



Seoul's Advanced Traffic Management System



SEOUL METROPOLITAN
GOVERNMENT



Introduction

ITS Global Leader, The Seoul TOPIS

01 STEP ONE

History of Seoul TOPIS(1)

TOPIS 1.0 **Seoul TOPIS**

2004 : Open TOPIS, Install Smart Card System

2005 : Unmanned Regulation 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(2)



TOPIS 3.0

2013 : Open integrated control center

2014 : Release of TOPIS Platform (Seoul's ITS Solution)



2008

TOPIS 2.0 SEOUL TOPIS

2008 : Install Bus Information Terminals (BIT)

2009 : Mobile Service

2010 : Open traffic & bus information data

2011 : Introduction of standard design(VMS, VDS)

2013

Seoul TOPIS (Seoul Transport Operation and Information Service)



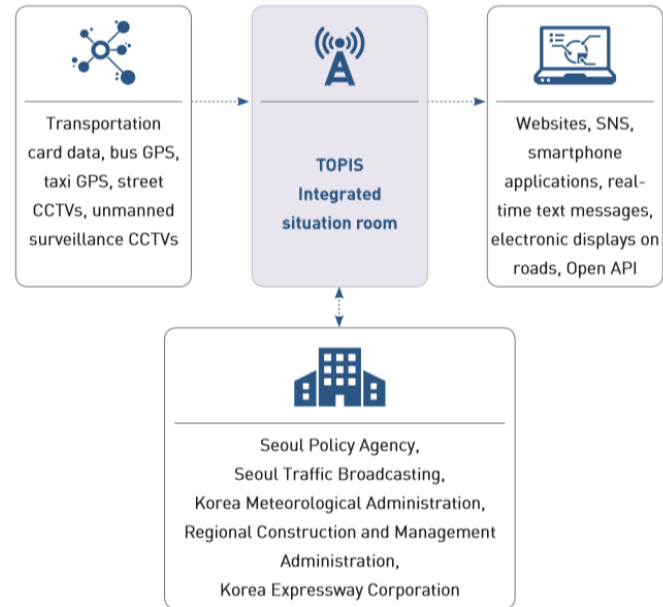
Seoul TOPIS is the Intelligent Transportation System (ITS) brand of Seoul Metropolitan Government. The first service of its kind in Korea, it was introduced in 1998 to address urban transportation problems.

TOPIS 3.0, a city management hub

TOPIS 3.0 is a smart metropolitan city management hub that manages transportation, disasters, and other security-related events in an integrated manner.

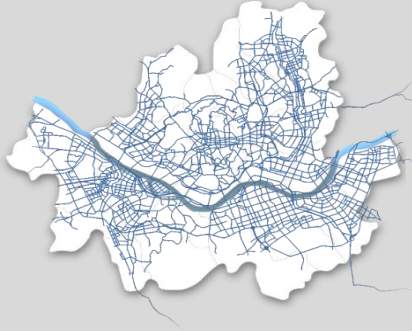
It is an **advanced transportation information system** that allows prompt judgments and responses to be made in times of emergency and predicts and prevents transportation problems before they occur through big data analysis.

Information flow chart



Seoul TOPIS Today(1)

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



70,000 Vehicles
Taxis with GPS data being
collected



VDS



Volume Speed
Incident

1,955 detectors

CCTV



849

24 hour Traffic surveillance &
monitoring



3600 controllers

Real time traffic signal
controller

85 mil./day



The number of transportation
Card Data



9,550 devices

BMS & Transportation card
devices



85%

Stops with BIT /
Total Bus Stops

5,697

서울역	100	5분	151	7분
버스환승센터	421	저상	504	10분
02-006	1711	6분	7011	15분
서울 Topis	곧도착 : 471			

Bus Information Terminal



24mil./day

The Number of open data
(traffic & bus information)



2,062 Persons/year

Foreign visitor to TOPIS



VMS
326



574km
Length of roads
for traffic condition forecasting



95 systems
Lane Control System
(LCS)

13 systems

Ramp
Metering
System
(RMS)



02 STEP TWO

Main System of Seoul TOPIS

Seoul TOPIS Platform : Introduction

ITS Global Leader,
The Seoul TOPIS



Center Platform

Center Operation/ Integrated Urban Management Monitoring/Emergency Response Systems, etc.

TOPIS PLATFORM



ITS Solution Incorporating Seoul's ITS
Implementation Experience and
Technology



FTMS Platform

Urban Expressway Traffic Management System



Bus Platform

Bus Information System(BIS)
Bus Management System(BMS)



Green Transport Zones Vehicle Management System

Enforcement of Class 5 Emissions Vehicles
Green Transport Zone Total Vehicle Volume
Management



