MANAGING THE KUALA LUMPUR ROAD NETWORK WITH THE INTEGRATED TRANSPORT INFORMATION SYSTEM

Ir Mahfix bin Omar,
Director,
Road Transport Department,
City Hall, Kuala Lumpur

ABSTRACT

The Integrated Transport Information System (ITIS) project for the Klang Valley was initiated by the Federal Government in early 2001 and deployed on a design-build basis in 3Q 2002. With the City Hall, Kuala Lumpur as the implementing agency, the project was successfully completed and handed over in June 2005.

Using a spectrum of different technologies and equipment, the ITIS has since been gainfully used by City Hall as well as the Police for management of network operations and in particular for management of incidents over a network comprising over 200kms of roadways. This Paper discusses the technologies used in the ITIS, network operations, in particular in the detection and management of incidents, lessons learnt to-date as well the roadmap for future operations and ITS related deployment.

## 1. Background of the Integrated Transport Information System (ITIS)

Work on the ITIS project commenced in 3Q 2002. This project, which was awarded on a design-build basis, is a first step towards the coordinated integration of existing but separate traffic planning and traffic management systems in Kuala Lumpur. The ITIS project was completed in mid- 2005 and has since been providing real time traffic reporting and incident management for the city.

This large scale complex project involved, among others, the installation of over 250 CCTV cameras for traffic monitoring at key junctions, 700 video-based vehicle detector stations, 140 variable message signs and 1600 units of vehicle tracking units to serve as dynamic probes. These various systems are to be linked to an Advanced Traffic Management System (ATMS) and an Advanced Traveller Information System (ATIS) which are housed within a new purpose built facility, the Transport Management Center (TMC). Real-time traffic information are currently disseminated to the public via a call center, through the internet (www.itis.com.my), and arrangements with radio media. Efforts are underway to expand the various channels of communications via commercial media.

2.   The Kuala Lumpur Road Network

The Kuala Lumpur road network comprise 3 major concentric ring roads (the Inner Ring Road, Middle Ring Road 1 and the Middle Ring Road II, with average radii of 1.5km, 3km and 10kms, respectively). These are served by a number of major radials of 4 to 6 lane dual carriageways which puncture the concentric ring roads at major junctions and/or interchanges.

ITIS equipment are concentrated along 45 major roadways covering a combined length of about 150kms. Video based vehicle detector stations (VDS) or automatic incident detection (AID) system monitor traffic flows along these key roads. For example, the system provides can provide key statistics relating to in and out-bound flows based on the VDS info as shown in the following figures (in relation to the Middle Ring Road 1 which generally define the Central Planning Area of Kuala Lumpur).
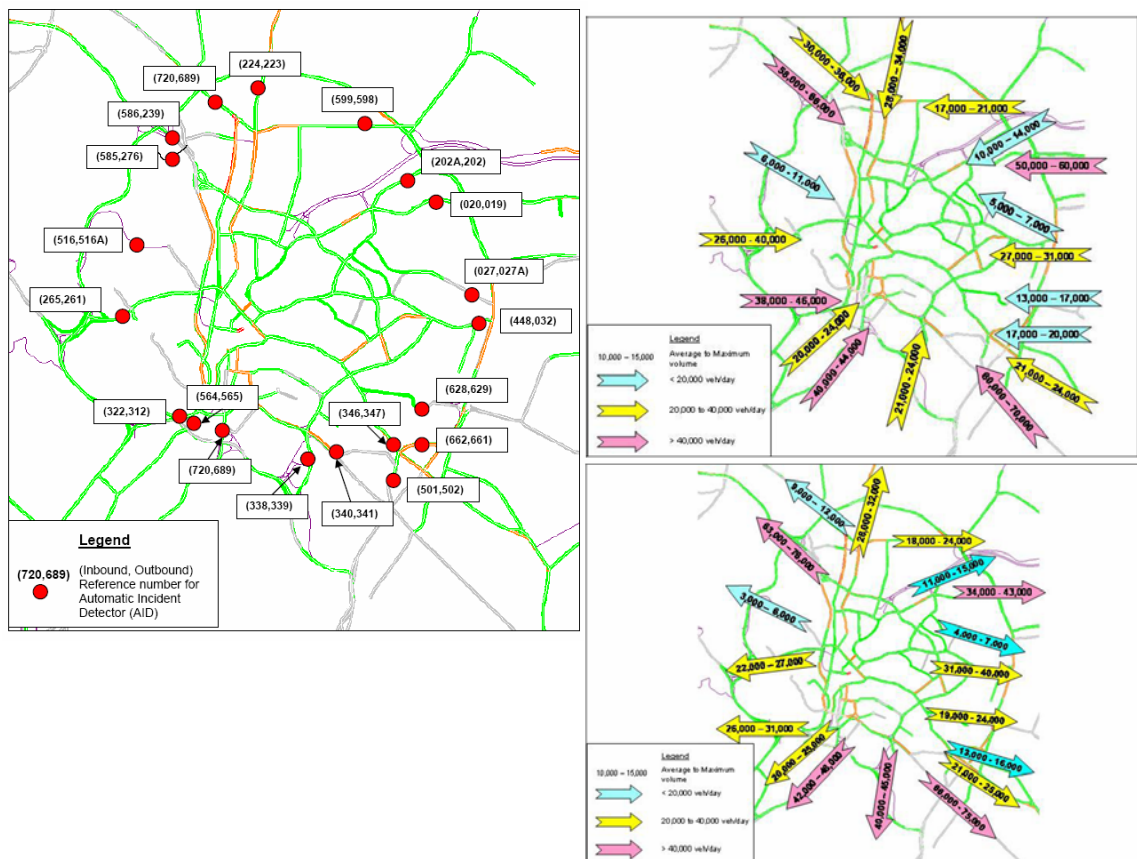
3.   Current Operations

