DEVELOPMENT OF THE DATA-SHARING MECHANISM FOR GEO-SPATIAL INFORMATION IN ASIA

Kiyoshi Honda[1] and Yoko Makino[2,] Venkatesh Raghavan[3], Phisan, Santitamnont[4], Surat Letrlum[5]

[1, 2,5]Asian Institute of Technology, P.O. BOX, 4 Patumthani 12120, Bangkok, Thailand
1) Email: honda@ait.ac.th
2) Email: yoko@ait.ac.th
5) Email: surat@ait.ac.th
[3]Osaka City University, 3-3-138 Sugimoto, Sumiyoshi, Osaka 558-8585, Japan
Email: raghavan@media.osaka-cu.ac.jp
[4]Chulalongkorn University, Patumwan, Bangkok 10330, Thailand
Email: Phisan.S@eng.chula.ac.th

ABSTRACT

In Asia, many researchers and agencies started to realize that the sharing and opening of geo-spatial information is an important contribution to the society and could improve socio-economic well-being. However, accessibility, integrity and interoperability among existing GIS databases are still inadequate in Asia, and, thus, the contribution of data to society and people's life is not satisfactory made yet.

Digital ASIA is an initiative to provide people and community with easy access to geo-spatial information over the Internet through open sharing of GIS and Remote Sensing Data among all the countries of Asia. Digital ASIA will strive to develop a mechanism for the sharing of geo-spatial information, which will be suited and relevant to the technological, infrastructure needs of and Asian societies. Furthermore, Digital ASIA will provide technological support and know-how for delivery of up-to-date information from various countries and regions promptly in order to speed up the implementation of Spatial Data Infrastructure for sustainable social and economic development.

1 INTRODUCTION

Under the name of Digital Earth, numerous efforts have been put on the development of global dataset. Technology to share GIS data, such as Web GIS, Open GIS and Distributed GIS on the Internet is rapidly progressing. On the other hand, in Asia, regional to local GIS dataset are not yet well developed. Datasets that cover Asia or international regions such as GMS (Greater Mekong Sub-region) do not exist although better understanding and planning over regions are becoming increasingly important at this international era (Bishop et al., 2000).

Many organizations, agencies, and companies in Asia have already realized the usefulness of Remote Sensing (RS) and GIS data, and have been developing their own databases. The quality of planning and decision making process are strongly influenced by the data availability and data completeness. Eighty percent of time and costs occupied in developing GIS is allocated to database acquisition and integration (Thomas and Hardin, 2000). However, accessibility, integrity and interoperability among existing GIS databases are still inadequate in Asia. As a result, the contribution of this data to society and people's life is not enough.

Digital ASIA is aiming to address these problems by establishing a scheme to share and integrate geo-spatial information at the regional to local scale over the Internet using Web GIS, Open GIS and Distributed GIS technology in Asia.

The main objectives of Digital ASIA are

- To develop the mechanism of data sharing, so that various partners can participate easily
- To provide a guideline for developing applications and demonstration systems
- To help any agencies who would like to open data
- To stimulate demonstration systems which will be bases of future operational system
- To develop a set of tools which is useful to open the data easily
- To exchange experience of "lesson and learn" in developing demonstration systems among participating agencies

The main contribution of Digital ASIA will be

- To provide individuals and communities with easy access to geo-spatial information over the Internet through open sharing of RS and GIS data among all the countries of Asia, and supporting them to utilize the RS/GIS resources for sustainable socio-economic development in the Asian region.
- To solve the problem of limited access to geo-spatial datasets, to promote community/individual participation in planning and development processes and to enhance environmental awareness in the Asian region from a spatial perspective of Asia as one borderless landmass

2 APPROACH/MECHANISM OF DIGITAL ASIA

2.1 Approach

Since Digital ASIA it not a project for specific applications, but an open initiative to stimulate data sharing and opening of geo-spatial information, Digital ASIA will develop a series of demonstration systems to show the usefulness, feasibility of the concepts with partners who would like to open their data as a first step. These demonstration systems will be bases for future operational and large-scale systems. Digital ASIA will provide technical support, guidelines, and server space if necessary. Some partners will become regional supporting nodes of Digital ASIA to enhance activities at national or local levels.