ATMS Platform

Arterial Road Traffic Management System
Traffic Signal Operating System



Traffic Big Data Platform

Traffic Forecasting System
Traffic Policy Support System



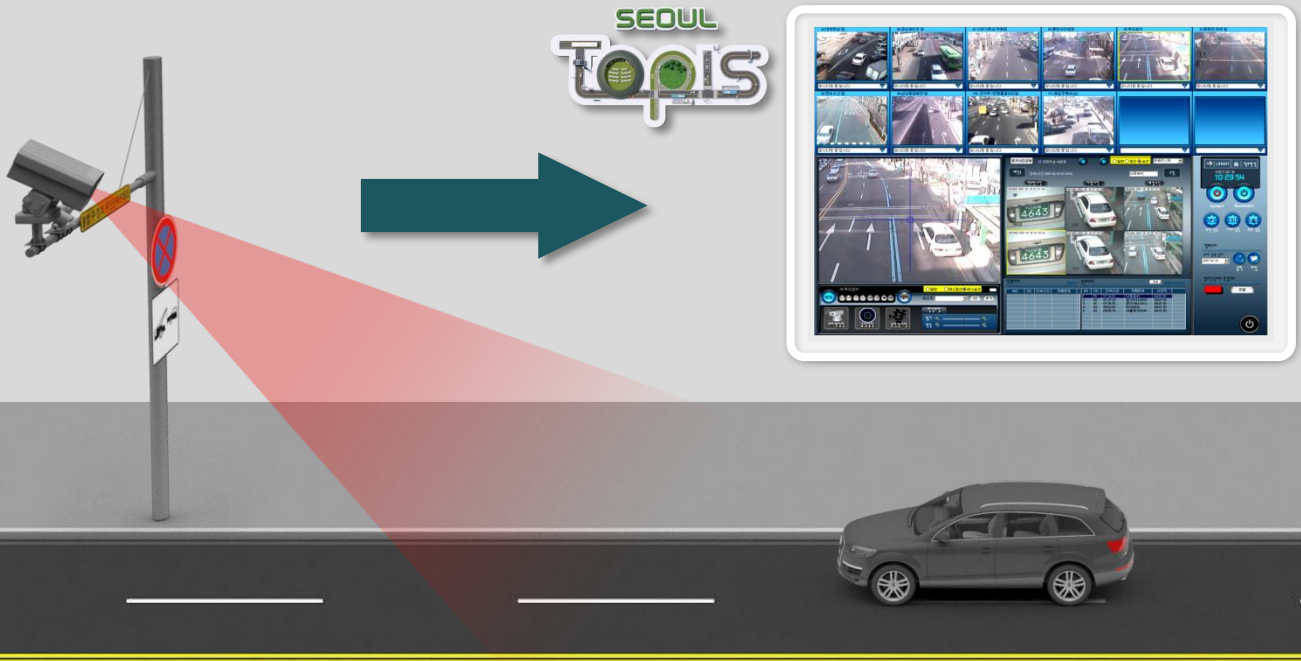
C-its Autonomous Vehicle Testbed

Piloting Autonomous Vehicle Testbed / Mobility



Unmanned Enforcement Platform

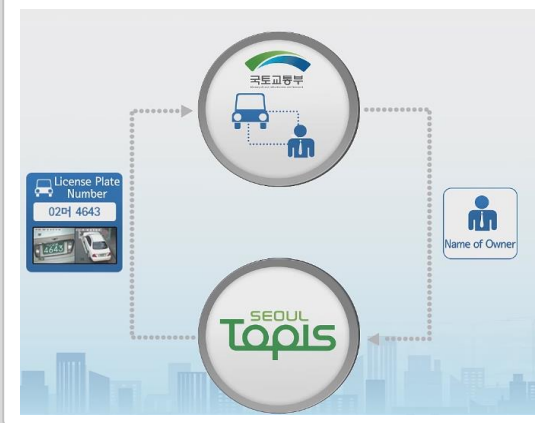
Unmanned Enforcement System
Automatic Fine System



Fixed enforcement System(308)

