





1 Introduction

This guide covers all services delivered under CitiAnalytics. Please note that you may have different modules to those described within this guide.

CitiAnalytics is Citi Logik's web-based portal to access real time and historic analysis tool, using underlying mobile network data (MND) from Vodafone. The system gains access to all recorded anonymised live events taking place on Vodafone mobile devices and through a series of algorithms that process this data in real time. This results in the real-time identification of:

- People within a Station Area

All data is also saved to create an historic database. This allows the production of historic data and baseline data.

This information is then post processed to provide clients with key outputs through the CitiAnalytics web portal. This guide covers functionalities specifically for live station metrics updating in near time information.

The portal was designed to be as intuitive as possible, making it easy for the user to navigate and find information.

After this introduction, this user guide covers:

- Mobile network Data and Citi Logik;
- Installation and setup, including user types;
- Login;
- Menus; and
- Details of the views.

1.1 Web Portal URL

<https://web.citianalytics.com/login.html>

2 Live Stations Using Mobile Network Data (MND) Introduction

The Live Stations Service uses MND from the Vodafone Network processed by Citi Logik.

Vodafone customers communicate their positions with the networks of Vodafone cells every time they use their mobile phones to text or make a call and through ad-hoc events generated through applications running on smart phone devices, such as web searching, location services etc. Each such communication is registered by one of the network cells as an 'event' with a unique and anonymous user ID, a timestamp, a local area code (LAC¹) and the cell's ID being attributed to it.

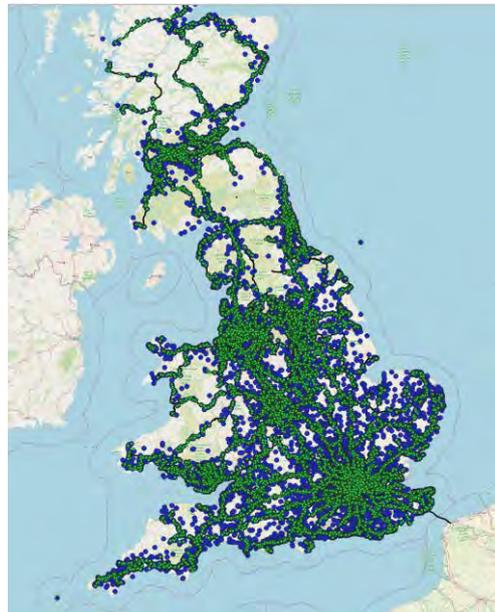
Each event that is recorded can be either an 'active' or 'passive' event. Passive events refer to mobile devices' background periodic updates and their reassignments between Vodafone LACs and as such may not necessarily coincide with physical activities of Vodafone customers on their devices. Passive events translate into handovers between each LAC, which generates spatially less detailed information but a very large sample i.e. the whole pool of Vodafone devices which can be followed (see section on privacy and license restriction).

Active events refer to phone calls, web-browsing, email or text exchanges, with references to the cells which have been used by customers during such 'live' communications. Generally active events translate into handovers between each cell tower used by a phone when active which generates spatially very detailed information but with a limited sample.

The anonymisation of events is a regulated activity that Vodafone (the MNO) must adhere to. The customer details associated with each recorded event are replaced with an encrypted ID, which from here on shall be called the device ID. The device ID allows the tracking of movements of mobile devices in terms of visited places and durations of stay, in a way that is not compromised. This information is anonymised within the core network to GDPR compliant standards and then processed by Citi Logik as billions of events per day.

These events are then monitored to identify if a device comes within a predefined area within and around one of 20 defined stations. From this we can calculate the number of people within a station area in real time (2-4 minutes processing time) and display this within the Citi Analytics Web Portal.

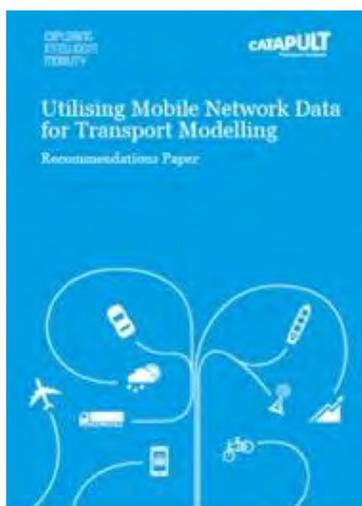
¹ LAC – Location Area Code is a unique number for the current location area. A location area is a set of base stations that are grouped together to optimize signaling.



