



improving
public transport
through technology

Ghost Buses

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Status of this document

This document is Published.

If there are any comments or feedback arising from the review or use of this document please contact us at secretariat@rtig.org.uk

1 Introduction

1.1 About this document

- 1.1.1 This document has been produced for the Real Time Information Group (RTIG). It is an extract from the document RTIGT041 Accuracy and Quality of real Time Predictions.
- 1.1.2 It provides guidance on the causes of Ghost Buses.

1.2 Background and context

- 1.2.1 In recent years, there has been an increasing focus on delivering improved public transport information to passengers. For authorities, this is seen in part, as a means of achieving broader policy objectives such as increasing modal shift away from private car use and therefore easing congestion on the roads; as well as improving the environment. For bus operators, this is seen as a key part of improving the image of the public transport offer.
- 1.2.2 The result of this focus is that most bus operators are now providing real time data for customers. Indeed, from 2021 bus operators were required under the Bus Services Act 2017 to provide location data to the Bus Open Data Service for the majority of their services. This presents a unique opportunity to ensure consistent provision of bus location data to customers.
- 1.2.3 Previous reports and specifications from RTIG have covered a wide range of topics, and a number of the reports have made passing reference to the quality and/or accuracy of real time information: in the form of predicted arrival and departure times. However, up to now, none have specifically covered the quality and accuracy of predictions.
- 1.2.4 With the near ubiquitous provision of location data for the bus fleet in the UK within reach, it is timely to consider the quality of data to ensure that the information produced is fit for purpose. The full report sets out to address this gap through advice from RTIG.
- 1.2.5 This report specifically addresses one key customer challenge - the presentation of information about a journey for which a bus then does not appear at the customer location.

1.3 Scope

- 1.3.1 This report has no statutory or other legal basis and is purely to provide advice to suppliers, authorities and bus operators who supply or use real time information systems.
- 1.3.2 All aspects of a real time system: from originating source data through to dissemination channels, are potentially impacted by this report.

1.4 Acknowledgements

- 1.4.1 RTIG is grateful to the members of its Accuracy and Quality of Prediction Working Group for contributing to the construction and validation of this document - in particular: Swiftly Inc, TfL, SYPTE, WYCA, TfGM, Trapeze, VIX, ITO World, Transport API, Passenger and r2p UK.

2 Ghost Buses

2.1 What are Ghost Buses?

- 2.1.1 A 'Ghost Bus' occurs when a service is shown as predicting on on-line and/or electronic outputs (passenger information display screens, on-line, SMS etc.) but the bus (apparently) never arrives at the stop.
- 2.1.2 These occur infrequently in most systems but can be particularly frustrating to a customer who does have some understanding of the difference between timetabled and predicted times (see the later section on presenting information to the customer).
- 2.1.3 There are many reasons for 'Ghost Buses' and the most common are discussed in this document.

2.2 Intermittently Tracked or Untracked Vehicles

- 2.2.1 Predicted or Scheduled time shown will disappear when the schedule time passes; meanwhile the bus might:
 - 1 have been cancelled physically but not electronically;
 - 2 have broken-down but has not been cancelled electronically;
 - 3 have been involved in an incident but has not been cancelled electronically;
 - 4 have been diverted from route at short notice;
 - 5 have gone off-route for longer and further than the prediction system can handle;
 - 6 become untracked and running late but will still call; or
 - 7 have faulty hardware leading to no data updates, no GPS, stuck GPS, or no electronic ticket machine feed.
- 2.2.2 In addition, the following will affect all Running Boards in the Block:
 - 8 radio / GPRS black hole gaps in coverage lead to jumps in real time passenger information;
 - 9 more than one ticket machine is signed in with the same Journey details.

