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Authors:	Nicola Ferrè, Stefano Marangon, Songyin Qiu
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Proposal of a first-cut data product specification document for the *zone* geographical component

1. Overview

1.1 Title

First-cut data product specification document for the *zone* geographical component (hereinafter referred to as "GeoZone").

1.2 Description

The present document defines the data product specifications for the geographic information related to the *zones* as per the OIE Standard on Zoning described in chapter 4.3 of the Terrestrial Code[1].

This document content and structure are consistent with the international standards for data product specifications "ISO 19131 Geographic information – Data product specification" and include the technical documentation of the application schema, the spatial object types with their properties, use cases and other specifications for the deployment of the application schema.

1.3 Informal description of the data product

According to the OIE a *zone* is a part of a country defined by the Veterinary Authority, containing an animal population or subpopulation, with a specific animal health status with respect to an infection or infestation for the purposes of international trade or disease prevention or control[2]. The extent of a zone and its geographical limits are established on the basis of natural, artificial or legal boundaries, and made public through official channels. The scope of the GeoZone is to provide the rules for collecting the spatial information on *zone*s. The GeoZone shall be used also as a data model for exchanging *zone* geospatial data.

[1] OIE – Terrestrial Animal Health Code, 2014

[2] The definitions and the concepts presented here are extracted from the document of the "JOINT MEETING BETWEEN THE SCIENTIFIC COMMISSION AND THE CODE COMMISSION" of 14 February 2018 (A_TAHSC_Feb_2018_Part_A.pdf).

Summary

2. Specification scope

The main aims of the GeoZone are to provide the rules for collecting the *zone's* spatial information.

The rules defined in the GeoZone ensure transparency, consensus and methodological coherence for the creation, modification, verification, and the sharing of the *zone's* geospatial data.

The geospatial data of a *zone* collected according to the GeoZone specifications can be used in GIS applications for **inventory**[3] and for **visual explorative spatial analysis**[4] purposes.

2.1. In scope

The GeoZone provides a set of specifications to assist OIE Member States in harmonising:

- the acquisition of geospatial data related to a *zone*;
- the transmission of geospatial data related to a *zone* to and from the OIE.

2.2. Out of scope

It is out of the scope of GeoZone the specification of information that is not relevant to the geographical characterization of a *zone*. In particular, the GeoZone data product specification is not designed to acquire and manage any information about sanitary measures, biosecurity plans, surveillance procedures, animal traceability or any other activity performed by the Veterinary Authority within a *zone*.

2.3. Modelling assumptions

1. The *zone* extent. The extent of a *zone* and its geographical limits should be established by the Veterinary Authority on the basis of natural, artificial or legal boundaries and made public through official channels.

2. Spatial information about *zones*. A *zone* is characterised by its designation period, the concerned animal disease, the type of zone established (e.g.: free zone, infected zone) and the disease control measures implemented.

3. Data Sharing. GeoZone shall be used to collect and exchange *zone* geospatial data between different Veterinary Authorities and the OIE, in particular:
   - the OIE will get a tool for inventorying *zones*;
   - the OIE will get a tool for the harmonization of diverse data sources thus promoting transparency, consensus and methodological coherence of the geographical information used to characterize *zones*;
   - GeoZone will allow the implementation of a reproducible method for sharing *zones* geospatial data.

2.3 Terms and definition

Application schema – an application schema provides a description of the semantic structure of the dataset identifying the spatial object types and the reference systems required for a complete description of the geographic information [ref.: ISO 19109].

Conceptual model – model that defines concepts of the universe of discourse [ref.: ISO 19101].

[3] GIS inventory is essentially a catalogue of geospatial data. Its primary purpose is to track the availability and the status of collected spatial data. A GIS inventory for the zones geographical component (i) provides spatial and non-spatial information about zones, (ii) enables the representation, through choropleth maps, of the spatial distribution of zones according to the defined zone's characteristics (e.g.: disease, type of zone, etc.), and (iii) enhances the improvement of the accuracy and of the organisation of the stored *zone* data.

[4] The visual explorative spatial analysis of zone spatial data enables the evaluation of the spatial and temporal evolution of zones, either as a preliminary step toward the study of spatial patterns of zones, and for identifying global trends and local outliers.

Domain – a territory over which rule or control is exercised. A sphere of activity, concern, or function.
Data model - an abstraction of the real world that incorporates only the properties deemed relevant to the application at hand. The data model would normally define specific groups of entities, and their attributes and the relationships between these entities. A data model is independent from a computer system and its associated data structure. A map is one example of an analogue data model.
Data product specification - a data product specification is a detailed description of a dataset or dataset series together with additional information that will enable it to be created, supplied to and used by another party. It forms the basis for producing or acquiring data. It may also help potential users to evaluate the data product to determine its fitness for use by them.
Data schema - formal description of a data model
Feature – abstraction of real world phenomena. It is the starting point for modelling of geographic information and a digital representation of a real world entity or an abstraction of the real world. It has a spatial domain, a temporal domain, or a spatial/temporal domain as one of its attributes. Examples of features include almost anything that can be placed in time and space, including desks, buildings, cities, trees, forest stands, ecosystems, delivery vehicles, snow removal routes, oil wells, oil pipelines, oil spill, and so on. Features are usually managed in groups as feature collections. The terms feature and object are often used synonymously.
Feature type – a class that specifies sets of spatial objects with common properties and operations applicable to the objects.
Feature attribute – characteristic of a feature. NOTE: A feature attribute has a name, a data type and a value domain associated to it.
Interoperability - capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units. Interoperability, in the context of the geomatics domain, refers to software components which operate reciprocally (working with each other) to overcome tedious batch conversion tasks, import/export obstacles, and distributed resource access barriers imposed by heterogeneous processing environments and heterogeneous data.
Schema matching = Mapping - schema matching is the process of identifying that two objects are semantically related in order to find the possible method/process/software for the transformations between the objects.
Service - a computation performed by a software entity on one side of an interface in response to a request made by a software entity on the other side of the interface. A collection of operations, accessible through an interface that allows a user to evoke behaviour of value to the user.
Spatial object = feature Specialization – association describing inheritance relationship between feature types, where a more general feature type is the result of generalization and a specialized feature type is the result of specification.
Standardisation – is the process to produce a standard. A **standard** is a documentation established by consensus and approved by an accredited standards body nationally or internationally recognized by industrial, professional, trade, or governmental organizations. Standards reflect agreements on products, production method, terminology, practices, services or operations.
Unified Modelling Language (UML) – an open modelling standard for conceptual schema language defined and maintained by the Object Management Group.
Universe of discourse – view of the real or hypothetical world that includes everything of interest [ref.: ISO

19101.]
Use case scenario - a possible sequence of real world events used as a test case for specifying or testing information systems designed to help manage such events.

