CONNECTING CABLE'S NETWORK AND APPLICATIONS WITH ITS INDUSTRY PARTNERS WHILE MAINTAINING OUR INDIVIDUALITY

Mitch Weinraub
Thomas Engdahl
Joshua Seiden
Comcast Media Center (CMC)

Abstract

The cable industry is working aggressively to expand the range of services that meet consumers demand for personalized programming. In order to deliver these new services efficiently, the industry is changing its video delivery infrastructure towards architecture that is open and network –based, connecting headends to backbone networks and using data to drive events.

From its position at the intersection of programmers, advertisers, application developers, MSOs and hardware manufacturers, the Comcast Media Center (CMC) has been able to develop a unique perspective on the current state of systems development and the gaps that are yet to be resolved. From this intersection, it has become apparent that the cable systems serving standalone markets will want to join larger MSOs in expanding their level of connectivity, both vertically and horizontally, in order to the opportunities that are emerging succeed in today's market place.

The connections that the cable industry is making fall into two primary categories. First, the industry will want to create tighter connections to existing partners and other MSOs. Second, the industry is extending its connections to key partners in the media and entertainment industry and to advertisers. Perhaps more importantly, cable systems will also want to expand the connectivity initiatives that involve seemingly competitive industries, such as mobile media providers and internet advertising structures.

INTRODUCTION

Throughout the history of cable television in the United States, the business has been based on local providers providing a unique service in each market. Besides providing an acceptable mode of operation, it has also proven valuable in competing against satellite and other providers that, due to their technological differences, were forced to deliver a homogenous service to the entire country.

Even as some cable MSOs grew larger and began to align their services, a number of traditional cable aspects had remained unchanged. More recently, cable MSOs have begun to standardize their navigation, packaging and other offers across their footprint, but these standardizations often remain within a particular MSO.

However, there is less standardization between MSOs. Examples include major market DMAs served by two or more cable systems that haven't created ad interconnects. It is becoming easier to make these types of connections thanks to standardization among cable operators, as evidenced by CableLabs' recently issued

specifications for Modular Headend Architecture.

Another example of movement toward greater standardization is the multi-MSO funded organization known as Canoe Ventures. With this organization in place, some major, positive steps are being taken to make sure that interactive and advanced advertising efforts are as standardized as possible. This, when successful, will allow for the widest possible footprint for new and exciting forms of advertising.

The industry's move toward greater interconnectivity will support the steps being taking by initiatives such as Canoe in order to offer highly competitive advanced advertising and other new business opportunities in today's environment. As this paper will demonstrate, one of the major challenges facing the cable industry in the near future is the ability to maintain the local and individual aspects that have defined cable throughout its history while making these new connections..

The significant and meaningful connections that are emerging include using SIP (session initiated protocol) and other key technologies to connect service platforms between MSOs, connecting to content providers, broadcasters and major studios, connecting with interactive television authors and platforms, and connecting with prominent advertisers and their agencies. These connections allow the cable industry to continue to grow and remain foremost in the minds of consumers as the primary service provider for entertainment and telecommunications services.

Things Changed When Consumers Became Connected

Some business historians may trace the beginning of a connected marketplace back to the use of the U.S. Highway system, a national telephone system, railroads, or even the Wells Fargo Wagon. Similar to these past significant events, the ability for consumers to go online has served as a major catalyst for the connected marketplace. Thanks to the Internet's World Wide Web, services now had the ability to aggregate communities and consumers in ways not possible before. In a significant way, this added a new dimension to business and created brand new opportunities. Before this change, it was possible to be successful by providing a good product or service to a limited (in both size and geographic diversity) market. Local stores flourished and providers that best serviced a focused marketplace won the day.

When consumers went online, this all began to change, but it took a while. At first, online services looked a lot like the off-line services that preceded them. Compuserve, Prodigy, and America Online became the dominant players. Each provided a suite of services that was individual, unique and catered to the specific users that they were trying to attract. And for a while this worked well. Even as the web began to emerge, these services lived on as the best way to connect to the web as well as to access additional "walled-garden" services. However, as web based services began to add features, the walled-garden approach became less and less valuable. Web based services - those that allowed access by millions of consumers regardless of their internet service provider (ISP) or means of access - quickly became more valuable than those (within the walled garden) that only served members of the private club.

