

INSPIRE

Infrastructure for Spatial Information in Europe

INSPIRE Domain Model

Title	INSPIRE Domain Model
Creator	IOC Services Team
Date	20-04-2010
Subject	INSPIRE Domain Model
Status	Draft Final, Acceptance by the Initial Operating Capability Task Force is pending
Publisher	IOC Services Team
Type	Text
Description	Draft conceptual model that defines the most important (technical) entities of INSPIRE (as of data, metadata, services) and their linkages.
Format	MS Word
Source	IOC Services Team
Rights	Draft versions: IOC Services Team, Task Force, Drafting Teams. Final: Public
Identifier	INSPIRE Domain Model v0.9.1 - draft final_EDITS.doc
Language	En
Relation	Not applicable
Coverage	Project duration

Table of Contents

1 Introduction.....	3
1.1 Summary.....	3
1.2 Scope of Work.....	4
1.3 Notes & Known Limitations.....	4
1.4 Structure of the document.....	4
2 Referenced Documents.....	5
3 INSPIRE Domain Model.....	5
3.1 Domain Model diagram (UML object model).....	7
3.2 Spatial Data & Data Themes	8
3.2.1 Entities.....	8
3.2.2 Linkages.....	8
3.3 Metadata & Discovery	9
3.3.1 Entities.....	9
3.3.2 Linkages.....	11
3.4 View Service & Layers.....	12
3.4.1 Entities.....	12
3.4.2 Linkages.....	13
3.5 Download Service, Feature Types and Predefined Datasets.....	13
3.5.1 Entities.....	13
3.5.2 Linkages.....	14
4 Variants & Special Cases.....	15
4.1 Layers composed of more than one spatial object type.....	15
4.2 Distributed/separated spatial datasets.....	16
4.3 Simple and Extended Service Binding in Metadata.....	18

1 Introduction

1.1 Summary

The aim of the technical guidance documents is to describe how INSPIRE should be implemented from a technical perspective. Technical guidance documents are available for the technical components of INSPIRE separately, each of which is focusing to the characteristics of the component, in the broader context of the technical infrastructure for INSPIRE they are building blocks e.g. each of the network service types, metadata, spatial data. Many use cases and workflows in a spatial data infrastructure are comprehensive and span across various technical components. These workflows and use cases are not directly handled in the INSPIRE technical guidance documents. For example:

Discovery services and metadata serve the purpose to discover, evaluate and use geospatial resources in INSPIRE. Such resources are at a minimum spatial datasets and services that provide access to them. Workflow examples are: "I found a metadata document for a spatial dataset, how can i use it?", "I am visualizing a layer of a view service and am interested in the spatial dataset for further analysis; how do i find an appropriate download facility?" Automated discover-evaluation-use workflows require that metadata is accessible through a discovery services via linkages, that metadata is linked to the resources they describe and that –in case that resources are linked together, e.g. a spatial dataset is accessible through a service which is described via a separated metadata document- metadata of related resources are linked together.

Discovery services provide access to metadata. The selection of OGC CSW ISO APP as base specification for the discovery service involve that service interface and metadata have dependencies, both in terms of content and encoding. These are mainly metadata elements needed for discovery (and not necessarily required by the directive itself) such as: identifiers for resources, identifiers for metadata records.

Layers provide a visualization representation of spatial datasets. The IR interoperability of spatial data sets and services provide definitions for layers. These definitions mandate the layers name, its title, its minimum symbolization and the spatial object types to be used as data sources, given that spatial object types are represented through spatial datasets. This has a major impact on the way that the layers of a view service are organized (and possibly how a member state organizes its view services). This is especially through the fact that the layer name is used as identifier and needs to be unambiguous within a view service instance, meaning that only one instance of layer with the layer name following the official layer definition can be used. Category layers can help in situations, where the corresponding spatial datasets is more than one.

Layers provide a visualization representation of spatial datasets. Metadata records for these spatial datasets exist and are accessible through discovery services. Beside providing a description of the spatial dataset used to build up a layer, the metadata allows to initialize additional workflows like accessing the data itself. This requires that layers provide a linkage to the metadata description of the spatial dataset. This is done through the element "metadataUrl" as part of the capabilities. This element is to be populated with a single URL that allows access to an unambiguous metadata record. The discovery service provides the "GetRecordById" operation. This operation allows expressing access in a single HTTP/GET URL but requires a metadata element "fileIdentifier" which is the identifier of a metadata record.

The minimum geospatial resource that is been described through metadata is a spatial dataset. However it might be required or wished that also view services are described with a dedicated metadata document in order to provide more information on the service itself. Such service metadata would obviously benefit if they are related to the metadata of spatial datasets they operate on; "now that I found this spatial dataset, show me services that provide access to it". This is facilitated through the metadata element "operatesOn" using the resource identifier of the spatial dataset. For automated invocation, metadata for view services provide two mechanism: simple binding using the metadata element "resourceLocator" pointing to the capabilities of the view service or an extended binding allowing to express that a targeted operation on the view service needs to be invoked (like a "getMap" operation directly referencing a particular layer).

To provide guidance and to help understanding the nature of technical components (entities), their relationships, their context and how they could interact to realize use cases and workflows is the purpose of the INSPIRE domain model.

1.2 Scope of Work

The INSPIRE domain model as such serves as conceptual model to define the most important (technical) entities of INSPIRE (as of data, metadata, services) and their linkages. The aim is to help understand the nature of these entities and the linkages, their purpose, context and how they could interact to realize use cases and workflows.

The current work on the domain model focuses on the INSPIRE metadata, discovery and view services and related Technical Guidance Documents and is aiming to identify gaps not directly visible when working on the individual items. In the mid term the domain model serves as input for an updated INSPIRE architecture document. The domain model can subsequently be extended by taking additional aspects (e.g. download, transformation & invoking services, data specification for annex II & III, georm, etc.) into account.

Scope of work for version 1.0:

- Identify gaps that are not directly visible when working on single aspects, e.g. single Technical Guidance documents (TG)
- Get a common understanding of INSPIRE (from the technological point of view)
- Provide input for the finalization of the technical guidance documents for view and discovery and if applicable to metadata

Scope of work for future versions:

- Provide input for an updated INSPIRE architecture document (or a core element of this document)
- Subsequent extension by additional TGs (Download/Invoke/Transformation services)
- Subsequent extension by taking additional aspects into account (Schema's, Registries, Access Control/GeoRM entities)
- Base for future evolution of INSPIRE specifications

1.3 Notes & Known Limitations

Notes:

- The terms "feature type" and "spatial object type" are used equivalent. The terms "feature type" is the terminus technicus used in the base standard for download services (WFS), the term "spatial object type" is used in the INSPIRE context.
- Information elements of entities display in the model as "attributes". In the base specifications (as listed in chp 2) these can match to more complex structures; "attributes" is a simplification.
- Further explanations and examples on the coupling of metadata for spatial datasets and service can be found in Annex F of the OGC CSW ISO Application Profile 1.0 (OGC # 07-045).

