Wireless Access - Key to Broadband Internet in Rural India

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Telecommunications Network in India

- Rapid expansion of the network in last 5 years
- Over two million lines added every month
- Total capacity around 50 million lines expected to grow to 200 million in just a few years
- Wireless/mobile connections exceed land lines (GSM and CDMA)
- Large scale fiber deployment has reached close to the village
- Only .3% of fiber capacity utilized
- Emergence of Broadband/Internet

Situation in Rural and Remote Areas

- Large areas without adequate facilities
- Irregular power supply, dust and humidity
- Widely varying temperatures
- Shortage of trained manpower
- Feeling of isolation
- Very little Internet penetration
- Expensive communication facilities
- Unfulfilled obligations of service operators
- Cable TV has reached ahead of telephone (?)

Requirements

- A multipurpose broadband connection to every user
- A digital pipe of 2Mbps+
- User friendly, ease of operation and maintenance
- Rugged and reliable
- High affordability

Technology Options for Broadband Access

- Fiber
- Wireless
- Wireline/DSL
- Powerline
- Optical Wireless
- Cable(TV)
- Local distribution via ethernet

Current Indian Rural Scenario

- Good coverage by public long distance payphones/booths Rural Switch RAX provides telephony in many rural areas all over the country
- A low cost affordable product developed specially for the purpose
- Wireless access in a few areas
- Rugged and reliable, able to withstand rural environment
- Some coverage by domestic satellite
- Few value added services
- Only narrow band Internet service (if any)

Technology Trends

- Data communication exceeds telephony
- Wireless/mobile subscribers exceed landline subscribers
- Broadband on Wireless
- Emergence of the Next Generation Networks Technology
- The world goes digital, mobile and virtual

Implications

- Telephone line (narrow band) goes to ethernet (broadband)
- IP on telephony to telephony on IP
- Last mile becomes first kilometer
- PSTN to a 'global' ethernet?
- Cellphone as a computer?
- Ever plunging costs of transmission and processing
- Ease of creating new products and services by integrating diverse devices and technologies

Key Drivers

- Wireless Technology
- Digital Signal Processing-DSP
- Device technologies
- Imaging and display devices affordable software products and development tools

Next Generation Network (NGN) Technology

- All services on a common IP/Packet network
- A single convergent multiservice secure network
- Extension of the AIN approach
- Separation of the control, signaling and switching QoS and MPLS
- QoS problems not fully mastered
- In general, moving all functions to software and std platforms

Advantages of NGN

- Open Systems - more choices, multiple vendors
- Lower costs - working to standards cuts development time
- Innovative services - working to standards
- Lower risks - compatibility with products and technologies from multiple vendors
- A means of utilizing full potential of the packet infrastructure
- Moving from Network Centric Multiservice model to Service Centric Multinetwork Model

Basic NGN Components

- Softswiches
- Media gateways
- Signaling protocols/stacks
- Tools like MPLS for ensuring QoS
- Tools for managing broadband wireless
- Techniques for large scale packet network deployment

Softswitch

- Core ‘switching’ or CO call control software on a standard platform
- More than separating the network software from network hardware
- Bring switching from telecom domain into the ‘data’ domain
- No hard constraints of traditional switches
- Ease of application development
- No large scale deployment yet

Media Gateways

- The interface between the PSTN and the Internet 'cloud'
- From TDM (circuit) to IP
- Connection between the telephone line T1/E1 and the ethernet
- Signaling gateways
- Range of products

Signaling and Protocols

- SS7 and beyond
- TCP/IP
- TCAP-Transaction Capabilities Application Part
- Sigtran-Signaling Transport
- MTP Message Transport Layer
- SCTP-Stream Control Transmission Protocol

Rural Broadband Model

- Very large demand (millions+)
- A 2+ Mps digital pipe to every subscriber
- Low cost, rugged and reliable
- Build on the large optical fiber base
- Take care of the last few miles
- Dominant role for wireless last mile solutions
- Commercially viable and attractive

Plan: Mission 2007- 'Every Village a Knowledge Center'

- Reach over 400,000 villages
- About 10 lines (digital pipes) per village
- Optical fiber within 30Km of most villages
- Satellite links for remove locations
- Wireless for the access network
- Average additional investment of about $100 per line

Services

- Telephony
- Internet access
- Multimedia, video, imaging, etc
- Support basic services
- Education, Health, Local Government, Agriculture,etc
- Information kiosks
- Very simple user friendly, local language support
- Very low cost terminal/phone

One Approach

- Create a nationwide network for rural broadband service
- Tune existing components for for low cost ethernet
- Distributed servers, softswitches and gateways to meet community needs
- Resource Centers
- Embedded components for lower cost
- Specially developed low cost terminal

Favourable Factors

- Ever plunging cost of hardware
- Rapid fall in transmission cost
- Technology as commodity
- Large MNCs are focusing on developing countries

Wireless Solution

- WiFi and WiMax
- WiMax, the interface between fiber network and the local network
- WiFi for the local distribution via ethernet/star
- WiFi network interface with other links, satellite, cable, radio, etc.

Need for Innovation

- Maturing WiFi Technology
- Benefit from antenna/array technology/MIMOs
- Benefit from infrastructure already created e.g. GSM, CDMA, etc.
- Custom antennas for extension of WiFi range
- Any role for mesh networks?
- Any applications for software radios?

In Conclusion

- Wireless is the key technology for wiring India
- Low cost solutions with focus on WiFi and WiMax
- Great opportunities for the innovative engineer
- Need modest investment
- Products and technologies could have global impact