Open GIS Consortium Inc.

Date: 2002-12-13

Reference number of this OpenGIS® project document: **OGC 02-087r3**

Version: 1.1.1

Category: OpenGIS® Implementation Specification

Editor: Douglas Nebert

OpenGIS® Catalog Services Specification

Copyright notice

Document type: OpenGIS® Publicly Available Standard
Document subtype: Implementation Specification
Document stage: Adopted
Document language: English

Contents

i. Preface

This document explains how Catalog Services version 1.1.1 are organized and implemented for the discovery and retrieval of data and services metadata. The prior public version of this specification was 1.0. Catalog Services version 1.1.1 supercedes and deprecates version 1.0.

ii. Submitting organizations

The following organizations submitted the original document or its revisions to the Open GIS Consortium, Inc. in response to the OGC Request 6, Core Task Force, Catalog Working Group, A Request for Proposals: OpenGIS® Catalog Interface (OpenGIS® Project Document Number 98-001r2):

BAE SYSTEMS Mission Solutions (formerly Marconi Integrated Systems, Inc.)
Blue Angel Technologies, Inc.
Environmental Systems Research Institute (ESRI)
Geomatics Canada (Canada Centre for Remote Sensing (CCRS))
Intergraph Corporation
MITRE
Oracle Corporation
U.S. Federal Geographic Data Committee (FGDC)
U.S. National Aeronautics and Space Administration (NASA)
U.S. National Imagery and Mapping Agency (NIMA)

Contributing Entities

The submitting entities were grateful for the contributions from the following companies in the development and revision of this Interface Specification:

Compusult, Limited
GEODAN IT bv
Hammon, Jensen, Wallen & Associates, Inc (HJW)
JRC (Joint Research Centre), European Commission
SICAD GEOMATICS

iii. Document contributor contact points

All questions regarding this document should be directed to the editor or the contributors:

Contact	Company	Address	Phone	Email
Yonsook Enloe	SGT, Inc.	7701 Greenbelt Rd Greenbelt, MD 20770	Voice : +1-704-243-2085 fax : +1-704-243-2150	yonsook.enloe@gsfc.nasa.gov
Doug Nebert	U.S. Federal Geographic Data Committee	USGS National Center, Mail Stop 590 12201 Sunrise Valley Drive Reston, VA 20192	Voice: +1-703-648-4151 fax: +1-703-648-5755	ddnebert@usgs.gov

iv. Revision history

Date	Release	Editor	Primary clauses modified	Description
12Aug1999	1.0	Nebert	N/A	Original Specification entitled "Catalog Interface Implementation Specification" OGC Document 00-034
28Mar2001	1.1	Nebert	Made fine-grain CORBA and OLE/COM Annexes to Informative, added abstract conformance test suite, fixed coarse-grain CORBA IDL	Document only made available to OGC membership pending passage of Version 2.0. (OGC Document 01-040)
11Nov2002	1.1.1	Nebert, Katz,	State diagram changes, renamed specification and changed WWW Profile to Z39.50 Profile, added introductory words as required for new format	Document primarily reflects conversion to newer OGC/ISO document format

v. Changes to the OpenGIS® Abstract Specification

The OpenGIS® Abstract Specification does not require changes to accommodate the technical contents of this document.

vi. Future work

Improvements to this document are planned in version 2.0 to incorporate independent efforts within the OGC community to include 1) a "stateless" Web profile of catalog services and 2) interfaces associated with registries of all types of information resource objects. Work on Version 2 will begin by convening a new Revision Working Group in early 2003, with issuance of a revised specification anticipated in late 2003.

vii. Foreword

Attention is drawn to the possibility that some of the elements of this part of OGC 02-087 may be the subject of patent rights. The Open GIS Consortium, Inc. shall not be held responsible for identifying any or all such patent rights.

This third edition cancels and replaces the second edition (OGC 01-040), which has been technically revised.

This document, through its implementation profiles, references several external standards and specifications as dependencies:

- Common Object Request Broker Architecture (CORBA/IIOP), Version 2.X, The Object Management Group (OMG): http://www.omg.org

- Information and documentation -- Information retrieval (Z39.50) -- Application service definition and protocol specification: http://www.iso.ch/iso/en/CatalogDetailPage.CatalogDetail?CSNUMBER=27446&ICS1=35&ICS2=240&ICS3=30

- Unified Modeling Language (UML) Version 1.3, The Object Management Group (OMG): http://www.omg.org/cgi-bin/doc?formal/00-03-01

- The eXtensible Markup Language (XML), World Wide Web Consortium, http://www.w3.org/TR/1998/REC-xml-19980210

Annex A, the Abstract Conformance Test Suite, is normative to this specification and shall be implemented when a computing environment requires catalog services. All other annexes are informative and provide background information, such as terminology and alternative implementation approaches.

Introduction

This document provides guidance on the deployment of catalog services through the presentation of abstract and implementation-specific models. Catalog services support the ability to publish and search collections of descriptive information (metadata) for data, services, and related information objects. Metadata in catalogs represent resource characteristics that can be queried and presented for evaluation and further processing by both humans and software. Catalog services are required to support the discovery of registered information resources within a collaborating community.

OpenGIS® Catalog Services Specification

1 Scope

This OpenGIS® document specifies the abstract and implementation models required to publish and access digital catalogs of metadata for geospatial data, services, and related resource information. Metadata act as generalized properties that can be queried and returned through catalog services for resource evaluation. Catalog services support the use of one of several well-known query languages to find and return results using well-known content models (metadata schemas) and encodings. This OpenGIS® document is applicable to the implementation of interfaces on catalogs of data and services.

2 Conformance

Abstract conformance to the mandatory catalog service interfaces is described in Annex A. This Annex does not yet provide detail for optional interface packages for Access and Management Services (See Section 6.2). In a given community, a test suite should include test metadata records with a variety of element values and a series of queries that would return correct and properly formatted results. Test data and queries are not included in this document.

3 Normative references

The following normative documents contain provisions that, through reference in this text, constitute provisions of this part of OGC 02-087. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of OGC 02-087 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

Abstract Specification Topic 13: Catalog Services, version 4, OGC document 99-113

OpenGIS® Simple Features Specification for CORBA

4 Terms and definitions

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

4.1 data clearinghouse

Collection of institutions providing digital data, which can be searched through a single interface using a common metadata standard [ISO 19115]

4.2 data level

Stratum within a set of layered levels in which data is recorded that conforms to definitions of types found at the application model level [ISO 19101]

4.3 dataset series

Collection of datasets sharing the same product specification [ISO 19113, ISO 19114, ISO 19115]

4.4 feature catalog

Catalog containing definitions and descriptions of the feature types, feature attributes, and feature relationships occurring in one or more sets of geographic data, together with any feature operations that may be applied [ISO 19101, ISO 19110]

4.5 geographic dataset

Dataset with a spatial aspect [ISO 19115]

4.6 metadata dataset

Metadata describing a specific dataset [ISO 19101]

4.7 metadata entity

Group of metadata elements and other metadata entities describing the same aspect of data

NOTE 1 A metadata entity may contain one or more metadata entities

NOTE 2 A metadata entity is equivalent to a class in UML terminology [ISO 19115]

4.8 metadata schema

Conceptual schema describing metadata

NOTE ISO 19115 describes a standard for a metadata schema. [ISO 19101]

4.9 metadata section

Subset of metadata that defines a collection of related metadata entities and elements [ISO 19115]

4.10 profile

Set of one or more base standards and - where applicable - the identification of chosen clauses, classes, subsets, options and parameters of those base standards that are necessary for accomplishing a particular function [ISO 19101, ISO 19106]

4.11 qualified name

Name that is prefixed with its naming context

EXAMPLE The qualified name for the road no attribute in class Road defined in the Roadmap schema is RoadMap.Road.road_no. [ISO 19118]

4.12 reporting group

Data with common characteristics forming a subset of a dataset

NOTE 1 Common characteristics can include belonging to an identified feature type, feature attribute or feature relationship; sharing data collection criteria; sharing original source; or being within a specified geographic or temporal extent.

NOTE 2 A reporting group can be as small as a feature instance, an attribute value, or a single feature relationship. [ISO 19109, ISO 19113]

4.13 schema

Formal description of a model [ISO 19101, ISO 19103, ISO 19109, ISO 19118]

4.14 service

A service is a capability that a service provider entity makes available to a service user entity at the interface between those entities [ISO 19101, ISO 19119]

4.15 service interface

Shared boundary between an automated system or human being and another automated system or human being [ISO 19101]

4.16 state

Condition that persists for a period

NOTE the value of a particular feature attribute describes a condition of the feature [ISO 19108]

4.17 transfer protocol

Common set of rules for defining interactions between distributed systems [ISO 19118]

5 Conventions

5.1 Symbols (and abbreviated terms)

Some frequently used abbreviated terms:

API Application Program Interface

COM Component Object Model

CORBA	Common Object Request Broker Architecture
COTS	Commercial Off The Shelf
DCE	Distributed Computing Environment
DCP	Distributed Computing Platform
DCOM	Distributed Component Object Model
IDL	Interface Definition Language
ISO	International Organization for Standardization
OGC	Open GIS Consortium
UML	Unified Modeling Language
XML	eXtensible Markup Language
Z39.50	Service definition for information search and retrieval, also known as ISO 23950

5.2 UML notation

The diagrams that appear in this document are presented using the Unified Modeling Language (UML) static structure diagram. The UML notations used in this document are described in Figure 1below.

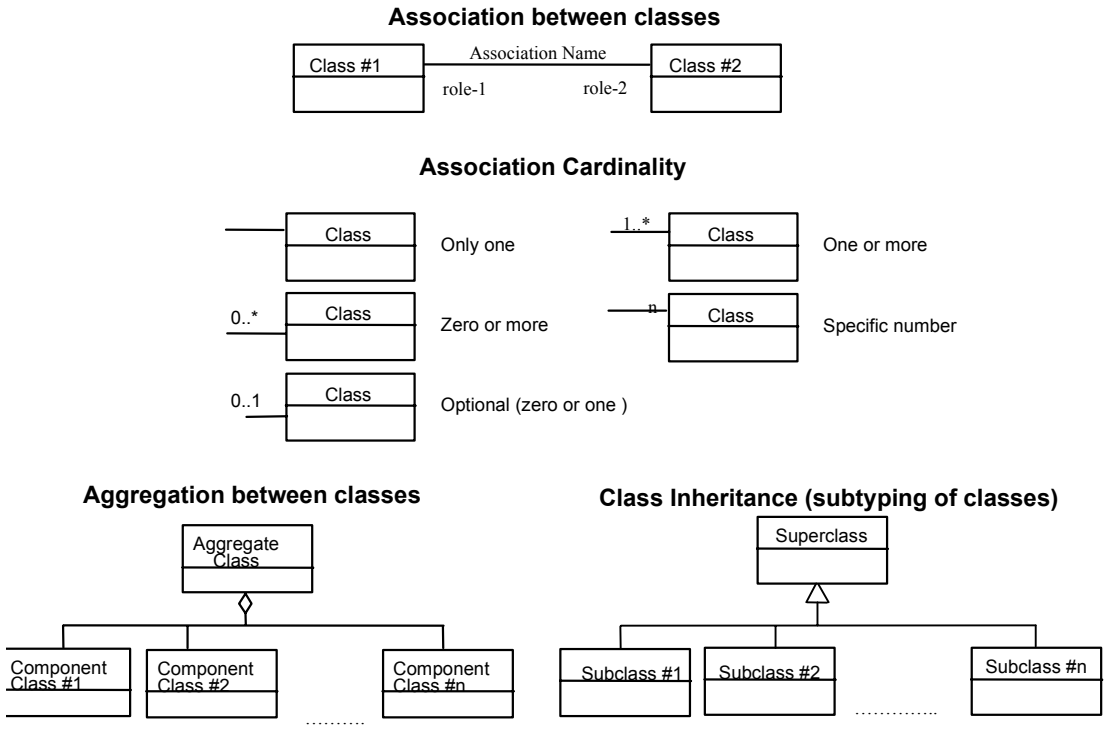


Figure 1- UML Diagram

In this diagram, the following three stereotypes of UML classes are used:

a) <<Interface>> A definition of a set of operations that is supported by objects having this interface. An Interface class cannot contain any attributes.

b) <<DataType>> A descriptor of a set of values that lack identity (independent existence and the possibility of side effects). A DataType is a class with no operations whose primary purpose is to hold the information.

c) <<CodeList>> is a flexible enumeration that uses string values for expressing a list of potential values.

In this document, the following standard data types are used:

a) CharacterString – A sequence of characters

b) Integer – An integer number

c) Double – A double precision floating point number

d) Float – A single precision floating point number

6 Overview

Section 6 provides a descriptive overview of key issues in the development of the OGC Catalog Interface.

6.1 Context of Catalog Services

The geospatial community is a very broad-based community that works in many different operational environments, as shown in the information discovery continuum in Figure 2. On one extreme there are tightly coupled systems dedicated to well defined functions in a tightly controlled environment. At the other extreme are Web based services that know nothing about the client. The initial catalog submissions addressed two parts of this continuum. One proposal addressed the controlled Enterprise environment where a degree of a-priori knowledge exists about the client and server. The other proposal addressed the global Internet case where no a-priori knowledge exists between client and server. This document provides a specification that is applicable to the full range of catalog operating environments.

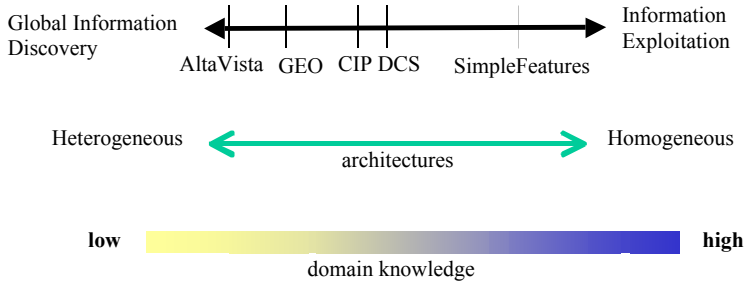


Figure 2 - Information Discovery Continuum

6.2 Reference Model Architecture

The Reference Model for the OGC Catalog Interface is composed of two parts: a Reference Architecture and a Decomposition of Catalog Services.

Figure 3 shows the Reference Architecture assumed for development of the OGC Catalog Interface. The architecture is a multi-tier arrangement of clients and servers. To provide a context, the architecture shows more than just catalog interfaces. The bold lines illustrate the scope of OGC Catalog and Features interfaces. Where appropriate, OGC Feature interfaces have been re-used in the OGC Catalog interface, as discussed in Section 6.9.

The Application shown in Figure 3 interfaces with the Application Server using the OGC Catalog Interface. The Application Server may draw on one of three sources to respond to the Catalog Service request: a Metadata Store local to the Application Server, another Application Server, or a Data Store. The interface to the local metadata store is internal to the Application Server. The interface between Application Servers is the OGC Catalog Interface. The interface to the Data Store is the OGC Features Interface. In this case an Application Server is acting as both a client and server. See Section 6.10 for more about

Distributed Searching. Data returned from an OGC Features query is processed by the Application Server to return the data appropriate to a Catalog request.

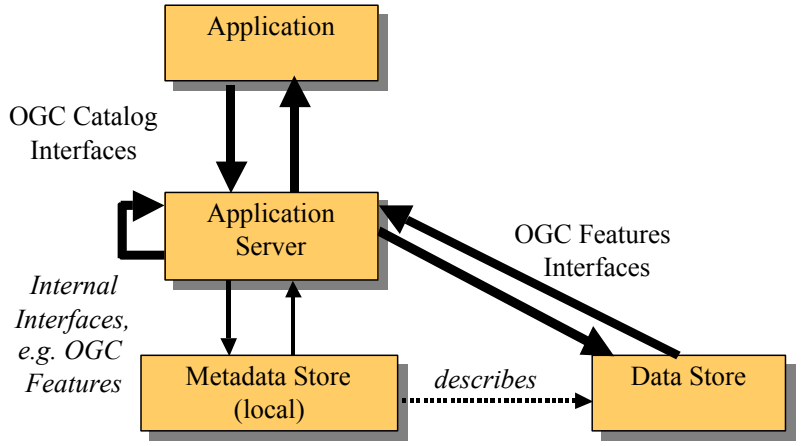


Figure 3 - Reference Model Architecture

Figure 4 shows a decomposition of the OGC Catalog Services. Discovery Services are those services that allow a client to locate metadata that describes data. Access Services provide the client with methods to request services on the data. Access Services are divided into two types. Direct Access provides the client with a handle that provides the data to the client. The specific definition of such a handle is outside of the scope of the OGC Catalog Interface. Brokered Access provides the client with methods to order data that will be delivered in some means outside of the Catalog Interface. The Management Service defines methods for a client to change the metadata held by a catalog.

The Discovery Service is to be provided by all Application Servers claiming compliance with the OGC Catalog Interface. The Access and Management Services are optionally required for an OGC compliant catalog. But, if an application server claims Access or Management compliance, this OGC Catalog Interface specification defines how the services are to be implemented.

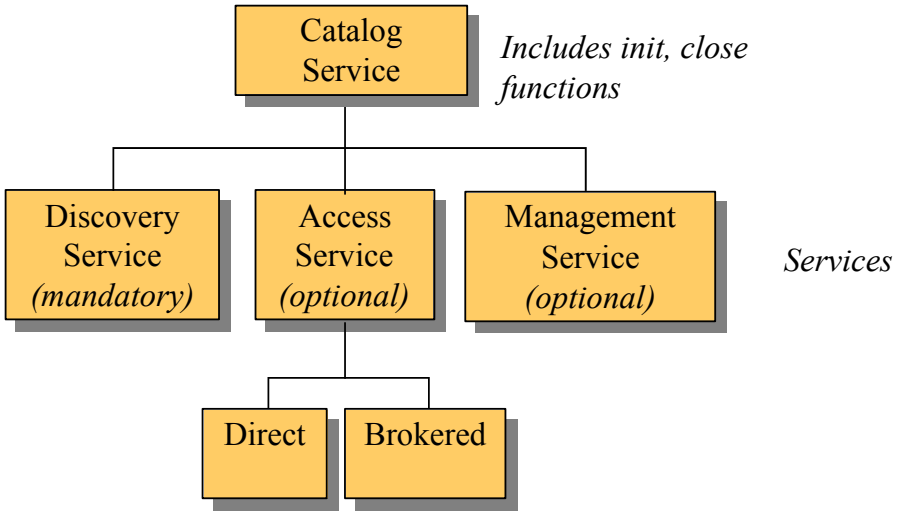


Figure 4- Decomposition of Catalog Services

6.3 Cross Profile Interoperability

The OGC Catalog General Model defines the behaviors and interfaces applicable to all implementations of OGC Catalogs. In the real world, there is no one solution that fits everyone's needs. The OGC Catalog Profiles provide refinements of the General Model targeted toward specific implementation communities. For those communities, the Profile defines the standards for compliance.

The distributed computing environment can categorize profiles that operate within it. This Specification defines a DCP as any set of protocols and services that allow two entities to communicate. DCPs addressed in this specification include CORBA, OLEDB, and the World Wide Web.

The General Model provides the glue that ties the Profiles together. Every Profile must demonstrate consistency with the General Model in terms of behaviors and interfaces. This consistency allows for the construction of Bridges between Profile implementations. A Catalog Bridge, as shown in Figure 5 might consist of software layered over implementations of two or more Profiles. The Profile implementations would all expose the same interfaces to the Bridge code. In this way, a Bridge may serve as little more than a store and forward device for Catalog request and response messages. The Profile implementations are responsible for executing those messages within their implementation domain.

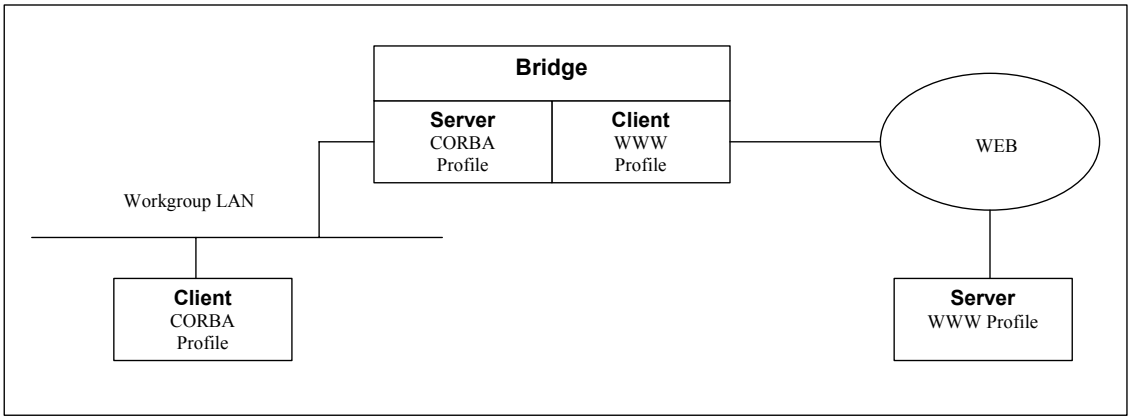


Figure 5- An Example of a One-Way Bridge

6.4 Catalog Object Model

The static class diagram of Figure 6 illustrates how the Catalog Services can utilize an OGC Features Implementation. A catalog entry "references" the data it describes through a feature-to-feature association. Since metadata can be associated at any level in the feature hierarchy, the target of this reference can be any subclass of feature, but will most commonly be associated to the feature collection, or logical data set. The catalog entry consists of an aggregation of metadata attributes, at least one of which describes the "footprint" of the data referenced. Thus, a catalog entry meets the fundamental definition of a feature. For this reason, the Catalog Entry class realizes the Feature interface, that is, it supports all interface protocols defined on Feature. Since the catalog entries are sub-types of feature, their aggregation, the Catalog, is a sub-type of feature collection. Thus, the Catalog realizes the interface for Feature Collection. Whenever a catalog is implemented according to an OGC compliant feature data store, it is possible to access that data store directly using any OGC feature data access interface. Thus, one mechanism to implement robust catalogs is the use of OGC compliant feature data stores.

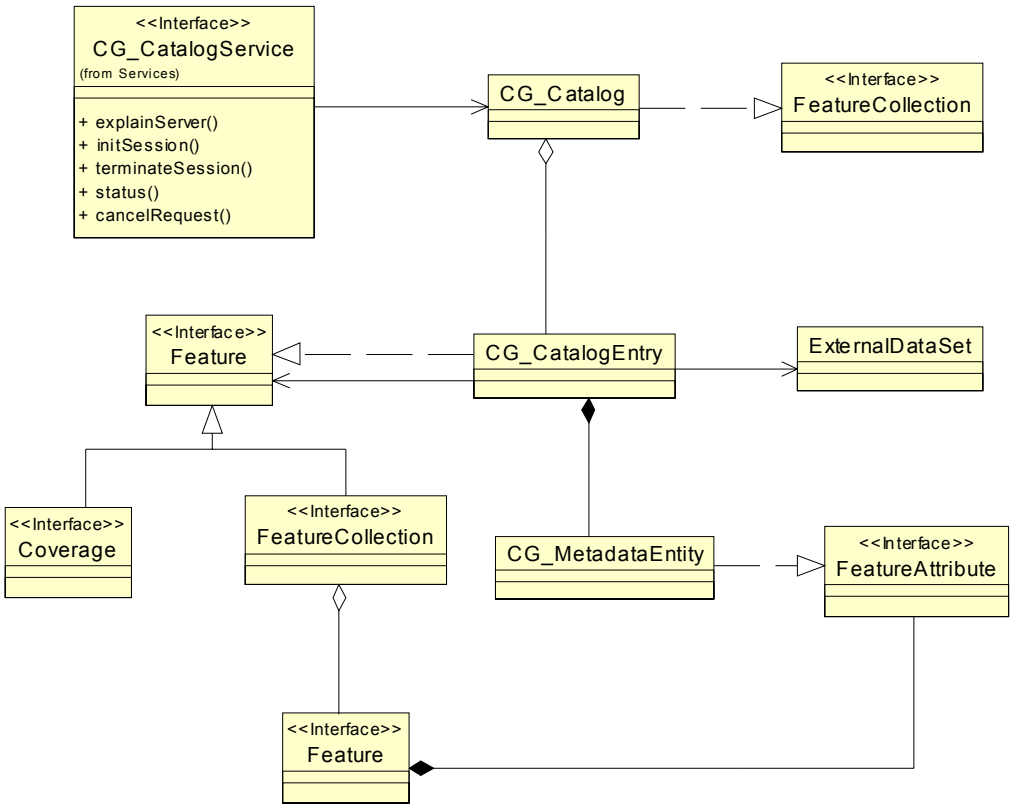


Figure 6- Catalog Object Model

6.5 Metadata Model Independence

Metadata structures, dependencies, and definitions -- known as schema -- exist for multiple information communities. For the purposes of interchange of information within an information community, a metadata schema may be defined that provides a common vocabulary, which supports search, retrieval, display, and association between the description and the object being described. Although this specification does not require the use of a specific schema, the adoption of a given schema within an information community ensures the ability to communicate and discover information.

The geomatics standardization activity under Technical Committee 211 includes a formal schema for geospatial metadata that is intended to apply to all types of information. This metadata standard, ISO 19115, currently a Draft International Standard (December 2001) includes a proposal for core metadata elements in common use. All future registered ISO TC211 metadata profiles must include these core elements. For the purpose of information exchange across OpenGIS/Geomatics communities, the schema and core elements of ISO 19115 must be implemented by conforming implementations.

6.6 Query Language

The Query Capabilities of the OpenGIS Catalog Interface are intended to provide a minimum subset of query capabilities that can be assumed at OGC Compliant Catalog implementations while providing maximum flexibility for enabling alternate styles of query, result presentation, and query languages. The flexibility goals are accomplished through the use of a query service call that contains the parameters needed to establish the query /result presentation style and a query expression parameter that includes the actual query and an indication of the query language used.

The interoperability goal is supported by the specification of a minimal query language, which must be supported by all compliant OpenGIS Catalog Services (defined in Section 8). This query language supports nested Boolean queries, text matching operations, temporal data types, the Simple Features "well known text representations"" and Simple Features relational operators. The minimal query language syntax is based on the SQL WHERE clause in the SQL SELECT statement.

The minimal query language assists the consumer in the discovery of datasets of interest at all sites supporting the OpenGIS Catalog Services. The ability to specify alternative query languages allows for evolution and higher levels of interoperability among more tightly coupled subsets of Catalog Service Providers and Consumers.

6.7 Use of XML

The eXtensible Markup Language (XML) version 1.0 is used in the implementation of certain aspects of catalog services to promote easy encoding and decoding of structured information. To facilitate translation of information between implementation profiles XML is used: 1) to package the elements of a query, and 2) to package the structured information being returned from a query.

Standard metadata schemas are expressed in this specification using XML with Document Type Declarations (DTDs) that are separate from the XML document they describe. In catalog applications, the documents marked-up in XML must include either reference to the DTD in the header line, and/or the DTD embedded in the document. XML-Schema is an approved Recommendation from the World Wide Web Consortium that is intended to define a more rigorous successor to the DTD.

6.8 Browse Images

In the OpenGIS® community there are a significant number of non-character data items that can be used for Discovery. A good example of this type of metadata is a browse image, a reduced resolution version of an image that is used by the consumer to select the data he wishes to order. The browse image can be acquired from a service or as a standard piece of metadata based on the size and ability to accept parameterization. The inclusion of a small data item such as a thumbnail image is useful in the catalog results presentation. In contrast, a large static or a dynamic browse image that selected different resolutions or bands of the image based on request parameters uses the access service and be represented by the

appropriate URI in the catalog results. There is a large spectrum between these two extremes and our legacy systems handle browse images in all the ways discussed.

The current advice of this specification is to encode very small browse images such as thumbnail images as part of the catalog query result presentation using a common encoding supported in XML Schema. For all larger browse images treat them as an access service and place a referencing URI in the appropriate result fields.

6.9 Interoperability and Compliance with Simple Features

A functional requirement for this proposal was to use the Simple Feature types and functions wherever possible, such as Feature, Feature Collection, Geometry, and Spatial Reference System and the spatial operators. This proposal tries to maintain conceptual compatibility with the Simple Features Implementation Specifications in the following manners:

1. Query comparison operators consistent with those defined in simple features are used in the Catalog Specification Metadata query mechanism.

2. The Access service of the catalog specification allows for a simple transition to Simple Feature access mechanisms.

The consistency between the query mechanism within the catalog specification and the query language within the simple features specification allows an implementation to use a simple features data store for the storing of metadata.

An alternative design uses the simple features query language directly to access metadata. This design was rejected to preserve legacy implementations using Z39.50 metadata servers incapable of supporting a complex query language. Since many Z39.50 metadata servers use SQL databases as backends, a negotiation phase between a client and a particular server could promote the query language to a full object-SQL for Simple Features.

The current query model allows for three types of query language:

- A common, mandatory query language using SQL style syntax, Z39.50 Type 1 operation style, and spatial operations derived from the simple features model in the OGC Simple Features Implementation Specification.

- Any dialect of SQL conformant with the OGC Simple Features Implementation Specification.

- Z.39.50 Type 1 query.

This specification allows support of additional query languages as they are identified.

Each conformant server must support the mandatory query language. Other languages are optional. Because of the limitations placed upon the mandatory query language it will be

possible to implement a service that translates the mandatory query language syntax into either of the other two languages.

6.10 Distributed Search

The Reference Architecture for the OGC Catalog allows for catalog requests to be distributed to multiple catalogs. The architecture allows for a Catalog to accept a request from a client and distribute the request to other Catalogs. For the OGC Catalog Service, Distributed Catalog Searching is defined as a service that involves services of multiple Catalog Servers, in addition to the primary client-server interaction. A catalog server may be able to perform Distributed Searching by propagating secondary catalog service requests to other catalog servers.

To enable Distributed Searching, the following items are needed:

- A multi-tier Reference Architecture as provided by this specification (as defined in Section 6.1)

- A data model to define how searches are to be distributed as defined by an information community.

- Messages with elements applicable to Distributed Searching as provided by this specification

To support distributed searching, a community develops a data model that determines how a search will be distributed to coordinated data servers. The OGC Catalog General Model allows data model neutrality with respect to distributed searching.

Several of the Discovery messages defined in Section 3 contain elements that pertain to distributed searching. The query message contains elements that allow the client to request certain search behavior with respect to distribution. The request and response messages define elements that allow for the retrieval and comprehension of a distributed result set. The request and response messages contain elements that allow for understanding the status of distributed searches.

7 The General Model

7.1 Introduction of The General Model

The General Catalog Interface Model is composed of a single high-level view. It also touches on the concept of having an OGC Service Architecture Framework where the Catalog Interface is one component of such a framework. Both Structural and Dynamic models are provided. This model supports the creation of integrated systems of OGC Catalog Clients and Servers. These client and server components exercise a fine degree of control and coordination upon each other. This environment also facilitates the integration of Catalog Management and Simple Features Access within the catalog Discovery context. The model provides a generalized interface between the client and server that requires all control and coordination between client and server components to occur at an aggregated level.

The model provides a set of service interfaces that support the discovery, access, maintenance and organization of catalogs of geospatial information. The interfaces specified are intended to allow users or application software to find information that exists in multiple distributed computing environments, including the World Wide Web (WWW) environment.

The dynamic model is represented as transitions in the state of the CG_CatalogService object. That is, all of the behavior is expressed by the states and the state transitions of the CG_CatalogService object that is affected by the messages sent by the client. A stateless form of catalog search is also referenced in this specification, but the details of implementation are not yet specified.

A more detailed implementation design is included as informative Annex C at the end of this specification document. The annex also describes a small set of interfaces that an implementer might employ in order to facilitate a mapping between a general and more detailed profile. Such interfaces are private and left up to an implementer to specify how they are developed.

7.2 Structural Model

7.2.1 Overview of the Interface Model

Figure 6 shows the general service interfaces. These interfaces allow the discovery, access and management of geospatial data and services. This model is based on the concept of interface operations passing Request – Response Message Pairs between a client and a server. Stated another way, this architecture uses a messaging based structure to describe the access and invocation of Catalog services.

As seen in Figure 7 there are four major interfaces, CG_CatalogService, CG_Discovery, CG_Access and CG_CatalogManager. These are described in more detail in the following sections of this document. The taxonomy of interfaces that have been placed above the CG_CatalogService interface (i.e., OGC_Service and OGC_Stateful) have been created to put forth the idea of having an overall architectural framework for the different services that will be developed over time to populate the OGC Service Architecture. In the future, a Stateless Catalog service will be defined.

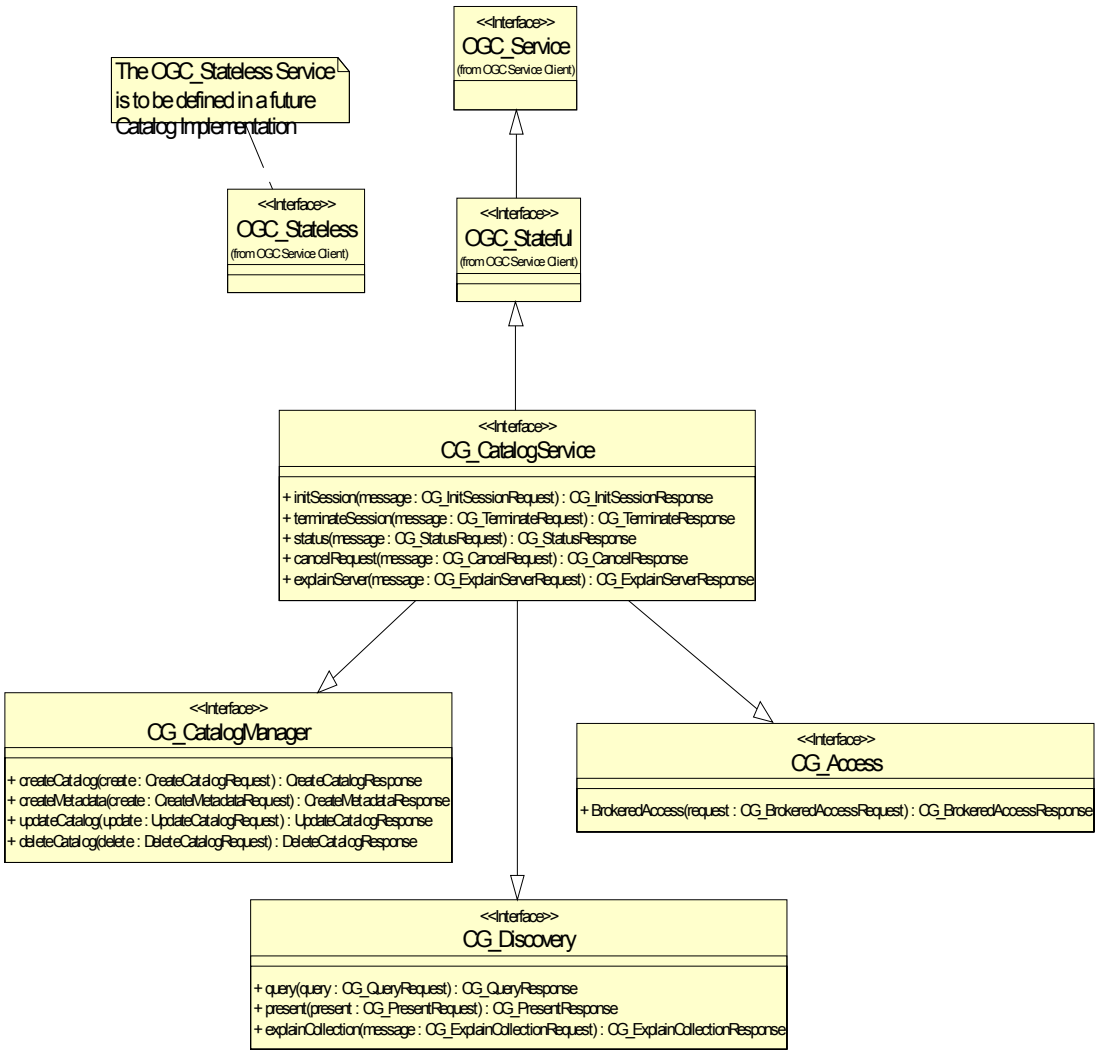


Figure 7 - Main Static Class Diagram of the General Interface Model

7.2.2 The Messaging Model

As previously noted, the general interface model is based on the passing of messages between a client and a catalog server. To support this type of model, a message-based structure has been developed to describe the access and invocation of catalog services. The following three figures (8, 9, and 10) are static class diagrams that depict this message-based taxonomy.

Central to this taxonomy is the CG_Message class. CG_Message provides a consistent set of parameters that are populated for all messages. The underlying implementation platform uses these parameters to perform message routing and session management. Subclasses of CG_Message are CG_Request and CG_Response. CG_Request messages encompass all messages from a client requesting a service from the server. CG_Response messages

encompass all messages from a server generated in response to a client request. There is a one to one relationship between requests and responses. That is to say, for each request, one and only one response will be generated.

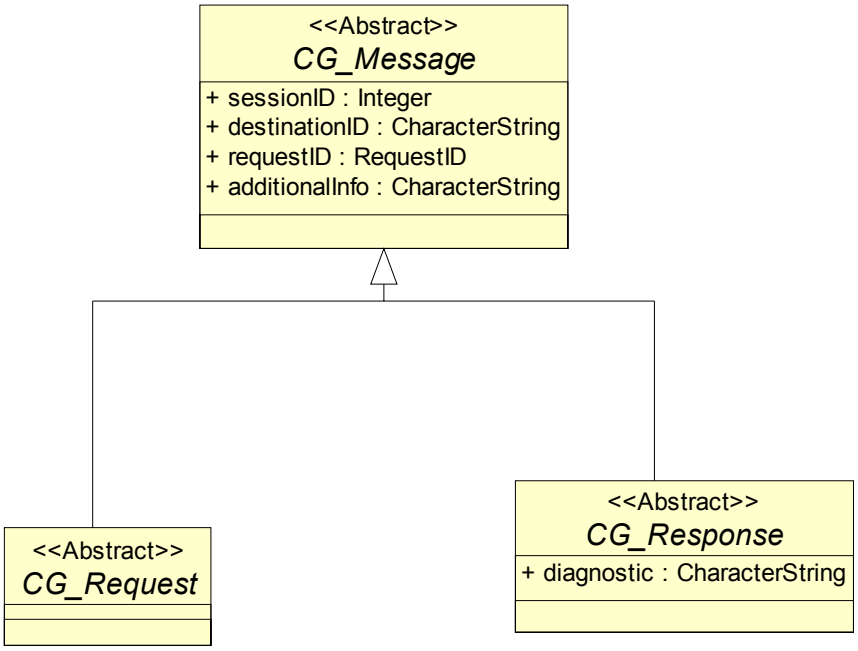


Figure 8 - Main Class Diagram for Message Package

7.2.2.1 The Message Class (CG_Message)

The CG_Message class defines the core set of parameters expected of each message exchanged between a client and server. These parameters support message routing and session management. All request and reply messages are subclasses of the CG_Message class.

CG_Message ::= sessionID destinationID requestID additionalInfo format

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

7.2.2.1.1 Message Parameters:

sessionID: Type = Integer

This is a unique identifier for this client/server session. The session identifier value is assigned in response to a CG_InitSessionRequest. All further messages within that session will contain that identifier in the sessionID parameter.

destinationID: Type = CharacterString

The DestinationID parameter identifies the target for this message. It can identify a server, service, or a process within a service. The exact format of the destinationID is DCP dependant. In a CORBA profile it is an OID while in a Z39.50 Profile it is a URI.

requestID: Type = CG_RequestID

The RequestID parameter is an identifier unique to this message. In the case of a request message, this identifier can be used to monitor and control the processing resulting from the request message. The formal definition of the CG_RequestID data type is in Section 7.2.5.

additionalInfo: Type = CharacterString

This parameter provides a means of passing additional data that may only be relevant within the context of a specific message exchange. For example, if a server cannot execute a query as specified, it may transform the query into a query it can process. In this case the reformed query is sent back to the client in the queryResponse as additionalInfo.

7.2.2.1.2 Message Operations: None

7.2.2.2 Request Messages (CG_Request)

A client invokes Catalog services through request messages. Request messages include the parameters of the message class but do not add any of their own. All messages to invoke specific catalog services are subclasses of the CG_Request class.

CG_Request ::= sessionID destinationID requestID additionalInfo format

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

7.2.2.2.1 Message Parameters: None

7.2.2.2.2 Message Operations: None

7.2.2.3 Response Messages (CG_Response)

The server uses response messages to reply to client requests. The CG_Response class is the root class for all response messages constructed by the server in response to a client request.

CG_Response ::= sessionID destinationID requestID additionalInfo format diagnostic

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

diagnostic ::= CharacterString

7.2.2.3.1 Message Parameters:

diagnostic: Type = CharacterString

This parameter provides a means of passing diagnostic data relevant within the context of the specific message exchange.

7.2.2.3.2 Message Operations: None

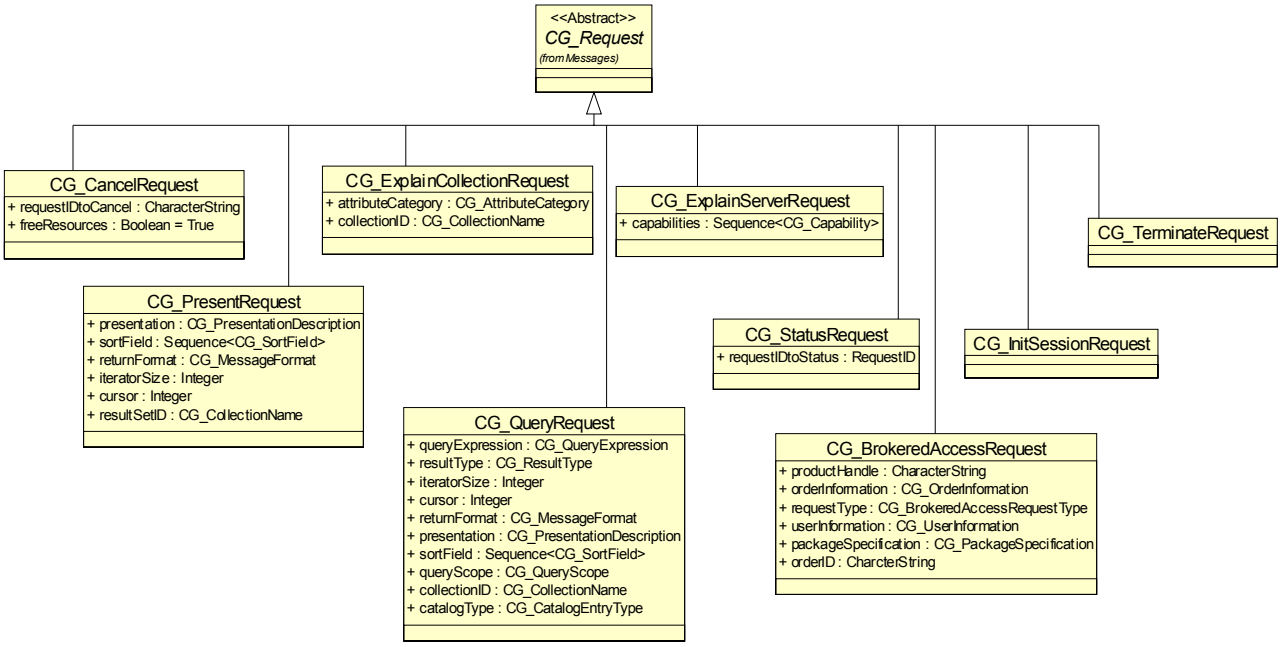


Figure 9 - Request Message Classes and Their Attributes (Parameters) Defined for OGC Catalog Interface Model

7.2.2.4 The Message Class (CG_Message)

The CG_Message class defines the core set of parameters expected of each message exchanged between a client and server. These parameters support message routing and session management. All request and reply messages are subclasses of the CG_Message class.