Known limitations:

- The domain model is described as a UML object model, a class/component based model that works with entity types instead of entity instances (object) is still subject to be done. For understanding purposes and the goals of the domain model for the current work of the IOC TF, an object model is deemed to be appropriate.
- The domain model uses an artificial example for simplification purposes. This introduces the risk that certain issues will not be transparent. This risk is being addressed by
 - o Member states taking the example to match the model to national real life situations; these will be discussed in a separate workshop. Issues with significant impact on the model will be added to this document.
 - o Addition of an entity type based domain model that uses class diagrams (later).
- The model also covers the INSPIRE download service which is not in scope of the current work of the IOC TF; this is mainly done because a second service type that works on the spatial data is needed besides view service. We want to make sure that the same principles work independent of the view service.

1.4 Structure of the document

In chapter 5 & 5.1 the domain model diagram and the example used to create it is introduced. Chapters 5.2 to 5.5 explain each area as of: "Spatial Data & Data Themes", "Metadata & Discovery", "View Service & Layers" and "Download Service, FeatureTypes and Predefined Datasets". For each area, the entities and linkages between entities (across the domain model) are explained.

As the domain model in chapter 6 is created based on a particular example, it does not cover a wide variety of alternative setups. An (uncomplete) selection of them is addressed in chapter 6.

2 Referenced Documents

- INSPIRE Metadata Implementing Rules: Technical Guidelines based on EN ISO 19115 and EN ISO 19119 (Revised edition) 03.02.2009 - http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/metadata/MD_IR_and_ISO_2009_0218.pdf
- INSPIRE Metadata Regulation 03.12.2008 - <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008R1205:EN:NOT>
- INSPIRE View Service Technical Guidance (Version 2.0) 28.07.2009 - http://inspire.jrc.ec.europa.eu/documents/Network_Services/Technical%20Guidance%20View%20Services%20v%202.0.pdf
- Technical Guidance Discovery Services (2.0) 23.07.2009 - http://inspire.jrc.ec.europa.eu/documents/Network_Services/Technical%20Guidance%20Discovery%20Services%20v2.0.pdf
- Draft Technical Guidance Download Services (version 2.0) 25.09.2009 - [http://inspire.jrc.ec.europa.eu/documents/Network_Services/INSPIRE%20Draft%20Technical%20Guidance%20Download%20\(Version%202.0\).pdf](http://inspire.jrc.ec.europa.eu/documents/Network_Services/INSPIRE%20Draft%20Technical%20Guidance%20Download%20(Version%202.0).pdf)
- Regulation on INSPIRE Network Services 19.10.2009 - <http://eur-lex.europa.eu/JOHtml.do?uri=OJ%3AL%3A2009%3A274%3ASOM%3AEN%3AHTML>
- Network Services Architecture (Version 3.0) 30.09.2008 - http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/network/D3_5_INSPIRE_NS_Architecture_v3-0.pdf
- Regulation on interoperability of spatial data sets and services 11.12.2009 <http://ec.europa.eu/transparency/regcomitology/index.cfm?do=Search.getPDF&IA6b4z6edALEzOuvQ2DQwEuYwr24bl+u6M8oCwqIYrvB7EJR+poTzWZ/2wT/z/JFTr7x0HnynbcJdi/BzR4ZvdPpAur0FOHhej8jYcN49FA=>

As well as all documents which are referenced in the above mentioned documents.

3 INSPIRE Domain Model

In order to make the model understandable and readable, the INSPIRE domain model is displayed and explained by example (see Figure 2). The diagram shows instances of the entity types instead of the types themselves. Related entities are grouped. Groups are “Spatial Data & Data Themes”, “Metadata & Discovery”, “View Service & Layers” and “Download Service, FeatureTypes and Predefined Datasets”. Each group has a shortcut name. Context and contents of each group is described in a separate chapter (chapter 3.2 to 3.5). The linkages between the entities are expressed as associations through out the model. The associations name their nature and are explained with the entities themselves in the chapters describing the groups.

The following example is used to build the model:

Netherlands have a national spatial dataset “TOP10NL”. This spatial dataset contains a collection of spatial objects that are instances of spatial object type StatisticalUnits::NUTSRegion. The SpatialDataSet is accessible in three ways:

1. display of layers that represent spatial objects via a view service BaseData.NL
2. direct access to spatial objects via a download service BaseData.NL
3. access/download of a predefined dataset in a compressed format (e.g. zip file) via a download service

A discovery service allows querying the metadata collection of NL. As part of this example, three records of the collection are of interest:

1. metadata document describing the spatial data set TOP10NL
2. metadata document describing the view service BaseData.NL
3. metadata document describing the download service BaseData.NL

These metadata documents are linked to each other as well as to the resources they represent.

Note: By taking a simplified example, certain aspects and issues are not visible. A selection of these is addressed in chapter 4.

