ICT in Health Care : A Case Study on Computer Network Applications in an Healthcare Institution in India

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In association with ICTP and
Mr.G.Repici, Telecom Italia, Italy

INDIA – A Multi Cultural Multi Lingual Country
Some Glimpses

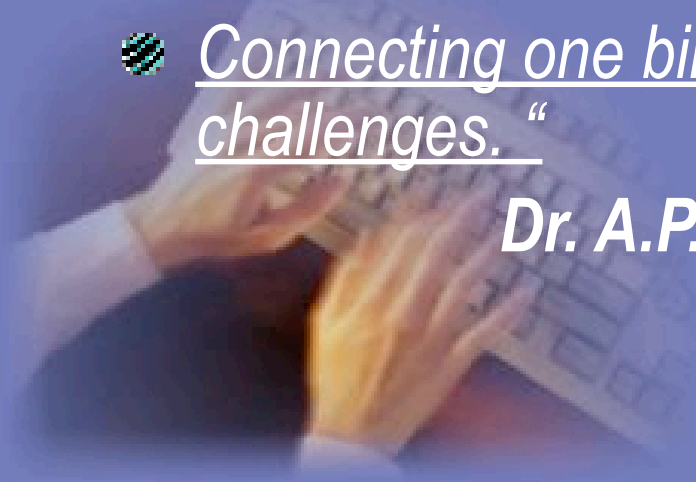
Secular …

Co-existence

Vision of our President

- *“The total land area of India is around 3.3 million square kilometer with 7000 kilometer of coast line. The altitude of the country varies from the sea level to 8,600 meter. The entire area is spread into deserts, hilltops, mountain tops, sea shores, islands, valleys and plains. Out of the billion plus population in the country 70% live in six hundred thousand villages. India is poised to become a knowledge society*.
- Electronic and knowledge connectivity is the key to realize this goal.
- *Connecting one billion people throws up multiple challenges. “*

Dr. A.P.J. Abdul Kalam, President of India



Virtual University - Through Universal Tele-Education

CORE COMPETENCE

- Universities of Calcutta, Mumbai and Madras
- Other Institutions
- International institutions

- Identification of Experts
- Content Development
- Content Generation
- Content Workflow
- Content Deployment
- Delivery through
  - e-Learning
  - Tele-Education
- Digital Library

Central HUB of all Universities

- Coordinate
- Organize
- Schedule
- Broadcast
- Manage
- Maintain
- Infrastructure Storage
- Delivery through
  - E-learning
  - Tele-education

VSAT
BROADBAND

WIRELESS
for Last mile

Remote Class rooms

Online Tele-Education

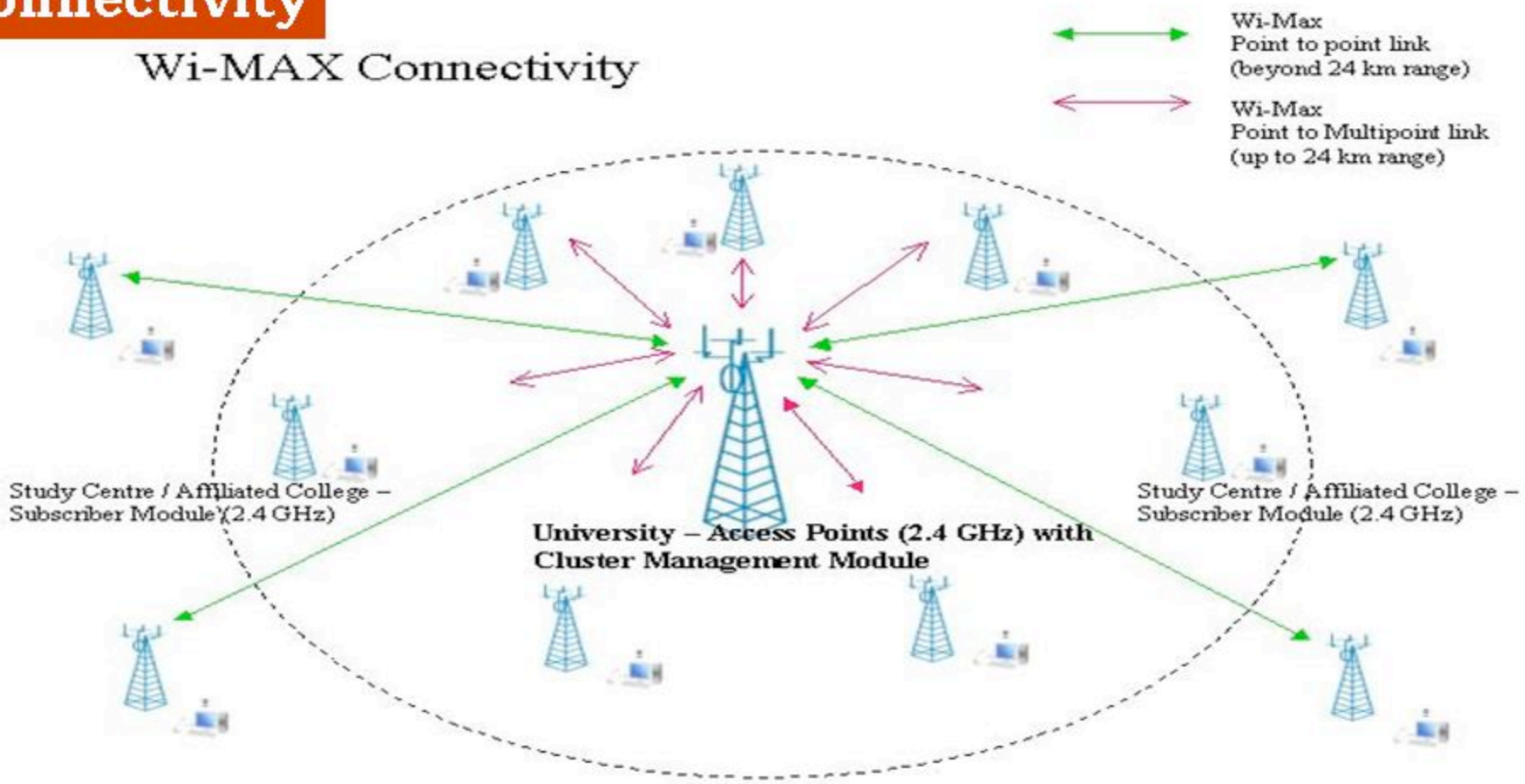
- Virtual Interaction
- Live sessions
- Effective Two way communication
- Synchronized Multimedia
- Collaboration

Beneficiaries

- Affiliated Colleges
- Study Centres
- Learning centres
- Individual Students
- Village Panchayat Knowledge Centres

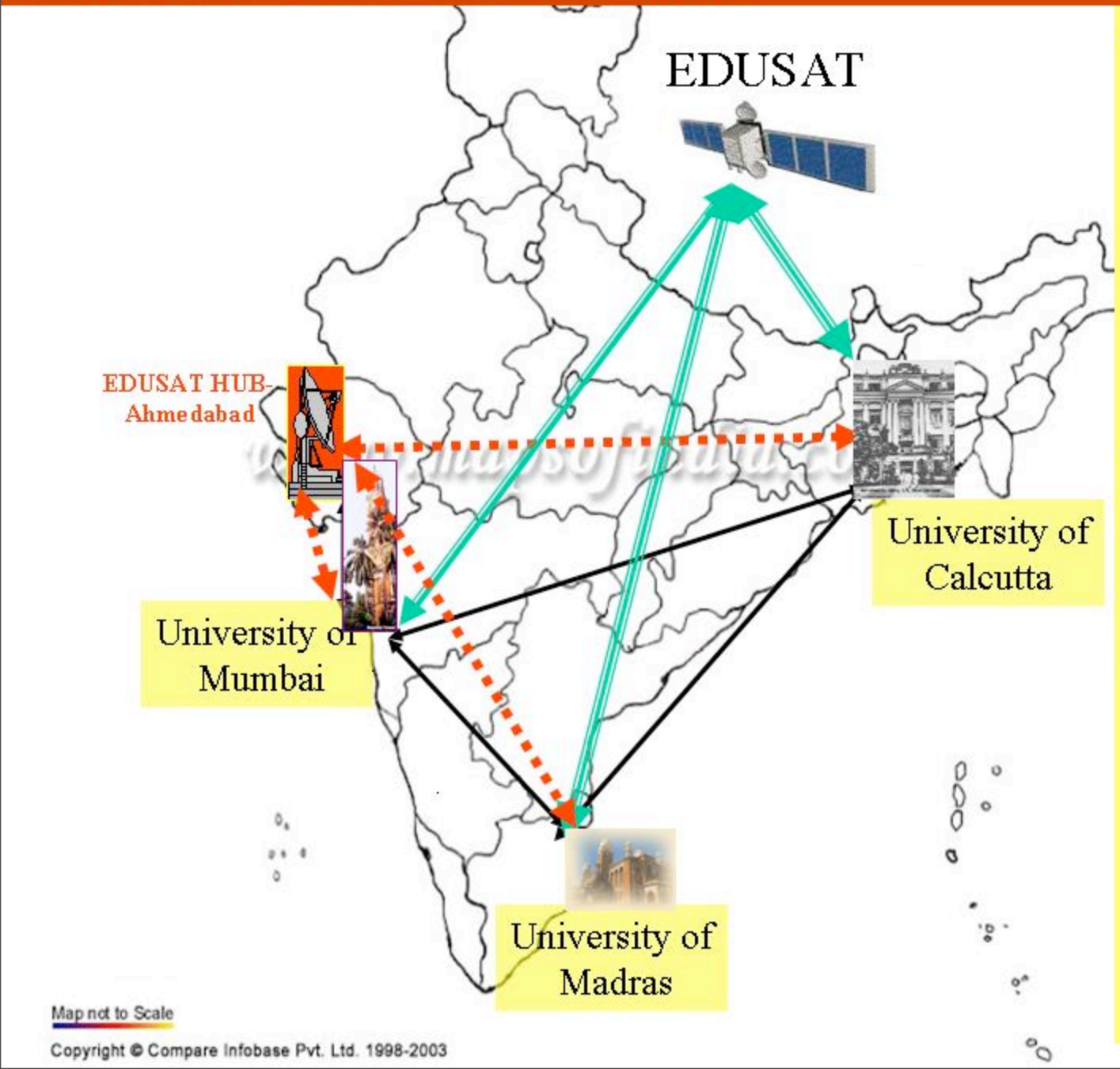
Multi-Pronged approach for Tele-Education

