ROUTE
A Methodological Overview

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route
outdoor media analytics

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Introduction

Out of Home Audience Measurement: Creating the Gold Standard

The measurement of Out of Home audiences is simple in theory yet can be fiendishly complex in practice to carry out.

In theory, to create an accurate estimate of the number and types of people who have an opportunity to see advertising appearing on billboards, bus shelters, station carriages, shopping mall signs, taxi sides, underground station walls, supermarket car parks and all the myriad environments in which Out of Home advertising appears, we need a measurement system comprising **six** components:

1. A **frame database** containing information on each frame or panel (we generally refer to advertising billboards or panels as 'frames') that need to be measured – including its exact location (latitude and longitude) on a digital map, its angle to the road and details of any information about the site that will influence peoples' likelihood to be able to see it;
2. **Counts** of the people travelling (either walking, driving, or otherwise moving) along each street, road or route and through every location where OOH frames are sited;
3. An indication of the typical **travel behaviour** of individuals over time;
4. A series of **modelling** processes that allow us to provide audience estimates for frames with no external counts and/or are not passed by anybody in the travel survey;
5. A way to adjust raw counts of people passing frames to a more **realistic** estimate of how many of them will have had a chance to see the advertising as they pass;
6. A method and system to **process** and then to **report** all these data in usable forms.

There are multiple ways to approach each of these challenges, some more accurate (and more expensive) than others. When Route was launched in Great Britain in 2013, a number of methodological choices were made. The methods have not changed fundamentally over the years; but they have been adapted and refined as the medium itself has changed and new techniques have been tried and tested.

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Route – an Overview

Route was a pioneer in OOH audience measurement, with many 'firsts' to its credit. So was its predecessor, POSTAR, the body managing OOH audience measurement prior to Route. POSTAR focused largely on measuring roadside billboards and bus shelters; Route was designed to capture many more of the different environments in which OOH advertising appears, including on trains, taxis and buses, inside underground stations and shopping malls as well as alongside roads.

The first task was to map all the poster locations, ultimately capturing the information necessary to estimate how many people would be able to see frames in each of these locations. This included the precise geographical position of each site and physical information affecting its visibility to people passing by – such as whether any obstacles obscured the panel from any points, the direction it is facing, its angle to the road and its size etc.

These data were collected for around 240,000 frames across the country (the number reported on in March 2020 stood at 392,432 frames covering multiple environments, including 92,740 roadside frames and 91,119 interior tube frames).

The next challenge was to find ways to count how many people were driving, walking or otherwise passing along every public pathway in the country. 'Public pathways' include not just major roads and city streets, but the corridors inside underground and overground stations, the escalators inside shopping centres, the inside and outside of airports and the interiors of trains. In short anywhere people went and could potentially be exposed to OOH advertising.

The solution to this was to create a **Traffic Intensity Model** (TIM). The TIM is designed to take traffic counts (which are available for some, but not all routes) alongside certain attributes for each kind of road. From these data, a modelling process was developed to create traffic estimates along all the pathways where people pass in view of a poster. Different approaches were later added to cover indoor environments.

The third component of the system is a **Travel Habits Survey.** This is used to get a picture of the types of people represented in these traffic statistics and estimates (e.g. gender, age, education levels etc.) and to understand how individuals travel between different points.

As noted above, many roads do not have continuous or even sporadic traffic counts. And however large the sample of people on a travel survey, there will always be frames that nobody in the sample actually passes during the course of fieldwork. For this reason, the fourth component consists of various **models** we need to create to generate audience estimates for every frame.

The fifth component of the Route system is a set of **Visibility** factors, applied to the numbers of people we calculate as having passed a frame on their journeys. This accounts for the differing likelihood that people in real life will have to view each of these frames, depending on factors such as the size of the frame, the environment it is in and how far they are away from it.

Finally, Route data is made available to underwriters via ASCII flat files and a companion document outlining the Reach & Frequency algorithm calculations to be used in whatever end-user software they prefer. Standard subscribers have access to the data via a delivery system (API or other software system).

1. The Inventory Management System

MGE Data's Inventory Management System (IMS) provides the foundation of Route's measurement approach, used alongside an Inventory Classification System (ICS). The system was first designed in 2006 and delivered to Route two years later. As at April 2020, it has been deployed in 18 countries. Its role is to provide frame data input for the audience modelling processes which are then used in the reach and frequency calculation.

Updating the information on each frame is the responsibility of panel owners.

Each frame is first classified according to its GPS co-ordinates and orientation (angle) to the road. The system automatically generates a 'Visibility Area', based on the maximum distance from which the frame is visible and the furthest angle from which it can be seen. Any permanent obstacles (such as buildings and the width of the street) are considered in re-sizing the area to a realistic one, within which the frame can be seen.

