro-Burst Monitoring

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.

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 96 µsec	0x16 or later 0x10 or later 0x15 or later 0x6 or later 0x14 or later
Cisco Nexus 9300	73 µsec 78 µsec	0x8 or later 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 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.
- On TOR switches that contain a Network Forwarding Engine (NFE2), micro-burst monitoring requires IO FPGA version 0x9 or later.

  Beginning with Cisco NX-OS 7.0(3)I5(1), micro-burst monitoring on Cisco Nexus 9200 or 9300-EX TOR switches 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

TOR Switch	IO FPGA Version
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. 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 for Cisco Nexus 9200, 9300, 9300-EX, and 9300-FX2 Platform Switches

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

For the Cisco Nexus 9300-EX and 9300-FX2, you can enable independent microburst thresholds per queue on these devices. Therefore, those parameters are given under the individual queue(s) in the queuing policy-maps. On the Cisco Nexus 9300-FX, 9364C switches. The thresholds are per switch, and therefore are given globally and apply to any queues where microburst detection is enabled in the queuing policy.

Note This procedure is for all Cisco Nexus 9000 Series switches except the Cisco Nexus 9300-FX, 9332C, and 9364C switches. For the previously mentioned switches, see Configuring Micro-Burst Detection for Cisco Nexus 9300-FX, 9332C, and 9364C Switches, on page 6.

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:
	`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`	Configures the class map of type queuing and then enters policy-map class queuing mode.

	Command or Action	Purpose
	`c-out-def` `switch(config-pmap-c-que)#`	
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. Cisco Nexus 9200, 9300-EX, or 9300-FX2 switches: 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-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** *slot/port*
	Example:
	`switch(config)# interface ethernet 1/1`
	`switch(config-if)#`
		Configures the interface.

Step 8	**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.

Configuring Micro-Burst Detection for Cisco Nexus 9300-FX, 9332C, and 9364C Switches

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

For the Cisco Nexus 9300-EX and 9300-FX2, you can enable independent microburst thresholds per queue on these devices. Therefore, those parameters are given under the individual queue(s) in the queuing policy-maps. On the Cisco Nexus 9300-FX, 9364C switches. The thresholds are per switch, and therefore are given globally and apply to any queues where microburst detection is enabled in the queuing policy.

Note This procedure is for Cisco Nexus 9300-FX, 9332C, and 9364C switches.

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:** `switch# configure terminal`	Enters global configuration mode.
Step 2	**hardware qos burst-detect rise-threshold** *rise-threshold-bytes* **bytes fall-threshold** *fall-threshold-bytes* **bytes** **Example:** `switch(config)# hardware qos burst-detect rise-threshold 10000 bytes fall-threshold 2000 bytes`	Specifies the rise-threshold and the fall-threshold for micro-burst detection.
Step 3	**policy-map type queuing** *policy-map-name* **Example:**	Configures the policy map of type queuing and then enters policy-map mode for the policy-map name you specify.

	Command or Action	Purpose
	`switch(config)# policy-map type queuing custom-out-8q-uburst`	
Step 4	**class type queuing** *class-name* **Example:** `switch(config-pmap-que)# class type queuing c-out-8q-q-default`	Configures the class map of type queuing and then enters policy-map class queuing mode.
Step 5	**burst-detect enable** **Example:** `switch(config-pmap-c-que)# burst-detect enable`	Enable microburst detection on the queue.
Step 6	**exit** **Example:** `switch(config-pmap-c-que)# exit`	Exits policy-map class queue mode.
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.

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 Intfc	Queue	Start Depth (bytes)	Start Time	Peak Depth (bytes)	Peak Time	End Depth (bytes)	End Time	Duration
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	243856	2011/01/11 22:31:52:182158	243856	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