

West Bengal State Council of Science & Technology
Department of Science & Technology
Government of West Bengal
Bikash Bhavan (4th Floor), Salt Lake, Kolkata-700091

WEST BENGAL STATE SPATIAL DATA INFRASTRUCTURE (WBSSDI) PROJECT

Notice Inviting "Expression of Interest (EOI) for Development of Geo-portal"

West Bengal State Council of Science & Technology (WBSCST) invites Expression of Interest (EOI) from reputed, established and reliable System Integrators (SI) in connection with the development of Web based Geo-Portal and Data Clearing House under West Bengal State Spatial Data Infrastructure (WBSSDI) project.

The pre-qualification criteria

- Firm should have established proven experience and expertise in Geographic Information System (GIS), Resource Mapping, International Standardisation Organisation (ISO)/ Open Geospatial Consortium (OGC) standards based data/metadata/ service creation, development of interoperable systems, Spatial Data Infrastructure (SDI)/ Enterprise GIS, and development of Service Oriented Architecture (SOA) based Geo Portal.
- The firm should use OGC Certified Products, data, and services.
- The firm should have preferably minimum annual turnover of Rs. 10 crores and submitted audited financial statements over the last three years.
- The firm should furnish Govt. Registration certificates/documents, organization bye-laws etc.
- For all the above, the firm should furnish the documentary evidences.

The sealed covers containing the EOI should be addressed to The Member Secretary, West Bengal State Council of Science & Technology, Department of Science & Technology, Government of West Bengal Bikash Bhavan (4th Floor), Salt Lake, Kolkata-700091. The technical documents should not exceed more than 200 pages.

The last date for receipt of EOI is 31-08-2010 by 3:00 PM.

WEST BENGAL STATE SPATIAL DATA INFRASTRUCTURE (WBSSDI)

Objective:

The objectives of the project are to

1. Develop a web based Geo Portal to acquire, process, store, distribute and improve the utilization of geospatial data based on ISO/OGC standards and
2. Develop Data Clearing House which would be a gateway of spatial data being generated by various agencies of the Government of West Bengal.

Genesis of WBSSDI Project

In spite of several initiatives launched by the government over the past decades to promote the use of spatial data and tools /technologies like GIS, GPS and Remote Sensing at different levels of planning, there has not been adequate improvement in the quality of resources management decisions/ strategies. Non-availability and inaccessibility of spatial data of desired resolution and currency, incompatible datasets, lack of user friendliness of the processing tools and inadequate capacity amongst the end users have been the major bottlenecks. It has therefore been imperative to improve the spatial data management practices and appropriately align the tools/technologies with the workflow or business processes of decision making bodies like Panchayati Raj Institutions (PRIs) and Urban Local Bodies (ULBs) in the framework of Spatial Data Infrastructure.

Taking note of some of the issues stated above, several policy level changes have been brought out recently. Government of India has constituted the NSDI for providing single window access to spatial data held by different national level survey/data providing agencies. The National Map policy has been further liberalized in June 2006 to make available spatial datasets as Open Series Maps to support decision making process. The National Data Sharing Policy has been approved by the Cabinet in June 2010 to facilitate sharing and exchange of digital geospatial data between the providers and end-users. State Governments are showing keen interest in setting up State Spatial Data Infrastructures to support decentralized planning.

The Information and Communication Technologies have further evolved with advancements in the fields of database management, workflow management, internet and web based services. Under the provision of the revised policies, data providing organizations at the national and the state levels are required to be re-oriented/upgraded with the deployment of advanced tools and technologies. Databases of various data providers need to be reengineered so as to make the relevant datasets available and accessible to potential user agencies. Emerging concepts like Enterprise GIS, Geo spatial interoperability, Geo Web Services, Geo Visualization and the Geo semantic web etc., have to be explored and utilized.