The recent Internet success stories have been services that reach out to the widest possible audience. Whether you look at it from the perspective of a "tipping point" or a "network effect", the volume of users doesn't just demonstrate linear growth for these services, it is also responsible for the basic success and is the only way the service could survive. To paraphrase the famous line from Marshall McLuhan, in the new business environment, it could be said that the mass is the message.

One example of the mass of a service being critical to its success is eBay. eBay began its life as Auctionweb, a component of the online services offered by Echo Bay, a consulting firm that served the San Francisco bay area. The Auctionweb portion of the site quickly grew to become the entire Echo Bay site, which was renamed eBay and broadened its scope to serve all comers on the web.[i] Once available to the world, the volume of buyers, sellers and items available grew exponentially and the rest, as they say, is history. In this case, the mass of the offering has completely transformed the service.

Likewise, YouTube.com and social networking sites like Facebook provide excellent examples of mass or scale. With the entire world of on-line users able to participate, these services have been wildly successful (from a usage if not yet a financial perspective). For these services, the network effect or mass is they key to their success. Their features may not be extraordinary or cutting edge, but the sheer number of users and connections that can be made has been integral to their success.

A number of additional examples could be cited, but the critical point here is that these services represent a new kind of business success. The success of these kinds of services wouldn't have been possible without the mass or scale of the connections being made. These services could not survive in small or isolated environments. In fact, it could be argued that they are successful primarily because they didn't isolate themselves but opened and connected their services to a bigger market.

This is the model that the cable industry is beginning to follow with its deployment of advanced video interactive services. In today's marketplace there are multiple competitors aiming to deliver service, many in a non-traditional fashion without even owning their own networks. In response, cable operators are opening their networks to connect a wider range of services to their customers, markets and vendors, which allows the industry's new advanced services to be successful. In this environment, the whole will be greater than the sum of the parts. This requires having a (big) slice of an extremely large pie as opposed being limited to a single cupcake. The following sections of this paper outline specific areas of the business where the potential for these opportunities may be realized through building connections.

MSOs NEED TO CONNECT MORE THAN EVER BEFORE

In the past, cable was a parallel sort of service where each head-end could handle and process programming independently, without any connection or knowledge of one another. In the case of traditional linear services (like CNN and HBO) it didn't matter if there wasn't an interactive connection. Conversely, the new advanced services that the industry and its partners are striving to create are often the kinds of services that can't succeed or perhaps even survive without extensive connections. From gaming to advertising to shopping to new ways for viewing content, the cable industry is poised to play a big role in the interactive,

connected and personalized service offerings of the next decade. However, many of these services fit the new business models outlined above. This means that they will require mass and scale as opposed to closed systems in order to succeed.

Canoe Ventures is already driving some of the key connections that will be required to enable advanced advertising related services. These efforts are expected to prove extremely valuable and successful for all participants. This section of this paper focuses on the connections between providers that will be necessary to support and drive the growth of services outside of those directly related to advertising, which Canoe is already addressing.

Some of the most basic interactive services being developed today are in the area of gaming. While these games are fun and entertaining on an individual level, they really become interesting when individuals can play and measure their performance against others. Although larger MSOs may be able to aggregate enough of a user base within their own footprint, this type of mass market just won't be possible MSOs serving smaller markets or single headends. In addition, game developers will have the opportunity to create truly "game changing" gaming opportunities when they can draw upon and rely upon a large and diverse user base, such the one available via the Internet.

Likewise, voting and polling applications are often sited as early opportunities for cable's new interactive platforms. Like gaming, these applications thrive only when the base of users is large enough. One of the reasons that American Idol works so well and attracts such a large audience is that anyone and everyone can cast their vote and be part of the process. In order for EBIF and tru2way™ applications to become the new standard for consumer interaction, they

will need to work everywhere -on every cable system regardless of size or location.

Additionally, new cable interactive services will need to connect to other systems that may not be based on the same middleware. For instance, cell phone text messaging systems, 1-800 numbers and websites can already cast votes and aggregate polls. Applications riding on the cable industry's iTV platforms will need to connect to these existing platforms (and others yet to be invented) in order to gain the mass and scale necessary to be successful.