3.1 Domain Model diagram (UML object model)

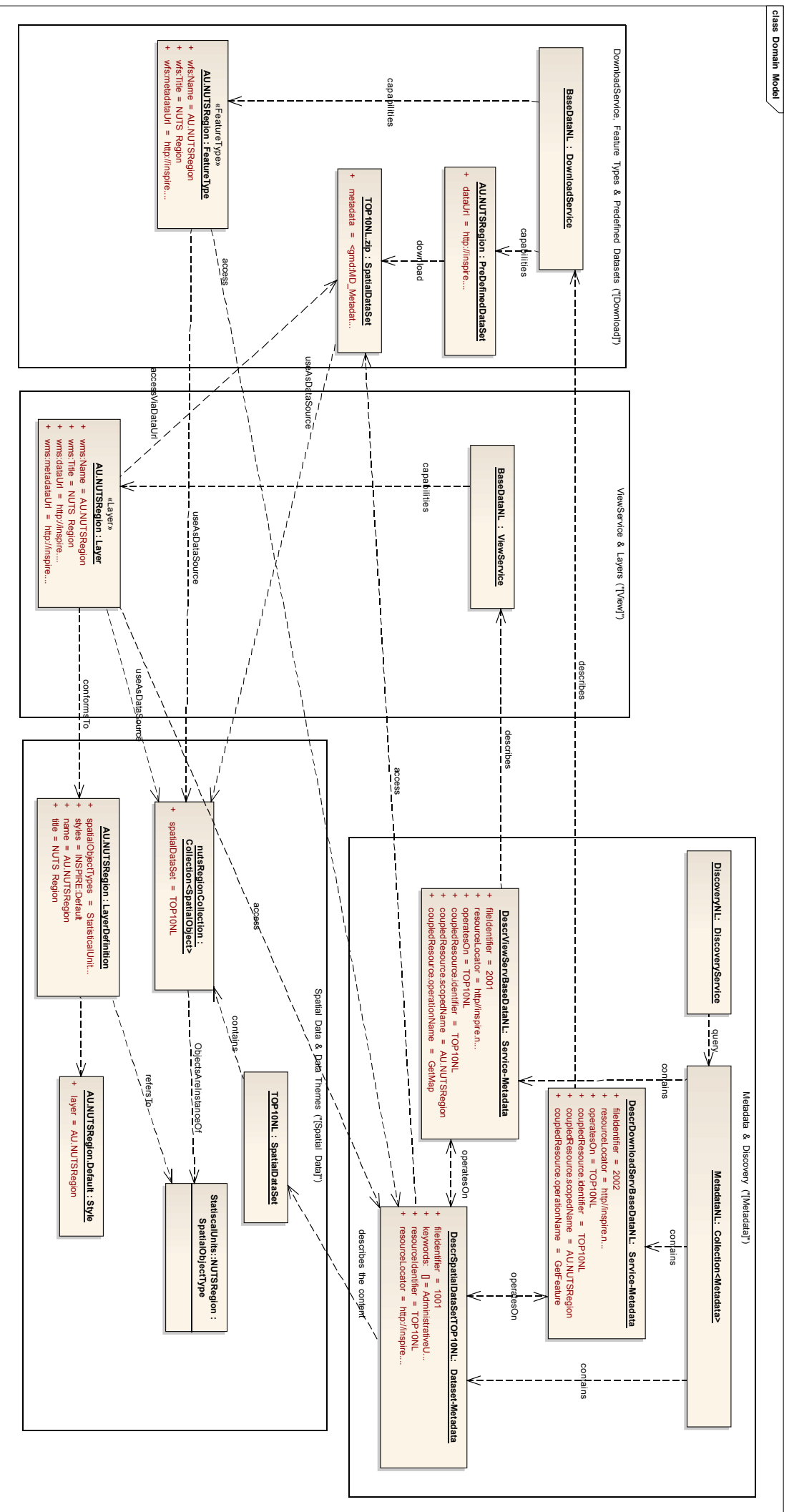


Figure 1: Domain Model diagram (UML object model)

3.2 Spatial Data & Data Themes

The spatial dataset used in the example is “TOP10NL”. This spatial dataset contains a collection of spatial objects that are instances of spatial object type StatisticalUnits::NUTSRegion. The collection of spatial objects is the data source which is published through an INSPIRE download services as feature type and predefined dataset and through an INSPIRE view service as layer. The definition of layer defines how a layer of a view service is defined that displays the data. In terms of metadata, the spatial dataset itself is described by a single metadata document.

3.2.1 Entities

The following table describe the entity and their type.

Entity	Type	Description
TOP10NL	SpatialDataSet	TOP10NL is national physically available spatial data set that includes spatial objects.
nutsRegionCollection	Collection<SpatialObject>	Collection of spatial objects that implement the spatial object type StatisticalUnits::NUTSRegion of the annex theme Administrative Units (AU).
AU.NUTSRegion	LayerDefinition	The definition of the layer as defined by the Implementing Rule on interoperability of spatial data sets and services, annex II. Defines which spatial object types are to be used for that layer, the styles, the name and the title. A view service that wants to display the spatial objects of the data set TOP10NL need to do this via a layer that is conformant to this layer definition.
AU.NUTSRegion.Default	StyleDefinition	Definition of the symbology that should be used when displaying spatial objects of that spatial object type.

Table 1: Entities of Spatial Data & Data Themes

3.2.2 Linkages

The following table describe the linkages between the entities both inside this group and to entities of other groups (indicated by the group shortcut in “[/]”). These linkages are display in the domain model diagram (see Figure 1) as named association; source, destination and association name equal the model.

From	Association	To	Description
[Download] AU.NUTSRegion:FeatureType	useAsDataSource	[Spatial Data] nutsRegionCollection :Collection <SpatialObject>	Access the spatial objects of the data set TOP10NL via the download service. The link is established in the configuration of the download service (matching its feature type to the appropriate data source).
[Download] TOP10NL.zip:SpatialDataSet	isRepresentationOf	[Spatial Data] TOP10NL : SpatialDataSet	Download of a predefined dataset as zip via a download service. The link is established through a http link pointing to the file as part of the capabilities. (note: the current version of the download service TG 2.0 is not clear on how this expressed in the capabilities).
[View] AU.NUTSRegion:Layer	useAsDataSource	[Spatial Data] nutsRegionCollection :Collection <SpatialObject>	Displays the layer (representing the spatial dataset TOP10NL and its spatial objects) via the view service. The link is established in the configuration of the view service (matching its layer to the appropriate data source).
[View] AU.NUTSRegion:Layer	conformsTo	[SpatialData] AU.NUTSRegion : LayerDefinition	The layer representing the spatial objects of the data set TOP10NL needs to be conformant to the corresponding layer definition.

Table 2: Linkages of Spatial Data & Data Themes

3.3 Metadata & Discovery

The example includes three metadata documents: a description of the spatial dataset “TOP10NL”, a description for the view service that displays the spatial dataset as layer and a description for the download service that provides access to the data of the spatial dataset. The metadata documents describing the services are linked to description of the spatial dataset allowing to navigate from one to the other. All metadata documents are linked to the resources for access: to the download service (including a direct link to a predefined dataset of TOP10NL as URL) and to the view service.

In terms of discovery, all metadata documents can be accessed through the discovery service using query expressions that include the queryables and directly using the identifier of the metadata documents via the element fileIdentifier.

3.3.1 Entities

The following table describe the entity and their type.

