Lofty wireless platforms for high speed broadband

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Floating high in the sky, tethered balloons may soon be a welcome sight for broadband users outside cities. Trials in England recently demonstrated these aerial platforms can wirelessly deliver data up to 200 times faster than an ordinary wired broadband connection.

The test was conducted under the IST project Capanina, now studying the use of wireless and optical broadband technologies from high-altitude platforms (HAPs). A typical HAP is an airship that floats at an altitude of 20 km. The test called on equipment operating in the 31/28 GHz millimetre-wave band. These frequencies are much higher than today's fixed wireless access links and enable higher data rates, but their signals can for example be affected by rain.

According to project contact Alan Gobbi, 'stratospheric broadband' fills the gap between satellite and terrestrial wireless technologies. "Place airships fitted with these communications technologies every 60 km, in a grid configuration, and you would have complete coverage of everywhere on the ground. You could offer everything from mobile phone calls to high-definition TV."

The project's target data rate is 120 Mbits/sec, currently much faster than the fastest ADSL (Asymmetric Digital Subscriber Line) connection. In the trial, the partners even achieved 270 Mbits/sec using a free-space optical link.

If ADSL speeds cannot keep pace with evolving multimedia

applications, HAPs could step in. “These platforms could provide low-cost broadband for suburban and rural areas where there are no alternatives,” says Gobbi. “But we are not saying HAP-based broadband will replace ADSL in city centres.”

Besides offering wide-area coverage, this technology has another major benefit. “The cost of establishing an HAP-related communications device is one-tenth the cost of a satellite. In terms of a satellite’s ability to serve multiple users on the ground with broadband, HAPs can support one thousand times more people,” says Gobbi. “They could offer cheaper solutions for medium-density areas, filling the gap between cables/fibre for high-density cities and satellite for sparsely populated areas.”

HAP technology could even serve passengers on a train travelling up to 300 km/hour. It would involve steerable antennas, on the airship and vehicle, with sophisticated beam control. The project’s partners are studying related issues, such as the need for line-of-sight communication at these high frequencies and signal break-up due to tunnels.

Two more HAP trials are planned. In August 2005, an untethered balloon will be flown in the lower end of the stratosphere over Sweden, testing HAP performance in extreme cold and the effect of a balloon bobbing around. In the summer of 2006, the partners will team up with the Communications Research Laboratory of Japan for a global HAP trial involving solar-powered unmanned aircraft.

“Our trials proved the concept of aerial platforms delivering reliable optical high-speed communications,” says Gobbi. He believes broadband delivered from HAPs to fixed users could be a reality within three to five years, with services to travelling users coming two years later.

But he recognises this will require more industrial effort, especially for

setting up the infrastructure: “The partners have their own exploitation plan. If there are gaps, we will link up with other organisations and service providers.” For an innovative follow-up project, Gobbi would like to study the delivery from airships of WiMAX, the increasingly popular broadband wireless standard.

Source: IST Results