ADVERTISING INSERTION AND VOD: A MATCH MADE IN HEAVEN

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Abstract

Video-on-demand (VOD) is now a standard 'must-have' service for cable operators. It is highly strategic in reducing churn and growing premium digital subscriptions. It also provides a great financial return on invested capital through movies on demand and subscription VOD (SVOD). Local ad sales, meanwhile, continue to provide cable operators significant cash flow and are an excellent promotional vehicle for cable operator's various services including VOD. As viewers migrate to on-demand, local and national ad insertion must migrate as well in order to sustain and grow cable ad sales' revenue. In addition, VOD and digital cable platforms offer unique opportunities to target advertising to households, as well as interact with ads, both of which have the potential to grow ad sales businesses for both operators and cable networks far beyond today's TV advertising market share.

ADVERTISING INSERTION AND VOD

VOD streams are unique, one-to-one TV sessions with each household. VOD ad insertion is local ad insertion but in VOD content. VOD ad insertion appears to be unique and advantageous for advertisers and ad sales operations in that it has the potential to:

- Use local breaks in VOD content similar to traditional local breaks on broadcast cable (called ad replacement)
- Create new local breaks before and after VOD content (called playlists)
- Recapture digital viewers watching VOD and not watching broadcast cable
- Support geographically targeted and household addressable ads
- Provide 100% measurable advertising data

Historically, cable operator's and cable networks' ad sales businesses have not leveraged VOD although some have experimented with it. This is primarily due to multiple factors including: 1) most VOD content is pay-per-view movies and premium cable programming, which is not normally ad-supported programming and does not have local breaks; 2) a lack of critical mass of viewers; and 3) a lack of acceptable audience measurement data available (and the newness of the medium) to the advertising industry.

However, these factors are all changing. Ad-supported cable networks such as ESPN are becoming VOD programmers themselves. In addition, a number of new programmers are appearing only on VOD services, such as MagRack, and may consider ad-supported models. The number of VOD households has rapidly increased as well, to 16.5 million of the 23 million digital homes (66.6 million basic homes) now, and is growing to more than 38.2 million by the end of 2008.[1] VOD usage and VOD audiences are also growing weekly. For instance, nCUBE has seen on average 10-15 VOD session starts per digital subscriber per month in the field. Lastly, ad agencies, media buyers and advertisers are being exposed to the medium. However, they will need to value new audience measurement data and will need to be able to process it with their back office

[1] Kagan VOD & iTV Investor, July 23, 2003

systems, which they rely on to plan effective ad campaigns and to value advertising. Nielsen Media Research, the leading audience measurement service, has published a VOD system interface specification, which is being implemented into VOD vendors' systems and may address advertisers' needs.

This paper presents both technical requirements and an implementation for advertising insertion around VOD content (i.e. playlists) and in local breaks in VOD content (i.e. ad replacement). VOD content includes movies, SVOD, free VOD and network PVR. The solution leverages existing ad sales organizations, research, and traffic and billing systems as a starting point. However, the solution scales into the future with household level addressable advertising using newer traffic and billing, and research systems. There are several other advanced advertising applications being implemented, tested and speculated by nCUBE and others which are not discussed in this paper including:

- Advertiser-sponsored free VOD using long form ads and programming on the VOD service
- Interactive advertising for direct response, surveys, coupons, personalized messages and more
- Linking from traditional ads to long form programming on the VOD service
- Advertising on digital video recorders

These applications may be the topics of subsequent papers. This paper will talk specifically about extending today's ad insertion business and technical operations into VOD. Of particular relevance in combing ad insertion operations with VOD systems are:

- Organizational responsibilities, architecture and workflow
- Traffic and billing system configuration and back office integration
- Detecting local breaks
- Inserting ads in VOD content
- Targeting ads by geography
- Household addressability in the future

An overview of today's ad insertion technology and today's VOD technology follows. These two sections are helpful for those unfamiliar with the technical aspects of each and also set the context for extending ad insertion into VOD.

Today's Ad Insertion

Local cable ad sales is a mature and growing business in the U.S. contributing significantly to cable operators' revenue and net income. Ad sales organizations sell TV commercial time designated for local insertion on cable networks to ad agencies and advertisers. Ads are sold for particular networks, day parts, programs, or groups of networks. Each cable network provides 2 to 3 minutes per hour for local insertion, or enough to run 96 ads each on average per day. Typically, 15 to 25% are used for cable operator marketing purposes. There are more than 80 ad supported networks with roughly 40 carried on analog and 40 carried on digital cable. Most ad sales revenue occurs on the top 20 networks carried in the analog domain. However, operators are rapidly moving toward 40 channels of ad insertion and are also beginning to migrate away from analog cable and toward all digital cable.

Cable operators use traffic and billing (T&B) systems to enter orders, schedule spots and bill advertisers. T&B systems track the number of ads that are sold and thirty second ads available to be sold (called "avails") for each network, and produce schedules for the ad insertion systems so it knows which ads to play. The schedules list ads to play during each local break on each network. Based on schedules, the ad insertion system determines which ads need to be encoded, distributed, and

removed, as well as whether any are missing. Once played, the ad insertion systems log each ad played and returns the logs to the T&B system so that advertisers may be billed.

