RTIG

UK Real Time Information Group

The Integration of RTI into Bus Fleet Management

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1 Introduction

1.1 About this document

1.1.1 This document has been produced for the Real Time Information Group (RTIG) by Centaur Consulting Limited (Centaur). It is one of the deliverables to be completed under RTIG Government Task 1.2: Evaluation of implementations.

1.1.2 Amongst the services that RTIG provides is a range of monitoring studies, reviews and surveys that utilise its ability to connect with a broad base of UK implementers. Within this remit, DfT has commissioned RTIG to undertake a review of how bus operators integrate their RTI systems into their fleet management processes and systems.

1.2 Document status

1.2.1 This document is a **final version**.

2 The potential benefits of integration

2.1 Introduction

2.1.1 RTI systems have frequently been installed for one purpose, usually to provide improved information to passengers about real time bus running. However there are many other potential benefits, as discussed in RTIG's note on *Quality of Service & Evaluation*, which itemises 8 "hypotheses".

2.1.2 This section refines this from an operators perspective, and outlines:

- the impact of RTI on management processes;
- how RTI systems would need to link in with other operator systems to achieve benefits.

2.2 Impact on management processes

Introduction

2.2.1 There are a variety of management processes relating to the day-to-day operation of the bus fleet which RTI systems have the potential to improve. This review covered processes for:

- the driver;
- the management of buses services in real time;
- the management of incidents in real time;
- the management of messages to the general public and other clients;
- the management of performance reports;
- the management of schedules.

2.2.2 This section summarises the areas in which it was perceived that RTI systems could, in principle, have an impact (positive or negative) on bus operations.

Driver processes

2.2.3 Real-time information systems require drivers to log on to the system. The easier this is, the more likely it is to be done, and much effort has gone into simplifying this.

2.2.4 Also, the more the driver gets out of the RTI system, the greater his incentive to log on. For example, information from the OBU can be used to perform automatic fare stage updating. This eliminates the need for drivers to mark fare stages manually.

2.2.5 Most importantly, RTI systems can give drivers schedule adherence information on their OBU (or OBU-linked ETM display). This assists the driver in maintaining a punctual service.

Management of bus services in real time

2.2.6 Bus operators manage their fleets. Some of this is driven by the bus driver: for example, drivers can call in using a radio system if they are delayed. Controllers can then advise on action to take.

2.2.7 Where RTI is available, pre-emptive management is possible. Controllers can readily monitor individual buses and call the driver under particular circumstances. As the controller may be in a better position to know of, for example, congestion conditions further along the route, this enables a more intelligent judgment to be made.

2.2.8 Communications with bus drivers could be either through existing voice radio or by sending data messages to the bus.

Management of incidents in real time

2.2.9 RTI systems assist in with the management of accidents and incident as they occur. Types of incidents include:

- buses breaking down;
- attacks on drivers;
- congestion.

2.2.10 If a bus breaks down or experiences mechanical difficulties on route then the depot can be informed, either by the driver calling in or via automated vehicle monitoring.

2.2.11 Systems can be set up so if the driver presses a panic button then an alert, identifying the location of the bus, is immediately sent to the controller. This can then be passed onto the police or supervisors who can attend the incident as quickly as possible, without the bus driver having to call in location information over the radio system in potentially dangerous circumstances.

2.2.12 If an incident occurs on the network and buses are held up in congestion, coordination with local authority partners can help buses move around the network more freely.

Messages to the general public and other clients

2.2.13 As well as timing information, messages can be posted on at-stop signs, which typically scroll underneath the RTI for bus services. In some cases this can be done only by the local authority, in some areas this can only be done by the bus operator and in some areas both can post messages on signs.

Performance reports

2.2.14 The information collated from RTI systems can be analysed to give useful information for bus operators as it can be used to assess the performance of the fleet. In some cases, data from RTI systems has been presented to head offices to inform them of the punctuality of local services.

2.2.15 Examination of separate historical RTI data could be used to capture valuable statistics such as using schedule adherence over time to create reliability statistics in line with the Traffic Commissioners criteria if they were required.

