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Research paper

Satellite network underlying LMS for coverage and performance enhancement

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Abstract

Facilitating the process of learning in real life by employing of available communication techniques (mostly by internet) is termed as E-learning. With time advance, education of today developed with more publicity so then, students from remote venues are get-ting access to their course of interest even though far once of courses, with such capability of education, students start searching the interested cours-es and teaching style as well, that raised a new concern to be applied into classical methods of educations. Rural and remote regions can be provided with quality education through E-learning; the same is proposed in this article to connect stu-dent with remote lecturers and tutors effectively.

Keywords: E-learning; Satellite; GSM; Education, IoT; Orbit; UGC; CEC.

1. Introduction

Learning is defined in [1] as skills and information that leads to facilitate people's lives and given by means of study. Furthermore, all knowledge is a mother of skills and it can be gained by multiple ways such as practical experience or teaching through a knowledgeable person; that is termed to the classical means of learning. Form the other hand, E-learning may term as gaining of knowledge in smarter way with more ease of information and knowledge delivery irrespective of location and time [2]. Many applications are used with E-learning such that: virtual class-rooms, web learning, computer and mobile based leaning; another definition can be stated which is the information delivery by utilizing digital electronic and communication technologies such that internet, satellites, CD-ROM and interactive television [3]. All electronic learning systems (E-learning) are basically constructing of three functional components such content (things to be taught), service to be delivered to candidates and technology to be used for ensuring of those services. Students can be provoked for knowledge gaining by providing all interested education means such that virtual classrooms, quizzes, etc. all those facilities can be accessed distantly, the same had been developed when internet and communication technologies have been developed.

Countries like India have developed interested contributions in terms of distance education and electronic learning, EDUSAT is a unique kind satellite which being used for E-learning purposed and manufactured by ISRO (Indian space research organization) [4]. This satellite is connecting of large number of instates which are widely involved in electronic learning.

Since electronic learning is facilitating the efforts of its candidates to travel for attending classical lectures, it is well known as flexible and far less cost. Many advantages are obvious for this type of education system which are summarized as:

- Cost effective: if we compared the electronic learning with traditional learning, the first is lesser cost.
- Rapid and speedy: study that given in [5] has proved that, electronic learning is fifty present faster that classical learning, the study made one student course completion and feedbacks.
- Gap less communication learning: it reduces the problem of multiple instructors of the same subject as in here, every instructor is having own study material and own teaching methods.
- Mobility education: access is more ease and location independent.
- Time independent: candidate can join any time and less time constrains are provided by electronic learning.
- Upgradable: system content can be upgraded easily and quickly.

Students can be grouped together from different locality and share their knowledge and thoughts through electronic forums and discussion groups within E-learning system, such concept will help to construct a reliable community of students with portentous outcomes. Developing process of electronic learning system at any county is strongly dependable on internet; so as to we have to study the internet users and population of internet in that particular region of interest. Statistical and published researched shown that internet users and their population is widely increased by the end of 2012. For developing of E-learning system at middle-east region, studies show a good population of internet users within this area so that efficient system can be built.

2. Satellite network

For enhancement of electronic learning, organizations tend to put satellites on earth orbits to facilitate the communication between the instructors and e-learning candidates. Indian satellite for education purposes which is designed and used by some large education institutes like IGNOU and NIOS will be detailed in this section.

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2.1. Edu sat

This family of satellite was designed on late time of 2014 as first educational server satellite from its kind in India. The mail agenda of this satellite was to provide an interactivan distance education across the country; this technology is reflected the contribution of Indian space organization in education and their commitment to deliver education to those bodies on remote regions hence, they are maximizing the number of learners. [7] is listing the conceptual structure of this satellite; video and voice from live lectures and offline lectures are now possible to be broadcasting throughout all parts of country with help of this satellite which is placed in 74 degrees east longitude of Geostationary orbit. Table 2 in below is summarizing the technical specifications of this satellite.

