

Case Study: Wireless Internet in the Khumbu Region of the Nepalese Himalayas

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Background

Nepal is home to some of the highest mountains in the world. This gift from nature attracts thousands of trekkers and hundreds of climbers every year, especially to the Khumu region of the Himalayas, home to Mount Everest. Getting to the base camp of Mount Everest involves a 4-day trek from Lukla, which has regular flights to Kathmandu, the nation's capital. During the climbing season, which lasts a total of 5 months every year, the area is full of tourists. The local Sherpas earn good money from the tourist trade.

Even though this region earns considerable foreign exchange for the Nepalese government, there is no functional telecommunications infrastructure. Tourists bring their own satellite phones for voice and data communications. The local Sherpas are completely deprived.

The Problem

Needless to say, lack of telecommunications in such an important part of the country poses a serious problem. Tourists need the service to remain in contact. The locals need it for development.

The rough mountainous terrain makes the deployment of any infrastructure extremely difficult and costly. It is just not possible to lay cables. Wireless Internet is the only viable solution. Thanks to advances in voice-over-IP, the same infrastructure can be used for voice and Internet access.

The Goals

The goal of this project is to link Namche (the first major settlement on the trek from Lukla) to the Everest base camp using wireless Internet. In the process, small villages, monasteries and tourist spots will also be inter-connected. The network will be connected to the global Internet using satellite.

The network will be used for Internet access, voice, distance education and telemedicine.

Describe Available Solutions

It is possible to establish the network using VSAT terminals at each location. However, this would be very expensive, both in terms of initial investment and operating costs.

Business Model

The project is both social and commercial. The idea is to charge tourists for Internet and voice services, and use the profits to support local use of the infrastructure during the months when tourism is down.

The technology being used is inexpensive 802.11b wireless Ethernet. Currently, we are using Cisco Aironet 350 radios donated by Cisco.

Project Economics

The RF equipment, including 802.11b radios are being donated by Cisco. Intel has donated notebook PCs. Sponsorships for more notebook PCs are being solicited. Yahoo! UK & Ireland has made a donation of 2,500 pounds. Implementation is being carried out by WorldLink Communications free of charge.

The major cost component is power. Most of the areas do not have utility power. Solar power systems have been used. But, these are very expensive (around US\$10,000 per site).

For connectivity to the Internet backbone, VSAT terminals have been installed in Namche and the Everest base camp. The one in Namche is a 3m C-band terminal costing around US\$18,000. The base camp one is a 1.2m Ku-band terminal costing around US\$8,000. The monthly bandwidth cost for both terminals is US\$2,500 per month.

During the tourist months, users are charged US\$1 per minute for Internet use. During the previous tourist season (March 15 to June 1, 2003), the project raised US\$17,532. After deducting US\$6,250 for Internet bandwidth and US\$1,250 for wages and miscellaneous expenses, the profit was US\$10,032. This is sufficient to pay the operating costs till September 15, when the next tourist season starts.

The above figures are from operations at Namche and base camp only. As the network is expanded to other tourist spots, the revenue will increase.

How the project is being deployed

The first stage of the project was completed on April 1, 2003. The goal was to provision Internet access services in Namche and the Everest base camp, operate the setup for one tourist season, and assess financial and operational feasibility.

Financially, the project is viable, as discussed above. Operationally, there are several issues. Logistics, electricity and manpower are the major constraints. Since the area is very remote with almost non-existent infrastructure, logistics is a nightmare. For the same reason, trained manpower from the urban areas are reluctant to spend extended periods in this region. Provisioning solar power is expensive, and maintaining the solar power system is difficult. Extreme variations in temperature drastically reduce the life of the batteries. The manpower problem is being handled by training local Sherpas. Only

the indigenous population is willing and capable of spending extended periods under the harsh conditions in the Khumbu region.

The second stage of the project, which is under implementation at the moment, involves linking a school in Syangboche via wireless Ethernet to the Internet in Namche. This will provide Internet access to the local population and provide a test bed for distance education. Since the base camp is closed, the notebook PCs from there will be used. The success of this stage will be measured by:

1. Acceptance and use of the technology by the locals. How much do the locals use the Internet and for what purpose? How much are they willing to pay? Besides e-mail, voip and chatting, what other applications are possible? Training in computer and Internet use will be provided.
2. Success of distance education. Illiteracy is the major problem in the Khumbu region. Since working as a porter for tourists earns a decent living, the local Sherpas are not motivated to attend schools. Those that leave the region and get an education are reluctant to return. A Sherpa living in Colorado has agreed to conduct English classes over the Internet for the school children.

Success of the second stage will determine the course of the project. The ultimate goal is to provide Internet access to most of the areas in the Khumbu region.

The Everest base camp represents one of the most hostile and remote parts of the world. The only way to get there is to walk for 3-4 days. Since the altitude is around 5600m, one cannot simply land by helicopter; within half an hour, the person would suffer from altitude sickness due to lack of oxygen to the body, which could be fatal. There is no power, no buildings, and no infrastructure of any kind. The entire base camp is located on a glacier, which moves at a rate of 10-feet per day. So, a VSAT installation is not possible. Wireless antennas also need to be realigned periodically. The temperature falls to -20C in the night and could reach 15C during the day. This extreme temperature fluctuation reduces the life of batteries and electronic components.

Successful operation under such harsh conditions is an achievement in itself. Several lessons were learnt and are being learnt in the process. For example, we had to design special Styrofoam cases for outdoor equipment to conserve heat. Later, going against conventional wisdom and popular belief, we were able to successfully operate the VSAT terminal on the glacier. These lessons are highly applicable to wireless Internet projects in remote areas with very adverse operating conditions.