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DIGITIZING THE INDIAN CABLE - ON IP

- R. Balajee

INTRODUCTION

The growth of the Indian CATV industry had been phenomenal. It is the result of unleashing the entrepreneurial energies of a generation waiting for an opportunity. 52 million CATV homes with a growth rate of 8% is something that is possible only through the collective energies of thousands of Cable operators, be it the MSO's or the LCO's. It is more dramatic than a walk-man or iPod (which are designed, engineered and marketed out of years of research), creating a business opportunity worth billions of dollars out of thin air.

While this industry flourished out of the entrepreneurial energies, lack of planning and vision for the future has resulted in what seems to be a stalemate on the progress of this industry. DTH is threatening to take the entertainment sails out of this industry. TELCO's are doing their bit with Triple-Play on copper and IP-TV. CATV being a low cost initiative it enjoyed low cost labor borne out of semi-skilled technical personnel it employed. The network itself was not scientifically designed and developed for scalability in terms of applications.

FROM NOW TO THE FUTURE

Cable TV industry is at cross-roads, simply put. It needs to adopt technologies while retaining the entrepreneurial vigor with which it was borne out. It has the potential to face the challenges of time and emerge victorious at the cross-point. LCO's were so miffed at the time of expansion of channels and the consolidation that this industry went through when MSO's entered the scene with high profile funding and equipments. Everybody thought it is going to end soon. But LCO's have not only thrived in co-operation with MSO's, but are also becoming channel partners for ISP's and TELCO's and becoming the access people.

Similarly today with TELCO's and DTH questions and doubts are raised about the MSO's and LCO's capability to sustain. In fact what is being questioned is not just the MSO's or LCO's capabilities, but the worthiness of the very basic co-axial cable TV system itself. The key question is, Does the Co-axial Cable TV network in India has the capability to withstand the technological onslaughts and provide for new applications and services with good quality of service..?

DIGITIZING ON IP

One solution to this problem would be to convert a portion of the Indian Cable TV network to IP network. Clearly the future is moving towards IP based broadcasting. In not so distant future, we would be having TV channels and shows on web that would be delivered to end user directly on TV

over the net. TV could become much more web-like with millions of shows to download from web.

The power of IP TV arises from the fact that the programmes need not be broadcast programmes alone. It could be any programme on the web which has a limitless capacity for programmes. Net based innovations and Digital TV have started converging is another angle to the emerging IP-TV story.

Traditional broadcasters and cable operators have been wrestling with technologies such as PVRs (personal video recorders) which allow viewers to take more control over what and when they watch. But IP-TV has the potential to disrupt that even more. Hundreds of different programmes could be sent to different homes at the same time as required by them from the web.

Such an IP network can trigger applications like Gaming, Video Phones, online shopping, live traffic camera streams and host variety of other applications. Whatever the content, it is exciting that there are many more new distribution channels. And there are portals, allowing access to movies like Yahoo, Google and MSN.

And why do I believe that the Indian Co-axial cable TV network is the only network that can do that and CITIUS could be the platform for doing it.? The answer is simple. Let's look at a simple calculation.

A typical Fiber Optic Node caters to 1000 co-axial cable subscribers. And assume I would be able to reach a Fiber based IP connection of 2 GBps to this node. Assume I am going to use 50 CATV analog channels on the cable. It would provide 1800 Mbps usable bandwidth on cable. This translates to 1.8Mbps dedicated bandwidth to every home. If a Fiber Optic Node caters to only 500 subscribers, as it is in planned networks it is 3.6 Mbps to every home.

And this set up is already available in India. Most of the Indian CATV network is easily carrying 50 channels. There is no other network in India, which is so well placed like the CATV network that can provide real broadband services including video.

Ofcourse the network is not dimensioned like above. It is dimensioned as a broadcast network where channels are slotted and not subscribers. I made the above calculation just to show the fact that Indian Cable TV network could become a powerful interactive medium at every home. But migrating from a broadcast network to an IP network is possible in a very profitable way.