Like the games and voting/polling services described above, both social interaction services (living room versions of Facebook, etc.,) and content sharing services (such as YouTube) will also require the interaction of extremely large number of users in order to succeed. As a result, cable and other last-mile service providers will want to find ways to connect their offerings and share or aggregate their users and interactions across the video universe, as well as extending to online, mobile and other electronic platforms.

While applications or content services providers require open systems that support the seamless delivery of their services, it will be important for the connected ecosystem to support each cable system's or MSOs requirements for certain forms of autonomy. In addition to differences with local navigation, each system or MSO will want to maintain the look and feel that supports its brand identity as the provider of services that are delivered over the local network. Fortunately, the connections required on the back-end that allow for mass and scale to be aggregated don't need to affect the front end where user interfaces and branding opportunities are presented. Using structures defined later in this paper,

we can accomplish one without impacting the other.

In the case of cable system operators and other last-mile service providers, the question is "How can these connections be made?" The initial plans for most of the services described above focus primarily on the local servers necessary to deliver applications to customers. However, the connections required to allow these services to work well and really grow are as important as the core functionality. Examples like cell phone call processing or SABRE in the airline industry represent forms of "coop-etition" where competitors in the same marketplace have come together to create common systems allowing an entire industry to grow. For example, the SABRE airline reservations tool is used by more than 90 airlines across the globe. This has enabled single interfaces and on-line booking services, but it wasn't always the case. Likewise, it wasn't always so easy to get your cell phone to work across different phone networks. These industries have found a way to share data and transactions. This is the model that the cable industry could follow in order to achieve the full potential for advanced services while maintaining differentiation.

For the cable industry, this involves establishing standard and trusted points of data exchange. In this scenario, each cable system operator would need to trust a centralized service that will allow all players (cable and non-cable alike) to publish high scores and aggregate votes and user generated content in a way that allows the entire pie to grow. Historically, there are examples of cable MSOs that banded together to address this need and Canoe serves as the latest example. Achieving these requirements would involve:

1. Establishing a high level committee that would agree (on behalf of the interested MSOs) on the definition of centralized services for data exchange.

2. Creating an RFP to allow interested vendors to describe the details of the systems necessary to support the exchange.

3. Establishing a timeline for the deployment of a beta system that application developers would use to test against.

Making these connections creates numerous service opportunities. The biggest opportunities typically lie in the services that will be invented in order to take advantage of the connected platform. However, some of the services that can quickly emerge include:

1. **Television- based social networking** – Whether more like Facebook, Dating on Demand or some combination of the two, meeting and sharing with others across the country and the world will undoubtedly be significant.

2. **Television program related sharing** – Examples include real-time on screen fantasy sports matchups; or what to watch next - recommendations from friends or just real time program chats with social connections. Interactive applications that directly relate to television content are also likely to proliferate.

3. **Meaningful Real-time Voting and Polling** – When most if not all viewers can be connected and

aggregated, voting and polling with immediate results becomes possible.

4. **Real-time competition on a mass scale** – ideas in this space include massively multi-player quiz shows or prediction contests. When the industry is able to match the quality and presence of television with real-time, two way connectivity on a large scale, the kinds of games customers are likely to play will evolve and expand past what can be envisioned today.

As mentioned above, the best ideas are almost always those that can't yet even be imagined. Innovations that creative developers using tru-2-way can come up with in their proverbial garages can't even be imagined until the world that provides these kinds of connections comes into existence. The successes of the internet are a great reminder that vast, new capabilities are a prerequisite for game-changing successes such as eBay and YouTube. History has also shown that replicating walled garden environments, such as Prodigy or Compuserve, on a big a screen in the living room may not be enough take to take the industry where it wants to go.

TECHNOLOGICAL REQUIREMENTS FOR THE CONNECTED ECOSYSTEM

Offering the next generation of services described above will require video services to become IP-based. This will allow for new applications to utilize the Internet to provide enhanced services as well as connect to existing Internet-based services and applications.

The primary goal of the industry is to not only increase the choice of applications offered to customers, but to also begin to leverage ubiquity to generate new forms of revenue. The current approach for video delivery in the cable industry focuses on "every MSO as its own entity". The resulting effect is that some MSOs find themselves able to create new revenue streams while others struggle to follow on the coattails. As history demonstrates, innovation occurs at a faster level when the cable industry can leverage its existing capabilities in other platforms and implement them across the majority of cable operators

As organizations such as Canoe focus on deploying interactive ads nationally, they cannot be as successful without ubiquity. Ubiquity is achieved when a single application can be distributed and function across the entire cable footprint, in every environment. The most straightforward approach for accomplishing this objective would be to construct applications generically, using generic interfaces, thus preventing the need to create new versions of applications for every single deployment in the country. This is obviously a daunting challenge, but with a few changes to how the industry does business today, it can be accomplished.

