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Geolinked Data Access Service (GDAS)

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i. Preface

This document is the result of work undertaken to support the Canadian Geospatial Data Infrastructure (CGDI), and in particular the National Land and Water Information Service (NLWIS), and the National Forest Information Service (NFIS). The standard was first implemented as a prototype in 2002 by Agriculture and Agri-Food Canada (AAFC).

ii. Submitting organizations

The following organizations submitted this Implementation Specification to the Open GIS Consortium Inc.:

a) GeoConnections / Natural Resources Canada

iii. Submission contact points

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iv. Revision history

Date	Release	Author	Paragraph modified	Description
17 Feb 2004	0.9.1	P. Schut		Initial document, formatted for OGC template
20 Feb 2004	0.9.1	T. Kralidis	All	Updated contact info, commented.
26 Feb 2004	0.9.1	P. Schut		Added schemas as Annexes, added section 0.4, addressed other comments from Tom.
3 Mar 2004	0.9.1		7.1.4, 7.2.3.8, Annexes A B and C	Made numerous minor corrections, incorporated corrections and changes supplied by Daniel, restored headers, reformatted, added Annex A.3
11 Mar 2004	0.9.1	P. Schut	ĺ	Minor formatting, dropped examples in text
04 May 2004	0.9.1	P. Schut		Altered parameter names in GetData request. Altered keywords for Type

v. Changes to the OpenGIS® Abstract Specification

The $\mathsf{OpenGIS}^{\mathbb{C}}$ Abstract Specification does not require changes to accommodate this $\mathsf{OpenGIS}^{\mathbb{C}}$ standard.

Foreword

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. Open GIS Consortium Inc. shall not be held responsible for identifying any or all such patent rights. However, to date, no such rights have been claimed or identified.

This is the first version of this standard.

This standard is related to the Geolinking Service, which is currently in preparation as a discussion document at OGC.

Introduction

This document is the specification for a Geolinked Data Access Service (GDAS).

This specification is intended to provide a very simple way to implement on-line access to the vast number of data collections that contain geographically related information, but which do not include a rigorous definition of the geometry of the geographic object.

Geolinked data is geographically-related data in which the geometry is not directly stored with the attribute data, but instead a geographic identifier is used. The geographic identifier refers to a geometric feature in a separate geospatial data set. An example of geolinked data is a table of populations of Canadian cities. The table does not contain the geographic location of each city, but instead uses the city name. The city name can be used to join the population data to a separate geospatial data set that contains the geographic location of each city, in order to map the information or perform some sort of geospatial analysis.

A GDAS provides a simple standardized way to exchange attribute information that applies to a well-known geospatial dataset (a Framework dataset). A GDAS delivers information in an XML format that can be used in a variety of ways, including use by models to perform calculations, or visualized as a web map.

The development of services based on this specification presupposes the existence of corporate databases that contain geographically referenced information, but where the corporate environment does not contain a direct link to a GIS. The Geolinkage Field (the names of each of the cities in the above example) must exist in a compatible format in both the geolinked data set and the geospatial data set (e.g., the city name in both data sets must be identical), to provide the linkage between the two data sets.

0.1 The requirement for GDAS

Almost all corporate databases contain some kind of geographic identifier, regardless of whether or not the database is housed in a computing environment that supports GIS. Geographic identifiers can include postal codes, municipality names, telephone area codes, or more special purpose identifiers such as school districts. Geolinking technology allows this corporate data to be found and used for mapping or spatial analysis.

The geographic identifiers used in corporate databases usually reference a spatial framework. A spatial framework in this context is a partitioning of the surface of the earth into a set of management units. Municipalities, postal codes, telephone area codes, ecoregions, and watersheds are all examples of spatial frameworks. These frameworks

all have one thing in common – they contain a descriptor that can be used to uniquely identify any individual management unit –and that same identifier is found in the corporate database.

Here are some typical database contents along with their spatial frameworks:

- Sales by retail outlet or by municipality
- Insurance payments by postal code
- Telephone numbers by area code
- Farms by Census Agricultural Region
- Students by school district

The GDAS specification is a way to expose this corporate data to other computers, so that it can be found and accessed, and a way to merge that data with the spatial data that describes the framework, in order to enable mapping or geospatial analysis.

0.2 Advantages of GDAS

The advantages of the GDAS specification is that it allows organizations to house their corporate data on systems that are optimized for the management of that data, and yet to take advantage of GIS technology to examine and analyze that data. In addition, it is

- Simple to implement
- Lightweight
- Multi-purpose
- Highly scaleable
- Easy to use
- Usable across the Internet

GDAS allows corporate data to be maintained closest to source, and yet allow the latest data to be obtained when analysis is being performed, regardless of whether or not the geospatial system can make a direct connection to the corporate data management system. Exposing the data through a GDAS allows the corporate data managers to change their underlying database design and security safeguards without compromising access to data that should be accessible by other systems. In effect, GDAS supports both distributed data management, as well as the distributed processing of geospatial data.

Geolinking is based on two related specifications. Attribute data is provided to other computers on the network by implementing a Geolinked Data Access Service (GDAS). At some other node on the network, a Geolinking Service allows a computer to use data from a GDAS stream by incorporating it into a local dataset. This local dataset may

support Web Mapping, desktop GIS, or even some analytical capability that may in turn produce another GDAS stream.

0.3 Applications of GDAS

0.3.1 GDAS and Web Mapping

The most widely applicable use of GDAS may be to support Web mapping. In this case, a Geolinking Service is placed on top of a Web Mapping Service (WMS), to create a Geolinking WMS. Attributes provided through a GDAS stream are merged into a local dataset by the Geolinking Service, which then allows a WMS layer to be produced. The resulting dataset can be stored for future queries (and exposed as a standard layer by the WMS), or discarded after processing if data volatility is of concern.

0.3.2 GDAS and Desktop GIS

Similar to Web mapping, a spatial data warehouse that supports desktop GIS may have its attribute data supplemented or amended by data provided via a GDAS stream. In this case, a Geolinking Service adds fields to a spatial dataset in the warehouse, or amends the contents of existing attribute fields.

0.3.3 GDAS and Distributed Spatial Data Processing

GDAS also allows for the ability to do more rudimentary calculations with the data. For example, it is trivial to take two separate GDAS streams for the same framework data and calculate the differences between the two attributes, and provide that result in the form of another GDAS stream. For example,

- Input GDAS stream 1: student enrollment for 1996
- Input GDAS stream 2: student enrollment for 2003
- Output GDAS stream: difference in student enrollment between 1996 and 2003

0.3.4 GDAS and Modelling

When geospatial data is available on the Internet through a GDAS, it is easy to feed that data into models (e.g. climate change models). A model can be enabled to accept data in GDAS format on the front end, and a GDAS to deliver the output of the model. This setup makes it easy to run different input scenarios through the model, ultimately simplifying data management, and reducing the potential for errors in input data.

0.3.5 GDAS and Spatial Data Replication

GDAS also allows for the ability to replicate databases across the Internet. A GDAS XML stream can be used to regularly update the contents of a data warehouse and its associated metadata tables, based on the latest information available from the primary data warehouse.

0.4 GDAS, WFS, and GML

It may be argued that the existing WFS and GML specifications can be modified to support the functionality offered by GDAS, however there are a number of reasons why GDAS should be a separate specification:

- 1) WFS and GML are primarily designed to address the editing and transmission of the geography that describe spatial features. GDAS is targeted towards the transmission of attributes which describe spatial features, without transmitting the geography. The types of databases that contain these two disparate concepts are quite separate, and geolinking is not likely to be needed when the two types of data are found together, so it makes sense to have separate custom schemas for each type of data, particularly since there are other factors to be considered.
- 2) GML does not accommodate the concept of geospatial frameworks or geolinked datasets, and the metadata required to completely support these concepts. Although GML could certainly be extended to completely handle geolinked data requirements, it makes more sense to have a simpler lightweight XML schema that is customized to deal with geolinked data.
- 3) There are several ways that geolinked attributes can be coded in GML. Standardizing this for ease of implementation would require a GML profile or a use case, which would then have to be adopted through some standards process. Given the potential importance of geolinked data as a source of information for Web-based GIS activities, a separate specification is warranted.
- 4) The XML stream produced by a GDAS is much simpler, more intuitive, and easier to write, read, and debug than GML. This easy of implementation is important because it will facilitate the acceptance of this technology among the IT community responsible for systems that contain geolinked data.
- 5) It is easy to generate GDAS XML streams directly from corporate database management technology. The use of WFS/GML typically requires installation of additional software, which may impede the adoption of GDAS in the corporate domain

The use of GDAS does not preclude the use of GML. A Geolinking Service can be set up to merge a GDAS stream with a GML stream. The output would be an amended GML stream that incorporates the attribute information that was provided by the GDAS.

