



A Managed and Optimized OTT/TVE Video Delivery Experience

Monetizing Multi-Screen Video
At Home and On-The-Go

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MONETIZING MULTI-SCREEN

The world of video delivery is changing. Users are no longer chained to their living room TVs. TV has evolved to be any display device, whether used at home or on the go. Video service providers must answer the challenge to unlock the potential of multi-screen delivery, or risk losing customer attention and loyalty.

The availability of intelligent Internet Protocol (IP)-connected displays, or “multi-screen devices,” has outpaced the ability of traditional content delivery companies to service these devices. Initial forays into the new world of multi-screen are often free or authentication-based extensions to these new device types. The true potential of this market will only be realized when content delivery can be fully monetized, extending the established content and delivery ecosystems to fully embrace this technology.

The economics of this new market segment are compelling. Already most service providers face challenges and competition in their market. Subscriber penetration statistics are key, since additional users of the service provide new revenues with relatively little infrastructure investment costs. This increases average revenue per user (ARPU), a key metric for the health of the business. Investing in competitive service offerings to enable the migration to all-IP services while at the same time preserving existing infrastructure creates additional major business expenses. Providing additional services to allow customers to view content whenever and wherever they want saves these expenses even if the additional revenue potential is not considered.

Current video delivery technology requires installation of expensive set-top box (STB) hardware at each display. Popular

video services, such as whole-home digital video recorder (DVR), may require additional investments in home gateways and upgrades to the STB terminals. However, over-the-top (OTT) delivery is mostly software and IP based, with intelligent clients in the display. Complex services, such as multi-room viewing, can now be done with a simple session shift between any Internet-connected communicating devices.

IP-based delivery allows service providers to break the heavy chains of video delivery, expanding to new screens, new services and new markets. In effect, the supply chain of video delivery can be commoditized by promoting open standards for IP delivery with a number of significant and immediate business advantages:

- » Increased ARPU and increased subscriber base
- » Competitive service offering around cost-effective, multi-room content delivery
- » Ability to bundle and monetize specialty content to targeted subscriber groups
- » On-the-go consumption of premium content on consumer-managed devices

MULTI-SCREEN DELIVERY: CHALLENGING AND COMPLEX

Current delivery networks are expensive and inflexible and are falling behind in terms of customer expectations. Expansion to IP delivery will solve many of these issues, but will take a substantial investment of time and money. Cost-effective hybrid IP solutions that are compatible with existing back-office systems can help service providers to upgrade their networks in a controlled and efficient manner, and quickly deliver advanced features to end-users.

There is astounding growth in the number and types of devices in a home capable of displaying video. Each device may have a different screen size, resolution, display capabilities and operating system. It is impractical for the video delivery network to customize content control and delivery for each device type. This can be solved by implementing controlling applications for each device which normalizes their network appearance. And, it allows the delivery network to interact with each different device in a controlled and standardize manner, greatly reducing cost and expanding the number of devices reached.

IP video delivery is much less constrained than traditional fixed-channel (QAM) broadcast video transmission. QAM technology will continue to improve in bandwidth efficiency and on-demand services, but in a relatively linear fashion. Modern adaptive bitrate streaming techniques build on widely deployed IP-based HTTP edge caching technology. Service providers can inexpensively deploy in-network content delivery network (CDN) schemes to facilitate IP service migration while maintaining the high level of video quality that customers expect. IP delivery further lends itself to extension to off-network and true on-the-go consumption, which can greatly increase customer reach. A hybrid approach that takes advantage of the best of both QAM and IP delivery will create the most value for service providers and delivery the best service to end users.

Finally, the addition of an IP delivery network into existing video deployment architectures requires simple integration with common back-office infrastructure, and the same interfaces to subscriber and billing databases can be used. Systems can also be extended to include device information, since the old assumption of single delivery to a provider-owned STB may no longer be valid.

“IP video delivery is much less constrained than traditional fixed-channel (QAM) broadcast video transmission.”

To summarize, the following challenges can be met with a managed over-the-top delivery architecture, which can be optimized for video delivery, preserving the same user experience:

- » Extend content delivery to all multi-screen home-consumer devices
- » Inexpensive upgrade to IP networks for OTT content delivery
- » Normalization of consumer premise equipment
- » Multi-screen extension for true on-the-go consumption
- » Common back-office infrastructure to support both service provider Consumer Premises Equipment (CPE) and consumer devices

MANAGED VIDEO SERVICE DELIVERY OVER UNMANAGED NETWORKS: THE NEXT FRONTIER

Service providers typically bundle high-speed Internet access along with traditional TV and VOD. The Internet connection offers an attractive alternative delivery network to subscribers. Until recently, service providers have not taken advantage of that network for video delivery, leaving it open to competitors such as Netflix and Hulu to create overlay over-the-top schemes for video delivery. There is obviously a huge demand for these services, and consumers are willing to pay a premium for the option to view expanded content over the Internet connection.

