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TOWARDS 3D UTILITY NETWORK CADASTRE: EXTENDED SERBIAN LADM COUNTRY PROFILE

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Introduction



This paper presents:

- analysis of utility network cadastre in Serbia and related laws and documents
- extended Serbian LADM country profile to cover the needs of utility cadastre
- discussion on possibilities to use existing data and technologies to represent 3D utility network data and legal spaces

Utility network cadastre in Serbia



- National regulations related with utility network cadastre:
 - the Law on state survey and cadastre from 2009
 - the Rulebook on survey and utility network cadastre from 2010
 - the Manual for implementation and maintenance of the utility network digital database from 2005,
 - the Law on the procedure for registration in the real estate cadastre and utility network cadastre from 2018

- Definition:
 - The utility network cadastre is the main register of the utility lines and rights to them, together with the property owner's rights, and contains information on the following: water supply network, sewage and drainage network, hot water network, electricity network, telecommunications network, pipeline network, gas pipeline network, and common facilities
 - the Law states the necessity for implementing a unified information system of both the real estate cadastre and the utility network cadastre

Utility network cadastre in Serbia



■ Existing problems:

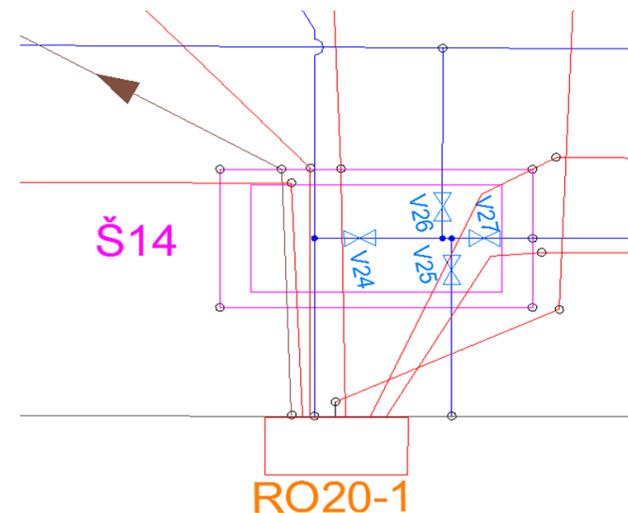
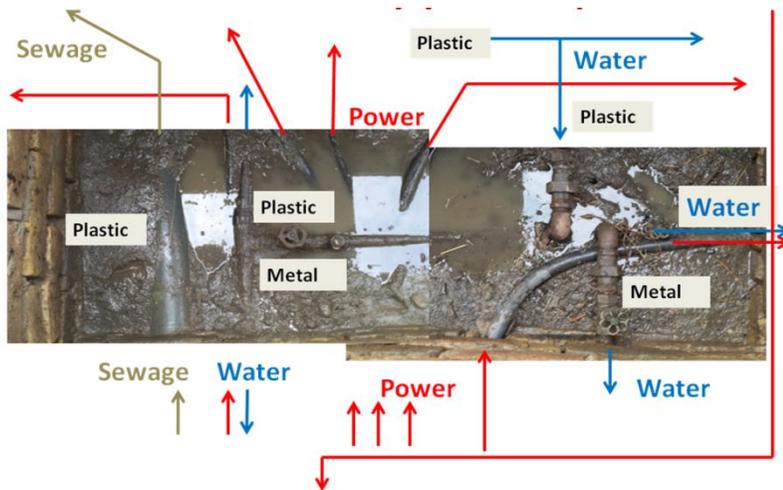
- 1. A number of municipalities in Serbia do not have an established utility network cadastre at all*
- 2. For municipalities where data exist it is usually not up-to-date*
- 3. In the past it was not unusual that utility lines were dug in without registering*
- 4. Today, the process of registering changes in the registry is time-consuming*
- 5. The poor synchronization in conducting the works on utility lines results in frequent digging, ground subsidence and damaging the utility lines.*
- 6. lack of harmonization of data in the register and on the field*
7. RR data are stored separately from geometries and attributes of the utility lines which makes it difficult to issue correct data to the parties
8. Unified information system of both real estate and utility line cadastre is not yet implemented and data is not based on unified data model

