

Representing OGC Geospatial Web Services in OWL-S Web Service Ontologies

Kristin Stock,^{*1,2} Anne Robertson³ and Mark Small³

¹Centre for Geospatial Science, University of Nottingham,
Nottingham NG7 2RD, United Kingdom kristin.stock@nottingham.ac.uk

²Allworlds Geothinking, Nottingham, United Kingdom

³EDINA, Causewayside House, 160 Causewayside, Edinburgh EH9 1PR, United Kingdom a.m.robertson@ed.ac.uk; mark.small@ed.ac.uk

Abstract

OWL-S is an ontology for describing web services in a way that includes the semantics (meaning) of the web service, including the semantics of its behaviour and the semantics of the static information objects with which it interacts. OWL-S has not been widely used to describe geospatial web services, most of which conform to specifications of the Open Geospatial Consortium (OGC).

This paper describes an approach to the description of OGC web services using OWL-S that takes advantage of the generic OGC specifications to reduce the amount of work involved in creating web service ontologies for OGC web services, and that uses the GetCapabilities document that is provided for all OGC web services.

The approach defines an OWL-S OGC web service ontology that describes the OGC web service specifications (specifically in this case Web Map Service and Web Feature Service), and then shows how a web service ontology may be created by creating instances of the OWL-S OGC ontology and the contents of the GetCapabilities document, thereby reducing the effort involved in creating web service ontologies for OGC web services.

Keywords: web services, ontologies, geospatial, OGC

* Corresponding Author

1 INTRODUCTION

Geospatial web services around the world almost universally conform to standards developed by the Open Geospatial Consortium (OGC¹), a consortium that works towards interoperability for geographic information. These standards define a range of web services with different purposes and functionality, but largely focus on the syntactic aspects of the web services to ensure that it is possible for distributed systems to access and integrate multiple web services from different providers. Little work has been done to comprehensively address the semantic aspects of OGC web services. However, the OGC web services standards each define a document called GetCapabilities that describes the invocation details and functionality of OGC web services with limited semantic information.

Work has also been undertaken in the general information systems community towards developing methods to describe the semantics of web services in ways that allow automated discovery, execution and orchestration of such web services. This work takes the form of web service ontologies: representations that describe what a web service does using a formal specification that can be understood by machines and reasoned about.

This paper proposes a method for the representation of OGC-compliant geospatial web services using OWL-S web service ontologies. This method can be used to automatically populate a web service ontology from the OGC GetCapabilities document, optionally manually augment the web service ontology content with additional semantic information, and use the web service ontology for semantic discovery, execution and workflow chaining of OGC web services.

The structure of the paper is as follows: Section 2 describes a case study that is used to illustrate the work; Section 3 provides background information about semantic descriptions of geospatial web services and their use; Section 4 describes the role and content of the OGC GetCapabilities document; Section 5 presents a summary of the OWL-S web service ontology; Section 6 describes the way in which an OGC GetCapabilities document may be represented in an OWL-S ontology; Section 7 explains how this OWL-S representation may be used by automated systems; Section 8 summarises a demonstration implementation of the approach and Section 9 evaluates and discusses the implications and outcomes of the work.

This paper will provide the reader with an understanding of the semantic issues associated with geospatial web services, as well as showing how OGC web services may be semantically enabled within the bounds of the existing

¹ <http://www.opengeospatial.org/>

specifications and how the functionality provided by web service ontologies may be employed to assist in the automated use of geospatial web services. The work described in this paper was completed as part of the COMPASS² project, a project to develop a geospatial knowledge infrastructure. A number of other papers describe the other aspects of this project, and the interested reader is referred to Stock et al (2009).

2 CASE STUDY

A case study was undertaken to test and evaluate this work. A number of OGC web services were created in the marine science domain with the aim of supporting marine scientists. The goal was to allow scientists to discover these resources and then immediately execute OGC web services without having to take any extra steps, and the approach described in this paper was intended to achieve this end.

The case study particularly focussed around the use of marine instruments, but most of the web services that were created addressed generic aspects of the marine and coastal environment, as these are useful to scientists who study marine instruments, as well as more specific information about the instruments themselves. The generic web services addressed topics including elevation, bathymetry, climate, weather, tides, marine structures and obstructions, conservation and environmental protection. Two geographic areas were covered in the case study: the Severn Estuary near Bristol, UK and the Firth of Forth in Scotland, UK.

For illustrative purposes in this paper, two web services in particular are used:

- a Web Map Service showing bathymetry and elevation in the Firth of Forth and
- a Web Feature Service providing data on climate and oceanography in the Severn Estuary.

The appendices to this paper include the web service ontologies for these two web services.

3 BACKGROUND

3.1 The Benefits of Semantically-Enabled Geospatial Web Services

OGC web services provide a number of functions, some of which are more clearly defined than others. For example, the Web Map Service (de la Beaujardiere, 2006) provides a map or basic feature information in response to a request; a Web Feature Service (Vretanos, 2005) may provide feature

² <http://compass.edina.ac.uk/>

information, or may alternatively allow feature information to be added, edited or deleted; a Web Processing Service (Schut and Whiteside, 2005) may perform almost any geospatial process, with only some core parameters for the request and response defined. In all of these cases, to varying degrees, it is not possible to determine the exact semantics (meaning) of the web service's function or the data it uses from the existing standards, and it is not possible to use the information that is available to automate the process of web service discovery, execution and orchestration.

The most clearly defined of these three examples (Web Map Service) returns a map in response to a request. In this case, the main semantically-undefined component is the data content. Layers are selected by name, but little more is known about the data from a semantic point of view. This means that it is difficult to determine whether two web services provide data that is semantically similar or not. At the other end of the spectrum, very little can be determined from a Web Processing Service using its current representation about what kind of process it performs. Thus one of the most important benefits of semantically-enabled geospatial web services is that they are more meaningfully described so that users (human and machine) are more able to determine whether they provide the function that is required.

Furthermore, the representation of such a description of web service semantics using ontologies provides benefits in terms of automation. Web service ontologies were designed with the intention of describing the most important characteristics of a web service to allow automated discovery, execution and chaining. The formal ontology specification allows such automation to be performed, and in particular, allows inference to be used to perform more intelligent automation of the orchestration process (Gone and Schade, 2008). Thus the use of ontologies augments the functionality that would be available if other descriptive mechanisms were used and permits a wider range of automation.

3.2 Previous Work

A number of efforts have demonstrated and tested the description of geospatial web services with web service ontologies, including SWING (Roman et al 2007), eMerges (Tanasescu et al 2007) and Lutz (2007). However, in these cases, while web services conforming to the OGC standards are described with web service ontologies, the existing GetCapabilities content from the OGC standards is not used. Descriptions are created manually from knowledge of the data set inputs and outputs and axioms may be used to describe pre and postconditions.

Other relevant work that has sought to work together with the existing specifications has examined how OGC web services may be semantically

annotated, and has addressed the role of the GetCapabilities document of the OGC standards. This work proposes methods for adding links in the OGC GetCapabilities document to ontology descriptions, either by including a link from data object descriptions in GetCapabilities to the semantically equivalent concept in a domain ontology, or by linking functionality described in GetCapabilities to the semantically equivalent process in an ontology of web service processes (Maue 2008).

Thus previous work describes OGC web services using web services ontologies alongside the GetCapabilities document, or supplements the GetCapabilities document with links to ontologies. This paper proposes another solution: to store and augment the GetCapabilities content in a web services ontology and use it to assist with the tasks of discovery, execution and orchestration.

Approaching the issue from the other direction, the purpose of web service ontologies is to support dynamic discovery, execution and orchestration of web services. Other work has demonstrated the storage of information about OGC web service specifications and actual web service implementations to support dynamic discovery and execution using feature type catalogues rather than web service ontologies (Stock et al, forthcoming).

4 GETCAPABILITIES

The GetCapabilities document is a central feature of OGC web service specifications. It is mandatory and provides metadata about a web service that implements an OGC specification. A user (human or machine) may execute the GetCapabilities operation on a web service and expect to receive in response a GetCapabilities document that describes the abilities, formats and data offered by the web service. This is intended to allow users to formulate a request after reviewing the GetCapabilities document, and facilitates automated discovery and execution of web services (Whiteside, 2007). The work described in this paper is not concerned with the format of the GetCapabilities request, but only the GetCapabilities document that is the response.

The GetCapabilities document has a set of core components that are included in GetCapabilities documents for all OGC web services, and then each OGC web service specification may nominate additional components that are specific to its own functionality. This paper addresses the core components and the components that are specific to the OGC Web Map Service (WMS) (de la Beaujardiere, 2006) and Web Feature Service (WFS) (Vretanos, 2005). These are described in the following Sections.

4.1 Core Components

The core components of the GetCapabilities document (which apply to all OGC web services) include basic parameters followed by a number of sections with more specific purposes. Beyond this, particular web service specifications may include additional sections. Table 1 shows the core components of the GetCapabilities document for a given web service, documented in the OGC Web Services Common Specification (Whiteside, 2007).

Table 1: Core GetCapabilities Components

Name	Definition	Data Type	Multiplicity ³
version	The version of the specification for the GetCapabilities operation.	Character String.	1
updateSequence	The version of the service metadata document.	Character String.	0..1
ServiceIdentification Section: Information identifying the specific web service.			
serviceType	The type of OGC web service (the specification, for example WMS).	Character String.	1
serviceTypeVersion	The version of the web service specification supported (may be several) by the service.	Character String.	1..*
profile	The application profile supported by the service.	Character String.	0..*
title	The title of the web service, for human consumption.	Character String.	1..*
abstract	A brief narrative description of the web service, for human consumption.	Character String.	0..*
keywords	Unordered list of keywords or phrases.	MD_Keywords (ISO 19115)	0..*
fees	The fees and terms for using the web service.	Character String.	0..1
accessConstraints	Any access constraints that apply on the data from the web service.	Character String.	0..*
ServiceProvider Section: Information about the organisation providing the web service.			
providerName	The name of the organisation providing the web service.	Character String.	1
providerSite	The web site of the service provider.	CI_OnlineResource (ISO 19115)	0..1
serviceContact	Contact name, address and other relevant details.	CI_ResponsibleParty (ISO 19115)	0..1
OperationsMetadata Section: Information about the operations implemented by the service. For each operation (1..*).			
name	The name of the operation.	Character String.	1
DCP	Information for a Distributed Computing Platform supported for this operation.	DCP data structure, consisting of HTTP connect point URLs and get and post URLs and domain constraints (OGC Web Services Common)	1..*
parameter	Details of domains of a parameter for the operation.	DomainType (OGC Web Services Common)	0..*

³ The specifications express multiplicity and optionality separately, but in this table, the two are combined.

constraint	Constraints on a quantity used by this operation that is not a parameter.	DomainType (OGC Web Services Common)	0..*
------------	---	--	------

4.2 Web Feature Service

The OGC Web Feature Service specification (Vretanos, 2005) augments the core components in Section 4.1 with additional components that are specific to the Web Feature Service. Table 2 describes these components.

The Web Feature Service specification also defines valid values for constraints and parameters in the core OperationMetadata Section.

Appendix A contains the GetCapabilities document for the case study severn_co_wfs web service.

Table 2: Additional Web Feature Service Components

Name	Definition	Data Type	Multiplicity ⁴
FeatureType Section: The feature types (and operations on each feature type) that are available for the service. For each feature type (0..*)			
Name	The name of the feature type with namespace.	Qname	1
Title	The human readable title of the feature type (e.g. for menus).	Character String	1
Abstract	An abstract describing the feature type.	Character String	0..1
Keywords	Keywords describing the feature type.	ows:Keywords	0..*
DefaultSRS	The default spatial reference system to be used if an SRS is not specified in the request.	anyURI	0..1
OtherSRS	Other supported spatial reference systems that can be requested.	anyURI	0..*
NoSRS	A label indicating that the feature type has no spatial properties.	CharacterString	0..1
Operations	The set of operations that are supported for the feature type.	OperationsType (enumerated list)	0..*
OutputFormats	The MIME types indicating output formats that may be generated for a feature type.	Character String	0..*
WGS84BoundingBox	The edges of a rectangle or set of rectangles that enclose the data in the feature type.	Ows:WGS84BoundingBox	1..*
MetadataURL	Links to metadata describing the data in the feature type.	MetadataURLType (includes type (e.g. ISO 19115) and format.	0..*

⁴ The specifications express multiplicity and optionality separately, but in this table, the two are combined.

ServesGMLObjectType Section: If the service supports the GetGMLObject operation, the GML object types that are not derived from gml:AbstractFeatureType and that are available from the service, defined in a base GML schema or an application schema. For each object type (0..*)			
Name	The name of the GML object type with namespace.	Qname	1
Title	The human readable title of the GML object type (e.g. for menus).	Character String	1
Abstract	An abstract describing the GML object type.	Character String	0..1
Keywords	Keywords describing the GML object type.	ows:Keywords	0..*
OutputFormats	The MIME types indicating output formats that may be generated for a GML object type.	Character String	0..*
SupportsGMLObjectType Section: The GML object types that the service is capable of serving if it was deployed to serve data from a GML application schema. For each object type (0..*)			
Name	The name of the GML object type with namespace.	Qname	1
Title	The human readable title of the GML object type (e.g. for menus).	Character String	1
Abstract	An abstract describing the GML object type.	Character String	0..1
Keywords	Keywords describing the GML object type.	ows:Keywords	0..*
OutputFormats	The MIME types indicating output formats that may be generated for a GML object type.	Character String	0..*
Filter_Capabilities Section: The parts of the filter encoding specification that are supported by the web service (0..1)			
Spatial_Capabilities	The types of geometry and geometry operations supported by the web service.	Spatial_CapabilitiesType, including Geometry Operands and Spatial Operators (both enumerated lists).	1
Scalar_Capabilities	The types of operations that are supported by the web service relating to comparisons and arithmetic.	Scalar_CapabilitiesType, including Logical Operators, Comparison Operators and Arithmetic Operators and Functions (enumerated lists)	1
Id_Capabilities	The types of identification that are supported by the web service (GMLObjectId and FeatureID).	Id_CapabilitiesType (enumerated list)	1

4.3 Web Map Service

The OGC Web Map Service specification (de la Beaujardiere, 2006) deviates slightly from the format specified for Core elements that was described in Section 4.1. However, much of the content is similar, if named slightly differently. Table 3 identifies the core components in the Web Map Service Specification and maps them to core elements from the OGC Web Services Common Specification, in

the interests of creating a single format for OGC GetCapabilities content that can then be mapped to OWL-S. Table 4 shows the additional elements that do not correspond to the core OWS elements.

Appendix B contains the GetCapabilities document for the case study forth_be web map service.

Table 3: Core WMS Components Mapped to OWS

WMS GetCapabilities	OWS Equivalent
Service Section:	
Title	ServiceIdentification.title
Abstract	ServiceIdentification.abstract
KeywordList	ServiceIdentification.keywords
OnlineResource	ServiceProvider.providerSite
ContactInformation	ServiceProvider.serviceContact, ServiceProvider.providerName
Fees	ServiceIdentification.fees
AccessConstraints	ServiceIdentification.accessConstraints
Capabilities Section:	
Request	OperationsMetadata.name, OperationsMetadata.DCP

Table 4: Additional Web Map Service Components

Name	Definition	Data Type	Multiplicity ⁵
Service Section:			
LayerLimit	The maximum number of layers a client may request in a single request to the web service.	Positive Integer	0..1
MaxWidth	The maximum width of the requested map in a request to the web service.	Positive Integer	0..1
MaxHeight	The maximum height of the requested map in a request to the web service.	Positive Integer	0..1
Capabilities Section:			
Exception	The error-reporting formats supported by the web service.	Character String	1..*
Layer Section (within Capabilities Section): For each layer (0..*):			
Name	The name of the layer.	Character String	0..1
Title	The human-readable title of the layer (for menus etc).	Character String	1
Abstract	A description of the layer.	Character String	0..1
KeywordList	A set of keywords describing the layer.	List of Keywords, each Character String	0..1
CRS	An identifier for the coordinate system used by the layer.	Character String	0..*

⁵ The specifications express multiplicity and optionality separately, but in this table, the two are combined.

EX_GeographicBoundingBox	The limits of the layer in latitude and longitude.	wms:longitudeType and latitudeType	0..1
BoundingBox	The limits of the layer in coordinates in a specified map reference system.	x, y, resolution and CRS.	0..*
Dimension	Details of coordinate systems used for temporal, vertical and other dimensions.	Dimension elements listing name, units and other relevant values.	0..*
Attribution	Details of the provider of the layer.	Title, OnlineResource and Logo for the provider.	0..1
AuthorityURL	The URL of an authority used to define elements in the layer (for example, concepts from the Global Change Master Directory).	OnlineResource and name.	0..*
Identifier	The identifier or identifiers defined by a particular authority.	Character String and authority name (references AuthorityURL).	0..*
MetadataURL	A URL referencing more detailed metadata about the layer.	OnlineResource, type (e.g. ISO 19115) and format	0..*
DataURL	The URL of the source data used to create a layer.	OnlineResource and format.	0..*
FeatureListURL	The URL of a list of the features included in a layer.	OnlineResource and format.	0..*
Style	Details of presentation styles available for use with the layer.	The name, title, abstract, legendURL, styleSheetURL and styleURL.	0..*
MinScaleDenominator	The minimum scale denominator for which it is appropriate to display the layer.	Double	0..1
MaxScaleDenominator	The maximum scale denominator for which it is appropriate to display the layer.	Double	0..1
Layer	Layers may be nested within each other to signify classification and grouping of layers.	Layer data type.	0..*
queryable	A flag indicating whether the layer supports the GetFeatureInfo operation.	Boolean	0..1
cascaded	A number indicating how many levels of retransmission have occurred, meaning that the layer obtains some or all of its content from another server.	Integer	0..1
opaque	A flag indicating whether the layer has significant non-data areas that may	Boolean	0..1

	be displayed transparently.		
noSubsets	A flag indicating whether the web service can provide only part of the full bounding box.	Boolean	0..1
fixedWidth	A flag indicating whether the maps can be resized.	Boolean	0..1
fixedHeight	A flag indicating whether the maps can be resized.	Boolean	0..1

5 OWL-S WEB SERVICE ONTOLOGY

OWL-S⁶ is an ontology for the representation of web services that is built using the Web Ontology Language (OWL). OWL⁷ is the dominant method for describing description logic ontologies of all kinds (including for domain concepts, as well as web services), and OWL-S is designed to support web service discovery, invocation, composition and interoperation.

OWL-S has a basic model in which a Service is described using three sub-ontologies:

- A profile, which describes what the service provides to prospective clients (connected to the service via the *presents* property), and is particularly useful for discovery. This includes a description of what is accomplished by the service, limitations on service applicability and quality of service and requirements that the service requester must satisfy to use the service successfully. A service can have any number of profiles.
- A process model, which describes how the service is used (connected to the service via the *describedBy* property) and is used to assist with composition and interoperation. This includes the semantic content of the requests, the conditions under which particular outcomes will occur, and where necessary, the step by step processes leading to those outcomes. A service can be described by no more than one process model.
- A grounding, which describes how a client can interact with the service (connected to the service via the *supports* property) and is used to assist with invocation of the service. This includes a communication protocol, message formats, port numbers and other service specific details of invocation. A service can have a number of groundings.

A major competitor to OWL-S for the description of web service semantics is the Web Service Modelling Ontology (WSMO). This is built using the Web Services Modelling Language (WSML⁸), a language created for the purpose by combining description logics, first order logic and logic programming.

⁶ <http://www.w3.org/Submission/OWL-S/>

⁷ <http://www.w3.org/TR/owl-ref/>

⁸ <http://www.w3.org/Submission/WSML/>

While both ontologies represent similar aspects of web services (process model, grounding and descriptive information), they vary in certain ways (Lara et al 2005). OWL-S was selected for this work, mainly because it is more mature than WSMO, particularly in the area of grounding, which is an important part of the OGC GetCapabilities specification, because it is well supported by tools and because it uses a language that was already being used in the project. However, a mapping between WSMO and OWL-S has been defined (de Bruijn and Lausen 2005), and it is expected that it would not be difficult to apply the work in this paper to WSMO.

6 REPRESENTING AN OGC WEB SERVICE IN OWL-S

OGC web services conform to OGC specifications, and thus much of the information stored in OWL-S is identical for all services that conform to a particular specification. Therefore in this work, a generic OWL-S OGC web service ontology was created to store the definitions of the specifications themselves, including the operations, inputs, outputs, preconditions and effects. Appendix C contains the owl file for this ontology. For this work, only Web Feature Service (WFS) and Web Map Service (WMS) were included, and these have semantically fixed operations and parameters (that is, the meaning of the behaviour is the same for all implementations). Thus the only variations for implementations of WFS and WMS are in which operations are supported and in possible parameter values. However, other more generic web service specifications (for example, Web Processing Service (Schut and Whiteside 2005)) allow much more variation in the behaviour of the web service, in which case the generic descriptions in the OWL-S OGC web service ontology would be more limited.

In all cases, a web service ontology is then created for each actual web service implementation. This creates instances of the OWL-S OGC web service ontology to describe the details of the web service, including all of the content of the GetCapabilities document. In the case of more flexible web service specifications like Web Processing Service (Schut and Whiteside 2005), additional semantics would also be required to describe the behaviour of the web service that could not be encapsulated in the generic OWL-S OGC web service ontology.

Specifically, the OWL-S OGC ontology developed in this work (Appendix C) includes classes to describe:

- specialised service types for WFS and WMS;
- the processes that a WFS and WMS may offer and the inputs and outputs that are allowed for each process;

- the bindings between specific operations and their connect points (the URL that may invoke them), and connections between the operations and the processes that they implement.

The web service ontology for each web service implementation specifies the operations that are supported (of the full set included in the OWL-S OGC ontology) and their bindings and describes the feature types and layers in the case of WFS and WMS respectively. Table 5 shows the mappings between the elements of the GetCapabilities document and the different parts of the WFS and WMS GetCapabilities documents, and Appendices D and E contain the web service ontologies for the two case study web services: severn_co_wfs and forth_be respectively.

Table 5: Mappings from GetCapabilities to OWL-S

GetCapabilities Component	Core		OWL-S
	WFS	WMS	
version			Service.sourceDocVersion
updateSequence			Service.sourceDocVersion
serviceType			Service.serviceType
serviceTypeVersion			Service.serviceTypeVersion
profile			Not required as there are no commonly used profiles for WFS and WMS.
title		Title	Profile.servicename
abstract		Abstract	Profile.textDescription
keywords		KeywordList	Profile.hasTopic
fees		Fees	Profile.fees
accessConstraints		AccessConstraints	Profile.accessConstraints
providerName		ContactInformation	ActorDefault:Actor (instance name)
providerSite		OnlineResource	ActorDefault:Actor.webURL
serviceContact.IndividualName		ContactInformation	ActorDefault:Actor.name
serviceContact.PositionName			ActorDefault:Actor.title
serviceContact.ContactInfo.Phone.Voice			ActorDefault:Actor.phone
serviceContact.ContactInfo.Phone.Facsimile			ActorDefault:Actor.fax
serviceContact.ContactInfo.Address (excluding email)			ActorDefault:Actor.physicaladdresses
serviceContact.ContactInfo.ElectronicMailAddress			ActorDefault:Actor.email
serviceContact.Role			ServiceProvider.role
serviceContact.ContactInfo.HoursOfService			ServiceProvider.hoursOfService
serviceContact.ContactInfo.ContactInstructions			ServiceProvider.contactInformation
Name ⁹		Request	OgcHttpOperation.name
DCP ⁹		Request	OgcHttpConnectPoints
Parameter ⁹			OgcHttpParameter
Constraint ⁹			OgcHttpConstraints

⁹ For each operation.

	Name ¹⁰		HasFeatureTypeComponent.Name
	Title ⁶		HasFeatureTypeComponent.Title
	Abstract ⁶		HasFeatureTypeComponent.Abstract
	Keywords ⁶		FeatureType.hasTopic
	DefaultSRS ⁶		HasFeatureTypeComponent.DefaultSRS
	OtherSRS ⁶		HasFeatureTypeComponent.OtherSRS
	NoSRS ⁶		Not included, indicated by absence of DefaultSRS and OtherSRS.
	Operations ⁶		HasFeatureTypeComponent.FeatureTypeOperations
	OutputFormats ⁶		HasFeatureTypeComponent.Format
	WGS84BoundingBox ⁶		HasFeatureTypeComponent.owlcs.w.BoundingBox
	MetadataURL ⁶		HasFeatureTypeComponent.MetadataResource
	Name ¹¹		HasFeatureTypeComponent.Name
	Title ⁷		HasFeatureTypeComponent.Title
	Abstract ⁷		HasFeatureTypeComponent.Abstract
	Keywords ⁷		FeatureType.hasTopic
	OutputFormats ⁷		HasFeatureTypeComponent.Format
	Name ¹²		HasFeatureTypeComponent.Name
	Title ⁸		HasFeatureTypeComponent.Title
	Abstract ⁸		HasFeatureTypeComponent.Aabstract
	Keywords ⁸		FeatureType.hasTopic
	OutputFormats ⁸		HasFeatureTypeComponent.Format
	Spatial_Capabilities		SpatialCapabilities
	Scalar_Capabilities		ScalarCapabilities
	Id_Capabilities		IdCapabilities
		LayerLimit	WMSOperationProfile.layerLimit
		MaxWidth	WMSOperationProfile.maxMapWidth
		MaxHeight	WMSOperationProfile.maxMapHeight
		Exception	WMSOperationProfile.exceptionFormat
		Name ¹³	hasLayerComponent.Name
		Title ⁹	hasLayerComponent.Title
		Abstract ⁹	hasLayerComponent.Abstract

¹⁰ For each feature type.

¹¹ For each served GML object type.

¹² For each supported GML object type.

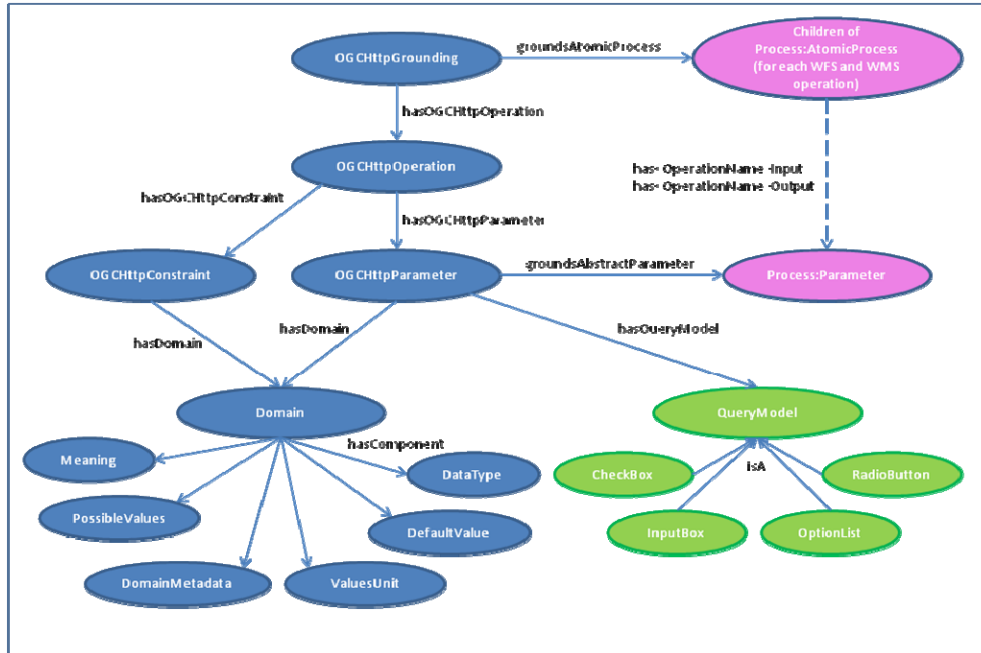
¹³ For each layer.

