UDMS and GeoSmartCity Workshop

The GeoSmartcity Underground Data model and Data harmonization

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Summary

- Objectives
- Design of the underground scenario data model
  - Methodology for the production of the GSC data model
  - INSPIRE DS extension approach
  - An insight into the GSC data model
- Data harmonisation

Objectives

- To design the data model needed to harmonize the overall heterogeneous spatial datasets to be further managed by the hub.
- To harmonize the spatial datasets from the different heterogeneous sources onto the common target schemas.

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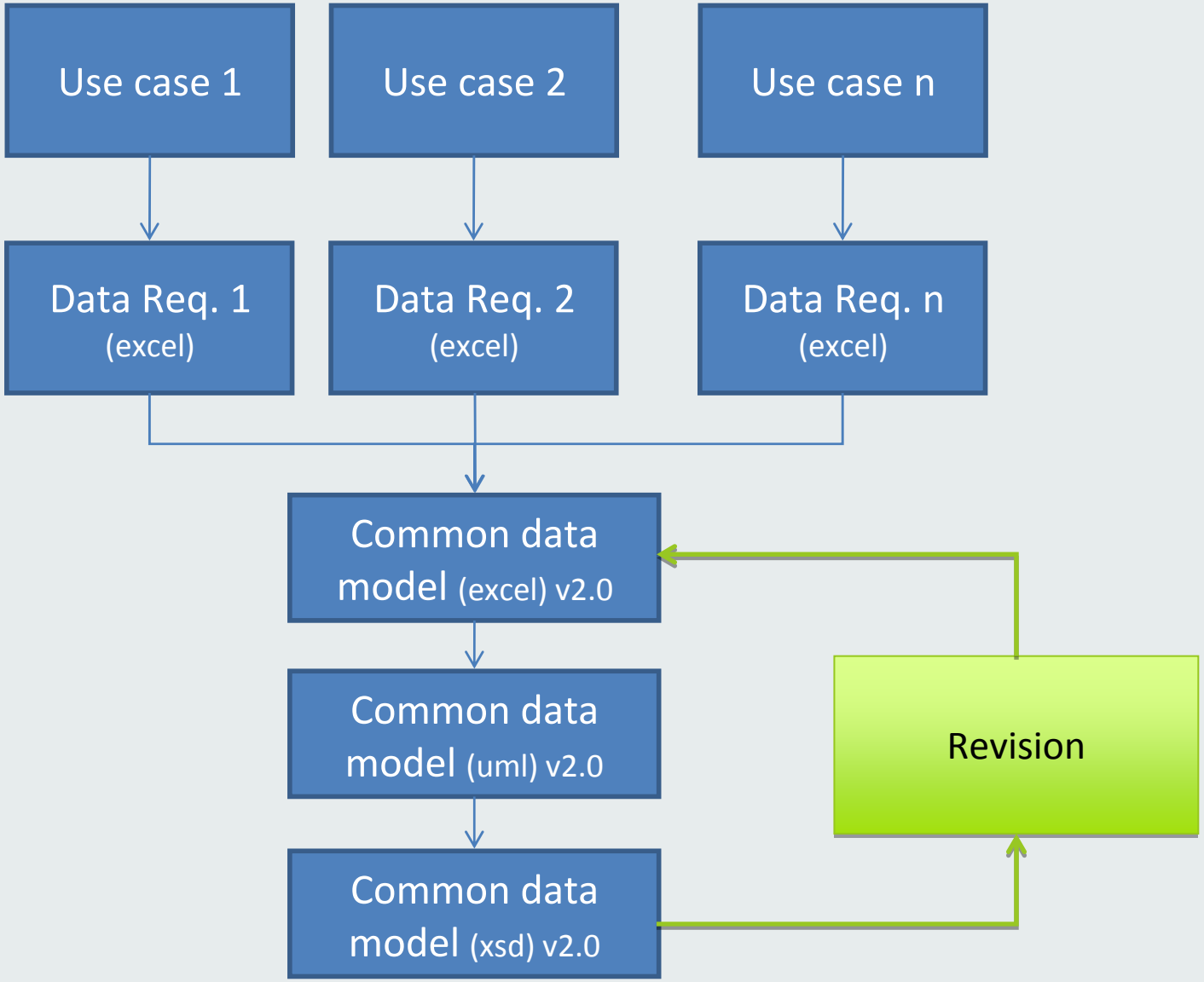
Use case 1
Use case 2
Use case n
Data Req. 1 (excel)
Data Req. 2 (excel)
Data Req. n (excel)
Common data model (excel) v2.0
Common data model (uml) v2.0
Common data model (xsd) v2.0
Revision

1. Create a template file in order to collect the pilots' data modelling requirements in a structured way.
2. Request each pilot to provide the list of attributes / information, the code list / code list values needed to run its use cases.
3. Align pilots' data modelling requirements
4. Compare data requirements so collected with the relevant INSPIRE Data Specifications
5. Provide an extension of the INSPIRE data models to take into account those elements included in pilots' data modelling requirements not covered by the INSPIRE Data Specifications.
6. Detailed procedures and instructions for the revision loop

