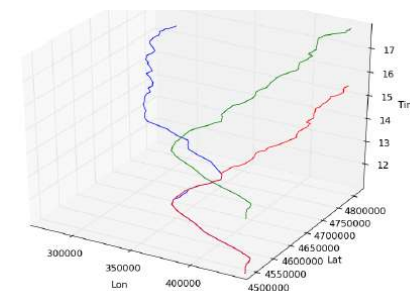
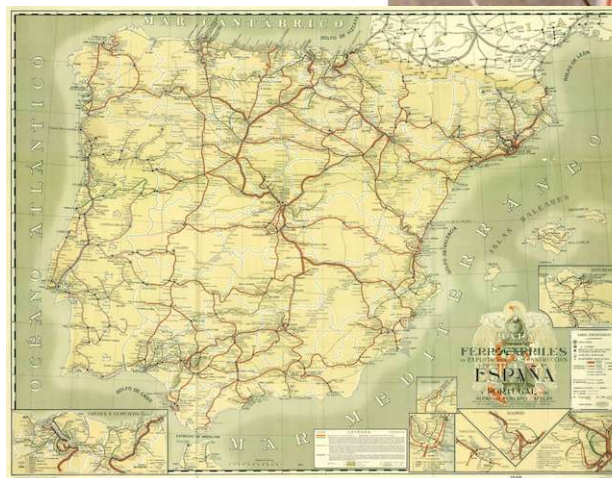
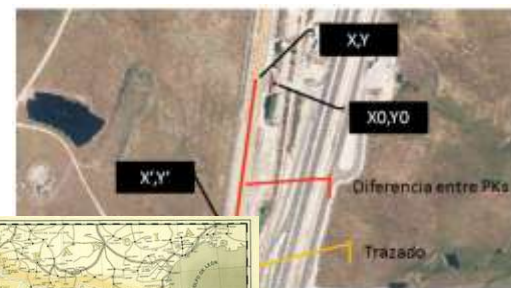
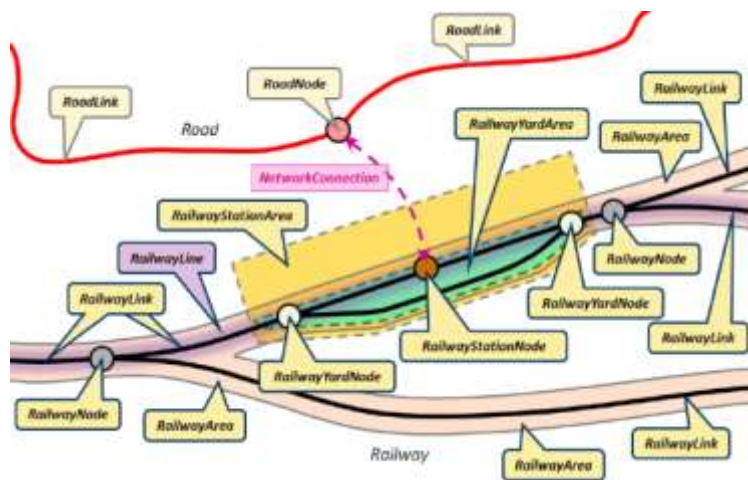


Implementing a Railways Operational Topology based on INSPIRE: An Interoperability Improvement with RINF

José Gómez Castaño ^{1,2}

¹ [jgomez03@pdi.ucm.es] Group of Extragalactic Astrophysics and Astronomical Instrumentation - UCM