Schedule improvements

2.2.16 RTI gives a wealth of information about historical running. This can be used to assess and revise timetables, to take more accurate account of typical road conditions, delays caused by many passengers boarding at popular times, transient changes such as roadworks, etc.

2.3 Integration with other management systems

Introduction

2.3.1 RTI systems can be integrated with the different systems associated with running and maintaining bus operations. Integration has the potential to produce a number of business benefits, from refined information on customers to improvement of current practices or processes.

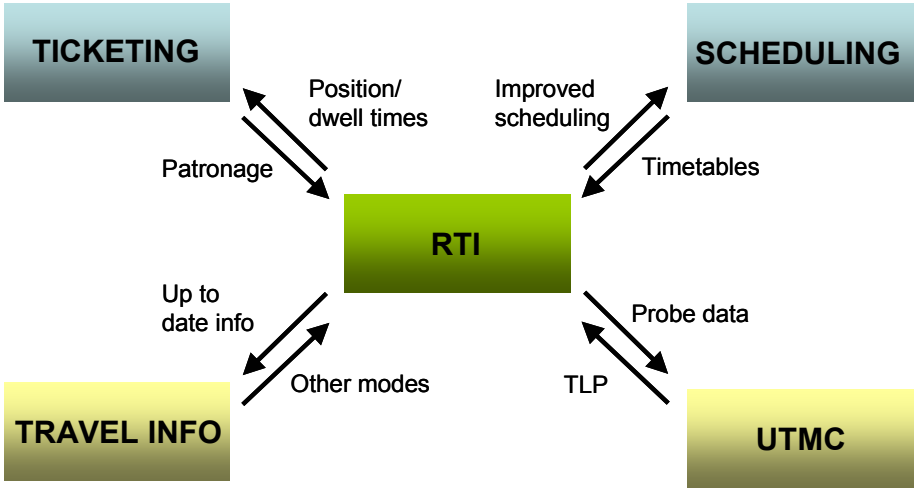

Figure 1: Integration of systems

2.3.2 Figure 1 shows some of the different systems that could be integrated with an RTI system. The two systems highlighted in blue (ticketing and scheduling systems) are generally the responsibility of the bus operator, and the two systems highlighted in yellow (travel information and UTMC) are usually managed by local authority partners.

2.3.3 Some fleet management benefits arise from the use of RTI systems in isolation. Other benefits require integration with these other systems:

- *ticketing systems*: RTI systems can give both position and dwell times at stops. This can be linked with ticketing information to give details about patronage.
- *scheduling systems*: RTI data can be used to improve scheduling and timetables, which are required as base data for most RTI systems.
- *travel systems*: RTI can be inputted into travel systems to form part of a suite of travel information for the public. Potential information about other transport could be shared with bus RTI systems to allow greater connectivity.

- *UTMC systems*: integration with UTMC systems can give traffic light priority to buses. Also location data of buses on the network can give traffic managers probe vehicles data on how well the network is operating.

Integration of RTI and ticketing systems

2.3.4 Bus location data from OBUs and ticketing data from ETMs can be used by operators to obtain useful information about the bus services. More useful information can be obtained by integrating data combined from both sources.

2.3.5 For example, integrated datasets could potentially enable bus operators to perform detailed analysis of dwell times at bus stops in relationship to tickets issued. When a large dwell time is incurred for a low patronage movement, this may indicate poor stop design or location (eg in a position where the bus finds it hard to move away from the stop).

Integration of RTI and timetabling systems

2.3.6 All RTI systems rely on the quality of underlying base data. If timetable data is incorrectly inputted then buses will not show up accurately on the system and on at-stop signs; therefore correctly entered timetabling and other base data is critical for success of any system.

2.3.7 Updates to schedules usually require off-line analysis, and are not likely to require system linkages in the reverse direction.

Integration of RTI and travel information systems

2.3.8 Real time information from buses is useful for third parties who are providing travel information services. They may distribute information through any or all of the following:

- travel information websites such as Transport Direct;
- SMS services;
- phone services such as Traveline.

