

IFC Rail Project

Storyline (SL) Implementation Report (IR)

***Subgrade Renewal (SR)
Detailed design phase (DD)***



SL-IR-SR-DD-SNCF-SETEC

Contents

1	Storyline documentation update	3
1.1	Updated Storyline Synthesis	4
1.2	Updated Storyline Description	6
2	Storyline test objective update	8
3	Storyline test organisation	8
4	Exchange Scenario (ES) and Tests	9
4.1	Exchange Scenario: SLSR-DD-DDA-ES2.....	9
4.1.1	Exchange Scenario: SLSR-DD-DDA-ES2.....	9
4.1.2	ES Test description and results.....	10
4.2	Exchange Scenario: SLSR- DD-DD-ES3	11
4.2.1	Exchange Scenario: SLSR- DD-DD-ES3	11
4.2.2	ES Test description and results.....	12
5	Supporting Files and Storyline Archives	13
5.1	Exchange Requirements (ER)	13
5.2	SL Data archives.....	13
5.3	Test Dataset(s).....	13

Room: Railway Room
Project/Activity: IFC Rail Phase 2

Date: 2021.12.10
Test Leader: Heidi CASTELLANOS LEYRA
Romaric BOUDOU
Alan BROOK DIAZ
ID: SLSR-DD
Stakeholder: SNCF-SETEC

Document Title: WP1: Storyline (SL) Implementation Report
Version: 1.0

Intellectual Property Rights for Data provided for Unit Tests (including Dataset)

As far as the data for the Unit Tests (Data) has been provided by the IFC Rail Consortium members (Stakeholder) either directly or on behalf of a IFC Consortium member by a 3rd party the following regulations apply to the Intellectual Property (IP) Rights of the data:

The IP of the data is entirely owned by the Stakeholder.

The Data is provided and can be used only for the purpose of testing to implement the IFC Rail Standard by Software Developers.

Any other utilization of the Data beyond the scope of the implementation of the IFC Rail Standard needs prior written approval of the IP owner of the Data.

In course of performing the services of the tests or providing advice pre-existing invention, discovery, original works of authorship, development, improvements, trade secret, concept, or other proprietary information or intellectual property right owned by the Software Developer who performs the tests are not affected and remain in the ownership of the Software Developer

By participating in the project IFC Rail Phase 2 and using the Data the Software Developer acknowledges the above IP rights for the Data.

1 Storyline documentation update

The Storyline objective evolved since the aims were set, in this document the main initial goals are recalled and the evolutions during the project are identified.

The main evolutions are recapitulated below:

- Test timeline
- Exchange scenarios scope
- Test main perimeter
- Objects to be modelled

