



# Pilot project Establishment of Croatian Railways GIS

Josip Lisjak, dipl. ing. geod.  
prof. dr. sc. Vlado Cetl, dipl. ing. geod.  
dr. sc. Hrvoje Matijević, dipl. ing. geod.



# Croatian Railways



- ▶ Croatian Railways Infrastructure Ltd. for management, maintenance and building of railway infrastructure
- ▶ Fully or predominantly owned by the Republic of Croatia

NSDI  
subject

Croatian Law on State Survey and Real Estate Cadastre

# Croatian NSDI



- ▶ Croatian Law on State Survey and Real Estate Cadastre (NN 16/07)
- ▶ Chapter V. – Croatian NSDI
- ▶ Includes definition, data, metadata, services, NSDI responsible bodies and their power/jurisdiction

# NSDI subjects



- ▶ NSDI subjects participate in implementation and maintenance of NSDI by maintaining spatial data and services, and on demand make available the information on spatial data for which they are responsible. NSDI subjects are (NN 16(2007):
  - ▶ Public administration bodies,
  - ▶ Bodies of regional and local self-government,
  - ▶ Public systems fully or predominantly owned by the Republic of Croatia,
  - ▶ Physical and legal persons that have been entrusted with managing spatial data by competent authorities and regimes from this articles,
  - ▶ Physical and legal persons that use data and services within the scope of NSDI and provide public services based on that data.

# NSDI subjects



- ▶ Croatian Railway subject? – **YES!!**
- ▶ New Croatian Law on Croatian NSDI (Zakon o NIPP-u) in preparation – until Croatia is a full member of EU
- ▶ Accepting all deadlines from INSPIRE!
- ▶ **Available Metadata + Spatial Data from Annex I**

# Spatial Data Themes



## Annex I:

1. **Coordinate reference systems**
2. **Geographical grid systems**
3. **Geographical names**
4. **Administrative units**
5. **Addresses**
6. **Cadastral parcels**
7. **Transport networks**
8. **Hydrography**
9. **Protected sites**