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

1) Searching vehicle owner



Automatic vehicle owner and address search

2) Issuing and transmitting fine



Charging penalty and sending the mail to post office

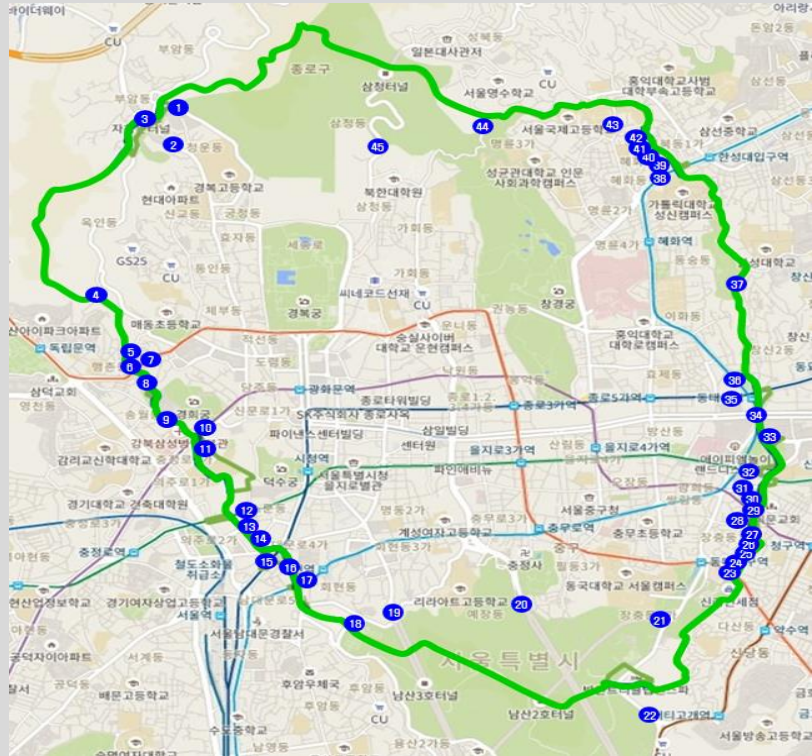
3) Automated fine delivery



Automatic mail sending

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

Traffic Volume Management System in Hanyang Doseong



ANPR (Automatic Number Plate Recognition) Location



- **Restricted Vehicles : Vehicles with Class 5 Emissions Levels**
- **Enforcement Period : Regular (Sat, Sun, Public Holidays included), 06:00-21:00**
- **In Effect Since : '19. 12. 1**
- **Enforcement and Levying Penalties**
 - **Enforcement Method : Monitoring entrance to Green Traffic Zones (45 locations)**
 - **Levying Penalties : Once per day, ~ about \$100 (about \$200 upon 3 violations)**

Establishing a sustainable advanced system through application of the newest technologies

1 IoT

Vehicle Traffic Management Center

Real Time Monitoring → Data Analysis → Obstacle Sensing

Mobile Real Time Monitoring

Before Service Composition

- Automated record management for equipment
- Mobile Real-Time Obstacle Monitoring

2 AI

[Plate Recognition] [Personal Information Masking]

AI Deep Learning

- Center Based Plate Recognition
- Automatic personal information masking

3 Blockchain

Preventing tampering of data

- Ensuring data integrity
- Efficient response to civil complaints

4 Big Data · Chatbot

Decision Making Support
Streamlining Administrative Efficiency

- Calculation and analysis of converged indicators
- Implementing Korea's first traffic-focused Chatbot

Green Traffic Zone Vehicle Management System

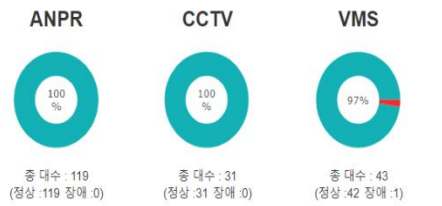
통합관제

- 모니터링 및 통합관제
 - 녹색교통진흥지역 지도 조회
 - 교통량 현황 조회
 - 단속량 현황 조회
 - CCTV 영상 관제
 - 지도기반 교통정보 조회
 - 시설물 상태조회
 - 관제 구성정보관리
 - 이벤트 관리
 - RTU 관리
 - RTU 장비정보관리
 - RTU 링 체크
 - NVR 장비정보관리

- CCTV 관리
 - CCTV 장비정보관리
 - CCTV 제어관리
 - CCTV 상태이력조회
 - CCTV 시설물 장애 관리
 - CCTV 장애 조치 관리
 - CCTV 파라미터 관리
 - CCTV 장애이력조회
 - CCTV 장애통계조회
 - CCTV 제어이력 조회

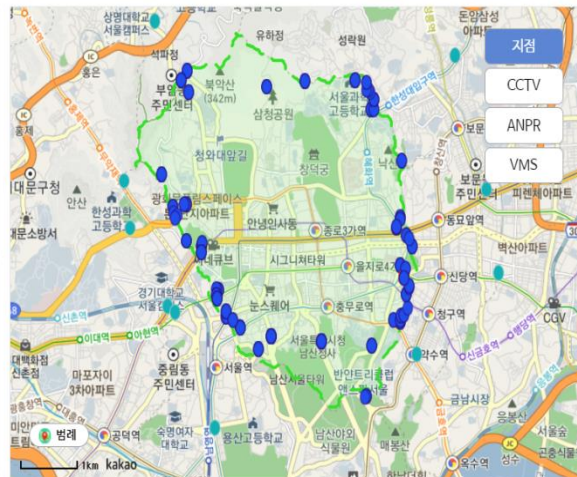
- VMS 관리
 - VMS 장비정보관리
 - VMS 상태정보조회
 - VMS 상태요구
 - VMS 제어관리
 - VMS 장비현황모니터링
 - VMS 호출관리

시설물 현황



단위시스템 현황

시스템	상태	시스템	상태
과태료부과	●	사전등록결계	●
빅데이터	●	1-3초 혼잡통행료	●
AI	●	모바일고지	●
IOT 플랫폼	●		



날씨 출처: 기상청, 한국 기상공단

맑음 9.5도 미세먼지 초미세먼지

데이터는 실시간 관측된 자료이며 측정소 현지 사정이나 데이터의 수신상태에 따라 미수신될 수 있습니다.

