EDIT - discussion #7917

Revise ReferenceSystemTerms

11/20/2018 06:41 PM - Andreas Kohlbecker

Status:	In Progress	**Start date:**	
Priority:	Priority14	**Due date:**	
Assignee:	Andreas Müller	**% Done:**	30%
Category:	cdm	**Estimated time:**	0:00 hour
Target version:	CDM UML 5.43		
Severity:	normal		

Description

A spatial reference system (SRS) or coordinate reference system (CRS) is a coordinate-based local, regional or global system used to locate geographical entities.
Some of the default terms provided by the eu.etaxonomy.cdm.model.location.ReferenceSystem class, do not conform to a reference system:

- WGS84: Is the World Geodetic System 84 also known as WGS 1984, EPSG:4326, this one is perfectly ok
- GoogleEarth: makes no sense if names like this. GoogleEarth is the name of an application. This term should be renamed to one of Web Mercator, Google Web Mercator, **Spherical Mercator**, and has the code is EPSG:900913
- Gazetteer: is a geographical dictionary or directory used in conjunction with a map or atlas, it is not a reference system and must be removed
- Map: makes no sense at all as reference system, remove it!

Background information on geodetic reference systems:

A geodetic datum or geodetic system is a coordinate system, and a set of reference points, used to locate places on the Earth (or similar objects). Reference systems are composed of a couple of constructs like an ellipsoid, geoid, anchor coordinates, etc.

ellipsoid

In geodetic coordinates, the Earth's surface is approximated by an ellipsoid. An Earth ellipsoid is a mathematical figure approximating the Earth's form, used as a reference frame for computations in geodesy, astronomy, and the geosciences. Various different ellipsoids have been used as approximations.

(http://www.kowoma.de/gps/geo/mapdatum.htm)

"Auch wenn zwei Länder dasselbe Ellipsoid verwenden (z. B. Deutschland und Österreich das Bessel-Ellipsoid), unterscheiden sie sich doch in diesem Zentralpunkt bzw. Fundamentalpunkt. **Daher können sich die Koordinaten der gemeinsamen Grenzpunkte um bis zu einem Kilometer unterscheiden**. ... Das Geoid gibt also sozusagen Normal-Null für die gesamten Erde an. So definiert das WGS-84 Geoid Höhen für jeden Punkt auf der gesamten Erde." (https://de.wikipedia.org/wiki/Referenzellipsoid)

geoid

The geoid is the shape that the ocean surface would take under the influence of the gravity and rotation of Earth alone, if other influences such as winds and tides were absent. This surface is extended through the continents (such as with very narrow hypothetical canals).

"Die Meereshöhe ist die durchschnittliche Höhe der Ozeane. Gezeitenkräfte und lokale Gravitationsunterschiede bewirken weltweite Unterschiede dieser Höhe im Bereich von Hunderten von Metern. Wäre überall auf der Erde nur Wasser, so hätte aufgrund der Gravitationsunterschiede die Erde trotzallem weder die Form einer Kugel noch die eines einfachen Ellipsoiden." (http://www.kowoma.de/gps/geo/mapdatum.htm)

For us it is important to note that a geodetic reference systems is an ideal approximation to the shape and form of the earth. Any coordinate (longitude / latitude) defines a point in this geometric structure. **A coordinate in a geodetic system can not be compared to the coordinate of another system without having the knowledge on the reference systems.**

Ein falsches Kartendatum kann zu Fehlern bei der Positionsbestimmung von mehreren hundert Metern führen.

Links:

- https://en.wikipedia.org/wiki/Geodetic_datum
- https://de.wikipedia.org/wiki/Geod%C3%A4tisches_Datum

- https://en.wikipedia.org/wiki/Reference_ellipsoid
- https://en.wikipedia.org/wiki/Geographic_coordinate_conversion

Conclusions

1. Without the the geodetic reference system logitute and latitute are in accurate and can differ from the actual location by up to several 100m.
2. ReferenceSystemTerms should preferrably have a link to the according entry in http://spatialreference.org so that automatic calulations can be done.
3. The terms *Gazetteer*, *Map* are measurement methods and must not be mixed with geodetic reference system
4. The term *GoogleEarth* should be translated into the reference system used by google (WGS 84): https://gis.stackexchange.com/questions/20259/what-datum-reference-ellipsoid-does-google-earth-use#20265 --> "The heights on google earth refer to EGM96 and are, therefore, Geoidal heights. The lat/long are referred to the WGS 84 ellipsoid."