Utility network cadastre in Serbia



Existing problems:

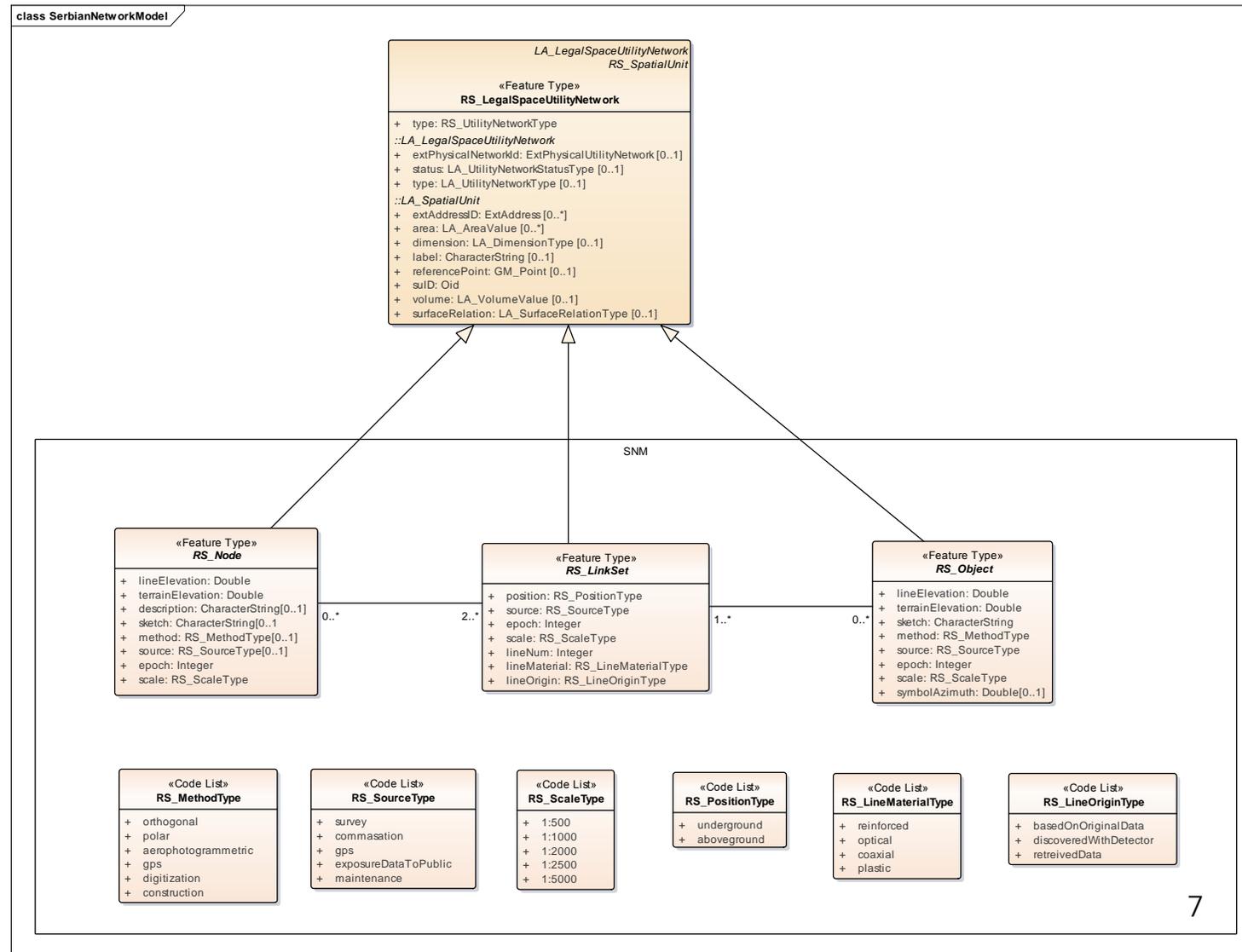
- 2D data (shp, dxf) does not give a good insight into the position of the utility lines in some situations like crossing or passing of the lines at a sharp angle, crossing of the utility line from the subterranean to the above ground and vertical installation of utility lines in the same trench, in older factories parts of utility line installations pass under the buildings or many pipelines and cables that overlap one over the other due to upgrading of the system