Connectivity



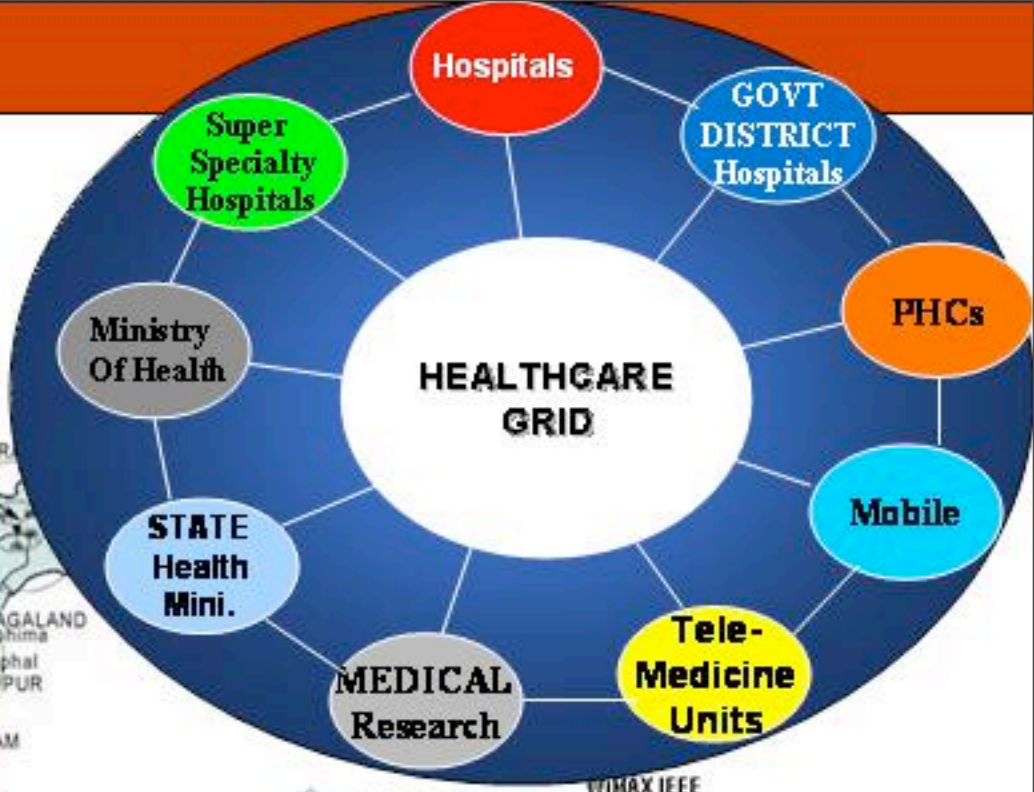
- Use the Wireless connectivity to connect the Affiliated colleges and Learning Centres in a high bandwidth network.
- Use VSAT for connecting the difficult regions

VIRTUAL UNIVERSITY GRID

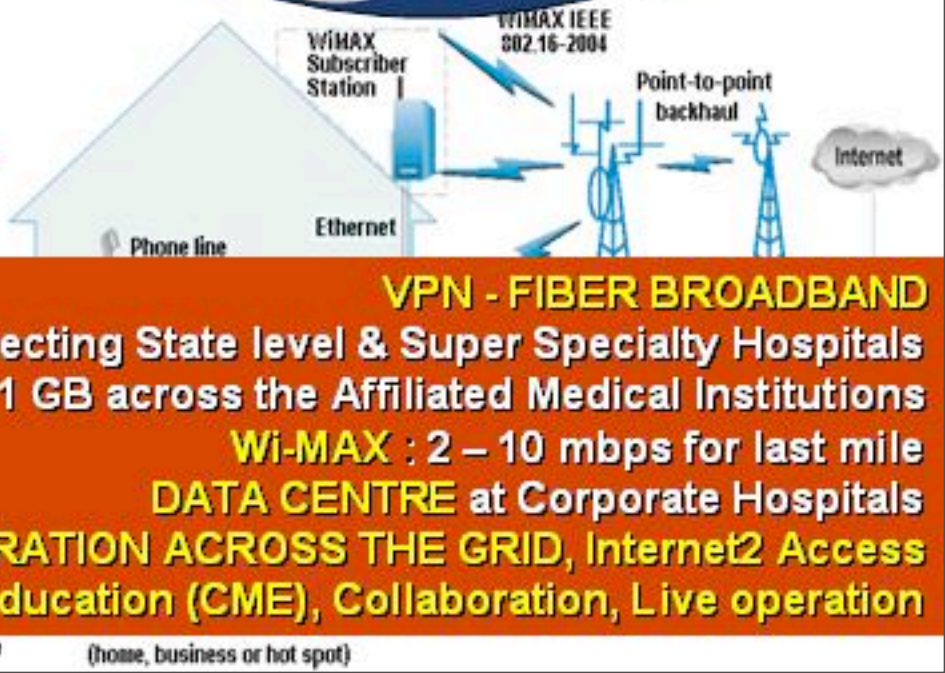


- Connect the Three universities using High bandwidth Fiber Broadband network
- Establish Virtual University GRID
- Use EDUSAT/ WiMAX connectivity to connect the affiliated colleges.

Health GRID



- ISRO Tele-medicine network Connects 25 super specialty hospital and linked with 100 remote hospitals including islands
- AIIMS, Amrita, Apollo, Aravind, Sankaranedralaya, CARE and other corporate are having tele-medicine services
- RB is connected to CARE hospital through tele-medicine



VPN - FIBER BROADBAND

10 GB connecting State level & Super Specialty Hospitals

1 GB across the Affiliated Medical Institutions

Wi-MAX : 2 – 10 mbps for last mile

DATA CENTRE at Corporate Hospitals

MESSAGING AND COLLABORATION ACROSS THE GRID, Internet2 Access

Tele-Medicine, Tele-Education (CME), Collaboration, Live operation

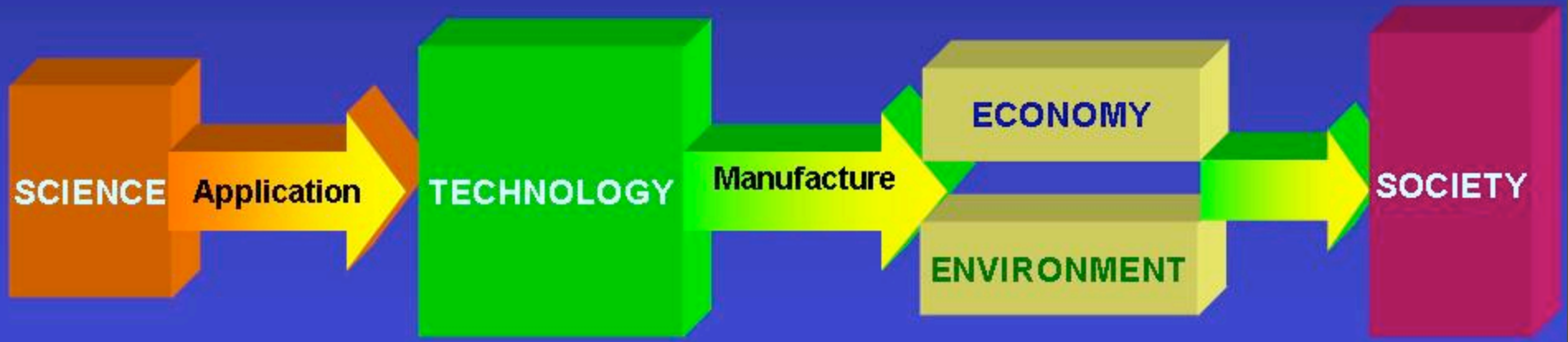
Technology is the most
Non-linear tool

Technology can effect the most fundamental changes in the ground rules of economic competitiveness

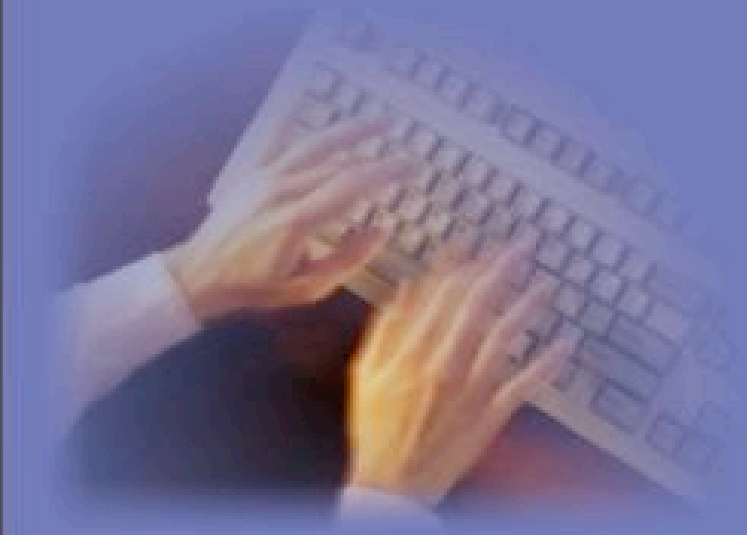
Science is linked to *Technology* through Applications

