

HOW TO PROVIDE BROADBAND ACCESS FOR RURAL AND REMOTE AREAS OF DEVELOPING COUNTRIES

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ABSTRACT

World Telecommunication Development Conference, March 7-15, Doha, Qatar (WTDC'06) of the ITU approved the programs and resolutions to follow up Tunis Commitment and Tunis Agenda of World Summit on the Information Society, November, Tunisia (WSIS'05) for the communications development of developing countries in particular in their rural and remote areas. ITU-D Study Group 2 has been focusing on this subject for years and the results of its study could provide guidelines for the policy makers, planners and practitioners etc. of the developing countries. The provision of broadband access and e-applications services over the broadband access are highly needed in rural and remote areas. The needs of the e-healthcare, e-education and e-administration among others are high. This paper discusses key issues for promoting the development projects identified by ITU-D SG2 Rapporteur's Group on rural communications as the results of its activities such as questionnaire and case study analysis and e-discussion.

KEYWORDS

Broadband access for rural areas, e-applications, financing the projects, technologies for infrastructure development

1. INTRODUCTION

The WTDC'06 was the first global development conference held in the wake of WSIS'05. Doha Action Plan as agreed upon by the WTDC'06 is taking into consideration the several important action lines related to the rural communication development set out by the Summit such as infrastructure development and the provision of e-applications in the rural and remote areas. The Action Plan is based on the six programs, five global initiatives and the associated resolutions reflecting the conclusions of the Summit and the needs of developing countries. Programs 2, 3, and 6 for ICT in rural, isolated and poorly served regions have been expanded to include indigenous communities. The activities of ITU-D Study Group 1&2 for the period of 2006-2010 will follow up the action lines set out by the Doha Action Plan. The subject of development of least developed countries, small island developing states and telecommunications for disaster relief are stressed in the

programs of Doha Action Plan. There are Questions under the Study Group 2, Q10-2/2 “communications for rural and remote areas” and Q14-2/2 “telecommunications for e-health” which are the subjects for the member states and sector members of the ITU-D to submit contributions for promotion of studies of these questions to be reflected in the report to the next WTDC. To date, ITU-D Rapporteur’s Group on Q10-2/2, in particular, set out the analysis reports on the questionnaires globally distributed to its member states and sector members and the responses on the situations of rural communications, and the case studies submitted by the developing countries implementing the rural communications projects. The Rapporteur’s Group is conducting e-discussions on the selected topics on the rural communications since autumn of 2005.

<http://www.itu.int/ituweblogs/ITU-D-SG2-Q10/>

Based on the results of these studies, this paper discusses the key issues for the promotion of communications in the rural and remote areas, in particular, broadband access for the e-applications for rural communities. Through the studies of ITU-D Rapporteur’s Group on Q10-2/2, it was found out that the development of rural communications is now at the highest priority in most of the developing countries.

2. INFRASTRUCTURE DEVELOPMENT

There are choices of technologies available in the market to be applied to the rural and remote areas depending on the surrounding conditions of the areas. The selection of technologies should be based on the selection criteria taking into consideration the cultural, geographic, demographic, political and economic landscape of an area that would be best suited for the scenario. All around the world, major telecommunication firms, small local operators, cooperatives and individuals are offering telecommunication services by using different, innovative and unique technological solutions. The definition of broadband is not given by the ITU yet, however, bit rate of 1Mbps or higher may be sufficient for most of the e-applications to be provided globally. In the developing countries, and in the rural and remote areas, in particular, 56kbps/64kbps or higher speed may be realistic for their broadband services considering economic and technical viability. The broadband infrastructure to provide services in the rural and remote areas may be divided into two separate sections namely trunk line (backbone) and access line (last mile).

2.1 TRUNK LINE TECHNOLOGY

For trunk lines, the following traditional technologies could be taken into consideration depending on the situation of the locations.