² [jgomezc@adif.es] Dirección de Planificación y Gestión de Red - ADIF





25-29 MAY 2015
LISBON CONGRESS CENTER, PORTUGAL

Agenda

Objective

Previous situation

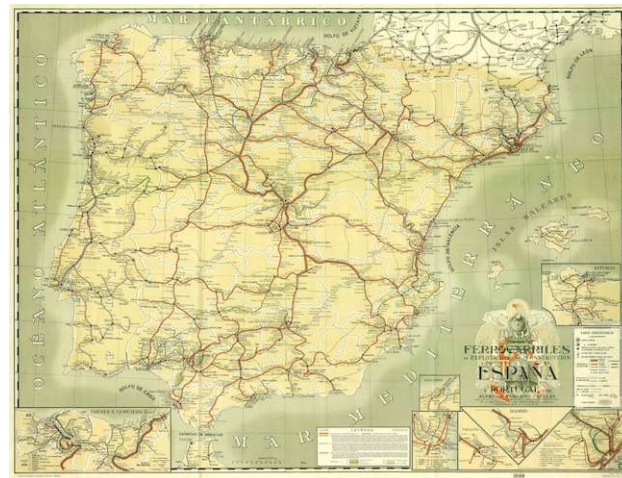
INSPIRE Railways

RINF

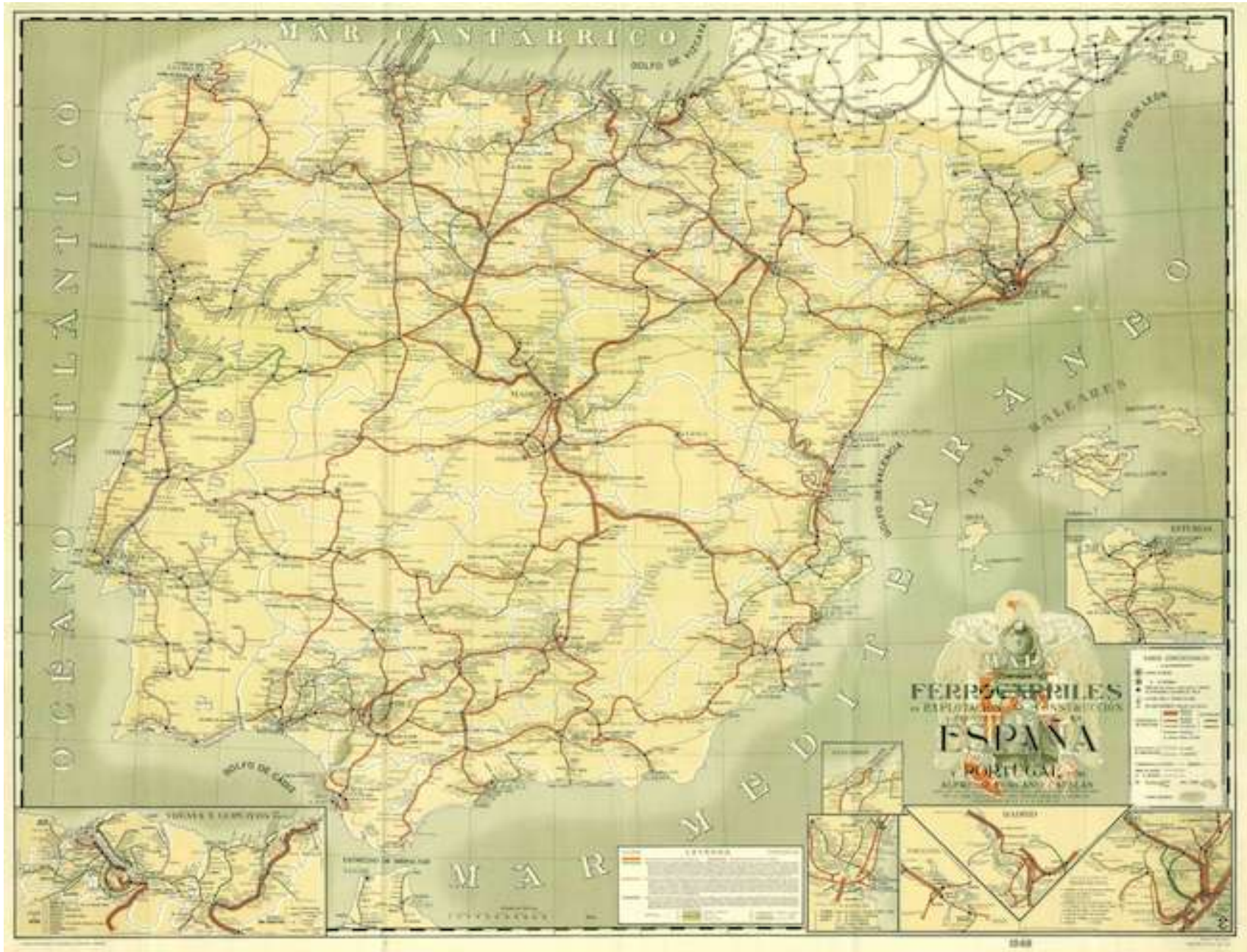
Operational Examples

Objective

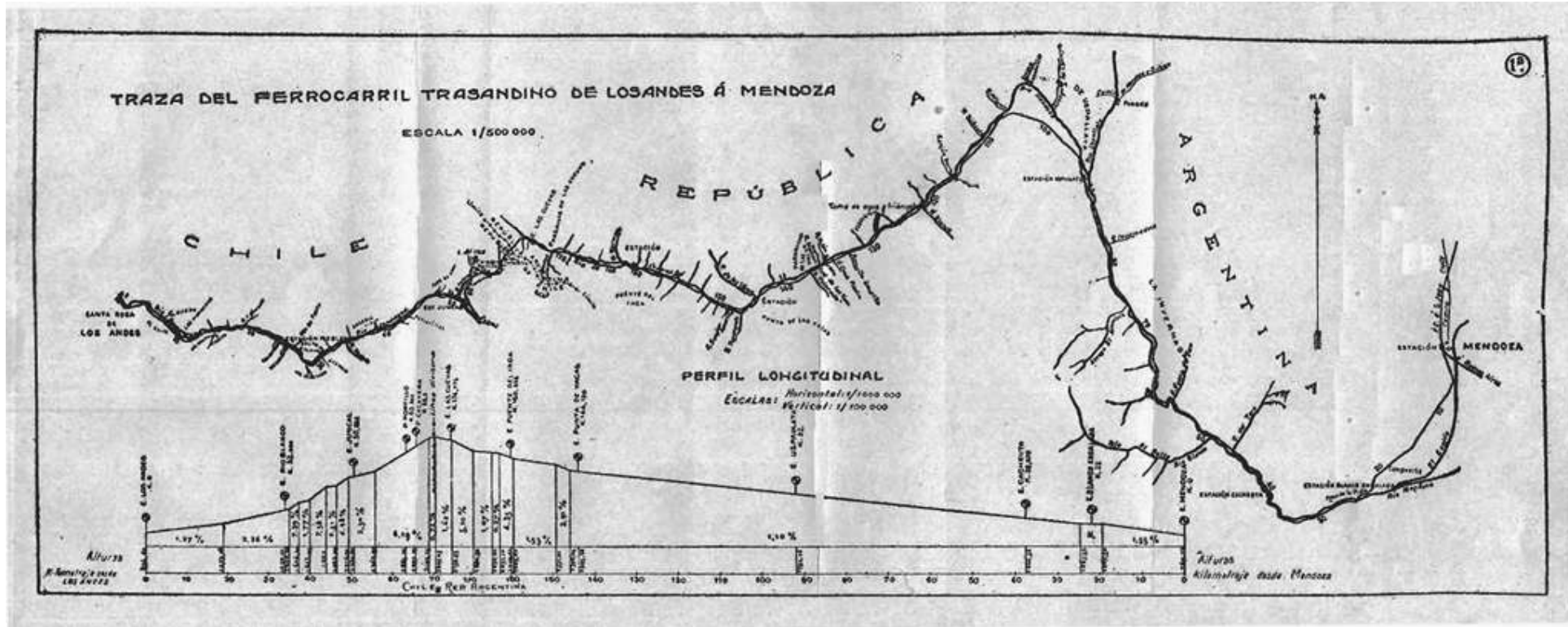
The aim of this work is to implement traditional geometries and Attributes, defined in RINF, using INSPIRE railways features in an operational environment, and show some working examples



Once Upon a Time – Railways geography

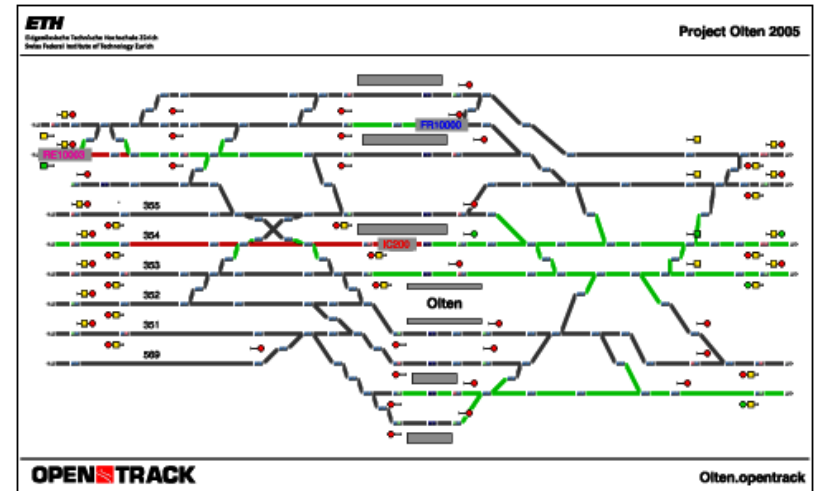
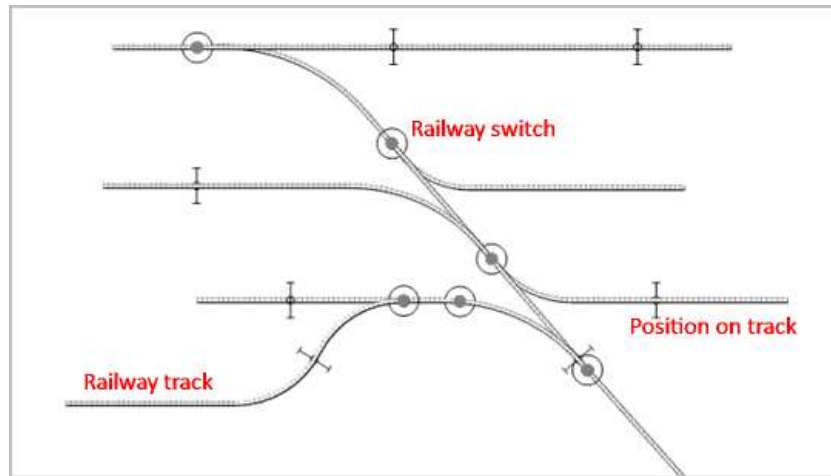


