

**buildingSMART International**  
Railway Room

# IFC Rail Phase 2 Report

## Executive Summary

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## 1. INTRODUCTION

This report summarises the results, organisation, methodology, scope and other essential information of the IFC Rail Project Phase 2. The purpose of this report is to prove the progress of the IFC Rail Project Phase 2, together with the deliverables which are submitted to the buildingSMART International (bSI) Standard Committee Executive (SCE) (main documents only, details see Chapter 4):

- IFC Rail Unit Test Report
- IFC Rail Implementers Forum Report
- IFC Rail Storyline Validation Report
- IFC 4.3 Specification
- IFC Rail UML Report 2.0
- IFC Rail Property Set Report
- IFC Rail Data Requirements in OntoRail
- IFC Property Sets for bSDD
- Alignment based Reference View
- Test Instructions.

IFC Rail Phase 2 is the continuation of the IFC Rail Project after the completion of Phase 1 in Q1 2020. Documents are available on the bSI servers.

The results of IFC Rail Phase 2 were elaborated within two years by

- **Domain Experts** who are skilled in design, construction, management, operation for rail infrastructure to define the business storylines,
- **Technical Experts** for data modelling of linear assets and neighbouring domains,
- **Experts from other infrastructure domains** such as bridge, road, ports & waterways and
- **Software Vendors** in the IFC Rail Implementers Forum. Storylines were formulated by stakeholder representatives and implemented by Software Vendors to find general usages of the schema in real business cases.

These requirements are thus expanding the 'classical' use of IFC which are seen benefitting the design stage of buildings. Key of this extension is the previously mentioned target of supporting maintenance processes. Thus, a lifecycle view on data is introduced resulting in a demand driven approach.

Examples on logical and technical level are the importance of alignment, parts of the assets and sites having geometric dimensions of hundreds of kilometres whilst maintaining high numeric precision, implementing, or referring to existing data concepts which are already used by the stakeholders, topological descriptions, requirements to represent legal ownership, etc.

One key finding is the ability to have localisation and alignment of the standard.

## 2. PROJECT ORGANIZATION

In 2017 CRBIM and 7 European rail infrastructure managers decided to step in the development of a common strategic concept and implementation strategy for the digitalization of rail infrastructure under the flag of the Building Information Modelling (BIM) idea to bring the digitalization of rail infrastructure one step further. In 2015, CRBIM publicly released the first IFC Rail Specification for the railway industry at bSI. These became the foundation of the IFC Rail Project Proposal and the IFC Rail consortium. After Phase 1 from 2018-2019 the stakeholders decided to run a Phase 2 in the years 2020 and 2021, which is finalized in early 2022.

The stakeholders of the IFC Rail Project Phase 2 are:

- Austria: ÖBB-Infrastruktur AG
- China: CRBIM
- Finland: Väylävirasto
- France: MINnD and SNCF Réseau
- Italy: RFI
- Sweden: Trafikverket
- Norway: Bane NOR
- Denmark: Banedanmark
- Switzerland: SBB Infrastruktur

The IFC Rail Project organisation for the Phase 2 (April 2020 – Jan 2022) is summarised in the diagram below.

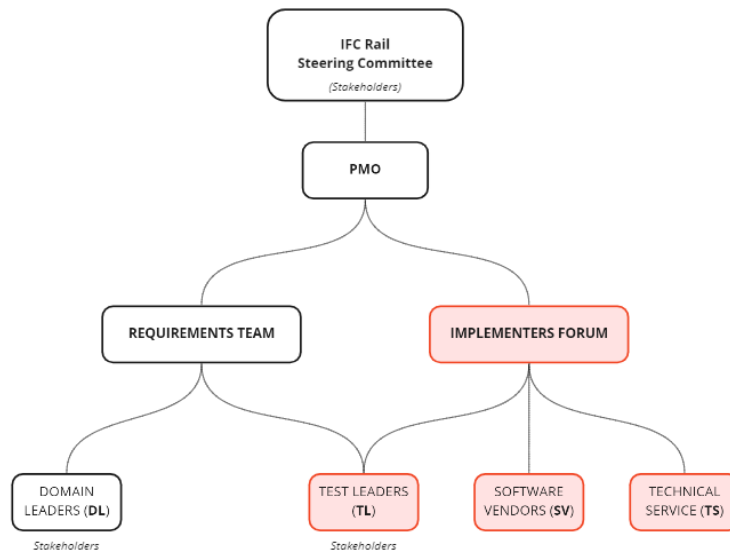


Figure 1 IFC Rail Phase 2 Project Organization

- **IFC Rail Project Steering Committee:** The highest decision and lead body of the project and commissioned by the stakeholders in the consortium agreement to oversee the IFC Rail Project. IFC Rail has monthly steering committee meeting to report and comment on the progress of the project.
- **Project Management and PMO:** The IFC Rail PMO is an international, multicultural, multidiscipline, and multilingual team with representants from all over the world. It is one of the key-success-factors to bring rail-experts, modelling-experts, and management capacity together to a goal-oriented working mode in a highly complex subject. To deal with the different national requirements towards an international standard is also a challenging discipline itself.
- **Technical Service Team:** This group was responsible for the development of all methods, processes and toolsets which are necessary to deploy the IFC Rail standard together with the CTO-Office from bSI. Furthermore, the group is responsible for quality assurance as well to formalize business requirements (storylines) to be understood by Software Vendors. The running redesign of bSI processes and toolbox was an important factor to be respected for the sustainability of IFC 4.3 Standard. The work of the Technical Service Team (namely, process and methodology summarised in the following paragraphs) is now proposed as part of the new reference methods and toolset in bSI. bSI relies also on this work to carry the standard forward to the ISO certification, which should be published in 2023.
- **Implementers Forum:** IFC Rail Implementers Forum provides the basis to track progress of the unit tests and storyline testing and to report back to the stakeholders. It plays a key role in the communication and coordination between the Software Vendors, Test Leaders and the Technical Service Team.

The pandemic did not stop a good communication in between Test Leaders, Rail Domain Leaders, Technical Service Team, Software Vendors and PMO. From April 2020 to January 2022, hundreds of meetings were organized through Zoom and Microsoft Teams. Besides,

there are more than 100 PMO meetings and dozens of liaison meetings with bSI Infrastructure Room.

Figure 3 below shows the official meetings organized in Phase 2.

