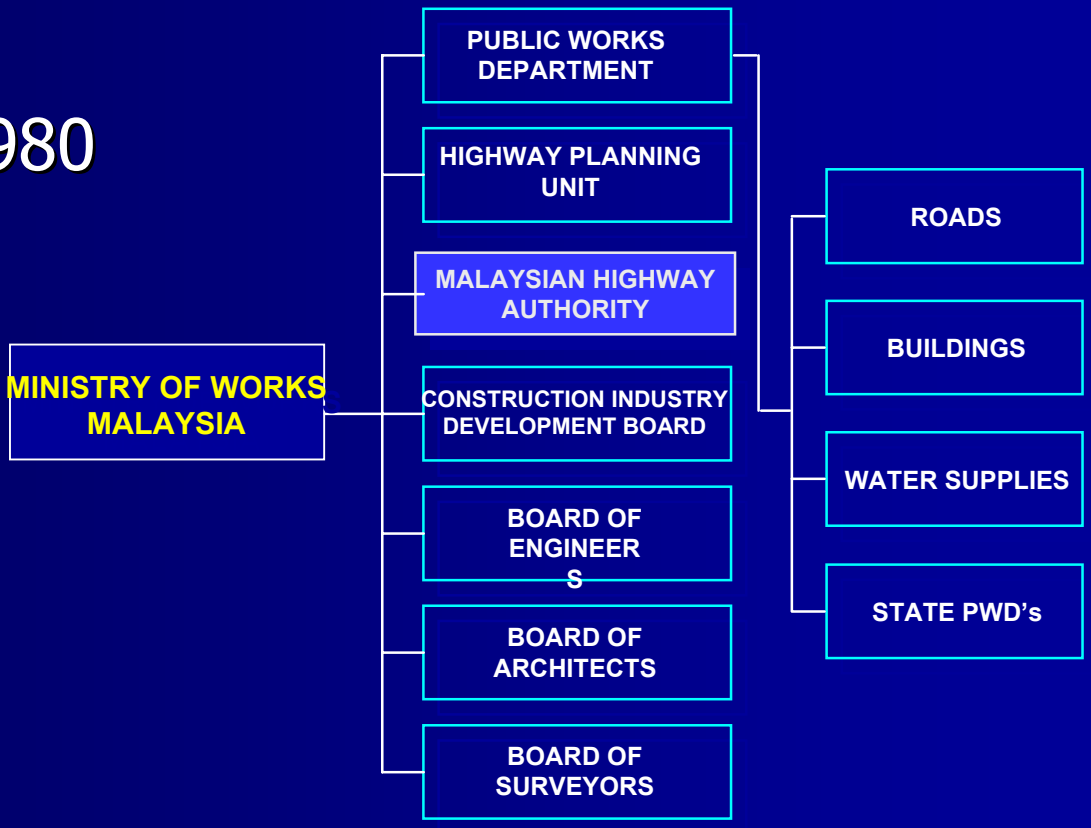
IMPROVING MALAYSIAN TOLLED HIGHWAYS OPERATIONS USING INTELLIGENT TRANSPORT SYSTEMS (ITS)

Abu Bakar Bin Hashim

Malaysian Highway Authority (MHA)

Background Of MHA

- Statutory Body Under Ministry Of Works
- Setup in 1980



MHA Responsible for all *toll highways and expressways* in Malaysia

MINISTRY OF WORKS MALAYSIA

PUBLIC WORKS DEPARTMENT

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.

MALAYSIAN HIGHWAY AUTHORITY

1. A ***Statutory Body*** Established under an Act of Parliament (Act 231,1980)
2. Responsible for all ***toll highways and expressways*** in Malaysia

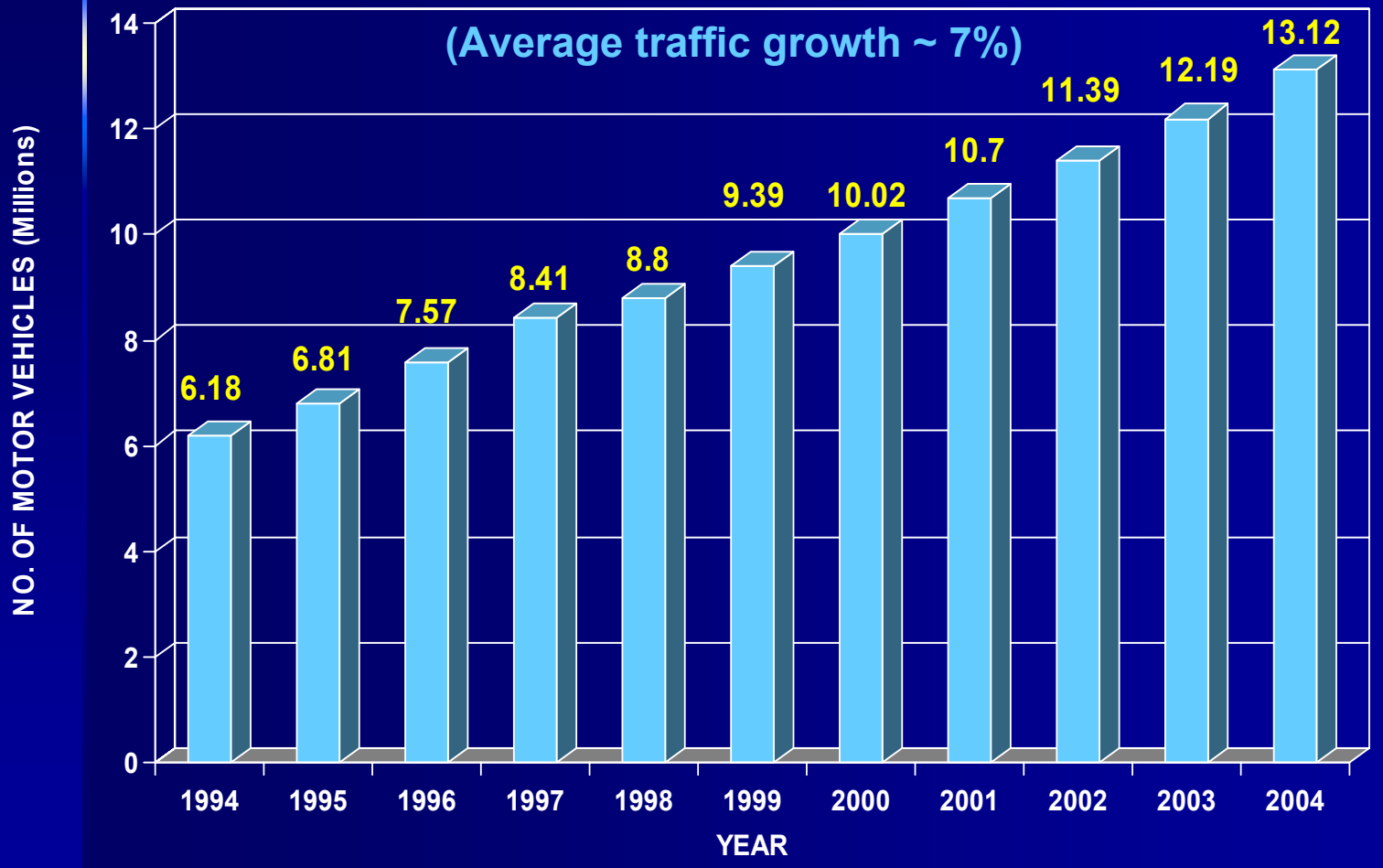
A Few Facts On Malaysia

- **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**

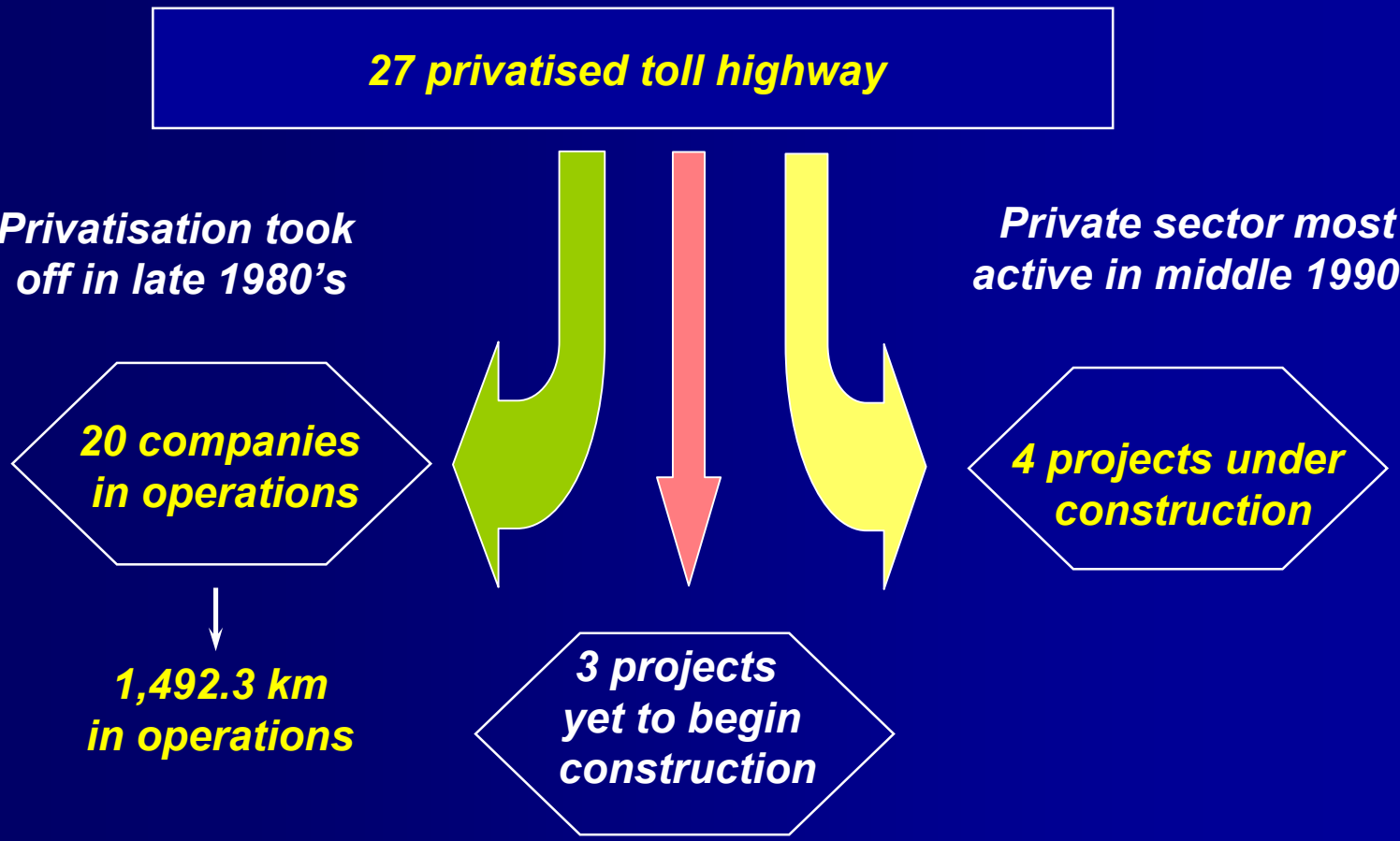
* Department of Statistics, Malaysia
** Department of Road Transport, Malaysia

