DVEO Dynamic Ad Insertion Solutions

Multi-function and Targeted Ad Insertion to Optimize Content Monetization and Advertising ROI

Overview

(Rev 2.3)
Table of Contents

Executive Summary ......................................................... 3

1 AD SERTER IP/ASI/SDI™ .................................................. 4
   1.1 Introduction ........................................................................ 4
   1.2 Ad Serter Key Functionality ................................................. 5
   1.3 Application Examples ..................................................... 6
   1.4 Ad Serter Platforms ....................................................... 7

2 AD SPOTTER™ ................................................................. 8
   2.1 Introduction ........................................................................ 8
   2.2 AD SPOTTER™ Defining Characteristics ................................. 9
   2.3 Key Functionality ............................................................... 9

3 AD SPOTTER – Technical Overview ...................................... 10
   3.1 Components ..................................................................... 10
   3.2 SPOT 35 ........................................................................... 10
   3.3 SPOT Serter ....................................................................... 12
   3.4 SPOT Server ..................................................................... 13

About DVEO® ........................................................................ 14
Executive Summary

As digital video services ("channels", "on demand" content, collectively "programs") make their way from the point of origination to the viewers, there can be any number of reasons for the desire, or even an urgent need, to insert or overlay a program with other content that may be informational. Examples of the latter might be a TV station or network logo, sports results, promotions for programs coming up and, more often than not, commercial advertising. Some of the content is inserted along the way for the purpose of revenue generation, mostly advertising as a means to monetize programming, while some may be mandated by local government, such as emergency alerts in response to an impending natural catastrophe.

Often the content that arrives from a remote location carries ads that are either not relevant to the local viewers or have become outdated. This creates monetization opportunities by offering ad spots for local businesses, and changes the value proposition of the program by enabling insertion of ads that carry relevance for the local region, city or even small town.

Advertising comes in many forms, such as the typical 30-second commercial that is “spliced” into the video stream seamlessly, usually followed by several more commercials, after which the program resumes. There may also be a requirement not to interrupt the program completely, in which case advertising may be overlaid semi-transparently, or positioned around the video (at the top or bottom, L-shaped wrap around, etc.).

It follows that whatever the reason for digital program insertion (DPI), or modification of the original content video stream, a flexible multi-purpose technology is desired to deal with many potential requirements – all of which can occur within the span of a single commercial break.

A special category that allows for extremely high advertising rates is live TV broadcasts of sports events, which has become the most valuable content as ardent fans vicariously battle along with their favorite teams. It is possible to maximize content monetization during the event itself since sports fans’ expenditures are elastic.

In order to maximize revenues, advertisers require highly targeted Ad Insertion platforms to increase the success and return on their expenditures. Modern video delivery networks can purchase data that determines a viewer's geographical location and the type of device used for watching. This and other demographic data presents opportunities for multi-criteria targeted advertising, an opportunity for higher revenues all around.

Truly sophisticated live content creators may wish to insert ad spots based on the program context. Due to the nature of live events, programs may not always be broadcast as originally scheduled. Live sporting events can be extended, sometimes unpredictably, due to factors such as extra time, "sudden death", penalty kicks, etc. Based on a traditional static schedule, it would not be possible to capitalize on these additional opportunities for higher revenue sports advertising. In these cases the flexibility of manual ad insertion is desirable.

Advertisers are also interested in targeting commercials to specific regions and user groups. While traditional Ad Insertion systems use regional ad insertion technologies, all viewers are still presented with the same ads.

The trend toward watching live content on mobile devices, and as IP-based video delivery is becoming ubiquitous at home and while on the go, a more sophisticated advertising campaign may utilize a viewer's geo-location and other information available from the mobile device to deliver highly targeted ads.

DVEO always works closely with its customers to capture needs and requirements for next-generation systems. As will become evident in this document, DVEO has developed ad insertion solutions in response to real customer requirements in order to provide a flexible targeted ad insertion framework, which breaks away from the static schedule norm towards a more dynamic operational mode.