The Core Network for Rail

2.1 Expanding to Full Population

The data from one network provider can be expanded to Full UK Population using a methodology approved by DfT with support by Citi Logik. This is published as the Catapult recommendations to DfT for utilising mobile network data for transport planning and mobile data is a recognised source of origin destination information by DfT.



This method has been accepted by engineering consultancies for over 5 years in transport planning and design as the main data source

MND has been the primary data source in £1Bn+ projects and successfully accepted in public enquiries.

As a simplified process Citi Logik applies expansion from Vodafone devices to person trips using both localised market share and mobile penetration based on DfT approved methodology, this technique does not require information for all mobile operators data.

This approach uses network identified Home and Work locations provided by Vodafone based on device behaviour. The process matches Vodafone device counts of home location to Census Population at Local level e.g LSOA. This provides an accurate expansion factor for a localised area. E.G Simplified - 1500 person census location and 350 VF night-time devices = expansion 4.29.



Across the UK, each area is unique and so is the expansion factor for each device, as described in the Catapult document. This takes care of variances in market penetration for any given locality and also automatically caters for users with multiple devices including tablets.

Using the expansion number, we can multiply the number of individual VF devices seen by their respective expansion number to produce a total count of travelling persons. Results have previously been validated for rail journeys in trials against onboard counts undertaken by Tracsis.

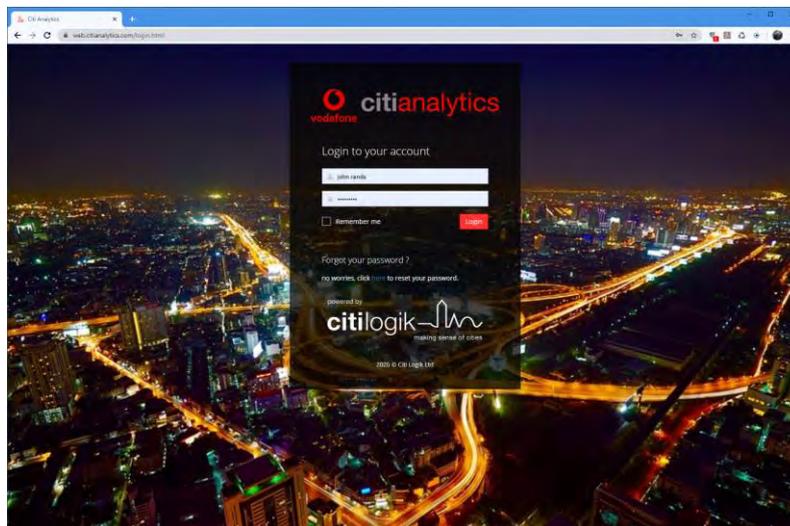
3 Login

CitiAnalytics operates as a web-based portal, and hence no installation is required. An electronic device with web access and a common browser is needed. The portal interface is responsive and will adjust its layout to any browser/device used.

Access to the portal is done through the following link:

<https://web.citianalytics.com>

When prompted, enter your login and password. If you do not have a login/password, please contact your administrator.



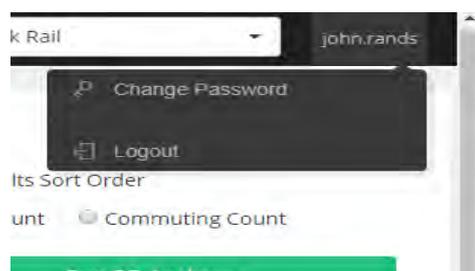
On your first login, it is recommended that you change your password using the “Forgot your password” function which will email you a link to your email account which has already been created for you.

Self Admin

Once logged in users can undertake various basic admin tasks through the drop-down menu top right of the screen. Select your username displayer in the top right-hand corner

This includes:

- Change password.
- Logout.