	KeywordList ⁹	Layer.hasTopic
	CRS ⁹	hasLayerComponent.SRS
	EX_GeographicBoundingBox ⁹	hasLayerComponent.owl-csw:BoundingBox
	BoundingBox ⁹	hasLayerComponent.owl-csw:BoundingBox
	Dimension ⁹	hasLayerComponent.Dimension
	Attribution ⁹	hasLayerComponent.Attribution
	AuthorityURL ⁹	hasLayerComponent.URI (with URI.purpose = Authority)
	Identifier ⁹	hasLayerComponent.Identifier
	MetadataURL ⁹	hasLayerComponent.MetadataResource
	DataURL ⁹	hasLayerComponent.URI (with URI.purpose = Data)
	FeatureListURL ⁹	hasLayerComponent.URI (with URI.purpose = FeatureList)
	Style ⁹	hasLayerComponent.Style
	MinScaleDenominator ⁹	hasLayerComponent.MinimumScaleDenominator
	MaxScaleDenominator ⁹	hasLayerComponent.MaximumScaleDenominator
	Layer ⁹	hasLayerComponent.Layer
	queryable ⁹	hasLayerComponent.Queryable
	cascaded ⁹	hasLayerComponent.Cascaded
	opaque ⁹	hasLayerComponent.Opaque
	noSubsets ⁹	hasLayerComponent.NotSubsettable
	fixedWidth ⁹	hasLayerComponent.Width
	fixedHeight ⁹	hasLayerComponent.Height

OWL-S models inputs and outputs as classes, and this approach has been followed in the OWL-S OGC ontology to describe the parameters of the operations. However, many of these inputs and outputs have their own internal structure (for example, the Query input of a WFS), in which case a mixture of properties and classes is used to define the structure of the input or output itself (for example, WFS Query and WFS Feature Collection).

OWL-S provides a WSDL grounding in which an OWL-S file references a WSDL document that describes the grounding, and provides links between the OWL-S components and the WSDL components. However, the work described in this paper is intended to be used with an architecture that stores registry contents in ontologies, and provides mechanisms for storing ontologies, not xml documents (Stock et al, 2009). A RDF version of WSDL has been created (Kopecky, 2006), and the most standards-compliant solution would be to use a grounding based on the WSDL RDF mapping. However, time limitations made this impossible, and a simplified grounding has been used that reflects the OGC grounding. This is depicted diagrammatically in Figure 1.

Figure 1: OGC Http Binding



The semantics of an OGC web service are described using this approach in the following ways:

- the inputs, outputs, preconditions and results describe the semantics of the function of the web service;
- inputs, outputs (and also preconditions and results as part of other expressions) can be connected to concepts in domain ontologies and
- the OWL-S OGC ontology includes a `hasTopic` property that may connect either an entire web service or a particular aspect thereof (specifically feature types or layers in the case of WFS and WMS respectively) to domain concepts to which they relate.

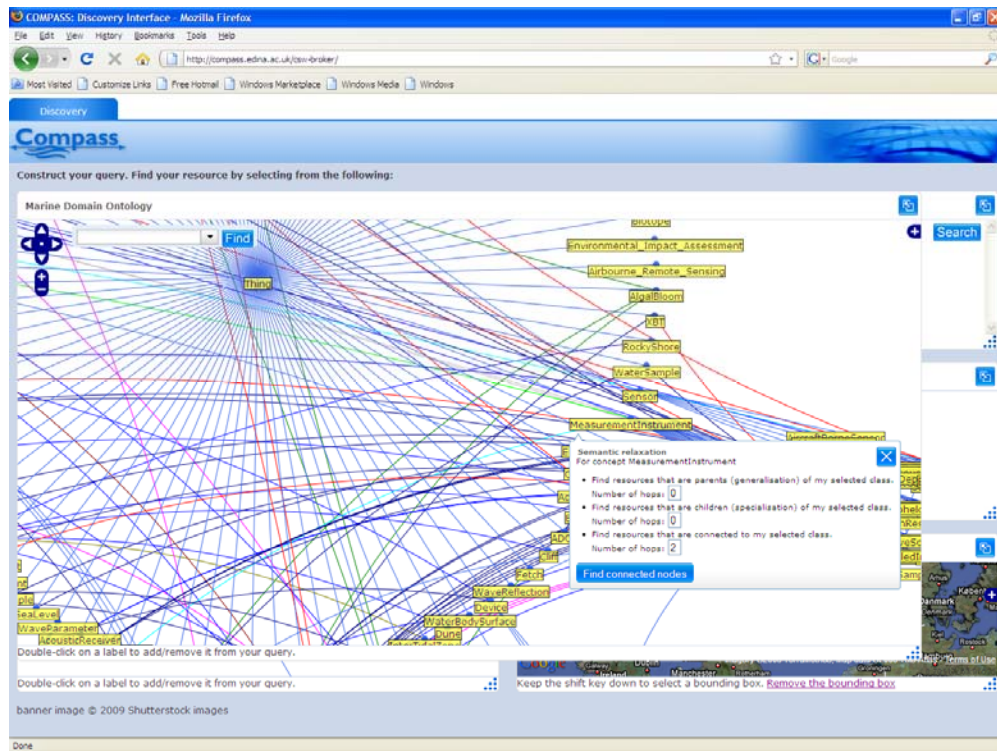
7 AUTOMATED INTERACTION WITH GEOSPATIAL WEB SERVICES THROUGH OWL-S

A particular goal of the project was to allow OGC WMS and WFS to be dynamically executed by users. However, this required that users be prompted for some parameter values. In order to support dynamic execution of the web services, additional elements were added to the OWL-S OGC web service ontology to allow an input form to be dynamically generated. These additional elements appear in green in Figure 1, and have attributes including name, label, size and maximumLength, generally conforming to HTML form structure.

8 A DEMONSTRATION IMPLEMENTATION

An application was developed to demonstrate the use of this approach in the marine domain for both discovery and dynamic execution of OGC web services, using a range of web services including those in the case study (Section 2). To demonstrate semantic discovery, an ontology of marine instruments was displayed to allow the user to select concepts of interest, with the option to also search for resources that related to other concepts that were linked to the selected concept (see Figure 2) as parents, children or some other kind of relationship, with a specified number of hops. The query was then executed to search for web services that were connected to the selected domain concepts through the hasTopic property (either directly or through feature types or layers) through an OGC Catalogue Services for the Web interface, using OWL files accessed through Jena middleware.

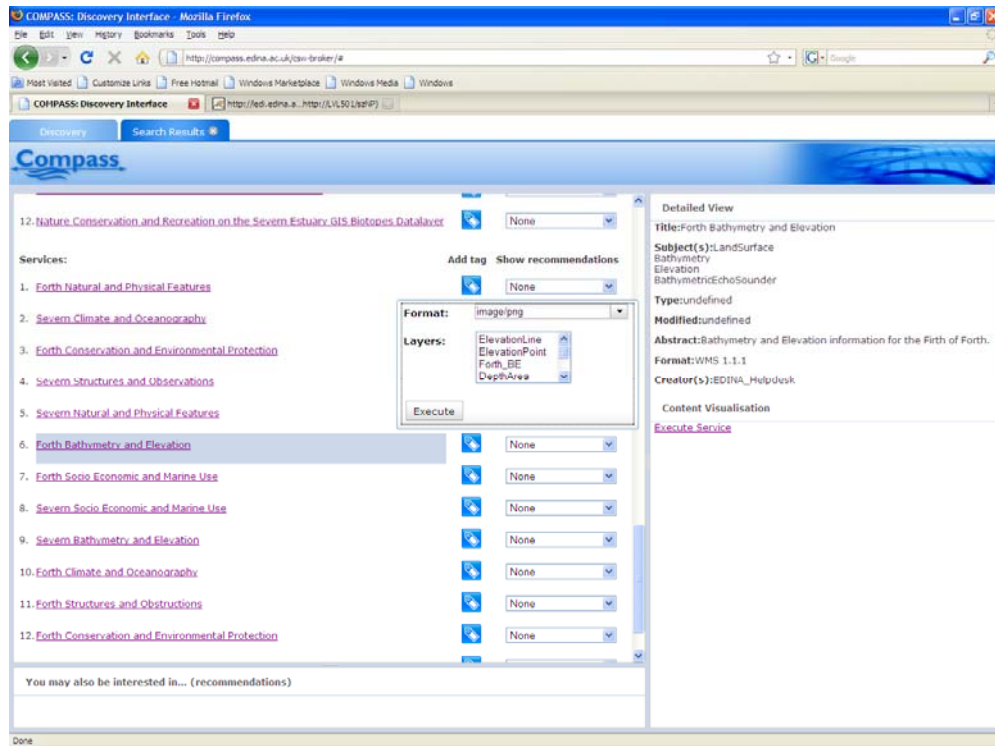
Figure 2: Ontology Browsing



Once the results were displayed, the application demonstrated the dynamic execution of web services. Users could click on web services to execute them.

The application then interrogated the web service ontology to establish whether any of the parameters required for the default operation of that web service link (in the case of a Web Feature Service the default operation was GetFeature, and in the case of a Web Map Service it was GetMap) had attached query models. A form was dynamically created using any linked query models to seek user input (see Figure 3). For example, in the case of the Web Feature Service, a query model was included for the featureType parameter (typically, when a WFS is called using a URL or XML fragment, this parameter is included to indicate for which feature types the user would like to retrieve data). In the web service ontology, the parameter had an attached query model that was an OptionList and an attached Domain that specified the possible values from the set of feature types that the WFS supplied. The user then selected the feature type of interest, and the binding URL (stored in OgcHttpOperation) was combined with the selected feature type to create the call to the web service.

Figure 3: Executing a Web Service



9 DISCUSSION

OWL-S is a cumbersome way to describe web services. In particular, there is significant repetition. Ostensibly, the purposes of expression are different, but in practise in the case of OGC web services, the result is significant duplication of content. This occurs particularly in the definition of parameters. Input and output parameters are defined in three places: for the processes that the web service operations implement; for the grounding of that web service and finally for in the profile of a web services operation. These three descriptions have different purposes, and the sets of inputs and outputs may not be identical (for example, the profile may contain only the parameters that are appropriate to advertise what the web service does), but nevertheless, it is not efficient to define the parameters multiple times. In the implementation described in this paper, the input and output parameters were described fully only in one place (as part of the process definition). They were also described in the grounding only if they had a query model, domain or constraint, and linked them to the process definition as per Figure 1, and they were not described in the Profile at all (but there is a link between the Profile and the Process at operation level, so the parameters could be deduced). This is not technically correct implementation of OWL-S, and the programme that accesses the web service ontology needs to know about this implementation, but it is certainly more practical.

The OWL-S OGC ontology describes the WFS and WMS specifications, and then relies on instances being created to describe actual implementations of those specifications (as in Appendices D and E). Again in the interests of practicality, instances were not created of each parameter for each operation. Instances were created for the operations supported by the web service implementation, and from this the parameters could be deduced from the OWL-S OGC ontology.

It was also difficult to model some of the cardinality constraints for the input and output parameters due to the nature of OWL. In order to avoid massive proliferation of properties, a generic `has<parameter>Component` property was used to describe the subcomponents of non-atomic parameters (for example, Query). This reduced the ability to fully model the constraints on the WFS and WMS parameter values, but reduced the complexity of the ontology.

The OWL-S ontology was used to describe in some detail the data made available by WFS and WMS (feature types and layers respectively). The method was useful in this respect, because it allowed the data offered by the web service to be semantically described, and could potentially be used for intelligent resource discovery and orchestration.

The web service specifications were not fully described for the purposes of this demonstration, as only limited time was available. Specifically:

- results and preconditions were not fully described, and in any case are partially dependent on the implementation, so may not be generalisable to the OWL-S OGC ontology;
- the WSDL grounding was not used (see Section 6) and
- the full complexity of some parameters was not modelled (for example, the subcomponents of Query were not fully described).

The approach proposed here could be automated so that the web service ontologies could be automatically generated from the GetCapabilities documents (it would even be possible to do this dynamically). However, there is limited capacity to automatically generate the semantic links to domain ontology concepts, as this depends on understanding of the web service and the appropriate concepts to link.

In summary, the full use of OWL-S according to its original design to model OGC web service is inefficient and time-consuming. Thus this work adopted a partial implementation of OWL-S that avoided duplication.

The separation of the generic components of the specification in their own ontology (OWL-S OGC), and then the creation of an ontology for each web service instance that created instances of the generic OWL-S OGC ontology proved to make the definition of web service ontologies easier. As can be seen in Appendices C, D and E, the generic OWL-S OGC ontology is many times longer than the ontologies that were created for each web service instance, and thus the burden on the creator of web services is significantly reduced by the presence of the OGC specifications and the creation of the generic OWL-S OGC ontology.

The case study and demonstration application showed that this approach to web service ontologies could be used to discover web services using related domain concepts, and also to dynamically collect user parameters and execute web services. However, the orchestration capabilities of the approach were not tested. It is thought that the work may profitably be extended beyond that presented here to include other OGC specifications (for example, Web Processing Service (Schut and Whiteside, 2005)).

10 CONCLUSIONS

This paper has described an approach to the use of OWL-S to define the semantics of OGC web services. It is a limited approach in that it does not fully employ OWL-S in the way that its designers intended, but it demonstrates a more practical implementation of what is a fairly cumbersome specification.

The work described in this document demonstrates how the OWL-S OGC web service ontology can be used to support discovery and dynamic execution of web services, and shows that web service ontologies can be combined with OGC standards to produce an operable system for semantic enablement of geospatial web services.

Acknowledgements

This work was funded under the COMPASS Project by the Joint Information Systems Committee of the UK, and their assistance is gratefully acknowledged.

References

- de Bruijn, J. and Lausen, H. (2005). *Web Service Modeling Language*. W3C Member Submission 3 June 2005. <http://www.w3.org/Submission/WSML/>.
- de la Beaujardiere, J. (2006). *Web Map Service Implementation Specification*. Open Geospatial Consortium Specification 06-042.
- Gone, M. and Schade, S. (2008). Towards Semantic Composition of Geospatial Web Services – Using WSMO instead of BPEL. *International Journal of Spatial Data Infrastructure Research* 3.
- Kopecky, J. (2006). WSDL RDF Mapping: Developing Ontologies from Standardized XML Languages. In *Advances in Conceptual Modelling – Theory and Practice*, Lecture Notes in Computer Science 4231. pp312-322.
- Lara, R., Polleres, A., Lausen, H., Roman, D., de Bruijn, J. and Fensel, D. (2005). *A Conceptual Comparison between WSMO and OWL-S*. Technical paper, DERI.
- Lutz, M. (2007). Ontology-based descriptions for semantic discovery and composition of geoprocessing services. *Geoinformatica* 11.
- Maue, P. (2008). *Semantic annotations in OGC Standards*. Open Geospatial Consortium Discussion Paper 08-167.
- Roman D and Klien E. (2007). SWING – A Semantic Framework for Geospatial Services. In *The Geospatial Web: How Geobrowsers, Social Software and the Web 2.0 are Shaping the Network Society*. Arno Scharl, Klaus Tochtermann (eds.). London, Springer
- Schut, P. and Whiteside, A. (2005). *Web Processing Service Implementation Specification*. Open Geospatial Consortium Specification 05-007r6

- Stock, K., Atkinson, R., Higgins, C., Small, M., Woolf, A., Millard, K. and Arctur, D. (forthcoming). A semantic registry using a Feature Type Catalogue instead of ontologies to support spatial data infrastructures. *International Journal of Geographical Information Science*, in press.
- Stock, K., Robertson, A., Bishr, M., Stojanovic, T., Ortmann, J., Reitsma, F. and Medyckyj-Scott, D. (2009). eScience for Sea Science: A Semantic Knowledge Infrastructure for Marine Scientists. 5th IEEE International Conference on e-Science, Oxford, UK, December 9-11.
- Tanasescu V, Gugliotta A, Domingue J, Gutiérrez Villarías L, Davies R, Rowlatt M, Richardson M and Stincic S. (2007). Geospatial Data Integration with Semantic Web Services: the eMerges Approach. In *The Geospatial Web: How Geobrowsers, Social Software and the Web 2.0 are Shaping the Network Society*. Arno Scharl, Klaus Tochtermann (eds.). London, Springer
- VRETANOS, P. (2005). *Web Feature Service Implementation Specification*. Open Geospatial Consortium Specification 04-094.
- Whiteside, A. (2007) OGC Web Services Common Specification. OGC document 06-121r3.

Appendix A: GetCapabilities Document for the severn_co_wfs Web Feature Service

```
<?xml version="1.0" encoding="UTF-8" ?>
- <wfs:WFS_Capabilities xmlns:wfs="http://www.opengis.net/wfs"
  xmlns:gml="http://www.opengis.net/gml" xmlns:ogc="http://www.opengis.net/ogc"
  xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
  instance" updateSequence="0" version="1.1.0" xsi:schemaLocation="http://www.opengis.net/wfs
  http://schemas.opengis.net/wfs/1.1.0/wfs.xsd">
- <ows:ServiceIdentification xmlns:ows="http://www.opengis.net/ows">
  <ows:Title>SeaZone WFS</ows:Title>
  <ows:Abstract>deegree 2.2 WFS (1.1.0)</ows:Abstract>
- <ows:Keywords>
  <ows:Keyword>WFS</ows:Keyword>
  <ows:Keyword>deegree</ows:Keyword>
  <ows:Keyword>SeaZone</ows:Keyword>
  <ows:Keyword>complex</ows:Keyword>
  <ows:Keyword>1.1.0</ows:Keyword>
  </ows:Keywords>
  <ows:ServiceType>WFS</ows:ServiceType>
  <ows:ServiceTypeVersion>1.1.0</ows:ServiceTypeVersion>
  <ows:Fees>None</ows:Fees>
  <ows:AccessConstraints>None</ows:AccessConstraints>
  </ows:ServiceIdentification>
- <ows:ServiceProvider xmlns:ows="http://www.opengis.net/ows">
  <ows:ProviderName>EDINA</ows:ProviderName>
  <ows:ProviderSite xlink:href="http://edina.ac.uk/" xlink:type="simple" />
- <ows:ServiceContact>
  <ows:IndividualName>Lasma Sietinsone</ows:IndividualName>
  <ows:PositionName>GIS Technician</ows:PositionName>
- <ows:ContactInfo>
- <ows:Phone>
  <ows:Voice> +44 (0)131 651 +44 (0)131 651 1241</ows:Voice>
  <ows:Facsimile> +44 (0)131 650 +44 (0)131 650 3308</ows:Facsimile>
  </ows:Phone>
- <ows:Address>
  <ows:DeliveryPoint>Causewayside House, 160 Causewayside</ows:DeliveryPoint>
  <ows:City>Edinburgh</ows:City>
  <ows:AdministrativeArea>Scotland</ows:AdministrativeArea>
  <ows:PostalCode>EH9 1PR</ows:PostalCode>
  <ows:Country>United Kingdom</ows:Country>
  <ows:ElectronicMailAddress>I.sietinsone@ed.ac.uk</ows:ElectronicMailAddress>
  </ows:Address>
  <ows:OnlineResource xlink:href="http://ledi.edina.ac.uk:48080/severn-co/services" xlink:type="simple" />
  <ows:HoursOfService>9.00-17.00</ows:HoursOfService>
  <ows:ContactInstructions>e-mail</ows:ContactInstructions>
  </ows:ContactInfo>
  <ows:Role>PointOfContact</ows:Role>
  </ows:ServiceContact>
  </ows:ServiceProvider>
- <ows:OperationsMetadata xmlns:ows="http://www.opengis.net/ows">
- <ows:Operation name="GetFeature">
- <ows:DCP>
- <ows:HTTP>
  <ows:Get xlink:href="http://ledi.edina.ac.uk:48080/severn-co/services?" xlink:type="simple" />
  <ows:Post xlink:href="http://ledi.edina.ac.uk:48080/severn-co/services" xlink:type="simple" />
  </ows:HTTP>
  </ows:DCP>
- <ows:Parameter name="resultType">
```

```

<ows:Value>results</ows:Value>
<ows:Value>hits</ows:Value>
  </ows:Parameter>
- <ows:Parameter name="outputFormat">
  <ows:Value>text/xml; subtype=gml/3.1.1</ows:Value>
  </ows:Parameter>
</ows:Operation>
- <ows:Operation name="DescribeFeatureType">
- <ows:DCP>
- <ows:HTTP>
  <ows:Get xlink:href="http://ledi.edina.ac.uk:48080/severn-co/services?" xlink:type="simple" />
  <ows:Post xlink:href="http://ledi.edina.ac.uk:48080/severn-co/services" xlink:type="simple" />
  </ows:HTTP>
</ows:DCP>
- <ows:Parameter name="outputFormat">
  <ows:Value>text/xml; subtype=gml/3.1.1</ows:Value>
  </ows:Parameter>
</ows:Operation>
- <ows:Operation name="GetCapabilities">
- <ows:DCP>
- <ows:HTTP>
  <ows:Get xlink:href="http://ledi.edina.ac.uk:48080/severn-co/services?" xlink:type="simple" />
  <ows:Post xlink:href="http://ledi.edina.ac.uk:48080/severn-co/services" xlink:type="simple" />
  </ows:HTTP>
</ows:DCP>
- <ows:Parameter name="AcceptVersions">
  <ows:Value>1.1.0</ows:Value>
  </ows:Parameter>
- <ows:Parameter name="AcceptFormats">
  <ows:Value>text/xml</ows:Value>
  </ows:Parameter>
- <ows:Parameter name="Sections">
  <ows:Value>ServiceIdentification</ows:Value>
  <ows:Value>ServiceProvider</ows:Value>
  <ows:Value>OperationsMetadata</ows:Value>
  <ows:Value>FeatureTypeList</ows:Value>
  <ows:Value>ServesGMLObjectTypeList</ows:Value>
  <ows:Value>SupportsGMLObjectTypeList</ows:Value>
  <ows:Value>Filter_Capabilities</ows:Value>
  </ows:Parameter>
</ows:Operation>
- <ows:Operation name="GetFeatureWithLock">
- <ows:DCP>
- <ows:HTTP>
  <ows:Get xlink:href="http://ledi.edina.ac.uk:48080/severn-co/services?" xlink:type="simple" />
  <ows:Post xlink:href="http://ledi.edina.ac.uk:48080/severn-co/services" xlink:type="simple" />
  </ows:HTTP>
  </ows:DCP>
</ows:Operation>
- <ows:Operation name="LockFeature">
- <ows:DCP>
- <ows:HTTP>
  <ows:Get xlink:href="http://ledi.edina.ac.uk:48080/severn-co/services?" xlink:type="simple" />
  <ows:Post xlink:href="http://ledi.edina.ac.uk:48080/severn-co/services" xlink:type="simple" />
  </ows:HTTP>
  </ows:DCP>
</ows:Operation>
- <ows:Operation name="Transaction">
- <ows:DCP>
- <ows:HTTP>
  <ows:Get xlink:href="http://ledi.edina.ac.uk:48080/severn-co/services?" xlink:type="simple" />

```



```

<ows:Post xlink:href="http://ledi.edina.ac.uk:48080/severn-co/services" xlink:type="simple" />
  </ows:HTTP>
  </ows:DCP>
- <ows:Parameter name="inputFormat">
  <ows:Value>text/xml; subtype=gml/3.1.1</ows:Value>
  </ows:Parameter>
- <ows:Parameter name="idgen">
  <ows:Value>GenerateNew</ows:Value>
  <ows:Value>UseExisting</ows:Value>
  </ows:Parameter>
- <ows:Parameter name="releaseAction">
  <ows:Value>ALL</ows:Value>
  </ows:Parameter>
  </ows:Operation>
- <ows:Parameter name="srsName">
  <ows:Value>EPSG:4326</ows:Value>
  </ows:Parameter>
- <ows:Constraint name="DefaultMaxFeatures">
  <ows:Value>15000</ows:Value>
  </ows:Constraint>
- <ows:Constraint name="DefaultLockExpiry">
  <ows:Value>5</ows:Value>
  </ows:Constraint>
  </ows:OperationsMetadata>
- <wfs:FeatureTypeList>
- <wfs:FeatureType xmlns:app="http://www.deegree.org/app">
  <wfs:Name>app:LVL102_szCO_TidesCurrents_line_nw25000040</wfs:Name>
  <wfs:Title>Tides and Tidal Currents</wfs:Title>
  <wfs:Abstract>The Climate and Oceanography topic contains data relating to climate, weather and tides.
    This varies from locations where measurement and monitoring is or has been known to occur to
    predicted tidal currents. All these datasets are of a mainly temporal nature.</wfs:Abstract>
- <ows:Keywords xmlns:ows="http://www.opengis.net/ows">
  <ows:Keyword>SeaZone</ows:Keyword>
  <ows:Keyword>Marine</ows:Keyword>
  <ows:Keyword>Topic: Climate and Oceanography (CO)</ows:Keyword>
  <ows:Keyword>Theme: Tides and Tidal Currents</ows:Keyword>
  <ows:Keyword>Level: 102</ows:Keyword>
  <ows:Keyword>Geometry: line</ows:Keyword>
  <ows:Keyword>Feature code: SZFEATCODE</ows:Keyword>
  <ows:Keyword>Feature description: SZFEATDESC</ows:Keyword>
  </ows:Keywords>
  <wfs:DefaultSRS>EPSG:4326</wfs:DefaultSRS>
- <wfs:Operations>
  <wfs:Operation>Query</wfs:Operation>
  </wfs:Operations>
- <wfs:OutputFormats>
  <wfs:Format>text/xml; subtype=gml/3.1.1</wfs:Format>
  </wfs:OutputFormats>
- <ows:WGS84BoundingBox xmlns:ows="http://www.opengis.net/ows">
  <ows:LowerCorner>-4.0 50.0</ows:LowerCorner>
  <ows:UpperCorner>-2.0 52.0</ows:UpperCorner>
  </ows:WGS84BoundingBox>
  </wfs:FeatureType>
- <wfs:FeatureType xmlns:app="http://www.deegree.org/app">
  <wfs:Name>app:LVL102_szCO_TidesCurrents_line_nw25000060</wfs:Name>
  <wfs:Title>Tides and Tidal Currents</wfs:Title>
  <wfs:Abstract>The Climate and Oceanography topic contains data relating to climate, weather and tides.
    This varies from locations where measurement and monitoring is or has been known to occur to
    predicted tidal currents. All these datasets are of a mainly temporal nature.</wfs:Abstract>
- <ows:Keywords xmlns:ows="http://www.opengis.net/ows">
  <ows:Keyword>SeaZone</ows:Keyword>

```

```

<ows:Keyword>Marine</ows:Keyword>
<ows:Keyword>Topic: Climate and Oceanography (CO)</ows:Keyword>
<ows:Keyword>Theme: Tides and Tidal Currents</ows:Keyword>
<ows:Keyword>Level: 102</ows:Keyword>
<ows:Keyword>Geometry: line</ows:Keyword>
<ows:Keyword>Feature code: SZFEATCODE</ows:Keyword>
<ows:Keyword>Feature description: SZFEATDESC</ows:Keyword>
  </ows:Keywords>
<wfs:DefaultSRS>EPSG:4326</wfs:DefaultSRS>
- <wfs:Operations>
  <wfs:Operation>Query</wfs:Operation>
  </wfs:Operations>
- <wfs:OutputFormats>
  <wfs:Format>text/xml; subtype=gml/3.1.1</wfs:Format>
  </wfs:OutputFormats>
- <ows:WGS84BoundingBox xmlns:ows="http://www.opengis.net/ows">
  <ows:LowerCorner>-6.0 50.0</ows:LowerCorner>
  <ows:UpperCorner>-4.0 52.0</ows:UpperCorner>
  </ows:WGS84BoundingBox>
  </wfs:FeatureType>
- <wfs:FeatureType xmlns:app="http://www.deegree.org/app">
  <wfs:Name>app:LVL101_szCO_TidesCurrents_point_nw25000060</wfs:Name>
  <wfs:Title>Tides and Tidal Currents</wfs:Title>
  <wfs:Abstract>The Climate and Oceanography topic contains data relating to climate, weather and tides.
    This varies from locations where measurement and monitoring is or has been known to occur to
    predicted tidal currents. All these datasets are of a mainly temporal nature.</wfs:Abstract>
- <ows:Keywords xmlns:ows="http://www.opengis.net/ows">
  <ows:Keyword>SeaZone</ows:Keyword>
  <ows:Keyword>Marine</ows:Keyword>
  <ows:Keyword>Topic: Climate and Oceanography (CO)</ows:Keyword>
  <ows:Keyword>Theme: Tides and Tidal Currents</ows:Keyword>
  <ows:Keyword>Level: 101</ows:Keyword>
  <ows:Keyword>Geometry: point</ows:Keyword>
  <ows:Keyword>Feature code: SZFEATCODE</ows:Keyword>
  <ows:Keyword>Feature description: SZFEATDESC</ows:Keyword>
  </ows:Keywords>
  <wfs:DefaultSRS>EPSG:4326</wfs:DefaultSRS>
- <wfs:Operations>
  <wfs:Operation>Query</wfs:Operation>
  </wfs:Operations>
- <wfs:OutputFormats>
  <wfs:Format>text/xml; subtype=gml/3.1.1</wfs:Format>
  </wfs:OutputFormats>
- <ows:WGS84BoundingBox xmlns:ows="http://www.opengis.net/ows">
  <ows:LowerCorner>-6.0 50.0</ows:LowerCorner>
  <ows:UpperCorner>-4.0 52.0</ows:UpperCorner>
  </ows:WGS84BoundingBox>
  </wfs:FeatureType>
- <wfs:FeatureType xmlns:app="http://www.deegree.org/app">
  <wfs:Name>app:LVL101_szCO_TidesCurrents_point_nw25000040</wfs:Name>
  <wfs:Title>Tides and Tidal Currents</wfs:Title>
  <wfs:Abstract>The Climate and Oceanography topic contains data relating to climate, weather and tides.
    This varies from locations where measurement and monitoring is or has been known to occur to
    predicted tidal currents. All these datasets are of a mainly temporal nature.</wfs:Abstract>
- <ows:Keywords xmlns:ows="http://www.opengis.net/ows">
  <ows:Keyword>SeaZone</ows:Keyword>
  <ows:Keyword>Marine</ows:Keyword>
  <ows:Keyword>Topic: Climate and Oceanography (CO)</ows:Keyword>
  <ows:Keyword>Theme: Tides and Tidal Currents</ows:Keyword>
  <ows:Keyword>Level: 101</ows:Keyword>
  <ows:Keyword>Geometry: point</ows:Keyword>

