The development of Thailand Spatial Data Infrastructure (NSDI)

Present by

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Geo-Informatics and Space Technology Development Agency (Public Organization) :
GISTDA, Thailand
VISION and MISSION of GISTDA

“GISTDA : Delivering Values from Space”

To develop space technology and geo-informatics applications to be beneficial to the general public

To develop the satellite data base and the derived natural resources information center

To provide data services relating to space technology and geo-informatics

To provide technical services and develop human resources in satellite remote sensing and geo-informatics

To conduct researches and development as well as to implement other activities related to space technology, including the development of small satellites for natural resources survey

To be the core organization to establish common standards for remote sensing and geo-informatics systems
Geo-Informatics and Space Technology Development Agency (Public Organization)

- Under Ministry of Science and Technology
- Provide a service from Satellite Data to Application
- Including Consultation and Capacity Building

Headquarters (Government Complex- Chaeng Wattana)

Earth Observation Center (Lad Krabang)

Sirindhorn Center for Geo-Informatics

Space Krenovation Park (Sriracha)

Institute of Space Knowledge Development (Bangkhen)
GISTDA Mission/ Service

**Upstream**
- Ground Receiving Station
- Resell of Satellite Data
- Coastal Radar System (Gulf of Thailand)
- Develop/ Implement software for Receiving station

**Midstream**
- Process Satellite Data
- Value-Added Product
- DEMs
- Mobile Mapping System
- Specific applications such as Disaster, Emergency Response, Coastal Management, Natural Resource Management

**Downstream**
- Service to Provincial
- Solution to Private sectors
- TMS
- NSDI
- Collaboration with Public and Private sectors
- Sirindhorn International Center for Geo-informatics

National Spatial Data Infrastructure
Upstream Missions: Satellite Data Provider

Variety Satellites in Service

Ranging from:
- Low resolution - Very High Resolution
- Optical - Radar
- Direct Reception - Resell

National Spatial Data Infrastructure
The first and only EO Satellite of Thailand “Thaichote”, formerly named “THEOS” is operated by Thai (GISTDA), launched on 1 October 2008 by Dnepr Rocket at Yasny base, Russia.

PAN: 2 m. resolution, 22*22 km.  
MS: 15 m. resolution, 90*90 km.  
4 bands: R, G, B, NIR
Midstream Missions: Products & Services

AIS DATA LAYER
HF RADAR DATA LAYER
SAT. DATA LAYER
MAP DISPLAYING BASEMAP WITH TWO OPERATIONAL LAYERS

Applications
- Agriculture (GISAgro)
- Disaster Monitoring
- Coastal Radar
- Mobile Operation & UAV

NSDI
- High Resolution
- Web Map Service

Rice Production Monitoring
- rice.gistda.or.th/ricefield/

Delivery Channels through GI Applications
- National Spatial Data Infrastructure
- Thailand Monitoring System (TMS)
- GISchangwat.gistda
- GISAgro
- GISchangwat.gistda
- GISchangwat.gistda

Maritime and Pollution Assessment
- AIS DATA LAYER
- SAT. DATA LAYER
- Delivery Channels through GI Applications
Training Courses by GISTDA

Such as....

• GIS for Beginners
• Satellite Image Processing and Interpretation
• Advanced Modeling in GIS
• Internet GIS and Web Map Server
• GIS Programming using Python
• Surface Analysis and 3D Visualization

...for Local and International Users
Sirindhorn Center for Geo-Informatics (SCGI) at SKP, Sri Racha, Chon Buri Province (inaugurated 20/03/2015)
Dormitory Building
Space Inspirium
GISTDA was assigned to be the secretariat of the National Committee on Geo-information: NCGI by MOST is secretary and GISTDA is assistant secretary.

