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IPTV: A NEW DIMENSION IN ONLINE VIDEO STREAMING – A STUDY OF THE INDIAN SCENARIO

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Objective of the paper: The present paper shall try to answer questions related to technological and regulatory challenges faced by IPTV and the constraints related to its successful implementation in India. The study also analyses the potential of IPTV as a tool of education in context to the changing paradigm of Teaching-Learning Methodology and pedagogy.

Methodology: The primary data has been collected from relevant working papers of government and private organizations as well as literature review. The secondary data includes interviews and excerpts from reports of various web portals.

Abstract

Post globalization, the satellite technology and internet has been two of the most potent weapons for innovations in education of the country. With television meteorically becoming arguably the most popular and influential mass media, cutting across all generations, the introduction of IPTV(Internet Protocol Television) has thrown wide open immense possibilities of a neo-popular technology- a convergence of TV technology with internet which is likely to encourage study rather than repel it.

However, in a consumer sensitive third world-*ish* market like India's, it is not easy to set the diffusion of an innovation. The already existing and dominant cable tv and DTH market paves little way for IPTV. Computers and access to the World Wide Web is still not a regular feature in educational institutions. There is acute lack of inducive environment in the educational scene where IPTV may thrive. There are issues of ethical and legal considerations with IPTV getting caught in a three pronged confusion of TV, internet and telecommunications.

The response to IPTV in India has been mixed with reports of business getting winded up, faulty customer service and infighting between technological partners. Inspite of that, successful use of the technology by frontline institutions like IIT Kharagpur keeps the momentum alive.

The present paper presents a critical commentary on the technological uniqueness of IPTV, its potential, challenges and the viability of changes it may offer as a tool of communication.

Keywords: IPTV, DTH, Cable TV, HDTV, Interactivity, ISP, Broadband, QoS, LAN, Ethernet.

Emergence of satellite and internet

The popularity of the audio visual mass media especially television has been growing in India by leaps and bounds. After the economic liberalization of Indian economy in the early '90s the cable TV became a household phenomenon exposing the Indian audience to world TV content. The satellite transmission technology replaced the erstwhile terrestrial broadcasting and helped to expand the quality as well as market of television.

Another revolutionary mode of communication that India experienced during the period was internet. Using cables, fibre optics, satellite and telecommunication technology, internet revolutionized the norms of the society by empowering people with communication and interactivity at the speed of light and at miniscule price! It changed the socio economic pattern of the country.

And it was evident that internet was to play a big role in the process with the development of projects like NME-ICT in the government level. In the private level, the trend of using internet based applications like email, web portals and web cameras gained momentum in corporate sector as well as NGOs. Educational institutions emphasized on setting up computer labs comprising computers with internet facility for teaching and research. Simultaneously satellite and telecommunication technology kept on reinventing with high definition television, direct to home and 3G. The latest in this line is IPTV a potent blend of internet and television.

Technological integration & convergence through IPTV

According to the ITU, IPTV is defined as "Multimedia services such as television/video/audio/text/graphics /data delivered over IP-based networks managed to support the required level of QoS/QoE, security, interactivity and reliability."(Recommendation ITU-T Y.1991) Another more detailed definition of IPTV is the one given by Alliance for Telecommunications Industry Solutions (ATIS) IPTV Exploratory Group on 2005:

"IPTV is defined as the secure and reliable delivery to subscribers of entertainment video and related services. These services may include, for example, Live TV, Video On Demand (VOD) and Interactive TV (iTV). These services are delivered across an access agnostic, packet switched network that employs the IP protocol to transport the audio, video and control signals. In contrast to video over the public Internet, with IPTV deployments, network security and performance are tightly managed to ensure a superior entertainment experience, resulting in a compelling business environment for content providers, advertisers and customers alike."

Basically, Internet Protocol television (IPTV) is a system through which television services are delivered using the Internet protocol suite over a packet-switched network such as the Internet, instead of being delivered through traditional terrestrial, satellite signal, and cable television formats.

