

# Broadband Quality of Service Experience

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- The users
- The need for broadband
- Broadband access technologies
- Summary

# The Next Billion in India



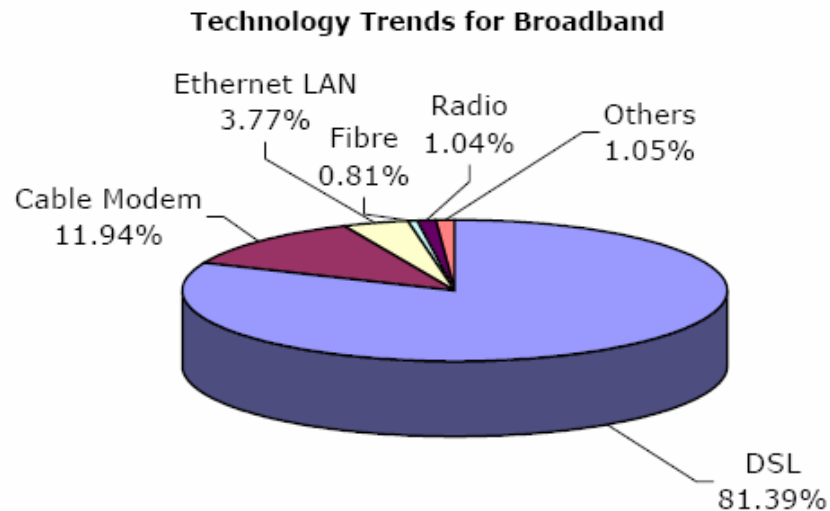
**Required Coverage**  
**~70% of population**  
**4900 Towns ~300m people**  
**~350 000 Villages ~450m people**



