AP 2021
ITS Asia Pacific Forum Brisbane

17th Asia Pacific Forum on Intelligent Transport Systems

Brisbane Convention & Exhibition Centre
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The current ITS status in Korea

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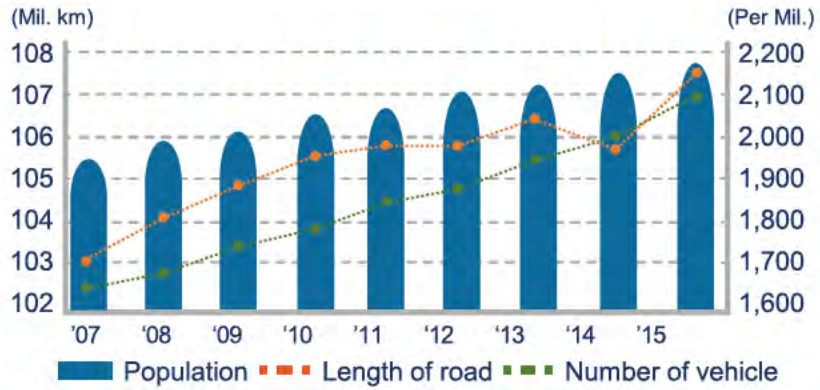
#ITSAP2021

CONTENTS

Background

Background

Increase Rate(Population, Road, Vehicle)



Overpopulated in Metropolitan Cities

- Seoul Metropolitan 52.4%
- Busan / Ulsan Metropolitan 14.3%
- Daegu Metropolitan 7.4%
- Daejeon Metropolitan 5.8%
- Gwangju Metropolitan 3.4%

Five Metropolitan Areas, 83.4%

Pollution

Congestion

Accident

Background

“Resolving Transportation Problems by Introducing ITS”

Options

Construct new roads

- Covered in geometric design
- Not likely to happen on a large scale (Cost, Time)

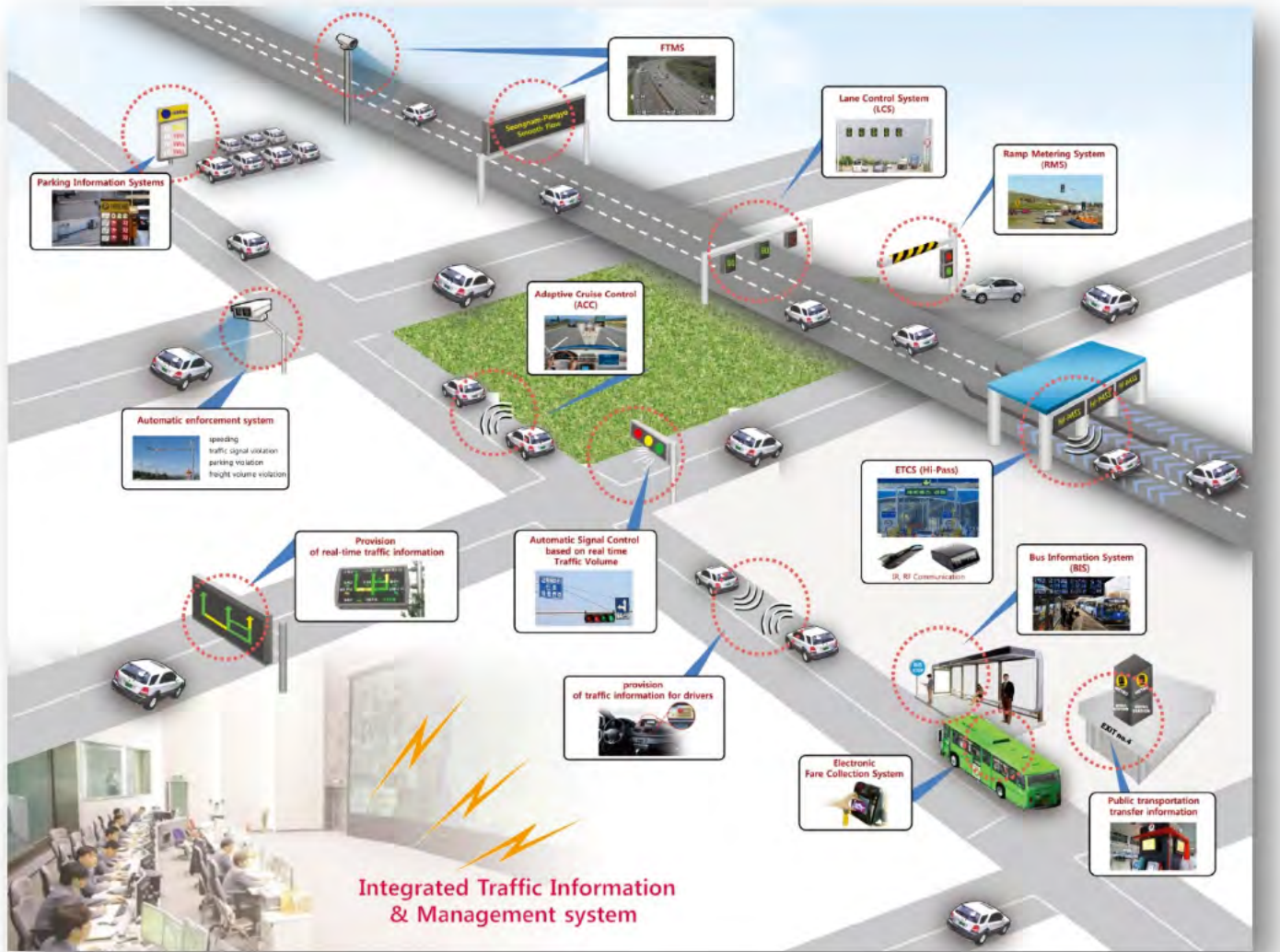
Reduce Traffic

- Transportation Demand Management
- Alternative transportation

Increase existing infrastructure capacity

- Uses Intelligent Transport Systems(ITS)

Background


FTMS
Lane Control System (LCS)
Ramp Metering System (RMS)
Parking Information Systems
Adaptive Cruise Control (ACC)
Automatic enforcement system
speeding
traffic signal violation
parking violation
freight volume violation
ETCS (Hi-Pass)
IR, RF Communication
Provision of real-time traffic information
Automatic Signal Control based on real time Traffic Volume
Bus Information System (BIS)
provision of traffic information for drivers
Electronic Fare Collection System
Public transportation transfer information
Integrated Traffic Information & Management system

