



Efficient data inventarisation for KLIP Digital Phase using QGIS

KLIP Digital Phase - Context

- ▶ KLIP: “Kabel en Leiding Informatie Portaal”
- ▶ Flemish legislation
- ▶ Goal: prevent damage through digging to underground cables and pipelines



- ▶ Major cause of accidents is the cumbersome process for obtaining maps of the subsoil infrastructure



KLIP Digital Phase - context

KLIP: Portal & Web Services

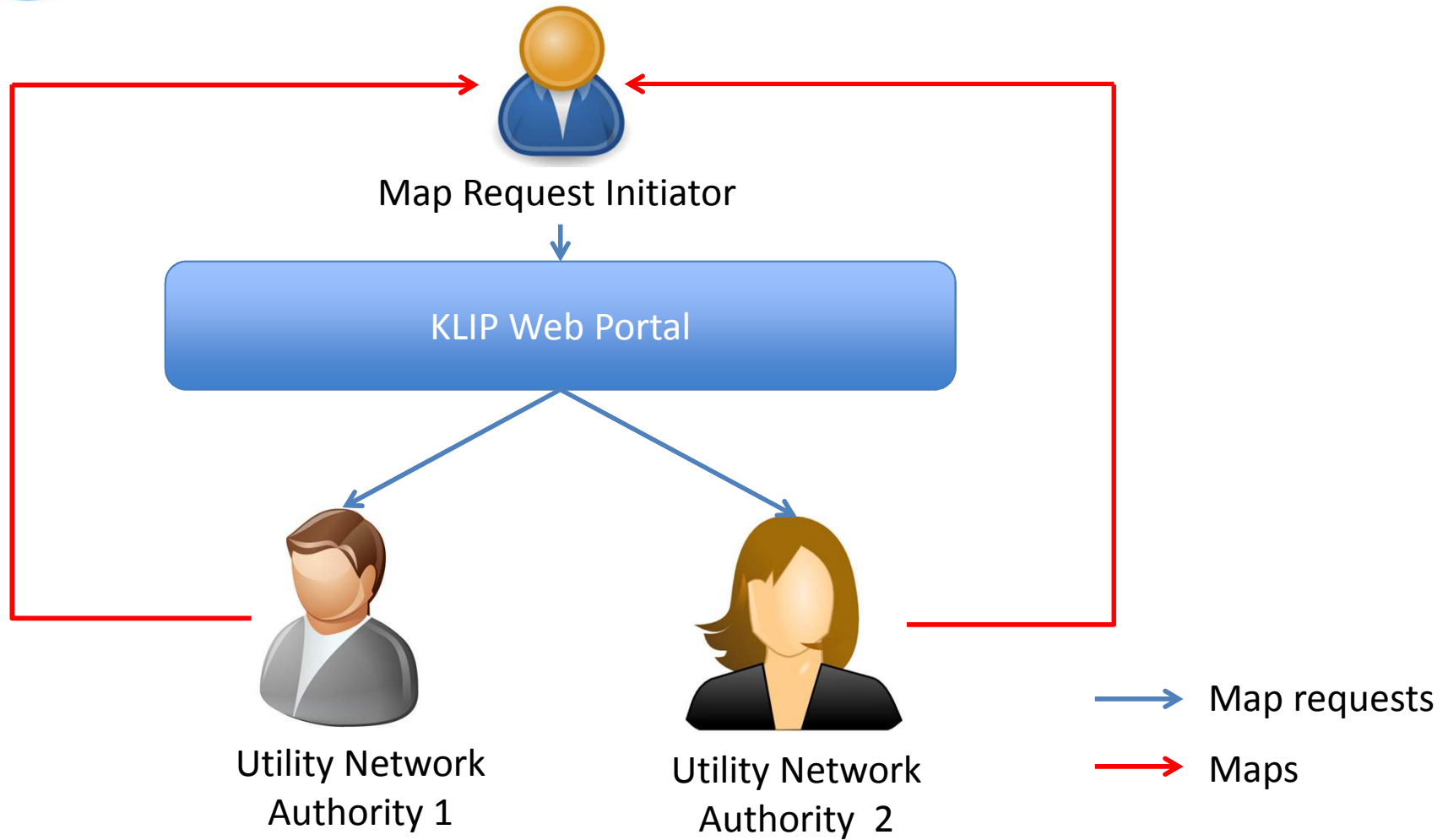
Objective: better information exchange between

- ▶ Diggers that create map requests: Map Request Initiators - MRI
- ▶ Cable and pipeline operators that need to reply to those map requests –Utility Network Authorities -UNA

KLIP “Analogue” phase

- Operational since 2007
- UNA mandated to register with KLIP
- MRI mandated to introduce map requests

