Hybrid DVB and OTT Pay-TV Solution: Scalable, Secure, Multi-Device

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Background: DVB Operators and IP Video

IP Video Mandate

In an increasingly competitive landscape, where DVB network operators must fend off traditional competitors as well as emerging over-the-top (OTT) providers, it is necessary to consider augmenting offerings with multiscreen video services, providing consumers with the ability to view content on devices other than their televisions. Progressive digital TV operators in various countries have chosen to adopt alternative video delivery technologies for OTT delivery to complement their own managed network services. Adaptive bitrate (ABR) streaming is a technology of particular interest to operators to help implement this new delivery model. It is an effective and complementary delivery method to the managed and multicast network services, resulting in hybrid DVB+OTT or IPTV+OTT delivery. In some cases, operators go beyond their managed network footprint to "unmanaged" IP third-party networks as a way of "following" their roaming subscribers or possibly reaching new ones, assuming content rights are secured.

Multi-network operators inevitably face the issues of securing both content and revenues when offering services beyond the core network. In this paper, various architecture options are presented to show the key security and delivery elements in hybrid DVB + OTT networks.

As will become evident, there are proven solutions already available to manage multi-network video operations effectively. 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 OTT offerings.

This evolution has been fueled by the introduction of ABR streaming protocols, which power consumer-quality OTT video services. The ABR 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. ABR 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.

ABR 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 ABR 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).

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 and delivery control on a streaming network as content owners demand in today's DVB and IPTV pay-TV systems.

Video Services Selection and the Consumer Experience

The consumer experience ultimately dictates the success of any video service offering, and that experience is directly influenced by the types of services made available by the network operator. In the world of multiscreen video delivery, that usually implies the following extensions to a "traditional" DVB pay TV service offering:

a) Electronic program guide (EPG) extending to a flexible web-based navigation application with high interactivity content and the ability to span managed and unmanaged networks.

b) "Large screen" TV fed by a set-top box (STB) extending to IP- (or Internet-) connected compelling consumer devices like smartphones, tablets and PCs, as well as ABR streaming-capable STBs connected to large screen TVs and native "connected" TV's. Common to those devices is the OTT ability to handle Apple HTTP Live Streaming (HLS) and Microsoft Smooth Streaming formats, with an evolution towards MPEG-DASH.

c) Linear ("live"), on-demand and time-shifted TV viewing available in both DVB-only and DVB+OTT models; OTT also offers the ability to place-shift, as well as time-shift the consumer experience assuming the handheld device is authorized to receive TV programming in a location outside the residence with a broadband IP connection. Compared to OTT-only providers, managed network operators typically have the additional competitive advantage of offering linear and time-shifted TV, in addition to VOD, making a comprehensive offering consisting of the various service types critical in the competitive arena.

Achieving this hybrid DVB+OTT offering necessitates applying content security and digital rights management (DRM) to all services, across all constituent networks and consumer devices. Thus, subscriber "super domains" are created across networks and even DRM systems – all devices belonging to a subscriber are managed as one domain. When a domain device is entitled, all devices become entitled, creating a frictionless user experience.

Technology Background and Requirements

The ABR protocols are well-positioned to address mass delivery of video services with managed and unmanaged IP networks and their corresponding QoE challenges. Popular formats today are Apple HTTP Live Streaming (HLS), Microsoft Smooth Streaming (MSS) and, to a lesser degree, Adobe HTTP Dynamic Streaming (HDS). The recently standardized MPEG-DASH is a new format that builds on existing technology, and is meant to be a unifying standard for adaptive streaming. The industry is currently in the early adoption phase for MPEG-DASH, with the focus on consumer devices and appropriate operating systems adopting the standard.

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

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. HLS uses the transport stream variety, and MSS and HDS use the MPEG-4 format.

A recent trend in the ABR deployment portion of DVB+OTT networks is “best-of-breed”, multi-vendor ecosystems. The fast-changing nature of multiscreen technology has resulted in highly focused technology vendors driving technical developments as they continue to support and learn from live customer deployments today. This has led to the use of open protocols and standards when available, supported by a number of ad hoc public standardization efforts.

