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A DEDICATED SATELLITE TO PROVIDE INFORMATION AND COMMUNICATION NETWORKS AT NATIONAL AND STATE LEVELS FOR EDUCATION

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EDUSAT

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1. General Background

Ministry of Human Resource Development (MHRD) and Indian Space Research Organization (ISRO) of Department of Space, Govt. of India conceived the idea of using Information and Communication Technology (ICT) in the year 1993 through IGNOU-ISRO collaboration limited to the distance education students of IGNOU. In view of the effectiveness and success of this pioneering initiative, ISRO-IGNOU collaboration steadily grew. An **Uplink**, *an equipment to project pictures and voice* to a satellite from where it can be reflected back at specified ground locations provided with a **receive terminal** *(an equipment to receive pictures and voice projected by an uplink to the satellite and reflected back to ground)* was provided at Delhi in IGNOU by ISRO. From the location of a receive terminal one could also **talkback** to the expert in the studio of IGNOU at Delhi, who could then respond. Such a network is called **two-way audio and one-way video (2A & 1V)**.

Abbreviations and Glossary of terms used in this document are given in Annexure-I and Annexure-II respectively.

1.1 Existing Networks supported by ISRO

National Network:

Networks with both ways audio and one or both way/ways video are called **interactive** and are more useful and effective than usual **TV Telecast**. In the year 1995, ISRO provided to IGNOU, Training & Development Communication Channel (TDCC) national 2A&1V network and IGNOU extensively used this 2A & 1V interactive national network for education and training, which is being shared by several other organizations for education and training. Such a capability for a few state level networks was also provided by ISRO and provision for two more states is in hand currently. By the year **2000 ISRO** provided additional satellite capability enabling IGNOU to start **Gyan Darshan Telecast Channel I** which very quickly picked up as a common educational channel for NCERT, IGNOU, UGC, NIOS, etc. *This channel is being received at the receive terminals set up by IGNOU and also through cable-operated networks, which have opted for it.*

The capability of IGNOU in producing quality distance education content both in print and multimedia and tremendous advancement of ISRO in space technology complimented each other extremely well and it is at this juncture of IGNOU-ISRO cooperation that ISRO Chairperson, declared in 2002 that IGNOU and ISRO have a great common mission to educate the nation through ICT networks provided by Indian satellites. On the basis of the initial success of the ICT system, **IGNOU was provided a quantum jump in Satellite capacity by connecting to the new satellite INSAT-3C launched in February 2002 by ISRO.** *This enabled IGNOU to develop capacity for two interactive channels for teleconferencing and four other TV telecast channels.* Out of

these one channel for UGC and another for IITs is being telecast from IGNOU by connecting through microwave links.

This further extended and expanded the use of IGNOU's uplink facility, where massive Teachers Training for Primary and Secondary Education, Interaction at the national level with Teachers, parents and functionaries under Sarva Shiksha Abhiyan (SSA), Integrated Education for the Disabled, Training under Women's Empowerment through Self-help groups etc. were undertaken. IGNOU also digitalized the connectivity for clear pictures and sound. IGNOU consistently and dynamically incorporated essential changes in technology to match the requirements of ISRO. List of IGNOU's receive terminals for SSA project is given in Annexure-III.

A very successful role model for cooperation and mutual understanding between the leading educational organizations emerged, which was managed through a Steering Committee with the Vice-Chancellor IGNOU being its Chairperson. Some senior Officials of MHRD and a few other ministries, and user organizations were members of the Committee. The office of the Steering Committee was located in IGNOU. The Departments of Higher & Secondary Education and Elementary Education & Literacy, MHRD have set up two Core Groups with Vice Chancellor, IGNOU as Chairperson and members from the MHRD, DECU of ISRO, NCERT, NIEPA, DEP-SSA, UGC, AICTE and ICAR to act as the focal point for utilizing the EDUSAT capability. These Core Groups along with senior officials of the MHRD have met a few times with the Secretary, Departments of Higher & Secondary Education and the Secretary, Department of Elementary Education & Literacy in Chair. The Chairperson of the Core Group had also several discussions about the availability of various networks and their suitability with the Director, DECU, ISRO and the Advisor (EDUSAT), ISRO keeping in view the existing networks and capabilities. The present document is based on all the above inputs and it presents a comprehensive proposal for effective use of ICT capabilities of EDUSAT for Elementary Education, Literacy, Vocational Education and Teachers Training.

State Level Networks

Category I. States with Ku Band or Ku Band and Extended C Band networks .

- **Andhra Pradesh:** Ku Band uplink in Dr. B.R. Ambedkar Open University (BROU), Hyderabad with a **total of 1805 interactive down links** covering all districts
- **Karnataka:** Both Ku-Band Hub and Extended C-Band uplink with extensive down links covering all districts. The Extended C Band uplink is located in Abdul Nazir Sahab State Institute for Rural Development, Mysore with **200 receive terminals**. Ku Band uplink is at Department of State Educational Research and Training (DSERT), Bangalore and Visvesvaraya Technological University has **100 receive terminals**.

Category II. States with Extended C Band network

- **Goa:** Extended C-Band Uplink is at Goa University with 20 receive terminals covering all districts.

- **Gujarat:** Extended C-Band Uplink in Bhaskaracharya Institute of Space Applications and Geoinformatics (BISAG), Gandhi Nagar, with about 550 receive terminals covering all districts. 200 more receive terminals upto taluka level are in process of installation. Besides this, State Government plans to put 200 Ku Band receive terminals also.
- **Madhya Pradesh:** Extended C-Band Uplink in the State Academy of Administration, Bhopal with a **total of 1350 receive terminals** (*48 receive terminals, one each at district headquarters + 338 at Block level + 1012 in all Gram Panchayats of three districts*) covering all the districts.
- **Orissa:** Extended C-Band Uplink at Orissa Space Application Centre (ORSAC), Bhubaneswar with a **total of 1434 receive terminals** (1085 in Gram Panchayats of KBK districts + 314 in Block Development Offices + 30 one each in every District Rural Development Agency Offices + 5 in other locations) covering all the 30 districts.
- **Tamil Nadu:** Extended C-Band Uplink in Anna University, Chennai which has already provided **20 receive terminals** and **another 180 receive terminals** are proposed to be provided covering all districts.

