



CANADIAN GEOSPATIAL DATA INFRASTRUCTURE INFORMATION PRODUCT 5

The Canadian Geospatial Data Infrastructure: Better Knowledge for Better Decisions

GeoConnections

2005



Natural Resources
Canada

Ressources naturelles
Canada

Canada

Vision



The Canadian Geospatial Data Infrastructure

**Better knowledge for
better decisions**

**GeoConnections
2005**



Preface

This document is an update of the original Canadian Geospatial Data Infrastructure (CGDI) Vision that was created in 2000. Since that time, there have been significant developments and progress made in the development of the CGDI. The first five years have resulted in the development of an infrastructure that includes data and services, and in the establishment of key relationships and partnerships.

The aim of this document is to help set the course for the next five to ten years. The vision herein has been developed with the input of many. Rich contributions were received through a multi-faceted consultation process. Throughout the consultations there was widespread support for the current operating principles and vision statement. This input has allowed the preparation and presentation of a vision that encompasses the reflections and considerations of those with a keen interest in the future of the CGDI.

Intended Audience

This document has been prepared to provide a vision that is accessible to those with an avid or even a casual interest in the future of the CGDI. Those more technically inclined are encouraged to access the companion Architecture document that is available on the CGDI Website at: <http://www.cgdi.ca>.

Scope

The CGDI Vision document provides a description of the vision, mission, objectives and goals for the CGDI for the next five to ten years. There are two companion documents to the vision:

1. The CGDI Architecture document provides insight into the technological aspects of the infrastructure; and
2. The CGDI Roadmap document outlines the routes to achieving the vision and implementing the infrastructure.

The Canadian Geospatial Data Infrastructure (CGDI)

"Better knowledge for better decisions"

This document is an update of the original Canadian Geospatial Data Infrastructure (CGDI) Vision that was created in 2000. While consultations and research proved the original Vision to still be valid, it has been enhanced with new (*) ideas.

Vision

**To enable access to the authoritative and comprehensive sources of Canadian geospatial information to support decision-making.*

Mission

- Enable decision-making and policy development that address Canada's priority issues such as health, social, cultural, economic, and natural resources.
- Facilitate access to the leading sources of Canadian geospatial information
- Provide continued involvement and leadership in the development of geospatial standards and specifications.
- Foster partnerships and sharing of geospatial information across all sectors, at all levels of government, and at the international level.
- Support a broad and vibrant user community.
- Ensure that infrastructure operations are on going and sustainable.

Guiding Principles

Open: The CGDI will be based on open and interoperable standards and specifications for operations and information exchange.

Transparent: The CGDI will allow users to access data and services seamlessly, despite any complexities of the underlying technology.

Cooperative: The CGDI will facilitate the cooperation and collaboration of participating organizations from all sectors, levels of government, and academia.

Evolving: The network of organizations participating in the CGDI will continue to address new requirements and business applications for information and service delivery to their respective users.

Timely: The CGDI will be based on technologies and services that support timely or real-time access to information.

Self-sustaining: The CGDI will be sustained through the contributions of the participating organizations and broad user community, and through its relevance to these groups.

Self-organizing: The CGDI will enable various levels of participating organizations to contribute geospatial information, metadata, services and applications.

***User-driven:** The CGDI will emphasize the nurturing of and service to a broad user community. Users will drive the future development of the CGDI.

***Closest to Source:** The CGDI will build upon its principle of self organization by encouraging organizations that are closest to source to provide data. This will increase quality and efficiency by eliminating duplication and overlap.

***Secure:** The CGDI will be secure and protect data that is sensitive or proprietary

Table of Contents

Preface	i
Intended Audience	i
Scope	i
Summary.....	ii
Vision	ii
Mission	ii
Guiding Principles	ii
Table of Contents	iv
1. Introduction.....	1
2. Context of the CGDI	3
2.1 Why a CGDI?.....	3
2.2 Progress to Date	4
Standards and Specifications	4
Data	4
Services and Applications.....	5
Relationships	5
Policies.....	5
3. Towards the Future.....	7
3.1 Guiding Principles.....	7
Founding Principles	7
Building Principles.....	8
3.2 Vision.....	9
3.3 Mission	10
3.4 Mission Objectives and Related Goals.....	10
4. Achieving the Vision.....	12
4.1 Document Linkages	12
4.2 A Renewed Architecture	12
4.3 A Roadmap for the Future	13
Appendix: Glossary of Terms	14

1. Introduction

Geospatial information plays an important role in the everyday lives of Canadians. Every time someone watches a weather forecast on TV, uses a roadmap, or phones 911, geospatial data is being utilized. Simply put, geospatial information provides almost infinite details or characteristics (i.e. buildings, roads, demographics, water, soil, weather, topography, wildlife, farming, etc.) regarding a geographic location, on land or water, and at a street, local, regional, provincial, national, or global level.