Nearly 100% of all ad insertion systems in use today use digital ad content based on MPEG 2 content locally encoded at 4 to 6 Mbps constant bit rate (CBR). Digital ads, mostly thirty seconds long, are distributed as data files and are stored on video servers' hard disk drive arrays located in headends. During local breaks ads stream from the video servers and are switched in place of ads in the cable network feed. Local breaks in ad-supported cable programming (e.g. CNN) are identified by the presence of cue signals detected by the ad insertion system. Historically, cue signals consisted of DTMF tones carried in a second audio channel in each ad-supported cable network receive at each headend. Cable networks are migrating to newer MPEG cue packets specified by SCTE in the SCTE 35 (formerly SCTE DVS 253) standard. The SCTE 35 cue packets multiplexed into the MPEG 2 program stream along with other elements such as video, audio and data. The cue packets signal local break positions and insertion splice in and out points.

Once the cue is detected, ads are streamed from video servers at the appropriate time. Today, they are typically decoded to analog and switched into analog broadcasts prior to distribution into the cable plant and distributed to viewers' homes. With digital cable growing in popularity, and with cable operators migrating to all digital cable, ads may also be streamed from video servers and switched into digital broadcasts where decoding to analog occurs in digital set-top boxes in viewers' homes. When digital ads are inserted into digital cable programming, as opposed to analog programming, it is called Digital Program Insertion (DPI). DPI represents the next significant wave of ad insertion deployments, with both standard definition television (SDTV) and high definition television (HDTV) naturally supported for ads and programming.

Analog and digital switching each have unique requirements. Analog switches must be accurate and fast time-wise such that the switch into the local break is not late so that the beginning of the network's underlying ad is not shown or heard. And they must not switch out of the local break too late so that the network's programming following the local break is not stepped over, although cues may also be sent to signal the end of the break which may prevent this; in which case the local ad would be cut short. They must also not switch too slowly such that black video results. Lastly, analog switches typically contain audio automatic gain control and level matching circuitry to ensure that audio levels of the networks and ads match.

Digital switching is done by ad splicers which are statistical bitrate re-multiplexers typically located in headends for efficiently creating digital multiplexes with digital cable programming. Ad splicers have the same time accuracy requirements as the analog switches. Audio level matching is a more complicated issue however for DPI than for analog and cooperation among cable networks, splicer manufacturers and cable operators are required to ensure consistent audio levels before and after switching.

Local cable is unique in that it can insert advertisers' commercials across a metropolitan area (i.e. "market"), and can also "target" ads to geographic regions within a market (i.e. "zones"). This flexibility offers advertisers tremendous efficiency in reaching relevant viewers, while maximizing ad sales revenue for operators. With digital set-tops, local cable ad sales operators are experimenting with "addressable advertising" in which different

ads are played to different households (and individual set-top boxes) based on each household's lifestyle segment. Addressable advertising offers tremendous efficiency since ads are directed to the most relevant households (e.g. has children) versus targeted advertising in which ads are played which are relevant to household characteristics of a geographic region (e.g. incomes >$100K) or just the geography itself (e.g. near Bob's Ford)

An example of today's ad insertion system is depicted in Figure 1, below. In Figure 1, the SkyVision HQ manages the day-to-day workflow and monitoring functions required to manage multiple ad insertion systems from a single location. The key functions are:

- Import traffic schedules from T&B
- Encode and distribute new ads and schedules to headend insertion systems
- Alert of missing ads and system failures
- Remove expired ads
- Monitor breaks and insertions
- Retrieve verification logs and export to T&B

