RTIG

UK Real Time Information Group

RTI-UTMC Links Case Study Review

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List of contents

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 the deliverable to be completed under RTIG Government Task 07/1.4: Case Studies RTI-UTMC Links. In the 2006 and 2007 Transport Technology Surveys, conducted by RTIG, local authorities were asked whether their real-time information systems were integrated with their traffic management systems. We now wish to probe the connections between real-time information and traffic management systems in more depth and will seek to understand what benefits have been achieved and what issues have arisen.

1.1.2 This review will draw on interviews with a number of volunteer authorities to capture the range of practices and experiences. Representatives from Local Authorities have been asked to participate who have indicated that their RTI systems and UTMC systems are integrated in the 2007 Annual Survey. Discussions were focussed on a written set of questions (recapped as Annex A) and the validated interview notes, which summarise the local practices underlying the main text, are presented as annexes B-D.

1.1.3 This Document covers:

- which aspects of each type of system might be integrated with the other
- what types of integration is occurring around the country, and the experiences of local authorities
- any trends which emerge concerning integration of RTI and UTMC systems

2 Possible links between Public Transport systems and UTMC systems

2.1 Background

2.1.1 Traffic congestion threatens the economy, environment and safety of many towns and cities and the health and quality of life of their inhabitants. Pressure on road space has heightened concerns about the environmental impact of road traffic, particularly in terms of air quality, noise and visual intrusion. Congestion

2.1.2 Local transport policy makers and practitioners have needed to support ever-wider ranges of policies, to address issues of congestion and network management including:

- giving priority to public transport and other selected vehicles;
- improving the conditions for pedestrians, the disabled, cyclists and other vulnerable road users;
- reducing the impact of traffic on air quality;
- improving safety;
- restraining traffic in sensitive areas;
- providing improved congestion and demand management.

2.1.3 Because of this complexity, the effective management of the traffic network in its entirety has not been easy to implement. Only by means of a wide-ranging and flexible approach to standardising traffic management systems could urban traffic managers make effective and efficient use of technology to deliver their full transport policy.

2.1.4 The six-year, £6M Urban Traffic Management and Control programme was initiated in 1997 to assist achieve this. The first three years of the UTMC programme was a research phase. Some 19 projects established and validated specific aspects of a new approach to the use of systems in traffic management – one based on modular systems and open standards. Some projects looked at applications (eg air quality, bus priority) or implementation issues (eg cost modelling, migration, safety). Others assessed technical issues, including communications, data standards and data security. In 2001 the 'demonstrator' phase of the programme consolidated the results of this earlier research. In this phase, four cities around the UK (Preston, Reading, Stratford-upon-Avon and York) implemented, in a pragmatic way, full-scale demonstrator projects based on the UTMC approach. These research and demonstration projects have generated a wealth of understanding of how, in practice, the UTMC goals and principles can be brought to effective fruition.

2.1.5 The UTMC Programme concluded in 2004, but the management and support of UTMC was undertaken by the UTMC Development Group (UDG) of stakeholders. The UDG is the custodian of the UTMC Document Set and responsible for its management and upkeep. It works closely with industry, and has strong links with a parallel UTMC Suppliers Forum. Since 2006, the UDG has had a corporate arm, UTMC Ltd, which undertakes the formal aspects of the UDG's work: holding intellectual property rights, holding contracts and dealing with finances.

2.1.6 UTMC facilitates the coordinated management of the transport network by acting as a framework that will enable the integration of ITS applications, 'wrapping' existing applications and providing a simple, flexible technical structure for new ones to be incorporated. UTMC has at its heart a Common Data Base (CDB) through which a number of systems can be linked via a standard database or IP protocols. This allows the different systems to communicate and share information with each other. The systems which operate through the CDB can include: VMS, CCTV, Air Quality Monitors, traffic counters, website information. Figure 1 illustrates schematically how a UTMC system might be built to integrate a number of different applications:

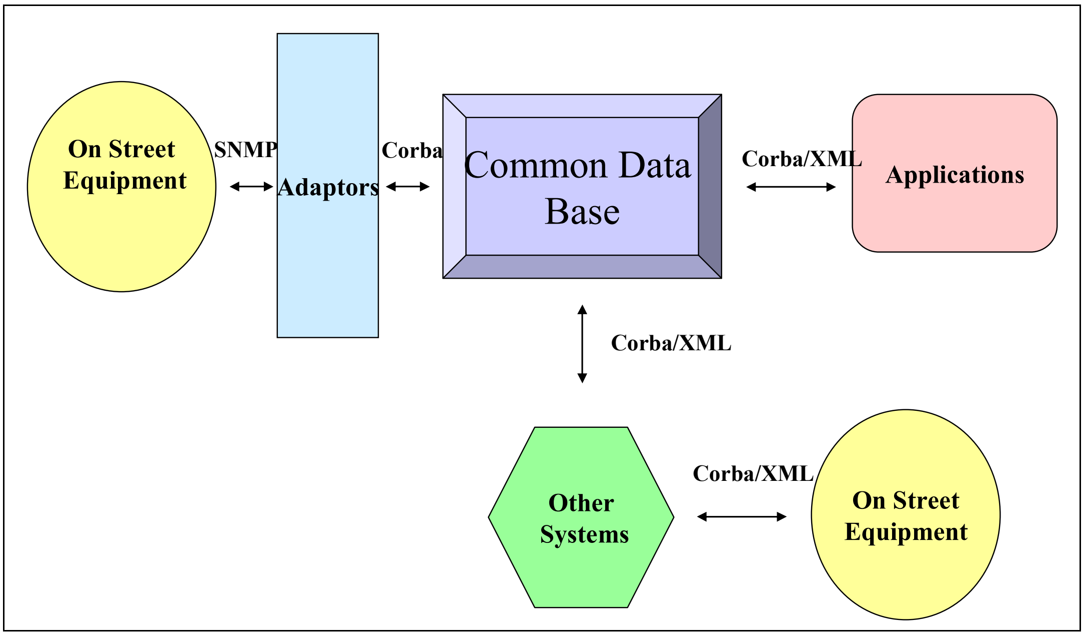

Figure 2.1: Schematic diagram of a UTMC system

2.1.7 An RTI system uses vehicle location systems to calculate the position of a bus on its route. This allows the system to predict its arrival at stops along the way. Although the systems are discrete there are a number of potential areas in which the information gathered from the one system might be useful to the other system.

2.2 Integration of Systems

Bus Priority

2.2.1 Bus priority uses (for example radio signals) to signal their arrival, triggering green lights to speed their passage through an intersection. Bus priority can be implemented with varying degrees of complexity:

- It can occur locally when the bus "talks" directly to the traffic lights and the decision is taken there whether to grant priority.

- It can be implemented such that the bus sends a signal to the traffic lights which then relay the message to a central processing unit which then can adjust other aspects of the network as a result of the decision taken by the traffic lights;

- It can be implemented such that the bus sends a signal to the traffic lights which then relay the message to a central processing unit which then itself takes the decision of whether to grant priority:

- It can be implemented such that the bus sends a signal directly to a central processing unit which then takes a decision whether to grant priority.

2.2.2 Bus priority can benefit both local transport operators and network managers:

- By allowing late buses priority though traffic lights, operators can provide a more consistent service which travellers can rely on to get them where they need to be on time

- Network managers are able to use the information received about late buses to make judgements about the state of the network such as congestion and loading. They can then make appropriate decisions for the network as a whole.

2.2.3 However, a number of complexities result in granting traffic light priority:

- Establishing which buses get priority, eg how to decide what to do if more than one bus approaches a junction requesting priority;

- Ensuring that giving bus priority at multiple junctions does not adversely affect the network as a whole.

Probe vehicles

2.2.4 Probe vehicles use their AVL systems to alert the network manager of their position along the road. These give an ambulatory picture of the state of the road network at any one time, rather than at specific points along the road network. Information gathered can be used in real time to adjust to conditions on the network or can be used historically to predict the likely behaviour on the network given certain circumstances. Advantages of exchanging this information:

- Typically UTMC systems gather network data from devices which are fixed on the road, often near junctions. Probe vehicles are able to cover a far wider area, thereby giving a wider picture to traffic managers in real time.

- There are numerous potential areas in which probes might be used to cover a wide area such as pollution monitoring, weather information.

2.2.5 Some problems which might arise include:

- accounting for the frequent stops which buses make for embarking/debarking passengers such that it is not misunderstood as congestion;

RTI Signs

2.2.6 Real time information signs could be used to display network messages as well as bus service information. Similarly, signs could be used to display emergency messages. In both instances there are operational issues which would need careful thought to ensure that the correct procedures are in place such that only authorised personnel are able to trigger these types of messages. To avoid traveller confusion, a protocol would need to be established to ensure that a clear priority was in place for each message type.

CCTV

2.2.7 Some vehicles are fitted with CCTV which is used for bus lane enforcement. If the data from these images were shared, these images could provide traffic managers with a picture of the causes of congestion on the network.

2.2.8 CCTV may also be fitted to shelters and bus terminals. Fixed CCTV can provide traffic managers with a way of viewing conditions on the network.

2.2.9 Some problems which might arise include:

- Data ownership. What are the legal ramifications of sharing the data gathered by CCTV with another department?

- CCTV control. Where CCTV is capable of Pan, Tilt and Zoom, (PTZ) who is able to control the CCTV and under what circumstances.

Prepayment Cards

2.2.10 Although prepayment cards are in use in few areas, it is possible for these proximity cards to hold other information alongside the payment information and therefore to have multiple uses. For instance, cards such as the oyster card might also hold prepayment information for car parks, or permission to access an area which is restricted to general traffic. Therefore although there is no shared data, there is shared use of the card.

2.2.11 Some advantages of using prepayment cards for multiple purposes:

- Users need only one card rather than many for multiple purposes. This may be particularly useful for the disabled travellers who may find it difficult to distinguish between multiple cards.

2.2.12 Some concerns in using prepayment cards for multiple purposes:

- Who has responsibility for management of the card?

Network Situation

2.2.13 It is similarly beneficial for a bus operator to be given information about the state of the local road network in real time. Because traffic managers have a view of the network as a whole, they can relay changes on the network to local bus operators. These can range from a car breakdown causing an obstruction to a civil contingency. If a bus operator has access to this information in real time, it allows him to adjust his services appropriately as changes occur. At present this only happens if the bus operator looks at the public website provided by the network manager.

2.2.14 In principle, information concerning the real time state of the network could be passed from the network management system directly to real time information signs allowing them to adjust the message. This would give passengers information about their service and allow them to make informed decisions about their journey. This information is not currently shared in this way.

