OVER-THE-TOP (OTT) OPTIMIZED MULTI-SCREEN VIDEO DELIVERY FOR SERVICE PROVIDERS
TV EVERYWHERE (TVE)
Where is “TV Everywhere”? The internet has permeated all other forms of communication, with the sole exception of home television. You can get my email anywhere. You can surf the internet in your car with your smartphone. You can view user generated content on every conceivable topic. However, live broadcast is still largely chained to your living room TV. The view experience is primitive by any standard – although you have more channel choices, you are still limited to a fixed broadcast menu. Where is the capability to view TV program when, where and how you want to?

There is huge consumer interest in a high-quality video experience that is available on any screen, anywhere. Also, consumers want to extend the limited pause and review capabilities of the current channel to all channels, all the time. Consumers have hints of the TVE experience with streaming Video on Demand from non-service provider sources like NetFlix. But full TVE capabilities for live broadcasts is still not common. This presents a major opportunity for service providers to regain consumer loyalty.

Over-the-top (OTT) transmission techniques can be easily extended into the service provider’s backbone network or used in conjunction with external Content Delivery Networks (CDNs). This allows the service provider to easily augment their current delivery mechanisms and realize the advantages of TVE without a major overhaul.

While OTT video delivery has gained popularity, it is not without major challenges. The Internet as a whole is still ill-prepared for large-scale live video delivery to the masses. Video viewing experience varies depending on network conditions and Internet congestion. Many endpoints lack the hardened content protection required for premium content delivery and advanced adaptive streaming for optimal video delivery.

A major issue is managing the “unmanaged” devices consumers want to use for TVE viewing. The proliferation of endpoint devices has a multiplying effect on the number of video formats that need to be prepared, cached and delivered. This is very different from the current service provider model of using “managed” set top boxes with known characteristics and performance.

Cost-effective delivery requires solving a number of daunting challenges, including:

- Normalizing devices to reduce the explosion of profiles
- Transmitting over unmanaged networks without the service provider’s direct control
- Integrating with existing back-office infrastructure and data centers
- Centralizing entitlement and authentication
- Delivering premium content with consistent content protection
- Optimizing video delivery
- Providing a common user experience across all device types

ENTER OVER-THE-TOP
OTT, by definition, is a delivery paradigm that leverages Internet Protocol (IP) networks, clouds and content delivery networks (CDNs) to deliver video. It is often classified as an unmanaged delivery method since the networks it leverages can only be indirectly controlled and are subject to network congestion caused by other users and applications.

Embracing OTT video in a service provider’s environment means extending set-top-box (STB) managed video services to run over unmanaged networks and deliver video to uncontrolled endpoint devices. The goal of OTT is to provide service comparable to managed delivery to STBs, in terms of video quality and user experience. To achieve this, the OTT client software must function as a virtual STB platform. A centralized OTT video distribution platform in a service provider’s data center, working together with an intelligent client in the target device, can form an end-to-end path that normalizes all aspects of delivery to achieve a common experience.

CHALLENGES IN NORMALIZING OTT VIDEO FOR SERVICE PROVIDERS
OTT presents a major new challenge: how to mimic the existing and familiar approach of delivering content over predictable managed networks. First and foremost, service providers must:

- Leverage existing managed infrastructure and back offices
- Make OTT the seamless extension for their existing managed services
- Adapt to variable and unpredictable bandwidth conditions for OTT delivery
- Account for differences in capabilities of multiple new devices without sacrificing the user experience
- Enforce content protection across all screens
Plan for a workflow that can scale to large N-Screen deployments

The issue is greatly complicated by the number and diversity of endpoints that must be supported. For example, most OTT endpoints do not come with complete hardware support for content protection, which makes enhancing device hardening via software the norm, not the exception. Many of these devices do not support advanced adaptive streaming required for quality operation over unmanaged networks. If supported at all, some devices may only support a particular implementation that is hard to normalize from a video preparation perspective.

Service providers must evaluate current practices and weed out shortsighted, complex and silo’ed approaches to today’s TV Everywhere and OTT multi-screen initiatives. For OTT multi-screen video to be a seamless extension of their TV services, several OTT functional gaps must be addressed.

CONSISTENT USER EXPERIENCE AND INTERFACE

Customers have come to expect digital video recorder (DVR) time-shift services and session shifting between TVs in the home. This user experience must be extended to OTT. Diverse OTT devices must depend on a networked or software-based DVR architecture to normalize the multiscreen DVR experience. This requirement implies that user session shifting from one screen to another must also depend on a centralized service inside the service provider network which is agnostic of the transport network, CDNs or the actual endpoint device.

