

Adopting Cloud Service in the National Spatial Data Infrastructure

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In Korea, NSDI(National Spatial Data Infrastructure) was implemented for integrating and sharing the nationally generated spatial data. One of the main roles of implementing NSDI is providing spatial data to public agencies. And now, the establishment plan for NSDI with the technical advancement should be needed. This paper deals with the technical aspects of adopting cloud service in the NSDI. First, we propose the concept for target system, which shows the current and future NSDI. In the future NSDI model, GIS cloud and governance systems are included. Service functions for cloud system and infrastructure implementation design directions are derived. Finally, governance system implementation plan is described. This research will contribute to the implementation of NSDI cloud service system.

Keywords: GIS, Spatial Data, Infrastructure, Cloud Service

I. INTRODUCTION

Korea MOLIT (Ministry Of Land Infrastructure and Transport) had implemented NSDI (National Spatial Data Infrastructure) project since 2008, and the project was finished at 2012. The main objective of NSDI is sharing the spatial information, which is produced and stored by various local government and ministries, by linking and integrating [1]. However, it has a limitation to obtain the latest version of spatial data due to the distributed ownership and physical linking [2]. With the information technology advances (i.e cloud services), it is needed to advancing NSDI as a cloud based system for effective spatial data sharing.

Spatial information services provided by public agencies have common functions. MLTM (2011) analyzed the spatial information services in the public agencies, and many functions in the services are overlapped [3]. Since functions can be reused, such an overlapped function implementation causes waste of budget. Adopting cloud system to NSDI, national budget can be saved.

This paper deals with adopting cloud service in the NSDI. We propose concept for target system, which compares current and future NSDI in the next chapter. This is followed by implementation plan for GIS cloud system. Implementation plan includes service functions for the system, and implementation direction for the system. Finally, we propose governance system for cloud based NSDI.

II. IMPLEMENTATION PLAN

A. Concept for Target System

Current NSDI can be divided into three regions. Those are data integration region, service framework region, and information usage region. Data integration region is composed of management support system and national

spatial integrated data warehouse. Service framework region provides standard service and spatial application service. Information usage region has local government administrative work services.

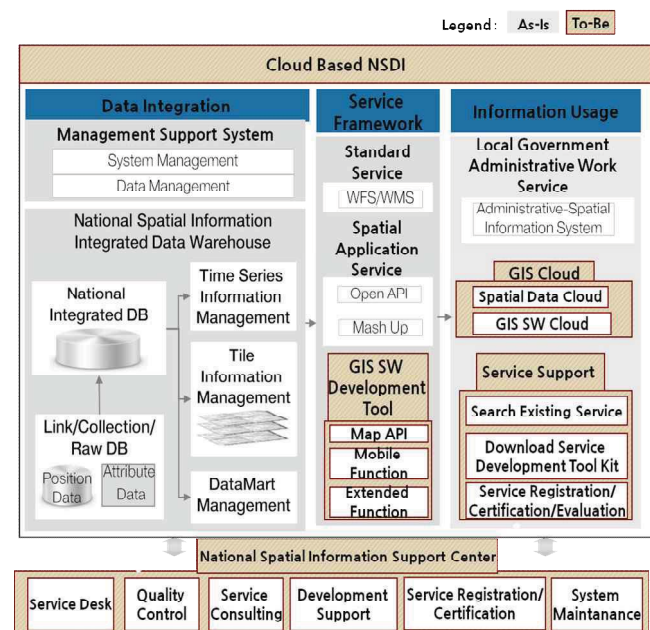


Fig. 1 CONCEPTUAL DIAGRAM FOR TARGET SYSTEM

To adopt cloud service in the NSDI, three modules and one center should be added in the current system. First module is GIS SW development tool in the service framework region. Various functions for implementing GIS service are pre-implemented in this module. Second module is GIS cloud service in the information usage region. GIS cloud service is composed of data cloud and SW cloud. Users can access the spatial data and easily implements the GIS service by using this module. Third module is service support. Users can search existing service, and determine the re-usable service. This portal also provides service registration/certification/evaluation.

