



Over-the-Top (OTT) Distribution and Protection of Premium Content with SecureMedia's Encryptonite ONE™ HLS+ Solution

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SECUREMEDIA

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Introduction

Support for multi-screen and multi-place access to premium entertainment has become ever more vital to service providers, content owners and device manufacturers. There are new barriers to overcome in order to efficiently deliver linear and on-demand video content “over-the-top” in a secure manner to a variety of devices.

The market conditions unfolding now represent a completely different environment for delivering video entertainment compared to the past few years. Sales of connected devices such as smartphones and tablets are surging and pure over-the-top (OTT) content services like Netflix, Amazon, and Hulu are gaining in popularity as well. In this rapidly-changing landscape, traditional subscription TV service providers must progress their “TV Everywhere” initiatives to provide their subscribers with anywhere-anytime-any device access.

The evolution of adaptive streaming technologies has made it possible to economically deliver uninterrupted, high-quality video over variable networks to a range of devices. Adaptive streaming, with continuous automatic tuning of the video stream to meet limitations in network bandwidth and receiving device resources, delivers the best possible viewing experience while also minimizing delivery costs. As a result, most of the over-the-top content services today have implemented, or are in process of implementing, some form of adaptive streaming to provide a satisfying viewing experience on a variety of Internet-connected devices.

For cable/IPTV operators looking to extend the reach of their branded services beyond in-home TV, there are a number of adaptive streaming alternatives to consider including solutions from Apple, Microsoft, and Adobe. Despite the advantages that some of the adaptive streaming solutions might hold over others, the Apple HTTP Live Streaming (HLS) protocol is emerging as a de facto standard for OTT content delivery due to its open submission of HLS as a draft specification to the Internet Engineering Task Force (IETF), and the high penetration of Apple iPad®/iPhone®/iPod® devices in the market that support HLS.

Motorola’s SecureMedia leverages the growing adoption of HLS to help service providers rapidly and effectively extend linear and on-demand content delivery to connected devices beyond the operator’s managed network and the subscriber’s home.

SecureMedia’s Encryptonite ONE™ HLS+ solution provides a streamlined process for service providers to ingest, transcode, and securely deliver live and on-demand content via standard HTTP methods and infrastructure. Critically, SecureMedia has added layers of its award-winning Encryptonite ONE™ digital rights management protection to the specified HLS encryption method. This meets the stringent security requirements of Hollywood studios and major broadcasters for licensing and distribution of their premium content. SecureMedia has also developed customized clients for various devices (smartphones and tablets, game consoles and hybrid set-top boxes) that leverage native HLS players where possible or provide HLS playback capability where none previously existed— all with Encryptonite ONE System DRM protection. Motorola engineering has also developed improvements to the HLS client control algorithms for enhanced video quality. In essence, Encryptonite ONE HLS+ embodies the combination of Motorola’s extensive experience in the field of video processing and SecureMedia’s 15-year history of delivering cutting edge encryption and digital rights management technology for a superior adaptive streaming solution.

With the Encryptonite ONE HLS+ solution, SecureMedia has enhanced the security, reach, and quality of the HLS protocol without tampering with its basic operating mechanisms. This preserves the benefits of a standardized adaptive streaming approach. Service providers can streamline their content ingestion, encoding, and delivery workflows while achieving the security necessary to license premium content and create compelling, differentiated services for their customers. Content owners can be assured that their most valuable video assets will be delivered at the highest possible quality to a broader range of devices with a trusted Encryptonite ONE level of protection. At the same time, manufacturers can attract premium OTT services to their devices and maximize their customer’s product experience by implementing the Encryptonite ONE HLS+ client.

The OTT Premium Service Mandate

For cable/IPTV providers, the question is no longer whether, but how, to advantageously extend the reach of their branded services beyond the traditional set-top box/TV combination. The increasing penetration of smartphones, tablets, connected TVs, and other IP-enabled devices has established a new universe of highly-attractive video viewing platforms on which a growing portion of their subscribers' time will be spent consuming video entertainment.