1.1 Updated Storyline Synthesis

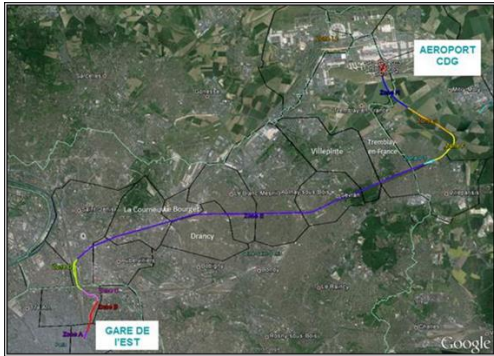

Room:	Railway Room	Author: Test Leader	Heidi Castellanos Leyra Alan Brook Diaz Romaric Boudou
Project/Activity:	IFC Rail Phase 2	Verification: Technical Expert	Florian Hulin
Document Title:	Storyline: Subgrade renewal	Approbation: Test leader	Alan Brook Diaz
Version:	1.0	PMO checker:	Guy Pagnier
Date:	2021.12.10	ID:	SLSR-DD
Description (a)	This operation concerns the substructure renewal as a result of horizontal and vertical alignment track changes during a design phase.		
Project Phases (b)	<input type="checkbox"/> PL - Planning <input type="checkbox"/> Build <input type="checkbox"/> ID - Intermediate design <input type="checkbox"/> Operation & Maintenance <input checked="" type="checkbox"/> DD - Detailed design <input type="checkbox"/> Dismiss		
Use Cases (c)	<input type="checkbox"/> ECM - Existing Condition Modelling <input checked="" type="checkbox"/> RDM - Railway Design Modelling <input type="checkbox"/> RDM.DD - Feasibility Study for Railway <input checked="" type="checkbox"/> RDM.RIDM - Railway Intermediate Design Modelling <input checked="" type="checkbox"/> RDM.RDDM - Railway Detailed Design Modelling <input type="checkbox"/> ICM - Interference and Coordination Management <input type="checkbox"/> 3DV - 3D Visualization <input type="checkbox"/> QTO - Quantity Take-Off <input type="checkbox"/> INMP - Handover from Builder to Maintainer (Information Needed for Maintenance Perspective)		
Domains	<input checked="" type="checkbox"/> Track (*)	Ballasted track	
	<input type="checkbox"/> Signalling (*)		
	<input type="checkbox"/> Energy (*)		
	<input type="checkbox"/> Telecom (*)		
	<input checked="" type="checkbox"/> Alignment (*)		
	<input checked="" type="checkbox"/> Other (*)	Earthworks, Geotechnical, Drainage	
Tested Concepts (d)	Common Infra Unit Test topics <input type="checkbox"/> Geo-reference <input checked="" type="checkbox"/> Alignment (Horizontal+Vertical) <input checked="" type="checkbox"/> Linear Placement (Point) <input checked="" type="checkbox"/> Linear Span Placement (From-To) <input type="checkbox"/> Linear Placement with broken chainage <input type="checkbox"/> Terrain <input type="checkbox"/> Geotechnics (IFCborehole) <input checked="" type="checkbox"/> Earthworks <input checked="" type="checkbox"/> Subgrade <input checked="" type="checkbox"/> Drainage Railway Specific Unit Test topics <input checked="" type="checkbox"/> Cant Alignment <input checked="" type="checkbox"/> Linear Placement with Cant <input checked="" type="checkbox"/> Swept Area Solid Geometry (parametrically create 3d geometry of rail according to rail profile and alignment)		

	<input type="checkbox"/> Railway Spatial Structure and Spatial Zone <input type="checkbox"/> System functional breakdown <input type="checkbox"/> Wireless connection <input type="checkbox"/> Track elements (a panel or very small section of track) <input type="checkbox"/> Signal elements <input type="checkbox"/> Overhead Contact Line elements <input type="checkbox"/> Telecom elements
Test Leader TL (e)	Heidi CASTELLANOS LEYRA Romarc BOUDOU Alan BROOK DIAZ
Domain Experts DE (e)	Florian LENTZ – SNCF Valentin HOURDE – SNCF Pingoud Marc SBB CFF FFS Ivano RAMBLADI- RFI Florian HULIN -SNCF Davide SALERNO – Italferr Christophe BLANCHET MinNd Emmanuela PUGLIESE – RFI Annamaria D'ALO' – RFI Francesco LASAPONARA – Italferr Alexander Werfring -OBB Lonis COLLOT – SNCF
Technical Experts TE (e)	Florian HULIN (SNCF)
Software Vendors SW (e)	GeoMedia – ACCA - RailComplete
Test Dataset (e)	SNCF

(a) 2 lines description (b) chose maxi 1 phase and 4 use cases (c) list only domains for the test (d) indicate Covered Unit Test Topics (e) specify names and companies

