



SPATIAL
INTEROPERABILITY
DEMONSTRATION
PROJECT

Notional Architecture Executive Summary

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1 Introduction

This Executive Summary provides a high level overview of the SIDP Notional Architecture. It is an introduction to the key concepts in the Notional Architecture document, as well as a reference to other related documents or information sources.

This summary

- discusses the conceptual background of and requirements for a Notional Architecture
- describes the relationships between the SIDP Notional Architecture and other Australian public spatial infrastructure systems
- describes the key underlying standards of the Notional Architecture
- describes the basic premises of the Architecture
- provides an overview of the service components of the Architecture
- provides a brief description of an idealised geo-enabled enterprise information portal

The SIDP commissioned the Open Geospatial consortium – Australasia (OGC-A) to develop a Notional Architecture building on earlier work by OGC-A for the Western Australia Department of Land Information (DLI) and the Queensland Spatial Information Infrastructure Council (QSIIC). The Notional Architecture is to provide a roadmap for the SIDP, government agencies, corporations and other bodies implementing interoperable systems using technology supporting open geospatial standards. The Notional Architecture is an idealised description of the services and standards, following the ISO Reference Model for Open Distributed Processing and OGC Open Reference Model, required to produce an interoperable spatial infrastructure. The Notional Architecture articulates the broad range of specifications required for a geo-enabled portal which meets the requirements for the Australian Spatial Data Infrastructure.

The SIDP Notional Architecture comprises five volumes

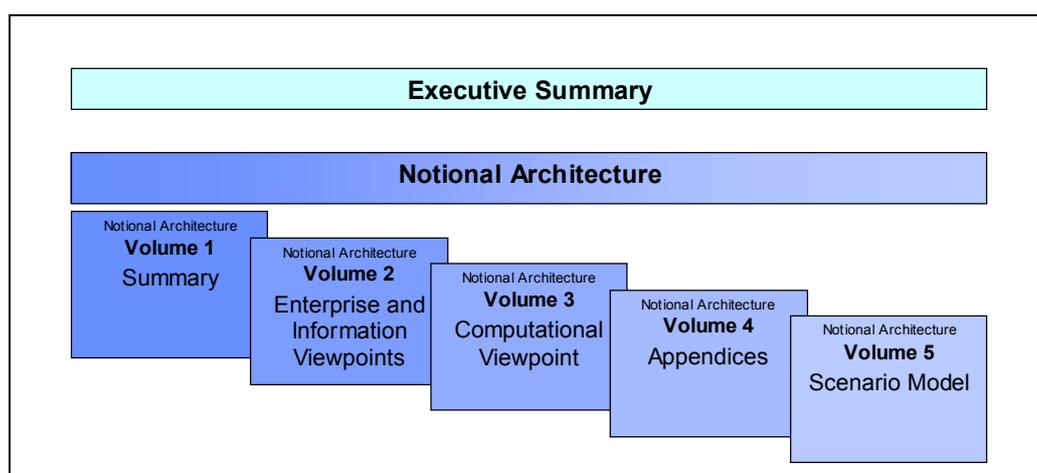
[SIDP Notional Architecture Volume 1 – Summary](#)

[SIDP Notional Architecture Volume 2 – Technical Considerations: Viewpoints, part 1](#)

[SIDP Notional Architecture Volume 3 – Technical Considerations: Viewpoints, part 2](#)

[SIDP Notional Architecture Volume 4 – Appendices](#)

[SIDP Notional Architecture Volume 5 – Model to assist in the preparation of scenarios](#)



SIDP Notional Architecture Documents

1.1 Notional Architecture Document Lifecycle

The Notional Architecture is a dynamic model. The standards and specifications referred to are evolving. Many projects are being undertaken around the world which test the varied aspects of interoperability. There is also an increasing interest in alignment between business processes, workflows and information, product manufacturing and delivery, especially within the context of the e-Government Interoperability Frameworks. The SIDP will monitor developments in the public arena.

OGC-A will review the Notional Architecture at six monthly intervals to ensure that the Architecture is kept current with the information generated by the SIDP and by other relevant projects worldwide. Special reviews of the Architecture may be initiated if the Technical Committee of the Open Geospatial Consortium updates any of the underlying standards on which the Architecture is based.

All documentation updates will be posted on the [SIDP web site](http://www.sidp.com.au) (www.sidp.com.au).

1.2 How to Use This Document

A Volume Guide is provided at the start of each section of this Summary (see example below). The highlighted part of the Guide indicates the volume of the Notional Architecture document containing more detail on the topics discussed in the section.

Notional Architecture Volume Guide				
Volume 1	Volume 2	Volume 3	Volume 4	Volume 5

Section 9 of this document contains a list of acronyms and a glossary of technical terms used in this summary.

2 The SIDP

2.1 Purpose of the SIDP

The Spatial Interoperability Demonstration Project (SIDP) is a collaborative initiative between the Australian Spatial Information Business Association (ASIBA) and the Open Geospatial Consortium – Australasia (OGC-A). The project is funded under the AusIndustry Innovation Access Program with additional in-kind support provided by private sector companies and government agencies.

The SIDP's purpose is to demonstrate the benefits of linking business processes and sharing spatial and other information resources across organisational lines. The linking is independent of where the data, information and processing tools, accessible over the internet, are physically located and what type of computer system is used.

For a full overview of the SIDP and its deliverables consult the [Project Overview](#) on the SIDP website.

2.2 SIDP Scenarios

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In order to produce some “real world” systems for demonstration, the SIDP defines and implements three scenarios in the areas of Emergency Management and Insurance. The demonstration scenarios are being defined and refined by a series of workshops held in July and August 2004.

These scenarios

- identify opportunities for shared, distributed Web Services for accessing data, geoprocessing and business services over the internet
- align with components of the Notional Architecture
- provide a gap analysis between existing and required capabilities
- consider the custodial arrangements by which Web Services could evolve from design concept through prototype demonstrator to operational stability

The Notional Architecture presents a scenario based on the Regional Reports created by the Queensland Treasury as a means of briefing the Department of Premier and Cabinet, as a sample. The regional reporting process also provides, for example, an economic report on a geographic region, or information about a region affected by an emergency incident.

