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OGC Best Practices Document: Gazetteer Service - Application Profile of the Web Feature Service Implementation Specification

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i. Preface

There is growing interest in the development of a common feature-based model for access to named features, often referred to as a gazetteer. Two major activities form the basis of this specification, an OGC Discussion paper on gazetteers, and an ISO draft standard for geographic identifiers.

As a result of the OGC Geospatial Fusion Services Testbed Phase I and the Web Mapping Testbed Phase II, an Open GIS Gazetteer Interface was defined and published as an OGC Discussion Paper [OGC 2001]. The standardization process in the ISO TC 211 led to a separate mature draft standard defining "Spatial referencing by geographic identifiers" [ISO19112] that defines an abstract model to be implemented by a gazetteer service.

The outcomes of these activities have been taken into account and a consolidated Gazetteer Service implementation specification has been developed and published as a discussion paper [OGC 02-076r3]. As the underlying specifications have been further developed the present document makes the necessary adjustments.

The Gazetteer Service is a specialized Application Profile (hereafter referred to as "profile") of a Web Feature Service that specifies a minimum set of Feature Types and operations required to support an instance of a gazetteer service. Instances within a collection of gazetteer features may be – as the terms in a thesaurus – related to each other and constitute a hierarchical vocabulary of geographic places. The overall information model is here implemented as a GML application schema that defines a general feature type to be served by a Gazetteer Service.

By using the capabilities of a Web Feature Server, the Gazetteer Service as proposed here exposes the following interfaces to query location instances in a gazetteer database:

- Get or Query features based on thesaurus-specific properties (broader term (BT), narrower term (NT), related term (RT))
- Retrieve properties of the gazetteer database, such as the location type class definitions and the spatial reference system definitions

Suggested additions, changes, and comments on this draft report are welcome and encouraged. Such suggestions may be submitted by OGC portal message, email message, or by making suggested changes in an edited copy of this document.

The changes made in this document version, relative to the previous version, are tracked by Microsoft Word, and can be viewed if desired. If you choose to submit suggested

changes by editing this document, please first accept all the current changes, and then make your suggested changes with change tracking on.

ii. Submitting organizations

The following organizations submitted this document to the Open Geospatial Consortium Inc.

- a) lat/lon GmbH
- b) US Federal Geographic Data Committee
- c) GeoConnections / Natural Resources Canada (Environment Canada)
- d) Social Change Online Pty Ltd

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iv. Revision history

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2005-04-12				New Document structure according to 05-009
2005-10-11	0.9.1	Fitzke	all	Complete revision.
2005-	0.9.1	Carl Reed	Numerous	Edits for consistency, grammar, etc.
2006-01-09	0.9.1	Jens Fitzke	GetFeature examples	Added more examples. Minor corrections on document and schema / example files.
2006-03-16	0.9.2	Rob Atkinson	all	ISO 19112 data model conformance

2006-05-29	0.9.3	Rob Atkinson	All	Editorial revision filling in missing clauses. Added abstract conformance tests. Some reorganisation of order
2006-05-29	0.9.3	Jens Fitzke	All	Minor edits in contributors section and others. Added further examples.
2006-06-03	0.93	Rob Atkinson	Appendix C	Samples, formatting

v. Changes to the OGC Abstract Specification

The OpenGIS™ Abstract Specification does not require changes to accommodate this OpenGIS™ standard. It is recommended however that the Abstract Specification be extended to explicitly incorporate the ISO 19112 standards to be consistent with current practice with regards to implementation of ISO TC211 standards.

vi. Future work

This profile implements the minimal set of elements from the ISO 19112 model to provide useful, standardised services.

Future extensions may include convenience methods to traverse parent/child relationships, vocabulary-oriented access protocols.

The main area requiring standardisation relates to the definition of Feature Types and the correspondence to SI_LocationType. Currently, the implementation supports a token or a URL reference, whose semantics are clear, but the details of the target object is unspecified.

In the future, Gazetteer Services may have transactional interfaces added to enable updates by ad-hoc authorities. This could be implemented using WFS transactional capabilities but may require constraints over the content model to conform to ISO 19112 semantics.

Foreword

This document cancels and replaces OGC 02-076r3. It represents a complete revision of this former document version, especially with respect to WFS, Geography Markup Language (GML), and ISO 19139 (Geographic Metadata Implementation Model). The Gazetteer Service is considered a profile of the WFS specification. It is related to and makes use of the WFS, Filter Encoding, GML, and ISO 19139 specifications.

This document includes 4 annexes; Annexes A, B are normative, and Annexes C, D are informative.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The OGC shall not be held responsible for identifying any or all such patent rights.

Introduction

This document defines a Gazetteer Service profile of the OGC Web Feature Service Specification. The OGC Gazetteer Service allows a client to search and retrieve elements of a georeferenced vocabulary of well-known place-names.

This profile extends the WFS interface in a way that a client is able to

- Determine if a WFS implementation is acting as a Gazetteer Service.
- Query the Gazetteer Service in order to retrieve place-name features without closer examination of the feature type definitions
- Access metadata about the gazetteer(s) provided by the service

To ensure semantic interoperability this profile defines the response schema elements according to the gazetteer data model defined in [ISO 19112].

The overall design principle of this profile is to make gazetteer service behaviour to be completely predictable, and allowing setup as easy as possible – provided that a web feature service instance is available. The following list gives an overview of the specific characteristics of a gazetteer service in comparison to a web feature service:

- The service type is “WFS” (this allows a server instance to act both as a general web feature service and a gazetteer service).
- The gazetteers (collection of locations) are described by metadata objects of a well defined feature type (SI_Gazetteer). Presence of this feature type is sufficient to determine that a service acts a gazetteer for the FeatureTypes described by the collection of SI_Gazetteer objects.
- The Gazetteer WFS serves at least one FeatureType derived from SI_LocationInstance and described by a feature of type SI_Gazetteer
- To support absolute URL references to single instances of a place-name database a gazetteer service is able to process KVP-encoded GetFeature requests issued by using HTTP GET.