GISTDA has direct mission, enough resource, and suitable technology. For example: Prototype of GI portal/platform, Knowledge and specialist about Geo-informatics technology, Hardware and software, Budget, etc.
National Committee on Geo-information: NCGI

Sub-committee on Policy Directive & Evaluation

WG on NSDI Action Plan Development


Capacity Building/Outreach

Government, Social & Citizens

NSDI Portal: ThaiSDI (Gateway & Clearinghouse)

GIs Standards

Base data

FGDS Agencies

FGDS

geo-information (GIS)

Thematic GIS

Thematic GIS

Thematic GIS

providers/users

Admin. boundary

Transportation

Hydrology

Urban & Town

Forest

Land use

Topographic map

Cadastral

Naval Hydrographic

Satellite ortho-images

Aerial ortho-photos

DEM

Geodetic and GPS

Base data

National Spatial Data Infrastructure
National Committee on Geo-information: NCGI 2015

Cabinet

NCGI

Committed Secretariat (MOST, GISTDA)


NCGI 2016

- Signed by Prayuth Chanocha, Prime Minister of Thailand on 13 September 2015
- Announced at Thai Government Gazette on 23 September 2015
- To drive the policy and Implementation about Geo-informatics, Mapping, and Remote Sensing under GIS Standard for data deduplication and data integration among agencies, also the collaboration to meet the need of user
Thailand NSDI Elements

- Partnerships & Institutional Framework
- Standards
- Fundamental Geographic Data Set: FGDS
- Metadata
- Clearinghouse / Portal
1. Partnerships & Institutional Framework

- Management, Resource, Driving
- Institutional framework, collaboration, Stakeholder, and responsibility
- Policy and Implementation
- Rule, Regulation, law

*Policy, Regulation, and Institution framework that leads to collaboration and implementation of Geo-Informatics development*

*Users, Providers, Administrators, Custodians, Value Added Resellers, Corporate or Individual
Public or Private
Partnerships, Collaboration*
2. National Standardization

Thai Industrial Standards Institute (TISI) has mission to develop national standards of products and services to be in line with the requirements and international practices. In 2005, a standard was announced by TISI.


Geo-Informatics and Space Technology Development Agency (GISTDA) is core organization to establish common standards for remote sensing and geo-informatics systems.

- Study on National Standard (ISO/TC211) and 23 standards were announced

National Committee on Geo-information: NCGI established sub-committee to study and develop GI Standard and announced 14 standards in 2012.

- NCIG standard: 14 standards in 2012 (adapted ISO/TC211)
3. Fundamental Geographic Data Set: FGDS

- 13 FGDS Layers which defined by National Committee on Geo-information: NCGI

<table>
<thead>
<tr>
<th>1. Aerial photos</th>
<th>2. Satellite images</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Geodetic control monuments</td>
<td>4. DEM</td>
</tr>
<tr>
<td>5. Administrative boundary</td>
<td>6. Transportation network</td>
</tr>
<tr>
<td>9. Land use</td>
<td>10. Forest boundary</td>
</tr>
<tr>
<td>11. Topographic map (image)</td>
<td>12. Cadastral</td>
</tr>
<tr>
<td>13. Naval hydrographic</td>
<td></td>
</tr>
</tbody>
</table>

- National map scales: 1:4,000 / 1:10,000 / 1:25,000 / 1:50,000 / 1:250,000

- FGDS is very essential and will create direct, tangible benefit in supporting GIS development in both public and private agencies.
4. Metadata

- For search and access by Spatial Data Clearinghouse (Discovery Metadata)

- For managed and Detailed data

- GISTDA developed Metadata program, name’s Metadata Editor and try to promote Metadata Online

  data that provides information about other data to facilitate in the discovery of relevant information.
5. Clearinghouse / Portal

- FGDS and other Geo-informatics data Searching service
- Display all Geo-informatics data
- Analyzing and Processing the data
- Online Maps
- Metadata
- WMS, WFS, WCS

Online platform That can access and download map data as portal, Also metadata service for searching and describe the data

National Spatial Data Infrastructure
Outreach and Capacity Building
National Spatial Data Infrastructure (NSDI)