DVEO offers two major products to optimize content monetization and advertising ROI, the AD SERTER and the AD SPOTTER. Both solutions are integrated with DVEO’s encoding/transcoding, streaming and media server products, enabling the creation of advanced, yet affordable, end-to-end content delivery solutions.
1 AD SERTER IP/ASI/SDI™

1.1 Introduction

As digital video services (“channels”, “on demand” content, collectively “programs”) make their way from the point of origination to the viewers, there can be any number of reasons for the desire, or even an urgent need, to insert or overlay a program with other content that may be informational. Examples of the latter might be a TV station or network logo, sports results, promotions for programs coming up and, more often than not, commercial advertising. Some of the content is inserted along the way for the purpose of revenue generation, mostly advertising as a means to monetize programming, while some may be mandated by local government, such as emergency alerts in response to an impending natural catastrophe.

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It follows that whatever the reason for digital program insertion (DPI), or modification of the original content video stream, a flexible multi-purpose technology is desired to deal with many potential requirements – all of which can occur within the span of a single commercial break.

The DVEO Ad Serter IP/ASI/SDI™ family of products is a cost-effective, software-based platform that combines splicing with advanced video transcoding functionality, offering insertion of video clips, ads, graphics, text, and logos anywhere into live or stored content in real-time without manual intervention. Ad Serter IP and ASI works by decoding the MPEG transport stream, overlaying the graphics, and transcoding the result.

Traditionally in North America, splicing local advertisements into live streams requires a playout source and SCTE-35 based “ad splicer.” Ad Serter combines the source and splicer, plus an SCTE-35 decoder. In other parts of the world, ad initiation arrives via IP or R-S485 signaling. Traditional platforms use SDI signals to provide graphics solutions.

<table>
<thead>
<tr>
<th>Live Presentation</th>
<th>Splice Trigger Received</th>
<th>Next Ad Inserted</th>
<th>Back to Live view</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:37:00 to 10:43:00 AM</td>
<td>10:43:01 AM</td>
<td>10:44:01 AM</td>
<td>10:45:01 AM</td>
</tr>
</tbody>
</table>

Figure 1: Seamless Ad Insertion - Splicing with SCTE-35 or other Ad Triggers

Employing powerful Intel® Xeon® based hardware and a modular multi-functional Linux based software platform, Ad Serter works in both the uncompressed and compressed video domains, thus eliminating the need for additional decoders and encoders and making the solution highly cost-effective.

Moreover, traditional ad splicers do not allow for last-minute alerts or scrolling text on top of the video. With the Ad Serter, last-minute content can be added, such as static or scrolling text or even a .png image on top of the video. As creating commercials is an expensive process, this potential for last-minute dynamic ad insertion helps advertising clients get the maximum out of their campaigns while maximizing operator revenue. Ad Serter also features ad inventory management with “as-played” reporting for Traffic & Billing Systems.
1.2 Ad Serter Key Functionality

- Inserts or overlays graphics, video clips, logos, CG, scrolling text, and emergency alerts into live and stored video feeds on a schedule or via signaling like SCTE-35
- Supports both High Definition and Standard Definition, MPEG-2 or H.264
- Static, rotating, flipping, or blinking graphics, logos, and text
- Drag-and-drop, scheduled play-out or via Cue Tones (SCTE-35)
- IP, ASI or SDI/HD-SDI inputs/outputs
- Inserts content in 1-30 IPTV, cable TV or on-air TV channels
- Evergreen Schedule Player – When input is lost, it plays pre-recorded “evergreen” content
- Play-out Server with Logo, Alert and Crawl Insertion
- Browser-based GUI
- Master Server controls up to 100 Ad Serter servers (2,000 channels) at different physical sites
- Auto Import Schedules – Supports Traffic & Billing System generated schedules
- Auto generation of “As Run” (as played) logs
- Cloud based ad files transcoder
- Auto scheduler fills empty schedule slots by promo spots
- SCTE-35 generation to provide DPI Cueing Messages for downstream AD Serters or DPI equipment
- Programmable PID Mapping to remove unwanted audio tracks from output
- MPEG-2 or H.264 transcoder with video scaling
- Supports multi language, Unicode fonts
- 1:1 Redundancy with automatic failover using e.g. the DVEO StreamWatch IP/48™

![Ad Serter Key Functionality Diagram](image)

Figure 2: Examples of Ad Serter Versatility

The Ad Serter is available in both broadcast and telco version, combining network interfaces.

