

# Towards Internet for the Next Billion

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## Introducing the TeNeT Group

Incubating Entrepreneurs in a University  
Balancing Economic Growth & Social Development

A group of 19 faculty members at IITM and about 15  
companies incubated or nurtured by it with about 1500  
engineers

Have a dream  
for India

Incubate a S&T supported  
corporate entity  
which creates a business  
towards the dream  
*Must function as a business entity*

- 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
  - 700 m in India
- ARPU today for 100m subscribers: Rs. 350 (\$7)
- ARPU tomorrow for next billion: Rs. 100 (\$2)

# Broadband Access to Villages

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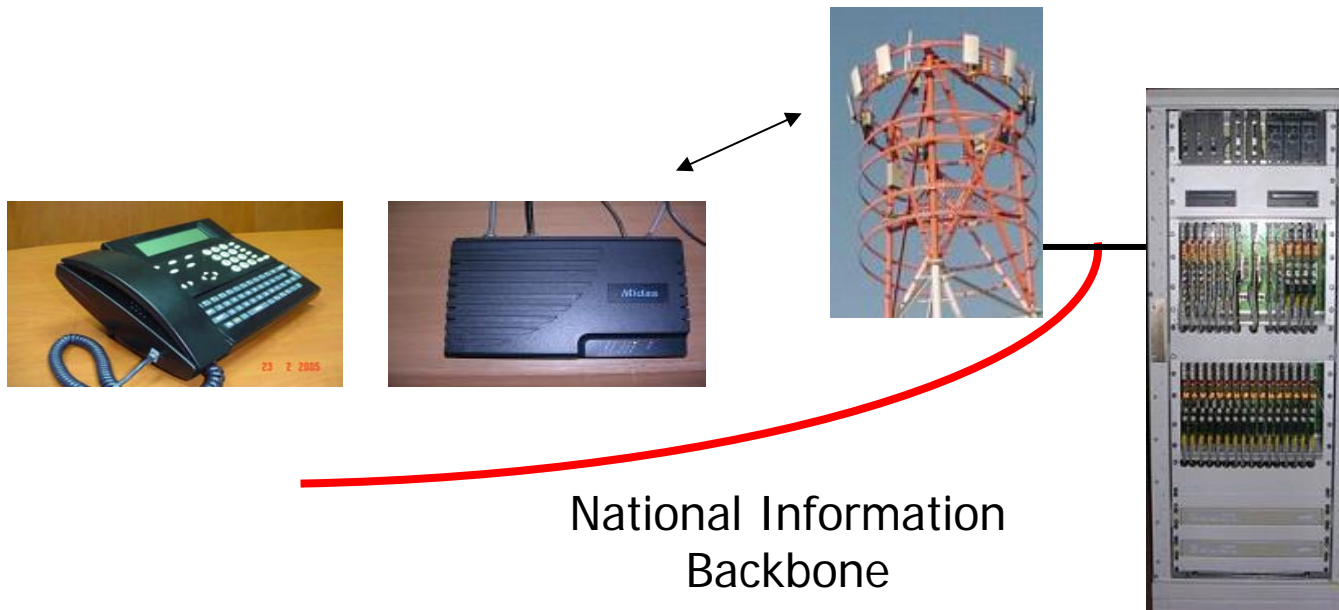
- Need guaranteed 256 kb/s per user
- Low-subscriber density – few users per village
- Copper local loop scarce, unreliable
- GPRS coverage mostly not available today

**Solution: Broadband corDECT**

- 256 kbps **Always ON** per user  
512 kbps also possible
- Telephone is added bonus: **upto 3000 subscribers**
- Upto **1000** Internet subscribers **per cell** site
- High-density **urban** (1-3 km cell radius)  
deployment
- 25 km **rural** coverage (using Relay Base Station)  
**⇒ Broadband anywhere**

# BBcorDECT: Major Innovations

- x3 bit rate: **256 kbps per user**
- dual-polarization antenna technology **doubles spectrum re-use**
- Internet to Ethernet: **~ 60 Mbps per site**