UC-GSCP07-01	UC-GSCP07-02	UC-GSCP07-03	UC-GSCP11-01	UC-GSCP09-01	UC-GSCP09-02	UC-GSCP08-01	DATA LOGIC NAME	DESCRIPTION LOGIC NAME	DATA TYPE	INSPIRE (<DataTheme>.<AttributeName>)
P07										
1	1	1					Underground.LinearClass.GEOMETRY_3D	Segment of the network described according its type in the whole network	Geometry	Utility and Government Services.Common Utility Network Elements.UtilityLink.centrelineGeometry
2	2	2					Underground.LinearClass.COD_CLASSE	Numeric code of the class according to the Content Specification for the Topographic DB rule	Text(6)	Utility and Government Services.Common Utility Network Elements.UtilityLink.inspireId.localId- Si crea il localId come formatted string Cod_classe-FileID ??
3	3	3					Underground.LinearClass.FILE_ID	Unique progressive identifier of the class objects	Integer(19)	Utility and Government Services.Common Utility Network Elements.UtilityLink.inspireId.localId. Si crea il localId come formatted string Cod_classe-FileID ??
4	4	4					Underground.LinearClass.L_CREATION	Input date of the object into the Municipality Geographic Information System	Date	Utility and Government Services.Common Utility Network Elements.UtilityLink.beginLifespanVersion
5	5	5					Underground.LinearClass.COM_ISTAT	ISTAT code of the Municipality in the format rrpppccc (rr=Region, pp=Province, ccc=Municipality)	Text(8)	
6	6	6					Underground.LinearClass.TP_STR_COD	Code of the road	Text(8)	
7	7	7					Underground.LinearClass.TP_STR_NOM	Name of the road	Text(254)	
8	8	8					Underground.LinearClass.ES_AMM_CF	Functional classification of the road	Code list	
9	9	9					Underground.LinearClass.L_EG_COD	Fiscal code/VAT number of the managing authority	Text(16)	
10	10	10					Underground.LinearClass.L_EG_NOM	Name of the managing authority	Text(50)	Common Utility Network Elements.UtilityNetwork.authority role
11	11	11					Underground.LinearClass.L_BORN	Date of the installation/setup/workability	Date	Utility and Government Services.Common Utility Network Elements.UtilityLink.validFrom
12	12	12					Underground.LinearClass.L_DIA	Nominal diameter in mm	Integer(8)	Utility and Government Services.Common Utility Network Elements.Pipe.pipeDiameter
13	13	13					Underground.LinearClass.L_LUNG	Length in m	Decimal	Utility and Government Services.Common Utility Network Elements.duct.lenght?
14	14	14					Underground.LinearClass.L_MAT	Type of material	Code list	Utility and Government Services.CommonExtendedCommon Utility Network Elements.Pipe.PipeMaterialType

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The INSPIRE DS extension approach

INSPIRE
Infrastructure for Spatial Information in Europe

INSPIRE Generic Conceptual Model

Title	D2.5: Generic Conceptual Model, Version 3.4
Status	Version for Annex II/III data specifications v3.0
Creator	Drafting Team "Data Specifications"
Date	2014-04-08
Subject	Generic Conceptual Model of the INSPIRE data specifications
Publisher	Drafting Team "Data Specifications"
Type	Text
Description	Generic Conceptual Model of the INSPIRE data specifications
Contributor	Members of the INSPIRE Drafting Team "Data Specifications", INSPIRE Spatial Data Interest Communities & Legally Mandated Organisations, INSPIRE Consolidation Teams and other Drafting Teams
Format	Portable document format (pdf)
Source	Drafting Team "Data Specifications"
Rights	Public
Identifier	D2.5_v3.4
Language	En
Relation	n/a
Coverage	Project duration

Annex F
(informative)

Example for an extension to an INSPIRE application schema

F.1 Introduction

The agreement on harmonised data specifications addresses the need of users, in particular pan-European users, to combine multiple spatial data sets without repetitive manual intervention and in such a way that the result is coherent. This requires an effort to transform the existing spatial data to the new harmonised data specifications. In the long-term, it is the hope that less and less effort will be required for such transformations and that data providers start to re-use the harmonised data specifications as the basis for their spatial data sets in case they are restructured. Since national spatial data sets will in almost all cases contain information not covered by the INSPIRE data specifications, national SDIs or community SDIs will typically have to extend the INSPIRE data specification for their own purpose.

The Generic Conceptual Model has been designed to support such extensions. This annex provides an example for a simple extension.

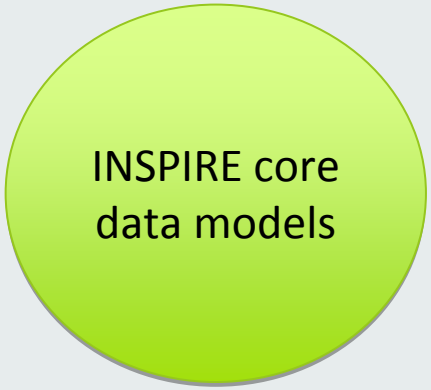
F.2 General rules

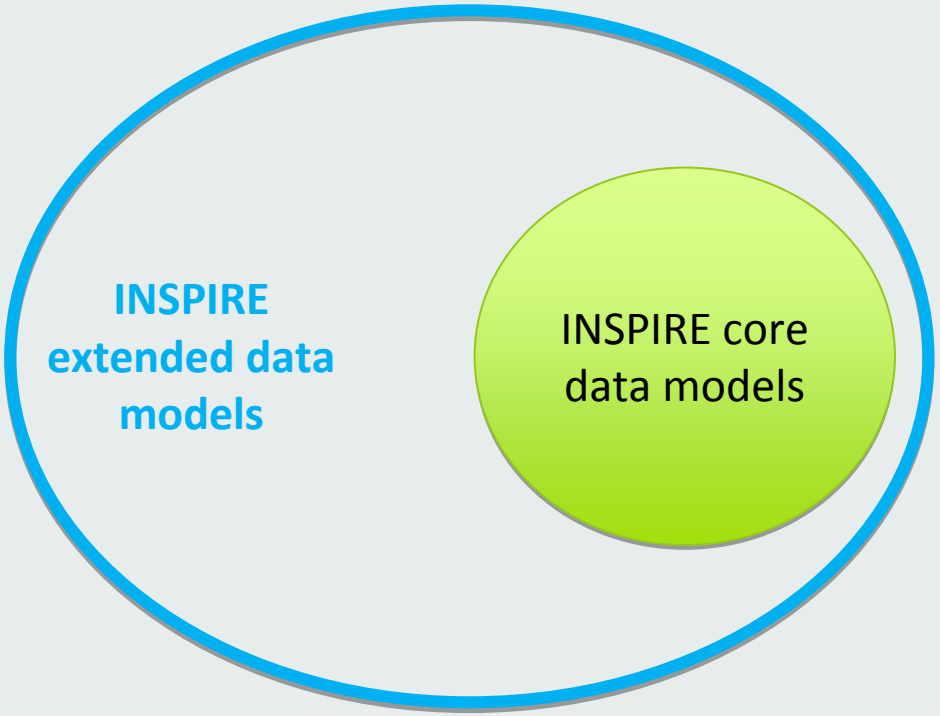
The INSPIRE data specifications have been developed through a process involving the European stakeholders. While the future maintenance of the specifications has not yet been fixed, it is reasonable to assume that this will be the case in the future, too. The INSPIRE