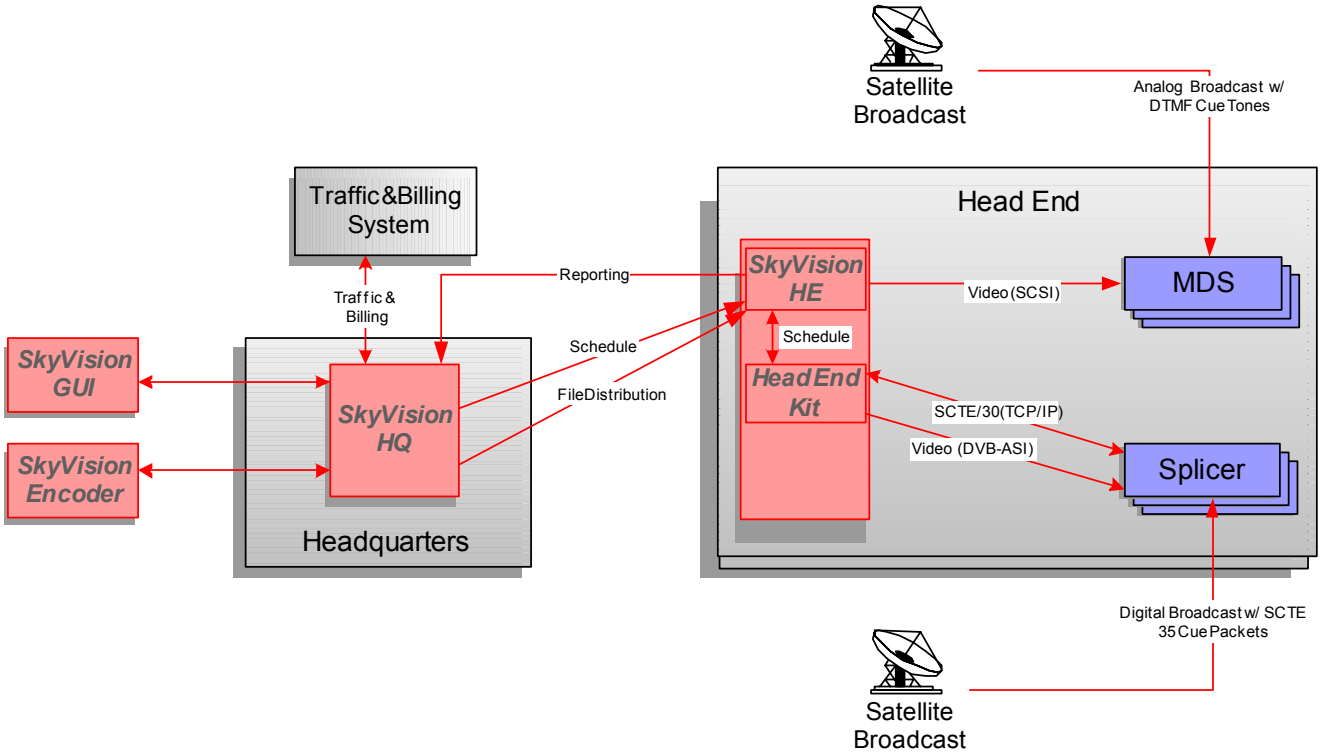

Figure 1. A schematic diagram of nCUBE's SkyVision digital ad insertion system deployed for both analog and digital cable. Analog MDS switch decoders and digital DPI splicers shown in a headend with nCUBE's SkyVision HE ad server. Ad insertion servers and switches in multiple headends are managed centrally with the SkyVision HQ and MPEG encoder.

Today's Video on Demand

With VOD, subscribers select programming from menus or their programming guides and request and control video streams. VOD workflow is not too dissimilar from ad insertion and both workflows can be automated or performed manually, as the situation demands. An example of today's VOD system is depicted in Figure 2, below. In Figure 2, the nABLE

HQ manages the day-to-day workflow and monitoring functions required to manage multiple VOD systems from a single location. The key functions are:

- Import asset metadata and content files from asset distribution systems (catchers mitts)
- Distribute new content to headend VOD systems
- Alert of missing content and asset metadata errors, and system failures
- Remove expired content
- Publish asset metadata to VOD menus
- Authorize subscribers and post charges to subscriber management systems (billing)
- Monitor buys, sessions and bandwidth, and report data

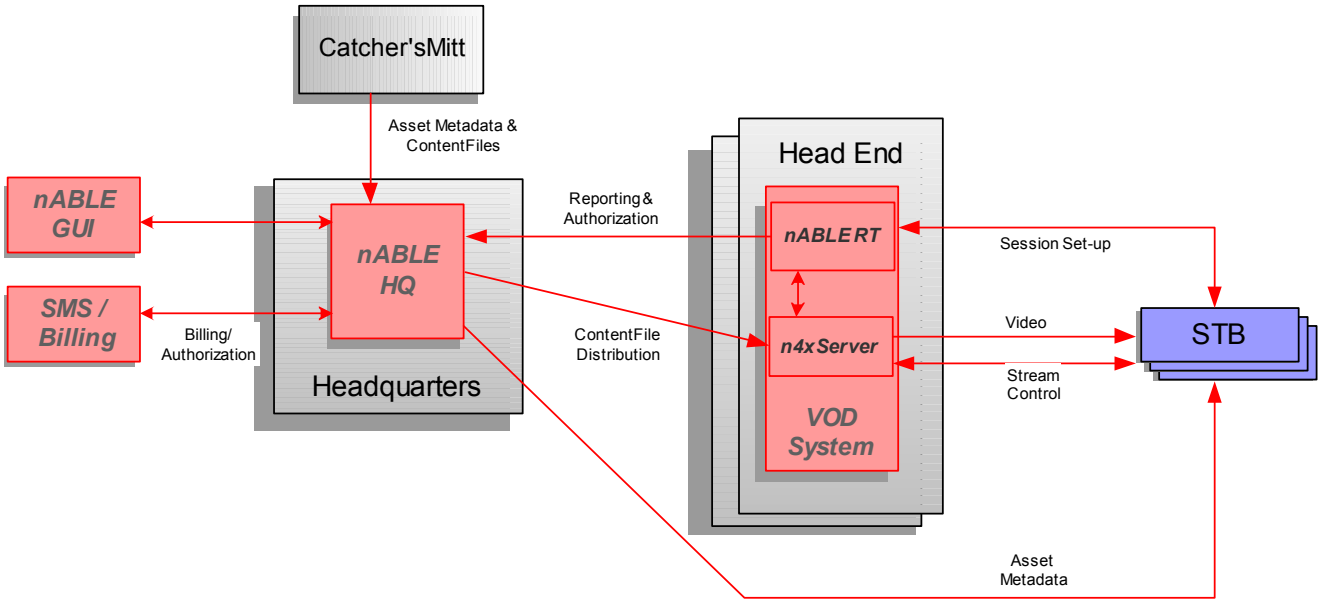

Figure 2. A schematic diagram of a typical deployed nCUBE nABLE VOD system. The n4x video server and nABLE RT session and resource manager are shown in a headend. (On demand application server and client that provide the subscriber user interface are not explicitly shown but the functionality is implied in HQ, RT and STB since actual configurations vary depending on the deployment.) VOD systems in multiple headends are managed centrally with nABLE HQ.

Before getting into the specifics of VOD ad insertion it's important to understand the process of requesting a title and setting up a VOD session since this is when ads are selected and inserted in and around VOD content, in this implementation discussed below. Prior to selecting a title, the asset metadata and content files are imported from the catcher's mitts. The content files are typically encoded at MPEG2 3.75 Mbps (CBR SPTS) as specified in CableLabs VOD content specification. They are distributed to the VOD servers in the headends prior to each title's availability start date, which are contractually set by the content provider and included in the asset metadata. The metadata is validated and published the on-demand application's VOD menus and/or digital cable programming guides where subscribers can navigate and make selections. The metadata includes content provider, start date, end date, title, category, description, rating, actors, price and more. Other files such as DVD cover graphics may accompany a title and are also retrieved from catcher mitts, and

published as part of the menu information seen by subscribers along with the metadata. Content files are removed once their end date is past.