```

```

<ows:Keyword>Feature code: SZFEATCODE</ows:Keyword>
<ows:Keyword>Feature description: SZFEATDESC</ows:Keyword>
  </ows:Keywords>
  <wfs:DefaultSRS>EPSG:4326</wfs:DefaultSRS>
- <wfs:Operations>
  <wfs:Operation>Query</wfs:Operation>
  </wfs:Operations>
- <wfs:OutputFormats>
  <wfs:Format>text/xml; subtype=gml/3.1.1</wfs:Format>
  </wfs:OutputFormats>
- <ows:WGS84BoundingBox xmlns:ows="http://www.opengis.net/ows">
  <ows:LowerCorner>-4.0 50.0</ows:LowerCorner>
  <ows:UpperCorner>-2.0 52.0</ows:UpperCorner>
  </ows:WGS84BoundingBox>
  </wfs:FeatureType>
  </wfs:FeatureTypeList>
- <ogc:Filter_Capabilities>
- <ogc:Spatial_Capabilities>
- <ogc:GeometryOperands>
  <ogc:GeometryOperand>gml:Envelope</ogc:GeometryOperand>
  <ogc:GeometryOperand>gml:Point</ogc:GeometryOperand>
  <ogc:GeometryOperand>gml:LineString</ogc:GeometryOperand>
  <ogc:GeometryOperand>gml:Polygon</ogc:GeometryOperand>
  </ogc:GeometryOperands>
- <ogc:SpatialOperators>
  <ogc:SpatialOperator name="Crosses" />
  <ogc:SpatialOperator name="Intersects" />
  <ogc:SpatialOperator name="BBOX" />
  <ogc:SpatialOperator name="Overlaps" />
  <ogc:SpatialOperator name="Touches" />
  <ogc:SpatialOperator name="Beyond" />
  <ogc:SpatialOperator name="Within" />
  <ogc:SpatialOperator name="Equals" />
  <ogc:SpatialOperator name="Contains" />
  <ogc:SpatialOperator name="Disjoint" />
  </ogc:SpatialOperators>
  </ogc:Spatial_Capabilities>
- <ogc:Scalar_Capabilities>
  <ogc:LogicalOperators />
- <ogc:ComparisonOperators>
  <ogc:ComparisonOperator>LessThanEqualTo</ogc:ComparisonOperator>
  <ogc:ComparisonOperator>LessThan</ogc:ComparisonOperator>
  <ogc:ComparisonOperator>NullCheck</ogc:ComparisonOperator>
  <ogc:ComparisonOperator>GreaterThan</ogc:ComparisonOperator>
  <ogc:ComparisonOperator>GreaterThanEqualTo</ogc:ComparisonOperator>
  <ogc:ComparisonOperator>Like</ogc:ComparisonOperator>
  <ogc:ComparisonOperator>EqualTo</ogc:ComparisonOperator>
  <ogc:ComparisonOperator>Between</ogc:ComparisonOperator>
  </ogc:ComparisonOperators>
- <ogc:ArithmeticOperators>
  <ogc:SimpleArithmetic />
  </ogc:ArithmeticOperators>
  </ogc:Scalar_Capabilities>
- <ogc:Id_Capabilities>
  <ogc:EID />
  <ogc:FID />
  </ogc:Id_Capabilities>
  </ogc:Filter_Capabilities>
</wfs:WFS_Capabilities>

```

Appendix B: GetCapabilities Document for the forth_be Web Map Service

```
<?xml version="1.0" encoding="ISO-8859-1" standalone="no" ?>
<!DOCTYPE WMT_MS_Capabilities (View Source for full doctype...)>
- <!--
  end of DOCTYPE declaration
-->
- <WMT_MS_Capabilities version="1.1.1">
- <!--
  MapServer version 5.2.1 OUTPUT=GIF OUTPUT=PNG OUTPUT=JPEG OUTPUT=WBMP OUTPUT=SVG SUPPORTS=PROJ
  SUPPORTS=AGG SUPPORTS=FREETYPE SUPPORTS=ICONV SUPPORTS=WMS_SERVER SUPPORTS=WMS_CLIENT
  SUPPORTS=WFS_SERVER SUPPORTS=WFS_CLIENT INPUT=TIFF INPUT=EPPL7 INPUT=OGR INPUT=GDAL
  INPUT=SHAPEFILE
-->
- <Service>
  <Name>OGC:WMS</Name>
  <Title>Forth_BE</Title>
  <OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
    xlink:href="http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&"
    xlink:type="simple" />
- <ContactInformation>
- <ContactPersonPrimary>
  <ContactPerson>EDI NA Helpdesk</ContactPerson>
  <ContactOrganization>EDI NA</ContactOrganization>
  </ContactPersonPrimary>
  <ContactVoiceTelephone>0131 650 3302</ContactVoiceTelephone>
  <ContactElectronicMailAddress>edina@ed.ac.uk</ContactElectronicMailAddress>
  </ContactInformation>
</Service>
- <Capability>
- <Request>
- <GetCapabilities>
  <Format>application/vnd.ogc.wms_xml</Format>
- <DCPType>
- <HTTP>
- <Get>
  <OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
    xlink:href="http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&"
    xlink:type="simple" />
  </Get>
- <Post>
  <OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
    xlink:href="http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&"
    xlink:type="simple" />
  </Post>
  </HTTP>
  </DCPType>
</GetCapabilities>
- <GetMap>
  <Format>image/png</Format>
  <Format>image/gif</Format>
  <Format>image/png; mode=24bit</Format>
  <Format>image/jpeg</Format>
  <Format>image/vnd.wap.wbmp</Format>
  <Format>image/tiff</Format>
  <Format>image/svg+xml</Format>
- <DCPType>
- <HTTP>
- <Get>
```

```

<OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
  xlink:href="http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&"
  xlink:type="simple" />
</Get>
- <Post>
  <OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
    xlink:href="http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&"
    xlink:type="simple" />
  </Post>
</HTTP>
</DCPType>
</GetMap>
- <GetFeatureInfo>
  <Format>text/plain</Format>
  <Format>application/vnd.ogc.gml</Format>
- <DCPType>
- <HTTP>
- <Get>
  <OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
    xlink:href="http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&"
    xlink:type="simple" />
  </Get>
- <Post>
  <OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
    xlink:href="http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&"
    xlink:type="simple" />
  </Post>
</HTTP>
</DCPType>
</GetFeatureInfo>
- <DescribeLayer>
  <Format>text/xml</Format>
- <DCPType>
- <HTTP>
- <Get>
  <OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
    xlink:href="http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&"
    xlink:type="simple" />
  </Get>
- <Post>
  <OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
    xlink:href="http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&"
    xlink:type="simple" />
  </Post>
</HTTP>
</DCPType>
</DescribeLayer>
- <GetLegendGraphic>
  <Format>image/png</Format>
  <Format>image/gif</Format>
  <Format>image/png; mode=24bit</Format>
  <Format>image/jpeg</Format>
  <Format>image/vnd.wap.wbmp</Format>
- <DCPType>
- <HTTP>
- <Get>
  <OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
    xlink:href="http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&"
    xlink:type="simple" />
  </Get>
- <Post>

```

```

<OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
  xlink:href="http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&"
  xlink:type="simple" />
</Post>
</HTTP>
</DCPType>
</GetLegendGraphic>
- <GetStyles>
  <Format>text/xml</Format>
- <DCPType>
- <HTTP>
- <Get>
  <OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
    xlink:href="http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&"
    xlink:type="simple" />
  </Get>
- <Post>
  <OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
    xlink:href="http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&"
    xlink:type="simple" />
  </Post>
  </HTTP>
  </DCPType>
  </GetStyles>
  </Request>
- <Exception>
  <Format>application/vnd.ogc.se_xml</Format>
  <Format>application/vnd.ogc.se_inimage</Format>
  <Format>application/vnd.ogc.se_blank</Format>
  </Exception>
  <VendorSpecificCapabilities />
  <UserDefinedSymbolization SupportSLD="1" UserLayer="0" UserStyle="1" RemoteWFS="0" />
- <Layer queryable="0" opaque="0" noSubsets="0">
  <Name>Forth_BE</Name>
  <Title>Forth_BE</Title>
  <SRS>EPSG:4326</SRS>
  <LatLonBoundingBox minx="-4" miny="55.5" maxx="-2" maxy="56.2" />
  <BoundingBox SRS="EPSG:4326" minx="-4" miny="55.5" maxx="-2" maxy="56.2" />
- <Layer queryable="0" opaque="0" cascaded="0" noSubsets="0">
  <Name>DepthArea</Name>
  <Title>DepthArea</Title>
  <SRS>EPSG:4326</SRS>
  <LatLonBoundingBox minx="-4" miny="55.5" maxx="-2" maxy="56.2" />
  <BoundingBox SRS="EPSG:4326" minx="-4" miny="55.5" maxx="-2" maxy="56.2" />
  </Layer>
- <Layer queryable="0" opaque="0" cascaded="0" noSubsets="0">
  <Name>DepthLine</Name>
  <Title>DepthLine</Title>
  <SRS>EPSG:4326</SRS>
  <LatLonBoundingBox minx="-4" miny="55.5" maxx="-2" maxy="56.2" />
  <BoundingBox SRS="EPSG:4326" minx="-4" miny="55.5" maxx="-2" maxy="56.2" />
  </Layer>
- <Layer queryable="0" opaque="0" cascaded="0" noSubsets="0">
  <Name>BathymetryArea</Name>
  <Title>BathymetryArea</Title>
  <SRS>EPSG:4326</SRS>
  <LatLonBoundingBox minx="-4" miny="55.5" maxx="-2" maxy="56.2" />
  <BoundingBox SRS="EPSG:4326" minx="-4" miny="55.5" maxx="-2" maxy="56.2" />
  </Layer>
- <Layer queryable="0" opaque="0" cascaded="0" noSubsets="0">
  <Name>BathymetryLine</Name>

```

```
<Title>BathymetryLine</Title>
<SRS>EPSG:4326</SRS>
<LatLonBoundingBox minx="-4" miny="55.5" maxx="-2" maxy="56.2" />
<BoundingBox SRS="EPSG:4326" minx="-4" miny="55.5" maxx="-2" maxy="56.2" />
</Layer>
- <Layer queryable="0" opaque="0" cascaded="0" noSubsets="0">
  <Name>ElevationPoint</Name>
  <Title>ElevationPoint</Title>
  <SRS>EPSG:4326</SRS>
  <LatLonBoundingBox minx="-4" miny="55.5" maxx="-2" maxy="56.2" />
  <BoundingBox SRS="EPSG:4326" minx="-4" miny="55.5" maxx="-2" maxy="56.2" />
  </Layer>
- <Layer queryable="0" opaque="0" cascaded="0" noSubsets="0">
  <Name>ElevationLine</Name>
  <Title>ElevationLine</Title>
  <SRS>EPSG:4326</SRS>
  <LatLonBoundingBox minx="-4" miny="55.5" maxx="-2" maxy="56.2" />
  <BoundingBox SRS="EPSG:4326" minx="-4" miny="55.5" maxx="-2" maxy="56.2" />
  </Layer>
</Layer>
</Capability>
</WMT_MS_Capabilities>
```

Appendix C: The OWL-S OGC Ontology

```
<?xml version="1.0"?>
<rdf:RDF
  xmlns:expression="http://www.daml.org/services/owl-s/1.1/generic/Expression.owl#"
  xmlns:objectlist="http://www.daml.org/services/owl-s/1.1/generic/ObjectList.owl#"
  xmlns:service="http://www.daml.org/services/owl-s/1.1/Service.owl#"
  xmlns:grounding="http://www.daml.org/services/owl-s/1.1/Grounding.owl#"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:owl="http://www.w3.org/2002/07/owl#"
  xmlns="http://compass.edina.ac.uk/ontologies/owl-s_ogc.owl#"
  xmlns:actor="http://www.daml.org/services/owl-s/1.1/ActorDefault.owl#"
  xmlns:time="http://www.isi.edu/~hobbs/damlttime/time-entry.owl#"
  xmlns:profile="http://www.daml.org/services/owl-s/1.1/Profile.owl#"
  xml:base="http://compass.edina.ac.uk/ontologies/owl-s_ogc.owl">
  <owl:Ontology rdf:about="">
    <owl:imports rdf:resource="http://compass.edina.ac.uk/ontologies/owlcsw.owl"/>
    <owl:imports rdf:resource="http://www.daml.org/services/owl-s/1.1/Profile.owl"/>
    <owl:imports rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl"/>
    <owl:imports rdf:resource="http://www.daml.org/services/owl-s/1.1/Service.owl"/>
    <owl:imports rdf:resource="http://www.daml.org/services/owl-s/1.1/Grounding.owl"/>
    <owl:imports rdf:resource="http://www.daml.org/services/owl-s/1.1/ActorDefault.owl"/>
  </owl:Ontology>
  <owl:Class rdf:ID="LockFeature">
    <rdfs:subClassOf>
      <owl:Class rdf:ID="WFSAtomicProcess"/>
    </rdfs:subClassOf>
  </owl:Class>
  <owl:Class rdf:ID="Abstract">
    <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string">
      >A summary of the element.</rdfs:comment>
    <rdfs:subClassOf>
      <owl:Restriction>
        <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
        <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string">
          >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
        </owl:Restriction>
      </rdfs:subClassOf>
    <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  </owl:Class>
  <owl:Class rdf:ID="TotalFeaturesDeleted">
    <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string">
      >Reports the total number of features affected by some kind of write action (i.e. insert, update, delete).</rdfs:comment>
    <rdfs:subClassOf>
      <owl:Restriction>
        <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
        <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string">
          >http://www.w3.org/2001/XMLSchema#integer</owl:hasValue>
        </owl:Restriction>
      </rdfs:subClassOf>
    <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  </owl:Class>
  <owl:Class rdf:ID="IdCapabilities"/>
  <owl:Class rdf:ID="Bezier">
    <owl:disjointWith>
      <owl:Class rdf:ID="Envelope"/>
    </owl:disjointWith>
  </owl:disjointWith>
```



```

<owl:disjointWith>
  <owl:Class rdf:ID="CubicSpline"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:ID="OffsetCurve"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:ID="Clothoid"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:ID="CircleByCenterPoint"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:ID="ArcByCenterPoint"/>
</owl:disjointWith>
<rdfs:subClassOf>
  <owl:Class rdf:ID="GeometryOperands"/>
</rdfs:subClassOf>
<owl:disjointWith>
  <owl:Class rdf:ID="Point"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:ID="Circle"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:ID="Solid"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:ID="TriangulatedSurface"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:ID="Polygon"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:ID="Geodesic"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:ID="Triangle"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:ID="LineString"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:ID="Arc"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:ID="Tin"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:ID="PolyhedralSurface"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:ID="ArcByBulge"/>
</owl:disjointWith>
</owl:Class>
<owl:Class rdf:ID="CapabilitiesRequest">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
</owl:Class>

```

```

    <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
  </owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>Request to a WFS to perform the GetCapabilities operation. This operation allows a client to retrieve a Capabilities
XML document providing metadata for the specific WFS server. The GetCapabilities element is used to request that a
Web Feature Service generate an XML document describing the organization providing the service, the WFS operations
that the service supports, a list of feature types that the service can operate on and list of filtering capabilities that the
service support. Such an XML document is called a capabilities document.</rdfs:comment>
</owl:Class>
<owl:Class rdf:about="#GeometryOperands">
  <rdfs:subClassOf>
    <owl:Class rdf:ID="SpatialCapabilities"/>
  </rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:ID="GetFeatureWithLock">
<rdfs:subClassOf>
  <owl:Class rdf:about="#WFSAtomicProcess"/>
</rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:ID="Intersect">
  <owl:disjointWith>
    <owl:Class rdf:ID="Beyond"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:ID="BBox"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:ID="Disjoint"/>
  </owl:disjointWith>
  <rdfs:subClassOf>
    <owl:Class rdf:ID="SpatialOperators"/>
  </rdfs:subClassOf>
  <owl:disjointWith>
    <owl:Class rdf:ID="Touches"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:ID="Contains"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:ID="Equals"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:ID="Overlaps"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:ID="Crosses"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:ID="Within"/>
  </owl:disjointWith>
</owl:Class>
<owl:Class rdf:ID="Expiry">
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
<rdfs:subClassOf>
  <owl:Restriction>
    <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>http://www.w3.org/2001/XMLSchema#integer</owl:hasValue>

```

```

    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >The expiry attribute is used to set the length of time (expressed in minutes) that features will remain locked as a result
    of a GetFeatureWithLock request. After the expiry period elapses, the locked resources must be released. If the expiry
    attribute is not set, then the default value of 5 minutes will be enforced.</rdfs:comment>
  </owl:Class>
  <owl:Class rdf:ID="TotalFeaturesUpdated">
    <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >Reports the total number of features affected by some kind of write action (i.e. insert, update, delete).</rdfs:comment>
    <rdfs:subClassOf>
      <owl:Restriction>
        <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
        <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
          >http://www.w3.org/2001/XMLSchema#integer</owl:hasValue>
      </owl:Restriction>
    </rdfs:subClassOf>
    <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  </owl:Class>
  <owl:Class rdf:ID="OgcHttpGet">
    <rdfs:subClassOf>
      <owl:Class rdf:ID="OgcHttpConnectPoints"/>
    </rdfs:subClassOf>
    <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >The URL that is used to invoke the web service operation with the http get request method.</rdfs:comment>
  </owl:Class>
  <owl:Class rdf:ID="UnitSymbol">
    <rdfs:subClassOf>
      <owl:Restriction>
        <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
        <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
          >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
      </owl:Restriction>
    </rdfs:subClassOf>
    <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
    <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >The symbol to be used for the unit (abbreviation).</rdfs:comment>
  </owl:Class>
  <owl:Class rdf:about="#OffsetCurve">
    <owl:disjointWith>
      <owl:Class rdf:about="#Circle"/>
    </owl:disjointWith>
    <owl:disjointWith>
      <owl:Class rdf:about="#CircleByCenterPoint"/>
    </owl:disjointWith>
    <owl:disjointWith>
      <owl:Class rdf:about="#Solid"/>
    </owl:disjointWith>
    <owl:disjointWith>
      <owl:Class rdf:about="#Geodesic"/>
    </owl:disjointWith>
    <owl:disjointWith>
      <owl:Class rdf:about="#CubicSpline"/>
    </owl:disjointWith>
    <owl:disjointWith>
      <owl:Class rdf:about="#Clothoid"/>
    </owl:disjointWith>
    <owl:disjointWith>
      <owl:Class rdf:about="#PolyhedralSurface"/>
    </owl:disjointWith>
  </owl:Class>

```

```

<owl:disjointWith>
  <owl:Class rdf:about="#Envelope"/>
</owl:disjointWith>
<rdfs:subClassOf rdf:resource="#GeometryOperands"/>
<owl:disjointWith>
  <owl:Class rdf:about="#Tin"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#Arc"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#TriangulatedSurface"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#LineString"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#ArcByCenterPoint"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#ArcByBulge"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#Polygon"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#Point"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#Triangle"/>
</owl:disjointWith>
<owl:disjointWith rdf:resource="#Bezier"/>
</owl:Class>
<owl:Class rdf:ID="NumberOfFeatures">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >http://www.w3.org/2001/XMLSchema#integer</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >The numberOfFeatures attribute should contain a count of the number of features in the response. That is a count of all
    features elements derived from gml:AbstractFeatureType.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="QueryModel">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >A model that may be used to query the user for values to input into the operation call. This is used if the call to the
    operation is to be dynamically constructed with some user input. This is used in conjunction with the values for the
    parameter's domain to solicit input from the user, and default values and other constraints included in the parameter
    construct are not repeated here. For example, default values from the Domain construct for the parameter should be used to
    set initial values in the query control. The query model is adapted from the HTML input requirements, and the values
    herein are intended to be enough to automatically generate the input form.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="Cascaded">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"

```

```

    >http://www.w3.org/2001/XMLSchema#integer</owl:hasValue>
  </owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The layer comes from another server, possibly several levels of cascade away, as indicated by this
value.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="DescribeFeatureType">
  <rdfs:subClassOf>
    <owl:Class rdf:about="#WFSAtomicProcess"/>
  </rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:ID="LessThan">
  <owl:disjointWith>
    <owl:Class rdf:ID="NotEqualTo"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:ID="Between"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:ID="NullCheck"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:ID="EqualTo"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:ID="GreaterThan"/>
  </owl:disjointWith>
  <rdfs:subClassOf>
    <owl:Class rdf:ID="ComparisonOperators"/>
  </rdfs:subClassOf>
  <owl:disjointWith>
    <owl:Class rdf:ID="LessThanEqualTo"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:ID="GreaterThanEqualTo"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:ID="Like"/>
  </owl:disjointWith>
</owl:Class>
<owl:Class rdf:ID="InsertedFeature">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>Reports the list of identifiers of all features created by a transaction request. New features are created using the Insert
action and the list of identifiers must be presented in the same order as the Insert actions were encountered in the transaction
request. Features may optionally be correlated with identifiers using the handle attribute (if it was specified on the Insert
element).</rdfs:comment>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
</owl:Class>
<owl:Class rdf:ID="ArithmeticOperators">
  <rdfs:subClassOf>
    <owl:Class rdf:ID="ScalarCapabilities"/>
  </rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:ID="Code">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The code attribute may be used to specify an exception code indicating why an action failed.</rdfs:comment>
  <rdfs:subClassOf>
    <owl:Restriction>

```

```

    <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
    <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
  </owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
</owl:Class>
<owl:Class rdf:ID="Layer">
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The map layers offered by the web service.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="OptionList">
  <rdfs:subClassOf rdf:resource="#QueryModel"/>
</owl:Class>
<owl:Class rdf:ID="Style">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >Details of an reference to the style that may be used for a layer.</rdfs:comment>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
</owl:Class>
<owl:Class rdf:ID="Units">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The units of the dimensional axis.</rdfs:comment>
</owl:Class>
<owl:Class rdf:about="#Overlaps">
  <owl:disjointWith>
    <owl:Class rdf:about="#Beyond"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Disjoint"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Crosses"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#BBox"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Touches"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Within"/>
  </owl:disjointWith>
  <rdfs:subClassOf>
    <owl:Class rdf:about="#SpatialOperators"/>
  </rdfs:subClassOf>
  <owl:disjointWith>
    <owl:Class rdf:about="#Contains"/>
  </owl:disjointWith>
  <owl:disjointWith>

```

```

    <owl:Class rdf:about="#Equals"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Intersect"/>
</owl:Class>
<owl:Class rdf:about="#Triangle">
  <owl:disjointWith>
    <owl:Class rdf:about="#Geodesic"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByCenterPoint"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByBulge"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Arc"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Point"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Solid"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#PolyhedralSurface"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Bezier"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Tin"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#CircleByCenterPoint"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#TriangulatedSurface"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Envelope"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Circle"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#CubicSpline"/>
  </owl:disjointWith>
  <rdfs:subClassOf rdf:resource="#GeometryOperands"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Clothoid"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Polygon"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#LineString"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#OffsetCurve"/>
</owl:Class>
<owl:Class rdf:ID="Dimension">
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"

```

```

>The Dimension element declares the existence of a dimension and indicates what values along a dimension are
valid.</rdfs:comment>
</owl:Class>
<owl:Class rdf:about="#SpatialCapabilities">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The types of geometry and geometry operations supported by the web service.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="FeatureTypeName">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The name of the feature type that the user is interested in.</rdfs:comment>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
</owl:Class>
<owl:Class rdf:ID="DefaultSRS">
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The default spatial reference system for the feature type, used as a reference for the geometries of geographic
features.</rdfs:comment>
  <owl:equivalentClass>
    <owl:Class rdf:ID="SRS"/>
  </owl:equivalentClass>
</owl:Class>
<owl:Class rdf:ID="QueryPixelj">
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The pixel row to query.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="Delete">
  <rdfs:subClassOf>
    <owl:Class rdf:ID="FeatureTypeOperations"/>
  </rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:about="#BBox">
  <owl:disjointWith rdf:resource="#Intersect"/>
  <owl:disjointWith rdf:resource="#Overlaps"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Crosses"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Disjoint"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Contains"/>
  </owl:disjointWith>
  <rdfs:subClassOf>
    <owl:Class rdf:about="#SpatialOperators"/>
  </rdfs:subClassOf>

```



```

<owl:disjointWith>
  <owl:Class rdf:about="#Within"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#Touches"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#Equals"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#Beyond"/>
</owl:disjointWith>
</owl:Class>
<owl:Class rdf:ID="Range">
  <rdfs:subClassOf>
    <owl:Class rdf:ID="AllowedValues"/>
  </rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:ID="Unset">
  <rdfs:subClassOf>
    <owl:Class rdf:about="#FeatureTypeOperations"/>
  </rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:about="#Like">
  <owl:disjointWith rdf:resource="#LessThan"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#GreaterThanOrEqualTo"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#EqualTo"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#GreaterThan"/>
  </owl:disjointWith>
  <rdfs:subClassOf>
    <owl:Class rdf:about="#ComparisonOperators"/>
  </rdfs:subClassOf>
  <owl:disjointWith>
    <owl:Class rdf:about="#LessThanEqualTo"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Between"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#NullCheck"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#NotEqualTo"/>
  </owl:disjointWith>
</owl:Class>
<owl:Class rdf:ID="MetadataResource">
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >A resource that contains metadata for the element.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="Map">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The map generated in response to the GetMap request.</rdfs:comment>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
</owl:Class>

```

```

<owl:Class rdf:about="#Solid">
  <owl:disjointWith>
    <owl:Class rdf:about="#Tin"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Geodesic"/>
  </owl:disjointWith>
  <rdfs:subClassOf rdf:resource="#GeometryOperands"/>
  <owl:disjointWith rdf:resource="#Triangle"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#PolyhedralSurface"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#LineString"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Circle"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByCenterPoint"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Point"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Polygon"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Clothoid"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Arc"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#TriangulatedSurface"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByBulge"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#OffsetCurve"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#CubicSpline"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Bezier"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Envelope"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#CircleByCenterPoint"/>
  </owl:disjointWith>
</owl:Class>
<owl:Class rdf:ID="GMLContent">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >A chunk of GML content conforming to the specified format.</rdfs:comment>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    </owl:Restriction>
  </rdfs:subClassOf>