(*) specify further sub-disciplines

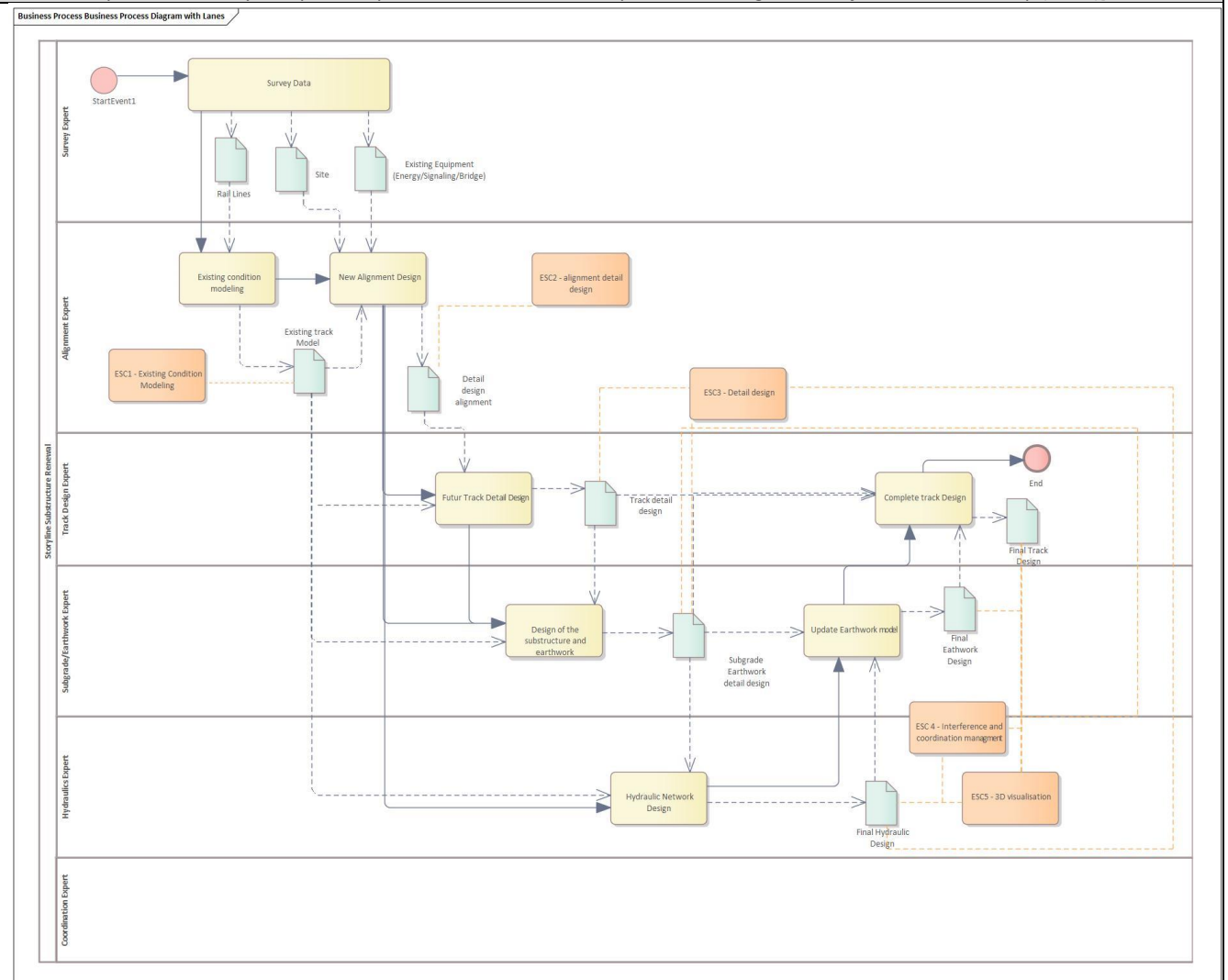
1.2 Updated Storyline Description

Description of the Business case	<p>This data set storyline is part of a Railway liaison between <i>Charles de Gaulle Airport</i> and <i>Paris Gare de l'Est</i></p> <p>Two main lines alignment are redesigned.</p> <p>VA : 300m aprox</p> <p>DA: 900m aprox</p> <p>V1X : 100m aprox</p> <p>Turnouts :</p> <p>BS 4422 tg 0.0654</p> <p>BS 4415 G Tg0.05</p> <p>The new design causes subgrade renewal, earthworks, and the implementation of new drainage system.</p> <p>This case also comprehends a new bridge that is part of the data set but won't be part of the test case.</p> <p>This test case will only concern:</p> <ul style="list-style-type: none"> • Modification of existing tracks • The connection with the new track (Turnout) • The substructure renewal • Drainage system <p>It's to notice that the content of the test, was modified from the original content, which aimed the model of Earthworks and existing infrastructure.</p> <div data-bbox="448 1196 943 1550" data-label="Image">  <p>A satellite map showing the proposed railway alignment (in red) connecting Gare de l'Est in the south to Aéroport CDG in the north. The alignment passes through various suburban areas like Drancy and Tremblay.</p> </div> <div data-bbox="967 1196 1493 1550" data-label="Image">  <p>A detailed satellite map of the Saint-Denis area. It highlights the railway alignment (red line) passing through Zone D, near the Gare de l'Est and the Pont de Soisson. The map also shows the Aéroport Paris-Charles de Gaulle to the north and Aubervilliers to the east.</p> </div>
Duration	<p>Around 3-4 weeks for a complete track/earthworks design.</p>
