

# Convergence & Broadband in Digital Era

ITU-TRAI  
INTERNATIONAL TRAINING PROGRAMME  
(ITP 2012)

*Rajkumar Upadhyay*  
*Advisor, TRAI*

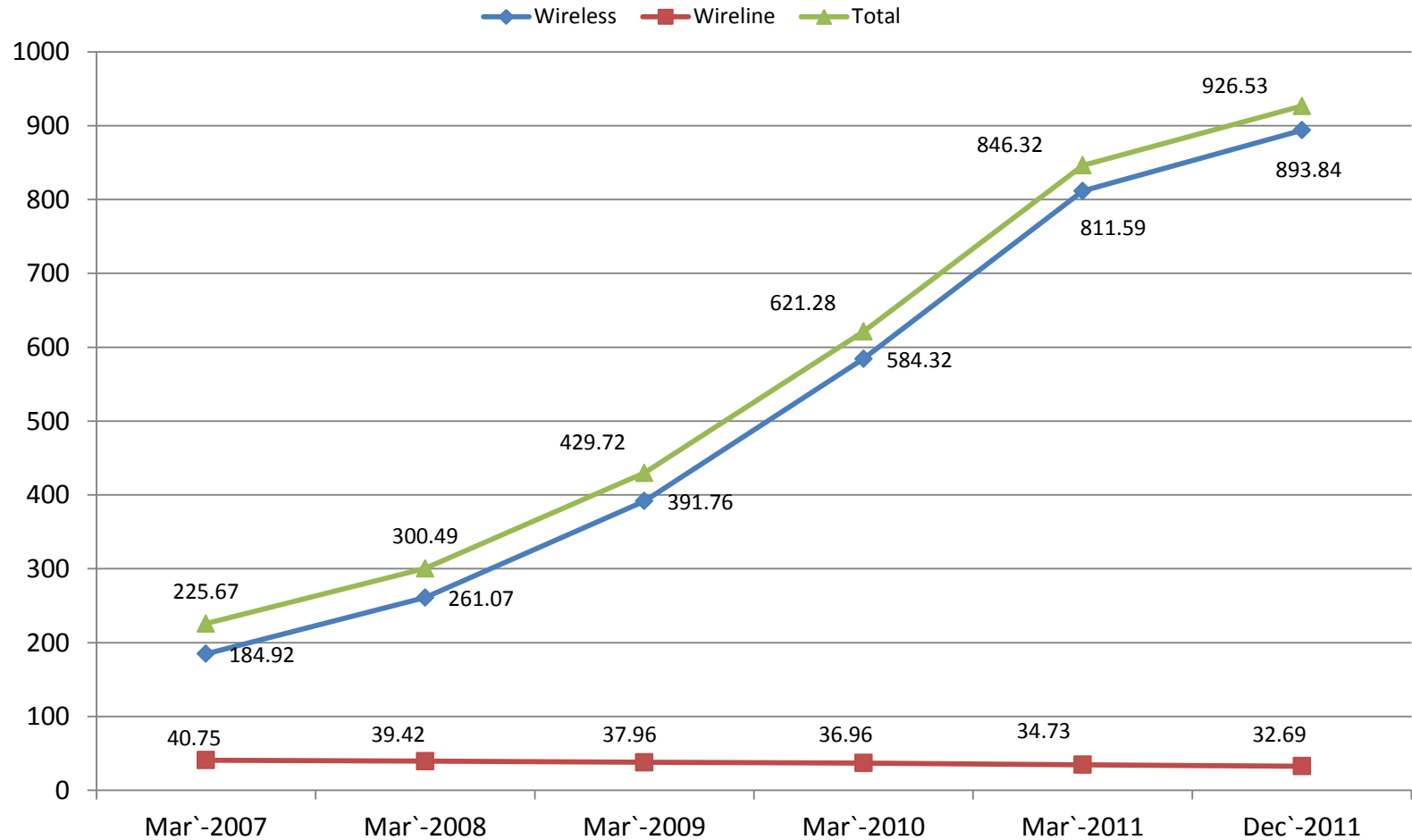
# Agenda

- India at a glance
- Why Broadband?
- Drivers of Broadband
- Broad factors affecting the growth of broadband
- National Broadband Plan of India
- Convergence
- Regulatory Issues
- Steps taken towards Convergence

## India at a glance

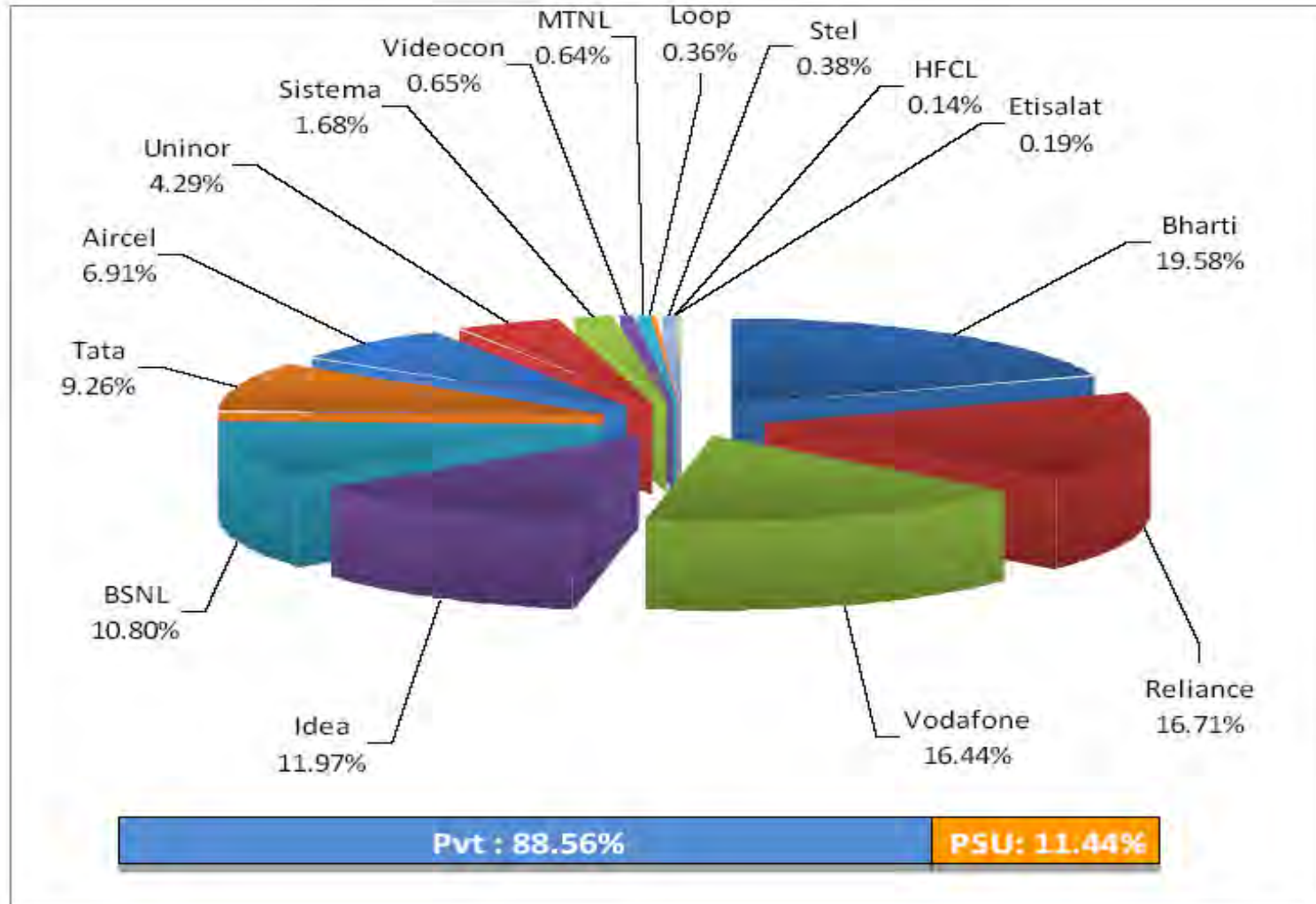
Population	1.21 Billion
Area	3.33 million km <sup>2</sup>
GDP	1.72 Trillion USD
Per capita Income	1219 USD
Literacy rate	74.04%
Language	22 Languages
Life Expectancy	65 Years

# Subscriber Growth (in millions)

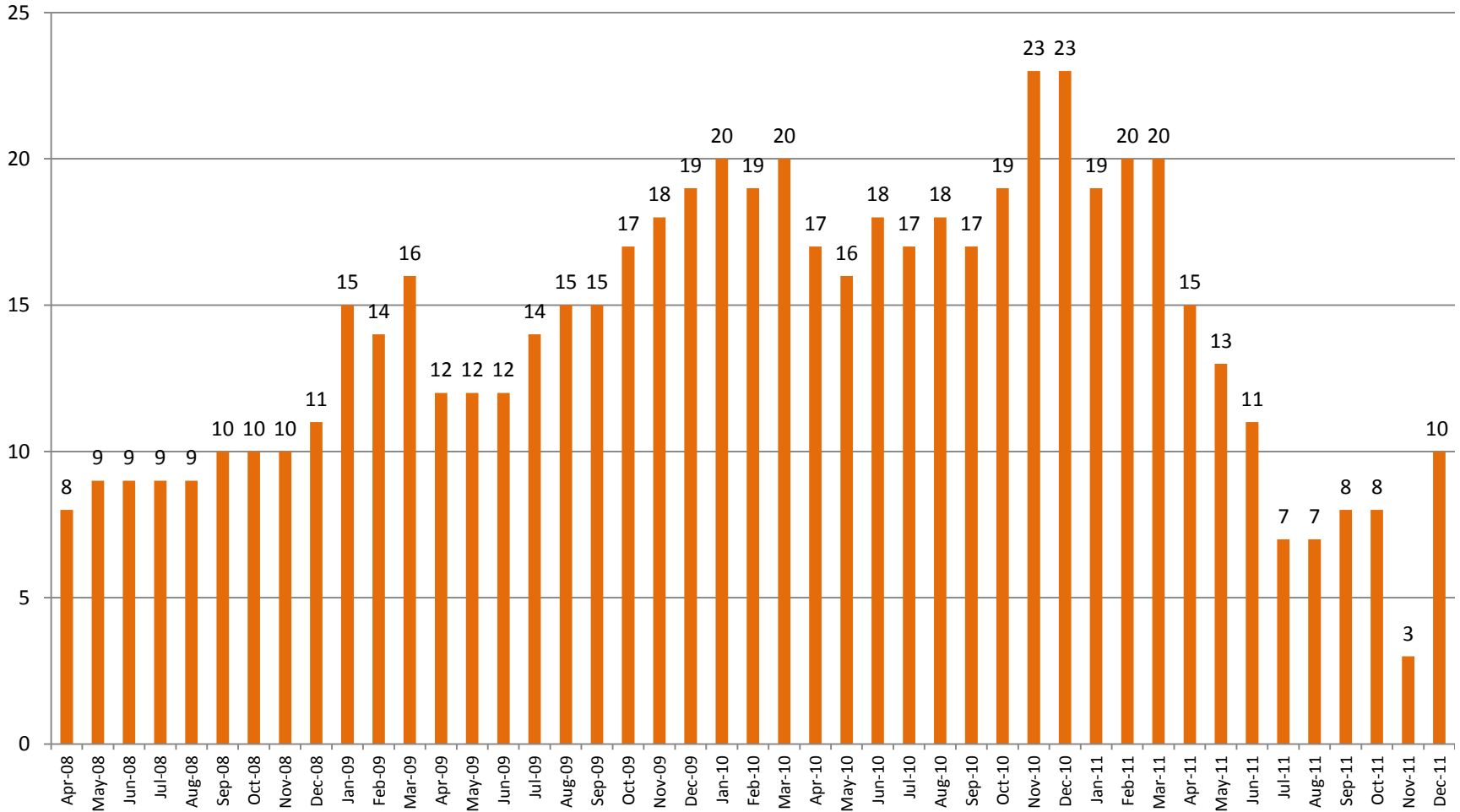


# Fifteen operators providing cellular services

( Market share, Jan-2012)