2.3 Buses not assigned to journeys

- 2.3.1 For a prediction to be generated, the data sent by the ticket machine to the real time system must match some or all of the expected data required for it to be assigned to a journey:

- 10 the driver enters the wrong information into the ticket machine, so the bus is assigned to the *wrong* or *no* trip - resulting in no predictions;
- 11 poor quality logons - the driver signs on to the ticket machine too early or late or when too far away from the start point of the journey. The bus will not then be successfully assigned to a trip;
- 12 driving off-route because of a diversion due to roadworks or an incident -, causing the bus to be too far away from its expected stops along the route - resulting in predictions being removed from bus stop displays and outputs. If the bus subsequently returns to the route, a system will often identify this and start to create predictions again; or
- 13 a planned journey not operating because of the weather, or operational reasons, for example, staff absence or no vehicle available for the journey.

2.4 Cross-Journey Prediction Disjuncture

- 2.4.1 Due to a driver and/or vehicle on an incoming service scheduled to perform a follow-on journey, being unable to do so. This can be due to:
- 14 the driver of the follow-on service being unavailable due to illness or roster issues;
 - 15 vehicle failure;
 - 16 the vehicle being reallocated to another (deemed as more important) service;
 - 17 the incoming service being so late that the follow-on service overlaps with a subsequent run of that follow-on service; or
 - 18 the incoming service being so late that it is truncated early (turned back).

2.5 Customer misunderstanding

- 2.5.1 Disruption to high frequency services can lead to confusion as the prediction system cannot represent: 'bus bunching' effectively; service-run overlaps; and buses running the same service overtaking one-another (predictions on a display do not uniquely identify a bus journey - only the service).

2.6 Overdue Cleardown

- 2.6.1 'Due' left up too long after the bus has departed because of:

- 19 latency;
- 20 incorrect coordinates for a stop;
- 21 slow traffic;
- 22 incorrect/incomplete dataset for journey times/line-of-route; or
- 23 infrequent prediction update.

2.7 Congestion/statutory layover affecting predictions

- 2.7.1 Variable traffic speed can 'freeze' predictions or even drive a prediction back up; or the requirement for a service to 'layover' may also affect predictions. Either of these occurrences can cause confusion to the customer.

2.8 Service display order 'artefacts'

- 2.8.1 As displays cycle through the next 'n' services, the displayed order of departure can change due to:
 - 24 latency differences between service providers;
 - 25 physically changed order of arrival (buses overtaking one another); or
 - 26 algorithmic and programming specifications.

2.9 Faulty data sets

- 2.9.1 Incomplete and inaccurate data may also lead to misleading information being displayed. Examples include:
 - 27 configuration – the bus doesn't actually call at that stop;
 - 28 days of operation / holidays;
 - 29 diversions – often too small to be considered;
 - 30 TransXChange schema validation / missing elements;
 - 31 rejected data - speeding buses, times running backwards; and
 - 32 complex data – staff with the skills to ensure that the data is correct are not always available.

2.10 Other faults

- 2.10.1 Sometimes other schedule/prediction providers (e.g. Google) will show a service is scheduled when it's not because the data is stale (i.e. it has taken too long to get to the receiving system to be regarded as accurate).
- 2.10.2 Whilst there is no easy solution to these undoubtedly frustrating situations, it is good practice to regularly review why journeys have not been predicted: to identify where there are repeating faults or errors that can be addressed.

3 Solutions

3.1 Range of Solutions

- 3.1.1 Each of the different reasons for a journey being on customer information products and a bus (apparently) never arriving at the stop has a different cause which are described in Chapter 2.
- 3.1.2 For each cause of a ghost bus there is one or more potential solutions or mitigations possible. There is no one single solution to ghost buses and many of these will be operator and possible route or locality specific.

3.2 Vigilance

- 3.2.1 The key action key action to being able to remove or reduce a potential cause of ghost buses is vigilance, so that you:
 - 33 know that they are happening;
 - 34 can identify the cause;
 - 35 can remove or mitigate the cause;
 - 36 are able to monitor for further occurrences and reviewing the actions already taken.
- 3.2.2 Only through regular review and an attention to detail is it possible to reduce the frequency of ghost buses.