Table 1: Edu sat Design Specifications

Subject	Details
Mass to be lifted of	1920 Kilo gram
Dimensions	2.4x1.65x1.15 (in meters)
Power supply	Solar panels 2044 w
Life of service	84 months

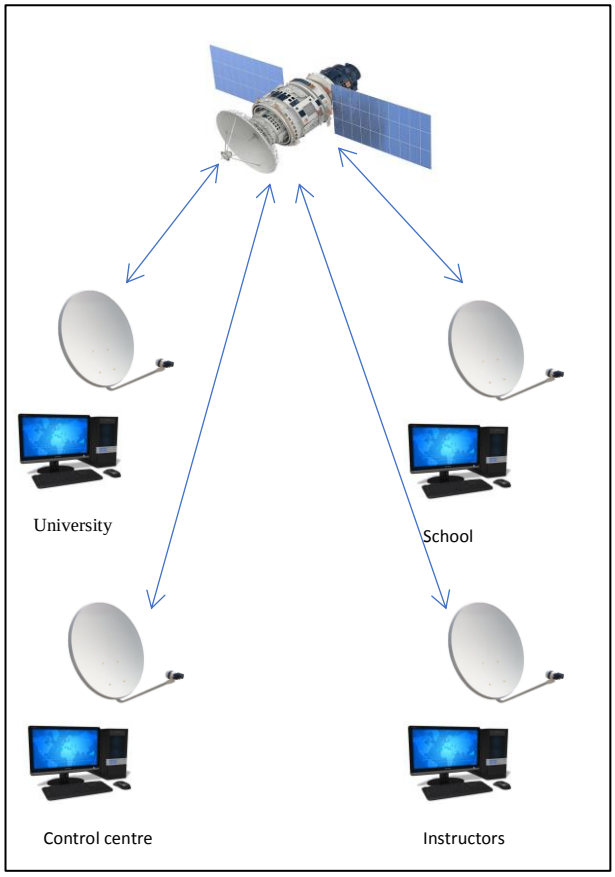


Fig. 1: Conceptual Structure of Edu sat.

Figure 1, is giving the EDUSAT satellite architecture; the link budget of this satellite can be listed as below:

- Six upper extended: 37 dB-watt coverage (national) with C-band transponders.
- Five lower bands: 55dB- watt for beam spot coverage which generates isotropic radiation of power at Ku-band.
- One deacon band: to control the uplink power and gaining as accurate as possible positioning of ground antenna.
- One lower band: at Ku-bands for national coverage at 50 dB-watt.

Engineering education facilities are ensured to be delivered by EDUSAT across India, this setup is essentially helped to connect large number of facilities and students from different engineering colleges. The task of this satellite is facilitated by Indian space research organization (ISRO) by allotting a division for EDUSAT in space. At any particular university, the Grants Commission (UGC) are in turn communicating the subject syllabus by special band (channel) called consortium educational communication (CEC). Toper universities in India are using the services of EDUSAT such as IIT Chennai, IGNOU, IIT Kharagput and many others.

2.2. Inset

This is multi-purpose satellite orbit that owned by Indian space research organization (ISRO), it is known as Indian national satellite system, main agenda of this satellite is to enhance communication services and broadcasting including education services. This satellite is developed jointly DoT, DoS and IRaD; and considered as largest satellite system in pacific Asia region. Table 3 is listing the series of INSAT which are recently launched and in service.

Table 2: Inset Satellite Family

SN.	Version
1	INSAT-2E
2	INSAT-3B
3	INSAT-3A
4	INSAT-3E
5	INSAT-3C
6	GSAT-2
7	KALPANA-1
8	EDUSAT
9	INSAT-4A
10	EDUSAT-1
11	GSAT-12
12	GSAT-8

Services like disaster alerting, weather forecasting are also provided by this satellite; 175 transponders are provided by his system on C band, EX-C band and Ku band making it a multipurpose satellite. By this more than 9.5 million people are able to watch television broadcast also satellite mobile services are being provided by the same. As stated in [9], telemedicine network is also supported by this system which is capable to link data of 160 hospitals across the country.