- Arrange **workshop** “Data preparing and sharing through web map service for local institution” for local official and local network of Regional Centers of Geo-informatics and Space Technology (5 Centers).
  - More than 4 times per year
  - Participants not less than 300 persons per year

- Arrange the **conference, seminar, and Training** to enhance awareness and promote utilization of **spatial data** among agencies to support public and private sectors applications of geospatial data, also evaluate and summary annual output and outcome
<table>
<thead>
<tr>
<th>Country</th>
<th>Operator</th>
<th>Agency’s type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaysia</td>
<td>Malaysian Center for Geospatial Data Infrastructure (MaCGDI), Ministry of Natural Resource and Environment</td>
<td>Government</td>
</tr>
<tr>
<td>Singapore</td>
<td>Singapore Land Authority (SLA), Ministry of Law</td>
<td>Government</td>
</tr>
<tr>
<td>Philippine</td>
<td>Department of Environment and natural Resources (DENR)</td>
<td>Government</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Indonesia National Spatial Data/ NTT DATA</td>
<td>Government collaborate with Private Sector</td>
</tr>
<tr>
<td>Brunei</td>
<td>Survey Department, Ministry of Development</td>
<td>Government</td>
</tr>
<tr>
<td>Cambodia</td>
<td>Cambodian Ministry of Land Management, Urban Planning and Construction</td>
<td>Government</td>
</tr>
<tr>
<td>Laos</td>
<td>National Geographic Department, Prime Minister Office</td>
<td>Government</td>
</tr>
<tr>
<td>Vietnam</td>
<td>Ministry of Natural Resources and Environment (MONRE)</td>
<td>Government</td>
</tr>
<tr>
<td>Myanmar</td>
<td>The UN Country Team and Humanitarian Country Team</td>
<td>UN</td>
</tr>
</tbody>
</table>
But…

The problem of Thailand’s NSDI Development

- Conflicction of agencies policy,
- Differentiate of data standard,
- Limitation of data sharing,
- Lack of expert and human resource,
- Lack of infrastructure,
- Lack of budget, etc.
A Web Map Service (WMS) is a standard protocol for serving georeferenced map images over the Internet that are generated by a map server using data from a GIS database. The specification was developed and first published by the Open Geospatial Consortium in 1999. (Source: http://en.wikipedia.org/wiki/Web_Map_Service)
Please notice:

1. The Concordance of positioning accuracy of each map layers.

2. Software for mapping service (WMS)
   - Commercial Software: high cost
   - Open source Software: need developer and programmer
   - No package software that ready to use, as Plug and play

3. The difference of data production standard.

4. Gap of rule and regulation, which don’t cover the serving of online digital data.
National Geo-Informatics Infrastructure Services Portal: NGIS Map Portal

http://www.ngis.go.th/home/
Concept of NGIS Map Portal...

1. NGIS is not NEW

2. Implement from the government policy
   - Statement of the Prime Minister on 6 January 2015
   - Cabinet resolution on 20 January 2015

NGIS Map Portal purpose to....

- **Share** Map/Image
- **Integrate** Map/Image
- **Access** from anywhere and anytime
Output

2019
- Service all types of data (WMS, WFS and Catalogue Service) through NGIS Portal to all sector
- Data analyzing (Web Processing Service), own map creating
- Service FGDS of all Thailand in WFS format

2018
- Service all of data in WMS and WFS through NGIS Portal to all government agencies
- Catalogue Service searching through NGIS Portal
- Service FGDS of 40 provinces in WFS format through NSDI Portal

2017
- Service map images of all data producer in WMS format through NGIS Map Portal
- Service FGDS of 15 provinces in WFS format through NSDI Portal

2016
- Service map images in WMS format through NGIS Map Portal
- Service FGDS of a province in WFS format through NSDI Portal

NGIS Portal:
- NGIS Portal that can provide all types of data and service (WMS, WFS, and WCS).
- Also, Metadata servicing, data analyzing, Map creating, application developing on portal