OpenGIS[©] Interface — Geolinked Data Access Service

1 Scope

This specification applies to the creation and use of Geolinked Data Access Service (GDAS) documents which unambiguously describe a set of attributes that apply to a geospatial dataset (a "framework" dataset), and that might be used by particular clients for the purpose of mapping or data processing.

This specification defines an encoding for GDAS using eXtensible Markup Language [XML 1.0].

This specification is relevant to Clients of the OGC Geolinking Service [currently an OGC discussion document].

This specification does not address the archival, cataloging, discovery or retrieval of GDAS XML documents.

2 Conformance

Conformance with this specification shall be checked using all the relevant tests specified in Annex A (normative).

3 Normative references

- [1] CGDI architecture pages at http://www.geoconnections.org/architecture/
- [2] GDAS Version 0.8.2:

http://www.geoconnections.org/architecture/archdocs.cfm?file=technical/specifications/g eolinked das/geolinked data access service.html

- [3] GDAS Version 0.9.0 NFIS / DM Solutions
- [4] URL to Geolinker Discussion Paper
- [5] XML 1.0 (October 2000), eXtensible Markup Language (XML) 1.0 (2nd edition), World Wide

Web Consortium Recommendation, Bray, T., Paoli, J., Sperberg-McQueen, C.M., and Maler, E.,

eds., < http://www.w3.org/TR/2000/REC-xml>

IETF RFC 2045 (November 1996), *Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies*, Freed, N. and Borenstein N., eds., http://www.ietf.org/rfc/rfc2045.txt

IETF RFC 2119 (March 1997), Key words for use in RFCs to Indicate Requirement Levels, Bradner, S., ed., http://www.ietf.org/rfc/rfc2119.txt.

IETF RFC 2396

IETF RFC 2616

4 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

4.1

framework dataset

a geospatial dataset that partitions the surface of the earth into a set of management units. Municipalities, postal codes, telephone area codes, ecoregions, and watersheds are all examples of spatial frameworks

4.2

attribute dataset

a set of values that describe some aspect of a framework dataset. Population, temperature, and income are all examples of attribute data that could reference a framework dataset.

4.3

geolinking

the merging (joining) of an attribute dataset to a framework dataset

4.4

operation

specification of a transformation or query that an object may be called to execute [OGC AS 12]

4.5

interface

named set of **operations** that characterize the behavior of an entity [OGC AS 12]

4.6

service

distinct part of the functionality that is provided by an entity through **interfaces** [OGC AS 12]

4.7

service instance

actual implementation of a **service** – a software component on which a **client** can invoke an **operation**

4.8

server

actual implementation of a service (see service instance)

4.9

client

software component that can invoke an operation from a server

4.10

request

invocation of an **operation** by a **client**

4.11

response

result of an operation returned from a server to a client

4.12

map

pictorial representation of geographic data.

4.13

capabilities

service-level metadata describing the **operations** and content available at a **service instance**.

5 Conventions

5.1 Symbols (and abbreviated terms)

CGDI Canadian Geospatial Data Infrastructure

CGI Common Gateway Interface

EPSG European Petroleum Survey Group

GIF Graphics Interchange Format

GIS Geographic Information System

OGC 04-010r1

HTTP Hypertext Transfer Protocol **IETF Internet Engineering Task Force** JPEG Joint Photographic Experts Group MIME Multipurpose Internet Mail Extensions OGC Open GIS Consortium **OWS OGC Web Service** PNG Portable Network Graphics **RFC** Request for Comments SLD Styled Layer Descriptor SOAP Simple Object Access Protocol URI Uniform Resource Identifier URL Uniform Resource Locator WCS Web Coverage Service WFS Web Feature Service WMS Web Map Service XML Extensible Markup Language

6 Basic service elements

6.1 Introduction

This clause specifies aspects of Geolinked Data Access Server behavior (more generally, of OGC Web Service behavior) that are independent of particular operations or are common to several operations or interfaces.

6.2 Version numbering and negotiation

6.2.1 Version number form

The published specification version number contains three positive integers, separated by decimal points, in the form "x.y.z". The numbers "y" and "z" will never exceed 99. Each OWS specification is numbered independently.

6.2.2 Version changes

A particular specification's version number **shall** be changed with each revision. The number **shall** increase monotonically and **shall** comprise no more than three integers separated by decimal points, with the first integer being the most significant. There may be gaps in the numerical sequence. Some numbers may denote experimental or interim versions. Service instances and their clients need not support all defined versions, but **must** obey the negotiation rules below.

6.2.3 Appearance in Requests and in Service Metadata

The version number appears in at least two places: in the Capabilities XML describing a service, and in the parameter list of client requests to that service. The version number used in a client's request of a particular service instance **must** be equal to a version number which that instance has declared it supports (except during negotiation as described below). A service instance may support several versions, whose values clients may discover according to the negotiation rules.

6.2.4 Version number negotiation

A Client may negotiate with a Service Instance to determine a mutually agreeable specification version. Negotiation is performed using the **GetCapabilities** operation [see Clause 7] according to the following rules.

All Capabilities XML must include a protocol version number. In response to a **GetCapabilities** request containing a version number, an OGC Web Service **must** either respond with output that conforms to that version of the specification, **or** negotiate a mutually agreeable version if the requested version is not implemented on the server. If no version number is specified in the request, the server **must** respond with the highest version it understands and label the response accordingly.

Version number negotiation occurs as follows:

- a) If the server implements the requested version number, the server **must** send that version.
- b) If a version unknown to the server is requested, the server **must** send the highest version it knows that is less than the requested version.
- c) If the client request is for a version lower than any of those known to the server, then the server **must** send the lowest version it knows.
- d) If the client does not understand the new version number sent by the server, it **may** either cease communicating with the server **or** send a new request with a new version number that the client does understand but which is less than that sent by the server (if the server had responded with a lower version).
- e) If the server had responded with a higher version (because the request was for a version lower than any known to the server), and the client does not understand the proposed higher version, then the client **may** send a new request with a version number higher than that sent by the server.

The process is repeated until a mutually understood version is reached, or until the client determines that it will not or cannot communicate with that particular server.

EXAMPLE 1 Server understands versions 1, 2, 4, 5 and 8. Client understands versions 1, 3, 4, 6, and 7. Client requests version 7. Server responds with version 5. Client requests version 4. Server responds with version 4, which the client understands, and the negotiation ends successfully.

EXAMPLE 2 Server understands versions 4, 5 and 8. Client understands version 3. Client requests version 3. Server responds with version 4. Client does not understand that version or any higher version, so negotiation fails and client ceases communication with that server.

The version parameter is mandatory in requests other than **GetCapabilities**.

6.3 General HTTP request rules

6.3.1 Overview

At present, the only distributed computing platform (DCP) explicitly supported by OGC Web Services is the World Wide Web itself, or more specifically Internet hosts implementing the Hypertext Transfer Protocol (HTTP). Thus the Online Resource of each operation supported by a service instance is an HTTP Uniform Resource Locator (URL). The URL may be different for each operation, or the same, at the discretion of the service provider. Each URL **must** conform to the description in [HTTP] but is otherwise implementation-dependent; only the parameters comprising the service request itself are mandated by the OGC Web Services specifications.

HTTP supports two request methods: GET and POST. One or both of these methods may be defined for a particular OGC Web Service type and offered by a service instance, and the use of the Online Resource URL differs in each case.