Technology is linked to *Economy and Environment* through Manufacture

Economy and Environment link Technology to *Society*



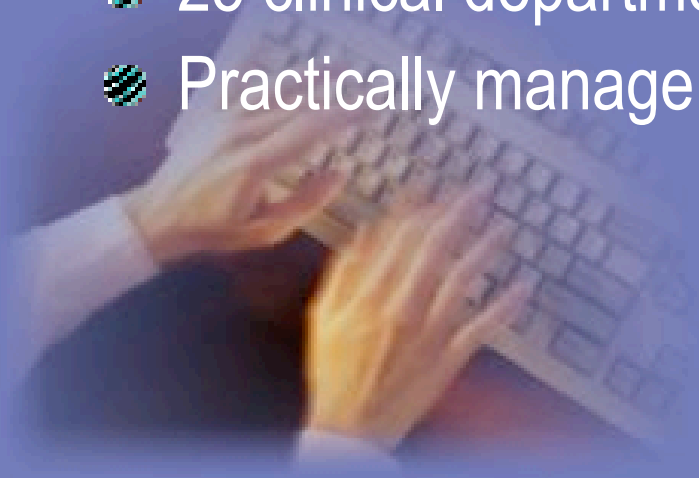
Case study on
All India Institute of Medical Sciences



All India Institute of Medical Sciences

About AIIMS

- Premier National Medical Institute
- Conducts teaching programs in medical & paramedical subjects, both undergraduate and postgraduate levels
- Teaching in research in 42 disciplines
- Leader in medical research – 600 research publications in a year.
- 25 clinical departments, 4 superspecialty centers
- Practically manage all types of disease conditions



All India Institute of Medical Sciences

About AIIMS

- Patient attendance data (2000)

Departments	Patients attended	Patients admitted	Patients in surgery
Main hospital	1236708	50415	90049
Ophthalmic sciences	344534	16067	15871
Cancer	46853	8504	753
Neurosciences	59854	5514	2665
Cardio thoracic sciences	103523	9399	3005
Community medicine	171416	4333	1305
Total	1,962,888	94,233	113,663

All India Institute of Medical Sciences

About AIIMS

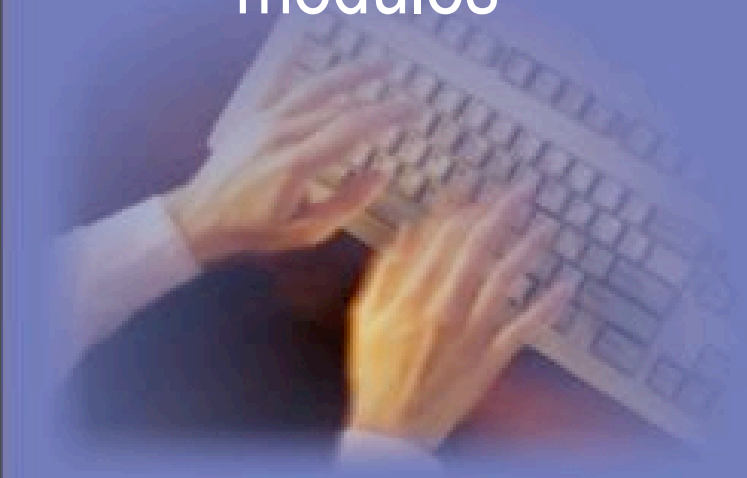
Departments	50
Teaching faculty/consultant doctors	500
Nursing staff	1800
Scientists	100
UG students	250
PG students	800
Admin & support staff	4500
Hospital beds	1700

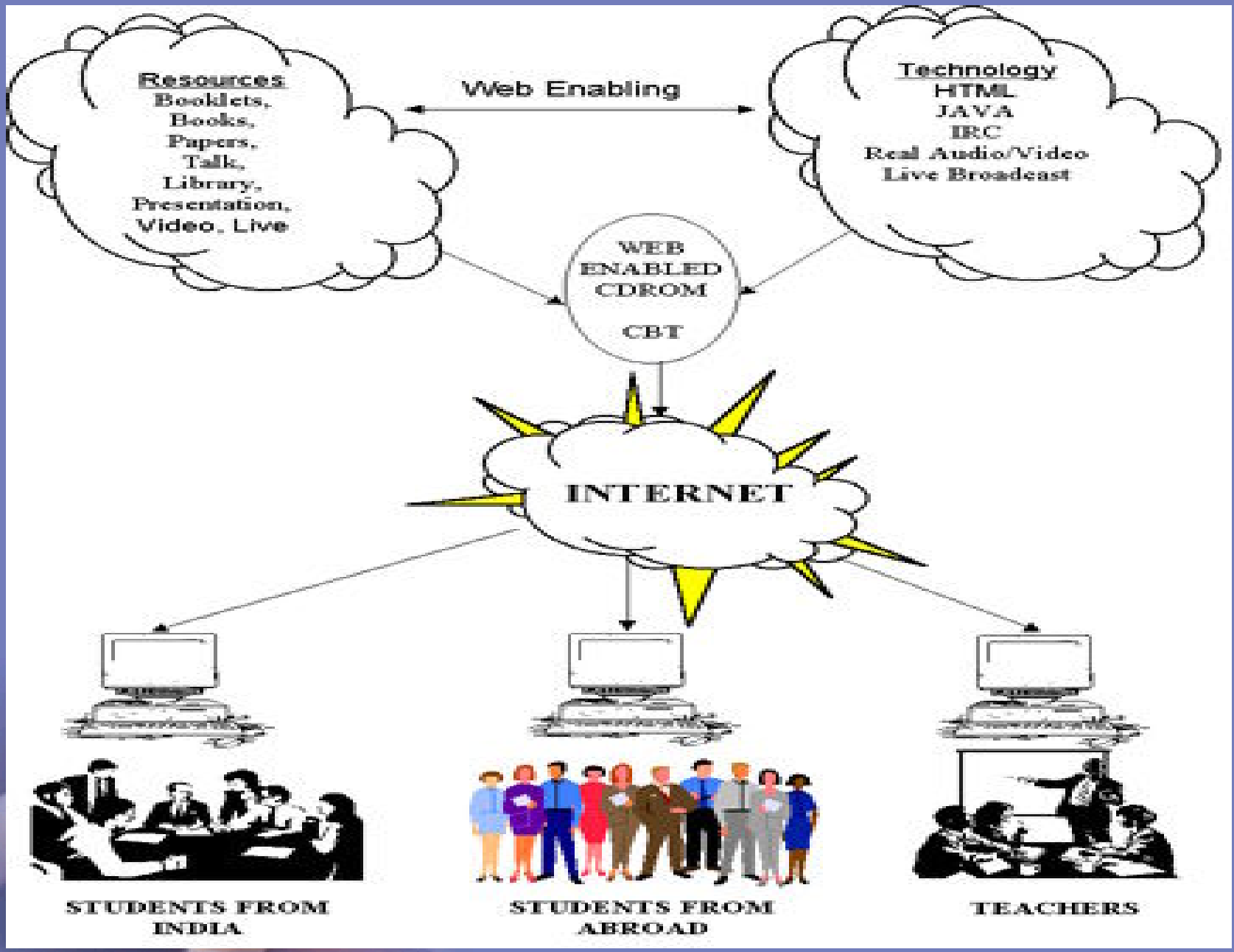
Network Applications in a Tertiary care hospital - AIIMS

- Intranet & Internet Systems
  - Academic & research information
  - Human resource information
- Hospital Information Systems
- Library Information systems
- Telemedicine applications systems

Intranet applications at AIIMS

- Web enabled human resource information systems
- Web enabled teaching modules for students
- Web enabled hospital information system modules




Resources
Booklets,
Books,
Papers,
Talk,
Library,
Presentation,
Video, Live
Web Enabling
Technology
HTML
JAVA
IRC
Real Audio/Video
Live Broadcast
WEB
ENABLED
CDROM
CBT
INTERNET
STUDENTS FROM
INDIA
STUDENTS FROM
ABROAD
TEACHERS

Teaching in the Department of Microbiology at AIIMS

Class Schedules (Under Graduate)

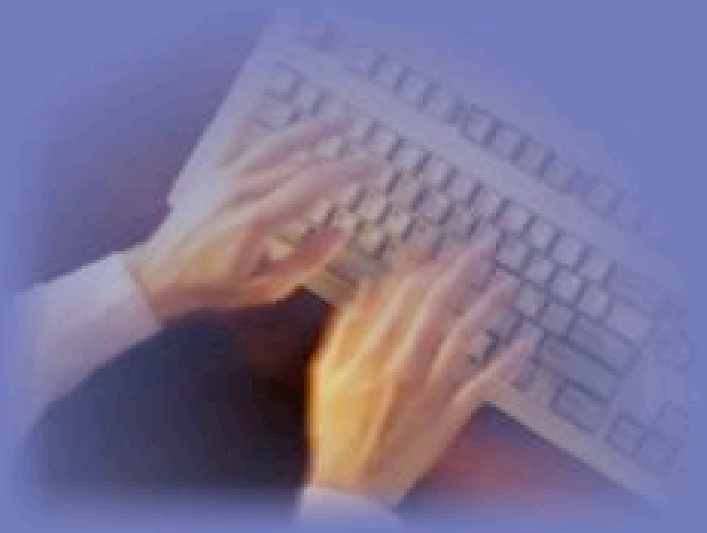
- Teaching Programme III Semester
- Teaching Programme V Semester

Class Notes(UG)

- Staphylococcal Infection
- Lab Diagnosis of Syphilis
- E. coli diarrhea
- Lab Diagnosis of Pulmonary tuberculosis
- Wound infection
- Anthrax

Internet Applications at AIIMS

- Official website
- Health educations modules
- Ask the doctor systems
- Online information



All India Institute of Medical Sciences

Ask The Surgeon at AIIMS

Heart Valve Surgery (A Guide to Patients)

Coronary Artery Bypass Surgery (A Guide to Patients)

Internet Access at AIIMS

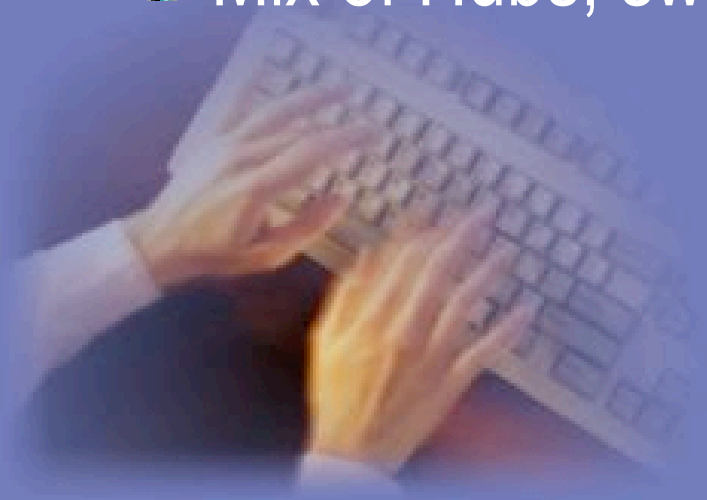
- Around 1000 nodes with Internet Access round the clock, 365 days
- All the Faculty with internet access
- Students share the internet connection in laboratories
- Students have access to internet in Library, Computer facility.