The SIDP scenarios reflect further real world business requirements. The SIDP Project Management Team models the outcomes of the workshops, workflows for the SIDP scenarios and identifies specific Web Services for implementation. Modelling the scenarios provides additional examples of how the Notional Architecture and the modelling process can generate systems to realise actual business outcomes.

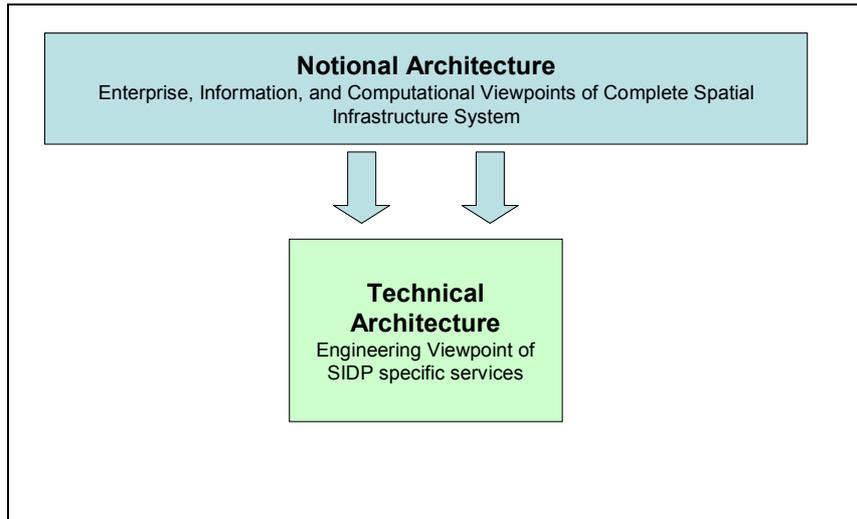
Series 1 workshops were conducted around Australia during July and August 2004. The [Executive Workshop Briefing](#), the [Operational Workshop Presentations](#) and the [Outcomes Report](#) are available on the SIDP website.

Series 2 workshops are scheduled for April and May 2005. The [SIDP Website](#) has more details.

2.3 SIDP Technical Architecture

The SIDP Technical Architecture is derived from the SIDP Notional Architecture. The ISO Reference Model for Open Distributed Processing (ISO RM-ODP) and OGC Open Reference Model define five Viewpoints. The Notional Architecture addresses the Enterprise, Information and Computational Viewpoints.

The Technical Architecture, commissioned from CSIRO (ARRC) details the Engineering Viewpoint for those services to be implemented in the SIDP. When the project is completed the final Viewpoint, the Technology Viewpoint, will be documented in the form of the “Implementation Architecture”. An explanation of the different viewpoints of the ISO RM-ODP is provided in section 4.3.



Relationship between the Notional Architecture and the Technical Architecture

The SIDP Technical Architecture contains detailed components, services and interfaces that are specific to the SIDP scenarios. The Technical Architecture also identifies components to be integrated as part of the SIDP, which may form the foundation of the Australian Spatial Data Infrastructure (ASDI) once the SIDP is completed. References to the SIDP Technical Architecture are found in section 6.

3 Notional Architecture Background

3.1 What is the Notional Architecture?

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The SIDP Notional Architecture is an idealised description of the services and interfaces required to construct interoperable spatial infrastructure systems. The architecture is notional in that it makes no assumptions about physical implementation and the only assumption made about vendors and institutions is that they accept and support open, non-proprietary standards.

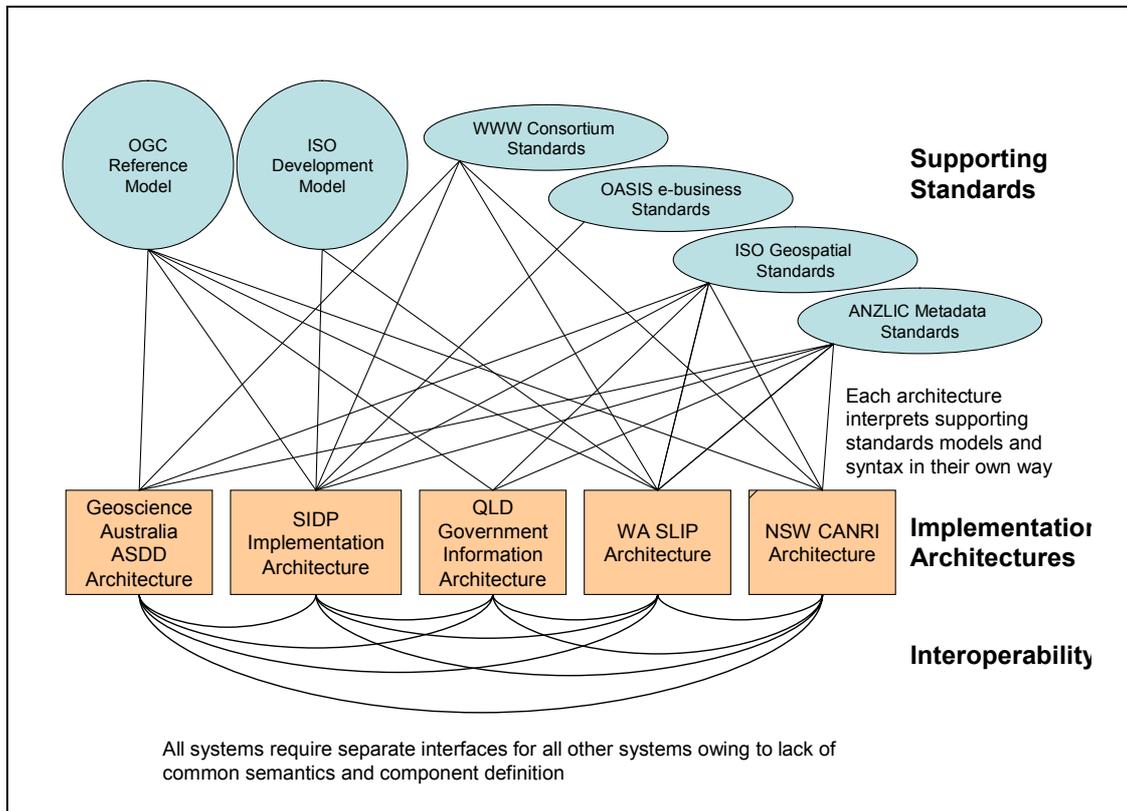
The Notional Architecture is concerned with spatially located data, discovery services, geospatial processing services and related business process services such as authentication, authorisation, auditing, digital rights management and pricing. It is based on Australian and international spatial data and data processing standards as discussed in section 4.

