STRATEGY ON THE TEST-BED OF KOREAN LAND SPATIALIZATION PROGRAM FOR UBIQUITOUS GIS

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KEY WORDS: Korean Land Spatialization Program, Five Core Projects, Test-bed, Ubiquitous GIS, Proving Ground, Showcase

ABSTRACT:

This paper proposes the strategy on the Test-bed of Korean Land Spatialization Program (KLSP) for Ubiquitous GIS in Korean Society. KLSP is one of the VC-10 (Value Creator 10) Projects which shares Ministry of Land Transport and Maritime (MLTM)'s vision of "Better Life Quality for the Future Society." The KLSP has been started since 2006 and it will be lasted till 2012. For 5 years, 132 million dollars are funded by Korean government. The goal of Test-bed is to create the design and implement for the integrated test-bed which accommodate various new technologies and outputs produced from five core projects. The well-harmonized collaborative co-operations between proving ground and showcase have driven the Korean Land Spatialization Group (KLSG) to a successful management. The importance of KLSP's test-bed is in the use of collaborative model capabilities for the interoperability of KLSG. This model enables us to maintain and decision, because an establishment of supporting system for successful accomplishment can become enormous when the performance may be adversely impacted.

1. INTRODUCTION

In recent years, GIS technology has been more and more involved in the use of ubiquitous concept. The Korean government recognized the value of ubiquitous GIS by geo-spatial information needs in the Korean society. The Korean NGIS (National GIS), initiated in 1995, has become one of the most visible and progressive national GIS programs worldwide. After successful completion of two preceding 5-year programs, the third NGIS was inaugurated in 2006 with the slogan, "building ubiquitous infrastructures for digital Korea." The R&D component of this 3rd NGIS is entitled The Korean Land Spatialization Program (KLSP), which aims at providing not only technological support for the NGIS, but also geospatial information technology for shaping the future ubiquitous society. The Korean Land Spatialization Group (KLSG), which controls and manages the KLSP, is planning a KLSP Test-bed for testing, integrating, and exhibiting the KLSP outcome (Park et al. 2009).

KLSP is one of the VC-10 (value creator 10) projects which shares Ministry of Land Transport and maritime Affair's vision of "Better Life Quality for the Future Society." This grand project is composed of five core projects : Geospatial Information Infrastructure, Land Monitoring, Intelligent Urban Facility Management, Design information-based Indoor-Outdoor Geospatial Information and Application Technology Development, and Ubiquitous GIS Core S/W Technology. Research Coordination Project (KLSG Integrated Projects), which is subdivided into five sub-projects, was launched on September 11, 2007 (now at the fourth year as of June 27, 2009). INHA University is the leading organization of this project.

The purpose of this study is to create the strategy of action plan for the integrated Test-beds which accommodate various new technologies and outputs produced from KLSP. It intends to do this by establishing a detailed action plan and promotion plan for five core research projects based integrated Test-beds.

2. RELATED WORK

The research on the topic of Test-beds is currently ongoing in several R&D Programs. One of the most important points of reference is the test-beds for GI interoperability platform which, since 1998, has been testing a various technology and services tools to "collaborative design and demonstration interface specification for a subset of core location application services defined by the Test-beds" by GIUZ(2002). The platform of GI interoperability is freely shared to help accelerating the adoption and development of the involved technologies. Currently the project is still far from proposing unified approach; rather it is a definition of OGC Web Map Services, Web Feature Services, and algorithms which, although well categorized, are not yet fully integrated. However, the platform of GI interoperability is one of the most interesting and challenging project in the area.