오늘 교통량/5등급 교통량

	전체	진입	진출
교통량	112,192	62,250	49,942
5등급 교통량	1,808	1,033	775
단속량	6	6	

단속 시스템 처리 현황

모바일 고지 처리 (단위: 초)

처리순서

- 차량통과
- IOT 전송
- 과태료 처리
- 모바일 고지

교통량/단속량 | 지정별 교통량/단속량 | 차종별 교통량/단속량 | 단속 시스템 처리 현황



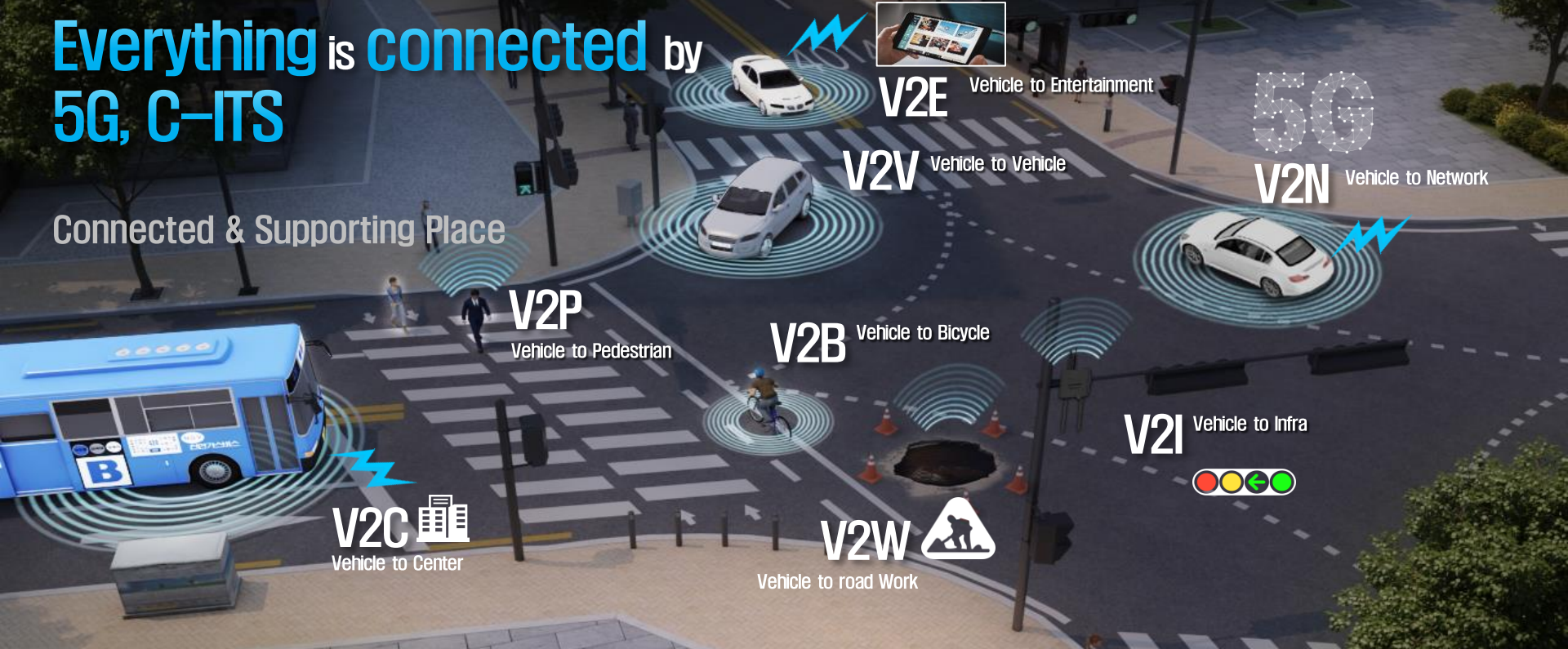
Next Generation Intelligent Transport System (C-ITS)

C-ITS (Cooperative-Intelligent Transport Systems)

Advanced transport system to prevent traffic accidents, manage roads, and support autonomous vehicle operations through real time information sharing of traffic conditions enabled by vehicle-to-vehicle, vehicle-to-people, and vehicle-to-infrastructure 2-way communication

Everything is connected by
5G, C-ITS

Connected & Supporting Place



To secure traffic safety in central bus-only lane
Introduction of the Seoul public transportation C-ITS service