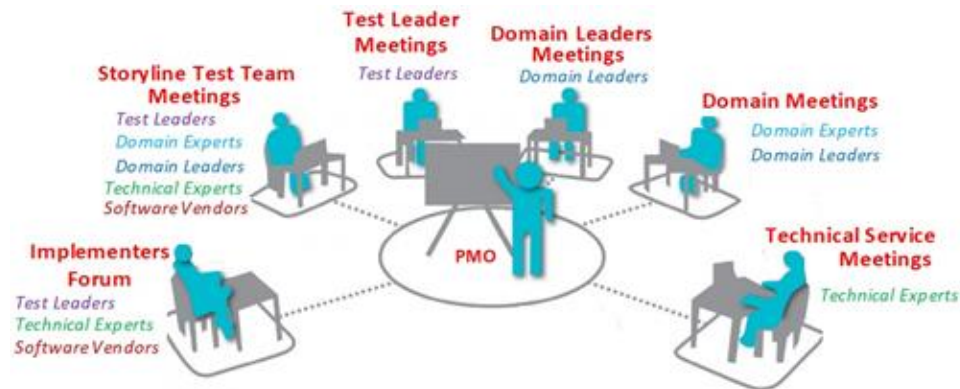


Figure 2 IFC Rail Phase 2 Project Teams

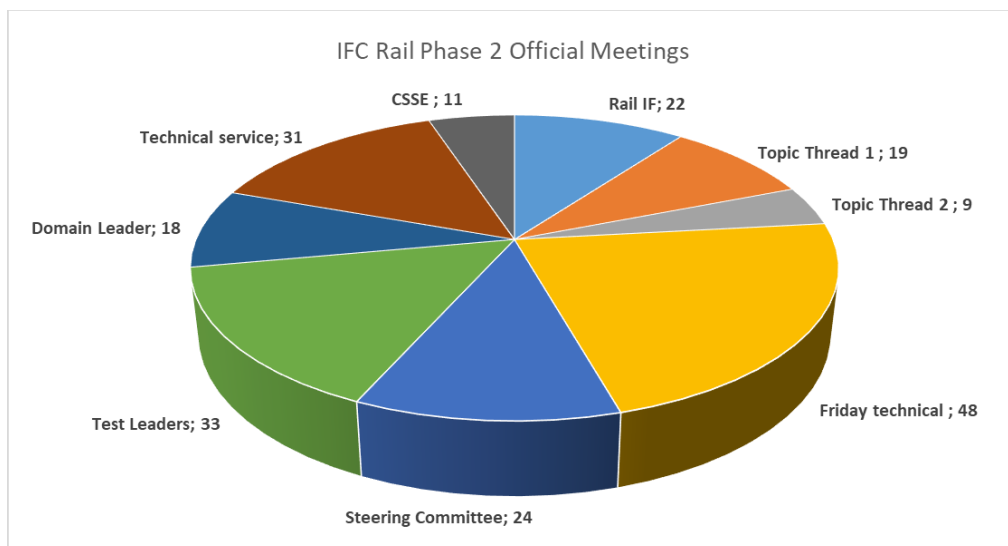


Figure 3 IFC Rail Phase 2 Official meetings

### 3. RELATIONSHIP WITH OTHER PROJECTS AND DOMAINS

To achieve the common goal, the extension of IFC 4.3, the interaction with the other projects and overlapping topics is an inherent task of the IFC Rail Project. The project organisation was taken into consideration by the creation of the working group "Common Schema" (see *Figure 4*). A specific focus was made on Railway Alignment to satisfy Rail Domain needs for cant, linear placement and geometry.

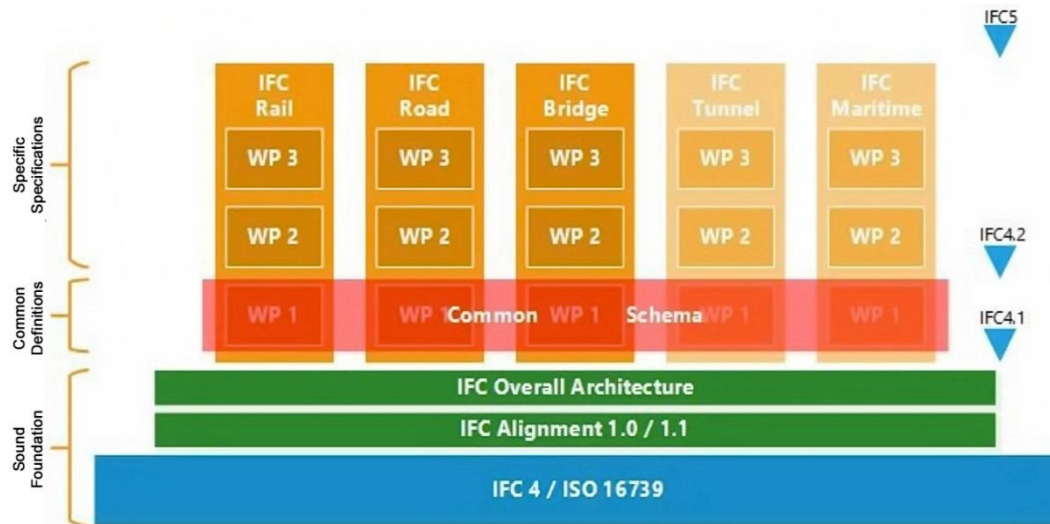


Figure 4 IFC Rail Project in the context of IFC and bSI roadmap

## 4. DELIVERABLES

The official deliverables of the IFC Rail Project Phase 2 are organised by work packages according to the project proposal. The overall structure is shown in *Figure 5*. The major content of each work package is described as follows.

### 4.1 WORK PACKAGES

- **WP1:** focuses on unit tests executed by Software Vendors for railway-relevant parts in IFC 4.3. The IFC Rail Unit Test Report describes the methodology, organisation, and work break structure for implementing unit tests. It also summarises the results, including statistics of work performance, issue collection and update for key subjects in the standard. The details are documented in appendices, including list of Software Vendors, IFC files produced by vendors and their descriptions, test coverage, and rework report for alignment. The IFC Rail Implementers Forum Report summarises the performance of Software Vendors in unit tests and storylines. It can serve as an important reference for project stakeholders for business planning. Besides, all the IFC files and reference code during test processes are delivered in GitHub repositories.
- **WP2:** focuses on validation for storylines. The Storyline Validation Report describes aims and scope, description, realization process and methodology, organization of test teams, and overview of results. There are 11 storylines conducted by the project, each of which is reported as a Storyline Implementation Report in appendices.
- **WP3:** focuses on property set definitions as input for buildingSMART Data Dictionary (bSDD). The Property Set Report documents the process, scope and results of property sets that are defined or updated in IFC Rail Phase 2. There are in total 156 new property sets and quantity sets defined, and 24 property sets and quantity sets updated. They are a part of IFC 4.3 specification that is submitted to ISO. They are also provided as input for bSDD to be further maintained and used by Software Vendors.
- **WP4:** focuses on updating the IFC 4.3 standard and all the relevant UML models that are developed in IFC Rail Project Phase 1. Based on test and validation in WP1 and WP2, IFC 4.3 schema is significantly updated together with concept templates and documentation. This work is collaboratively finished with bSI Infrastructure Room and bSI IFC 4.3 release team. The IFC 4.3 specification is submitted to ISO and will be published as bSI final standard. Its UML counterpart is generated and reported in IFC Rail UML report. The Conceptual Model Report and Mapping Diagram Report are also updated accordingly.
- **WP5:** focuses on collaboration with external standardisation initiatives. IFC Rail conceptual model and data requirements<sup>1</sup> are provided to UIC OntoRail platform, which shares railway-focused ontologies from different organizations.
- **WP6:** focuses on Alignment based Reference View (AbRV), which is collaboratively developed with bSI Infrastructure Room as a subset of IFC 4.3 under the guidance from bSI. It is a generic Model View Definition (MVD) that contains the fundamental concepts in infrastructure and railway including georeferencing, alignment, linear placement, infrastructure-focused parametric geometry, railway elements, bridge elements, road