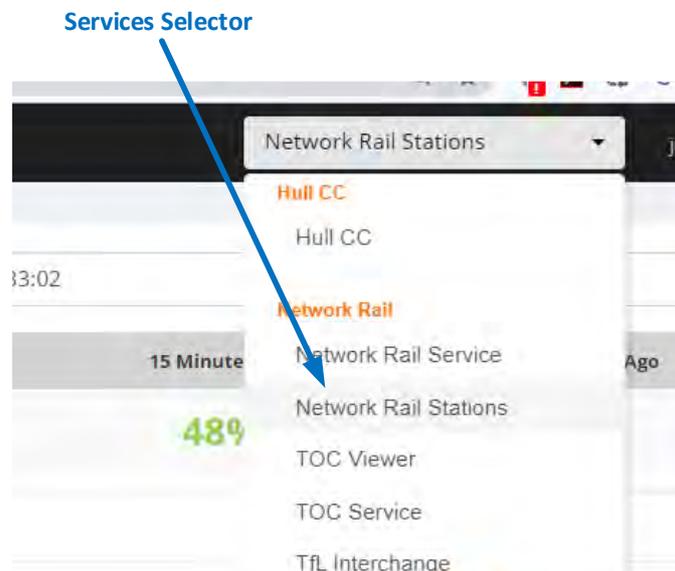


4 Menus

CitiAnalytics has been designed to offer a flexible approach to data access for multiple clients and client groups.

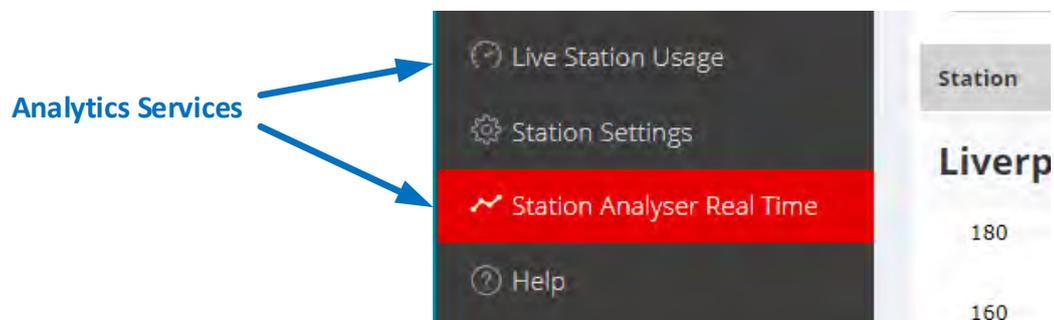
Access hierarchy is shown through Service Selection via drop down menu and Analytics Services displayed as service tabs.

It is likely that most users will only have access to one Service Selector drop down service but can have multiple Analytics Services depending upon permission.



Service Selector

Please check to see if you have additional services permissioned under Service Selector if you can't find what you are looking for.