An Online Resource URL intended for HTTP GET requests is in fact only a URL prefix to which additional parameters must be appended in order to construct a valid Operation request. A URL prefix is defined as an opaque string including the protocol, hostname, optional port number, path, a question mark '?', and, **optionally**, one or more serverspecific parameters ending in an ampersand '&'. The prefix uniquely identifies the particular service instance. For HTTP GET, the URL prefix **must** end in either a '?' (in the absence of additional server-specific parameters) or a '&'. In practice, however, Clients **should** be prepared to add a necessary trailing '?' or '&' before appending the Operation parameters defined in this specification in order to construct a valid request URL.

An Online Resource URL intended for HTTP POST requests is a complete and valid URL to which Clients transmit encoded requests in the body of the POST document. A GDAS server **must not** require additional parameters to be appended to the URL in order to construct a valid target for the Operation request.

6.3.2 Key-value pair encoding (GET or POST)

6.3.2.1 Overview

Using Key-Value Pair encoding, a client composes the necessary request parameters as keyword/value pairs in the form "keyword=value", separated by ampersands ('&'), with appropriate encoding [IETF RFC 2396] to protect special characters. The resulting query string may be transmitted to the server via HTTP GET or HTTP POST, as prescribed in the HTTP Common Gateway Interface (CGI) standard [IETF RFC 2616].

Table 1 summarizes the request parameters for HTTP GET and POST.

Table 1 –Parts of a Key-Value Pair OGC Web Service Request

URL Component	Description
http://host[:port]/path	URL of service operation. The URL is entirely at the discretion of the
	service provider.
{name[=value]&}	The query string, consisting of one or more standard request parameter name/value pairs defined by an OGC Web Service. The actual list of required and optional parameters is mandated for each operation by the
	appropriate OWS specification.

Notes: [] denotes 0 or 1 occurrence of an optional part; {} denotes 0 or more occurrences.

A request encoded using the HTTP GET method interposes a '?' character between the service operation URL and the query string, to form a valid URI which may be saved as a bookmark, embedded as a hyperlink, or referenced via Xlink in an XML document.

6.3.2.2 Parameter ordering and case

Parameter names **shall not** be case sensitive, but parameter values shall be case sensitive. In this document, parameter names are typically shown in uppercase for typographical clarity, not as a requirement.

Parameters in a request **may** be specified in any order.

An OGC Web Service **must** be prepared to encounter parameters that are not part of this specification. In terms of producing results per this specification, an OGC Web Service **shall** ignore such parameters.

6.3.2.3 Parameter lists

Parameters consisting of lists shall use the comma (",") as the delimiter between items in the list: e.g., parameter=item1, item2, item3. Multiple lists can be specified as the value of a parameter by enclosing each list in parentheses ("(", ")"): e.g., parameter=(item1a,item1b,item1c),(item2a,item2b,item2c). If a parameter name or value includes a space or comma, it shall be escaped using the URL encoding rules [IETF RFC 2396].

6.3.3 XML encoding

Clients may also encode requests in XML for transmission to the server using HTTP GET or (more often) HTTP POST. The XML request must conform to the schema corresponding to the chosen operation, and the client must send it to the URL listed for

that operation in the server's Capabilities XML file, in accordance with HTTP POST [IETF RFC 2616]).

NOTE To support SOAP messaging, clients need only enclose this XML document in a SOAP envelope as follows:

6.4 General HTTP response rules

Upon receiving a valid request, the service **must** send a response corresponding exactly to the request as detailed in the appropriate specification. Only in the case of Version Negotiation (described above) may the server offer a differing result.

Upon receiving an invalid request, the service **must** issue a Service Exception as described in Subclause 6.5 below.

NOTE As a practical matter, in the WWW environment a client should be prepared to receive either a valid result, or nothing, or any other result. This is because the client may itself have formed a nonconforming request that inadvertently triggered a reply by something other than an OGC Web Service, because the Service itself may be non-conforming, etc.

6.5 Service exceptions

Upon receiving an invalid request, the service **must** issue a Service Exception XML message to describe to the client application or its human user the reason(s) that the request is invalid.

Service Exception XML **must** be valid according to the Service Exception XML Schema in Subclause A.3, Annex A. In an HTTP environment, the MIME type of the returned XML **must** be "". Specific error messages can be included either as chunks of plain text or as XML-like text containing angle brackets ("<" and ">") if included in a character data (CDATA) section as shown in the example of Service Exception XML in Subclause A.3.

Service Exceptions **may** include exception codes as indicated in Subclause A.3, Annex A. Servers **shall not** use these codes for meanings other than those specified. Clients **may** use these codes to automate responses to Service Exceptions.

7 Geolinked Data Access Service operations

A GDAS must have the knowledge about the data it serves (in other words, the service is a data dependent service). The GDAS specification includes two mandatory operations:

GetCapabilities GetData

For each operation three request methods are defined:

HTTP GET using URL-encoded Key-Value Pairs (KVP). All servers **must** support this method (the regular URL format we're used to)

HTTP POST using URL-encoded Key-Value Pairs (KVP). This method is optional.

HTTP POST with XML-encoded requests. This method is optional.

7.1 GetCapabilities (required)

7.1.1 General

The purpose of the GetCapabilities operation is to provide access to general information about the service itself and specific information about the available data.

7.1.2 GetCapabilities overview

The general form of a GetCapabilities request is defined in the Basic Service Elements section. Table 2 outlines the GDAS key-value pairs for the parameters of the GetCapabilities request. When making this request of a GDAS, which may offer other OGC Web Services as well, it is necessary to indicate that the client seeks information about the GDAS in particular. Thus, the SERVICE parameter of the request **shall** have the value "GDAS" as shown in Table 2 below.

TABLE 2: The parameters of a GetCapabilities request URL

Request Parameter	Required/Optional	Description
Version=0.9.1	Optional	Request Version. Defaults to
		the latest available version,
		currently 0.9.1
Service=GDAS	Required	Service Type, must be GDAS
Request=GetCapabilities	Required	Request Name

7.1.3 GetCapabilities request parameters

7.1.3.1 VERSION

The **optional** VERSION parameter, and its use in version negotiation, is specified in the Basic Service Elements section

7.1.3.2 SERVICE

The **required** SERVICE parameter indicates which of the available service types at a particular service instance is being invoked. This parameter allows the same URL prefix to offer Capabilities XML for multiple OGC Web Services. When invoking GetCapabilities on a GDAS that implements this version of the specification or a later one, the value "GDAS" **shall** be used.

7.1.3.3 REQUEST

The nature of the **required** REQUEST parameter is specified in the Basic Service Elements section. To invoke the GetCapabilities operation, the value "GetCapabilities" **shall** be used.

Here is an example of a **KeyValuePair GetCapabilities** request using the HTTP GET method:

http://foo.bar/foo?SERVICE=GDAS&REQUEST=GetCapabilities&VERSION=0.9.1

7.1.3.4 XML Encoding

XML encoded **GetCapabilities** requests use the HTTP POST method with the body of the request (POST data) of type text/xml.

For example, a client may encode a **GetCapabilities** request in XML as follows:

<GetCapabilities version="0.9.1" service="GDAS"/>

7.1.4 GetCapabilities Response

The Basic Service Elements section specifies general rules about the GetCapabilities response.

In the particular case of a GDAS complying with this version of the standard, the Extensible Markup Language (XML)[XML 1.0] response **shall** be valid according to the XML schema in Annex A of this document. The schema specifies the required and optional content of the response and how the content is formatted.

A server's Capabilities XML **may** reference an exact copy of the schema in Annex A instead of the master copy at the URL stated in the Annex. The schema copy **shall** be located at a fully-qualified and accessible URL to permit XML validating software to retrieve it.

A server **may** comply with other published or experimental versions, in which case it **shall** support Version Negotiation as described in the Basic Service Elements section. A

schema for version 0.9.1 was published as an annex to that version of the GDAS specification. Other schemas are archived at http://www.geoconnections.org/>.

The response to a **GetCapabilities** operation is an XML document that contains the capabilities of an implementation of this service, the operations it supports, and the data it serves. An example of the results from a **GetCapabilities** request is found in Annex B:

The **GetCapabilities** document includes the generic Service and Capability sections common to all OGC Web Services. These sections are not described in detail here, apart from two fields specific to a GDAS service: GeolinkidsLimit and AttributeLimit.

The optional <GeolinkidsLimit> element in the service metadata is a positive integer indicating the maximum number of **GeolinkIds** a client is permitted to include in a single GetData Request. If the value of this element is "0", this feature is not supported. If this element is absent, the server imposes no limit.