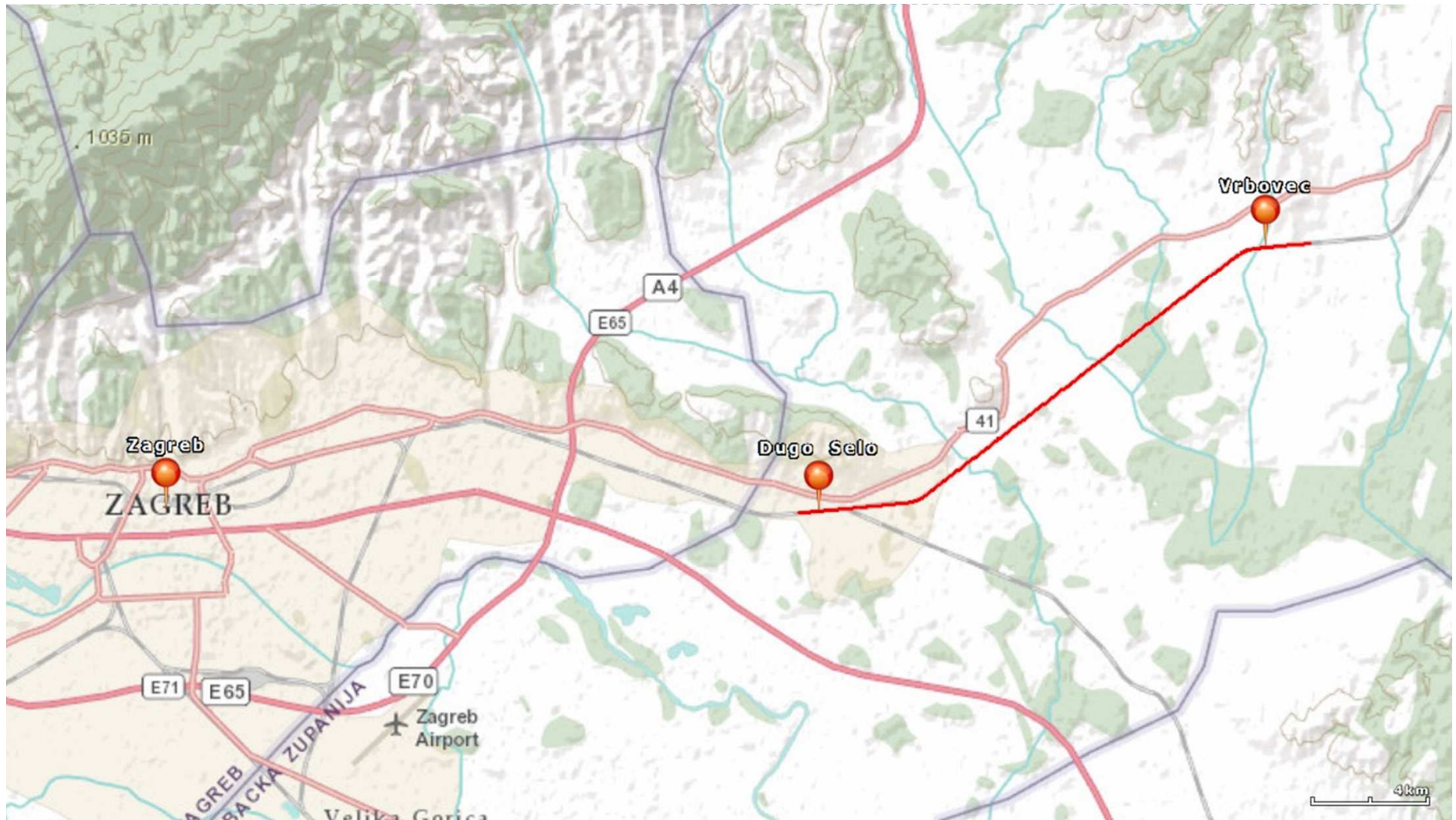
# TOR



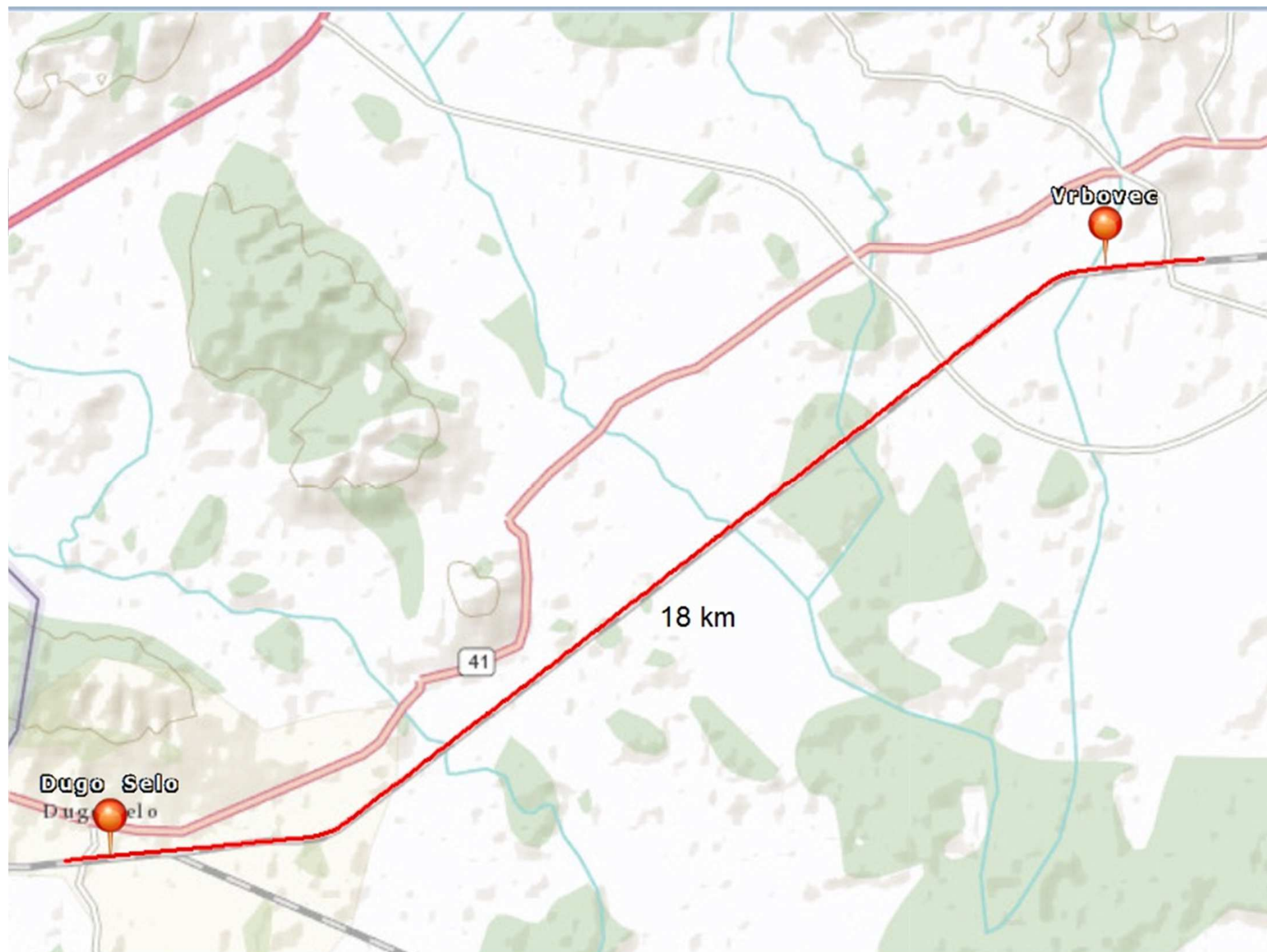
- ▶ Test availability of spatial data within Croatian Railway archives
- ▶ Analyze current condition and quality of available spatial data
- ▶ Prototyping geodatabase model
- ▶ Pilot railway section Dugo Selo - Vrbovec