Registered No. Of Motor Vehicles In Malaysia

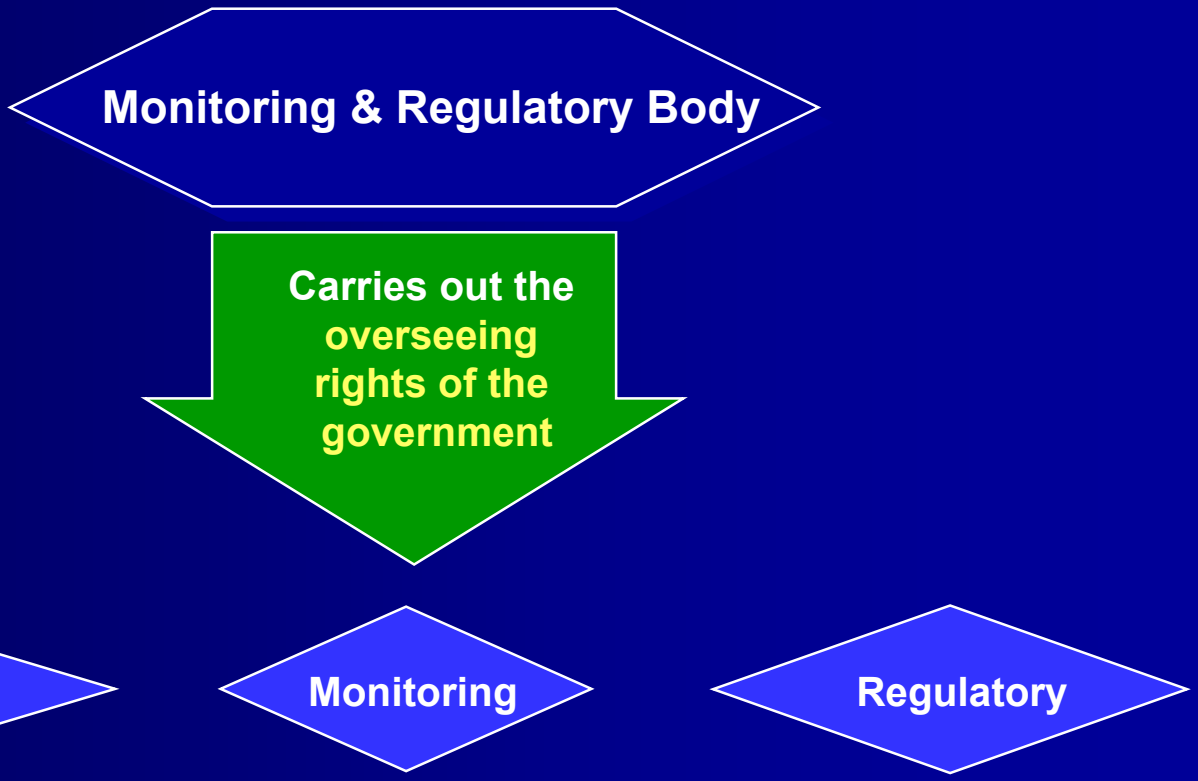


Source: Department of Road Transport, Malaysia

The Advent of Toll Highway Privatization



Role of MHA in Highway Privatization



Rights and Obligations of MHA

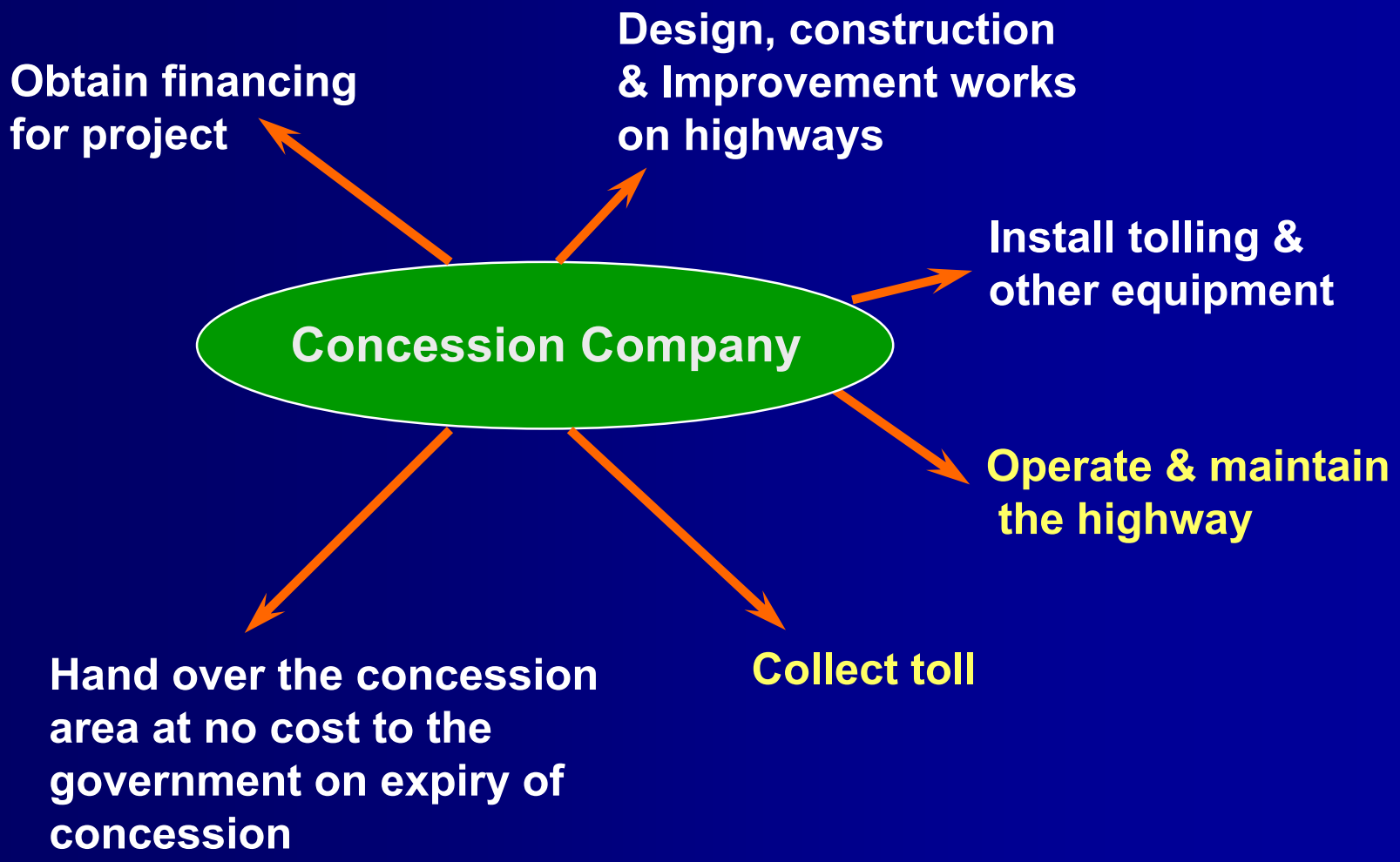
Current Functions

- 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

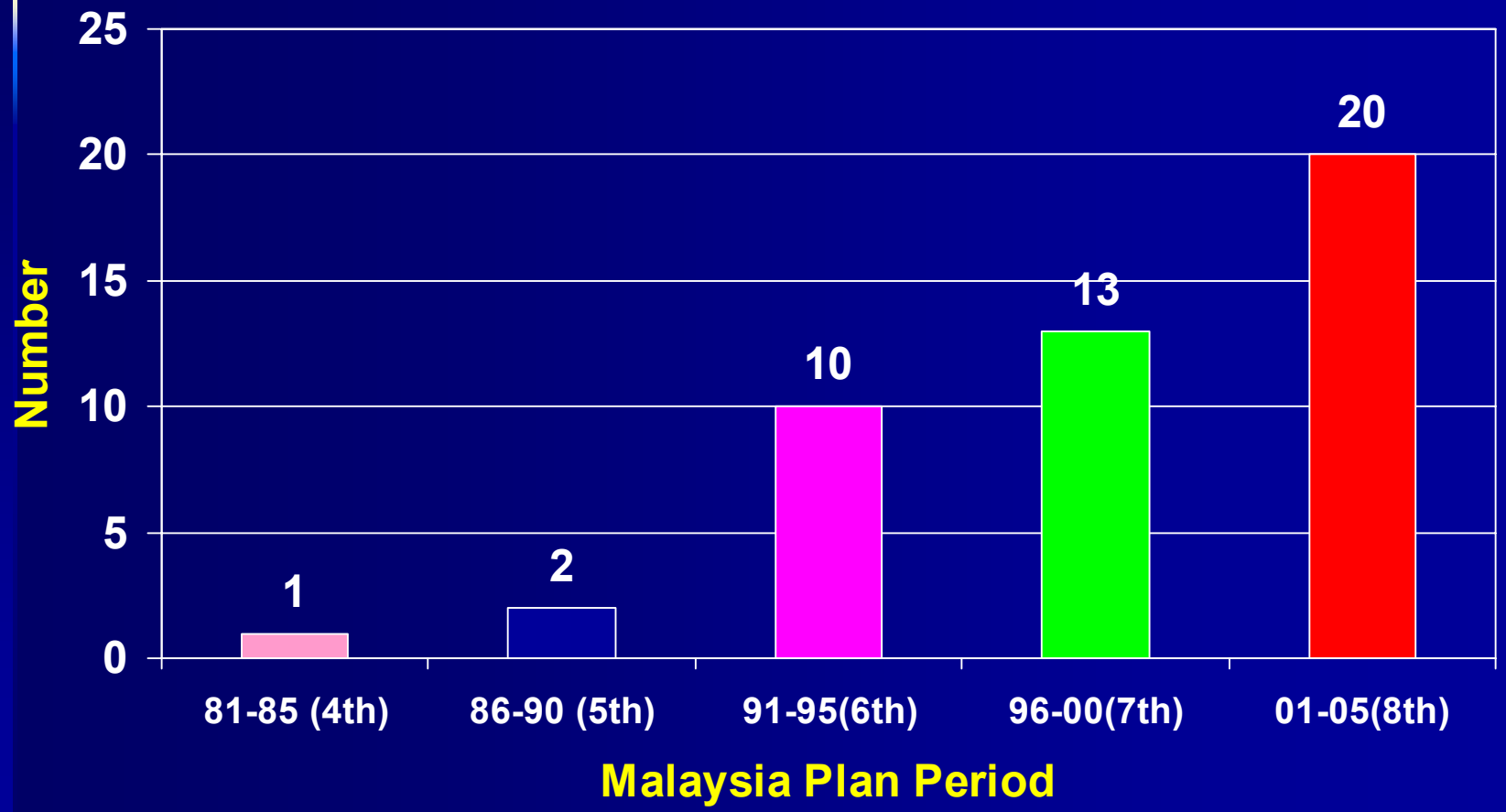
Rights and Obligations of MHA (Cont)