CHOICE OF UPSTREAM

It is possible to make Indian CATV network into an IP network, provided we have a return path. Indian CATV network is not two way. Wherever two-way network has been defined, reverse path management has been a problem. This problem does not manifest itself initially. It starts appearing once the scaling of network on two-way reaches more than 10-15% is practically seen. And with environmental factors like rain maintaining the reverse path bleeds the operator with limited scalability.

And with return path through cable, the upstream bandwidth will always be limited and network issues will rise with more subscribers on the network. Hence return path through cable does not lend itself to a successful IP-TV solution in the Indian context.

A way forward would be to provide a return path on wireless technologies that provide internet access. There are multiple Wireless technologies like GSM, CDMA , corDECT and Wi-Fi in India.

Of these GSM and CDMA are mobile wireless technologies and not much suited for Fixed wireless access. This is because they provide very low upstream bit rates for internet access. CDMA or GSM, even with their 3G variants does not provide more than 100+ Kbps per base station (shared for all subscribers in a base station) and for a fixed broadband solution like Cable, this kind of upstream is too poor to run even primitive applications like browsing.

Wi-Fi is another technology that can be used for upstream wireless. The problems with this approach is that Wi-Fi ranges only in 100-300 meters and that too in a in-building environment with multiple

reflections it does not work at all. A typical cable operators' network spans atleast 1.5km in radius and it is difficult to work with such a low range. Another very important problem is that since this is free spectrum, lot of interference is possible and services could get blacked out totally.

Another wireless technology is corDECT which has capabilities to provide upstream bit rates from 1 Mbps to 3 Mbps per base station. With this kind of bandwidth several Mbps can be evacuated on upstream from a single cell site. CorDECT also provides bandwidths from 70 kbps to 256kbps dedicated to every user on both upstream and downstream. The range of corDECT is around 10 Kms and for 256/512 and other higher kbps upstream, it is recommended to be limited to 3-4 Kms.

Essentially Indian Cable Operators have to invest in return path through wireless. It would help them in evolving into a pure IP network with very high scalability and protection of investment.

CITIUS – CABLE AND WIRELESS PLATFORM

CITIUS provides a platform for Cable downstream and Wireless upstream. It is a scalable architecture where it uses one CATV channel and provides shared 36Mbps usable bandwidth per CATV channel on downstream and 32-256kbps or higher wireless upstream dedicated bandwidth to every user.

This architecture can be independently scaled for multiple CATV channels. Because of wireless upstream, it can be made sure that every subscriber has dedicated wireless upstream bandwidth that is rate limited at the subscriber terminal.

Now every subscriber is on an IP network where the downstream is controlled at the head-end to 256/512 kbps or higher bandwidth and upstream is controlled at the CPE from 32-256 kbps or higher bandwidths.

Currently operators can provide toll quality voice and broadband internet services on PC in CITIUS platforms. It is planned to provide broadcast channels on IP to subscribers through IP Set Top Box. Applications like gaming, video-phones, thin-clients, TV channels from web can be run on this IP Set Top Box and made available on TV. Since the bandwidth in a single channel is limited, number of subscribers in uni-cast mode and number of channels in multi-cast mode will be limited.

For eg. We estimate that from a Fiber Optic Node (LCO point), upto 100 subscribers can be served in a Single Channel. Out of 36 Mbps usable bandwidth, 6 Mbps (at 25% concentration ratio) would be used for internet access of 100 subscribers, 30 Mbps would be used for 21 broadcast channels or 21 simultaneous unicast on-demand channels which means 21 subscribers can be simultaneously watching video on IP on a single channel. This translates to 100 subscribers, if we assume a concentration ratio of 20%.