Gazetteer Profile of the Web Feature Service Implementation Specification

1 Scope

This OpenGIS™ document specifies the OpenGIS Gazetteer Service operations as a profile of the Web Feature Service (WFS-G). Services compliant with this specification **shall** provide Feature Types derived by extension from the well-known Feature Type SI_LocationInstance. In Addition, they **may** support queries based on the (parent/child) relationships of feature instances, as defined in ISO 19112.

Geographic Features: SI_LocationInstance

The following UML class diagram illustrates the concept of the base Feature Types SI_Gazetteer and SI_LocationInstance:

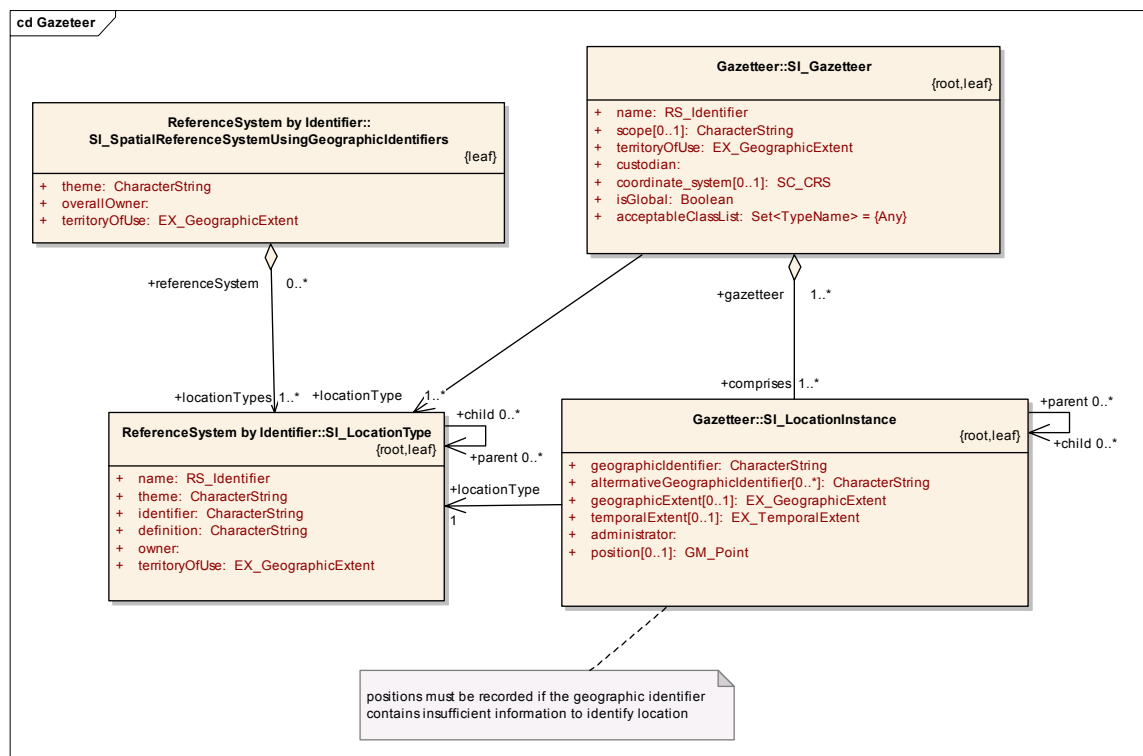


Figure 1 Gazetteer class diagram (from ISO 19112)

The scope of the gazetteer service is to provide SI_LocationInstance derived objects, and metadata via SI_Gazetteer objects. FeatureTypes (SI_LocationType) are assumed to be implemented in a Feature Type Catalog in accordance with [ISO 19110] and so no requirement to serve these non-spatial definition objects is specified. This clause also allows purely 2D-spatial WFS services to conform to the WFS-G profile.

SI_LocationType Feature Types **may** be supported by a Gazetteer Service to describe the Gazetteer's internal organization.

Note that the object model for ISO 19112 has been refactored according to the rules of ISO19118 to allow generation of normative GML 3 application schemas. Figure 2 shows the extent of the refactored model (named ISO19112_Impl)

