Seoul's Challenges & Achievements

in Sustainable and Intelligent Urban Transport

Seoul Metropolitan Government

CONTENTS

01 STEP ONE

Introduction

Seoul Condition & Transport Infra

10.3mil.
(Capital region 25mil)

3.1mil.
(Capital region 4.7mil)

327.1km
(9 lines)

9,334
(629 route)

72,109

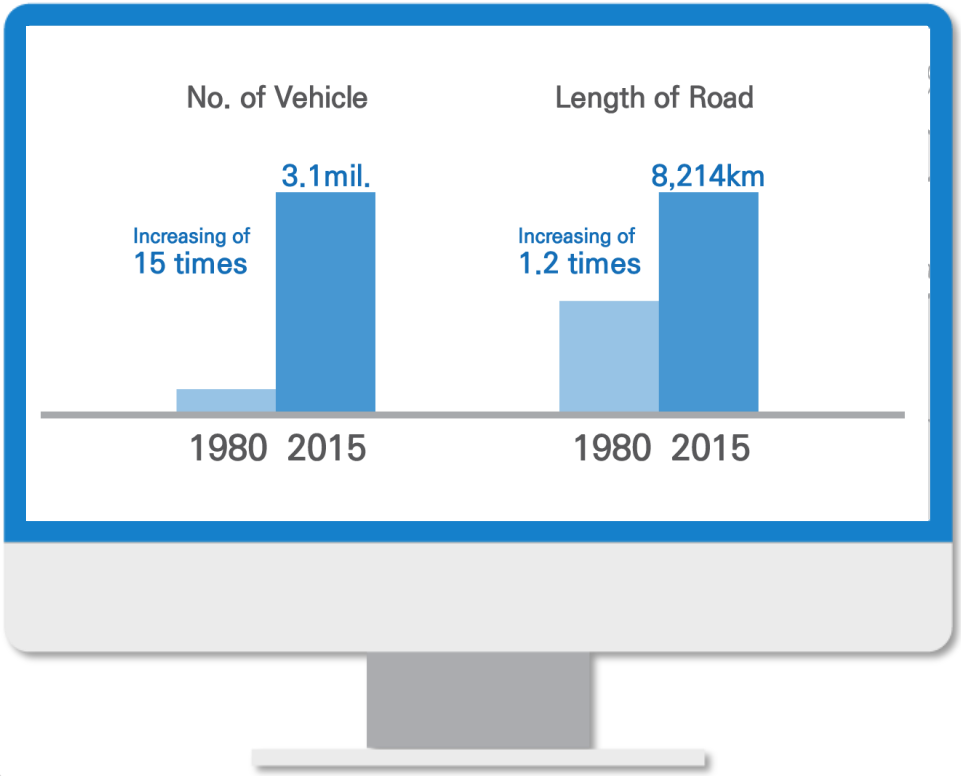
Transport Condition

Increasing of Income

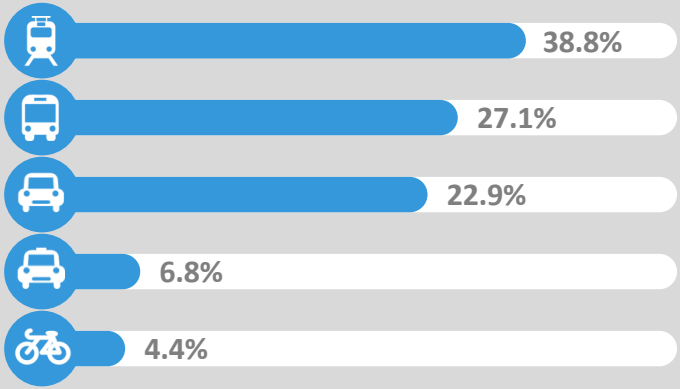
Rapidly Increasing of Pop.

Housing Site Development

Dramatic Increasing Of Traffic Congestion



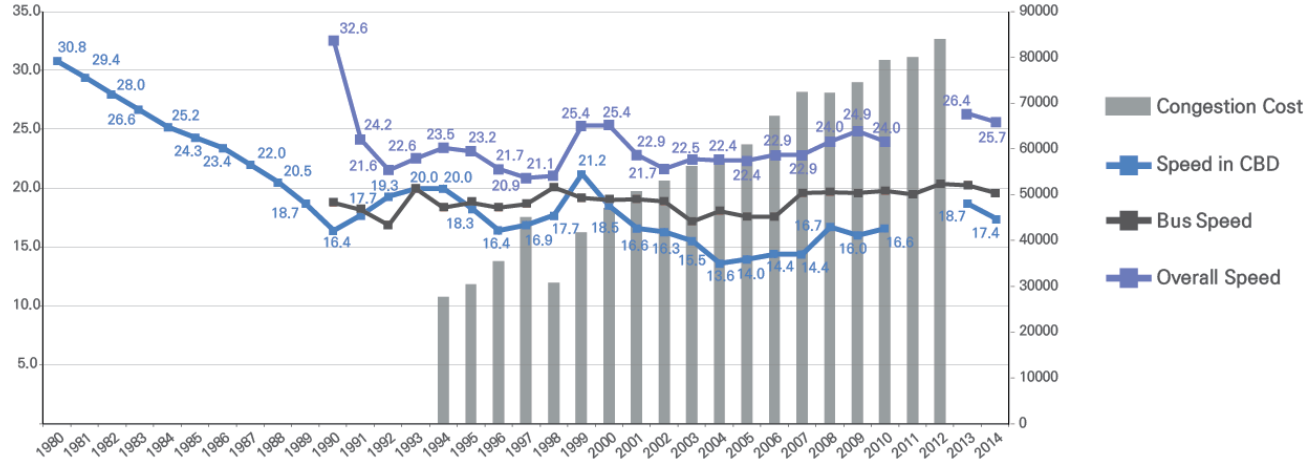
Modal Share.



Transit Share rate

65.9%

Shift in Travel Speed & Traffic Congestion Cost



Trips per day

32.5mil.

Congestion Cost

76.5bil.

History and Change of Seoul Transport

Little Transport Service

Not Enough Transportation Infra

Low Transit Service

Era of "My Car"

Building Urban Expressway

1950

1970

1980

1988

Korea War

Building Urban Infrastructure

Building Transportation Network (Subway, Road, Bridge)

Seoul Olympic

History and Change of Seoul Transport

Public Transportation Reform

Expand BRT(Bus Rapid Transit)

Integrated Fare & Transfer system (Subway + Bus)