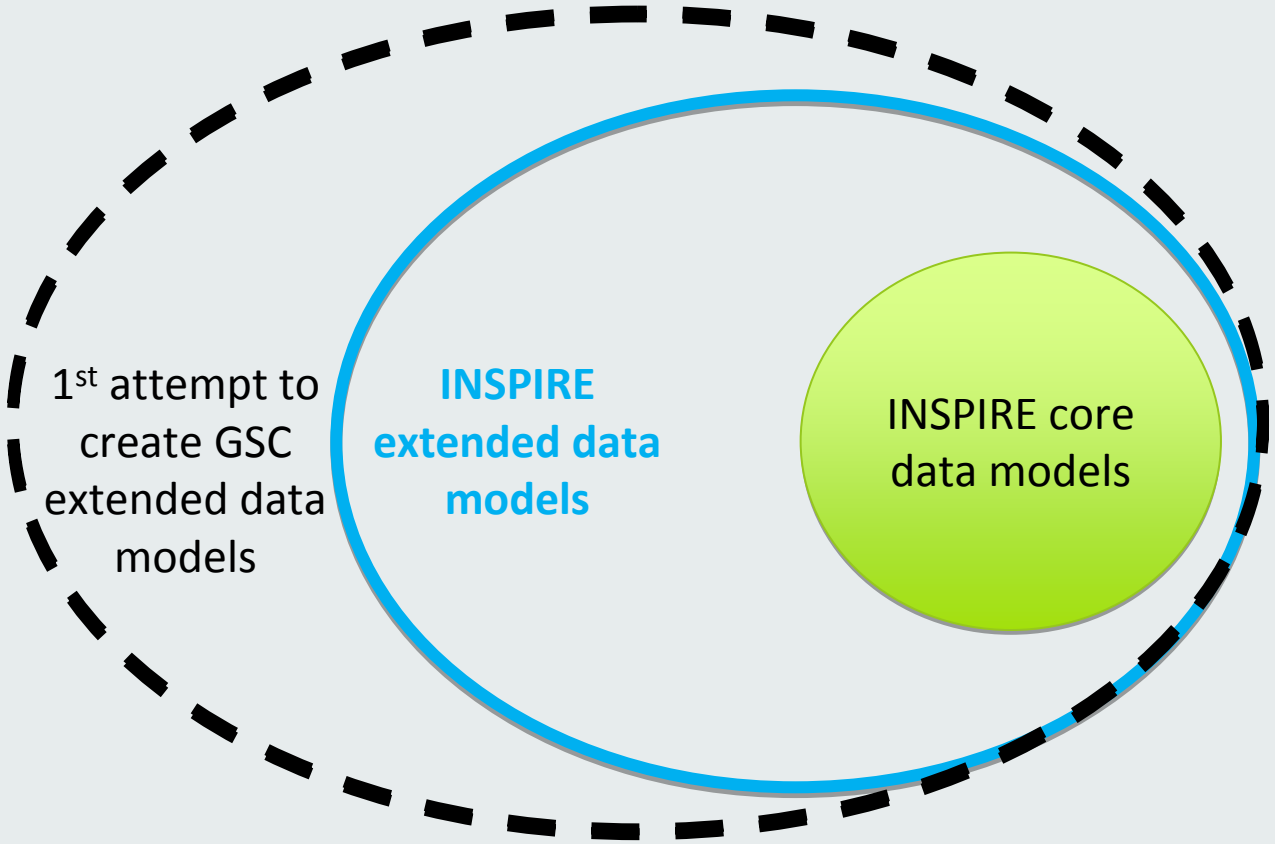
Extending an INSPIRE data specification would imply at a minimum that:
- the extension does not change anything in the INSPIRE data specification but normatively references it with all its requirements
- the extension does not add a requirement that breaks any requirement of the INSPIRE data specification

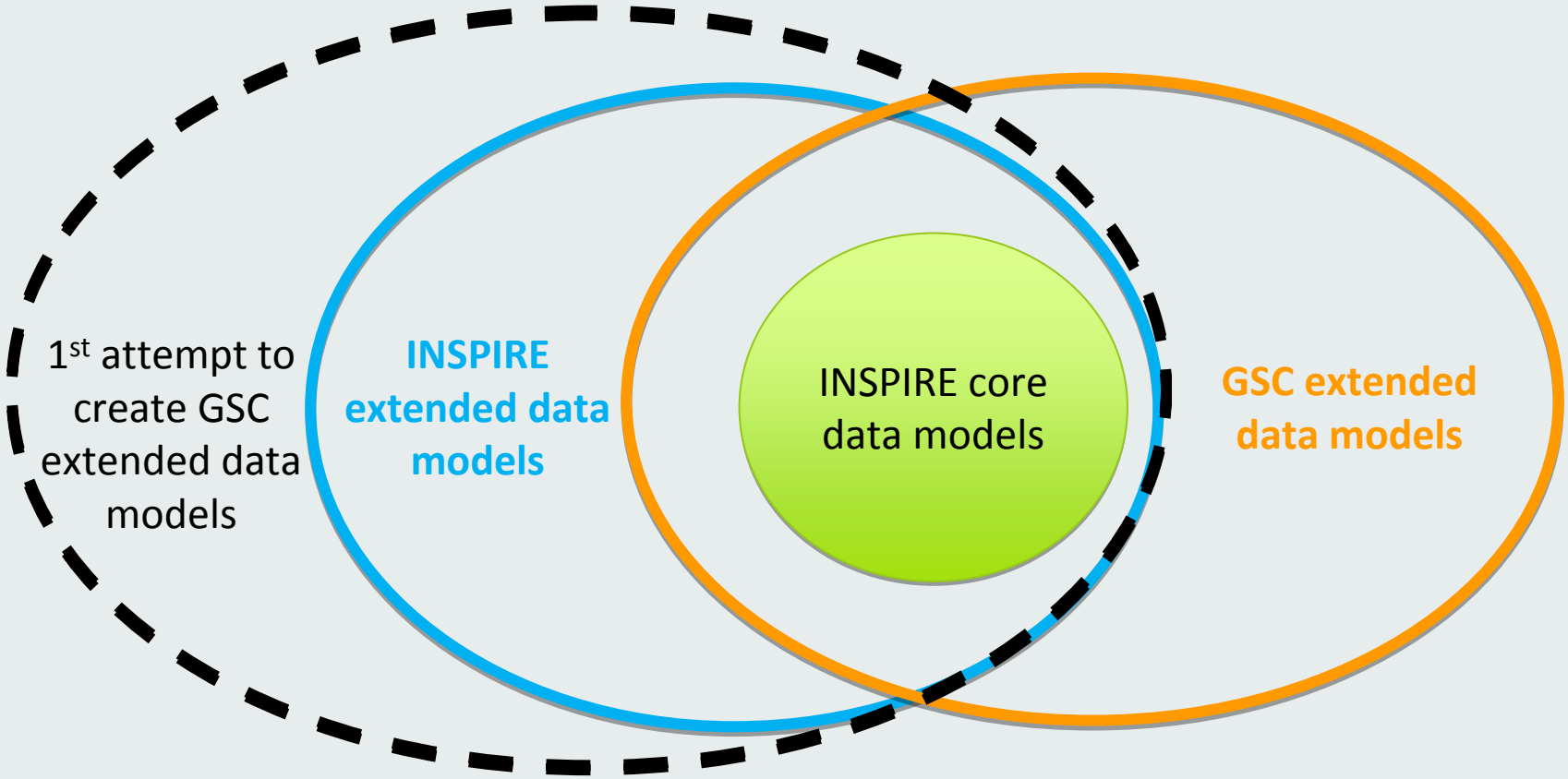
However, the extension may, for example, do any of the following:
- add new application schemas importing INSPIRE or other schemas as needed
- add new types and new constraints in your own application schemas
- extend INSPIRE code lists as long as the INSPIRE data specification does not identify the code list as a centrally managed, non-extensible code list
- add additional portrayal rules