Integration of RTI and UTMC systems

2.3.9 RTI systems can be linked to traffic light priority or traffic management systems. These can give buses priority through urban areas and can assist with schedule adherence during congestion. This requires a live link between the RTI system and the traffic light control system.

3 Realising the benefits

3.1 Introduction

3.1.1 Case studies examined were selected to cover projects that contain a mix of different RTI system suppliers. This was done to help capture a marketplace overview rather than to analyse implementation of a particular type of RTI system. For each case study, interviews were conducted with personnel from the operator in question, often with a local authority officer present. Full details of each case study can be found in the Annexes to this report.

City	Bus operator	Local authority/PTE	RTI system supplier
Brighton	Brighton and Hove Buses	Brighton and Hove City Council	Siemens
Edinburgh	Lothian Buses	City of Edinburgh Council	INEO
Leicester	FirstGroup	Leicester City Council	INIT
Manchester	Stagecoach	Greater Manchester PTE	Infocell

Table 1: Case studies overview

3.2 Impact on management processes

Driver processes

3.2.1 In all projects, bus operators were keen to make the log-on process as simple as possible for drivers. In many cases a single log-on point through the ETM was desired rather than having to logon to the ETM and RTI systems separately.

3.2.2 When installed, all RTI system users experienced difficulties in getting drivers to log on to the RTI system correctly. This has generally been resolved by having controllers connect drivers who have not logged on.

3.2.3 Of the four cities examined, automatic fare stage updates are used solely in Manchester. Some operators, like Brighton and Hove Buses, felt this function was of little value as they operate flat fairs across the city.

Management of bus services in real time

3.2.4 In all cases, prior to the introduction of RTI, bus operators used basic voice comms to manage fleets. On routes where RTI is now available, those procedures have been superseded with pre-emptive management.

3.2.5 The real time information systems used by the bus operators have a means of displaying the bus position against its timetabled position. Typically this is indicated by flagging buses with degrees of red for services running late or degrees of green for early running. Most systems have an option for displaying buses on a geographical map but it is the route diagrams which are most commonly used by controllers.

3.2.6 All case studies showed that the RTI system enable bus operators to manage the fleet in a more pro-active manner, by:

- inserting new buses into the corridor;

- instructing a late running bus to skip stops if a following bus is close behind;
- managing buses to maintain a even headway.

3.2.7 In the case studies examined, management instructions are given by the controller contacting drivers using voice communications, rather than data communications. This way provides for clearer instruction by the controller and acknowledgement by the driver of action required.

3.2.8 Delays are often caused by incidents out of the control of the bus operator; however instances of early running can be reduced if the driver and controller are aware of the bus's position against the timetable.

3.2.9 In some areas, the role of supervisors has also changed following the introduction of RTI as they are no longer required to track where buses on are route or departure times. For example, in Brighton, city centre supervisors have been exchanged with staff who undertake a customer facing role.

Management of incidents in real time

3.2.10 Edinburgh uses automated vehicle monitoring. If a bus breaks down or experiences mechanical difficulties on route then the depot can be informed, and the fleet can be managed in real time to accommodate these difficulties. Also the RTI system will often be able to give the controller quick information about the bus such as driver, vehicle type etc. This information is used by Lothian Buses to assist with repairs in Edinburgh.

3.2.11 In Brighton the local authority traffic manager has access to the location of buses across the city and can listen to voice calls between the controller and bus driver. Therefore if an incident occurs they can react quickly to improve traffic flows. For example, if an illegally parked car prevents buses passing, traffic officers can be alerted and the offending vehicle promptly removed.

Messages to the general public and other clients

3.2.12 Bus operators have used general messages on at-stop signs to provide passengers with (or remind them of) relevant information. Examples include general timetable changes (eg Sunday timetable running over Christmas period), security alerts or specific messages if a bus is not running on a particular route.