The Effects of the ITS

Improvement

The number of Public Transportation Passengers

Economic

High-benefit cost ratio

Use only 1% of road construction costs to reduce 20% of traffic jams B/C for ITS deployment by each city : 2.2~6.2

Seoul 2.27, Daejeon 5.2,
Ulsan 4.64, Suwon 2.39,
Jeonju 2.9, Jeju 6.2

$11.8B worth of Social benefits per year

Increase travel speed by 15~20%

Effect on ETCS(Hipass)
Tollgate passing time : 14sec to 2sec. reduce (improvement of 85.7%)
Social benefit : USD 9.6M/year

Safe

Number of fatal accidents

Convenience

Citizens Satisfaction

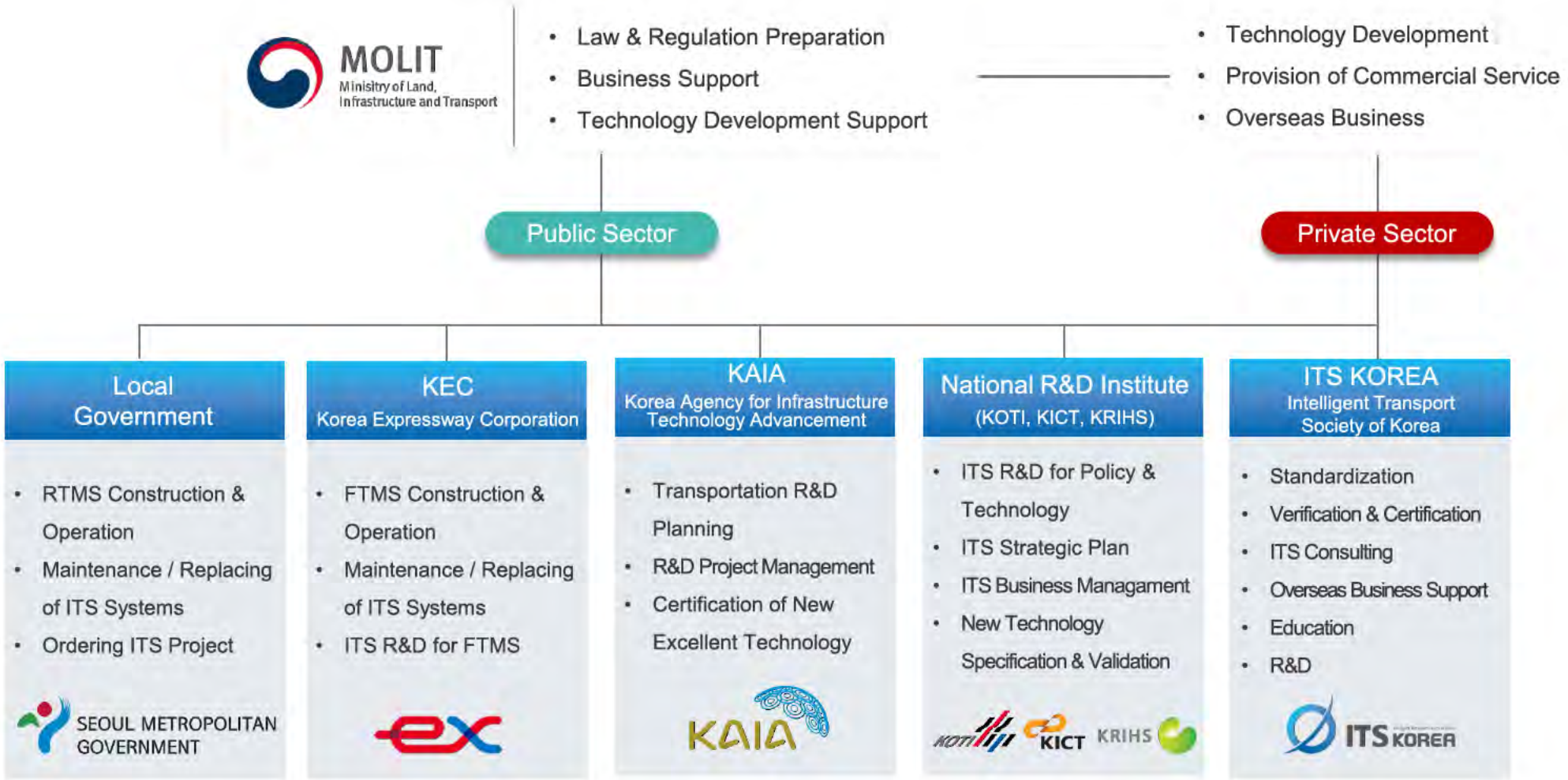
Eco-Friendly

Reducing greenhouse gas & oil consumption

Reducing greenhouse gas And oil consumption based on decrement of traffic congestion and idling

Per 1,000km of road covered with ITS
☞ Annually 19,000 tons reduced through ETCS service
☞ Annually 2.3 tons reduced

Collaboration with Relevant Organization



Milestones of ITS in Korea

1993-1998 — 1 STAGE Introduction

- **1993** Review of ITS by the presidential SOC Investment Plan Group
- **1994** FTMS Pilot Project (Gyeongbu Expressway)
- **1997** Establish 1st National ITS Master Plan
- **1998** ITS Pilot Project (Gwacheon)
- **1998** Hold the 5ths ITS World Congress

1999-2004 — 2 STAGE Foundation

- **1999** Enactment of the Transportation System Efficacy Act
- **1999** Development ITS Architecture
- **2001** Establish 2nd National ITS Master plan
- **2001** Hi-pass (ETCS) Pilot Project
- **2002** National ITS Standardization Plan Established
- **2003** Project on Establishing ITS Model City (Jeonju, Daejeon, Jeju)
- **2004** ITS Implementing on Seoul Urban Expressway

