Increasing education & training opportunity using space science & technology

V. Sundararamaian

Indian Space Research Organization
Department of Space, Government of
India

P. S . Roy

National Remote Sensing Agency
Department of Space, Government of
India

Traditional System

Education has been around for most of human history. To put it simply, education is the teaching of ideas, abilities, principles etc;

India has a long history of organized education. The *Gurukuls* system of education is one of the oldest on earth, and was dedicated to the highest ideals of all-round human development: physical, mental and spiritual. *Gurukuls* were traditional residential schools of learning; typically the teacher's house or a monastery .

International Scenario

According to UNESCO, in the world today there are about 1 billion non-literate adults

- This 1 billion is approximately 26 percent of the world's adult population. Women make up two-thirds of all non-literates.

- 98 percent of all non-literates live in developing countries. In the least developed countries, the overall illiteracy rate is 49 percent.

- 52 percent of all non-literates live in India and China. Africa as a continent has a literacy rate of less than 60 percent.

- In all developing countries, the percentage of children aged 6-11 not attending school is 15 percent. In the least developed countries, it is 45 percent

Education Scenario in India

1027 Million Population
350 million Illiterates
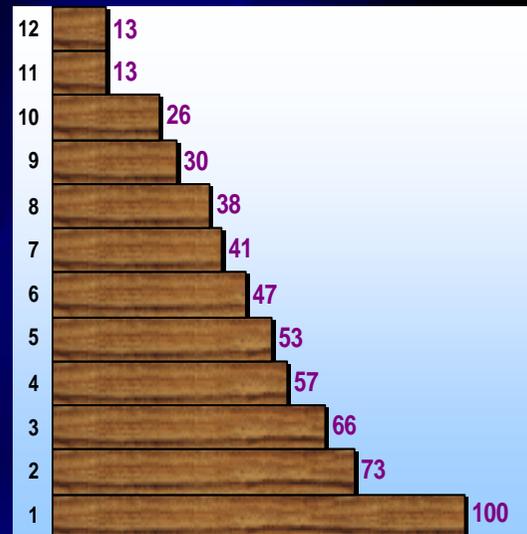
87 % Drop out
by Std 12

No. of Students per School
285

- Over 50% Teachers at school level are Educated only up to Secondary school level.

- Due to the shift in the employment pattern, in recent years, highly talented and qualified persons with teaching skills have been attracted away from moderately paying teaching profession, resulting in shortage of talented teachers.

No. of Students per Teacher
71

Education Scenario in India

➢ In India female illiteracy is as high as 45.8% and rural illiteracy about 43%.

➢ By the end of 10th five year plan, in the case of secondary education, there will be an addition of about 6.9 million students requiring an additional 1,30,000 new teachers and about 34,500 new school units.

➢ Lack of good qualified teachers has affected performance and failure rates are very high in Mathematics, Science and English at secondary school level.

Challenges in Education

➤ Current education issues include which teaching method (s) are most effective?

➤ How to determine what knowledge should be taught?

➤ Which knowledge is most relevant?

➤ How well the pupil will retain incoming knowledge?

Space technology has important role to play towards meeting the above challenges ….

INDIAN GURUKUL SYSTEM

"PROFESSION" EDUCATION

FOCUS ON "OVERALL" DEVELOPMENT

MULTI-FACETED KNOLWEDGE

MEMORY APPROACH

Enhancing Education Domain

➢ Traditional way of teaching needs teachers, teaching accessories, classroom and students;

➢ To achieve advancement of knowledge; subject expertise needs more than the present form of education;

➢ Changing socio-economic environment has left many deprived of *real Knowledge.* A priority need to build a knowledge society.

➢ Space technology has important role to play towards achieving the above needs of education and training opportunities.

Education & Space

- The space science & technology has opened up new opportunities for humanity in the field of Communication, entertainment, natural resource mapping, meteorology, Disaster management, education, exploring the universe……;

- Satellite for education is a mean to enlarge the scope of education and its access….;

- Satellite school or virtual classroom is a system where an expert in a subject can simultaneously teach (formal or informal media/ content) hundreds of students in various schools or colleges across a wide area in .

Space Science, Technology & Its Applications

National Space Systems

Communication	Remote Sensing	Space Science
↓	↓	↓
INSAT Series of Satellites	IRS Series of Satellites	X-Ray Payloads, Ground Equipments, Astrosat
↓	↓	↓
Meteorology, Radio/TV Broadcast, Disaster Warning	Natural Resources Monitoring and Management	Understanding of Solar System, Astronomy and Life in Space
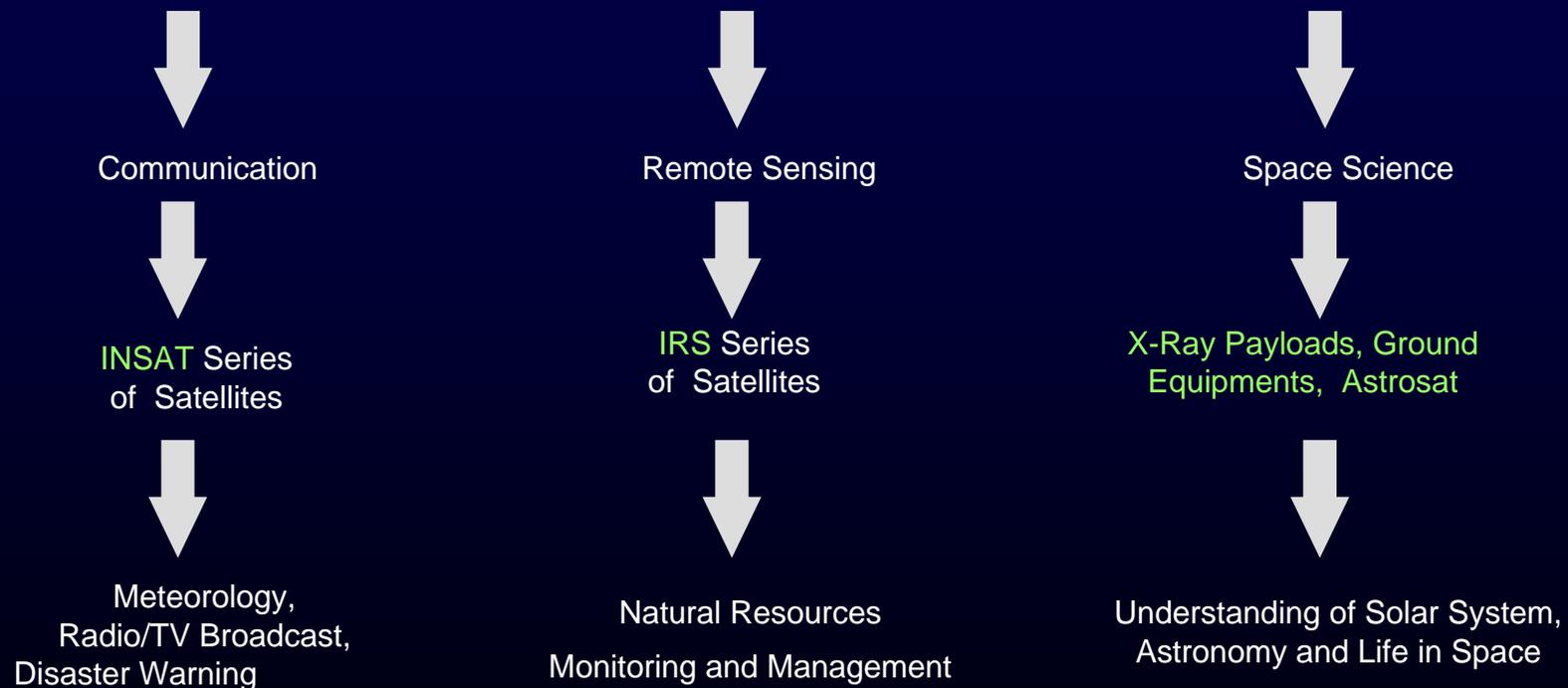
INSAT system
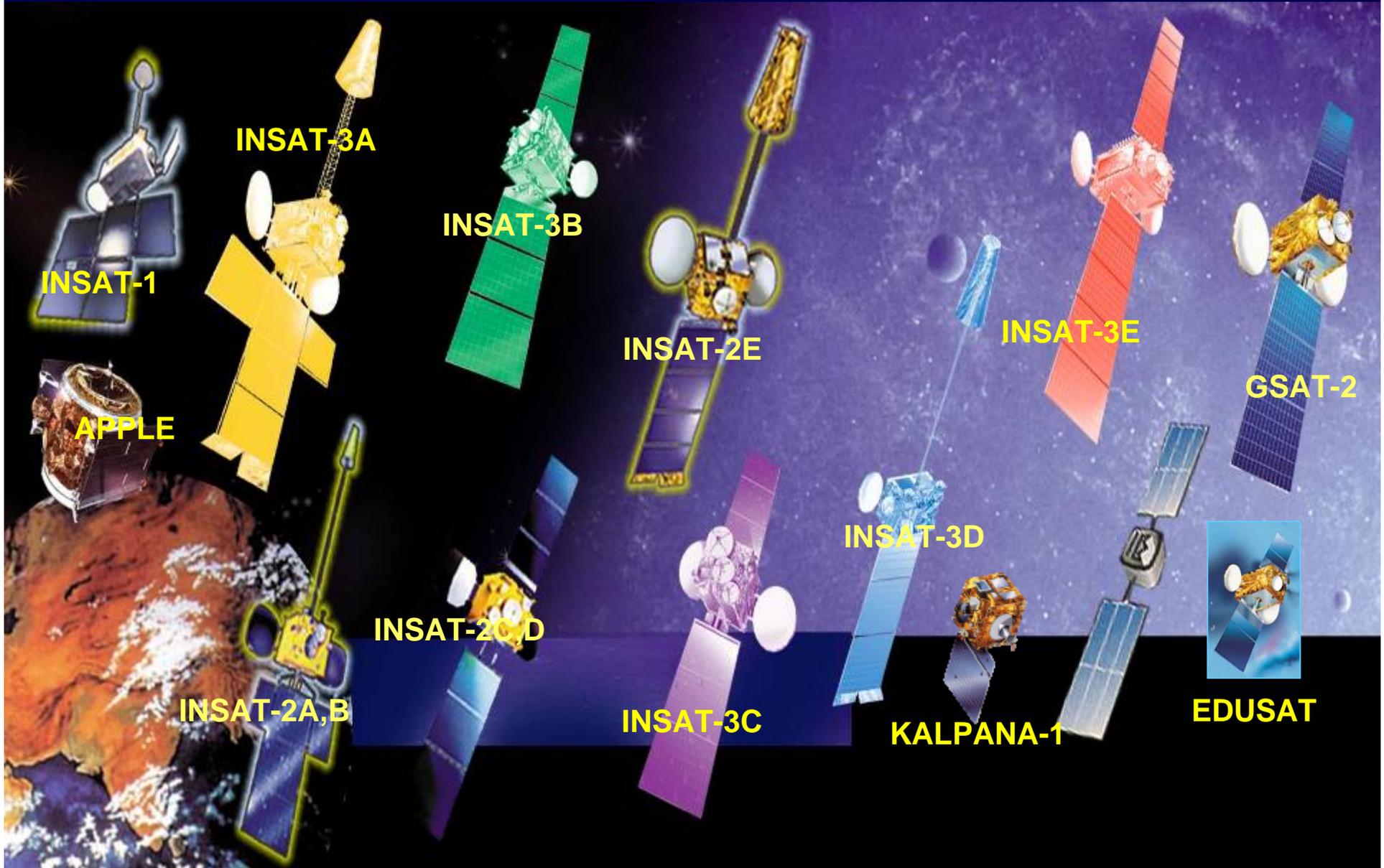
INSAT APPLICATIONS

