Fiber-optic speeds achieved over copper lines

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(PhysOrg.com) -- Bell Labs, Alcatel-Lucent's research arm, has demonstrated industry record broadband download speeds of up to 300 Megabits per second using two traditional twisted pair copper telephone lines. The achievement could extend the use of copper-based broadband networks, which are in wide use around the world, and it could provide another means of providing faster broadband in areas where fiber-optic and other cable technologies are unavailable.

French telecommunications giant Alcatel-Lucent said the speeds achieved would enable service providers to use the existing copper-based infrastructure to satisfy demand for fast broadband for home and business users for many years to come. Achieving faster speeds is important for Internet service providers who want to compete with the fundamentally different technology used by cable companies.

The demonstration used DSL (digital subscriber line) phantom mode, which was developed in 1986 as an analog telephony technique. This adds a “phantom” channel in addition to the two channels transmitted

over a twisted pair copper telephone line. The positive half of the phantom is sent down one wire, and the negative half is sent down the other. Analog processors at the receiving end extract the two real signals and the phantom.

Phantom mode adds to the bandwidth but also introduces noise or "crosstalk" into the signal, and to cancel out this effect they used a "vectoring" technique. Bandwidth was also increased by a third technique called "bonding," which treats the two lines in the twisted pair as if they were a single cable. Vectoring and bonding are standard means of increasing DSL broadband speed, but neither is widely used in the US.

The prototype technology achieved transmissions of 300 Megabits per second (Mbps) over 400 meters and up to 100 Mbps at up to one kilometer. Standard download speeds over ADSL using copper infrastructure are generally around 20 Mbps.

Head of Bell Labs research, Gee Rittenhouse, said in a company statement that DSL phantom mode is an important breakthrough because it "combines cutting-edge technology" with a business model that will enable service providers to offer the latest broadband services using the existing network infrastructure.

To use the new technique, the user must have two telephone lines already installed, and a modem designed to use the two lines.

Fast broadband speeds over copper lines were also demonstrated last year by Ericsson, who achieved transmission speeds of 500 Mbps, but their system used six bonded telephone lines, rather than the two in Alcatel-Lucent's prototype.

More information: Company press release.