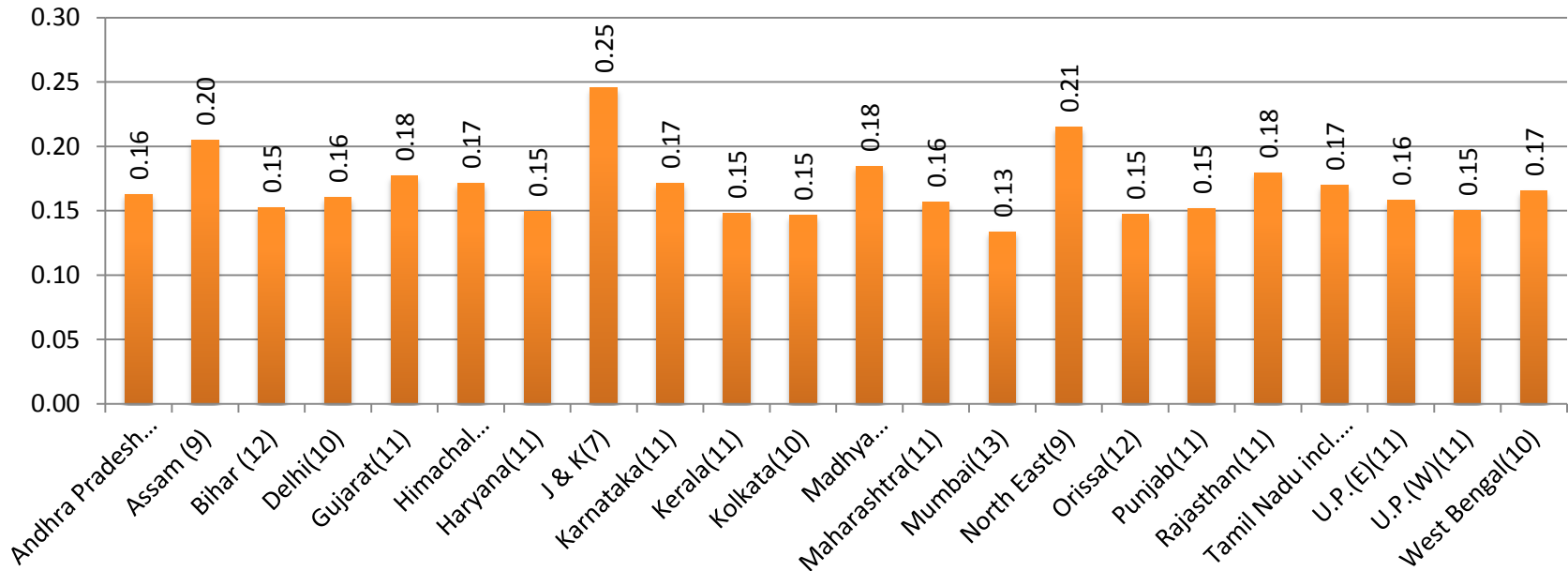


## Net Wireless Subscribers Addition per Month (in millions)



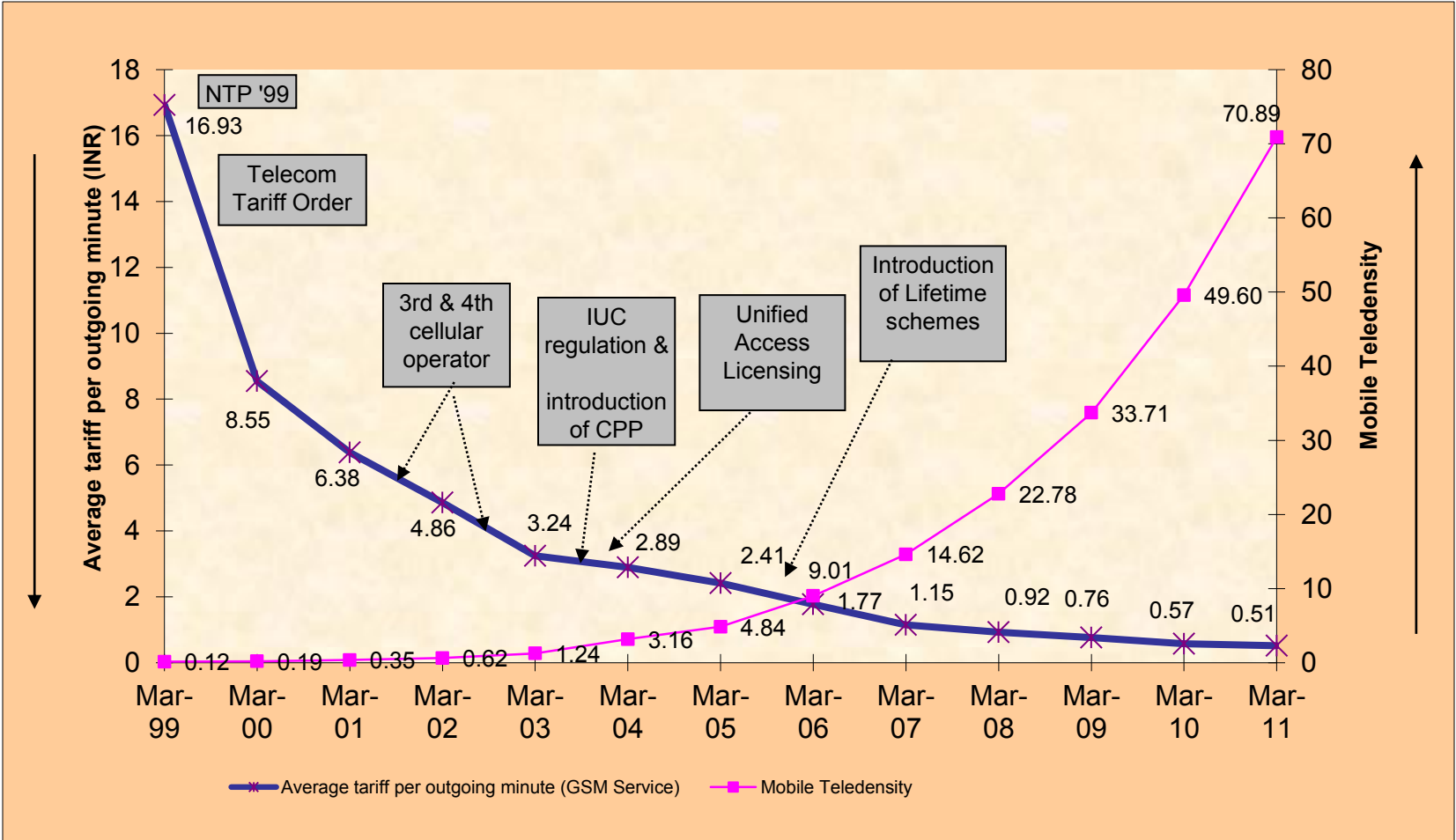
## Level of competition in wireless telephony

Circle wise HHI (Wireless) as on 31st March 2011



(\*\*) indicates number of operators in the circle

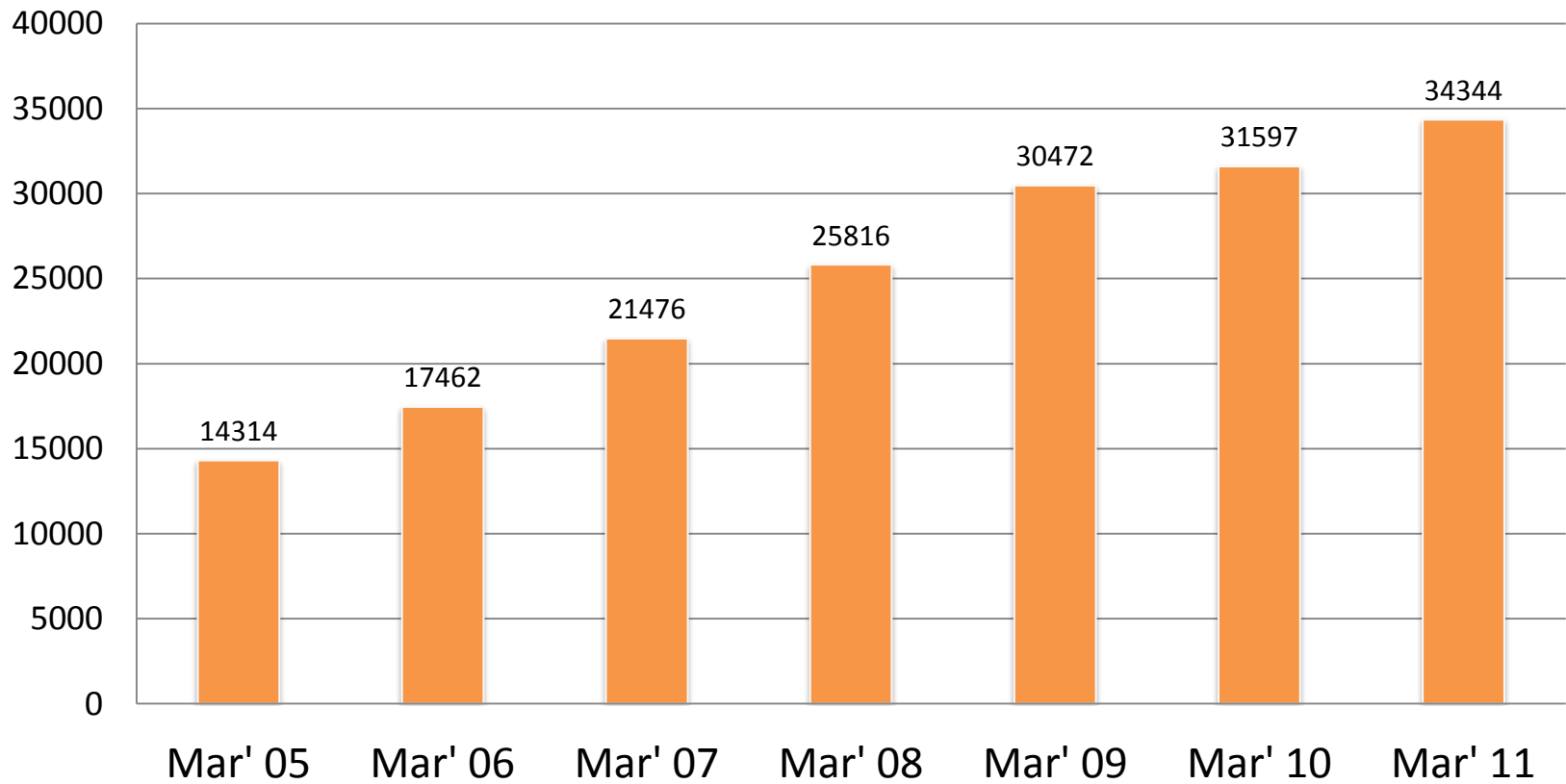
# Mobile tariffs, growth and some key initiatives



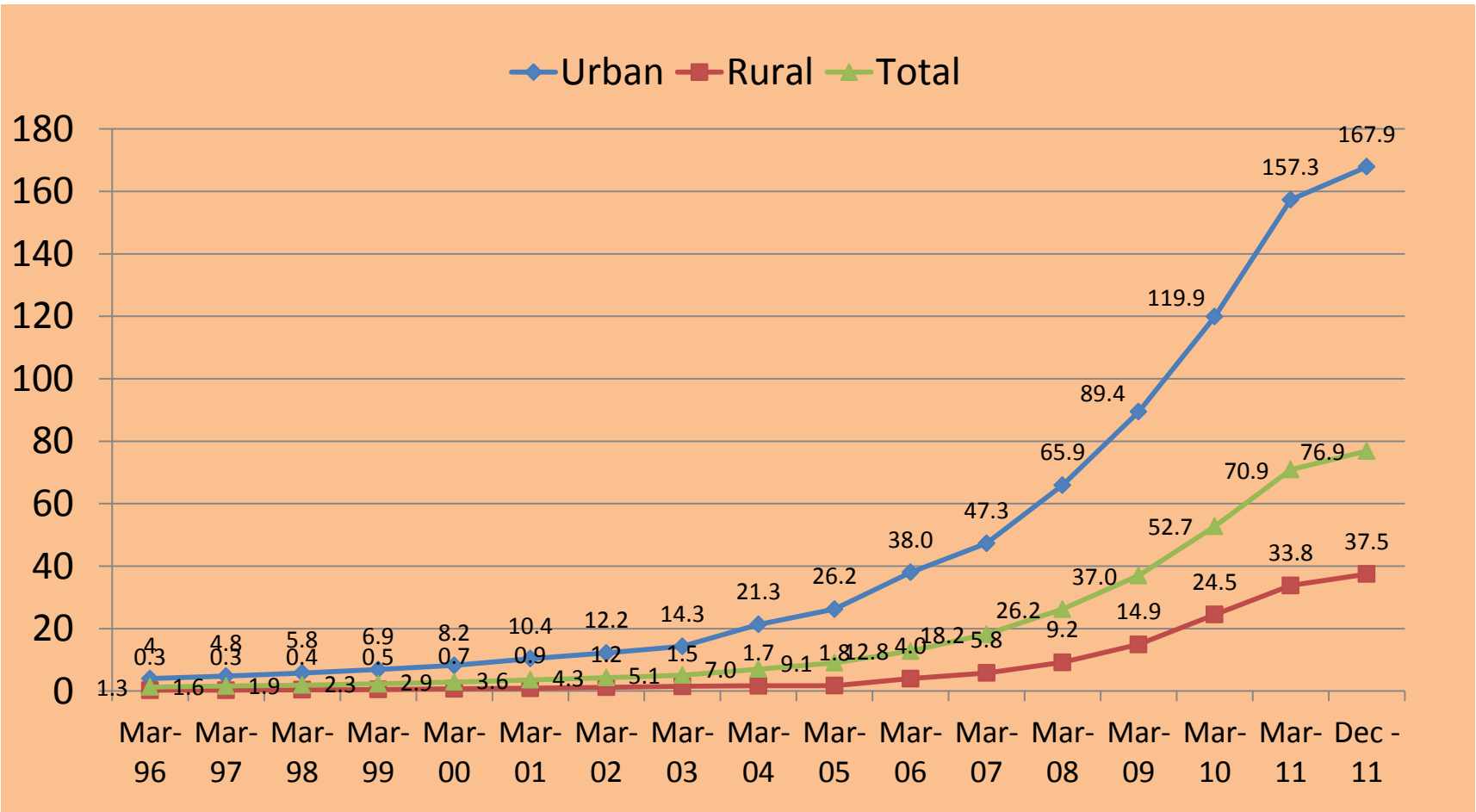


# Revenue Growth

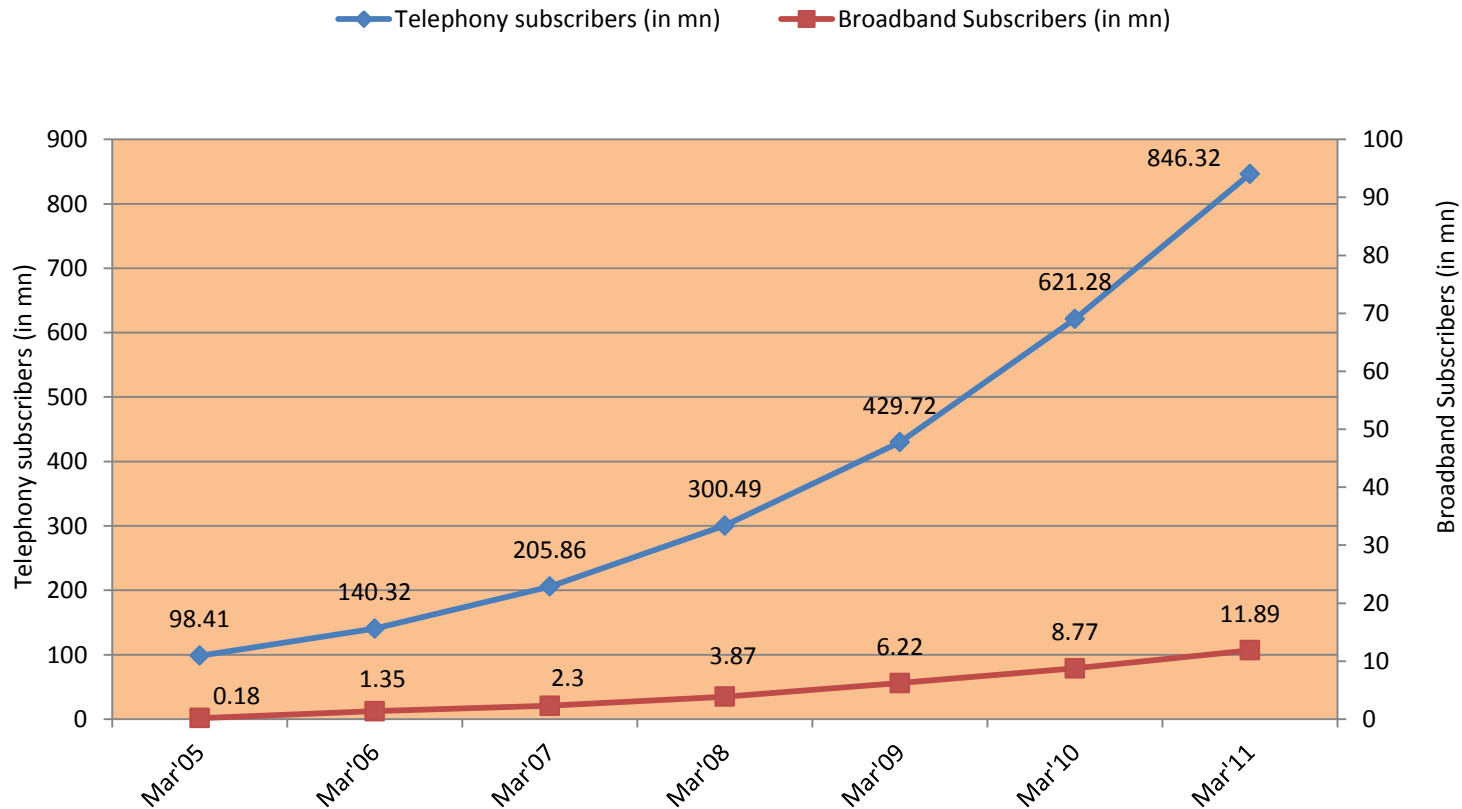
## Revenue (In million USD)



# Bridging the digital divide – growth in teledensity



# Broadband vs Telephony growth in India



- Monthly broadband subscriber growth is just about 0.25 mn as compared to 18 mn of telephony subscribers

# Why broadband?

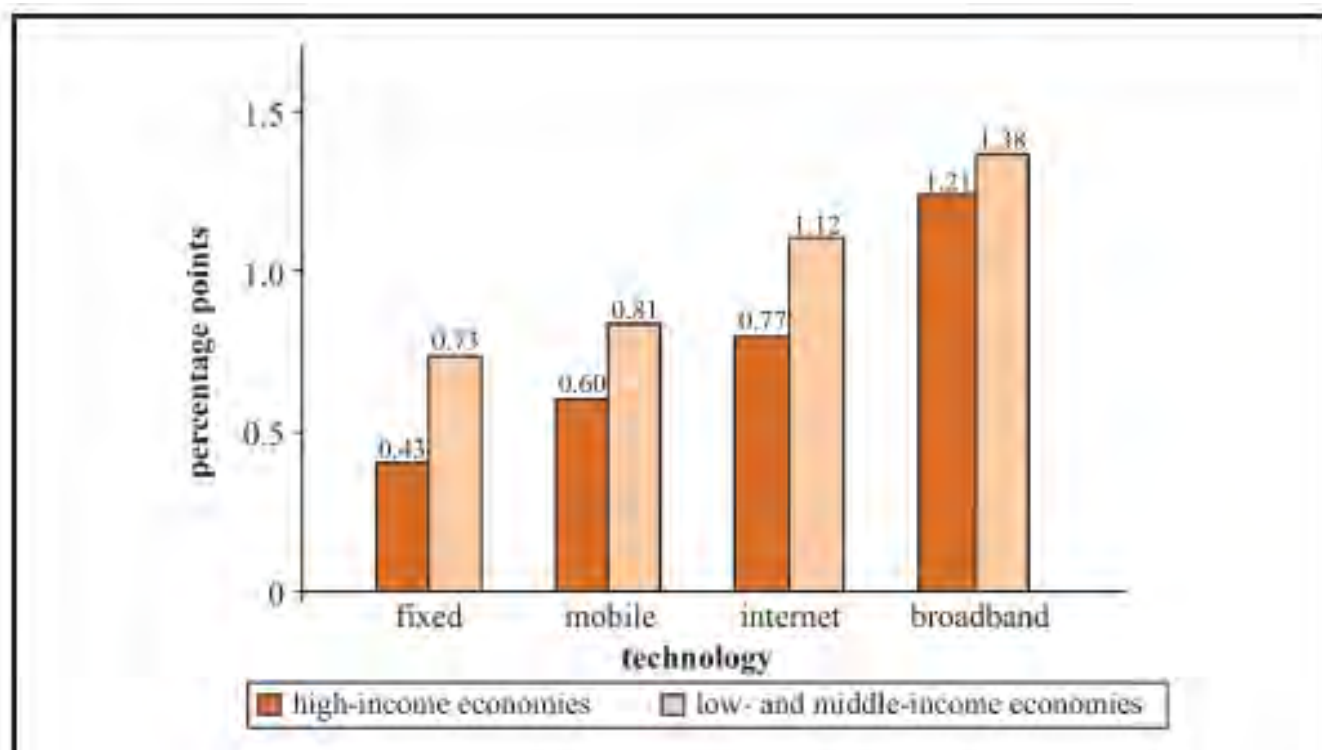
# Why Broadband ?