What is geospatial data?

Geospatial data is information that can be mapped or otherwise associated with a particular place, for example, the location of a river, crime statistics for a neighbourhood, or the spread of infectious diseases.

The developments in information technology over the past decade have made both the access to and the need for geospatial information expand exponentially. In 1999, the Government of Canada recognized this new environment and invested \$60 million in a national partnership initiative to improve access to geospatial information over the Internet. This initiative, known as GeoConnections, was led by Natural Resources Canada and was mandated to accelerate the development of a Canadian Geospatial Data Infrastructure (CGDI).

Today, the CGDI facilitates the discovery, sharing and use of Canadian geospatial information and services. It is leading to various innovations and unforeseen applications that have increasing social and economic value.

The CGDI's current success has been predicated on its ability to bring a broad base of stakeholders together from industry, academia, and all levels of government in pursuing a common objective. It is through these national partnerships that standards have been created and adopted so that the infrastructure developed is accessible to everyone.

What is the CGDI?

Simply put the CGDI is made up of people, partnerships, geospatial content and technology with an aim to facilitate better policy and decision making.

While great strides have been made in building the CGDI, there is a need for refinement of the infrastructure and greater participation of partners, to ensure a critical mass of geospatial data, services, and applications. Without continued investment and contributions from all the partners, it is unlikely that the CGDI will be able to continue to provide geospatial information to assist in policy development and decision making by governments, industry, and the not-for-profit sector.

Rich contributions to the Vision for the CGDI were received through a multi-faceted consultation process. Throughout the consultations there was widespread support for the current operating principles and vision statement.

With this in mind, this Vision document aims to illustrate the direction that the CGDI must follow in the future to develop into the geospatial information infrastructure that Canada needs.

2. Context of the CGDI

2.1 Why a CGDI?

Canada is recognized as one of the leading nations in the integration of geospatial science, geospatial technology and the Internet. The CGDI delivers geographic content to the information highway through access to over 1400 geospatial database collections. The CGDI does not house this information but rather provides an infrastructure that allows a diverse community to share geospatial information and data based on common standards.

The CGDI provides the technology standards, access systems and protocols necessary to harmonize all of Canada's geospatial databases, and to make them accessible on the Internet. It is vital that there be standards and interoperability in the area of geospatial data technology. If not, time, money and effort will be duplicated, and Canada's geospatial data will be a patchwork at best. Through the CGDI, Canadian governments at all levels are managing their responsibilities more efficiently and enhancing decision making with more complete information at their disposal.

Canadians benefit from these advances whether as users or providers of data, technology and expertise. With continued advancement, Canadian businesses will be able to sustain and enhance their position in global markets with sought-after geospatial data products, expertise, and services.

The CGDI was created to:

- Facilitate sharing of geospatial information;
- Improve planning for future investments in geospatial data;
- Expand collaborative partnerships that help leverage investments and reduce duplication;
- Encourage the adoption of standards for sharing and using geospatial information;
- Enable informed decision making by providing easy access to current information, knowledge and expertise;
- Promote efficiency by reducing duplication of efforts through national standards, specifications and services that support collaboration;
- Enable usability for Canadian governments, firms and individuals that need a reliable system, an "infrastructure" to access and use these resources;
- Facilitate growth in the export of Canadian technology, products, expertise, and services.

2.2 Progress to Date

Since 2000, significant strides have been made toward achieving the original Vision for the CGDI. Efforts have focused on enabling access to standards-based Web services, leveraging existing and emerging technologies and standards to adopt a general-purpose service-based platform. Overall, notable progress has been made in the following key areas:

Standards and Specifications

Open standards and specifications are at the heart of the CGDI. Working closely with international standards bodies and national working groups, GeoConnections endorsed a number of standards for the CGDI that provide the foundation for an open and distributed network.

Specifications have been endorsed for the visualization (Web Map Service), presentation (Styled Layer Descriptor), and storage (Web Map Context) of data. Specifications for data manipulation (Web Feature Service), querying (Filter Encoding), and for coding the transport and storage of geographic information (Geography Markup Language) also have been endorsed. Specifications for searching Geospatial data resources (Geodata Discovery Service) and for providing a standard way of describing Geospatial data (Metadata for Geodata) represent other accomplishments in the area of standards and specifications.