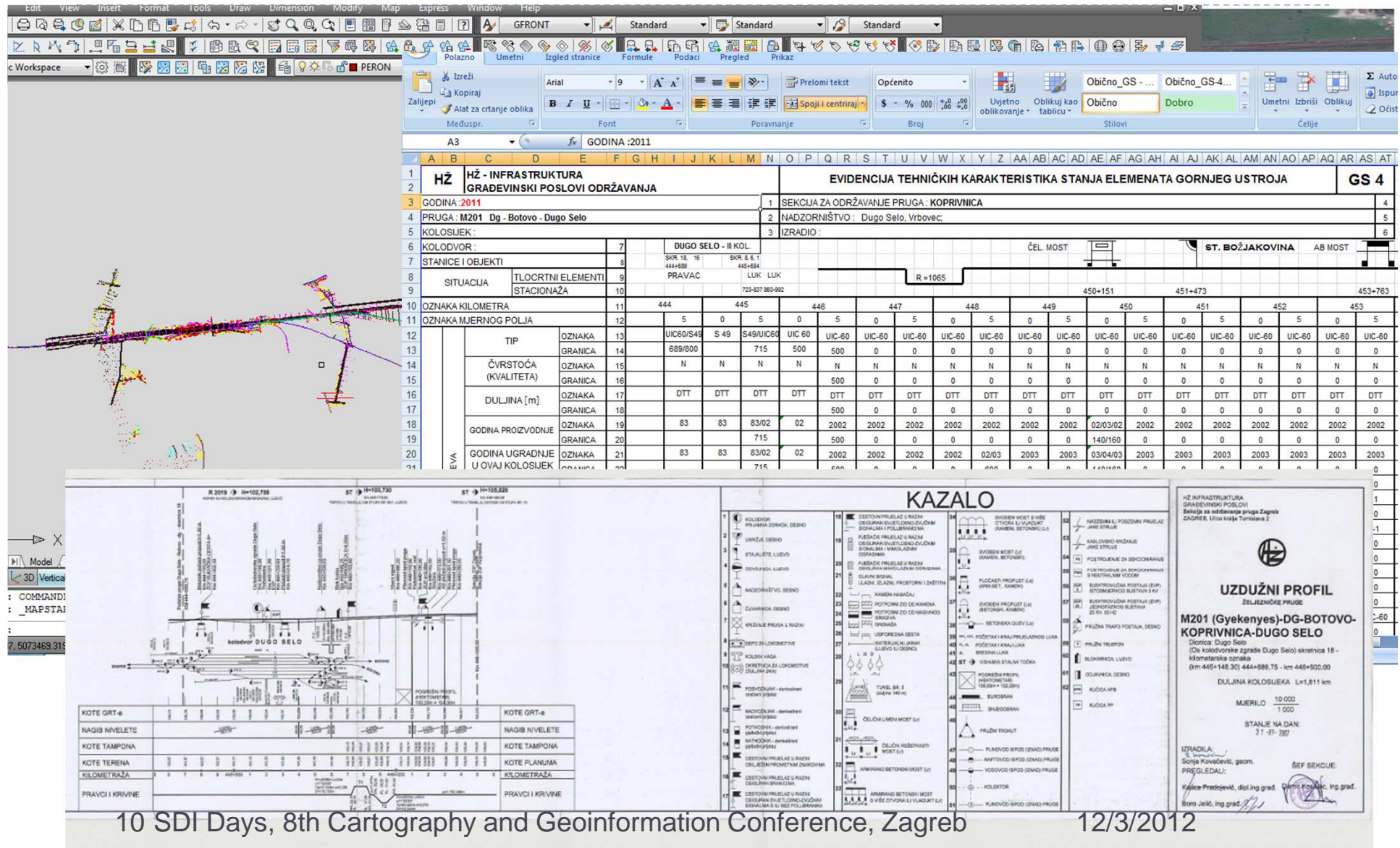
# Location







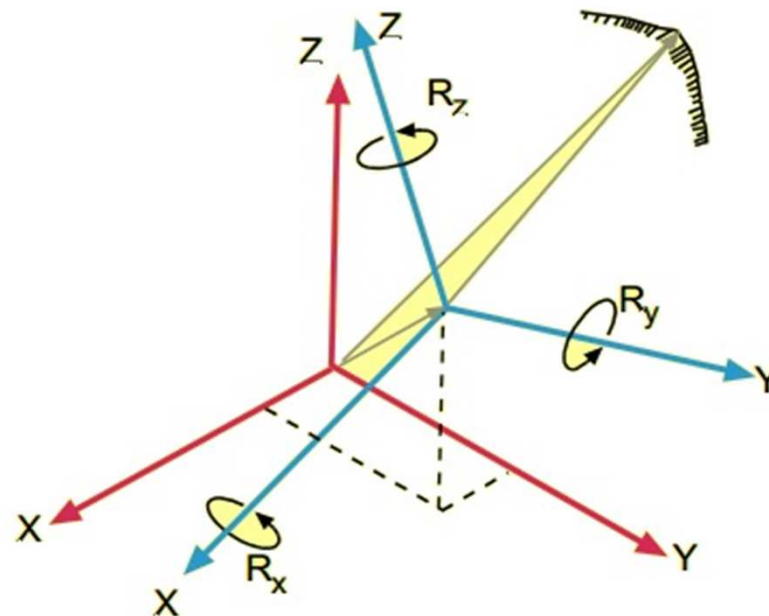
# Gathering data



# Coordinate system



- ▶ HDKS —→ HTRS96/TM
- ▶ 7-parameter Helmert method





# Conceptual database model



- ▶ Data for publishing with NSDI
- ▶ Data for internal use for all work processes of Croatian Railways
- ▶ Filtering data
- ▶ Coordination with experts from Croatian Railways



