Opening up SCOOT® data

By Subu Kamal, Mark Crabtree (TRL Software) and Hannah Tune (TfGM)

TRL Software Limited

1 Need for project

Technology continues to advance and with it an increasing amount of data is potentially available via a multitude of sources. This includes data about the movement of people using the transport network. The uses to which the data can be put, particularly when combining sources, is only just starting to be explored.

Technology is allowing SCOOT® messages to be made available in a more usable format. The SCOOT® algorithms take data from detectors on street and turns it into a model of traffic movements. The data is used directly to optimise the signal timings for minimum delay. The SCOOT® messages exist to allow operation to be inspected and tuned to obtain maximum benefits. Before now the messages have been viewable only by the owners of the installed instances of SCOOT®. Now, TRL Software has produced a cloud hosted SCOOT® UTC which, amongst other benefits, allows the SCOOT® messages to be made available to anyone (who is granted access).

There is a wealth of data within the SCOOT®-UTC system that could be made available for other purposes. Historically, availability of this data has been limited by the at-market solutions which have been selective in what data can be presented and readily accessed. Opening up the SCOOT® messages creates a unique opportunity for Greater Manchester digital eco-system to create new innovative services.

2 TfGM background

With 2,7M inhabitants, and an area of 1,276 Km^2, Greater Manchester has more than 5,6 million journeys across the transport network each day, equating to over 2.1 billion journeys every year, 268 million of which are made by public transport modes. TfGM aim to keep the city-region moving and growing, working hard to make travel easier through a better-connected Greater Manchester. This includes encouraging sustainable transport modes. However, the high use and dependency on private motorised vehicles for journeys as short as 1km results in congested urban centres and key route networks. This contributes to the deterioration of air quality which, in turn, costs businesses in Greater Manchester £1.3 billion. Therefore, resilience and reliability are the most pressing issues of existing and future transport in GM.

The current network is liable to congestion and delays, public transport overcrowding. These delays are caused by excessive private car use compounded with constraints on the existing highway infrastructure. TfGM therefore strive to have an efficient multimodal transport network, balancing the requirements of all road users, bus, metrolink, cycle and pedestrian. When safety is included, managing the traffic signal network can be extremely difficult.

2.1 Aims for ITS and Highway efficiency:

The development of new technology, traffic management systems and ways of working help TfGM to investigate the best approach for improving the transport system for all. The work with TRL has allowed use of the open standards to extract network data more easily, which can be used for:

- Analysis of junction performance,
- Investigation into use cases around connected vehicles,
- Investigation into how we better incorporate active travel into junction operation.

The benefit to TfGM of the TRL SCOOT® UTC and its basis in open standards is that it allows TfGM to make the best use of our existing assets and data which, in turn, can be utilised to improve congestion and delay. The integration of third-party data through open standards also presents a substantial benefit and a move towards easier integration and interoperability.

Engaging with third parties who can make use of the data and improve customer information which leads to improved customer experience across journeys for all modes and we continue to work in this area to encourage utilisation of the data.

2.2 TfGM Infrastructure:

Greater Manchester currently utilises existing sensing infrastructure for transport monitoring, this being: automatic traffic counters (flow and classification), CCTV, a network of Bluetooth sensor, video analytics sensors (150 approx.), as well as third party data sources such as floating car data for example Waze for cities data, allowing us to plan operationally and strategically.

2.3 Improvements for TfGM

Having greater access to the UTC SCOOT® data enhances this already substantial network of data. Making better use of these assets will allow a more coordinated and data driven approach to how we manage the network, addressing key issues such as:

- Identification of congestion hotspots – poor junction performance and junction design – improved safety if addressed
- Improving air quality – by reducing congestion
- Encouraging sustainable transport modes through better integration with the traffic signal control system
- Looking to the future and opportunities for connected vehicle – through investigation and trial of GLOSA

3 TRL Software UTC, Powered by SCOOT® 7

3.1 Why open up the data?

Traffic control and network management is a data driven process. In adopting an open data approach the benefits expected are bidirectional, with not only the authority enabling access to data previously kept behind a walled garden, but creating the opportunity to receive new and novel data which in turn has the potential to benefit the operational and strategic direction of network and urban management.