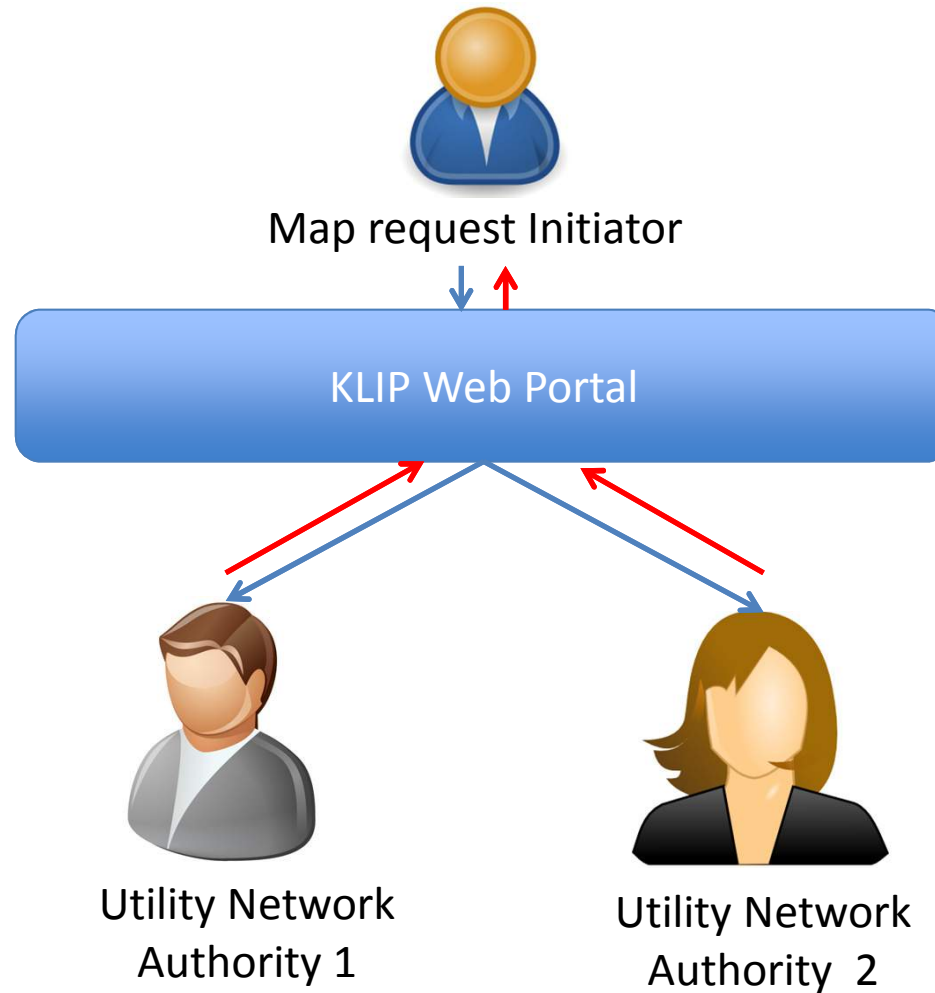
Process KLIP "analogue" Fase



Process KLIP "analogue" Fase



Process KLIP Digital Phase



Possible since
April 2015
Mandated for
January 2016!

→ Map requests
→ Maps

KLIP Digital Phase – Data model & Format

No more free choice concerning the format of the maps

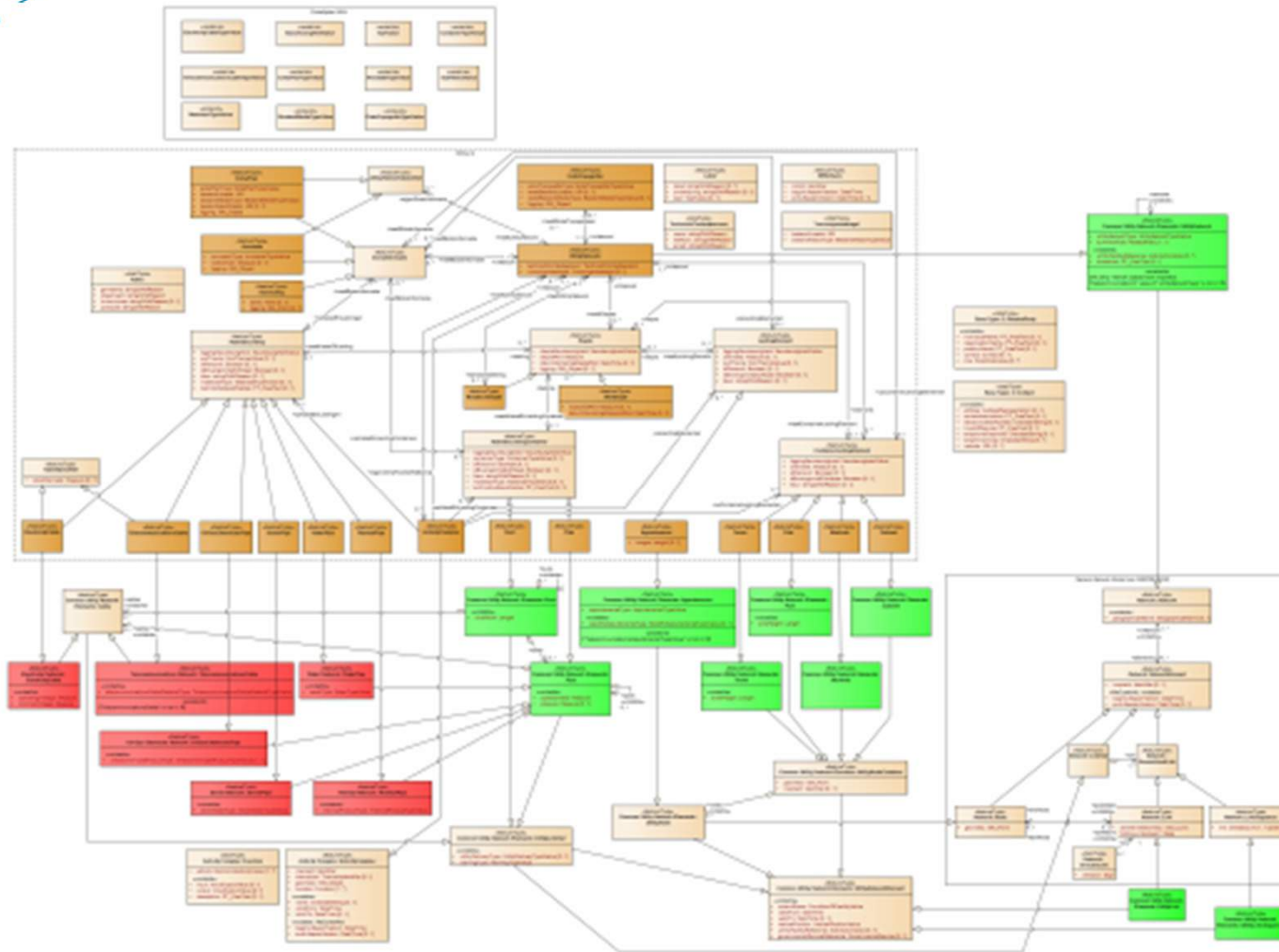
- ▶ Geographic information must be delivered in accordance with the “Informatiemodel Kabels en Leidingen (IMKL)”
- ▶ IMKL package
 - ▶ IMKL encoded as GML
 - ▶ Extra files (response letters, detailed drawings, ...) referred to from within the IMKL



```
<?xml version="1.0" encoding="utf-8"?>
<gml:FeatureCollection gml:id="ID_1c0c5554-5c4a-
467a-a9ef-9f36b5af2bf7" ">
  <net:beginLifespanVersion>2001-12-
17T09:30:47.0Z</net:beginLifespanVersion>
  <net:inspireId>
    <base:Identifier>
      <base:localId>001</base:localId>
      <base:namespace>aquacom-
be</base:namespace>
      <base:versionId>v2</base:versionId>
    </base:Identifier>
  </net:inspireId>
  ....
```