2005-2010 — 3 STAGE Growth

- **2005** Bus Information System (BIS) Pilot Project (Suwon-Sadang)
- **2006** Five ITS Centers of Regional Administration Established
- **2007** Nationwide Expansion of ETCS
- **2009** Revision of National Transport Efficiency Act
- **2009** Deployment of ATMS by Local Government
- **2010** Hold the 17th ITS World Congress in Busan

2011-Present — 4 STAGE Next Generation

- **2012** 54 Traffic Information Centers (BIS Centers) in Operation
- **2012** Establish ITS Masterplan for Vehicle and Roads 2020
- **2013** Research on Introduction Plan for C-ITS
- **2014** SMART Highway Project
- **2014** Private-Public Cooperation in Traffic Information (MoU)
- **2016** C-ITS Pre-Deployment Project
- **2016** R&D on Cooperative Automated Driving Roadway System(C-ARS)

Legal Basis

National Integrated Transportation System Efficiency Act

- In order to improve the efficiency, integration, and connectivity of the transportation system, the law stipulates clauses necessary for land, sea, and air traffic policies
- Promote the convenience of people's lives and contribute to economic development

[Article 73] Establishment of ITS Basic Plan

- In order to facilitate the dissemination of ITS development, establish a national-level basic plan 10 years
- Review and modify the ITS basic plan every 5 years considering changes of condition

[Article 74] ITS Planning of Government

- Mayors and governors can establish a basic plan for ITS corresponding areas
- However, ITS local plans should be established before the project is implemented when trying to enforce the ITS project

2000 **ITS Masterplan 21**

2011 **ITS Masterplan 2020**

Plan for ITS Integration of Land, Sea, and Air Transport

2012 **ITS Masterplan 2020** by sectors

2020 ITS Plan for Vehicle and Road Transport

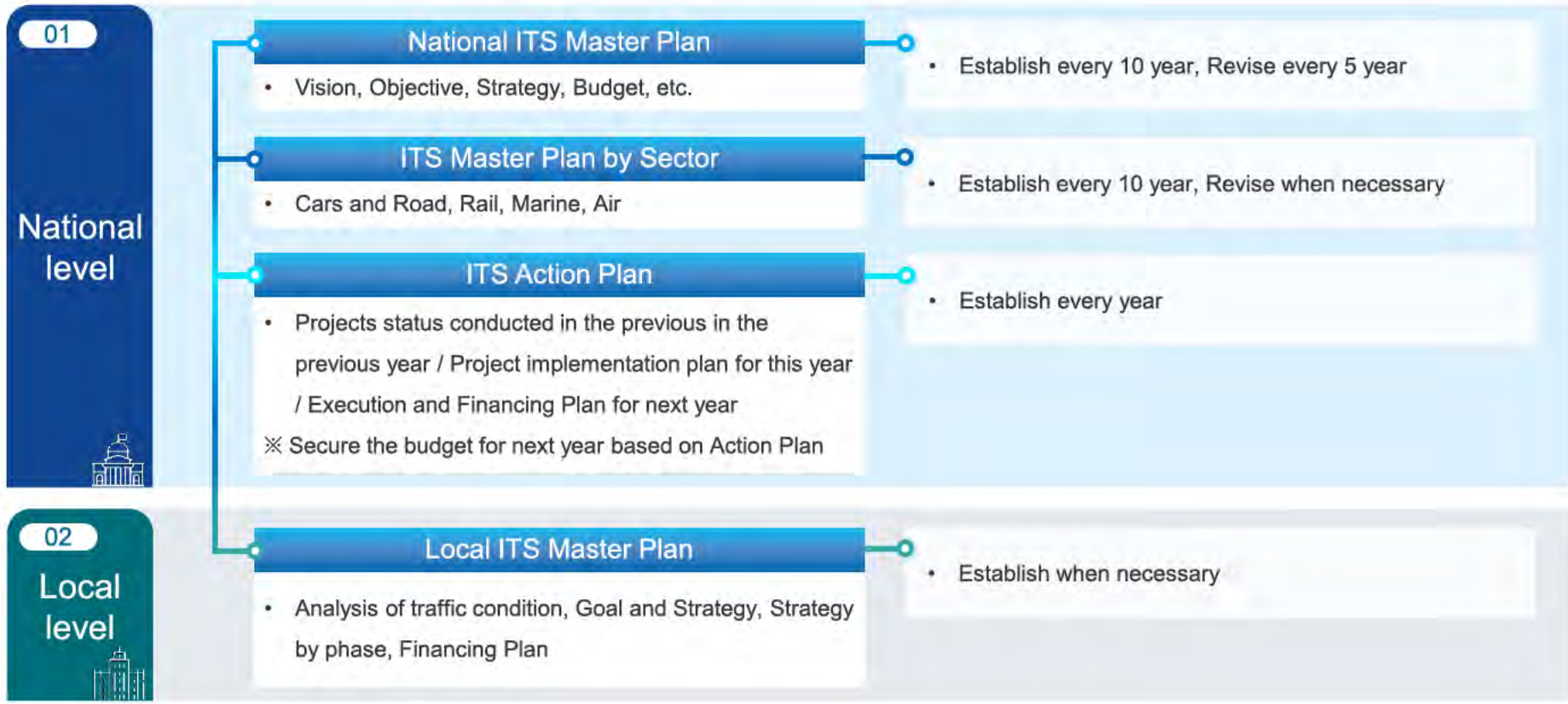
2019 **ITS Masterplan 2030** Ongoing

Plan for ITS Integration of Land, Sea, and Air Transport

Legal Basis

ITS Master Plan

- Roadmap for Systematic and Efficient Implementation of ITS(Intelligent Transport Systems)



Legal Basis

National ITS Master Plan 2030

Objectives

- Establishment of “ITS Master Plan 2030 for Vehicles and Road Transport” based on the “National Transport System Efficiency Act”, considering current and future circumstances and trends
- Proactively conduct research for revision of the existing Act.
- Provide an institutional basis for the sustainability of ITS business and activation of related industry

Target Area & Period

- Target area : Nationwide road networks including expressways, national highways and urban roads
- Target period : 2020~2030 (10 years)

Scope of the Work

- Outline and background of the plan
- Investigation of the domestic and overseas situation and drawing implications
- As-is analysis on ITS for vehicles and road transport
- Establishment of the plan
- Improvement of legal basis for ITS

ITS Architecture

Definition

- The national ITS architecture is a framework that defines services and functions provided by ITS, divides the boundaries of services / functional areas, defines participants and organizations for each area, and expresses their roles and mutual cooperation system.