1990 — 2000 — 2004 — 2010

PTR

Increased Traffic Congestion

Initiating Travel Demand Management

Starting ITS & TSM

Human-oriented transportation

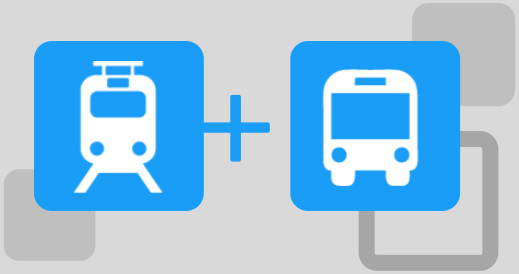
Rebuilding Road Space for Pedestrian

Car Sharing and Bicycle sharing Services

The vision of Seoul Transportation

Supply-oriented Transport

The Great Public Transportation Service & Strengthening TDM



New Vision

HUMAN-oriented

Depended on Fossil Fuels

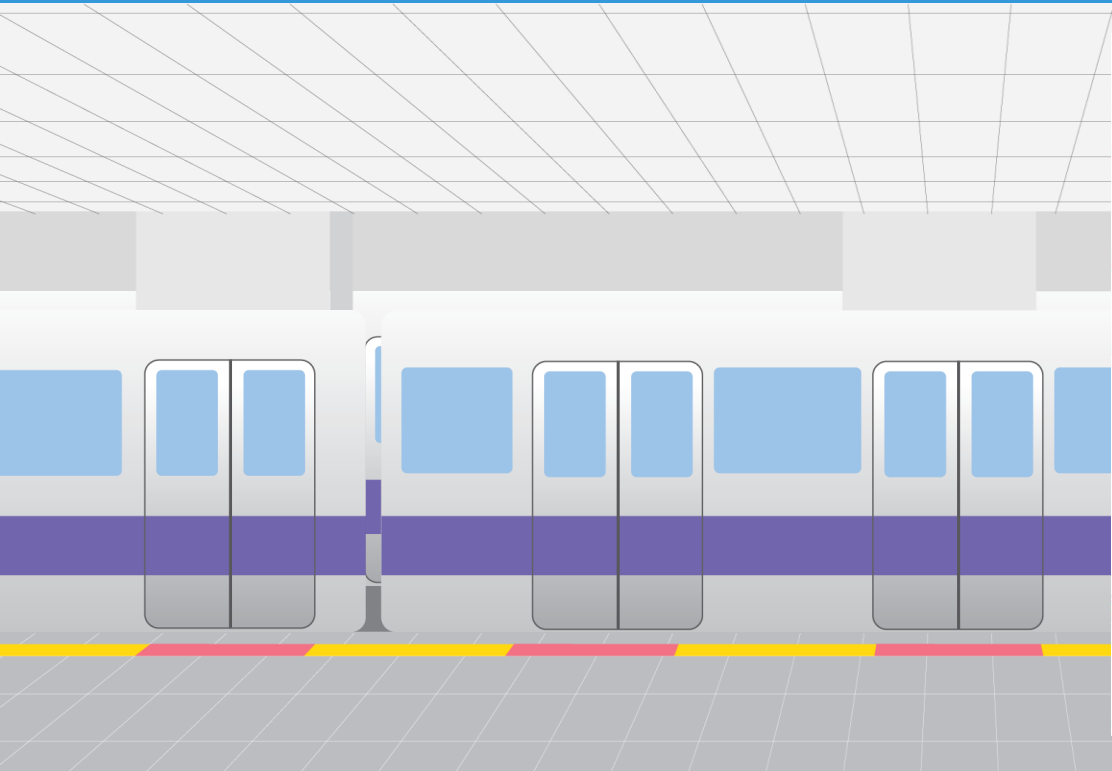
Vehicle-oriented City

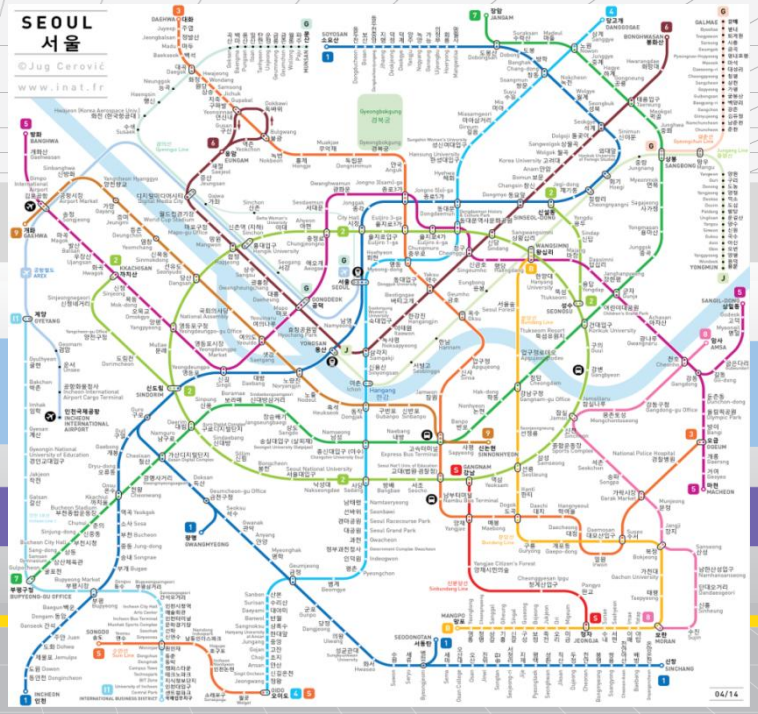
Eco-friendly, Human-Oriented Transportation

ITS & Share

- Upgrade of Transportation System based on ITS
- Sharing of Car & Parking lot

Subway Service





1974 **OPEN**

Line 1~9

336.1km, 307 stations
3,715 rolling stocks
※ National railroad in Seoul
121.7km

5.4mil. /day

Safe and Pleasant

Platform Screen Door &
Free WiFi at all stations

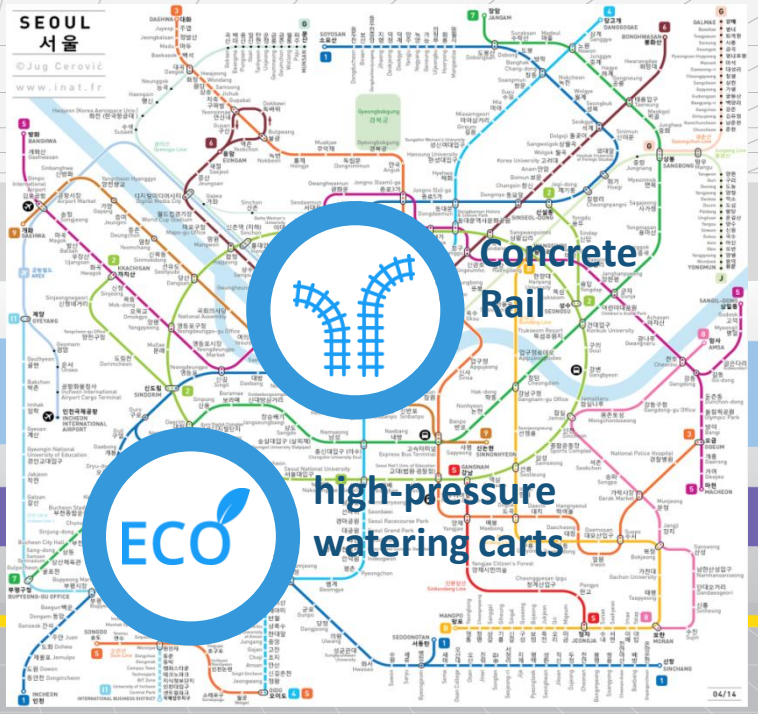
SAFETY FIRST

Subway Service

Free WiFi

Screen Door

Convenient Facilities



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5.4mil. /day

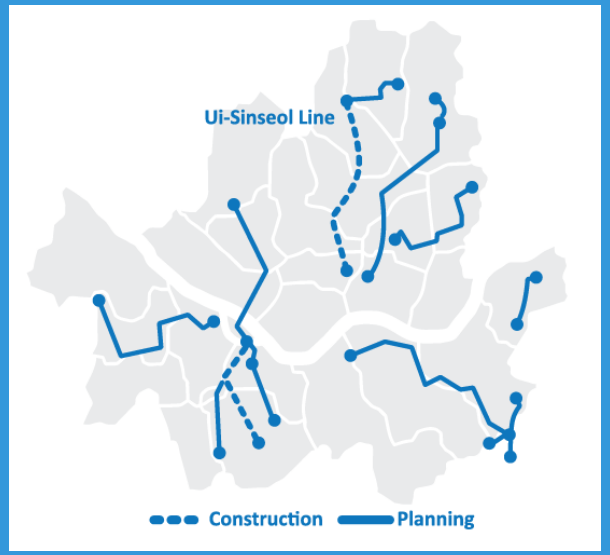
Safe and Pleasant

Platform Screen Door &
Free WiFi at all stations

SAFETY FIRST

Extend Subway Network.

Network of LRT Line
for low-transit service area



Under Construction ▼ Planning

19.5km — 96.7km

-2025

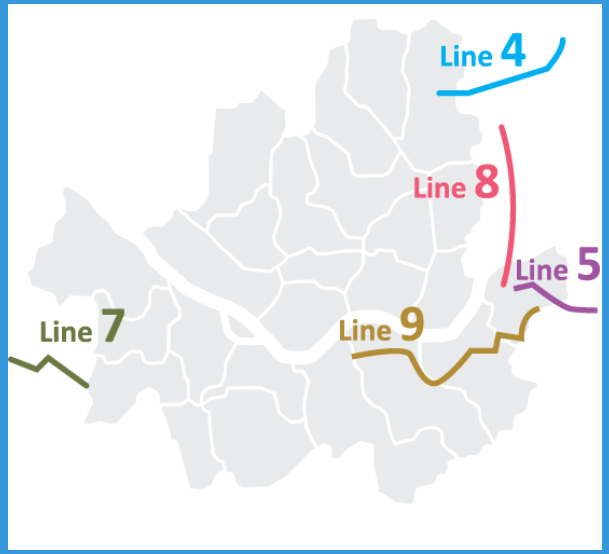
LRT Construction
(96.7km, 9 lines)

Extend Metro Line

Under Construction
Line 9, 12.9km

Planning
Line 4, Line 5, Line 8

Extend Metro Line Network



Bus Service

All City Buses, Eco-friendly
(CNG or Electronic Buses)

2,589 Low-flower Buses
(35% of All city buses)

High-class Bus Stop
(convenient Shelter, BIT)

City Bus

390 routes, 7,855 buses
6,064 bus stops
19,910 bus drivers

5.8mil. /day

Night Bus

00-05
8 routes, 47 buses

Safe Return

-Choice of Place to get off near home after 11 PM
- Return home with Safe Scout

02 STEP TWO

Changes in policy framework, setting a new target

PTR – Public Transportation Reform : Background

Limitations

Supply ⬇ Demand ⬆

- Urban & Sub-urban development
- Increasing of Traffic Demand
- Traffic Congestion Cost Increase