IMKL - Model



KLIP Digital Phase – Presentation Model

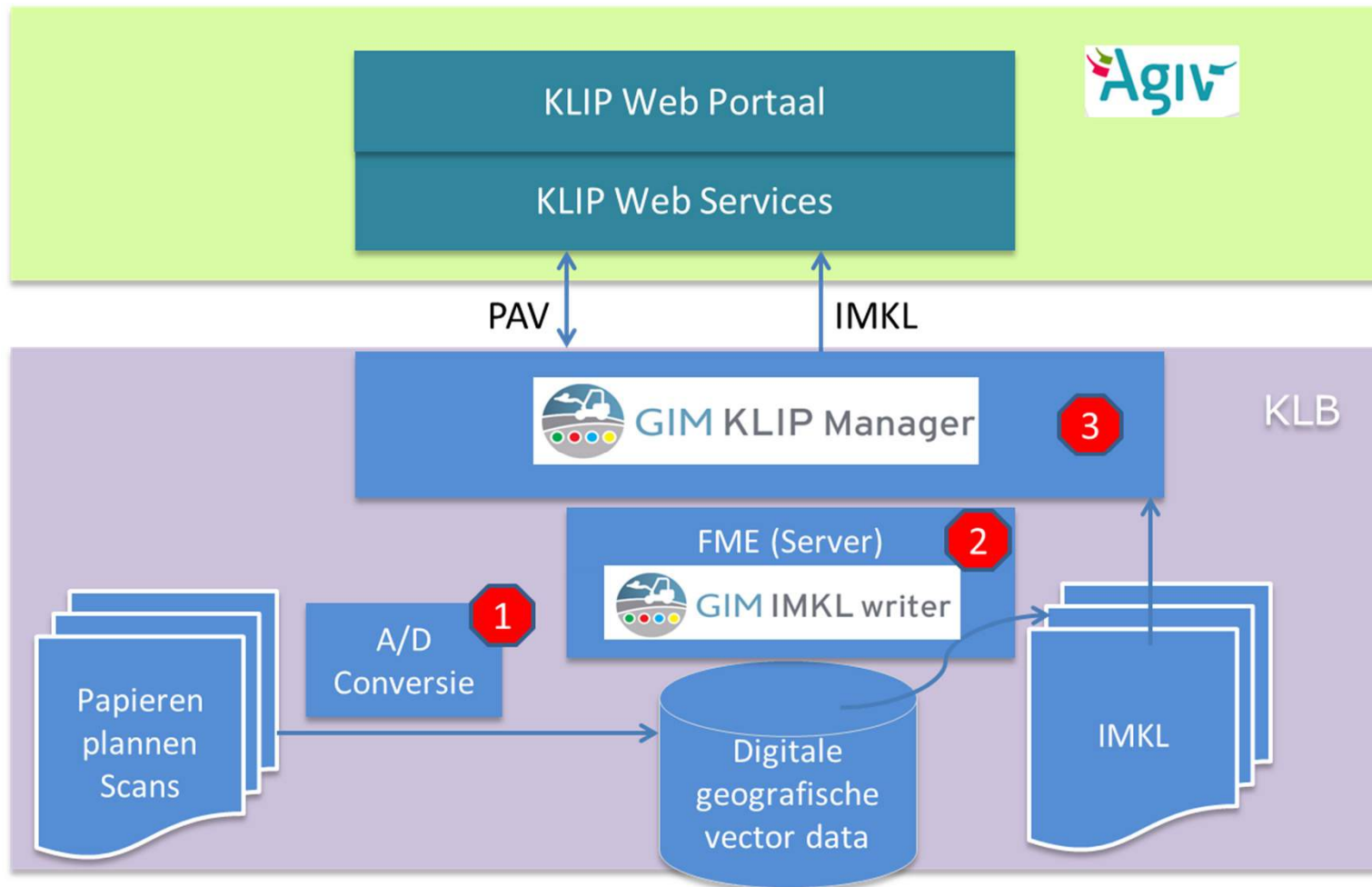
Symbology with which the IMKL is portrayed is defined within the “Presentatie Model Kabels en Leidingen (PMKL)”

```
<?xml version="1.0" encoding="utf-8"?>
<gml:FeatureCollection gml:id="ID_1c0c5554-5c4a-
467a-a9ef-9f36b5af2bf7" ">
  <net:beginLifespanVersion>2001-12-
17T09:30:47.0Z</net:beginLifespanVersion>
  <net:inspireId>
    <base:Identifier>
      <base:localId>001</base:localId>
      <base:namespace>aquacom-
be</base:namespace>
      <base:versionId>v2</base:versionId>
    </base:Identifier>
  </net:inspireId>
  ....
```





What does a UNA require for KLIP Digital Phase





Data digitisation with QGIS



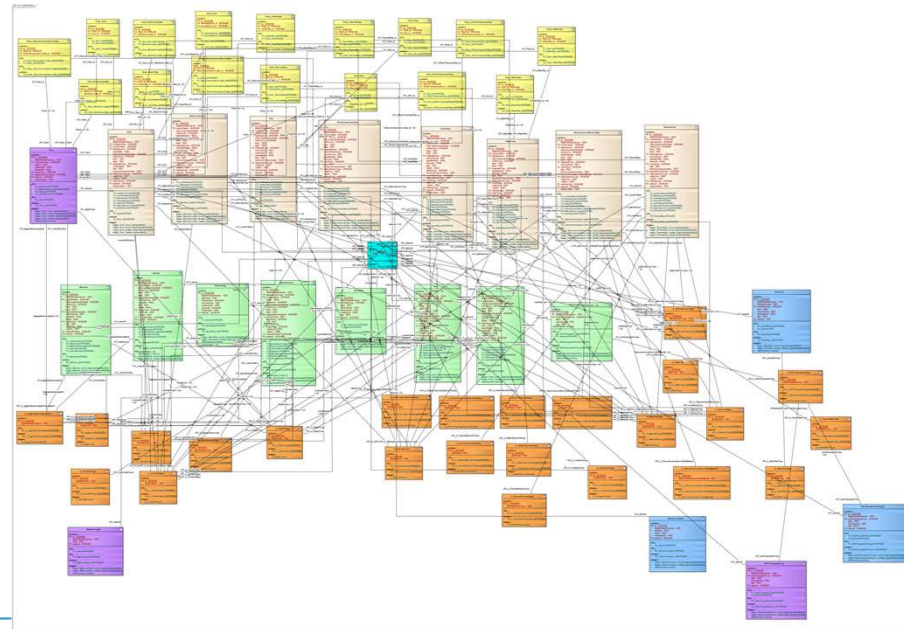
- ▶ Still a lot of (smaller) UNA's do not have digital vector data about their subsoil infrastructure
- ▶ Only data that is available are paper plans and scans
- ▶ Need for a cost-effective and simple data digitisation solution