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<sup>1</sup> Data Requirements Report is a deliverable in IFC Rail Project from 2018 to 2019. It is available on: [https://buildingsmart-1xbd3ajdayi.netdna-ssl.com/wp-content/uploads/2019/10/RWR-IFC\\_Rail-Data\\_Requirements\\_Report\\_-\\_pdf](https://buildingsmart-1xbd3ajdayi.netdna-ssl.com/wp-content/uploads/2019/10/RWR-IFC_Rail-Data_Requirements_Report_-_pdf).



elements and ports and waterway elements. It is a superset of Reference View (RV), so it also contains a minimum set of building domain concepts. Test Instructions are created for essential exchanges in this MVD and provided to bSI as material input for certification.

- **WP7:** focuses on communications in the project. The main deliverable is the Final Report Executive Summary for the project (this document). In addition, Steering Committee meeting minutes, other project meetings, minutes and recordings are shared to project stakeholders as an internal deliverable.

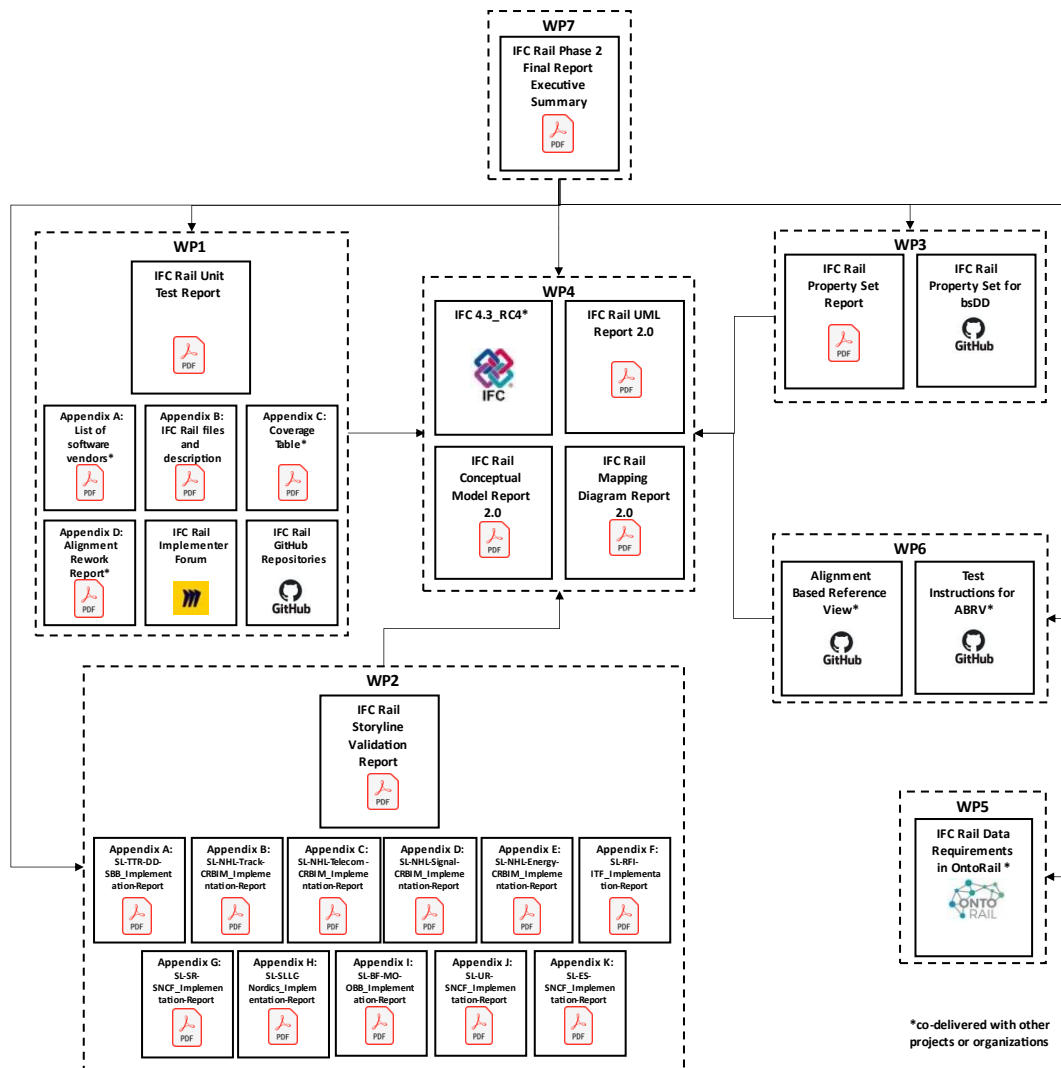


Figure 5 IFC Rail Phase 2 deliverable structure

## 4.2 OVERVIEW OF DELIVERABLES:

All official deliverables of IFC Rail Project Phase 2 are shown in Figure 5 and specified in Table 1: DeliverablesTable 1.

Table 1: Deliverables

WP	Deliverable ID	Deliverable Name
WP7	RWR-IFC-Rail-P2-WP7	IFC Rail Phase 2 Final Report – Executive Summary
WP1	<a href="#">IR-2021-1039-PS-B</a>	IFC Rail Unit Test Report
	<a href="#">IR-2021-1039-PS-F</a>	Appendix A: List of Software Vendors
	<a href="#">IR-2021-1039-PS-G</a>	Appendix B: IFC Rail Files and Description
	<a href="#">IR-2021-1039-PS-I</a>	Appendix C: Coverage Table
	<a href="#">IR-2021-1039-PS-J</a>	Appendix D: Alignment Rework Report
	<a href="#">RWR-IFC-Rail-P2-WP1-A</a>	IFC Rail Implementers Forum Report
	<a href="#">RWR-IFC-Rail-P2-WP1-B</a>	Repository: IFC Rail Sample Files
	<a href="#">RWR-IFC-Rail-P2-WP1-C</a>	Repository: IFC Rail Unit Test Reference Code
WP2	<a href="#">RWR-IFC-Rail-P2-WP2</a>	IFC Rail Storyline Validation Report
	<a href="#">RWR-IFC-Rail-P2-WP2-A</a>	Appendix A: Storyline Implementation Report – Track Turnout Renewal - SBB
	<a href="#">RWR-IFC-Rail-P2-WP2-B</a>	Appendix B: Storyline Implementation Report – New HS Line - Track - CRBIM
	<a href="#">RWR-IFC-Rail-P2-WP2-C</a>	Appendix C: Storyline Implementation Report – Design a New HS Line - Telecom - CRBIM
	<a href="#">RWR-IFC-Rail-P2-WP2-D</a>	Appendix D: Storyline Implementation Report – Design a New HS Line - Signalling - CRBIM
	<a href="#">RWR-IFC-Rail-P2-WP2-E</a>	Appendix E: Storyline Implementation Report – Design a New HS Line - Energy - CRBIM