The IMS enables the following processes:

- Initial loading of inventory data provided by the frame owners
- Adjustment of each panel to its correct position and bearing (this can be checked by competitors)
- Assignment of each panel to a street segment on a digital map (this is automatic but can be manually adjusted if necessary).
- Visibility adjustments (see later section)
- Reporting and output to other components of the measurement
- Reporting and output to frame owners
- **Updates and reporting of new and discontinued frames provided by media owners**

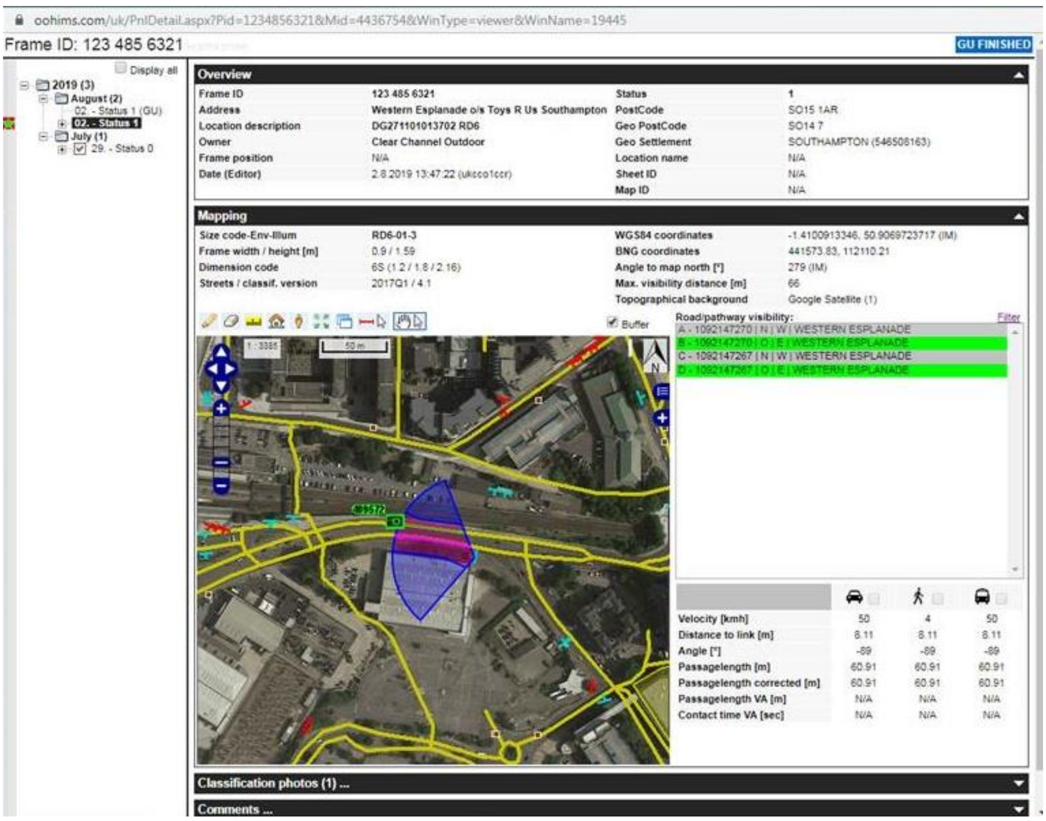
Field Name	Example
Town.	Southampton
Frame ID	1234856321
Frame Type	4
Site Address	Western Esplanade, o/s Toys R Us
Postal Sector	SO14 7
Size ID	606
Size_width	0.9
Size_Height	1.59
Inputdate	02/08/2019
Illumination	3
OS Grid Easting	441573.8298
OS Grid Northing	112110.2109
Obstacle Type	D

All frame locations are classified using variables of relevance to audience measurement, particularly those required for calculating visibility adjustment factors.

They include:

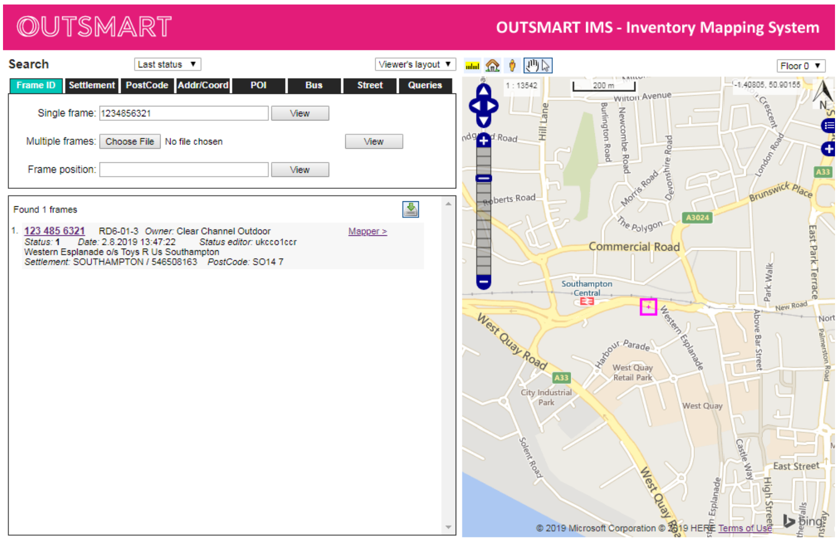
- GPS co-ordinates
- The size and format of the panel
- Whether static, rotating or digital
- Whether illuminated
- Distance from and angle to the road
- Obstacles

Below are some example screens from the system. The shaded area indicates the theoretical Visibility Area. Within this area, the street infrastructure influences the actual size of the area (in this case we can see that some of it includes the roof of a building – so this is excluded from any calculations).