The TMC currently only operates in 2 shifts from 7am to 11pm daily Mondays to Fridays and on weekends from 8am to 6pm. There are plans to expand the operations to full 24x7x365 in the near future.   The two shifts overlap in the afternoon between 2 to 4pm during the daily shift handovers.

The five key functional groups, under the executive management of City Hall in the TMC, are organized as follows:

- ATMS Operations Group (ATOG): responsible for all front line traffic coordination and incident management

- Call Center Operations Group (CCOG): responsible for the operation of the call center and interface with media agemcies

- Server Network Operations Group (SNOG): responsible for the tuning and management of all IT operations, and in particular database management.

- Engineering and Technical Services Group (ETSC): responsible for management and maintenance of all roadside systems, including communication systems, vehicle tracking systems, liaison with third party contractors, toll concessionaires, etc. The ETSG is also involved in data mining, traffic analysis, and geographical information systems.

- Building Management Group (BMG): responsible for all management of maintenance of all TMC facilities including all backup systems.

Front line management of the road network in the city is primarily the ambit of the ATOG for which operations are coordinated via a hierarchy of functions beginning at the top tier by the Operations Manager, Shift Manager, Duty Supervisors and Traffic Controllers or web agents.

At peak periods, there are about 50 staff working at the TMC. These include the joint forces comprising City Hall staff, engineering and maintenance staff from the main contractor as well as staff from the Police forces.

The four key areas of ATMS operations in the TMC are as follows:

- Incident management related to detection, validation, monitoring and response
- Inform and advise public of traffic flow conditions
- Management of events with various agencies
- Engineering for Enhanced Safety and Traffic Flows

Incident Management

The TMC uses an array of tools in the detection of incidents, with the two primary ones being the automatic incident detection system (AID) and the CCTV monitoring system. A key part of this lies in the AID stations which provide traffic volumes, speeds and (lane) occupancies on three-minute cycles which are used to generate a dynamic map of the network congestion. This "congestion map" is utilised by traffic controllers to get a real time pulse of the overall flow conditions and to scout for points of unusual congestion which are symptomatic of traffic incidents.

An average of about 30 incidents are captured daily and these generally fall into the following main categories with varying levels of severity:

- Stopped vehicles
- Accidents
- Spillage, road debris
- Construction works
- Flash floods
- Unusual congestion
- Maintenance works resulting in lane blockages
- Unplanned closures

Severities are rated based on number of lanes affected, length or duration of impact, location and time of incident, all of which are direct contributors to the speed and intensity of propagation of traffic congestion.