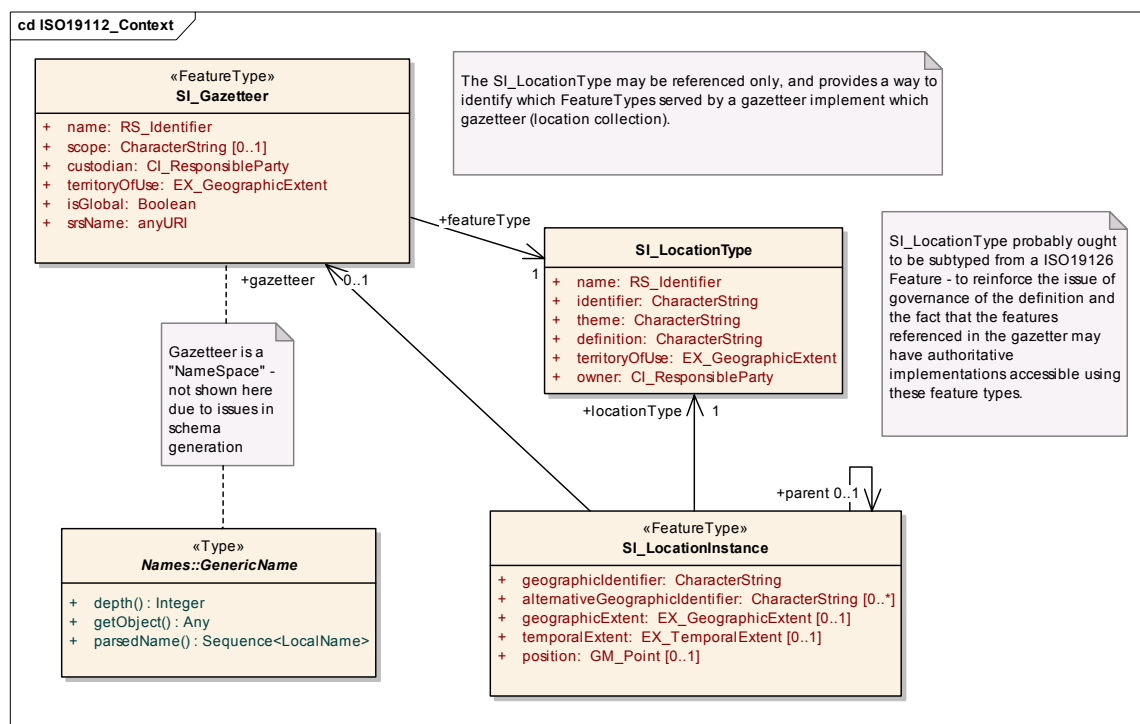


Figure 2 ISO19112 model refactored to conform to ISO19118

Operations

To support query processing, a gazetteer service has the following operations:

GetCapabilities

As a web feature service, a gazetteer service must be able to describe its capabilities. Specifically, it must indicate which feature types it can service, what operations are supported on each feature type, and what the structure of the gazetteer database is like.

DescribeFeatureType

As a web feature service, a gazetteer service must be able, upon request, to describe the structure of any feature type it can service. Gazetteer service feature types are derived from the base type SI_LocationInstance.

GetFeature

As a web feature service, a gazetteer service must be able to service a request to retrieve feature instances. In addition, the client should be able to specify which feature properties to fetch and should be able to constrain the query spatially and non-spatially.

The above operations are common to versions 1.0 and 1.1 of the WFS specification. Additional constraints are that WFS 1.0 must support the GML 2.1 implementation of each FeatureType, whereas WFS 1.1 must support the GML 3.1.1 implementation. Each may optionally advertise and support the alternative format, thus a WFS 1.0 conformant service may support GML3.1.1 as an optional output format.

Additionally, a gazetteer service supporting WFS 1.1 interface may implement the GetGMLObject operation:

GetGMLObject

A gazetteer service may be able to service a request to retrieve element instances by traversing XLinks that refer to their XML Ids.

Based on the operation descriptions above, two classes of gazetteer services can be defined:

Basic Gazetteer Service

A basic Gazetteer Service would implement the GetCapabilities, DescribeFeatureType and GetFeature operations.

XLink Gazetteer Service

An XLink Gazetteer Service would support all the operations of a basic gazetteer service and in addition it would implement the GetGmlObject operation for local and/or remote XLinks, and offer the option for the GetGmlObject operation to be performed during GetFeature operations.

2 Conformance

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

3 Normative references

The following normative documents contain provisions that, through reference in this text, constitute provisions of this document. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the normative document referred to applies.

ISO 19105:2000, *Geographic information — Conformance and Testing*

ISO 19112:2003, *Geographic information — Spatial Referencing by Geographic Identifiers*

OGC 05-008, *OGC Web Services Common Specification*

OGC 03-105r1, *Geography Markup Language (GML) Implementation Specification version 3.1.1*

OGC 04-094, *Web Feature Service Implementation Specification version 1.1*

OGC 04-095, *Filter Encoding Implementation Specification version 1.1*

The OWS Common Specification contains a list of normative references that are also applicable to this candidate Implementation Specification.

In addition to this document, this specification includes several normative XML Schema files. These are posted online at the URL <http://schemas.opengis.net/gazetteer/1.0/>. These XML Schema files are also bundled with the present document. In the event of a discrepancy between the bundled and online versions of the XML Schema files, the online files shall be considered authoritative.

4 Terms and definitions

For the purposes of this specification, the definitions specified in Clause 4 of the OWS Common Implementation Specification [OGC 05-008] shall apply. In addition, the following terms and definitions apply.

Gazetteer: A database used to translate between different representations of geospatial references, such as place names and geographic coordinates

5 Conventions

5.1 Abbreviated terms

Most of the abbreviated terms listed in Subclause 5.1 of the OWS Common Implementation Specification [OGC 05-008] apply to this document, plus the following abbreviated terms.

FTC: Feature Type Catalog

5.2 UML notation

Most diagrams that appear in this specification are presented using the Unified Modeling Language (UML) static structure diagram, as described in Subclause 5.2 of [OGC 05-008].

5.3 Document terms and definitions

This document uses the specification terms defined in Subclause 5.3 of [OGC 05-008].

6 Gazetteer Service overview

A Gazetteer defines a set of *location instances*, each of which provides a binding between representations of a location within a CRS and as an identifier. Each location instance is a *Feature*, and is a (possibly one of many) representation of a “real-world” object. The representation of the real-world object within the Gazetteer is designed to be used to perform this translation, and to allow the set of such Features to be discovered and searched.

The gazetteer service is thus a WFS serving a predictably structured set of features representing Gazetteers and the sets of location instances they contain.

The constraints are common to versions 1.0 and 1.1 of the WFS specification. Additional constraints are that WFS 1.0 must support a GML 2.1 implementation of each FeatureType, whereas WFS 1.1 must support the GML 3.1.1 implementation. Each may optionally advertise and support the alternative format, thus a WFS 1.0 conformant service may support GML3.1.1 as an optional output format.