3.2.13 One of the bus operators approached, Brighton and Hove Buses, operates services for local schools. If the RTI system indicates that a bus is delayed on-route and will be late to commence the school run, controllers can contact the school directly and inform them of the delay and the circumstances.

Performance reports

3.2.14 In some cases, data from RTI systems has been presented to head offices to inform them of the punctuality of local services. However, the degree to which this was used varied across the four case studies.

3.2.15 Examination of separate historical RTI data could be used to capture valuable statistics such as using schedule adherence over time to create reliability statistics in line with the Traffic Commissioners criteria if they were required.

Schedule improvements

3.2.16 In all cities, RTI has been used to assess and revise timetables used by bus operators. Generally, operators are keen to take advantage of this functionality. For example, Lothian Buses runs spare RTI equipped vehicles on other routes so that their schedules can be assessed as well as those for the primary RTI equipped corridor.

3.2.17 The ease of analysing schedule adherence data depends on the functionality of the RTI system with some software packages being better designed for this function than others. Some can compile information of a number of days or routes whereas others can only present archived data for individual routes one day at a time.

3.2.18 The potential sensitivity of schedule adherence data is also treated differently by the various bus operators. Some are content to receive reports on schedule adherence to timetables from local authority partners, whereas others are more protective about allowing others to see that information.

3.3 Integration with other management systems

Integration of RTI and ticketing systems

3.3.1 Of the four case study sites there is currently little integration with ticketing systems. Reasons cited for not wishing to integrate included:

- a desire to have a separate ticketing system that will be unaffected if the RTI system faults;
- a desire to ensure that third parties (either local authority/PTE or bus operators within the RTI partnership) could not access ticketing data through the RTI system;
- a flat fare system was used across the city;
- the granularity of data was not required for analysis.

Integration of RTI and timetabling systems

3.3.2 Importing data from timetabling systems has proved problematic for most projects across the country. In most cases automated data feeds have been desired but these have not been successful because of the different ways in which timetables and their variations are described by different systems. This has resulted in many system managers relying on manual data feeds. These suffer from inefficiency and human error.

3.3.3 Two systems have been more successful at integration. Stagecoach in Manchester has developed a bespoke interface to the RTI system based on data requirement from Infocell. In Edinburgh integration with the timetabling systems was identified as a key requirement at an early stage. They selected RTI system supplier Ineo, who have previous experience of integrating with Lothian Buses' Hastus scheduling system.

Integration of RTI and travel information systems

3.3.4 The case studies show that little information is exchanged by the bus operators directly and that integration of RTI into travel information systems is usually done through local authority partners.

Integration of RTI and UTMC systems

3.3.5 In all the case studies examined in this report the installation of the RTI system has been combined with the introduction of intelligent traffic light priority system which only gives the bus priority if it is running late.

3.3.6 The degree of integration with Urban Traffic Management and Control (UTMC) varies across the case studies; however in all cases no formal data feed of RTI data has been introduced. Brighton and Hove City Council have not physically integrated RTI into their UTMC system; however local authority and bus operator partners have put in place several procedures to capitalise on the data produced by the system.

4 Conclusions

4.1 At the present moment, the level of integration of RTI into fleet management is variable.

4.2 The case studies analysed in this report show that RTI systems are being used by bus operators to improve:

- the management of buses in real-time;
- the schedule adherence of their fleet;
- responses to incidents and accidents;
- the processes used by drivers and depot managers in their jobs.

4.3 Integration with traffic management and UTMC systems has caused little difficulty from a bus operator perspective with intelligent traffic light priority commonly being used to assist late buses adhere to schedule. Integration with traveller systems has largely been carried out by local authority partners.

4.4 By contrast, there has been little integration with ticketing and timetabling systems. With ticketing systems this is mainly through lack of perceived benefit or a requirement to keep commercially sensitive data secure. In the case of timetabling systems this is because of because of technical difficulties.

4.5 Some of the RTI systems examined in this report have only recently been installed and it is likely that integration into processes and systems is at an early stage. Further sharing of best practice on how to maximise the benefits of RTI systems, over the course of the next few years, would be likely to be useful in helping achieve this.