CG_Message ::= sessionID destinationID requestID additionalInfo format

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

7.2.2.4.1 Message Parameters:

sessionID: Type = Integer

This is a unique identifier for this client/server session. The session identifier value is assigned in response to a CG_InitSessionRequest. All further messages within that session will contain that identifier in the sessionID parameter.

destinationID: Type = CharacterString

The DestinationID parameter identifies the target for this message. It can identify a server, service, or a process within a service, or a list of services to which messages may be sent in a distributed environment.

requestID: Type = CG_RequestID

The RequestID parameter is an identifier unique to this message. In the case of a request message, this identifier can be used to monitor and control the processing resulting from the request message. The formal definition of the CG_RequestID data type is in Section 7.2.5. The requestID is usually set by the client to permit status and cancel operations against the active request.

additionalInfo: Type = CharacterString

This parameter provides a means of passing additional data that may only be relevant within the context of a specific message exchange.

7.2.2.4.2 Message Operations: None

7.2.2.5 Request Messages (CG_Request)

A client invokes Catalog services through request messages. Request messages include the parameters of the message class but do not add any of their own. All messages to invoke specific catalog services are subclasses of the CG_Request class.

CG_Request ::= sessionID destinationID requestID additionalInfo format

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

7.2.2.5.1 Message Parameters: None

7.2.2.5.2 Message Operations: None

7.2.2.6 Response Messages (CG_Response)

The server uses response messages to reply to client requests. The CG_Response class is the root class for all response messages constructed by the server in response to a client request.

CG_Response ::= sessionID destinationID requestID additionalInfo format diagnostic

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

diagnostic ::= CharacterString

7.2.2.6.1 Message Parameters:

diagnostic: Type = CharacterString

This parameter provides a means of passing diagnostic data relevant within the context of the specific message exchange for transferring error messages in the response.

7.2.2.6.2 Message Operations: None

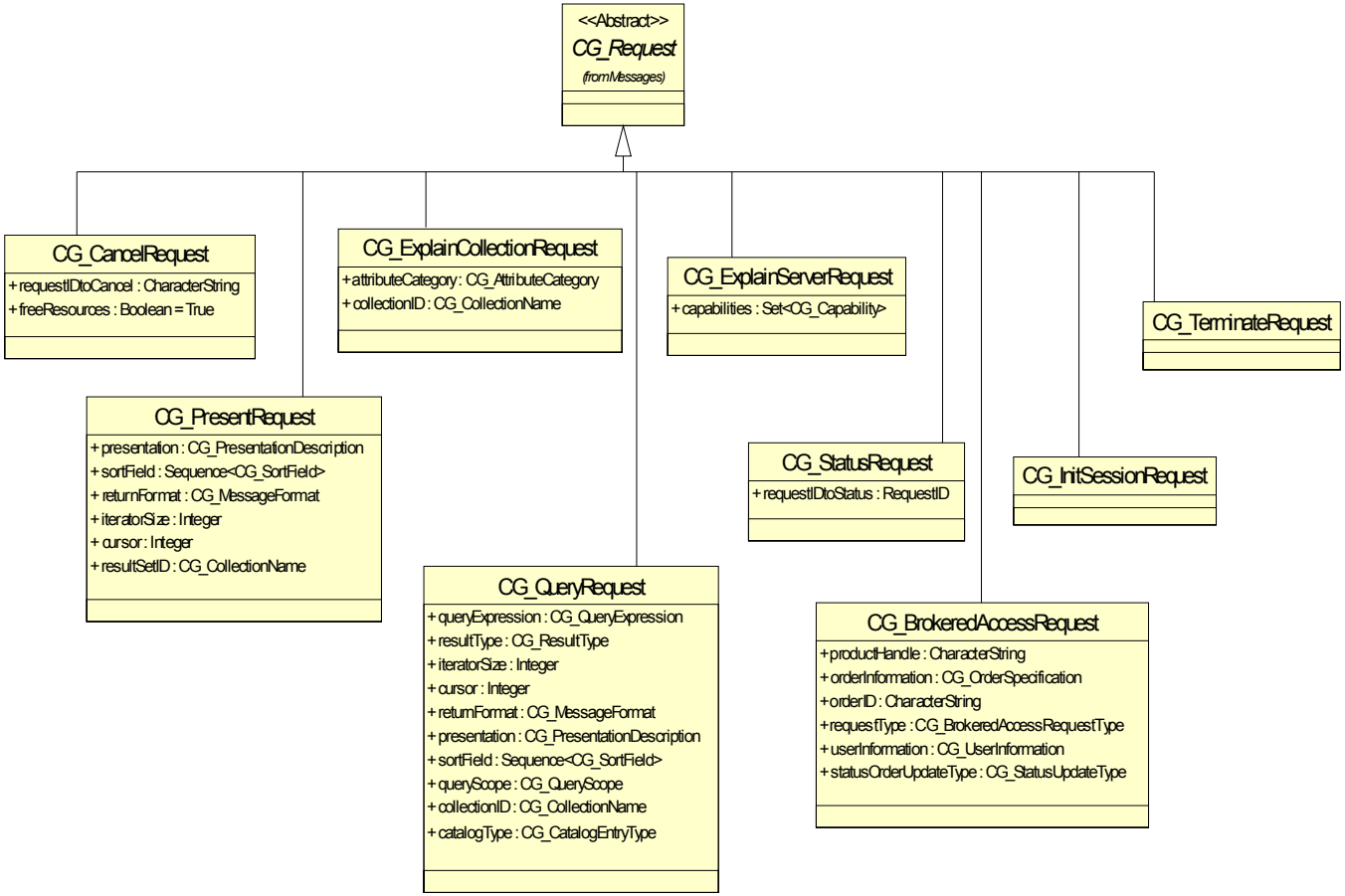


Figure 10 - Request Message Classes and Their Attributes (Parameters) Defined for OGC Coarse-Grain Catalog Interface Model

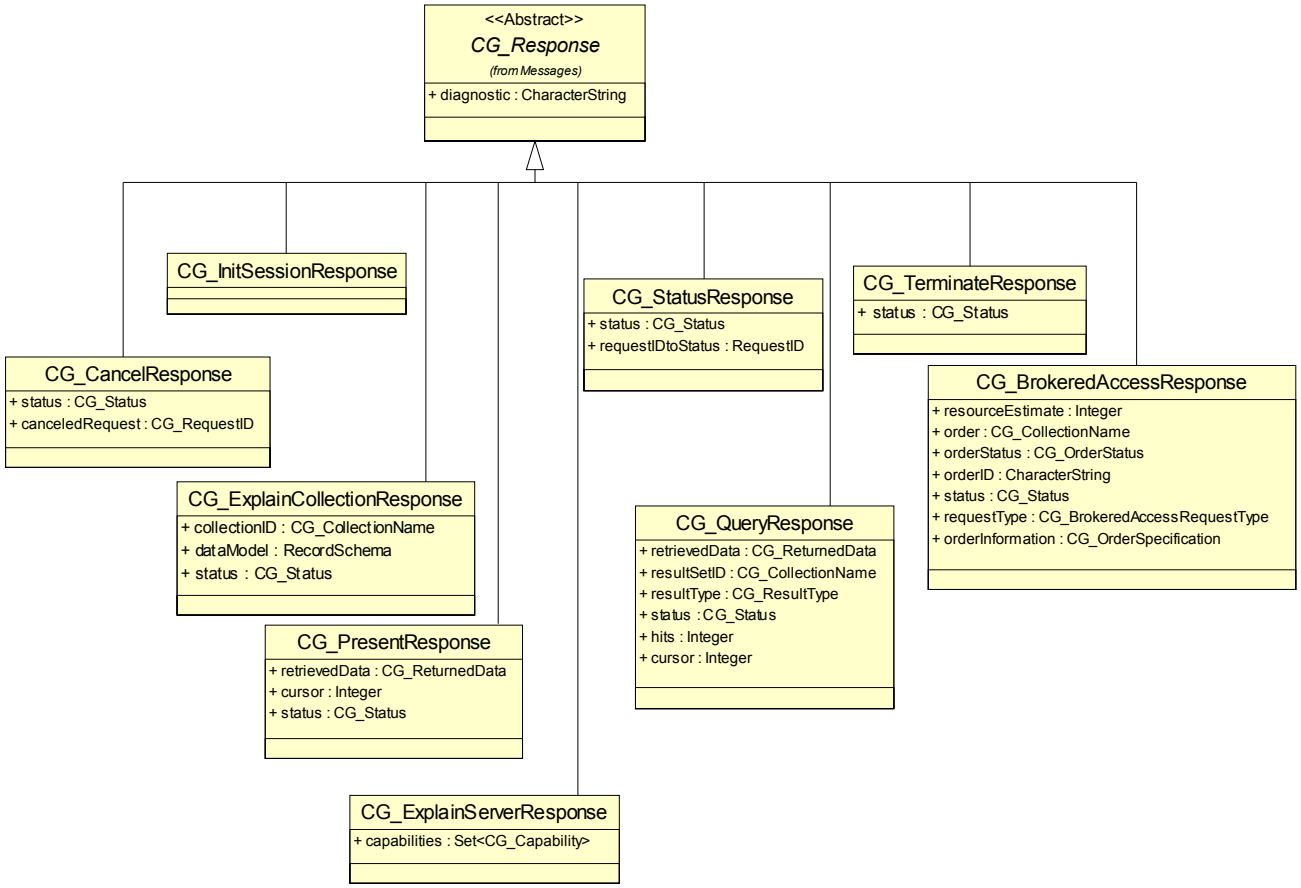


Figure 11 - Response Message Classes and Their Attributes (Parameters) Defined for OGC Coarse-Grained Catalog Interface Model.

7.2.3 CG_CatalogService Interface

Server level interfaces (i.e., those provided in the interface CG_CatalogService) provide access to the services that support the establishment and management of a user session. Core capabilities include the discovery of server capabilities, session initialization and termination and request status and termination. The specific operations put forth in the coarse-grained General Model supporting the CG_CatalogService Server are listed in Table 1.

Table 1 - The Operations of the CG_CatalogService Interface

Operation Name	Input Message Type	Returned Message Type	Function Provided
InitSession	CG_InitSession-Request	CG_InitSessionResponse	This operation generates a unique identifier used to track the context of session.
TerminateSession	CG_TerminateRequest	CG_TerminateResponse	This operation terminates the session
Status	CG_StatusRequest	CG_StatusResponse	This operation is used to check on the status of a current pending request.
CancelRequest	CG_CancelRequest	CG_CancelResponse	This operation is used to terminate any request.
ExplainServer	CG_ExplainServer-Request	CG_ExplainServer-Response	This operation lists all the conventions and services available during the current session.

All request messages generated for these interfaces must specify the Catalog Server in the destinationID parameter, and the sessionID is also needed in some instances. Catalog services are accessed through request messages, and the results returned through response messages. Errors in processing a request message are reported to the client by returning the appropriate response message using the diagnostic parameter to return the error status and error message and with all service specific parameters unpopulated.

7.2.3.1 CG_InitSessionRequest

The CG_InitSessionRequest message is used to establish a session between the Catalog Server and the Catalog Client. SessionID may be null in CG_InitSessionRequest. If a sessionID is supplied in CG_InitSessionRequest, the server is not obliged to accept the sessionID. The server is free to supply any SessionID in CG_InitSessionResponse.

CG_InitSessionRequest ::= sessionID destinationID requestID additionalInfo

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

Message Parameters: None

Message Operations: None

7.2.3.2 CG_InitSessionResponse

The CG_InitSessionResponse message is used to acknowledge the establishment of a session between the Catalog Server and the Catalog Client. This message provides the session identifier that will be used to establish the session context for each subsequent message.

CG_InitSessionResponse ::= sessionID destinationID requestID additionalInfo diagnostic

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

diagnostic ::= CharacterString

Message Parameters: None

Message Operations: None

7.2.3.3 CG_TerminateRequest

The CG_TerminateRequest message is used to terminate the current session. These messages originate at the client and are addressed to the catalog server. Upon receipt of the message, the Catalog Server will validate the message, stop all processing for that session and delete any queries and result sets.

CG_TerminateRequest ::= sessionID destinationID requestID additionalInfo

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

Message Parameters: None

Message Operations: None

7.2.3.4 CG_TerminateResponse

The server uses the CG_TerminateResponse message to deliver back to a client the completion status of a CG_TerminateRequest.

CG_TerminateResponse ::= sessionID destinationID requestID additionalInfo diagnostic status

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

diagnostic ::= CharacterString

status ::= CG_Status

7.2.3.4.1 Message Parameters:

status: Type = CG_Status

The Status parameter conveys the success or failure of the terminate request.

7.2.3.4.2 Message Operations: None

7.2.3.5 CG_ExplainServerRequest

The CG_ExplainServerRequest message is used to expose and negotiate the services and conventions governing this session. CG_ExplainServerRequest messages originate at the client. They are initially populated with the properties desired by that client using the capabilities parameter. Each capabilities component can be populated with either a value or a “wildcard”. When populated with a wildcard, the client is requesting the server to report on the options available for that capability. In response to a request, the server can confirm,

deny or report on each capability. Capabilities requested by value are confirmed by returning the same capability/value pair as requested. Capabilities requested by value that are not supported by the server are denied by not returning that capability. When reporting the server returns all of the values supported for a requested capability. The CG_Capability data type is described in Section 7.2.7.3

CG_ExplainServerRequest ::= sessionID destinationID requestID additionalInfo capabilities

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

capabilities ::= Set<CG_Capability>

7.2.3.5.1 Message Parameters:

capabilities: Type = Set<CG_Capability>

The capabilities parameter passes a list of CG_Capability data types specifying the capabilities and conventions of interest to the user. CG_Capability is a complex data type that is described in Section 7.2.5.

7.2.3.5.2 Message Operations: None

7.2.3.6 CG_ExplainServerResponse

The CG_ExplainServerResponse message is used to expose and negotiate the services and conventions governing this session. The capabilities parameter is received from the Explain Server request and populated with the data desired. The details of populating the response are given in the CG_ExplainServerRequest. This parameter is then inserted into the response message and returned to the user.

CG_ExplainServerResponse ::= sessionID destinationID requestID additionalInfo

diagnostic capabilities

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

diagnostic ::= CharacterString

capabilities ::= Set<CG_Capability>

7.2.3.6.1 Message Parameters:

capabilities: Type = Set<CG_Capability>

The capabilities parameter contains a list of CG_Capability data types detailing the capability and convention information requested by the user. CG_Capability is a complex data type that is described in Section 7.2.5.

7.2.3.6.2 Message Operations: None

7.2.3.7 CG_StatusRequest

The client uses the CG_StatusRequest message to discover the current status of any processing taking place as a result of a specific request. The server returning the current status of the request generates a CG_StatusResponse message.

CG_StatusRequest ::= sessionID destinationID requestID additionalInfo requestIDtoStatus

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

requestIDtoStatus ::= CG_RequestID

7.2.3.7.1 Message Parameters:

requestIDtoStatus: Type = CG_RequestID

The identifier of the Request that the user has initiated.

7.2.3.7.2 Message Operations: None

7.2.3.8 CG_StatusResponse

The CG_StatusResponse message is used by the server to deliver to the client the current status of any processing taking place relating to the specified request. The server generates these messages in response to a CG_StatusRequest message.

CG_StatusResponse ::= sessionID destinationID requestID additionalInfo requestIDtoStatus status

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

requestIDtoStatus ::= CG_RequestID

status ::= CG_Status

7.2.3.8.1 Message Parameters:

requestIDtoStatus: Type = CG_RequestID

The identifier of the Request for which this message is delivering information.

status: Type = CG_Status

The status parameter conveys the current status of the selected request.

7.2.3.8.2 Message Operations: None

7.2.3.9 CG_CancelRequest

The CG_CancelRequest message is used to terminate any request. It is assumed that in terminating a request that any result set or other resources associated with the request will be "garbage collected" by the server if freeResources is true. Upon receipt of the message, the Catalog Server will validate the message, stop all processing for the target and release appropriate resources dependent on the request.

CG_CancelRequest ::= sessionID destinationID requestID additionalInfo

requestIDtoCancel freeResources

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

requestIDtoCancel ::= CG_RequestID

freeResources ::= Boolean

7.2.3.9.1 Message Parameters:

requestIDtoCancel: Type = CG_RequestID

The identifier of the Request to be canceled.

freeResources: Type = Boolean

If set to FALSE, the partial result set is not deleted until the client terminates the session. Default value is TRUE.

7.2.3.9.2 Message Operations: None

7.2.3.10 CG_CancelResponse

The server uses the CG_CancelResponse message to report on the success or failure of an attempt to cancel a request.

CG_CancelResponse ::= sessionID destinationID requestID additionalInfo diagnostic

status canceledRequest

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

diagnostic ::= CharacterString

status ::= CG_Status

canceledRequest ::= CG_RequestID

7.2.3.10.1 Message Parameters:

status: Type = CG_Status

Indicates whether or not the cancel request was successful.

canceledRequest: Type = CG_RequestID

Identifier for the request object that was the target of the cancel request.

7.2.3.10.2 Message Operations: None

7.2.4 CG_Discovery Interface

The CG_Discovery Interface provides users a way to discover what data, services and other resources are available to them. These interfaces do not provide access to the resources themselves; rather, they provide information on what the resources are and how to access them. The specific operations of CG_Discovery are found in Table 2.

Table 2 - The Operations of the CG_Discovery Interface

Operation Name	Input Message Type	Returned Message Type	Function Provided
Query	CG_QueryRequest	CG_QueryResponse	This operation is used to search for data/services from a given catalog server and may return records from the result set.
Present	CG_PresentRequest	CG_PresentResponse	This operation is used to retrieve records from a result set created from the issuance of a query.
ExplainCollection	CG_ExplainCollection Request	CG_ExplainCollection -Response	This operation is used to explain the data model of the catalog.

7.2.4.1 CG_QueryRequest

The CG_QueryRequest message is used to request that the Catalog Server create a subset (Result Set) of the catalog holdings or to further subset an existing Result Set. CG_QueryRequest messages originate at the client. They are populated with the criteria to be used to select the Result Set and parameters governing the scope of the query and the format of the response. Upon receipt of the message, the Catalog Server will identify those elements of the query space to be included in the Result Set and create a Result Set containing those elements. Response to the client will be through the CG_QueryResponse message. Timing of the response message is governed by the resultType parameter.

CG_QueryRequest ::= sessionID destinationID requestID additionalInfo queryExpression resultType

iteratorSize cursor returnFormat presentation sortField queryScope

collectionID catalogType

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

queryExpression ::= CG_QueryExpression

resultType ::= CG_ResultType

iteratorSize ::= Integer

cursor ::= Integer

returnFormat ::= CG_MessageFormat

presentation ::= CG_PresentationDescription

sortField ::= Set<CG_SortField>

queryScope ::= CG_QueryScope

collectionID ::= CG_CollectionName

catalogType ::= CG_CatalogEntryType

7.2.4.1.1 Message Parameters:

queryExpression: Type = CG_QueryExpression

The queryExpression parameter contains the criteria used to subset the search space. CG_QueryExpression is formally defined in Section 7.2.7.

resultRecommended Implementation Type: Type = CG_ResultType

The resultType parameter is used to specify how the user wants the result set presented. CG_ResultType is formally defined in Section 7.2.7.

iteratorSize: Type = Integer

The iteratorSize parameter indicates the maximum number of result set entries to be returned in the CG_QueryResponse.

cursor: Type = Integer

The Cursor parameter identifies the first result set entry to be returned in the CG_QueryResponse.

returnFormat: Type = CG_MessageFormat

This parameter specifies the encoding standard to be used for returning the result set. CG_MessageFormat is formally defined in Section 7.2.7.

presentation: Type = CG_PresentationDescription

The Presentation parameter is only valid when results are requested returned directly in the CG_QueryResponse. This parameter informs the server which of the attributes in the result set elements are to be returned to the client. The CG_PresentationDescription parameter is defined in Section 7.2.7.

sortField: Type = Set<CG_SortField>

The sortField parameter specifies how the result set data is to be sorted prior to presentation. The CG_SortField type is defined in Section 7.2.7.

queryScope: Type = CG_QueryScope

The queryScope parameter is used to specify the size of the query space for distributed catalogs. CG_QueryScope is formally defined in Section 7.2.7.

See Section 6.10 for a discussion about distributed searching.

collectionID: Type = CG_CollectionName

This parameter identifies the search space for this query. A search space can be the catalog holdings, a result set, or a named subspace of the catalog holdings. CG_CollectionName is formally defined in section 7.2.7.

catalogType: type = CG_CatalogEntryType

The catalogType parameter specifies the types of catalog entries to query. CG_CatalogEntryType is an enumerated code list formally defined in Section 7.2.7.

7.2.4.1.2 Message Operations: None

7.2.4.2 CG_QueryResponse

The server uses the CG_QueryResponse message to report back to a client on the status of a CG_QueryRequest. The behavior of the CG_QueryResponse depends on the result type parameter as shown in Section **Error! Reference source not found.**. Additionally, the contents of the CG_QueryResponse depend on the result type parameter.

CG_QueryResponse ::= sessionID destinationID requestID additionalInfo diagnostic

retrievedData resultSetID resultType status hits cursor

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

diagnostic ::= CharacterString

retrievedData ::= CG_ReturnData

resultSetID ::= CG_CollectionName

resultType ::= CG_ResultType

status ::= CG_Status

hits ::= integer

cursor ::= Integer

7.2.4.2.1 Message Parameters:

retrievedData: Type = CG_ReturnData

The retrievedData parameter contains a subset of the results of this query request. It is organized and formatted as specified in the presentation, messageFormat, and sortField parameters. This parameter is only populated if resultType = Results. A formal definition of the CG_ReturnData type can be found in Section 7.2.7.

resultSetID: Type = CG_CollectionName

This parameter identifies the Result Set generated for the query. Further query, present and cancel requests for this Result Set will supply this value through the collectionID parameter. The CG_CollectionName type is defined in Section 7.2.7.

resultType: Type = CG_ResultType

The resultType parameter indicates how the server responded to the query request. CG_ResultType is formally defined in Section 7.2.7.

status: Type = CG_Status

The Status parameter conveys the success or failure of the query request. The CG_Status type is formally defined later in Section 7.2.7.

hits: Type = Integer

Indication of the number of entries in the result set.

cursor: Type = Integer

The Cursor parameter identifies the last item in the result set that was returned in this retrieved data set.

7.2.4.2.2 Message Operations: none

7.2.4.3 CG_PresentRequest

The CG_PresentRequest message is used to request that the Catalog Server deliver a portion of a Result Set. CG_PresentRequest messages originate at the client. CG_PresentRequest messages are populated with the identifier for the Result Set and parameters governing the format of the response. Upon receipt of the message, the Catalog Server will build a subset of the Result Set based on the specified cursor location, the iterator size, and the attributes defined in the presentation parameter. This subset will then be returned to the client through the CG_PresentResponse message.

CG_PresentRequest ::= sessionID destinationID requestID additionalInfo resultSetID presentation

sortField returnFormat iteratorSize cursor

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

resultSetID ::= CG_CollectionName

presentation ::= CG_PresentationDescription

sortField ::= Set<CG_SortField>

returnFormat ::= CG_MessageFormat

iteratorSize ::= Integer

cursor ::= Integer

7.2.4.3.1 Message Parameters:

presentation: Type = CG_PresentationDescription

The Presentation parameter informs the server which of the attributes in the result set elements are to be returned to the client. Presentation serves the same function and has the same format as the corresponding parameter in the CG_QueryRequest message. The CG_PresentationDescription parameter is defined in Section 7.2.7.

sortField: Type = Set<CG_SortField>

The sortField parameter specifies how the result set data is to be sorted prior to presentation. The CG_SortField type is defined in Section 7.2.7.

returnFormat: Type = CG_MessageFormat

This parameter specifies the encoding standard to be used for returning the result set. CG_MessageFormat is formally defined in Section 7.2.7.

iteratorSize: Type = Integer

The iteratorSize parameter indicates the maximum number of result set entries to be returned at one time.

cursor: Type = Integer

The Cursor parameter identifies the first result set entry to be accessed when traversing the result set.

7.2.4.3.2 Message Operations: None

7.2.4.4 CG_PresentResponse

The CG_PresentResponse message is used by the server to deliver to a client a subset of the Result Set. The server generates these messages in response to a CG_PresentRequest message.

CG_PresentResponse ::= sessionID destinationID requestID additionalInfo diagnostic retrievedData

cursor hits status

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

diagnostic ::= CharacterString

retrievedData ::= CG_ReturnData

cursor ::= Integer

hits ::= Integer

status ::= CG_Status

7.2.4.4.1 Message Parameters:

retrievedData: Type = CG_ReturnData

The retrievedData parameter contains a subset of the results of the query request. It is organized and formatted as specified in the presentation, returnFormat, and sortField parameters. A formal definition of the CG_ReturnData type can be found in Section 7.2.7.

cursor: Type = Integer

The Cursor parameter identifies the last item in the result set that was returned in this retrieved data set.

hits: Type = Integer

Indication of the number of entries in the result set.

status: Type = CG_Status

The Status parameter conveys the success or failure of the query request. The CG_Status type is formally defined in Section 7.2.7.

7.2.4.4.2 Message Operations: None

7.2.4.5 CG_ExplainCollectionRequest

The CG_ExplainCollectionRequest inquires for information on the data taxonomy (model) of a particular catalog or catalog collection.

CG_ExplainCollectionRequest ::= sessionID destinationID requestID additionalInfo

attributeCategory collectionID returnFormat

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

attributeCategory ::= CG_AttributeCategory

collectionID ::= CG_CollectionName

returnFormat ::= CG_MessageFormat

7.2.4.5.1 Message Parameters:

attributeCategory: Type = CG_AttributeCategory

This parameter allows the client to specify the types of attributes that they want data about. Currently defined values are queriable, presentable and all. CG_AttributeCategory is formally defined in Section 7.2.7.

collectionID: Type = CG_CollectionName

This parameter specifies the collection for which the client wants the data structure explained. CG_CollectionName is formally defined in Section 7.2.7.

7.2.4.5.2 Message Operations: None

7.2.4.6 CG_ExplainCollectionResponse

The CG_ExplainCollectionResponse returns the requested information on the data taxonomy of the selected catalog collection.

CG_ExplainCollectionResponse ::= sessionID destinationID requestID additionalInfo diagnostic collectionID dataModel returnFormat

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

diagnostic ::= CharacterString

collectionID ::= CG_CollectionName

dataModel ::= CG_SchemaID

status: Type = CG_Status

7.2.4.6.1 Message Parameters:

collectionID: Type = CG_CollectionName

This parameter specifies the collection from which the dataModel parameter was derived. CG_CollectionName is formally defined in Section 7.2.7.

dataModel: Type = CG_SchemaID

This parameter provides the data model information requested by the client. CG_SchemaID is formally defined in Section 7.2.7.

status: Type = CG_Status

The Status parameter conveys the success or failure of the request. The CG_Status type is formally defined in Section 7.2.7.

7.2.4.6.2 Message Operations: None

7.2.5 CG_Access Interface

The CG_Access Interface provides the user with a means to access the items located through the Discovery service. Access is divided into two categories, direct and brokered. Direct access is for those resources that are readily available over public interfaces such as the OGC Simple Features and Catalog. Methods for Direct Access are outside of the scope of the Catalog Interface, although the Catalog Interface will return a "handle" to the client to allow Direct Access. Not all resources can be accessed directly. Brokered access provides interfaces for gaining access to resources that are controlled. Controlled resources might include those for which the following applies:

1. a fee is charged,
2. have security limitations,
3. require additional processing or
4. are not available electronically.

The brokered access operation provides a means for the user to provide the necessary information to request access to a resource (i.e., order) and for the owner to provide the data necessary to achieve that access.

7.2.5.1 CG_BrokeredAccessRequest

The CG_BrokeredAccessRequest is a service requesting data that cannot be made available directly.

CG_BrokeredAccessRequest ::= sessionID destinationID requestID additionalInfo

productHandle orderInformation orderID requestType

userInformation statusOrderUpdateType

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

productHandle ::= CharacterString

orderInformation ::= CG_OrderSpecification

orderID ::= CharacterString

requestType ::= CG_BrokeredAccessRequestType

userInformation ::= CG_UserInformation

statusOrderUpdateType ::= CG_StatusUpdateType

7.2.5.1.1 Message Parameters:

productHandle: Type = CharacterString

The product handle is the identifier for a specific product taken from the catalog metadata for that product.

orderInformation: Type = CG_OrderSpecification

For CG_BrokeredAccessRequestType = orderEstimate or OrderQuoteAndSubmit,the specification of the current order request as provided as by the client or modified by the server during the estimation process.

For CG_BrokeredAccessRequestType = orderMonitor or orderCancel, CG_OrderSpecification is ignored and may not be supplied.

orderID: type = CharacterString

The orderID parameter provides a unique identifier for an order in progress. This ID can be used to inquire about the status of the order as it is being processed. For CG_BrokeredAccessRequestType = orderMonitor or orderCancel, orderID shall be supplied. For requestType = orderEstimate or OrderQuoteAndSubmit, orderID shall be empty.

requestType: Type = CG_BrokeredAccessRequestType

The request type parameter identifies the type of service the client needs from the server. Valid values are estimate, submit, monitor and cancel. Estimate is used to check if the order is valid and to request an estimate of resources required to fill the order. Submit is a request to order and deliver the products(s). Monitor provides the current status of the order. Cancel requests that the order be cancelled. The server must grant cancellation of the order. CG_BrokeredAccessRequestType is formally defined in Section 7.2.5.

userInformation: Type = CG_UserInformation

To receive products it is necessary to provide requester identification, billing and delivery data as part of the order. This parameter is used to provide that data.

statusOrderUpdateType : Type = CG_StatusUpdateType

How a given client likes to be kept informed about the status of a given order.

7.2.5.1.2 Message Operations: None

7.2.5.2 CG_BrokeredAccessResponse

The server generates the CG_BrokeredAccessResponse message in response to a CG_BrokeredAccessRequest.

CG_BrokeredAccessResponse ::= sessionID destinationID requestID additionalInfo diagnostic format orderStatus resourceEstimate order orderID status requestType

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

diagnostic ::= CharacterString

format ::= CG_MessageFormat

orderStatus ::= CG_OrderStatus

resourceEstimate ::= CharacterString

order ::= CG_CollectionName

orderID ::= CharacterString

status ::= CG_Status

requestType ::= CG_BrokeredAccessRequestType

orderInformation ::= CG_OrderSpecification

7.2.5.2.1 Message Parameters:

orderStatus Type ::= CG_OrderStatus

This parameter indicates the status of the order. The status of the order is different than the status of a CG_Access message. The status of the message is reported in the response in the status parameter. The CG_OrderStatus type is formally defined in Section 7.2.5 of this specification.

resourceEstimate: Type = CharacterString

This parameter reports back on the resources needed to process and/or deliver the requested resource. Examples of these resources are time until delivery and cost.

order: Type = CG_CollectionName

The order parameter returns a name or id of the requested product object online. This parameter can be used for direct access (such as through simple features) to the online product. The CG_CollectionName type is formally defined in Section 7.2.5 of this specification.

orderID: type = CharacterString

The orderID parameter provides a unique identifier for an order in progress. This ID can be used to inquire about the status of the order as it is being processed. This number is generated by the server in response to a CG_BrokeredAccessRequest where requestType = orderEstimate or OrderQuoteAndSubmit

status: Type = CG_Status

The Status parameter conveys the status of the requested product. The CG_Status type is formally defined in Section 7.2.5.

requestType: Type = CG_BrokeredAccessRequestType

The request type parameter identifies the type of service the client needs from the server. CG_BrokeredAccessRequestType is formally defined in Section 7.2.5.

orderInformation: Type ::= CG_OrderSpecification

For CG_BrokeredAccessRequestType = orderEstimate or OrderQuoteAndSubmit, the specification of the current order request as provided as by the client or modified by the server during the estimation process. .

For CG_BrokeredAccessRequestType = orderMonitor or orderCancel, CG_OrderSpecification is ignored and may not be supplied.

7.2.5.2.2 Message Operations: None

7.2.6 CG_CatalogManager Interface

Note: The contents of this section are preliminary and incomplete

The design of these interfaces is planned for

A Future Version of this specification

The CG_CatalogManager Interface provides for the maintaining and updating of a catalog service. The operations defined for this interface are listed in Table 3.

Table 3 - The Operations of the CG_CatalogManager Interface

Operation Name	Input Message Type	Returned Message Type	Function Provided
createCatalog	CG_CreateCatalogRequest	CG_CreateCatalogRequest	This operation is performed to start the process of creating a new catalog or a new set of catalog entries of an existing catalog service.
createMetadata	CG_CreateMetadataRequest	CG_CreateMetadataResponse	This operation is initiated to create metadata about a given set of products held in a catalog.
updateCatalog	CG_UpdateCatalogRequest	CG_UpdateCatalogResponse	This operation is used to update the contents of a given catalog service.
deleteCatalog	CG_DeleteCatalogRequest	CG_DeleteCatalogResponse	This operation is used to delete the contents of a given catalog service entry (entries).

7.2.6.1 CG_CreateCatalogRequest

A client with the appropriate user privileges uses this message to add new information to a catalog service.

CG_CreateCatalogRequest ::= sessionID destinationID requestID additionalInfo

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

Message Parameters: TBD

Message Operations: TBD

7.2.6.2 CG_CreateCatalogResponse

This message is used/sent by the server to acknowledge/accept the request to add new information to the catalog.

CG_CreateCatalogResponse ::= sessionID destinationID requestID additionalInfo diagnostic

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

diagnostic ::= CharacterString

Message Parameters: TBD

Message Operations: TBD

7.2.6.3 CG_CreateMetadataRequest

A client that has the appropriate user privileges uses this message to add metadata entries to a catalog.

CG_CreateCatalogRequest ::= sessionID destinationID requestID additionalInfo

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

Message Parameters: TBD

Message Operations: TBD

7.2.6.4 CG_CreateMetadataResponse

This message is used/sent by the server to acknowledge/accept the request to add new metadata entries to the catalog.

CG_CreateCatalogResponse ::= sessionID destinationID requestID additionalInfo diagnostic

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

diagnostic ::= CharacterString

Message Parameters: TBD

Message Operations: TBD

7.2.6.5 CG_UpdateCatalogRequest

A client that has the appropriate user privileges uses this message to update various types of information (e.g., data or metadata) to a catalog.

CG_UpdateCatalogRequest ::= sessionID destinationID requestID additionalInfo

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

Message Parameters: TBD

Message Operations: TBD

7.2.6.6 CG_UpdateCatalogResponse

The server uses/sends this message to acknowledge/accept the request to update various types of information (e.g., data or metadata) to a catalog.

CG_UpdateCatalogRequest ::= sessionID destinationID requestID additionalInfo diagnostic

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

Message Parameters: TBD

Message Operations: TBD

7.2.6.7 CG_DeleteCatalogRequest

A client with appropriate user privileges uses this message to delete various types of information (e.g., data or metadata) to a catalog.

CG_UpdateCatalogRequest ::= sessionID destinationID requestID additionalInfo

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

Message Parameters: TBD

Message Operations: TBD

7.2.6.8 CG_DeleteCatalogResponse

This message is used/sent by the server to acknowledge/accept the request to delete various types of information (e.g., data or metadata) to a catalog.

CG_UpdateCatalogRequest ::= sessionID destinationID requestID additionalInfo diagnostic

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

Message Parameters: TBD

Message Operations: TBD

7.2.7 Parameter Type Definitions

This section provides definitions for all of the parameter data types used in Request-Response Message Pairs. These definitions assume the use of the OGC well known data types where applicable.

7.2.7.1 CG_AttributeCategory

Recommended Implementation Type: Code_List

Used By: CG_ExplainCollectionRequest

CG_AttributeCategory is a code list for selecting the types of catalog entry attributes to be exposed by an explain request. The valid values for this type are the following:

Table 4 - Attribute Category Values

Value	Explanation
queriable	Attributes can be queried
presentable	Attributes are only displayed, not queried
both	Attributes that can be queried and presented

7.2.7.2 CG_BrokeredAccessRequestType

Recommended Implementation Type: Code_List

Used By: CG_BrokeredAccessRequest

CG_BrokeredAccessRequestType is a code list for identifying the nature of a brokered access request. Valid values for this type are shown in Table 6.

Table 6 - Brokered Access Request Types

Value	Explanation
orderEstimate	Validate and obtain the estimate of an order specification
orderQuoteAndSubmit	Obtain a quote and subsequently submit an order specification
orderMonitor	Monitor the progress of an order request
orderCancel	Cancel an order request

7.2.7.3 CG_Capability

Recommended Implementation Type: Complex data structure

Used By: CG_ExplainServerRequest, CG_ExplainServerResponse

Uses: CG_AllSupportedRequest, CG_Defaults, CG_Explain, CG_Query, CG_Messaging, CG_Session, CG_SoftwareInformation, CG_SupportedCollections

CG_Capability is a super class for organizing descriptions of catalog capabilities and session conventions. It is a collection of subtypes (subclasses) that can be aggregated together into a single data entity in the CG_ExplainServerRequest and CG_ExplainServerResponse. Each subtype addresses a specific piece of data relating to the interactions between a client and the server Figure 11 shows the Capability Class and its subclasses that have been defined for the Catalog General Interface Model.

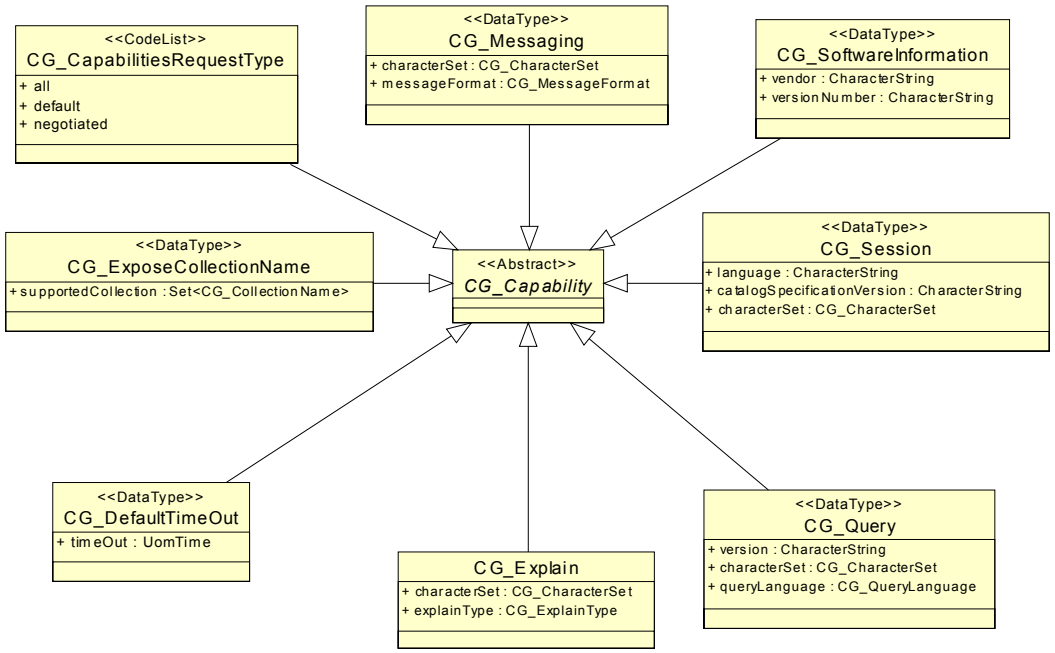


Figure 11 - Static Class Diagram showing CG_Capability Class and Its Instantiated Subtypes.

7.2.7.3.1 CG_CapabilitiesRequestType

Recommended Implementation Type: Code_List

Used By: CG_Capability

This is a subtype of capabilities that allows for the request and response of specific capability structures using the following code list values:

Table 5 - Capability Types

Value	Explanation
all	Return full set of capabilities
default	Return only default (preferred) capabilities
negotiated	Responds to client-requested capabilities or alternatives if not supported

Parameter is only submitted as part of a request message from the client. When this parameter is null or all, the response shall include a complete list of all capabilities supported by the server.

7.2.7.3.2 CG_DefaultTimeOut

Recommended Implementation Type: DataType

Used By: CG_Capability

This parameter is the default time out that a client can set for a session. After a period of no activity in a session, the server may unilaterally close a session without notification to the client (see Section 3.1). The server must be prepared to respond to client request for a session that has timed out by returning the paired response containing a diagnostic indicating that the session does not exist. The single parameter in CG_DefaultTimeOut is the default time out and it is specified using the UomTime data type from the OGC Basic Package[1], Unit of Measure.

7.2.7.3.3 CG_Explain

Recommended Implementation Type: data structure composed of explainType and characterSet

Used By: CG_Capability

Uses: CG_QueryLanguage, CG_CharacterSet

This parameter provides information on the explain supported by the server. This is a data structure composed of the following elements:

characterSet: (type = CG_CharacterSet) specifies the expected character set.

explainRecommended Implementation Type: (type = CG_ExplainType) specifies the level or type of Explain supported.

7.2.7.3.4 CG_Messaging

Recommended Implementation Type: Data structure

Used By: CG_Capability

Uses: CG_CharacterSet, CG_MessageFormat

The CG_Messaging parameter is a data structure containing data describing the messaging conventions a particular server observes. Sub-types of the messaging type are:

characterSet: (type = CG_CharacterSet) describes the character sets supported

---

[1] OGC Basic Package: see OpenGIS project document 99-005r3, January 1993.

messageFormat: (type = CG_MessageFormat) describes the formatting of the messages.

7.2.7.3.5 CG_Query

Recommended Implementation Type: data structure composed of version, characterSet and queryLanguage fields

Used By: CG_Capability

Uses: CG_QueryLanguage, CG_CharacterSet

This parameter provides information on one of the query languages supported by the server. This is a data structure composed of the following elements:

version: (type = character string) specifies the version of queryLanguage supported.

characterSet: (type = CG_CharacterSet) specifies the expected character set.

queryLanguage: (type = CG_QueryLanguage) specifies the query language supported.

7.2.7.3.6 CG_QueryLanguage

Recommended Implementation Type: Code_List

Used By: CG_Query, CG_QueryExpression

This code list contains the query languages supported by a given catalog server that the client has initiated a session with. OGC_Common is the default for all implementations. The list of query languages follows:

OGC_Common

Z3950_TypeOne

SQL3_SimpleFeature

SQL2_SimpleFeature

The OGC_Common query language is defined in Section 8. All implementations must support OGC_Common.

