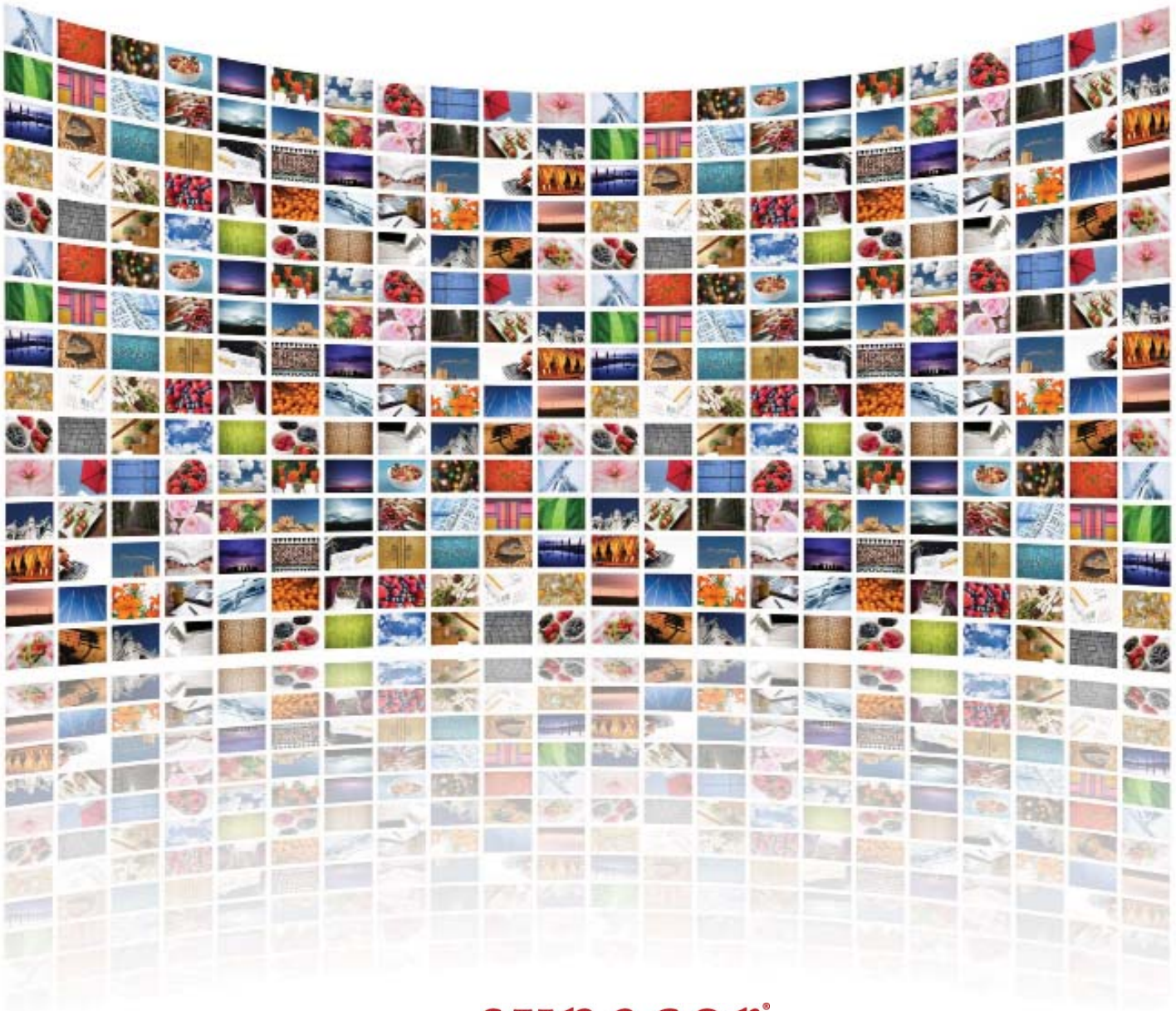
TV Everywhere

TVE 101: A Guide for MVPDs and Programmers

How television content can be viewed anywhere, on any device, at any time.



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“If I am an authorized Pay TV subscriber, I should be able to watch TV programming here, there, and everywhere…”

Meet Bob...

Bob is a fan of Conan O’Brien. Bob is on the portal of his Multichannel Video Programming Distributor (MVPD) via his laptop computer and sees a promotion for full episodes of Conan on TBS (A). Bob uses his MVPD provided email username and password to log-in (B), thereby authorizing him to watch the video immediately on his laptop (C).

A.

B.

C.

Sounds good.

Now how do we make it happen?

Overview

This paper is presented in two parts...

Part I is an overview of the TV Everywhere ("TVE") experience from the perspective of the consumer. What do we mean by TVE? What does the consumer see when he or she selects a TVE viewing option? This overview serves as a basic introduction to TVE for MVPD and television programmer executives and business owners.

Part II is a closer examination of how TVE actually works. What are the components of a fully functioning TVE system? What does the provisioning and operation of the system require of MVPDs and programmers? This analysis is more technical in nature and may be more suitable for operations and technology executives.

Part I
The Basic TVE Consumer Proposition

TVE presumes that:

• The current library of advertising supported, premium television network programming, and Video on Demand, will be available to authorized users to be viewed anywhere, on any enabled device, and…

• Television programming that is currently available only via linear television will be made available to MVPD and Programmer audiences within defined windows anywhere, on any enabled device, and...

• Television programming networks will be available to stream online in real time.

A TVE solution allows MVPDs and Programmers to extend their brands and customer ownership to the web, enhancing the value of their subscription offerings, and providing the necessary security to safeguard video assets and enable a safe and family-friendly online video experience.

The complete TVE system will have the following characteristics:

• The consumer must be able to quickly and easily identify themselves for the purpose of gaining access to TVE content.

• All the content that is available to any individual consumer must be displayed in a convenient, well-ordered, and sensible manner: by brand, by category, by genre.

• The available content must be accessible from any enabled device.

• The system must be service provider agnostic.

• The consumer must be delighted by the discovery and the day-to-day reality that he or she can watch television programming here, there, and everywhere.

Above all, TVE must be easily accessible to the consumer. The consumer experience begins with the availability of any content the consumer may be authorized (entitled) to access by virtue of a subscription relationship with any MVPD.

TVE programming should be supported by a robust offering of complementary features and functionality that connect authenticated users to the content that interests them across the devices they want to use. IP-based traditional VOD and PPV programming and streaming networks should both be available on television sets, DVR enabled set top boxes, desktop PCs, net books and laptops, tablets, and mobile devices.

In order to create maximum awareness, drive engagement, and emphasize the value-add of an online video service for MVPD subscribers, the TVE solution should be fully integrated into the MVPD's web portal, as well as be accessible from the programmer's website, employing awareness and promotion drivers to each portal or website via a range of SEO, social network, advertising, and other marketing channels. This integration leverages the customer relationship and brand affinity that both MVPDs and programmers have built up with users.

The TVE System

The TVE VES supports a complete end-to-end online video ecosystem that is able to power streaming television programming and also Web Video, either separate or combined, in a fully integrated experience.

Key features of a complete TVE System, as illustrated in Figure 1, include:

A Vibrant & Easy to Use Online Video Experience for Consumers.

While the system itself must support the ingesting, encoding, storage, and quality delivery of a large library of advertising supported and premium video content, via MVPD or Programmer video websites, the consumer experience begins with a user interface (UI) that provides a content rich search and discovery experience. The UI makes it easy to browse or search for content.

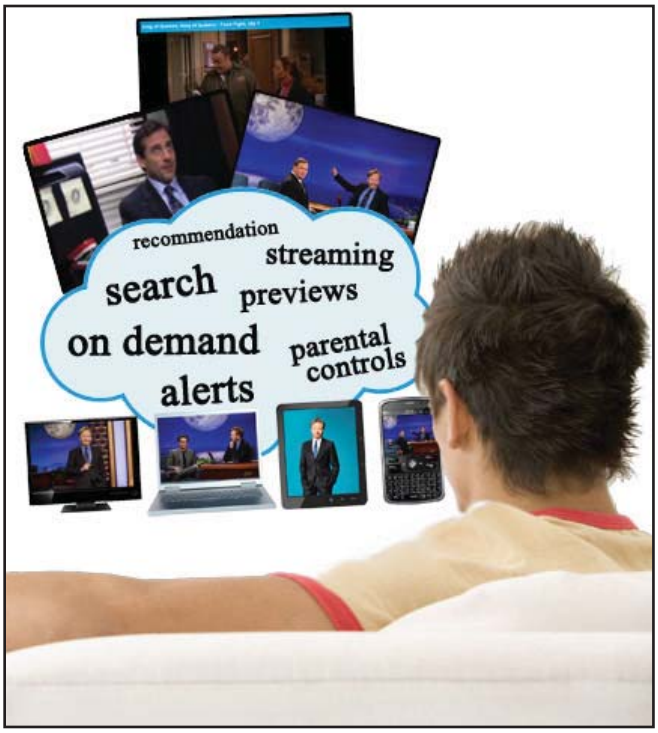


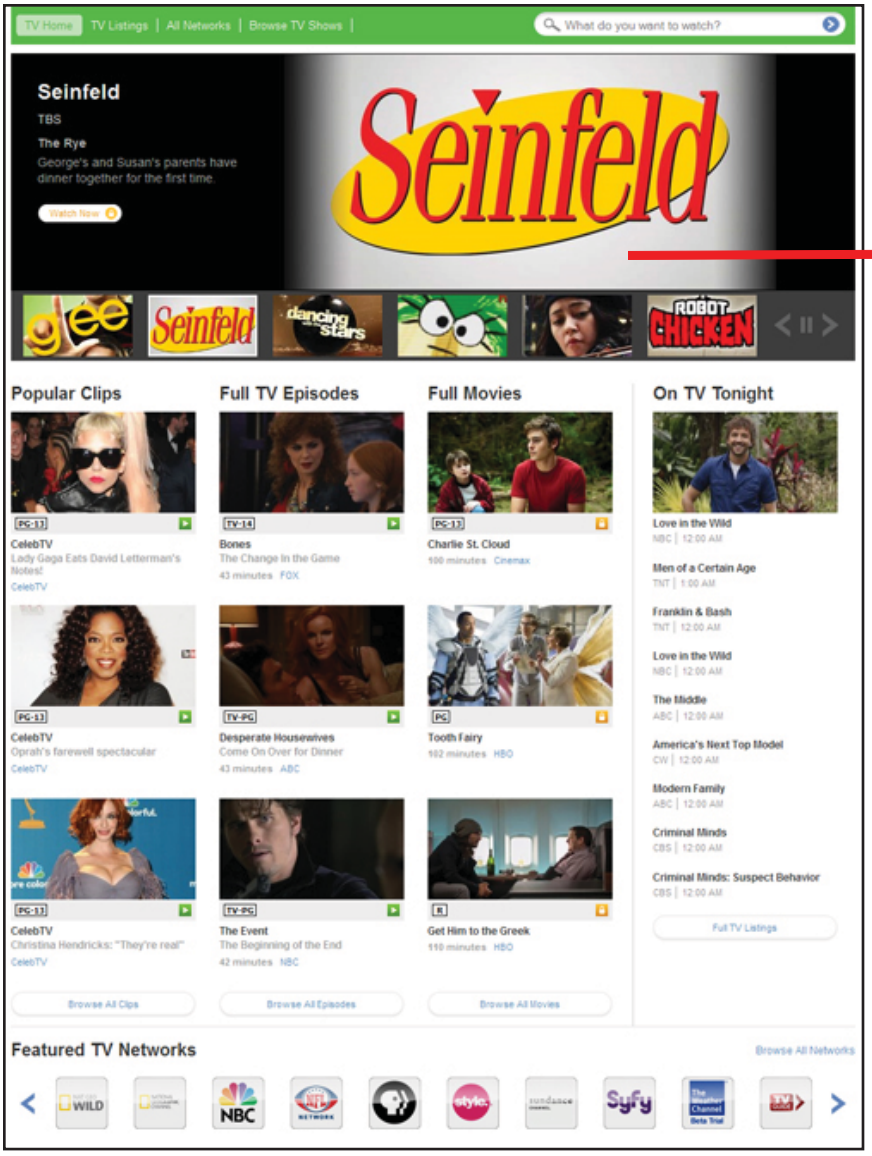
Figure 1.

The experience is enhanced by content recommendation and customization features, including Favorite Shows/Channels/Actors, and Watch Lists, etc., highlighting what is available from an MVPD or programmer, what content or content areas a specific user already has access to, and what specific content the user might want to select. See Figure 2 on the next page.

The MVPD UI should be able to combine the MVPD TVE and web video content in a single experience. The combined experience can then serve as a common destination video site for linear TV listings, online TV and video content, on demand, and a PPV storefront on all platforms.

