HKIE Technical Seminar

Traffic Control and Surveillance System (TCSS)
Infrastructure, Challenges and Trends

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Traffic Control and Surveillance System

WHAT

Traffic Control and Surveillance System

WHAT

Centralized Computerized

Integrated **System** **Traffic**

Design & Implement **Control and Surveillance**

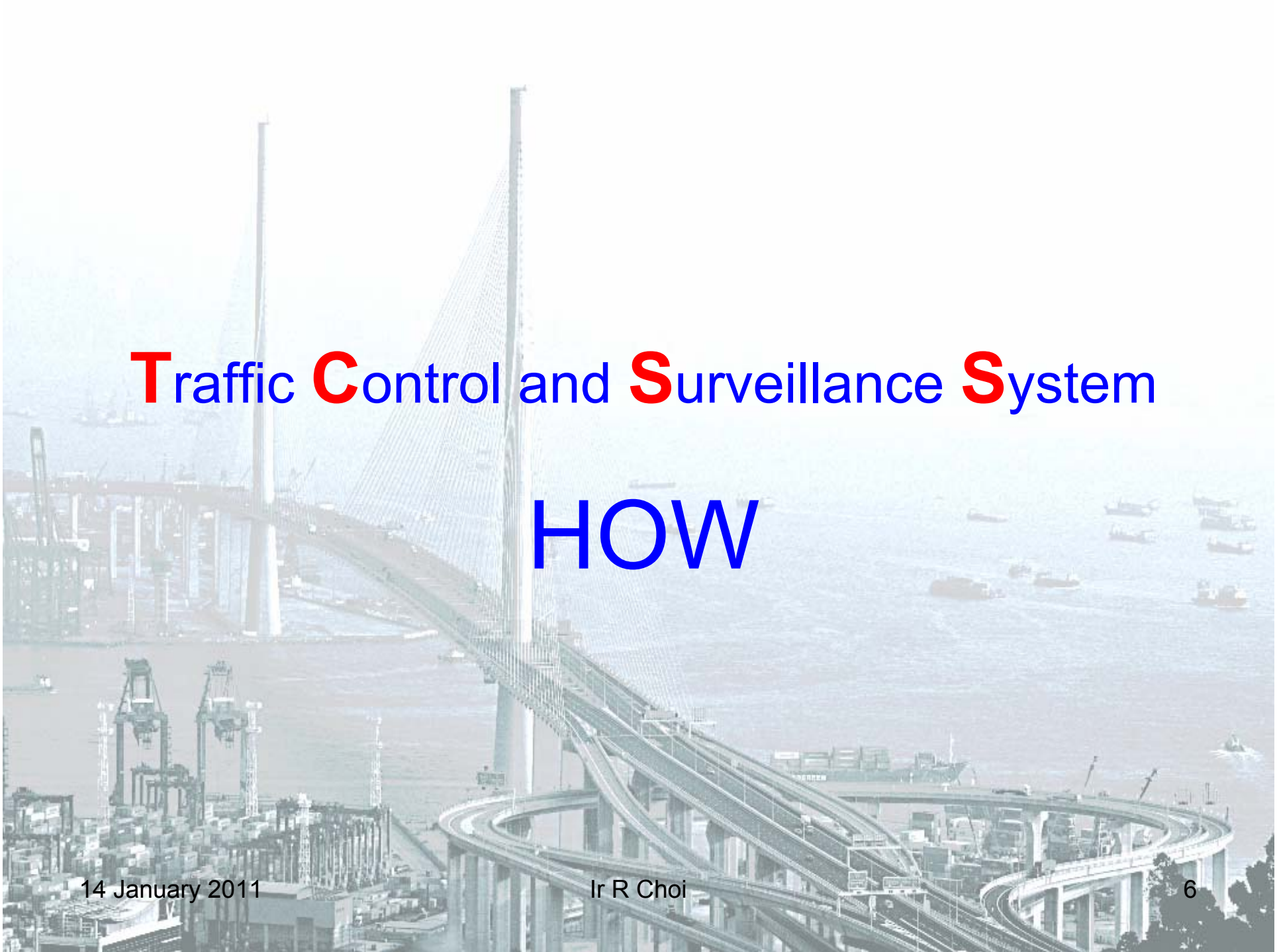
System Freeway **Traffic**

Traffic Control and Surveillance System

OBJECTIVES

Traffic Control and Surveillance System

OBJECTIVES



Traffic Control and Surveillance System

HOW

Traffic Control and Surveillance System

HOW

- Surveillance
- Lane Management
- Traffic Information Dissemination
- Tunnel Management
- Bridge Management
- Centralized Traffic Monitoring
- Speed Enforcement

