The Analog-to-Digital Transition is Only the Beginning

- By Steve Christian, VP of Marketing, Verimatrix

As outlined in our previous article, Next Generation Multi-network Digital TV Security, the ongoing digitalization of cable TV networks in India presents operators and technology vendors with challenges and opportunities previously unheard of in the history of television in India.

This article will discuss what Indian cable operators need to consider beyond adopting the Digital Video Broadcasting (DVB) standard, or when choosing a managed cable IPTV approach, as part of the analog-to-digital transition. In an increasingly competitive landscape, where cable TV must fend off competition from established satellite direct-to-home (DTH) enterprises as well as emerging over-the-top (OTT) operators, it is necessary to reach beyond the managed network. Progressive digital TV operators in other parts of the world have chosen to adopt alternative video delivery technologies for OTT delivery to complement the managed network services. Of particular interest is so-called adaptive bitrate streaming as an effective and complementary delivery method to the managed network services, especially when combined for hybrid DVB+OTT or IPTV+OTT delivery.

Multi-network operators inevitably face the issues of securing both content and revenues when offering services beyond the core network. The article looks at security issues that should be addressed when using popular adaptive streaming protocols such as HTTP Live Streaming
Moreover, examples will be provided to illustrate how the baseline HLS protocol security can be enhanced for commercial grade pay-TV services. As will become evident, there are proven solutions already available to manage multi-network video operations effectively, especially when combining DVB or IPTV with HLS for hybrid service delivery.

In this respect, Indian cable TV operators planning not only for the digital transition, but also looking beyond to the multi-network world, will benefit by taking a cue from operators that have already made such moves. There are proven multi-network vendor ecosystems that Indian cable TV operators should consider when making the analog-to-digital transition in order to prepare video service and security architectures for delivery beyond the core managed network.

**ADDING IP-BASED DELIVERY**

While early incarnations of multi-network architectures were concerned with combining managed IP networks (telco TV grade) with DVB cable and satellite delivery, there is now a shift towards combinations of services over managed DVB and IPTV networks with unmanaged OTT ditto.

This evolution has been fueled by the introduction of adaptive rate streaming (ARS) protocols, which power consumer quality OTT video services. The ARS delivery method makes use of what the Web does best – efficient and massively scalable delivery of data, in this case video – using the HTTP protocol. ARS is also particularly well-suited to mobile content delivery, as it replaces the concept of fixed network managed quality of service (QoS) in favor of a client optimized consumer experience.

The focus on quality of experience (QoE) is particularly important given that an enjoyable television experience has traditionally been best supported in a controlled, managed network. Achieving an effective QoS over the multi-hop Internet has always seemed daunting.

ARS technology has emerged as an ideal complement to managed network delivery of video. Consumers with high-bandwidth connections and newer hardware can experience HD quality video streaming, while others with lower bandwidth can still enjoy video streaming using adaptive bit rate technology. This allows for efficient use of network resources and provides a more scalable and robust service for consumers.

**DIGITAL TRANSITION**

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ARS technology has emerged as an ideal complement to managed network delivery of video. Consumers with high-bandwidth connections and newer hardware can experience HD quality video streaming, while others with
lower bandwidth receive a stream optimum to local conditions. Each user enjoys an uninterrupted experience with the highest quality possible. It even permits extension of services across different screen resolutions and formats and seamless roaming between Wi-Fi and 3G/4G networks.

Another ARS advantage is that content delivery networks (CDNs) already have massive deployments of acceleration servers supporting HTTP protocols (the Web file delivery standard). Therefore, as video traffic ramps up, there are capital and operational efficiencies in using HTTP and no need for separate server delivery systems otherwise required for legacy video streaming protocols like real time streaming protocol (RTSP) and real time messaging protocol (RTMP).

**SPOTLIGHT ON HTTP LIVE STREAMING**

The ARS protocol HTTP Live Streaming (HLS), originally defined by Apple, is well-positioned to address QoE challenges. Other formats are Microsoft’s Smooth Streaming and Adobe’s HTTP Dynamic Streaming. This article focuses on HLS due to the fact that an increasing number of operators are choosing to leverage HLS for OTT video services. HLS is also open for third-party content security extensions.

At a technical level, there are variations to how ARS protocols deliver video, such as differences in the manifest file, which is the global descriptor file that shows which bit rates are available and how to switch between those bit rates.

There are also differences in the way the compressed video is encapsulated. The two major variants in packet or “chunk” types that exist are a) fragmented MPEG 4 file format, and b) MPEG 2 transport stream format. A major advantage with HLS is its use of the MPEG-2 transport stream format, which provides a natural fit for video head-ends already supporting that standard. The DVB standard is of course based on the MPEG-2 format too, making hybrid DVB+HLS an ideal combination.

A challenge facing operators when adding pay-TV OTT video is the application of content and revenue security. It is imperative to be able to provide equivalent levels of revenue protection as if you were reading it naturally.
and delivery control on a streaming network as content owners demand in today’s DVB and IPTV pay-TV systems.