```

```

    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
</owl:Class>
<owl:Class rdf:ID="TotalFeaturesInserted">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >Reports the total number of features affected by some kind of write action (i.e, insert, update, delete).</rdfs:comment>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#integer</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
</owl:Class>
<owl:Class rdf:ID="WMSProfile">
  <rdfs:subClassOf>
    <owl:Class rdf:ID="Profile"/>
  </rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:ID="Name">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >A unique identifier (full qualified name including namespace) for the element for machine
  consumption.</rdfs:comment>
</owl:Class>
<owl:Class rdf:about="#Contains">
  <owl:disjointWith>
    <owl:Class rdf:about="#Touches"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Equals"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Intersect"/>
  <owl:disjointWith rdf:resource="#Overlaps"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Within"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Crosses"/>
  </owl:disjointWith>
  <rdfs:subClassOf>
    <owl:Class rdf:about="#SpatialOperators"/>
  </rdfs:subClassOf>
  <owl:disjointWith rdf:resource="#BBox"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Beyond"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Disjoint"/>
  </owl:disjointWith>
</owl:Class>

```

```

<owl:Class rdf:ID="Property">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The Property element is used to specify one or more properties of a feature whose values are to be retrieved by a Web
  Feature Service. While a Web Feature Service should endeavour to satisfy the exact request specified, in some instance this
  may not be possible. Specifically, a Web Feature Service must generate a valid GML3 response to a Query operation. The
  schema used to generate the output may include properties that are mandatory. In order that the output validates, these
  mandatory properties must be specified in the request. If they are not, a Web Feature Service may add them automatically
  to the Query before processing it. Thus a client application should, in general, be prepared to receive more properties than it
  requested. Of course, using the DescribeFeatureType request, a client application can determine which properties are
  mandatory and request them in the first place.</rdfs:comment>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
</owl:Class>
<owl:Class rdf:about="#Polygon">
  <owl:disjointWith>
    <owl:Class rdf:about="#PolyhedralSurface"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByBulge"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Circle"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#OffsetCurve"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByCenterPoint"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#CircleByCenterPoint"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Clothoid"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#LineString"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Solid"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Envelope"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#TriangulatedSurface"/>
  </owl:disjointWith>
  <rdfs:subClassOf rdf:resource="#GeometryOperands"/>
  <owl:disjointWith rdf:resource="#Triangle"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#CubicSpline"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Bezier"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Arc"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Geodesic"/>
  </owl:disjointWith>

```

```

</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#Point"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#Tin"/>
</owl:disjointWith>
</owl:Class>
<owl:Class rdf:ID="TimeStamp">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >http://www.w3.org/2001/XMLSchema#datetime</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >The timeStamp attribute should contain the date and time that the response was generated.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="DefaultValue">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >The default value for the quantity.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="DefaultDimensionValue">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >The default value to use for the dimension if it is unspecified.</rdfs:comment>
</owl:Class>
<owl:Class rdf:about="#LessThanEqualTo">
  <owl:disjointWith rdf:resource="#Like"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Between"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#LessThan"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#GreaterThan"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#NullCheck"/>
  </owl:disjointWith>
  <rdfs:subClassOf>
    <owl:Class rdf:about="#ComparisonOperators"/>
  </rdfs:subClassOf>
  <owl:disjointWith>
    <owl:Class rdf:about="#EqualTo"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#GreaterThanEqualTo"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#NotEqualTo"/>
  </owl:disjointWith>

```

```

</owl:Class>
<owl:Class rdf:ID="OtherSRS">
  <owl:equivalentClass>
    <owl:Class rdf:about="#SRS"/>
  </owl:equivalentClass>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >Available spatial reference systems for the feature type, used as a reference for the geometries of geographic
features.</rdfs:comment>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    </owl:Restriction>
  </rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:ID="ReferenceSystem">
  <rdfs:subClassOf>
    <owl:Class rdf:ID="ValuesUnit"/>
  </rdfs:subClassOf>
  <owl:disjointWith>
    <owl:Class rdf:ID="UnitOfMeasure"/>
  </owl:disjointWith>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >Identifier of the reference system of this set of values.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="GMLObjectID">
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The identifier for a GML object. A GetGmlObjectType element contains exactly one GmlObjectId. The value of the
gml:id attribute on that GmlObjectId is used as a unique key to retrieve the complex element with a gml:id attribute with
the same value.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="Not">
  <rdfs:subClassOf>
    <owl:Class rdf:ID="LogicalOperators"/>
  </rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:about="#NotEqualTo">
  <owl:disjointWith rdf:resource="#LessThanEqualTo"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Between"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#EqualTo"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#GreaterThanEqualTo"/>
  </owl:disjointWith>
  <rdfs:subClassOf>
    <owl:Class rdf:about="#ComparisonOperators"/>
  </rdfs:subClassOf>

```

```

<owl:disjointWith>
  <owl:Class rdf:about="#GreaterThan"/>
</owl:disjointWith>
<owl:disjointWith rdf:resource="#Like"/>
<owl:disjointWith rdf:resource="#LessThan"/>
<owl:disjointWith>
  <owl:Class rdf:about="#NullCheck"/>
</owl:disjointWith>
</owl:Class>
<owl:Class rdf:ID="GetGMLObject">
<rdfs:subClassOf>
  <owl:Class rdf:about="#FeatureTypeOperations"/>
</rdfs:subClassOf>
<rdfs:subClassOf>
  <owl:Class rdf:about="#WFSAtoomicProcess"/>
</rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:ID="PossibleValues"/>
<owl:Class rdf:ID="TraverseXLinkExpiry">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The traverseXlinkExpiry attribute value is specified in minutes. It indicates how long a Web Feature Service should
  wait to receive a response to a nested GetGmlObject request. This attribute is only relevant if a value is specified for the
  traverseXlinkDepth attribute.</rdfs:comment>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#positiveInteger</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
</owl:Class>
<owl:Class rdf:ID="ResultType">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The resultType attribute is used to indicate what response a WFS should return to user once a GetFeature request is
  processed. Possible values are: results - meaning that the full response set (i.e. all the feature instances) should be returned.
  hits - meaning that an empty response set should be returned (i.e. no feature instances should be returned) but the
  "numberOfFeatures" attribute should be set to the number of feature instances that would be returned.</rdfs:comment>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
</owl:Class>
<owl:Class rdf:ID="Query">
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
</owl:Class>
<owl:Class rdf:ID="Format">
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>

```

```

<rdf:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The outputFormat attribute is used to specify what schema description language should be used to describe features.
The default value of 'text/xml; subtype=3.1.1' means that the WFS must generate a GML3 application schema that can be
used to validate the GML3 output of a GetFeature request or feature instances specified in Transaction operations. For the
purposes of experimentation, vendor extension, or even extensions that serve a specific community of interest, other
acceptable output format values may be advertised by a WFS service in the capabilities document. The meaning of such
values is not defined in the WFS specification. The only proviso is such cases is that clients may safely ignore
outputFormat values that do not recognize.</rdf:comment>
</owl:Class>
<owl:Class rdf:about="#GreaterThanEqualTo">
<owl:disjointWith rdf:resource="#LessThanEqualTo"/>
<rdf:subClassOf>
<owl:Class rdf:about="#ComparisonOperators"/>
</rdf:subClassOf>
<owl:disjointWith>
<owl:Class rdf:about="#Between"/>
</owl:disjointWith>
<owl:disjointWith rdf:resource="#LessThan"/>
<owl:disjointWith>
<owl:Class rdf:about="#NullCheck"/>
</owl:disjointWith>
<owl:disjointWith rdf:resource="#Like"/>
<owl:disjointWith>
<owl:Class rdf:about="#EqualTo"/>
</owl:disjointWith>
<owl:disjointWith rdf:resource="#NotEqualTo"/>
<owl:disjointWith>
<owl:Class rdf:about="#GreaterThan"/>
</owl:disjointWith>
</owl:Class>
<owl:Class rdf:ID="Filter">
<rdf:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The Filter element is used to define spatial and/or non-spatial constraints on query. Spatial constrains use GML3 to
specify the constraining geometry. A full description of the Filter element can be found in the Filter Encoding
Implementation Specification.</rdf:comment>
<rdf:subClassOf>
<owl:Restriction>
<owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
<owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
</owl:Restriction>
</rdf:subClassOf>
<rdf:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
</owl:Class>
<owl:Class rdf:ID="QueryOperation">
<rdf:subClassOf>
<owl:Class rdf:about="#FeatureTypeOperations"/>
</rdf:subClassOf>
</owl:Class>
<owl:Class rdf:ID="Handle">
<rdf:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
<rdf:subClassOf>
<owl:Restriction>
<owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
<owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
</owl:Restriction>
</rdf:subClassOf>
<rdf:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
<rdf:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"

```


>The handle attribute allows a client application to assign a client-generated request identifier to a WFS request. The handle is included to facilitate error reporting. A WFS may report the handle in an exception report to identify the offending request or action. If the handle is not present, then the WFS may employ other means to localize the error (e.g. line numbers).</rdfs:comment>

```
</owl:Class>
<owl:Class rdf:about="#Crosses">
  <owl:disjointWith>
    <owl:Class rdf:about="#Beyond"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Within"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Contains"/>
  <owl:disjointWith rdf:resource="#Intersect"/>
  <rdfs:subClassOf>
    <owl:Class rdf:about="#SpatialOperators"/>
  </rdfs:subClassOf>
  <owl:disjointWith rdf:resource="#Overlaps"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Equals"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Disjoint"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Touches"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#BBox"/>
</owl:Class>
<owl:Class rdf:about="#Profile">
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Profile.owl#Profile"/>
</owl:Class>
<owl:Class rdf:about="#Arc">
  <owl:disjointWith>
    <owl:Class rdf:about="#Envelope"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Bezier"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Clothoid"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Tin"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#PolyhedralSurface"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Point"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Circle"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Triangle"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByCenterPoint"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#OffsetCurve"/>
  <owl:disjointWith rdf:resource="#Solid"/>
  <rdfs:subClassOf rdf:resource="#GeometryOperands"/>
  <owl:disjointWith rdf:resource="#Polygon"/>

```

```

<owl:disjointWith>
  <owl:Class rdf:about="#CubicSpline"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#Geodesic"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#LineString"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#ArcByBulge"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#CircleByCenterPoint"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#TriangulatedSurface"/>
</owl:disjointWith>
</owl:Class>
<owl:Class rdf:ID="ReturnNearbyValues">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >Boolean attribute indicating whether nearest value of the dimension will be returned in response to a request for a
  nearby value.</rdfs:comment>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >http://www.w3.org/2001/XMLSchema#boolean</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
</owl:Class>
<owl:Class rdf:ID="Height">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >http://www.w3.org/2001/XMLSchema#integer</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >The height of the image in pixels.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="MaxFeatures">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >The maxFeatures attribute is used to specify the maximum number of features that a GetFeature operation should
  generate (regardless of the actual number of query hits).</rdfs:comment>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >http://www.w3.org/2001/XMLSchema#positiveInteger</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
</owl:Class>
<owl:Class rdf:about="#SpatialOperators">
  <rdfs:subClassOf rdf:resource="#SpatialCapabilities"/>

```

```

</owl:Class>
<owl:Class rdf:ID="OgcHttpConstraint">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >A constraint that applies to the operation but not specifically to a parameter.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="Locator">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The locator attribute is used to locate an action within a &lt;Transaction&gt; element. The value of the locator attribute
  is either a string that is equal to the value of the handle attribute specified on an &lt;Insert&gt;, &lt;Update&gt; or
  &lt;Delete&gt; action. If a value is not specified for the handle attribute then a WFS may employ some other means of
  locating the action. For example, the value of the locator attribute may be an integer indicating the order of the action (i.e.
  1=First action, 2=Second action, etc.).</rdfs:comment>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
</owl:Class>
<owl:Class rdf:ID="Width">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#integer</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The width of the image in pixels.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="GetMap">
  <rdfs:subClassOf>
    <owl:Class rdf:ID="WMSAtomicProcess"/>
  </rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:ID="Domain">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The domain over which the constraint or parameter constraint applies.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="FeatureToLock">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The FeatureToLock element contains one or more Lock elements that define which features of a particular type should
  be locked. A lock identifier (lockId) is returned to the client application which can be used by subsequent operations to
  reference the locked features.</rdfs:comment>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
</owl:Class>
<owl:Class rdf:ID="Insert">
  <rdfs:subClassOf>
    <owl:Class rdf:about="#FeatureTypeOperations"/>
  </rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:ID="OgcHttpOperation">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >A class describing the HTTP operation that is the grounding for an OGC OWL-S atomic process.</rdfs:comment>
  <rdfs:subClassOf rdf:resource="http://www.w3.org/2002/07/owl#Thing"/>
  <rdfs:subClassOf>

```

```

<owl:Restriction>
  <owl:cardinality rdf:datatype="http://www.w3.org/2001/XMLSchema#int"
  >1</owl:cardinality>
  <owl:onProperty>
    <owl:FunctionalProperty rdf:ID="groundsAtomicProcess"/>
  </owl:onProperty>
</owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf>
  <owl:Restriction>
    <owl:onProperty>
      <owl:FunctionalProperty rdf:ID="name"/>
    </owl:onProperty>
    <owl:cardinality rdf:datatype="http://www.w3.org/2001/XMLSchema#int"
    >1</owl:cardinality>
  </owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf>
  <owl:Restriction>
    <owl:onProperty>
      <owl:ObjectProperty rdf:ID="hasConnectPoints"/>
    </owl:onProperty>
    <owl:minCardinality rdf:datatype="http://www.w3.org/2001/XMLSchema#int"
    >1</owl:minCardinality>
  </owl:Restriction>
</rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:ID="OgcHttpPost">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The URL that is used to invoke the web service operation with the http post request method.</rdfs:comment>
  <rdfs:subClassOf rdf:resource="#OgcHttpConnectPoints"/>
</owl:Class>
<owl:Class rdf:ID="ValuesReference">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:cardinality rdf:datatype="http://www.w3.org/2001/XMLSchema#int"
      >1</owl:cardinality>
      <owl:onProperty>
        <owl:FunctionalProperty rdf:about="#name"/>
      </owl:onProperty>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="#PossibleValues"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >A reference to a list of values at another location.</rdfs:comment>
</owl:Class>
<owl:Class rdf:about="#TriangulatedSurface">
  <owl:disjointWith>
    <owl:Class rdf:about="#PolyhedralSurface"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Geodesic"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#LineString"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByCenterPoint"/>
  </owl:disjointWith>
</owl:disjointWith>

```

```

    <owl:Class rdf:about="#ArcByBulge"/>
  </owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#Tin"/>
</owl:disjointWith>
<owl:disjointWith rdf:resource="#Polygon"/>
<owl:disjointWith>
  <owl:Class rdf:about="#Circle"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#Envelope"/>
</owl:disjointWith>
<rdfs:subClassOf rdf:resource="#GeometryOperands"/>
<owl:disjointWith rdf:resource="#OffsetCurve"/>
<owl:disjointWith>
  <owl:Class rdf:about="#CubicSpline"/>
</owl:disjointWith>
<owl:disjointWith rdf:resource="#Arc"/>
<owl:disjointWith>
  <owl:Class rdf:about="#Clothoid"/>
</owl:disjointWith>
<owl:disjointWith rdf:resource="#Solid"/>
<owl:disjointWith>
  <owl:Class rdf:about="#CircleByCenterPoint"/>
</owl:disjointWith>
<owl:disjointWith rdf:resource="#Bezier"/>
<owl:disjointWith rdf:resource="#Triangle"/>
<owl:disjointWith>
  <owl:Class rdf:about="#Point"/>
</owl:disjointWith>
</owl:Class>
<owl:Class rdf:ID="IdentifierGeneration">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The idgen attribute control how a WFS generates identifiers from newly created feature instances using the Insert
  action. The default action is to have the WFS generate a new id for the features. This is also backward compatible with
  WFS 1.0 where the only action was for the WFS to generate a new id.</rdfs:comment>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
</owl:Class>
<owl:Class rdf:ID="Queryable">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The layer may be queried using GetFeatureInfo.</rdfs:comment>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#boolean</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
</owl:Class>
<owl:Class rdf:ID="RequiredElevation">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"

```

```

>The elevation to be used to generate the data (i.e. it should be data that exists at the specified
elevation).</rdfs:comment>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
<rdfs:subClassOf>
  <owl:Restriction>
    <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:about="#AllowedValues">
<rdfs:subClassOf rdf:resource="#PossibleValues"/>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The list of valid values and/or ranges for the quantity.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="Transaction">
<rdfs:subClassOf>
  <owl:Class rdf:about="#WFSAutomaticProcess"/>
</rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:ID="LockID">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >The value of the lockId attribute is an identifier that a Web Feature Service generates when responding to a
    GetFeatureWithLock request. A client application can use this value in subsequent operations (such as a Transaction
    request) to reference the set of locked features.</rdfs:comment>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      </owl:Restriction>
    </rdfs:subClassOf>
  </owl:Class>
  <owl:Class rdf:ID="InsertElement">
    <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
    <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >The Insert element is used to indicate that the Web Feature Service should create a new instance of a feature type. The
      feature instance is specified using GML3 and one or more feature instances to be created can be contained inside the Insert
      element.</rdfs:comment>
  </owl:Class>
  <owl:Class rdf:ID="CurrentValues">
    <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >Boolean attribute valid only for temporal extents (i.e. if attribute name="time"). This attribute, if it either 1 or "true",
      indicates (a) that temporal data are normally kept current and (b) that the request parameter TIME may include the keyword
      "current"
      instead of an ending value (see C.4.1). Default = 0.</rdfs:comment>
    <rdfs:subClassOf>
      <owl:Restriction>
        <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
        <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
          >http://www.w3.org/2001/XMLSchema#boolean</owl:hasValue>
        </owl:Restriction>
      </rdfs:subClassOf>
    <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  </owl:Class>
</owl:Class rdf:ID="GetFeature">

```

```
<rdfs:subClassOf>
  <owl:Class rdf:about="#WFSAtomicProcess"/>
</rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:about="#Clothoid">
  <rdfs:subClassOf rdf:resource="#GeometryOperands"/>
  <owl:disjointWith rdf:resource="#Polygon"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#PolyhedralSurface"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#OffsetCurve"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Point"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Arc"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Tin"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#CircleByCenterPoint"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByCenterPoint"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#CubicSpline"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Circle"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#TriangulatedSurface"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Geodesic"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Solid"/>
  <owl:disjointWith rdf:resource="#Bezier"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Envelope"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#LineString"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByBulge"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Triangle"/>
</owl:Class>
<owl:Class rdf:about="#Point">
  <owl:disjointWith>
    <owl:Class rdf:about="#CircleByCenterPoint"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#TriangulatedSurface"/>
  <owl:disjointWith rdf:resource="#Solid"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Tin"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Triangle"/>
  <owl:disjointWith rdf:resource="#Arc"/>
  <owl:disjointWith rdf:resource="#Bezier"/>
  <owl:disjointWith>
```

```

    <owl:Class rdf:about="#CubicSpline"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Circle"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Clothoid"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Geodesic"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByBulge"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#PolyhedralSurface"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Envelope"/>
  </owl:disjointWith>
  <rdfs:subClassOf rdf:resource="#GeometryOperands"/>
  <owl:disjointWith rdf:resource="#OffsetCurve"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByCenterPoint"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Polygon"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#LineString"/>
  </owl:disjointWith>
</owl:Class>
<owl:Class rdf:ID="MetadataStandard">
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >The standard used to define the metadata (e.g. ISO 19115).</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="URI">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >A URI uniquely identifying the element.</rdfs:comment>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    </owl:Restriction>
  </rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:ID="MapRequest">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >The part of the map request from GetMap that is used in GetFeatureInfo.</rdfs:comment>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
</owl:Class>
<owl:Class rdf:ID="InputBox">
  <rdfs:subClassOf rdf:resource="#QueryModel"/>
</owl:Class>

```



```

<owl:Class rdf:ID="FID">
  <rdfs:subClassOf rdf:resource="#IdCapabilities"/>
</owl:Class>
<owl:Class rdf:ID="CheckBox">
  <rdfs:subClassOf rdf:resource="#QueryModel"/>
</owl:Class>
<owl:Class rdf:ID="And">
  <rdfs:subClassOf>
    <owl:Class rdf:about="#LogicalOperators"/>
  </rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:ID="RequiredTime">
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >The date and time to be used to generate the data (i.e. it should be data that was current at the specified
    time).</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="ReleaseAction">
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >The releaseAction attribute is used to control how a Web Feature service releases locks on feature instances after a
    Transaction request has been processed. Valid values are ALL or SOME. A value of ALL means that the Web Feature
    Service should release the locks of all feature instances locked with the specified lockId regardless of whether or not the
    features were actually modified. A value of SOME means that the Web Feature Service will only release the locks held on
    feature instances that were actually operated upon by the transaction. The lockId that the client application obtained shall
    remain valid and the other, unmodified, feature instances shall remain locked. If the expiry attribute was specified in the
    original operation that locked the feature instances, then the expiry counter will be reset to give the client application that
    same amount of time to post subsequent transactions against the locked features.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="PropertyValue">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >The Value element contains the replacement value for the named property.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="Opaque">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"

```

```

    >http://www.w3.org/2001/XMLSchema#boolean</owl:hasValue>
    <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
  </owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The layer fills most of the area and can be considered opaque for display purposes (if this is false, it may contain
significant gaps so may be suitable for overlay).</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="Functions">
  <rdfs:subClassOf rdf:resource="#ArithmeticOperators"/>
</owl:Class>
<owl:Class rdf:ID="TraverseXLinkDepth">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >This attribute indicates the depth to which nested property XLink linking element locator attribute (href) XLinks are
traversed and resolved if possible. A value of "1" indicates that one linking element locator attribute (href) XLink will be
traversed and the referenced element returned if possible, but nested property XLink linking element locator attribute (href)
XLinks in the returned element are not traversed. A value of "*" indicates that all nested property XLink linking element
locator attribute (href) XLinks will be traversed and the referenced elements returned if possible. The range of valid values
for this attribute consists of positive integers plus "*". If this attribute is not specified then no xlinks shall be resolved and
the value of traverseXlinkExpiry attribute (if it specified) may be ignored.</rdfs:comment>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
</owl:Class>
<owl:Class rdf:about="#LineString">
  <owl:disjointWith rdf:resource="#Polygon"/>
  <owl:disjointWith rdf:resource="#Triangle"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Tin"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#OffsetCurve"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#PolyhedralSurface"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#TriangulatedSurface"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByBulge"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Bezier"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#CubicSpline"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Envelope"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Arc"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Circle"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Clothoid"/>
  <owl:disjointWith rdf:resource="#Point"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#CircleByCenterPoint"/>
  </owl:disjointWith>

```

```

<owl:disjointWith>
  <owl:Class rdf:about="#ArcByCenterPoint"/>
</owl:disjointWith>
<owl:disjointWith rdf:resource="#Solid"/>
<rdfs:subClassOf rdf:resource="#GeometryOperands"/>
<owl:disjointWith>
  <owl:Class rdf:about="#Geodesic"/>
</owl:disjointWith>
</owl:Class>
<owl:Class rdf:ID="BackgroundTransparency">
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
<rdfs:subClassOf>
  <owl:Restriction>
    <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#boolean</owl:hasValue>
  </owl:Restriction>
</rdfs:subClassOf>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The background transparency of the map.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="FeaturesNotLocked">
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >In contrast to the FeaturesLocked element, the FeaturesNotLocked element contains a list of ogc:Filter elements
    identifying feature instances that a WFS did not manage to lock because they were already locked by another
    process.</rdfs:comment>
</owl:Class>
<owl:Class rdf:about="#Between">
  <owl:disjointWith>
    <owl:Class rdf:about="#NullCheck"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#GreaterThan"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#NotEqualTo"/>
  <owl:disjointWith rdf:resource="#GreaterThanEqualTo"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#EqualTo"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#LessThanEqualTo"/>
  <rdfs:subClassOf>
    <owl:Class rdf:about="#ComparisonOperators"/>
  </rdfs:subClassOf>
  <owl:disjointWith rdf:resource="#Like"/>
  <owl:disjointWith rdf:resource="#LessThan"/>
</owl:Class>
<owl:Class rdf:about="#ComparisonOperators">
  <rdfs:subClassOf rdf:resource="#ScalarCapabilities"/>
</owl:Class>
<owl:Class rdf:about="#Equals">
  <rdfs:subClassOf rdf:resource="#SpatialOperators"/>
  <owl:disjointWith rdf:resource="#BBBox"/>
  <owl:disjointWith rdf:resource="#Contains"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Disjoint"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Intersect"/>
  <owl:disjointWith rdf:resource="#Crosses"/>

```

```

<owl:disjointWith rdf:resource="#Overlaps"/>
<owl:disjointWith>
  <owl:Class rdf:about="#Touches"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#Beyond"/>
</owl:disjointWith>
<owl:disjointWith>
  <owl:Class rdf:about="#Within"/>
</owl:disjointWith>
</owl:Class>
<owl:Class rdf:about="#Geodesic">
  <owl:disjointWith rdf:resource="#OffsetCurve"/>
  <owl:disjointWith rdf:resource="#TriangulatedSurface"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Tin"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Solid"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Circle"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Bezier"/>
  <owl:disjointWith rdf:resource="#Polygon"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#CubicSpline"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Triangle"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#CircleByCenterPoint"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByCenterPoint"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Clothoid"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Envelope"/>
  </owl:disjointWith>
  <rdfs:subClassOf rdf:resource="#GeometryOperands"/>
  <owl:disjointWith rdf:resource="#LineString"/>
  <owl:disjointWith rdf:resource="#Point"/>
  <owl:disjointWith rdf:resource="#Arc"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByBulge"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#PolyhedralSurface"/>
  </owl:disjointWith>
</owl:Class>
<owl:Class rdf:about="#FeatureTypeOperations">
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
</owl:Class>
<owl:Class rdf:ID="FeatureCollection">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string">
        http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>

```

```

    <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >This element is a container for the response to a GetFeature or GetFeatureWithLock (WFS-transaction.xsd) or
    GetFeatureInfo request.</rdfs:comment>
  </owl:Class>
  <owl:Class rdf:ID="Title">
    <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >A human readable title for the element.</rdfs:comment>
    <rdfs:subClassOf>
      <owl:Restriction>
        <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
        <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      </owl:Restriction>
    </rdfs:subClassOf>
    <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  </owl:Class>
  <owl:Class rdf:ID="DataType">
    <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >Reference to the data type of the set of values.</rdfs:comment>
  </owl:Class>
  <owl:Class rdf:about="#NullCheck">
    <owl:disjointWith rdf:resource="#GreaterThan"/>
    <owl:disjointWith rdf:resource="#LessThan"/>
    <owl:disjointWith>
      <owl:Class rdf:about="#EqualTo"/>
    </owl:disjointWith>
    <owl:disjointWith>
      <owl:Class rdf:about="#GreaterThan"/>
    </owl:disjointWith>
    <owl:disjointWith rdf:resource="#NotEqualTo"/>
    <owl:disjointWith rdf:resource="#Like"/>
    <rdfs:subClassOf rdf:resource="#ComparisonOperators"/>
    <owl:disjointWith rdf:resource="#Between"/>
    <owl:disjointWith rdf:resource="#LessThanEqualTo"/>
  </owl:Class>
  <owl:Class rdf:ID="GetCapabilities">
    <rdfs:subClassOf>
      <owl:Class rdf:about="#WFSAtomicProcess"/>
    </rdfs:subClassOf>
    <rdfs:subClassOf>
      <owl:Class rdf:about="#WMSAtomicProcess"/>
    </rdfs:subClassOf>
  </owl:Class>
  <owl:Class rdf:ID="FeaturesLocked">
    <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
    <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >The LockFeature or GetFeatureWithLock operations identify and attempt to lock a set of feature instances that satisfy
    the constraints specified in the request. In the event that the lockAction attribute (on the LockFeature or
    GetFeatureWithLock elements) is set to SOME, a Web Feature Service will attempt to lock as many of the feature
    instances from the result set as possible. The FeaturesLocked element contains list of ogc:FeatureId elements enumerating
    the feature instances that a WFS actually managed to lock.</rdfs:comment>
  </owl:Class>
  <owl:Class rdf:ID="UpdateElement">
    <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >One or more existing feature instances can be changed by using the Update element.</rdfs:comment>
    <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
  </owl:Class>
  <owl:Class rdf:about="#EqualTo">
    <owl:disjointWith rdf:resource="#LessThanEqualTo"/>
    <owl:disjointWith>