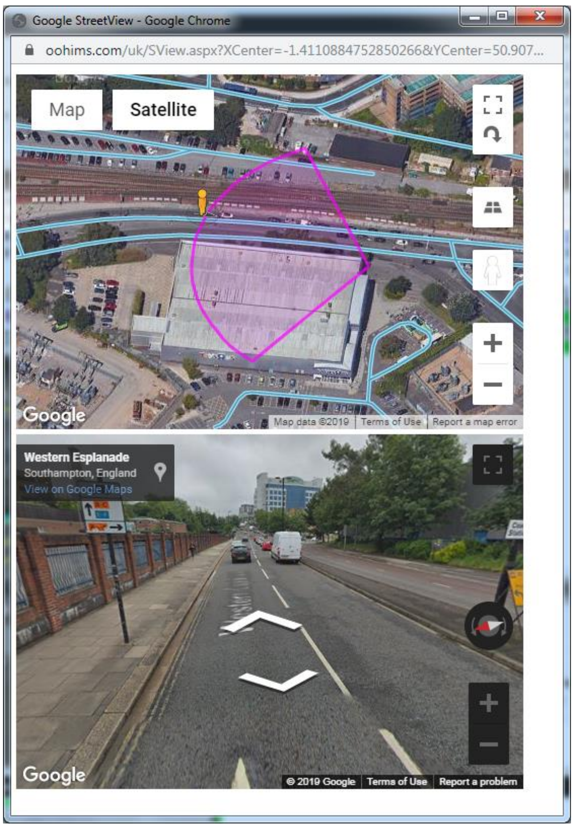


Example frame: satellite view

We can also look at panel locations in the context of their wider geographical environment. Here we have the same frame seen on a map (which can be zoomed in or out as needed):



And we can also look at a photograph of the frame location using Google Street View:



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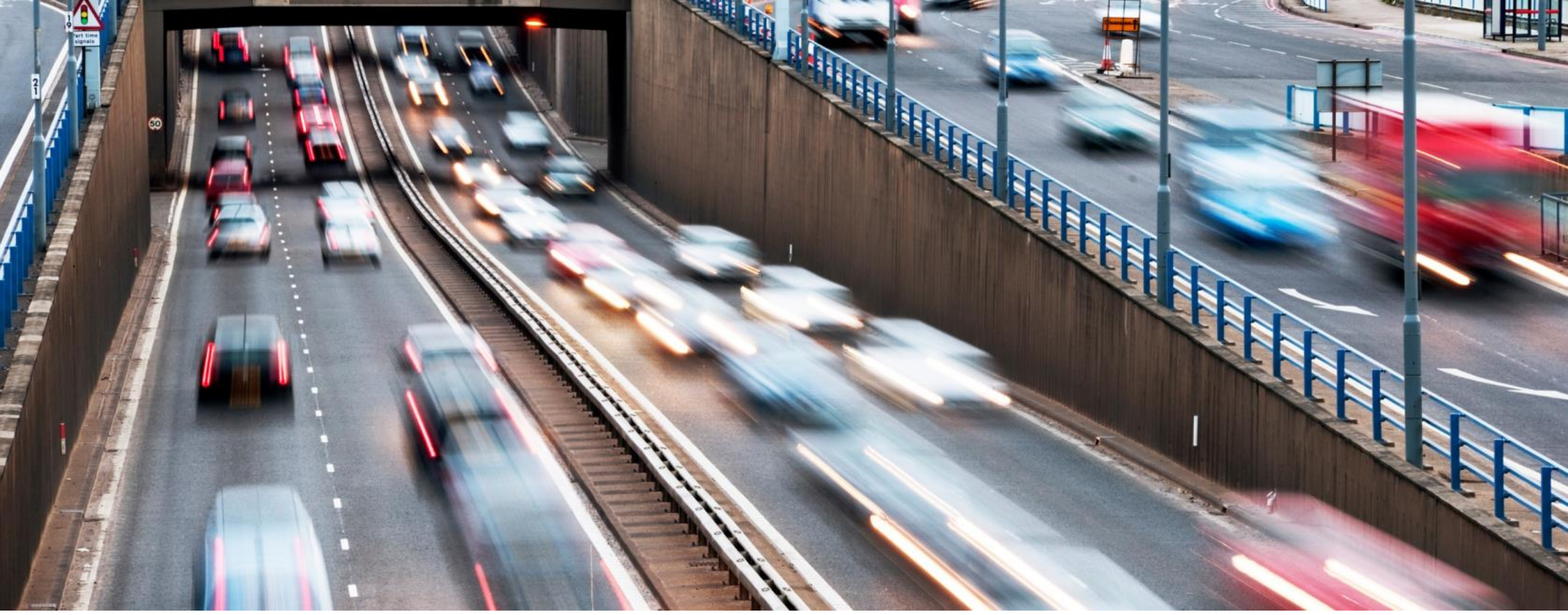

2. Traffic Counts

Having built a detailed database and map of all the advertising frames needing to be measured, the next step is to find out how many people pass by each of the frames. Part of the solution is to source official traffic and pedestrian counts and those collected by commercial suppliers.

The count data is culled from a range of sources capturing information on the number of vehicles and pedestrians travelling along these routes. They vary in levels of sophistication covering different types of roads, pavements, walkways in and around stations and airports, the inside of trains, buses and tube cars, and inside shopping malls. Route ingests well over 100 separate sources of count data in its system.

Vehicle Traffic Counts

Road traffic volumes are collected by the Department of Transport, which reports 'Annual Average Daily Flow' (AADF) information (essentially a count of the number of vehicles passing a point on the road every day) for 43,847 of the 4.2 million sections of road (or 'links) across Great Britain.

Just a handful of these are continuous counts (where vehicle volumes are measured and reported at all times of day and for every day in the year). In theory, such counts on every road would represent the ideal dataset for building an OOH measurement system.

In practice, it would be computationally challenging, demanding the ingestion of massive data volumes from every road in the country every day of the year. The data processing challenge is even greater considering the need to cover more than just roads and more than just cars.

The Department for Transport collects the data using 12-hour manual counts from around 8,000 roadside locations and continuous data from several hundred automatic traffic counters.

