SUPARCO TELEMEDICINE PILOT PROJECT

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Abstract

Telemedicine is defined as, the delivery of e-health services, where distance is a critical factor, by all e-health professionals using telecommunication technologies for the exchange of medical information for diagnosis, treatment and prevention of diseases and injuries, research and evaluation, and for continuing education of health care providers, all in the interests of advancing the health of individuals and their communities.

Many developing countries have inadequate health care and medical services and suffer from a shortage of doctors and other health care professionals. The inadequate distribution of doctors/specialists, infrastructures of telecommunications, roads and transport make it even more difficult to provide health care in remote and rural areas. Where clinics and hospitals exist, they are often ill-equipped and, especially, outside urban areas beyond the reach of normal communications.

Keeping in view natural disasters which severely damage landline communications, therefore, affected areas become isolated to provide medical facilities, in these situations; satellite communication by using VSAT technology is the reliable means of direct connection to the disaster areas where communication is critical for tele-medical consultations and patient treatment.

SUPARCO, being a national space agency of Pakistan and having an experience in satellite communications has initiated a Satellite Communication based Telemedicine network as pilot project which has been successfully established. VSAT (Very Small Aperture Terminal), state of art technology has been selected to provide broad band (satellite) connectivity, for live video conferencing, transfer of high quality biomedical images i.e. CT scan, MRI, X-rays etc, that best meets the requirements of doctors/specialists. Two sites have been connected through Paksat-1 satellite transponder, one at Jinnah Post Graduate Medical Center (JPMC), Karachi as hub and other at Shikarpur civil hospital (interior Sindh) as remote site.
Furthermore, SUPARCO has joint venture with JPMC for better utilization of satellite based network infrastructure regarding telemedicine applications, including tele-consultations and tele-trainings etc.

**Telecom infrastructure and Health situation in Pakistan**

Pakistan is strategically located in the heart of Asia. It consists of four provinces and total population is about 162 million. Pakistan is one of the most densely populated countries in the world. Telemedicine/tele-health is being increasing used effectively in developing countries where rural areas lack medical facilities. For countries that have a poor terrestrial telecommunications infrastructure, satellite communications provides quick and cheap means of communication. Pakistan, due to its vast size, large segment of population residing in far flung areas, and inadequate/unsatisfactory terrestrial telecommunication network, is an ideal candidate for satellite based telemedicine. Furthermore, National telecom has provided approximate 47% telephone lines at the village and about 53% is still looking for telephone line facility at village level. These conditions become worse in case of ISDN, DSL or Fiber connectivity at the village level.

Pakistan being a developing country lacks even basic health care infrastructure. According to statistics, on an average there is only one doctor for about 1555 (\(1:1555\)) patients in the country. However, medical Specialist to population ratio is about 1:12800

The figure-1 below shows the urban and rural population disparity. A large number of population of Pakistan, about 70% lives in rural areas while the percentage of doctors working in rural areas is only about 22%. The ratio of hospital beds is about 18% for the rural areas and about 82% for urban areas.

![Figure-1](image-url)
Project Objectives

- To identify technologies, methods and procedures necessary for providing tele-medicine/e-health facilities using satellite communications.
- To develop the expertise and know-how to establish telemedicine facilities in remote areas.
- To develop the capability to establish tele-medicine facilities in natural and anthropogenic disasters.
- To demonstrate the benefits and effectiveness of telemedicine.
- To utilize effectively bandwidth of Paksat-1 satellite for the Telemedicine applications in Pakistan.

Collaboration between SUPARCO and JPMC, Karachi

Keeping in view of above mentioned situation of telecom infrastructure and health services within the country, SUPARCO had initiated a Telemedicine pilot project headed by a Project Manager. He had supported by team of four engineers and technicians to establish satellite based Telemedicine network by using Paksat-1 satellite transponder for e-health applications. In the preliminary phase of project, meetings were held between SUPARCO engineers team with the doctors of JPMC to get their requirement, i.e. quality of video conferencing, data transfer services with reliability of communication link required regarding Telemedicine applications. Further, also set the responsibilities of SUPARCO and JPMC for better utilization of Telemedicine applications.

Location of Project

During the discussions with doctors of JPMC, they highlighted the problems of Shikarpur district (Interior Sindh), and hence, the civil hospital Shikarpur had been selected as remote site and JPMC as central (Hub) site. Geographically, Shikarpur is approximately 500km away from Karachi and has advantages that the same hospital renders the medical services for some remote areas of Baluchistan province which is near to the Shikarpur. The total strength of male/female doctors are about 37 and 260 beds are available at civil hospital Shikarpur.

Solution

To provide specialty care for the people living in remote areas of the country, there are two possible solutions:

Option-1

- To build medical units equipped with latest medical equipment on an extensive scale, which requires huge investment of time, finances and effort.

Option-2

- To connect already established health centers with each other and with advanced medical establishments of the cities, by using satellite communication.

By analyzing of above options 1 & 2, the option-2 is more viable and applicable to connect the established health care units situated at remote
sites with the super specialty hospitals and teaching hospitals in the big cities within short time by using satellite communication link with the quality of video and data communication services required for telemedicine applications.

**Technology used**

Very Small Aperture Terminal (VSAT), state of art technology has been selected regarding the requirements of doctors. VSAT is a small satellite earth station used for satellite broad band connectivity. Detailed network diagram is shown in Fig.2. Each system consists of;

- 3.7 meter (Tx/Rx) dish antenna with linear polarization (Vertical/Horizontal)
- Satellite Modem (2.4Kbps 5Mbps)
- RFT (25 watt)
- Router
- LAN switch
- Video equipment along with 29" Flatron TV
- Data rate (1024Kbps)

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**Benefits**

- Easy and takes short time to install
- No dependency on land line
- Reliable communication
- Best meet the requirement of Telemedicine applications
SUPARCO’s Contribution

- Provided free VSAT equipment for pilot project
- Allocation of free bandwidth on Paksat-1 satellite transponder
- Provided manpower for designing of network, installation, testing and commissioning of system at both sites.
- Technical consultancy and assistance

Conclusion

- The pilot project would help, determine the benefits of this technology for the social and health sectors at low cost and in a relatively short time.

- It will also help demonstrate the use of the technology in educating doctors/paramedical staff in rural areas on latest medical practices.

- The project relates to various sectors, including research, telecommunication, human resource development and social welfare. It is a humanitarian project aimed at providing satellite based communication network for transfer of medical information and health care services to distant areas as well as in disaster areas.