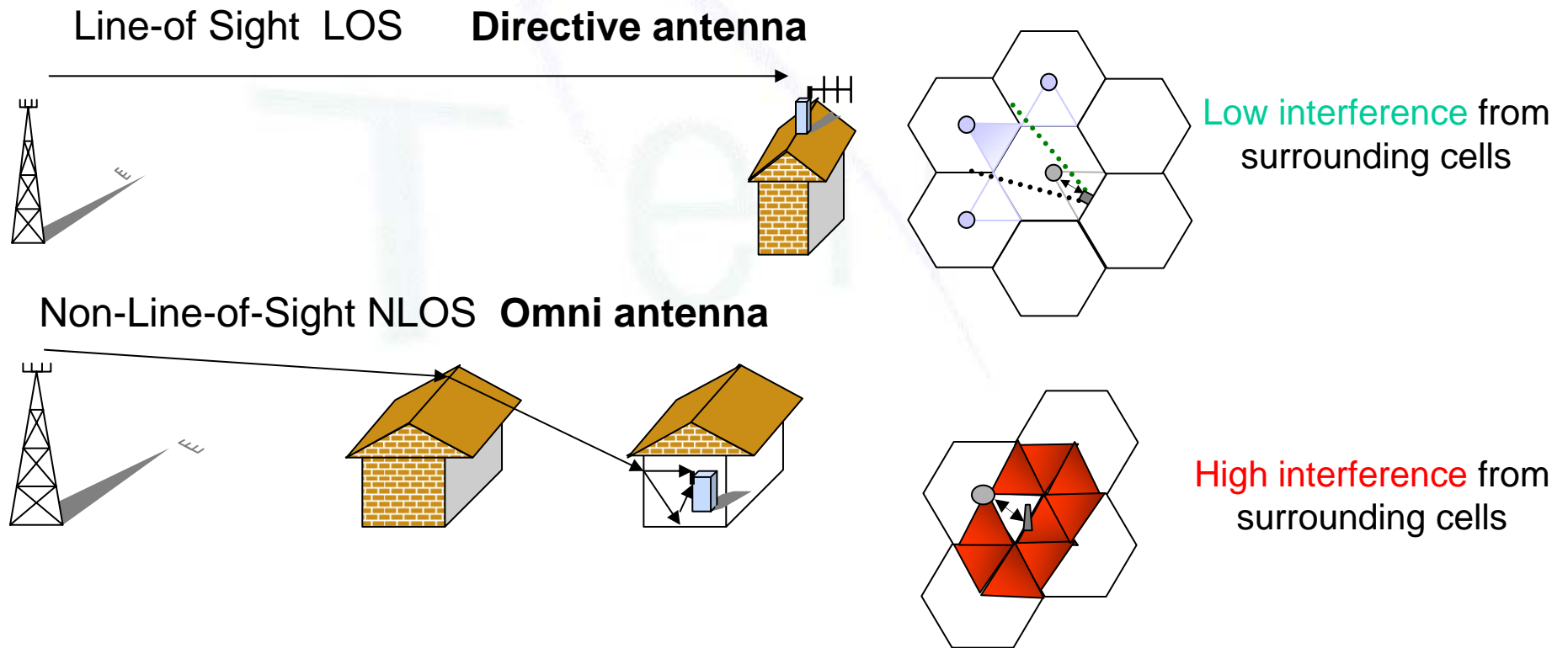
# Broadband Wireless Technologies

Technology	Capacity bits/sec/Hz/cell	Remarks
CDMA technologies – HSDPA (Europe), EV-DO (Qualcomm), TD-SCDMA (China)	1.8	mobility
802.16 D (current Wimax)	1.8	LOS, fixed
Flash-OFDM (Flarion, USA)	4.0	mobility
iBurst (Arraycom, USA)	4.0	mobility, smart antenna
<b>Broadband corDECT (India)</b>	<b>10.0</b>	<b>LOS, fixed</b>
802.16e (Wimax, end 2006)	4.0	mobility



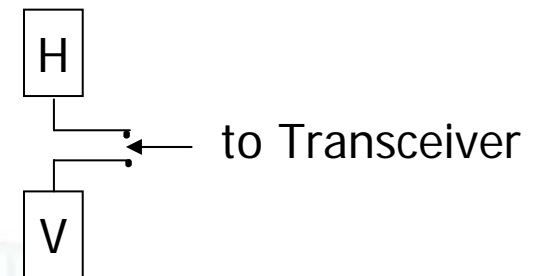
# LOS and Non-LOS Systems

- **LOS** : 10-20 times **longer range** and
- **LOS** : 5-10 times **higher spectrum efficiency**



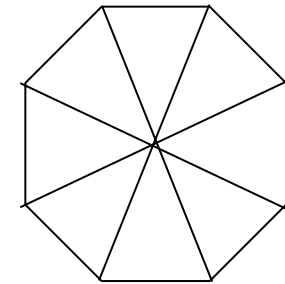
- **Multi-Level Modulation**
  - x1, x2, x3 bit rate
  - same bandwidth
  - sophisticated **Signal Processing** as in 3G / Beyond 3G
- What does it buy?
  - **256 kbps per user** now instead of 80 kbps earlier
  - higher bit rate not at the expense of subscriber capacity

- Every subscriber terminal has **two antennas**
  - **H**orizontal polarization and
  - **V**ertical polarization



- H and V polarization for each frequency acts as if **two frequencies** are available  
**⇒ doubles capacity**