```

```

    <owl:Class rdf:about="#GreaterThan"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#NullCheck"/>
  <owl:disjointWith rdf:resource="#Between"/>
  <owl:disjointWith rdf:resource="#NotEqualTo"/>
  <owl:disjointWith rdf:resource="#Like"/>
  <rdfs:subClassOf rdf:resource="#ComparisonOperators"/>
  <owl:disjointWith rdf:resource="#LessThan"/>
  <owl:disjointWith rdf:resource="#GreaterThanEqualTo"/>
</owl:Class>
<owl:Class rdf:ID="FeatureType">
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The Feature Type or GML Object Type used by a web service.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="Attribution">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >Attribution indicates the provider of a Layer or collection of Layers. The provider's URL, descriptive title string, and/or
  logo image URL may be supplied. Client applications may choose to display one or more of these items. A format element
  indicates the MIME type of the logo image located at LogoURL. The logo image's width and height assist client
  applications in laying out space to display the logo.</rdfs:comment>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
</owl:Class>
<owl:Class rdf:about="#CircleByCenterPoint">
  <owl:disjointWith>
    <owl:Class rdf:about="#PolyhedralSurface"/>
  </owl:disjointWith>
  <rdfs:subClassOf rdf:resource="#GeometryOperands"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#CubicSpline"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByCenterPoint"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Envelope"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Bezier"/>
  <owl:disjointWith rdf:resource="#Clothoid"/>
  <owl:disjointWith rdf:resource="#Triangle"/>
  <owl:disjointWith rdf:resource="#Polygon"/>
  <owl:disjointWith rdf:resource="#Solid"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByBulge"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#OffsetCurve"/>
  <owl:disjointWith rdf:resource="#Arc"/>
  <owl:disjointWith rdf:resource="#Point"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Circle"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#LineString"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Tin"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#TriangulatedSurface"/>
  <owl:disjointWith rdf:resource="#Geodesic"/>
</owl:Class>
<owl:Class rdf:ID="FeatureVersion">
  <rdfs:subClassOf>

```

```

<owl:Restriction>
  <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
  <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
</owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >For systems that implement versioning, the featureVersion attribute is used to specify which version of a particular
feature instance is to be retrieved. A value of ALL means that all versions should be retrieved. An integer value 'i', means
that the ith version should be retrieve if it exists or the most recent version otherwise.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="BackgroundColour">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >A hexadecimal value indicating the required background colour.</rdfs:comment>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:ID="Or">
  <rdfs:subClassOf>
    <owl:Class rdf:about="#LogicalOperators"/>
  </rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:ID="Lock">
  <rdfs:subClassOf rdf:resource="#FeatureTypeOperations"/>
</owl:Class>
<owl:Class rdf:about="#Disjoint">
  <rdfs:subClassOf rdf:resource="#SpatialOperators"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Within"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Beyond"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Intersect"/>
  <owl:disjointWith rdf:resource="#Crosses"/>
  <owl:disjointWith rdf:resource="#Contains"/>
  <owl:disjointWith rdf:resource="#BBox"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Touches"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Equals"/>
  <owl:disjointWith rdf:resource="#Overlaps"/>
</owl:Class>
<owl:Class rdf:ID="NotSubsettable">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >http://www.w3.org/2001/XMLSchema#boolean</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>

```

```

<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The layer may only be displayed in its entirety. Parts of the map may not be displayed.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="CapabilitiesResponse">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >XML encoded WFS GetCapabilities operation response. This document provides clients with service metadata about a
  specific service instance, including metadata about the tightly-coupled data served. If the server does not implement the
  updateSequence parameter, the server shall always return the complete Capabilities document, without the updateSequence
  parameter. When the server implements the updateSequence parameter and the GetCapabilities operation request included
  the updateSequence parameter with the current value, the server shall return this element with only the "version" and
  "updateSequence" attributes. Otherwise, all optional elements shall be included or not depending on the actual value of the
  Contents parameter in the GetCapabilities operation request.</rdfs:comment>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
</owl:Class>
<owl:Class rdf:ID="RadioButton">
  <rdfs:subClassOf rdf:resource="#QueryModel"/>
</owl:Class>
<owl:Class rdf:about="#Touches">
  <owl:disjointWith rdf:resource="#Intersect"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Beyond"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Equals"/>
  <rdfs:subClassOf rdf:resource="#SpatialOperators"/>
  <owl:disjointWith rdf:resource="#BBBox"/>
  <owl:disjointWith rdf:resource="#Crosses"/>
  <owl:disjointWith rdf:resource="#Contains"/>
  <owl:disjointWith rdf:resource="#Overlaps"/>
  <owl:disjointWith rdf:resource="#Disjoint"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Within"/>
  </owl:disjointWith>
</owl:Class>
<owl:Class rdf:ID="Identifier">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >An identifier for the layer, assigned by some authority as indicated in AuthorityID (for example, a category from the
  Global Change Master Directory).</rdfs:comment>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#integer</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
</owl:Class>
<owl:Class rdf:ID="Service">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty>
        <owl:FunctionalProperty rdf:ID="serviceType"/>
      </owl:onProperty>
      <owl:cardinality rdf:datatype="http://www.w3.org/2001/XMLSchema#int"

```



```

    >1</owl:cardinality>
  </owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf>
  <owl:Restriction>
    <owl:onProperty>
      <owl:FunctionalProperty rdf:ID="sourceDocVersion"/>
    </owl:onProperty>
    <owl:cardinality rdf:datatype="http://www.w3.org/2001/XMLSchema#int"
      >1</owl:cardinality>
    </owl:Restriction>
  </rdfs:subClassOf>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Service.owl#Service"/>
</owl:Class>
<owl:Class rdf:about="#WFSAtomicProcess">
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#AtomicProcess"/>
</owl:Class>
<owl:Class rdf:ID="OgcHttpGrounding">
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Service.owl#ServiceGrounding"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >An OGCHttpGrounding is a collection of OGCAAtomicProcessGrounding instances, one for each atomic process in the
    process model.</rdfs:comment>
</owl:Class>
<owl:Class rdf:about="#LogicalOperators">
  <rdfs:subClassOf rdf:resource="#ScalarCapabilities"/>
</owl:Class>
<owl:Class rdf:about="#ArcByBulge">
  <owl:disjointWith rdf:resource="#Polygon"/>
  <owl:disjointWith rdf:resource="#Triangle"/>
  <owl:disjointWith rdf:resource="#Arc"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Envelope"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Clothoid"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Tin"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Bezier"/>
  <rdfs:subClassOf rdf:resource="#GeometryOperands"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByCenterPoint"/>
  </owl:disjointWith>
  <owl:disjointWith>
    <owl:Class rdf:about="#Circle"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#TriangulatedSurface"/>
  <owl:disjointWith rdf:resource="#Solid"/>
  <owl:disjointWith rdf:resource="#LineString"/>
  <owl:disjointWith rdf:resource="#Geodesic"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#PolyhedralSurface"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Point"/>
  <owl:disjointWith rdf:resource="#CircleByCenterPoint"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#CubicSpline"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#OffsetCurve"/>
</owl:Class>
<owl:Class rdf:ID="Meaning">

```

```

<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The meaning or semantics of the quantity.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="QueryPixel">
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The pixel column to query.</rdfs:comment>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
</owl:Class>
<owl:Class rdf:ID="SimpleArithmetic">
<rdfs:subClassOf rdf:resource="#ArithmeticOperators"/>
</owl:Class>
<owl:Class rdf:ID="EID">
<rdfs:subClassOf rdf:resource="#IdCapabilities"/>
</owl:Class>
<owl:Class rdf:ID="Logo">
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The logo of a supplier that may be displayed by the client.</rdfs:comment>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
</owl:Class>
<owl:Class rdf:about="#Envelope">
<owl:disjointWith rdf:resource="#Arc"/>
<owl:disjointWith rdf:resource="#Solid"/>
<owl:disjointWith>
<owl:Class rdf:about="#Tin"/>
</owl:disjointWith>
<owl:disjointWith rdf:resource="#Clothoid"/>
<owl:disjointWith rdf:resource="#Geodesic"/>
<rdfs:subClassOf rdf:resource="#GeometryOperands"/>
<owl:disjointWith rdf:resource="#TriangulatedSurface"/>
<owl:disjointWith>
<owl:Class rdf:about="#Circle"/>
</owl:disjointWith>
<owl:disjointWith rdf:resource="#CircleByCenterPoint"/>
<owl:disjointWith rdf:resource="#Point"/>
<owl:disjointWith rdf:resource="#Polygon"/>
<owl:disjointWith rdf:resource="#ArcByBulge"/>
<owl:disjointWith>
<owl:Class rdf:about="#ArcByCenterPoint"/>
</owl:disjointWith>
<owl:disjointWith>
<owl:Class rdf:about="#PolyhedralSurface"/>
</owl:disjointWith>
<owl:disjointWith>
<owl:Class rdf:about="#CubicSpline"/>
</owl:disjointWith>
<owl:disjointWith rdf:resource="#OffsetCurve"/>
<owl:disjointWith rdf:resource="#Triangle"/>
<owl:disjointWith rdf:resource="#LineString"/>
<owl:disjointWith rdf:resource="#Bezier"/>
</owl:Class>
<owl:Class rdf:ID="SortBy">
<rdfs:subClassOf>
<owl:Restriction>
<owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
<owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
</owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"

```

>The SortBy element is used specify property names whose values should be used to order (upon presentation) the set of feature instances that satisfy the query.</rdfs:comment>

```
</owl:Class>
<owl:Class rdf:ID="MinimumScaleDenominator">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >Minimum scale denominator for which it is appropriate to display this layer.</rdfs:comment>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#float</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
</owl:Class>
<owl:Class rdf:ID="XLinkProperty">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
</owl:Class>
<owl:Class rdf:about="#Beyond">
  <rdfs:subClassOf rdf:resource="#SpatialOperators"/>
  <owl:disjointWith rdf:resource="#Intersect"/>
  <owl:disjointWith rdf:resource="#Disjoint"/>
  <owl:disjointWith rdf:resource="#Touches"/>
  <owl:disjointWith rdf:resource="#Contains"/>
  <owl:disjointWith rdf:resource="#Equals"/>
  <owl:disjointWith rdf:resource="#BBBox"/>
  <owl:disjointWith rdf:resource="#Overlaps"/>
  <owl:disjointWith rdf:resource="#Crosses"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Within"/>
  </owl:disjointWith>
</owl:Class>
<owl:Class rdf:about="#PolyhedralSurface">
  <owl:disjointWith>
    <owl:Class rdf:about="#CubicSpline"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Polygon"/>
  <owl:disjointWith rdf:resource="#ArcByBulge"/>
  <rdfs:subClassOf rdf:resource="#GeometryOperands"/>
  <owl:disjointWith rdf:resource="#CircleByCenterPoint"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Tin"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Point"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#Circle"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#OffsetCurve"/>
  <owl:disjointWith>
    <owl:Class rdf:about="#ArcByCenterPoint"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#Bezier"/>
  <owl:disjointWith rdf:resource="#Envelope"/>
```

```

<owl:disjointWith rdf:resource="#Triangle"/>
<owl:disjointWith rdf:resource="#Arc"/>
<owl:disjointWith rdf:resource="#TriangulatedSurface"/>
<owl:disjointWith rdf:resource="#Solid"/>
<owl:disjointWith rdf:resource="#LineString"/>
<owl:disjointWith rdf:resource="#Clothoid"/>
<owl:disjointWith rdf:resource="#Geodesic"/>
</owl:Class>
<owl:Class rdf:about="#Circle">
<owl:disjointWith rdf:resource="#Solid"/>
<rdfs:subClassOf rdf:resource="#GeometryOperands"/>
<owl:disjointWith>
  <owl:Class rdf:about="#ArcByCenterPoint"/>
</owl:disjointWith>
<owl:disjointWith rdf:resource="#OffsetCurve"/>
<owl:disjointWith>
  <owl:Class rdf:about="#CubicSpline"/>
</owl:disjointWith>
<owl:disjointWith rdf:resource="#CircleByCenterPoint"/>
<owl:disjointWith rdf:resource="#TriangulatedSurface"/>
<owl:disjointWith rdf:resource="#Polygon"/>
<owl:disjointWith rdf:resource="#ArcByBulge"/>
<owl:disjointWith rdf:resource="#Point"/>
<owl:disjointWith rdf:resource="#PolyhedralSurface"/>
<owl:disjointWith>
  <owl:Class rdf:about="#Tin"/>
</owl:disjointWith>
<owl:disjointWith rdf:resource="#Triangle"/>
<owl:disjointWith rdf:resource="#Arc"/>
<owl:disjointWith rdf:resource="#Bezier"/>
<owl:disjointWith rdf:resource="#LineString"/>
<owl:disjointWith rdf:resource="#Envelope"/>
<owl:disjointWith rdf:resource="#Geodesic"/>
<owl:disjointWith rdf:resource="#Clothoid"/>
</owl:Class>
<owl:Class rdf:about="#GreaterThan">
<owl:disjointWith rdf:resource="#LessThan"/>
<owl:disjointWith rdf:resource="#EqualTo"/>
<owl:disjointWith rdf:resource="#Between"/>
<rdfs:subClassOf rdf:resource="#ComparisonOperators"/>
<owl:disjointWith rdf:resource="#NotEqualTo"/>
<owl:disjointWith rdf:resource="#NullCheck"/>
<owl:disjointWith rdf:resource="#Like"/>
<owl:disjointWith rdf:resource="#LessThanEqualTo"/>
<owl:disjointWith rdf:resource="#GreaterThanEqualTo"/>
</owl:Class>
<owl:Class rdf:ID="MultipleRequestableValues">
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>Boolean attribute indicating whether multiple values of the dimension may be requested.</rdfs:comment>
<rdfs:subClassOf>
  <owl:Restriction>
    <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >http://www.w3.org/2001/XMLSchema#boolean</owl:hasValue>
    <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
  </owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
</owl:Class>
<owl:Class rdf:ID="Version">
<rdfs:subClassOf>

```

```

<owl:Restriction>
  <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
  <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
</owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The version attribute is used to indicate the version of the specification that a request conforms to. If the version
attribute is not specified then the service should assume that the request conforms to greatest available specification
version.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="AnyValue">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >Specifies that any value is allowed for this quantity. The class has no content - it's existence indicates that the quantity
can have any value.</rdfs:comment>
  <rdfs:subClassOf rdf:resource="#PossibleValues"/>
</owl:Class>
<owl:Class rdf:ID="ExceptionsFormat">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The format to be used for error reporting. XML is the default.</rdfs:comment>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    </owl:Restriction>
  </rdfs:subClassOf>
</owl:Class>
<owl:Class rdf:about="#Within">
  <owl:disjointWith rdf:resource="#Touches"/>
  <owl:disjointWith rdf:resource="#Disjoint"/>
  <owl:disjointWith rdf:resource="#Beyond"/>
  <owl:disjointWith rdf:resource="#Intersect"/>
  <owl:disjointWith rdf:resource="#BBox"/>
  <owl:disjointWith rdf:resource="#Crosses"/>
  <owl:disjointWith rdf:resource="#Contains"/>
  <owl:disjointWith rdf:resource="#Equals"/>
  <owl:disjointWith rdf:resource="#Overlaps"/>
  <rdfs:subClassOf rdf:resource="#SpatialOperators"/>
</owl:Class>
<owl:Class rdf:ID="ServiceProvider">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The organisation providing the web service.</rdfs:comment>
</owl:Class>
<owl:Class rdf:about="#Tin">
  <owl:disjointWith>
    <owl:Class rdf:about="#CubicSpline"/>
  </owl:disjointWith>
  <owl:disjointWith rdf:resource="#PolyhedralSurface"/>
  <owl:disjointWith rdf:resource="#Circle"/>
  <owl:disjointWith rdf:resource="#OffsetCurve"/>
  <owl:disjointWith rdf:resource="#Point"/>
  <owl:disjointWith rdf:resource="#Triangle"/>
  <owl:disjointWith rdf:resource="#LineString"/>
  <owl:disjointWith rdf:resource="#Envelope"/>
  <owl:disjointWith rdf:resource="#Solid"/>
  <rdfs:subClassOf rdf:resource="#GeometryOperands"/>

```

```

<owl:disjointWith rdf:resource="#CircleByCenterPoint"/>
<owl:disjointWith>
  <owl:Class rdf:about="#ArcByCenterPoint"/>
</owl:disjointWith>
<owl:disjointWith rdf:resource="#Geodesic"/>
<owl:disjointWith rdf:resource="#TriangulatedSurface"/>
<owl:disjointWith rdf:resource="#ArcByBulge"/>
<owl:disjointWith rdf:resource="#Clothoid"/>
<owl:disjointWith rdf:resource="#Arc"/>
<owl:disjointWith rdf:resource="#Bezier"/>
<owl:disjointWith rdf:resource="#Polygon"/>
</owl:Class>
<owl:Class rdf:about="#ArcByCenterPoint">
<owl:disjointWith rdf:resource="#OffsetCurve"/>
<owl:disjointWith rdf:resource="#ArcByBulge"/>
<owl:disjointWith>
  <owl:Class rdf:about="#CubicSpline"/>
</owl:disjointWith>
<owl:disjointWith rdf:resource="#Tin"/>
<owl:disjointWith rdf:resource="#TriangulatedSurface"/>
<owl:disjointWith rdf:resource="#Polygon"/>
<owl:disjointWith rdf:resource="#Solid"/>
<rdfs:subClassOf rdf:resource="#GeometryOperands"/>
<owl:disjointWith rdf:resource="#Arc"/>
<owl:disjointWith rdf:resource="#Bezier"/>
<owl:disjointWith rdf:resource="#CircleByCenterPoint"/>
<owl:disjointWith rdf:resource="#Circle"/>
<owl:disjointWith rdf:resource="#PolyhedralSurface"/>
<owl:disjointWith rdf:resource="#LineString"/>
<owl:disjointWith rdf:resource="#Triangle"/>
<owl:disjointWith rdf:resource="#Geodesic"/>
<owl:disjointWith rdf:resource="#Clothoid"/>
<owl:disjointWith rdf:resource="#Envelope"/>
<owl:disjointWith rdf:resource="#Point"/>
</owl:Class>
<owl:Class rdf:about="#UnitOfMeasure">
<owl:disjointWith rdf:resource="#ReferenceSystem"/>
<rdfs:subClassOf>
  <owl:Class rdf:about="#ValuesUnit"/>
</rdfs:subClassOf>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>Identifieir of the unit of measure of this set of values.</rdfs:comment>
</owl:Class>
<owl:Class rdf:about="#WMSAtomicProcess">
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#AtomicProcess"/>
</owl:Class>
<owl:Class rdf:ID="Exception">
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The Exception element reports an exception code and exception message indicating why the corresponding action of a
transaction request failed.</rdfs:comment>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
</owl:Class>
<owl:Class rdf:ID="MaximumScaleDenominator">
<rdfs:subClassOf>
  <owl:Restriction>
    <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>http://www.w3.org/2001/XMLSchema#float</owl:hasValue>
  </owl:Restriction>
</rdfs:subClassOf>

```

```

<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>Maximum scale denominator for which it is appropriate to display this layer.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="ServiceType">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The service attribute is included to support service endpoints that implement more than one OGC service. For example,
  a single CGI that implements WMS, WFS and WCS services. The endpoint can inspect the value of this attribute to figure
  out which service should process the request. The value WFS indicates that a web feature service should process the
  request. This parameter is somewhat redundant in the XML encoding since the request namespace can be used to determine
  which service should process any give request. For example, wfs:GetCapabilities and easily be distinguished from
  wcs:GetCapabilities using the namespaces.</rdfs:comment>
  <rdfs:subClassOf>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Restriction>
          <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterValue"/>
          <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
          >WFS</owl:hasValue>
        </owl:Restriction>
        <owl:Restriction>
          <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
          >WMS</owl:hasValue>
          <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterValue"/>
        </owl:Restriction>
      </owl:unionOf>
    </owl:Class>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
</owl:Class>
<owl:Class rdf:about="#ValuesUnit">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >Indicates that this quantity has units or a reference system, and provides the values used.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="DomainMetadata">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >Reference to metadata about the domain.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="Function">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >A function may be used as a select item in a query. However, if a function is used, care must be taken to ensure that the
  result type matches the type in the &lt;rest missing from spec>&gt;.</rdfs:comment>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
</owl:Class>
<owl:Class rdf:about="#SRS">
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
  <rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
      <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
    </owl:Restriction>
  </rdfs:subClassOf>

```

```

</rdfs:subClassOf>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>A recognised spatial reference system used as a reference for the geometries of geographic features.</rdfs:comment>
<owl:equivalentClass rdf:resource="#DefaultSRS"/>
<owl:equivalentClass rdf:resource="#OtherSRS"/>
</owl:Class>
<owl:Class rdf:ID="Message">
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
<rdfs:subClassOf>
<owl:Restriction>
<owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
<owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
</owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>If an action fails, the message element may be used to supply an exception message.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="LockAction">
<rdfs:subClassOf>
<owl:Restriction>
<owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
<owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
</owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The lockAction attribute is used to indicate what a Web Feature Service should do when it encounters a feature instance
that has already been locked by another client application. Valid values are ALL or SOME. ALL means that the Web
Feature Service must acquire locks on all the requested feature instances. If it cannot acquire those locks then the request
should fail. In this instance, all locks acquired by the operation should be released. SOME means that the Web Feature
Service should lock as many of the requested features as it can.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="OgcHttpParameter">
<rdfs:subClassOf rdf:resource="http://www.w3.org/2002/07/owl#Thing"/>
<rdfs:subClassOf>
<owl:Restriction>
<owl:cardinality rdf:datatype="http://www.w3.org/2001/XMLSchema#int"
>1</owl:cardinality>
<owl:onProperty>
<owl:FunctionalProperty rdf:about="#name"/>
</owl:onProperty>
</owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf>
<owl:Restriction>
<owl:cardinality rdf:datatype="http://www.w3.org/2001/XMLSchema#int"
>1</owl:cardinality>
<owl:onProperty>
<owl:ObjectProperty rdf:ID="groundsAbstractParameter"/>
</owl:onProperty>
</owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf>
<owl:Restriction>
<owl:onProperty>
<owl:FunctionalProperty rdf:ID="hasQueryModel"/>
</owl:onProperty>

```



```

    <owl:maxCardinality rdf:datatype="http://www.w3.org/2001/XMLSchema#int"
    >1</owl:maxCardinality>
  </owl:Restriction>
</rdfs:subClassOf>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The parameter, used to express constraints on parameter values that apply to the particular web service implementation
(as opposed to the general set of inputs and outputs that are permitted), and directions for querying. The query model is
used by an application in combination with the Domain (for example specifying constraints on the value or datatype that
the parameter can have) to solicit user input before constructing the request.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="NoValue">
  <rdfs:subClassOf rdf:resource="#PossibleValues"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>Specifies that no value is allowed for this quantity. The class has no content - it's existence indicates that the quantity
can have no value.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="DeleteElement">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The Delete element is used to indicate that one or more feature instances should be removed from the feature
repository.</rdfs:comment>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Input"/>
</owl:Class>
<owl:Class rdf:ID="GetFeatureInfo">
  <rdfs:subClassOf rdf:resource="#WMSAtomicProcess"/>
</owl:Class>
<owl:Class rdf:ID="Value">
  <rdfs:subClassOf rdf:resource="#AllowedValues"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>An actual allowed value for the parameter.</rdfs:comment>
</owl:Class>
<owl:Class rdf:about="#CubicSpline">
  <owl:disjointWith rdf:resource="#Circle"/>
  <owl:disjointWith rdf:resource="#Triangle"/>
  <owl:disjointWith rdf:resource="#ArcByCenterPoint"/>
  <owl:disjointWith rdf:resource="#OffsetCurve"/>
  <owl:disjointWith rdf:resource="#Solid"/>
  <owl:disjointWith rdf:resource="#Point"/>
  <owl:disjointWith rdf:resource="#PolyhedralSurface"/>
  <owl:disjointWith rdf:resource="#Arc"/>
  <owl:disjointWith rdf:resource="#Bezier"/>
  <owl:disjointWith rdf:resource="#Clothoid"/>
  <owl:disjointWith rdf:resource="#Envelope"/>
  <owl:disjointWith rdf:resource="#Polygon"/>
  <owl:disjointWith rdf:resource="#TriangulatedSurface"/>
  <owl:disjointWith rdf:resource="#Geodesic"/>
  <owl:disjointWith rdf:resource="#CircleByCenterPoint"/>
  <owl:disjointWith rdf:resource="#ArcByBulge"/>
  <owl:disjointWith rdf:resource="#LineString"/>
  <owl:disjointWith rdf:resource="#Tin"/>
  <rdfs:subClassOf rdf:resource="#GeometryOperands"/>
</owl:Class>
<owl:Class rdf:ID="WFSPProfile">
  <rdfs:subClassOf rdf:resource="#Profile"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>This subclass of Profile is created because the OGC web services include a range of operations that are often different
in flavour and certainly different in their inputs and outputs. However, there are still a number of generic properties that
apply to all operation profiles, and these are included at the Profile level.</rdfs:comment>
</owl:Class>
<owl:Class rdf:ID="Extent">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"

```

```

>Text content indicating available value(s) for dimension.</rdfs:comment>
<rdfs:subClassOf>
  <owl:Restriction>
    <owl:onProperty rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#parameterType"/>
    <owl:hasValue rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >http://www.w3.org/2001/XMLSchema#string</owl:hasValue>
  </owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Output"/>
</owl:Class>
<owl:ObjectProperty rdf:ID="hasLayerComponent">
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#Name"/>
        <owl:Class rdf:about="#Title"/>
        <owl:Class rdf:about="#Abstract"/>
        <owl:Class rdf:about="#SRS"/>
        <rdf:Description rdf:about="http://compass.edina.ac.uk/ontologies/owlcsw.owl#BoundingBox"/>
        <owl:Class rdf:about="#Dimension"/>
        <owl:Class rdf:about="#Attribution"/>
        <owl:Class rdf:about="#MetadataResource"/>
        <owl:Class rdf:about="#URI"/>
        <owl:Class rdf:about="#Identifier"/>
        <owl:Class rdf:about="#Style"/>
        <owl:Class rdf:about="#Layer"/>
        <owl:Class rdf:about="#MaximumScaleDenominator"/>
        <owl:Class rdf:about="#MinimumScaleDenominator"/>
        <owl:Class rdf:about="#Height"/>
        <owl:Class rdf:about="#Width"/>
        <owl:Class rdf:about="#Queryable"/>
        <owl:Class rdf:about="#NotSubsettable"/>
        <owl:Class rdf:about="#Cascaded"/>
        <owl:Class rdf:about="#Opaque"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
  <rdfs:subPropertyOf>
    <owl:ObjectProperty rdf:ID="hasParameterComponent"/>
  </rdfs:subPropertyOf>
  <rdfs:domain rdf:resource="#Layer"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasExceptionComponent">
  <rdfs:domain rdf:resource="#Exception"/>
  <rdfs:subPropertyOf rdf:resource="#hasParameterComponent"/>
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#Code"/>
        <owl:Class rdf:about="#Locator"/>
        <owl:Class rdf:about="#Message"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasGetCapabilitiesOutput">
  <rdfs:domain rdf:resource="#GetCapabilities"/>
  <rdfs:range rdf:resource="#CapabilitiesResponse"/>
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#hasOutput"/>
</owl:ObjectProperty>

```

```

<owl:ObjectProperty rdf:ID="hasLogoComponent">
  <rdfs:subPropertyOf rdf:resource="#hasParameterComponent"/>
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#URI"/>
        <owl:Class rdf:about="#Format"/>
        <owl:Class rdf:about="#Height"/>
        <owl:Class rdf:about="#Width"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
  <rdfs:domain rdf:resource="#Logo"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasGetMapOutput">
  <rdfs:domain rdf:resource="#GetMap"/>
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#hasOutput"/>
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#Map"/>
        <owl:Class rdf:about="#Message"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasAttributionComponents">
  <rdfs:domain rdf:resource="#Attribution"/>
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#Title"/>
        <owl:Class rdf:about="#URI"/>
        <owl:Class rdf:about="#Logo"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
  <rdfs:subPropertyOf rdf:resource="#hasParameterComponent"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasUpdateElementInput">
  <rdfs:domain rdf:resource="#UpdateElement"/>
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#Property"/>
        <owl:Class rdf:about="#PropertyValue"/>
        <owl:Class rdf:about="#Filter"/>
        <owl:Class rdf:about="#Format"/>
        <owl:Class rdf:about="#Handle"/>
        <owl:Class rdf:about="#FeatureTypeName"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
  <rdfs:subPropertyOf rdf:resource="#hasParameterComponent"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasDescribeFeatureTypeInput">
  <rdfs:domain rdf:resource="#DescribeFeatureType"/>
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">