2.2 Structure

To achieve these objectives, Digital ASIA will form the Digital ASIA Network (DAN), which will help partners to open their data through the development of demonstration systems. DAN would be comprised of an Advisory Committee, Technical Support Team, Participating Application Developers (partners) and a Secretariat. Advisory Committee will help to provide directions of DAN and develop guidelines. Technical Supporting Team will provide substantial technical support to partners to develop their demonstration systems. A series of useful tools for systems will be developed by the team as well. Partners of participating Application Developers will be encouraged to open and share data over the Internet and will be supported to develop tailor applications suited to their specific needs.

The Secretariat will support overall management of DAN and its activities. The implementation structure of the DAN is illustrated in Figure 1.

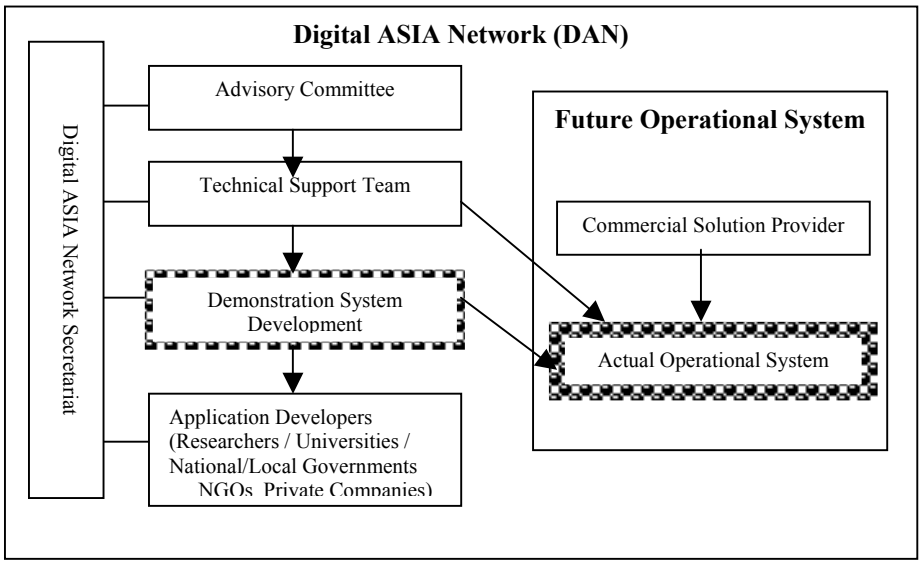

Figure 1. Implementation structure of the Digital ASIA

2.3 Guideline for geo-spatial data sharing

Digital ASIA will develop a guideline at a concept/policy level and technical level so that those who would like to provide access to their data could easily evolve data sharing concepts, by following the guideline and participate to the mechanism mentioned above. In Asia, even though the scale of maps is small, national security will be a big issue for providing open access to geo-spatial data. There is a need to define several categories of openness of the data ranging from meta-data level, serving data without actual features and full access including every feature data, so that the geo-spatial Web-service providers could easily choose their levels. Those who would like to open their data need to define a policy for data sharing which also includes issues such as the level of data access. The policy and specification will address and propose such as rationale of sharing data, security, the level of sharing, copy rights, costs, standard protocol, standard system/software and so on.

2.4 DAN Web Map Server

Technical support team has implemented DAN Web Map Server (DWMS) as a test bed and as a common plat form of Digital ASIA. Those partners who need a server outside of their place because of limited server space or limited Internet bandwidth, may place their demonstration systems on this DWMS. Several demonstration systems have been implemented in DWMS.

2.5 Utilization of free software

DAN will make a full use of free software to save cost. DAN technical support team currently support these systems to enhance the effectiveness of support.

Server: LINUX (Mandrake 8.2), Windows 2000
WMS: Minnesota Map Server or other OGC compliant servers as a situation demand
SQL: PostgreSQL/mySQL or SQL92 Compliant SQL

2.6 A series of tools for geo-spatial information sharing

Intuitive tools for system installation and management would be developed. They include software packaging of OS, WMS, and Application Builder to make it easy to transfer existing data on the server, controlling open/access level to the data and so on. These tools will help participating application developers to install and maintain the system easily.

3 APPLICATION OF DIGITAL ASIA TO SOCIETY

Digital ASIA encourages that every partners who agreed to the concepts of Digital ASIA to initiate projects from their end by utilizing the rationale of data sharing. A series of systems developed under the concepts will accelerate the data sharing in Asia. Hunan resources development is one of the most important agenda. Without capable engineers, the system could not be implemented or sustained. The development plans described below are the samples of the projects under the concepts of Digital ASIA.

