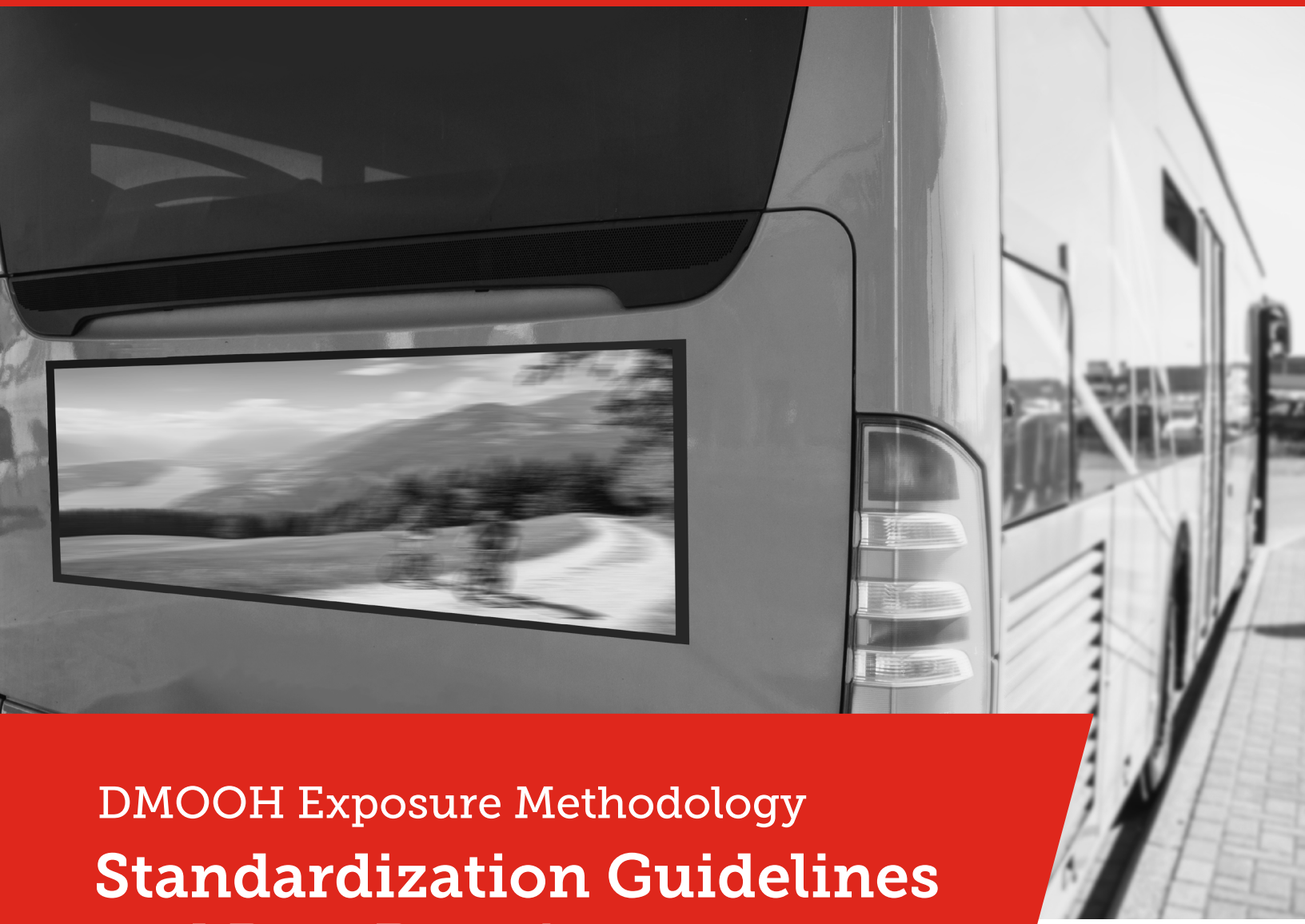
Out of Home Advertising Association of America



DMOOH Exposure Methodology

Standardization Guidelines and Best Practices

A framework for standardizing the methodology for capturing mobile advertising IDs that represent the audience exposed to Digital Moving Out-of-Home (DMOOH) media.