The optional <AttributeLimit> element in the service metadata is a positive integer indicating the maximum number of **Attributes** a client is permitted to include in a single GetData Request. If this element is absent, the server imposes no limit.

The Capability section contains a **GeolinkedData** element describing the data available on this server. The **GeolinkedData** element and its sub-elements describe the attribute information available from the GDAS. The structure of the major **GeolinkedData** sub-elements is as follows:

```
GeolinkedData
Framework (1 or more framework sub-elements in GeolinkedData)
...
Dataset (1 or more dataset sub-elements for each Framework)
...
Attribute (1 or more attribute sub-elements for each Dataset)
```

The **GeolinkedData** sub-elements are described in more details below.

7.1.4.1 Framework

The Framework element contains metadata describing the Framework and one or more Dataset sub-elements. The Framework describes a GIS dataset and the Dataset describes a set of attributes that could be applied to that layer. A GDAS provides data for one or more frameworks. The following elements provide metadata about a framework.

7.1.4.1.1 Organization

The name of the organization that is responsible for maintaining the framework dataset.

7.1.4.1.2 **Domain**

The Internet domain name of the organization responsible for maintaining the framework dataset.

7.1.4.1.3 Name

The name of the framework dataset. Generally the name by which the dataset might be identified within a GIS environment.

7.1.4.1.4 Title

A human readable sentence fragment that might form a title if the framework dataset were displayed in map form.

7.1.4.1.5 Description

A complete description or abstract that describes the framework dataset

7.1.4.1.6 Version

The version identifier of the framework dataset. Version "1" can be used where no other versioning number is available.

7.1.4.1.7 Release date

The date that the framework dataset was first released for use. Alternatively, instead of a date, the content may be a version number of the framework dataset. In either case, this uniquely identifies the version of the dataset.

7.1.4.1.8 Documentation

Location (generally a URI) of complete documentation describing the framework dataset.

7.1.4.1.9 GeolinkageField

The key field within the framework dataset (i.e. in the GIS) that is referenced by all datasets that apply to this Framework.

7.1.4.1.10 Dataset

The Dataset element contains metadata describing the data source on the server and one or more attributes available for geo-linking. More than one dataset may be present for each Framework. The following sub-elements provide metadata about a dataset.

7.1.4.1.10.1 Organization

The name of the organization that is responsible for maintaining the attribute dataset.

7.1.4.1.10.2 Domain

The Internet domain name of the organization responsible for maintaining the attribute dataset.

7.1.4.1.10.3 Name

The name of the attribute dataset. Typically the name by which the dataset is identified within the corporate database environment.

7.1.4.1.10.4 Title

A human readable sentence fragment that might form a title if the attribute dataset were displayed in a tabular form.

7.1.4.1.10.5 Description

A complete description or abstract that describes the attribute dataset.

7.1.4.1.10.6 Version

The version identifier of the attribute dataset. Version "1" can be used where no other versioning number is available.

7.1.4.1.10.7 Release Date

The date that the attribute dataset was first released for use.

7.1.4.1.10.8 **Documentation**

Location (generally a URI) of complete documentation describing the attribute dataset.

7.1.4.1.10.9 GeolinkageField

The key field within the attribute dataset (i.e. the corporate database) that references the key identifier found in the framework dataset. Note: The Dataset's **GeolinkageField** value is a field name in the corporate database, for the geolinkage field used by this Dataset and the framework it belongs to. The Framework and Dataset **Geolinkage Field** values (i.e. the field names) do not have to be identical.

7.1.4.1.10.10 Attribute

The Attribute element describes an attribute from a Dataset that can be retrieved using **GetData** requests. Note that the duplication of **Version**, **ReleaseDate**, and **Documentation** between **Dataset** and **Attribute** ensures that this specification allows for maximum flexibility in how an organization structures or maintains its databases. More than one attribute may be present in a dataset.

7.1.4.1.10.10.1 Name

The name of the attribute. Generally the field name of the attribute within the corporate database table.

7.1.4.1.10.10.2 Units

Units of measurement of the attribute. Free form text.

7.1.4.1.10.10.3 Type

Type of attribute. Restricted to the following recommended keywords:

TABLE 3: Valid keywords for Type

$ \sqrt{} $			
Keyword	Description		
Nominal	Names (e.g. Canada)		
Ordinal	Ranking (e.g. high=1, medium=2, low=3)		
Measure	Numeric measurement or calculated value (e.g.degrees Celsius)		
Count	Total number of objects (e.g number of cows)		

Use of these keywords facilitates automation of map legends, and validation of allowable calculations.

7.1.4.1.10.10.4 Title

A human readable sentence fragment that describes the attribute, and might form part of a map title or legend if the information were to be mapped.

7.1.4.1.10.10.5 Description

A complete description or abstract that describes the attribute.

7.1.4.1.10.10.6 Version

The version identifier of the attribute. Version "1" can be used where no other versioning number is available.

7.1.4.1.10.10.7 Release Date

The date that the attribute was last updated.

7.1.4.1.10.10.8 Documentation

Location (generally a URI) of complete documentation describing the attribute.

7.2 GetData operation (required)

This operation provides a means for a client to retrieve geolinked data. The geolinked data (attribute values) are returned to a client as an XML document.

Note: Some extremely simple implementations of GDAS may support only a single set of attributes for one geographic dataset, stored as a static file, rather than as a dynamic XML stream generated in response to a **GetData** request.. It is expected that those implementations would ignore any of the **GetData** parameters that are passed to the server, even the ones that are marked as required below. (This is compatible with the default of behavior of HTTP servers serving static documents which ignore the QUERY_STRING part of a GET URL that points to a static document.)

7.2.1 Key-value Pair Encoding

The following keywords are defined for **KeyValuePair GetData** requests:

TABLE 4: The parameters of a GetData request URL

Request Parameter	Required/Optional	Description
Service=GDAS	Required	Service Type
Request=GetData	Required	Request Name
Version=0.9.1	Required	Request Version
FrameworkDomain	Required	See below
FrameworkName	Required	See below
FrameworkVersion	Required	See below
DatasetDomain	Required	See below
DatasetName	Required	See below
Attribute	Required	See below
Geolinkids	Optional	See below

A sample **GetData** request is shown in Annex B.4:

7.2.2 XML Encoding

A sample XML-encoded **GetData** request is shown in Annex B.5:

7.2.3 GetData Request Parameters

7.2.3.1 Service

Service specifies the type of service being requested. For GDAS services, the only valid value is "GDAS". This is to allow other OGC services to be delivered from the same URL

7.2.3.2 Request

Request specifies the type of request being made. For a **GetData** request, the only valid value is "**GetData**"

7.2.3.3 Version

The version of the GDAS service requested, for this version of the specification the value is "0.9.1".

7.2.3.4 FrameworkDomain

The domain name that uniquely identifies the agency responsible for the framework - e.g. ec.gc.ca

7.2.3.5 FrameworkName

Framework specifies the geospatial dataset to which the attributes should apply (this allows a GDAS to support multiple frameworks from a single instance - e.g. provinces, and counties, although only one Framework/Dataset combination can be accommodated within any one GetData query).

7.2.3.6 Framework Version

The version identifier of the framework dataset. Note that FrameworkVersion is only used in the KVP encoding for an HTTP request using the GET or POST methods. Version is used in an HTTP request when using XML in a POST method.

7.2.3.7 DatasetDomain

The domain name that uniquely identifies the agency responsible for the attribute data.

7.2.3.8 DatasetName

Dataset specifies the attribute dataset from which the attributes should be drawn (this allows a GDAS to support multiple geolinked datasets - e.g. climate normals for 1991, and climate normals for 2001).

7.2.3.9 Attribute

The Attribute parameter identifies the specific variable(s) being requested (e.g. mean monthly temperature for July).

Note that all attributes in a **GetData** request must be from a single geolinked dataset.

In Key-Value Pair mode, the value of ATTRIBUTE is a comma-delimited list of 1 or more attribute names, e.g.

ATTRIBUTE=cows, heifers, totcattle

In an XML-encoded request, there is one <a tribute>....../Attribute> element for each attribute in the request.