In addition to these general rules that are mainly implied by the rules of UML, further harmonisation will be achieved, if the extensions conform to all requirements of this document and the document "Guidelines for the encoding of spatial data", too.


INSPIRE core
data models


INSPIRE
extended data
models
INSPIRE core
data models


1st attempt to create GSC extended data models
INSPIRE extended data models
INSPIRE core data models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INSPIRE core data models
GSC extended data models

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Extension of INSPIRE Utilities and Governmental Services (US) - *"Utility networks"* sub-model

Pilots involved :

[**P06**] Comarca of Pamplona (ES), [**P07**] Genova (IT), [**P08**] Oeiras (PT), [**P09**] Flanders Region (BE), [**P10**] South Moravian Region (CZ), [**P11**] Ruda Śląska (PL)

Focus on the Italian use cases:

GSC data modelling helps process of alignment of the National Specification on Utility networks to INSPIRE Directive requirements.

Focus on the Flanders Region use cases:

GSC data model extends INSPIRE US data model taking into account the information needed by Flanders sewer network management (Aquafin's AQS2.0 data model)

GSC - Underground Scenario

Utility Networks Profile:

- is based on a node-arc-node structure and network concept
- information is detailed in :
  - one "Common Utility Networks Elements" application schema, that contains all the common elements shared among the different utility network type
  - six network - specific application schemas
    - Electricity network
    - Oil, Gas & Chemicals network
    - Sewer network
    - Telecommunications network (only proposed in the technical guidance, out of legislation)
    - Thermal network
    - Water network

