

Nokia Siemens Networks Village Connection – bringing the benefits of affordable mobile access to rural communities

Nokia Siemens
Networks



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1. Executive overview

The communications industry have a truly historic opportunity – over the coming years, the majority of the world will be connected using mobile, wireless broadband and fixed broadband systems. As a result, in 2015: We will live in a world, in which five billion people are connected. People can use the services they want anytime, anywhere with their preferred devices.

The global connected mobile community is no longer confined to the world's richest consumers, and significant benefits will be brought to the people in developing countries. In a typical developing country, an increase of 10 mobile phones per 100 people boosts GDP growth by 0.6% (*source: The impact of telecoms on economic growth in developing countries, Waverman, Meschi and Fuss, 2005*). This macro-level benefit is the result of the many improvements – both large and small – that mobility brings to the everyday lives of individuals.

Around half the world's population lives in villages and many of these people need access to mobile communications in order to reap the considerable economic and welfare benefits that the technology brings. However, mobile operators need to adopt innovative solutions to provide access for these communities.

The chief challenge is cost. While today's mobile customers in emerging markets typically spend between USD 7 and USD 10 per month on mobile services, providers seeking to access emerging rural markets have to make mobile connectivity affordable for people who can spend just USD 2 or USD 3

per month. This demands an effective way to keep the total cost of mobile ownership below USD 3 per month.

Nokia Siemens Networks Village Connection trials are underway in India to demonstrate that the necessary innovations in technology and business systems are ready to meet this challenge.

The novel Nokia Siemens Networks Village Connection network architecture transfers responsibility for local network and business functions to a local level, building cost-effective connectivity village by village. Established operators may opt to employ local people to manage access within each village, or local entrepreneurs may license the mobile access rights for their surrounding area. Whichever option is chosen, capital costs are slashed and operating costs are significantly reduced compared with conventional network roll-outs.

The success of the trial Nokia Siemens Networks Village Connection deployment in India demonstrates that the technology is ready to meet the challenge of providing mobile access to low-income subscribers. In addition, the Nokia Siemens Networks Village Connection business model will generally be self-sustaining in key emerging markets, although initial support may sometimes be required to jumpstart the business system.

2. Introduction

The enormous growth in mobile services in the past few years has been largely confined to the 2.5 billion mostly urban consumers world wide. The challenge now lies in providing affordable connectivity for the people living in rural areas.

Around 3 billion people – or half the world's population – live and work in rural areas. Low incomes and lack of infrastructure often leave them unable to enjoy the benefits of affordable access to people, information and services. Affordable communication technology therefore plays a crucial role in advancing their welfare and economic growth.

Based on their relative income, people in this segment of the population are likely to spend around USD 2–3 per month at most on mobile services, compared with an average monthly spend of USD 7–10 by the majority of existing users in emerging markets. Mobile access with a total cost of ownership (TCO) of no more than USD 3 per month will therefore be critical.

Challenge for the operators is to provide the service in an economically feasible manner. Research indicates that the M&S related costs can represent up to 30% of the total operating expenditure (OPEX) in emerging markets. The site costs and operation and maintenance together generally represent 80% of the total network operating expenditure in the emerging markets. (Source: *Pyramid Research 2006, Low-cost Mobile Business Models, Strategies for the Profits at the bottom of the Pyramid.*) It is clear that in addition to addressing the capital expenditure (CAPEX) pressure, there needs to be innovation to address the different OPEX elements in the value chain.

Three key areas must be addressed to successfully meet the USD 3 target. It requires innovative technologies to deliver low-cost solutions, novel business models for rural areas and the synthesis of a new value network to make the solution feasible.

The Nokia Siemens Networks Village Connection initiative works on all three fronts with the aim of turning rural roll-outs into a lucrative realistic business opportunity that will enable the mobile communications industry to provide rural customers with an effective solution in the very near term. The main innovation is done on the business model, however technology and regulation are needed to support it.

Nokia Siemens Networks Village Connection is an innovative solution which enables operators to capture the rural market potential by offering voice and sms service to villages with relatively low investment.

3. The benefits of mobile communication

Mobile communications has proven to be the most effective way to provide rural coverage. The high volumes has lowered the cost of technology down significantly and brought the technology available for an increasing number of users.

The documented macroeconomic benefit of mobile communications is the result of countless improvements that mobile access brings to the everyday lives of individual customers.

