

RNE PCS CB Technical Specifications

Version 7.1
06.11.2025

Version History

Date	Version	Description	Author
20.12.2023	0.1	Document created	Máté Bak (Supercharge)
04.01.2024	0.2	Appendix B - Message sequences and scenarios: Message sequence diagrams added.	Máté Bak (Supercharge)
12.01.2024	0.3	Message sequence diagrams finished.	Máté Bak (Supercharge)
30.01.2024	0.4	Update according to RNE feedback, scenario clean up path changes proposal	Máté Bak (Supercharge)
22.03.2024	1	First draft release: <ul style="list-style-type: none"> • Not final specifications • Changes can be expected in the next versions (e.g., visually improved diagrams, content of section regarding path alteration, path modification and path cancellation), handling of PaPs published by RFCs) • The formatting is not final 	Nicolas Jasinski (RailNetEurope)
28.06.2024	2	Main updates: <ul style="list-style-type: none"> • Appendix B – Path request scenarios: differences compared to the Sector Handbook are included • Handling PaPs in inbound/outbound directions • New paragraph: “Clarification regarding a similar use case from the Sector Handbook”. • Use cases: <ul style="list-style-type: none"> ◦ Reference train creation ◦ PR submission with pre-accepted offer (no PaPs included) ◦ Comment creation and finalisation by the RA in Observations ◦ Observations completion by the LA and promotion to Post-processing phase 	Nicolas Jasinski (RailNetEurope)
28.02.2025	3	Main updates: <ul style="list-style-type: none"> • Identifiers • Route object creation restrictions 	Nicolas Jasinski (RailNetEurope)

		<ul style="list-style-type: none"> • Handling RU appointment in inbound/outbound directions • Pre-booking finished by RFC • Reference Train rejection by the LIM from Path Elaboration phase • Add territory • Remove territory • Partial offer and harmonisation • Error messages • Feasibility study 	
2025.03.24	4	<p>Process flows:</p> <p>All references and images have been removed for the FigJam process flows. Instead of that, all the process flows have been redrawn in the same format on reference train, request and on offer level.</p> <p>Process description and process flow have been created for: NPR, LPR, AHPR, Pre-booking subflow, FS, PM, PA, PC.</p> <p>The TrainInformation chapter has been extended with the path request functionality description.</p> <p>Appendix with the message sequences and scenarios have been moved to the core text, grouped as the following:</p> <ul style="list-style-type: none"> • Common scenarios • NPR specific • LPR specific • AHPR specific • FS specific • Partial offer and partial harmonisation • PA • PM • PC <p>The table and the text description of the messages for each scenario have been removed. Having there the references to the TSI message matrix IDs, those were redundant.</p> <p>The error code table has been removed and outsourced to a new Appendix.</p> <p>Three new Appendixes have been added:</p> <ul style="list-style-type: none"> • TSI message matrix • Error codes • Source code of the mermaid diagrams. With that any large diagram can be checked in details and large resolution using any kind mermaid editor (e.g. https://mermaid.live/) 	Máté Bak (Supercharge)