7.2.7.3.7 CG_Session

Recommended Implementation Type: Data Structure

Used By: CG_Capability

Uses: CG_CharacterSet

The CG_Session parameter contains data describing the constraints on any sessions supported by a server. This is a data structure containing the following elements:

language: (type = Character String) – language supported by the interface

catalogSpecificationVersion: (type = Character String) – OGC Catalog compliance version

characterSet: (type = CG_CharacterSet) – character set used for text encoding

7.2.7.3.8 CG_SoftwareInformation

Recommended Implementation Type: Data structure

Used By: CG_Capability

This parameter is a CG_Capability type used to identify the vendor and version number of the server software suite. CG_SoftwareInformation is a data structure containing the following elements:

vendor: (type = Character String) – name of the software manufacturer

SWversionNumber: (type = Character String) – version number of this release

IFversionNumber (type = Character String) – version number of OGC Catalog Interface supported by the software suite.

7.2.7.3.9 CG_SupportedCollections

Recommended Implementation Type: set<CG_CollectionName>

Used By: CG_ExposeCollectionName

Uses: CG_CollectionName

A capability used for requesting and returning the collections that the server has knowledge of and can provide access to a client request.

7.2.7.4 CG_CatalogEntryType

Recommended Implementation Type: Code_List

Used By: CG_QueryRequest, CG_PresentResponse

A catalog contains several different types of data. This parameter provides for the selection of one of those types for processing. It is implemented as a code list that takes the following values:

Data set – the lowest level packaging of Features that have been cataloged

Data set collection – a grouping of data sets that have commonality (ISO 19115: data set series)

Service – a set of interfaces that provide access to or operations on data (e.g. catalog service)

7.2.7.5 CG_CharacterSet

Recommended Implementation Type: Code_List

Used By: CG_Messaging, CG_Query, CG_Session

This parameter type represents one of the standard computer character representation systems. It is implemented as a code list that takes the following values:

ASCII

UniCode

Shift-JIS

7.2.7.6 CG_CollectionName

Recommended Implementation Type: Union data

Used By: CG_QueryRequest, CG_QueryResponse, CG_ExplainCollectionRequest, CG_ExplainCollectionResponse, CG_BrokeredAccessResponse, CG_ReturnData

Collection Name is a type that identifies a catalog data resource. It can point to a catalog, catalog entry, named catalog subspace, named catalog superspace or a result set. This type is a union of two base types:

collection ID (character string)

collection Name (character string).

7.2.7.7 CG_Record

Recommended Implementation Type: Collection of name-value pairs

Used By: CG_Schema

A record is name-value pair association implemented as a simple look-up and query mechanism that associates keys (of a selected type) to values. Most commonly used for finding attributes by name within a record or record-like associative memory.

select – return a value using a key

insert – add a value using a key

delete – delete a value using a key

keylist – list the keys

7.2.7.8 CG_MessageFormat

Recommended Implementation Type: Code_List

Used By: CG_QueryRequest, CG_PresentRequest, CG_Messaging

CG_MessageFormat is an enumerated code list of the available formats for encoding a returned data set. Valid values for this type are:

XML

HTML

TXT

7.2.7.9 CG_OrderItem

Recommended Implementation Type: Data Structure

Used by: GC_BrokeredAccessRequestType

This data structure contains the specification of a single order item (i.e. e. the product that is ordered and that is to be delivered):

- productId, which is the identifier of the ordered product.
- productPrice, which is the price of the product.
- productDeliveryOptions, which contains delivery options for the product.
- processingOptions, which specifies the processing options that are to be applied on the product before delivery.
- sceneSelectionOptions, which specifies the selection of the scene from the whole product that is to be delivered.

7.2.7.10 CG_OrderSpecification

Recommended Implementation Type: Data Structure

Used By: CG_BrokeredAccessRequest

The specification of the order request as provided as input by the client if CG_BrokeredAccessRequestType = orderEstimate or OrderQuoteAndSubmit.

The structure contains the following information about the product specification:

- orderCentreID – identifies the order center at which the order will be performed
- orderPrice –the price for the whole order
- orderDeliveryDate - the latest date at which the order can be expected to be delivered to the user.
- orderCancellationDate – the latest date at which the user can cancel the order.
- deliveryMethod – how the order will be delivered to the user: e-mail, ftp or mail.
- package – contains the definition of how the packages which compose the order

7.2.7.11 CG_OrderStatus

Recommended Implementation Type: Code_List

Used By: CG_BrokeredAccessResponse

CG_ OrderStatus is a code list for identifying the status of an order. Valid values for this type are:

Table 8 - Order Status Codes

Value	Explanation
orderBeingEstimated	the order is currently being estimated by the target order handling system. An Estimate is an approximation only.
orderEstimated	indicates that the order has been successfully validated and that an estimate is provided.
orderBeingQuoted	the order is currently being quoted by the target order handling system. A Quote shall be considered contractually binding.
orderBeingProcessed	the order is currently being processed by the target order handling system.
orderCompleted	processing of order has been completed.
orderNotValid	the order has not been successfully validated.

orderCancelled	the order has been cancelled

7.2.7.12 CG_PackageSpecification

Recommended Implementation Type: Data Structure

Used By: CG_BrokeredAccessRequest, CG_OrderSpecification, CG_PackagingType

The specification of a single package or multiple packages.

The structure contains the following information about the packaging order:

- packageId – the identifier of the ordered package
- packagePrice –the price for the package
- package – the detailed information concerning the specification of package. (See packagingType)
- packageMedium –the medium on which the package will be delivered to a user.
- packageSize – the size of the package in kilobytes.

7.2.7.13 CG_PackagingType

Recommended Implementation Type: Code List

Used By: CG_PackageSpecification, CG_BrokeredAccessRequest
The specification of the packaging method used to deliver an order to a user.

- predefinedPackage: A package predefined by the given catalog service
- adhocPackage: A package constructed of OrderItems to fulfill a particular order

7.2.7.14 CG_PaymentMethod

Recommended Implementation Type: Code_List

Used By: CG_UserInformation

This code list contains the payment methods for an order secured through using a CG_Access operation. The supported methods are the following:

- credit
- cash

- purchaseOrder

7.2.7.15 CG_PredefinedPresentationType

Recommended Implementation Type: Code_List

Used By: CG_PresentationDescription

This parameter is a code list defining pre-defined query presentation descriptions supported by a data server. Current values that this parameter can take are:

- full - includes all defined standard elements from the information community schema. This is a large set of elements, but it ensures that clients receive everything their users may need to evaluate the retrieval record for further processing. Note that, while all schema elements are returned, some elements may be meaningless for the record that is actually returned, and may contain undefined values.

- brief - includes a minimal subset of the defined standard information community schema elements available from the appropriate database schema.

7.2.7.16 CG_PresentationDescription

Recommended Implementation Type: Data Union

Used By: CG_QueryRequest, CG_PresentRequest
Uses: CG_PredefinedPresentationType, RecordType

This parameter type contains the name and types of the requested attributes that will be returned by a query or present request. Alternately, this parameter may be the name of a Predefined Presentation Type.

- attributes: (type = sequence<RecordType>) – list of attribute name/type pairs

- name: (type = CG_PredefinedPresentationType) –), identifying a predefined presentation type.

7.2.7.17 CG_QueryExpression

Recommended Implementation Type: Data Structure

Used By: CG_QueryRequest

Uses: CG_QueryLanguage

CG_QueryExpression contains a description of the query language being used and the query string. The query string is a character string. The query language is specified using the CG_QueryLanguage type.

- theQuery: (type = CharacterString) – the text defining the query
- theNamespace: (type = CharacterString) – where the attributes used in theLanguage are defined.
- theLanguage: (type = CG_QueryLanguage) – the query language being used

7.2.7.18 CG_QueryScope

Recommended Implementation Type: Code_List

Used By: CG_QueryRequest

CG_QueryScope is a code list describing the size of the search space for a query. Current valid values for this type are:

distributed

local

See Section 6.10 for a discussion of distributed search behavior.

7.2.7.19 CG_RequestID

Recommended Implementation Type: Data Structure

Used By: CG_Message, CG_StatusRequest, CG_CancelRequest, CG_CancelResponse

CG_RequestID is a compound number used to uniquely identify a specific request in a global context. The client creates these parameters from two values, the SessionID and a counter. The Session ID provides a globally unique identifier for this request context. A counter provides a session unique identifier. Joined together, they form a globally unique identifier for a request.

sessionID: (type = uint) – globally unique session identifier

counter: (type = uint) – session unique identifier

7.2.7.20 CG_ResultType

Recommended Implementation Type: Code_List

Used By: CG_QueryRequest, CG_QueryResponse

CG_ResultType is a code list describing the type of data to be returned in a query response message and the behavior of the message response (see Section 3.1). Current valid values for this type are:

validate - the CG_QueryResponse is returned as soon as CG_QueryRequest has been determined to be valid. Query processing continues after the CG_QueryResponse is returned. CG_Status will be set to 'failure' in case of an invalid query and to 'processing ' in case of a valid query. Reasons for failure are provided in the diagnostic of CG_QueryResponse.

resultSetID - the CG_QueryResponse is returned as soon as the resultSetID is available and the query has completed processing.

hits- the CG_QueryResponse is returned as soon as the query has completed processing and the number of hits has been determined. Metadata records are not returned in the CG_QueryResponse

results - the CG_QueryResponse is returned as soon as the query has completed processing and the results have been formatted for return. Metadata records are returned in the CG_QueryResponse

7.2.7.21 CG_ReturnData

Recommended Implementation Type: Data Structure

Used By: CG_QueryResponse, CG_PresentResponse

Uses: CG_MessageFormat

CG_ReturnData is a data type for packaging result set elements for return to the client. This data structure contains two components. The encoding component identifies the technique used to encode the result set data. The payload component contains the actual encoded data.

encoding: (type = CG_MessageFormat) – this component identifies the encoding technique used to package the catalog data. It is of type CG_MessageFormat which is defined in Section 7.2.7.8.

payload: (type = CharacterString) – payload is a “blob” for holding the returned catalog data. The structure of this component is defined by the encoding parameter.

7.2.7.22 CG_Schema

Recommended Implementation Type: Complex Data

Used By: CG_SchemaID

Table 9 - Minimal Mandatory Attribute Definitions

Name	Single or multi word designation assigned to a data element.
Definition	Statement that expresses the essential nature of a data element and permits its differentiation from all other data elements.
Representation Category	Type of symbol, character or other designation used to represent a data element.
Form of Representation	Name or description of the form of representation for the data element, e.g. 'quantitative value', 'code', 'text', 'icon'.
Datatype of data element values	A set of distinct values for representing the data element value.

7.2.7.23 CG_SchemaID

Recommended Implementation Type: Union Data

Used By: CG_ExplainCollectionResponse

Uses: CG_Schema, SchemaName

The CG_SchemaID is a data type used to represent the schema of a data, feature or catalog collection. It is a union of two elements, a named identifier for a well known schema, or an element of type CG_Schema.

schemaName : (type = CharacterString)

schema := (type = CG_Schema)

7.2.7.24 CG_SortField

Recommended Implementation Type: Data Structure

Used By: CG_QueryRequest, CG_PresentRequest

Uses: CG_SortOrder

CG_SortField provides sorting information to the server for formatting data returned to the client. This type consists of an attribute name and sort order descriptor. The attribute name identifies the result set attribute type to be sorted on. The sort order descriptor is of the CG_SortOrder type.

attributeName: (type = character string) – name of attribute to sort on

sortOrder: (type = CG_SortOrder) – how the attributes are to be ordered by the sort

7.2.7.25 CG_SortOrder

Recommended Implementation Type: Code_List

Used By: CG_SortField

CG_SortOrder is an enumerated code list for defining how a value is to be sorted. The current valid values for this type are shown in Table 10.

Table 10 - Sort Order Operations

OPERATOR	DESCRIPTION
Ascending	Sort in ascending alphanumeric order based on the attribute
Descending	Sort in descending alphanumeric order based on the attribute

7.2.7.26 CG_Status

Recommended Implementation Type: Code_List

Used By: CG_TerminateResponse, CG_StatusResponse, CG_CancelResponse, CG_PresentResponse, CG_BrokeredAccessResponse

CG_Status is a code list for representing the current status of a resource or request. The valid values for this type are the following:

- success: the request has been processed without error.
- successResultsAvailable: the request has been processed without error and outputs of the processing can be retrieved.
- processingNormal: the requested operations have begun but are not completed. No errors have been identified.
- processingQueued: the requested operations have begun but are not completed. No errors have been identified. The processing has been temporally suspended and will resume when other processing has been completed.

- processingPausedOrSuspended: the requested operations have begun but are not completed. No errors have been identified. The processing has been temporally suspended and will resume when triggered by an external event.

- failure: the request could not be completed due to errors being encountered. On a best effort basis the server has returned to the state prior to the request.

- failureAccessDenied : the request could not be completed because the privileges of the client did not permit the operation. On a best effort basis the server has returned to the state prior to the request.

7.2.7.27 CG_StatusUpdateType

Recommended Implementation Type: Code List

Used By: CG_OrderStatusUpdateType

This parameter defines how the user requesting the order desires to be kept informed about the order processing.

- manual: The user performs the status request using the Catalog Interface

- automatic: The OHS filling the order provides status updates for the user via email

7.2.7.28 CG_UserInformation

Recommended Implementation Type: Data Structure

Used By: CG_BrokeredAccessRequest

This parameter type is a data structure used to provide information about the user.

- userName: (type = Character String) – name of the user

- userAddress: (type = CharacterString) – billing, home or delivery address of user

- phoneNumber: (type = CharacterString) – home or office phone number for user

- faxNumber: (type = CharacterString) – home or office fax number for user

- emailAddress: (type = CharacterString) – e-mail address for the user

- NetAddress: (type = CharacterString) – Address of the users' primary computer.

- PaymentMethod: (type = CG_PaymentMethod) – defines the payment method

7.2.7.29 RecordType

Recommended Implementation Type: MetaClass

Used By: CG_PresentationDescription

A set of AttributeName - AttributeType pairs. A structural metadata entity for controlling the instances of the class Record.

7.3 Dynamic Model

The Catalog Interface defines a stateful session (a stateless interface will be added in future versions of the Implementation Specification). This section defines the states of the session and the allowed transitions between the states. All other state transitions are disallowed and are consider errors if exhibited by a server.

A physical server may support more than one session. Each of the sessions are independent when viewed from the interface defined by this specification.

In the state models below, a transition is typically triggered by a request. Following the messaging model introduced earlier, a CG_Request is paired with a CG_Response. Generally, a transaction in this model is bounded by a request-response pair. Note that a transaction can be statused or cancelled while it is active, i.e., before a response is issued. Once the server has sent a CG_Response, the server treats the receipt of a CG_StatusRequest (or CG_CancelRequest) as an error, to which it responds gracefully. Gracefully means that the server should respond with a CG_StatusResponse (or a CG_CancelResponse) with a diagnostic indicating that the RequestIDtoStatus (or the RequestIDtoCancel) is not recognized. The server shall not change state in response to a CG_StatusRequest (or CG_CancelRequest) when the transaction is complete, i.e., a CG_Response has been sent.

7.3.1 UML State Diagram Notation

The state diagrams in the following sections use the UMLnotation. Figure 12 provides a summary of the UML notation used in the following sections. Transitions are the paths between states. A transition will occur if the event occurs and the guard condition is true. If a transition occurs, the Action is completed prior to entering the next state.

Composite states contain multiple sub-states. Both the Sequential Composite State and the Concurrent Composite State types are used in model for the Catalog Interface. In a Sequential Composite State only one sub-state is active at any given time. UML defines that when a transition enters Concurrent Composite State all of the sub-states are active, although some of the sub-states may remain in the Initial State. When exiting a composite state, all sub-states are exited as well.

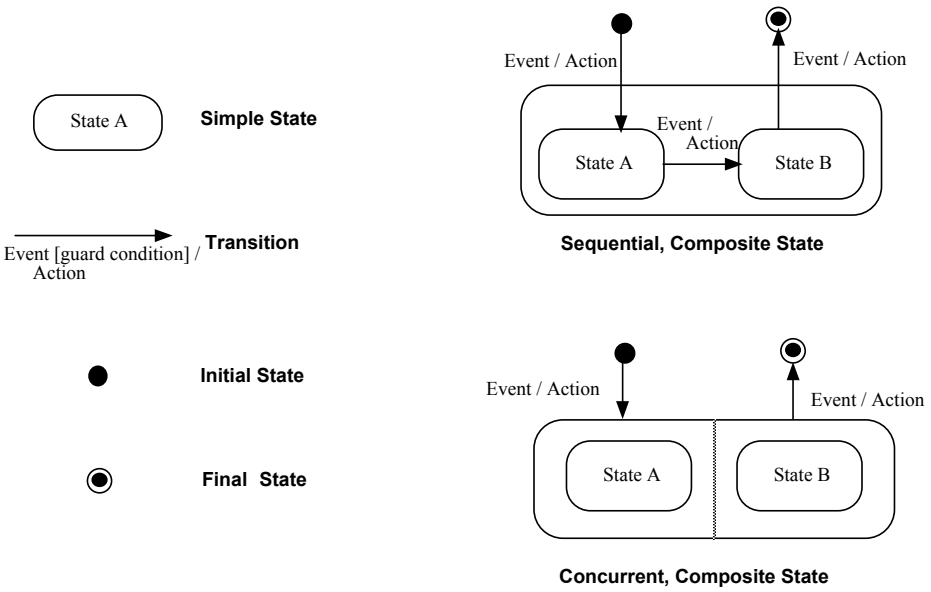


Figure 12 - UML State Diagram Notation

7.3.2 Catalog Server State Machine

The top-level state diagram for the Catalog Interface is shown in Figure 13. After a successful initialization, the session will be in the Main state. The Main state is a concurrent, composite state, consisting of four substates: Discovery, Access, Management, and Explain. While in the Main state, CG_Requests (other than CG_TerminateRequest) may cause transitions internal to the substates. To determine what transition occurs for the various CG_Requests, the internals of the substates must be examined. (If a server does not support interfaces associated with a substate, the substate is not present for sessions with that server. For example, if the server does not support CG_access, then the Access Substate is not present.)

When a CG_TerminateRequest is received, the session will transition from any the Main state to the end state, ending all processing associated with the substates of Main. The Catalog Session state diagram allows the server to end a session after a designated, configurable duration, i.e., timeout. When a session times-out, the server closes the session without notification to the client. The server must be prepared to respond to client requests for a session that has timed out by returning the paired response containing a diagnostic indicating that the session does not exist.

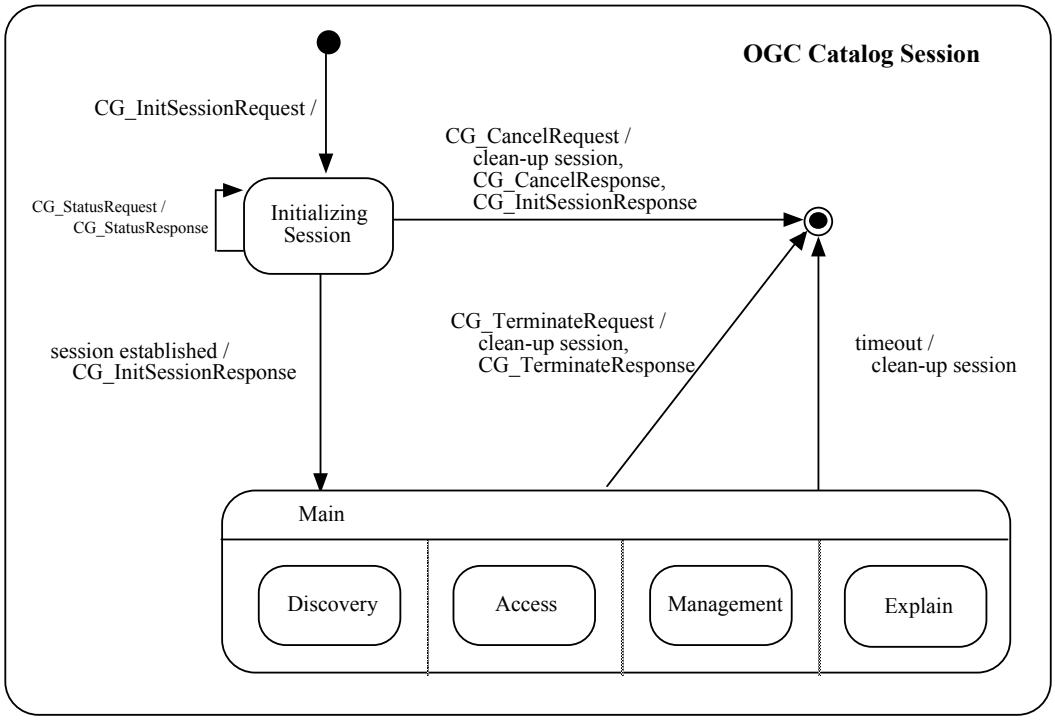


Figure 13 - Catalog Session State Diagram

7.3.3 Discovery State

Two views of the Discovery State diagram are provided: Figure 14 shows an abbreviated state diagram, Figure 15 shows the complete Discovery state diagram. The abbreviated version is only provided to assist the reader in understanding the complete diagram.

A session can be in the Discovery substate, once a successful initialization has occurred at which time the Discovery substate will be in the initial state. Upon receiving any CG_QueryRequest, the Discovery state will transition to the Processing Query state. Transitions leaving the Processing Query state are dependent upon the resultType that was requested in the CG_QueryRequest that caused entry into the Processing Query state. The four potential values for resultType are Validate, Result Set ID, Hits, Results. If a CG_PresentRequest is sent by the client prior to the query completing, the session will transition to the Processing Query and Formatting Results state. The formatting of records and a CG_PresentResponse must occur causing a transition to the Processing Query state, prior to completing the query and sending a CG_QueryResponse, if necessary.

When the query completes and the resultType was not Results, the state will transition to the Idle state, sending a CG_QueryResponse unless the resultType was Validate, in which case a response has already been sent. When the resultType was Results, the state will pass to the Formatting Records for Query state, until the results are ready and a CG_QueryResponse containing the records can be sent. While in the Idle state, a CG_PresentRequest may be sent by the client, in which case, if a result set is present, the state will transition to the Formatting Records state, until the results are ready and a CG_QueryResponse containing the records

can be sent. As will be seen in the next diagram, there need not be a result set when the Discovery substate is Idle. If no result set is present while in the Idle state and a CG_PresentRequest is received, the state will not transition and a CG_PresentResponse will be returned with a diagnostic.

If a CG_QueryRequest is received while in the Idle state, the result set for the session, if present, will be reset, and the state will transition to the Processing Query state, creating a new result set. A catalog session can only have a single result set. (Future enhancements of the Catalog Interface may allow multiple result sets to exist in a session.) The result set is also deleted when a CG_TerminateRequest is received and the Catalog Interface state, which includes the Discovery substate, transitions from Main to the end state.

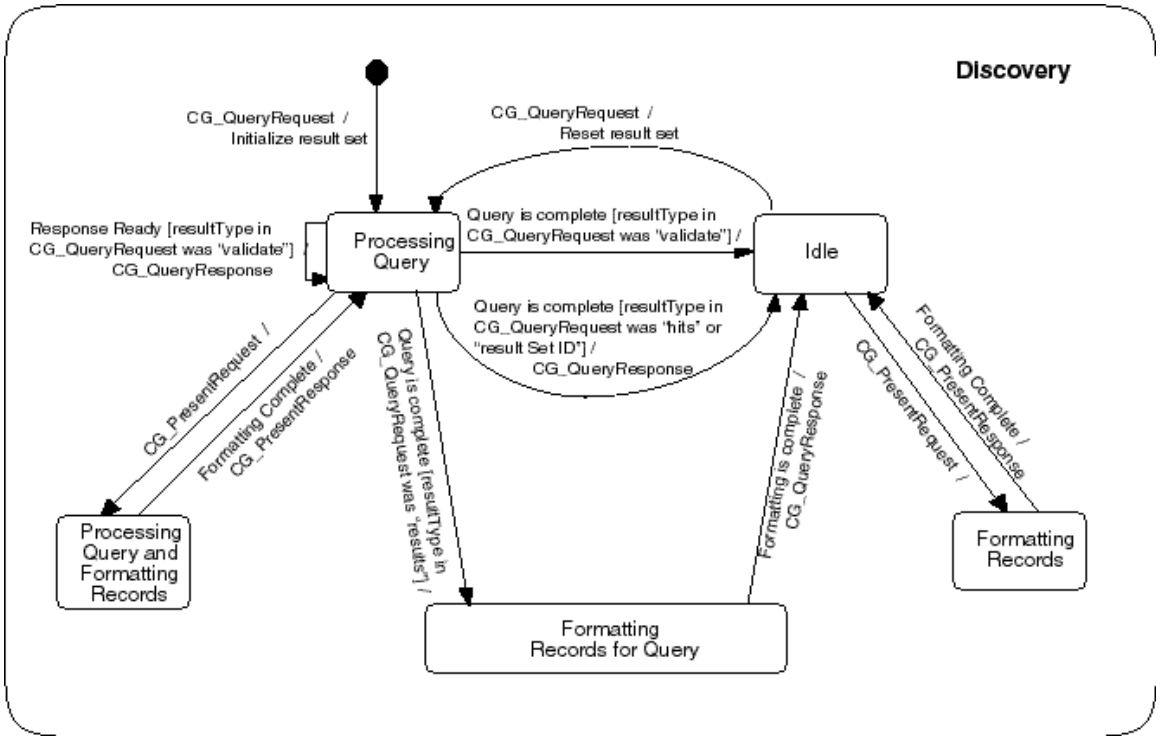


Figure 14 - Discovery State Diagram (without Status and Cancel)

The complete Discovery state diagram adds CG_StatusRequest and CG_CancelRequest. The substates of Discovery remain the same, but additional transitions are present. If a CG_CancelRequest is received while in the Processing Query state, the session will transition to the Idle state. Depending upon the value of the freeResources parameter in the CG_CancelRequest, a result set may or may not exist once in the Idle State. Note that because the client sets the request ID in a request, the client knows the ID that is used in a status or cancel request.

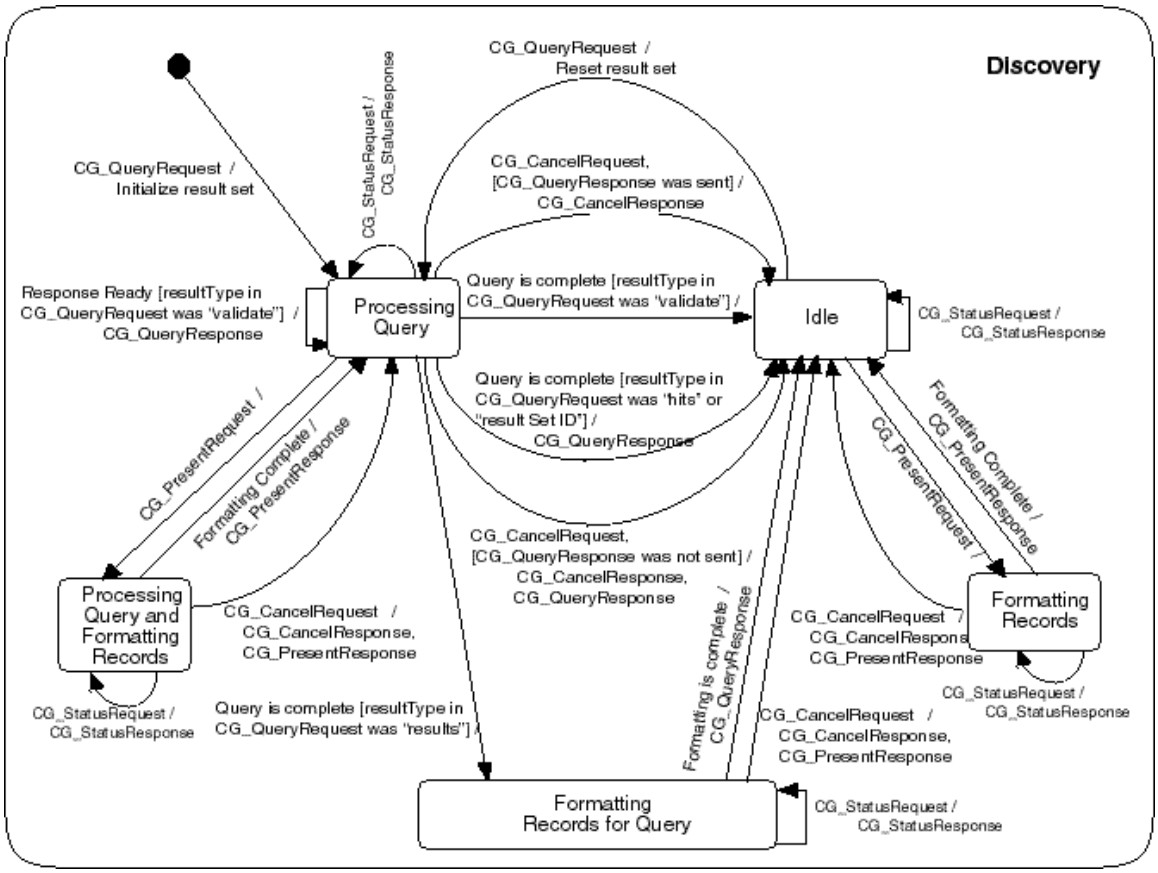


Figure 15 - Discovery State Diagram (Complete)

7.3.4 Access State Diagram

The Access State Diagram is shown in Figure 16. A session can be in the Access substate, once a successful initialization has occurred at which time the Access substate will be in the initial state. Upon receiving a CG_BrokeredAccessRequest, the Access state will transition to the Processing Request State. During the Processing Request State, the state of an Order may be modified based on the contents of the CG_BrokeredAccessRequest. The state of the Order is a separate state machine; see Figure 17 and Figure 18. Transitions in the Order state may occur independent of OGC Catalog Interface requests, e.g., order fulfilled is a transition that occurs without a CG_BrokeredAccessRequest. The server may delete orders. The server must be prepared to respond to client request for an order that has been deleted by returning the paired response containing a diagnostic indicating that the order does not exist.

Once the processing of a CG_BrokeredAccessRequest has completed a response is sent and the state transitions to Idle. Transition out of the Idle state occurs upon the client sending a CG_BrokeredAccessRequest in which case the state transitions to Processing Request. When a CG_TerminateRequest is received, the Catalog Interface state, which includes the Access substate, transitions from Main to the end state also closing the Access state.

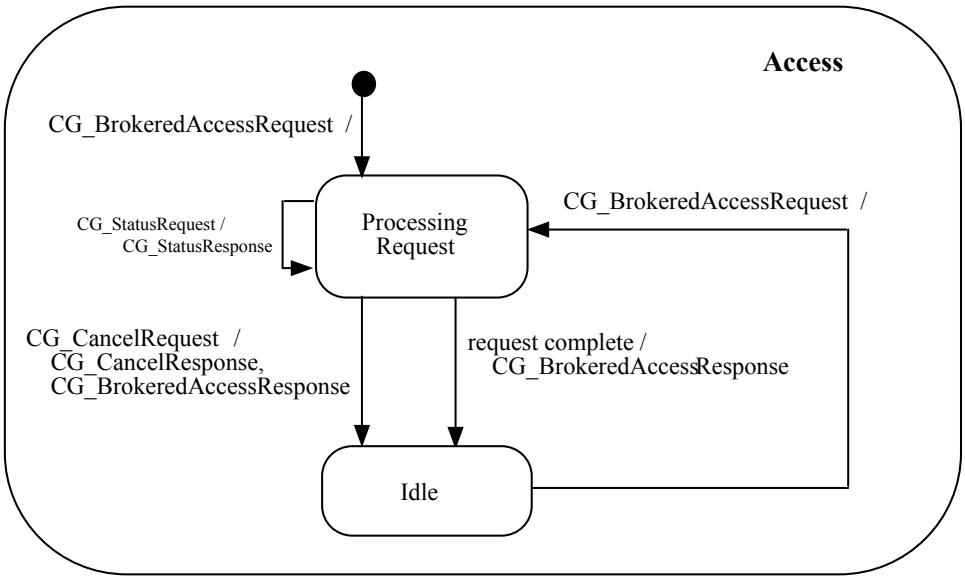


Figure 16 - Access State Diagram

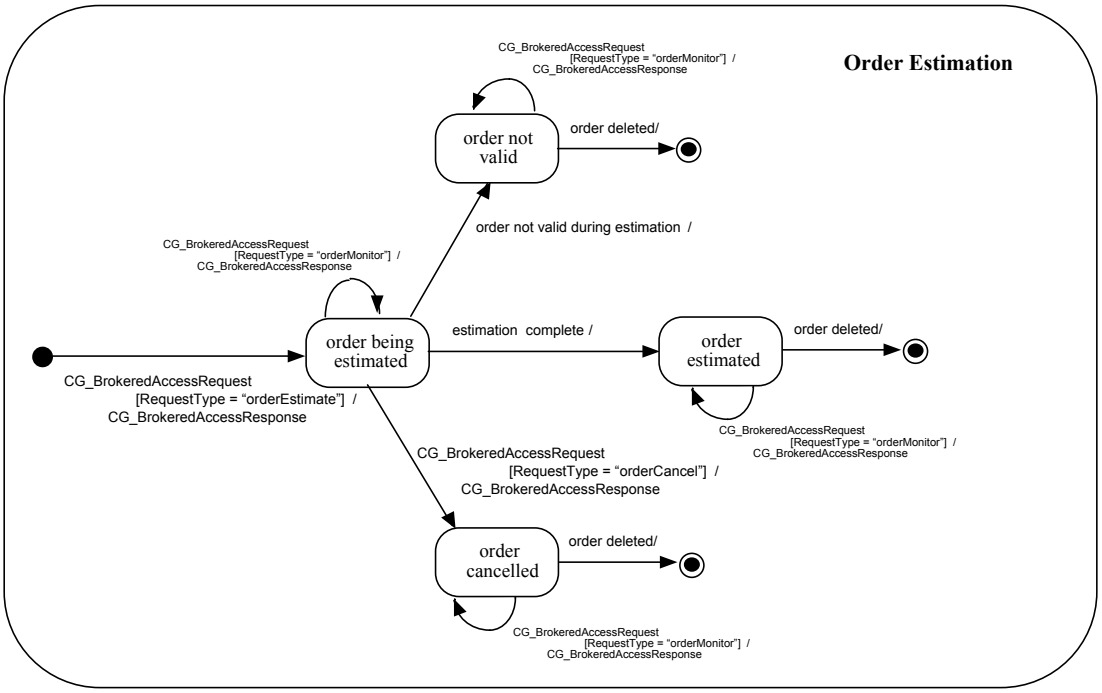


Figure 17 - Order Estimation State Diagram

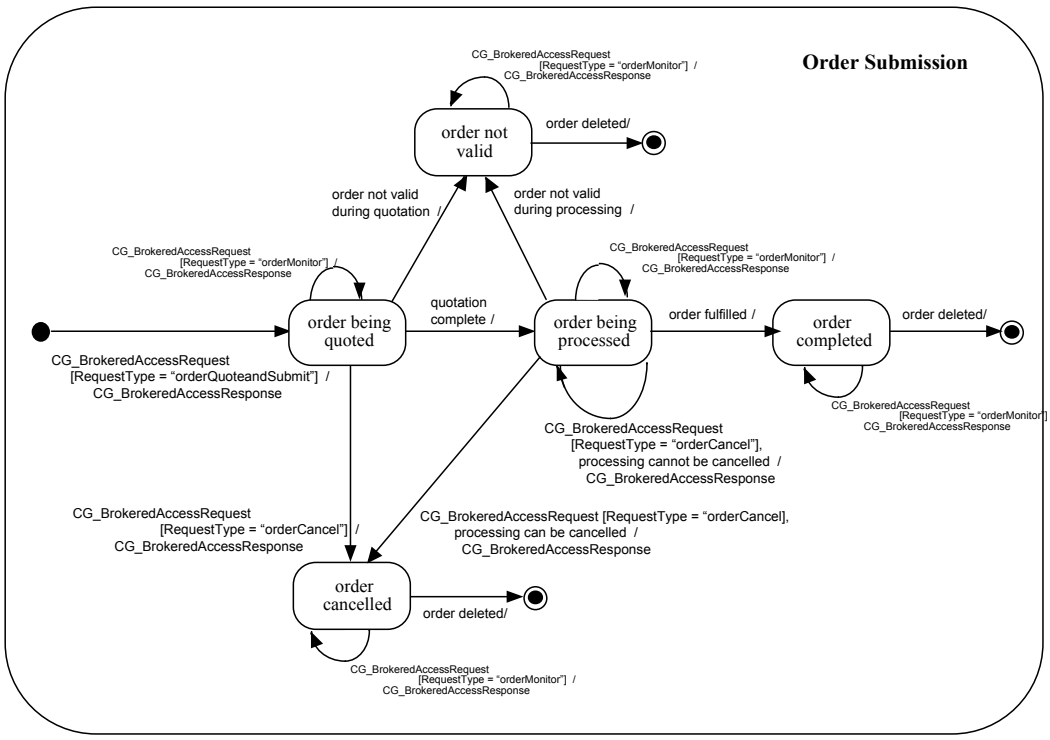


Figure 18 - Order Submit State Diagram

7.3.5 Management State

The Management State Diagram is shown in Figure 19. A session can be in the Management substate, once a successful initialization has occurred at which time the Management substate will be in the initial state. The requests are independent and paired, i.e., the response upon leaving the Processing Request state is determined by the request that caused the transition into the Processing Request State.

Once the processing of a request has completed a response is sent and the state transitions to Idle. Transition out of the Idle state occurs upon the client sending a subsequent management request in which case the state transitions to Processing Request. When a CG_TerminateRequest is received, the Catalog Interface state, which includes the Management substate, transitions from Main to the end state also closing the Management state.

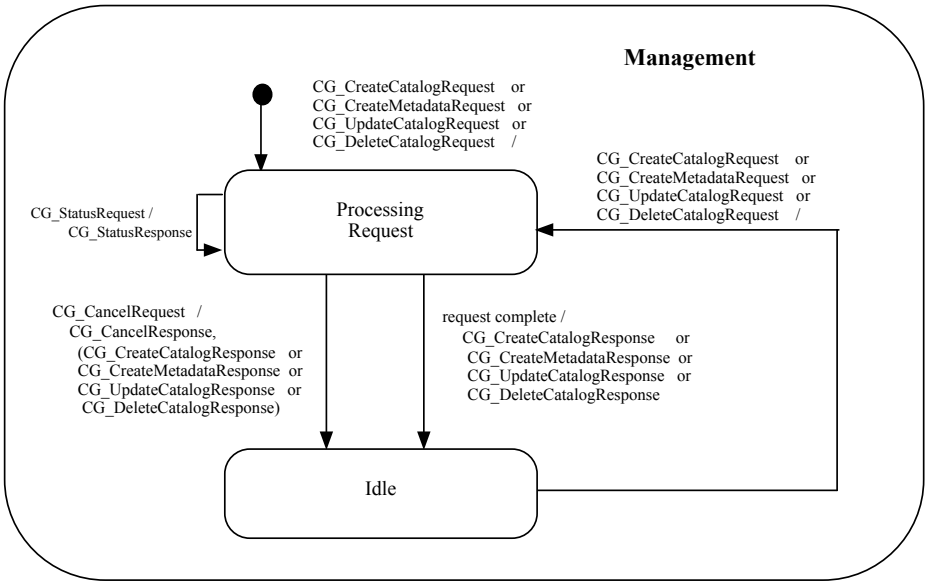


Figure 19 - Management State Diagram

7.3.6 Explain State Diagram

The Explain State Diagram is shown in Figure 20. A session can be in the Explain substate, once a successful initialization has occurred at which time the Explain substate will be in the initial state. The requests are independent and paired, i.e., the response upon leaving the Processing Request state is determined by the request that caused the transition into the Processing Request State.

Once the processing of a request has completed a response is sent and the state transitions to Idle. Transition out of the Idle state occurs upon the client sending a subsequent explain request in which case the state transitions to Processing Request. When a CG_TerminateRequest is received, the Catalog Interface state, which includes the Explain substate, transitions from Main to the end state also closing the Explain state.

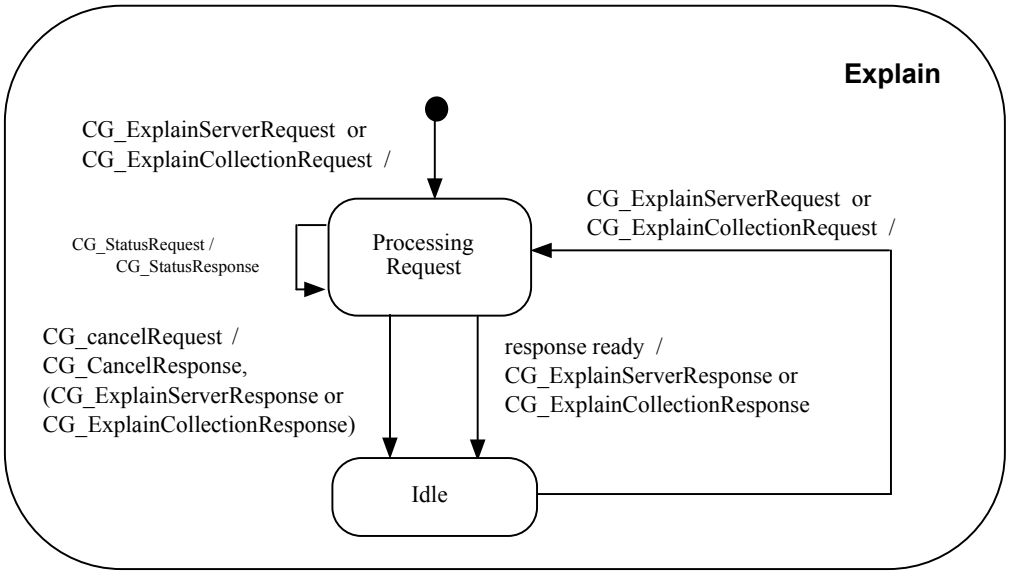


Figure 20 - Explain State Diagram

8 OGC_Common Catalog Query Language

This section defines the OGC_Common Catalog Query Language. OGC_Common is the query language to be supported by all OGC Catalog Interfaces in order to support search interoperability.