To date, service providers have not used their own Internet connection to augment video delivery. This is because of several issues, such as concerns over video quality, the expense (both CAPEX and OPEX) of enabling this alternative video delivery mechanism, and worries over back-office integration needed to provide a seamless and consistent experience to their customers. On the path to an all-IP future, and hybrid approach with enhanced IP content delivery for VOD and continued QAM delivery for linear content provides several advantages.

AZUKI SYSTEMS ENHANCES THE POWER OF OTT VIDEO DELIVERY

Azuki has built a managed and optimized OTT solution on top of a universal multi-screen live and VOD delivery framework, enabling service providers to capitalize on multi-screen and TV Everywhere initiatives with:

- » End-to-end entitlement control per subscriber, device and content
- » Dynamic multi-screen ad insertion
- » Extended HTML5 compatibility for monetization and security
- » Detailed consumption analytics and metrics from all device types
- » Anywhere, anytime, any device session-shifting

There are specific issues related to using an unmanaged IP network for reliable high-quality video delivery. Each of these can be overcome with proper management and deployment of end-to-end controls. Typically, transmission issues such as jitter and latency are a primary concern. Higher bandwidths and improved network characteristics have led to wide-scale use of Internet streaming. Advancements in adaptive bitrate streaming allow each user to achieve the highest possible video quality at all times. These schemes are end-user or “pull” based, which provide a much better and more consistent experience than older server-based “push” technologies. With proper network partitioning and edge caching, streaming video can provide the same consistent level of Quality of Experience (QoE) expected from traditional VOD delivery.

Network reliability can be improved by using Content Delivery Network Interconnection (CDNi) techniques. The ability to measure and select alternative delivery paths can greatly lower transport costs with a very high degree of resiliency. In-network CDN techniques can be extended to public CDNs, where the service provider may have less direct control over the IP delivery network, without degradation of video delivery services. Public CDNs are currently optimized for

web content, not video. Upload is a slow and unpredictable process, often with as much as a 2 minute latency (too much for Live content). High quality adaptive bitrate segmented delivery with many small files further increases latencies and delays. CDNi techniques allow the delivery network and client to optimize the CDN selection to ensure the best scale, capacity, geographic reach and service level.

Multi-screen delivery is typically considered to be more difficult to monetize, partially due to the lack of monitoring and analytics capabilities. However, the addition of end-to-end controls and an intelligent client “closes the loop” on monitoring. With a normalized client, any multi-screen device can be managed like an STB, creating a “virtual set-top box” environment. Detailed analytics for content delivery metrics and troubleshooting will open the door for the monetization of OTT content delivery. In addition, the ability to personalize services and target advertising not only to the home, but also to a specific user, device and location unlocks the potential of an even greater monetization potential.

The overall challenge can be summed up as delivering a managed service over an unmanaged network. A core principal of service providers is managed service delivery. Their brand is created by consistent high-quality video delivery, protecting content rights to fulfill contractual obligations to the content owners, a high level of service to their customers, and a consistent experience when interacting with the network or guide information. Many of these tenets are inconsistent with best-effort IP network delivery. It may be difficult to ensure consistent high-quality video delivery under varying network conditions and congestion. End-user devices have different user-interface philosophies, leading to an inconsistent user experience.

Azuki’s end-to-end approach closes the loop on managing service delivery. Adaptive bitrate transmission is utilized to rapidly respond to varying network conditions, providing the end user with the highest possible video quality at all times. Video segments are reliably transmitted to withstand any bit errors or lost packets that might affect quality. Detailed analytics not only keep a record of what video was watched when and where, but also assist in debugging and troubleshooting. For the first time, service providers can offer the quality and controls needed to preserve their brand, even on consumer-owned devices.

Closed-loop controls are only part of the story. To provide a system that can be widely and inexpensively deployed to any device on any network, both device management and network optimization must be implemented.

DEVICE MANAGEMENT

Any screen, anytime, anywhere. Customers are demanding that they be able to view their content no matter where they are, at home or on the go. A customized approach that addresses only one device type, such as Apple® iPhone® and iPad®, is too limited. True multi-screen deployment can only be achieved if all device types can be “normalized” to present a consistent interface to the network and back-office support systems. New generations of devices come and go on a scale faster than a service provider can respond to. Any useful system must be able to support new generations of devices, devices which may not have even been designed yet when the system is first deployed.