Browsing for video based on branded network, editorial picks, provider, most popular, or most recent searches should be enabled. Recommendations through editorial components and simple asset relational algorithms, with a roadmap to create more complex algorithms based on asset information and user behavior and user history, should be supported. Users should be able to select their favorite shows and favorite channels or be notified of new content of interest via watch lists, reminders, and alerts.

Figure 2. The Consumer Search and Discovery Experience



Editorial components may feature top content by category, with frequent updates to promotional components, based on relevancy and importance.

Household Management tools may be integrated into the experience that allow the customer to manage access to content (with the enforcement of spending limits where applicable), in a way that meets the needs of their family or household.

The essential mediation experience is illustrated in Figure 3 below and will be explained further in a later section of this paper.

Content requiring approval of the MVPD via authentication and authorization ("mediation"), before any consumer may access it, can be identified in a number of ways in the UI, for example:

Green "play" button = content does not require mediation

Yellow lock icon = content requires mediation, but user has not logged in yet to require approval (please log in)

Red closed lock icon = content requires mediation and user is not approved

Figure 3. Content Requires Mediation: "Please Log In"

Key UI experiences on an MVPD's site

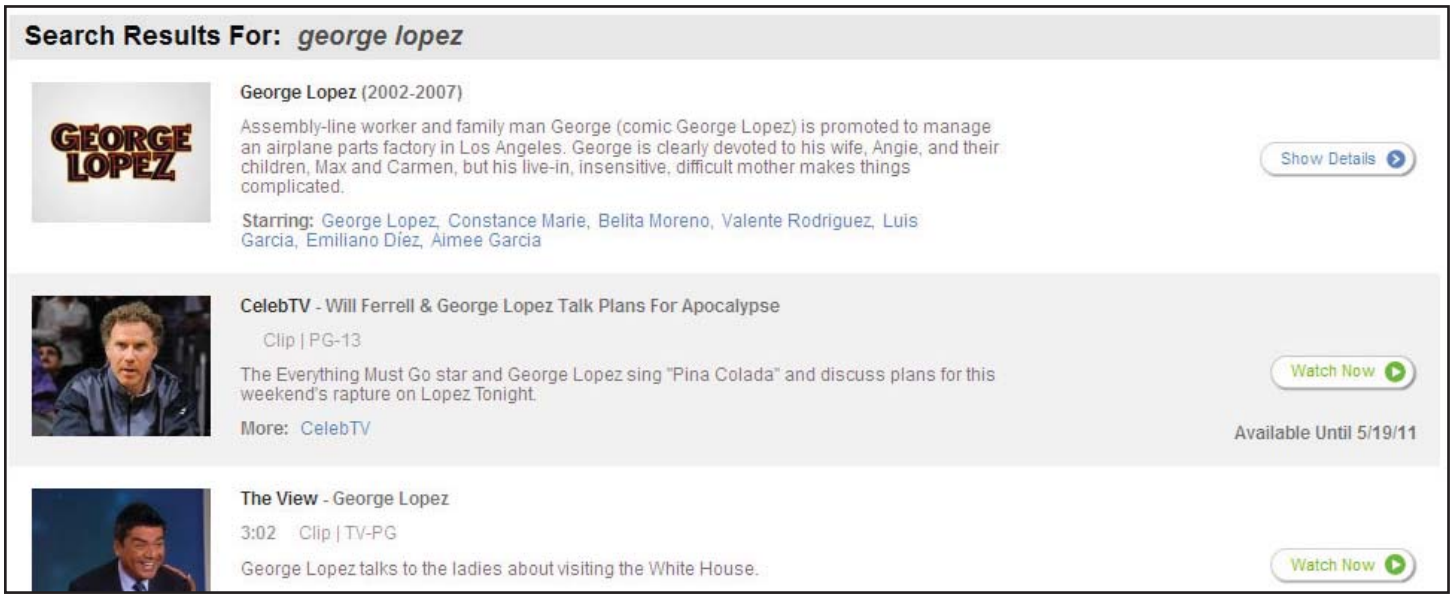
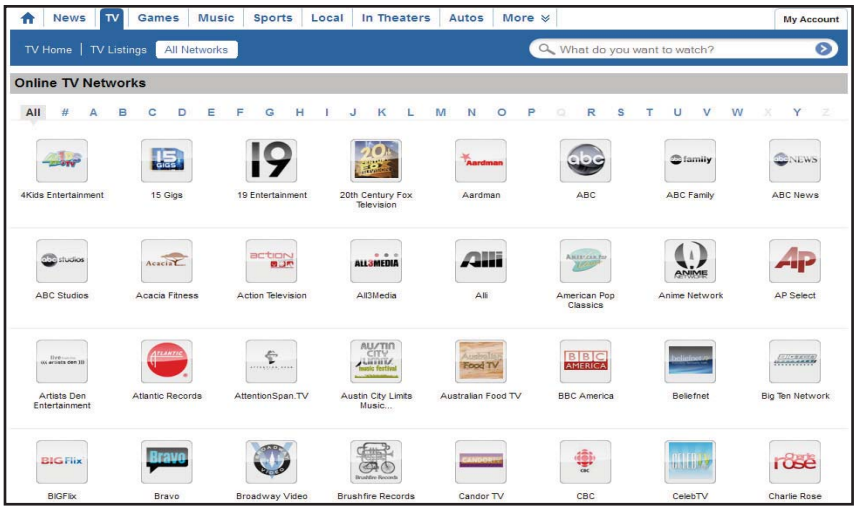


Figure 4. Search Results

Search Results Page

The Search Results Page responds to a specific user generated query with results from all data inputs from a variety of sources: listings for TV Shows or series (both ad supported and premium video), specific movies, On Demand content, Pay Per View titles, content segmented by actor/actress. Search filtering allows users to modify their search results by video type (Full Episode, Movie, Clip), Network, and/or Show.

Figure 5. Example directory of TV networks.



Network Page

The Network Page provides a convenient directory of all the programmers that provide content from which a user can select. Easily identified brand logos help the consumer locate the content of his or her choice.

Player Page

The system must allow the MVPD to aggregate various video player solutions to provide users with a seamless user experience across programmers, leveraging standards for video distribution regardless of business agreement. The system should be flexible enough to support a solution, or solutions, that satisfy the business requirements of individual content providers. For example, a content provider may require that its content be played back on a page that is specifically branded by its network that features promotions for other content from the same network.

The optimal player page solution supports all programmer distribution models: hosted, embedded, syndicated and chromeless. Each has its own distinct advantages and disadvantages.

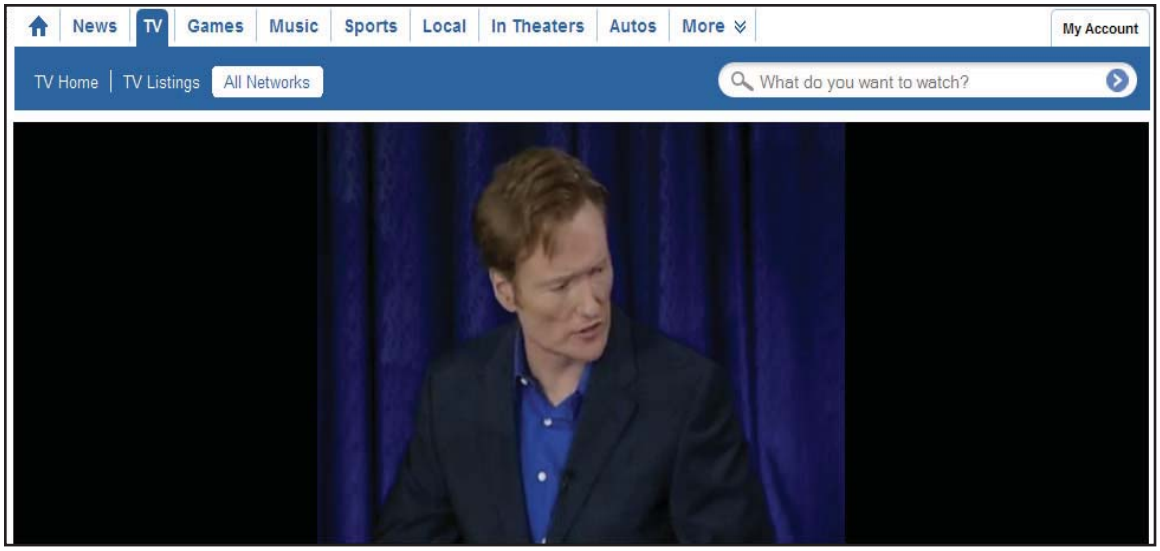


Figure 6. Programmer Embedded Player

Hosted Model

The MVPD ingests and hosts all of the content for playback in an MVPD provided player experience. ***Advantage:*** Seamless consumer playback experience across content providers. ***Disadvantage:*** The MVPD may be ingesting an increasingly large—and ultimately unmanageable—number of assets on a daily basis with a complex set of business rules to be applied to each asset. Multiple copies of the same programming may end up being stored in a large number of locations without guarantee of standards.

Syndicated Model

The programmer hosts and streams the video for playback via an MVPD provided player. ***Advantage:*** Quality of encode, DRM and streaming are minimally insured by programmer; seamless consumer playback controls across content providers. ***Disadvantage:*** Variations in streaming and player quality and experience may exist across multiple programmers and MVPDs.

Embedded Player

The programmer hosts and streams the video for playback via a programmer provided player. See Figure 6. ***Advantage:*** The programmer controls the video playback and advertising experience end-to-end with continuity of experience between MVPD and programmer sites. Direct access to reporting. ***Disadvantage:*** Consumers may be confused by different functionality and player controls provided across multiple programmers. Fraud Management must be coordinated between programmers and MVPDs; for example programmers may send MVPDs stream "heartbeats" and user IDs to MVPDs to facilitate fraud detection.

Chromeless Player

The programmer hosts and streams the video for playback via a programmer provided player wrapped in the MVPD player experience. ***Advantage:*** The programmer controls the video playback with continuity

of playback quality between MVPD and programmer sites. ***Disadvantage:*** Absence of contiguous experience between MVPD and programmer sites in terms of player functionality. Fraud management must be coordinated between programmers and MVPDs.

While MVPD portals are expected to leverage syndicated players to pull in video from programmers, it is not required, and the decision to adopt one player solution over another should be completely independent of the access/authentication engine. The players can be wrapped with enhanced functionality and metadata, including recommendations, favorites, etc., to offer a deeper and richer television programming viewing experience. Desirable features include social networking tools, user comments and ratings with recommended content based on what a user is watching, as well as user input and viewing history.

Favorites Platform

The TVE system should provide the user with the ability to designate favorites and manage shows, networks, and videos across all platforms. This will produce "user video queues", favorite channels, and favorite shows. This data can help power the search & recommendation experience.

Alerts Platform

An alerts platform should provide the user (end-user or marketing manager) with the ability to set alerts based on selected criteria. The wide array of functionality described above is powered by an extensive aggregation and integration of metadata from multiple external and internal sources.

A Metadata "Store"

The TVE system must support the integration of metadata from a wide variety of programmer and 3rd party sources, including TV Listings, series /show information, and the on demand catalog as well as customer data from the MVPD. The system must meet both the requirements of the metadata source providers and consumer expectations for the presentation and searching of metadata. Different data providers may have requirements for when, where and how their data is presented. Consumers will expect to be able to search metadata by network, date aired, etc.

The system ingests metadata from programmers via APIs and a normalized interface that then allows the MVPDs to connect directly to the system APIs rather than ingesting metadata from all the individual programmers. The APIs provide the system with the flexibility to access the metadata provided by a large number of programmers in a variety of ways.

TV Listings data may be sourced from a number of providers (Tribune, Rovi, IMDb, etc.) and should be source agnostic. Subject to the type of content and requirements of the providers, information may be mapped to a time-vectored experience with channel and show information available for all streaming or linearly presented content, or a response to a search query or simple browse, based on assumed or user-provided information (e.g. zip code, or MVPD provider). The display of on demand metadata may be separated for the purpose of browsing and searching of on demand titles.

Metadata may include celebrity news, actor biographies, and other content enrichment features, all accessible from a variety of points of access view: via browsing, searching in the video channel, or even integration into an MVPD's hosted web search landing pages where possible.

Customer focused metadata such as channel lineups, sub-account relationships, and parental controls settings are sourced from the MVPD. The MVPD serves as the source of truth for customer data.

More detailed use cases for the application of metadata will be defined in Part II.

Key UI Experiences on a Programmer's Site

Accessing TVE content may occur via the MVPDs portal or via a programmer's website. The strong affinity between the programmer content and the network brand, in many instances due to the on air promotion of the Programmer's website, will lead many users to search for a program they may have recently missed or learned about directly from the programmer.

