Creating a Community-based Telecommunications Network

The start of the 21st century may well be remembered as the turning point when the provision of telecommunications services to the world's masses not only became technically and financially feasible, but also a strong priority among governments, development agencies, and the private sector. What until recently was viewed as an obligation among service providers, is now being perceived as an opportunity to cheaply tap new markets and become the backbone for other value-added services.

This sea change in attitudes has largely been the result of the massive popularity of wireless networking devices, particularly in developing countries. In recent years, equipment costs have plummeted as their capabilities have sharply increased, a trend that looks poised to continue for the foreseeable future. Compared to traditional wired alternatives, wireless infrastructure is not only cheaper and quicker to deploy, but also a faster and more adaptable solution.

Development practitioners who have leveraged information and communication technologies (ICTs) to improve the delivery of a range of socio-economic services over that past decade have well documented[1] the benefits of inexpensive and timely access to information. Previously isolated communities not only gain access to relevant information, but also gain entry into the global marketplace, creating local wealth in areas ranging from financial services to agriculture. Telecommunication networks also enable communication and collaboration at the local level, and become increasingly valuable as more people are connected to them. Recent improvements of technologies and applications, coupled with a corresponding decrease in associated costs have made scaling and replicating such networks not only possible, but profitable.

Re-focusing on Demand

For the past decade, the international development community has focused primarily on delivering computer-based ICT services, in spite of evidence that suggests the highest demand in rural areas is most likely for voice-based services. Person-to-person communications has historically been the killer-app for telecommunication services. Even as the amount of data traffic has grown globally, the bulk of it still comprises direct communication applications such as email, SMS, and VoIP. In the rural context, where literacy rates are low and most information needs are basic, demand for such services is likely to be even higher.

The development community's focus on data-driven services that connect rural areas to the 'outside world' also neglects the historical demand for interconnection at the local level. The rapid expansion of rural communications the US underwent in the early part of the 20th century, for instance, was largely a result of independent rural telcos being set up to facilitate communication between other rural areas. These telcos continued to grow and interlink with one-another, eventually forming a seamless national network. There is no reason to believe that, given the right enabling environment, the same thing couldn't happen in much of the rural developing world today. As such, a focus on voice applications is an ideal starting point for creating sustainable local telecommunication networks.

---

[1] **http://www.digitaldividend.org/**

A number of new technologies have been developed in recent years that have drastically lowered the cost of providing voice services. First and foremost has been the Internet, and specifically, its underlying packet switching Internet Protocol (IP). Unlike its circuit-switching predecessor, IP enables greater data transfer rates using less capacity. Costs are lowered further since IP allows the delivery of both data and voice services through the same channels

Other important technologies are built upon this IP-based infrastructure. For one, the rapidly evolving 802.11 wireless standard, which includes WiFi and WiMAX, is delivering connectivity to rural areas at a substantially lower cost. New call-switching software efficient enough to run on a standard PC is also allowing for the delivery of voice services using low-cost Voice over Internet Protocol (VoIP). With demand from developed economies continuing to reduce prices, this combination of WiFi/WiMAX and VoIP is a current dynamic that is just now gaining momentum and being implemented in selected locations in developed countries.