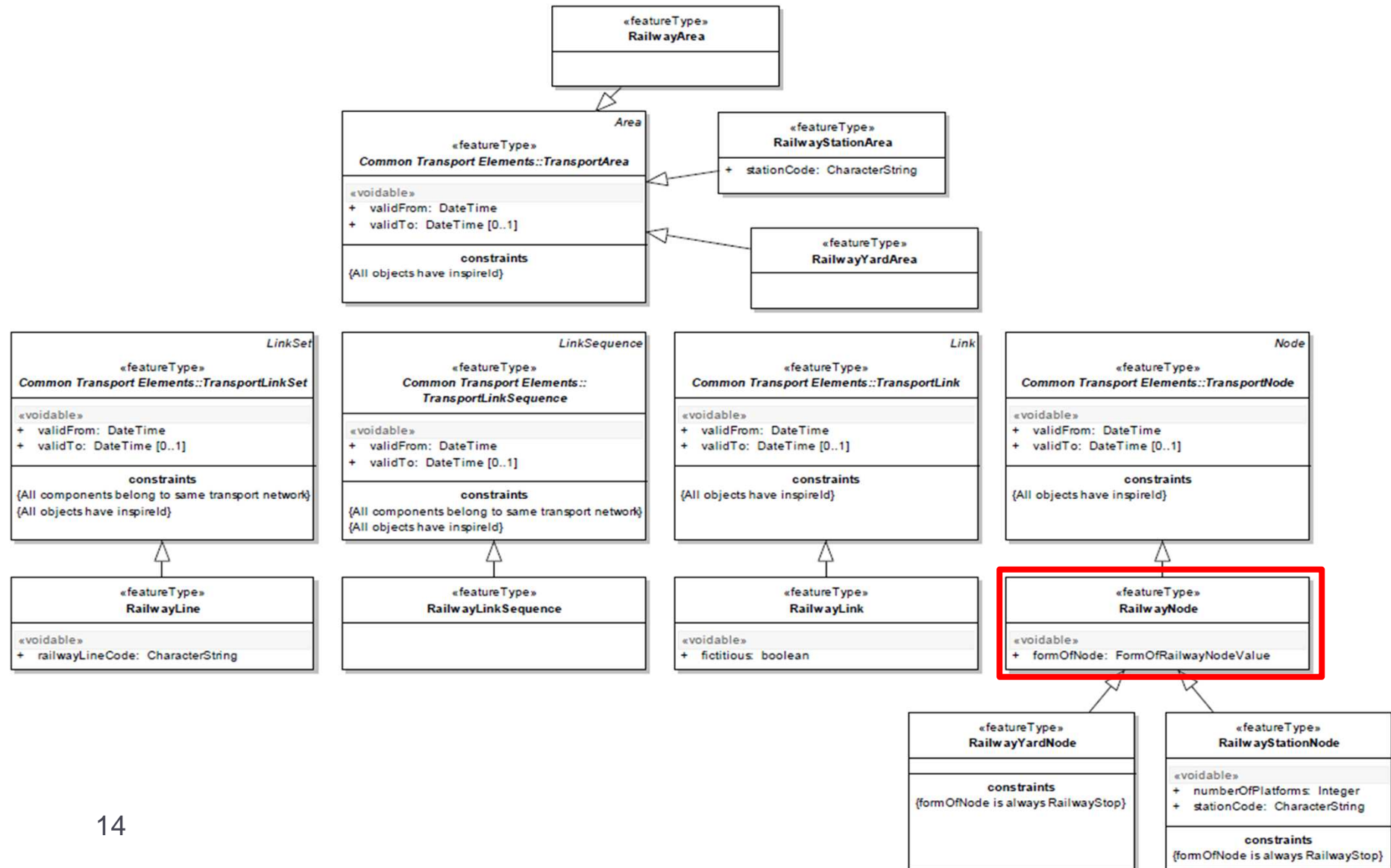
# INSPIRE data specifications



# Expanded database model

# INSPIRE Data Specification on Transport Networks

class Railway Transport Network: Spatial objects types - Links, Nodes and Areas

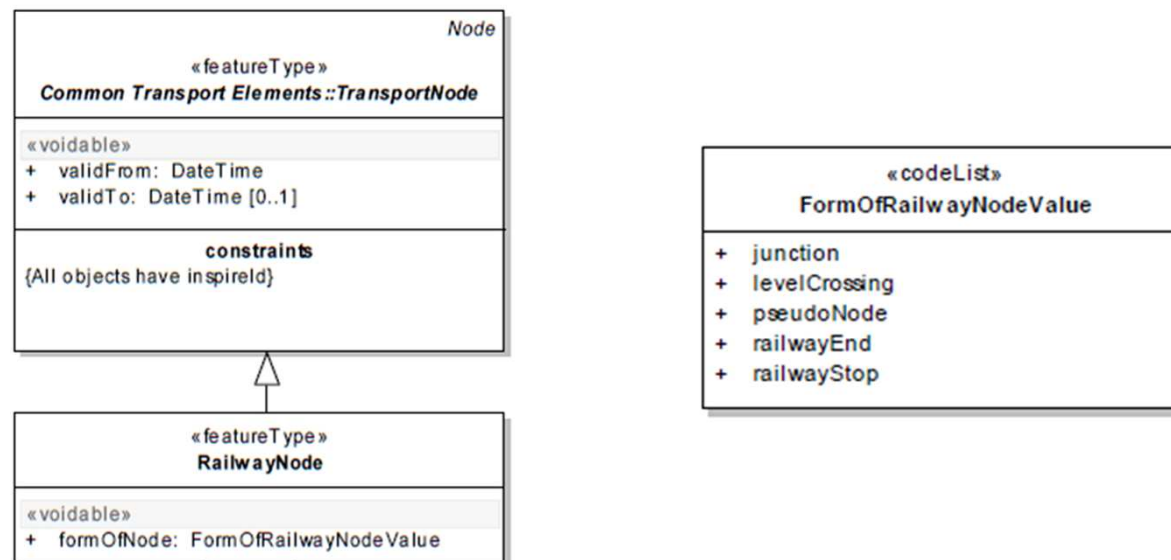




# Example: RailwayNode




- ▶ Subtype of: TransportNode
- ▶ Definition: A point spatial object which represents a significant point along the railway network or defines an intersection of railway tracks used to describe its connectivity.



# Example: RailwayNode

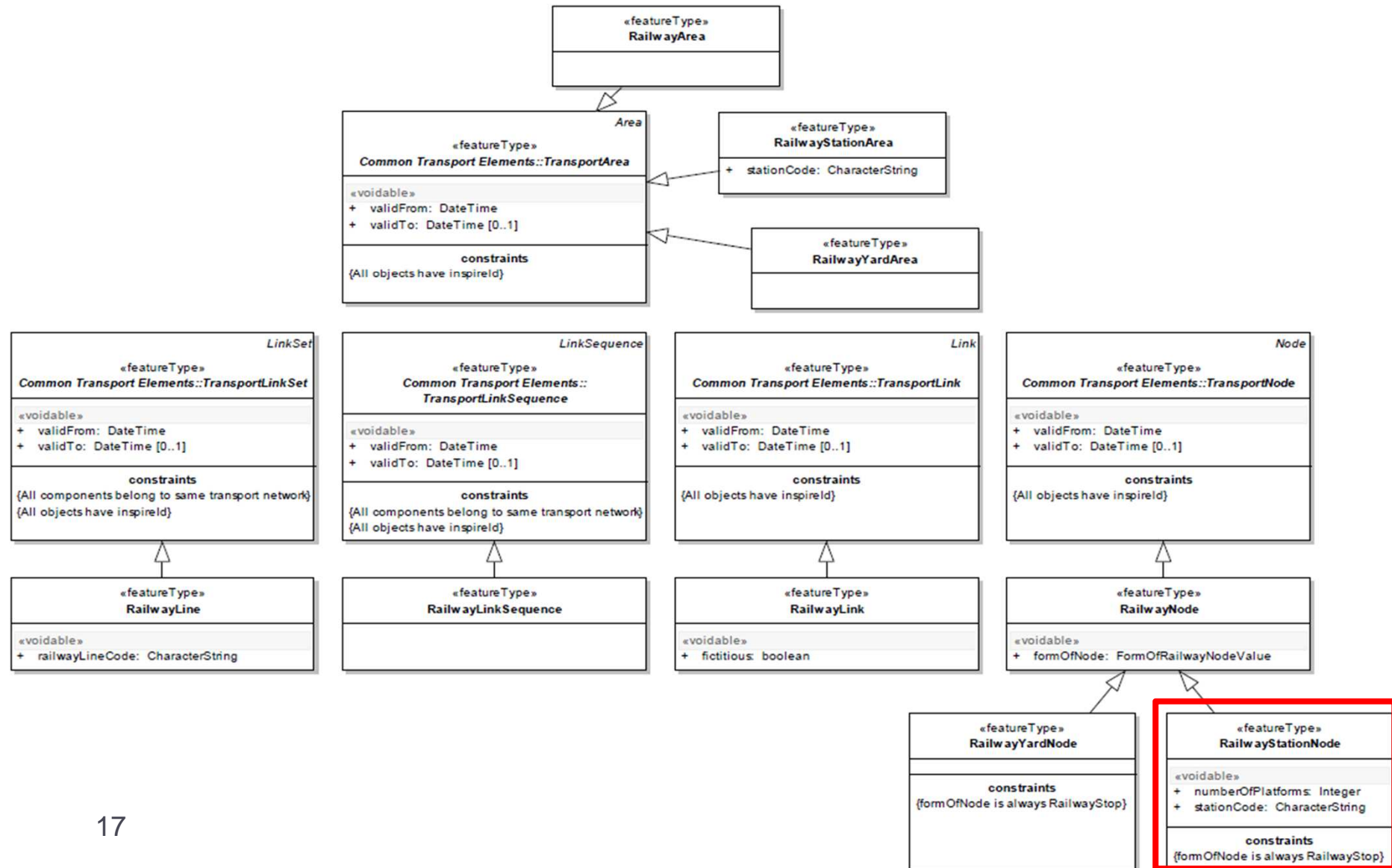


 Simple feature class RailwayNode				Geometry Point Contains M values No Contains Z values No		
Field name	Data type	Default value	Domain	Prec- ision	Scale	Length
OBJECTID	Object ID					
Shape	Geometry					
ID	Long integer	0	formOfRailwayNodes	0		
FormOfNode	Long integer			0		
stacionaza	Double			0	0	
namespace	String					50
InspireID	String					50

Coded value domain	
formOfRailwayNodes	
Description	tipovi čvorova
Field type	Long integer
Split policy	Default value
Merge policy	Default value
Code	Description
1	junction
2	levelCrossing
3	pseudoNode
4	railwayEnd
5	railwayStop