There are many possible user flows on a programmer's website. A successful flow will likely include:

- The ability of the user to choose their MVPD.
- Adequate messaging for those users who may not have, or have forgotten, their authentication credentials: user name and/or password.
- The ability to be returned to the programmer's site following the viewing of a video to access additional content from the programmer.

One possible user flow is described below.

A user visits a programmer's TVE website and searches for programs that are of interest. Initially, he or she may be searching for a particular channel, program, or episode, or may be simply browsing through the catalogue of available programs sorted by channel or category. Programs that are restricted display an orange button, or "Get Access" key, indicating that access to this program is limited to subscribers only.

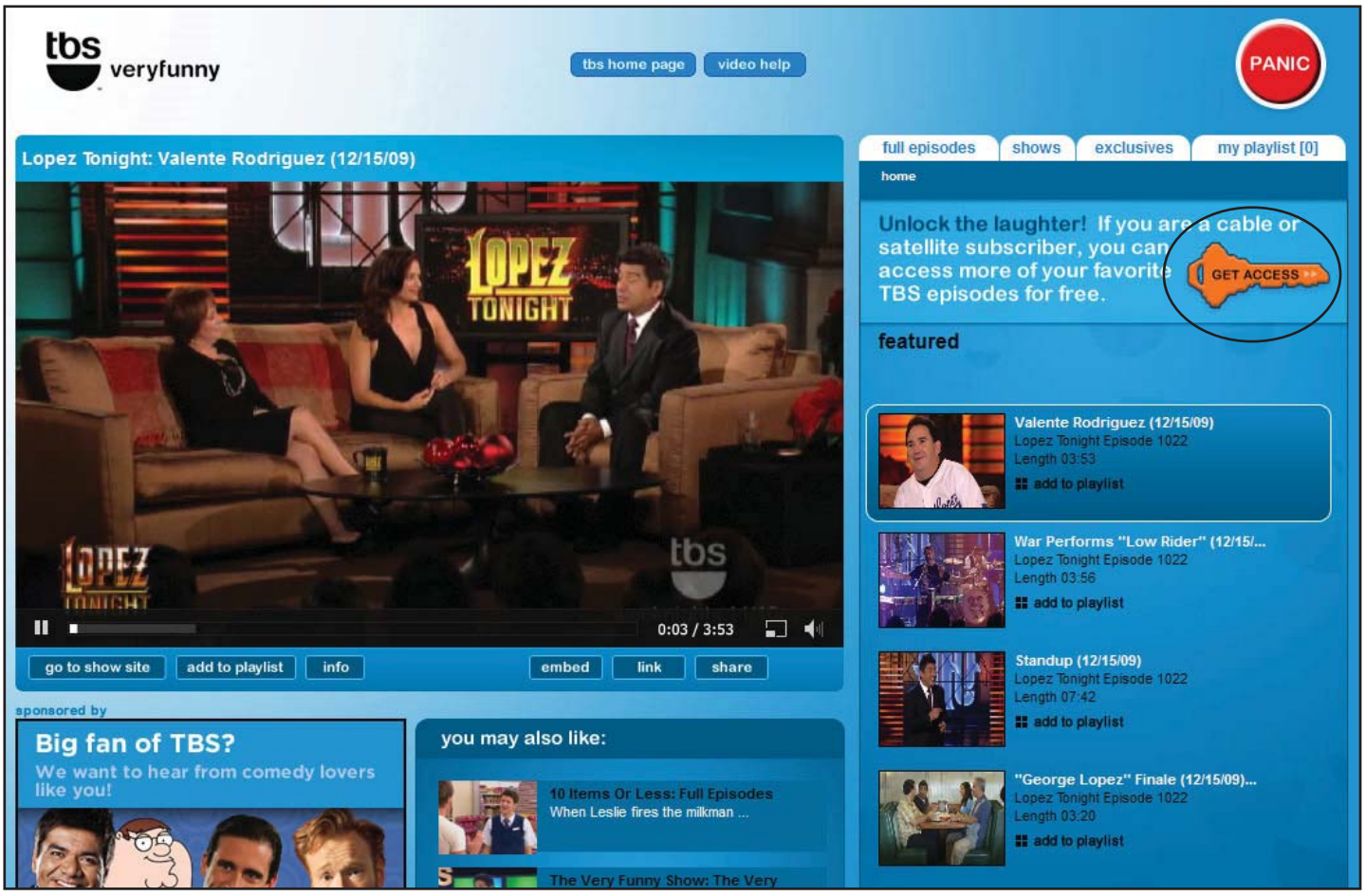


Figure 7.

Once a program of interest is identified, the user clicks "Get Access" and is shown a list of MVPD providers to choose from. Here the user must select their provider from the list.

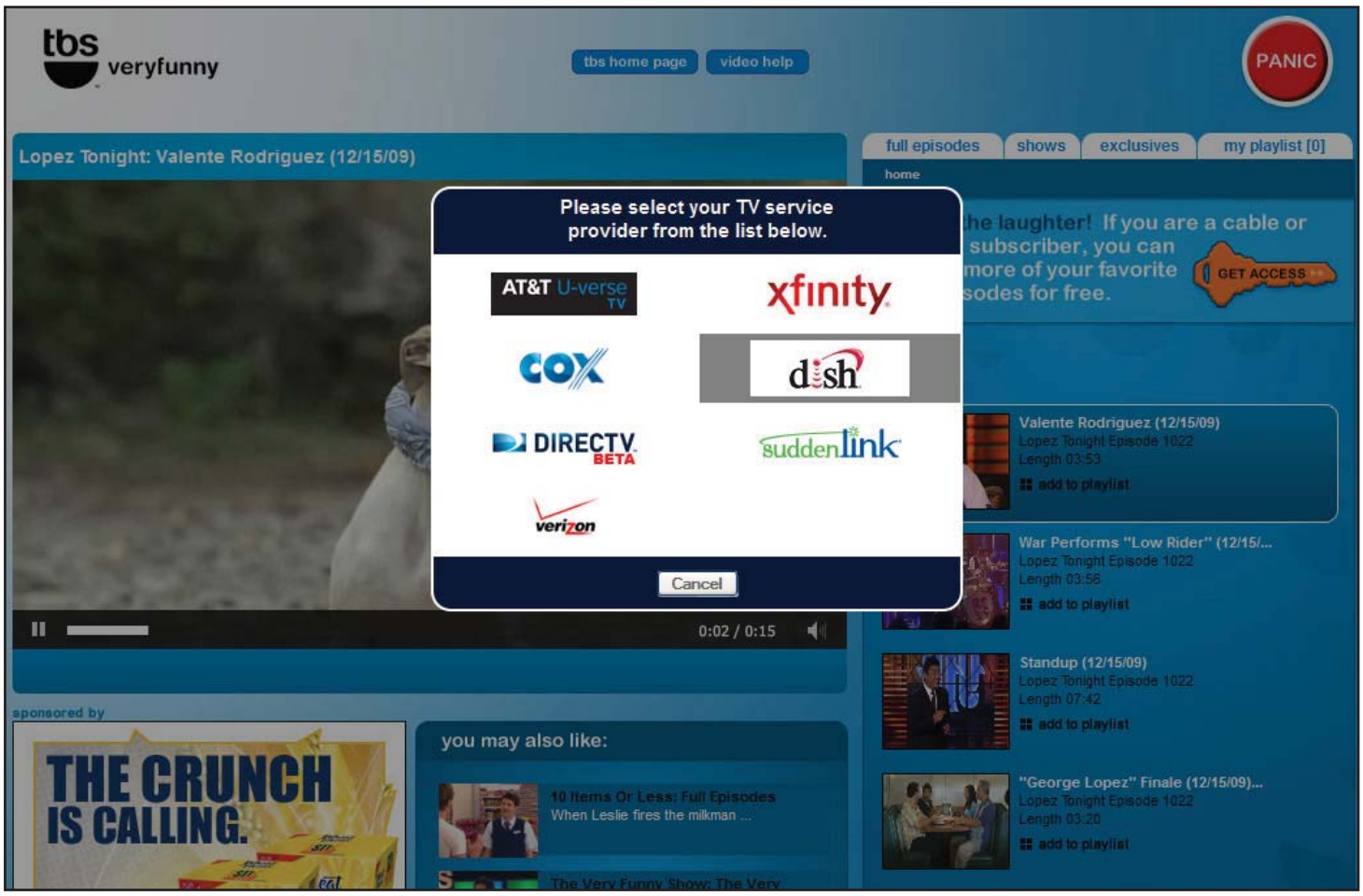


Figure 8.

If the user is not a subscriber of one of the listed, or eligible, MVPDs, the programmer may define the messaging and remediation of its choice. For example, the Programmer may ask the user to identify their location and then return a list of eligible MVPDs in their area.

If one of the MVPDs is selected, the user is served the relevant log-in screen based on their selection. The user then enters his or her credentials (usually an MVPD provided email address and self-selected password) and clicks "Log In".

If a user does not know his or her identity credentials, he or she may receive messaging that directs the user toward a credentials acquisition.

Figure 9. The Log In Box.

If the log in is accepted, the user is then allowed to watch TVE content streaming via the player. The site may also indicate that the user has successfully logged in and is authorized; for example changing the orange "Get Access" icon to Green, indicating to the user that he or she is authorized. If the login is not accepted, then the user may receive an up-sell message and be directed to the appropriate sales path.

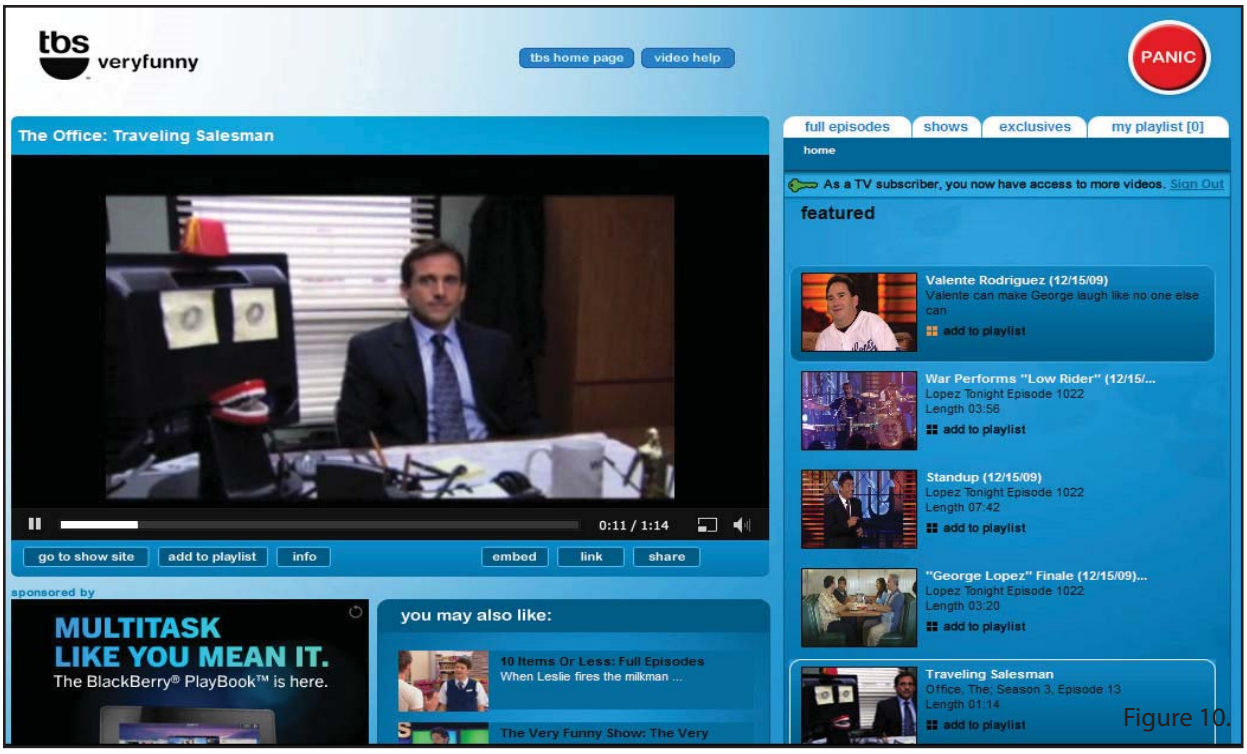


Figure 10.

This is but one of many possible flows that Programmer's may choose.

A Comprehensive Mediation Platform

The Mediation Platform should be able to authenticate users (establish that a user is a customer in good standing), and to authorize users (to access a particular asset by virtue of his or her subscription level or rights profile). The components of the mediation platform can be divided into must-have features and those features that are good-to-have, but that could be added as the system evolves.