Traffic Control and Surveillance System

HOW

- **Surveillance**
  - **CCTV System**
  - **Overheight Vehicle Detection System**
  - **Vehicle Detection System and Automatic Incident Detection System**
  - **Emergency Telephone System**
- Lane Management
- Traffic Information Dissemination
- Tunnel Management
- Bridge Management
- Centralized Traffic Monitoring
- Speed Enforcement

Traffic Control and Surveillance System

HOW

- Surveillance
- **Lane Management**
  - **Lane Use Signal**
  - **Traffic Plans**
- Traffic Information Dissemination
- Tunnel Management
- Bridge Management
- Centralized Traffic Monitoring
- Speed Enforcement

Traffic Control and Surveillance System

HOW

- Surveillance
- Lane Management
- **Traffic Information Dissemination**
  - **Variable Speed Limit Sign**
  - **Prismatic Sign**
  - **Fully Variable Message Sign**
  - **Radio Re-broadcast System and Public**
- Tunnel Management
- Bridge Management
- Centralized Traffic Monitoring
- Speed Enforcement

Traffic Control and Surveillance System

HOW

- Surveillance
- Lane Management
- Traffic Information Dissemination
- **Tunnel Management**
  - **15 Tunnels with TCSS**
  - **100% Surveillance Coverage**
  - **Contra-Flow Operation**
  - **Environmental Monitoring System (NO2, CO, Visibility)**
- Bridge Management
- Centralized Traffic Monitoring
- Speed Enforcement

Traffic Control and Surveillance System

HOW

- Surveillance
- Lane Management
- Traffic Information Dissemination
- Tunnel Management
- **Bridge Management**
  - **Tsing Ma Bridge & Kap Shui Mun Bridge firstly opened in 1997**
  - **Weather Management**
- Centralized Traffic Monitori
- Speed Enforcement

