



South Essex Rapid Transit Major Scheme Business Case

Appendix 6B ITS Procurement

April 2010



A partnership project between Essex County Council, Southend-on-Sea Borough Council and Thurrock Council

sert ITS Integration

Technical report

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Contents

1	INTRODUCTION	1
	Project background	1
	Essex Traffic Control Centre	1
	Developing ITS for <i>sert</i>	1
	About this document	2
2	ITS AND INFORMATION REQUIREMENTS FOR <i>SERT</i>	3
	Sert specification	3
	Existing ITS technologies and approach	4
	Long term goals and key technologies	6
	Potential new technologies and their functionality	8
3	INTEGRATION CONSIDERATIONS	9
	On vehicle architecture	9
	Communications	9
	Use of staff resources and experience at ETCC	9
	Knowledge sharing	9
	Static information	10
4	CONCLUSIONS AND NEXT STEPS	11
	Integration and benefits	11
	Next steps	11

1 Introduction

Project background

- 1.1 *sert* is being actively promoted as an innovative approach to public transport delivery and one that uses transport technology in order to provide a frequent and rapid service in the South Essex area.
- 1.2 In order to deliver a modern, attractive service it is anticipated that *sert* will provide:
- Real time passenger information (at stop, interchanges and via other channels);
 - High quality ‘static’ passenger information;
 - Priority for *sert* vehicles over traffic at key junctions;
 - Passenger and driver security by means of CCTV (at stop and in vehicle);
 - Enforcement cameras to capture traffic regulation infringements;
 - Service management via a Control Centre, to ensure buses run to frequency.
- 1.3 This functionality will require an integrated network of transport technologies, traditionally known as an ‘Intelligent Transport System’ (ITS). ITS technologies are being widely used across the UK to provide bus passengers with real time information and high frequency services. In some cases this involves the integration of traffic management and bus technologies.

Essex Traffic Control Centre

- 1.4 Essex CC (ECC) already has a well established ITS, which uses the Essex Traffic Control Centre (ETCC) as its command and control hub. The ETCC, and the various associated transport technologies deployed across the County, provides ECC with key traffic management and information provision tools. This includes using a bus automatic vehicle location (AVL) system to provide real time passenger information (RTPI) to signs across the bus network, bus priority equipment for allowing late running vehicles to pass through junctions and service management functions for depots to manage their vehicles more effectively. The Centre also has access to a network of CCTV cameras both local authority and police owned.
- 1.5 Initial discussions with ECC have revealed that ITS will continue to evolve as a key traffic management and information tool and that a strategy has been developed for long term deployment plans.

Developing ITS for *sert*

- 1.6 With this in mind it was agreed that in order to save capital and maintenance costs, and to ensure that the *sert* system is fully compatible with ITS installed across the county, consideration should be given to integrating certain operational aspects with ETCC. This will essentially mean that *sert* will ‘piggyback’ on existing ITS infrastructure, communications and share similar on-board equipment specification. ECC are keen to explore the possibilities of this approach as it will allow them to continue their integrated approach to traffic management and information provision across the County.

About this document

- 1.7 This document outlines the existing ITS provision in Essex, the specific ITS requirements of *sert*, the strategic direction ECC are heading with regard to ITS and how *sert* could integrate in order to save costs.
- 1.8 This will allow the ETCC to broaden their strategic management of the network and to provide a consistent approach to passenger information across the County, including the *sert* corridors.

2 ITS and information requirements for *sert*

2.1 ITS technologies are generally used for the following:

- Traffic demand management;
- Information provision;
- Journey time monitoring;
- Car park guidance and management;
- Safety.

Sert specification

2.2 The *sert* Specification (May 2009) sets out the following ITS specific requirements:

Vehicles

- On board audio and visual information provision (next stop and bus stopping);
- Exterior information (destination and route);
- On-board static CCTV;
- Automatic Vehicle Location (AVL) via GPS for provision of real time passenger information, traffic signal priority and service management;
- Forward facing cameras for enforcement purposes.

Stops

- Standard level of information provision at all stops, including a ‘Tube’ style route map, information on other public transport services and a local area map with information;
- Real Time Passenger Information at all stops via electronic displays and RNIB Key Fobs;
- Static CCTV surveillance at all stops;
- Passenger help points at main stops.

Operations and Control Centre

- Control centre for real time tracking of *sert* vehicles and CCTV coverage;
- Static and on-vehicle CCTV enforcement;
- System to allow for high frequency service provision throughout the day.

Marketing and Information

- Branded *sert* website (<http://www.sert.org.uk>), with access to real time information.