**Existing Coverage**  
**~40% of population**  
**1700 Towns ~350m people**  
**~70m rural coverage**

# Emerging Market Explosion

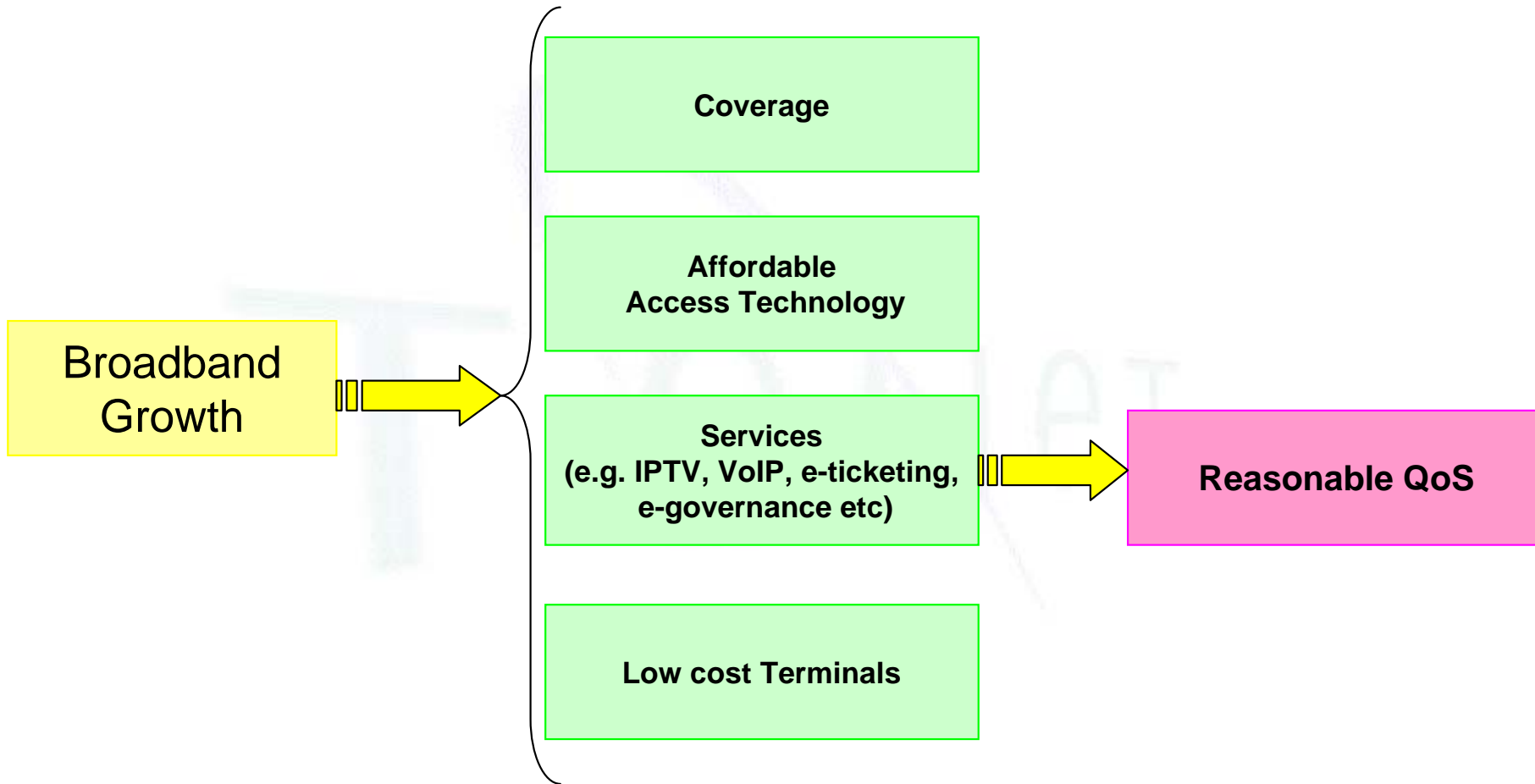
- India adds **10M** telephone lines monthly: crossed 410m in Feb 2009
  - Was struggling 12 years ago to add 1M lines yearly
  - Right price point exploded the market
- Government policy to add **50M** Broadband connections in 4 years
  - Today only 5m Broadband connections



**Similar trend in other Emerging Markets**

- Dense urban areas – 10,000 people/sq. km
- Sparse rural areas
  - Village every 3-10 km
  - Population 1,000 - 25,000
  - Within 25 km of fibre
- ARPU today for 5m subscribers : Rs. 280 (\$7)
- ARPU tomorrow for rapid expansion: Rs. 100 (\$2.5)

# Enablers for Broadband Growth



# YouTube+Facebook Dominates

Alexa Global Traffic – Relative Page Views



Source: Alexa Global Traffic as of 3/12/08

## Alexa Global Traffic Rankings

2005 <sup>(1)</sup>	
Rank	Web site
1	yahoo.com
2	msn.com
3	google.com
4	ebay.com
5	amazon.com
6	microsoft.com
7	myspace.com
8	google.co.uk
9	aol.com
10	go.com

2008 <sup>(2)</sup>	
Rank	Web site
1	yahoo.com
2	youtube.com
3	live.com
4	google.com
5	myspace.com
6	facebook.com
7	msn.com
8	hi5.com
9	wikipedia.org
10	orkut.com

Traffic rank is based on three months of aggregated historical traffic data from Alexa Toolbar users and is a combined measure of page views / users (geometric mean of the two quantities averaged over time).

(1) Rankings as of 12/31/05, excludes Microsoft Passport; (2) Rankings as of 3/12/08  
 Source: Alexa Global Traffic Rankings, Morgan Stanley Research





Rs12,500 kit Monitors temperature, blood-pressure, stethoscope, pulse count, ECG remotely

Can blood tests be done tomorrow?

