

CleanTap Screens for Screens

Counterfeit Connected TV and the Digital Ad Industry's Failure to Prevent Delivery of Ads to Spoofed Screenless Devices

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DISCLAIMER:

This research document was prepared by CleanTap to analyze observed patterns in Connected TV (CTV) ad delivery using bid-stream data sourced from multiple real-time bidding (RTB) marketplaces. Measurement verification appeared technically functional; however, the gap emerged in how buyer-side and platform-side controls were configured or applied. In particular, the ineffective use of blocking or monitoring tags (on the buyer side), or disregard for device/content signals (on the platform side), ultimately allowed delivery of the observed ad. Our intention is not to implicate, embarrass, or assign blame to any company, publisher, platform, supply-side partner (SSP), demand-side platform (DSP), or advertiser referenced herein. The entities mentioned in this report are not beneficiaries of these exploits. In many cases, they are victims of technical or systemic inefficiencies that undermine transparency and trust in the CTV ecosystem. CleanTap invites all relevant stakeholders to collaborate by confirming findings, validating data, and sharing insights on current safeguards and future initiatives designed to enhance the integrity of CTV advertising. The examples chosen to be presented should reflect positively more than negatively for the completeness and transparency of transaction data.



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Abstract

This research investigates vulnerabilities in the Connected TV (CTV) advertising marketplace, revealing how low-cost hardware, AI-enabled tools, and a general lack of industry safeguards enable the generation of counterfeit ad impressions. Using a Raspberry Pi setup, CleanTap simulated CTV environments while documenting consistent occurrences where major streaming platforms and ad tech vendors were unable to prevent fraudulent ad transactions based on available signals. Findings suggest systemic gaps in fraud and waste prevention were observed across the CTV supply chain and recommend urgent industry reforms.

Keywords: *CTV, ad fraud, device spoofing, counterfeit inventory, Raspberry Pi, programmatic advertising, verification, FAST, AVOD, emulated devices*



Executive Summary

This report outlines an experiment showing the successful forgery of Connected TV (CTV) ads. Due to the degree of fragmentation in the landscape of what devices can load ads, streaming app owners are required to make their services as widely accessible as possible. Our research confirms that low-cost hardware setups, including Raspberry Pi devices, Android TV emulators, HDMI dummy plugs, and residential proxy networks, allow the successful simulation of monetized ctv streaming environments.

We assembled a CTV streaming capable device using a Raspberry Pi and programmed it to simulate a legitimate streaming viewer using basic automation. Through this simulated environment, CleanTap researchers demonstrated that counterfeit CTV devices could receive and virtually render premium video ad impressions through major ad tech infrastructure. These included high-CPM campaigns served via top-tier SSPs (e.g., Pubmatic and FreeWheel), DSPs (e.g., The Trade Desk and Amazon DSP), and measurement tools (e.g., Integral Ad Science, DoubleVerify, Innovid, iSpot, and more).

The research experiment confirms fundamental enforcement gaps in the CTV supply chain. Despite injecting bot-like signals, spoofed headers, and tunneling traffic through AWS proxies, the counterfeit devices received ads from top national brands. Even while verification tools accurately recorded synthetic behavior, the absence of effective platform- or buyer-side controls allowed ads to transact, regardless.

Key findings show that:

- Spoofed CTV devices could impersonate legitimate streaming viewers to load Tier-1 CTV apps, visit FAST channels, and generate counterfeit ad space.
- Tier-1 CTV apps could not prevent the creation of fraudulent inventory.
- Major ad tech companies' systems facilitated the buying and selling of this inventory.
- Verification and analytics platforms often recorded devices as synthetic but delivery continued and impressions transacted due to media buying platforms and publishers upstream.
- The media budgets of advertisers big and small are being lost to buying counterfeit ad space, with the degree of exposure varying by many factors.

The study concludes that the industry's current approach to classifying and transacting inventory is insufficiently discriminatory of vague and general device identifiers. The larger issue is the system vulnerability rather than individual actors. CleanTap proposes a new model: strict filtration at the exchange entry point, exoneration of device types and app bindings, and greater transparency for buyers.



About the Company

CleanTap is an advertising technology company founded in 2024. We address one of the most pressing issues plaguing the rapidly growing CTV advertising market: counterfeit inventory and misrepresentation. We operate a point of entry filtered ad exchange and curation service that provides verified, high-quality ad space for CTV buyers, with our core objective being to identify counterfeit CTV inventory and eliminate it from the marketplace.

Much of the ad space sold as "CTV" advertising isn't actually on connected "TV devices", but small screens and virtual machines. Through our exchange as well as the analysis of ad space on behalf of partner companies, some of the things we routinely observe are issues that reflect this.

- We see desktop, mobile, and tablet inventory bundled into CTV packages.
- We see Digital out-of-home (DOOH) screens in airports, bars, restaurants, and point-of-sale kiosks falsely categorized as CTV.

The CleanTap objective is to identify bad CTV, and get rid of it, so that advertisers only see legitimate ad space. Our approach centers on filtering and curation done on the sell side at the point of entry. We proactively distinguish between legitimate connected TV placements and counterfeit inventory that masquerades as premium CTV space.

As co-founders of CleanTap, William Rand and Shailin Dhar have a decade-long history of vulnerability and exploit research within the digital advertising technology market. They originally put their minds together in 2016 to work on a foundational report in ad-fraud research: Mystery Shopping in the Ad-Verification Space. Co-founder Jenna Martinez led the framework and oversight of this experiment, providing leadership on research rigor and standards of reporting.



Introduction

In early 2025, CleanTap engineers began observing consistent anomalies in programmatic bidstream data across multiple campaigns and exchange connections. A recurring pattern of vague or generic device types, particularly “Generic Smart TV” and “Generic Android TV”, was appearing in bid requests that otherwise claimed to represent Connected TV (CTV) environments. These signals persisted across several supply paths and bore hallmarks of virtualized or spoofed traffic.

Through our proprietary, custom-built exchange, we’ve seen a significant amount of counterfeit ad space originating from placements on premier CTV apps. To understand the mechanics behind these signals, CleanTap designed a controlled experiment from end to end to determine whether virtualized environments could successfully request and render premium CTV ad creatives under current market conditions. The objective was not to theorize but to replicate, measure, and validate the potential for counterfeit CTV supply to enter programmatic auctions as legitimate inventory.

What follows is a technical breakdown of the market dynamics that shaped this investigation, the infrastructural conditions that allow such traffic to exist, and the specific vulnerabilities CleanTap sought to test through empirical replication.

CTV Market Dynamics

As of early 2024, CTV viewership in the United States surpassed that of traditional linear television for the first time, 234 million versus 232 million. Streaming now accounts for approximately 42–46% of total television viewing time, signaling a significant shift in audience behavior. However, the flow of advertising dollars has not kept pace. Linear TV still commands roughly 63% of total ad time, while CTV captures only 32.5%.^{1 2}

This imbalance is not driven by audience scarcity but rather by a lag in market alignment. CTV inventory often yields higher revenue per hour than linear, yet advertiser budgets remain weighted toward legacy platforms. This signals a structural inefficiency, where spend does not reflect where audiences are actually consuming content.

How CTV Ad Delivery Works

CTV ad delivery functions through a chain of apps, devices, and intermediaries. Popular streaming services such as Pluto, Tubi, and Xumo are delivered via applications installed on smart TVs, HDMI streaming dongles, set-top boxes, gaming consoles, and even mobile devices. Many of these services include Free Ad-Supported Streaming TV (FAST) channels, which mimic the linear TV experience but are streamed over the internet. The supply chain generally follows a familiar sequence: publishers make inventory available, supply-side platforms (SSPs) connect it to bidders, demand-side platforms (DSPs) bid on behalf of advertisers, and ads are delivered to end viewers.

Device Identification

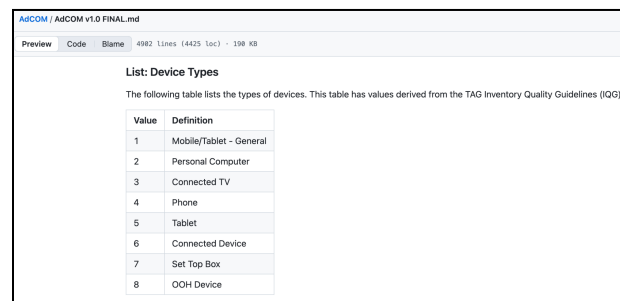
¹ Friedman, Wayne. "CTV Continues Ad Gains, But Linear Has More Ad Time Viewed." *MediaPost*, 17 Dec. 2024, www.mediapost.com/publications/article/401946/ctv-continues-ad-gains-but-linear-has-more-ad-tim.html.

² "5 Key Stats on CTV: Growth Normalizes, Subscriptions Reign, and Ad Spend Evolves." *eMarketer*, www.emarketer.com/content/ctv-growth-normalizes-subscriptions-ad-spend-evolves.



Device identification in this ecosystem relies heavily on user-agent strings and self-declared metadata, which are provided at the time of the ad request. In most cases, systems classify a stream based on what the device claims to be, rather than through independent hardware verification. 3rd party verifiers, however sophisticated, can only provide input based on the signal provided to them by the requesting platform. To further weaken the integrity of protections, platforms employing 3rd party verification vendors can choose to “disregard, ignore, or fault to action” the classification of the vendor.³ This leaves a blind spot in validation, especially problematic when a single app can legitimately run on dozens of different device form factors, from actual living room smart TVs to desktop browsers to set-top boxes and even AndroidTV emulators. The fragmentation makes it easier for fraudulent or spoofed environments to blend in. Generic labels like “Generic Smart TV” or “Generic Android TV” are especially vulnerable to exploitation, and many publishers lack the visibility or filtering tools needed to distinguish between genuine CTV devices and virtualized imposters.

Image 1: List of Standardized Device Type Values Passed in the Bid Stream ⁴



Value	Definition
1	Mobile/Tablet - General
2	Personal Computer
3	Connected TV
4	Phone
5	Tablet
6	Connected Device
7	Set Top Box
8	OOH Device

How Bad Actors Exploit These Gaps

Bad actors exploit these enforcement gaps without having to bypass verification using spoofed streaming environments. Many television operating systems (Android TV, Amazon’s Fire TV, LG’s WebOS, Samsung’s Tizen, Roku OS for Roku devices, and Apple’s tvOS) can be virtualized in software for legitimate testing purposes. However, these same capabilities can be repurposed to run large-scale fraud operations. When combined with HDMI dummy plugs (to trick a device into thinking a display is connected) and proxy configurations (to manipulate

³ Media Ratings Council, Inc. "MRC IVT Requirements and Processes for Pre-Bid Comments on the Recent Adalytics Blog." 2025, mediaratingcouncil.org/sites/default/files/News/MRC%20Statement%20on%20pre%20bid%20IVT%20requirements%20and%20processes.pdf.

⁴ Interactive Advertising Bureau. "AdCOM v1.0 FINAL." *GitHub*, github.com/InteractiveAdvertisingBureau/AdCOM/blob/main/AdCOM%20v1.0%20FINAL.md#list--device-types-.



apparent geography), an attacker can simulate the conditions of a real CTV viewing session without ever involving a real household screen.^{5 6 7}

Image 2: Raspberry Pi with TV Hat

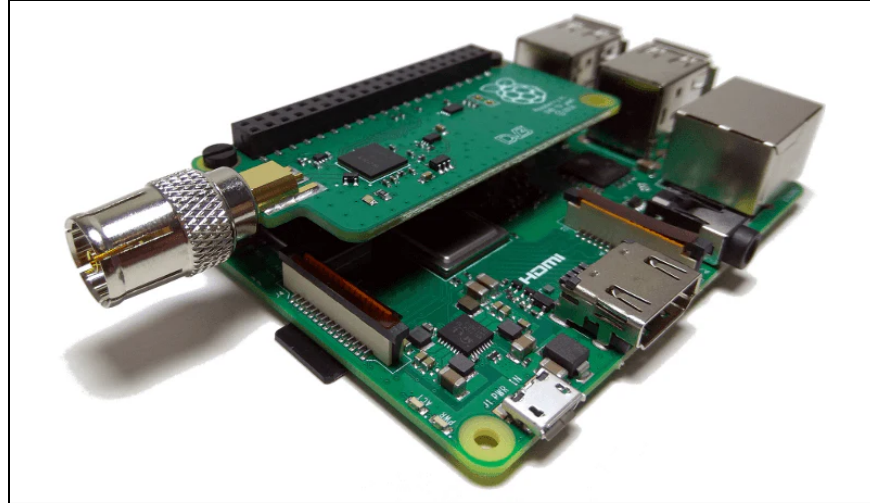


Image 3: Raspberry Pi with HDMI Dummy Plug



⁵ "How To Stream Digital TV With The Raspberry Pi TV HAT." *The Pi Hut*, thepihut.com/blogs/raspberry-pi-tutorials/how-to-stream-digital-tv-with-the-raspberry-pi-tv-hat.

⁶ Williams, Al. "Dummy Plug Gets Smarter With Raspberry Pi." *Hackaday*, 16 June 2025, hackaday.com/2025/06/16/dummy-plug-gets-smarter-with-raspberry-pi/.

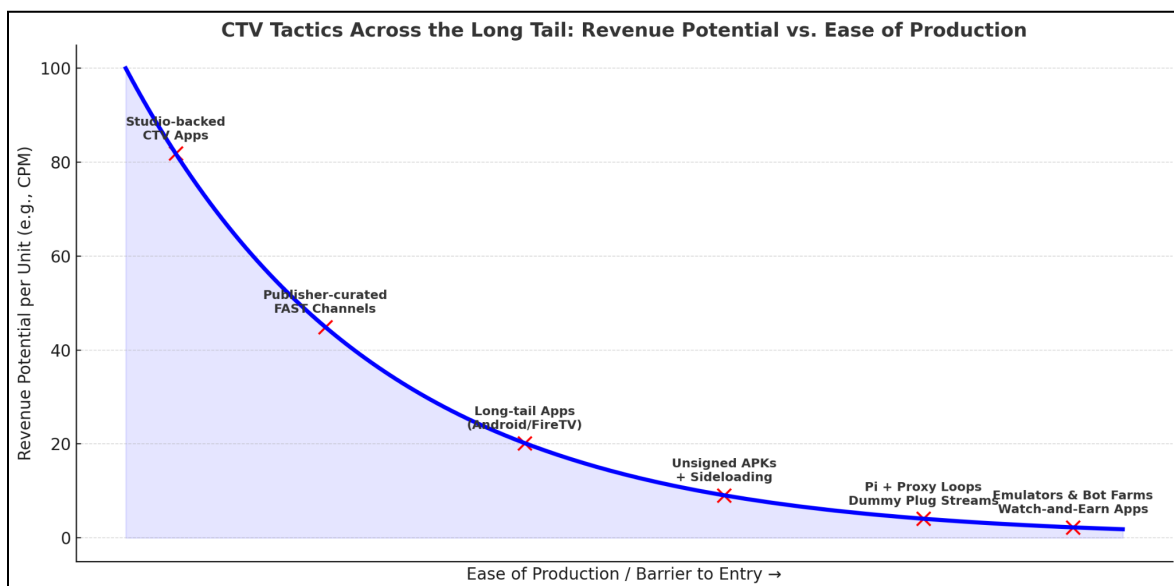
⁷ Brown, Doug. "Modifying an HDMI Dummy Plug's EDID Using a Raspberry Pi." *Downtown Doug Brown*, June 2025, www.downtowndougbrown.com/2025/06/modifying-an-hdmi-dummy-plugs-edid-using-a-raspberry-pi/.



AI-Enabled Accessibility

The rise of AI tools has made such exploitation even more accessible. Over the past 18–24 months, large language models (LLMs), no-code automation platforms, and integrated development environments (IDEs) such as Android Studio have significantly lowered the skill threshold for deploying automated or virtualized CTV environments. Online communities, including Reddit’s r/webscraping, r/beermoney, and r/androidtv, as well as BlackHatWorld, actively share scripts, troubleshooting guides, and monetization tactics. These forums cover methods ranging from building app farms and automating “watch-and-earn” reward schemes to setting up continuous ad loop monetization on FAST or AVOD services. The combination of low-cost hardware, easily accessible code, and detailed public playbooks has created an environment where counterfeit CTV traffic can be produced at scale, monetizing at the same premium prices intended for real, human viewers.

Image 4: Graph of CTV Tactics Across the Long Tail



Operational Definitions

- **Connected TV (CTV):** A television device or large full-screen format connected to the internet that can stream digital video, typically via an app-based platform. In practice, this term is inconsistently applied; some define it strictly as a large household screen, while others include any device running a CTV-capable app.
- **FAST (Free Ad-Supported Streaming TV):** Channels and platforms offering linear-style programming for free, monetized through advertising. Examples include Pluto TV, Tubi, and Xumo.
- **AVOD (Ad-Supported Video on Demand):** Platforms offering on-demand content for free or at a reduced subscription cost, supported by ads rather than, or in addition to, subscription revenue.



- **Supply Path:** The chain of intermediaries between a publisher and an advertiser, typically including the publisher, supply-side platform (SSP), ad exchange, and demand-side platform (DSP).
- **Supply-Side Platform (SSP):** A technology provider that helps publishers automate the sale of their advertising inventory to multiple buyers, often via real-time bidding (RTB).
- **Demand-Side Platform (DSP):** A technology platform used by advertisers to buy digital ad inventory across multiple exchanges and SSPs programmatically.
- **Exchange:** A marketplace where multiple supply aggregators and bidding buyers connect, enabling the programmatic auctions of ad impression opportunities.
- **Bid Request:** The standardized packet of information sent from an SSP to DSPs in real time, containing metadata about the ad impression opportunity (device, app, content, user ID, location, etc.).
- **User-Agent String (UA):** A text identifier sent by a device or browser to describe itself, including device type, operating system, and version. In CTV, these are often self-declared and not hardware-verified, making them vulnerable to spoofing.
- **Generic Smart TV / Generic Android TV:** Catch-all classifications often used in bid requests when device metadata is incomplete, unverified, or intentionally vague. Commonly associated with spoofed or emulated environments.
- **Emulated Device / Virtual Machine (VM):** A software-based replication of a hardware device, allowing an operating system (e.g., Android TV, Tizen, WebOS) to run in a non-native environment such as a server or desktop computer.
- **HDMI Dummy Plug:** A small plug-in device that simulates the presence of a connected display, tricking the operating system or application into enabling display-dependent functionality even when no physical screen is attached.
- **Device ID / Identifier for Advertising (IFA):** A persistent, platform-specific identifier used for ad targeting and measurement. Replication of IFAs across multiple devices or IP addresses is a common fraud indicator.
- **Pre-Bid Verification:** The process of checking an ad impression for quality and compliance after it enters the auction but before a DSP bids on it.
- **Pre-Auction Intervention:** The process of filtering or rejecting low-quality impressions before they enter the auction at all. CleanTap uses this approach to remove counterfeit supply from circulation upstream.
- **App Farm:** A controlled set of devices, virtual machines, or emulators configured to repeatedly run specific apps or content to generate ad revenue.
- **Watch-and-Earn Scheme:** A monetization tactic in which automated systems continuously view ad-supported content to collect rewards, cash payouts, or ad revenue shares.
- **AVOD/FAST Loop:** A repeated playback cycle of ad-supported video content to generate artificial ad impressions without genuine audience engagement.