Variable Message Signs

2.2.15 Variable Message Signs (VMS) are typically used on the road network to display messages concerning the state of the network, directions to facilities (eg car parks) and warning messages (eg expected delays or road works ahead). However, it is also possible for a VMS sign to display information concerning public transport services and facilities.

2.2.16 Some concerns in using VMS to display public transport messages

- Care must be taken to ensure that signs are not required to change their messages too frequently or rapidly to avoid confusing travellers. The length of time required for a message to remain static on a VMS sign viewed from a moving vehicle will be greater than for a RTI sign viewed by a standing individual.

Provision of Static Data (eg network maps)

2.2.17 Some information may be exchanged between a UTMC system and an RTI system which is not generated in real time. These might include:

- Network maps. These may have a greater level of detail and accuracy at a local level than the Ordnance Survey maps;
- Bus timetables.

2.2.18 Other information might come to either system from outside

- Scheduled disruptions such as road works, utilities works, and large events such as football matches come from the Highways Agency. This allows the bus operator to adjust bus timetables, frequencies and routes to respond to planned changes on the network and allows the network managers to adjust the timings of traffic lights to accommodate changes in a planned fashion.
- Unscheduled disruptions could come from a variety of sources:
    - Environment agency for floods and adverse weather
    - Police for civil contingencies and accidents

2.3 Diagrammatic representation of Possible UTMC-RTI Links

2.3.1 Below is a diagram showing the ways in which information might travel between Passenger Transport and a UTMC system. The left side shows diagrammatically the traffic management system and the right side show the passenger transport systems. Note that all those systems which are passenger transport related, but are not real time information related, appear outside the boxes. The large arrows crossing the dotted line show which information is currently shared between the two systems. Dotted arrows indicate where information might be shared.

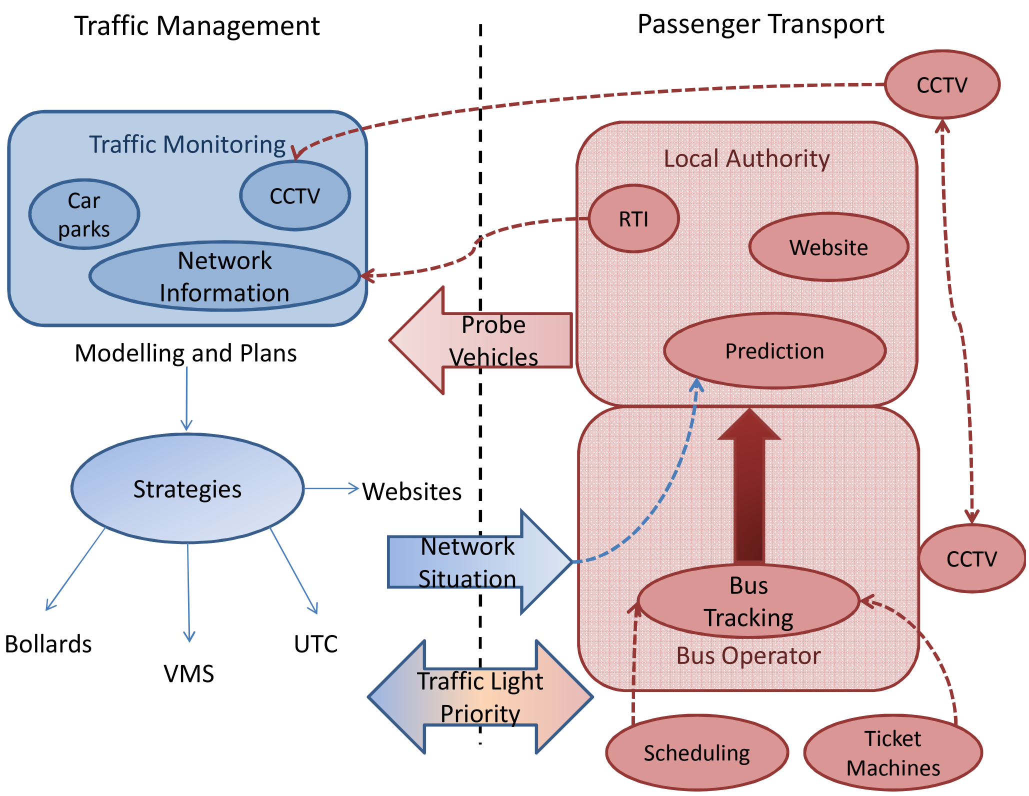

Figure 2.1: The possible information flows between passenger transport systems and UTMC systems.

3 The National Position

3.1 Introduction

3.1.1 During the autumn of each year, RTIG undertakes an Annual Survey which gives a snapshot of the current position of real time information system provision in the UK. It looks at trends over time and projects expected trends into the future. As the implementation of real time systems has matured, RTIG has also begun to look at other technologies and how their provision has been developing within the bus industry.

3.1.2 For the last four years, the Annual Survey has asked Local Authorities whether they integrate their real time information system with their UTMC system. Over the last four years, some clear trends have emerged.

3.2 How levels of integration have changed

3.2.1 In 2004, approximately 26% of those Local Authorities with real time information systems integrated them with their UTMC systems. This rose to 36% in 2005 and remained relatively stable in 2006. By 2007, the percentage of Local Authorities integrating the two systems had risen substantially to 57%. Local Authorities were also asked to project into the future whether they expected to integrate the systems. The next two years (2008 and 2009) continue to show significant increases. The graph below shows the growth in integration from 2004 to 2009.