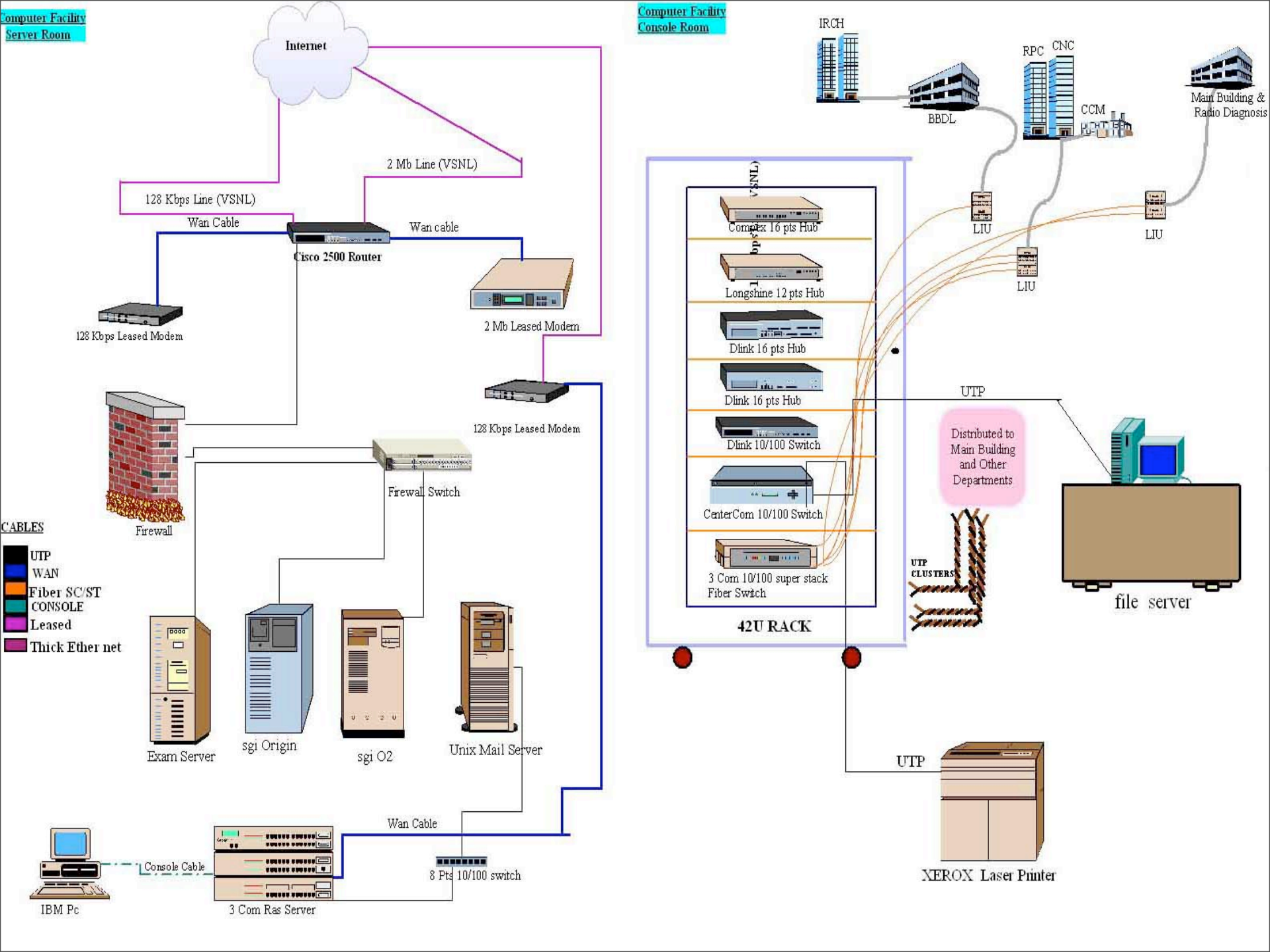
Internet Infrastructure at AIIMS

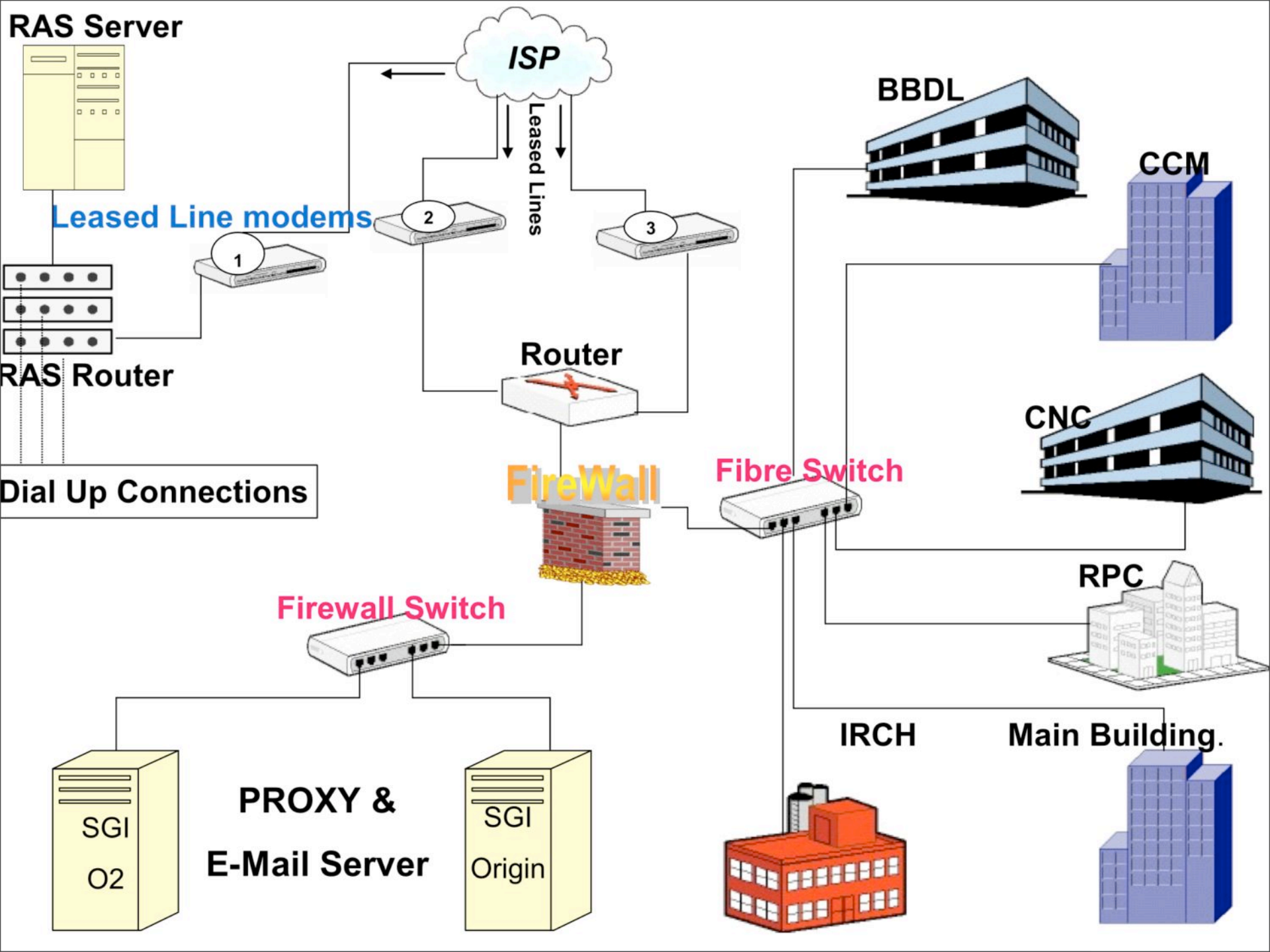
- 2 MBPS leased line, 128K x 2 lines
- Cisco and Dlink routers – 2 Number
- 3Com Remote Access Server 1+2 (24port)
- SGI O2 Webserver
- SGI Origin 200 Proxy server
- Cyberoam Webmail, content filter
- CA Etrust Firewall server
- Servers for Application hosting (Exam, Search, etc.,)

Internet Infrastructure at AIIMS

- Cat 5 based last mile connectivity
- Few locations with wireless connectivity
- Fiber optics backbone > 2km length
- Mix of Hubs, switches (100's)