A remarkable work in the field of the wireless LBS is test-bed for WiFi positioning and location based services (LBS), the evolution of the work proposed by Barend Kobben (2007). The test-bed is designed to provided proving ground for LBS research, and it is a valued services for the University of Twente (UT) campus community. Initiated n early 2005, the project's team is comprised of members from the University of Twente Computer Architecture Design and Test for Embedded System Group, the UT department of Information Technology, Library and Education, and the International Institute for Geospatial Information Science and Earth Observation. The system delivers mapping information for LBS and mobile applications through the use of adaptive, cartography aware database objects. One of the important sensed context parameter is location awareness, which is important for all spatial applications, and is currently being dealt with in research as well as implementations by Bunningen et al. (2005). On the one side of the ubiquitous GIS is National Spatial Infrastructure (NSDI) that technological roadmap in KLSP with practical utility, and on the other is model of commercialization (Park, et al., 2009).

3. KOREAN LAND SPATIALIZATION PROGRAM

3.1 Overview

As the R&D component of the third NGIS, the primary objective of The Korean Land Spatialization Program is to take the lead in technological development in order to support the "building ubiquitous infrastructures for digital Korea." National interest in geospatial information technology is very high since numerous mapping and positioning-based IT

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solutions have become enmeshed in the fabric of the Korean people's life. Moreover, the recognized need for intensive R&D also reflects the following specific trends and requests related to geospatial information technology.

"Spatialization of information," which involves attaching location tags to existing information, is considered to be a possible means of overcoming the crisis of information overload, and a problem that will only worsen in the future. The value of spatialization is strongly backed up by a noticeable trend in the Information Technology (IT) industry. In 2005, "Google Earth" sensationally debuted, enabling ordinary citizens to access high-resolution satellite images through beautiful fly-through navigation.

Geospatial information technology has been recognized as one of the core technologies for shaping the future information society as well as realizing higher-value-added industries. As Microsoft's acquisitions show, technologies such as mapping and positioning are key to the "spatialization of information" framework.

Table 1. Contents of KLSP

Core Projects		Sub-projects	Organization name of KLSP
1	Geospatial Information Infrastructure	R&D on Innovative Management of Geodetic Reference Frameworks	University of Seoul
		R&D on Constructing Next Generation Digital Maps	Korean Association of Surveying and Mapping (KASM)
2	Land Monitoring	R&D on Acquiring Data for Land Monitoring	Korean Institute of Geoscience and Mineral Resources (KIGAM)
		R&D on Processing and Applying for Land Monitoring	INHA University
3	Intelligent Urban Facility Management	R&D on Practical Use of the Core Technology for Facility Management Platform	Korean Institute of Construction Technology (KICT)
		Development of Integrating Management Application Technology for Intelligent Urban Facility	Korean Institute of Construction Technology (KICT)
4	Design information-based Indoor/Outdoor Geospatial Information and Application Technology Development	R&D on Renewal of Geospatial Database based in the Dynamic Construction Data	Konkuk University
		R&D on Construction on Indoor Space Data and Application	KT Corporation
5	Ubiquitous GIS Core S/W Technology	u-GIS Processing and Management Technology	Electronics and Telecommunications Research Institute (ETRI)
		On-demand Land Information Provision Technology	Electronics and Telecommunications Research Institute (ETRI)

professionals in geospatial information technology participating in the planning phase. The effort produced a refined list of R&D items and expected budgets, organized the R&D program, and offered a management strategy. In order to determine the key research components of the 3rd NGIS, a variety of technology management techniques were used. In the result, research directions were summarized into 5 core projects and 10 specific sub-projects (table 1).

3.2.1 Geospatial Information Infrastructure: Before an advanced technology is implemented, the foundational infrastructure on which it will stand should be strengthened. Likewise, the ubiquitous society would not be feasible without the support of geospatial information of high quality. Therefore, building a strong geospatial information infrastructure is the first requirement of the Korean Land Spatialization program.

3.2.2 Land Monitoring: Land monitoring is also composed of two main areas of R&D which are acquiring data for land monitoring of aerial/terrestrial monitoring technology including ubiquitous USN-based land monitoring as well as conventional space borne/airborne monitoring, Processing and Applying for Land Monitoring.

intelligent ground urban facility management, and development of a centralized urban facility management platform.

