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Recent Advances in DTH Headend Design

— **Thomas G. Parish**
Vice President, Broadcast Technology
Globecomm Systems, Inc.

In today's competitive direct-to-home (DTH) environment, the new DTH operator requires a service platform that offers both quality content and applications which differentiate his service over and above the competition and, in turn, revolutionizes the way television is viewed by his customers. In concert with this, many of the new DTH operators want their headend infrastructure to provide a service platform where the content can be digitized and transcoded into multiple formats for distribution via various transport technologies including Internet protocol television (IPTV), over-the-top (OTT), and mobile TV.

Over the past two years, Globecomm has proposed and/or built several multimedia processing centers that are capable of delivering multimedia

content for DTH, IPTV, OTT, and mobile applications. In the process of engineering these systems, multiple issues had to be solved. The issues can be categorized in order of priority as:

- Cost issues
- DTH versus IP architecture issues
- Code rate issues

Cost issues

One of the major recurring costs for a DTH system is the leasing of satellite transponders and, therefore, a system design that minimizes the number of transponders that are required to meet the service objectives is critical.

Today, there are two design considerations that can minimize the number of transponders. The first has to do with DVB standards related to modulation. By utilizing the new



DVB-S2, which allows 8PSK modulation versus QPSK modulation, an approximate 30 percent reduction in transponder bandwidth can be realized. Secondly, by transitioning to the new MPEG-4 compression algorithms versus MPEG-2, another 25 percent reduction in transponder bandwidth may be gained.

The issue of cost enters the equation in two segments of the design. The first is the uplink and the cost of MPEG-2 versus MPEG-4 encoders as related to transponder recurring cost savings. It can be easily shown that any added cost of MPEG-4 encoders over MPEG-2 encoders is easily paid for by transponder cost savings in less than one year.

In addition, the cost of set top boxes (STB) also figures in the equation. Two years ago, the cost differential between MPEG-4 and MPEG-2 chip sets was three to one and the cost of an MPEG-4 STB was two times as expensive as an MPEG-2 STB. Assuming that an MPEG-2 STB cost USD 60 (Rs. 3000) versus USD 120 (Rs. 6000) for MPEG-4, then with 1,000,000 customers there was a fixed cost differential of USD 60 million (Rs. 300 crore). Based on this, it made more sense to stay with MPEG-2. However, with the large population of potential



Bharti Airtel DTH

subscribers in India, the new Indian DTH operators were able to commit to quantities large enough to drive the costs of the MPEG-4 STB down to MPEG-2 levels and this made the solution easy to implement using DVB-S2 and MPEG-4 compression.

DTH versus IP architecture issues

Until recently, the existing DTH world was predominantly MPEG-2 with variable bit rate (VBR) encoding operating into a statistical multiplexer via an MPEG transport stream Asynchronous Serial Interface (ASI). IPTV, OTT, and mobile TV are predominantly MPEG-4 with constant bit rate (CBR) encoding where the output is IP encapsulated and multiplexed via an Ethernet service switch (router). Therefore, in today's flexible, state-of-the-art next generation "media processing center" the design must be capable of providing distribution of DTH, IPTV, OTT, and mobile TV and the issue is how to cost effectively implement all of them in a compatible network configuration that satisfies the requirements of all. The solution has been provided by some of the new encoders and multiplexers that have been developed and fielded in the past year and a half. For example, there are encoders available today that can process and compress content in MPEG-4 and provide dual GigE IP outputs with two identical simultaneous streams, one configured to be VBR and the other to be CBR or capped variable bit rate encoding.



Bharti Program Acquisition POD

With the output IP encapsulated, all of the channels can be aggregated into one or more IP streams using routers/switches for further distribution. New generation of multiplexers or media gateways are capable of providing a wide range of multiplexing and remultiplexing applications for DTH, cable, and terrestrial contribution systems. These IP multiplexers accept Gigabit Ethernet inputs and have multiple output ports, some of which can be MPEG transport streams with ASI interface and the others can be IPTV outputs with Gigabit Ethernet interface. Alternatively, the output of the encoders can be separately fed to the DTH system and to the IPTV system assuming that the encoder output is IP encapsulated and the interface is Gigabit Ethernet. By designing the system in an IP centric configuration, it allows for many options.

