Department of Science and Technology, Government of India invites Expression of Interest (EOI) in sealed envelope for setting up of a National Data Registry (NDR) at NSDI.

Disclaimer: This EOI is not an offer by the Office of the NSDI. DST or a tender document but it is an invitation to receive responses from eligible interested parties. The purpose of this EOI document is to provide such necessary information to Interested service providers that may be useful to them in formulating their proposals in response to this EOI.

The Expressions of Interest (EOI) is invited from the interested service providers to come up with a proposal for setting up of an NDR for NSDI. The NDR is proposed to be developed for hosting a set of registers relating to different aspects of spatial and attribute data sets provided by the Nodal Agencies of NSDI for correct interpretation and processing of their data sets and the resulting applications/products for end users. The NDR should be linked to the national and state level agencies' Data Nodes over the web for accessing their services (WMS/ WFSI CS-W/ WCS etc.). Utility of the NDR should be demonstrated in providing GIS applications and products for a set of well-defined and user needs by using these services.

Interested parties who have valid authorization and also have competence and experience to carry out such work are requested to submit the EOI along with supporting documents in sealed envelopes addressed to the Under Secretary, National Spatial Data Infrastructure, Department of Science and Technology, Ministry of Science and Technology, East Block 7, Level 6, Sector-1, R.K.Puram, New Delhi-110066 so as to reach the aforesaid address on or before 1500 Hrs on 30th November, 2015. EOI may be dropped at a box at the above-mentioned address or sent by Registered post/Speed post so as to reach the aforesaid address on or before the said date. If sent by post, DST will not be responsible for loss or delay in transit.

Background

India has, over the past years, produced a rich “base” of map/image information through systematic field/aerial remote sensing surveys. Standardised metadata for most of these maps and images have been captured and made accessible through India Geo-portal (https://www.nsdiindia.gov.in) of NSDI to facilitate data discovery and access. Portals of the NSDI Nodal Agencies like Survey of India (Surveykshan), National Remote Sensing Centre (Bhuvan), National Informatics Centre (NIC) (National Data Portal); Forest Survey of India; Geological Survey of India; Karnataka State S&T Council (Govt. of Karnataka); and State IT Mission (Govt. of Kerala) etc., have been providing Web Map Services (WMS) and
Catalogues for their data sets for human visualization and developing possible GIS applications. Efforts are currently being made by the Nodal Agencies to make interoperable Web Feature Services (WFS) accessible for download of feature data in standard encoding specifications (e.g. OGC’s Geography Markup Language) for processing on a GIS Platform. More national and state-level geo-portals are likely to emerge in the near future for provision of feature and attribute data services over the web. With web-based data services gradually getting accessible from various agencies, emphasis in NSDI is shifting from enabling ‘data’ services to ‘product or application’ services so that required products/applications could be prepared on a GIS Platform and delivered to the end user for decision support.

Various information resources mentioned above like geo-spatial feature data/service metadata (ISO 19115/ ISO 19119/ NSDI Metadata version 2.0/ BIS LITD-22-3335F), data/services (ISO 19136/ ISO 19142/ ISO 19128 etc.), feature catalogues etc. are usually governed by feature concept definitions, application schemas, data classification systems (e.g. code lists), units of measurement, and spatial reference systems. These resources are expected to change over time with evolution of newer conceptual innovations, standards, technologies, and applications. Towards this goal, there is a need for setting up a mechanism for keeping track of these changes and making those publicly accessible for ensuring consistent processing and interpretation of spatial data for decision-making by end users. This is proposed to be achieved by establishing a set of registers, implementation of the registers on a web-accessible registry, defining procedures for registering the resources on the registry by data providers and provision of a suitable governance structure for overseeing the processes of registration of a resource. It has thus been decided to operationalise a National Data Registry for NSDI with the following technical specifications:

**Technical Specifications**

The vendor must have the competence and experience in the development and implementation of geo-portals, provision of geo-spatial data services; feature data modeling and application schema development using state-of-art international standards; developing and setting up data registers etc. A broad set of technical specifications for the NDR is indicated at Annex I. Operationalization of the National Data Registry (NDR) should be as per these specifications and to the satisfaction of a Technical Committee to be notified by the competent authority for monitoring the implementation.

**Responses to the EOI**

Interested parties are expected to send their responses to the above EOI before the due date as per the following broad guidelines/items:

a) **Company Profile**

b) **Overall approach or method of NDR development and utilization in GIS use case (application) Implementation**
c) Approaches/methodology for NDR related metadata compilation (e.g. Geospatial Feature Definitions, Feature Catalogue, Application Schema, Code lists, Units of Measure, Spatial Reference Systems, Search Mechanisms, Querying and Response, Identity Management etc.)

d) Suggested Hardware

e) Suggested Software and other utilities

f) Quantity and quality of manpower to be engaged in the development/implementation

g) Proposed modes of interaction with NSDI Stakeholder Agencies/Departments to capture relevant information on the above content of said registers and formulating domain-specific data models/content & structure standards

h) Any other facts/items if need to be mentioned.

Any further information/clarification in respect of this EOI may be sought from Sri Nirmalendu Kumar, Hardware Engineer, National Spatial Data Infrastructure (NSDI), East Block-7, Level-5, Sector-1, R. K. Puram, New Delhi using the email (Nirmalendu.kumar@nic.in).