8.1 Assumptions during the development of OGC_Common Query Language:

- The query will have a syntax similar to the SQL "Where Clause"
- The expressiveness of the query will not require extensions to various current query systems used in geospatial catalog queries other than the implementation of some geo operators.
- The query language is extensible
- OGC_Common supports both tight and loose queries. A tight query is defined where if a catalog doesn't support an attribute/column specified in the query, no entity/row can match the query and the null set is returned. In a loose query, if an attribute is undefined, it is assumed to match

8.2 BNF definition of OGC_Common Query Language

```
<SQL terminal character> ::=

    <SQL language character>

<SQL language character> ::=

     <simple Latin letter>
```



```
    | <digit>
    | <SQL special character>
<simple Latin letter> ::=
      <simple Latin upper case letter>
    | <simple Latin lower case letter>
<simple Latin upper case letter> ::=
     A | B | C | D | E | F | G | H | I | J | K | L | M | N | O
    | P | Q | R | S | T | U | V | W | X | Y | Z
<simple Latin lower case letter> ::=
          a | b | c | d | e | f | g | h | i | j | k | l | m | n | o
    | p | q | r | s | t | u | v | w | x | y | z
<digit> ::=
    0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9
<SQL special character> ::=
      <space>
    | <double quote>
    | <percent>
    | <ampersand>
    | <quote>
    | <left paren>
    | <right paren>
    | <asterisk>
    | <plus sign>
    | <comma>
    | <minus sign>
    | <period>
    | <solidus>
    | <colon>
    | <semicolon>
```

```
    | <less than operator>
    | <equals operator>
    | <greater than operator>
    | <question mark>
    | <left bracket>
    | <right bracket>
    | <circumflex>
    | <underscore>
    | <vertical bar>
    | <left brace>
    | <right brace>
<space> ::=  /*space character in character set in use In ASCII it would be 40*/
<double quote> ::= "
<percent> ::= %
<ampersand> ::= &
<quote> ::= '
<left paren> ::= (
<right paren> ::= )
<asterisk> ::= *
<plus sign> ::= +
<comma> ::= ,
<minus sign> ::= -
<period> ::= .
<solidus> ::= /
<colon> ::= :
<semicolon> ::= ;
<less than operator> ::= <
<equals operator> ::= =
<greater than operator> ::= >
```

```
<question mark> ::= ?

<left bracket> ::= [

<right bracket> ::= ]

<circumflex> ::= ^

<underscore> ::= _

<vertical bar> ::= |

<left brace> ::={

<right brace> ::=}

<separator> ::= { <comment> | <space> | <newline> }...

/* The next section of the BNF defines the tokens available to the language. I
          have deleted the concepts of bit string, hex string and national
          character string literal, since those types do not have equivalents in
          GIAS or CIP/GEO. Also a significant number of the keywords have been
          removed with Keywords have been added to support the geo literals. */

<token> ::=

      <nondelimiter token>

    | <delimiter token>

<nondelimiter token> ::=

      <regular identifier>

    | <key word>

    | <unsigned numeric literal>

<regular identifier> ::= <identifier body>

<identifier body> ::=

    <identifier start> [ { <underscore> | <identifier part> }... ]

<identifier start> ::= <simple latin letter>

<identifier part> ::=

      <identifier start>

    | <digit>

<key word> ::=

      <reserved word>

<reserved word> ::=
```

```
    AND | POINT  |LINESTRING

    |POLYGON |MULTIPOINT  |MULTILINESTRING  |MULTIPOLYGON

    | EMPTY  | DATE | TIME | TIMESTAMP|FALSE| TRUE| UNKNOWN |LIKE  | MINUTE  |
          MONTH

    |  NOT | NULL |

<unsigned numeric literal>::=

      <exact numeric literal>

    | <approximate numeric literal>

<exact numeric literal> ::=

      <unsigned integer> [ <period> [ <unsigned integer> ] ]

    | <period> <unsigned integer>

<unsigned integer> ::= <digit>...

<approximate numeric literal> ::= <mantissa> E <exponent>

<mantissa> ::= <exact numeric literal>

<exponent> ::= <signed integer>

<signed integer> ::= [ <sign> ] <unsigned integer>

<sign> ::= <plus sign> | <minus sign>

< character string literal> ::=

   <quote> [ <character representation>... ] <quote>

<character representation> ::=

      <nonquote character>

    | <quote symbol>

<quote symbol> ::= <quote><quote>

/*End of non delimiter tokens*/

/* I have limited the delimiter tokens by eliminating, interval strings and
          delimited identifiers BNF and simplifying the legal character set to
          the characters to a single set so no identification of character set
          would be needed decision. */

<delimiter token> ::=

      <character string literal>

    | <SQL special character>
```

```
      | <not equals operator>

      | <greater than or equals operator>

      | <less than or equals operator>

      | <concatenation operator>

      | <double greater than operator>

      | <right arrow>

      | <left bracket>

      | <right bracket>

< character string literal> ::=

<quote> [ <character representation>... ] <quote>

<character representation> ::=

        <nonquote character>

      | <quote symbol>

<quote symbol> ::= <quote><quote>

<not equals operator> ::= <>

<greater than or equals operator> ::= >=

<less than or equals operator> ::= <=

/*The following section is intended to give context for identifier and
           namespaces.  It assumes that the default namespace is specified in the
           query request and does not allow any overrides of the namepace */

< identifier> ::=

     < identifier start [ { <underscore> | <identifier part> }... ]

< identifier start> ::= <simple Latin letter>

< identifier part> ::=

        <simple Latin letter>

      | <digit>.

<attribute name> ::= <simple attribute name>

       | <compound attribute name>

<simple attribute name>::=<identifier>

<compound attribute name>::= < identifier><period> [{<identifier><period>}…]
```

```
       <simple attribute name>

/*The rest of the BNF is the real BNF for the query capabilities.*/

<search condition> ::=<boolean value expression>

<boolean value expression> ::=

      <boolean term>

    | <boolean value expression> OR <boolean term>

<boolean term> ::=

      <boolean factor>

    | <boolean term> AND <boolean factor>

<boolean factor> ::=

    [ NOT ] <boolean primary>

<boolean primary> ::=

      <predicate>

    | < routine invocation>

<predicate> ::=

      <comparison predicate>

    | <text predicate>

    | < null predicate>


<comparison predicate> ::= <attribute name> <comp op> <literal>

<text predicate> ::= <attribute name> [ NOT ] LIKE <character pattern>

<null predicate> ::= <attribute name> IS [ NOT ] NULL

<character pattern> ::= <character string literal> /* In a character pattern the
          character percent is used as a wildcard to represent an arbitrary
          string. This allows LIKE to implement the effect of many characters
          matching operations, such as: contains, begins with, ends with, not
          contains, not begins with, not ends with, and so forth. For example:

    attribute like '%contains_this%'

     attribute like 'begins_with_this%'

     attribute like '%ends_with_this'

    attribute like ‘d_ve’ will match ‘dave’ or “dove””
```



```
      attribute not like '%will_not_contain_this%'
      attribute not like 'will_not_begin_with_this%'
      attribute not like '%will_not_end_with_this'*/
<comp op> ::=
       <equals operator>
     | <not equals operator>
     | <less than operator>
     | <greater than operator>
     | <less than or equals operator>
     | <greater than or equals operator>
<literal> ::=
       <signed numeric literal>
      | <general literal>
<signed numeric literal> ::=
    [<sign> ] <unsigned numeric literal>
<general literal> ::=
       <character string literal>
     | <datetime literal>
     | <boolean literal>
     | <geography literal
<boolean literal> ::=
       TRUE
     | FALSE
     | UNKNOWN
<routine invocation> ::=
      | <geoop name>< georoutine argument list>
      | <relgeoop name><relgeoop argument list>
      | <routine name> <argument list>
```

```
<routine name> ::= < attribute name>

<geoop name> ::= EQUAL |DISJOINT |INTERSECT |TOUCH |CROSS |WITHIN |CONTAINS
          |OVERLAP |RELATE

<relgeoop name> ::= DWITHIN |BEYOND

<argument list> ::=

      <left paren> [ <positional arguments>]  <right paren>

<positional arguments> ::=

    <argument> [ { <comma> <argument> }... ]

<argument> ::= <literal> | <attribute name>

<georoutine argument list> ::=

    <left paren> <attribute name> <comma> <geometry literal>  <right paren>

<relgeoop argument list> ::=

   <left paren> <attribute name> <comma> <geometry literal> <comma> <tolerance>

   <right paren>

<tolerance> ::=

    <unsigned numeric literal> <comma> <distance units>

<distance units> ::= = “feet” | “meters” | “statute miles” | “nautical miles” |
          “kilometers”

/*this set of units is just an example. The real list of distance unit must be
          developed*?

<geometry literal> :=

     <Point Tagged Text>

…. | <LineString Tagged Text>

     | <Polygon Tagged Text>

     | <MultiPoint Tagged Text>

     | <MultiLineString Tagged Text>

     | <MultiPolygon Tagged Text>

     | <GeometryCollection Tagged Text>

     | <Envelope Tagged Text>

<Point Tagged Text> :=

    POINT <Point Text>
```

```
<LineString Tagged Text> :=

    LINESTRING <LineString Text>

<Polygon Tagged Text> :=

    POLYGON <Polygon Text>

<MultiPoint Tagged Text> :=

    MULTIPOINT <Multipoint Text>

<MultiLineString Tagged Text> :=

    MULTILINESTRING <MultiLineString Text>

<MultiPolygon Tagged Text> :=

    MULTIPOLYGON <MultiPolygon Text>

<GeometryCollection Tagged Text> :=

    GEOMETRYCOLLECTION <GeometryCollection Text>

<Point Text> := EMPTY | <left paren> <Point> <right paren>

<Point> := <x> <space><<y>

<x> := numeric literal

<y> := numeric literal

<LineString Text> := EMPTY

     | <left paren> <Point >  {<comma> <Point > }… <right paren>

<Polygon Text> := EMPTY

     | <left paren> <LineString Text >  {<comma> < LineString Text > }…<right
          paren>

<Multipoint Text> := EMPTY

     | <left paren> <Point Text >  {<comma> <Point Text > }…  <right paren>

<MultiLineString Text> := EMPTY

     | <left paren> <LineString Text >  {<comma> < LineString Text > }…  <right
          paren>

<MultiPolygon Text> := EMPTY

     | <left paren> < Polygon Text >  {<comma> < Polygon Text > }…  <right
          paren>

<GeometryCollection Text> := EMPTY
```

```
     | <left paren> <Geometry Tagged Text> {<comma> <Geometry Tagged Text> }…
             <right paren>
<Envelope Tagged Text> ::=
    ENVELOPE <Envelope Text>
<Envelope Text> := EMPTY
| <left paren> > <WestBoundLongitude> <comma> EastBoundLongitude> <comma>
NorthBoundLatitude <comma> <SouthBoundLatitude> < <right paren>
<WestBoundLongitude> := numeric literal
<EastBoundLongitude> := numeric literal
<NorthBoundLatitude> := numeric literal
<SouthBoundLatitude> := numeric literal
<datetime literal> ::=
<date literal>
| <time literal>
| <timestamp literal>
<date literal> ::=
    DATE <date string>
<date string> ::=
    <quote> <unquoted date string> <quote>
<unquoted date string> ::= <date value>
<date value> ::=
     <years value> <minus sign> <months value><minus sign> <days value>
<years value> ::= <datetime value>
<datetime value> ::= <unsigned integer>
<months value> ::= <datetime value>
<days value> ::= <datetime value>
<time literal> ::=
TIME <time string>
```

```
<time string> ::=

    <quote> <unquoted time string> <quote>

 unquoted time string> ::=

    <time value> [ <time zone interval> ]

<time value> ::=

    <hours value> <colon> <minutes value> <colon> <seconds value>

<hours value> ::= <datetime value>

<minutes value> ::= <datetime value>

<seconds value> ::=

<seconds integer value> [ <period> [ <seconds fraction> ] ]

<seconds integer value> ::= <unsigned integer>

<seconds fraction> ::= <unsigned integer>

<time zone interval> ::=

<Z>|<sign> <hours value> <colon> <minutes value> /*  Z= Coordinated
          Universal Time, signed numerics are offsets from UTC*/

<timestamp literal> ::=

TIMESTAMP <timestamp string>

<timestamp string> ::=

<quote> <unquoted SQL timestamp string> <quote>

|<quote> <unquoted ISO timestamp string> <quote>

<unquoted  SQL timestamp string> ::=

<unquoted date string> <space> <unquoted time string>

<unquoted  ISO timestamp string> ::=

<unquoted date string> <T> <unquoted time string>
```

9 Z39.50 Profile

9.1 Architecture

The Z39.50 Profile uses a message-based client server architecture. The profile maps each of the general model operations to a corresponding service specified in the ANSI/NISO Z39.50 Application Service Definition and Protocol Specification [*ISO 23950*] [*http://lcweb.loc.gov/z3950/agency/document.html*]. For conformance, clients and servers must support Z39.50 Version 3.

The Z39.50 Profile specifies the use of the following transport mechanisms:

- HyperText Transport Protocol (HTTP) where services are encoded in XML using the XML Encoding Rules (XER) [*http://asf.gils.net/xer*].

- Directly over TCP where services are encoded using the Basic Encoding Rules (BER) [*ISO 8825*].

9.1.1 Supported Services

Each operation specified in this profile corresponds to a Z39.50 Service, and consists of a client request message followed by a server response message. The Z39.50 Services used in this profile include the Init, Search, Present, Resource Control, Trigger Resource Control, Sort, Extended Services and Close.

9.1.2 Transport (HTTP)

The client transmits request messages to the server and the server returns responses to the client over HTTP version 1.0 or 1.1. A logical session is maintained between the client and server using state management as specified in *IETF RFC 2109: HTTP State Management Mechanism* [*http://www.w3.org/Protocols/rfc2109/rfc2109*], where the SessionID is maintained in a cookie named "XERSessionId".

Request messages are transmitted using the HTTP POST method. As other HTTP methods become widely available, other HTTP methods may be used (such as the HTTP SEARCH method). The content of the HTTP method contains the request message, and the content of the HTTP response contains the response message. In both cases, the message content is encoded in XML and the Content-Type is application/x-xer-z3950. Once the Content Type is registered, the Content Type will become application/xer-z3950.

9.1.3 Transport (TCP)

The client transmits request messages to the server and the server returns response messages to the client directly over TCP as specified in *IETF RFC 1729: Using the Z39.50 Information*

Retrieval Protocol in the Internet Environment [*ftp://ftp.ietf.org/rfc/rfc1729.txt*], where all request and response messages are encoded using BER.

9.2 General Model to Z39.50 Profile Message Mapping

Table 11 provides a mapping between general model operations and the Z39.50 Profile services. The Z39.50 Profile messages are defined in Section 9.4. The messages listed under the Z39.50 Profile Service column are representative operations from the ISO 23950 standard that provide appropriate functionality. Further interpretation is provided through details in the footnotes. This table is provided to orient the programmer in correspondence with the general model but does not provide parameter-level mapping. This table also only depicts the mandatory (Discovery) catalog services operations and does not declare equivalence for the optional management and access operations in this version.

Table 11 - General Model to Z39.50 Profile Message Mapping

General Model Operation	Z39.50 Profile Service
CG_InitSessionRequest	initRequest[1]
CG_InitSessionResponse	InitResponse[1]
CG_TerminateRequest	close[2]
CG_TerminateResponse	close
CG_ExplainServerRequest	searchRequest[3, 4]
CG_ExplainServerResponse	searchResponse
CG_StatusRequest	triggerResourceControlRequest
CG_StatusResponse	resourceControlRequest
CG_CancelRequest	triggerResourceControlRequest
CG_CancelResponse	none[5]
CG_QueryRequest	searchRequest[3,6] and sortRequest
CG_QueryResponse	searchResponse and sortResponse
CG_PresentRequest	presentRequest
CG_PresentResponse	presentResponse
CG_ExplainCollectionRequest	searchRequest[7]
CG_ExplainCollectionResponse	searchResponse[7]
CG_BrokeredAccessRequest	extendedServicesRequest[8]
CG_BrokeredAccessResponse	extendedServicesResponse[8]

[1] The following init Options are used in this profile: search, present, sort, extended-services, trigger-resource-control, named result sets, and resource-control.

[2] Although Z39.50 permits both the client and server to initiate a Close request, for conformance with the general model, only the client is permitted to initiate a Close request. In practice, a server may terminate a session after a reasonable amount of idle client activity.

[3] Note that the CG_ResultType values of results and hits are supported in this profile. The CG_ResultType values of result set ID and validate are unsupported.

[4] The CG_ExplainServerRequest is implemented using a searchRequest on the Explain Database with ExplainCategory = TargetInfo and DatabaseInfo.

[5] For HTTP transport, a message with no content is returned.

[6] The CG_CatalogEntryType and CG_QueryScope parameters in the CG_QueryRequest are implemented in the Z39.50 Profile as external elements of the SearchRequest. The externals are defined in Section 9.5.1.

[7] The CG_ExplainCollectionRequest is implemented using a searchRequest on the Explain Database with ExplainCategory = TargetInfo and RetrievalRecordDetails.

[8] Brokered Access is implemented in the Z39.50 Profile using the Order Extended Service defined in Section 9.5.2. The Order Extended Service uses the Z39.50 Extended Service mechanism.

9.3 Example Sequence Diagram

The following sequence diagram illustrates a typical set of transactions that may occur between a client and server, and between the server and its interface to an external catalog system. The client sends an initRequest message to the server, the external system processes the initRequest message by initializing a session with the client and the server returns an initResponse message to the client. This interaction establishes a session in which all subsequent interactions occur.

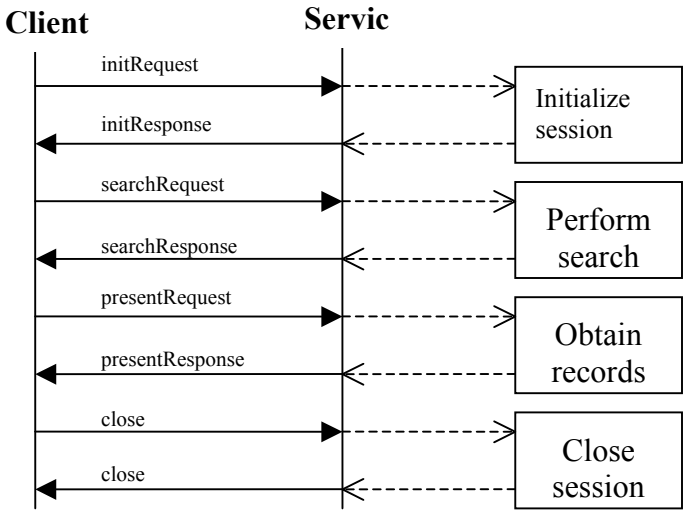


Figure 21 - Z39.50 Profile Sequence Diagram

Next the client constructs a query and sends the query in the searchRequest message to the server. The server runs the search on the external catalog system, and returns the requested results in the searchResponse message. If the search was successful, a virtual result set is created and the client may request records from the result set using the presentRequest message. In the presentRequest, the client may request any contiguous set of records from the result set (e.g., records 10 through 20). The server returns the records to the client in the presentResponse message. The client may continue to perform additional searches and record retrievals, or may close the session with the server by sending a close message. Optionally, the server may respond with a close message.

9.4 Interface Definition – XML

For HTTP transport the XML messages are defined by the XML encoding rules. The specification for the XML encoding rules can be found at http://asf.gils.net/xer . This specification derives the encoding of the Application Protocol Data Units (APDUs) from the ASN.1 specification of Z39.50 available from http://lcweb.loc.gov/z39.50/agency/document.html .

For information a DTD for Z39.50 encoded using XER is given below.

```
<!-- The ISO23950 namespace is the specification in ASN.1
     maintained at "http://lcweb.loc.gov/z3950/agency/asn1.html" -->

<!ELEMENT Search (
    initRequest |
    initResponse |
    searchRequest |
    searchResponse |
    presentRequest |
    presentResponse |
    resourceControlRequest |
    resourceControlResponse |
    sortRequest |
    sortResponse |
    extendedServicesRequest |
    extendedServicesResponse |
    close
    )>

<!-- Initialization service definitions -->
<!ELEMENT initRequest (
    referenceId?,
    protocolVersion,
    options,
    preferredMessageSize,
    exceptionalRecordSize,
    idAuthentication?,
    implementationId?,
    implementationName?,
    implementationVersion?,
    userInformationField?,
    otherInfo?
    )>
<!ELEMENT initResponse (
    referenceId?,
    protocolVersion,
    options,
    preferredMessageSize,
    exceptionalRecordSize,
    result,
    implementationId?,
    implementationName?,
    implementationVersion?,
    userInformationField?,
    otherInfo?
    )>
```



```
<!-- Search service definitions -->
<!ELEMENT searchRequest (
    referenceId?,
    smallSetUpperBound,
    largeSetLowerBound,
    mediumSetPresentNumber,
    replaceIndicator,
    resultSetName,
    databaseNames,
    smallSetElementSetNames?,
    mediumSetElementSetNames?,
    preferredRecordSyntax?,
    query,
    additionalSearchInfo?,
    otherInfo?
    )>
<!ELEMENT searchResponse (
    referenceId?,
    resultCount,
    numberOfRecordsReturned,
    nextResultSetPosition,
    searchStatus,
    resultSetStatus?,
    presentStatus?,
    records?,
    additionalSearchInfo?,
    otherInfo?
    )>

<!-- Present service definitions -->
<!ELEMENT presentRequest (
    referenceId?,
    resultSetId,
    resultSetStartPoint,
    numberOfRecordsRequested,
    recordComposition?,
    preferredRecordSyntax?,
    otherInfo?
    )>
<!ELEMENT presentResponse (
    referenceId?,
    numberOfRecordsReturned,
    nextResultSetPosition,
    presentStatus,
    records?,
    otherInfo?
    )>

<!-- Resource control service definition -->
<!ELEMENT resourceControlRequest (
    referenceId?,
    suspendedFlag?,
    resourceReport?,
    partialResultsAvailable?,
    responseRequired,
    triggeredRequestFlag?,
    otherInfo?
    )>
<!ELEMENT resourceControlResponse (
    referenceId?,
    continueFlag,
    resultSetWanted?,
```



```
    otherInfo?
    )>

<!-- Close service definition -->
<!ELEMENT close (
    referenceId?,
    closeReason,
    diagnosticInformation?,
    resourceReportFormat?,
    resourceReport?,
    otherInfo?
    )>

<!-- Sort service definition -->
<!ELEMENT sortRequest (
    referenceId?,
    inputResultSetNames,
    sortedResultSetName,
    sortSequence,
    otherInfo?
    )>
<!ELEMENT sortResponse (
    referenceId?,
    sortStatus,
    resultSetStatus?,
    diagnostics?,
    otherInfo?
    )>

<!-- extendedServices service definition -->
<!ELEMENT extendedServicesRequest (
    referenceId?,
    function,
    packageType,
    packageName?,
    userId?,
    retentionTime?,
    permissions?,
    description?,
    taskSpecificParameters?,
    waitAction,
    elements?,
    otherInfo?
    )>

<!ELEMENT extendedServicesResponse (
    referenceId?,
    operationStatus,
    diagnostics?,
    taskPackage?,
    otherInfo?
    )>


<!-- Auxiliary initialization service definitions -->
<!ELEMENT protocolVersion (#PCDATA)> <!-- values: version-1 version-2
                                          version-3 -->
<!ELEMENT options (#PCDATA)>         <!-- values: search present delSet
                                          triggerResourceCtrl resourceCtrl sort
                                          extendedServices namedResultSets -->
<!ELEMENT preferredMessageSize (#PCDATA)>   <!-- integer -->
<!ELEMENT exceptionalRecordSize (#PCDATA)>  <!-- integer -->
```



```
<!ELEMENT result (#PCDATA)>                 <!-- values: true | false -->
<!ELEMENT implementationId (#PCDATA)>       <!-- general string -->
<!ELEMENT implementationName (#PCDATA)>     <!-- general string -->
<!ELEMENT implementationVersion (#PCDATA)>  <!-- general string -->
<!ELEMENT userInformationField (External)>

<!-- Auxiliary search service definitions -->
<!ELEMENT smallSetUpperBound (#PCDATA)>     <!-- integer -->
<!ELEMENT largeSetLowerBound (#PCDATA)>     <!-- integer -->
<!ELEMENT mediumSetPresentNumber (#PCDATA)> <!-- integer -->
<!ELEMENT replaceIndicator (#PCDATA)>       <!-- values: true | false -->
<!ELEMENT resultSetName (#PCDATA)>          <!-- general string -->
<!ELEMENT smallSetElementSetNames (genericElementSetName | databaseSpecific)>
<!ELEMENT mediumSetElementSetNames (genericElementSetName | databaseSpecific)>
<!ELEMENT preferredRecordSyntax (#PCDATA)>  <!-- object identifier -->
<!ELEMENT additionalSearchInfo (#PCDATA)>   <!-- subelement omitted -->
<!ELEMENT resultCount (#PCDATA)>            <!-- integer -->
<!ELEMENT searchStatus (#PCDATA)>           <!-- values: true | false -->

<!-- Query definition -->
<!ELEMENT query (type-0 | type-1 | type-2 | type-100 | type-101 | type-102)>
<!ELEMENT type-0 (#PCDATA)>                 <!-- any -->
<!ELEMENT type-1 (attributeSet, rpn)>       <!-- RPN query -->
<!ELEMENT type-2 (#PCDATA)>                 <!-- octet string -->
<!ELEMENT type-100 (#PCDATA)>               <!-- octet string -->
<!ELEMENT type-101 (attributeSet, rpn)>     <!-- RPN query -->
<!ELEMENT type-102 (#PCDATA)>               <!-- octet string -->

<!-- Query operand definitions -->
<!ELEMENT rpn (op | rpnRpnOp)>              <!-- op is Operator -->
<!ELEMENT rpn1 (op | rpnRpnOp)>             <!-- op is Operator -->
<!ELEMENT rpn2 (op | rpnRpnOp)>             <!-- op is Operator -->
<!ELEMENT rpnRpnOp (rpn1,
                    rpn2,
                    op)>                    <!-- op is Operand -->
<!ELEMENT op (
    (attrTerm | resultSet | resultAttr ) |
    (and | or | and-not)
    )>                                      <!-- op is Operand & Operator -->
<!ELEMENT attrTerm (attributes, term)>      <!-- AttributesPlusTerm -->
<!ELEMENT resultSet (#PCDATA)>              <!-- general string -->
<!ELEMENT resultAttr (#PCDATA)>             <!-- subelements omitted -->
<!ELEMENT numeric (#PCDATA)>                <!-- integer -->
<!ELEMENT string (#PCDATA)>                 <!-- general string -->
<!ELEMENT general (#PCDATA)>                <!-- octet string -->
<!ELEMENT complex (#PCDATA)>                <!-- subelements omitted -->

<!-- Query operator definitions -->
<!ELEMENT and EMPTY>                        <!-- null -->
<!ELEMENT or EMPTY>                         <!-- null -->
<!ELEMENT and-not EMPTY>                    <!-- null -->

<!-- Auxiliary present service definitions -->
<!ELEMENT resultSetStartPoint (#PCDATA)>        <!-- integer -->
<!ELEMENT numberOfRecordsRequested (#PCDATA)>   <!-- integer -->
<!ELEMENT recordComposition (simple)>           <!-- complex omitted -->
<!ELEMENT simple (genericElementSetName | databaseSpecific)>

<!-- Auxiliary search and present service definitions -->
<!ELEMENT numberOfRecordsReturned (#PCDATA)>    <!-- integer -->
<!ELEMENT nextResultSetPosition (#PCDATA)>      <!-- integer -->
<!ELEMENT presentStatus (#PCDATA)>              <!-- values: success |
                                                     partial-1 | partial-2 |
```

```
                                                partial-3 | partial-4 |
                                                failure -->

<!-- Record and diagnostic definitions -->
<!ELEMENT records (
    responseRecords |
    nonSurrogateDiagnostic |
    mutipleNonSurDiagnostics
    )>
<!ELEMENT responseRecords (Item*)>          <!-- sequence of NamePlusRecord -->
<!ELEMENT name (#PCDATA)>                   <!-- general string -->
<!ELEMENT record (retrievalRecord | surrogateDiagnostic)>
<!ELEMENT retrievalRecord (External)>
<!ELEMENT surrogateDiagnostic (defaultFormat | externallyDefined)>
<!ELEMENT nonSurrogateDiagnostic (diagnosticSetId | condition | addinfo)>
<!ELEMENT mutipleNonSurDiagnostics (Item*)>

<!-- Auxiliary resource control definitions -->
<!ELEMENT suspendedFlag (#PCDATA)>           <!-- values: true | false -->
<!ELEMENT partialResultsAvailable (#PCDATA)> <!-- values: subset | interim
                                                  | none -->
<!ELEMENT responseRequired (#PCDATA)>        <!-- values: true | false -->
<!ELEMENT triggeredRequestFlag (#PCDATA)>    <!-- values: true | false -->
<!ELEMENT continueFlag (#PCDATA)>            <!-- values: true | false -->
<!ELEMENT resultSetWanted (#PCDATA)>         <!-- values: true | false -->

<!-- Auxiliary close service definitions -->
<!ELEMENT closeReason (#PCDATA)>            <!-- values: finished | shutdown |
                                                systemProblem |  costLimit |
                                                resources | securityViolation |
                                                protocolError | lackOfActivity|
                                                peerAbort | unspecified -->
<!ELEMENT diagnosticInformation (#PCDATA)>  <!-- general string -->
<!ELEMENT resourceReportFormat (#PCDATA)>   <!-- object identifier -->

<!-- Auxiliary sort definitions -->
<!ELEMENT inputResultSetNames (Item*)>      <!-- sequence of general string -->
<!ELEMENT sortedResultSetName (#PCDATA)>    <!-- general string -->
<!ELEMENT sortSequence (Item*)>             <!-- SeqOf SortRequ.sortSeq -->
<!ELEMENT sortElement (generic | databaseSpecific)>
<!ELEMENT sortRelation (#PCDATA)>           <!-- values: ascending | descending
                                                 ascendingByFrequency |
                                                 descendingByFrequency -->
<!ELEMENT caseSensitivity (#PCDATA)>        <!-- values: caseSensitive |
                                                 caseInsensitive -->
<!ELEMENT missingValueAction ((abort | null), missingValueData)>
<!ELEMENT abort EMPTY>                      <!-- null -->
<!ELEMENT null EMPTY>                       <!-- null -->
<!ELEMENT missingValueData (#PCDATA)>       <!-- octet string -->
<!ELEMENT generic (sortfield | elementSpec | sortAttributes)>
<!ELEMENT databaseName (#PCDATA)>           <!-- general string -->
<!ELEMENT dbSort (sortfield | elementSpec | sortAttributes)>
<!ELEMENT sortfield (#PCDATA)>              <!-- general string -->
<!ELEMENT elementSpec (
    (schema?, elementSpec?) |
    (elementSetName | externalSpec)
    )>                                      <!-- SortKey, Specification -->
<!ELEMENT schema (#PCDATA)>                 <!-- object identifier -->
<!ELEMENT elementSetName (#PCDATA)>         <!-- general string -->
<!ELEMENT externalSpec (External)>
<!ELEMENT sortAttributes (id, list)>
<!ELEMENT id (#PCDATA)>                     <!-- object identifier -->
```

```
<!ELEMENT list (Item*)>                    <!-- SeqOf AttributeElement -->
<!ELEMENT sortStatus (#PCDATA)>            <!-- values: success | partial-1 |
                                                failure -->


<!-- Auxiliary extendedServices definitions -->
<!ELEMENT function (#PCDATA)>              <!-- values: create | delete |
                                                modify -->
<!ELEMENT packageType (#PCDATA)>           <!-- object identifier -->
<!ELEMENT packageName (#PCDATA)>           <!-- general string -->
<!ELEMENT retentionTime (value | unitUsed)>
<!ELEMENT permissions (Item*)>
<!ELEMENT allowableFunctions (Item*)>      <!-- values: delete |
                                                modifyContents |
                                                modifyPermissions | present |
                                                invoke -->
<!ELEMENT description (#PCDATA)>
<!ELEMENT taskSpecificParameters (External)>
<!ELEMENT waitAction (#PCDATA)>            <!-- values: wait | waitIfPossible|
                                              dontWait | dontReturnPackage -->
<!ELEMENT elements (#PCDATA)>              <!-- general string -->
<!ELEMENT operationStatus (#PCDATA)>       <!-- values: done | accepted |
                                                failure -->
<!ELEMENT taskPackage (External)>

<!ELEMENT referenceId (#PCDATA)>           <!-- octet string -->
<!ELEMENT resultSetId (#PCDATA)>           <!-- general string -->
<!ELEMENT diagnostics (Item*)>             <!-- sequence of DiagRec -->
<!ELEMENT databaseNames (Item*)>
<!ELEMENT otherInfo (#PCDATA)>             <!-- subelement omitted -->
<!ELEMENT resourceReport (External)>
<!ELEMENT resultSetStatus (#PCDATA)>       <!-- values: empty | subset |
                                                interim | unchanged | none -->

<!-- Definition of additional components -->

<!-- Authentication (initRequest) -->
<!ELEMENT idAuthentication (open | idPass | anonymous | other)>
<!ELEMENT open (#PCDATA)>                  <!-- visible string -->
<!ELEMENT idPass (groupId?, userId?, password?)>
<!ELEMENT groupId (#PCDATA)>               <!-- general string -->
<!ELEMENT userId (#PCDATA)>                <!-- general string -->
<!ELEMENT password (#PCDATA)>              <!-- general string -->
<!ELEMENT anonymous EMPTY>                 <!-- null -->
<!ELEMENT other (External)>

<!-- AttributesPlusTerm -->
<!ELEMENT attributes (Item*)>              <!-- SeqOf AttributeElement -->
<!ELEMENT term (#PCDATA)>                  <!-- data types omitted -->

<!-- AttributeElement -->
<!ELEMENT attributeSet (#PCDATA)>          <!-- object identifier -->
<!ELEMENT attributeType (#PCDATA)>         <!-- integer -->
<!ELEMENT attributeValue (numeric | complex)>

<!-- ElementSetNames -->
<!ELEMENT genericElementSetName (#PCDATA)>  <!-- general string -->
<!ELEMENT databaseSpecific (Item*)>        <!-- sequence of (dbName, esn) -->
<!ELEMENT dbName (#PCDATA)>                <!-- general string -->
<!ELEMENT esn (#PCDATA)>                   <!-- general string -->

<!-- DiagRec -->
<!ELEMENT defaultFormat     (diagnosticSetId | condition | addinfo)>
```

```
<!ELEMENT diagnosticSetId   (#PCDATA)>      <!-- object identifier -->
<!ELEMENT condition         (#PCDATA)>      <!-- integer -->
<!ELEMENT addinfo           (v2AddInfo | v3AddInfo)>
<!ELEMENT v2AddInfo         (#PCDATA)>      <!-- visible string -->
<!ELEMENT v3AddInfo         (#PCDATA)>      <!-- general string -->
<!ELEMENT externallyDefined (External)>

<!-- IntUnit -->
<!ELEMENT value (#PCDATA)>                  <!-- integer -->
<!ELEMENT unitUsed (unitSystem | unitType | unit | scaleFactor)>
<!ELEMENT unitSystem (#PCDATA)>             <!-- general string -->
<!ELEMENT unitType (string | numeric)>
<!ELEMENT unit (string | numeric)>
<!ELEMENT scaleFactor (#PCDATA)>            <!-- integer -->

<!-- Elements added by the XER specification -->
<!-- the Item tag is used for many things:
AttributesPlusTerm                      (attributes, term)
AttributeList                           (attributeSet?, attributeType,
                                         attributeValue)
Records.responseRecords                 (name, record)
DiagRec                                 (defaultFormat | externallyDefined)
SortRequest.sortSequence                (sortElement, sortRelation,
                                         caseSensitivity, missingValueAction?)
SortElement.databaseSpecific            (databaseName, dbSort)
ElemenSetnames.databaseSpecific         (dbName, esn)
Permissions                             (userId, allowableFunctions)>
InternationalString                     (#PCDATA)
-->
<!ELEMENT Item (#PCDATA)>

<!-- Global auxiliary definitions -->
<!ELEMENT External (direct-reference, encoding)>
<!ELEMENT direct-reference (#PCDATA)>
<!ELEMENT encoding (single-ASN1-type | octet-aligned)>
<!ELEMENT single-ASN1-type (#PCDATA)>
<!ELEMENT octet-aligned   (#PCDATA)>
```

9.5 Definition of Externals

9.5.1 Additional Search Info

This section contains the parameters used in the "otherInfo" part of a Z39.50 searchRequest in order to implement the CG_CatalogEntryType and CG_QueryScope parameters in the CG_QueryRequest of the General Model.

"otherInfo" in a SearchRequest may be used by the origin to specify the scope of a search, i. e. whether the search domain is wide or restricted to a local search. This is achieved using the SearchControl EXTERNAL in otherInfo. SearchControl is defined below using ASN.1 notation. If otherInfo is not provided, the type of item descriptors to be searched shall be derived from the query definition and/ or the content of the collection and the default scope of a local search shall be assumed.

The Search Control structure contains two items: itemDescriptorType which maps to CG_CatalogEntryType and searchScope which maps to CG_QueryScope. The CIP-Release-B-APDU {Z39.50-CIP-B-APDU 1} defines the following items:

```
SearchControl ::= SEQUENCE
     {
          itemDescriptorType [1] IMPLICIT INTEGER
               {
                    collectionDescriptorSearch (1),
                    productDescriptorSearch (3),
                    serviceDescriptorSearch (4),
                    catalogDescriptorSearch (5)
               }
          searchScope [2] IMPLICIT INTEGER
               {
                    localSearch (1),
                    wideSearch (2)
               }
     }
```


For further information, see Section 3.5.2.5 and Appendix E. 6.1. of Catalogue Interoperability Protocol (CIP) Specification - Release B, CEOS/WGISS/PTT/CIP-B, June 1998, Issue 2.4, Committee on Earth Observation Satellites (CEOS) (ftp://harp.gsfc.nasa.gov/incoming/fed/cip_spec24.pdf).

9.5.2 Order Extended Service

The *Order Extended Service*, which is a custom Z39.50 Extended Service, allows an *origin* to order products previously queried. The *Order ES* is presented in Table 12.

Further information describing the Order Extended Service can be found in Catalogue Interoperability Protocol (CIP) Specification - Release B, CEOS/WGISS/PTT/CIP-B, June 1998, Issue 2.4, Committee on Earth Observation Satellites (CEOS) (ftp://harp.gsfc.nasa.gov/incoming/fed/cip_spec24.pdf).

Table 12 - Order Extended Service

ASN.1 Definition	Meaning

{Z39.50-CIP-Order-ES} DEFINITIONS ::=
BEGIN
IMPORTS OtherInformation, InternationalString, IntUnit
FROM Z39.50-APDU-1995;
 	
CIPOrder ::= CHOICE
{
esRequest [1] IMPLICIT SEQUENCE{
toKeep [1] OriginPartToKeep,
notToKeep [2] OriginPartNotToKeep},
taskPackage [2] IMPLICIT SEQUENCE{
originPart [1] OriginPartToKeep,
targetPart [2] TargetPart}
}
	The Order Extended Serivce uses the Z39.50 Extended Servi ce Facility.

OriginPartToKeep ::= SEQUENCE
{
action [1] IMPLICIT INTEGER {
orderEstimate (1),
orderQuoteAndSubmit (2),
orderMonitor (3),
orderCancel (4)},
orderId [2] InternationalString OPTIONAL,
orderSpecification [3] OrderSpecification OPTIONAL,
statusUpdateOption [4] StatusUpdateOption OPTIONAL,
userInformation [5] UserInformation OPTIONAL,
otherInfo [6] OtherInformation OPTIONAL
}
	The **OriginPartToKeep** contains the following:
	• **action**, which indicates the type of operation that is requested to be performed for the order request. The supported operations are the following:
	  • **orderEstimate**, which is used to validate and obtain the estimate of an order specification.
	  • **orderQuoteAndSubmit**, which is used to quote[2] and submit an order specification.
	  • **orderMonitor**, which is used to monitor the progress of the processing of an order request.
	  • **orderCancel**, which is used to cancel an order request.

[2] The estimate for an order is approximate and non-binding, whereas the quote for an order is precise and binding.

ASN.1 Definition	Meaning
	• **orderId**, which is the identifier of the order request as provided as input by the origin. • **orderSpecification**, which is the specification of the order request as provided as input by the origin. Note that, in principle, the order request specified by the origin is unstructured, i.e. it contains a list of item descriptor identifiers and the order options related to them, but does not attempt to group them into packages and delivery units. • **statusUpdateOption**, which indicates how the origin wishes to be kept up to date as to the status of the order processing. • **userInformation**, which contains the personal user information as provided as input by the origin. • **otherInformation**, which contains additional information not specified by the CIP.

`OriginPartNotToKeep ::= SEQUENCE`
`{`
`orderId [1] InternationalString OPTIONAL,`
`orderSpecification [2] OrderSpecification OPTIONAL,`
`userInformation [3] UserInformation OPTIONAL,`
`otherInfo [4] OtherInformation OPTIONAL`
`}`
	The **OriginPartNotToKeep**[3] contains the following:
	• **orderId**, which is the identifier of the order request.
	• **orderSpecification**, which is the specification of the order request.
	• **userInformation**, which contains the personal user information.
	• **otherInformation**, which contains additional information not specified by the CIP.

[3] The definitions used in *OriginPartNotToKeep* are strictly identical to the ones provided in *OriginPartToKeep*. The former is used as input by the *target* (which may overwrite some values as appropriate) for the definition of *TargetPart*, whereas the latter remains unmodified and is stored in the *task package*. This duplication therefore allows the comparison of the order as specified by the *origin* (*OriginPartToKeep*) with the order as returned by the *target* (*TargetPart*).

ASN.1 Definition	Meaning

TargetPart ::= SEQUENCE
{
orderId [1] InternationalString,
orderSpecification [2] OrderSpecification OPTIONAL,
orderStatusInfo [3] OrderStatusInfo OPTIONAL,
userInformation [4] UserInformation OPTIONAL,
otherInfo [5] OtherInformation OPTIONAL
}
	The **TargetPart** contains the following:
	• **orderId**, which is the identifier of the order request as provided as output by the target.
	• **orderSpecification**, which is the specification of the order request as provided as output by the target. This order specification provided by the target overrides the specification provided as input by the origin in **originPartNotToKeep.** It contains the item descriptors and order options supplied as input, with any necessary modifications or additions, in a structured manner, i.e. the item descriptors are grouped into packages and delivery units.
	• **orderStatusInfo**, which indicates the status of the order request being performed[4].
	• **userInformation**, which contains the personal user information.
	• **otherInfo**, which contains additional information not specified by the CIP

StatusUpdateOption ::= CHOICE
{
manual [1] NULL,
automatic [2] IMPLICIT INTEGER {
eMail (1)}
}
	The **StatusUpdateOption** provides options for how the user will receive updates on the status of an **extended service** request. The parameters are:
	• **manual** the user performs the status request.
	• **automatic** where the OHS filing the order provides status updates for the user via **email**[5].

[4] Note the difference between the *operationStatus*, which is provided in the *ES Response*, and the *orderStatusInfo*, which is included in the *task package*. *operationStatus* provides status information for the *ES operation* as a whole and indicates whether the *ES operation* has been performed successfully or not by the *target*. *orderStatusInfo* provides status information for the order specified in the *task package* and indicates the state of the order or the process being performed for an order at the LOHS.

[5] This could be expanded in the future to include, for example, automatic update via the *origin*.

ASN.1 Definition	Meaning

UserInformation ::= SEQUENCE
{
userId [1] InternationalString,
userName [2] InternationalString OPTIONAL,
userAddress [3] PostalAddress OPTIONAL,
telNumber [4] InternationalString OPTIONAL,
faxNumber [5] InternationalString OPTIONAL,
emailAddress [6] InternationalString OPTIONAL,
networkAddress [7] InternationalString OPTIONAL,
billing [8] Billing OPTIONAL
}
	The **Userinformation** structure is presented by the origin part of a request to a target. The information provided contains mandatory fields (the user identifier) and optional fields. The target will allow the **Userinformation** structure contents to be used as an input to the delivery specification for elements which can be altered by the user. The target will refer to the local database contents for the user and will use the contents of the database, or the **Userinformation** structure depending on the privilege of the user to offer alternative information. The **UserInformation** structure consists of the following attributes:
	• **userId** the user identifier, the identifier which the user provides as part of an **InitializeRequest.**
	• **userName** the full name of the user.
	• **userAddress** a structure to hold the users address.
	• **telNumber** the users telephone number.
	• **faxNumber** the fax number for the user.
	• **emailAddress** the electronic mail address for the user.
	• **networkAddress** the network address to send files to electronically. For Internet addresses, the address is written in URL format to allow directories as well as domain's to be specified.
	• **billing** the method of payment (and hence of billing) available for the user.