The HLS format, introduced by Apple, being standard on the various popular Apple handheld and tablet iOS devices, has become widespread in deployment including adoption by Adobe’s own Media Server and Google’s integration into the Android operating system.

Securing Hybrid DVB+OTT Video Services

From an OTT content security perspective, the requirements are still 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 a fine grain level. Amongst these issues are the needs for device identification and authentication – to securely associate a specific device with a subscriber (and 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. Verimatrix has extended the basic HLS security with techniques otherwise found in DVB and IPTV pay-TV systems, thereby qualifying the enhanced HLS security solution to protect premium content.

Microsoft Smooth Streaming Security – PlayReady DRM

PlayReady is a DRM solution from Microsoft. The PlayReady content access technology is used to protect digital media (content) from unauthorized usage by defining, incorporating and enforcing usage rights. PlayReady enables secure distribution of content over the Internet and enforces rules chosen by the content or service provider. PlayReady provides support for enforcing policies such as expiration date.

Clients and servers are the two main components in a PlayReady system. These components communicate using protocols specified by Microsoft. Content is protected by a content packaging service using PlayReady, after which it is transferred to clients that decrypt the content by using information stored in a license. There are various content distribution models, including download and streaming. This document focuses on securing services that utilize the Microsoft Smooth Streaming adaptive bitrate protocol.

Each license contains specific usage rights, defining exactly how the content may be used and under what conditions. For example, a video file license may enable a "right to play" but restrict the "right to burn to DVD." The license might be valid for a limited time period.

Microsoft provides an open licensing scheme and software developer kit that allows any vendor to license one or more parts of PlayReady, such as the headend license server or a PC client, or other consumer device client. Verimatrix is a PlayReady DRM licensee for the purpose of providing unified rights management across heterogeneous networks and for all types of devices.

ABR Delivery Best Practices

As adaptive streaming technology expanded to network operator managed platforms, beyond OTT competitive provider delivery, it has taken on new characteristics and corresponding “best practices.” Some of the key elements include the following:

- High capacity, high performance hardware-based MPEG-2 or H.264 to H.264 transcoding, scaling and de-interlacing, for the lowest cost of operation for a rich channel line-up.

- Separated packaging from transcoding to allow for “transcode once, package many” approaches, as well as remote packaging architectures where multicast IP is a preferred backbone networking option. This even allows the use of one-way media – like satellite – for the backbone portion. It also allows a flexible VOD / live hybrid packaging architecture with high-capacity transcoders dedicated to real-time, live processing.

- Output profiles numbering between 6 and 8, with a trend towards expanding this number, corresponding to different classes of end user devices with the ultimate objective to offer the best possible video quality within the constraints of the device or network. Higher bitrate profiles are now increasingly going to “full HD” 1920 x 1080 progressive video at 25 or 29.97 frames per second. Along the same lines of higher video quality and higher bitrates is full frame rate (50 or 59.94 frames per second) 1280 x 720 progressive video being delivered as an adaptive streaming profile of HD input video. That input can be either 1280 x 720 p, or 1920 x 1080 interlaced format.

- Output profiles corresponding to the same multi-bitrate (MBR) group coming from two different transcoder devices in two different locations, allowing a “load balancing redundancy” architecture with more profiles under steady state operation and half the profiles in the unlikely case of a complete chassis or location service outage.

- Handling ad markers through the transcoding and packaging process, using SCTE 35 and other industry standards

- Ecosystem-friendly packager with proven integration with CDNs.

RGB's Video Multiprocessing Gateway (VMG™) is the industry's answer to these evolving industry needs. It is the only carrier-class transcoding platform in the industry, providing high availability through multi-level redundancy features. With unmatched density and capacity – supporting up to 144 transcoded HD streams or 432 output profiles for adaptive streaming per 13 RU chassis – the modular VMG provides the scalability required for cost-efficient, pay-as-you-grow expansion as subscriber growth dictates.