- 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

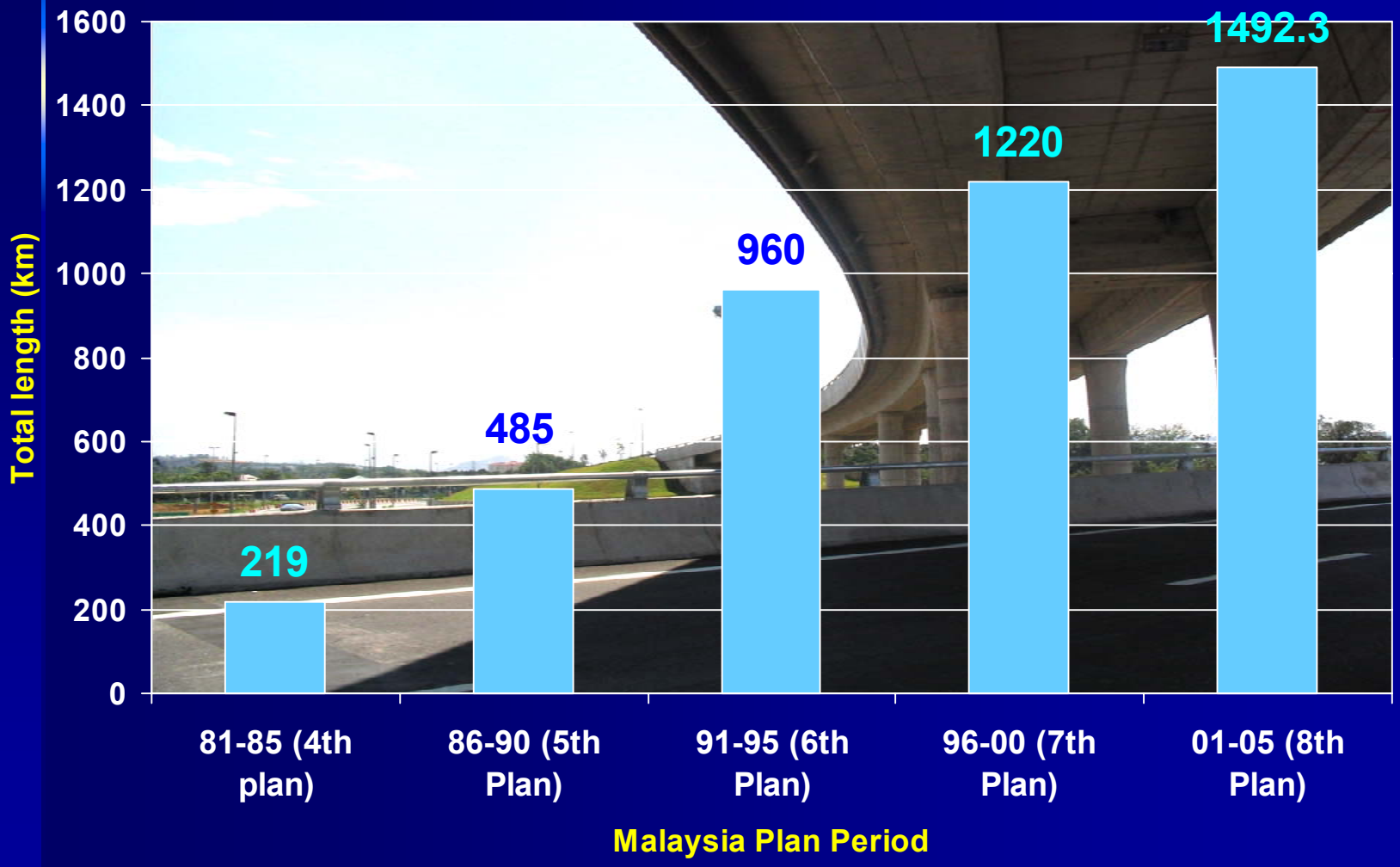
Rights & Obligations of Concession Company



Number Of Privatized Toll Highway In Operation



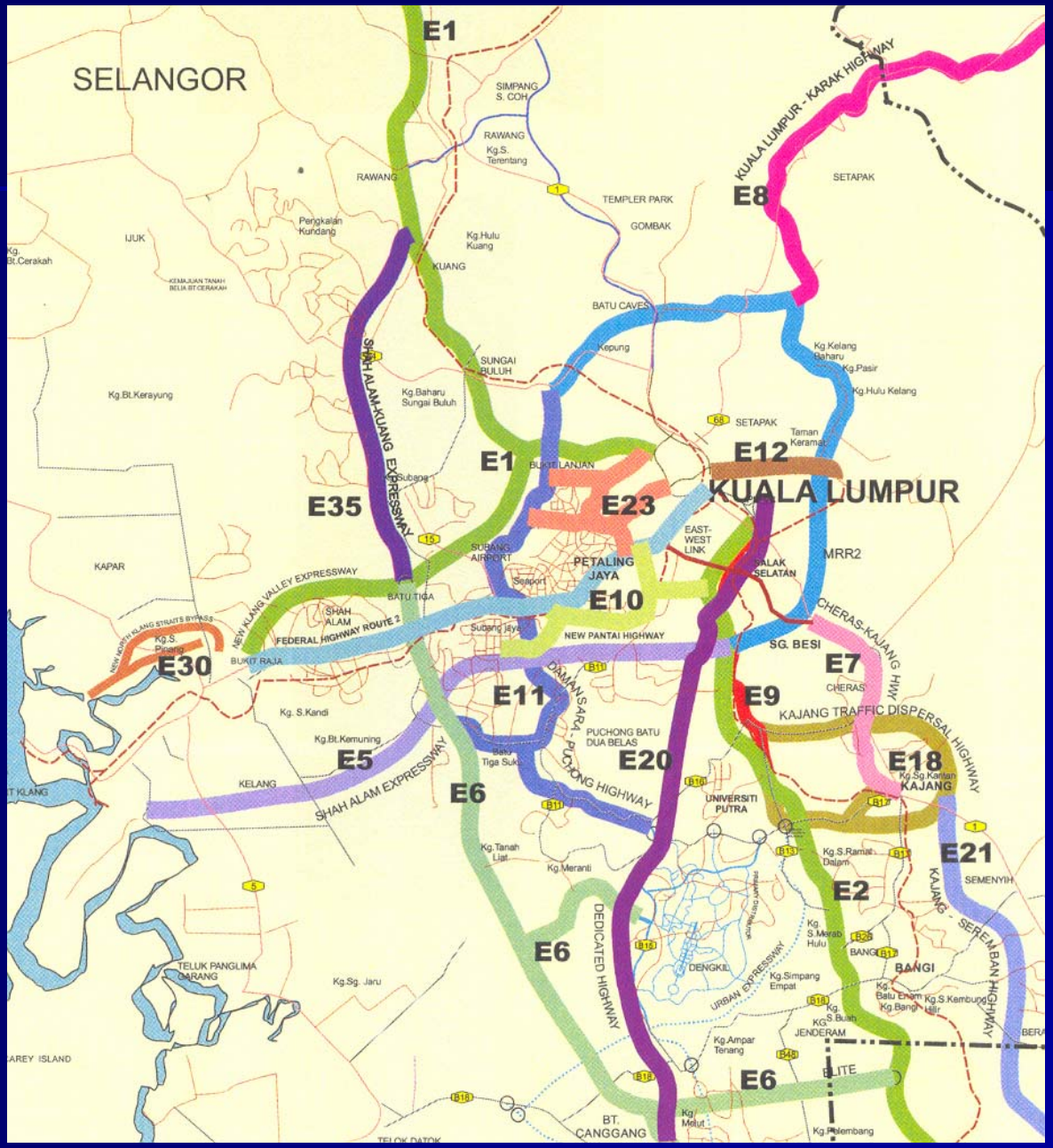
Total Highway Length (km)



MAJOR INTER URBAN HIGHWAYS IN PENINSULAR MALAYSIA

LEMBAGA LEBUHRAYA MALAYSIA

Highways In Klang Valley



ITS User Services Implemented For Tolled Highways

Traffic Management (ATMS – Advanced Traffic Management Systems)	1	Transportation Planning Support
	2	Traffic Control
	3	Incident Management
	4	Demand Management
	…	
	6	Infrastructure Maintenance Management
Traveler Information (ATIS – Advances Traveller Information Systems)	7	Pretrip Information
	8	On-trip Driver Information
	…	
	10	Personal Information Services
	….	
Emergency Management (EMS)	26	Emergency Notification And Personal Security
	27	Emergency Vehicle Management
	28	Hazardous Materials And Incident Notification
Electronic Payment (EP)	29	Electronic Financial Transactions
	…	

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.

Issues On Electronic Tag Implementation

- 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.