Code rate issues

For mobile TV, the coding and frame rates are significantly less than those for DTH or IPTV and, therefore, two alternatives are available. That is, either transcoding or running separate encoders. Transcoding of MPEG-4 is more difficult than MPEG-2 and could be an issue. Since mobile TV

operates in a 6 to 8 MHz band, the number of channels that can be multiplexed is in the order of 10 to 15 depending on the encoding rate having separate encoders.

Headend infrastructure subsystems

The headend is composed of multiple subsystems that are all integrated together to provide for the distribution to the home of multimedia content. The channels which consist of television, radio, or helpline are primarily turnaround services; however, NVoD and local playout channels may also be provided. The primary systems that are implemented in a next-generation DTH broadcast center are content aggregation, digital media processing, compression, IP encapsulation and rate management, IP transport, encryption, subscriber management, quality of service measurement and monitoring, compliance monitoring, IT infrastructure, and satellite transport. In the design of these subsystems, there are enhancements that can differentiate one DTH service from another.

While a discussion of all of the above subsystems would be too long, recent advances relative to compliance mon-

"Today we are seeing a rapid convergence of content delivery networks where Internet protocol and advanced video compression are enabling revolutionary new services and advances in the DTH market."

itoring and confidence monitoring may be of interest.

Many countries require compliance monitoring of television and radio transmissions for various reasons. In India, every channel must be monitored and recorded for 90 days. An Indian DTH provider may have as many as 250 to 500 channels of video and audio and depending on the storage data rate this can be a significant amount of data storage ranging into several hundred terabytes or more. In the past, this recording process was done on an individual channel basis and recorded at a data rate much lower than the transmission rate utilizing "Windows Media 9" or equivalent encoding. Within the past year and a half, several companies have introduced MPEG-TS (transport stream) recording and playback. The recorder can typically record up to 1 terabyte of MPEG-TS which allows for three days of data at a 50 Mbps data rate. After that, the data is automatically transferred to network area storage (NAS). Client workstations allow retrieval and viewing of individual programs from central storage based on time stamping.

With regard to confidence monitoring, Globecomm recommends utilizing multi-image displays, which provide for multiple windows of video, audio, and data on unified and coordinated screen monitors. For confidence monitoring, where signal presence is a must to maintain service level, multi-image displays provide the necessary tools to monitor and check baseband status at all times on an automated basis. The processors have the ability to recognize alarms from individual input sources and have the ability to provide a chain view of that service upon alarm. Of particular importance in a DTH environment is the capability to carousel channels on a timed basis. With 250 to 500 channels, it would take twenty to thirty 50 inch video displays to show all the channels with a reasonable size. Using the carousel approach, the monitor wall display can grow up to 1000 channels without adding displays.



Globecomm NOC

Differentiators

Service enhancements can make a significant difference to the user experience and thereby make the offering more compelling and desirable. This is particularly important in India where, by government mandate, all content must be made available to all operators. Therefore, since content cannot be a differentiator, service enhancement is critical. One of the biggest viewer complaints is related to program loudness, which can be traced to audio level variations between channels, audio level variations between program to commercial, and variations within program segments. The human brain can detect variations in sound levels as small as 0.05 dB so if a commercial is 3 dB louder than the program source it can be very annoying. Intelligent gain control is available today, which integrates audio de-embedder, frame sync, loudness processor, delay, and audio re-embedder resulting in a positive increase in the overall acoustic playback experience. This is done at the SDI interface prior to MPEG encoding. Another issue is lip sync management. Co-timing video and audio in perfect sync has been an issue ever since we migrated from silent movies. As encoding and decoding systems become more complex; proper management of managed buffers and FIFOs are critical to keep audio and video in time. Intelligent lip sync management is available as a multipoint error reporting and analysis system allowing for adjustment on a per channel basis.

Interactive applications can also pro-

vide an enhanced viewer experience. The simplest of these are the provision of a mosaic screen where the subscriber has a choice of four to eight channels on a single screen and using his navigation buttons on the television remote can access the channel of his choice. The next level up from the mosaic screen is based on B SkyB Sports Active where the application allows the viewer to select different camera angles during an event, read live statistics updated throughout the match and watch highlights. Other applications utilizing this concept can be weather, horoscope, news, and transportation schedules.

One of the most important differentiators is the set top box capabilities and the look and feel of the navigation system, which includes the electronic program guide. Having optional STBs, which provide for Personal Video Recording (PVR), and/or telephone modems for two way interactive applications allows up scaling for those subscribers that can afford it.