OAAA.org

OBJECTIVES:

- Enable industry-wide collaboration to establish a standard for DMOOH exposure and drive ongoing improvements
- Increase the adoption of DMOOH by making it easier to buy with consistent and transparent methodology for exposure data collection
- Empower marketers to incorporate DMOOH into their omnichannel marketing strategy by providing a foundation to support the use and development of data solutions using DMOOH exposure data

PROBLEM STATEMENT:

DMOOH is a special class of Digital Out-of-Home (DOOH) wherein the location of a particular venue or unit is not fixed. As such, DMOOH faces similar challenges as standard DOOH in understanding who was exposed to an ad. Today, these challenges can be addressed by leveraging mobile location data, similar to how it is done on DOOH. However, the fact that DMOOH venues move requires additional context to accurately capture exposure.

Therefore, the definition of DMOOH exposure is today not consistent within the industry. This lack of standardization leads to the same problems facing standard DOOH, the most pressing of which is that adoption of DMOOH by omnichannel markets has been slowed.

DOCUMENT PURPOSE:

Serve as an addendum to OAAA's **"DOOH Exposure Methodology Standardization Guidelines and Best Practices,"** covering exposure measurement methodology for digital ads on vehicles, or digital moving out of home (DMOOH) media.

FOCUS AREA:

Exposed mobile advertising IDs can be used for various purposes. As the primary objective of this initiative is to make it easier for omnichannel marketers to adopt DMOOH, the initiative focuses primarily on the retargeting and attribution use cases of DMOOH exposure data. This initiative is not intended to alter any existing impression-based currency measurement systems for DMOOH.

KEY CONSIDERATIONS FOR CAPTURING DMOOH EXPOSURE

INPUT VARIABLES:

In the published DOOH guidelines, one component of venue data is the latitude and longitude of the venue. MDOOH venues, however, in general have a different position for each ad play. As such, information about the venue, such as latitude and longitude, are documented alongside information about the ad play itself.

The most notable differences from standard DOOH are:

- Two sets of latitude, longitude, and timestamp (for start and end)
- Media position is required

Like DOOH, there are different inventory or vehicle types within the DMOOH industry. For all inventory types, however, the same input variables are required. For example, screen placement (media position) on a vehicle is a necessary input variable in the same way facing is necessary for standard DOOH: it defines which direction a screen is oriented (in this case relative to the vehicle).

In order to understand the exposure, it is crucial to define the variables (i.e. environment, inventory type, media position) and data availability by inventory type. Listed below are methods recommended for capturing the exposure to DMOOH displays.

DMOOH EXPOSURE CAPTURE BY VEHICLE TYPE

OUTDOOR DISPLAYS:

- **Left Side:** mobile device observed within the viewing distance of the inventory type if the screen is placed on the left side of the vehicle (street side) and an ad plays
- **Right Side:** mobile device observed within the viewing distance of the inventory type if the screen is placed on the right side of the vehicle (curbside) and an ad plays
- **Front Side:** mobile device observed within the viewing distance of the inventory type if the screen is placed on the front side of the vehicle and an ad plays
- **Rear Side:** mobile device observed within the viewing distance of the inventory type if the screen is placed on the rear of the vehicle and an ad plays

MINIMUM CONNECTIVITY REQUIREMENTS.

Not only is it important that media operators collect the necessary GPS Data from the vehicle's whereabouts, it's even more important that the GPS Data collection *at a minimum* coincides with the beginning **and** ending of each ad play. An operator can collect the GPS Data more frequently (e.g. every 1 second), but it is not required.

In essence, the media operator must collect the GPS Data from the screen when the Bid Request or Ad Play actually occurs.

GTFS data is recommended to account for the travel time/space where GPS can't account for it such as underground or when a moving vehicle's ad player suffers connectivity issues. Using this data will help to bridge the gap across player and Transit Authorities' technical capabilities.