Roles of National ITS Architecture

National ITS Architecture

1 Foundation to Ensure Interoperability and Compatibility

- Defining object and methods for information connection
- Framework of standardization for interoperability

2 Supporting ITS Planning and Designing

- Defining ITS services in detail :
- Providing the Physical elements of the systems that are built and operated by implementing body
- Defining both systems to be connected and information to be shared

3 Avoiding Duplicate Investment & Defining All Necessary Service

- Identify the shared elements for connecting information
- Defining roles and cooperative relationship among relevant organization

ITS Architecture

Types of ITS Architecture

Service

- Describe services provided by the system from a user perspective by accepting the service definition defined in the national basic plan of intelligent transport systems

Logical Architecture

- It defines the functions and data flow for unit service implementation. It consists of function definitions, data flow definitions between functions, data flow specifications, and data flow diagrams.

Physical Architecture

- For the unit service implementation, the function defined in the logical architecture is assigned to the physical component and the information flow from the data flow to the physical component is defined.
- It defines the media and communication system of information flow between physical components.

Business Architecture

- It defines the units (systems) to be constructed and operated for the provision of services, and regulates laws, systems, project implementation frameworks, and management areas.
- Derive information linkage (message flow) between systems from information flow and show it as AFD (Architecture Flow Diagram)
- Provide associations with ITS standards by indicating relevant ITS standards on AFD
- Compose business unit (system construction, operation unit) by examining the degree of sharing of functional and physical components between unit services, business implementation frameworks, and management areas.

ITS Standardization

Why is ITS Standardization necessary?

01 ITS Project Object	1 System Implementation	2 System Operation	3 Service Quality Upgrade
02 Evolution of Concept	▪ ITS installation is led by the government ▪ Diverse ITS systems and services are used	▪ Connection among various ITS systems becomes important ▪ Traffic information service is provided (integrated links) ▪ Understanding & compliance to standards is necessary	▪ Private companies provide ITS service and service quality is upgraded ▪ ITS quality and performance are upgraded. ▪ Active participation in ITS standardization
03 Standardization	Diverse Specifications of Systems	Connection of Information	System Stabilization, Sale of high quality products

ITS Standardization

Technical Regulation

- MOLIT established 6 technical regulation as the national standards for nation-wide interoperability and compatibility between ITS system.

Number of Publication	Title
2016 - 206	**The Basis Traffic Information Exchange Ⅰ**
2016 – 186	**The Public Transport(BUS) Information Exchange**
2016 – 207	**The Basis Traffic Information Exchange Ⅱ**
2013 – 251	**ETCS Information Exchange by DSRC [RSE-OBU]**
2016 - 208	**The Basis Traffic Information Exchange Ⅳ**

De-facto standards

- 65 de-facto standards oriented ITS industries are established and disseminated as of DEC.2014.
- These are about Requirements, Message sets, Conformity and Performance test and etc.

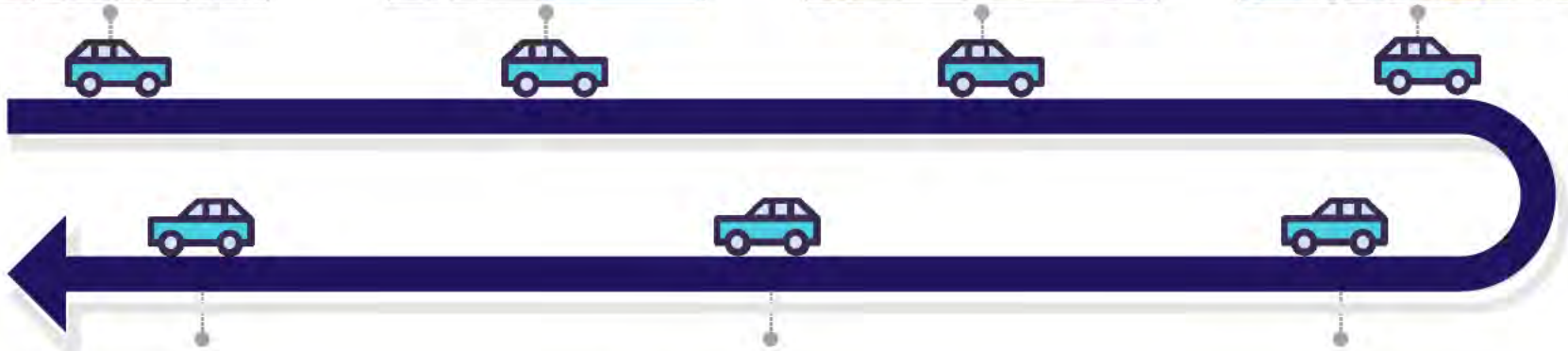
Korean ITS Service Architecture

Public Transportation Provide Bus Information
- Manage bus operation
- BRT system

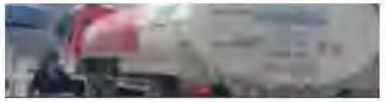
Traffic Management
- Traffic control & providing traffic information
- Manage traffic incidents
- Real-time adaptive control
- Automatic enforcement

Traffic Information Center
- Integrated management ITS
- Monitoring real-time traffic condition and Providing traffic information(VMS, Internet, App)
- Exchange traffic information

Electronic Payment
- ETCS(Electronic Toll Collection System) : Hipass
- AFCS(Automatic fare collection System) for public transportation