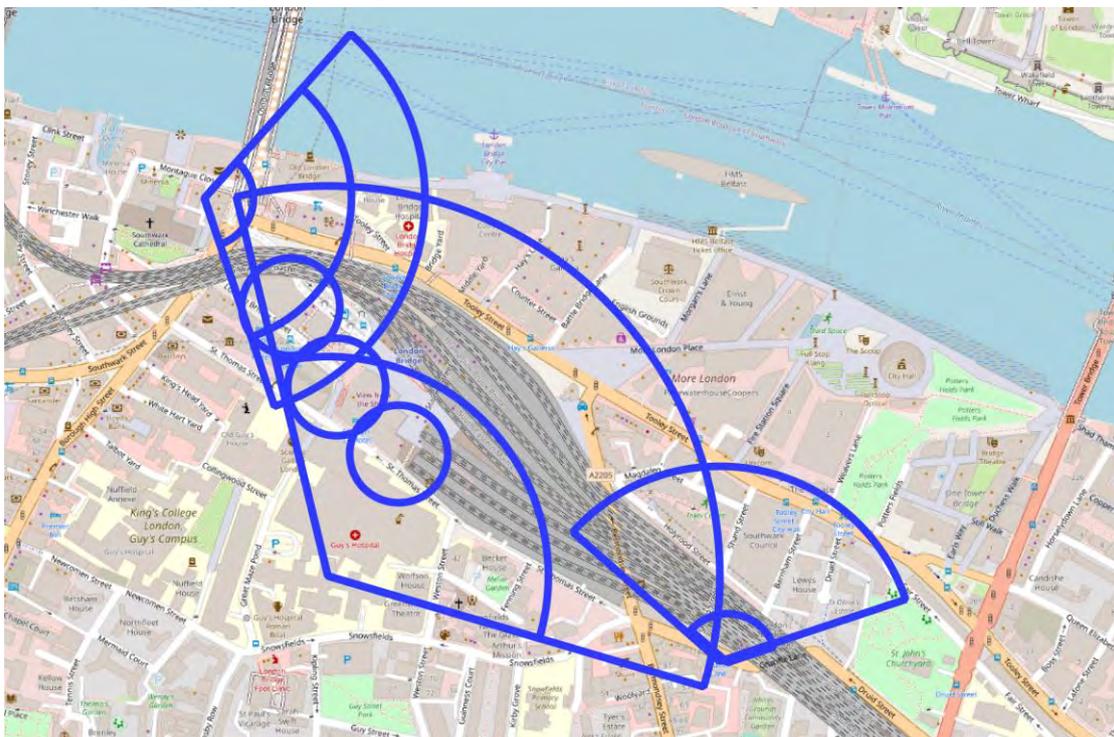


Analytics Services

5 Live Stations

This dashboard provides detailed access to the Live Stations Service. This encompasses three main screens, Live Stations (summary view on 20 stations), Individual detail view and Station Settings.

The Live stations service uses a very defined set of cellular cells as depicted in a representation below that provide coverage across the station estate.

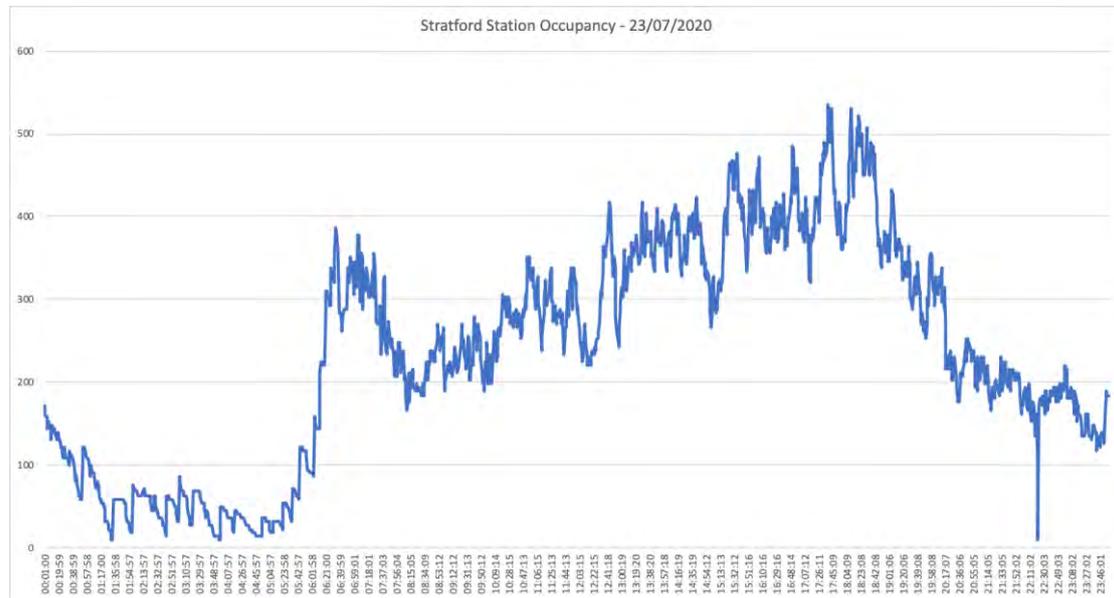


The cells have been hand selected provide as much accuracy to counting devices within the station area and minimising overflow into the surround area. In reality, the cells will cover beyond the Station and complex algorithms have been developed to remove counts for devices which are not likely to fit visitors and travelers to the station area. E.g. local residents, business adjacent etc.