Data

Information that supports decision making must be based on quality data to provide value to the decision maker. CGDI framework data helps fulfill this requirement. It is the set of continuous and fully integrated geospatial data that provides context and reference information for the country. Significant strides have been made in this area, highlighted by the progress achieved through the GeoBase initiative, which has produced agreement on six layers of geospatial framework data and increased inter-jurisdictional cooperation. CGDI framework data will serve as the underpinning for a number of geospatial applications.

The CGDI also provides access to thematic data sets that describe the characteristics of geospatial features, providing information on specific topics, such as rainfall, geology, or population. Thematic data attributes are geospatially referenced so they can be tied to locations on the Earth and be used in applications.

The Atlas of Canada provides a collection of maps and related information about Canada. It offers thematic data such as freshwater and population distribution via CGDI Web services. The GeoConnections Discovery Portal is an ideal place to discover thematic data. Searching on a particular subject (e.g., vegetation or snowfall) yields thematic results. Most thematic data sets

can be distributed via the CGDI, and it is the sharing of these data sets that will enable the most powerful CGDI applications.

Services and Applications

Web services provide the basis for interactions across the Internet that allow users to contribute, access, and exchange geospatial data. The GeoConnections Discovery Portal allows for the discovery of geospatial Web services and identifies those that conform to CGDI-endorsed specifications.

Applications use one or more Web services to view, publish, edit or discover geospatial data from Web servers. Applications based on core CGDI components, interfaces and services are beginning to deliver many of the anticipated benefits to Canadians.

From an end-user perspective, significant developments have occurred in the viewer client applications that display graphics from map servers and the discovery client applications that allow for searching for geospatial data. For data providers, publisher and editor applications allow providers to select how to distribute their data to users, and how to add, remove or update shared data.

Relationships

The CGDI has fostered relationships and partnerships with collaborators from public, private and academic sectors. For example, CGDI advisory groups have cross-sectoral memberships enabling them to leverage expertise and contributions from all stakeholders.

As well, the Canadian Geomatics Accord creates a framework for federal, provincial and territorial collaboration on geomatics issues. The Accord is a key federal/provincial/ territorial partnership agreement and has been successful in focusing efforts on more efficient geomatics data collection, distribution, and maintenance.

Policies

Significant strides have been made in the area of policy. Extensive cross-country consultations in 1999-2000 provided key policy input that helped shape the CGDI's current form.

In recognition of the importance of policy development, CGDI stakeholders worked at finding solutions to the difficult policy issues involved in enhancing access to government geospatial data. Policy development focused on creative consensus-building approaches to address the following areas:

- Enabling increased access to and use of government geospatial data in the public and private sectors
- Resolving copyright, licensing and distribution issues that inhibit data sharing and use
- Promoting inter-agency geospatial data-sharing arrangements

- Defining roles and responsibilities for various public and private interests in the development and promotion of enabling policies
- Expanding public and private partnerships
- Enhancing government efficiencies in collecting, maintaining and distributing geospatial data
- Exploring the development of alternative and/or complementary mechanisms for financing data development, maintenance and dissemination activities.

3. Towards the Future

3.1 Guiding Principles

The CGDI has enjoyed successes and challenges over the past five years. At its inception the guiding principles of the CGDI set the course and scope of the initiative. These principles remain relevant today, with some minor modifications. Combined, these guiding principles serve as the foundation upon which the Vision and Mission of the CGDI is built. During recent consultations, the geospatial community reviewed and endorsed the principles in addition to providing suggestions that three new principles be included.

The original principles (founding principles) are listed in order of importance; the three new principles (building principles) are listed separately.

Founding Principles

- 1. Open:** The CGDI will be based on open and interoperable standards and specifications for operational transactions and information exchange. “Open and shared” in this context means that the specifications are available for the world to take, use, and modify for other purposes. These specifications will be based on national and international standards where available.
- 2. Transparent:** The CGDI will allow users to access data and services seamlessly in a manner that removes the complexities of the underlying technology and information infrastructure. “Seamless” implies the elimination or hiding of artificial boundaries introduced by jurisdictional organizational structure or by technical issues such as scale or quality of information.
- 3. Cooperative:** The CGDI will facilitate the cooperation and collaboration of participating organizations from the private sector, all levels of government, and academia. The CGDI will define common technologies and standards rather than prescribing single or proprietary implementation solutions.
- 4. Evolving:** The network of participating organizations will continue to encompass new requirements and business applications for information and service delivery to their respective users. The CGDI will evolve to meet these changing requirements and developments.
- 5. Timely:** The CGDI will define and recommend technologies and services that will support timely or real-time access to information. The CGDI may define minimum levels of service for those contributing to the CGDI.

