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Geospatial Data Catalogue Service ; Status and Issues

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ABSTRACT

Geospatial interoperability has been pursued by propagating international standards and OGC standards. The NGIC, GeoConnection and other catalogue services are reviewed with aspect to metadata and search functions. Detailed metadata could be driven to users after finding what they want to have. Criteria for search were not fully overlapped with metadata, as simple and typical searches are prevailing. OGC catalogue service standards were made but catalogue services in Korea have been implemented in their own ways, not fully compliance-tested. Different domain technologies have been developed regardless of geospatial service, the relationship and integration methods between catalogue services and other core technologies are reviewed in the form of a pair table. Other issues in geospatial service were discussed in the level of raising issues.

Keywords : Catalogue service, Geospatial data, OGC, Metadata, Integration and service platform

요 약

공간정보의 상호운영성을 확보하기 위하여 국제표준 및 개방형지리정보 표준협회에서 만든 표준이 널리 적용되어왔으며, 카탈로그 서비스에 대한 부분 역시 그러하였다. 국가지리정보유통망 서비스와 캐나다의 GeoConnection서비스 및 기타 다양한 공간정보의 카탈로그를 제공하는 서비스 사이트를 분류하고 그곳에서 사용되는 메타데이터 현황을 조사하였다. 실제 필수메타데이터는 잘 준용되고 있으나 메타데이터를 자동으로 추출하는 프로세스 등은 미약하였으며, 검색을 위한 기준과 메타데이터가 100% 일치하지는 않았다. 지적재산권보호기술과 카탈로그의 기술적 통합 등 이슈가 되는 주변기술과의 결합가능성을 테이블을 작성하여 구현방안을 검토하였다. 서비스 카탈로그에 대한 적합성평가를 받은 국가의 공간정보 카탈로그 서비스는 없었다. 서비스되는 공간정보가 종류가 많고 다양해지고 쌍방향 정보가 되는 과정에서 메타데이터를 사용자가 편하게 이해할 수 있는 표현방법 및 기타 보안관련 사항 등에 대한 논의를 추가하였다.

주요어 : 카탈로그 서비스, 공간정보, OGC, 통합과 서비스 플랫폼

1. Introduction

As the geospatial data production increases, updating cycle needs to be shorter than before. The temporal gap between data production and propagation becomes smaller, and data users can be served too much information (Study Group, 2008). As appropriate guide

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for data being also essential for each user, then catalogue service become one of the hottest issues not only in Korea but also in the world. U-city service should have some interface with geospatial information (Kim, 2008). Though interoperability for service propagation has been pursued by making standards for catalogue service in OGC (OpenGIS consortium), complete geospatial service is not available in 2009 in Korea.

(1) Study Purposes

I aim to review geospatial data service in Korea and to classify the service whether it is in public domain or in private domain. The second purpose is to clarify the limitations of geospatial catalogue service in the technical sense of digital right management and to check the current measures for authentification test bed. The final purpose is to discuss the potential risks and business models for the geospatial cataloging service.

(2) Methods

Firstly I review the standards related to geospatial data catalogue services and analyze the current status of metadata services for domestic and foreign websites. Secondly, I check the catalogue service with mash-up process in the web map services in case of Korea.

2. Catalogue service status and standards

The OpenGIS Catalogue Services Interface Standard (CAT) supports the ability to publish and search collections of descriptive information (metadata) about geospatial data, services and related resources. Providers of resources use catalogues to register metadata that conform to the provider's choice of an information model; such models include descriptions of spatial references and thematic information. Client applications can then search for geospatial data and services in very efficient ways.

Overall system use case in implementation specification is in the FIG 1. A representative public catalogue service in Korea is NGIC (national geographic information catalogue) service.

Starting in 2002, each year sees the expansion of data and enhancement of hardware and functions of software. However there was transit period from paper map with metadata to digital map with metadata. Two types of metadata coexist in the NGIC catalogue. Paper map had a metadata set for each sheet. Even though all the paper map were converted to digital format, NGII (National Geographic Information Institution), metadata were not changed into geospatial data format, but were kept for each sheet. That is to say, repetitive metadata were estabished for each sheet of NGII format data.