TRL Software Limited have been developing a UTC system that includes SCOOT® 7.0, known as the TRL Software UTC Powered by SCOOT® 7. The wealth of data that is produced by SCOOT® and the UTC hitherto has not always been easily available. A unique feature of TRL's SCOOT® UTC will be that any of the data it produces can be made available either offline or in real time (as SCOOT® runs).

Opening up the data creates a social contract through a sharing economy of data exchange; this would reduce reliance on third party data aggregation services which can be prohibitively expensive, in addition to reducing the provision of on street physical detection infrastructure. Where these are direct costs which can be reduced, immediate savings can be realised as a prelude to gained value.

Transport technology industry has not significantly changed in terms of end user value. One of the key reasons for this is access to data previously kept behind a walled garden. TRL strongly believe that if *you want to disrupt an industry that has not changed, we should liberate the data*.

3.2 What the SCOOT® UTC offers

Designed and developed by teams highly experienced in working with the SCOOT® kernel and algorithms, TRL's SCOOT® UTC brings accessibility to all local authorities.

TRL inherently works to values and objectives designed to enhance the daily lives of road users and is committed to reducing total cost of ownership of the SCOOT® UTC. TRL are also involved in key aspects of future mobility in order to make the best use of new and emerging technological solutions to future transport issues.

The key objectives of TRL's SCOOT® UTC are:

- Technology agnostic - works with any signal controller and Outstation Transmission Units (OTU) from any signal controller manufacturer using standard UG405 protocols. Also compatible with any cloud service provider in any user selected regions.
- Makes use of SCOOT® version 7 which includes:
    - Manual triggering of gating.
    - Generalised recovery from LRT or bus priority activity;
    - Multiple split optimisation which improves the accuracy of the model and timings.
    - Green man period optimised to number of pedestrians;

    - Modelling link departures to help with optimisation in general, loop failure logic and to reduce detection requirements;
    - Cooperative signals data to provide road users with information that can help with their journey.
- SaaS:
    - subscription based;
    - no hardware dependencies;
    - vertical and horizontal scalability depending on user needs;
    - automatic updates for subscribers.
- Usability – completely browser based with modern user interface and functionality to make setting up and maintenance as easy as possible. Also available on mobile devices and through API's.

Development of the UTC is continuous, and many exciting developments are planned in addition to the features and functionality that are already present. This includes strategy management, interfacing with common databases and full cloud-based interfacing.

3.3 How it solves the problem.

Before now SCOOT® messages and data could be observed in real time by various means. However, the information was only visible through displaying the contents of the messages on screen and through ASTRID. TRL's SCOOT® UTC makes the data available in JSON format via APIs. This allows the data to be 'consumed' in a way that makes its use in external applications possible. This isn't to say the data is available to just anyone, users of the data would have to be granted access. But it allows the data to be used in a completely free and practical way.

The information is accessed via a standard developer portal provided by the host. The portal is designed to give access to the data contained in the SCOOT® messages to software developers. This allows the information to be used in whatever way the consumer of the data requires, including real time use as well as gathering historical information.

4 Implementing the SCOOT® UTC in Manchester

As part of DfT's funding competition 'Making better use of local authority transport data' Transport for Greater Manchester (TfGM) working with TRL Software has:

- Deployed TRL's 'Urban Traffic Control (UTC), powered by SCOOT® 7 at a network of signal-controlled junctions in Greater Manchester.
- Engaged with the Greater Manchester data community to better understand their needs, opening up data to a more user driven approach.
- Provided previously inaccessible or high cost SCOOT® UTC data via the TRL open data platform.

For the project that TRL has conducted with TfGM, the SCOOT® UTC was implemented on the A665 through Radcliffe to the north of Manchester City centre. This included six junctions and two pedestrian crossings. The network has operated in a remarkably trouble-free manner for several months including more recently when traffic volumes have begun to reach their pre-pandemic levels once more. TfGM were quickly assured about the ability of

the SCOOT® UTC to work to their satisfaction, including the notification of faults. See Figure 1.