A Brighton and Hove Buses

A.1 Introduction

A.1.1 The interview for this case study was conducted with Mike Best, Brighton and Hove Buses and Sue Westwood, Brighton and Hove City Council.

A.2 RTI systems overview

A.2.1 Over recent years Brighton and Hove Buses have deployed a real time information system with local authority partners, Brighton and Hove City Council. Rollout of the Siemens system commenced in the summer of 2001 with the fitting of 25 buses on a single route. Since then the whole fleet of 250 buses has been kitted out.

A.2.2 The funding for the system has been split between Brighton and Hove Buses and Brighton and Hove City Council, with the operator financing on-vehicle equipment and IT facilities at their headquarters and the local authority paying for at-stop signs, radio infrastructure and the main system server and their IT facilities.

A.3 Management processes

A.3.1 Prior to installation of the RTI system the controller relied on bus drivers calling in if their service was delayed. This can be difficult to do on route and drivers often didn't call in promptly. This meant it was difficult for controllers to react pro-actively when delays occurred.

A.3.2 Following the installation of the RTI system, Brighton and Hove Buses have appointed an RTI officer who is in charge of management of the system, inputting data and training personnel to use the system. In addition the RTI screen is manned between 9am and 5pm by a controller.

A.3.3 Prior to the RTI system, the role of the supervisor in the city centre was largely one of monitoring the bus services. This has changed to being entirely a customer service role as the management of buses is now performed at headquarters.

A.3.4 Two supervisors are positioned in the city centre in a car to assist with the management of services and response to emergencies. For example, if a driver presses the panic button then his location is recorded on the RTI system and therefore supervisors and police can respond appropriately.

A.3.5 The RTI system interface can display information on a geographical map and can be used to highlight areas of the city which may be experiencing difficulties (eg due to roadworks or congestion). Information can also be displayed as line diagrams of routes which included cross journey predictions and journey layover. Early and late buses are colour coded depending on the degree of deviation from the timetable.

A.3.6 The management of services which are on route is done over 2-way radio (which was in place prior to the RTI system). In addition, staff are employed to record the punctuality of services in the centre of town. Drivers report in if they are delayed and the controller adjusts services accordingly by:

- inserting new buses into routes;
- instructing drivers to miss part of their route;

- calling schools if services are delayed prior to a school run;
- informing passengers by sending text to at-stop signs.

A.3.7 Brighton and Hove services operate on city based routes. Because of this, headway maintenance is particularly important as buses typically start their trips on time as significant layover time is factored in at the end of each trip.

A.3.8 If there are significant problems on the road network and a number of services are affected, the RTI system allows the controller to manage the fleet in a coordinated manner, allowing headway on different routes to be maintained rather than to scheduled timetables. When delays occur, the RTI system also helps the bus operator to manage services around drivers' statutory breaks.

A.3.9 RTI means that if services are running late the controller can see bus positions on-screen allowing him to pre-empt problems more effectively, often before the bus drivers have had the chance to report their position into the depot.

A.3.10 The Siemens system in Brighton also allows the bus operator and local authority to display text onto the at-stop signs on street. This allows the operator to remind passengers of operational changes, such as Christmas timetables, or inform them if services are not running.

A.4 Integration

A.4.1 There is currently no integration between RTI and ETM systems. Drivers currently sign-on to ETM and RTI systems separately and information is not pooled. Having separate RTI and ETM units on-bus prevents the ETM operating incorrectly if the OBU is not functioning and therefore there are no plans to link the two pieces of equipment together. Also, as Brighton and Hove Buses operate a flat fare, automatic fare-stage updates are not important.

A.4.2 Currently timetable information is inputted into the Siemens system manually. Integration of the two systems is planned for the future, however because different ways the systems (Omnitimes and Siemens) set up variants in timetables this has proved difficult.

A.4.3 As the RTI system can only give details of services on individual days, building up a picture of schedule adherence over time can be difficult. This limits the ability of the system to be used as analysis tool. Nevertheless, timetables have been adjusted based on the information produced by the system.

