

Case Study: The Haiti Rural Broadband Initiative

Toward a New Model for Broadband Access in Haiti and Beyond

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Abstract - Only radically lower cost service delivery models can close the growing “broadband gap that characterizes much of the developing world. Inveneo’s Haiti Rural Broadband Initiative seeks to demonstrate one such model by combining low-cost wireless technologies, shared infrastructure and local IT capacity building to extend broadband to 22 un-served population centers in Haiti. While progress is possible, scaling such efforts involves a complex set of factors. This paper describes the program’s main elements, key goals and current status as well as preliminary lessons learned.

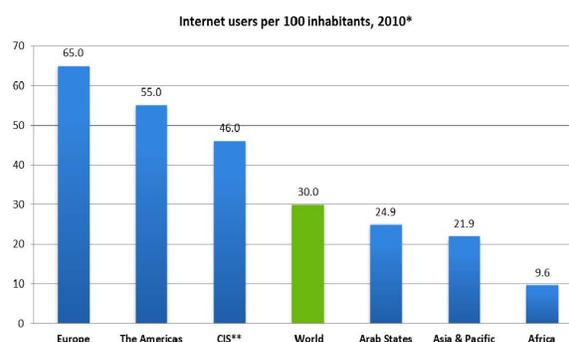
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I. BACKGROUND

The economic and social benefits of broadband connectivity have become increasingly evident. On the economic side, the World Bank estimates that every 10% increase in broadband penetration can yield an increase of as much as 1.4% in GDP growth. It is likely as well that broadband Internet may have even greater potential economic impact than voice connectivity alone.ⁱ At the same time, recent events in the Middle East and North Africa demonstrate that the Internet, and broadband in particular, can be a powerful force for social change, fostering greater social inclusion, civic participation and political transparency, not to mention improved education, healthcare, relief, and more. The debate among policymakers has now shifted from whether to promote broadband access to the question of how to do so most effectively.

In rich and middle-income countries, governments are answering this question through regulatory reform and by creating financial incentives for private providers, often by expanding Universal Service Funds, initially designed for voice, to include subsidies for the extension of broadband services to underserved regions. Approaches still vary between relatively market-driven and more state-led strategies,ⁱⁱ but even the relatively laissez faire USA is now moving toward significant public investments in expanding domestic broadband access.ⁱⁱⁱ

Unfortunately, despite evidence that broadband networks may have their greatest positive social and economic impact in poor and underserved communities in the developing world, it is in precisely these settings that regulatory reform and market forces are least likely to lead to increased service coverage to the “first mile”^{iv} and where the public resources necessary to foster expansion are in shortest supply.



* Estimate
** Commonwealth of Independent States
Regions are based on the ITU BDT Regions, see: <http://www.itu.int/ITU-D/ict/definitions/regions/index.html>
Source: ITU World Telecommunication /ICT Indicators database

Figure 1: Internet Use (% of population)

As Figure 1 shows, just 9.6% of the total population in Africa has access to the Internet, or less than 20% and

17% of the rate in the Americas and Europe, respectively. But this statistic does not convey the real discrepancy. Of Africa's 48 sub-Saharan countries, 29 (60%) have total Internet usage rates (at any speed) of less than 3%, and 15 (31%) show less than 1%. Broadband access rates are far lower still. Thus, while broadband access has exploded in much of the world, as an ITU 2009 report points out, there remains "a dramatic broadband divide, with very few fixed broadband subscribers or mobile broadband subscriptions in Africa."^v The poorest and most marginalized communities in the developing world face a disproportionately large broadband "access gap" and are falling further behind each day.^{vi}

But why? "Market failure is the typical answer. But markets often fail for reasons that can be addressed: First, the most common broadband technologies, designed for use in urban settings, are ill-suited to low density, rural settings with low average revenues per user (ARPU). Additionally, the cost of incremental infrastructure, especially towers and power systems, are high, as are operating costs, in part due to the lack of necessary IT skills. Finally, ISPs face significant uncertainty regarding actual demand in these regions and there is no established organizational mechanism whereby they can collaborate to reduce costs and risks alike.