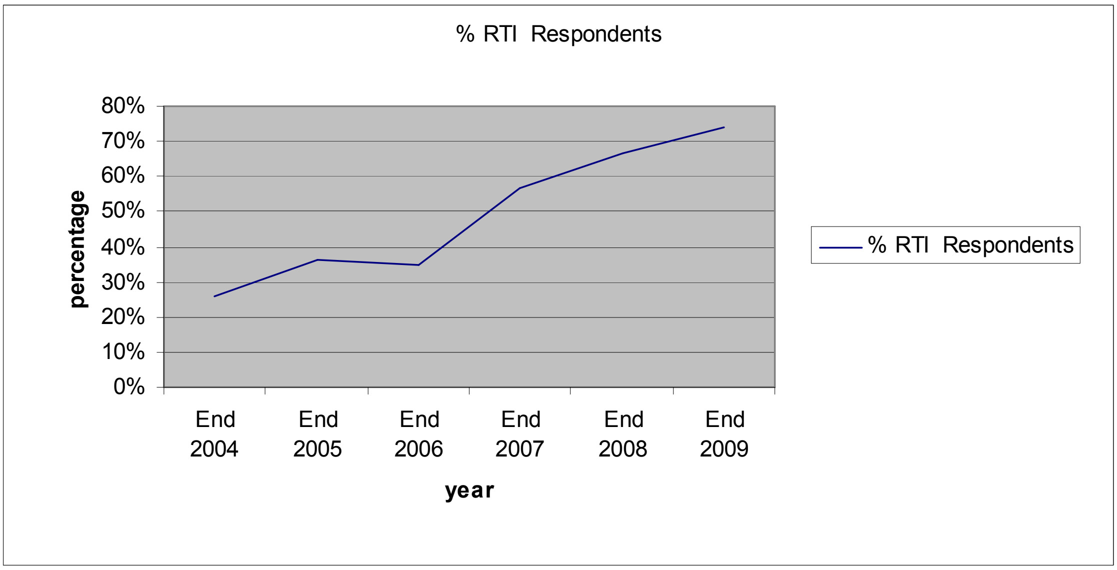

Figure 2.1: percentage of Local Authorities who integrate RTI with UTMC from 2004 to 2009

3.2.2 It would appear that the levels of integration, however, may be higher than this indicates. A number of authorities returned questionnaires in previous years indicating that they had integrated their traffic management system but did not return questionnaires in 2007. We estimate that if those questionnaires which we did not receive were added in the levels of integration of RTI systems with UTMC systems would be closer to 62%.

3.2.3 There is considerable variation among GO (Government Office) Regions. Some regions show no integration at all, while others have steadily increased since 2004. The table below shows the number of Authorities in each region who have integrated their RTI system with their UTMC system. The table also shows an adjusted 2007 column which indicates how the distributions would look if all those questionnaires which were not returned were added in.

Local Authority	End 2004	End 2005	End 2006	End 2007	Adjusted 2007
East Midlands	2	1	1	1	2
East of England	0	2	1	1	1
London	1	1	1	1	1
North East	1	1	0	0	1
North West	0	2	2	1	2
South East	3	2	3	5	5
South West	3	2	3	4	4
West Midlands	0	0	0	0	0
Yorkshire & the Humber	0	1	2	2	3
Wales	2	2	0	1	2
Scotland[1]	N/A	3	3	5	5
GB TOTAL	**11**	**17**	**16**	**21**	**26**

Table 2.1: Number of Local Authorities in each region integrating RTI with UTMC

3.2.4 There has been a steady growth in integration in the South East, the South West and Yorkshire and the Humber. Most other areas have vacillated between 1 and 2 systems within their region. A number of those who claimed to have integrated their UTMC and RTI systems in 2004 and 2005, changed their answers in later surveys, accounting for some of the apparent vacillation. These have not been included in the adjusted numbers in the table.

3.3 Reasons for Integrating

3.3.1 Respondents to both the 2006 and 2007 surveys were asked why they had decided to integrate the two systems whether the integration was already occurring or was going to take place in the future. They were given 3 options:

- Bus Priority
- Probe Vehicle
- Pressure of network congestion

[1] Scotland was not surveyed in 2004 and therefore no data is available for this year.

- Other

3.3.2 In both years, by far the most common reason for integration was bus priority. All those who responded to this question, indicated that bus priority was a reason for integration. Just over half of those who were integrating for bus priority, also indicated that they were seeking to relieve the pressures of network congestion Relatively few, approximately a quarter, of respondents in both years were using buses as probes.

3.3.3 Certainly the number of junctions with bus priority has been growing since 2006 and is projected to continue to grow into 2009. In 2006 and 2007 London had 1000 junctions with bus priority. No other region comes close to this number until 2009 when Yorkshire and the Humber will have 1100. Most regions show some growth between 2006 and 2009. Only the North West shows a significant reduction in junctions with bus priority between 2006 and 2007. This drop in the North West is certainly the result of a single large authority having switched off their system and submitting a nil return during 2007.