**HYBRID DVB+HLS DELIVERY**

Leveraging HLS enables new hybrid video service architectures and business models, and it offers a fast and cost-effective route for adding interactive services to previously broadcast-only (“one-way”) pay-TV networks. Thus a new breed of multi-network architectures is born, referred to as Hybrid DVB+HLS.

For Indian cable operators this means deploying DVB-C in combination with HLS. Delivering HLS video requires neither an agreement with broadband internet service providers (ISPs), nor a significant infrastructure investment. Operators can leverage the DVB network foundation and add the HLS video delivery through consumers’ broadband links, with services on both networks “meeting and merging” in a hybrid DVB+HLS set top box (STB), further supported by unified program navigation. Please refer to the figure “Hybrid DVB-OTT Principles”.

Of course, cable operators with two-way cable plant can act as both video broadcasters and ISPs, giving them both a technical and commercial competitive advantage in consumer relationships.

HLS is particularly attractive for DVB operators as widespread vendor support for both standards simplifies the deployment process while also facilitating the development of new business models and increasing revenue security. A deft combination of a managed DVB network foundation complemented by HLS delivered services can hit a number of important bases, including:

- High quality television presentation on the household main screen or home theater installation.

**HYBRID DVB-OTT PRINCIPLES**

![](image)

**HYBRID DVB-OTT PRINCIPLES**

- Enhanced multi-service delivery on a single network.
- Improved quality of service for live and on-demand content.
- Enhanced revenue opportunities through interactive services.
- Improved consumer experience through unified program navigation.

**DIGITAL TRANSITION**

The digital transition is a crucial step in modernizing the television broadcast infrastructure. It involves the transition from analog to digital television technology, which offers several benefits over its predecessor.

- **Improved Picture Quality:** Digital TV provides a clearer, more detailed picture with less interference and static.
- **Increased Channel Capacity:** The same frequency bandwidth used for analog TV can carry many more digital channels, allowing for more content options.
- **Interactive Services:** Digital TV enables the delivery of interactive services, such as program guides, weather updates, and newsflash inserts.
- **Closed Captioning:** Digital TV supports closed captioning for the hearing impaired, making content accessible to a wider audience.
- **Future-Proofing:** By transitioning to digital, the infrastructure is prepared for advancements in technology, such as high-definition television (HDTV) and 4K Ultra HD.

**Advantages of Digital TV:**

- **Economical:** Digital TV transmission efficiency reduces the amount of energy and spectrum required to broadcast TV.
- **Environmentally Friendly:** The reduction in energy consumption contributes to a greener future.
- **Technological Advancements:** Digital TV paves the way for innovations in television technology, enhancing the viewing experience for consumers.

**Challenges of Digital TV Transition:**

- **Funding:** The transition requires significant investment to upgrade existing infrastructure and purchase new equipment.
- **Coverage:** Not all areas have received the necessary digital TV signal.
- **Public Awareness:** Educating the public on the benefits of digital TV and how to make the most of it.
- **Compatibility:** Ensuring older equipment can still access digital content.

**Conclusion:**

The digital transition is a significant step towards modernizing television broadcasting. While there are challenges to overcome, the benefits of improved picture quality, increased channel capacity, and enhanced services make it a worthwhile endeavor. With continued investment and planning, digital TV can offer a wide range of improvements to both broadcasters and viewers alike.
New business models that include on-demand services as well as live DVB+OTT subscriptions.

Seamless catch-up TV and time shift services over unicast connections.

Unified program guide navigation for managed and unmanaged network content feeds.

Hence HLS delivered video is not only an effective tool for a DVB or IPTV operator to cast a wider net with its service offerings, beyond the managed network, but also to bring OTT video content into the mainstream TV offer for delivery to hybrid DVB+HLS STBs.

SECURING HYBRID DVB+OTT VIDEO SERVICES

From an OTT content security perspective, content security requirements are evolving. The industry is rediscovering all the pay-TV security issues and threats that drove traditional conditional access (CA) systems for the past 20 years, as well as the details of how these must be supported at fine grain level. Amongst these issues are the needs for device identification and authentication – to securely associate a specific device with a payment method and the distributed responsibility for other hardware security support features in the target devices.

When targeting hybrid network delivery, the development of a comprehensive content security strategy is of paramount importance. A real challenge for operators is to eliminate the distribution and consumption silos that often frustrate consumers and nudge them towards alternative (sometimes illicit) sources. The operator needs to enable a frictionless user experience on all devices that it wishes to support.

ENHANCED HLS SECURITY

While the HLS protocol incorporates a baseline security model for service delivery, it does not define a complete solution for streaming high-value protected content. In fact, HLS is the only HTTP-based protocol that has been designed for third-party security extensions by not locking it down to a particular security technology. To that end, HLS defines a common scrambling mechanism (AES) such that vendors may build encoders, scramblers or client device players...
without locking themselves, or their pay-TV operator customers, to a specific CA/DRM system. In a sense, this is similar to the DVB Simulcrypt approach, which defines a common scrambling algorithm adopted by the entire DVB ecosystem.