<table>
<thead>
<tr>
<th>Ad Serter – IP/ASI 1ch</th>
<th>Ad Serter – SDI/IP 1ch</th>
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</thead>
<tbody>
<tr>
<td>Ad Serter – IP/ASI 2ch</td>
<td>Ad Serter Telco IP/IP 1-30 Programs – SD</td>
</tr>
<tr>
<td>Ad Serter – SDI/HD-SDI 1ch</td>
<td>Ad Serter Telco IP/IP 1-30 Programs – SD + HD</td>
</tr>
</tbody>
</table>
1.3 Application Examples

Figure 3: Ad Serter Telco IP/IP Multi-screen Architecture

Figure 4: Ad Serter Telco IP/IP

Figure 5: Ad Serter + Emergency Alert System
### 1.4 Ad Serter Platforms

**Figure 6: Example of Emergency Alert System Message**

**Figure 7: Multi-function Ad Serter Example**

**Figure 8: Management Console with EAS Scheduler**

**Figure 9: Ad Serter SDI (1 RU)**

**Figure 10: Ad Serter SDI – Rear**

**Figure 11: Ad Serter Telco – Rear**
2 AD SPOTTER™

2.1 Introduction

Privately held TV broadcasters ("networks") rely on advertising to finance content. For obvious reasons, live sports programming has become the most valuable content as ardent fans vicariously battle along with their favorite teams. It is imperative to maximize content monetization during the live event – the value diminishes rapidly later.

In order to maximize revenues, advertisers require highly targeted Ad Insertion platforms to increase the success and return on their expenditures. Modern video delivery networks can purchase data that determines a viewer's geographical location and the type of device used for watching. This and other demographic data presents opportunities for multi-criteria targeted advertising, an opportunity for higher revenues all around.

The traditional Ad Insertion platforms use analog cue tones or SCTE-35 (Digital Program Insertion Cueing Message for Cable) standard triggers to insert spots into the live stream. These platforms operate on pre-scheduled Ad Insertion, where spots are played using relatively static and inflexible schedules.

Truly sophisticated live content creators may wish to insert ad spots based on the program context. Due to the nature of live events, programs may not always be broadcast as originally scheduled. Live sporting events can be extended, sometimes unpredictably, due to factors such as extra time, "sudden death", penalty kicks, etc. For example, a soccer game might extend into overtime and thus start using a time slot that was originally scheduled for another type of program. The time and ad spots available for sports advertisers thus increase. Based on a traditional static schedule, it would not be possible to capitalize on these additional opportunities for higher revenue sports advertising. In these cases the flexibility of manual ad insertion is desirable.

Advertisers are also interested in targeting commercials to specific regions and user groups. While traditional Ad Insertion systems use regional ad insertion technologies, all viewers are still presented with the same ads.

The trend toward watching live content on mobile devices, and as IP-based video delivery is becoming ubiquitous at home and while on the go, a more sophisticated advertising campaign may utilize a viewer’s geo-location and other information available from the mobile device to deliver highly targeted ads.

The DVEO AD SPOTTER™ is a multi-criteria ad management platform for end to end delivery. It utilizes multiple approaches to determine the type of live content in progress, and information about the viewer to dynamically select ads to maximize revenue. AD SPOTTER generates SCTE-35 and cue tones with content type information, interprets SCTE-35 information and the viewer’s receiver data, and then inserts user targeted ads seamlessly.

When the content creator or originator is not involved in this process and the SCTE-35 content type parameter is not available, DVEO incorporates other techniques to identify content type. These techniques could involve the analysis of program guide, closed captions, and face, image and video recognition of the live video signals.
2.2 **AD SPOTTER™ Defining Characteristics**

Content and Viewer based Targeted Dynamic Ad Insertion is the focus of DVEO’s new high-end, multi-dimensional advertising platform AD SPOTTER that utilizes both content and viewer information to make decisions about the actual “advert” played out to any viewer.

Today there is a copious amount of information available about both content (in the form of metadata) and the viewers (e.g. consumer behavior and preferences, etc.). Advanced ad systems may combine content type, consumer profiles, and geo-location data by “mining” multiple data bases that contain this information, but the question then is “what to do with that information, and which is more important than the other?”

AD SPOTTER actually combines the content types already mentioned, in real-time, and then lets the operator determine the dynamics of weighing these information repositories and creating better “Targeted Ads”.

![Dynamic Ad Insertion Diagram](image)

**Figure 14: AD SPOTTER - Multi-criteria Targeted Ad Insertion**

In addition to providing the adverts, AD SPOTTER also provides very flexible ad initiation options. Ads can be initiated via almost any mechanism, such as SCTE-35, IP messaging, scheduled or manual triggering.