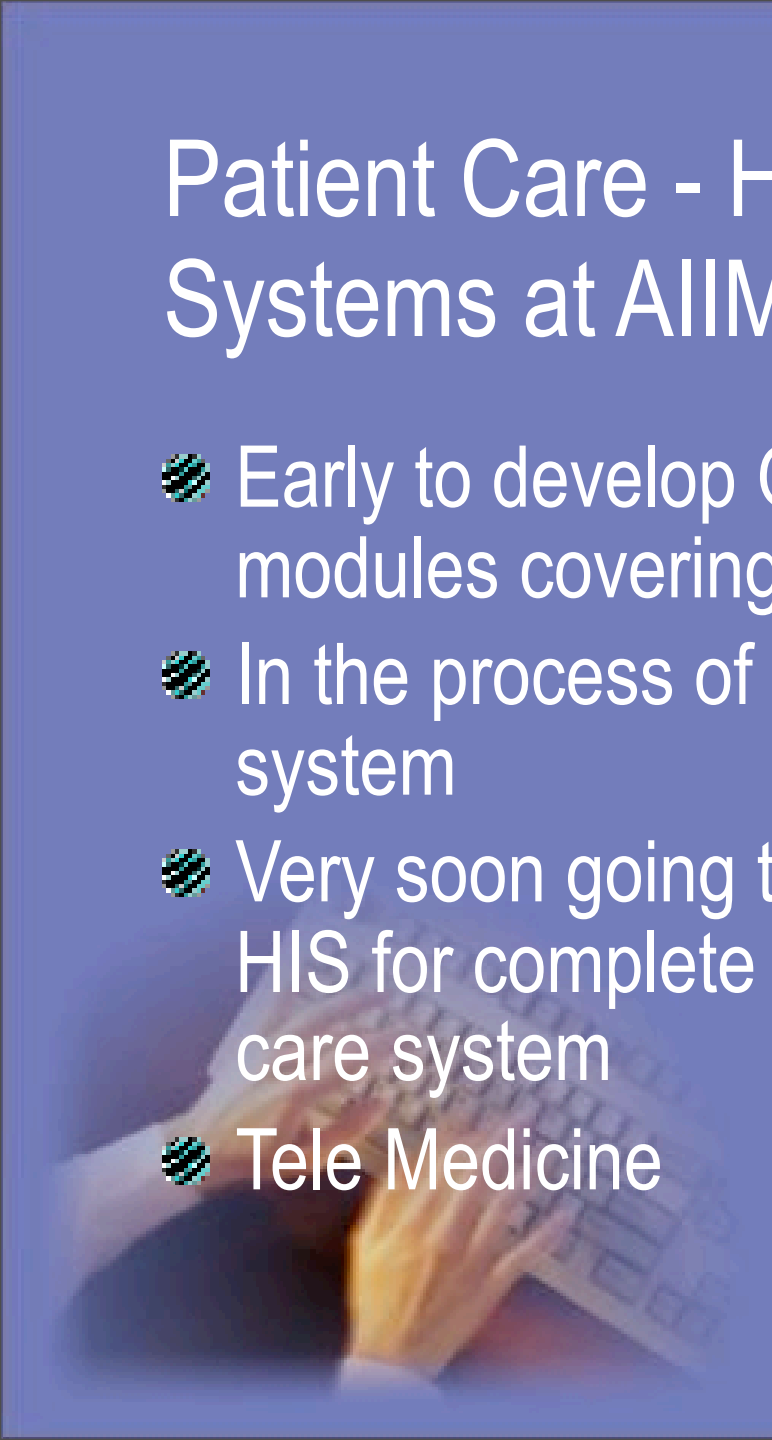



Computer Facility
Server Room
Internet
2 Mb Line (VSNL)
128 Kbps Line (VSNL)
Wan Cable
Wan cable
Cisco 2500 Router
128 Kbps Leased Modem
2 Mb Leased Modem
128 Kbps Leased Modem
Firewall
Firewall Switch
CABLES
UTP
WAN
Fiber SC/ST
CONSOLE
Leased
Thick Ether net
Exam Server
sgi Origin
sgi O2
Unix Mail Server
Wan Cable
Console Cable
IBM Pc
3 Com Ras Server
8 Pts 10/100 switch
Computer Facility
Console Room
IRCH
BBDL
RPC
CNC
CCM
Main Building &
Radio Diagnosis
LIU
LIU
LIU
Complex 16 pts Hub
Longshine 12 pts Hub
Dlink 16 pts Hub
Dlink 16 pts Hub
Dlink 10/100 Switch
CenterCom 10/100 Switch
3 Com 10/100 super stack
Fiber Switch
42U RACK
UTP
Distributed to
Main Building
and Other
Departments
UTP
CLUSTERS
file server
UTP
XEROX Laser Printer

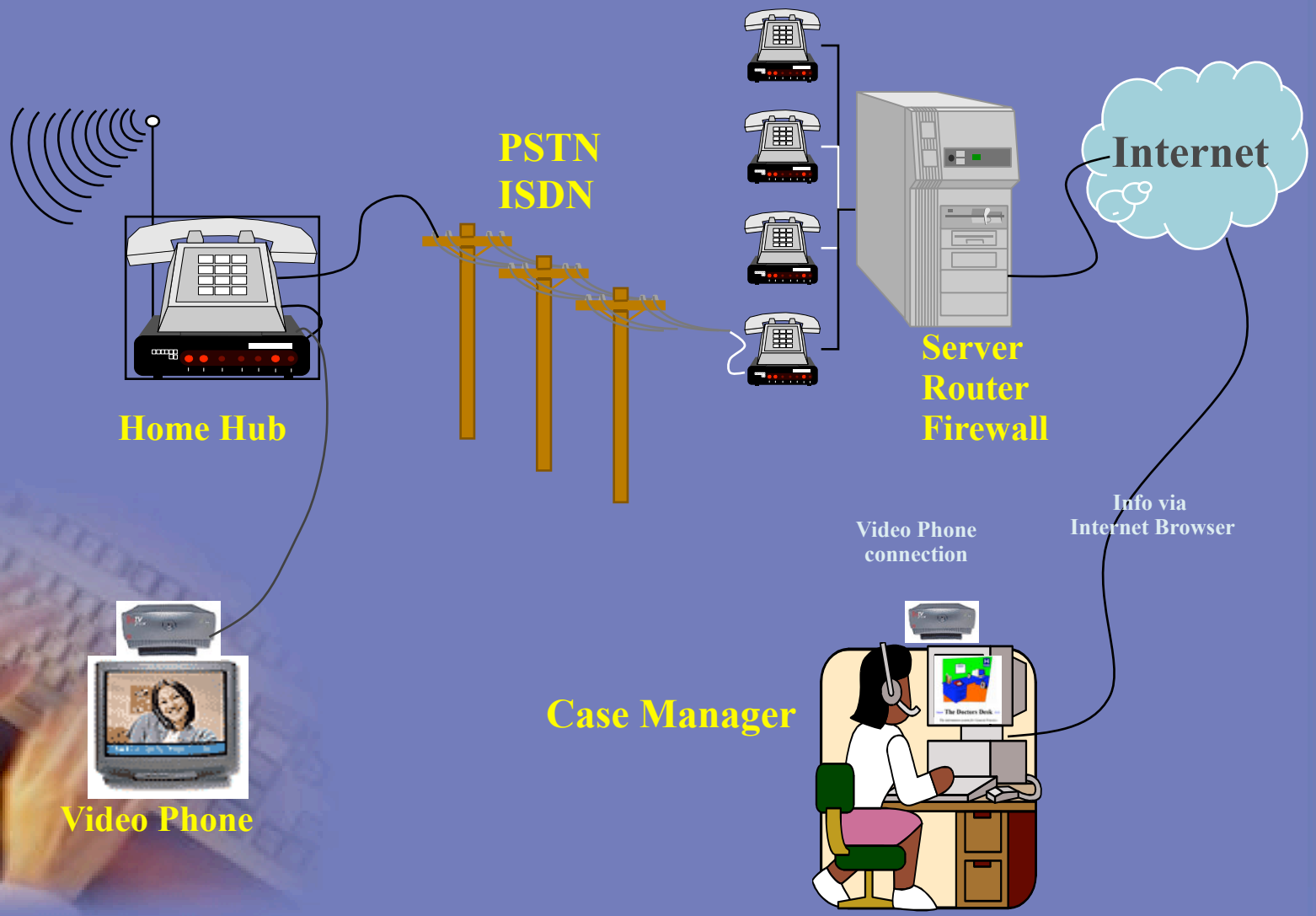

RAS Server
ISP
Leased Lines
BBDL
CCM
Leased Line modems
1
2
3
RAS Router
Router
CNC
Dial Up Connections
FireWall
Fibre Switch
RPC
Firewall Switch
IRCH
Main Building.
SGI
O2
PROXY &
E-Mail Server
SGI
Origin

Patient Care - Hospital Information Systems at AIIMS

- Early to develop Oracle based HIS with 16 modules covering all functionalities of Hospital
- In the process of reengineering the whole system
- Very soon going to implement the state of art HIS for complete automation of hospital patient care system
- Tele Medicine



What is Telemedicine (TM) ?