As the leading IPTV content security supplier, Verimatrix has applied its extensive experience in protecting premium TV services delivered over IP networks. The Verimatrix Video Content Authority System (VCAS™) includes enhancements to the baseline HLS protocol, making it suitable for delivering high-value pay-TV content in both live and on-demand scenarios.

Verimatrix provides secure HLS key management and other security related features required in IPTV and DVB pay-TV systems, in order to protect both content and service revenue. This includes device authentication and entitlement management, to assure that client devices are attached to paying customers. This ensures that only bona fide subscribers are able to watch the pay-TV content without the need to be locked into a specific CA/DRM system.

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to watch protected content. After a specific content is selected by the consumer, a simultaneous transaction occurs to obtain the keys required to decrypt the video. The Verimatrix ViewRight security kernel inside the receiver requests the key, obtains it from the VCAS head-end key database upon positive entitlement verification, and unlocks the stream for viewing. The kernel is also capable of ensuring key aspects of the client environment are consistent with content licensing conditions, addressing issues such as output controls, content overlays and run-time OS integrity.

In additional to content being encrypted for live services, the content also remains protected when stored on on-demand streaming servers, and in subscribers’ digital video recorders. An entitlement check is always performed prior to issuing a key that enables content decryption.

Using a combination of DVB and HLS provides operators with an ideal environment for deploying hybrid STBs with a unified security regime. The resulting hybrid service delivery is fully protected and operates in a reliable fashion on all hybrid devices. Please refer to the figure “DVB + OTT Multi-network Solution.”

HLS is of course well-suited for tablet and smartphone delivery since a very large base of such devices already supports HLS, whether based on iOS or Android operating systems (OS). For example, protected video stream support for HLS, which leverages Verimatrix enhanced HLS security, is found on iOS devices (iPad, iPhone, iPod Touch), Android OS devices (tablets, smartphones, and connected TV/STBs), and also on Windows and Mac OS computing platforms. So a single streaming format gives the operator access to the widest possible range of OTT devices.

NEW ARCHITECTURES, NEW BUSINESS MODELS

While it is important to deploy a streaming technology that can seamlessly accommodate a wide range of devices, it is equally critical to choose one that features robust revenue and content security. Both are essential for ensuring that an operators’ service delivery platform reaches as many device types as its subscribers could possibly want to use.
Choosing the right streaming and security combination will enable Indian cable operators to provide a richer consumer experience with more personalized choices as regards content, time and place. Increasing the number of supported device types helps increase subscriber adoption of new services. Additionally, the more screens are supported simultaneously, the more eyeballs are available for both advertising and transactional revenue.

MAKING THE MULTI-NETWORK DIGITAL TV SECURITY CHOICE

For Indian cable operators it is imperative to choose a security architecture that supports both the immediate analog-to-digital transition while also laying a sound foundation for the future – a future that may include delivery to PCs and Macs, games consoles, smart phones and tablets – in addition to DVB-C and hybrid DVB+OTT STBs.
Cable operators should look for a CA/DRM system that unifies revenue security for video services to hybrid DVB+OTT devices as well as across mobile networks. Drawing from the experience already gained by progressive multi-network operators elsewhere, they can choose proven encryption, conditional access, digital rights management and video watermarking techniques without having to go through an expensive and frustrating trial-and-error process.

In other words, Indian cable operators can escape the silo based (single-network) restrictions while actually enhancing the hybrid network revenue security and ensuring a frictionless consumer experience. In fact, a single security authority can provide new levels of protection essential to hybrid STB and multi-screen business models that simply can’t be achieved with legacy systems.

A single security authority with multi-layered protection is exemplified by the Verimatrix Video Content Authority System (VCAS™ 3). Please refer to the figure “VCAS 3 High-level Architecture.” The third-generation VCAS 3 provides a unified multi-network platform, protecting multi-screen services to hybrid STBs, PC/Macs, tablets and smart phones. Deployed by progressive multi-network operators in Europe, Middle East and Asia Pacific, it is a proven way forward as Indian cable TV operators grapple with the digital transition reality, indeed the multi-network reality.■

### ABOUT AUTHOR

Steve Christian is Vice President of Marketing, Verimatrix.

Steve Christian has a wealth of experience in the digital media and Internet technology space and is a speaker on media technology and business trends at industry events around the globe. At Verimatrix he is responsible for product strategy, marketing programs and management of brand equity. Prior to joining Verimatrix Mr. Christian was VP Marketing at streaming media specialist Nine Systems and has also run his own “virtual VP” technology marketing consultancy, helping the growth of a variety of software, wireless and Internet security ventures. His background includes product and services management at Wind River, ST Microelectronics and Raytheon. Mr. Christian has a first class degree in Physics from the University of Bristol and an MBA from the Open University in the UK.