Once a title is selected, the on-demand application in the set-top box (STB) initiates a session set-up request to the VOD system in the headend. The commonly used protocol choices implemented for session set-up (including teardown of a session) today are RTSP and DSM-CC. In the session set-up request message, the STB communicates the requested title's asset ID, and the STB's MAC address and its service group. The MAC address is unique to each STB. The service group identifies the population of STBs, which share the same group of 6 MHz VOD channels (QAM modulators and RF upconverters) each with a capacity of 10 VOD streams, or 10 simultaneous one-to-one TV sessions. Service groups are essential in economically setting up VOD sessions and streaming. They are also relevant to VOD ad insertion as explained later.

In a cable plant there is a fixed amount of RF spectrum for video equal to a fixed number of 6 MHz video channels. Analog cable TV requires a 6 MHz video channel for each cable network broadcast on analog. With digital cable TV, ten or more cable network broadcasts share a single 6 MHz video channel. Digital and analog cable networks (e.g. CNN) are broadcast through the entire cable plant and are available, with varying service tiers, to subscribers simultaneously. For VOD, however, broadcasting all simultaneous viewers' VOD sessions through the entire cable plant requires too much capacity and is not economically viable. Therefore, each 6 MHz channel assigned to VOD is assigned to a service group. Each service group serves a particular subset of the VOD capable homes in any given deployment. Service groups can be any size but 24 MHz or four 6 MHz channels each are common. A 24 MHz service group has a capacity of 240 VOD streams. If each VOD stream can serve 10 digital subscribers, then a 24 MHz service group can serve at least 2,400 VOD enabled digital homes. In a market with 240,000 digital homes, there would be 100 service groups. The homes sharing a service group are typically clustered in the same geographic region making service groups relevant to geographically targeted advertising, as discussed later. A service group with 2,400 digital subs represents about 7,000 cable homes at 34% digital penetration and about 10,000 homes passed. Assuming that there are 500 homes passed for each optical node in an HFC plant, a service group consists of twenty optical nodes all sharing the same VOD video RF spectrum. As digital penetration grows and as VOD usage increases, service groups will either get larger in MHz or smaller in optical nodes or both.

Using the STB's MAC address the VOD system checks the household's authorization for the requested content and posts any charges. Based on the service group passed to the VOD system from the STB, the VOD system's session and resource manager determines the best way to route the video stream and allocates the required bandwidth (e.g. 3.75 Mbps) from the video server and through the digital cable plant. Then, using the asset ID, it instructs the video server to stream the requested content. Using the session set-up protocol (RTSP or DSM-CC), it provides the STB with both the frequency of the 6 MHz channel (RF channel of the QAM modulator) and the MPEG2 program number carrying the requested video. The STB tunes to the frequency and program number and the viewer sees the stream. The viewer can then pause, fast forward, rewind, stop and resume the stream. When doing so the on-demand application in the STB communicates a command to the VOD system using either RTSP or DSM-CC protocols.

VOD Ad Insertion

There are two primary applications of VOD ad insertion applications: 1) playlists, and 2) ad replacement. With playlists, ads are inserted around VOD content such as movies, TV programming and other on-demand content. When ordering a title, such as a movie, the viewer sees ads prior to the movie itself. Ads may also be present at the end of the title and even after resuming from pause. Playlists are important for advertisers as well as for promotional purposes for cable networks and cable operators wishing to promote other products. Similarly, thirty-second ads can be sold and inserted ahead of and after their VOD programming.

Today, VOD programmers and cable operators edit promotional ads and paid ads into the beginning and end of their VOD content making it part of the same content file. If they choose to change the ads for a title, the entire program must be re-edited and redistributed. Playlists, however, allow the ads to change dynamically on the VOD server and therefore do not require editing in advance or redistributing the entire program. Only the new ads need to be distributed.

Ad replacement allows ads to be inserted in local breaks in VOD programming while it is streaming to a household. Ad replacement is similar to playlists in the way video segments can be sequenced and it leverages much of the same technology.

For playlists and ad replacement to work there must be local breaks in content and there must be a way for local breaks to be detected. Very little VOD content today has local commercial breaks or any breaks at all. Many cable operators believe that that will change over the next few years as the number of cable programmers supplying VOD content grows. This is especially true if network personal video recording (nPVR) succeeds with ad-supported programming. VOD ad insertion creates a viable business model for content providers' ad sales operations and may be part of the business model that encourages cable networks to contribute content.

Technically, both playlists and ad replacement are nearly identical. One main difference is that playlists can be applied to content that may or may not have pre-existing local breaks and embedded ads in those local breaks when it is loaded onto the VOD server. Ad replacement, on the other hand, specifically applies to those local breaks and replacing those embedded ads.

In order to insert ads in and around VOD content, a number of operational and technical details must be implemented:

- Organizational responsibilities, architecture and workflow
- Traffic & billing system configuration and back office integration
- Detecting local breaks
- Inserting ads in VOD content
- Targeting ads by geography
- Household addressability in the future

ORGANIZATIONAL RESPONSIBILITIES, ARCHITECTURE AND WORKFLOW

Organizationally, different people are responsible for ad sales and cable system operations. With VOD ad insertion, where the VOD system is also the insertion system, each groups' roles and responsibilities may be unclear. The best way to manage this is for ad sales personnel to manage the workflow for schedules, ads and logs just as they do today but treating the VOD system as the ad insertion system along with their traditional ad insertion systems. However, cable system personnel should continue to own and manage the VOD system and the VOD programming. This is

very similar to how DPI ad splicers are dealt with today. The splicers insert the digital ads into digital programming but have another function with respect to the cable system. Simply put, ad sales personnel should continue to manage ads and cable system personnel should continue to manage the VOD system itself, including storage and stream requirements.