According to Nielsen, Smartphone penetration in the U.S. has reached 40 percent of all subscribers, with nearly 16 million users now accessing video every month. Nielsen projects that number will hit 90 million in 2012. With the deployment of 3.5G and 4G mobile networks and mass consumer uptake of tablets now in full sway, anywhere/anytime access to video on high-resolution portable screens is on its way to becoming a common facet of consumers' entertainment experience. Status quo is not an option for service providers while the likes of Netflix, Amazon, Google TV, and a growing host of other players build portfolios of compelling content to lure subscribers away from their existing TV services.

Indeed, service providers must recognize the opportunity to outdo these Web-based ecosystem providers by offering their subscribers a far more complete and compelling experience. The new branded cable/IPTV service paradigm must combine support for access to live network TV, time-shifted TV, premium VOD, special interest programming, and the most popular Web video content—all available on multiple devices through a common search-based navigation system.

The Vital Role of Adaptive Streaming

An essential technology component to enabling this new IP-based anytime/anywhere service model is adaptive streaming. Adaptive streaming dynamically adjusts streaming bit rates to changing network and device conditions so that content is delivered at the highest level of quality that can be sustained at any given time. For service providers, adaptive streaming effectively extends the reach of linear and on-demand content delivery to any device in the world that's connected to a broadband link, whether it be cable, wire-line, or wireless.

Adaptive streaming establishes multiple profiles for a given piece of live or on-demand content as defined by encoding bit rate, resolution and formatting dimensions. It is generally implemented by transcoding a video asset into multiple versions with varying bit-rates, and then dividing each version into a series of sequential time segments, or "chunks." The chunks are typically a few seconds in duration and are stored on a Web server.

At the initiation of a video streaming session, the video client is provided a playlist, or "manifest," file listing the chunks and profiles stored on the server for the desired content. The client requests chunks from the manifest sequentially, selecting the proper profile for each chunk based on an adaptation algorithm, which takes into account the available access data rate on the delivery network, the amount of processing power available on the device, and other device parameters. The device then retrieves the appropriate chunk of content at the optimal profile for that moment. While that chunk is delivered, the adaptive client monitors the network and device conditions and selects the next appropriate chunk. All the profiles are synchronized or aligned with each other so that the appropriate chunk is transmitted in seamless sequence with no skips or frame misalignments.

The primary benefits that adaptive streaming offers for content distribution include:

- for HTTP-based methods, compatibility with existing Internet infrastructure and equipment, including the ability to traverse firewalls and home networks like standard Web traffic
- the ability to adjust content delivery to low-bandwidth conditions and resource-constrained devices
- uninterrupted content playback in fluctuating network conditions
- fast content start-up and channel change, achieved by starting a streaming session at the lowest bit-rate profile, then increasing bit-rate to the optimal level

For cable/IPTV operators, there are a number of adaptive streaming solutions to consider when looking to extend the reach of services beyond their network and the standard set-top box. The leading adaptive streaming protocols include solutions from Apple (HTTP Live Streaming or HLS) and Microsoft (Microsoft Silverlight Smooth Streaming or MSSS), as well as proprietary approaches from Adobe (Adobe Dynamic Streaming or ADS), Move Networks, and Widevine. Not surprisingly, many of the connected devices targeted by service providers natively support only one or none of these incompatible adaptive streaming protocols. This complicates the decision as to which adaptive streaming solution or solutions an operator should choose to expand its service to the widest possible audience.

Despite the advantages that some of the adaptive streaming solutions might hold over others, the Apple HLS protocol is emerging as a de facto standard for OTT content delivery due to:

- the high penetration of iPad/iPhone/iPod devices in the market that support HLS
- the compatibility of HLS with standard Internet HTTP infrastructure and Apple's open submission of HLS as a draft specification to the Internet Engineering Task Force (IETF)
- the use of the H.264 video codec and the MPEG-2 Transport Stream container in HLS, which fits very well with existing broadcast operations and workflows

To emphasize, Motorola's SecureMedia group is dedicated to helping service providers rapidly and effectively extend linear and on-demand content delivery to a plethora of connected devices beyond the operator's managed network and subscriber's home. Advancing security of the HLS protocol to safely deliver premium content to multiple devices over a mix of networks is a top priority for SecureMedia.

