Kerala State Spatial Data Infrastructure (KSDI)

Thiruvananthapuram 18 January 2013: Kerala is trending towards an information and knowledge society, specifically with the focus on Information Technology and "transparent" e-governance.

Initiatives by the Central & State Governments, including the IT Act , establishing PPP models, etc., makes it clear that within a few years an unprecedented capability will exist for sharing of data in C2G, G2C, G2G, C2B, B2C, etc spaces. Amongst this wide variety of data, spatial or map information will be a major content. (Spatial data: an electronic map of environmental or demographic information. The maps can include features such as city boundaries, census tract boundaries, streets, schools, etc.).

This spatial information is vital to making appropriate decisions at the local/state level planning, implementation of state action plans, infrastructure development, disaster management support, business development, etc. Natural resources management, flood mitigation, environmental restoration, land use assessments and disaster recovery are just a few examples of areas in which decision makers are benefiting from spatial information.

Until recently, maps/ data in paper form have been the key source in a wide variety of applications and decision-making. This is changing as more spatially referenced data and information on a wider variety of topics or themes (e.g., population, land use, agriculture, climate, and soils) are being produced, stored, transferred, modified and analyzed in digital form.

Over the past years, state of Kerala has produced a lot of information through topographic surveys, geological surveys, soil surveys and the use of the remote sensing images. There is also a need to integrate other Department level data and create an enterprise picture. This facility is not available for everybody in a systematic manner – mainly because the information is "owned" by various agencies, and there exists differences in formats, standards, update-cycles, etc. Encapsulating these maps and images into a Spatial Data Infrastructure has been recognized which has led to the formation of Kerala Spatial Data Infrastructure (KSDI) on similar lines as National Spatial Data Infrastructure (NSDI). Only through common conventions and technical agreements, standards, metadata definitions, network and access protocols, will it be possible for the KSDI to set up base infrastructure needed towards realizing the goal of an SDI. The goal of an SDI is to make data that is required for decision-making available to the right person who needs it, at the right time, and for addressing a rightful need.

The emphasis on an SDI is on information transparency and sharing, with the recognition that spatial information is a national resource and citizens, society,

private enterprise and government have a right to access it, appropriately. NSDI or KSDI facilitates this through common conventions, standards, metadata definitions, network and access protocols. The beauty of an SDI is that it allows each agency to provide its data in any digital format. It is like a collective gain from individual ownership. KSDI ensures the availability of converged and meaningful data for the benefit of this state and thereby the country.

NSDI has successfully brought out metadata and data exchange standards in tune with the international standards of ISO and OGC. The same have been adopted for use in KSDI.

The key components of an SDI are:

1. Spatial database : Data (spatial) repository - to store data
2. Software client / GIS Software or Geo-portal- to display, query, and analyze spatial data
    a. GIS: Geographic information system (GIS) is a system designed to capture, store, modify, analyze, manage, and present all types of geographical data
3. Catalogue service - for the discovery, browsing, and querying of metadata or spatial services, spatial datasets and other resources
4. Spatial data service - allowing the delivery of the data via the Internet
5. Processing services - such as datum and projection transformations
6. Standards: The Open Geospatial Consortium (OGC) is an international industry consortium of 384 companies, government agencies, universities, and individuals participating in a consensus process to develop publicly available geo-processing specifications.

Few uses of KSDI

- Natural resources management: e.g. assists decision makers in managing water resources, permits anyone to browse and query state-owned lands and state-owned and –leased facilities, etc.
- Energy: e.g. Understanding where developed wind energy assets exist and where wind energy potential remains unexploited, climate change indices, etc.
- Infrastructure Management, Planning: e.g. City wide application for infrastructure management gives a comprehensive online map for property and frequently used municipal information. Additional information includes wetland identification/marking, floodplain, sewer service areas, pincode, city boundaries, emergency service data, and more. Land use planning, support in state/district plan generation, etc.
- Telecommunications: e.g. Mapping and planning of Telecommunications Towers.
- Education: e.g. Assists in analyzing existing locations of education institutions per district or upto panchayat levels, and to help in planning for new educational institutions.
- Public Safety: e.g. interactive crime mapping

- Hazards/Risk Management e.g. maps showing flood hazards, and ways to manage the hazard, environmental impact analysis, etc.
- Property Records
- Election Consolidation – e.g. Spatial data and a simple application can assist state for routing appropriate ballot reaches each constituency. Location of Polling Places, etc.

KSDI – Creation

The National Spatial Data Infrastructure (NSDI) has been established for sharing and improving utilization of spatial data generated by various agencies. Following the suite, the Karnataka State and the Delhi State have already established SDIs under their respective Governments. In addition the Jharkhand, West Bengal and north-eastern states have already initiated setting up of the SDIs. In line with the NSDI, vide G.O (MS) No/ 26/2009/ITD dated 06.10.2009 the Kerala Government has set up the Kerala State Spatial data Infrastructure (KSDI) to promote geospatial data sharing at State level.

