Skip the navigation

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Intel preps thin fiber optics to shuffle data between computers

Intel is readying silicon photonics for use at the motherboard level

By Agam Shah
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IDG News Service - Intel is taking the first steps to implement thin fiber optics that will use lasers and light as a faster way to move data inside computers, replacing the older and slower electrical wiring technology found in most computers today.
Intel's silicon photonics technology will be implemented at the motherboard and rack levels and use light to move data between storage, networking and computing resources. Light is considered a much faster vehicle to move data than copper cables.

The silicon photonics technology will be part of a new generation of servers that will need faster networking, storage and processing subsystems, said Justin Rattner, Intel's chief technology officer, during a keynote at the Open Compute Summit in Santa Clara, California, on Wednesday.

At the conference, Intel and server maker Quanta Computer are showing a prototype server rack architecture that is capable of moving data using optical modules. The server uses an Intel silicon switch and supports the chip maker's Xeon and Atom server chips.

The new rack architecture with silicon photonics is a result of more than a decade of research in Intel's laboratories, Rattner said. He said silicon photonics could enable communication at speeds of 100G bps (bits per second), and transfer data at high speeds while using lesser power compared to copper cables. The technology could also consolidate power supplies and fans in a data center, reducing component costs.

Intel's research revolved around the production of devices needed to implement silicon photonics at the rack level, including modulators and detectors. The company is now producing silicon photonics modules that can transfer data at 100G bps, and is offering it to a few clients for testing.

Silicon photonics could potentially redefine server designs, Rattner said. With the high-speed bandwidth, processing and storage units could be decoupled from servers and stored in separate boxes. Once the infrastructure with silicon photonics is in place, server designs could change even more, Rattner said.

> Intel is working with Facebook to define new server technologies that will lead to the decoupling of computing, networking and storage resources. The high-bandwidth connection offered by silicon photonics will be key in bringing the rack technologies to reality, and the processor, switch and other modules need to work together on power management, protocol support, load balancing and handshakes to make high-speed data transfers possible.
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> Critical to this step is "the introduction of silicon photonics in not just the inter-rack fabric, but also the intra-rack fabric," Rattner said.
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> Intel is already using fiber optics with its Thunderbolt connector technology, which like USB 3.0, shuffles data between host devices and peripherals. At last week's International CES show in Las Vegas, Corning announced Thunderbolt Optical Cables that can stretch up to 100 meters.

Intel is being aggressive with pushing silicon photonics into the data center, said Jason Waxman, general manager of the cloud platforms group, in an interview. He said it could be in use in fewer than five years, but did not commit to a timeline.

There are multiple protocols that could be supported for high-speed data transfers, including InfiniBand, Ethernet and PCI-Express, Waxman said. Intel said it will implement the InfiniBand networking technology inside its chips, which could enable faster data transfers.

It is only a matter of time until copper wires are replaced by fiber optics, said Dean McCarron, principal analyst at Mercury Research.

"Over time you will see the server communication infrastructure -- which includes switches -- to include photonics," McCarron said.

High-speed communication networks use optical technology, and so far the bandwidth in servers was adequate, McCarron said. But with more data flowing through networks, there is a growing demand to crank up the speed over connections, which is where silicon photonics comes into play.

"We're going to keep seeing continued demands for the interconnect. It is a forgone conclusion we will have to go to photonics," McCarron said.

Initial implementations may be expensive, and there may be a need to introduce protocols that could enable high speed data transfers over fiber optics.

> "Eventually the signalling gets far too complex, and the move to photonics makes sense," McCarron said. "The motivation is how do you economically get to higher speeds."