Traveler Information
- Car navigation

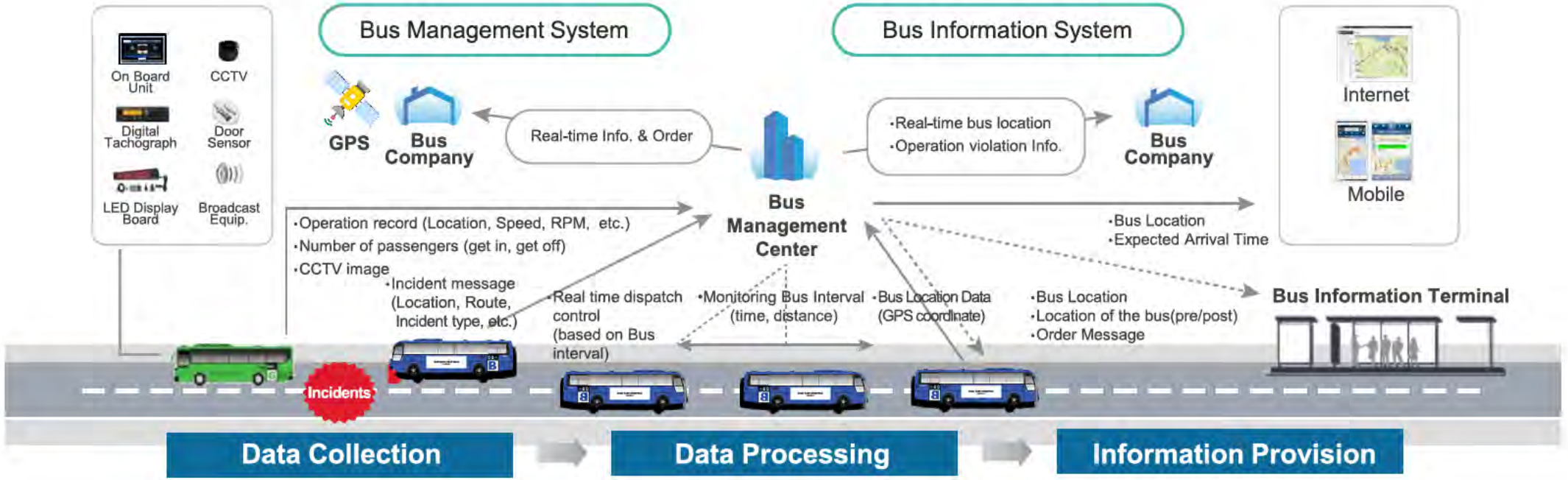


Commercial Vehicle Operations
- Manage freight vehicle
- Manage hazardous materials

Intelligent vehicle & Road
- C-ITS
- Autonomous driving & road

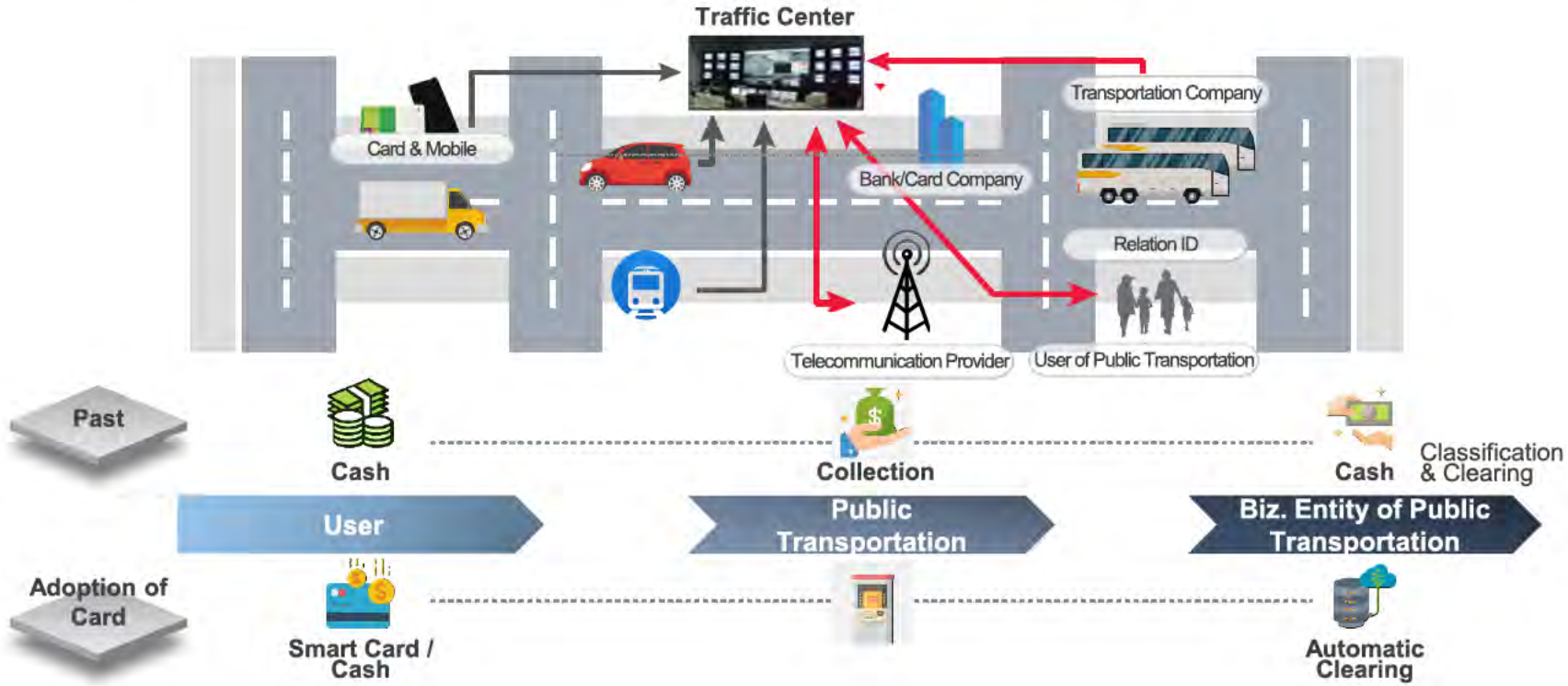
Bus Information Management System(BIMS)

- Bus Information Management System(BIMS) tracks buses' location and status in real-time to improve punctuality of bus operation
- Also, It disseminates real-time bus information through the internet, mobile app Bus Information Terminal(BIT) to improve convenience of users
- BIMS is operating in 69 local governments and continue to expand



Automatic Fare Collection System(AFCS)