Related issues:

Related to EDIT - feature request #7218: SpecimenTypedesignationsWorkingsetEd...	**Closed**

History

#1 - 11/20/2018 06:41 PM - Andreas Kohlbecker

- Status changed from New to Feedback

- Assignee changed from Andreas Kohlbecker to Andreas Müller

- % Done changed from 0 to 20

Hi Andreas, please commment

#3 - 11/21/2018 08:31 AM - Andreas Kohlbecker

I discovered that adding 'gazetteer' was an explicit requirement which was handled in #2374. What was the purpose, use case for adding this term?

#4 - 11/21/2018 08:49 AM - Andreas Kohlbecker

- Related to feature request #7218: SpecimenTypedesignationsWorkingsetEditor: support for Reference system added

#5 - 11/21/2018 11:18 AM - Wolf-Henning Kusber

The entries are mixing Reference class and the method for finding the correct value. The method might be of interest, but only as the method.

#6 - 11/21/2018 08:14 PM - Andreas Kohlbecker

- Description updated

- % Done changed from 20 to 30

I did some further investigation on reference systems and their importance on geolocations. I adding these informations to the issue description.

The key insight is "**A coordinate in a geodetic system can not be compared to the coordinate of another system without having the knowledge on the reference systems.**"

#7 - 11/21/2018 08:14 PM - Andreas Kohlbecker

- Description updated

#8 - 11/22/2018 07:38 AM - Andreas Kohlbecker

- Description updated

#9 - 11/22/2018 07:48 AM - Andreas Kohlbecker

- Description updated

#10 - 11/22/2018 07:55 AM - Andreas Kohlbecker

- Description updated

#11 - 11/22/2018 08:22 AM - Andreas Kohlbecker

- Description updated

#12 - 10/12/2020 04:48 PM - Andreas Kohlbecker

- Priority changed from New to Highest

- Target version changed from Release 5.5 to Release 5.18

Andreas Kohlbecker wrote:

> I discovered that adding 'gazetteer' was an explicit requirement which was handled in #2374. What was the purpose, use case for adding this term?

@Andreas M.: Please can you give feedback on this question, so that we can make progress in this issue?

BTW: I am moving this issue to the current milestone otherwise it it getting lost.

I set the issue priority to highest, since this ticket still was on 'New'

#13 - 10/12/2020 06:02 PM - Andreas Kohlbecker

I checked the usage of ReferenceSystemTerms in the production dbs:

```
cdm_production_algaterra
--      WGS84
--      Google Earth

cdm_production_campanulaceae
--      WGS84

cdm_production_caryo_amaranthaceae
--      WGS84
--      Gazetteer

cdm_production_cichorieae
--      WGS84

cdm_production_corvidae
--      Google Earth
--      WGS84
--      Map

cdm_production_flora_central_africa
--      Estimated
--      Gazetteer
--      Label
--      Map
--      Google Earth

cdm_production_flora_malesiana_prospective
--      WGS84

cdm_production_phycobank
--      WGS84

cdm_production_piB_ants_pilot
--      WGS84

cdm_production_piB_chenopodium_pilot
--      Google Earth
--      Gazetteer
--      WGS84

cdm_production_piB_spiders_pilot
--      WGS84

cdm_production_salvador
--      WGS84
```

The only databases using invalid geospacial reference system definitions are: cdm_production_flora_central_africa, cdm_production_piB_chenopodium_pilot, cdm_production_corvidae, cdm_production_caryo_amaranthaceae ('Google Earth' also is invalid but can be translated into *Google Web Mercator [EPSG:900913]*)

I suggest to transform this information into annotations, so that we can clean up the ReferenceSystemTerms

#14 - 11/09/2020 01:33 PM - Andreas Müller

- Assignee changed from Andreas Müller to Andreas Kohlbecker

We had discussed this issue some years ago and as far as I remember the result was, that the term ReferenceSystem might be incorrect as it is more used as a conglomerate of different types of possiblities to define what has been used to define the coordinates. But for current users and usecases this was fully enough so we decided to keep it as it is and not to make the model more complicated than needed.
If there is a real and urgent usecase now for distinguishing the different types we may think About splitting the attribute and vocabularies.

#15 - 11/09/2020 02:06 PM - Andreas Kohlbecker

- Assignee changed from Andreas Kohlbecker to Andreas Müller

I remember the outcome differently.