- ICT in general and broadband in particular **contribute to GDP growth and poverty elevation.**
- World bank study indicates that **1.38 % increase in GDP** for every **10% increase** in broadband penetration.
- Broadband provides **access to enormous information** and knowledge bank.
- **Boost employment opportunities** and IT proliferation.
- **Creates entrepreneurship.**
- Provides a **platform for creation of advanced applications.**
- **Better revenue realization** through online payment and monitoring facilities.



**Broadband impacts all facets of life**

# Impact of Broadband penetration on Economy



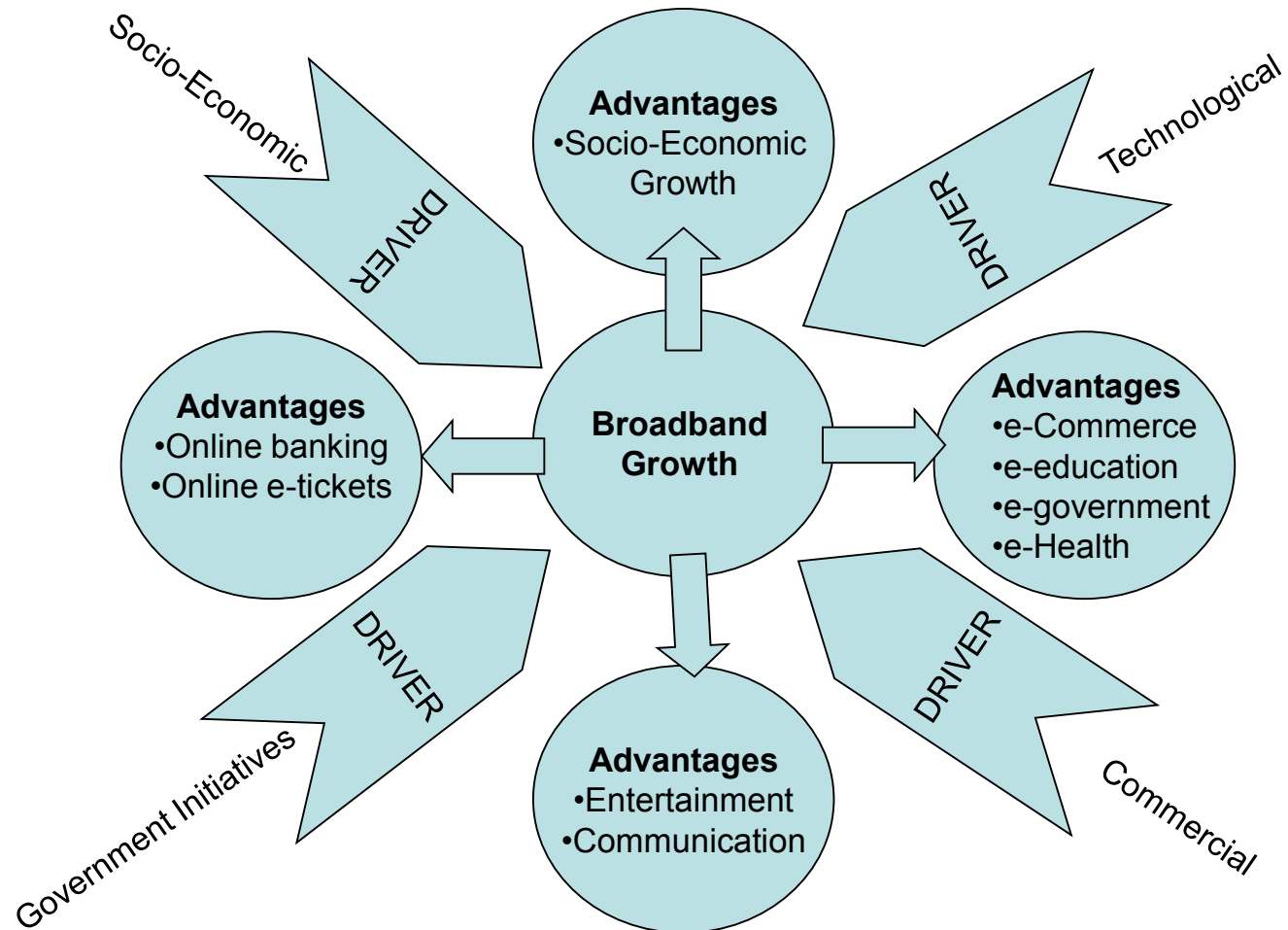
Source: Christine Zhen-Wei Qiang (2010) - Broadband infrastructure investment in stimulus packages: relevance for developing countries