2.4 International standards

ISO 19101: Geographic information -- Reference model -- Part 1: Fundamentals
ISO 19107: Geographic information – Spatial schema
ISO 19108: Geographic information – Temporal schema
ISO 19109: Geographic information – Rules for application schema
ISO 19115: Geographic information -- Metadata -- Part 1: Fundamentals
ISO 19131: Geographic information – Data product specifications
ISO 19136: Geographic information -- Geography Markup Language (GML)
ISO 19157: Geographic information -- Data quality

2.5 Acronyms and abbreviations

zone	zone defined according to the OIE Zoning procedure as described in chapter 4.3 of the Terrestrial Code
GeoZone	data product specifications for the geographic information related to the *zone*
ISO	International Organisation for Standardisation
UML	Unified Modelling Language.
GI	Geographic Information
GIS	Geographic Information System
IT	Information and Communications Technology
OIE	World Organisation for Animal Health

2.6 Disclaimer

The content of this data product specification does not reflect the official opinion of the OIE. Responsibility for the information and views expressed in the present document lies entirely with the authors.

3 Data content and structure

3.1 Description

A single spatial type of object called «Zoning» has been defined to spatially represent the *zone*. This type of object contains the core properties that can be categorised into 3 sets of information:

1. Zone specific properties: the properties that provide a basic set of information describing the zone:
   - 1.1 **geometry**: the geometry representing the spatial extent of the spatial object. The geometry of a *zone* shall be represented as polygon;
   - 1.2 **designation period:** the time when the zone was legally designated or became effective;
   - 1.3 **competent authority:** the Veterinary Authority responsible for delivering the zone;
   - 1.4 **legal basis**: the reference to, or citation of, the legislative instrument or document that establishes the zone.
2. Classification properties: additional properties to distinguish different types of *zone*. These are defined using two classification properties:
   - 2.1 **zone type**: it provides a high level classification of the *zone* according to the definition included in the OIE Terrestrial Code (e.g. containment zone, free zone, infected zone);
   - 2.2 **disease**: it states the disease at the basis of the decision to establish the *zone.*
3. Controlled activities: activities implemented within the *zone* with the purpose to control the disease. Example of controlled activities include: animal movements, surveillance, vaccination, etc.
   - 3.1 **activity**: the type of activity that is implemented within the zone to control the disease;
   - 3.2 **target population**: the animal population interested by the control activities;
   - 3.3 **activity period**: the time period of the implementation of the control activities. It may be different from the zone **designation period**.

3.2 UML overview

The use of UML allows an automated processing of application schemas and the encoding, querying and updating of data based on the application schema across different themes and different levels of detail.

The application schemas included in this section are specified in UML, version 2.1. The spatial object types, their properties and associated types are shown in the UML class diagrams.

Note that ISO 19109 specify a profile of UML to be used in conjunction with the ISO 19100 series. This includes in particular a list of stereotypes and basic types to be used in application schemas and described below.

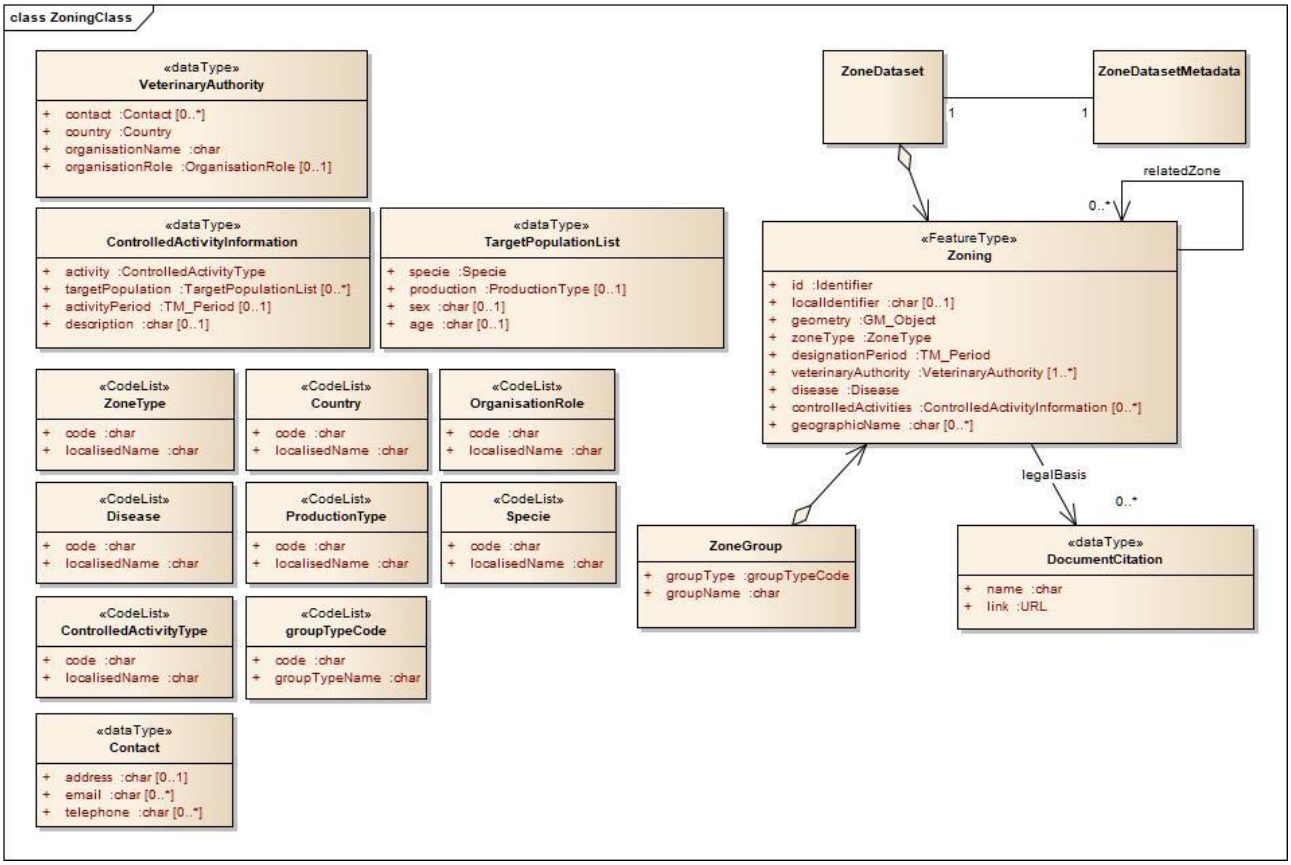


Figure 1. UML class diagram: overview of the Zoning application schema

3.2.1 Stereotypes

Above the name of classes in the application schema of figure 1, there is a stereotype name in quotes. Stereotypes are used to extend the basic UML elements and give them different meanings. In the Zoning application schema three types of stereotypes are used:

- **FeatureType**: represents geographic object types. It is an XML element whose XML Schema-type is derived from gml:AbstractFeatureType (ISO 19136);
- **DataType**: XML element with a complex content model; it does not have identity (ISO 19136). It is a Complex type dependent of FeatureType;
- **CodeList**: stereotype that represents an extendable lists of possible values;
- **Enumeration**: fixed lists of possible values. Attributes that use such lists may only take values from the list.

3.2.2 CodeList

CodeLists are modelled as classes in the application schemas. Their values, however, are managed outside the application schema. These classes will be managed centrally by means of code list registers.

3.2.3 CodeList language

The language used in the codeList classes is described by the i18N approach. Each code in the codeList has a set of different localised names. A framework that should allow the inclusion also of the names in newest languages can possibly be developed.

3.2.4 Zone identifier management

The “external object identifier” approach shall be used for the spatial object identifier . With “external object identifier” we intend a unique object identifier which is published by the Veterinary Authority.It refers to a single spatial object.

The zone identifier shall not be changed during the life-cycle of a spatial object.

A specific framework for the generation and validation check (to ensure no duplication) of the zone identifier should be defined (e.g. Universally unique identifier - UUID).

3.2.5 Geometry representation

The geometry representation (indicated in the Zoning featureType as GM_Object) refers to the Simple Feature spatial schema as defined in Herring, John R. (ed.), OpenGIS® Implementation Standard for Geographic information – Simple feature access – Part 1: Common architecture, version 1.2.1, Open Geospatial Consortium, 2011. ISO 19107 has also been used for describing the spatial characteristics of the geographic features.

This specification restricts the spatial schema to Polygons[5]. In particular, where a *zone* is comprised of multiple parts, the geometry of every single part should be provided.

3.2.6 Temporality representation

The designationPeriod and the activityPeriod use the TM_Period property as per ISO 19108:2006. This property defines separate the "beginPosition" from the "endPosition". The attributes "beginPosition" specifies the date at which the zone or the activity became valid. The attribute "endPosition" specifies the date at which the zone or the activity is no longer valid.

3.3 Feature catalogue

The information about the feature catalogue are presented in annex E – Feature catalogue

4 Coordinate reference system

Spatial data set shall be made available using the **WGS84** coordinate reference system.

This data model proposes to use the http URIs provided by the Open Geospatial Consortium as coordinate reference system identifiers. These are based on and redirect to the definition in the EPSG Geodetic Parameter Registry (*http://www.epsg-registry.org/*).

The WGS84 is coded in the EPSG registry with the code 4326.

```
GEOGCS["WGS 84",
    DATUM["WGS_1984",
        SPHEROID["WGS 84",6378137,298.257223563,
            AUTHORITY["EPSG","7030"]],
        AUTHORITY["EPSG","6326"]],
    PRIMEM["Greenwich",0,
        AUTHORITY["EPSG","8901"]],
    UNIT["degree",0.01745329251994328,
        AUTHORITY["EPSG","9122"]],
    AUTHORITY["EPSG","4326"]]
```

5 Temporal Reference Systems

The purpose of this data model is to provide an unambiguous and well-defined method for representing dates. Therefore, to avoid misinterpretation in the numeric representations of dates, particularly when data is transferred between countries with different conventions for writing numeric dates, the data shall be

[5] A Polygon is a planar Surface defined by 1 exterior boundary and 0 or more interior boundaries. Each interior boundary defines a hole in the Polygon. (rif.: OGC 06-103r4).

organised in a way that the largest temporal term (the year) appears first in the data string and progresses to the smallest term (the second).

Example. 1968-06-27 shall be used to refer to 27th June 1968.

6 Data quality

This chapter includes a description of the principal data quality elements that should be used to evaluate and document data quality for data sets related to the spatial data.

The descriptions of the elements and measures are based on the Annex D of ISO 19157 Geographic information – Data quality.

The following quality elements are described:

1. Number of excess items
   Definition: Number of excess items in the dataset in comparison with the number of items envisaged (ISO 19157 identifier 2; Completeness - Commission).
   Description: this data quality element considers the presence of mutually exclusive features, such as the possible existence of excesses of polygons. For instance, the generation of a zone for every single measure applied instead of generating a single zone with multiple measure applied.
   Measure: count of all items in the dataset that are missing.
2. Number of missing elements
   Definition: count of all items that should have been in the data and are missing (ISO 19157 identifier 5; Completeness – Omission).
   Measure: count of all items in the dataset that are missing
3. Number of items not compliant with the rules of the conceptual schema
   Definition: since the conceptual schema explicitly describes rules, these rules shall be followed. Violations of such rules are, for example, invalid coordinate reference systems, duplication of features, etc. (ISO 19157 identifier 10; Logical consistency – Conceptual consistency).
   Measure: count of all items in the dataset that are not compliant with the rules of the conceptual schema.
4. Mean value of positional uncertainties
   Definition: mean value of the positional uncertainties for a set of positions where the positional uncertainties are defined as the distance between a measured position and what is considered the corresponding true position (ISO 19157 identifier 28; Positional accuracy – Absolute or external accuracy).
   Measure: mean value

6.1 Minimum data quality requirements

No minimum data quality requirements are defined for the spatial data theme[6].

6.2 Recommendation on data quality

- datasets will not be able to repeat feature,
- the core data set is already established by the model.

[6] Once the minimum data quality requirements are defined, a test should be performed. In this case, the testing of minimum requirements of data quality can be difficult to perform. Moreover, it is important for the testing that evaluation criteria are specified and that costs related the assessment of quality (if not already available) are assessed.