Traffic Control & Surveillance System

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

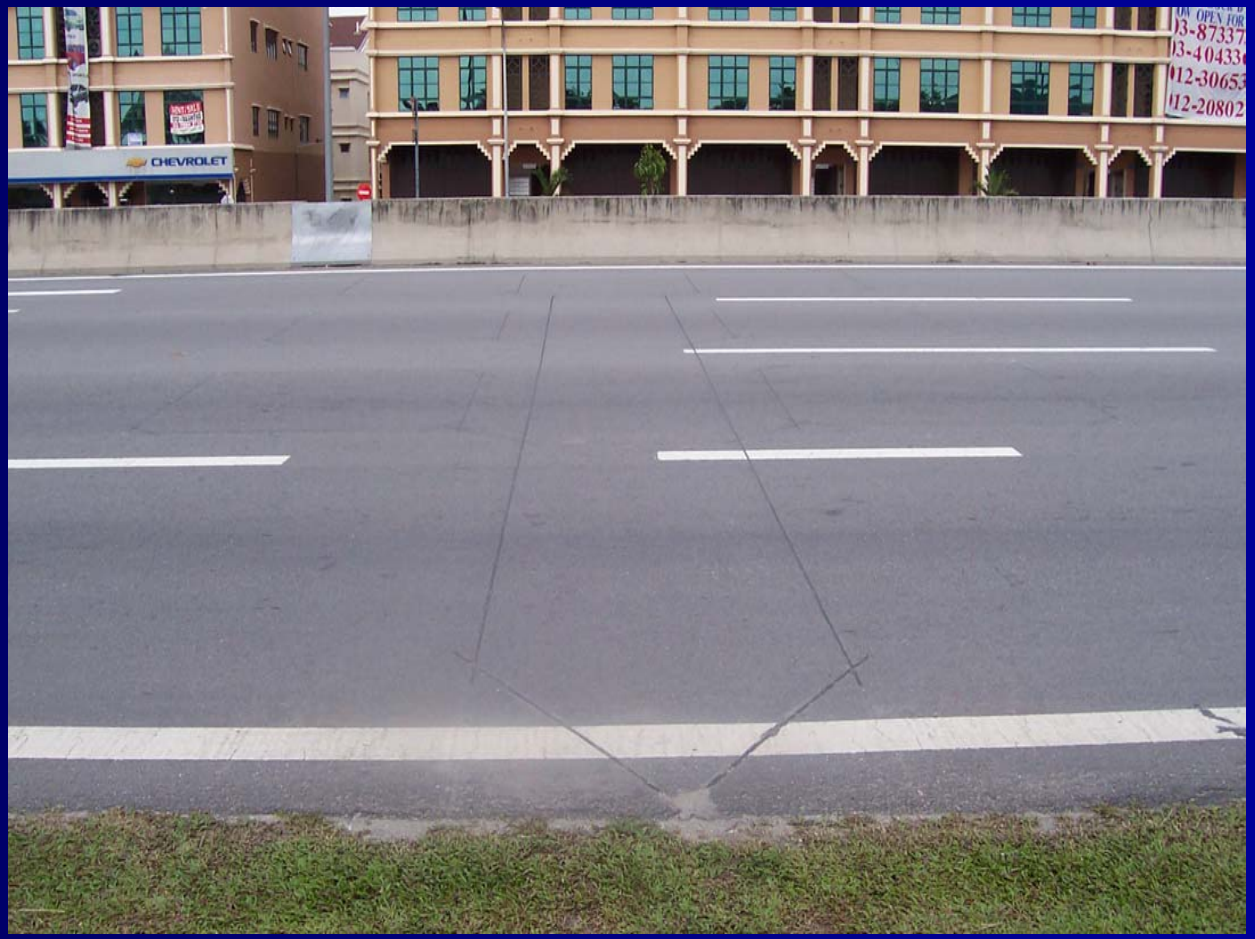
- Traffic information collection
  - Traffic congestion (loop)
  - Speed detector
  - Emergency call (SOS)
  - CCTV (video)
- Traffic information processing
  - GIS
  - Data fusion (alarm)
- Traffic information dissemination
  - Traffic advisory (VMS)
  - Speed display
- Decision execution and enforcement
  - 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

TRAFFIC CONTROL AND MONITORING CENTRE (TMC)

Information Dissemination

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Variable Message Signboard (VMS)

Speed Detector & Display

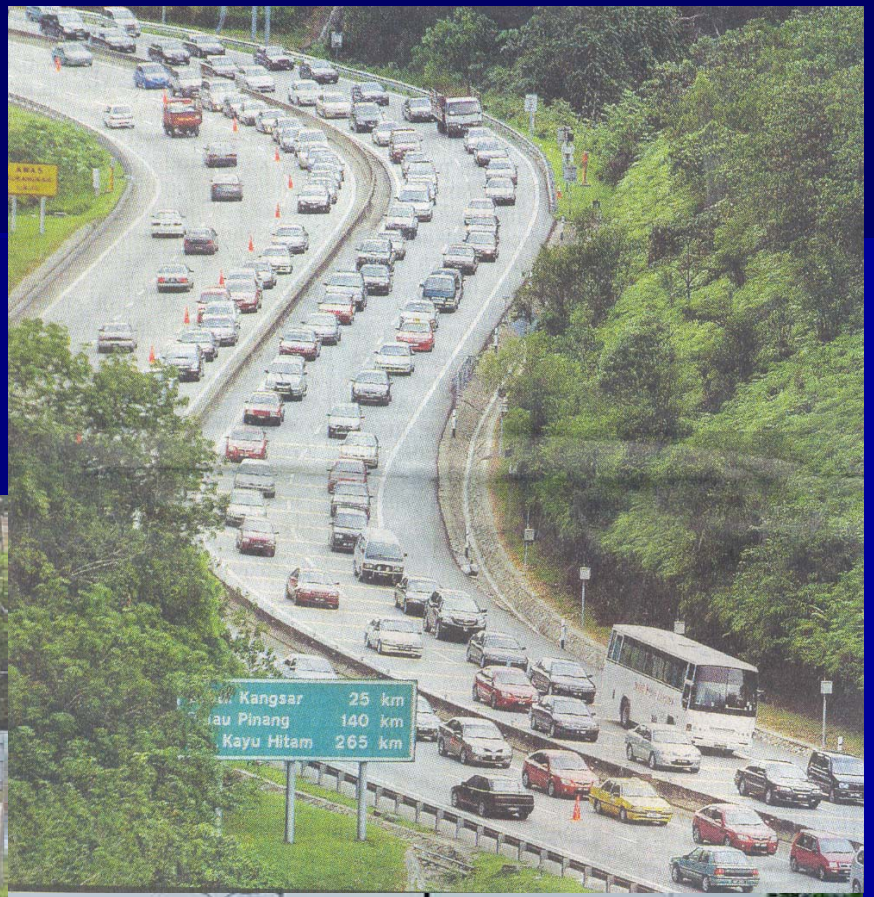
Installed Components

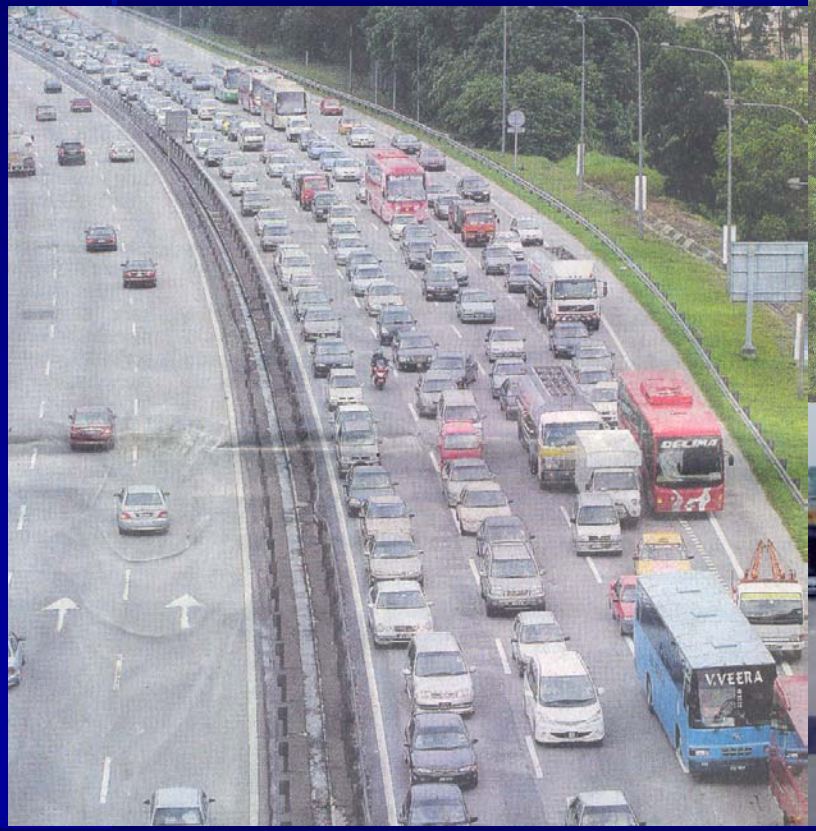
LIST OF HIGHWAYS	CCTV	VMS	VDS/AVDS
NORTH SOUTH EXPRESSWAY	55	8	37
NORTH SOUTH EXPRESSWAY CENTRAL LINK	2	12	8
SHAH ALAM EXPRESSWAY	15	4	9
WESTERN KL TRAFFIC DISPERSAL SCHEME HIGHWAY	41	12	5
DAMANSARA-PUCHONG HIGHWAY	19	5	4
PENANG BRIDGE	15	4	-
MALAYSIA-SINGAPORE SECOND CROSSING EXPRESSWAY	7	12	11
NEW NORTH KLANG STRAIT BYPASS HIGHWAY	9	3	5
AMPANG ELEVATED HIGHWAY	13	3	37
NEW PANTAI EXPRESSWAY	15	5	6
KAJANG TRAFFIC DISPERSAL RING ROAD	23	6	26
GUTHRIE CORRIDOR EXPRESSWAY	8	5	-
EAST COAST EXPRESSWAY	3	6	12