2025.0613	5	<p>Path modification, path cancellation sequence diagram header updates.</p> <p>Error handling during path changes processes.</p> <p>General validations to all path changes process (chapter 4.6)</p> <p>Path changes processes moved to sub-chapter 4.6.1, 4.6.2, 4.6.3.</p> <p>5.1.24 Add/remove territory use case added</p> <p>Appendix D: added</p> <p>Path request split functionality: updated</p>	Máté Bak (Supercharge)
2025.08.29	6	<p>Updated:</p> <ul style="list-style-type: none"> • 5. Message sequences and actions (general part) • Glossary • 3.2.1.5 ReferenceTrainIDSubCalendar • 5.13.1 ObjectInfoMessage use cases <p>Added:</p> <ul style="list-style-type: none"> • 3.2.2 Offset • 3.2.2 Weight of set of cars • 3.2.2 Length of set of cars 	Nicolas Jasinski (RailNetEurope) / Máté Bak (Supercharge)
2025.09.01	6.1	<p>Track changes from v6 are kept.</p> <p>Updated: appendix A (new column "Implementation readiness status for the UAT")</p>	Nicolas Jasinski (RailNetEurope) / Máté Bak (Supercharge)
2025.10.16	6.2	<p>Updated:</p> <ul style="list-style-type: none"> • 1.3.3. ReferenceTrainIDSubCalendar. Validity period and shifting rules with the OTR • 5.14 inbound ErrorMessage sets red light for requests in Path Elaboration • 5.5.1/5.5.2 PTIDs in the switch to partial actions 	Máté Bak (Supercharge)
2025.10.28	6.3	<p>Updated: 3.2.1.21 Free text field, SenderReference mandatory (alignment with section 5.14)</p> <p>Added: 5.15 Handling user defined comments</p>	Máté Bak (Supercharge) Nicolas Jasinski (RailNetEurope)
2025.11.03	7	Major version release	Nicolas Jasinski (RailNetEurope)
2025.11.06	7.1	<p>Fixes made to diagrams:</p> <ul style="list-style-type: none"> - 5.9.1 Path request submission by the Leading Applicant - 5.5.7 Final offer submission by an Involved IM (partial) - 5.10.4 Study creation/update and finalisation by an Involved IM 	Thomas Raney (RailNetEurope)

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1. Overview

1.1 Intended audience

This document is intended for technical stakeholders involved in the design, development, usage and maintenance of their implementation to connect to PCS CB via its API based on TAF/TAP TSI.

1.2 Scope

The goal of PCS-CB is to support the following processes following the TAF/TAP TSI standard as much as possible:

- New Path Request and allocation process
- Late Path Request and allocation process
- Ad hoc Path Request and allocation process
- Path Alteration process (triggered by IM)
- Path Modification process (triggered by applicant)
- Path Cancellation
- Feasibility Study process

2. Glossary

Abbreviation	Description
PRM	Path Request Message
PDM	Path Details Message
PCoM	Path Coordination Message
PCM	Path Confirmed Message
PDRM	Path Details Refused Message
OIM	Object Info Message
RC	Receipt Confirmation Message
EM	Error Message
TOI	Type Of Information
TOR	Type Of Request
OIT	Object Info Type
MS	Message Status
PTID	Planned Transport Identifiers
RPTID	Related Planned Transport Identifiers
PR	Path Request object
PA	Path object
RO	Route object
TR	Reference train object
PNA	Path Not Available Message
PCaM	Path Cancelled Message
OTR	Offset To Reference

IA	Initiator Applicant/Pair Applicant of the initiator IM
IIM	Initiator IM/Pair IM of the initiator IM
AA	Affected Applicant
AIM	Affected Infrastructure Manager
LA	Leading Applicant
LIM	Leading Infrastructure Manager
PPA	Participating Applicant
PIM	Participating Infrastructure Manager
RIM	Responsible IM
FTF	Free Text Field
TOH	Type Of Harmonisation
PT	Process Type
TI	Train Information
PI	Path Information
TIE	Train Information Extended

3. System overview

3.1 Data object model

The data object model defined in the Sector Handbook applies (Case Reference object excluded)

3.2 Communication standard: TAF/TAP TSI

3.2.1 Sector-level specification (Joint Sector Group)

Sector specification defined by the Joint Sector Group (JSG) based on the Technical Specification for Interoperability relating to the Telematics Applications for the Freight and Passenger subsystems of the rail system in the European Union (TAF/TAP TSI):

- Joint Sector Group Handbook version 3.4
- Sector XSD.schema version 3.4.1.0

3.2.2 PCS-level specification

The following topics, mainly from the message exchange perspective, are either not or not sufficiently described in the sector specification:

- Information exchanges “between” the applicants and “between” the IMs for coordination purposes

- Process phase transition actions at Reference Train-level triggered by the Leading Applicant or the Leading IM, or at Path Request- / Path Object-level in case of partial harmonisation