Observed Gaps in the CTV Advertising Ecosystem

Despite the large audience migration in recent years from linear television to CTV, the advertising infrastructure has not kept pace in its ability, or incentives, to validate inventory quality. The industry still relies heavily on self-declared metadata, particularly user-agent strings and app bundle IDs, to classify devices and content environments. This approach assumes



honesty in the supply chain, but offers little in the way of hardware verification, leaving the door open for falsified or spoofed traffic.

The problem is compounded by the fragmentation of viewing environments. A single CTV app may be legitimately installed via dozens of form factors, from smart TVs and HDMI dongles to mobile devices, desktop browsers, and even virtual machines. Within this variety, vague classifications like “Generic Smart TV” or “Generic Android TV” appear frequently, masking the true utility of the device. In practice, publishers, SSPs, DSPs, and even 3rd party verifiers often lack the technical visibility or controls to differentiate between human viewers on physical screens and automated, virtualized environments.

At the same time, technological accessibility has shifted the threat landscape. The past two years have seen a dramatic lowering of the barrier to entry for building and deploying automated environments, thanks to AI-assisted development tools, emulator-friendly operating systems, and widespread information-sharing on forums. Motivated actors, even without advanced technical skills, can now virtualize Android TV, Fire TV, Roku OS, WebOS, Tizen, or tvOS, pair these environments with HDMI dummy plugs and proxies, and operate them at scale to request high-value CTV ad impressions.

The combination of metadata-based classification, fragmented device ecosystems, and easy access to virtualization tools has created an environment where counterfeit CTV supply can enter the market largely undetected. This misalignment between perceived and actual supply perpetuates the core inefficiency in the market: buyers believe legitimate inventory is scarce while legitimate sellers struggle to fill ad loads, both outcomes driven not by audience size, but by information asymmetry and unverifiable device integrity.

Hypothesis

Based on the patterns observed in the bidstream and the structural dynamics outlined above, CleanTap hypothesizes that a measurable portion of programmatically transacted CTV ad inventory is not delivered to actual CTV devices, but instead to virtualized or spoofed environments.

Further, CleanTap hypothesizes that these environments, built using publicly available tools such as Android emulators, virtual machines, HDMI dummy plugs, and common app builds, can successfully request and render premium CTV ads while presenting generic or ambiguous device metadata.

The experiment was constructed to simulate these conditions in a controlled manner, evaluate the extent to which these environments could participate in ad auctions, and assess whether upstream pre-auction filtration offers a more robust control mechanism than traditional post-auction verification.



Method

Design

This experiment evaluated whether counterfeit CTV devices configured with generic TV and even overt bot indicators could request and receive advertisements through the existing CTV advertising supply chain. A synthetic test environment was used instead of human participants, allowing controlled observation of ad delivery and auction data flows.

Cluster analysis of bidstream data indicated patterns consistent with automation: device signatures marked as “Generic Smart TV” or “Generic Android TV,” perfectly uniform impression intervals, and improbable device-IP combinations across disparate subnets. These anomalies were disproportionately present in long-tail FAST inventory and were often linked to aggressive reseller activity. We reserved efforts on sophisticated spoofing to attempt to recreate the observations in live exchange activity, and recorded the seller visibility whenever available in the metadata.

The testbed was built around a Raspberry Pi configured to operate as a virtual streaming device. This low-cost (USD \$35–\$50), commercially available device was selected for its compatibility with popular streaming applications and ability to emulate common CTV platforms such as Roku, FireTV or Android TV. Using freely available code, the Raspberry Pi was able to run unmodified Free Ad-Supported Streaming Television (FAST) applications, including Pluto TV, Tubi, and Xumo.

To inspect and record ad delivery data, all network traffic from the Raspberry Pi was routed through a laptop running man-in-the-middle proxy software (mitmproxy). This allowed decryption of traffic, capturing of bid requests, auction parameters, impression events, and creative tracking metadata.

Sample Size

To remain in compliance with legal boundaries and ethical research norms, we deliberately limited the operational scale of our testing. The total volume of ad requests and impressions was capped to remain well below thresholds that would trigger legal scrutiny, such as those defining “material financial harm.” Our research team, drawing on over a decade of experience supporting legal investigations into advertising fraud, is acutely aware that even academic testing involving large-scale counterfeit activity can be viewed unfavorably by regulatory bodies. As such, we intentionally restricted our activity to simulate proof-of-concept scenarios rather than stress-test systemic impact at full scale.

Measures

The study captured and analyzed the following data parameters tied to the advertising events:

- *Bid Requests*: Number of populated auction requests sent based on ad breaks in streaming content.
- *Completed Auctions*: Number of victorious and accepted bids on ad opportunities, these event URLs
- *Ads Received (Imps)*: Number of advertisement creatives delivered to streaming app
- *Ads “Rendered”*: Number of advertisements received to device and queued in stream



- *Post-View Tracking*: Number of impression events where post-event tracking events were communicated to buy side systems
- *Sell Side Systems*: Names of entities and technology firms that facilitated ad transactions on behalf of seller
- *Buy Side Systems*: Names of entities and technology firms that facilitated ad transactions on behalf of buyer
- *Brands*: Names of the advertising brands that purchased the ad space generated by the experimental counterfeit device
- *Analytics/M Measurement*: Names of the entities and technology firms that collected data from the transaction for the purposes of measurement or analytics
- *CPM Range & Average*: This refers to the range of CPM values and average (mean) of the bid prices paid by the brands and their buy side systems.

Procedure

1. *Device Setup & Configuration*
 - 1.1. Installed HDMI dummy plug to emulate a connected display.
 - 1.2. Sideloaded commercial FAST apps (Pluto TV, Tubi, Xumo) without modification.
 - 1.3. Configured the Raspberry Pi to run these apps and navigate between channels autonomously.
2. *Network Routing & Traffic Capture*
 - 2.1. Routed all device traffic through mitmproxy for decryption and inspection.
 - 2.2. In some runs, used AWS data center proxies to create clearly detectable non-residential traffic; in others, residential Wi-Fi was used to simulate realistic home networks.
 - 2.3. Periodically altered user-agent strings to include explicit bot declarations (e.g., “I’m a bot. Please don’t buy or sell the ad space I’m seeing.”).
3. *Automated Operation*
 - 3.1. Developed scripts to operate the Raspberry Pi without human intervention, launching apps, switching channels, and playing content.
 - 3.2. Operated headless for long runs; occasionally connected a small debug screen for visual documentation.
4. *Data Collection*
 - 4.1. Captured request/response pairs from SSPs, DSPs, and ad servers.
 - 4.2. Logged impression events, auction metadata, and creative asset details.
 - 4.3. Recorded device advertising IDs, IP addresses, CPM pricing, and geolocation data.
5. *Test Scale & Ethical Controls*
 - 5.1. Limited the experiment to under 10,000 ad opportunities, with an estimated total spend under \$500, to minimize financial impact.
 - 5.2. No campaign performance was intentionally disrupted, and no private systems were accessed.



Results

Key Findings

Across 10 days of controlled testing, 100% of counterfeit CTV device activity, spanning thousands of unique bid requests from 2 distinct IP addresses, were accepted into live auctions with victorious bidders. These virtualized devices successfully attracted advertisements from 54 individual brands, including 9 Fortune 100 Brands, through transactions routed via 5 sell side platforms and 4 demand side platforms. The tables below show the breadth of the data collected in this experiment.

Table 1: Index of Log Activity

Purpose/Role	Endpoint Examples	Company Examples	Number of Events Available In Logs
Sell Side Transaction	fwmrm.com, springserve, smaato	Pubmatic, FreeWheel, SpringServe, Verve	2500+
Buy Side Transaction	adsrvr, pubmatic, smaato	TheTradeDesk, Amazon DSP	2500+
Tracking/Beacon	adobedtm.com, tags.tiqcdn.com, Tvpixel,	TVPixel, Adobe, Tealium	7500+
Ad-Serving - Seller	googleapis, springserv	Google, SpringServe	2000+
Ad-Serving - Buyer	innovid.com, google	Innovid	2000+
Content App Host	pluto.tv, mtvnservices.com,	Pluto/Paramont, Tubi, Xumo	9000+
Measurement-Verification	api.b2c.com, moatads, dvtech, adsafeprotected	FouAnalytics, Moat, IntegralAdScience, DoubleVerify	7500+
Measurement-Analytics	extremereach, vaultcdr, kochava	ExtremeReach, Kochava, Tatari	3000+
Audience Graph Sync	rlcdn.com, enduser.adsrvr, tapad,	LiveRamp, TapAd, TheTradeDesk	2000+

The web request logs recorded and preserved from this activity, contain a series of https requests with system specific url parameters corresponding to each impression event. For any single advertisement impression, there are multiple ad-technology systems that receive data related to the transaction and serving of the ad. These include seller platforms, buyer platforms, ad-servers, measurement systems, analytics services, and others.



Examples of Counterfeit CTV Monetization

Below are examples of individual impression events, with the preserved chain of all of the observed related https requests. Specific parameter components of each individual request URL have been parsed out.

Example 1: Pluto x Charmin

A TV Streaming agent was deployed with deliberately obvious characteristics to assess content platform detection capabilities. In this case, the streaming agent retained its default Raspberry Pi user agent ("Dalvik/2.1.0 (Linux; U; Android 15; Pi 4 Build/BP1A.250505.005)") without modification, with all traffic routed through Amazon Web Services infrastructure to maximize detectability. The TV streaming agent accessed Pluto.tv and navigated to the FailArmy channel, where normal content playback allowed advertising, and tracking operations to proceed until sufficient data was collected. The example below tells the story of one ad space, one auction and one creative of one campaign. But during each ad break, there are anywhere from 3-6 ads.

Note: Screen capture was disabled during this test, so visual creative examples are not available, only server event logs.

Table 2: Impression Details for Example 1 (Pluto x Charmin)

Advertiser	Charmin (P&G)
Price (CPM)	\$12.50
Buy Side System	TheTradeDesk
Buyer Ad-Server	Innovid
Publisher/App	Paramount/Pluto.tv
Sell Side System	PubMatic
Assumed Player Size (HxW)	1080 x 1920
Agency	Unknown
Placement Type	Midroll
Creative Length	15 seconds
Ad View Completion	4/4
Measurement/Attribution	SpringServe
Content/Channel	Fail Army (Jukin Media)
Declared Device	Dalvik 2.1.0, Android, Raspberry Pi 4 Build,

**Table 3: Sequence of Events Related to Ad Impression Example 1 (Pluto x Charmin)**

Events in Sequence	Domain Endpoint	Company	Purpose
1	s.innovid.com	Innovid	Image Pixel
2	infinity-c41.youboranqs01.com	YouBora	Tracking / Beacon
3	st.pubmatic.com	PubMatic	Record Sold Impression
4	tpsc-video-uw.doubleverify.com	DoubleVerify	Measurement/Analytics
5	enduser.adsrvr.org	TheTradeDesk	Record Won Auction
6	census-app.scorecardresearch.com	Comscore	Measurement/Analytics
7	infinity-c41.youboranqs01.com	YouBora	Tracking / Beacon
8	pi.ispot.tv	iSpot	Measurement/Analytics
9	vid-io-pdx.springserve.com	SpringServe	Tracking / Beacon
10	infinity-c40.youboranqs01.com	YouBora	Tracking / Beacon
11	tpsc-video-uw.doubleverify.com	DoubleVerify	Measurement/Analytics
12	rtr.innovid.com	Innovid	Tracking / Beacon
13	usw-ca2.adsrvr.org	TheTradeDesk	Tracking / Beacon
14	vid-io-pdx.springserve.com	SpringServe	Tracking / Beacon
15	vtrk.dv.tech	DoubleVerify	Measurement/Analytics
16	conduit-beacon.mtvnservices.com	Pluto/Paramount	Tracking / Beacon
17	k.pluto.tv	Pluto/Paramount	Tracking / Beacon
18	ag.innovid.com	Innovid	Ad-Serving
19	odr.mookie1.com	Xaxis/GroupM	UNKNOWN
20	cm.g.doubleclick.net	Google	Ad-Serving
21	cf-d-v4-service-channel-stitcher-us e1-1-prd.pluto.tv	Pluto/Paramount	Ad-Serving
22	siloh-ns1.plutotv.net	Pluto/Paramount	Ad-Serving
23	assets.adobedtm.com	Adobe	Tracking / Beacon



Events in Sequence	Domain Endpoint	Company	Purpose
24	7f077.v.fwmrm.net	FreeWheel	Tracking / Beacon
25	app-measurement.com	Google	Measurement/Analytics
26	connectivitycheck.gstatic.com	Google	CDN
27	play.googleapis.com	Google	Tracking / Beacon
28	sp.pluto.tv	Pluto/Paramount	Ad-Serving
29	infinity-c40.youborans01.com	YouBora	Tracking / Beacon
30	cfd-v4-service-channel-stitcher-us e1-1.prd.pluto.tv	Pluto/Paramount	Ad-Serving

The following is a breakdown of specific ad events from the above table titled: *Sequence of Events Related to Ad Impression Example 1 (Pluto x Charmin)*

Ad Event 1
(*Example 1: Pluto x Charmin*)

URL:

https://s.innovid.com/1x1.gif?project_hash=1igi5u&client_id=8492&video_id=1534900&channel_id=4931367&publisher_id=1271&placement_tag_id=0&project_state=2&r=1751717348592&placement_hash=1be3a7&device_id=8b8869ac-aad4-2953-22ed-c05b14e414e3&action=play&ivc_exdata=ivc_app_bundle_id=eyeq&ivc_deviceid_raw=8b8869ac-aad4-2953-22ed-c05b14e414e3&ivc_inapp_optout=0&ivc_transaction=eceab68d-a302-4ca1-8ada-3aff67bd4926&ivc_creativeid=lvw3tpbc&ivc_placementid=nk4ku52&ivc_dealid=EYEQ-PUB-PGC-01&ivc_publisherid=163962&ivc_site=eyeq&ivc_supplyvendor=pubmatic&ivc_campaignid=us8n43h&ivc_dsp=ttd&ivc_ttdimpid=eceab68d-a302-4ca1-8ada-3aff67bd4926&ivc_ttdid=&ivc_signalid=&ivc_ttd_dco_mappingrule_macro=&ivc_ttd_mappingrule_single_output=&ivc_category=&ivc_dealID=EYEQ-PUB-PGC-01&dipn=deviceid&deviceid=8b8869ac-aad4-2953-22ed-c05b14e414e3&ivc_deviceid_raw=8b8869ac-aad4-2953-22ed-c05b14e414e3&iv_geo_dma=511&iv_geo_country=US&iv_geo_city=Ashburn&iv_geo_state=VA&iv_geo_zip=20149&iv_geo_lat=39.0469&iv_geo_lon=-77.4903

Table 4: Ad Event 1 Key Values

Key	Value	Definition
client_id	8492	Advertiser/client identifier
publisher_id	1271	Website/app publisher ID



Key	Value	Definition
channel_id	4931367	Advertising channel
placement_tag_id	0	Ad placement location
action	play	Video event being tracked (video started playing)
imp	eceab68d-a302-4ca1-8ada-3aff67bd4926	Impression ID
device_id	8b8869ac-aad4-2953-22ed-c05b14e414e3	Device ID used for tracking throughout the ad calls
ivc_app_bundle_id	eyeq	Bundle ID (Paramount here)
ivc_deviceid_raw	8b8869ac-aad4-2953-22ed-c05b14e414e3	Device ID
ivc_inapp_optout	0	Data Collection Opt-Out
ivc_transaction	eceab68d-a302-4ca1-8ada-3aff67bd4926	Transaction ID
ivc_creativeid	lvw3tpbc	TTD Creative ID
ivc_placementid	nk4ku52	TTD Placement ID
ivc_dealid	EYEQ-PUB-PGC-01	Deal ID = “Paramount EyeQ-Pubmatic-Proctor & Gamble Companies-Deal ID 01”.
iv_geo_dma	511	DMA code, 511 corresponds to Washington DC (Hagerstown)
iv_geo_country	US	Country
iv_geo_city	Ashburn	City
iv_geo_state	VA	State
iv_geo_zip	20149	Zip code
iv_geo_lat	39.0469	Latitude
iv_geo_lon	-77.4903	Longitude



Image 5: Screenshot of Innovid Event URL Parameter Mapping from (mitmproxy) - Ad Event 1 (Pluto x Charmin)

```
timestamp: "2025-07-05T08:10:39.524709"
type: "HTTPFlow"
request:
  method: "GET"
  url: "https://s.innovid.com/1x1.gif?project_hash=ligi5u6client_id=84926video_id=15349006channel_id=49313676publisher_id=12716placement_tag_id=06project_state=26rw=17517173485926placement_hash=1be3a76de
vice_id=8b8869ac-aad4-2953-22ed-c05b14e414e3actionsplay6ivc_exdata=ivc_app_bundle_id=308b8869ac-aad4-2953-22ed-c05b14e414e326ivc_inapp_optout=308b8869ac-aad4-2953-22ed-c05b14e414e326ivc_transaction=308
ceab68d-a302-4ca1-8ada-3aff67bd492626ivc_creativeid=301vw3tpbc26ivc_placementid=30nk4ku5226ivc_dealid=30EYEQ-PUB-PGC-01326ivc_publisherid=3016396226ivc_site308b8869ac-aad4-2953-22ed-c05b14e414e326ivc_campaignid=308b8869ac-aad4-2953-22ed-c05b14e414e326ivc_dsp=301ttt26ivc_ttdimpid=308ceab68d-a302-4ca1-8ada-3aff67bd492626ivc_ttdid=30826ivc_signalid=30826ivc_ttd_dco_mappingrule_macros=30826ivc_ttd_mappingrule_singl
e_output=30826ivc_category=30826ivc_dealid=30EYEQ-PUB-PGC-01326ivc_deviceid=308b8869ac-aad4-2953-22ed-c05b14e414e326ivc_deviceid_raw=308b8869ac-aad4-2953-22ed-c05b14e414e326ivc_geo
_dma=3081326ivc_geo_country=30826ivc_geo_city=308ashburn26ivc_geo_state=308VA26ivc_geo_zip=3082014926ivc_geo_lat=30839.046926ivc_geo_lon=308-77.4903"
host: "s.innovid.com"
port: 443
path: "/1x1.gif?project_hash=ligi5u6client_id=84926video_id=15349006channel_id=49313676publisher_id=12716placement_tag_id=06project..
country=30826ivc_geo_city=308ashburn26ivc_geo_state=308VA26ivc_geo_zip=3082014926ivc_geo_lat=30839.046926ivc_geo_lon=308-77.4903"
headers: { "User-Agent": "Dalvik/2.1.0 (Linux; U; Android 15; Pi 4 Build/BP1A.250505.005) CTV 5.57.0-b3fa07174b", "Accept-Charset": "UTF-8", Accept: "**/*", ... }
```

In the request header, the user agent of the Raspberry Pi is present as is the region, state, and lat / lon coordinates of Ashburn, VA, the heart of Northern Virginia's "Data Center Alley," which hosts the largest data center footprint in the United States by a wide margin. Registered clusters of data center IP addresses are typically the starting point of IP block lists in the ad technology marketplace.