The street-level road traffic estimates provide the number of vehicles that pass each 'Count Point' location. They cover each junction-to-junction link along Great Britain's major road network, and for a sample of locations on the minor road network. The following statistics are generated:

- ***Average annual daily flow:*** the number of vehicles that travel past the count point (in both directions) on an average day of the year
- ***Average annual daily flow by direction:*** the number of vehicles that travel past the location on an average day of the year, by direction of travel
- ***Raw counts:*** Where a raw count has been conducted at a given location, this provides the number of vehicles that travel past the location on the given day of the count, by direction of travel, for each hour between 7am to 7pm.

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Manual traffic counts

Manual counts are conducted on a weekday by a trained enumerator, for a twelve-hour period (7am to 7pm). They are carried out between March and October, excluding all public holidays and school holidays.

Manual counts on major roads: It is not possible to count every single location every year; therefore, sections of road are surveyed on either an annual basis or in cycles every 2 years, every 4 years or every 8 years. The frequency is based on the traffic level. This means not every link in the major road network has a 12 hour count every year.

Manual counts on minor roads: Due to the vast number of minor roads in Great Britain it is not possible to count the traffic on most of them; instead a representative sample of minor road sites are counted each year. The difference in traffic between the two years is then applied to overall minor road estimates to calculate estimates for the latest year.

Automatic traffic counts

The Department for Transport's road traffic statistics team have approximately 300 automatic traffic counters at locations on Great Britain's road network. The locations represent a **stratified panel sample**, providing observations that can be used to estimate in-year traffic variations by road and vehicle type.

Automatic traffic counters are permanent installations embedded in the road, which combine Inductive Loops with Piezoelectric Sensors in a 'Loop – Piezo Sensors – Loop' array, and record information about vehicles passing over them, including vehicle length and wheelbase, to classify vehicles.

The Department for Transport's road traffic statistics also make use of automatic traffic counter data collected and maintained by other organisations. These include:

- ***Highways England:*** operates over 10,000 automatic traffic counters on some of the motorways and 'A' roads in England.
- ***Transport Scotland:*** operates more than 900 automatic traffic counters on some of the motorways and 'A' roads in Scotland.
- ***Transport for London:*** operates over 300 automatic traffic counters on roads in London.

Travel speeds are culled from an external data source: HERE Traffic Patterns, which provides vehicle speeds for every HERE link where vehicles pass. Pedestrian walking speeds are calculated from the Travel Survey (see later section). It is calculated from the time spent by panel members travelling from one place to another, as captured by the MobiTest meter.

Residential Cars

In residential areas, we model car traffic volumes. Car counts for each 'output' area are pulled from the census, with each car being assigned to an address point. What is called a 'flow model' is then created, which estimates the traffic flows from individual address points to where they join major road networks.

Counting Pedestrians - Overview

Pedestrian counts are handled differently to vehicle traffic counts. They are gathered from a range of sources including direct footfall counts (shopping mall footfall, station usage, etc.) and indirect estimates (ticket sales etc.).

For Route, the country is divided into just under 230,000 'output' areas, detailing the size and composition of the population and the number of cars owned by each household. Count data is accessed from around 988,000 locations (most of them bus stops). The table below has the details.

Count station reference	Count description	Number of Count points
C001	Output area counts - including daytime counts from Census data	(227,759) *
C002	RODS (Rolling Origin & Destination Survey) data for London Underground (entries and exit) plus Patronage data for DLR	314
C003	LENNON (Latest Earnings Network Nationally Over Night) data for train stations plus Glasgow subway and Light Rail	2,792
C004	CAA (Civil Aviation Authority) data for Airport	31
C005	Volume on HERE links - Buses - bus stops	875,923
C006	External count data for Supermarket	17,995
C007	External count data for Shopping centres	1,774
C008	PMRS (Pedestrian Market Research Services) survey data for footfall	14,729
C009	Internal client - Schools	48,118
C010	Leisure facilities	5,599
C011	Point-X data for car-parks	14,790
C012	HERE data for Service stations	138
C013	HERE data for Hospitals	1,380
C014	HERE data for Bus Stations	160
C015	HERE data for Tourist attractions	992
C016	HERE data for Post offices	2,456
C017	Sourced and approved extra counts (bespoke PMRS, MO & LDC counts) - Shopping locations other	753

** We have adult population data for 227,759 output areas, but the counts are spread over all residential postcodes in the area and are not single POI counts*

Counts are grouped into three categories:

1. Residential pedestrian counts

Residential counts are computed for routes connected to houses/address points. The census population of each area is assigned to address points on links inside an area 'polygon' (boundary). Each link and sub-link are then assigned part of the total population weighted by the number of address points assigned to it.

This residential component represents pedestrian flows close to where people live. A general factor of 2.5 visits per day is applied to each residential link value as an average. It results from travel survey analysis of the average number of trips made by people during the day (in and out)

2. Points of interest

'Points of Interest' (e.g. schools, bus and train stations, shopping malls etc.) are places pedestrians tend to gravitate towards – as cars do to road links. For each Point of Interest, we look at census data on the size of the resident and working population in the immediate area. For some POIs, detailed pedestrian count data is also available.

3. Bus stops/links turnover

The first version of our model was based on how people moved around bus stops. This generated counts for links with bus stops. We have since started to evaluate all links covered by bus lines to make the bus 'gravity' (see modelling section) connected and gap-free. We also enhanced the model by making a finer division of links into sub-links, which has helped us to achieve a better representation of buses within the local traffic volumes.