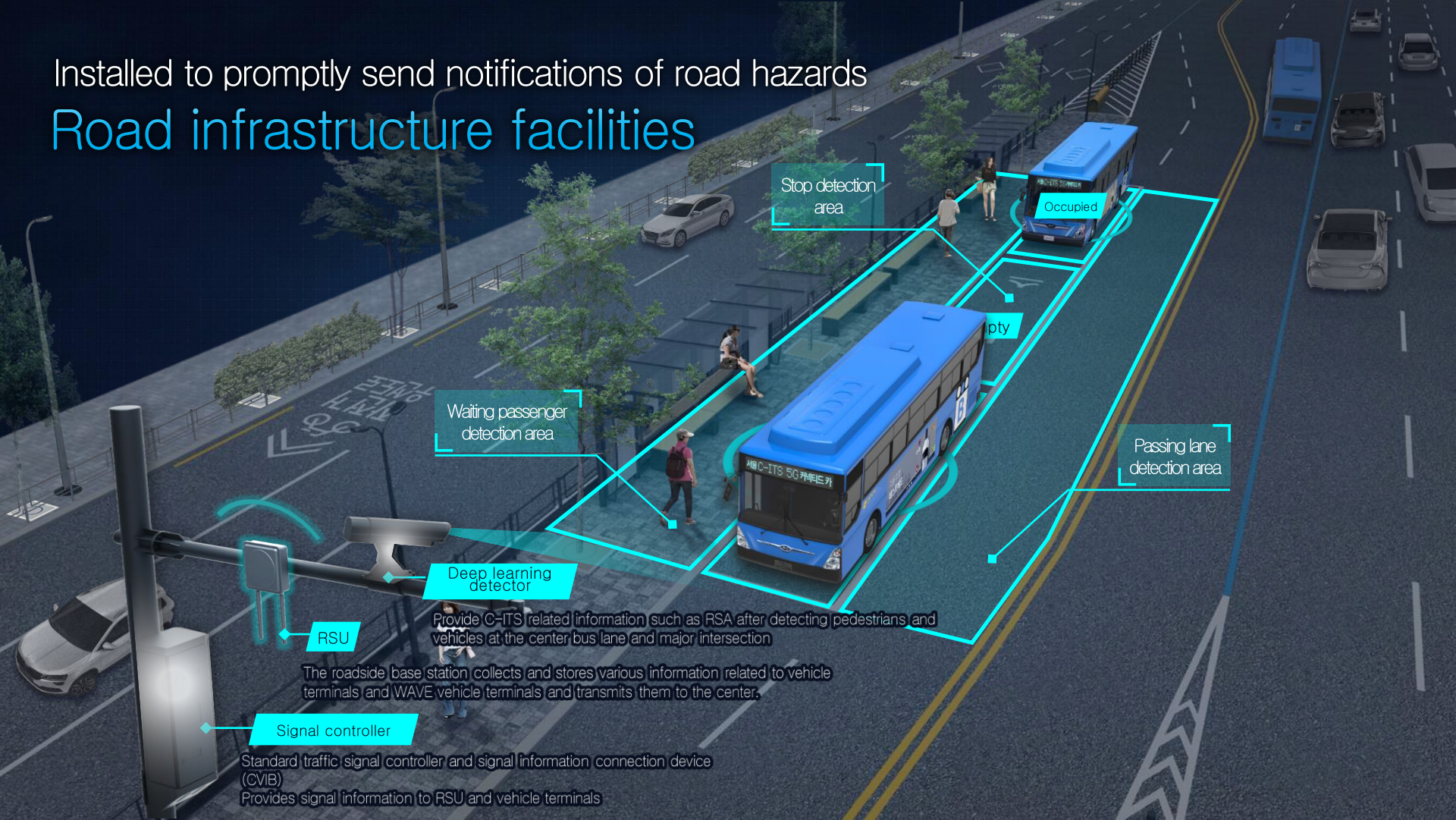
Implementation of C-ITS service on city buses

C-ITS infrastructure installed on 151km of major arterial roads with 1600 city buses and central bus-only lanes



Installed to promptly send notifications of road hazards

Road infrastructure facilities



Implementation of the world's first integrated 5G vehicle system

5G all-in-one terminal (All-in-One)

- 5G + Bus Operation Management (BMS)
- + Transportation Card (AFC)
- + Vehicle-to-machine communication (V2X)
- + advanced driver assistance system (ADAS)



Advanced Driver Assistance Systems (ADAS)
Pothole/rubber cone detection/HD map update function

Bus integrated terminal
C-ITS, BMS, AFC bus terminal capable of simultaneous service

V2X terminal
World's first 5G, C-V2X, WAVE simultaneous service



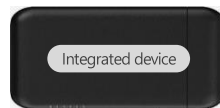
ADAS Camera



ADAS body



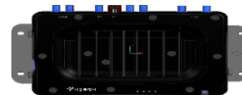
Bus display device



Integrated device



GPS antenna



V2X terminal



C-V2X/WAVE antenna



5G antenna

5G Connected Public Transport System



Pothole detection and transmitting
photo evidence



Traffic cone detection



Road lane adherence detection



HD Map updates

C-ITS (Cooperative-Intelligent Transport Systems)

C-ITS infrastructure in arterial roads with median bus lanes (121km)

Autonomous Mobility Testbed

2021-06-07

20.4°C ☀️ 20:23:16

서울 C-ITS 인프라 현황 시스템 Seoul C-ITS Monitoring System

2021-06-07(일요일) 20:23:16

현재속도: 65.57

공과수: 27,016건 | 금과수: 35,282건

안방주행차량: 7,833건 | 급차안방량: 359,524건

자율주행 차량: 23건 | 무단행단 차량량: 244건

메시지 총 수신 Data 량

I4Q	0.01TB
IIQ	0.14TB

메시지 총 수신 건수

I4Q	32,312,461건
IIQ	668,978,064건

인프라별 수신 현황

C-ITS (Cooperative-Intelligent Transport Systems)

Integrating C-ITS services into city buses

Autonomous Mobility Testbed

2021-06-07

20.4°C ☀️ 20:24:20

신호제어기

- RSU
- 보행자 검지
- 교차로 검지
- 승강장혼잡
- 정차면 검지
- 승강장혼잡 우회자료
- 불법주정차
- 터널유고 검지
- 위험구간 검지
- 관제 CCTV
- Seoul Future Mobility