- Curriculum based courses
  - Online TT ( 9<sup>th</sup> , 10<sup>th</sup> , 12<sup>th</sup> std )
- Skill enhancement courses
  - Spoken English on video
  - Photoshop tutorials
  - html tutorials
- Conceptual learning
  - MS-Office
  - Computers and Internet

The screenshot shows the homepage of the Online TT website. The header features the text "Online TT" in a large, white, sans-serif font, with "An Online educational service of RTBI, IIT Madras" underneath. To the right of the text are several small, colorful icons representing various educational fields like science, technology, and language. Below the header is a navigation bar with buttons for "Home", "Choose subjects", "Question Types", "Take a Test", and "Logout". The main content area has a "Welcome to OnlineTT" heading and a paragraph describing the service's focus on rural students and its three-pronged format: Learn, Practice, and Evaluate. On the right side, there is a login form with fields for "Login ID", "Password", "Board" (set to "Tamil Nadu"), and "Standard". A "Login >>" button is positioned below the form, along with a link to "Get an OnlineTT account". The footer contains the text "Designed with <xhtml/> and (css)" and "2008 © IIT Madras".

- OnlineTT: 1100 registrations with a pass % of 89, up from ~50%



“ DesiCrew provides back office solutions through competent rural workforce ”

Key Differentiator: Provides access to a large untapped workforce with lower attrition rates.



[www.desicrew.in](http://www.desicrew.in)

**In 2008 ...**

18,75,000 pages digitised

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100,000 kms of roads traced on maps

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20,000 mobile-user queries answered

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80 resources

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1500+ temporary staff

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Services in 3 languages

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6 offices

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7 verticals

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3 Awards

and counting ....



