A New Approach to Localized Advertisement Insertion

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1. Introduction to Ad Insertion

Ad insertion is the process of overlaying certain national advertisements with more targeted, local ads in live channels. Broadcasters, cable operators and IPTV providers are keen to fully capitalize on the profitability of local ad insertion; advertisers aspire to get closer to more targeted end users. Although local ad insertion is already a successful business model for various operators, numerous broadcasters and cable multi-system operators (MSOs) are held back from fully realizing the potential of ad insertion due to the costly capital expenses (CAPEX) associated with legacy technology ad insertion infrastructures.

When local ad insertion was first introduced, a localized infrastructure model dominated the industry, and it continues to be the standard today. However, that model is becoming obsolete. Recent technical advances in several key areas, specifically in the areas of cloud computing and video processing, are creating an opportunity to dramatically reduce the CAPEX and operating expenses (OPEX) of ad insertion systems.
2. Demand for a More Effective Ad Insertion Solution

In the mid-1990s, the dawn of digital storage prompted the first computer-based ad servers. Digital storage revolutionized TV and spurred the growth of computer-based ad insertion products. The invention of the DVD, which stores video compactly at good quality using MPEG-2 video compression was also revolutionary. MPEG-2 was widely adopted by the TV industry and facilitated the streaming of digital TV via radio, satellite, cable and the Internet.

TV is also broadcast via antenna masts, which allow smaller operators to supply TV to targeted areas that would be uneconomical for larger broadcasters to service. These smaller operators source content from larger cable networks and TV channels, creating an opportunity to insert ads targeted at local demographics. These local ad insertion markets are referred to as direct marketing areas (DMAs).

To service DMAs, operators set up head-ends to distribute content locally and insert local advertising into digital TV streams. These head-ends serve as the transmission points of a localized ad insertion infrastructure. In a localized ad insertion infrastructure, an MPEG transport stream carrying many channels from content providers is created for an operator. The program content includes ad breaks. An operator targets when local ads will be spliced into the program content. Then at the MSOs, local ads are spliced in, replacing the national ads that come with the content, according to a schedule set by the operator.

This costly ad insertion infrastructure forces broadcasters, cable operators and IPTV providers to consider new methods of ad insertion management, and the next step in the evolution of ad insertion technology.
3. Current Solutions

Local ad Insertion is currently performed by employing a traditional broadcast equipment chain that includes the following functional modules:

- AD CONTENT INGEST
- ENCODING / TRANSCODING
- AD SERVER
- AD SPLICER
- DATABASE SERVER
- TRAFFIC & BILLING

Each of these modules (except for the ad splicer) is typically an application running on a PC-based server. Usually, two of each device are purchased to provide redundancy in case of hardware failure. Each module also incurs operational costs for power, cooling, maintenance, warranty, and repair.

The ad splicer module is unique for several reasons. First, it must be physically present at a local head-end in order to interrupt program content and insert the local advertisements. Because it performs this operation in the compressed domain (MPEG), it has traditionally required a powerful specialized hardware platform.
Today, for most MSOs, bandwidth optimization is crucial. Thus, increasingly efficient statistical multiplexing, or StatMux technology, is often used in order to meet the end users’ demand for the highest possible picture quality while maximizing the number of channels broadcast. StatMuxing takes advantage of the bursty nature of compressed video. Since MPEG compression exploits redundant information in consecutive video frames to compress the content, it results in peeks and dips in the required bandwidth corresponding to the program content.

Very little bandwidth is required to carry program segments when little changes from frame to frame, such as a person sitting at a desk. Conversely, program segments with rapid action, such as some sporting events, require a spike in bandwidth. Rather than dedicate fixed bandwidth to each program (constant bitrate or CBR), many MSOs use variable bitrate (VBR) encoding, allowing the StatMux to allocate bandwidth to channels dynamically, in real time, based on supply and demand.

While StatMuxing is an elegant solution for MSOs, it creates a challenge for ad splicers performing local ad insertions into streams. Ad splicers must insert statically encoded ad files into dynamically varying streams. The solution is that ad splicers must also perform trans-rating of the program in order to dynamically adjust the bitrate as required. This solution has two major consequences. The first is that trans-rating drives up both the cost and complexity of ad splicer hardware. The second is that because of the time constraint of live streams, real-time trans-rating induces a reduction in image quality when compared to normal distribution encoding.

Cloud computing, by definition, is the sharing of resources to achieve coherence and economies of scale over a network. Cloud computing is a service, rather than a product, where information is provided to devices as a utility (similar to an electricity grid). Clouds can be public, private or hybrid. Cloud computing centers on maximizing the efficacy of the shared resources. Cloud resources are often shared by multiple users as well as dynamically reallocated per request. Maximizing computing power reduces the environmental footprint because less power, air conditioning and rack space are needed to run systems.

Additionally, cloud computing provides multiple users access to a single server to retrieve and update data without the purchase of licenses for separate applications. Migrating to the cloud allows users to move away from a traditional CAPEX model (buy the dedicated hardware and depreciate it over time) to an OPEX model (pay for cloud computing as a service). Cloud computing allows companies to avoid upfront infrastructure costs, and paves the way for solutions that provide future-proof technology, which continually increases efficiency.

If we consider the highly inefficient traditional broadcast equipment chain described above, it is easy to see how moving these functions into the cloud can dramatically reduce the costs and complexities of the solution. Most of these legacy server-based functions (transcoding, content storage, and database) are ideal candidates for a cloud computing service solution. Furthermore, redesigning the traditional broadcast equipment chain to work within the cloud will actually increase the reliability and performance of the overall solution. This is because cloud service providers (such as Amazon) deploy sophisticated architectures and tools to control and monitor their network and ensure service-level agreement (SLA) compliance.
5. Vigor Systems® Advertio® Plus

Vigor Systems has developed the ad insertion-as-a-service based on our extensive experience in both cloud computing and ad insertion. Vigor ad insertion-as-a-service relocates all of the legacy broadcast modules to the Vigor Cloud. Only a single device, the Advertio Plus, remains located at the broadcast head-end facility.

The Advertio Plus is a combined ad server and splicer. It connects to the Vigor Cloud service via a standard Internet connection. All control and monitoring of the Advertio Plus is performed via an access portal, which is also hosted in the Vigor Cloud. Once running in the cloud, these services are priced as a subscription-based service model; MSOs no longer need to purchase and maintain a rack of servers.

This seems like an ideal solution – but what about the complexity of insertion into StatMux environments?
6. Vigor AdCoder™

To solve the complex problem of insertion into a StatMux environment, Vigor Systems has developed a proprietary technology: the AdCoder, a cloud-based pre-processing of content that does not require expensive and complicated hardware. AdCoder preserves the maximum image quality of the ad without altering any of the other programs in the multiplex.

AdCoder leverages the power of cloud computing. Rather than trans-rate the video in real time in a powerful device at a head-end, AdCoder pre-processes the ad files in the Vigor Cloud. The ad files are enhanced with ancillary data. This ancillary data contains information that enables the Advertio Plus to trans-rate the content in real-time. The extensive video processing is performed in the Vigor Cloud, where computer power and storage are abundant, scalable, and cost effective.
7. Conclusion

Cloud computing is having a disruptive impact on many existing business models, and local ad insertion is no exception. Vigor Systems has leveraged the power and advantages of cloud computing, and combined them with some clever video processing technology, to fundamentally change the cost model for doing local ad insertion. Ad insertion can now be purchased as a service, eliminating the need for costly CAPEX. This elimination results in an immediate return on investment for operators, a reduction in overall costs, and an increase in reliability of operations.