Category III. States where ISRO is in the process of providing Extended C Band network

- **Kerala:** Extended C-Band Uplink at Thiruvananthapuram and receive terminals **under process of installation by ISRO**
- **Rajasthan:** Extended C-Band Uplink and receive terminals are **under process of installation by ISRO**

Category IV. States with Studios and some Extended C Band receive terminals but no uplinking facility

- **Bihar:** Studio at SIET, Patna and there are some Extended C-Band receive terminals. **Ku Band/Extended C Band Uplink to be provided.**
- **Maharashtra:** Studio at SIET, Pune and some Extended C-Band receive terminals. **Ku Band/Extended C Band Uplink to be provided.**
- **Uttar Pradesh:** Studio at SIET, Lucknow and there are some Extended C-Band receive terminals. **Ku Band/Extended C Band Uplink to be provided.**

Category V. States in the North-East and Sikkim

The Government of India is giving special focus on the development of education in the North-East Region including Sikkim. The Hon'ble Human Resource Development Minister had convened a meeting of all the Chief Ministers, Education Ministers and officials of the Department of Education of the region in July 2004. In the meeting, great emphasis was laid to ensure access of education to remote and less-developed areas of the

region. There is also a need for massive teachers training of untrained in-service teachers, which has to be completed during the next 2-3 years. Almost all the States have contacted IGNOU for training these teachers through the distance mode. It is, therefore, essential that a strong reach of Ku Band network is provided to 311 blocks in the region on first priority. In view of the special focus on the North-East, ISRO has made a provision of a regional HUB for the North-East. It is, therefore, important that the HUB which will be located in the region may provide connectivity through one Sub-HUB in each of the States in the North-East and Sikkim. The receive terminals will be set up by the user agencies.

A few other states like Chattisgarh, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Punjab, Uttaranchal and West Bengal do not have any reasonable communication facility. Thus Ku Band networks could be created for these states.

Note: (i) Additional receive terminals can be installed by the respective states to increase access and extend reach to cover further areas. The cost per is Rs. 50,000/- to 60,000/-. **The above networks will be supported by EDUSAT.**

(ii) Currently the above state level networks are not connected to the national networks. But it is possible to establish the connectivity by providing equipment costing nearly Rs. 5 lakh. The possibility of this connectivity is being explored by IGNOU with mutual agreement with the states.

International Network

A few receive terminals have been even established by IGNOU in Sri Lanka and Nepal for teaching learning of IGNOU courses and programmes.

2. Emergence of EDUSAT and Tasks ahead.

These successful joint interventions propelled the idea of expanding the ICT networks by sending a separate satellite in space by ISRO. Thus ISRO Chairperson, made a presentation in October 2002 in a meeting attended by senior academics from Universities and IITs, Heads of organizations like AICTE, CSIR, DBT, DEC, DST, IGNOU, NCERT, NCTE, NIOS, NIEPA, UGC, Secretaries and other officials of MHRD and ISRO about the possibility of launch of a dedicated satellite EDUSAT for education and training. In this meeting the capability of EDUSAT and its impact on the entire educational system was greatly appreciated and ISRO decided to take further necessary action for the development and launch of the satellite, which has just successfully materialized on September 20, 2004 in the form of EDUSAT.

Our missions for total literacy, compulsory education for all in the age group of 6-14 years, massive training of untrained teachers, refresher courses for teachers and the contemporary compulsions for lifelong learning with constraints on costs are visualized as challenging tasks to be accomplished in a tight time frame. Compulsory education for all in the age group of 6-14 years will also result in tremendous increase in demand for higher education in the near future and we have to address the crucial issue of equity and access to higher education at low costs. However our country's strength in IT, and availability of EDUSAT facilities for ICT would be of great help in achieving the desired goals in each sector of education and training with low costs and extensive reach. Out of

these tasks it seems teachers training and training of master trainers at different levels need to be given some initial priority.

As already pointed out in most of the states in the North East Region and the Sikkim and a few others like Chhattisgarh, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Punjab, Uttaranchal and West Bengal, the reach through ICT networks is of even greater importance and deserves consideration on priority. Even otherwise we do not have any ISRO supported uplink facilities focused to meet the regional and local requirements. Such facilities will greatly support education in the region through local institutions and in local languages. IGNOU has already developed contents of Teacher Training programmes in several languages of the North East like Hindi, English, Assamese, Bengali, Garo, Khasi etc.

3. EDUSAT supported applications for Elementary Education and Literacy

EDUSAT will have enormous capacity for providing a variety of options for Interactive/Broadcast/ Telecast Modes and Online communication networks at the national, regional and state level. These are described below.

I. Extended C Band Network: EDUSAT will support Extended C Band also. Technically Extended C Band will be preferable for existing Extended C Band 2A&1V Networks so that the life of the networks gets enhanced at marginal cost required in reorientation of the dish. The network is extendable to cable operated networks. *The users will meet the cost for reorientation of dish at receive terminals whereas ISRO has assured shifting of uplink from existing satellite to EDUSAT.*

The states like Bihar, Maharashtra and Uttar Pradesh that have developed studios being used only for production should also be provided suitable uplinks.

II. Ku Band Network: EDUSAT will support KU Band also. In states where we do not have Extended C Band Uplink it will be preferable to go for Sub-Hub and Ku Band down links. The network will support 1A&1V and 2A&1V (convertible to 2A&2V by adding a web-camera/Handicam). The cost of the three types of Ku Band receive terminals is given in Annexure-IV.