3.2.4 Design information-based Indoor/Outdoor Geo-spatial Information and Application Technology: From the perspective, which has taken the initiative in furthering the NGIS program, integration of construction and geospatial information technology has been a crucial issue from the earliest stage. The research areas of this category are integration of construction CAD and GIS, construction resource and site management with LBS technology, construction underground investigation and management with geospatial information technology.

3.2.5 Ubiquitous GIS Core S/W Technology: Ubiquitous Geographic Information Services (UbiGIS) is a part of the major Ubiquitous Computing (UbiComp) technology trend, as mentioned previously. Not only the UbiComp infrastructure but also advanced positioning and mapping technology are required in order to realize UbiGIS. The research areas of this category are system developments for ubiquitous geospatial information processing, integration, advanced visualization and positioning technology for UbiGIS, indoor spatial information processing and management.

4. TEST-BED OF KLSP

KLSP Test-bed, where all projects' result are integrated and tested, has one integrated portal system providing various research results and services. In order to work together, the project's results in one-conditioned site and platform must be designed and developed to be interoperable with each other. Each KLSP project organized into 5 core and sub-projects has different character and is developed and managed by the different research institute. Because of these properties, the common systematic frame needs the system integration so that these heterogeneous project's results can work together.
And then we tried to find the complicated specification of each procedure. By clarifying these specifications of procedures, we could design world-class hub of u-GIS technology that ubiquitous land model are component of (1) measurement and Validation of field test/integrated operation, (2) realization and Verification of independent/ integration services (Figure 1).

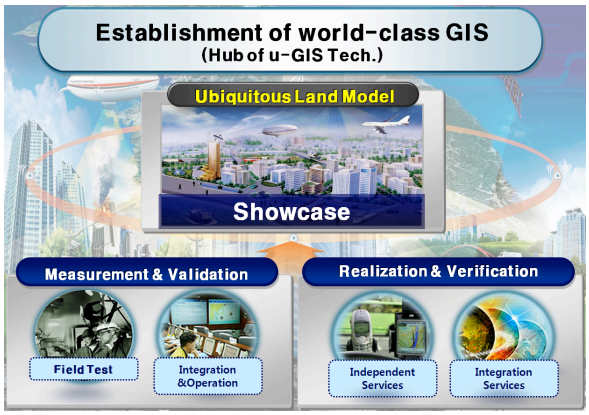


Figure 1. Goal of KLSP Test-bed

4.1 Strategy of KLSP Test-bed

As shown in Figure 1, Establishment of world class GIS will be installed all over a regional territory including transportations, buildings and environmental geography. The construction of KLSP Test-bed, manages, and administrates the outcomes and information of each core project for integrated showcase of Ubiquitous Land Model. KLSP's results in the Test-bed must be designed and developed to be interoperable with each other to work together collaborative. The five core projects and numerous sub-projects in the KLSP are developed and managed by the different research institutes so that they have to have different properties. Because of these properties, the system integration should be attained as a common systematic frame so that the heterogeneous results may work together well.

4.1.1 Measurement and Validation of R&D Outcomes: Using R&D Outcomes for measurement and validation is just one of the many techniques available for field test. There are various reasons to choose field based proving. One is fact that it is a validation of practicality. Because the ubiquitous technology exists, the technology can be done by laboratory-only tests, without adding any applying field of real world. This argument is, of course, also true for ubiquitous technology, which needs almost worldwide coverage, but KLSP test-bed has the validation of also being usable real world. The other, compared to various techniques such as position infrastructure, digital processing of satellite, RFID or Software technology, the interoperability not covered by measurement is real time.

4.1.2 Realization and Verification of Integrated Services: We give a high priority to the technologies that can be directly applicable to the outcomes of the five core projects which are in progress by using linkable technologies. We set up linkages among research outcomes which share core techniques and design systems together from the beginning of the project. KLSP will operate a technical oversight committee to manage this task for realization and verification of integrated services. So, we will develop research outcomes as market products so that they can be sold in the market. The product should be developed as a standard and package "integrated Test-beds." Actively transfer developed technologies to the industry partners, regardless of the phase of the project. We give high priority to the partners participating public (e.g. Local government) works so that they can instantly use the technologies developed from tax payers' money.