상암 TB

서울전체

여의도 TB

캐넥티드카 차량 수: 925

지능주행차량 차량 수: 3

자랑 전채

- 지능주행 시범
- 자율주행 차량
- 캐넥티드 버스
- 캐넥티드 택시
- 긴급차량

서울 C-ITS 모니터링 시스템 (Seoul C-ITS Monitoring System)

2021-06-07 20:24:20

현재 속도: 65.57

공과수: 27,016건

공차시간: 35,282건

연방주행차량: 7,833건

급차신변량: 359,524건

중용량선: 23건

무단횡단 차량량: 244건

수집데이터간수

구분	수집데이터간수
PD	85,838
승강	162,030
터널	17,647
소계	265,515

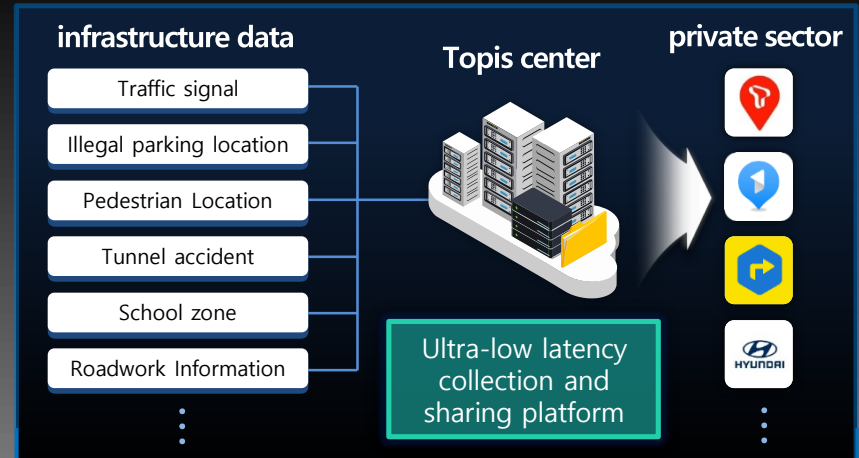
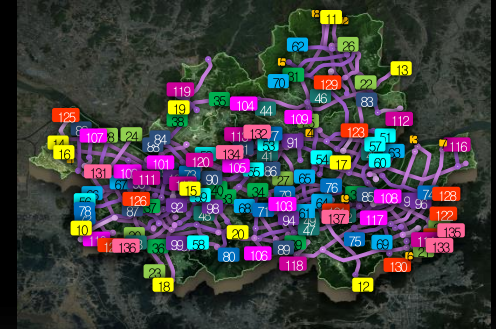
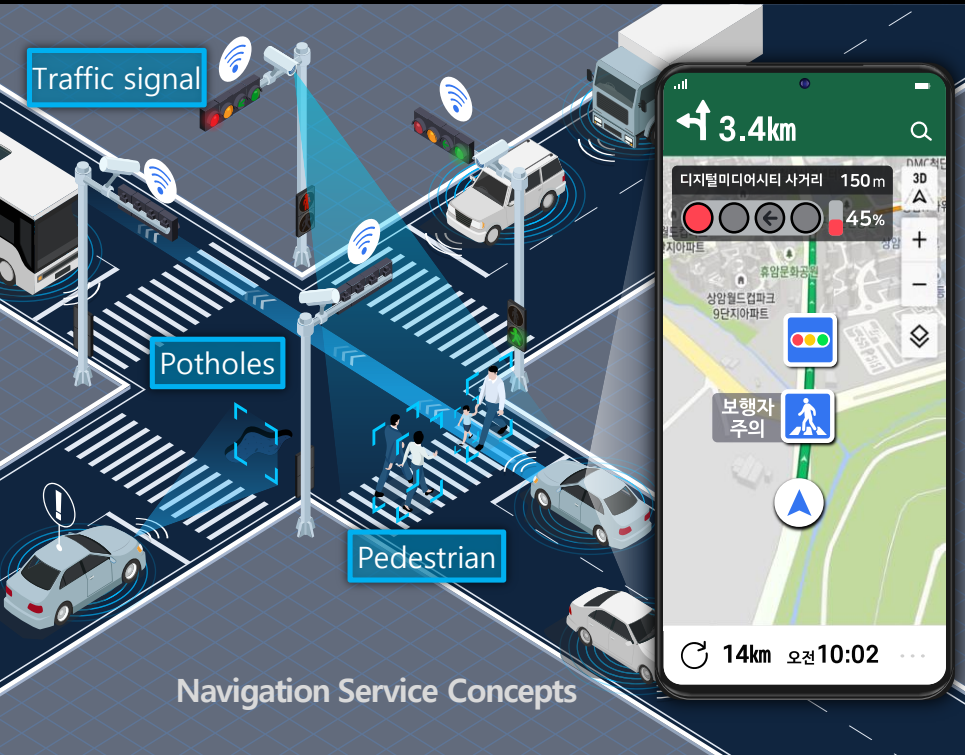
제공데이터간수