When a vehicle is not in motion (e.g., due to traffic congestion or being held at a traffic signal), it remains feasible to measure to what the ad played, by correlating the vehicle's coordinates prior to becoming motionless to when motion resumes. Direction is only necessary for when vehicle is moving.

For non-reporting GPS, where GTFS is available (which may include times routing as an acceptable alternative), then the same for directionality and exposure would be calculated or known.

Where no GPS or GTFS is known, then, yes it may be impossible to know or extrapolate exposed devices. If the position of travel of a vehicle is unknown or incorrect, then it may be impossible to accurately determine the orientation of the vehicle and to correctly assign the exposed devices to the appropriate side of the vehicle.

The direction of travel and speed of the vehicle prior to the ad play should also be included for as a minimum to reinforce and provide as a check for calculating direction from beginning and ending points from the ad play. Direction is only necessary for when the vehicle is moving. position and time in position may be relative for non-moving vehicles with last known directionality.

Additionally, any device with location services embedded in the hardware can report precision and confidence of the latitude and longitude. This should be reported as much as possible. Likewise, the requirement of disclosure of the location precision and confidence of the signal data of mobile devices observed within proximity to the vehicle is incredibly important and should be captured, summarized, and reported where possible.

ROUTING

The GPS Data collected from a moving screen are discrete points in space and time. Essentially, it is a trail of breadcrumbs. Data is received regarding where the vehicle was located when the ad began playing, and where the ad was located when the ad stopped playing. However, data isn't provided as to how that vehicle got from the first point to the next.

"Routes" are the paths that a vehicle travels along. As opposed to GPS data, which is observed and point-based, routes are not observed directly and are continuous line segments.

If one assumes the vehicle **did in fact** travel along the vehicle's assigned surface to get from Waypoint A to Waypoint B, then a **routing engine** can be used to determine and contextually understand the specific route the vehicle took to get from Waypoint A to Waypoint B. Routing engines consider several factors to determine how the vehicle drove from Waypoint A to Waypoint B. These factors include:

- Lat/Long coordinates for waypoint A and waypoint B
- Distance between waypoint A and waypoint B
- Timestamps associated with waypoint A and waypoint B
- Duration between both waypoints timestamps
- Surface the vehicle is traveling on
- Type of vehicle

From these known factors, all derived from the information in the **Required Input Variables from Ad Play Data** schema outlined above, the routing engine can estimate the actual route the vehicle took.

Routing Disclaimer: *If the duration between way points are too far apart, the routing engine may determine that the vehicle's route is "inconclusive" or "unroutable". If this happens, the system cannot infer where the vehicle drove and ultimately, determine exposure. In the event this happens, one suggestion would be to eliminate this path in its entirety from the analysis. As referenced, GTFS data, where available, will help bridge the gap when GPS is undetectable or if there are connectivity issues with the ad player.*

Routing Vizualized

FIGURE 1: REQUIRED INPUT VARIABLES FROM MOVING AD PLAY DATA

VARIABLE	DESCRIPTION	SAMPLE VALUE
Campaign ID	Campaign ID associated with the ad play	HTpXbLjfS8uKKMXXXXXXXX
Creative ID	Creative ID associated with the ad play	PZp_H8rJTSGliVXXXXXXXX
Vehicle ID (Venue ID)	Globally unique identifier of the screen/vehicle	vae9d:acb1234
Start Latitude	Precise screen latitude at beginning of ad play	40.750921
Start Longitude	Precise screen longitude beginning of ad play	-73.987718
Start Timestamp	The time the ad play began in UTC; ISO format	2020-10-20T04:00:13.176245Z
End Latitude	Precise screen latitude at end of ad play	40.751921
End Longitude	Precise screen longitude at end of ad play	-73.988718
End Timestamp*	The time the ad play ended in UTC; ISO format	2020-10-20T04:00:21.176245Z
Duration*	Creative duration in seconds	8
Venue Type	Venue type of screen	transit.bus
Media Position	Position of screen placement relative to vehicle	curbside
Publisher Name	Name of publisher	Publisher ABC

LAT/LONG PRECISION AND DISTANCE BY INVENTORY TYPE AND MEDIA POSITION (SUGGESTED)

