Secured Spatial Data Infrastructures for National Economical Development

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Contents

1. Introduction of NSDI
2. Key Technologies for NSDI Realization
3. Applications using NSDI
4. Conclusion
### Overview of Hitachi’s Business

- Various Hitachi’s information and control system support social life.

#### Wide applicable area from information to control systems

<table>
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<tr>
<th>Power Systems</th>
<th>Railway Systems</th>
<th>Social Infrastructure &amp; Industrial Systems</th>
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</thead>
<tbody>
<tr>
<td>Power system monitoring and control</td>
<td>Traffic control</td>
<td>ITS and ETC systems</td>
</tr>
<tr>
<td>Customer service support Management support</td>
<td>Seat reservations</td>
<td>Water supply and sewage monitor-ing and control</td>
</tr>
<tr>
<td>Thermal/nuclear power instrumentation and control</td>
<td>IC cards boarding ticket systems</td>
<td>Steel rolling mill control</td>
</tr>
</tbody>
</table>

#### Control System Technologies and Information System Technologies

<table>
<thead>
<tr>
<th>Simulation and analysis technologies</th>
<th>Control systems middleware</th>
<th>High-speed transaction processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autonomous decentralized system architecture</td>
<td>Large-scale, high-reliability databases</td>
<td></td>
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</tbody>
</table>

#### Platforms and Components

<table>
<thead>
<tr>
<th>Information platforms</th>
<th>Control components</th>
<th>Power electronics products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servers</td>
<td>Control servers</td>
<td>UPS</td>
</tr>
<tr>
<td>Storages</td>
<td>EIC integrated controllers</td>
<td>High-voltage inverters</td>
</tr>
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<td></td>
<td></td>
<td>Power converters</td>
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What is NSDI?

- NSDI is a national platform to process, manage and provide geospatial data. The geospatial data contributes to national development in wide area, such as e-government, social infrastructure and land use management.
- The NSDI is comprised of ICT, Data and Law.

ICT

IT infrastructure to create, update, maintain and provide geospatial information

Data

Map data (thematic map, common map)
Satellite imagery
Satellite positioning
Census/statistics

Law

• NSDI law
• Master plan
• National Committee

NSDI: National Spatial Data Infrastructure
Supposed IT Challenges in Laos

- Laos has great potentials for economic growth.
- Map applications can contribute to solve a lot of challenges in Laos.

- Social Infrastructure construction
  - Planning maintenance

- Acceleration of e-Government realization
  - Asset management

- Creation and improvement of industries and job opportunities
  - IT industries Survey

- Environment conservation and agricultural improvement
  - Forestry/Agricultural product

- Peoples’ welfare and rights
  - Finding and protection of land rights

Digital map
Map Data Sharing among Ministries, Industrial sectors and National Public

- National maps affect major impact on ministries, industrial sectors, national public.

Ministries to create maps

- Data to be shared

NSDI Database

Common map

NSDI users

Ministries to use maps

Infrastructure

Agriculture

Forestry

Industrial sectors

Existing map data

National public
Extended Uses of NSDI

- New applications based on common base maps by Laos NSDI are generated easily.
- New IT industries and job opportunities are expectable.

Social infrastructure management

Urban planning

Laos NSDI as a national property

Disaster prevention

Sightseeing

NSDI consists of two levels, wide area maps and rural/city maps.
Since data is shared among ministries, common object items should be specified.
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NSDI technologies consist of Map production technologies and Spatial ICT.

Map Production

- Survey
- Map plotting
- Accuracy control
- Map object representation

Technology Integration

ICT

- Digitalization
- Data flow management
- Data transmission
- Standardization
- Application
- Security
NSDI Data Center

- NSDI is realized as the "Data Center".
- In the NSDI Data Center, "Data Life Cycle" technology is implemented.
- New and historical maps are always available.

The NSDI Data Life Cycle involves the following steps:

1. Initial Data Input
2. Data Integration
3. Update
4. Distribution
5. Spatial Analyses

The NSDI Users (Spatial data sharing) receive standardized data format from the NSDI Data Center.
Key Technology — Initial Data Input

- Digital map conversion technologies has already developed.
- All middle-scale maps of entire Japan and main large-scale maps of rural /city areas has been digitalized in Japan.
- Paper maps can be converted to digital maps (semi-)automatically.

Paper maps → Flatbed scanner → Map editing terminal → Digital maps
Key Technology ÿ Data Integration (1) ÿ

- NSDI spatial data consists of wide area maps and rural/city maps.
- Common map objects available in ministries are integrated and provided.