> conglomerate of different types of possibilities to define what has been used to define the coordinates

The CDM is so much correct in many of the data domains. Mixing these two very different things must appear so much wrong do any one who is involved into the GIS world at least a little bit more than superficially, that I must speak of a lack of understanding of the what a reference system is in GIS.

Not only that it can be disturbing, it also causes problems when doing calculations with coordinates as there is no controlled vocabulary to rely on when doing coordinate transformations.

Therefore I strongly vote for changing this since it is not correct that way. For the point maps in the dataportal it may mean that the location of the gathering is not correctly placed on the map (see above: "Ein falsches Kartendatum kann zu Fehlern bei der Positionsbestimmung von mehreren hundert Metern führen.")

BTW: The literal refernence "Google Earth" can be translated into a correct CRS so that except from "Gazeteer" there will be only once db left which is using more that that cdm_production_flora_central_africa.
Maybe we can also translate "Gazeteer" to something more meaningful. BTW: To which Gazeteer is this referring to?

#16 - 11/10/2020 08:52 AM - Andreas Kohlbecker

BTW: the CRS for GPS is WGS 84

For solving the the current misconception in the model we need to distinguish the **geographic reference system** from the **localization method**. This can be done at least in two different ways:

1. introduce a second field localizationMethod in Point, which can be free text or a term. The terms Estimated, Gazetteer, Label, Map, Google Earth will move to this field. In cases where the localizationMethod has as defined CRS this can be expressed by the Point.referenceSystem
2. introduce a specific term class for localizationMethod which also can express the CRF in those cases where it is defined by the used method. This strategy, however, imposes problems: If only the CRS is known, the method needs to be labeled as *unknown* this will lead to irritating term labels like *unknown (WSG84)*, *unknown (EPSG:900913)*

Therefore I prefer option 1.

#17 - 11/10/2020 09:44 AM - Andreas Müller

- Assignee changed from Andreas Müller to Andreas Kohlbecker

So you are planning to use the reference system for computations in the near future?

#18 - 11/10/2020 09:47 AM - Andreas Müller

- Category changed from cdmlib to cdm

- Target version changed from Release 5.18 to CDM UML 5.43

#19 - 11/10/2020 11:07 AM - Andreas Kohlbecker

Andreas Müller wrote:

> So you are planning to use the reference system for computations in the near future?

Placing point on a map involves computation! That's what we are doing by now already.

#20 - 11/10/2020 11:07 AM - Andreas Kohlbecker

- Assignee changed from Andreas Kohlbecker to Andreas Müller

#21 - 11/10/2020 05:51 PM - Andreas Müller

- Category changed from cdm to cdmlib

- Assignee changed from Andreas Müller to Andreas Kohlbecker

- Target version changed from CDM UML 5.43 to Release 5.18

Andreas Kohlbecker wrote:

> Andreas Müller wrote:
>
> > So you are planning to use the reference system for computations in the near future?
>
> Placing point on a map involves computation! That's what we are doing by now already.

So what do we need in the reference attribute for this computation.

#22 - 11/10/2020 05:53 PM - Andreas Kohlbecker

- Assignee changed from Andreas Kohlbecker to Andreas Müller

Andreas Müller wrote:

> Andreas Kohlbecker wrote:
>
> > Andreas Müller wrote:
> >
> > > So you are planning to use the reference system for computations in the near future?
> >
> > Placing point on a map involves computation! That's what we are doing by now already.
>
> So what do we need in the reference attribute for this computation.

The CRS!

#23 - 11/11/2020 08:59 AM - Andreas Kohlbecker

Do you really think that a measurement method is the same as the mathematical model that is needed to make sense of the value?

#24 - 12/02/2020 04:17 PM - Andreas Müller

- Target version changed from Release 5.18 to Release 5.19

#25 - 01/27/2021 04:50 PM - Andreas Müller

- Target version changed from Release 5.19 to Release 5.21

#26 - 03/02/2021 09:41 PM - Andreas Müller

- Target version changed from Release 5.21 to Release 5.22

#27 - 05/12/2022 06:05 PM - Andreas Müller

- Tracker changed from task to discussion

- Status changed from Feedback to In Progress

- Target version changed from Release 5.22 to Release 5.45

#28 - 05/12/2022 06:05 PM - Andreas Müller

- Category changed from cdmlib to cdm

- Target version changed from Release 5.45 to CDM UML 5.43

#29 - 01/05/2023 08:09 PM - Andreas Müller

- Priority changed from Highest to Priority14