LEMBAGA LEBUHRAYA MALAYSIA

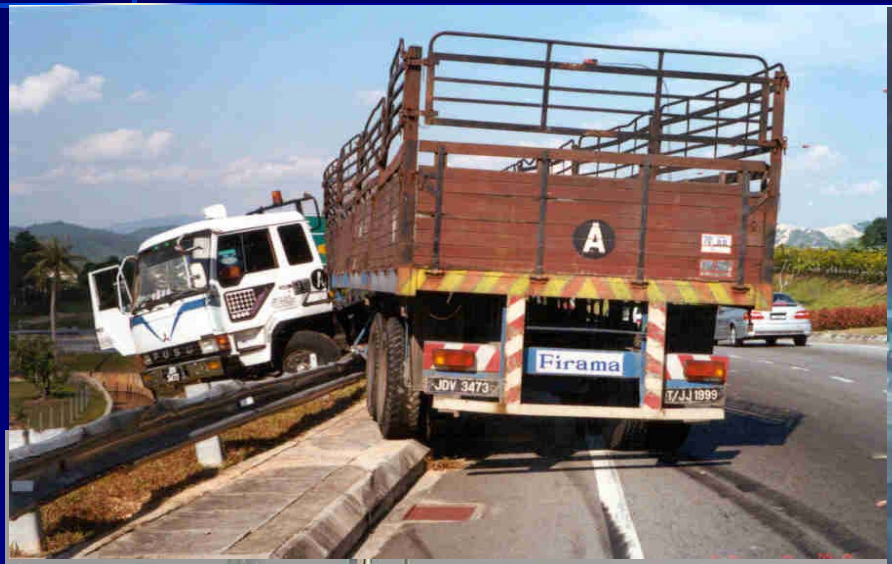
Types Of Information

Traffic Congestion





Accidents



LEMBAGA LEBUHRAYA MALAYSIA

29/10/05 BH

29-10-05
BERITA HARIAN

15 maut hari pertama

Jalan bandaran catat kemalangan tertinggi dalam Ops Sikap IX

Oleh Adha Ghazali dan Azrina Azhan

KUALA LUMPUR: Sebanyak 1,006 kemalangan jalan raya membabitkan 15 kematian dicatatkan di seluruh negara pada hari pertama Ops Sikap IX sejak dilancarkan kelmarin.

Daripada jumlah itu, jalan bandaran mencatatkan jumlah kemalangan tertinggi sebanyak 484 kes, diikuti jalan Persekutuan (226), jalan negeri (174), lebuh raya (73), dan jalan lain (49).

Daripada 15 kematian yang dicatatkan semalam, 12 adalah penunggang motosikal, masing-masing satu kematian membabitkan pembonceng motosikal, penumpang kereta dan pemandu van.

Penguasa Perhubungan Awam Polis Diraja Malaysia, Superintendan Mohamad Daud, berkata antara negeri yang mencatatkan jumlah kemalangan tertinggi ialah Selangor dengan 293 kes, diikuti Kuala Lumpur (142) dan Johor (126).

Selain itu, beliau berkata, Selangor turut mencatatkan jumlah kematian tertinggi sebanyak lima orang, diikuti Kedah dengan tiga kematian dan, masing-masing dua di Perak, Negeri Sembilan, Johor dan satu di Melaka.

"Sepanjang hari pertama Ops Sikap IX, sebanyak 10,548 saman dikeluarkan atas pelbagai kesalahan dan anggota trafik di seluruh negara diarah bersedia 24 jam sepanjang operasi ini diadakan di lokasi yang dikenal pasti.

"Polis menjangka tempoh kemuncak operasi kali ini ialah sehari sebelum sambutan Deepavali kerana pergerakan pulang ke kampung akan bermula pada waktu itu," katanya.

Ketua Polis Negara, Tan Sri Mohd Bakri Omar, berkata statistik polis mendapati sepanjang Ops Sikap purata kematian menurun kepada 15 kes sehari berbanding 17 pada hari biasa.

Beliau turut menyatakan penurunan itu bagaimanapun hanya sementara memandangkan kehadiran anggota dan pegawai polis yang ramai di jalan raya pada musim perayaan.

FAKTA NOMBOR

Kes kemalangan dalam Ops Sikap IX

293 Selangor

142 Kuala Lumpur

126 Johor

Plus guna AVDS atasi kesesakan musim raya

KUALA LUMPUR: PLUS Expressways Bhd (Plus) membantu polis dan Jabatan Pengangkutan Jalan (JPJ) mengurangkan kesesakan di Lebuh Raya Utara-Selatan sepanjang musim perayaan ini menerusi Sistem Pengesanan Kenderaan Automatik (AVDS).

Alat canggih yang memantau lalu-lintas secara automatik itu menyediakan maklumat mengenai jumlah kenderaan di lebuh raya sebelum disalurkan kepada polis, JPJ dan media penyiaran.

Pengarah Urusan Plus, Datuk Idrose Mohamed, berkata setakat ini AVDS dipasang di Lebuhraya Elite, manakala kerja pemasangannya di Lebuh Raya Utara-Selatan dari Rawang-Subang dan Jalan Duta, sedang dilaksanakan.

"Kenderaan menggunakan lebuh raya pada musim perayaan meningkat berkali ganda. Justeru, maklumat diberikan AVDS disalurkan kepada radio untuk dihebahkan, selain polis dan JPJ," katanya selepas pelancaran Galeri Jejantas Plus dan Pameran 'Back To Tradition' di Restoran Jejantas Sungai Buloh (Arah Utara), dekat sini, semalam.

Program itu dilancarkan Timbalan Menteri Kerja Raya, Datuk Ir Mohd Zin Mohamed. Turut hadir, Pengerusi Plus, Tan Sri Mohd Sheriff Kassim; Ketua Pegawai Eksekutif (CEO) The New Straits Times Press (M) Bhd (NSTP) Datuk Syed Faisal Albar dan Timbalan Ketua Pengarang Kumpulan NSTP yang juga Pengarang Kumpulan Berita Harian Sdn Bhd, Datuk Hishamuddin Aun.

Galeri yang berlangsung sehingga 30 November ini menyediakan pameran 44 gambar dari Pusat Foto NSTP berkonsepkan masyarakat Malaysia menyambut Aidilfitri dan Deepavali sejak zaman sebelum merdeka hingga kini.

Landslide

Flood

Actions To Be Taken

PATROL TEAM

Current System - Weaknesses:

Each Highway Concessionaire has its own Traffic Control Centre
- No ***sharing*** of information

Other Highways

KESAS

LDP/SPRINT

NO INTEGRATION & COORDINATION

Each control centre operates independently.

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

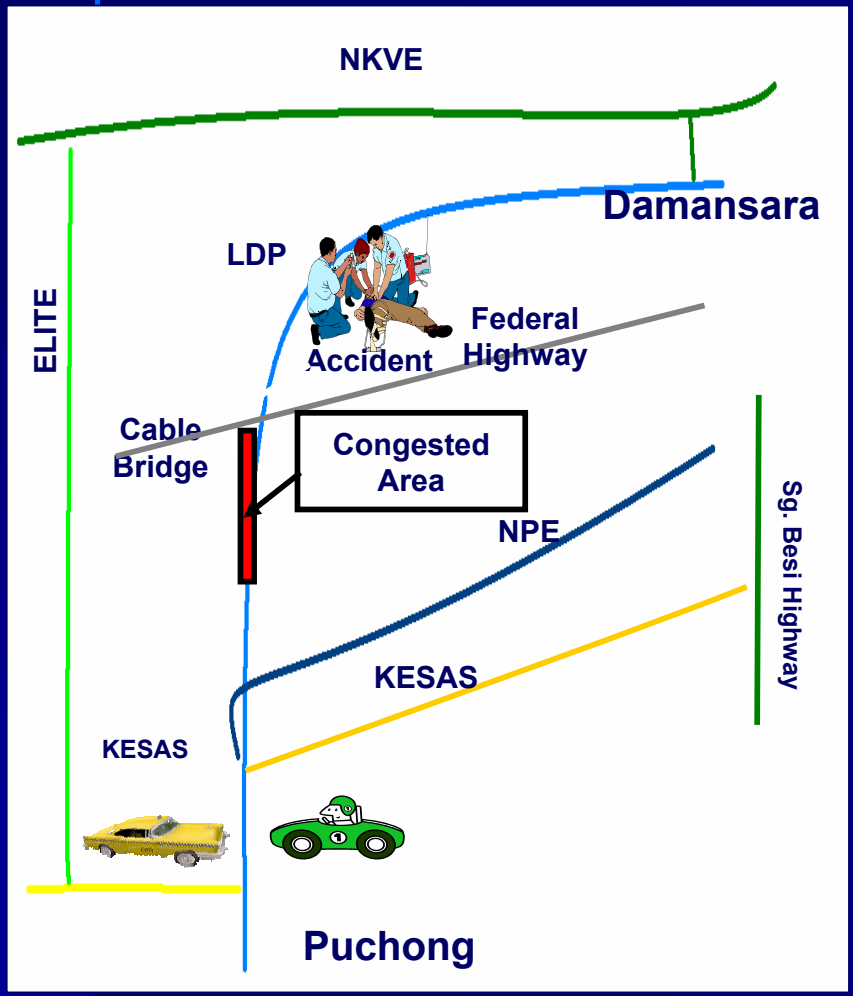
NPE

No ***automation***. Reliability of reaction and response time in emergencies a concern because system is too

PLUS

Current System's Weaknesses (Example)

No Sharing of Information



LDP Control Centre

Should I advise driver to use alternative road? But I don't know the traffic condition at other highways….