4.2 KLSP's R&D Outcomes for applying Test-bed

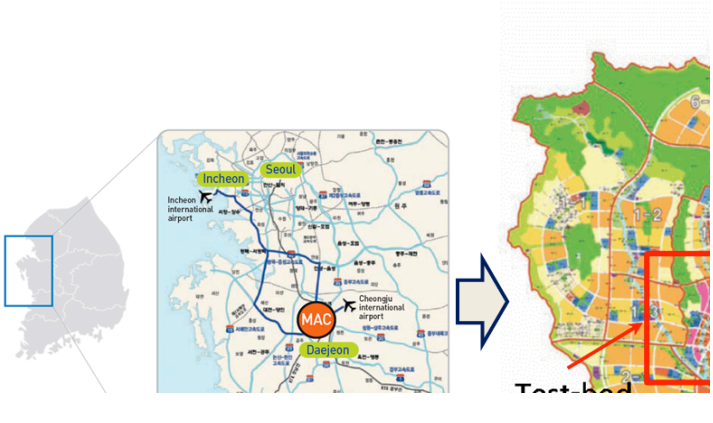
As mentioned above, the KLSP consists of 5 core research consortiums including 96 research. Because each institute has different research which develops different outcomes for its own purposes, the 34 representative outcomes are decided as final outcomes. 29 outcomes of our representative outcomes will be applied to the KLSP Test-bed site and the rest of the outcomes could not be applied to the Test-bed, because they could not be tested on the limited Test-bed, but whole Korean Peninsula. As shown table 2, each outcome has a different purpose and is equipped with different types of sensor devices, and uses different communication media. All of the systems of outcomes transmit measuring data to the main control center.

Table 2. Contents of KLSP's 29 Outcomes

Core Projects		KLSP's Outcome for ap
Main control center		Management Center for Proving Grou
1	Geospatial Information Infrastructure	Management System on the Ubiquitou
		Geospatial System on the Equipments Information
		Development of Equipment on the Gr
		Multi-Looking Aerial Photographic Sy System
		Management System on the Next Gen
		Acquisition System on the Real-time A
		System on the Fixed Ground Censor b
		System on the Ground-based Video In

4.3 Selecting of the Region for Integrated Services

There has recently been much industry and research activity in the realm of R&D. The purpose of the KLSP's Test-bed is not the development validation of R&D outcome, but rather to set up the "u-Land Model" for ubiquitous GIS. The KLSP Test-bed is unique in that it combines input from 29 outcomes concerned with the practical package of both new and established techniques to provide useful services for citizens in local government. Thus, selection of the region for integrated services helps to improve practical interoperability of Test-bed.