Image 6: Screenshot of Pubmatic Event URL Parameter Mapping from (mitmproxy) - Ad Event 1 (Pluto x Charmin)

```
url: "https://s.pubmatic.com/track?orderid=1639626s=11340456s=54561800uc=243&adType=36fse=12517173485926publisher_id=12716placement_tag_id=06project_state=26rw=17517173485926placement_hash=1be3a76de
vice_id=8b8869ac-aad4-2953-22ed-c05b14e414e3actionsplay6ivc_exdata=ivc_app_bundle_id=308b8869ac-aad4-2953-22ed-c05b14e414e326ivc_inapp_optout=308b8869ac-aad4-2953-22ed-c05b14e414e326ivc_transaction=308
ceab68d-a302-4ca1-8ada-3aff67bd492626ivc_creativeid=301vw3tpbc26ivc_placementid=30nk4ku5226ivc_dealid=30EYEQ-PUB-PGC-01326ivc_publisherid=3016396226ivc_site308b8869ac-aad4-2953-22ed-c05b14e414e326ivc_campaignid=308b8869ac-aad4-2953-22ed-c05b14e414e326ivc_dsp=301ttt26ivc_ttdimpid=308ceab68d-a302-4ca1-8ada-3aff67bd492626ivc_ttdid=30826ivc_signalid=30826ivc_ttd_dco_mappingrule_macros=30826ivc_ttd_mappingrule_singl
e_output=30826ivc_category=30826ivc_dealid=30EYEQ-PUB-PGC-01326ivc_deviceid=308b8869ac-aad4-2953-22ed-c05b14e414e326ivc_deviceid_raw=308b8869ac-aad4-2953-22ed-c05b14e414e326ivc_geo
_dma=3081326ivc_geo_country=30826ivc_geo_city=308ashburn26ivc_geo_state=308VA26ivc_geo_zip=3082014926ivc_geo_lat=30839.046926ivc_geo_lon=308-77.4903"
host: "s.innovid.com"
port: 443
path: "/1x1.gif?project_hash=ligi5u6client_id=84926video_id=15349006channel_id=49313676publisher_id=12716placement_tag_id=06project..
country=30826ivc_geo_city=308ashburn26ivc_geo_state=308VA26ivc_geo_zip=3082014926ivc_geo_lat=30839.046926ivc_geo_lon=308-77.4903"
headers: { "User-Agent": "Dalvik/2.1.0 (Linux; U; Android 15; Pi 4 Build/BP1A.250505.005) CTV 5.57.0-b3fa07174b", "Accept-Charset": "UTF-8", Accept: "**/*", ... }
```

Based on the data in this Pubmatic tag, the price of the ad space sold was \$12.50 CPM.

Image 7: Screenshot of DoubleVerify Event URL Parameter Mapping from (mitmproxy) - Ad Event 1 (Pluto x Charmin)

```
flow_index: 204
timestamp: "2025-07-05T08:10:39.537729"
type: "HTTPFlow"
request:
  method: "GET"
  url: "https://tpsc-video-uw.doubleverify.com/event.png?vstevt=0&dup=ef4b5bed-33f4-4d31-992f-a61f1bc8a3efvst_start_tmstp=[TIMESTAMP]"
  host: "tpsc-video-uw.doubleverify.com"
  port: 443
  path: "/event.png?vstevt=0&dup=ef4b5bed-33f4-4d31-992f-a61f1bc8a3efvst_start_tmstp=[TIMESTAMP]"
  headers: { "User-Agent": "Dalvik/2.1.0 (Linux; U; Android 15; Pi 4 Build/BP1A.250505.005) CTV 5.57.0-b3fa07174b", "Accept-Charset": "UTF-8", Accept: "**/*", ... }
  content_length: 0
  content_type: "N/A"
  response: { status_code: 204, content_length: 0, content_type: "N/A", ... }
  patterns: [ "Video: video", "GET Request" ]
```

There was a tracking or tag pixel server callback event related to verification/measurement firm DoubleVerify.

Ad Event 5 (Example 1: Pluto x Charmin)

URL:

https://enduser.adsrvr.org/enduser/video/?ve=creativeView&imp=eceab68d-a302-4ca1-8ada-3aff67bd4926&ag=nk4ku52&crd=lvw3tpbc&cf=9024289&fq=0&t=1&td_s=eyeq&rcats=&mste=eyeq&mflid=4&mssi=&mfsi=&sv=pubmatic&uho=152&agsa=&wp=12.500000&rgz=20149&dt=Mobile&osf=Android&os=Android150&br=Chrome&svpid=163962&rlangs=en&mlang=&did=EYEQ-PUB-PGC-01&rcxt=InApp&tmpc=17.540000000000002&vrtid=14,15&osi=&osv=&daid=8b8869ac-aad4-2953-22ed-c05b14e414e3&dnr=0&vpb=MidRoll&crrelr=&npt=&cc=1~KLUV_WNa1XJFFACdBwCzzjdsAbweKwKIWAJ5nkAePwCVH4AowoAdOcAuwgDrhQFQXCHr_gF0rvB2_4AhagLwUoj1BLTxAQd4AJB6AfICXH0A0hW23BiRilfzaK3XZwICDPFbd74dfbZ2dsuvwxuUv5WE3QrC



buVgtVCxwqBYLUxxWpAOUNFCNKeV5733WW18ltVnQRFxtiLUV1cMvCwdX4glyfVhKWKx7r
 SwrB4LCouVhAVCYE5esIs9_9U9XyQv0_OiHzpWZ6BPjP-Q-r9vN_eve_ccuCywAqqUAKO
 8xUHRUMK1F3J0uOkSY0RLANwBPpyVSA1M5F20fRvLz-kQ6oc.&dur=1~KLUV_WMFOcgkMwC
 1AQDaa2ZudWlqYSUKD21TcG8FaXNwb3Q4AEAAcfwufDrpD4VaThKUUpS_6kfdRdaRneyMSn
 wiJxhk.&durs=10fqGg&bdc=10&mk=Generic&mdl=4&adpt=pubo&ict=Unknown&said
 =05914A50-1DE6-43B2-8827-16BC1BE44980V&auct=3&mgnr=comedy&cxdur=30.01-
 45&cx1vs=1&csg=EgAaACIAKAeyB3VucmF0ZWQ6BmNvbWVkeUD_____B0iAD1IGY29tZWR
 5Wgl0b3QgUmF0ZWRIAA..&sfe=1aa095e4&vp=0

Table 5: Ad Event 5 Key Values

Key	Value	Definition
imp	eceab68d-a302-4ca1-8ada-3aff67bd4926	TTD Imp ID (matches previous Innovid tracker)
ag	nk4ku52	Ad Group
crid	lvw3tpbc	Creative ID
ve	creativeView	View Event
t	1	Details it's an impression event
sv	pubmatic	Supply vendor (PubMatic is the supply-side platform)
did	EYEQ-PUB-PGC-01	Deal ID = "Paramount EyeQ-Pubmatic-Proctor & Gamble Companies-Deal ID 01".
svpid	163962	Supply vendor publisher ID
wp	12.500000	Winning Price (corresponds to Pubmatic's URL above)
tmpe	17.540000000000002	Time played to completion
td_s	eyeq	Trade Desk site identifier
mste	eyeq	Media source/site
rcxt	InApp	Request context (in-app environment)
mfld	4	Media field/format identifier
daid	8b8869ac-aad4-2953-22ed-c05b14e414e3	Device advertising ID (same as previous tracker)
dt	Mobile	Device Type. This is interesting because this is



Key	Value	Definition
		not a mobile device. This is a fully formed CTV device and is no more mobile than a Chromecast dongle or an Amazon Fire stick.
osf	Android	Operating System Family
os	Android150	Specific OS version (Android 15.0)
br	Chrome	Browser. This is incorrect. We do not have Chrome installed on this device.
mk	Generic	Device make. This highlights the issue we brought up in the introduction of this whitepaper
vpb	MidRoll	Video ad placement
vrtd	14,15	Video-related targeting data
mgnr	comedy	Media Genre

Image 8: Screenshot of TheTradeDesk Event URL Parameter Mapping from (mitmproxy) - Ad Event 5 (Pluto x Charmin)

```

timestamp: "2025-07-05T08:10:39.724844"
type: "HTTPFlow"
request:
  method: "GET"
  url: "https://enduser.adsrvr.org/enduser/video/?ve=creativeView&imp=eceab68d-a302-4ca1-8ada-3aff67bd4926&ag=nk4ku52&crld=lvw3tpbc&cf=9024289&fq=0&t=1&td_s=eyeq&rcats=&mste=eyeq&mfld=4&mssi=&mfsi=&sv=pubmatic&uho=152&agsa=&wp=12.500000&rgz=20149&dt=Mobile&osf=Android&os=Android150&br=Chrome&svpid=163962&rlangs=en&mlang=&did=EYEQ-PUB-PGC-01&rcxt=InApp&tmpc=17.54000000000002&vrtd=14,15&osi=&osv=&daid=8b8869ac-aad4-2953-22ed-c05b14e414e3&dnr=0&vpb=MidRoll&crrelr=&npt=&cc=1~KLUv_WNa1XJFFACdBwCzzjdsAbweKwKIWAJ5nkAePwCVH4AowoAdOcAuwgDrhQFQXChr_gF0rvB2_4AhagLwUoj1BLTxAQd4AJB6AfICXH0A0hW23BiRilfzaK3XZwICDPFbd74dfbZ2dsuvuxaUv5WE3QrC"
  host: "enduser.adsrvr.org"
  port: 443
  path: "/enduser/video/?ve=creativeView&imp=eceab68d-a302-4ca1-8ada-3aff67bd4926&ag=nk4ku52&crld=lvw3tpbc&cf=9024289&fq=0&t=1&td_s=eyeq&rcats=&mste=eyeq&mfld=4&mssi=&mfsi=&sv=pubmatic&uho=152&agsa=&wp=12.500000&rgz=20149&dt=Mobile&osf=Android&os=Android150&br=Chrome&svpid=163962&rlangs=en&mlang=&did=EYEQ-PUB-PGC-01&rcxt=InApp&tmpc=17.54000000000002&vrtd=14,15&osi=&osv=&daid=8b8869ac-aad4-2953-22ed-c05b14e414e3&dnr=0&vpb=MidRoll&crrelr=&npt=&cc=1~KLUv_WNa1XJFFACdBwCzzjdsAbweKwKIWAJ5nkAePwCVH4AowoAdOcAuwgDrhQFQXChr_gF0rvB2_4AhagLwUoj1BLTxAQd4AJB6AfICXH0A0hW23BiRilfzaK3XZwICDPFbd74dfbZ2dsuvuxaUv5WE3QrC"
  headers: { "User-Agent": "Dalvik/2.1.0 (Linux; U; Android 15; Pl 4 Build/8PLA.250505.005) CTV 5.57.0-b3fab7174b", "Accept-Charset": "UTF-8", "Accept": "**/*", ... }

```

This auction completion event from TheTradeDesk shows the winning price of \$12.50 (&wp=12.500000).

Ad Event 9 (Example 1: Pluto x Charmin)

URL:

https://enduser.adsrvr.org/enduser/video/?ve=creativeView&imp=eceab68d-a302-4ca1-8ada-3aff67bd4926&ag=nk4ku52&crld=lvw3tpbc&cf=9024289&fq=0&t=1&td_s=eyeq&rcats=&mste=eyeq&mfld=4&mssi=&mfsi=&sv=pubmatic&uho=152&agsa=&wp=12.500000&rgz=20149&dt=Mobile&osf=Android&os=Android150&br=Chrome&svpid=163962&rlangs=en&mlang=&did=EYEQ-PUB-PGC-01&rcxt=InApp&tmpc=17.54000000000002&vrtd=14,15&osi=&osv=&daid=8b8869ac-aad4-2953-22ed-c05b14e414e3&dnr=0&vpb=MidRoll&crrelr=&npt=&cc=1~KLUv_WNa1XJFFACdBwCzzjdsAbweKwKIWAJ5nkAePwCVH4AowoAdOcAuwgDrhQFQXChr_gF0rvB2_4AhagLwUoj1BLTxAQd4AJB6AfICXH0A0hW23BiRilfzaK3XZwICDPFbd74dfbZ2dsuvuxaUv5WE3QrC



buVgtVCxWqBYLUxxWpAOUNFCNKeV5733WW18ltVnQRFxtiLUV1cMvCwdX4glyfVhKWKx7r
SwrB4LCouVhAVCYE5esIs9_9U9XyQv0_OiHzpWZ6BPjP-Q-r9vN_eve_ccuCywAqqUAKO
8xUHRUMK1F3J0uOkSY0RLANwBPYVSA1M5F20fRvLz-kQ6oc.&dur=1~KLUv_WMFOcgkMwC
1AQDAa2ZudWlqYSUKD21TcG8FaXNwb3Q4AEAAcfwufDrpD4VaThKUpS_6kfdRdaRNeyMSn
wiJxhk.&durs=10fqGg&bdc=10&mk=Generic&mdl=4&adpt=pubo&ict=Unknown&said
=05914A50-1DE6-43B2-8827-16BC1BE44980V&auct=3&mgnr=comedy&cxdur=30.01-
45&cxlvs=1&csg=EgAaACIAKAeyB3VucmF0ZWQ6BmNvbWVkeUD_____B0iAD1IGY29tZWR
5Wgl0b3QgUmF0ZWRIAA..&sfe=1aa095e4&vp=0

Table 6: Ad Event 9 Key Values

Key	Value	Definition
event	js_start	JavaScript-based video ad start event
seat	29546	owner id of the Springserve seat
dealid	lvw3tpbc	Creative ID
_dsp_pub_name	Paramount+Global	Publisher Name in DSP
_dsp_pub_id	520311	Publisher ID
app_name	EYEQ	Creative ID
_dsp_app_id	EYEQ	DSP application identifier
app_bundle	EYEQ	App bundle identifier
_dsp_pub_name	Paramount+Global	Publisher Name in DSP
_dsp_pub_id	520311	Publisher ID
app_name	EYEQ	Creative ID
_dsp_app_id	EYEQ	DSP application identifier
app_bundle	EYEQ	App bundle identifier
content_genre	comedy	Content genre classification
content_categories	330,646	IAB content category codes
rating	Not+Rated	Content Rating
w	1920	Video resolution width
h	1080	Video resolution height
did	8b8869ac-aad4-2953-22ed-c05	Device advertising ID (consistent



Example 2: Pluto x McDonalds

The same method was deployed for Example 2 as was used for Example 1.