3.2 Why Have a Notional Architecture?

Notional Architecture Volume Guide				
Volume 1	Volume 2	Volume 3	Volume 4	Volume 5

Ad hoc interoperability between different spatial systems is difficult and expensive, requiring each system to construct individual interfaces to each other system. Even when the same supporting standards are used, different interpretations of the syntax and the models can restrict interoperability.

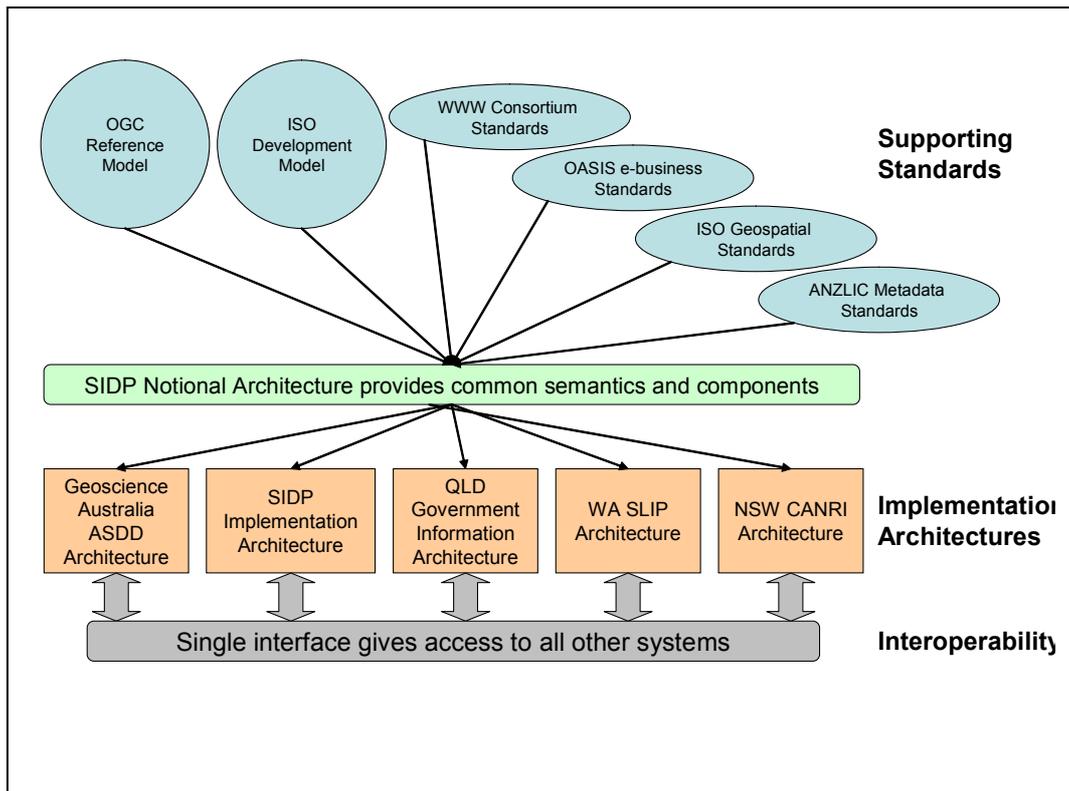
Many of the standards do not address the issue of the semantics, or contextual meaning, of the data. Consider a user querying a road network information system. If their query refers to a route into Melbourne, are they referring to a road designation (eg Route 1) or a path from where they are now to Melbourne? One road may carry several designators (eg Princes Highway, Route 1 etc) and for systems to interoperate successfully they need to have a common understanding of the context in which these designators apply.



Multiple implementations of standards without common semantics or component definition

The Notional Architecture describes a framework in which those semantics can be managed and also defines common components that provide a unifying, and simplifying approach to sustainable and cost-effective interoperability. With the Notional Architecture as the reference, systems will require only a single interface that conforms to the specifications in order to gain interoperability with all other systems that meet the same specifications.

A widespread adoption of the Notional Architecture will help ensure interoperability between systems at all levels of government (federal, state, and local), academia, industry, and other agencies. It will also help stimulate the market for spatial information services by providing a unified means of accessing data and processing services with a reduction in development costs for specialist service providers and end-users.



Notional Architecture provides common component definitions and semantic framework

When complete, the SIDP demonstrators, based on the Notional Architecture, will also provide the Australian community with demonstration capabilities consistent with those of the more than fifty nations that are developing interoperable national spatial data infrastructures. These national activities are supported by regional collaborative efforts in Asia and the Pacific, Europe, the Americas and Africa as well as an emerging Global Spatial Data Infrastructure effort.

3.3 Relationship with Australian Government Spatial Infrastructure Initiatives

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The custodian for the Australian Spatial Data Infrastructure is the Australia and New Zealand land Information Council (ANZLIC)

The SIDP Notional Architecture contains a superset of the components and interface definitions from current Australian spatial infrastructure initiatives. These initiatives include the [Australian Spatial Data Directory](#), the [Western Australia Shared Land Information Platform](#), the [Queensland Government Information Architecture](#) and the [New South Wales Community Access to Natural Resources Information](#).

The SIDP Notional Architecture has been offered to, and accepted by, the Spatial Data Infrastructure Committee of ANZLIC (December 2004).

4 Underlying Standards to the Notional Architecture

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Volume 1	Volume 2	Volume 3	Volume 4	Volume 5

The SIDP Notional Architecture is based on a large suite of national and international standards. A complete list of supporting references for these standards can be found in the bibliographies in Volumes 2 and 3.