The Elements of Application Creation and Distribution

EBIF (Enhanced Television-Binary Interchange Format) and tru2way represent set-top abstraction layers. While these two abstraction layers work in different ways, they accomplish a similar task. Deploying applications that run in EBIF or tru2way, make it possible to have the applications be portable from one platform to another without modifying the application's code.

Application success is typically defined by both reach and use. It will be easier to

achieve national distribution if only one version of the application exists. One of the challenges to overcome is allowing each MSO to retain its own look and feel while all MSOs are using the same application. This can be accomplished more easily if first, the application is broken up into several components, second, it relies heavily on using library-type functions, and third templates are used for allowing the application to adapt to the unique elements of a local environment without touching the software. The nature of how the software is structured can be expanded from its current functionality to achieve these goals.

As application developers innovate these new products, implementation and adoption will be easier for those that implement proper design and technique. Applications developed with industry-approved Software Development Kits (SDKs) keep developers within the proper guardrails for the EBIF client or tru2way stacks deployed in the field. In addition, applications that implement Templates will allow for quick customization for new skins, new behaviors, new look and feel, without modifying the core code.

Once well-designed applications are created, they will need to be deployed quickly and efficiently. Understanding that MSOs may deploy a wide variety of carousels and infrastructure in their networks underscores the need and benefits of using standard data formats such as CODF (OpenCable Content Definition Format). An important goal is to avoid the implementation of proprietary interfaces in the application distribution, data gathering and reporting chain. A "publish and distribute" architecture available to all content providers and application developers, and subscribed to by multiple cable operators, can help to dramatically

accelerate the deployment of national applications in rapid fashion. Once this cross-MSO CDN exists, an advertiser or application developer can gain access to a nationwide footprint at a fraction of today's costs.

It is conceivable to implement intelligent features into this application delivery CDN, such as the ability to customize applications on the fly. Creating this abstraction layering capability can allow an application developer to ingest a single application into this CDN. An automated workflow engine will attach or bind the application to any number of individual templates. The results of such a process work for both the MSO and the content provider. Each MSO can receive a custom version of the application that is branded and behaves in a way that maintains the common look and feel of their network. Multiple content providers and advertisers can use the same application and achieve similar functionality, but with a look and feel that responds to the content.

Set-top Abstraction Layers

Supporting these new interactive applications on cable plants will require leveraging new open architecture technologies such as EBIF and tru2way to support widely deployed applications across a wide variety of headend networks. EBIF and tru2way provide abstraction layers to both the network and the set-top box in different ways. EBIF is a data format that allows an EBIF client on a set-top box to act as a presentation engine for EBIF applications. Tru2way, conversely, enables an entirely new platform and infrastructure. Tru2way will also allow developers and advertisers to create widgets that would work with video-based applications similar to the role of widgets with Internet-based applications.

Due to the existing footprint of well over 60 million EBIF-capable set-tops, EBIF is becoming the technology of choice for advertisers and application developers looking to immediately deploy their applications. In addition, cable MSOs are also deploying infrastructure to support tru2way applications.

Interactive Application Sources

Interactive applications will originate from a variety of sources, including interactive content authors who are new to the cable industry.. As previously outlined, the open, global and interactive characteristics of the Internet have allowed it to benefit from the development of new and innovative applications. By creating translation engines and other types of interfaces to these applications, the cable industry can accelerate the deployment of complex, cross-platform applications on its video platform.

Abstracting Cross-Platform Communication

Because EBIF applications have the ability to communicate with application servers on the Internet, those application servers can achieve a cross-platform presence. An example of this would be an EBIF application that communicates over the Internet to a Facebook application through a proxy on the cable headend network. Once the connection to the Facebook application is made, that application can leverage the cross-platform footprint of Facebook and carry the customer experience onto iPhones, Blackberrys and other mobile devices. Leveraging applications such as Facebook in this manner allows an MSO to use the cross-platform connectivity of Internet-based application as an abstraction layer. While the actual EBIF applications running on the

set-top box will be a simpler application than the Internet-based applications they can be utilized to initiate this cross-platform experience and provide customers with the type of global connectivity and interactivity they are seeking.

