Emerging Trends in Broadband Policy & Regulation- A case study from emerging market

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Introduction

Broadband- Broad Definition

- **Generally, Broadband describes high speed, high capacity data communication making use of DSL, Cable Modem, Ethernet, Fixed Wireless Access, Optical Fiber, W-LAN, V-SAT etc.**
- **There is no specific international definition for the Broadband though there is a common understanding that it should be better than ISDN.**
- **As per Broadband Policy 2004, Broadband in India is defined as:**
  - **'Always-On' data connection that is able to support various interactive services including Internet access having the capacity of a minimum download speed of 256 Kbps to an individual subscriber form the Point of Presence of the service provider.**

    (The interactive services will exclude any services for which a separate license is specifically required)

    There is a move to upgrade this to 2 MBPS.

Broad ICT Statistics-India
(Sept. 2007)

1) Population- 1.1 billion

2) Fixed Teledensity – 3.6 (40 million nos.)

3) Mobile Teledensity – 18.5 (205 million nos.)

4) Gross Teledensity – 22 (245 million nos.)

5) Internet Connections – 40 million

No. of PCs- 22 million

7) No. of TVs- 105 million

8) No. of Cable TV Connections- 62 million

9) International Connectivity- 380 Gbps/16.7Tbps (Designed)

10) National connectivity- 10 Gbps (7 Lakh Kms)

11) Broadband Connections (>=256 Kbps) – 2.75 Million

12) International Gateways by ISPs- 25 (Including 8 on Submarine cables)

Top 15 countries in Internet usage

Year-end 2005	Internet users (Mil)	Share %
USA	197.8	18.3
China	119.5	11.1
Japan	86.3	8.0
India	50.6	4.7
Germany	46.3	4.3
UK	35.8	3.3
South Korea	33.9	3.1
Italy	28.8	2.7
France	28.8	2.7
Brazil	25.9	2.4
Russia	23.7	2.2
Canada	21.9	2.0
Indonesia	18.0	1.7
Mexico	16.9	1.6
Spain	15.8	1.5
Top 15 countries	750.0	69.4
Worldwide Total	1081	100

(American Consulting Firm)

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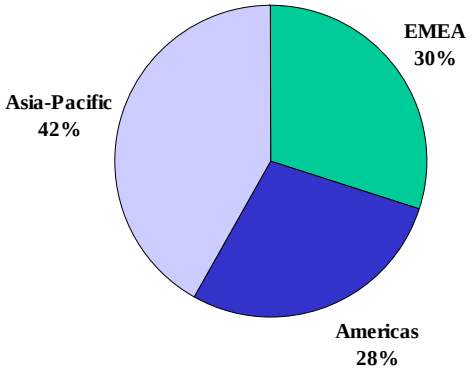
Targets for Internet & Broadband Penetration (Broadband Policy 2004)

Year Ending	Internet Subscribers (in million)	Broadband Subscribers (in million)
2005	6.0	3.0
2007	18.0	9.0
2010	40.0	20.0
Sept. 2007 (Actual)	40	2.75

Broadband -Regional distribution

Asia-Pacific leads



Share of 176 m lines, June 2005

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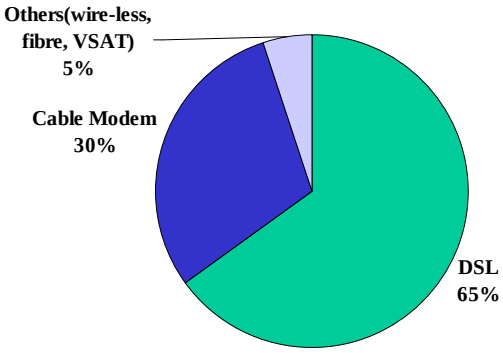
Broadband – Technology wise deployment



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Roadblocks for Broadband

1. Price

- Price for broadband access @ USD 7 per month – still unaffordable to masses

2. Access to the customer

- Lack of access to the incumbent's copper loop for DSL by competitors
- Low quality of cable TV infrastructure and lack of industry organization
- High costs for DTH and VSAT access
- Bottlenecks preventing wireless solutions from spreading
- Cumbersome processes for Right Of Way (ROW)