INVENTORY TYPE	MEDIA POSITION	LAT/LONG PRECISION	DISTANCE IN METERS
Buses & Trolleys	Street Side	Distance from Center; on the left side of the vehicle	30
	Curbside	Distance from Center; on the right side of the vehicle	25
	Front	Distance from Center; in front of the vehicle	15
	Rear	Distance from Center; behind the vehicle	15
Wrapped Vehicle	Street Side	Distance from Center; on the left side of the vehicle	25
	Curbside	Distance from Center; on the right side of the vehicle	20
	Front	Distance from Center; in front of the vehicle	10
	Rear	Distance from Center; behind the vehicle	10
Taxi & Rideshare Top	Street Side	Distance from Center; on the left side of the vehicle	20
	Curbside	Distance from Center; on the right side of the vehicle	15
	Front	Distance from Center; in front of the vehicle	5
	Rear	Distance from Center; behind the vehicle	5
Micro Mobility	Street Side	Distance from Center; on the left side of the vehicle	3
	Curbside	Distance from Center; on the right side of the vehicle	3
	Front	Distance from Center; in front of the vehicle	3
	Rear	Distance from Center; behind the vehicle	3
Large Format Truck	Street Side	Distance from Center; on the left side of the vehicle	25
	Curbside	Distance from Center; on the right side of the vehicle	20
	Front	Distance from Center; in front of the vehicle	10
	Rear	Distance from Center; behind the vehicle	10

UPDATES TO CHILD CATEGORIES
TRANSIT: VEHICLES

CHILD CATEGORY	CATEGORY DEFINITION	ENUMERATION ID	STRING VALUE (DEPRECATED)
Buses & Trolleys	Displays located on or in city or intercity, either public or private buses or trolleys	102	transit.buses
Wrapped Vehicle	Advertising displays placed on sides, rear and front (if applicable) of vehicles visible to nearby pedestrians and drivers	103	wrapped.vehicles
Taxi & Rideshare Top	Advertising displays placed on top of taxi and rideshare vehicles visible to nearby pedestrians and drivers	104	transit.taxi_rideshare_top
Micro Mobility	Advertising displays place on micro mobility vehicles to nearby pedestrians and drivers	108	
Large Format Trucks	Advertising displays placed on the side of delivery vehicles, mobile billboards, or semi trailers to nearby pedestrians and drivers	109	transit.large_format_trucks

UPDATES TO GRANDCHILD CATEGORIES & IDS
TRANSIT: BUSES & TROLLEYS

GRANDCHILD CATEGORY	CATEGORY DEFINITION	ENUMERATION ID	STRING VALUE (DEPRECATED)
Bus (Outside)	Advertising outside a bus, primarily visible to people not riding the bus	10203	transit.buses.bus_outside
Double Decker (Outside)	Advertising outside a double decker bus, primarily visible to people not riding the double decker bus	10204	transit.buses.double_decker_outside
Trolley (Outside)	Advertising outside a trolley, primarily visible to people not riding the bus	10205	transit.buses.trolley_outside

UPDATES TO CHILD CATEGORIES
TRANSIT: MICRO MOBILITY

GRANDCHILD CATEGORY	CATEGORY DEFINITION	ENUMERATION ID	STRING VALUE (DEPRECATED)
Bicycle	Advertising outside a bicycle, primarily visible to pedestrians	10801	transit.micro_mobility.bicycle
Scooter	Advertising outside a scooter, primarily visible to pedestrians	10802	transit.micro_mobility.scooter

UPDATES TO GRANDCHILD CATEGORIES & IDS
TRANSIT: LARGE FORMAT TRUCKS

GRANDCHILD CATEGORY	CATEGORY DEFINITION	ENUMERATION ID	STRING VALUE (DEPRECATED)
Delivery Truck	Advertising outside a delivery truck, primarily visible to pedestrians and drivers	10901	transit.large_format_trucks.delivery_truck
Mobile Billboard	Advertising outside a mobile billboard, primarily visible to pedestrians and drivers	10902	transit.large_format_trucks.mobile_billboard
Semi Trailer	Advertising outside a semi trailer, primarily visible to pedestrians and drivers	10903	transit.large_format_trucks.semi_trailer

DATA QUALITY

In order for DMOOH to be accurately measured, it is vital that the Location Data set used to generate exposure is of the highest quality. As discussed in the appendix of the parent document "DOOH Exposure Methodology Standardization Guidelines and Best Practices", data quality spans 4 main categories; accuracy, precision, passiveness, and scale. To achieve quality across all 4, one must use persistent, SDK-based Location Data.