Components include:

- The necessary infrastructure to support the protocols for mediation and granting of access rights to users across multiple sites or devices ("Federated Identity Management"), integrated with the MVPD's existing back-end account management and billing services, to tie customer information to video access rights.
- The ability to integrate with, and interoperate with, multiple 3rd party mediation and security solutions. The system should provide a platform that is accessible to a number of MVPD or programmer mediation services leveraging standard interfaces by industry initiatives, such as the Open Authentication Technology Committee ("OATC") and Cable Labs.
- Integration with multiple programmers to enable customers to access content on both MVPD and programmer sites.

- A federated identity management system that meets industry standards for:
  - Username and password recovery: the granting of user identities to those who lack them but are authorized to receive them, and providing existing authentication credentials to those who already have them but have lost or forgotten either username or password, as illustrated below. This can be accomplished by effective messaging to users at key stages of authentication.
  - Fraud detection (as further discussed in Part II).
  - Sub Account Management (Parental Controls – also as further discussed in Part II).

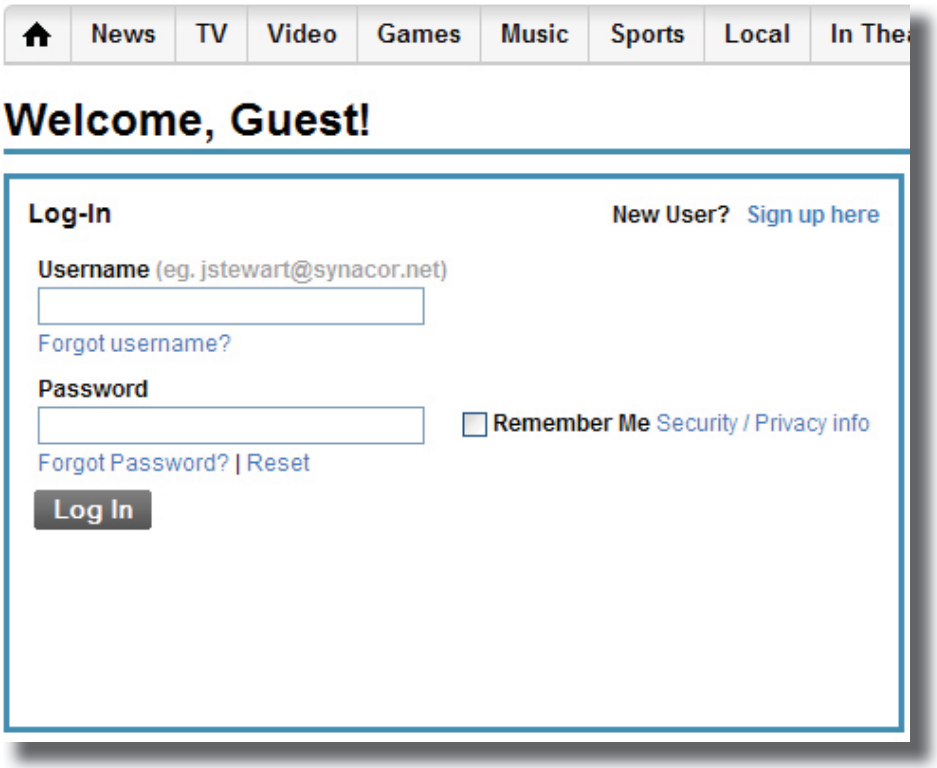


Figure 11.

As the system matures, secure access should become more seamless and transparent to users.

While the system may not have the following features initially, the roadmap should include:

- Account linking of alternative identities: Facebook, Google, etc.
- Auto-login (or network based login) for those users accessing content via an MVPD website from a residential gateway (obviating the need to log-in at all.)
- Secure Persistence: Users should not have to enter credentials too frequently.

Part II offers a more detailed analysis of the Mediation platform.

Figure 12. Authenticating on a Device

Connected Device Support

The consumer experience must extend to any qualified device. Qualified devices are those that:

- Allow the authentication and authorization of users.
- Support the necessary form factor for a suitable UI and presentation of the metadata.
- Allow the secure streaming of video.
- Support for fraud protection.

The system must include support for tablets and select other devices enabling a continuity of experience in the multi-device environment. Device support must include authentication and video streaming capabilities. Support for component/widgets that can live in a variety of platform and device environments is desirable.

After selecting a video, the user may be required to authenticate on the device in a manner similar to the PC or in a manner specific to that device as defined by the manufacturer. Search & Discovery optimized for each device platform must be available. Remote DVR and STB management are desirable.

Unlike a download service (like the current iTunes offering that allows a consumer to purchase and download a video to a mobile device for later viewing), the solution described herein is a streaming video solution and as such the ability to watch streaming videos in flight would not be possible (unless the aircraft had WiFi).

Business Rules

The creation and management of sometimes complex business rules is essential to ensure the proper authorization and secure delivery of television video and promotions.

Business rules will include: **geo restrictions and blackouts, defined windows for exhibition, device limitations, free previews and promotions, etc.**

Programmer rights must be clearly defined; including geo-restrictions, windows, and any device or platform restrictions. *The implementation of business rules will be explored further in Part II.*

Robust tracking and reporting of clicks, streams etc. —down to asset level detail—may be required. Industry accepted tracking and reporting tools such as Adobe's Omniture and Nielsen Watermarks may be accommodated as programmer expectations for comprehensive usage metrics are rising.

Advertising and Promotion

The system should support a fully functional video ad insertion platform (with display advertising adjacencies) that can deliver on any of a variety of advertising monetization strategies. Whatever model for inventory sharing at the network or local levels is agreed to by MVPDs and programmers should be supported, including the ability to notify and detect any pre-, mid- or, post-roll ad inventory, and dynamically serve ad campaigns into that inventory on the MVPD portal is required. Comprehensive ad trafficking and reporting capability must be a hallmark of the system.

In addition to dynamic ad insertion, the system should also support playback of shows with the original ad load from the linear viewing so usage can be counted in Nielsen's C3 viewing statistics. Including this viewership in audience totals is an important part of making TV Everywhere an extension of the existing advertising model.

Opportunities for up-sell messaging for specific channels, tiers, or individual programs and the clear presentation of up-sell paths that lead to conversion may be required.

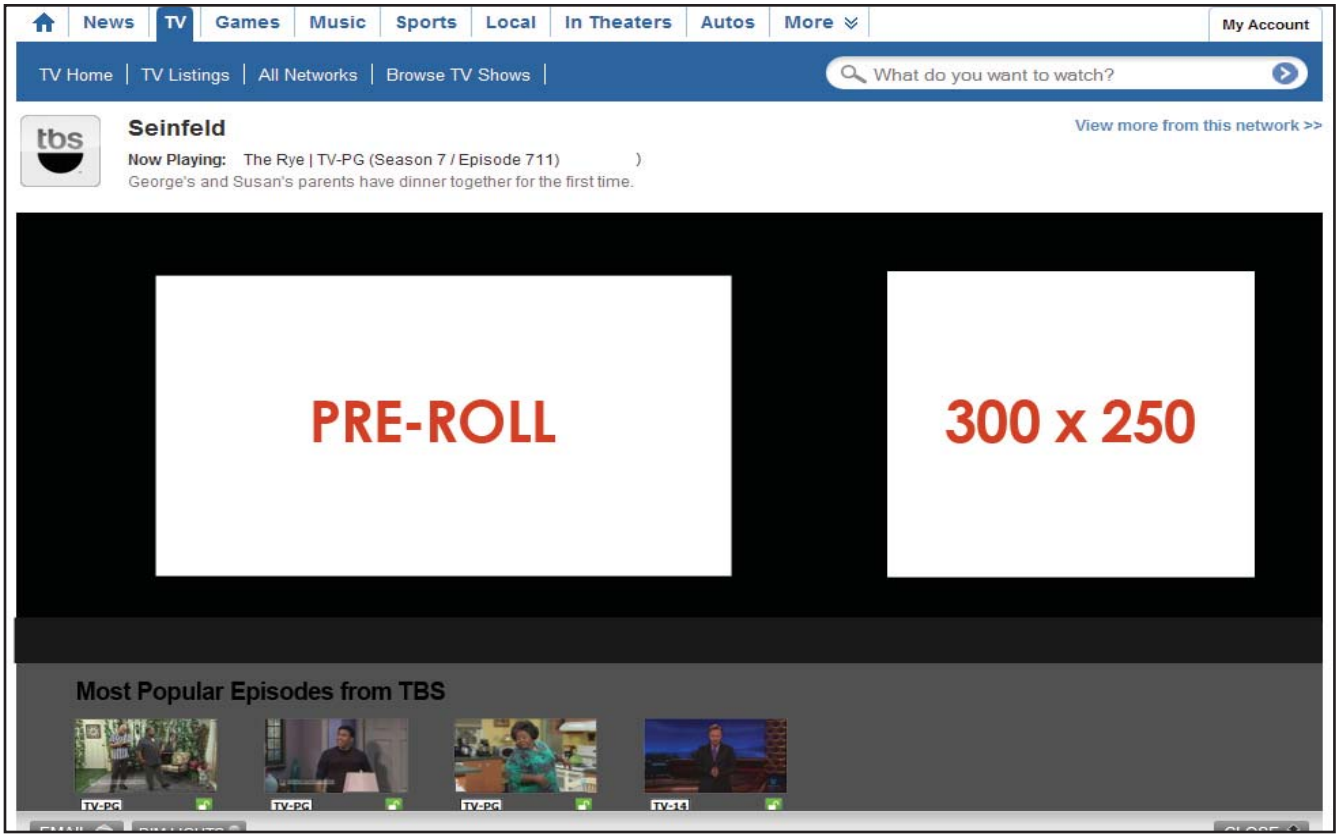


Figure 13.

Perhaps the most important contribution to the overall success of TVE will be the Programmer and MVPD's commitment to market the service to consumers. Raising consumer awareness, ensuring that any subscriber that needs access to credentials can easily obtain them, and promoting the benefits of being able to watch television programming here, there, and everywhere, will increase the likelihood that consumers will quickly and enthusiastically embrace this exciting addition to their television viewing experience.

The back office components of the TVE System will now be explored in greater detail in Part II.

Part II
Delivering Video Assets and Metadata

So how does it all work?

How are the TVE programs—the video assets—delivered to consumers? How do they get from here to there, and then made available to authorized viewers?

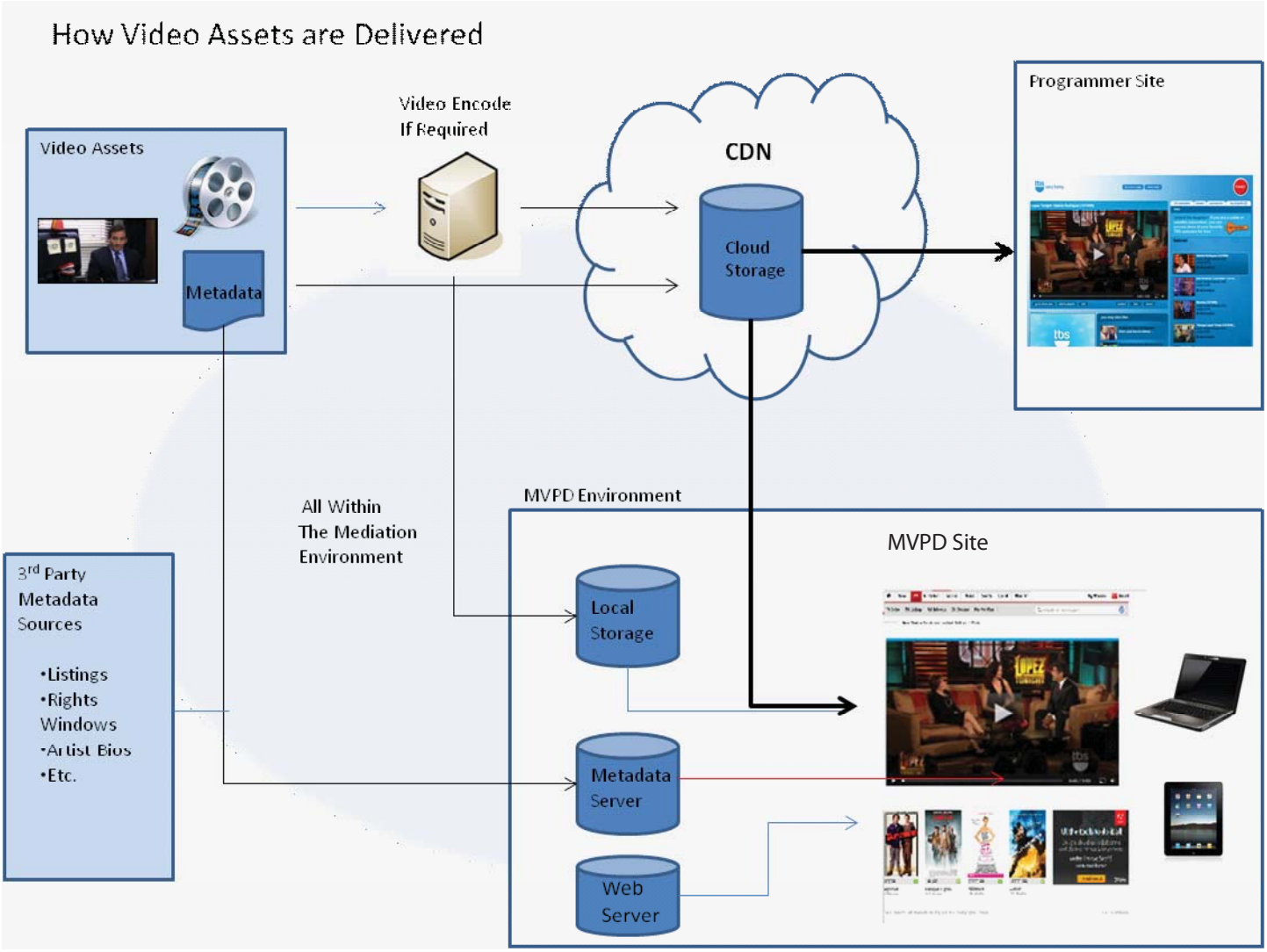


Figure 14. Asset and Metadata Delivery Paths.

