

**INDIA**  
**Reinventing itself in**  
**Communications Sector**  
**Technology & R&D perspective**

**A professional point of view by**

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**India's Premier National R&D Centre for Telecom Solutions**

# **Telecom Sector Background Information**

## **(All figures indicative only)**

- **Total Urban Population approx 27%**
- **Urban Towns >5100 ( Less than 100 k Population )**
- **Total Villages > 550 k ( Less than 5k population )**
- **Subscribers over 100 Million, Teledensity > 9.5 %, 35 % (2010)**
- **Wireless Subscribers already more than fixed line subscribers ( about : 54%, 46% )**
- **Broadband projections 3 million(2005 ), 9 million (2007), 20 million (2010); Internet Connections double of these**
- **Internet users > 16 million**
- **Cable TV connections > 60 million (Approx.)**
- **14.5 million Rural Connections**

## **Related Scenario**

- **Sharply declining tariffs, Competition amongst public private service providers**
- **Falling ARPUs**
- **Favourable Government policies**
- **Independent regulator, dispute settlement agency**
- **Open playing field to multiple players in various segments of the network and services**
- **Unified licensing regime**
- **Established USO fund**
- **Comprehensive Broadband Policy Announced**
- **Comprehensive review of spectrum, policy, pricing**
- **Progressive FDI policy. Simultaneously, Government considering ways and means to boost indigenous R&D and manufacture**

# Role Players In Changing Telecom Scenario

- **Users**
  - With Service Wish List ( Mainly Urban)
  - With Social Needs ( Mainly Rural )
- **Content & Application Developers**
- **Network Operators & Service Providers**
- **Infrastructure Providers**
- ***Governments & Administrations for***
  - *Policy*
  - *Social Role*
  - *Standards*
  - *Regulation*
  - *Spectrum & Resource Provisioning*
  - *Dispute Settlement*



# Drivers for ICT R&D in India

- **Push for Self reliance**
- **Tremendous growth potential in tele-density, broadband**
- **Availability of highly professional and skilled manpower**
- **Specific need in the country**
  - **Variable Requirements**
  - **Vastly varying environment**
  - **To improve connectivity in rural & remote areas**
    - **Telephone**
    - **Mobility**
    - **Broadband**

# ICT Investment Growth Rates in India (According to one of the estimates)

- BPO sector growth rate is 40%
- Services sector growth rate is 34%
- Enabled Services growth rate is 60%
- *Product R&D growth rate is 40%*