BROADCAST
- ➤ **Television Broadcasting**
- ➤ **Direct To Home (DTH)**
- ➤ **TV & Radio Networking**

COMMUNICATION
- ➤ **Speech Circuits On Trunk Routes**
- ➤ **VSAT Connectivity**

METEOROLOGICAL
- ➤ **Meteorological Imaging**
- ➤ **Data Collection Platform**
- ➤ **Disaster Warning**
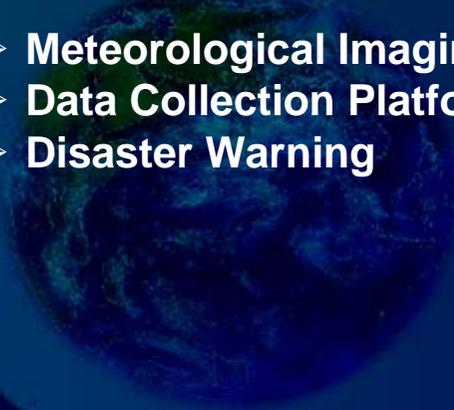
DEVELOPMENTAL
- ➤ **Tele-health**
- ➤ **Tele-education**
- ➤ **Emergency Communication**

OTHERS
- ➤ **Mobile Satellite Service**
- ➤ **Search and Rescue**
- ➤ **Satellite Navigation**
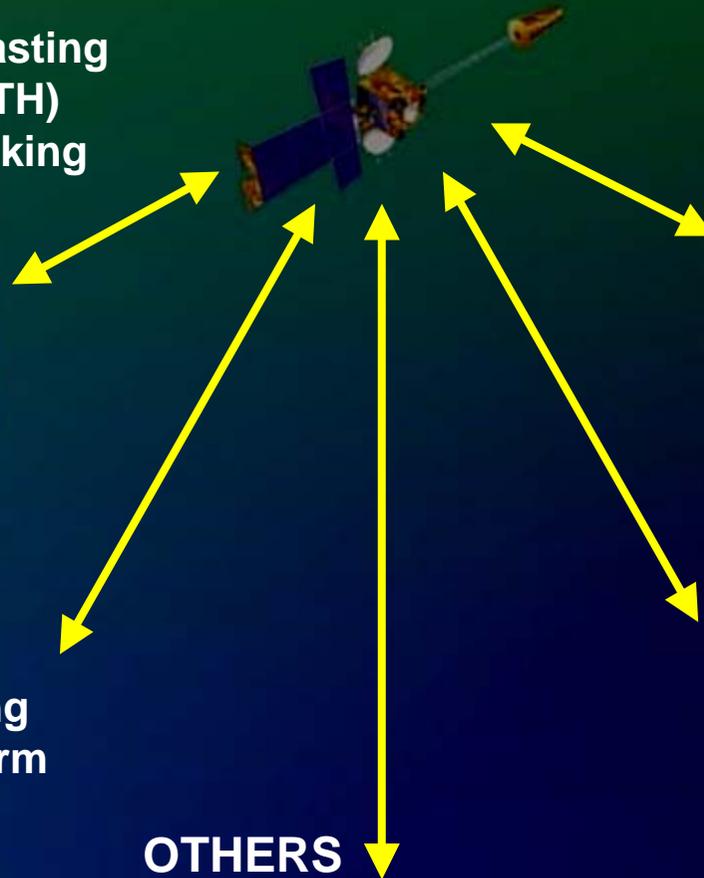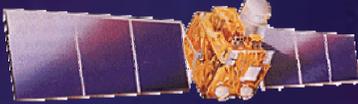
Indian Remote Sensing Satellites – Present & future

Remote Sensing Applications

- Forest and Bioresources

- Agriculture and Soil Mapping

- Water Resource Assessment

- Watershed Management Planning

- Wasteland Inventory

- Terrain Characterisation

- Settlement and Monitoring of Urbanisation

- Engineering Geology Applications

SHARing of Experience in Space (SHARES)

India made an offer, way back in 1982 at the second United Nations Conference on Peaceful Users of Outer Space (UNISPACE-82), to share its experience in the applications of space technology with other developing countries. ISRO initiated the programme "SHARES – *Sharing of Experience in Space.*" The focus under SHARES being on the experience of the Indian space programme, the thrust is mainly towards capacity-building in space applications such as in remote sensing and communications.

SHARES Opportunities

- Regular courses at the Indian Institute of Remote Sensing (IIRS);

- Laboratory work and on-the-job training;

- Participation in selected projects and programmes;

- Joint experiments using Indian sounding rockets, satellites and balloons and observation times in ground based astronomical observatories;

- Training in project implementation;

- Any other support on a case by case basis.

Capacity Building

SHARES is mainly available in the following areas :

- Remote Sensing techniques and applications
    - Indian Institute of Remote Sensing (IIRS), Dehradun;
    - National Remote Sensing Agency, Hyderabad;
    - Space Application Center, Ahmadabad

- Satellite communications techniques and applications
    - Space Applications Centre (SAC) Ahmedabad

- Satellite based developmental and educational communication
    - Development and Educational Communication Unit (DECU) Ahmedabad

- Custom designed courses
    - Thumba Equatorial Rocket Launching Station (TERLS), Thiruvananthapuram.

    - ...

SHARES Programme Support by ISRO

Country	No. of students	Theme
Bangladesh	11	Forestry & Ecology, Geosciences, Land information System, Land use Planning, Remote Sensing, Soil & Land use Planning
Bhutan	2	Remote Sensing
France	1	Geosciences
India	2	Geosciences
Iran	1	Remote Sensing
Kazakstan	1	Remote Sensing
Kenya	6	Forestry & Ecology, Geosciences, Urban & Regional Planning
Malaysia	4	Photography
Malta	1	Remote Sensing
Mangolia	2	Agriculture & Soil, Water Resource

SHARES Programme Support by ISRO

Country	No. of students	Theme
Myanmar	2	Forest Management, Geoinformatics
Nairobi	1	Geosciences
Nepal	4	Forestry & Ecology, Geoinformatics
Nigeria	9	Forest Management, Geoinformatics, Geosciences, Land information System, Remote Sensing, Soil & Land use Planning
Russia	1	Remote Sensing
Srilanka	1	Urban & Regional Planning
Sudan	5	Aerial & Satellite photo processing, Geosciences, Photography, Urban & Regional Planning
Syria	2	Remote Sensing
Tanzania	2	Geosciences, Land information System
Thailand	1	Urban & Regional Planning
Uzbekistan	1	Geoinformatics
Vietnam	13	Agriculture & Soil, Coastal & Marine Resources, Forestry & Ecology, Geosciences, Remote Sensing, Water Resource

IIRS Trainee under SHARES Programme

Year	No. of students	Country
1986	4	1
1988	6	3
1989	11	6
1990	6	4
1991	3	2
1992	4	2
1994	2	2
1995	5	4
1996	1	1
1997	3	3
1998	5	3
1999	15	4
2001	3	2
2002	2	1
2003	3	3