Furthermore, a consistent user experience requires that an intelligent client-side software development kit (SDK) exists for consistent user interface (UI) development that not only makes it possible to develop cross-platform applications, but also allows each endpoint device to be individually optimized for device-specific screen characteristics and features. The challenge is in striking a delicate balance between a common cross-platform UI and individual device optimization. For example, a UI design for phones with a small screen may not look good on tablets with a much larger screen. A common application framework can be used to create device profiles for the presentation layer.

CONTENT PROTECTION ACROSS DIFFERENT SCREENS

Most OTT devices are unsecure by nature. This requires that new software protection techniques be implemented to achieve a normalized content protection/digital rights management (DRM) environment. Many devices which are considered secure may only work with a particular DRM back end or may require that a device-specific handshake be performed for content decryption and key storage. Multiscreen video delivery will inevitably evolve into a tiered content rights scheme based on device types. For example, content rights enforcement on high-definition-capable devices is more stringent than smaller electronics gadgets with low resolution. In addition, existing video services for desktops and STBs may have embraced DRM back ends which are incompatible with or inextensible to new OTT streaming endpoints. Normalizing device DRM quickly becomes one of the thorniest issues to tackle. To further complicate the matter, consistent content protection must be implemented in concert with normalized adaptive streaming delivery.

OPTIMAL VIDEO QUALITY

Unlike cable and Internet Protocol television (IPTV) STBs, OTT video leverages the public Internet (an unmanaged network) and CDNs for delivery. As such, OTT video is subject to latency and bandwidth fluctuations due to real-time network conditions beyond the control of service providers. However, with video moving to segmented adaptive streaming delivery and with the presence of native applications, end-to-end OTT control is now possible.

This opens up the possibility of intelligent OTT bandwidth management to create a delivery experience that can rival managed delivery.

Despite the promise of HTTP and Moving Picture Experts Group (MPEG) Dynamic Adaptive Streaming over HTTP (DASH) for unifying adaptive streaming, the market will continue to point to the coexistence of several major adaptive streaming protocols with HTTP Live Streaming (HLS) and Microsoft® Smooth Streaming leading the pack.

The first issue is one of normalization. When an endpoint does not support any adaptive streaming or it supports multiple adaptive streaming protocols, how do we normalize them for the benefit of reducing the number of video formats? HLS normalization for OTT devices will likely be the most used protocol until the MPEG DASH standard becomes ubiquitous. What the market needs is a normalized HLS with future upgradability toward MPEG DASH while promising coexistence with other dominant streaming protocols such as Microsoft Smooth Streaming.

Delivery costs and regulatory considerations such as net neutrality also weigh in. Service providers increasingly want to leverage their respective CDNs to form a federated network for improved delivery coverage and cost reduction.
WORKFLOW INTEGRATION, SIMPLIFICATION AND AUTOMATION

Service providers need to seamlessly extend their existing workflow to include OTT delivery. Any changes must be minimized, if not eliminated. Existing media preparation resources such as transcoding farms, back-office entitlement and DRM servers must be leveraged whenever possible.

Without a consistent and automated workflow, the time and resources associated with supporting multiple operating systems (OSes) and devices, such as smartphones and tablets, desktop/laptop, connected TV, gaming console, standard and OTT STB, can grow uncontrollably.

Oftentimes, the multiple workflow and technology silos used to support such environments don’t work well together, making TV Everywhere and similar deployments highly complex, costly and hard to manage.

PERSONALIZED SERVICES

Consistent with CableLabs® DOCSIS® principles for STB-based service personalization that leverages the underlying network intelligence to correlate user, device and content together, OTT must normalize that aspect, likely with the help of an intelligent endpoint client and some additional OTT network infrastructure. The key lies in how the client collaborates with its OTT video server to provide this equivalent intelligence.

Together they serve as an aggregation point for OTT video-specific analytics that can be exported to a centralized metadata and user repository already in the service provider’s network.