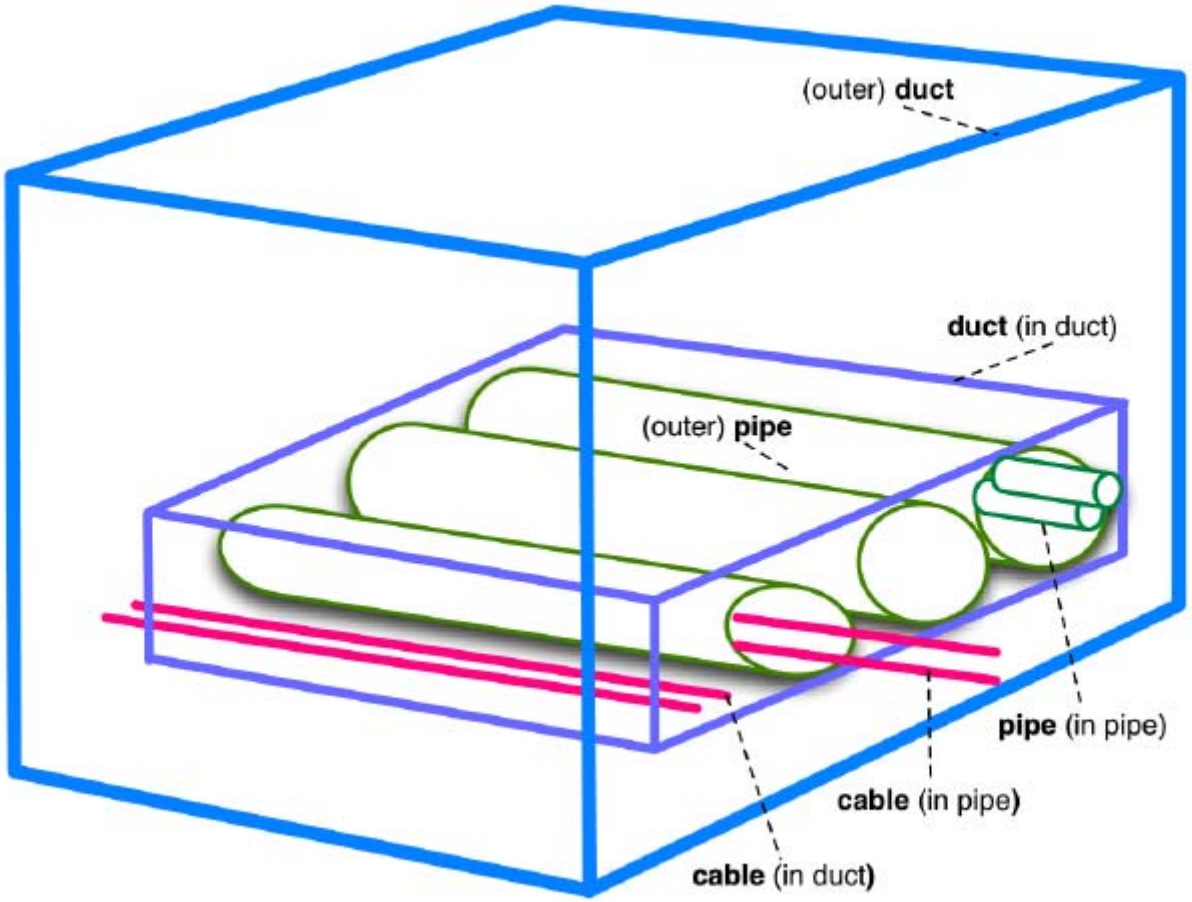
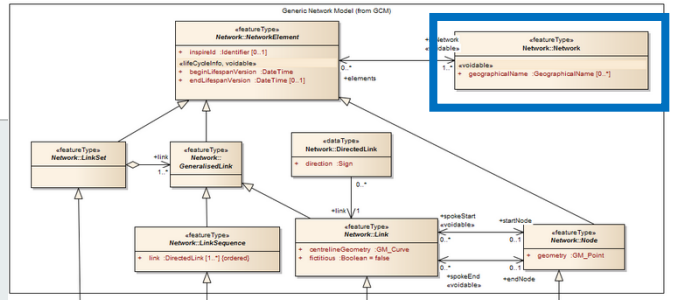
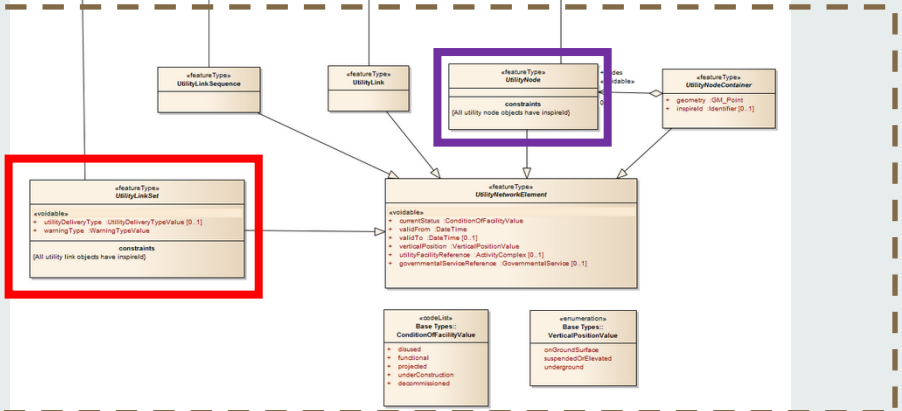


Figure 9 – Physical relations between cables, pipes and ducts

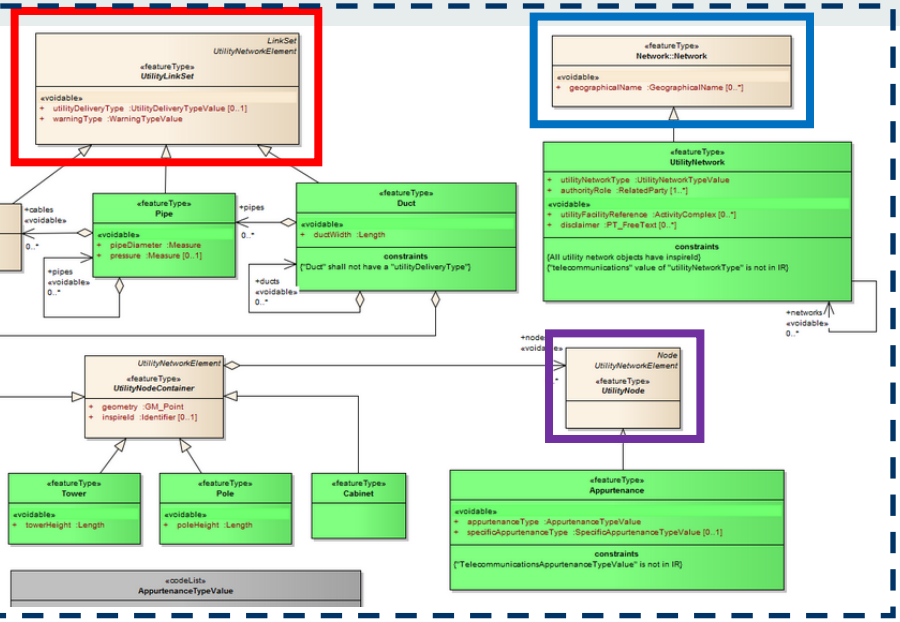
Generic Network Model (from GCM)