Considerations for Choice of an Adaptive Platform

The variations in adaptive streaming approaches from one solution to another, combined with the fact that many of the new connected devices offer either selective support or no support for adaptive streaming, creates a matrix of complexity when trying to deliver video to as many devices as possible. For example, Apple devices do not support Adobe Flash players; Microsoft Silverlight clients are only available on Windows devices; and so forth. To this point, service providers have needed to implement multiple adaptive streaming platforms to reach a range of devices or limit themselves to reaching a subset of devices by using a single delivery silo. (See figure 1.)

Content security is also a critical issue to address in choosing a delivery platform. Again, if a service provider is looking to extend the reach of its premium broadcast channels and VOD programs beyond the fortress of the set-top box, they need to adopt a delivery platform with the content encryption and digital rights management capabilities acceptable to the Hollywood studios and leading broadcast networks.

Service providers should work with a vendor highly experienced in the field of content security that can address the multitude of protection challenges that arise from delivering content to so many different devices that have their own design characteristics and resource limitations. The DRM system must be adaptable to these varying devices and updateable to address changes in device design and components. In essence, as device capabilities improve and content owner requirements for content security evolve, the security should improve to enable higher-value content to be licensed for distribution to the relevant device(s).

Service providers also need to maintain their brand on various devices and need to be able to deploy a client application that points users to a service portal providing a consistent look and feel across multiple devices. It is critical that the service provider's brand stands out in order to win recognition as the provider of this new entertainment experience.