# Multimedia

**Converged Services**

**Voice**

Mainly

**Now**

Technology

Dial up

Dependent

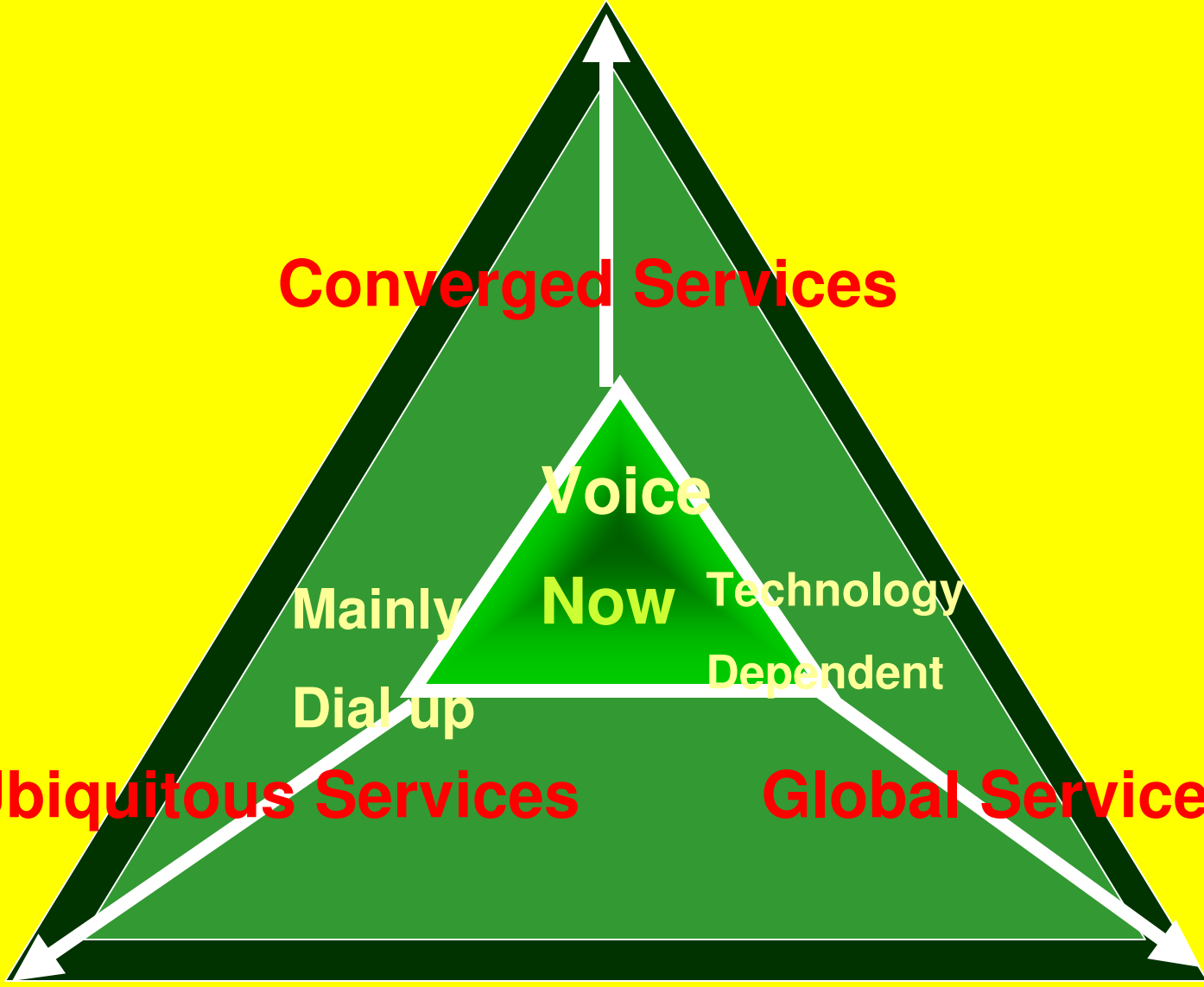
**Ubiquitous Services**

**Global Services**

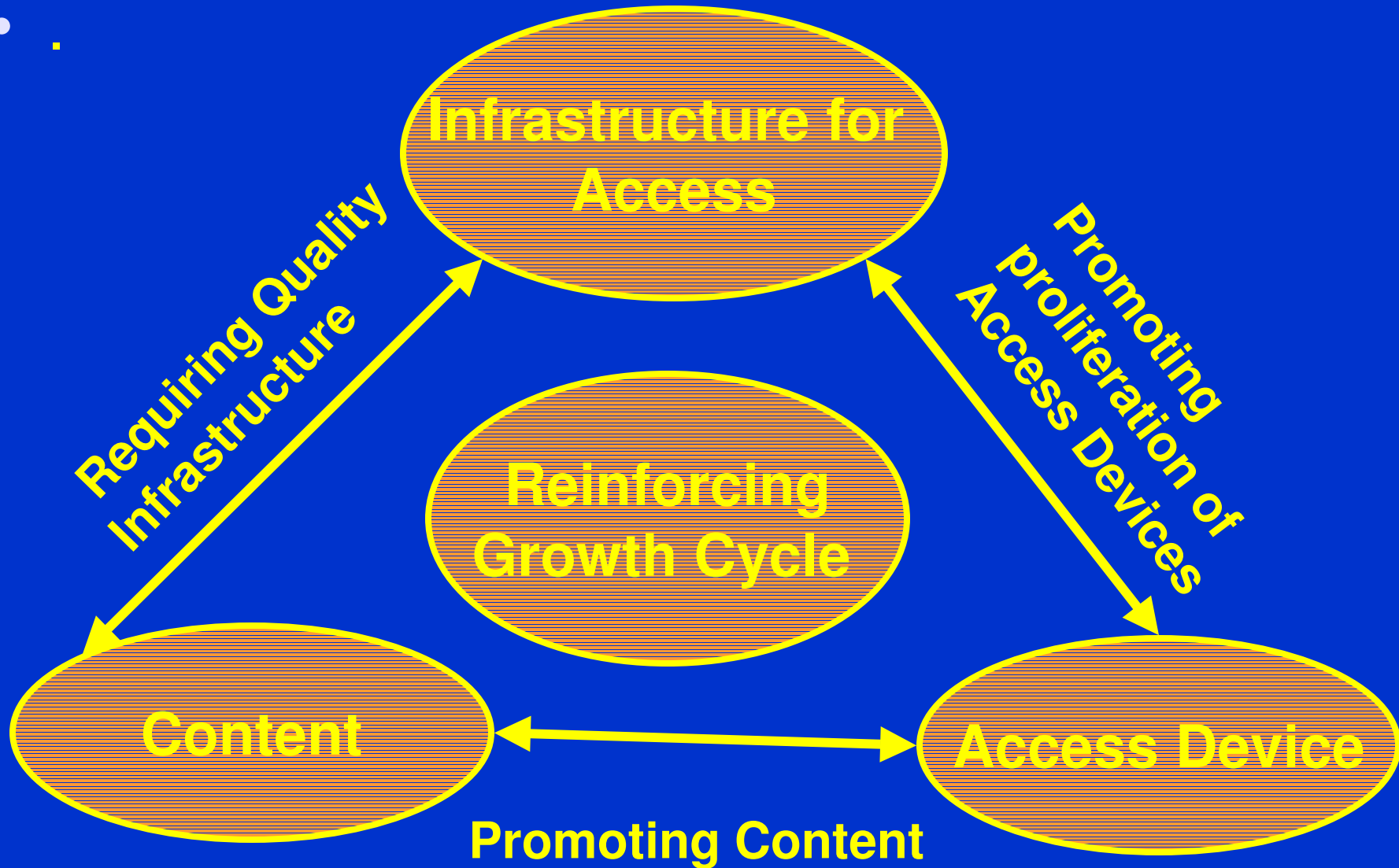
**Always  
ON**

**Changing Services Scenario**

**Seamless  
Mobile**



# Interplay of Drivers in Telecom Growth



# Other Network Elements and Features

## *FUTURE PROOF OPEN PLATFORM FOR CONVERGED SERVICES*

- **Enhanced Mobility and Terminals**
- **Broadband Access**
- **High Bandwidth Optical Transport**
- **Fibre Feeding last Mile Wireless Access**
- **Multi-Access, Multi-Service Protocols - MPLS**
- **Advanced Network Intelligence and Management**
- **Multi-mode, Multi-band, Multi-Functional Wireless Devices**
- **WLAN Hotspots in Public and Semi-Public Locations**
- **Different QoS and Bandwidths**
- **Configurable Software Defined Radio**

# Technologies for next generation

*Openness to All Types of End-users, Services and Applications 24\*7 Requirement , Location, Service Software and Hardware.*

- Growing Productivity of Microprocessors
- Powerful Digital Signal Processors & Engines
- Optical Communication System
- Effective Methods of Digital Compression and Transportation of Information
- Powerful Software Applications Technologies