- 1.66 bps/Hz **per sector**
- **6 or 8 sectors**
  - increase to 12 later, where needed
- Spectrum re-use in **every sector, every cell**
  - ⇒  $1.66 \times 8 \times 0.75 = 10 \text{ bits per sec/Hz/cell}$



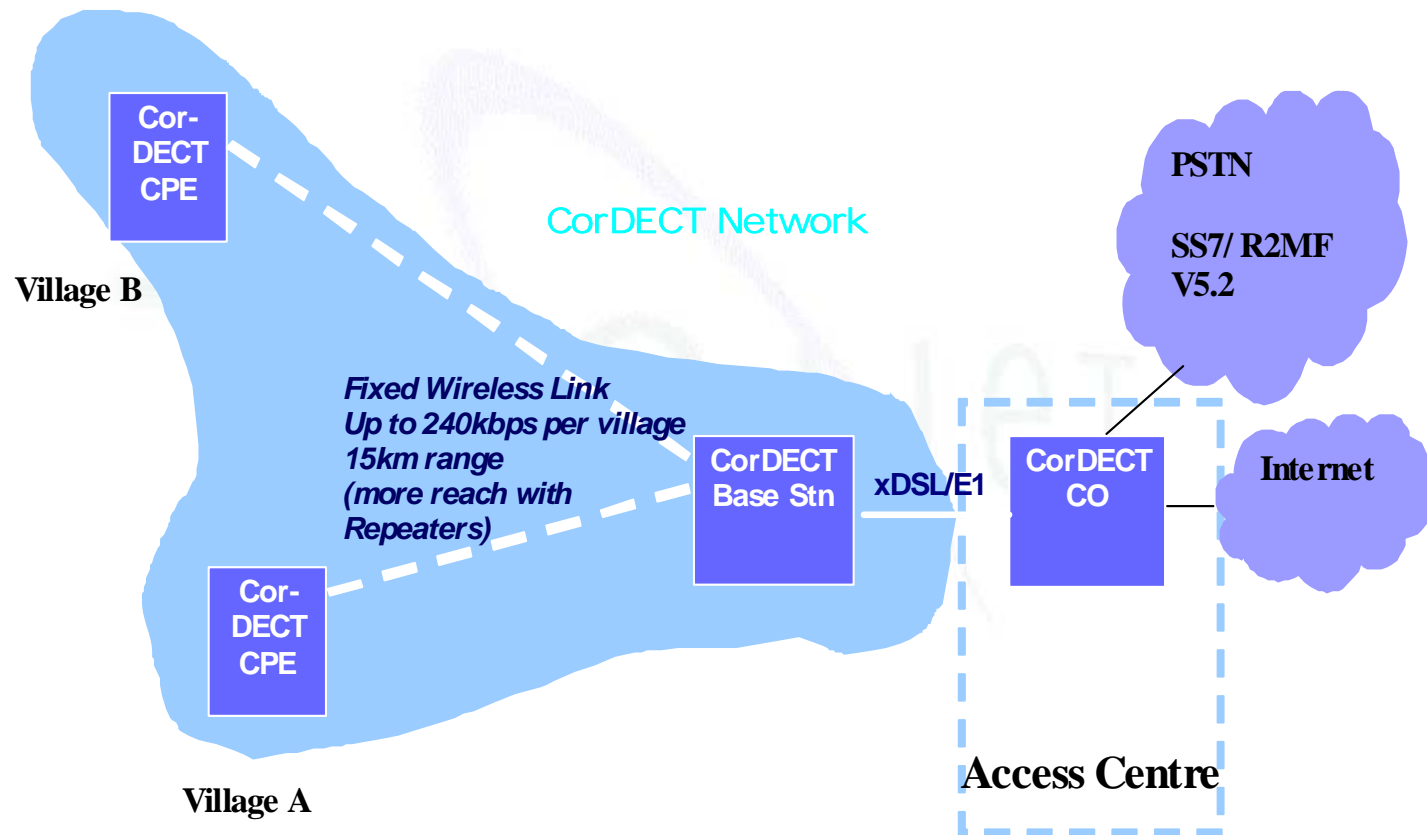
↑  
re-use efficiency factor

## 2. Intra-village: Micro-GSM

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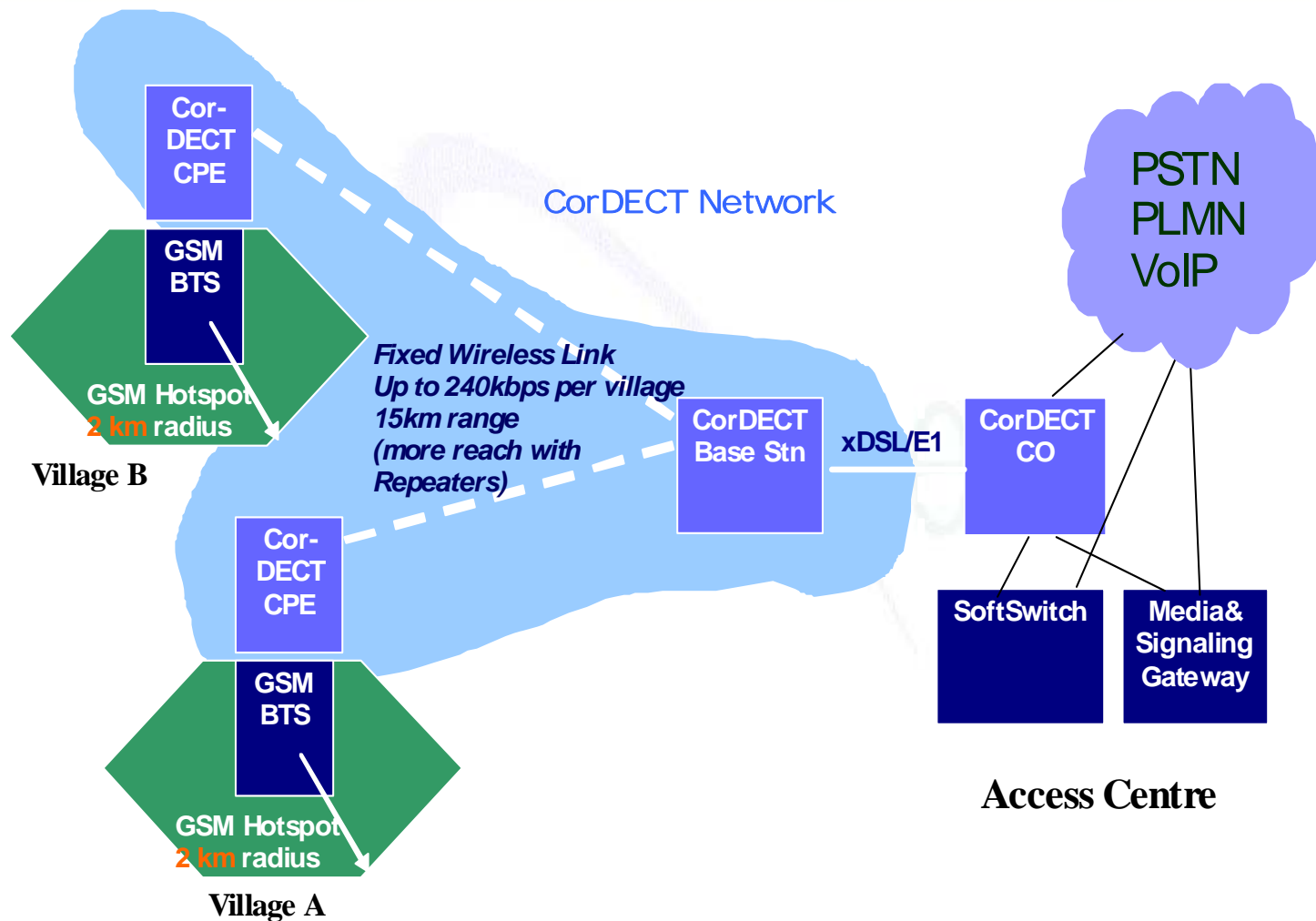
- Large number of villages without telephone connections
- Villages – geographically scattered, sparsely populated
  - Good case for localised coverage (hotspot concept)
- Low ARPU customers
- Essentials to address this market
  - Low cost, and scalability
- Differentiation between urban and rural markets
  - Differential billing (calls within villages switched locally)
- Huge market potential
  - 600,000 villages in India, 2,000,000 villages worldwide
  - Most villages in India within 15 km of a fibre backbone

# corDECT Rural Deployment



- GSM the obvious choice for low cost terminals
- Availability of large number of used GSM phones – a further boost
- Connectivity through packet-switched network – future proof, lower cost
- corDECT as solution for packet-switched back-haul
- Leveraging the large number of corDECT deployments worldwide
  - Excellent reach in rural areas

