

# Broadband Evolution in India

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November 7, 2002



# What is Broadband?

- According to the FCC:
  - Broadband: Infrastructure capable of delivering bandwidth of 200 Kbps in each direction
  - High Speed: Infrastructure capable of delivering over 200 Kbps in at least one direction

# Broadband Elements - Wireline

- ISDN – Integrated Services Digital Network
  - Basic Rate Interface, BRI (2 channels, 128 Kbps)
  - Primary Rate Interface, PRI (23 channels, 1.5Mbps).
- DSL – Digital Subscriber Line
  - Overlay on POTS
  - Asymmetric, ADSL (640 Kbps up, 8M Kbps down)
  - Symmetric, SDSL (up to 1.5 Mbps in both directions).
  - DSL extremely popular in Europe
- Cable Modem
  - Designated 6 MHz slot inside a cable TV network.
  - Typically hybrid fiber coax (HFC) is taken to a head-end to service 500 to 1000 homes.
  - Data speeds depend on instantaneous traffic.
  - Twice as many cable modems in U.S. as DSL

# Broadband Elements - Wireless

- Fixed Wireless:
  - LMDS (Local Multipoint Distribution Service) operates in the 28 GHz bands.
    - Range of about 5 miles with line of sight
    - 2 Gbps theoretical and about 45 Mbps actual bandwidth
    - Can support thousands of voice calls, 200 cable channels and high speed data access.
  - MMDS (Multichannel Multipoint Distribution Service) operates in the 2.5 GHz band.
    - Range of about 35 miles
    - Line of sight issues mitigated by Vector OFDM (multipath reassembly)
    - 10 Mbps theoretical and about 2 Mbps actual bandwidth
    - Expanding from video origins to data access
- Satellite:
  - One way; 400 Kbps down, 56 Kbps (phone path)
  - Two way entrant; 1.5 Mbps down and 256 Kbps up.

# Broadband Technology Potential

Technology	Business Case	Cost	Potential
ISDN	Leverage telecom infrastructure; offer bundled voice and data	Moderate to low	Low (technology late to market)
DSL	Leverage high quality telecom infrastructure	Low	High
Cable Modem	Leverage installed cable entertainment infrastructure	Low	Very High
LMDS	Provide high bandwidth in dense urban areas where laying fiber is expensive	High	Low
MMDS	Provide moderate bandwidth for communities in range from mainstream distribution path	Moderate	Moderate (advantages will erode with time)
Satellite	Moderate bandwidth for difficult terrain or isolated needs	High	Isolated

There is (practically) no broadband in  
India...

But...

India will be one of the most important telecom (voice and data) markets in the world within five years...

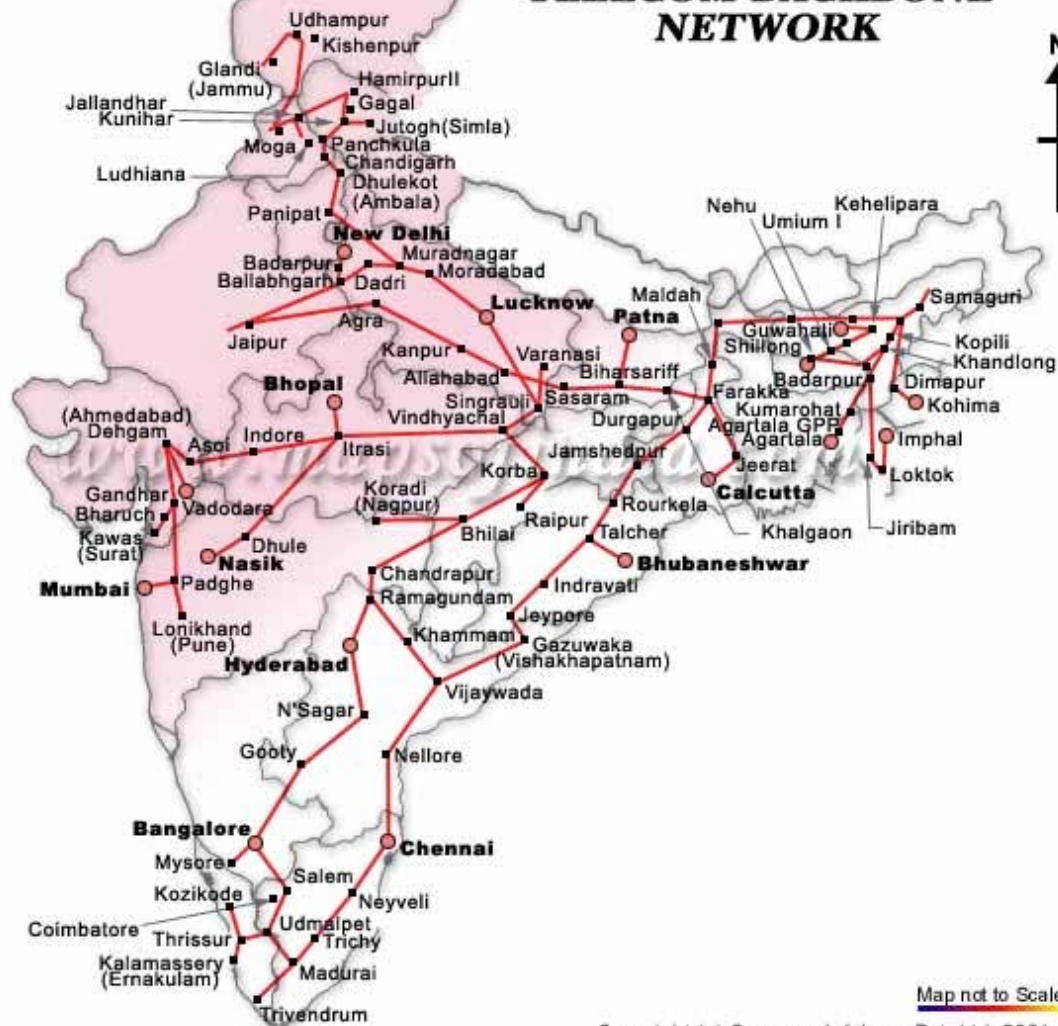
Why?