6.1 Processing Requests

This section of the document outlines, in general terms, the protocol to be followed in order to process Gazetteer Service requests. Processing requests would proceed as follows:

1. A client application (optionally) would request a capabilities document from the WFS-G. Such a document contains a description of all the operations that the WFS-G supports, a list of all feature types that it can service, and a description of the structure of the underlying gazetteer datastore.
2. A client application (optionally) makes a request to a web feature service for the definition of one or more of the feature or element types that the WFS-G can service. (This is optional, and may be used to discover additional elements)
3. A client application (optionally) requests the set of gazetteer metadata SI_Gazetteer objects to identify the feature types that implement the gazetteer

data model. (These feature types will be SI_LocationInstance or a type derived from this by extension)

4. Based on the definition of the SI_LocationInstance Feature Type, and possibly other properties of a specified Feature Type that extends this, the client application generates a request as specified in the WFS interface [OGC 04-094]
5. The WFS-G is invoked to read and service the request.
6. When the WFS-G has completed processing the request, it will generate a status report and hand it back to the client. In the event that an error has occurred, the status report will indicate that fact.

Note that “client application” may include Registries and other middleware, as well as conventionally understood “end-users”.

Note also that a client may be “bound” to the Gazetteer service content by configuration, or discover the implementing SI_LocationInstance FeatureTypes through a services registry and may thus be able to skip steps 1,2 and 3.

The definition of the WFS-G profile is intended to make the discovery and invocation of WFS-G services possible through service registries.

7 Shared aspects

7.1 Introduction

This clause specifies aspects of the Gazetteer Service behavior that are shared by several operations.

7.2 Operation request encoding

The encoding of operation requests shall use HTTP GET with KVP encoding and HTTP POST with XML and/or KVP encoding as specified in Clause 11 of [OGC 05-008]. Table 1 summarizes the Gazetteer Service operations and their encoding methods defined in this specification.

Table 1 — Operation Request Encoding

Operation	Request Encoding
GetCapabilities (required)	XML and mandatory KVP
DescribeFeatureType (required)	XML and mandatory KVP
GetFeature (required)	XML and optional KVP

8 GetCapabilities operation (required)

8.1 Introduction

This is a standard WFS requirement, with both the request and response requirements unchanged by the WFS-G profile.

The mandatory GetCapabilities operation allows clients to retrieve service metadata from a Gazetteer server. The response to a GetCapabilities request shall be an XML document containing service metadata about the server, including specific information about the feature types it can service, and the supported operations on each feature type. This clause specifies the XML document that a Gazetteer server must return to describe its capabilities.

8.2 Operation request

The GetCapabilities operation request shall be as specified in Subclauses 7.2.2 through 7.2.4 of [OGC 05-008]. The “service”, “request”, and “AcceptVersions” parameters shall be implemented by all gazetteer services. The “Sections” and “updateSequence” parameters are optional implementation by gazetteer services. All gazetteer services shall implement HTTP GET transfer of the GetCapabilities operation request, using KVP encoding. Services can also implement HTTP POST transfer of the GetCapabilities operation request, using XML encoding **only**.

The value of the “service” parameter shall be “WFS”. The allowed set of service metadata (or Capabilities) XML document section names and meanings shall be as specified in Tables 3 and 7 of [OGC 05-008].

8.3 GetCapabilities operation response

Normal response

The WFS-G profile creates no additional requirements of the WFS GetCapabilities operation beyond the ability to serve the nominated Feature Types: SI_Gazetteer and SI_LocationInstance (or a derived type advertised in SI_Gazetteer records).

9 DescribeFeatureType operation (required)

9.1 Introduction

The DescribeFeatureType operation allows gazetteer clients to retrieve schema descriptions which define, how the gazetteer server will generate feature instances on output (in response to GetFeature requests).

This profile makes no further changes to this WFS operation except that it defines a base schema for certain FeatureTypes.

9.2 Examples

To request a feature type schema document, a client could issue the following DescribeFeatureType operation request with minimum contents:

```
http://ogc.a-domain.org/wfs-g?
  service=WFS
  &request=DescribeFeatureType
  &typename=iso19112:SI_LocationInstance
  &namespace=xmlns(iso19112=http://www.opengis.net/iso19112)
```

The corresponding minimum request encoded in XML is:

```
<?xml version="1.0" ?>
<wfs:DescribeFeatureType
  version="1.1.0"
  service="WFS"
  xmlns:iso19112="http://www.opengis.net/iso19112"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.opengis.net/wfs
  ../wfs/1.1.0/WFS.xsd">
  <TypeName>iso19112:SI_LocationInstance</TypeName>
</wfs:DescribeFeatureType>
```