# INSPIRE Data Specification on Transport Networks

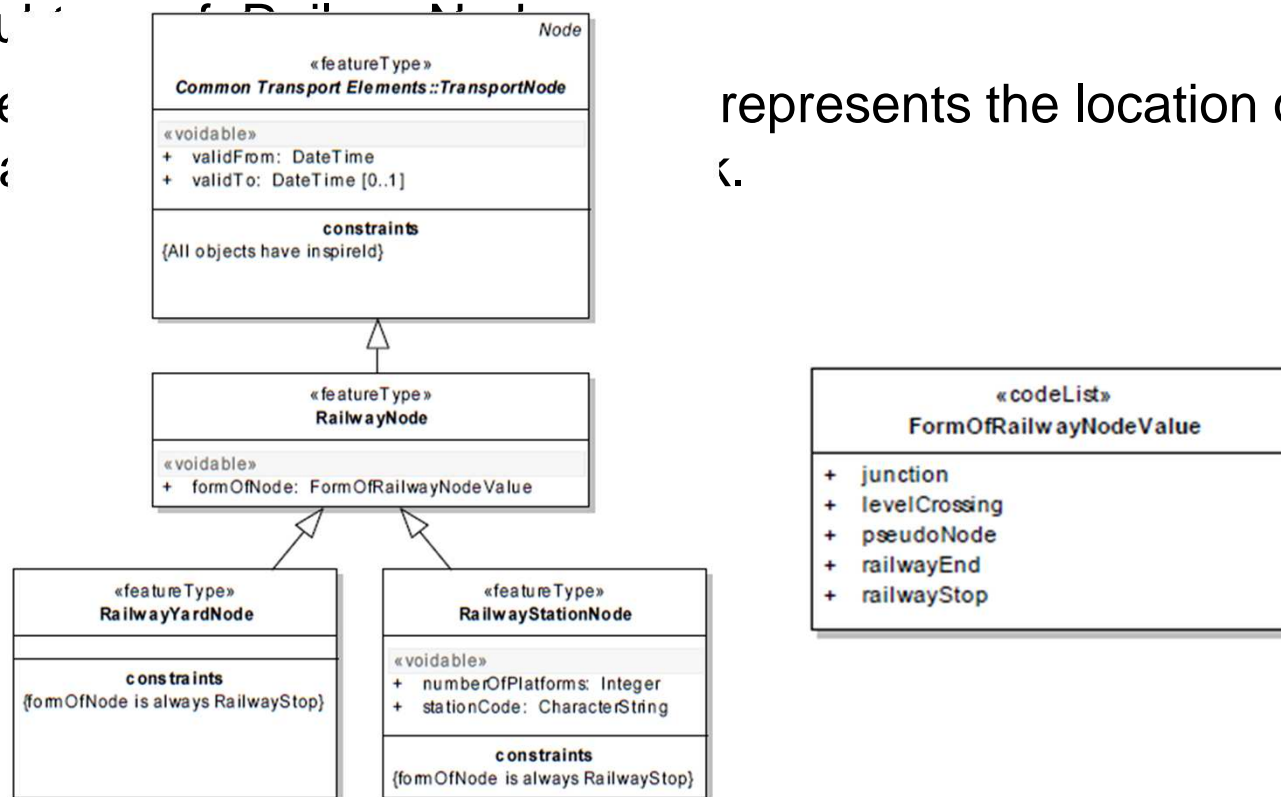
class Railway Transport Network: Spatial objects types - Links, Nodes and Areas



# Example: RailwayStationNode



- Summary
- Description
- Station



represents the location of a railway

# Example: RailwayStationNode



Simple feature class RailwayStationNode				Geometry Point		
				Contains M values	No	
				Contains Z values	No	
Field name	Data type	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID					
Shape	Geometry					
FormOfNode	Long integer	5	formOfRailwayNodes	0		
railwayStationCode	Long integer			0		
stacionaza	Double			0	0	
ID	Long integer			0		
namespace	String					50
InspireID	String					50
numberOfPlatforms	Long integer			0		

Coded value domain formOfRailwayNodes	
Description	tipovi čvorova
Field type	Long integer
Split policy	Default value
Merge policy	Default value
Code	Description
1	junction
2	levelCrossing
3	pseudoNode
4	railwayEnd
5	railwayStop

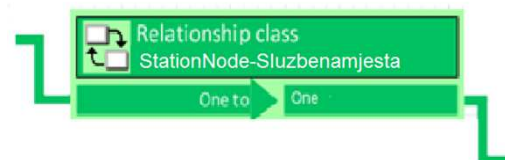


Table Sluzbena_mjesta						
Field name	Data type	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID					
ID	Long integer			0		
Naziv	String					50

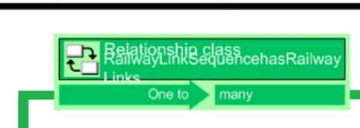


# Line geometry features



Field name	Data type	Default value	Domain	Prec- ision	Scale	Length
OBJECTID	Object ID					
ID	Long integer			0		
nazivPruge	String					50
stareOznake	String					50
oznakaCI3	String					50
oznakaCI6	String					50
gradDuljina	Double			0	0	
nominalGauge	Double			0	0	
nominalGaugeCategory	Long integer		nominalGaugeCategory	0		
railwayType	Long integer		railwayType	0		
railwayUse	Long integer		railwayUse	0		
stacionazaPocetak	Double			0	0	
stacionazaKraj	Double			0	0	
namespace	String					50
InspireID	String					50

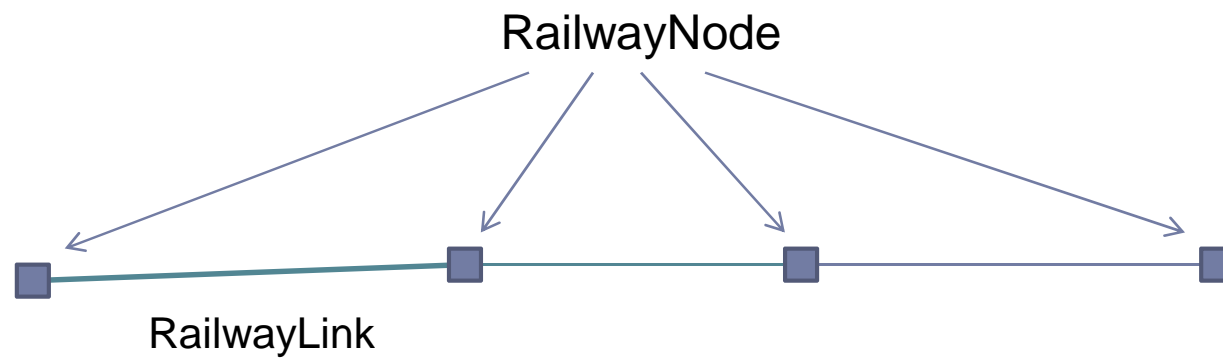
Field name	Data type	Default value	Domain	Prec- ision	Scale	Length
OBJECTID	Object ID					
Shape	Geometry					
Shape_Length	Double			0	0	
ID	Long integer			0		
vrstaElementa	Long integer		vrstaElementa	0		
numberOfTracks	Long integer			0		
slijedPoveznica	Long integer			0		
stacionazaPocetak	Double			0	0	
stacionazaKraj	Double			0	0	
vrstaPragova	Long integer		vrstaPraga	0		
tipTracnica	Long integer		tipTracnica	0		
vrstaZastora	Long integer		vrstaZastora	0		
namespace	String					50
InspireID	String					50
visinaKraj	Double			0	0	
visinaPocetak	Double			0	0	