Moreover, AD SPOTTER can insert ads inside, overlaid, or around the video content via slices, overlays, crawl messages, alert bugs, and video squeezes.

Just as important as the ads, AD SPOTTER created streams are designed to be transmitted via HTTP Live Streaming (HLS) protocol and other modern delivery mechanisms.

Standards such as SCTE-35, SCTE-118, and SCTE-130 are basic ways to provide Program Specific Ad Insertion. Standards based implementations have both advantages and disadvantages. As advertisers and networks demand more sophisticated features, a standards based approach may limit what can be achieved. DVEO adopts a pragmatic approach by adhering to standards when available, and when the customer so prefers. Where customer requirements go beyond standards, or the cost of the standards based approach would exceed available budget, DVEO provides practical and affordable solutions to meet immediate customer needs. Compliance with standards at a later date is always possible when practical and desired.

2.3 **Key Functionality**

- Targeted, dynamic multi-criteria, multi-stream HLS Ad Inserter
- Combines content type, viewer profile and geo-data by "mining" multiple data bases in real-time
- Ads inserted inside, overlaid or around the content via slices, overlays, text crawls, alert bugs, and video squeezes
- Ads initiated via various mechanisms, e.g. SCTE-35, Contact Closure, IP messaging, scheduled or manual triggering
3 AD SPOTTER – Technical Overview

3.1 Components

The AD SPOTTER provides three components to carry out the aforementioned tasks:

1. **SPOT 35** – Transcodes content and inserts SCTE-35 with metadata required for Ad Insertion
2. **SPOT Sertser** – Interprets SCTE-35 commands and prepares live streams with multiple ad combinations
3. **SPOT Server** – Serves user targeted streams to viewers

AD SPOTTER communicates with Network, Affiliate and MSO databases regarding content type, business rules, and distributor profiles.

![Diagram](image)

From the diagram shown above, there are two parallel data paths:

a) Video streams containing data in SCTE-35 packets, and 

b) Other data, such as spot file information, is delivered out of band by the network.

The following describes each component in more detail.

3.2 **SPOT 35**

SPOT 35 is an SDI to IP/ASI transcoder and SCTE-35 Creator and Inserter. It offers three possible inputs for the live program content:

1. HD-SDI
2. ASI MPTS or SPTS
3. IP MPTS or SPTS

For creating and inserting SCTE-35, SPOT 35 uses contact closure or SCTE-104.

To be compatible with mobile devices, an H.264 codec for video and AAC codec for Audio is recommended. MPEG-2 and AC-3 audio codecs are also supported, but require more transcoding when delivering to mobile devices and to certain set top boxes.

The SCTE-35 configuration file is XML based and it specifies:

- Pre-roll Delay
- Program Genre Type
- Tier / Zone
- Ad Type for given zone

There are ways to provide different SCTE-35 commands to different zones/tiers. One approach uses a common PID, which is received by all. Another approach uses Multiple PIDs and each zone looks for the PID assigned to it. The resulting ASI output is passed on to the modulator for transmission via satellite, while IP output can be passed to the network or to the cloud.
Dynamic Ad Insertion

DVEO's "DOZER™" technology provides UDP Automated Packet Recovery and can be used to send signals to MSOs, IPTV operators, affiliates, or regional head ends.

Figure 15: SPOT 35 at Network / Content Creator
3.3 **SPOT Serter**

SPOT Serter receives signals via IP or ASI through satellite receivers or IP networks. If a DOZER is used at the network to transmit IP, a receiver DOZER is required at the Affiliate as well.

![SPOT Serter Diagram](image)

**Figure 16: SPOT Serter**

SPOT Serter inserts local emergency alert messages provided by the Affiliate, which can also insert local "bugs," channel lineups, and other graphical resources. It has an Emergency Alert Messaging system that is independent of SCTE-35 signals.