3. Cost of connectivity

- Lack of effective competition in the "within city"/ last mile access networks
- High costs of international bandwidth (Now reducing)
- Ineffective implementation of National Internet Exchange of India (NIXI)

4. Fiscal policies

- High taxes and duties, and lack of fiscal incentives for faster Broadband growth

5. Content and applications

- Lack of locally relevant content and absence of "change agent" to drive growth

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Govt's Role in Promoting Broadband

- **Creating the right policy environment by removing entry barriers.**
- **Creating National Backbone infrastructure.**
- **Establishing Internet Exchange in the country.**
- **Permitting Unlimited Competition for Broadband.**
- **Encouraging International players to setup Gateways in the country.**
- **Funding community investment in Broadband in uneconomic remote rural areas.**
- **Leveraging Govts own demand and setting example by being on-line leader.**
- **Extending special tax concessions for equipments & access devices used for Broadband.**

Enabling Regulation for Broadband

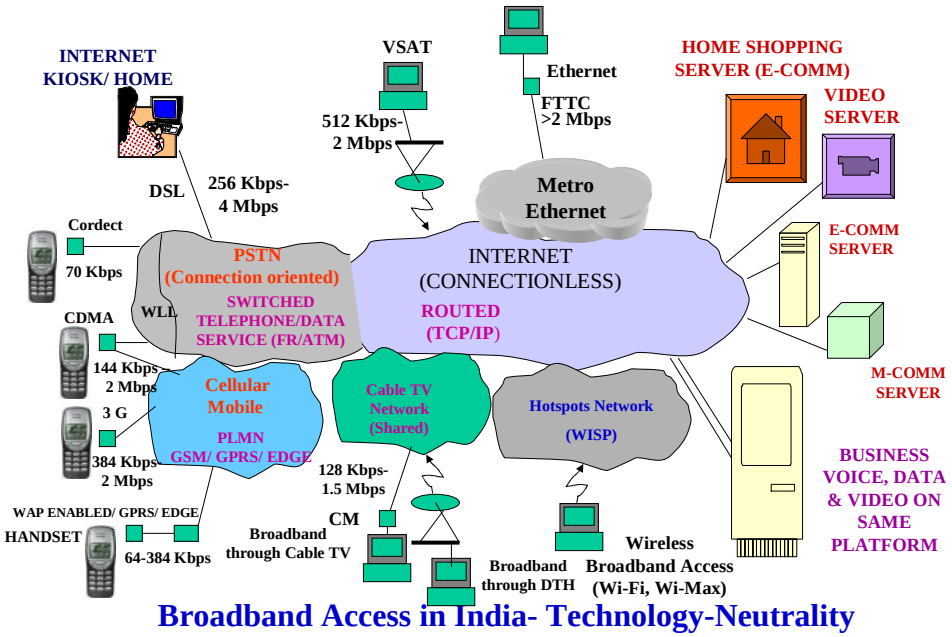
- **Promoting facility-based competition by lowering market entry barriers.**
- **Permitting infrastructure sharing among different service providers for optimum utilization and cost reduction.**
- **Allowing captive infrastructure of utility companies to be used for public Broadband service.**
- **Reducing the bottleneck in last-mile access by facilitating deployment of alternative technologies like Cable TV network, Wireless, Power Line, unbundling of local loop, etc.**
- **Reducing the cost of bandwidth for domestic and international Internet connectivity.**
- **Allocation of suitable Radio Spectrum for Broadband services and reduced spectrum charges.**
- **Permitting broadcast infrastructure like DTH to be used for Broadband access.**

Liberalized Licensing and Regulation for Broadband Services

- **Same as Internet Service Providers' (ISP) License.**
- **The most liberal licensing regime.**
- **Unlimited competition (160 ISPs operational, 400 Licenses signed).**
- **Minimal entry fee.**
- **No license (revenue share) fee except 6% for Internet Telephoy. No contribution to Universal Service Fund (USF).**
- **Permitted to have own international gateway through sub-marine optical fiber cable or satellite.**
- **FDI limit of 74% for ISPs as well as International gateway service providers.**
- **Permitted to make use of BSO's Dialup Network, Cable TV's Network, own Copper, Fiber, Radio for last-mile connectivity.**
- **2.4 Ghz (ISM) and and 5.7 to 5.8 GHz band de-licensed for indoor as well as outdoor usage for broadband access (5.1 to 5.3 Ghz delicensed for indoor & in-campus usage).**
- **High speed WLL permitted for BSOs.**
- **A liberal V-SAT licensing policy (upto 2Mbps).**
- **Permission to use DTH setup for Receive-Only Internet.**