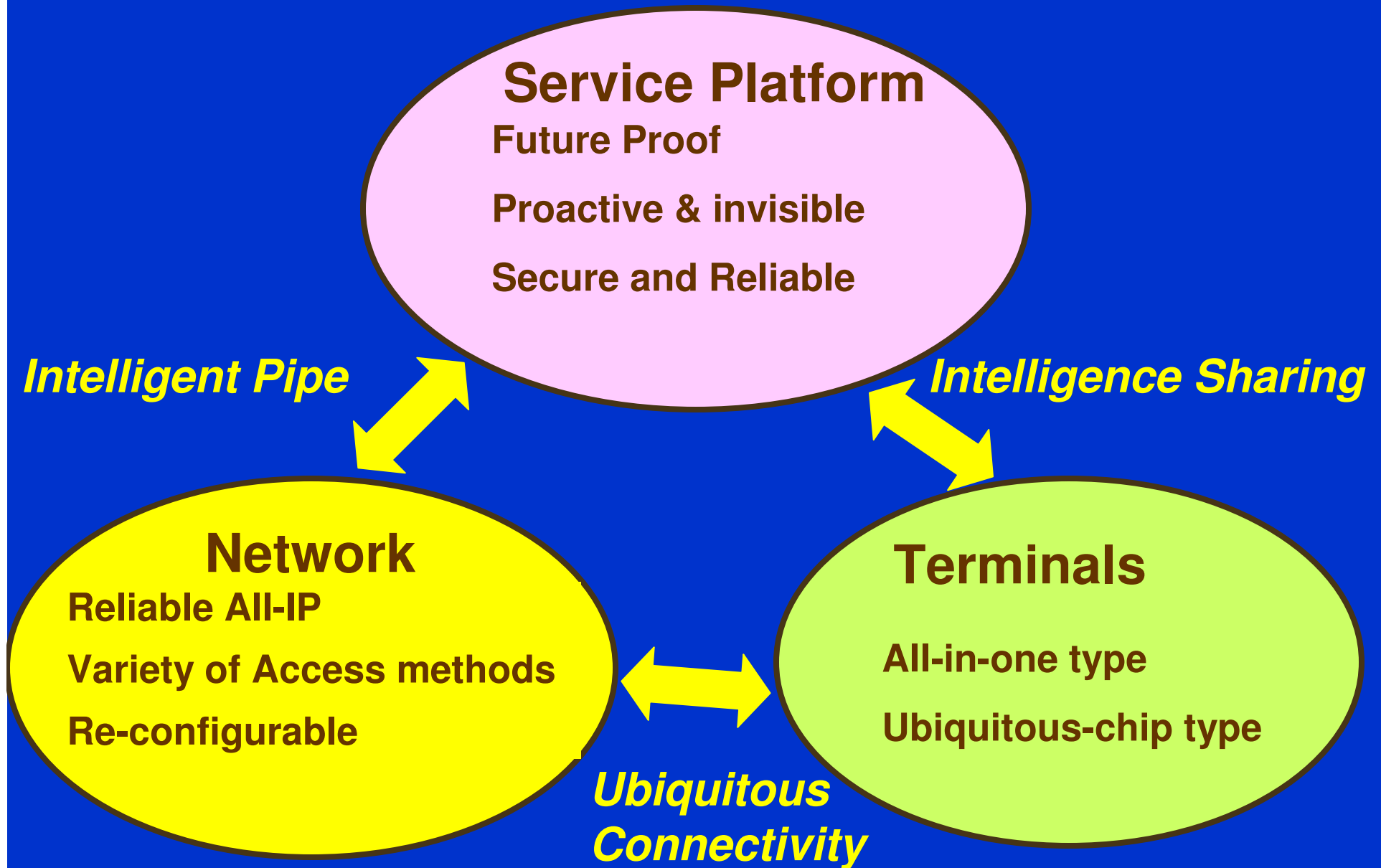
# Broadband Technologies

- All technologies and media relevant in Indian Context
- Many fold cable TV connections than Internet indicate Entertainment driven Broadband Scenario
- Cable TV Network also being refurbishing - triple play
- Low teledensity --- limited volume of copper loop DSL
- Optical fibre interconnecting switches and back haul
- Wireless a strong contender for roll out of Broadband
- Wi-max backhaul a possibility in remote & rural areas
- Satellite for inaccessible areas
- VSAT operators foresee a good role
- 2.4 Ghz delicensing , 5 Ghz strong Contender, 3.5 ??
- Rural Broadband Kiosks, Community Telecentres
- Local, regional language Content major component for value addition