3. E-learning case study

3.1. IGNOU

As practice of electronic learning systems, Indira Gandhi National Open University is one good case that deploying an E-learning system. This organization had established around 30 years ago and serving around two million local students today; from the other hand, students from thirty countries are also being provided with education from this university. Very large network of regional centres and study schools are affiliated under this organization; advance learning methods and effective technologies of distance learning are being used within this university. In the domain of E-learning systems, IGNOU has started developing the environments for e-learners as follow:

- PAN AFRICAN Electronic Network and SAKSHAT: are developed by IGNOU as one of top portals of education.
- Electronic GyanKosh: is national digitized repository.

Those systems are used as platform for live virtual education, library and information by this university.

3.2. NIOS

The national institute of open schooling which is known formerly as NOS national open schooling is enrolling a 1.6 million student today. This organization is recognized as largest schooling institute in the world; NIOS was established on early 1979 by central board of secondary education (SBSE). This organization is declared globally as sustainable learner school of centric education and training by open learning and distant education as well. Following are some facts about NIOS:

- Largest open and distance schooling system in the world and in service since 1979 with 2235000 enrolled students since 1990.
- More than 20000 students are enrolling annually in vocational education and more than 250000 are enrolling in other open courses.
- NIOS is getting in touch with their leaner by more than 900 centres of vocational around the country and in abroad also.
- NIOS is drawn essential participation in education development by providing a self-instructional print of study material, personal contact program supported by CD-ROM, moreover, practical sessions of training are also provided. NIOS learning programs are taking place also by help of radio and TV broadcasting.

4. Proposed system

Employing of satellite communication to create E-learning system can fill up the gap between urban large infrastructure learning organizations and others rural educational organization of less or few resource and infrastructure and hence good outcomes from all prospection could be yielded. The proposed Electronic learning system is comprised of three main units as in hereafter.

a) Mobile web applications: centralized educational services such as courses, tutorials and sessions can be accessed by students and teachers as well with help of smart phone applications of web facilities. These terminals i.e. mobile phones can be used by professors to login with their own authentication identity and then all of system services will be possible for them such as posting an assignment, taking the attendance report or even starting a quiz. Another service such as sending of feedback or results to the parents by SMS or email can be embedded with this application. From the other hand, students can login as well with their allotted authentication information and participating the work through this application, they can also download any given materials by their teachers and attending the quizzes online, the mark can be given as well according to their performance. This system is expected to increase the interest of students to learn and hence developing the public ability. The figure 2 is detailing the structure of mobile applications that based on web and expected to provide the mentioned services in the above section. Apart from the mobile unit, user may login into the centralized system by using personal computers or laptops

b) Channels of communication: it can be wire or wireless means of transmission, channel is related to the medium that used to share the data between the centralized system and candidate. Our proposed system is depending basically on educational satellite such as INSAT so, the channel of interest in our case will be satellite channel that contains of two beams: the uplink which is used to transmit the data from ground station to the satellite and downlink to receive the information by any terminal from satellite.

c) Ground station: this unit is performing the multimedia broadcasting such as video and voice; transition of live lectures or recorded once to the satellite in orbits and also performing the control signalling to ensure successful delivery of information between any pair of communication. One point to be considered is that wider coverage is assured, that can be achieved by using a satellite station with multiple bands to cover as larger as possible geographical area.