IIRS Trainee under SHARES Programme
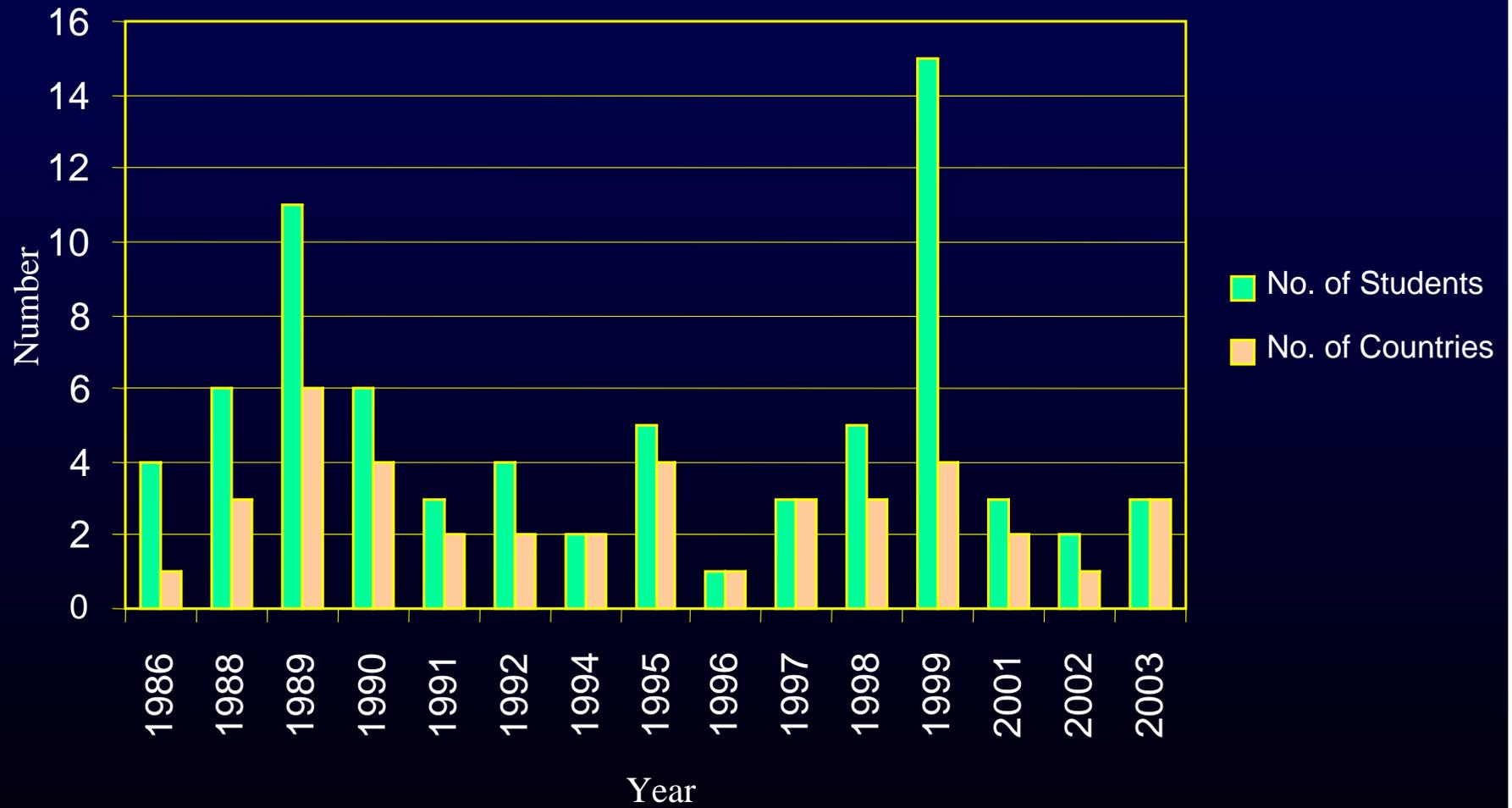
IIRS EDUSAT Training

- Proposed to start short training in RS, GIS and GPS from second half of 2006

- Few institutions/universities will benefit in pilot phase

- Internet based Training program (Under development) and the proposed Edusat training program will complement each other

- Already existing Edusat centres can also benefit from IIRS short training program.

IGNOU/UGC-CEC/
CIET-NCERT/State Hub

Teaching Hub

iirs

Teaching end (iirs)

2 W BUC

Tx

Tx-Rx Feed

Rx

Ku-Band LNBC

L-Band Transceiver

70 MHz Modem Radyne

Multi-Media PC with HDLC Tx Card

Microphone

MP3 Player

1.2 M Antenna

Teaching End at Blind People's Association, Vastrapur

Classrooms at Receiving End

Tx- Rx Feed

Ku-Band LNBC

DSDB receiver

Amplifier Speaker

Multi-Media PC with HDLC Rx Card

Speaker

1.2 M Antenna
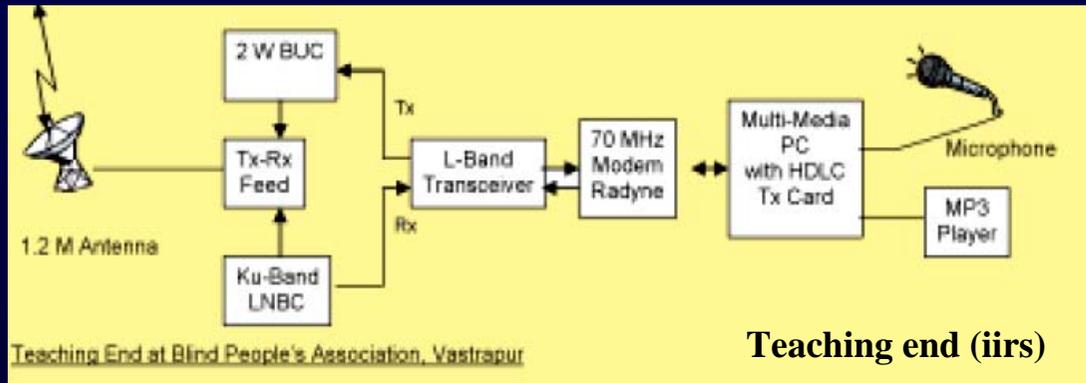
2-way Communication
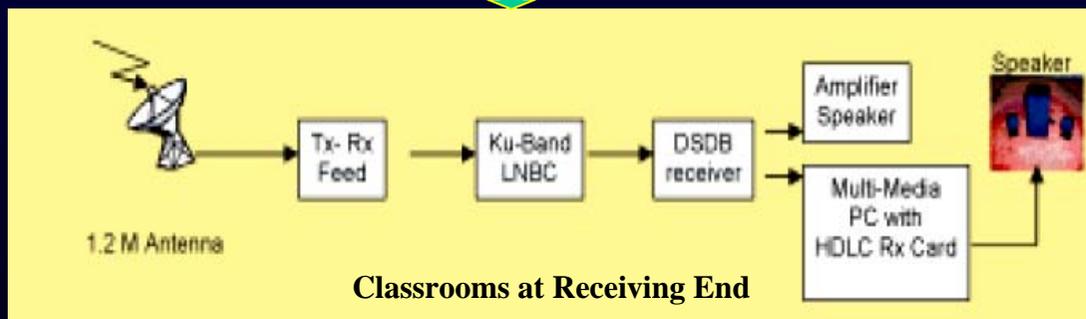
| **NIT** | **Pune Univ.** | **Vanastali Vidyapeeth** | **JNU** | **Jammu Univ** | **NITTTR** | **Jadavpur Univ** | **Tejpur Univ** | **Mizoram Univ** | **Madurai K Univ** | **HSG Univ** | **Andhra Univ** |

Warangal   Delhi   Chandigarh   Sagar   Vizag

Pilot phase – Proposed Institutions / Universities for Edusat based Training Program

P. S. Roy, NRSA India

CSSTEAP Educational Programmes

CSSTEAP provides education in 4 areas:

➤ Remote Sensing and Geographic Information Systems (RS & GIS)

➤ Satellite Meteorology & Global Climate (SATMET)

➤ Satellite Communications and Global Positioning Systems (SATCOM)

➤ Space and Atmospheric Sciences (Space Science)

Education Structure of CSSTEAP

Univ. Professors

Researchers

Scientists

Priviate Entities

Govt. Agencies and Institution

Project Personnel

Target Group

EDUCATION DESIGN

SKILL DEVELOPMENT
* Earth observation systems
* Satellite communications
* Meteorology & space science

PROJECT SUPPORT
* Planning projects
* Execution of projects
* Policy development

AWARENESS & PARTICIPATION
* Planning projects
* Execution projects
* Policy development

ISRO outreach Initiatives in education

- The concept of beaming educational programmes though satellites was demonstrated for the first time in the country (in 1975-76). It was called Satellite Instructional Television Experiment (SITE)

- SITE used the American Application Technology Satellite (ATS-6). Through SITE, programmes on health, education and hygiene were telecast directly to about 2,400 villages in six States. With the commissioning of INSAT system in 1983, a variety of educational programmes are being telecast;

- EDUSAT, India's first exclusive satellite for taking education to rural and remote areas, is expected to herald a revolution in instance and adult education in the country.

ISRO's Initiative in Development/Education Communication

Training & Development Communication Channel (TDCC)

➤ Distance Education and Training for Rural Development.

➤ Effectively utilised by various State Governments and Engineering Colleges, and Agriculture Universities.

➤ Extensively used for primary school teachers training

Jhabua Development Communications Project (JDCP)

➤ Programme started in Nov 1996 and was extended to 1062 Village Panchayats in 3 districts of MP, namely Jhabua, Dhar, Barwani.

➤ Programmes on Health, Hygiene, Agriculture etc., were broadcast predominantly to tribal population.

➤ Substantial gain in Health Awareness, General Knowledge and Govt. Schemes.

Gramsat Pilot Project

➤ An initiative to provide communication network at state level, connecting state capital to districts and blocks, enabling a reach to villagers – e-governance, disaster management, development information etc..

# Pre EDUSAT Transponder usage for education

- 1 Transponder for Gyandarshan.

- 1 Transponder for TDCC – 4 Parallel Channels.

- 1 Transponder for Telemedicine.

- 1 Transponder for APNET – MANA TV.

- 1 Transponder – ERNET for academic institutions.

- 1 Transponder for Edusat Pilot Projects.

- DD Non-Prime Time Transmission of Education & Development Programmes.