```

```

    <owl:Class rdf:about="#Version"/>
    <owl:Class rdf:about="#ServiceType"/>
    <owl:Class rdf:about="#Handle"/>
    <owl:Class rdf:about="#Format"/>
    <owl:Class rdf:about="#FeatureTypeName"/>
  </owl:unionOf>
</owl:Class>
</rdfs:range>
<rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#hasInput"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasGetMapInput">
  <rdfs:domain rdf:resource="#GetMap"/>
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#hasInput"/>
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#Version"/>
        <owl:Class rdf:about="#ServiceType"/>
        <owl:Class rdf:about="#Layer"/>
        <owl:Class rdf:about="#Style"/>
        <owl:Class rdf:about="#SRS"/>
        <rdfs:Description rdf:about="http://compass.edina.ac.uk/ontologies/owlcsw.owl#BoundingBox"/>
        <owl:Class rdf:about="#Height"/>
        <owl:Class rdf:about="#Width"/>
        <owl:Class rdf:about="#Format"/>
        <owl:Class rdf:about="#BackgroundTransparency"/>
        <owl:Class rdf:about="#RequiredTime"/>
        <owl:Class rdf:about="#ExceptionsFormat"/>
        <owl:Class rdf:about="#RequiredElevation"/>
        <owl:Class rdf:about="#BackgroundColour"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="presents">
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Service.owl#presents"/>
  <rdfs:range rdf:resource="#Profile"/>
  <rdfs:domain rdf:resource="#Service"/>
  <owl:inverseOf>
    <owl:ObjectProperty rdf:ID="presentedBy"/>
  </owl:inverseOf>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasStyleComponents">
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#Name"/>
        <owl:Class rdf:about="#Title"/>
        <owl:Class rdf:about="#URI"/>
        <owl:Class rdf:about="#Abstract"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
  <rdfs:subPropertyOf rdf:resource="#hasParameterComponent"/>
  <rdfs:domain rdf:resource="#Style"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasInsertElementComponent">
  <rdfs:subPropertyOf rdf:resource="#hasParameterComponent"/>
  <rdfs:domain rdf:resource="#InsertElement"/>
  <rdfs:range>

```

```

<owl:Class>
  <owl:unionOf rdf:parseType="Collection">
    <owl:Class rdf:about="#GMLContent"/>
    <owl:Class rdf:about="#IdentifierGeneration"/>
    <owl:Class rdf:about="#Handle"/>
    <owl:Class rdf:about="#Format"/>
  </owl:unionOf>
</owl:Class>
</rdfs:range>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasMetadataResourceComponent">
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#Format"/>
        <owl:Class rdf:about="#MetadataStandard"/>
        <owl:Class rdf:about="#URI"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
  <rdfs:subPropertyOf rdf:resource="#hasParameterComponent"/>
  <rdfs:domain rdf:resource="#MetadataResource"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasProcess">
  <rdfs:domain rdf:resource="#Profile"/>
  <rdfs:range rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Process"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasLockFeatureInput">
  <rdfs:domain rdf:resource="#LockFeature"/>
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#Version"/>
        <owl:Class rdf:about="#ServiceType"/>
        <owl:Class rdf:about="#Handle"/>
        <owl:Class rdf:about="#Expiry"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#hasInput"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasGetGMLObjectOutput">
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#GMLContent"/>
        <owl:Class rdf:about="#FeatureType"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#hasOutput"/>
  <rdfs:domain rdf:resource="#GetGMLObject"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasTransactionOutput">
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#Version"/>
        <owl:Class rdf:about="#TotalFeaturesUpdated"/>
        <owl:Class rdf:about="#Exception"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>

```

```

    <owl:Class rdf:about="#TotalFeaturesInserted"/>
    <owl:Class rdf:about="#TotalFeaturesDeleted"/>
  </owl:unionOf>
</owl:Class>
</rdfs:range>
<rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#hasOutput"/>
<rdfs:domain rdf:resource="#Transaction"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="describedBy">
  <rdfs:domain rdf:resource="#Service"/>
  <owl:inverseOf>
    <owl:ObjectProperty rdf:ID="describes"/>
  </owl:inverseOf>
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Service.owl#describedBy"/>
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#DescribeFeatureType"/>
        <owl:Class rdf:about="#GetFeatureInfo"/>
        <owl:Class rdf:about="#GetGMLObject"/>
        <owl:Class rdf:about="#GetMap"/>
        <owl:Class rdf:about="#Transaction"/>
        <owl:Class rdf:about="#GetCapabilities"/>
        <owl:Class rdf:about="#GetFeature"/>
        <owl:Class rdf:about="#LockFeature"/>
        <owl:Class rdf:about="#GetFeatureWithLock"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasGetCapabilitiesInput">
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#hasInput"/>
  <rdfs:domain rdf:resource="#GetCapabilities"/>
  <rdfs:range rdf:resource="#CapabilitiesRequest"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasFeatureToLockComponent">
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#Filter"/>
        <owl:Class rdf:about="#Handle"/>
        <owl:Class rdf:about="#FeatureTypeName"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
  <rdfs:domain rdf:resource="#FeatureToLock"/>
  <rdfs:subPropertyOf rdf:resource="#hasParameterComponent"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasMapRequestComponent">
  <rdfs:subPropertyOf rdf:resource="#hasParameterComponent"/>
  <rdfs:domain rdf:resource="#MapRequest"/>
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#RequiredElevation"/>
        <owl:Class rdf:about="#Format"/>
        <owl:Class rdf:about="#BackgroundColour"/>
        <owl:Class rdf:about="#Style"/>
        <owl:Class rdf:about="#Layer"/>
        <owl:Class rdf:about="#Height"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>

```

```

    <owl:Class rdf:about="#ExceptionsFormat"/>
    <owl:Class rdf:about="#Width"/>
    <owl:Class rdf:about="#SRS"/>
    <owl:Class rdf:about="#BackgroundTransparency"/>
    <owl:Class rdf:about="#RequiredTime"/>
    <rdf:Description rdf:about="http://compass.edina.ac.uk/ontologies/owlcsw.owl#BoundingBox"/>
  </owl:unionOf>
</owl:Class>
</rdfs:range>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:about="#presentedBy">
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Service.owl#presentedBy"/>
  <rdfs:range rdf:resource="#Service"/>
  <rdfs:domain rdf:resource="#Profile"/>
  <owl:inverseOf rdf:resource="#presents"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasGetFeatureOutput">
  <rdfs:domain rdf:resource="#GetFeature"/>
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#FeatureCollection"/>
        <owl:Class rdf:about="#FeatureType"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#hasOutput"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasFeatureTypeComponent">
  <rdfs:domain rdf:resource="#FeatureType"/>
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#FeatureTypeOperations"/>
        <owl:Class rdf:about="#Name"/>
        <owl:Class rdf:about="#Abstract"/>
        <owl:Class rdf:about="#Title"/>
        <owl:Class rdf:about="#OtherSRS"/>
        <owl:Class rdf:about="#DefaultSRS"/>
        <owl:Class rdf:about="#Format"/>
        <owl:Class rdf:about="#MetadataResource"/>
      <rdf:Description rdf:about="http://compass.edina.ac.uk/ontologies/owlcsw.owl#BoundingBox"/>
    </owl:unionOf>
  </owl:Class>
  </rdfs:range>
  <rdfs:subPropertyOf rdf:resource="#hasParameterComponent"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasFeatureCollectionComponent">
  <rdfs:subPropertyOf rdf:resource="#hasParameterComponent"/>
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#NumberOfFeatures"/>
        <owl:Class rdf:about="#LockID"/>
        <owl:Class rdf:about="#TimeStamp"/>
        <owl:Class rdf:about="#GMLContent"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
  <rdfs:domain rdf:resource="#FeatureCollection"/>

```

```

</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasDomainComponent">
<rdfs:domain rdf:resource="#Domain"/>
<rdfs:range>
<owl:Class>
<owl:unionOf rdf:parseType="Collection">
<owl:Class rdf:about="#Meaning"/>
<owl:Class rdf:about="#PossibleValues"/>
<owl:Class rdf:about="#DefaultValue"/>
<owl:Class rdf:about="#DataType"/>
<owl:Class rdf:about="#DomainMetadata"/>
<owl:Class rdf:about="#ValuesUnit"/>
</owl:unionOf>
</owl:Class>
</rdfs:range>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasIDCapabilities">
<rdfs:domain rdf:resource="#Profile"/>
<rdfs:range rdf:resource="#IDCapabilities"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasTopic">
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The topic of the feature type, layer or web service (replacing the keyword parameter). This can link to any other
domain concept from another ontology.</rdfs:comment>
<rdfs:domain>
<owl:Class>
<owl:unionOf rdf:parseType="Collection">
<owl:Class rdf:about="#FeatureType"/>
<owl:Class rdf:about="#Profile"/>
<owl:Class rdf:about="#Layer"/>
</owl:unionOf>
</owl:Class>
</rdfs:domain>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasGetFeatureInfoOutput">
<rdfs:domain rdf:resource="#GetFeatureInfo"/>
<rdfs:range>
<owl:Class>
<owl:unionOf rdf:parseType="Collection">
<owl:Class rdf:about="#FeatureCollection"/>
<owl:Class rdf:about="#FeatureType"/>
</owl:unionOf>
</owl:Class>
</rdfs:range>
<rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#hasOutput"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasGetFeatureWithLockInput">
<rdfs:domain rdf:resource="#GetFeatureWithLock"/>
<rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#hasInput"/>
<rdfs:range>
<owl:Class>
<owl:unionOf rdf:parseType="Collection">
<owl:Class rdf:about="#Handle"/>
<owl:Class rdf:about="#ServiceType"/>
<owl:Class rdf:about="#Version"/>
<owl:Class rdf:about="#Query"/>
<owl:Class rdf:about="#Expiry"/>
<owl:Class rdf:about="#ResultType"/>
<owl:Class rdf:about="#Format"/>
<owl:Class rdf:about="#MaxFeatures"/>

```



```

    <owl:Class rdf:about="#TraverseXLinkDepth"/>
    <owl:Class rdf:about="#TraverseXLinkExpiry"/>
  </owl:unionOf>
</owl:Class>
</rdfs:range>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasLockFeatureOutput">
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#hasOutput"/>
  <rdfs:range rdf:resource="#LockID"/>
  <rdfs:domain rdf:resource="#LockFeature"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasGetGMLObjectInput">
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#ServiceType"/>
        <owl:Class rdf:about="#Version"/>
        <owl:Class rdf:about="#Handle"/>
        <owl:Class rdf:about="#GMLObjectID"/>
        <owl:Class rdf:about="#Format"/>
        <owl:Class rdf:about="#TraverseXLinkDepth"/>
        <owl:Class rdf:about="#TraverseXLinkExpiry"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#hasInput"/>
  <rdfs:domain rdf:resource="#GetGMLObject"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="supportedBy">
  <rdfs:range rdf:resource="#Service"/>
  <owl:inverseOf>
    <owl:ObjectProperty rdf:ID="supports"/>
  </owl:inverseOf>
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Service.owl#supportedBy"/>
  <rdfs:domain rdf:resource="#OgcHttpGrounding"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:about="#describes">
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Service.owl#describes"/>
  <rdfs:domain>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#GetFeature"/>
        <owl:Class rdf:about="#Transaction"/>
        <owl:Class rdf:about="#GetFeatureWithLock"/>
        <owl:Class rdf:about="#DescribeFeatureType"/>
        <owl:Class rdf:about="#GetCapabilities"/>
        <owl:Class rdf:about="#GetGMLObject"/>
        <owl:Class rdf:about="#LockFeature"/>
        <owl:Class rdf:about="#GetFeatureInfo"/>
        <owl:Class rdf:about="#GetMap"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:domain>
  <rdfs:range rdf:resource="#Service"/>
  <owl:inverseOf rdf:resource="#describedBy"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasOgcHttpOperation">
  <rdfs:domain rdf:resource="#OgcHttpGrounding"/>
  <rdfs:range rdf:resource="#OgcHttpOperation"/>
</owl:ObjectProperty>

```

```

<owl:ObjectProperty rdf:about="#groundsAbstractParameter">
  <rdfs:domain rdf:resource="#OgcHttpParameter"/>
  <rdfs:range rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#Parameter"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasGetFeatureWithLockOutput">
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#hasOutput"/>
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#FeatureCollection"/>
        <owl:Class rdf:about="#FeatureType"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
  <rdfs:domain rdf:resource="#GetFeatureWithLock"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:about="#supports">
  <owl:inverseOf rdf:resource="#supportedBy"/>
  <rdfs:range rdf:resource="#OgcHttpGrounding"/>
  <rdfs:domain rdf:resource="#Service"/>
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Service.owl#supports"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasFeatureIDComponent">
  <rdfs:domain>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#FeaturesLocked"/>
        <owl:Class rdf:about="#FeaturesNotLocked"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:domain>
  <rdfs:subPropertyOf rdf:resource="#hasParameterComponent"/>
  <rdfs:range rdf:resource="#FeatureType"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasDomain">
  <rdfs:range rdf:resource="#Domain"/>
  <rdfs:domain>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#OgcHttpConstraint"/>
        <owl:Class rdf:about="#OgcHttpParameter"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:domain>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasOgcHttpParameter">
  <rdfs:domain rdf:resource="#OgcHttpOperation"/>
  <rdfs:range rdf:resource="#OgcHttpParameter"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasTransactionInput">
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#hasInput"/>
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#ServiceType"/>
        <owl:Class rdf:about="#Handle"/>
        <owl:Class rdf:about="#Version"/>
        <owl:Class rdf:about="#LockID"/>
        <owl:Class rdf:about="#InsertElement"/>
        <owl:Class rdf:about="#UpdateElement"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>

```

```

    <owl:Class rdf:about="#DeleteElement"/>
  </owl:unionOf>
</owl:Class>
</rdfs:range>
<rdfs:domain rdf:resource="#Transaction"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasServiceProvider">
  <rdfs:range rdf:resource="#ServiceProvider"/>
  <rdfs:domain rdf:resource="#Profile"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The provider of the service.</rdfs:comment>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasQueryComponent">
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#Property"/>
        <owl:Class rdf:about="#FeatureVersion"/>
        <owl:Class rdf:about="#Function"/>
        <owl:Class rdf:about="#SortBy"/>
        <owl:Class rdf:about="#XLinkProperty"/>
        <owl:Class rdf:about="#Filter"/>
        <owl:Class rdf:about="#Handle"/>
        <owl:Class rdf:about="#SRS"/>
        <owl:Class rdf:about="#FeatureTypeName"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
  <rdfs:domain rdf:resource="#Query"/>
  <rdfs:subPropertyOf rdf:resource="#hasParameterComponent"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasScalarCapabilities">
  <rdfs:range rdf:resource="#ScalarCapabilities"/>
  <rdfs:domain rdf:resource="#Profile"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasDeleteElementInput">
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#Filter"/>
        <owl:Class rdf:about="#Handle"/>
        <owl:Class rdf:about="#FeatureTypeName"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
  <rdfs:subPropertyOf rdf:resource="#hasParameterComponent"/>
  <rdfs:domain rdf:resource="#DeleteElement"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasInsertedFeatureComponent">
  <rdfs:domain rdf:resource="#InsertedFeature"/>
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#Handle"/>
        <owl:Class rdf:about="#FeatureTypeName"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
  <rdfs:subPropertyOf rdf:resource="#hasParameterComponent"/>
</owl:ObjectProperty>

```

```

<owl:ObjectProperty rdf:ID="hasGetFeatureInput">
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#hasInput"/>
  <rdfs:domain rdf:resource="#GetFeature"/>
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#Handle"/>
        <owl:Class rdf:about="#ServiceType"/>
        <owl:Class rdf:about="#TraverseXLinkExpiry"/>
        <owl:Class rdf:about="#TraverseXLinkDepth"/>
        <owl:Class rdf:about="#MaxFeatures"/>
        <owl:Class rdf:about="#Version"/>
        <owl:Class rdf:about="#ResultType"/>
        <owl:Class rdf:about="#Format"/>
        <owl:Class rdf:about="#Query"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasSpatialCapabilities">
  <rdfs:domain rdf:resource="#Profile"/>
  <rdfs:range rdf:resource="#SpatialCapabilities"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasDescribeFeatureTypeOutput">
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#GMLContent"/>
        <owl:Class rdf:about="#FeatureType"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
  <rdfs:domain rdf:resource="#DescribeFeatureType"/>
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#hasOutput"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasGetFeatureInfoInput">
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#Version"/>
        <owl:Class rdf:about="#ServiceType"/>
        <owl:Class rdf:about="#Layer"/>
        <owl:Class rdf:about="#MapRequest"/>
        <owl:Class rdf:about="#Format"/>
        <owl:Class rdf:about="#QueryPixeli"/>
        <owl:Class rdf:about="#QueryPixelj"/>
        <owl:Class rdf:about="#Message"/>
        <owl:Class rdf:about="#MaxFeatures"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:range>
  <rdfs:subPropertyOf rdf:resource="http://www.daml.org/services/owl-s/1.1/Process.owl#hasInput"/>
  <rdfs:domain rdf:resource="#GetFeatureInfo"/>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:ID="hasDimensionComponent">
  <rdfs:domain rdf:resource="#Dimension"/>
  <rdfs:subPropertyOf rdf:resource="#hasParameterComponent"/>
  <rdfs:range>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">

```

```

    <owl:Class rdf:about="#Name"/>
    <owl:Class rdf:about="#ReturnNearbyValues"/>
    <owl:Class rdf:about="#DefaultDimensionValue"/>
    <owl:Class rdf:about="#Units"/>
    <owl:Class rdf:about="#Extent"/>
    <owl:Class rdf:about="#MultipleRequestableValues"/>
    <owl:Class rdf:about="#UnitSymbol"/>
    <owl:Class rdf:about="#CurrentValues"/>
  </owl:unionOf>
</owl:Class>
</rdfs:range>
</owl:ObjectProperty>
<owl:ObjectProperty rdf:about="#hasConnectPoints">
  <rdfs:domain rdf:resource="#OgcHttpOperation"/>
  <rdfs:range rdf:resource="#OgcHttpConnectPoints"/>
</owl:ObjectProperty>
<owl:DatatypeProperty rdf:ID="xlink_type">
  <rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The type of xlink href.</rdfs:comment>
  <rdfs:domain>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#OgcHttpGet"/>
        <owl:Class rdf:about="#OgcHttpPost"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:domain>
</owl:DatatypeProperty>
<owl:DatatypeProperty rdf:ID="exceptionFormat">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The error reporting formats supported by the web service.</rdfs:comment>
  <rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
  <rdfs:domain rdf:resource="#WMSProfile"/>
</owl:DatatypeProperty>
<owl:DatatypeProperty rdf:ID="label">
  <rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
  <rdfs:domain rdf:resource="#QueryModel"/>
</owl:DatatypeProperty>
<owl:DatatypeProperty rdf:ID="maximumValue">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >Maximum value of this numeric parameter.</rdfs:comment>
  <rdfs:domain rdf:resource="#Range"/>
  <rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#float"/>
</owl:DatatypeProperty>
<owl:DatatypeProperty rdf:ID="reference">
  <rdfs:domain>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#ValuesReference"/>
        <owl:Class rdf:about="#Meaning"/>
        <owl:Class rdf:about="#DataType"/>
        <owl:Class rdf:about="#UnitOfMeasure"/>
        <owl:Class rdf:about="#ReferenceSystem"/>
        <owl:Class rdf:about="#DomainMetadata"/>
      </owl:unionOf>
    </owl:Class>
  </rdfs:domain>
  <rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
</owl:DatatypeProperty>

```

```

<owl:DatatypeProperty rdf:ID="rangeClosure">
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >Types of range.</rdfs:comment>
  <rdfs:domain rdf:resource="#Range"/>
  <rdfs:range>
    <owl:DataRange>
      <owl:oneOf rdf:parseType="Resource">
        <rdf:rest rdf:parseType="Resource">
          <rdf:rest rdf:parseType="Resource">
            <rdf:rest rdf:parseType="Resource">
              <rdf:rest rdf:resource="http://www.w3.org/1999/02/22-rdf-syntax-ns#nil"/>
              <rdf:first rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
              >closed-open</rdf:first>
            </rdf:rest>
            <rdf:first rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
            >open-closed</rdf:first>
          </rdf:rest>
          <rdf:rest>
            <rdf:first rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
            >closed</rdf:first>
          </rdf:rest>
          <rdf:rest>
            <rdf:first rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
            >open</rdf:first>
          </owl:oneOf>
        </owl:DataRange>
      </rdfs:range>
    </owl:DatatypeProperty>
  <owl:DatatypeProperty rdf:ID="maxLength">
    <rdfs:domain rdf:resource="#QueryModel"/>
    <rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#int"/>
    <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >The maximum length of input permitted.</rdfs:comment>
  </owl:DatatypeProperty>
  <owl:DatatypeProperty rdf:ID="purpose">
    <rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
    <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >The purpose of the URI (to indicate where service requests use multiple URIs, which is for each
    purpose).</rdfs:comment>
    <rdfs:domain rdf:resource="#URI"/>
  </owl:DatatypeProperty>
  <owl:DatatypeProperty rdf:ID="accessConstraints">
    <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >Any access constraints that apply on the data from the web service.</rdfs:comment>
    <rdfs:domain rdf:resource="#Profile"/>
  </owl:DatatypeProperty>
  <owl:DatatypeProperty rdf:ID="minValue">
    <rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#float"/>
    <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >Minimum value of this numeric parameter.</rdfs:comment>
    <rdfs:domain rdf:resource="#Range"/>
  </owl:DatatypeProperty>
  <owl:DatatypeProperty rdf:ID="spacing">
    <rdfs:domain rdf:resource="#Range"/>
    <rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#float"/>
    <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >The regular distance or spacing between the allowed values in a range. Shall be included when the allowed values are
    NOT continuous in this range. Shall not be included when the allowed values are continuous in this range.</rdfs:comment>
  </owl:DatatypeProperty>
  <owl:DatatypeProperty rdf:ID="size">
    <rdfs:domain rdf:resource="#QueryModel"/>
    <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"

```

```

>The size of the input sutructure.</rdfs:comment>
<rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#int"/>
</owl:DatatypeProperty>
<owl:DatatypeProperty rdf:ID="authority">
<rdfs:domain rdf:resource="#Identifier"/>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The authority by whom the identifier for the layer is specified.</rdfs:comment>
<rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
</owl:DatatypeProperty>
<owl:DatatypeProperty rdf:ID="nArgs">
<rdfs:domain rdf:resource="#Functions"/>
<rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
</owl:DatatypeProperty>
<owl:DatatypeProperty rdf:ID="xlink_href">
<rdfs:domain>
<owl:Class>
<owl:unionOf rdf:parseType="Collection">
<owl:Class rdf:about="#OgcHttpGet"/>
<owl:Class rdf:about="#OgcHttpPost"/>
</owl:unionOf>
</owl:Class>
</rdfs:domain>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The actual URL</rdfs:comment>
<rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
</owl:DatatypeProperty>
<owl:FunctionalProperty rdf:ID="hoursOfService">
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
></rdfs:comment>
<rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
<rdf:type rdf:resource="http://www.w3.org/2002/07/owl#DatatypeProperty"/>
<rdfs:domain rdf:resource="#ServiceProvider"/>
</owl:FunctionalProperty>
<owl:FunctionalProperty rdf:ID="maxMapWidth">
<rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#int"/>
<rdfs:domain rdf:resource="#WMSProfile"/>
<rdf:type rdf:resource="http://www.w3.org/2002/07/owl#DatatypeProperty"/>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The maximum width of a requested map.</rdfs:comment>
</owl:FunctionalProperty>
<owl:FunctionalProperty rdf:ID="contactInstructions">
<rdfs:domain rdf:resource="#ServiceProvider"/>
<rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
<rdf:type rdf:resource="http://www.w3.org/2002/07/owl#DatatypeProperty"/>
</owl:FunctionalProperty>
<owl:FunctionalProperty rdf:about="#hasQueryModel">
<rdfs:domain rdf:resource="#OgcHttpParameter"/>
<rdf:type rdf:resource="http://www.w3.org/2002/07/owl#ObjectProperty"/>
<rdfs:range rdf:resource="#QueryModel"/>
</owl:FunctionalProperty>
<owl:FunctionalProperty rdf:ID="serviceTypeVersion">
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The version of the web service specification supported (may be several) by the service.</rdfs:comment>
<rdf:type rdf:resource="http://www.w3.org/2002/07/owl#DatatypeProperty"/>
<rdfs:domain rdf:resource="#Service"/>
<rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
</owl:FunctionalProperty>
<owl:FunctionalProperty rdf:ID="hasActor">
<rdfs:domain rdf:resource="#ServiceProvider"/>
<rdf:type rdf:resource="http://www.w3.org/2002/07/owl#ObjectProperty"/>

```

```

<rdfs:range rdf:resource="http://www.daml.org/services/owl-s/1.1/ActorDefault.owl#Actor"/>
</owl:FunctionalProperty>
<owl:FunctionalProperty rdf:ID="maxMapHeight">
<rdf:type rdf:resource="http://www.w3.org/2002/07/owl#DatatypeProperty"/>
<rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#int"/>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The maximum height that a requested map can have.</rdfs:comment>
<rdfs:domain rdf:resource="#WMSProfile"/>
</owl:FunctionalProperty>
<owl:FunctionalProperty rdf:about="#serviceType">
<rdfs:domain rdf:resource="#Service"/>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The type of OGC web service (the specification, for example WMS).</rdfs:comment>
<rdf:type rdf:resource="http://www.w3.org/2002/07/owl#DatatypeProperty"/>
<rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
</owl:FunctionalProperty>
<owl:FunctionalProperty rdf:about="#groundsAtomicProcess">
<rdf:type rdf:resource="http://www.w3.org/2002/07/owl#ObjectProperty"/>
<rdfs:domain rdf:resource="#OgcHttpOperation"/>
<rdfs:range>
<owl:Class>
<owl:unionOf rdf:parseType="Collection">
<owl:Class rdf:about="#DescribeFeatureType"/>
<owl:Class rdf:about="#GetCapabilities"/>
<owl:Class rdf:about="#Transaction"/>
<owl:Class rdf:about="#GetFeature"/>
<owl:Class rdf:about="#LockFeature"/>
<owl:Class rdf:about="#GetGMLObject"/>
<owl:Class rdf:about="#GetFeatureWithLock"/>
<owl:Class rdf:about="#GetFeatureInfo"/>
<owl:Class rdf:about="#GetMap"/>
</owl:unionOf>
</owl:Class>
</rdfs:range>
</owl:FunctionalProperty>
<owl:FunctionalProperty rdf:about="#sourceDocVersion">
<rdfs:domain rdf:resource="#Service"/>
<rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
<rdf:type rdf:resource="http://www.w3.org/2002/07/owl#DatatypeProperty"/>
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>The version of the source documents used to create the ontology, including both the version of the GetCapabilities
specification and the version of the GetCapabilities document instance, using the format &lt;&lt;GetCapabilities
version&gt;&lt;document version&gt;&lt;/rdfs:comment>
</owl:FunctionalProperty>
<owl:FunctionalProperty rdf:about="#name">
<rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>&lt;/rdfs:comment>
<rdfs:domain>
<owl:Class>
<owl:unionOf rdf:parseType="Collection">
<owl:Class rdf:about="#ValuesReference"/>
<owl:Class rdf:about="#Meaning"/>
<owl:Class rdf:about="#DataType"/>
<owl:Class rdf:about="#UnitOfMeasure"/>
<owl:Class rdf:about="#ReferenceSystem"/>
<owl:Class rdf:about="#DomainMetadata"/>
<owl:Class rdf:about="#Domain"/>
<owl:Class rdf:about="#OgcHttpOperation"/>
<owl:Class rdf:about="#QueryModel"/>
<owl:Class rdf:about="#Functions"/>