Inveneo believes that progress in closing the broadband gap can be achieved through a well-conceived and coordinated effort to design a sustainable service delivery framework, Figure 2; one that combines appropriate IT solutions, local capacity building and effective governance of shared infrastructure. Inveneo and partners are working to define and deploy such a service framework, starting in Haiti.

II. THE HAITI RURAL BROADBAND INITIATIVE

The Inveneo-led Haiti Rural Broadband (HRB) initiative is a collaborative program seeking to catalyze sustainable broadband access in underserved parts of Haiti. HRB seeks to test idea that significant capital and operating cost savings can be realized through 1) the use of low-cost wireless technologies, 2) an emphasis on building local IT capacity to deploy and support broadband infrastructure and 3) new approaches to cooperative network ownership and management.

HRB's short-term objective is to bring affordable, reliable and sustainable broadband access to 6 regions and 20 currently un-served population centers across Haiti.

The larger goal is to define a flexible framework, networking toolkit and deployment methodology that can deliver sustainable, localized broadband extension programs in rural and low resource areas across the developing world. HRB is currently in the final phases of rollout and has achieved many of its initial goals, but continues to struggle in some areas.

This section describes the main elements that distinguish the HRB Initiative and the program's initial goals. The following section presents actual result to date and preliminary "lessons learned".

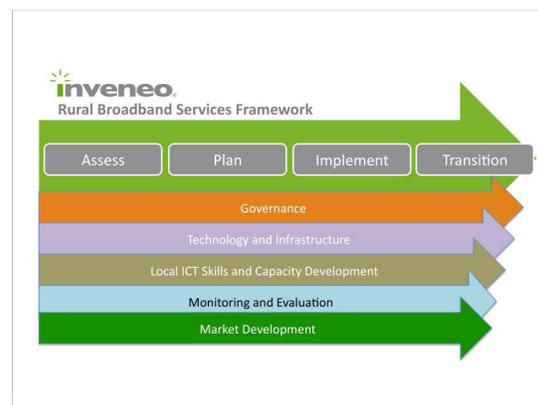


Figure 2: Rural Broadband Services Framework

A. An "Ecosystem Approach"

Governments are typically the main drivers behind broadband extension programs. The HRB framework is rooted in the idea that, where governments are weak, distracted or otherwise unable to play this role, as in Haiti, coordinated efforts by non-governmental actors may still yield significant progress. HRB relies on an eco-system of stakeholders including catalytic donors, ISPs, local IT entrepreneurs, implementing partners and strategic "anchor tenants" and is dedicated to the idea that a well-structured partnership can deliver increase broadband access even in the absence of government leadership or subsidy.

B. Low-Cost Wireless/WiFi Technology

The single greatest impediment to market-based provision of broadband service in underserved areas is the high cost of deploying and supporting traditional broadband networks. Commercial technologies designed for high density, urban markets are not well suited to rural and low-density settings. Since most of these technologies are proprietary, they are relatively expensive for low ARPU settings.

Dramatic improvements in performance and reductions in the cost of off-the-shelf radio networking solutions make it possible to deploy reliable and complex broadband networks at much lower cost.^{vii} For this model, solutions that are based on open standards, including 802.11/WiFi, provide added benefit in that they are well documented via the Internet on how to deploy and support.

Power consumption is a key operating cost for wireless networks. Typically power consumption for a broadband base station is more than 100 watt and point-to-point link microwave transmitters typically require a minimum of 50 up to 100 watts per link side. Using 802.11 WiFi equipment reduces these numbers to less than 20 watts for a base station setup and less than 10 watts for point-to-point links per link side. This represents a power saving of 80% or more. A typical site Inveneo deploys consisting of 2 point-to-point backhaul links, three sectorial access antennas for client access, network router and network switch requires, in total, 60 watts of continuous power supply which can be either AC or DC. The total cost for wireless, networking and power-conditioning equipment installed at an existing tower is less than \$3000 USD.