In response to such a request, the gazetteer server might generate a document that looks like the following example:

```
<?xml version="1.0" encoding="UTF-8"?>
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:gmd="http://www.isotc211.org/2005/gmd"
  xmlns:gml="http://www.opengis.net/gml"
  xmlns:iso19112="http://www.opengis.net/iso19112"
  elementFormDefault="qualified"
  targetNamespace="http://www.opengis.net/iso19112" version="1.0">
<import namespace="http://www.opengis.net/gml"
  schemaLocation="http://schemas.opengis.net/gml/3.1.1/base/gml.xsd"/>
```



```
<import namespace="http://www.isotc211.org/2005/gmd"
schemaLocation="http://www.seegrid.csiro.au/xsd/iso19139/gml3.1.1version/gmd/gmd.xsd"/>
<element name="SI_LocationInstance" substitutionGroup="gml:_Feature"
type="iso19112:SI_LocationInstanceType"/>
<complexType name="SI_LocationInstanceType">
  <complexContent>
    <extension base="gml:AbstractFeatureType">
      <sequence>
        <element name="geographicIdentifier" type="string"/>
        <element maxOccurs="unbounded" minOccurs="0"
name="alternativeGeographicIdentifier" type="string"/>
        <element minOccurs="0" name="geographicExtent">
          <complexType>
            <sequence minOccurs="0">
              <element ref="gmd:EX_GeographicExtent_PropertyType"/>
            </sequence>
            <attributeGroup ref="gml:AssociationAttributeGroup"/>
          </complexType>
        </element>
        <element minOccurs="0" name="temporalExtent">
          <complexType>
            <sequence minOccurs="0">
              <element ref="gmd:EX_TemporalExtent_PropertyType"/>
            </sequence>
            <attributeGroup ref="gml:AssociationAttributeGroup"/>
          </complexType>
        </element>
        <element minOccurs="0" name="position"
type="gml:PointPropertyType"/>
        <element minOccurs="0" name="gazetteer"
type="iso19112:SI_GazetteerPropertyType"/>
        <element name="locationType"
type="iso19112:SI_LocationTypePropertyType"/>
        <element minOccurs="0" name="parent"
type="iso19112:SI_LocationInstancePropertyType"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>
<complexType name="SI_LocationInstancePropertyType">
  <sequence minOccurs="0">
    <element ref="iso19112:SI_LocationInstance"/>
  </sequence>
  <attributeGroup ref="gml:AssociationAttributeGroup"/>
</complexType>
<complexType name="SI_GazetteerPropertyType">
  <sequence minOccurs="0">
    <element ref="iso19112:SI_Gazetteer"/>
  </sequence>
  <attributeGroup ref="gml:AssociationAttributeGroup"/>
</complexType>
<element name="SI_LocationType" substitutionGroup="gml:_Feature"
type="iso19112:SI_LocationTypeType"/>
<complexType name="SI_LocationTypeType">
```

```

<complexContent>
  <extension base="gml:AbstractFeatureType">
    <sequence>
      <element name="name">
        <complexType>
          <sequence minOccurs="0">
            <element ref="gmd:RS_Identifier_PropertyType"/>
          </sequence>
          <attributeGroup ref="gml:AssociationAttributeGroup"/>
        </complexType>
      </element>
      <element name="identifier" type="string"/>
      <element name="theme" type="string"/>
      <element name="definition" type="string"/>
      <element name="territoryOfUse">
        <complexType>
          <sequence minOccurs="0">
            <element ref="gmd:EX_GeographicExtent_PropertyType"/>
          </sequence>
          <attributeGroup ref="gml:AssociationAttributeGroup"/>
        </complexType>
      </element>
      <element name="owner" type="string"/>
    </sequence>
  </extension>
</complexContent>
</complexType>
<complexType name="SI_LocationTypePropertyType">
  <sequence minOccurs="0">
    <element ref="iso19112:SI_LocationType"/>
  </sequence>
  <attributeGroup ref="gml:AssociationAttributeGroup"/>
</complexType>
</schema>

```

10 GetFeature operation (required)

10.1 Introduction

The GetFeature operation allows retrieval of features from a gazetteer service. A GetFeature request is processed by a WFS-G and when the value of the outputFormat attribute is set to text/gml; subtype=gml/3.1.1, a GML instance document, containing the result set, is returned to the client

This profile makes no changes to this WFS operation.

The GetFeature operation **must** support the following behaviour:

1. get all entries in a gazetteer (empty filter)

2. get all entries in each separate gazetteer (see clause “Supporting Multiple Gazetteers”)
3. get entry by name
4. get entry by id
5. get entries within a bounding box
6. get entries within a polygon geometry
7. Each of the above queries for a specified featureType

10.2 Examples

A client would start to retrieve gazetteer metadata from SI_Gazetteer feature instances:

```
<?xml version="1.0" ?>
<wfs:GetFeature
  version="1.0.0"
  service="WFS-G"
  xmlns="http://www.opengis.net/wfs-g"
  xmlns:iso19112="http://www.opengis.net/iso19112"
  xmlns:wfs="http://www.opengis.net/wfs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.opengis.net/wfs
  ../wfs/1.1.0/WFS.xsd">
  <TypeName>iso19112:SI_LocationInstance</TypeName>
</wfs:GetFeature>
```

