IMPROVING MALAYSIAN TOLLED HIGHWAYS OPERATIONS USING INTELLIGENT TRANSPORT SYSTEMS (ITS)

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Malaysian Highway Authority (MHA)
Background Of MHA

- Statutory Body Under Ministry Of Works
- Setup in 1980

MINISTRY OF WORKS MALAYSIA

PUBLIC WORKS DEPARTMENT

HIGHWAY PLANNING UNIT

MALAYSIAN HIGHWAY AUTHORITY

CONSTRUCTION INDUSTRY DEVELOPMENT BOARD

BOARD OF ENGINEERS

BOARD OF ARCHITECTS

BOARD OF SURVEYORS

ROADS

BUILDINGS

WATER SUPPLIES

STATE PWD’s
MINISTRY OF WORKS MALAYSIA

PUBLIC WORKS DEPARTMENT

MALAYSIAN HIGHWAY AUTHORITY

1. Government Agency
2. Responsible for the provision of infrastructures and public utilities specifically roads, water supplies, buildings, airports, ports and jetties in the country.

1. A Statutory Body
   Established under an Act of Parliament (Act 231, 1980)

2. Responsible for all toll highways and expressways in Malaysia
A Few Facts On Malaysia

- **Total Land Area**: 329,727 sq. km
- **Population in Q3-2005**: 26.26 million*
- **Registered Vehicles**: 13.12 million**
- **Length of Roads**
  - Toll Highways: 1,492.3 km
  - Other Federal Roads + State Roads: 75,732.7 km
  - **Total**: 77,225.0 km

* Department of Statistics, Malaysia
** Department of Road Transport, Malaysia
Registered No. Of Motor Vehicles In Malaysia

(Average traffic growth ~ 7%)

Source: Department of Road Transport, Malaysia
The Advent of Toll Highway Privatization

27 privatised toll highway

Privatisation took off in late 1980’s

20 companies in operations

1,492.3 km in operations

3 projects yet to begin construction

4 projects under construction

Private sector most active in middle 1990’s
Role of MHA in Highway Privatization

Monitoring & Regulatory Body

Carries out the overseeing rights of the government

Supervision

Monitoring

Regulatory

Design, construction, operation and maintenance of privatised toll highway projects
Rights and Obligations of MHA

Current Functions

- To approve design brief and detailed design of works
- Acquisition of reports on quality control tests & work progress
- Make site visits, witness quality control test & inspect site records
- Requisition of material information for monitoring
- Acquisition of land for project
Rights and Obligations of MHA (Cont)

- Carry out safety audit & gazette for highway opening
- Acquisition of maintenance & inspection reports during operation
- Direct further investigations & the carrying out of maintenance & repair works
- Inspect the highway & its facilities & monitor the traffic volume
Rights & Obligations of Concession Company

- Obtain financing for project
- Design, construction & Improvement works on highways
- Install tolling & other equipment
- Operate & maintain the highway
- Collect toll
- Hand over the concession area at no cost to the government on expiry of concession
Number Of Privatized Toll Highway In Operation

<table>
<thead>
<tr>
<th>Malaysia Plan Period</th>
<th>Number</th>
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<tbody>
<tr>
<td>81-85 (4th)</td>
<td>1</td>
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<tr>
<td>86-90 (5th)</td>
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<td>91-95 (6th)</td>
<td>10</td>
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<tr>
<td>96-00 (7th)</td>
<td>13</td>
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<tr>
<td>01-05 (8th)</td>
<td>20</td>
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</tbody>
</table>
Total Highway Length (km)

- 1986-1990 (5th Plan): 485 km
- 1996-2000 (7th Plan): 1220 km
- 2001-2005 (8th Plan): 1492.3 km
MAJOR INTER URBAN HIGHWAYS IN PENINSULAR MALAYSIA
Highways In Klang Valley
### ITS User Services Implemented For Tolled Highways

<table>
<thead>
<tr>
<th>Traffic Management (ATMS – Advanced Traffic Management Systems)</th>
<th>1</th>
<th>Transportation Planning Support</th>
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</thead>
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<tr>
<td>2</td>
<td></td>
<td>Traffic Control</td>
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<td>3</td>
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<td>Incident Management</td>
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<td></td>
<td>Demand Management</td>
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<td>6</td>
<td></td>
<td>Infrastructure Maintenance Management</td>
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<tr>
<td>Traveler Information (ATIS – Advances Traveller Information Systems)</td>
<td>7</td>
<td>Pretrip Information</td>
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<td>On-trip Driver Information</td>
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<td>...</td>
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<tr>
<td>10</td>
<td></td>
<td>Personal Information Services</td>
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<tr>
<td>Emergency Management (EMS)</td>
<td>26</td>
<td>Emergency Notification And Personal Security</td>
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<tr>
<td>27</td>
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<td>Emergency Vehicle Management</td>
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<tr>
<td>28</td>
<td></td>
<td>Hazardous Materials And Incident Notification</td>
</tr>
<tr>
<td>Electronic Payment (EP)</td>
<td>29</td>
<td>Electronic Financial Transactions</td>
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<tr>
<td>...</td>
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</tbody>
</table>
ITS Implementation