Content Processing Challenge

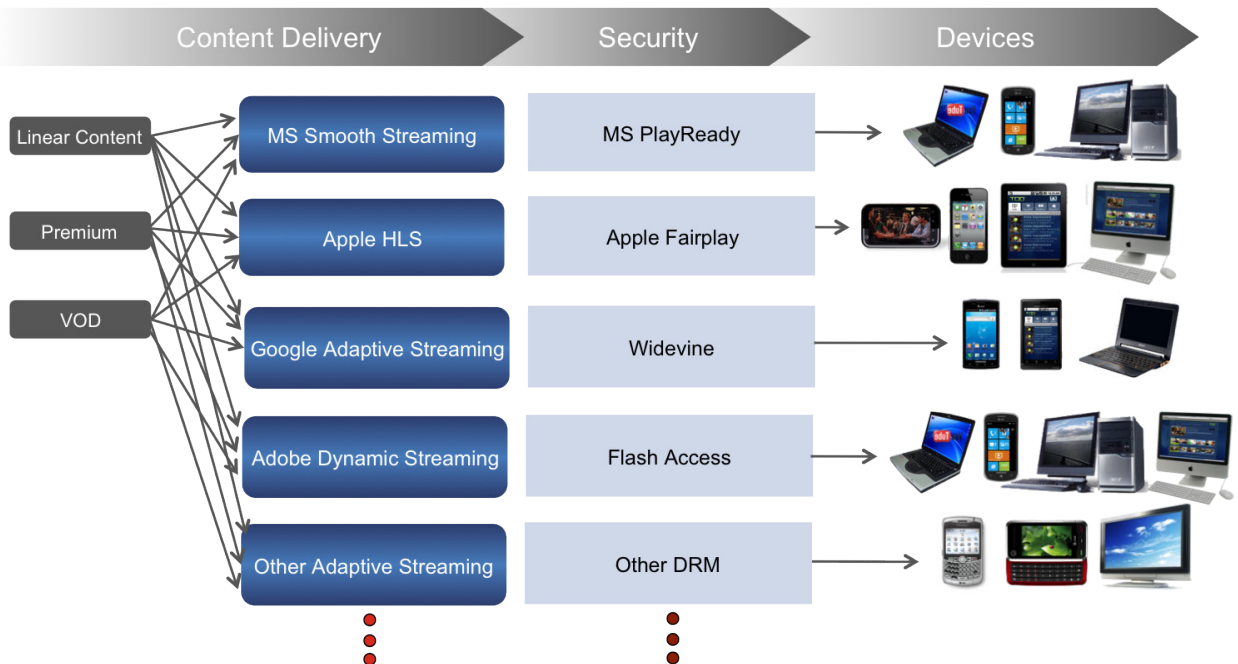


Figure 1. Content Processing Challenge

SecureMedia Encryptonite ONE™ HLS+ Solution

SecureMedia has seized upon the growing proliferation of HLS adaptive streaming to create a streamlined platform for delivering both linear and on-demand content over variable networks to a wide range of devices. The Encryptonite ONE HLS+ solution leverages HLS as a common content distribution method to all devices, with SecureMedia providing customized clients for each device targeted. In this manner, service provider costs of encoding, processing, and storing content in multiple formats for multiple devices are minimized and workflows are simplified. Another key benefit of the Encryptonite ONE HLS+ solution is that it is a browser-independent solution that can be used for any media application across many devices. (See Figure 2.)

Simplifying the Process

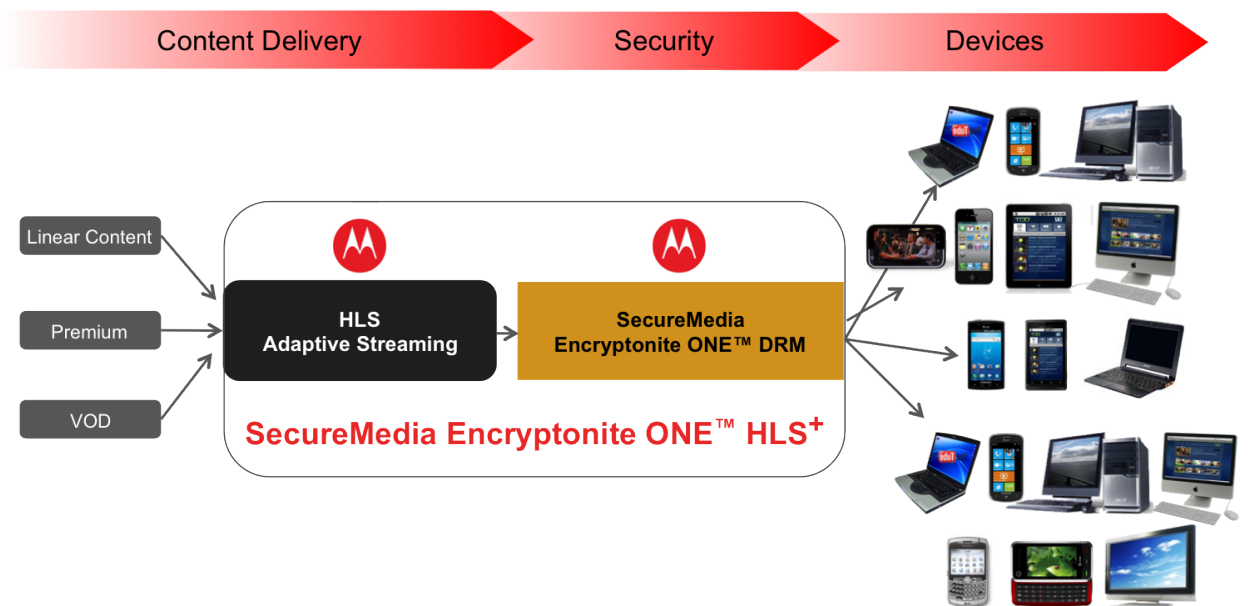


Figure 2. Simplifying the Process

SecureMedia HLS+ Encoding and Chunking

Encryptonite ONE HLS+ is a complete end-to-end adaptive streaming platform. At the point of content origination (i.e. broadcast feed or VOD file reception) transcoders are deployed to adapt the data rate and resolution of the incoming video into multiple profiles appropriate for the targeted devices and distribution network(s). In the Encryptonite ONE HLS+ system, SecureMedia utilizes transcoders from best-of-breed vendor partners.

For the adaptive stream modification, SecureMedia has developed an HLS-compliant “chunker” to segment the video stream for HTTP delivery and generate the relevant manifest file. The chunker is integrated with SecureMedia’s Encryptonite ONE Broadcast Encryptor to encrypt the content for secure distribution and storage. The Broadcast Encryptor and Chunker are both controlled by an HLS+ encryption key controller extension to the standard Encryptonite ONE DRM system, providing encryption keys and associated reference data.