As the demand for IP based services increase, more channels can be brought in under IP services. At that time more subscribers in uni-cast mode can be added or more channels in multi-cast mode can be provided. Over a period the entire Cable network would be a IP network. With the dimensioning of 1000 subscribers per Fiber Optic Node and 50 channels, each subscriber can have 1.8 Mbps dedicated downstream bandwidth for Voice, Video and Data over a period. Thus it can happen incrementally.

Since CITIUS is a home-grown device, it would also address the problems of lightning strikes, safety issues etc. Issues on Fiber disruption would still remain. But when Cable is disrupted CITIUS provides a life-line service with bi-directional wireless system.

Thus the reliability of the service with CITIUS as compared to a traditional Cable Modem service would be more than 99% and would reach the TELCO grade of service (99.99%) for voice and internet access.

40 MBPS ON A SINGLE CATV CHANNEL

CITIUS uses the ITU J.83b standards for cable downstream. ITU J.83b standards define the way in which 40 Mbps data can be transmitted on a single CATV channel of 6 MHZ bandwidth. 40 Mbps can

be got with 256 Quadrature Amplitude Modulation. The conventional CMTS systems use 64 QAM and provide near 30 Mbps on a single 6 MHz Channel. Typically they work at signal levels as low as 45dbuv.
If the Indian CATV cable network is going to continue one-way, there is no problem in setting up the signal levels higher on the network as the problems of reverse path noise does not exist. With a 60dbuv level signal Indian CATV network can support 256 QAM and this would provide 40 Mbps on a single channel.

TV WORKS INTERNET WORKS

Another key issue is that the end subscriber as well as the Local Cable Operators should be able to identify problems related to running data on cable very simply. In other words if internet does not work on Cable, there should be methods which are effective in finding if it can work or not. This is very important if the system needs to be user friendly.

Assuming upstream goes on wireless, for downstream on cable there are parameters that one would be looking at to ensure that internet on downstream channel is OK. They are the Signal level, Bit Error Rate and Modulation Error Rate.

A signal level of 60 dbuv would ensure 256 QAM on Indian CATV network. This signal level is dependent on the amplifiers that are present in the network and in most cases easy to set up. A Bit Error Rate of atleast 10-6 is required, while ideal requirement is 10-8. Bit Error Rate is influenced by either the Signal level or the interference level. Since signal levels are easy to maintain, the interference levels are the one to look at.

Interference can originate from the Head-end or amplifiers or unterminated connections. Of these ensuring minimal interference at the head-end is easy. Most LCO's do it as part of their daily life. Ensuring minimal interference at amplifier points is bit more tricky, but this is also a job that the Local Cable Operator does as part of the daily lives. Un-terminated connections causing reflection and interference is a way of life in India and is bound to cause higher Bit Error Rates. This problem can be solved either by ensuring that all open ends are terminated properly or placing the channel for internet at a higher frequency. At frequencies above 300 MHz the attenuation on cable is high and hence the reflections from un-terminated connections attenuate rapidly to cause any significant interference.

Hence it is absolutely possible to set up a 256 QAM digital internet channel on a 6 Mhz Indian CATV channel. And we can ensure that if the TV works the internet also works. There could be conditions in which the TV would work even with slight problems, but by ensuring adequate signal level, higher frequency and terminating open connections we would be able to ensure that internet works when TV works and TV also works with good quality picture.

256KBPS ON WIRELESS

CITIUS uses corDECT spectrum for upstream.