Once Upon a Time – Railways characteristics



From construction plans and sketches
No interoperability
Difficult up to date

Today – Different railways topologies



Every organization has its own proprietary attributes and topology

Today – Standards

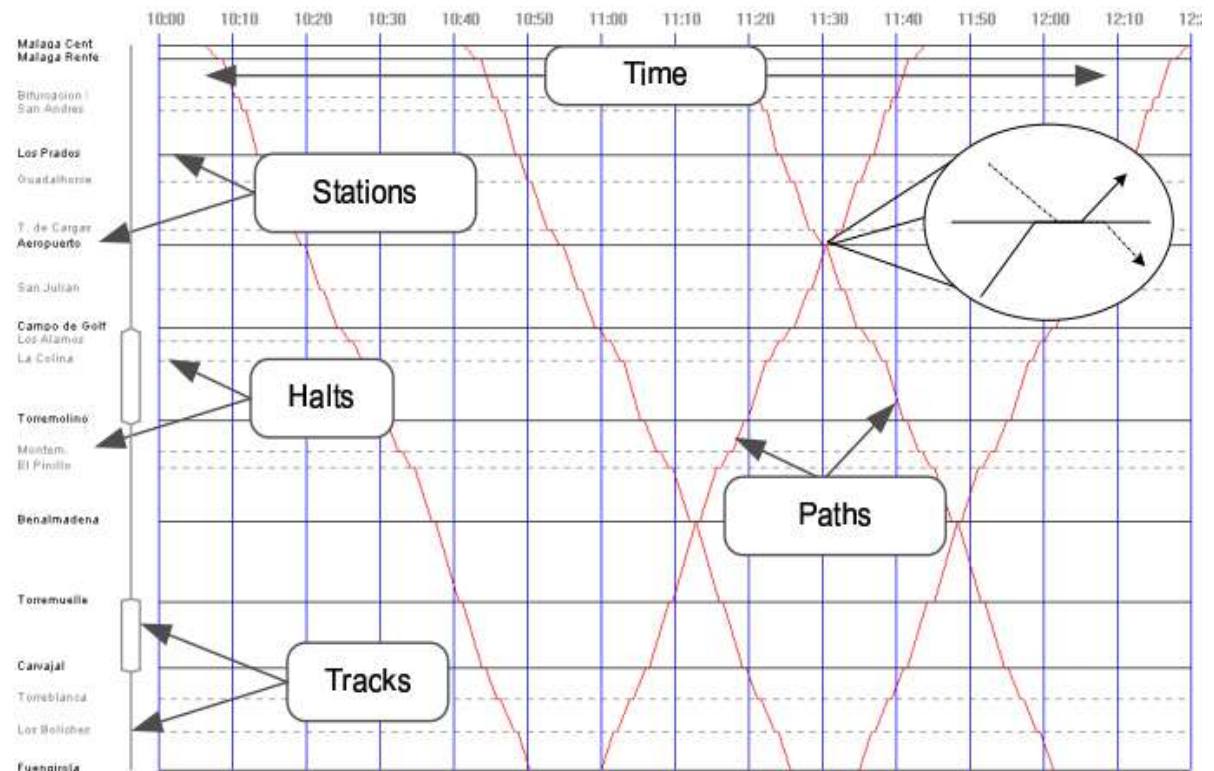
The image displays the UIC RailTopoModel standard, which is a common data infrastructure model for railway infrastructure. It features several logos and a technical diagram. The logos include DB (Deutsche Bahn), adif (Administración de Infraestructuras Ferroviarias), deimos SPACE, INSPIRE (Infrastructure for Spatial Information in Europe), ML.org, and Indra. The technical diagram shows a railway track layout with labels for 'Railway track', 'Position on track', and 'ACK'. The diagram also includes the text 'Project Olten 2005' and 'Olten.opentrack'.

Common data infrastructure model

Railway capacity and topology uses

Railway capacity is the maximum number of trains which can be scheduled in the

Timetable
Interlocking
Building planning



Tools

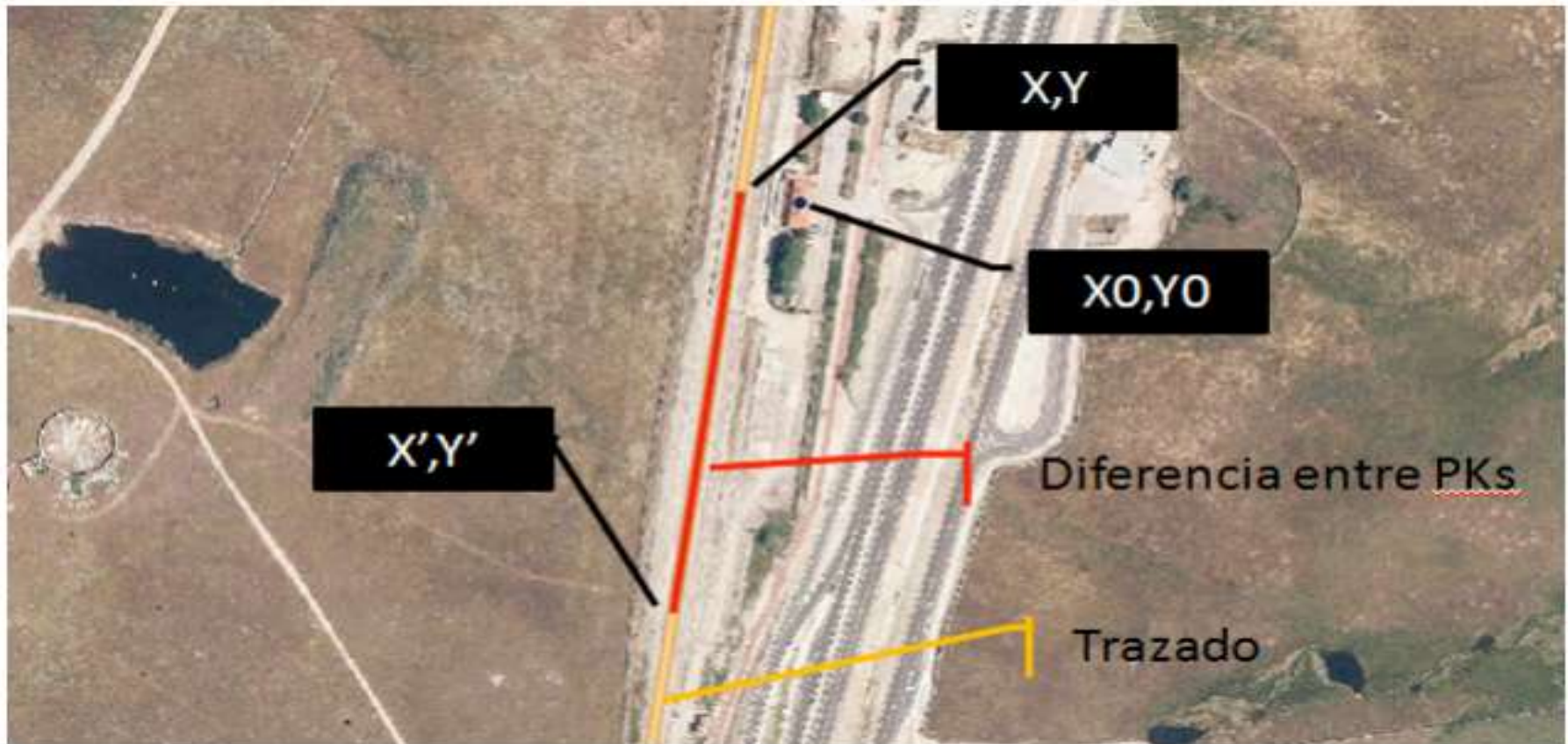
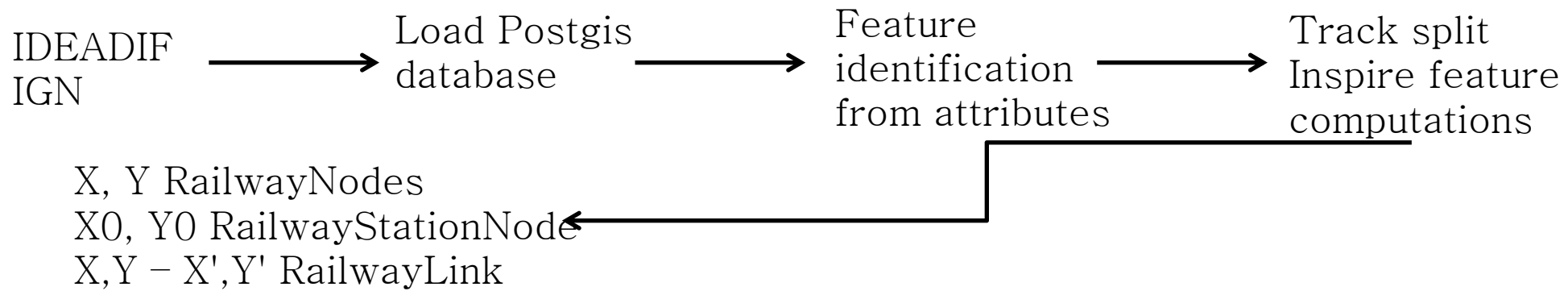
Datasources