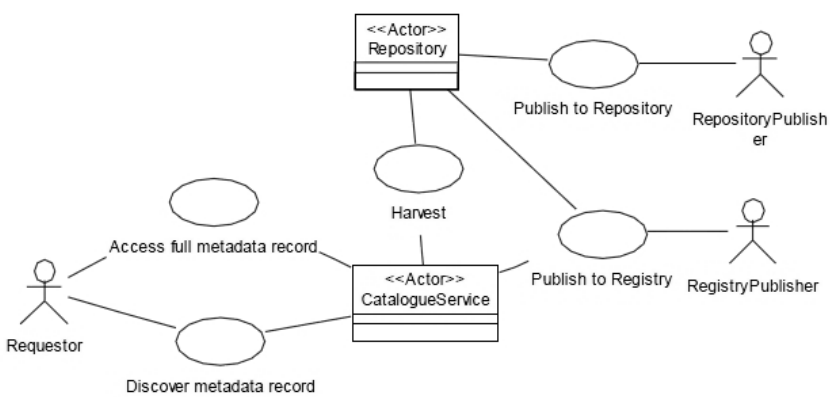

FIG 1. Overall System Use Cases (OGC 07-038)

NGIC in Korea have implemented all the functions with compliance with the implementation specification, but the repository building process was not performed automatically but each manager or system implementer inserted all the metadata from excel sheet to database directly, as interface of repository harvesting was not ready. That is to say, it is necessary to build metadata before the setting repository harvesting function is implemented.

It is necessary to search maps based on administration unit and a certain area (AOI: area of interest) on the map, even though administration unit is not included in the list of metadata. Most of mandatory classes are listed when detailed information of metadata is requested. For the satellite imagery data, the product name is such as Quickbird, SPOT, Landsat regarded as an important item for the catalogue service, even though the product names are not included in the list of mandatory item in IS 19115-2.

Within the Canadian catalogue service such as GeoConnection, there is metadata search based on IS 19115 and 19115-2. But the thematic map providers such as FEMA (Federal Emergency Management Agency) and EPA (Environmental Protection Agency) do not provide full metadata but some of the mandatory metadata such as production year, agency name.

According to GeoConnection, the Next Generation Stateless Catalogue is software that, when in place, will enable users of the CGDI (Canadian geographic data infrastructure) to manage a wide range of detailed data metadata related to such things as web services, map styles, image collections, geographic data sets and coordinate reference systems.

Advance search Options in GeoConnection includes search by location (administration unit), place name, postal code and latitude and longitude, subject, time period and product types. Products types are categorized into airborne product, map and charts, digital elevation model, geopolitics thematic map, nautical chart, thematic maps, topographic maps, satellite imagery and on-site measurements and study materials.

The Abstract Test Suite for catalogue service 2.5 offers several concept for the check out the conformance test as follows (OGC 04-017r1)

- Assessing conformance requires consistency across the various viewpoints (i.e., clear mapping of concepts) and across the models they define; in general, the set of viewpoints should not make mutually contradictory statements. This sub clause documents the mapping between views: how elements in one view are related to elements in another view.
- A reference point identifies a behavior or proposition that must be satisfied at a particular interaction point. A reference point may be declared as a conformance test point which is used to test observed behavior, this amounts to functional or “black-box” testing that ignores implementation details and emphasizes external functionality.
- Conformance classes that bundle together a specific set of interfaces may also be defined in order to distinguish different service capability levels (for example, a transactional catalogue, a sessional catalogue).

Table 1. Metadata in the Geosptial Catalogues

	ISO standard	limited metadata for convenience
NGIC (national gis catalugue) site	· core metadata including(three times clicks from the data search allow the metadata information · data sheet, metadata sheet	· scale, geographic name, coordinate system criteria · search on the map
Thematic Maps	· core metadata including · metadata set · hierarchical metadata · Forest GIS portal · Environmental GIS portal	· thematic maps · free data on line · service charge on CD offline delivery

· Conformance testing involves testing both the capabilities and the behavior of an implementation; it does not include assessment of the performance or the robustness or the reliability of an implementation.