Table 7: Impression Details for Example 2 (Pluto x McDonalds)

Advertiser	McDonald's
Price (CPM)	\$24.82983
Buy Side System	TheTradeDesk
Buyer Ad-Server	Innovid
Publisher/App	Paramount/Pluto.tv
Sell Side System	FreeWheel
Assumed Player Size (HxW)	1080 x 1920
Agency	Starcom
Placement Type	Midroll
Creative Length	15 seconds
Ad View Completion	4/4
Measurement/Attribution	iSpot.tv
Content/Channel	FailArmy (Jukin Media)
Declared Device	Dalvik 2.1.0, Android, Raspberry Pi 4 Build,

Table 8: Sequence of Events Related to Ad Impression Example 2 (Pluto x McDonalds)

Events in Sequence	Domain Endpoint	Company	Purpose
1	ny1-bid.adsrvr.org	TheTradeDesk	Record won auction
2	conduit-beacon.mtvnservices.com	Paramount (MTV Network Services)	Record sold impression
3	rtr.innovid.com	Innovid	Record ad-creative delivery
4	tapestry.tapad.com	TapAd	Record event for Agency
5	k.pluto.tv	Paramount (Pluto.tv app)	Ad Video Play Start



Events in Sequence	Domain Endpoint	Company	Purpose
6	k.pluto.tv	Paramount (Pluto.tv app)	Ad Impression Render Event
7	ag.innovid.com	Innovid	Record Ad Video Start
8	dt.adsafeprotected.com	IntegralAdScience	Record Ad Video Start
9	mobile.adsafeprotected.com	IntegralAdScience	
10	ag.innovid.com	Innovid	Record “init” initiate? event
11	mobile.adsafeprotected.com		
12	cf-d-v4-service-channel-stitcher-use11-1-prd.pluto.tv	Paramount (Pluto.tv app)	Confirmation event of continued stitched stream
13	siloh-ns1.plutotv.net	Paramount (Pluto.tv app)	CDN for pluto?
14	siloh-ns1.plutotv.net	Paramount (Pluto.tv app)	CDN for pluto?
15	infinity-38.youboranqs01.com	YouBora	1st quartile Ad View Completion Tracker
16	7f077.v.fwmrm.net	FreeWheel (Comcast)	1st quartile Ad View Completion Tracker
17	unified.adsafeprotected.com	IntegralAdScience	1st quartile Ad View Completion Tracker
18	dt.adsafeprotected.com	IntegralAdScience	1st quartile Ad View Completion Tracker
19	enduser.adsrvr.org	TheTradeDesk	1st quartile Ad View Completion Tracker
20	s.innovid.com	Innovid	1st quartile Ad View Completion Tracker
21	k.pluto.tv	Paramount (Pluto.tv app)	1st quartile Ad View Completion Tracker
22	ag.innovid.com	Innovid	1st quartile Ad View Completion Tracker



Events in Sequence	Domain Endpoint	Company	Purpose
23	infinity-c38.youboranqs01.com	YouBora	Timed Ping Beacon
24	cfd-v4-service-channel-stitcher-use11-1.prd.pluto.tv	Paramount (Pluto.tv app)	Confirmation event of continued stitched stream
25	enduser.adsrvr.org	TheTradeDesk	2nd quartile (Midpoint) Ad View Completion Tracker
26	s.innovid.com	Innovid	2nd quartile (Midpoint) Ad View Completion Tracker
27	k.pluto.tv	Paramount (Pluto.tv app)	2nd quartile (Midpoint) Ad View Completion Tracker
28	7f077.v.fwmrm.net	FreeWheel (Comcast)	2nd quartile (Midpoint) Ad View Completion Tracker
29	infinity-c38.youboranqs01.com	YouBora	2nd quartile (Midpoint) Ad View Completion Tracker
30	ag.innovid.com	Innovid	2nd quartile (Midpoint) Ad View Completion Tracker
31	unified.adsafeprotected.com	IntegralAdScience	2nd quartile (Midpoint) Ad View Completion Tracker
32	dt.adsafeprotected.com	IntegralAdScience	2nd quartile (Midpoint) Ad View Completion Tracker
33	assets.adobetm.com	Adobe	
34	7f077.fwmrm.net	FreeWheel (Comcast)	3rd quartile Ad View Completion Tracker
35	unified.adsafeprotected.com	IntegralAdScience	3rd quartile Ad View Completion Tracker



Events in Sequence	Domain Endpoint	Company	Purpose
36	enduser.adsrvr.org	TheTradeDesk	3rd quartile Ad View Completion Tracker
37	k.pluto.tv	Paramount (Pluto.tv app)	3rd quartile Ad View Completion Tracker
38	dt.adsafeprotected.com	IntegralAdScience	3rd quartile Ad View Completion Tracker
39	infinity-c38.youboranqs01.com	YouBora	3rd quartile Ad View Completion Tracker
40	s.innovid.com	Innovid	3rd quartile Ad View Completion Tracker
41	ag.innovid.com	Innovid	3rd quartile Ad View Completion Tracker
42	cfid-v4-service-channel-stitcher-use11-1.prd.pluto.tv	Paramount (Pluto.tv app)	Confirmation event of continued stitched stream
43	s.innovid	Innovid	4th quartile Ad View Completion Tracker
44	7f077.fwmrm.com	FreeWheel (Comcast)	4th quartile Ad View Completion Tracker
45	enduser.adsrvr.org	TheTradeDesk	4th quartile Ad View Completion Tracker
46	k.pluto.tv	Paramount (Pluto.tv app)	4th quartile Ad View Completion Tracker
47	ag.innovid.com	Innovid	4th quartile Ad View Completion Tracker
48	unified.adsafeprotected.com	IntegralAdScience	4th quartile Ad View Completion Tracker
49	infinity-c38.youboranqs01.com	YouBora	4th quartile Ad View Completion Tracker
50	infinity-c38.youboranqs01.com	YouBora	Ad Break Completion



The following is a breakdown of specific ad events from the above table titled: *Sequence of Events Related to Ad Impression Example 2 (Pluto x McDonalds)*.

Ad Event 1
(Example 2: Pluto x McDonalds)

URL:

[**Table 9: Ad Event 1 Key Values**](https://ny1-bid.adsrvr.org/bid/feedback/paramount?t=1&iid=47080318-1578-4ec8-9f13-f37e71d1dc2c&crid=hhz596ar&wp=24.829830&aid=20-1&wpc=USD&sfe=1a99334d&puid=c9dd0b9de9c3aed8-9553-030c318f21f1&bdc=22&tdid=&uidd=pqX6FNidjZrcP0jkdRS4kd6_FXJFiLW_vh1KQBD11NwmsygJ&pid=2s13z2r&ag=vtm8m26&adv=ap9ihth&sig=1toX6UIoy2FozJjMSCYO_230b12Yw54o3MDqQrEb9dns.&bp=24.8298304345763&cf=8805246&fq=0&td_s=tv.pluto.android&rcats=&mste=q5tt3f&mflid=4&mssi=&mfsi=&uhow=17&agsa=&rgz=10536&svbttd=1&dt=Mobile&osf=Android&os=Android150&br=Chrome&rlangs=01&mlang=&svpid=1&did=PLU-US-TTD-OP-ROn-PODDED-01&rcxt=InApp&lat=41.270900&lon=-73.685700&tmpc=31.480000000000018&daid=c9dd0b9de9c3aed8-9553-030c318f21f1&vp=0&osi=&osv=&sft=2&bx=120&mdl=4&testid=iavc1%20&vpb=MidRoll&cc=1~KLUV_WNa1XJFLQB9CABTUD5fcm4QCVTqsSKAQCWQxxLI4weg8gMQMQfsYAPsIgywlhgAxRwy7h9A5wpruH_AEAoC8FKI9QS08QKgACQfoC8AFcfGA5aK3PoiC4qXs2jtV6fEQgwBAakMqW2EPmtu18pyNbObt n5rSTsVpDeVo6eFipWCxSrhmCFiQBQbQQCQiiladlxnvvs9K0WXYyqzoHjIStJa6bKCiDhDHmCZPQRk6WitdFioekK2i0vDUsRi3WlhWT0WFBYryQdCYE5esIs9_9U9XyQWNd_5DYn_fbu9c4txyeNZ5T6xPAIZcFVtAGRoHcAhh1wEoBFHkQxI1wWyGWATgE_EY4mfubMsNbC-4tnt0bJSSb&dur=1~KLUV_WMFoCgkOgCdAwAzBRERXGCF5QoGHLam11LMSILXkhYjGm0BOPZyW1jlz3kvm7YbU8h7rCEmmccdZ9NhACCIi9zKxhw2HhXoq4kWKbtR0mkGw78IhZewAtCPEnYS50k5UEYBSS0dlPyntKCicy3oDrMdoFw0vSEcB53skcG&durs=xs5BbA&crrelr=&pc m=1&vc=12&said=o0ca4-1751233357813474854-86-520311midr&ict=Unknown&auc t=1&mgnr=comedy&cxdur=30.01-45&cxlvs=1&us_privacy=1YNN&im=1&mc=88a9a8d 5-0274-47ff-86ff-6249d334473f&idl=XY3007XMAkAtDr_GXHuKfK6KFPRa1b8A32wk RkuZo05hDok7g&ev=EPgnMo_0VBCy6jkXp05tkw3oYkM71y-8nc3N_0QGtBk.&rsv=0.00 0664693952467591&csg=EgAaACIAKAeyBXR2LTE0gZjb211ZH1A_wdIxAS5BmNvbWVke VoFVfYtMTRiAA&abr=4963706a-a44a-41c2-9bd3-589f98877e9c&tail=1</p></div><div data-bbox=)

Key	Value	Definition
iid	47080318-1578-4ec8-9f13-f37e71d1dc2c	Impression ID
crid	hhz596ar	Creative ID
wp	24.829830	Winning Price
aid	20-1	Undefined
wpc	USD	Winning Price Currency
sfe	1a99334d	Undefined



Key	Value	Definition
puid	c9dd0b9de9c3aed8-9553-030c318f21f1	Publisher ID
bdc	22	Undefined
uidd	pqX6FNidjZrcP0jkdRS4kd6_FXJFilW_vh 1KQBDI1NwmsygJ	User ID
pid	2sl3z2r	TTD Placement ID
ag	vtn8m26	TTD Ad Group
adv	ap9ihth	TTD Advertiser ID
sig	1toX6UIoy2FozJjMSCYO_230bl2Yw54o 3MDqQrEb9dns.	Undefined
bp	24.8298304345763	Bid Price
cf	8805246	Undefined
fq	0	Undefined
td_s	tv.pluto.android	App Bundle ID
mste	eq5tt3f	Undefined
mflid	4	Undefined
uhow	17	Undefined
rgz	10536	Undefined
svbttd	1	Undefined
dt	Mobile	Device Type
osf	Android	Operating System
os	Android150	Operating System
br	Chrome	Browser
rlangs	1	Undefined
svpid	1	Undefined
did	PLU-US-TTD-OP-RON-PODDED-01	Deal ID
rext	InApp	Context



Key	Value	Definition
lat	41.270900	Latitude
lon	-73.685700	Longitude
tmpe	31.480000000000000	Time played to completion
daid	c9dd0b9de9c3aed8-9553-030c318f21f1	Undefined
vp	0	Undefined
sft	2	Undefined
bx	120	Undefined
mdl	4	Undefined
testid	iavc1	Undefined
vpb	MidRoll	Pod
cc	1~KLUv_WNa1XJFLQB9CABTUD5fcM4QCVTqsSKAqCWQxxLI4weg8gMQMQfsYAPsIgywlhgAxRWy7h9A5wpruH_AEAoC8FKI9QS08QKgACQfoC8AFcfgA5aK3PoiC4qXs2jtV6fEQgwBAakMqW2EPmtu18pyNbObtn5rSTsVpDeVo6eFipWCxSrhQmCFiQBQbQQCQiladlxnvvs9K0WXYyqzoHjIStJa6bKCiDhDHmCZPQRk6WitdFioekK2iOvDUsRi3WlhWT0WFBYryQdCYYE5esIs9_9U9XyQWNd_5DYn_fbu9c4txyeNZ5T6xPAIZcFVtAGRoHcAhh1wEoBFHkQxI1wWyGWATgE_EY4mfubMsNbC-4tntObJSsB	Undefined
dur	1~KLUv_WMFOcGkOgCdAwAzBRERXGCF5QoGHLam11LMSILXkhYjGm0BOPZyW1jlz3kvm7YbU8h7rCEmmccdZ9NhACCI9zKxhw2HhXoq4kWKbtROmkGw78IhZewAtCPEnYS50k5UEYBSSOdIPyntKCicy3oDrMdofw0vSECB53skcG	Undefined
durs	xs5BbA	Undefined
vc	12	Undefined
said	o0ca4-1751233357813474854-86-520311midr	Session ID



Key	Value	Definition
ict	Unknown	Undefined
auct	1	Auction Count
mgnr	comedy	Genre
exdur	30.01-45	Content Duration
cxlvs	1	Undefined
us_privacy	1YNN	US Privacy Consent
im	1	Undefined
mc	88a9a8d5-0274-47ff-86ff-6249d334473f	Undefined
idl	XY3007XMAkAtDr_GXHuKfK6KFPRa1b8A32wkRkuZo05hDok7g	Undefined
ev	EPgnMo_0VBCy6jkXp05tkw3oYkM71y-8nc3N_0QGtBk.	Undefined
rsv	0.000664693952467591	Undefined
csg	EgAaACIAKAeyBXR2LTE0OgZjb21lZHlA_wdIxASBmNvbWVkeVoFVFYtMTRiAA	Undefined
abr	4963706a-a44a-41c2-9bd3-589f98877e9c	Undefined
tail	1	Undefined

Ad Event 2
(Example 2: Pluto x McDonalds)

URL:

https://conduit-beacon.mtvnservices.com/tracking/impressions?adid=hhz596ar&adomain=mcdonalds.com&bbucket=0&bid_price=24.83&bidid=20-1&cid=conduit&conduit_id=e9386c79-aba4-4312-ab8d-5d3e649db5a2&crid=hhz596ar&dealid=PLU-US-TTD-OP-RON-PODDED-01&impid=20-1&inventory=indirect&guarantee|pluto|us||&requestid=o0ca4-1751233357813474854-86-520311-midro11_20-5&seat=ttd_openpath&ssid=17833694

Table 10: Ad Event 2 Key Values

Key	Value	Definition
-----	-------	------------



adid	hhz596ar	Advertiser ID
adomain	mcdonalds.com	Advertiser URL
bbucket	0	Undefined
bid_price	24.83	Bid price
bidid	20-1	Undefined
cid	conduit	Undefined
conduit_id	e9386c79-aba4-4312-ab8d-5d3e649db5a2	Undefined
crid	hhz596ar	Creative ID
dealid	PLU-US-TTD-OP-RON-PODDED-01	Deal ID
impid	20-1	Unknown
inventory	indirect&guarantee pluto us	Additional inventory details
requestid	o0ca4-1751233357813474854-86-520311-midroll_20-5	Bid Request ID
seat	ttd_openpath	Bidder Seat
ssid	17833694	Server-Side ID

Ad Event 28
(Example 2: Pluto x McDonalds)

URL:

https://7f077.v.fwmrm.net/ad/l/1?s=o0ca4&n=520311;520311;82125;112214;169843;191701;376521;378678;379619;382114;384777;386329;505334;510839;511664;512028;512029;515123;515188;515189;516273;516274;516448;511939;511940;512166;512167;512188;515211;515219;516328;516374;516584;516790;516830;516834;516869;517097;517365;517370;517375;517420;517424;518308;519276;519346;519353;519611;519629;520024;520177;520606;523319;524565;524796;524880;524990;525748;527997;528776;528945;529012;529095;529256;529333;529939;530362;531823;532203;535029;535045&t=1751233357813474854&f=67108864&r=520311;520177&adid=53783346&reid=57000182&arid=327680&auid=&cn=midPoint&et=i&_cc=&tpos=0&async=0&iw=&uxnw=520311&uxss=sg922798&uxct=4&metr=1031&init=1

Table 11: Ad Event 28 Key Values



Key	Value	Definition
s	o0ca4	Session ID
n	520311;520311;82125;112214;169843;191701;376521;378678;379619;382114;384777;386329;505334;510839;511664;512028;512029;515123;515188;515189;516273;516274;516448;511939;511940;512166;512167;512188;515211;515219;516328;516374;516584;516790;516830;516834;516869;517097;517365;517370;517375;517420;517424;518308;519276;519346;519353;519611;519629;520024;520177;520606;523319;524565;524796;524880;524990;525748;527997;528776;528945;529012;529095;529256;529333;529939;530362;531823;532203;535029;535045	Undefined
t	1751233357813474854	Undefined
f	67108864	Undefined
r	520311;520177	Undefined
adid	53783346	FreeWheel Ad ID
reid	57000182	Undefined
arid	327680	Undefined
cn	midPoint	Ad position
et	i	Undefined
tpos	0	Undefined
async	0	Undefined
uxnw	520311	Undefined
uxss	sg922798	Undefined
uxct	4	Undefined
metr	1031	Undefined
init	1	Undefined



Ad Event 38 (Example 2: Pluto x McDonalds)

URL:

https://dt.adsafeprotected.com/dt?asId=4f395fca-7f64-50fb-c009-ff2ab490d2b1&advEntityId=2455463&ias_xcua=&tv=%7Bc%3A475aff5c553211f0909946b9239b7abf%2CpingTime%3A-4%2Ctime%3A4%2Ctype%3Am%2Cve%3A%7BvEventCount%3A4%2CvEvents%3A%5B%7Bt%3A0%2Ctp%3AadVideoStart%7D%2C%7Bt%3A1%2Ctp%3AadVideoFirstQuartile%7D%2C%7Bt%3A2%2Ctp%3AadVideoMidpoint%7D%2C%7Bt%3A3%2Ctp%3AadVideoThirdQuartile%7D%5D%7D%7D

Table 12: Ad Event 38 Key Values

Key	Value	Definition
asId	4f395fca-7f64-50fb-c009-ff2ab490d2b1	Ad Safe ID
advEntityId	2455463	Advertiser Entity ID
ias_xcua	(empty)	Undefined
tv	{c:475aff5c553211f0909946b9239b7abf,pingTime:-4,time:4,type:m,ve:{vEventCount:4,vEvents:[{t:0,tp:adVideoStart},{t:1,tp:adVideoFirstQuartile},{t:2,tp:adVideoMidpoint},{t:3,tp:adVideoThirdQuartile}]}}	Undefined

Ad Event 45 (Example 2: Pluto x McDonalds)

