# Technology Advancements in the Next Generation of Domain Agnostic Spatial Data Infrastructures

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Spatial Data Infrastructures (SDI) are typically composed of a suite of products focused on improving spatial information discovery and access. Proliferation of SDI initiatives has caused the "Yet Another Portal" (YAP) syndrome to emerge with each initiative providing a new mechanism for cataloguing and enabling users to search for spatial information resources. Often coarse-grained and incomplete metadata information available via these SDIs renders them to being analogous with an antiquated library catalogue.

We posit that the successful use of SDI resources requires attention to be focused on various semantic aspects of the information contained within – particularly the information models and vocabularies. Currently it is common for understanding of these models and vocabularies to be built into portals. This does not enhance interoperability between SDIs, nor does this provide a means for referencing or searching for a specific feature (e.g., the City of Sydney) without first knowing the location of the information source for the feature and the form in which it is represented. SDI interfaces, such as OGC WFS, provide data from a spatial representation perspective, but do not provide identifiers that can easily be cited or used across system boundaries. The lack of mechanisms to provide stable identifiers of a feature renders it permanently scoped to a particular dataset.

The other three important aspects that are commonly lacking in SDIs are the inadequate handling of feature level metadata that is commonly not sufficient enough for more than the most basic data discovery; features delivered through SDI are not well integrated with information systems that deliver statistical information about those features; and, importantly there are inadequate mechanisms to reconcile and associate multiple identities and representations of the same real world feature.

In this paper we present an extended view of an SDI architecture with integrated support for information models and controlled vocabularies with enhanced linkage capabilities between datasets. These components are realised with reference implementations through the Spatial Information Services Stack (SISS). The proposed Linked Data approach to managing and using feature level identifiers to link information systems to SDI information resources, being developed through the Spatial Identifier Reference Framework (SIRF) for Social Protection in Indonesia Project. It uses Unique Resource Identifiers (URIs) to access feature information using traditional SDI data access interfaces. These identifiers are used to explicitly reference individual features. This is analogous to a citation database, enabling explicit reference to identified real world features within a particular dataset. Furthermore, these identifiers can be conceptualised as 'spatial bookmarks' and used to link multiple representations of the same feature in different layers of a traditional SDI, as well as linking spatial features to statistical information held in systems beyond SDI boundaries.

The technology development effort has brought together over 20 participants including CSIRO, Geoscience Australia, Australian Bureau of Meteorology, Australian universities, and Australian government agencies as well as international initiatives, which have made significant contributions to the development of the semantic information management components of the SISS. The authors propose that through the use of the methodologies described in this paper, SDI can realise its potential as a spatial enablement mechanism that supports linking of multiple information systems, rather than remaining as a platform to deliver collections of spatial representations.