- ▶ GIM selected QGIS as the GIS Tool of choice
 - ▶ Free
 - ▶ User friendly
 - ▶ Can handle complex data models
 - ▶ Easy to implement PMKL symbology
 - ▶ Support for portable database format as SpatiaLite



Implementation of Database in SpatiaLite

- ▶ Using Enterprise Architect to read in the IMKL UML model
- ▶ Slightly simplifying the model
- ▶ Generating the database creation statements





SpatiaLite

Layers with
geometry

Tables
without
geometry

Many to many
relationships –
coupling tables

Codelist tables
for picklists

Views for
display

	Aansluiting		cl_AppurtenanceType
	ActivityComplex		cl_ContainerType
	Annotatie		cl_CurrentStatus
	Appurtenance		cl_Diameteruom
	Cabinet		cl_DiepteType
	Duct		cl_Diepteuom
	Duct_Duct		cl_ElectricityCableSubThema
	Duct_ElectricityCable		cl_ExtraPlanType
	Duct_OilGasChemicalsPipe		cl_ExtraTopografieType
	Duct_Pipe		cl_Heightuom
	Duct_SewerPipe		cl_LiggingNauwkeurigheid
	Duct_TelecommunicationsCable		cl_MateriaalType
	Duct_ThermalPipe		cl_OilGasChemicalsPipeSubThema
	Duct_WaterPipe		cl_SewerPipeSubThema
	ElectricityCable		cl_SewerWaterType
	ExtraPlan		cl_TelecommunicationsCableMaterial
	ExtraTopografieLine		cl_TelecommunicationsCableSubThema
	ExtraTopografiePoint		cl_ThermalPipeSubThema
	ExtraTopografiePolygon		cl_ThermalProductType
	Maatvoeringen		cl_UtilityDeliveryType
	Manhole		cl_VerticalPosition
	Network		cl_WarningType
	OilGasChemicalsPipe		cl_WaterPipeSubThema
	Pipe		cl_WaterType
	Pole		
	SewerPipe		
	TelecommunicationsCable		
	ThermalPipe		
	Tower		
	Track		
	Track_Duct		vw_Duct
	Track_ElectricityCable		vw_ElectricityCable
	Track_OilGasChemicalsPipe		vw_OilGasChemicalsPipe
	Track_Pipe		vw_Pipe
	Track_SewerPipe		vw_SewerPipe
	Track_TelecommunicationsCable		vw_TelecommunicationsCable
	Track_ThermalPipe		vw_ThermalPipe
	Track_WaterPipe		vw_WaterPipe
	WaterPipe		
	cl_AnnotatieType		
	cl_AppurtenanceSubThema		



QGIS Configuration

- Creation of a QGIS Project that contains
 - Background layers offered as WMTS layers
 - Layers and Tables from the SpatiaLite database
 - Specific attribute editing forms for each of the different objects
 - Implemented the one-to many and many-to-many relationships between the different objects
 - Implemented the symbology

QGIS Configuration – editing forms

Layer Properties - Network | Fields

Attribute editor layout: Autogenerate Python Init function

Fields

Id	Name	Type	Type name	Length	Precision	Comment	Edit widget
0	id	qlonglong	INTEGER	0	0		Text Edit
1	beginLifespanVersion	QString	TEXT	0	0		Date/Time
2	thema	qlonglong	INTEGER	0	0		Value Relation
3	naam	QString	TEXT	0	0		Text Edit
4	diepte	double	REAL	0	0		Text Edit
5	diepteuom	qlonglong	INTEGER	0	0		Value Relation
6	dieptenauwkeurigheid	qlonglong	INTEGER	0	0		Value Relation
7	dieptedatumopmeting	QString	TEXT	0	0		Date/Time
8	disclaimer	QString	TEXT	0	0		Text Edit
9	technischeContactpersoonNaam	QString	TEXT	0	0		Text Edit
10	email	QString	TEXT	0	0		Text Edit
11	voorzorgsmaatregel	QString	TEXT	0	0		File Name

Relations

Suppress attribute form pop-up after feature creation Default

Style OK Cancel Apply Help

QGIS Configuration – editing forms – date/time

Edit Widget Properties - beginLifespanVersion (Network)