	<a href="#">RWR-IFC-Rail-P2-WP2-F</a>	Appendix F: Storyline Implementation Report – Acquisition and Upgrade of an Existing Railway Line – RFI+Italferr
	<a href="#">RWR-IFC-Rail-P2-WP2-G</a>	Appendix G: Storyline Implementation Report – Subgrade Renewal - SNCF+MINnD
	<a href="#">RWR-IFC-Rail-P2-WP2-H</a>	Appendix H: Storyline Implementation Report – Level Crossing – Trafikverket+FTIA
	<a href="#">RWR-IFC-Rail-P2-WP2-I</a>	Appendix I: Storyline Implementation Report – Tamping BIM2Field2BIM - OEGB
	<a href="#">RWR-IFC-Rail-P2-WP2-J</a>	Appendix J: Storyline Implementation Report – Urban Railway Infra-System Integration - MINnD
	<a href="#">RWR-IFC-Rail-P2-WP2-K</a>	Appendix K: Storyline Implementation Report – ERTMS (System and Design of Technical Rooms and Wired Network) - SNCF
WP3	<a href="#">RWR-IFC-Rail-P2-WP3</a>	Property Set Report
	<a href="#">RWR-IFC-Rail-P2-WP3-A</a>	Repository: IFC 4.3.x property sets for bSDD
WP4		IFC 4.3 Specification
	<a href="#">RWR-IFC-Rail-P2-WP4-A</a>	Conceptual Model Report (V 2.0)
	<a href="#">RWR-IFC-Rail-P2-WP4-B</a>	IFC Rail UML Report (V 2.0)
	<a href="#">RWR-IFC-Rail-P2-WP4-C</a>	Mapping Diagrams Report (V 2.0)
WP5	<a href="#">RWR-IFC-Rail-P2-WP5-A</a>	Database: IFC Rail Data Requirements in OntoRail
WP6	<a href="#">RWR-IFC-Rail-P2-WP6-A</a>	Alignment based Reference View (AbRV) Scope
	<a href="#">RWR-IFC-Rail-P2-WP6-B</a>	Repository: MVD Test Instructions

The internal deliverables of the IFC Rail Project Phase 2 are the UML model in XML format and project meeting minutes. They are not published as official deliverables but are delivered to project stakeholders.

- **UML model in XML:** belongs to WP4. the UML model formatted in XML, which contains the IFC Rail conceptual model, mapping diagrams and IFC 4.3 in UML including schema and property sets. It is the source to generate chapters in Conceptual Model

Report, Mapping Diagrams Report, IFC Rail UML Model Report and Property Sets Report.

- **Project meeting minutes** belongs to WP7. Minutes for official meetings organized in IFC Rail Project Phase 2, including Steering Committee meeting, Implementers Forum meeting, PMO and Test Leaders meeting.

## 5. METHODOLOGY

Due to the large size and comprehensiveness of IFC Rail Project Phase 2, different processes are applied in different work packages and tasks.

The primary methodology is a test-driven approach for software implementation and validation applied in WP1 and WP2. As shown in Figure 6, a storyline defines a realistic process in a railway project, which consists of one or more exchange scenarios, where topics or functions for unit tests are derived. Based on implementations performed by Software Vendors, the entire process goes through “testing, verification and validation” to ensure that implementations and the underlying IFC standard fulfil business requirements in the railway industry. During this process, issues and feedback are collected from Software Vendors, Technical Service Team, and Test Team members. They are taken as input for updating the IFC standard in WP4.

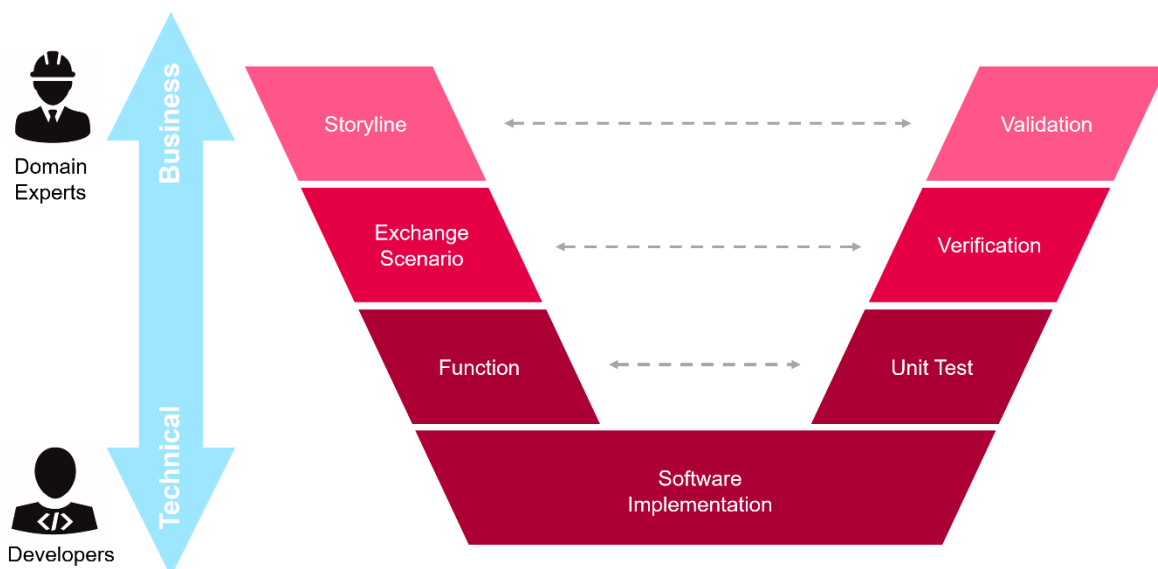


Figure 6 Structure of the test-driven methodology applied in WP1 and WP2

A quality assurance process is applied in WP3, WP4 and WP6 to update the IFC standard, define property sets and the MVD. As a shared data model, IFC contains many common concepts across infrastructure domains. Therefore, updates on IFC usually require experts from different domains to assess. In WP3, WP4 and WP6, each proposed update is assigned to at least two reviewers to control the quality. Based on the feedback, the proposal will be updated until it is approved by all the reviewers. This process is shared by IFC Rail Project Phase 2 and Infrastructure Room projects. It is conducted on a common GitHub repository, in which “pull requests” are used to manage proposals.