Minimum set of values:

1. Number of excess items
   Error value: 0.
2. Number of missing elements
   Error value: 0.
3. Number of items not compliant with the rules of the conceptual schema
   Error value: 0.
4. Mean value of positional uncertainties
   Error value: the positional accuracy is portrayed as an estimated value based to the scale of the of the background map used to derive the spatial data as follows:

Scale 1:n	**Estimated geometric accuracy, normal data quality**
1 000 000	500 m
500 000	250 m
250 000	125 m
100 000	50 m
<100 000	max 50m

7 Metadata

This chapter provides a structure for describing digital *zone* dataset and defines metadata elements and the common set of metadata terminology. The core metadata elements are listed below (mandatory and recommended optional) as required for describing a dataset. An "M" indicates that the element is mandatory. An "O" indicates that the element is optional. A profile of the ISO 19115 Geographic information — Metadata standard was used.

1. Citation (dataset title): name by which the resource is known. [M]
2. Abstract: brief narrative summary of the content of the resource. The description may include (but is not limited to) abstract, keywords, area or location covered by the dataset, information about the source data used in creating the dataset. [M]
3. Purpose: the purpose for which the dataset has been issued (e.g. new dataset, re-issue, update, etc.). [M]
4. Date: reference date for the cited resource. [M]
5. PointOfContact: name and position information for an individual or organization that is responsible for the resource. [M]
6. Language: language used in the dataset. [M]
7. characterSet: full name of the character coding standard used for the dataset. [O]
8. dataExt: geographical extent of the dataset described with bounding box. [M]
9. ReferenceSystem: spatial reference system used by the source data [M]

8 Data product delivery

The complexity of the geospatial data supply chain is presented in annex A that describes the quest for spatial data interoperability from a technical perspective.

Four different types of delivery mechanisms have been identified:

1. The **web service**. This data specification proposes the use of GML as default encoding. GML is an XML grammar defined to express geographical features. GML serves as a modelling language for geographic systems as well as an open interchange format for geographic transactions on the Internet.
2. The **file transfer** via dedicated protocols.
3. The **editing of data** via dedicated web interfaces.
4. The editing of data via dedicated web client with extended functionalities provided by an add-on software or plugin.

9 Data collection

Member States may collect the zone data using their own processes and according to their own specifications and requirements, provided that they can perform the necessary transformations in order that the zone data fulfil the present specification. In practice, it is expected that spatial data is provided to the OIE at very different scales/resolutions, covering different zone types, and following different modelling approaches. In order to lift constraints which would complicate the sharing of information from Member States with the OIE, **no spatial data collection rules are specified**, except that national administrative data of best available quality according to this specification are provided after international boundaries have been edge matched between responsible organizations of neighbouring countries.
The main recommendations on data collection methods are presented and discussed in annex B.

10 Portrayal

This clause defines the rules for layers and styles to be used for the portrayal of the spatial object types described for this spatial information. In particular, for the Zoning spatial object classified using a *zoneType* and *disease* enumeration-valued attribute, several layers may be defined.

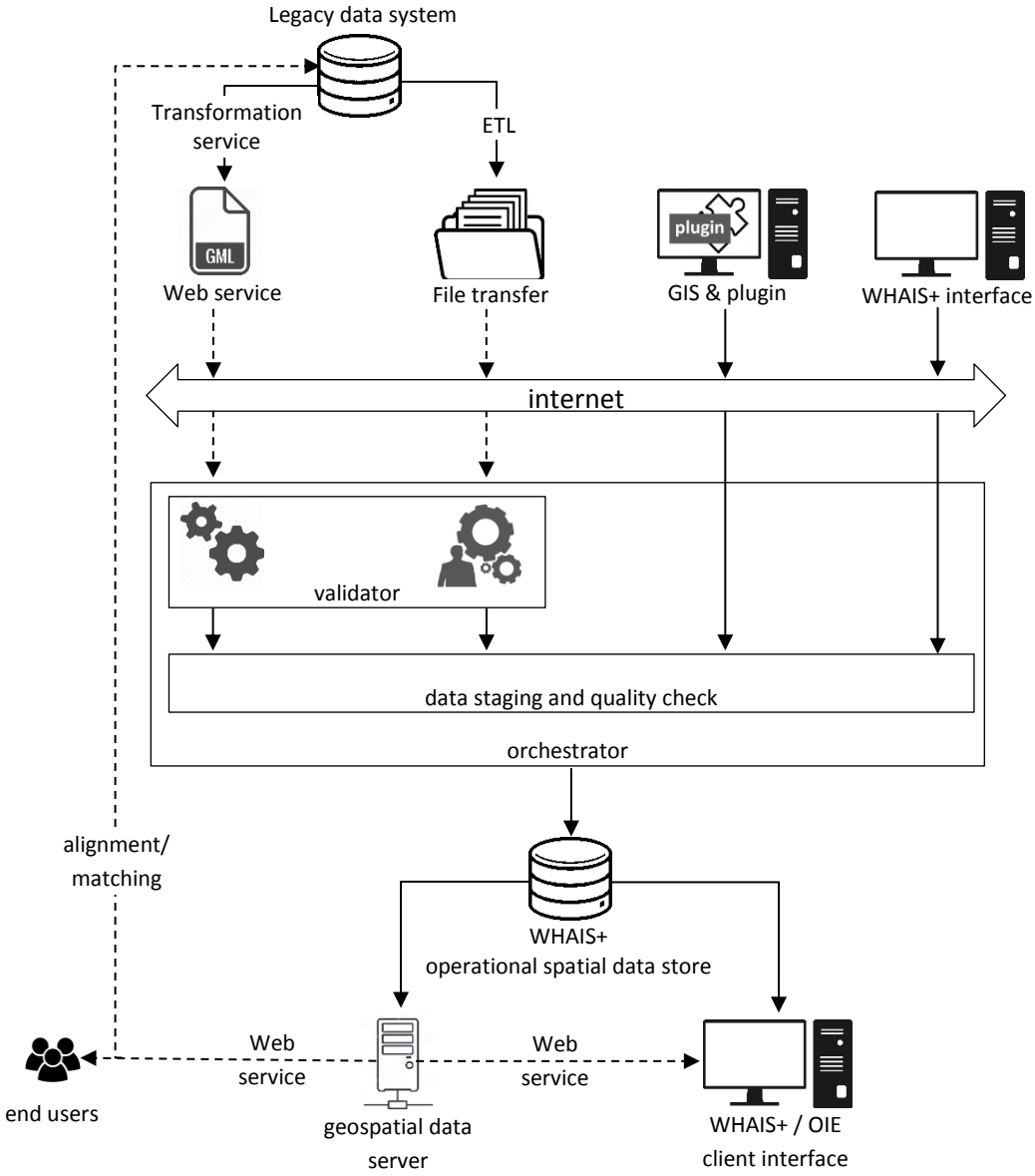
The OpenGIS® Symbology Encoding (SE) [7] shall be used to represent and colour of geographic feature.
Examples of layers are provided in annex C

[7] http://www.opengeospatial.org/standards/se

Annex A - Data supply chain

(informative)

A possible layout of the data supply chain is outlined in the schema below.