Aim	<p>The aim of the business study is to define</p> <ul style="list-style-type: none"> • The limits of the substructure renewal • The new subtraction composition and materials • The means needed to construction process • Assure subgrade drainage • If the renewal work is coherent with the track phasing works • The cost of the operation • The geometry of the new substructure
In Scope	<ul style="list-style-type: none"> • Change of horizontal and vertical track alignment

	<ul style="list-style-type: none"> • Change of track material (sleeper/rail/ballast). • Subgrade linear positioning • Drainage linear positioning
Out of Scope	<ul style="list-style-type: none"> • Change of signalling positioning • Change of catenary positing • Third party network impact • Build and maintenance data

Specific Detailed Process Map for this Storyline

[process map that defines realistic exchange scenarios between software applications ; reference to general processes defined in the IFC Rail Requirements analysis report Chapter 2 : IFC Rail Process Map also called High-level Reference Process Map (HLRP)]



HLRP	ES nbr	From	To	Note [optional]
	SLSR- DD -IDA-ES2	Alignment Designer	Everyone	IDA- Intermediate alignment design
	SLSR- DD -ID-ES3	Track Designer Earthworks designer Drainage designer	Track Designer Earthworks designer Drainage designer	ID- Intermediate design

2 Storyline test objective update

The original aim of the test was:

- Checking compelling geometry
- Checking compelling semantics (IFC classes used, and properties)
- Checking IFC FILES structure

The main goal was adapted, according to:

- Project new timeline
- Software vendors participation and interest
- Schema development
- Available checking tools

Test team decided to concentrate on geometry verification, using different tools:

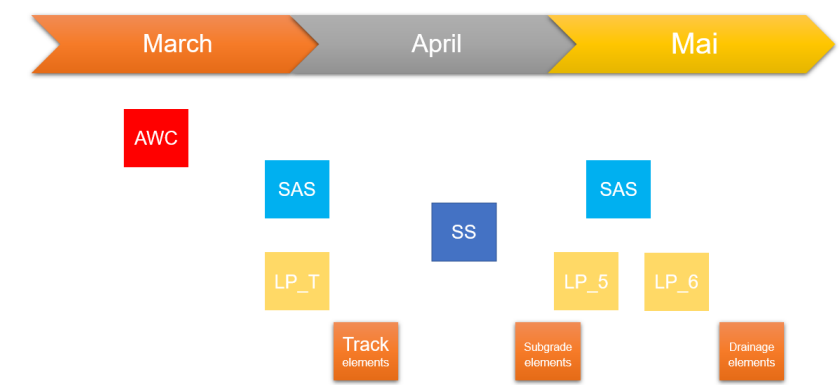
- Viewers available: RDF and ACCA.
- Spread XLS sheets to check compelling X,Y,Z coordinates

The main objective was to check that the geometry generated with the SV IFC Files was compelling with the original data set.