An abstract test suite was developed independently of any particular implementation, according to the OGC CITE framework; the abstract test cases are then transformed into executable tests that can be run on a real testing device or system. There is no trial for Korean NGIC and GeoConnection to get the compliance test for the standards.

3. Platform or advanced system integration? What is the relation with catalogue service?

Among some of the many meanings of platform, we usually imagine a completely new computer hardware and a software platform in order to run applications. Assembly language could be written directly, but usually software developers target the new hardware platform using a cross compiler such as .net platform, Java platform, Symbian platform, Linux platform. But what is service platform? The word of "Service Platform" is used with additional descriptive adjectives, such as Service Delivery Platform, Keyword Service Platform, Geospatial Service Platform. Platform as a service (PaaS), to say, delivery of a computing platform and solution stack as a service (Wainewright, 2009). Open Platform as a service intends to developer use any programming language, any database, any operating system, any server, etc. Open platform favors geospatial service, as geographically distributed environments is the one of the driving force for open platform and as free API was available Udell, 2009).

Metadata implementation and geospatial service scenario is not limited to catalogue service or to a specific platform such as Google maps, MS virtual world, naver map and but the data flow and mash-up and save and print functions, digital right and editing technologies can be combined with different ways (Table 2).

Simple information service might include map service in the 1990s, then Open API is one of the big trends using geospatial information, finally Mash-up service become replace the former service then subordination will accelerate. In the future, ubiquitous platform of location-based real-time service will one of the killer application (Yun, 2008).

Technologies which guarantee interoperability cannot obtain by scattered software developer groups, so the integration process seems to be treated as tedious and time-consuming process. But the complexity and inter-dependency get larger, the abstract standards won't work to implement system of systems. So technologies in individual domain can be compared with the combination methods in the Table 2, as examples.

Bishr *et als.* (2006) addressed the essential information model that is required for GeoDRM digital licensing to

Table 2. The Ways for Combination of Catalogue Functions with Other Functions

	encryption Digital Right Management	metadata catalogue server for query	data viewer or editor for UCC
encryption Digital Right Management		Application level Graphic Use Interface	xml parsing integration
metadata catalogue server for query	Application level Graphic Use Interface		xml parsing integration or dll link
data viewer or editor for UCC	xml parsing integration	xml parsing integration or dll link	

function. Authentification issue is also one of the important issues, as geospatial service with detailed information itself dangerous motivation and evokes infringement of privacy, information espionage and information piracy. OGC started "security" is preparing as a guideline for the geospatial service. We may add new issues to the Table 2 and get some idea how to integrate the functions with a respect of each functions or technology dependency.

4. Discussions

There is also more discussion material to implement for geospatial catalogue service which cannot solved by standards.

First, most of metadata are made by producer-side not by consumer-side. So too many mandatory metadata cannot be easily delivered to data consumer. Especially data fusion and mash-up service are increasing; the metadata cannot be controlled in the same level. Cataloging service is not any more independent of simple registry data. Another challenge is the serviced data in the scene or window frame are not limited one or two sets of data, but combined geospatial features, building modeling, imagery and multimedia data such as photography, video clips. Do they need registry of metadata for the all kind of data? At least geospatial data cannot be excluded from other dataset, since the digital water marking technology for the geospatial data are required independently?

May the semantic web with geospatial data be a powerful answer for the issue? But the semantic web is an emerging technology, so further considerations should be related to catalogue services.

Delivery of metadata set for multiple sets of data should reorganized to allow the information consumers to understand metadata intuitively, not by scrolling all the meta data sets of each dataset. Interwoven with UCC data, metadata of geospatial data are not limited to data producer-side but non-experts people may add wrong information, too. What will the role of catalogue service for geospatial data? XML is one of the standards to share metadata and to make machine readable one, but the representation of metadata is not well defined yet and has not drawn enough attention from service providers.

5. Conclusions

Interoperability has been pursued by propagating international standards and OGC standards. The NGIC and GeoConnection and other catalogue services are reviewed in the aspect of metadata and search functions. Detailed metadata could be driven to users after having found the right data. Criteria for search were not fully overlapped with meta data, as simple and typical searches are prevailing. More efficient combination of metadata should be designed for mash-up service with many different geographic data.

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