

# ROLE OF SATELLITE COMMUNICATION IN E-LEARNING AND ITS DISTRIBUTION

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## ABSTRACT

*E-learning is a concept of imparting higher education to people through electronic medium as well as networked information and communication systems. But the extension of quality education to rural and sub urban areas need an effort to develop tools and methods for reaching the mass. Satellite communication can play a pivotal role in this strive. In this paper we will discuss the role of EDUSAT, a satellite developed by ISRO to serve educational sector, network requirements to make satellite communication useful for the distribution of the lectures via satellites, along with a blend of satellite enabled classroom sessions.*

**Keywords:** EDUSAT, IBT, ROTs, SITs, VSAT, WBT

## I. INTRODUCTION

In the present scenario, the major objective of people is to earn maximum for their livelihood as well as meeting their requirements to live a luxurious life as well. But, to have a constant growth in their working domain, higher education is primary requirement for them to pursue along with their jobs. Here comes the role play of e-Learning. E-learning is the use of technology to enable people to learn anytime and anywhere. It includes training, the delivery of just in time information and guidance from experts. It includes all forms of electronically supported learning and teaching. The information and communication systems, serve as specific media to implement the learning process. E-learning is the computer and network-enabled transfer of skills and knowledge. The content is usually delivered via internet, internet/extranet, audio or video tape, satellite TV and CD-ROM. It involves both out of classroom and in classroom training mostly with the aid of internet based technologies (IBT) or web based technologies (WBT).

However, with the increasing demand of e-learning, there is a wide scope of improving the technology along with an enhanced methodology of blended learning for implementing the learning in a more effective and feasible manner, to bring more number of people making the best use of e-learning. Satellite communication if incorporated with the existing technology and teaching methodologies would prove extremely beneficial to make e-learning more approachable to the mass, both in the urban as well as rural areas.

EDUSAT, the first exclusive satellite for serving the educational sector, has already been launched by ISRO on 20<sup>th</sup> September, 2004. This satellite can be used extensively for making e-learning a better experience for the learners.

## II. EDUSAT

With the growing demand for an interactive satellite-based distance education system with the aid of audio visual medium, ISRO conceived the project of GSAT-3 also known as EDUSAT, employing the direct to home (DTH) quality broadcast. It was launched into the Geosynchronous Transfer Orbit (GTO) at a height of 36,000 km. by ISRO's Geosynchronous Satellite Launch Vehicle (GSLV-F01), with the orbit at 74° E longitude. It carries five lower Ku band transponders with regional beam coverage, one Ku beacon, six upper extended C-band transponders and twelve C band high power transponders with extended coverage, covering southeast and northwest regions apart from Indian mainland using 63 W LTWTAs. The EDUSAT network provides satellite based Tele-education facilities to students and teachers of the engineering colleges in the country.

## III. NETWORK REQUIREMENTS

For the purpose of implementing a satellite network across the country, a two way network system has to be established: a) Transmission end, b) Receiving end. The Transmission end is the one where the teachers or the subject experts sit and provide the subject content that has to be delivered to the students. The receiving end is the one where the students can retrieve the information or the content delivered from the teaching end.

### 3.1 Transmission End

In the network, the transmission end consists of a well prepared studio and a small uplink earth station. In the studio, we have two PCs, a digital camera, DVD player, switcher, modem, and sound system. One PC is called the Multimedia Server, which is loaded with software called VLC. This software is used to control the transmission. Other PC is called the presentation PC, which is used to present the notes, slides or other content prepared by the teacher. The digital camera is used to get the image of the teacher and can control remotely. A DVD player is also included to show some recorded movies or recorded lectures whenever necessary. Presentation PC, DVD player and Digital camera are attached to the switcher, which is used to select the signal coming from any of the three. The presenter PC has a digital monitor that can be used as a white board. Teacher can write text or draw pictures using a digital pen on this white board and this image can also be transmitted to the student's end. A Mic is directly attached to the server for the transmission of the audio signals.

Finally the mixed output is send to the modem through server computer, where modem converts the digital signals into the analog form and send to the dish antenna through high quality cables. The studio which originates live or recorded lectures is linked to the uplink earth station. The dish antenna is pointed to the satellite, to which the signals are sent. The satellite will reflect this low power beam to the hub. There it will be boosted and send back again to satellite again.

