

Tackling the Top Two Causes of Storage Networking Congestion

CloudIQ AIOps predicts optics failures and speeds up SAN congestion remediation for Connectrix switches

By Jai Bansal, Network Product Manager



Because you are reading this, I expect that you have a stake in data storage, its dependency on storage area networking (SAN) and in resolving SAN conditions that can impede your business.

This centers on Fibre Channel (FC), the SAN technology that has been around for over 25 years and still is the preferred network for high performing storage and applications. It has evolved consistently, increasing performance from 1G to an amazing 64G (Gen7) while providing the familiar reliability and an enriched feature set.

Despite its evolution, there are two main causes of FC SAN Congestion that you need to overcome:

- Congestion due to over-subscription
- Congestion due to link integrity

Cause #1: Keeping Up with FC SAN Evolution

As FC evolves, SAN administrators must keep up with how to manage its expanded capabilities. They must identify and migrate their storage and hosts to the next-generation platforms to realize performance benefits. During migrations planning, host infrastructure often presents the biggest challenge because the final decision is driven by the users of the applications running on each host. This often leads to delays in migrations, which in turn causes an imbalance between host and storage performance capabilities.

When a host is not able to process the data being received quickly enough, the port transmitting the data will have to wait until the host is ready to receive more data. In this scenario, the host is considered to be a “slow-drain” device. This creates a queue at the transmitting port, and eventually this creates back pressure causing congestion in the fabric which can affect the input-output traffic for other devices.

A common slow-drain scenario is when a host attached to the SAN is slower than the storage that it accesses (e.g., an 8G host accessing 16G or 32G storage), and the host can cause congestion in the fabric if it uses large block READs (Figure 1). This happens because the

storage will be returning the data at a higher speed than the host can consume. Because the host can't receive all the data being sent by the storage, it will keep queuing up on the switch port connected to the host. This causes congestion on the switch port. This is a very common scenario and is known as *congestion due to over-subscription*. If this scenario continues for long enough, the congestion can propagate towards the transmitting device and impact other devices in the fabric. This is known as *congestion spreading due to over-subscription*.

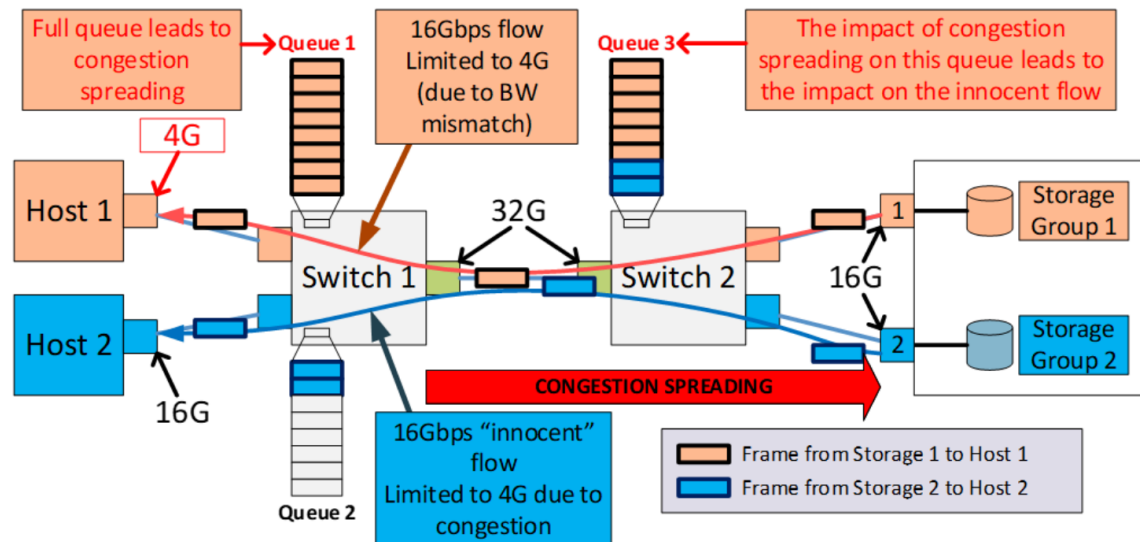


Figure 1: Congestion Spreading due to Over-subscription

Cause #2: Maintaining Physical Integrity in SAN

Another major reason for congestion is physical errors on links that can reduce the link integrity. There are various reasons behind those errors. The most common are failing optics and dirty cables. At times, the power values of an optic can drop so low where it will start generating errors or fail altogether. Dirt can also cause damage to the optic and reduce its lifetime while causing it to generate errors on the link. The errors generated because of a failing optic or dirt could cause congestion in the fabric. This is known as *congestion due to link integrity*.

How AIOPs Software Helps Overcome Both Challenges

Dell Technologies helps you manage these challenges through its CloudIQ AIOPs application, which applies machine learning and other algorithms to telemetry from Connectrix SAN switches and provides insights that speed up troubleshooting and time-to-resolution.

CloudIQ actively notifies you within minutes of congestion due to over-subscription or due to link integrity and different errors and delivers recommendations to help resolve the congestion. It also determines if a particular port is congested based on a *congestion ratio*, which is

calculated based on the time spent at zero transmit credit and the number of frames transmitted.