☒ Editable
☐ Label on top

Field format
 date & time

Widget display
 default yyyy-MM-dd HH:mm:ss
☐ calendar popup
☐ allow NULL values

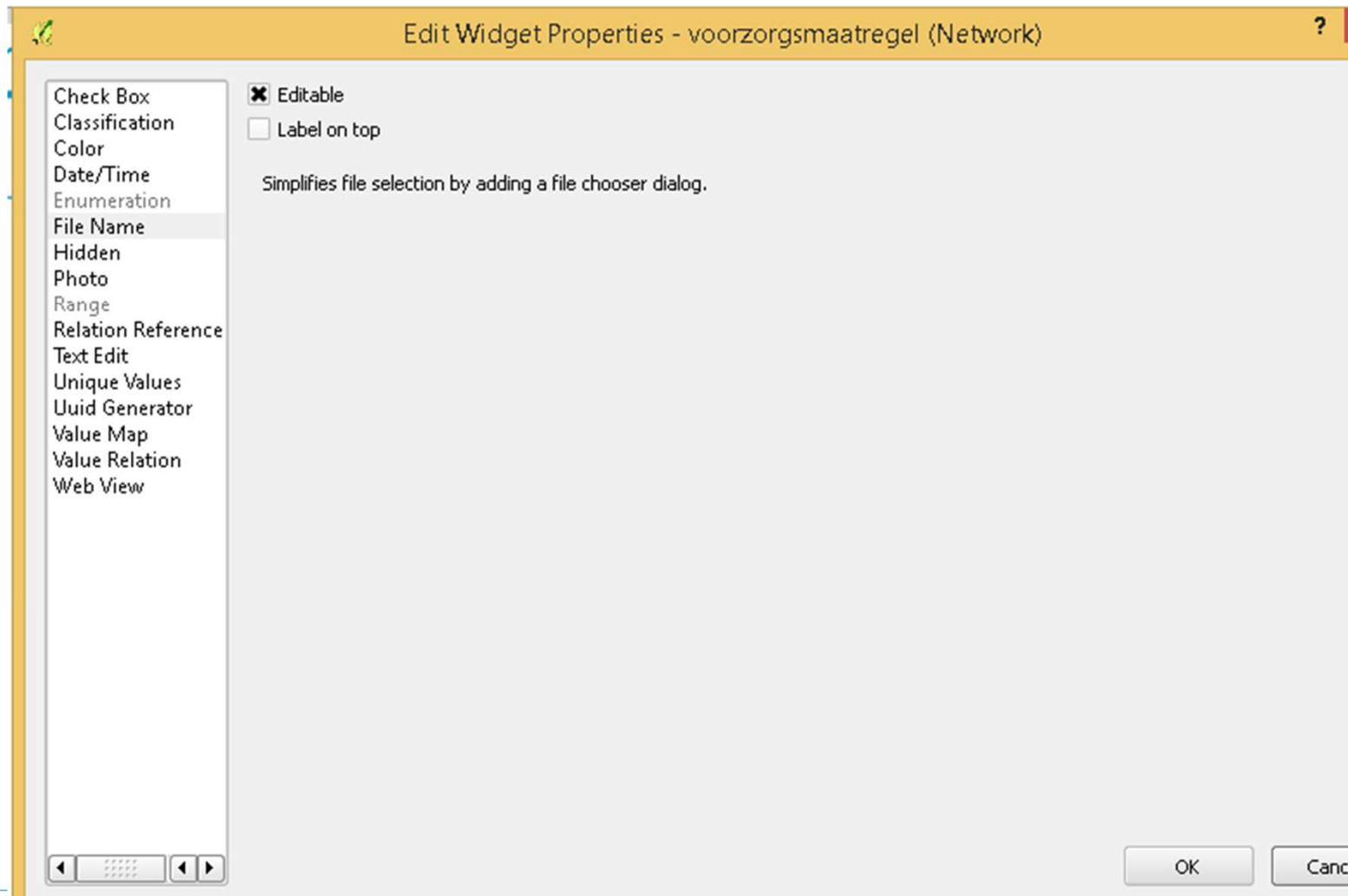
preview 2015-10-28 00:00:00

OK Cancel





QGIS Configuration – editing forms – File browse Box



QGIS Configuration – editing forms – Result

Network - Feature Attributes

id	NULL
beginLifespanVersion	2015-10-28 23:31:29
thema	electricity
naam	Electriciteitsnetwerk
diepte	80
diepteuom	cm
dieptenauwkeurigheid	tot50cm
dieptedatumopmeting	2015-10-29 23:31:29
disclaimer	Disclaimer
technischeContactpersoonNaam	Jef Smets
email	Jef.smets@xxx.be
voorzorgsmaatregel	C:\Users\steven\Desktop\osgeo\Pages from AND_D_042.pdf

OK Cancel

QGIS Configuration - relationships

Project Properties | Relations

General
CRS
Identify layers
Default styles
OWS server
Macros
Relations

	Name	Referencing Layer	Referencing Field	Referenced Layer	Referenced Field	Id
1	Duct_Duct_2	Duct_Duct	inwendigeDuct_id	Duct	id	Duct_Duct20150608143254710_inwendigeDuct_id_Duct20150608143254601_id
2	Duct_Duct_1	Duct_Duct	uitwendigeDuct_id	Duct	id	Duct_Duct20150608143254710_uitwendigeDuct_id_Duct20150608143254601_id
3	Duct_ElectricityC...	Duct_ElectricityC...	Duct_id	Duct	id	Duct_ElectricityCable20150608143254835_Duct_id_Duct20150608143254601_id
4	Duct_ElectricityC...	Duct_ElectricityC...	ElectricityCable_id	ElectricityCable	id	Duct_ElectricityCable20150608143254835_ElectricityCable_id_ElectricityCable201506081...
5	Duct_OilGasChe...	Duct_OilGasChe...	Duct_id	Duct	id	Duct_OilGasChemicalsPipe20150608143254945_Duct_id_Duct20150608143254601_id
6	Duct_OilGasChe...	Duct_OilGasChe...	OilGasChemicalsP...	OilGasChemicalsP...	id	Duct_OilGasChemicalsPipe20150608143254945_OilGasChemicalsPipe_id_OilGasChemicals...
7	Duct_Pipe_1	Duct_Pipe	Duct_id	Duct	id	Duct_Pipe20150608143255054_Duct_id_Duct20150608143254601_id
8	Duct_Pipe_2	Duct_Pipe	Pipe_id	Pipe	id	Duct_Pipe20150608143255054_Pipe_id_Pipe20150608143258441_id
9	Duct_SewerPipe_1	Duct_SewerPipe	Duct_id	Duct	id	Duct_SewerPipe20150608143257004_Duct_id_Duct20150608143254601_id
10	Duct_SewerPipe_2	Duct_SewerPipe	SewerPipe_id	SewerPipe	id	Duct_SewerPipe20150608143257004_SewerPipe_id_SewerPipe20150608143258660_id
11	Duct_Telecommu...	Duct_Telecommu...	Duct_id	Duct	id	Duct_TelecommunicationsCable20150608143257113_Duct_id_Duct20150608143254601_id
12	Duct_Telecommu...	Duct_Telecommu...	Telecommunicatio...	Telecommunicatio...	id	Duct_TelecommunicationsCable20150608143257113_TelecommunicationsCable_id_Teleco...
13	Duct_ThermalPip...	Duct_ThermalPipe	Duct_id	Duct	id	Duct_ThermalPipe20150608143257222_Duct_id_Duct20150608143254601_id
14	Duct_ThermalPip...	Duct_ThermalPipe	ThermalPipe_id	ThermalPipe	id	Duct_ThermalPipe20150608143257222_ThermalPipe_id_ThermalPipe2015060814325900...
15	Duct_WaterPipe_1	Duct_WaterPipe	Duct_id	Duct	id	Duct_WaterPipe20150608143257332_Duct_id_Duct20150608143254601_id
16	Duct_WaterPipe_2	Duct_WaterPipe	WaterPipe_id	WaterPipe	id	Duct_WaterPipe20150608143257332_WaterPipe_id_WaterPipe20150608143300332_id
17	Track_Duct_2	Track_Duct	Duct_id	Duct	id	Track_Duct20150608143259348_Duct_id_Duct20150608143254601_id
18	Track_Duct_1	Track_Duct	Track_id	track	id	Track_Duct20150608143259348_Track_id_track20150608143314807_id
19	Track_Electricity...	Track_Electricity...	ElectricityCable_id	ElectricityCable	id	Track_ElectricityCable20150608143259457_ElectricityCable_id_ElectricityCable20150608...
20	Track_Electricity...	Track_Electricity...	Track_id	track	id	Track_ElectricityCable20150608143259457_Track_id_track20150608143314807_id
21	Track_OilGasChe...	Track_OilGasChe...	OilGasChemicalsP...	OilGasChemicalsP...	id	Track_OilGasChemicalsPipe20150608143259566_OilGasChemicalsPipe_id_OilGasChemicals...
22	Track_OilGasChe...	Track_OilGasChe...	Track_id	track	id	Track_OilGasChemicalsPipe20150608143259566_Track_id_track20150608143314807_id
23	Track_Pipe_2	Track_Pipe	Pipe_id	Pipe	id	Track_Pipe20150608143259676_Pipe_id_Pipe20150608143258441_id
24	Track_Pipe_1	Track_Pipe	Track_id	track	id	Track_Pipe20150608143259676_Track_id_track20150608143314807_id