III. Two-way Computer Connectivity: Besides the conventional television broadcasting which is available in Extended C-band, a major feature of the EDUSAT Networks will be providing computer connectivity in KU Band. This type of computer connectivity can be used for –

- Virtual classrooms
- Access to databases
- Audio networks

In virtual classrooms, the teacher can be conducting a class using power point presentation or VCDs etc. and students could be asking questions. The connectivity could be one-way audio, one-way video or two-way video (at 384 Kbps)

For data access learning/teaching material could be made available in central database which students and teachers could access as and when required.

Audio networks could be established for having audio conferences.

Note: EDUSAT will not support C Band connectivity therefore it should continue with INSAT-3C.

EDUSAT will have capacity to provide both Ku band connectivity of any of the above types or a combination of them. In order to support connectivity, ISRO is setting up one National HUB at Ahmedabad and 5 Regional HUBs for providing the networks. **These will be installed and maintained by ISRO.**

In view of the IGNOU-ISRO long and successful collaboration, IGNOU will be the initial nodal centre for EDUSAT connectivity and utility. Thus setting up of the North Regional HUB for Ku Band is being considered by ISRO either at ISRO Earth Station or IGNOU at New Delhi. In case the Regional Hub is set up at ISRO Earth Station then IGNOU will be provided with a Sub-Hub. ISRO will also provide 50 Ku Band receive terminals each to IGNOU and NCERT. Additional 50 receive terminals will be established by both IGNOU and NCERT from their own resources. An uplink facility will be provided to NCERT also.

4. Management of the system

As regards **management of the system**, IGNOU/NCERT will maintain the Ku Band HUB/uplink in their studios at New Delhi. Besides 50 receive terminals to be provided by ISRO, 50 additional receive terminals will be developed by IGNOU/NCERT each. There will be a National level Steering Committee at IGNOU with IGNOU Vice-Chancellor as Chair and members representing officials/academics of MHRD, DECU-ISRO, NCERT, NCTE, NIOS and NIEPA. The steering committee will ensure that ICT network is multi-user with optimal sharing of resources ensuring quality. Different users will have to pay for the time utilized on the facility.

Content Development

This is an important component, which needs immediate attention and action. In view of enormous software required for successful utilization of the EDUSAT capabilities, it will be essential to motivate all institutions/organizations for developing capabilities in terms of multimedia educational software. To begin with, IGNOU, NCERT and NCTE should organize national level workshops for sensitization jointly. Existing resource centres like IGNOU and NCERT should provide initial expertise and experience to the new institutions. The software development should use existing institutions/private studios/professionals on hiring basis to support the academics. The National Steering Committee should provide mechanism for vetting of the software.

Content generation will be undertaken at two levels. First, video programmes will be produced based on the education and training needs of the states. These programmes will be telecast through ROTs. Besides the national institutions like IGNOU, NCERT, etc., SIETs will be involved in the production of programmes on elementary education. The facilities available in the states shall be optimally utilized for this purpose.

At the second level, teleconferencing sessions will be organized through the national and regional/ state uplinks. Best experts available in the curricular, pedagogy and used for teleconferencing sessions, which may be converted into video programmes for wide dissemination/utilization. The state SSA will use teleconferencing for training of teachers and other functionaries associated with SSA. (BRCs, CRCs, PTAs, MTAs, VECs, etc.)

Costs

The unit cost of different types of receive terminals is given in Annexure-IV. In order to increase the quality of transmission, the cost will go up but it is believed that the foregoing budget should be enough to meet the initial requirements.

State Level ICT Networks

One each uplink in 17 States with 10-15 receive terminals each with a total of 200 receive terminals will be provided initially by ISRO. The connectivity of the State uplink to receive terminals within the State would be 1V and 2A. The connectivity will also ensure data transmission in the form of e-mails, etc. **The management system** will be similar to that proposed for the National level network through a State Steering Committee. The uplink could be located in SIETs, Regional Centres of IGNOU or some other organizations. The responsibility of these organizations will be to maintain and provide room for studio with DGCam and software facilities. Additional receive terminals could be set up by the State concerned. The system will be multi-user and every user will have to pay on the basis of the time utilized. The Steering Committee will have the responsibility similar to those for national steering committee. The content development will also be on the lines parallel to those proposed for national level network. The academics in the State will be encouraged to plan and develop content with the support of existing resources in IGNOU, NCERT, SCERTs, etc. Instead of setting up studios, the professionals, studios and equipment will be hired, wherever required.

5. EDUSAT Phase II

- To expand Ku Band uplinks and receive terminals
- Interactive online education through virtual classrooms in schools
- To expand receive terminals in C Band / Extended C Band
- To ensure connectivity between state level C Band connectivity and national level C Band connectivity
- To extend the connectivity in the schools.

Abbreviations

AICTE	All India Council for Technical Education
BRC	Block Resource Centre
CSIR	Council for Scientific and Industrial Research
DBT	Department of Biotechnology
DIET	District Institute of Education & Training
DEC	Distance Education Council
DST	Department of Science & Technology
DEP	Distance Education Programme
DRS	Direct Reception System
DTH	Direct to Home
DL	Distance Learning
EMIS	Education Management Information System
ISRO	Indian Space Research Organization
ICAR	Indian Council for Agriculture Research
ICT	Information & Communication Technology
IIT	Indian Institute of Technology
IGNOU	Indira Gandhi National Open University
MHRD	Ministry of Human Resource Development
NIOS	National Institute of Open Schooling
NCERT	National Council of Educational Research & Training
NIEPA	National Institute of Educational Planning & Administration
NCTE	National Council for Teacher Education
ROT	Received only Terminals
SCERT	State Council of Educational Research & Training
SSA	Sarva Shiksha Abhiyan
SIET	State Institute of Educational Technology
SIE	State Institute of Education
TDCC	Training and Development Communication Channel
UGC	University Grants Commission
2A-1V	Two-way audio & one-way video
2A-2V	Two-way audio & two-way video

GLOSSARY

A/V, 1A/1V: A/V is audio-video. 1A/1V is one-way audio and one-way video.