Road Construction

- Developed Area
- High Construction Cost ($50~80milloon / km)

Subway Construction

- Long Construction Time (10~20years)
- High Construction Cost ($100~110milloon / km)

Problems

Bus Route

Complicated, Centralized in Particular Lines

Company

Small Size, Low Willingness to Invest

Operation

Slow, Not on time

Drivers & Passenger

- Poor Welfare, Unfriendly
- Uncomfortable

What should we do

Public Transportation Reform

Not a Choice But a Must

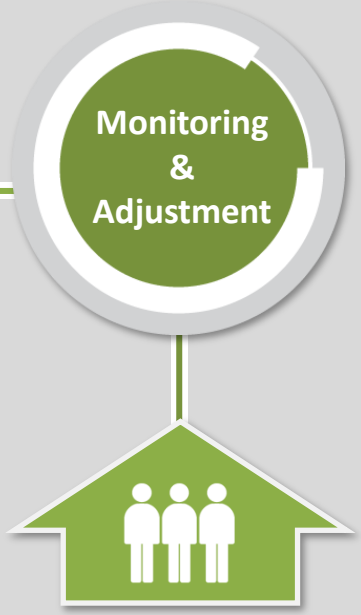
PTR – Public Transportation Reform : Strategies & Action Plan

4 Social consensus
4-1. Citizens' Committee

3 Assistant system
3-1. Integrated Fare system (Subway + Bus)
3-2. Introduction of high-quality buses

2 Infrastructure
2-1. Expansion of BRT
2-2. Improvements in transportation centers
2-3. Introduction of high-quality buses

1 Bus routing/operating
1-1. Public ownership, Private operation
1-2. Establishment of trunk and feeder lines
1-3. Scientific operation management(BMS)



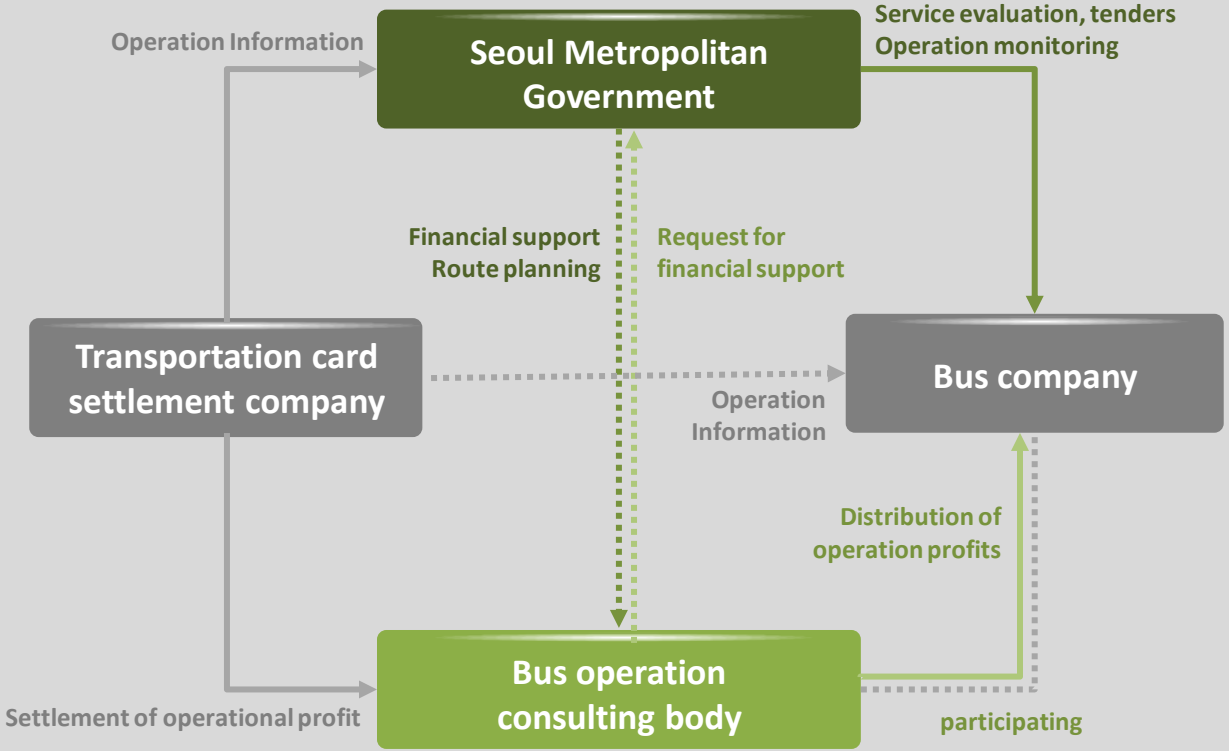
PTR – Public Transportation Reform : Semi-public transportation system

Government

1) Operational plan
2) Infrastructure Construction

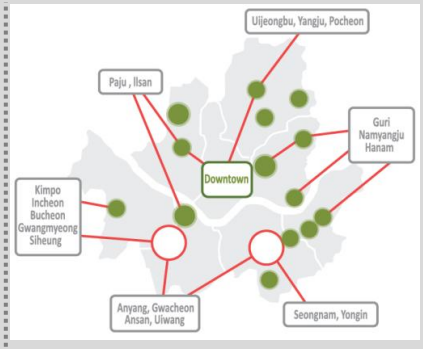
Bus Company

1) Operation and maintenance
2) Labor management

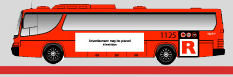


PTR – Reorganized bus routes and numbering system

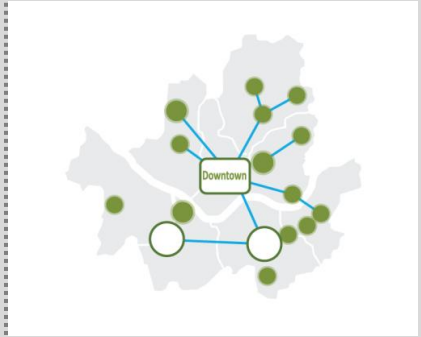
(Sub)Urban areas ↔ Center cities
Meet the demand of passenger car



Inter-regional Lines



Connecting suburban areas and center cities
Meet the demand of passenger car



Trunk Lines

Link trunk line buses or subways for easy transfer
Satisfy the local needs and secure accessibility

Feeder Lines

Circular bus service for business in urban areas

Circular Lines

PTR – Smart Card(T-Money) & Transfer System

Free transfer bus-bus, bus-subway in Capital Region,

free transfer within 30 minutes (maximum of 5 times)

New Fare System

money

One Card, All Pass

Train(KTX)

Express Bus

Express way

money

Any Modal

Taxi

City Bus

Subway

NFC + Mobile

Anywhere

McDonald's

Integrated distance based fare system

5km, 1200won → 4km, 0won

Total 1,200 Won (Basic Rate Within 10km)

10km, 1,250won → 4km, 100won

Total 1,350 Won

(Basic Rate 1,250won of Subway + Additional Rate 100won for 10km to 15km)

100%

99%

59.2%

Card Usage Rate('15)

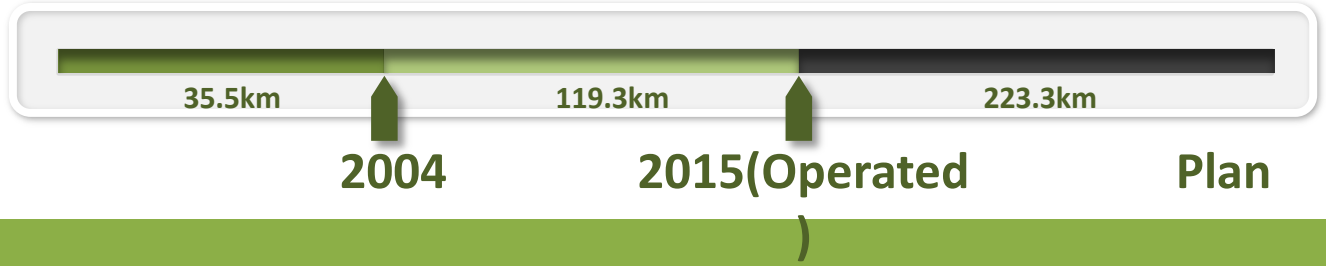
PTR – Bus Rapid Transit(BRT)