Traffic Control and Surveillance System

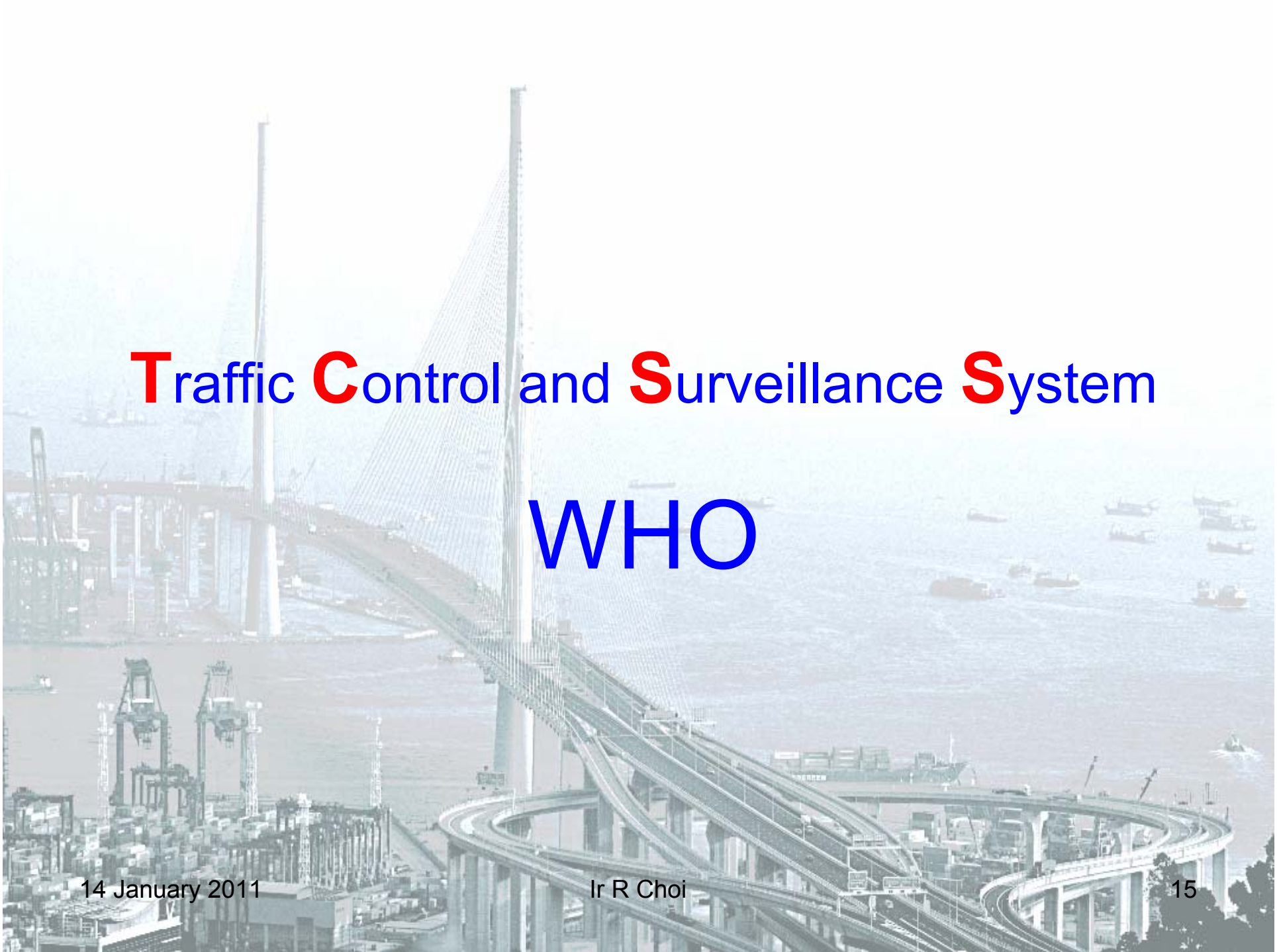
HOW

- Surveillance
- Lane Management
- Traffic Information Dissemination
- Tunnel Management
- Bridge Management
- **Centralized Traffic Monitoring**
  - **Traffic Management and Information Centre (TMIC)**
  - **ETCC in Transport Department**
  - **ETCC in Police and Highway Department**
- Speed Enforcement

Traffic Control and Surveillance System

HOW

- Surveillance
- Lane Management
- Traffic Information Dissemination
- Tunnel Management
- Bridge Management
- Centralized Traffic Monitoring
- **Speed Enforcement**
  - **By Police**
  - **By MOM Operator**
  - **Future integrate into TCSS**



Traffic Control and Surveillance System

WHO

Traffic Control and Surveillance System

WHO

Government	Planning new route
Government + TCSS Consultant	Control & Mangement Concepts
TCSS Consultant + TCSS Contractor	Design & Construction
TCSS Contractor + MOM Contractor	Operation & Maintenance