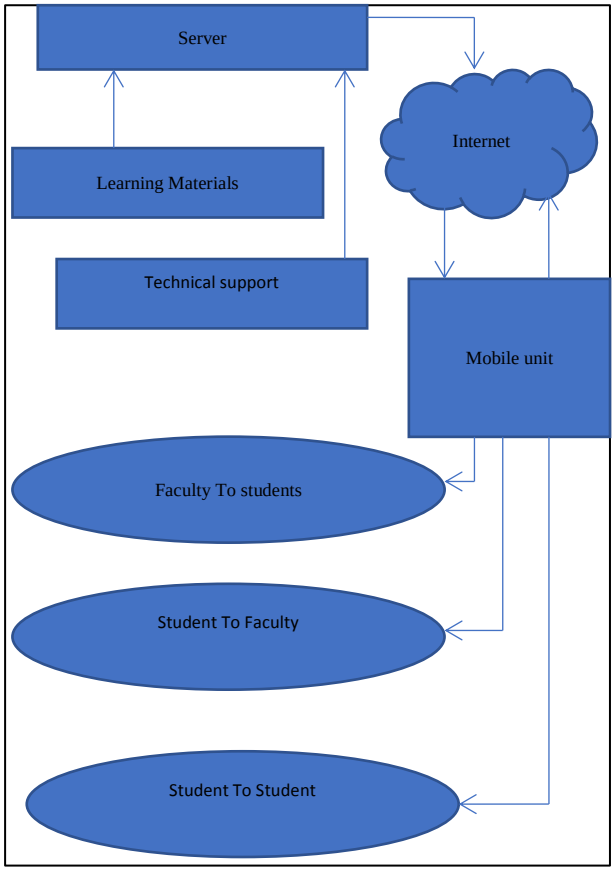


Fig. 2: Mobile Web Application Structure.

5. Practical model

In our model, lectures or any other educational material can be receded or live broadcasted to the satellite station which is in turn rerouting this information to the registered receivers (universities) in different coverage regions, those receivers will be applying this material on the registered website of every college. A web application can be used over smart phone to access those courses or it can be done directly by web browsers from any terminal computer to access college website. Concept of interactive classrooms will provide the facilities of remotely attending of live lectures and communicating with the subject export by means of voice, the proposed work of us involves a web application with login facility where student, teachers can be login and the last can remark any student as absent or present, the event activity can be displayed also of this virtual classroom. Subject expert can send email to any parents.

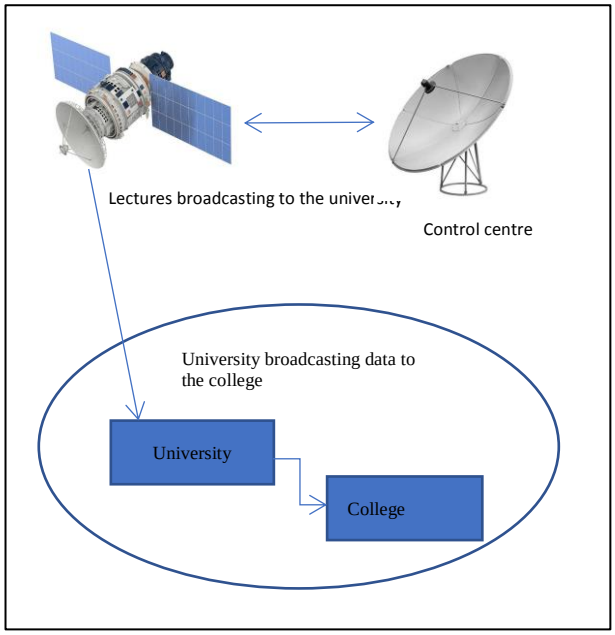


Fig. 3: Practical Model of Proposed System.

6. Conclusion

In this article, the strategy of satellite and their impact on learning management system is discussed. LMS can be enhanced to overcome larger remote locations by means of satellite network. Many standards satellites are developed by some countries to support LMS and scientific researches like EDUSAT which is used to connect thousands of students from remote geographical locations with their instructors. We proposed electronic learning system underlying with satellite integration to improve education quality and increase the student ability of leaning. Satellite can help to deliver live and interactive information for larger geographical areas. Three functional components are depended in our system; the data is being accessed by web application or personal computers. Students can reach easily to this system by mobile phones or personal computers, the access to this system will require internet arability. Lectures and study materials are being broadcasted from the control centre to satellite directly by individual channel.

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