2A/1V, 2A/2V: 2A/1V is two-way audio and one-way video. 2A/2V is two-way audio two-way video.

Broadcasting: Transmission of a signal, which does not have any restriction as far as its reception is concerned. (Receiver does not require any communication with the transmitter). It is always a one-way communication. Point (transmitter) to unlimited Multi-points (Receivers only) without any requirement of communication from receivers. Therefore an essential requirement of broadcasting is that

- Any body anywhere within the coverage area can join the network any time for its reception.
- Reception should be error tolerant and non-propagating (Error). It means that if reception is disturbed due to any reason it should automatically get restored as soon as cause of disturbances is over and at the same time it should not carry forward.

Coverage: Area over which defined resources of satellites can be effectively and uniformly utilized.

Data Transmission: It usually refers to the transmission of information in the form of text, graphics, and pictures etc. including e-mails.

Down Link: Signal coming from satellite towards any ground station is known as down link.

DTH: Full form Direct to Home. A system, which enables receiving of programmes Telecast through a satellite, where a reception system comprising of a small dish and TV or Computer is provided.

DVB: Digital Video Broadcasting

DVB-RCS: An open standard satellite based technology for broadband two-way connectivity.

EDUSAT: Educational Satellite

Extended C Band: Communication frequency band for satellite communication (4 to 7 GHz)

Forward Link: Usually signal transmitted from HUB is called forward link.

GSAT-3: Third Satellite Launched through ISRO's own Geo-synchronous launch vehicle GSLV-3 (same as EDUSAT)

Gyan Darshan: A bouquet of 4 TV transmission channels being telecast nationally through ISRO-IGNOU uplink at the Studio of IGNOU in New Delhi. The satellite used for these channels is INSAT-3C.

Gyan Vani: A network of 40 FM dedicated radio stations for education being set up by 2005 by IGNOU under an agreement between IGNOU and Prasar Bharti. Fourteen of them are already in place and the remaining of them are in different stages of being set up. These Radio Stations have a reach of nearly 60-75 Km around their locations. Besides radio broadcast interactive radio counseling is also conducted through these stations.

Handycam camera: See Web Camera

HUB: A Master Control Station in the network which performs the job of Network controlling, Traffic assignment, Commissioning of interactive terminals, Login log out, decommissioning, Data rate assignment, connectivity management etc.

Interactivity: Two-way communication between two ground stations.

Interactivity with Asynchronous Link: Two way interactivity between two ground stations with different data rates.

Interactivity with Synchronous Link: Two way interactivity between two ground stations with identical data rates.

Interactive education through TV network: The instructor at a central place can be both heard and seen at the receive terminals and students at the terminal can talk back / and also be seen by the instructor depending on the 2A/1V or 2A/2V network.

INSAT: INSAT (Indian National Satellites) are a series of satellites projected and maintained by ISRO for multipurpose space applications. INSAT-3B, INSAT-3C are satellites in this series.

Interactive On-line education: The instructor and the students can interact from both the sides through on-line connectivity of computer nodes as in e-mails. To catch the movements in real-time greater bandwidth that is higher data transmission rate will be required.

Interactivity & its speed: For educational network the forward link i.e. from teaching end to classrooms is always in a broadcast mode. For video broadcast with video conferencing quality this is 512 Kbps (For TV Broadcast it is 3 Mbps).

For interaction from remote end it could vary based on the requirements. For Audio it could be 32/64 Kbps. For text it could be 16 Kbps, For data file transfer it could be any where between 16 to 384 Kbps. For Video conferencing it could be 192 / 256 / 384 Kbps. However in any case this will never be more than 384 Kbps.

Ku Band: Communication band for satellite communication (11 to 15 GHz)

LMS: Learning Management System. Usually it is a WEB based management system kept at a major nodal point. There should be mechanism for accessing the server at nodal point from all remote terminals. For accessing the server it requires communication request from remote end and hence this facility can be utilized by only interactive terminals.

MFTDMA: Multi Frequency Time Division Multiple Access. A transmission scheme, where remote terminals are assigned a frequency and slot for its data transmission. Transmission rate at remote end is controlled by the TDM channel by assigning the number of slots .

Multicast: In IP mode of data connectivity Point to Multipoint communication is known as Multicasting. Like broadcast here also any user in receive only mode can join any time.

National Beam is a satellite communication system, which covers the whole country.

Peripherals (Teaching end): Equipment other than basic hardware.

PCs: Desk Top Personal computer

UPS: Uninterrupted Power Supply.

Touch screen: A Screen like PC monitor which can be used for on line editing with Glass-pen. A Teaching aid

SVGA to PAL Converter: All IP based data demodulator, outputs are viewed normally on PC. A card, which converts SVGA (PC) output to PAL output for viewing on TV.

Video Compression Hardware: A hardware cards where Video and Audio inputs are fed for compression

Camera: Normally there are two types of camera
Camera with USB Port
Camera with Video Output

Quality of camera is decided by its capture range, zooming capability, position programming, memory, resolution, etc. Higher the resolution higher the data rate requirements for transmission. For 512 KBPS Transmission very high-resolution camera is not recommended (though it can be interfaced with the system) since final resolution will be decided by the Compression technique.

PTZ Camera: This camera is required at Teaching end for remote controlling the transmission. This is known as Pan Tilt Zoom camera. Normally It can be remotely controlled for 180 Deg Azimuth and more than 60 Deg elevation with 10-12 pre-programmed positions.

Camera switch: If more than two cameras are used than a switch is required for feeding the video out put to video compression hardware unit.

Studio Feed: Any video feed from studio / from other source is acceptable.

Mike: Lapel/collar (wireless) mike or ordinary (wire) mike. It is preferred that mike should be push to talk type.

Speaker: Earphone / wall mounted / PC attached.

Other equipments are: DVD Player / VCR / CD Player etc.