Two major ITS components implemented on tolled highways:

- Electronic Road Pricing
- Traffic Control and Surveillance System
Electronic Road Pricing

- Electronic Tag System
- Contact-less Smart Card System
Contact-less Smart Card System

- 1st implemented for Penang Bridge in 1995
- As prepaid card
- Replacement of pre-printed discount voucher
Electronic Tag System (ETC)

- 1st implemented for Penang Bridge in 1995
- Used 2.45 Ghz microwave one piece tag
- Other implementation by other highway used 5.8 Ghz microwave one piece tag.
There was no standard ready to be adopted.

Different concession company used different system offered by different vendor / manufacturer.

Users need to invest on more than one tag.
The Move To Use Common Tag

- In 2004, the government standardized the ETC and all highway operators have now adopted contactless payment method based on the IR frequency.
Under the concession agreements, concession companies are required to establish Traffic Surveillance and Control System in order to manage the highways efficiently and effectively.
TCSS Major Functions

- Traffic information collection
  - Traffic congestion (loop)
  - Speed detector
  - Emergency call (SOS)
  - CCTV (video)

- Traffic information processing
  - GIS
  - Data fusion (alarm)

- Traffic information dissemination
  - Traffic advisory (VMS)
  - Speed display

- Decision execution and enforcement
  - Incident management
Traffic Information Collection
EMERGENCY TELEPHONE SYSTEM
- AT EVERY 2 KM
Vehicle Detection System (VDS) - loop
Vehicle Detector
Closed Circuit Television Camera (CCTV)
- For Traffic Surveillance / Vehicle Detector
Information Processing
Information Dissemination
Variable Message Signboard (VMS)
Speed Detector & Display

KELAJUAN ANDA
60 KM/J
KURANGKAN LAJU

KELAJUAN ANDA
65 KM/J
KURANGKAN LAJU
## Installed Components

<table>
<thead>
<tr>
<th>LIST OF HIGHWAYS</th>
<th>CCTV</th>
<th>VMS</th>
<th>VDS/AVDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORTH SOUTH EXPRESSWAY</td>
<td>55</td>
<td>8</td>
<td>37</td>
</tr>
<tr>
<td>NORTH SOUTH EXPRESSWAY CENTRAL LINK</td>
<td>2</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>SHAH ALAM EXPRESSWAY</td>
<td>15</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>WESTERN KL TRAFFIC DISPERIAL SCHEME HIGHWAY</td>
<td>41</td>
<td>12</td>
<td>5</td>
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<tr>
<td>DAMANSARA-PUCHONG HIGHWAY</td>
<td>19</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>PENANG BRIDGE</td>
<td>15</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>MALAYSIA-SINGAPORE SECOND CROSSING EXPRESSWAY</td>
<td>7</td>
<td>12</td>
<td>11</td>
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<tr>
<td>NEW NORTH KLANG STRAIT BYPASS HIGHWAY</td>
<td>9</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>AMPANG ELEVATED HIGHWAY</td>
<td>13</td>
<td>3</td>
<td>37</td>
</tr>
<tr>
<td>NEW PANTAI EXPRESSWAY</td>
<td>15</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>KAJANG TRAFFIC DISPERAL RING ROAD</td>
<td>23</td>
<td>6</td>
<td>26</td>
</tr>
<tr>
<td>GUTHRIE CORRIDOR EXPRESSWAY</td>
<td>8</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>EAST COAST EXPRESSWAY</td>
<td>3</td>
<td>6</td>
<td>12</td>
</tr>
</tbody>
</table>
Types Of Information
Traffic Congestion
Accidents
15 maut hari pertama

Jalan bandaran catat kematangan tertinggi dalam Ops Sikap IX

Pengurusan Perhubungan Dewan Pelita Diraja Malaysia, Superintendent Maha
Desh Daud, berkata aktor negara yang menembakkan jumlah kematangan ter-
inggi ialah Selangor dengan 280 kes, diikuti Kuala Lumpur (180) dan Johor (138).
Setelah itu, beliau berkata, Selangor turut memainkan peranan的重大 dalam mencapai keselamatan tertinggi seumur lama, diikuti
Selangor dengan 33 kes kemudian, disusul oleh Perak, Negeri Sembilan
di bawah dan Sabah di akhir.