# Wireless Technology Scene

- **Some predict 100 million mobile subscribers till 2006**
- **Expected wireless penetration ( 2008 ) > 14%**
- **3 major operators share 60% of mobile subs**
- **Latest monthly additions show 76% & 24% share of GSM & CDMA respectively**
- **3.0 million FWT terminals, Growth 8.7%**
- **Wireless Kiosks - temporary events, shows , sales**
- **Wireless e-governance, banking — limited by secy issues**
- **Limited mobility based on CDMA, CDMA-1x, in use**
- **WiFi hot spots. WiMax for access and backhaul**
- **Spectrum issues under consideration**
- **Wireless to play significant role also to achieve rural teledensity of 6- 8% by 2010**
- **GPRS, EDGE being strongly contemplated by operators**
- **Discussion for IMT 3G services & spectrum requirements**

# MOBILE NETWORKING STRUCTURE



# **Spectrum Management**

*Frequency Bands used by Applications may need lesser Spectrum than Originally Planned due to Technology Improvements and Dynamic Provisioning*

- **Extensive Use of Spectrum Management Tools**
- **Spectrum Re-Farming**
  - **Optimize Spectrum Use**
  - **Accommodate Demands of New Frequency Bands for**
    - **New Technologies**
    - **Growth of Subscribers and Services**

# The Intelligent Services Layer of the Networks

Third Party Content

Customers

Shared  
Library of  
Services  
on  
Internet

**Service Plane = Service and Application Layers**

**Service Control Logic out of switching/routing systems  
Service nodes used as shared resources**

**Transport Layer of Telecommunication Network**

*Transparency of Layers to make Design and  
Deployment of New Services Almost Instantaneous*

# **Continued Need of Regulation, Standards**

- **To Effectively Address Technological Challenges & Innovation**
- **Interconnectivity and Interoperability**
- **Appropriate Migration Scenarios**
- **Higher Performance and Lower Costs**
- **Intellectual Property Rights, Security and Privacy, Legal & Political Aspects, Fair Competition**

# **Telecommunication Networks Security and Resilience 2015**

***Network Security Important due to Traffic Growth***

## **Technology Solutions For**

- **New Security Threats to Grow Further due to Greater Connectivity**
- **Increasing Amount of Traffic and User Services**
- **Failures of Networks with different Operational Speed, Complexity, Topologies, grades of availability**

# Rural Communication

*Factors, Those may Still be Valid in Some Rural Areas. However, the Number of Such Areas will Reduce Progressively*

- Fewer Access Points
- Lower Speed and Volume of Data
- Acceptance of One Order Lower QOS
- Limited and Sparse Service Areas
- Variable Environmental Conditions
- Economically not profitable
- Power Supply Problem in some Places & Topologies
- Zero Maintenance Systems, Preferably