Local businesses and entrepreneurs benefit from access to market information, new business opportunities and staying within reach

of customers and business contacts. Even a business with no office or storefront can advertise its contact details using a simple roadside board, for instance. Farmers can call ahead to check which market will offer them the best price for their crops, while seasonal workers are just a phone call away at harvest time.

Of course, the mobile businesses themselves also spur economic activity, with local franchisees or entrepreneurs taking the opportunity to run their own mobile access businesses. In some regions, airtime is already being traded as a new form of currency.

In rural areas, mobility can improve healthcare by making it easier for people to access professional help. Better communication can also improve more effective co-ordination between healthcare professionals working in the field, often in remote areas that would otherwise leave them isolated. Specific health initiatives are also possible, such as using text messages to deliver test results or reminders about taking medication.

The benefits to education include the mobile delivery of multimedia materials to classrooms, as well as support for informal learning and knowledge sharing. Innovative training programs enable rural communities to develop the local capabilities they need in order to thrive.

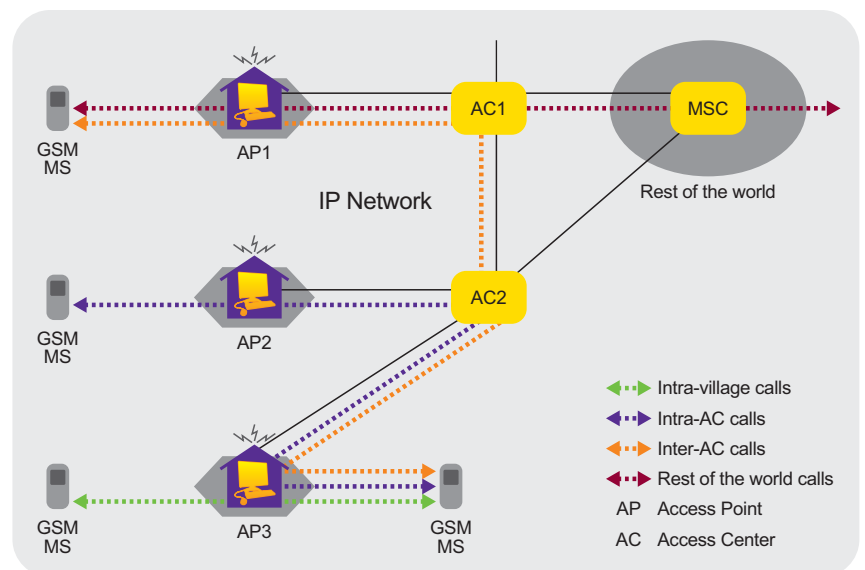
While all these benefits are already being felt in many parts of the world, others have been excluded from the process because it has not previously been possible to offer them mobile access in a cost-effective way. The affordable access opportunities provided by Nokia Siemens Networks Village Connection are set to change all that.

4. Technical solution

The Nokia Siemens Networks Village Connection solution is designed to provide a cost-efficient addition to existing GSM networks, effectively extending coverage beyond the point at which a conventional network roll-out would be too expensive. In addition to utilizing the interoperability and usability of GSM technology, the Village Connection approach relies on a network solution that significantly lowers the initial capital expenditure and virtually eliminates the operational expenditure typically associated with traditional wireless networks. This is particularly important in rural areas, where such costs are often amplified and networks often serve small numbers of low-paying subscribers.

4.1 Network architecture
 Network topology not only affects CAPEX but also directly impacts on OPEX. A conventional hierarchy increases network complexity and entails higher operating costs in terms of deployment and maintenance, backhaul and utilities. These costs may be acceptable in urban deployments, where a large number of relatively high-spending users demand uninterrupted access to all the latest mobile services. However, they may render a conventional network uneconomical in sparsely populated, low-income rural areas.

Figure 1. Nokia Siemens Networks Village Connection architecture





4.2 GSM Access points

Each village typically hosts one GAP, which is an integrated local wireless access point comprising RF, power and IT hardware and software, all bundled into a compact unit.

The GAP software runs on a PC that is connected to a GSM transmitter with an omni-antenna. It is a plug-and-play module, which can be installed and powered up easily. It needs no explicit commissioning or operations support from trained network personnel. Each GAP can typically support up to 80 subscribers. Scaling in a given area is achieved by the addition of more GAPs or incremental TRX within the same unit.

The plug-and-play nature of the GAPs, coupled with support for local subscriber management (provisioning, billing, and customer support, for instance), enables a local entrepreneur to host the GAP. Alternatively, an operator may engage personnel at the village level to handle all network operation and subscriber management functions locally. This distributed management model is critical to the viability of rural roll-outs, since it eliminates the OPEX traditionally associated with wireless networks (network operation and maintenance, billing, customer care and so on).

