



Troubleshooting Fibre Channel BB credit 0 errors

OnCommand Insight

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Fibre Channel uses buffer-to-buffer credits (BB credits) to control transmission flow. The credit value is decremented when a frame is sent from a port and the credit value is replenished when the port receives a response. If the BB credits in the port are not replenished, the transmission flow can be impacted. Ports need memory, or buffers, to temporarily store frames until they are assembled in sequence, and delivered. The number of buffers is the number of frames a port can store and is called a Buffer Credit.

As the available credits for a given port approach zero, an error warns that the port will stop receiving transmissions when zero is reached and will not resume until the BB credits are replenished.

Insight performance policies allow you to set thresholds on the following port metrics.

BB credit zero - Rx
Number of times the receive buffer-to-buffer credit count transitioned to zero during the sampling period
BB credit zero - Tx
Number of times the transmit buffer-to-buffer credit count transitioned to zero during the sampling period
BB credit zero - Total
Number of times this port had to stop transmitting because the attached port was out of credits to provide
BB credit zero duration - Tx
Time in milliseconds during which the Tx BB credit was zero during the sampling interval

BB Credit errors might be caused by some of the following scenarios:

- If a given implementation has a high percentage of FC frames of sizes significantly less than the maximum size, then more BB_Credits might be required.
- Workload changes to your environment that could be impacting ports or devices that are connected to them, such as storage nodes.

You can use the fabric, switch, and port asset pages to monitor your Fibre Channel environment. Port asset pages present summary information about the resource, its topology (the device and its connections), performance charts, and tables of associated resources. When troubleshooting Fibre Channel issues the performance chart for each port asset is helpful because it shows traffic for the selected top contributor port. Port asset pages also show buffer-to-buffer credit metrics and port errors in this chart, with Insight displaying a separate performance chart for each metric.

Creating performance policies and thresholds for ports

You can create performance policies with thresholds for metrics associated with a port. By default, performance policies apply to all devices of the specified type when you create them. You can create an annotation to include only a specific device or a set of devices in the performance policy. For simplicity, an annotation is not used in this procedure.

Before you begin

If you want to use an annotation with this performance policy, you must create the annotation before you create the performance policy.

Steps

1. From the Insight toolbar, click **Manage > Performance policies**

The existing policies are displayed. If a policy exists for switch ports, you can edit the existing policy, adding the new policies and thresholds.

2. Edit an existing port policy or create a new port policy

- Click the pencil icon at the far right of the existing policy. Add the thresholds described in steps “d” and “e”.
- Click **+Add** to add a new policy
 - a. Add a “Policy Name”: Slow Drain Device
 - b. Select port as object type
 - c. Enter First occurrence for “Apply after window” of
 - d. Enter threshold: BB credit zero - Rx > 1,000,000
 - e. Enter threshold: BB credit zero - Tx > 1,000,000
 - f. Click “Stop processing further policies if alert is generated”
 - g. Click “Save”

The policy you create monitors the thresholds you set over a period of 24 hours. If the threshold is exceeded a violation is reported.

