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Case study:

Remote office communications system

National ICT Australia

from imagination to impact...

The challenge

Setting up and maintaining communications links for groups of people working in remote locations can be a tough task.

A lack of technical support and the need for equipment that is portable puts immediate constraints on design and function. Then there are the additional challenges imposed by wireless communications links and a requirement to handle multiple voice and data streams concurrently.

Existing remote communications offerings are designed for single users. Portable and reliable, they can provide voice and data facilities from virtually anywhere on the planet.

However they have not been designed to provide services to more than one user at a time. Although satellite modems continue to drop in both size and price, there has been no corresponding improvement in other equipment needed for this task. Creating a shared infrastructure still requires technical skill and a range of hardware components.

Bandwidth costs are also a consideration, as satellite links are typically up to 10 times the cost per megabyte of ground-based links. Existing technologies do not adequately address the dual problem of coping with the long delays inherent in satellite links and the need for data compression to reduce the amount of bandwidth required.

The NICTA approach

Aware of these challenges, a project team from NICTA's Network and Pervasive Computing program focused on developing ways to improve the efficiency of remote area communications links. Working with a range of existing codecs (data conversion tools) and networking protocols, they sought to create a method of dealing with network latency and compression in a single step.

Starting with the end product in mind – an instant office – the team strove to extend the capabilities of existing Performance Enhancing Proxies (PEP). PEPs are responsible for taking traffic from conventional land-based networks and adding the extra protocols needed to allow that traffic to be transmitted over satellite links.

Until now, technologists have uses PEPs in this way, and dealt with the need for data compression as a separate, subsequent step. While this works, it adds complexity to the system and does not allow it to work as efficiently as it might.

The NICTA research team has developed a new type of PEP which can also deal with compression. By using complex algorithms, the software is able to adjust for communications link delays and add compression in a single step.

The team has also studied standard voice codecs and found methods of improving their efficiency, reducing transmission overheads while maintaining voice quality.

The results

Test results have shown the new compression PEP delivers savings in bandwidth usage of between 30 and 40 per cent. This is achieved because the compression algorithm knows exactly what type of link the traffic is using and the PEP can monitor how much compression is being used.

The technology has been shown to work with as little as 100 kilobit-per-second data links, making it particularly applicable in situations where bandwidth resources are constrained.

As a next step, the NICTA team has successfully embedded the compression PEP software into a small computing device dubbed the Portable Remote Office (7-PrO).

Using off-the-shelf hardware components and a Linux operating system, the researchers have designed the device specifically to be used by people with limited technical knowledge working in remote locations.

The 7-PrO can handle four concurrent voice calls using IP telephony. It can also connect to a corporate network using a pre-configured virtual private network link.

The box, which is battery powered and easily connects to a satellite modem, also supports Wi-Fi, allowing wireless handsets and notebook computers to be used. Its in-built PBX even lets users make 'local' calls between handsets.

The device also contains a print server and the option of adding network attached storage resources. As its name suggests, it is a fully fledged instant office.

The NICTA team has also developed a second product, the 7-ip server, which is installed at the ground station end of the satellite link. This box converts the satellite link protocols back to those compatible with public networks (such as the PSTN) and decompresses both voice and data transmissions.

Commercialisation opportunities

The design of the NICTA compression PEP software makes it easily portable between different hardware platforms. While it has been demonstrated to work efficiently in the 7-PrO, it will perform equally well in a range of other devices.

This makes prospects for its commercialisation particularly strong. Indeed, the 7-PrO is the first project to successfully pass through the rigorous NICTA assessment process designed to establish the viability of developments. A number of satellite communications service providers have already expressed interest in licensing the technology.

End users are likely to include mining and exploration companies, emergency response teams and organisations looking to quickly establish office facilities in regional and remote areas.