Entity	Type	Description
DiscoveryNL	DiscoveryService	National discovery service of Netherlands.
MetadataNL	Collection<Metadata>	Collection of metadata that is queryable and accessible via the discovery service.
DescrSpatialDataSetTOP10NL	Dataset-Metadata	<p>Metadata document describing the spatial data set TOP10NL. The document includes the following elements:</p> <p><i>fileIdentifier = 1001</i> The fileIdentifier represents the identifier of the metadata document and is unique in the collection. It can be used to directly access the document via the GetRecordById operation of the discovery service. The usage of a UUID (Universal Unique Identifier, as specified by IETF (http://www.ietf.org)) is recommended to ensure identifier’s uniqueness.</p> <p><i>keyword[] = {“Administrative Units”}</i> Keywords are used to make the document discoverable. One of the keywords represents the name of the INSPIRE data theme that the spatial data set represents as required by the INSPIRE Metadata Regulation.</p> <p><i>resourceIdentifier = “TOP10NL”</i> The resourceIdentifier is the unique resource identifier of the resource (here the spatial data set).</p> <p><i>resourceLocator = “http://inspire.nl/download-basedata.nl/NL.ZOP10NL.zip”</i> The resourceLocator points to the resource if this is possible via a single URL. For accessing predefined datasets via the download service, this is the case. It could also point to any other location from where access is possible. This could include a link to a shop system or other access facilities. The link can also be access controlled and enforce authentication.</p>
DescrViewServBaseDataNL	Service-Metadata	<p>Metadata document describing the view service BaseData.NL. The document includes the following elements:</p> <p><i>fileIdentifier = 2001</i> [see above]</p> <p><i>resourceLocator=http://inspire.nl/viewservice-basedata.nl/capabilities</i> The resourceLocator points to the resource if this is possible via a single URL. For a service, this is the capabilities document of the view service.</p>

		<p><i>operatesOn="TOP10NL"</i> Expresses that the described view service operates on the resource with the given identifier. Can be used to define a query that provides access to the metadata document describing the spatial dataset itself.</p> <p><i>The following additional metadata elements are recommended for the extended binding of the service to the service metadata. They are needed if a targeted operation on the view service needs to be invoked (like directly referencing a particular layer); See also chapter 4.3 on simple and extended binding.</i></p> <p><i>coupledResource.identifier="TOP10NL"</i> Used for service coupling, see also annex F in the OGC ISO App Spec. for details¹. This element establishes the link to the resource via its identifier.</p> <p><i>coupledResource.scopedName="AU.NUTSRegion"</i> This element establishes the link to the layer of the view service via the layer name.</p> <p><i>coupledResource.operationName="GetMap"</i> This element defines the operation to be executed.</p>
DescrDownloadServBaseDataNL	Service-Metadata	<p>Metadata document describing the download service BaseData.NL. The document includes the following elements:</p> <p><i>fileIdentifier = 2002</i> [see above]</p> <p><i>resourceLocator=http://inspire.nl/downloadservice-basedata.nl/capabilities</i> The resourceLocator points to the resource if this is possible via a single URL. For a service, this is the capabilities document of the download service.</p> <p><i>operatesOn="TOP10NL"</i> Expresses that the described download service operates on the resource with the given identifier. Can be used to define a query that provides access to the metadata document describing the spatial dataset itself.</p> <p><i>The following additional metadata elements are recommended for the extended binding of the service to the service metadata. They are needed if a targeted operation on the download service should be invoked (like directly referencing a particular feature type); See also chapter 4.3 on simple and extended binding.</i></p> <p><i>coupledResource.identifier="TOP10NL"</i> Used for service coupling, see also annex F in the OGC ISO App Spec. for details². This element establishes the link to the resource via its identifier.</p> <p><i>coupledResource.scopedName="AU.NUTSRegion"</i> This element establishes the link to the feature type of the download service via the feature type name.</p>

1 note that figure 17 in annex F displays fileIdentifier; this is an error, it must be resourceIdentifier as indicated in the corresponding table

		<i>coupledResource.operationName="GetFeature"</i> This element defines the operation to be executed.
--	--	---

Table 3: Entities of Metadata & Discovery

3.3.2 Linkages

The following table describe the linkages between the entities both inside this group and to entities of other groups (indicated by the group shortcut in "[/]"). These linkages are display in the domain model diagram (see Figure 1) as named association; source, destination and association name equal the model.

From	Association	To	Description
<i>[Metadata]</i> DescrDownloadServBaseDataNL: Service-Metadata	<i>operatesOn</i>	<i>[Metadata]</i> DescrSpatialDataSetTOP10NL: Dataset-Metadata	Metadata on the spatial data set can be accessed from the metadata on the download service via a query using the element resourceIdentifier as queryable.
<i>[Metadata]</i> DescrSpatialDataSetTOP10NL: Dataset-Metadata	<i>operatesOn</i>	<i>[Metadata]</i> DescrDownloadServBaseDataNL: Service-Metadata	Metadata on the download service can be accessed from the metadata on the spatial data set via a query using the element operatesOn as queryable and the resourceIdentifier of the spatial dataset as value.
<i>[Metadata]</i> DescrViewServBaseDataNL: Service-Metadata	<i>operatesOn</i>	<i>[Metadata]</i> DescrSpatialDataSetTOP10NL: Dataset-Metadata	Metadata on the spatial data set can be accessed from the metadata on the view service via a query using the element resourceIdentifier as queryable.
<i>[Metadata]</i> DescrSpatialDataSetTOP10NL: Dataset-Metadata	<i>operatesOn</i>	<i>[Metadata]</i> DescrViewServBaseDataNL: Service-Metadata	Metadata on the view service can be accessed from the metadata on the spatial data set via a query using the element operatesOn as queryable and the resourceIdentifier of the spatial dataset as value.
<i>[Metadata]</i> DescrSpatialDataSetTOP10NL: Dataset-Metadata	<i>access</i>	<i>[Download]</i> TOP10NL.zip:SpatialDataSet	Download of a predefined dataset as zip via a download service (including the required metadata). The link is established through a http link pointing to the file via the resourceLocator element.
<i>[Metadata]</i> DescrSpatialDataSetTOP10NL: Dataset-Metadata	<i>describes</i>	<i>[Data]</i> TOP10NL : SpatialDataSet	Metadata that describes the spatial data set.
<i>[Metadata]</i> DescrDownloadServBaseDataNL: Service-Metadata	<i>describes</i>	<i>[Download]</i> BaseDataNL:DownloadService	Metadata that describes the download service. From the metadata document the described download service can be accessed directly. Two ways are possible: <ol style="list-style-type: none"> 1) Via the resourceLocator, which –in this case- contains a link to the download service capabilities, they can be accessed and used by a client. 2) Via the resourceLocator, which –in this case- contains a link to the download service endpoint plus the coupledResource element a client can directly invoke an operation (e.g. GetFeature) on a particular feature type of the download service. Option 2 is needed if it is required to link to a specific feature type within a download service. Option 1 only links to the service as a whole.
<i>[Metadata]</i>	<i>describes</i>	<i>[View]</i>	Metadata that describes the download service.