"Seputih hari pertama Ops Sikap IX, kes kematangan ialah yang pertama
dalam muncul dalam jumlah besar, dan ini juga menunjukkan keadaan
trafik yang ramai di Jalan raya pada musim perayaan.

Plus guna AVDS atau kesesakan musim raya

Kuala Lumpur, Klang, dan Port Klang mem-
akan polis dan jumlah Peng-
ungsai Lalai (JPL) mengakibatkan ke-
seianan di Lebih Banya Utara-Seberang Perai segmen musim perayaan ini mence-
ral Sistem Pencegahan Kendaraan Au-
antik (AVDS).

Alat inilah yang memainkan lalai in-
tas secara automatik itu menyediakan maklumat mengenai jumlah tendangan di lebih cawan polis untuk disalurkan ke-
pada polis JPL dan media penyiaran.

Pengarah Uraman Polis, Datuk Kedion
Mohamed, berkata sejak banjir AVDS digabung di Lebuhraya Elite, masalah
dayap Transit komunikasi di Lebuhraya
Utara-Seberang Perai daripada Lebu-
harian Jalan Duta, sedikit dilokusikan.

"Kenderaan menarik lebih rayakan
pada musim perayaan meningkat ber-
kali lipat. Jumlah maklumat diberi
kan AVDS disalurkan kepada radio un-
tuk (GlobeTelco), televisi, polis dan JPL.

Kemudian, seterusnya, polis lalu, dan bank polis banjir.

Surat Bapa kepada Datuk Seri Ismail Sab-
by, yang menerima perintah daripada Menteri Kebajikan Rakyat, Datuk Sri Mohd Zin
Mohamed, Turut hadir dalam perniagaan Plus,
Ten Sri Megat Dr. Shafie Kasim, Ketua Pe-
gawai Khas (CEO) The New Straits
Times Press (D) Sdn Bhd (NSTP) Datoi Syed
Rashid Albar dan Timbalan Perwakilan Pe-
tinggi Kumpulan NSTP yang juga Pe-
ninggung Kumpulan Berita Harian Sdn
Bhd, Dato Ibrahim bin Ali.

Geladah yang berlangsung sejak 30
November ini menyediakan pemantauan ki-
gambil dari Pixel Foto NSTP berkon-
sepkan sepanjang Malaysia menyambut
Aidilfitri dan Deepavali sejuk, ra-
unan semula melibatkan hingga kail.
Landslide
Flood
Actions To Be Taken
PATROL TEAM
Each Highway Concessionaire has its own Traffic Control Centre - No **sharing** of information

No **coordination** amongst the various centres especially in emergencies.

No **automation**.

Reliability of reaction and response time in emergencies a concern because system is too
Should I advise driver to use alternative road? But I don’t know the traffic condition at other highways…. Should I go there via KESAS-ELITE-NKVE? What is the traffic condition over there?

I am working at KL, Should I go there via NPE or KESAS-Sg. Besi Highway? What is the traffic condition over there?
Way Forward......

MALAYSIAN HIGHWAY AUTHORITY TRAFFIC MANAGEMENT CENTRE (LLMTMC)
TMC Overview

- KESAS
- Other Highways
- LDP/SPRINT
- NPE
- PLUS

Traffic Information

Public
TMC Objectives:

1. **Real time** supervision & communication centre for the highway network under the authority of LLM.

2. Double as **emergency** control and supervision centre.

3. As foundation & basis for **integration and standardization** of Traffic Control Centers for privatized highways.

4. As **focal point** for national level integration to other road networks (Municipalities, Non privatized roads).
TMC Operations Concept

Allows LLM to:

1. **Monitor and supervise** the highway concessionaires operation from a “NETWORK” point of view.