- .ADIF Infrastructure attribute data
- .IDEADIF – ADIF Spatial Data Infrastructure
- .IGN

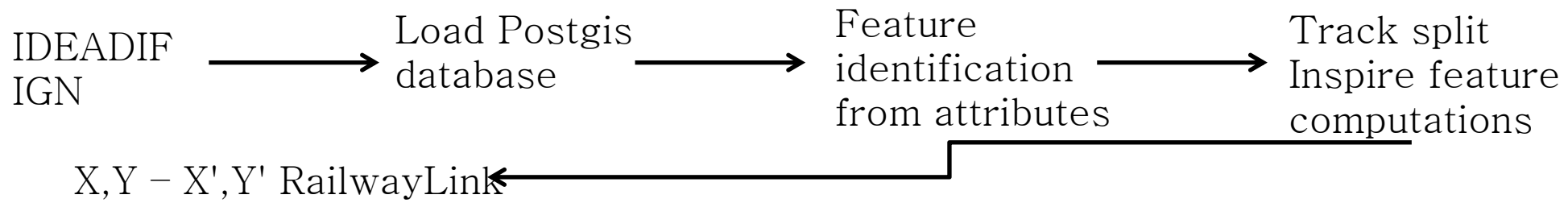
Tools

- .Python
- .GDAL
- .PostGis Database
- .Apache
- .Geoserver

INSPIRE feature implementation



INSPIRE feature implementation



INSPIRE & RINF

INSPIRE Railways

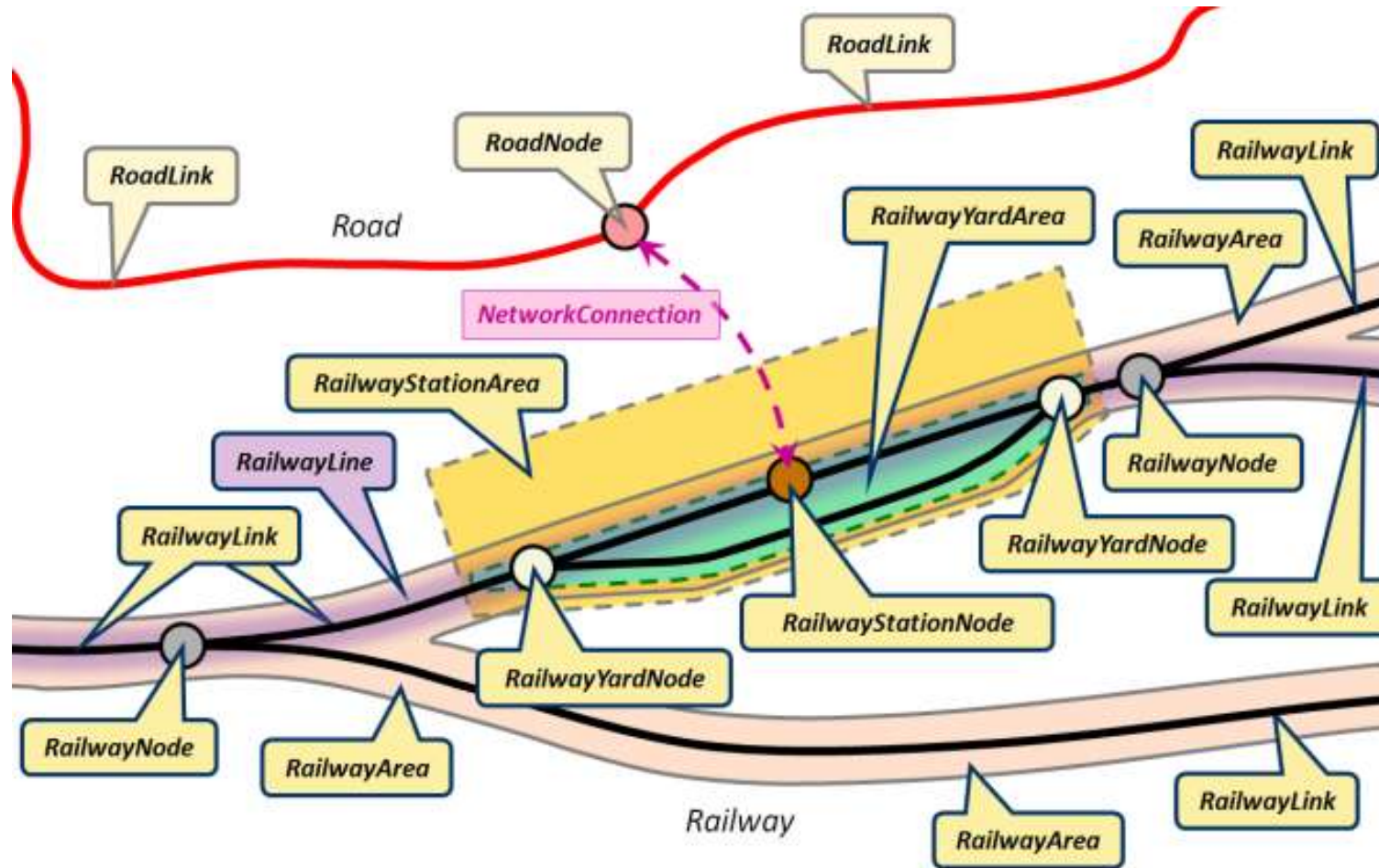
The Rail Transport Networks application schema (Rail Schema) employs a link and node structure to represent the rail tracks used for transportation in the form of a linear network. The Rail Schema inherits classes from the Common Transport Schema and also creates its own classes to describe properties of the rail network such as Ownership restrictions that can apply to whole sections of the network element or subsections that can be described using linear referencing.