IPTV services may be classified into three main groups:

- live television, with or without interactivity related to the current TV show;
- time-shifted television: catch-up TV (replays a TV show that was broadcast hours or days ago), start-over TV (replays the current TV show from its beginning);
- video on demand (VOD): browse a catalog of videos, not related to TV programming.

IPTV is distinguished from Internet television by its on-going standardization process (e.g., European Telecommunications Standards Institute) and preferential deployment scenarios in subscriber-based telecommunications networks with high-speed access channels into end-user premises via set-top boxes or other customer-premises equipment. The Internet protocol-based

platform offers significant advantages, including the ability to integrate television with other IP-based services like high speed Internet access and VoIP. A switched IP network also allows for the delivery of significantly more content and functionality. In a typical TV or satellite network, using broadcast video technology, all the content constantly flows downstream to each customer, and the customer switches the content at the set-top box. The customer can select from as many choices as the telecoms, cable or satellite company can stuff into the "pipe" flowing into the home. A switched IP network works differently. Content remains in the network, and only the content the customer selects is sent into the customer's home. That frees up bandwidth, and the customer's choice is less restricted by the size of the "pipe" into the home. This also implies that the customer's privacy could be compromised to a greater extent than is possible with traditional TV or satellite networks. It may also provide a means to hack into, or at least disrupt the private network.

Another advantage of an IP-based network is the opportunity for integration and convergence. This opportunity is amplified when using IMS-based solutions. Converged services implies interaction of existing services in a seamless manner to create new value added services. One example is on-screen Caller ID, getting Caller ID on a TV and the ability to handle it (send it to voice mail, etc.). IP-based services will help to enable efforts to provide consumers anytime-anywhere access to content over their televisions, PCs and cell phones, and to integrate services and content to tie them together. Within businesses and institutions, IPTV eliminates the need to run a parallel infrastructure to deliver live and stored video services.

The global scenario of IPTV

Globally IPTV market has successfully reached an advanced stage (Highlighted Stage in above picture) where it has been growing rapidly in the last 3 to 4 years. IPTV has grown from strength to strength from its first deployment in 1999 to 2009 in terms of numbers of subscribers and revenues. At the end of 2008 global IPTV subscriber base was 23 million grown to 26.7 million in 2009 and it is expected to grow at a CAGR of 32% to 81 million by end 2013. In terms of service revenue Global IPTV market is $6.7 billion in 2009 and is expected to grow to $19.9 billion by 2013 as per industry estimates. Globally there are around a hundred and twenty IPTV

providers in over sixty countries, with Europe and the far eastern markets taking the top spots. Currently Hong Kong, France, Taiwan and Belgium are leading the pack in terms of IPTV penetration. By 2013, Europe and North America will generate a larger share of global revenue, due to very low ARPUs in China and India, the fastest growing (Ultimately, the biggest markets) in Asia.

In the last few years major developments have taken place in the global IPTV market. One of the major developments that should interest companies who are planning to foray into IPTV deployment in India, China and other emerging markets is the deployment of IPTV services over ADSL access on telephone wire or without interest connection. Operators like Deutsche Telekom (German telecoms operator) and Akash Optifibres in India are providing IPTV without internet/broadband connection. Other major milestone for IPTV was approval of a new ITU standard that supports global rollout of IPTV services. This should definitely encourage many global IPTV service providers to look at the Indian market either to provide services directly or the cable operator route. This is another major development in the global IPTV space wherein cable operators are providing IPTV services through their existing network. Butler-Bremmer is one such recent example of leading cable operator providing IPTV services. Though examples like these are still few and far between, but cable operators abroad are starting to deliver IPTV services over Docsis 3.0, a CableLabs platform that bursts data in excess of 100 Mbit/s.

IPTV in India

Indian IPTV market is at a nascent stage where it is being deployed over DSL, ADSL and ADSL2+ network infrastructure owned by operators like BSNL, MTNL & Airtel. Indian market has witnessed an interesting battle where for the first time state owned companies are aggressively promoting IPTV when private players have kept a low profile. Till now state-owned telecom companies BSNL and MTNL were not considered formidable competitors to private telecom companies. But interestingly these two are aggressively marketing IPTV in India. Recently BSNL and MTNL along with Smart Digivision (Official franchisee for IPTV) announced ‘MyWay’ will be launched in over 54 cities, the largest IPTV launch in the country.