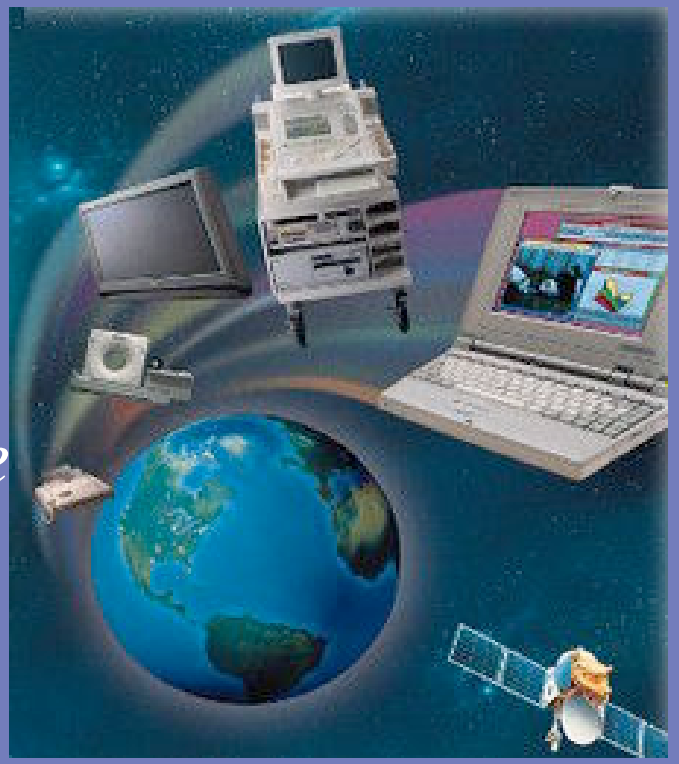


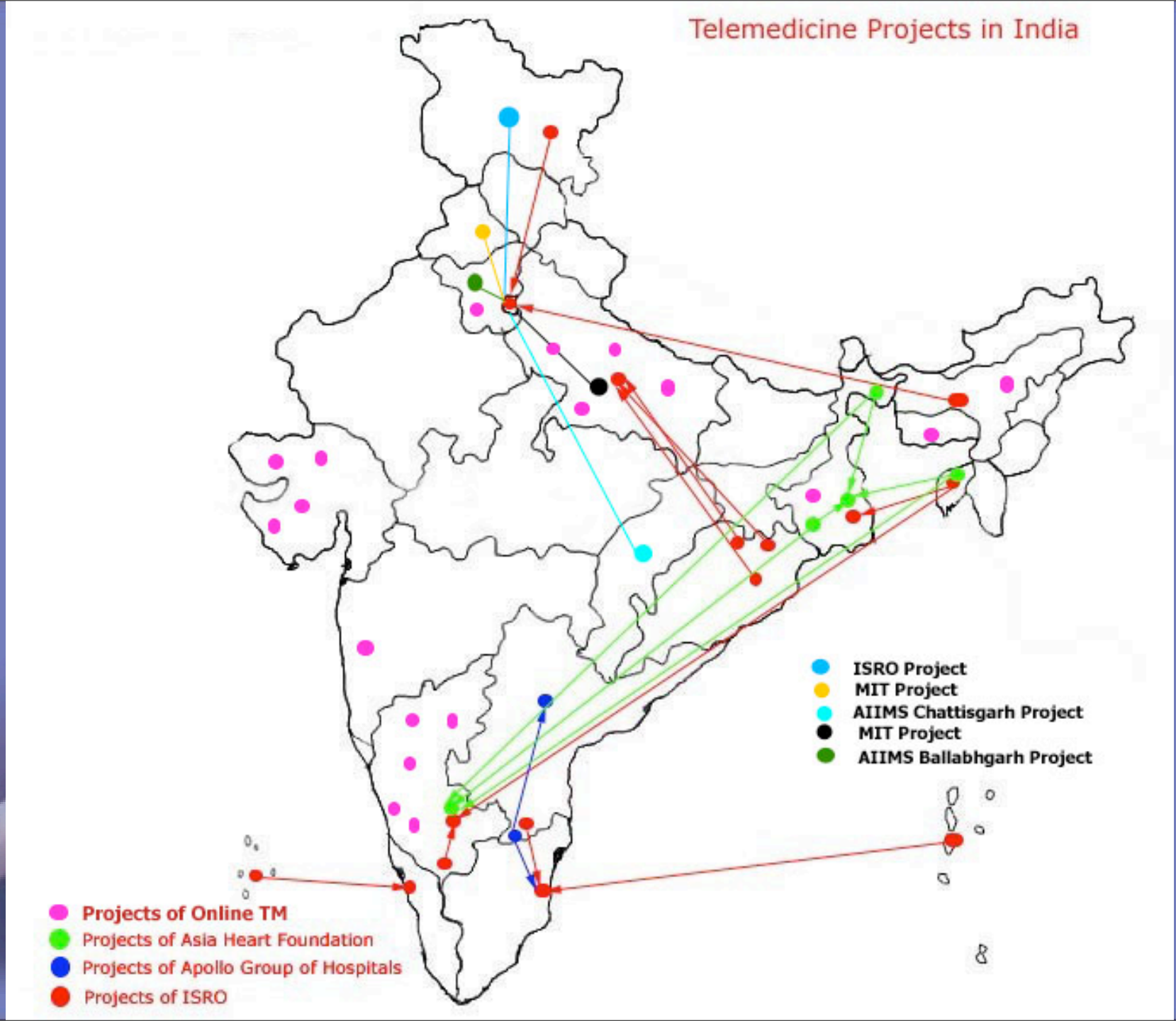
Telemedicine Defined

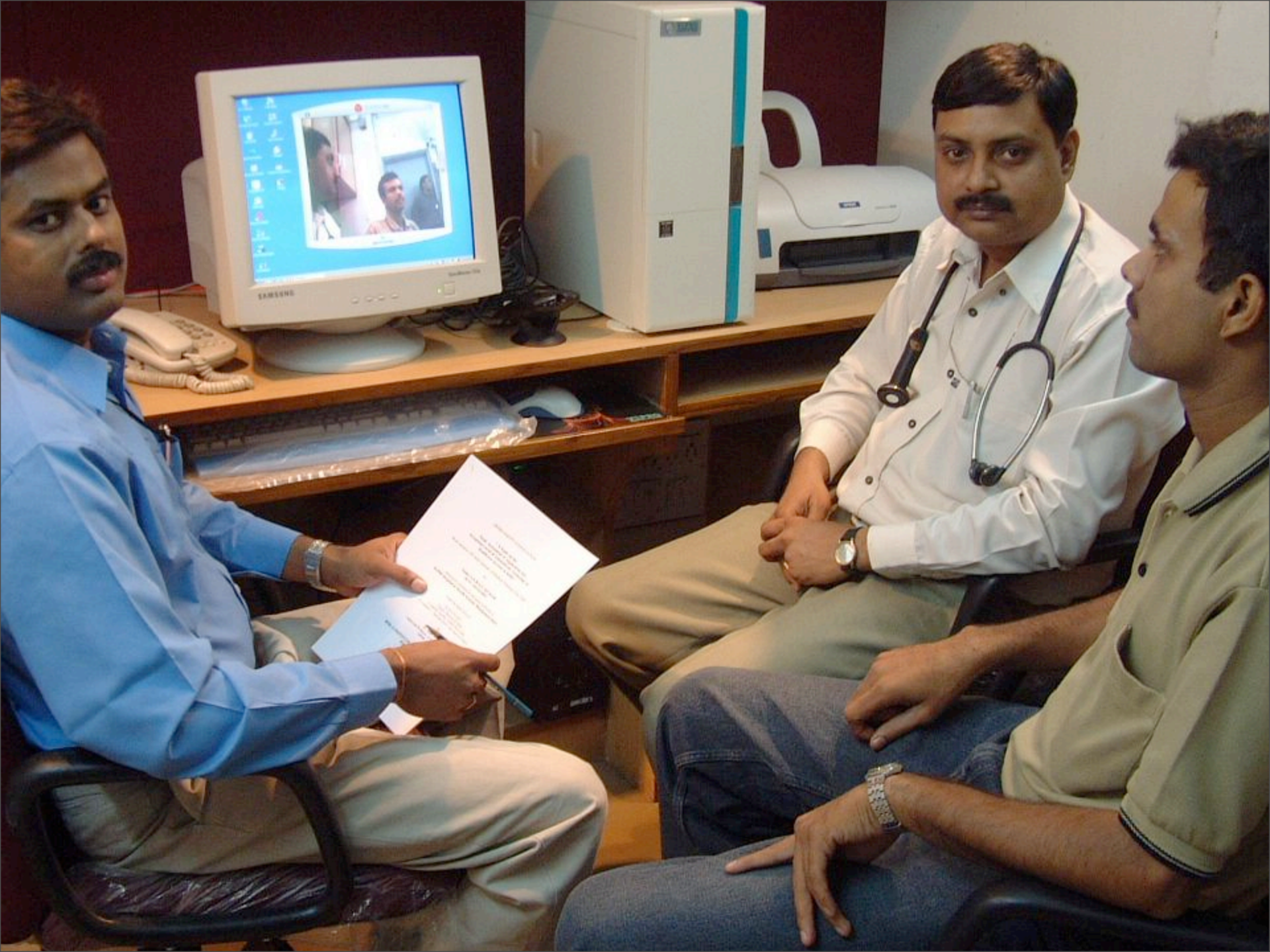
The electronic transfer of medical information

from a referring health care provider at one site to a consulting physician at anothe site