- 2.3 The specification outlined above is an established approach to providing modern public transport management and information services. Many local authorities across the UK employ similar ITS technologies, including ECC¹.

Existing ITS technologies and approach

TRIPS (Travel Real-time Information and Priority System)

- 2.4 TRIPS is ECC's Automatic Vehicle Location (AVL) system that provides both RTPI and bus priority for late running buses. It was developed as a joint project between ECC, Southend on Sea Borough Council and Thurrock Council, with cooperation with local bus operators.

- 2.5 With regards to current AVL system scope, there are approximately:

- 456 buses equipped with AVL technology;
- 267 electronic at-stop signs;
- 9 bus operators signed up to the system;
- 15 bus depots with access to the system;
- 47 junctions with bus priority;
- 12 radio base stations.

- 2.6 The current system provides real time information, and bus management functionality, for approximately 165 bus routes in Essex.

- 2.7 TRIPS relies on drivers logging into the on-board unit in order to broadcast real time information about the vehicle they are driving. In some cases drivers will not log into the system and thus no positional information is broadcast for the bus results in no RTPI being displayed at bus stops.

- 2.8 There are plans to migrate to an AVL system that does not require a separate logging in process. The driver simply enters in the route number into the electronic ticket machine and the AVL system initiates automatically. This will improve the accuracy of the RTPI system and provide operators with a better day-to-day overview of vehicle performance and schedule adherence. It is anticipated that the procurement will begin on a new AVL/RTPI/bus priority system in 2010 for delivery in 2012, which is within the delivery timeframe from *sert*.

Communications

- 2.9 AVL systems require communications methods to exchange data and voice communications between the bus and the 'back-end' which is generally located at depot or at a control centre. Information is then sent to at-stop signs by the same method.

- 2.10 The ECC AVL system currently uses a Private Mobile Radio Band 3 (PMR3). Coverage is provided by base stations installed at the following locations:

- Braintree;

¹ 2008 Public Transport Technology Survey - Real Time Information Group/DfT

- Harlow;
- Clacton;
- Saffron Walden;
- Colchester;
- Basildon;
- Southend;
- Chelmsford;
- Lakeside (Thurrock);
- Grays;
- Maldon;
- Harwich.

- 2.11 Whilst it appears that coverage extends to the proposed *sert* routes, it is important that as many black spots as possible are resolved before delivery. Essex CC are already considering how to cover these black spots by using ‘General Packet Radio Service’ (GPRS) in areas with little or no coverage, including rural areas.
- 2.12 GPRS is a mobile data service that relies on 2G cellular communications networks methods and thus generally has a wider range. One of the benefits of GPRS is that it uses existing cellular networks and so base station infrastructure does not need to be maintained by the local authority. GPRS can cover both voice and data communications, however it can be expensive if data ‘packets’ are sent from the bus on a very frequent basis.

Data management for RTPI

- 2.13 The provision of real time passenger information requires timetable data to be input into the real time information system. This allows the system to assess where the bus currently is and compare it to where it should be according to its timetable information. If it is behind schedule, the RTI system will estimate how much it is delayed by and will provide an updated estimated time of arrival at each stop on the bus’s route.
- 2.14 Essex CC currently manually update the RTI system with timetable information provided by the scheduling systems of multiple bus operators. In some cases the timetable information has to be altered in order for it to suit the RTI system. The alternative to this time consuming process is to use the TransXChange export format, developed by the Department for Transport. This is a standardised electronic file exported by the bus operator’s scheduling system (if available) which can be loaded into an RTI system with a minimum of manual intervention. Coupled with the introduction of Electronic Bus Service Registration (EBSR), the automation of bus timetable information and its suitability for downstream users is improving.
- 2.15 Essex CC is keen for bus operators to move to TransXChange as soon as possible, in order to save time inputting data manually and to improve information accuracy. Essex CC is therefore encouraging all bus operators, both large and small, to start outputting timetable data in the TransXChange format.

Essex Traffic Control Centre (ETCC)

- 2.16 Opened in 2004, the ETCC was established to tackle congestion on Essex’s roads. As network expansion is not considered to be a sustainable approach to congestion management, the development of an integrated control centre provided ECC with an opportunity to monitor and manage the existing roads through the use of ITS technologies as well as providing information to the public.
- 2.17 ETCC provides traffic managers with a strategic view of the road network. With communications links to the Highways Agency (HA) and neighbouring local authorities, ECC can detect and quickly react to incidents that may occur on the road network. CCTV is used to monitor congestion hotspots, but automated technologies such as Automatic Number Plate Recognition (ANPR) and count detectors keep a close watch on traffic flows by measuring average journey times. If flows stray from historical trend data, warnings are given to traffic managers.
- 2.18 ETCC also has a ‘view’ of the TRIPS AVL system. A console allows them to view equipped bus progress across the network, and ‘probe’ vehicles are colour coded according to schedule adherence. If buses turn red it is a sure sign that traffic conditions have become poor and the CCTV network can be used to pinpoint the source of the problem and rectified accordingly.