I am working at Damansara, 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

LLM Traffic Control Centre

NPE

Traffic Information

PLUS

Public

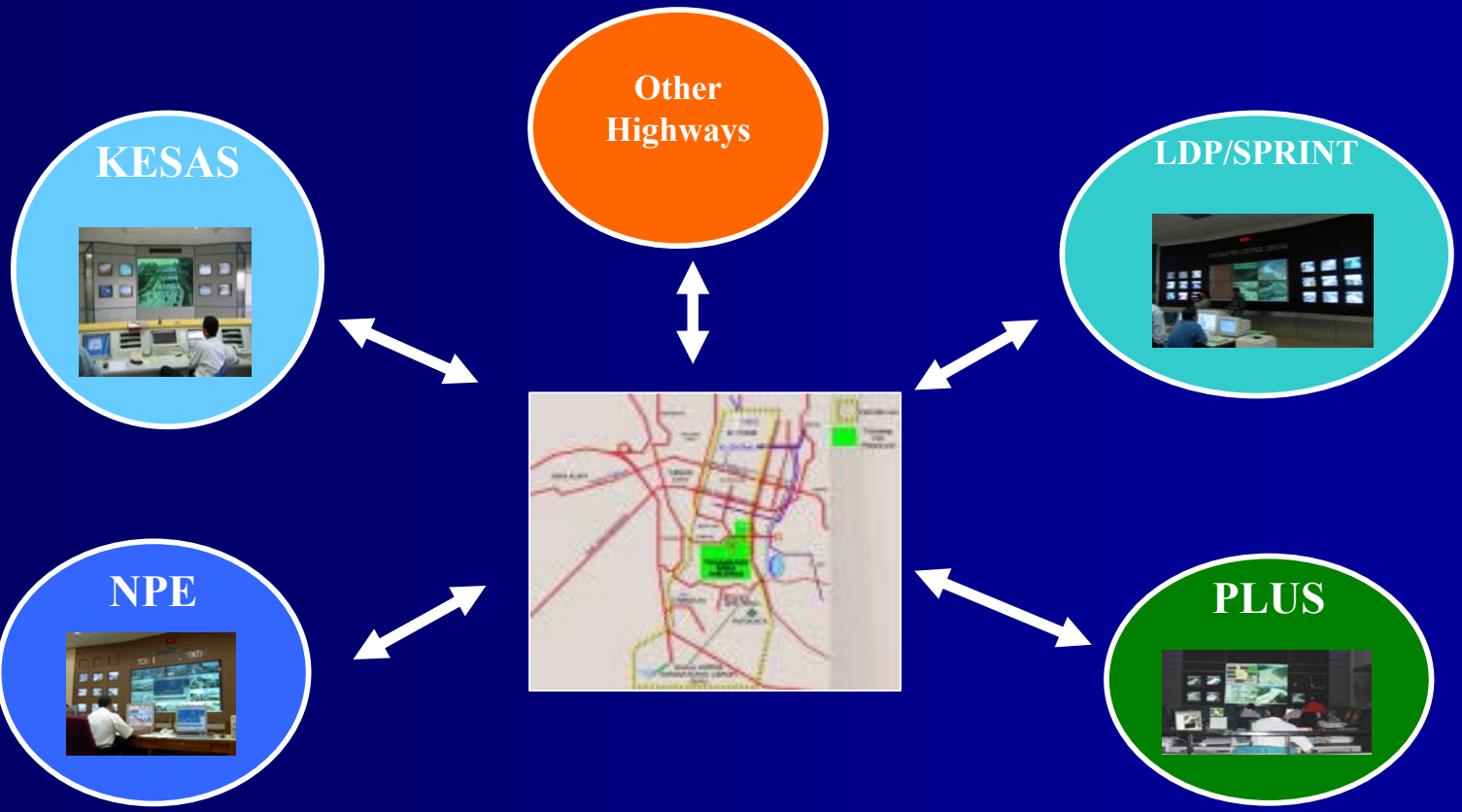
TMC Objectives:

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 :

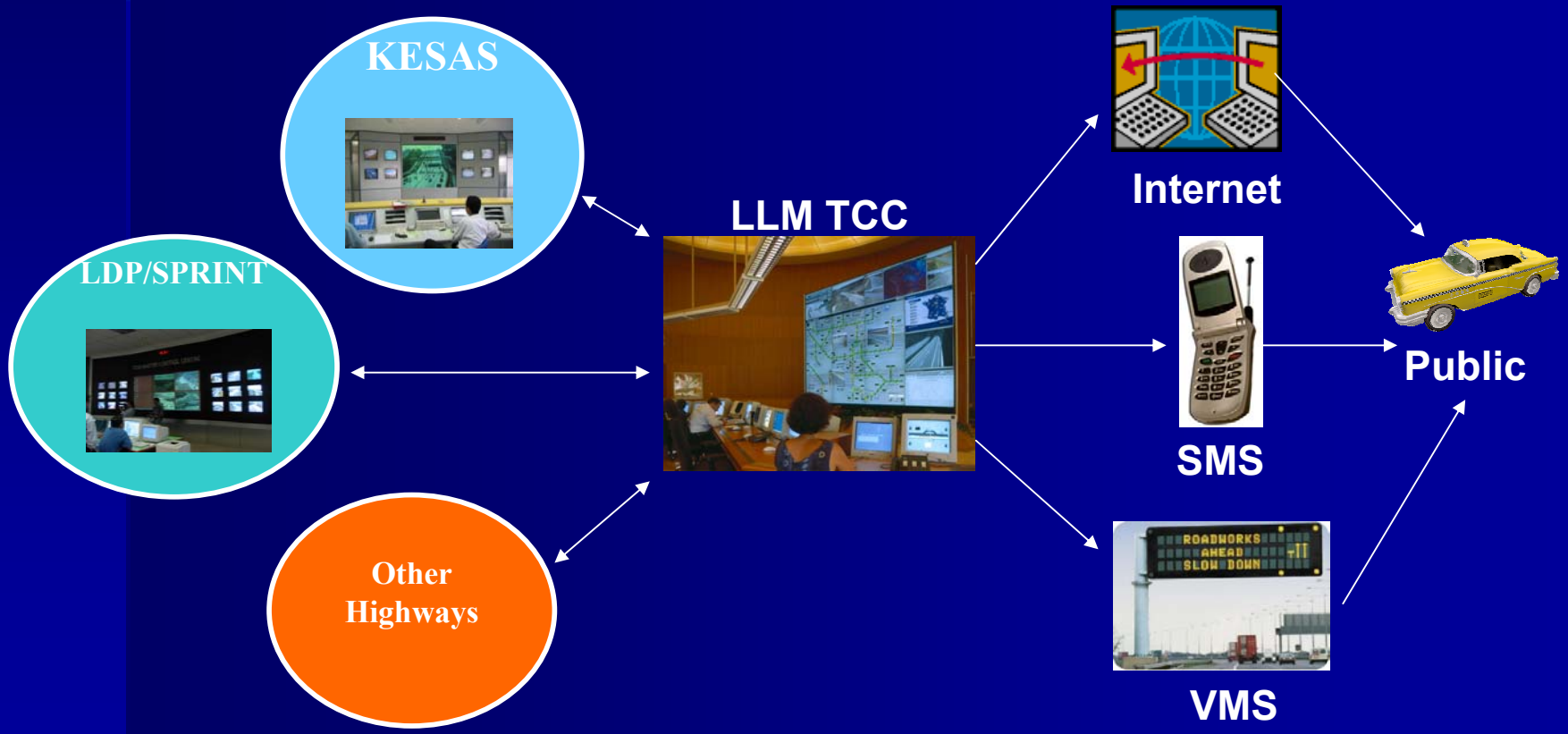
1. ***Monitor and supervise*** the highway concessionaires operation from a "NETWORK" point of view.



TMC Operations Concept

Allows LLM to :

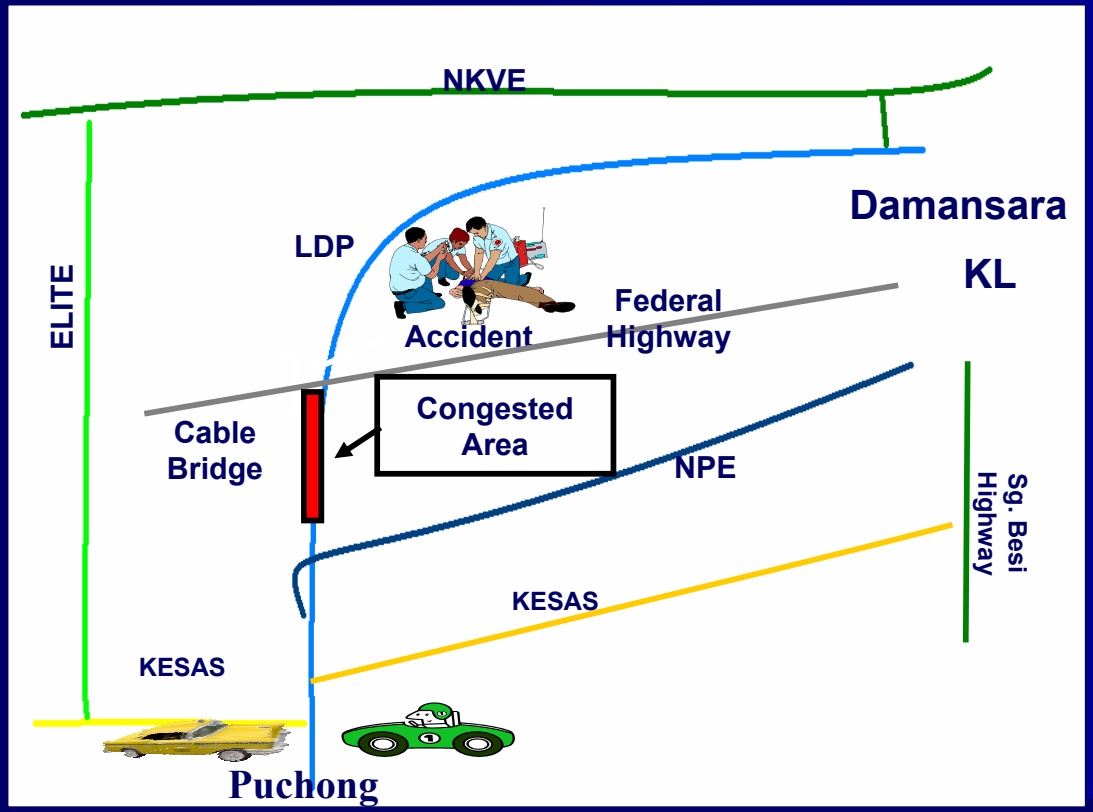
2. Coordinate actions amongst multiple concessionaires with emphasis on improving service quality to highway users, example provision of traffic information.