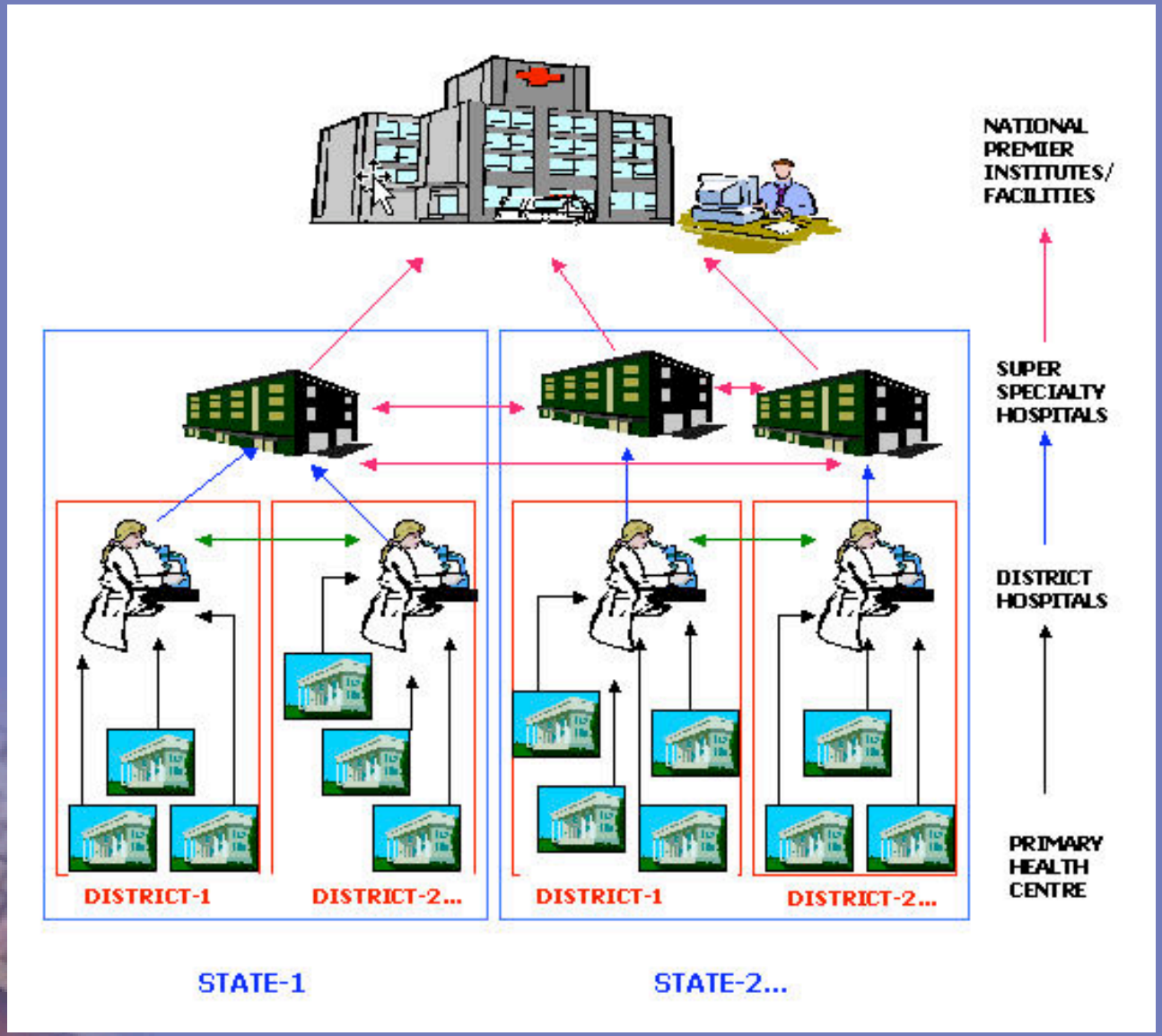
utilizing Communication and Information technology.



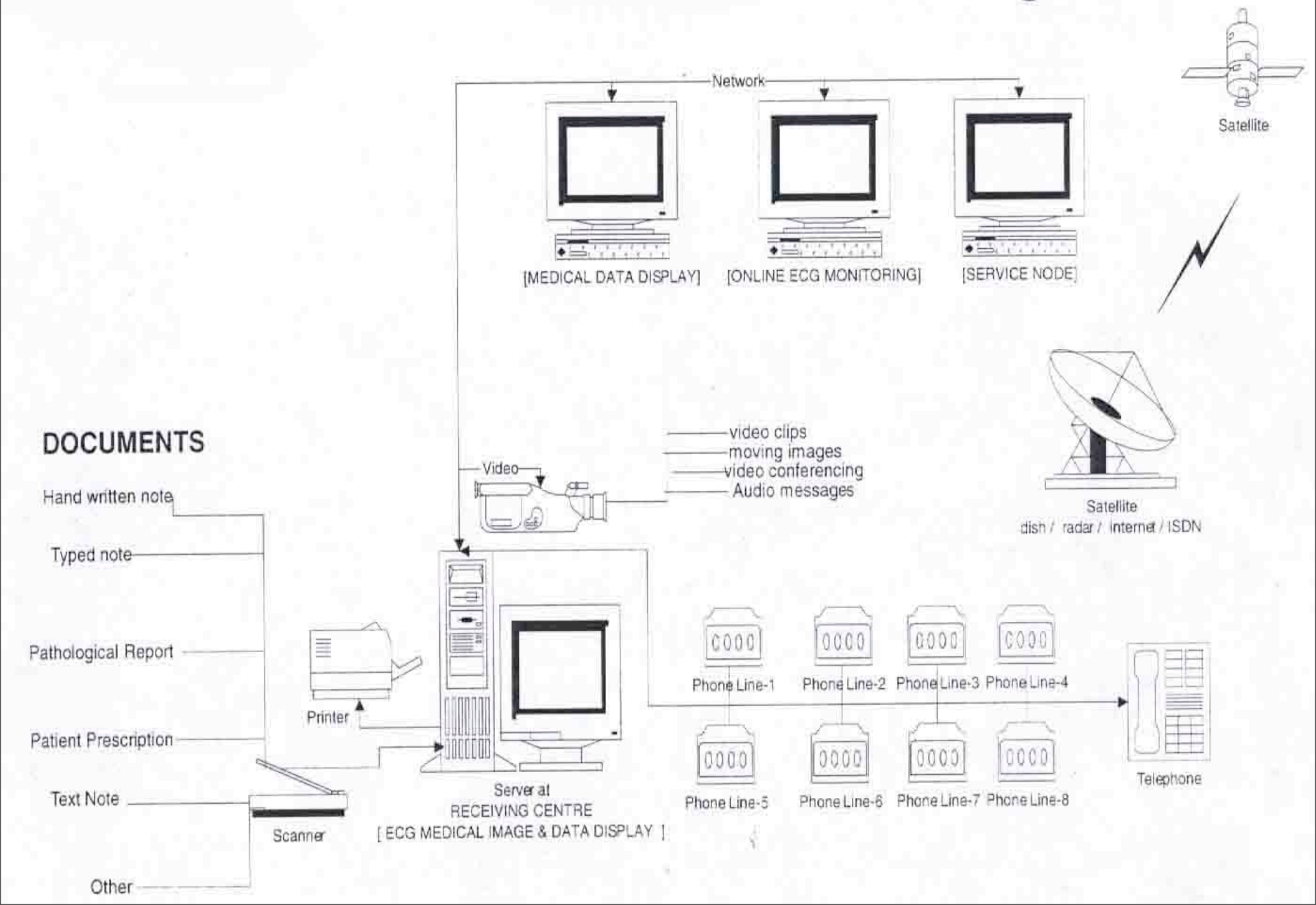

Telemedicine Projects in India
ISRO Project
MIT Project
AIIMS Chattisgarh Project
MIT Project
AIIMS Ballabhgarh Project
Projects of Online TM
Projects of Asia Heart Foundation
Projects of Apollo Group of Hospitals
Projects of ISRO



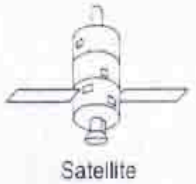
TM Implementation Model for India



Receiving Centre



Transmitting Centre



DOCUMENTS

- ONLINE ECG
- X'RAY
- Hand written note
- Typed note
- ECG
- EEG
- Pathological Report
- CT Scan
- MRI
- Cath Lab
- Patient Prescription
- Text Note
- Other

Scanner

Printer

Data Base

video clips

moving images

video conferencing

Audio messages

Video

(Transmitting Centres)
[ECG DISPLAY]

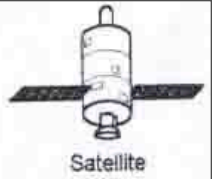
Telephone

Phone Line

Patient

12 Lead ECG M/C

Panel Doctor System



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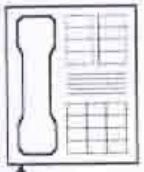
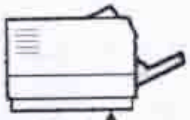
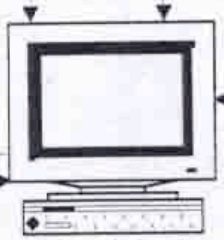
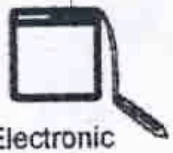
- video clips
- moving images
- video conferencing
- Audio messages









Critical Analysis

- AIIMS has good network infrastructure for Internet access to Faculty and scientists
- No connectivity / network services to all the campus and hostels.
- Need a project Implementation of wireless access to students at hostels of AIIMS.
- Need to plan a project for design & Implementation of wireless access to service areas of hospital.
- Implementation of wireless access to city hospitals for closer co-ordination of trauma, organ donation, and e-governance.