3 Storyline test organisation

Kick-off meeting:

- Presentation of the storyline content
- Test milestones planning
- Presentation of the acting SV
- Expectations from Stakeholders
 - Acceptance criteria



Ritual meetings with SV:

Meetings were organised every 2-3 weeks with active SV involved in the production of the IFC Files and SV acting as observers of the storyline test development. These meetings allowed to the SV to presents their progress on the implementation, uprise blocking points, presenting the next milestone from the test team, and give the feedback concerning the las IFC File publication.

On top of these ritual meetings, meetings were scheduled if a specific topic was to be addressed with TS experts or test team.

4 Exchange Scenario (ES) and Tests

4.1 Exchange Scenario: SLSR-DD-DDA-ES2

4.1.1 Exchange Scenario: SLSR-DD-DDA-ES2

Id	SLSR-DD-DDA-ES2
Detailed Alignment design	
<p>In this scenario, alignment designer takes the line requirements, and adapt the existing track alignment to fulfil the geometrical needs for a higher speed operation. He will then export this information from his domain software to the other domains. He will not only be exporting the alignment but the new line characteristics. The other domains will use this information to develop and start designing their models</p>	
Geometry and positioning requirements <i>[General description / concepts => specific on Excel sheets]</i>	
<ul style="list-style-type: none"> • Alignment (designed main tracks and secondary tracks for turnouts): <ul style="list-style-type: none"> ○ Horizontal Alignment ○ Vertical Alignment ○ Cant Alignment, ... 	
Spatial requirements <i>[General description of spatial element requirements => specific on Excel sheets]</i>	
Physical and functional requirements <i>[General description of physical elements, functional elements and important information => specific on Excel sheets]</i>	
<p>Line requirements of new alignment</p> <ul style="list-style-type: none"> ✓ Line name/ID and nbr, Track id, speed (limit and commercial), key Line characteristics, Traffic axle loads and type (UIC gauging), etc. ✓ For the Horizontal Alignment will need to exchange design properties such as : <ul style="list-style-type: none"> ○ Radius : Applied Cant, Equilibrium Cant, Cant Deficiency, Cant excess ○ Clothoids : cant gradient, cant deficiency gradient 	
Covered Unit Test: to be filled by Technical Expert	
ID	Unit Test
	Alignment Cant

4.1.2 ES Test description and results

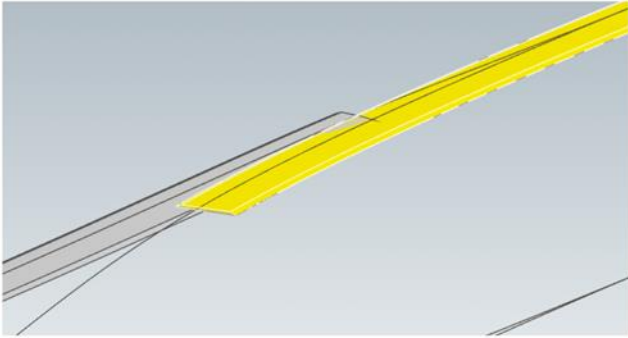
Test Completion (Specify level of completion and if reserves/punchlist opened, additional TS works....)
<p>Software developers involved:</p> <ul style="list-style-type: none"> ○ ACCA ○ RC ○ Geomedia <p>The verification was done manually checking the following information:</p> <ul style="list-style-type: none"> ○ X,Y,Z coordinates of each alignment segment : horizontal, vertical and cant ○ Segment length ○ Segment radius ○ Segment slope ○ Cant Value ○ Cant Stationing placement ○ IFC Classes used in the structure of the file <p>The used viewers are:</p> <ul style="list-style-type: none"> ○ ACCA ○ RDF <p>XLS were used also to compare the original data with the information on the viewers.</p>
Test Team and Test Leader Satisfaction (Specify the Box/Github links to find the test results or documents....)
<ul style="list-style-type: none"> • After some iterations, the results were satisfying. <p>The import test wasn't tested. This part is key to a successful alignment test as:</p> <ul style="list-style-type: none"> • The alignment for a railway project is almost never done in only one software. • The rail alignment should be able to be read by almost every type of modelling software
Tests and Results Archives (Specify the Box/Github links to find the test results or documents....)
<p><u>AWC / Avec la technologie Box</u></p>