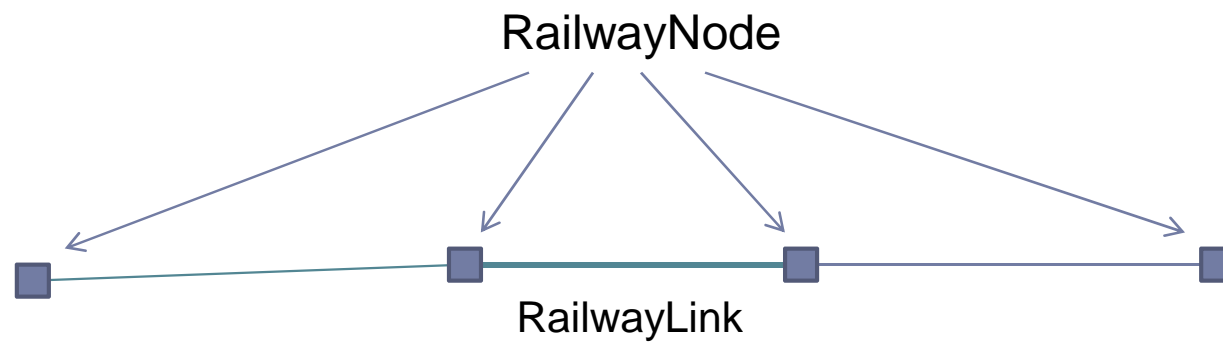
Field name	Data type	Default value	Domain	Prec- ision	Scale	Length
OBJECTID	Object ID					
ID	Long integer			0		
nazivDionice	String					50
designSpeed	Double			0	0	
pruga	Long integer			0		
stacionazaPocetak	Double			0	0	
stacionazaKraj	Double			0	0	
zavarenikolosijek	Long integer		Boolean	0		
electrified	Long integer		Boolean	0		
namespace	String					50
InspireID	String					50