KSDI- Functionalities

The portal is used as a starting point and a web gateway to access the geospatial data content, which would have the capability to handle data storage, retrieval and updation. The proposed web-based geo-portal would be built on a Service Oriented Architecture (SOA), by means of interoperable OGC-Compliant Web Services, which would allow the users spread across the internet, to view the data availability, query, download and perform various spatial and non-spatial functions and analysis through the KSDI network and publish them seamlessly. Access to and maintenance of the underlying master database will be done by uploading data by KSDI itself or from remotely available servers of the spatial data generating agencies.

KSDI Geoportal and Clearinghouse will be designed to act as the primary intermediary between providers of geo-data/geo-information, geo-related services and users. With a framework of open access and collaboration, the proposed KSDI solution would serve as integral medium between various environmental, economic, socio-cultural and governmental stakeholders. This will foster in building objective and innovative network community in supporting NSDI vision of “access to organized spatial data, use of infrastructure at community, local, state, regional and national levels for sustained economic growth."

KSDI will encompass data handling facilities, the complex of institutional, organizational, technological, human and economic resources and serve and host geographic data and attributes, sufficient documentation (metadata), a means to discover, visualize, and evaluate the data (catalogues and Web mapping), and methods to provide access to the geographic data, alongside custom services, including Decision Support Systems to support the data applications for a specific application domain or enterprise via internet.

In this architecture, KSDI Gateway and its user interface allow a user to query distributed collections of spatial Information through their metadata descriptions. A user interested in locating spatial Information uses a search user interface, fills out a search form, specifying queries for data with certain properties. The search request is passed to the Metadata Server and the data will be displayed to the user.

KSDI- Infrastructure Development

The main participating agencies of KSDI -that include various government agencies- will contribute to the initial centralized spatial data repository. This would range from high-resolution imagery from various sources, geological datasets, thematic and statistical data pertaining to social, cultural, economic and administrative areas, conservation, data relating public works and utilities to scientific publications, multimedia etc. This comprehensive turn- key solution of the Geo portal and clearing house for Kerala would be implemented through setting up of Kerala Geoportal.

With launching of the Geoportal, spatial data information for different domains such as infrastructure, traffic planning, resource availability, demographic status, socio-economic status, health and culture-related information etc., even up to cadastral scale will be within a mouse click away. With the State having its own initiatives related to data and Information management, including governance guidelines and data sharing protocols, KSDI would serve the following broad range of roles:

- Develop ICT infrastructure for data processing, storage, and dissemination over internet
- Web technology to discover, access, query, search and consistent presentation of the results across multiple participating agencies
- Provide a single window access mechanism to the digital spatial/non spatial data through a decentralized architecture at all levels of the government, academia, and institutions.
- Retain intellectual rights of the owner while sharing the data between the producers and users.
- Implement an OGC standard based on an open architecture for interoperability across various platforms and accessing data (spatial, non spatial and metadata) as secure web services.
- Support spatial data inputs from multiple sources with seamless integration and presenting a unified view as WMS, WFS and WCS etc.,
- Ability to link various disparate external non spatial business databases with the internal spatial data and present it as a consolidated view.
- Support KSDI's four core components: institutional framework, technical standards, fundamental datasets, and clearing house.
- Provide open interfaces to data and services that facilitate exchange of spatial information across various stakeholders as a collaboration tool.
- Deliver this data to their external clients, in real-time and independently from the software they use and share this data with their clients
- Ensure proper use and security of data, managing the permissions of the users.

- Provide an interface offering a dedicated solution to the particular business cases of external or internal clients.
- Periodic data updation and infrastructure development in data providing agencies
- Customized decision support system development according to the user needs
- Assist in capacity building to efficiently manage, use and share digital data and information
- Further adoption of nationally accepted standards and guidelines for Information management and promotes leading practice in Information management
- Provide participants in the State and local government departments and projects, access to relevant spatial Information and tools to reduce setup-costs and duplication of costs.
- Support development of State, local and community networks through open and efficient sharing of Information resources and knowledge
- Ensure the sustainable management of data used or created in projects with-in the state
- Allow relevant stakeholders to fully exploit the Information generated from State to local government projects.
- Integration of spatial Information into the daily operations of the State and local government.
- Foster collaborative efforts and interaction between various bodies.
- Provide the means for regulators, planning committees, managers, individuals and their organizations to discover access and use spatial data.
- Apart from offering principal access to geo data in Kerala State, the portal will serve custom geo-related services as well as geo-specific applications to varied user groups.
- Integrate specific Decision Support Systems, which would serve as a centralized platform for management of State's resources and planning related activities.
- Infrastructure development in selected data providing agencies