Support of video delivery to any multi-screen device over an unmanaged IP network presents challenges that must be solved by the OTT delivery system. A unique ID must be associated with the device for both subscriber-identification and device-profiling purposes. Modern-device operating systems provide common interfaces, but diverse hardware implementation creates fragmentation even within the same class of devices. Monetization of high-value content requires strict content-protection enforcement to meet contractual usage obligations. Common-content encryption, digital rights management (DRM), and user entitlement must be standardized across all devices.

Adaptive bitrate streaming techniques, including Apple® HTTP Live Streaming (HLS) and Microsoft® Smooth Streaming, have been shown to provide the best end-user experience. Proper device management must include support for adaptive streaming even if it is not supported natively on the device. All multi-screen devices must present the same appearance to the network and supporting back-office systems; otherwise, solutions are impractical due to the high costs and support needs for independently supporting each diverse device type.

Device normalization is facilitated by providing a thin media client on each device. The client can be aware of specific device characteristics and interfaces, while presenting a common standardized appearance to the controlling network delivery systems.

“With a normalized client, any multi-screen device can be managed like an STB, creating a “virtual set-top box” environment.”

PROTECTING CONTENT

Another example of the need for device normalization is universal content protection. Contracts for the use of the most valuable content require high levels of control protection to ensure proper usage and to prevent piracy. Traditionally, service providers have solved that issue with a hardware approach using specialized hardware in the STB. However, the STB solution is expensive and inflexible. The need is to distribute video to all display screens, whether they are under direct management of the service provider or not.

New multimedia display devices and operating systems have a wide range of content-protection capabilities. It is a requirement for managed service delivery to normalize content protection and entitlement. Users demand a consistent interface experience to all devices. Software approaches can be taken to achieve the same level of protection on phones and tablets as that achievable on specialized hardware units such as STBs. That way, the network can prepare and protect the content once, and then display that encrypted content on a range of device and OS types.

Complementing universal content protection is entitlement controls. Due to device capabilities and content licensing restrictions, there may be restrictions on the quality of the content (SD or HD) that different devices are allowed to access. Also, there may be location-based or network-based restrictions on what content can be viewed. An entitlement function working hand in hand with content protection allows the service provider the flexibility to offer premium content to a wide range of devices, with specific restrictions automatically enforced in real time.

KEY ROTATION

Content is protected via DRM, which securely encrypts content. The content can only be unlocked and viewed if the user and device are authorized with a decryption key. A single key is typically sufficient for single-use Video on Demand (VOD) applications, where a user might watch a two-hour movie. However, for live/linear viewing, additional measures need to be taken.

Premium live events may extend over a long period. Examples may include a virtual ticket to the Olympics or a sports tournament which might comprise several channels that are active over a long period of time. To prevent piracy, the service provider may be required to change or “rotate” the decryption key periodically to provide additional content protection. Another example may be a single live feed or channel containing several programs. Key rotation may be used in this case to enforce parental controls for the various programming on that live/linear channel, with the key change triggering an entitlement call to the user that the user is permitted to watch that specific program.

DELIVERING CONSISTENT USER EXPERIENCE

The goal of a future service provider is not only to deliver any content to any device, but also to provide the same user experience each time. Subscribers must interact with the network in a similar manner and recognize consistent branding across all of their devices. Without a consistent interface, subscribers are more apt to search for alternate services, since they are less constrained by the learning curve of different interfaces. Branding is also critical, especially in a world where there is strong competition for subscriber dollars and attention.

“To prevent piracy, the decryption key can change or “rotate” periodically to provide additional content protection.”

Similarly, the network must have a common view for all devices. Otherwise, complexity will increase to unsustainable levels if, for example, each device requires a different video preparation, delivery mechanism, ad insertion protocol, analytics gathering or service interface. Both the user and network appearances of the device must be normalized to provide a common experience for both the subscriber and the service provider.

The key to device normalization is the per-device delivery client. This is a universal layer that interfaces to both ends of the connection. It provides tight synchronization with the service provider back end and also provides a consistent user experience across all devices.