BRT

For faster, reliable & Punctual bus

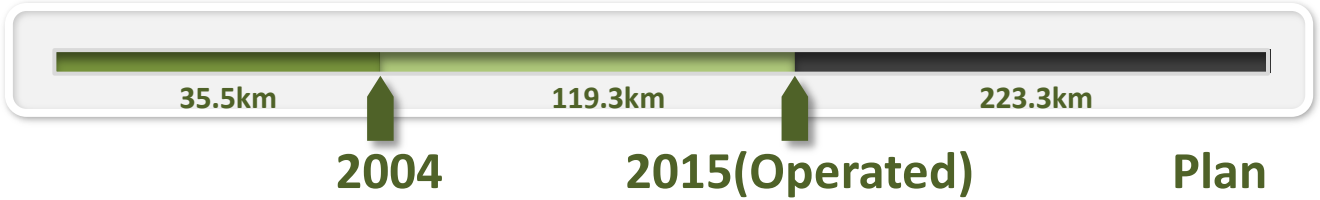
PTR – Bus Rapid Transit(BRT)

12Corridor,
119.3km



PTR – Bus Rapid Transit(BRT)

12Corridor,
119.3km

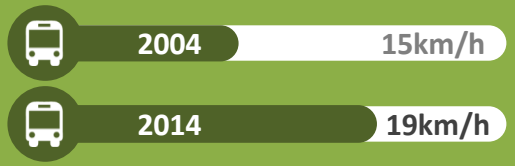


BRT Station

000

Bus Speed

33%

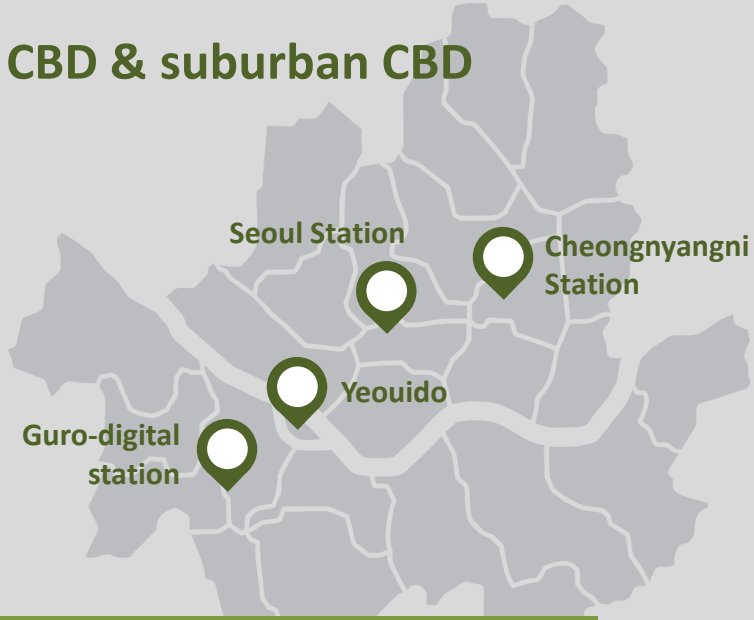


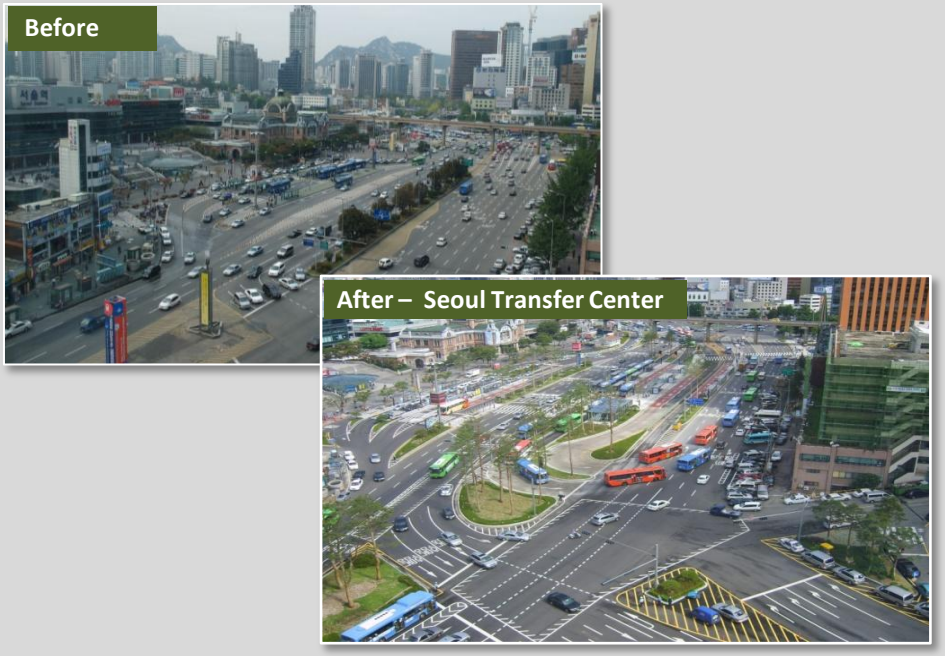
Variance in Operation Time

± 1-2min

PTR – Transit Center

In CBD & suburban CBD





Seoul Transfer Center

80,000 person/day

Number of passengers for transfer

Modal, able to transfer

Train(KTX) ↔ Bus ↔ Taxi ↔ Subway

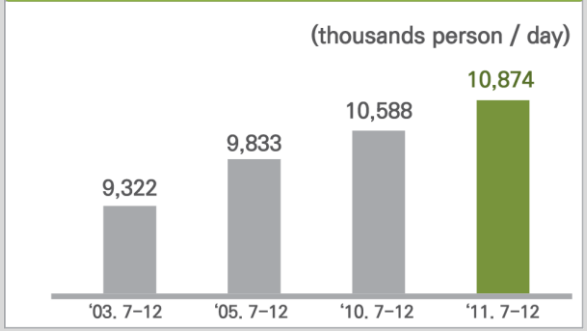
Time for Transfer

12min → **3min**

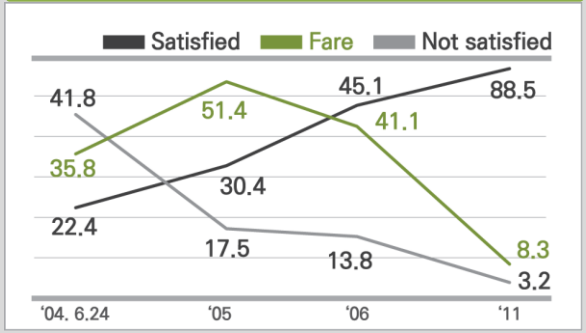
PTR – Major Achievement

Social benefits expected : $ 1.4 billion

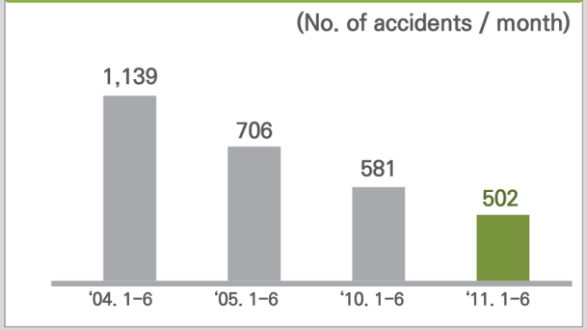
Increase of Passengers



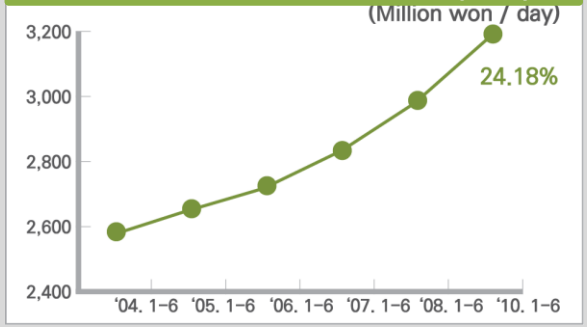
Citizens' satisfaction



Decline in bus accidents



Increase in fare revenues (Bus)



Pedestrian-oriented transportation environment

Car-free Day

Transit Mall

Car-free Street

Barrier-free walking Space

03 STEP THREE

Efforts of Seoul for sustainable urban transport

- Provision of decent public transportation service
- Eco-friendly, human-oriented transportation system

History of Seoul TOPIS 1

TOPIS 1.0 Seoul TOPIS

2004 : Open TOPIS, Install Smart Cart System
2005 : Unmanned Surveillance System





1998 2004

"The First" introduction of ITS

1998 : Implementation in Nam-San area(10.6km)
2000 : Advanced traffic management system in urban expressway

History of Seoul TOPIS 1

TOPIS 3.0

2013 : Open integrated control center
2014 : Release of TOPIS Platform (ITS Solution)