The Nokia Siemens Networks Village Connection solution has no hierarchical network structure. Instead it comprises village-level GSM access points (GAPs) and regional access centers (ACs). The link between the GAP and subscriber terminals is via GSM, while the link between the GAPs and ACs is via IP.

Call control has been shifted to the edge of the network, with a GAP handling call completion within each village. Multiple GAPs aggregate to an AC, which handles call completion within its area (known as a Nokia Siemens Networks Village Connection domain). As this call control is now taking place in the village, the AP host is able to provide subscriber management related tasks for the village area.

4.3 Access centers

The other component of the Nokia Siemens Networks Village Connection solution is the AC, which aggregates traffic from various GAPs, switches calls between GAPs and connects the Nokia Siemens Networks Village Connection network to the existing GSM network.

Each AC can support up to 200 GAPs or around 14,000 subscribers within its Nokia Siemens Networks Village Connection domain. It can interconnect with other networks (such as the PSTN or PLMN) over the A-Interface via MSC and optimize backhaul and interconnection costs.

An IP link between the GAP and the AC provides tremendous flexibility in the transmission media, which could include point-to-multipoint WiMAX, microwave, fiber or satellite. A Standard A interface is required for AC-MSC connectivity.

4.4 Flexible services

Bearing in mind the goal of providing mobile connectivity with a total cost of ownership of no more than USD 3 per month, the Nokia Siemens Networks Village Connection solution supports basic voice and SMS services inside the village. In addition to the village internal calls, the end-user is able to receive and make calls and SMSs to other networks. This may be easily expanded at any point to include a range of value-added services (VAS), including bringing cost-effective Internet services to villages, thanks to the IP link between the AC and GAP.

5. Business model

It is essential to create a successful business model if affordable access is to become a reality for rural subscribers. The Nokia Siemens Networks Village Connection set-up requires many players to work together, some of whom will be entering the mobile communication value network for the first time. Each one must be able to sustain a viable business.

5.1 The value network

The success of Nokia Siemens Networks Village Connection requires and enables a partnership involving a range of stakeholders.

5.1.1 The subscriber

Affordability is the key for the Nokia Siemens Networks Village Connection subscriber in a village. For many of these subscribers, Nokia Siemens Networks Village Connection provides their only realistic way of accessing the benefits of mobility, in terms of business and social opportunities, education and healthcare.

Each subscriber can choose between various call plans, including local-only options and those offering external Nokia Siemens Networks Village Connection domain connectivity and roaming. The ideal charging model is flat fee (although duration-based billing could also be supported) for traffic within the Nokia Siemens Networks Village Connection domain, with duration-based charges applied when calling outside the village. Both post and pre-paid billing are possible.

5.1.2 The entrepreneur

For the first time, the Nokia Siemens Networks Village Connection model gives local people the opportunity to host their own mobile access point. This represents a potentially lucrative business opportunity, and the village entrepreneur or franchising business is an entirely new player in the value network.

In the “Hosted GAP” model, a village entrepreneur, or GAP operator, owns and operates the GAP and has been assigned the frequency and franchised the rights to operate in

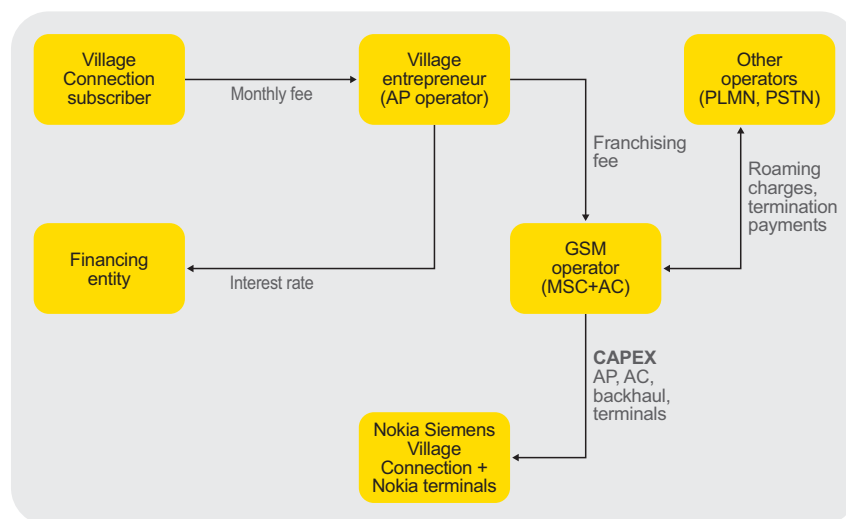


Figure 2. Value network & business models

the village from a traditional GSM operator. This GAP operator would be responsible for the operation and maintenance of the equipment, village-level demand aggregation (subscriber acquisition), sale/lease of terminals to local subscribers and handling basic customer management functions, including provisioning and billing.