3.1 MODIS image server development

This project will develop MODIS data image server at AIT as one of the demonstration system. Not only providing with time series raw/process data for research and applications in near real time, the data will be shared by other map servers so that the image can be overlaid with their data. The system will be based on Free, Minnesota Internet Map Server for the implementation. Full resolution of the data will be kept at the server side, but the image, which will be served to users, will be re-sampled to the resolution of their terminal. Thus, users will be able to browse whole image up to full resolution even if the speed of the network is such as telephone line connection. Those who need datasets will be able to download them after selecting necessary area and bands, although the on-line distribution depends on the bandwidth of the Internet structure.

3.2 Open GIS training course

The technical supporting team is developing a course curriculum and materials of the Open GIS training course. The course contains Open GIS, Internet GIS, its application, XML, Data clearing house etc. The hand-on session includes implementation of LINUX, Minnesota Map Server, modification of a server, connecting with external RDBMS, connecting other Map Server etc. The first training is being planned in November at AIT. The technical support team is also seeking for opportunity to organize the training course in other countries.

3.3 Environmental and disaster monitoring using MODIS the image server

The MODIS image server will provide easy access to the environmental and disaster monitoring. The data will contribute to monitoring such as forest degradation or recovery process, forest fire, suspended sediment, coastal zone environment, water pollution, vegetation change caused by climatic events or disasters. The MODIS server will contribute to near real time data provision to the region, which contribute people's life through disaster mitigation (Iwao and Honda, 2001). The data will be provided to concerned agencies in Asia on a near real time basis. Each agency will be able to monitor/analyze the situation of disasters such as flood, drought, fires, and so on. Currently Ministry of Laos and AIT are discussing about the utilization of the data for environmental monitoring including disasters. Once the system has been established, getting near real time data will benefit not only Laos but also all areas that fall in the footprint of our receiving station.

3.4 Regional scale data development

GIS data will be developed intensively to meet the growing demand for geo-spatial information in the regional level. Digital Mekong is one of the possible projects of Digital ASIA to support development especially at GMS. GMS is an international region that consists of Cambodia, Lao PDR, Myanmar, Thailand, Vietnam, and Yunnan province of the People's Republic of China. Many activities on research, human resources development, regional planning, infrastructure investment including GIS database development are going on. However, there is no comprehensive and consistent GIS database which covers the GMS. Each country may have their GIS databases but because of the difference of data specifications, the data is hardly used for over viewing or planning of GMS as a whole. For Digital Mekong is to contribute to the development of GMS by providing comprehensive regional geo-spatial database such as basic geographic data, landuse/landcover, natural resources, dynamic vegetation change or agriculture activity information derived from remote sensing data. Digital Mekong also provides data sharing system among stakeholders, which is extremely important to address regional or transboundary environmental problems and conflicts.

3.5 Gulf of Thailand coastal zone database

Southeast Asia START Regional Centre (SEA START RC, http://www.start.or.th/) holds a valuable data regarding coastal zone in South East Asia. It opened their data for Gulf of Thailand under the concepts of Digital ASIA, which can be accessed at DWMS.

3.6 Other systems and projects

Several other demonstration systems have been developed and placed in DWMS, such as Urban Geoscientific Data in Phuket and Hanoi developed by DCGM III Working Group, experimental aerial photograph server and so on.

An idea on the system development on near real time base environmental monitoring using MODIS combined with Master level education is being formed among AIT and Laos government agencies, in which data sharing mechanism will be implemented to enhance the effectiveness of the data utilization.

4 CONCLUSIONS

Several institutions have already showed their willingness to participate Digital ASIA as application developers, and actually some of them has already started providing online data access. Various kinds of environmental data will be available on the Internet, which will be shared by environmental researchers, or other agencies that should have more direct link to the policy implementation in respective countries. People will have more easy access to geo-spatial information, such as maps regarding facilities, government's development plan as well as remote sensing images, and will have more opportunity to visualize their country and region. Through the participation of various researchers/organizations, a number of demonstration systems will be developed which will form base for implementing scalable and operational systems for mission-critical needs.

The improvement of accessibility to environmental data will provide individuals with more opportunity to see their environment from the viewpoint of Asia as a whole. In Asia,

few individuals have opportunity to recognize their environment at this kind of scale. Awareness to their environment enhanced by Digital ASIA will increase their motivation to think about their environment and to participate to the sustainable development of society.

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