To address the situation until the update of the sector specification and / or of the RNE Timetabling handbook(s) and the implementation in PCS, PCS-specific solutions have been defined based on the sector specification:

- Timetable information exchange “between” the applicants and “between” the IMs:
 - Information sent by an applicant or IM to PCS: usage of the message type defined in the JSG Handbook with an adjusted content for a similar action, for example with a different type of Information Code (appendix A: sub-action 25 and 108).
 - Information sent by PCS to the intended applicant or IM recipient: Usage of the “Object Info Message” message type from PCS to send the information to the intended applicant and IM recipients (appendix A: sub-action 30 and 114).
- Path request and offer preparation status information exchange “between” the applicants and “between” the IMs:
 - Information sent by an applicant or IM to PCS: usage of the “Path Coordination Message” message type (appendix A: sub-action 45).
 - Information sent by PCS to the intended applicant or IM recipient: usage of the “Path Coordination Message” message type (appendix A: sub-action 20).
- Reference Train-level transition actions (appendix A: sub-action 65 and 127).
 - Information sent by an applicant or IM to PCS: for most of the sub-actions, usage of the “Path Coordination Message” message type. The message contains the Type of Information Code included in the
 - Information sent by PCS to the intended applicant or IM recipient:
 - For “Reference Train creation” and “Promotion to Harmonisation actions”: usage of the “Object Info Message” message type (appendix A: sub-action 4 and 16).
 - For other actions than the “Reference Train creation” and “Promotion to Harmonisation” actions: usage of the “Path Coordination Message” message type (appendix A: sub-action 45 and 50).

PCS CB specifications may be interpreted as different compared to the Sector Handbook descriptions are presented in the paragraphs named “Clarification regarding a similar action from the Sector Handbook”. This information is included only for the message sequences relevant for the New Path Request process.

3.2.3 TAF/TAP TSI message elements

See annex A.

3.2.3.1 MessageHeader

The message header is common for all applicant or IM messages. The Sender, Recipient and Message type fields are used to route the message to the right recipient based on configuration on the sending CI.

It contains the following elements:

- MessageReference
 - MessageType: it indicates the the type of the sent/received message
 - MessageTypeVersion: it contains the schema version that is used for the message
 - MessageIdentifier: unique id of the message generated by the Common Interface
 - MessageDateTime: generated by the Common Interface
- MessageRoutingID (optional)
- SenderReference
- Sender: for outbound messages it is RNE (3178), for inbound messages it is the company code of the applicant or the IM who sent the message.
- MessageDateTimeCreated (optional)
- Recipient: for inbound messages it is RNE (3178), for the outbound message it is the company code of the applicant or the IM who receives the message.

3.2.3.2 AdministrativeContactInformation

This element is used to define administrative contact information of the user who either sent the message or worked on the UI and whose action triggered a message. It contains the following elements:

- Name (mandatory)
- Address
- eMail
- PhoneNumber
- FaxNumber
- FreeTextField

From all above, RNE PCS-CB will only use the Name and the email fields.

For the inbound communication, the content of the name and email fields from the AdministrativeContactInformation element included in the message is inserted in the change log on the UI and comments section (when the RA submits a comment in the observation phase). Use case to be defined: the information contained in this element does not refer to an existing user or registered company information (*change request from RNE exists for the above specified inbound communication use case*).

For the outbound communication, the following behaviours apply:

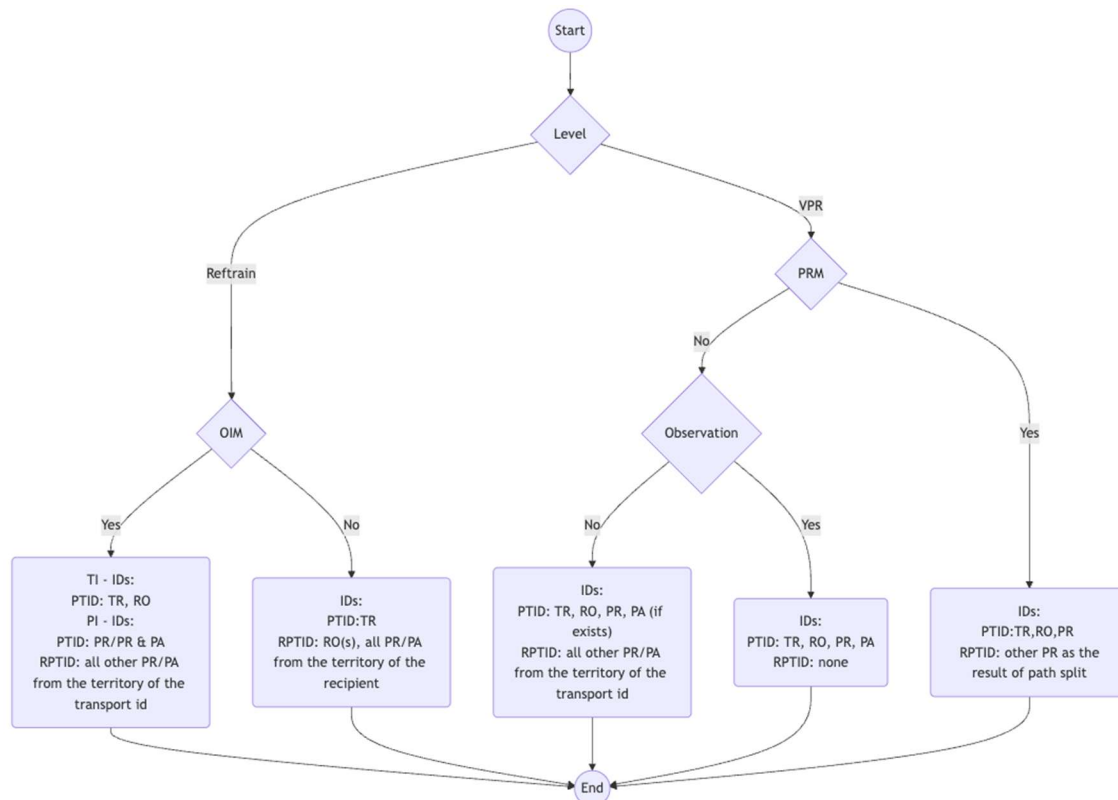
- Update from a user not related to any leading company transitions (e.g. submit request, send draft offer): the message is generated with the data of the user or of the user's company (example: a generic email address is defined at the company-level) who performed the update.

- Leading company specific update (e.g. submit request, send draft offer): the pair company of the leading company gets the data of the user who triggered the change, every other company gets the data of the user who made the last change on the object.

3.2.3.3 Identifiers

The Identifiers section contains all the necessary PlannedTransportIdentifiers related to the path request or offers. Each identifier uses the same structure that is defined in the CompositIdentifierPlannedType.

- ObjectType: It provides the possibility for differentiation between the objects. It is a 2AN field with the following possible values:
 - TR: enum for the reference train
 - RO: enum for the route object
 - PR: enum for the path request object
 - PA: enum for the path object
 - CR: enum for the case reference
 - TC: enum for the TCR (Temporary Capacity Restriction) objects. Not expected that any TCRs will be used in Phase 1 in RNE PCS-CB, thus it is not applicable there.
- Company: With a 4AN CompanyCode, it is the identifier of the railway company (applicant, IM, RU, AB, RFC) owner of the object.
- Core: It is the main part of the identifier and is determined by the company that creates it. It is 12AN with the possibility of the following special characters: -*.
- Variant: The variant shows a relationship between two identifiers referring to the same business case. It is a 2AN field. The following restrictions apply:
 - Reference train: it must be 00 and no other value is supported
 - Route: it cannot be 00, it starts with 01
 - Path request: it cannot be 00, it starts with 01
 - Path: it cannot be 00, it starts with 01
- TimetableYear: Refers to the timetable period in which the business will be carried out. It can have values from 2012 to 2097. For RNE PCS-CB, it will be the year that is either selected by the LA on the UI, or received in the PRM/PCoM message upon creation. For any other object, the TimetableYear values must be the same as the value of the reference train.
- StartDate: Not applicable to planning related objects, thus it will not be used in RNE PCS-CB.