Fortifying the Security of HLS with the Encryptonite ONE™ System

In the HLS draft specification, Apple defined a standardized stream encryption method and the structure for references to the decryption key files in the manifest file. By itself, and as implemented by some content distributors, the HLS encryption specification alone does not provide the level of protection required by Hollywood studios or leading broadcasters for high-value content. It takes additional security processes to build a digital rights management capability around HLS adaptive streaming as provided by SecureMedia's Encryptonite ONE System.

In HLS+, the Encryptonite ONE System adds the following critical security features (see figure 3):

- client registration and authentication
- client tamper-proofing and clone detection
- viewing entitlement management and delivery
- decryption key management and delivery
- offline rights management for disconnected playback

SecureMedia Encryptonite ONE™ HLS+ System Components

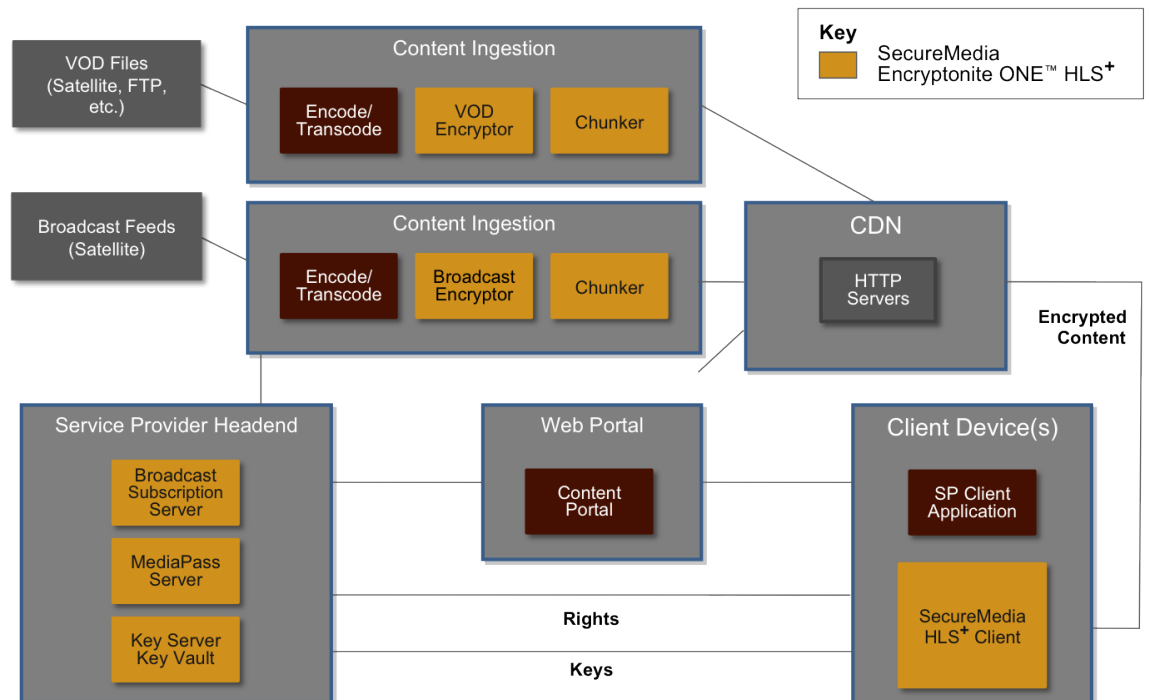


Figure 3. SecureMedia Encryptonite ONE™ HLS+ System Components

Encryptonite ONE™ HLS+ Custom Clients

In deploying Encryptonite ONE HLS+ across multiple clients, SecureMedia leverages, where possible, native media players that support HLS, as is the case with Apple iOS-based devices. On iPad/iPhone/iPod devices, the native iOS Movie Player supports HLS streaming, and SecureMedia deploys a companion Encryptonite Decoder Client that handles all DRM system communications, registration/authentication, entitlement processing, and decryption key retrieval and processing. The Encryptonite Decoder Client also establishes a secure communication channel with the iOS Movie Player to pass the processed decryption key into the player where the encrypted HLS chunks are decrypted.