```



```

    <owl:Class rdf:about="#URI"/>
  </owl:unionOf>
</owl:Class>
</rdfs:domain>
<rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
<rdfs:type rdf:resource="http://www.w3.org/2002/07/owl#DatatypeProperty"/>
</owl:FunctionalProperty>
<owl:FunctionalProperty rdf:ID="fees">
  <rdfs:type rdf:resource="http://www.w3.org/2002/07/owl#DatatypeProperty"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The fees and terms for using the web service.</rdfs:comment>
  <rdfs:domain rdf:resource="#Profile"/>
  <rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
</owl:FunctionalProperty>
<owl:FunctionalProperty rdf:ID="layerLimit">
  <rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#int"/>
  <rdfs:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >The maximum number of layers that can be requested in a single request.</rdfs:comment>
  <rdfs:domain rdf:resource="#WMSProfile"/>
  <rdfs:type rdf:resource="http://www.w3.org/2002/07/owl#DatatypeProperty"/>
</owl:FunctionalProperty>
<owl:FunctionalProperty rdf:ID="role">
  <rdfs:type rdf:resource="http://www.w3.org/2002/07/owl#DatatypeProperty"/>
  <rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
  <rdfs:domain rdf:resource="#ServiceProvider"/>
</owl:FunctionalProperty>
</rdf:RDF>

<!-- Created with Protege (with OWL Plugin 3.3.1, Build 430) http://protege.stanford.edu -->

```

Appendix D: The severn_co_wfs Web Feature Service OWL-S Ontology

```
<?xml version="1.0"?>
<rdf:RDF
  xmlns:process="http://www.daml.org/services/owl-s/1.1/Process.owl#"
  xmlns:te="http://www.isi.edu/~pan/damlttime/time-entry.owl#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:owl="http://www.w3.org/2002/07/owl#"
  xmlns="http://compass.edina.ac.uk/ontologies/ao/Severn_co_wfs.owl#"
  xmlns:service="http://www.daml.org/services/owl-s/1.1/Service.owl#"
  xmlns:protege="http://protege.stanford.edu/plugins/owl/protege#"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:ogc="http://compass.edina.ac.uk/ontologies/owl-s_ogc#"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
  xmlns:actor="http://www.daml.org/services/owl-s/1.1/ActorDefault.owl#"
  xmlns:profile="http://www.daml.org/services/owl-s/1.1/Profile.owl#"
  xmlns:owlcsw="http://compass.edina.ac.uk/ontologies/owlcsw.owl#"
  xml:base="http://compass.edina.ac.uk/ontologies/ao/Severn_co_wfs.owl">
<owl:Ontology rdf:about="">
  <owl:imports rdf:resource="http://compass.edina.ac.uk/ontologies/owl-s_ogc"/>
</owl:Ontology>
<ogc:OgcHttpParameter rdf:ID="Transaction_DefaultLockExpiry_OgcHttpParameter">
  <ogc:hasDomain>
    <ogc:Domain rdf:ID="DefaultLockExpiryDomain">
      <ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string">
        >DefaultLockExpiryDomain</ogc:name>
      <ogc:hasDomainComponent>
        <ogc:Value rdf:ID="Value_5"/>
      </ogc:hasDomainComponent>
    </ogc:Domain>
  </ogc:hasDomain>
  <ogc:groundsAbstractParameter>
    <ogc:Expiry rdf:ID="Expiry"/>
  </ogc:groundsAbstractParameter>
</ogc:OgcHttpParameter>
<ogc:Format rdf:ID="InputFormat"/>
<ogc:Name rdf:ID="LVL101_szCO_TidesCurrents_point_nw25000060">
  <process:parameterValue
rdf:parseType="Literal">LVL101_szCO_TidesCurrents_point_nw25000060</process:parameterValue>
  </ogc:Name>
  <ogc:Disjoint rdf:ID="Disjoint"/>
  <ogc:FeatureType rdf:ID="LVL102_szCO_TidesCurrents_line_nw25000060_FeatureType">
    <ogc:hasFeatureTypeComponent>
      <ogc:Name rdf:ID="LVL102_szCO_TidesCurrents_line_nw25000060">
        <process:parameterValue
rdf:parseType="Literal">LVL102_szCO_TidesCurrents_line_nw25000060</process:parameterValue>
        </ogc:Name>
      </ogc:hasFeatureTypeComponent>
      <ogc:hasFeatureTypeComponent>
        <ogc:DefaultSRS rdf:ID="EPSG_4326">
          <process:parameterValue rdf:parseType="Literal"></process:parameterValue>
        </ogc:DefaultSRS>
      </ogc:hasFeatureTypeComponent>
      <ogc:hasFeatureTypeComponent>
        <ogc:Abstract rdf:ID="Abstract">
          <process:parameterValue rdf:parseType="Literal">The Climate and Oceanography topic contains data relating to
climate, weather and tides. This varies from locations where measurement and monitoring is or has been known to occur to
predicted tidal currents. All these datasets are of a mainly temporal nature.</process:parameterValue>
        </ogc:Abstract>
      </ogc:hasFeatureTypeComponent>
    </ogc:FeatureType>
  </ogc:Name>
  <ogc:hasFeatureTypeComponent>
    <ogc:DefaultSRS rdf:ID="EPSG_4326">
      <process:parameterValue rdf:parseType="Literal"></process:parameterValue>
    </ogc:DefaultSRS>
  </ogc:hasFeatureTypeComponent>
  <ogc:hasFeatureTypeComponent>
    <ogc:Abstract rdf:ID="Abstract">
      <process:parameterValue rdf:parseType="Literal">The Climate and Oceanography topic contains data relating to
climate, weather and tides. This varies from locations where measurement and monitoring is or has been known to occur to
predicted tidal currents. All these datasets are of a mainly temporal nature.</process:parameterValue>
    </ogc:Abstract>
  </ogc:hasFeatureTypeComponent>
</ogc:Name>
</ogc:FeatureType>
</ogc:Format>
</ogc:OgcHttpParameter>

```

```

</ogc:hasFeatureTypeComponent>
<ogc:hasFeatureTypeComponent>
  <ogc:QueryOperation rdf:ID="QueryOperation">
    <process:parameterValue rdf:parseType="Literal">QueryOperation</process:parameterValue>
  </ogc:QueryOperation>
</ogc:hasFeatureTypeComponent>
<ogc:hasFeatureTypeComponent>
  <ogc:Format rdf:ID="textxml_subtype_gml3.1.1">
    <process:parameterValue rdf:parseType="Literal">text/xml; subtype=gml/3.1.1</process:parameterValue>
  </ogc:Format>
</ogc:hasFeatureTypeComponent>
<ogc:hasFeatureTypeComponent>
  <owls:BoundingBox rdf:ID="WGS84BoundingBox">
    <owls:upperCorner>
      <owls:Point rdf:ID="UR">
        <owls:x rdf:datatype="http://www.w3.org/2001/XMLSchema#float"
          >-4.0</owls:x>
        <owls:y rdf:datatype="http://www.w3.org/2001/XMLSchema#float"
          >52.0</owls:y>
      </owls:Point>
    </owls:upperCorner>
    <owls:lowerCorner>
      <owls:Point rdf:ID="LL">
        <owls:y rdf:datatype="http://www.w3.org/2001/XMLSchema#float"
          >50.0</owls:y>
        <owls:x rdf:datatype="http://www.w3.org/2001/XMLSchema#float"
          >-6.0</owls:x>
      </owls:Point>
    </owls:lowerCorner>
    <owls:crs rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >WGS84</owls:crs>
  </owls:BoundingBox>
</ogc:hasFeatureTypeComponent>
<ogc:hasFeatureTypeComponent>
  <ogc:Title rdf:ID="Tides_and_Tidal_Currents">
    <process:parameterValue rdf:parseType="Literal">Tides and Tidal Currents</process:parameterValue>
  </ogc:Title>
</ogc:hasFeatureTypeComponent>
</ogc:FeatureType>
<ogc:OgcHttpParameter rdf:ID="Transaction_InputFormat_OgcHttpParameter">
  <ogc:groundsAbstractParameter rdf:resource="#InputFormat"/>
  <ogc:hasDomain>
    <ogc:Domain rdf:ID="InputFormatDomain">
      <ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >InputFormatDomain</ogc:name>
      <ogc:hasDomainComponent>
        <ogc:Value rdf:ID="text_xml_subtype_gml_3.1.1"/>
      </ogc:hasDomainComponent>
    </ogc:Domain>
  </ogc:hasDomain>
</ogc:OgcHttpParameter>
<ogc:ResultType rdf:ID="ResultType"/>
<ogc:Overlaps rdf:ID="Overlaps"/>
<ogc:WFSProfile rdf:ID="Severn_co_WFS_Profile">
  <ogc:hasSpatialCapabilities>
    <ogc:Touches rdf:ID="Touches"/>
  </ogc:hasSpatialCapabilities>
  <ogc:hasProcess>
    <ogc:GetFeature rdf:ID="GetFeature">
      <ogc:describes>

```

```

<ogc:Service rdf:ID="Severn_co_WFS">
  <ogc:describedBy>
    <ogc:GetFeatureWithLock rdf:ID="GetFeatureWithLock">
      <ogc:describes rdf:resource="#Severn_co_WFS"/>
    </ogc:GetFeatureWithLock>
  </ogc:describedBy>
  <service:supports>
    <ogc:OgcHttpGet rdf:ID="Severn_co_WFS_Grounding">
      <service:supportedBy rdf:resource="#Severn_co_WFS"/>
      <ogc:hasOgcHttpOperation>
        <ogc:OgcHttpOperation rdf:ID="GetFeatureGrounding">
          <ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
            >GetFeature</ogc:name>
          <ogc:hasConnectPoints>
            <ogc:OgcHttpGet rdf:ID="OgcHttpGet">
              <ogc:xlink_type rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
                >simple</ogc:xlink_type>
              <ogc:xlink_href rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
                >http://ledi.edina.ac.uk:48080/Severn-be/services?</ogc:xlink_href>
            </ogc:OgcHttpGet>
          </ogc:hasConnectPoints>
          <ogc:hasConnectPoints>
            <ogc:OgcHttpPost rdf:ID="OgcHttpPost">
              <ogc:xlink_href rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
                >http://ledi.edina.ac.uk:48080/Severn-be/services</ogc:xlink_href>
              <ogc:xlink_type rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
                >simple</ogc:xlink_type>
            </ogc:OgcHttpPost>
          </ogc:hasConnectPoints>
          <ogc:hasOgcHttpParameter>
            <ogc:OgcHttpParameter rdf:ID="GetFeature_resultType_OgcHttpParameter">
              <ogc:hasDomain>
                <ogc:Domain rdf:ID="ResultTypeDomain">
                  <ogc:hasDomainComponent>
                    <ogc:Value rdf:ID="results"/>
                  </ogc:hasDomainComponent>
                  <ogc:hasDomainComponent>
                    <ogc:Value rdf:ID="hits"/>
                  </ogc:hasDomainComponent>
                  <ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
                    >ResultTypeDomain</ogc:name>
                </ogc:Domain>
              </ogc:hasDomain>
              <ogc:groundsAbstractParameter rdf:resource="#ResultType"/>
            </ogc:OgcHttpParameter>
          </ogc:hasOgcHttpParameter>
          <ogc:hasOgcHttpParameter>
            <ogc:OgcHttpParameter rdf:ID="GetFeature_OutputFormat_OgcHttpParameter">
              <ogc:hasDomain>
                <ogc:Domain rdf:ID="OutputFormatDomain">
                  <ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
                    >OutputFormatDomain</ogc:name>
                  <ogc:hasDomainComponent rdf:resource="#text_xml_subtype_gml_3.1.1"/>
                </ogc:Domain>
              </ogc:hasDomain>
              <ogc:groundsAbstractParameter>
                <ogc:Format rdf:ID="OutputFormat"/>
              </ogc:groundsAbstractParameter>
            </ogc:OgcHttpParameter>
          </ogc:hasOgcHttpParameter>

```

```

    <ogc:groundsAtomicProcess rdf:resource="#GetFeature"/>
  </ogc:OgcHttpOperation>
  </ogc:hasOgcHttpOperation>
  </ogc:OgcHttpGrounding>
</service:supports>
<ogc:serviceType rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>WFS</ogc:serviceType>
<ogc:describedBy rdf:resource="#GetFeature"/>
<ogc:describedBy>
  <ogc:DescribeFeatureType rdf:ID="DescribeFeatureType">
    <ogc:describes rdf:resource="#Severn_co_WFS"/>
  </ogc:DescribeFeatureType>
</ogc:describedBy>
<ogc:sourceDocVersion rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>1.1.0/0</ogc:sourceDocVersion>
<ogc:presents rdf:resource="#Severn_co_WFS_Profile"/>
<ogc:describedBy>
  <ogc:GetCapabilities rdf:ID="GetCapabilities">
    <ogc:describes rdf:resource="#Severn_co_WFS"/>
  </ogc:GetCapabilities>
</ogc:describedBy>
<ogc:describedBy>
  <ogc:LockFeature rdf:ID="LockFeature">
    <ogc:describes rdf:resource="#Severn_co_WFS"/>
  </ogc:LockFeature>
</ogc:describedBy>
<ogc:serviceTypeVersion rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>1.1.0</ogc:serviceTypeVersion>
</ogc:Service>
</ogc:describes>
</ogc:GetFeature>
</ogc:hasProcess>
<ogc:hasSpatialCapabilities>
  <ogc:Within rdf:ID="Within"/>
</ogc:hasSpatialCapabilities>
<ogc:hasProcess>
  <ogc:Transaction rdf:ID="Transaction"/>
</ogc:hasProcess>
<ogc:hasSpatialCapabilities rdf:resource="#Disjoint"/>
<ogc:hasSpatialCapabilities>
  <ogc:Envelope rdf:ID="Envelope"/>
</ogc:hasSpatialCapabilities>
<profile:textDescription rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>deegree 2.2 WFS</profile:textDescription>
<ogc:hasScalarCapabilities>
  <ogc:GreaterThan rdf:ID="GreaterThan"/>
</ogc:hasScalarCapabilities>
<ogc:hasScalarCapabilities>
  <ogc:NullCheck rdf:ID="NullCheck"/>
</ogc:hasScalarCapabilities>
<ogc:hasSpatialCapabilities>
  <ogc:Contains rdf:ID="Contains"/>
</ogc:hasSpatialCapabilities>
<ogc:hasSpatialCapabilities>
  <ogc:Equals rdf:ID="Equals"/>
</ogc:hasSpatialCapabilities>
<ogc:hasScalarCapabilities>
  <ogc:GreaterThanEqualTo rdf:ID="GreaterThanEqualTo"/>
</ogc:hasScalarCapabilities>
<ogc:hasSpatialCapabilities>

```

```

    <ogc:Beyond rdf:ID="Beyond"/>
  </ogc:hasSpatialCapabilities>
<ogc:hasSpatialCapabilities>
  <ogc:Intersect rdf:ID="Intersect"/>
</ogc:hasSpatialCapabilities>
<ogc:hasProcess rdf:resource="#DescribeFeatureType"/>
<ogc:hasProcess rdf:resource="#GetCapabilities"/>
<ogc:accessConstraints rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>None</ogc:accessConstraints>
<profile:serviceName rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>SeaZone WFS</profile:serviceName>
<ogc:hasProcess rdf:resource="#LockFeature"/>
<ogc:hasSpatialCapabilities>
  <ogc:Point rdf:ID="Point"/>
</ogc:hasSpatialCapabilities>
<ogc:hasServiceProvider>
  <ogc:ServiceProvider rdf:ID="EDINA">
    <ogc:contactInstructions rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >e-mail</ogc:contactInstructions>
    <ogc:hasActor>
      <actor:Actor rdf:ID="EDINA_Actor">
        <actor:phone rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >+44 (0)131 651 1241</actor:phone>
        <actor:title rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >GIS Technician</actor:title>
        <actor:physicalAddress rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >Causewayside House, 160 Causewayside, Edinburgh, Scotland, EH9 1PR, United
Kingdom</actor:physicalAddress>
        <actor:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >Lasma Sietinsone</actor:name>
        <actor:webURL rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >http://edina.ac.uk/</actor:webURL>
        <actor:fax rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >+44 (0)131 650 3308</actor:fax>
        <actor:email rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
        >l.sietinsone@ed.ac.uk</actor:email>
      </actor:Actor>
    </ogc:hasActor>
    <ogc:role rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >PointOfContact</ogc:role>
    <ogc:hoursOfService rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >9.00-17.00</ogc:hoursOfService>
  </ogc:ServiceProvider>
</ogc:hasServiceProvider>
<ogc:hasSpatialCapabilities>
  <ogc:Crosses rdf:ID="Crosses"/>
</ogc:hasSpatialCapabilities>
<ogc:hasScalarCapabilities>
  <ogc:EqualTo rdf:ID="EqualTo"/>
</ogc:hasScalarCapabilities>
<ogc:hasSpatialCapabilities rdf:resource="#Overlaps"/>
<ogc:hasIDCapabilities>
  <ogc:FID rdf:ID="FID"/>
</ogc:hasIDCapabilities>
<ogc:hasScalarCapabilities>
  <ogc:LessThanEqualTo rdf:ID="LessThanEqualTo"/>
</ogc:hasScalarCapabilities>
<ogc:hasIDCapabilities>
  <ogc:EID rdf:ID="EID"/>
</ogc:hasIDCapabilities>

```

```

<ogc:hasProcess rdf:resource="#GetFeatureWithLock"/>
<ogc:hasSpatialCapabilities>
  <ogc:LineString rdf:ID="LineString"/>
</ogc:hasSpatialCapabilities>
<ogc:presentedBy rdf:resource="#Severn_co_WFS"/>
<ogc:hasScalarCapabilities>
  <ogc:SimpleArithmetic rdf:ID="SimpleArithmetic"/>
</ogc:hasScalarCapabilities>
<ogc:fees rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>None</ogc:fees>
<ogc:hasSpatialCapabilities>
  <ogc:BBox rdf:ID="BBox"/>
</ogc:hasSpatialCapabilities>
<ogc:hasScalarCapabilities>
  <ogc:Like rdf:ID="Like"/>
</ogc:hasScalarCapabilities>
<ogc:hasScalarCapabilities>
  <ogc:LessThan rdf:ID="LessThan"/>
</ogc:hasScalarCapabilities>
<ogc:hasSpatialCapabilities>
  <ogc:Polygon rdf:ID="Polygon"/>
</ogc:hasSpatialCapabilities>
<ogc:hasScalarCapabilities>
  <ogc:Between rdf:ID="Between"/>
</ogc:hasScalarCapabilities>
</ogc:WFSPProfile>
<ogc:Name rdf:ID="LVL602_szBE_Elevation_line_nw25000060">
  <process:parameterValue
rdf:parseType="Literal">LVL602_szBE_Elevation_line_nw25000060</process:parameterValue>
</ogc:Name>
<ogc:FeatureType rdf:ID="LVL101_szCO_TidesCurrents_point_nw25000060_FeatureType">
  <ogc:hasFeatureTypeComponent rdf:resource="#LVL101_szCO_TidesCurrents_point_nw25000060"/>
  <ogc:hasFeatureTypeComponent rdf:resource="#textxml_subtype_gml3.1.1"/>
  <ogc:hasFeatureTypeComponent rdf:resource="#WGS84BoundingBox"/>
  <ogc:hasFeatureTypeComponent rdf:resource="#EPSG_4326"/>
  <ogc:hasFeatureTypeComponent rdf:resource="#Abstract"/>
  <ogc:hasFeatureTypeComponent rdf:resource="#QueryOperation"/>
  <ogc:hasFeatureTypeComponent rdf:resource="#Tides_and_Tidal_Currents"/>
</ogc:FeatureType>
<ogc:Value rdf:ID="Value_15000"/>
<ogc:Version rdf:ID="AcceptVersion"/>
<ogc:Name rdf:ID="LVL601_szBE_Elevation_point_nw25000040">
  <process:parameterValue
rdf:parseType="Literal">LVL601_szBE_Elevation_point_nw25000040</process:parameterValue>
</ogc:Name>
<ogc:Value rdf:ID="Value_EPSG_4326"/>
<ogc:Name rdf:ID="LVL101_szCO_TidesCurrents_point_nw25000040">
  <process:parameterValue
rdf:parseType="Literal">LVL101_szCO_TidesCurrents_point_nw25000040</process:parameterValue>
</ogc:Name>
<ogc:Name rdf:ID="LVL608_szBE_DepthAreas_line_nw25000040">
  <process:parameterValue
rdf:parseType="Literal">LVL608_szBE_DepthAreas_line_nw25000040</process:parameterValue>
</ogc:Name>
<ogc:OgcHttpParameter rdf:ID="DescribeFeatureType_OutputFormat_OgcHttpParameter">
  <ogc:hasDomain rdf:resource="#OutputFormatDomain"/>
  <ogc:groundsAbstractParameter rdf:resource="#OutputFormat"/>
</ogc:OgcHttpParameter>
<ogc:Name rdf:ID="LVL605_szBE_Bathymetry_line_nw25000060">

```

```

<process:parameterValue
rdf:parseType="Literal">LVL605_szBE_Bathymetry_line_nw25000060</process:parameterValue>
</ogc:Name>
<ogc:OgcHttpOperation rdf:ID="LockFeatureGrounding">
<ogc:hasConnectPoints rdf:resource="#OgcHttpPost"/>
<ogc:hasConnectPoints rdf:resource="#OgcHttpGet"/>
<ogc:groundsAtomicProcess rdf:resource="#LockFeature"/>
<ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>LockFeature</ogc:name>
</ogc:OgcHttpOperation>
<ogc:Value rdf:ID="text_xml"/>
<ogc:Domain rdf:ID="DefaultMaxFeaturesDomain">
<ogc:hasDomainComponent rdf:resource="#Value_15000"/>
<ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>DefaultMaxFeaturesDomain</ogc:name>
</ogc:Domain>
<ogc:FeatureType rdf:ID="LVL102_szCO_TidesCurrents_line_nw25000040_FeatureType">
<ogc:hasFeatureTypeComponent>
<ogc:Name rdf:ID="LVL102_szCO_TidesCurrents_line_nw25000040">
<process:parameterValue
rdf:parseType="Literal">LVL102_szCO_TidesCurrents_line_nw25000040</process:parameterValue>
</ogc:Name>
</ogc:hasFeatureTypeComponent>
<ogc:hasFeatureTypeComponent rdf:resource="#QueryOperation"/>
<ogc:hasFeatureTypeComponent rdf:resource="#Abstract"/>
<ogc:hasFeatureTypeComponent rdf:resource="#Tides_and_Tidal_Currents"/>
<ogc:hasFeatureTypeComponent rdf:resource="#EPSG_4326"/>
<ogc:hasFeatureTypeComponent rdf:resource="#textxml_subtype_gml3.1.1"/>
<ogc:hasFeatureTypeComponent>
<owlcsw:BoundingBox rdf:ID="WGS84BoundingBox_2">
<owlcsw:lowerCorner>
<owlcsw:Point rdf:ID="LL_2">
<owlcsw:x rdf:datatype="http://www.w3.org/2001/XMLSchema#float"
>-4.0</owlcsw:x>
<owlcsw:y rdf:datatype="http://www.w3.org/2001/XMLSchema#float"
>50.0</owlcsw:y>
</owlcsw:Point>
</owlcsw:lowerCorner>
<owlcsw:upperCorner>
<owlcsw:Point rdf:ID="UR_2">
<owlcsw:y rdf:datatype="http://www.w3.org/2001/XMLSchema#float"
>52.0</owlcsw:y>
<owlcsw:x rdf:datatype="http://www.w3.org/2001/XMLSchema#float"
>-2.0</owlcsw:x>
</owlcsw:Point>
</owlcsw:upperCorner>
<owlcsw:crs rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>WGS84</owlcsw:crs>
</owlcsw:BoundingBox>
</ogc:hasFeatureTypeComponent>
</ogc:FeatureType>
<ogc:OgcHttpParameter rdf:ID="Transaction_srsName_OgcHttpParameter">
<ogc:hasDomain>
<ogc:Domain rdf:ID="srsNameDomain">
<ogc:hasDomainComponent rdf:resource="#Value_EPSG_4326"/>
<ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>srsNameDomain</ogc:name>
</ogc:Domain>
</ogc:hasDomain>
<ogc:groundsAbstractParameter>

```



```

    <ogc:SRS rdf:ID="SRS"/>
  </ogc:groundsAbstractParameter>
</ogc:OgcHttpParameter>
<ogc:OgcHttpParameter rdf:ID="GetCapabilities_AcceptVersions_OgcHttpParameter">
  <ogc:hasDomain>
    <ogc:Domain rdf:ID="AcceptVersionsDomain">
      <ogc:hasDomainComponent>
        <ogc:Value rdf:ID="Value_1.1.0"/>
      </ogc:hasDomainComponent>
      <ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string">
        >AcceptVersionsDomain</ogc:name>
    </ogc:Domain>
  </ogc:hasDomain>
  <ogc:groundsAbstractParameter rdf:resource="#AcceptVersion"/>
</ogc:OgcHttpParameter>
<ogc:IdentifierGeneration rdf:ID="IdentifierGeneration"/>
<ogc:Name rdf:ID="LVL605_szBE_Bathymetry_line_nw25000040">
  <process:parameterValue
rdf:parseType="Literal">LVL605_szBE_Bathymetry_line_nw25000040</process:parameterValue>
</ogc:Name>
<ogc:OgcHttpParameter rdf:ID="Transaction_idgen_OgcHttpParameter">
  <ogc:groundsAbstractParameter rdf:resource="#IdentifierGeneration"/>
  <ogc:hasDomain>
    <ogc:Domain rdf:ID="idgen_Domain">
      <ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string">
        >idgen_Domain</ogc:name>
      <ogc:hasDomainComponent>
        <ogc:Value rdf:ID="GenerateNew"/>
      </ogc:hasDomainComponent>
      <ogc:hasDomainComponent>
        <ogc:Value rdf:ID="UseExisting"/>
      </ogc:hasDomainComponent>
    </ogc:Domain>
  </ogc:hasDomain>
</ogc:OgcHttpParameter>
<ogc:ReleaseAction rdf:ID="ReleaseAction"/>
<ogc:OgcHttpParameter rdf:ID="Transaction_ReleaseAction_OgcHttpParameter">
  <ogc:hasDomain>
    <ogc:Domain rdf:ID="ReleaseActionDomain">
      <ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string">
        >ReleaseActionDomain</ogc:name>
      <ogc:hasDomainComponent>
        <ogc:Value rdf:ID="ALL"/>
      </ogc:hasDomainComponent>
    </ogc:Domain>
  </ogc:hasDomain>
  <ogc:groundsAbstractParameter rdf:resource="#ReleaseAction"/>
</ogc:OgcHttpParameter>
<ogc:MaxFeatures rdf:ID="MaxFeatures"/>
<ogc:Name rdf:ID="LVL601_szBE_Elevation_point_nw25000060">
  <process:parameterValue
rdf:parseType="Literal">LVL601_szBE_Elevation_point_nw25000060</process:parameterValue>
</ogc:Name>
<ogc:Format rdf:ID="AcceptFormat"/>
<ogc:Domain rdf:ID="AcceptFormatDomain">
  <ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string">
    >AcceptFormatDomain</ogc:name>
  <ogc:hasDomainComponent rdf:resource="#text_xml"/>
</ogc:Domain>
<ogc:OgcHttpOperation rdf:ID="TransactionGrounding">