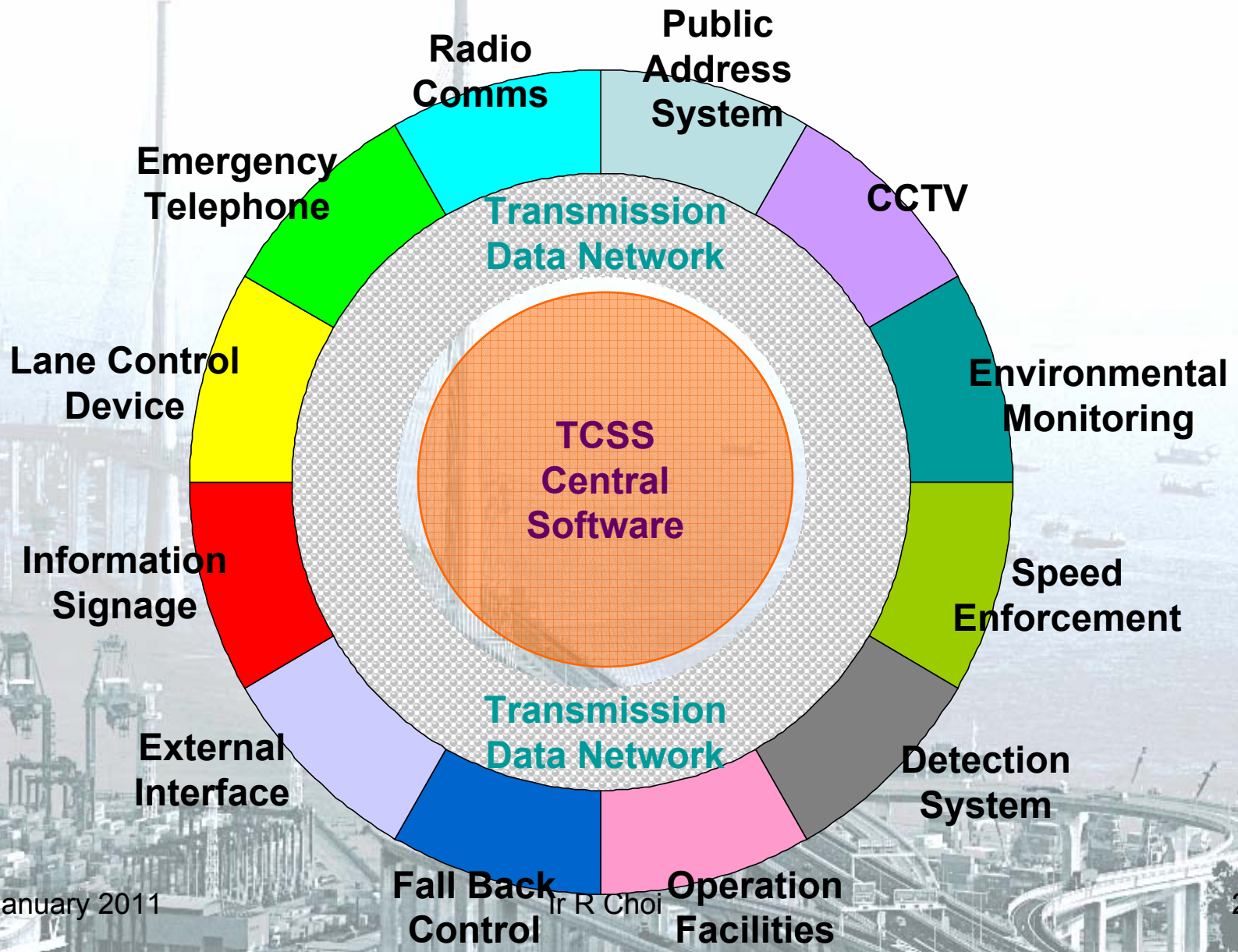
Traffic Control and Surveillance System

WHERE and WHEN

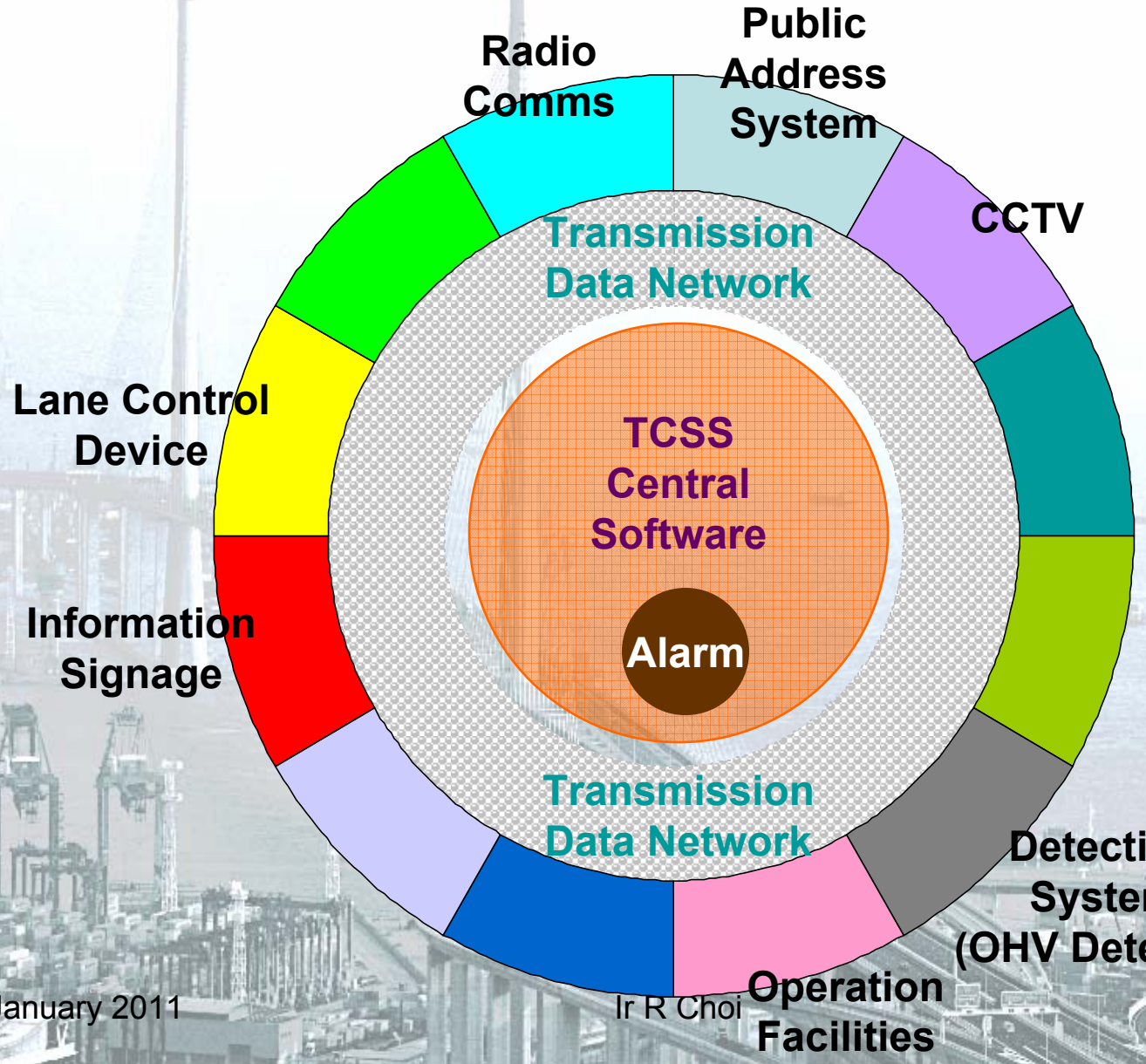
- [1989] Eastern Harbour Crossing
- [1990] Shing Mun Tunnel
- [1991] Tate's Cairn Tunnel
- [1997] Lantau Fixed Crossing and Route 3
- [1997] Western Harbour Crossing
- [1998] Tai Lam Tunnel and Route 3 (Country Park)
- [2001] Kai Tak Tunnel
- [2002] Tseung Kwan O Tunnel
- [2002] Tsing Yi North Costal Road
- [2003] Aberdeen Tunnel
- [2007] Deep Bay Link
- [2007] Lion Rock Tunnel
- [2008,2010] Route 8
- [2010] Cross Harbour Tunnel

