**Paper    Dublin City Councils Traffic and Incident Management Centre Systems and Applications Upgrade**

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## Abstract:

Coordinating and managing the dynamic flow of people and goods in an urban environment requires access to real time information regarding the current state of the transport network and the ability to process and disseminate this information to multiple network users who use a variety of transport modes while continuously keeping the information relevant and up to date. The growing demands being placed on saturated urban infrastructures, coupled with physical and fiscal constraints that limit the options to increase the network capacity require road authorities to ensure that they have an integrated traffic management system which allows them receive and process data and reach high volumes of people through mixed media streams as efficiently as possible. A traffic control and incident management centre provides a single purpose built location to integrate the traffic management core systems to support safe and efficient management of urban transportation requirements for a cities citizen.

## Introduction:

Dublin City Council is the largest local authority in the Republic of Ireland founded in 1840 with a city area of 114 sq km and a city population of 528,000 approximately. It is one of four local authorities in the Dublin region with a combined population of over 1.27 million people. The city council is the roads authority for the city region with the Environment and Transportation Department responsible for all aspects of traffic management, road maintenance construction, public lighting etc. As the largest local authority with the highest population density Dublin City Council is committed to sustainable transport while ensuring the wellbeing of the city, its citizens and the large number of people who access the city for mixed use.

With its strategic position at the core of the region and country's economic engine room, management of the transportation network under its own local authority's remit, together with the coordination of the Greater Dublin Areas transport network, public transport service providers, neighbouring local authorities and the National Transport Authority is pivotal to sustaining a smarter cities policy.

As well as managing our own adaptive traffic management system and extensive CCTV network we also deploy and manage SCATS and CCTV in two other local authorities in the Dublin Region and in

other counties across Ireland. These deployments are managed within our own infrastructure utilising a wide range of communication techniques of which we manage with our service providers and on our own private fibre network. Dublin City Council also hosts the nationwide Real Time Passenger Information service covering all bus, tram and train services in Ireland from its dedicated traffic data centre for Dublin City and the nationwide rollout of RTPI.

As part of Dublin City Councils commitment to support sustainable transport, smarter city policies and our involvement with projects such as the INSIGHT and TAMS ( Traffic Asset Management) the decision to invest in the redesign and refurbishment of a dedicated purpose built Traffic and Incident Management Centre was taken. Phase 1, the redesign and refurbishment was completed and commissioned in June 2013. It incorporates a dedicated traffic control operations centre together with a local incident room with an external incident room and off site incident room to coordinate and manage major incidents in the Greater Dublin Area.

## Traffic Management Centre Operations

The traffic management centre operates 24*7* 365 days a year dedicated to supporting the management of the road network as well as supporting all other departments in the local authority with its out of hours support service receiving and logging incidents on the CRM and supporting the nationwide RTPI service for public transport providers.



Figure 1

It hosts Irelands only dedicated traffic radio program "Live Drive" on Dublin City fm which is broadcast live from the centre week days between 07:00am – 10:00am and 04:00pm – 07:00pm.

During the peak AM and PM periods AA Road Watch are present and they use the CCTV camera network along with our operations team to provide the AA website and national radio stations with the most up to date traffic reports for national news bulletins.

Dublin City Council twitter account tweets regular traffic updates and incidents as they occur.

During peak times and throughout the management of major events in the city the control centre also provide facilities for An Garda Siochana Traffic Corp and public transport providers to access the centre and systems to assist their agencies by coordinating operations from the control centre. Access to our CCTV network is also provided to Dublin Bus operations and control centre, Dublin Fire Brigade and An Garda Siochana control and command centre, the Motorways control centre, the National Transport Authority, Tram operators and other local authorities over our private fibre network.

A local incident management room was included in the new design together with an external incident room which has access to the CCTV and core applications to allow the control centre manage and coordinate major incidents where the relevant stakeholders can organise and coordinate their agencies within a strategic framework. The upgrade of the CCTV, AV systems and the communications infrastructure has expanded the network access to the CCTV enabling more diverse access and management techniques to be employed to manage major events such as adverse weather conditions, state visits or major incidents as and when they occur. The inclusion of a HDMI matrix to allow other stakeholders involved in the coordination of operations display onto the monitors with their own laptops without any networking issues offers added versatility.

## Intelligent Transportation Systems Used

The following is a list of some the core ITS systems used during the day to day operations in the traffic management centre. These are used to actively manage the transport network promoting sustainable transport, actively biasing the transport network in favour of public transport and interaction with contracted support services to maintain our infrastructure.

- SCATS (Sydney Coordinated Adaptive Traffic System) > 750 sites
- FMS (Fault Management System)
- CCTV Network >250 cameras
- RTPI (Real Time Passenger Information)
- DPTIM (Dublin Public Transport Interface Module)

- HGV Permit System
- PGMS (Parking Guidance Management System)
- Trips

### Sydney Coordinated Adaptive Traffic System

Dublin City Council uses SCATS the adaptive traffic management system to coordinate and manage the city's traffic. SCATS primarily manages the dynamic timing of signal phases at traffic intersections. The system uses sensors at each traffic intersection to detect vehicle presence in each lane and pedestrian demands. The vehicle sensors are inductive loops installed beneath the road surface. The team of traffic control operators monitor site alarms, increase/decrease split plans to aid traffic flow and are supported by a team of ITS and Traffic Officers who help maintain and monitor system performance.