LMS WEB SERVER: High-end server for asynchronous teaching.

Peripherals (Satellite Interactive Terminal): Equipment other than basic hardware. PC
UPS
Video Compression Hardware (If video interactivity is also required)
Camera (If video interactivity is also required)
LCD Projector.

Peripherals (ROT): Equipment other than basic hardware. (Receive Only Terminal)
PC
UPS
Liquid Crystal Display (LCD) Projector.

RCS: Return Channel Through Satellite

Receive terminals: It is an equipment which mainly consists of a dish antenna and other peripherals like TV, computer, a camera to receive or receive and transmit back audio-video signals through satellite. The configuration and size of dish antennas depends on the type of satellite communication and type of communication requirements like 1A/1V, 2A/1V, 2A/2V with or without facility for data transmission.

Regional Beam is a satellite communication system, which covers a specified region of the country.

Return Link: Usually Signal originated from remote locations towards HUB is known as return link.

ROT: Receive only terminals. Any signal originated from main hub can be received on the ROT.

SIT: Satellite Interactive Terminal. This terminal can receive the broadcast signal transmitted from Main HUB and can interact with any other similar SITs configured under Main Network. It can also receive signal transmitted from the Sub-HUB. Since SIT signal with special status of Sub-HUB will automatically get broadcast from Main HUB. (In IP Mode of transmission broadcast is actually equivalent to Multicast)

Spot Beam: Special beam on spacecraft which provides high power over well defined restricted area on earth; same is also called regional beam since it provides satellite coverage with higher power over a limited region.

Sub-HUB: It is not a very standard terminology. A ground station, which can be used for providing

- On line broadcasting for a teaching session,
- Can handle the two way interaction with classrooms meant for its transmission,
- Part of main network (Main HUB) however does all the functions transparently for its own network is called Sub HUB.

This terminology is used only for DVB-RCS Based network proposed by ISRO. The Sub HUB is provided a special status by the main HUB during its configuration and commissioning.

Once configured with a special status in the main network, this Sub-HUB can then any time transmit dedicatedly high data rate Up Link. For present case of DVB-RCS EDUSAT network it is planned to provide 512 KBPS constant rate Up link facility to the Sub HUB.

TDM: Time division multiplexed. A transmission scheme where all information sources are multiplexed and converted in to a single digital continuous stream

Transponder: An onboard system, which provides link between two ground stations through satellite. It receives input from one-ground station converts its frequency amplifies and sends it back to earth for an area, which is under its antenna coverage. Its Major parameters are Frequency band, bandwidth and EIRP (Power)

TV Broadcast: Standard MPEG-2 Transmission with minimum 4 MHz bandwidth.

Two-way communication for education: It can be done in following two ways.

- On line live or synchronous teaching: Simultaneous communication between two ground stations in both the direction. It is assumed that person is physically present at both the end. Delay is only because of link and should be non cumulative.
- Off-line or asynchronous teaching: Communication between two ground stations in both the direction. It is assumed that person is not physically present at both the end. Delay is only because of link and there could be cumulative delay because of off-line processing. Learning through LMS comes under this category.

Two-way video communication: Simultaneous two way live link between two ground stations capable of transmitting Video signal.

Unicast: In IP mode of data connectivity Point to Point communication is known as unicast. Here data flow takes place only when task of proper handshaking between two stations involved in communication is completed.

Up Link: Signal transmitted from any ground station towards satellite is known as Uplink.

Video Broadcast: Any broadcasting signal having a Video component comes under video broadcasting . (Audio component is always assumed integral part of video broadcasting by default). TV Broadcast is also therefore is a video broadcast. Video broadcasting can be done using video compression technique and corresponding decoder is required for its decoding at the receiver.

Video broadcast with interactivity: Such kind of network has got two components as far as its reception is concerned.

- Since basically the transmission is of broadcast nature, any body can receive it any time any where with in its coverage area. It means any receive only terminals can be part of the network.
- For interactive an additional channel (Pipe) is required between remote locations and Transmitter from where broadcasting is taking place. Interaction is performed through this link.
- In satellite communication the forward link or the broadcasting is done through satellite link and Interactivity is done by various other means or also through satellite. Usually this kind of network always operates with asynchronous data link. It means that forward link is at higher rate and return link for interaction is at lower rate.

Interaction if done through satellite the kind of data flow depends on the pipe availability. Following are the various kinds of data traffic requirements

Text: There is as such no standard for text interaction. Faster the speed faster will be the interaction.

Voice: 9.6 Kbps onwards data rates are used for voice
32 Kbps is universally accepted rate for its quality
64 Kbps is very commonly used rate for high quality voice

Audio: 64 Kbps is very commonly used
128 Kbps is universally accepted rate for stereo quality

Video: Video interaction can be done at a very low rate and depends on quality and particularly on movements. Usually good quality static video are accepted at 64 Kbps and 384 Kbps is universally accepted rate for on line video interaction

Video Conferencing standard: Uses video compression techniques for the reduction of bandwidth. Though not a standard but 384 Kbps quality is universally accepted for video conferencing. It can go to any higher data rate as well as some times it is carried out at as low as 64 Kbps.

Web camera / Handycam camera: Web camera is a low quality and low price camera that connects directly to a computer. Handycam camera is a little costlier with better pictures.

Annexure-III

**State wise List of C Band Receive terminals installed under SSA Programmes
Only (there are others also in some Extended C Band state networks)**

ASSAM IN 24 DISTRICTS

1.	SPO , Guwahati	9.	DIET, Morigaon	17.	DIET, Cachar
2.	DIET, Barpeta	10.	DIET, Sonitpur	18.	DIET, Nagaon
3.	DIET, Bongaigaon	11.	SCERT, Guwahati	19.	DIET, Kamrup
4.	DIET, Darang	12.	SIE, Jorhat,	20.	DIET, Karimganj
5.	DIET, Dhubari	13.	DIET, Nalbari	21.	DIET, N.C.Hills
6.	DIET, Galpara	14.	DIET, Lakhimpur Azad	22.	DIET, Jorhat
7.	DIET, Karbi Anglong	15.	DIET, Sibsagar	23.	DIET, Dibrugarh
8.	DIET, Kokrajhar	16.	DIET, Golaghat	24.	BTC, Hailakandi.