Utility Network Profile – Abstract Types



Utility Network Profile – CommonTypes



Mapping Italian directive

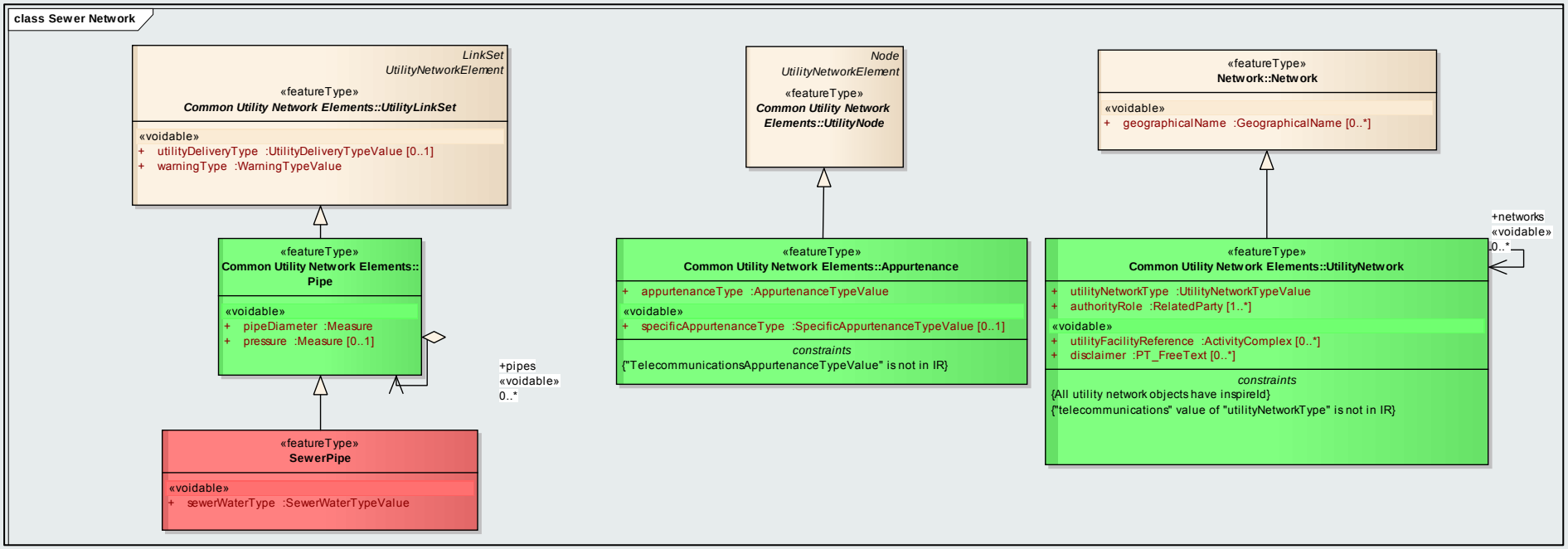
Specifiche di Contenuto per i DB delle Reti di Sottoservizi - Versione 2.0

Utility Network	Classe:Tratta della rete
Utility Link	Classe:Tratta della rete
Pipe	Classe:Tratta della rete
Appurtenance	Classe:Nodo della rete

The GeoSmartCity Utilities and Governmental Services data model version 2.0 extends the core INSPIRE data model for Utilities and Governmental Services:

- **7 INSPIRE feature types extended** adding new attributes to the relevant INSPIRE US core feature types
  - UtilityNetwork
  - ActivityComplex
  - SewerPipe
  - WaterPipe
  - OilGasChemicals Pipe
  - TelecommunicationsCable
  - ElectricityCable
- **9 feature types created from scratch** (no corresponding feature type in the INSPIRE US core model exists)
  - SewerAppurtenance
  - WaterAppurtenance
  - OilGasChemicalsAppurtenance
  - SoilDigs
  - Intervention
  - TransformationProjects
  - InfrastructureOrigin
  - MunicipalIntervention
  - CrowdSourcing

An example of GSC extension: the sewer network

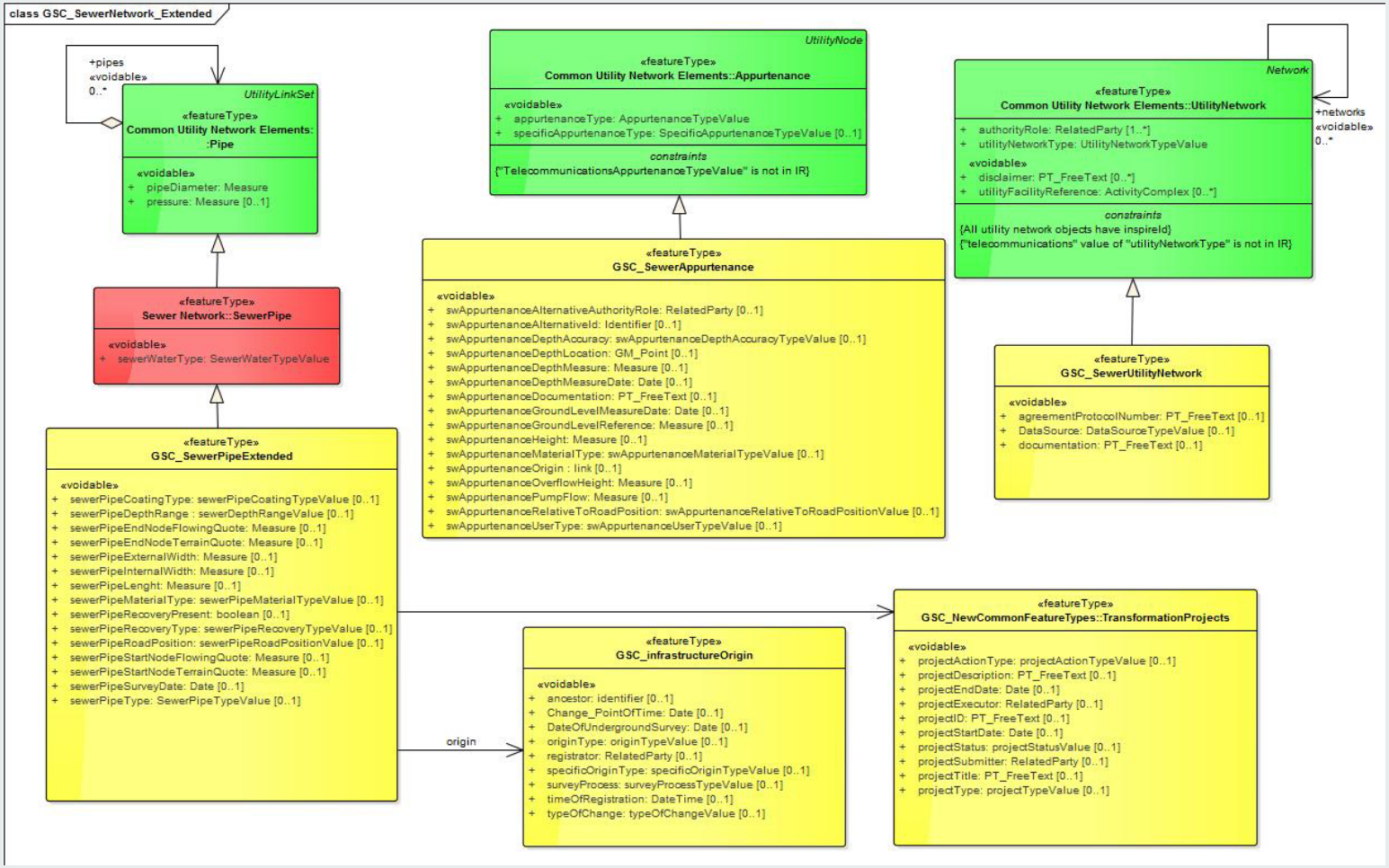


UML of the INSPIRE core SewerNetwork

GeoSmartCity extension of the "Sewer Network" - version 2.0

- The GeoSmartCity data model for sewer network
  - extends 2 INSPIRE-core feature types:
    - sewerPipe
    - sewerAppurtenance
  - introduces 2 new feature types:
    - InfrastructureOrigin - (Flanders region requirements)
    - TransformationProject (Flanders region + Italian requirements)