DescrViewServBaseDataNL: Service-Metadate		BaseDataNL:ViewService	From the metadata document the described view service can directly be accessed. Two ways are possible: 3) Via the resourceLocator, which –in this case- contains a link to the view service capabilities, they can be accessed and used by a client. 1) Via the resourceLocator, which –in this case- contains a link to the view service endpoint plus the coupledResource element a client can directly invoke an operation (e.g. GetMap) on a particular layer of the view service. Option 2 is needed if it is required to link to a specific layer within a view service. Option 1 only links to the service as a whole.
[Download] AU.NUTSRegion:Feature Type	access	[Metadata] DescrSpatialDataSetTOP10NL: Dataset-Metadate	The capabilities of the download service include a metadataURL per feature type that belongs to the spatial dataset. This URL points to the metadata document of the spatial dataset represented in the feature type. The linkage invokes the operation GetRecordById using the fileIdentifier (identifier of the metadata document).
[View] AU.NUTSRegion:Layer	access	[Metadata] DescrSpatialDataSetTOP10NL: Dataset-Metadate	The metadata of the view service capabilities include a metadataURL per layer elements. This URL points to the metadata document of the spatial dataset represented through the layer. The linkage invokes the operation GetRecordById using the fileIdentifier (identifier of the metadata document).

Table 4: Linkages of Metadata & Discovery

3.4 View Service & Layers

The spatial dataset TOP10NL is display via a single layer in a view service. The layer uses the collection of spatial objects as data source and is defined in the view service capabilities according to the appropriate layer definition. The layer element of the view service capabilities also allows to access the metadata of the spatial dataset via a single URL and to the predefined dataset of the spatial dataset via a single URL.

3.4.1 Entities

The following table describe the entity and their type.

Entity	Type	Description
BaseDataNL	ViewService	A view service that displays the base data of NL, this is the TOP10NL.
AU.NUTSRegion	Layer	Layer of the view service used to display the spatial object type StatisticalUnits::NUTSRegion from AU. Attributes (as included in the capabilities for layer ~ layer metadata): <i>wms:Name = "AU.NUTSRegion"</i> Name of the layer; this is also used as unique identifier of layer with the view service capabilities. There can only be one layer with that name in a view service. The value is to be taken from the layer definition which is part of the IR interoperability of spatial data sets and services, annex II.

		<p><i>wms:Title = "NUTS Region"</i> Title of the layer; for display purposes. The value is to be taken from the layer definition which is part of the IR interoperability of spatial data sets and services, annex II.</p> <p><i>wms:dataUrl = http://inspire.nl/download/NL.ZOP10NL.zip</i> The dataUrl points to a resource if this is possible via a single URL. For accessing predefined datasets via the download service, this is the case. It could also point to any other location from where access is possible. This could include a link to a shop system or other access facilities. The link can also be access controlled and enforce authentication.</p> <p><i>wms:metadataUrl = http://inspire.nl/discovery/GetRecordById/1001</i> This URL points to the metadata document of the spatial dataset represented in the layer. HTTP/GET call on GetRecordById using the fileIdentifier (identifier of the metadata document). Will provide exactly one result.</p>
--	--	---

Table 5: Entities of View Service & Layers

3.4.2 Linkages

The following table describe the linkages between the entities both inside this group and to entities of other groups (indicated by the group shortcut in "[/]"). These linkages are display in the domain model diagram (see Figure 1) as named association; source, destination and association name equal the model.

From	Association	To	Description
[View] AU.NUTSRegion:Layer	<i>access</i>	[Metadata] DescrSpatialDataSetTOP10NL: Dataset-Metadata	The metadata of the capabilities of the view service include a metadataURL per layer. This URL points to the metadata document of the spatial dataset represented in the layer. The linkage invokes the operation GetRecordById using the fileIdentifier (identifier of the metadata document).
[View] AU.NUTSRegion:Layer	<i>useAsDataSource</i>	[Spatial Data] nutsRegionCollection :Collection <SpatialObject>	The layer provides a visual representation of spatial objects of the data set TOP10NL via the view service. The link is established in the configuration of the view service (matching its layer to the appropriate data source).

Table 6: Linkages of View Service & Layers

3.5 Download Service, Feature Types and Predefined Datasets

The download service is out of scope for the current work items of the IOC TF. However for the domain model it is important to have more than one service providing access to the resource. This chapter will be updated as the technical guidance document for the INSPIRE download service evolves.

The content of spatial dataset TOP10NL is accessible via a single feature type and a predefined dataset in a download service. The feature type uses the collection of spatial objects as data source. The feature type element of the download service capabilities allows to access the metadata of the spatial dataset via a single URL. The download service also provides access to the content of spatial dataset TOP10NL as predefined dataset including the required metadata e.g. as zip file.

3.5.1 Entities

The following table describe the entity and their type. The current download service TG (version 2.0) does not include these details! They have been transferred from the View Service.

Entity	Type	Description
BaseDataNL	DownloadService	A download service that provides access to the base data of NL, this is the TOP10NL. The current example of the domain model uses one download service

		that handles direct access and access to predefined spatial datasets. This is an assumption! Alternative is to have both means of access separated (including to have two metadata documents, one for each of the services).
AU.NUTSRegion	Feature Type	<p>Feature Type of the download service used to provide access to the spatial objects of StatisticalUnits::NUTSRegion from AU. Attributes (as included in the capabilities for feature type ~ feature type metadata):</p> <p><i>wfs:Name = "AU.NUTSRegion"</i> Name of the feature type; this is also used as unique identifier of feature type with the download service capabilities. There can only be one feature type with that name in a download service.</p> <p><i>wfs:Title = "NUTS Region"</i> Title of the feature type; for display purposes.</p> <p><i>metadataUrl = http://inspire.nl/discovery/GetRecordById/1001</i> This URL points to the metadata document of the spatial dataset represented in the feature type. HTTP/GET call on GetRecordById using the fileIdentifier (identifier of the metadata document). Will provide exactly one result.</p>
AU.NUTSRegion	PreDefinedDataSet	It is not yet clear, how the availability of a predefined dataset is to be expressed in the capabilities of the download service. An attribute providing the download http url would be helpful. E.g. like: <i>dataUrl = http://inspire.nl/download/NL.ZOP10NL.zip</i>
TOP10NL.zip	SpatialDataSet	File including the spatial data set TOP10NL and corresponding metadata e.g. as Zip.