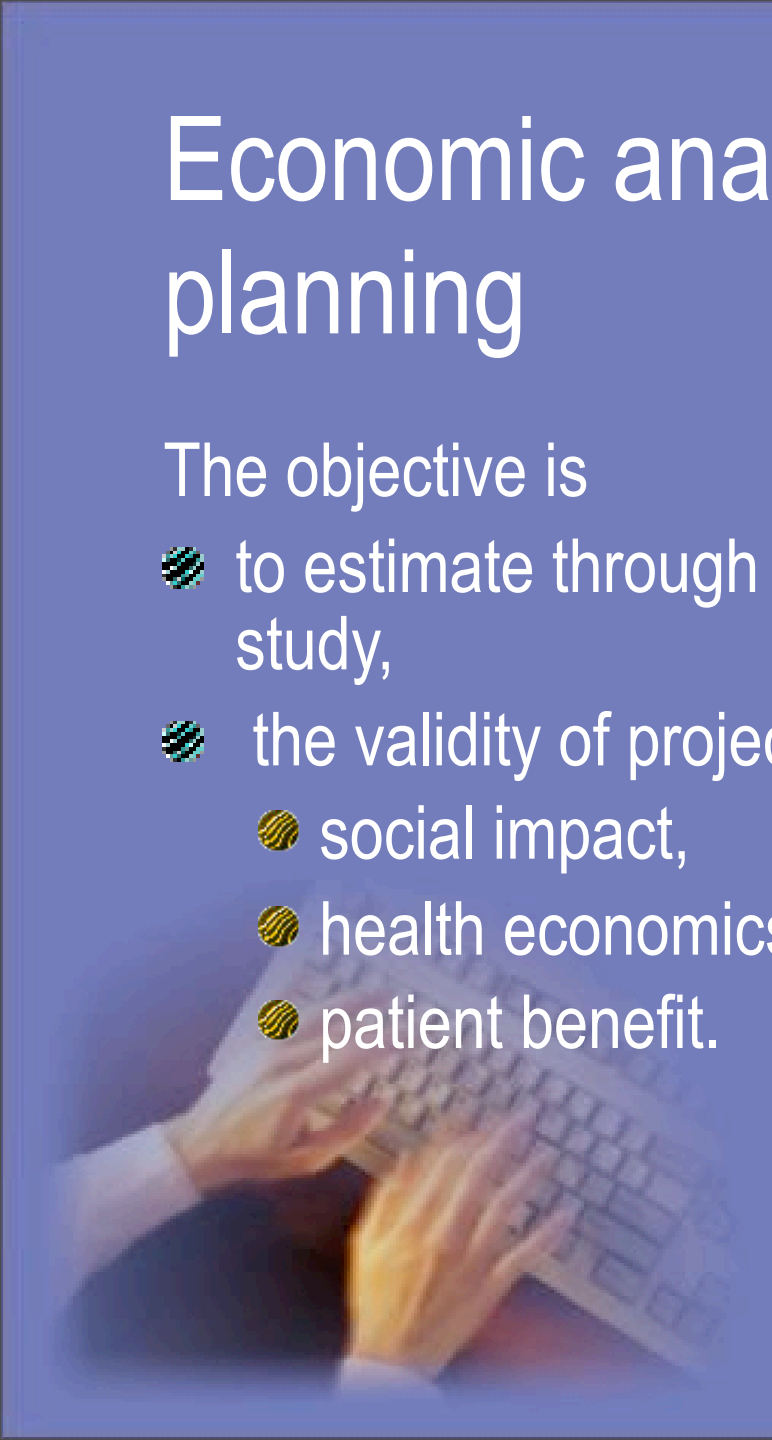
Internet connectivity ratio

Departments	50	1:1
Teaching faculty/consultant doctors	500	1:1
Nursing staff	1800	-
Scientists	100	1:1
UG students	250	1:50
PG students	800	1:50
Admin & support staff	4500	1:50

Economic analysis and project planning

The objective is

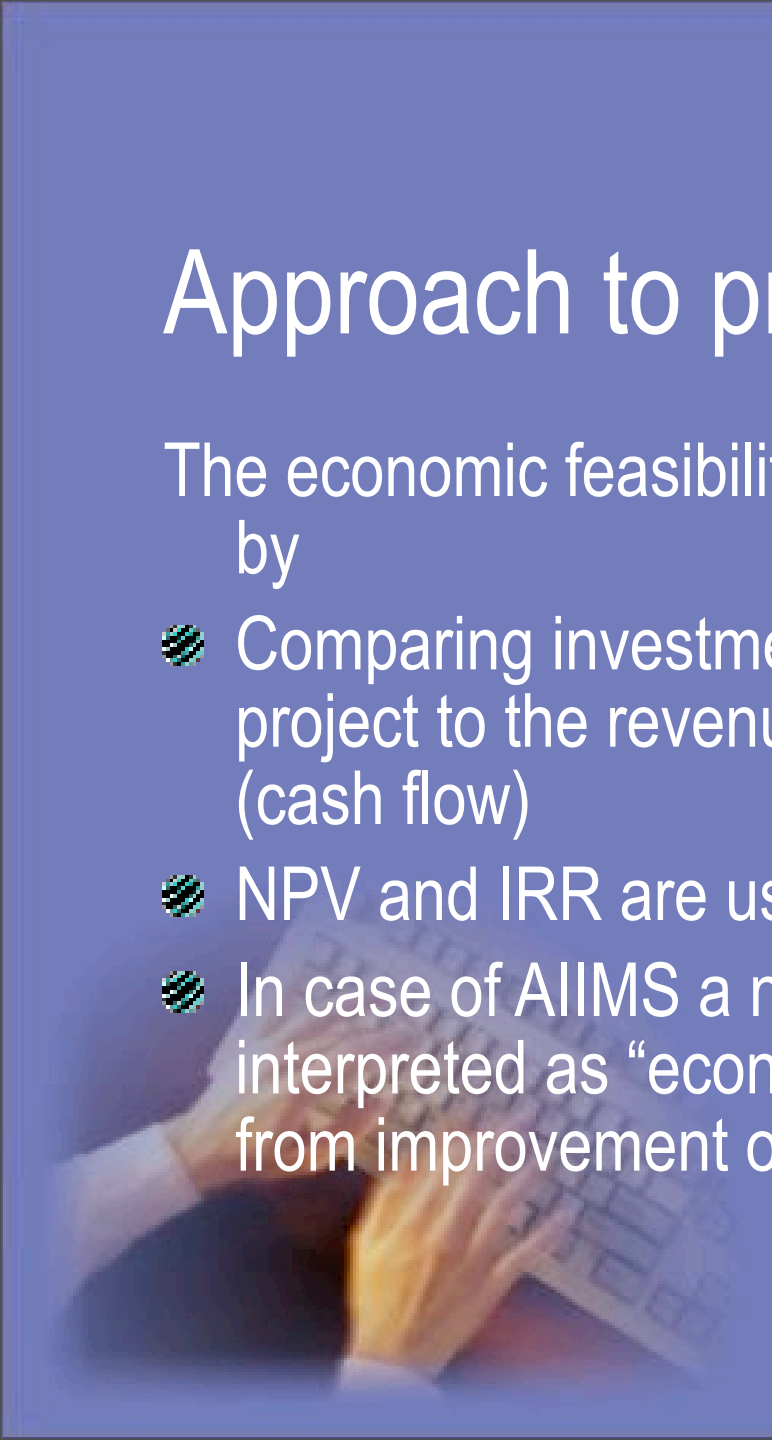
- to estimate through traditional economic feasibility study,
- the validity of project in terms of
  - social impact,
  - health economics,
  - patient benefit.



Approach to project feasibility

The economic feasibility of a project is usually estimated by

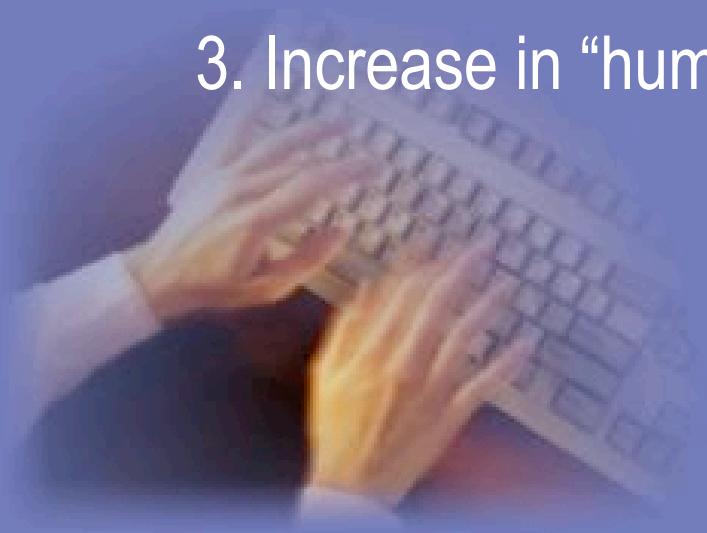
- Comparing investments and annual expenses of the project to the revenue obtained thorough the project (cash flow)
- NPV and IRR are used
- In case of AIIMS a non profit organization revenues are interpreted as “economies” coming back to Hospital from improvement of working activity.



Benefits of Intranet system

The current literature separates the benefits provided by an Intranet system in to three savings

1. Direct reductions in intermediate consumption
2. Shorter time necessary to complete tasks
3. Increase in “human resource productivity”



Provisional project plan

The capital expenses, recurring expenses are calculated

Doctors – estimating time and labour saving are calculated

Nurses - estimating time and labour saving are calculated

Admin Staff -estimating time and labour saving are calculated

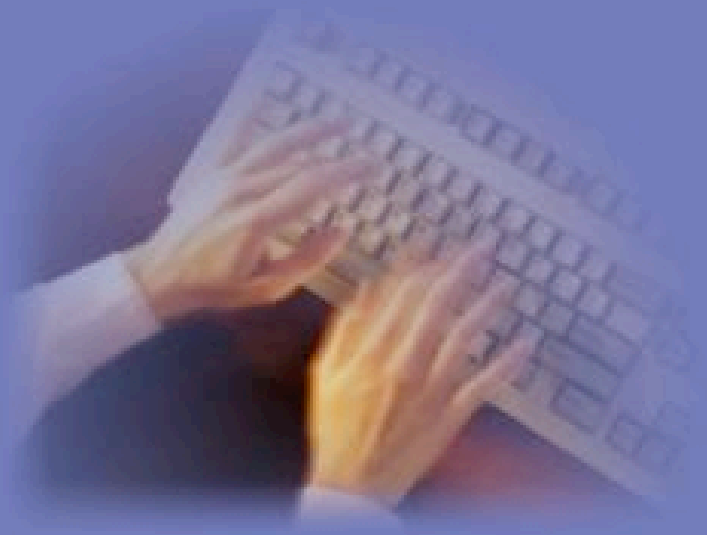
Students - estimating time and labour saving are calculated

NPV and IRR are calculated and tabulated

Though we get a –ve IRR, when all the social benefits and "economies" are calculated the IRR turns +ve.

This draft provisional case study will work as base for further actual survey and working model.

Thank you



Thanks to the President of India's website for Photos and some slides.