

fast facts

Project: Innovative WiMAX Broadband Internet Access

Lead Organization: Bac Ha International University

Country: Vietnam

Budget: 29,392.00 USD



situation

During the past decade, use of the Internet and ICT services has rapidly increased from a penetration rate of less than 5% to the current 23.7% in Vietnam. However, as is the case in many other developing countries in the Asia Pacific region, Vietnam faces a severe digital divide among its regions and social groups. The digital divide, which refers to people with regular, effective access to ICT and those without this access, has contributed to greater economic and social gaps between the poor and the affluent. This gap directly relates to the discrepancy in income and education levels, including literacy between urban and rural areas. For this reason, an economical, efficient, and sustainable infrastructure that has a capability to deliver the Internet to large user groups in challenging rural areas is needed.

solution

Recent statistics show that the majority of the current 23.7% of Vietnamese who frequently use the Internet are located almost exclusively in Vietnam's big cities, such as Ha noi, Ho Chi Minh, Hai phong, Hue, and Da nang. At present, Vietnam's Internet Service Providers (ISPs) are reluctant to expand into rural areas due to issues of geographic accessibility, low population density in rural areas, and low demand and purchasing power within these communities.

This project investigates the feasibility of expanding internet access into these areas using WiMAX (Worldwide Interoperability for Microwave Access), a wireless communications standard designed to provide 30 to 40 megabit-per-second data rate.

Given the fact that WiMAX base stations are typically extremely compact, it's possible to add WiMAX hardware to existing TV broadcasting equipment. This means WiMAX could be made available on TV broadcast frequencies which are not currently being used for actual television channels. As such, the system promises an operating cost sharing between television industry and ISPs, eliminating the initial setup cost of network equipment that ISPs normally incur.

To investigate the feasibility of such an arrangement in Vietnam, the project team set out to test this theory in rural areas of the country which had both existing TV broadcast infrastructure and lower-band UHF frequencies available for repurposing.

Operating at lower UHF bands is desirable because it allows for larger coverage areas per base station, meaning fewer towers would be needed to provide service to a wide area of the country. To validate the concept of the proposed ICT infrastructure, this project follows a systematic engineering approach: study and model the geographic and demographic profile of a sample rural area; validate the theoretical feasibility (via calculation and simulation) of the WiMAX Internet technology via TV broadcasting using the realistic rural model; and then assess what requirements and commercially available equipment would be needed to implement an actual ICT infrastructure.

The project itself involved both site and equipment surveys as well as evaluation and simulation of the system using software specifically designed to test wireless connections. These experiments showed that the proposed system (using a sub-GHz WiMAX signal) could successfully link stations up to 37km apart. Additionally, the total equipment cost of the sub-GHz WiMAX system consisting of 1 base station and 4 subscriber stations (used for a sample calculation) is less than USD 30,000, of which the base station equipment represents 90% of the cost, a price which could easily be decreased as less expensive equipment becomes available. Under an agreement with a TV broadcasting provider, it may be possible to share other costs, such as tower and maintenance.

Research on equipment and infrastructure was supplemented by user research surveys and several outreach workshops. One such survey, conducted in Bac Ninh (located in rural area of the country) has been able to provide information not only about the prices people would be willing to pay for internet access, but also which applications they would like to be able to access once internet becomes available.

broader impact

This project demonstrated that WiMAX has a high potential value for both the Vietnamese government and private enterprises looking to expand into rural areas.

Bac Ha International University and the Institute of Electrical and Electronics Engineers (IEEE) Communication Society of Vietnam co-hosted a full day end-of-project workshop to further support project efforts by making a series of educational presentations available to various government authorities, along with the results and findings of ISIF 2009, culminating in an open forum discussion between the research group and workshop participants. A virtual copy of the workshop is available at <http://www.bhiu.edu.vn/Home/research/2010/03/445.aspx>

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