Traffic Control and Surveillance System

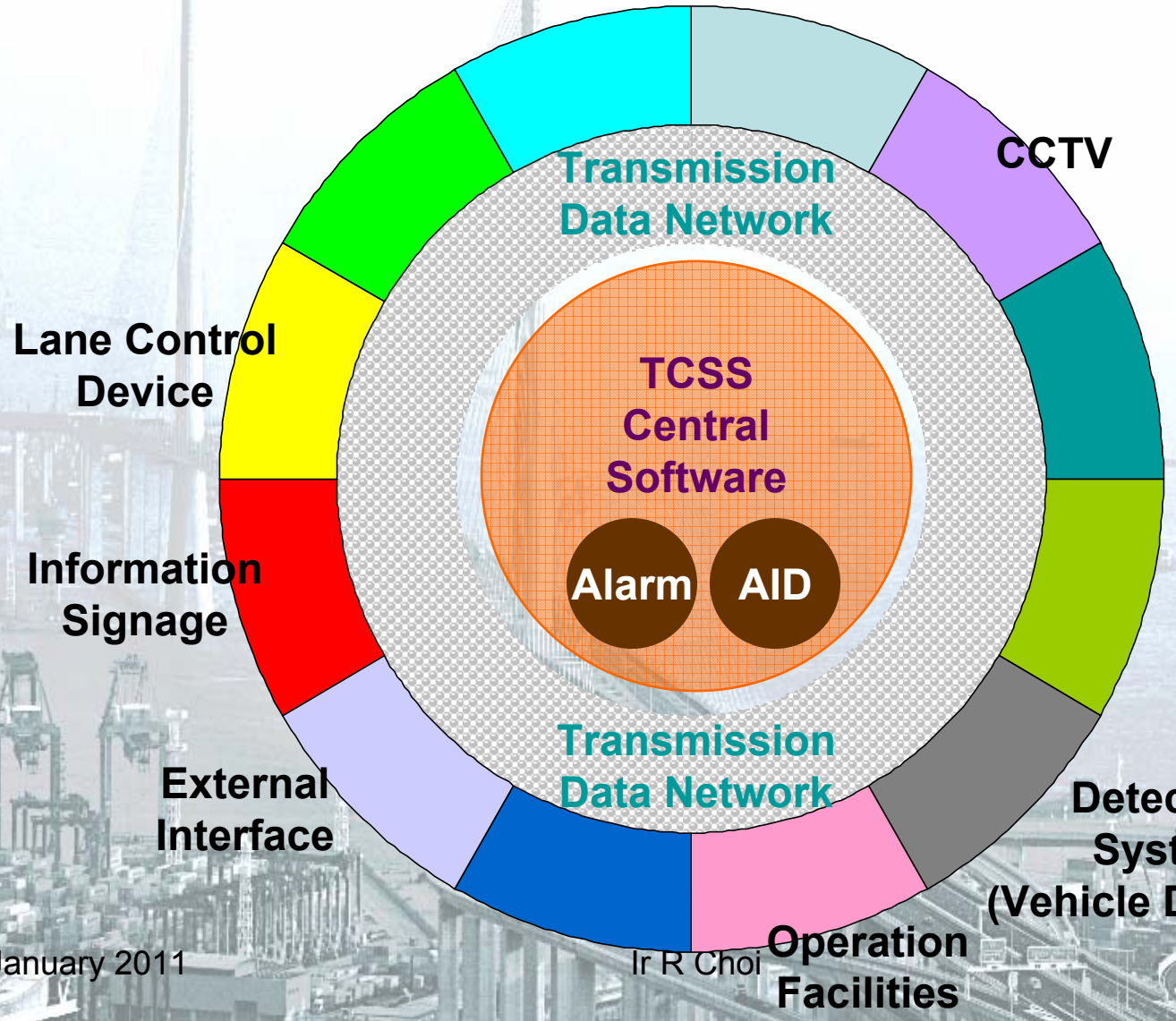
ENGINEERING


Radio Comms
Public Address System
Emergency Telephone
CCTV
Transmission Data Network
Lane Control Device
Environmental Monitoring
TCSS Central Software
Information Signage
Speed Enforcement
Transmission Data Network
External Interface
Detection System
Fall Back Control
Operation Facilities