GeoSmartCity extension of the "Sewer Network" - version 2.0



GeoSmartCity extension of the “Sewer Network” – ongoing version 2.1

Based upon Flanders Region pilot’s feedback

New Feature type:

TransformationAction

Associations:

sewerPipeHasProjectAction

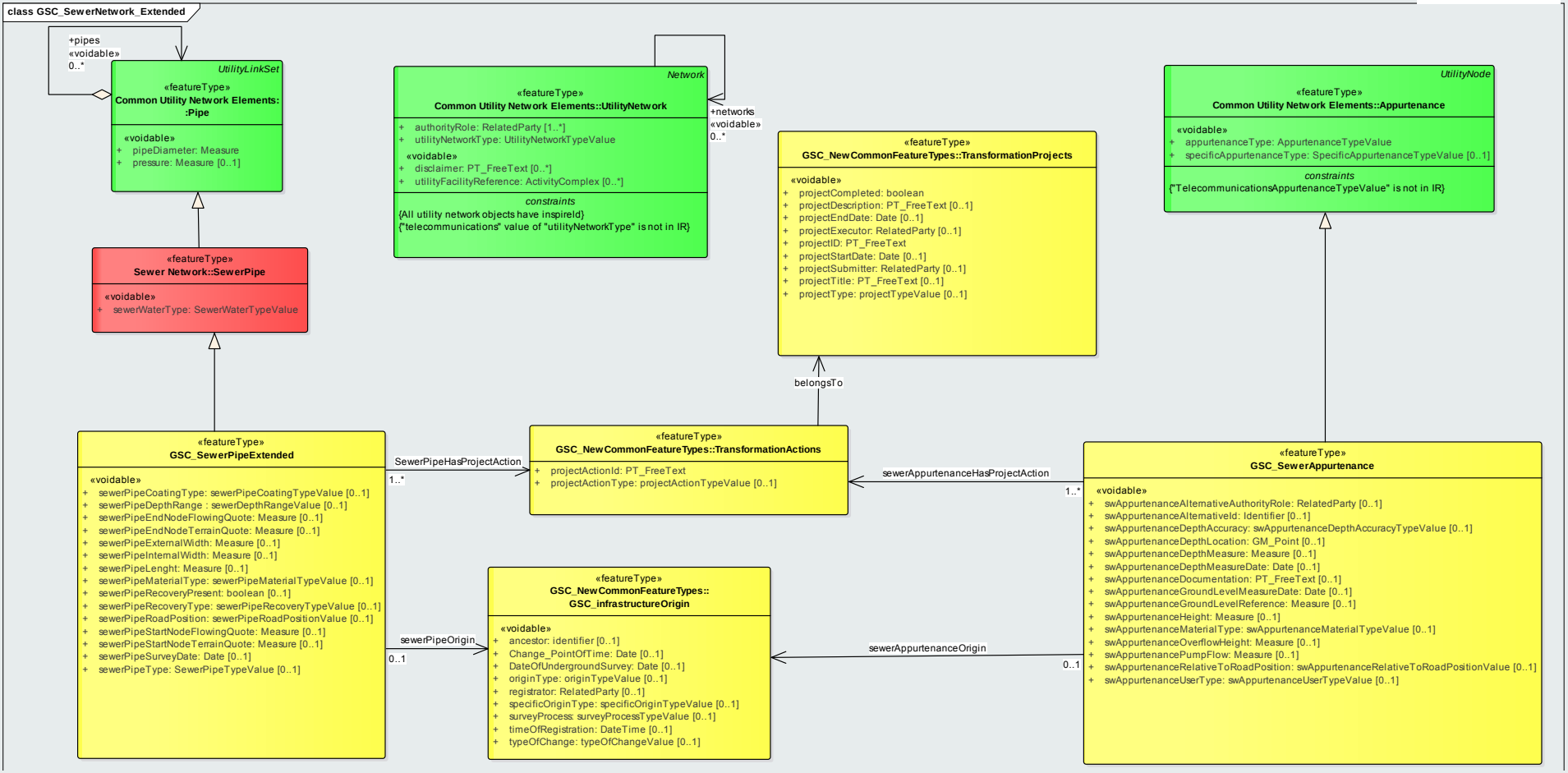
sewerAppurtenanceHasProjectAction

actionBelongsToProject

sewerPipeHasOrigin

sewerAppurtenanceHasOrigin

GeoSmartCity extension of the “Sewer Network” version 2.1



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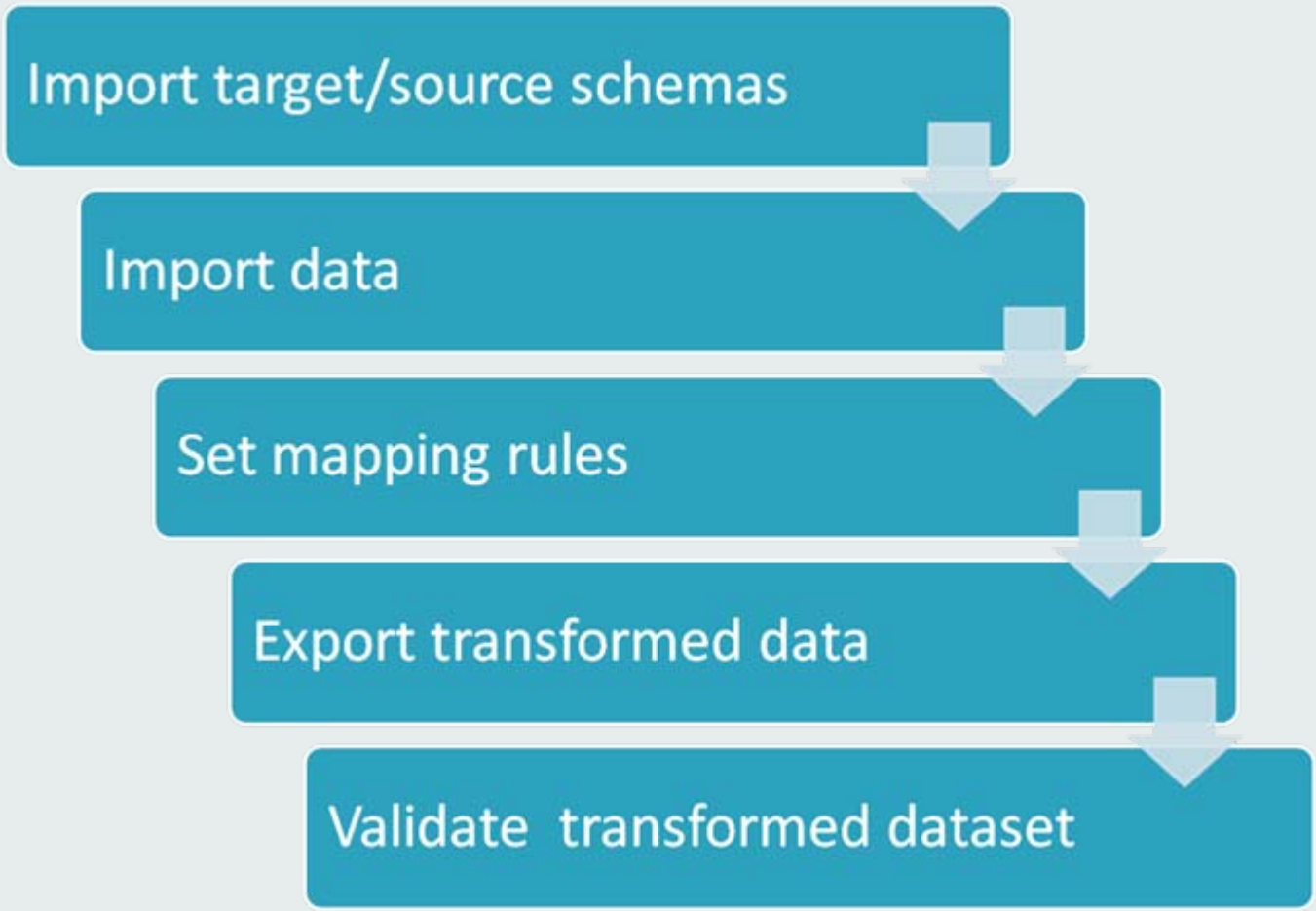
Generic workflow to transform datasets according to selected target schema requirements



Mapping table overview: SewerPipeExtended feature Type - vers.2.1

Legend

	attribute not present in INSPIRE (core)ft		association
	attribute present in INSPIRE extended ft		attribute of INSPIRE (core) ft
			attribute not present in GSC DM 2.0 version

Type	Documentation	Attribute / Association role	Attribute documentation	Values / Enumer	Multiplicity	Voidable /	P07	P11	P09	P08	Notes
SewerPipeExtended Supertypes: Pipe UtilityLinkSet UtilityNetworkElement LinkSet NetworkElement		sewerWaterType	Type of sewer water.	codelist SewerWaterTypeValue	1	voidable	SewerNetwork.L_F_TIPFOG	TypKanal	sewerAppurtenance.sewerWaterType		
		sewerPipeType	Type of the segment	codelist SewerPipeTypeValue	1	voidable	SewerNetwork.L_F_TY	RODZAJPRZEWODU	sewerLink.sewerLinkType		
		sewerPipeLenght		Measure	0..1		Underground.LinearClazz.L_LUNG				
		sewerPipeDepthRange	Depth range of the pipe	CodeList depthRangeValue	0..1		Underground.LinearClazz.L_PRO				
		sewerPipeRoadPosition	partition relative to the road	CodeList roadPartitionValue	0..1		Underground.LinearClazz.L_POS				