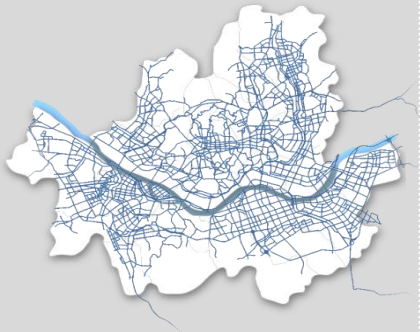
2008 2013

TOPIS 2.0

2008 : Install Bus Information Terminals (BIT)
2009 : Mobile Service
2010 : Open traffic & bus information data
2011 : Introduction of standard design(VMS, VDS)

Present of Seoul TOPIS 1

1,268km
Length of roads for travel speed data collection



35,000Vehicles
Probe car collecting GPS data

VDS

Volume Speed Incident

1,181detectors

CCTV

832
24 hour Traffic suvilence & mornitering

VMS
326

3600cotrollers
Real time traffic signal controller

33systems
Lane Control System (LCS)

13systems
Ramp Metering System (RMS)

Present of Seoul TOPIS 2

44%
of all bus stops

2,612

Bus Information Terminal

7,800devices
BMS & Transportation card devices

98%
Accuracy of BIS

96%
Citizen's satisfaction for BIS

24mil./day
The Number of open data (traffic & bus information)

85mil./day
The number of transportation Card Data

192km
Only Traffic communications network

1,600 Persons/year
Foreign visitor to TOPIS

Present of Seoul TOPIS 3

16.4mil. dollars/year

Maintenance Cost

4 teams

32 persons

Organization of TOPIS

150 persons

Maintenance personnel

Information media

Web, Mobile

Broadcasting (Radio, IPTV)

VMS & BIT SNS, LED Sign

308 systems

Unmanned Regulation System

(illegal parking,exclusive bus & bicycle lane violation)

180 Thousand/year

The number of charging penalty

157km

Length of roads for traffic condition forecasting

ITS Global Leader, The Seoul TOPIS

04 STEP ONE

Main System of Seoul TOPIS : Integrated Control Center System

24hours Integrated Monitoring and Surveillance
(Road traffic, Transit, Disaster & Emergency management)

Data Integration & analysis

Monitoring

Control & Operating

Control & Operating

VDS/CCTV/AVI Bus OBE/Taxi GPS

Incident & Disaster Information

Traffic Signal

Transportation Card Data

기상청

Meteorological Admin

Citizen Reports

경찰청

Police agency

Control Tower

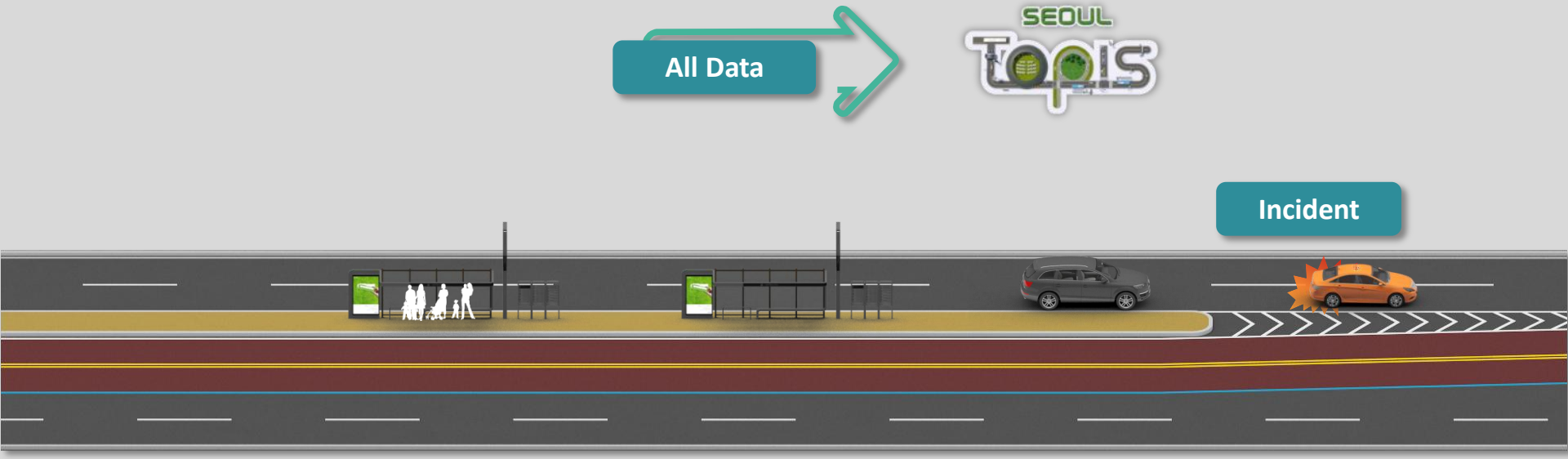
Determination and Immediate response

Operator

Control all devices & Information provision

VMS/Traffic Signal/Web/ Mobile/SNS/LCS/ Broadcasting

Main System of Seoul TOPIS : BMS & BIS 1



Seoul TOPIS

Collecting Data

1) Real time bus location(GPS Data) & bus speed
2) Arriving & Departure Time on bus stop
3) Operating data(non-stop, reckless driving, etc)
4) No. of boarding and getting off passengers on bus stops
5) Incident information

Information Process

1) All bus Interval / Last bus Information
2) All bus arriving time forecasting
3) Analysis of securing bus operating situation
4) Analysis of bus passenger data
5) Analysis of total travel time & distance

Main System of Seoul TOPIS : BMS & BIS 2

"Bus + Subway" public transport information integration

1) All Bus & Subway arrival time
2) Last bus & Subway information
3) All Bus & Subway route, transfer service
4) Bus detour & congestion information
5) Incident information

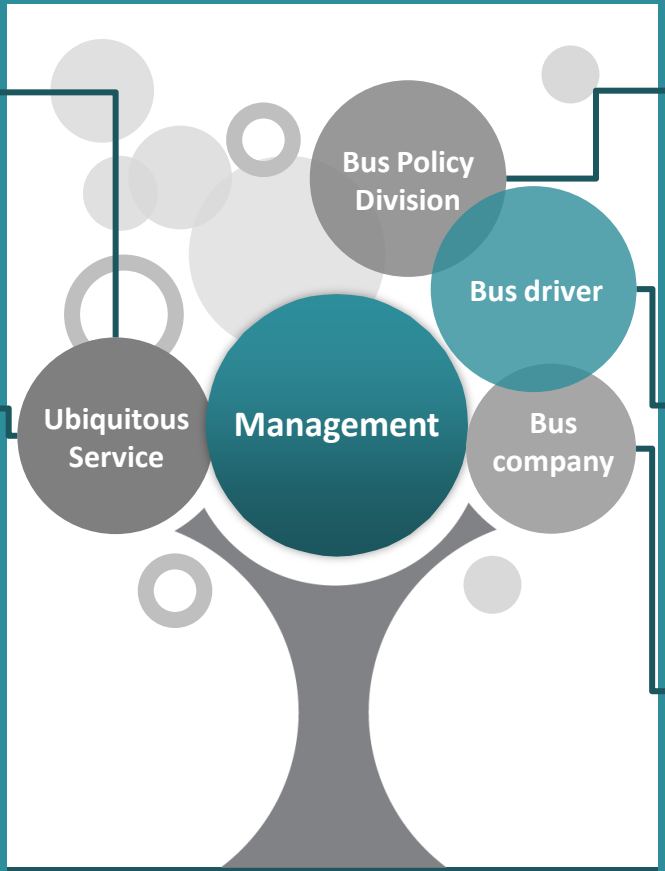
Information Provision Media

BIT

Web, Mobile

Web Portal(OpeAPI)

Telecommunication company



Evaluation of bus Company

1) Result of bus operation
(not-stop, reckless driving)
2) Basic data for operation cost calculation
(total travel distance, frequency of bus running)