QGIS Configuration – Symbology

Layer Properties - appurtenance | Style

Rule-based

Label	Rule	Min. scale	Max. scale	Count	Dupl
electricity	"network" = 'electricity'				
"appurteTyp" = 'aarding'	"appurtenanceType" = 'aarding'				
"curStatus" = 'functional'	"currentStatus" = 'functional'				
"curStatus" = 'disused'	"currentStatus" = 'disused'				
"curStatus" = 'gepland'	"currentStatus" = 'gepland'				
"appurteTyp" = 'mof'	"appurtenanceType" = 'mof'				
"appurteTyp" = 'point'	"appurtenanceType" = 'point'				
"appurteTyp" = 'streetLight'	"appurtenanceType" = 'streetLight'				
oilgaschemicals	"network" = 'oilgaschemicals'				
sewer	"network" = 'sewer'				
telecommunication	"network" = 'telecommunication'				
thermal	"network" = 'thermal'				
water	"network" = 'water'				
gemengd	"network" = 'gemengd'				

Refine current rules Count features Rendering order...

▼ Layer rendering

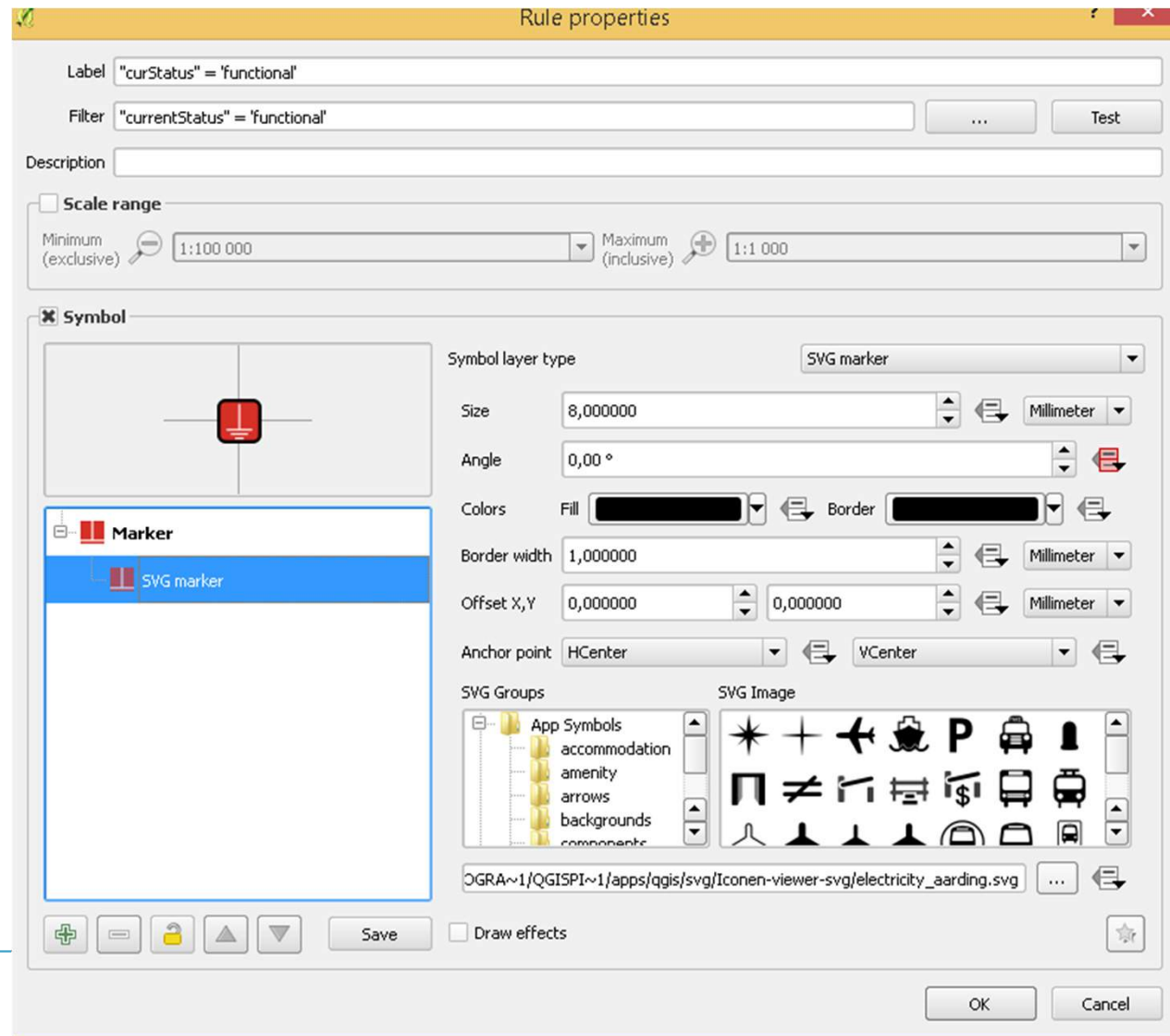
Layer transparency: 0

Layer blending mode: Normal Feature blending mode: Normal

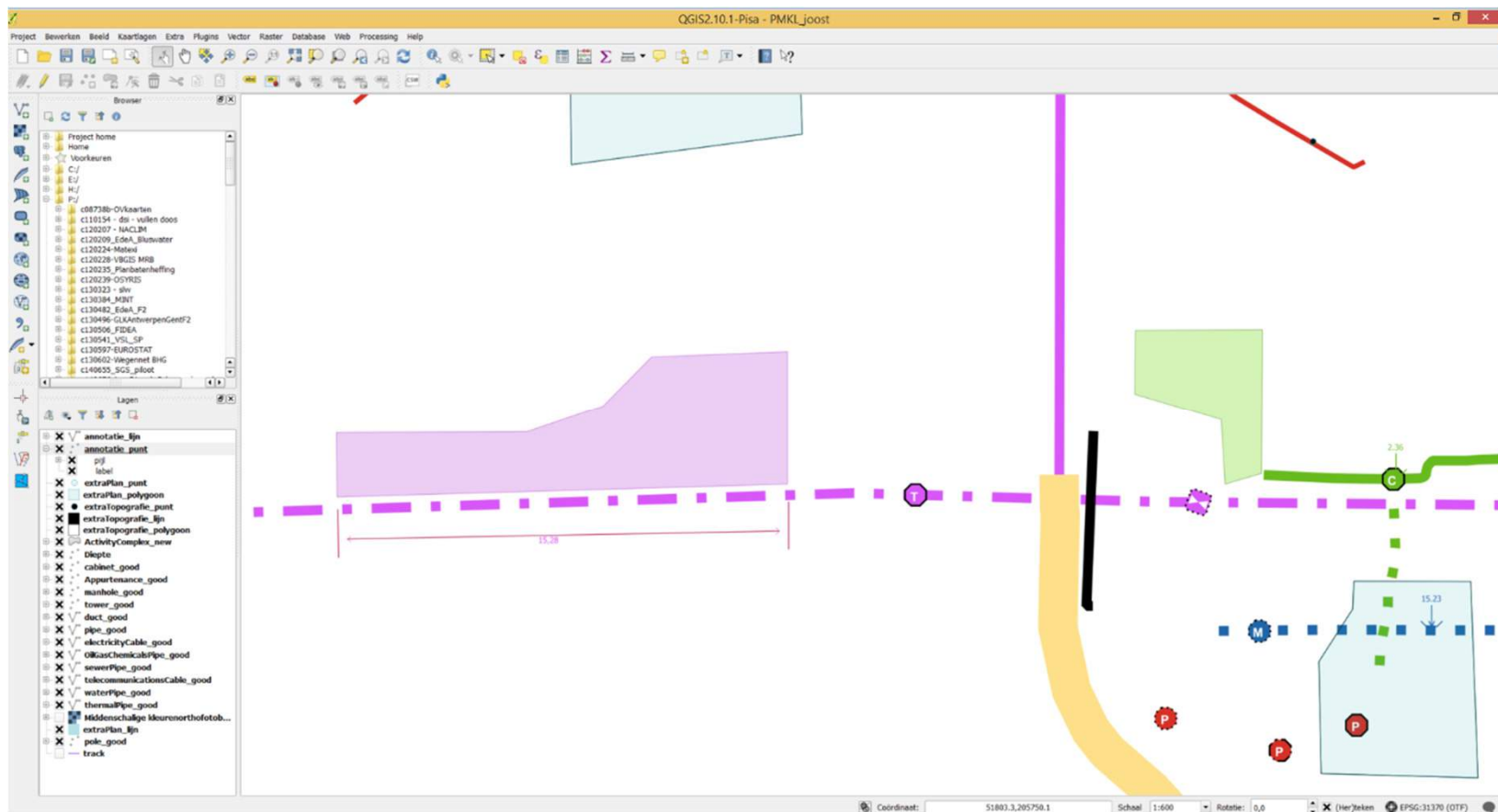
☐ Draw effects

Style OK Cancel Apply Help

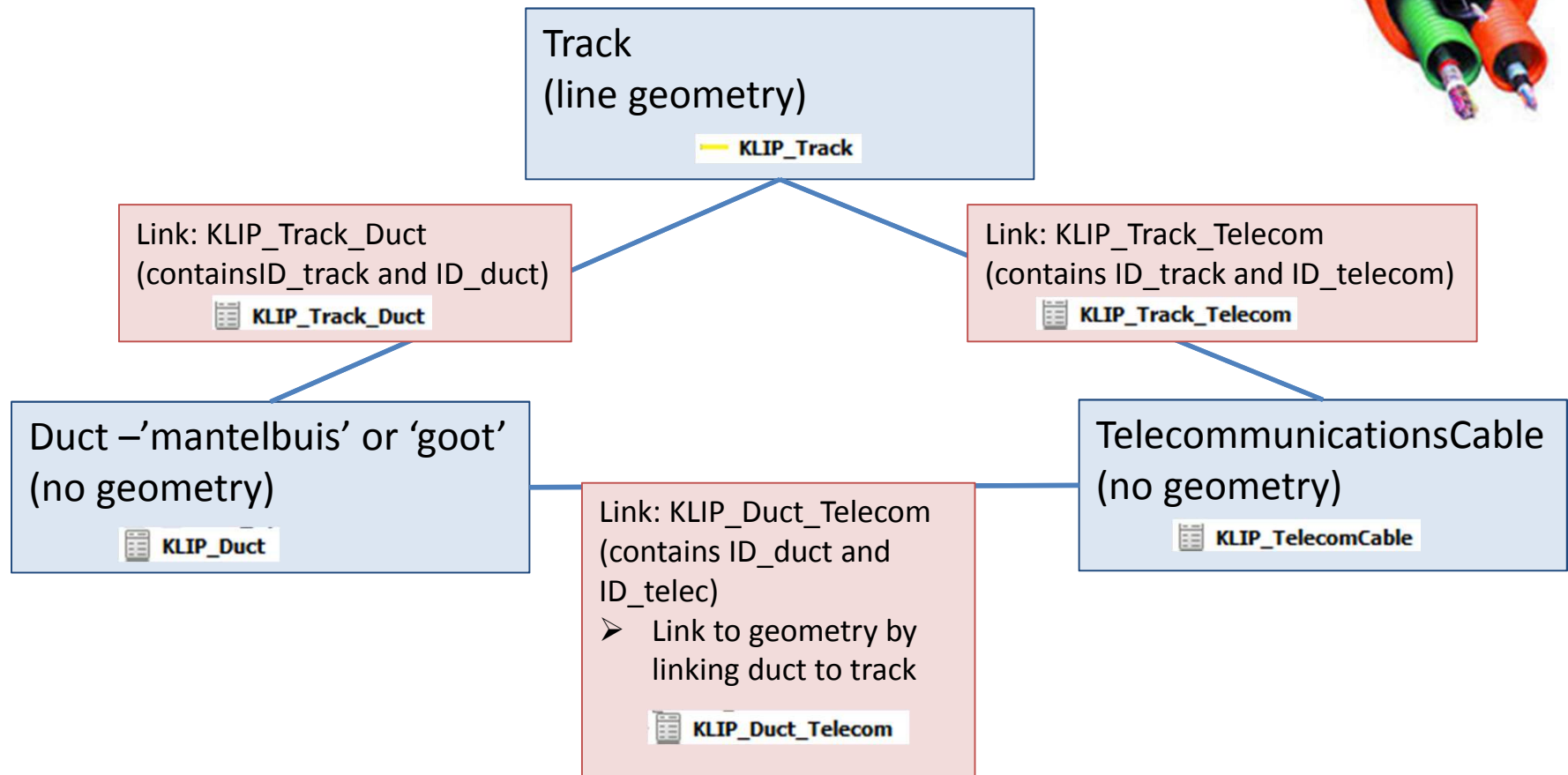
QGIS Configuration – Symbology Implementation