# GSM-CorDECT Integration





# TeNet Wired Broadband: Cable Internet

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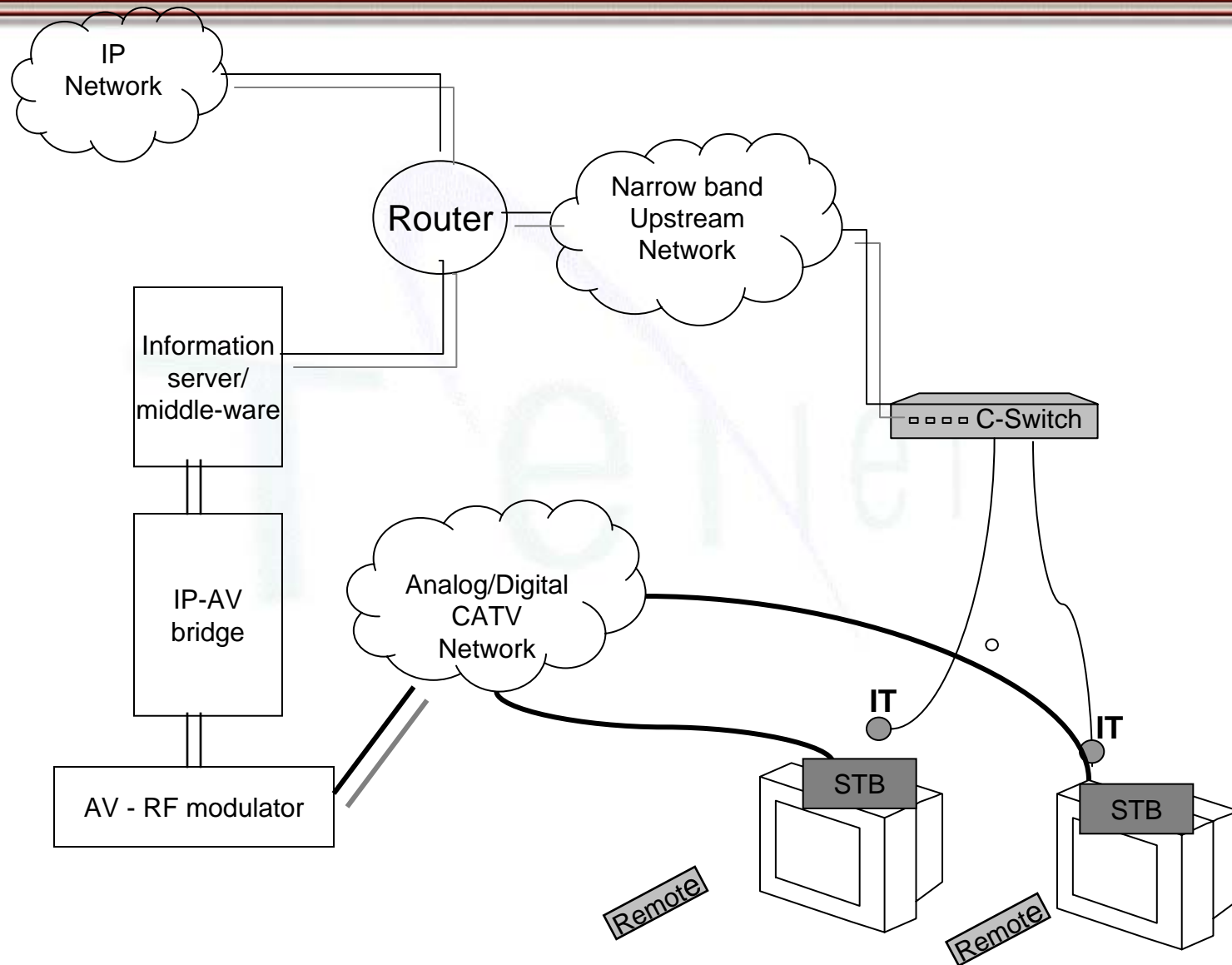
- 60,000 CATV operators serving 60m homes
- Rs. 70-150/month
- Cable connection quality good for TV, not good enough for upstream digital

# TeNet Wired Broadband: Cable Internet

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Triple-play products from Midas provide 40 Mb/s downstream on coaxial cable:

- CITIUS: upstream on corDECT – PC + TV
- CATIUS: upstream on Ethernet – PC + TV
- PRIMO: Digital/analog CATV downstream, upstream on Ethernet – Internet on TV+STB



Weather

Train info

PNR status

Cinema Tkt

Pizzas

Call taxi

LPG

Emergency

Bus routes

Head lines

*PRIMO*

Music

Movies

Games

Email

Chat

e-diary

e-shop

Jobs

Loans

**shaadi.com** Matrimonials



Looking for  
**Lifepartner**

GE Money  
Home Loan

From an idea to reality...

More info >>



GE imagination at work



Register Free

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திருமணத்திற்கு



**Tamil  
Matrimony.com**  
No.1 Tamil Matrimony

- Mail, SMS, Internet Search, Banking from TV
- Customized Internet based services on TV
  - Train, Airline, pizza's, call-taxi's, movies, music enquiries and booking
- Phone-book, e-diary, blogs on TV
- Local language interfaces on TV
- Personalized web-page for every user on TV
- All these and more unlimited services on TV
  - accessed only with remote by all age-groups

- Overall cost per line of the solution is targeted at less than \$20 per subscriber excluding DVB-C STB
- Three revenue streams are possible
  - Subscription revenue from subscribers
  - Advertising revenues
  - Revenues from content providers for streaming their content to TV.