By virtue of its modular, multi-function design, the VMG can also serve a range of other video processing functions, including transrating, grooming, ad insertion and program substitution. Its support of these functions allows for parallel distribution of programming over MPEG-2 TS to traditional STBs, as well as ad insertion utilizing traditional SCTE standards.

Due to its unified functionality, the VMG requires only a single management system, saving the cost and headaches of cabling and configuration of multiple video processing devices, and its high-density design reduces rack space and power requirements. And in keeping with the best-of-breed theme, it employs a best-of-breed processor approach, utilizing the best processor for the job – ASICs for computationally demanding tasks with little feature evolution needs, such as video transcoding; FPGAs for lighter-weight tasks that can be processed in parallel and that may require feature evolution, such as ad insertion; and general purpose processors for rapidly evolving functionality that requires frequent updates, and computationally simple tasks, such as audio processing, that require reconfiguration in different deployments.

Working as an integrated pair, RGB's VMG and TransAct Packager provide a flexible solution for delivering and monetizing content to multiple devices. And the Packager offers both software- and hardware-based options, giving operators maximum flexibility.

Architecture Options

A number of joint DVB+OTT architectures are possible depending on the set of services planned by the network operator with Verimatrix providing secure key management and CAS/DRM functions and RGB Networks providing scalable video transcoding and packaging/encryption functions.

The architectures examined and corresponding service categories are the following:

- Single Network DVB offers traditional pay-TV services such as tiered analog, digital SD and HD broadcast, as well as near video-on-demand (NVOD) and related services. Navigation is typically done by native EPGs residing in STBs feeding large screen TVs.

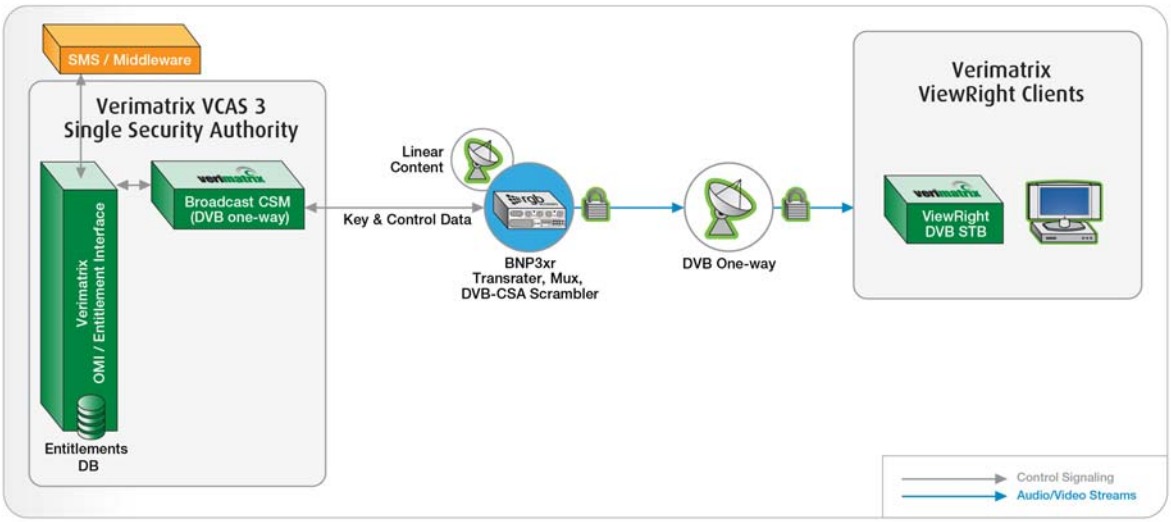
- Multi-Network DVB + IPTV/Hybrid offers DVB and IPTV services, which are typically multicast IP services to STBs or multicast-fed PCs with services like the "single network DVB" category, with the addition of true VOD over a two-way IP network interfacing to VOD streamers and backoffice systems. Adding an advanced EPG, or even middleware, is made possible by the two-way IP network.