3. Travel Behaviour Survey

The role of the travel survey within Route is to add depth to the traffic volume data. A travel survey helps us to profile the people travelling along major routes (using demographic and other descriptors) and to trace how the number of locations visited over a period of time accumulates. This then helps us analyse the reach and frequency of OOH advertising campaigns.

Many options exist for collecting travel data. Some studies simply ask people to recall their recent travel behaviour. Typically, they will be telephoned and asked to tell the interviewer the origin and destination of every journey they took outside their home on the previous day or two, the mode of transport used (e.g. by car, public transport or on foot) and the purpose of the journey (e.g. for work, shopping or leisure). The fastest route between the locations logged during the interview can be calculated automatically (rather than asking people to recall the detailed route).

Given that people don't always use the fastest or most obvious route to travel between destinations, other approaches can prompt them with maps (in face-to-face interviews) to show them the actual routes used.

Both of these methods rely on recall – people accurately remembering all their travel behaviour. Apart from the obvious flaw that people may not be able to recall every journey or may remember the details incorrectly, confining the journeys covered to just one or two days gives a very limited insight into how travel builds over time.

The Route solution is to ask a representative sample of people – recruited face-to-face – to carry a small device with them which automatically captures their GPS locations on a near-continuous basis. This device – the MobiTest meter – weighs just 86 grams and measures 8cm x 4cm – easily fitting into a pocket or bag.

People are asked to carry the meter with them for two weeks whenever they leave home and then to charge it when they retire for the night. Prior to this, they are asked to complete a recruitment questionnaire which collects information on their demographics and travel behaviour.

The meter is then placed by the interviewer, who takes the participant through what they are being asked to do. A self-completion questionnaire is also left with them to complete during the survey period. This is used to collect attitudinal and media consumption data.

The meter is accurate to within 2 metres and captures location data every second. Both movement and static periods are captured which enables us to determine – without having to ask the participant – whether they are walking or travelling in a vehicle. Estimates are also made as to their likely mode of transport when using a vehicle – for example whether they are travelling in a car or on a bus.

This classification is a good example of the level of sophistication built into the Route system. To determine whether people are travelling on a bus or in a car:

- The respondent must travel through a certain number of consecutive links (and travel for certain minimum time) that are part of digitised bus route we have stored in the system;
- The respondent must be a frequent bus user (taken from the recruitment questionnaire)
- The journey cannot be directly after a one classified as being in a car (which means that they must be classified as pedestrian before they can start a bus journey).

Data from the device is retrieved by GPS whenever it is plugged in to charge. An advantage of this is that compliance can be checked during rather than at the end of fieldwork when it is retrieved by Ipsos. In the case of problems, panel managers can call participants quickly to check whether they are being compliant or whether there is a technical fault preventing data being transmitted.

7,200 people are recruited every year to participate in the Travel Survey, with information accumulated over a three-year rolling period (i.e. reporting on a base sample of just under 22,000 people every year).

Earlier generations of MobiTest (first used in 2004) were only equipped with GPS. In 2016, Route adopted a new generation of multi-sensor meters. These have allowed us to penetrate indoor environments where GPS signals are weak or non-existent.

The sensors employed include a digital accelerometer, gyroscope, barometer, magnetometer, thermometer and wi-fi capability to add to the GPS capability. When synchronised by time code, they help us detect direct differences in motion (acceleration, direction) and indirect differences (altitude, temperature, distance to access points, speed, etc.). From these data, in conjunction with plans and maps of the indoor environments, we can capture detailed information about the likely routes people take within shopping malls and other indoor environments.

4. Modelling

A number of modelling processes are used within the Route system. These include the Traffic Intensity Model (TIM), various behavioural models for movement within indoor locations (e.g. shopping malls and airports), 'virtual' contacts created to model travel survey behaviour beyond the 2-week survey period and Contact Redistribution modelling (a method to redistribute contacts between frames).

Traffic Intensity Model - Vehicles

This is used to:

1. Generate traffic flow estimates for each part of the road network;
2. Provide an assessment of the reliability of each estimate – used in the modelling process;
3. Update estimates when new data is available;

Data Layers

The model is organised into data 'layers' which are then subject to 'flow models' that transform the less than perfect count data into traffic estimates for each road section.

The first layer in the system is a digital map of Great Britain. This is licensed from HERE Technologies, a company which provides mapping and location data. All roads and pedestrian areas of the country are represented in the HERE database. It has also been expanded to indoor locations. Every road on this map consists of what are called *links, sub-links* and *nodes*, where a link is a section of road, a sub-link is a smaller section of road and a node is the start or end of a link.

The second layer of data in the TIM consists of characteristics associated with each of these links. These include the road type, the presence of buses, traffic rules (e.g. is it a one-way or two-way street, whether there are speed limits or other restrictions) and so on. This is sometimes referred to as the *network topology*.

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Road links are classified into five types, each of which have different levels of traffic intensity:

Functional Class	Description	Road Types
1	Roads with few, if any, speed changes, controlled access, high volume, maximum speed travel between major metropolitan areas	Motorways
2	Roads with few, if any, speed changes, high volume, high speed travel to and from Functional Class 1 roads	Major Highways
3	Roads that connect Functional Class 2 roads at a high volume with lower mobility	Non-primary A roads
4	High volume of traffic movement at moderate speeds between neighbourhoods	B roads
5	All other roads	Local roads

In the 2020 version of TIM (TIM 6) Great Britain had a total of 4,216,071 road links, further divided into 27,054,141 sub-links. This additional sub-classification enables us to apply traffic flows at a more detailed and granular level, reflecting the ways in which cars and people move along them.