Extended Serbian LADM country profile



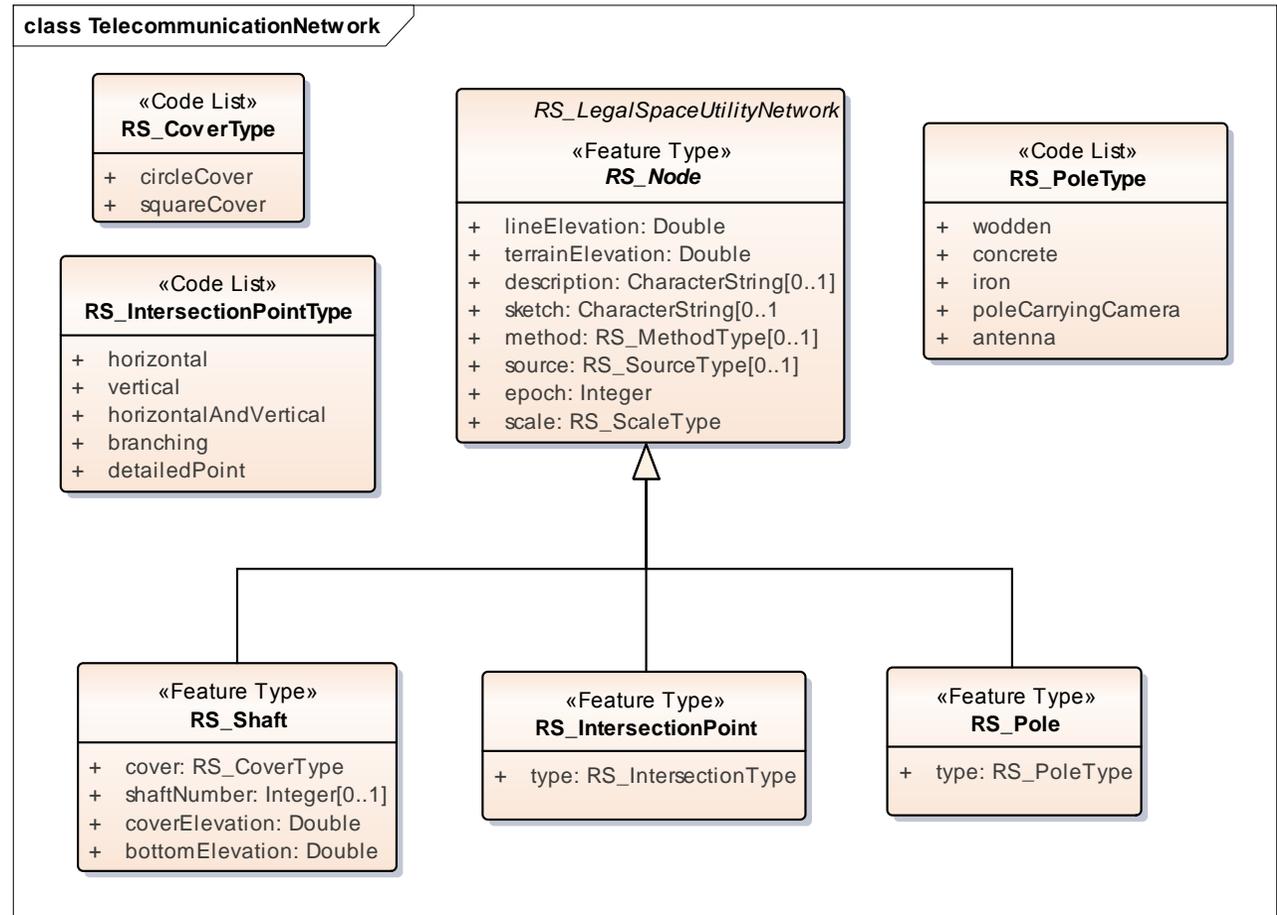
- network model represented by nodes, link sets and objects



Extended Serbian LADM country profile



- Specialization of network elements for particular type of utility network
- Example: nodes in telecommunication network
- This could solve problems 7 and 8!