Maintaining MSO Identity - Application Customization

As more and more applications become available, maintaining a common look and feel on the MSO's network that is also consistent with their navigation paradigm will become an important part of success-fully deploying applications. Unlike applications on a PC, iTV applications are presented as a service offered by the MSO. While application vendors strive to have their own look and feel. A customer who interacts with many applications from multiple vendors may find a different style each time they launch a different application. This could be unsettling if an application loads or navigates differently from the other applications on the same cable plant.

Allowing each MSO to maintain consistency with their navigation paradigm involves building applications that can be customized to "fit" an application to the MSO's network. However, application customization will impede progress unless it is done in a way that reduces, or even eliminates, re-testing the application on each MSO's network. Rapid deployment and wide-scale adoption cannot occur when there are multiple testing and certification processes. Instead, the most successful applications are likely to be those that "white-label" their applications, allowing each MSO to "skin" the application to their standards. Options include allowing each MSO to use its own colors, logos, and messaging. Expanded functionality would include capabilities to drive customers to

other services like VOD, or launch other interactive applications. For example, an MSO or content provider may deploy an application that is bound to a specific television show (i.e. voting and polling, etc.) In addition, the MSO or content provider may choose to add a button on the application that can launch VOD sessions of older episodes of the program.

News and weather applications will also require a level of customization. These apps will require the ability to utilize localized feeds as a source of data.. Traffic reports, local news and sports, and local weather may come from existing RSS feeds or other data feeds. A single application must be able to define all of these data sources, skins, and behaviors without modifying the source code of the application.

Standardized Infrastructure requirements

A key success requirement for quickly deploying applications on a cable plant is to limit the amount of required testing while ensuring that the application will execute safely and perform well. Accomplishing this will require both the industry's continued embrace of open standards and focusing on building a standardized architecture.

A variety of technologies may be used for developing this standardized architecture. First, by standardizing on a few software development kits (SDKs), application developers can be assured that they are developing their applications within a certified and tested framework. Second, the use of templates will allow for advertisers and application developers to quickly customize and deploy applications. Finally, and as previously described, by standardizing the back-office infrastructure required to support interactive applications,

cable systems will be able to deploy applications developed by multiple application vendors across the same infrastructure.

SDKs

Widely used for online interactive applications software development kits (SDKs) are typically a set of development tools that allows developers to create applications for a particular software, middleware or hardware. The iPhone is a great example of how an SDK can be leveraged to successfully build a variety of applications. Application developers need to know little about the iPhone if they have the proper SDK to build applications. The iPhone SDK keeps developers confined to the capabilities and limitations of the device.

The cable industry currently has several choices when it comes to EBIF and tru2way SDKs. As the technologies mature, the choices of SDKs are likely to consolidate, thus providing a consistent and common toolkit for developing interactive applications. Common toolkits allow developers to leverage a common framework, and help to ensure that applications will exhibit similar behaviors. The benefits to this approach are that the resulting applications will tend to have a common look and feel, they will behave similarly, and they tend to be more predictable. This approach will also serve to shorten the test time.

Moreover, applications developed with an EBIF or tru2way toolkits have many advantages over applications developed by proprietary tools. SDKs provide an environment where a developer can simulate the application's behavior before loading it on a set-top box. This allows for a certain level of testing of an application and the middleware before the code is loaded on a

set-top. Developer toolkits also help to keep software developers within the guardrails allowed by the EBIF client or the tru2way stack. As a result, applications are developed with "safe and tested" methods, thereby making the code less intrusive than a native application.

Templates

What if an organization wants to develop interactive ads or applications but it doesn't have the luxury to hire its own software development staff? For example, an advertiser may want to implement an interactive EBIF ad and distribute it into a national broadcast. If the advertiser doesn't have a software development staff, or doesn't want to hire a third party to develop a customized application, it could still implement the application by utilizing "templates".

The concept of templating is used throughout the Internet advertising industry today. Advertisers can purchase a template and quickly customize it for their advertising needs. Their main benefit is that the deployed ad is a fully tested application without the advertiser having to invest in software development. For example, advertisers can purchase Google AdWords templates to create Internet-based ads for their business. The templates require little software development experience and allow advertisers to instantly deploy ads that display during internet searches or navigation to topical websites.