In the above context WBSSDI project was sanctioned by Department of Science & Technology, Govt. of India (DST, GOI) to West Bengal State with active support of the Department of Science & Technology, Government of West Bengal (DST, GOWB) which is being implemented by WBSCST. This project is an extension of the National Spatial Data

Infrastructure which has already been established by DST, GOI as per the approval of the Central Cabinet (No. SMP/25/003/05 dated 13th June 2006 New Delhi).

The Scope of the WBSSDI includes:

- To acquire, process, store, distribute and improve the utilization of spatial data (maps) which would be a gateway of spatial data being generated by various agencies of the Government of West Bengal.
- It aims at setting up a data clearing house and Geo Portal which will enable all the planners and decision makers in the government.
- Scientists, teachers & student communities, general public and even the workers at the grass root level to have an access to the latest data on the various natural resources, infrastructure facilities and weather information.
- Once the Geo Portal is set up it is expected to provide tools that will be helpful for Government to do Land resource management, Water Resource Management, Infrastructure Development, Disaster Management etc using databases over Internet.

Natural Resource Data Management System (NRDMS) in West Bengal

Geographic Information System (GIS) software has been in vogue for developing digital maps for various requirements of end users. These GIS tools are designed to cater to various spatial analysis which are necessitated on account of planning and executions problems posed by the end users at the field level. The GIS tool has been designed to enable different analysis pertaining to digital terrain modeling, parametric analysis, network analysis etc. WBSCST through its project titled Natural Resource Data Management System (NRDMS) has been creating and updating periodically the digital database at all the 18 districts of the State and providing analyzed information to the end users. The digital database includes maps (spatial) and statistical data (non-spatial). The statistical data is linked to the maps through a primary key which is Village Census Code/ Id. NRDMS is providing analyzed information by collating and integrating the spatial and non spatial data on natural resources and infrastructure facilities from various national and state level sources.

Once the attribute data is linked to the map, queries can be made for analytical purposes to meet the user requirement. There are spatial analysis modules available within the GIS software which can project the solutions spatially.

Brief scope of the Project on Development of Geo-portal

Under WBSSDI project, West Bengal State Council of Science & Technology (WBSCST) intends to set up a single window access mechanism in the form of a Web based Geo-portal and Data Clearinghouse to help users discover/ access geo-spatial data sets useful in Decentralised Planning process. Those geo-spatial data sets acquired, maintained, and provided by various concerned state-level government/ private/ academic/ or civil society organisations in West Bengal are proposed to be covered in the Project. The Geo-portal will

primarily be used on an experimental basis for providing access to spatial data/ metadata sets/ services currently held by WBSCST at different district data centres set up under NRDMS Programme. The data/ metadata/ services will be initially accessed by the concerned staff based at the districts from the NRDMS Centres or the Line Departments to support activities relating to the task of Decentralised Planning in the State. These services will be extended to general public with certain restrictions in due course under provisions of the prevailing rules and regulations. Other organisations/ agencies will be gradually invited to share their data/ metadata sets held or provided by them by publishing their details in the Geo-portal. Provision has to be made to host the metadata of Data Providers.

In support of the above, the technical scope of the work includes conducting requirement analysis, preparing a real world object catalogue; developing a conceptual data model based on the requirement/ object catalogue; creating a centralized database including the metadata in WGS84/ UTM projection; publishing metadata of data providers other than WBSCST; creation of a geo-portal for making the data/ metadata sets accessible from or publishing in the database using geo-web services; customisation of available software to support the above/ coding; testing of the Geo-portal/ database/ services; user acceptance testing; and final deployment of the complete system. Various geo-spatial data / process standards made available by International Standardisation Organisation (ISO)/ Open Geo-spatial Consortium (OGC) should be used. The scope of work also includes appropriate documentation at various stages of the above activities. The developer will initially develop and test a prototype of the complete system based on the initial set of requirement. Based on the feedback given by the user, the rest of the requirement will be included in the system. Maintenance of the system for 3 years is also part of the portal requirement, etc.