Figure 3, below, shows an architecture for VOD ad insertion in which both the ad management and VOD management systems and headquarter facilities remain unchanged from today's ad sales and VOD.

With this organizational and architectural arrangement, ad sales operations remain relatively unchanged. Using their existing ad management application in their HQ, they still:

- Import traffic schedules from T&B
- Encode and distribute new ads and schedules to headend insertion systems
- Alert missing ads and system failures
- Remove expired ads
- Monitor breaks and insertions
- Retrieve verification logs and export to T&B

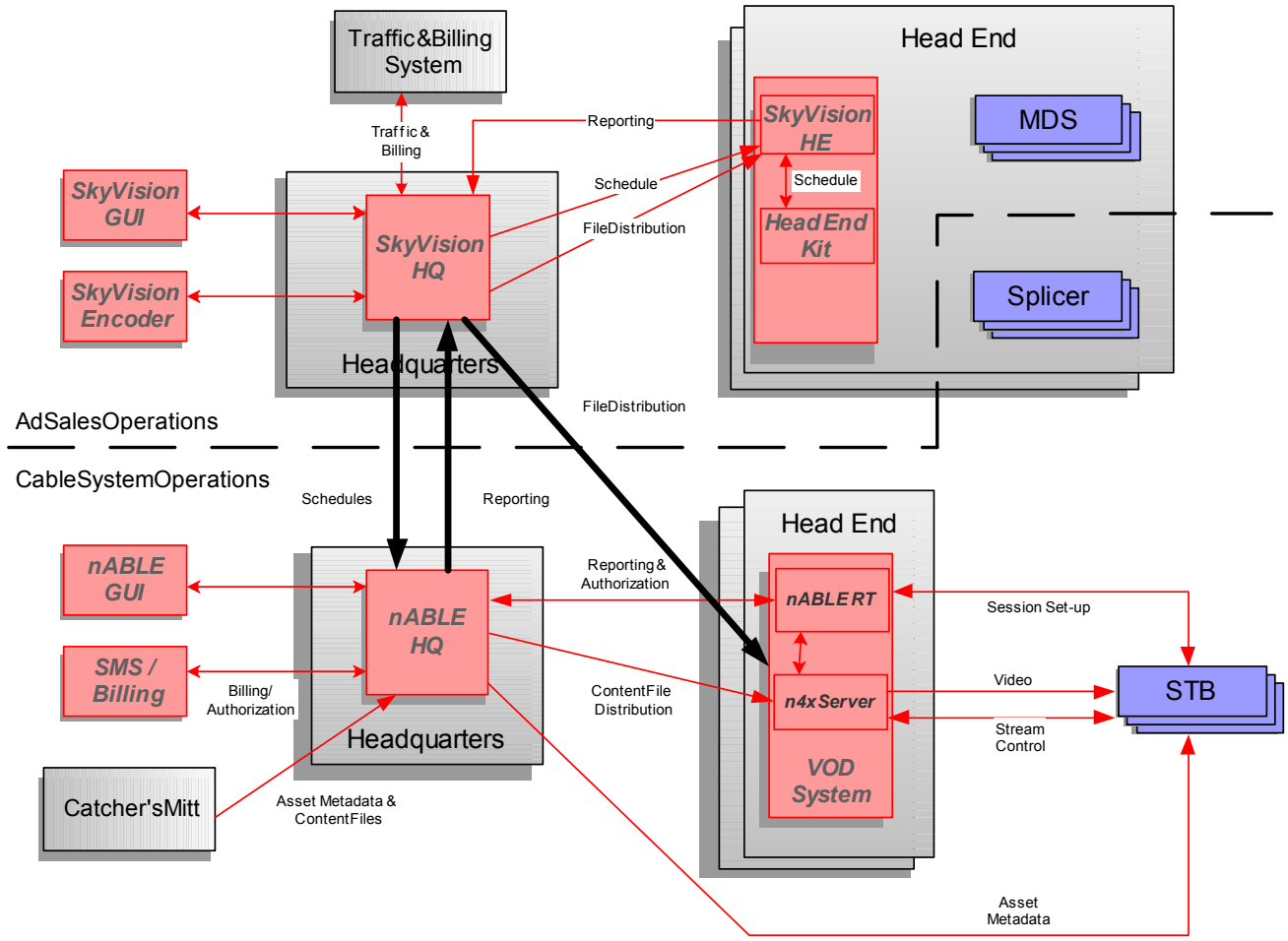

Figure 3. nCUBE's VOD ad insertion architecture and management responsibilities with nCUBE's SkyVision ad insertion system and nABLE VOD system and n4x video server. Ad sales operators view VOD as another inserted and manage ads, schedules and logs similar to traditional insertion systems.

Traffic & Billing System Configuration and Back Office Integration

Today's T&B systems and the existing schedule format could be used for VOD ad insertion initially. However, new formats and interfaces will be needed eventually. The schedule interface is a flat ASCII file today. The T&B system creates a daily schedule for each cable network in which ads are being inserted. The inserter uses that day's schedule for encoding ads, distributing ads and playing ads in the correct program or day part. The schedule includes break windows and ad names (a.k.a. spot IDs) and ad positions in each break.