The schema is composed by three different layers:

Layer 1) **Data sources**. Two main classes of data sources and data streams are considered. The first class recognises that the data provider has a legacy spatial data system in place, the second class includes providers that do not have a system for the management of spatial data in place. The cases are discussed below:

a. Legacy spatial data system in place. It is presumed that the legacy system has specific data models and procedures to manage spatial data (included the *zone* spatial data) and that it is possible to obtain the *zone* spatial data according to the geoZone data specification. The *zone* spatial data structured according to the geoZone data specification can be obtained in two ways: (i) by means of a Transformation Service, or (ii) by means of an Extract Transformation and Load (ETL) protocol.

i. *Transformation Service*. The execution of transformation service, that is executed on XML based Geography Markup Language (GML) data or Web Feature Service (WFS), can be generally categorized as off-line and on-the-fly transformation approaches.
   - Off-line transformations are usually executed entirely as a pre-processing phase and the transformed data is served afterwards to the users through Web Services. The off-line transformation approach is suitable for situations where the differences between the source and the target schemas are considerable, or for situations where the transformation process requires some manual tuning during its execution.
   - The on-the-fly transformation approach is based on a real-time on-line process where the client requests the transformation to the server and the server transforms and returns the output to the client through a Web Service.

   The Transformation service is essentially automated.

ii. *ETL*. The ETL tools extract data from the legacy system source, transform it into the geoZone data specification, and then load it into a staging data structure for its subsequent forwarding via internet means to the system that can save and incorporate it. The sharing and forwarding can be made via email, FTP, or any means eventually ending with an uploading procedure.

   The ETL is essentially a manual process even if some steps can be automated.

b. Legacy spatial data system NOT in place. It is presumed that the data provider has not any system for managing zone spatial data. In this case the provider can supply the zone spatial information to WAHIS+ in two ways: by means of a GIS software equipped with a dedicate add-on or plugin or by means of a dedicated WAHIS+ interface.

i. *GIS & plugin*. This solution is based on a GIS software (e.g. ArcGIS, QGIS) integrated with a dedicated add-on or plugin to capture the zone spatial data according to the geoZone data specification. The data provider edits the zone spatial data according the geoZone data specification protocol and store the information in a local repository. The add-on or plugin organises the data do be transmitted to WHAIS+. Transmission can be made via email, FTP, or my means of an uploading procedure.

ii. *WAHIS+ interface*. This type of data collection is performed by a provider that by means of a dedicated WAHIS+ interface edits the zone spatial data directly in the WAHIS+ environment. For this solution WAHIS+ should provide a dedicated extension to edit the spatial and non-spatial information described by the geoZone data specification.

Layer 2) **Data orchestrator**. The second layer is dedicated to the collection of data provided by the data providers. The data collection is managed by a data orchestrator. A data orchestrator automates the processes of data collection regardless the types of data source. Usually a data orchestrator is composed of: (i) validator, (ii) data quality processor, and (iii) orchestration database for the data staging.

a. *Validator*. The validator component is dedicated to check the markup validity of Web documents (e.g.: GML, XML, HTML, etc.) including compliance with geoZone data specification, verification of referenced resources, and so on. The markup validity of a web

service is an essential pre-requisite of the acquisition of data provided by a web service because only valid Web documents will be processed by the orchestrator.

b. *Data quality processor*. A series of procedures for data quality assurance. Data quality assurance is the process of data profiling to discover inconsistencies and other anomalies in the data with respect to the data quality specification defined by geoZone, as well as performing data cleansing to improve the data quality.
c. *Orchestrator database*. The orchestrator database is the nucleus of the Orchestrator installation containing all the runbooks, the configuration settings, and logs. The orchestrator database contains also the data staging area. The staging area is a temporary location where data from the source systems is copied before being forwarded to the production layer.

Layer 3) **Production and applications layer**. This layer is dedicated to the deployment of the collected data. In the production and applications layer, the data are structured according to the geoZone data specification. The data can be deployed by WAHIS+ interface, other modalities decided by the OIE business logic, or published online in the web for the download and made available to authorised end-users.

Annex B – Spatial data collection methods

(informative)

The spatial information of a feature is collected, digitised and organised on a GIS with the appropriate layers through the process called spatial data collection.

It is possible to distinguish 4 different types of data collection for the zone spatial component:

1. primary data capture (direct measurement);
2. secondary data capture (derivate from other sources);
3. data transfer (input of data from other systems);
4. data derived from a GIS function (e.g. buffer, merge).

Primary geographic data capture

This method refers to the capturing of datasets through physical surveying techniques performed by means of GPS. Although this technique is the most accurate for gaining data on the target GIS system, it is more time consuming and expensive.

Secondary geographic data capture

The secondary vector data capture digitizes vector objects starting from paper maps or digital geographic data sources. According to the type of data source we can have:

Manual digitizing: Digitization starts over a paper map using of a digitizing tablet, that is a manual pointing device that creates an identical vector map on the computer screen.

Heads-up digitizing: The process is similar to the manual digitization, but the map is in digital format (raster) and is plotted based on the vector data in order to be drawn on a computer screen.

Data transfer

One of the biggest problems with the data obtained from external sources is that they are encoded in many different formats, syntactic and semantics. While the former and the second are relatively simple to encode and decode, the latter is much more difficult since it is concerned with converting the meaning of the stored information. The imported data can comply with the data product specifications after the ETL process, which also includes a schema matching analysis, is performed.

GIS function

Spatial data can be also generated from a GIS function. Here below are described some cases:

- The area obtained from the buffer function (in this case the operator should pay attention to the spatial accuracy of the object used to generate the polygon that surrounds and encompasses the object).
- The area derived by a merging operation between two or more polygons (in this case the operator should pay attention on the presence of slivers and holes).