TMC Operations Concept

Allow LLM to :

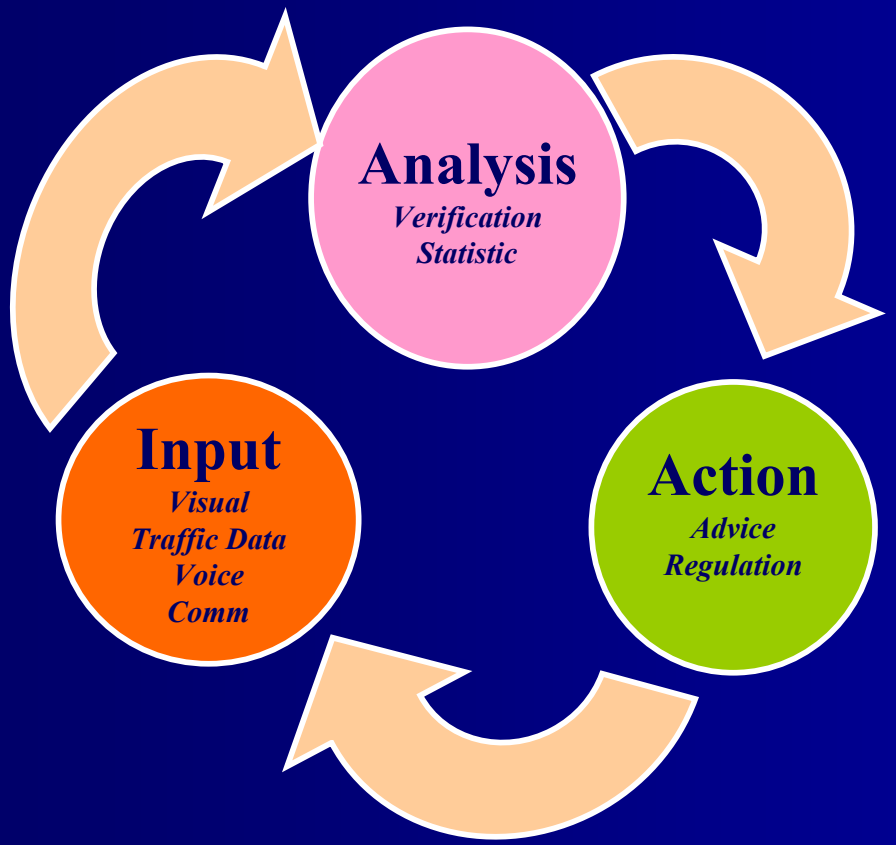
3. Eliminate blind spots and grey areas in traffic management especially at interchanges involving 2 highways. This is important especially in emergencies.



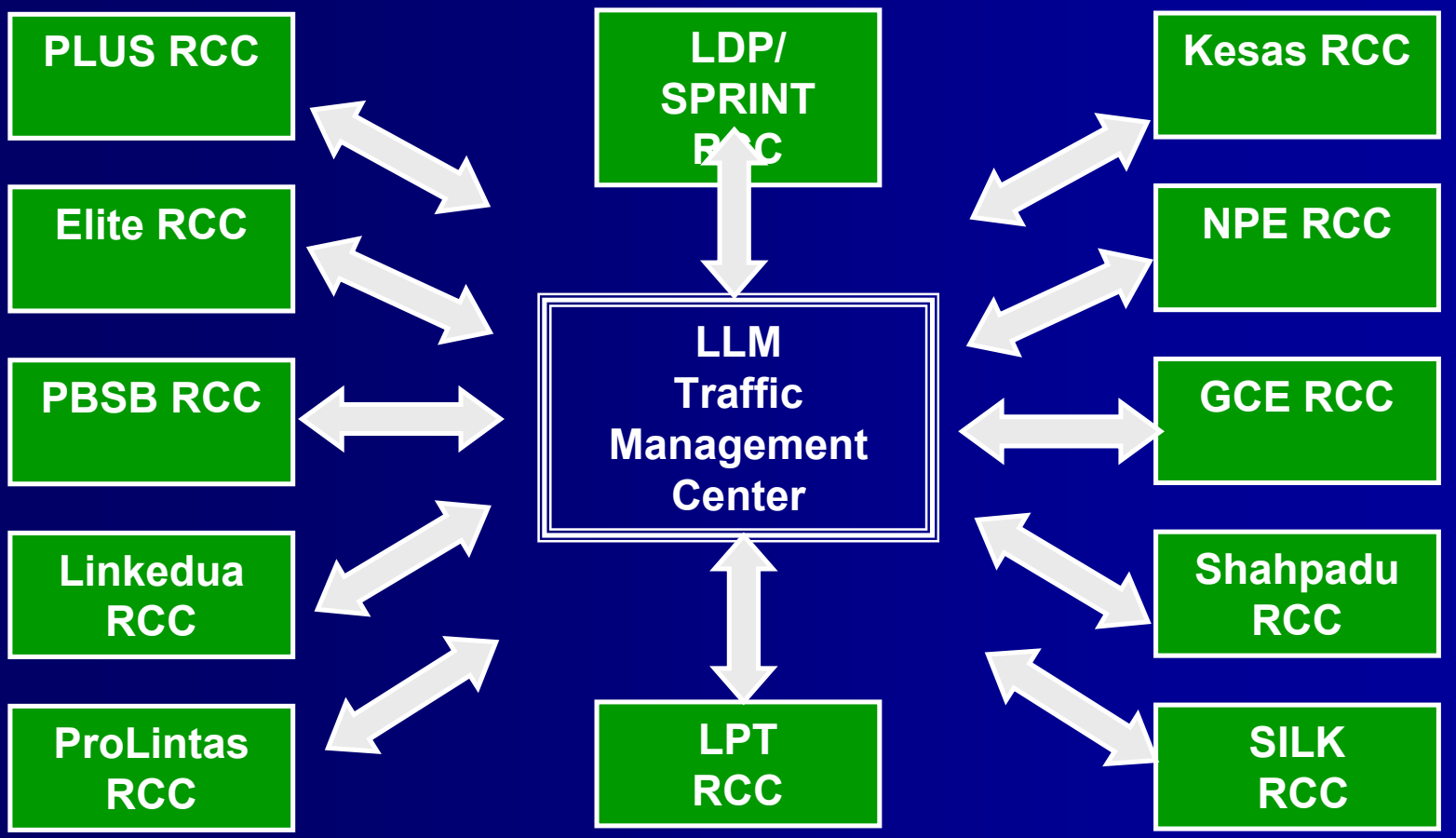
TMC Operations Concept

Allow LLM to :

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



TMC–RCC Integrations



Physical Interfaces

Interface Server

Interface Server

Interface Server

Interface Server

Telco Infra.

LLM Traffic Control Centre

3 main components:

1. Interface Server
2. Telco infrastructure
3. LLM TCC Setup

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

TMC-RCC Connectivity

Concessionaire's Existing TCSS

New

LLM Remote Server

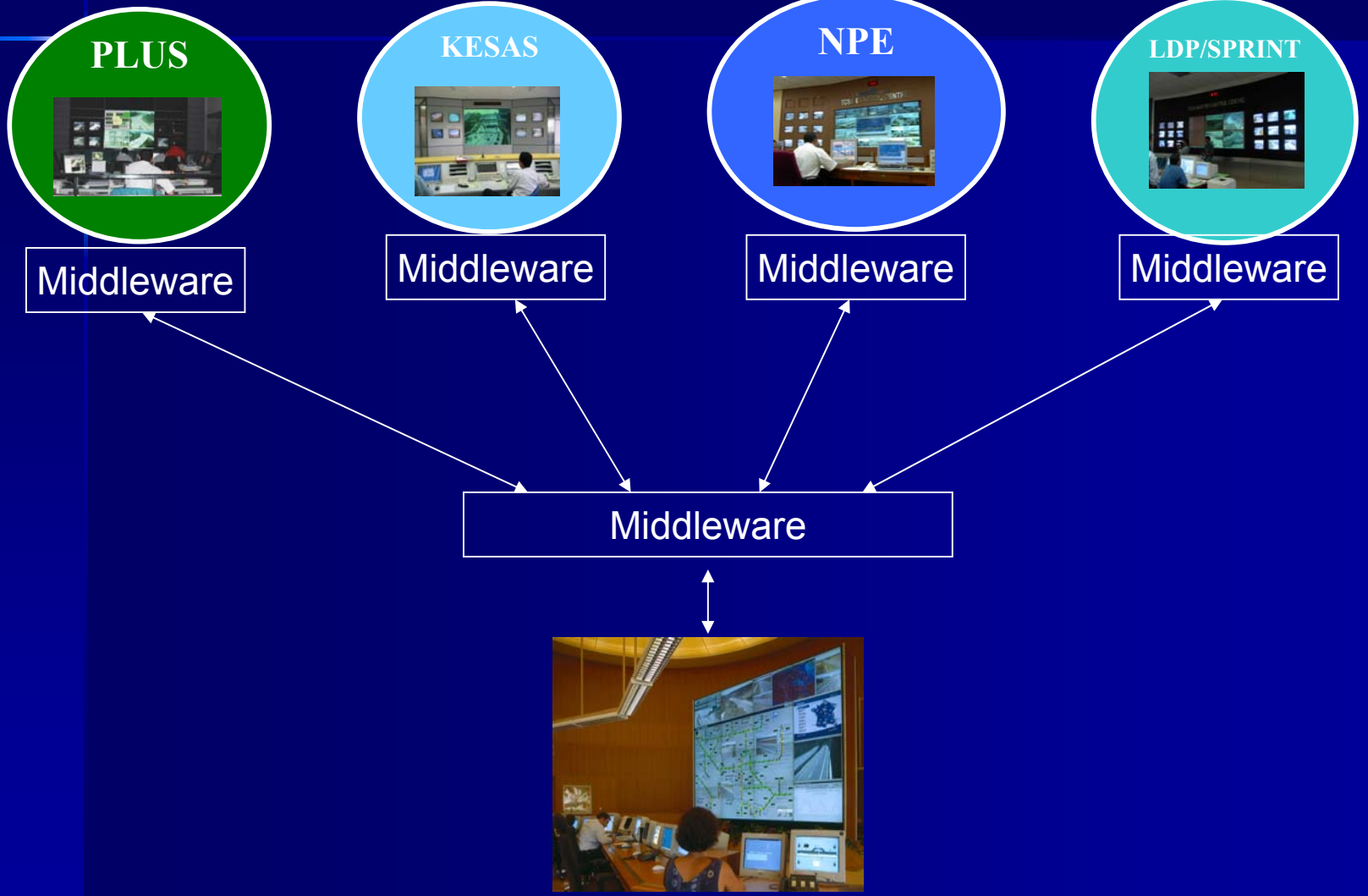
Concessionaire's Control Center

Wide Area Network

LLM TMC

TMC Operation Room

Logical Integrations



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

Wide Area Network

IP Phone (new)

Leased line (New)

Hub (new)

Existing Hub

Router and Firewall (New)

Existing Video Server /CCTV Controller

Video Transmission Equipments (New)

LLM Remote Server (New)