Table 7: Entities of Download Service, FeatureTypes and Predefined Datasets

3.5.2 Linkages

The following table describe the linkages between the entities both inside this group and to entities of other groups (indicated by the group shortcut in "[/]"). These linkages are display in the domain model diagram (see Figure 1) as named association; source, destination and association name equal the model.

From	Association	To	Description
[Download] AU.NUTSRegion:Feature Type	access	[Metadata] DescrSpatialDataSetTO P10NL: Dataset- Metadata	The capabilities of the download service include a metadataURL per feature type. This URL points to the metadata document of the spatial dataset represented in the feature type. The linkage invokes the operation GetRecordById using the fileIdentifier (identifier of the metadata document).
[Download] AU.NUTSRegion : FeatureType	useAsDataSource	[Spatial Data] nutsRegionCollection :Collection <SpatialObject>	Access the spatial objects of the data set TOP10NL via the download service. The link is established in the configuration of the download service (matching its feature type to the appropriate data source).
[Download] TOP10NL.zip : SpatialDataSet	useAsDataSource	[Spatial Data] TOP10NL : SpatialDataSet	Download of a predefined dataset as zip via a download service. The link is established through a http link pointing to the file as part of the capabilities (note: the download service TG 2.0 is not yet clear on how this expressed in the capabilities).

Table 8: Linkages of Download Service, FeatureTypes and Predefined Datasets

4 Variants & Special Cases

As the domain model currently is based on a particular example, it can not cover any variants. A couple of these variants or “special cases” have been identified during the creation of the model by the IOC TF service team. This chapter will introduce these variants and describe how they can be solved. As it is likely that more of these variants will be identified, the chapter is subject to future extension.

4.1 Layers composed of more than one spatial object type

The domain model covers the case that a collection of spatial objects conform to one spatial object type is part of one spatial dataset. This is been represented in one layer of one view service. The IR interoperability of spatial data sets and services include layer definition that have more than one spatial object type associated; therefore layers have to be defined that allow two data sources, one for each collection of spatial objects per spatial object type.

This case therefore covers the layer definition of HY.PhysicalWaters.Waterbodies and how it can be mapped to layers in a view service. As of the IR interoperability of spatial data sets and services, HY.PhysicalWaters.Waterbodies should be represented as a layer consisting of two HY spatial object types: Watercourse and StandingWater. In the selected (artificial) example, one spatial dataset per spatial object type exists.

A recommended solution is to use a category layer in the view service to be conformant to the layer definition of the IR and sub layers to establish the connections to the two spatial data sets.

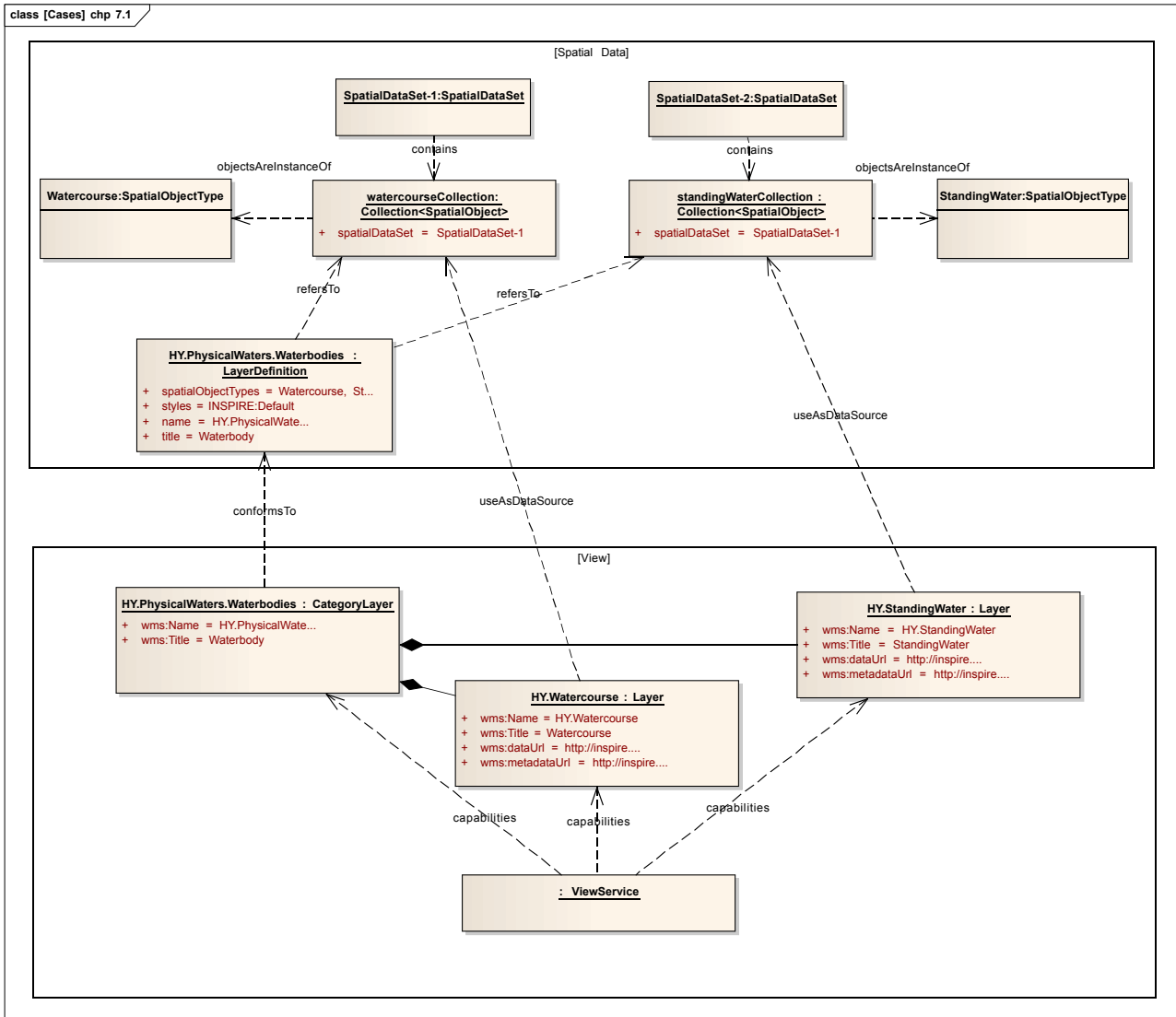


Figure 2: Variant - Layers composed of more than one spatial object type

The category layer

- is the “official” INSPIRE layer
- is conformant to the layer definition of the IR interoperability of spatial data sets and services
- does not have a corresponding spatial dataset, therefore
- can have a metadataUrl (e.g. if there is a metadata document describing the composition of the two spatial data sets)
- can have a dataUrl (e.g. if there is a file accessible via a URL that includes the data of both spatial data sets)