Using the above written structure, the RNE PCS-CB will have the following identifiers.

- **TrainID:** the requests are grouped under the umbrella of a reference train (but are not directly linked to it) and which is the base entity of the RNE PCS CB. Each reference train will have its unique identifier. The user will have the option to ask the system to generate the ID.
- **RouteID:** the reference train will be composed of route(s). Each route will have its unique identifier. The user will have the option to request the system to generate the ID.
- **PathRequestID:** All path request objects will have their own unique identifiers. The user will have the option to request the system to generate the ID.
- **PathID:** All path objects will have their own unique identifiers. The user will have the option to request the system to generate the ID.

3.2.3.4 Identifier

This field is used only in the ObjectInfoMessage.

This element always contains the TR ID of the Reference Train as the OIM is used always as Information about the whole reference train.

3.2.3.5 ReferenceTrainIDSubCalendar

The OffsetToReference status (activated or deactivated) mandatory or opti) can be updated by RNE JO Support upon request (default status: deactivated!). If it's activated, PCS CB will allow and require the OTR value from the users either via the GUI or via the messages.

In outbound communication, the ReferenceTrainIDSubCalendar will be calculated based on the PlannedCalendar of the object and the OTR.

For the inbound communication, the following validations will be done:

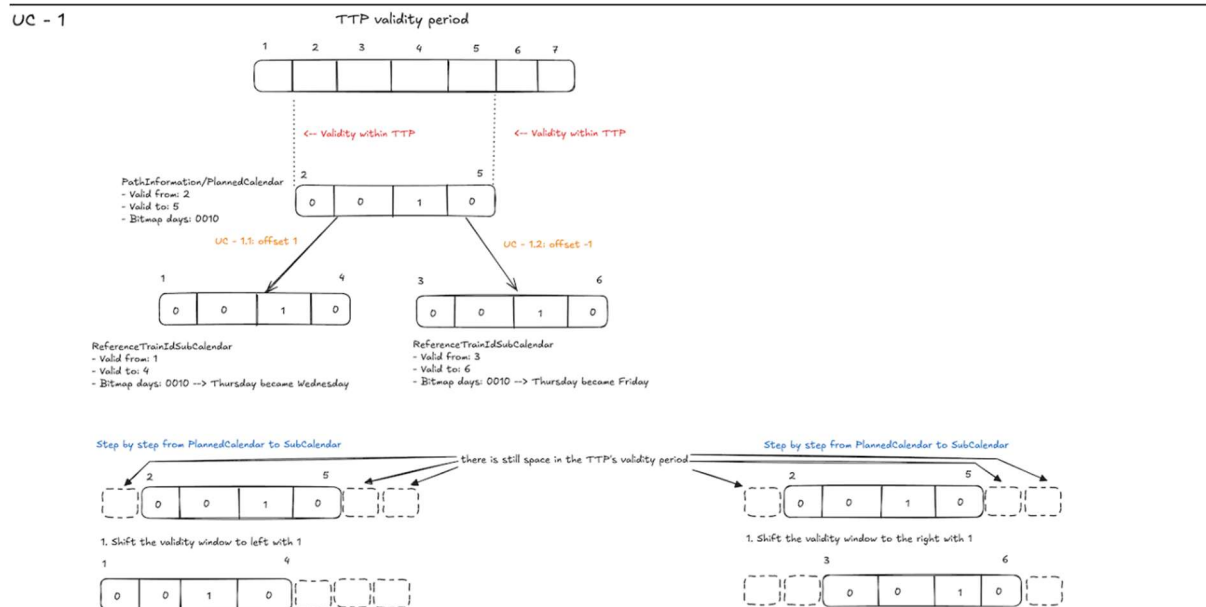
- Presence of the OffsetToReference in the message and,
- Correctness of the OffsetToReference value. $\text{ReferenceTrainIDSubCalendar} + \text{OTR} \neq \text{PlannedCalendar}$

By default, the BitmapDays element is optional in the ReferenceTrainIDSubCalendar. When the validity period of the ReferenceTrainIDSubCalendar covers only one day, the BitmapDays can be left out from the message. In this case, PCS CB will consider that that single bit would be a “1”. However, when the validity period of the ReferenceTrainIDSubCalendar would cover more running days, the BitmapDays are expected.