One common, albeit ill-advised, method of increasing exposure counts for the purposes of retargeting is to amplify the location data set using Bid Stream data. However, bid stream data is highly inaccurate and imprecise, which leads to false exposures. Furthermore, bid stream data is often very low fidelity, which limits the number of observations one can make for a given user. This makes it difficult to apply to various conversion environments, which degrades measurement results leads to questioning the efficacy of the channel itself.

PRIVACY

As stated in the parent document, mobile advertising ID and location data must be collected, stored, processed, and disclosed under the premise of safeguarding consumer privacy. To ensure compliant use of DOOH exposure data, all companies that provide and use DOOH exposure data shall stay compliant with privacy regulations that apply to them, including but not limited to GDPR and CCPA. For example, entities that produce exposure data of California subjects should be registered with the California State Attorney General as a Data Broker.

APPENDIX:

DEFINITIONS:

- A **"Vehicle"** can be defined as a thing used for transporting people or goods from one point to another, especially on land, such as buses, trains, taxis, bikes, and anything that moves. It must be assumed that the environment, location, and orientation of the vehicle will change during each ad play.
- **Speed** - "Speed" can be defined as the rate at which a vehicle is moving. The speed of a vehicle can fluctuate at any given time. Additionally, it should be noted that a vehicle can stop for extended periods of time. For example, a driver can park and the screen should be treated as place-based.
- **Surfaces** - a "Surface" can be defined as the unique material and infrastructure on which a vehicle travels to get from one point to another; a vehicle can only travel from one point to another via pre-defined surfaces. There are a variety of surfaces a vehicle can travel on including, but not limited to:
    - **Conventional Road** -a "Conventional Road" is defined as a wide way leading from one place to another, especially one with a specially prepared surface which vehicles can use.
    - **Rail Tracks** - the "Rail Tracks", is a permanent structure that enables trains to move by providing a dependable surface for their wheels to roll.
    - **Sidewalk** - a "Sidewalk" is defined as a paved path for pedestrians, typically affixed at or near the side of a road.
- **Waypoints -** A waypoint is an intermediate point or place on a route or line of travel, a stopping point, or a point at which the course is changed. For the purpose of this document, a waypoint is either the beginning or ending of each ad play.
- **Rule of the Road -** A custom or law regulating the direction in which two vehicles should move to pass one another upon meeting, or which should yield to the other to avoid collision. This rule includes the "driving side": the side of the road vehicles must drive. In the United States, and for purposes of this document, vehicles travel on the right side of the road.
- **Snap to Road -** "Snap to Road" is a map matching feature that ensures that the GPS data is tied to the road that the vehicle is traveling and doesn't measure areas off the roadway path.

VEHICLE ROUTE SYSTEMS

A vehicle must operate within a specific system. The different "Systems" include:

- **Fixed Route Systems** - a "Fixed Route System" is defined as a system of designated transportation in which a vehicle operates along a prescribed route according to a fixed schedule. Examples of vehicles on fixed route systems include public transportation and paratransit.
    - **Disclaimer:** even if a vehicle operates on a fixed route, the exact time a vehicle is set to be in a specific location **CANNOT** be assumed as there are environmental factors, such as red lights, traffic accidents, and weather, that can cause the vehicle to deviate from the intended schedule.
- **Dynamic Fleet System** - a "Dynamic Fleet System" is defined as a system in which a vehicle has autonomy to travel wherever its operator wants/needs to travel, whenever the operator wants/needs to travel. A vehicle in this type of system can be leveraged for personal use, or via transit-like service, but on a smaller, more flexible scale. The routes these vehicles take vary each day, hour, and even minute. No route or schedule can be assumed until after the vehicle has traveled its course. Examples of a dynamic fleet system include personal vehicles, rideshare/carshare, and micro transit (scooters/bicycles).