It is important to note that, although these alternative technologies may be considered more “enterprise grade than “carrier grade, they are more than capable of supporting the volume of data traffic and quality of service required for success in Haiti. If, on the other hand, the network grows beyond the capacity of this model, to the point where these technologies are no longer appropriate, investment in more scalable solutions (e.g. Wimax) would be justified.

C. Carrier-Neutral - Shared Network Infrastructure

Towers and power systems alone account for most of the capital costs of wireless network deployments. For this reason, many policymakers now encourage or even mandate a “shared infrastructure” regime in low-density and poor areas. HRB leverages existing infrastructure of cooperating service providers, including towers and power systems, but takes the principle of leverage one step further by also using the existing assets (e.g., towers, relay sites, security measures) of strategic customers to support the network and reduce costs.

The HRB network itself is carrier-neutral - cooperatively “owned and operated” to allow service providers access to the network on a non-discriminatory basis. This ensures price competition and open access for all customers. For this model to be sustainable in a

highly competitive wireless market, a governance structure is essential if partners are to effectively (and cooperatively) manage their shared assets.

In the Haitian case, Inveneo initially played role of the neutral party “governing board” for the establishment of the model. However, Inveneo has since begun work to establish an independent third party governance board to take over long-term management of the program upon Inveneo’s exit. The Haitian-based legal entity that will own and manage the open backbone network infrastructure does not need a license to operate, as it does not sell any services to end-users itself.

D. Local Entrepreneurship and IT Capacity

One reason why carriers don’t serve remote and low-density areas is the relatively high cost of deploying and supporting infrastructure and serving clients. As a partial solution to this challenge, Inveneo developed the “BATI” program (in Creole, “Bati Anfòmatrik Teknisyen yo ak Inveneo - translated to English “Building Information Technicians with Inveneo”), which identifies and trains local entrepreneurs capable of connecting new users to the network and providing ongoing customer support. Modeled after Inveneo’s successful Certified ICT Partners (ICIP) Program, the BATI provides ICT training to the rurally based entrepreneurs, as well as the ability to sell connectivity contracts from the participating ISPs to local customers. With locally based, skilled technician-entrepreneurs capable of both selling contracts and maintaining connections, the goal of this model is to lower operating costs for carriers, increase network uptime, and promote local income generation. As independent agents, BATI entrepreneurs build their businesses by providing installation and support services under contract with partnering ISPs. They are also able to offer general IT services, including appropriate computing solutions, to broadband customers based on the training and support they receive from Inveneo and partners.

To support initial capitalization of the BATI entrepreneurs, Inveneo has partnered with Fonkoze, the largest microfinance organization in Haiti, to provide secured startup loans to BATI entrepreneurs once they have completed training and have signed contracts with a service provider.

E. Catalytic Investments

Many broadband initiatives get hung up around negotiations with incumbent carriers about the shared investments necessary to achieve expanded service to

rural areas. Whether or not there is competition in the market, it can be difficult to convince broadband providers of the business case vis-a-vis rural areas. HRB is designed to overcome such obstacles by providing catalytic funding for infrastructure, network rollout and IT capacity building.

By combining seed funding for network rollout, extremely low overall deployment and operating costs, and training of local support capacity and catalytic seed funding for network rollout the HRB model overcomes the traditional barriers for broadband expansions to rural areas.

F. Focus on Strategic “Anchor Tenants”

Few individual Haitians living in rural and low-resource centers can afford a personal broadband Internet connection or the computing equipment required to take advantage of it, now matter how low the cost. HRB is therefore focused on identifying organizational users, such as schools, hospitals and clinics, aid and relief organizations, microfinance branches, and businesses, which will serve as initial clients for the network. These organizations are more likely to have the financial resources to pay for broadband services. They are also best positioned to make broadband directly accessible to the local population through programs that leverage shared, and community-based computing infrastructure (for example, in schools and community centers).