ANDHRA PRADESH IN 22 DISTRICTS

1.	SPO, Hyderabad	9.	DIET, Khammam	17.	DIET, Adilabad
2.	DIET, Adilabad	10.	DIET, Karimnagar	18.	DIET, Vizianagaram
3.	DIET, Kurnool	11.	DIET, Nizamabad	19.	DIET, Ranga Reddy
4.	DIET, Annatpur	12.	DIET, Mahabubnagar	20.	DIET, Visakhapatnam
5.	DIET, Karveti Nagar	13.	DIET, Mynampadu	21.	DIET, SrikaKulam
6.	DIET, Guntur	14.	DIET, Nalgonda,	22.	Sub-DIET, AraKuvally
7.	DIET Warangal	15.	DIET, Nellore		
8.	DIET, Medak	16.	DIET, Guddapah		

BIHAR IN 21 DISTRICTS

1.	SPO Patna	8.	DIET, Sasaram,	15.	DIET, Bhagalpur
2.	SCERT,Patna	9.	DIET, Patna	16.	DIET, Nawada
3.	DIET, East Champran	10.	DIET, Sonapur	17.	DIET, , Begusarai
4.	DIET, Vaishali	11.	DIET, Madhubani	18.	DIET, Madhepura
5.	DIET Sitamarhi	12.	DIET, Munger	19.	DIET, Samastipur
6.	DIET, Gaya,	13.	DIET, Purnia	20.	DIET, Siwan
7.	DIET Muzaffarpur	14.	DIET, Bhojpur	21.	DIET, , Nalanda

CHHATTISGARH IN 7 DISTRICTS

1.	SPO Raipur	4.	BIT, Mahasamund	7.	SCERT, Raipur,
2.	BIT Janjgir	5.	BIT, Dhamtari		
3.	BIT Kanker	6.	IASE/ BTI Bilaspur		

GUJARAT (2)

1.	GCERT, Ahmedabad
2.	SPO Gandhinagar

HARYANA IN 15 DISTRICTS

1.	SPO Chandigarh	6.	DIET, Narloal	11.	DIET, Ambala
2.	DIET, Bhiwani	7.	DIET, Kurukshetra	12.	DIET Faridabad
3.	DIET, Sirsa	8.	DIET, Gurgaon	13.	DIET Rohtak
4.	DIET, Jind	9.	SCERT Gurgaon	14.	DIET Sonapat
5.	DIET, Hissar	10.	SIEMAT, Bhiwani	15.	DIET Shahpur

HIMACHAL PRADESH IN 14 DISTRICTS

1.	SPO Shimla H	6.	SCERT, Solan	11.	DIET Dharamshala
2.	DIET, Sirmaur	7.	DIET Hamirpur	12.	DIET Kinnaur
3.	DIET, Kullu	8.	DIET Una,	13.	DIET Solan
4.	DIET,Chamba	9.	DIET Bilaspur	14.	DIET Shimla
5.	DIET,Lahul & Spiti	10.	DIET Mandi		

JHARKHAND IN 23 DISTRICTS

1.	SPO, RANCHI	9.	DPC, Koderma	17.	DIET Dhanbad
2.	DIET Jamshedpur	10.	DPC, Hazari Bagh	18.	DIET Godda
3.	DIET, Ranchi	11.	DIET, Deoghar	19.	DIET Gumla
4.	DIET, Chartra	12.	DIET, Giridh	20.	DIET. Latehar
5.	DIET,Chaibasa	13.	DPC, Sahibganj	21.	DPO, Lohar dagga
6.	DPC, Dumka	14.	DPC, PaKur	22.	DPO, Daltenganj,
7.	DPC Nala Jamtara	15.	DPC Garhwa	23.	DPO, Simdega
8.	DPC, Chaibasha	16.	DPC, Bokaro		

KERALA IN 7 DISTRICTS

1.	DIET, Trivandrum	4.	DIET, Palakkad	7	SCERT Thiruvananthapuram
2.	DIET, Kasargode	5.	DIET, Thodupuzha		
3.	DIET, Malappuram	6.	DIET, Wayanand		

MADHYA PRADESH IN 11 DIST.

1.	SCERT Bhopal	5.	BRC, Burahnpur	9.	BRC, Neemuch
2.	BRC, Annupur	6.	BRC, Dindori	10.	BRC, Sheopur- Kalan
3.	BRC, Ashok nagar	7.	BRC, Harda	11.	BRC, Umaria
4.	B.T.I. Barwani	8.	BRC, Katni		

ORISSA IN 24 DISTRICTS

1.	SPO Bhubaneshwar	9.	DIET, Koraput	17.	STS, Sonepur
2.	DIET, Baragarh	10.	DIET, Keojhar,	18.	SCERT, Bhubaneswar
3.	DIET,Mayurbhanj	11.	DIET,Gajapati	19.	DIET, Jajpur
4.	DIET, Kalahandi	12.	DIET, Sambalpur	20.	DIET, Ganjam
5.	DIET, Cuttack	13.	DIET, Phoolbani	21.	DIET, Balasore
6.	DIET, Bolangiri	14.	STS, Malkanagiri	22.	DIET, Jeypore,
7.	DIET, Boudh	15.	STS, Nawarangpur	23.	DIET Sundergarh
8.	DIET, Dhenkanal	16.	STS Naupada	24.	DIET Khurda

Rajasthan In 19 districts

1.	SPO Jaipur	8.	DIET, Churu	15.	DIET, Jhunjhunu
2.	DIET, Sirohi	9.	DIET, Dholpur	16.	DIET, Bhilwara
3.	DIET, Alwar	10.	DIET, Jaipur	17.	DIET, Sikar
4.	DIET, Dausa	11.	DIET, Jhalwar	18.	DIET, Tonk
5.	DIET, Bharatpur	12.	DIET, Karouli	19.	SCERT Udaipur
6.	DIET, Bundi,	13.	DIET, Nagaur		
7.	DIET, Sriganganagar	14.	DIET, Distt.- Kota		

UP IN 46 DIST.

