Audio-accessible RTI

1 The issue

1.1 RTIG recognises the importance to the bus sector[1] of the need to support travellers with impairments. We have good, long standing relationships with key national disability charities to ensure that we are providing the best practical, technical advice to local authorities, bus operators, and the systems industry.

1.2 On-street passenger information displays sometimes include a means of providing audio information to those who have difficulty in using the visual displays. This is seen as an important part of ensuring accessibility to bus services and associated information.

1.3 In approaching this, since accessibility is about more than just public transport information, systems implementers need to be mindful how they fit into the wider, non-transport market for accessibility systems (including the development of personal devices and the rapid rollout of the Internet of Things).

1.4 This note supersedes RTIGT013-1.1 dated 31 July 2007.

1.5 ***Note***: there is an increasing need for audio-accessible information to be incorporated in a larger framework of information provision which is relevant to, and accessible by, passengers with a range of (including multiple) disabilities. These considerations are important but far-reaching, and are beyond the scope of this paper.

2 Architecture options

2.1 Getting audio information to travellers, like any other kind of RTI, involves a large number of cooperating technology systems, and there are many different technical possibilities for how this can be achieved.

2.2 In planning a system, the most significant distinction lies in where the audio signal is generated, because this fundamentally affects the nature of the service offered to the passenger. In this view, we therefore distinguish:

- Solutions where the audio comes from a public loudspeaker
- Solutions where the audio comes from a personal system

2.3 In the former case, the local authority[2] is responsible essentially for the whole of the system and service, and the passenger responsibility is simply to activate the audio. In the latter case, the passenger is taking much more functional control, and the systems required by the local authority may be considerably simpler.

2.4 There is also a large range of possible "mixed" or "hybrid" structures. For example, one could imagine fob-triggered audio at some key stops being supplemented by smartphone-accessible audio for a much wider range of stops.

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1 The phrase "bus sector" is used for convenience here, but the analysis and commentary applies equally to most if not all other public transport modes.

2 We use the term "local authority" loosely here: in practice some of this may be done through partnership with retail developers, housing providers, public transport operators, etc.

Audio from infrastructure

2.5 Systems available today typically use a "key fob" method of activation: relevant travellers are provided with a small personal device that can be used to trigger an audio announcement. This means that audio is only provided on demand and not continuously, thus limiting noise nuisance. Fobs are normally issued locally, and the audio announcement systems are designed into the RTI systems (at stop and in vehicle) which are procured locally.

2.6 By far the most popular and mature system is REACT. Originally developed by the Royal National Institute of Blind People (RNIB) many years ago, REACT is a general purpose wayfinding system, not specifically geared to transport; however it has successfully been used for travel information (including RTI) is a number of schemes around the UK.

2.7 Technical specifications for REACT are maintained by RNIB in respect of (a) the fob-receiver air interface and (b) the receiver-system link used to determine what is announced. The sole RNIB licensee for the specifications is React Technologies Ltd, and REACT units (ie the devices mounted at stop, which receive trigger messages from nearby fobs/smart devices and interact with the local RTI system) are single-source.

2.8 However it is understood that the air interface specifications have now been developed as open standards[3]. One consequence of this is the potential for fobs to be virtualised, for example as software on a smartphone, enabling a third party app developer to access REACT system functionality, and potentially bypassing the need for a stop-mounted unit.

Audio from personal device

2.9 With the advent and popularity of smartphones[4], alternative architectures become possible. A smartphone-based system can be built in many different ways, ranging from using the smartphone as merely an alternative triggering system (ie a virtual fob, as described above) or as a fully-featured travel guide with its own onboard functionality. The various system designs require very different implementations of at-stop (and to an extent even back-office) equipment.

2.10 While various different approaches have been trialled, there is currently no leading market offer for smartphone-based accessible travel solutions. Partly this is because of the relative newness of the opportunity, but partly too it is because the huge flexibility opens so many design options. For instance:

- Communication could be local (eg WiFi, Bluetooth) or wide area (ie over normal cellular comms: GPRS, 3G, LTE etc)
- User location could be open (eg based on inbuilt GPS) or contextual (based on RFID, NFC, QR codes etc)
- User interface could be based on basic tapping (and/or swiping), or could include more sophisticated elements such as voice interaction or haptics

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3 Information provided by React Technologies Ltd. We do not yet have details on the publication and maintenance of the standard, or of its use by other developers.

4 In a recent survey, RNIB has estimated that 60% of people with visual impairments have access to smart mobile technology.

2.11 The local authority role varies concomitantly. Options include:

- Doing all of the processing, and relaying an audio stream locally to the user device – effectively the same architecture as REACT but using the smartphone as a loudspeaker
- Taking into account user preferences, for example on specific bus services or message settings, perhaps through a central account-based system
- Simply making available core RTI through a data publication (eg in SIRI-SM format), and relying on one or more third parties to convert this into an accessible audio service through their own server/app architecture

3 RTIG position

Market state of the art

3.1 RTIG believes that the recent huge changes in system networking, data policy and personal technology will have major ramifications for the *mechanisms* of providing accessible bus information, for their *cost-benefit*, and for their *utility*. There is currently no clear "best approach" on the market, and there will doubtless be a period of years in which various structures are designed and trialled before any consolidation appears.