## Natural Fibre Based Products

### Home furnishing:

Hand-woven natural fibre Mats, Carpets, Placemats

### Knits:

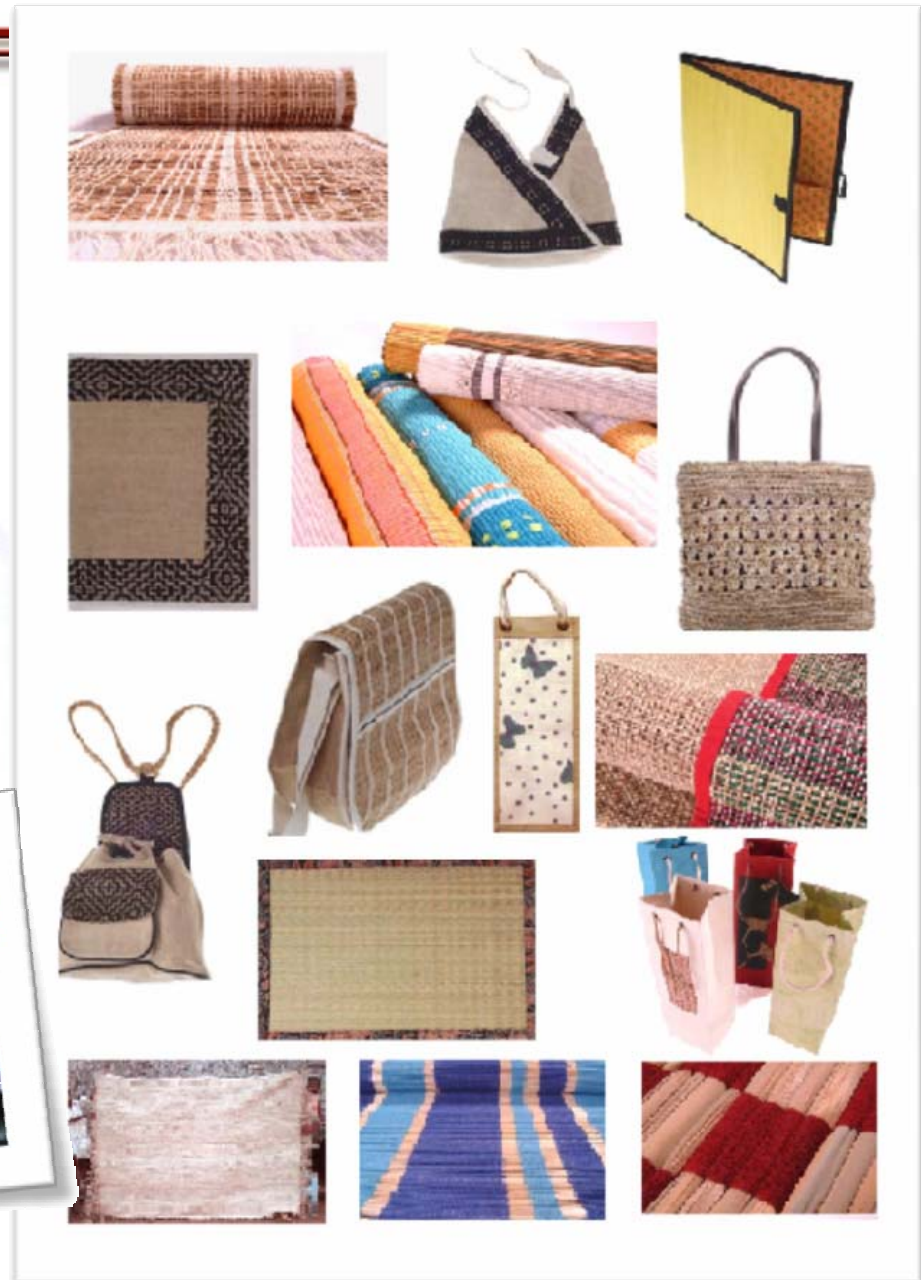
Banana Fibre Crochet Bags, Knotted Bags