The server returns a feature collection with SI_Gazetteer feature instances:

```
<?xml version="1.0" encoding="UTF-8"?>
<wfs:FeatureCollection xmlns:gml="http://www.opengis.net/gml"
  xmlns:wfs="http://www.opengis.net/wfs"
  xmlns:iso19112="http://www.opengis.net/iso19112"
  xmlns:gco="http://www.isotc211.org/2005/gco"
  xmlns:gmd="http://www.isotc211.org/2005/gmd"
  xmlns:xlink="http://www.w3.org/1999/xlink">
  <gml:featureMember>
    <iso19112:SI_Gazetteer gml:id="ID_1">
      <iso19112:identifier>NGA GNS (Germany
subset)</iso19112:identifier>
      <iso19112:scope>A scope description goes here</iso19112:scope>
      <iso19112:territoryOfUse>
        <gmd:EX_GeographicBoundingBox gml:id="ID_BOX_1">
          <gmd:westBoundLongitude>
            <gco:Decimal>
              -180.00
            </gco:Decimal>
          </gmd:westBoundLongitude>
          <gmd:eastBoundLongitude>
            <gco:Decimal>
```

```

        180.00
      </gco:Decimal>
    </gmd:eastBoundLongitude>
    <gmd:southBoundLatitude>
      <gco:Decimal>
        -90.00
      </gco:Decimal>
    </gmd:southBoundLatitude>
    <gmd:northBoundLatitude>
      <gco:Decimal>
        90.00
      </gco:Decimal>
    </gmd:northBoundLatitude>
  </gmd:EX_GeographicBoundingBox>
</iso19112:territoryOfUse>
<iso19112:custodian>
  <gmd:CI_ResponsibleParty gml:id="ID_RP_1">
    <gmd:organisationName>
      <gco:CharacterString>NGA</gco:CharacterString>
    </gmd:organisationName>
    <gmd:role>
      <gmd:CI_RoleCode codeList="http://www.example.com"
codeListValue="owner"/>
    </gmd:role>
  </gmd:CI_ResponsibleParty>
</iso19112:custodian>
<iso19112:coordinatesystem>WGS84</iso19112:coordinatesystem>
<iso19112:featureType>
  <iso19112:locationType gml:id="ID_ADM1">
    <iso19112:name>FIRST-ORDER ADMINISTRATIVE
DIVISION</iso19112:name>
    <iso19112:theme>Administrative Boundary
Features</iso19112:theme>
    <iso19112:identifier>name</iso19112:identifier>
    <iso19112:owner xlink:href="#ID_RP_1"/>
    <iso19112:territoryOfUse xlink:href="#ID_BOX_1"/>
  </iso19112:locationType>
  <iso19112:locationType gml:id="ID_ADM2">
    <iso19112:name>SECOND-ORDER ADMINISTRATIVE
DIVISION</iso19112:name>
    <iso19112:theme>Administrative Boundary
Features</iso19112:theme>
    <iso19112:identifier>name</iso19112:identifier>
    <iso19112:owner xlink:href="#ID_RP_1"/>
    <iso19112:territoryOfUse xlink:href="#ID_BOX_1"/>
  </iso19112:locationType>
  <!-- more iso19112:locationType instances go here -->
  <iso19112:locationType gml:id="ID_PPL">
    <iso19112:name>POPULATED PLACE</iso19112:name>
    <iso19112:theme>Populated Place Features</iso19112:theme>
    <iso19112:identifier>name</iso19112:identifier>
    <iso19112:owner xlink:href="#ID_RP_1"/>
    <iso19112:territoryOfUse xlink:href="#ID_BOX_1"/>
  </iso19112:locationType>
  <!-- more iso19112:locationType instances go here -->

```

```

        </iso19112:featureType>
    </iso19112:SI_Gazetteer>
</gml:featureMember>
</wfs:FeatureCollection>

```

The available location types are advertised in the iso19112:featureType element.

The POPULATED PLACE location type could then be used to fetch all associated SI_LocationInstance feature instances:

```

<?xml version="1.0" encoding="iso-8859-1"?>
<wfs:GetFeature outputFormat="text/xml; subtype=gml/3.1.1"
  xmlns:wfs="http://www.opengis.net/wfs"
  xmlns:ogc="http://www.opengis.net/ogc"
  xmlns:iso19112="http://www.opengis.net/iso19112">
  <wfs:Query typeName="iso19112:SI_LocationInstance">
    <ogc:Filter>
      <ogc:PropertyIsEqualTo>
        <ogc:PropertyName>locationType/name</ogc:PropertyName>
        <ogc:Literal>POPULATED PLACE</ogc:Literal>
      </ogc:PropertyIsEqualTo>
    </ogc:Filter>
  </wfs:Query>
</wfs:GetFeature>

```

The server returns a feature collection with SI_LocationInstance feature instances:

```

<wfs:FeatureCollection
  xmlns:wfs="http://www.opengis.net/wfs"
  xmlns:gml="http://www.opengis.net/gml"
  xmlns:iso19112="http://www.opengis.net/iso19112"
  xmlns:gco="http://www.isotc211.org/2005/gco"
  xmlns:gmd="http://www.isotc211.org/2005/gmd"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.opengis.net/iso19112 ../iso19112.xsd">
  <gml:description>Example Gazetteer Service Response:
SI_LocationInstance Feature Type</gml:description>
  <gml:name>ExampleGazetteerResponse1</gml:name>
  <gml:boundedBy>
    <gml:Envelope srsName="EPSG:4326">
      <gml:lowerCorner>7 50.5</gml:lowerCorner>
      <gml:upperCorner>7.3 51.3</gml:upperCorner>
    </gml:Envelope>
  </gml:boundedBy>
  <gml:featureMember>
    <iso19112:SI_LocationInstance>
      <gml:description>Sample Location Instance from NGA
GNS</gml:description>
      <iso19112:geographicIdentifier>
        Bonn

```

```
</iso19112:geographicIdentifier>
<iso19112:geographicExtent>
  <gmd:EX_GeographicBoundingBox>
    <gmd:westBoundLongitude>
      <gco:Decimal>7.0</gco:Decimal>
    </gmd:westBoundLongitude>
    <gmd:eastBoundLongitude>
      <gco:Decimal>7.2</gco:Decimal>
    </gmd:eastBoundLongitude>
    <gmd:southBoundLatitude>
      <gco:Decimal>50.5</gco:Decimal>
    </gmd:southBoundLatitude>
    <gmd:northBoundLatitude>
      <gco:Decimal>51.2</gco:Decimal>
    </gmd:northBoundLatitude>
  </gmd:EX_GeographicBoundingBox>
</iso19112:geographicExtent>
<iso19112:position>
  <gml:Point srsName="EPSG:4326">
    <gml:pos>7.1 50.7333333</gml:pos>
  </gml:Point>
</iso19112:position>
<iso19112:administrator>
  <gmd:CI_ResponsibleParty>
    <gmd:organisationName>
      <gco:CharacterString>NGA</gco:CharacterString>
    </gmd:organisationName>
    <gmd:role>
      <gmd:CI_RoleCode codeList="http://www.example.com"
codeListValue="owner"/>
    </gmd:role>
  </gmd:CI_ResponsibleParty>
</iso19112:administrator>
<iso19112:locationType gml:id="PPL">
  <iso19112:name>Populated Place</iso19112:name>
  <iso19112:theme>Populated Place Features</iso19112:theme>
  <iso19112:identifier>name</iso19112:identifier>
  <iso19112:definition/>
  <iso19112:owner>
    <gmd:organisationName>
      <gco:CharacterString>NGA</gco:CharacterString>
    </gmd:organisationName>
    <gmd:role>
      <gmd:CI_RoleCode codeList="http://www.example.com"
codeListValue="owner"/>
    </gmd:role>
  </iso19112:owner>
  <iso19112:territoryOfUse>
    <gmd:EX_GeographicBoundingBox>
      <gmd:westBoundLongitude>
        <gco:Decimal>
          -180.00
        </gco:Decimal>
      </gmd:westBoundLongitude>
      <gmd:eastBoundLongitude>
```

```

        <gco:Decimal>
            180.00
        </gco:Decimal>
    </gmd:eastBoundLongitude>
    <gmd:southBoundLatitude>
        <gco:Decimal>
            -90.00
        </gco:Decimal>
    </gmd:southBoundLatitude>
    <gmd:northBoundLatitude>
        <gco:Decimal>
            90.00
        </gco:Decimal>
    </gmd:northBoundLatitude>
    </gmd:EX_GeographicBoundingBox>
</iso19112:territoryOfUse>
</iso19112:locationType>
</iso19112:SI_LocationInstance>
</gml:featureMember>
    <!-- more GazetteerMember elements ... -->
</wfs:FeatureCollection>