South Korea

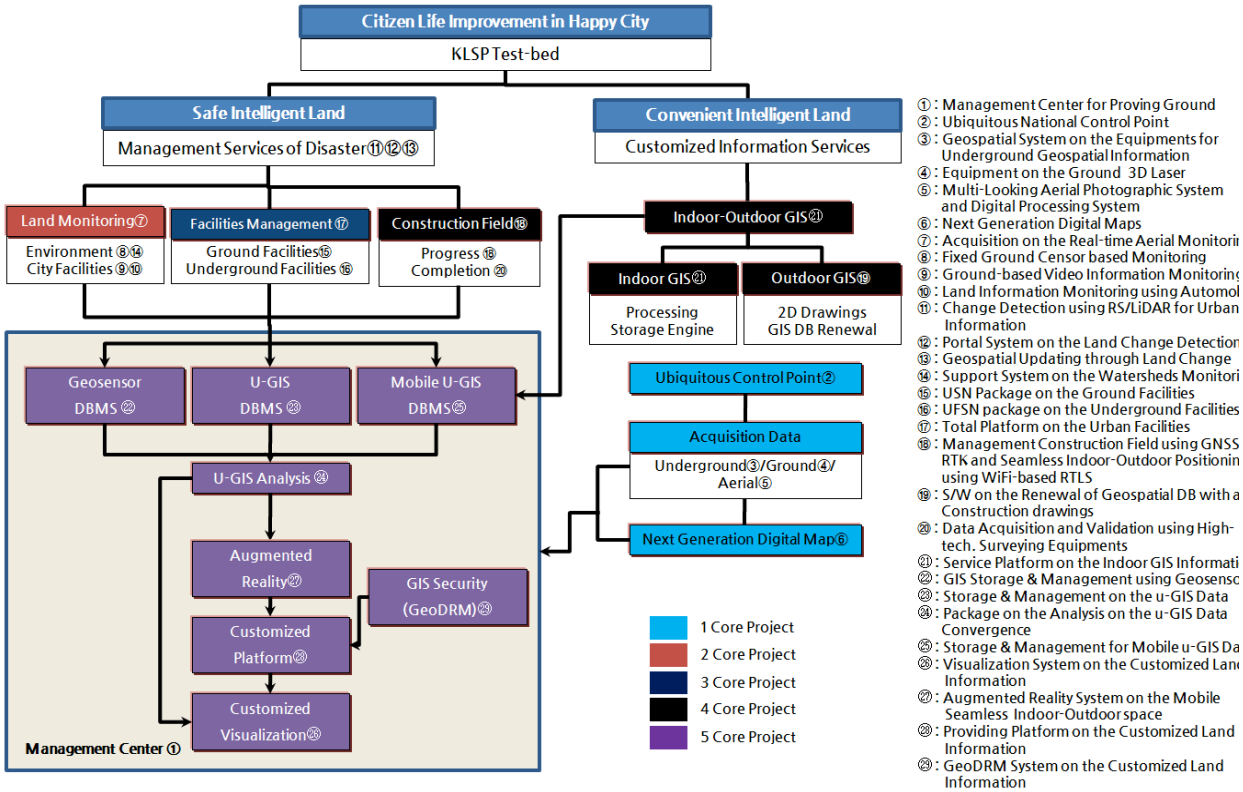


Figure 3. Integrated Services Concept of KLSP Test-bed

bed(weighted ratio: 20%). Figure 2 shows the Multifunctional Administrative City (MAC) of selective local government. Cutting-edge KLSP outcomes shall be applied to MAC for environmental prevention, management of under ground/ground facilities, land monitoring, and convenience for citizen life improvement. Through this, the quality of life and value of the city shall be enhanced innovatively, and we offer Fig. 3 services.

bed, but whole Korean Peninsula. Second, KLSP Test-bed offer integrated services for realization and verification. The KLSP Test-bed is unique in that it combines input from 29 outcomes concerned with the practical package of both new and established techniques to provide useful services for citizens in local government. Thus, selection of the region for integrated services helps to improve practical interoperability of Test-bed. And finally, our Test-bed was qualified by the hub of ubiquitous GIS using the showcase on the integrated services. It is that Establishment of world class GIS will be installed all over a regional territory including transportations, buildings and environmental geography.

The construction of KLSP Test-bed, manages, and administrates the outcomes and information of each core project for integrated showcase of Ubiquitous Land Model. KLSP's results in the Test-bed must be designed and developed to be interoperable with each other to work together collaborative. As part of its objectives to perform strategy, the KLSP also launched a number of innovative field proving ground, reaching out to different practical use. The Korean national R&D program was among the first to include a field test with the selection of local

government which activities from research to constructing proving ground.

KLSP lead to the strategy that Test-bed is in the use of collaborative model capabilities for the interoperability of R&D. The strategy of Test-bed enables us to maintain and decision, because a establishment of supporting system for successful accomplishment can become enormous when the performance may be adversely impacted. With the rapid progress of GIS technology and increasing popularity of practical u-GIS, it is expected that there will be increasing requirements for human-activity. It is likely that the future generations of KLSP five core projects.

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