QGIS Configuration – Symbology – Result



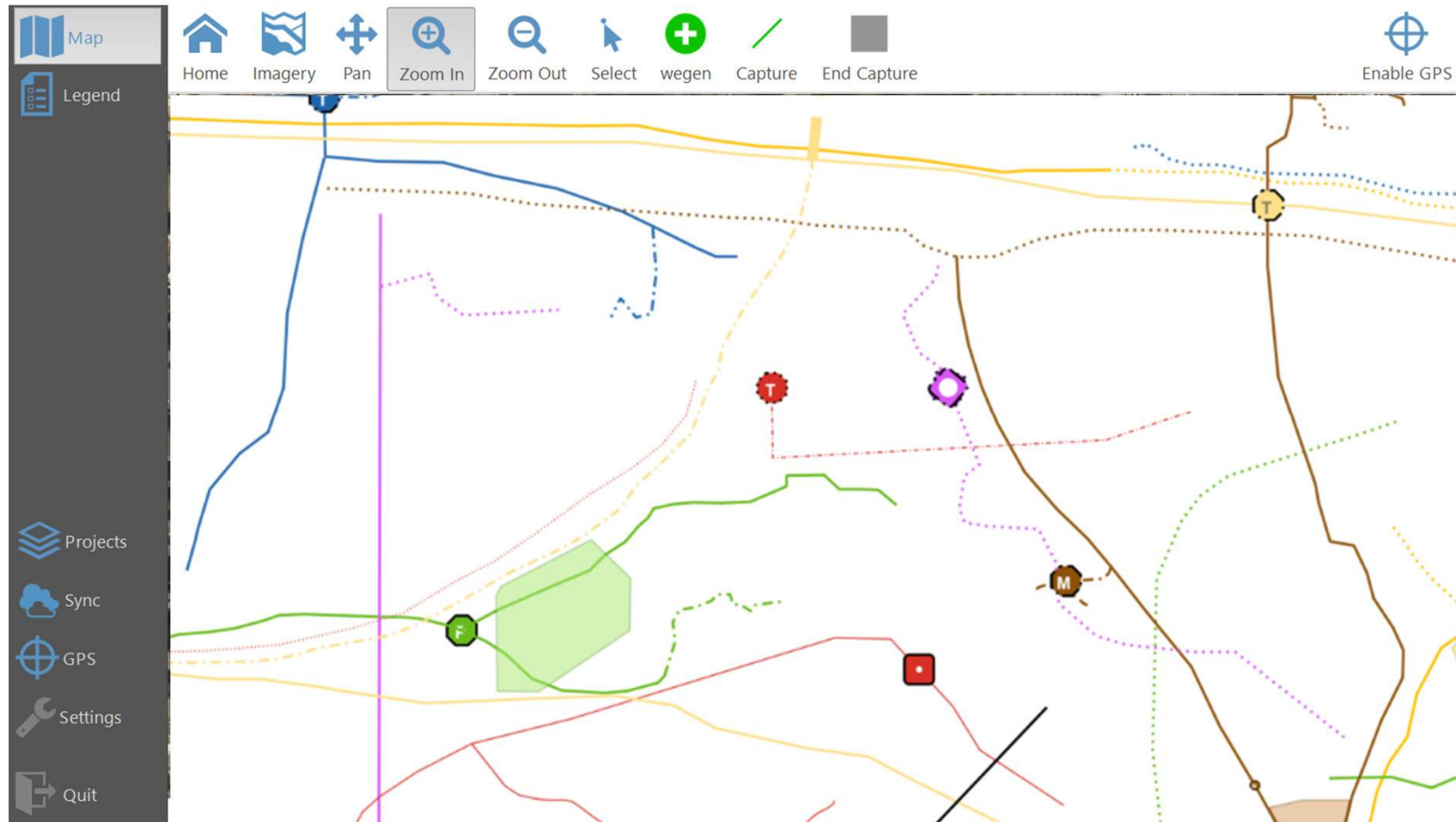
Duct – Cable Relationships modelling







Mobile Offline Viewer using QGIS





Conclusion

- ▶ QGIS proved to be a convenient data inventarisation solution with nice configuration possibilities for
 - ▶ designing custom editing forms
 - ▶ implementing complex relationships between objects
 - ▶ applying complex symbologies
 - ▶ SpatiaLite support

- ▶ Is in use by
 - ▶ >10 Communes
 - ▶ Flemish regional agencies (SpatiaLite and SQLServer)



To come

QGIS Plugin for Orbit Mobile Mapping API