WEST BENGAL STATE SPATIAL DATA INFRASTRUCTURE (WBSSDI) **GEOPORTAL**

Introduction

Under Department of Science and Technology, GOI's NRDMS Programme, West Bengal State Council of Science & Technology (WBSCST) – an autonomous body of Government of West Bengal – intends to develop a Geo-portal and Data Clearinghouse (as defined below) to support the task of Local Level Planning. WBSCST releases this request to solicit proposals from qualified and experienced firms/ organizations for setting up the Geo-portal and the Clearinghouse.

This document describes the project requirement, scope of technical work, and the architecture suggested on the basis of the experience and the insight gained by NRDMS, DST, GOI in other projects implemented by it in the recent years. Vendors are expected to provide their state-of-the-art solutions in their response to this Expression of Interest for evaluation by WBSCST/ DST, Govt. of West Bengal for preparation of the Request for Proposal (RFP).

Geo-portal

A Geo-portal is a web site that provides a view into a universe of spatial content and activity through a variety of links to other sites, communication and collaboration tools, and special features geared

towards the community served by the Geo-portal. As an open Web resource, a geo-portal should connect through open interfaces to data and services with similar interfaces. Catalogues and registries that conform to Open GIS Specifications play an important role in geo-portals. [Adapted from OGC's Glossary of terms (<http://www.opengeospatial.org/glossary>)].

Clearinghouse

A clearinghouse is a decentralized system of servers located on the Internet that contain field-level descriptions of available digital spatial data. This descriptive information, known as metadata, is collected in a standard format to facilitate query and consistent presentation across multiple participating sites. A clearinghouse provides information about who is providing which authorized geo-information for which application. [Adapted from OGC's Glossary of terms (<http://www.opengeospatial.org/glossary>)].

Project Description

In support of the above requirement, the vendor is primarily expected to customize, install, demonstrate and operationalise relevant hardware, software and data for the Geo-portal and the Clearinghouse mechanism. Access to and maintenance of the underlying master database will be done by uploading data from remotely available spatial data generating agencies and survey agencies. Key services will be provided as per the architecture and specifications suggested in this document. Core staff of WBSCST will be trained on the functioning and operation of the equipment and provision of services so that after the completion of the project, it would be possible for the core staff to maintain the system on their own with minimal support from the vendor as per the terms and conditions of the warranty and maintenance agreement. As is required under a SDI, the Geo-portal will be regularly upgraded to help data/ service providers publish their metadata/ data / services for access by the customers over the web. Some key web applications also need be demonstrated for access. On the completion of the project, the set up will be run and maintained by WBSCST/State Government.

Detailed Scope of the work

Real world object catalogue

Based on the requirement analysis of the user departments, a detailed catalogue of underlying real world objects clearly defining each object will have to be drawn up.

Deliverable(s): A Real World Object Catalogue useful in developing the Data Models (conceptual/ physical) for implementation in the subsequent stages of the Project. The catalogue will form the base for demonstrating semantic interoperability between various spatial data nodes of the data providing agencies/ Line Departments

Conceptual Data Model

A conceptual data model bringing out the objects and the associations is required to be developed and appropriately documented. Unified Modelling Language (UML) formalism conforming to the specifications of ISO 19109 (Geographic Information – Rules for Application Schema) is required to be used in its development. The Conceptual Model is expected to be physically implemented for storing geo-spatial data sets in an OGC-certified Relational Database Management System (RDBMS) or distribution in OGC's Geography Mark up Language (GML) specification version 2.1.2 or higher (GML version 3.1's Simple Feature Profile 1 or 2 will be preferred). The Conceptual model should

address software recommendations, refinement of physical system configuration (servers, network, and storage requirements, etc.) provided at Annex as well as a conceptual database design based on the applications identified and master data list generated during the Requirement Analysis/ Object Cataloguing phase.

