Augmenting QoS using NPAR with PowerEdge FX2

Technical Note by:

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SUMMARY

QoS is a tool widely used by network administrators to prioritize network flows in situations where bandwidth is overprovisioned. While often thought of as a mechanism to prioritize data services like Voice over IP (VoIP) or IPTV, it is also a critical element of any converged networking solution where Ethernet is utilized as a transport for storage applications like Fiber Channel over Ethernet (FCoE) and iSCSI and with management tools like console access and vMotion.

Configuring QoS can be complex but an easy way to accomplish similar benefits, or to augment the solution is available on Dell PowerEdge Servers through NPAR. While this technology is available on all PowerEdge Servers it is particularly useful as a mechanism to establish bandwidth rules for FX2 nodes.

Background

According to Wikipedia, "Quality of service is the ability to provide different priority to different applications, users, or data flows, or to guarantee a certain level of performance to a data flow." Two of the challenges with configuring QoS is that there are often limits to how many data-flows can be managed and once established, the QoS rules tend to be static. This approach can be problematic during "events" where an immediate response must be prioritized over day to day operations. For example, imagine a QoS environment where FCoE and VoIP traffic flows are prioritized over all other traffic. In a normal working environment, this may be the ideal configuration but in the event of an issue where an administrator must quickly relocate all workloads to a different server or risk downtime, this prioritization may not be adequate.
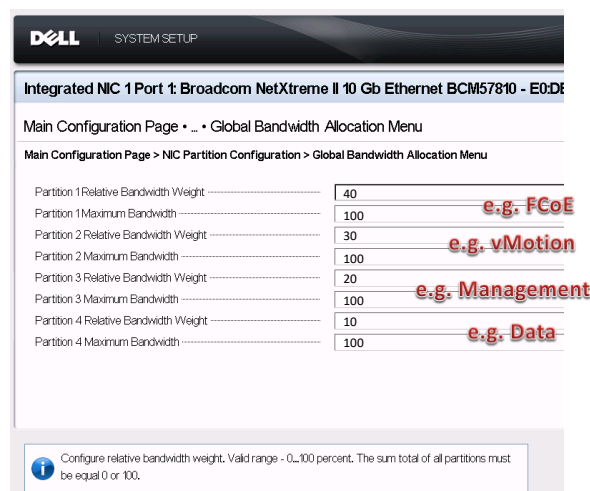
NPAR

NPAR is a technology available on Dell 10Gb/s and faster Network Interface Cards (NIC) that allows the administrator to segment the NIC. Most importantly, once segmented, the administrator can configure bandwidth rules for the Server that are independent from the QoS rules established for the network. The important concept here is that each NIC can be assigned to use 100% of the maximum bandwidth and like QoS can also assign weights to each NIC to control the data flow when constraints exist. Setup occurs during system setup by enabling NPAR and then clicking on the NIC Partition Configuration.
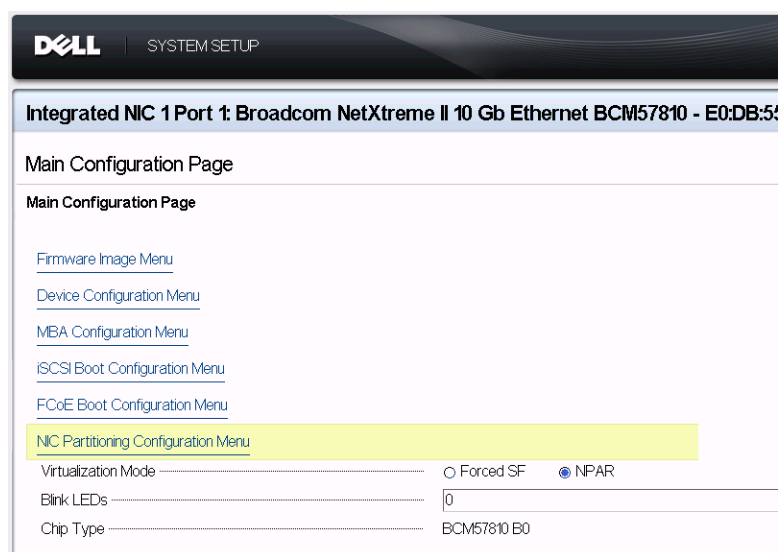
Augmenting QoS with NPAR

Like QoS, NPAR assigns a bandwidth weight. It is important to understand that these weights are only used when the NIC is constrained and they simply guarantee a percentage of bandwidth under these conditions. When setup in an un-constrained environment (as shown below) each NIC partition can access 100% of the bandwidth.

One example of where this could be useful would be: imagine a QoS configuration on the switch configured to prioritize FCoE first, VoIP second and define "best effort" for everything else. This may be appropriate in a normal operating environment but it won't be of much use if there is an urgent requirement to perform a vMotion event to recover from an impending hardware failure.

The example above configures storage the same as the QoS setting but takes a completely different approach to the remaining partitions. In this case, vMotion is prioritized over data to ensure that in the event of an emergency, vital server functions like FCoE and vMotion are prioritized over VoIP (which would be configured on the "Data" network). During normal operation, VoIP would be prioritized on the switch and since vMotion would not be in use, would also be utilizing all available bandwidth on the server. During a vMotion event, VoIP would still receive QoS benefits like "loss-less" IP flow but the available bandwidth would be prioritized below the vMotion event.

Conclusion

Capabilities like NPAR are of particular relevance in an FX2 environment where stacking of IO Modules can be used to enhance East/West traffic flows like the vMotion test outlined in the following Tolly Report: "Dell PowerEdge FX2 Network Architecture Network Flexibility versus Cisco UCS".
http://www.tolly.com/DocDetail.aspx?DocNumber=216101