Each device from the Vodafone network is then expanded to full UK population using a methodology approved by DfT to provide fully representative numbers of people at the station.

Please bear in mind that some stations incorporate large amounts of retail space and so not every person visiting has an intention to travel or has recently arrived by rail.

The profile of station counts therefore does not reflect the normal am and pm peak expectations in all cases as retail and visitors can substantially add to the counts.



Stratford Station Occupancy Profile – 23/07/2020

5.1.1 Utilising Mobile Network Data To understand Station Occupancy

A weighting process is also included so that are given a weight proportional to the coverage of the station.

A device is assumed to be within the station from the time an event is seen within a cell covering a station until an event on a cell away from the station is recorded or a timeout period reached.

A device is assumed to have left after a period of 30 minutes without events.

The count excludes people either working or living within cells covering the station. Ie regularly present within the station area

The system undertakes calculations every minute.

Privacy restrictions: should the occupancy drop below 10, the portal will return a station occupancy of 10.

5.1.2 Key Meanings

The system returns the total number of people seen within the realm of the station. This means that people are counted if they are:

- On platforms
- On trains waiting at the platform
- On the station concourse or waiting area
- In shops at the station
- In the very close vicinity of the station in some instances

5.1.3 Incoming Flow and Outgoing Flow

This shows people entering and exiting the station area. This will include people visiting the retail and may not be train related activities.

This will also include people entering the station on foot, by underground (provided they end up within cellular coverage) and those arriving by rail.

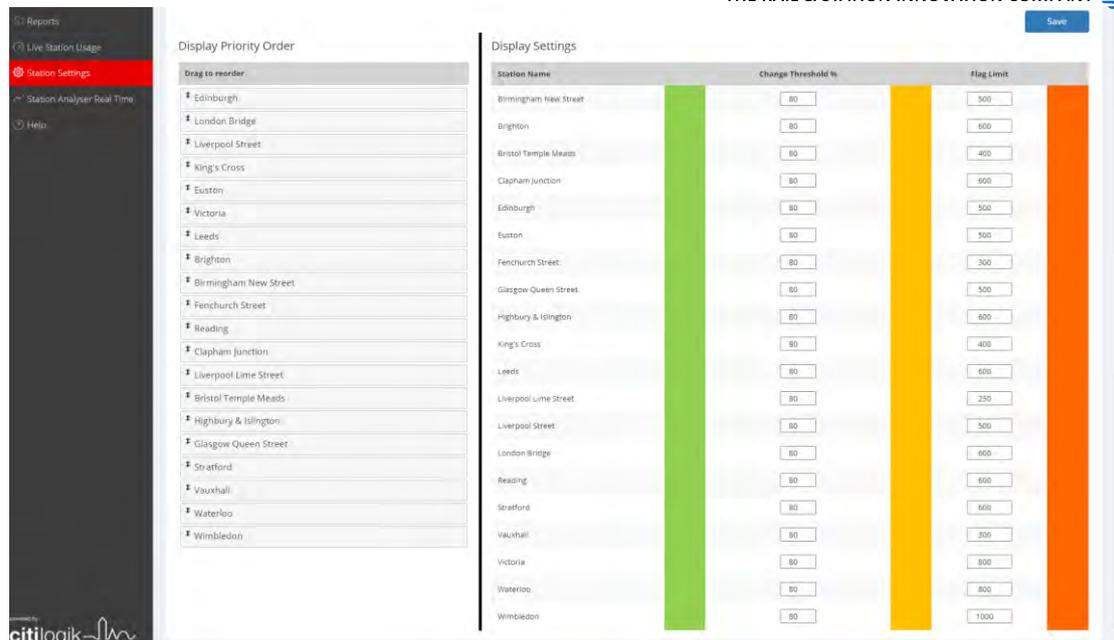
For some stations, the definition of the station can also be quite difficult as the station concourse also doubles as a shopping centre.

Please note that at some stations stopping trains will show some flow as passengers using devices whilst in the station will show up as incoming and outgoing flow.

5.2 Station Settings

5.2.1 Station Settings

This web page has two main functions; firstly, to set a station display order when Priority is selected and secondly and most importantly to set thresholds for status changes based on the number of people within the station area.