Deliverable(s): Conceptual Data Model in UML on a standard CASE Tool (e.g., Latest Rational Rose) implementable in RDBMS with Spatial blades/ OGC's GML, with appropriate documentation

Centralized database

To begin with, a web-enabled centralized database of various existing spatial, attribute or statistical data is required to be developed at WBSCST to store spatial, attribute or statistical data sets already available with WBSCST or NRDMS data centres. The spatial datasets are available mostly in ESRI Shape formats linked to various attribute and statistical data. In some cases, attribute or statistical data sets may be provided as MS Access/ Excel or Dbase III/ IV files. The database should be created in an industry-standard enterprise RDBMS with appropriate (data) security environment. Proper indexing mechanism of data sets should be adopted to facilitate efficient search and access. Associated metadata for the geo-spatial data sets should also be appropriately included into the database to support discovery and access by a group of concurrent users over the net. The existing data available at WBSCST adds up to about 100 GB and is likely to increase in the coming years. Number of concurrent users is also expected to increase over the years. Mechanism for updation of existing data sets on the database using OGC standards-based Web Feature Service (WFS) should be provided to facilitate updation/ maintenance of the database from WBSCST's/ District NRDMS Centres/ Block level Centres located in the Districts/ Blocks/ individual Line Departments/ Agencies of the Government of West Bengal. Scalability of the size of storage and access should be kept in view in working out the system configuration. In due course, depending on requirement, individual Line Departments/ Agencies of the Government of West Bengal may be persuaded to develop and maintain their spatial/ attribute data nodes as per their mandates in the interest of efficient provision of up-to-date data sets.

Deliverable(s): A Centralized database containing available spatial, attribute or statistical data sets and metadata sets from NRDMS District/ Block Data Centres and various Line Departments/ Agencies of Government of West Bengal as provided by WBSCST with facility to remotely update the Database and metadata from the individual Data Centres/ Line Departments

Publishing metadata of data providers in the Geo-portal/ Clearing house

A provision should be made in the system to permit various geo-spatial data providers in the State to publish their metadata sets into the centralized database and get them registered either directly at WBSCST or from a remote location using the Web. The Metadata standards prescribed in ISO 19115 should be adopted.

Deliverable(s): A web-based service for registration/ publication/ upload/ updation of metadata at the Geo-portal/ clearinghouse

Creation of Geo-portal

Following the specifications of OGC's Geo-spatial Portal Reference architecture, a Geo-portal (a website for West Bengal State Spatial Data Infrastructure) be developed, demonstrated and installed to provide portal services, portrayal services, data services, and catalogue services. The portal

services should be available to address the needs of the viewer clients, discovery clients, management clients, authentication & access control and exposed services. The portrayal services should include map services, styling services, coverage services, and the map context services. The data services should include features, coverage, and symbology management. The catalogue services should include data discovery, service discovery, catalogue update and query language. The development should be done in an iterative way based on feedbacks received from the users and WBS CST staff. Some of the other specifications for the Geo-portal are:

- The portal will be used as a starting point and frequent gateway to access web resources and Geospatial data content
- It also has to support JSR-168 Java Specification, Request Portlet specifications to allow portlets to be portable between portal framework environments
- It has also support / allow features like Web Services for Remote Portlets, portrayal services, OGC based geo-visualization etc.
- Customization of the software as per necessity and commonly used application development is also part of the job.
- Geoportal developed must have capability to handle data storage, retrieval and update. It has to also support automatic and manual form based input/update of metadata using required services.
- Hence flawless working of at least 10 commonly used applications from the Needs Assessment Report, two from each Line Department/ Agency based on availability of data sets and feedback from WBS CST should be demonstrated

Deliverable(s): A Geo-portal with the above requirement/ specifications

Customization of data/ software for creation of Geo-portal

Commercial-off-the-shelf Spatial Data Infrastructure (SDI) software package should be customised and installed to support provision of the following web services: The supplied software has to work on both Windows and Linux platform. Upgrades/New Versions of the software has to be provided by the vendor free of cost during the period of Warranty and AMC.