# **Rural Communication Services**

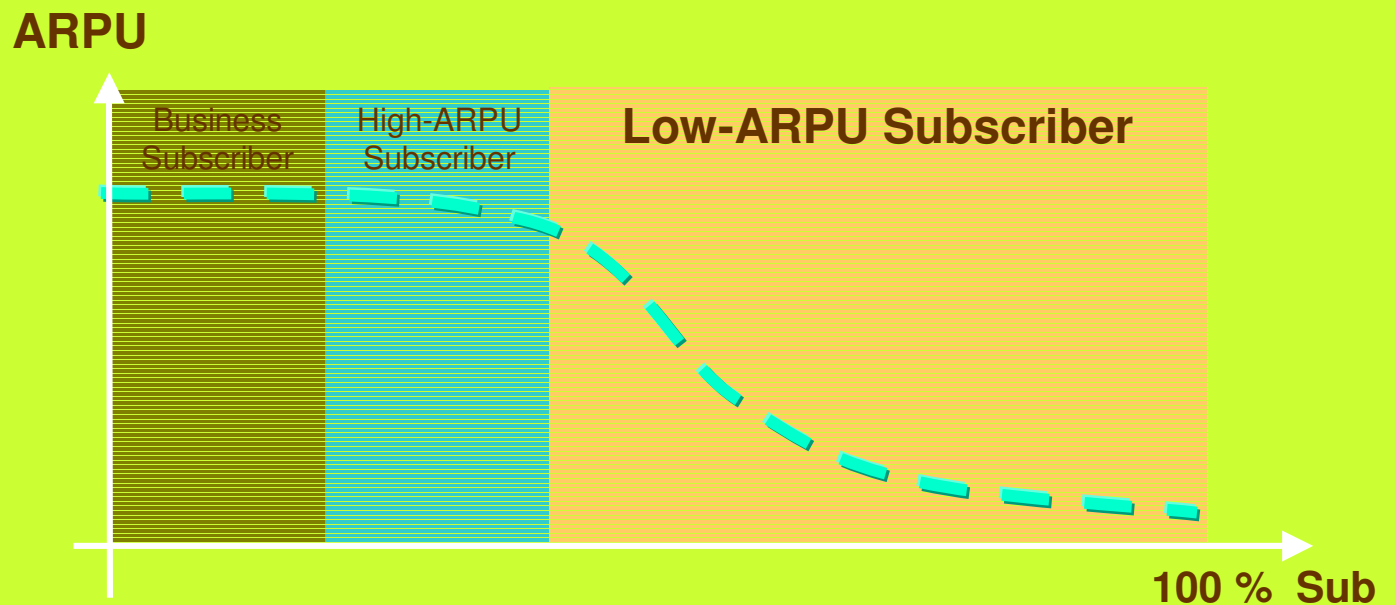
- **Apart for other City Type of Services, Special Focus on**
  - **Tele-Education, Tele-Health, e-Governance, Disaster Control Systems, Environmental Monitoring Systems, Multipurpose Community Tele-Centres, Local Governance, Issues of National Perspective, Internet**

## **Technologies**

- **Normally Urban Technologies may be Used**
- **Some Needs of the Community in Rural and Under-Provided Areas to be Addressed Differently than Those Provided in Urban Areas**