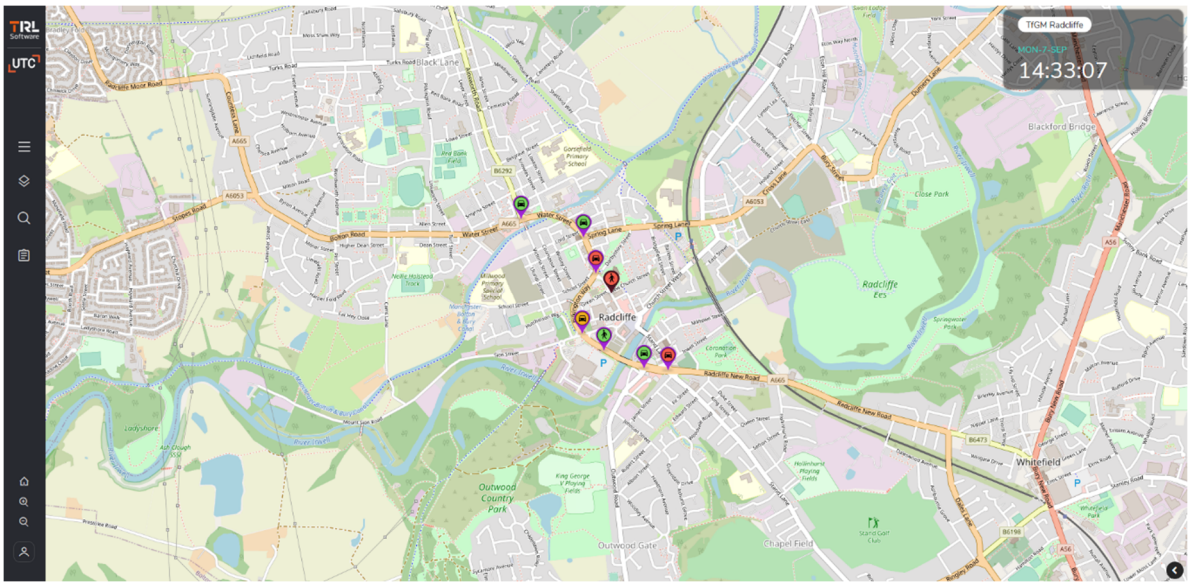

Figure 1: Radcliffe network as controlled by TRL's SCOOT® UTC

Initially the SCOOT® data made available in the project was limited to historical information. This was further limited to specific important SCOOT® messages to provide focussed information for interested parties to consider. Selected users were granted access to the data. All the data for the selected messages has been placed in the UTC database and made available to approved users. Potential uses for the data are for research, and to allow road use patterns to be investigated for example.

Live messages available via APIs, including the GLOSA-enabling X41 message have now been made available. The availability of the data allows possibilities around:

- enhanced information being made available to travellers,
- combining with other data sources to enhance the uses to which it can be put,
- Information that estimates when the signals will change, with tolerances (GLOSA).
- Informing drivers of the state of traffic signals to help them modify their approach to suit, which can lead to fuel consumption, emission and safety benefits;
- Strategy development from operational data that can lead to better incident mitigation
- Journey time and congestion information can help commercial partners such as WAZE.
- Enhanced fault management through third party applications having access to system data.

These are just some of the possibilities and app developers are at the beginning of their journey.

Continued project work streams are:

- Exploration of the application of C -ITS messages that can utilise the SCOOT® messages that are easily accessible, based on the open infrastructure within TRL's SCOOT® UTC.

- Continued investigation into the use case for data with academic partners University of Manchester and the Alan Turing Institute.

5 Conclusions

- The need for open data has been identified and the TRL SCOOT® UTC has been developed to open up SCOOT® data.
- TRL and TfGM embarked on a project to demonstrate the openness of the data, implementing the SCOOT® UTC on a selected part of the TfGM highway network. The implementation was on the A665 in Radcliffe, north of the city centre.
- The SCOOT® UTC has been successfully running for several months, including recently with traffic flows reaching their pre-pandemic levels once more.
- Historic SCOOT® data has been available to approved users, dating back to the implementation of the SCOOT® UTC.
- Live data has been made available more recently and the X41 data has been on particular interest.