```

Example 2

This example fetches a subset of properties of the feature type SI_LocationInstance. The feature instances that are retrieved by the request are identified by a substring of the place-name property “geographicIdentifier”.

```

<?xml version="1.0" encoding="iso-8859-1"?>
<wfs:GetFeature outputFormat="text/xml; subtype=gml/3.1.1"
  xmlns:wfs="http://www.opengis.net/wfs"
  xmlns:ogc="http://www.opengis.net/ogc"
  xmlns:iso19112="http://www.opengis.net/iso19112">
  <wfs:Query typeName="iso19112:SI_LocationInstance">
    <ogc:PropertyName>geographicIdentifier</ogc:PropertyName>
    <ogc:PropertyName>locationType/name</ogc:PropertyName>
    <ogc:Filter>
      <ogc:PropertyIsLike wildCard="%" singleChar="#" escapeChar="!">
        <ogc:PropertyName>geographicIdentifier</ogc:PropertyName>
        <ogc:Literal>Bonn%</ogc:Literal>
      </ogc:PropertyIsLike>
    </ogc:Filter>
  </wfs:Query>
</wfs:GetFeature>

```

Example 3

This example fetches a subset of properties of the feature type Address which is derived by extension from iso:19112:SI_LocationInstance. The feature instances that are retrieved by the request are identified by a substring of the place-name property

“geographicIdentifier” and the name of the parent feature – which in this case is a postal code.

```
<?xml version="1.0" encoding="iso-8859-1"?>
<wfs:GetFeature outputFormat="text/xml; subtype=gml/3.1.1"
  xmlns:wfs="http://www.opengis.net/wfs"
  xmlns:ogc="http://www.opengis.net/ogc"
  xmlns:myns="http://www.example.com/myns"
  xmlns:iso19112="http://www.opengis.net/iso19112">
  <wfs:Query typeName="myns:Address">
    <ogc:PropertyName>geographicIdentifier</ogc:PropertyName>
    <ogc:PropertyName>locationType/name</ogc:PropertyName>
    <ogc:Filter>
      <ogc:And>
        <ogc:PropertyIsLike wildCard="%" singleChar="#" escapeChar="!">
          <ogc:PropertyName>geographicIdentifier</ogc:PropertyName>
          <ogc:Literal>Bahnhof%</ogc:Literal>
        </ogc:PropertyIsLike>
        <ogc:PropertyIsEqualTo>
          <ogc:PropertyName>parent/geographicIdentifier</ogc:PropertyName>
          <ogc:Literal>53123</ogc:Literal>
        </ogc:PropertyIsEqualTo>
      </ogc:And>
    </ogc:Filter>
  </wfs:Query>
</wfs:GetFeature>
```

Annex A: Abstract test suite

(normative)

A.1 Test module for general capabilities

A.1.1 General capabilities

8. Test purpose: Confirm that the Gazetteer Service satisfies conformance requirements that generally apply to all service interactions.
9. Test method: Falsification testing of HTTP response.
10. Reference: OGC 05-025r1
11. Test type: Capability

A.1.2 Required capabilities

1. Test purpose: Confirm that the Gazetteer Service satisfies profile specific requirements in terms of supported operations.
2. Test method: Inspection of GetCapabilities response: verify that mandatory operations are support for all required invocation (DCP) methods.
3. Reference: Clause 7.2
4. Test type: Capability

A.2 Test module for Accessible Content conformance

A.2.1 Gazetteer Service advertised

Test case identifier:

urn:x-ogc:specification:wfs-g:atc:content: AdvertiseSIGazetteerSchema

Test purpose: Confirm that the service satisfies conformance requirement that a gazetteer service is available.

Test method: Check SI_Gazetteer Feature Type is advertised in the GetCapabilities response.

Reference: Clause 8.3.1

Test type: Capability

A.2.2 SI_Gazetteer Feature Type response conformance

Test case identifier:

urn:x-ogc:specification:wfs-g:atc:content:ValidateSIGazetteerSchema

Test purpose(s): Confirm that GetFeatures response is well structured for type SI_Gazetteer

Test method: Invoke GetFeature operation to return all records of type SI_Gazetteer. Check response validates against published schema.

Reference: Clause 8.3.1, Annex B.

Test type: Basic

A.2.2 Gazetteers refer to available feature types

Test case identifier:

urn:x-ogc:specification:wfs-g:atc:content:GazetteerLocationTypesAvailable

Test purpose(s): Confirm that the feature types advertised in available gazetteers are provided.