India's Focussed Initiative: Tele-education
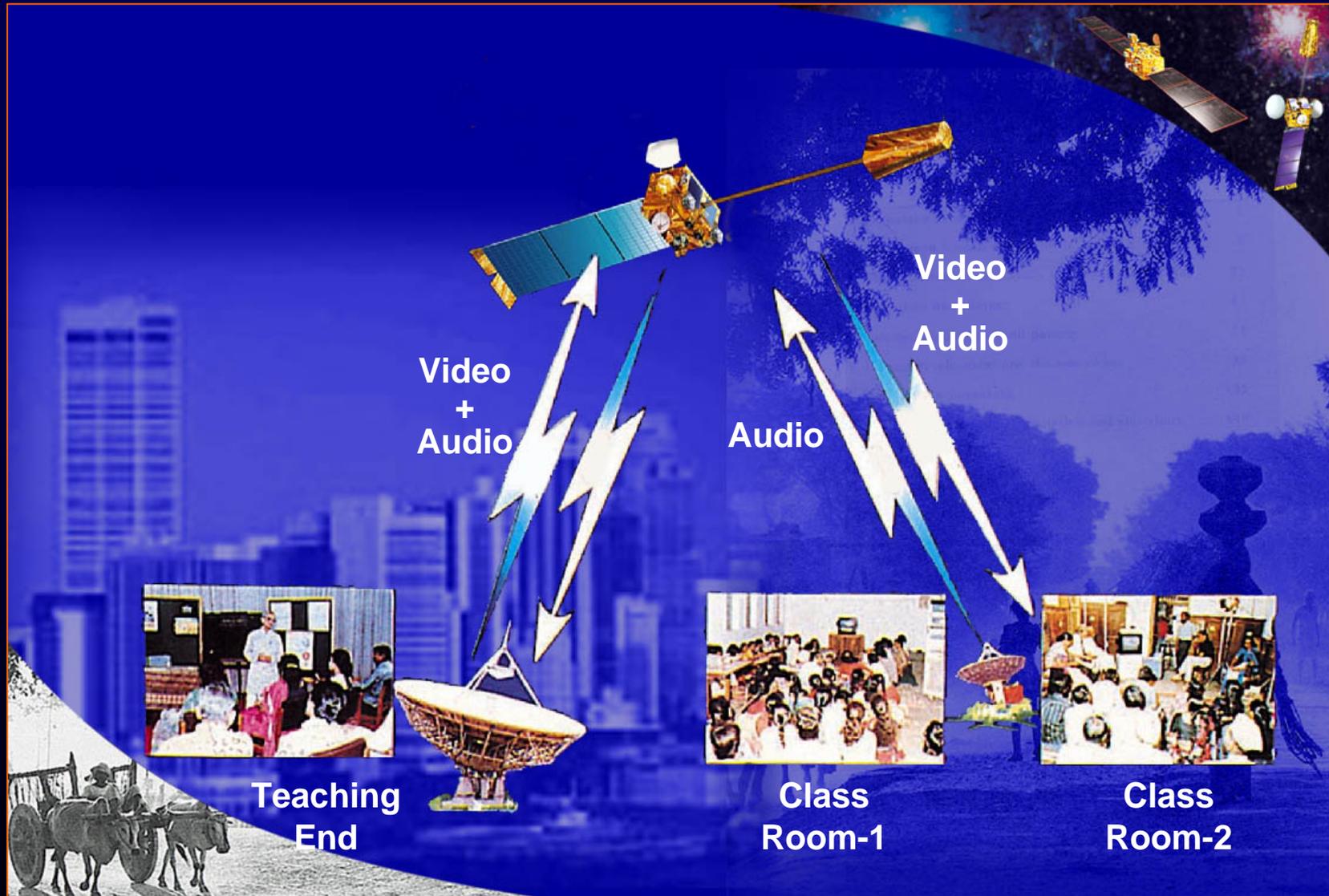
Education Satellite System

Objectives of Education Satellite System is to meet the Challenge of Number and Quality through:

- ❑ Providing Effective Teachers Training.

- ❑ Supplementing the Curriculum based Teaching in several Regional Languages.

- ❑ Greater Community Participation and Monitoring.

- ❑ Providing Access to Quality Resource Persons (Higher & Professional Education).

- ❑ Strengthening the Distance Education Efforts Initiated by Various Agencies.

- ❑ Taking Education to Every Nook & Corner of the Country.

- ❑ Providing Access to New Technologies.

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# Operational GEO Satellites

EDUSAT

INSAT-2E

INSAT-3B

INSAT-3A

INSAT-3E

INSAT-3C

KALPANA-1

GSAT-2

48

55

74

83

93.5
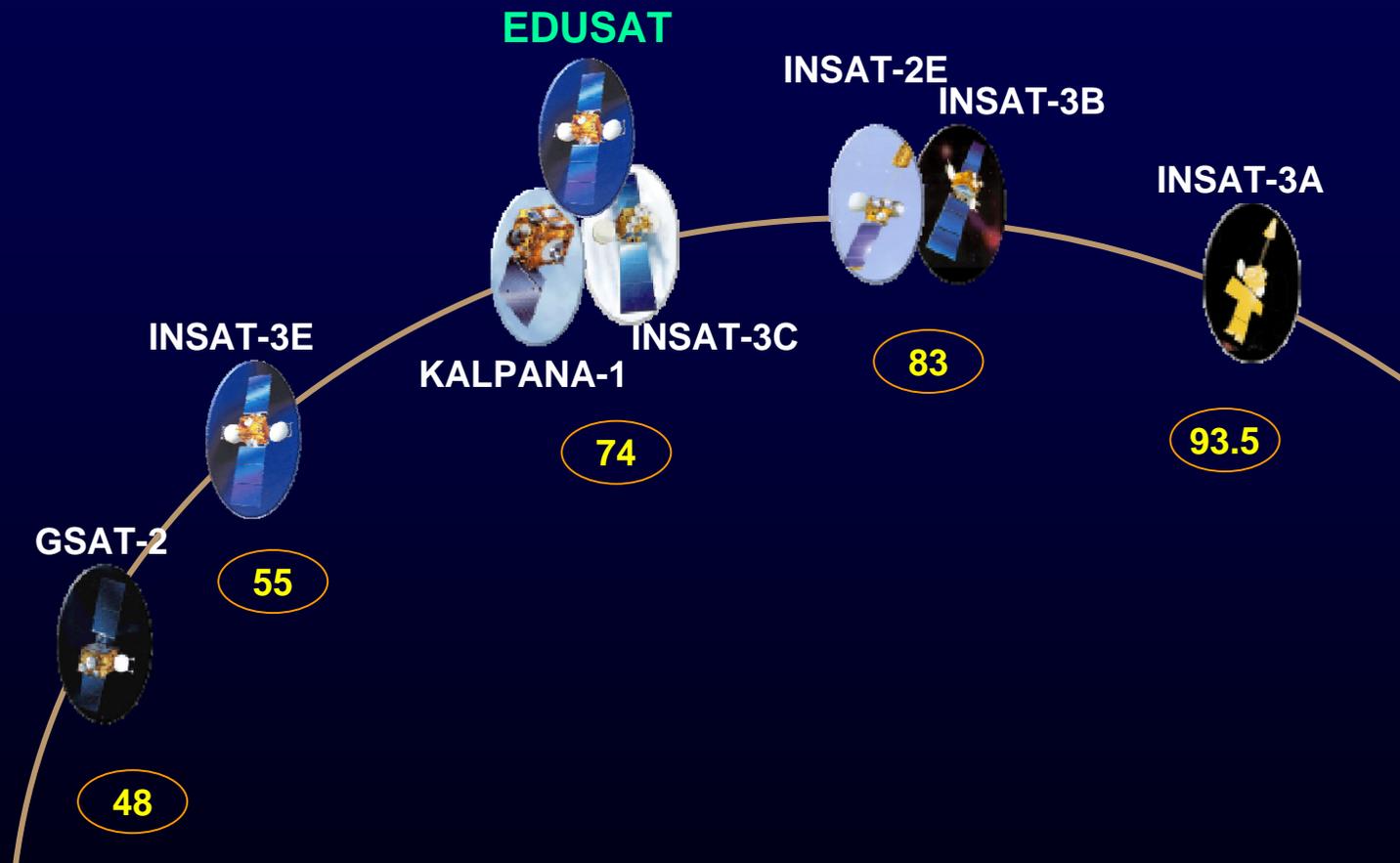
GSAT-3 (EDUSAT)
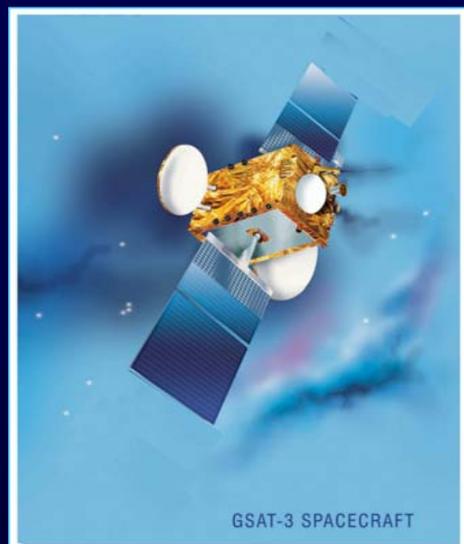
Type of Mission	Educational / Communication
Life of Mission	10 Years
Orbital Location	74 deg. E
Physical Dimension	I-2000 Structure Cuboid 1530mm X 1650mm X 2400mm
Mass @ Lift-off	1950 kg
Dry Mass	820 kg
Power generation	2400 W (Normal) 750 W (Eclipse)

GSAT-3 SPACECRAFT

Launched by indigenous GSLV on 20th Sep 2004.

Specially configured to meet the requirements of India.

