Chapter 27
Development and Implementation of Interoperable Secure SDI Model Using Open Source GIS

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ABSTRACT

It is observed that none of the academic institutes in India contributes for the development of SDI model at national level. Some of the developed models are not highly encouraging with respect to technical, organisational and institutional aspects. Non-availability of a standard functional SDI model based on SOA, Lack of technical interoperability and security aspects have also been a prime concern in SDI models using Open Source GIS (OSGIS). This article discusses appropriate application areas, i.e. the Education Sector, Geographical Indication and Mineral Resources Information Infrastructures to develop and implement the SDI model by a suitable adoption of OSS. The architecture of SOA-based interoperable and secure SDI models, which links the metadata server to database server, 3-tier interoperability and security framework with the help of OSGIS is developed and implemented.

INTRODUCTION

GIS plays a vital role in generating reliable information for planning and decision making in various fields from local to global level. The growing need to organise data across different disciplines and organisations and also the need to create multi-participant, decision-supported environments have resulted in the concept of Spatial Data Infrastructure (SDI). SDI is an initiative intended to create an environment that will enable a wide variety of users to access, retrieve and disseminate spatial as well as attribute data in an easy and secure way (Smith et al., 2004). SDIs allow the sharing of data and thus enable users to save resources, time and effort when trying to acquire new datasets by avoiding duplication of expenses associated with generation and maintenance of data (Goodchild, 2007). Thus, data are the important phenomena for building of SDI model.

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During the recent past, nations have realised that it is beneficial to efficiently manage existing spatial information by taking a perspective that starts at a local level and proceeds through state, national and regional levels to a global level through SDI (Carrera and Ferreira, 2007). SDI is fundamentally about facilitation and coordination of the exchange and sharing of spatial data between stakeholders in the spatial data community (Puri et al., 2007). It is necessary to utilise appropriate frameworks and technologies which aims on implementation of SDI. It also relies on effective management of the spatial data, metadata and web services (Najaret al., 2007; Maguire & Longley, 2005). At Global Level, Global Spatial Data Infrastructure (GSDI) is an ongoing initiative for development of SDI. It specifies a standard Cookbook ver. 2.0 to enable builders of SDI to make use of and build on existing SDI components in a way which makes their endeavours compatible with the efforts of other SDI builders (GSDI Cookbook, 2008).

National Spatial Data Infrastructure (NSDI) is a national initiative to provide access to spatial data. NSDI is a natural culmination of all that has happened in the area of surveying and mapping, remote sensing applications and GIS applications (Davies, 2003). As per McLaughlin (1991), NSDI would provide data that is created only once to varied users, and can be used many times. It avoids duplication of data and provides a platform for discover, access and publish geospatial data. Goodchild (2007) defined the concept of NSDI as the aggregate of agencies, technologies, people and data that together constitute a nation's mapping enterprise.

According to Executive Order 12906 of April 11, 1994 by USA president Bill Clinton, focus was shifted for the development of NSDI at national level as FGDC (Federal Geographic Data Committee) model. There are similar initiatives in Australia and New Zealand as ANZLIC (Australia and New Zealand Land Information Council) model, in Europe as INSPIRE (Infrastructure for Spatial Information in Europe) model and in Asia as Indian NSDI model (Sivakumar et al., 2004). Indian NSDI model is an initiative at national level to offer better and efficient access to the geospatial data and aims to make sure that users acquire consistent and reliable datasets to meet their requirements, even though the data are collected, stored and maintained by the different level of authorities (Singh, 2009). Indian NSDI can be used in a variety of social, economic and environmental applications. The movement for Indian NSDI was initiated in 2000 jointly by the Department of Science and Technology (DST), Government of India (GOI) and Indian Space Research Organisation (ISRO). For India, it was a high moment in the movement of NSDI when GOI came out with a resolution on the constitution of NSDI on June 13, 2006. The implementation of NSDI requires a robust infrastructure based on policy and administrative arrangements, people and technology and a means by which spatial/ non-spatial data is made accessible to the community (Puri et al., 2007; Barik, 2017). Enable the establishment of a national repository of a digital "warehouse" of the national map data holdings and facilitate sharing and access to the digital spatial information are the major imperatives that drive the country towards the establishment of NSDI in India.

Georgiadou (2003) explained two important approach for development of any NSDI in Indian context as bottom-up and top-down approach. For development of Indian NSDI, concept of both bottom-up and top-down as well as the concept of SDI at village, district and state level; has also been effectively demonstrated (Georgiadou et al., 2007). Presently Indian NSDI has released Metadata Standards 2.0 (Singh et al., 2012). Credentials of the NSDI metadata standards have been established by the fact that the service sits on the metadata created using these standards. India Geo portal and Karnataka Geo portal of the province of Karnataka have come up after sustained efforts. A numerous number of tools have been developed for geospatial data visualisation have helped in taking the geospatial data to the people through web-based systems for management of elections, water resources, health etc. (Internet-1, 2016).