3.3.4 The table below shows the actual number of junctions with bus priority by region in 2006 and 2007 and the projected number of junctions with bus priority in 2008 and 2009:

Local Authority	**End 2006**	**End 2007**	**Projected End 2008**	**Projected End 2009**
East Midlands	75	24	130	300
East	48	67	97	127
London	900	1000	1000	1000
North East	15	23	23	23
North West	110	7	53	55
South East	163	213	249	271
South West	87	114	139	154
West Midlands	0	0	21	21
Yorkshire & the Humber	45	53	700	1100
Wales	143	180	180	180
Scotland	142	150	371	396
GB TOTAL	**1728**	**1831**	**2963**	**3627**

Table 2.2: Number of Junctions with Bus Priority by Region 2006 – 2009.

4 Integration Trends

4.1 Introduction

4.1.1 Integration of RTI with UTMC has been increasing in the UK over the last few years. We spoke to a number of authorities to assess what their experiences had been and what issues they had faced.

4.2 Trends

Bus Priority

4.2.1 From both the Annual Survey data and the Case Study discussion, integration seems only to be being implemented to a limited degree. Bus priority, as indicated by the Annual Survey, is the most common type of integration. Because bus priority can be implemented in a number of different ways (see discussion sections 2.2.1 to 2.2.3) it is difficult to generalise about bus priority. Priority implemented at a local level at relatively few junctions appears to be straightforward. However, priority implemented through a UTMC system seems to be rather more complicated. A number of issues surfaced in discussions with case study participants:

- Where there are multiple buses requesting priority through multiple junctions it is challenging to establish a strategy for granting priority. That is, what is the algorithm for deciding which buses are granted priority such that there is not a detrimental knock-on effect to the network as a whole?

- Because the RTI system and the UTMC system are two independent systems which can and do exist in parallel and have two different goals, it can be challenging to bring them operationally together. Those who operate an RTI system value integration for different reasons from those that operate a UTMC system:

  - RTI systems operators value bus priority because it provides consistency in bus travel times for the bus traveller.

  - UTMC systems operators value bus priority because it provides them with a greater level of control over the network as a whole.

  Although these reasons are not incompatible, the perspectives are undeniably different and it requires an act of will for the different systems operators to understand the issues of the other. This means that integration needs to happen at a human level before it can effectively happen at a technological level.

- Although guidance exists both in RTIG and UTMC for how to implement bus priority from a purely technical perspective – RTIG's *TLP and Cleardown Specification* and UTMC's *Technical Framework Specifications* – these mainly covered the technical information for physically integrating the two systems. It did not include information on how to prioritise requests from multiple buses and how to manage the data in complex systems. There was a feeling that guidance could, therefore, be extended to include operational issues. Some work was being done on this in individual systems as they were developed, but in order to ensure coherence they needed to be brought under the RTIG/UTMC umbrella.

4.2.2 The Annual survey also shows that only in a relatively few regions are significant numbers of junctions giving bus priority. Although we cannot give details of specific Local Authorities, we can note that of those that give bus priority, 9 local authorities (32%) have 10 or fewer junctions, 14 local authorities (52%) have between 10 and 50 and only 4 local authorities (14%) have greater than 50 junctions with bus priority. This may reflect the complexity of ensuring that priority at any particular junction does not have a detrimental effect on the network as a whole. Growth is expected over the next few years, but in many local authorities only by the addition of a few junctions.

Probe Vehicles

4.2.3 From the Annual Survey data, it seems clear that the use of probe vehicles is far less prevalent than bus priority measure. This was borne out by this research; only one of our Case Study respondents was introducing Probe Vehicles. In SYTPE, where probe vehicles were being developed, there were issues with the data exchange protocol. They hoped to be able to put forward the agreed protocols as a possible standard to UTMC and RTIG. However, such a standard would require the acceptance of both communities to be affective.

4.2.4 Probe vehicles are being used for a number of purposes:

- Positioning. SYPTE are trying to get to the point where they can accurately determine the position of a vehicle every 30 seconds. Then, using triangulation, they can determine the speed at which the vehicle travels along a stretch of road. This will contribute to providing accurate journey time information to the public.

- Air Quality probes.

- Weather probes.

4.2.5 Data from probe vehicles are being used historically rather than in real time to inform scheduling predictions. Thus, data gathered can be analysed to determine the likely behaviour of a bus on a given day in particular conditions. These conditions may be quite specific: for instance, how is bus likely to behave on a rainy Friday at 3 in the afternoon. SYTPE reported no difficulties with operators in sharing data since the data was not perceived as commercially sensitive.

Data

4.2.6 The integration of the two systems does not yet appear to be generating additional useful data. However, it also appears that full use is not yet made of the data which was generated by the RTI system when it stood alone.

4.2.7 No respondents used data to inform their Punctuality Improvement Partnerships.

4.2.8 Data sharing with operators is a mixed picture. SYPTE have found no difficulty in sharing data because they have an explicit Data Sharing Agreement which they have found works well. In Leicester, by contrast, the data which might be used to inform Punctuality Partnerships is seen as commercially sensitive and confidential to First.

4.2.9 The issues of data sharing are consistent with RTIG's findings in its 2006 *Case Study Report Analysis: Current Practice and Issues*:

RTI data is not widely shared. Most RTI data is owned by the operators and much of it is deemed commercially sensitive. Although it is shared with Local Authorities where data sharing agreements are in place, the data to which Local Authorities have access is limited. Some data is shared between neighbouring authorities where buses cross boundaries. Otherwise, data is not shared with other organisations.