**Developing countries will get more benefit from higher broadband penetration.**

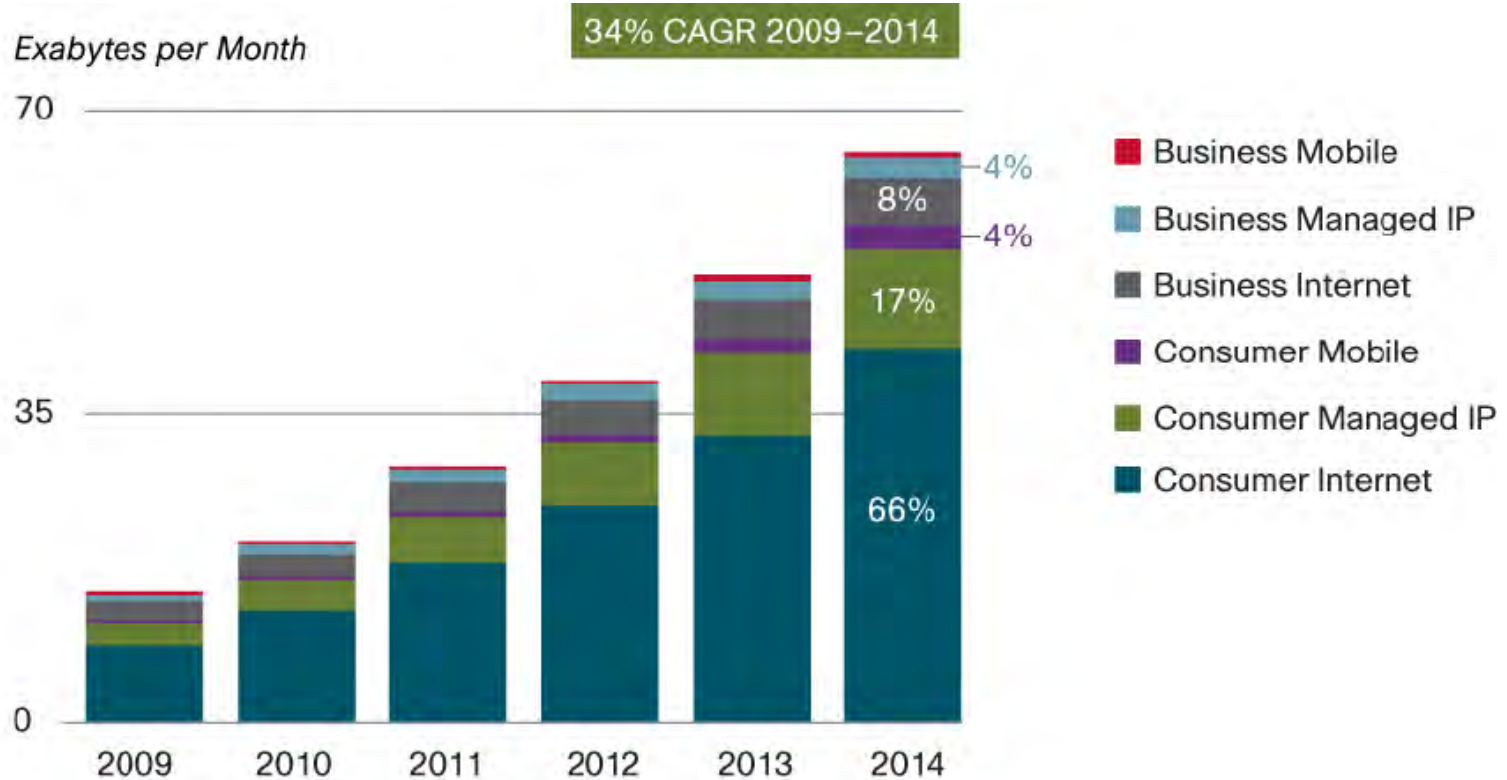
# Drivers of Broadband



# Drivers and Advantages of Broadband



# Growth in IP traffic

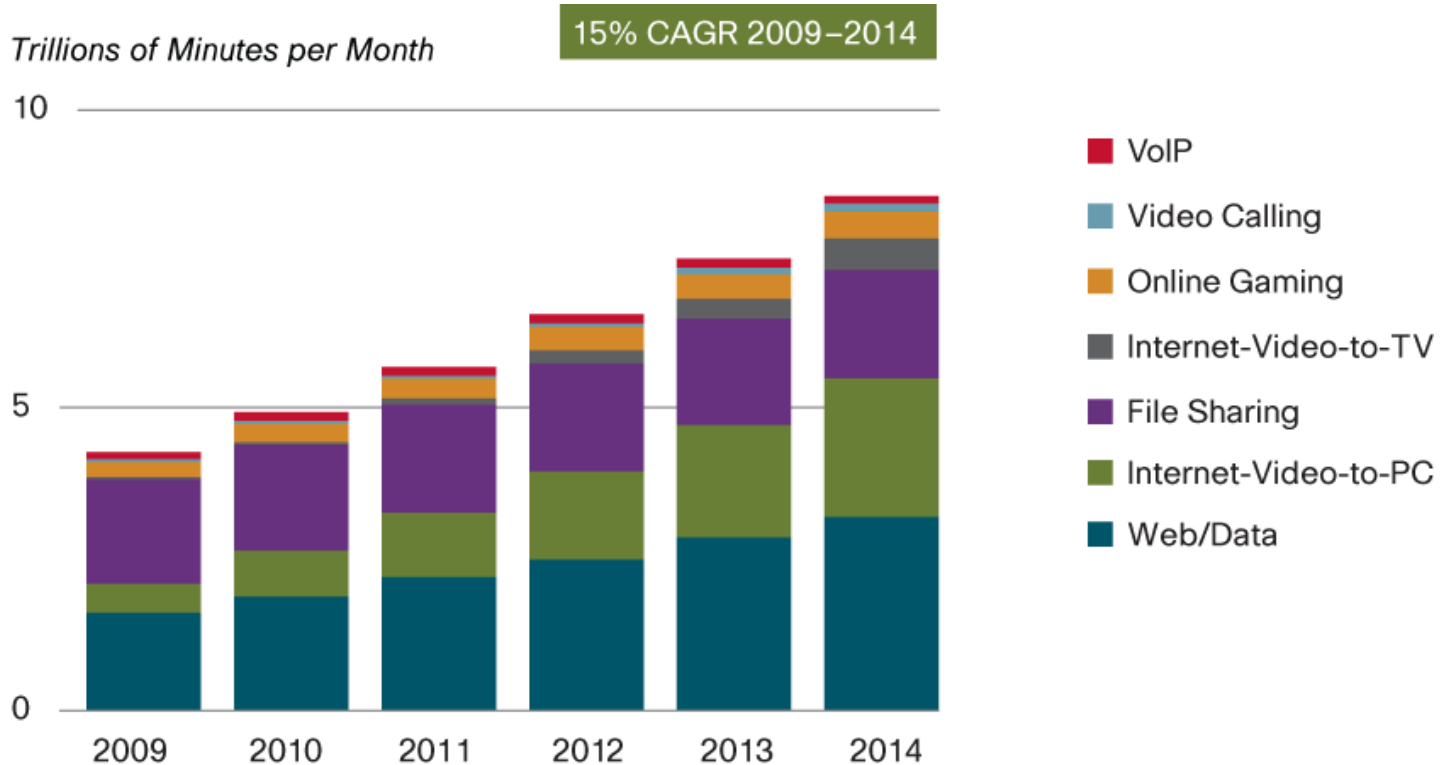


**Expected to reach 64 Exabytes per Month in 2014**

Source: CISCO VNI, 2010

1 Exa byte =  $10^{18}$  byte

## Growth of Consumer Internet Minutes of Use



**Consumer Internet Minutes of Use Will Reach 7.7 Trillion Minutes per Month in 2014**

Source: CISCO VNI, 2010

## Growing Number of Applications

### Picking Applications

Cloud Computing, Grid Computing

Online gaming, Live online events, IPTV, Video on Demand

E-commerce, Tele working

### Face Book

750 million active users

30 billion pieces of content shared each month

### Twitter

3 billion requests a day

200 million tweets per day

### YouTube

2 billions views per day

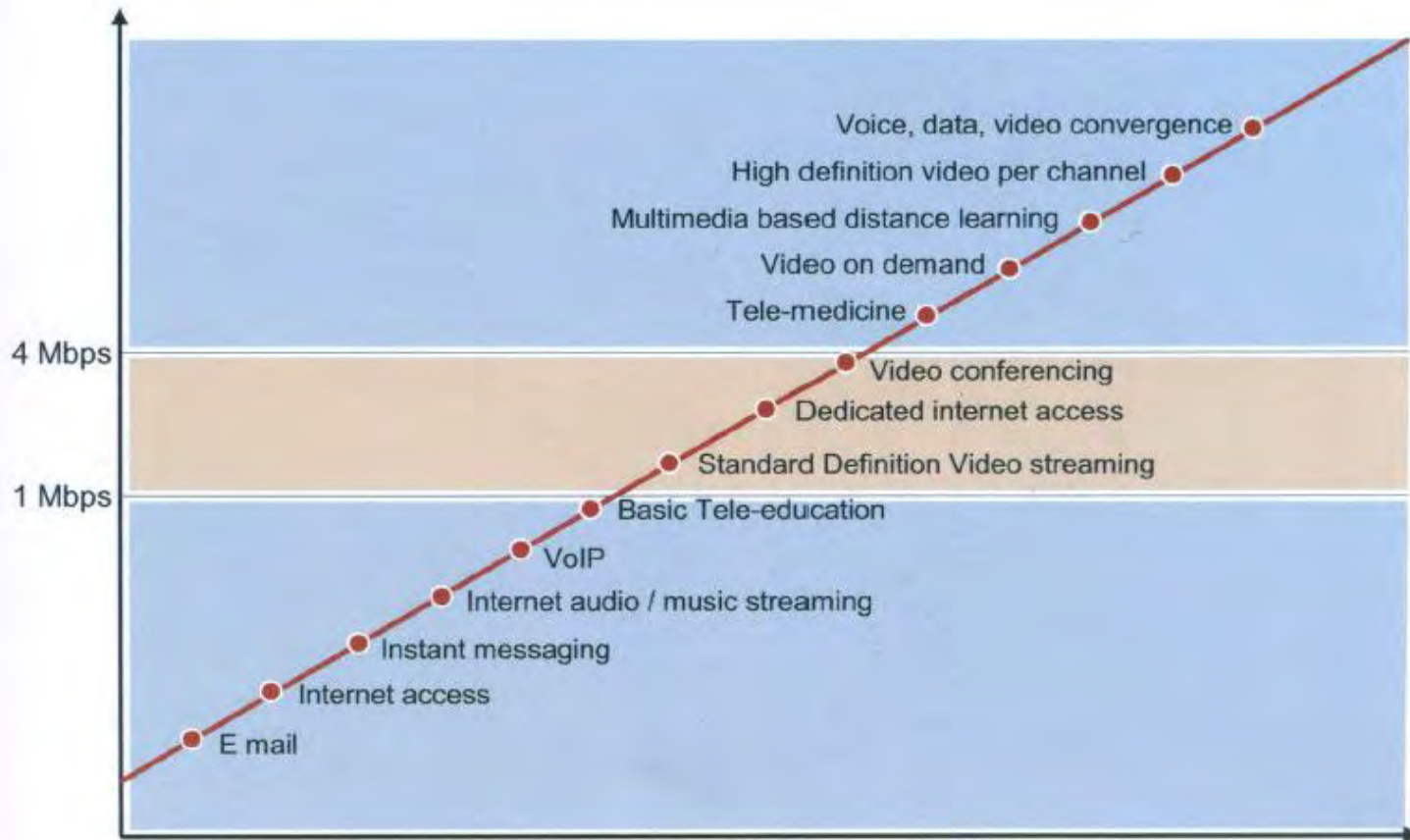
7000 hours of video

100 million views/day on mobile

## Growing Bandwidth Requirement

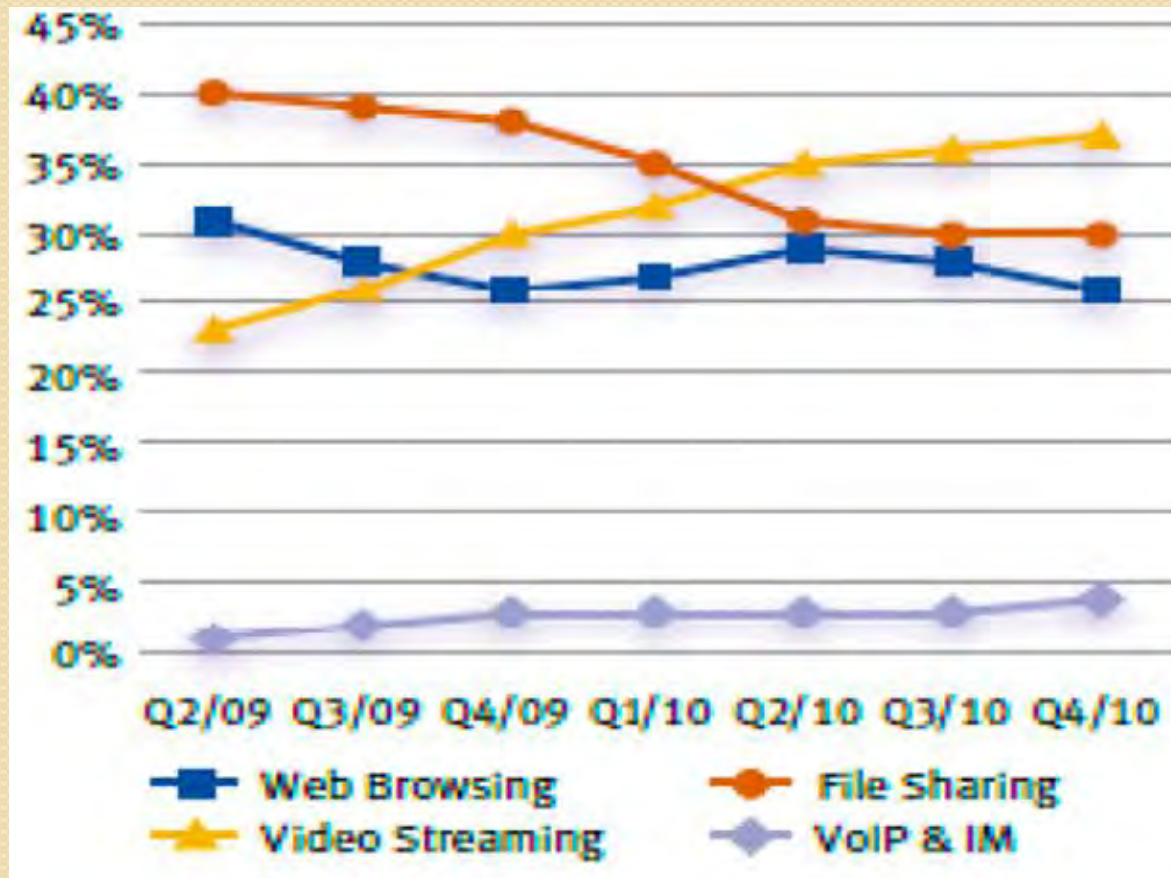
Application	BW (Kbps)
E-mail	64
VoIP	256
Browsing and file transfer	1,024–4,096
Online gaming	448–2,048
Audio channels	128–6,144
Multi-set IPTV	3,072–10,024
Video call file transfer	3,072–10,024
Cloud computing	4,096–20,480