The TVE system is an end-to-end solution that is comprised of complementary technologies, distribution paths, and sources of data. Assets may be licensed, encoded and stored by programmers for delivery on demand to their own websites and device Apps, or to an MVPD's portal. The video asset itself and its associated metadata follow separate but parallel paths, as illustrated in Figure 13 above. The metadata is used to populate the search and discovery experience, and to ensure that the selected asset is delivered to the right site, device, and authenticated user.

TVE Asset & Metadata Flow Use Cases

There are multiple use cases for the delivery of video assets.

Four alternatives are presented below.

Use Case #1: The MVPD requested flow with programmer embedded player.

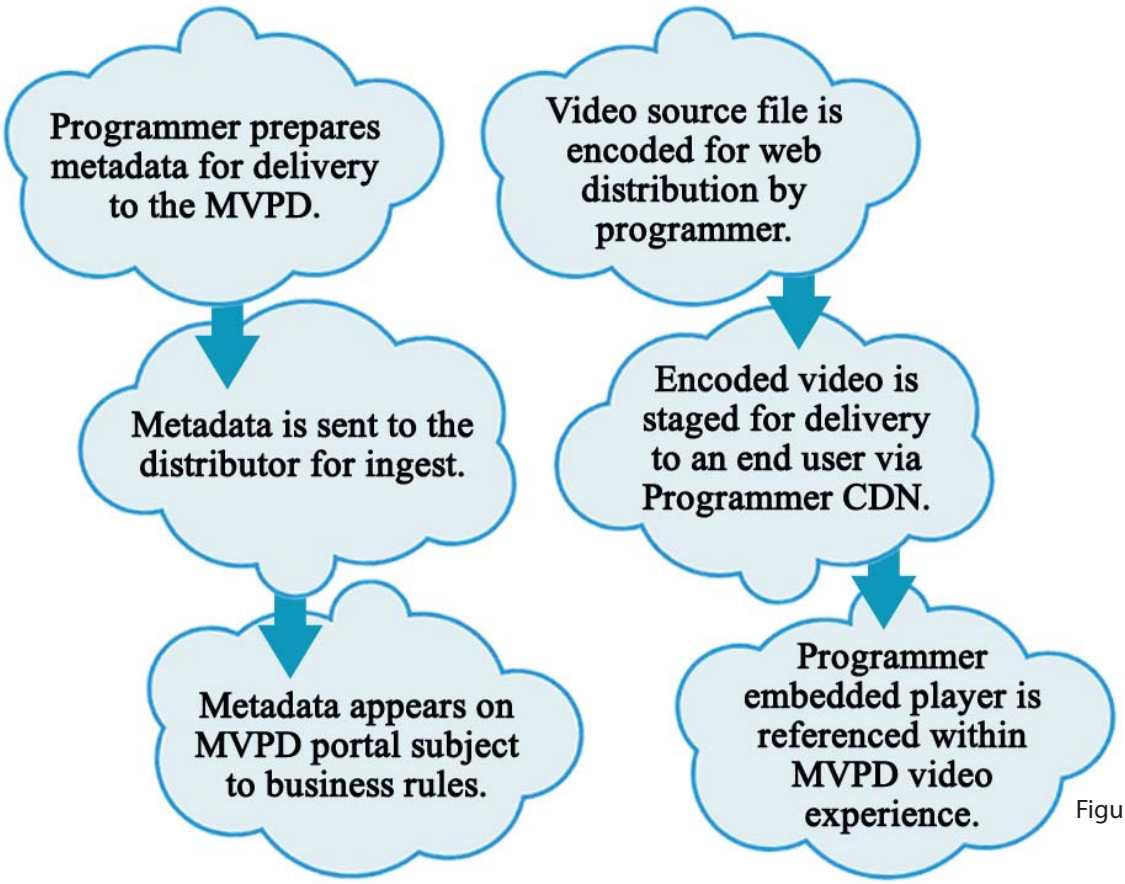


Figure 15.

The user searches metadata on an MVPD portal and selects an asset to play. The production asset is then delivered to the end-user from the programmer CDN to an embedded programmer player within the MVPD's user experience.

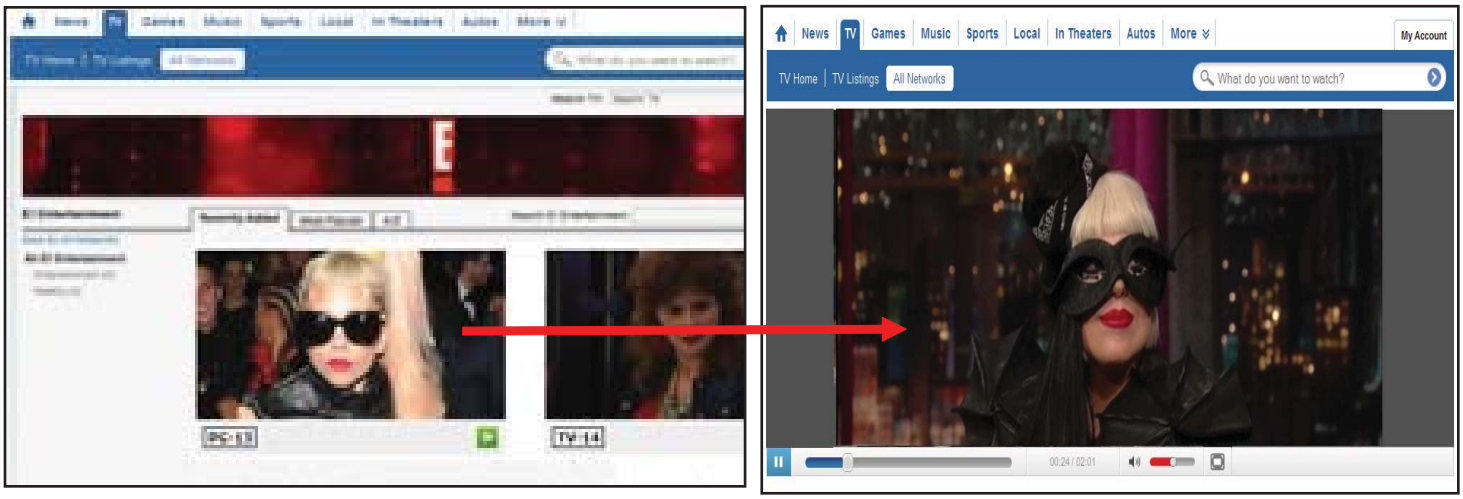


Figure 16.

Use Case #2: The programmer hosts and MVPD provides the playback experience

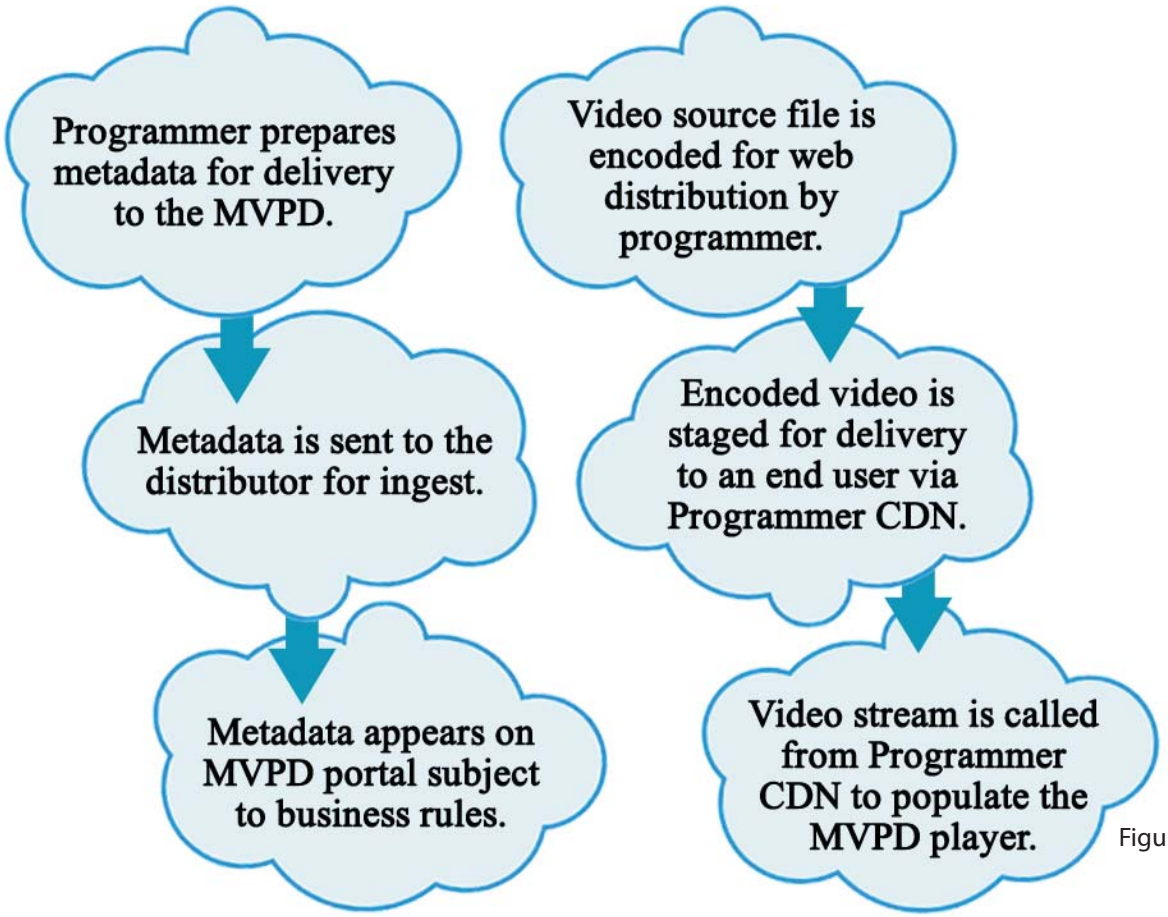


Figure 17.

The user searches metadata from an MVPD portal and selects an asset to play. The production asset is delivered to end-user via the programmer CDN to an MVPD player within the MVPD user experience.