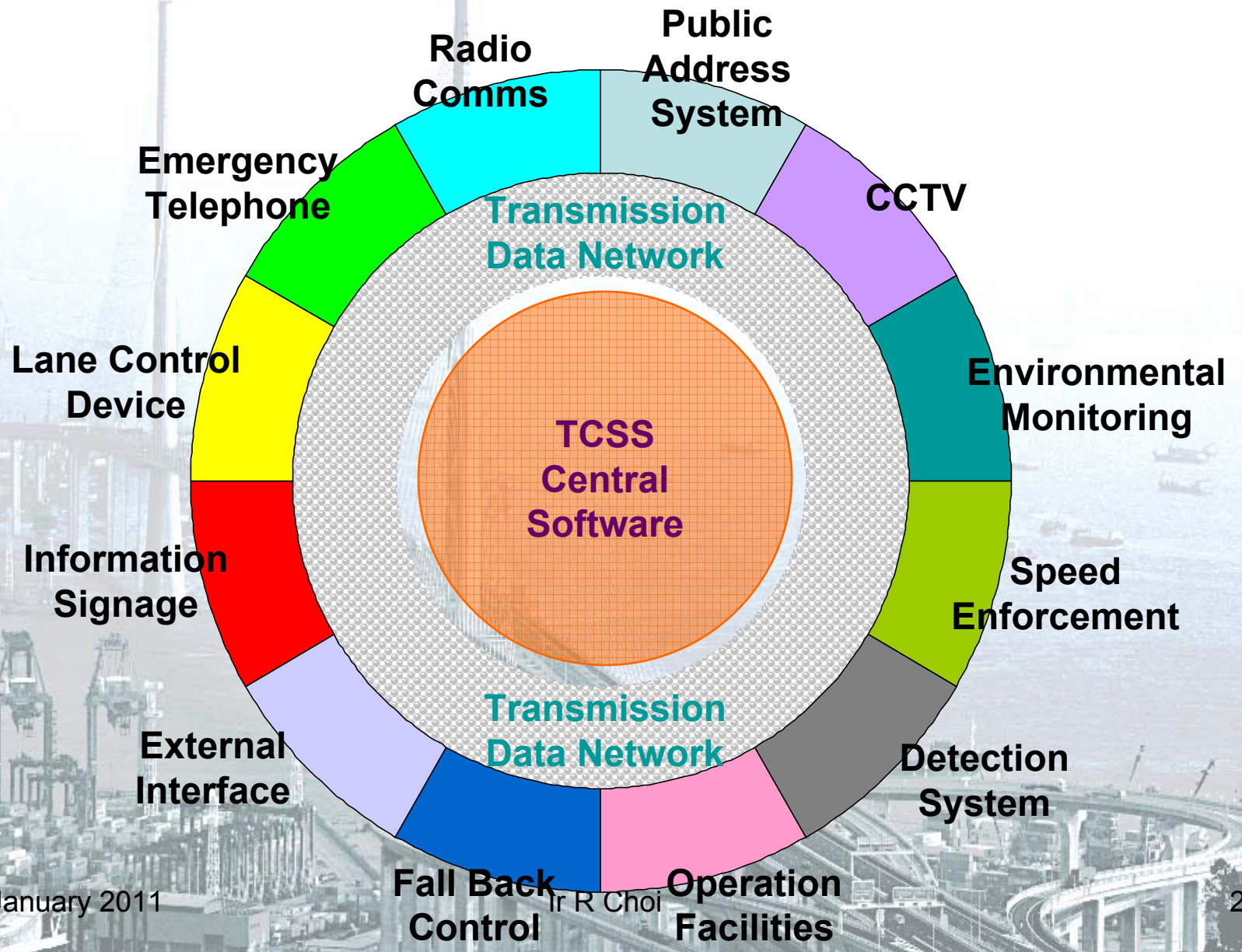
Example: Overheight Vehicle



Example: Congestion



Example: Central Software Failure



Traffic Control and Surveillance System

CCTV Surveillance Development

Analogue System ➔ Digital System

Tape Recording ➔ HDD Recording

Individual Network ➔ Integrated Network

Local Surveillance ➔ Pubic Broadcast

Limited monitoring points ➔ Multiple monitoring points

Operation Concern ➔ Public Concern (Privacy Zone)

CCTV Surveillance
Future

- Less Data Rate but Higher video quality
- Larger system size
- Rely more on Video Analytic and Auto-Detection
- Less Operator Patrol
- Video repeat to Public (TV, Internet, Mobile Phone)

Traffic Control and Surveillance System

Vehicle Detection and Automatic Incident Detection Development

Pavement Invasive Detector ➔ Non-Pavement Invasive Detector

Radio Frequency Detector ➔ Video Imaging Detector

Detection rely on single detector ➔ System-wide detectors

Detection based on variables ➔ intelligent algorithms

Constant logic ➔ Adaptive Logic

Traffic Control and Surveillance System

Vehicle Detection and Automatic Incident Detection

Future

- Integrate with CCTV System, share camera
- Integrate with JTIS
- Traffic Condition for General Pubic

