EXPLAINER

TOPIS: A Control Tower for Managing Urban Mobility

Seoul's Transport Operation & Information Service is a central platform that monitors and manages city-wide public transportation and road traffic. Photo credit: Seoul Metropolitan Government

Seoul's Transport Operation and Information Service (TOPIS) is an integrated data hub for smart city management.

Published: 11 December 2019

Introduction

With a population of over 10 million, 3 million registered vehicles, 338.4 kilometers of subway lines, 7,413 buses, 71,974 taxis, and 32.1 million journeys every day, managing Seoul's transport network is a colossal task.

In particular, rapid development in Seoul—the capital and largest city of the Republic of Korea—puts its transportation network under growing pressure that a small failure can bring down a large section of the intricately interlinked system. So it has become even more important to ensure that all parts of Seoul's transport network run smoothly. It is a challenge that requires round-the-clock monitoring across the city, multi-layered information synthesis, complex processing, and prompt and effective control—well beyond the scope of conventional means of administration and communication.

In response, Seoul created the Transport Operation and Information Service (TOPIS), a data management and control system that integrated scattered sources of transport-related information.

This article is adapted from *Seoul's Intelligent Transportation System: Transport Operation & Information Service*, a series of briefs on public transportation published by the Seoul Urban Solutions Agency.

What is TOPIS?

TOPIS serves as a control tower for monitoring, data collection and analysis, information sharing, and response management. Through its interaction with various networks and public agencies across the city, the scope of TOPIS' information also includes disaster response and law enforcement.
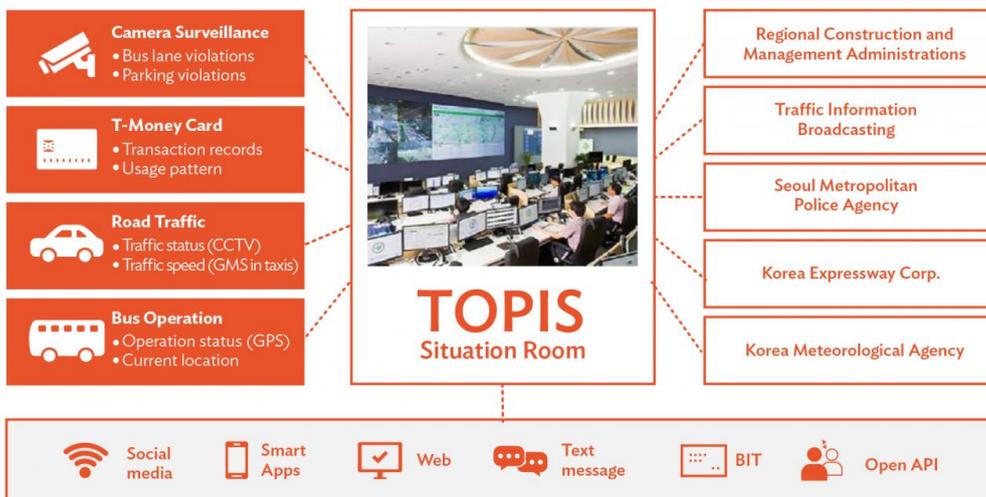
What can it do?

Collect real-time data on bus operations

TOPIS plays a central role in the smart management of Seoul's bus service. Bus Management System uses global positioning system (GPS) and radio frequency (RF) communication to collect real-time operation data from over 7,400 buses running around the city. Collected data informs operational control (detours, service adjustments, etc.) as well as service management and assessment.

Live bus operation information collected through Bus Management System is provided to the public via the Bus Information System. Service information such as the current location of individual buses, arrival time estimates, and service status are disseminated on various platforms like the Bus Information Terminal at bus stops, apps and websites.

Forecast traffic demand

Going beyond live monitoring, TOPIS utilizes big data to provide predictive analysis. Traffic data accumulated over 10 years is used to produce traffic demand forecasts to prevent congestions before they emerge.