3. Click **Dashboards > Violations Dashboard**

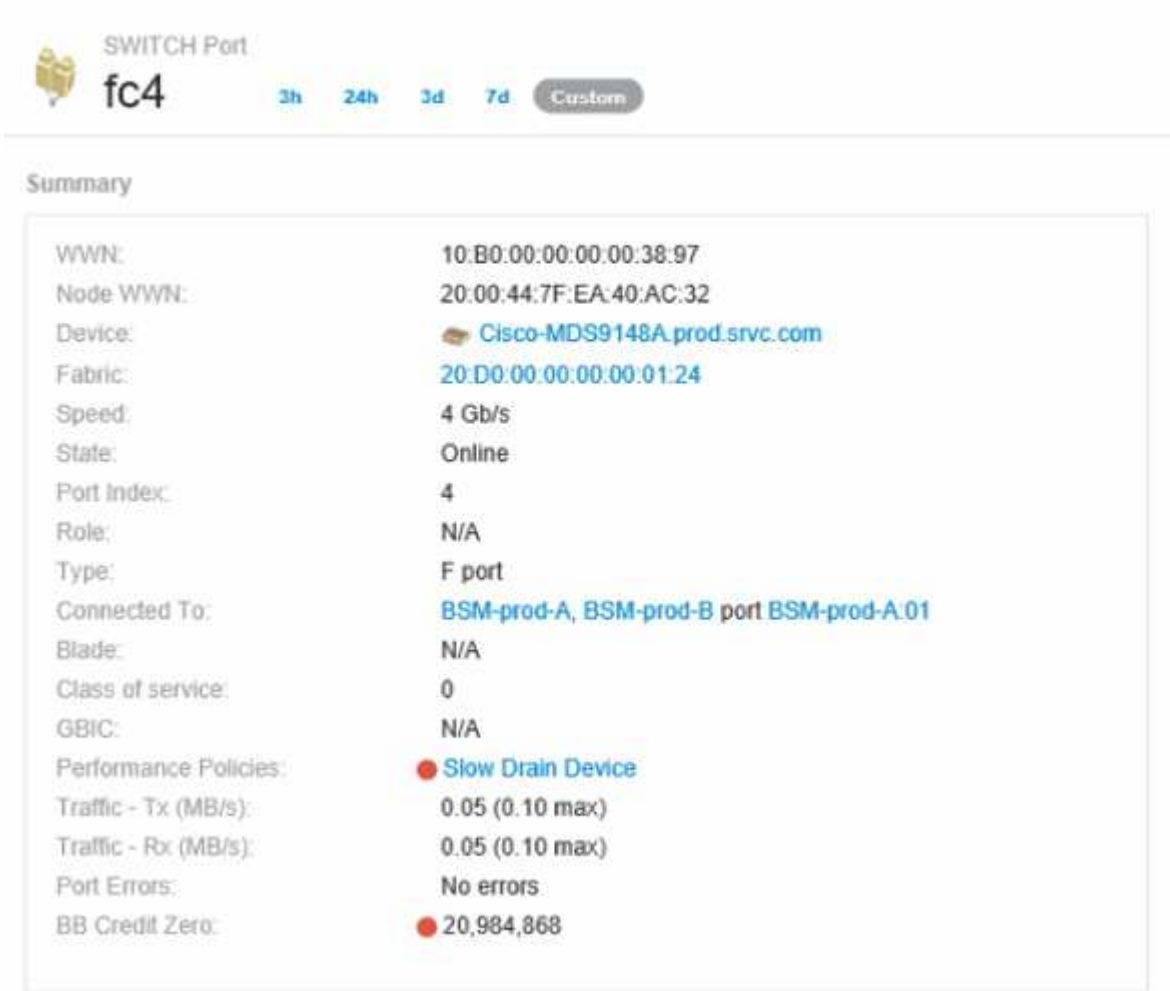
The system displays all of the violations that have occurred on the system. Search or sort the violations to view the “Slow Drain Device” violations. The Violations Dashboard shows all of the ports that experienced BB Credit 0 errors exceeding the thresholds that were set in the performance policy. Each switch port identified in the violations dashboard is a highlighted link to the Port Landing Page.

4. Click on a highlighted port link to display the Port Landing Page.




The port landing page is displayed and includes information useful for BB Credit 0 troubleshooting:

- Devices the port is connected to
- Identification of the port reporting the violation, which is a Fiber Channel Switch port.