Key standards for the Notional Architecture are

- Australian Spatial Data Infrastructure (ASDI)
- Open Geospatial Consortium Reference Model (OGC-RM)
- International Standards Organisation Reference Model for Open Distributed Processing (ISO RM-ODP)

An overview of each of these standards is provided in sub-sections 4.1, 4.2 and 4.3.

A brief description of the World Wide Web Consortium Web Services is given in the sidebar in section 5.

Specific implementation and technology standards such as Microsoft .NET or J2EE are outside the scope of the SIDP Notional Architecture.

4.1 Australian Spatial Data Infrastructure

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The Australian Spatial Data Infrastructure is an initiative of ANZLIC. It is a national framework for linking users with providers of spatial information. The ASDI comprises the people, policies and technologies necessary to enable the use of spatially referenced data through all levels of government, the private sector, non-profit organisations and academia.

Key components of the ASDI are the

- [Australian Spatial Data Directory](#)
- [Standards](#)
- [Spatial metadata](#)

Read more about the Australian Spatial Data Infrastructure on the [Geoscience Australia](#) website.

4.2 OGC Reference Model

Notional Architecture Volume Guide				
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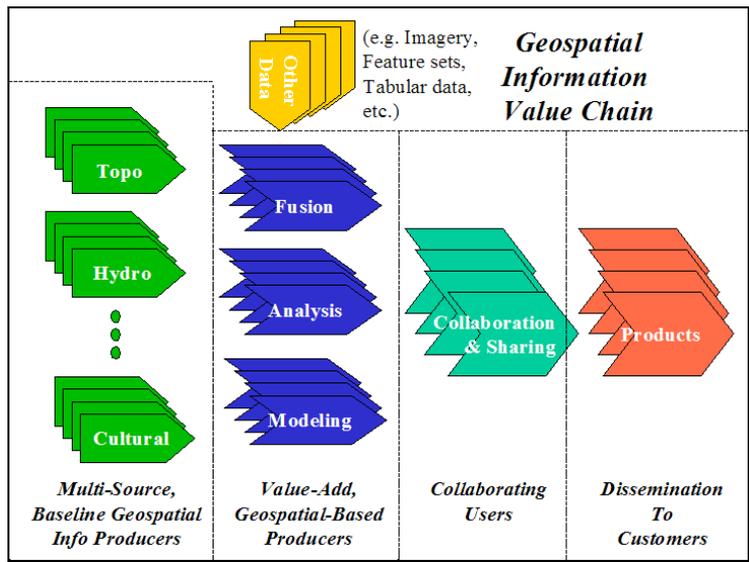
The OGC Reference Model provides a framework in which to deliver spatial interface and encoding specifications. The OGC-RM provides a foundation for the OGC Technical Baseline (the currently approved OpenGIS Specifications as well as a number of candidate specifications that are in progress), describes the OGC requirements baseline for geospatial interoperability, describes the OGC architecture framework through a series of non-overlapping viewpoints and regularises the development of domain-specific interoperability architectures.

The benefits of interoperability can be seen in the Geospatial Information Value Chain diagram, which illustrates an information value chain for geospatial information within an enterprise or information community. The value chain starts with geospatial information sources entering an interoperable environment. These then pass through geoprocessing chains, creating intermediate value-added geospatial-based products along the way. The diagram shows several examples of such value-added products including fusion (combining, correlating, annotating, and interrelating geospatial information from many sources into a single structure) and analysis (operating on geospatial information for the purpose of deriving new information, extracting results or understanding its nature and significance).

What is the OGC?

OGC is an international not-for-profit trade association dedicated to promoting new technical and commercial approaches to interoperable geoprocessing. The OGC was founded in response to widespread recognition of the problem of non-interoperability in the geospatial industry with its many negative ramifications for industry, government and academia. With greater than 80% of business and government information having some reference to location, the vision of OGC includes a national and global infrastructure in which geospatial or location referenced data and geoprocessing resources are accessible to everyone. The OGC vision also includes ge-enabling a wide variety of activities currently outside the domain of geoprocessing, opening new markets and giving rise to new kinds of businesses and new benefits to the public.

The core mission of OGC is to deliver spatial interface and encoding specifications that are openly available for global use. The OGC Reference model focuses on the technology aspects of the OGC mission.



Geospatial Information Value Chain. From the OGC Reference Model

The last step in the value chain involves creating for both internal customers and external customers finished products that either contain geospatial information, or are derived from geospatial information. Typical products provide functions such as visualisation and portrayal, reporting, analysis or information transfer and dissemination.

The Notional Architecture provides a unified approach for projects implementing the OGC-RM as part of the ASDI. It provides specific interpretations of the information semantics and computational components required to build spatial infrastructure. These include the geographic general feature model, standard conceptual schemas for spatial-temporal geometry and topology, the Publish-Find-Bind pattern for service discovery and the OGC Web Services Framework.

4.3 ISO Reference Model for Open Distributed Processing

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The ISO RM-ODP defines a structural framework for system specifications. The main structuring approach used in ISO RM-ODP architecture is the definition of viewpoints (see sidebar “What are the ISO RM-ODP Viewpoints?”)

The Notional Architecture details only the enterprise, information and computational viewpoints of a hypothetical, fully featured, spatial infrastructure system.

The engineering and technology viewpoints are not considered in the Notional Architecture because each requires the detailing of specific hardware, software and communications technologies and the identification of their roles in implementation. The SIDP Technical Architecture embodies the engineering viewpoint which establishes the model that will be the basis for the implementation of specific SIDP services. When the services are available the Technology Viewpoint will be documented in the form of the Implementation Architecture.

What are the ISO RM-ODP Viewpoints?

A viewpoint is a subdivision of the specification of a complete system, established to bring together those particular pieces of information relevant to some particular area of concern during the design of the system. Viewpoints are not completely independent as key items in each are identified as related to items in the other viewpoints. However, the viewpoints are sufficiently independent to simplify reasoning about the complete specification. Each viewpoint in the set can be related to all the others. They do not form a fixed sequence like a set of protocol layers, nor are they created in a fixed order according to some design methodology. An architecture is expressed in terms of the complete set of related viewpoints, without laying down how a complete specification is to be constructed for any given system.