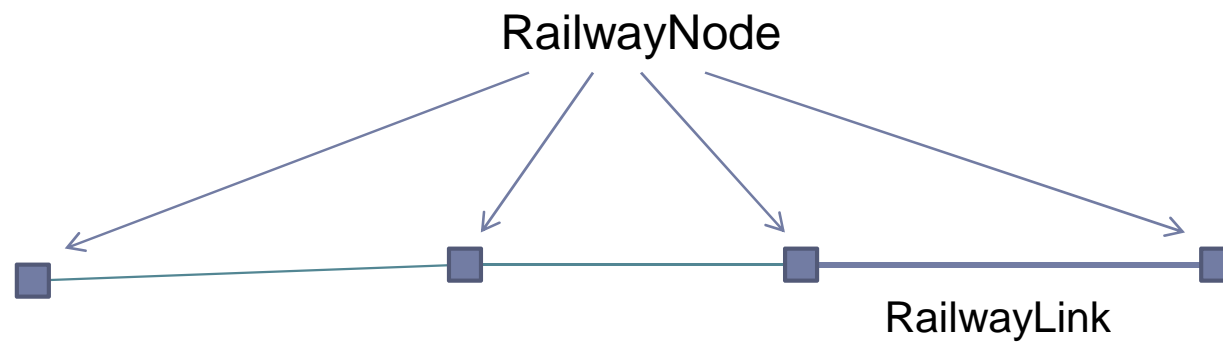
# Visualization



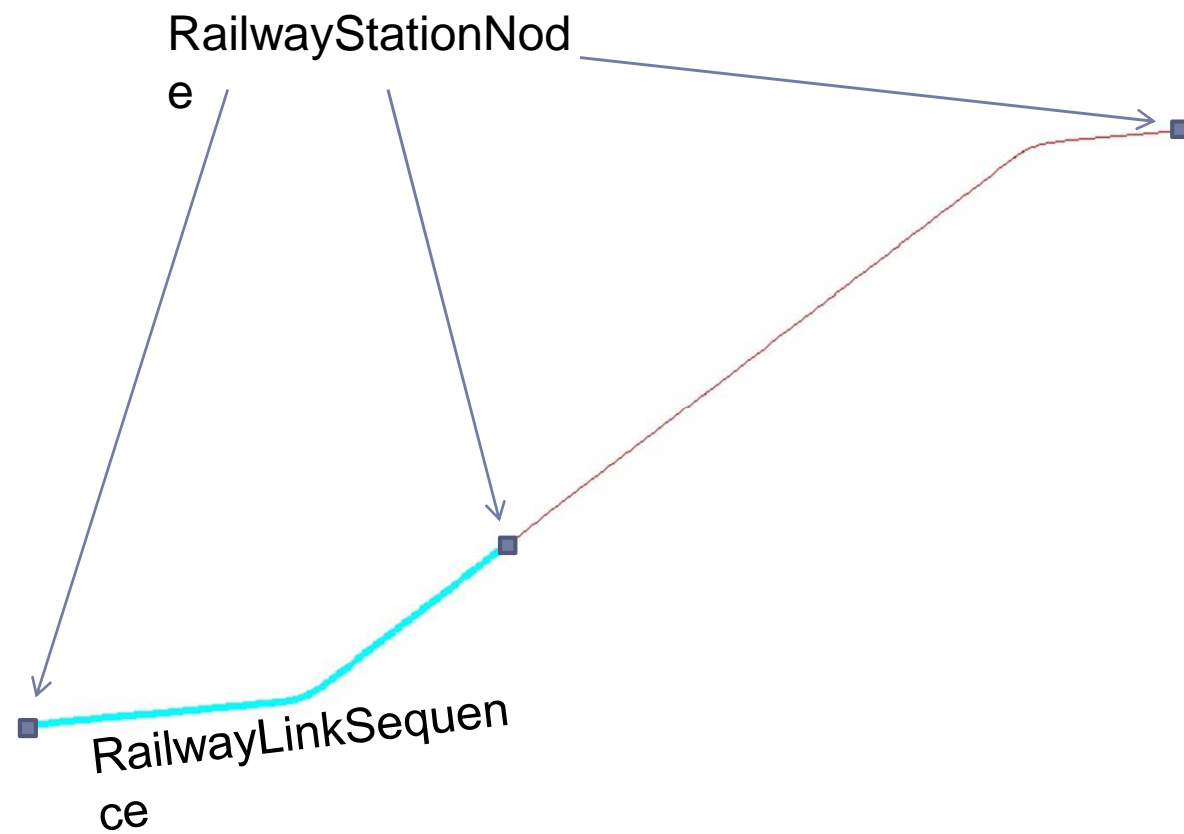
# Visualization



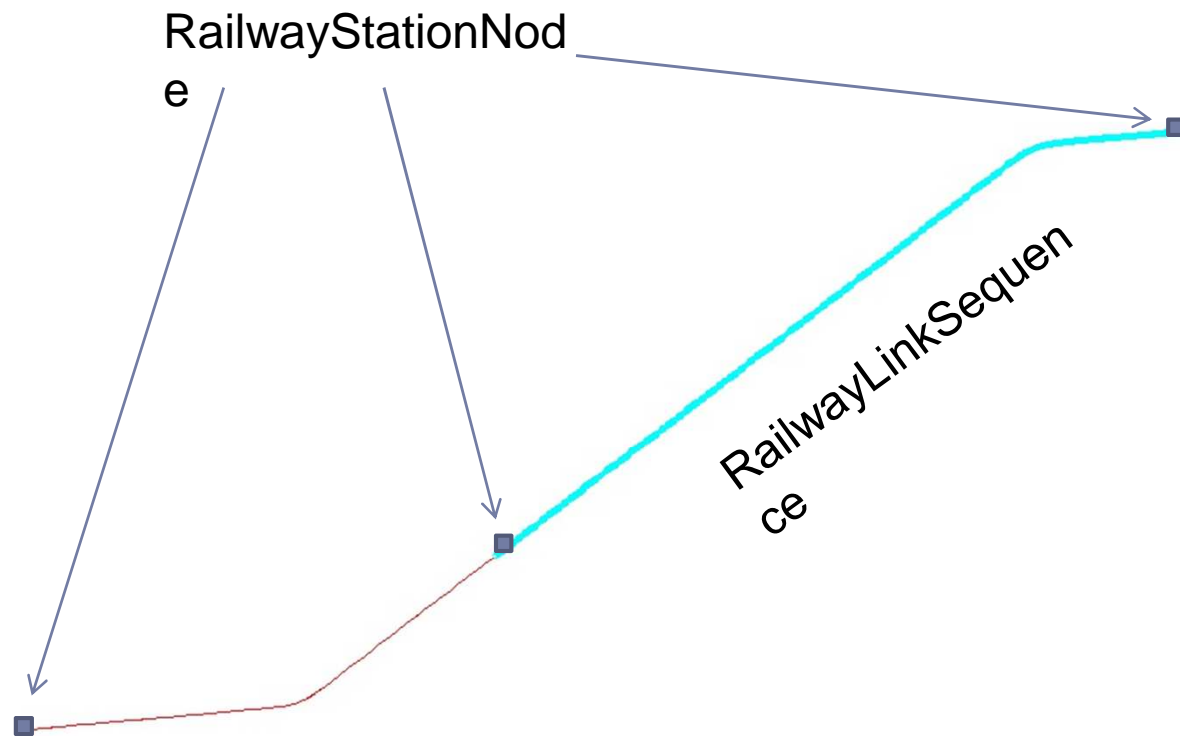
# Visualization



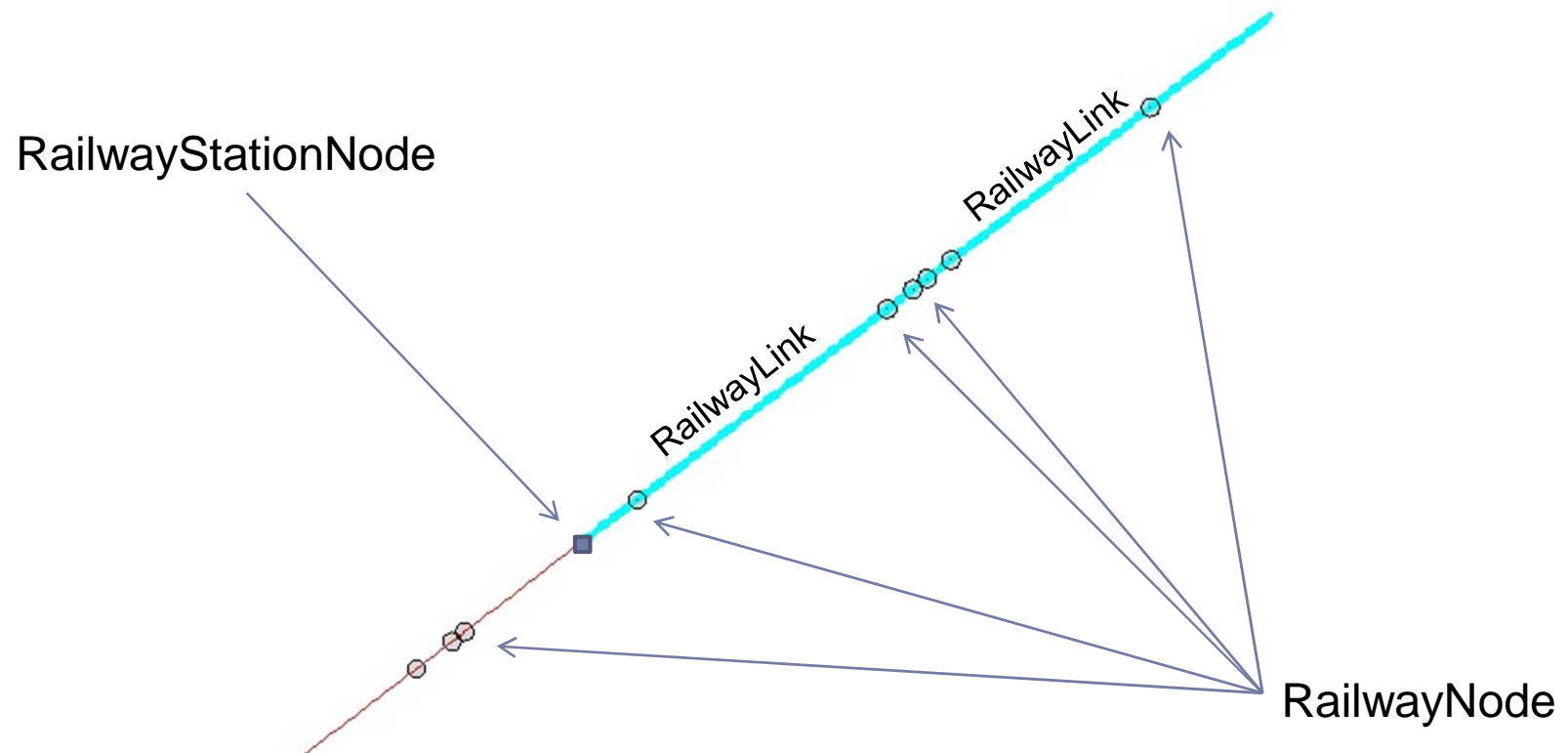
# Visualization



# Visualization



# Visualization





# Unique identifier management

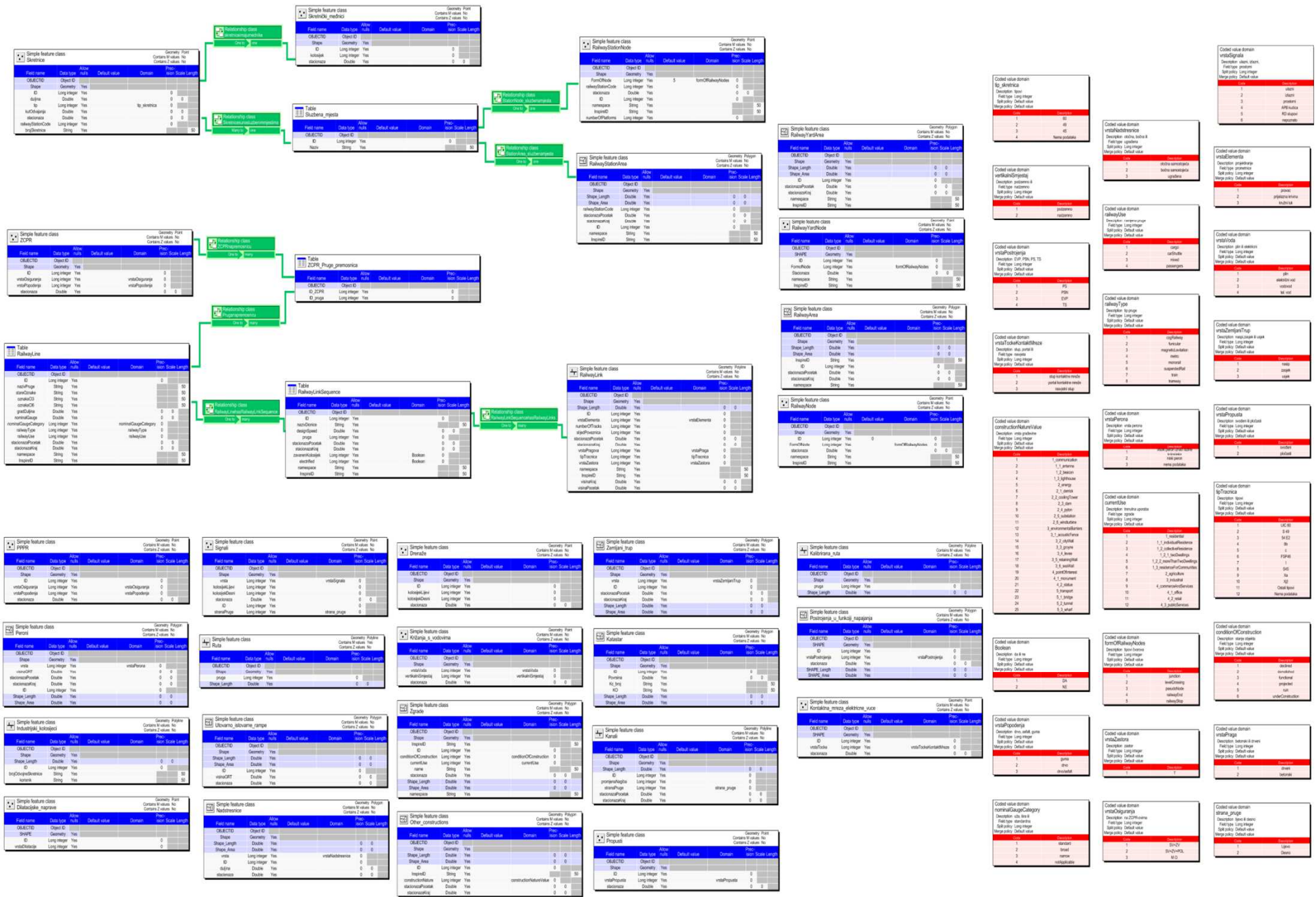


## ► InspireID

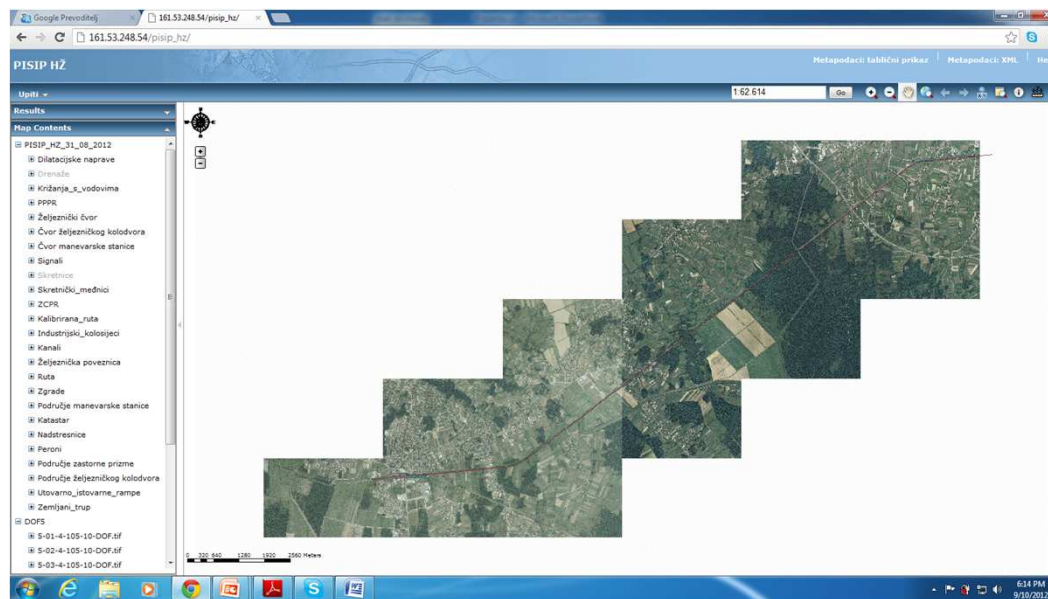
INSPIRE Feature Class	Namespace	Number of class within theme	Global InspireID
RailwayLink	HR.HZ.TN	01	HR.HZ.TN_01-local_database_ID
RailwayLinkSequence	HR.HZ.TN	02	HR.HZ.TN_02-local_database_ID
RailwayLine	HR.HZ.TN	03	HR.HZ.TN_03-local_database_ID
RailwayNode	HR.HZ.TN	04	HR.HZ.TN_04-local_database_ID
RailwayStationNode	HR.HZ.TN	05	HR.HZ.TN_05-local_database_ID
RailwayYardNode	HR.HZ.TN	06	HR.HZ.TN_06-local_database_ID
RailwayArea	HR.HZ.TN	07	HR.HZ.TN_07-local_database_ID
RailwayStaionArea	HR.HZ.TN	08	HR.HZ.TN_08-local_database_ID
RailwayYardArea	HR.HZ.TN	09	HR.HZ.TN_09-local_database_ID