Station Name	Change Threshold %	Flag Limit
Birmingham New Street	80	300
Brighton	80	600
Bristol Temple Meads	80	400
Clapham Junction	80	600
Edinburgh	80	500
Euston	80	500
Fenchurch Street	80	300
Glasgow Queen Street	80	500
Highbury & Islington	80	600
Kings Cross	80	400
Leeds	80	600
Liverpool Lime Street	80	250
Liverpool Street	80	500
London Bridge	80	600
Reading	80	600
Stratford	80	600
Vauxhall	80	300
Victoria	80	300
Waterloo	80	800
Wimbledon	80	1000

STATION LIST	
Birmingham New Street	Liverpool Lime Street
Brighton	Liverpool Street
Bristol Temple Meads	London Bridge
Clapham Junction	London Fenchurch Street
Edinburgh Waverley	Reading
Euston	Stratford
Glasgow Queen Street	Vauxhall
Highbury and Islington	Victoria
Kings Cross	Waterloo
Leeds	Sheffield

5.2.2 Flag Limit

This is a value used to set a change of status from yellow to orange at a level when the station reaches a specific capacity. This limit number does not represent overall station capacity, merely a limit with respect to a predetermined threshold. E.g it could be calculated to a Covid working number.

The change threshold is the Percentage of the flag limit when the display changes from Green to Yellow.

5.3 Live Stations (Summary View)

5.3.1 Control Room View

This view provides a summary across 20 defined stations.

STATION LIST	
Birmingham New Street	Liverpool Lime Street
Brighton	Liverpool Street
Bristol Temple Meads	London Bridge
Clapham Junction	London Fenchurch Street
Edinburgh Waverley	Reading
Euston	Stratford
Glasgow Queen Street	Vauxhall
Highbury and Islington	Victoria
Kings Cross	Waterloo
Leeds	Sheffield

Last Updated: 29/07/2020 12:00:08 Display Order: Name Priority Busiest

Station	Live Usage Count - %	Incoming Flow (5 minutes)	Outgoing Flow (5 minutes)	5 Minutes Ago	15 Minutes Ago	30 Minutes Ago
Birmingham New Street	303 - 61%	312	310	62%	62%	58%
Brighton	621 - 104%	486	446	81%	74%	71%
Bristol Temple Meads	225 - 56%	256	238	64%	60%	80%
Clapham Junction	194 - 32%	140	194	23%	32%	38%
Edinburgh	315 - 63%	338	279	68%	56%	62%
Euston	241 - 48%	219	214	44%	43%	42%
Fenchurch Street	86 - 29%	94	86	31%	29%	33%
Glasgow Queen Street	236 - 47%	254	227	51%	45%	45%
Highbury & Islington	400 - 67%	315	284	53%	47%	53%
King's Cross	166 - 42%	163	199	41%	50%	44%

20 Station Summary View

The screen is updated every two minutes and for convenience, the last update time is displayed in the top left corner.

The display order can be sorted in one of three options; Alphabetically, by Priority (the order is set under Station Settings), or by busiest station using the % figure.

5.3.2 Heading Explained

Live Usage Count

This shows the current count of people within the station area covered by the defined Vodafone cells being used. The number is displayed together with a Percentage against the flag limit reference level set in Station Setting.

This provides a very easy to understand view on the overall station utilisation. Please remember that this does include all people, not just travellers within the station.

Historic changes

The system also show the counts for the past 5 minutes, 15 minutes and 30 minutes periods allowing an understanding of the change of growth or reduction for the station.

Incoming Flow and Outgoing Flow

This shows people entering and exiting the station area. This will include people visiting the retail and may not be train related activities.

This will also include people entering the station on foot, by underground(provided they end up within cellular coverage) and those arriving by rail.

For some stations, the definition of the station can also be quite difficult as the station concourse also doubles as a shopping centre.

Please note that at some stations stopping trains will show some flow as passengers using devices whilst in the station will show up as incoming and outgoing flow.