# India Telecom Statistics

- Teledensity (ratio of people:phones) amongst the worst in the world, around 3%
- Slow growth caused by government monopoly, inefficiency and cost. Typically a new line cost \$775 to install and could take years to provision
- India telecom capacity(in 2000) was only 1.4% of China's
- Currently 14<sup>th</sup> largest telecom market
- Total number of fixed line phones: under 25 million
- Fixed line phone expansion is only 4M per year
- Since 1994, rapid deregulation of govt. control
- Aggressive new telecom policy in 1999

# TELECOM BACKBONE NETWORK



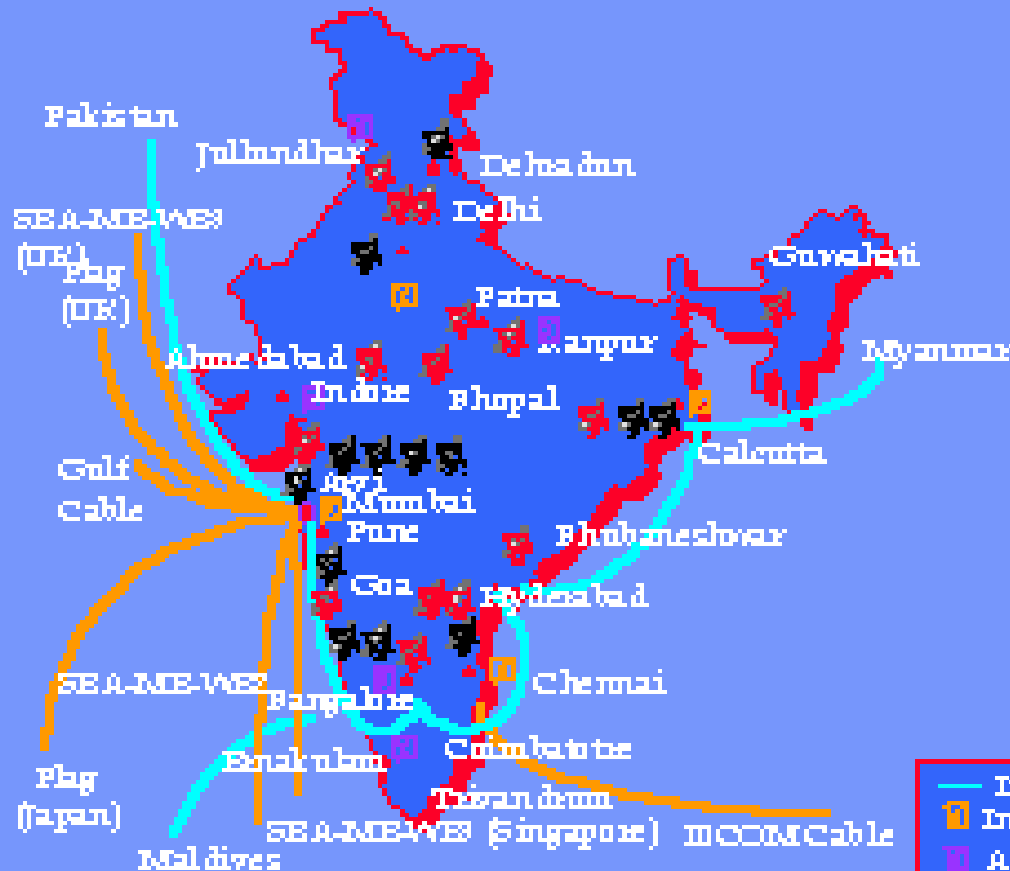
# VSNL Profile

- Public sector company, started 1986
- Traded on LSE and NYSE
- Owns and operates: international gateways, submarine cables (4), satellite earth stations, Gigabit routed exchange. India's first and largest ISP
- Provides
  - telephone services to 236 countries
  - Telex, EDI, Fax, Packet Switching, Gateway services, videoconferencing, IPLCs,
  - Internet access, ISDN, leased lines, managed networks (70% market share)
- Revenues: \$1.6 billion (2001) of which voice services contributed 80%. Net income: \$350 million