From a T&B perspective, VOD does not have a fixed number of breaks in a fixed number of cable networks. With traditional ad insertion, the number of breaks and their break lengths are configured into the T&B system, in advance, for each program and day part of each cable network. That way the T&B systems and the ad sales organization can track the number of avails sold and the inventory available. With VOD, there are not a fixed set of avails to configure in advance; nor are there specific day parts.

The best method to create and track inventory for VOD in T&B is to estimate the number of sessions, and hence impressions, expected in the future based on historic session reports from the VOD system. The estimate can be refined over time with regular reporting.

Instead of cable networks, VOD virtual networks will need to be defined in the VOD system. The T&B system will publish a daily list for each VOD virtual network just as it does for each cable network today. The simplest case is to create a single virtual network (call it VOD1) for VOD. This may be sufficient in the beginning. More sophisticated virtual networks which could be implemented, and in any combination, include:

- VOD regions (e.g. East and West)
- VOD categories (e.g. movies, SVOD)
- VOD playlist and VOD ad replacement
- VOD titles (e.g. Larry King Live)
- VOD content provider (e.g. ESPN, Warner Home Video)

Each virtual network can be scheduled independently of the others and do not share inventory. With virtual networks, schedules can be created which vary by region, category, title, content provider and more.

Since all VOD virtual networks are part of the same physical VOD systems, the total number of impressions is the sum of the impressions of each of VOD virtual networks configured. An impression report from the VOD system for each virtual network assists in predicting inventory for each. Day parts could be used in T&B and for impression reports, but initially a 24-hour day part probably makes sense. In the T&B schedule, all ads would occur in the same 24-hour break window each day.

Once virtual networks and day parts are defined, and avail inventory estimates are entered, the ads can be priced and sold and orders can be entered into the T&B system. The current T&B schedule lists each ad to play during each day for each network, or virtual network in this case. That could be quite a long list if there are one or just a few virtual networks and a lot of playlists and ad replacement opportunities. This is an area of future optimization for T&B interfaces. Instead of repeating ads, specifying the frequency of occurrence for repeated ads would be more efficient and real time interfaces would be an even better solution.

Once the schedules are published, the VOD ad insertion system plays and logs the ads for reporting and billing. With VOD today, each session is logged in the VOD system's database

for later reporting. Advertising content on VOD is logged just the same. These logs may be returned to the billing system and used for billing and reporting to advertisers. The billing system can simply count the ads played against the ads ordered and determine if the contract was met. If not, it can schedule 'make goods' in the future in which it schedules enough additional ads to fulfill the commitment (sold for each virtual network) in the future within the flight of the contract. Alternatively, it's conceivable that VOD ads can be sold on a per impression basis in which each time the ad plays the advertiser can be charged.

The biggest billing issue with VOD ad insertion is determining the value of the ads in the first place. VOD is a new medium for ad sales managers, and advertisers and their agencies are used to TV measurement and traditional delivery methods. A number of reports will be needed from the VOD system for use by cable ad sales operators to show their customers what was delivered. Today's T&B systems and ad agency back office systems may not make much sense of VOD's one-to-one impression data given that they were designed for tradition TV advertising which is based on reaching a certain size and type of TV audience and is very much based by Nielsen's measurement data.

However, the data collected by VOD systems shows very detailed, exact viewer information about every individual impression. And, when combined with other research and measurement data presents a detailed view of the audience that can be inspected down to individual households. The data available from the VOD system for each ad in each VOD session includes:

- Name of advertiser
- Name of ad
- Spot ID of ad content viewed
- Viewer set-top ID (MAC address)
- Viewer account number
- Viewer service group
- Session date
- Session start and end times
- Session stream activity and times (e.g. pause, fast forward, resume, etc)

By combining data from the VOD system with other quantitative and qualitative data, advertisers and ad agencies can learn about their viewers as a group, and cable operators can use the data for billing purposes. Nielsen's involvement in VOD should help make ad agencies and advertisers more comfortable with the medium and its value in the future.

Cable operators could use the STB ID and account number to obtain viewers' home addresses and their zip codes. Zip codes are more specific than service group and yields more accurate information about viewers when combined with qualitative research data. A number of market research databases and applications, such as Claritas, provide qualitative characteristics about geographic areas by zip code, which enhances the VOD and Nielsen data. Further, numerous databases provide very specific information about particular households which can be generalized and made anonymous in such a way as to be permissible for use with advertisers when combined with the VOD data.

Privacy law prohibits cable operators from sharing data about specific viewers, without their permission, with third parties. However, generalized qualitative and quantitative information about the characteristics of groups of viewers rolled up and made anonymous, can be shared with third parties. (Cable operators should check with their legal counsel regarding privacy law.)

Detecting Local Breaks

Before local breaks can be detected, they need to be there in the first place. Breaks may be created differently for playlists and for ad replacement. Playlist breaks may be defined by VOD content providers or by cable operators or by both. Ad replacement breaks, however, are always defined by the VOD content provider. Both could use cue packets and metadata to define break positions and lengths. It is likely that playlist breaks would use metadata where as ad replacement breaks would use cue packets. This is because it is much simpler to use metadata when creating ad avails before and after content by either programmers or cable operators. In addition, CableLabs is considering support for playlists in the next release of the VOD metadata standard which today's VOD content providers, cable operators and VOD vendors all support. Using metadata and supporting playlists is likely to evolve first because of the industry momentum as well as the fact that today's content does not have local breaks. Since ad replacement applies to content, which already has local breaks in it, it is more likely to have cue packets already in the content when loaded onto the VOD server.