The table below shows TIM 6 links split by functional class and their count, length and average daily vehicular traffic (avg. number of cars per link). FC5 roads, which make up more than three-quarters of the roads by length – only account for 14% of traffic volumes.

Functional Class	No of links	Length of links (in miles)	Average traffic intensity (number of cars per day per link)	Share of Daily Traffic Volumes
1	53,297	7,579	31,754	14.46%
2	176,955	13,596	13,125	19.84%
3	305,283	18,145	10,840	28.27%
4	498,253	34,187	5,454	23.22%
5	3,182,283	234,757	523	14.22%
Total	4,216,071	308,265	2,777	100.00%

This information helps us to build what is known as a *directed-graph,* so we can understand the way traffic flows. A one-way street obviously allows traffic to flow in only one direction; a two-way road consists of two opposite links in the directed graph.

Links are also classified according to whether most of the traffic will flow *through* them or will *originate* or *terminate* at the link. A car park or residential *cul-de-sac*, for example, will be an origin or destination; an A road running through a city suburb is more likely to be a flow link.

A third layer added to this map is traffic count data from the Department of Transport (see Section 2). These are in the form of **Annual Average Daily Flow (AADF) information. As noted earlier, some** 43,847 of the 4.2 million road links across Great Britain offer traffic counts.

The Modelling Process

The purpose of the model is to estimate traffic volumes for links with no count data from the data we do have. To do this we need to model how traffic *flows* between and amongst all the known count points. Complex regression models are used, with the computation split into two independent phases.

In the first phase, a simulation model is applied to construct an initial flow and reliability estimate based on the traffic counts, network topology and link classifications just outlined. In the second phase, this initial estimate is *balanced* to satisfy flow conservation (i.e. the amount of traffic entering an intersection needs to equal the amount of traffic exiting it).

For example, if a count station is located at a T-junction leading from one A road onto another, we will have a count of the number of cars entering the junction. There are two choices available to the vehicles: to turn left or right. Those turning right will eventually pass another intersection, with further choices available to them – perhaps to carry straight on or to turn.

At some point, another count station will be passed, enabling an accurate count of vehicles entering and leaving the links either side of it. The job of the flow model is to quantify what happens between count stations using everything known about the characteristics of the road links in between and to ensure the number entering and leaving each link is identical.

Vehicle Occupancy

As we are counting people rather than the vehicles they travel in, we need to estimate the average number of people travelling in each car. For this, Route uses the National Travel Survey (NTS), which yields occupancy levels of between 1.4 and 1.5 depending on the size of the area being measured.

Incorporating MobiTest data

The journeys of both the urban and suburban population are measured. One challenge is to distinguish between pedestrian and vehicular movement, especially in built-up areas, where speeds tend to be low and the GPS signal can sometimes be lost.

The second-by-second GPS data captured by the MobiTest meter is used in two different ways:

- To determine the sequence of street links along which people travel
- To map their intersections with Points of Interest

The sequence of street links represents each respondent journey. GPS data are matched with the roadside network to determine which streets/roads were travelled on by the respondent. For each of the street links, we have information about the time they spend on this link and on the average speed of travel. This, together with overall respondent travel patterns and knowledge of any access restrictions related to the different street links, helps us to determine their mode of transport.

Intersections with Points of Interest provide information about likely visits to these locations.

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Step 1 - POI visits

We evaluate visits to Points of Interest based on second-by-second GPS traces at and around each location (‘buffers’ are drawn around Points of Interest to indicate the likely area within which people will be heading to or away from each place). The size of each buffer will vary according to the location type.

For example, a major train station or shopping centre will have a much larger buffer than most bus stops. All visits longer than three minutes are initially assumed to represent a stop. Each stop is matched with a location and a Point of Interest. Data for any measured POI are cleaned further by looking at travel behaviour before and after the stop to be as certain as possible that people are, in fact, walking rather than travelling in a vehicle.

Step 2 – Travel survey population assignment

The Travel Survey sample can never be large enough to accurately represent visits to every single Point of Interest in the country (which is clear when we compare Travel Survey data with measured external counts – e.g. of shopping mall footfall). So, a certain amount of data integration is carried out to enable projection of our sample to the population (for example, we segment people according to their typical travel behaviour on weekdays vs. weekends). From this procedure, we generate average daily pedestrian flow estimates for each Point of Interest.

The travel survey population assignment allows us to evaluate the pedestrian flow (‘gravity’) to and from Points of Interest and to merge the gravities between multiple POIs close to one another. This latter situation arises when, for example, a bus station is next to a train station and we need to determine how many people are visiting either one of these in isolation or both.