- Multi-Network DVB + IPTV + OTT is a superset of the "DVB + IPTV/Hybrid" category, with the additional capability of multiscreen video delivery of live and on-demand services. In some cases, OTT is chosen to replace IPTV even to the large HDTV screen enabled by adaptive bitrate streaming-capable STBs. Advanced middleware supports a seamless multi-network user experience – in fact, the user is typically not even aware that multiple networks are utilized.

- Multi-Network, Multi-DRM offers delivery of the various types of services already mentioned above, with the additional capability of different DRM systems that are all combined and abstracted into a single operator management layer. This approach allows operators to manage subscribers belonging to different DRM domains in a seamless fashion, and thus bring more content and services to customers with manageable operations complexity.

Single Network: DVB

A standards-compliant DVB one-way network is shown below, typical for one-way networks offering pay-TV services over satellite or one-way cable.

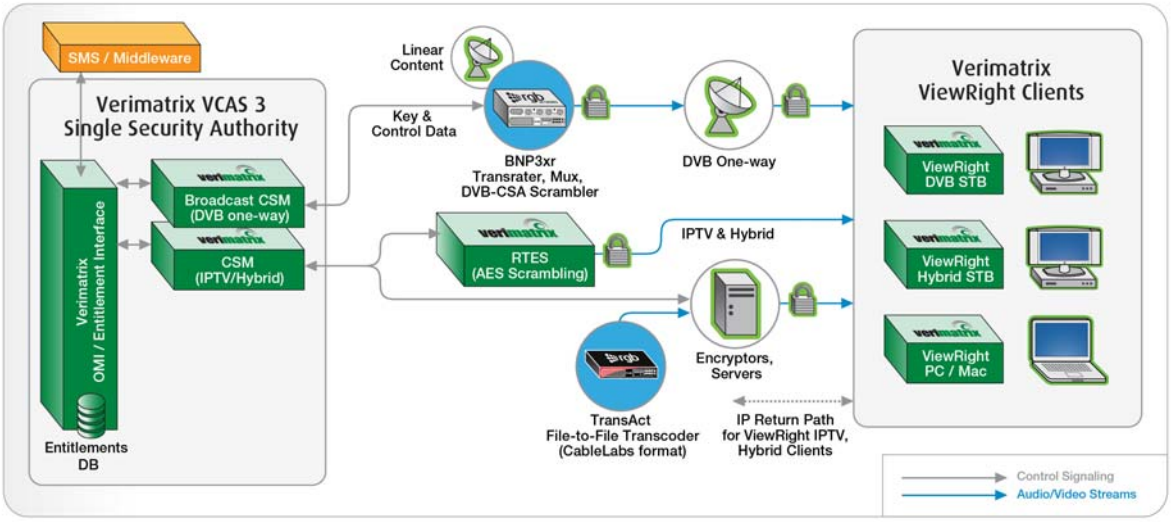


The Verimatrix system provides key management functions, coupled with device authentication and entitlement management to ensure that client devices are attached to paying customers. The ViewRight DVB STB client is used in the receiving device to perform the client-side authentication and descrambling functions and the final delivery of content to the customer.

The BNP3xr from RGB performs real-time scrambling using the DVB Common Scrambling Algorithm (CSA) in tight synchronization with the Verimatrix system, as well as multiplexing the encrypted content scrambling keys (ECMs) and entitlement messages (EMMs) that are then delivered to the downstream ViewRight DVB STB clients. The BNP3xr is also more than a scrambler, offering re-multiplexing, MPEG-2 rateshaping and transrating, as well as digital program insertion (DPI) and seamless splicing and grooming functions for applications such as scheduled program substitution and zoned ad insertion.

Multi-Network: DVB+IPTV/Hybrid

A multi-network system is shown below with DVB one-way delivery, along with a two-way network used for IPTV multicast and on-demand services.