### Accessories & Corporate Gifts:

Bags, folders, conference bags, back packs from natural fibres

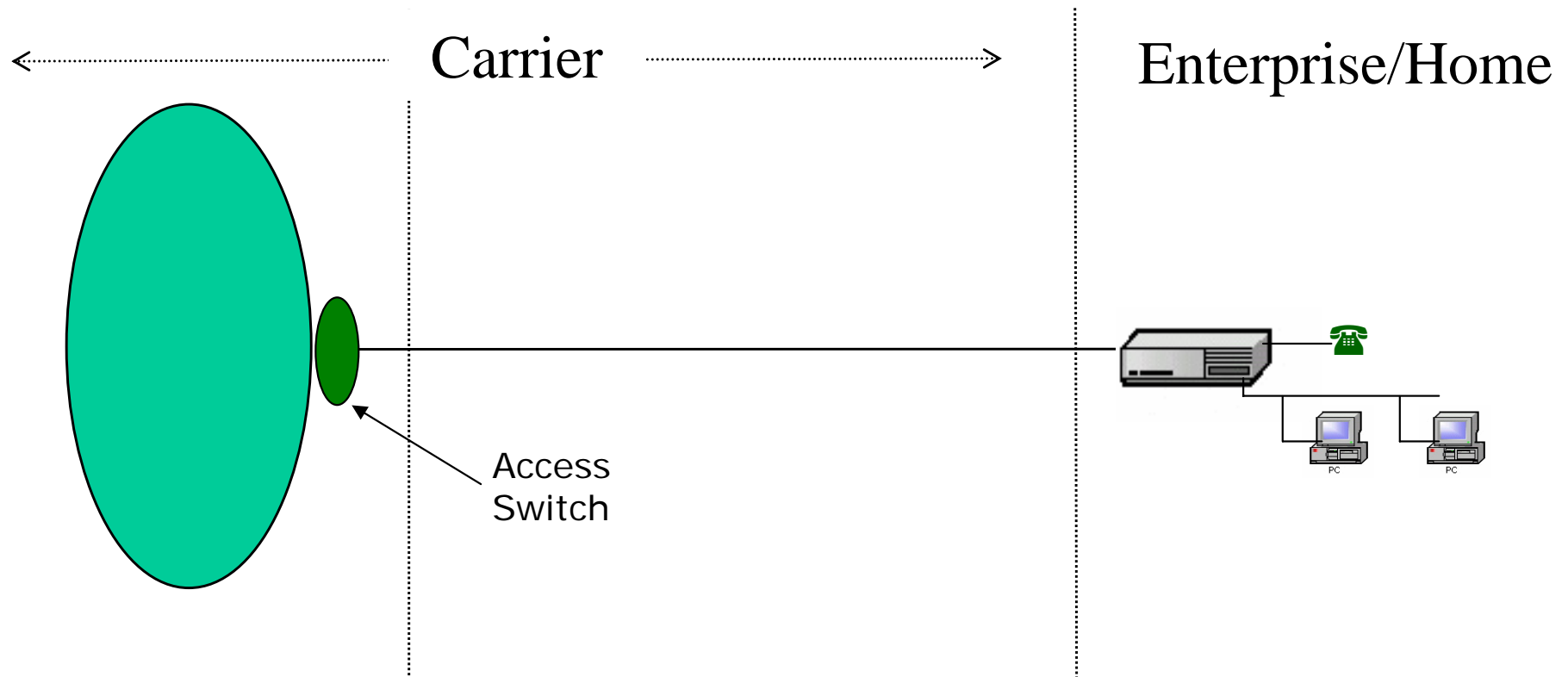


[www.ropeindia.com](http://www.ropeindia.com)