OrderSpecification ::= SEQUENCE
{
orderingCentreId [1] InternationalString,
orderPrice [2] PriceInfo OPTIONAL,
orderDeliveryDate [3] InternationalString OPTIONAL,
orderCancellationDate [4] InternationalString OPTIONAL,
deliveryUnits [5] SEQUENCE OF DeliveryUnitSpec,
otherInfo [6] OtherInformation OPTIONAL
}
	The **OrderSpecification** is the specification of the order request and contains the following:
	• **orderingCentreId**, which identifies the ordering centre at which the order will be performed.
	• **orderPrice**, which is the price for the whole order.
	• **orderDeliveryDate**, which is the latest date at which the order can be expected to be delivered to the user.
	• **orderCancellationDate**, which is the latest date at which the user can cancel the order.
	• **deliveryUnits**, which contains the definition of the delivery units which compose the order.
	• **otherInfo**, which may be used to provide additional information not specified by the CIP.

ASN.1 Definition	Meaning

DeliveryUnitSpec ::= SEQUENCE
{
deliveryUnitId [1] InternationalString OPTIONAL,
deliveryUnitPrice [2] PriceInfo OPTIONAL,
deliveryMethod [3] DeliveryMethod OPTIONAL,
billing [4] Billing OPTIONAL,
packages [5] SEQUENCE OF PackageSpec,
otherInfo [6] OtherInformation OPTIONAL
}
	The **DeliveryUnitSpec** contains the specification of a single delivery unit (i.e. part of an order that is delivered as a unit):
	• **deliveryUnitId**, which is the identifier of the delivery unit.
	• **deliveryUnitPrice**, which is the price of the delivery unit.
	• **deliveryMethod**, which is the method with which the delivery unit is delivered to the user.
	• **billing**, which is the method with which the user is going to be billed.
	• **packages**, which contains the definition of the packages which compose the delivery unit.
	• **otherInfo**, which may be used to provide additional information not specified by the CIP.

DeliveryMethod ::= CHOICE
{
eMail [1] InternationalString,
ftp [2] FTPDelivery,
mail [3] PostalAddress,
otherInfo [4] OtherInformation
}
	The **DeliveryMethod** defines the method with which a delivery unit is delivered to the user and is one of the following:
	• **eMail**, which specifies the email address that the order will be delivered to
	• **ftp**, which specifies that the order will be delivered via ftp, the type of transfer and the ftp address
	• **mail**, which specifies that the order will be delivered via mail and provides the postal address
	• **otherInfo**, which may be used to provide additional information (such as an alternative delivery method) not specified by the CIP.

ASN.1 Definition	Meaning

FTPDelivery ::= SEQUENCE
{
transferDirection [1] IMPLICIT INTEGER
{
push (0),
pull (1)
},
ftpAddress [2] InternationalString
}
	The **FTPMethod** defines the method with which a delivery unit is delivered to the user and is one of the following:
	• **transferDirection**, which specifies that the order will be delivered via e-mail.
	• **ftpAddress**, which specifies that the order will be delivered via ftp.

Billing ::= SEQUENCE
{
paymentMethod [1] PaymentMethod,
customerReference [2] IMPLICIT CustomerReference,
customerPONumber [3] IMPLICIT InternationalString OPTIONAL
}
	The **Billing** structure[6] contains attributes which describe the method by which a user will pay for a service, together with supporting information regarding the payment. The attributes are:
	• **paymentMethod** indicates the method of payment used.
	• **customerReference** is the customer provided reference for the order.
	• **customerPONumber** is the purchase order provided by the customer for the order.

PaymentMethod ::= CHOICE
{
billInvoice [0] IMPLICIT NULL,
prepay [1] IMPLICIT NULL,
depositAccount [2] IMPLICIT NULL,
privateKnown [3] IMPLICIT NULL,
privateNotKnown [4] IMPLICIT EXTERNAL},
}
	The **PaymentMethod** structure contains attributes which describe the method by which a user will pay for a service. The attributes are:
	• **billInvoice** indicates that an invoice is to be sent to the user (or payee).
	• **prepay** indicates that payment has already been agreed/performed.
	• **depositAccount** indicates that there is a deposit account for the payment.
	• **privateKnown** indicates that the payment method is private and known.
	• **privateNotKnown** contain private unknown payment method information.

CustomerReference ::= SEQUENCE
{
customerId [1] InternationalString,
accounts [2] SEQUENCE OF InternationalString
}
	The **CustomerReference** structure contains attributes which provide a customer reference for the order. The attributes are:
	• **customerId** indicates the customer identifier at the LOHS.
	• **accounts** is the name of the account(s) available to apply charges to on behalf of the user.

[6] The Billing structure used by the Order Extended Service is derived from the *addlBilling* structure defined in the *Item Order ES*.

ASN.1 Definition	Meaning
`PostalAddress ::= SEQUENCE { streetAddress [1] InternationalString, city [2] InternationalString, state [3] InternationalString, postalCode [4] InternationalString, country [5] InternationalString }`	**PostalAddress** contains the postal address for a user and consists of: • **streetAddress**, which is the street name and number. • **city**, which is the name of the city (or nearest city). • **state**, which is the name of the state or county. • **postalCode**, which is the country specific postal code. • **country**, which is the name of the country.

`PackageSpec ::= SEQUENCE { packageId [1] InternationalString OPTIONAL, packagePrice [2] PriceInfo OPTIONAL, package [3] CHOICE { predefinedPackage [1] PredefinedPackage, adHocPackage [2] AdHocPackage }, packageMedium [4] InternationalString, packageKByteSize [5] INTEGER, otherInfo [6] OtherInformation OPTIONAL }`	The **PackageSpec** contains the specification of a single package (i.e. part of an order that is delivered on a single medium):
	• **packageId**, which is the identifier of the package.
	• **packagePrice**, which is the price of the package.
	• **package**, which contains the specification of the package. The package is one of the following:
	  • **predefinedPackage**, which is a package pre-defined by the data provider.
	  • **adHocPackage**, which is a package constructed ad-hoc by the data provider to fulfil the order request.
	• **packageMedium**, which is the medium on which the package will be delivered to the user.
	• **packageKByteSize**, which contains the size of the **package** in kilobytes.
	• **otherInfo**, which may be used to provide additional information not specified by the CIP.

`PredefinedPackage ::= SEQUENCE { collectionId [1] InternationalString, orderItems [2] SEQUENCE OF OrderItem, otherInfo [3] OtherInformation OPTIONAL }`	A **PredefinedPackage** contains the definition of a package that is pre-defined by the data provider. A PredefinedPackage is a collection that is stored in advance (i.e. not to fulfil a specific order) on a medium and is defined as follows: • **collectionId**, which is the identifier of the pre-packaged collection. Must be formatted according to the naming convention for collection identifiers specified in Appendix E. • **orderItems**, which contains the list of the order items contained in the package. • **otherInfo**, which may be used to provide additional information not specified by the CIP.

ASN.1 Definition	Meaning
`AdHocPackage ::= SEQUENCE OF OrderItem`	An **AdHocPackage** is a package that is defined ad-hoc by a data provider to fulfil a specific order. An **AdHocPackage** contains the list of the order items contained in the package.
`OrderItem ::= SEQUENCE { productId [1] InternationalString, productPrice [2] PriceInfo OPTIONAL, productDeliveryOptions [3] ProductDeliveryOptions OPTIONAL, processingOptions [5] ProcessingOptions OPTIONAL, sceneSelectionOptions [6] SceneSelectionOptions OPTIONAL, orderStatusInfo [7] OrderStatusInfo OPTIONAL, otherInfo [8] OtherInformation OPTIONAL }`	The **OrderItem** contains the specification of a single order item (i.e. the product that is ordered and that is to be delivered): • **productId**, which is the identifier of the ordered product. • **productPrice**, which is the price of the product. • **productDeliveryOptions**, which contains delivery options for the product. • **processingOptions**, which specifies the processing options that are to be applied on the product before delivery. • **sceneSelectionOptions**, which specifies the selection of the scene from the whole product that is to be delivered. • **orderStatusInfo**, which indicates the status of the order item[7]. • **otherInfo**, which may be used to provide additional information not specified by the CIP.
`ProductDeliveryOptions ::= SEQUENCE { productByteSize [1] INTEGER OPTIONAL, productFormat [2] InternationalString OPTIONAL, productCompression [3] InternationalString OPTIONAL, otherInfo [4] OtherInformation OPTIONAL }`	The **ProductDeliveryOptions** contains the specification of the options regarding the delivery of a product: • **productByteSize**, which contains the size of the product in bytes. • **productFormat**, which specifies the format of the product. • **productCompression**, which specifies the compression mechanism applied to the product. • **otherInfo**, which may be used to provide additional information not specified by the CIP.
`ProcessingOptions ::= CHOICE { formattedProcessingOptions [1] EXTERNAL, unformattedProcessingOptions [2] InternationalString }`	The **ProcessingOptions** specifies the processing options that are to be applied on the product before delivery and is one of the following: • **formattedProcessingOptions**, which specifies the processing options according to the format specified in [ORD]. • **unformattedProcessingOptions**, which specifies the processing options in a free-text form.

[7] Note the difference between the *orderStatusInfo* in *TargetPart*, which indicates the state, or the process being performed for, an order as a whole at the LOHS, and the *orderStatusInfo* in *OrderItem*, which indicates the state, or the process being performed for, a specific order item within an order at the LOHS.

ASN.1 Definition	Meaning

SceneSelectionOptions ::= CHOICE
{
formattedSceneSelectionOptions [1] EXTERNAL,
unformattedSceneSelectionOptions [2] InternationalString
}
	The **SceneSelectionOptions** specifies the selection of the scene from the whole product that is to be delivered and is one of the following:
	• **formattedSceneSelectionOptions**, which specifies the scene selection options according to the format specified in [ORD].
	• **unformattedSceneSelectionOptions**, which specifies the scene selection options in a free-text form.

PriceInfo ::= SEQUENCE
{
price [1] IntUnit,
priceExpirationDate [2] InternationalString,
additionalPriceInfo [3] InternationalString OPTIONAL
}
	The **PriceInfo** contains the information related to the price of an item:
	• **price**, which contains the price of the item.
	• **priceExpirationDate**, which specifies the latest date at which the price provided is valid (i.e. until the expiration date the origin is guaranteed that the price will not vary. However, after the expiration date the price may change).
	• **additionalPriceInfo**, which may be used to provide a textual explanation when the price of a item differs from the sum of the elements which compose this item (e.g. it can be used to explain why the price of a delivery unit differs from the sum of the prices of the packages which compose the delivery unit).

OrderStatusInfo ::= SEQUENCE
{
orderState [1] CHOICE
{
staticState [1] StaticState,
dynamicState [2] DynamicState
},
additionalStatusInfo [2] InternationalString OPTIONAL
}
	OrderStatusInfo describes the status of an extended service order request. The different status values are:
	• **orderState** indicates the state of the order request or the processing being performed for the order:
	  • **staticState** indicates the state of the order when no order request is being performed.
	  • **dynamicState** indicates the processing that is currently performed for an order request.
	• **additionalStatusInfo** contains additional status information provided by the LOHS (e.g. to clarify the meaning of the **orderState**).

StaticState ::= [1] IMPLICIT INTEGER
{
orderNotValid (1),
orderEstimated (2),
orderCompleted (3)
}
	StaticState describes the state of an order when no order request is active. The possible states are:
	• **orderNotValid** indicates that the order has not been successfully validated.
	• **orderEstimated** indicates that the order has been successfully validated and that an estimate is provided.
	• **orderCompleted** indicates that the order has been completed.

ASN.1 Definition	Meaning

`DynamicState ::= [2] IMPLICIT INTEGER`
`{`
`orderBeingEstimated (4),`
`orderBeingQuoted (5),`
`orderBeingProcessed (6),`
`orderBeingCancelled (7),`
`orderBeingDeleted (8)`
`}`
 	
`END`
	DynamicState describes the state of an order when an order request is active and thus being process. The possible states are:
	• **orderBeingEstimated** the order is currently being estimated by the target order handling system.
	• **orderBeingQuoted** the order is currently being quoted by the target order handling system.
	• **orderBeingProcessed** the order is currently being processed by the target order handling system.
	• **orderBeingCancelled** the order request which was previously sent to the target is being cancelled.
	• **orderBeingDeleted** the order is being deleted.

10 CORBA Profile – Coarse Grain

10.1 Architecture - Object Model

This section describes the CORBA profile. The intention of the CORBA profile is to follow the General Model closely. This enables the building of lightweight bridges between the CORBA profile and the Z39.50 Profile.

The CORBA profile is described in IDL (interface definition language) of OMG (the Object Management Group).

10.2 Event Traces

The interfaces in the IDL follow the General Model as closely as possible. Therefore all conventions, operation names and cases are borrowed from the General Model. An alternative is using the conventions of the CORBA IDL for Simple Features, in which all names are in lower case. This alternative is rejected to stay close to the General Model.

The core of the CORBA profile consists of only one interface: CG_CatalogServices. The separate services of the General Model (discovery, access and management) are defined in separate interfaces to reflect the General Model. They are all realized by the central interface CG_CatalogServices. The operations of CG_CatalogServices take without exception a request message as an input parameter and return a response parameter. All messages are filled with standard or compound CORBA structures. Name value pairs, an optional way to transfer meta information, are borrowed from the OMG CORBA 2.3 Dynamic Any specification.

10.3 Interface Definition - IDL

This section describes the CORBA IDL. It first describes enumerations and then structures, unions, and messages, respectively. It concludes with a description of the CG_CatalogServices interface, the core of the profile, and other interfaces.

All enumerations, structures, unions, messages and interfaces are part of the OGC_CatalogService module. Module names have to be harmonized across all OGC CORBA specifications and have to be prefixed by org.opengis.

```
#pragma prefix "opengis.org"

module OGC_CatalogService

{

...

};
```

Throughout the module OGC_CatalogService the new IDL types wstring and wchar is used instead of string and char to allow usage of different character codesets (other than Unicode) for internationalization (i18n).


```
In CORBA IDL type definitions for sequences containing different element
          datatypes are used to avoid anonymous sequences in IDL mappings
          for some programming languages.
```

10.3.1 Enumerations

Enumerations can be modeled by a direct translation of all code-lists of the General Model. The following enumerations are borrowed literally:

```
enum CG_AttributeCategory {queriable, presentable, both};

enum CG_CatalogEntryType {product, collection, catalog, service};

enum CG_CharacterSet {ASCII, UniCode, ShiftJIS};

enum CG_PredefinedPresentationType {full, brief};

enum CG_QueryLanguage {OGC_Common, Z3950_TypeOne, SQL3_SimpleFeature,
          SQL2_SimpleFeature};

enum CG_QueryScope {distributed, local};

enum CG_ResultType {validate, resultSetID, hits, results};

enum CG_SortOrder {ascending, descending};

enum CG_Status {success, successResultsAvailable, processingNormal,
          processingQueued, processingPausedOrSuspended, failure,
          failureAccessDenied};
```

The CORBA profile adds an **NV** entry to the message format enumeration. Specifying NV lets the server return results as name-value pairs. Name-value pairs are specified in the OMG CORBA 2.3 DynamicAny specification, but to be complete, the definition is repeated below. Usage of NameValuePair specification from OMG CORBA 2.3 DynamicAny aligns Catalog Services CORBA Profile with revision 1.1 (draft 3) of Simple Feature Access for CORBA.

```
enum CG_MessageFormat {XML, HTML, TXT, NV};

#pragma prefix "omg.org"

#include <orb.idl>

module DynamicAny {

   ...

  typedef string FieldName;

  struct NameValuePair {

    FieldName id;

    any value;
```

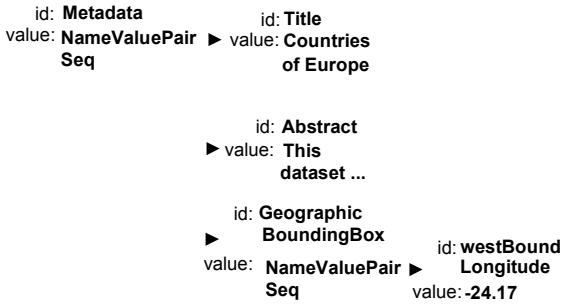


```
  };
typedef sequence<NameValuePair> NameValuePairSeq;
  ...
};
```

So if the server gives the results back as XML in the next example:

```
<?xml version="1.0"?>
<!DOCTYPE Metadata SYSTEM "min.dtd" >
<Metadata><Title>Countries of Europe</Title>
<Abstract>This dataset contains the countries of Europe</Abstract>
<GeographicBoundingBox><westBoundLongitude>-24.17</westBoundLongitude>
<eastBoundLongitude>40.71</eastBoundLongitude>
<northBoundLatitude>71.26</northBoundLatitude>
<southBoundLatitude>27.63</southBoundLatitude>
</GeographicBoundingBox>
</Metadata>
```

Name-value pair results are as follows:



The advantage is that pure CORBA environments do not have to parse the XML to get the results. They receive them in a suitable general structure. If the CORBA server is combined with another type of client, e.g. a Web client, then probably XML (the default) will be preferred.

The **any value** member can contain any type: standard types as long, double, string, types as NameValuePair or NameValuePairSeq (this gives the possibility to create recursive structures) or user-defined types.

10.3.2 Structures and unions

Most of the structures and unions from the General Model can be translated directly into CORBA structs and unions.

```
union CG_CollectionName

   switch(long)

   {

      case 1 : wstring collectionID;

      case 2 : wstring collectionName;

   };
```

A new capability is present in CG_QueryExpression in the CORBA Profile that allows passing of parameters that can't be converted to strings but must be bound to variables in string *theQuery* (e.g. "?" in JDBC). For example, references or handles for metadata retrieved from related collections in previous queries. *queryParameters* might contain a NameValuePairSeq or non ASCII XML Data. The additional member aligns Catalog Services query facilities with respective Simple Feature Access for CORBA query facilities.

```
struct CG_QueryExpression

{

   wstring theQuery;

   wstring theNamespace;

   CG_QueryLanguage theLanguage;

   any queryParameters;

};
```

To allow for globally unique *sessionID* a long long (Long) is used as datatype instead of long (Integer).

```
struct CG_RequestID

{

   long long sessionID;

   long counter;

};

struct CG_SortField
```



```
{
   wstring attributeName;
   CG_SortOrder sortOrder;
};
```

The General Model specifies the structure member **payload** as string for the CG_ReturnData, indicating it as a 'blob'. It is more correct within CORBA to specify an **any** structure member here so that strings or name-value pairs or sequences can be stored.

```
struct CG_ReturnData
{
   CG_MessageFormat encoding;
   any payload;
};
```

The CG_PresentationDescription union in the General Model contains a sequence of tuple-types in the presentation description. For the CORBA profile it is not necessary to have tuple-types here, a sequence of attribute names is sufficient. The tuple-types are not defined in the CORBA profile. In CORBA IDL type definitions for sequences containing different element datatypes are used to avoid anonymous sequences in IDL mappings for some programming languages.

```
typedef sequence<wstring> StringSeq;
union CG_PresentationDescription
   switch(long)
   {
      case 1 : StringSeq attributes; // CG_TupleType in GM
      case 2 : CG_PredefinedPresentationType presentationType;
   };
```

The CG_SchemeID structure uses a structure member CG_Schema. This is in the CORBA profile defined as a sequence of name-value pairs from the OMG CORBA 2.3 DynamicAny module. All names, types, and used sequences can be specified in name-value pairs. A schema, tuple-type or a dictionary is not needed here. If a schema or anything like that is specified in a general OGIS module in the future, it might be taken over here.

```
typedef DynamicAny::NameValuePairSeq CG_Schema;
struct CG_SchemaID
```



```
{
  wstring schemeName;
  CG_Schema schema;
};
```

10.3.3 Definitions for brokered access

The General Model defines some code-lists and structures for brokered access. These definitions are directly translated into their CORBA counterparts:

```
enum CG_BrokeredAccessRequestType {orderEstimate, orderQuoteAndSubmit,
       orderMonitor, orderCancel};
struct CG_OrderItem
{
  // Note: datatypes not provided by GM
  any productID;
  any productPrice;
  any productDeliveryOptions;
  any processingOptions;
  any sceneSelectionOptions;
};
struct CG_OrderSpecification
{
  // Note: datatypes not provided by GM
  any orderCentreID;
  any orderPrice;
  any orderDeliveryDate;
  any orderCancellationDate;
  any deliveryMethod;
  any package;
};
```

```
enum CG_OrderStatus {orderBeingEstimated, orderEstimated,
   orderBeingQuoted, orderBeingProcessed,
   orderCompleted, orderNotValid, orderCancelled};
enum CG_PackagingType {predefinedPackage, adhocPackage};
struct CG_PackageSpecification
{
   // Note: datatypes not provided by GM
   any packageId;
   any packagePrice;
   CG_PackagingType package;
   any packageMedium;
   long packageSize;
};
enum CG_PaymentMethod {credit, cash, purchaseOrder};
enum CG_StatusUpdateType {manual, automatic};
struct CG_UserInformation
{
   wstring userName;
   wstring userAddress;
   wstring phoneNumber;
   wstring faxNumber;
   wstring emailAddress;
   wstring netAddress;
   CG_PaymentMethod paymentMethod;
};
```

10.3.4 Capabilities

The capabilities in the General Model are designed with inheritance. In CORBA designing capabilities as interfaces can reflect this, but this is not useful. Capabilities like messages (see

below) have to be transferred over the network. Therefore, they are defined as either type definitions or structures.

```
typedef boolean CG_AllSupportedRequest;

typedef boolean CG_Defaults;

struct CG_DefaultTimeOut

{

  unsigned long long timeOut;

  // used to be OGC_Basic::UomTime, but OGC_Basic is no longer
        maintained as normative part of the Catalog Services
        Specification

};

typedef boolean CG_Explain;

struct CG_Messaging

{

  CG_CharacterSet characterSet;

  CG_MessageFormat messageFormat;

};

struct CG_Query

{

  wstring version;

  CG_CharacterSet characterSet;

  CG_QueryLanguage queryLanguage;

};

struct CG_Session

{

  wstring language;

  wstring catalogSpecificationVersion;

  CG_CharacterSet characterSet;

};
```

```
struct CG_SoftwareInformation

{

   wstring vendor;

   wstring SVversionNumber;

   wstring IFversionNumber;

};

typedef sequence<CG_CollectionName> CG_SupportedCollections;
```

To be able to make a sequence of different capabilities, a union CG_Capability is created, encompassing all derived capabilities.

A union normally has a discriminator. This can be a **long** value, but this is generally not preferred because you have to remember the value indicating the intended capability. Therefore, an enumeration of capabilities is included in the CORBA profile.

```
enum CG_CapabilityType

   { ctAllSupportedRequest, ctDefaults, ctDefaultTimeOut, ctExplain,
          ctMessaging,  ctQuery, ctSession, ctSoftwareInformation,
          ctSupportedCollections };

union CG_Capability

   switch(CG_CapabilityType)

   {

      case ctAllSupportedRequest : CG_AllSupportedRequest
           allSupportedRequest;

      case ctDefaults : CG_Defaults defaults;

      case ctDefaultTimeOut : CG_DefaultTimeOut timeOut;

      case ctExplain : CG_Explain explain;

      case ctMessaging : CG_Messaging messaging;

      case ctQuery : CG_Query query;

      case ctSession : CG_Session session;

      case ctSoftwareInformation : CG_SoftwareInformation
           softwareInformation;

      case ctSupportedCollections : CG_SupportedCollections
           supportedCollections;

   };
```

10.3.5 General messages

The General Model is a message-based model, where messages are designed in the form of a class hierarchy. In CORBA IDL, the messages are translated as structs. Writing them in the form of interfaces is not useful. In CORBA, the objects (instances of interfaces) stay on a remote server machine and are referred to by a client machine. They are not transferred over the network. This is definitely not the intention for messages.

All messages have the same form as the messages described in the General Model. However, messages in the form of structs cannot inherit from each other in CORBA. Therefore the CG_Message class is also included in the CORBA profile and a member of all other messages, called 'base'.

```
struct CG_Message

{

   long long sessionID;

   wstring destinationID;

   CG_RequestID requestID;

   wstring additionalInfo;

};
```

All other messages, which in the General Model inherit from CG_Message, have in the CORBA profile the CG_Message as a structure member. The next messages do not add extra structure members. Alternatively, they might have been modeled by a typedef. But to be consistent with the rest of the messages these message have **base** as a structure member.

Note that the response in the General Model also contains a string structure member **diagnostic**. This parameter is not specified in the CORBA profile. Error handling will be handled by exceptions, the standard CORBA facility. Exceptions are described below. WWW/CORBA bridges can catch these exceptions and convert them into diagnostic info if necessary.

```
struct CG_InitSessionRequest

{

   CG_Message base;

};

struct CG_InitSessionResponse

{

   CG_Message base;
```



```
};
struct CG_TerminateRequest
{
   CG_Message base;
};
struct CG_TerminateResponse
{
   CG_Message base;
   CG_Status status;
};
```

The status and cancel messages add a few structure members in addition to the **base** structure member.

```
struct CG_StatusRequest
{
   CG_Message base;
   CG_RequestID requestIDtoStatus;
};
struct CG_StatusResponse
{
   CG_Message base;
   CG_RequestID requestIDtoStatus;
   CG_Status status;
};
struct CG_CancelRequest
{
   CG_Message base;
   CG_RequestID requestIDtoCancel;
   boolean freeResources;
```



```
};

struct CG_CancelResponse

{

  CG_Message base;

  CG_Status status;

  CG_RequestID canceledRequest;

};
```

The explain server messages add sequence of capabilities to the base message. The capability-type sequence can be filled with capability-types to specify which capabilities are requested from the server. The server responds with reporting each capability in a sequence of capabilities.

```
typedef sequence<CG_CapabilityType> CG_CapabilityTypeSeq;

struct CG_ExplainServerRequest

{

  CG_Message base;

  CG_CapabilityTypeSeq capabilities;

};

struct CG_ExplainServerResponse

{

  CG_Message base;

  CG_CapabilityTypeSeq capabilities;

};
```

10.3.6 Discovery messages

There are three request/response message pairs in the discovery service. To enhance distributed searching, an additional structure member for the query message is provided. This member is not included in the General Model. This structure member **asynchronous** can be set to **true** to force asynchronous searching. The query method will return immediately, setting structure member **hits** in the response to zero. Query results can be retrieved later on, when the query is ready. The progress of the query can be examined with the status messages. The query can be cancelled with the cancel messages.

Note: This asynchronous behaviour is only specified for the query request message. All other operations (e.g. init, terminate, status, cancel, explain, present) are not considered as time-consuming and return immediately after processing.

Another structure member, **maxLevel**, is added to have more control in the range of the distribution. If one catalog contains another one, that other one contains a third one, and so on, you will possibly specify that only two levels of sub-catalogs will be searched. Setting the **maxLevel** member to two will force this. Setting **maxLevel** to -1 forces searching all sub-catalogs.

Note: If the **queryScope** is **Local** there is no distributed search at all.

```
typedef sequence<CG_SortField> CG_SortFieldSeq;

struct CG_QueryRequest

{

   CG_Message base;

   CG_QueryExpression queryExpression;

   CG_ResultType resultType;

   long iteratorSize;

   long cursor;

   CG_MessageFormat returnFormat;

   CG_PresentationDescription presentation;

   CG_SortFieldSeq sortField;

   CG_QueryScope queryScope;

   CG_CollectionName collectionID;

   CG_CatalogEntryType catalogType;

   boolean asynchronous;

   long maxLevel;

};

struct CG_QueryResponse

{

   CG_Message base;

   CG_ReturnData retrievedData;

   CG_CollectionName resultSetID;
```



```
    CG_Status status;
    long hits;
    long cursor;
};
struct CG_PresentRequest
{
    CG_Message base;
    CG_CollectionName resultSetID;
    CG_PresentationDescription presentation;
    CG_SortFieldSeq sortField;
    CG_MessageFormat returnFormat;
    long iteratorSize;
    long cursor;
};
struct CG_PresentResponse
{
    CG_Message base;
    CG_ReturnData retrievedData;
    long cursor;
    long hits;
    CG_Status status;
};
struct CG_ExplainCollectionRequest
{
    CG_Message base;
    CG_AttributeCategory attributeCategory;
    CG_CollectionName collectionID;
```



```
    CG_MessageFormat returnFormat;
};
struct CG_ExplainCollectionResponse
{
    CG_Message base;
    CG_CollectionName collectionID;
    CG_SchemaID dataModel;
    CG_Status status;
};
```

10.3.7 Management messages

The General Model defines messages for managing catalogs. These messages are translated to the CORBA profile literally. The General Model must still define the contents of the messages. Therefore, not all messages are described here in detail.

```
struct CG_CreateCatalogRequest
{
    CG_Message base;
    // tbd
};
struct CG_CreateCatalogResponse
{
    CG_Message base;
    // tbd
};
...
```

The same applies to the messages CG_CreateMetadataRequest, CG_CreateMetadataResponse, CG_UpdateCatalogRequest, CG_UpdateCatalogResponse, CG_DeleteCatalogRequest, CG_DeleteCatalogResponse.

10.3.8 Access messages

The General Model specifies direct access and brokered access. Direct access is provided by interfaces such as the OGC Simple Features and Coverage interfaces for CORBA. If a

catalog entry denotes an OGC Feature, a Feature Collection or a Coverage, the meta-information of this entry can be populated with an **ior** (interoperable object reference). This meta-information entity is called **ior** and is filled with the standard representation of an **ior**, specified by the OMG (Object Management Group), the creators of CORBA. In XML this looks like the following (abbreviated) example:

```
<ior>IOR:010631002800000049444c3a6f6d672e6f...</ior>
```

Brokered access is specified by a request and a response message, conform all operations of the General Model. The messages are listed below.

```
struct CG_BrokeredAccessRequest
{
  CG_Message base;
  wstring productHandle;
  CG_OrderSpecification orderInformation;
  wstring orderID;
  CG_BrokeredAccessRequestType requestType;
  CG_UserInformation userInformation;
  CG_StatusUpdateType statusOrderUpdateType;
  CG_PackageSpecification packageSpecification;
};
typedef sequence<long> LongSeq;
struct CG_BrokeredAccessResponse
{
  CG_Message base;
  CG_OrderStatus orderStatus;
  LongSeq resourceEstimate;
  CG_CollectionName order;
  wstring orderID;
  CG_Status status;
  CG_BrokeredAccessRequestType requestType;
```



```
};
```

10.3.9 Exceptions

Exceptions are not specified in the General Model because they are profile specific. In CORBA exceptions are considered as an appropriate way to notify error situations to clients. The CORBA profile specifies exceptions. The **diagnostic** structure member of the response messages are not used in the CORBA profile, their role is taken over by the exceptions. Some exceptions specify the **diagnostic** (w) string as an exception parameter. By other exceptions this is not necessary, as the exceptions are self-explaining.

```
exception InvalidRequest{};

exception InvalidSession{};

exception InvalidCollection{ sstring diagnostic; };
```

The exception InvalidQuery is thrown if the client specifies an invalid query.

Note: The exception is not thrown if the **resultType** field is set to **validate**.

```
exception InvalidQuery{ wstring diagnostic; };
```

The exception NotImplemented is defined in cases where the client asks for not-implemented behavior. This might occur by requesting the optional access or management services.

```
exception NotImplemented{ wstring diagnostic; };
```

The NotSupported exception is thrown if the client specifies something in a request parameter that is not implemented by the server. For example the client can specify its query in Z3950_TypeOne, but the server can only interpret OGC_Common queries.

```
exception NotSupported{ wstring diagnostic; };
```

The last exception, CatalogError, indicates an error when none of the above exceptions is appropriate.

```
exception CatalogError{ wstring diagnostic; };
```

10.3.10Catalog Service interfaces

The interface CG_Discovery implements methods for discovery: **query**, **present** and **explainCollection**. These methods take a request message as input parameter and return a response message as output parameter.

```
interface CG_Discovery

{

   CG_QueryResponse query(in CG_QueryRequest request)

       raises(InvalidSession, CatalogError);
```



```
    CG_PresentResponse present(in CG_PresentRequest request)

        raises(InvalidSession, CatalogError);

    CG_ExplainCollectionResponse explainCollection(in
           CG_ExplainCollectionRequest request)

        raises(CatalogError);

};
```

The next interface describes the CG_Manager interface, which defines catalog management functions. All methods are taken literally from the General Model. These methods create, update, or delete catalog entries. The appropriate meta information will be provided in the request messages.

By specifying a CORBA **ior** (interoperable object reference) in the meta-information, the following functions are possible:

- direct access to OGC Simple Features, OGC Feature Collections or OGC Coverages
- distributed search through multiple catalog services

To enable this functionality the field **ior** must be filled with the correct ior in the standard OMG ior string representation.

```
interface CG_Manager

{

    CG_CreateMetadataResponse

         createMetadata(in CG_CreateMetadataRequest request)

           raises(NotImplemented, CatalogError);

    CG_CreateCatalogResponse

         createCatalog(in CG_CreateCatalogRequest request)

           raises(NotImplemented, CatalogError);

    CG_UpdateCatalogResponse

         updateCatalog(in CG_UpdateCatalogRequest request)

           raises(NotImplemented, CatalogError);

    CG_DeleteCatalogResponse

         deleteCatalog(in CG_DeleteCatalogRequest request)
```



```
            raises(NotImplemented, CatalogError);

};
```

The interface CG_Access is the interface for access messages. It describes only one operation: the brokeredAccess function which has the request as input and which returns the response. Direct access is provided by interfaces as the Simple Feature interface and the Coverage interface. These interfaces are not described here. The client can get a reference to these interfaces by examining the **ior** field in the meta-information.

```
interface CG_Access

{

   CG_BrokeredAccessResponse

        brokeredAccess(in CG_BrokeredAccessRequest request)

           raises(NotImplemented, CatalogError);

};
```

The CG_CatalogServices interface is the core of the CORBA profile. All operations have a comparable form of the operations specified in the General Model. This consists of a request message as an input parameter and a response message as a return value.

The CG_CatalogServices inherits from the interfaces CG_Discovery, CG_Access and CG_Manager. In this way these services are realized.

Note: Access and manager services are optional. If a server does not implement these services it throws the exception **NotImplemented**.

The CG_CatalogServices also inherits from OGC_StatefulService that is described below.

```
interface CG_CatalogServices : OGC_StatefulService, CG_Discovery,
          CG_Access, CG_Manager

{

   CG_InitSessionResponse initSession(in CG_InitSessionRequest request)

        raises(CatalogError);

   CG_TerminateResponse terminateSession(in CG_TerminateRequest request)

        raises(InvalidSession, CatalogError);

   CG_ExplainServerResponse explainServer(in CG_ExplainServerRequest
          request)

        raises(CatalogError);
```



```
    CG_StatusResponse status(in CG_StatusRequest request)
         raises(InvalidSession, InvalidRequest, CatalogError);
    CG_CancelResponse cancel(in CG_CancelRequest request)
         raises(InvalidSession, InvalidRequest, CatalogError);
};
```

10.3.11Basic interfaces

Because of the asynchronous behavior of the query operation, a callback notifying the termination of the query might be useful. The Observer Design Pattern [GAMMA97] describes a standard mechanism for notifications to one or more clients. We envision that such a mechanism will be useful for many operations in the OpenGIS world. Therefore the OGC_Observer and the OGC_Subject interfaces are modeled separately. These interfaces might be moved to an OGC general module, in the same or a similar form. The next interfaces describe the mechanism.

Note: They are not mentioned in the General Model, as this is a CORBA specific behaviour.

```
interface OGC_Observer;
interface OGC_Subject
{
   void attachObserver(in OGC_Observer Observer);
   void detatchObserver(in OGC_Observer Observer);
   void notifyObserver();
};
interface OGC_Observer
{
   void updateSubject(in OGC_Subject ChangedSubject);
};
```

The CG_CatalogServices interface inherits from **OGC_Service**. This is envisioned as the basic interface for all OpenGIS services. As it does not exist yet, the content of this interface is not clear.

```
interface OGC_Service : OGC_Subject
{
```



```
};

interface OGC_StatefulService : OGC_Service
{
};
```