On devices without native HLS support, such as the PC and Android-based smartphones and tablets, SecureMedia delivers a separate media player application that integrates the Encryptonite Decoder Client and features a Motorola-developed HLS download manager. The proprietary client rate adaptation algorithm developed by Motorola is notable in that it selects higher video rates more aggressively than Apple's implementation on iOS devices, while also proactively preventing client buffer underflows for an enhanced viewing experience.

To date, SecureMedia has developed HLS+ clients for Android smartphones and tablets, including the latest Droid family of handsets from Motorola. HLS+ clients have also been developed for Apple iPad/iPhone/iPod devices, PC and Mac (OS X), Sony Playstation 3™, and the Motorola IP and hybrid set-top boxes. SecureMedia's development roadmap also includes HLS+ clients for set-top boxes from other manufacturers, Internet-connected TVs, and Blu-Ray Disc™ players.

The Encryptonite ONE™ Digital Security System

The Encryptonite ONE System is an all-software, open platform DRM system running on standard off-the-shelf servers. It provides a level of protection matching any hardware configuration, but with far greater flexibility at far lower costs. The system has been widely evaluated and certified by motion picture studios and TV programmers as meeting the highest performance standards, with the result that it has been deployed by service providers worldwide to support IP delivery of premium linear and on-demand content.

The Encryptonite ONE System platform comprises many functions including:

- a patented Indexed Encryption™ process that encrypts each data sample (i.e. adaptive chunk) uniquely and maintains persistent content encryption in delivery and storage
- a patented key delivery method that protects decryption keys and separates them from encrypted content and rights delivery thereby enabling multiple deployment scenarios, including centralized key management for multiple affiliate storefronts vending encrypted content and rights
- device registration, authentication, clone detection and authorization via the Encryptonite System Access Manager
- iDetect™ tamper detection supporting disablement of decryption process if blacklisted software components are detected on the user's device
- provision of secure communications channels from Encryptonite servers to Encryptonite clients thereby protecting content requests, rights delivery, system messages, and updates
- secure offline content playback and rights management even through device power cycles

When a subscriber has purchased a device at retail and wants to access the service provider's IP-based content, the service provider simply downloads the Encryptonite ONE HLS+ client specific to that device. From that point on, whenever the subscriber accesses the service, the device is fully equipped to operate as an extension of the service provider's ecosystem.

Conclusion

The strategic imperative to provide access to premium linear and on-demand content from any device brings into play a vast realm of operational complexities for service providers. One of the most daunting has been the need to support multiple content ingestion and processing platforms, most of which are sub-optimal with respect to the quality of content protection, adaptive streaming or both.

SecureMedia works closely with service providers and device manufacturers and leverages its deep experience as a provider of state-of-the-art DRM security. This has made it possible for service providers to eliminate the expense and operational headache of running multiple-content distribution platforms to reach devices beyond traditional managed networks. Now, through the use of the Encryptonite ONE HLS+ platform, service providers can deliver a full range of premium content to set-tops, smartphones, tablets, game consoles, and connected TVs of every description.

This innovation marks a key step in Motorola Mobility's development of its portfolio to enable the best possible consumer experience in the cable/satellite TV, IP, and emerging mobile service domains. Through the combination of Motorola Mobility and SecureMedia technologies, service providers will be able to maximize operational efficiency, minimize costs, and meet content owner security requirements in their migration to a multi-screen service.

About Motorola Mobility

Motorola Mobility, Inc. (NYSE:MMI) fuses innovative technology with human insights to create experiences that simplify, connect and enrich people's lives. Our portfolio includes converged mobile devices such as smartphones and tablets; wireless accessories; end-to-end video and data delivery; and management solutions, including set-tops and data-access devices. For more information, visit motorola.com/mobility.

About SecureMedia

SecureMedia is the world's most experienced provider of proven open platform content protection software for the multi-screen delivery of linear and on-demand video content over IP-enabled networks. Founded in 1996 and headquartered in Lowell, Massachusetts, USA, SecureMedia, a Motorola Mobility Inc. Company, was first to introduce the Hollywood studios and leading broadcasters to the advantages of software-based content security systems. Today, SecureMedia is "Enabling Entertainment Everywhere!™" by delivering innovative, award-winning digital content delivery and security solutions.

More information at www.securemedia.com



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