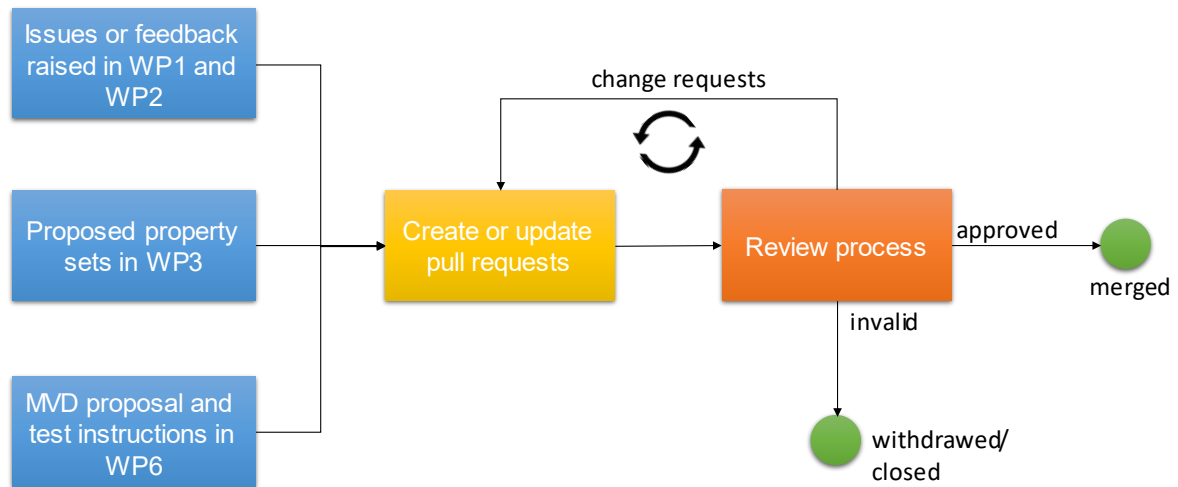


Figure 7 General quality assurance process for updating the standards

## 6. STAKEHOLDERS EXPECTATIONS

During this project, one of the objectives for the stakeholder was to test the IFC Rail implementation carried out by Software Vendors in realistic configuration and get business-oriented results to satisfy the end users (i.e., signalling or track engineers, etc.).

Each stakeholder defined the most adequate storyline according to its needs and expectations. All storylines were based on existing projects to make sure the end users will be able to check the rail domain results.

Table 2: Overview of Storylines

Country	Stakeholder	Storyline Title	Business-oriented Storyline Project
Austria	ÖBB	BIM2Field2BIM	Tamping works on ÖBB+FTIA+SBB+SNCF Railway Lines
China	CRBIM	New High Speed Line (HSL): Track	Jakarta-Bandung Jakarta-Bandung
China	CRBIM	New High Speed Line (HSL): Energy	Xi'an to Shiyao High-Speed Railway Line
China	CRBIM	New High Speed Line (HSL): Signaling	Lu-nan High-Speed Railway Line
China	CRBIM	New High Speed Line (HSL): Telecom	Wuhan-Xiangyang-Shiyao High-Speed Railway Line
Finland, Sweden, Norway, Denmark	TFIA, Trafikverket, Bane NOR, Banedanmark	Level Crossing	Existing Level Crossing Modernization
France	SNCF / MINnD	Subgrade Renewal	Charles de Gaulle Airport to Paris Gare de l'Est Railway Liaison
France	MINnD	Urban Railwayinfra-System Integration	New Urban Railway Project in France
France	SNCF	European Rail Traffic Management System (ERTMS)	Cannes-Grasse Railway Line
Italy	RFI	Acquisition and upgrade of an existing railway line	Cancello – Benevento Railway Line
Switzerland	SBB	Track Turnout Renewal	Track Renewal (FbE) Z0, Basel GB Gl. Z19-Z21, W 895, 897

The selections of the rail domains, the use cases, the BPMN main phase and the type of construction (new construction, renewal works, modernization or line upgrading) to be tested for each storyline, were agreed with PMO in order to guarantee the complete coverage of each subject.

Through various storylines, our goal was to test in existing project situation all the cases and make sure the end users such as trackwork engineers, telecom designers, etc. were able to understand, utilize and perform their activities using the IFC specification.

In the following table, the selected and agreed subjects are summarized per storyline. For more details, please refer to the IFC Rail Storyline Validation Report in which all the Storyline Implementation Reports are provided in appendices.

Table 3: Subject by Storyline

		SBB	CRBIM	CRBIM	CRBIM	CRBIM	RFI	SNCF / MINnD	Nordics	ÖBB	MINnD	SNCF
		Track Turnout Renewal	New High Speed Line (HSL): Track	New High Speed Line (HSL): Energy	New High Speed Line (HSL): Signaling	New High Speed Line (HSL): Telecom	Acquisition and upgrade of an existing railway line	Subgrade Renewal	Level Crossing	BIM2Field2BIM	Urban Railway infra-System Integration	European Rail Traffic Management System (ERTMS)
Project Types	New Construction		X	X	X	X					X	
	Renewal	X						X		X		
	Modernization / Upgrade						X		X			X
Domains	Alignment	X	X	X	X	X	X	X	X	X	X	
	Track	X	X	X	X	X	X	X		X	X	
	Energy			X		X	X				X	-
	Signaling			X	X		X		X		X	X
	Telecom					X	X				X	X
	Infra: Earthworks, Geotechnic, Drainage, Bridge, Tunnel, Road, Utilities, Railway station(s), Subgrade, Building rooms (bui), Station Yard (sy)		EB	rsBSbr	sySbr	br	BT	EGD	R		RBDU	
Phases	Planning						X					
	Intermediate Design										X	
	Detailed Design	X	X	X	X	X		X	X		X	X
	Build									X		
	Operation & Maintenance						X			X		
Use cases	ECM - Existing Condition Modeling	X	X				X		X		X	X
	RDM - Railway Design Modeling	X	X	X	X	X		X	X		X	X
	ICM - Interference and Coordination Management			X	X	X			X		X	X
	3DV - 3D Visualization	X	X	X	X	X	X		X		X	X
	QTO - Quantity Take-off	X	X	X	X	X	X		X			
	INMP - Information Needed for Maintenance Perspective									X		

A Test Leader (stakeholder representative) was responsible of a storyline and all tests were carried out by some Software Vendors integrated in the Test Team where at least one dedicated Technical Expert was identified (mainly from the stakeholder) and all required Infrastructure or Rail Domain Experts (from stakeholders) were staffed. The following table shows all stakeholder contributions within all storylines.

Table 4: Stakeholder contribution by Storyline

	Stakeholders					
Storyline	Austria	China	Italy	Nordics	France	Switzerland
BIM2Field2BIM ÖBB	TL			C	C	C
New HSL Track CRBIM		TL				
New HSL Energy CRBIM		TL				
New HSL Signaling CRBIM		TL	C			
New HSL Telecom CRBIM		TL			C	
Level Crossing Nordics			C	TL		
Substructure Renewal SNCF			C		TL	C
Infra-System integration MINnD			C		TL	C
ERTMS SNCF		C	C		TL	
Acquisition / upgrade line RFI			TL		C	C
Track Renewal SBB					C	TL

TL=Test leaders C=Contribution



## 7. INVOLVEMENT OF SOFTWARE VENDORS

As software implementation is the essential work in IFC Rail Project Phase 2, the challenge is to onboard and motivate Software Vendors during the development of the standard. IFC Rail Implementers Forum is established to respond to this challenge. The IFC Rail Implementers Forum is the organization onboarding and managing communication with Software Vendors. It is a global initiative, involving 10 railway stakeholders of the project and 28 Software Vendors from 16 countries. Figure 8 captures the participation of the forum and its cross-continental coverage.