URL:

https://enduser.adsrvr.org/enduser/video/?ve=complete&imp=47080318-1578-4ec8-9f13-f37e71d1dc2c&ag=vtn8m26&crId=hhz596ar&cf=8805246&fq=0&t=1&td_s=tv.pluto.android&rcats=&mste=eq5tt3f&mflD=4&mssi=&mfsi=&sv=paramount&uhow=17&agsa=&wp=24.829830&rgz=10536&dt=Mobile&osf=Android&os=Android150&br=Chrome&svpid=1&rlangs=01&mlang=&did=PLU-US-TTD-OP-RON-P-ODDED-01&rcxt=InApp&tmpc=31.480000000000018&vrtd=14,15&osi=&osv=&daid=c9dd0b9d-e9c3-aed8-9553-030c318f21f1&dnr=0&vpb=MidRoll&crrelr=&npt=&cc=1~KLUV_WNa1XJFLQB9CABTUD5fcm4QCVTqsSKAqCWQxxLI4weg8gMQMQfsYAPsIgywlhgAxRWy7h9A5wpruH_AEAoC8FKI9QS08QKg-ACQfoC8AFcfGA5aK3PoiC4qXs2jtV6fEQgwBAakMqW2EPmtu18pyNbObtn5rSTsVpDeVo6eFipWCxSrhQmCFiQBQbQQCQiiladlxnvvs9K0WXY-y-qzoHjIstJa6bKCiDhDHmCZPQRk6WitdFioekK2i0vDUsRi3WlhWT0WFBYryQdCYIE5esIs9_9U9XyQWN-d_5DYn_fbu9c4txyeNZ5T6xPAIZcFVtAGRoHcAhh1wEoBFHkQxI1wWyGWATgE_EY4mfubMsNbC-4tntObJSSB&dur=1~KLUV_WMFoCgkOgCdAwAzBRERXGCF5QoGHLam11LMSILXkhYjGm0B-OPZyW1jlz3kvm7YbU8h7rCEmmccdZ9NhACCIi9zKxhw2HhXoq4kWKbtROmkGw78IhZewAtCPEnYS50k5UEYBSSOd1PyntKCicy3oDrMdofw0vSECB53skcG&durs=xs5BbA&bdc=22&uidd=pqX6FNidjZrcP0jkdRS4kd6_FXJFiLW_vh1KQBD11NwmsygJ&id1=XY3007XMAkAtDr_GXHukfK6KFPRa1b8A32wkRkuZo05hDok7g&mdl=4&test



id=iavc1%20&pcm=1&ict=Unknown&said=o0ca4-1751233357813474854-86-520311-midroll_20-5&auct=1&mgnr=comedy&cxdur=30.01-45&cxlvs=1&us_privacy=1YN N&csg=EgAaACIAKAEyBXR2LTE00gZjb211ZH1A_____wdIxASBmNvbWVkeVoFVFYtMTRiAA..&tail=1&sfe=1a99334d&vp=0

Table 13: Ad Event 45 Key Values

Key	Value	Definition
ve	complete	Event Type (completion)
imp	47080318-1578-4ec8-9f13-f37e71d1dc2c	Impression ID
ag	vtn8m26	Ad Group
crid	hhz596ar	Creative ID
cf	8805246	Undefined
fq	0	Undefined
t	1	Undefined
td_s	tv.pluto.android	Bundle ID
mste	eq5tt3f	Undefined
mflid	4	Undefined
sv	paramount	Supply Vendor
uhow	17	Undefined
wp	24.829830	Winning Price
rgz	10536	Zip Code
dt	Mobile	Device Type
osf	Android	Device Operation System
os	Android150	Device Operating System
br	Chrome	Browser Type
svpid	1	Undefined
rlangs	01	Undefined
did	PLU-US-TTD-OP-RON-PODDED-01	Deal ID



Key	Value	Definition
rcxt	InApp	Ad Environment
tmpe	31.480000000000018	Time played to completion
vrtd	14,15	Undefined
daid	c9dd0b9d-e9c3-aed8-9553-030c318f21f1	Undefined
dnr	0	Undefined
vpb	MidRoll	Video Ad Position
cc	1~KLUv_WNa1XJFLQB9CABTUD5fcM4QCVTqsSKAqCWQxxLI4weg8gMQMQfsYAPsIgywlhgAxRWy7h9A5wpruH_AEAoC8FKI9QS08QKg-ACQfoC8AFcfgA5aK3PoiC4qXs2jtV6fEQgwBAakMqW2EPmtu18pyNbObtn5rSTsVpDeVo6eFipWCxSrhQmCFiQBQbQQCQiiladlxnvvs9K0WXY-y-qzoHjIStJa6bKCiDhDHmCZPQRk6WitdFioekK2iOvDUUsRi3WlhWT0WFBYryQdCYYE5esIs9_9U9XyQWN-d_5DYn_fbu9c4txyeNZ5T6xPAIZcFVtAGRoHcAhh1wEoBFHkQxI1wWyGWATgE_EY4mfubMsNbC-4tntObJSsB	Undefined
dur	1~KLUv_WMFOcgkOgCdAwAzBRERXGCF5QoGHLam11LMSILXkhYjGm0B-OPZyW1jlz3kvm7YbU8h7rCEmmccdZ9NhACCI9zKxhw2HhXoq4kWKbtROmkGw78IhZewAtCPEnYS50k5UEYBSSOdIPyntKCicy3oDrMdofw0vSEcB53skeG	Undefined
durs	xs5BbA	Undefined
bdc	22	Undefined
uidd	pqX6FNidjZrcP0jkdRS4kd6_FXJFiW_vh1KQBD11NwmsygJ	Undefined
idl	XY3007XMAkAtDr_GXHuKfK6KFPRa1b8A32wkRk_uZo05hDok7g	Undefined
mdl	4	Undefined
testid	iavc1%20	Undefined
pcm	1	Undefined
ict	Unknown	Undefined



Key	Value	Definition
said	o0ca4-1751233357813474854-86-520311-midroll_20-5	Session ID
auct	1	Undefined
mgnr	comedy	Undefined
cxdur	30.01-45	Undefined
cxlvs	1	Undefined
us_privacy	1YNN	US Privacy Consent
csg	EgAaACIAKAeyBXR2LTE0OgZjb21lZHlA_____wdI xA5SBmNvbWVkeVoFVFYtMTRiAA..	Undefined
tail	1	Undefined
sfe	1a99334d	Undefined
vp	0	Undefined



Example 3: Pluto x Ro.com

The user agent of the bot was changed from “Dalvik/2.1.0 (Linux; U; Android+15; Pi 4 Build/BP1A.250505.005)” one to “Dalvik/2.1.0, I’m a Bot, Don’t Buy or Sell Ad Space that I’m seeing.” All traffic was routed through Amazon Web Services. An HDMI dummy plug was used to enable a complete rendering process. A movie was loaded on the Pluto Icons channel called “Julie and Julia.” The initial ad pod was sold by Pluto.tv brokered by Freewheel. Full unencoded URLs are below:

Image 10: Full Encoded URLs from Initial Ad Pod

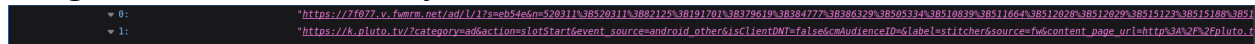


Table 14: Impression Details for Example 3 (Pluto x Ro.com)

Advertiser	Charmin (P&G)
Price (CPM)	\$12.50
Buy Side System	TheTradeDesk, Amazon
Buyer Ad-Server	Innovid, Google
Publisher/App	Paramount/Pluto.tv
Sell Side System	Pubmatic, SpringServe, Amazon, BidSwitch
Assumed Player Size (HxW)	1080 x 1920
Agency	Unknown
Placement Type	Midroll
Creative Length	15 seconds
Ad View Completion	4/4
Measurement/Attribution	DoubleVerify, Moat
Content/Channel	Fail Army (Jukin Media)
Declared Device	Dalvik 2.1.0, Android, Raspberry Pi 4 Build,

Table 15: Sequence of Events Related to Ad Impression Example 3 (Pluto x Ro.com)

Events in Sequence	Domain Endpoint	Company	Purpose
1	s.innovid.com	Innovid	Ad-Serving
2	st.pubmatic.com	PubMatic	Sell Side Transaction



Events in Sequence	Domain Endpoint	Company	Purpose
3	vid-io-pdx.springserve.com	SpringServe	Sell Side Transaction
4	usw-ca2.adsrvr.org	TheTradeDesk	Record Won Auction
5	tpsc-video-uw.doubleverify.com	DoubleVerify	Measurement/Analytics
6	tps.doubleverify.com	DoubleVerify	DoubleVerify measurement endpoint
7	vtrk.dv.tech	DoubleVerify	DoubleVerify video tracking pixel
8	dpm.demdex.net	Adobe	Tracking/Beacon
9	cm.g.doubleclick.net	Google	Ad-Serving
10	match.adsrvr.org	TheTradeDesk	DSP Identity Graph
11	enduser.adsrvr.org	TheTradeDesk	Buy Side Transaction
12	vam-bid.adsrvr.org	TheTradeDesk	Buy Side Transaction
13	idsync.rlcdn.com	LiveRamp	Tracking/Beacon
14	gum.criteo.com	Criteo	Retargeting & bidder ID sync
15	stats.g.doubleclick.net	Google	Tracking/Beacon
16	tag.simplifi	Simplifi	Tracking/Beacon
17	securepubads.g.doubleclick.net	Google	Ad-Serving
18	x.bidswitch.net	BidSwitch	Sell Side Transaction
19	edge.smaato.net	Verve	Sell Side Transaction
20	video.moatads.com	Moat/Oracle	Measurement/Analytics
21	logx.optimizely.com	Optimizely	Measurement/Analytics
22	aax.amazon-adsystem.com	Amazon Ads	DSP Bid Response
23	ib.adnxs.com	AppNexus/Microsoft	Sell Side Transaction
24	pixel.advertising.com	Advertising(.)com	Tracking/Beacon
25	trc.taboola.com	Taboola	Tracking/Beacon



Events in Sequence	Domain Endpoint	Company	Purpose
26	f-log-attribution.gameloft.com	GameLoft/Vivendi	Tracking/Beacon
27	boot.pluto.tv	Pluto/Paramount	Content App Bootloading
28	k.pluto.tv	Pluto/Paramount	App Ad-Related Analytics
29	siloh-ns1.plutotv.net	Pluto/Paramount	Pluto content CDN / stream delivery
30	cdn-media.brightline.tv	Brightline	Rich media ad assets (interactive ads)
31	events.brightline.tv	Brightline	Ad interaction event tracking
32	assets.adobedtm.com	Adobe	Tracking/Beacon
33	tags.tiqcdn.com	Tealium	Tracking/Beacon
34	a-fds.youborafds01.com	Youbora	Measurement/Analytics
35	beacons.extremereach.io	ExtremeReach	Tracking/Beacon
36	lma.npaw.com	NPAW	Measurement/Analytics
37	census-app.scorecardresearch.com	Comscore	Measurement/Analytics
38	app-measurement.com	Google	Measurement/Analytics
39	imasdk.googleapis.com	Google	Ad-Serving
40	7f077.v.fwmrm.net	FreeWheel	Sell Side Transaction
41	p.tvpixel.com	TV Pixel	Tracking/Beacon
42	pi.ispot.tv	iSpot.TV	Measurement/Analytics
43	control.kochava.com	Kochava	Measurement/Analytics
44	kvinit-prod.api.kochava.com	Kochava	Measurement/Analytics
45	secure.insightexpressai.com	Nielsen	Measurement/Analytics
46	direct-ipv4-prod.telemetry.vaultdc r.com	Tatari	Tracking/Beacon

The following is a breakdown of specific ad events from the above table titled: *Sequence of Events Related to Ad Impression Example 3 (Pluto x Ro.com)*



Ad Event 28
(Example 3: Pluto x Ro.com)

URL:

`https://k.pluto.tv/?category=ad&action=slotStart&event_source=and
roid_other&isClientDNT=false&cmAudienceID=&label=stitcher&source=fw&co
ntent_page_url=http://pluto.tv&pod_Type=ad&streamType=channel&timeline
_id=686f34bcfd92ab53e87e7801&index_timeline=4&episode_id=66a7dfaa5b669
a00139e3f53&series_id=66a7dfa85b669a00139e3f2d&clip_id=66a7dfa85b669a0
0139e3f3a&partnerCode=F2505800000&partner_id=Sony+Pictures&ch_id=64b58
5f84ea480000838e446&app_name=Pluto.tv&app_domain=Pluto.tv&player_width
=1920&player_height=1080&_fw_player_width=1920&_fw_player_height=1080&
from_stitcher=true&device_ua=Dalvik/2.1.0,+I'm+a+Bot,+Don't+Buy+or+Sel
l+Ad+Space+that+I'm+seeing.&ip_address=54.237.203.184&deviceId=2cbc001
5-a487-41e9-8dc7-9fb19b9eabe7_af2f9a0b2a8e92b8&deviceVersion=15_35&app
Version=5.57.0-leanback&deviceType=android&deviceMake=Raspberry&device
Model=Pi+4&embedPartner=&stitcherReqId=a277ac74-8fcd-94bd-8692-295c70d
37ce6&deviceUserAgent=Dalvik/2.1.0,+I'm+a+Bot,+Don't+Buy+or+Sell+Ad+Sp
ace+that+I'm+seeing.&ipAddress=54.237.203.184&origDeviceType=android,R
aspberry,ctv&origIPAddress=54.237.203.184&sessionId=374fdca5-5da5-11f0
-861a-aa7be1381612&cluster=prd&us_privacy=1YNN&abTestId=0&transaction_
id=1469194d-2316-4434-9b0b-67f15ec8ea63&root_url=&preroll=false®ion
=us&country=US&event_id=3c8e5a71-1e5a-4959-9714-bf2fcba82b43`

Table 16: Ad Event 28 Key Values

Key	Value	Definition
event	js_start	JavaScript-based video ad start event
event_source	android_other	Source platform for the event (Android device, non-standard)
isClientDNT	false	Do Not Track flag - client is allowing tracking
cmAudienceID	(empty)	Campaign Manager audience identifier
label	stitcher	Event label - indicates ad stitcher service
source	fw	Source system (likely FreeWheel ad server)
content_page_url	http://pluto.tv	URL of the content page
pod_Type	ad	Type of content pod (advertisement)



Key	Value	Definition
streamType	channel	Type of stream (linear channel)
timeline_id	686f34bcfd92ab53e87e7801	Unique timeline identifier for this content
index_timeline	4	Position index within the timeline
episode_id	66a7dfaa5b669a00139e3f53	Unique episode identifier
series_id	66a7dfa85b669a00139e3f2d	Unique series identifier
clip_id	66a7dfa85b669a00139e3f3a	Unique clip identifier
partnerCode	F2505800000	Partner/content provider code
partner_id	Sony+Pictures	Content partner (Sony Pictures)
ch_id	64b585f84ea480000838e446	Channel identifier
app_name	Pluto.tv	Application name
app_domain	Pluto.tv	Application domain
player_width	1920	Video player width in pixels
player_height	1080	Video player height in pixels (1080p)
_fw_player_width	1920	FreeWheel player width parameter
_fw_player_height	1080	FreeWheel player height parameter
from_stitcher	true	Indicates event originated from ad stitcher
device_ua	Dalvik/2.1.0,+I'm+a+Bot,+Don't+Buy+or+Sell+Ad+Space+that+I'm+seeing.	Device user agent
ip_address	54.237.203.184	IP address of the device
deviceId	2cbc0015-a487-41e9-8dc7-9fb19b9eabe7_af2f9a0b2a8e92b8	Unique device identifier
deviceVersion	15_35	Device OS version (Android 15, build 35)



Key	Value	Definition
appVersion	5.57.0-leanback	Pluto TV app version (Android TV/leanback interface)
deviceType	android	Device type classification
deviceMake	Raspberry	Device manufacturer (Raspberry Pi)
deviceModel	Pi+4	Device model (Raspberry Pi 4)
embedPartner	(empty)	Embed partner identifier
stitcherReqId	a277ac74-8fcd-94bd-8692-295c70d37ce6	Ad stitcher request ID
deviceUserAgent	Dalvik/2.1.0,+I'm+a+Bot,+Don't+Buy+or+Sell+Ad+Space+that+I'm+seeing.	Full device user agent string
ipAddress	54.237.203.184	IP address (duplicate parameter)
origDeviceType	android,Raspberry,ctv	Original device type classification (Connected TV)
origIPAddress	54.237.203.184	Original IP address
sessionId	374fdca5-5da5-11f0-861a-aa7be1381612	User session identifier
cluster	prd	Server cluster (production)
us_privacy	1YNN	US Privacy String (CCPA compliance)
abTestId	0	A/B test identifier
transaction_id	1469194d-2316-4434-9b0b-67f15ec8ea63	Transaction identifier for this ad event
root_url	(empty)	Root URL parameter
preroll	false	Indicates this is not a pre-roll ad
region	us	Geographic region (United States)
country	US	Country code



Key	Value	Definition
event_id	3c8e5a71-1e5a-4959-9714-bf2f cba82b43	Unique event identifier

Ad Event 35
(Example 3: Pluto x Ro.com)

URL:

[https://beacons.extremereach.io/cp-imp?cid=477037&creative_id=67418195&line_item=15972228&companion_id=0&er_ts=1752162167&vv=2.0&gpp=\[GPPSTRING\]&gpp_sid=\[GPPSECTIONID\]&hasIpSync=1&](https://beacons.extremereach.io/cp-imp?cid=477037&creative_id=67418195&line_item=15972228&companion_id=0&er_ts=1752162167&vv=2.0&gpp=[GPPSTRING]&gpp_sid=[GPPSECTIONID]&hasIpSync=1&)

Table 17: Ad Event 35 Key Values

Key	Value	Definition
cid	477037	Campaign ID - unique identifier for the advertising campaign
creative_id	67418195	Creative ID - unique identifier for the specific creative/ad asset
line_item	15972228	Line Item ID - identifier for the specific ad line item or insertion order
companion_id	0	Companion Ad ID - identifier for companion ads (0 indicates no companion ad)
er_ts	1752162167	Extreme Reach Timestamp - Unix timestamp for when the beacon fired
vv	2.0	Version - beacon or tracking version (version 2.0)

Ad Event 46
(Example 3: Pluto x Ro.com)

URL:

https://tatari-direct-ipv4-prod.telemetry.vaultdcr.com/4446666b51119eec158546fe15f2127b0df720b2?isci=RBFCV2V130H&mediaplan=ro_body_PARAMOUNT_STREAMING_CULTURE_F35%2B_OTT_3Q25&vendor=EyeQ&placement_group=ro_body_PARAMOUNT_STREAMING_CULTURE_F35%2B_OTT_3Q25_30&advertiser_id=181325&mediaplan_id=477037&vendor_id=106487&placement_group_id=G15972228&creative_id=67418195&referrer=