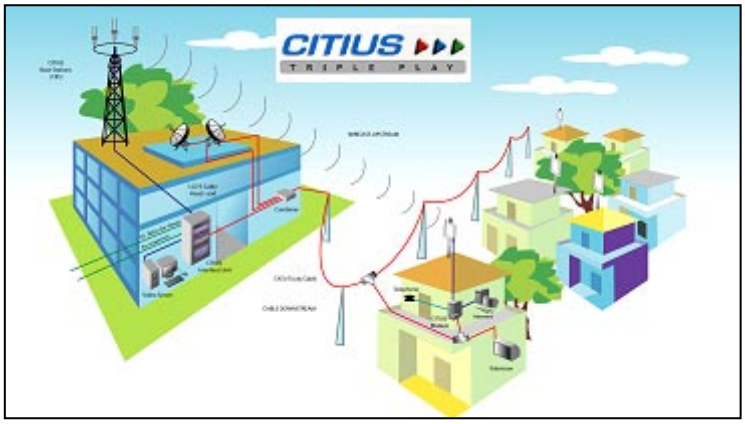
BBcorDECT is the broadband version of corDECT. It is the same technology with a different modulation scheme to improve spectrum efficiency and speed. It provides simultaneous voice and internet access. It offers dedicated, sustained upstream access of 32 to 256 kbps and higher.

What is corDECT ?

CorDECT is a Fixed Wireless Access standard. It operates at 1880-1900 Mhz spectrum. In India this spectrum has been reserved for this indigenous technology. It provides simultaneous voice and internet access. This spectrum is licensed and ISP's can avail this spectrum easily.

HOW DOES CITIUS WORK ?

CITIUS consists of a CITIUS Interface Unit placed at the head-end, Base Stations mounted on buildings and Subscriber Terminals installed at subscriber premises.



The CIU and base stations are connected using copper or dark fiber. CITIUS subscriber terminals are either Single Subscriber Terminals commonly referred as CITIUS modems or Internet Terminals in which case they are mounted like a DP Box outside the building and only Ethernet cables are taken into Subscriber premises.

The CIU integrates the Wireless Upstream and Cable Downstream and present a single internet interface to Internet on Gig-E/FE.

Each Base Station typically provides a 3 Mbps wireless interface on its coverage area. Multiple Base Stations can be mounted in a sector to increase the capacity in a given sector. The Base Stations are small in size/weight and can be mounted on top of towers or poles on buildings.

Subscribers can be provisioned with 256/512/higher downstream bandwidth speeds. On the upstream 256 kbps speeds can be given dedicated to users.

CONCLUSION

Our main goal currently is to provide real broadband connectivity to end users using the Indian Cable and eventually grow it into an IP-TV solution. CITIUS has been deployed with an ISP, a TELCO and 2 MSO's. The trials have gone very successfully in each place and we expect to deploy 50k lines of CITIUS for broadband internet, voice and triple-play solution. I should mention again that while we brought in CITIUS as a technology, it is the people like the MSO's and ISP's whom we partnered with for trials, who converted this technology into a product for their masrket. And the whole thought process that is expressed over here is again the collective entrepreneurial energy of a nation that is voicing itself loudly and not that of one person or company. ■

R. Balajee heads the Cable Wireless Business in Midas Communication Technologies. For over a decade, Midas Communication Technologies has been in the forefront of developing indigenous state-of-the art telecommunication broadband access solutions on wireless and copper. Currently, infrastructure for over 2.5 million wireless lines is being deployed by all major telecommunication service operators in India like BSNL, MTNL, HFCL InfoTel, Shyam Tele-link and as well as across the globe including Brazil, Honduras, Bangladesh, Sri-Lanka, Bhutan, DR Congo, Nigeria, Tunisia, Iran, Togo etc. Midas's broadband solution on copper has been deployed by BSNL, the largest telecom operator in India and is operational in over 400 exchanges across the country, in its earlier form. Midas product range includes Remote Ethernet Switches, Leased Line Modems, IP DSLAMS, Routers and Remote Access Servers.

Midas

Midas has entered into Cable segment with a vision of providing broadband connectivity and services to 50 million broadband homes in India with the motto "Wherever TV works, Internet works".

Midas is the recipient of several awards, honors and distinctions awarded by DSIR, Ministry of Science and Technlogy, MAIT, IETE, Ministry of Communications & Information

Technology, Dept. of Information Technology, CSIR etc..

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