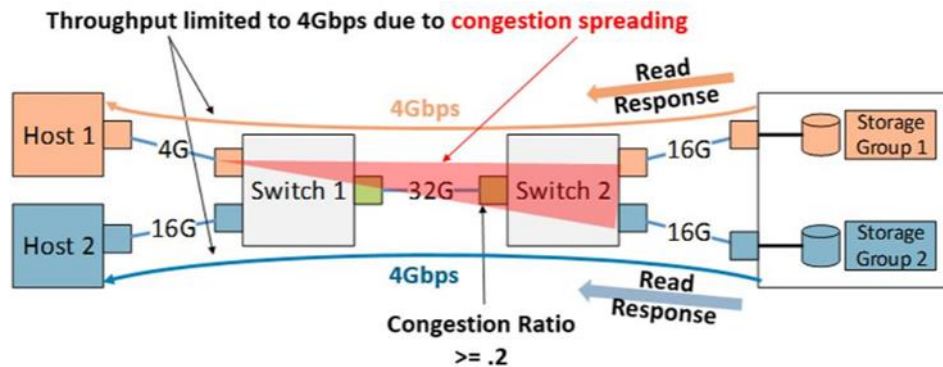


Figure 2: Congestion Ratio

Issue: 1 hour ago. A high port utilization on PrdSQL_184_hba0 in Production West Switch and Severe congestion ratio on switch SRDF LINK was detected

Resolution: Check attached end device SRDF LINK attached to switch port fc2/45 on Production West Switch. Contact Dell Support if you need help with resolving errors that may cause congestion in the fabric.

Figure 3: CloudIQ – Health Issue and Recommendation based on congestion due to over-subscription and link integrity

Using CloudIQ, you can proactively identify optics that are approaching failure, including optics at risk of failing within a week, a month or a quarter. Optics details can also be viewed for the selected port. Using these insights, you can proactively plan to replace the optic and avoid issues, including congestion, arising out of the failing optic.

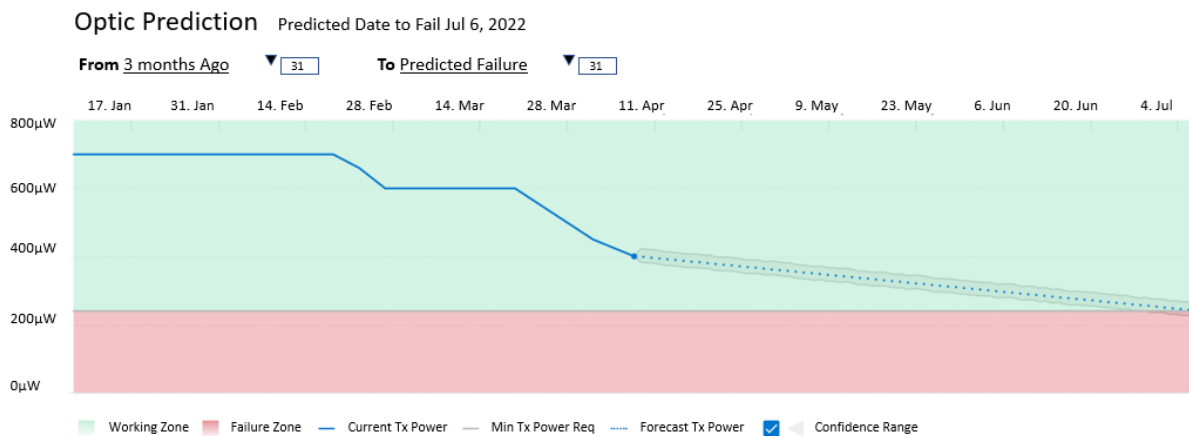


Figure 4: Optics Failure Prediction

CloudIQ AIOps does a lot more: it calculates health scores for each Connectrix SAN switch, based on component and performance issues, and makes recommendations to remediate those specific issues. Performance analysis at switch and port level captures performance anomalies based on the historical seasonality. Configuration and capacity information at the switch and port level helps in planning and proactively managing the switches.

Issue: 1 day ago. One of the temperature sensors crossed the Critical Threshold.

Resolution: Check the environment for any faulty fan tray units. The fan's speed will increase automatically. Remove and reinsert the faulty fan tray unit.

Figure 5: CloudIQ – Health Issue and Recommendation based on component status

Besides providing accurate and actionable information for overcoming all your SAN challenges, CloudIQ also monitors Dell storage, data protection, server, hyperconverged and IP network gear. This all-in-one view gives you a full understanding of your Dell environment across all your locations and a growing set of Dell-based services in public clouds. Moreover, CloudIQ is included with your Dell ProSupport contracts.

See a CloudIQ for Connectrix demo on www.dell.com/cloudiq

Read the [Congestion Spreading and How to Avoid It white paper](#).



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Jai Bansal is Product Manager of Dell Connectrix storage area network and PowerSwitch IP network systems and drives their development to help Dell customers meet the demands of modern applications. He has been with Dell for more than 12 years and overall has more than 21 years of experience working in IT Support, Services, Engineering and Product Management. Jai has diplomas in Computer Engineering and Business Administration as well as 12 diverse IT certifications. Outside of work, Jai enjoys playing and following a variety of sports.

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