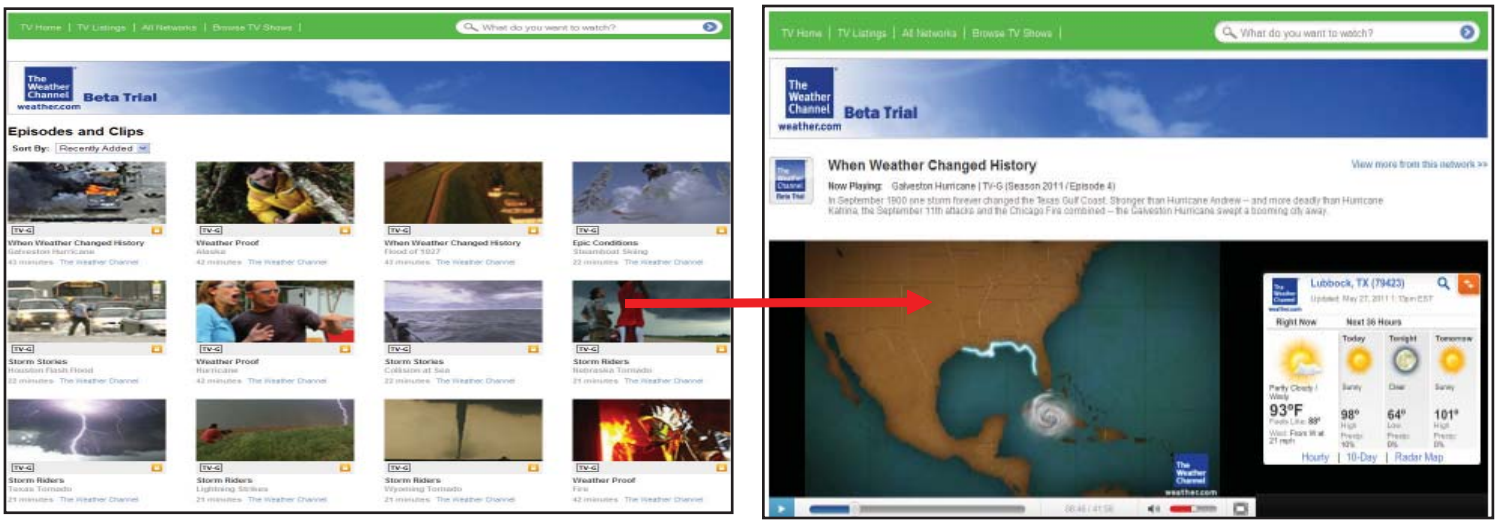


Figure 18.

Use Case #3: The programmer hosts and the MVPD deep-links to the asset on the programmer's site.

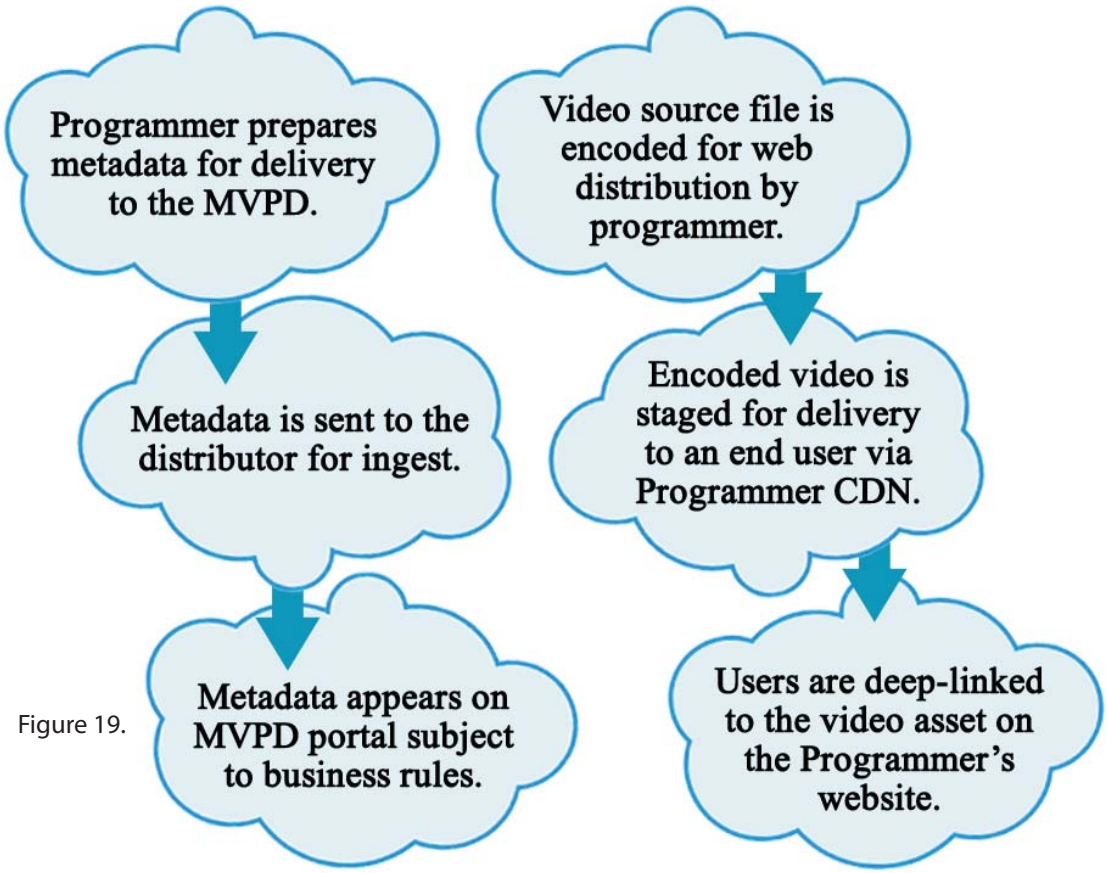


Figure 19.

The user searches metadata from MVPD portal and selects an asset to play. The user is deep-linked into the programmer site. Production asset is delivered to end-user from programmer CDN within the programmer user experience.

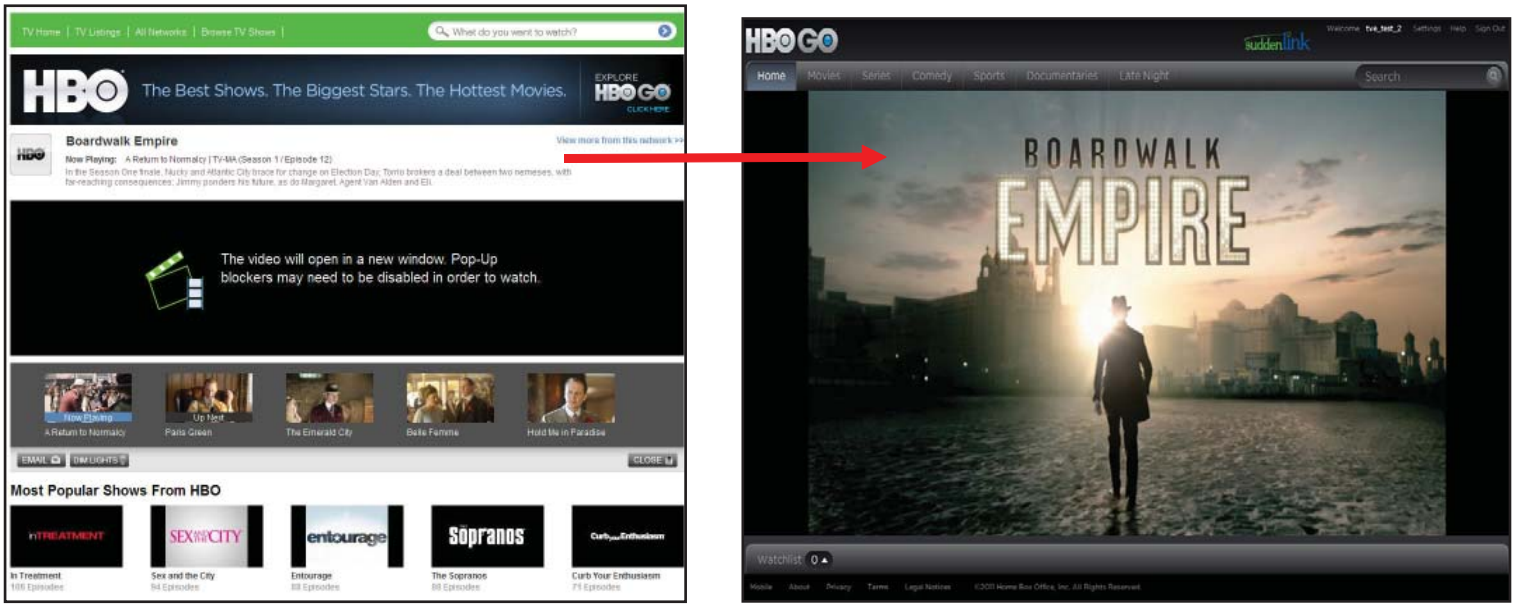


Figure 20.

Use Case #4: MVPD hosted video played back in MVPD provided player.

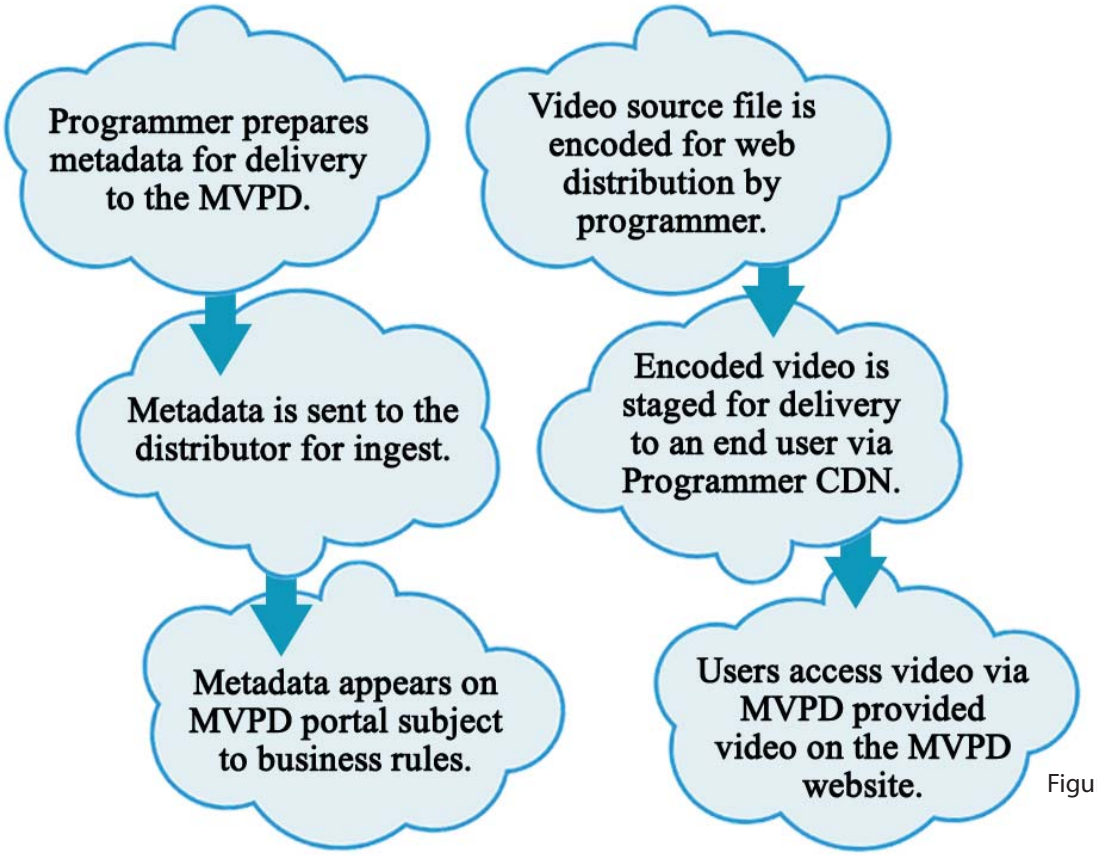


Figure 21.

The user searches metadata from an MVPD portal and selects an asset to play. The production asset is delivered to end-user from the MVPD internal or external CDN to an MVPD player within the MVPD user experience.

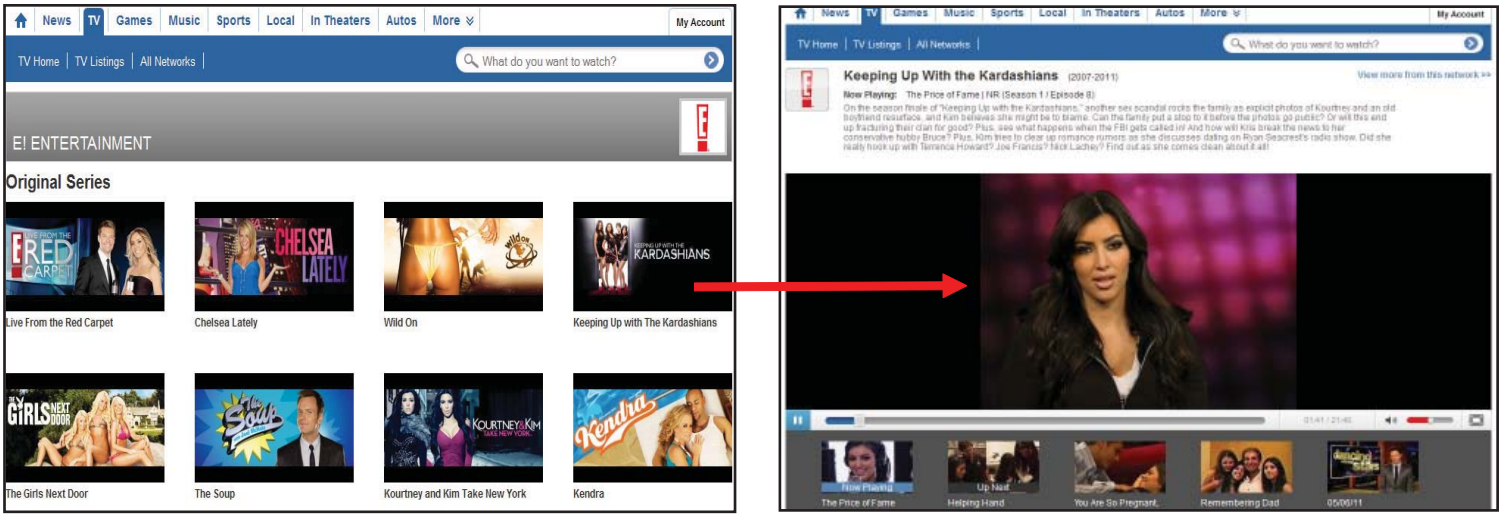


Figure 22.