For playlists, the metadata needs to identify and be applied to:

- Content provider, category, and title, hierarchically (e.g. all new releases)
- Break position (e.g. before and after)
- Break length (e.g. 60 seconds)
- Break owner (e.g. network, operator, marketing, shared, etc.)

The playlist metadata can be implemented by content providers in advance as part of what is pitched to the VOD system. The metadata can also be augmented locally by the cable operator after it is pitched using the VOD asset management system.

For ad replacement, using SCTE 35 cue packets, the standard is already in place and starting to be used in traditional ad insertion. The cue packets signal breaks through MPEG packets multiplexed into the program stream. In VOD, cue packets would be present in content loaded onto the server and used to identify local break positions and insertion splice points. The VOD system may use cue packets in real-time for ad insertion or may use them during content ingest and translate them to a proprietary internal metadata format or the standard future metadata format so that the VOD server does not have to filter for cue packets in real time; it can use metadata just as it does with playlists.

Inserting Ads in VOD Content

In order to support playlists and ad replacement, VOD systems need a way to assemble multiple MPEG video files and need to be able to switch in and out of MPEG video files seamlessly from viewers' perspectives. nCUBE's VOD video server leverages nCUBE's Logical Content technology to dynamically assemble video files for playlists and ad replacement in video streams in real-time. nCUBE's Logical Content technology supports seamless streaming of multiple MPEG2 files playing back-to-back with zero black frames and with fast forward and rewind across the boundaries. Logical Content also allows MPEG2 video files to seamlessly switch from in and out splice points switching from one MPEG2 video to another at any MPEG group of pictures (GOP) boundary in real-time while playing from the video server with zero black frames. The files are never compiled into a single static file but are assembled during streaming for each viewer's session. That way an ad can be changed dynamically for targeting, addressability or new schedules. Logical Content is illustrated in Figure 4, below.

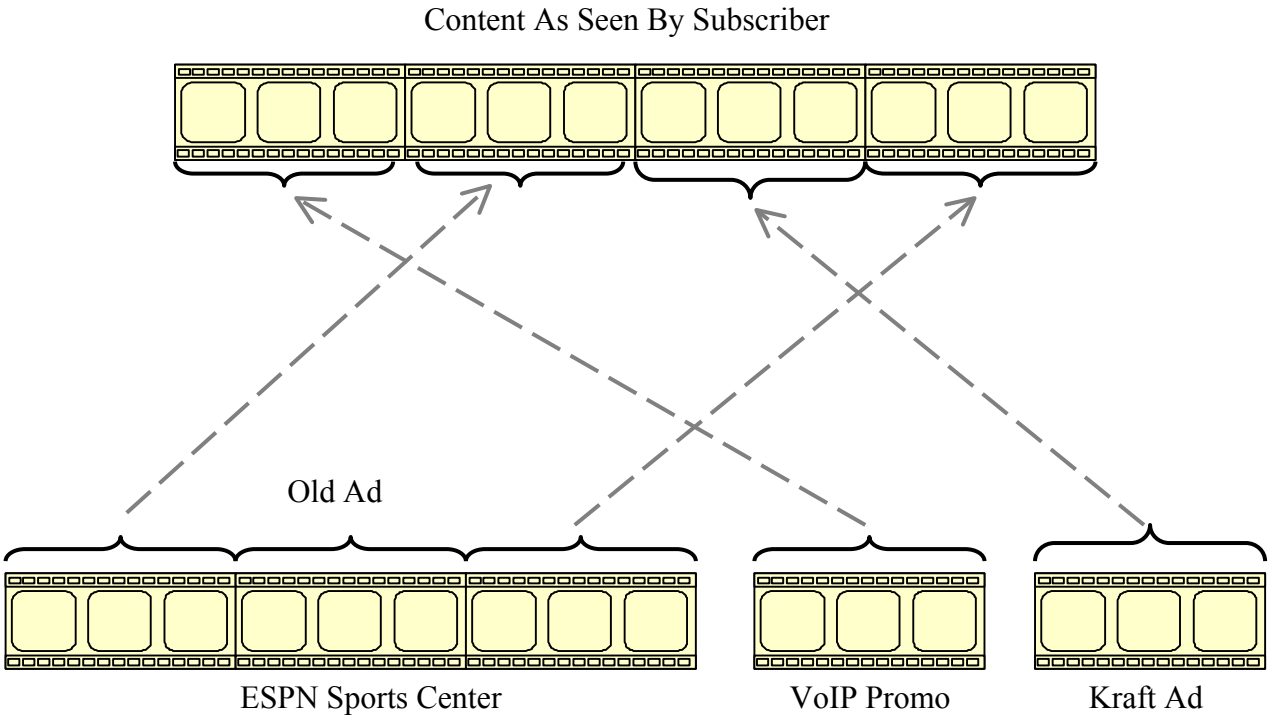

Figure 4. nCUBE's Logical Content technology for dynamic VOD ad insertion with playlists and ad replacement applications.

To create playlists or perform ad replacement, the VOD system needs to perform the following steps during play out after receiving the VOD session set-up request and requested asset ID (which is in the session set-up message):

1. From the asset ID, determine break positions and break length specified in the asset's metadata and synchronize the breaks with the stream position (assuming any cue packets were translated into metadata when the title was loaded).

2. Determine the virtual network based on the criteria discussed in the T&B section, above (e.g. category selected, region where STB is located, etc.).