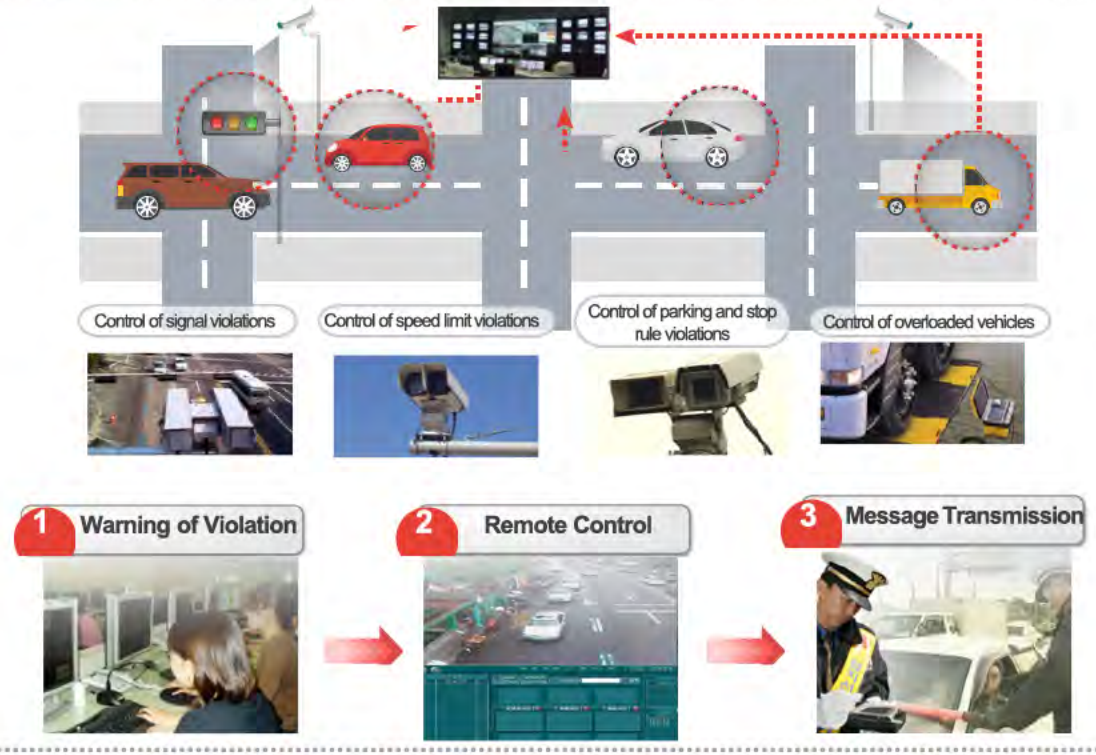
- AFCS is a payment service that allows to pay for all the public transport modes with one card
- Improve convenience of public transport by using Electronic Transport Card to pay fare
- It supports automated and optimized processes for full-fledged internal/external handling of automated fare clearing
- In Seoul, smart card use for Bus is 98.9% and for subway is 100% (as of '17.12)



Automatic Traffic Enforcement System(ATES)

- ATES is a system to enforce violation on the roads including speeding, signal violation, illegal parking and overloaded vehicles
- It contributes to smooth traffic flow & accident prevention by securing the road capacity through enforcement

Traffic Management Center



Improved Road Capacity

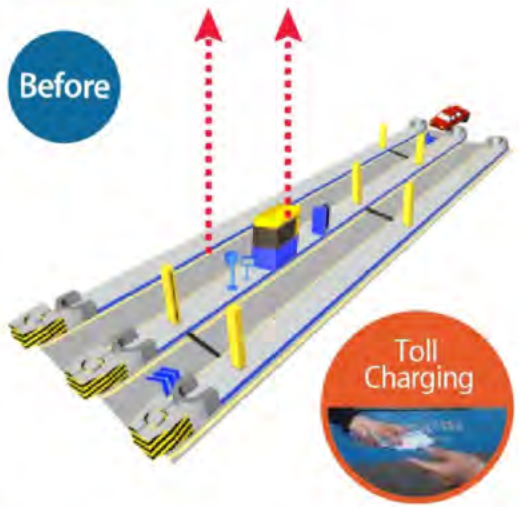
Electronic Toll Collection System(ETCS)

- ETCS is a toll payment system using DSRC to avoid unnecessary stopping at the toll booth
- As of Mar.2018, It has been installed in 43% of toll booths and 78% of the users has been using it to pay toll fees for toll roads

TCS Vehicle Process

TCS Charging Data

Toll Center



" TCS capacity : 450 vehicles /hour "

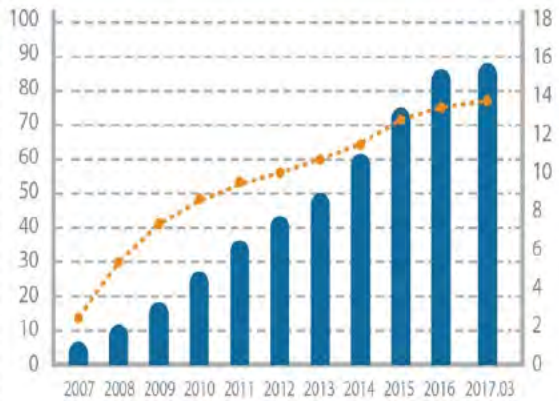
ETCS Vehicle Process

ETCS Charging Data

Toll Center

" ETCS capacity : 1,800 vehicles /hour "