3.2 For "mainstream" RTI, there is an increasing recognition that at-stop signage, while relatively pricey to provide, is quasi-universal and fits closely the way that most passengers want basic information; conversely, web- or mobile-based services can be richer, but are much more demanding on passengers' devices, applications, comfort with IT, and willingness to engage actively. Similar considerations apply for audio services: there is no single, perfect technical solution.

3.3 However, unlike "passive" displays, audio services will very likely always require some technical participation from the user. It is generally regarded as essential to minimise the number of devices a person has to hold, and the systems they need to understand. Ideally there should be only one: this would imply the need for interoperability between personal devices from anywhere in the country with RTI announcement systems anywhere else in the country.

3.4 In terms of architectures and service offers:

- REACT is a mature product, but increasingly seen as both limited in capability and expensive to install and operate. While we understand that it is currently undergoing radical redevelopment, the newer architectures are not yet available or proven.
- App users are not currently well served for audio services. While there are many RTI apps available, and text to speech services can be used in conjunction with them, the interfaces of all the popular services are designed for text entry and list display. Further, there is very limited consideration of the additional information that disabled travellers might need.
- More futuristic solutions, including those based on various forms of augmented reality[5], are still at the research stage. Apart from their commercial unavailability, there is still a big question on the affordability of such services for the users.

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5 For instance, the Guide Dogs/Microsoft project Cities Unlocked, which focussed on a "3D soundscape".

- At a higher level of information management, solution concepts such as pervasive tagging, indoor location services, and the internet of things offer potential platforms for total transport, end-to-end journeys, mobility as a service and the smart city agenda. This area is quite slippery: some elements are likely to be practical in the relatively short term, and others are very definitely not.

3.5 Developments in disability technologies will continue to raise opportunities for system design and enhancement. For example the Wayfindr initiative[6] is increasingly gaining support for audio-based wayfinding for visually impaired people; while there is currently no direct link to stop-centric bus RTI, the ambitions of end-to-end journey guidance could well bring the two together in the short-to-medium term.

Local accessibility projects

3.6 RTIG's current position remains that projects should weigh up the benefits of existing products against the potential to roll out services much more widely or at lower cost using other solutions. Where the trade-off lies will depend on the scale of the system and on the development of technology and standards over the coming few years.

3.7 Not everyone has access to a smartphone, and among those that do, not everyone will use them in this way – whether because they find it difficult, because their device is not suitably equipped, or simply because they prefer not to. Furthermore, while the cost case looks strong, the smartphone architecture has not developed a critical mass of (mainstream, standardised) products.

3.8 Mindful of the comment just made, our current view is that local authorities, operators and information service providers should approach the provision of audio information with the following baseline assumptions:

- Strategic solutions should be focussed on personal smart technologies – certainly including smartphones, but not necessarily just smartphones. The personal technology industry is capable of creating many more specialist ways of providing information to specific groups of users than can sensibly be addressed through a single, all-purpose at-stop device.

- Nevertheless, consideration of alternatives is still required for those who do not have access to – or cannot use – smart devices, through simpler user tools such as "traditional" REACT fobs, smartcards or just button presses.

- At-stop display/audio facilities, where they are provided, should be kept quite basic, and geared to the mainstream of travellers. The evidence is increasingly strong that while people like universal at-stop facilities, they need to be kept really simple if they are to avoid creating confusion.

- Central systems need to be considered carefully, in terms of the information they collect and manage, and the various dissemination channels. The architecture, services and associated manpower is increasingly going to determine the quality of service, and the longevity of the system.

- Designing and integrating systems with open protocols, wherever possible, will by very important in this.

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6 Wayfindr is a not-for-profit body aiming to build an "open standard" for wayfinding apps. More information is available at https://www.wayfindr.net/, including the current draft version of the standard (registration is required).

- Discussions with disability groups (local and national) may be helpful for raising awareness, for quantifying the market and project benefits, and perhaps for programme phasing.

- Discussions with all kinds of technology providers – including, where available, the local community of open-data app developers – still has the potential to create new innovative concepts, and maybe even drive the future market. Larger authorities could benefit from an "RFI" model of engagement, early in the project (ie before any procurement is decided).

4 Future steps

4.1 From the position presented here, it is clear that the marketplace for accessible bus information currently has shortcomings, both in the presentation to users and in the suitability of systems for acquisition and deployment. While much of this will be resolved over time through a mixture of innovation, pilot and in-service experience, we believe that there are some steps that could be taken to facilitate this process.

- Continued research into the use in practice, and the utility, of bus information. While it may be difficult to quantify social or economic benefits, a clearer understanding of what works and what doesn't would be a major help to project design. This research must, of course, to recognise that different travellers have different needs.

- Open standardised interfaces between personal devices (or the servers supporting them) and the transport system, whether this is locally at-stop or remotely through centre-to-centre mechanisms, will be essential to ensure that audio information services are not locked into little local projects. RTIG has a clear role in developing these, building on its links with disability charities.

- Common, good-practice guidance would help local authorities understand how to connect to third parties, whether individual or professional, and would help the broader information service community (including app developers) make best use of the available information sources.

4.2 Achieving this will require a national perspective from the bus sector (and its supply chain), the disability communities and with national/local policymakers. RTIG is keen to play its part in this on behalf of the industry. Specifically we will support any national policy initiative with technical advice and guidance. We will also maintain links with relevant international standardisation activities in this area.