구분	제공데이터간수
승강	247,775
MPP	2,776
ROOM	73,739
터널	89,673
TM	159,828
소계	580,793

일일데이터간수

구분	일일데이터간수
수집	265,515
제공	580,793
BSM	278,851
합계	1,125,159

Opening road infrastructure data to the private sector



신호 제어기

5G

Wireless

Autonomous vehicle

Standard signal controller (developed in 2010-R25)

Traffic lights and remaining time by 0.1 second

Opening traffic sign

Illegal parking detection



Blind spot monitoring (pedestrian detection)

Portable construction device



Ultra-low latency C-ITS infra

Mobility center open to public



Control + PR + Business

Multiplex space

Open 24 hrs to public



Ultra-low latency C-ITS infra

Mobility center open to public

Autonomous driving infra specialized to Seoul city

Real-time precise road update

Specialized traffic safety facility for autonomous driving

Automatic update platform for a precise road map

Traffic signal

Road strips (crosswalk, etc.)

Building and unoccupied parking area

Lane, construction & hazard situations (pothole)

Traffic sign

Real-time precise road update

Specialized traffic safety facility for autonomous driving

ADAS (Advanced Driver Assistance Systems)-based real-time precise road map update platform

Real-time update of potholes, construction sites, etc.



Autonomous vehicle test operation area



First autonomous shuttle operation in the world

Introduction of a new autonomous driving sign

Introduction of exclusive parking slots for autonomous vehicles

Expanded demonstration of autonomous driving mobility

Autonomous circular bus



스프링클라우드



SML-오토모스



Autonomous parking (Valet parking)



Autonomous vehicle sharing service (On Demand)

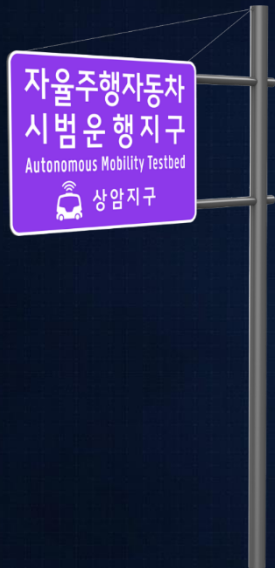


Paid autonomous vehicles start to operate (2021.11.)

상암

도심

강남

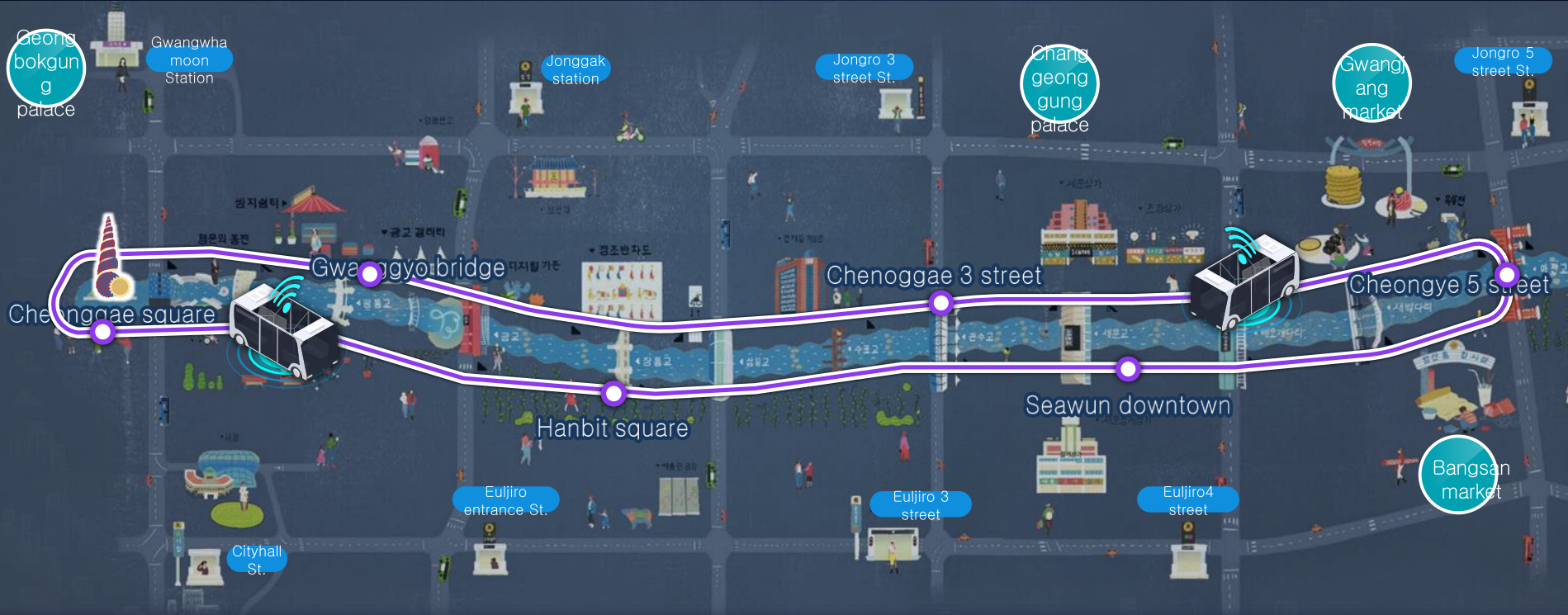


Starting with **Sangam, Gangnam**, etc
Expansion of the autonomous driving test
operation area



Area	6.2 km ²
Road	32.8 km (24 R)
population	Approx. 200,000 persons/day
Main areas	Sangam DMC, Noeul ·Haneul ·Nanjicheon Stream ·Hangang Park, etc.

