## The Wireless Internet Opportunity for Developing Countries



Edited by The Wireless Internet Institute







United Nations Information and Communication Technology Dask Force

# The Wireless Internet Opportunity for Developing Countries

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This reference document serves as a basis for seminars and roundtable discussions to be held at the World Summit on Information Society in Geneva in December 2003 and provides a multi-annual living knowledge base with ongoing updates in both electronic and printed form.

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#### THE SECRETARY-GENERAL

#### WELCOMING MESSAGE TO "THE WIRELESS INTERNET OPPORTUNITY FOR DEVELOPING COUNTRIES" CONFERENCE New York, 26 June 2003

It gives me great pleasure to send my greetings to the Wireless Internet Institute, the United Nations Information and Communication Technologies Task Force, and all other organizers and participants in this conference on wireless Internet opportunities for developing countries.

As you know well, the swift emergence of a global "information society" is changing the way people live, learn, work, and relate. An explosion in the free flow of information and ideas has brought knowledge and its myriad applications to many millions of people, creating new choices and opportunities in some of the most vital realms of human endeavour.

Yet too many of the world's people remain untouched by this revolution. A "digital divide" threatens to exacerbate already-wide gaps between rich and poor, within and among countries. The stakes are high indeed. Timely access to news and information can promote trade, education, employment, health, and wealth. One of the hallmarks of the information society—openness—is a crucial ingredient of democracy and good governance. Information and knowledge are also at the heart of efforts to strengthen tolerance, mutual understanding, and respect for diversity.

Wireless technologies have a key role to play everywhere, but especially in developing countries and countries with economies in transition. With considerable speed and without enormous investments, Wi-Fi can facilitate access to knowledge and information, for example by making use of unlicensed radio spectrum to deliver cheap and fast Internet access. Indeed, it is precisely in places where no infrastructure exists that Wi-Fi can be particularly effective, helping countries to leapfrog generations of telecommunications technology and infrastructure and empower their people.

For this to happen, however, we urgently need to reach a clear understanding of Wi-Fi's development potential, identify the obstacles, and develop a realistic plan of action that would bring together all stakeholders—governments, the private sector, civil society—in a coherent, synergistic, and sustainable endeavour. This conference offers a valuable forum for doing just that. Your recommendations will also help guide the work of the UN Information and Communication Technologies Task Force. I wish you every success and look forward to working with you on one of the leading development challenges of our times.

Kofi A. Annan

## Off the map

DakNet, Karnataka State, India

Www ireless broadband can have the biggest impact in rural areas where there is the least infrastructure. In these poor areas, with limited or unavailable connectivity options, a little bit of wireless can go a long way.

First Mile Solutions, based in Cambridge, Massachusetts, has been working to develop an affordable, low-risk wireless infrastructure to bridge the digital divide and jumpstart the rural communications market.

"We don't really know how people are going to use infrastructure where it hasn't existed," says Founder and Managing Partner Amir Alexander Hasson. "It may not even make sense yet to call it a market, the some 4 billion people living in rural areas who lack communications infrastructure."

In collaboration with Professors Sandy Pentland and Rich Fletcher of MIT Media Lab, Hasson has developed a "store-and-forward" infrastructure for rural areas using local transportation. Villages surrounding a town within 10 to 80 kilometers have an array of transportation vehicles passing through on a daily basis, raising a promising connectivity possibility. In addition to picking up and dropping off passengers, what if you could do the same with data?

Originally funded and patented by the MIT Media Lab, DakNet—the name comes from the Hindi word "dak," which means "post" or "postal"—has been implemented in India and Cambodia (and soon Nigeria). DakNet is essentially a store-and-forward wireless broadband network using a Mobile Access Point, or MAP, device that is mounted on any vehicle that frequently passes by a series of villages.

When the vehicle comes in range of a Wi-Fienabled kiosk within the village (up to 1 km depending on line-of-sight, velocity, and use of antennas), the MAP automatically senses a wireless connection with a kiosk and delivers and collects data at an average "goodput" (adjusted for connection-dropping) of 2.3 Mbps. After making a routine circuit, the vehicle returns to a hub, such as a cyber café, VSAT, or post office, and uplinks to the

#### THINGS TO REMEMBER

► Applications that are compatible in different settings increase the chances of their adoption. In India, DakNet worked as an intranet for land record changes. In Cambodia, it is used for e-mail and as a non-real-time search engine.