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

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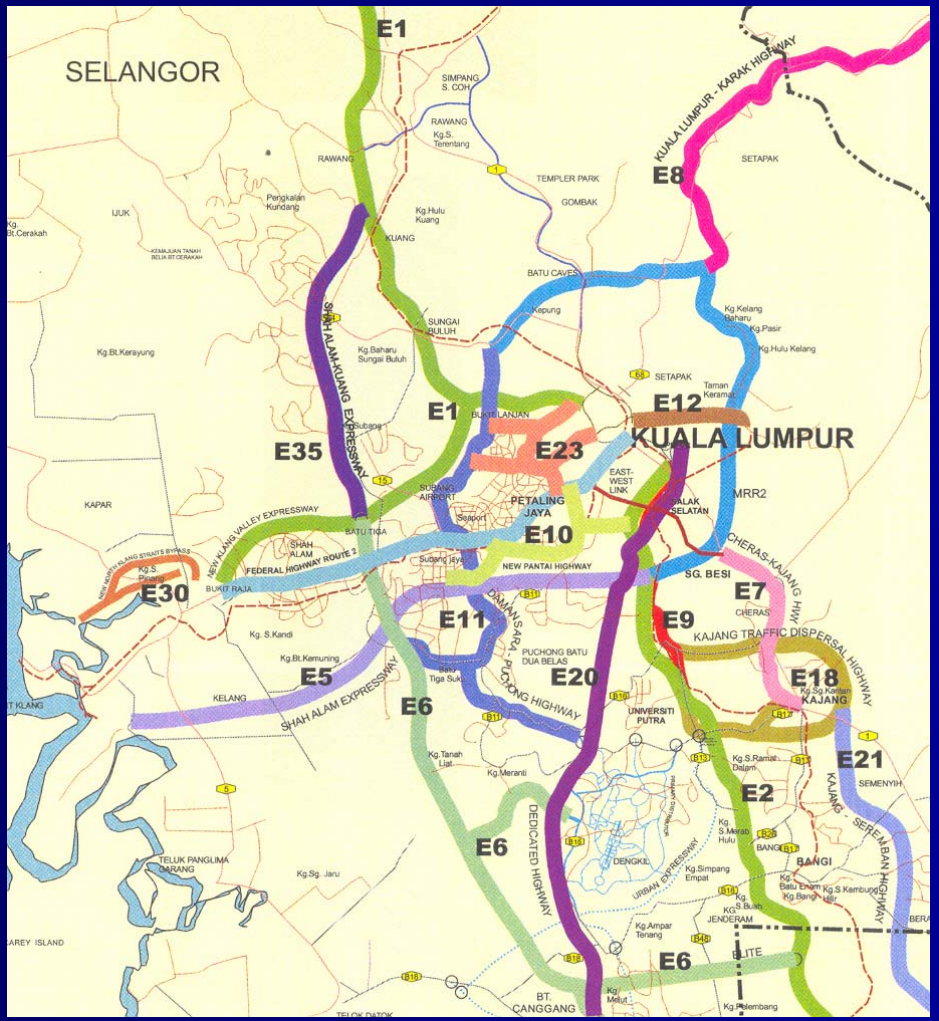
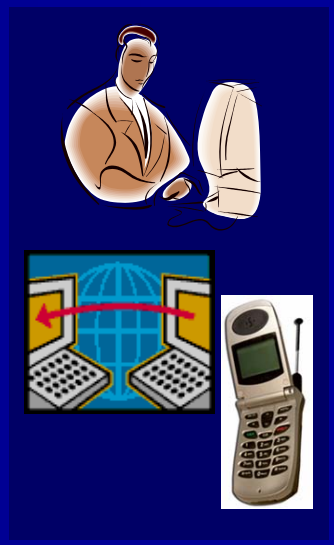
Road Map With Traffic Condition On The WEB



Role Play

KEMALANGAN JLN RAYA
DI SUNWAY
GUNA JLN ALTERNATIF

PUBLIC



LDP/SPRINT

KESAS

LLM TMC

Benefits Of ITS For All

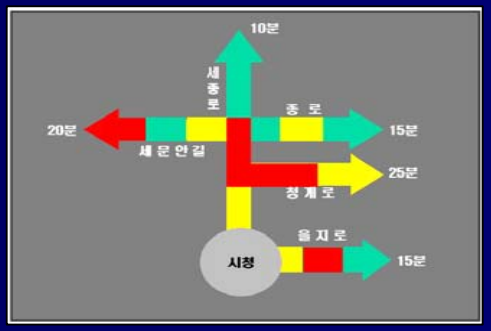
- Reducing Accidents
  - Incident detection and warning systems
  - Faster emergency response time
- Helping to Relieve Congestion
  - Demand management
    - Electronic payment
  - Network Efficiency
    - Incident detection and management
    - Driver information
  - Encouraging Modal Shift
    - Pretrip 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

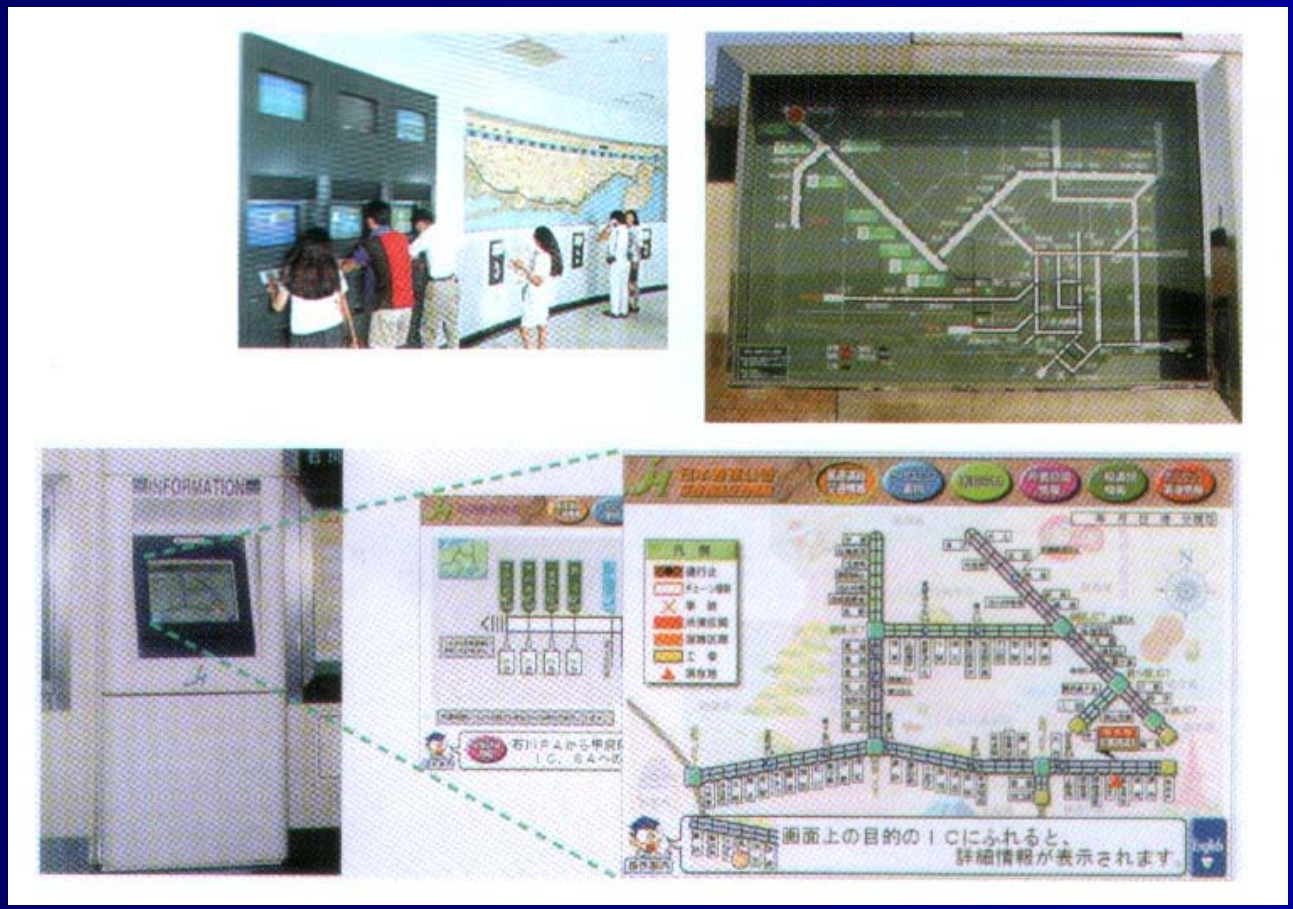
The Future



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

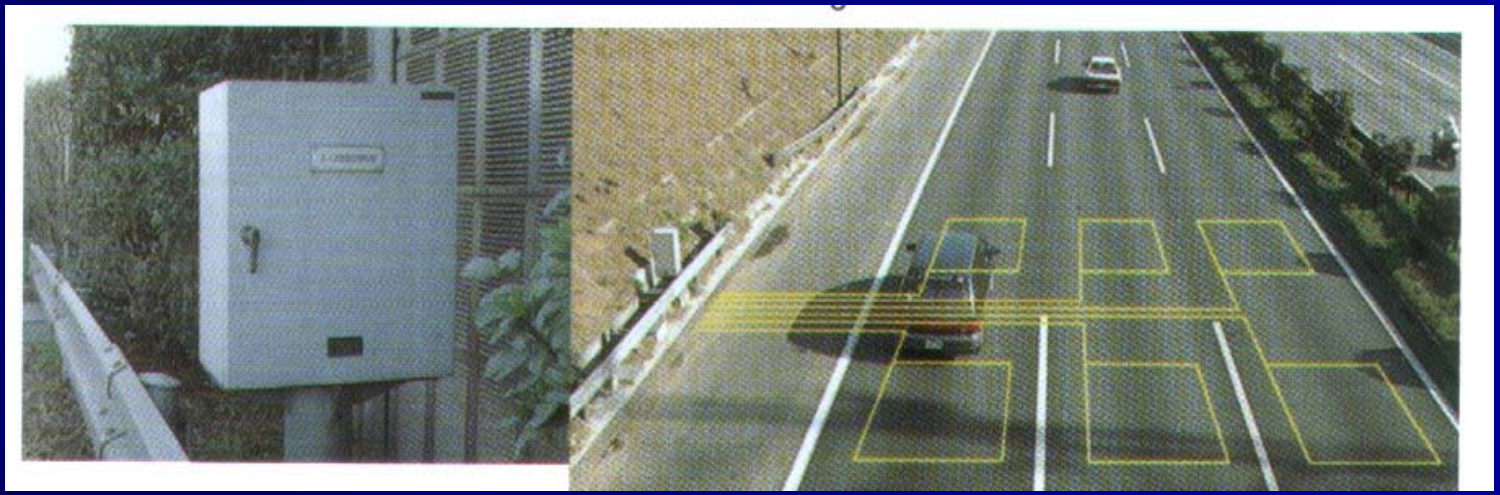
Vehicle Detectors

- 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.



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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.