COMET

- 2.19 The COMET system provides a strategic traffic management overview of the roads network for traffic managers in the ETCC. It brings together a range of on-street UTC technologies - such as count detectors and SCOOT loops - and provides a graphical view of what the current network conditions are. It is also possible to compare journey time information against historical statistics (stored in a database) to judge whether traffic flows are abnormal. Faults on the traffic management system can also be reported.

Existing traveller information provision

- 2.20 Through the use of the COMET and TRIPS it is possible for the ETCC to broadcast real time travel information to the public via a variety of channels. These include:
- At stop signs;
 - Dedicated information kiosks;
 - Dedicated website and Traffic Map (<http://www.essexcc.gov.uk/travel>);
 - Variable message signs;
 - Radio broadcast;
 - ETCC Information Desk (phone and face-to-face).

Long term goals and key technologies

- 2.21 With regard to the ‘next steps’, ECC and its partners are carefully considering the evolution of its existing ITS and real time information systems. Goals include:
- Improved quality and accuracy of real time information;
 - Providing real time information for more bus services;
 - The development of a ‘data warehouse’ for collecting and analysing data;

- Providing real time information to mobile phones and the internet;
- Increasing bus patronage

New AVL/RTPI System

- 2.22 As previously mentioned, consideration is being given to procuring a new AVL system. This will ultimately provide the backbone to the provision of RTPI and (potentially) bus priority.
- 2.23 There is a risk that the new AVL/RTPI system may not be in place by the time *sert* begins operation. It is very important that this issue is taken into consideration, as it could have an impact on potential integration. A separate *sert* system should be avoided at all costs, but the possibility of *sert* running from the existing TRIPs system should be taken into account. One of the issues surrounding this approach is that the existing system may not be able to accommodate *sert*.
- 2.24 ECC are currently investigating the possibility of procuring a new system that will be operational within the *sert* delivery timeline. It has been agreed in principle that *sert* will integrate with this new system as much as possible.

Data warehouse

- 2.25 ECC are interested in procuring a data warehouse which will collect and store real time data produced by the AVL system. This will allow both ECC and bus operators to manage punctuality more effectively by using ‘real world’ data to develop more accurate timetables and schedules. It will also allow traffic managers and transport planners to establish where bus journey times are being impeded and provide evidence for the promotion of bus priority schemes.
- 2.26 The data warehouse will also collect and store data produced by traffic management systems. This will include journey time, air quality, queue and car park data. This data can be mined to produce reports for traffic managers and planners at ECC.
- 2.27 There is scope for *sert* to use historical data collected by the data warehouse to provide operators with punctuality reports, produce more accurate timetables and establish how effectiveness of any bus priority installations.

Evolving the ECC Traffic Map

- 2.28 Essex CC’s dedicated website has recently been upgraded. The website now offers users the opportunity to view an interactive traffic map of the county. This map takes a data feed from the COMET server and publishes geo-referenced traffic information for accidents, events, incidents, road works and congestion.
- 2.29 The view is similar to the one available to traffic managers using COMET to monitor the network. The map uses journey time/traffic flow data collected by various ITS equipment to provide congestion information, for sections of the network where live information is available.
- 2.30 The map does not currently provide bus RTPI, but this functionality is on Essex CC’s wish list, and it may be more appropriate if the map is renamed to include public transport information as well.
- 2.31 Users are required to ‘zoom in’ to view congestion information, and there is no search function where users could look for information on specific towns, roads or places of interest. Highways Agency data for trunk roads and motorways is also not

displayed (this is available via the Essex Travel Portal). The map also does not provide any journey planning functionality, but again this is a future requirement of Essex CC.