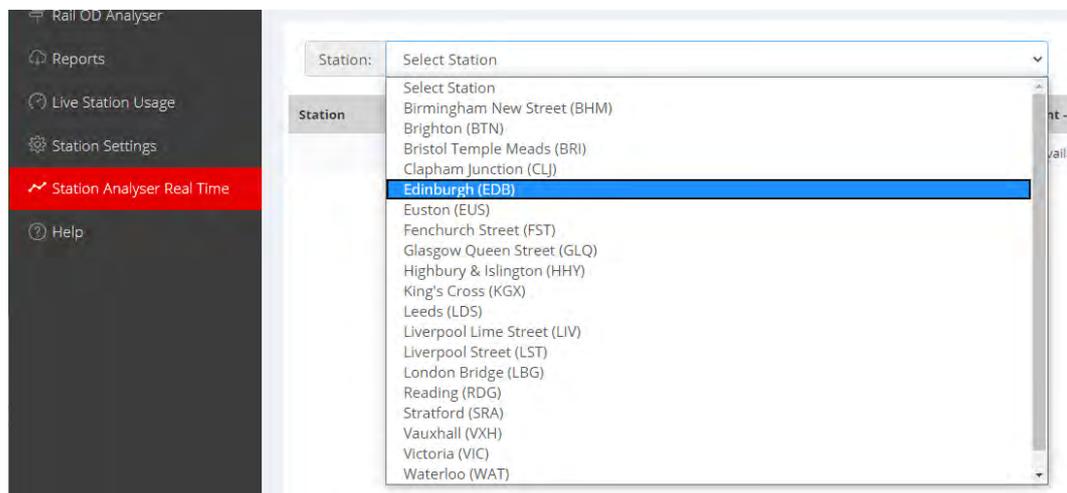
5.4 Station Analyser Live

This is the start of more detailed analytics which can take place at an individual station.



Station Analyser

The individual station is first selected using the drop down box.

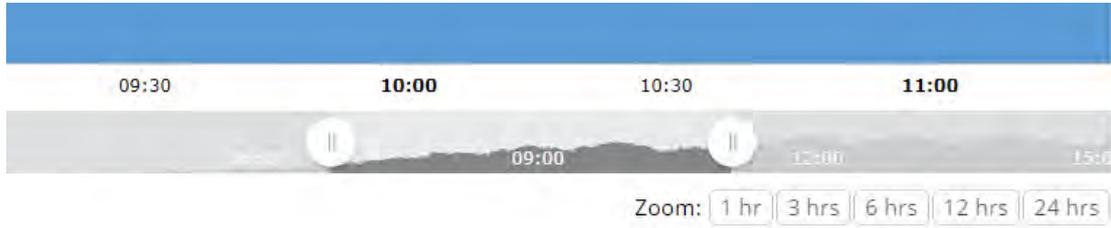


Station Selector

The web portal will then display the same Counts, and historic counts covering 5, 15, and 30 ago numbers.

A graph will be displayed covering a period of 1 hour to 24 hours. A zoom set of radio button allows the user to select the displayed window time period within the last 24 hours.

The graph can also be manipulated manually by dragging the time markers to any desired time.



Time Markers and Time Windows

The results columns for Commuting Count and Average Journey Time will be added later in the project cycle delivery.

5.4.1 Downloading the Results

For convenience and further analytics, the results returned can be downloaded in their entirety in one of 3 formats. Excel, CSV or Json and in multiple image formats.



Download Results



6 Data Privacy

To protect individuals and to ensure that the system cannot be used to identify individuals there is a minimum number of 10 which must be presented if there are a minimum of at least 1 device. If there are no Vodafone devices, then there will be no results returned.

This is a legal requirement for GDPR and Mobile Network Operators for data sharing.

The Rule – Where the count is between 1 and 10 then the GDPR and Data Privacy requirements will be applied, and the number 10 will be displayed.

6.1 Future Services

Additional analytics capability may be added to this service over time.



7 Reports

Currently there no initial reports available.



8 Support

8.1 User Guide

Please refer to the “Help” tab option on the main left-hand menu bar as this will always contain the latest user guide.

8.2 Browser Support

The system has been optimised for Chrome and Edge browsers. Low screen resolution devices and some legacy browsers may experience different presentation of the web portal.

8.3 Latest Updates

The system is updated on a regular basis with new features and presentation changes being applied. These are available next time the user logs into the system.