- PC+software costs Rs. 20,000+, requires constant maintenance, upgrades, data backup
- Too expensive and complex for many middle-class people
- Server-based computing provides a low-cost, hassle-free *appliance* to the customer
- Midas' MeTeL
- Novatium' NetPC

# NetPC: Computing as a Service



- **Network computer:** multimedia client  
full desktop PC experience but without its maintenance issues
- **Utility computing:** service provider makes computing resources available to the customer as needed,  
charges them based on usage rather than a flat rate
- The **network computing architecture combined with** the **utility computing model** will enable affordable computing for a wide market base



- Based on cell-phone processor
  - ⇒ Low cost (Rs. 4,000 sale price) declining with time
- Client-pull for screen updates
  - ⇒ Adapts to network bandwidth
- Multi-media streamed from source to NetPC
  - ⇒ Lower CPU load on server, lower bandwidth

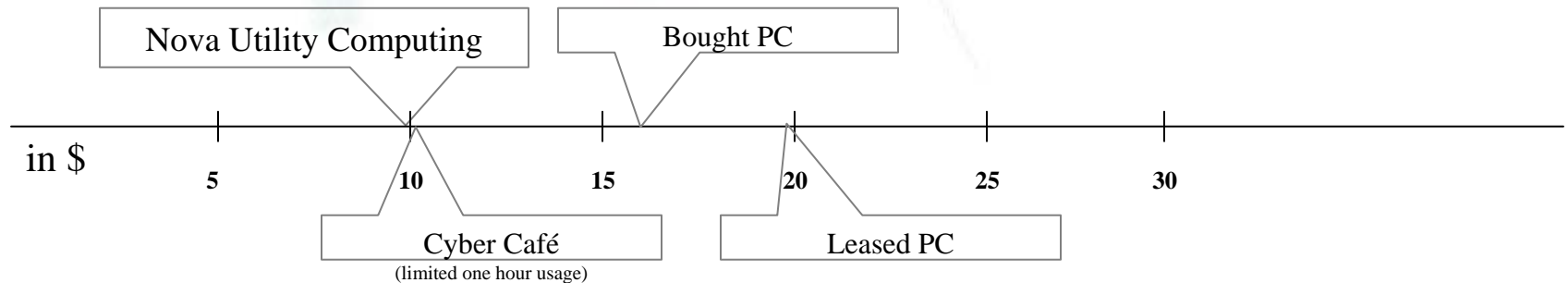


# NetPC Distinction

Platform	Uniqueness	Advantage
<i>Device Design</i>	System Design Server – Client partitioning Audio Video Codec Implementation	Optimal Bandwidth use PC-like user experience Connectivity to TV and monitor
<i>Interoperable</i>	Windows 2000/2003 Solaris Linux	Fits to any environment
<i>Network</i>	Ethernet (10/100) Wi-fi DSL/ADSL	Applicability to home users, office, factories, government, schools, colleges... <b><i>practically anyone!</i></b>
<i>Manage</i>	Session management Optima Management System <ul style="list-style-type: none"><li>•<i>Client Management</i></li><li>•<i>Peripherals Monitoring &amp; Control</i></li></ul>	Truly remote manageable. Central monitoring and support. Reduces overhead costs and enhances service levels
<i>Secure</i>	Authentication <ul style="list-style-type: none"><li>•<i>Biometric</i></li><li>•<i>Smartcard based</i></li><li>•<i>IPSec enabled</i></li></ul>	Highly secure Tamper proof Kids' proof Get rid of worries of “what if?..”
<i>Convergence</i>	Audio – video codec implemented (MPEG1/2/4, MP3, etc)	Stream the audio/video content or live TV. Ideal for home or education or training