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National spatial information support center is designed for management of cloud based NSDI especially for cloud based service. Conceptual diagram for target system is showed in Fig. 1.

B. GIS Cloud System

In Fig. 1, two modules are presented in information usage region. We deals with definition of cloud service functions for two modules. Table 1 shows the definition of cloud service functions. Basically, functions for GIS cloud module are similar with traditional GIS SW module. Cloud based NSDI aims service function reuse. User, who intends to development GIS service, searches the existing service. If user finds the optimal service component in the service catalog, then he downloads the component, and implements the service easily with low cost. Those specific functions are categorized in service unit function. User, who intends to sell his component, conducts service registration. System manager evaluate the service and certified it.

TABLE I DEFINITION OF CLOUD SERVICE FUNCTIONS

Unit Function	Specific function
File	File management
	Layer export/import management
Layer	Layer management
	Layer attribute management
	Layer group management
	New layer management
Editing/Shar ing	Layer sharing management
	Layer editing management
Spatial calculation/ analysis	Layer spatial calculation management
	Layer spatial analysis management
Support	Print management
	Certification management
	Quota management
Base/Them atic map	Thematic map management
	Tile management
	Base map management
Service	Searching existing service
	Downloading service module
	Service registration
	Service certification
	Service evaluation
Tool kit	Development tool kit management

To implement the cloud based NSDI, several design directions should be considered. First, performance degradation of infrastructure should be prevented. Unlike current NSDI, responding velocity degradation can be expected due to mass storage concentration from the various local governments and ministries. Second, public and private infrastructure (WEB server, WAS server, DB, Network etc.) should be separately implemented. Third, infrastructure should be easily expanded horizontally and vertically, since frequent business rule changes are expected when adopting cloud system.

C. Governance System

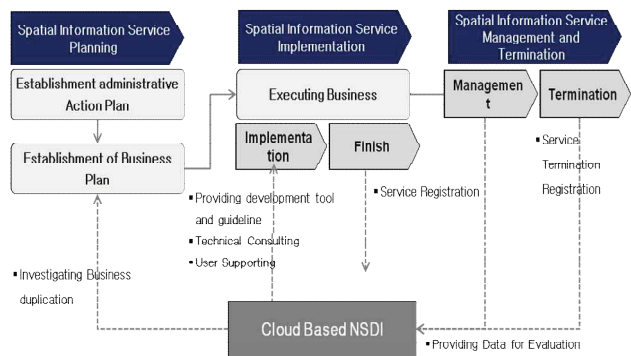


Fig. 2 GOVERNANCE ROLE DEFINITION FOR EACH STEP

With the cloud service based NSDI expansion, new governance system is needed. The role NSDI is expanded to service implementation and management when adopting cloud service. Therefore, service life-cycle management is possible in public sector. Fig. 2 presents the governance role definition for each service life-cycle. In planning step, administrative action plan and business plan are established. In this phase, NSDI provides investigating result for business duplication. During the service implementation, NSDI provides development tool, guide lines, technical consulting. After implementation, developer conducts the service registration for reuse. NSDI determines the service termination considering the data from the management.

III. CONCLUSIONS

In this paper, adopting cloud service in the NSDI is discussed. Concept for target system is proposed when NSDI adopting cloud service. Comparing current NSDI, three modules and one center is added. For implementing target system, definition of cloud service function is discussed. Proposed cloud based NSDI has service component reuse function. Therefore, related six specific functions are proposed. Finally, we define the governance role for each service life-cycle. For further study, technical architecture for system is needed for cloud based NSDI system.

REFERENCES

- [1] J. Youn, "The Establishment of BPR for National Spatial Data Infrastructure Quality Management System", *Journal of the Korean Society for Geospatial Information System*, vol. 22, no. 4, pp. 81-89, 2014.
- [2] MLTM, A Development Plan for National Spatial Information Platform, Ministry of Land, Transport and Maritime Affairs, pp. 1-18, 2012.
- [3] MLTM, A Policy Research on National Spatial Information Integrated DB Usage Foundation and Action Plan, Ministry of Land, Transport and Maritime Affairs, pp. III.6-III.54, 2011.