Broadband Policy- Technology Neutrality

- **Service Providers can choose any technology**
- **Over existing infrastructure**
  - ✓DSL/ ADSL over Copper loop
  - ✓Cable Modem over Cable TV network
  - ✓Power Line Broadband Access
- **Over new Cable Infrastructure**
  - ✓Fiber To The Curb (FTTC)
  - ✓Fiber To The Home (FTTH)
  - ✓Hybrid Fiber Coaxial (HFC)
  - ✓Metro Ethernet over Fiber
- **Over Wireless Infrastructure**
  - ✓Fixed Wireless Broadband Access (FWBA) (WiMax 802.16d)
  - ✓Wireless LAN (Wi-Fi) (802.11a/ b/ g)
  - ✓Satellite (V-SAT, DTH)
  - ✓High speed WLL (GPRS, EDGE, CDMA, CorDect)
  - ✓3G Cellular Mobile System (WCDMA, EVDO, IMT2000)
  - ✓B3G Technologies (802.16e, WiBRO, Mobi-Fi)



Broadband Access in India- Technology-Neutrality

(making use of existing infrastructure & wireless)

Enabling Faster Growth of Broadband

1. Evolution of Alternate Last Mile Technologies
2. Mobile Technology Developments
3. Broadband using DTH for Receive-only Access
4. V-SAT for Broadband Access
5. Facilitating Radio Spectrum for Broadband Access
6. Fiscal measures to reduce the cost of access devices, infrastructure and service
7. Reduction in the cost of connectivity
8. Quality of Service for Broadband
9. National Internet Exchange of India (NIXI)

1. Evolution of Alternate Last Mile Technologies

- Use of Coaxial Cable for Telecom Services (Cable TV Network for Broadband and telephony local loop).
- Use of DSL technology on traditional Copper Loops (DIY, Franchising, Shared unbundling, Bit stream access).
- Wireless Access Service for Fixed and Mobile communication.
- VSAT-based Access in remote areas.
- DTH based one-way Broadband Access.
- Emergence of Metro Ethernet Networks

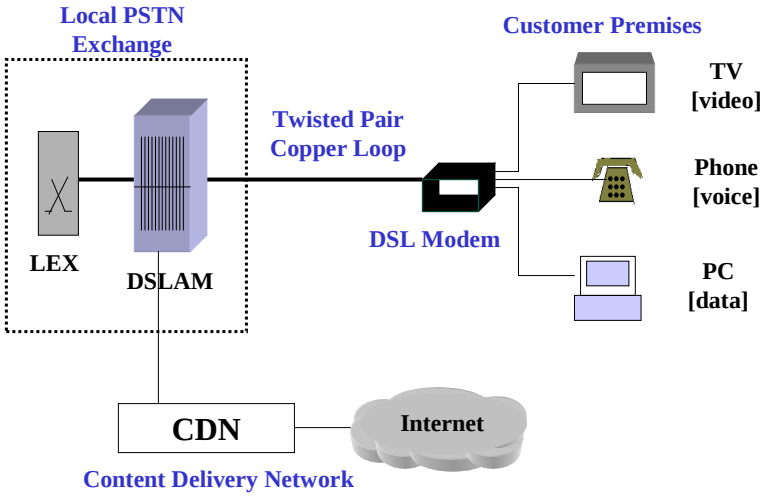
Technology Alternatives for Wireline Broadband

1. Evolution of Wireline Technologies

i) Use of Digital Subscriber Loop (DSL) technology on traditional Copper Loops (DIY, Franchising, Shared unbundling, Bit stream access)

- Asymmetric DSL (ADSL) – 1 Mbps upstream/ 8 Mbps downstream, 3 Km
- ADSL (G.Lite) – Splitter free, 512 Kbps upstream/ 1.5 Mbps downstream, 5.4 km
- Symmetrical DSL – 1.5 Mbps, 3 Km
- Single pair High-speed DSL (SHDSL) – 2.3 Mbps symmetric, 3 Km
- ADSL 2, ADSL 2 plus – 8/16 Mbps, 1.5 Km
- Very high Data Rate DSL (VDSL) – 52 Mbps, 1.5 Km