Interactive application templates will come in two forms: content-driven templates and application-driven templates. Content-driven templates implement a single function, but they can be configured to present entirely different sets of data. Request for Information (RFI), VOD Telescoping, and Voting/Polling

applications are examples of content-driven templates. An example of a content-driven template is a voting and polling application. A Voting/Polling template allows the content provider to modify the look of the application and to also define the data that it will present, such as a question on which contestant to vote for or a set of trivia questions.

The second form of template is an application-driven template. Application-driven templates tend to be more complex applications that were originally developed as stand-alone applications, like electronic program guides (EPGs) and fantasy football applications. Application-driven templates will allow MSOs to customize the application to achieve a similar look and feel to other key navigational functions and to provide a consistent experience to the consumer.

Implementing an application-driven template will allow an application developer to develop a single application and customize it for every customer quickly and safely.

Standardizing back-office requirements

SDKs and Templates simplify the work on the client-side. However, the back-office and infrastructure required to run these applications also needs to be standardized, as described earlier. CableLabs and the cable industry are currently working on ways to standardize back-office requirements. This will be essential to allowing cable video customers to experience e-commerce and other transactional applications with the same ease of use that they enjoy with online shopping or ordering an On Demand movie.

APIs

The complex testing of applications occurs today because it is necessary. Most of the software deployed on current cable plants is hardware-specific, so any changes or variations can cause problems in the network. However, implementing new services with abstraction layers and standards not only allows for portability and broader support, but also limits the risk when the new services are introduced or changed. As the industry experienced with DOCSIS and PacketCable, open standards and abstraction layers work. Hardware and software vendors in the online ecosystem do not have to regression test every iteration of hardware and software on their platforms because applications are developed using open or published (sometimes licensed) APIs to the operating system. Similarly, web browser developers are not required to test their browsers against all possible websites because the browser is acting as a presentation layer for a standardized format of data – not unlike EBIF.

Sandboxes

In addition to supporting open standards, the cable industry's connected ecosystem can benefit from faster methods of integrating new services. One of the approaches being used to shorten the development cycle is to allow developers access to a live, MSO Grade, test cable plant that is representative of a real cable network. Providing application developers access to this test network, or "sandbox" during their development process gives them the ability to learn, and identify issues that cannot be identified in a simulation environment. To encourage innovation from a wide cross-section of developers, access to a sandbox may be the only way a developer may be able to afford to test their application. To accomplish this, organizations such as

CableLabs, and centralized services providers such as HITS AxIS can provide "sandboxes" to application developers to develop and test new applications on a representative cable plant. This approach can not only reduce the development time, but also accelerate the test cycle, enabling applications developers and MSOs to deploy new services much faster.

Providing these sandboxes also enables the cable industry to incubate new application developers and encourages innovation on cable networks. By reducing the cost of building an environment to innovate new applications, sandboxes also help to foster the next generation of application developers. Organizations like OEDN, which encourage college students to begin developing applications for the cable industry as they do today for iPhone and the Internet, also provide the infrastructure for students to integrate their applications. Enabling these new application developers helps to grow the ecosystem that will provide MSOs with more choices of applications to offer their customers.

On-boarding

Organizations that provide an operational environment for application developers should be prepared to offer developers an easy, accessible on-boarding process that allows for rapid introduction of new applications into the market. Mini-mobile applications and the iPhone "App Store" illustrate that the connected world is more about small, inexpensive and often temporary applications rather than complex, expensive ones. Accordingly, good on-boarding organizations help to breed innovation and competition by encouraging a wide universe of application developers to develop, test and deploy an even wider range of applications to run on cable networks.

A good on-boarding process also helps in the building of a knowledge base of best practices, known infrastructure problems and typical pitfalls that can be shared amongst all developers. In addition, it offers application developers the privacy and protection required for keeping their intellectual property safe.

A CONNECTED ECOSYSTEM FOR ADVERTISERS

By connecting MSOs and back offices, local cable systems will be able to present advertisers and content providers with the opportunity to communicate to their customers with the most powerful medium (high definition, large screen, surround sound television) while using the web-proven tactics of personalization and interactivity. However, some additional connections will be required in order for the advertising and content community to take full advantage of these advanced opportunities.