A.4.4 Brighton and Hove City Council have not physically integrated RTI into their UTMC system, however local authority and bus operator partners have put in place several procedures to capitalise on the data produced by the system.

A.4.5 At the local authority office a computer screen shows the status of buses in the town centre. In addition, the voice calls between depot and drivers can be heard. This allows the local authority to respond to incidents on the network encountered by drivers. For example, if a road traffic accident has occurred UTC operators can examine this with CCTV and take appropriate measures. The council can also be alerted to illegally parked vehicles which disrupt traffic flow.

A.4.6 The UTC can also alter the phasing of traffic lights if buses are being held up at a particular junction. Priority can be given by increasing the duration of green lights. Once the buses have returned to schedule after passing through the junction, the phasing of traffic lights is returned to normal.

A.4.7 Links to public information systems are in the main managed by Brighton and Hove City Council.

A.4.8 As all the buses in the 3 depots managed by Brighton and Hove Buses are equipped with OBUs, rotation of buses does not cause any difficulties.

A.5 Other comments

A.5.1 In the future Brighton and Hove Buses would like to use a radio LAN to update OBU rather than having to physically update each bus individually when core data in revised.

B FirstGroup Leicester

B.1 Introduction

B.1.1 The interview for this case study was conducted with Steve Zanker, FirstGroup Buses Leicester. Additional information was supplied by David Wright, Leicester City Council.

B.2 RTI systems overview

B.2.1 Installation of RTI equipment on FirstGroup buses in Leicester commenced in 2000/2001 with the deployment of kit from Init on 12 vehicles. This was undertaken with local authority partners Leicester City Council who have been the driving force behind RTI deployment. Both the local authority and operator helped developed the system specification and additional functionality for the operator was recently added through an upgrade of the system.

B.2.2 Since then the system has expanded and RTI equipment is now installed on approximately 90 buses of a fleet of 105. FirstGroup in Leicester are currently looking to train a small number of staff to use the RTI system now that most of the fleet is covered. In addition, a small number of drivers will be poled to give feedback on the system.

B.2.3 The costs of deploying and maintaining RTI equipment is shared between the operator and the local authority with FirstGroup financing the purchasing of on-bus kit and on-going maintenance costs.

B.3 Management processes

B.3.1 FirstGroup in Leicester operates on regular city based routes. Because of this, headway maintenance is particularly important as buses typically start their trips on time as layover time is factored in at the end of each trip. The management of services which are on route is done over 2-way radio which was in place prior to the RTI system. Drivers are expected to report in if they are delayed and the controller adjusts services accordingly.

B.3.2 As not all buses are equipped with RTI OBU's, the RTI system is used in conjunction with drivers calling in to manage the fleet. The controller uses the RTI system to monitor bus services on a computer screen through a line based display. In addition the older system of drivers calling in is used.

B.3.3 RTI system means that if services are running late the controller can see bus positions on-screen allowing him to pre-empt problems more effectively, often before the bus drivers have the chance to report their position into the depot.

B.3.4 Actions taken by the controller when services are delayed include:

- instructing drivers to miss part of a trip if the bus is running late and a following service is close behind;
- inserting new buses into routes.

B.3.5 As the number of RTI equipped buses increases, fleet management using the RTI system is more viable. Staff are employed to record the punctuality of services in the centre of town to record the starting time of trips. The RTI system can then be used to assist with headway maintenance.

B.3.6 Drivers currently sign-on to ETM and RTI systems separately.

B.4 Integration

B.4.1 There is currently no integration between RTI and ETM or timetabling systems and local authority personnel input base data from timetables manually. Omnitimes schedules are produced by FirstGroup and are sent to Leicester City Council for inputting into the Init system. Leicester City Council are looking to automate this data feed later in the year.

B.4.2 The Init RTI system can provide details of schedule adherence and these are regularly received from Leicester City Council who manage the RTI system centrally. The RTI can also measure dwell times at stops.