1.	SIEMAT Allahabad-	17.	DIET Siddharth Nagar	33.	DIET Kanpur Dehat
2.	DIET Badaun,	18.	DIET Sonbhadra	34.	DIET Kushinagar
3.	DIET Bahraich,	19.	DIET Agra	35.	DIET Mahoba
4.	DIET Barabanki	20.	DIET Azamgarh,	36.	DIET Mainpuri
5.	DIET Bareilly	21.	DIET Ballia	37.	DIET Mathura
6.	DIET Basti	22.	DIET Bijnaur	38.	DIET Mau Nath Bhanjan
7.	DIET, Deoria	23.	DIET Bulandshahar	39.	DIET Meerut
8.	DIET Firozabad	24.	DIET Etah	40.	DIET Mirzapur
9.	DIET, Gonda	25.	DIET Faizabad	41.	DIET Muzaffarnagar
10.	DIET Hardoi	26.	DIET Farukhabad	42.	DIET Pratapgarh
11.	DIET Lakhimpur Kheri	27.	DIET Fatehpur	43.	DIET Rai Bareilly
12.	DIET Lalitpur	28.	DIET Ghaziabad	44.	DIET Sultanpur
13.	DIET Moradabad	29.	DIET Ghazipur	45.	DIET Unnao
14.	DIET Pilibhit	30.	DIET Jalaun,	46.	SCERT Lucknow
15.	DIET Rampur	31.	DIET Jaunpur		
16.	DIET Shajahanpur	32.	DIET Jhansi,		

UTTARANCHAL IN 11 DISTRICTS

1.	SPO Dehradun	5.	DIET Uttarkashi	9.	DIET, Paudhi
2.	DIET Pithoragarh	6.	SCERTTihri Garhwal	10.	DIET,Rudra Prayag
3.	DIET Haridwar	7.	DIET , Almora	11.	DIET, Dehradun)
4.	DIET Tehri,	8.	DIET, Nanital		

WEST BENGAL IN 1 DISTRICTS

1.	SCERT Kolkata
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CHANDIGARH (1)

1.	SIE, CHANDIGARH
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DELHI (11)

1.	SCERT, New Delhi	5.	DIET, Moti Bagh	9.	DIET, Karkardoma
2.	EdCIL, 10-B Indraprastha Estate,	6.	DIET Daryganj	10.	DIET R.K. Puram i
3.	DIET, Keshav Puram	7.	DIET, Pitampura,	11.	DIET, Sahadra,
4.	DIET Rajinder Nagar	8.	DIET Ghumman Hera		

GOA (1)

1.	SIE, GOA
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KARNATAKA IN 12 DISTRICTS

1.	SPO,Bangalore	5.	DIET, Chmraj Nagar	9.	DIET, Kolar
2.	DIET, Bangalore(Rural)	6.	DIET, Dharwad	10.	DIET, Koppal
3.	DIET, Belgaum	7.	DIET, Illakal	11.	DIET, Mandya
4.	DIET, Bidar	8.	DIET, Kamalpur, Gulbarga	12.	DIET, Raichur

MAHARASTHARA IN 10 DIST.

1.	SPO, Bombay	5.	DIET, Jalana	9.	DIET, Aurangabad
2.	DIET, Beed	6.	DIET, - Latur	10.	DIET,Osmanabad,
3.	DIET, Dhule	7.	DIET, Nanded		
4.	DIET, Gadchirali	8.	DIET, Parbhani		

PONDICHERRY (1)

1.	SIE, ,PONDICHERRY
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PUNJAB (16)

1.	SCERT Chandigarh	7.	DIET, Fatehgarh Sahib	13.	DIET, Ludhiana
2.	DIET, Nawan shehar	8.	DIET, Ferozpurpur	14.	DIET, Patiala
3.	DIET, Jalandhar	9.	DIET, Faridkot	15.	DIET, Ropar
4.	DIET, Hoshairpur	10.	DIET, Mansa	16.	DIET, Gurudaspur
5.	DIET, Seikhupura (Kap.)	11.	DIET, Sangrur		
6.	DIET, (Bhatinda)	12.	DIET, Moga		

TAMILNADU IN 9 DIST.

1.	SPO Chennai	4.	DIET, Dharmapuri	7.	DIET, Triplicane,(I) Chennai
2.	DIET, Cuddalore	5.	DIET,Karur	8.	DIET, Triplicane, (II) Chennai
3.	DIET Thriuvannamalai	6.	DIET, Kanya Kumari	9.	DTERT, Chennai

DADRA AND NAGAR HAVELI (1)

1.	SIE, Silvassa
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DAMAN AND DIU (1)

1.	SIE, DAMAN AND DIU
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ARUNACHAL PRADESH (8)

1.	Director of School Education, Itanagar	4.	DIET, East Kameng	7.	DIET Roing & Lower Dibang Valley
2.	SIE Arunachal Pradesh	5.	DIET, Changlang	8.	DIET, Pasighat
3.	DIET, Papumpare	6.	DIET Kameng		

TRIPURA (4)

1.	DIET, Kakraban Tripura (South)	3	SCERT, Agartala, Tripura (west)
2	DIET, Agartala, Tripura (west)	4	SSA, Agartala, Tripura West

NAGALAND (5)

1.	SCERT Kohima	3	DIET, Ciechama	5	DIET, Tuensang
2	State Project Office, Kohima	4	DIET, Ongbangkong		

MIZORAM (1)

