QLogic Continues Momentum as its Fibre Channel Switches are Chosen by HP

Move happens as battle lines are drawn between HP and Cisco

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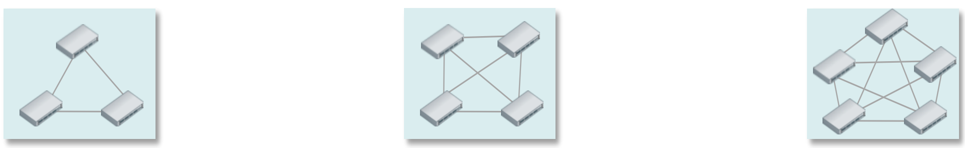
QLogic Inc. announced on February 18th, 2010 a new collaboration with IT giant HP in a further push to increase its share of the Fibre Channel (FC) switching market. As part of the agreement, HP will OEM QLogic's 5800V and 5802V Series of stackable 8Gb FC switches and offer them under the moniker *HP StorageWorks SN6000*. These switches are unique in their use of QLogic's inter-switch link (ISL) technology, which makes them *stackable,* and thus, allows for simpler scalability, more flexible configuration, and lower cost compared to the traditional non-stackable variety. These advantages are particularly relevant for large or quickly-growing storage area networks (SANs).HP will offer these products together with its storage and server offerings including the HP BladeSystem Virtual Connect, HP StorageWorks Modular Smart Array (MSA) and HP StorageWorks Enterprise Virtual Array (EVA) systems.

Networking Math

Growing your network

Networking switches are equipped with a limited number of ports to which storage subsystems or host adapters connect. For example, standard-height (1U) FC switches can come in versions from 8 up to 64 ports. It makes sense to purchase a switch with enough ports to satisfy connectivity requirements, e.g., a 24-port switch to connect 21 end points. However, as the network, and thus, the connectivity requirements grow, a switch's port capacity can be exceeded. If the switch's capacity cannot be extended, one solution is to replace it with a larger switch or director that meets the new requirement. This option is problematic as it does not take advantage of the investment already made in the form of the older, smaller switch. Furthermore, there is a limit to how many ports even the largest switches can support. Alternatively, the increased connectivity requirements can be met by adding another switch *in addition* to the existing one. This solution has the advantage that the existing investment is protected and the network can scale gradually. For this approach, the multiple switches need to be interconnected; ideally, a fully-connected (mesh) topology is employed in which every switch has direct connections to all others, thus minimizing the number of hops a data packet travels through. In order to create a fully-connected topology, each of the n switches connects to its $n-1$ peers. Every pair shares one connection, so there are $n(n-1)\ /\ 2$ connections (see Figure 1).



3 switches, 3 connections | 4 switches, 6 connections | 5 switches, 10 connections

Figure 1: No. of switches vs. no. of interconnections; source: QLogic

Non-stackable Switches

In traditional, non-stackable switches, the normal user ports are employed to connect the switches, and in order to avoid bottlenecks, two ports/cables are used on each side, thus doubling the available interconnection bandwidth. Ports that are used for interconnections are unavailable to connect hosts or storage subsystems, so the number of usable ports is reduced. At two cables per connection with two ports on each side, the number of user ports used for interconnection duties thus becomes $2n(n-1)$. For n switches of k ports each, the number of usable ports is therefore $n(k+2)-2n^2$. It is easy to see that no matter how large the switches are, as more switches are added, the quadratic term starts to dominate and the ratio of usable ports, i.e., the part of the purchased ports that can actually be used to connect network end-points, deteriorates. Furthermore, whenever a new switch is added, it is safe to assume that the old switch is fully populated. This means that in order to connect the new switch, some devices that are connected to an old switch need to be disconnected and reconnected to the new switch, causing operation disruption and requiring non-trivial, time consuming reconfiguration.
Table 1 demonstrates the effects of adding non-stackable industry-standard 24-port switches in a fully-connected topology. The *usable ratio* is calculated as the amount of ports usable to connect network end-points divided by the number of ports present (purchased). The *incremental ratio* calculates the percentage of ports each additional switch contributes that can be used freely. It reveals that the fifth and sixth switch are barely utilized, which suggests that maintaining a fully-connected topology becomes impractical, and an hierarchical, multi-hop topology needs to be employed, at a cost of lower performance and higher configuration complexity.

no. of switches	1	2	3	4	5	6
usable ports	24	44	60	72	80	84
usable ratio	100%	92%	83%	75%	67%	58%
incremental ratio	n/a	83%	67%	50%	33%	17%

Table 1: Usable ports with non-stackable 24-port switches in fully-connected topology

Stackable Switches

The defining characteristic of stackable switches is the availability of dedicated interconnection points, *inter-switch link (ISL) technology* in QLogic speak, to serve interconnection duties. They free up the user ports from having to connect to other switches, with the result that all user ports can be used to attach network end-points (see Figure 2).