B.4.3 Performance is typically measured by FirstGroup through the AIM tracker system that is installed on approximately 10% of buses. However, First Leicester is also presenting their RTI system data to central office to give a further level of detail although this is not mandatory.

B.4.4 Traffic light priority is available for buses that are running late. There is no integration of UTMC and RTI system data.

B.4.5 Links to public information systems such as the StarTrak SMS service and Transport Direct are managed by Leicester City Council.

B.4.6 There has been little rotation of buses from the depot and therefore integration with other RTI systems has not been an issue.

B.5 Other comments

B.5.1 Generally the system has been well received by drivers and functionality has been added satisfactorily where necessary. To date, man-power resources have presented more difficulties than financial input. In addition, the change in culture required to move from older styles of fleet management has also had to be considered.

C Lothian Buses

C.1 Introduction

C.1.1 The interview for this case study was conducted with Bill Johnston, Lothian Buses.

C.2 RTI systems overview

C.2.1 Phase 1 of the RTI system in Edinburgh has been procured by a partnership of Lothian Buses and City of Edinburgh Council with financial assistance from the Scottish Executive. The Phase is centred on a Quality Bus Corridor identified by the Scottish Executive and was procured from RTI system supplier Ineo. FirstGroup were also involved in developing specifications and the tendering processes and may participate in Phase 2.

C.2.2 Installation of RTI buses commenced in 2004 and 257 buses are now equipped. These are used to service a corridor requiring approximately 200 vehicles. The current fleet comprises 635 buses and is run out of three depots. A further 101 RTI equipped buses are planned. The Ineo OBUs are physically mounted on Wayfarer 3 ticketing machines.

C.3 Management processes

C.3.1 The management of bus services is done over 2-way radio which was in place prior to the RTI system. Drivers are expected to report in if they are delayed and the controller adjusts services accordingly. This system is still used on non-RTI equipped buses. If a bus broke down then the engineers would react accordingly, however this would not be pro-active.

C.3.2 At the control centre there are three manned control positions:

- Engineering: this controller handles engineering works. For RTI equipped buses, information on the status of the bus is sent back to controllers at the management centre allowing engineers to pro-actively maintain the fleet.
- Accidents: this controller deals with accidents. If the bus has RTI then the location of the accident can be readily found and details of the bus and driver are easily accessible.
- Real Time Information: the RTI controller checks the logging on of buses and the operation of buses along the RTI corridor. Information can be displayed to the controller in a number of different ways: coloured flags indicate where the bus is running early late or on-time on a geographical network or a line chart for the different routes can be displayed.

C.3.3 For the driver a uni-directional link to Wayfarer 3's has been used so that they only have to logon to the ETM as before and not separately to the RTI OBU.

C.3.4 As not all buses are equipped with RTI OBU's, the RTI system is used in conjunction with drivers calling in to manage the fleet. The controller uses the RTI system to monitor bus services on a computer screen through a route based display.

C.3.5 Actions taken by the controller when services are delayed include:

- instructing drivers to miss part of a trip if the bus is running late and a following service is close behind;
- inserting new buses into routes.

C.3.6 The RTI system means that if services are running late the controller can see bus positions on-screen allowing him to pre-empt problems more effectively, often before the bus drivers have the chance to report their position into the depot.

C.3.7 Staff are employed to record the punctuality of services in the centre of town. The RTI system can then be used to assist with headway maintenance.

C.4 Integration

C.4.1 A key provision identified by Lothian Buses prior to procuring the RTI system was the need to link to their timetabling and driver management system Hastus which was installed in 1985. Ineo were identified as having experience of this in area in other countries. A software interface between timetabling systems and the RTI system has been developed and this allows the bus operator to revise both the timetabling and RTI system core data.

C.4.2 The data on Ineo OBUs are updated via a wireless LAN at the depot. This uploads 10 days worth of data to the bus. Each night more detailed RTI data is transferred from the buses over the WLAN link, such as information on dwell times, top speeds of buses etc. This allows Lothian to compare actual running times versus timetabled data and the speed that the buses used on route. This has allowed timetables to be improved. As some spare RTI buses have been running along other corridors data from those has also been analysed in this way.