Table 18: Ad Event 46 Key Values



Key	Value	Definition
Hash	4446666b51119eec158546fe15f2127b0df720b2	URL path hash - likely a unique identifier or encrypted tracking token
isci	RBFCV2V130H	Industry Standard Commercial Identifier (ISCI) - unique ad identifier for broadcast tracking
mediaplan	ro_body_PARAMOUNT_STREAMING_CULTURE_F35%2B_OTT_3Q25	Media Plan Name - "Reach & Frequency Body Paramount Streaming Culture Female 35+ OTT Q3 2025"
vendor	EyeQ	Vendor/Supply Source - EyeQ is the supply-side platform or inventory source
placement_group	ro_body_PARAMOUNT_STREAMING_CULTURE_F35%2B_OTT_3Q25_30	Placement Group - media plan with 30-second creative duration
advertiser_id	181325	Advertiser ID - unique identifier for the advertiser
mediaplan_id	477037	Media Plan ID - unique identifier for this media plan (matches Extreme Reach campaign ID)
vendor_id	106487	Vendor ID - unique identifier for EyeQ vendor
placement_group_id	G15972228	Placement Group ID - unique identifier with "G" prefix (matches Extreme Reach line item)
creative_id	67418195	Creative ID - unique identifier for the ad creative (matches Extreme Reach creative ID)

Ad Event 40
(Example 3: Pluto x Ro.com)

URL:

<https://7f077.v.fwmrm.net/ad/l/1?s=eb54e&n=520311%3B520311%3B82125%3B191701%3B379619%3B384777%3B386329%3B505334%3B510839%3B511664%3B512028%3B512029%3B515123%3B515188%3B515189%3B516273%3B516274%3B516448%3B376521%3B382114%3B511939%3B511940%3B512166%3B512167%3B512188%3B515211%3B515219%3B516328%3B516374%3B516584%3B516790%3B516830%3B516834%3B516869>



%3B517097%3B517365%3B517370%3B517375%3B517411%3B517420%3B517424%3B518308%3B519276%3B519346%3B519353%3B519611%3B519629%3B520024%3B520177%3B520606%3B523319%3B524565%3B524796%3B524880%3B524990%3B525748%3B527997%3B528776%3B528945%3B529012%3B529256%3B529333%3B529939%3B530362%3B531823%3B532203%3B535029%3B535045&t=1752162563356911910&f=201326592&r=520311&adid=86698537&reid=957024087&arid=0&aid=&cn=defaultImpression&et=i&_cc=86698537,957024087,,,1752162565,1&tpos=0&async=0&iw=&uxnw=520311&uxss=sg922798&uxct=4&metr=1031&init=1&asid=412913681&ssid=18624905&vcid2=2cbc0015-a487-41e9-8dc7-9fb19b9eabe7_af2f9a0b2a8e92b8

Table 19: Ad Event 40 Key Values

Key	Value	Definition
s	eb54e	Session identifier or site code
t	1752162563356911910	Timestamp - high precision timestamp for the ad request
f	201326592	Format or frequency parameter - likely ad format identifier
r	520311	Request ID or reference identifier
adid	86698537	Ad ID - unique identifier for the specific advertisement
reid	957024087	Request Entity ID - identifier for the ad request entity
arid	0	Ad Request ID - additional request identifier (0 = default/none)
aid	(empty)	Ad User ID - user identifier for targeting
cn	defaultImpression	Campaign name or event type - indicates this is a default impression event
et	i	Event type - 'i' stands for impression
_cc	86698537,957024087,,,1752162565,1	Creative Context - comma-separated values including ad ID, entity ID, timestamp, and flags
tpos	0	Time position - position in the content timeline (0 = start)



Key	Value	Definition
async	0	Asynchronous flag - 0 indicates synchronous request
iw	(empty)	Impression width parameter
uxnw	520311	User experience network identifier
uxss	sg922798	User experience session identifier
uxct	4	User experience context type or count
metr	1031	Metrics identifier or measurement code
init	1	Initialization flag - indicates this is an initial request
asid	412913681	Ad Session ID - unique identifier for this ad session
ssid	18624905	Server Session ID - server-side session identifier
vcid2	2cbc0015-a487-41e9-8dc7-9fb19b9eabe7_af2f9a0b2a8e92b8	Video Client ID v2 - device identifier (matches previous Pluto TV deviceId)

Ad Event 40 Key Value Pair Breakdown

Device Consistency: The vcid2 parameter matches the deviceId from the earlier Pluto TV URL, confirming this is tracking the same Raspberry Pi 4 device across different ad tech platforms.

Creative Context Breakdown: The _cc parameter contains:

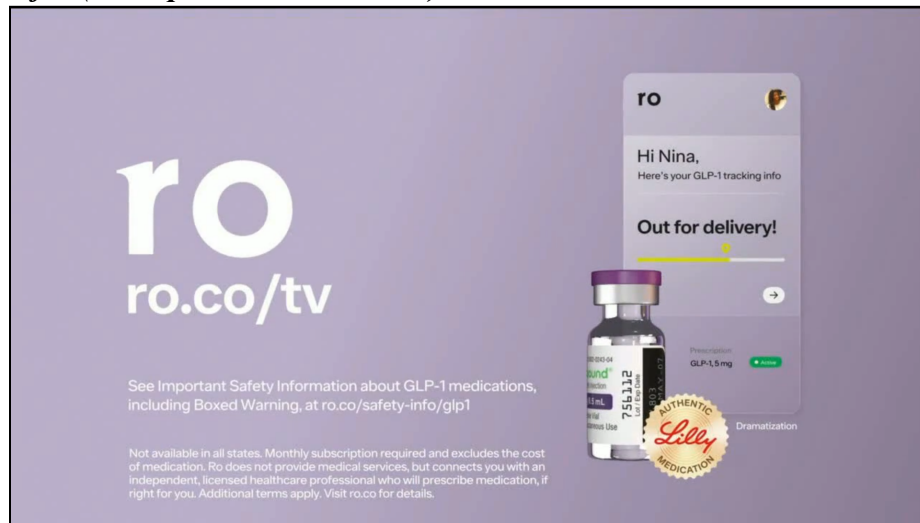
- Ad ID: 86698537
- Entity ID: 957024087
- Timestamp: 1752162565 (slightly different from main timestamp)
- Additional flags: 1

Session Hierarchy: Multiple session identifiers suggest different levels of tracking:

- User Experience Session (uxss): sg922798
- Ad Session (asid): 412913681
- Server Session (ssid): 18624905
- Video Client ID (vcid2): Device-level identifier



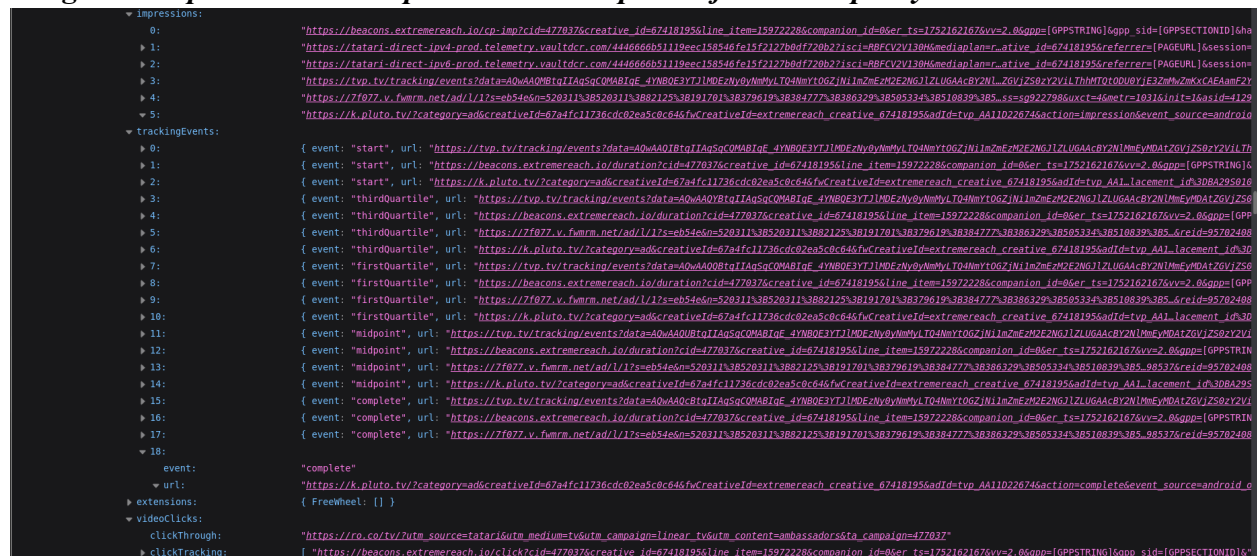
Image 11: Ad for (Example 3: Pluto x Ro.co)



Additional Ads in the Same Ad Pod as (Example 3: Pluto x Ro.co)

The above breakdown of ad event key value pairs was in reference to one individual ad impression (*Example 3: Pluto x Ro.com*) within a pod of multiple ad breaks. Examples of additional ads and their trackers in this ad pod are included below:

Image 12: Sequential Web Request Records captured from mitmproxy



Companion Ad 1 - Target Circle Week Ad Campaign

Table 20: Details of Companion Ad 1 - Target Circle Week Ad Campaign

Advertiser	Publisher	BuySide Tech	Sell Side Tech
Target	Pluto/Paramount	TradeDesk/Google	FreeWheel

Image 15 : Amazon Prime Day Campaign Ad



Image 16: Screenshot of Companion Event 2 Recorded by mitmproxy

[illegible]



Discussion

These results demonstrate that the verification of CTV ad delivery was functioning as expected, but control mechanisms, both on the buyer and platform side were insufficient to prevent counterfeit ad delivery, even under clearly declared traffic forgery conditions (e.g., Raspberry Pi). Ads were still delivered to virtualized or spoofed devices, indicating that the failure was not in measurement accuracy, but in how detection signals were, or were not, integrated into real-time decisioning processes within transaction platforms.

Current CTV buying and selling systems place heavy reliance on self-declared metadata within device headers, without requiring strong hardware-level authentication. This creates a systemic vulnerability, a disconnection between what the auction perceives and what is actually happening on the device. In that space, unauthorized or counterfeit inventory can pass through otherwise legitimate supply chains. Our controlled sessions across Pluto, Tubi, and Xumo confirm this issue is not isolated to a single platform but rather represents an industry-wide structural gap.

Importantly, the observed ad delivery persisted despite verification efforts, suggesting that the true issue lies in the lack of actionable enforcement on both sides of the transaction. For buyers, the primary mechanisms are blocking or monitoring tags. For platforms, the expectation is to incorporate device and content signals into real-time auction logic. However, as cited in MRC guidance, platforms can and sometimes do ignore these signals, resulting in the continued acceptance of invalid inventory.

Furthermore, market incentives are misaligned. SSPs and DSPs may deprioritize filtering in favor of transaction volume, and verification vendors, particularly constrained by Server-Side-Ad-Insertion (SSAI), often default to post-campaign analysis rather than in-auction filtering. For instance, although DoubleVerify and Integral Ad Science flagged synthetic activity in Tubi sessions, campaigns from Trivago and University of Maryland Global Campus were still executed. This suggests a lag between detection and actionable suppression of invalid inventory, driven upstream by media buying and inventory platforms. The SSAI model, especially with pod-based bidding, operates more like a reservoir than a fresh stream of ad impressions. This creates additional exposure points for contamination unless rigorous filtering is applied before ad slots are made available for sale. In that sense, platform-level controls should be considered a critical filtration stage - not just verification.

Ultimately, the gap is not in measurement, but in enforcement and control execution. This distinction matters: verification vendors are correctly flagging suspect traffic, but systems across the CTV ecosystem are not fully designed to act on these signals in real time. This exposes advertisers to unnecessary risk, undermines confidence in the ecosystem, and potentially invites regulatory scrutiny. The patterns observed here reinforce the need for robust upstream filtration, not just accurate measurement, to ensure integrity in CTV ad delivery.



Conclusion

The experiment confirms that the current CTV advertising ecosystem is vulnerable to counterfeit device traffic, even when such traffic is overtly marked as non-human. This vulnerability spans publishers, SSPs, DSPs, ad servers, and verification vendors, suggesting that it is systemic rather than isolated to specific platforms or partners.

Addressing the issue requires shifting from passive detection to proactive prevention. This includes:

- Implementing device-level verification at the point of bid request entry.
- Enforcing stricter pre-auction filtering based on known emulator signatures, device/SDK mismatches, and proxy IP usage.
- Aligning CTV supply definitions between buyers and sellers to close classification loopholes.
- Reducing reliance on self-declared metadata and increasing direct hardware authentication.

Without these reforms, counterfeit CTV inventory will continue to flow through legitimate ad supply chains, eroding trust in the medium and potentially causing lasting damage to its perceived value.



APPENDIX: Additional Results

Example 4: Tubi x UMGC

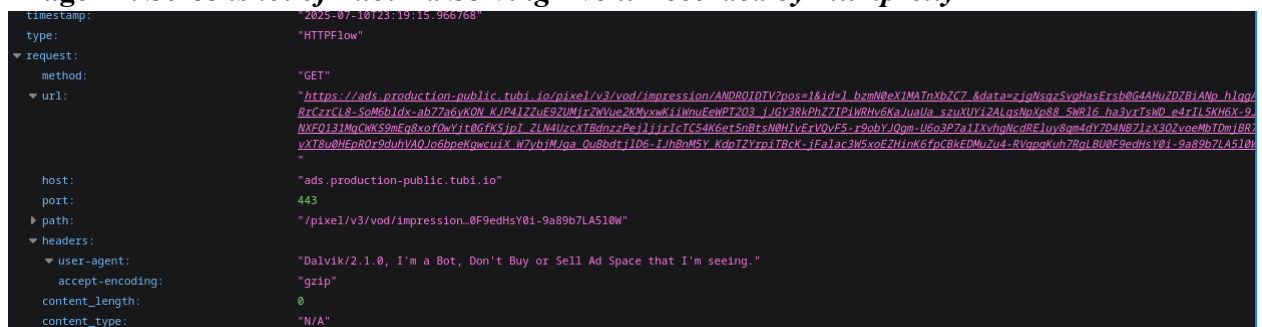
We deployed our TV Streaming agent with deliberately obvious characteristics to assess content platform detection capabilities. In this case, we changed the user agent of the the TV streaming agent from the default Raspberry Pi user agent ("Dalvik/2.1.0 (Linux; U; Android 15; Pi 4 Build/BP1A.250505.005)") or "Dalvik/2.1.0, I'm a Bot, Don't Buy or Sell Ad Space that I'm seeing." We also routed all traffic through Amazon Web Services infrastructure to maximize detectability.

The streaming agent accessed Tubi's content, such as Aquaman and the Lost Kingdom. From here, we allowed normal content playback, advertising, and tracking operations to proceed until sufficient data was collected. Tubi appears to use a custom ad serving set up where ads are pre-fetched and ad viewers load bits of the entire ad (using .ts files) while trackers fire throughout the ad. There were no click tracking events.

URL of Tubi Impression Pixel:

https://ads.production-public.tubi.io/pixel/v3/vod/impression/ANDROIDTV?pos=1&id=l_bzmN0eX1MATnXbZC7_&data=zjgNsQzSvqHasErsb0G4AHuZDZBiANp_hlqgARrCzrCL8-S0M6bldx-ab77a6yKON_KJP4lZZuE9ZUMjrZWVue2KMyxwKiiWnuEeWPT203_jJGY3RkPhZ7IPiWRHv6KaJuaUa_szuXUYi2ALqsNpXp88_5WR16_ha3yrTswD_e4rIL5KH6X-9JNXFQ131MqCWKS9mEq8xof0wYjt0GfKSjpI_ZLN4UzcXTBdnzzPejljjrIcTC54K6et5nBtsN0HIvErVQvF5-r9obYJQgm-U6o3P7a1IXvhgNcdREluy8qm4dY7D4NB71zX30ZvoeMbTDmjBR7vXT8u0HEPr0r9duhVAQJo6bpeKgwcuix_W7ybjMJga_QuBbdtjlD6-IJhBnM5Y_KdpTZyrpiTBcK-jFalac3W5xoEZHink6fpCBkEDMuZu4-RVqpqKuh7RgLB U0F9edHsY0i-9a89b7LA510W

Image 17: Screenshot of Tubi Ad Serving Event Recorded by mitmproxy



URL of IAS Tracking Pixel:

[https://unified.adsafeprotected.com/vevent/impression/2542998/88428032?synthetic=true&xsId=afd64099-ace8-45dc-a5cb-8a61101d376d&mon=88428032&omidPartner=\[OMIDPARTNER\]&apiframeworks=7&bundleId=\[BUNDLEID\]&blockedAdTracking=\\${DC_BLOCKED_AD}&ias_xappb={{APP_BUNDLE](https://unified.adsafeprotected.com/vevent/impression/2542998/88428032?synthetic=true&xsId=afd64099-ace8-45dc-a5cb-8a61101d376d&mon=88428032&omidPartner=[OMIDPARTNER]&apiframeworks=7&bundleId=[BUNDLEID]&blockedAdTracking=${DC_BLOCKED_AD}&ias_xappb={{APP_BUNDLE)



Image 18: Screenshot of AdSafe/IAS Event Recorded by mitmproxy

```
timestamp: "2025-07-10T23:19:15.669995"
type: "HTTPFlow"
request:
  method: "GET"
  url: "https://unified.adsafeprotected.com/vevent/impression/2542998/88428032?synthetic=true&xsId=e9dff106-0833-4882-83e1-da5194c41cdc&mon=88428032&omidPartner=%5BOMIDPARTNER%5D&apiframeworks=7&bundleId=%5BUNDLEID%5D&blockedAdTracking=%7BDC_BLOCKED_AD%7D&ias_xappb=%7B%7BAPP_BUNDLE%7D%7D"
  host: "unified.adsafeprotected.com"
  port: 443
  path: "/vevent/impression/2542998/88428032?synthetic=true&xsId=e9dff106-0833-4882-83e1-da5194c41cdc&mon=88428032&omidPartner=%5BOMIDPARTNER%5D&apiframeworks=7&bundleId=%5BUNDLEID%5D&blockedAdTracking=%7BDC_BLOCKED_AD%7D&ias_xappb=%7B%7BAPP_BUNDLE%7D%7D"
  headers:
    user-agent: "Dalvik/2.1.0, I'm a Bot, Don't Buy or Sell Ad Space that I'm seeing."
    accept-encoding: "gzip"
  content_length: 0
```