- Catalogue Service on Web (CSW) for both upload and download of metadata by remote clients e.g. NRDMS (District/ Block) Data Centres Web Map Service (WMS) for provision of maps (spatial data with colours, styles, legend, annotation etc.). Facilities for preparing and serving maps on the fly from boundary (district, Block, Mouza etc.) data and various collateral attribute fields/ values available in associated tabular data should be provided. User should be able to select and retrieve both spatial and attribute data sets for the map service on line.
- Web Feature Service (WFS/GML) for upload/ download of OGC's GML data (OGC's GML 2.1.2 or higher specification version should be followed. GML version 3.1's Simple Feature Profile 1 or 2 will be preferred.) conforming to WBS CST's OGC GML Application Schema and other data formats like ESRI's Shape format.
- Web Registry Service (WRS) for enabling data/ service providers to register their datasets / services onto the clearinghouse.
- Web Coverage Service (WCS) for sharing coverages like satellite images from the

database server.

A feature client should be enabled to download geo-spatial data sets from the database conforming to the designed GML application schema to facilitate value addition. Provision for accessing spatial data sets on the server/ Geo-portal from a PDA or a mobile phone using standard plug-ins should also be made.

Deliverable(s): Customized software code for the Geo-portal with necessary documentation and operational provision of services like CSW, WMS, WFS/ GML, WRS, WCS conforming to OGC standard specifications and WBSCST's application schema/ data model. Conformance to OGC (core)/ WBSCST (application) standards should be demonstrated using 2/3 vendor GIS software package to show Geo-spatial Interoperability between the Geo-portal data sets/ processes and WBSCST's user's package.

Security system to handle data, user identity and network

In order to secure the Geo-portal/ clearinghouse from unauthorized access, an appropriate security software module having provisions to safeguard data sets, manage user identity and transaction security; detect unauthorized intrusion, permit authorization/ authentication, and non-repudiation based access controls on resources is required to be identified and installed with necessary hardware. The Security system should have facilities to create federated access and single sign on, on-the-fly creation of secured access and functionalities for user-friendly operations.

Testing of the Geo-portal/ database/ services

Different units of the envisaged system like the Geo-portal or the database or the geo-web services should be thoroughly tested for individual satisfactory performance.

User acceptance testing

A user acceptance test should be carried out to test the effectiveness, efficiency and user-friendliness of the integrated system. A set of criteria will be defined and finalised with the users in advance for testing of the system. The Needs Assessment Document drawn up at item 1 of this Scope of Work should form the base for the user acceptance testing.

Final deployment of the complete system

Based on the outcomes of the user acceptance test, the complete system should be integrated and operationalise for use. The complete system and its use should be presented to an audience that might include elected representatives, officials from different tiers of the Governmental hierarchy from the State, District, Block, G.P.; other employees of different concerned organizations and selected citizens with an opportunity for a question and answer session.

Deliverable(s): Public presentation, generally utilizing electronic visuals to enhance understanding of the information presented through a series of 2-3 workshops in different parts of West Bengal. An executive summary on the system and the possible outcomes may be shared with elected representatives and senior officials of the Government to make them aware of the availability of the Geo-portal/ Clearinghouse facility.

Training of organisational staff

In order to help use and manage/ maintain the complete system, 15 users are required to be provided hands-on training for 4 weeks at WBCSCT. A group of 25 persons from different user organisations of West Bengal State is required to be exposed to the use of the Geo-portal and the available services at WBCSCT for two weeks.

Deliverable(s): Trained staff to the satisfaction of WBCSCT

System Maintenance

The complete system consisting of Geo-portal and the associated hardware and software should be covered under a three years comprehensive maintenance warranty/ contract to facilitate provision of web-based geo-services on a regular basis.

Deliverable(s): Uninterruptible availability of the Geo-portal/ clearinghouse over the web/ net

Report and Time schedule

WBCSCT suggests a timeline of six working months (24 working weeks) for the entire work. Work carried out by the Vendor in terms of both quantity and the quality of deliverables shall be assessed by the project Review Committee of WBCSCT from time to time to be decided by WBCSCT.