Please note that the above-written “ReferenceTrainIDSubCalendar + OTR = PlannedCalendar” comparison is valid for the validity period of those too. It means that the validity periods are shifted as well. Please find further explanation on the drawing below.

Use case 1

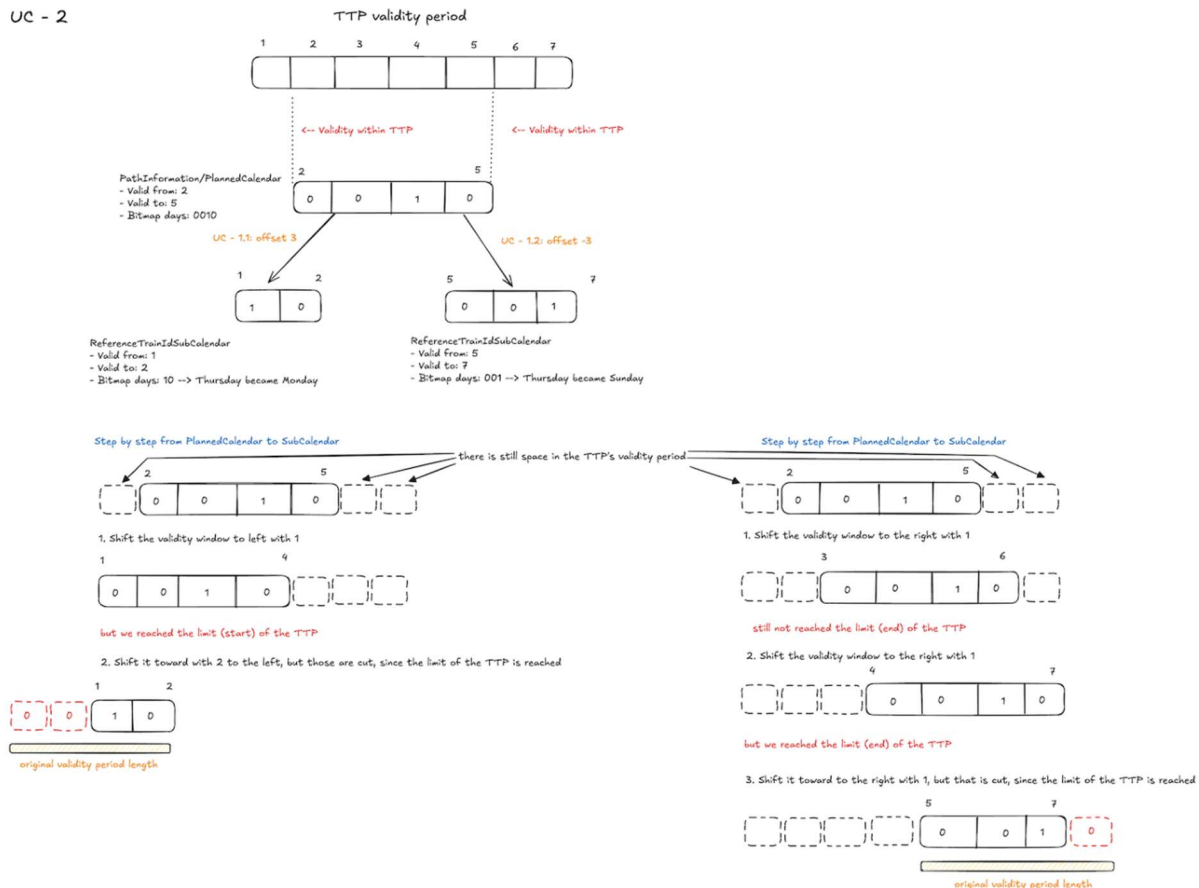
PlannedCalendar validity period is shifted with the OTR, but even after the shift, it can remain in the validity period of the timetable period. The timetable period is symbolised only from 1 to 7.