# Economics for Home Use

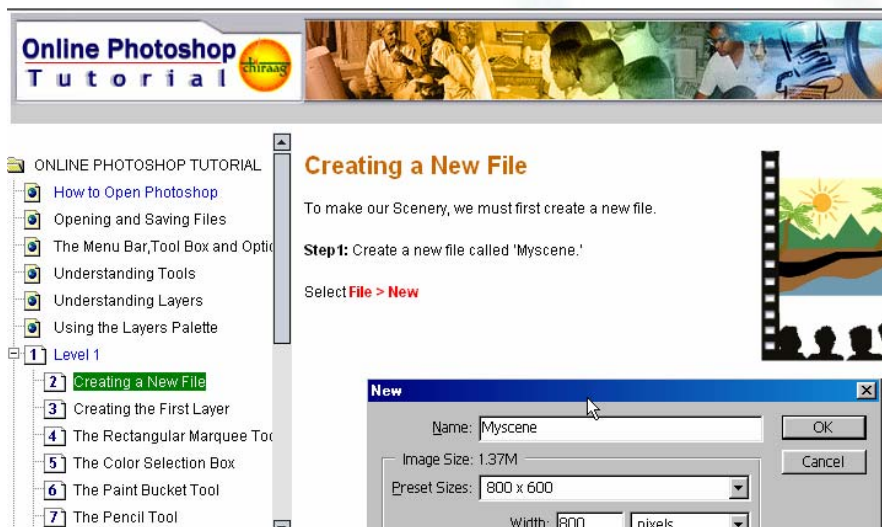
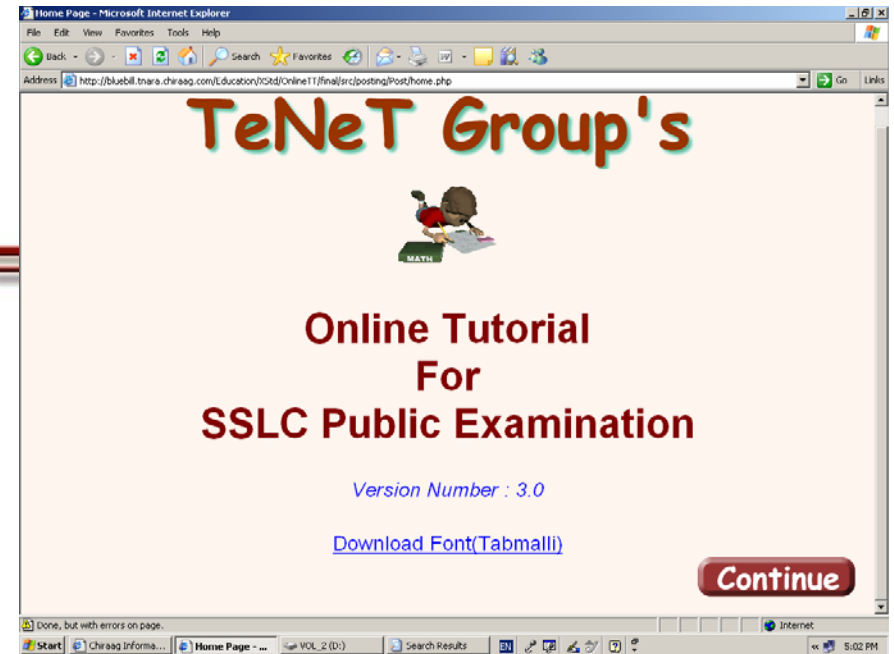
- Per-month cost including hardware, software, UPS, network connection, maintenance:
  - PC purchase: \$16.00
  - PC lease: \$19.70
  - **Nova NetPC: \$10.00**





# Education

- Curriculum based
  - Passing SSLC: excellent results
- Skill based
  - Spoken English
  - Computer Basics
  - CAD, Web development, Photoshop