		sewerPipeStartNodeTerrainQuote	Terrain quote of initial node	Measure	0..1		SewerNetwork.QUO_INI				
		sewerPipeStartNodeFlowingQuote	Flowing quote of the initial node	Measure	0..1		SewerNetwork.SCO_INI				
		sewerPipeEndNodeTerrainQuote	Terrain quote of final node	Measure	0..1		SewerNetwork.QUO_FIN				
		sewerPipeEndNodeFlowingQuote	Flowing quote of the final node	Measure	0..1		SewerNetwork.SCO_FIN				
		sewerPipeInternalWidth	Internal width of the profile of the element	Measure	0..1		SewerNetwork.L_F_LARG				
		sewerPipeInternalHight	Internal height of the profile of the element	Measure	0..1		SewerNetwork.L_F_ALT				
		sewerPipeExternalWidth	External width of the profile of the element	Measure	0..1			WymiarPoziomy			
		sewerPipeExternalHight	External height of the profile of the element	Measure	0..1			WymiarPionowy			
		sewerPipeSurveyDate	date of the measurement of the object in the field	date	0..*			DATAPOMIARU			
		sewerPipeCoatingType	Type of the external protection	CodeList PipeCoatingTypeValue	0..1						
		sewerPipeMaterialType		CodeList PipeMaterialTypeValue	0..1		Underground.LinearClazz.L_MAT				
		sewerPipeOrigin	link to origin infrastructureOrigin ft	Link	0..1	voidable					link to InfrastructureOrigin feature ty - See GSC-New feature spreadsheet
		sewerPipeProjectAction	link to origin infrastructureOrigin ft	Link	1..*	voidable					link to ProjectAction feature type - See GSC-New feature spreadsheet
		sewerPipeDeliveryLocationType	"sewage treatment plant "rail" surface water body "other	CodeList SewerNetwork.L_F_REC			SewerNetwork.L_F_REC				

THANK YOU!

QUESTIONS?