# Bandwidth requirement per user



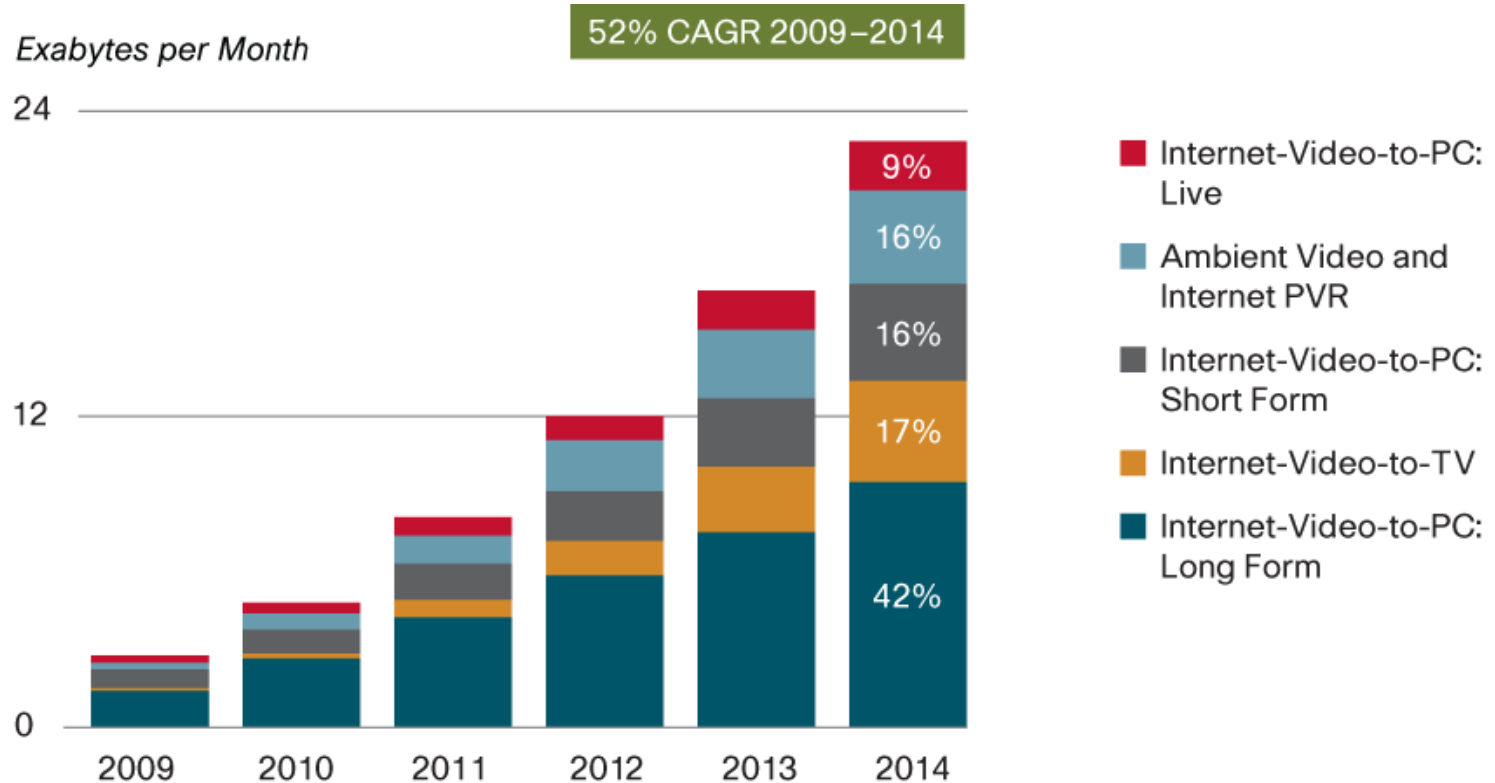


# Growth in Mobile Data Usage for major Applications



Source: Allot Communications, February 2011

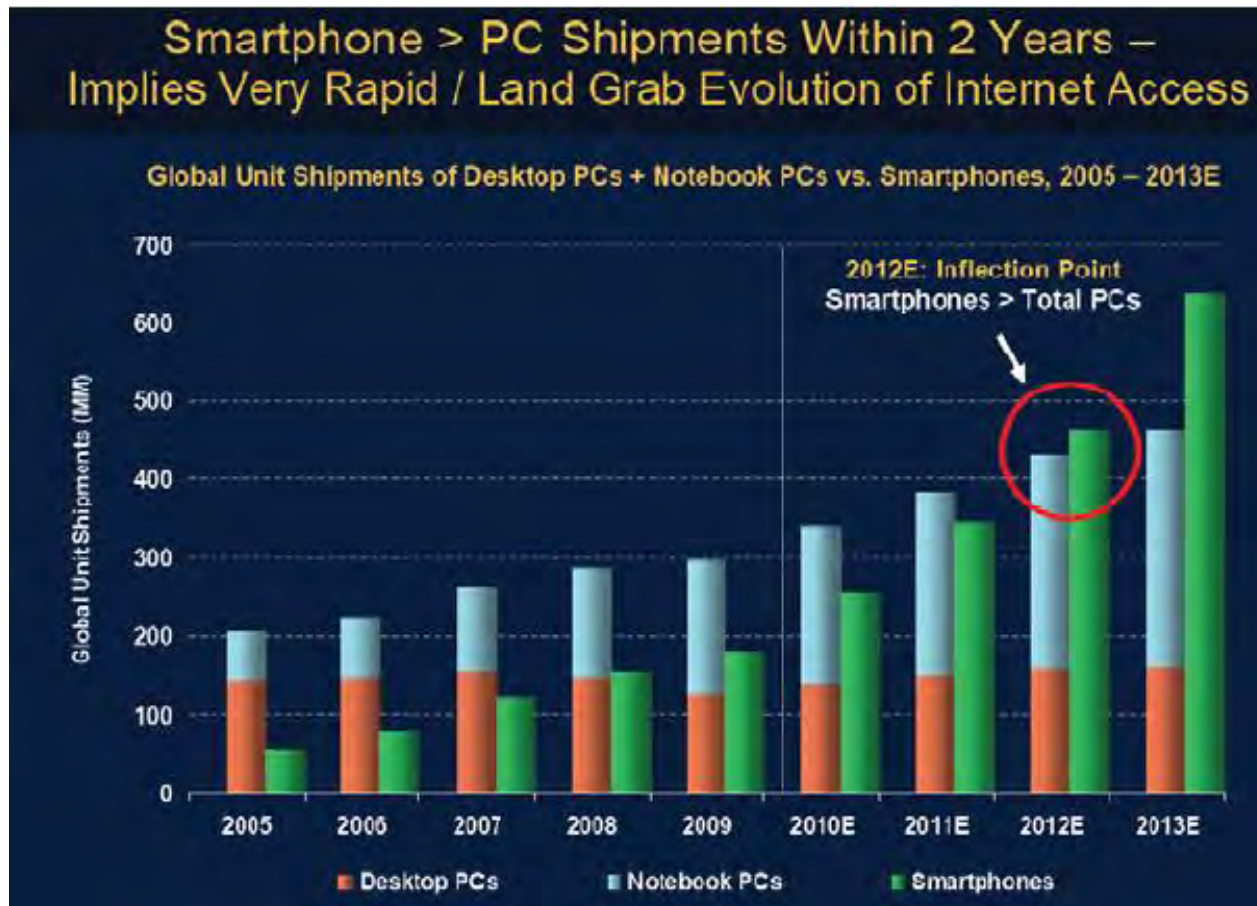
## Internet Video Growth



**Advanced Internet video (3D and HD) will increase 23-fold between 2009 and 2014.**

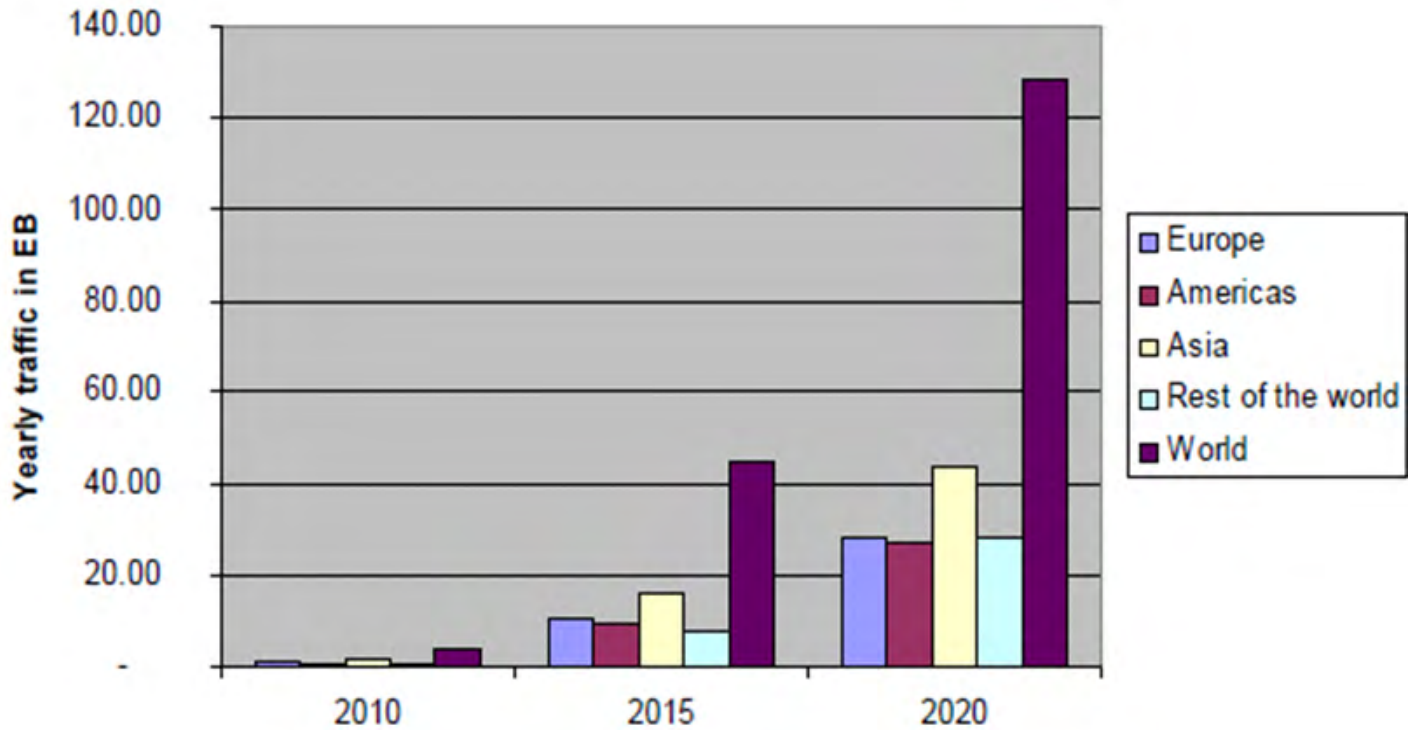


# Smart Phones are overtaking PCs



Source: Morgan Stanley, November 2010

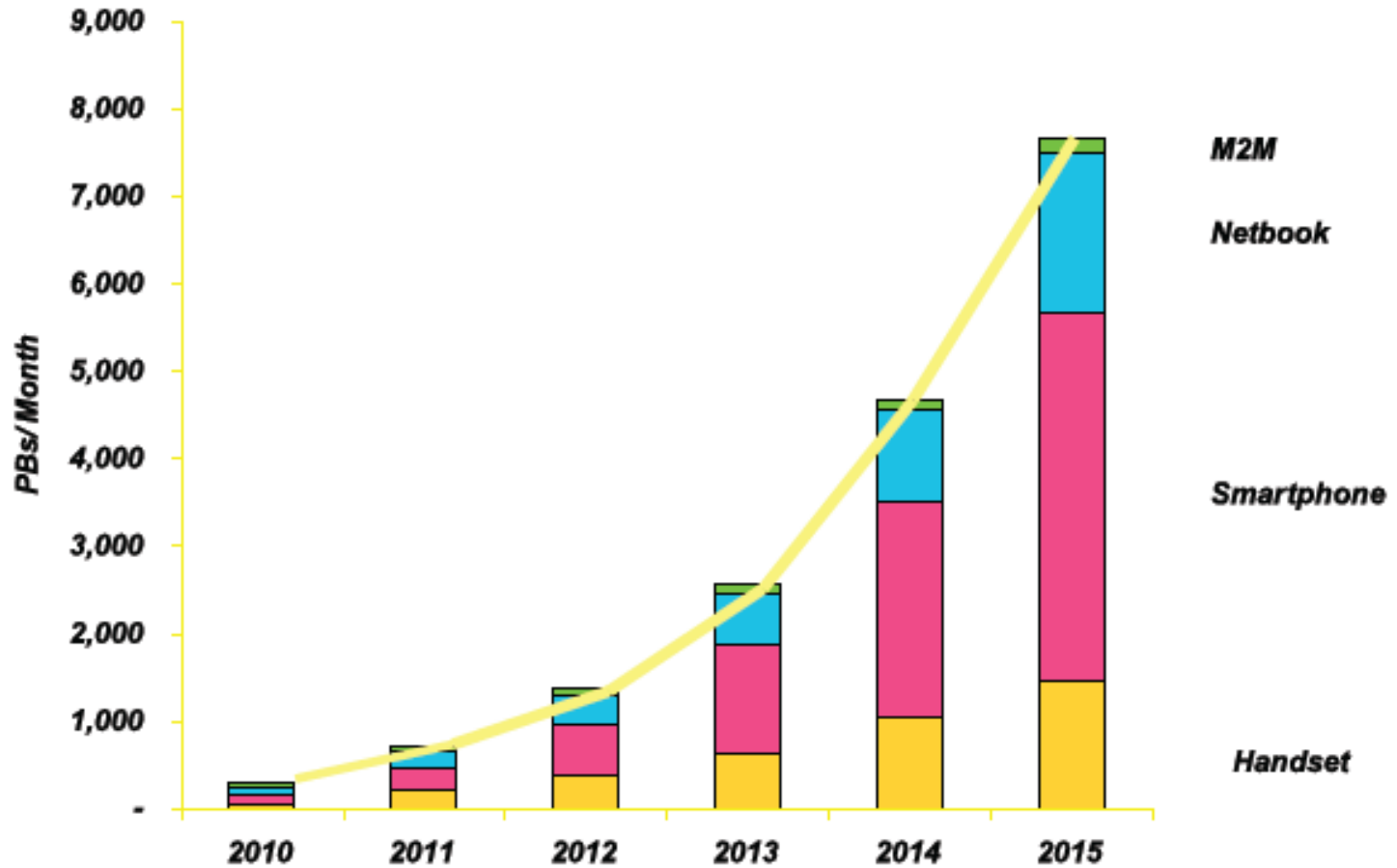
## Global Mobile traffic (Exabyte / year)



Source: IDATE, January 2011

- Asia to lead the data traffic growth

# Global Mobile Data Growth (Petabytes/ month)



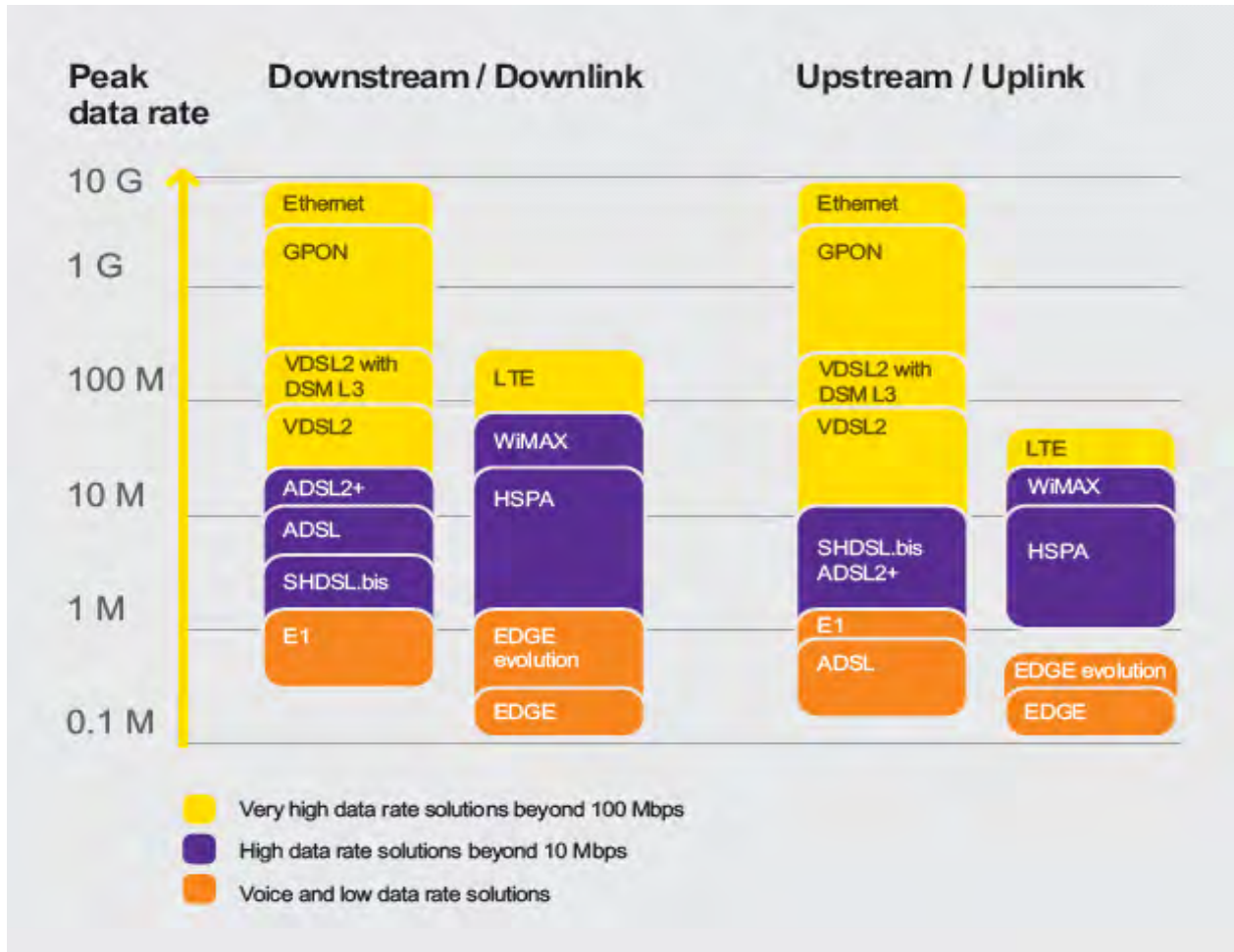
Source: Alcatel Lucent, February 2011

## Average traffic per device (MB/month)

Device Type	2009	2010	2015
Non Smartphone	1.5	3.3	54
E-reader	5	11	245
Smartphone	35	79	1,272
Portable Gaming Console	Not Available	250	879
Tablet	28	405	2,311
Laptop and netbook	1,145	1,708	6,522
M2M module	3	35	166

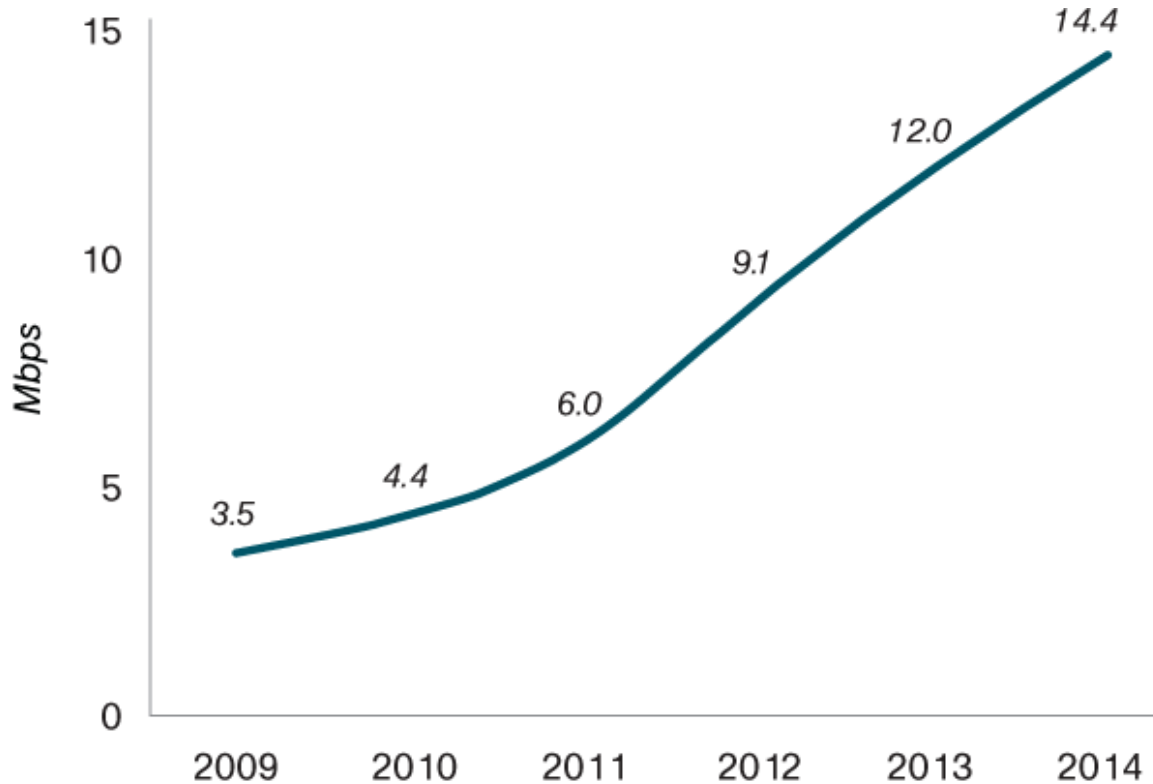
Source: CISCO VNI Mobile, 2011

# Wireline and Wireless data rates



Source: Nokia Siemens Network

## Average Global Broadband Speed



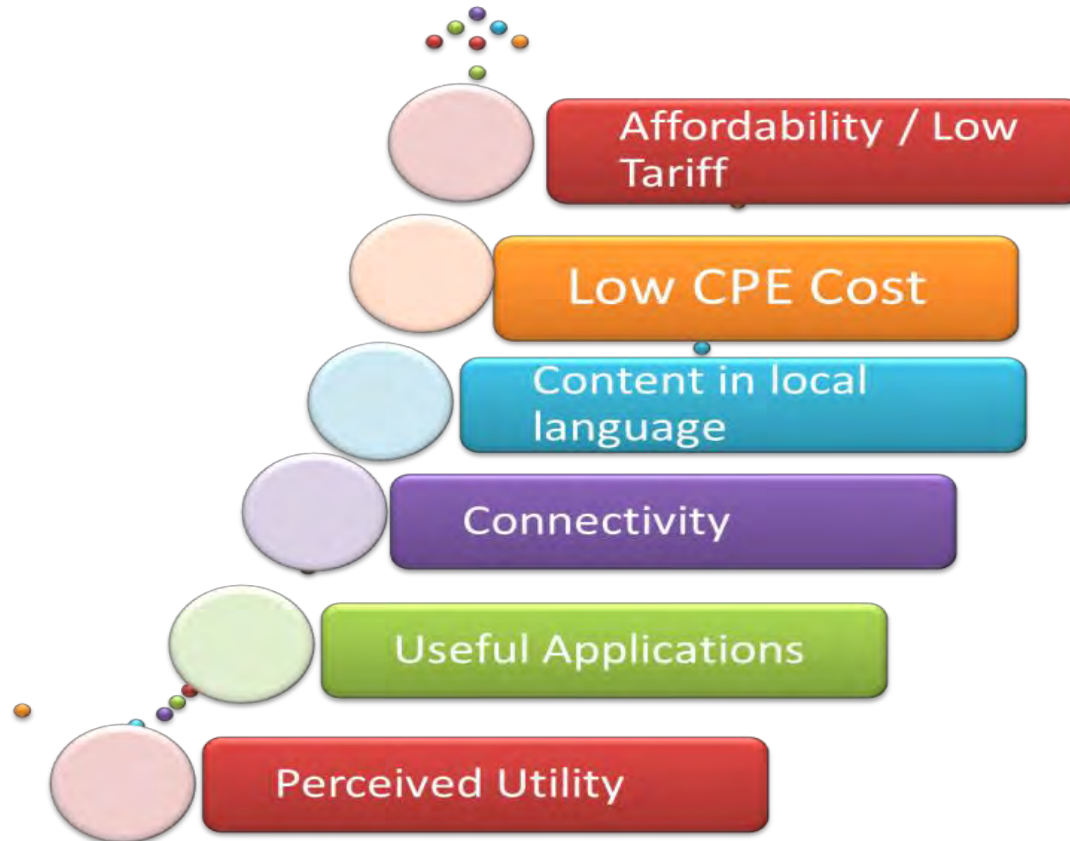
Source: CISCO VNI, 2010

**Average Global Broadband Speed Will Quadruple to Reach 14.4 Mbps in 2014**

# Broad factors affecting the growth of broadband



# Factors affecting the Growth of Broadband

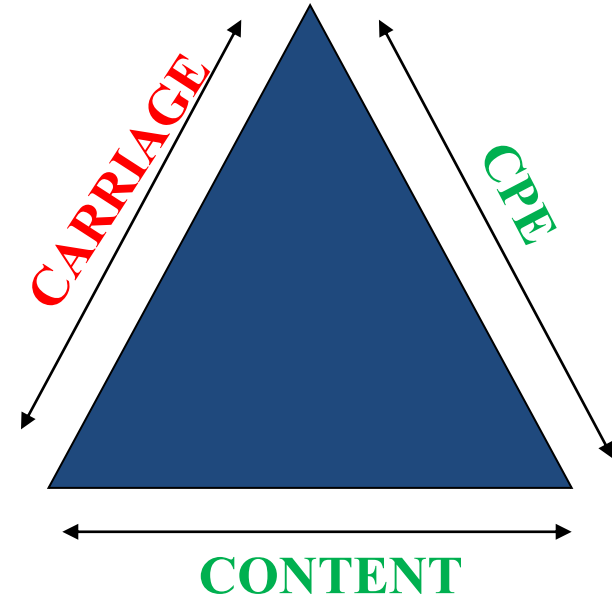




## Broadband Growth: Critical Factors

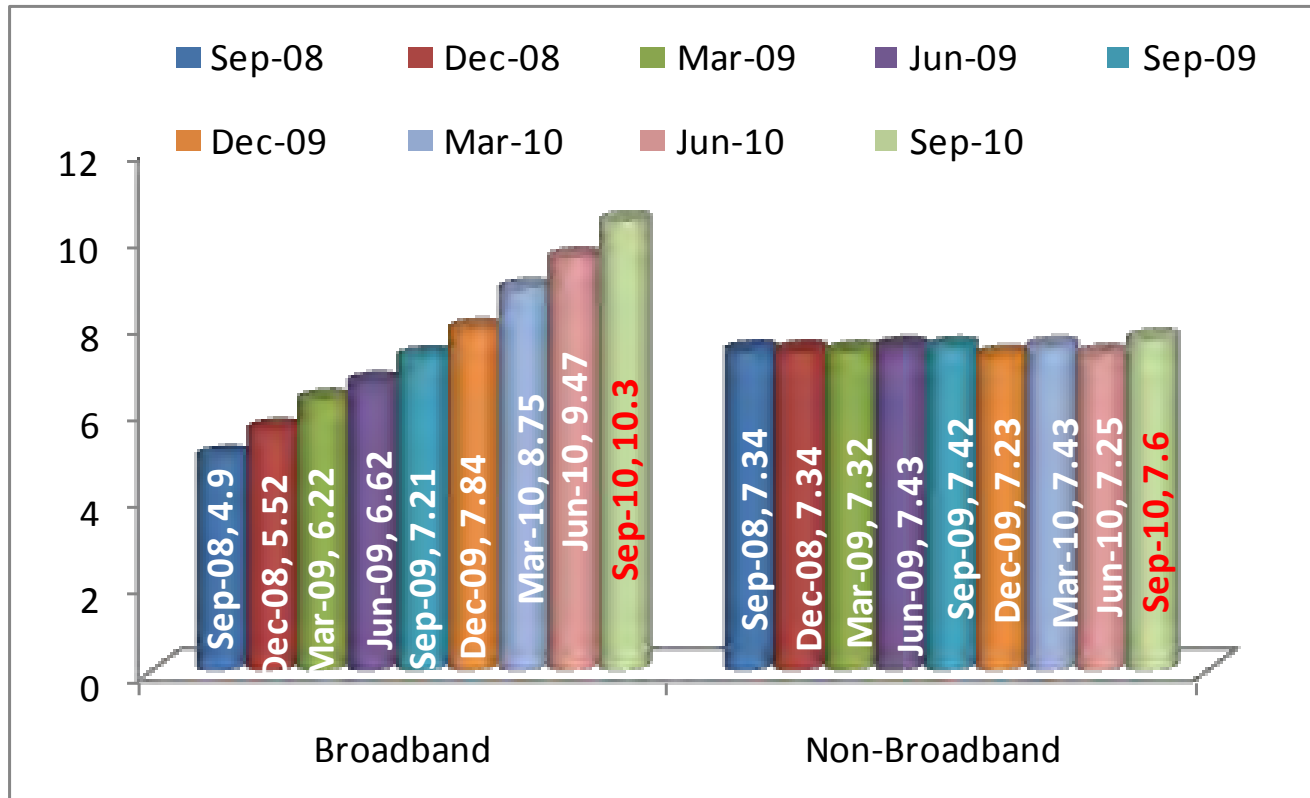
### • 3C Diagram: The growth of Internet & Broadband depends on 3Cs

- Appropriate network to **carry** broadband.
- Suitable **content** development and availability.
- Availability and affordability of **Customer premises Equipment (CPEs)**.