7.2.3.10 GeolinkIds

The optional GEOLINKIDS parameter can be used to limit the number of records that will be returned by the server. If this parameter is omitted then all records from the dataset are returned.

In **KeyValuePair** mode, the value is a comma-delimited list of values of the **GeolinkageField** for the selected dataset, e.g.

GEOLINKIDS=BC,AL,SA,MA

Note that when id values are part of a Key-value Pair Encoding request, then the encoding will have to form a valid URL.

In an XML-encoded request, the **GeolinkIds**> element contains one **I>...** leement for each value.

7.2.4 GetData Response

The response to a **GetData** request shall be defined by the XML schema found in Annex C. The schema specifies the required and optional content of the response and how the content is formatted. A server's **GetData** XML **may** reference an exact copy of the schema in Annex A instead of the master copy at the URL stated in the Annex. The schema copy **shall** be located at a fully-qualified and accessible URL to permit XML validating software to retrieve it.

A server **may** comply with other published or experimental versions, in which case it **shall** support Version Negotiation as described in the Basic Service Elements section. A schema for version 0.9.0 was published as an annex to that version of the GDAS specification. Other schemas are archived at http://www.geoconnections.org/.

The response to a **GetData** operation is an XML document that contains the requested data. A sample response to a **GetData** request is found in Annex B.

7.2.4.1 Response Structure

The body of the response is a GDAS_Data element which includes a single Framework element corresponding to the requested Framework. The Framework element in turn contains a Dataset element for the dataset specified in the **GetData** request. The Framework and Dataset elements also contain a copy of their respective metadata (identical to what was found in the capabilities).

Finally the Dataset element contains one or more Attribute sub-elements, and exactly one rowset element. These are described in more details below.

7.2.4.2 Attribute elements

The Dataset element in the response contains one Attribute element for each of the attributes included in the request. Each attribute element includes metadata about the attribute, basically a copy of what was also found in the capabilities.

7.2.4.3 Rowset

The Rowset is a sub-element of the Dataset. It contains 1 or more Row elements, one for each record of data requested by the client.

7.2.4.3.1 Row

Each Row consists of an <I> (id) element with the value of the **GeolinkageField** for this record, followed by one <V> (value) tag for each selected attribute. The first <V> value in a row corresponds to the first attribute, the second <V> value corresponds to the second attribute and so on.

7.2.4.3.1.1 I

An identifier (e.g. polygon identifier) that indicates which geospatial feature this data applies to. This identifier is found in the Geolinkage Field of the Framework Dataset (i.e. City name in the example given in the introduction.)

7.2.4.3.1.2 V

The value of the attribute for that geospatial feature identified by <V> above.

Example of a Rowset when two attributes were selected for three features:

```
<Rowset>
  <Row>
    <I>1</I>
    < V > -33.61772 < / V >
    <V>12.8</V>
  </Row>
  <Row>
    <I>5</I>
    < V > -27.45909 < /V >
    < V > 23.4 < / V >
  </Row>
  <Row>
    <I>6</I>
    < V > -26.90000 < /V >
    <V>15.3</V>
  </Row>
</Rowset>
```

Annex A (normative)

GDAS XML Schemas

A.1 GetCapabilities Response Schema

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified">
   <xs:element name="Abstract" type="xs:string"/>
<xs:element name="Address" type="xs:string"/>
<xs:element name="AddressType" type="xs:string"/>
    <xs:complexType name="AttributeType">
        <xs:sequence>
           <xs:element ref="Name"/>
           <xs:element ref="Units"/>
           <xs:element ref="Type"/>
<xs:element ref="Title"/>
           <xs:element ref="Description"/>
           <xs:element ref="Version"/>
           <xs:element ref="ReleaseDate"/>
           <xs:element ref="Documentation"/>
        </xs:sequence>
    </xs:complexType>
    <xs:complexType name="CapabilityType">
        <xs:sequence>
            <xs:element name="Request" type="RequestType"/>
           <xs:element name="Exception" type="ExceptionType"/>
           <xs:element name="GeolinkedData" type="GeolinkedDataType"/>
        </xs:sequence>
    </xs:complexType>
   <xs:element name="City" type="xs:string"/>
    <xs:complexType name="ContactAddressType">
        <xs:sequence>
           <xs:element ref="AddressType"/>
           <xs:element ref="Address"/>
            <xs:element ref="City"/>
           <xs:element ref="StateOrProvince"/>
           <xs:element ref="PostCode"/>
            <xs:element ref="Country"/>
        </xs:sequence>
   </xs:complexType>
   <xs:element name="ContactElectronicMailAddress" type="xs:string"/>
    <xs:element name="ContactFacsimileTelephone" type="xs:string"/>
    <xs:complexType name="ContactInformationType">
        <xs:sequence>
           <xs:element name="ContactPersonPrimary" type="ContactPersonPrimaryType"/>
           <xs:element name="ContactAddress" type="ContactAddressType"/>
           <xs:element ref="ContactFacsimileTelephone"/>
            <xs:element ref="ContactElectronicMailAddress"/>
        </xs:sequence>
    </xs:complexType>
    <xs:element name="ContactOrganization" type="xs:string"/>
    <xs:element name="ContactPerson" type="xs:string"/>
    <xs:complexType name="ContactPersonPrimaryType">
        <xs:sequence>
            <xs:element ref="ContactPerson"/>
            <xs:element ref="ContactOrganization"/>
        </xs:sequence>
    </xs:complexType>
    <xs:element name="Country" type="xs:string"/>
   <xs:complexType name="DCPTypeType">
```

```
<xs:sequence>
       <xs:element name="HTTP" type="HTTPType"/>
   </xs:sequence>
</xs:complexType>
<xs:complexType name="DatasetType">
   <xs:sequence>
       <xs:element ref="Organization"/>
       <xs:element ref="Domain"/>
       <xs:element ref="Name"/>
       <xs:element ref="Title"/>
       <xs:element ref="Description"/>
       <xs:element ref="Version"/>
       <xs:element ref="ReleaseDate"/>
       <xs:element ref="Documentation"/>
       <xs:element ref="GeolinkageField"/>
       <xs:element name="Attribute" type="AttributeType" maxOccurs="unbounded"/>
   </xs:sequence>
</xs:complexType>
<xs:element name="Description" type="xs:string"/>
<xs:element name="Documentation" type="xs:string"/>
<xs:element name="Domain" type="xs:string"/>
<xs:complexType name="ExceptionType">
   <xs:sequence>
       <xs:element ref="Format"/>
   </xs:sequence>
</xs:complexType>
<xs:element name="Format">
   <xs:simpleType>
       <xs:restriction base="xs:string">
           <xs:enumeration value="text/xml"/>
       </xs:restriction>
   </xs:simpleType>
</xs:element>
<xs:complexType name="FrameworkType">
   <xs:sequence>
       <xs:element ref="Organization"/>
       <xs:element ref="Domain"/>
       <xs:element ref="Name"/>
       <xs:element ref="Title"/>
       <xs:element ref="Description"/>
       <xs:element ref="Version"/>
       <xs:element ref="ReleaseDate"/>
       <xs:element ref="Documentation"/>
       <xs:element ref="GeolinkageField"/>
       <xs:element name="Dataset" type="DatasetType" maxOccurs="unbounded"/>
   </xs:sequence>
</xs:complexType>
<xs:element name="GDAS_Capabilities">
   <xs:complexType>
       <xs:sequence>
           <xs:element name="Service" type="ServiceType"/>
           <xs:element name="Capability" type="CapabilityType"/>
       </xs:sequence>
       <xs:attribute name="version" type="xs:string" use="required"/>
   </xs:complexType>
</xs:element>
<xs:element name="GeolinkageField" type="xs:string"/>
<xs:complexType name="GeolinkedDataType">
   <xs:sequence>
       <xs:element name="Framework" type="FrameworkType" maxOccurs="unbounded"/>
   </xs:sequence>
</xs:complexType>
<xs:complexType name="GetType">
   <xs:attribute name="onlineResource" type="xs:string" use="required"/>
</xs:complexType>
```