Hipass Usage & OBU Sale

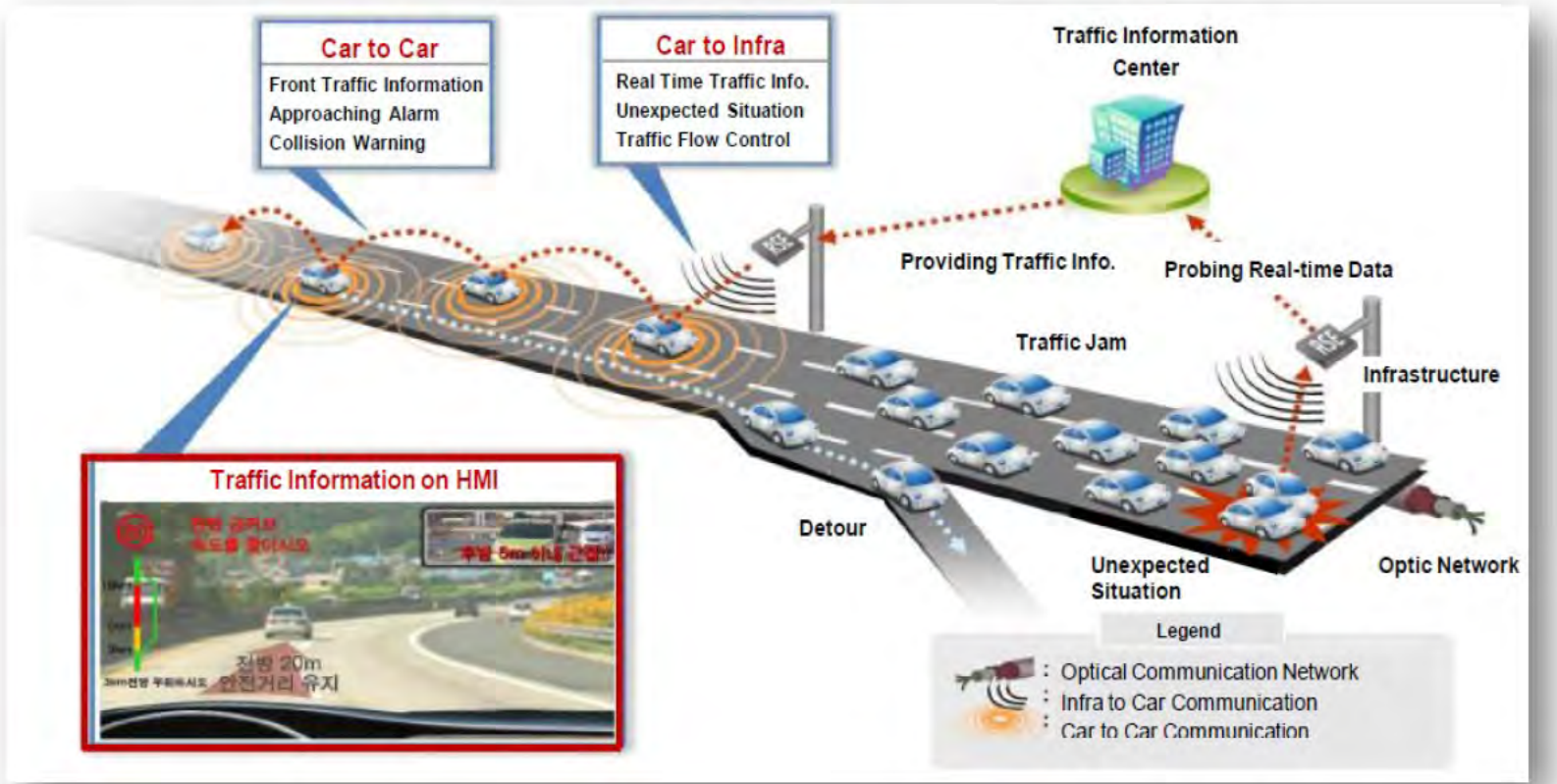


Installed on all expressway

It is very efficient to use those Hipass OBU equipped cars as a probe car data for traffic management

Why needs C-ITS?

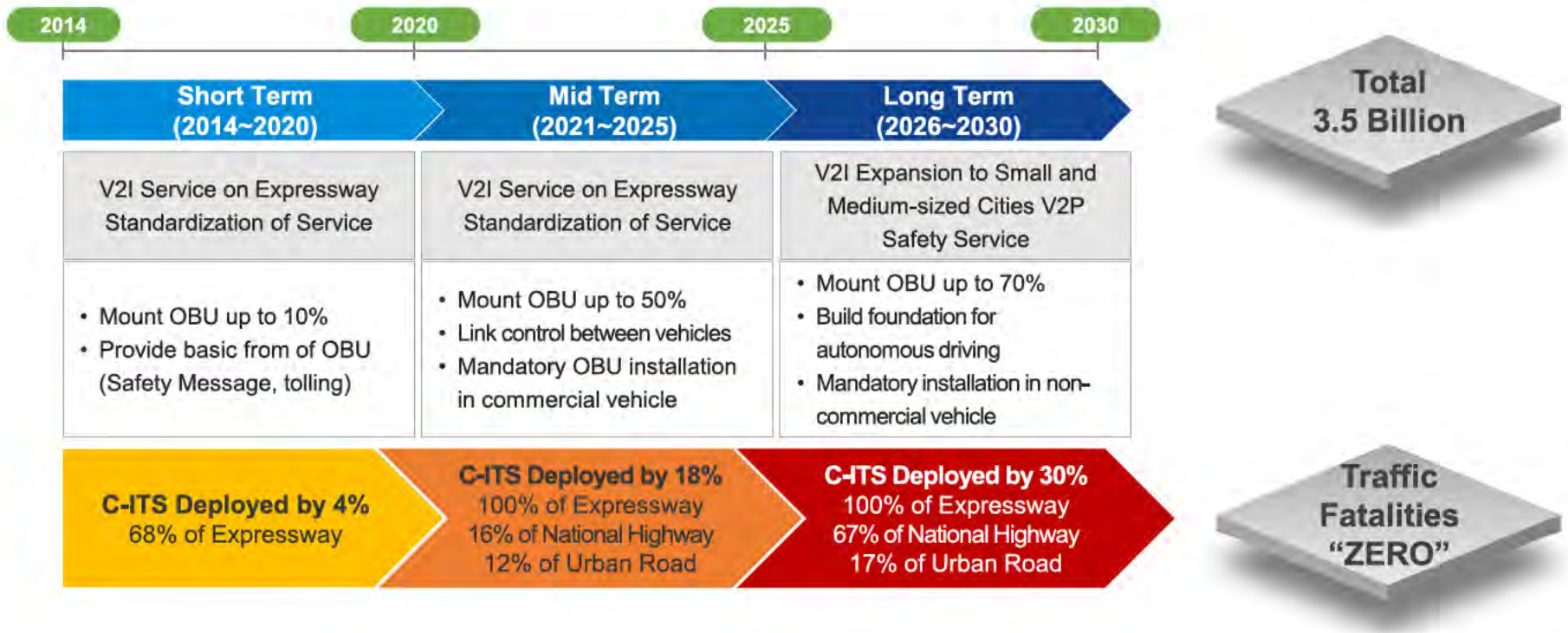
- New Paradigm for ITS providing a service on the open platform
- Focusing on Safety, Mobility, Sustainability
- Improving Road Safety by V2V, V2I and V2P communication