### Fault Management System

The fault management system is a web based service containing libraries of the traffic assets which are deployed across the city and in other local authorities which are supported by the traffic control centre. This system is used as an asset management tool to collect information on assets, log faults automatically and manually, manage the fault flow process, schedule work orders and record and report on asset performance. The Dublin City Council FMS is connected to all ITS systems to automatically raise faults on our systems as they occur using a dedicated ITS port with an SNMP trap in IP devices on the network.

### CCTV Network

There are over 270 CCTV cameras deployed in the Dublin region managed by Dublin City Council on its own dedicated fibre network. These are an essential part of the traffic management strategy and as part of the control centre redesign resilience was introduced and capacity added to future proof the system. A single CCTV matrix output displayed on a video monitor bank was replaced by LCD screens capable of accepting CCTV outputs from a Series 3 Matrix, decoding Indigo Vision CCTV over IP streams, in addition to multiple inputs from traffic management systems. Two matrices are used one analogue series III and one digital indigo vision stream. This allows options to display a mix of analogue and digital streams on the video wall or if one system fails it offers backup for system resilience. CCTV is also available over the network to individual users through Indigo Vision to enable out of hours support and monitoring and enable access for other departments. An example of this is its use by our colleagues in the drainage department who access the CCTV to assist in water level monitoring levels during periods of potential flooding.

**Real Time Passenger Information**

The RTPI deployment is managed by DCC and the system is hosted in our dedicated data centre. There are 583 street displays covering eight counties all supported by Dublin City Council. The nationwide rollout of street displays is an ongoing project which Dublin City Council are partnered with the public transport providers and the National Transport Authority to manage the process.

**Dublin Public Transport Interface Module**

Dublin Bus provides Dublin City Council with real time data feeds from their AVL systems via the SIRI interface protocol and Bus Eireann via the VDV standard interface. The DPTIM application provides public transport traffic signal priority via a mixture of different data feeds and detector configurations from a variety of interfaces from the two bus providers.

In addition to this, road side units that provide an interface from the Bus AVL system to the local controller are also available. These systems normally interface to the local controller; however it is also feasible for the serial/Ethernet interfaces to be made available at a central location.

Road side units interfacing to SCATS traffic controllers are currently used for tram priority with the main logic and processing taking place in the local traffic controller. It is also required as part of this project ,to provide centralised processing and interfacing for tram priority.

SCATS centrally sets the priority levels which can be granted at each junction and these priority level changes by time of day as requested.

**HGV Permit System**

The Dublin Port Tunnel opened on 20 December 2006 providing direct access between Dublin Port and the national road network for Heavy Goods Vehicles (HGVs). Dublin City Council introduced the HGV Management Strategy to encourage maximum use of the Port Tunnel by port-related traffic and to enhance the city centre environment.

The Dublin City Council HGV Management Strategy was introduced on the 19 February 2007. The HGV Strategy provides for a ban on 5+ axle vehicles during the hours of 07.00-19.00 seven days a week from a designated cordon area and provides a limited permit scheme for 5+ axle vehicles that need to load/unload within the city centre area. In addition, as the HGV cordon is a closed cordon around the port area, Dublin City Council operates a Rebate Scheme for affected vehicles.

The HGV Strategy has resulted in dramatic reductions of 5+ axle vehicles within the city centre area of between 80 - 94% on different routes within the cordon area. Approximately 6,050 5+ axle HGVs per day use the Port Tunnel and Dublin City Council issue an average of 80 permits per day. HGV permits are available online.

**<u>Parking Guidance Management System</u>**

The PGMS system accumulates running totals of spaces and other relevant data from Dublin City's car parks and communicates such data over network links to a management system based in Dublin City Council.

The management system continuously disseminates car park information as appropriate, to a network of Variable Message Signs, which are commissioned around the city. Operators in the Traffic Management Centre operate the Parking Guidance System and use its functionality, where necessary, to send information messages, both text and graphic, to motorists and the general public.

**<u>Travel Reporting and Integrated Performance System</u>**

The TRIPS Travel Time system is a sophisticated facility that directly integrates with, and provides accurate Travel Time prediction, information on road network performance, and other important information on the operation of the SCATS Adaptive Traffic Management System.

TRIPS interfaces with SCATS in such a way that it guarantees high performance data streaming, with no impact on the operation of the SCATS Regional Computers or Central Management system.

The TRIPS Data collection and processing availability is 1 minute. TRIPS actively collects and processes Travel Time data every 60 seconds, ensuring that TRIPS outputs are always consistent with current road demands.

TRIPS can collect data directly from SCATS Strategic Monitor files, or from the TRIPS ITS Server, via a local area network.