In addition to the connections discussed earlier, the capabilities of a more robust platform for seamlessly delivering and managing advertising and other forms of content will help to increase effectiveness. Moreover, these enhanced capabilities would allow content placement opportunities on the cable video platform to be more competitive with other content platforms, largely by leveraging their capabilities.

The connected ecosystem described in this paper provides advertisers with a platform that combines television's powerful ability to engage audiences with the interactive capabilities and reach offered by the Internet. Today, advertisers use on-air campaigns to drive traffic to web sites where they can provide more information and transactional opportunities. The connected cable ecosystem will allow these interactive elements to occur over the video platform itself.

Personalizing Content Through Changeable Elements

The connected ecosystem can support the advertising and content communities' interests for optimizing the value of their content by expanding the methods for reaching potential customers who are the most interested in their ads or content. Currently, one of the advantages of placing ads by node is the ability to sell that inventory to neighborhood advertisers. The connected cable ecosystem would expand the market for these hyper-local ad avails by providing the capability for national advertisers to reach specific neighborhoods or other demographics anywhere in the country.

Supporting the growing demand for segmented advertising requires an expanded approach towards managing, tracking, and delivering content. It is relatively simple to manage one of a few pieces of content that are distributed nationwide, or to a few regions of the country. It becomes exponentially harder to manage content that may have multiple versions, with different interactive applications attached to them, with different text overlays, linking to different actions, and all designed to reach different communities.

Combining demographic data concerning a neighborhood or customer with the cable system's ability to deliver content by node, opens up the possibility for personalized content. However, delivering the message that will be the most relevant to that neighborhood can involve managing as many as 20 different elements that

customize the message for maximum impact. An example would be a cruise ship ad that features older adults when it appears in neighborhoods with that demographic while replacing those scenes with images of family activities in neighborhoods that skew to that demographic. Stitching those elements together requires pairing the ad server with an ad-decision engine that will ensure the ad containing the right elements appears in front of the right viewer.

Delivering this type of content to the hosting and serving devices will require the ability to automate management of the bidirectional metadata. This is to ensure that the multiple elements of the ad delivered to the serving environment are assembled the correct way for that particular node. The ability to take advantage of advanced capabilities such as these is result of both the technology platforms being available, and accessible at large-enough scale for the content to be available to a large audience. The connected cable ecosystem plays the important role of being able to mange the delivery of the content and the metadata across a national footprint, but to also aggregate engagement data across all markets and by each demo, while observing strict privacy guidelines.

Interactive advertising

In order to fully support interactive advertising – all of the content and its associated elements should be managed and tracked across multiple delivery platforms. As an illustrative example, assume an interactive ad may have links to telescope to a long-form video on VOD, and also to support a prospective consumer's ability to receive more information about a particular product or service. To achieve the desired result, the linear ad needs to be delivered to the Ad insertion system, the long-form content to the VOD server, and the

information requests content and instructions to the RFI system. All of this content and the associated metadata that describes it need to be delivered to all of the devices, and verified to ensure the consumer experiences the desired result. Ads delivered via tape are physically incapable of containing the data required for interactive capabilities. The open standards architecture described earlier in this paper is intended to support interactive advertising applications by providing the interface to remote carousels or ad servers and the asset and scheduling metadata to insert an asset into a digital video stream. Advertisers interested in taking advantage of the connected ecosystem's iTV capabilities will also require the interactive application templates that were previously described.

Accelerating time to market

Another requirement of the advertising community for delivering personally relevant content that can be addressed by a connected ecosystem is accelerated delivery. Rapid, timely delivery of all of the content and its associated elements across the entire footprint is an important element of the video system operating in a comparable manner to the other (i.e. Web, mobile, etc.,) platforms. Examples of ads that are heavily dependent upon time-to-market for their effectiveness include political campaign ads where a candidate will want to create and place an ad to respond to a new attack ad from his or her opponent. Another example would be advertisements that encourage greater audience engagement by mixing images from the program with ad content, such as a carmaker's ad that features "the play of the game."

To achieve rapid delivery requirements, the ability to accelerate the collaboration and approval processes can also be improved. Advertising content is typically created in a

collaborative process between one or more production houses. Ad agencies approve this content before it's distributed to the end destinations. As the number of versions of the content, and associated elements grow, the processes that track and support the approval will need to take on the same level of sophistication as the delivery processes.