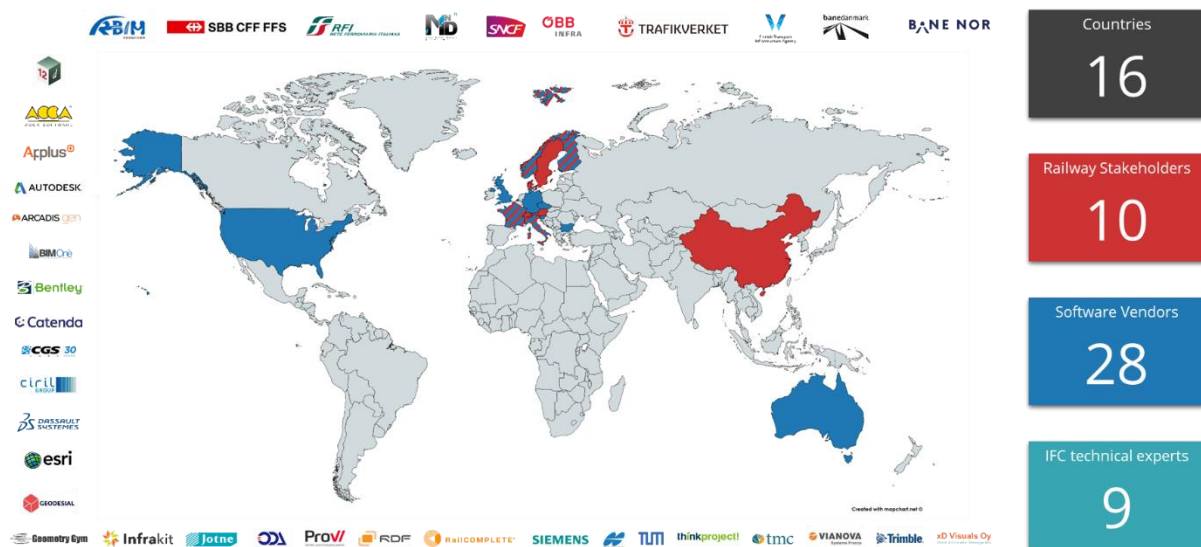


Figure 8 Participation of IFC Rail Implementers Forum and its cross-continental coverage

Under the IFC Rail Implementers Forum, series of meetings are organized with Software Vendors to discuss test activities of the standard on different levels and aspects. Official meetings with them are listed as follows:

- **Implementers Forum Meeting:** high level meeting focuses on coordination and communication with Software Vendors to identify common interests, communicate general progress and facilitate organizations.
- **Unit Test Topic Meetings:** focuses on specific topics and cases for unit tests. Meetings are grouped into three series.
- **In-depth Technical Discussion on IFC 4.3:** focuses on technical issues identified during implementation of IFC 4.3, participated by Software Vendors and Technical Service Team from IFC Rail and Infrastructure Room projects.
- **Storyline Meetings:** organized by each Test Leader for a storyline, participated by the Test Team and Software Vendors who join the storyline.

The collaboration with Software Vendors is managed on a project GitHub repository, that has in total received 1189 commits. As requested by the Stakeholders of the project, Software Vendors' activities are monitored through some key performance indicators (KPIs) to derive the level of engagement and the level of success. The Forum has been able to consistently produce a monthly report to the Steering Committee.

## 8. COLLABORATION WITH BSI INFRASTRUCTURE ROOM PROJECTS

In parallel with IFC Rail Project Phase 2, there are two projects in bSI Infrastructure Room that share the same goal. An IFC railway model relies on many common subjects shared with other infrastructure domains, including georeferencing, alignment, linear placement and stationing, parametric geometry, spatial structure, system and functional structure, and shared elements such as drainage, cabling, and earthworks. These common subjects usually require much more efforts to be invested by Software Vendors than those required by domain-specific ones. Therefore, intensive collaboration with bSI Infrastructure Room projects is important for consensus finding in the standard and consistent implementation among Software Vendors.

The collaboration is organized through uncountable technical meetings and common repositories on GitHub to update the standard led by bSI Infrastructure Room projects.

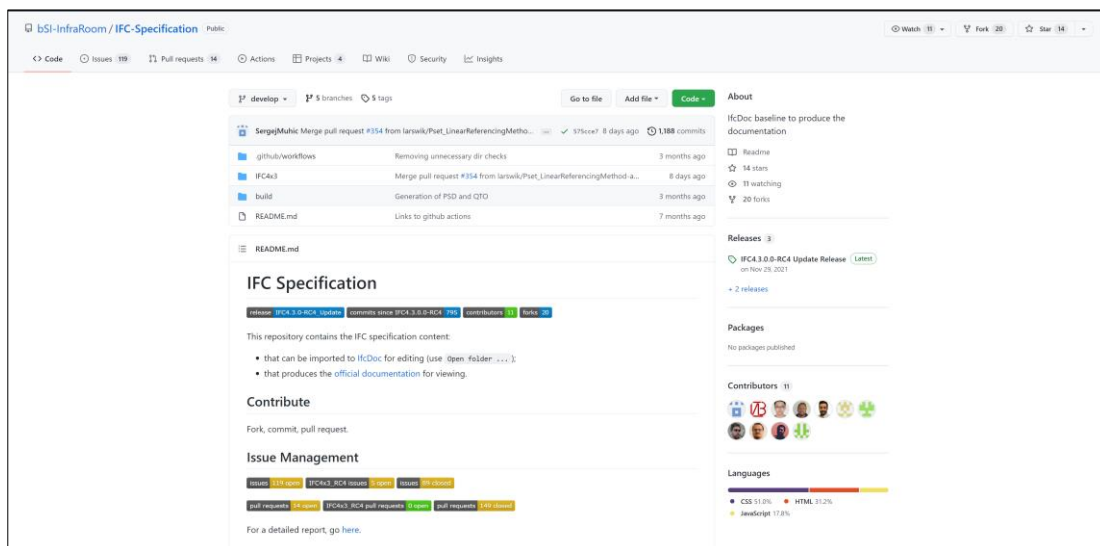


Figure 9 Common GitHub repository for collaboration with bSI Infrastructure Room projects

Collaborations are mainly in WP1, WP3, WP4 and WP6. Results are reflected in deliverables of these work packages (Figure 5). As the most fundamental deliverable, the IFC 4.3 standard has been updated through more than 100 pull requests, more than 500 commits and uncountable discussions tracked in GitHub or meeting minutes. This collaborative process has been proven to be essential to deliver a consistent standard with high-quality across infrastructure domains.