# Operators' Challenges for Rural Areas – Subscriber Segments

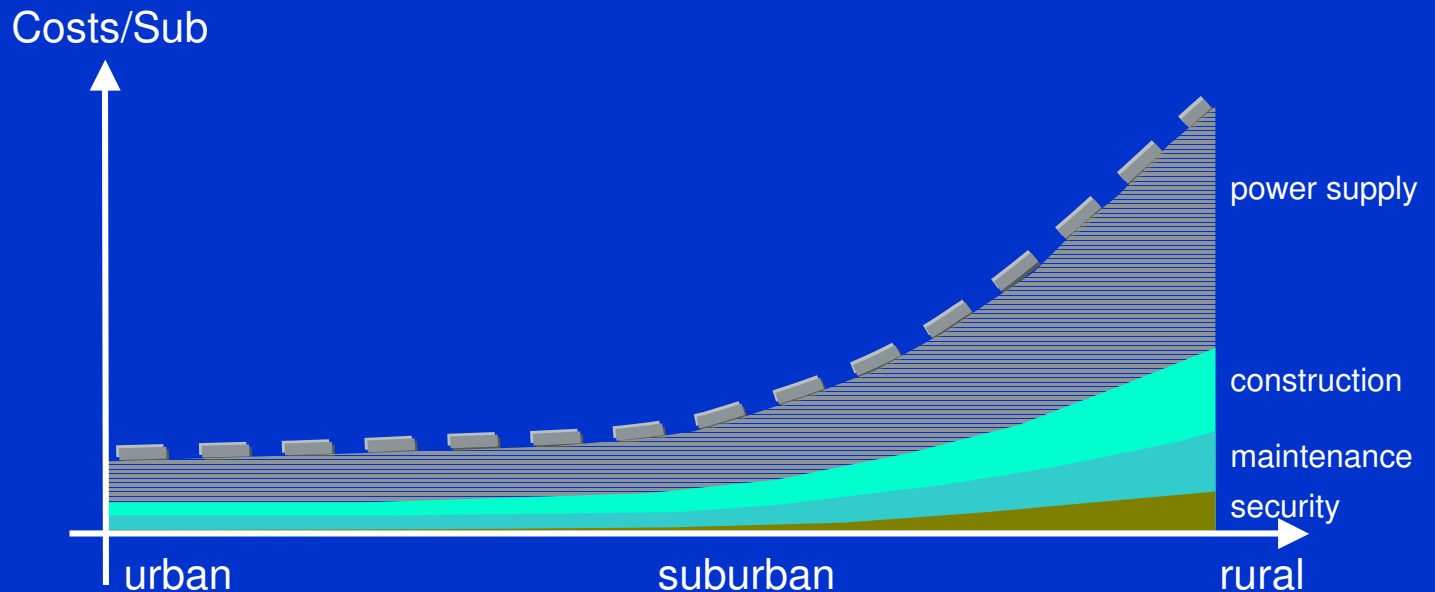
LOW ARPU



\*ARPU: average revenue per user

# Operators' Challenges for Rural Areas – Infrastructure Costs

- Especially in areas where missing public infrastructure costs are significantly higher than equipment costs.