Payload	EIRP	G/T
5 Ku – Regional beam	53 dBW	7 dB/K
1 Ku – National beam	50 dBW	3 dB/K
6 Ext-C – National beam	37 dBW	-1 dB/K
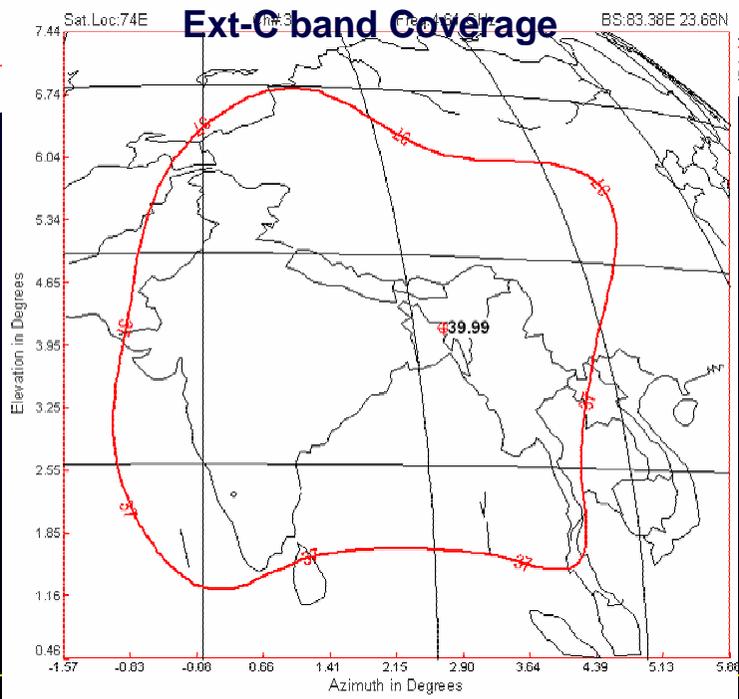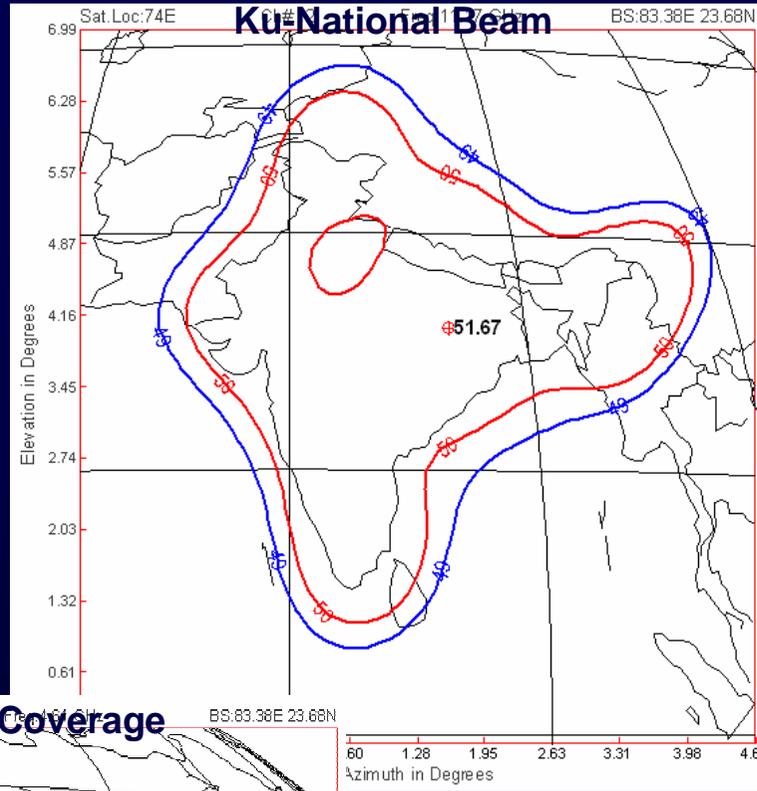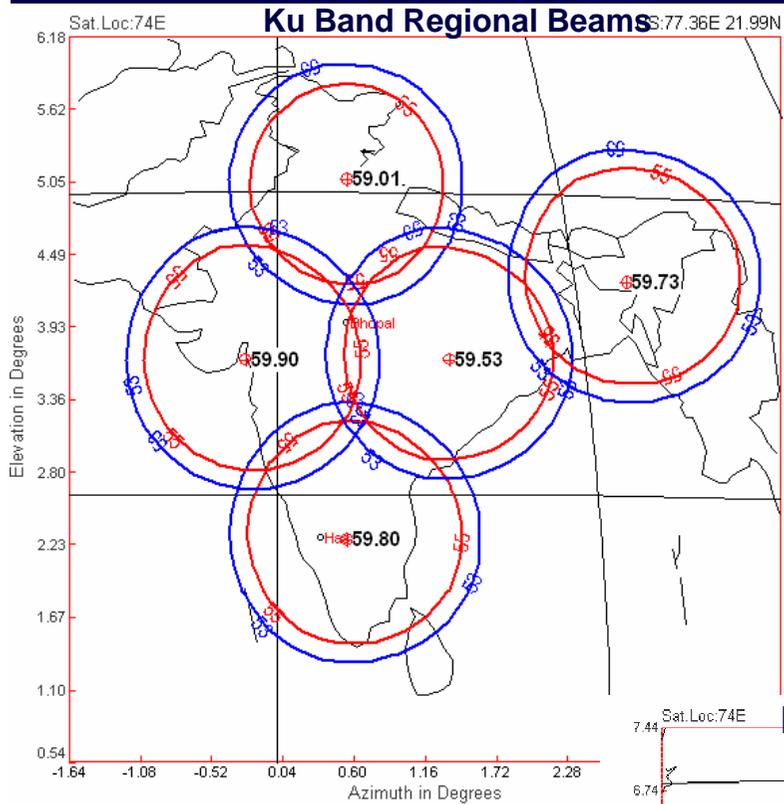
Ku Band Regional Beams

Ku-National Beam

Ext-C band Coverage

Ku-National Beam

Ext-C band Coverage

Sat.Loc:74E   Ch#3   Freq:4.61 GHz   BS:83.38E 23.68N

P. S. Roy, NRSA India

EDUSAT Network

Ku &
Ext C

0.9/1.2/1.8m

ROT

School

Studio

HUB

State Capital

1.2/1.8 m

SIT
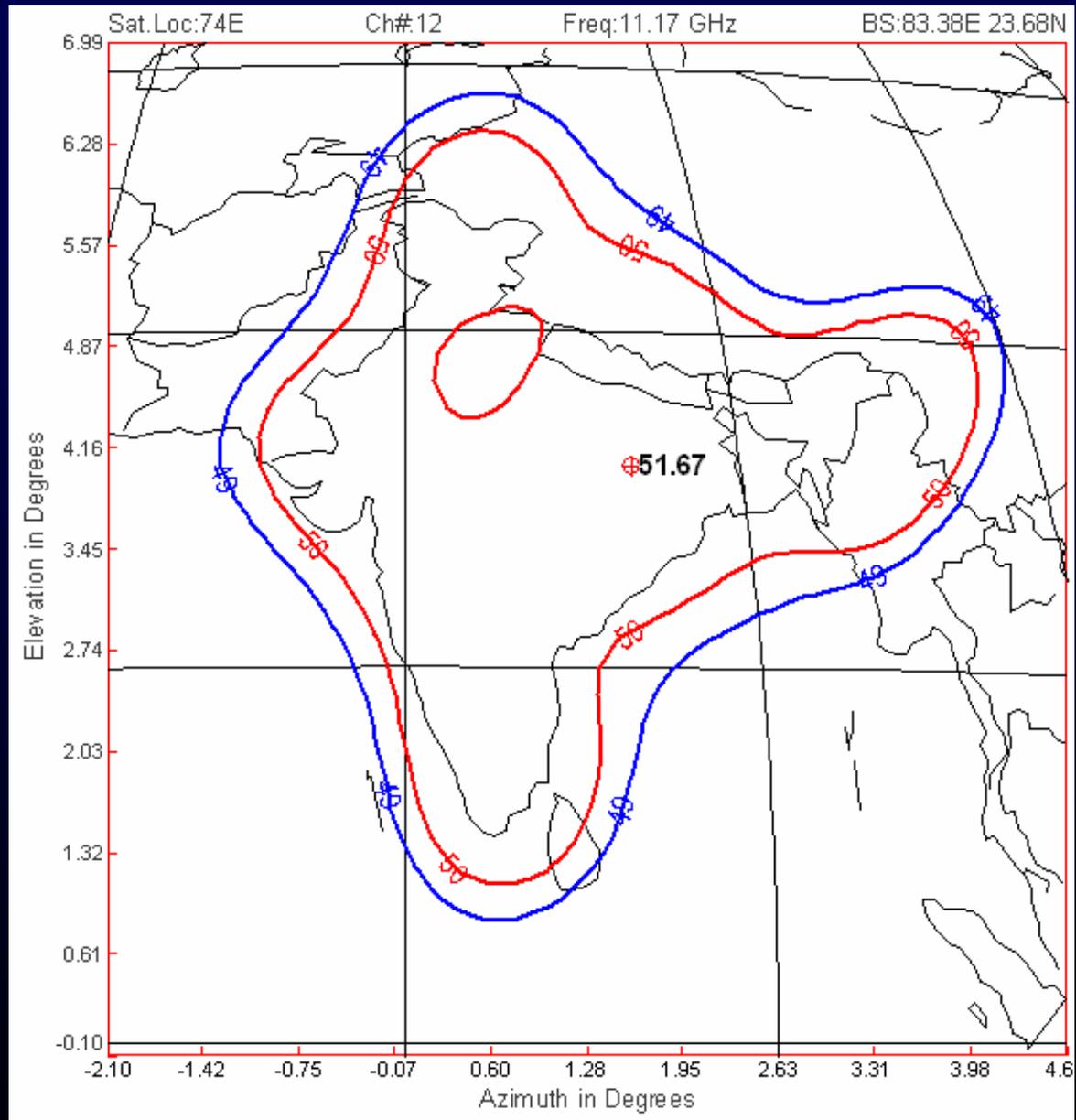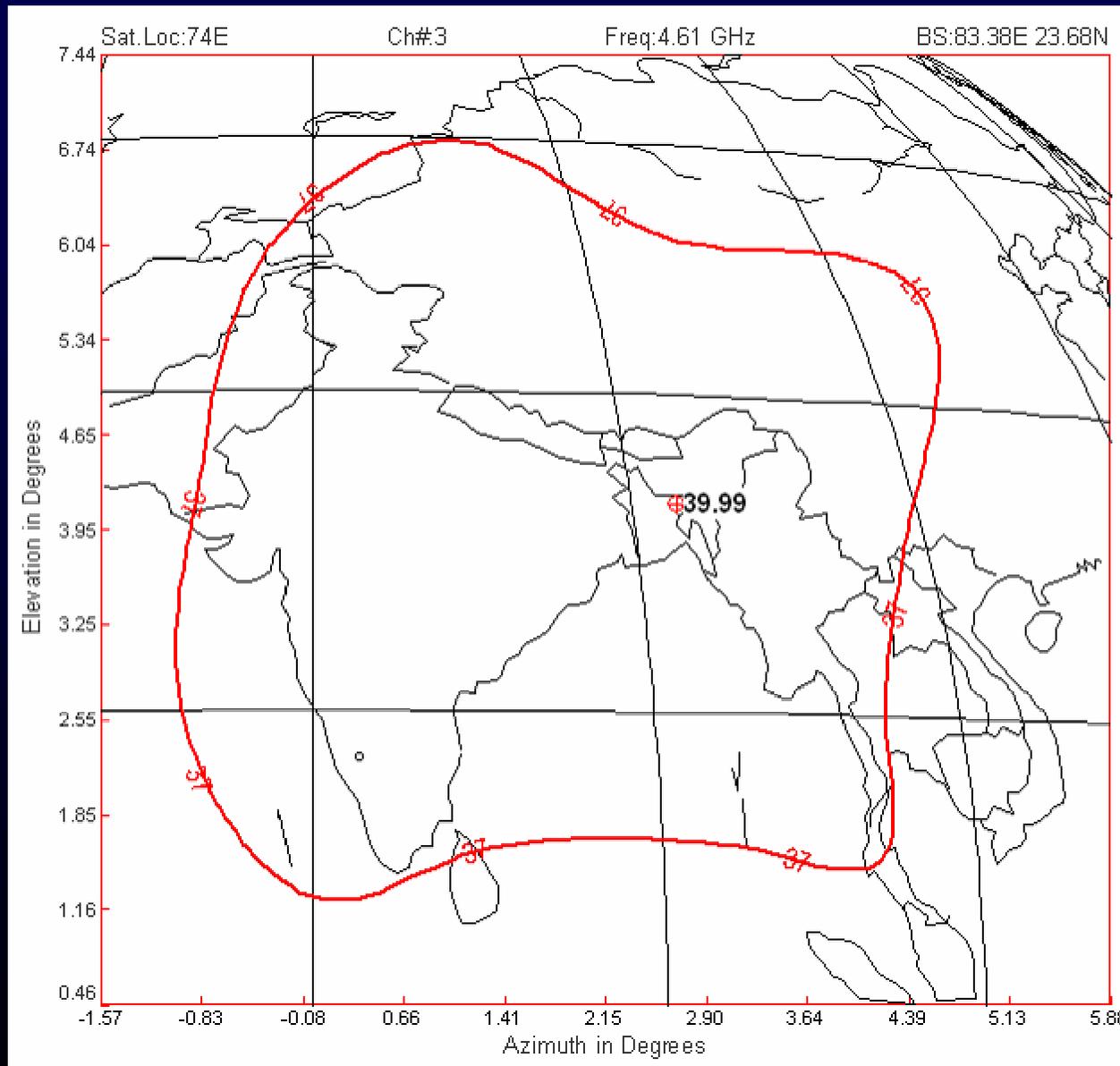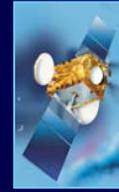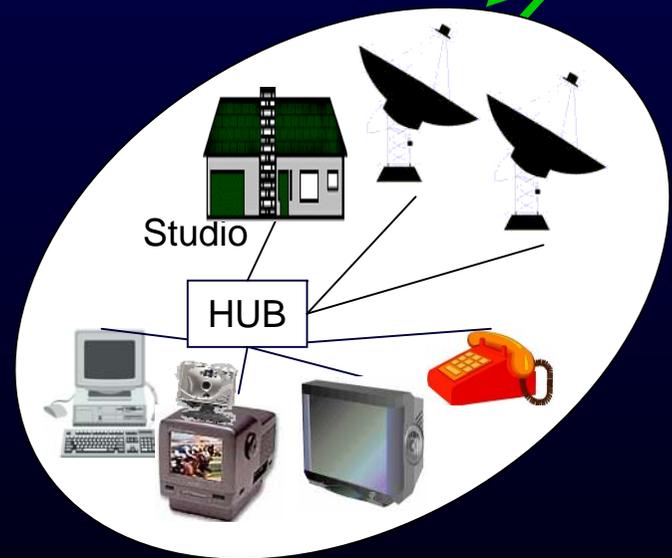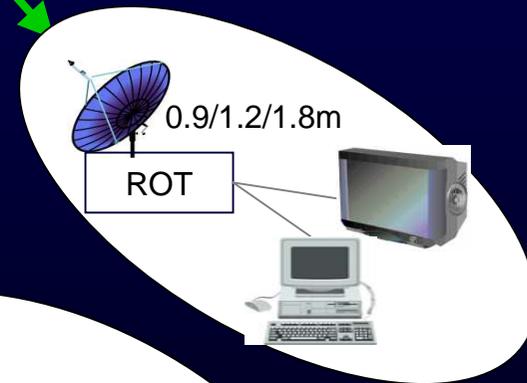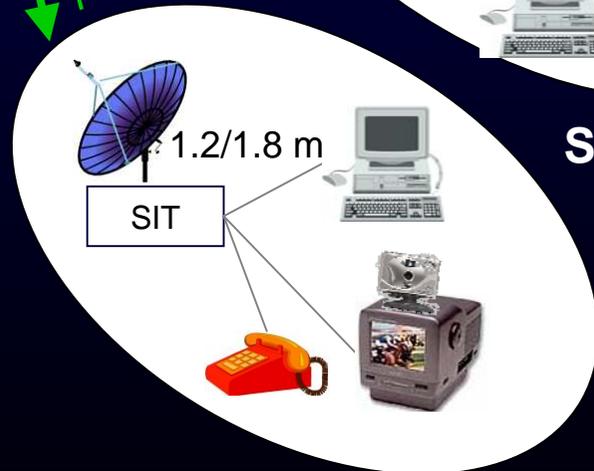
Higher Secondary/University