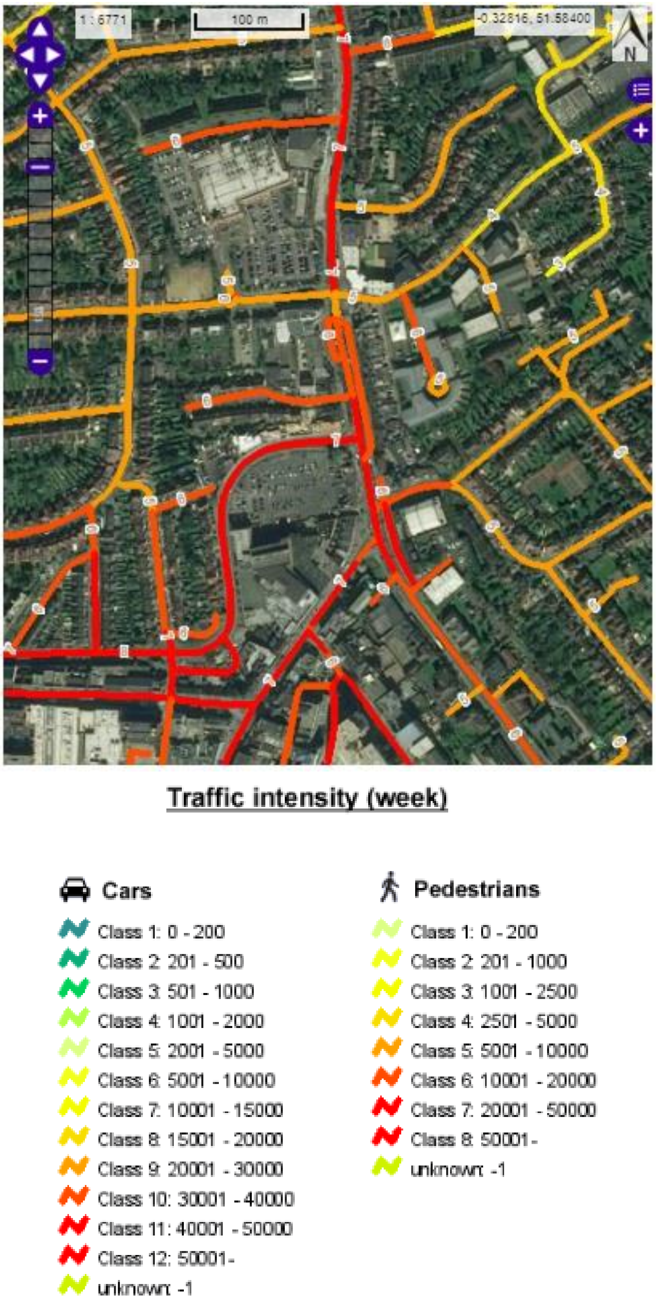
Step 3 – Footfall counts

These are described in Section 2. The pedestrian counts from various sources including direct footfall counts (mall footfalls, station usage, etc.) and indirect estimates (ticket sales etc.).

Step 4 - Gravity modelling

The next step is to build a ‘gravity’ model, a technique for estimating the flow of people between any two places based on the size of the group and the distance between the points. This is designed to expand the count data we have to the approximately 4 million pedestrian links identified.

The image below shows a gravity model distribution and how counts spread in relation to other counts.

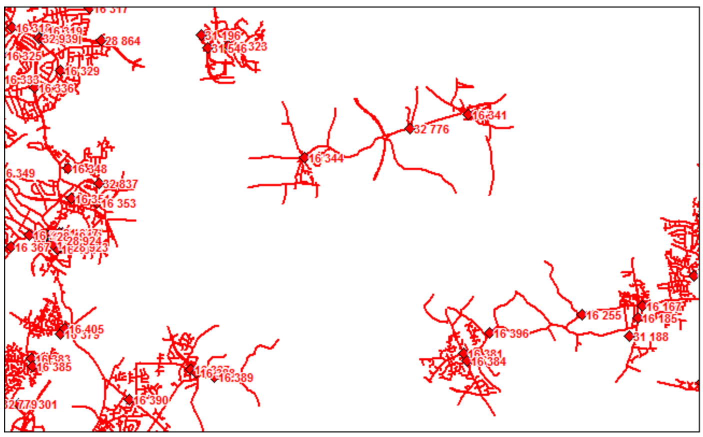


Example - PEDESTRIAN model

We assume that visitors need to travel along adjacent streets and pavements to be present at individual POIs. Gravity distribution involves assigning pedestrian volumes to each link connected to a Point of Interest. In the model, the number of pedestrians we count as travelling towards or away from a POI (known as pedestrian 'intensity') falls as we get further away from the location.

Where two POIs are close together, we take the data we have on the combined area around the two points and make certain assumptions to avoid duplication of pedestrians and overestimation of the final traffic volumes. This is based on learnings from Step 2.

HERE links comprise the main geography underpinning the Pedestrian Intensity Model. From TIM 5 onwards, Route divided these links into shorter sub-links. For each of these, HERE provides information on any access restrictions. For example, pedestrians cannot access motorways. But they can of course walk the wrong way down one-way streets.



Example - POI and spider web of gravity links connected to each point

Gravity Processing

Gravity processing from the first to the sixth version of the TIM was based on scripts running on three separate count threads (detailed in Section 2). i.e.:

- Residential
- POIs
- Bus stops and links

The final gravity was created as a combination of all three components.

Scripts are generated around each POI attractor gravity polygon (boundary) and these are intersected by sub-link centroids. Using centroids (points) instead of sub-links (lines) improves performance.

Curves were converted in a series of steps where each step represents a specific gravity distance. Each distance has a defined gravity factor. This factor considers the number of connected sub-links dividing the volume after gravity application by the number of connected sub links.

This means that locations connected to 4 different sub-links have 2 times faster gravity decrease than a location connected to 2 different sub links.