6. **Self-sustaining:** The CGDI will be sustained through the contributions of the participating organizations and the broad user-community and through being relevant to these groups.
7. **Self-organizing:** The CGDI will enable various levels of participating organizations to contribute geospatial information, metadata, services and applications without the requirement for centralized administration, access, and data warehousing.

Building Principles

- **User-driven:** The CGDI will emphasize the nurturing of and service to a broad user community. This will include future developments, services, and enhancements that are driven by the needs of users, with an aim to facilitate policy and decision making.
- **Closest to Source:** The CGDI will build upon its principle of self organization to encourage organizations that are closest to source to provide data. This will increase quality and efficiency by eliminating duplication and overlap. The CGDI will need to be developed further through partnerships with municipal, provincial and territorial governments, other federal departments and agencies, as well as international sources.
- **Secure:** The CGDI recognizes the importance of openness as one of its fundamental principles, but realizes that there is also a need to secure certain data that is sensitive or proprietary. In conjunction with this need for security is the need for high stability and for reliability of the data, to ensure that timely access is maintained.

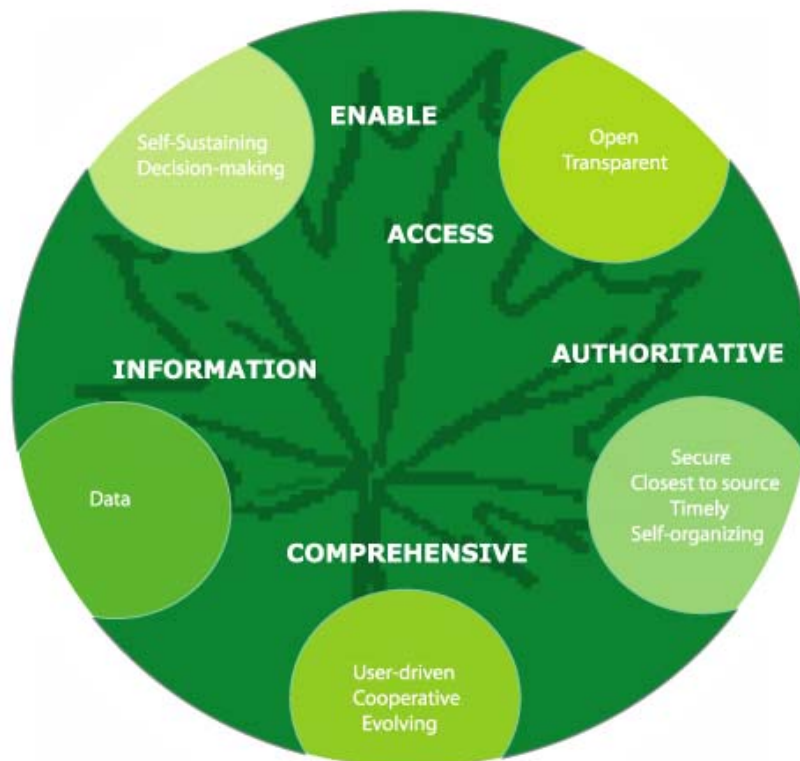
3.2 Vision

This Vision will help set the needed mission, goals and objectives for achieving the CGDI of the future. It is an overarching touchstone against which to chart CGDI progress.

The Vision for the CGDI is:

To enable access to the authoritative and comprehensive sources of Canadian geospatial information to support decision-making.

The image below depicts the relationship between the Vision and the Guiding Principles for the CGDI.



There are five key terms within the Vision that tie it directly to the Guiding Principles of the CGDI:

- Enable
- Access
- Authoritative
- Comprehensive
- Information

Enable is tied directly to self-sustaining. The CGDI does not create data or technological infrastructures, rather it enables organizations to contribute to and make decisions based on information available through the CGDI.

Access builds on the principles of transparency and openness. The open standards of the CGDI are designed to provide transparent and seamless access to geospatial information.

An **authoritative** CGDI will use data that is closest to source, is based on open standards and specifications, and allows for contributors to self organize. For the CGDI to be authoritative, it must provide timely and secure access to data.