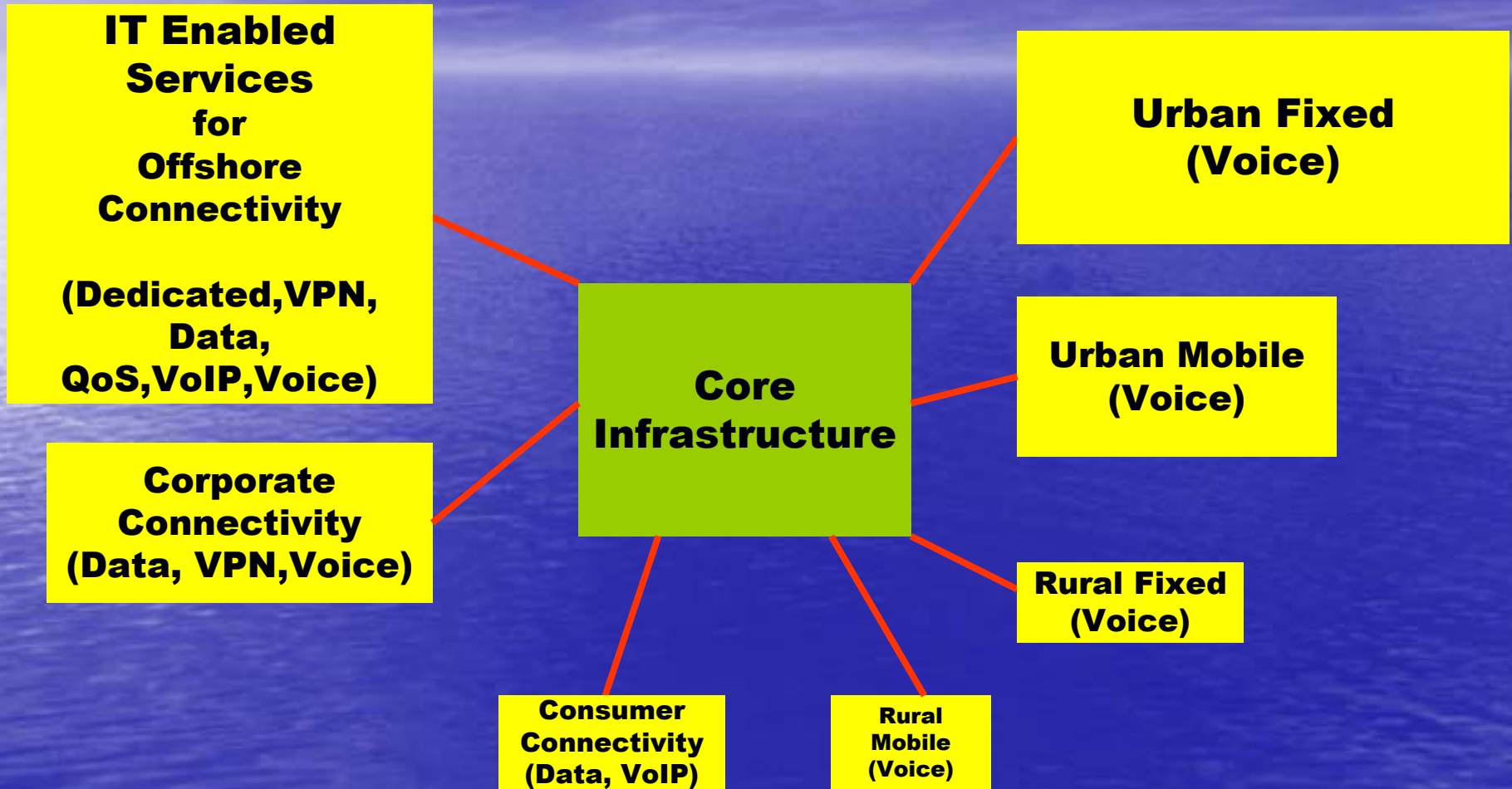
# VIDESH SANCHAR NIGAM LIMITED

## A4 VSNL's Proposed Infrastructure - 2002

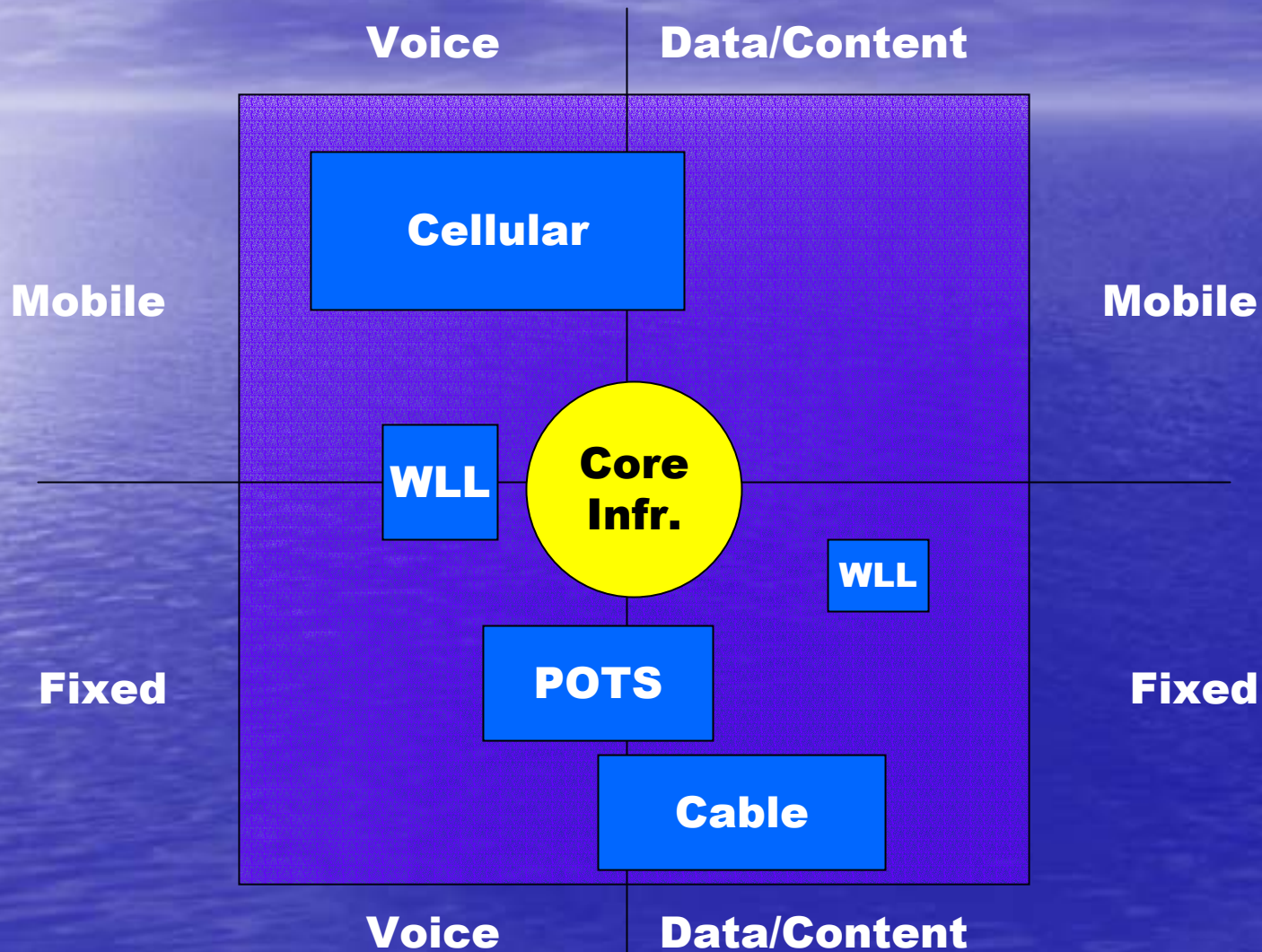


- ◆ 9 international gateways
- ◆ 42 satellite earth stations
- ◆ 5 operational undersea cables
- ◆ India-M Multimedia Network
- ◆ ATM switches
- ◆ Antariksh Satellite