5 Conclusions

5.1 Introduction

5.1.1 This section draws conclusions based on the trends outlined in the previous section.

5.2 Conclusions

5.2.1 Integration between RTI and UTMC is still a limited affair. Although there are a number of ways in which the UTMC system might be integrated with an RTI system, at present integration is largely limited to bus priority.

5.2.2 Although bus priority is being implemented by Local Authorities, there seems to be quite a wide spectrum in the complexity of the integration. The complexity of the integration, unsurprisingly, determines the levels of guidance and support required. Where integration occurs locally, it appears that there is sufficient guidance available. However where integration occurs through a central UTMC computer, there are a number of areas which need to develop and RTIG can play a significant role:

- understanding the perspectives between each of the communities needs to be encouraged and facilitated;
- developing specifications which overcome the operational barriers inherent in the different needs of each community;
- developing specifications which address the transfer of complex data.

5.2.3 The differing perspectives of the UTMC community and the bus community mean that they come to the issue of integration with different expectations. Although the two perspectives are not wholly incompatible, it remains an effort of will to overcome the different expectations and the different goals of the two communities.

5.2.4 There is evidence both from the Annual Survey 2007 and from this Case Study Review that bus probes are being deployed, but on a limited basis. Although there are potentially enormous benefits to be gained from the data gathered from probes, it is not clear that the systems and operations are sufficiently mature to realise the full benefit.

5.2.5 Data sharing is also a mixed picture. Some had no problem sharing data, others found that it was considered commercially sensitive and this was a bar. Where data sharing agreements were in place this provided an extant mechanism. However, it is not clear from this study what the prevailing position is across the country.

A Evaluation Questions

A: Administrative Details

A1. Name of authority ______________________________

A2. Contact name ______________________________

A3. Contact telephone number ______________________________

A4. Contact email address ______________________________

B: Integrating an RTI System and a Traffic Management system

What aspects of your RTI system are integrated with your traffic management system (eg bus priority, vehicle probes?) Do you intend to extend this to include other aspects? If so, when and what aspects?

Did you or will you roll out the real-time/traffic management link across a wide area, or only in specific places (eg only the town centres). How do you choose where to implement it?

Does your integrated real-time/traffic management cross any LA boundaries? Did you liaise with any other LAs to ensure integration across Local Authority boundaries?

Were both systems already operational when you integrated them, or did you implement one and then the other? What made you decide to integrate them?

Has the integration process been a smooth one? Did it require significant expenditure? Were suppliers able to provide what you needed? Did you have to replace kit or were you able to upgrade?

Who/what did you consult in order to integrate the two systems? Was there guidance available to help you? If so, what was it? If not, where were the gaps?

Is there any special kit, software etc. required to link your real-time system with your traffic management system? How much of a problem is it if bus operators move their buses to another part of the country?

Who manages the integrated portions of the network?

Does the integration of the two systems provide you with any additional data? Is it useful, useable and used? How could it be made more useful?

Do you use the data from the integrated systems to inform your Punctuality Improvement Partnerships (or similar)?

What were the main issues you encountered when trying to integrate your real-time system with your traffic management system?

B Leicester City Council Case Study

B.1 Introduction

B.1.1 Thanks to David Wright for completing the case study questions and for participating in a short telephone interview on Thursday 13 March 2008.

B.2 Leicester and Integration

B.2.1 Currently, Leicester has bus priority for late running buses only. There are no plans to extend this to integrate UTMC and RTI further. This covers some 24 junctions at present, but they intend to roll it out to cover all (approximately 300) junctions. They are implementing this on a corridor basis. They select corridors depending on whether the corridor is being developed in other ways at the same time such as other road improvements. The council also consults with bus operators when making this decision.

B.2.2 At present bus priority is in operation in Leicester City and in Leicester County Council areas. It is currently being started in Derby City Council area and will start in the Nottingham City area in the next year or so. Very few buses cross the boundary from Leicester into other Local Authority areas. However, although bus priority would be locally controlled, late buses which did cross the boundary would still be given priority.

B.2.3 Integrating the two systems was straightforward since the SCOOT and traffic signals had the facilities to introduce bus priority and the buses were capable of sending information to the traffic signals. For the RTI team, the main impetus for integrating the two systems was ensuring the consistency of journey times. For the travelling public, knowing that a journey will consistently take the same time is more important than small gains in time. This is why they do not see giving all buses priority at traffic lights as worthwhile. The wider congestion management gains are really network issues rather than RTI issues.

B.2.4 Expenditure was required for both systems in order to integration them. The traffic signals required only manpower to fit and wire equipment and to program the signalling. Expenditure for the RTI aspects of the integration covered both physical units which receive signals from the buses in the traffic signals and the manpower to manage the RTI database. Buses were already fitted such that they could send short-range radio signals to the traffic signal controllers as standard, so there was no need to upgrade or refit these. Because suppliers were able to supply to Leicester's requirements so there was no need to replace or upgrade any equipment, integrating was largely a matter of altering some wiring in the relay boxes and programming.

B.2.5 Leicester only consulted the system suppliers for guidance on integration. There was no problem with the integration since the RTI system provides a clean relay output for the signal controller so compatibility was easy. Leicester felt that the technical guidance for integrating the systems was straightforward and adequate. The more substantial issue is ensuring that the relevant people and the operations can be integrated.