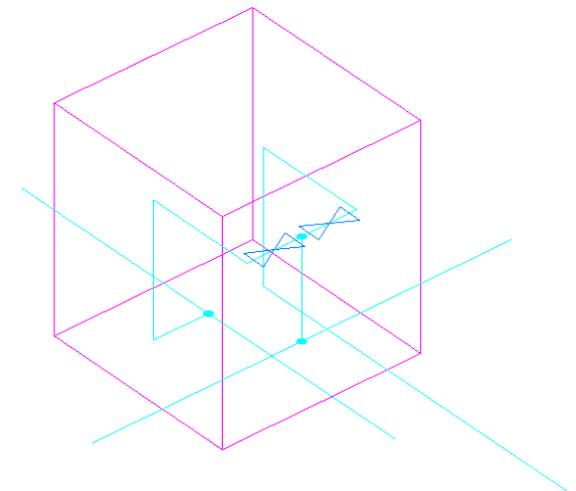
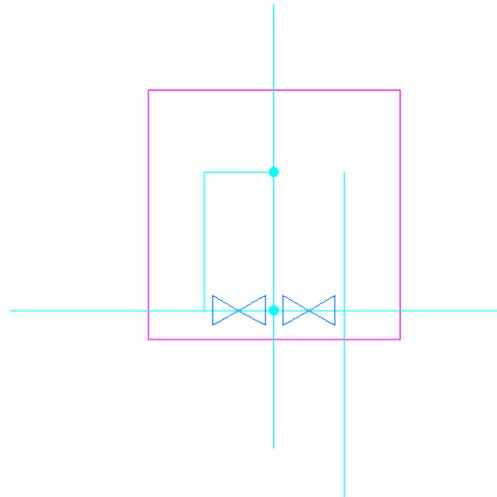
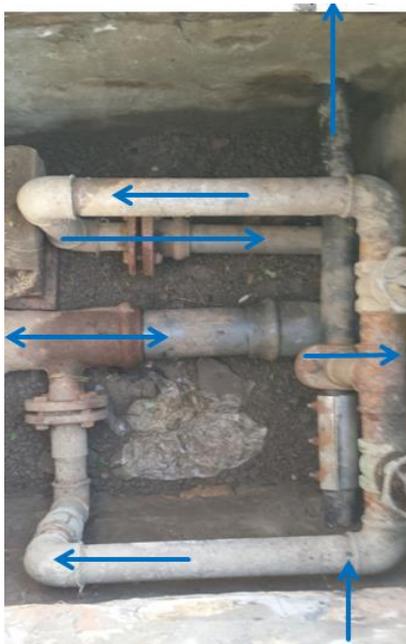


3D data for utility network cadastre



■ Technologies:

- Ground Penetrating Radar (GPR) – for underground utilities, to record correct data on utilities without digging
- Georeferenced radargrams are used to transform results from the field in 2D or 3D models of underground utilities

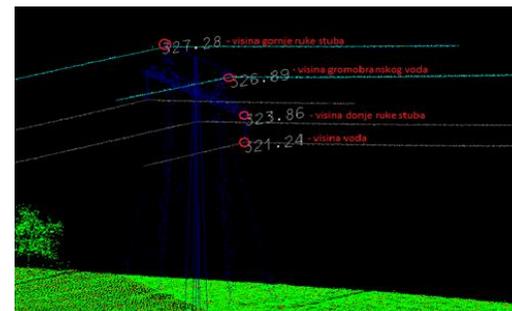
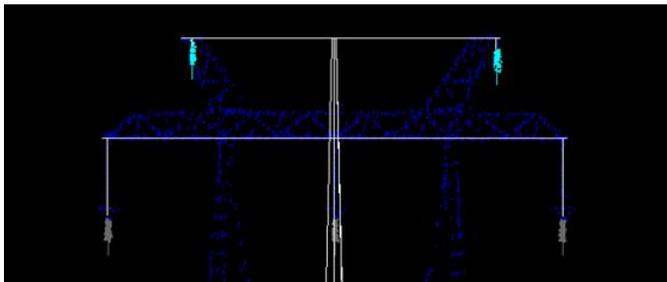
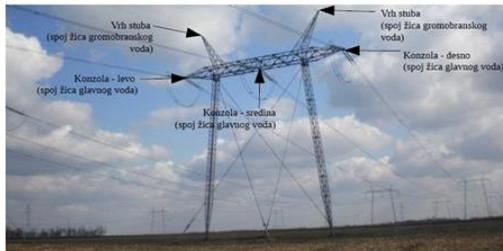