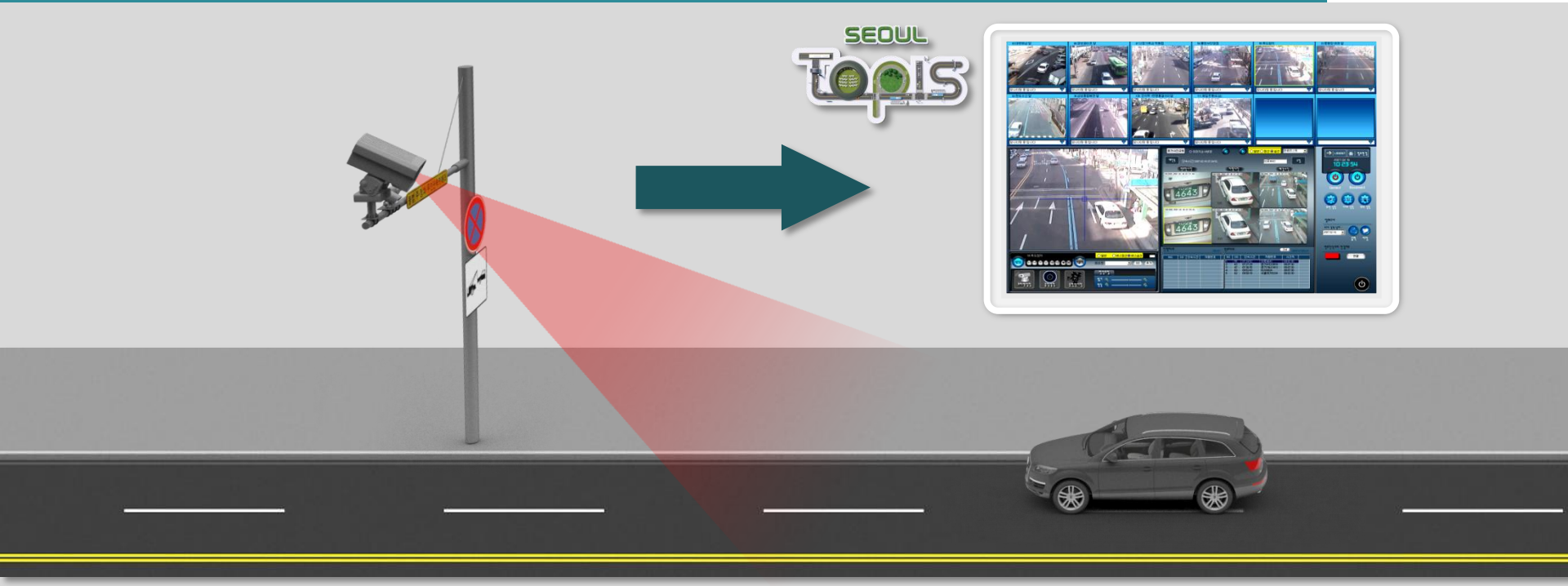
Notice for securing bus driving

1) Real-time interval
2) Real-time detour route
3) Incident information

Notice for securing bus driving

1) Bus location and speed
2) Data related with bus operation

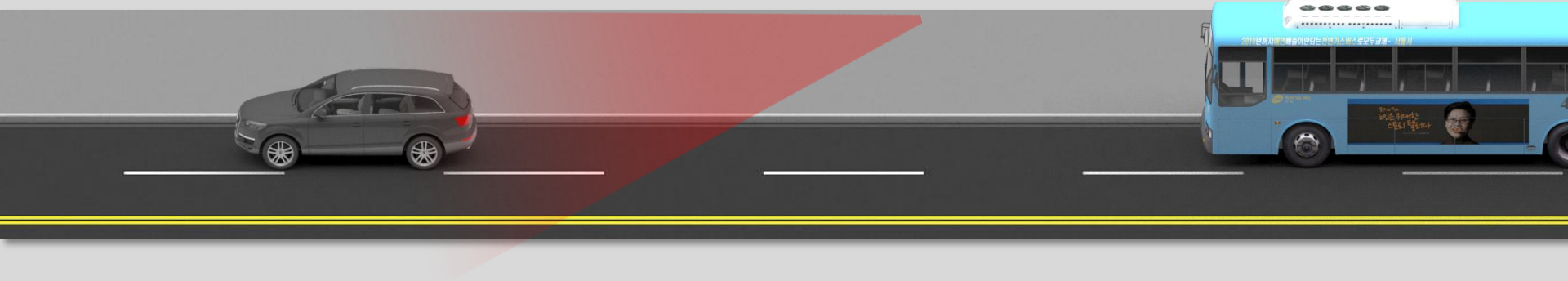
Main System of Seoul TOPIS : Unmanned Regulation System 1



Fixed enforcement System(308)

1) Enforcing Illegal Parking within 200m
2) Exclusive bus & bicycle lane violation

Main System of Seoul TOPIS : Unmanned Regulation System 1



Fixed enforcement System(308)

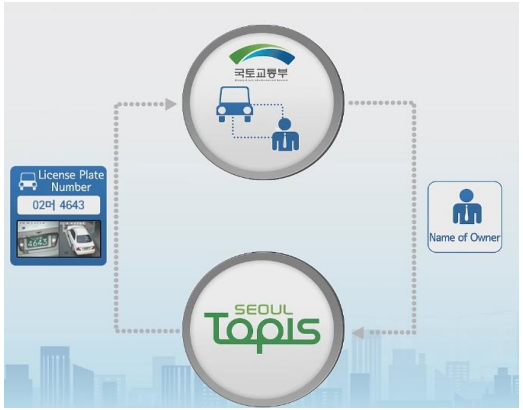
1) Enforcing Illegal Parking within 200m
2) Exclusive bus & bicycle lane violation

Automatic enforcement System (7routes, 28buses)

1) Automatic detection and enforcement violation at all routes using camera system mounted on bus
2) All bus route enforcement(Origin to final destination)

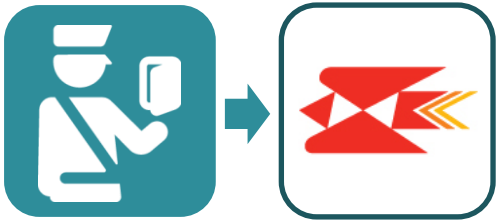
Main System of Seoul TOPIS : Automatic Charging Penalty System

1) Searching vehicle owner



Automatic vehicle owner search

2) Charging penalty



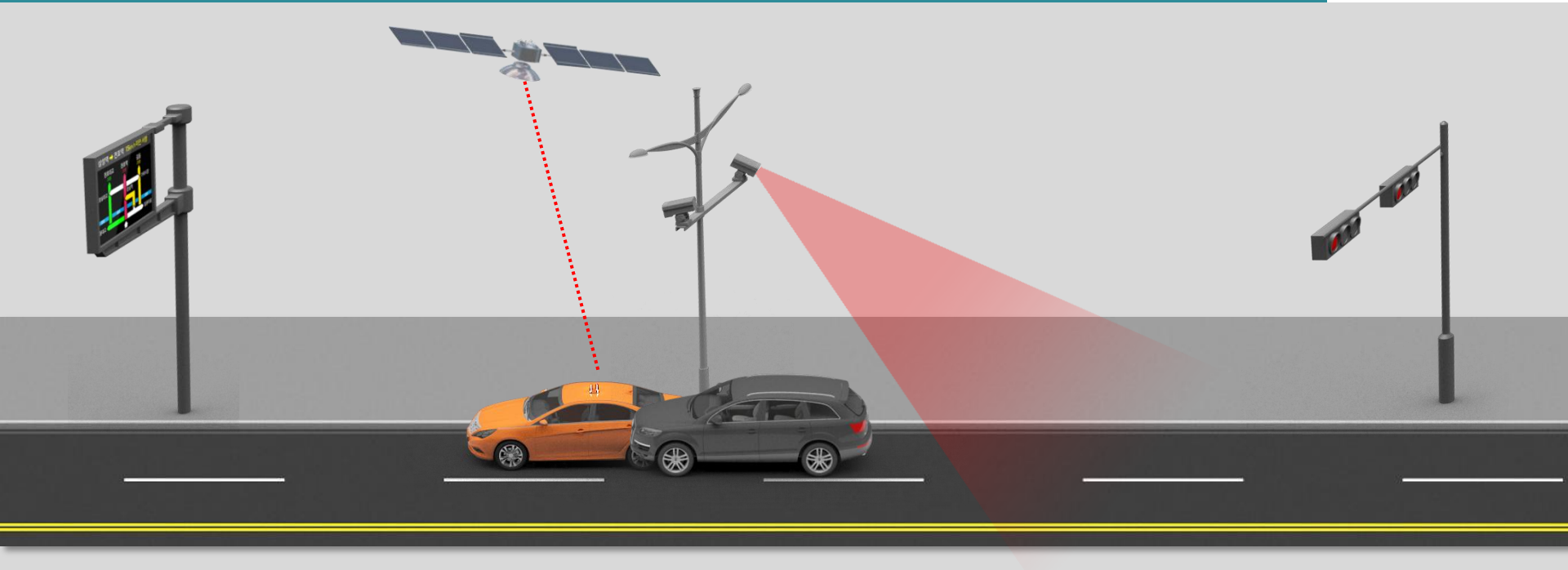
Charging penalty and sending the mail to post office

3) Sending Mail

Automatic mail sending

Take 2-3 days to deliver the fine bill to vehicle owner (Non automatic system: 10~15 days)

Main System of Seoul TOPIS : ATMS(Advanced Traffic Management System)