Types of connectivity

1. **Broadcast**

   ◆ Receive Only System at all classrooms.

   ◆ Covering Primary Education.

Receive Only
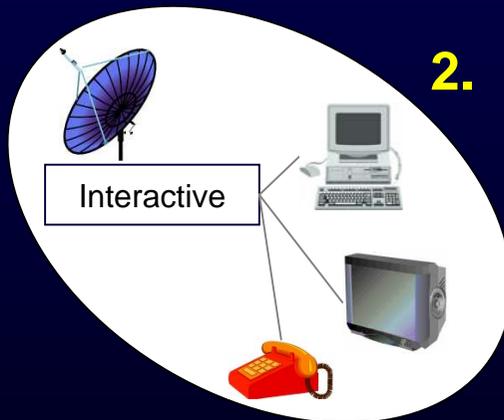
2. **Interactive Teaching**

   ◆ One-way video and Two-way audio.

   ◆ Return link through satellite.

   ◆ Secondary and Higher Secondary Education.

Interactive

3. **Video Interactive Teaching**

   ◆ Video interactive systems.

   ◆ Higher and Professional Education.

V/C
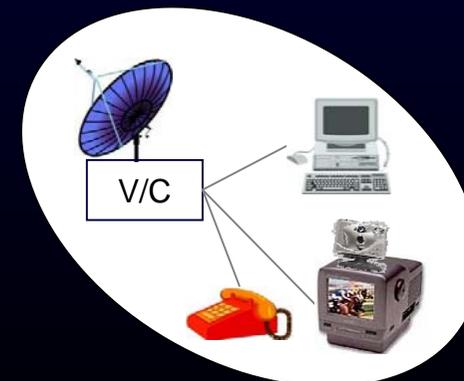
Candidate User Agencies

State Level:

- [ ] State Universities, Engineering and Degree Colleges

- [ ] Higher Secondary and Secondary Schools

- [ ] State Education Department

- [ ] State Open Universities

- [ ] Vocational Institutions

National Level:

- [ ] National Level Autonomous Educational Institutions

- [ ] National Open Universities.

- [ ] Institutes of Continuing Education in Govt. and Pvt. Sectors.

- [ ] Professional Institutes.

EDUSAT - Satellite

Ku Spot Beam
Feed Assembly

Ku Multibeam Beam
Tx/Rx Parabolic
Refl 1.2 m

South solar
Array

North solar
Array

Ku National
Tx/Rx Shaped
Refl 1.1m

EV Panel

Ext C Tx/Rx
Shaped Refl
2.0m
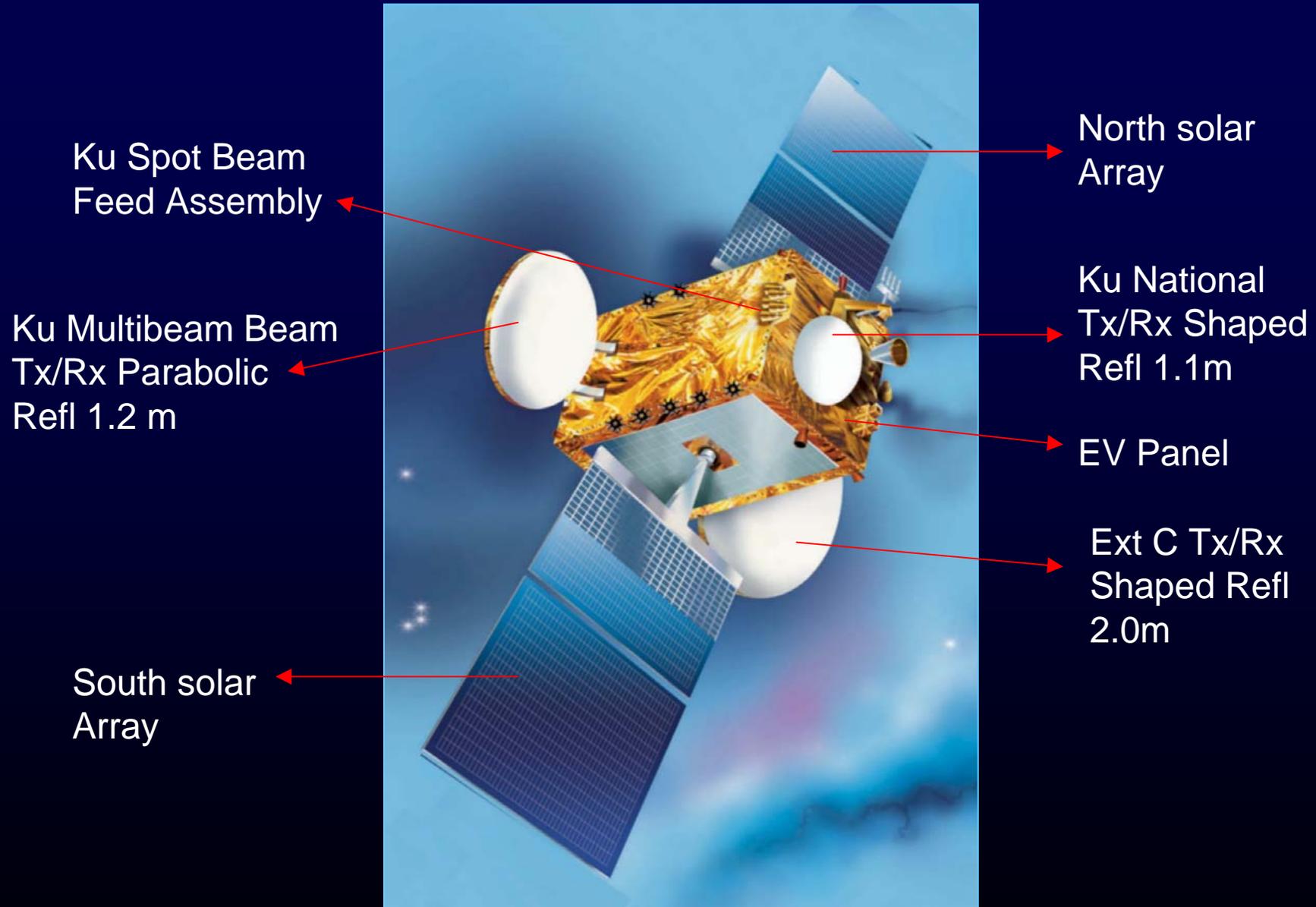
TRANSPONDER CAPACITY AND USAGE

