Developing and Implementing APIs in Road-Related Systems

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1. Introduction

The Road Bureau of the Ministry of Land, Infrastructure, Transport and Tourism (the Road Bureau) is moving forward with construction of a road data platform (xROAD) to promote the use of data in road management, etc., by linking the various road-related data through API linkage.

Specifically, this initiative aims to link data on traffic volume, structure specifications, and the like and build a 3D platform that uses and benefits from the data necessary for road management, on top of platform data centered on 3D point group data from mobile mapping systems (MMS), digital road
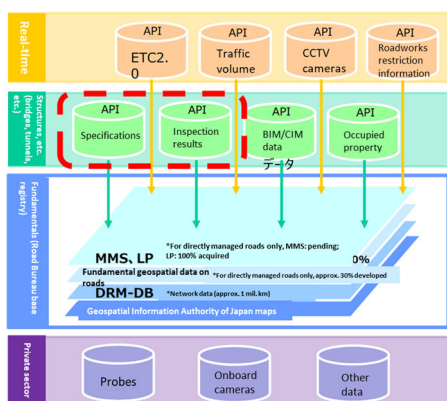

Fig. 1. Concept diagram for xROAD

map databases (DRM-DB), fundamental geospatial data on roads, and other data (fig. 1).

Our division is also improving the functions of and developing new systems as part of the construction of xROAD, so this paper presents the systems that we are in charge of developing and improving, using APIs as an entry point.

2. What is an API?

An API (application programming interface) is a set of rules (or a program to transmit data using the rules) that define shared methods for exchanging data and other information so that the functions and data held by a certain system can be made available for use by another external system. Then, API linkage refers to the mechanisms whereby the system passing the data and the system receiving the data can exchange data by communicating to each other according to the API.

Due to its nature of having each system communicate based on shared rules, API linkage makes it possible to link data in new ways without significantly altering existing systems, so it enables cost and time savings in development and improvement and is being used in various settings.

At the Road Bureau, too, API linkage is an important technology in xROAD to build an environment that allows the effective use of data that was previously held disparately by several systems.

Our division is improving functions and conducting new development in three systems—the fundamental geospatial management system

for roads, the point group storage, management, and processing system, and the road sign database—and the following sections present these systems and the APIs being (or to be) used in them.

3. Fundamental geospatial management system for roads

The fundamental geospatial management system for roads is broadly composed of three functions: the data conversion and storage function, the browsing function, and the data provision function.

When paving works, etc. for a road are completed, the contractor is required to create a CAD drawing known as a "roadwork completion drawing" and deliver it to the Electronic Delivery Storage and Management System, and "fundamental geospatial data on roads" (fig. 2), which is GIS data with the structures in the road zone divided into 30
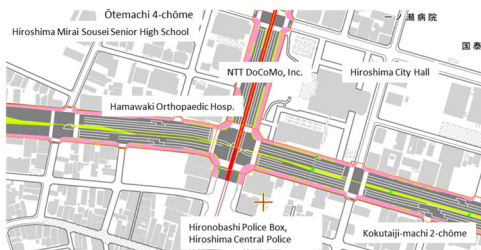
Fig. 2. Image of fundamental geospatial data

layers, is created from this roadwork completion drawing. Because the fundamental geospatial management system for roads has a specification that acquires CAD data from the Electronic Delivery Storage and Management System by an exclusive line and automatically creates GIS data, the data is developed without human involvement.

The fundamental geospatial data on roads thus created is accumulated in the system as a

database, and not only can MLIT employees use the browsing function to check them over the Internet, but they can also check works information and download CAD data by clicking points on the map.

In addition, we have also implemented API linkage functions to provide fundamental road maps to external systems and are currently able to provide image data in PNG format through the Web Map Service (WMS) (fig. 3). WMS is a standard specification when providing map images online, an out system has a mechanism that outputs map image data within the
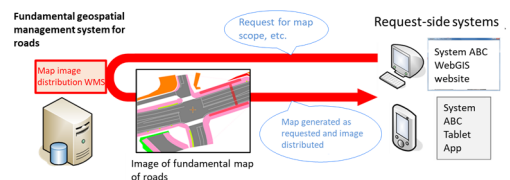
Fig. 3. Image of data linkage through WMS

specified scope when a rectangular scope is designated by two arbitrary coordinates.

Moreover, we are considering system improvements to enable API linkages through outputs of CAD data and CSV format for roadwork completion drawings and works specification data, among others.

4. Road sign database and MMS data storage, management, and processing system

The Information Platform Division, under the direction of the Road Bureau, has just built a road sign database to make use of MMS data to create a database of all road signs under MLIT management in Japan. In future, we intend to consider API specifications for API linkages with the National Road Facility Inspection Database,[*] for example (fig. 4).

* A database composed from a group of several databases on road facilities. Built in the cloud.

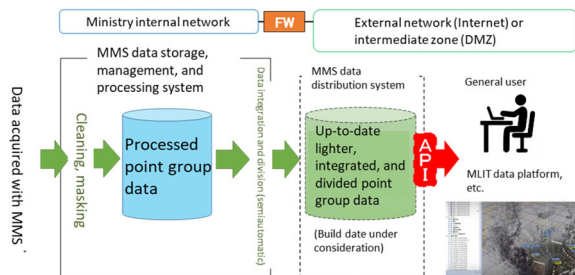Fig. 4. Image of linkage with the road sign database

Fig. 5. Image of MMS data linkage

Furthermore, under the guidance of the Road Bureau, we are moving forward with 3D point group data and image data acquisition through MMS for roads directly managed by the national government, and these data are stored in the MMS data storage, management, and processing system developed by our division (fig. 5). As the MMS data itself has a large file size and cannot be transmitted easily over a network, we are considering making the data lighter and distributing it through API linkages.

5. Conclusion

Our division is also making improvements to systems through API linkages with the aim of advanced usage of the various data. We hope to work on xROAD through the above initiatives to promote greater work efficiency and the use of new technologies in the maintenance and management fields, for example.

☞See here for detailed information

1) Research Institute for Road and Street, "What Is the National Road Facility Inspection Database?"
http://rirs.or.jp/tenken-db/