Suggested Architecture

The proposed web-based geo-portal has to be developed using Web based Server based on OGC/ ISO standards. The web portal should allow the users spread across the internet, to view and query the spatial information and the related maps. This information shall be picked from a central server repository. The Central repository will be on standard RDBMS package. The component should be an integral part of the system and users will access this component through the portal. The portal should cater to WMS/WFS/WCS/CSW and other Portal services. Relevant software products based on the latest versions of OGC/ ISO technical specifications should be supplied, installed and customised for service provision free of cost. Map services must also be created to access the spatial data from the repository. Based on the security features of the Web portal, users will be allowed to access the various services.

System Architecture

The proposed system will be a web based system built to serve the users spread over the Internet and intranet. The server-side will host the web enabled database for serving spatial data already existing with WBCSCT. WBCSCT will be able to run the web applications for different geo-web services on web browsers. Typically, the WBCSCT will request information from an Internet server holding the data repository. Then the server will process the request and send the information back to the client viewer. The server components, i.e., the web server/application server and the data server will form a part of the server architecture. Only authorized/registered WBCSCT's staff will have access to the server application/ database.

This architecture will have to be developed specifically for Internet applications for publishing spatial data. The system should be potentially capable of getting scaled up to handle state-wide

district/ block NRDMS centres. It should also meet server capacity needs as web site access demand increases. WBSSDI should have an interface with the India Geo-portal.

The Web Server will host Internet Information Server (IIS), application server for providing portal services. The database servers will host RDBMS. A hardware firewall will check all the dataflow between the Web Server and the database server. The users of the system will access the web application. The database will be accessed by the web application only. This will provide a clear segregation of three different layers such as user interface, application & business logic and database layers. The basic components could be stated as web server, security server, application server, database server, and back up server.

A minimum architecture has been provided here. The bidders are expected to assess the minimum architecture and suggest their own based on the software product/ portal requirement. The average web response time should be around 10 seconds initially with a group of 500 concurrent users that is likely to go up to 5000 in the next few years. ISO 9000 certification for manufacturing from OEM should be provided by the vendor. There should be Local Area Network and access to the servers via internet Leased Line (2Mbps).

Geo-portal/ Web Server The Web server will host the portal application. User will connect to this application over the Internet. This application runs on the Web server and will interact with Database server. Only authorized users will have access to the Portal services.

Database server The database server will host the standard RDBMS. A backup database server will also be provided. The Web server will interact with this server as the gateway to spatial data stored in a RDBMS. The spatial data stored in the database server shall be scalable to cater to large volumes of raster as well as vector data of other agencies to be hosted on the web in future. Security servers serve the purpose of keeping the data safe from intrusion/misuse/snooping and for identity management.

Portal Requirement

Users: They must be able to login, create/change passwords and browse 'relevant' parts of the portal. They should be able to discover information using key words. They should be able to access objects/features using key words/coordinates. They should be able to check the status of ongoing queries created by them. They should be able to create new queries and modify the rules of predefined queries before it has started. They should be able to define new query formats. They should be able to browse a Data catalogue.

Data Providers: They should be able to put metadata for users, browse the list of requests made by the users. The data of data providers shall be OGC compatible. They should be able to provide catalogue services. They should be able to restrict the end users for specified Information. They should be able to check the status of the user requests.

System Administrator: The System Administrator sets up profiles for end users and data providers. They should have control over data access by users. They should be able to add new data products to the existing Catalogue. They should be able to remove data products from the Catalogue. They should be able to restrict user accessing classified information.

System: Whenever the System Administrator creates the profiles of users and data providers, the

System should notify the corresponding user/data providers about his account information. During the query set up by the user, the system should send notification (reply for queries) to the Data Providers. The system frequently notifies the users of any relevant information about the queries

Suggested WBSSDI Network Diagram