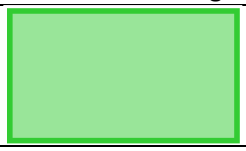
Annex C – Styles for the main Zoning classification values

(informative)

This annex describes some types of layers used for the portrayal of the spatial object types according to the zoneType value

Style name	Zoning.InfectedZone.Default
Spatial object type	zoneType = infectedZone
Abstract	The geometry is rendered using a red (#FF0000) fill with a transparency of 50% and a solid red (#FF0000) outline with a stroke width of 2 pixels
Example	

Style name	Zoning.ContainmentZone.Default
Spatial object type	zoneType = ContanimentZone
Abstract	The geometry is rendered using a light brown (#CDAA66) fill with a transparency of 50% and a solid light brown (#CDAA66) outline with a stroke width of 2 pixels
Example	

Style name	Zoning.FreeZone.Default
Spatial object type	zoneType = FreeZone
Abstract	The geometry is rendered using a light green (#33CC33) fill with a transparency of 50% and a solid light green line (#33CC33) outline with a stroke width of 2 pixels
Example	

Style name	Zoning.ProtectionZone.Default
Spatial object type	zoneType = ProtectionZone
Abstract	The geometry is rendered using a mango (#FFD37F) fill with a transparency of 50% and a solid mango (#FFD37F) outline with a stroke width of 2 pixels
Example	

Annex D – Use cases

(informative)

This annex describes some use cases that were used as a basis for the development of this data specification. Each use case has a detailed description that outlines the requirements and provides specific examples and illustrations to better explain the data model and thus facilitating the understanding and the way of implementation of the data model.

The type of use case, their contents and views set out in this annex derives exclusively from the research activities performed by the Istituto Zooprofilattico Sperimentale delle Venezie and the Chinese Academy of Inspection and Quarantine scientists within the framework of the OIE cooperation project entitled "Capacity development for implementing a Geographic Information System (GIS) applied to surveillance, control and zoning of Avian Influenza and other emerging avian diseases in China".

To draw Avian Influenza infected zones

Use Case Description	
Name	Draw Avian Influenza infected zones
Primary actor	Spatial planner in the Member Country
Goal	To draw the zone's boundary and to store the related characteristics of an Avian Influenza infected zones.
System under consideration	Animal disease control
Description	The spatial planner defines the extent of the zone and draw the boundary according to a protocol derived from the legislation of the Member Country. A set of zone's characteristics are stored in the attribute of the zone spatial object. Information about a set of appropriate control measures established by the Veterinary Authority within the zone can be stored in the attribute of the zone spatial object.
Pre-condition	Information about the Avian Influenza outbreaks are obtained/generated from local data sources. Ancillary spatial data (e.g. river branches, major roads, administrative boundaries, etc.) are available to the spatial planner. The spatial planner uses a GIS software and follow a protocol to draw the zone boundary and register the related characteristics of an Avian Influenza infected zones.
Flow of Events – Basic Path	
Step 1	The spatial planner verifies the quality and format of the spatial information about the Avian Influenza outbreak and if necessary, performs the spatial transformation of this data in order to overlay the spatial information with the ancillary spatial data.
Step 2	According to the protocol derived from the legislation of the Member Country, the spatial planner displays the spatial data (e.g. ancillary data, outbreaks data) in a GIS software and performs the spatial function to edit the zone boundary and the zone characteristics.
Step 3	The spatial planner activates the procedure for the validation of the zone borders and the related characteristics. If one or more information are not validated by the Veterinary Authority, the process envisages to perform again step 2.
Step 5	At the end of the validation process, the spatial planner activates the procedure for transferring the zone data to WHAIS+.

Finding zones

Use Case Description

Name	Finding zones in a Member Country
Primary actor	Analyst
Goal	Identifying a list of zones and including the map in a report.
System under consideration	Risk analysis
Description	An analyst from a Veterinary Authority needs to perform a risk analysis for importing domestic animals from a given country. The analyst needs to acquire information about the spatial distribution of zones of a given disease in the interested area/ region.
Pre-condition	WAHIS+ provides zone spatial data by means of a file transfer process or a web service. The analyst has the ancillary spatial data (e.g. administrative boundaries, major roads, etc.) for the interest area.
Post-condition	The maps derived from the analysis are included in a specific report.
Flow of Events – Basic Path	
Step 1	By using a GIS software, the analyst accesses the zone dataset provided by WHAIS+.
Step 2	The analyst queries the zones for a given set off criteria (e.g. disease, period of time).
Step 3	The analyst organises the layers for the analysis and develops the required maps from the queried data.
Step 4	The analyst activates the procedure for the validation of the output and for its inclusion in a specific report.

Group of zones by epidemic

Use Case Description	
Name	Group of zones by epidemic
Primary actor	Epidemiologist and Analyst
Goal	To define a logical list of zones which are grouped or related together by a single characteristic.
System under consideration	Animal disease control
Description	The epidemiologist identifies a list of zones according to a given characteristic. It is not mandatory for a zone to be part of a group.
Pre-condition	Two or more zones for a given disease have been already defined in WHAIS+. The epidemiologist defines the characteristic/ criteria for grouping the zones.
Flow of Events – Basic Path	
Step 1	By using a GIS software, the analyst accesses the zone dataset provided by WAHIS+ and identifies the zones that should be grouped together.
Step 2	The analyst verifies if a group with the same characteristic is already stored in the acquired dataset in order to avoid duplications.
Step 3	The analyst queries the zones for the specific characteristic provided by the epidemiologist.
Step 4	The analyst, for each queried spatial object, assigns the group code in order to include them in the group. The group code is stored in the attribute of the zone spatial object.
Step 5	The epidemiologist validates the data modified by the analyst.
Step 6	At the end of the validation process, the spatial planner activates the procedure for transferring each zone with the updated values to WHAIS+.