Smart Digivision plans to offer IPTV services to 1.6 million to 1.7 million broadband subscribers of BSNL and MTNL in these selected 54 cities which comprise 80 per cent of the country's broadband subscriber base. Private players like Airtel and Reliance have not aggressively promoted their IPTV services. Infact Reliance has quietly launched their services in some areas in Mumbai without much fuss. While on the other hand Airtel has been going slow on IPTV, they are still in the process of evaluating more cities (Bangalore, Mumbai and Chennai) before launching aggressively. Private players believe DTH is for masses and IPTV is for the classes. However private players do realize that IPTV in the long run can become ARPU driver. Some of the other interesting developments that took place in the Indian IPTV market in the last few months was the roll out of wireless STBs (hardware essential for accessing IPTV, digital cable or DTH services) for its Internet Protocol TV (IPTV) services by Aksh Optifibre. Aksh has plans of commercially rolling out its wireless STBs for IPTV services. This will enable consumers to access IPTV services in any part of their
home without having to physically make wire connections from the STB to the TV sets. Though this is very expensive right now (three times costlier than the a normal box for accessing digital cable or a DTH, IPTV service) but we believe if this is commoditized just like mobile handsets it can penetrate throughout India creating a mass consumption drive eventually resulting in price reduction.

India's first IPTV deployment was in 2006, when MTNL rolled out its IPTV service in Mumbai followed by BSNL. Other major players like Bharti Airtel and Reliance Communications were given the go ahead to launch their IPTV
services in the Indian market in Feb-2008 by TRAI. Airtel has launched its service in Jan-2009 while Reliance has quietly launched their services in Mumbai.

Scenario for IPTV market in India is driven by certain factors like

- Interactivity
- Value added services
- Customer-end benefit
- Fuelling broadband demand

Some of the key IPTV Service Providers in India include BSNL, MTNL, Bharti-Airtel and Reliance.

Is India ready for IPTV?

This is one big question everyone has on their mind. Operators are aggressively promoting DTH services and not IPTV services. Based on Knowledgefaber surveys and expert interviews it seems that IPTV is going to take some time to gather critical mass. Based on those interviews and surveys the following facts have been gathered:-

• Telecom players (read carriers) are not very aggressively pushing IPTV right now. They are heavily involved in their DTH service promotions.
• Companies are playing safe and waiting to see the results of IPTV launch of some of the existing companies.
• Operators are waiting for the broadband infrastructure to grow and be IPTV ready.

It seems that IPTV will take some years to gain scale and will directly depend on telcos push, infrastructure and broadband penetration. Its success would depend on how seriously the top 4 telcos (with broadband infrastructure) take it up. Their involvement and creation of push would depend on the rate of return and the point of break even. Also possibility of global IPVT giant entering the Indian market
cannot be ruled out. Despite low internet penetration rate of 2% it is predicated that India will have 2.5 million IPTV subscribers by 2018 with just 6% broadband penetration rate making it fourth highest in Asia.

Threat of substitutes? Question of substitute does not arise here as IPTV would have to go beyond people's imagination. "Just providing video Programs/video on demand through IPTV does not seem to be a viable business model in India since cable and DTH have already established a very large viewership base for themselves. Telco and IPTV service providers have

to come out with innovative services newer applications that can catch the attention of consumers. Unless IPTV establishes a unique selling proposition (USP), it will not be a popular choice
or a substitute for DTH or Cable operators.