Broadband over copper loop (DSL)



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ii) Cable TV Networks can play a significant role in providing broadband

- Broadband over cable TV accounts for 74% of total connections in US, and 55% in Canada
- 62 million cable homes in India, but infrastructure can not support bi-directional communication and requires upgrade
- Regulatory environment, via an ISP license, allows this with some MSO's and operators already doing so
- For advances to occur, better organization of the industry needed to be executed
- Cable operators will need to adopt innovative business models to compete in converged environment
  - Possible to provide upgraded entertainment services such as interactive digital TV, pay-per-view, video on demand and time-shifted TV
  - Benefits operators with significantly higher ARPU and better customer retention
  - To start with Cable TV network which is uni-directional can be used for downloading, the uplink to be conventional narrow band like dialup/ ISDN/ RADIO
- Operators need training to create awareness about utility of their networks and understanding of the investments required, returns possible, and technical aspects

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iii) Fibre Optic Cable Technologies

- Fiber To The Curb (FTTC) – by existing operators
- Fiber To The Home (FTTH) – Fibre in last mile to deliver converged services
- Hybrid Fiber Coaxial (HFC) – by Cable TV operators
- Metro Ethernet (Fibre based) – extending the range of LAN
- GPON (Gigabit - Passive Optical Network) – triple play over TDM
- No limitation of distance or throughput speeds

iv) Broadband over Powerline (BPL) Technologies

- Use of existing domestic power connections for sending data
- Throughput in the range of 1 MHz (4 – 6 Mbps)
- Ideal for rural areas where telecom / cable TV infrastructure may not be there

v) Metro Ethernet Networks

- Use of Ethernet beyond LAN
- Use of high-speed access using hybrid fiber/ copper based Ethernet technology
- Power over Ethernet (POE)

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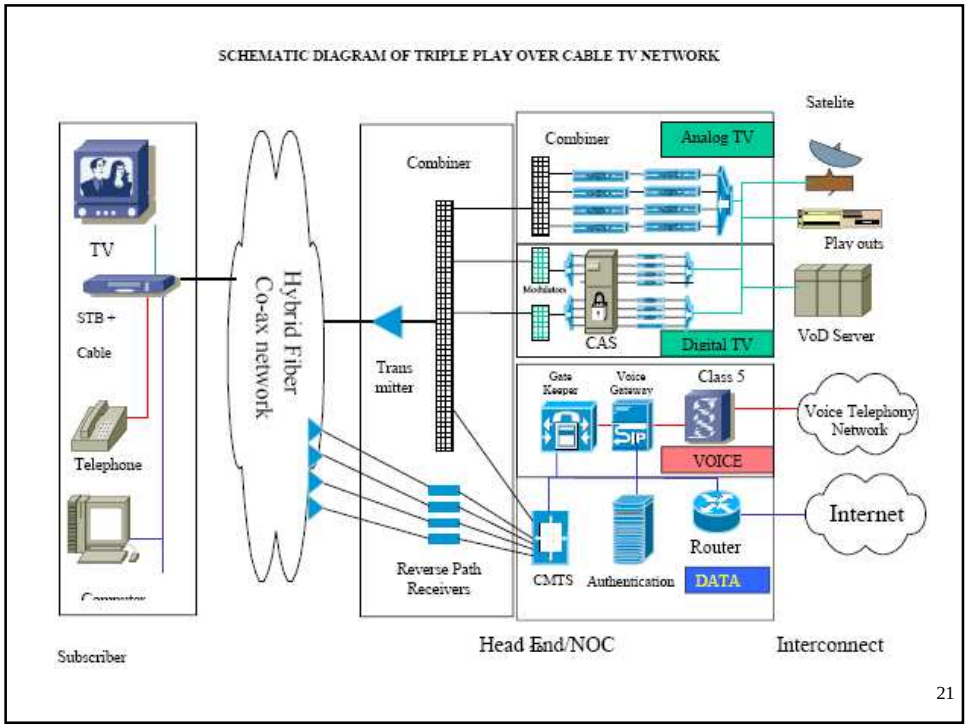