# Broadband Access Technologies

# Telecom Network



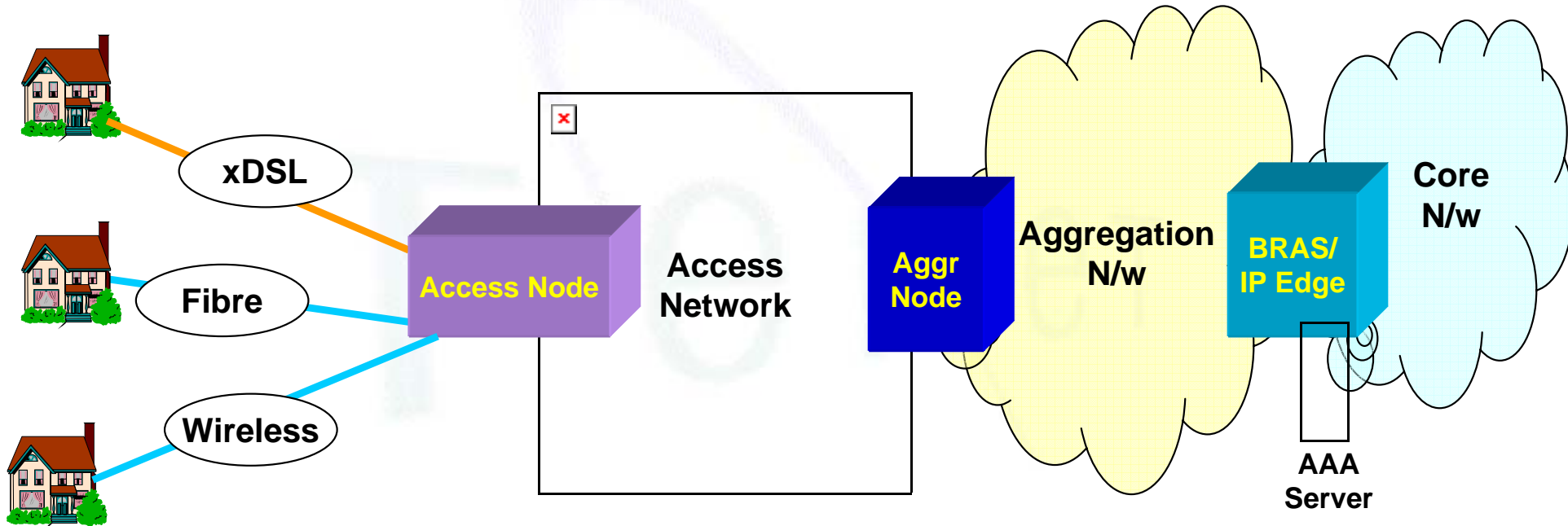
## Backbone network

Optical network  
Backbone exchange and  
terabit Routers and Switches

## Access Network

from exchange / PoP to home / office  
will carry voice and Internet

# Broadband Network Architecture

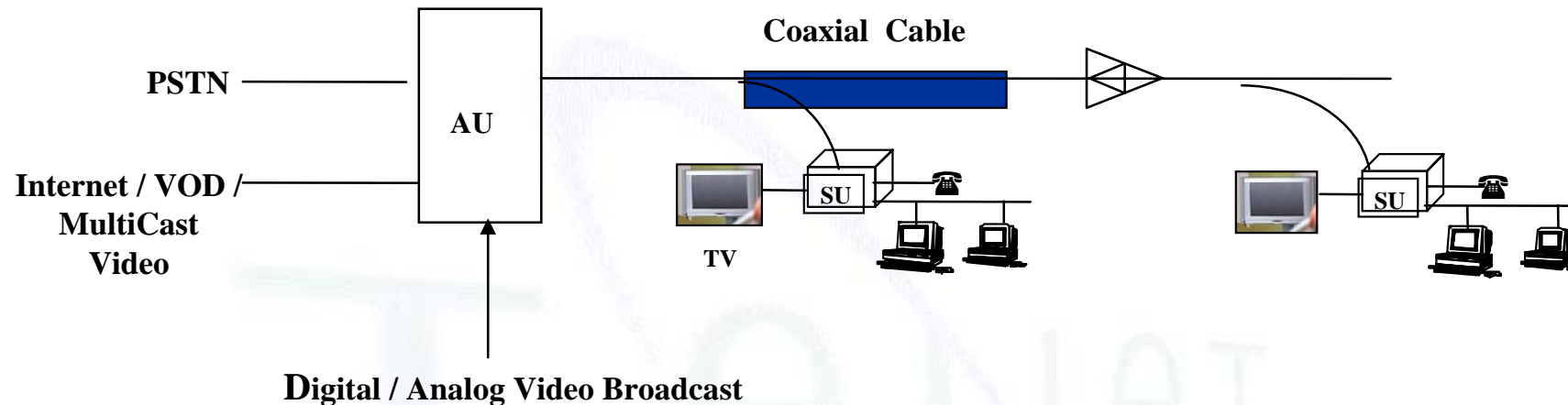




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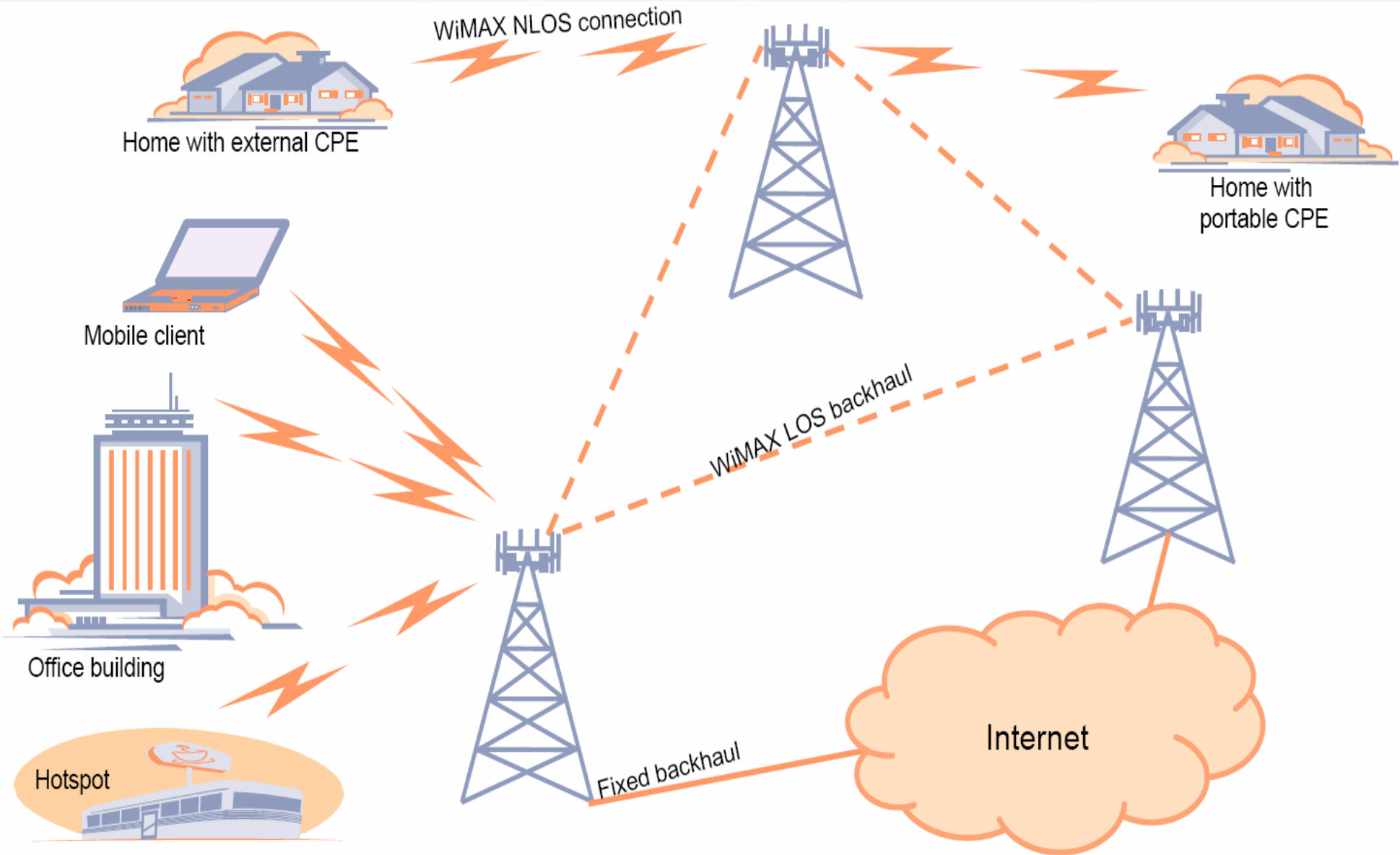
TeNet

# Access Using Coaxial Cable



- coaxial cable can provide voice, Internet as well as video
  - Each 6MHz video channel can provide 30-40 Mbps data
  - ideal for access network
  - high background noise in 5 to 40 MHz band
    - poor quality of cable and connectors, installation technique and illegal taps reduces reverse bit-rate

# WiMAX Architecture



- Throughput depends on distance, number of users, spectrum availability, reuse of spectrum
  - GSM IS-54: 9.6 kb/s per channel
  - CDMA IS-95: 9.6 kb/s per channel
  - GPRS: 115-150 kb/s **shared**
  - 3G (HSDPA/EVDO): 0.3-3 Mb/s **shared**
  - Midas Broadband corDECT: 256-512 kb/s **dedicated**
  - WiMAX: 1-2 Mb/s **shared**

**Most wireless broadband is shared and noise-prone  
==> instantaneous fluctuations in throughput**

- Need for broadband
  - Many existing and new applications
  - Many operators offer services
- Internet access becomes more essential
  - Customers need guaranteed quality
- Wireless broadband: shared, noisy access network ==> frequent quality variations

- TeNeT Group: <http://www.tenet.res.in>, <http://www.rtbi.in>
- Articles on the various broadband technologies:  
<http://en.wikipedia.org>
- Email: [tag@tenet.res.in](mailto:tag@tenet.res.in)

**Thank You**