B.2.6 Leicester is concerned with bus operators moving their buses around the country which affects the RTI kit as a whole. Since the bus priority kit is integral to the RTI kit, it is part of this much wider concern.

C South Yorkshire PTE Case Study

C.1 General

C.1.1 Thanks to Tim Rivett for completing the case study questions and for participating in a short telephone interview on 20 March 2008.

C.2 South Yorkshire and Integration

C.2.1 SYPTE initially had both an RTI system and a UTMC system. The main drivers for integration were the need to improve public transport information and bus priority.

C.2.2 Currently South Yorkshire has bus priority at traffic lights using RTIG local receivers. This has been implemented at Sheffield and Doncaster and will be implemented in Rotherham and Barnsley over the next few months. In Sheffield and Leeds, they are using implementing bus priority over PMR using a modified RTIG protocol into SCOOT.

C.2.3 SYPTE have found that where bus priority is locally implemented such that the bus "talks" directly to the traffic light and priority is granted there, this is relatively straightforward. However, this only works for very simple junctions such as crossroads, and where there are relatively few traffic lights.

C.2.4 Where the junctions become more complex, such as roundabouts, or where the frequency of buses along a corridor is high then the local solution is insufficient. If priority is granted through a UTC system, then traffic managers have some ability to see what is coming and make their decisions according to lateness of the bus and loading on the network. However, this too has limitations because it cannot easily handle more than 12 buses an hour if significant priority is required to be given as the recovery time back to the normal pattern for the signal cycle has to be considered..

C.2.5 Further complexity occurs when multiple buses attempt to access bus priority. If priority is given on a "first come" basis, then it is likely that late buses may be made even later. Further, any changes to the traffic light phasing can cause congestion to build in other portions of the network. Therefore, a bus priority system needs to have some way of addressing which buses get priority and needs to take into account any knock-on effect for the rest of the network.

C.2.6 SYPTE has so many buses trying to do so many different movements that they are struggling to do any kind of meaningful bus priority at all. Currently they have 190 triggers configured at 100 junctions and at peak times this results in 9000 bus priority requests per hour. The approach to solving this problem is to become increasingly selective about where, when and under what circumstances priority is given.

C.2.7 South Yorkshire plans to use the real time equipped vehicles as vehicle probes into UTMC using an RTIG Server 2 Server vehicle centric feed by late 2008 in Sheffield, Rotherham, Barnsley and Doncaster. Buses report their position on the network every 30 seconds regardless of where they are. That is, they do not need to be at a junction or bus stop to report their position. They can then, using triangulation methods, calculate the speed at which they were travelling along a given stretch of road. This gives traffic managers two types of information:

- They can see in real time what is happening on the road network. For instance, if a bus is going 30mph in a 60mph zone, then there is likely to be congestion or an incident.

- They also have historical data which they can use to plan for the future. For instance, they can track traffic patterns according to time of day and weather conditions so that their prediction algorithms are more exact on a day-to-day basis, and accurate journey time information can be provided to the public.

C.2.8 SYPTE have not found the use of data a problem. They have found that as long as they can sit down with bus operators and explain that what they want the data is for is limited and not commercially sensitive, it has not been a problem. SYPTE has a good Data Sharing Agreement in place with their operators. Key to this has been having a good personal relationship with the bus operators; most things can be overcome where trust has been built up.

C.2.9 The bus priority and vehicle probes are part of an Integrated Transport project which will ensure that all of South Yorkshire is covered. The integrated system will cover all four South Yorkshire Metropolitan Borough Councils.

C.2.10 SYPTE feels that they have had to develop much of the technical standards for their system through their partnership with West Yorkshire PTE. They have worked with Microsense and ACIS for the UTC and SCOOT software and with Tenet on the UTMC Common database. The data exchange protocols for vehicle probes from RTIG Server to Server into the UTMC Common database are XML based and are being developed by Cloud Amber. When the protocols are agreed, these will be offered to RTIG and the UDG as a possible industry standard.

C.2.11 RTIG has a part to play in facilitating integration in the future:

- Technical standards are needed to standardise the way in which data gets transferred between buses and UTMC systems.

- Operation standards are needed to guide implementers in how to go about integrating the RTI with UTMC.

- Case Studies are needed to explore how those that are implementing are going about it and where the successes and difficulties are. From this the benefits and business case can be derived.

- Crucial to ensuring that integration can occur is ensuring that RTIG works with the UDG to ensure that any standards which are developed are acceptable to both. A likely place for this to take place would be through the Joint Technical Group.

D Glasgow Case Study

D.1 General

D.1.1 Thanks to Hamilton Purdie for completing the case study questions and for taking the time for a telephone interview on 13 March 2008.