### 3.2 Receiving End

Receiving end consists of the Satellite Interactive terminals (SITs) or Receive Only Terminals (ROTs). The boosted beams are sent to the dish antennas of all the SITs or ROTs located in different parts of the country. The SITs also consist of a dish antenna, modem, web camera, mic, sound systems and personal computer. The signals reach modem from the dish antenna in the analog form, converted into the digital format and then sent to the PC which is loaded with the VLC software, which is used to view the multicasting programs. The live

lectures or the recorded lectures are received in the classrooms which may be interactive or non-interactive. The students can interact with the experts on the teaching end in Interactive classrooms through a voice link via satellite (64 kbps audio return channel). The question and the subject expert's response can be heard live in all classrooms. Non-interactive classrooms have Receive only facility and here the interaction can take place between the students and the subject experts via telephone line or mobile phones or internet etc.

#### **IV. DISTRIBUTION SYSTEM**

In the preceding section we came to know about how the transmission of the lectures is done via satellite. Now, the most important aspect that we have to consider is the distribution of the signals from the satellite to the receiving end. The distribution of the signals from the satellite can be done in the following two ways:

##### **4.1 VSATs**

It stands for very small aperture terminals. The underlying concept behind VSAT systems is to bring telecommunications serving directly to the end user directly without any intermediate hierarchy. The development of this technology has allowed data and voice communication cost effective for a broad range of users. They operate in the Ku band because it is less congested.

Suppose a user opts for a particular course through e-learning, from an institution that has the facility of providing the learning through satellite communication, the educational institution will provide a VSAT at the home of the person seeking the course, through which that person can receive the transmission on his TV set.

Alternately, to lower the initial cost of installation, people already having the DTH facility at their home, can be provided with the transmission of the lectures through the existing dish antennas at their place. For this purpose, the institutions can hold up an agreement with the DTH service providers to broadcast their transmission on pay cable channel basis. With this facility the learning will become more feasible. After getting registered for the course in the institution, the learner can buy the subscription of the lectures on monthly basis of pay per view basis. Thus, making e-learning more feasible and less expensive.

##### **4.2 Cable Network**

The distribution of the lectures broadcasted via satellites can be implemented making use of the cable network as well, which still hold its roots deep into the Indian society, from urban areas to the rural areas as it's still a cheaper option for people to avail. With the digitization of the cable television network, the distribution becomes similar to that of the VSATs. The learner can buy the subscription through pay cable television mode and receiving the broadcast of the live or recorded lectures from the institutions in their homes. With the digitization of the cable network, they will be able to enjoy the features like Pay per view, which the people having DTH facility enjoy at a bearable cost.

The above mentioned methods of distribution of the lectures to the learners would be very beneficial in terms of time and money as well as making e-learning easily approachable for the people living in the remote areas. Another advantage of this method of distribution would be such that a person who wants to view a lecture again can avail it by choosing the option of video on demand i.e. pay per view basis.

## V. CLASSROOM SESSIONS

In order to make the learning more effective, the institutions providing e-learning should use a blend of the classroom sessions as well, to provide a better understanding of the subjects to the learner.

For this purpose, the institutes should have learning centres at various locations in the country. These centres should have classrooms which should be designed and structured as SITs (satellite interactive terminals). Sessions should be organized in these centres on weekly or monthly basis as per the requirement of the learner. This will enable them to interact with the subject experts directly, through a voice link via satellite. They can clear their doubts in these sessions by asking questions and getting the response from the expert on the spot.

Apart from this, subject experts can deliver their lectures live, on specific topics, which can be organized here in the SITs on demand of the learners, which they might find cumbersome to understand through ROTs.

## VI. CONCLUSION

With the increasing demand of e-learning, new tools and methodologies need to be developed to make e-learning feasible to more number of people, also making it a better experience while keeping in mind its cost effectiveness too. In this strive, Satellite communication can prove to be a very useful tool. Already having EDUSAT, a satellite completely dedicated for educational sector, can provide connectivity to schools, colleges and other non formal education institutions to deliver e-learning, covering a large geographical area to reach the masses residing in the remote areas as well.

Along with this, the classroom sessions would make learning much more enhanced provided the classrooms have the access of the satellite utility. Since the life span of a satellite is 10 to 15 years, there is an immediate need of launching more such satellites dedicated to serve the educational sector.

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