Capacity

83 — C Band
42 — Ext C Band
20 — Ku Band
2 — BSS
3 — MSS
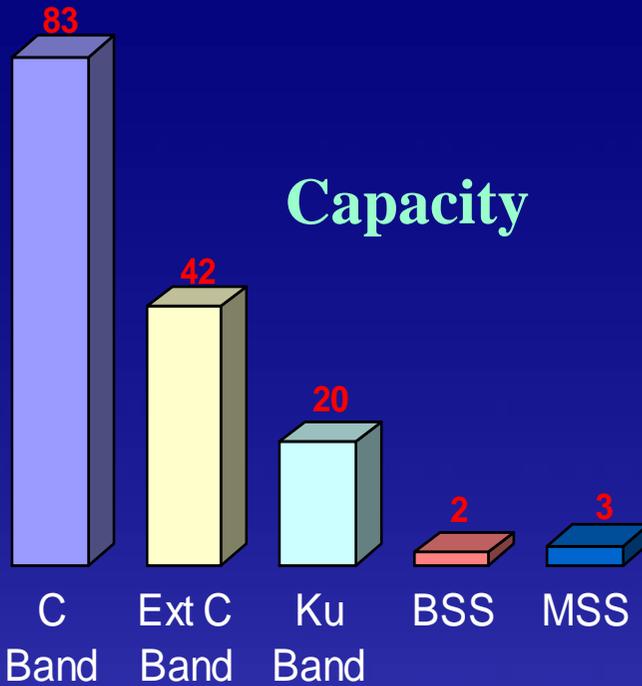
150 Transponders

Distribution

- Additional (On 3E) 11
- EDUSAT 12
- DOT/ BSNL 29
- DD 20
- Govt. 22
- Pvt. VSAT 20
- Pvt. TV 23
- Spare 13

150 Transponders
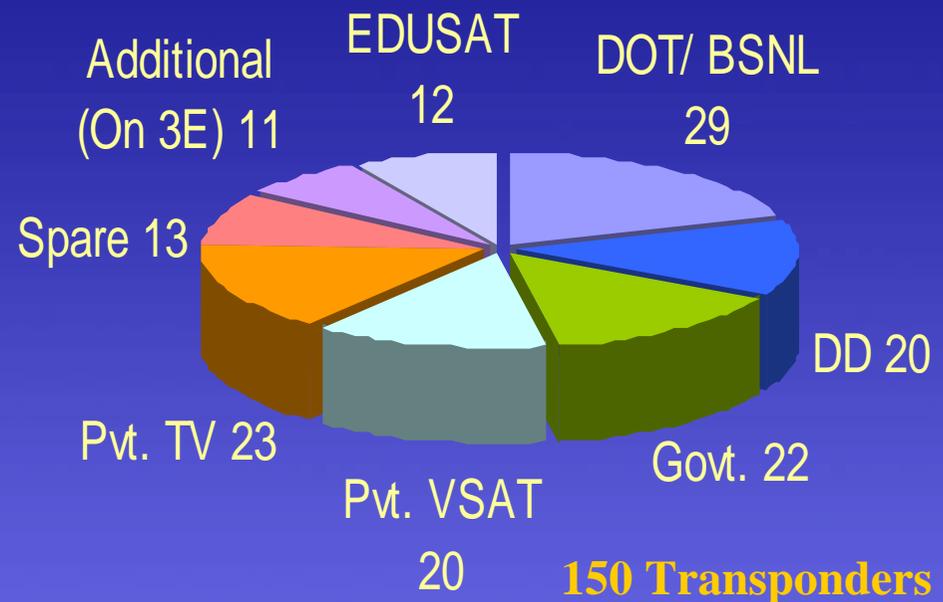
EDUSAT Programme initiatives

Phases of Implementation

Edusat Pilot Projects

- Pilot Projects were taken up in Karnataka, Maharashtra and Madhya Pradesh ahead of Edusat Launch.

- In Karnataka, VTU has begun regular classes providing lessons for 100 Engineering Colleges from Sep 15, 2004.

- In Maharashtra, YCMOU is conducting regular contact classes for 75 locations spread over the state from 20th Oct 2004.

- In Madhya Pradesh, Rajiv Gandhi Technical University is conducting trial transmission of classes.

Experiences From Edusat Project …

➢ Colleges with inadequate teaching should be given preference over well established colleges for Edusat connectivity.

➢ Quality should be improved emphasising professionalism and media experts need to be consulted after achieving Video and Audio quality.

➢ Transmission rate of teaching end video and audio to be increased to 1 Mbps.

➢ Provision should exist to record the programme at college end.

➢ Distributed viewing of lectures at colleges should be facilitated through LAN connection.

➢ Proper training to be given to coordinators and students to use the interactive system.
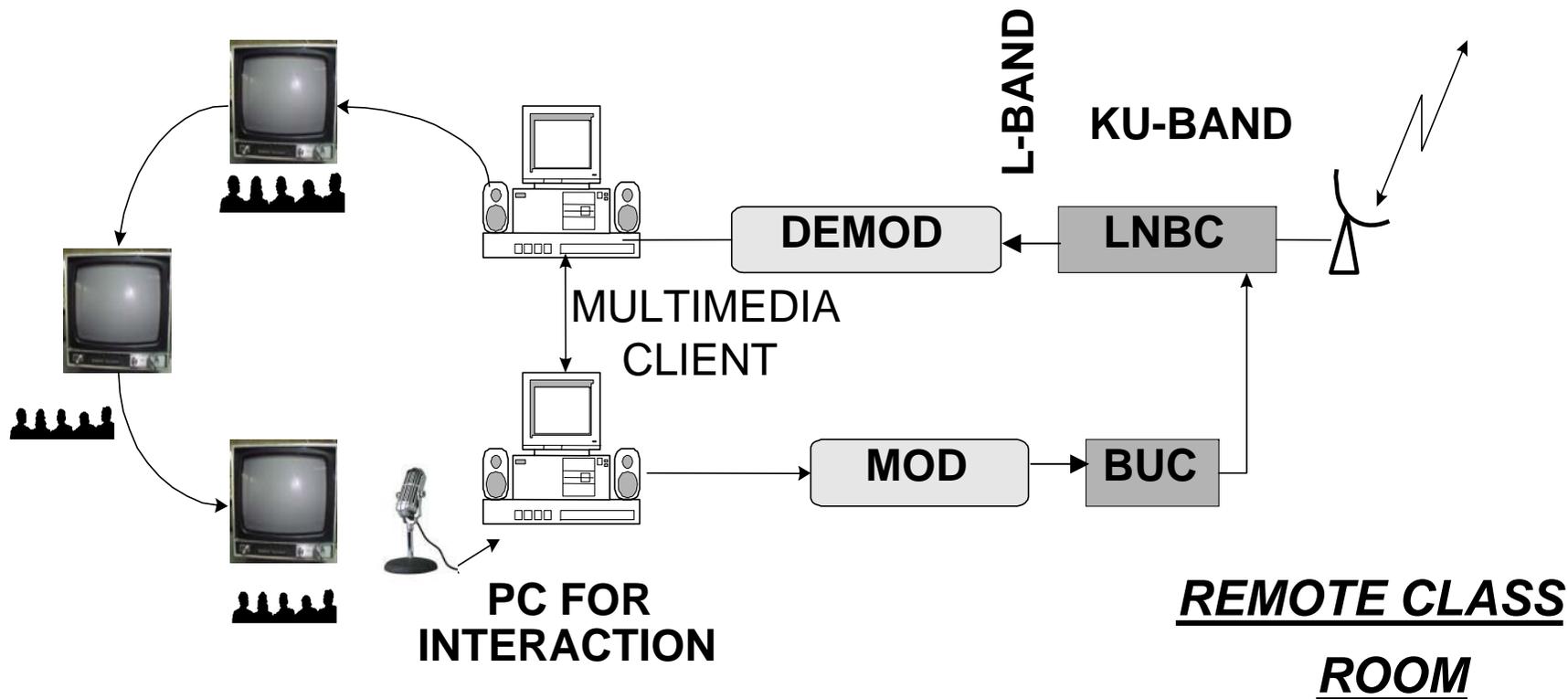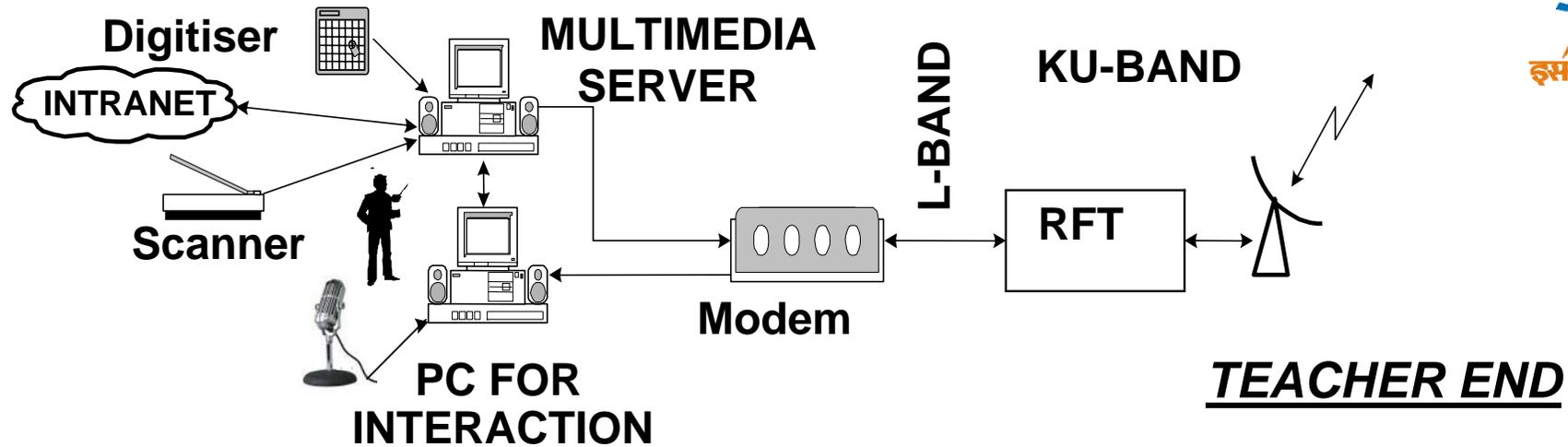
EDUSAT Terminal Configuration