# Demand Drivers



# Anticipated Growth Sectors in India



# Internet Access Marketplace

- No limit on ISPs and license fee waived
- About 100 ISPs operational serving about 3 million subscribers
- Anticipated to be 11 million connections and 23 million subscribers by Dec 2003
- Demand for broadband is very low; limited availability of ISDN, DSL and cable modem
- Strong internet café culture: SIFY has 600 cafés in primary cities, with intent to franchise

# Cable Marketplace

- Ad-hoc poorly regulated industry
- However, Indians are entertainment crazy
- Three times as much TV as telephones
- There are 35 million cable TV connections often strung on rooftops and trees
- Siticable, India's largest cable TV provider has set up pilot data service in Hyderabad
- Satyam Online provides a modem-equipped TV set with infrared mouse and keyboard.
- Typically cable modem services are still expensive compared to dial-up ISP rates



# Cellular Services in India

- Country divided into 22 circles on GSM standard
- Three private + one government operator in each circle; Total of 42 cellular networks
- License fee plus revenue share system
- Cellular now available in over 200 cities
- Total cellular usage is about 7 million with a growth rate of about 25%
- Cell phone call costs twenty times a fixed line call
- Key players: BPL-BTAL, Bharti-Singtel, Hutchison, BSNL and MTNL
- BSNL plans to have 4 million users by 2004 in 600 cities; will also roll out WLL services
- BPL is planning a national GPRS roll-out after Mumbai trial
- India unlikely to migrate to 3G anytime soon

# Broadband Projects

- Reliance Infocom:
  - building a 115,000 km of fiber covering 115 cities; will be Asia's largest broadband network
  - Duct path being laid at 100 km per day
  - Reliance also connecting Chennai to Singapore and setting up data centers
- VSNL has started a 1 Gbps national network
- BPL Broadband is laying a 15,000 km fiber network with five international gateways
- Gas Authority of India (GAIL) plans to build a 9500 km network to connect 11 cities
- Indian Railways has a broadband project (Taitel)
- BSNL is signing up franchises for ADSL based video on demand, cable TV, video-conferencing and fast internet
- New Skies Satellites (Intelsat spinoff) signing up large enterprise deals for voice, video and content
- SIFY (India's 2<sup>nd</sup> largest ISP) is offering fixed wireless connectivity to residential apartment blocks in major cities
- VSNL signs up with ITXC to execute VoIP in foreign markets

# Limited Mobility for Voice - WLL

- Unique government initiative for rapid phone expansion; controversial
- Mobile WLL CDMA phone connects to POTS system
- Allows data transfer rates of 144 Kbps
- 20 Km radius of mobility from base station
- Extends POTS but encroaches on cellular
- Multiple conflicts: license fees, revenue fees, interconnect agreements, urban-rural commitments
- Currently about 300,000 subscribers to WLL phones

# SoftSwitch – Disruptive Technology

- Softswitch – software applications that emulate voice circuit switches to control, route and process calls over a network
- Will supplant proprietary CO circuit switches in packet switched systems
- Key advantages: greater bandwidth, smaller footprint, faster deployment and capability to process voice, data and video
- Costs 50 to 60% less than hardware switches
- Very useful for CLECs to provide integrated IP and PSTN services, VoIP and VoDSL on same network
- Players: Cisco, Lucent, 3Com, Nortel, Tellabs, Siemens

# Internet Telephony

- Legalized in April 2002
- Allows for three types of service:
  - PC in India to PC anywhere
  - PC in India to phone outside India
  - IP based H323/SIP device to similar IP addressable devices anywhere
- Expected to facilitate lower cost, lower quality voice based interactions
- Reduces cost of operations for servicing customers overseas
- Initial consumer usage: through internet cafes

# Complex Issues and Choices

**Rural versus Urban  
(Regulator Issue)**

**Let market decide? Require cross-subsidy?  
Require commitments?**

**Incumbent vs New  
(Regulator Issue)**

**Require shared infrastructure? Allow  
customer switching? Allow market pricing?**

**Technology Spec.  
(Regulator Issue)**

**Require common standards or allow market  
based adoption? How about new technology?**

**Promote Competition  
(Govt/Labor Issue)**

**How do you treat a government incumbent?  
How do you increase efficiency?**

**Market Choices  
(Company Strategy)**

**Where should you compete? Voice (fixed,  
wireless), internet access, infrastructure?**

**Market Choices  
(Company Strategy)**

**Should you have a vertically integrated  
solution? Or specialize in one part of stack?**