10.3.12Complete IDL

```
//--------------------------------------------------------------------
// Module       : OGC_CatalogService
//--------------------------------------------------------------------
// Purpose      : CORBA profile for catalog services
//--------------------------------------------------------------------
// Authors      : Barend Gehrels, Geodan IT b.v., the Netherlands
//                Joined Catalog Response Team
// Date         : july 13, 1999
//                july 26, 1999: errata based upon minor GM changes
//                july 30, 2000: Juergen Ebbinghaus (SICAD)
//                               and Barend Gehrels:
//                               changes based on SICAD Review
//                               - string -> wstring
//                               - long SessionID -> long long
/                               - e.g. sequence<type> TypeSeq
//--------------------------------------------------------------------
#pragma prefix "opengis.org"
#include <DynamicAny.idl>
module OGC_CatalogService
{
  //------------------------------------------------------------------
  // Parameter type definitions
```

```
    //-------------------------------------------------------------------
    // 3.2.7.1
    enum CG_AttributeCategory {queriable, presentable, both};
  // 3.2.7.2
    enum CG_BrokeredAccessRequestType {orderEstimate, orderQuoteAndSubmit,
           orderMonitor, orderCancel};
    // 3.2.7.3 capabilities see below
    // 3.2.7.4
    enum CG_CatalogEntryType {product, collection, catalog, service};
    // 3.2.7.5
    enum CG_CharacterSet {ASCII, UniCode, ShiftJIS};
    // 3.2.7.6
    union CG_CollectionName
      switch(long)
      {
        case 1 : wstring collectionID;
        case 2 : wstring collectionName;
      };
    // 3.2.7.7 CG_Dictionary see CG_Scheme
    // 3.2.7.8
    enum CG_MessageFormat {XML, HTML, TXT, NV};
    // 3.2.7.9
    struct CG_OrderItem
    {
      // Note: datatypes not provided by GM
      any productID;
      any productPrice;
```



```
    any productDeliveryOptions;
    any processingOptions;
    any sceneSelectionOptions;
};
// 3.2.7.10
struct CG_OrderSpecification
{
    // Note: datatypes not provided by GM
    any orderCentreID;
    any orderPrice;
    any orderDeliveryDate;
    any orderCancellationDate;
    any deliveryMethod;
    any package;
};
// 3.2.7.11
enum CG_OrderStatus {orderBeingEstimated, orderEstimated,
    orderBeingQuoted, orderBeingProcessed,
    orderCompleted, orderNotValid, orderCancelled};
// 3.2.7.13
enum CG_PackagingType {predefinedPackage, adhocPackage};
// 3.2.7.12
struct CG_PackageSpecification
{
    // Note: datatypes not provided by GM
    any packageId;
    any packagePrice;
    CG_PackagingType package;
```

```
    any packageMedium;

    long packageSize;

};

// 3.2.7.14

enum CG_PaymentMethod {credit, cash, purchaseOrder};

// 3.2.7.15

enum CG_PredefinedPresentationType {full, brief};

// 3.2.7.16

typedef sequence<wstring> StringSeq;

union CG_PresentationDescription

    switch(long)

    {

      case 1 : StringSeq attributes; // CG_TupleType in GM

      case 2 : CG_PredefinedPresentationType presentationType; // name
        in GM

    };

// 3.2.7.3.7

enum CG_QueryLanguage {OGC_Common, Z3950_TypeOne, SQL3_SimpleFeature,
       SQL2_SimpleFeature};

// 3.2.7.17

struct CG_QueryExpression

{

    wstring theQuery;

    wstring theNamespace;

    CG_QueryLanguage theLanguage;

    any queryParameters;

};

// 3.2.7.18
```



```
enum CG_QueryScope {distributed, local};

// 3.2.7.19

struct CG_RequestID

{

   long long sessionID;

   long counter;

};

// 3.2.7.20

enum CG_ResultType {validate, resultSetID, hits, results};

// 3.2.7.21

struct CG_ReturnData

{

   CG_MessageFormat encoding;

   any payload;

   // XML,HTML,TXT will return a string

   // NV will return a DynamicAny::NameValuePairSeq (from CORBA 2.3
        Dynamic Any)

};

// 3.2.7.22 CG_Scheme

typedef DynamicAny::NameValuePairSeq CG_Schema;

// 3.2.7.23 CG_SchemeID

struct CG_SchemaID

{

   wstring schemeName;

   CG_Schema schema;

};

// 3.2.7.25

enum CG_SortOrder {ascending, descending};
```

```
// 3.2.7.24

struct CG_SortField

{

  wstring attributeName;

  CG_SortOrder sortOrder;

};

// 3.2.7.26

enum CG_Status {success, successResultsAvailable, processingNormal,
       processingQueued, processingPausedOrSuspended, failure,
       failureAccessDenied};

// 3.2.7.27

enum CG_StatusUpdateType {manual, automatic};

// 3.2.7.28 CG_TupleType

// 3.2.7.29

struct CG_UserInformation

{

  wstring userName;

  wstring userAddress;

  wstring phoneNumber;

  wstring faxNumber;

  wstring emailAddress;

  wstring netAddress;

  CG_PaymentMethod paymentMethod;

};

//-------------------------------------------------------------------

// Capabilities, 3.2.7.3

//-------------------------------------------------------------------

enum CG_CapabilityType
```

```
    { ctAllSupportedRequest, ctDefaults, ctDefaultTimeOut,
      ctExplain, ctMessaging,  ctQuery, ctSession,
      ctSoftwareInformation, ctSupportedCollections };
// 3.2.7.3.1
typedef boolean CG_AllSupportedRequest;
// 3.2.7.3.2
typedef boolean CG_Defaults;
// 3.2.7.3.3
struct CG_DefaultTimeOut
{
  unsigned long long timeOut;
};
// 3.2.7.3.4
typedef boolean CG_Explain;
// 3.2.7.3.5
struct CG_Messaging
{
  CG_CharacterSet characterSet;
  CG_MessageFormat messageFormat;
};
// 3.2.7.3.6
struct CG_Query
{
  wstring version;
  CG_CharacterSet characterSet;
  CG_QueryLanguage queryLanguage;
};
// 3.2.7.3.8
```

```
struct CG_Session
{
   wstring language;
   wstring catalogSpecificationVersion;
   CG_CharacterSet characterSet;
};
// 3.2.7.3.9
struct CG_SoftwareInformation
{
   wstring vendor;
   wstring SVversionNumber;
   wstring IFversionNumber;
};
// 3.2.7.3.10
typedef sequence<CG_CollectionName> CG_SupportedCollections;
// 3.2.7.3
union CG_Capability
   switch(CG_CapabilityType)
   {
      case ctAllSupportedRequest : CG_AllSupportedRequest
        allSupportedRequest;
      case ctDefaults : CG_Defaults defaults;
      case ctDefaultTimeOut : CG_DefaultTimeOut timeOut;
      case ctExplain : CG_Explain explain;
      case ctMessaging : CG_Messaging messaging;
      case ctQuery : CG_Query query;
      case ctSession : CG_Session session;
```



```
      case ctSoftwareInformation : CG_SoftwareInformation
        softwareInformation;

      case ctSupportedCollections : CG_SupportedCollections
        supportedCollections;

    };

//-------------------------------------------------------------------

// Messages

//-------------------------------------------------------------------

struct CG_Message

{

   long long sessionID;

   wstring destinationID;

   CG_RequestID requestID;

   wstring additionalInfo;

};

struct CG_InitSessionRequest

{

   CG_Message base;

};

struct CG_InitSessionResponse

{

   CG_Message base;

};

struct CG_TerminateRequest

{

   CG_Message base;

};

struct CG_TerminateResponse

{
```

```
    CG_Message base;
    CG_Status status;
};
typedef sequence<CG_CapabilityType> CG_CapabilityTypeSeq;
struct CG_ExplainServerRequest
{
    CG_Message base;
    CG_CapabilityTypeSeq capabilities;
};
struct CG_ExplainServerResponse
{
    CG_Message base;
    CG_CapabilityTypeSeq capabilities;
};
struct CG_StatusRequest
{
    CG_Message base;
    CG_RequestID requestIDtoStatus;
};
struct CG_StatusResponse
{
    CG_Message base;
    CG_RequestID requestIDtoStatus;
    CG_Status status;
};
struct CG_CancelRequest
{
```



```
    CG_Message base;
    CG_RequestID requestIDtoCancel;
    boolean freeResources;
};
struct CG_CancelResponse
{
    CG_Message base;
    CG_Status status;
    CG_RequestID canceledRequest;
};
typedef sequence<CG_SortField> CG_SortFieldSeq;
struct CG_QueryRequest
{
    CG_Message base;
    CG_QueryExpression queryExpression;
    CG_ResultType resultType;
    long iteratorSize;
    long cursor;
    CG_MessageFormat returnFormat;
    CG_PresentationDescription presentation;
    CG_SortFieldSeq sortField;
    CG_QueryScope queryScope;
    CG_CollectionName collectionID;
    CG_CatalogEntryType catalogType;
    boolean asynchronous;
    long maxLevel;
};
struct CG_QueryResponse
```

```
{
  CG_Message base;
  CG_ReturnData retrievedData;
  CG_CollectionName resultSetID;
  CG_Status status;
  long hits;
  long cursor;
};
struct CG_PresentRequest
{
  CG_Message base;
  CG_CollectionName resultSetID;
  CG_PresentationDescription presentation;
  CG_SortFieldSeq sortField;
  CG_MessageFormat returnFormat;
  long iteratorSize;
  long cursor;
};
struct CG_PresentResponse
{
  CG_Message base;
  CG_ReturnData retrievedData;
  long cursor;
  long hits;
  CG_Status status;
};
struct CG_ExplainCollectionRequest
```



```
{
   CG_Message base;
   CG_AttributeCategory attributeCategory;
   CG_CollectionName collectionID;
   CG_MessageFormat returnFormat;
};
struct CG_ExplainCollectionResponse
{
   CG_Message base;
   CG_CollectionName collectionID;
   CG_SchemaID dataModel;
   CG_Status status;
};
// Messages for access
// 3.2.5.1
struct CG_BrokeredAccessRequest
{
   CG_Message base;
   wstring productHandle;
   CG_OrderSpecification orderInformation;
   wstring orderID;
   CG_BrokeredAccessRequestType requestType;
   CG_UserInformation userInformation;
   CG_StatusUpdateType statusOrderUpdateType;
   CG_PackageSpecification packageSpecification;
};
// 3.2.5.2
typedef sequence<long> LongSeq;
```

```
struct CG_BrokeredAccessResponse
{
  CG_Message base;
  CG_OrderStatus orderStatus;
  LongSeq resourceEstimate;
  CG_CollectionName order;
  wstring orderID;
  CG_Status status;
  CG_BrokeredAccessRequestType requestType;
};
// Messages for managing functions
struct CG_CreateCatalogRequest
{
  CG_Message base;
  // tbd
};
struct CG_CreateCatalogResponse
{
  CG_Message base;
  // tbd
};
struct CG_UpdateCatalogRequest
{
  CG_Message base;
  // tbd
};
struct CG_UpdateCatalogResponse
```



```
{
  CG_Message base;
  // tbd
};
struct CG_DeleteCatalogRequest
{
  CG_Message base;
  // tbd
};
struct CG_DeleteCatalogResponse
{
  CG_Message base;
  // tbd
};
struct CG_CreateMetadataRequest
{
  CG_Message base;
  // tbd
};
struct CG_CreateMetadataResponse
{
  CG_Message base;
  // tbd
};
//---------------------------------------------------------------
// Exceptions
//---------------------------------------------------------------
exception InvalidSession{};
```

```
exception InvalidRequest{};
exception InvalidCollection{ wstring diagnostic; };
exception InvalidQuery{ wstring diagnostic; };
exception NotImplemented{ wstring diagnostic; };
exception NotSupported{ wstring diagnostic; };
exception CatalogError{ wstring diagnostic; };
//---------------------------------------------------------------
// Interfaces
//---------------------------------------------------------------
interface OGC_Observer;
interface OGC_Subject
{
  oneway void attachObserver(in OGC_Observer Observer);
  oneway void detachObserver(in OGC_Observer Observer);
  oneway void notifyObserver();
};
interface OGC_Observer
{
  void updateSubject(in OGC_Subject ChangedSubject);
};
interface OGC_Service : OGC_Subject
{
};
interface OGC_StatefulService : OGC_Service
{
};
interface CG_Discovery
```

```
{

   CG_QueryResponse query(in CG_QueryRequest request)

        raises(InvalidSession, InvalidQuery, InvalidCollection,
        NotSupported, CatalogError);

   CG_PresentResponse present(in CG_PresentRequest request)

        raises(InvalidSession, InvalidCollection, NotSupported,
        CatalogError);

   CG_ExplainCollectionResponse explainCollection(in
        CG_ExplainCollectionRequest request)

        raises(CatalogError);

};

interface CG_CatalogServices;

interface CG_Access

{

   // Direct access is provided by the IOR fields in the meta-
        information

   // itself

   // Brokered access

   CG_BrokeredAccessResponse

        brokeredAccess(in CG_BrokeredAccessRequest request)

        raises(NotImplemented, CatalogError);

};

interface CG_Manager

{

   CG_CreateMetadataResponse

        createMetadata(in CG_CreateMetadataRequest request)

        raises(NotImplemented, CatalogError);

   CG_CreateCatalogResponse

        createCatalog(in CG_CreateCatalogRequest request)

        raises(NotImplemented, CatalogError);
```

```
      CG_UpdateCatalogResponse

           updateCatalog(in CG_UpdateCatalogRequest request)

           raises(NotImplemented, CatalogError);

      CG_DeleteCatalogResponse

           deleteCatalog(in CG_DeleteCatalogRequest request)

           raises(NotImplemented, CatalogError);

   };

   interface CG_CatalogServices : OGC_StatefulService, CG_Discovery,
          CG_Access, CG_Manager

   {

      CG_InitSessionResponse initSession(in CG_InitSessionRequest
           request)

           raises(CatalogError);

      CG_TerminateResponse terminateSession(in CG_TerminateRequest
           request)

           raises(InvalidSession, CatalogError);

      CG_ExplainServerResponse explainServer(in CG_ExplainServerRequest
           request)

           raises(CatalogError);

      CG_StatusResponse status(in CG_StatusRequest request)

           raises(InvalidSession, InvalidRequest, CatalogError);

      CG_CancelResponse cancel(in CG_CancelRequest request)

           raises(InvalidSession, InvalidRequest, CatalogError);

   };

};
```

11 Bibliography

ISO/IEC 8825:1990 Information technology -- Open Systems Interconnection -- Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1)

ISO 19101:2002 Geographic information -- Reference model

ISO 19103:2002 (DTS) Geographic information - Conceptual schema language, (Draft Technical Specification)

ISO 19106:2002 (DIS) Geographic information - Profiles

ISO 19108:2002 Geographic information - Temporal schema

ISO 19109:2002 (DIS) Geographic information - Rules for application schema

ISO 19110:2001 (DIS) Geographic information - Methodology for feature cataloguing

ISO 19113:2002 Geographic information - Quality principles

ISO 19114:2001 (DIS) Geographic information - Quality evaluation procedures

ISO 19115:2001 (DIS) Geographic information - Metadata

ISO 19118:2002 (DIS) Geographic information - Encoding

ISO 19119:2002 (DIS) Geographic information - Services

ISO 23950:1998 Information and documentation -- Information retrieval (Z39.50) -- Application service definition and protocol specification

Annex A: Abstract Test Suite for Conformance (Normative)

All implementation profiles should provide methods for conformance testing that adhere to this generalized abstract test suite. Conformance for extended (optional) interfaces, including the Access and Management Service are not described herein.

Test case identifier: Initialize

a) Test Purpose: To determine conformance by initializing a session

b) Test Method: Client sends CG_Initiliaze Request to the Catalog Server, Server responds with a CG_IntializeResponse

c) Reference: OGC Catalog Services Specification

d) Test Type: TBD

e) Test Verdict: pass/fail

Test case identifier: Query and Present

a) Test Purpose: To determine conformance by performing a query

b) Test Method: As part of a session, the client sends a CG_QueryRequest. The server performs the query and responds with a CG_QueryResponse. Client then sends a CG_PresentRequest, server responds with a CG_PresentResponse. The query must complete without error and the records returned in the CG_PresentResponse must match the query.

c) Reference: OGC Catalog Services Specification

d) Test Type: TBD

e) Test Verdict: pass/fail

Test case identifier: Terminate

a) Test Purpose: To determine conformance by terminating a session

b) Test Method: As part of a session, the client sends a CG_TerminateRequest. The server responds with a CG_TerminateResponse. No errors occur.

c) Reference: OGC Catalog Services Specification

d) Test Type: TBD

e) Test Verdict: pass/fail

Annex B: CORBA Profile – Fine Grain (Informative)

Fine-Grain CORBA Structural Model –Overview

This section defines the Fine Grain CORBA Profile of the OGC Catalog Specification. The Fine Grain portion is divided into four sections for purposes of explanation:

1) The Library and Manager interfaces – Used to place requests with the Catalog Service

2) The Responses – Used to retrieve the results of a request

3) The Datatypes – The data types used as parameters in the requests and responses operations

4) Callback – Used to notify clients of the status of a request

These elements are used together in a simple three-step pattern to provide the Catalog Service capabilities:

1) The Library object provides a Manager object to the client.

2) This Manager object provides one or more operations for a specific capability such as query or access. When successfully invoked by the client, these operations return a Response object.

3) That Response objects provides one or more operations that allow retrieval of the results of the request, such as the results of a query.

B.2 Managers

The Manager segment of the Fine Grain General Model is composed of the Library interface, which acts as a Factory for the Managers, two abstract interfaces (LibraryManager and ResponseManager) which define operations common to the concrete Managers and five concrete Managers (CatalogMgr, OrderMgr, CreationMgr, UpdateMgr and DataModelMgr) each specialized to provide a specific capability. Figure C-1 shows the UML describing these interfaces, relationships and their operations. Details for each interface are given below.

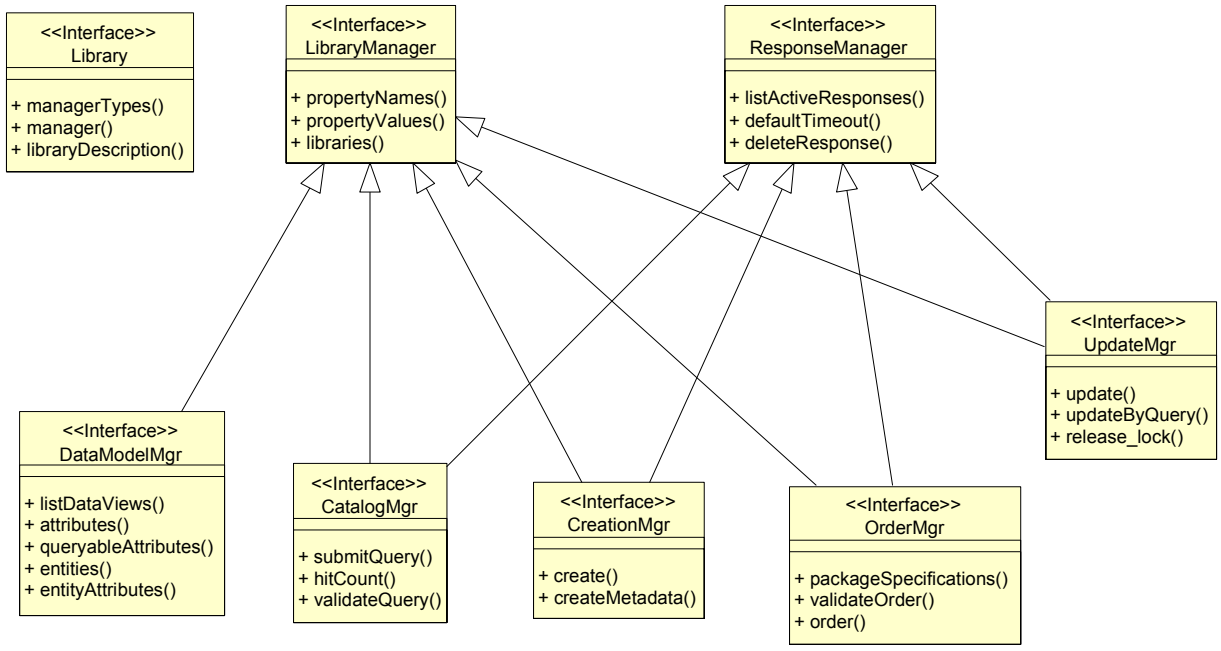


Figure B- 1 - Static Class Diagram of the Library and Managers

B.2.1 Library

The Library interface serves as the starting point for any interaction with the rest of the fine-grained interfaces. All capabilities of a library system are accessed through the concrete manager objects. The Library interface is the mechanism by which a client discovers and requests access to manager objects.

B.2.1.1 Public Operations:

managerTypes () : ManagerTypeList

This operation allows a client to discover which managers a particular library supports. A ManagerTypeList structure is returned from a successful invocation of this operation.

manager (manager_type: in ManagerType, access_criteria: in OGCBasic::NameValueList) : LibraryManager

This operation is a request to be given access to a manager object. A successful invocation will return a reference to an object of type LibraryManager. The client then can use this Manager to make requests for specific Catalog services.

libraryDescription () : LibraryDescription

This operation returns descriptive information about the library. A successful invocation of this operation will return a populated LibraryDescription structure. See the Datatypes Section 3.3.4 for details on the LibraryDescription structure.

B.2.1.2 LibraryManager

The LibraryManager interface serves as the (abstract) root for all types of manager objects in the Fine Grained Model. It is abstract in the sense that a concrete LibraryManager object by itself would serve no real purpose. Its real purpose is to define certain operations that are common to all types of manager objects in the Fine Grained Model. Public operations follow:

propertyNames () : OGCBasic::NameList

This selector operation allows a client to obtain a list of property names. A property name is the name component of a NameValue pair. The NameList returned by this operation identifies all the property names supported or known by this manager. These properties are used to describe any characteristics of a Manager.

propertyValues (desired_properties : in OGCBasic::NameList) : PropertyList

This operation allows a client to discover the properties and the current values of those properties that describe a Manager.

libraries () : LibraryList

This selector operation allows a client to determine the specific geospatial library system(s) this Manager supports.

B.2.1.3 ResponseManager

The ResponseManager is an abstract interface that defines operations common to all managers that use Response objects as part of their operations. Public operations follow.

listActiveResponses () : ResponseList

This operation allows a client to determine what responses this ResponseManager is managing. A successful invocation of this operation will return a ResponseList structure

defaultTimeout () : OGCBasic::RelativeTime

This operation allows a client to get the default value of the lifetime of the Responses being managed by this ResponseManager. This time is the length of time the Response object must be maintained before the Response is deleted. This time is used by a count down timer, which is reset with each invocation of an operation on the specific Response object. When

the count down expires, i.e., no invocations during the timeout period, the Response object may be “garbage collected”.

deleteResponse (response : in Response) : void

This operation allows a client to destroy a Response and free all resources associated with that Response.

B.2.1.4 CatalogMgr

The CatalogManager Interface allows a client to submit queries to search the catalog of holdings of a geospatial library. Derived from LibraryManager, ResponseManager. Public Operations:

submitQuery (view_name : in ViewName, query : in Query, result_attributes : in OGCBasic::NameList, sort_attributes : in SortAttributeList, properties : in PropertyList) : SubmitQueryResponse

This operation allows a client to submit a query to search a catalog. The client indicates the product type of interest by supplying the desired value in *view_name*. The client indicates the view of the catalog of interest in *view_name*, the query expression itself in *query,* the set of attributes to be returned in *result_attributes* and any sorting to be done in *sort_attributes*. The parameter *properties* is used to supply any implementation specific parameters. A successful invocation returns a SubmitQueryResponse object, which is used to retrieve the query results. If the property list contains the property “lock” (type = Boolean) and the lock is set to true, the products that are returned by the query are locked for update.

hitCount (view_name : in ViewName, query : in Query, properties : in PropertyList) : HitCountResponse

This operation allows a client to determine the number of results ("hits") that would be returned from a particular query. The parameters used are the same as used in the submitQuery operation.

validateQuery (view_name : in ViewName, query : in Query, result_attributes : in OGCBasic::NameList, sort_attributes : in SortAttributeList, properties : in PropertyList) : boolean

This operation allows a client to verify that a specific query is valid. The parameters used are the same as used in the submitQuery operation.

B.2.1.5 OrderMgr

The OrderMgr Interface allows a client to submit orders for data sets or products from a geospatial library. The OrderMgr provides operations to place an order (order), specify how it is to packaged and delivered (i.e., packageSpecifications), and to validate an order specification prior to submitting the order to a library (validate). Derived from LibraryManager, ResponseManager. Public Operations:

packageSpecifications () : OGCBasic::NameList

This operation returns a NameList containing all packaging specifications known or acceptable to this OrderMgr. The details of the packageSpecifications are implementation dependent.

validateOrder (order : in OGCBasic::DG_DirectedGraph, properties : in PropertyList) : ValidationResults

This operation is used to determine if an order request for a data set or product from a geospatial library is valid. The operation returns a data structure indicating the validity of the order and information concerning details specific to the validation of the order.

order (order : in OGCBasic::DG_DirectedGraph, properties : in PropertyList) : OrderResponse

This operation is used to request delivery of one or more datasets or products (i.e. place an order). The client defines the order by assembling a DG_DirectedGraph containing all necessary elements of the desired order.

B.2.1.6 CreationMgr

The CreationMgr interface allows a client to nominate a data set or product to a library(s) for inclusion in the library holdings. This interface also allows a client to nominate the metadata of a data set or product for inclusion without supplying the data set or product itself. Derived from LibraryManager, ResponseManager. Public Operations:

create (new_product : in OGCBasic::FileLocationList, creation_metadata : in OGCBasic::DG_DirectedGraph, properties : in PropertyList) : CreateResponse

This operation allows a client to nominate a data set or product for inclusion in the holdings of a library(s). The data set or product nominated must be accompanied by the appropriate metadata. The metadata may be in the product itself in the DG_DirectedGraph or a combination of the two.

createMetadata (creation_metadata : in OGCBasic::DG_DirectedGraph, view_name : in ViewName, properties : in PropertyList) : CreateMetaDataResponse

This operation allows a client to nominate the metadata of a data set or product for inclusion in a library(s) without supplying the data set or product itself. The client nominates the metadata by supplying all metadata elements in the DG_DirectedGraph creation_metadata.

B.2.1.7 UpdateMgr

The UpdateMgr Interface provides the capability for a client to modify existing catalog entries. Derived from LibraryManager, ResponseManager. Public Operations:

update (view : in ViewName, changes : in UpdateDG_DirectedGraphList, properties : in PropertyList) : UpdateResponse

This operation allows a client to modify existing catalog entries. The desired modifications are defined by specifying the view that is being updated along with an UpdateDAGList that contains the entries with the modified and/or additional values.

updateByQuery (updated_attribute : in OGCBasic::NameValue, query : in Query, view_name : in ViewName, properties : in PropertyList) : UpdateByQueryResponse

This operation allows a client to update one or more catalog entries by supplying a query to select the entries to be changed in *query* and a NameValue pair containing the attribute to be updated and its new value in *updated_attribute*.

releaseLock (lockedProduct : in UID::Product) : void

This operation manually releases a lock that has been placed on a Product. The Product reference for the locked Product is provided in the parameter lockedProduct. A Product is locked through the Catalog Manager.

B.2.1.8 DataModelMgr

The DataModelMgr Interface allows a client to discover and access the metadata model being used by a given Geospatial Library. Derived from LibraryManager. Public Operations:

listDataViews (properties : in PropertyList) : ViewList

This operation exposes the hierarchy of data view types recognized by this library. See the DataTypes Section 3.3.4 for details of the ViewList structure. The term "*view*" as used in this section is equivalent to the queryable attribute set of a Z39.50 implementation. It may also be thought of as equivalent to a metadata profile of the proposed international standard on Metadata that has been generated by members of the ISO TC/211 standards body.

attributes (view_name : in ViewName, properties : in PropertyList) : AttributeInformationList

This operation returns an AttributeInformationList, which describes the requested data view. The AttributeInformationList is composed of elements of type AttributeInformation. The AttributeInformationList contains both queryable and non-queryable attributes. See the DataTypes Section 3.3.4 for the details of the AttributeInformationList structure.

queryableAttributes (view_name : in ViewName, properties : in PropertyList) : AttributeInformationList

This operation returns an AttributeInformationList , which describes a specific data view. The AttributeInformationList is a sequence of elements of type AttributeInformation. The AttributeInformationList contains the subset of all attributes that are queryable. See the DataTypes Section 3.3.4 for the details of the AttributeInformationList structure.

entities (view_name : in ViewName, properties : in PropertyList) : OGCBasic::DG_DirectedGraph

This operation returns a DG_DirectedGraph, which represents a set of entities and their relationships that compose a specific data view.

entityAttributes (entity : in Entity, properties : in PropertyList) : AttributeInformationList

This operation returns an AttributeInformationList, which represents a set of attributes that describes a specific entity. The AttributeInformationList contains elements of type AttributeInformation. See the DataTypes Section 3.3.4 for the details of the AttributeInformationList structure.

B.2.2 Responses

The Response segment of the Fine Grain General Model is composed of one abstract interface (Response) and seven concrete Responses. Each of these concrete responses is returned by a specific Manager operation. Figure 13 shows the UML describing these interfaces, relationships and their operations. Details for each interface are listed in the following sections. Table B.2.2-1 provides a mapping of the Manager interfaces that create the concrete Response Interfaces when the appropriate operation of the Manager interface is invoked.

Table B-1 - Response Interfaces Created by Invoking An Operation of a Manager Interface

Fine-Grain Manager Interface	Manager Interface Operation	Response Interface Created by Invoking the Operation of The Manager Interface
CatalogMgr	SubmitQuery	**SubmitQueryResponse**
	HitCount	HitCountResponse
Order	Order	OrderResponse
CreationMgr	Create	CreateResponse
	CreateMetadata	CreateMetadataResponse
UpdateMgr	Update	UpdateResponse

	UpdateByQuery	UpdateByQueryResponse

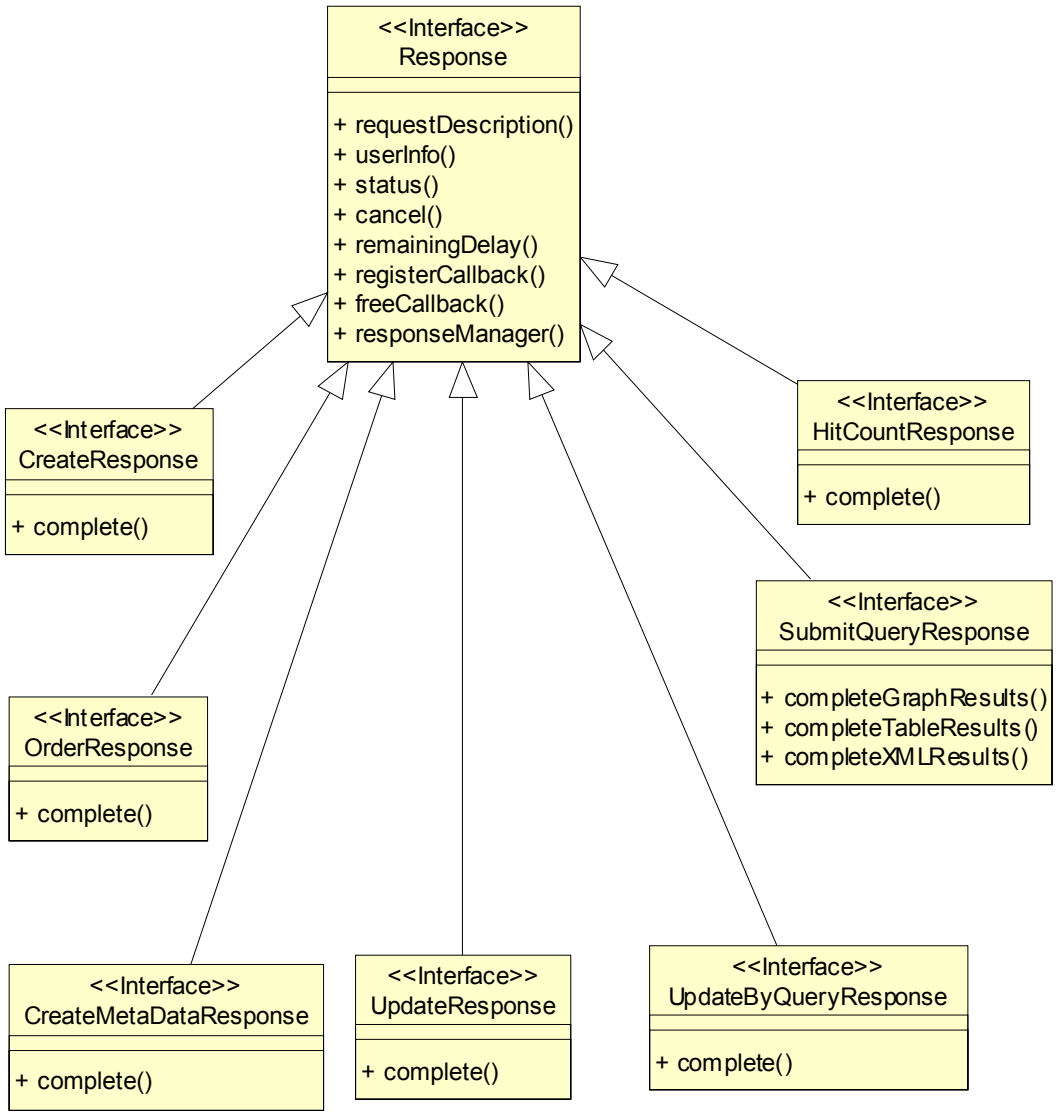


Figure B-2 – Static Class Diagram of The Response Interfaces

B.2.2.1 Response

The Response Interface is an abstract interface that defines those operations that are common to all concrete Response objects. Public Operations:

requestDescription () : OGCBasic::RequestDescription

This operation returns a populated RequestDescription structure that describes the Request that generated this Response. See the DataTypes Section 3.3.4 for details on the RequestDescription structure.

userInfo (message : in string) : void

This operation allows a user to provide information that describes the Response. The client supplies this information in the form of a string in a message form. A successful invocation of this operation associates the client's message with the Request.

status () : OGCBasic::Status

This operation returns the current status of the Response. This operation can be used to poll the Response to determine whether or not it has completed processing.

cancel () : void

This operation is used to terminate further processing of a Response.

remainingDelay () : OGCBasic::RelativeTime

This operation returns an estimate of the time until the Response reaches completion.

registerCallback (callback : in CB::Callback) : void

This operation allows a client to register a Callback object with a Response object. The purpose of a Callback object is to provide an operation to allow the Response object to notify the client that processing of a Response has reached a terminal state.

freeCallback (callback : in CB::Callback) : void

This operation allows a client to remove a Callback previously registered with a Response. The client supplies a reference to the Callback that is to be de-registered

responseManager () : ResponseManager

This operation allows a client to discover which ResponseManager is managing the Response object.

B.2.2.2 SubmitQueryResponse

The SubmitQueryResponse Interface is used to obtain the results from submitting a query to the catalog service of a geospatial library. This Response is returned from the submitQuery operation of the CatalogMgr. Derived from Response. Public Operations:

completeGraphResults (start_point : in unsigned long, length : in unsigned long, results : out QueryResults) : OGCBasic::State

This operation returns a set of query results expressed as a Directed Graph structure. See the DataTypes Section 3.3.4 for details on the DG_DirectedGraph structure.

completeTableResults (start_point : in unsigned long, length : in unsigned long, results : out

This operation returns a set of query results expressed as a NameValueTable structure. See the DataTypes Section3.3.4 for details on the NameValueTable structure.

completeXMLResults (start_point : in unsigned long, length : in unsigned long, results : out string) : OGCBasic::State

This operation returns a set of query results expressed as an XML document.

B.2.2.3 OrderResponse

The OrderResponse Interface is used to return the status of the processing of an order. This Response is returned from the order operation of the OrderMgr. Derived from Response. Public Operations:

complete () : OGCBasic::State

This operation allows a client to wait until processing of the order is complete, and to obtain the final status.

B.2.2.4 CreateMetaDataResponse

This Interface is used to create new metadata entries for the catalog holdings of a geospatial library. This Response is returned from the createMetadata operation of the CreationMgr. Derived from Response. Public Operations:

complete (new_product : out UID::Product) : OGCBasic::State

This operation waits until the creation processing is complete, and then returns the identifier for the dataset product just created.

B.2.2.5 CreateResponse

The CreateResponse interface is used to create new product entries in a geospatial library. This Response is returned from the create operation of the CreationMgr. Derived from Response. Public Operations:

complete (new_product : out UID::ProductList) : OGCBasic::State

This operation waits until the creation processing is complete, and then returns a ProductList containing the references to all newly created dataset(s) or product(s).

B.2.2.6 UpdateByQueryResponse

The UpdateByQueryResponse interface is used to complete the processing of an update of a catalog entry operation. This Response is returned from the updateByQuery operation of the UpdateMgr. Derived from Response. Public Operations:

complete () : OGCBasic::State

This operation waits until the update processing is complete, and then returns the update status.

B.2.2.7 UpdateResponse

The UpdateResponse interface is used to complete the processing of an update operation of a catalog entry. This Response is returned from the update operation of the UpdateMgr. Derived from Response. Public Operations:

complete () : OGCBasic::State

This operation waits until the update processing is complete, and then returns the status of the update operation.

B.2.2.8 HitCountResponse

The HitCountResponse Interface is used to return the number of hits obtained in response to an invocations of the hitCount operation of the CatalogMgr. Derived from Response. Public Operations:

complete () : OGCBasic::State

This operation allows a client to complete processing of the HitCountResponse. This operation returns a value that indicates the total number of results ("hits") that would be returned if the query were executed. It also returns a State indicating details of the completed operation.

B.2.3 DataTypes

This section defines the data types used by the operations of the Managers and Response interfaces. This section is divided into two subsections: Catalog Specific Types and OGC Types. Catalog Types are types defined specifically for the use of the Catalog Service. OGC Types are used by the Catalog Service but are very general in nature (i.e., might be used by other OGC services).

B.2.3.1 Catalog Specific DataTypes

B.2.3.1.1 AttributeInformation

A collection of elements that together describes an attribute used in a metadata model.

Public Attributes:

attribute_name : string

The name of the attribute being described

attribute_units : string

The units of measure for this attribute.

description : string

A human-readable description of the attribute

sortable : boolean

A flag indicating whether this attribute is sortable.

updateable : boolean

A flag indicating whether this attribute is updateable by clients

B.2.3.1.2 AttributeInformationList

A sequence of AttributeInformation structures.

B.2.3.1.3 AttributeType

Defines the list of all possible Attribute Types.

Public Attributes:

text

integer

floating_point

ogcbasic_coordinate

ogcbasic_polygon

ogcbasic_abs_time

ogcbasic_rectangle

ogcbasic_image

ogcbasic_height

ogcbasic_elevation

ogcbasic_distance

ogcbasic_percentage

ogcbasic_ratio

ogcbasic_angle

ogcbasic_file_size

ogcbasic_file_location

ogcbasic_count

ogcbasic_weight

ogcbasic_date

ogcbasic_linestring

ogcbasic_data_rate

ogcbasic_bin_data

boolean_data

ogcbasic_duration

B.2.3.1.4 Change

A structure used to indicate which node of a DG_DirectedGraph is to be changed and what type of change is to be performed.

B.2.3.1.5 ChangeList

A sequence of Change structures.

B.2.3.1.6 ChangeType

An enumerated data type used to indicate the type of change to an attribute value being requested.

Public Attributes:

add_change :

Indicates a change to add a new Node to a DG_DirectedGraph

update_change :

Indicates a change that will update an existing Node in a DG_DirectedGraph

delete_change :

Indicates a change that will delete a Node from a DG_DirectedGraph

B.2.3.1.7 DateRange

A structure that defines a range of dates.

B.2.3.1.8 Domain

A union data type that defines a container to hold a domain value.

Public Attributes:

The table below contains the list of DomainType and their ranges used in the enumeration "DomainType" (D.2.3.1.9).

DomainType	DomainType Range
date_value	DateRange
text_value	unsigned long
integer_value	IntegerRange
integer_set	IntegerRangeList
floating_point_value	FloatingPointRange
list	OGCBasic::NameList
ordered_list	OGCBasic::NameList
integer_range	IntegerRange
floating_point_range	FloatingPointRange
floating_point_set	FloatingPointRangeList
geographic	OGCBasic::Rectangle
geographic_set	OGCBasic::RectangleList
binary_data	OGCBasic::BinData
boolean_value	**boolean**

B.2.3.1.9 DomainType

This enumeration defines the set of all possible data types expected to be used in a metadata model. It is used by the DataModelMgr to describe an attribute in a metadata model.

Public Attributes:

date_value :

text_value :

integer_ value:

floating_point_ value:

list :

ordered_list :

integer_range :

floating_point_range :

geographic :

integer_set :

floating_point_set :

geographic_set :

binary_data :

boolean_value :

B.2.3.1.10 Entity

A string value used as an identifier for an entity in a metadata model.

B.2.3.1.11 FloatingPointRange

A structure that defines a range of floating point numbers.

Public Attributes:

lower_bound : double

The lower limit of the range.

upper_bound : double

The upper limit of the range.

B.2.3.1.12 FloatingPointRangeList

A sequence that defines a set of floating point ranges.

B.2.3.1.13 IntegerRange

A structure that defines a range of integers.

Public Attributes:

lower_bound : long

The lower limit of the range

upper_bound : long

The upper limit of the range

B.2.3.1.14 IntegerRangeList

A sequence that defines a set of integer ranges.

B.2.3.1.15 LibraryDescription

A structure that contains a human-readable description of a Library.

Public Attributes:

library_name : string

An identifier for this instance of a Library.

library_description : string

A human-readable description of this Library. This may contain information such as a description of its holdings and ordering or pricing schemes.

library_version_number : string

A field that indicates the version of the Library system software (i.e. N.N.N).

B.2.3.1.16 LibraryDescriptionList

A sequence of LibraryDescriptions.

B.2.3.1.17LibraryList

A sequence of Library identifiers.

B.2.3.1.18 ManagerType

An identifier for a type of Manager. The current valid values are "CatalogMgr", "OrderMgr", "DataModelMgr", "CreationMgr" and "UpdateMgr".

B.2.3.1.19 ManagerTypeList

A sequence of ManagerTypes.

B.2.3.1.20 Polarity

An enumeration used to indicate the direction of a sort.

Public Attributes:

B.2.3.2 ascending :

descending :

B.2.3.2.1 PropertyList

A typedef that contains a name value pair.

B.2.3.2.2 Query

A structure that contains a query expression for submittal to a catalog.

B.2.3.2.3 QueryResults

A structure that is used as one of the three means to encode a set of query results, the others being NameValueTable and XML. See the operations of the SubmitQueryResposnse interface.

B.2.3.2.4 RequirementMode

An enumeration that defines a flag to indicate whether the attribute is required to be present in every catalog entry.

Public Attributes:

mandatory :

This parameter is used to indicate a catalog entry is mandatory.

optional :

This parameter is used to indicate a catalog entry is optional.

B.2.3.2.5 ResponseList

A sequence of Response identifiers.

B.2.3.2.6 SortAttribute

A structure used to indicate the attribute to be sorted upon and its direction.

B.2.3.2.7 SortAttributeList

A sequence of SortAttributes.

B.2.3.2.8 UpdateDG_DirectedGraph

A structure that defines a set of changes to another DG_DirectedGraph. It includes the new values (data) and how these changes are to be applied to the other DG_DirectedGraph (changes).

B.2.3.2.9 UpdateDG_DirectedGraphList

A sequence of UpdateDG_DirectedGraph structures.

B.2.3.2.10 ValidationResults

This data type is returned to indicate if a requested operation is valid. It is used in the CatalogMgr::validateQuery and OrderMgr::validateOrder operations.

Public Attributes:

valid : boolean

If TRUE requested operation is valid. If FALSE requested operation is not valid.

warning : boolean

If TRUE warning field contains a description of a warning condition associated with the validity of the requested operation (i.e. Valid but ...). If FALSE no warning is given.

details : string

The text describing the warning.

B.2.3.2.11 ValidationResultsList

A sequence of ValidationResult structures.

B.2.3.2.12 View

This structure is used to define the relationship between Views and other Views (sub-views).

B.2.3.2.13 ViewList

A sequence of Views

B.2.3.2.14 ViewName

A string used as an identifier for a View. A View is used to denote a specific set of attributes that may be used together in queries.

B.2.3.2.15 ViewNameList

A sequence of ViewName

B.2.3.3 Proposed Additional OGC Basic Data Types

In Version 1.1 of this Specification this section of Annex C describes basic types used in the Fine Grain Model and Profile. These types will need to be "harmonized" with existing OGC Basic types. Once this harmonization work is completed this informative Annex of the Catalog Specification will be revised to reflect which existing OGC Basic Types were adopted by the Catalog Specification Revision Working Group (RWG) and which types were put forth as candidates to augment the OGC Basic Types Repository.

B.2.3.3.1 AbsTime

A structure defining an absolute time, including the date.

B.2.3.3.2 BinData

A "blob" of binary data

B.2.3.3.3 Cardinality

An enumeration that defines the possible values of cardinality.

Public Attributes:

one_to_one :

one_to_many :

many_to_one :

many_to_many :

one_to_zero_or more:

one_to_one_or_more:

one_to_zero_or_one:

B.2.3.3.4 DG_DirectedGraph

A Directed Graph structure is essentially a directed acyclic graph. The graph contains two types of information; data elements called “nodes”, and relationships among these nodes called “edges”. Figure B-3 is a representation of the DG_DirectedGraph that has been created from reverse engineering of the IDL used to define a Directed Graph. It was created using a commercial CASE tool that has the functionality to reverse engineer IDL into UML.

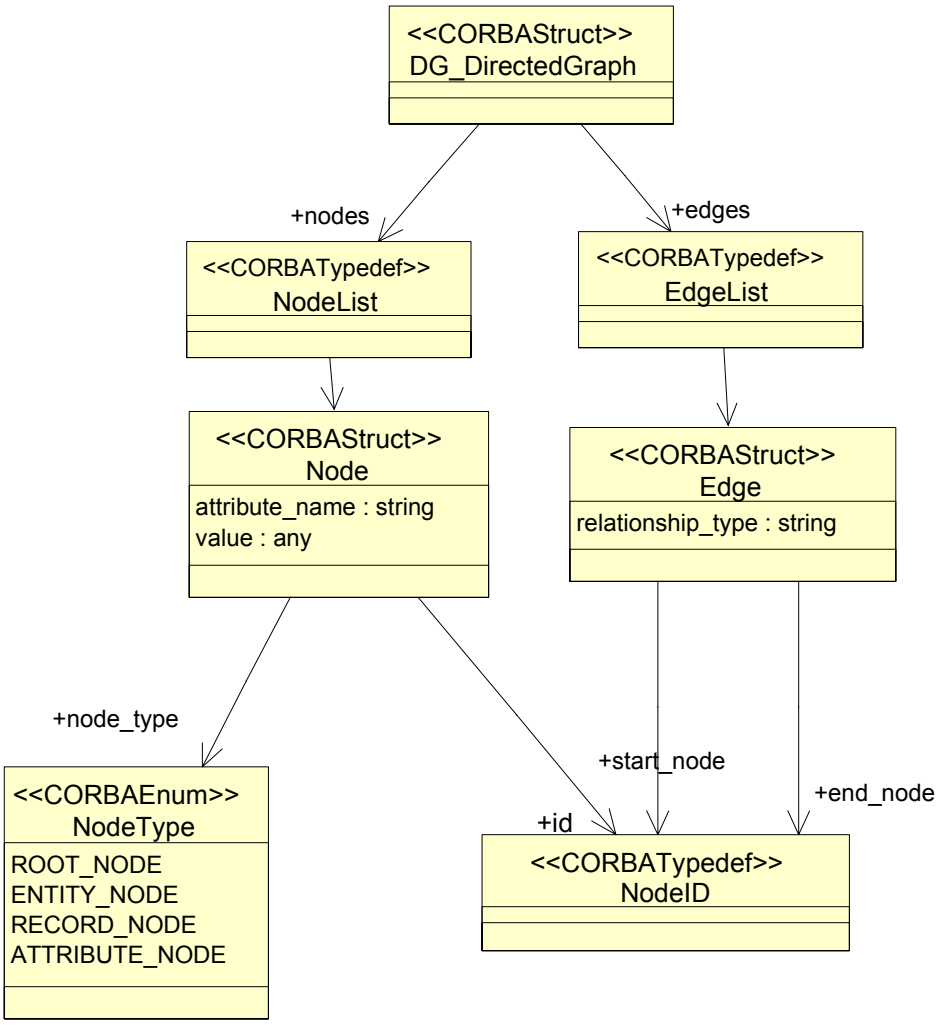


Figure B-3 - The DG_DirectedGraph

B.2.3.3.5 DG_DirectedGraphList

A sequence of Directed Graphs

B.2.3.3.6 Date

A structure describing a single date as day, month and year.

Public Attributes:

year : unsigned short

The year stated as a four digit number.

month : unsigned short

The month stated as an unsigned short whose valid range is 1-12, where 1=January and 12=December.

day : unsigned short

The day of the month.

B.2.3.3.7 Edge

A structure defining the relationship between two nodes.

Public Attributes:

relationship_type : string

Defines the type of relationship if any exist between two Nodes of a DG_DirectedGraph.

B.2.3.3.8 EdgeList

A sequence of Edges

B.2.3.3.9 FileLocation

This structure contains the location and access information for a file.

Public Attributes:

user_name : string

An identifier for a user that has access to this file.

password : string

A password associated with the user_name field

host_name : string

The host on which this file resides.

path_name : string

The complete path to the directory containing this file.

file_name : string

The name of the file.