RINF

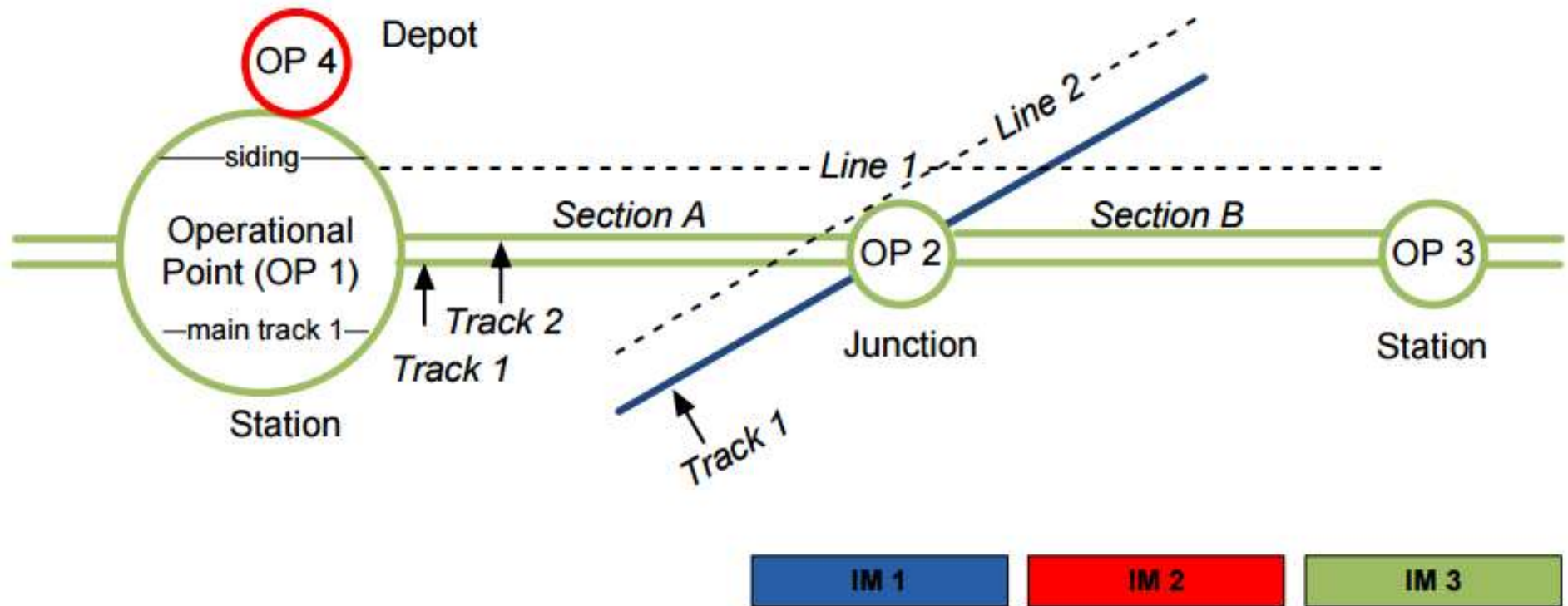
The activity of the WG Register of Infrastructure (RINF) scheduled in the ERA work programme 2009 is based on Article 18 of Regulation 1335/2008 amending Regulation 881/2004 establishing a European Railway Agency (ERA) and Article 35 of Directive 2008/57/EC on the Interoperability of the Rail System within the Community.

INSPIRE	Common	RINF
Focused on Spatial Data	20 common attributes Coordinate Systems RINF Annex H	Focused on Attribute Data