Table 2 repeats the previous analysis using the switches from QLogic/HP's announcement. Each switch has a maximum of 20 user ports and four ISL ports, which means a maximum of five switches can be employed in a fully-connected topology. Studying the table, it is apparent that no user ports are 'wasted' when stackable switches are employed: users get the full capacity purchased. Note, with three switches, stackable and non-stackable alternatives provide the same number of ports, despite the non-stackable switches having 20% more user ports per switch; at four switches and beyond, the stackable switches overtake their counterparts and actually offer more ports. Finally, it is still feasible to maintain a fully-connected topology with five stackable switches, whereas the non-stackable variety would realistically have to change to a hierarchical topology at this level or even earlier. Another way of looking at this aspect is that realistically, the maximum user port number that can be made available in a fully-connected (and thus fast) topology with non-stackable 24-port switches is 72, or 84 if all economical considerations are ignored. Stackable 20-port switches can very simply deliver a maximum of 100 fully-connected ports.

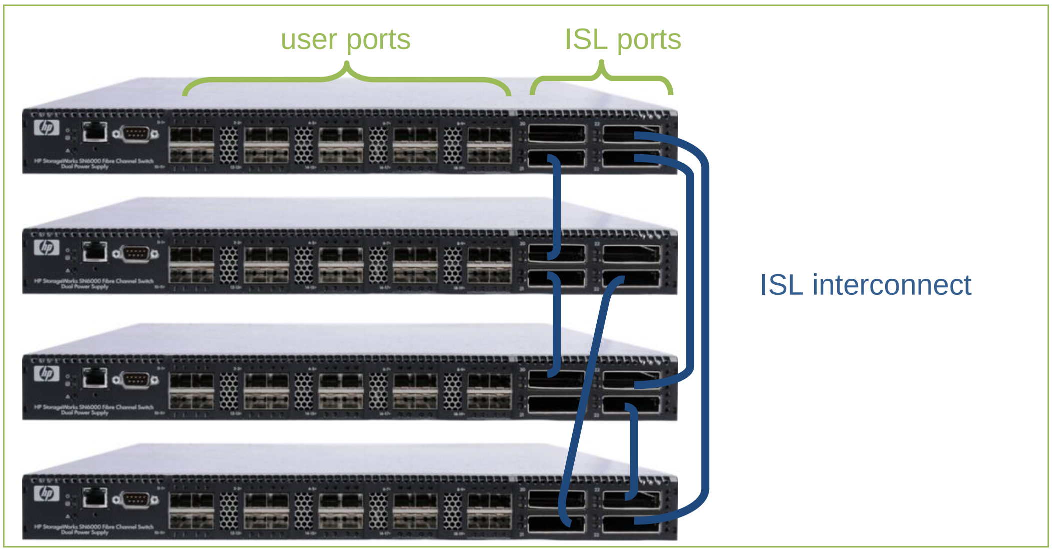


Figure 2: Stackable switches; source: QLogic

no. of switches	1	2	3	4	5	6
usable ports	20	40	60	80	100	n/a
usable ratio	100%	100%	100%	100%	100%	n/a
incremental ratio	n/a	100%	100%	100%	100%	n/a

Table 2: Usable ports with QLogic 5800V/HP SN6000 20-port stackable switches (fully-connected)

Economics

In its announcement, QLogic quotes *Wikibon* stating that stackable switches can yield cost savings of up to 74% compared to non-stackable alternatives. Note that this calculation depends on cost assumptions made, primarily that the cost per port is the same for both stackable and non-stackable switches. Product literature can be confusing to read as user and ISL ports are often referred to as 'ports' indiscriminately. It is important to keep in mind that there is no such thing as a free lunch. ISL ports need to be paid for in some way, so it may not be easy to find a stackable 20-plus-4-ISL-port switch for the price of a non-stackable 20-port switch (if the latter can be found). Therefore, at small installation sizes of one or two switches, non-stackable switches may still be competitive. However, as soon as the number of switches rises to three or more, the advantages of stackable switches start to dominate. From a pure 'user-port per dollar' standpoint, as long as these stackable switches can be found for less than an equivalent non-stackable 28-port switch, the choice becomes a no-brainer. Technical considerations, which are discussed below, further tip the scale in favor of stackable switches.