Incidents are picked by ATOG and all pertinent information are made available online to CCOG, the Enforcement Directorate and the Police coordinators at the TMC. Using the CCTV for visual verification, the appropriate field response is dispatched either by the Enforcement Directorate and/or by the Police. The importance of this work, specifically clearance of blockage and response to emergencies, all of which are self-initiated cannot be over-emphasised.

The Operations Center currently also has hotline links with the City Hall Traffic Control Center in the City Hall HQ, as well as with the Enforcement Directorate Operations Center for wide area coordination. Arrangements for additional direct communications with other first responder agencies are being planned.

Advising the Public

Information on congestion is made available to the public and motorists via the variable message signboards (VMS) as well as via the call center. The number of calls received from the public has been uptrend basis since inception of operations (up to 60 calls daily during major situations) while anecdotal response on the VMS has also been highly encouraging.

A number of radio stations also contact CCOG on a regular, albeit ad hoc, basis for traffic information. Efforts are underway to formalise a more coordinated communications channel between the TMC and radio stations.

Management of Events

Since inception of operations the TMC has assisted various agencies, and in particular, the Police in managing various road closures and events. These range from monitoring of timing of road closures and their impacts, CCTV coverage over protocol roads, and the publication of advisory messages to effect diversions.

The ITIS' web of CCTVs have provided critical logistical support for field operations without which these same operations would have been operating partially in the "blind". It has almost become perfunctory for many agencies such as the Public Works Department (PWD), event management firms and and various contractors to contact the TMC of planned road closures.

The role of the TMC in managing major traffic flows during the festive holidays such as the Merdeka celebrations, Ramadan, Chinese New Year, etc and the traditional exodus of vehicles to and from the city during long breaks have become more critical.

Engineering for Enhanced Safety and Traffic Analysis

Prior to the TMC, there have been various anecdotal experiences on localized points of traffic congestion in the city.

Through ITIS, City Hall now identified various "hot spots" in the city's road network , supported in many cases by visual recordings and hard data. Concerted efforts are now being made to determine how best to alleviate these problem areas. These efforts would likely include a range treatments such as traffic calming measures, improved channelisation and lane balancing, implementation of tidal flows, change of circulation patterns, and physical upgrading.

Using the tools provided by the system, City Hall is now in the enviable position of continuing to accumulate a wealth of data that could be mined in many more ways than previously anticipated.

For example, based on VDS data collected over a period of time, work has started to profile the various roads to gain a better understanding of the parameters impacting on local and network congestion. Some of the attached figures show the trend, scatter and relational analysis based on flow, speed and densities.
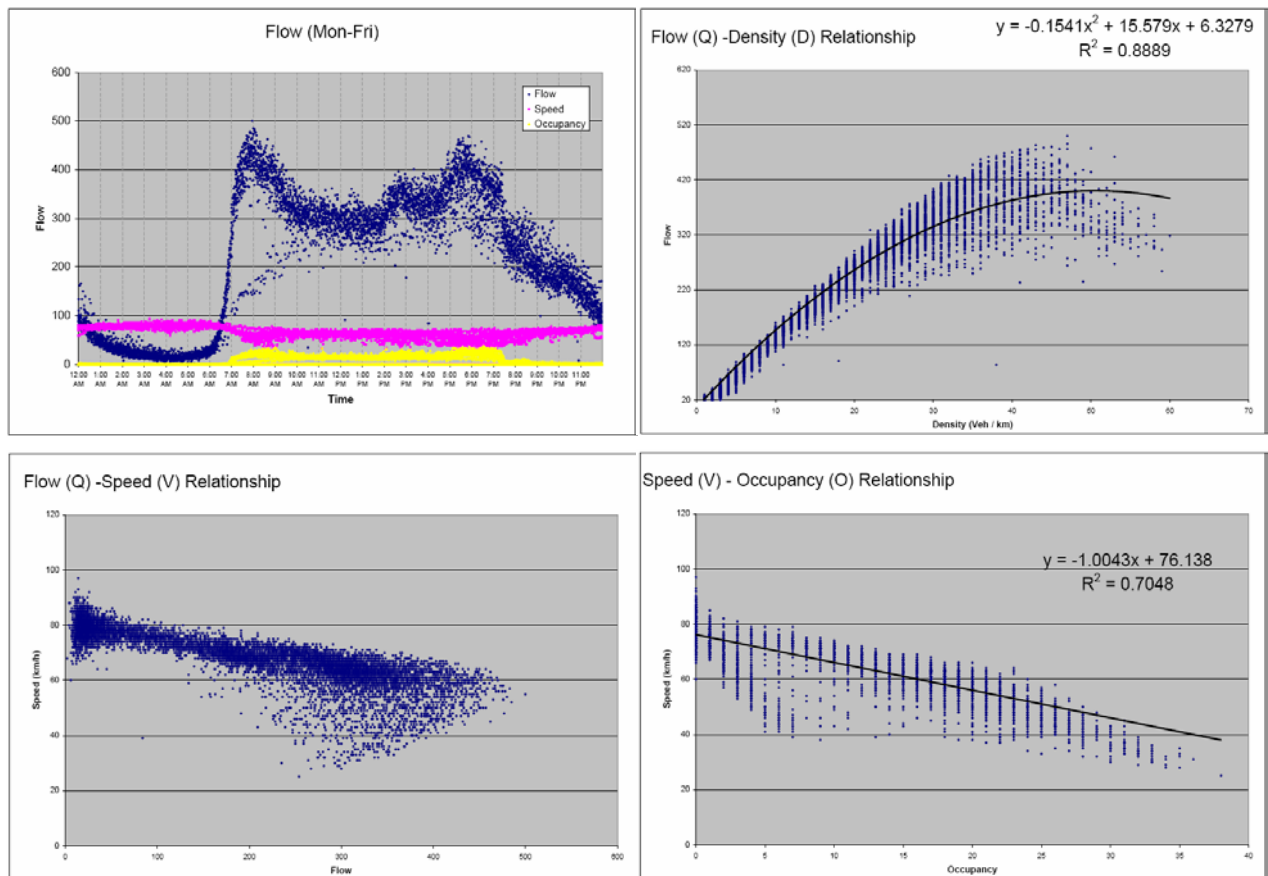
4.   Lessons Learnt and Challenges