## 9. COOPERATION WITH UIC

UIC cooperated with bSI based on a formal cooperation agreement. First contacts were established in early 2016, where IFC Rail and UIC RSM (Rail System Model) projects were found to be complementary: the aim of the UIC is to embrace the full functional aspects of rail over their whole lifecycle, including but not limited to the construction and the hardware aspects. For its part, bSI had not intention to extend IFC by IFC Rail and Road, not however to duplicate standards.<sup>2</sup>

UIC cooperation was a complement to the considerable involvement of six major European railway companies, further developing the initial contributions by the China Railways BIM Alliance.

Consistency between IFC and RSM was already partially ensured by reliance on other industry standards, such as those promoted by the OGC (Open Geospatial Consortium). Semantic consistency was identified as an important subject, to be addressed by a common data dictionary.

Common works include the finalizing of track geometry (the alignment topic in IFC) and its formal link with network topology provided by RSM. Another shared subject was the methodology and the model for defining net properties, i.e., properties assigned to whole lines or corridors or networks such as “electrified” or “B loading gauge”. Conceptual alignment of the IFC Rail and RSM models was also achieved for the Track, Energy, and Signalling subsystems, leading to the release of RSM 1.2 in 2021.

Currently, UIC promotes the integration of, inter alia, IFC Rail classes and terminology in the Common Data Model developed by the Linx4Rail project under Shift2Rail. For that purpose, ontologies extracted from IFC Rail are contributed by bSI in view of integration in Ontorail.org, the UIC online dictionary.

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<sup>2</sup> Reference: UIC-bSI meeting minutes, 27/1/2016

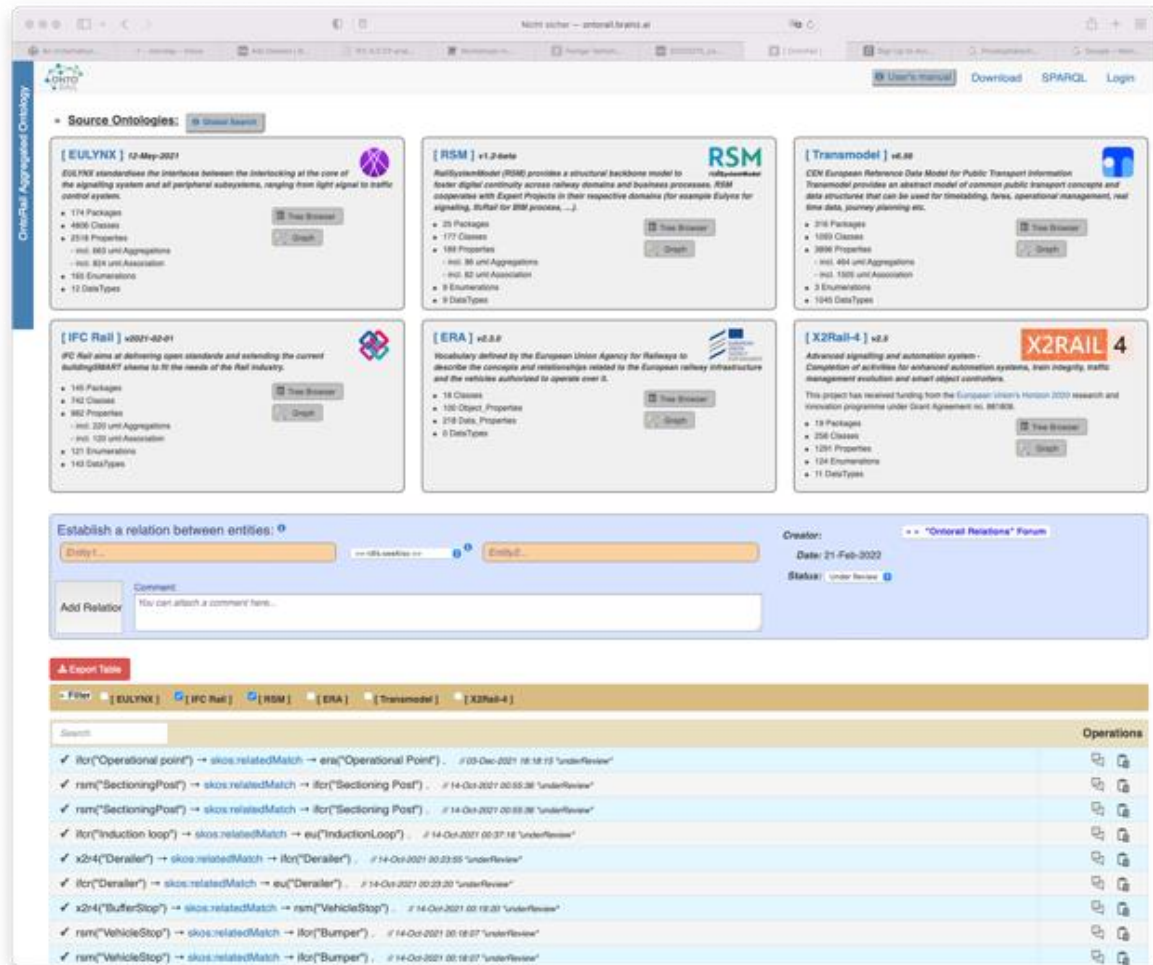


Figure 10 OntoRail.org: Cooperation bSI and UIC on basis of different standardisation initiatives