2.1.1 WIRE LINE TECHNOLOGY

2.1.1.1 FIBER OPTIC CABLE

Fiber optic cable can carry thousands times more data than either electric signals or radio waves because optical light uses higher frequencies. Fiber technology is widely used for backbone connections and other heavy bandwidth areas. Since the costly elements of fiber cables are the actual laying work of the cable and the termination equipment, it is typically installed in large bundled strands to accommodate future bandwidth needs. As technologies have improved, the price of the equipment has dropped and currently the cost of fiber rollout is approaching near to the cost of other wired networks. While most fiber optic cable is laid in the ground, Japanese companies such as NTT have started using aerial cables to connect homes. This decreases the costs of installation and makes use of existing power poles as anchors. In India on the other hand, fiber cable is used for the extension from the urban gateway to the rural hub centers because of its lower transmission loss requiring no intermediate repeater.

2.1.1.2 POWER LINE COMMUNICATION

Power-line communication (PLC) is a simple concept that uses available power lines for telecommunication. Sending data via power line communication (PLC) can save costs since power lines form one of the most extensive networks in the world, surpassing the phone network in size and coverage. PLC uses transmission above 1 MHz over a power cable. The wide-ranging deployment of the electric power system enables PLC to reach outlying rural areas and provide data speed of transmission comparable to ADSL (Asymmetric Digital Subscriber Line) into the customer's end. It allows simultaneous transmission of voice and data, which means that one can make telephone calls while using the Internet. Some of the disadvantages of this technology are data signal disruption due to noise interference and attenuation over long distances, interference with radio, television, telephone, and DSL signals, etc.

2.1.2 WIRELESS TECHNOLOGY

2.1.2.1 SATELLITE COMMUNICATION

While satellite connections are more expensive than other methods of delivery, they provide a viable option to rural and remote areas that have no other telecommunications alternatives. The advantages of satellite-based services are well known for remote or hard to reach areas and in situations requiring high reliability or multi-casting communications. Satellite systems are also likely to be more reliable, more robust and easier to maintain than wired and terrestrial wireless systems. This is important for deployment in rural areas, especially in mountainous, jungle or desert terrain. VSAT technologies, in particular, offer simplicity and economy in network design.

2.1.2.2 FIXED WIRELESS

Point to point fixed wireless technologies are available to provide access to rural and remote areas which can offer the long range transmission from urban centers to rural hub stations. There are technologies which deploy 2.4GHz unlicensed frequency spectrum or

other licensed spectrums. These technologies have economical advantage for use in the rural and remote areas.

2.2 ACCESS LINE TECHNOLOGY

2.2.1 WIRE LINE TECHNOLOGY

2.2.1.1 COPPER

In the last mile, or the local loop, the pair of copper wires would continue to be a possible medium for rural telecommunications development to provide POTS (plain old telephone service) and by employing Digital Subscriber Line (DSL) technology access to broadband services. DSL provides a digital connection over the copper wires of the local telephone network. This allows an ordinary phone line to provide digital communication without blocking access to voice services by using the unused portion of the copper wire bandwidth. A key advantage of DSL technologies is that they use existing copper twisted pair wiring and do not require new cabling. DSL speeds are affected by the distance between the subscriber and the local exchange, type of DSL technology, the gauge of the wire, etc. The technology is also influenced by the condition of the copper wire. In most of the rural community, households are located in the limited small areas in cluster within the reach of copper pairs, i.e., within 100 ~1km radius.

2.2.2 WIRELESS TECHNOLOGY

The potential of wireless technologies to provide telecommunications services in rural areas is recognized internationally. Wireless roll-out costs are significantly lower than wireline.

2.2.2.1 MULTIPOINT MICROWAVE DISTRIBUTION SYSTEM-MMDS

MMDS frequencies (2.1 GHz to 2.7 GHz) which were traditionally used to provide one-way, analogue wireless cable TV broadcast service is now being used for providing broadband services. This frequency range does not require line of sight. With MMDS, a transmitting tower must be placed at a high elevation and can provide high-speed data rates of up to 10 Mbps over a 48-56 km radius.

2.2.2.2 LOCAL MULTIPOINT DISTRIBUTION SYSTEM-LMDS

LMDS was originally designed for wireless digital television transmission. It occupies a large amount of spectrum above 20 GHz and can provide two-way broadband service including video, telephony and high-speed Internet access. The higher frequencies of LMDS require line of sight.