To modify the spatial information of an Avian Influenza infected zone

Use Case Description	
Name	Modify the spatial information of an Avian Influenza infected zones
Primary actor	Spatial planner

Goal	If the spatial information of a zone that has been already sent to WAHIS+ needed to be modified, a new spatial object must be uploaded in the WHAIS+. All the previous information of the zone shall be versioned (the management and storage of the changes applied to the zone, allowing the chronologic reconstruction of the zones spatial distribution) and the new version of the zone is stored.
System under consideration	Animal disease control
Description	The spatial planner, among the zones already sent to WHAIS+, identifies the zone with the not correct value (either geometry or attribute) and edit the end date of zone validity in order to create an old version of the zone. After this operation the spatial planner performs the activities of the "To draw Avian Influenza infected zones" use case
Pre-condition	The correct information about the zone is provided to the spatial planner. Information about already defined zones are available in WHAIS+.
Flow of Events – Basic Path	
Step 1	By using a GIS software, the analyst accesses the zone dataset provided by WHAIS+
Step 2	The analyst queries the zones for a given identifier.
Step 3	The analyst verifies the zone information of the identified zone.
Step 4	The spatial planner modifies the end of validity of the identified zone (to create an old version of the identified zone) and save the edit.
Step 5	The analyst activates the procedure for the validation of the update value and, subsequently, activates the procedure for sending the zone data to WHAIS+.
Step 6	The spatial planner starts the process described in the "To draw Avian Influenza infected zones" use case

Management of Avian Influenza infected zone validity period

Use Case Description	
Name	Management of Avian Influenza infected zone validity period.
Primary actor	Spatial planner
Goal	To manage the date when an Avian Influenza infected zone is not in force any more.
System under consideration	Animal disease control
Description	According to the legislation, the spatial planner updates the value of the endPosition property of a specific Avian Influenza infected zone.
Pre-condition	The OIE zone has already been constituted and transmitted to the OIE.
Flow of Events – Basic Path	
Step 1	By using a GIS software, the analyst accesses the zone dataset provided by WHAIS+.
Step 2	The analyst queries the zones for a given identifier.
Step 3	The spatial planner updates the designation period value, in particular the endPosition property.
Step 4	The spatial planner activates the procedure for the validation of the updated value.
Step 5	At the end of the validation process, the spatial planner activates the procedure to send the zone with the updated values to WHAIS+.

Annex E – Feature catalogue

1. *Spatial objects*

Zonig	
Definition:	Area defined by a Veterinary Authority that represents the territorial extent where some specific measures or activities are put in place for the purposes of disease prevention or control and/or international trade.
Attributes	
Name:	**Id**
Value type:	Identifier
Definition:	Spatial object identifier
Description:	A unique object identifier published by the Veterinary Authority, which shall be used to reference the spatial object. The Identifier is an identifier of the spatial object, not an identifier of the zone. In particular, if a zone is changed or modified, a new Id shall be provided. The Identifier should be generated by a specific framework (e.g. UUID).
Multiplicity:	1
Name:	**localIdentifier**
Value type:	char
Definition:	Code given by the data producer
Description:	The local identifier is unique within the dataset: no other geographic feature of a single data source can have the same identifier. The length of the local identifier is not limited. It is recommended that only the following characters are used in the identifier: {"A"..."Z", "a"..."z", "0"..."9", "_", "-"}, i.e. only letters of the Latin alphabet, numbers, the underline character and the hyphen are recommended. The UUID can be used as a local identifier.
Multiplicity:	0..1
Name:	**geometry**
Value type:	GM_Object
Definition:	Geometry representing the spatial extent of the zone
Description:	The geometry of a zone should be encoded as a GM_Polygon.
Multiplicity:	1
Name:	**zoneType**
Value type:	ZoneTypeCode
Definition:	It provides a high level classification of the zone (e.g. containment zone, free zone, infected zone)
Description:	It is the type of zone defined by the competent Veterinary Authority. The list of possible values of this code list is defined by the OIE.
Multiplicity:	1
Name:	**designationPeriod**
Value type:	TM_Period
Definition:	When the zone is legally designated or became effective
Description:	The designationPeriod uses the ISO 19108 TM_Period, which is comprised of two properties - gml:beginPosition and gml:endPosition. If the zone shall remain in force for an indeterminate period of time or it is not determinate, then the endPosition and the indeterminate position ”unknown" are be used to state that the zone is effective, regardless of a time end.
Multiplicity:	1
Name:	**vetrinaryAuthority**
Value type:	VeterinaryAuthorityList

Definition:	Veterinary Authority that is responsible for delivering the zone data
Description:	The term describes the Veterinary Authority that has designed the zone and is responsible for the delivery of the related information to the OIE and other stakeholders. It can be also specified the authority that is the holder, or the collector, or the producer of the spatial information.
Multiplicity:	1..*
Name:	**`disease`**
Value type:	DiseaseCode
Definition:	Description of the disease which control determined the decision to establish the zone
Description:	This is a fundamental classification value that specializes the zone.
Multiplicity:	1..*
Name:	**`controlledActivities`**
Value type:	ControlledActivityInformation
Definition:	Description of the activities or control measures put in place in the zone
Description:	A controlled activity is an activity or a measure that is either permitted, prohibited, enforced, promoted or restricted within the zone. Examples are: - Movement control - Stamping-out, slaughter or pre-emptive slaughter - Import or export restrictions - Herd accreditation - Isolation and quarantine - Cleaning and disinfection - Vector and reservoir control - Treatment of products and by-products - Vaccination and other medical measures
Multiplicity:	0..*
Name:	**`geographicName`**
Value type:	char
Definition:	Geographical name that is used to identify a zone
Description:	The values in this propriety can refer to any level of the administrative division of the country.
Multiplicity:	0..*
Association role: `legalBasis`	
Value type:	DocumentCitation
Definition:	Reference to, or citation of, the legal instrument or document that establishes the zone
Multiplicity:	1..*
Association role: `relatedZone`	
Value type:	Zoning
Definition:	Reference to a previous version of a zone
Description:	In case a zone is changed or modified, this relation keeps track of the previous *versions* of the zone.
Multiplicity:	0..*

2. Zone dataset

ZoneDataset	
Definition:	Represents a collection of instances of the zone defined by the spatial object type Zoning. This class is essentially used to associate the metadata information to the collection of zones. No attributes are associated to this class.

3. Zone dataset Metadata

ZoneDatasetMetadata	
Definition:	Contains metadata information. This way of handling metadata is used to carry information about the zone dataset and is, therefore, not necessarily linked to Zoning feature class.

