Emerging Technology Trends

November 19th, 2007

100 gigabits per second over copper?

Posted by Roland Piquepaille @ 9:40 am
Categories: Computers & Internet, Wireless & Telecom, Engineering & Innovation
Tags: Gigabit, Modem, Cable, Modems, Network Technology, Telecommunications, Personal Technology, Hardware, Components, Networking, Roland Piquepaille

According to Penn State engineers, transmission rates of 100 gigabits per second are possible today over copper. But only on distances of less than 100 meters. And only with high-end Category 7 copper cables. These Ethernet cables are made up of four pairs of twisted wires shielded to reduce crosstalk. The Penn State technology could provide an alternative to glass fiber optics cables in computer datacenters where distances between systems are not too big. In other words, it would be possible to interconnect servers inside a building at speeds similar to the ones provided by more expensive fiber optic cabling.

This demonstration has been achieved by a team including two graduate students in electrical engineering, Ali Enteshari and Jarir Fadlullah. The team was supervised by Mohsen Kavehrad, professor of electrical engineering.

The researchers worked with Nexans, a company manufacturing Category 7 cables (Wikipedia reference). The Nexans ones are called LANmark-7 cables. And instead of the 10 gigabits per second transmission rate provided by this technology, they "have examined the possibility of sending digital data at a rate of 100 gigabits per second over 100 meters of Category-7 copper cable," according to Kavehrad.

But how could they push up the data transmission rate by a factor of 10? First, let's look at the limitations of all data cables. "All transmission cables are limited by the distance they can transmit data without degradation of the signal. Before errors and interference make the signals non-recoverable, cable systems use repeaters — which are similar to computer modems — to capture, correct or recover data, and resend it. The distance between repeaters depends on the cable and the approach used by the modem to correct errors."

So what was their new approach to this old problem? "Using information on specifications and characteristics of the cables from Nexans, the researchers modeled the cable with all its attributes including modeling crosstalk. They then designed a transmitter/receiver equipped with an interference canceller that could transfer up to 100 gigabits using error correcting and equalizing approaches."

And what results did they obtain? "'A rate of 100 gigabit over 70 meters is definitely possible, and we are working on extending that to 100 meters, or about 328 feet,' says Enteshari. 'However, the design of a 100 gigabit modem might not be physically realizable at this time as it is technology limited. We are providing a roadmap to design a high speed modem for 100 gigabits.'"

But even the researchers recognize that their technology is not deployable today. They think that "two or three generations in the future, the technology of chip circuitry will allow

these modem designs to be built."

So stay tuned! It would be great to get this speed at home.

Sources: Penn State Live, November 16, 2007; and various websites

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Roland Piquepaille lives in Paris, France, and he spent most of his career in software, mainly for high performance computing and visualization companies. For disclosures on Roland's industry affiliations, click here.

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