Support traffic policy and administration

Traffic data analysis is used to facilitate mid- to long-term policy planning for transport demands. Combined with other big data resources such as T-money usage records and general urban data, TOPIS supports evidence-based policymaking.

Provide 24/7 traffic monitoring

Connecting hundreds of CCTV feeds and detectors from Seoul's key roads, TOPIS provides 24/7 monitoring of traffic conditions. Developing situations such as accidents, road works, and public rallies are detected real-time to coordinate timely response measures like traffic signal change, adjustable lane control and detour suggestions.

Live traffic information collected by TOPIS is provided to the public through a range of channels such as social media, apps, dedicated TOPIS website, transport broadcasts, road signage terminals, and satellite navigation service.

Support city management

The eyes and ears of the TOPIS network—enhanced through information-sharing with various public agencies—support broader city management ranging from law enforcement and disaster response to civil defense. For instance, on-road CCTVs and unmanned surveillance cameras on buses are used to detect traffic violations such as bus lane transgression and illegal parking.

Why is TOPIS effective?

TOPIS represents a central, city-wide platform for comprehensive urban monitoring and operations. It is able to collect an enormous array of real-time data and information from throughout the city, and as such, is the backbone upon which the city's entire public transportation and traffic management policies are formulated and implemented.

Building on this enormous bank of data being collected and analyzed, TOPIS also provides comprehensive and real-time traffic/public transportation-related information to the general public. In these two major ways, TOPIS has been able to fundamentally transform the very fabric of the city's urban mobility patterns, and in particular, has contributed to catalyzing significantly increased modal share of public transportation.

TOPIS also represents robust data management frameworks and institutional coordination for urban transportation and management policies. With the consolidation of standardized data from multiple departments within the Seoul Metropolitan Government and external institutions onto a single platform, the Seoul Metropolitan Government is able to gain a comprehensive and accurate overview of urban conditions, and shape strategic policies in an efficient manner. Moreover, in the case of emergency or disaster situations requiring tightly coordinated multi-agency operations, TOPIS is able to act as a central control tower due to its linkages with systems from external institutions, and its own array of subsystems and networked CCTVs.

How did Seoul set it in place?

Prior to the establishment of TOPIS, the Seoul Metropolitan Government implemented the Namsan region traffic management system and the urban highway traffic management system in 1998 and 2000 respectively. These systems laid the preliminary groundwork for the establishment of a true intelligent transport system (ITS) platform in the city.

In 2004, the Seoul Metropolitan Government established the first iteration of the system—TOPIS 1.0—as a core ICT component of the city's transportation reform program. TOPIS 1.0 was the first city-wide transportation management system to gather key traffic information, such as speed, traffic volume, and live feeds to help manage road situations and enhance the operation of the public bus system.

In 2009, the Seoul Metropolitan Government expanded the functionalities of TOPIS to provide more information-based services to the public through smart phone apps, the internet, and bus information terminals. TOPIS 2.0 was launched to provide traffic and public transportation information, such as bus arrival and location information, and traffic conditions.

In 2013, TOPIS 3.0 was launched. It has comprehensive urban management functionalities and data integration framework. Through robust cross-institutional coordination with other institutions, such as the National Police Agency and the Korea Meteorological Administration, TOPIS 3.0 incorporated information on urban safety and disaster into its operations. Moreover, it uses big data analytics to

provide traffic forecasting services.

Resources

Seoul Urban Solutions Agency. *Seoul's Intelligent Transportation System: Transport Operation & Information Service*. Seoul.

Urban SDG Knowledge Platform. Transport Operation and Information System (TOPIS).

Seoul Urban Solutions Agency

The Seoul Urban Solutions Agency (SUSA) was established by the Seoul Metropolitan Government to share its urban development experiences with other cities seeking to become sustainable and smart urban domains. Through a wide network of partnerships with the public and private sectors within and outside the Republic of Korea, SUSA works to connect and leverage its wide range of knowledge and resources to assist in solving the development challenges of its partner cities.