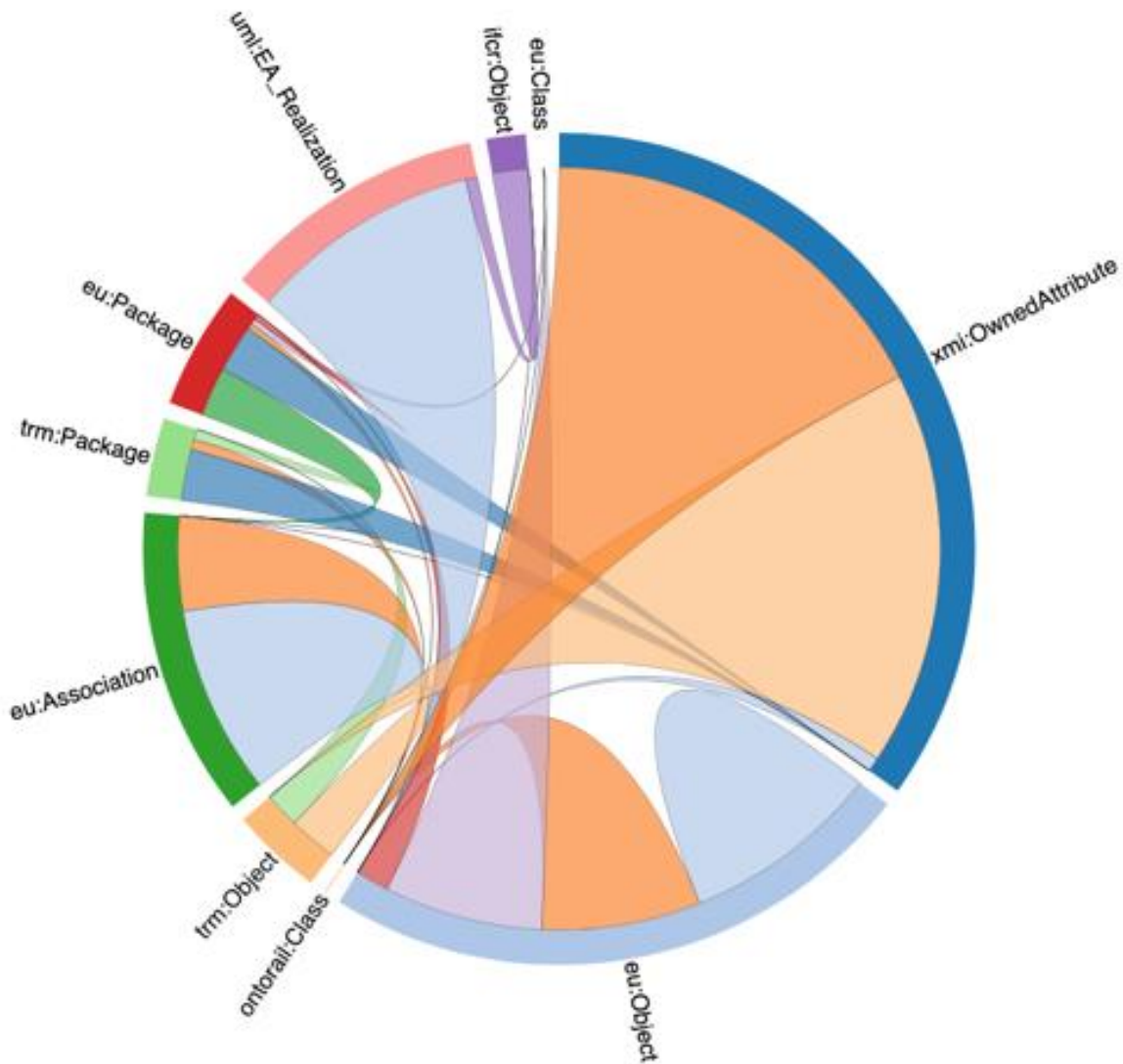


Figure 11 *OntoRail.org: Status of relationships*

UIC places many hopes in further cooperation with bSI to promote and federate consistent shared models that are open for a wide range of use cases and will foster the development of robust IT solutions.

## 10. FINANCIALS

### 10.1 BUDGET

The stakeholders agreed on a cash budget totalling EUR 2'100'000, - The budget was equally distributed between 6 seats (i.e. EUR 350'000/seat) with one vote in the project steering committee for each seat. But it was also agreed that a seat can be split between amongst additional parties (stakeholder) to allow more stakeholders to contribute.

*Table 5: Budget*

IFC Rail 4.3. Phase 2 Budget - Contributors April 2021 - March 2022	CRBIM	OBB	RFI	SBB	France MINnD/SNCF	Nordics TRV/FTIA/Banedenmark/BaneNor
Total Contributions (EUR)	2'100'000	350'000	350'000	350'000	350'000	350'000

In addition, there was a reserve in the amount of EUR 233'819, - coming from the project IFC Rail Phase 1. All stakeholders agreed to transfer the full amount to this project. As a result, the total budget totalled EUR 2'333'819, -

The budget was broken down as below:

*Table 6: Budget positions*

IFC Rail 4.3. Phase 2 Budget Positions April 2021 - March 2022	
PM/PMO Services	1'097'000
Prog. Mgmt. Communication	70'000
Tech Services	789'000
Travel	60'000
bSI Mgmt charge (4% total funding)	84'000
total Contributions	2'100'000
carry forward from Phase 1	233'819
total available for Project	2'333'819

*During the project, it was also agreed that any unused travel funds will be assigned to Technical Services.*

*As in the previous project there were also in-kind contributions from stakeholders in the form of Domain Experts, Test Leaders, Business Experts. In addition, Software Vendors contributed via representatives at the "Implementers Forum" and other in-depth technical discussions with technical experts.*



## 10.2 ACTUALS

As in the previous project, bSI and PM (applitec) have agreed that PM/PMO runs all payments to third parties with detailed reporting of expenditures to bSI. For that purpose, PMO continued to use the already established separate bank account (Fiduciary Account) where all payments to third parties as well as all reimbursements from bSI were executed. All transactions had been reported in detail to bSI and the balances of the bSI internal reporting and the Fiduciary Account have been reconciled. bSI has reported no issues on the financial reporting of the project or on any payments made.

Execution of the project:

Project work has started April 18<sup>th</sup>, 2021, and was finished March 28<sup>th</sup>, 2022, so the project could be completed within the planned time frame.

PM/PMO/Communication/bSI Fees services had been charged according to budget, Technical Services, Travel, and all expenses were reimbursed against presentation of reports of hours worked and/or receipts.

At the time of the drawing of this report not all invoices have yet reached the project office, therefore an accrual of EUR 70'000 has been set up to account for the outstanding cost.

As of March 10<sup>th</sup>, a total of EUR 2'055'235 had been spent. Under the consideration of the contingency of EUR 70'000 the project could be performed within the projected overall cost. The reserve from IFC Rail Phase 1 could be preserved and PMO suggests transferring the final net proceeds to the upcoming project IFC Rail "Applying IFC 4.3".

Table 7: Budget vs Actual as per 10.03.2020

IFC Rail 4.3. Phase 2 Actual vs Budget					
	Budget	Actuals Expensed	Contingency max	Total Actuals incl Contingency	Act Vs Bud
PM/PMO Services	1'097'000	1'097'000		1'097'000	-
Prog. Mgmt. Communication	70'000	70'000		70'000	-
Tech Services	789'000	800'420	70'000	870'420	81'420
Travel	60'000	3'815		3'815	-56'185
bSI Mgmt charge (4% total funding)	84'000	84'000		84'000	-
				-	-
total Contributions /Cost	2'100'000	2'055'235	70'000	2'125'235	25'235
carry forward from Phase 1	233'819				
total	2'333'819			2'125'235	-208'584

PM suggests transferring the final available funds to the RWR project "Applying IFC 4.3". That proposal was unanimously accepted by the Project Steering Committee at the Steering Committee Meeting March 15, 2022.

## 11. CONTRIBUTOR LIST

Table 8: Contributor List

Consortium	Company	Name
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	RWR Steering Committee	Adrian Wildenauer, Eivind Tysnes Pagander, Franz Josef Peer, Joakim Fenigsen Lockert, Modestino Ferraro, Patrick Offroy, Pierre-Etienne Gautier, Peter Axelsson, Sheng Liming, Suo Ning, Tarmo Savolainen, Vincent Keller, Winfried Stix (RWR Chairman)
CRBIM	Engineering Management Center of China RAILWAY	Tang Xiaoguang, Sheng Liming, Xin Weiike, Liu Yanhong, Shen Dongsheng, Suo Ning
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\*Technical experts, \*\*Rail Domain Leaders, \*\*\*Test Leaders

Note: names and companies are simply listed alphabetically

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