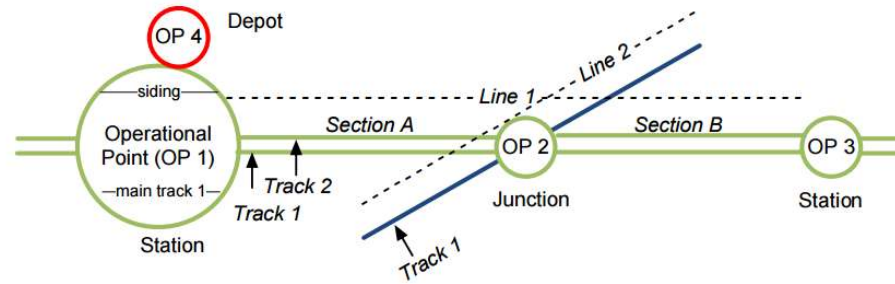
INSPIRE & RINF – INSPIRE elements



INSPIRE & RINF – RINF elements



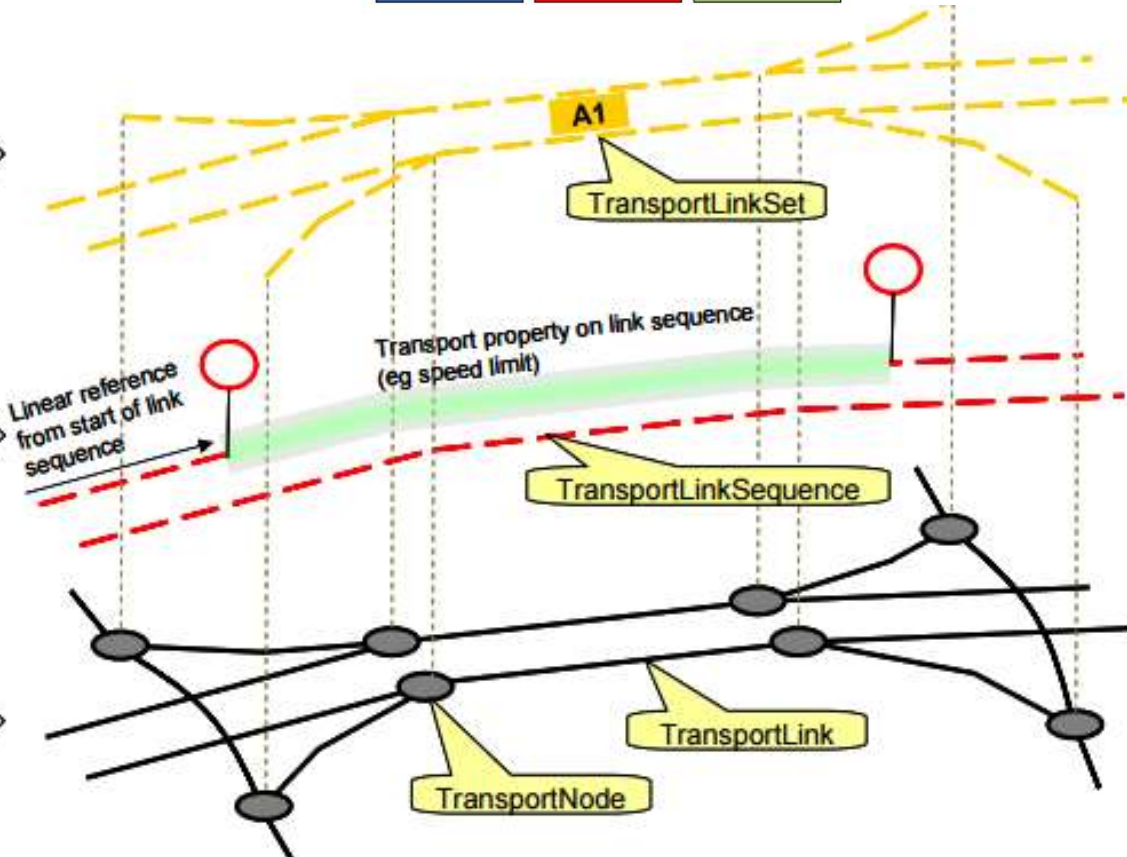
INSPIRE & RINF



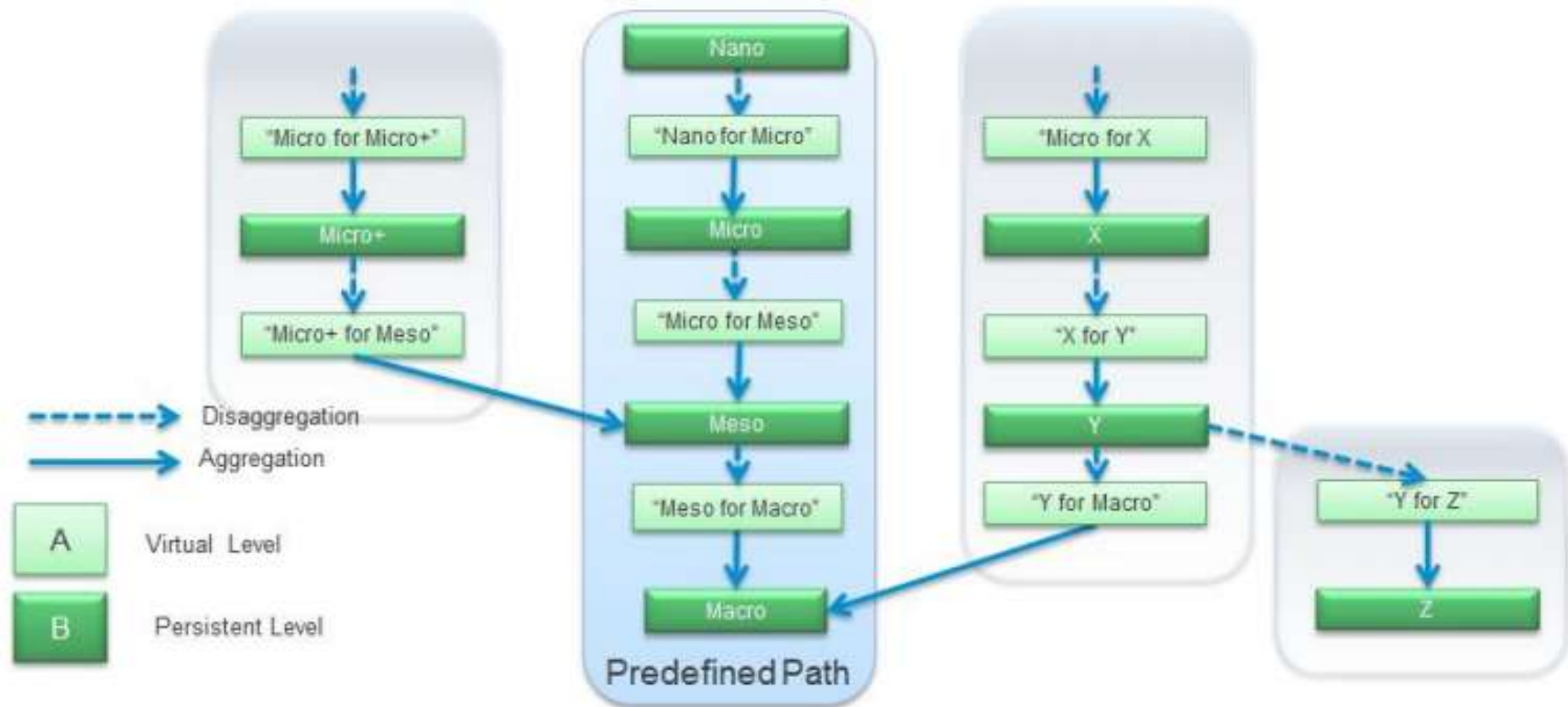
Individual links and link sequences form link set (eg motorway with exits)

Individual links are used to build link sequences (eg for linear referencing of transport properties)

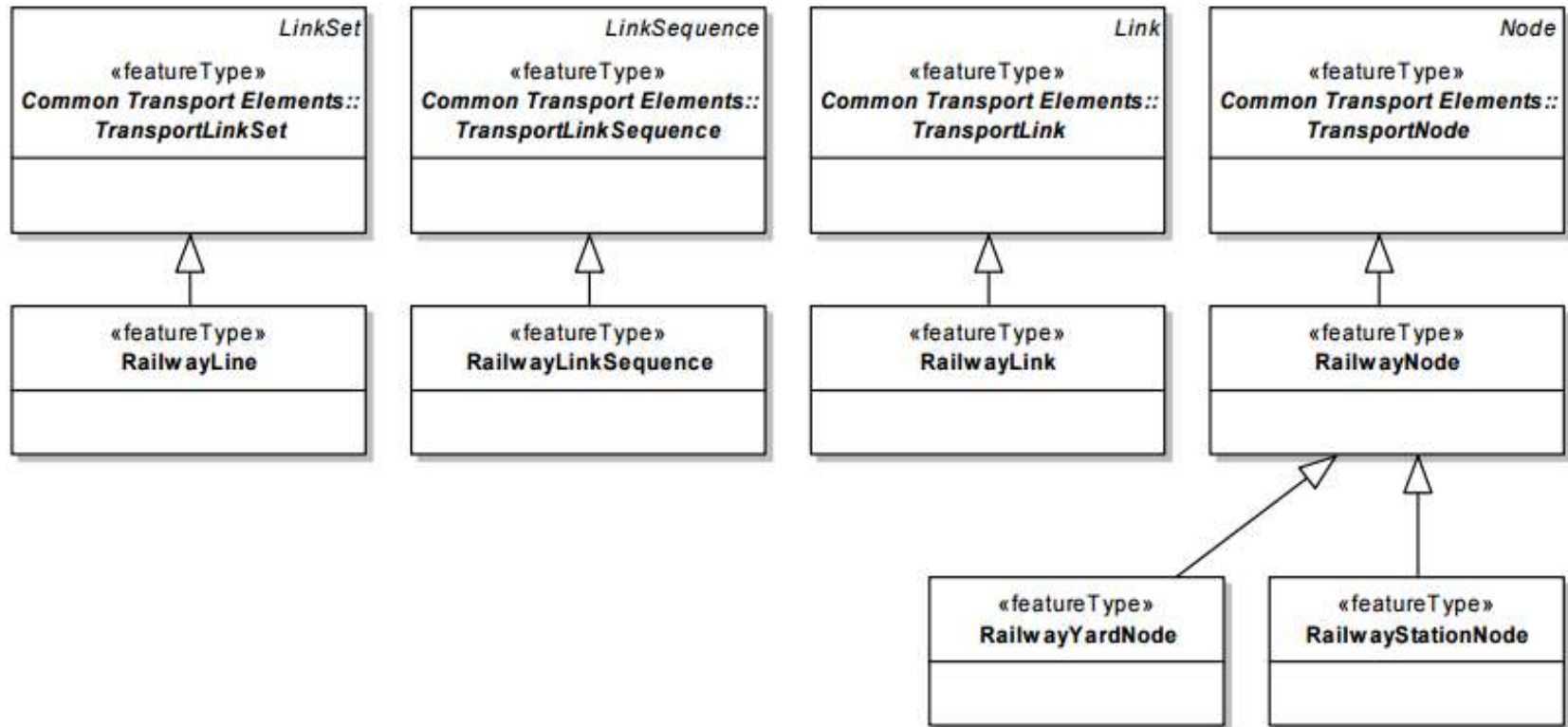
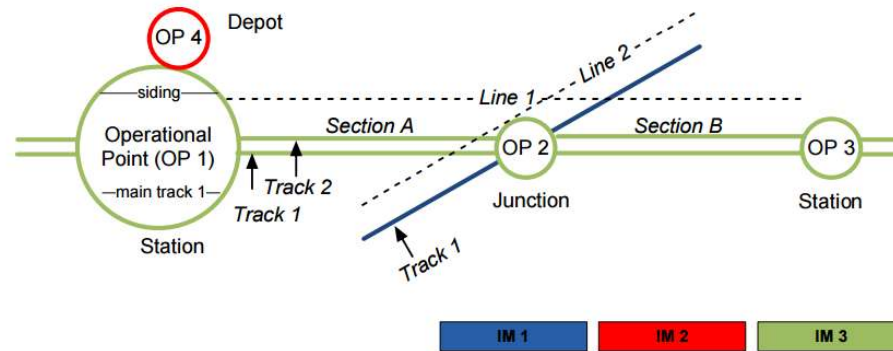
Basic network of transport links and (optional) nodes