Establishing a Rural Community Telco

USAID's Darrell Owen has done a good job identifying the primary components of a fully-functional community-based telecommunications network built to serve the latent demands for local-community voice communications. The core technologies include 1) an Internet Protocol (IP) network in lieu of a circuit switched network, 2) voice services that are provided through Voice over IP (VoIP) in lieu of custom hardware-based switching, 3) wireless distribution, be it WiFi and/or WiMAX in lieu of terrestrial land lines, and 4) for the more remote locations, satellite-based backbone/back haul for connecting the rural system to the Internet.
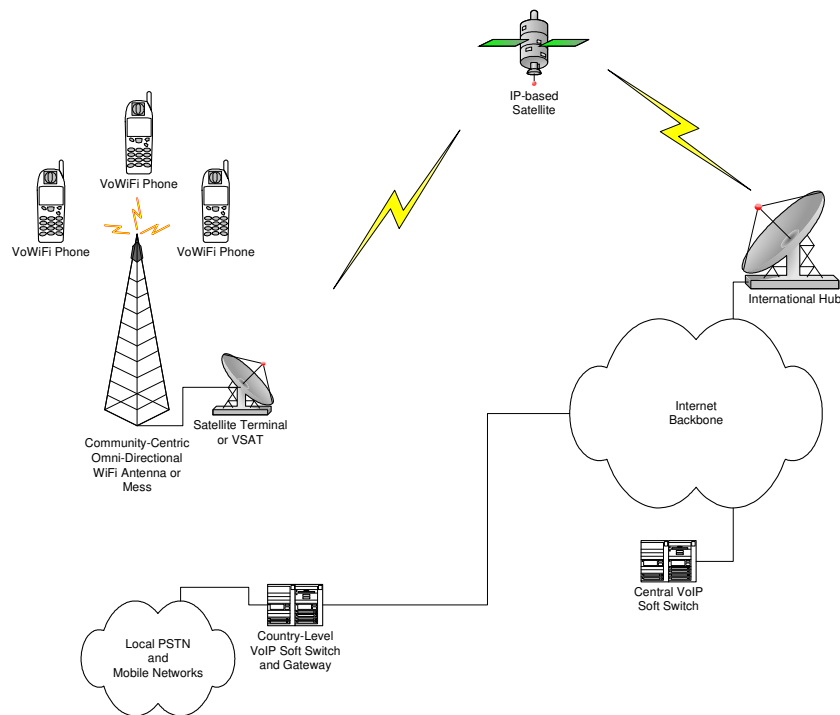
The Technologies

Internet – packet switching replaces the industry-standard circuit switching, substantially reducing costs and allowing for the integration of additional value-added services.

VoIP Soft-switch – routes the packets to/from those making the call, and provides interconnection to the PSTN.

WiMAX & WiFi -

Mesh Networks –

WiFi Phones – UT Starcom and ZyXEL are already producing VoIP-enabled handsets. In Vietnam, USAID is also piloting the use of a $10 900 Mhz VoIP cordless phone. Other handset manufacturers are pushing manufacturing costs lower. Motorola ($30) and Infineon ($20) both expect to introduce models in early 2006. Not all VoIP phones are SMS-ready, but the functionality can be added with minimal additional cost.

Satellites – where terrestrial solutions are not available, satellites will allow remote communities to reach outside their network. New satellites, such as the IPStar and BGAN are providing IP services at a substantially lower cost than has been possible in the past.

The easily deployed network provides multiple telephony access points for both inter-community and long distance calling in addition to supporting data. The use of off-the-shelf technologies allow this to be done at a cost that is literally pennies-on-the-dollar for what has been possible in the past.

There are several options for providing these services to the local community. One obvious approach is to upgrade an existing telecenter to become a true "last mile" solution provider by focusing on voice services, and delivering expanded access into the community through selected businesses or even homes that serve as "phone shops" for the immediate neighbors. Another approach is to turn an existing satellite or satellite-based phone into a local community telco by adding WiFi/WiMAX distribution capabilities. Creating a new business from scratch, possibly with the technical support or financing assistance of an existing licensed carrier, is also an option.

Mobile-driven Applications

Beyond the revenue earned from traditional voice services, a number of value-added applications can improve the cost-effectiveness and sustainability of the local network. For existing or future telecenters that become local community telcos, additional earnings will help maintain operations while demand for pure data services steadily increases.

There are a number of mobile-enabled services that have already been deployed in emerging markets.

Financial Services

Cell phones are increasingly being used to make financial transactions. In South Africa, for example, the WIZZIT[2] banking facility allows account holders to user their mobile to remit money to a friend, buy airtime, or pay accounts. The service was developed specifically to provide the unbanked and underbanked with an affordable alternative to mainstream bank offerings, and has no monthly fees and no minimum balance requirements.

Two companies from the Philippines have also rolled out similar plans. Globe Telecom's G-Cash[3] service allows subscribers to transfer funds domestically and internationally and make payments via texting. Authorized G-Cash outlets let users load or withdraw cash from their phones and receive international remittances. Another, SMART Communications[4] has enabled electronic sales of small increments of pre-paid airtime via SMS, creating a business opportunity for 450,000 entrepreneurs. In partnership with Mastercard, the company also launched Smart Money, a service which enables users to transfer money from a bank account to a Smart Money account. Subscribers can then use their Smart Money card like a debit card, or transfer money via SMS to another user's card.