The ISO RM-ODP defines five viewpoints of the system and its environment. These are

- the **enterprise** viewpoint focuses on the purpose, scope and policies for the system
- the **information** viewpoint focuses on the semantics of the information and information processing performed
- the **computational** viewpoint enables distribution through functional decomposition of the system into objects which interact at interfaces
- the **engineering** viewpoint focuses on the mechanisms and functions required to support distributed interaction between objects in the system.
- the **technology** viewpoint focuses on the choice of technology in the system

5 Notional Architecture Premises

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The Notional Architecture is based on the following premises:

- a number of resources exist as Web Services (see sidebar)
- resources include:
 - Data sets
 - Services that access, manipulate, or portray data sets
 - Processes that 'chain' services
- all resources are accessible only as services accessed by web agents such as browsers or applications
- users can only use web agents to access these resources to create information products
- providers of resources may need to account for, and possibly charge for, their use
- resources are offered in a distributed manner by a variety of custodians

The Web Services that provide the various resources are defined using an ISO/OSI three tier model. This model requires that the presentation capabilities, the processing capabilities that embody business rules and the data access capabilities are all defined and implemented as separate services. The groups of services defined in the Notional Architecture are covered in section 6.

Web agents or clients can be browsers ("thin" clients), applications ("thick" clients) or plug-ins ("chubby" clients). Clients are discussed in section 7.

Users may be people using a "thick", "thin", or "chubby" client to access resources or they may be automated processes.

Providers of resources are government agencies, corporations or other organisations that provides spatial services complying with the ASDI standards. In the context of the SIDP, providers of resources will be ASIBA and OGC members and participating Australian government agencies.

Custodians are responsible for managing the products that users receive, the services that generate them and the data that are employed. The ASDI is underpinned by integrated spatially related information services that are federated. The term "federated" is used throughout this project in the sense used by the Queensland Government Information Architecture (1999) i.e. *"agencies are independent and have their own accountability. They operate according to the principle of "mutual best interest" by collaborating to provide efficient, accountable, auditable delivery of authoritative information products, services and data to Executive Government, within government, to businesses and to the public."*

What are Web Services?

The term *Web Services* describes a standardised way of integrating Web-based applications using open standards over an Internet protocol backbone. Popular examples of standards used by Web Services are as follows: XML is used to encode the data, SOAP or GML is used to transfer the data, UDDI is used for listing what services are available and WSDL and CS/W can be used for describing the available services. Used primarily as a means for businesses to communicate with each other and with clients, Web Services allow organisations to communicate data without intimate knowledge of each other's IT systems behind the firewall.

Unlike traditional client/server models, such as a Web server/Web page system, Web Services do not provide the user with a graphical user interface (GUI). Web Services instead share business logic, data and processes through a programmatic interface across a network. The applications interface with each other, not with users. Developers can add the Web service to a GUI (such as a Web page or an executable program) to offer specific functionality to users.

6 Notional Architecture Service Component Overview

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Seven broad groups of capabilities required for spatial infrastructure platforms are identified in the Notional Architecture. Each of these capabilities has a group of Web Services defined to meet those capabilities. The seven SIDP capability groups are

- provide applications to users
- interrogate registries and catalogues
- generate data portrayals
- access data
- carry out geographic processing
- authenticate, authorise and account for users
- store and manage spatial data, statistical tables, accounting records, catalogue and registry entries, etc. in various repositories

Within each group, capabilities are implemented as specific content and service components. Each component operates as a web service communicating on a transactional basis with other components, user agents and remote applications via the internet.

Component services are provided and accessed through the internet from many different physical locations. The internet provides the backbone by which these services communicate both between themselves and with people using browsers and other tools. Standard internet messaging protocols and mark up languages define the rules by which messages are created and interpreted. A wide variety of information products can be generated using “just in time” processing, dynamically assembling and combining components from one or many service providers.

The functions of each group of services are

- **Application Services** provide server-side client generators for accessing business and data access services. These link to browsers or other applications to provide the services to the users.
- **Authentication, Authorisation and Accounting Services** manage and account for spatial data infrastructure and processing resources.
- **Data Repository Services** provide permanent storage of geographic objects, temporal events, associated geolinkable non-spatial data, user audit and management records, registry and catalogue metadata, and articulated service and data use policies. There are three types of data repositories and their associated services – datastores (dynamic content), libraries (reference information) and registers (metadata).
- **Data Access Services** are used by web agents (including automated processes) and other Web Services to acquire copies of data in either original or processed form. This encompasses simple existing facilities for downloading copies of entire data elements such as GML files, shapefiles, raster images or database records, as well as more sophisticated services delivering data through Geodata Processing Services. Additionally, transactions (creation, replace, update, delete) to existing data stores can be accommodated through the use of transactional interfaces, such as the OGC Web Feature Service. This capability is very useful, for example, when users collect new information in the field via a mobile device and wish to send the new transactions to the server.

- **Geodata Processing Services** are the tools that operate on geospatial data and provide services that add value to the final information product. Geodata Processing Services conduct transformations of data originating from Data Repositories or other Geodata Processing Services and may deliver their outputs to Portrayal Services, Data Services or other processing services.
- **Portrayal Services** prepare visualisations and representations of data originating from Data Repositories and Geodata Processing Services. Web agents receive images representing the data, not the actual data values. These images may be maps, statistical charts, choropleth depictions, VRML animations or narrative packages such as summaries delivered in PDF format. A common existing Portrayal Service required for the SIDP platform is the Web Mapping Service.
- **Registry and Catalogue Services** provide a common mechanism to search and access information about resources available on a network. Registries support “search and discovery” by providing reference pointers to largely static descriptions services, their interfaces and their components. Catalogues support “search and discovery” by providing reference pointers to more volatile descriptions of geodata set contents. Resources are network addressable instances of typed data or services. These services also provide tools enabling authorised Web Agents to classify, register, describe and maintain resource metadata according to their assigned authority type. “Search and discovery” is implemented using the Publish-Find-Bind model (see Volume 4).