Indian market is extremely sensitive to price and to successes stakeholders will have to carefully price their services to win in a competitive environment. Currently IPTV Packages are aggressively priced in fact some of the packages are at par with prices of DTH packages. However cost of STBS (Set Top Boxes) are extremely high and needs to come down drastically to attract more subscribers. This can be the potential make or break for success of IPTV in the Indian market. Indian market offers great opportunity for set top box manufacturers for long term growth. Set top box manufacturers can look at innovative design models with low cost manufacturing capabilities to support mass demand from the Indian market. Companies would have to draw inspiration from mobile/handset manufacturers like Nokia, LG, and Samsung etc who churned out low cost customized devices targeted at the Indian market. Globally companies are trying to integrate High Definition Television (HDTV) with a built in set top box which acts as a multi compatible device that can support Cable, DTH & IPTV. One such initiative in India is taken by Aksh Optifibre which is currently testing an integrated television set in which IPTV has been integrated so that consumers do not need any extra box.This is just a beginning of various innovative business models to push IPTV into the hands of consumer the next wave of development in highly competitive markets like India and China might bring global innovation for IPTV.

Prospects of IPTV-A case in education

The Indian Institute of Technology at Kharagpur (IIT-K) wanted to deliver educational content to its students in a more flexible and organised manner, and decided to use IT as the enabler.

With the assistance of its alumni, the institute set up a campus-wide converged IP network with over 4,000 access points that cover every hostel room. The network offers multi-layered switched QoS, video-on-demand, multi-cast video, and the ability to host IP telephony in the future. The new multimedia-friendly network gives the 5,000 students on the campus unrestricted access to the network from their rooms without the need to be physically present at specific locations.

One of the most reputed educational institutes in India, IIT-K trains its students to be scientists and engineers. The institute recognises that information networks have emerged as strategic assets, and are a critical element for delivering education and services.

Many educational institutes have adopted new applications for education and information dissemination, and applications such as streaming video and video-on-demand have revolutionised the way educational content is delivered to students. IIT-K did not want to be an exception, and felt that its students deserved to be given access to modern learning methods as well.

In a gesture of goodwill, the 2000-2001 alumni of IIT-K, many of whom are successful professionals in Silicon Valley, decided to provide funds for networking the student hostels on campus. “The alumni felt that students need to be given the opportunity to work on world-class networks early in their careers if they have to perform. This gives them the flexibility to learn and build on a strong foundation,” explains Suprabhat Chatterjee, National Business Development Manager, Enterprise, India & SAARC, Cisco Systems (India).

Other than the opportunity to work on up-to-date systems, it was necessary to encourage students to pursue their interests and hobbies apart from their regular course curriculum. The idea was not to put a curb on a student’s creativity and learning. The institute felt a latent need to provide state-of-art IP networking which could enhance the quality of the educational experience.

The objectives were to deliver live lectures and screen events with the help of IP multicasting, deliver high-quality video-on-demand to students’ hostels without affecting the network performance and bandwidth, standardise repetitive courses through video-on-demand, and

provide opportunities to students and staff to pursue fields of individual interest in addition to standard course curriculum.

The campus already had a network based on Ethernet and ATM technology. Untouched by the network were 14 hostels in the campus. Each hostel is divided into two parts with 14-16 wings in each part. Each wing has 32-48 rooms per floor.

There was a suggestion to have a common room in the hostel with network outlets for all to share, but this would have created other problems since there were a large number of students. Another idea was to build a large network that would encompass all areas of the campus, and this was the way to go, the institute decided. Planning and designing a network of this scale gave rise to a number of considerations which had to be kept in mind. They were:

The type of applications—there were plans to offer applications such as IP-TV through multicasting, video-on-demand, and mpeg2- and mpeg4-based live speeches, events and lectures.

Size of content—each presentation comprised rich audio and visual elements and was as long as an hour. As a result, the size of each file was large.

Geographical spread—the hostel buildings were spread over an area of 2.5-3 square kilometres.

Utilisation would be the heaviest in the evening after classes.

“Based on these considerations, the network design had to accommodate a very robust backbone, high switching capacity, and strong load-balancing capabilities. It had to offer QoS so that traffic in one VLAN would not affect traffic of the other wing and the entire network,” explained Prof S Kumar, Member of Faculty, Mechanical Engineering Department, IIT-K. The network was segmented using VLANs to reduce collision of domains and broadcast domains, and deploy QoS in terms of the applications. “For instance, a person working on a site for educational research or collaborative study should be given higher traffic priority over an e-mail user or a music download,” says Kumar. This act of prioritisation does not restrict any network activity, but simply increases the time taken by a job with a lower priority.