```
<xs:complexType name="GetCapabilitiesType">
       <xs:sequence>
           <xs:element ref="Format"/>
           <xs:element name="DCPType" type="DCPTypeType"/>
       </xs:sequence>
   </xs:complexType>
   <xs:complexType name="GetDataType">
       <xs:sequence>
           <xs:element ref="Format"/>
           <xs:element name="DCPType" type="DCPTypeType"/>
       </xs:sequence>
   </xs:complexType>
   <xs:complexType name="HTTPType">
       <xs:sequence>
           <xs:element name="Get" type="GetType"/>
       </xs:sequence>
   </xs:complexType>
   <xs:element name="Keyword" type="xs:string"/>
   <xs:complexType name="KeywordListType">
       <xs:sequence>
           <xs:element ref="Keyword" maxOccurs="unbounded"/>
       </xs:sequence>
   </xs:complexType>
   <xs:element name="Name" type="xs:string"/>
   <xs:element name="GeolinkIdsLimit" type="xs:positiveInteger"/>
   <xs:element name="AttributeLimit" type="xs:positiveInteger"/>
<xs:element name="OnlineResource" type="xs:string"/>
<xs:element name="Organization" type="xs:string"/>
   <xs:element name="PostCode" type="xs:string"/>
   <xs:element name="ReleaseDate" type="xs:string"/>
   <xs:complexType name="RequestType">
       <xs:sequence>
           <xs:element name="GetCapabilities" type="GetCapabilitiesType"/>
           <xs:element name="GetData" type="GetDataType"/>
       </xs:sequence>
   </xs:complexType>
    <xs:complexType name="ServiceType">
       <xs:sequence>
           <xs:element ref="Name"/>
           <xs:element ref="Title"/>
           <xs:element ref="Abstract"/>
           <xs:element ref="OnlineResource"/>
           <xs:element name="KeywordList" type="KeywordListType"/>
           <xs:element name="ContactInformation" type="ContactInformationType"/>
           <xs:element ref="GeolinkIdsLimit"/>
           <xs:element ref="AttributeLimit"/>
       </xs:sequence>
   </xs:complexType>
   <xs:element name="StateOrProvince" type="xs:string"/>
    <xs:element name="Title" type="xs:string"/>
    <xs:element name="Type">
       <xs:simpleType>
           <xs:restriction base="xs:string">
               <xs:enumeration value="nominal"/>
               <xs:enumeration value="ordinal"/>
               <xs:enumeration value="measure"/>
               <xs:enumeration value="count"/>
           </xs:restriction>
       </xs:simpleType>
   </xs:element>
   <xs:element name="Units" type="xs:string"/>
   <xs:element name="Version" type="xs:string"/>
</xs:schema>
```

A.2 GetData Response Schema

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified">
   <xs:complexType name="AttributeType">
       <xs:sequence>
           <xs:element ref="Name"/>
           <xs:element ref="Units"/>
           <xs:element ref="Type"/>
           <xs:element ref="Title"/>
           <xs:element ref="Description"/>
           <xs:element ref="Version"/>
           <xs:element ref="ReleaseDate"/>
           <xs:element ref="Documentation"/>
       </xs:sequence>
   </xs:complexType>
    <xs:complexType name="DatasetType">
       <xs:sequence>
           <xs:element ref="Organization"/>
           <xs:element ref="Domain"/>
           <xs:element ref="Name"/>
           <xs:element ref="Title"/>
           <xs:element ref="Description"/>
           <xs:element ref="Version"/>
           <xs:element ref="ReleaseDate"/>
           <xs:element ref="Documentation"/>
           <xs:element ref="GeolinkageField"/>
           <xs:element name="Attribute" type="AttributeType" maxOccurs="unbounded"/>
           <xs:element name="Rowset" type="RowsetType"/>
       </xs:sequence>
   </xs:complexType>
    <xs:element name="Description" type="xs:string"/>
   <xs:element name="Documentation" type="xs:string"/>
   <xs:element name="Domain" type="xs:string"/>
   <xs:complexType name="FrameworkType">
       <xs:sequence>
           <xs:element ref="Organization"/>
           <xs:element ref="Domain"/>
           <xs:element ref="Name"/>
           <xs:element ref="Title"/>
           <xs:element ref="Description"/>
           <xs:element ref="Version"/>
           <xs:element ref="ReleaseDate"/>
           <xs:element ref="Documentation"/>
           <xs:element ref="GeolinkageField"/>
           <xs:element name="Dataset" type="DatasetType"/>
       </xs:sequence>
   </xs:complexType>
    <xs:element name="GDAS_Data">
       <xs:complexType>
           <xs:sequence>
               <xs:element name="Framework" type="FrameworkType"/>
           </xs:sequence>
           <xs:attribute name="version" type="xs:string" use="required"/>
       </xs:complexType>
   </xs:element>
   <xs:element name="GeolinkageField" type="xs:string"/>
   <xs:element name="I" type="xs:string"/>
   <xs:element name="Name" type="xs:string"/>
   <xs:element name="Organization" type="xs:string"/>
   <xs:complexType name="RowType">
       <xs:sequence>
           <xs:element ref="I"/>
           <xs:element ref="V" maxOccurs="unbounded"/>
       </xs:sequence>
```

```
</xs:complexType>
   <xs:complexType name="RowsetType">
       <xs:sequence>
           <xs:element name="Row" type="RowType" maxOccurs="unbounded"/>
       </xs:sequence>
   </xs:complexType>
   <xs:element name="ReleaseDate" type="xs:string"/>
   <xs:element name="Title" type="xs:string"/>
   <xs:element name="Type">
       <xs:simpleType>
           <xs:restriction base="xs:string">
              <xs:enumeration value="nominal"/>
              <xs:enumeration value="ordinal"/>
               <xs:enumeration value="measure"/>
               <xs:enumeration value="count"/>
           </xs:restriction>
       </xs:simpleType>
   </xs:element>
   <xs:element name="Units" type="xs:string"/>
   <xs:element name="V" type="xs:string"/>
   <xs:element name="Version" type="xs:string"/>
</xs:schema>
```

A.3 Service Exception Schema

This subclause contains the Service Exception Schema corresponding to this version of the GDAS specification. This subclause also summarizes the defined exception codes and their meanings.

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema targetNamespace="http://www.opengis.net/ogc" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:ogc="http://www.opengis.net/ogc" elementFormDefault="qualified" attributeFormDefault="unqualified">
    <xs:element name="ServiceExceptionReport">
       <xs:annotation>
           <xs:documentation> The ServiceExceptionReport element contains one or more
ServiceException elements that describe a service exception. </xs:documentation>
       </xs:annotation>
       <xs:complexType>
           <xs:sequence>
               <xs:element name="ServiceException" type="ogc:ServiceExceptionType" minOccurs="0"</p>
maxOccurs="unbounded">
                   <xs:annotation>
                       <xs:documentation> The Service exception element is used to describe a
service exception. </xs:documentation>
                  </xs:annotation>
               </xs:element>
           </xs:sequence>
           <xs:attribute name="version" type="xs:string" fixed="1.2.0"/>
       </xs:complexType>
   </xs:element>
   <xs:complexType name="ServiceExceptionType">
           <xs:documentation> The ServiceExceptionType type defines the ServiceException element. The
content of the element is an exception message that the service wished to convey to the client application.
</xs:documentation>
       </xs:annotation>
       <xs:simpleContent>
           <xs:extension base="xs:string">
               <xs:attribute name="code" type="xs:string">
                   <xs:annotation>
```

Otherwise the service may try to use other means to locate the exception such as line numbers or byte offset from the beginning of the request, etc ... </xs:documentation>

where in the client's request an exception was encountered. If the request included a 'handle' attribute, this may be