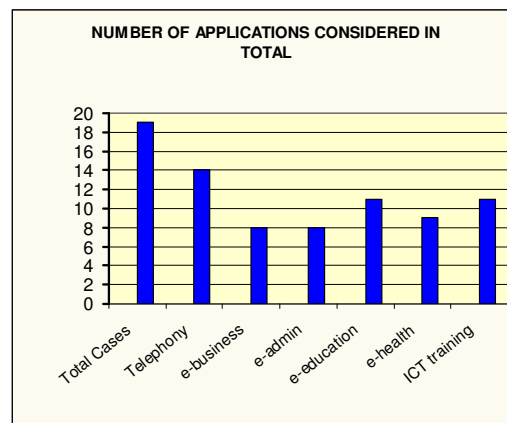
2.2.2.3 802.11B/G-WIFI & 802.16-WIMAX

WiFi (Wireless Fidelity) and WiMax (Worldwide Interoperability for Microwave Access) are technologies based on an evolving standard for point-to-multipoint wireless networking. Carriers can use WiFi and WiMax to provide wireless Internet service via transceivers to users' antennas. WiMax is faster and has a longer range than WiFi. WiMax equipment should be able to transmit 32 - 56 km with maximum data rates close to 70 Mbps. The higher frequencies in the range require line of sight. Unlike wireless LAN technologies in the 802.11 series, WiMax is meant to be a high-speed wireless backbone, or middle-mile technology. Whereas WiFi deploying internationally agreed 2.4GHz ISM band (Industrial, Scientific and Medical use), provides broadband (11Mbps -54Mbps) cellular coverage with the radius of 2-10km.

3. NEEDS OF THE E-APPLICATIONS

According to the analysis of case studies collected by the ITU-D Rapporteur's Group on "rural communications", most of the cases include several types of services, however for the two cases in areas of very low telecommunication facilities, basic telephony is the only service considered. In general ICT training and e-education besides telephony were the most frequently considered, and it looks reasonable that to teach how to use this new tools is the most important at the beginning in order to allow its use for other applications like e-business, e-administration, e-healthcare, etc. For e-healthcare applications, collaboration between administrations and experts, etc. of both areas for the project implementation is essential. The Figure 3-1 gives us the number of applications in the 19 cases analyzed.

FIG. 3-1 E-APPLICATIONS CONSIDERED IN THE COLLECTED CASE STUDIES

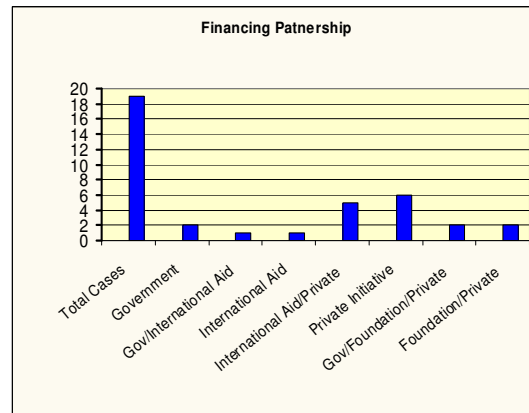


4. FINANCING AND PARTNERSHIP ASPECTS OF THE PROJECTS

Ministries of Communication, telecommunication operators of the countries, private organizations for development promotion, communities involved, banks and international organizations are the participants in the financing and execution of the projects. Universal service obligations, initiatives from governments, national organizations for development or international aid funds are the motives or opportunities for these projects, the origin is diverse but the target is to use the ICT as a catalyzer in developing rural, poor and

isolated areas. (See Figure 4-1)

FIGURE 4-1 FINANCING PARTNERSHIP



5. OPERATIONS & MAINTENANCE

Participation by concerned members of the community in all aspects of local telecommunications infrastructure development including definition of the required services and applications should be promoted; and this will ensure that maximum sustained benefit can be derived from the infrastructure. After implementation of the projects they should be handed on to local administrations, local service operators or the communities themselves for the smooth operation and maintenance. ICT training for all members of the local community should be promoted regardless of age and gender as the best means to ensure equal access to and benefit and additional opportunity from the local telecommunications infrastructure resources.

6. CONCLUSIONS

It is widely accepted that the promotion of ICT services can act as a catalyzer for the improvement of quality of life for people in the rural and remote areas. E-healthcare e-education, e-agriculture, and e-administration among others are most demanded services by the rural communities. Preparation for the telecommunication development projects for rural and remote areas by the government of developing countries will facilitate the mobilization of funds for the development from the international aid agencies and institutes, etc.

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