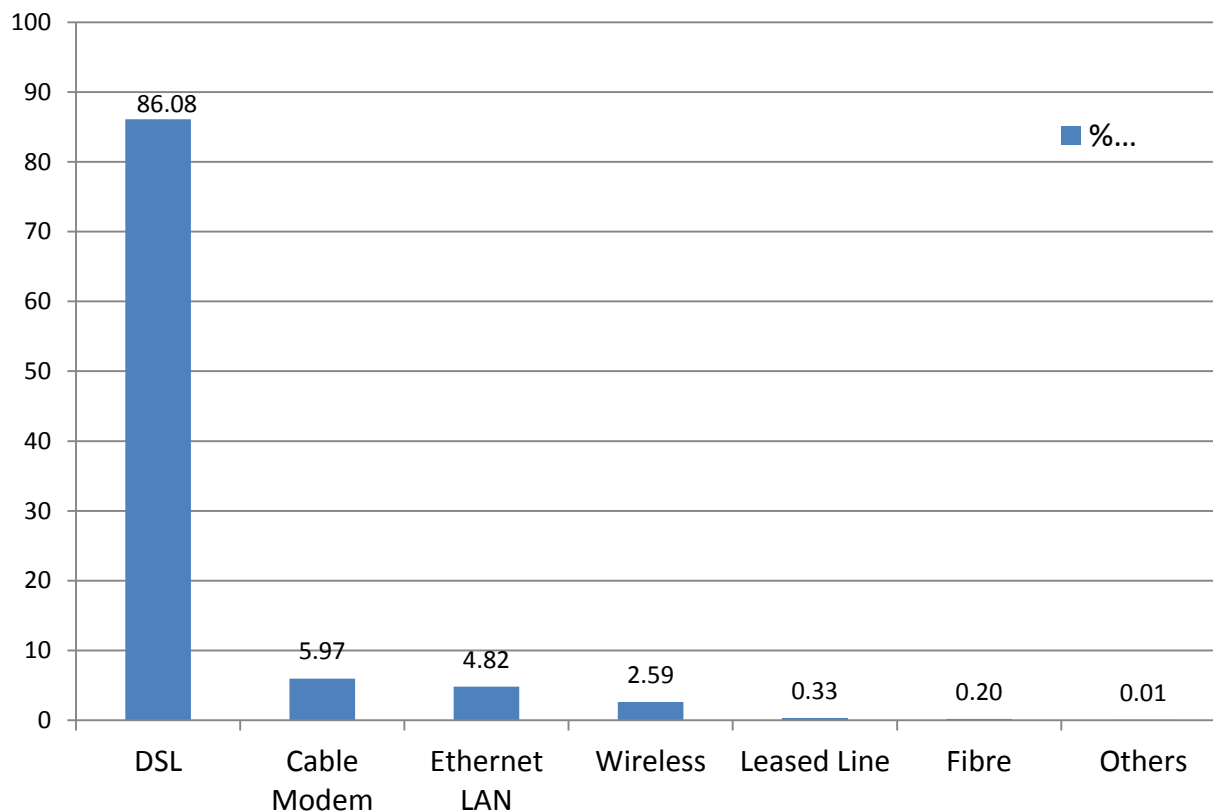
- Networks, devices and applications drive each other in a virtuous circle.

## Broadband Growth in India



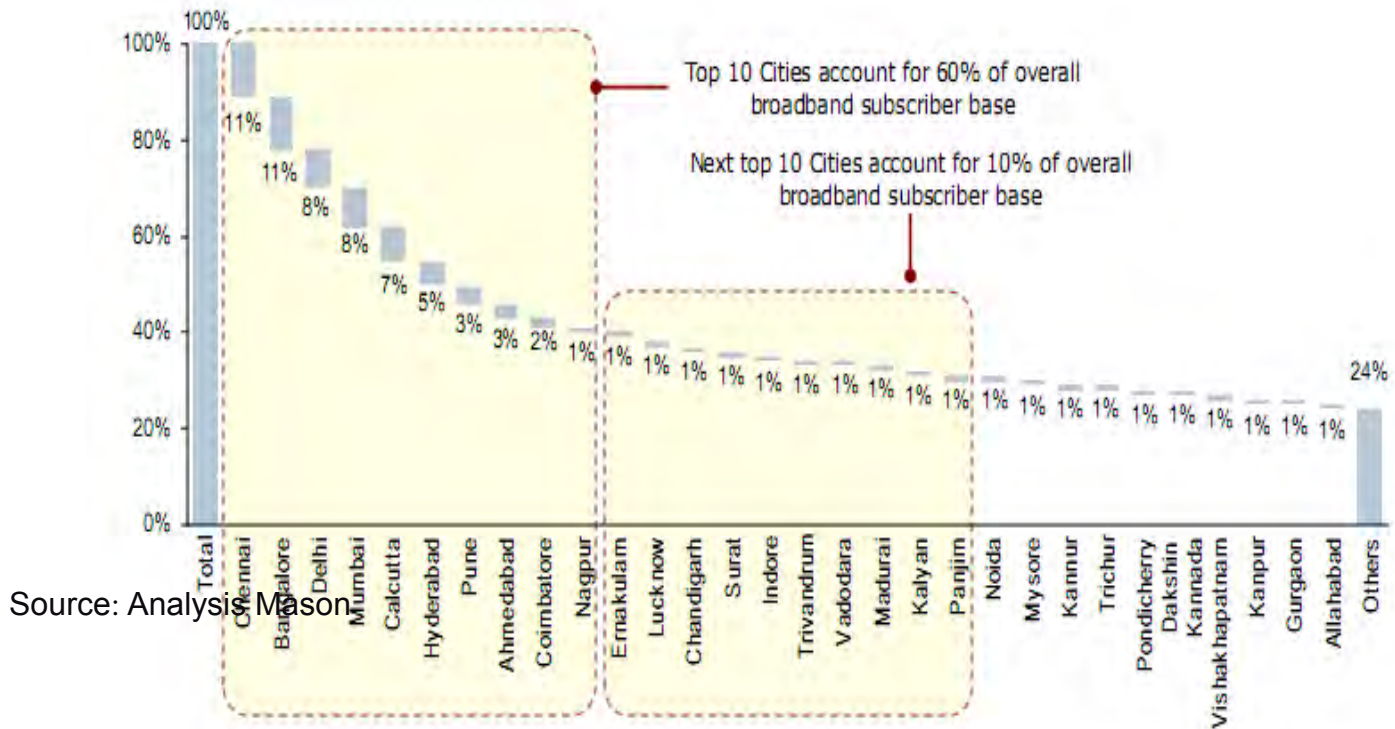
**Target, set by Broadband Policy 2004, of 9 million broadband connections by the end of the year 2007 and 20 million connections by the end of the year 2010 was not met**

## Technology wise broadband connections



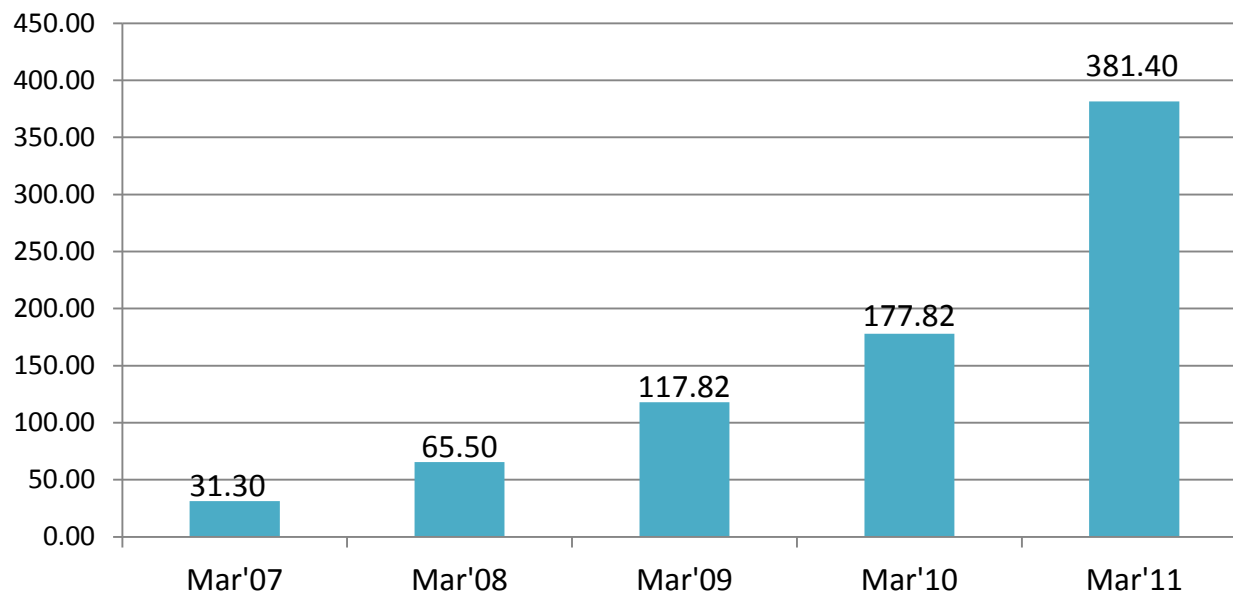
- More than 86% of existing broadband connections have been provided using DSL technologies

# Broadband DSL Connections by Cities



• Most of the DSL broadband users are concentrated in metros or A1 class cities

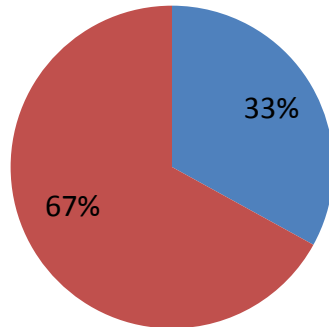
## Number of Wireless customers subscribed to Data services (in million)



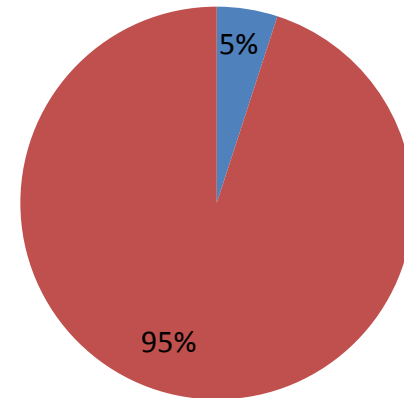
- Increasing number of users using their mobile handsets for accessing Internet using GPRS & EDGE technologies, which provide limited speed not capable to support several new applications

## Geographical distribution of subscribers

Wireless subscribers



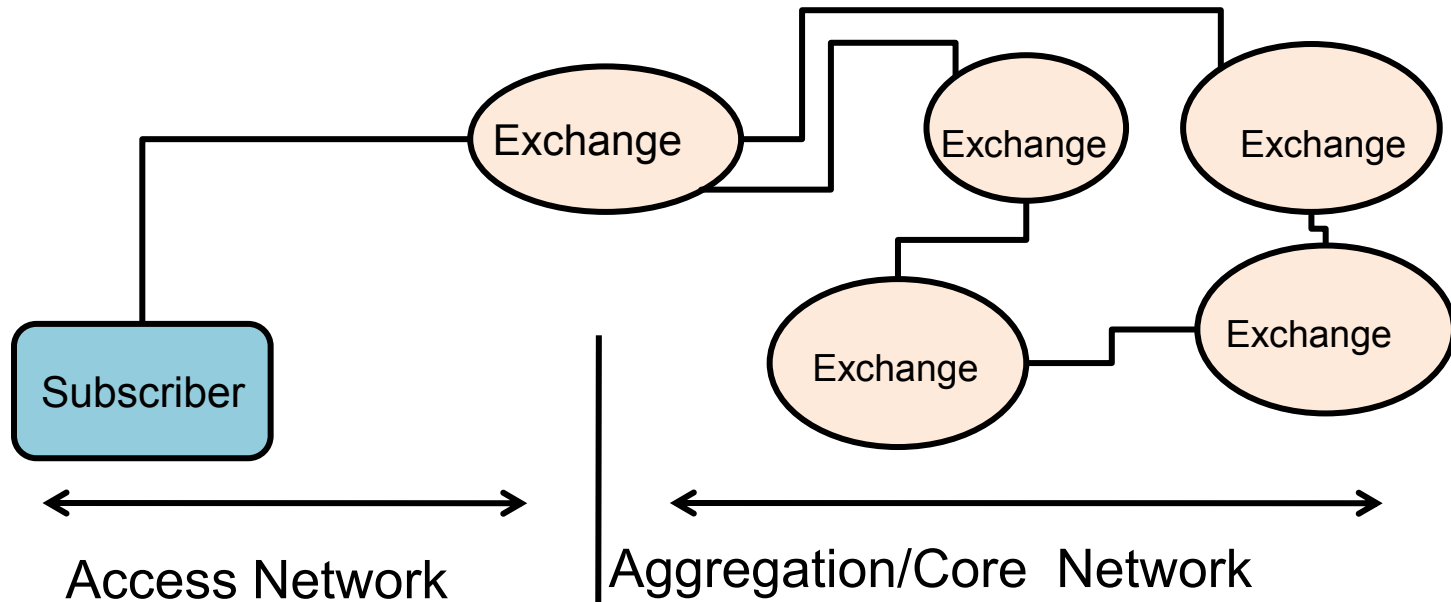
Broadband subscribers



■ Rural  
■ Urban








- Only 5% broadband connections in rural areas as compared to 33% wireless telephone subscribers

## Broadband Network



- In access network, any wireline (DSL, Cable TV, fibre) or wireless (BWA, 3G) technology can be used.
- Aggregation/Core network should be able to support high bandwidth, which can not be supported by wireless technologies.
- **Optical fiber is necessary to support high bandwidth requirement in Aggregation/Core Network for carriage**