The layers

- may follow the nomenclature and use the spatial object type name as layer name. This is not a must.
- do have a corresponding spatial dataset, therefore
- do have a metadataUrl
- do have a dataUrl

4.2 Distributed/separated spatial datasets

Another case could be, that a certain spatial object type is distributed across two spatial datasets, each of which cover a certain area of a member state and that a view service should be set up which provides a member state wide visual representation of the spatial object type as layer using the two spatial datasets as data source. This case therefore covers the layer definition of PS.ProtectedSite, contained in two distributed spatial datasets and how it can be mapped to layers in a view service.

As of the IR interoperability of spatial data sets and services, PS.ProtectedSite should be represented as a layer consisting of one PS spatial object type: ProtectedSite. In the selected (artificial) example, two spatial datasets for the one spatial object type exist. These spatial datasets are physically separated and represent two different areas of a member state: north and south.

Case 1: It is desired to incorporate them in the same view service

If they should be part of the same view service and displayed together, a recommended solution is to use a category layer in the view service to be conformant to the layer definition of the IR and sub layers to establish the connections to the two spatial data sets.

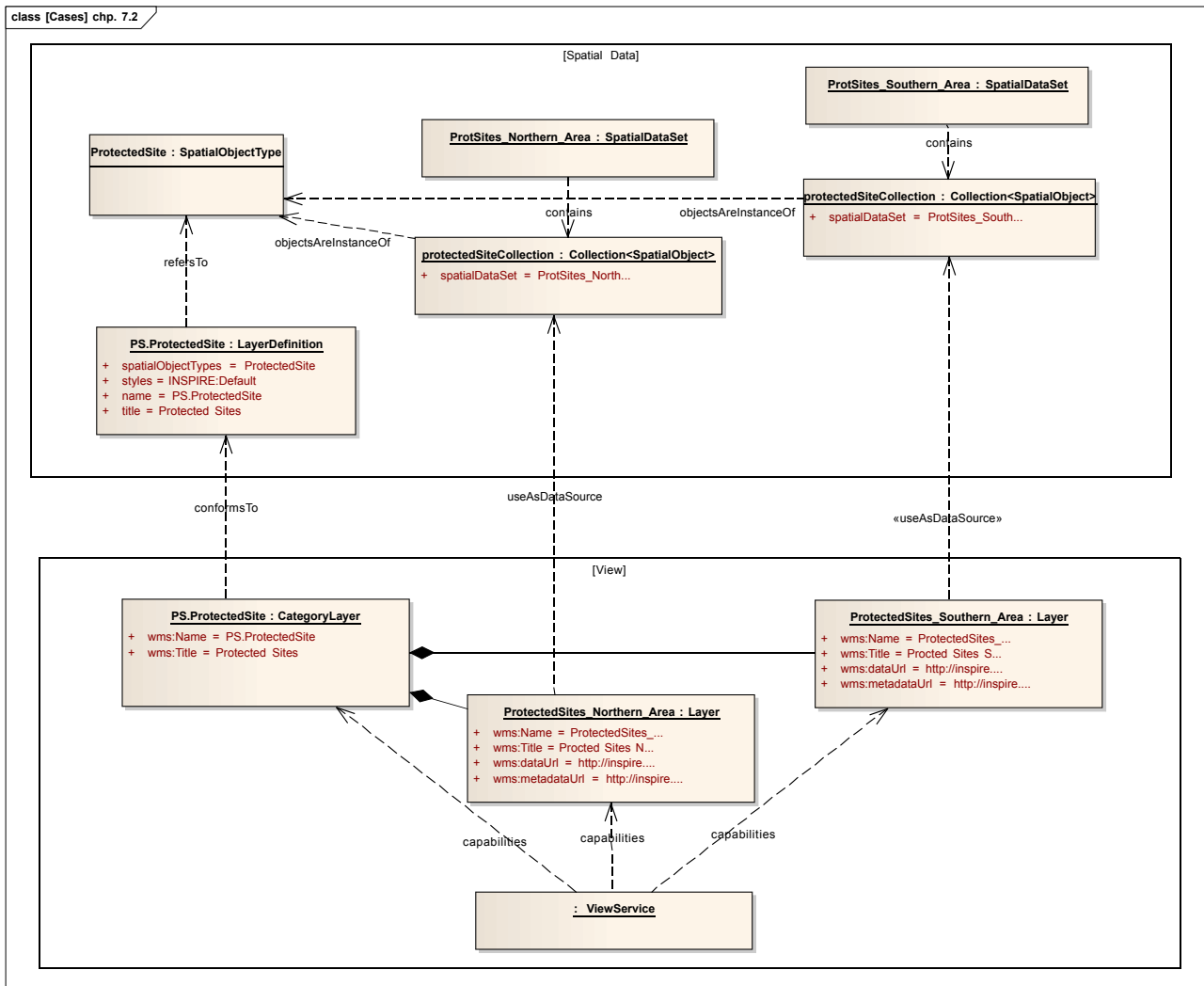


Figure 3: Variant – Publishing of distributed/separated spatial datasets in one view service

The category layer PS.ProtectedSite

- is the “official” INSPIRE layer
- is conformant to the layer definition of the IR interoperability of spatial data sets and services
- does not have a corresponding spatial dataset, therefore
- can have a metadataUrl (e.g. if there is a metadata document describing the composition of the two spatial data sets)
- can have a dataUrl (e.g. if there is a file accessible via a URL that includes the data of both spatial data sets)

The layers ProtectedSites_Northern_Area and ProtectedSites_Southern_Area

- may follow the nomenclature and use the spatial object type name as layer name. This is not a must.
- do have a corresponding spatial dataset, therefore
- do have a metadataUrl

- do have a dataUrl

Case 2: Provide access via two separated view services

An alternative for the usage of a category layer as described in case 1 is to set up two separate view services, each handling one single layer representing the protected sites data for the northern region and for the southern region.