Motorola recently unveiled M-Wallet[5], a downloadable software application that allows users to pay bills, purchase products, or transfer money using their cell phones. The company is targeting the estimated $18 billion that is sent annually from the U.S. to Latin America by immigrants and migrant workers as one of its early markets.

Finally, Way Systems[6] has designed a low-cost technology to transform cell phones into wireless Point of Sale (POS)/ATM Terminals, making it feasible for small and medium sized merchants in developing countries to accept credit card payments. The company recently formed a strategic alliance with Visa International to explore opportunities for joint development of mobile commerce solutions.

---

[2] **http://www.wizzit.co.za/Wizzit_index.htm**
[3] **http://www.myglobe.com.ph/gcash/about.asp**
[4] **http://www.digitaldividend.org/case/case_smart.htm**
[5] **http://www.redherring.com/article.aspx?a=15639**
[6] **http://www.wayinc.com/**

Agricultural Services

Agriculture information portals are reaching new audiences with mobiles. The Kenya Agricultural Commodity Exchange (KACE)[7], in conjunction with mobile telephone company Safaricom, has developed an SMS system to give farmers access to market prices. FOODNET[8] provides a similar service to farmers in East and Central Africa. The SMS systems allow farmers to bypass exploitative middlemen, who often charge below-market rates to farmers with few other options in terms of crop sales. In addition, the system will help farmers manage their trips to market, which can become expensive in terms of travel costs and lost time in the fields.

Other companies provide the SMS service to drive traffic to their other online offerings. In the Philippines, B2Bpricenow.com[9] runs an e-marketplace through which farmers and cooperatives can market their wares, bypassing traditional trader networks that often manipulate market prices. Agriwatch[10] provides commodity research reports, industry news, and runs an online auction for Indian producers and suppliers. Subscription costs for the services are minimal and can be split between a group of farmers that share the information.

Health Services

Mobile-enabled health applications can be used for both disease management and prevention. In Peru, the for-profit Voxiva[11] has developed and implemented a technology platform that enables medical professionals to collect data in real-time and communicate with one another in order to effect change based on the data. By leveraging the web, phone, fax, email and SMS, the company provides solutions for a range of sectors, including health, relief and development, and eGovernment.

In South Africa, On-Cue Compliance uses an SMS-based service to help reduce reoccurring medical problems that arise when people forget to take their medications. The company sends timely reminders to their cell phones using a low-cost open source software operating system. The system is currently being used in the treatment of tuberculosis patients in Cape Town with almost a 100% success rate.

WorldTalk[12] provides on-demand, interactive health information and voice services to people in rural communities in developing countries, in their own language and over any phone. The service overcomes illiteracy barriers, and can also be used to provide other types of information, such as housing, agricultural, government and employment. The non-profit is currently piloting projects in South Africa and India.

---

[7] http://www.kacekenya.com/marketinfo/sms.asp
[8] http://www.foodnet.cgiar.org/market/Latest%20Market%20News.htm
[9] http://www.b2bpricenow.com/contents/mainpage.asp
[10] http://agriwatch.com/smsService.asp
[11] http://www.nextbillion.net/files/Voxiva.pdf
[12] http://www.worldtalk.org/

Summary

Improved lower-cost technologies are finally making it possible to erase the telecommunications divide that persists throughout rural developing areas. Demand for voice services in emerging markets is already so high that existing networks almost always run at full capacity, and evidence exists that latent demand in rural areas is huge. The powerful combination of WiFi/WiMAX and VoIP now makes it possible to rapidly scale-up networks, offering a lifeline to communities with no fixed-line alternative. The low cost of deployment ensures that service costs remain affordable to the end user, while its ability to offer data services ensures long-term utility.

A number of SMS and voice-enabled applications are already in use in these markets, providing financial, agricultural, health and other information services.   Many are being offered by established operators eager to expand their markets and increase customer loyalty. Developed to meet the needs of underserved people living at the base of the pyramid, these phone-enabled services are set to expand as coverage increases.
N