FLEXIBLE MONETIZATION

OTT video delivery brings new third-party monetization opportunities that service providers may want to take advantage of in the future. For instance, both Apple iOS and Google Android offer integrated ad platforms that

AZUKI MEDIA PLATFORM™

Designed to help service providers deliver next-generation TV Everywhere experiences and services, the Azuki Media Platform is a dynamic, managed and optimized multi-screen video delivery solution, with intelligent client architecture, that enables:

- Live and VOD content ingestion, both dynamically as well as automatically associated with appropriate metadata, social connections, entitlements and rights information.
- One-time content preparation for multiple platforms/networks.
- Dynamic control and switch of programs and services on the fly.
- Personalization of user experience with no changes to the video stream.
- Dynamic and targeted multi-screen ad insertion and replacement.
- “Follow-me” (i.e., bookmarking) content for live and VOD across multiple devices.
- Time-shifted TV (Start-Over TV, Catch-Up TV and network DVR) for all channels across all screens.
- Flexibility to customize and personalize user interface and experience.
- Social interactivity and third-party integrations.
- Advanced search, discovery and recommendation for any content to be discovered, watched or sent to any device for viewing at any time, online and offline.
- Multi-screen real-time content, consumption-based metrics.
- Full digital rights management (DRM) protection with root of trust at all times.
- On-the-fly robust policy enforcement on any device over any network.
- Flexible multi-screen monetization options.
may be leveraged for certain new services. Today’s OTT video delivery lacks the ability to seamlessly integrate with third-party services to support device-specific targeted ads and payment platforms. Flexible dynamic ad insertion along with device hardening and content protection is required for content distributors to both acquire rights and successfully monetize the highest value content on any screen.

**OTT: TODAY’S CHALLENGE. TOMORROW’S OPPORTUNITY.**

The Azuki Media Platform™ provides a turn-key OTT solution that can easily be integrated into existing service provider delivery networks. It is a complete end-to-end media delivery platform with an intelligent client architecture that supports multiple device types. It plugs into 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 any screen, Azuki Systems is focused on bringing value to customers by simplifying the delivery of OTT Live and Video on Demand (VOD) to any device over any network.

The next-generation TV Everywhere solution enables service providers to easily and efficiently implement a winning strategy for dynamic provisioning of video services by:

**Enabling Consistent User Experience and Interface Across All Screens With:**

- Simplified device management with a common video software development kit (SDK) with multi-screen universal client
- HLS adaptive streaming on non-Apple devices, STBs and smart TVs
- Centralized play/stop/resume state management across any IP-based device
- Content-access flexibility with centralized authentication interfaces

**Providing Powerful Content Protection on All Screens With:**

- Device hardening on unsecure OTT devices for early access to valuable premium content
- Multi-DRM solutions, including Microsoft® PlayReady®, Google Widevine® and Azuki DRM servers for central key and device management
- Key rotation for live content protection

**Delivering Superior Video Quality Under Any Network Condition:**

- Stateless media upload capability with parallel uploads to multiple CDNs and CDN federations to increase workflow throughput and lower latency
- Server-side or network-side bandwidth capping to enforce traffic management and user class of service
- Client-side preload to facilitate quick channel startup and switching
- Universal adaptive streaming on all devices to ensure the best possible video quality

**Simplifying, Normalizing and Automating the Workflow By:**

- Using a single workflow for content ingestion and preparation on all devices to reduce infrastructure CAPEX/OPEX.
- Integrating with existing CMS and transcoding farms via a unique connector architecture and flexible workflow
- Leveraging containerization, CDN federation and device SDK to provide wholesale services
- Taking advantage of 50 percent reduction in the number of required CDN content profiles

**Personalizing Services Through:**

Real-time logging and association of device, user and content metadata

- Connector interfaces to:
  - Major third-party recommendation and analytical engines
  - Service provider’s specific digital storefronts and EPGs
  - Major social networking APIs

**Monetizing New OTT Content Delivery Opportunities by Leveraging:**

- One common app API to support multiple-device or OS specific ad and subscription platforms
- Templates for various online and offline monetization options:
  - Subscription
  - Authentication
  - Rental
  - PPV
AZUKI: SIMPLIFYING OTT VIDEO DELIVERY INFRASTRUCTURE TO N-SCREENS

A service provider’s ability to increase revenue and profitability lies in its ability to meet today’s TV Everywhere challenges and tomorrow’s dynamic service provisioning of Live and VOD with scale, security, quality and reliability. It is critical to build a video delivery foundation based on industry standards that will support service providers’ video competitiveness in the future.

Many vendors are claiming they can deliver OTT video to N-Screens, but few have Azuki Systems’ experience to back it up. We strive to integrate with, not replace, service providers’ existing video delivery infrastructure – seamlessly. We leverage open standards such as HTTP Live Streaming and Microsoft® PlayReady®, while ensuring that we are future-ready in the form of MPEG DASH and MPEG International Standard.

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

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