- 2.32 With regard to integrating *sert* into the Traffic Map it would be beneficial if the map could show routes (perhaps with a ‘hotlinked’ zoom to the corridors) with real time bus information available straight from the map. If journey planning was to be included, it would be useful for *sert* routes to be included in any results and indicated as such (with the *sert* logo for example). Again, there could be scope to provide a consolidated map on the Essex Travel Portal that includes interactive traffic and public transport information.
- 2.33 There is also scope to include the data produced by COMET in a ‘dynamic’ journey planner that provides journey results according to real-world network conditions. The existing Essex Travel Portal (<http://www.essex.gov.uk/travel>) could potentially be a better channel to display this information, but still using the COMET mapping interface as its ‘base’.

Potential new technologies and their functionality

- 2.34 It is worth bearing in mind potentially useful technologies that *sert* could use to provide a number of operational functions and information services to the public. These are currently outside of the *sert* specification, but could be introduced at a later date.
- 2.35 These include:
- Smartcard based ticketing;
 - Mobile phone/internet-based ticketing;
 - Floating vehicle data for informing on traffic conditions;
 - Vehicle occupancy technology;
 - Environmental monitoring equipment;
 - Live on-board and at-stop CCTV;
 - On-board WiFi for internet access;
 - Dynamic journey planning;
 - Locational specific on-board advertising.
- 2.36 This list should be updated as technologies continue to come to market and the strategy for ITS in ECC is developed.

3 Integration considerations

3.1 In order to begin the process of how *sert* can be integrated with the ETCC and other ITS in ECC, the following should be considered:

- On bus vehicle architecture;
- Communications;
- The use of staff resources at ETCC;
- Knowledge sharing;
- Static information.

On vehicle architecture

3.2 On vehicle system architecture details should be provided to *sert* for the procurement of equipment for the *sert* vehicles. This will assist in specifying the *sert* vehicles at the procurement stage where as much ITS equipment will be included as possible. The purpose of this is to provide consistency across the bus fleet in ECC and to allow for, where needed, the interchange of equipment.

3.3 Examples may include:

- CCTV (cameras and recording device);
- AVL and RTPI;
- On-board computer (or integrated ticket machine);
- Communications equipment;
- On board information (audio/visual);
- Wiring looms;
- Bus priority equipment.

Communications

3.4 As previously stated ECC has a comprehensive PMR network. However, there are a number of gaps in coverage that will require filling. Work should be carried out to establish whether these gaps, if left as they are, will have an affect on *sert*'s performance - including maintaining frequency and real time management options.

Use of staff resources and experience at ETCC

3.5 As well as integrating technologies, it is worth considering using experienced staff from ETCC to monitor *sert*. Whilst integrate will no doubt requires further staff to be employed to bolster the ETCC, using an existing member who has experience with AVL and RTPI to manage a *sert* team maybe a useful approach.

Knowledge sharing

3.6 It would be useful for any operational lessons learned to be shared when specifying and planning the ITS for *sert*. This may include any technical issues that arose, resource complications and the reactions of both the public and drivers to the

system. This could help to smooth the way for the introduction of RTPI and associated technologies when *sert* is launched.

Static information

- 3.7 Consideration should also be given to static information, in particular its design and how it is produced. If there is an existing production system, it may be beneficial for this to be used for *sert*. Static information should also be consistent across ECC.

4 Conclusions and Next steps

Integration and benefits

4.1 It is evident that there are a number of areas where *sert* could integrate with ITS deployed in ECC, including the ETCC. Benefits that integration could bring include:

- cost savings;
- shared communications infrastructure;
- data accuracy;
- improved operational efficiency;
- more accurate and consistent passenger information;
- potential for expansion and enhancement as ECC ITS comes online;
- unified approach to ITS across ECC.

4.2 These benefits should be felt by both the public and ECC. The public will benefit from accurate information provision across a number of media and the availability of high frequency bus services. ECC and the ETCC will have a broader strategic overview of public transport operations in Essex and will also be able to provide the public with the most accurate information possible.

Next steps

4.3 It is important that ECC's ITS Strategy is explored further in order to understand deployment timelines for applicable technologies in the *sert* project area. This will provide a high level overview of how and when ITS can be integrated.

4.4 It has been recommended by ECC that a future stakeholder meeting is carried out to discuss some of the issues raised in this paper. These include:

- CCTV projects;
- AVL/RTPI upgrade;
- Forward facing cameras and legislation;
- Any potential new technologies for ITS and passenger information;
- *sert* business case;
- *sert* proposed routes.

4.5 From there, a more detailed view of ITS deployment can be taken. This will include understanding the implications of the proposed new AVL system, once it has been procured, and how the features could be used to provide a rapid transit services. The development of a technical feasibility study for an ETCC/*sert* unified control room could be carried out at this stage, with the addition of a high level strategy for integration. This should include communications network coverage for the AVL system.