# Status of optical fiber network

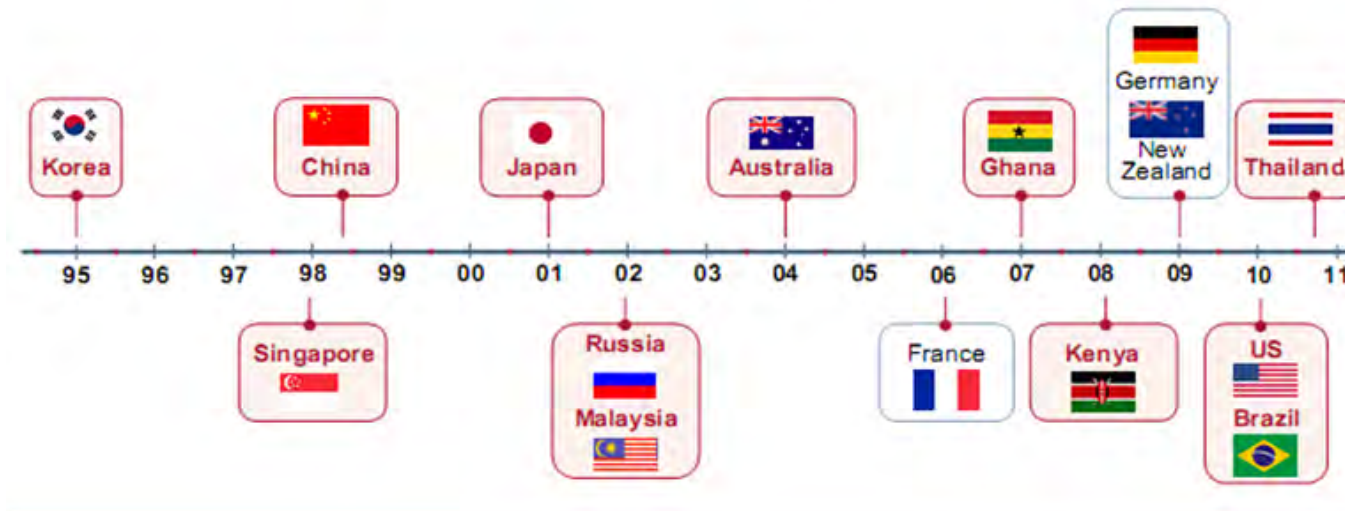
Service Provider	Total Fibre Laid	Cities / Towns Covered	Metros / Tier I Cities*	Other Cities / Towns	Gram Panchayats	Mid Sized Villages	Small Villages
 BSNL	614,755 RKm**	All cities & 28 K gram panchayats	●	●	◐	○	○
 Reliance	190,000 RKm**	44	●	◐	○	○	○
 Airtel	126,357 RKm**	130	●	◐	○	○	○
 Tata Communications	40,000 RKm**	60	●	◐	○	○	○
 RaiTel	37,720 RKm	600	●	◑	◐	○	○
 PowerGrid	21,652 RKm	110	●	◐	○	○	○
 GAILTEL	13,000 RKm	200	◑	◐	○	○	○

Level of Backbone Infrastructure Coverage : Very High ● High ◑ Medium ◐ Low ◒ No Coverage ○

• Fiber mainly available to back haul and limited to cities



# Introduction of National Broadband Plan by developed and developing countries



Source: Analysis mason

## Government Stimulus for Broadband

- **“Superfast national network is the only way to “turbo-charge Australia's economic future.”** *Kevin Rudd Australian Prime Minister on National Broadband Network*
- **“I would spend more on communications compared to highways and bridges.”** *Leonard Waverman the author of the Connectivity Scorecard*
- **“Relying on market forces alone will not bring robust and affordable broadband services to all parts of rural America,”** *Federal Communication Commission (FCC)*
- **“Bandwidth is demolisher of imbalances and a great leveler in the knowledge society. Making the bandwidth available is like the government laying the roads”.** *Dr APJ Abdul Kalam, ex- President of India*

Country	Stimulus Package for Broadband	Country	Stimulus Package for Broadband
USA	USD 7.2 Billion	Sweden	USD 820 Million
Australia	USD 30 Billion	UK	BP 200 Million
Canada	USD 225 Million	Korea (Rep.)	USD 24.6 Billion

# National Broadband Plan

- Elements of broadband plan
- Penetration projections
- Bandwidth requirement
- Spectrum Requirement
- Costing for the plan
- Content and CPE
- Benefits

## National Broadband Plan - India

### National Broadband Network (NBN) : Targets and goals

- NBN Network will be established in two phases:
  - **Phase I** : covering all cities, urban areas and Gram Panchayats by the year 2012.
  - **Phase II**: all habitations having a population more than 500 by the year 2013.
- The objective of national broadband Network is also to provide :
  - Fibre to home in 63 cities covered under Jawahar Lal Nehru Urban Renewal Mission (JNNURM),
  - Fibre to kerb in all other cities (0.5Km from any residence) .
- National Broadband Network will support following bandwidth:
  - 10 Mbps download speed in 63 Metro and large cities by the year 2014
  - 4 Mbps in 352 cities by the year 2014
  - 2 Mbps in towns and villages by the year 2014

## Combination of technology with fibre in core and aggregation

### Targets 2012

- 75 million broadband households :
  - 17 million DSL,
  - 30 Million cable TV network
  - 28 million wireless

### Targets 2014

- 160 million broadband households:
  - 22 million DSL,
  - 78 million cable TV network
  - 60 million wireless

Cable TV Act modified (2011) to mandate digitalisation of Cable TV network.

## Speed

### Definition of Broadband

- Common definition for wireline and wireless broadband.
- “A data connection using any technology that is able to support interactive services including Internet access and support minimum download speed of 512 Kilo bits per second (Kbps)”
- The upload speed will atleast be half the download speed.

## Broadband Penetration Projections Demographic Pattern

Year	Wireline Broadband households			Wireless broadband households	Total broadband households
	DSL BB (in Millions)	Cable BB (in Millions)	Total	Wireless BB Subscriber (in Millions)	
<b>2010</b>	11.0	-	11.0	-	11.0
<b>2012</b>	16.6	28.0	44.6	26.5	71.1
<b>2014</b>	22.2	72.0	94.2	59.7	153.9

Year	No of Households	% of Households to be covered for broadband	Number of Broadband households
<b>2012</b>	<b>268 Million</b>	<b>30%</b>	<b>~75 Million</b>
<b>2014</b>	<b>275 Million</b>	<b>60%</b>	<b>~160 Million</b>

## Institutional and Industry Structure

### National Optical Fibre Agency

- National Optical Fibre Agency is set up as a Special Purpose Vehicle
- 100% Central Government-owned holding company.
- Will establish and maintain National Optical Fibre Network (NOFN) created under National Broadband Plan
- Government supplier and will provide Open access to National Broadband Network
- Competition in access for providing application and services

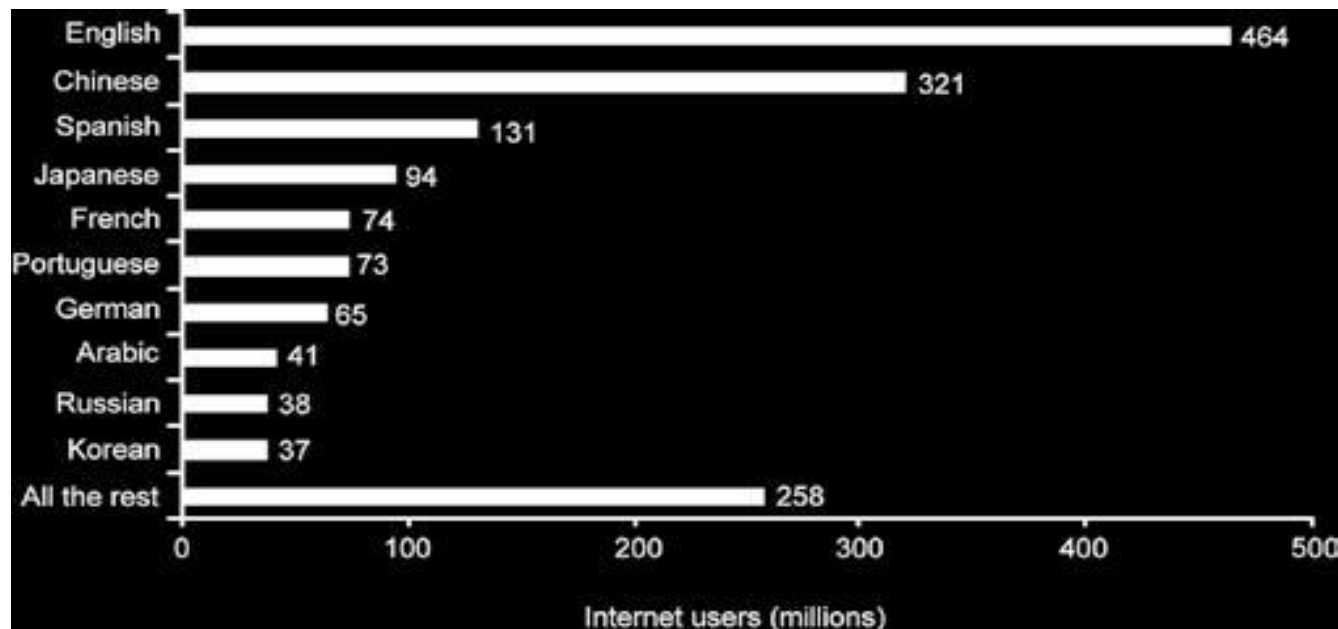


## Funding Source

- This network will be established at a cost of about 14 billion USD.
- It will be financed by:
  - USO fund and ;
  - The loan given/ guaranteed by Central Government

# Content

- The distribution of Internet users by language suggests that the largest share (about 30 percent) of Internet users speaks English, followed by Chinese (20 percent) and Spanish (8 percent).



# Content

- Value of broadband is realized when it delivers useful applications and content to end-users.
- The wide availability of fast and reliable networks and versatile devices to connect to those networks encourage innovators and entrepreneurs to develop exciting and useful applications and content.
- **English literacy in India is low.**
- The content in local vernacular languages will increase interest of the local population in broadband utilization.
- **Considering specific requirements, content development in regional languages need to be encouraged.**
- **Content policy** which incentivise content providers to provide content in Indian vernacular languages & to telecom operators who partner with such content providers may be helpful

# Content

- The World Wide Web Consortium (W3C) is an international community that develops standards to ensure the long-term growth of the Web.
- W3C's vision for the web involves participation, sharing knowledge, and thereby building trust on a global scale
- One of W3C's primary goals is to make these benefits available to all people, whatever their hardware, software, network infrastructure, **native language**, culture, geographical location, or physical or mental ability.
- **Requirement to make the internet available in all languages which are being understood by more than 1.2 billion people of the country. To improve the broadband penetration the availability of local language platforms in the web is of paramount importance.**
- **Mobile phones, smartphones, personal digital assistants, interactive television systems, voice response systems, kiosks and even certain domestic appliances can all access the web. These should support the local vernacular languages of the region so that people can be benefitted.**

## Customer Premise Equipment

- The fruits of broadband will be realized only if one has broadband connectivity and suitable device to access broadband.
- High Cost of PC and other access devices commonly known as CPEs is one of the major impediments in spread of broadband & Internet.
- Though, over the years, the cost of computers has come down and there are newer devices such as smartphones, but for most users the cost of access device remains a challenge.
- In order to ensure affordability of Customer premises equipment cost, Government may review the duties levied on inputs and finished products used in providing broadband and Internet services .
- Customer premises equipment including modem and routers used for Internet and broadband may be considered for 100% depreciation in the first year.

## RoW

### Right of Way

- Right of way without any charges for all projects undertaken by National Optical Fibre Agency subject to reinstatement.
- Government may notify the charges for Right of Way in consultations with the State Governments on priority basis for telecom service providers and ensure easy availability of RoW.



# Wireline Broadband Penetration Projections

Demographic Areas	2010			2012			2014		
	HHs (million)	Broadband Penetration (%)	Broadband HHs (millions)	HHs (million)	Broadband Penetration (%)	Broadband HHs (millions)	HHs (million)	Broadband Penetration (%)	Broadband HHs (millions)
<b>Metros</b> (population more than 1 million)	28	20%	5.6	29	70%	20	~29	100%	29
<b>Cities</b> (population 0.1 million to 1 million)	22	5%	1.10	22	40%	9	23	80%	19.2
<b>Towns</b> (population upto 0.1 million)	23	4%	0.92	23	25%	6	24	50%	12
<b>Villages</b>	188	2%	3.77	194	8%	15	198	20%	39.6
<b>Total House Holds (India)</b>	<b>261</b>	<b>4%</b>	<b>11.39</b>	<b>268</b>	<b>~20%</b>	<b>50</b>	<b>275</b>	<b>36%</b>	<b>~100</b>

HHs- House Holds

## Wireless Broadband Penetration Projections

Demographic Areas	2012			2014		
	HHs (million)	Wireless Broadband Penetration (%)	Wireless Broadband HHs (millions)	HHs (million)	Wireless Broadband Penetration (%)	Wireless Broadband HHs (millions)
<b>Metros (population more than 1 million)</b>	29	38%	10.5	30	62%	18
<b>Cities (population 0.1 million to 1 million)</b>	22	23%	5	23	45%	11
<b>towns (population upto 0.1 million)</b>	23	13%	3	24	50%	7.2
<b>Villages</b>	193	5%	8	199	12%	23.5
<b>Total House Holds (India)</b> HHs- House Holds	<b>268</b>	<b>10%</b>	<b>26.5</b>	<b>275</b>	<b>22%</b>	<b>59.7</b>



## Bandwidth Requirement (Villages)

Villages	2012			2014		
	Total	Wireless	Wireline	Total	Wireless	Wireline
<b>Total Broadband Subscriber in Villages (in millions)</b>	23.0	8.0	15.0	63.1	23.5	39.6
Av. No of HHs* per village	327.00	327.00	327.00	334	334	334
BB penetration (%)	12%	4%	8%	32%	12%	20%
BB Households	39.64	13.48	26.16	106.44	39.64	66.80
BW requirement per HH (in Mbps)	2	2	2	2	2	2
BW requirement in access network ( in Mbps) per village	79.29	26.97	52.32	212.9	79.28	133.60
contention ratio	10:01	10:01	10:01	10:01	10:01	10:01
BW requirement per village in Backhaul in Mbps	7.93	2.70	5.23	21.29	7.93	13.36
BW req. Per Gram panchayat in Mbps (2.24 village per GP)	17.76	6.04	11.72	47.69	17.76	29.93
BW req. Per Block in Mbps (approx 41 gram panchayat per block)	728.19	247.68	480.51	1955	728.13	1226.98

## Wireline Bandwidth Requirement

Bandwidth Requirement	Rural/ Urban	Area	2012 in Mbps	2014 in Mbps
<b>Bandwidth per household</b>	<b>Rural</b>	<b>Village</b>	2	2
		<b>Town</b>	2	4
	<b>Urban</b>	<b>Cities</b>	2	4
		<b>Big Cities and metro</b>	2	4
<b>Backhaul requirement</b>	<b>Rural</b>	<b>Village</b>	7.93	21.29
		<b>Gram Panchayat</b>	17.76	47.69
		<b>Block</b>	728.19	1955
	<b>Urban</b>	<b>Town</b>	451.80	1927.68
		<b>Cities</b>	7955	34091
		<b>Big Cities and metro</b>	145238	447619

## Wireless Bandwidth Requirement

<b>Estimated Spectrum Requirements for Wireless Broadband in Rural areas</b>		
	<b>2012</b>	<b>2014</b>
Number of blocks	6000	6000
Average number of villages per block	100	100
Number of Households per village	327	334
Percentage of HH having BB	4%	12%
Estimated HHs having BB in a village	13.1	40.1
BB data rates per HH (Mbps)	2	2
BB data rate per CSC	10	20
BW required per village	36.2	100.16
BW required per block (Mbps)	3616	10016
Contention Ratio	10:1	10:1
Max downloaded data throughput required (Mbps)	362	1002
Download/Upload traffic channel bandwidth ratio	3:1	2:1
Total data Throughput required (Mbps)	482.1	1502.4
Estimated throughput per cell with 20 Mhz Spectrum (Mbps)*	40	90
<b>Total BTSs required to meet the throughput demand in a block</b>	12	17
* For 2012, single sector has been taken and for 2014, three sectors is taken.		