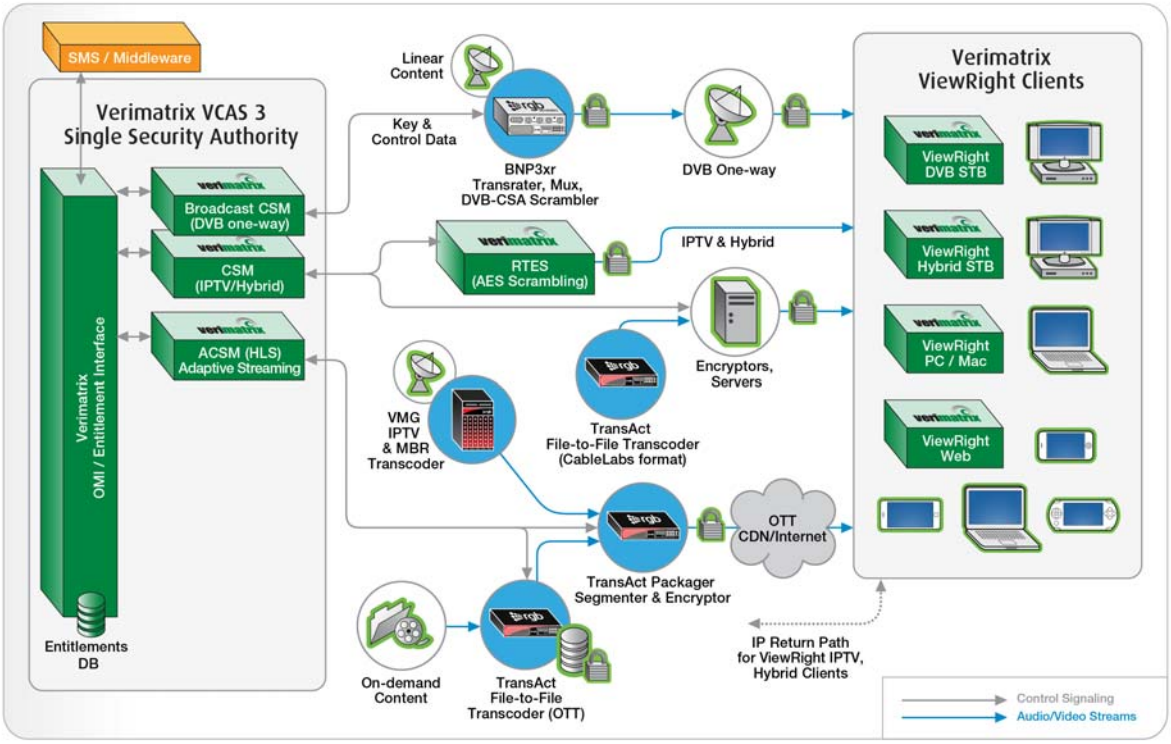
In this diagram, the Verimatrix broadcast and IPTV/Hybrid CSMs are used to manage keys and scrambler control, with the DVB CSA scrambling performed by the RGB's BNP3xr and the AES IPTV scrambling performed by the Verimatrix Real-Time Encryption Server (RTES). Verimatrix ViewRight DVB STB, Hybrid STB, and PC/Mac clients then receive the secured streams at the customer side and perform the necessary handshaking with the CSM and OMI back-office systems to ultimately descramble the content and allow it to be rendered on the display.

The Verimatrix ViewRight security kernel inside the receiver requests the key, obtains it from the VCAS headend 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.

On-demand services are typically handled by a back-office system coupled with middleware on the receiving device. RGB's TransAct Transcoder for file-to-file transcoding can be used to prepare files (or VOD assets) for delivery to the client devices by modifying audio and video parameters, as well as handling metadata as necessary for use by the middleware and client to locate and play back the content. A typical format for VOD assets on the output of the TransAct Transcoder follows CableLabs ADI specification, with the resulting video complying with SD and HD (720p and 1080i) standards carried in MPEG-2 transport stream wrappers. After transcoding, the assets are stored in video streams in encrypted format through interfacing with the Verimatrix CSM IPTV/Hybrid system, or are encrypted after the content is requested by a client device "on the fly" through such devices as edge QAMs in the case of digital cable.