C.4.3 There is no pooling of ETM and RTI data for analysis. It was decided at an early stage during the project not to explore this to prevent the Council or other bus operators potentially having access to commercially sensitive information.

C.4.4 Traffic light priority is available for buses. These are triggered by when the bus is running late rather than through transponders in the road which give all buses priority whether they require it or not. Other interactions with UTC are managed by the local authority.

C.4.5 Links to public information systems such as RTI signs, websites and SMS services are managed by The City of Edinburgh Council.

C.4.6 In order to accommodate the rotation of buses around the three depots run by Lothian Buses additional vehicles have been equipped.

D Stagecoach Manchester

D.1 Introduction

D.1.1 The interview for this case study was conducted with John Pollock and Stuart Roughly for Stagecoach Manchester and Peter Simm and Duncan Adderley for GMPTE.

D.2 RTI systems overview

D.2.1 Stagecoach in Manchester has equipped 50 vehicles (out of a fleet of 566 buses) during Phase 1 of deployment RTI equipment. This will be increased as later phases roll-out. The buses are equipped on a busy city route (route 192). The RTI system is supplied by Infocell and ETMs are provided by ERG. The system has been supported by funding from DfT and GMPTE. In the future Stagecoach Manchester plan to take a depot based approach to rollout of RTI rather than a route based approach. Stagecoach has 6 depots in Manchester.

D.3 Management processes

D.3.1 Controllers for route 192 are located in the centre of the city at Piccadilly bus station. Before the introduction of RTI is was difficult for them to gauge the spread of buses along the 192 route and this meant that any bunching of buses could only be dealt with by re-introduction gaps at the start of any new journey from Piccadilly. The controllers have been issued with PDAs which shows the location of buses along the route and this enables them to pre-empt bunching by contacting drivers and directing them on route.

D.3.2 There is a bi-directional link between ETMs and OBUs. This allows the driver to logon directly to the RTI system through the ETM.

D.4 Integration

D.4.1 Stagecoach Manchester has Trapeze timetabling software. Originally it was planned to use TransXChange to import files from Trapeze into the RTI system however this was found to be unsatisfactory, partly because of the time taken to unpack files. Therefore Stagecoach obtained the layout of the data files required by Infocell and now automatically produces supplementary file based on Trapeze data for the RTI system. The development of this interface has been carried out by the IT team at Stagecoach which is partly based in Manchester.

D.4.2 Stagecoach has also found that the GMPTE files for RTI bus stops are inconsistent and Stagecoach have therefore written in an RTI description into the files. Stagecoach have walked each route and cleansed data appropriately. Inspectors are now responsible for maintaining and updating data files.

D.4.3 RTI data has been used to assess current timetables. The data has confirmed some thoughts regarding scheduling on certain routes, and timetables will be adjusted accordingly at a suitable time.

D.4.4 In Manchester bi-directional ETM links are in place and this potentially allows joint analysis of RTI and ETM however this is not currently taking place. The data for ETM fare stage updates has been produced for all routes so that when the planned further rollout of RTI equipment occurs the data is in place.

D.4.5 There is no direct link between the RTI systems and UTC. GMPTE are currently considering how to make use of the RTI data that the system will provide, for example whether to use buses as probe vehicles. TLP is currently available at 6 points on the route. This is triggered if the bus is late and has superceded the previously installed Sietag system that gave buses priority whether they were late or early. This is set to increase to 40 junctions over the city in the future.

D.4.6 Rotation of buses within depots has been accommodated by fitting extra buses. One of the lessons learnt from Phase 1 has been that a depot by depot approach to fitting of buses is easier to adopt for management purposes.

D.4.7 Links to public information systems such as RTI websites, SMS services and at-stop signs have been principally managed by GMPTE.

D.5 Other comments

D.5.1 The system has just been installed and partners are currently assessing the ways of maximising the potential of RTI data.