There are many alternative use cases, but these examples illustrate the variety of scenarios that the system must be able to accommodate based on programmer and MVPD preferences.

TVE System Components

There are many components to the complete TVE Ecosystem. Some components provided by the MVPD and/or their service providers, others are provided by programmers. The model below assumes an MVPD-centric solution, which may be offered to consumers as a part of their Pay TV subscription via an MVPD provided web portal, but the exact configuration and components required may vary from MVPD to MVPD or programmer to programmer, depending on what hosting, delivery, and player solution, or solutions, they employ.

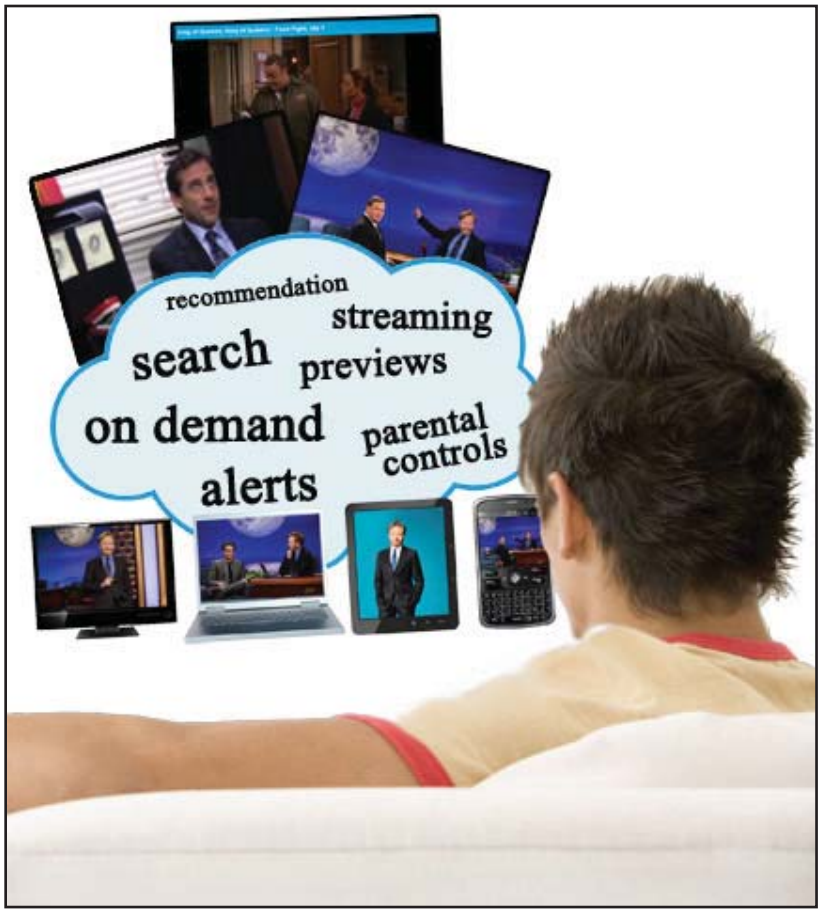


Figure 23.

A Winning Consumer Experience

As previously discussed in Part I, the consumer facing experience begins with well-executed video sites that are created and hosted by, or for, the MVPD and each authorized programmer. Powering these experiences are the following end-to-end back office components described below:

Video Asset Manager (VAM)

A VAM system supports ingest and hosting of video and metadata from a variety of sources, in a variety of formats, and effectively executes the business authorization and display rules to sufficient scale. The content is aggregated and stored on secure CDNs, or the MVPD serving platform, as required.

Asset ingestion

Storage is apportioned across programmers, operator infrastructure, and CDN(s) as the business rules dictate. Origins for asset ingestion and storage, including programmers and MVPDs, may be provided by 3rd parties (Limelight, Akamai, Avail TVN, the Platform, Brightcove, Synacor, etc.).

Encoding

Encoding from all program sources should be supported for both short-form and long-form content and multi-platform video delivery (Web, Tablet, Mobile, TV App, etc.). Adaptive-bit rate should be supported to enable a high quality playback experience. Controls are enforced in the programming page and the video player before the user accesses an asset. Therefore, programmer and MVPD sites can use best-of-breed video delivery systems as needed to provide the best quality of service possible. (The industry stands to benefit from greater standardization in this area).

CDN

Programmers and MVPDs may choose to select their own CDN solutions for storage and bandwidth for content staging and distribution (e.g. Limelight, Akamai). Bandwidth may be split between operator infrastructure and other CDN(s) based on business requirements.

DRM

The system must meet the business rules and the requirements of content rights owners and programmers that require DRM solutions. The system should support one or more DRM solutions such as Widevine or Adobe Flash Access.

Key Rotation for Live Streams

As may be required by industry open standards initiatives.

The Video Asset Use Case #1 referenced earlier for example would require the programmer to have solutions to deliver the functionality of each of the components described above. If the MVPD is hosting and serving assets they would be required to have the same.

Parental Controls App:

(Primarily of Interest to MVPDs)

Users generally want the ability to manage access within their households ("HH") via parental controls. The system must be able to offer MVPD HH management that interoperates with any programmer specific account management functionality. The system HH controls should be able to act as the global HH management level that encompasses all participating programmers.

End to End Back Office Platform

Figure 24.

Below are additional services that the Platform must be able to support in order to enable a satisfying television viewing experience for the consumer beyond the set top box.

Online Provisioning of Subscriptions

Allowing a user to subscribe to a service he or she would otherwise not be allowed to access through an App that would result in the customer either directly paying (via credit card), or the enabling MVPD to bill separately.

Online VOD Consumption

The ability for a user to consume On Demand content that is delivered from the existing MVPD VOD infrastructure, including PPV, on their PC's via the portal or on a device other than a set top box (STB).

Transactional VOD Picklist

The ability for a user to add content to a "Picklist" from a platform that is rendered and then made available for consumption on their television sets via the STB.

DVR Controls

Remotely program a DVR with content selections made online.

The Mediation Platform Detail

The mediation platform is the core enabling technology for the TVE system.

The mediation platform supports the integration of multiple programmers with multiple MVPDs.

Integration includes authentication services: validating the identity of a user via a login, and authorization services: validating that the authenticated user has an active subscription with access to requested channels.

A mediation platform has three key features that make it flexible and robust:

- Standards based authentication and authorization mechanisms that are independent of the video streaming solution.
- Support for several different authentication and authorization protocols for back-end integration with MVPDs utilizing interfaces that are already available like simpleSAMLphp.
- A flexible rules engine.

Mediation provides authentication and authorization solutions that exist independent of the other components of the system necessary to deliver a full online video experience. As mediation must interoperate with a variety of delivery solutions, as previously outlined, it is modular and independent by design, offering a single integration point for MVPD and programmer participants in an online, multi-device access control framework. While the programmer and MVPD can integrate directly, to do so would create a large number of integrations that would have to be made and maintained. With the authentication and authorization platform acting as the target, it can "mediate" between the parties and more easily and effectively manage the complexity and necessary scale of communications.

The MVPD will need to provision users with federated credentials, creating a system that either assigns a username (and the ability to create a password associated with that username), and leveraging their existing billing system or some other pre-existing user account.

The system normalizes communication among the MVPD, the platform and "n" number of programmers for the purposes of ensuring that users meet the business requirements and rules before the credentials of any user are accepted and video consumption is allowed.

The solution should provide the necessary features to support a secure online system, while retaining maximum flexibility to support all participants.

The Mediation Platform Functions:

• Identity provisioning for programmer sites serving as content providers in a federated identity system. As identity provider, it authenticates users based on a username and password provided by the MVPD.

• Answering authorization queries regarding content and services to which an authenticated user is allowed access, based on their MVPD subscription.

• Integration with MVPD backend systems for both authentication (username/password) and authorization (channel line-ups), ideally working with interfaces the MVPD already has.

• Caching data from the MVPD systems to insulate these systems from excessive load.

• Rules engine support for additional flexibility in the authorization communication between MVPDs and programmers. Simple rules could be offers like free access to a channel for a weekend as a promotion.

Mediation Specifications

The primary authentication interface is via a federated identity system with the TVE system acting as the identity provider and the programmer site acting as a service provider. A SAML solution integrates with many different types of service provider packages.

The mediation platform integrates with MVPD systems to access account systems to validate usernames and passwords, and with the billing and channel line-up systems to validate what channels a user receives from their subscription.

To maximize efficiency and effectiveness and to limit the number of integrations required, the number of mediation platforms in the system should be limited. With a single mediator, each programmer or MVPD need only integrate once to get access to all other parties in the system.

Programmer and MVPD Integrations

The glue that holds everything together is the Single Sign On (SSO) integration. Alternative providers can usually provide one or more of the pieces of this TVE ecosystem. However, tying it all together is complex and requires technical expertise, agnosticism, and platform flexibility. The common thread is the SSO that leverages the federated identity and account information, and secure APIs for authorization and metadata.

Mediation Integration for Programmers

The TVE system platform integrates with a programmer website to provide the SSO authentication and authorization.

For authentication, the programmer site can follow several models:

• **Walled Garden** - Content is kept in a designated area (behind a SSO wall) that requires authentication to access.

• **Per Asset** - individual assets are presented on pages that show both ad-supported and premium content together, and the authentication and authorization checks are initiated when a user selects to view a restricted asset.

In either model, when authentication is requested, the user is first presented with a dialog box and asked to select their MVPD. Once selected, the programmer site initiates a SAML request and forwards the user to a login page that is presented by the mediation platform on behalf of the MVPD.

The login page can be presented in several ways:

- Redirecting the user from the programmer site to the MVPD login page.
- Creating an iframe on the programmer page and loading the MVPD login page within the iframe.
- Displaying a popup and loading the login page within the popup window.

Redirecting users can cause confusion and can be a poor user experience. Displaying a popup window provides for a better experience, but requires extra work on the programmer site to allow the original underlying page to pull in session information after authentication. Therefore, given current web technology, the iframe solution is currently most widely adopted.

Identifying the user's MVPD is required for the programmer to know which authentication page to send the user to. The user enters his or her credentials on the login page which is appropriately (and reassuringly) branded for the MVPD. The mediation platform communicates with the MVPD source system to verify the user's credentials. Depending on the response, the programmer site should allow access to the content (affirmative), or display an agreed upon message that might be an error message, or an up-sell message (denied). Upon successful login, the programmer site can then use this identifier to create a session with the Programmer site, honoring any agreed-upon rules for session length.

The scenarios described here refer to the programmer site, but they apply equally to the MVPD's portal, as further described below. The mediation platform should store rules that help determine the authorization response, and programmer sites and MVPD portals should access the same rule set. In the case of content being displayed on the MVPD site via a syndicated player, the MVPD site is still responsible for performing proper authentication and authorization before requesting playback from the programmer's video solution.

Mediation Integration for MVPDs

For base-level integration with an MVPD, the mediation platform needs:

- A method to authenticate users with credentials attached to the MVPD user account.
- A way to query a full channel line-up for a given user.

The preferred method to meet these needs is for the MVPD to deploy a web service which allows the mediation layer to both validate credentials and retrieve the customer's channel lineup information for use in the authorization process. However, as the integration between the MVPD, and programmers and mediation layer has no real standard at this time, the platform and methodologies should remain flexible to accommodate existing MVPD back office APIs or protocols.

There are many options for integration ranging from providing full identity management and authenticating users internally to a simple proxy, which passes authentication requests through to the MVPD system via an agreed-upon protocol. In either case, the MVPD is insulated from the specifics of the SAML communication with each programmer site, and requires only a single integration with the mediation platform, which need not involve SAML.