3D data for utility network cadastre



■ Technologies:

- LIDAR technology – for powerlines
- processing of data implies the classification of the point cloud automatically and manually, as well as 3D and 2D vectorization of the poles and powerlines



3D data for utility network cadastre



- Serbian utility network cadastre is 2D based CAD oriented
- In order to prevent loosing, such 3D data can be referenced as a spatial source (RS_SpatialSource).
- The Law from 2018 introduces the novelty that each property is identified with unique property number.
- This is particularly important to mark real estate in 3D data sources and make search easier

- This could solve problem 9!

3D data for utility network cadastre



- Another mechanism for 3D data access is through the metadata which systematically describe 2D and 3D utility network datasets
- This approach, although simple, would allow systematic usage and maintenance of the data
- An example: metadata for the extracted power lines dataset in the vector format

(MD_Metadata)
metadataIdentifier: (MD_Identifier)
...
contact: (CI_Responsibility)
role: (CI_RoleCode) author
party: (CI_Organisation)
name: Republic geodetic authority
dateInfo: (CI_Date)
date:
DateTime: 20180725
dateType: (CI_DateTypeCode) creation
metadataStandard: (CI_Citation)
title: ISO 19115-1
version: International Standard
referenceSystemInfo: (MD_ReferenceSystem)
referenceSystemIdentifier: (RS_Identifier)
code: 4326
codeSpace: EPSG
identificationInfo: (MD_DataIdentification)
citation: (CI_Citation)
title: Power Lines
date: (CI_Date)
date: 2017-05
dateType: (CI_DateTypeCode) creation

abstract: Power lines extracted from LIDAR data
status: (MD_ProgressCode) completed
pointOfContact: (CI_Responsibility)
role: (CI_RoleCode) resourceProvider
party: (CI_Organisation)
name: Republic Geodetic Authority, Serbia
...
resourceMaintenance:
(MD_MaintenanceInformation)
maintenanceAndUpdateFrequency:
(MD_MaintenanceFrequencyCode) daily
resourceFormat: (MD_Format)
name: DGN
version: 8
descriptiveKeywords: (MD_Keywords)
keyword: Power Lines
keyword: LIDAR
keyword: classification
...
resourceSpecificUsage: (MD_Usage)
specificUsage: Obtained data can be used in
cadastre, electrical control and energy
management system.

...
resourceConstraints: (MD_Constraints)
useLimitation: ...
spatialRepresentationType:
(MD_SpatialRepresentationTypeCode) vector
spatialResolution: (MD_Resolution)
equivalentScale: (MD_RepresentativeFraction)
denominator: ...
language: eng
characterSet: (MD_CharacterSetCode) ucs2
topicCategory: (MD_TopicCategoryCode)
utilitiesCommunication
topicCategory: (MD_TopicCategoryCode)
planningCadastre
extent: (EX_Extent)
description: Serbia
geographicElement: (EX_GeographicBoundingBox)
...
resourceLineage: (LI_Lineage)
scope: (DQ_Scope)
level: (MD_ScopeCode) dataset
statement: Dataset is created using semi-
automatic classification of point cloud data in
order to extract valid 2D/3D cadastre data...

Conclusion



This paper :

- provides an overview on how the utility network cadastre in Serbia is organized in relation to legal regulations
- emphasizes the issues that exist in utility network cadastre
- introduce unifying data model of real estate cadastre and utility network cadastre through the development of the extended Serbian LADM country profile
- describes examples of using 3D data and presents means for facilitating this data through linking with 3D spatial sources and usage of metadata
- Future work:
 - examine the possibilities of the integration of legal and 3D data and possibilities of identification of 3D spatial units in the utility network cadastre.
 - analyze the possibilities to use GML based formats such as CityGML Utility Network ADE and LandInfra InfraGML

Thank you very much for your attention!



Questions?

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