Haiti has long been a focal point for international aid and relief organizations. The devastating Haiti earthquake of 2010 only increased their numbers and prompted many to extend their work outside of Port-au-Prince. Inveneo used the Haiti NGO Aid Map (<http://haiti.ngoaidmap.org/>), other open-source mapping tools and our on-the-ground experience and contacts to identify clusters of potential anchor tenants. These clusters served as the starting point for our network design efforts. HRB initially targeted six rural areas because of identified potential anchor clients and their likely demand for broadband connectivity.

III. RESULTS TO DATE

The Haiti Rural Broadband program has been under construction for 15 months. Our plan is to finalize network rollout and to withdraw Inveneo staff from Port au Prince by Mid-2012. Finalization of the governing organization will be underway through the later half of 2012. While not yet complete, HRB is sufficiently in place to provide a working model/framework for rural broadband in an emerging region.

The current status of HRB initiative can be defined in three key program components: Network Infrastructure, Capacity Building, and Governance.

A. Network Infrastructure

Initial Goals: Reliable and manageable WiFi-based network reaching 6 zones, 20-22 communes and 200 customers.

To Date: the HRB network reaches five of the six targeted “zones and covers 16 of 22 targeted “communes, as shown in Figure 3. The network supports a total of 169 radios (Ubiquiti) and rests atop 40 plus existing towers and supporting power systems. The 22 targeted population centers are home to approximately 1.8m Haitians. This represents almost 19% of Haiti’s total population but almost 30% of the country’s previously “offline population”.

Beyond the physical infrastructure, success in connecting clients to the network has been relatively modest compared with initial goals, with 65 customers currently connected or approved and schedule for connection. At current growth rates, we expect to have approximately 150 clients on the network by the end of 2012.

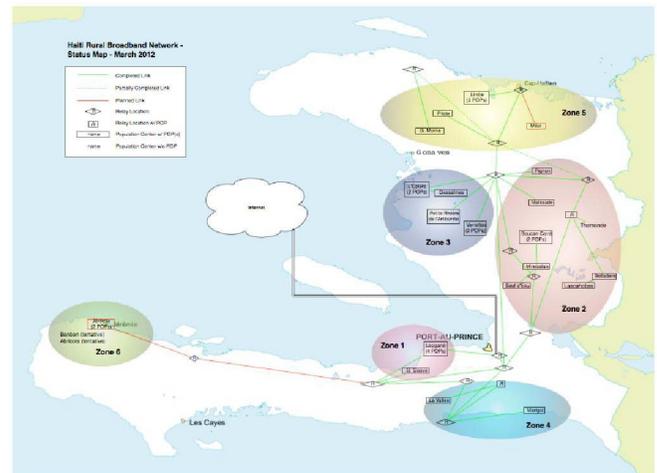


Figure 3: Haiti Network Rollout

B. Capacity Building

Initial Goals: 40 trained and active BATI, 2 trained backbone service providers, trained Network Operations Center (NOC) operator

To Date: As of March 2012, Inveneo's BATI program has identified, trained and preliminarily certified 62 BATI (60 men and 2 woman) in 6 HRB target zones. Of these, almost 50% (27) have signed contracts with partner ISPs. The training process is both didactic and hands on. Of the 27 signed BATI, nine are currently fully trained and able to connect customers to the network without direct support from Inveneo staff. The remaining BATI are in the "hands on" phase of their training and we hope to bring them fully onboard by the end of April, 2012.