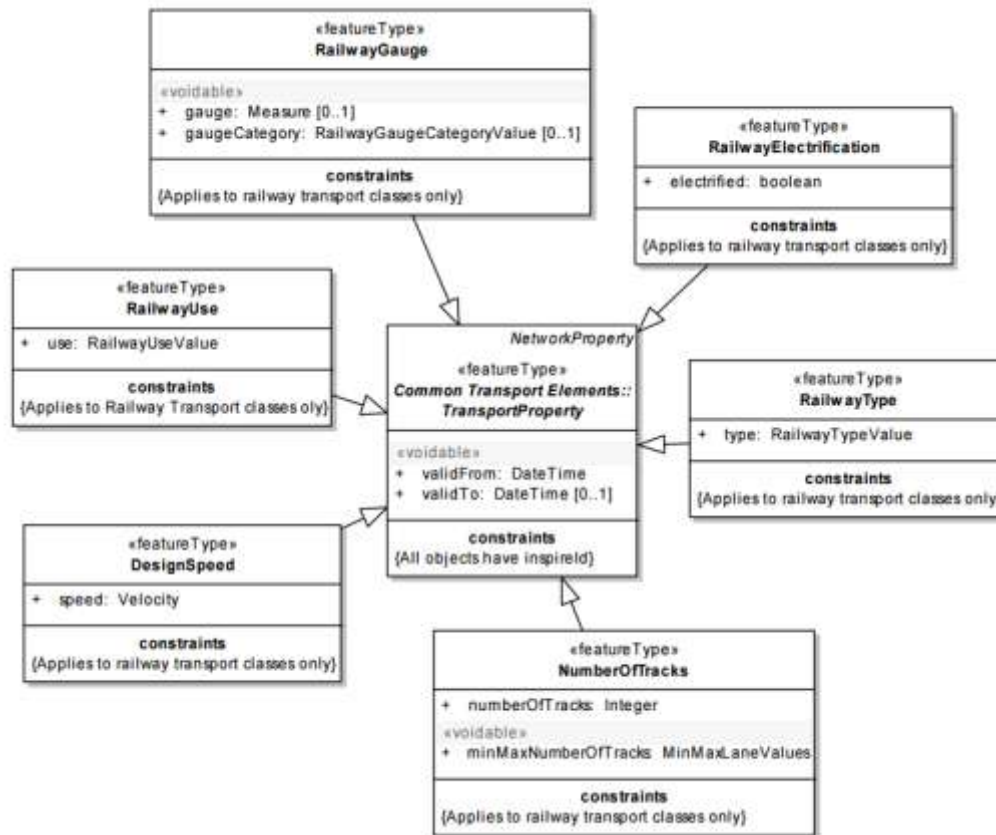
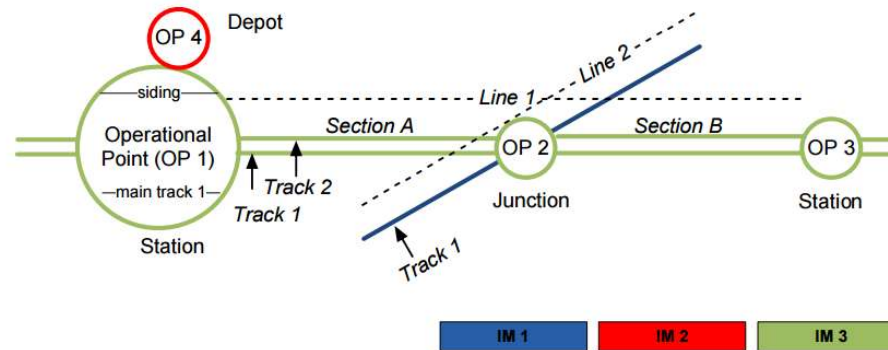
INSPIRE & RINF - Agregation