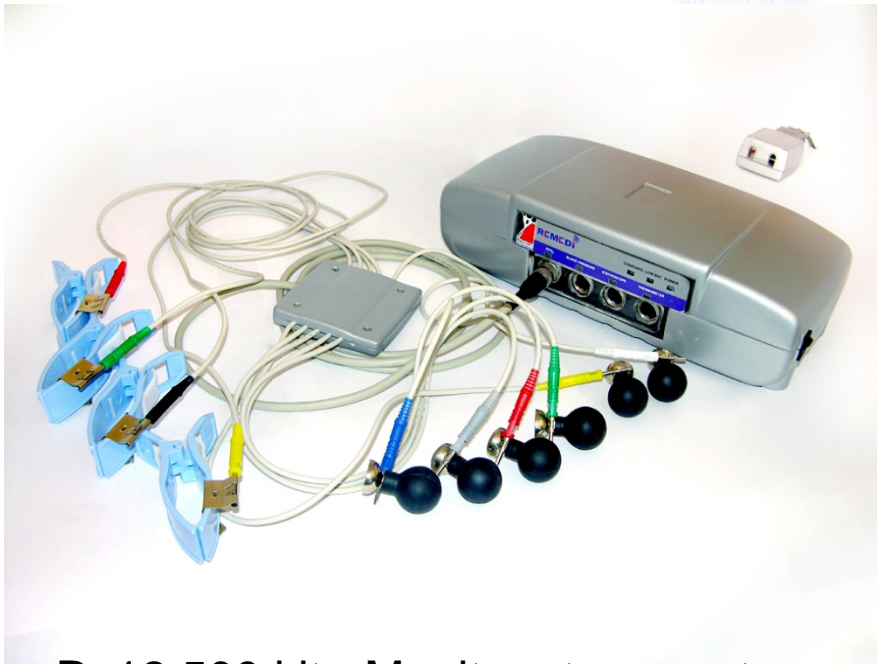
# Rural Finance

Vortex designs a Rural ATM  
at Rs. 50,000  
a 15<sup>th</sup> of prevalent cost



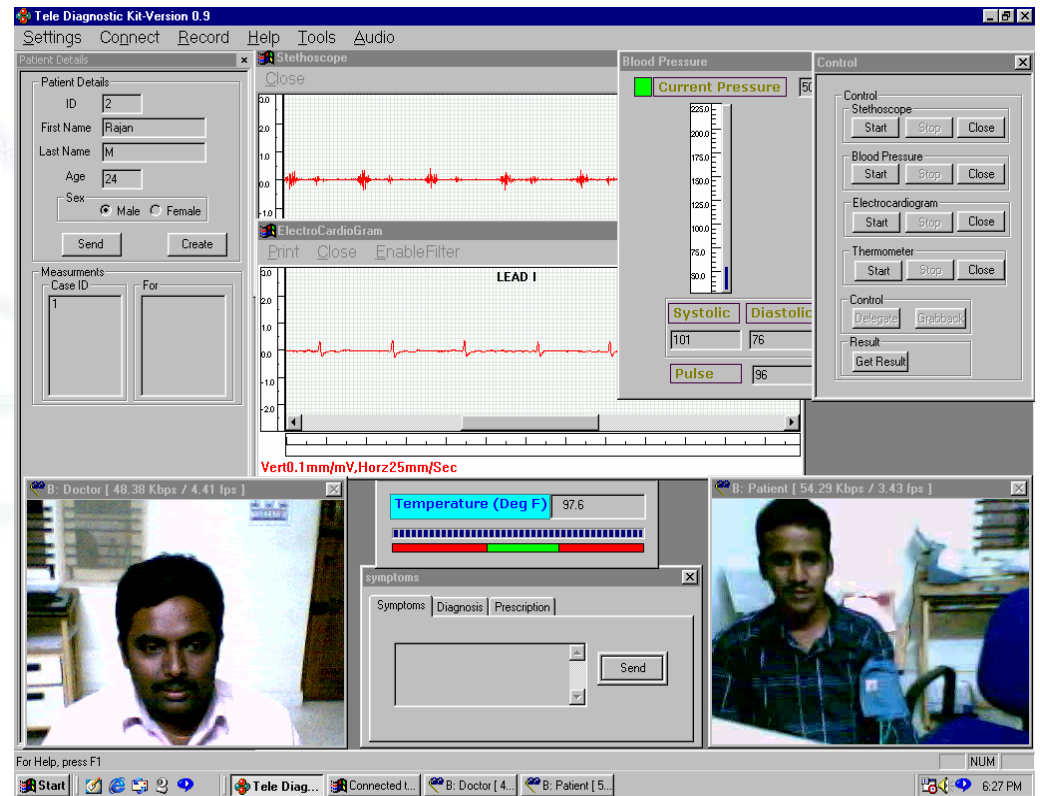


# ReMeDi™ Tele-medicine



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

Can blood tests be done tomorrow?





# TeNET Income Generation: Rural BPO

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- Usual ITES model – outsource to urban back office with 100s of staff
  - Quality control, security
  - Ease of distribution of work
- Rural BPO – outsource to 10s of villages with 3-20 staff each
- Challenges:
  - distribution of work, quality control, security

# Rural BPO: Pegasus

- Scan paper forms at head office
- Distribute via Internet to local servers
- Web-based application for data-entry, optimised for operation over 35-256 kb/s
  - PHP, MySQL, AJAX, Javascript
- Double-data entry + spot checking
- Online performance monitoring, payment, training
- Visual forms developer based on Nvu
- *Pilot: 20 kiosks, 2-5 seats each*





- Education
  - Skills-based
  - Curriculum-based – TeNeT **OnlineTT**
- Finance
  - Rural ATM – Vortex **Gramateller**
  - Web-based micro-finance ASP
- Telemedicine
  - NeuroSynaptic **ReMeDi**
- ...

Unpredictable, frequent outages because urban gets priority

- **IIT-M Rural Technology & Business Incubator (RTBI)** is incubating companies for:
  - Solar power
  - Bio-diesel

- Understand requirements
- Design products using advanced and mundane technology, keeping in mind commercial viability and environmental factors
- Work with business entities for sustainability and scalability

TeNeT Group has developed infrastructure products and basket of applications for Internet for the next billion

- TeNeT Group -- [www.tenet.res.in](http://www.tenet.res.in)
- Broadband corDECT, microGSM, Primo -- [www.midascomm.com](http://www.midascomm.com)
- Nova NetPC – [www.novatium.com](http://www.novatium.com)
- Pegasus rural BPO -- [www.desicrew.in](http://www.desicrew.in)  
[www.nilgirinetworks.in](http://www.nilgirinetworks.in)
- Email: [tag@tenet.res.in](mailto:tag@tenet.res.in)