Multi-Network: DVB+IPTV+OTT

A DVB+IPTV+OTT multi-network system is shown below where the scope of receiving devices expands beyond STBs and multicast-fed PCs to HTTP-enabled mobile, tablet and PC devices receiving live and on-demand content over unicast IP networks inside or outside the consumer's home. Content consumption outside the home is subject to content rights granted to the network operator.



In this architecture, the HTTP Live Streaming (HLS) adaptive streaming format augments the DVB one-way and IPTV/Hybrid delivery paths discussed above. The ACSM HLS function is now added in the Verimatrix system, combining with the DVB and IPTV CSM to present a single API to the operator's back-office subscriber management and billing systems with the OMI/entitlement interface. The Verimatrix key management system (KMS) interfaces with RGB's TransAct Packager using a key-exchange API developed jointly by the two vendors as a proposed standard within the API workgroup of the MPEG Industry Forum and other open standard bodies. The Packager, which along with formatting and segmenting requested streams, encrypts them as well, must have access to the keys in order to perform the encryption. The TransAct Packager is available as a hardware/software integrated appliance, or as a Linux-based software-only version to be deployed on the general purpose compute platform of the network operator's choice.

The TransAct Packager receives appropriately-formatted live streams from the industry's highest capacity hardware-based, carrier-class transcoder, RGB's Video Multiprocessing Gateway (VMG). This modular platform, able to handle over 130 live broadcast streams (all of which can be HD, or a combination of SD and HD), can output over 430 single program transport streams (SPTS), each corresponding to a particular resolution and bitrate for a broadcast input. The video always consists of H.264-encoded streams and the audio can be a variety of formats, with AAC-LC being the most popular. All outputs corresponding to a given input are IDR-frame aligned to allow the downstream TransAct Packager to

properly “chunk” the streams into HTTP-wrapped segments. In the case of HLS, the broadcast-standard MPEG-2 transport stream format is used as the system-level layer combining audio and video content. The output of the TransAct Packager interfaces with CDNs, represented by either outsourced services like Akamai and Limelight, or through operator-built CDN infrastructure. CDNs allow the HTTP/unicast-based stream requests from client devices to properly scale.

Verimatrix has extended the basic HLS security, which includes AES-128 encryption, with specific pay-TV security techniques in order to qualify the solution for licensing of premium content and adequately protect pay-TV services for all forms of connected devices. The most essential security techniques commonly used in pay-TV systems for managed networks are client device authentication and subscriber entitlement management, both provided as standard in VCAS for Internet TV. Another essential feature is the value-added common entitlement API built into VCAS, which provides a single point of integration with business management systems.