A detailed view of the service components is described in Volume 3. While not definitive , these components are indicative of the types of components required by the SIDP platform.

Further detail on the specific components that will be part of the SIDP demonstration scenarios are in the SIDP Technical Architecture.

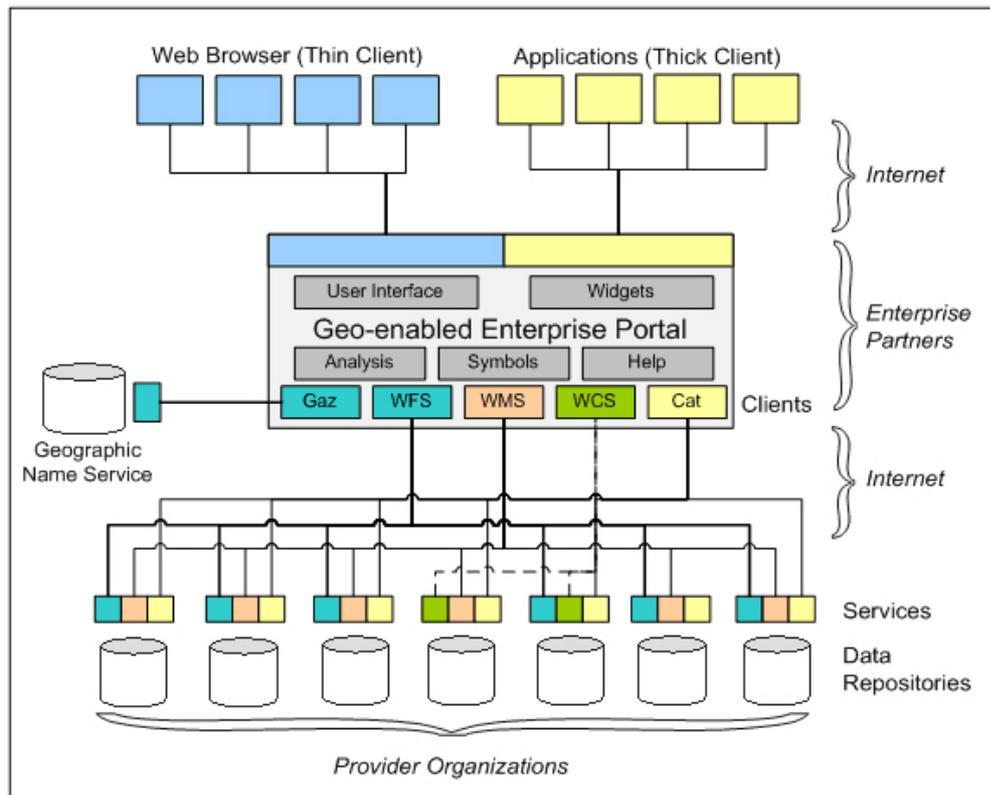
7 Notional Architecture Portal Platform

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The Notional Architecture Portal Platform presents a high level service component view of the SIDP Notional Architecture. The salient points for SIDP are that:

- “thin” clients are web browsers for people accessing services through the World Wide Web
- “thick” clients are remote applications acting as their own web agents and able to invoke services according to agreed message standards and protocols. “Thick” clients can be remote GIS desktop applications used directly by people or they can be autonomous tasks such as statistical analysis and modelling engines
- enterprise Partners configure the Web Services to conduct business processes such as analysis, data manipulation, presentation of products according to designated symbologies and layouts, and may also to provide interactive help to users
- catalogue services support the publication of service and data characteristics (metadata) and provide a means for their discovery by appropriate agents. Catalogues also provide information about the language structures and interface capabilities supported by each service. All services to be accessed in the SIDP require catalogue references

- gazetteer services support searches and other applications (such as portrayal) requiring the names of locations and features
- web feature services (WFS) abstract data as topographic features encoded in geographic mark-up language (GML) that are amenable to further analytical or representational processing, such as may be done with “thick” clients. WFS deliver vector data content and attributes but can also handle content such as point data from gazetteer services
- web coverage services (WCS) similarly abstract coverage data (including raster data) to “thick” clients or for portrayal through WMS
- web mapping services (WMS) provide pictorial portrayals of data as maps which are readily visualised and manipulated in “thin” clients but are not suitable for further processing. WMS may stream and portray content from WFS



SIDP Portal Platform

When completed, the SIDP Portal will expose data stores to the SDI via OpenGIS compliant service interfaces. The services used to access the data stores are, in many cases, existing legacy systems adapted with appropriate wrappers or middleware to translate from their internal proprietary formats and interfaces to the external open standard mechanisms required for interoperability within and between SDIs. The SIDP Portal will enable Australian geospatial community data services with appropriate interoperability interfaces, to exchange services and data with other SDI participants at State, Commonwealth and international levels. International connectivity options include image repositories maintained by US NASA and EROS Data Center³, the Asian- Pacific regional SDI, the United Nations SDI-based interoperability framework, services operated by the World Bank and OECD, and numerous non-governmental institutions such as the World Conservational Monitoring Centre and the World Resources Institute.

8 Conclusion

The SIDP Notional Architecture is a framework for building interoperable regional and national systems and services to use spatial information in more effective and efficient ways.

The Architecture is

- focussed on user-driven product, process and service, not data
- vendor, content, technology, and institution neutral
- based on a distributed architecture
- designed to allow agencies and custodians to retain control over their data and internal processes
- evolutionary, building on existing systems rather than replacing them
- incremental and component based.

The main benefits of adopting and using the Notional Architecture are that it provides

- a standard way of interpreting the underlying models and their syntax
- a guideline for building standard components of a spatial infrastructure architecture
- a guideline for implementation where there are no existing spatial systems
- an assurance that systems developed are interoperable between all levels, irrespective of whether the scope of the system is local government, state government, federal government, industry specific, academic etc.