Meeting the demand for accelerating time-to-market is well beyond the capabilities of tape dubbing and overnight delivery systems. These ads will need to travel at the speed of light, not FedEx. A network-based architecture appears to be the most appropriate means to support these content delivery needs. Understanding that the participants in this ecosystem will be comprised of both large and small companies located around the globe suggests that the content management and delivery system will need to overcome such issues as packet loss, corrupted files, longer transport session times, lost productivity, manual monitoring and the lack of real-time, item-detail reporting of file transfer activity. These asset delivery systems will need to provide fast, fault-tolerant, secure, and audited digital delivery that will represent a core element in the supply chain for addressable advertising. Delivering in real time leaves no time for mistakes.

Meeting the Advertiser's Quality Requirements

Ensuring quality throughout the asset delivery process is also increasingly important to the advertising community. Their ads are built and tailored for customers who will be viewing them on large, high-resolution display devices. As such quality of experience becomes an increased focal point. The ecosystem will also need to provide content providers and others stakeholders in the distribution chain with the ability to monitor and measure quality throughout the content distribution process. Incorporating these design, operational and measurement elements into the asset delivery system will improve the likelihood of adoption and probability of success for advertisers and other enterprise market stakeholders that use connected cable architecture to meet the needs of their customers and grow their businesses.

As with the connections described in previous sections of this paper, meeting the interest of the advertising and content communities will also involve extending beyond the connected cable video network. In order to provide access to the features and flexibility found on the web, connected cable networks will also need to connect to the systems and services that enable these web capabilities.

One example of the systems cable may want to connect with are advertising decision engines. These web based systems that decide which ad to provide to a particular customer, at a particular time are becoming extremely advanced and valuable. Today, these systems primarily support banner ads but they are expanding into video ads as well. These types of decision engines will be advantageous for expanding the capabilities that cable's new platform can offer to advertisers and content providers. In addition, leveraging the mass and scope of the data collected and analyzed by these web-based systems will enhance the value of the cable video platform to companies that require this information in order to optimize the effectiveness of their content delivery activities.

SUMMARY

With all of the recent advances in technology, the cable industry is quickly

moving past a wired world into a connected world. In fact, consumers aren't just connected occasionally, they are always connected. They can get e-mail, connect to the internet and text or twitter anytime of day or night, regardless of location.

For cable to lead the development of advanced services from advertising to game playing to social networking, it will want to embrace the concepts of connectivity. Historically, cable systems were being limited to a single medium that provided "last mile" connectivity for video consumers. However, a connected view of the world can't end there. Limiting the view to ways to connect to the consumer would squander the opportunity for being a major player in the products and services that consumers access through those pipes.

Consumers of today and tomorrow have an expectation that a single device or application is connected to the rest of their world. Evidence that this is necessary becomes obvious in situations like looking around the plane when the flight lands. Almost everyone immediately reaches for his or her cell phone. In many cases the user doesn't immediately make a voice call, but rather spends the taxi time reconnecting to their world, checking e-mail, answering texts or checking news and scores. This is the environment in which cable will play a greater role by continuing to build upon its commitment to an open, connected ecosystem.

The decisions that all cable MSOs make over the next few years will help to realize the potential for cable's video platform to serve an increasingly larger and more dynamic environment . Realizing the fullness of that potential will require the connections that allow consumers to access the personally relevant services they want more easily.

By connecting to other wire providers and cable systems, the industry could ensure that its services can deliver the mass and scale required for success in today's world. This entails connecting technologies in ways that allow for localization and personalization without requiring custom development and extended deployment cycles. It also involves connecting advertising platforms in ways that allow advertisers to enjoy the power and presence of the high definition, large screen, surround sound television with the interactive, dynamic and personalized capabilities that have evolved on (the far less impactful) Internet platforms.

The time is right for evolving to meet the connected society of the future. Connections to both its existing base of friends and partners, as well as connections to other, somewhat competitive, electronic industries will be critical for success in a connected world. The cable industry is in a unique position to provide both consumer and back office services connections in ways that can take advantage of a world where often, the mass is the message.

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[i] *How did eBay start?,* **A brief history of eBay, By Aron Hsiao, about.com**