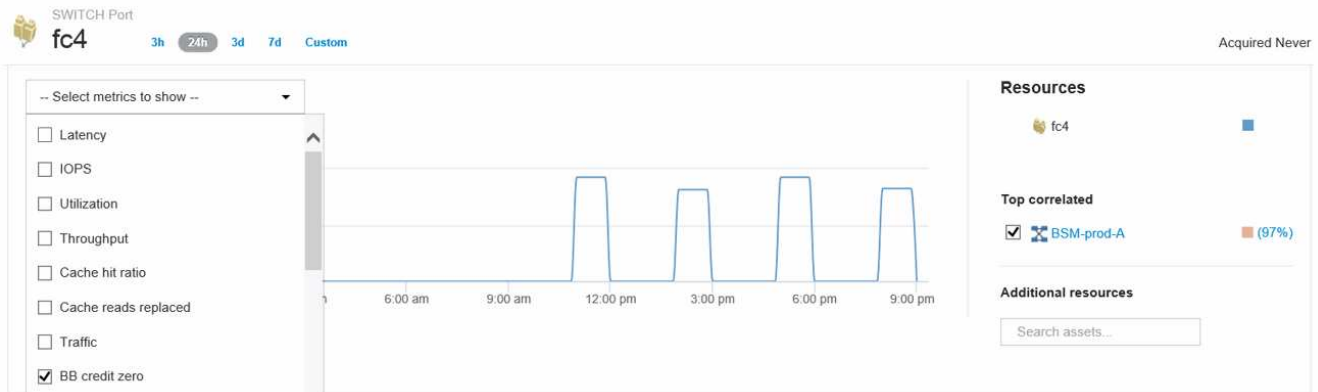
- The port's speed
- The associated node and port name




Summary

WWN:	10.B0:00:00:00:00:38:97
Node WWN:	20.00:44:7F:EA:40:AC:32
Device:	 Cisco-MDS9148A.prod.srvc.com
Fabric:	20.D0.00.00.00.00.01.24
Speed:	4 Gb/s
State:	Online
Port Index:	4
Role:	N/A
Type:	F port
Connected To:	BSM-prod-A, BSM-prod-B port BSM-prod-A.01
Blade:	N/A
Class of service:	0
GBIC:	N/A
Performance Policies:	 Slow Drain Device
Traffic - Tx (MB/s):	0.05 (0.10 max)
Traffic - Rx (MB/s):	0.05 (0.10 max)
Port Errors:	No errors
BB Credit Zero:	 20,984,868


5. Scroll down to view the port metrics. Click **Select metrics to show** > **BB credit zero** to display the BB credit graph.



Resources

-  fc4

Top correlated

-  BSM-prod-A (97%)

Additional resources

Search assets...

6. Click **Top correlated**

The top correlated resource analysis shows the connected controller node the port is servicing as the resource most correlated with performance. This step compares the IOPS metrics of the port activity with the overall node activity. The displays shows the Tx and Rx BB Credit Zero metrics and the controller node's IOPS. The display shows the following:

- The controller IOs are highly correlated with the port traffic
- The performance policy is violated when the port is transmitting IO to the server.
- Given that our port performance violation is occurring in conjunction with a high IOPS load on the storage controller it is likely that the violation is due to the workload on the storage node.



7. Return to the Port Landing Page and access the storage controller node's landing page to analyze the workload metrics.

The Node shows a utilization violation and metrics show high "cache reads replaced" that correlates to buffer-to-buffer zero credit states.

Storage:	BSM-prod-A, BSM-prod-B
HA partner:	BSM-prod-B
State:	N/A
Model:	FAS6070
Version:	8.0.5 7-Mode
Serial number:	700001181351
Memory:	98,304 MB
Utilization:	● 21.26% (94.56% max)
IOPS:	232.73 IO/s (1,153.00 IO/s max)
Latency:	7.07 ms (15.00 ms max)
Throughput:	22.44 MB/s (106.00 MB/s max)
Processors:	12
Performance Policies:	● Node Utilization Node Read Latency

8. From the Node landing page, you can compare the BB credit zeroes by selecting the port from the correlated resources list, and select utilization data, including Cache utilization data, for our node from the metrics menu.



This data makes it clear that the Cache hit Ratio is inversely correlated to our other metrics. Instead of being able to respond to the server load from cache, the storage node is experiencing high cache reads replaced. It is likely that having to retrieve most of the data from disk rather than cache is causing the delay in the port's transmission of data to the server. The cause of the performance problem appears likely to be a workload generated change in IO behavior, and that the node cache, and its configuration, are the cause. The problem might be solved by increasing the node's cache size or change the caching algorithm's behavior.

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