D.2 Integrating UTMC and RTI in Glasgow

D.2.1 Glasgow's legacy CITRAC traffic control system is over 20 years old. The system ensures the traffic signal timings at individual junctions and along traffic routes are correctly synchronised for the safe and efficient movement of pedestrians and vehicles through the City. It is intended that this be replaced by the BIAS (Bus Information and Signalling) system. In the first instance, this has been introduced in partnership with First Glasgow along 8 bus corridors in the Glasgow and West Dunbartonshire Council Areas. The diagram below shows schematically the corridors covered by BIAS:

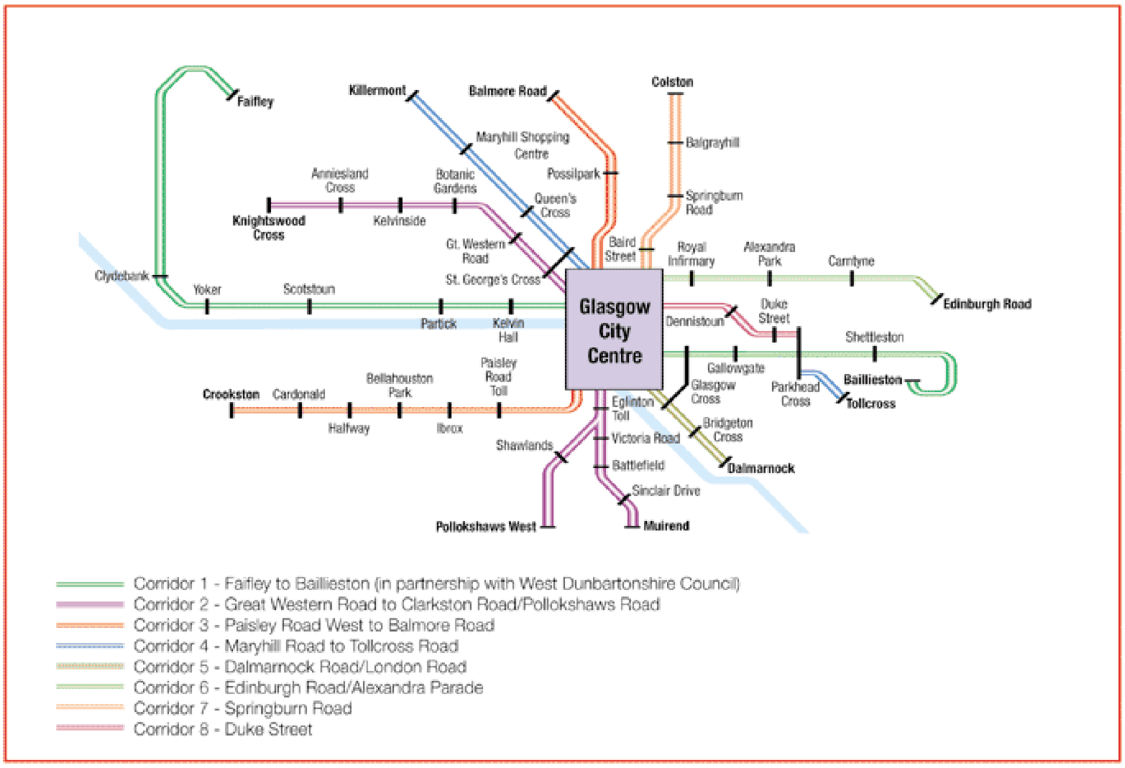

Figure D1: Diagram of the eight corridors covered by the BIAS System in partnership with First Glasgow

D.2.2 BIAS consists of two systems – BIAS UTC and BIAS AVL - which were supplied under two separate contracts, funded under the Scottish Government's Public Transport Fund. BIAS UTC is installed within the Traffic Control Centre and interfaces directly with both the BIAS AVL system and the legacy CITRAC System. The BIAS UTC system allows traffic managers to see the not only the road network conditions but also monitor the progression of the buses throughout the quality bus corridors. Fault information from both the BIAS and the CITRAC systems are passed through the Common Information Base (CIB) to a fault management system. There they can be appropriately addressed and sent to the Traffic Signal Maintenance Contractor who is also on-line to the system.

D.2.3 The BIAS AVL system uses GPS to monitor the bus fleet's positions and transmits the actual expected arrival in Real Time. Each BIAS equipped bus has an On-Board Unit (OBU) which interfaces with the ticket machines, detination board sign, digital next stop variable message sign, and a Global Positioning System (GPS) receiver. The On-Board computer can then compare the actual position of the bus with schedule adherence information which in turn allows UTMC Strategies to be invoked at the Central Data Base. In particular, by knowing where the late running buses are, the system can alter the SCOOT parameters to be altered such that priority is given at traffic signals and the system then returns to its normal condition as soon as possible. The system alerts the Operators to look at CCTV cameras at the location of the delay. Further, information concerning the actual arrival of the bus can be fed to Real Time Information signs at bus shelters, giving passengers an accurate picture of the expected arrival of their bus.

D.2.4 Glasgow began the process of integrating UTMC with RTI 7 years ago and hope to have completed the process within the next few months. It has taken longer than expected. The system currently covers the Glasgow and West Dunbartonshire areas and includes 350 traffic signals, 500 buses and 250 signs. Another 4 Local Authorities are now looking to join the BIAS system.

D.2.5 Glasgow believes that the data generated by the integration of the two systems has great potential. They are still developing this potential of taking data from the AVL RTI system and merging this with the data from the UTMC system. At present data does not inform Punctuality Improvement Partnerships as the data is perceived as commercial in confidence to First Glasgow. The partnership is investigating the potential of this as well, and it may be used in the future.

D.2.6 There have been a few problems with integrating the two systems:

- Standards: initially there was a lack of standards particularly in the Corba, but this was supplied by the AVL contractor and supplemented by the CIB contractor.

- Operational: it was challenging to get the different parties to be able to think and operate in different ways.

- Development: The greatest difficulty has been not with either the UTMC or the RTI standards which provide the necessary information, but the time required by the Contractors to develop both the hardware and software to meet the challenging requirements specified by the Clients.