9 References

9.1 Acronyms

ANZLIC	Australian New Zealand Land Information Council http://www.anzlic.org.au/
ASDD	Australian Spatial Data Directory http://asdd.ga.gov.au/asdd/
ASDI	Australian Spatial Data Infrastructure
ASIBA	Australian Spatial Information Business Association http://www.asiba.com.au/
CANRI	Community Access to Natural Resource Information (NSW) http://www.canri.nsw.gov.au/
CSDGM	Content Standard for Digital Geospatial Metadata (USA FGDC)
DLI	Department of Land Information (Western Australia) http://www.dli.wa.gov.au/
FGDC	Federal Geographic Data Committee (USA) http://www.fgdc.gov/
GA	Geoscience Australia (Australian Government) http://www.ga.gov.au/
GIA	Government Information Architecture (Queensland) http://www.iie.qld.gov.au/comminfo/gia/
GIF	Graphic Interchange Format (Unisys)
GML	Geography Mark-up Language (OGC) http://www.opengis.org/docs/02-023r4.pdf
ISO	International Organisation for Standardisation http://www.iso.org/
ISO RM-ODP	International Organisation for Standardisation Reference Model for Open Distributed Processing
J2EE	Java 2 Enterprise Edition
JPEG	Joint Photographic Expert Group format (including JPEG2000)
OASIS	Organisation for the Advancement of Structured Information Standards http://www.oasis-open.org/who/
OGC	Open Geospatial Consortium http://www.opengis.org/
OGC-A	Open Geospatial Consortium – AustralAsia
OGC-RM	Open Geospatial Consortium Reference Model
OSI	Open Source Initiative http://opensource.mirrors.ilisys.com.au/
PDF	Adobe Portable Document Format
PNG	Portable Network Graphics (W3C) http://www.w3.org/Graphics/PNG/
SDI	Spatial Data Infrastructure
SIDP	Spatial Interoperability Demonstration Project
SLIP	Shared Land Information Platform (DLI and WALIS , WA)
SOAP	Simple Object Access Protocol (W3C) http://www.w3.org/TR/2000/NOTE-SOAP-20000508/
UDDI	Universal Discovery Description and Integration (OASIS) http://www.uddi.org/
VRML	Virtual Reality Markup Language
W3C	World-Wide Web Consortium http://www.w3.org
WCS	Web Coverage Service (OGC) – see Glossary
WFS	Web Feature Service (OGC) – see Glossary
WMS	Web Mapping Service (OGC) – see Glossary
WSDL	Web Services Description Language (W3C) http://www.w3.org/TR/wsdl
XML	Extensible Mark-up Language (W3C) http://www.w3.org/XML/

9.2 Glossary

Application	A program that performs a specific function directly for a user. Applications can make use of SDI.
Architecture	The organisational structure and operating environment of the SDI, including the relationships between its parts, and the principles and guidelines governing their design and evolution over time.
Binding	Specific syntax and parameter values used by a client to invoke a specific server operation
Catalogue	A registry that, in the SDI context, is usually used to describe spatial data sets.
Client	A software component or an application that accesses a service. Clients may be categorised in three ways <ul style="list-style-type: none">• Thin clients where the client supports only human-interface code, such as a web browser or a minimal PDA or WiFi handset, and must also support non-proprietary standards. They typically lack long-term memory such as disk drives. Application code and data access both run remotely and are entirely dependent on an external network connection.• Thick clients where the client supports all the human interface and application code, may support some or all data access code, and may support long-term data memory. Human interface code may be entirely customised and not conform to non-proprietary standards. May not even support human interfaces i.e. may be entirely automated remote processes. May operate at times without network connection.• Chubby clients have capabilities somewhere on the spectrum between thick and thin clients i.e. may support some application and data code, and may store limited amounts of data. Will usually but not necessarily support human interfaces. May operate well for limited time without network connection.
Component	Software that packages the client or server implementation of a service and can provide the realisation of a set of interfaces. A component consists of software code (source, binary or executable) or other equivalents such as scripts or command files.
Conceptual Architecture	An overview of the services, data, technology and institutional environment of SDI. It describes, in general terms, both what the SDI will include and how it will operate.
Coverage	A continuous representation of a portion of the earth's surface. A coverage may be a collection of features (like a vector dataset) or it may be a raster or gridded surface representing one or more attributes.
Custodian	The authoritative manager of an SDI resource, whether data set, service or component, who is responsible for the declaration of the policies regarding use and accounting for the resource.
Datastore	Any type of persistent storage for components and data. Content may be static or dynamic. May include database systems, file systems, structured text storage, XML repositories etc.
Gazetteer	A dictionary of geographical names. May encompass locations, cultural and landscape features and may embody various naming conventions including official name, names in common usage, traditional and community-based names. Attributes of gazetteer entries may include geographic coordinates, extent and topology. May be implemented through Web Feature Service for SDI applications such as user interfaces.
Geodata	Georeferenced spatial data such as a road network or a satellite image. Geodata explicitly describes the spatial extent of a set of features or describes a measurable surface. It includes both geospatial data and geolinked data.
Geospatial Data	Geodata with explicit geographic positioning information included, such as a road network from a GIS, or a georeferenced satellite image. Geospatial data may include attribute data that describe the features in the dataset.
Library	A type of registry intended for recording references to entity types (as distinct from recording instances) i.e. a look-up. Content is generally static once instantiated.
Map	A pictorial representation or portrayal of geographic data.
Metadata Standard	Data will be documented according to the FGDC Content Standard for Digital Geospatial Metadata (CSDGM) and/or the ISO 19115.
Notional Architecture	A design framework based on vendor-neutral, open standards.
Portal Services	Provides "one-stop" access to Provider Services. An online access point to a collection of geospatial data -- more precisely, to a collection of services that provide data or relevant functionality. A portal does not store or maintain the data and its associated services; rather, these are distributed in many computers nationwide and maintained by the agency or organisation that is responsible for its data and services. Portals shall be based on open standards and specifications that are defined collaboratively by various interested parties, are freely published, and are able to be implemented by any vendor or organisation.
Process	A system offering a single interface for the execution of a single task creating one or more products. Processes may be grouped to provide a service.