1.	SCERT, MIZORAM
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ANDAMAN & NICOBAR ISLAND (1)

1.	SIE, Port Blair
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JAMMU & KASHMIR (2)

1.	SIE Srinagar
2.	SIE Jammu Tawi

MANIPUR (1)

1.	SCERT, Imphal
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MEGHALAYA (1)

1.	SCERT Shillong
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LAKSHWDEEP (1)

1.	SCERT LAKSHADWEEP
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SIKKIM (1)

1.	SCERT, Gangtok
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BUDGETORY COSTS – FOR KU-BAND

The budgetary cost of Ku-band hardware at teaching end and classroom for a teleconferencing requirement operational at 512 Kbps/sec are as below:

1. Sub hub (teaching end)

Minimum Requirements		System Enhancement (if required)	
• Terminal	Rs. 2.5 L	• DVD player	Rs. 0.2 L
• PC (3 nos.)	Rs. 1.0 L	• Touch screen	Rs. 1.2 L
• Video Compressor Hardware Vigo/VLC	Rs. 0.6 L	• PTZ cameras*	Rs. 1.0 L
		* Only if studio is not available	
• UPS	Rs. 0.3 L		
TOTAL	Rs. 4.4 L	Total	Rs. 2.4 L

GRAND TOTAL Rs. 6.8 L

2. Interactive Classroom (SIT) – minimum requirement

Minimum Requirements		System Enhancement (if required)	
• Terminal	Rs. 1.3 L	• Projector (or LAN)	Rs. 0.5 L
• PC	Rs. 0.3 L	• Additional PC	Rs. 0.3 L
• UPS	Rs. 0.2 L	• Camera -	Rs. 0.6 L
		Only if 2-way video interactivity is needed	
TOTAL	Rs. 1.8 L	Total	Rs.1.4 L

GRAND TOTAL Rs. 3.2 L

3. Non interactive classroom (ROT)

Minimum Requirements		System Enhancement (if required)	
• Receive Only Terminal (data centric)	Rs. 0.3 L	• Projector (or LAN)	Rs. 0.5 L
• PC	Rs. 0.3 L		
• UPS	Rs. 0.2 L		
TOTAL	Rs. 0.8 L	Total	Rs. 0.5 L

GRAND TOTAL Rs. 1.3 L

**DEVELOPMENT AND EDUCATIONAL COMMUNICATION UNIT
INDIAN SPACE RESEARCH ORGANISATION
AHMEDABAD**

**PROPOSAL FORMAT FOR EDUSAT UTILISATION IN SEMI-
OPERATIONAL PHASE**

1. Name of the institution/organisation requesting the distance education network

Postal Address :

Contact person/s :

Phone No. :

Email ID :

Fax :
2. Introduction – Background of the institution/university, when was it established,
 - Activities of Institution :
 - Goals/objectives :
 - No. of colleges/schools :
 - Disciplines offered :
 - Existing means of technology and its uses :
3. Existing Infrastructure
 - Electronic Media and its uses :
(TV, Radio, computer and Internet)
 - Years of Experiences :

4. Need of distance education network by the institution –

- Objectives
- Target Group (educational sector)
- Subject
- Justification/need for technology

5. Requirements

➤ Network

- For exclusive use – Y/N
- Used by other institutions also – Y/N (specify the other institutions)

➤ Teaching End

- Where will it be located?
- Whether dedicated or shared – Y/N
- If shared, with whom?

➤ Types of communication/connectivity

There are two types of communication possible; two way communication between hub and remote terminals (interactive: only audio) or one way communication from hub to remote terminals (receive only).

➤ Satellite Interactive Terminals (SITs)

No. of SITs required in phases

- Phase I
- Phase II
- Phase III

◆ Total numbers of SITs required –

ROTS ONLY TERMINALS (ROTS)

No. of ROTs required in phases

- Phase I
- Phase II
- Phase III
- ◆ Total numbers of ROTs required –

➤ Objectives of Edusat Use

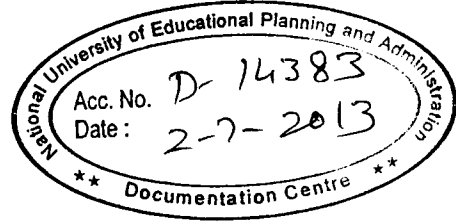
- Teacher Training
- Classroom Teaching
- Virtual Classroom
- Virtual Library
- Virtual Laboratory

➤ Expected type of traffic in network

- Data – Y/N
- Voice – Y/N
- Video (one-way)– Y/N
- Video (two-way)– Y/N
- All the above – Y/N

➤ Applications for which the network is required

- Power point – Y/N
- Interactive CD – Y/N
- Live lectures – Y/N
- Video clippings – Y/N
- Online examination – Y/N
- Registration – Y/N
- Admission procedure – Y/N
- Offline review of lectures – Y/N
- Digital library – Y/N



- Others (specify)

➤ Duration of usage

- Number of hours of use per day
- Number of days in a year -

➤ Content availability

- Discipline and subject-wise details of existing material and material that needs to be generated
- Availability of in-house content generation facility
- Possible local resources who can generate content generation

(Please attach a list with the contact addresses)

➤ Role of User Agency and specific contribution

Activity	Budgetary Provision *
Provide infrastructure (location of classroom)	
Setting up of Receiving Ends	
Content Generation	
Operational and maintenance responsibilities	

*Central government, State Government, Private Donors, Others

- Plan to raise the required finances if existing finances are in adequate

• **Please send the information in the above format to :**

Mr. B.S. Bhatia
 Director
 Development and Educational Communication Unit
 # 3120, SAC P.O.
 Jodhpur Tekra
 Ahmedabad - 380 015

Phone - 079-2691 3120
 Fax - 079-26768556
 Email - bsbhatia_decu@sac.isro.org
bsbhatia@yahoo.com
 Cc - hjoshi_decu@sac.isro.org

NUEPA DC



D14383

- Please send the name, phone no., email address of the contact person at your end.