Table 22: Key Values from URL of IAS Tracking Pixel

Key	Value	Definition
Path IDs	2542998/88428032	Campaign ID / Creative ID - hierarchical identifiers for the ad campaign and specific creative
synthetic	true	Synthetic flag - indicates this is a synthetic/test impression rather than real user traffic
xsId	afd64099-ace8-45dc-a5cb-8a61101d376d	Cross-session ID - complete UUID for tracking across sessions
mon	88428032	Monitor ID - matches the creative ID from the URL path for verification tracking
omidPartner	[OMIDPARTNER]	OMID Partner macro - placeholder for Open Measurement Interface Definition partner identifier
apiframeworks	7	API Frameworks - supported API framework version (7 = VAST/VPAID standards)
bundleId	[BUNDLEID]	Bundle ID macro - placeholder for mobile app bundle identifier
blockedAdTracking	`\${DC_BLOCKED_AD}`	Blocked Ad Tracking macro - for tracking prevention status
ias_xappb	`\${APP_BUNDLE}`	IAS Extended App Bundle - macro for app bundle identification

URL of UMG Ad:

http://ark.tubi.video/v2/7a5c4a4d629c3a52eea8b87d0309a429/1f58fa0c-a98d-489c-833b-470e4da8c6fe/854x480_800k_hevc.mp4



Image 19: Screenshot of UMGC Event Recorded by mitmproxy

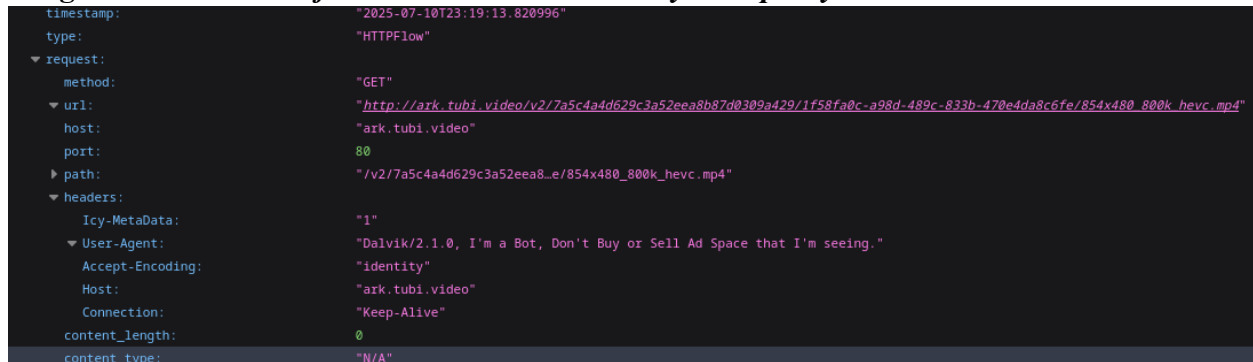


Image 19: Actual Image of UMGC Ad



URL of Nielsen Ad Rating:

https://secure-gl.imrworldwide.com/cgi-bin/m?ca=nlsn314054&cr=crtve&ce=tubitv&pc=tubitv_plc0001&ci=nlsnci734&am=3&at=view&rt=banner&st=image&cy=2&ep=&c42=provapn,tubitv&pub=tubitv&c10=plt,OTT&c45=provgenc1s,movie&pubid=4591244c-acfa-59f2-b853-3bc9d42f36fc&c8=devgrp,STV&c12=apv,f45bd90ea95d233bf3625044d90eedc8&c9=devid,4591244c-acfa-59f2-b853-3bc9d42f36fc&c13=asid,P66B0328C-351B-46BD-A27E-A492D78C51D4&c43=provcg,Aquaman_and_the_Lost_Kingdom&c44=provgen,GENRE_ACTION,GENRE_ADVENTURE,GENRE_FANTASY,GENRE_SCI_FI&r=1620657359135920005&uoo=0&c36=cref1,MV015305350000

Table 23: Key Values for URL of Nielsen Ad Rating

Key	Value	Definition
ca	nlsn314054	Client Account - Nielsen client account identifier



Key	Value	Definition
cr	crtve	Creative identifier or creative type
ce	tubitv	Client Entity - identifies Tubi TV as the platform
pc	tubitv_plc0001	Placement Code - specific placement identifier for Tubi TV
ci	nlsnci734	Nielsen Campaign Identifier - unique campaign ID
am	3	Ad Method - likely indicates ad serving method (3 = Connected TV)
at	view	Action Type - indicates this is a view event
rt	banner	Request Type - specifies banner ad format
st	image	Static Type - indicates image-based creative
cy	2	Cycle or campaign phase identifier
ep	(empty)	Episode parameter
c42	provapn,tubitv	Provider Application Name - Tubi TV application
pub	tubitv	Publisher - Tubi TV
c10	plt,OTT	Platform - Over-The-Top streaming
c45	provgencls,movie	Provider Genre Class - Movie content
pubid	4591244c-acfa-59f2-b853-3bc9d42f36fc	Publisher ID - unique identifier for Tubi TV
c8	devgrp,STV	Device Group - Smart TV
c12	apv,f45bd90ea95d233bf3625044d90eedc8	App Version - hashed application version identifier
c9	devid,4591244c-acfa-59f2-b853-3bc9d42f36fc	Device ID - unique device identifier (matches pubid)
c13	asid,P66B0328C-351B-46BD-A27E-A492D78C51D4	Ad Session ID - unique identifier for this ad session



Key	Value	Definition
c43	provcg,Aquaman_and_the_Lost_Kingdom	Provider Content Group - specific movie title
c44	provgen,GENRE_ACTION,GENRE_ADVENTURE,GENRE_FANTASY,GENRE_SCI_FI	Provider Genres - content genre classifications
r	1620657359135920005	Request ID - unique timestamp-based request identifier
uoo	0	User Opt-Out - indicates user has not opted out of tracking
c36	crefl,MV015305350000	Content Reference 1 - movie reference identifier

URL of Amazon Web Services Lambda:

[https://6vp1ra3213.execute-api.us-east-2.amazonaws.com/trackingPixelProcessing?advertiser_name=UMGC&mediaplan_name=UMGC OTT July 2025&vendor_name=TubiTV&placement_name=Pre-Roll/Mid-Roll Tubi_Targeted WDC_A18-34*&video_name=UMGC School for Real Life NonAFW - DC&advertiser_id=81597&mediaplan_id=477692&vendor_id=86673&placement_id=G15973170&video_id=51785714&referrer_url=&ad_id=UC2413815H&us_privacy=1YN-&gdpr_consent=&gdpr=0&gpp_string=\\$](https://6vp1ra3213.execute-api.us-east-2.amazonaws.com/trackingPixelProcessing?advertiser_name=UMGC&mediaplan_name=UMGC OTT July 2025&vendor_name=TubiTV&placement_name=Pre-Roll/Mid-Roll Tubi_Targeted WDC_A18-34*&video_name=UMGC School for Real Life NonAFW - DC&advertiser_id=81597&mediaplan_id=477692&vendor_id=86673&placement_id=G15973170&video_id=51785714&referrer_url=&ad_id=UC2413815H&us_privacy=1YN-&gdpr_consent=&gdpr=0&gpp_string=$)

Image 20: Screenshot of Custom Data Tracking Event Recorded by (mitmproxy)

```

timestamp: "2025-07-10T23:19:15.690311"
type: "HTTPFlow"
request:
  method: "GET"
  url: "https://6vp1ra3213.execute-api.us-east-2.amazonaws.com/trackingPixelProcessing?advertiser_name=UMGC&mediaplan_name=UMGC OTT July 2025&vendor_name=TubiTV&placement_name=Pre-Roll/Mid-Roll Tubi_Targeted WDC_A18-34*&video_name=UMGC School for Real Life NonAFW - DC&advertiser_id=81597&mediaplan_id=477692&vendor_id=86673&placement_id=G15973170&video_id=51785714&referrer_url=&ad_id=UC2413815H&us_privacy=1YN-&gdpr_consent=&gdpr=0&gpp_string=$(GPP_STRING_1002)&gpp_sid=$(GPP_SID)&domain=cb=1752203952"
  host: "6vp1ra3213.execute-api.us-east-2.amazonaws.com"
  port: 443
  path: "/trackingPixelProcessing?&domain=cb=1752203952"
  headers:
    user-agent: "Dalvik/2.1.0, I'm a Bot, Don't Buy or Sell Ad Space that I'm seeing."
    accept-encoding: "gzip"
  content_length: 0
  content_type: "N/A"

```

Table 24: Key Values for Amazon Web Services Lambda

Key	Value	Definition
advertiser_name	UMGC	Advertiser Name - University of Maryland Global Campus
mediaplan_name	UMGC OTT July 2025	Media Plan Name - University of Maryland Global Campus OTT campaign for July 2025



Key	Value	Definition
vendor_name	TubiTV	Vendor Name - Tubi TV streaming platform
placement_name	Pre-Roll/Mid-Roll Tubi_Targeted WDC_A18-34*	Placement Name - Pre-roll and mid-roll ads targeting Washington DC adults 18-34
video_name	UMGC School for Real Life NonAFW - DC	Video Name - "School for Real Life" creative for DC market (NonAFW = Non-Armed Forces Welcome)
advertiser_id	81597	Advertiser ID - unique identifier for UMGC
mediaplan_id	477692	Media Plan ID - unique identifier for this campaign
vendor_id	86673	Vendor ID - unique identifier for Tubi TV
placement_id	G15973170	Placement ID - unique identifier with "G" prefix
video_id	51785714	Video ID - unique identifier for the creative asset
referrer_url	(empty)	Referrer URL - source page URL (not populated)
ad_id	UC2413815H	Ad ID - unique creative identifier with "UC" prefix and "H" suffix
us_privacy	1YN-	US Privacy String - CCPA compliance string (1=version, Y=opt-out sale, N=opt-out targeted ads, -=not applicable)
gdpr_consent	(empty)	GDPR Consent String - European privacy consent (not applicable for US campaign)
gdpr	0	GDPR Flag - indicates GDPR does not apply (0 = no)
gpp_string	\$	Global Privacy Platform String - industry standard privacy framework (\$ indicates default/empty)
advertiser_name	UMGC	Advertiser Name - University of Maryland Global Campus



Key	Value	Definition
mediaplan_name	UMGC OTT July 2025	Media Plan Name - University of Maryland Global Campus OTT campaign for July 2025
vendor_name	TubiTV	Vendor Name - Tubi TV streaming platform
placement_name	Pre-Roll/Mid-Roll Tubi_Targeted WDC_A18-34*	Placement Name - Pre-roll and mid-roll ads targeting Washington DC adults 18-34
video_name	UMGC School for Real Life NonAFW - DC	Video Name - "School for Real Life" creative for DC market (NonAFW = Non-Armed Forces Welcome)
advertiser_id	81597	Advertiser ID - unique identifier for UMGC
mediaplan_id	477692	Media Plan ID - unique identifier for this campaign
vendor_id	86673	Vendor ID - unique identifier for Tubi TV
placement_id	G15973170	Placement ID - unique identifier with "G" prefix

This campaign was specifically set up for Tubi for the Washington DC market, targeting adults 18-34 for the July 2025 campaign. Given that the declared IP address of the proxy was registered in the Washington DC region, it resulted in a perceived matching of user and advertiser targeting.

URL for Extreme Reach:

https://beacons.extremereach.io/duration?cid=477692&creative_id=51785714&line_item=15973170&companion_id=0&er_ts=1752203952&session_id=ZbzxsuAo1qarHmsblCKeHt1752203952&er_fp=100d77955bcabbaf&er_did=4591244c-acfa-59f2-b853-3bc9d42f36fc&us_privacy=1YN-&gdpr_consent=&gdpr=0&vv=3.0&gpp=

Table 25: Key Values for Extreme Reach

Key	Value	Definition
cid	477692	Campaign ID - matches the UMGC campaign from the AWS tracker
creative_id	51785714	Creative ID - matches the video_id from the AWS tracker



Key	Value	Definition
line_item	15973170	Line Item ID - matches the placement_id (G15973170) from the AWS tracker
companion_id	0	Companion Ad ID - no companion ad associated (0 = none)
er_ts	1752203952	Extreme Reach Timestamp - Unix timestamp for when the duration event occurred
session_id	ZbzxsuAo1qarHmsblCKeHt1752203952	Session ID - unique session identifier with timestamp suffix
er_fp	100d77955bcabbaf	Extreme Reach Fingerprint - device/browser fingerprint identifier
er_did	4591244c-acfa-59f2-b853-3bc9d42f36fc	Extreme Reach Device ID - matches device IDs from previous trackers
us_privacy	1YN-	US Privacy String - CCPA compliance (1=version, Y=opt-out sale, N=opt-out targeted ads, -=not applicable)
gdpr_consent	(empty)	GDPR Consent String - European privacy consent (not populated)
gdpr	0	GDPR Flag - indicates GDPR does not apply (0 = no)
vv	3.0	Version - beacon version 3.0 (upgraded from 2.0 in previous example)
gpp	(empty)	Global Privacy Platform String - industry privacy framework (not populated)
cid	477692	Campaign ID - matches the UMGC campaign from the AWS tracker
creative_id	51785714	Creative ID - matches the video_id from the AWS tracker
line_item	15973170	Line Item ID - matches the placement_id (G15973170) from the AWS tracker
companion_id	0	Companion Ad ID - no companion ad associated (0 = none)
er_ts	1752203952	Extreme Reach Timestamp - Unix timestamp for when the duration event occurred



Key	Value	Definition
session_id	ZbzxsuAo1qarHmsbl CKeHt1752203952	Session ID - unique session identifier with timestamp suffix
er_fp	100d77955bcabbaf	Extreme Reach Fingerprint - device/browser fingerprint identifier
er_did	4591244c-acfa-59f2- b853-3bc9d42f36fc	Extreme Reach Device ID - matches device IDs from previous trackers
us_privacy	1YN-	US Privacy String - CCPA compliance (1=version, Y=opt-out sale, N=opt-out targeted ads, -=not applicable)
gdpr_consent	(empty)	GDPR Consent String - European privacy consent (not populated)
gdpr	0	GDPR Flag - indicates GDPR does not apply (0 = no)
vv	3.0	Version - beacon version 3.0 (upgraded from 2.0 in previous example)

Cross-Platform Tracking Consistency For (Example 4: Tubi x UMGC)

Campaign Continuity: This Extreme Reach duration beacon is tracking the same UMGC campaign seen in the AWS tracker:

- Campaign ID 477692 (matches mediaplan_id)
- Creative ID 51785714 (matches video_id)
- Line Item 15973170 (matches placement_id G15973170)

Device Consistency: The er_did parameter (4591244c-acfa-59f2-b853-3bc9d42f36fc) matches:

- The pubid and devid from the Nielsen tracker
- The device identifier pattern seen across multiple platforms

Duration Tracking: This /duration endpoint specifically tracks:

- Video completion events
- View duration metrics
- Engagement measurement
- Video performance analytics

Additional Ad in the Same Ad Pod as (Example 4: Tubi x UMGC)

Trivago is another campaign that appears to be directly served from Tubi. Unlike UMGC which is served from one file, Trivago is served from multiple files one at a time using the .ts format. At the time of this writing, the creative files are still active and can be downloaded / viewed.



Image 21 :Trivago Campaign Ad

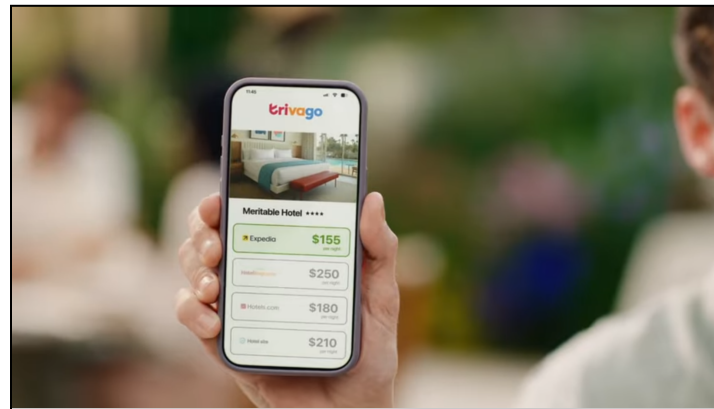


Table 26: Tubi Ad Serving Tracking Pixels Showing Completion of Ad Creative Play Time (Example 4 Tubi x UMGC)

URL	Quartile
https://ads.production-public.tubi.io/pixel/v3/linear/progress0/ANDROIDTV?pos=1&id=8gYhOU13BCxCicM4AnyF&data=sof2yvx2IOpWcA4FX72JYIIIEVNArGUTTNW-j3p_oZRZLPuiw6xQ-ydZtMMI4cKgV5XNKqatIpJh2ri7SeSe_aKtOCbn6N5U0dOGI0AJWIXtytHVtKGi-9L_PIRUxaThzujdU1dI5sPmmBhJsM65EUmFnGLxDZr_hPjYuMFZ2XrXLrihzJOOeorAZqaDzFzRltvWwMee_GzakJoZ-nvMID75On-mp3T5O8ghxdMUGxKNU42ZrgFBmLpBSQ3mkFWYtGF7a3_OLNudAmJleqYmc2r0RiW2OIWC8v2xskRFC1UPC7gqbsThhrbkbhJRNrHYrCp9miBBCHI9kplvlowxs1Ew	Start
https://ads.production-public.tubi.io/pixel/v3/linear/impression/ANDROIDTV?pos=1&id=8gYhOU13BCxCicM4AnyF&data=4rmMAwzaHCZcgKduEYjKHaKlylkWCYp8efexdf10EDInpIRVO3iaRd0XzVpEPWA2_uTF7zAJY5TiUUIAtYkFEzlpXhKJlIsK2hmP-q8iz474z-4B50FGf1R4pj1IET1RhIGlnBEUTMFj7yhORgdhIT1iP7_edBJDgTNeNzfz16nzVXPi43O-9ZZsir1KUCgWqzLhLbmkwfkUMmZzTTzhNqDTa6K0DtHZ9iFVIwKB2tbBc1K72WniLcAP-NRFJaPhORT67Q_GRJL1Ng0G3Dn01Rb7KI0kexNzXa6QY5QhA9sWi0AXnQ7XZDKLoc59SVREbTtfZG8-P1ddnjs8Zdl6E6RfFHIKHkAVuuCZGL2gEXR8fSi1JZjE0w45O6iLADsW11vQHyM	Impression
https://ads.production-public.tubi.io/pixel/v3/linear/progress25/ANDROIDTV?pos=1&id=8gYhOU13BCxCicM4AnyF&data=TK1bzvvD9Vp0njadR8JUGBvK7NTD0j6zt0gUQrCUXRGTw6uuLwse31u6OX_j1oiAKyovNB_9-MWECrXWm3W2Gi99feBfliMYTBj4RdvAfG101I2DG0FxSBQL2pSzV0flYhuHRz6qXP6dBWJLrUm3hCpWXell7KuGIal8AHSZSvm4MMqJ8OfVF-3XQdrRE5LVlyOCEaQI-necqm0oZRkStwCcr4uiw0MQagpyFeNaX6-YmRHcRkFnB9M5kL54RefOGRGUqNp8qNK41uRdCJOFIWmL25JQft3WCnBELfkv7_ivaOuI33UIlqmWPPjHHQka2ZIT3LzEVbVMbdkWNbItrOEKWg	25%