Test method: Invoke GetFeature operation to return all records of type SI_Gazetteer. Check that each of the feature types referenced in the *SI_Gazetteer/featureType* property of the result set are advertised in the capabilities document

Reference: Clause 8.3.1,

Test type: Basic

A.2.2 SI_LocationInstance conformance

Test case identifier:

urn:x-ogc:specification:wfs-g:atc:content:SILocationTypesConformant

Test purpose(s): Confirm that the gazetteer will correctly respond to requests based on the SI_LocationInstance featureType

Test method: Invoke GetFeatures on SI_LocationInstance feature type and validate response against SI_LocationInstanceType schema. Invoke GetFeatures using queries that specify name and location and check that a valid subset is returned for these queries.

Reference: Clause 10.1

Test type: Basic

A.2.2 SI_LocationInstance extensions conformance

Test case identifier:

urn:x-ogc:specification:wfs-g:atc:content:GazetteerLocationTypesConformant

Test purpose(s): Confirm that the feature types advertised in available gazetteers are specified as conformant extensions of SI_LocationInstance

Test method: Invoke DescribeFeatureType operation to for all featureTypes referenced in SI_Gazetteer records. Check that each of the feature types is derived from SI_LocationInstanceType or is declared as substitutable for the SI_LocationInstance element.

Reference: Clause 9

Test type: Basic

Annex B: XML schemas

(normative)

XML schemas are attached to this draft specification in a zip file.

In addition to this document, this specification includes several normative XML Schema files. These are to be posted online at the URL <http://schemas.opengeospatial.net/gazetteer> where a lower level directory is used for this Version (1.0.0). These XML Schema files are also bundled in a zip file with the present document. In the event of a discrepancy between the bundled and online versions of the XML Schema files, the online files shall be considered authoritative.

All these XML Schemas contain documentation of the meaning of each element and attribute, and this documentation shall be considered normative as specified in Subclause 11.6.3 of [OGC 05-008].

Annex C: Use Cases

(informative)

D.1 Navigation Use Case

In this use case, a viewer client application wishes to give the user the ability to navigate through a spatially organised information service using place names. This can be done by either allowing structured searches or by browsing a hierarchy of gazetteer terms to narrow down search requirements. The browse tree view of such a hierarchy is the general portrayal case, and gazetteer service searches return sub-trees of varying complexity.

Although this provides a framework for rich functionality, a simple Gazetteer Service can return an unstructured list that is either the child nodes of a query term, or possibly a complete list of nodes generated by walking the tree. In the most trivial case, the tree depth is one and there is no hierarchy.

The user can then select a geographic feature of interest for a variety of actions, for example:

- a) Zoom a map or otherwise run a query relating to the feature;
- b) Refine navigation choices with a new list of features within the feature specified; and

- c) Focus a locator map on a new scale, to show position of bottom most (target) term.

The interface would either build such a tree through recursive calls to the Gazetteer Service, or be able to extract a fully formed tree from a single call.

D.2 “Geocoding” Use Case

This Use Case pertains to a Geocoder Service that invokes a Gazetteer Service to extract a particular set of geometries that pertain to a given set of identifiers, which are derived from arbitrary resources.

The use of a network-accessible Gazetteer Service by a Geocoder Service may have the following advantages:

- The target vocabulary might be huge
- The target vocabulary may be highly specialized
- The target vocabulary may be partitioned across multiple nodes (e.g. use Australian Gazetteer Service to get Australian place names)
- The geometry of the Gazetteer Service may be inconvenient for the Geocoder Service to manage internally (e.g. size, multiple equivalents, on-the-fly generalization and re-projection required)

Other uses may include:

- Acquisition of a vocabulary for re-use (i.e. a generic Geoparser Service is pointed at documents containing names of water features in Uzbekistan – it might load the relevant Gazetteer Service out-of-band and cache it for some period). In this case consideration should be given to a “Gazetteer Content Standard” such as the Alexandria Digital Library Gazetteer Content Standard.
- A set of terms may be sent as a batch and a single response retrieved for improved efficiency. (Note this may simply replace the need for a Geocoder Service to remember common terms – although its own encoding of the geocoded output should re-use features.)

D.3 Service Invocation Use Case

A client or agent application performing service chaining may wish to exploit a Gazetteer Service to broaden particular search queries at run-time. For example, if the application is looking for information relevant to a particular suburb, it may wish to invoke a Gazetteer Service to find the city that contains the suburb in order to invoke a service organized by city names.

Consider the case of a tool to help locate relevant information – given a term, it might search for all synonyms of the term, thus making the term broader until a suitable result

set is found. In this way, today's rather primitive Web search collections could possibly be exploited to harvest related content.

D.4 Geographic Selection Use Case

A simple use of such an interface is to access a feature collection that acts as a non-hierarchical collection of named features. A request by a client or agent may be to return all named features of a given feature type or types that fall within a specific bounding geometry. This essentially general WFS request would return features that may not have the associations present in other use cases, and are therefore all “root” nodes. This interface would be easiest to realize against spatial data sets that have no explicit relationships among features, allowing the client to use and build filters to select different sets of features.

There may be no a-priori knowledge of a desired Gazetteer Service. This knowledge may be derived at run time according to other metadata from the source feature or document. Accordingly, the client should not need to store all possible instances of Gazetteer Services, but rather needs to be able to discover them at run time, as needed.

Annex D: Bibliography

- [1] ISO 31 (all parts), Quantities and units.
- [2] IEC 60027 (all parts), Letter symbols to be used in electrical technology.
- [3] ISO 1000, SI units and recommendations for the use of their multiples and of certain other units.
- [4] Guidelines for Successful OGC Interface Specifications, OGC document 00-014r1