The common device client must provide the following features:

- » Consistent delivery of adaptive streaming for optimum quality under all conditions
- » Normalized multi-screen content protection to enable delivery of premium content to any device
- » Real-time capture of useful analytics on the entire viewing experience, including user, device, bandwidth, quality and content
- » Multiple monetization options (i.e., subscription, rental, advertising, etc.)
- » Dynamic ad insertion/replacement
- » Consistent user interface across all screens to protect branding

NETWORK OPTIMIZATION

The key to successful deployment of high-quality video services over unmanaged IP networks is interactive network optimization. Unlike cable and managed IPTV delivery to set-top boxes, OTT video leverages un-managed IP network (i.e., the public Internet or mobile on-the-go delivery), and CDNs or shared origin servers for delivery. As such, OTT video is subject to latency and bandwidth fluctuations due to real-time conditions beyond the control of the service provider. This could either be congestion on the shared Internet connect, overload of the delivery server, or even temporary overloads in the display device. The delivery of a large number of linear channels presents a particularly daunting challenge because the underlying networks are shared resources.

End-to-end controls, along with segmented adaptive streaming, now allow providers to deliver a service level similar to a dedicated delivery network, but with much greater flexibility and lower costs. A delivery client in the target display device manages the adaptive streaming delivery and provides feedback to the controller server if network conditions deteriorate. Delivery can be optimized with the closed-loop controls existing at both the head end and client, to withstand network variability.

For example:

- » The proper CDN can be dynamically chosen to satisfy specific geographic reach requirements
- » Delays can be detected and delivery switched to a secondary CDN
- » System intelligence to load balance across multiple parallel CDNs for the purpose of scale in terms of number of channels or simultaneous users

Azuki's solution provides an optimized and consistent managed-user experience over unmanaged networks across multiple consumer-owned devices. Managed OTT optimized video augments the service providers' QAM and IPTV managed networks, making it possible for service providers to instantly have a hybrid video infrastructure in place. Azuki's managed OTT optimized video is easy to deploy and does not require large capital investments or high operating costs. It facilitates the quick expansion of virtual channels and screen reach (i.e., consumer devices) without further taxing the existing network.

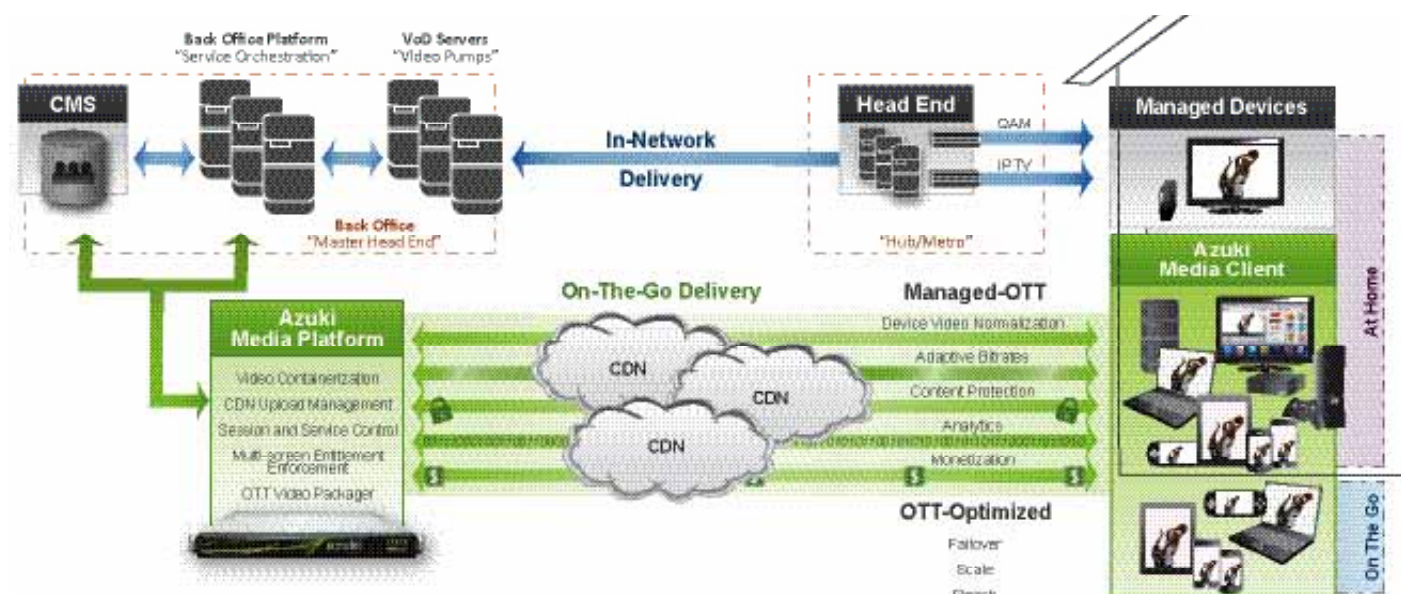
Most importantly, Azuki's managed OTT optimized video delivery helps to augment existing QAM delivery and pave the way for a speedier migration to all-IP networks.