B.2.3.3.10 FileLocationList

A sequence of FileLocation structures

B.2.3.3.11 Name

A generic string identifier.

B.2.3.3.12 NameList

A sequence of generic identifiers.

B.2.3.3.13 NameValue

A structure that associates an identifier with a value.

Public Attributes:

theValue : any

theName : string

B.2.3.3.14 NameValueList

A sequence of NameValue pairs

B.2.3.3.15 NameValueTable

The *NameValueTable* represents a two-dimensional structure that can be conceptualized as a rectangle. Table elements are indexed by each single entity of NameValueList being the row and each component (i.e., NameValue) of a NameValueList being an entity of a column. This is illustrated in Figure B-4.

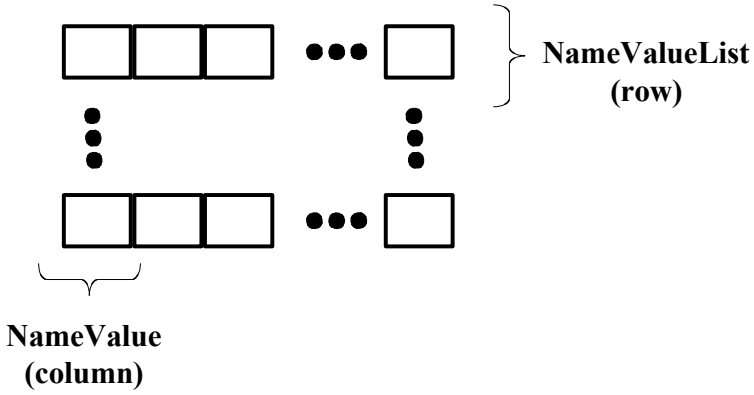


Figure B-4– Illustration of a NameValueTable

B.2.3.3.16 Node

A structure that contains information about the identification of a Node of a DG_DirectedGraph.

Public Attributes:

id : long

A long that uniquely identifies a node of a DG_DirectedGraph

B.2.3.4 Node_Type:

A structure that contains the type of nodes of a DG_DirectedGraph

attribute_name : string

The attribute being described.

value : any

The value of the attribute

B.2.3.4.1 NodeID

A numeric identifier for a Node in a DG_DirectedGraph

B.2.3.4.2 NodeList

A sequence of Nodes

B.2.3.4.3 NodeType

A structure that contains the type of nodes of a DG_DirectedGraph.

Public Attributes:

root_node :

entity_node :

record_node :

B.2.3.5 attribute_node :

B.2.3.5.1 RequestDescription

The structure *RequestDescription* is used to describe the type and details of a request submitted for processing. The *RequestDescription* structure is composed of four elements. The string *user_info* contains a message supplied by the submitting client, the contents of this message are completely determined by the client. The string *request_type* identifies the operation that was used to submit the request. The values and syntax of this element need to be defined in an implementation document of the Fine Grain CORBA profile. The string *request_info* contains any message the processing server wishes to return to the client concerning the specific request. It is intended to be human readable and is implementation dependent. The *NameValueList request_details* is intended to describe the parameters of the operation that generated this request. The specific names and values in this element are dependent on the operation that initiated this request and need to be defined in an implementation document.

B.2.3.5.2 OGCBasic::State

An enumerated data type defining the condition of a process, response object or catalog system element.

Table D-2 lists the enumerated types for the OGCBasic::State data type.

Table B-2. Enumeration of the State Conditions of OGCBasic::State

State	Description of Conditions
COMPLETED	All requested processing has completed successfully

IN_PROGRESS	Still processing, no error or abnormal conditions yet encountered
ABORTED	Processing has stopped due to an error or abnormal condition
CANCELED	Processing has been stopped by request
PENDING	Processing has not yet begun or has temporarily been halted
SUSPENDED	Processing has been temporarily suspended by client request
RESULTS_AVAILABLE	Processing has generated some results and made them available. Additional processing may occur.

B.2.3.5.3 OGCBasic::Status

The structure Status is used to describe the details of the current condition of a process, request, or system element. The Status structure is composed of three elements: *completion_state* a State (see above) indicating the current condition of the process, request or system element, *warning* a boolean that if TRUE indicates that the *status_message* field contains warning information and *status_message*, a string containing a human readable message that further amplifies or clarifies the State.

B.2.4 Callbacks

Callbacks are an optional portion of the Fine Grain General Model that allow clients to monitor the status of their Requests without either blocking or polling for status. This is done by the client implementing the Callback interface and supplying a pointer to this interface in the registerCallback operation of the Response interface. See the Response interface for the details of this operation.

B.2.4.1 Callback

The Callback interface is implemented by clients wishing to be notified of changes in state of their Requests.

Public Operations:

notify (description : in OGCBasic::RequestDescription) : void

This operation is invoked by a server to notify the client that owns this Callback that the state of a Request has changed. A description of the Request that has changed is provided in the RequestDescription parameter.

release () : void

This operation is invoked by the server to indicate to the client that the Callback resources may be released.

B.3 Fine-Grain Dynamic Model

This section describes two aspects of the dynamic behavior of the Fine Grain CORBA (FGC) portion of this specification. The following section contains a set of UML Sequence Diagrams showing how a client application would use certain interfaces of the FGC to perform a typical query of a catalog. Section 3.5.2 contains a set of state diagrams showing the legal transitions for the concrete Response Interfaces of the FCG. Both sections are not intended to be an exhaustive discussion of the dynamic behavior of the FGC portions of this specification, but show how a client application implementer may use the given set of interfaces proposed to accomplish the task of querying a catalog.

B.3.1 Sequence Diagrams of the Fine-Grain CORBA Model

This section contains a set of UML Sequence Diagrams showing how a client application would use the Library, CatalogMgr and SubmitQueryResponse Interfaces to query and obtain results from a Catalog Service. This same pattern is applicable to all other Manager interfaces of the FGC Specification. That is, a client would use the Library Interface to determine the functionality a given Library supports, invokes the appropriate Manager Interface to accomplish a given task (e.g., querying as shown in this set of diagrams). And finally, invoking operations on the appropriate Response Interface to complete the task.

B.3.1.1 Typical Query Sequence

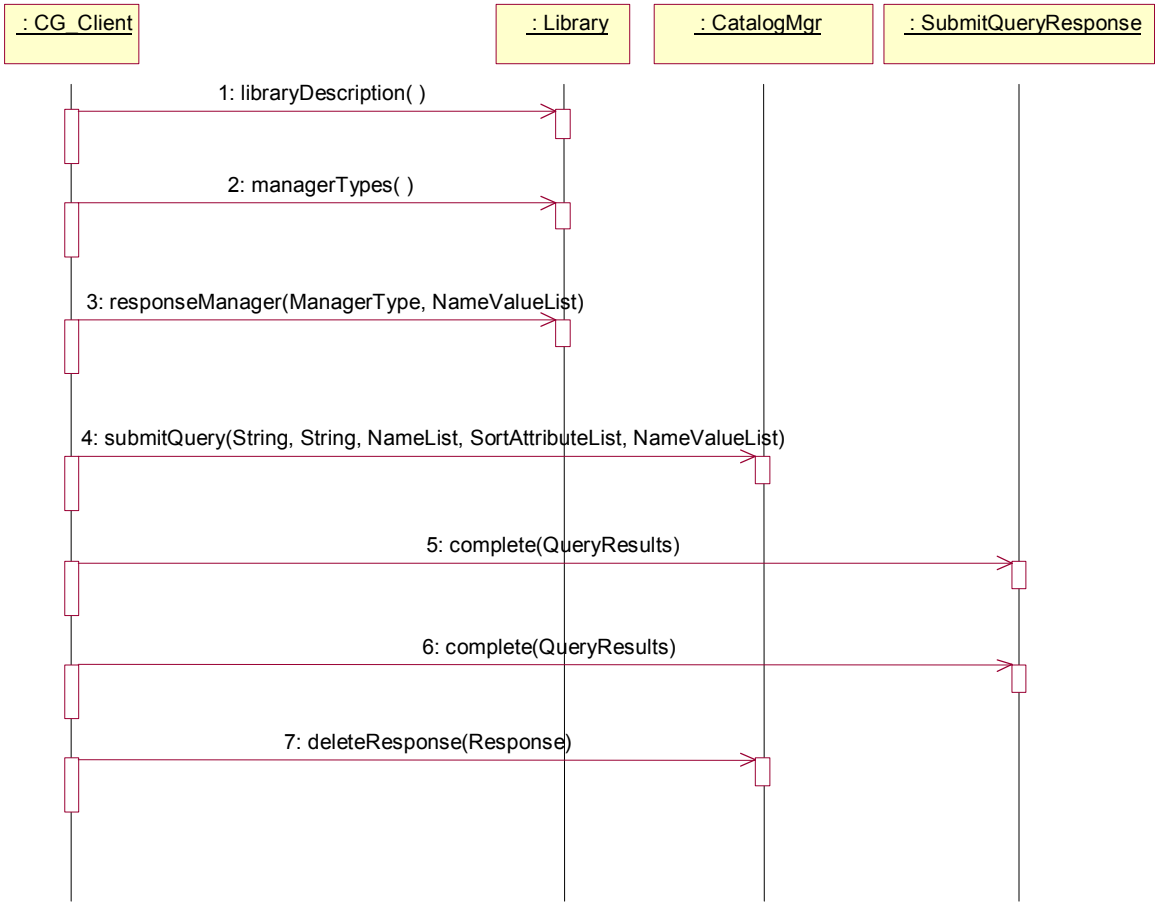


Figure B-5 - Typical Query Sequence

The typical query sequence diagram shown above illustrates how a client may submit a query against a Catalog Service and retrieve the results.

1. The client retrieves a description of the Library. This might contain such information as a summary of the Libraries' holdings, its capabilities or its pricing model.

2. The client retrieves a list of the Manager types supported by this implementation. Using this list, the client software can determine what set of capabilities this implementation offers (i.e., discovery, access/order, creation etc). The client selects one Manager value from this list (in this case the value "CatalogMgr") and uses it in a call to the requestManager operation.

3. The client requests a specific Manager type, passing in the desired ManagerType ("CatalogMgr") and a set of name value pairs that are used as access criteria. User name and password are the most common examples of access criteria. A successful invocation of this

operation returns a reference (pointer) to a Manager of the requested type. The client can now interact directly with that Manager.

4. The client submits a query to the CatalogManager, which includes the query expression itself (comparable to a SQL WHERE clause), a set of attributes to be returned (comparable to a SQL SELECT clause) and any desired sorting of the result set. A successful invocation of this operation returns a reference to a SubmitQueryResponse object. The results of the query can be accessed through this Response object.

5. The client can retrieve the results of the query via the complete operation. Each invocation returns the specified sequence of "hits".

6. The client calls complete to retrieve as many hits as needed or desired.

7. The client deletes the SubmitQueryResponse when its no longer has need of it.

B.3.1.2 Minimal Query Sequence

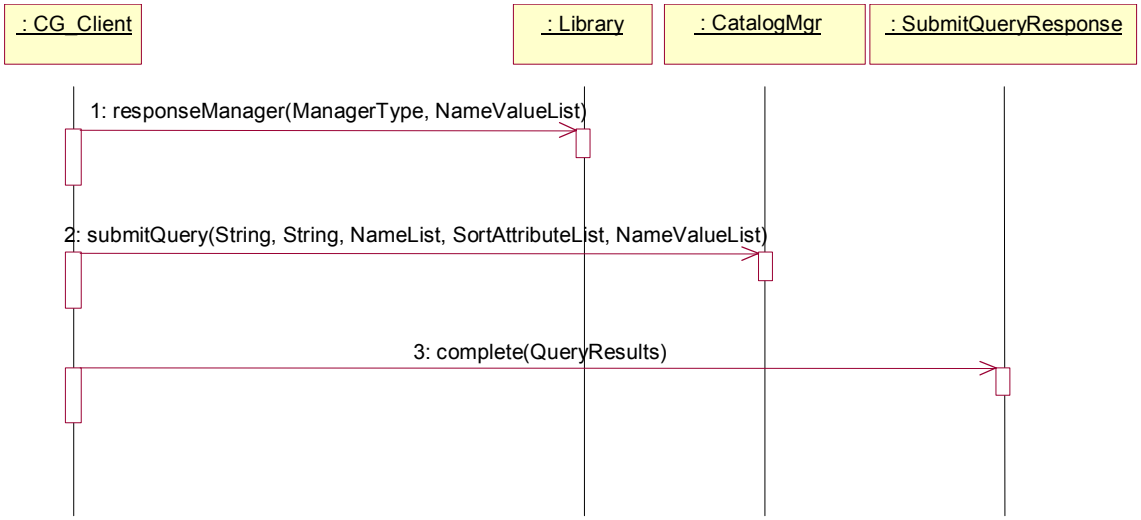


Figure B-6 - Minimal Query Sequence

The figure above shows the minimum set of operations required to perform a single query and retrieve some results.

1. The client requests access to a Manager passing in the desired ManagerType (in this case a CatalogMgr) and a set of name value pairs that are used as access criteria. (User name and password are common examples of access criteria). A successful invocation of this operation returns a reference (pointer) to a Manager of the requested type. The client can now interact directly with that Manager.

2. The client submits a query to the CatalogMgr, including the query expression itself (comparable to a SQL WHERE clause), a set of attributes to be returned (a SQL SELECT clause) and any desired sorting of the result set. A successful invocation of this operation returns a reference to a SubmitQueryResponse object. The results of the query can be accessed through this object.

3. The client can retrieve the results of the query via the complete operation. Each invocation returns the specified sequence of "hits". This operation is invoked repeatedly to return as many hits as needed or desired.

B.3.1.3 Query With Callback Sequence

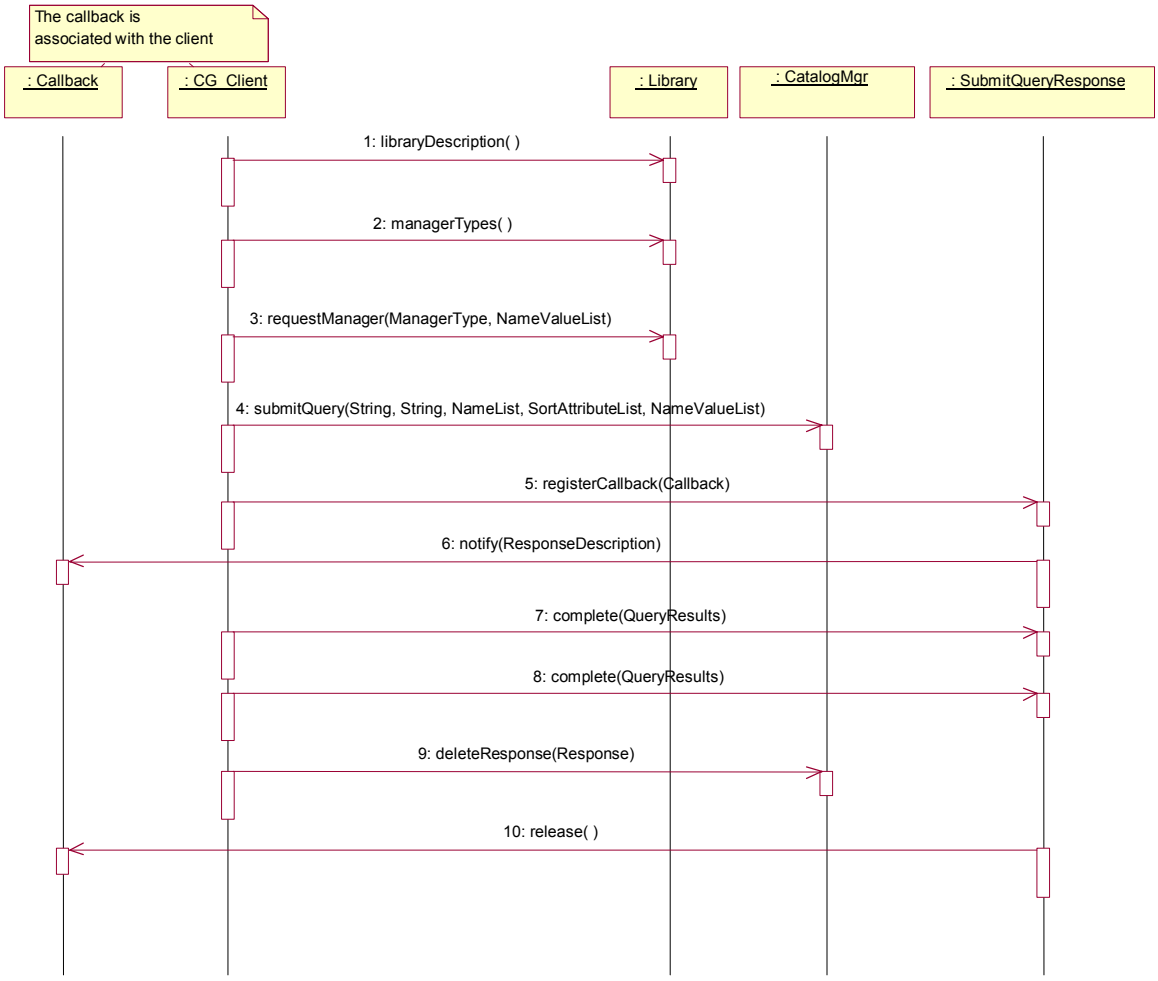


Figure B-7 - Query with Callback Sequence

The query with callback sequence diagram shown above illustrates how a client may use a Callback object to be notified that a query has been completed.

1. The client retrieves a description of the Library. This might contain such information as a summary of the Libraries' holdings, its capabilities or its pricing model.

2. The client retrieves a list of the Manager types supported by this implementation. Using this list, the client software can determine what set of capabilities this implementation offers (i.e., discovery, access/order, creation etc). The client selects one Manager value from this list (in this case the value "CatalogMgr") and uses it in a call to the requestManager operation.

3. The client requests a specific Manager type, passing in the desired ManagerType ("CatalogMgr") and a set of name value pairs that are used as access criteria. User name and password are the most common examples of access criteria. A successful invocation of this operation returns a reference (pointer) to a Manager of the requested type. The client can now interact directly with that Manager.

4. The client submits a query to the CatalogMgr, which includes the query expression itself (comparable to a SQL WHERE clause), a set of attributes to be returned (comparable to a SQL SELECT clause) and any desired sorting of the result set. A successful invocation of this operation returns a reference to a SubmitQueryResponse object. The results of the query can be accessed through this Response object.

5. The client registers a Callback object with the SubmitQueryResponse object.

6. The Catalog Service invokes the "notify operation" on the Callback object indicating the Response has completed processing.

7. The client can retrieve the results of the query via the complete operation. Each invocation returns the specified sequence of "hits".

8. The complete operation is called repeatedly to retrieve as many results as desired.

9. The client deletes the Response object.

10. The Catalog Service invokes the release operation on the Callback since it will not be called again.

B.3.1.4 Query With Polling Sequence

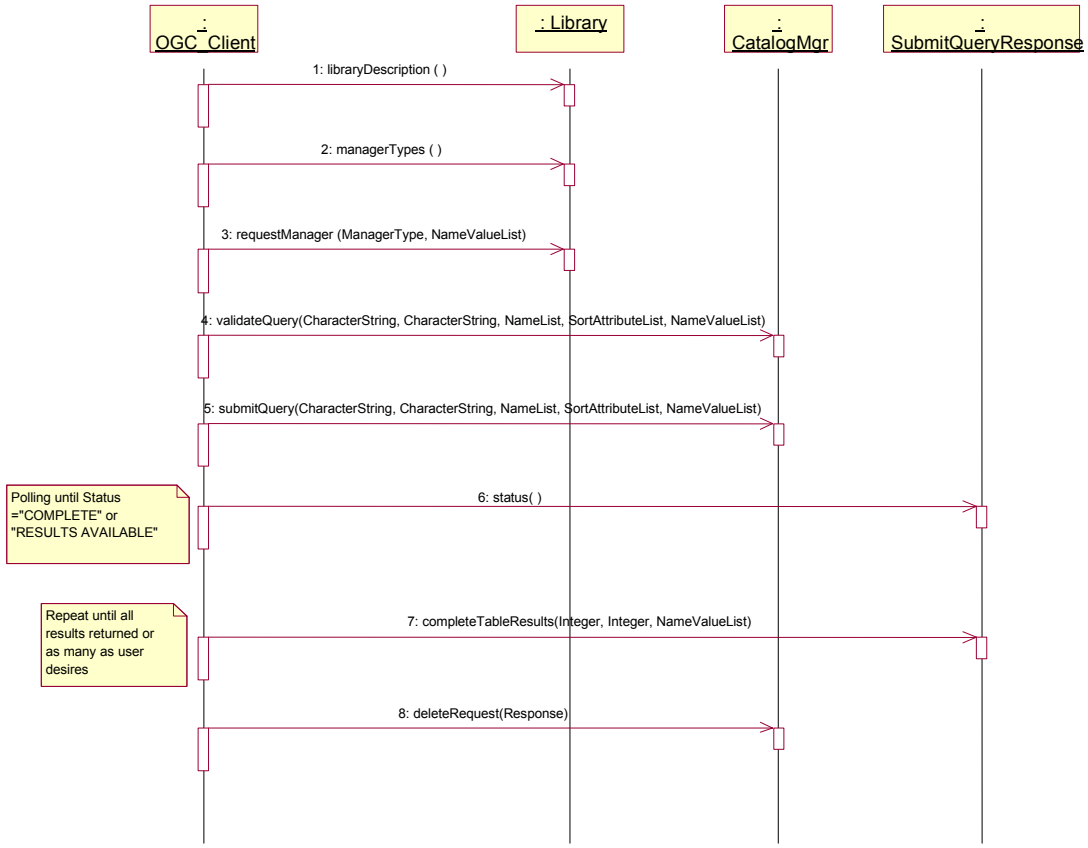


Figure B-8 - Query with Polling Sequence

Figure B-8 shown above illustrates how a client may use a polling mechanism to be notified that a query has been completed.

1. The client retrieves a description of the Library. This might contain such information as a summary of the Libraries' holdings, its capabilities or its pricing model.

2. The client retrieves a list of the Manager types supported by this implementation. Using this list, the client software can determine what set of capabilities this implementation offers (i.e., discovery, access/order, creation etc). The client selects one Manager value from this list (in this case the value "CatalogMgr") and uses it in a call to the requestManager operation.

3. The client requests a specific Manager type, passing in the desired ManagerType ("CatalogMgr") and a set of name value pairs that are used as access criteria. User name

and password are the most common examples of access criteria. A successful invocation of this operation returns a reference (pointer) to a Manager of the requested type. The client can now interact directly with that Manager.

4. The client submits a query to the CatalogMgr, which includes the query expression (comparable to a SQL WHERE clause), a set of attributes to be returned (comparable to a SQL SELECT clause) to be checked that it is syntactically correct.

5. The client then resubmits the query to the CatalogMgr. A successful invocation of this operation returns a reference to a SubmitQueryResponse object. The results of the query can be accessed through this Response object.

6. The client polls the status operation until it receives a status of “COMPLETE” or “RESULTS_AVAILABLE”.

7. The client can retrieve the results of the query via the complete operation. Each invocation returns the specified sequence of "hits". The complete operation is called repeatedly to retrieve as many results as desired or all are retrieved.

8. The client then deletes the Response object.

B.3.2 State Diagrams

This section provides a set of UML statechart diagrams that describe a particular aspect of the Fine Grain implementation behavior. These diagrams have been included for informative purposes only and do not imply a mandatory implementation for any of the concrete response interfaces. Table D-3 is a listing of the seven legal states a given Response Interface may have. It also provides a brief description of each of the states.

The following diagrams reflect the state machine for each *generalization* of the Fine Grain Interface Response. In the diagrams below, the states marked with an asterisk indicate that a Callback (if one has been registered with a given Response) is triggered when that state is entered.

Table B-3. Enumeration of the State Conditions of the Various Response Interfaces

State	Description of Conditions
COMPLETED	All requested processing has completed successfully
IN_PROGRESS	Still processing, no error or abnormal conditions yet encountered
ABORTED	Processing has stopped due to an error or abnormal condition
CANCELED	Processing has been stopped by request
PENDING	Processing has not yet begun or has temporarily been halted
SUSPENDED	Processing has been temporarily suspended by client request
RESULTS_AVAILABLE	Processing has generated some results and made them available. Additional processing may occur.

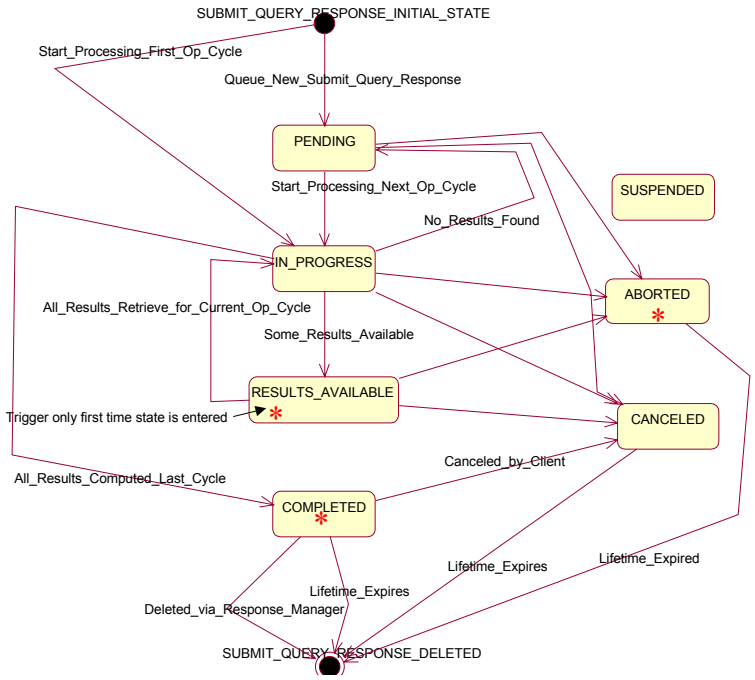


Figure B-9. State Diagram for SubmitQueryResponse Interface

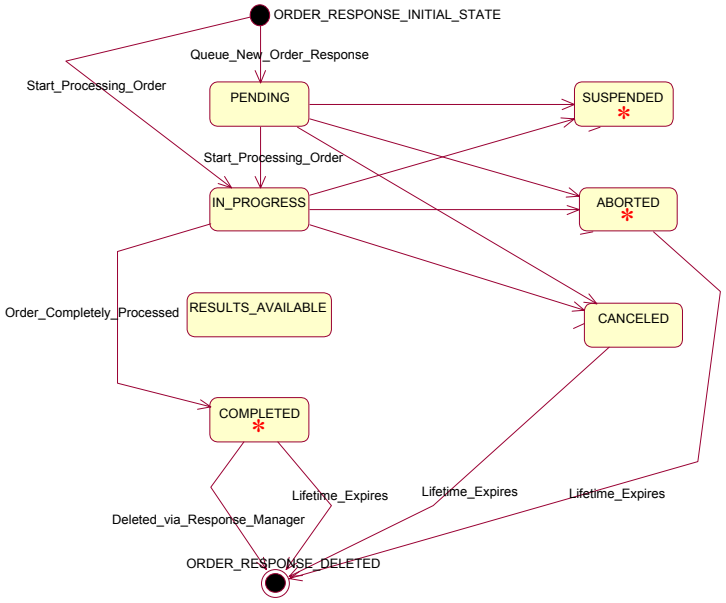


Figure B-10 - UML Statechart for OrderResponse Interface

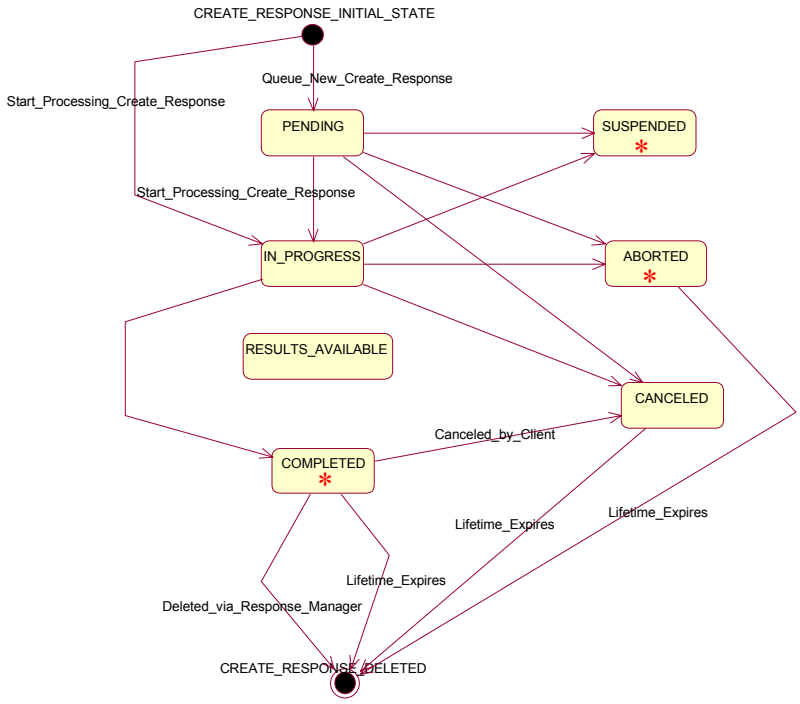


Figure B-11 - UML Statechart for CreateResponse Interface

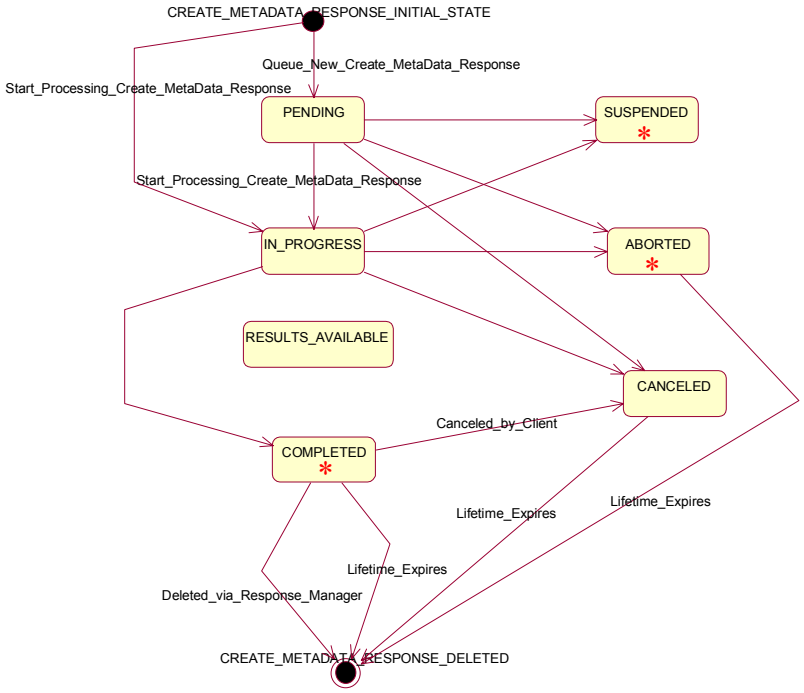


Figure B-12 - UML Statechart for CreateMetadataResponse Interface

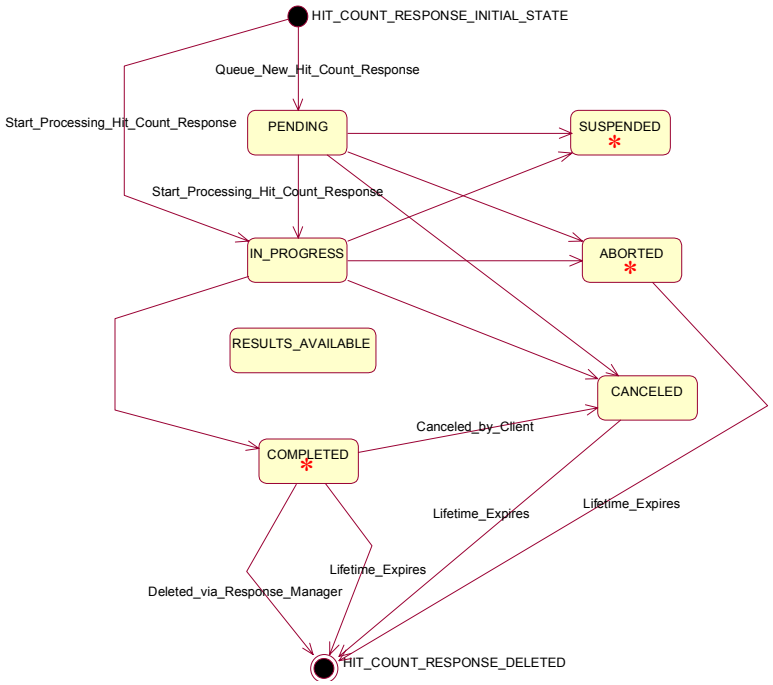


Figure B-13 - UML Statechart for HitCountResponse Interface

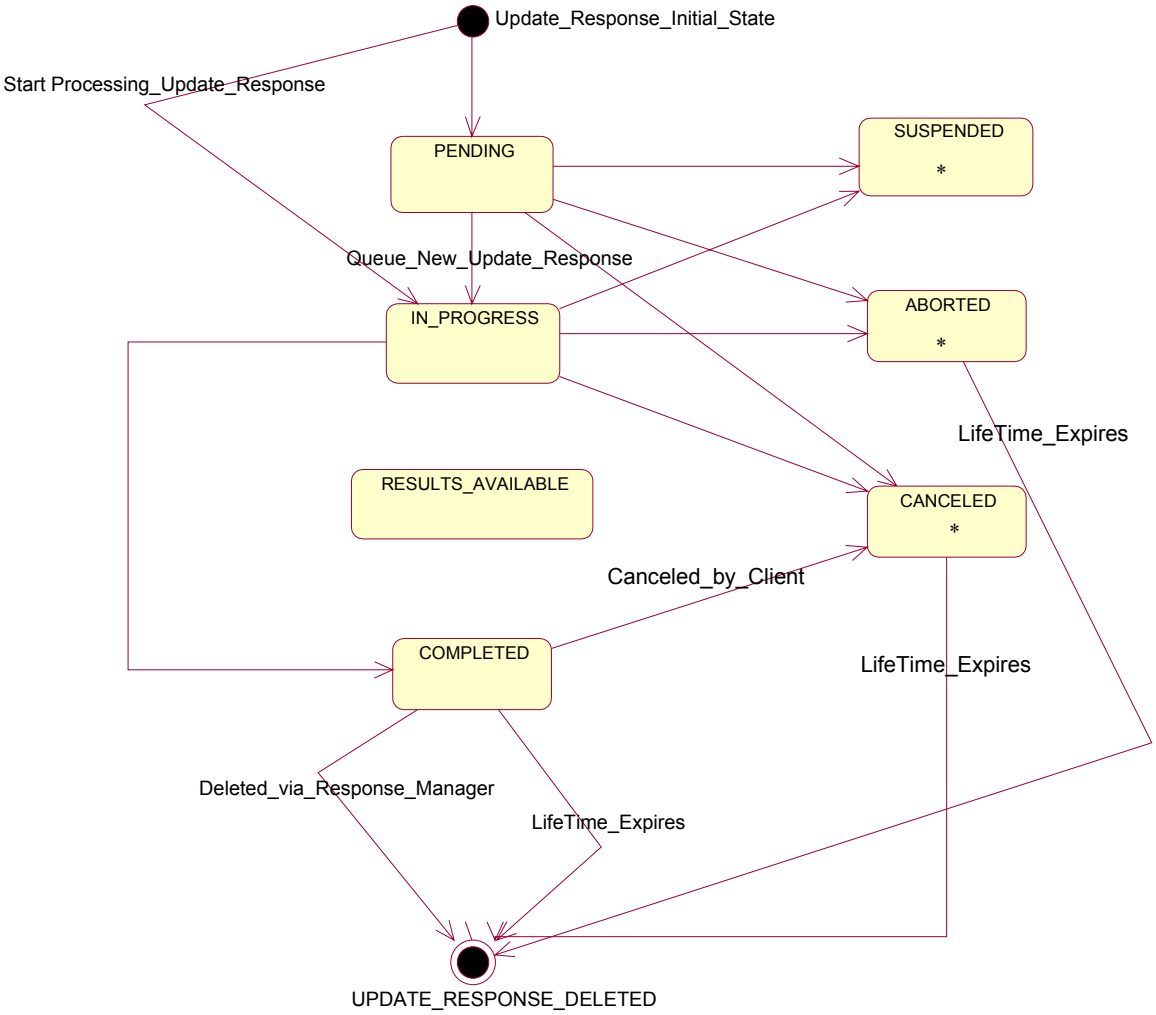


Figure B-14 – State Diagram for Update Response Interface

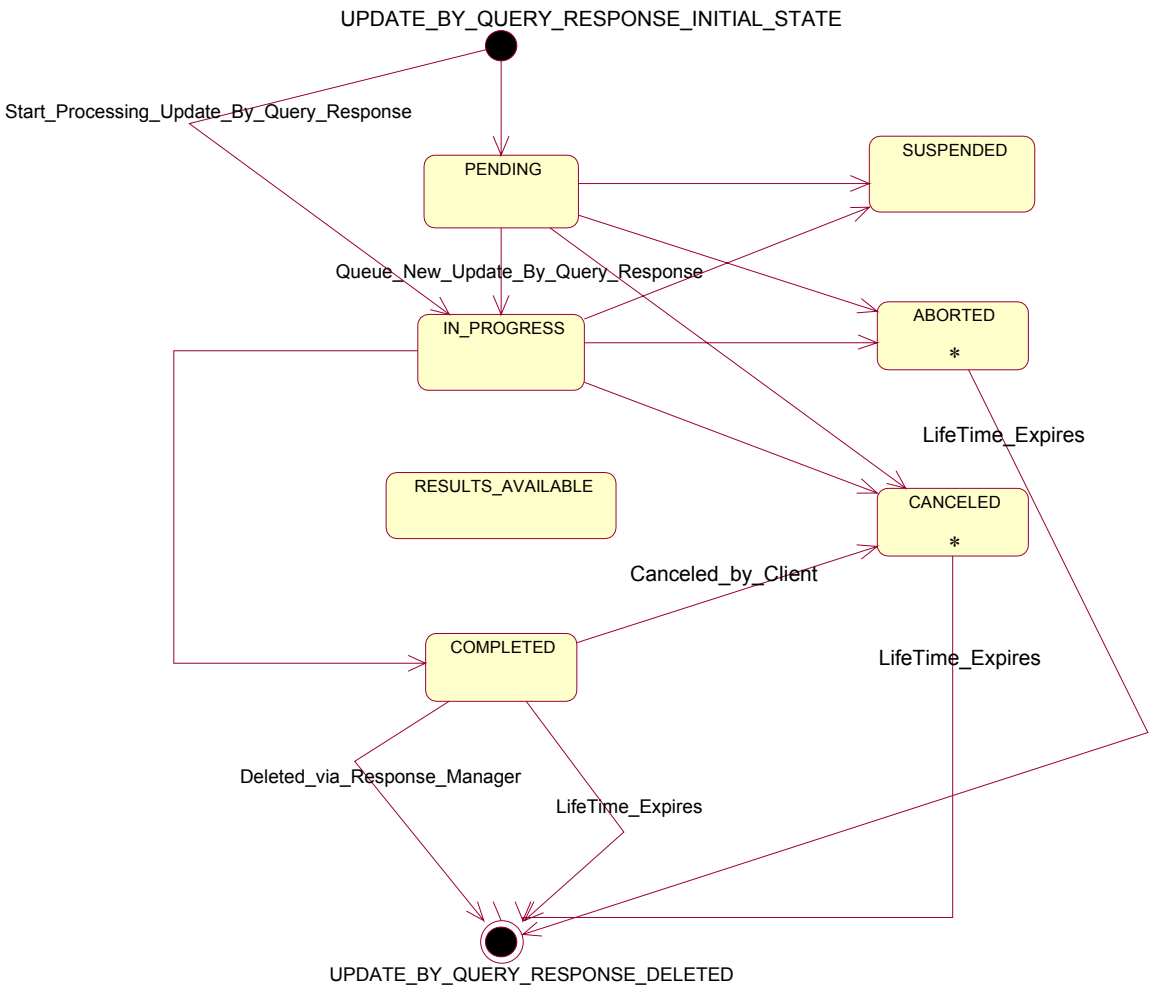


Figure B-15 - UML Statechart for UpdateByQueryResponse

Annex C: OLEDB Profile (Informative)

C.1 Architecture

The COM Profile uses OLEDB as the mechanism for accessing catalog data. OLEDB is the standard within the Microsoft developer community for locating and exchanging data. As such, this profile addresses two classes of catalog environment, those using pure OLEDB and those using OGC extensions. The majority of this profile will address the first case as pure OLEDB will address most of the functional needs. Extensions will be detailed where they are appropriate.

C.1.1 Required OLEDB Interfaces

The following OLEDB interfaces are required for a data server to act as an OGC Catalog server.

Datasource:

- IDBCreateSession (OLEDB Mandatory)
- IDBInitialize (OLEDB Mandatory)
- IDBProperties (OLEDB Mandatory)
- IDBAsyncStatus (OLEDB optional)

Session:

- IDBCreateCommand (OLEDB optional)
- IDBSchemaRowset (OLEDB optional)

Commands:

- IAccessor (OLEDB Mandatory)
- IColumnsInfo (OLEDB Mandatory)
- ICommand (OLEDB Mandatory)
- ICommandProperties (OLEDB Mandatory)
- ICommandText (OLEDB Mandatory)

Rowsets:

- IAccessor (OLEDB Mandatory)
- IColumnsInfo (OLEDB Mandatory)
- IRowset (OLEDB Mandatory)

IRowsetView (OLEDB optional)
IDBAsyncStatus (OLEDB optional)
Views:
IColumnsInfo (OLEDB Mandatory)
IAccessor (OLEDB optional)
IViewRowset (OLEDB optional)
IViewSort (OLEDB optional)

C.1.2 OGC Extensions to OLEDB

OLEDB only supports HTML, text and binary formats. To support XML, DAG and SGML return formats the following flags have been defined for the dwFlag parameter of the DBBINDING entry in the Accessor.

DBBINDFLAG_XML -> 0x4

DBBINDFLAG_DAG -> 0x8

DBBINDFLAG_SGML -> 0x10

OLEDB only supports SQL dialects. Support for non-SQL query languages requires the addition of the DBPROP_OGCLANG property to Command objects. This property can take the following values:

OGC_Common -> 1

Z3950_TYPEONE -> 2

SQL3_SIMPLEFEATURE -> 3

SQL2_SIMPLEFEATURE -> 4

The DBPROP_OGCLANG property is set instead of the DBPROP_SQLSUPPORT property through the SetProperties interface on Command objects.

The AttributeCategory Parameter of the Explain Collection Request is not directly supported in the pure OLEDB environment. To support this parameter, the parameter ATTRIBUTECATEGORY will be added to the property set supported by the GetRowset interface.