2. Mobile Technology Developments

- **GPRS, EDGE, CDMA-2000-1X, CorDect, 802.11 (WLAN, Wi-Fi),802.16d (Fixed WIMAX) PTT, Bluetooth (802.15) - Already Available.**
- **UWB, 3G, B3G, 802.11n, 802.16e (Mobile WiMAX), OFDM, 802.20(WWAN, Mobi-Fi, MBWA)- Emerging out.**
- **Personnel Area Network (PAN), Home Area Network (HAN), Vehicle Area Network (VAN)- becoming a possibility.**
- **Software Defined Radios (SDR) – Multi-Functional, Multiservice, Multiprotocol, Multiband, Multimode (Universal) Radios.**
- **Cognitive Radio – Capable of working in idle spectrum,Guard Bands**

Broadband Wireless Access (BWA) Technologies

Technology	*Max Throughput*	*Frequency Bands*	*Typical Range*	*Application*
WiFi (802.11x)	54 Mbps/ 11 Mbps	2.4 G, 5.1 G	100-400 mtrs	WLAN, HAN
WiMax (802.16x)	70 Mbps	700 MHz, 2.3 G, 2.5 G, 3.5 G, 5 G	Up to 50 Kms	WWAN
Mobi-Fi (802.20)`	40 Mbps	2.4, 3.5, 5.5 G	8-10 Kms	Mobile Broadband
CorDect	70 Kbps	1900 MHz	10-15 Kms	WWAN
WCDMA/ 3G	2.0 Mbps	1900-2100 MHz	Unlimited (Cellular)	Mobile Broadband
EV-DO,HSPDA	2.4 Mbps (shared)	450,,900,1800 MHz	Unlimited (Cellular)	Mobile Broadband
EDGE	230 Kbps	900,1800 MHz	Unlimited (Cellular)	Mobile Internet
GPRS	58 Kbps	900,1800 MHz	Unlimited (Cellular)	Mobile Internet
CDMA (2000-1X)	144 Kbps (shared)	450,,900,1800 MHz	Unlimited (Cellular)	Mobile Internet
FSO	100 Mbps to few Gbps	Light Wave	Few Kms	CAN
Microwave radio (MMDS/ LMDS)	Few Mbps	3.5 G – 31 G	50 Kms +	MAN
VSAT	20 Mbps	4 G – 11 G	Unlimited	GAN (Remote Area)
Wireless USB 2.0	480 Mbps	2.4 G	10 mtrs	PAN, HAN
Bluetooth(802.15.1	3 Mbps	2.4 G	1-10 mtrs	PAN, HAN
Infrared	16 Mbps	Light Wave	1-5 meter	PAN, HAN,
ZigBee/ UWB	200Kbps/400-500Gbps	2.5G-5.8G	1-100 mtrs	PAN, HAN, VAN
RFID	Few Kbps	2.4 G,900Mhz	Few Inches	PAN, HAN, VAN

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Technology Comparison – BWA (3G and beyond)

	WCDMA (3G)	HSDPA (3G+)	EVDO (3G)	802.16 a/d	802.16e	802.20
Bandwidth	5 MHz	5 MHz	1.25 MHz	1.25-20 MHz	1.25-20	1.25-5 MHz
Typical Spectrum	1.9-2.1 GHz	1.9-2.1 GHz	450-1900 MHz	2.3-5.8 GHz	2.3-3.8 GHz	Various
Downlink Peak Rate	0.4 bps/Hz	2.9 bps/Hz	2.5 bps/Hz	3.2 bps/Hz	3.2 bps/Hz	2.4-3.6 bps/Hz
Uplink Peak Rate	0.4 bps/Hz	0.4 bps/Hz	1.4 bps/Hz	2.4 bps/Hz	2.4 bps/Hz	1.2 bps/Hz
Ave DL Thr put	0.1 bps/Hz	0.7 bps/Hz	0.9 bps/Hz	0.53 bps/Hz	0.75 bps/Hz	0.78 bps/Hz
Ave UL Thr put	0.1 bps/Hz	0.1 bps/Hz	0.32 bps/Hz	NA	NA	0.35 bps/Hz
Flat IP Support	No	No	No	Yes	Yes	Yes
Mobility	Full	Full	Full	Fixed	Limited	Full

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ERROR: undefined
OFFENDING COMMAND: setl

STACK:

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