CURRENT MARKET DYNAMICS

Market dynamics are in a state of flux, and service providers are faced with a large number of challenges. Consumer behaviors are changing. They are rapidly adopting new devices and expect to be able to view content on those devices. There are fewer TV-by-appointment viewings, since customers expect to view content from the start whenever they are ready to view it. This leads to increased customer churn and cord cutting/shaving as they explore other media delivery options.

The competitive environment is challenging. Where many service providers once enjoyed a virtual monopoly on content delivery, they are now faced with new and unexpected competition. Other service providers are utilizing alternative delivery mechanisms to bypass geographical boundaries. New types of competitors are arising with focused business models to transmit only popular subsets of content directly over the Internet at very low prices. Even content owners are finding ways to sidestep the usual local affiliates and offer their content directly to the end users, initially on mobile devices but eventually directly to Internet-connected TVs.

Service providers must react quickly to these challenges or risk increasing customer erosion. They must deliver more content to more devices in more locations, while maintaining their brand quality.



MEETING THE NEEDS OF SERVICE PROVIDERS

Azuki Systems enables service providers to expand live and VOD services to new consumer-owned devices by leveraging and extending existing back-office and video delivery infrastructures. With Azuki, service providers can easily simplify the management and deployment of content protection, adaptive bitrate, analytics and monetization across multi-screens while optimizing network bandwidth to ensure consistent quality of user experience over unmanaged networks – at home and on the go.

Unlike first-generation OTT video services that have a limited reach due to lack of quality and limited device coverage and are unable to provide metrics or monetization options across multi-screens, Azuki provides the only managed and optimized OTT multi-screen video delivery platform that enables MSOs, mobile network operators (MNOs) and telco/IPTV providers to:

- » Capitalize on OTT delivery with multiple monetization options on consumer-managed devices (i.e., subscription, rental, purchase, freemium-to-premium conversion and advertising)
- » Deploy more content on more screens
- » Collect real-time analytics across multiple screens to understand user-managed devices and content-viewing habits
- » Provide studio-approved end-to-end content security for all screens
- » Manage bandwidth to ensure the delivery of high-quality video under any network condition

This results in direct benefits that are easily achieved and monetized:

- » Generate new revenue streams and increase ARPU with the launch of new services
- » Increase customer stickiness to reduce churn by enhancing/ extending current offerings and delivering new services on new devices
- » Increase/protect brand exposure by improving quality of service and consistent user experience across all devices

AZUKI SYSTEMS: REVVING UP OTT VIDEO DELIVERY FOR SERVICE PROVIDERS

The Azuki Media Platform was built from the ground up to support protected premium content delivery to multiple OTT device types. We constructed an end-to-end media-delivery platform with an intelligent client architecture that will support N-Screen devices and that is compatible with existing infrastructure and workflows – not to displace these technology investments, but to interface with them and provide an added level of intelligence for device plus network awareness. As the company leading the video delivery revolution to N-Screens, Azuki Systems is focused on bringing value to customers by simplifying the delivery of managed and optimized OTT live and VOD to any device over any network.

Many vendors claim they can deliver OTT video to multiple devices, but few have the experience to back it up. Azuki is leading the video delivery revolution for OTT optimized video delivery for service providers. We strive to integrate with, not replace, a service provider's existing video delivery infrastructure, seamlessly. We leverage adaptive streaming standards, such as Apple® HTTP Live Streaming (HLS) and Microsoft® PlayReady®, while ensuring future-proof extension to developing standards.

Azuki virtualizes the OTT client platform to ensure that adding support for new OTT endpoints devices will not require back-end or network-infrastructure changes. This results in fast time to market as new endpoints emerge. Azuki is transforming the way video is consumed today by enhancing the power of OTT video delivery with security, quality, scale and reliability.

The future belongs to those who can address all of these areas and meet their customers' needs, both current and long term.

ABOUT AZUKI SYSTEMS

Azuki Systems is leading the video delivery revolution to any screen over any network. Azuki's solutions deliver rich, protected content to any device over any network, allowing content owners, enterprises and service providers to capitalize on the explosive growth of smartphones, tablets and multiple screens. The Azuki Media Platform™ enables service providers, mobile operators and brand-name media, including HBO GO® and SHOWTIME ANYTIME® new mobile application, to combine the power of over-the-top delivery with the highest quality of user experience, content protection, scale and reliability. Founded in 2008 and based in Acton, Mass., Azuki is led by an executive team renowned for repeated success in launching disruptive technologies and scaling companies that have solved key technology challenges and provided their customers with a competitive edge. Visit www.azukisystems.com for more information.



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