ITIS has been a significant and successful milestone for City Hall in its continuing efforts to make Kuala Lumpur a safe city with a well managed transport infrastructure. The physical implementation of this complex project has not been without its difficulties, some of which includes the following:

- The project involved the construction of over 1000+ new pieces of road furniture. Given the limited spaces, particularly in the city center, it was important to find ways to re-combine multiple poles into a single functional unit. There are now instances where the CCTV, road signage, street lamp, traffic aspects are all co-located onto a single pole.

- The project involved significant trenching and ducting in many of the city's road pavements. Coordination with the city's road rehabilitation works with other utility firms could have been better achieved to mitigate some of the resurfacing works.

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- Strong support from all levels of local government (and external agencies and the public) is important for the success of such a complex project. Managing the expectations from these stakeholders is also important.

- TMC operations require dedicated, disciplined and well-motivated staff. Staff working in such a demanding operating environment needs a strong degree of focus, training, personal discipline and an analytical mind.

- For the TMC to be able to perform well, we require expertise from a broad spectrum of disciplines such as traffic engineering, transport planning, systems analysis, IT, public and media relations, GIS, civil, electrical / electronic engineers, legal advisory and customer support staff. We continue to source expertise in the fields of operations research, data analysis and those familiar with systems architectures.

5.   Challenges and The Way Forward

ITIS has provided the Kuala Lumpur City Hall a wide platform to launch improved services in the areas of planning (and profiling of flow conditions), integration of previously disparate systems and an operational model for smart partnerships between various public and provate agencies working under one roof.

Our continuing challenges relate to how best we can seek ways to expand and to further improve the system to better serve the twin objective of making a Kuala Lumpur a safe city with a world class transport infrastructure. These efforts would include, among others, expanding the information dissemination channels either through partnerships with the media, application service providers or via own TMC broadcasting station, enhancing the system to include elements of public security, enforcement of traffic and/or adoption of new technologies in management of traffic violations, use of emerging broadband technologies to expand the ease of deployment and to increase penetration of the system to new roadways.

We also continue to be cognizant of Government's efforts to formulate a common ITS architectural framework that would help create an improved inter-operability environment for various systems to co-exist. In expanding ITIS, we will need to be mindful of balancing technology with available operating resources and most importantly, developing our human talent pool.

Ir. Mahfix Omar, MALAYSIA