4.2 Exchange Scenario: SLSR- DD-DD-ES3

4.2.1 Exchange Scenario: SLSR- DD-DD-ES3

Id	SLSR- DD-DD-ES3
Detail design	
<p>In this exchange scenario</p> <p>Track designer will export :</p> <ul style="list-style-type: none"> - the new track elements : objects and properties <p>Earthworks designer will</p> <ul style="list-style-type: none"> - import the new track design - Design the subgrade renewal and earthworks elements - Export subgrade and earthworks elements <p>Track designer will import :</p> <ul style="list-style-type: none"> - Subgrade and earthworks elements - Model ballast elements - Export ballast <p>Hydraulics designer :</p> <ul style="list-style-type: none"> - Import track and earthworks model - Design new drainage network <p>Earthworks designer :</p> <ul style="list-style-type: none"> - Import drainage design to adapt the geometry of the subgrade) 	
Geometry and positioning requirements <i>[General description / concepts => specific on Excel sheets]</i>	
<ul style="list-style-type: none"> ✓ Linear reference system ✓ Sweep geometry alignment cant : track and earthworks ✓ Chainage of the new track ✓ Chainage of the substructure renewal area ✓ Linear positioning drainage and track ✓ Linear span placement for drainage, track, earthworks 	
Spatial requirements <i>[General description of spatial element requirements => specific on Excel sheets]</i>	
<ul style="list-style-type: none"> ✓ Spatial structure 	
Physical and functional requirements <i>[General description of physical elements, functional elements and important information => specific on Excel sheets]</i>	
<ul style="list-style-type: none"> ✓ Track objects and properties ✓ Track system properties: ballast requirements (depth mini ballast , type ballast) ✓ Earthworks objects, properties: subgrade layers, cut and fill, functional link between,. ✓ Drainage objects and properties 	
Covered Unit Test: to be filled by Technical Expert	
ID	Unit Test
	Swept area solid
	Linear placement
	Linear Span Placement (from-to)
	Track elements
	Drainage elements
	Spatial Structure

4.2.2 ES Test description and results

Test Completion
(Specify level of completion and if reserves/punchlist opened, additional TS works....)
<p>IFCRail classes not completely implemented: Ballast bed and subgrade are still a proxy and not an IFCRail Class</p> <p>Geometry representation issues that could be explain by the SV native 3d model</p>  <p>Verification limits and constraints:</p> <p>We are not able to access de geometry</p> <ul style="list-style-type: none"> • Verification not possible of the storyline requirements • Verification of the geometry construction with the IFC file not possible <p>The screen shots are useful, but test team needed complementary data to validate this test as satisfactory.</p> <ul style="list-style-type: none"> • Additional data was required to allow the verification process: • XLS From-to position (with AL chainage) • 3D DXF or DwG export • Cross sections in a DXF or DwG export • XLS points --> cloud point <p>To be noticed, that the import test wasn't carried out, due to a lack of time and interest from the SV.</p>
Test Team and Test Leader Satisfaction
(Specify the Box/Github links to find the test results or documents....)
<ul style="list-style-type: none"> • The test wasn't satisfactory
Tests and Results Archives
(Specify the Box/Github links to find the test results or documents....)
<p>Software Vendors Working Folder / Avec la technologie Box</p>

5 Supporting Files and Storyline Archives

5.1 Exchange Requirements (ER)

[Exchange requirements / Avec la technologie Box](#)

5.2 SL Data archives

[Subgrade renewal / Avec la technologie Box](#)

5.3 Test Dataset(s)

[Unit test / Avec la technologie Box](#)