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10GbE and FCoE and DCB: Ready for the Evolution of SAN Fabrics?

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As economic conditions recover in 2010 many organizations will be looking to evolve their IT operations with new datacenter technologies while enhancing business processes. Server and storage consolidation through virtualization technology has been an essential element to this evolution by helping administrators contain operational expenditures (OPEX) and capital expenditures (CAPEX). However, as IT consolidation increases overall utilization and I/O density of our virtualized data centers, the network is emerging as the new bottleneck and an area primed for innovation. In short, we simply need a larger “pipe” for communications to extend the benefits of IT consolidation through virtualization to the network.

Fortunately, new networking protocols have been swiftly making their way through the standards committees including 10 Gb Ethernet and Fibre Channel over Ethernet (FCoE). These new standards go by several names: “Converged Enhanced Ethernet,” “Data Center Ethernet,” and the industry-standard term “Data Center Bridging,” or DCB. Vendors are increasingly integrating these networking capabilities in new server, switch and Storage Area Network (SAN) designs that will lower overall deployment costs in 2010 and beyond. This article will provide an overview of the reasons DCB is being developed and how it can improve networking in the data center for applications, servers, and storage.

Background: Ethernet Requires TCP for Reliable Communications

While Ethernet is generally a reliable technology, data packets can be dropped in transmission due to network congestion, traffic load balancing, and loads on servers and switches. Dropped packets typically don’t cause big problems, but they can result in performance variations for applications.

Protocols such as TCP are run over IP on top of Ethernet to ensure seamless communications. TCP understands if packets were dropped during the communication; if so, those packets are re-sent, and if not, confirmation of a completed transmission is returned. With this “handshake,” TCP delivers reliable communications. TCP also provides routing capabilities so that communications work seamlessly across different networks.

DCB Delivers Reliability and Predictable Performance

DCB extends Ethernet by providing a network infrastructure that minimizes packet loss, enabling improved data networking and management within the DCB network environment with features for priority flow control (P802.1Qbb), enhanced transmission selection (P802.1Qaz), congestion notification (P802.1Qau), and discovery. The result is more deterministic network behavior. DCB is enabled through enhanced switches, server network adapters, and storage network adapters.
One component of the DCB framework is class-based pause (an extension to the IEEEP802.3x™ definition) that makes network performance extremely predictable by delivering “lossless” network traffic. While standard Ethernet performs very well, its performance can vary (see graphic). With DCB, the maximum performance is the same, but performance varies very little. This is extremely beneficial for data center managers, enabling them to better predict performance levels and deliver smooth traffic flows.