```
</xs:annotation>
    </xs:attribute>
    </xs:extension>
    </xs:simpleContent>
    </xs:complexType>
</xs:schema>
```

used to identify the offending component of the request.

Table A.1 — Exception codes defined by this specification

Exception Code	Meaning
InvalidFormat	Request contains a Format not offered by the service instance.
FrameworkNotDefined	Request is for a Framework not offered by the service instance.
FrameworkVersionNotDefined	Request is for a Framework Version not offered by the service instance.
DatasetNotDefined	Request is for a Dataset not offered by the service instance.
AttributeNotDefined	Request is for a Attribute not offered by the service instance.
GeolinkIdNotDefined	Request is for a GeolinkId that is not offered by the service instance.
CurrentUpdateSequence	Value of (optional) UpdateSequence parameter in GetCapabilities request is equal to current value of Capabilities XML update sequence number.
InvalidUpdateSequence	Value of (optional) UpdateSequence parameter in GetCapabilities request is greater than current value of Capabilities XML update sequence number.
MissingParameterValue	Request does not include a parameter value, and the service instance did not declare a default value for that parameter.
InvalidParameterValue	Request contains an invalid parameter value.

Annex B (informative)

XML Examples

B.1 Introduction

As an aid to understanding and a guide for implementation, this annex contains **example** XML which is valid according to the XML schemas in Annex A. Implementers should consult the main body of the specification document and the schemas to ensure compliance rather than editing this code without verification.

B.2 Example GetCapabilities request using the HTTP GET method

http://foo.bar/foo?SERVICE=GDAS&REQUEST=GetCapabilities&VERSION=0.9.1

B.3 Example GetCapabilities XML response

```
<?xml version="1.0" encoding="ISO-8859-1" standalone="no"?>
<GDAS Capabilities version="0.9.1" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:noNamespaceSchemaLocation="http://www.geoconnections.org/architecture/technical/specifications/geolinked
_das/gdas_0_9_1_cap.xsd">
   <Service>
       <Name>CGDI:GDAS</Name>
       <Title>2001 Census of Agriculture Geolinked Data Access Service</Title>
       <a href="Abstract">Abstract</a>>This data is from the 2001 Census of Agriculture for Canada. The frameworks supported are
Provinces, Census Districts, Census SubDivisions, and Census Agricultural Areas. This service includes a limited
subset of the attributes available for the Census of Agriculture.</Abstract>
       <OnlineResource>http://statscan.gc.ca/</OnlineResource>
       <KeywordList>
           <Keyword>Census of Agriculture</Keyword>
          <Keyword>Canada</Keyword>
          <Keyword>Statistics Canada</Keyword>
           <Keyword>Statistics</Keyword>
       </KeywordList>
       <ContactInformation>
          <ContactPersonPrimary>
              <ContactPerson>Beverley Hammond</ContactPerson>
              <ContactOrganization>Statistics Canada
          </ContactPersonPrimary>
          <ContactAddress>
              <AddressType>postal</AddressType>
              <Address>960 Carling Ave.</Address>
              <City>Ottawa</City>
              <StateOrProvince>Ontario</StateOrProvince>
              <PostCode>K1A 0C6</PostCode>
              <Country>Canada</Country>
          </ContactAddress>
          <ContactFacsimileTelephone>613-759-1937
          <ContactElectronicMailAddress>hammond@statcan.ca</ContactElectronicMailAddress>
       </ContactInformation>
       <GeolinkidsLimit>1000</GeolinkidsLimit>
       <a href="#">AttributeLimit>1</a>
```

```
</Service>
   <Capability>
       <Request>
          <GetCapabilities>
              <Format>text/xml</Format>
              <DCPType>
                 <HTTP>
                     <Get onlineResource="http://statscan.gc.ca/gdas?"/>
                 </HTTP>
             </DCPType>
          </GetCapabilities>
          <GetData>
              <Format>text/xml</Format>
             <DCPType>
                 <HTTP>
                     <Get onlineResource="http://statscan.gc.ca/gdas?"/>
                 </HTTP>
              </DCPType>
          </GetData>
       </Request>
       <Exception>
          <Format>text/xml</Format>
       </Exception>
       <GeolinkedData>
          <Framework>
              <Organization>Statistics Canada/Organization>
              <Domain>ec.qc.ca</Domain>
             <Name>provinces</Name>
              <Title>Provinces and Territories of Canada</Title>
              Description>Provincial and Territorial boundaries used for the 2001 Census of Canada.
</Description>
              <Version>2001</Version>
              <ReleaseDate>2001-06-03</ReleaseDate>
              <Documentation>http://geodepot.statcan.ca/Diss/Data/Geography/n_cd_e.cfm
              <GeolinkageField>pr</GeolinkageField>
              <Dataset>
                 <Organization>Statistics Canada
                 <Domain>statcan.ca</Domain>
                 <Name>2001AgCensus</Name>
                 <Title>2001 Census of Agriculture</Title>
                 <Description>2001 Census of Agriculture
                 <Version>2001</Version>
                 <ReleaseDate>2003-06-12</ReleaseDate>
                 <Documentation>http://www.statcan.ca/english/agcensus2001/about.htm</Documentation>
                 <GeolinkageField>province</GeolinkageField>
                 <Attribute>
                     <Name>cows</Name>
                    <Units>entities</Units>
                    <Type>count</Type>
                    <Title>Total cows</Title>
                    <Description>Mature female cattle (more than one year old).
                    <Version>2001</Version>
                     <ReleaseDate>2003-06-12</ReleaseDate>
   <Documentation>http://www.statcan.ca/english/agcensus2001/about.htm
                 </Attribute>
                 <Attribute>
                     <Name>heifers</Name>
                    <Units>entities</Units>
                    <Type>count</Type>
                     <Title>Total Heifers</Title>
                    <Description>Immature female cattle (less than one year old).
                    <Version>2001</Version>
                     <ReleaseDate>2003-06-12</ReleaseDate>
```

```
<Documentation>http://www.statcan.ca/english/agcensus2001/about.htm
             </Attribute>
             <Attribute>
                 <Name>totcattle</Name>
                 <Units>entities</Units>
                 <Type>count</Type>
                 <Title>Total cattle and calves</Title>
                 <Description>Cows, bulls, steers, heifers, and calves.
                 <Version>2001</Version>
                 <ReleaseDate>2003-06-12</ReleaseDate>
<Documentation>http://www.statcan.ca/english/agcensus2001/about.htm</Documentation>
              </Attribute>
          </Dataset>
      </Framework>
      <Framework>
          <Organization>Statistics Canada
          <Domain>ec.gc.ca</Domain>
          <Name>cd</Name>
          <Title>Census Divisions</Title>
          <Description>Census divisions defined for the 2001 Census of Canada. 
          <Version>2001</Version>
          <ReleaseDate>2001-06-03</ReleaseDate>
          <Documentation>http://geodepot.statcan.ca/Diss/Data/Geography/n_cd_e.cfm
          <GeolinkageField>cd</GeolinkageField>
          <Dataset>
             <Organization>Statistics Canada
             <Domain>statcan.ca</Domain>
             <Name>2001AqCensus</Name>
             <Title>2001 Census of Agriculture</Title>
             <Description>2001 Census of Agriculture
             <Version>2001</Version>
             <ReleaseDate>2003-06-12</ReleaseDate>
             <Documentation>http://www.statcan.ca/english/agcensus2001/about.htm
             <GeolinkageField>CensusDivision</GeolinkageField>
             <Attribute>
                 <Name>cows</Name>
                 <Units>entities</Units>
                 <Type>count</Type>
                 <Title>Total cows</Title>
                 <Description>Mature female cattle (more than one year old).
                 <Version>2001</Version>
                 <ReleaseDate>2003-06-12</ReleaseDate>
<Documentation>http://www.statcan.ca/english/agcensus2001/about.htm
             </Attribute>
             <Attribute>
                 <Name>heifers</Name>
                 <Units>entities</Units>
                 <Type>count</Type>
                 <Title>Total Heifers</Title>
                 <Description>Immature female cattle (less than one year old).
                 <Version>2001</Version>
                 <ReleaseDate>2003-06-12</ReleaseDate>
<Documentation>http://www.statcan.ca/english/agcensus2001/about.htm</Documentation>
             </Attribute>
             <Attribute>
                 <Name>totcattle</Name>
                 <Units>entities</Units>
                 <Type>count</Type>
                 <Title>Total cattle and calves</Title>
                 <Description>Cows, bulls, steers, heifers, and calves.
                 <Version>2001</Version>
```