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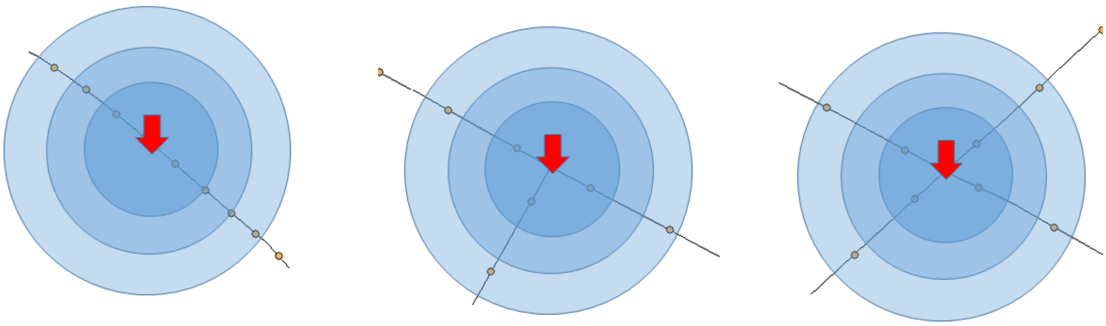

Example - Gravity in 2 directions, 3 directions and 4 directions

	Cumulative percent	
Distance travelled from location (m)	**Away from home**	**From home**
0	100,00%	100,00%
200	76,08%	77,18%
400	52,54%	56,48%
600	35,85%	42,20%
800	25,36%	32,47%
1000	18,49%	25,33%
2000	4,87%	8,20%
3000	1,68%	2,93%
4000	0,71%	1,15%
5000	0,33%	0,51%
6000	0,17%	0,24%
8000	0,00%	0,00%

Example - gravity by distance from home, as measured on the Travel Survey

TIM Updates

The Traffic Intensity Model (TIM) was first designed by MGE Data in 2008 and implemented in Great Britain the following year and in Croatia three years later. The approach was also implemented in The Czech Republic and Poland in 2015. But the TIM has not stood still.

Managing the Traffic Intensity Model is complex and challenging. Much has been learned about how traffic estimates can be improved – whether it be by ensuring the accuracy of the source data, adjusting some of the model procedures or adding new environments. As a result, the TIM implemented in 2009 has been updated roughly every year since. In April 2020, V6.0 was released. The main updates to the model in each version have been as follows:

TIM VEHICLE Versions

TIM Version	Main Developments	Date
1.0	Original version	2009
2.0	Update to counts, improvements to flow distribution	2012
3.0	Update to counts, geometry (previously missing road segments filled), extra granularity of links, bespoke counts added as well as local authority counts, update to VA method, speeds	2013
4.0	Updates to counts	2015
4.2	Update to geometry and counts	2016
4.3	Update to peds only to include traffic restriction	2017
5.0	Update to counts, geometry, move to sub-links, update to speeds	2018
6.0	Update to counts and geometry. Calibration of visibility observations from Travel Survey to Pedestrian model for frequently visited frames	2020

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TIM PEDESTRIAN Versions

TIM Version	HERE MAP Ver.	Geometry	Inputs and updates	Methods
1.0	2008q2	Links	RESID BUS POI	Initial Gravity v1
2.0	2008q2	Links	RESID BUS POI	Gravity v1
3.0	2012q4	Links	RESID BUS POI	Gravity v2
4.0	2012q4	Links	RESID BUS POI	Gravity v2
4.2	2015q3	Links	POI	Gravity v2
4.3	2015q3	Links	POI	Gravity v2
5.0	2017q1	Sub links	RESID BUS POI	Gravity v3
6.0	2018q1	Sub links	RESID BUS POI	Gravity v3

TIM Pedestrian updates were historically based on the following changes:

- HERE Version
- Input data updates
- All three inputs RESID, BUS POI or selected POI inputs
- Geometry set-up – links and sub-links
- Gravity distribution
  - Gravity V1- initial version, distribution low volumes to very long distances
  - Gravity V2- optimised to shorter distances with minimum impact on final volumes on links (faster processing speed)

Gravity V3- optimised to generate distribution results on sub links instead of original links

5. **Visibility**

The objective of adding Visibility factors is to enable users to shift from a simple ‘Opportunity to See’ measure (has a person passed by a poster frame?) to a ‘Likelihood’ to See. This will depend on factors such as the size of each panel, the distance people are away from it and the angle from which it is viewed.

Route has drawn on work undertaken in the past with Dr. Paul Barber and Birkbeck College, part of the University of London. An ongoing research project examines how people look at the many variations of advertising formats in different situations.

The approach uses eye tracking both in a laboratory setting as well as in a real-world setting. A sample of individuals was asked to view numerous scenes on a screen containing different frame types, while wearing special eye tracking headsets. They played one of three roles – as a driver, a passenger or a pedestrian – without any indication that the study was about advertising. They were asked simply to replicate their normal behaviour when outside their homes. Eye tracking research was then conducted in a real-world setting to validate the results. Eye tracking enabled Route to determine where people were likely to look while on the move.

The experiments produced a series of factors by which the gross audience for a frame could be adjusted depending on its specific characteristics. A mathematical rule was derived, permitting such adjustments to be made for any known set of parameters. By applying this information about how people view the real world, the audience for each frame can be adjusted to account for its likelihood to be seen.

Generally speaking, a site which is larger, illuminated, dynamic, next to slow-moving audience flows and placed at a perpendicular angle to an audience flow rather than at an angle - will have an increased likelihood-to-see factor. Route’s visibility work never stands still and is under constant review.

6.Reporting

Route data is updated quarterly for new and changed frames, and the reporting sample is refreshed annually. Currently, the data is distributed to underwriters via ASCII flat files, enabling them to ingest the data into the various end-user software platforms they favour. A companion document is also supplied, outlining the Reach & Frequency algorithm calculations to be used in analysing the data. Standard users access the data via a delivery system (API or software system).

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