## Systems Integration and Data Sharing

As previously mentioned the redesign and commissioning of the Traffic Management Centre was phase 1 of the project completed and the facility came online in June 2013. Phase 2 of the project is currently under way and is an ongoing process of system integration, testing and introduction of new systems and open source data sharing.

**TAMS**

Dublin City Councils Environment and Transportation Department are committed to a number of projects within the organisation, nationally and at a European level.

The Environment and Transportation department is taking a lead role in implementing a new Transportation Asset Management System (TAMS). The objective of TAMS is to provide Dublin City Council with a reliable geographic information management system which will be used to better plan, organise and manage the implementation of road works to meet the needs of customers.

Dublin City Council manages transportation assets with a value of over €2.35 billion consisting of 1,200km of public roads and footways, 147 bridges, traffic calming devices, signs, parking machines, road markings, cycle tracks and retaining walls. The efficient operation and maintenance of these assets is imperative in delivering the required service to road users while ensuring that value for money is achieved and the use of TAMS will enable Dublin City Council achieve this objective.

TAMS will be used by staff within the Roads Maintenance Section and a number of sections within the Traffic Division of the Environment & Transportation Department. TAMS will also interface with staff from other DCC corporate areas such as the IS Department, Customer Services and the Finance Department.

**DUBLINKED**

Another initiative the City Council are involved with is Dublinked, an initiative by the Dublin Region Local Authorities (DLAs) and National University of Ireland Maynooth to facilitate data-driven innovation in urban environments by

- Releasing data held by the DLA's, including data that would not normally be considered public.

- Providing a mechanism for other people and organisations to share data pertinent to the Dublin Region.

- Providing a structured mechanism for engaging with the local authorities to develop and trial new products and services.

- Encourage collaboration and innovation through a series of workshops and events.


Within the department we are currently supplying open source data on the following

- On travel times

- Environment and Noise monitoring statistics

- Dublin Bus GPS sample data as part of the INSIGHT project

- Ambient sound monitoring data

Journey times across Dublin City, from DCCs TRIPS system, in csv format. Journey times are supplied on a number of routes across the city. Each route consists of a number of links, each link is a pair of geo referenced Traffic Control Sites  updated once every minute.

**INSIGHT Project**

 The Intelligent Synthesis and real-time response using massive streaming of Heterogeneous data is an EU funded project in which Dublin City Council and a consortium of partners across the public and private sectors and academic institutes are looking to develop an adaptive, scalable and dependable, real-time infrastructure for improving our ability to cope with emergencies, reduce response times and deploy resources to the correct locations by utilising as much data as possible. It is under the umbrella of the Seventh Framework Programme (FP7) 2007-2013 which bundles all research-related EU initiatives together under one roof playing a crucial role in reaching the goals of growth, competitiveness and employment.

Dublin is a test bed for the **INSIGHT** project. Currently we generate large volumes of data from different streams, including our SCATS traffic management software, which controls over 750 junctions and city buses which return location data every 20 seconds. This project is led by the University of Athens and wants to demonstrate how such disparate streams can be married and analyzed by software and generate alerts automatically so that traffic is managed more quickly when there is an incident.

Currently the approach to incident detection is a manual approach that is the traffic management centre team monitoring CCTV to alert to incidents or from information received from members of the public via calls or social media. INSIGHT could alert to anomalies in traffic patterns through SCATS and bus data which would in turn alert the traffic manager to verify by CCTV and react accordingly. The system architecture is modular in design to accommodate the introduction of more data streams and nodes. An approach at present is investigating crowd sourcing through an APP which would help verify incidents and could be used to analyze areas where we currently do not have sensors or CCTV installed.

To predict anomalies before they occur we need real time feeds with other possible streams of data to include weather data and social media such as Twitter. In forecasting pluvial flooding with the

data from meteorological sources or social media could assist in deploying resources proactively to reduce the impacts on traffic.

It is hoped that real time feeds will be trialled by a prototype early in 2015 and the entire project scheduled to conclude in September 2015.

**<u>Conclusion:</u>**

In the era of "Big Data", the endless generation of massive data streams, "Citizen Journalists" with a public demanding instant up to the minute information at their finger tips, knowing what data you have available and how to use this data to increase the wellbeing of a city poses many questions for those in traffic management.

Dublin City Council as a member of IBM Smart Cities Challenge where information and data about the operations and services in the city is gathered in real-time and then analysed to identify problems and solutions to ongoing issues is looking to play an active role in managing the data streams it has available. Through our established core systems and proactive research and deployment of new technologies together with our approach to promoting open source data sharing we hope to play a leading role in advancing ITS technology to improve the wellbeing of our citizens.

We endeavour to take a place at the forefront of smart cities by implementing innovative technologies, extracting data generated by people and their movement patterns, analyzing and processing this data and returning this to the public as meaningful solutions to their transport requirements.

As a purpose built resource the traffic management centre will play a pivotal role in how this information is tested and deployed and its evolution will take shape side by side with the demands and changes in our city.