Hardware Configuration

Teaching End (Ku/Ext-C)

- 3.8/4.5 Meter Antenna

- 4/5 W HPA,(Supports 1 MBPS Transmission)

- 31.31/26.1 dB/Deg. K,G/T

Classroom End (Ku/Ext-C)

- 1.2/1.8 Meter Antenna

- 2 W HPA,(Supports 384 KBPS Transmission)

- 19.7/17.5 dB/Deg. K,G/T

Hub Configuration

Forward link :
1 Mbps to 8 Mbps
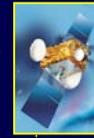
Broadcast

VSAT Hub

384 Kbps Return
Links
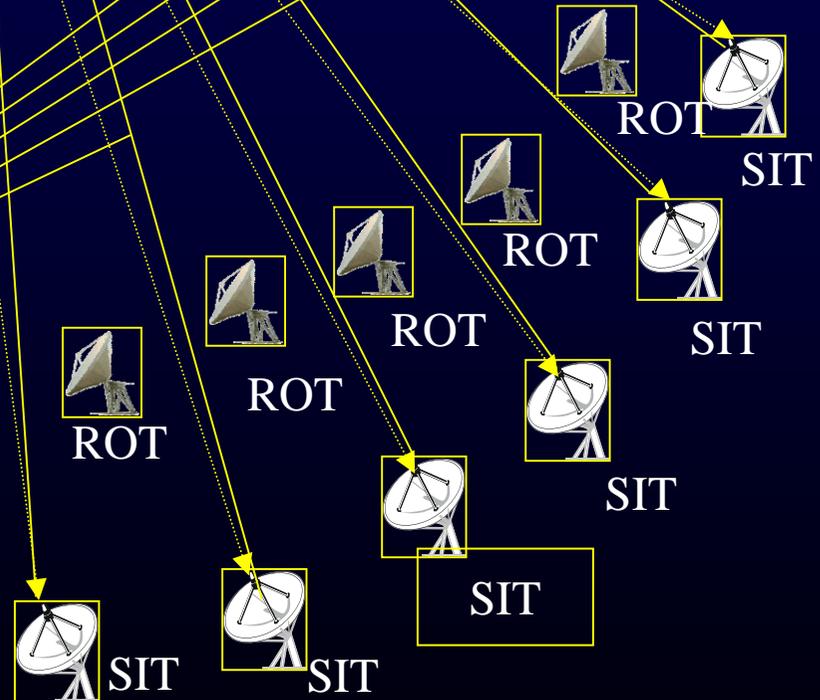
VSAT HUB
Network Requirement
Forward : 1 Mbps to 8 Mbps
(Max 8 simultaneous
Teaching end uplinks
each with minimum 1 Mbps)
Return   : 384 Kbps
(1 Link per class Max)

ROT

ROT

ROT

ROT

ROT

ROT

SIT

SIT

SIT

SIT

SIT

SIT

SIT
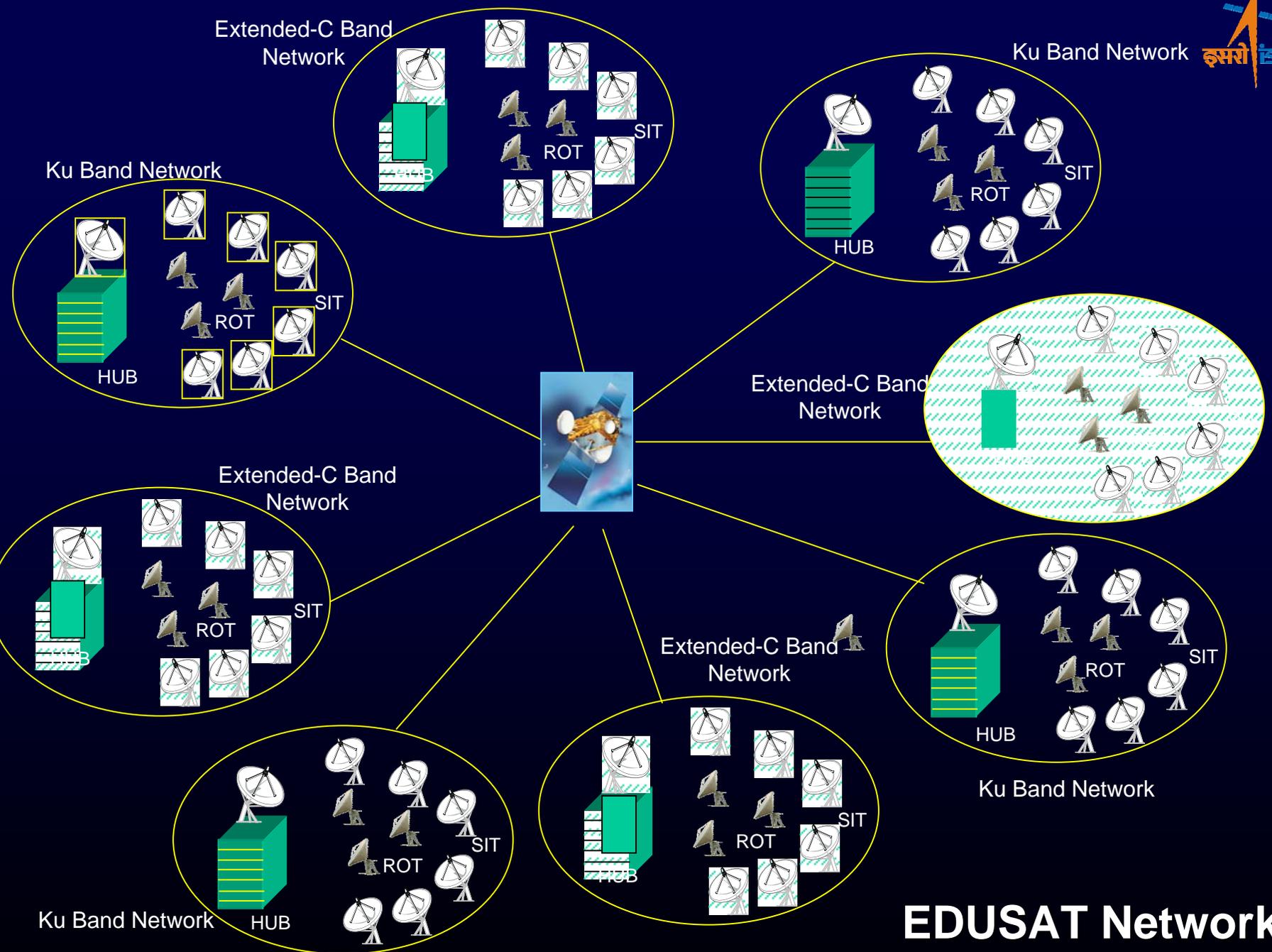
EDUSAT Network

Summary

- ❖ INDIA HAS A 3-PRONGED APPROACH:

  - ❖ SHARING ITS EXPERIENCE AT BI-LATERAL LEVEL

  - ❖ FOCUSSED APPLICATION OF SPACE FOR EDUCATION

  - ❖ MULTI-LATERAL EDUCATION MECHANISM THROUGH UN cssteap (SEPAARTE TALK)

- ❖ SHARES IS A GOOD MECHANISM FOR BI-LATERAL SHARING

  - ❖ MANY ASIA-PACIFIC NATIONS HAVE BEEN INVOLVED

- ❖ EDUSAT IS BRINGING FOCUS IN THE NATION ON USING HIGH-TECHNOLOGY TOOLS TO "BRIDGE THE GAPS IN EDUCATION SYSTEM"

  - ❖ SPACE PROVIDES A TOOL

  - ❖ A PARTNERSHIP WITH NATIONAL, STATE EDUCATION AUTHORITIES AND PRIVATE EDUCATION INSTITUTIONS

  - ❖ INITIAL STEPS HAVE BEEN SUCCESSFUL ….. A LOT MORE NEEDS TO BE DONE

  - ❖ CHALLENGE IS IN APPLICATION/UTILISATION

Summary

❖ It is envisaged that Edusat will be a boon to distance learning, teacher's training, primary education, secondary education and higher and professional education.

❖ Edusat will enable reaching out to a large population in remote areas and will address the issues of various disparities.

❖ It is anticipated that Edusat will be instrumental in preparing our learners for a knowledge-based economy and society.

❖ Edusat will facilitate creation of word-class knowledge resources and universal access to them..

❖ Edusat will help in taking education to the doorsteps of the students and will make "Learning when you want and at the speed you want" a reality.

❖ It can also facilitate video on demand, data broadcasting, easy storage and retrieval, examination through PC, Internet connectivity etc.
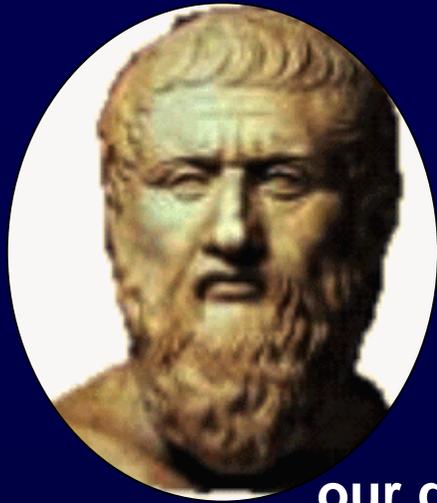
"Someday, in the distant future,
our grandchildren's grandchildren will develop
a new equivalent of our classrooms.
They will spend many hours in front of boxes
with fires glowing within.
May they have the wisdom to know
the difference between light and knowledge"

Plato (427-347 B.C)

Probably he envisioned Space enabled tele-education…….

Thank You