Collecting Traffic Data

1) Travel speed using detector(Urban express way) or taxi GPS data(City road)
2) Weather condition from Meteorological Admin
3) Traffic volume / Traffic situation from CCTC
4) Indent / data of real time traffic signal operation

Information Process & Management

1) All Traffic information process
2) Analysis of traffic congestion area & road
3) Planning of real time traffic signal operating
4) Control device & information provision(VMS, LCS, Traffic signal)
5) Real time speed change monitoring of rods Traffic event detection
6) Traffic information service for citizen(Web, Mobile, VMS, etc)

Main System of Seoul TOPIS : Big Data Analysis System

Card data

85 mil./day
(bus+subway+taxi)

Real time Operation data

26 mil./day
"bus, subway, taxi"
Location, GIS data
Traffic speed & volume

Socioeconomic index

The changing trend of Population, vehicle, lane use, etc

Data analysis

Calculation of policy index

Visualizing

Big data progress

Planning of new bus route

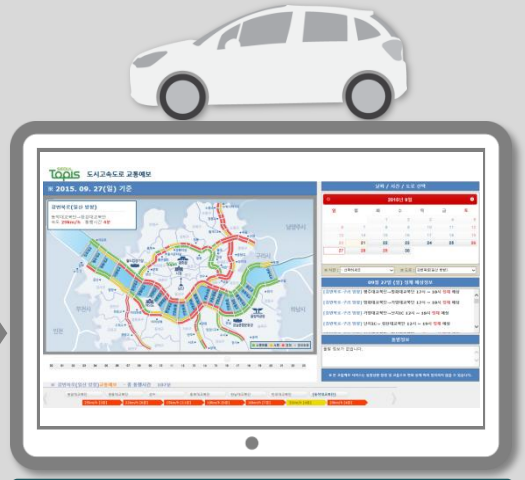
Planning of running interval, etc

Main System of Seoul TOPIS : Traffic forecasting System

Using of cumulated data more than 5 years

Traffic forecasting with the model developed by Korea Transport Institute

1) Short time traffic forecasting within 1hr. (15minite interval)
2) Long time traffic prediction within 30days (1 hour interval)
3) Traffic Forecasting in normal condition
4) Traffic Forecasting in occurred incident or road work



Traffic forecasting Service on web (Urban expressway)

2015	157km	Urban Expressway
2016	574km(417km)	Arterial road

90%

The accuracy rate of traffic forecasting (urban expressway)

Seoul TOPIS Platform : Instruction 1

Center Platform

Center Operating System Integrated Surveillance & Response System

Bus Platform

Bus Information System
Bus Management System

UR Platform

Unmanned Regulation System
Automatic Penalty Charging System

TOPIS PLATFORM

Total ITS Solution with Seoul ITS Technology & Operation experience

FTMS Platform

Urban expressway traffic Management System

ATMS Platform

Advance Traffic Management System
Traffic Signal Operating System

Big Data Platform

Traffic Forecasting System Analysis System for building Transport policy

Seoul TOPIS Platform : Instruction 2

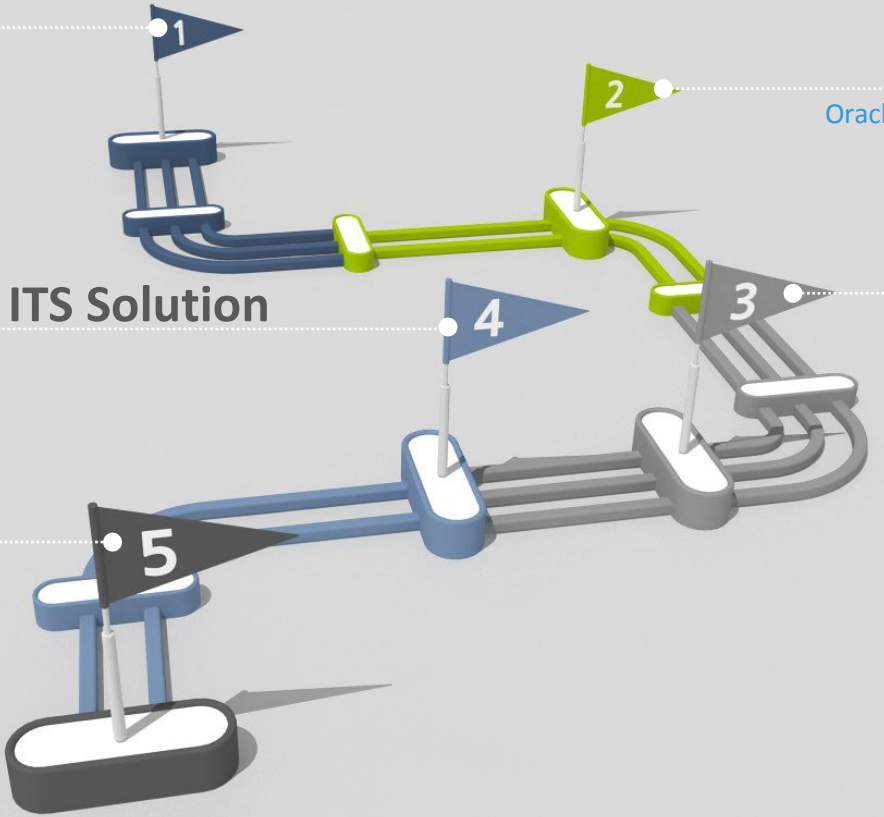
1. OS(operating system) **free**
Windows, Linux, Unix OS

2. DB free
Oracle, MS-SQL, My SQL, Tibero

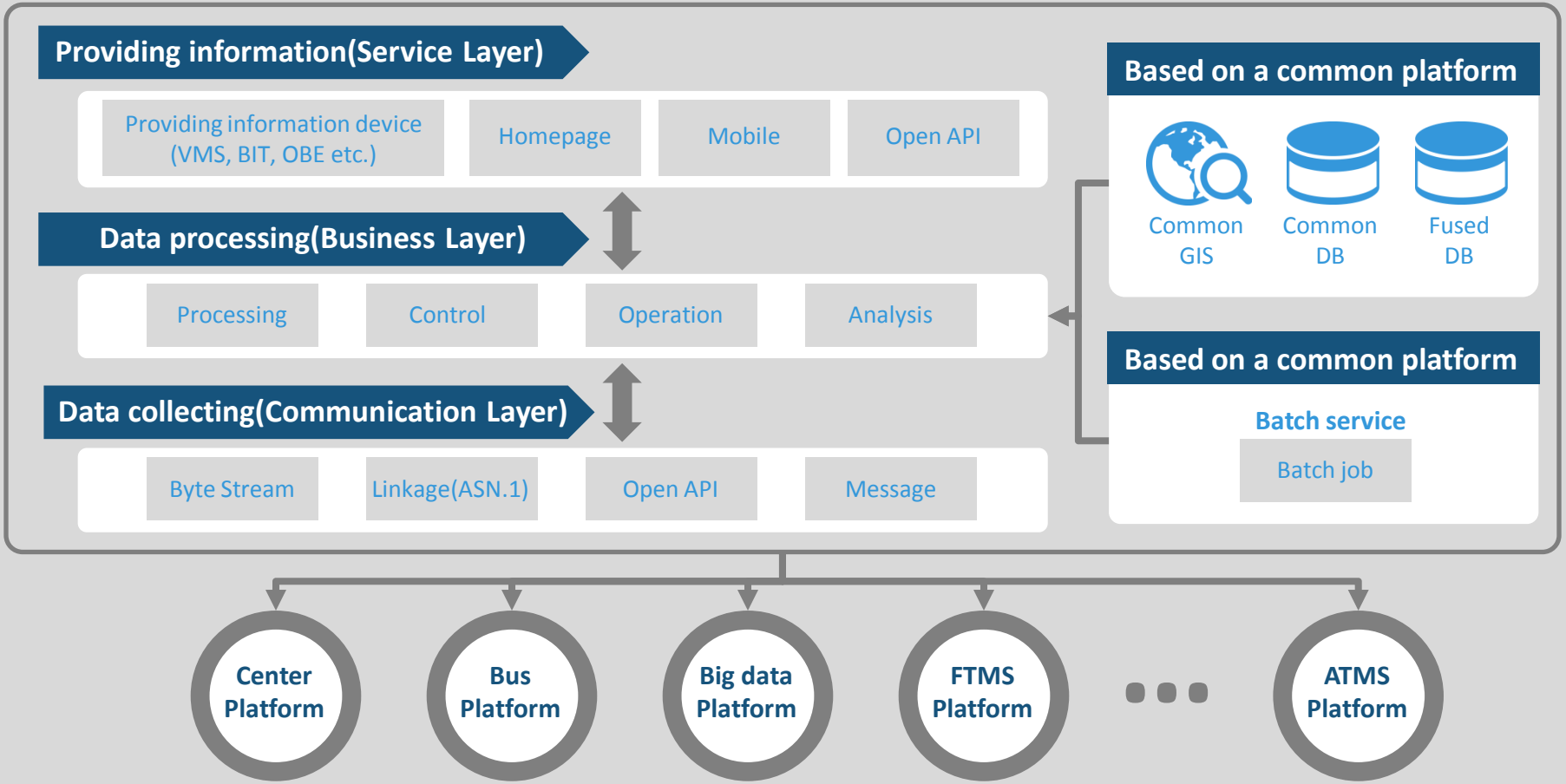
3. Media service free
Global web standard protocol, HTML5