Autonomous bus which is converged with tour, city experience ,moving



We relate with various places to see. Geongbokgung palace, Changeonggung palace, Gwangjang Market, Dongdaemoon Market and etc.

We provide the chance of riding autonomous vehicles to 90,000 citizens yearly.

상암

도심

강남



We will settle autonomous buses as public transportation till 2026



Driving on middle lane more than 100 autonomous buses till 2026

Creating an Autonomous Driving Environment



Providing precise road maps more than 2 lanes,
the information of traffic signals

Construction of essential infrastructure



03 STEP Three

Big Data Analysis Use Cases

Big Data Analysis Case : Night Bus

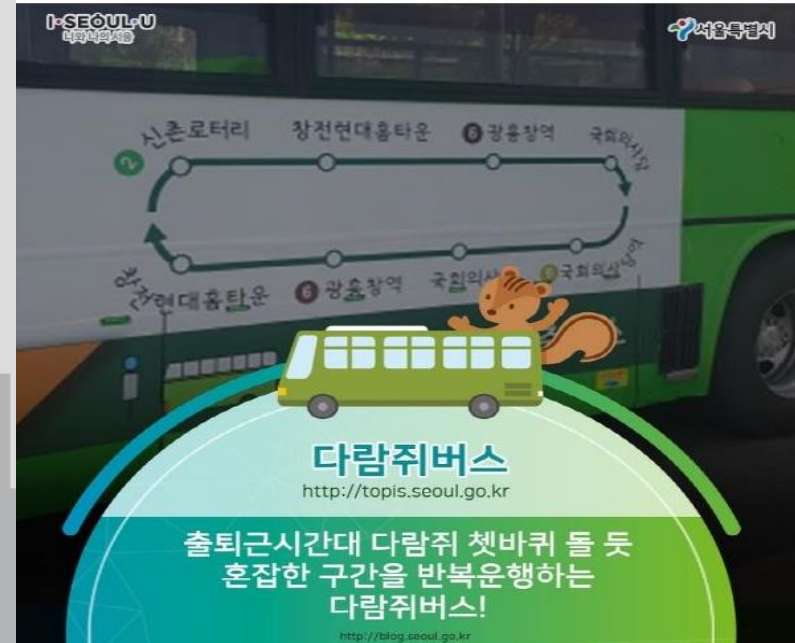
The Night Owl Bus

(Traffic card data + mobile call data)



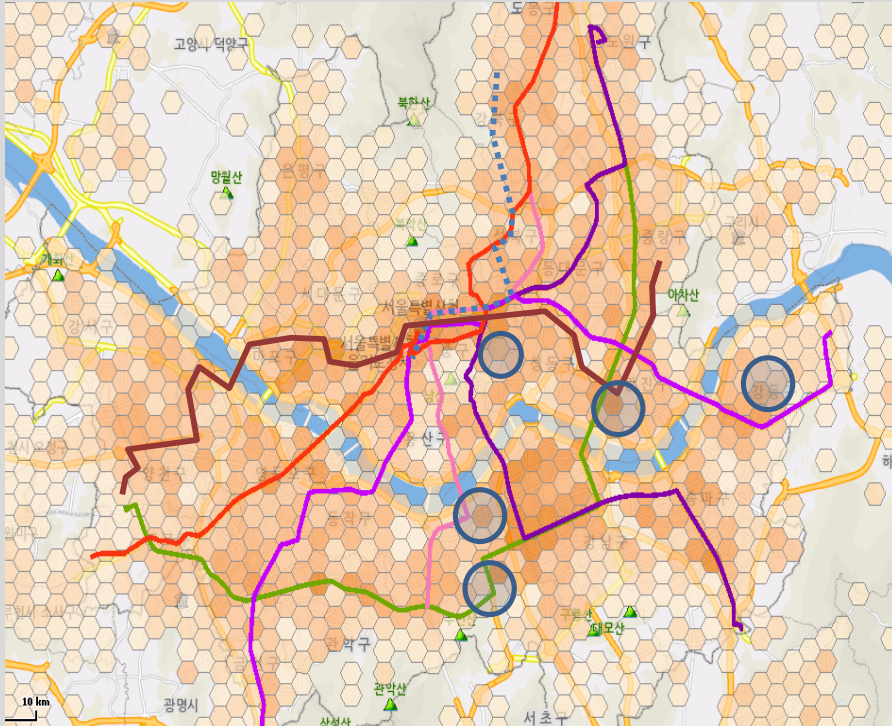
The Squirrel Bus

(Traffic card data + Bus operation records)



Big Data Analysis Case : Night Bus

Route Verification : KT Telecom subscriber data – night time calls and mobility patterns



Population Density Analysis (night time)



Seoul Night Bus Route

The Transformation of Seoul TOPIS

Pioneers the Evolution of Global ITS