In the “Managed GAP” model, the GAP is owned by the traditional GSM operator, but local employees or entrepreneurs would run local operations for a salary or fee.

5.1.3 The GSM operator

The GSM operator aggregates traffic from various village entrepreneurs. Operator is responsible for channelling the traffic between different villages as well as for the provisioning of external world connectivity to Nokia Siemens Networks Village Connection subscribers.

Depending on the regulatory position and frequency ownership, the GSM operator may continue to maintain a control point in this value chain because of the ownership of spectrum rights.

In the past, the cost of conventional network roll-outs has proved to be an insurmountable barrier for GSM operators seeking to access low-income rural subscribers. Nokia Siemens Networks Village Connection effectively removes this barrier and opens up an entirely new market for operators, whether they opt to franchise local operations or employ local people to manage them.

5.1.4 The authorities

Statutory bodies may include the licensor and/or the regulator responsible for licensing and spectrum allocation. In addition to standard operating terms, the license is also likely to specify conditions and responsibilities relating to the assignment of spectrum and subcontracting of last-mile operations to third parties.

5.1.5 The solution vendor

The Nokia Siemens Networks Village Connection solution vendor supplies the network infrastructure and subscriber terminals, either to the GSM operator or directly to the village entrepreneur.

For GSM operators, the Nokia Siemens Networks Village Connection solution vendor could supply a bundled package of the AC and a number of GAPs. Each GAP would be bundled with a number of mobile handsets. While variations are possible, in the early stages it is expected that a typical AC package would contain about 200 GAPs and 6,000 mobile handsets (30 handsets per GAP).

5.1.6 Other mobile network operators

Other networks exchange traffic with the Nokia Siemens Networks Village Connection connected to the GSM network and negotiate related settlement payments.

5.1.7 Financiers

Although the Nokia Siemens Networks Village Connection model is designed to be self-sustaining, initial financial input from investors may be needed in some cases to get the system up and running in the first place.

Venture capitalists and micro-finance entities may be involved in financing the purchase of terminals, GAP or AC equipment at the Nokia Siemens Networks Village Connection subscriber, or GAP operator level.

5.2 Alternative business models

In simple terms, there are two business models, as follows:

1. Franchise model. In this option, the traditional GSM operator would franchise out operating and frequency rights for rural regions in its license area. The franchisees would own and manage the APs and interconnect with the GSM operator for external connectivity to other villages or to the rest of the world. Within the village the GAP operator would be responsible for the operation and maintenance of the equipment, village-level subscriber acquisition, sale/lease of terminals to local subscribers and handling basic customer management functions, including provisioning and billing.

2. Traditional GSM operator extension. Nokia Siemens Networks Village Connection architecture provides the traditional GSM operator with the possibility of using their frequency in areas that they could not viably address using traditional GSM infrastructure. For these operators, Nokia Siemens Networks Village Connection is a low-cost extension of their existing GSM network. This approach could also be termed the managed GAP model.

Nokia Siemens Networks Village Connection enables innovative business models for rural villages.

6. Conclusions

Mobile access can deliver significant economic and welfare improvements to people on low incomes in rural communities. However, the costs associated with deploying and operating conventional mobile networks have prevented many communities from accessing these benefits before now. Innovative technologies and business models are needed if the mobile community is to embrace lower-paying subscribers.

The Nokia Siemens Networks Village Connection initiative clearly demonstrates that workable, cost-effective solutions are available. In addition to the many generic benefits provided by mobile access, the Nokia Siemens Networks Village Connection approach promotes economic growth by introducing local entrepreneurs and franchisees

to the value network for the first time. The novel architecture of the solution makes this possible by distributing call and subscriber management functions throughout the Nokia Siemens Networks Village Connection network at a local level.

This effectively reduces CAPEX and eliminates much of the OPEX associated with traditional network operations.

Early trials indicate that the Nokia Siemens Networks Village Connection business model and technology should provide an affordable solution that is a stepping stone for providing additional mobile connectivity for rural villages. Nokia Siemens Village Connection is strongly contributing to the target of 5 billion people connected in 2015.

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