The plan also intended that the network would use established industry standards and policies for the multiple VLANs and QoS to allow the best possible data rates and least latency.

14 to 16 access VLANs have been deployed at each hostel for individual wings. The network has been partitioned with smaller collision domains to provide high availability of network resources. This allows streaming multimedia (such as full frame mpeg-2 video lectures and distributed e-learning computing programmes) to provide shared whiteboard, chat and video simultaneously for multiple rooms at peak hours.

Two primary applications, video streaming and video-on-demand, were achieved through Cisco's IP-TV solution. This solution provides the streaming audio and video content at data rates up to 80 Mbps on mpeg-2 and mpeg-4 in both unicast and multi-cast formats for the entire network. In-house e-learning content servers have been developed at the institute's Centre for Educational Technology using the mpeg-4 standard.

The IP-TV solution has three components: the broadcast server, the archive server, and the control server.

A broadcast server helps to pre-plan the time of a broadcast to a select group. For instance, all computer science students staying in different hostel rooms can plan to attend a live lecture from an expert abroad at 7 pm. The broadcast can be planned in such a way that the media will only be distributed to the intended students in the multicast group at the specific time, automatically, without any reduction in network performance.

If a student who has missed a class wants to refer to the lecture or the notes given earlier, he can use the video-on-demand service for viewing the lecture. Although the size of the content can be huge, the network will automatically prioritise and balance load on the switches so that overall performance is unaffected.

The network uses content distribution managers to avoid effects of multiple media applications running on the network. This works with the help of content engines (at different locations) which push content to the nodes. Each hostel has a content engine which accesses the content

load kept at a central location. The content is pushed from the central location to the content engine at the edges, so when a request for any media arrives, the content is fetched from the local content distributor. This avoids load on the backbone.

There are 200-odd servers which converge in to the core (8-10 Gbps capacity) of the network based on two Catalyst 6500 switches. This is connected to multiple distribution switches. Each hostel has a distribution switch, and the entire switching capacity is around 32 Gbps. The Gigabit Ethernet LAN uses cables from D-Link. The servers are load balanced so that the same content can reside at multiple servers. If there is a request, and the data resides on multiple servers, a logical algorithm is used to carry the load across the switches to each desktop.

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The network enables IIT-K to deliver a complete e-learning package comprising various audio and video formats to be broadcast to classrooms and hostel rooms. This has considerably enhanced the students' academic activities and preparedness for industry. Every student has access to lecture material and virtual classrooms, and can conduct several projects and exercises online over the network. The network is also designed to cater to the QoS requirements of IP telephony. In future, the institute hopes to configure the network to enable students to make voice calls on IP phones and soft IP phones within the campus.

"The uniqueness is the scale and the range of applications. There are very few educational institutes that offer access to such rich media applications to their students," declares Prof Kumar. Another remarkable feature is the plan in terms of scalability design. If a new building or location is to be added, a new switch can be simply plugged into the network—and the network will auto-learn and configure itself a separate VLAN.

Challenges for IPTV in India

India still has a long way to go before IPTV can pick up momentum like wireless communication or DTH services. India has a lot of problems that exist as a barrier for growth of IPTV in India. Some of key issues are listed below:-

• Physical Infrastructure – One of the biggest challenge India faces is the required infrastructure for growth of IPTV. India lacks required high-speed wiring and copper cables and still dependent on copper or coaxial cables for deployment of IPTV network. Some parts of the world have successfully shifted to optic

fibre for deploying high quality IPTV services.

• Broadband penetration and n/w capability – One of the biggest and most important factor for success of IPTV in any country is its infrastructure for broadband services and broadband penetration. The existing broadband infrastructure would have to be substantially upgraded, India's broadband penetration is one of the lowest in the world and success of IPTV is directly dependant on Broadband penetration. India's broadband penetration rate is 2% (Rate of internet penetration of the total households) however it is expected to pick up pace in the coming years. However advanced technologies like VDSL, WiMAX or LTE can save the day for IPTV in India.