Spot Serter identifies SCTE-35 commands, matches the commands’ Tier data with its own Tier ID, and if the IDs match, it looks for Ad Type. The following Ad Types are supported in addition to traditional video commercials:

- **Static Alert** – This can be a short on-screen message, e.g. “Program Sponsored by [Company Name]”.
- **Crawl Message** – This can be a short Crawl message in the lower third e.g. “30% off at [Shop Name] when you mention [Sponsor’s] Promo code”
- **L-Squeeze** – This can be L-wrap graphic like a well-known TV manufacturer’s sponsor ad seen at many airports. Here the live video is scaled so as not to lose any content elements.
- **X, Y position, font information, and duration information are either specified by the Network or can be left to the Affiliate. These parameters are defined in an XML based configuration file.**

SPOT Serter prepares streams based on Program Type. For a given program type, different Zones or different profiles may be delivered ads based on their profile. SPOT Serter prepares streams for all possible combinations. If delivery to mobile devices is required, adaptive bitrate encoding is performed and multi-bitrate streams are prepared after which they are loaded into the SPOT Server.
3.4 SPOT Server

The SPOT Server is located at an Affiliate’s site for a small number of local users. It can also be located at a CDN for larger number of users. DVEO can potentially also utilize non-DVEO ad servers in place of the DVEO servers.

The SPOT Server is connected to SPOT Server via high bandwidth UDP capable Internet connections. A DOZER can be applied at the output of SPOT Server and at the input of SPOT Server to achieve error free real-time video connections.

SPOT Server has access to all possible SPOT Server generated streams required to address different user groups with targeted ads based on the content type.

When an HLS-capable device requests HLS content streams, Ad Server analyzes the player’s location, type, and user profile (if available). Based on the pre-defined matrix of user type and associated ad types, the right target stream is served to the player. When SCTE-35 is present in the live stream, the ad inserted in the user’s content stream matches the user’s profile. SPOT Server then delivers content and viewer based advertisement to live TV viewers.

The SPOT Server platform is designed to serve up to 300 devices/streams concurrently and it supports the HLS adaptive bitrate protocol. For higher number of streams, other DVEO server solutions can be integrated with the SPOT Server.

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Figure 17: SPOT Server at CDN or VPN Supporting Multicast
Overview
DVEO® is a privately held entity headquartered in San Diego, California, since 2001. DVEO develops and sells broadcast quality video encoding and streaming products, media servers and ad insertion solutions to leading broadcasters, telco TV/OTT and cable operators around the world. DVEO also designs and manufactures professional video products for OEM sales, and it is a private label marketer for a variety of complementary products from well-known corporations.

Vision & Mission
Our vision is to offer innovative and affordable digital video and telco TV grade products for IPTV, OTT, cable and broadcast applications that anticipate the evolving needs of progressive service providers and OEMs globally.
Our mission is to enable deployment of high-quality and easy-to-use, yet affordable solutions that enhance our clients’ profits and success by reducing CAPEX and OPEX, coupled with outstanding post-sales support. Since the launch we have focused on fostering long term relationships and this client-first attitude has positioned us as a trusted solutions provider for customers of all types.

Market Approach
In addition to direct sales to video operators of all types, complemented by indirect channels, DVEO provides OEM solutions that shorten time-to-market while reducing project risk and cost. Product volumes range from single and custom units, to thousands of units a month to meet dynamic customer requirements. Above all, we pursue long term partnerships with our customers for sustained mutual benefits.

DVEO continuously pursues advanced R&D efforts in key technologies for IP video and communications, while utilizing formal and de facto industry standards whenever possible.

Product Range
DVEO provides broadcast-quality IP video encoders and transcoders, decoders, media servers and ad insertion solutions, together with patent pending and award winning IP gateway technology ensuring error-free real-time video delivery over UDP. The DVEO solutions enable multi-screen service delivery to any device, anytime, anywhere in the world. Deployment models include turnkey installations and cloud-based service delivery.

All solutions are built on Linux OS and Intel Xeon-based platforms to ensure 24x7 reliability, and feature DVEO-developed software for maximum flexibility and upgradability, ensuring long term investment protection.

These ultra-reliable products are matched by valuable pre-sales consultancy, outstanding post-sales service and support, and – not least – unusual affordability.

Worldwide Customer Base
Customers include, among else, ABC, CBS, Fox, NBC, PBS, Sinclair Broadcast Group, Time Warner, Arris, Cisco, Harmonic, Intel, Lightsquared, and Sony. In fact, most major broadcasting organizations worldwide have become our valued customers over the years, together with trail-blazing IP video operators. From traditional broadcasting to the demands of leading-edge IPTV and OTT, we stay at the forefront of the digital and IP video revolution to ensure that our customers can improve their competitive positioning and market share.

Contact Us
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