Summary

Television advertising is on a forced march towards complete household addressability. Digital/OTT advertising (Hulu, YouTube TV, SlingTV, DTV Now) has been addressable from day one – each consumer sees ads that are targeted to a specific profile to which they belong. Traditional television advertising, on the other hand, is not addressable because of the very nature of television itself. It is a broadcast medium, so everyone watching the programming sees the same ads.

The core subject matter of this white paper is delivering Universal TV Addressability. This means that any household watching a live broadcast, on any TV platform, can see household targeted ads. Addressable advertising is highly attractive to advertisers as it allows them to pick the audience and deliver Ads specifically tailored to that audience. It is therefore much more efficient, and also delivers something else which traditional television advertising cannot: near real-time feedback on which households watched what content.
Current State & Constraints

There is already some addressability in traditional television. For example, two direct-to-home (“DTH”) operators in the U.S. – DirectTV and DISH – have implemented technology from Invidi Corporation (co-owned by Dish and AT&T) that utilizes the DVR functionality in the set-top-box (“STB”) to deliver ads on an addressable basis to more than 20 million households. However, this addressability is limited in two material respects:

1) It is limited to the two minutes per hour of advertising inventory (“local avails”) granted by the cable networks under their affiliation agreements. There is no addressability currently available for the big four networks – ABC, CBS, FOX and NBC – nor any of the national cable networks.

2) It is limited to only those STBs with specific technical capabilities (typically newer units).

While these business constraints have historically limited the type of addressable inventory to the MVPD affiliate inventory, expect all MVPDs to expand their support for Universal Addressability. Combine this with smart TV OEMs moving to support similar functionality... suddenly management of addressable TV becomes an industry-wide issue. The ability to expand the addressable TV footprint to all linear TV inventory is now within reach. However, scaling this business to empower all types of TV ad inventory will involve some more advanced approaches to controlling which ads are enabled, how the insertion process is managed, and how the targeted ads are stored on the smart STB, smart TV or other TV device – a.k.a. Universal Addressability.

A Look At The Underlying Technology: Pros & Cons of ACR

Early addressability initiatives mostly used Automated Content Recognition (ACR) software – think Shazam for TV. These approaches involved real-time ad detection of either watermarks (early ATSC 3.0 ad watermark trials) or fingerprinting technology (e.g. Sorenson real-time fingerprinting initiative) This rather simple solution involved real-time identification and replacement of the appropriate broadcast ad with a targeted ad previously stored on the TV STB or smart TV. Issues encountered included:

- Imposed delay in the broadcast required to identify and replace the ad
- Difficulty in detecting channel change during the targeted ad playout
- Difficulty in recognizing fast forward mode on different types of playout devices
- Getting splicing to be truly frame accurate
- Forecasting and sufficient pre-loads of different creatives required by different inventory owners
- Management of full pods and use-of-slates in non-standard durations
- Scalability of ad cache required to support the diversity of inventory owners in live linear TV

As we have learned about the single unit, real-time limitations of ACR-based dynamic replacement, it is clear that we have to expand our capability to a more intelligent control based approach that allows for as much advance notification and large-scale shared cache management.
The reality is that solving the use case for one primary addressable ad is relatively simple. However, we need to expand the problem set to include:

- The ability to predict and control which ads in any given show should be replaced or enhanced
- The ability to forecast which creative should be present in the TV or STB with sufficient advance notice to properly cache the correct ad creative.
- The need to get the clock right (meaning the new ad starts exactly where the old ad was) and perform frame-accurate ad splicing
- Not add any discernible latency to the live broadcast (especially sports)
- Efficiently manage a shared cache of ads with a common naming convention
- The ability to provide common control instructions to all broadcast distribution options including OTA, MVPD classic systems, ATSC3.0 and even OTT streaming services
- Amazingly, also coordinate between all the potential smart devices to ensure that "replacements of replacements" does not occur

**Building A Better Infrastructure: Addressable 2.0**

Next-generation concepts like Project OAR (Open Addressable Ready) are based on a flexible and informed concept of having the STB's and/or smart TV communicate, real-time, with the broadcast control systems of the various types of inventory owners. In this scaled model, upon “tune-in” (a.k.a. the consumer changing the channel or selecting the show) that data is sent to the device, either in-band (channel-based universal frame watermarking) or out-of-band signaling (Internet-based package of control data) that provides a more complete landscape of addressable ready inventory coming up.