```
<ReleaseDate>2003-06-12</ReleaseDate>
   <Documentation>http://www.statcan.ca/english/agcensus2001/about.htm
                 </Attribute>
             </Dataset>
          </Framework>
          <Framework>
             <Organization>Statistics Canada/Organization>
             <Domain>ec.gc.ca</Domain>
             <Name>csd</Name>
             <Title>Census Subdivisions</Title>
             <Description>Census subdivisions defined for the 2001 Census of Canada. 
             <Version>2001</Version>
             <ReleaseDate>2001-06-03</ReleaseDate>
             <Documentation>http://geodepot.statcan.ca/Diss/Data/Geography/n_cd_e.cfm
             <GeolinkageField>csd</GeolinkageField>
                 <Organization>Statistics Canada/Organization>
                 <Domain>statcan.ca</Domain>
                 <Name>2001AgCensus</Name>
                 <Title>2001 Census of Agriculture</Title>
                 <Description>2001 Census of Agriculture
                 <Version>2001</Version>
                 <ReleaseDate>2003-06-12</ReleaseDate>
                 <Documentation>http://www.statcan.ca/english/agcensus2001/about.htm</Documentation>
                 <GeolinkageField>CensusSubdivision</GeolinkageField>
                 <Attribute>
                    <Name>totcattle</Name>
                    <Units>entities</Units>
                    <Type>count</Type>
                    <Title>Total cattle and calves</Title>
                    <Description>Cows, bulls, steers, heifers, and calves.
                    <Version>2001</Version>
                    <ReleaseDate>2003-06-12</ReleaseDate>
   <Documentation>http://www.statcan.ca/english/agcensus2001/about.htm
                 </Attribute>
             </Dataset>
          </Framework>
      </GeolinkedData>
   </Capability>
</GDAS_Capabilities>
```

B.4 Example GetData request using the HTTP GET method

```
http://foo.bar/gdas?
SERVICE=GDAS&
REQUEST=GetData&
VERSION=0.9.1&
FRAMEWORKDOMAIN=statcan.ca&
FRAMEWORKNAME=Provinces&
FRAMEWORKVERSION=2001&
DATASETDOMAIN=statcan.ca&
DATASETNAME=2001AgCensus&
ATTRIBUTE=cattlecalves,cows&
GEOLINKIDS=10,11,12,13,24,35,46,47,48,59
```

B.5 Example GetData XML request using the HTTP POST method

```
<?xml version="1.0" encoding="UTF-8"?>
    <GetData version="0.9.1" service="GDAS">
   <Framework>
       <Domain>statcan.ca/Domain>
       <Name>Provinces</Name>
       <Version>2001</Version>
   </Framework>
    <Dataset>
       <Domain>2001AgCensus/Domain>
       <Name>2001AgCensus</Name>
       <a href="#">Attribute>cattlecalves</a></attribute>
       <a href="#">Attribute>cows</attribute></a>
       <Geolinklds>
           <I>10</I>
           <|>11</|>
           <I>12</I>
           <|>13</|>
           <|>24</|>
           <|>35</|>
           <|>46</|>
           <|>47</|>
           <|>48</|>
           <|>59</|>
       </GeolinkIds>
    </Dataset>
</GetData>
```

B.6 Example GetData XML response

```
<?xml version="1.0" standalone="no"?>
<GDAS Data version="0.9.1" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:noNamespaceSchemaLocation="http://www.geoconnections.org/architecture/technical/specifications/geolinked
_das/gdas_0_9_1.xsd">
   <Framework>
       <Organization>Statistics Canada/Organization>
       <Domain>statcan.ca</Domain>
       <Name>Provinces</Name>
       <Title>Provinces of Canada</Title>
       <Description>Provinces and Territories of Canada as defined for the 2001 Census. 
       <Version>2001</Version>
       <ReleaseDate>2002-05-01</ReleaseDate>
       <Documentation>http://geodepot.statcan.ca/Diss/Data/Geography/n_cd_e.cfm</Documentation>
       <GeolinkageField>pr</GeolinkageField>
       <Dataset>
          <Organization>Statistics Canada/Organization>
          <Domain>statcan.ca</Domain>
          <Name>2001AgCensus</Name>
          <Title>2001 Census of Agriculture</Title>
          <Description>2001 Census of Agriculture
          <Version>2001</Version>
          <ReleaseDate>2003-06-12</ReleaseDate>
          <Documentation>http://www.statcan.ca/english/agcensus2001/about.htm
          <GeolinkageField>province</GeolinkageField>
          <Attribute>
              <Name>cattlecalves</Name>
              <Units>entities</Units>
              <Type>count</Type>
              <Title>Total cattle and calves</Title>
              <Description>Total cattle and calves assessed by the 2001 Census of Agriculture. 
              <Version>2001</Version>
              <ReleaseDate>2003-06-12</ReleaseDate>
```

```
<Documentation>http://www.statcan.ca/english/agcensus2001/about.htm</Documentation>
</Attribute>
<Attribute>
   <Name>cows</Name>
   <Units>entities</Units>
   <Type>count</Type>
   <Title>Total cows</Title>
   <Description>Mature female cattle (more than one year old).
   <Version>2001</Version>
   <ReleaseDate>2003-06-12</ReleaseDate>
   <Documentation>http://www.statcan.ca/english/agcensus2001/about.htm
</Attribute>
<Rowset>
   <Row>
      <|>10</|>
      <V>36712</V>
      <V>11449</V>
   </Row>
   <Row>
      <|>11</|>
      <V>339164</V>
      <V>255175</V>
   </Row>
   <Row>
      <I>12</I>
      <V>433604</V>
      <V>275149</V>
   </Row>
   <Row>
      <I>13</I>
      <V>363100</V>
      <V>268236</V>
   </Row>
   <Row>
      <|>24</|>
      <V>5439246</V>
      <V>3875071</V>
   </Row>
   <Row>
      <I>35</I>
      <V>8562399</V>
      <V>6540971</V>
   </Row>
   <Row>
      <|>46</|>
      <V>5697708</V>
      <V>4589263</V>
   </Row>
   <Row>
      <|>47</|>
      <V>11595540</V>
      <V>10887362</V>
   </Row>
   <Row>
      <|>48</|>
      <V>26460804</V>
      <V>24576174</V>
   </Row>
   <Row>
      <|>59</|>
      <V>3256191</V>
      <V>2299424</V>
   </Row>
</Rowset>
```

</Dataset>

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</Framework>
</GDAS_Data>

Annex C (informative)

Changes from previous versions of the GDAS specification

C.1 Introduction

Previous versions of this specification were prepared under the auspices of the Geoconnections (Natural Resouces Canada). This annex details changes made to earlier versions of the specification produced by that organization.

C.2 Changes between version 0.8.2 and 0.9.0

- Added the ability to request multiple attributes in a single request:
- New ATTRIBUTES request parameter
- Former ATTRIBUTE parameter deprecated
- Set maxOccurs=unbounded for <Attribute> and <V> in GetData response schema
- Added the ability to pass a filter in the GetData request using the optional GeolinkIds parameter
- Made some parameters of **GetData** mandatory (they were all optional before) and added a note explaining that simple/static services can still operate in that context.
- Added definition of XML-encoded POST requests (GetCapabilities and GetData).
- Modified the GetCapabilities example to use text/xml instead of custom MIME types
- (application/cgdi.gdas_xml and application/cgdi.error_xml) in the Service definitions.
- Allow one or more Datasets inside a Framework in Capabilities (we used to be limited to one Dataset per Framework). Updated the text of the spec and the Capabilities schema accordingly.

C.2 Changes between version 0.9.0 and 0.9.1

- Reverted to **Attribute** parameter in all cases. **Attributes** parameter from 0.9.0 no longer valid.
- Changed Framework Version to FrameworkVersion in KVP encoding.
- Added <GeolinkidsLimit> to indicate if the service supports selection of specific GeoLink Ids.
- Added < AttributeLimit > to indicate if the service supports simultaneous retrieval of multiple attributes.
- Changed <ROW> to <Row>
- Changed <ROWSET> to <Rowset>
- Made additional parameters of **GetData** mandatory.

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- Dropped MIME type "application/vnd.ogc.*" in favour of "text/xml"
- Changed Domain to FrameworkDomain in GetData request
- Changed Framework to FrameworkName in GetData request
- Added DatasetDomain to GetData request
- Changed Dataset to DatasetName in GetData request
- Changed Interval to Measure in Attribute. Type
- Changed Ratio to Count in Attribute. Type
- Changed Attribute. Type keywords to mandatory

Bibliography