INSPIRE & RINF



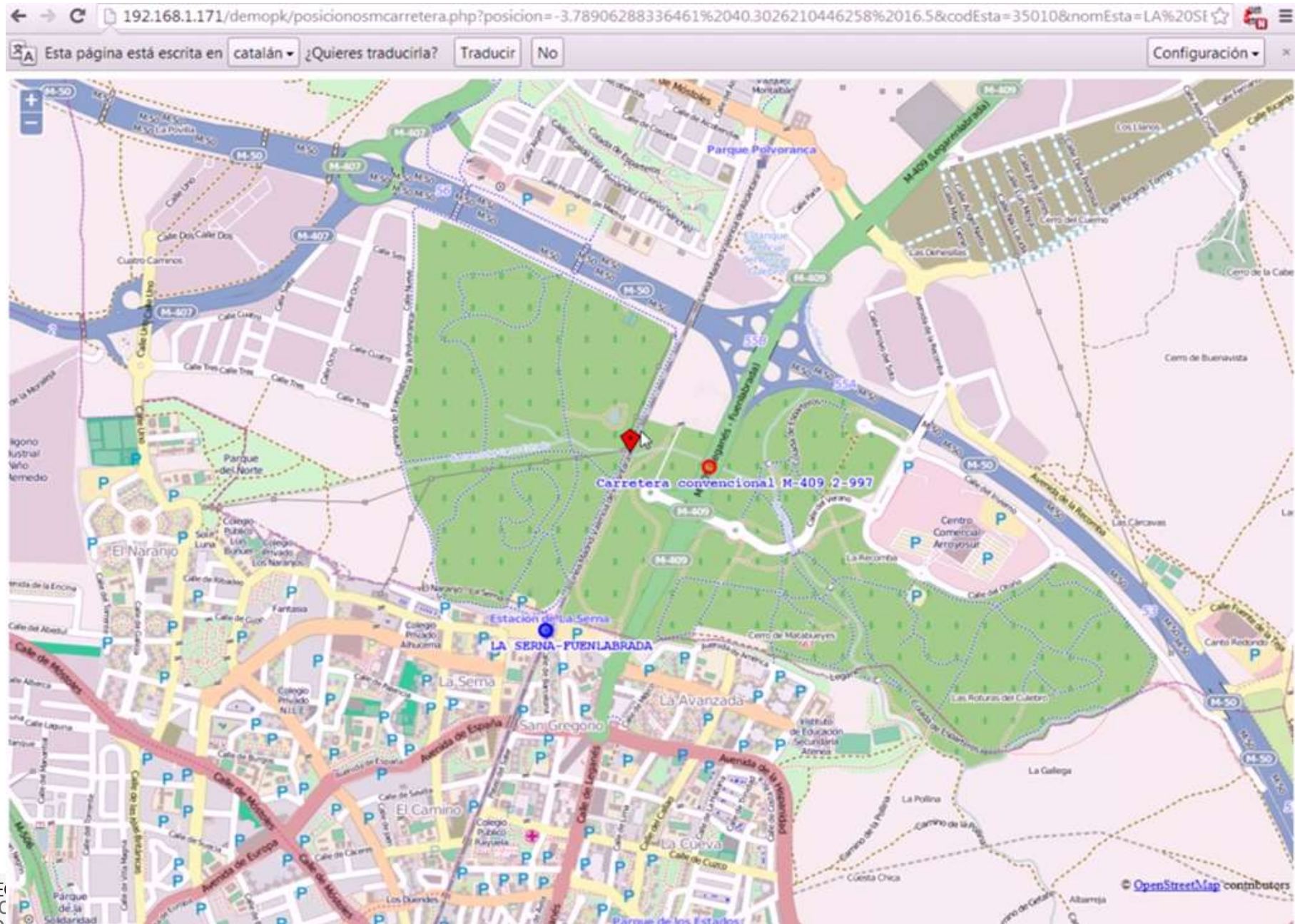
INSPIRE & RINF



Operational Examples – Incidence assistance

Use WPS services to exchange information

<https://www.youtube.com/watch?v=O6L9kdAYDA8>



Operational Examples – Railway capacity impact

<https://www.youtube.com/watch?v=63qbSx4hoxU>

The screenshot shows a web browser window with the URL `192.168.1.174/demopk/trenes.php?pkBuscado1=125&pkBuscado2=168&linea=200&Enviar=Enviar`. The page title is "Trenes afectados por incidentes en un tramo". Below the title, there is a text box explaining that the tool calculates and represents train paths crossing a specific segment. The form includes input fields for "PK Nominal Inicio" and "PK Nominal Final", and a dropdown menu for "Linea" set to "010 - PTA. DE ATOCHA-SEVILLA-S. JUSTA". A "Enviar" button is next to the dropdown. Below this, the "Selección de los puntos limítrofes" section is divided into two parts. The first part, "Elija el primer punto Buscando pk 125 en línea 200", has a "Localizar" column with three radio buttons and two "Estación Colateral" columns. The second part, "Elija el segundo punto Buscando pk 168 en línea 200", has a similar layout. A "Buscar Trenes" button is at the bottom left.

Trenes afectados por incidentes en un tramo

A partir de los PK que delimitan un tramo se calcula y representa sobre cartografía los trenes que atraviesan el mismo

PK Nominal Inicio: PK Nominal Final: Línea: 010 - PTA. DE ATOCHA-SEVILLA-S. JUSTA

Selección de los puntos limítrofes

Elija el primer punto Buscando pk 125 en línea 200

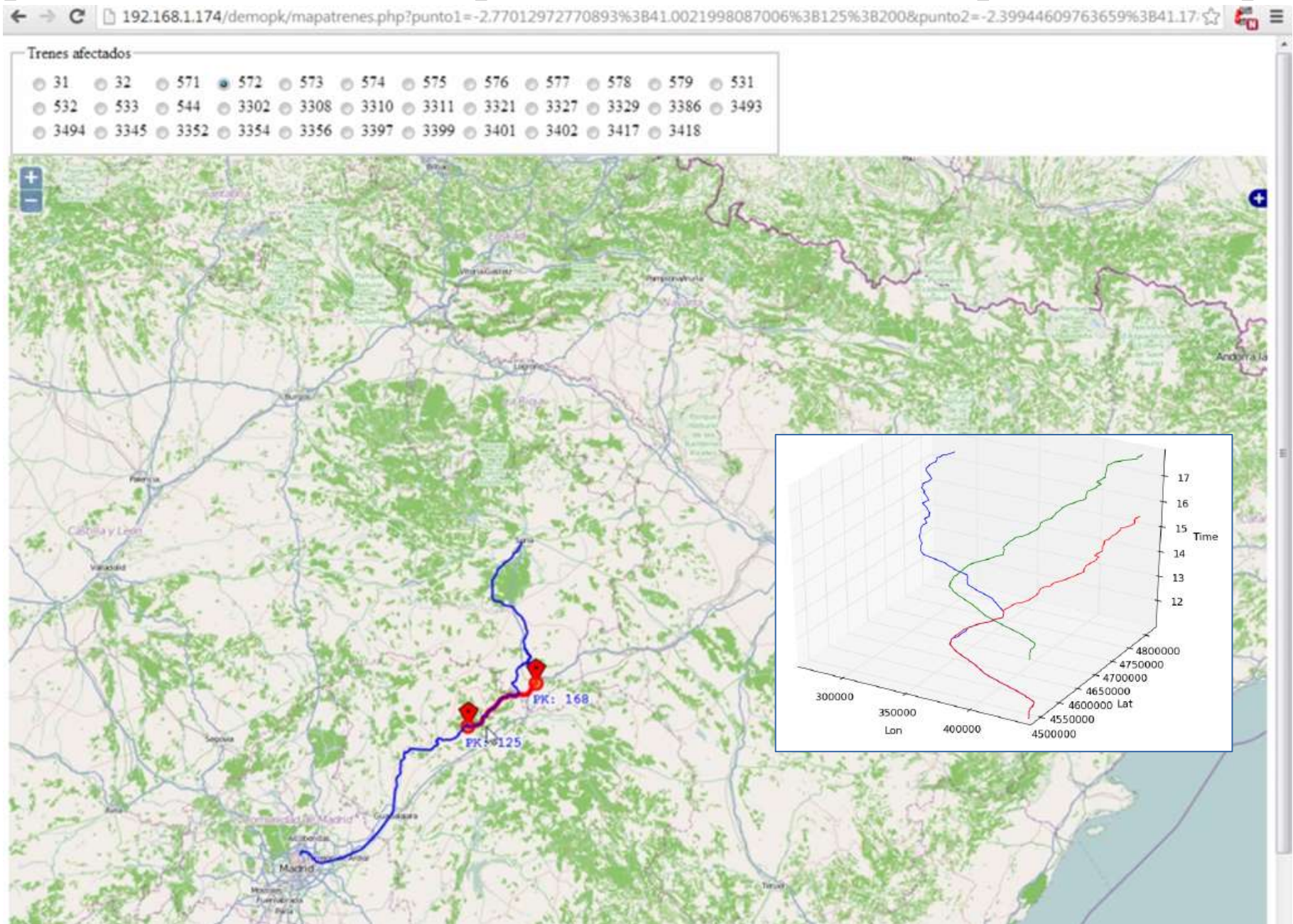
Localizar	Estación Colateral 1	Estación Colateral 2
<input checked="" type="radio"/>	BAIDES	SIGUENZA
<input type="radio"/>	SELGUA	MONZON-RIO CINCA
<input type="radio"/>	RODA DE BARA	RODA DE MAR (APD)

Elija el segundo punto Buscando pk 168 en línea 200

Localizar	Estación Colateral 1	Estación Colateral 2
<input checked="" type="radio"/>	MEDINACELI	C. DE R.
<input type="radio"/>	RAJMAT	MONTAGUT (CGO)
<input type="radio"/>	RODA DE BARA	RODA DE MAR (APD)

More than 3500 train paths will be taken into account

Operational Examples – Railway capacity impact



Operational Examples – on board system



Conclusion

INSPIRE railway schemas and RINF specifications may be used to represent railway elements from micro to macro level

They are standards that can be used to improve interoperability among organizations

It is necessary an attribute to link between both schemas. In this work, position has been choose

Allows Independence from any company

Allows a cost reduction in time integration and money

Future work

Make a conversion process between INSPIRE and RailTopomodel schemas

Add spatial analysis to more operational activities

Improve relations with other INSPIRE Themes as Road, Weather, etc



25-29 MAY 2015
LISBON CONGRESS CENTER, PORTUGAL

Thanks for your attention

Implementing a Railways Operational Topology
based on INSPIRE:
An Interoperability Improvement with RINF

José Gómez Castaño ^{1,2}

¹ [jgomez03@pdi.ucm.es] Group of Extragalactic Astrophysics and Astronomical Instrumentation - UCM

² [jgomezc@adif.es] Dirección de Planificación y Gestión de Red - ADIF