Case Study

When designing a network, the required connectivity usually dictates the number of switches and their topology. Suppose 80 user ports are required for a given deployment. When using stackable switches as above, four switches are sufficient to deliver the required ports, and they can be arranged in a fully-connected topology. To maintain a comparable performance, five non-stackable 24-port switches are required, meaning 10 connections between switches or 20 cables have to be used and 40 purchased user ports are unusable. In contrast, the stackable switches only need 6 interconnects (ISL connections only require one cable), and naturally, no user ports are wasted. Table 3 summarizes these findings.

Note that the more cables are employed, the more complex their configuration usually becomes; as well, an increased number of cables can impede air-flow, and thus, degrade cooling performance.

	no. of switches	no. of interconnects	user ports wasted
stackable, 20-port	4	6	-
non-stackable, 24-port	5	20	40

Table 3: Comparison of switching vs. non-switching alternative for 80 ports

Background

Product Details

HP sells the SN6000 in two versions, with or without a redundant power supply, respectively. They both offer 20 user ports of 8Gb throughput each, and 4 ISL ports that support a throughput of 10Gb (which can be extended to 20Gb through license activation). In its fastest version, the interconnect speed is therefore 25% faster than two bundled 8Gb connections. In total, more than 500 device ports can be supported in the fabric.

The hardware integrates into HP's Simple SAN Connection Manager (SSCM) software framework that allows the user to monitor, control, and configure all aspects of the SAN, including HBAs, switches, and storage subsystems, from one central user-friendly GUI application. The installation image and wizards supplied by HP can simplify the set-up and reduce the set-up time by up to two-thirds, according to QLogic.

Competitive Comparison

QLogic's 5800V/HP's SN6000 is a unique product in the market place. Brocade, another vendor of FC networking equipment, offers no stackable switches. Cisco's MDS 9134 is a stackable FC switch with two stackable ports, its user ports, however, only operate at 4Gb. Cisco does not currently offer any stackable FC switches that provide 8Gb user ports. QLogic's competitors have not offered many new technologies in their edge switching portfolios for a considerable amount of time.

Strategic Considerations

Much has been said lately about Cisco's move up-market with its *Unified Computing System* of integrated storage, network, computation, and virtualization solutions. This ingress into HP's market has certainly not been overlooked by its executives in Palo Alto. At the same time, HP's acquisition of 3Com of last year, in addition to its pre-existing *ProCurve* offerings, aims directly at the heart of Cisco's market. Tensions between these two giants would therefore be anything but surprising. Meanwhile, Brocade has been busy increasing its networking portfolio through its acquisition of Foundry, a move that affects the networking interests of both Cisco and HP.

QLogic, on the other hand, has minimal product overlap with HP, and therefore, no conflict. On the contrary, it has been a successful HP partner with their entry-level-SAN blade switches, so now the move up into the enterprise range with the SN 6000 switches comes as a logical next step in their business relationship. For QLogic, this increased partnership creates a huge opportunity to leverage HP's might and increase its market share in the Fibre Channel switching space, which is forecast to increase from $800M today to over $1B by 2011, according to Dell'Oro Group. With QLogic aligning so closely with HP, we predict that HP's FC edge switching revenue streams once flowing to Cisco will begin to quickly flow to QLogic. In the near future QLogic may very well become HP's preferred edge switch vendor.

The Bottom Line

With all these strategic machinations, it is easy to get distracted from the fact that QLogic's 5800V switches have no match in the market place, and this technological advantage was probably a crucial factor in steering HP's decision to select them. Stacking provides for a very simple and economical way to scale a SAN. Depending on the installation size and individual unit costs, cost savings compared to non-stackable alternatives can be significant, and the configuration is always simpler. If users expect their connectivity requirements to grow in the future (and who doesn't?) and want that growth to happen simply and seamlessly (again, who doesn't?), stacking capabilities must be considered. QLogic/HP's products are the only stackable 8Gb FC switches available in the market today. Finally, QLogic and HP provide a convenient, easy-to-use software package to simplify SAN management.

QLogic has been on quite a roll lately. First, it created the world's first single-chip Converged Network Adapter (CNA) with a full offload engine, an important step for the emerging Fibre Channel over Ethernet (FCoE) market. Then it convinced IBM and NetApp to choose this technology for their server and storage lineups. Third, it secured partnerships for its InfiniBand offerings and has now collaborations with SGI, Dell, IBM, and HP. Now, it is extending the existing partnership with HP to its unique offerings in the stackable FC switching market. Combining all these top-tier partners with QLogic's technology leadership should readily translate into success for a large part of its networking product portfolio.