C.2 Sequence Diagram

InitSessionRequest

Initializer::CreateDBInstance()

Datasource->IDBInitialize::Initialize()

Datasource->IDBProperties::SetProperties()

Datasource->IDBCreateSession::CreateSession()

InitSessionResponse

TerminateSessionRequest

Session->Release()

Datasource->Release()

TerminateResponse

ExplainServerRequest

Datasource->IDBProperties::GetProperties()

Datasource->IDBProperties::SetProperties()

Session->QueryInterface(IID_IDBSchemaRowset)

ExplainServerResponse

StatusRequest

Rowset->IDBAsynchStatus::GetStatus()

StatusResponse

CancelRequest

Rowset->IDBAsynchStatus::Abort()

CancelResponse

QueryRequest

Session->IDBCreateCommand::CreateCommand()

Command->ICommandProperties::SetProperties()

Command->ICommandText::SetCommandText()

Command->ICommand::Execute()

Rowset->IRowsetView::CreateView()

View->IColumnsInfo::GetColumnInfo()

View->IViewSort::SetSort()

View->IAccessor::CreateAccessor()

View->IViewRowset::OpenViewRowset()

Rowset->IRowset::GetNextRows()

Rowset->IRowset::GetData()

QueryResponse

PresentRequest

Rowset->IRowsetView::CreateView()

View->IColumnsInfo::GetColumnInfo()

View->IViewSort::SetSort()

View->IAccessor::CreateAccessor()

View->IViewRowset::OpenViewRowset()

Rowset->IRowset::GetNextRows()

Rowset->IRowset::GetData()

PresentResponse

ExplainCollectionRequest

Session->IDBSchemaRowset::GetRowset()

Rowset->IColumnsInfo::GetColumnInfo()

Rowset->IAccessor::CreateAccessor()

Rowset->IRowset::GetNextRows()

Rowset->IRowset::GetData()

ExplainCollectionResponse

C.3 Parameter Translation

This section addresses how catalog message parameter types defined in the General Model can be translated into and out of OLEDB equivalents.

C.3.1 CG_AttributeCategory

Recommended Implementation Type: Code_List

Used By: CG_ExplainCollectionRequest

CG_AttributeCategory is a code list for selecting the types of catalog entry attributes to be exposed by an explain collection request. These values are used by the client code to select the subset of the schema to return.

- Queriable
- Presentable
- Both

CG_AttributeCategory is supported through an extension to the GetRowset interface. ATTRIBUTECATEGORY is added to the property set supported by this interface. ATTRIBUTECATEGORY can take one of two bit values; queriable (0x01) and presentable (0x02). Both is the inclusive or of Queriable and presentable (0x03).

C.3.2 CG_BrokeredAccessRequestType

Recommended Implementation Type: Code_List

Used By: CG_BrokeredAccessRequest

Not currently mapped

C.3.3 CG_Status

Recommended Implementation Type: Code_List

Used By: CG_TerminateResponse, CG_StatusResponse, CG_CancelResponse, CG_PresentResponse, CG_BrokeredAccessResponse

CG_Status type variables are used to return status information to the General Model. This is a direct mapping of the OLE DB HRESULT values in most cases. More detailed information will be provided with each message description.

C.3.4 CG_Capability

Recommended Implementation Type: Complex data structure

Used By: CG_ExplainServerRequest, CG_ExplainServerResponse

Uses: CG_AllSupportedRequest, CG_Defaults, CG_ExplainCollection, CG_Query, CG_Messaging, CG_Session, CG_SoftwareInformation, CG_SupportedCollections

CG_Capability is an aggregate of the following parameter types.

C.3.4.1 CG_AllSupportedRequest

Recommended Implementation Type: Boolean

Used By: CG_Capability

When this parameter is set within a capabilities structure all other capabilities will be ignored and the server will be queried for the all of the capabilities supported.

C.3.4.2 CG_Defaults

Recommended Implementation Type: Boolean

Used By: CG_Capability

When this parameter is set within a capabilities structure, all other capabilities will be ignored and the server will be queried for the default capabilities supported.

C.3.4.3 CG_ExplainCollection

Recommended Implementation Type: Boolean

Used By: CG_Capability

CG_ExplainCollection is supported in OLE DB by the IDBSchemaRowset interface. This parameter will be set to TRUE for servers that support that interface.

C.3.4.4 CG_Query

Recommended Implementation Type: data structure composed of version, characterSet and queryLanguage fields

Used By: CG_Capability

Uses: CG_QueryLanguage, CG_CharacterSet

The CG_Query capability structure can be populated from the DBPROP_SQLSUPPORT property of the Data Source object. This is a read only property that is read from the Data Source object through the IDBProperties interface. This interface only reports on the variations of SQL supported. The versions of SQL supported are:

DBPROPVAL_SQL_NONE – no SQL support

DBPROPVAL_SQL_ODBC_MINIMUM

DBPROPVAL_SQL_ODBC_CORE

DBPROPVAL_SQL_ODBC_EXTENDED – cumulative based on ODBC 2.5 definitions

DBPROPVAL_SQL_ESCAPECLAUSES – ODBC escape clause syntax supported

DBPROPVAL_SQL_ANSI92_ENTRY

DBPROPVAL_SQL_FIPS_TRANSITIONAL

DBPROPVAL_SQL_ANSI92_INTERMEDIATE

DBPROPVAL_SQL_ANSI92_FULL - cumulative based on ANSI SQL 92 definitions

DBPROPVAL_SQL_ANSI89_IEF – supports ANSI 89 Integrity Enhancement Facility

DBPROPVAL_SQL_SUBMINIMUM – uses SQL rules but less capable than ODBC minimum.

Support for non-SQL query languages requires the addition of the DBPROP_OGCLANG property to Dataset objects. This property can take the following values:

OGC_Common -> 1

Z3950_TYPEONE -> 2

SQL3_SIMPLEFEATURE -> 3

SQL2_SIMPLEFEATURE -> 4

The DBPROP_OGCLANG property is set instead of the DBPROP_SQLSUPPORT property through the SetProperties interface on Dataset objects.

The components of the CG_Query structure are populated as follows:

Version == derived from the DBPROP_SQLSUPPORT property.

CharacterSet == only UNICODE or ASCII is valid. Client code must know what it can support.

QueryLanguage == always SQL.

C.3.4.5 CG_Messaging

Recommended Implementation Type: Data structure

Used By: CG_Capability

Uses: CG_CharacterSet, CG_MessageFormat

OLE DB only supports binary, text and HTML formatting, UNICODE and ASCII character sets. To support XML, DAG and SGML return formats the following flags have been defined for the dwFlag parameter of the DBBINDING entry in the Accessor.

DBBINDFLAG_XML -> 0x4

DBBINDFLAG_DAG -> 0x8

DBBINDFLAG_SGML -> 0x10

C.3.4.6 CG_Session

Recommended Implementation Type: Data Structure

Used By: CG_Capability

Uses: CG_CharacterSet

This capability provides information that is specific to the Catalog service. These properties can be added to a server product but are not currently available.

Language == not available

CatalogSpecificationVersion == not currently available

CharacterSet == limited to UNICODE or ASCII

C.3.4.7 CG_SoftwareInformation

Recommended Implementation Type: Data structure

Used By: CG_Capability

This capability structure can be populated from two of the Data Source Information properties. These are read only properties that can be read from the Data Source object through the IDBProperties interface.

Vendor == DBPROP_DBMSNAME (the name of the server product)

VersionNumber == DBPROP_DBMSVER (the version of the server product)

C.3.4.8 CG_SupportedCollections

Recommended Implementation Type: set<CG_CollectionName>

Used By: CG_Capability

Uses: CG_CollectionName

The DBPROP_DATASOURCENAME property can be queried using the IDBProperties interface on the data source but cannot be set. Only the current catalog data set name can be returned at this point.

C.3.5 CG_QueryLanguage

Recommended Implementation Type: Code_List

Used By: CG_Query, CG_QueryExpression

The CG_QueryLanguage parameter type can be mapped into the DBPROP_SQLSUPPORT property of the Data Source object. This is a read only property that is read from the Data Source object through the IDBProperties interface. This interface only reports on the variations of SQL supported. The versions of SQL supported are:

DBPROPVAL_SQL_NONE – no SQL support

DBPROPVAL_SQL_ODBC_MINIMUM

DBPROPVAL_SQL_ODBC_CORE

DBPROPVAL_SQL_ODBC_EXTENDED – cumulative based on ODBC 2.5 definitions

DBPROPVAL_SQL_ESCAPECLAUSES – ODBC escape clause syntax supported

DBPROPVAL_SQL_ANSI92_ENTRY

DBPROPVAL_SQL_FIPS_TRANSITIONAL

DBPROPVAL_SQL_ANSI92_INTERMEDIATE

DBPROPVAL_SQL_ANSI92_FULL - cumulative based on ANSI SQL 92 definitions

DBPROPVAL_SQL_ANSI89_IEF – supports ANSI 89 Integrity Enhancement Facility

DBPROPVAL_SQL_SUBMINIMUM – uses SQL rules but less capable than ODBC minimum.

Support for non-SQL query languages requires the addition of the DBPROP_OGCLANG property to Command objects. This property can take the following values:

OGC_Common -> 1

Z3950_TYPEONE -> 2

SQL3_SIMPLEFEATURE -> 3

SQL2_SIMPLEFEATURE -> 4

The DBPROP_OGCLANG property is set instead of the DBPROP_SQLSUPPORT property through the SetProperties interface on Command objects.

C.3.6 CG_CatalogEntryType

Recommended Implementation Type: Code_List

Used By: CG_QueryRequest

There is no direct way to use this parameter in OLEDB. It may be passed as a command parameter to some servers or included in query text.

C.3.7 CG_CharacterSet

Recommended Implementation Type: Code_List

Used By: CG_Messaging, CG_Query, CG_Session

OLE DB only supports ASCII and UNICODE character sets. Specific providers may only support one or the other.

C.3.8 CG_CollectionName

Recommended Implementation Type: Union data

Used By: CG_QueryRequest, CG_QueryResponse, CG_ExplainCollectionRequest, CG_ExplainCollectionResponse, CG_BrokeredAccessResponse, CG_ReturnData

CG_CollectionName can be mapped into several types of OLEDB parameters based on the message and message parameter. Specific mapping details can be found in each message section.

C.3.9 CG_MessageFormat

Recommended Implementation Type: Code_List

Used By: CG_QueryRequest, CG_PresentRequest, CG_Messaging

OLE DB only supports binary, text and HTML formatting. This parameter is used to build accessors for retrieving data from a Rowset. To support XML, DAG and SGML return formats the following flags have been defined for the dwFlag parameter of the DBBINDING entry in the Accessor.

DBBINDFLAG_XML -> 0x4

DBBINDFLAG_DAG -> 0x8

DBBINDFLAG_SGML -> 0x10

C.3.10 CG_PredefinedPresentationType

Recommended Implementation Type: Code_List

Used By: CG_PresentationDescription

Named presentations are not directly supported by OLEDB.

C.3.11 CG_PresentationDescription

Recommended Implementation Type: Data Union

Used By: CG_QueryRequest, CG_QueryResponse

Uses: CG_PredefinedPresentationType, RecordType

The list of attribute names is used to build accessors for retrieving data from a Rowset. Named presentations are not directly supported by OLEDB.

C.3.12 CG_QueryExpression

Recommended Implementation Type: Data Structure

Used By: CG_QueryRequest

Uses: CG_QueryLanguage

CG_QueryExpression maps directly into two parameters used for building queries in OLE DB. Queries are built using the IcommandText::SetCommandText interface the parameters are:

dialect == which is similar to the theLanguage element of CG_QueryExpression

command == a pointer to a text string such as the theQuery element

C.3.13 CG_QueryScope

Recommended Implementation Type: Code_List

Used By: CG_QueryRequest

There is no OLE DB equivalent to this parameter at this time.

C.3.14 CG_RequestID

Recommended Implementation Type: Data Structure

Used By: CG_Message, CG_StatusRequest, CG_CancelRequest, CG_CancelResponse

CG_RequestID is mapped by the client software into a Rowset handle.

C.3.15 CG_ResultType

Recommended Implementation Type: Code_List

Used By: CG_QueryRequest, CG_QueryResponse

CG_ResultType is a code list describing the type of data to be returned in a query response message. These values are used by the OLEDB client code to select the interfaces to exercise.

- resultSet
- results
- validate
- hits

C.3.16 CG_ReturnData

Recommended Implementation Type: Data Union

Used By: CG_QueryResponse, CG_PresentResponse

Uses: CG_CollectionName, CG_CatalogEntry

Packaging of data into a CG_ReturnData format is performed by the Rowset::GetData() method. The format of the returned data is determined by the dwFlag parameter of the DBBINDING entry in the Accessor.

C.3.17 CG_SortField

Recommended Implementation Type: Data Structure
Used By: CG_QueryRequest, CG_PresentRequest
Uses: CG_SortOrder

CG_SortField parameters can be mapped directly into OLD DB data types with a little processing.

attributeName == map into column information structure (DBCOLUMNINFO). Retrieve the column information using IcolumnsInfo::GetColumnInfo, identify the proper attribute by comparing attributeName to the DBCOLUNINFO entry pwszName, and get the ordinal for that column from the Iordinal entry. The ordinal values will be used to identify the sort attributes.

sortOrder == OLE DB type DBSORT

C.3.18 CG_SortOrder

Recommended Implementation Type: Code_List

Used By: CG_SortField

CG_SortOrder is similar to the OLE DB type DBSORT. DBSORT variables can indicate ascending or descending sorting only.

C.3.19 CG_UserInformation

Recommended Implementation Type: Data Structure

Used By: CG_BrokeredAccessRequest

Not yet mapped.

C.3.20 CG_PaymentMethod

Recommended Implementation Type: CodeList

Used By: CG_UserInformation

Not yet mapped.

C.3.21 RecordType

Recommended Implementation Type: Complex Data

Used By: CG_PresentationDescription

Maps into a data structure consisting of a key (character string) and a type (codelist).

C.3.22 Schema

Recommended Implementation Type: Complex Data

Used By: CG_SchemaID

Maps into an array of RecordType

C.3.23 CG_SchemaID

Recommended Implementation Type: Complex Data

Used By: CG_ExplainCollectionResponse

Uses: Schema, SchemaName

CG_SchemaID maps into a data structure consisting of:

schemaID ::= character string

schema ::= Schema

C.4 Detailed Implementation Guidance

C.4.1 Establish a catalog session

C.4.1.1 Request

CG_InitSessionRequest ::= sessionID destinationID requestID additionalInfo

sessionID ::= Integer

destinationID ::= CG_CollectionName

requestID ::= CG_RequestID

additionalInfo ::= String

C.4.1.2 Response

CG_InitSessionResponse ::= sessionID destinationID requestID additionalInfo diagnostic

sessionID ::= Integer

destinationID ::= CG_CollectionName

requestID ::= CG_RequestID

additionalInfo ::= XMLString

diagnostic ::= CharacterString

C.4.1.3 Pure OLEDB Processing

// Marshall the input parameters

sessionID == not used

destinationID == Name of data source, map to clsid through iterator, Data Links UI or Directory

requestID == not used

additionalInfo == not used

```
// Create a Data Source object

// clsid is an identifier for the data source.  It can be found through the iterator, data
   links UI or Active Directory.

myInitialize->CreateDBInstance

(

clsid                   // clsid generated from destinationID

pUnkOuter               // NULL

dwClsContext            // CLSTX_INPROC_SERVER (in process server)

pwszReserved            // NULL

riid                    // IID_IDBInitialize

&myDataSource                   // returned pointer Data source object

)

// Map myDataSource to destinationID.  This mapping will be persistent for use in all
further messages within this session.

// Initialize it

myData Source->IDBInitialize::Initialize()

// Set the properties, the following properties are recommended:

//        DBPROP_ASYNCTXNABORT

//        DBPROP_INIT_ASYNCH

//        DBPROP_MULTIPLERESULTS

//        DBPROP_MULTIPLESTORAGEOBJECTS

myData Source->IDBProperties::SetProperties
```


(

cPropertySets // Number of entries in rgPropertySets (4)

rgPropertySets // an array of DBPROPSET data structures

)

// Create a session

myDataSource->IDBCreateSession::CreateSession

(

pUnkOuter // NULL

riid // IID_IOpenRowset

mySession // Pointer to the session object

)

// Map mySession to sessionID. This mapping will be used for all further messages in this session.

// Marshal the output parameters

sessionID == map from mySession

destinationID == map from myDataSource

requestID == NULL

additionalInfo == NULL unless an error occurred

C.4.1.4 Relevant OLE DB Properties

DBPROP_ASYNCTXNABORT – (Data source) select whether transactions can be aborted asynchronously

DBPROP_INIT_ASYNCH – (Initialization) select asynchronous processing.

DBPROP_INIT_DATASOURCE – (Initialization) the name of the database to connect to.

DBPROP_INIT_LOCATION – (Initialization) the name of the catalog server.

DBPROP_MULTIPLERESULTS – (Data source) set the DBPROPVAL_MR_SUPPORTED and DBPROPVAL_MR_CONCURRENT flags to allow access to multiple result sets.

DBPROP_MULTIPLESTORAGEOBJECTS – (Data Source) set if access to more than one catalog at a time is supported

C.4.1.5 OGC OLEDB Extensions

None

C.4.2 End a Catalog Session

C.4.2.1 Request

CG_TerminateRequest ::= sessionID destinationID requestID additionalInfo

sessionID ::= Integer

destinationID ::= CG_CollectionName

requestID ::= CG_RequestID

additionalInfo ::= XMLString

C.4.2.1Response

CG_TerminateResponse ::= sessionID destinationID requestID additionalInfo diagnostic status

sessionID ::= Integer

destinationID ::= CG_CollectionName

requestID ::= CG_RequestID

additionalInfo ::= XMLString

diagnostic ::= CharacterString

status ::= CG_Status

C.4.2.3 Pure OLEDB Processing

// Marshall the input parameters

sessionID == maps to the session handle “mySession”

destinationID == maps to the Data Source handle “myDataSource”

requestID == not used

additionalInfo == not used

// Terminate the session

mySession->Release()

myDataSource->Release()

// Marshall the output parameters

sessionID == mapped from mySession

destinationID == mapped from myDataSource

requestID == NULL

additionalInfo == NULL

diagnostic == NULL unless an error occurred

status == mapped from HRESULT

C.4.2.4 Relevant OLE DB Properties

None

C.4.2.5 OGC OLEDB Extensions

None

C.4.3 Query the server properties

C.4.3.1 Request

CG_ExplainServerRequest ::= sessionID destinationID requestID additionalInfo capabilities

sessionID ::= Integer

destinationID ::= CG_CollectionName

requestID ::= CG_RequestID

additionalInfo ::= XMLString

capabilities ::= Sequence<Capability>

C.4.3.2 Response

CG_ExplainServerResponse ::= sessionID destinationID requestID additionalInfo

diagnostic capabilities

sessionID ::= Integer

destinationID ::= CG_CollectionName

requestID ::= CG_RequestID

additionalInfo ::= XMLString

diagnostic ::= CharacterString

capabilities ::= Sequence<Capability>

C.4.3.3 Pure OLEDB Processing

// Marshall the input parameters

sessionID == maps to the session handle “mySession”

destinationID == maps to the Data Source handle “myDataSource”

requestID == not used

additionalInfo == not used

capabilities == mapping of capabilities to OLE DB properties is described in section ----

// If CG_AllSupportedRequest or CG_Default specified

// Get all or the properties of the Data Source

myDataSource->IDBProperties::GetProperties

(

cPropertyIDSets // number of entries in rgPropertyIDSets

rgPropertyIDSets // DBPROPIDSET array

pcPropertySets // number of entries returned in rgPropertySets

&rgPropertySets // Pointer to property set buffer

)

// Else set all writeable properties and read them back

myDataSource->IDBProperties::SetProperties

(


```
        cPropertySets           // Number of entries in property set buffer
        &rgPropertySets                 // Pointer to property set buffer
        )
myDataSource->IDBProperties::GetProperties
        (
        cPropertyIDSets                 // number of entries in rgPropertyIDSets
        rgPropertyIDSets                // DBPROPIDSET array
        pcPropertySets                  // number of entries returned in rgPropertySets
        &rgPropertySets                 // Pointer to property set buffer
        )
        // See if this server supports CG_ExplainCollection
mySession->QueryInterface
        (
        riid                            // IID_IDBSchemaRowset
        (void **)&mySchemaRowset// pointer to Schema Rowset interface
        )
        // If mySchemaRowset == NULL, then set CG_ExplainCollection to FALSE
        // ELSE set CG_ExplainCollection to TRUE
        // Marshall the output parameters
sessionID == mapped from mySession
destinationID == mapped from myDataSource
requestID == copied from input parameter
additionalInfo == NULL
diagnostic == NULL unless an error occurred
capabilities == remap as described in section ---
```

C.4.3.4 Relevant OLE DB Properties

DBPROP_DATASOURCENAME – (Data source) the name of the data source

DBPROP_MAXSORTCOLUMNS – (View) maximum number of columns that can be supported in a sort.

DBPROP_SQLSUPPORT – (Data Source) specifies level of SQL support provided by server.

C.4.3.5 OGC OLEDB Extensions

None

C.4.4 Check the status of a request

C.4.4.1 Request

CG_StatusRequest ::= sessionID destinationID requestID additionalInfo requestIDtoStatus

sessionID ::= Integer

destinationID ::= CG_CollectionName

requestID ::= CG_RequestID

additionalInfo ::= XMLString

requestIDtoStatus ::= CG_RequestID

C.4.4.2 Response

CG_StatusResponse ::= sessionID destinationID requestID additionalInfo diagnostic status requestIDtoStatus

sessionID ::= Integer

destinationID ::= CG_CollectionName

requestID ::= CG_RequestID

additionalInfo ::= XMLString

diagnostic ::= CharacterString

status ::= CG_Status

requestIDtoStatus ::= CG_RequestID

C.4.4.3 Pure OLEDB Processing

```
        // Marshall the input parameters
sessionID == maps to the session handle “mySession”
destinationID == maps to the Data Source handle “myDataSource”
requestID == not used
additionalInfo == not used
requestIDtoStatus == map into myCommand
        // Request the status
myCommand->QueryInterface
        (
        riid                            // IID_IDBAsynchStatus
        (void **)&myAsynchStatus   // pointer to asynch status interface
        )
myAsynchStatus->GetStatus
        (
        HCHAPTER hChapter                   // DB_NULL_HCHAPTER
        ULONG ulOperation           // DBASYNCHOP_OPEN
        ULONG * pulprogress                 // current progress toward completing this phase
        ULONG * pulProgressMax    // returned maximum value of pulprogress
        ULONG * pulAsynchPhase    // Phase – can be initializing, populating or complete
        ULONG * ppwszStatusText   // supporting text
        )
        // percentage complete is pulprogress / pulProgressMax
        // Marshall the output parameters
sessionID == mapped from mySession
```

destinationID == mapped from myDataSource

requestID == copied from input parameter

additionalInfo == NULL

diagnostic == copy from ppwszStatusText

requestIDtoStatus == copied from input parameter

status == mapped from pulprogress, pulProgressMax and pulAsynchPhase

C.4.4.4 Relevant OLE DB Properties

DBPROP_CONNECTIONSTATUS – (Data source) gets the status of the catalog connection

C.4.4.5 OGC OLEDB Extensions

None

C.4.5 Cancel a request

C.4.5.1 Request

CG_CancelRequest ::= sessionID destinationID requestID additionalInfo

requestIDtoCancel freeResources

sessionID ::= Integer

destinationID ::= CG_CollectionName

requestID ::= CG_RequestID

additionalInfo ::= XMLString

requestIDtoCancel ::= CG_RequestID

freeResources ::= Boolean

C.4.5.2 Response

CG_CancelResponse ::= sessionID destinationID requestID additionalInfo diagnostic

Status canceledRequest

sessionID ::= Integer

destinationID ::= CG_CollectionName

requestID ::= CG_RequestID

additionalInfo ::= XMLString

diagnostic ::= CharacterString

status ::= CG_Status

canceledRequest ::= CG_RequestID

C.4.5.3 Pure OLEDB Processing

// Marshall the input parameters

sessionID == maps to the session handle “mySession”

destinationID == maps to the Data Source handle “myDataSource”

requestID == not used

additionalInfo == not used

requestIDtoCancel == map into myCommand

freeResources == not sure we can do this here

// Terminate the session

myCommand->QueryInterface

(

riid // IID_IDBAsynchStatus

(void **)&myAsynchStatus // pointer to asynch status interface

)

myAsynchStatus->Abort

(

HCHAPTER hChapter // DB_NULL_HCHAPTER

ULONG ulOperation // DBASYNCHOP_OPEN

)

// Marshall the output parameters

sessionID == mapped from mySession

destinationID == mapped from myDataSource

requestID == copied from input parameter

additionalInfo == NULL

diagnostic == NULL

status == mapped from HRESULT

canceledRequest == copied from input parameter requestIDtoCancel

C.4.5.4 Relevant OLE DB Properties

DBPROP_ABORTPRESERVE – Rowset property to preserve or delete results after an abort

C.4.5.5 OGC OLEDB Extensions

None – freeResources not currently supported

C.4.6 Issue a Query

C.4.6.1 Request

CG_QueryRequest ::= sessionID destinationID requestID additionalInfo queryExpression resultType

iteratorSize cursor returnFormat presentation sortField queryScope

collectionID catalogType

sessionID ::= Integer

destinationID ::= CG_CollectionName

requestID ::= CG_RequestID

additionalInfo ::= XMLString

queryExpression ::= CG_QueryExpression

resultType ::= CG_ResultType

iteratorSize ::= Integer

cursor ::= Integer

returnFormat ::= CG_MessageFormat

presentation ::= CG_PresentationDescription

sortField ::= Sequence<sortField>

queryScope ::= CG_QueryScope

collectionID ::= CG_CollectionName

catalogType ::= CG_CatalogEntryType

C.4.6.2 Response

CG_QueryResponse ::= sessionID destinationID requestID additionalInfo diagnostic

..... **retrievedData**

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

diagnostic ::= CharacterString

retrievedData ::= CG_ReturnData

resultSetID ::= CG_CollectionName

resultType ::= CG_ResultType

status ::= CG_Status

hits ::= integer

cursor ::= Integer

C.4.6.3 Pure OLEDB Processing

// Marshall the input parameters

sessionID == maps to the session handle “mySession”

destinationID == maps to the Data Source handle “myDataSource”

requestID == not used

additionalInfo == not used

queryExpression

theQuery == local LPCOLSTR variable “string”

theLanguage == local REFGUID variable “dialect”

resultType == used by this client to control query processing

resultSet == only return the resultSet ID

results == Return result data

validate == Only confirm that the query was accepted

hits == Only return the size of the result set

iteratorSize == used directly by IRowSet::GetNextRows

cursor == used directly by IRowSet::GetNextRows

returnFormat == Used to generate the Accessor.

presentation == Used to generate the Accessor

sortField

attributeName == maps into the column ordinal for this attribute

sortOrder == OLEDB type = DBSORT which can indicate ascending or descending sorts only

queryScope == used to indicate distributed query. May be ignored or included as a command parameter.

collectionID == may be included in the query string as an SQL FROM clause or included as a command parameter

catalogType == may be passed as a command parameter or included in query text.

```
        // Create a command object

mySession->IDBCreateCommand::CreateCommand

        (

         pUnkOuter                  // NULL

        riid                        // IID_ICommand

        (void **)&myCommand             // pointer to the command object

        )


        // Set the query language


myCommand->QueryInterface

        (

        riid                        // IID_ICommandProperties

        (void **)&myCommandProps        // pointer to command properties interface

        )

myCommandProps->SetProperties

        (

        cPropSets                   // Number of property sets (1)

        rgPropSets                  // the DBPROP_SQLSUPPORT property

         )

        // Insert the query text
```

```
myCommand->QueryInterface
        (
        riid                            // IID_ICommandText
        (void **)&myCommandText // pointer to command text interface
        )
myCommandText->SetCommandText
        (
        DBGUID_SQL                      // allows use of the DBPROP_SQLSUPPORT
property
        string                          // from queryExpression::theQuery
         )
        // Execute the command
myCommand->QueryInterface
        (
        riid                            // IID_ICommand
        (void **)&myCommandInterface    // pointer to command interface
        )
myCommandInterface->Execute
        (
        NULL
        IID_IRowset
        NULL
        NULL
        (void **) &myRowset
        )
        // If resultType parameter is resultSet or validate then skip to marshalling
```



```
        // If resultType parameter is hits then -------
        // If resultType parameter is results then process the Rowset data
        // Create a view from the Rowset
myRowSet->IRowsetView::CreateView
        (
        pUnkOuter
        riid                    // IID_IView
        myView
        )
        // get the column information
myView->IColumnsInfo::GetColumnInfo
        (
        ULONG * pcColumns                   // number of columns returned
        DBCOLUMNINFO * prgInfo              // array of column information
        OLECHAR ** ppStringsBuffer          // string data pointed to by prgInfo
elements
        )
        // apply sorting
myView->IViewSort::SetSort
        (
        ULONG cColumns              // Number of entries in rgColumns and rgOrders
        Const ULONG rgColumns[]     // column ordinals from prgInfo[].iOrdinal
        Const DBSORT rgOrders[]     // can be DBSORT_ASCENDING or
                                    //      DBSORT_DESCENDING
        )
```

```
        // Build an Accessor

        // The Accessor defines how the data returned by this query will be processed.  This is

        // where the presentation and returnFormat parameters come into play.  To build the
        Accessor,

        // traverse the list of attributes in the presentation parameter and add to the Accessor
        the

        // instructions for appending that attribute to the end of the retrievedData parameter.

myView->QueryInterface

        (

        riid                                    // IID_Iaccessor

        &myIAccessor                                    // pointer to the Accessor interface

        )

        // For each attribute on the Presentation list, find the column

        // and build a new DBBINDING entry for the Accessor.  Key entries are:

        //    iOrdinal = ordinal defines the location of the attribute in the Rowset

        //    obValue = offset in retrievedData where the value for this attribute is to be stored

        //    dwFlag = set DBBINDFLAG_HTML if returnFormat is HTML

        //    wtType = data format of copied data.  If messageFormat is HTML or TXT, set to
                DBTYPE_STR for ASCII and DBTYPE_WSTR for UNICODE text output.

myIAccessor->CreateAccesor

        (

        DBACCESSORFLAGS flags//DBACCESSOR_ROWDATA

        ULONG pcBindings            // number of entries in prBindings

        Const DBBINDING prBindings[]     // an array of DBBINDING structures, one for
each attribute

        ULONG rowsize                       // not used

        HACCESSOR * myAccessor // returned handle of the Accessor
```



```
        DBBINDSTATUS rgstatus[] // An array of status values, one for each rbindings
entry

        )

        // Create a Rowset with the sorting applied

myView->QueryInterface

        (

        REFIID riid                     // IID_IViewRowset

        Iunknown ** &myIViewRowset      // pointer to the ViewRowset interface

        )

myIViewRowset->OpenViewRowset

        (

        IUnknown ** outer               // NULL

        REFIID Riid                     // IID_IRowSet

        &myRowset                       // Sorted Rowset

        )


        // retrieve the data

myRowset->GetNextRows

        (

        HCHAPTER chapter                // DB_NULL_HCHAPTER

        LONG cursor                     // from input parameter

        LONG iteratorSize               // from input parameter

        ULONG * rowsreceived                    // number of rows actually returned

        HROW ** rowbuffer               // memory containing the row data

        )
```

myRowset->GetData

(

HROW rowbuffer // memory containing the row data

HACCESSOR myAccessor // the data Accessor object

Void * retrievedData.payload // payload portion of the returned data parameter

)

// Marshall the output parameters

sessionID == mapped from mySession

destinationID == mapped from myDataSource

requestID == maps to myRowSet

additionalInfo == NULL

diagnostic == NULL unless an error occurred

retrievedData == populated by IRowset::GetData

resultSetID == maps to myRowSet

resultType == copied from input parameter

status == map from HRESULT values

hits == TBD

cursor == input parameter + rowsreceived from Irowset::GetNextRows

C.4.6.4 Relevant OLEDB Properties

DBPROP_ACCESSORDER – (Rowset) set to DBPROPVAL_AO_RANDOM to enable presentation specification.

DBPROP_CANFETCHBACKWARDS – (Rowset) Boolean to allow backup the cursor

DBPROP_CANSCROLLBACKWARDS _ (Rowset) Boolean to allow backward scrolling of the Rowset

DBPROP_ROWSET_ASYNCH – (Rowset) governs how the Rowset is generated – maps to result type

DBPROP_MAXROWS – (Rowset) maps to iterator size?

DBPROP_SERVERCURSOR (Rowset) sets the cursor location

C.4.6.5 OGC OLEDB Extensions

ReturnFormat: standard OLEDB only supports HTML, text and binary formats. To support XML, DAG and SGML formats the following flags have been defined for the dwFlag parameter of the DBBINDING entry in the Accessor.

DBBINDFLAG_XML

DBBINDFLAG_DAG

DBBINDFLAG_SGML

QueryExpression: OLEDB only supports SQL dialects. Support for non-SQL query languages requires the addition of the DBPROP_OGCLANG property. This property can take the following values:

OGC_Common -> 1

Z3950_TYPEONE -> 2

SQL3_SIMPLEFEATURE -> 3

SQL2_SIMPLEFEATURE -> 4

The DBPROP_OGCLANG property is set instead of the DBPROP_SQLSUPPORT property through the SetProperties interface on command objects.

queryScope == Add optional command parameter

collectionID == SQL FROM clause equivalent, add optional command parameter or include in query string.

catalogType == may be passed as a command parameter or included in query text.

C.4.7 Present Query Results

C.4.7.1 Request

CG_PresentRequest ::= sessionID destinationID requestID additionalInfo presentation

sortField returnFormat iteratorSize cursor

sessionID ::= Integer

destinationID ::= CG_CollectionName

requestID ::= CG_RequestID

additionalInfo ::= XMLString

presentation ::= CG_PresentationDescription

sortField ::= Sequence<SortField>

returnFormat ::= CG_MessageFormat

iteratorSize ::= Integer

cursor ::= Integer

C.4.7.2 Response

CG_PresentResponse ::= sessionID destinationID requestID additionalInfo diagnostic retrievedData

cursor hits status

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

diagnostic ::= CharacterString

retrievedData ::= CG_ReturnData

cursor ::= Integer

hits ::= Integer

status ::= CG_Status

C.4.7.3 Pure OLEDB Processing

// Marshall the input parameters

sessionID == maps to the session handle “mySession”

destinationID == map to Rowset (myRowSet) created by previous query

requestID == not used

additionalInfo == not used

presentation == Used to generate the Accessor

sortField

attributeName == maps into the column ordinal for this attribute

sortOrder == OLEDB type = DBSORT which can indicate ascending or descending sorts only

returnFormat == Used to generate the Accessor.

iteratorSize == used directly by IRowSet::GetNextRows

cursor == used directly by IRowSet::GetNextRows

// Create a view from the Rowset

myRowSet->IRowsetView::CreateView

(

pUnkOuter

riid // IID_IView

myView

)

// get the column information

myView->IColumnsInfo::GetColumnInfo

(

ULONG * pcColumns // number of columns returned

DBCOLUMNINFO * prgInfo // array of column information

OLECHAR ** ppStringsBuffer // string data pointed to by prgInfo elements

)

// apply sorting

myView->IViewSort::SetSort

(

```
        ULONG cColumns                  // Number of entries in rgColumns and rgOrders
        Const ULONG rgColumns[]         // column ordinals from prgInfo[].iOrdinal
        Const DBSORT rgOrders[]         // can be DBSORT_ASCENDING or
                                        //      DBSORT_DESCENDING
        )
        // Build an Accessor
        // The Accessor defines how the data returned by this query will be processed.  This is
        // where the presentation and returnFormat parameters come into play.  To build the
        Accessor,
        // traverse the list of attributes in the presentation parameter and add to the Accessor
        the
        // instructions for appending that attribute to the end of the retrievedData parameter.
myView->QueryInterface
        (
        riid                            // IID_Iaccessor
        &myIAccessor                            // pointer to the Accessor interface
        )
        // For each attribute on the Presentation list, find the column
        // and build a new DBBINDING entry for the Accessor.  Key entries are:
        //    iOrdinal = ordinal defines the location of the attribute in the Rowset
        //    obValue = offset in retrievedData where the value for this attribute is to be stored
        //    dwFlag = set DBBINDFLAG_HTML if returnFormat is HTML
        //    wtType = data format of copied data.  If messageFormat is HTML or TXT, set to
                DBTYPE_STR for ASCII and DBTYPE_WSTR for UNICODE text output.
myIAccessor->CreateAccesor
        (
```



```
        DBACCESSORFLAGS flags//DBACCESSOR_ROWDATA

        ULONG pcBindings            // number of entries in prBindings

        Const DBBINDING prBindings[]    // an array of DBBINDING structures, one for
each attribute

        ULONG rowsize                   // not used

        HACCESSOR * myAccessor // returned handle of the Accessor

        DBBINDSTATUS rgstatus[] // An array of status values, one for each rbindings
entry

        )

        // Create a Rowset with the sorting applied

myView->QueryInterface

        (

        REFIID riid                 // IID_IViewRowset

        Iunknown ** &myIViewRowset      // pointer to the ViewRowset interface

        )

myIViewRowset->OpenViewRowset

        (

        IUnknown ** outer           // NULL

        REFIID Riid                 // IID_IRowSet

        &myRowset                   // Sorted Rowset

        )


        // retrieve the data

myRowset->GetNextRows

        (

        HCHAPTER chapter            // DB_NULL_HCHAPTER
```

LONG cursor // from input parameter

LONG iteratorSize // from input parameter

ULONG * rowsreceived // number of rows actually returned

HROW ** rowbuffer // memory containing the row data

)

myRowset->GetData

(

HROW rowbuffer // memory containing the row data

HACCESSOR myAccessor // the data Accessor object

Void * retrievedData.payload // payload portion of the returned data parameter

)

// Marshall the output parameters

sessionID == mapped from mySession

destinationID == mapped from myRowset

requestID == mapped from myRowSet

additionalInfo == NULL

diagnostic == NULL unless an error occurred

retrievedData == populated by IRowset::GetData

cursor == input parameter + rowsreceived from Irowset::GetNextRows

hits == rowsreceived

status == map from HRESULT values

C.4.7.4 Relevant OLEDB Properties

DBPROP_ACCESSORDER – (Rowset) set to DBPROPVAL_AO_RANDOM to enable presentation specification.

DBPROP_CANFETCHBACKWARDS – (Rowset) Boolean to allow backup the cursor

DBPROP_CANSCROLLBACKWARDS _ (Rowset) Boolean to allow backward scrolling of the Rowset

DBPROP_ROWSET_ASYNCH – (Rowset) governs how the Rowset is generated – maps to result type

DBPROP_MAXROWS – (Rowset) maps to iterator size?

DBPROP_SERVERCURSOR (Rowset) sets the cursor location

C.4.7.5 OGC OLEDB Extensions

ReturnFormat: standard OLEDB only supports HTML, text and binary formats. To support XML, DAG and SGML formats the following flags have been defined for the dwFlag parameter of the DBBINDING entry in the Accessor.

DBBINDFLAG_XML

DBBINDFLAG_DAG

DBBINDFLAG_SGML

C.4.8 Get the schema

C.4.8.1 Request

CG_ExplainCollectionRequest ::= sessionID destinationID requestID additionalInfo

attributeCategory collectionID

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

attributeCategory ::= CG_AttributeCategory

collectionID ::= CG_CollectionName

C.4.8.2 Response

CG_ExplainCollectionResponse ::= sessionID destinationID requestID additionalInfo diagnostic

collectionID dataModel

sessionID ::= Integer

destinationID ::= CharacterString

requestID ::= CG_RequestID

additionalInfo ::= CharacterString

diagnostic ::= CharacterString

collectionID ::= CG_CollectionName

dataModel ::= CG_SchemaID

C.4.8.3 Pure OLEDB Processing

// Marshall the input parameters

sessionID == maps to the session handle “mySession”

destinationID == maps to the Data Source handle “myDataSource”

requestID == not used

additionalInfo == not used

attributeCategory == See extensions

collectionID == not yet used

// a local data item to hold schema data

Schemadata == an array of structure

Schema_name – character string

Table – character string

Column_name – character string

Ordinal – integer

Data_type – code list (see OLEDB Programmer’s Reference Appendix A)

// Get the COLUMNS table from the schema Rowsets

mySession->QueryInterface

(


```
        riid                            // IID_IDBSchemaRowset
        (void **)&myISchemaRowset       // pointer to Schema Rowset interface
        )
myISchemaRowset->GetRowset
        (
        Iunknown * punkOuter            // NULL
        REFGUID rguidschema             // DBSCHEM_COLUMNS
        ULONG crestrictions             // 0
        Const VARIANT rgrestrictions[]  // NULL
        REFIID riid                     // IID_IRowSet
        ULONG cpropertysets             // 0
        DBPROPSET rgpropertysets[]      // NULL
        Iunknown ** myRowSet            // pointer to the schema Rowset
        )
        // get the column information for this Rowset
myRowSet->IColumnsInfo::GetColumnInfo
        (
        ULONG * pcColumns                   // number of columns returned
        DBCOLUMNINFO * prgInfo              // array of column information
        OLECHAR ** ppStringsBuffer          // string data pointed to by prgInfo
elements
        )
        // create an Accessor collecting the schema name, table, column name, ordinal and
data type
        //      Table == TABLE_NAME
        //      Schema_name == TABLE_SCHEMA
```

```
        //      Column_name = COLUMN_NAME
        //      Data_type == DATA_TYPE
        //      Ordinal == ORDINAL_POSITION
myRowSet->QueryInterface
        (
        riid                            // IID_Iaccessor
        &myIAccessor                            // pointer to the Accessor interface
        )
myIAccessor->CreateAccesor
        (
        DBACCESSORFLAGS flags//DBACCESSOR_ROWDATA
        ULONG pcBindings            // number of entries in prBindings
        Const DBBINDING prBindings[]    // an array of DBBINDING structures, one for
each attribute
        ULONG rowsize                   // not used
        HACCESSOR * myAccessor // returned handle of the Accessor
        DBBINDSTATUS rgstatus[] // An array of status values, one for each rbindings
entry
        )
        // get the data from each COLUMNS Rowset
myRowSet->GetNextRows
        (
        HCHAPTER chapter            // DB_NULL_HCHAPTER
        LONG cursor                 // 0
        LONG iteratorSize           // number of rows that rowbuffer can hold
        ULONG * rowsreceived            // number of rows actually returned
```


HROW ** rowbuffer // memory containing the row data

)

myRowset->GetData

(

HROW rowbuffer // memory containing the row data

HACCESSOR myAccessor // the data Accessor object

Void * Schemadata // temporary storage for schema data

)

// Marshall the output parameters

sessionID == mapped from mySession

destinationID == mapped from myDataSource

requestID == mapped from myRowSet

additionalInfo == NULL

diagnostic == NULL unless an error occurred

collectionID == copy from schemadata.table

dataModel == composed of

schemaName == copy from schemadata.schema_name

schema == composed of

key == copy from schemadata.column_name

type == map from schemadata.data_type

C.4.8.4 Relevant OLEDB Properties

DBPROP_COL_DEFAULT – (column) VARIANT specifying the default value for the column

DBPROP_COL_DESCRIPTION – (column) Human readable description of the column

C.4.8.5 OGC OLEDB Extensions

a) AttributeCategory Parameter: This parameter is not supported by the pure OLEDB environment. To support this parameter, the parameter ATTRIBUTECATEGORY will be added to the property set supported by the GetRowset interface.