```

```

<ogc:hasOgcHttpParameter rdf:resource="#Transaction_ReleaseAction_OgcHttpParameter"/>
<ogc:hasOgcHttpParameter>
  <ogc:OgcHttpParameter rdf:ID="Transaction_DefaultMaxFeatures_OgcHttpParameter">
    <ogc:groundsAbstractParameter rdf:resource="#MaxFeatures"/>
    <ogc:hasDomain rdf:resource="#DefaultMaxFeaturesDomain"/>
  </ogc:OgcHttpParameter>
</ogc:hasOgcHttpParameter>
<ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string">
  >TransactionGrounding</ogc:name>
<ogc:hasConnectPoints rdf:resource="#OgcHttpGet"/>
<ogc:hasOgcHttpParameter rdf:resource="#Transaction_idgen_OgcHttpParameter"/>
<ogc:hasOgcHttpParameter rdf:resource="#Transaction_srsName_OgcHttpParameter"/>
<ogc:groundsAtomicProcess rdf:resource="#Transaction"/>
<ogc:hasOgcHttpParameter rdf:resource="#Transaction_InputFormat_OgcHttpParameter"/>
<ogc:hasOgcHttpParameter rdf:resource="#Transaction_DefaultLockExpiry_OgcHttpParameter"/>
</ogc:OgcHttpOperation>
<ogc>Name rdf:ID="LVL602_szBE_Elevation_line_nw25000040">
  <process:parameterValue
rdf:parseType="Literal">LVL602_szBE_Elevation_line_nw25000040</process:parameterValue>
</ogc>Name>
<ogc:FeatureType rdf:ID="LVL101_szCO_TidesCurrents_point_nw25000040_FeatureType">
<ogc:hasFeatureTypeComponent rdf:resource="#LVL101_szCO_TidesCurrents_point_nw25000040"/>
<ogc:hasFeatureTypeComponent rdf:resource="#Abstract"/>
<ogc:hasFeatureTypeComponent rdf:resource="#textxml_subtype_gml3.1.1"/>
<ogc:hasFeatureTypeComponent rdf:resource="#WGS84BoundingBox_2"/>
<ogc:hasFeatureTypeComponent rdf:resource="#QueryOperation"/>
<ogc:hasFeatureTypeComponent rdf:resource="#Tides_and_Tidal_Currents"/>
<ogc:hasFeatureTypeComponent rdf:resource="#EPSG_4326"/>
</ogc:FeatureType>
<ogc>Name rdf:ID="LVL609_szBE_DepthAreas_region_nw25000040">
  <process:parameterValue
rdf:parseType="Literal">LVL609_szBE_DepthAreas_region_nw25000040</process:parameterValue>
</ogc>Name>
<ogc>Name rdf:ID="LVL609_szBE_DepthAreas_region_nw25000060">
  <process:parameterValue
rdf:parseType="Literal">LVL609_szBE_DepthAreas_region_nw25000060</process:parameterValue>
</ogc>Name>
<ogc:OgcHttpOperation rdf:ID="GetCapabilitiesGrounding">
<ogc:groundsAtomicProcess rdf:resource="#GetCapabilities"/>
<ogc:hasOgcHttpParameter rdf:resource="#GetCapabilities_AcceptVersions_OgcHttpParameter"/>
<ogc:hasOgcHttpParameter>
  <ogc:OgcHttpParameter rdf:ID="GetCapabilities_AcceptFormat_OgcHttpParameter">
    <ogc:groundsAbstractParameter rdf:resource="#AcceptFormat"/>
    <ogc:hasDomain rdf:resource="#AcceptFormatDomain"/>
  </ogc:OgcHttpParameter>
</ogc:hasOgcHttpParameter>
<ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string">
  >GetCapabilities</ogc:name>
<ogc:hasConnectPoints rdf:resource="#OgcHttpPost"/>
<ogc:hasConnectPoints rdf:resource="#OgcHttpGet"/>
</ogc:OgcHttpOperation>
<ogc>Name rdf:ID="LVL606_szBE_Bathymetry_region_nw25000040">
  <process:parameterValue
rdf:parseType="Literal">LVL606_szBE_Bathymetry_region_nw25000040</process:parameterValue>
</ogc>Name>
<ogc:OgcHttpOperation rdf:ID="GetFeatureWithLockGrounding">
<ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string">
  >GetFeatureWithLock</ogc:name>
<ogc:hasConnectPoints rdf:resource="#OgcHttpPost"/>
<ogc:hasConnectPoints rdf:resource="#OgcHttpGet"/>

```

```
<ogc:groundsAtomicProcess rdf:resource="#GetFeatureWithLock"/>
</ogc:OgcHttpOperation>
<ogc:Name rdf:ID="LVL608_szBE_DepthAreas_line_nw25000060">
  <process:parameterValue
rdf:parseType="Literal">LVL608_szBE_DepthAreas_line_nw25000060</process:parameterValue>
  </ogc:Name>
  <ogc:OgcHttpOperation rdf:ID="DescribeFeatureTypeGrounding">
    <ogc:hasOgcHttpParameter rdf:resource="#DescribeFeatureType_OutputFormat_OgcHttpParameter"/>
    <ogc:hasConnectPoints rdf:resource="#OgcHttpGet"/>
    <ogc:hasConnectPoints rdf:resource="#OgcHttpPost"/>
    <ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >DescribeFeatureType</ogc:name>
    <ogc:groundsAtomicProcess rdf:resource="#DescribeFeatureType"/>
  </ogc:OgcHttpOperation>
  <ogc:Name rdf:ID="LVL606_szBE_Bathymetry_region_nw25000060">
    <process:parameterValue
rdf:parseType="Literal">LVL606_szBE_Bathymetry_region_nw25000060</process:parameterValue>
    </ogc:Name>
    <ogc:Format rdf:ID="Format"/>
  </rdf:RDF>
```

<!-- Created with Protege (with OWL Plugin 3.3.1, Build 430) <http://protege.stanford.edu> -->

Appendix E: The forth_be Web Map Service OWL-S Ontology

```
<?xml version="1.0"?>
<rdf:RDF
  xmlns:j.0="http://www.daml.org/services/owl-s/1.1/Process.owl#"
  xmlns:misc="http://compass.edina.ac.uk/ontologies/miscellaneous_subjects_v1.owl#"
  xmlns:inst="http://compass.edina.ac.uk/ontologies/instruments_v3.owl#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:owl="http://www.w3.org/2002/07/owl#"
  xmlns:protege="http://protege.stanford.edu/plugins/owl/protege#"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:ogc="http://compass.edina.ac.uk/ontologies/owl-s_ogc#"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
  xmlns="http://compass.edina.ac.uk/ontologies/ao/forth_be.owl#"
  xmlns:j.1="http://www.daml.org/services/owl-s/1.1/ActorDefault.owl#"
  xmlns:j.2="http://www.daml.org/services/owl-s/1.1/Profile.owl#"
  xmlns:j.3="http://compass.edina.ac.uk/ontologies/owlcsw.owl#"
  xml:base="http://compass.edina.ac.uk/ontologies/ao/forth_be.owl">
  <owl:Ontology rdf:about="">
    <owl:imports rdf:resource="http://compass.edina.ac.uk/ontologies/owl-s_ogc"/>
    <owl:imports rdf:resource="http://compass.edina.ac.uk/ontologies/instruments_v3.owl"/>
  </owl:Ontology>
  <ogc:DefaultSRS rdf:ID="EPSG_4326">
    <j.0:parameterValue rdf:parseType="Literal">EPSG:4326</j.0:parameterValue>
  </ogc:DefaultSRS>
  <ogc:OgcHttpParameter rdf:ID="GetFeatureInfoFormat">
    <ogc:groundsAbstractParameter>
      <ogc:Format rdf:ID="Format"/>
    </ogc:groundsAbstractParameter>
    <ogc:hasDomain>
      <ogc:Domain rdf:ID="GetFeatureInfoFormatDomain">
        <ogc:hasDomainComponent>
          <ogc:Value rdf:ID="application_vnd.ogc.gml"/>
        </ogc:hasDomainComponent>
        <ogc:hasDomainComponent>
          <ogc:Value rdf:ID="text_plain"/>
        </ogc:hasDomainComponent>
      </ogc:Domain>
    </ogc:hasDomain>
  </ogc:OgcHttpParameter>
  <ogc:Value rdf:ID="image_png_mode_24bit"/>
  <ogc:OgcHttpParameter rdf:ID="GetCapabilitiesFormat">
    <ogc:groundsAbstractParameter rdf:resource="#Format"/>
    <ogc:hasDomain>
      <ogc:Domain rdf:ID="Domain">
        <ogc:hasDomainComponent>
          <ogc:Value rdf:ID="application_vnd.ogc.wms_xml"/>
        </ogc:hasDomainComponent>
      </ogc:Domain>
    </ogc:hasDomain>
  </ogc:OgcHttpParameter>
  <ogc:Title rdf:ID="Depth_Line">
    <j.0:parameterValue rdf:parseType="Literal">http://compass.edina.ac.uk/webservices/depthline</j.0:parameterValue>
  </ogc:Title>
  <ogc:Layer rdf:ID="ElevationLine">
    <ogc:hasLayerComponent>
      <ogc:Queryable rdf:ID="Queryable">
        <j.0:parameterValue rdf:parseType="Literal">0</j.0:parameterValue>
      </ogc:Queryable>
    </ogc:hasLayerComponent>
  </ogc:Layer>
</rdf:RDF>
```

```

</ogc:hasLayerComponent>
<ogc:hasLayerComponent>
  <ogc:Cascaded rdf:ID="Cascaded">
    <j.0:parameterValue rdf:parseType="Literal">0</j.0:parameterValue>
  </ogc:Cascaded>
</ogc:hasLayerComponent>
<ogc:hasLayerComponent>
  <j.3:BoundingBox rdf:ID="BoundingBoxLL">
    <j.3:upperCorner>
      <j.3:Point rdf:ID="PointY">
        <j.3:x rdf:datatype="http://www.w3.org/2001/XMLSchema#float"
        >2.0</j.3:x>
        <j.3:y rdf:datatype="http://www.w3.org/2001/XMLSchema#float"
        >56.2</j.3:y>
      </j.3:Point>
    </j.3:upperCorner>
    <j.3:lowerCorner>
      <j.3:Point rdf:ID="PointX">
        <j.3:x rdf:datatype="http://www.w3.org/2001/XMLSchema#float"
        >4.0</j.3:x>
        <j.3:y rdf:datatype="http://www.w3.org/2001/XMLSchema#float"
        >55.5</j.3:y>
      </j.3:Point>
    </j.3:lowerCorner>
    <j.3:crs rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >WGS84</j.3:crs>
  </j.3:BoundingBox>
</ogc:hasLayerComponent>
<ogc:hasLayerComponent>
  <ogc:Name rdf:ID="Forth_Elevation_Line">
    <j.0:parameterValue
rdf:parseType="Literal">http://compass.edina.ac.uk/webservices/elevationline</j.0:parameterValue>
  </ogc:Name>
</ogc:hasLayerComponent>
<ogc:hasTopic>
  <misc:Elevation rdf:ID="Elevation"/>
</ogc:hasTopic>
<ogc:hasLayerComponent>
  <j.3:BoundingBox rdf:ID="BoundingBoxEPSG4326">
    <j.3:upperCorner>
      <j.3:Point rdf:ID="PointY1">
        <j.3:y rdf:datatype="http://www.w3.org/2001/XMLSchema#float"
        >56.2</j.3:y>
        <j.3:x rdf:datatype="http://www.w3.org/2001/XMLSchema#float"
        >2.0</j.3:x>
      </j.3:Point>
    </j.3:upperCorner>
    <j.3:lowerCorner>
      <j.3:Point rdf:ID="PointX1">
        <j.3:y rdf:datatype="http://www.w3.org/2001/XMLSchema#float"
        >55.5</j.3:y>
        <j.3:x rdf:datatype="http://www.w3.org/2001/XMLSchema#float"
        >4.0</j.3:x>
      </j.3:Point>
    </j.3:lowerCorner>
    <j.3:crs rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >EPSG:4326</j.3:crs>
  </j.3:BoundingBox>
</ogc:hasLayerComponent>
<j.0:parameterType rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI"

```

```

>http://compass.edina.ac.uk/webservices/elevationline<j.0:parameterType>
<ogc:hasLayerComponent>
  <ogc:Opaque rdf:ID="Opaque">
    <j.0:parameterValue rdf:parseType="Literal">0</j.0:parameterValue>
  </ogc:Opaque>
</ogc:hasLayerComponent>
<ogc:hasLayerComponent>
  <ogc:Title rdf:ID="Elevation_Line">
    <j.0:parameterValue
rdf:parseType="Literal">http://compass.edina.ac.uk/webservices/elevationline</j.0:parameterValue>
  </ogc:Title>
</ogc:hasLayerComponent>
<ogc:hasLayerComponent>
  <ogc:NotSubsettable rdf:ID="NotSubsettable">
    <j.0:parameterValue rdf:parseType="Literal">0</j.0:parameterValue>
  </ogc:NotSubsettable>
</ogc:hasLayerComponent>
<ogc:hasLayerComponent rdf:resource="#EPSG_4326"/>
</ogc:Layer>
<ogc:Layer rdf:ID="ElevationPoint">
  <ogc:hasLayerComponent rdf:resource="#Cascaded"/>
  <ogc:hasLayerComponent rdf:resource="#EPSG_4326"/>
  <ogc:hasLayerComponent>
    <ogc:Title rdf:ID="Elevation_Point">
      <j.0:parameterValue
rdf:parseType="Literal">http://compass.edina.ac.uk/webservices/elevationpoint</j.0:parameterValue>
    </ogc:Title>
  </ogc:hasLayerComponent>
  <ogc:hasLayerComponent rdf:resource="#BoundingBoxEPSG4326"/>
  <j.0:parameterType rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI"
>http://compass.edina.ac.uk/webservices/elevationpoint</j.0:parameterType>
  <ogc:hasLayerComponent rdf:resource="#Opaque"/>
  <ogc:hasLayerComponent rdf:resource="#BoundingBoxLL"/>
  <ogc:hasLayerComponent>
    <ogc:Name rdf:ID="Forth_Elevation_Point">
      <j.0:parameterValue
rdf:parseType="Literal">http://compass.edina.ac.uk/webservices/elevationpoint</j.0:parameterValue>
    </ogc:Name>
  </ogc:hasLayerComponent>
  <ogc:hasTopic rdf:resource="#Elevation"/>
  <ogc:hasLayerComponent rdf:resource="#Queryable"/>
  <ogc:hasLayerComponent rdf:resource="#NotSubsettable"/>
</ogc:Layer>
<ogc:OgcHttpPost rdf:ID="GetCapabilitiesOgcHttpPost">
  <ogc:xlink_type xml:lang="en">simple</ogc:xlink_type>
  <ogc:xlink_href rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&amp;</ogc:xlink_href>
</ogc:OgcHttpPost>
<ogc:Title rdf:ID="Bathymetry_Line">
  <j.0:parameterValue
rdf:parseType="Literal">http://compass.edina.ac.uk/webservices/bathymetryline</j.0:parameterValue>
</ogc:Title>
<ogc:OgcHttpOperation rdf:ID="GetFeatureInfoOgcHttpOperation">
  <ogc:hasConnectPoints>
    <ogc:OgcHttpPost rdf:ID="GetFeatureInfoOgcHttpPost">
      <ogc:xlink_type rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>simple</ogc:xlink_type>
      <ogc:xlink_href rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&amp;</ogc:xlink_href>
    </ogc:OgcHttpPost>

```

```

</ogc:hasConnectPoints>
<ogc:hasConnectPoints>
  <ogc:OgcHttpGet rdf:ID="GetFeatureInfoOgcHttpGet">
    <ogc:xlink_href rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&amp;</ogc:xlink_href>
    <ogc:xlink_type rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >simple</ogc:xlink_type>
  </ogc:OgcHttpGet>
</ogc:hasConnectPoints>
<ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>GetFeatureInfo</ogc:name>
<ogc:hasOgcHttpParameter rdf:resource="#GetFeatureInfoFormat"/>
</ogc:OgcHttpOperation>
<ogc:GetCapabilities rdf:ID="GetCapabilities">
  <ogc:describes>
    <ogc:Service rdf:ID="Firth_of_Forth_Bathymetry_and_Elevation">
      <ogc:supports>
        <ogc:OgcHttpGrounding rdf:ID="Firth_of_Forth_Bathymetry_and_Elevation_Grounding">
          <ogc:supportedBy rdf:resource="#Firth_of_Forth_Bathymetry_and_Elevation"/>
          <ogc:hasOgcHttpOperation rdf:resource="#GetFeatureInfoOgcHttpOperation"/>
          <ogc:hasOgcHttpOperation>
            <ogc:OgcHttpOperation rdf:ID="GetMapGrounding">
              <ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
              >GetMap</ogc:name>
              <ogc:hasOgcHttpParameter>
                <ogc:OgcHttpParameter rdf:ID="GetMapFormat">
                  <ogc:hasDomain>
                    <ogc:Domain rdf:ID="Domain1">
                      <ogc:hasDomainComponent>
                        <ogc:Value rdf:ID="image_svg_xml"/>
                      </ogc:hasDomainComponent>
                      <ogc:hasDomainComponent>
                        <ogc:Value rdf:ID="image_tiff"/>
                      </ogc:hasDomainComponent>
                      <ogc:hasDomainComponent>
                        <ogc:Value rdf:ID="image_vnd.wap.wbmp"/>
                      </ogc:hasDomainComponent>
                      <ogc:hasDomainComponent>
                        <ogc:Value rdf:ID="image_jpeg"/>
                      </ogc:hasDomainComponent>
                      <ogc:hasDomainComponent rdf:resource="#image_png_mode_24bit"/>
                      <ogc:hasDomainComponent>
                        <ogc:Value rdf:ID="image_gif"/>
                      </ogc:hasDomainComponent>
                      <ogc:hasDomainComponent>
                        <ogc:Value rdf:ID="image_png"/>
                      </ogc:hasDomainComponent>
                    </ogc:Domain>
                  </ogc:hasDomain>
                <ogc:groundsAbstractParameter rdf:resource="#Format"/>
              </ogc:OgcHttpParameter>
            </ogc:hasOgcHttpParameter>
          </ogc:hasConnectPoints>
          <ogc:OgcHttpPost rdf:ID="GetMapOgcHttpPost">
            <ogc:xlink_href rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
            >http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&amp;</ogc:xlink_href>
            <ogc:xlink_type xml:lang="en">simple</ogc:xlink_type>
          </ogc:OgcHttpPost>
        </ogc:hasConnectPoints>
      </ogc:Service>
    </ogc:describes>
  </ogc:GetCapabilities>

```

```

<ogc:OgcHttpGet rdf:ID="GetMapOgcHttpGet">
  <ogc:xlink_type rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >simple</ogc:xlink_type>
  <ogc:xlink_href rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&amp;</ogc:xlink_href>
</ogc:OgcHttpGet>
</ogc:hasConnectPoints>
</ogc:OgcHttpOperation>
</ogc:hasOgcHttpOperation>
<ogc:hasOgcHttpOperation>
<ogc:OgcHttpOperation rdf:ID="GetCapabilitiesGrounding">
  <ogc:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >GetCapabilities</ogc:name>
  <ogc:groundsAtomicProcess rdf:resource="#GetCapabilities"/>
  <ogc:hasConnectPoints rdf:resource="#GetCapabilitiesOgcHttpPost"/>
  <ogc:hasConnectPoints>
  <ogc:OgcHttpGet rdf:ID="GetCapabilitiesOgcHttpGet">
    <ogc:xlink_href rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
    >http://ledi.edina.ac.uk:50087/cgi-bin/mapserv?map=mapfiles/Forth_BE.map&amp;</ogc:xlink_href>
    <ogc:xlink_type xml:lang="en">simple</ogc:xlink_type>
  </ogc:OgcHttpGet>
  </ogc:hasConnectPoints>
  <ogc:hasOgcHttpParameter rdf:resource="#GetCapabilitiesFormat"/>
  </ogc:OgcHttpOperation>
</ogc:hasOgcHttpOperation>
</ogc:OgcHttpGrounding>
</ogc:supports>
<ogc:serviceTypeVersion rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>1.1.1</ogc:serviceTypeVersion>
<ogc:sourceDocVersion rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>1.1.1/0</ogc:sourceDocVersion>
<ogc:describedBy rdf:resource="#GetCapabilities"/>
<ogc:serviceType rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
>WMS</ogc:serviceType>
<ogc:presents>
<ogc:WMSProfile rdf:ID="Firth_of_Forth_Bathymetry_and_Elevation_Profile">
  <ogc:hasServiceProvider>
  <ogc:ServiceProvider rdf:ID="EDINA">
    <ogc:hasActor>
    <j.1:Actor rdf:ID="EDINA_Helpdesk">
      <j.1:name xml:lang="en">EDINA_Helpdesk</j.1:name>
      <j.1:phone rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >+44 131 650 3302</j.1:phone>
      <j.1:email rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >edina@ed.ac.uk</j.1:email>
    </j.1:Actor>
    </ogc:hasActor>
  </ogc:ServiceProvider>
  </ogc:hasServiceProvider>
  <ogc:hasTopic rdf:resource="#Elevation"/>
  <ogc:hasTopic>
  <inst:Bathymetry rdf:ID="Bathymetry"/>
  </ogc:hasTopic>
  <j.2:textDescription rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >Bathymetry and Elevation information for the Firth of Forth.</j.2:textDescription>
  <j.2:serviceName rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >Forth_BE</j.2:serviceName>
  <ogc:presentedBy rdf:resource="#Firth_of_Forth_Bathymetry_and_Elevation"/>
  <ogc:hasProcess rdf:resource="#GetCapabilities"/>
</ogc:WMSProfile>

```



```

    </ogc:presents>
  </ogc:Service>
</ogc:describes>
</ogc:GetCapabilities>
<ogc:Layer rdf:ID="Forth_BE">
  <ogc:hasLayerComponent>
    <ogc:Title rdf:ID="Bathymetry_and_Elevation">
      <j.0:parameterValue rdf:parseType="Literal">http://compass.edina.ac.uk/webservices/forth_be</j.0:parameterValue>
    </ogc:Title>
  </ogc:hasLayerComponent>
  <ogc:hasLayerComponent>
    <ogc:Layer rdf:ID="DepthLine">
      <ogc:hasLayerComponent>
        <ogc:Name rdf:ID="Forth_Depth_Line">
          <j.0:parameterValue
rdf:parseType="Literal">http://compass.edina.ac.uk/webservices/depthline</j.0:parameterValue>
        </ogc:Name>
      </ogc:hasLayerComponent>
      <ogc:hasLayerComponent rdf:resource="#Cascaded"/>
      <ogc:hasLayerComponent rdf:resource="#Queryable"/>
      <j.0:parameterType rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI"
>http://compass.edina.ac.uk/webservices/depthline</j.0:parameterType>
      <ogc:hasLayerComponent rdf:resource="#Opaque"/>
      <ogc:hasLayerComponent rdf:resource="#BoundingBoxLL"/>
      <ogc:hasLayerComponent rdf:resource="#NotSubsettable"/>
      <ogc:hasLayerComponent rdf:resource="#Depth_Line"/>
      <ogc:hasLayerComponent rdf:resource="#BoundingBoxEPSG4326"/>
      <ogc:hasLayerComponent rdf:resource="#EPSG_4326"/>
    </ogc:Layer>
  </ogc:hasLayerComponent>
  <ogc:hasLayerComponent rdf:resource="#BoundingBoxEPSG4326"/>
  <ogc:hasLayerComponent rdf:resource="#Queryable"/>
  <j.0:parameterType rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI"
>http://compass.edina.ac.uk/webservices/forth_be</j.0:parameterType>
  <ogc:hasLayerComponent>
    <ogc:Name rdf:ID="Forth_Bathymetry_and_Elevation">
      <j.0:parameterValue rdf:parseType="Literal">http://compass.edina.ac.uk/webservices/forth_be</j.0:parameterValue>
    </ogc:Name>
  </ogc:hasLayerComponent>
  <ogc:hasLayerComponent>
    <ogc:Layer rdf:ID="BathymetryLine">
      <ogc:hasLayerComponent>
        <ogc:Name rdf:ID="Forth_Bathymetry_Line">
          <j.0:parameterValue
rdf:parseType="Literal">http://compass.edina.ac.uk/webservices/bathymetryline</j.0:parameterValue>
        </ogc:Name>
      </ogc:hasLayerComponent>
      <ogc:hasLayerComponent rdf:resource="#Bathymetry_Line"/>
      <ogc:hasLayerComponent rdf:resource="#NotSubsettable"/>
      <ogc:hasLayerComponent rdf:resource="#Opaque"/>
      <ogc:hasLayerComponent rdf:resource="#BoundingBoxEPSG4326"/>
      <ogc:hasLayerComponent rdf:resource="#Cascaded"/>
      <j.0:parameterType rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI"
>http://compass.edina.ac.uk/webservices/bathymetryline</j.0:parameterType>
      <ogc:hasLayerComponent rdf:resource="#EPSG_4326"/>
      <ogc:hasTopic rdf:resource="#Bathymetry"/>
      <ogc:hasLayerComponent rdf:resource="#BoundingBoxLL"/>
      <ogc:hasLayerComponent rdf:resource="#Queryable"/>
    </ogc:Layer>
  </ogc:hasLayerComponent>

```

```

<ogc:hasTopic rdf:resource="#Elevation"/>
<ogc:hasLayerComponent>
  <ogc:Layer rdf:ID="BathymetryArea">
    <ogc:hasLayerComponent rdf:resource="#Cascaded"/>
    <ogc:hasLayerComponent>
      <ogc:Name rdf:ID="Forth_Bathymetry_Area">
        <j.0:parameterValue
rdf:parseType="Literal">http://compass.edina.ac.uk/webservices/bathymetryarea</j.0:parameterValue>
        </ogc:Name>
      </ogc:hasLayerComponent>
      <ogc:hasLayerComponent rdf:resource="#BoundingBoxLL"/>
      <ogc:hasTopic rdf:resource="#Bathymetry"/>
      <ogc:hasLayerComponent>
        <ogc:Title rdf:ID="Bathymetry_Area">
          <j.0:parameterValue
rdf:parseType="Literal">http://compass.edina.ac.uk/webservices/bathymetryarea</j.0:parameterValue>
          </ogc:Title>
        </ogc:hasLayerComponent>
        <ogc:hasLayerComponent rdf:resource="#Opaque"/>
        <j.0:parameterType rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI"
>http://compass.edina.ac.uk/webservices/bathymetryarea</j.0:parameterType>
        <ogc:hasLayerComponent rdf:resource="#BoundingBoxEPSG4326"/>
        <ogc:hasLayerComponent rdf:resource="#NotSubsettable"/>
        <ogc:hasLayerComponent rdf:resource="#Queryable"/>
        <ogc:hasLayerComponent rdf:resource="#EPSG_4326"/>
      </ogc:Layer>
    </ogc:hasLayerComponent>
    <ogc:hasLayerComponent>
      <ogc:Layer rdf:ID="DepthArea">
        <ogc:hasLayerComponent rdf:resource="#Opaque"/>
        <ogc:hasLayerComponent rdf:resource="#Cascaded"/>
        <ogc:hasLayerComponent rdf:resource="#EPSG_4326"/>
        <ogc:hasLayerComponent>
          <ogc:Name rdf:ID="Forth_Depth_Area">
            <j.0:parameterValue
rdf:parseType="Literal">http://compass.edina.ac.uk/webservices/deptharea</j.0:parameterValue>
            </ogc:Name>
          </ogc:hasLayerComponent>
          <j.0:parameterType rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI"
>http://compass.edina.ac.uk/webservices/deptharea</j.0:parameterType>
          <ogc:hasLayerComponent rdf:resource="#BoundingBoxLL"/>
          <ogc:hasLayerComponent rdf:resource="#BoundingBoxEPSG4326"/>
          <ogc:hasLayerComponent>
            <ogc:Title rdf:ID="Depth_Area">
              <j.0:parameterValue
rdf:parseType="Literal">http://compass.edina.ac.uk/webservices/deptharea</j.0:parameterValue>
              </ogc:Title>
            </ogc:hasLayerComponent>
            <ogc:hasLayerComponent rdf:resource="#Queryable"/>
            <ogc:hasLayerComponent rdf:resource="#NotSubsettable"/>
          </ogc:Layer>
        </ogc:hasLayerComponent>
        <ogc:hasLayerComponent rdf:resource="#NotSubsettable"/>
        <ogc:hasLayerComponent rdf:resource="#ElevationPoint"/>
        <ogc:hasLayerComponent rdf:resource="#Opaque"/>
        <ogc:hasLayerComponent rdf:resource="#ElevationLine"/>
        <ogc:hasLayerComponent rdf:resource="#EPSG_4326"/>
        <ogc:hasTopic rdf:resource="#Bathymetry"/>
        <ogc:hasLayerComponent rdf:resource="#BoundingBoxLL"/>
      </ogc:Layer>
    </ogc:hasLayerComponent>
  </ogc:Layer>
</ogc:hasLayerComponent>

```

<ogc:OgcHttpOperation rdf:ID="OgcHttpOperation_37"/>
</rdf:RDF>

<!-- Created with Protege (with OWL Plugin 3.3.1, Build 430) http://protege.stanford.edu -->

LICENSING

This work is licensed under the Creative Commons Attribution-Noncommercial Works 3.0 License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-nd/3.0/> or send a letter to Creative Commons, 543 Howard Street, 5th Floor, San Francisco, California, 94105, USA.