Diagram:

- KESAS
- LDP/SPRINT
- PLUS
- NPE
- Other Highways
2. Coordinate actions amongst multiple concessionaires with emphasis on improving service quality to highway users, example provision of traffic information.
TMC Operations Concept

Allow LLM to:

3. Eliminate blind spots and grey areas in traffic management especially at interchanges involving 2 highways. This is important especially in emergencies.
Allow LLM to:

4. Collect and analyze real time traffic data for planning purposes.

TMC Operations Concept

Analysis
Verification
Statistic

Input
Visual Traffic Data Voice Comm

Action
Advice Regulation
TMC–RCC Integrations

- PLUS RCC
- Elite RCC
- PBSB RCC
- Linkedua RCC
- ProLintas RCC
- LDP/SPRINT RCC
- LLM Traffic Management Center
- LPT RCC
- Kesas RCC
- NPE RCC
- GCE RCC
- Shahpadu RCC
- SILK RCC

TMC–RCC Integrations

- PLUS RCC
- Elite RCC
- PBSB RCC
- Linkedua RCC
- ProLintas RCC
- LDP/SPRINT RCC
- LLM Traffic Management Center
- LPT RCC
- Kesas RCC
- NPE RCC
- GCE RCC
- Shahpadu RCC
- SILK RCC
An interface server will be located at each control centre to pull and transmit traffic data to LLM Traffic Control Centre. No modification is needed to their existing system.

3 main components:
1. Interface Server
2. Telco infrastructure
3. LLM TCC Setup
Logical Integrations

- PLUS
- KESAS
- NPE
- LDP/SPRINT

Middleware connections:
- PLUS Middleware
- KESAS Middleware
- NPE Middleware
- LDP/SPRINT Middleware

LLM Traffic Control Centre
**TMC System Integration**

- **Variable Message Signs**
  - Retrieval of current message text and equipment status

- **Vehicle Detection System (VDS)**
  - Retrieval of VDS data and equipment status

- **Surveillance CCTV**
  - Retrieval and recording of video inputs
  - Control of PTZ will be assisted by the concessionaire’s control center.

- **Voice Communication (New)**
  - Point to point among RCCs and TMC.
RCC System Setup

Concessionaire’s Control Center

Concessionaire’s Existing TCSS

Existing Hub

Existing Video Server /CCTV Controller

Video Transmission Equipments (New)

IP Phone (new)

Hub (new)

Leased line (New)

Router and Firewall (New)

LLM Remote Server (New)

Wide Area Network
TMC Immediate Benefits:

- Real time monitoring for LLM
- Proper communication between LLM and concessionaires
- Centralized coordination
- Central data processing
- Single point of highway information to public and motorist
Collect and monitor traffic information from concessionaires: video and data

Manage and advice concessionaires

Analyze statistical data

Publish Information:
- Web
- SMS
- MMS
Road Map With Traffic Condition On The WEB
Role Play
Benefits Of ITS For All

- **Reducing Accidents**
  - Incident detection and warning systems
  - Faster emergency response time

- **Helping to Relieve Congestion**
  - Demand management
    - Electronic payment
  - Network Efficiency
    - Incident detection and management
    - Driver information
  - Encouraging Modal Shift
    - Pretrip planning

- **Productivity and Operational Efficiency**
  - Electronic toll collection

- **Comfort Factors**
  - Real-time traffic information
Future.....
Enhancement of ITS for Malaysia Highways

- To Enhance Data Collection
  - To install more detectors
  - To install more CCTV cameras
  - To integrate with other control centers

- To Enhance Data Processing
  - To provide advance GIS system
  - To provide advance system for traffic management and incident management

- To Enhance Information Distribution
  - To install more VMS
  - To install dynamic graphical signboard
  - To have direct communication with broadcasters
  - To integrate with other control centers
  - To provide traffic info kiosk at strategic locations
The Future

Variable Traffic Message Signboard (VTMS)

- Graphic Color Display for Velocity
- Travel Time Display
- Text Message Display
Highway Information Terminal
Highway Information Terminal

User may access the system to gather traffic information via website, kiosk terminal or online audio attendance.

The implementation of the system can reduce traveling time, cost, free flow of traffic and also dynamical map.

Information terminals are installed at service and parking area to supply information regarding expressways in the vicinity and information on sightseeing and other leisure activities.
The Vital Component

Vehicle Detectors

- City Area – every 500 m
  - Enable more accurate info of traffic condition due to high traffic volume

- Highway – every 2 Km
  - Sufficient to detect traffic condition for better service level highway
Automatic Congestion Detecting System

Number of traveling vehicles, their speed and traffic density are measured by vehicle detectors installed at 2 kilometer intervals on the Expressways.

Computer aided system automatically identifies congestion and provides motorist with timely and accurate information on congestion length and travel time.
Thank you
Similar Model in UK

- National Traffic Control Centre (NTCC) at Birmingham, England built by Highway Agency.
- The NTCC provides traffic information via a website, telephone, VMS and travel news media.
- Each of the 7 RCC’s around the country will exchange data with the NTCC to enable seamless management of the Highway Agency network.
- The NTCC gather real time information from across the motorway network, making the lives of road users easier by keeping them better informed and making journey times more reliable.