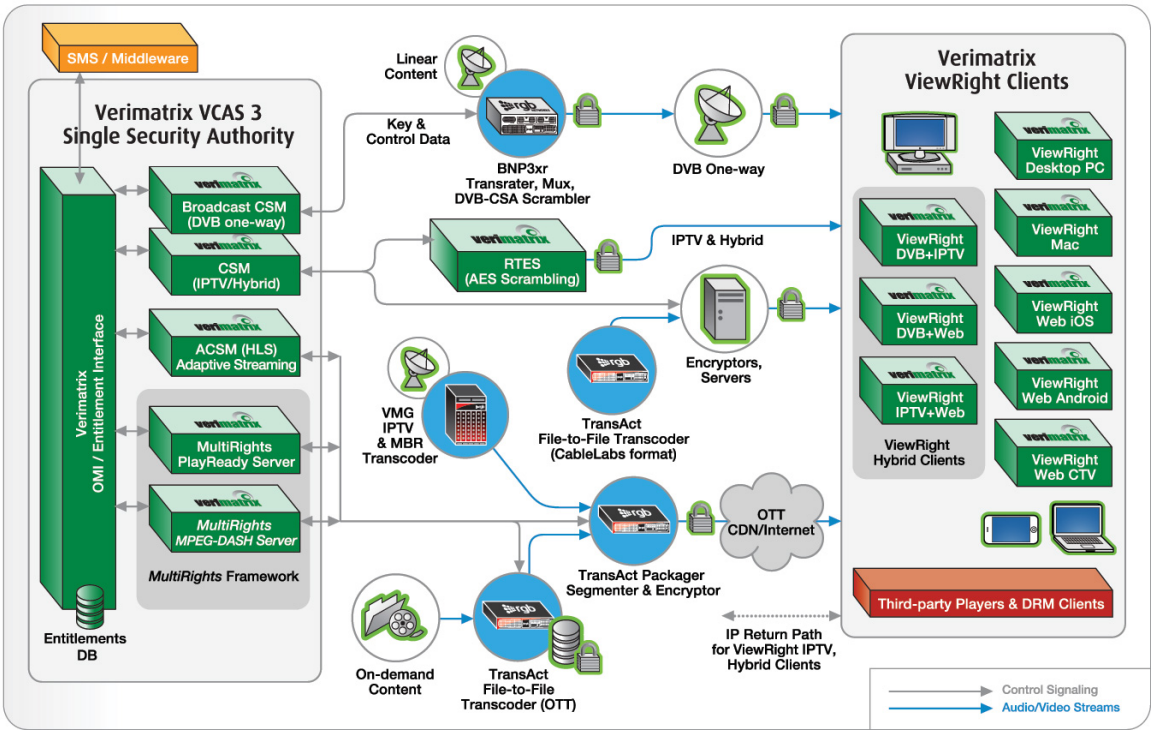
The client players in iPads, iPhones and other Apple iOS devices are uniformly scripted to Apple’s HLS fragmentation prescriptions in the QuickTime player. Thus, the mode of distributing the key in the stream is always the same. In contrast, support for HLS security on Android devices is a little more involved insofar as native client implementations of the HLS protocol vary from one brand of Android device to another and, sometimes, even from one model to another. Verimatrix has integrated its security system with a comprehensive range of third-party players to ensure its keys are properly distributed to whatever device is making a content request.

A fully secured database of encryption keys is a critical component to enabling ironclad, studio-compliant security in the adaptive streaming domains. When a device authenticated by VCAS requests content, the VCAS server generates a key that is precisely matched to entitlements associated with the requested program. The ViewRight client ensures device usage is consistent with policies pertaining to control over content output, content overlays and the integrity of the OS.

File-based services corresponding to movies- or episodes-on-demand form a key part of the multiscreen customer experience. For this class of services, RGB’s TransAct Transcoder is shown performing file-based transcoding offline to prepare the content for streaming on-demand with the appropriate format for the requesting device. Before the formatted assets get moved to streamers located strategically throughout the network, there is the option to encrypt the file so it can be stored securely on the streamers. An entitlement check is always performed prior to issuing a key that enables content decryption by the client at the time of content streaming. Entitlement checks can even extend to pre-encrypted assets that reside all the way out at the customer’s home network in a DVR or home gateway/server.

Multi-Network, Multi-DRM Solution

A multi-network, multi-DRM system is shown below where in addition to DVB, IPTV/hybrid and HLS adaptive streaming elements, different adaptive streaming formats are introduced to expand the universe of available content or consumer devices. A multi-network, multi-DRM scenario may also arise as a result of network operator consolidation and the merging of disparate operations.



This architecture shows the addition of the Verimatrix MultiRights multi-DRM framework as part of the VCAS 3 single security authority, which allows the system to scale beyond the HLS format of adaptive streaming. The video delivery layer is identical in that the TransAct Packager handles key exchange functions and real-time encryption for live streams of all ABR streaming formats, and the TransAct Transcoder handles key exchange and encryption functions for pre-encryption performed on file assets.

Verimatrix has brought together the entire complex processes required for providing security in both the HLS DRM environment, as well as the Microsoft Smooth Streaming PlayReady DRM environment that dominates content usage on PCs, Windows Phone, Xboxes and other devices running Windows OS.