4 Free embeded ITS Solution

5. Hardware free
Global standard connecting interface & protocol to equipment



Seoul TOPIS Platform : Framework



Seoul TOPIS Platform : Feature & Function 1

Response of Incident situation

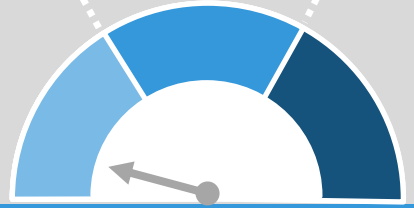
Monitoring of Traffic situation

System monitoring

Fast incident detection & response
Analysis of incident influence

Congestion area & road
Change of speed & volume

Operation monitoring of
all hardware & device
Monitoring of program process



Quick judgment & Response by dashboard

Seoul TOPIS Platform : Feature & Function 2

Integrated control of all device

VMS, VDS, CCTV, LCS, RMS, BIT,
Bus OBE & Traffic Signal

Strict authority management

Flexible setting of control right
by user level

Adaption of all media device

Web, Mobile, openAPI, IPTV,
Digital panel, etc

Seoul TOPIS Platform : Advantage & Strength 1

1. Open Source

Free modification & improvement

2. Easy Installation

Fast & easy setup at any city in the world

3. Saving Cost

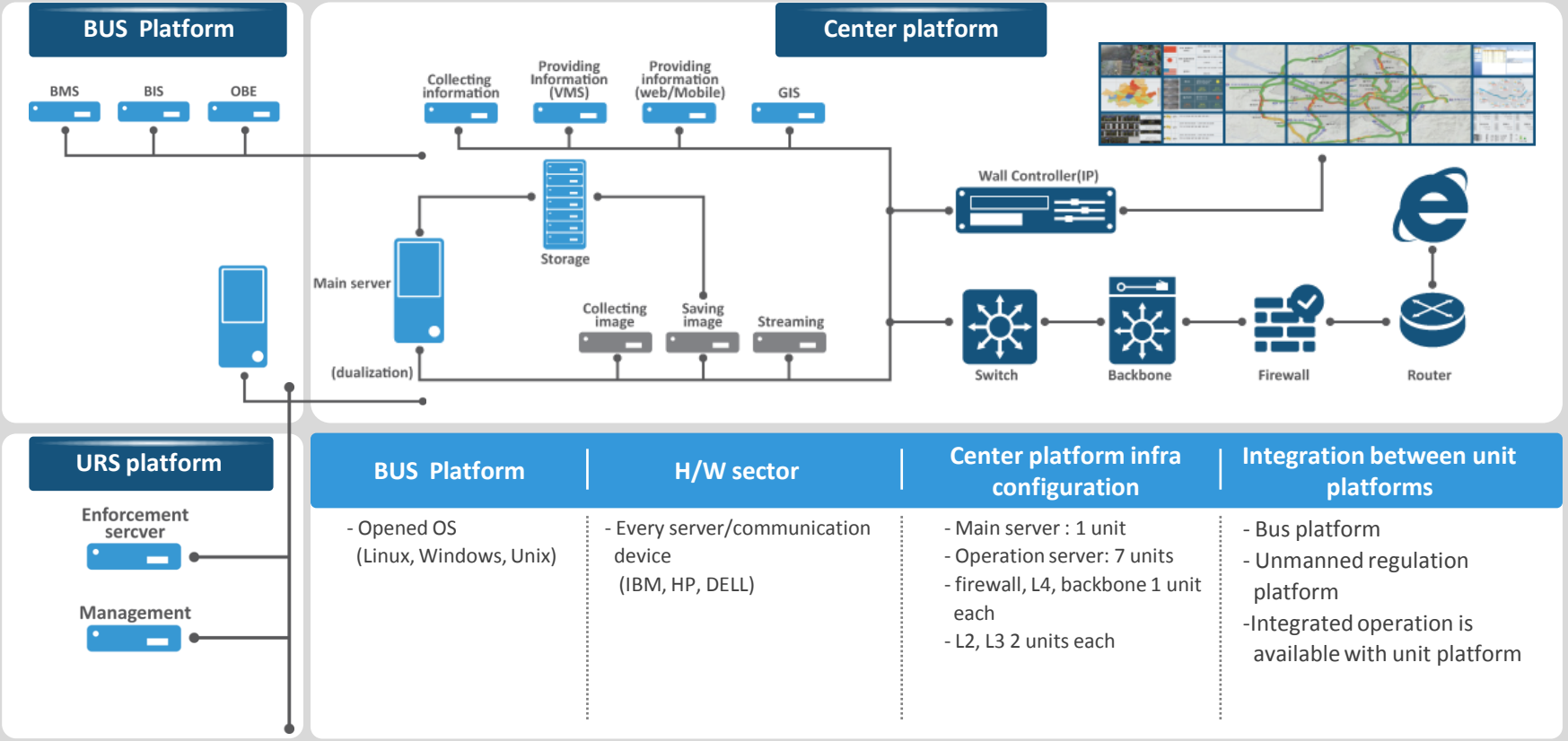
Minimum maintenance personnel & cost

4. High Technology

ITS Operating such as Seoul TOPIS

Seoul TOPIS Platform : Advantage & Strength 2

Cost-effective & flexible expanding hardware system

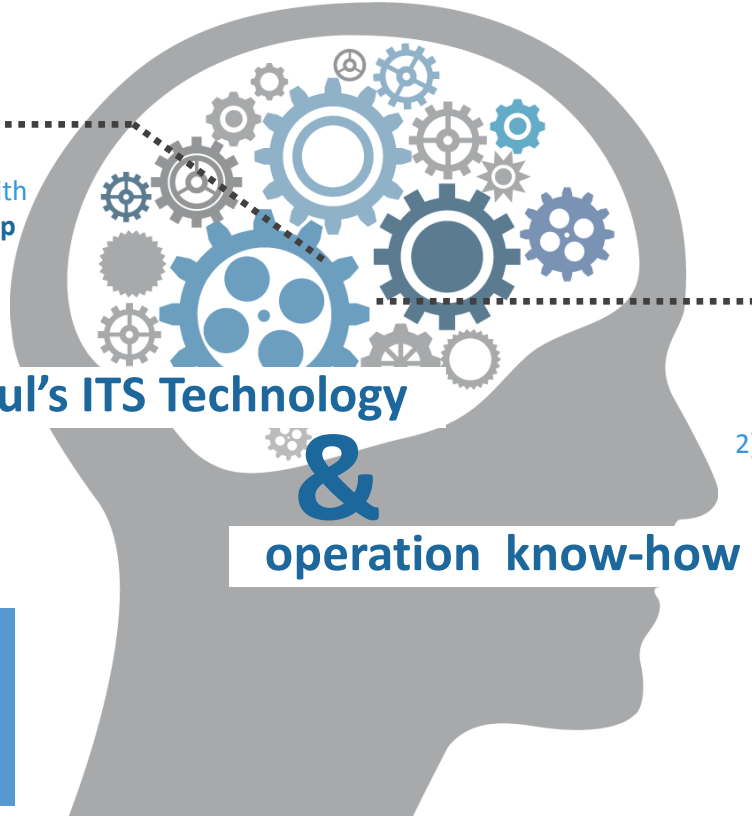


BUS Platform	H/W sector	Center platform infra configuration	Integration between unit platforms
- Opened OS (Linux, Windows, Unix)	- Every server/communication device (IBM, HP, DELL)	- Main server : 1 unit - Operation server: 7 units - firewall, L4, backbone 1 unit each - L2, L3 2 units each	- Bus platform - Unmanned regulation platform -Integrated operation is available with unit platform

Seoul TOPIS Platform : Supporting & Consulting

ITS Project Consulting

Consultation on ITS implementation, operation with **Seoul TOPIS official Friendship Partner, (LG CNS, SK)**



Technical support

1) Installation & Operation of Seoul TOPIS Platform

2) Policy development for various areas including ITS, BRT, Parking, TSM, Public Transport Operations, etc.

SEOUL TOPIS Friendship Partner

We are ready to help you

Contact anytime If you need