4. Zone group

ZoneGroup	
Definition:	Represents collections of zones according to a given parameter. This feature type is essentially used to group zones according to the characteristics of the disease, affected population, disease pattern, etc.
Attributes	
Name:	**groupType**
Value type:	groupTypeCode
Definition:	Type of parameter used to group the zone
Description:	The parameter used to group the zone could be epidemic, year, surveillance program, etc.
Multiplicity:	1
Name:	**groupName**
Value type:	char
Definition:	Name given to the group
Description:	A name is used to identify the group. For example, in case of an epidemic wave, a name can be the disease name plus a progressive number. The name must be written in English.
Multiplicity:	0..1

5. Data types

DocumentCitation	
Definition:	The Veterinary Authority defines a zone by means of a legal document. This document shall specify legal obligations (including, but not limited to, international conventions, laws and legal acts or implementing regulations) and the extent of the zone.
Attributes	
Name:	**name**
Value type:	char
Definition:	Name of the document
Description:	This should be the official name assigned to the legislative instrument. EXAMPLE. The official legal name for the containment zones established in Italy following two outbreaks of avian influenza in an area near Venice is: "*Ordinanza n. 7 del 24 gennaio 2017 Influenza Aviaria. Istituzione delle misure di restrizione a seguito di positività per HPAI H5N8 nei Comuni di Mira (VE) e di Piove di Sacco*"
Multiplicity:	1
Name:	**link**
Value type:	URL
Definition:	link to online version of the document
Description:	Link to an online version of the web page where the document is published. The type should be type="anyURI".
Multiplicity:	1

ControlledActivityInformation

Definition:	Information describing the type of activities implemented within the zone with the purpose to control the disease. Example of controlled activities include: animal movements, surveillance, vaccination, etc..
Attributes	
Name:	**activity**
Value type:	ControlledActivityType
Definition:	Type of measure put in place by the Veterinary Authority
Description:	Example of controlled activities include: animal movements, surveillance, vaccination, etc.
Multiplicity:	1
Name:	**targetPopulation**
Value type:	TargetPopulationList
Definition:	List of animal subject to the measure
Description:	A specific set of animal species that can be subjected to the measure defined.
Multiplicity:	0..*
Name:	**activityPeriod**
Value type:	TM_Period
Definition:	Time period defining when a measure applies
Description:	The designationPeriod uses the ISO 19108 TM_Period, which is comprised of two properties - gml:beginPosition and gml:endPosition. If the activity shall remain in force for an indeterminate period of time or it is not determinate, then the endPosition and the indeterminate position ”unknown" are be used to state that the zone is effective, regardless of a time end.
Multiplicity:	0..1
Name:	**description**
Value type:	char
Definition:	Narrative summary providing any additional information that further explains the controls applied
Description???	
Multiplicity:	0..1

VeterinaryAuthority	
Definition:	Information about the authority responsible for delivering the information about the zone.
Attributes	
Name:	**contact**
Value type:	Contact
Definition:	Contact information for the authority
Multiplicity:	0..1
Name:	**localizedNames**
Value type:	VeterinaryAuthority i18N
Definition:	
Multiplicity:	0..*
Name:	**country**
Value type:	Country
Definition:	Name of the country where the zone is located
Multiplicity:	1
Name:	**organisationName**
Value type:	char
Definition:	Name of the authority. The name should be in English language

Multiplicity:	1
Name:	**organisationRole**
Value type:	OrganisationRole
Definition:	Role of the authority in regard to the delivered data
Description:	Several different roles and responsibilities can be identified with respect for the delivered data. For instance data manager, data custodian, etc. It is compulsory that, at least, the national competent authority for the notification of the zone to OIE should be mentioned in the veterinaryAuthority property and the value this shall take is "authority".
Multiplicity:	0..1

TargetPopulationList	
Definition:	Information about the animal population subjected to the measure.
Attributes	
Name:	**Species**
Value type:	Species
Definition:	Name of the species. The name should be in English language
Multiplicity:	1
Name:	**production**
Value type:	ProductionType
Definition:	Name of the species type of production. The name should be in English
Description:	Sometimes, a well defined class of animal is subjected to the control measure. The type of production is a possible property used to classify these animals.
Multiplicity:	0..1
Name:	**sex**
Value type:	char
Definition:	Sex of the species
Description:	Sometimes, a well defined class of animal is subjected to the defined measure. The animals' sex is a possible property used to classify these animals.
Multiplicity:	0..1
Name:	**age**
Value type:	char
Definition:	Age of the specie
Description:	Sometimes, a well defined class of animal is subjected to the defined measure. The animals' age is a possible property used to classify these animals.
Multiplicity:	0..1

Contact	
Definition:	Communication channels by which it is possible to gain access to the Veterinary Autority.
Attributes	
Name:	**address**
Value type:	char
Definition:	Representation of the postal address information in a readable way
Description:	The attribute includes all the necessary readable address components which allow the identification of the address (e.g., country, region, municipality, address area, post code, street name and address number).
Multiplicity:	0..1
Name:	**eMail**

Value type:	char
Definition:	An address of the organisation or individual electronic mailbox
Multiplicity:	0..*
Name:	**telephoneVoice**
Value type:	char
Definition:	Telephone number of the organisation or individual
Multiplicity:	0..*

6. Code List

The code lists refer to a series of controlled vocabularies. The approach used shall be compliant to I18N (internationalization) technologies. I18N means modification of a software or related technologies so that a software can potentially handle multiple languages in the world. The model adopted here is to support many languages but only two of them, English (ASCII) and another one (localised name), at the same time. One have to specify the 'another' language, by a dedicated environmental variable.

The structure of each Code List class is based on a "code" variable dedicated to identify the localised name and the "localisedName" used to contain the localised name.

ZoneType	
Definition:	Controlled vocabulary and code list of the zone type defined by OIE
Description:	It defines the high-level classification of a zone. Possible zone type value are contaminated zone, free zone, infected zone, etc.
Country	
Definition:	Controlled vocabulary and code list of the countries name defined by OIE
OrganisationRole	
Definition:	Controlled vocabulary and code about the possible organisation's role
Description:	Possible role are: authority, data custodian, data manager, data provider, etc.
Disease	
Definition:	Controlled vocabulary and code list of the disease defined by OIE
ProductionType	
Definition:	Controlled vocabulary and code list of the animal type of production defined by OIE
Specie	
Definition:	Controlled vocabulary and code list of the animal species defined by OIE
ControlledActivityType	
Definition:	Controlled vocabulary and code list of the possible measure established in a zone defined by OIE
Description:	In a zone one or more measure can be established by the Veterinary Authority. These can be: vaccination, animal movement control, etc.
groupTypeCode	
Definition:	Controlled vocabulary and code list of the possible type criteria for grouping zones defined by OIE
Description:	Zones can be grouped according to a well defined criteria. A typical grouping criteria is "epidemic".