- **Checkpoint System:** a "Checkpoint System" is defined as a model in which the vehicle does not have a fixed route, yet stops at specific locations on a schedule. In between those scheduled locations, or checkpoints, the vehicle can deviate from any location within its service area or park for an extended period of time. Examples of a checkpoint system include rideshare/careshare and mobile billboards.

UNDERSTANDING GPS DATA; THE NEED AND IMPORTANCE OF TIME AND LOCATION.

The location of a stationary screen is constant; therefore, optimization and measurement can rely on temporal data alone. Conversely, when the screen moves, it is essential to know when the ad played (i.e temporal data) and where the screen was located when the ad played (i.e. GPS Data).

"GPS Data" is defined as latitude-longitude coordinates gathered by a piece of hardware within a device which communicates with a satellite such as a screen, car navigation system, or a mobile phone. The collection of GPS data is common and used for and within a variety of applications. For the purposes of this document, GPS Data references the collection of GPS coordinates from the screens themselves, as they are affixed to a vehicle. There are three common ways to collect this information:

1ST PARTY SOLUTIONS:

1. **Integrated into Screen.** For many media operators, it's likely there is GPS Equipment within the screen collecting the required GPS Data. As a result, the media owner has full control of the GPS Equipment, allowing them to control how often they collect the screen's location (i.e. GPS Data). This solution allows for more precise measurement; the collected GPS Data is already merged with the Ad Play Data within the same schema and sent back to the server.

2. **Integrated into Mobile Phone.** Perhaps due to screen size or budget constraints, some operators don't have the necessary GPS Equipment inside the screen to collect the required GPS Data. As a result, the media operators choose to collect the GPS Data from a mobile phone instead. In short, the media operator built an app that they require their drivers to download. As the driver operates the vehicle, the mobile phone collects GPS Data from the screens' whereabouts. The media owner has full access over the collection of the GPS Data, allowing them to control how often they collect the vehicle's location (i.e. GPS Data). Within this solution, there are drawbacks:

    a. Driver Error: The collection of GPS Data is contingent on the driver opening the app on their mobile phone and starting a trip so that the media operator can actually collect the necessary GPS Data.

    b. Disparate Data Sets: The GPS Data and the Ad Play Data are not collected within the same schema which may become problematic when the time comes to sync the data sets together.

3RD PARTY SOLUTIONS

Integrated into Vehicle. For operators who are unable to collect GPS Data from a hardware built into the screen, or via a mobile phone, the only alternative is to collect GPS Data from a physical device placed within the vehicle itself. Installing the GPS Equipment within the vehicle enables the media operator to collect the GPS Data on the vehicle's location; however, the media owner no longer has full control over the collection of the GPS data and cannot easily control how often they collect the data. The more often GPS Data is pulled from a device, the higher the data/server/processing costs are. Many 3rd Party Solutions have caps on the frequency that GPS Data can be pulled, so an operator may run into several roadblocks that prevent them from collecting the necessary information. Even if an operator was able to collect the GPS Data, the Ad Play Data and the GPS Data would not be in sync and, as a result, measurement would suffer.

GTFS Data

As referenced, GTFS data will help bridge the gap when GPS is undetectable or if there are connectivity issues with the ad player.

The General Transit Feed Specification (GTFS) is a data specification that allows public transit agencies to publish their transit data in a format that can be consumed by a wide variety of software applications. Today, the GTFS data format is used by thousands of public transport providers.

GTFS is split into a schedule component that contains schedule, fare, and geographic transit information and a real-time component that contains arrival predictions, vehicle positions and service advisories.

Key Contributors:

- OAAA Data and Analytics Committee and specifically,
- Reveal Mobile: Gabe Frangakis, Jonathan Frangakis
- StreetMetrics: Drew Jackson, Richard Greene, Rebecca Thompson
- Wrapify: James Heller