3. Choose the proper T&B schedule based on the virtual network (e.g. action category in East San Francisco).

4. Select the next ad(s) on the T&B schedules (or start with the first ad on the schedule) so that the ad lengths add up to the break length.

5. Play the ad(s) at the proper splice point using Logical Content technology and return to programming after break (unless the break occurs at the end).

6. Log the ad verification and other reporting data (e.g. advertising, ad name, time, etc.).

Lastly, it should be noted that VOD content is encoded at maximum of 3.75 Mbps with AC-3 audio as specified by CableLabs and that ad sales typically encodes at 4 to 6 Mbps and

may or may not have AC-3 audio (DPI requires AC-3). Although VOD systems can accommodate multiple rates, ads at higher bit rates would require more VOD bandwidth than operators have budgeted in their plant design.

Targeting Ads by Geography

Since a single VOD server may serve a large geographic region, it may make sense to select different ads depending on the viewer's location. It is very common for ad sales organizations to zone their operations today for this purpose. There are two primary applications for targeting ads to different geographic zones within a market: 1) some advertisers, such as a dry cleaner, are only interested in marketing to a particular part of town and do not need to advertise to a wider geographic region, and 2) some advertisers, such as an automobile manufacturer, want to advertise to a wide geographic region but want the ads themselves to be different in different parts of town. This second approach is branded AdTag and AdCopy by Adlink in the Los Angeles market, and others are deploying it now as well. Lastly, regions, or zones, will be defined hierarchically as well. Small zones can make up larger zones and the larger zones can make up an entire market.

Targeting ads to zones can be accommodated in VOD ad insertion by determining the viewer's location and matching it with a schedule for that region. In addition to the process outlined in the previous section about inserting an ad, the VOD system needs to determine the viewer's region prior to step 3 and then use the regional information to select the proper schedule for the proper virtual network. Keep in mind that virtual networks can be defined for regions as discussed in the T&B section of this document.

One way to determine the region is to use the VOD service group information passed to the VOD system in the session set-up request message. The service groups represent geographic regions consisting of about 2,400 digital subscribers based on the example in the section discussing today's VOD system, above. Using service groups, an ad zone can consist of as few as 2,400 digital subs although in practice the zone may consist of multiple service groups combined together. Once the service group is identified, the VOD system needs to associate it with a zone. The VOD system must hierarchically list the zones associated with each service group since smaller zones may be nested in larger zones. The VOD system then needs to choose the zone. This could be done randomly or sequentially.

Targeting ads to geographic regions can be accomplished with VOD ad insertion and today's T&B systems; however, the application pushes today's T&B systems beyond their intent and it is cumbersome. Newer T&B systems, or enhancements to current systems, will surely be required to take full advantage of VOD ad insertion and targeting.

Household Addressability in the Future

Removing the geographic constraints of targeted advertising and addressing ads to specific households dramatically changes the dynamics of TV advertising. Household level addressability combined with the one-to-one TV sessions of VOD provides an ideal ad medium. Advertisers have the potential to deliver their message to households in which their product or service is most relevant (e.g. >$100K income, with kids). One house may receive a diaper ad and their neighbor may receive an ad for heart medicine.

Advertisers can also measure the delivery to each set-top. Household addressability with VOD ad insertion could move TV advertising towards the highly lucrative direct mail business in future.

During a VOD session request, the VOD system receives the STB's unique MAC address, which can be used to select the ad that best matches each household's lifestyle. Existing T&B systems fall far short of supporting this application. Several companies have developed addressable advertising systems and databases for tracking household lifestyle information as part of or as extensions to T&B for household addressable advertising with DPI system. Using these new addressable advertising systems, the VOD system can request the ad to play for a particular STB in real-time through a new software interface. The format for a new real-time T&B interface is not yet standardized but is commonly understood as being needed for this and other applications.

The addressable advertising systems can use a variety of data sources to determine a household lifestyle profile including:

- Qualitative data for neighborhood characteristics
- TV viewing including VOD (quantitative data)
- Household credit card usage
- Grocery store shopping behavior

Based on a variety of factors, theses systems can determine a household profile and can simply tell the VOD system the ad to play. The VOD ad insertion system still needs to know in advance what ad content is needed in order to distribute the ads to the VOD servers, monitor ads and breaks and report back logs. However, today's flat file daily ad schedule currently imported for T&B systems goes away. In addition, verification logs would likely be returned in real-time over a new interface as well.

CONCLUSION

Local ad insertion is evolving to include VOD. This requires support for VOD ad insertion in both VOD systems and ad insertion systems. Local ad sales, cable marketers and content providers can take advantage of VOD ad insertion and both playlists and ad replacement can be used to create new inventory. VOD streams are unique, one-to-one TV sessions with each household giving it tremendous potential for targeting and household addressability.

Operationally, VOD advertising should be an extension of today's ad sales operations and has much of the same workflow, monitoring and general ad sales responsibilities. Existing T&B systems can be used in the beginning but will need to evolve in support of the new medium and make the most use of one-to-one TV. Methods for detecting and describing breaks need to be agreed to and standardized so that content may flow across different vendors' systems and different cable operators.

VOD ad insertion appears to be unique and advantageous for advertisers and ad sales operations in that it has the potential to:

- Use local breaks in VOD content similar to traditional local breaks on broadcast cable
- Create new local breaks before and after VOD content
- Recapture digital viewers watching VOD and not watching broadcast cable
- Support geographically targeted and household addressable ads
- Provide 100% measurable advertising data

VOD advertising and other advanced advertising technologies and business are unique to cable and should be fully exploited. nCUBE is a leader advertising insertion, VOD and advanced advertising today.