# Rollout of the Rural Networks – The Key Parameters

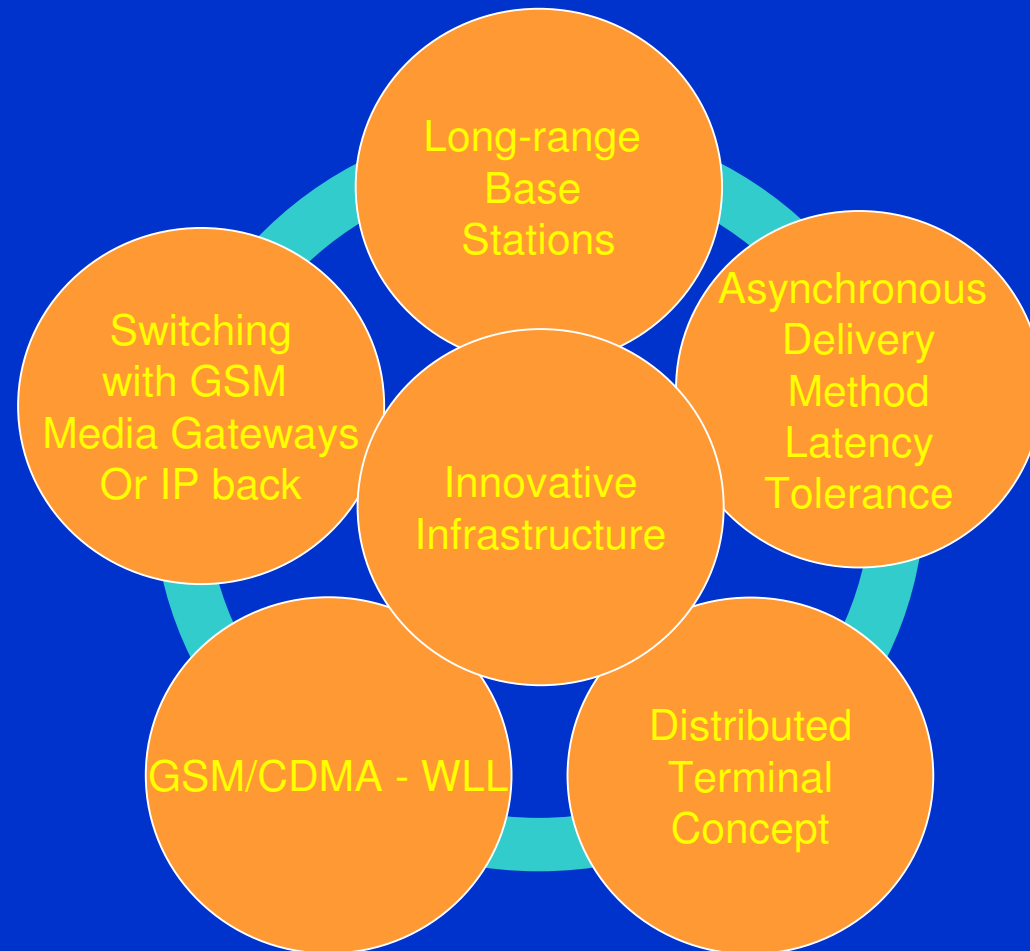
**Low  
population  
density**

**High  
infrastructure  
costs**

**Low ARPU  
subscriber**

**Expensive  
operation**

# Proposed building blocks for Rural Wireless network- Individual & Kiosks wit Service differentiation



# **Strengths required by Indian R&D organizations**

- **Pool of Highly Skilled Young Engineers**
- **Proven Design Methodologies**
- **State-of-the-art Design & Testing Tools Pilot Production Facility**
- **Hardware and Software Infrastructure support to Mass Manufacturing Base**
- **Proven Technology Transfer Methodology**
- **Installation and Long Term Customer Support Technologies & Products - Appropriate and relevant to needs & requirements of the country**
- **Ability to provide full range of Total Telecom Solutions**

# R&D Partnership Models in ICT

- **Short term and long term partnerships with Industry, Service Providers, users and research & development Organizations**
- **Direct Turnkey Solutions**
- **Joint Ventures**
- **Co-Branding**
- **Collaborative R&D**
- **Transfer of Technology**
- **Application Service Provisioning**
- **Joint bids against tenders**
- **Front-end marketing relationships**
- **Sponsored development for specific requirements**
- **Consultancy for future proof Network , Solutions and value added services**

# Some Examples of Indian ICT R&D Centres

- Tata Consultancy Services (TCS), *Mumbai*
- Wipro, *Bangalore*
- Infosys, *Bangalore*
- Other groups of Telcos, Industry and Service Providers
- C-DOT *Delhi*
- CDAC *Pune*
- CRL *Bangalore*
- TIFR *Mumbai*
- Media Lab Asia
- Institutions at Many Software Technology Parks
- IISC, Bangalore
- IIT, Delhi
- IIT, Mumbai
- IIT, Kanpur
- IIT, Kharagpur
- IIT, Chennai
- IIT, Gwahati
- IIT, Roorkee
- Cor-DECT Team

# Some examples of ICT R&D investors in India

## Telecom

- Lucent
- Motorola
- LG
- ZTE
- UTStarcom
- Huawei
- Nokia
- Siemens
- Ericsson

## Semiconductor

- Intel
- Motorola
- Texas Instruments
- Cypress
- Altera
- Xilinx

## • Software

- IBM
- Microsoft
- HP
- Oracle
- Google
- UBIS
- Synopsis
- Cadence
- Accenture

# **C-DOT's Current Setup & Projects**

- **Present staff strength of about 1100, comprising mainly of telecom Professionals**
- **Operating mainly from Delhi and Bangalore**
- **Presently working on**
  - **Next Generation Voice over IP Networks**
  - **Operation Support & Management Systems**
  - **Rural wireless and broadband systems**
  - **Advanced Intelligent Networks**
  - **Optical & Backbone Satellite systems**
  - **Solutions for Security, Strategic & Rural Network**
  - **Innovative Value Added Services**
  - **Fourth Generation System**

# CDOT's New Focus

- **Strategic partnerships of various modals to reduce time to develop, time to market and time to revenue**
- **Innovative technology based, cost effective, socio-economic solutions semi urban, rural and remote networks also leveraging existing networks ( Rural Wireless & Broadband System )**
- **Cost effective, appropriate technologies & solutions for India Specific & Global markets  
(NMS,OSS,AIN,VOIP,DWDM, Broadband Solutions)**
- **Solutions for strategic sectors like defense and security**
- **Futuristic technologies- (4G Wireless, fixed-mobile Convergence, Optical switches )**

**THANKYOU**

**FOR YOUR KIND  
ATTENTION**