For the CGDI to be **comprehensive** it must make a shift to be more user driven. It must continue to evolve to meet new needs and development and must continue to build on and create new cooperative partnerships.

Information encompasses both data and information. The information must be accurate and accessible through the CGDI to support policy and decision making.

3.3 Mission

To achieve the Vision of the CGDI, a coordinating organization will need to:

- Enable decision-making and policy development that address Canada's priority issues such as health, social, cultural, economic, and natural resources.
- Facilitate access to the leading sources of Canadian geospatial information
- Provide continued involvement and leadership in the development of geospatial standards and specifications.
- Foster partnerships and sharing of geospatial information across all sectors, at all levels of government, and at the international level.
- Support a broad and vibrant user community.
- Ensure that infrastructure operations are on going and sustainable.

3.4 Mission Objectives and Related Goals

For the Vision to be realized and the Mission to be effective, each Mission objective needs to be linked to measurable goals. An organization coordinating the further development of the CGDI must actively pursue targeted goals over the next five years. It should be noted that some goals can address multiple Mission objectives. The main objectives and corresponding goals for continued development of the CGDI are:

Objective 1: Support decision making and policy development to ensure Canada's health, social, cultural, economic, and natural resource heritage and future.

- Goal: Further improve policy development and further enable decision making based on geospatial information.

Objective 2: Facilitate access to the leading sources of Canadian geospatial information.

- Goal: Establish the CGDI as the primary channel for Canadian geospatial information, across all sectors and levels of government.
- Goal: Enable comprehensive federal, provincial and territorial, and municipal data to be made accessible via the CGDI.
- Goal: Continue excellence in technological infrastructure development.

Objective 3: Provide continued involvement and leadership in the development of geospatial standards and specifications.

- Goal: Monitor and contribute to the work of the Open Geospatial Consortium (OGC) and ISO (International Organization for Standardization) in partnership with industry, academia, and all levels of government.

Objective 4: Foster geospatial partnerships and contributions across all sectors, at all levels of government, and at the international level

- Goal: Continue relationships with existing advisory groups, and create new groups where needed.
- Goal: Communicate developments and create services to keep partners informed of opportunities and technology updates.
- Goal: Build on the foundation of the Canadian Geomatics Accord and look to formalize relationships at the provincial, local, and international levels.

Objective 5: Support a broad and vibrant user community

- Goal: Drive future CGDI development based on user needs.
- Goal: Foster opportunities within the geospatial and user community.
- Goal: Ensure there are appropriate service supports for users with the necessary financial and human resources available.

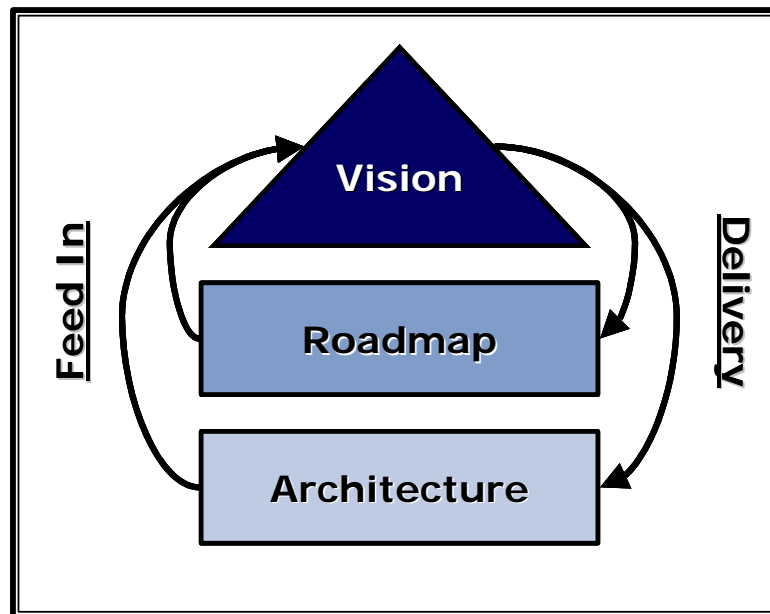
Objective 6: Ensure that the operations are on-going and sustainable.

- Goal: Secure funding to support the future operations of the CGDI.
- Goal: Investigate new models of governance with partners contributing to the self-sustainability of the CGDI.

4. Achieving the Vision

4.1 Document Linkages

As portrayed in the diagram below, the companion CGDI documents, are inseparably linked, with Architectural concepts and Roadmap requirements feeding the Vision. The Vision can be delivered only with a solid Architecture and Roadmap as its foundation.