Summary

Next generation media processing centers will provide a centralized service platform for content owners and service providers where services will include ingest, processing, encoding/transcoding, digital rights management, transports, and overall network management, as well as enhancement. The new Indian DTH operators are leading the way by building their broadcast centers, utilizing the latest technology with cutting-edge enhancements. ■

TV into various new media platforms and value-added services.

BSNL forays into IPTV service

Bharat Sanchar Nigam Limited (BSNL) would soon start its much-awaited Internet Protocol Television (IPTV) service. Ludhiana will become first city to have this service in Punjab. BSNL is all set for the soft launch of the service. After successful feedback, it will be launched at commercial level in the city. Through the service, BSNL will provide 120 television channels to its broadband subscribers at a monthly rental of Rs. 150. Subscribers will also have to deposit a security of Rs. 999 for a set top box.

Media processing center for Bharti's DTH

Globecomm Systems Inc. has completed the state-of-the-art media processing center in New Delhi for providing program origination for Bharti Airtel's new DTH service, Digital TV. Airtel Digital TV employs MPEG-4 over DVB-S2 to offer high audio and video quality in an HD-ready system, with a universal remote for both the set-top box and television and a significantly larger antenna offering superior rain-fade performance. The service will initially be marketed through 21,000 retail outlets in 62 cities and includes interactive applications for booking cinema tickets and travel packages, online shopping, and news and games.

The DTH program acquisition and uplink center that Globecomm designed, engineered, and integrated in March 2007, provides Bharti with a future-proof path to all forms of media distribution. Featuring two 11.3 m Ku-band antennae, Globecomm's AxxSys Orion monitor and control system, and 15 4.5 m receive-only antennae for program acquisition, the Airtel Digital TV center is based on a Globecomm media processing center (MPC) architecture for converting video into a wide variety of formats for distribution to cable TV, DTH satellite, or handheld and Internet video at many different bit rates and formats for live or file-based applications.

Big TV to increase number of channels

Big TV Home Entertainment service from Reliance Communications is gearing up to increase the bouquet of 200 channels to 400 channels in the coming few months. A release from Big TV said that it had ordered for additional capacity on MEASAT Satellite constellation and the company would be able to double the number of channels by increasing the satellite transponder capacity by 50 percent from the current eight to twelve.

Colors signs syndication deal with UTV

Viacom18's Hindi general entertainment channel (GEC) Colors has entered into a syndication deal with UTV for

a slate of 27 movies on a nonexclusive basis. Colors will have the rights for five airings spread over two and a half years. Though Zee network also has a syndication deal to telecast 21 UTV movies for its Hindi general entertainment channel Zee TV and movie channel Zee Cinema, Colors will get to telecast the movies, for which it has purchased the rights, ahead of Zee. UTV, however, will get to screen the movies first on its Hindi movie channel.

Colors also has a 16-film deal with Eros International that encapsulates titles from both their upcoming and old list.

Mauj Mobile partners FHM for mobile content

Mauj Mobile has announced an association with For Him Magazine (FHM) in a bid to keep in tune with fashion content needs of mobile users. The partnership will see a content distribution tie-up in the form of a mobile magazine. Through this partnership with FHM and working with MIA International, the company will enable consumers to access FHM's array of content such as editorial news, mobile calendars, interviews, animations, graphics, and wallpapers on the mobile platform. Additionally, Mauj Mobile will create a WAP site for FHM in the second phase of the rollout. The launch of FHM mobile in India joins a growing global, multi-platform FHM portfolio, including 31 international editions of the magazine, and increasing numbers of web and mobile sites across the world.

Sun TV to invest for TV film rights

Sun TV Network Limited is earmarking an annual spend of Rs 100 crore toward acquisition of movie rights for telecast on its various south Indian regional language networks. The company is also getting into movie production as a cushioning strategy against the high rise in acquisition costs.

Initially experimenting in Tamil language, the company will be investing around Rs. 40 crore a year as it focuses on in-house production of small-to-medium budget and script-driven movies.

Kids channels to be launched by Spaceton Media

Kids Media India (KMI), a wholly owned subsidiary of Dubai-based Spaceton Media, is launching a Hindi kids channel in India on 14 January. The company has completed all the necessary requirements to put up the channel on air.

Targeted at the age group of 4 to 12 years, the Hindi kids channel will be a mix of animation and live action. KMI, which is in the process of launching a kids channel in India, has a fund requirement of Rs. 100 crore over three years. KMI has already received Rs. 78 crore from its parent company, Spaceton Media Group. ■