Training the backbone service providers and NOC operators involves far fewer trainees but has posed it's own set of challenges. Training of the backbone partners occurred mostly "organically" during Inveneo's efforts to deploy the backbone. The lack of a formal curriculum combined with the fact that many of our processes and solutions were under development, has been a challenge. Most importantly, we have identified and trained just one backbone support partner. Having just one partner has both slowed network deployment and (possibly) resulted in performance problems due to the perceived lack of competition. In addition, it took several months to identify and begin training our NOC partners, in part because of difficulty in identifying an open source suite of NOC tools that can support the Multi-carrier network design we have deployed. Poor documentation of these tools has only compounded this challenge.

C. Governance Initial

Goal: 3 of Haiti's 5 largest ISPs to participate in HRB with a commitment to the shared infrastructure model and to funding network operations after the Inveneo handoff.

To Date: HRB has won the support of 4 of Haiti's leading ISPs. Three of the ISPs (Multilink, AccessHaiti and Voila) are offering services over the network, while one (Digicel) is offering to allow access to their infrastructure but is not currently offering services on the shared infrastructure.

Work to incorporate the non-profit foundation that will govern the network and its extension (with SIPs and Inveneo as members) is still underway. Conversations with ISPs and telecom policy makers (Conatel) suggest that the Haiti Rural Broadband Consortium may offer a useful institutional framework for cooperation among carriers/ISPs in sharing infrastructure and backhaul links beyond those supporting the HRB network.

IV. CONCLUSION

As much of the world sprints ahead as a result of significant public and private investments in broadband Internet connectivity, large parts of the developing world, especially the poorest countries in Africa, remain largely "offline". As a result, and despite convincing evidence that broadband connectivity can deliver significant economic and social benefits, populations living in these areas fall further behind every day. Narrowing this broadband access gap will require new rural broadband service models that radically lower capital and operating costs, and thereby the ARPU threshold for sustainable service.

Inveneo's Haiti Rural Broadband initiative has demonstrated that significant progress toward expanded broadband access can be achieved through integrated interventions that address not just technical challenges, but market and human capital development as well. It is also clear, however, that significant challenges remain.

As solutions to these challenges emerge, what's needed is more experimentation around how the core elements of a repeatable programmatic infrastructure are assembled, operationalized and scaled. Inveneo hopes to advance this agenda in the coming years through its recently launched Broadband for Good (BB4G) program.

Notes

ⁱ Zhen-Wei Qiang, Christine, Information and Communications for Development 2009: Extending Reach and Increasing Impact. See also OECD, Broadband and the Economy, Ministerial background report prepared for the OECD Ministerial Meeting on the Future of the Internet Economy, Seoul, 17-18 June 2009, available at www.oecd.org/dataoecd/62/7/40781696.pdf

ⁱⁱ See Scott Wallsten's (2008) Reverse Auctions and Universal Telecommunications Service: Lessons from Global Experience, for a good argument for the use of reverse auctions to promote universal service.

ⁱⁱⁱ Yongsoo Kim, Tim Kelly, and Siddhartha Raja, Building broadband: Strategies and policies for the developing world, Global Information and Communication Technologies (GICT) Department, World Bank January 2010

^{iv} Noting Titus Moetsabi's perspective, we understand the end user's perspective in using the term "first rather than "last mile.

^v THE WORLD IN 2009: ICT Facts and Figures ITU www.itu.int/ITU/ict/material/Telecom09_flyer.pdf

^{vi} See UNCTAD's Information Economy Report, 2010: ICTs, Enterprises and Poverty Alleviation (p. 24) for a recent assessment of the yawning broadband gap. See also Navas-Sabater, Dymond, Juntunen, Telecommunications and Information Services for the Poor: Toward a Strategy for Universal Access, World Bank Discussion Paper #432, April 2002.

^{vii} Arturo Muentekunigami Juan Navas Sabater, Options to Increase Access to Telecommunications Services in Rural and Low-Income Areas, page 7. "As new technologies with lower costs are becoming available, universal access policies can be more ambitious without necessarily incurring in higher costs or continuous subsidies.