In addition, early communication on what creative replacement units are needed, and what enhancements to the broadcast stream might be allowed (overlays, squeeze-backs, or other new types of inventory). Finally, rules about which device has rights to manage the addressable functionality. (e.g. a smart STB connected to a smart TV). Beyond painting a more complete picture of the inventory required, this approach also allows the smart TV device to secure any missing creatives that might not already be in cache. This logic can be applied to today's Over the Air Signals (ATSC1.0), any cable or satellite signal, and even the future planned ATSC 3.0 signal. In addition, for OTT services like Hulu, YouTube TV and SlingTV, these instructions will be implemented by the server side ad insertion, but will be consistent with the other broadcast outlets. Objective achieved; common advanced advertising across all distribution channels.
Control, Clock, Cache: Seamless Insertion/Replacement Across Multiple Platforms

The major challenges associated with achieving Universal Addressability can be broken down into three main categories: Control, Clock and Cache. We will first discuss each of these three categories in a little detail and then offer practical solutions to each.

In traditional linear TV, there are typically around 44 minutes of programming and 16 minutes of ads and “other stuff” (channel promos, public service announcements, etc.). National broadcast and cable networks control roughly 80% of the inventory, and 20% are controlled either by local station or MVPD affiliate (Comcast, DirecTV, Dish etc.) owned inventory. So under Universal Addressable Ready, MVPDs and smart TV distributors will have to worry about enabling national broadcast network inventory, local station inventory, and national cable network inventory. You can imagine that the business issues are even more daunting than the technical issues!

However there are also other inventory owners like daytime syndicated television studio inventory (Judge Judy, Ellen, Wheel of Fortune, etc.) and the emerging “Diginets” (GetTV, Bounce, etc.). The interesting part is that for addressable TV to get off the ground, some of the non-Nielsen rated networks and inventory typically bought by direct response advertisers may be where early addressability initiatives could have the most immediate impact. In any event, our objective is to make all ads “addressable-ready,” using an open standards approach and let the inventory owner’s work with their advertisers to scale the business.

Of important note; Nielsen is working feverishly to make C3/C7 broadcast inventory “addressable friendly.” This involves an arcane set of issues revolving GRP program measurement and how incremental addressability must be incorporated. The industry needs to support that effort if for no other reason it frees up large volumes of TV inventory for the national TV nets of all kinds.
Control: Inventory Owners Signaling Which Ads are Replaceable with What Creative

The solution for solving the advance notice problem is actually quite simple. When the consumer changes the channel, the inventory owner(s) need to communicate with the smart device on which ads are addressable. This involves up to three or four inventory owners communicating with the connected device with which ads are addressable, where the creative is, which ad decision system has control, and which smart device will do the deed! (See.. it’s simple!)

Waiting for the ad to show up in order to start this process is simply too little too late. Given that a substantial number of households have smart TVs that are connected to the internet, this is actually a relatively well-understood process. Web pages are compiled in a similar fashion billions a times a day… only in this case, the TV show cannot wait for the ad to load or for the live broadcast to be delayed. And since the smart TVs currently have limited cache that cannot pre-store all the relevant creative, this process has to be optimized and as much notice must be given to the smart TV as possible.
Clock: The Ability of a Smart Device to Splice the New Ad at Exactly the Right Time

The seamless insertion of advertising into a broadcast television signal requires accurate timing information (i.e. when exactly should the consumer device switch away from the broadcast and for how long). Ideally, this should be specified in frames since television signals have a very precise number of frames per second. A broadcast ad break will therefore consist of an exact number of frames (at the same frame rate) that must be replaced at exactly the right points if there are to be no discontinuities apparent to the viewer.

Determining the precise timing information required (e.g. ensuring the “clocks” in the devices are synchronized with master control) in advance is key since downstream devices need time to prepare for a seamless insertion. Different devices need different information at different times. For example, an STB will typically require four seconds notice of the exact start time whereas as a smart TV can execute a switch with one frame’s notice. The amount of time in advance that the ad creatives need to be loaded into the cache can also vary dramatically. For example, some devices have a very large cache (i.e. DVRs) while others (i.e. smart TVs) have very limited cache. This means that some devices have a limitation on how far in advance ads can be loaded (as in “no earlier than”) while some devices have limitations described in terms of “no later than” because they have very little bandwidth available to load ads (i.e. DVRs over satellite).

The ONLY system that has ALL the timing information ANY device could require is the broadcast playout/origination system – also known as the broadcast automation system or master control. In particular, if the precise start-time information is not extracted from the broadcast automation system directly there is no alternative but to delay the broadcast so that the information can be determined (e.g. by using ACR technologies). ACR is an imperfect solution, not only because of the delay required to recognize that an ad break has started, but also because it requires pre-processing of the ads.
With broadcast automation integration, the advance notice can be minutes or even hours – with ACR, the advance notice is limited to seconds since it is not practical to delay the broadcast by minutes for everyone.

If we assume that a broadcast automation integration is required (and we should), we now need to solve the problem of communicating the timing information to ANY consumer insertion device (i.e. STB or smart TV) in a manner that cannot be tampered with or which does not broadcast the location of the ads to everyone AND which does not require a delay in the broadcast.