• Network Capability – IPTV requires at least 1.5 Mbps line (with MPEG-4) for basic services at a good QOS and 8 Mbps line (with MPEG-4) for HDTV services. Some part of the broadband networks especially MTNL and BSNL networks are not ready yet. Most of the major cities like Delhi, Mumbai, Pune, Bangalore,
Chennai, etc. are SDTV compatible this is largely due BSNL and MNTL network and these are the cities where BSNL and MTNL first launched its IPTV in India.

• QOS (Quality of service) – India lacks the required infrastructure to support IPTV. Current subscribers have criticized the quality of services offered by these companies.

• Content Readiness and cost – Content is critical for success of IPTV & to compete with DTH and cable operators IPTV service providers will have to provide high quality innovative content. With respect to content there are various costs which are involved and it totally depends on what route does the player
take. It can be either fixed fee deal with broadcaster or Ala carte price per channel. Operators will have to offer services that are not being already provided by their competitor including live TV, Video on Demand (VOD) and Digital Video Recorders (DVRs).

• Cost of service for user – The cost of IPTV services offered are quite competitive but the cost of IPTV STBS is still very high. Cost of IPTV STBS will have to fall further, as they are more expensive than traditional DTH or Cable set top boxes.

• Regulatory framework – Some of the potential regulatory issues identified includes:-
Advertising – Targeted advertising and advertisement-less content delivery to allow nextgeneration business models
Time Shifted TV – Legal framework to support content storage, redistribution and superdistribution(e.g. access from multiple devices)
Privacy – Protect privacy of user content (with consideration for lawful intercept)
Piracy – Provide a framework for detection and prosecution. Alternate models: watermarking,crawling, etc.
Multimedia Communications – Triple play: voice, video and data regulations
Content Classification – Larger scale production

• IPTV Ecosystem – When we dig deeper into specific infrastructure and ecosystem required for IPTV we find the following trend in India.
o IPTV Infrastructure is not at par or as required for areas like Broadband/transport infrastructure and technology, Favorable Regulations, Customer understanding of product proposition, Content readiness and cost, Unified standards development and Pricing and Promotions.

Upcoming frontiers of IPTV

Wireless IPTV –Also called 'Quadruple Play' is going to be a revolution in India. Launch of 3G and WiMAX technology will bring about a huge change in the Indian market.

User Generated Content – IPTV is much beyond DTH when it comes to user generated content. Exclusivity of content and Differentiation will be key requirements for IPTV to be successful has gone beyond DTH potential to

go beyond DTH when it comes to brining user Interactivity believes that wireless IPTV is going to be a revolution in India. Launch of 3G and WiMAX technology will bring about a huge change in the Indian market.

Interactivity – IPTV is all about Interactivity, services from a cable or satellite operator are "pushed" into your home. The user has limited choice and has to keep on surfing channels for variety. Cable TV is a one-way communication where as IPTV provides for a two-way communication. User has complete control over the content he wishes to view. IPTV provides range of interactive services like customised channel views, programme flow,instant content sharing (News, videos, programmes, advertisement, music etc), email, betting, games, shopping, information, Internet access and even customised advertisements. You request a program from the TV guide and the program is delivered to you. Also content providers and operators will have to come up with more innovative interactive services to capture the imagination of Indian consumers.

Also, Windows Embedded-based solutions will enable more flexibility and versatility in offering services ranging from IP-based broadcasting to video-on-demand, IP telephony, gaming, and vertical markets such as

• Media: internal content distribution within news broadcasting, movie and video production services
• Hospitality: hotels, resorts, cruises, and luxury apartments
• Interactive point-of-sale advertising
• Education
• Corporate
• Government

It goes without saying that the more IPTV explores markets in various sectors its usage in education as well as education of IPTV as a unique media shall be enhanced in direct proportion.

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