C-ITS Pilot Project

- **Object** : Verifying technologies and services and laying the foundation for C-ITS deployment
- **Period** : July. 2014 ~ Dec. 2017
- **Area** : 88km long on expressway near Sejong city and Daejeon city, national Highway and urban road

C-ITS Master Plan



The Expected Effects of the C-ITS

- If C-ITS is deployed as a Master Plan, it is expected to provide numerous benefits, such as reducing accidents by 46%, social cost savings of 28%, and increasing speed by 30% 2030

Accident

181,391 (2011) → Reduced by 46% → 97,425 (2030)

Speed

20km/h (2011) → Improved by 30%(Urban) → 26km/h (2030)

Social Cost

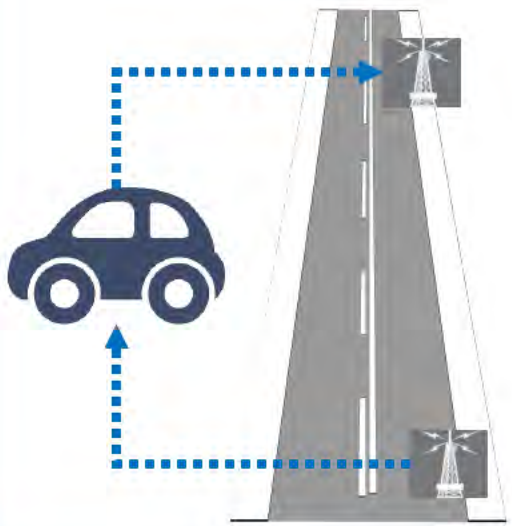
USD 12.7B (2011) → Reduced by 28% → USD 9.1B (2030)

Future Trend on Digital Road in Korea

Korea New Deal **ITS Master Plan 2030**

Digital Road Platform

Cooperative Automated Driving | **Shared Mobility** | **Green Mobility**



Components

AI, IOT, VR | **Big Data** | **Communication** | **Clouding**

- HD digital road map
- Connected Vehicle-Road- Pedestrian based on WAVE, 5G
- Traffic big data based image processing
- IOT based Road Facilities
- Data Security

AI based road operation maintenance

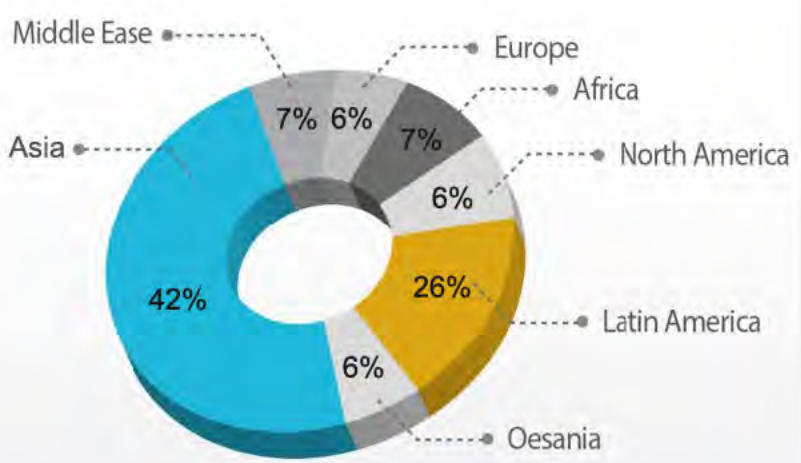
- Transport digital twin
- Traffic and signal control
- Automated facilities maintenance
- Incident managements

Regulations and Guidelines

International Cooperation

- Korean ITS exported to 44 countries since 2006
- As of March 2018, a total of about 136 projects have been conducted including ETCS (Electronic Toll Collection System), ATE(Automatic Traffic Enforcement), AFC(Automatic Fare Collection), ATMS(Advanced Traffic Management System) and PIS(Parking Information System), WIM(Weigh in Motion)

Export by Continent (based on number of Project, %)



Measure 1 : Exchange of Information

Global Cooperation

Objective

- To provide the opportunities for sharing ITS technologies and experience, and business matchmaking

Global Cooperation to provide the chance to share ITS Knowledge and Experience

- Host ITS Roadshow hosted 29 times in 23 countries which are evaluated as potential export market, since 2009
- Organize Exhibition and Seminars to promote ITS technologies and services
- Hold Invitation Workshop to provide professional training course for sharing ITS policy and technologies

ITS Roadshow

Exhibition

ITS Invitational Workshop

Measure 2 : Consulting Service

Consulting Service

Objective

- To provide a consulting service customized for other countries
- To conduct ITS Feasibility Study (F/S)

MOLIT's Infrastructure Master Plan Support Project

- Ministry of Land, Infrastructure and Transport (MOLIT) in Korea will strengthen the mutual cooperation in Transportation Infrastructure among overseas countries **by supporting financially and technically in building ITS Master plan based on full experience of Korea**
- Ongoing similar project : Establishment of ITS Master Plan for Medellin, Colombia
- Requirements : Strong willingness and interest from Recipient Country

  ex) An official letter from Ministry of Transportation and Communications

Measure 3 : Capacity Building

ITS Workshop Program

Objective

- To provide a training program to build capacity for ITS/Transportation officials
- To strengthen bilateral cooperation in ITS between countries

Module	Main Lecture	Technical Visits
Module 1. Overview of ITS in Korea	• Milestones of ITS in Korea - From Introduction to current development • Overview of ITS Services in Korea	• Seoul TOPIS Traffic Center • Anyang U-Traffic Center • Korea Expressway Corp. Traffic Center • Smart Highway Demo.
Module 2. Individual ITS technologies	• ITS Policies & Regulations in Korea • Major ITS Services in Korea • ATMS(Advanced Traffic Management System) • BIMS(Bus Information Management System) • ETCS(Electronic Toll Collection System) • Recent ITS Trends in Korea	

Lectures

Technical Visits

#ITSAP2021

Candidate city for ITS 2026

Gangneung

Beyond Mobility Connected World

Free Your Life with ITS