URL	Quartile
https://ads.production-public.tubi.io/pixel/v3/linear/progress50/ANDROIDTV?pos=1&id=8gYhOU13BCxCicM4AnyF&data=lhFHaZpYtLoA2o0hnhmzY6NTg8dOuPFNbDQ4kPns-OBxPpTWnLoOC9nrTxDMtfqDm9u0W1L-qnQPFiao40Q7bDK1y-lm4tx4d4S6oUexcbCmQQZvy0vu3L0KMcMBhhXuHL_PH4xwnQbXy198d6AOIYN34HWgdTh8YmMyXIPFmPpjzSGJo7ZB2L8uQMEqFuluYqOUfOGzTOYoPEbhG6bpZXLH99H8HCVeNovaGFNXDa1qcw9IUop4jheS5UOvngoZk4AZQJqzsMrWXYYP2NRwJPKtNvqhaWwiIdohWQIP24ma6CijY5irALd0A0yZeFeXX4cfHKArlHLGf4w3KW-kl9bJ-g	50%
https://ads.production-public.tubi.io/pixel/v3/linear/progress75/ANDROIDTV?pos=1&id=8gYhOU13BCxCicM4AnyF&data=zRzSOCRW1mSGPChnr7_9y_eamzHOAeFgm1n756FNwxr8xxjv35laVKnOYKtn5vCCurspD9FgBXnlmwTUpp_QZPv1MUGMa-_0iw8VUCnqkLbIfIcz3evgQJW4qhkF7KamuFyAdxjdhYpFuHKWiweGlrEAUWn9dEzsdUte0gtoXAsWWk4hUS8aI_Uwn03_WJ1ZpEKzHjoujzVxJBE7rFn7U9jXtBSgapX3GJ0d6uaCYlyYSCb2Rp0OG47vZ_ZS2RPDCpwVhqPEu0YJRj-p1HLzWpupSV0J_6X1bKbfU0UYqfsT97WKl_dKaFPXotsVLTVjU-93MQHrDnDGLqHC76CyjeMTbg	75%
https://ads.production-public.tubi.io/pixel/v3/linear/progress100/ANDROIDTV?pos=1&id=8gYhOU13BCxCicM4AnyF&data=V4epzcb0_-7fGcgzXePGk5jrHlHCKNhB5NtjMILma0lJrWfyRFj0DAk7R378ch_s91qEXJq0CSeLfh0Z0PuRCWpU5kCQNRJsZfmlpRl3KxpNwkXhL9m-DEv9Zr8faAB5hnDW2yT6-vOS238Z3lA9ztLpM25Z4h4UfKxM3mgsCYWjj25HAFzv4OkP08OmxGuG86UO4nebWP8-dzIejzuexMrRFs60k26DypA0u74vqxhjo02lICkSqizu98ddXSs10zHOCmDoJbACYU5wUpP0cKg8EQLBSp0XE2BsJAxbxcmVkd7qMjNNWosqeCJDGht9gJgvesKRaeFWW1K2zR1xjK1MdA	100%



Example 5: XUMO x Unidentified Advertiser

The TV streaming agent was deployed with deliberately obvious characteristics to test content platform detection capabilities. The default Raspberry Pi user agent was used: "Dalvik/2.1.0 (Linux; U; Android 15; Pi 4 Build/BP1A.250505.005)". Notably, Xumo automatically changed this to "XumoPlay/4.7.136 (Linux; Android 15; Pi 4 Build/BP1A.250505.005)" upon connection. Traffic was routed through a residential IP address to simulate normal viewing conditions.

After accessing Xumo's content, standard operations were allowed to proceed, including content playback, advertising, and tracking, until sufficient data had been collected. Channels visited included U.S. news and NFL sports content. This passive approach ensured that authentic platform behavior was observed rather than responses triggered by obvious automation.

Xumo used Google Dynamic Ad Insertion and Google Ad Manager for advertisement delivery. The ads themselves played from URLs such as the one shown below:

URL Google Video Ad Serve:

```
https://r7---sn-8xgp1vo-ab5e.googlevideo.com/videoplayback/faskm/468/faudshow/234/faudskip/235/fvidshow/150/fvidskip/0/fvskm/150/goap/slices=0-324908/goc/13/govp/slices=0-738,1369202-2768414/id/cc7c9cefb958d1cf/itag/340/mime/video/MP2T/sgoap/gir=yes;itag=340;xtags=ac=aac:accf=lc:ach=2:asr=48000:atbr=128;clen=488754;dur=30080;fmt=1748491256976558/sgovp/gir=yes;itag=340;xtags=vc=avc:vccf=main:vfr=29.97:vsz=1280x720:vtbr=2200;clen=8258442;dur=30030;fmt=1748491944289651/source/dclk_video_ads?acao=yes&cpn=gPHcrs5UQMya_ea0&ctier=L&expire=1752586040&initcwndbps=3556250&ip=0.0.0.0&ipbits=0&keepalive=yes&key=cms1&met=1752499649,&mh=16&mm=31&mn=sn-8xgp1vo-ab5e&ms=au&mt=1752499300&mv=m&mvi=7&nc=8264&pl=27&requiressl=yes&rmhost=r6---sn-8xgp1vo-ab5e.googlevideo.com&rms=au,au&shardbypass=md-default&signature=02188C7634CA9DA599C5FBEA3C93F57A835886EA.26942332D5328BA377DBF0B6013BD044AFAFEC9D&smhost=r11---sn-8xgp1vo-ab5d.googlevideo.com&sparams=acao,ctier,expire,faskm,fvskm,goc,id,initcwndbps,ip,ipbits,itag,met,mh,mime,mip,mm,mn,ms,mv,mvi,pl,requiressl,rmhost,rms,sgoap,sgovp,shardbypass,smhost,source,xpc&xpc=EgVovf3B0g==
```

Table 27: Key Values for Google Video Ad Serve

Key	Value	Definition
faskm	468	Fast Skip Metric - time threshold for skip button (4.68 seconds)
faudshow	234	Fast Audio Show - audio display time parameter



Key	Value	Definition
faudskip	235	Fast Audio Skip - audio skip time parameter
fvidshow	150	Fast Video Show - video display time parameter
fvidskip	0	Fast Video Skip - video skip time parameter (0 = no skip)
fvskm	150	Fast Video Skip Metric - video skip timing threshold
goap	slices=0-324908	Google Original Audio Profile - audio segment slices
goc	13	Google Original Container - container format identifier
govp	slices=0-738,1369202-2768414	Google Original Video Profile - video segment slices
id	cc7c9cefb958d1cf	Video ID - unique identifier for this ad video
itag	340	ITag - Google's format/quality identifier (340 = 720p H.264)
mime	video/MP2T	MIME Type - MPEG-2 Transport Stream video format
sgoap	gir=yes;itag=340;xtags=ac=aac:accf=lc:ach=2:asr=48000:atbr=128;clen=488754;dur=30080;lmt=1748491256976558	Segmented Google Original Audio Profile - detailed audio specs
sgovp	gir=yes;itag=340;xtags=vc=avc:vccf=main:vfr=29.97:vsz=1280x720:vtbr=2200;clen=8258442;dur=30030;lmt=1748491944289651	Segmented Google Original Video Profile - detailed video specs
source	dclk_video_ads	Source - DoubleClick video ads system
acao	yes	Access-Control-Allow-Origin - CORS header setting



Key	Value	Definition
cpn	gPHcrs5UQMya_ea0	Client Playback Nonce - unique playback session identifier
ctier	L	Connection Tier - connection quality level (L = Low/Limited)
expire	1752586040	Expiration timestamp for URL validity
initcwndbps	3556250	Initial Congestion Window BPS - initial bandwidth estimate
ip	0.0.0.0	IP Address - anonymized/placeholder IP
ipbits	0	IP Bits - IP address precision bits
keepalive	yes	Keep-Alive connection setting
key	cms1	Key - content management system identifier
met	1752499649	Metrics timestamp
mh	16	Media Handler - handler identifier
mm	31	Media Method - delivery method identifier
mn	sn-8xgp1vo-ab5e	Machine Name - Google server identifier
ms	au	Media Source - source type (au = audio)
mt	1752499300	Media Time - media timestamp
mv	m	Media Version - version identifier
mvi	7	Media Version Index - version index
nc	8264	Network Code - network identifier
pl	27	Playlist - playlist identifier
requiressl	yes	Require SSL - forces HTTPS connection
rmhost	r6---sn-8xgp1vo-ab5e.googlevideo.com	Redirect Media Host - fallback server



Key	Value	Definition
rms	au,au	Redirect Media Source - fallback source types
shardbypass	md-default	Shard Bypass - server routing preference
signature	02188C7634CA9DA599C5F BEA3C93F57A835886EA.26 942332D5328BA377DBF0B6 013BD044AFAFECD9	Digital signature for URL authentication
smhost	r1l---sn-8xgplvo-ab5d.googl evideo.com	Secondary Media Host - backup server
sparams	acao,ctier,expire,faskm,fvskm ,goc,id,initcwndbps,ip,ipbits,it ag,met,mh,mime,mip,mm,mn, ms,mv,mvi,pl,requiresl,rmho st,rms,sgoap,sgovp,shardbypa ss,smhost,source,xpc	Signed Parameters - list of parameters included in signature
xpc	EgVovf3BOg==	Extended Player Config - base64 encoded player configuration

Details of Video Stream for (Example 5 Xumo Ad x Unidentified Advertiser)

Video Quality:

- **Resolution:** 1280x720 (720p HD)
- **Frame Rate:** 29.97 fps
- **Video Bitrate:** 2200 kbps
- **Codec:** H.264/AVC (Main profile)

Audio Quality:

- **Codec:** AAC-LC (Low Complexity)
- **Channels:** 2 (stereo)
- **Sample Rate:** 48,000 Hz
- **Audio Bitrate:** 128 kbps

Ad Duration: ~30 seconds (30,030ms video, 30,080ms audio)

URL Xumo Content Serving:

https://android-tv-beacons.xumo.com/content/v2/impression.json?eventType=appReport&clientVersion=4.7.136×tamp=1752499171795&deviceId=0e655999-d737-4bb6-9bc1-d07f412e1372&sessionId=3120b879bed1e9cb-F0RE-7ed21a8732f32030&pageId=guidePage&pageViewId=177202c2e89f419eb017647e901d7b95&channelId= &categoryId= &assetId=&heroId=&position=&viewedItems=videoUrl=https://c300.play.lura.app/play/v1/live/ZHx8AbT0xVvm1el0epd7vw/master.m3u8?ts=1668459044045&app=Mp8DA1vKVAo04yHJ0QFZ3w&exp=2299179044&auth=8HJTW6prnzFjGE2Ki_8pf



vwxMRvWtSwRm3R54TN3_w&PlatformChild=androidtv&usprivacy=1YNN&coppa=0&a
 utoplay=auto&videomute=0&encoder=DC1-XUM0&fwDid=4c5217fd-a03f-4ffc-8a0
 6-50904048a1e4&tmsid=121705&palnonce=&rdid=4c5217fd-a03f-4ffc-8a06-509
 04048a1e4&islat=0&atts=&attmas=&idfv=&screenw=1920&screenh=1080&title=
 NFL%20Top%20100&interval=

Table 28: Key Values from Xumo Content Serving

Key	Value	Definition
eventType	appReport	Event Type - application reporting event
clientVersion	4.7.136	Client Version - Xumo Android TV app version
timestamp	1752499171795	Timestamp - Unix timestamp in milliseconds
deviceId	0e655999-d737-4bb6-9bc1-d07f412e1372	Device ID - unique identifier for the Android TV device
sessionId	3120b879bed1e9cb-F ORE-7ed21a8732f32 030	Session ID - unique session identifier with "FORE" indicator
pageId	guidePage	Page ID - indicates user is on the TV guide/program guide page
pageViewId	177202c2e89f419eb0 17647e901d7b95	Page View ID - unique identifier for this page view
channelId	(empty)	Channel ID - not populated
categoryId	(empty)	Category ID - not populated
assetId	(empty)	Asset ID - not populated
heroId	(empty)	Hero ID - not populated
position	(empty)	Position - not populated
viewedItems	videoUrl=https://c300 .play.lura.app/...	Viewed Items - detailed video URL with parameters
Base URL	c300.play.lura.app/pla y/v1/live/ZHx8AbT0 xVvm1el0epd7vw/m aster.m3u8	Lura live streaming URL for HLS video
ts	1668459044045	Timestamp for stream request



app	Mp8DA1vKVAoO4y HJ0QFZ3w	Application identifier (encoded)
exp	2299179044	Expiration timestamp
auth	8HJTWR6prnzFjGE2 Ki_8pfvwxMRvWtS wRm3R54TN3_w	Authentication token
PlatformChild	androidtv	Platform - Android TV
usprivacy	1YNN	US Privacy String - CCPA compliance
coppa	0	COPPA compliance - not applicable (0 = no)
autoplay	auto	Autoplay setting
videomute	0	Video mute setting (0 = unmuted)
encoder	DC1-XUMO	Encoder identifier for Xumo
fwDid	4c5217fd-a03f-4ffc-8 a06-50904048a1e4	FreeWheel Device ID
tmsid	121705	TMS (Tribune Media Services) ID
palnonce	(empty)	PAL (Publisher Ad Location) nonce
rdid	4c5217fd-a03f-4ffc-8 a06-50904048a1e4	Redirect Device ID (matches fwDid)
islat	0	Is Limit Ad Tracking (0 = tracking allowed)
atts	(empty)	ATT Status (iOS App Tracking Transparency)
attmas	(empty)	ATT Master (iOS tracking master setting)
idfv	(empty)	Identifier for Vendor (iOS)
screenw	1920	Screen width in pixels
screenh	1080	Screen height in pixels (1080p display)
title	NFL%20Top%20100	Content title - "NFL Top 100" (URL encoded)
interval	(empty)	Interval parameter



References

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Peer Review

CleanTap invited technical feedback from a selected group of marketplace participants referenced in this manuscript, including measurement firms, analytics providers, major verification vendors, and both demand & supply side platforms. Each group was given the opportunity to review the findings and provide official comment prior to release. CleanTap also shared the research with all known relevant trade groups for their feedback.

Integral Ad Science and The Trade Desk reviewed the material but declined to provide an official comment following discussion.

The following organizations were also invited to join the peer review but either did not respond within the requested time or directly to CleanTap:

- Innovid
- Pubmatic
- Freewheel
- PlutoTV
- Amazon Ads
- Google Ads
- Association of National Advertisers (ANA)
- American Association of Advertising Agencies (4A's)
- IAB Tech Lab
- Trustworthy Accountability Group (TAG)

The statements that follow include commentary from participants who chose to engage:

Comment

It should be noted that the MRC did not independently audit or validate the research conducted nor the results/findings and has no formal relationship with CleanTap. However, MRC periodically considers, reviews and provides feedback on industry research and in this instance, was provided the opportunity to review and discuss. Regardless of validation of these findings, we believe they highlight important measurement considerations in our industry. First, it is critically important that information regarding inventory and devices is provided and passed through industry protocols (such as OpenRTB) by sellers and sell-side platforms and validated by third-party organizations. Moreover, it is equally critical that buy-side platforms ingest, consider and action this information. The MRC has published IT requirements related to inventory mismatch and Bundle ID spoofing ([link](#)) using pre-bid information as compared to delivery and believes the passing, validation and use of such information facilitates adherence to these requirements.

Second, buyer organizations should ask questions about the use of such information, ensure it is utilized at their discretion and consider measurement of delivery by device, application and placement in the context of content. MRC has published guidance for device-based definitions of CTV and content-based definitions of OTT ([link](#)) and it is important these aspects are considered in tandem. Additionally, there is likely value in future updates to this guidance to further delineate device location, network, screen size and type to distinguish



devices (such as in-home CTV, out-of-home CTV, DOOH screens, etc.) for buyer consideration. The MRC will work to determine what future updates may be warranted in this area.

Finally, it is clear that device attestation, authentication and certification technical protocols are important to be developed and/or adopted (where they already exist) to further support existing IVT requirements.

- Ron Pinelli Jr., SVP Digital Research and Standards
Media Rating Council (MRC)

Comment

As part of the peer review, CleanTap and Double Verify reviewed the findings and collectively confirmed that DV measured the impressions accurately, classifying them both as invalid traffic (IVT) and as non-CTV devices.

“Together, we verified that the activity was correctly identified as invalid traffic and flagged as non-CTV devices by DV. For clients using post-bid measurement, these events were logged appropriately. For those with pre-bid protection enabled, the impressions were blocked entirely, preventing the incidents altogether.”

- Gilit Saporta, VP of Product, Fraud & Quality Analytics
DoubleVerify

Comment

Large parts of the industry continue to turn a blind eye to counterfeit ad impressions, as their methods of making money are not designed to reduce the volume of impressions they sell or measure. We designed Assembly Control to be proactive in our approach to fraud prevention and Clean Tap has been a great partner for us - particularly around device recognition. We will continue to lean into solutions that protect our brands from buying counterfeit impressions.

- Wayne Blodwell, Global SVP Programmatic
Assembly Global