RailwayLink:

HR.HZ.TN\_01-01



# WEB APPLICATION



-metadata

- table and xml

- INSPIRE conformant

[http://161.53.248.54/pisip\\_hz/](http://161.53.248.54/pisip_hz/)

# Results



- ▶ Inventarisation and analysis of available spatial data
- ▶ Spatial database prototype for Croatian Railways Infrastructure GIS
- ▶ Guidelines for implementing Croatian Railway GIS on entire railway network
- ▶ Guidelines for inclusion of spatial data to NSDI in conformity with the INSPIRE implementing rules
- ▶ Support for future application to European funds and tendering in order to establish a complete GIS

# Q&A



- ▶ Josip Lisjak, dipl. ing. geod.
- ▶ [josip@itd-gaudeamus.hr](mailto:josip@itd-gaudeamus.hr)
  
- ▶ prof. dr. sc. Vlado Cetl, dipl. ing. geod.
- ▶ [vcetl@geof.hr](mailto:vcetl@geof.hr)
  
- ▶ dr. sc. Hrvoje Matijević, dipl. ing. geod.
- ▶ [hmatijev@geof.hr](mailto:hmatijev@geof.hr)
  
- ▶ University of Zagreb
- ▶ Faculty of Geodesy
- ▶ Kačićeva 26
- ▶ 10000 Zagreb
- ▶ Croatia