Wide area maps: 1/25,000, 1/50,000

Topographical maps* as base maps

3D Generation

Overlay of images

Satellite Image: © DigitalGlobe, Inc. All Rights Reserved
Digital map is originally created by Hitachi
Key Technology • Data Integration (2) •

Rural/City maps: 1/2500, 1/5000

Road shapes
Public-private boundaries

Integration of buried conduits
Integration of houses/buildings

House/Building data is also shared
Key Technology  Update (1)

- Transfer GPS data to the NSDI server, and can be referred immediately.
- After reference, authorize official map data

RTK-GPS * positioning

Transmission (Wireless) of changed differences

Dedicated network, etc.

NSDI server

User terminal

Survey points

Underground pipes in construction fields

Survey point

Survey point

Updated conduit (Blue line)

Partial update of conduit

Newly constructed conduits

Survey points

Newly constructed conduit

* RTK-GPS: Real-Time Kinematic Global Positioning System
Find changed objects such as houses by comparing maps with images, and update the maps.

An example for house change detection and map update

Old map

Newly obtained image

Finding of changed objects
(For collection of fixed asset tax)

Not changed
To be confirmed
Demolished/shape changed
Newly constructed

© Digital globe/Hitachi Solutions
Key Technology \( ì \) Distribution \( ï \)

- Provide common map data as one-stop service by accessing NSDI portal site.
- Register Map suppliers/users in advance, and be certificated in access.
- Secured NSDI is realized.

Source: Geospatial Information Authority of Japan website
http://ckan.gsi.go.jp/
Ministries and rural governments upload their own maps onto NSDI base map. They can authorize users who can access to their map and/or data by themselves.

Ministry A and rural government C are permitted to access.

Only authorized ministries can access thematic maps.
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Road facility management system
Able to confirm condition in road facilities on 3 dimensional terrain map.

(a) Road facilities symbols and retrieval of attributes in a facility

(b) Conversion from symbols to graphical objects

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<thead>
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<th>Maps and data necessary for these application</th>
<th>Why are the maps and data necessary?</th>
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<tbody>
<tr>
<td>1</td>
<td>Common maps</td>
<td>topological map, road network, 3 dimensional terrain</td>
<td>to display status of road facilities on map</td>
</tr>
<tr>
<td>2</td>
<td>Data owned by ministries</td>
<td>maintenance information of road facilities</td>
<td>to display status of road facilities on map</td>
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Crop field and soil management
By managing various crop field and soil information in connection with field map, relevance of those information can be seen visually and the usage of integrated information can be realized.

Aerial photo or satellite imagery makes field data creation easy

Crop field information

Soil analysis mapping
(colored by value of available phosphate)

No. | Type                           | Maps and data necessary for these application                      | Why are the maps and data necessary?                              |
---|--------------------------------|--------------------------------------------------------------------|------------------------------------------------------------------|
1  | Common maps                    | topological map, aerial photo or satellite imagery                  | to create field data                                             |
2  | Data owned by ministries        | Information of crop field and soil                               | to display crop field and soil data on map                      |
Recognizing crop growth condition from satellite imagery
Using satellite imagery, possible to estimate the growth of wheat or protein content in rice.

For wheat, enable to reduce wheat drying costs through timely harvesting and improve its quality.

For rice, it will help build a most efficient fertilization plan to support the stable production of high-quality rice.

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<td>to analyze crop growth condition</td>
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Realization Steps for NSDI

- NSDI construction starts within ministries using maps frequently
- Other ministries and industrial sectors join step by step.

New attendees expand uses of NSDI

Participation of industrial sectors

Data distribution to national public

Ministries in which maps are used frequently

F/S

Small start

Within 5 years
Based on our past experience, the necessary conditions for success of NSDI projects are as follows

- Participants, ministries in Laos should be united under the project.
  - Consensus making
    * Ministries should agree map data sharing among ministries
    * Spatial object for map generation and map updating should be performed collectively
  - Government committee or related institution to promote the project.

- Ministries should be coordinated
  - Committee or institution management
  - Leadership for consensus making
  - Management of working groups
Conclusion

- NSDI can be a national property.

- NSDI has great impacts on a lot of fields.
  Examples:
  * governmental administration (mainly e-government)
  * social infrastructure construction
  * Creation of New IT industries
  * expansion of peoples’ welfare
  * environmental conservation/natural resource management

- Spatial analyses based on Big Data processing and ICT platform creates new application.

- Japanese team including Hitachi, Ltd. can be a big help to the realization of NSDI.
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