The check for channel line-ups requires the MVPD to determine accurate channel mappings for individual users. Due to the variation in channel line-ups from region to region, tier-level checks will often be insufficient.

User Attributes

As part of the authorization process, it is necessary to check a customer's attributes in order to verify their eligibility. A typical example of this is checking the customer's channel lineup to verify they subscribe to any given channel.

User Attributes in a TVE System

- **Username/password:** provided by the MVPD to identify the user and authenticate them to their account.
- **Current channel line-up** (channels to which the user is currently subscribed).
- **Content Ratings allowed:** the most mature rating the logged in user should be shown.
- **MVPD:** the MVPD from which the user currently receives service.

The username securely identifies the user. The channel line-up verifies the user's subscription. Ratings information provides guidance for any parental controls functionality. Credentials are shared with Programmers only to the extent necessary to complete the authorization at hand and are guarded to protect PII and confidentiality.

Managing Business Rules

Simple business rules may govern the access to television content. Such a rule may be constructed to simply asking for permission to access any content from one or more television Programmers (channels) in the authorization query, whereupon the system should return a yes, no, or indeterminate answer.

The system should also provide an interface for MVPDs to define other types of rules in conjunction with programmers.

For example, the system should allow MVPDs to allow a set of subscribers to enjoy a defined set of content on a promotional basis either for a period of time or for a certain number of shows or movies.

Similarly, the system should support rules based on the tiers or channel packages the subscriber may have access to. For example, additional content might be made available on a sports programmer's web site if the user subscribes to a particular television sports package.

Metadata ingested for the MVPD's portal should also be tagged with the required rules for viewing on the MVPD site. The MVPD portal can then query the mediation platform and leverage the same rules as the programmer site.

Implementing the TVE System

Preparation is required by both the MVPD and programmer to implement the TVE system.

The general process can be broken up into three phases, followed by launch:

Figure 25.

Planning

- Joint programmer and MVPD agreement on a project plan and timeline with a defined target launch date.
- Indentifying any unique integration requirements as between MVPD and programmer.
- Agreement on any parental control solution.
- Securing the necessary MVPD and programmer tech/dev resources.
- Understanding of business rules to be applied.

Integration

- Exchange of MVPD and programmer setup data: e.g. approved logos, customer support numbers.
- Programmer access to MVPD test and development staging interface in order to test authentication.

Testing

- MVPD provided test user accounts.
- Programmer access to the MVPD production environment.
- Commencement of a beta test.

Given the current state of standards and adoption, the launch process can require up to 120 days for a standard integration (depending upon the readiness of the MVPD and programmer), and will require technical resources from both the MVPD and the programmer. Post-launch activities will include the regular refreshing of content, which may require a continuing effort to ingest, encode, and host video assets in a variety of formats; keeping the metadata up to date and accurate; dynamic programming of the UI; and regular promotion of the availability of the service.

Programmer responsibilities will likely include:

- Asset Delivery (Bandwidth).
- Asset Hosting (Storage).
- Multi-platform Video Packaging (Encoding).
- Providing content metadata, including authorization/authentication rules, viewing windows, etc.

Operator backend integration with the mediation platform:

- MVPD's must have the ability to provision account information.
- The relevant parties must agree on the appropriate authentication integration method.
- The MVPD should supply appropriate APIs or interfaces to integrate with the mediation platform. for the purposes of authentication and authorization.
- If using a mediation platform, only the integration between the MVPD and the mediation platform will be necessary, which need not involve SAML.
- MVPDs should provide access to additional subscription information as needed to support new subscription information requests that may be added to mediation services in the future.
- An offline marketing strategy is recommended to raise awareness and drive adoption.

Key issues that both MVPDs and programmers should be prepared for:

- There is often a fundamental lack of understanding by the implementation teams at the MVPD or programmer as to how the product/service actually works. (It is hoped that this paper will help address this issue).
- In some instances, project managers and testers are the only ones assigned to implementation. Launching a TVE system and product is a broader effort that may involve product modifications on the MVPD and programmer sites, the setting of business rules, marketing, content publishing, etc.
- It is sometimes difficult to obtain test accounts from MVPDs. Each MVPD has its own challenges in the ability to create and maintain a suite of test accounts. In some cases test accounts have dependencies on actual hardware – in others, some billing systems do not support test accounts and the accounts tend to get revoked over time.
- The absence of step-by-step environment parity between MVPDs and programmers means each entity has its own "runway" and often there is not an equivalent stage or position on those runways that everyone can point to as a reference point. For example: The MVPD platform provider has Dev, UAT, and Production environments; a programmer has Dev, QA, UAT, and Production; the MVPD has only UAT and Production.
- MVPD billing system limitations. Certain user profile information is required to be able to determine whether a user meets the business requirements. Not all systems are created equal, and not all of the required information is able to be known. For example: some billing systems have no account relationship information; meaning the MVPD has no way to "tell" which sub-accounts are associated with a HOH.
- Finalized agreements. In some instances integration may begin before agreements between the parties are finalized which can often lead to scope creep and delays.
- The lack of standards. Although there has been rapid adoption of SAML, metadata distribution and player syndication lack formal industry standards which creates the need for more normalization across multiple entities.

Working with an experienced platform provider can help mitigate these issues, but there is no substitution for adequate planning and the dedication of the right resources.

Additional Topics of Interest

Using Standard Protocols

While an open source package, such as simpleSAMLphp (available from the simpleSAMLphp web site), is available as the identity provider solution, various organizations such as the OATC and Cable Labs are evaluating approaches to authorization that may well emerge as industry-wide standards.

Two primary areas will benefit from use of such a standard interface:

- Standardizing the data requirements and protocols for an authorization call (note that SAML is generally NOT used for authorization transactions) from the programmer to the mediation platform. This standard will likely include required fields that answer the base query regarding whether a user is authorized and optional queries, like are there available up-sell messages when a user is denied access to a service.

- Standards for additional programmer metadata containing rules for authorization on a per asset basis. For example, metadata for a show may be required to contain fields that indicate that subscription to a certain channel or channels is required for a customer to be allowed to access the desired asset.

In addition, a non-proprietary, standardized set of codes or identifiers for entities, like MVPDs, programmers, channels, etc., will facilitate interoperability. Such a system should have mappings to commonly used television listings data sets.

The Entertainment Identifier Registry ("EIDER") project is one effort to establish a standard for the provisioning of these identifiers.

Ability to Scale

The challenge to scale is expected to come primarily from live events that are time-based; such as breaking news, sports and weather. Unplanned events in particular can tax the system. Real time streaming of live events as they unfold will create peaks in usage of the mediation platform.

For a first-time user, a system should require one authentication check and one authorization check. However, depending on the duration of user sessions, subsequent checks can be limited. For example, if the user session lasts 30 days, and authorization checks are required once per day, only two checks are required, regardless of how much video a user enjoys.

Various limit levels are possible, such as performing an authorization check for each request on the external site. This solution can also scale well since the mediation layer can serve as a cache for MVPD data and insulate the source MVPD system from excessive load. Caching rules are set by the MVPD based on billing cycles and the volatility of source data. Even for this solution, only one call is required per video, so the resources needed for the authorization check are far less than those required to power the video experience and, as explained above, these checks should be independent of the act of serving the video.

In the mediation platform itself, the solution should scale horizontally and vertically, following typical web architecture patterns, essentially adding components at each layer (web server, caching layers, database, etc.) as needed based on level of activity.

Since this ideal solution requires only one integration on the part of the MVPD, it is manageable for MVPDs with a smaller subscriber pool. As the mediation platform can be shared across many smaller MVPDs, it is possible for all users of the system to receive the same quality of service and up-time.

Fraud Management

Shared Enforcement:

Since content may be streamed from several locations including the programmer's site and the MVPD's portal, all parties will need to work together to enforce proper usage. User activity (i.e. concurrent streams, type and number of authorized devices, number of authentication/authorization requests, location of requests, etc.) must be examined to determine whether a user or account is in breach of business rules. The engine can then produce appropriate error messaging for the end-user to A) to allow them to understand why they are being blocked and B) notify them of what they can do about it.

System Fraud Solutions:

The system should provide two main levels of fraud detection:

1. A real time solution that uses current activity like active streams, logins, and geographic location to enforce fraud rules.

2. Non real time analysis that detects patterns over time.

If a user has shared his or her credentials with many other users, this should be caught by both fraud checks.

The MVPD, in cooperation with Programmers and content owners, can agree on the necessary rules to protect content, such as a maximum fraud score limit. Once these limits are reached, the account can be locked requiring a cooling off period or a call to customer service to re-activate.

In addition, should there not be high enough usage to flag the account during real-time operation, the daily pattern matching check should detect that multiple uses are occurring from multiple locations during the same time period. The account can then be flagged following the MVPD policy.

Parental Control and User/Account Management

The system can access parental control data as part of the fetch of account information, to the extent that this data is available in a source system, and apply it to authorization queries.

The parental controls function allows for three different roles for users:

1. **Head of Household (HOH)** - This role allows the user full administrative privileges. Generally, the primary billing contact for the household is assigned this role.

2. **Admin -** When other users in the household need to be granted administrative privileges, the HOH can assign one or more Admin roles. A common Admin user is typically the HOH's spouse. An Admin user may modify the parental control values for all users in the household except for the HOH. An Admin may also toggle other users in the household between Admin and child status.

3. **Sub-Account** - (may be a child) granted no administrative privileges and must abide by the parental controls set for them by the HOH or Admin users.

Among the features of the parental controls system is the control over the assets that a sub-account user is allowed to view.

In addition to these programmer settings, there are additional global settings controlling:

- The maximum viewable TV/Movie ratings, including a boolean flag for whether or not to allow the viewing of unrated content.
- Whether or not purchasing is allowed.
- A monthly spending limit by dollar amount.

These parental control settings have default settings for new CHILD users that may vary per MVPD.

Devices

As previously suggested, tablets and other devices are an important component of the TV Everywhere experience. These devices are gaining in popularity, but devices such as tablets represent an entirely new and complex operating environment.

Tablet devices and their underlying operating systems such as iOS and Android are relatively new, and as a result have created:

- Fragmentation in hardware as well as software. The answer to the simple question: *"Will it play on an iPad?"* is "It depends." If the programmer provided video relies on a technology that is not supported by Apple, then the video will not stream. So, variations and the lack of standards in video codices supported for playback will have an impact.
- A lack of standardization of licensing agreements (rights) with Content Providers required for streaming and guidance on tablets and other devices.
- Referencing the same bookmark in a video assets across multiple devices may require the system to reference separate video files as devices often have different video standard specifications. As a result, there may be more than one video file for the same asset.
- The need to have familiar navigation and authentication/authorization for a given user extend across different OSs for tablets and mobile.

There is also strong interest in supporting integrations with DVR set-top boxes for recording and tuning on the part of MVPDs.

Replication of the portal and website video experience in a simply defined App for specific devices is the first requirement. As stated previously, the device must be able to authenticate and authorize access, have a form factor visual design for the device in question, and the device should be able to stream video. A Phase I approach could be limited to search and discovery and TV listings, but support for streaming video that meets the specs for the device will be required for a true TVE experience.

Devices themselves are not normally authenticated, but could be if a solution was presented. The typical authentication process involves a MVPD user using a web browser as a user agent to access programmer content. A device ID is appended to basic information about the user agent in order to assist with fraud detection.

As most initial tablet implementations will leverage full browser functionality, most of the infrastructure supporting Tablet implementations will be the same as for the PC.

The device functionality roadmap will include:

- DVR Application: The ability to schedule and manage DVR sessions from a web/tablet device.
- Tablet/Mobile "Control" Applications: Creation of technology to control the STB, or Blue Ray player, or other device.

Other Mediation Supported Products

While the examples provided here focus on television programming, the mediation platform can also be used for other types of access granted because of the user's subscription. Any content partner offering products that the MVPD wishes to tie to the subscription can make a standard authorization request, after a successful authentication request, with a product identifier passed rather than a television channel identifier. (For these other products, additional user information may be needed such as Geo location, zip code, etc.).

synacor

We hope this overview of a fully functional TVE system has been helpful. The availability of TVE marks the beginning of an exciting new chapter in the television viewing experience for consumers, programmers, and MVPDs. Synacor is pleased to be helping to make TVE a reality.

About Synacor

Synacor powers personalized home pages and online entertainment services for high speed internet customers. Streaming video is an increasingly important part of the home page experience for the portal of a broadband ISP, programmers, and the consumer internet experience in general (according to a recent Forrester Research study, over 33% of adults use the internet to watch video), and Synacor provides both the supporting technology and compelling consumer experiences to make it happen: everywhere.