► A project will run smoothly when every part of the value chain has a buy-in to the project; that is, state government, bus driver, end user, and so on.





A DakNet bus mounted with a MAP.

Internet backbone.

The result is broadband intranet wireless access and applications to areas where there may even be no telephone, for under \$500 per village.

Initial installations of DakNet are done by the First Mile Solution team, which also builds human-resource development capacity by training local teams about wireless networking, empowering them to maintain, expand, and upgrade the network themselves.

Although the data transport provided by DakNet



A DakNet hub with satellite uplink.

is not real-time, a very large amount of data can be moved at once, supporting a wide variety of non-real time applications, including audio and video messaging, e-mail, community bulletin boards, public health announcements, and music and video broadcasts. Information-intensive applications include collection of environmental sensor information, voting, census/polling, health records, and land records; as well as Web services such as searching and browsing, e-commerce, and voice-mail over IP. The service can also track the movement of goods. (1)

### Store-and-forward stepping-stones

In Karnataka State, the local government has pioneered the computerization of land records in what is recognized as the first state-level e-governance initiative in India. The Bhoomi project has been successfully implemented at district headquarters across Karnataka to completely replace the physical land-records system.

DakNet has taken Bhoomi one step farther, however, by decentralizing the land-records database to villages up to 70 km from the district headquarters, or "taluka," in Doddaballapur. DakNet uses a public government bus with a Mobile Access Point, or MAP, to transport landrecord requests from each village kiosk back to the taluka server. The server processes requests and outputs land records that are then delivered back to the kiosks for printing and payment (about \$0.32 per land record).

Amir Hasson answered questions about DakNet's design and economics and about a second implementation in Cambodia that delivers Internet access to remote schools through a similar store-and-forward wireless method.

## Q. What did the Karnataka drivers think about having an antenna mounted on their buses?

A. All of the bus drivers wanted to be the first DakNet-enabled bus, but gradually they realized that if all these people were doing land records from the village, they would not be riding the bus as often, and that meant they will lose revenue. At that point, they could not really object because they had orders from Karnataka's revenue department and e-governance department. Nevertheless, to scale the network, you would need to provide the right incentives for the means of transport as well.

Q. Does DakNet have a business model

#### associated with Bhoomi?

A. The Bhoomi project really is not designed to make money. It is going to take about 6.5-7 years for the total investment in those kiosks to pay off if they are doing only land records for Rs.15 per record. Other services need to be provided or we might need to develop cheap machines that just do land records very cheaply.

Q. Did you develop software for the project?

A. We worked with the National Informatic Center and customized their front end to work with our system. So it uses the same database (backend) but a different front end that works in a store-and-forward or asynchronous mode.

In India, we just provided an intranet—the bus going back and forth taking land records but in Cambodia, we are actually providing Internet access. You have full-fledged e-mail accounts using Outlook Express on each of the computers. People have e-mail IDs, and they are globally connected. With a non-real-time search engine, they can also enter a keyword search, such as "malaria," and the search is sent to our server in Cambridge where the cached results are e-mailed back to the user who can then browse the results offline.

### Q. What is the business model in Cambodia?

A. It is much more of a long-term approach where the schools have been funded by the World Bank and other donors as community centers of excellence with some minimal tuition. But as the schools have an economic development dynamic within their premises, they may become a commercial center that the villagers use for their daily needs.

Q. Do you see the store-and-forward

#### design as a long-term solution? Is this a stepping-stone or the end point?

A. Communications is a fundamental right and there are many advantages to real-time connectivity at some point. But what we are arguing is that you need a way to get there, and DakNet is a stepping-stone that's designed to be more or less seamless. We would like to position ourselves as a provider of seed technology that can also grow to provide the technology that is demanded as each village develops.

### A. What are some of the advantages of the store-and-forward design over a cell phone?

A. There are a lot of disadvantages of provid-

ing a real-time network especially if you're working in a shared-access kind of model. If you have a telecenter, with one phone booth for the whole village, the catch there is that the person who is being called is almost never at that phone booth. Someone has to record the message for the person who was called and then deliver the message. If you are paying for that kind of infrastructure, you need to provide access devices (phone/computer/handheld) in households and not as a shared model. The private sector will perk up when people will start to be able to afford their own access devices and we start to move away from the shared model. That's a kind of gold mine here.())