(T.K. Sarkar)
Under Secretary to the Government of India
Ph: 01126182973
National Data Registry (NDR) of NSDI

Introduction
Over the past years, efforts have been made by NSDI to compile and serve metadata of different partnering agencies and re-engineering the feature data sets for improving their use. The NSDI agencies have large amounts of feature data sets and are presently managed in file based systems largely through quadrangle sheets without appropriate strategies for fully automated search, querying, and processing. This is evidenced in the present ways to store and manage metadata sets as per the indices of quadrangle sheets of data providing organisations. Identification and maintenance of feature data sets thus pose a major challenge to the stakeholders thereby inhibiting appropriate use of the geo-spatial data in real-life applications. More effective use of the data requires proper registration, storage, and sharing of the feature data sets so that the data sets could be put to appropriate processes of governance in line with the provisions of NSDI Resolution, 2008. Registering spatial data sets is likely to involve capturing their definitions, descriptions, making them persistently and uniquely identifiable by assigning them identifiers, and organizing/maintaining the associated classification system or the code lists for reference by all.

Role of National Data Registry
NSDI has been working with national and state level data providing agencies to facilitate sharing of spatial data amongst stakeholders. This is to be achieved by (i) compiling and providing metadata sets to facilitate discovery and access of spatial data (ii) setting up of the Spatial Data Nodes for the provision of interoperable spatial data services (e.g., WMS, WFS etc.) and (iii) establishing a single window access mechanism to the metadata and spatial data sets through installation of a clearinghouse and geo portals. Metadata sets in NSDI 2.0 standard format have been compiled from various Survey Agencies or State Line Departments and made accessible from the geo portals (e.g. India Geo Portal at the National and State Geo Portals at State levels).

NSDI's metadata contains information regarding spatial data from various data providing agencies as per NSDI Metadata Version 2.0 standards founded on ISO 19115. These provide for citation, quality, features, lineage, temporality, reference systems, extent etc. These are served to users or their applications as catalogue services. The catalogue services offer functionalities to store and serve metadata about the data sets. However, current catalogue specifications do not define formal procedures for the modification of the stored information. User does not have the ways and means to ascertain, for example by whom and when some data sets or services have been modified, added or removed from the database or the catalogue.

Moreover, provision of these resources like data, metadata, and catalogue is governed by various standards that evolve or change over time. For consistent processing and interpretation of the data and services, it is essential that these changes are kept track of and properly managed. Establishment of registers in the form of a Registry with a suitable management structure is thus essential. These are required over and above the establishment and maintenance of data and service catalogue providing standardized catalogue services capable of getting consumed by end users or applications.

ISO 19135 prescribes standard specifications on procedures for registration of geographical information items and establishing a management structure. As per the terms and definitions in the document, register and registry are defined in the following way:
Register – a set of files containing identifiers assigned to items with descriptions of the associated items. An identifier is a linguistically independent sequence of characters capable of uniquely and permanently identifying that with which it is associated.

Registry – an information system on which a register is maintained. It is therefore essential to maintain registers of different geographical items and keep track of the item status for the benefit of the end user. The registers should be managed through proper governance procedures. ISO 19135 prescribes a common structure for the registers like identifier, name, definition, item class and status.

NDR Architecture

NDSI emphasizes the use of a service-oriented architecture (SoA — publish/find/bind model) for the management of the data sets and the services.

It is important to note that this architecture primarily separates any content into one of two categories — spatial objects representing phenomena in the real-world (the "data") and the other items of spatial information i.e. data description, referenced by or related to the spatial objects i.e. "metadata", but in a wider sense than geographic information metadata as understood in ISO 19115.

As per the architecture, there are three types of data sources i.e. National Agencies, State Government Agencies; and the academic industry/ citizenry (social media) or volunteered sources. Each source is expected to maintain its feature data and related metadata (as per BIS 3335/ NSDI metadata version 2.0 standards) and publish the content details in the registers/ catalogues of the NDR and Data/ Service Catalogues. For reference purposes, the registers/ catalogues are on one hand linked to the National Data Portal (data.gov.in) and on the other hand to the Application/ Service Platform. The Application/ Service Platform is expected to facilitate processing of data and services on the basis of the requirement of the user/ application or product module or Decision Support System (DSS). Based on the user requirement, a map service of the final product (WMS) is required to be provided to the user.
Specifications

There are several key characteristics associated with a register. Every item in the register is required to be associated with a unique, unambiguous and permanent identifier. A register keeps track of changes so that data created in the past can still be interpreted completely and correctly. Superseded or retired register items are also maintained in the registry for future reference.

The vendor is expected to implement and demonstrate use of the following kinds of spatial information registers i.e., Feature Concept Dictionary, Feature Catalogue; Application Schema; and the Code lists:

- The vendor should be fully involved in operationally developing and implementing the NDR.
  - Existing geo-portals of SCI, NRSC, GSI, FSI, CPCB, and Karnataka State SDI are required to be enabled for linkage with the NDR with appropriate data and services for supporting NDR implementation. The NDR should be developed based on standards to store various registers mentioned above. Any other register useful for running a select set of applications is also required to be developed.
  - Once operationalised, each data providing agency should be able to register their items in the NDR for reference by all - both humans and software applications. Harvesting should be provided. Facilities to define co-relationships across sources should be available. NDR should have standard interfaces for access.

- Setting up the NDR with the involvement of above partnering agencies under the supervision of NSDI/DST may include the following:
  - Develop application schema as per ISO/OGC standards
  - Convert data into feature model of OGC
  - Set up spatial database and application systems to provide CS-W, WCS, WFS; and WMS services
  - Identify and implement use cases for possible web processing services for users utilising above Data Node services
  - Set up necessary system platforms, hardware and software for operational NDR
  - Demonstrate search on these sources on NDR and prepare a few case studies demonstrating discovery and use of data and services from these sources for implementing GIS applications.