Traffic Control and Surveillance System

Lane Use Signal and Info Signage Development

Light Source: Halogen ➔ LED

Routine Maintenance ➔ Maintenance Free

Proprietary Protocol ➔ Standard Protocol

Traffic Control and Surveillance System

Lane Use Signal and Info Signage Future

- More effective employment of LUS (educated public)
- Widely use of Fully Variable Message Sign
- Introduce new kinds of signs (eg. Speed Map)
- More ad-hoc informative message
- Quantity of signs increases

Traffic Control and Surveillance System

Transmission Data Network Development

Copper ➔ Fibre Optic

Purely wired communication ➔ Accept wireless communication

Individual Network ➔ Integrated Trasmission

Low Bandwidth ➔ High Bandwidth

Serial Data Transmission ➔ Ethernet Transmission

Proprietary Protocol ➔ Open Protocol / Standard Protocol

Traffic Control and Surveillance System

Transmission Data Network
Future

- Demand on bandwidth increases
(Operational demands and technical demands)
- Single, Integrated Network
- No longer limited to independent LAN
- Security Issues
- Flexible for Expansion and Integration
- Wireless Communications

Traffic Control and Surveillance System

TCSS Central Software

Development

Single Redundancy level ➔ Multi-level redundancy

Schematic Graphical User Interface ➔ Map-based GUI

Un-Editable Database ➔ scaleable and Expandable

Sub-systems: Individual GUI ➔ Integrated GUI

Pre-defined Traffic Plan ➔ Rule-based Traffic Plan

Traffic Control and Surveillance System

TCSS Central Software

Future

- More Automation, less human interfere
- Single System for multiple sites
- Operation Control share among on-site and off-site centres
- Off-site maintenance

Traffic Control and Surveillance System

Voice Communications

(Radio Comm + Emergency Telephone + Public Address System)

Development

Analogue System ➔ Digital System

Individual Network ➔ Integrated Network

Open area ET ➔ Tunnel only ET

Voice Archive no compression ➔ compression

No Redundancy ➔ Redundant PABX and self healing

Traffic Control and Surveillance System

Voice Communications

(Radio Comm + Emergency Telephone + Public Address System)

Future

- Voice Sub-systems merge into a single voice system
- Digital, Encrypted Voice System
- Integrated with Mobile Phone
- Emergency Telephone System – fade out

Traffic Control and Surveillance System

CHALLENGE

Traffic Control and Surveillance System

CHALLENGE

- Environmental
- Maintenance
- Public Awareness

Traffic Control and Surveillance System

Environmental

- Energy Saving

  Use of LED, multi-level dimming

- Equipment Saving

  Integrated system design, common network, common workstation

- Material Saving

  Replace copper by fibre, integrate data transmission, 3 in 1 signal head

- Upgrade and Expand

  Modular design, standard protocol

Traffic Control and Surveillance System

Maintenance

- Maintenance and Repair
  - Public monitor on faulty equipment
  - Public rejection on road works
- Maintenance Free
  - Lubricate, replace consumable parts
- Cost
  - Maintenance Cost, traffic impact, accident cost

Traffic Control and Surveillance System

Public Awareness

- Privacy Issue
  - Example: Electronic Road Pricing
  - Example: Journey Time Indication System
  - TCSS: Surveillance Camera
- Road Works
  - More concerns and voice on TTA
- Information dissemination
- Public Expectation vs Technical Limitation

Traffic Control and Surveillance System
Hong Kong

- TCSS in Hong Kong since 1989
- Quietly serve Hong Kong Traffic: the most effective and efficient road network around all neighbouring cities
- Benchmark and Model for many other cities
- New TCSS to come

  Central-Wan Chai By-pass, Tuen Mun Road Widening,
  Tolo Highway Widening, Central Kowloon Route

- Expand and Connect to neighbouring cities

  Hong Kong – Zhuhai – Macao Bridge


Traffic Control and Surveillance System
THANK YOU