Registry	A listing of the specific, individual services, components, datasets or other entities that comprise the SDI or are relevant to its users. Instance registries are used to identify, locate, and describe individual instances. Many registries refer to associated Type Libraries that record the allowed types within registry classes e.g. types of services, types of user authorities.
Resource	Data, services and components that are published and underlie the creation of all useful products. Resources are presented to the internet as Web Services.
Schema	A schema is an expression of the Type using a particular data modelling language. Types can be described as classification taxonomy for a set of schema definitions. The OGC application data modelling language is GML and each schema fragment corresponding to a given type is defined in GML.
Server	(a) A software component that delivers a service. (b) A physical implementation of such a component that provides the realisation of its operations.
Service	A collection of operations, accessible through one or more interfaces, that allows a user to evoke behaviour of value to that user. A server delivers each service. A service may encapsulate many processes. A "service instance" is another name for a server (b).
SIDP	The AusIndustry Interoperability Demonstration Project.
Site	A location (e.g. URL) at which a system is accessed.
System	Servers and data organised to accomplish one or more Services. A system may be accessible at more than one site.
Web Agent	People or software that act on the web information space. Software agents include browsers, servers, proxies, spiders and multimedia players mediating interactions on behalf of a person, entity or process.
Web Coverage Service	Supports electronic interchange of geospatial data as "coverages" – that is, digital geospatial information representing space-varying phenomena. A WCS provides access to potentially detailed and rich sets of geospatial information, in forms that are useful for client-side rendering, multi-valued coverages and input into scientific models and other clients. The WCS may be compared to the OGC Web Map Service (WMS) and the OGC Web Feature Service (WFS); like them it allows clients to choose portions of a server's information holdings based on spatial constraints and other criteria. Unlike WMS (OGC document 01-068r3), which filters and portrays spatial data to return static maps (rendered as pictures by the server), the Web Coverage Service provides available data together with their detailed descriptions; allows complex queries against these data; and returns data with its original semantics (instead of pictures) which can be interpreted, extrapolated, etc. -- and not just portrayed. Unlike WFS (OGC Document 02-058), which returns discrete geospatial features, the Web Coverage Service returns representations of space-varying phenomena that relate a spatio-temporal domain to a (possibly multidimensional) range of properties.
Web Feature Service	Serves vector data (points, lines and polygons) to the web for use by applications on remote websites. Provides interfaces for describing data manipulation operations on geographic features using http as the distributed computing platform. A Web Feature Service request consists of a description of query or data transformation operations that are to be applied to one or more features. The request is generated on the client and is posted to a web feature server via http. The web feature server then reads and (in a sense) executes the request. The OGC Web Map Service (WMS) allows a client to overlay map images for display served from multiple Web Map Services on the Internet. In a similar fashion, the OGC Web Feature Service allows a client to retrieve geospatial data encoded in Geography Markup Language (GML) from multiple Web Feature Services
Web Map Service	Produces maps of georeferenced data. A "map" is a visual representation of geodata; a map is not the data itself. These map views are rendered in a 2D pictorial format such as PNG, GIF or JPEG. The WMS specification thus enables the creation of a network of distributed Map Servers from which clients can build customised maps. A particular WMS provider in a distributed WMS network need only be the steward of its own data collection. This stands in contrast to vertically integrated web mapping sites that gather in one place all of the data to be made accessible by their own private interface.
Web Service	Application logic accessible across a network using standard Internet protocols. Web Services combine the best aspects of component-based development and the Web. Like components, Web Services represent functionality that can be easily reused without knowing how the service is implemented. Unlike current component technologies that are accessed via proprietary protocols, Web Services are accessed via ubiquitous Web protocols (e.g. http) using universally accepted data formats (e.g. XML).

9.3 Bibliography

- ANZLIC *Metadata Guidelines* (v2 – February 2001), see <http://www.anzlic.org.au/download.html?oid=2358011755>
- ISO 10746, *Information technology -- Open Distributed Processing – Reference model*, see <http://www.iso.ch/iso/en/itff/PubliclyAvailableStandards/c020696e.zip> for overview
- OASIS ebXML see <http://www.ebxml.org/>
- OASIS Universal Discovery Description and Integration, see <http://www.uddi.org/>
- OpenGIS *Geography Markup Language (GML) Implementation Specification, version 3.0*, see <http://www.opengis.org/docs/02-023r4.pdf>
- OpenGIS *Reference Model (ORM)*, see <http://www.opengis.org/docs/03-040.pdf>
- OpenGIS *Web Coverage Server (WCS) Implementation Specification, version 1.0*, see <http://www.opengis.org/docs/03-065r6.pdf>
- OpenGIS *Web Feature Server (WFS) Implementation Specification, version 1.0*, see <http://www.opengis.org/docs/02-058.pdf>
- OpenGIS *Web Mapping Server (WMS) Implementation Specification, version 1.1.1*, see <http://www.opengis.org/docs/01-068r2.pdf>
- OpenGIS *Web Registry Service (WRS) Discussion Paper, version 0.0.2*, see <http://www.opengis.org/docs/01-024r1.pdf>
- OpenGIS *Web Services Architecture (OWS) Discussion Paper*, see <http://www.opengis.org/docs/03-025.pdf>
- Queensland *Government Information Architecture*, see http://www.governmentict.qld.gov.au/02_infostand/gia.htm
- SIDP *Technical Architecture*, see <http://www.sidp.com.au/index.cfm?Fuseaction=extrainfonew&Return=showtrolley&ProductID=7&categoryID=1>
- World Wide Web Consortium *Extensible Markup Language (XML) 1.0*, see <http://www.w3.org/XML/Core/#Publications>
- World Wide Web Consortium *Simple Object Access Protocol (SOAP) 1.1*, see <http://www.w3.org/TR/SOAP/>
- World Wide Web Consortium *Web Services Choreography Requirements* (Working Draft 11 March 2004), see <http://www.w3.org/TR/2004/WD-ws-chor-reqs-20040311/>
- World Wide Web Consortium *Web Services Description Language (WSDL) 1.1*, see <http://www.w3.org/TR/2001/NOTE-wsdl-20010315>