NGIS Map Portal:
- Established under Roadmap of integrated the utilization of Mapping, Satellite image and remote sensing
- From cabinet resolution on 20 January 2015
- Promoted the data service in WMS

NSDI Portal:
- Portal for FGDS data or other data service that produce by GI Standard or FGDS Standard in WMS, WFS, WCS format, include metadata service.
## Comparison ...  
**Data service & Web Map Service**

<table>
<thead>
<tr>
<th></th>
<th>Data</th>
<th>Web Map Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw data needed</td>
<td>✓</td>
<td>X</td>
</tr>
<tr>
<td>Data revised</td>
<td>✓</td>
<td>X</td>
</tr>
<tr>
<td>Scale zoom</td>
<td>✓</td>
<td>✓ (but have limitation)</td>
</tr>
<tr>
<td>Processed and Calculated</td>
<td>✓</td>
<td>X</td>
</tr>
<tr>
<td>Data updated</td>
<td>Depend on data collected</td>
<td>Depend on data provider updated</td>
</tr>
<tr>
<td>Attribute/ Style editing</td>
<td>✓</td>
<td>Limitation</td>
</tr>
<tr>
<td>Internet</td>
<td>No need</td>
<td>Need</td>
</tr>
<tr>
<td>Create map for printing and using</td>
<td>✓</td>
<td>✓ (but have limitation)</td>
</tr>
</tbody>
</table>
Function...NGIS Map Portal?

- Search all map from all government agencies
- Select your needed map layers
- Create application on portal
- Map is accurate/ update/ ready to use
- No cost
- Map/Image is accurate depend on each data owner/provider standard
NGIS Portal

Aerial ortho-photos

Satellite ortho-images

Geodetic and GPS

DEM

Forest

Admin. boundary

Internet/Intranet

Topographic map

Internet/Intranet

Cadastral

Internet/Intranet

NGIS Portal

Internet/Intranet

WMS

Internet/Intranet

WMS

Internet/Intranet

WMS

Internet/Intranet

WMS

Internet/Intranet

WMS

Internet/Intranet

Internet/Intranet

Internet/Intranet

Internet/Intranet

NGIS Map Portal with FGDS

National Spatial Data Infrastructure
Map Sharing on NGIS Map Portal

- **316 map layers shared through NGIS Map Portal**
- **Shared by 21 organizations**

**FGDS**

1. Aerial photos 9 Layers
2. Satellite images 8 Layers
3. Geodetic control monuments (-)
4. DEM 4 Layers
5. Administrative boundary 11 Layers
6. Transportation network 20 Layers
7. Hydrology 23 Layers
8. Urban and town 7 Layers
9. Land use 16 Layers
10. Forest boundary 17 Layers
11. Topographic map (image) (-)
12. Cadastral 8 Layers
13. Naval hydrographic 14 Layers
14. Other 173 Layers
15. Monitoring 6 Layers

1. Royal Thai Survey Department 1 Layer
2. Department of Lands 36 Layers
3. Department of Agricultural Extension 2 Layers
4. Department of City Planning 17 Layers
5. Phetchabun province 67 Layers
6. Ministry of Transport 11 Layers
7. Ministry of Natural resource and environment 5 Layers
8. Department of Alternative Energy Development and Efficiency 35 Layers
9. Department of Mineral Resources 15 Layers
10. Directorate Intelligence 1 Layer
11. Designated Areas for Sustainable Tourism Administration 39 Layers
12. Land Development Department 2 Layers
13. GISTDA 26 Layers
14. Department of Groundwater Resource 2 Layers
15. Office of Agricultural Economics 2 Layers
16. CSRS 3 Layers
17. Royal Irrigation Department 3 Layers
18. Department of rural road 4 Layers
19. Department of National Parks, Wildlife and Plant Conservation 3 Layers
20. Department of Public Works and Town & Country Planning 1 Layer
21. Regional Centers of Geo-informatics and Space Technology 28 Layers

316 map layers shared through NGIS Map Portal