4.2 A Renewed Architecture

Since the inception of the CGDI, the development of the architecture has centered on the endorsement and implementation of open standards and specifications. These standards are known as “CGDI-endorsed standards” and they provide the technical foundation of the infrastructure. Based on the achievements to date, the CGDI has reached a level of technical maturity that places it at the forefront of national geospatial infrastructures throughout the world.

As the user community continues to evolve and user capacity becomes increasingly sophisticated, the requirements placed on the infrastructure will grow accordingly. Above all is the demand for access to authoritative and comprehensive information. Within a geospatial infrastructure, data deserves the same prominence as services. The delivery of timely and accurate data has a number of architectural implications for the CGDI. Enhanced security, quality of service standards and improved search capabilities are some of the key architectural requirements. Prioritizing and delivering on these requirements will move the CGDI down the evolutionary path towards long-term sustainability.

4.3 A Roadmap for the Future

The Roadmap provides input into a detailed action and project plan that needs to be developed by CGDI's partnership community. The road to achieving the Vision for the CGDI is complex and challenging, but ultimately achievable and worthwhile. As the CGDI follows the Roadmap, detours will be made and bumpy roads will not be avoidable. Nevertheless, with a renewed emphasis on users, coordination, content and infrastructure, the foundation of the CGDI will thrive.

The Roadmap document combines the experiences, wisdom, and values of many. Relationships through partnerships and consultations have helped build the CGDI to date. Efforts in these areas must continue to be a focus. The future of the CGDI looks bright, but action, effort, and perseverance will be necessary to make the Vision of the future CGDI a reality.

Appendix: Glossary of Terms

Term	Definition
Application	The combined set of software programs that perform a specific function directly for a user. Further, a CGDI application is the utilization of CGDI technology (e.g., tools and/or services) and CGDI data by a given user or community of practice to address a specific issue.
Architecture	The organizational structure and operating environment of the CGDI, including the relationships between its parts, and the principles and guidelines governing their design and evolution.
Canadian Geospatial Data Infrastructure (CGDI)	An Internet infrastructure comprised of the developments of the federal, provincial, territorial and private-sector partners who are creating the technology, standards, access systems and protocols necessary to harmonize Canada's geospatial databases, and make them accessible on the Internet.
Client	A software component that accesses a service. The <i>Guide to the CGDI</i> distinguishes between a client (an inanimate part of the process) and a user (an individual who uses a computer, program, network or related service).
Data	Distinct pieces of factual information, especially information organized for analysis or used to reason or make decisions. Data is usually formatted in a special way, and exists in a variety of forms. Data in the CGDI comprises maps, satellite images, publications and other geospatial data provided by Canadian and international sources.
Framework Data	The set of geospatial data that provides the reference framework for all other CGDI data.
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.
Geographic Markup	

Language (GML)	An open XML grammar specification used to transfer geographic features via the Internet.
Geospatial	Referring to location relative to the Earth's surface. "Geospatial" is more precise in many GIS contexts than "geographic," because geospatial information is often used in ways that do not involve a graphic representation, or map, of the information.
Geospatial Data	Data 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 describes the features found in the dataset.
Geospatial Information	Information about entities and phenomena that includes their location with respect to the Earth's surface. Frequently used as a synonym for "geodata", but technically geodata are "dry" digitally represented facts or recorded observations, which on their own have no meaning. They become information when interpreted and put in context by humans.
Infrastructure	A reliable, supporting environment, analogous to a road or telecommunications network that facilitates the access to geographically related information using a minimum set of standard practices, protocols and specifications.
Interface	A specification for a set of operations that are made externally available by a component to other components. The state and functionality of a component is hidden, and is only made externally accessible through the interfaces of the components. The interfaces are the only "public" or "visible" part of the component. The same interface may be provided by several components and used by many components or applications.
Metadata	Information about data. Metadata describes how and when and by whom a particular set of data was collected, and how the data are formatted. Metadata is essential for understanding information stored in data warehouses.
Server	

	A physical installation of a component that delivers a service, and provides the realization of its operations.
Service	A collection of operations, accessible through one or more interfaces, that allows a user to evoke a behaviour of value to that user. A service is delivered by a server.
Specification	A document written by a consortium, vendor, or user that specifies a technological area with a well-defined scope, primarily for use by developers as a guide to implementation. A specification is not necessarily a formal standard.
Standard	A document that specifies a technological area with a well-defined scope, usually by a formal standardization body and process.