Thus, in addition to offering the VCAS for Internet TV enhanced HLS security, Verimatrix is also able to secure services that utilize the MSS protocol, all from a unified content security headend. Verimatrix MultiRights for PlayReady DRM is a fully integrated solution for linear and on-demand digital TV content delivery to a variety of device types equipped with the Microsoft Silverlight media player and supporting the MSS adaptive bitrate protocol:

- Silverlight-enabled PCs
- Windows Phone devices
- Connected TVs/STBs
- Xbox and other gaming consoles.

These devices are supported via native PlayReady clients, and thus no additional client-side technology integration is required.

A key value-add by Verimatrix is the common VCAS entitlement and management interface, which provides a single point of integration with back-end systems such as middleware and subscriber management/billing. Uniquely, while PlayReady DRM supports a multi-device domain concept as such, VCAS enables cross-DRM subscriber domain management beyond PlayReady alone (i.e. VCAS Super Domains). When content is entitled to a subscriber's domain (as opposed to a device), it is automatically available to all the domain's devices, whether IPTV, DVB, Hybrid, HLS or PlayReady DRM clients.

These systems are combined in the VCAS 3 headend so that decryption keys for either platform can be managed on the fly with each unicast stream in accord with whatever device is being served. This is done simultaneously for any program which is being accessed over both types of streaming platforms at the same time. The Verimatrix system relieves operators of any need to deal with these complexities by handling the abstractions of interfaces to billing and entitlement systems for each security domain.

Conclusion: RGB-Verimatrix Solution Advantages

With a strong partnering and ecosystem-friendly orientation, vendors focused on their area of expertise are coming together to kick-start adaptive bitrate and hybrid network deployments. Focused vendors are best able to keep up with the fast-evolving IP video market and the quick turns this industry tends to take. That's the approach that RGB and Verimatrix have taken to offer a joint multi-network solution architecture to meet various needs. Common to this architecture are the following benefits:

- Operator Security Management Interface: Single API for business management systems regardless of video delivery network allowing cross-network device "super domains"
- High capacity, hardware-based live transcoding for lowest cost of deployment and operation
- Distributed transcoder/packager/encryptor architecture for network deployment flexibility and lowest cost of operation ("transcode once, package many")
- Integrated MPEG-2 transrater, remux and DVB Simulcrypt scrambler
- Proven worldwide deployments in multi-vendor customer solutions, driven by RGB's and Verimatrix's pioneering efforts and mature, operator-friendly technology

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 network operators to provide a richer consumer experience with more personalized choices as regards to content, time and place. Increasing the number of supported device types helps increase subscriber adoption of new services. Additionally, the more screens that are supported simultaneously, the more eyeballs become available to increase both advertising and transactional revenue.

Making the Multi-Network Digital TV Security Choice

Network 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, DRM and video watermarking techniques without having to go through an expensive and frustrating trial and error process.

In other words, network 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 multiscreen 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). The third-generation VCAS 3 provides a unified multi-network platform, protecting multiscreen services to hybrid STBs, PC/Macs, tablets and smartphones. Deployed by progressive multi-network operators in Europe, Middle East and Asia Pacific, it is a proven way forward as network operators grapple with the multi-network reality.

Scaling Delivery of ABR Services

As multiscreen deployments progress, the advantages of hardware-based adaptive bitrate transcoding have become clear to many pay-TV operators. When delivered via a modular, carrier-class chassis, network operators launching more than a couple of live channels, or those looking to scale their earlier service offerings, are realizing its many benefits. With broad worldwide deployments, RGB's integrated VGM/TransAct Packager solution provides a unique and highly flexible solution that meets today's requirements as operators initially deploy IP video services in DVB environments, and can easily scale to grow with their expansion plans.

Together with the Verimatrix DRM solution, operators looking to maintain competitive advantage in a rapidly changing pay-TV environment have an ideal best-of-breed solution that will adapt to their evolving needs.