## Wireless Throughput & Spectrum Requirement

<b>Estimated Spectrum Requirements for Metro (Delhi)</b>		
	<b>2012</b>	<b>2014</b>
Max downloaded data throughput required (Gbps)	368	1,922
Download/Upload traffic channel bandwidth ratio	3:1	2:1
Total data Throughput required (Gbps)	491	2,883
BWA Spectrum Assigned to Service Provider (MHz)	20	20
Estimated throughput per cell with 20 MHz Spectrum (Mbps)	70	90
Estimated BTSs deployment by a Service providers	500	1000
Throughputs available with 20MHz spectrum (Gbps)	35	90
<b>Total Spectrum required for providing required throughputs (MHz)</b>	<b>280</b>	<b>641</b>

## Wireless Throughput & Spectrum Requirement

<b>Estimated Spectrum Requirements for A Class city</b>		
	<b>2012</b>	<b>2014</b>
Max downloaded data throughput required (Gbps)	48.6	246.0
Download/Upload traffic channel bandwidth ratio	3:1	2:1
Total data Throughput required (Gbps)	65	369
BWA Spectrum Assigned to Service Provider (MHz)	20	20
Estimated throughput per cell with 20 MHz Spectrum (Mbps)	70	90
Estimated BTSs deployment by a Service providers	150	250
Throughputs available with 20MHz spectrum (Gbps)	10.5	22.5
<b>Spectrum required for providing required throughputs (MHz)</b>	<b>123</b>	<b>328</b>

## Wireless Throughput & Spectrum Requirement

<b>Estimated Spectrum Requirements for Cities with 0.1-1 million population</b>		
	<b>2012</b>	<b>2014</b>
Max downloaded data throughput required (Gbps)	2.8	34.0
Download/Upload traffic channel bandwidth ratio	3:1	2:1
Total data Throughput required (Gbps)	3.8	51
BWA Spectrum Assigned to Service Provider (MHz)	20	20
Estimated throughput per cell with 20 MHz Spectrum (Mbps)	70	90
Estimated BTSs deployment by a Service providers	50	100
Throughputs available with 20MHz spectrum (Gbps)	3.5	9
<b>Spectrum required for providing required throughputs (MHz)</b>	<b>22</b>	<b>113</b>

## Estimated Spectrum Requirements (in MHz)

	2012	2014
For Metro cities	280	641
For A1 class city	123	328
For a City with 0.1 million -1 million population	22	113

- It will be very difficult to fulfill such spectrum requirements immediately hence work on refarming and digital dividend is required

## Cost of National Optical Fibre Network

Calculation of laying fiber and equipment		
	<b>Cost of fiber, trenching and laying</b>	
1	Cost of Optical Fiber (Rs/Km)	30,000
2	Average Digging and pulling Cost of OFC (Rs/ Km)	1,62,000
3	Cost of HDPE Pipes In Rs. Per Km	33,000
4	Total cost of OFC including labour and material (Rs/Km)	2,25,000
	<b>Cost of end equipment</b>	
5	Cost of OLT per unit	80,000
6	Cost of ONT per unit	15,000



## Cost of National Optical Fibre Network

<b>Cost of Access Aggregation Network and Backhaul for all Blocks</b>			
1	Average no of villages per block		59
2	Average block radius(km)		13
3	Optic fiber to splitter(km)		8
4	Optic fiber from splitter to village(km)		5
5	Average backhaul Block to DHQ(km)		50
	<b>Access aggregation cost</b>		
6	Cost of 2 OLTs (Rs)		160000
7	Cost of ONTs in a block(Rs)		1770000
8	Cost of trenching & laying cable (per km)		225000
9	Cable to be laid per block(km)		327
10	Cost of laying cable per block(Rs)		73575000
11	Cost of cable and equipment		75505000
12	Cost for all blocks(Rs)		481268870000.00
			<b>48127 crores</b>
	<b>Backhaul Cost</b>		
13	Average cable length(km)		50
14	Total length for all blocks(km)		318700
15	Cost of backhaul		71707500000
			<b>7171 crores</b>
16	<b>Total cost of aggregation +backhaul</b>		<b>55298 crores</b>

# Cost of national Optical Fibre Network

<b>Cost of laying fiber in Cities</b>		
Jawaharlal Nehru National Urban Renewal Mission (JNNURM) Cities		
		Fibre Length in each city (in Route Km)
Category A cities	7	1000
Category B cities	28	500
Other Cities	28	300
<b>Total Fibre</b>		29400
<b>Cost</b>	<b>Rs 662 crore</b>	
Remaining Cities	4315	100
<b>Total Fibre</b>		431500
<b>Cost</b>	<b>Rs 9709 crore</b>	

## Estimated Cost of Optical Fibre Infrastructure Rural & Urban

Area	Cost (in Rs)
Rural	55298 crore
JNURM cities	662 crore
Other cities	9709 crore
<b>Total</b>	<b>65669 crore</b>

The estimated revenue of SPV is expected to be Rs 26000 crore per year      Rs 100 crore = Rs 1 billion

## National Broadband Plan - India

### Benefits

- Easy access to high speed data and information to citizens,
- Promoting the efforts in the field of education, health , commerce , banking etc.
- Expected to provide high quality and reliable broadband network
- Provide lead to digital economy
- Enhance Participation of people in governance
- Generate additional revenue for the Government
- Boost to cable industry
- Effective disaster management, weather forecasting etc
- It enables various monitoring including environmental monitoring, Smart Monitoring (e.g. traffic, playground) etc.
- Ability to work from home facilitating reduced load on transportation.

# Convergence and regulatory issues

## Convergence

- Digitalisation, multi fold increase in computational power of devices and widespread use of Internet Protocol (IP) has led to convergence
- Convergence happening at the level of services, devices , networks and sectors
- Empowered introduction of services and applications hitherto not known
- Convergence is all around– mobile phones with video, radio and the Internet, radio over TV platforms and the Internet and TV over mobile platforms including digital radio, and the Internet
- Driving disruptive changes across the global telecom, IT, broadcasting, media and content sectors
- Offers the opportunity to do things differently, empowering citizens with better education, better health care, better job opportunities, better productivity, better networking and overall development of the society.
- Convergence has number of associated regulatory issues.



## Regulatory Issues

### Objectives of Regulatory framework

- Remain ***technology and platform neutral*** while permitting all evolving services
- Ensure ***fair competition within and across platforms***, including fair treatment to all services providers
- Remove ***barriers to entry***;
- Protect the ***interests of existing service providers*** while detailing a time-based plan for transition
- Provide equal and ***fair access to scarce resources***
- Foster growth of the industry through increasing efficiencies from ***vertical and horizontal integration***; Emphasize on an enabling regime for ***growth of application and services***



# Regulatory Issues

- **Unified Licensing** : Boundaries between various services being provided under vertically separate licenses are blurring
- **Spectrum Management**: For moving towards technology and service neutral licensing, it is necessary to have a revised spectrum management framework to respond to convergence .
- **Open access to infrastructure**: Structural, functional Separation for dealing with issue of vertical squeeze.
- **Unbundling of fibre infrastructure**: Service based access ( bitstream access ) and Infrastructure based access ( local loop unbundling)
- **Competition in Application and Services**: Promote competition in application & services, creation of relevant and local content
- **Content Regulation** : Need to ensure that content should not create any security or social threat and there is no infringement of copy rights, intellectual property rights.
- **Security**: The development of robust IP networks with possibility of billions of connected people and devices increase the security threats further.



# Steps towards convergence

# Policy reforms for convergence

## Towards convergence

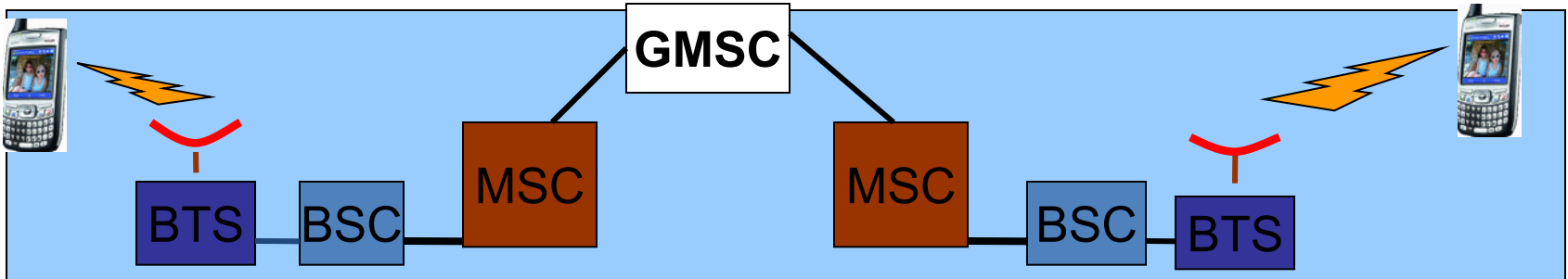
- Communication Convergence Bill 2000 was presented in the Parliament.
- **Internet telephony** was opened up for ISPs in April 2002
- **Unified access license** regime was introduced in November , 2003
- **Converged Regulator** - power to regulate broadcasting and cable TV sector was given to TRAI in 2004
- **Broadband Policy** announced in November 2004
- **Access providers were permitted to provide Internet, Internet telephony** and broadband including triple play in 2006
- **Cable TV Act modified** and Telecom services providers permitted to provide of IPTV services in 2008
- **Implementation of digitalisation with addressability of cable TV network** in a phased manner to be completed by December, 2017, which will also enable provisioning of broadband service through cable TV networks.

# Convergence: A reality (example from India)

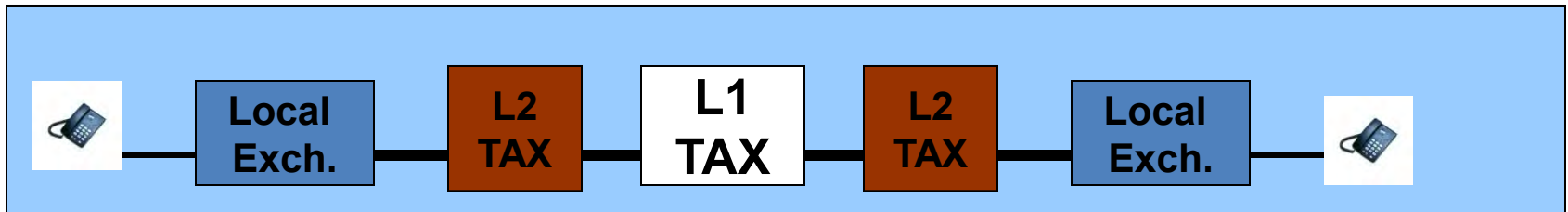
Broadcasting of TV channels is possible through various technologies and using different licenses

Technology Used	Charges	Number of channels
Cable TV network (analog)	USD 4 per month	100
DTH	USD 4 per month	125
Conditional Access System (Through Set Top Box) (digital)	USD 5 per month	100
IPTV	USD 5 per month	140

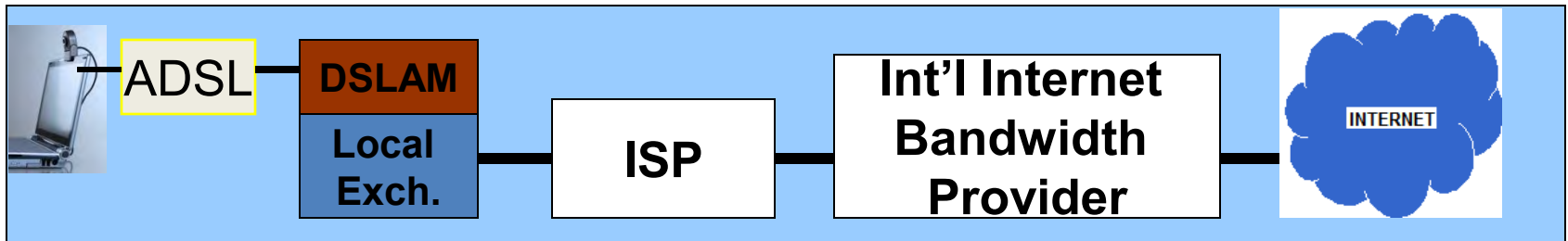
# Present Telecom Networks



**End-to-End Mobile Network**

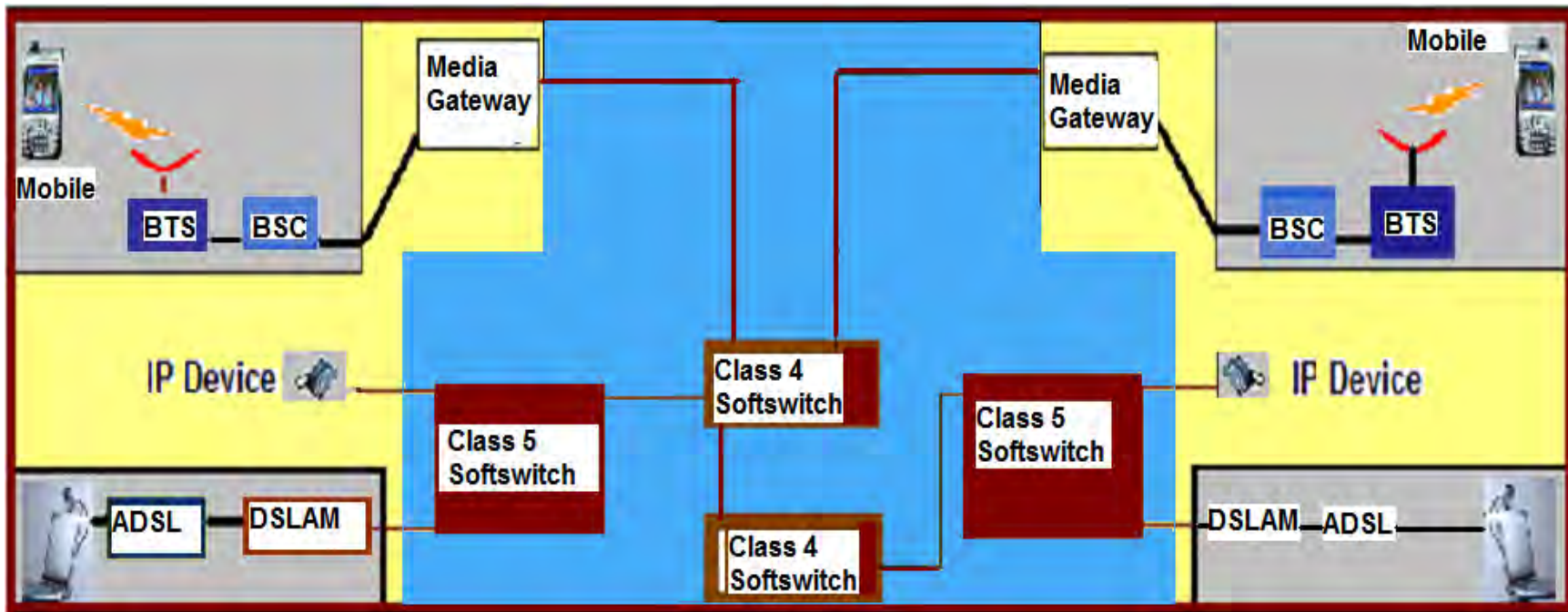


**End-to-End PSTN Network**



**Broadband Network**

# End-to-End convergence





## Convergence – INITIATIVES IN INDIA

(contd.)

- August 2008: TRAI recommended that ISPs may be permitted to provide Internet telephony calls to PSTN/PLMN and vice-versa within country.
- January 2009: TRAI issued consultation paper on Licensing issues related to Next Generation Networks with an objective to further focus to develop a suitable regulatory framework for smoother and faster march towards NGN.
- Following issues were identified
  - NGN Licensing Issues
  - NGN Interconnection Issues
  - NGN QoS Issues



➤ April 2009: In order to facilitate the migration towards NGN, licenses of Access providers have been amended to include the placement of following network elements:

- Media Gateway Controller (MGC)
- Media Gateway (MG)
- Trunk Media Gateway (TMG)
- Access Gateway (AG)
- Signaling Gateway (SG)

➤ Media Gateway Controller can be deployed outside the license service area controlling the Media Gateways deployed in each license service area.

# Draft New Telecom Policy 2012

## Strategies related to convergence:

- To orient, review and harmonise the legal, regulatory and **licensing framework** in a time bound manner to **enable seamless delivery of converged services** in technology neutral environment. Convergence would cover
  - **Convergence of services** i.e. convergence of voice, data, video, Internet telephony (VoIP), value added services and broadcasting services
  - **Convergence of networks** i.e. convergence of access network, carriage network (NLD/ ILD) and broadcast network
  - **Convergence of devices** i.e. telephone, Personal Computer, Television, Radio, inter-operable set top boxes and other connected devices
- To encourage digitalisation of the local cable networks
- To allow sharing of Networks and delink the licensing of Networks from the delivery of Service to the end users
- To facilitate resale at service level – both wholesale and retail



# Thank You

E-mail: [advbbpa@trai.gov.in](mailto:advbbpa@trai.gov.in)  
[rkupadhyay@gmail.com](mailto:rkupadhyay@gmail.com)