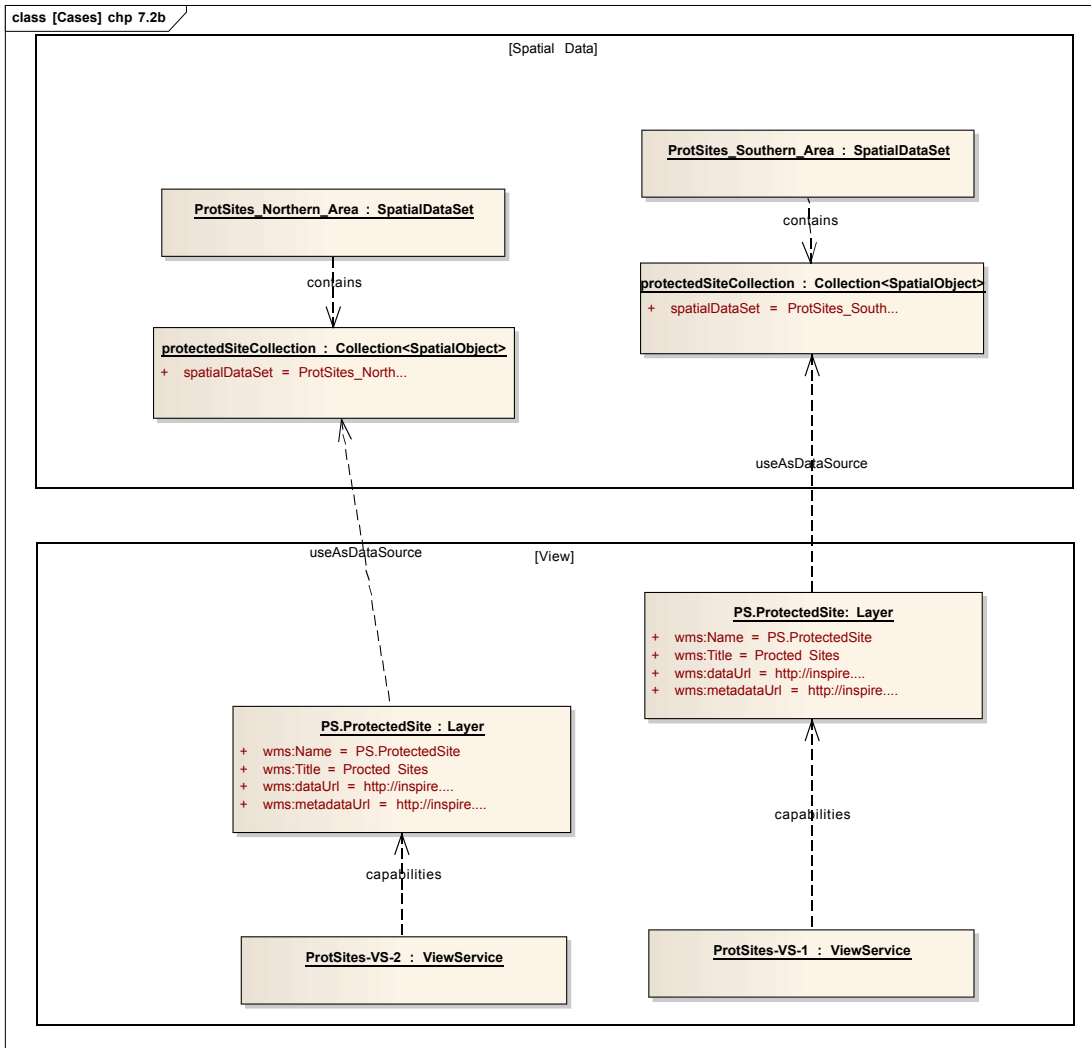


Figure 4: Variant – Publishing of distributed/separated spatial datasets in separated view services

Each layer

- is an “official” INSPIRE layer
- is conformant to the layer definition of the IR interoperability of spatial data sets and services
- does have a corresponding spatial dataset
- does have a metadataUrl
- could have a dataUrl (if there is a downloadable file available)

4.3 Simple and Extended Service Binding in Metadata

There are two ways to link a service metadata to the service itself; both can be used to invoke the service from the metadata

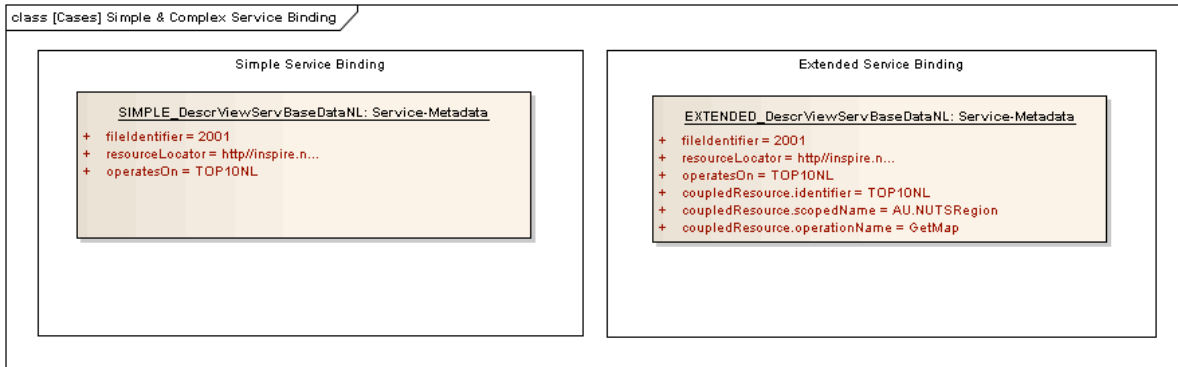


Figure 5: Simple and Extended Service Binding in Metadata

Simple

The metadata element "resourceLocator" contains a link as URL to the service. This link points to the capabilities of the service.

Extended

The extended linkage is using the metadata elements coupledResource.identifier, scopedName and operationName in addition (note that the element resourceLocator is needed as well, in this case, it includes the URL to the service itself). This will allow a more directed/targeted invoke of the service as you have additional information on the layer/feature type that represents the spatial data set and a dedicated operation.