There are several options out there for clock synchronization, but the trick will be to ensure that the viewer has no idea that an addressable ad was delivered to them because it was a seamless and frame accurate solution!
Cache: The Case for Shared, Predictive, Open Cache (SPOC)

While streaming services manage addressable ad insertion in the cloud, all broadcast platforms must do ad insertion at the individual device. While many smart TVs are connected to the Internet, they currently require some amount of ad caching. And typically most of these smart TVs don’t have the extra memory to pre-cache all the required ad inventory. So until the world of television is entirely IP-based (if ever) there will need to be a shared cache model for connected TVs. The SPOC model involves:

1. **Shared Cache** – This means that the ad replacement inventory on the STB or smart TV has to work across all networks, distributors, and other inventory owners. ABC does not get their own copy of a Toyota ad, but rather it is a common copy that can be played out on multiple outlets.
2. **Predictive** – Based on opt-in permission secured by the device owner (either MVPD or CE Company) some form of informed pre-caching needs to be present. This means that we can store in advance targeted ads that are likely to be played to any given household
3. **Open** – This functionality is not controlled or restricted by any given advertiser, network, or third party. However it is likely that the MVPD or CE Player will control the management of the cache and associated rules and functionality.
4. **Cache** – Standard ad naming (Ad-ID) and formats should be enforced for the cache. No one really competes on technical standards and TV has always been a common standard type medium. No reason to change now.

Below, ironically, if you look at the four different ways American broadcast TV will be distributed, only the OTT streaming services (which are unicast, not multicast/broadcast) will not need a device-based ad cache. Services like Hulu, YouTube TV, Sling TV etc. use server-side ad insertion (SSAI) and their cache is basically the internet itself. While latency may be an issue for these services, cache constraint is not.

Amazingly, all over-the-air (OTA), cable/satellite (MVPD) and the emerging ATSC 3.0 Digital Multicast broadcast signals will need a device cache to enable addressability. The bottom line is that from a device
perspective, ATSC 1.0, ATSC 3.0, MVPD STB and smart TVs will all require a SPOC-based ad cache. And it will likely need to be the same Ad Cache unless there is a separate STB for the service… go figure! (See Diagram Below)

There are subtleties to SPOC. First, the fact that it is shared across advertisers and networks means that to be efficient there needs to be a common ad identifier for all TV ads. Flushing the cache and then reloading the same ad is not going to work. There is a perfect solution for this problem; Ad-ID from the 4A’s and ANA. Using Ad-ID as the ad identifier is the most efficient solution because not only does it solve the common cache issue, but it also guarantees that the identifier is truly unique. Ad-ID is also the industry standard for identifying creative assets and has standardized associated metadata.

Second, management of the shared cache is going to need to be solved by the device distributor. It is highly likely that MVPDs will manage their cache and CE Companies with manage theirs. Realistically this is why Project OAR is so important to the future of addressable TV. It answers the calls by the industry’s technical brainiacs that there must be an open API-based solution for these issues. Cache optimization and stream integration will help the efficiency of the SPOC problem. Admittedly as OTT streaming captures more and more of this market, the SPOC problem will diminish. Keep in mind AOL only recently stopped charging a monthly fee for dial-up users. The consumer market is fragmented and total transformation could easily take years.
Conclusion

The promise of addressable TV advertising is so great that the hurdles – which are mainly business-related – are worth tackling. Based on the fact that addressable TV is already a reality for fixed one-minute local avail breaks in cable networks, the technology associated with delivering addressability at the household level has already been proven. The challenges of expanding this to the full inventory can be overcome by establishing:

1) Business relationships amongst the broadcasters/cable networks/syndicated programmers and addressable smart TV distributors and smart STB capable MVPDs;
2) Necessary signaling to enable the seamless replacement of the underlying broadcast ads; and
3) Adequate reporting, measurement and audit capabilities so that there is transparency and trust in the system. This and more will be covered in the upcoming TV[R]EV full report on addressable TV advertising.

But most importantly, this emerging industry need to coalesce around some open standards that allow for scale, cross platform consistency, measurement and yes, increased ARPU. If it was not clear in my analysis, the initiatives supporting ATSC3.0, the Nielsen/Sorenson ACR efforts, and Project OAR need to support a common approach to control, clock and cache. They are looking to tackle the exact same problems from a logistics standpoint, and if they want to compete in ad management or measurement, then fine. Just don’t logistically fragment the industry before it gets off the ground.

The best bet is an open-standards approach based on full integration and signaling from the inventory owner to the smart device. How different vendors solve specific implementations is not the issue, and nothing here implies that any vendor cannot build a standards based solution. Enabling large-scale purchase of addressable TV ads is the goal. Time to start rowing in the right direction!