Use case 2

PlannedCalendar validity period is shifted with the OTR, and with the shift, it would go out of the validity period of the timetable period. That is why the validity period will be cut accordingly. The timetable period is symbolised only from 1 to 7.

UC - 2



3.2.3.6 ObjectInfoType

It can have the following values according to the schema:

- R = request info about object
- I = Information about object
- U = update information on object
- N = information about a new object
- O = request about object and linked objects

In PCS CB, this message is used in inbound communication as an Information (I) about the request (depending on the use cases)

3.2.3.7 MessageStatus

The value is assigned by the sender of the message. It can have the following values:

- 1 = creation
- 2 = modification
- 3 = deletion

The proper value in a message will depend on the use case, though, in most cases it is 1 = creation.

3.2.3.8 TypeOfRUHarmonization

Type of RU harmonization possible values: Full, Part, None. It is an optional field. Though, if it is required in the future, the generation logic is the following:

- If the workflow is not broken among the path request objects, then Full.
- If the workflow is broken among the path request objects, then Part.

For further details, please check the partial offer and harmonisation actions.

3.2.3.9 TypeOfIMHarmonization

Type of IM harmonization possible values: Full, Part. It is an optional field. The following behaviour will apply:

- If the workflow is not broken among the path objects, then Full.
- If the workflow is broken among the path objects, then Part.

For further details, please check the partial offer and harmonisation actions.

3.2.3.10 CoordinatingIM

The leading IM. By default, the IM who is the partner of the leading applicant is set as CoordinatingIM. If the value is not changed by the LA or the LIM, then the field is sent with the company code of the IM.

3.2.3.11 LeadRU

The leading applicant information is sent in the LeadRU field with the company code of the leading applicant.

3.2.3.12 TypeOfRequest

The Type of Request element indicates the applicable planning process the RA is applying for. Indication of the request type is necessary for IMs to start the corresponding planning process (study, or binding path request or modification of the existing contracted object).

The Type of Request value depends on the use case. Possible values can be:

- Study: when the object is in Feasibility Study process
- Request: when the object is in any path request process
- Modification: when the object is in Path Modification, Path Cancellation or Path Alteration process

3.2.3.13 ProcessType

The following process types and corresponding code are available:

- 0: New Path Request and allocation process for annual timetable
- 1: Late Path Request and allocation process for annual timetable
- 2: Ad hoc path request and allocation process
- 4: Feasibility Study process
- 5: Path Modification process (triggered by applicant)
- 6: Path Alteration process (triggered by IM)
- 10: Path Cancellation process

3.2.3.14 TypeOfInformation

Type of Information is used in several messages for different purposes. Therefore, the recipient has to know the status which indicates why the message was sent. The message type must be considered to recognise which process and process step the information refers to.

The type of information code list of sector TAF TAP TSI XSD version 3.4.1.0 applies.

The proper value in a particular message will depend on the use case.

3.2.3.15 TrainInformation - Route object

The TrainInformation element is used to deliver the Route object for the IMs. It contains the following fields:

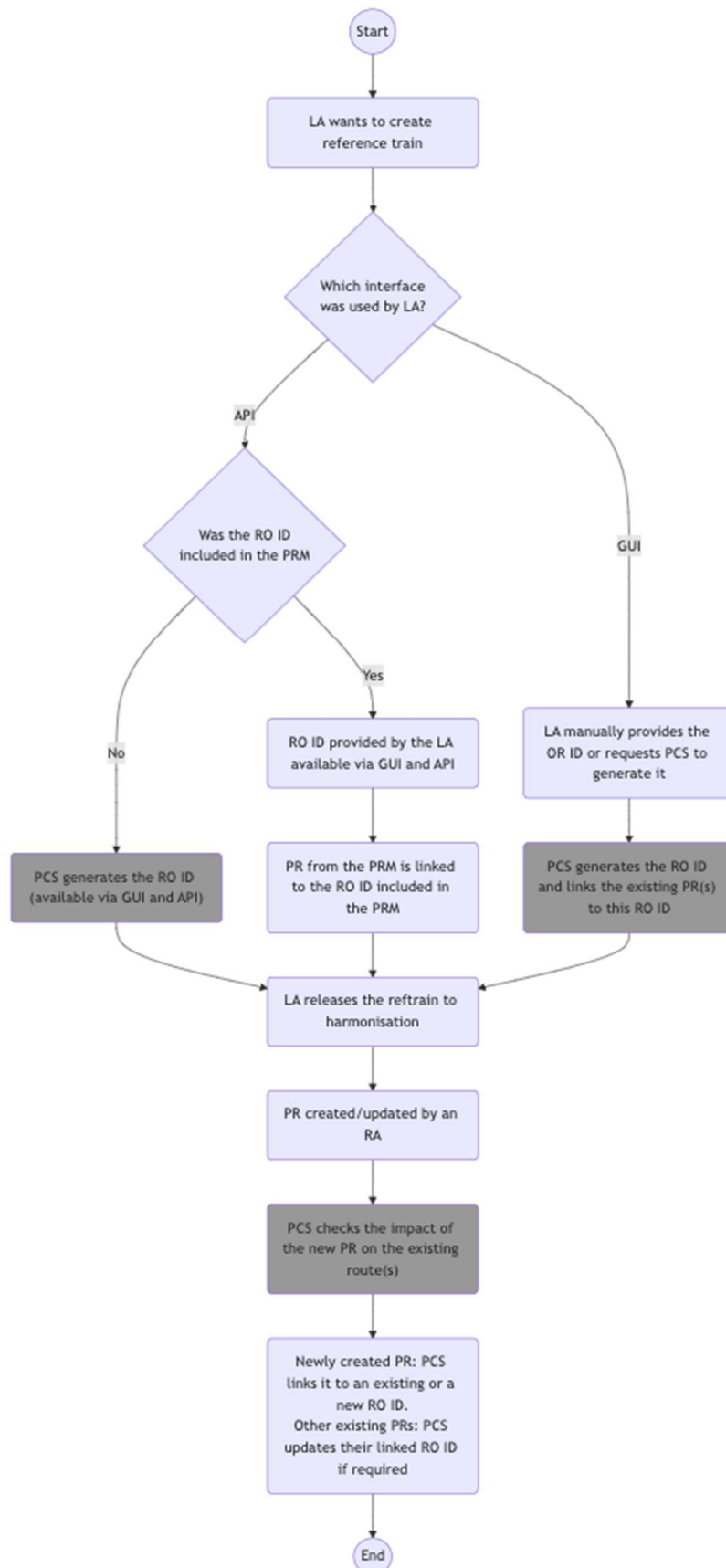
- PlannedJourneyLocation(s): the following locations should be listed:
 - Origin point
 - Handover point(s)
 - Destination point

Only the following elements of the PlannedJourneyLocation shall be provided:

- CountryCodeISO
- LocationPrimaryCode
- PrimaryLocationName
- PlannedCalendar: this is the planned calendar of the Route object (from the origin from the list above) with
 - Validity period: StartDate and EndDate are used for validity period.
 - Bitmap days: the running days inside the given validity period
 - Offset to reference: See in the ReferenceTrainIdSubCalendar chapter.
- PathPlanningReferenceLocation: the origin of the variation. For inbound messages, the field is ignored as there is no such function in the PCS CB.

Route - path request links

- PR created by RA via API:
 - 1) PR linked to the route indicated in the PRM (only in the Reference Train creation actions)
 - 2) In case of changes in the Ref TR impacting the routes, PCS links the PR to the correct route.
- PR created by RA via GUI:
 - 1) PR linked to the route(s) based on variations;
 - 2) In case of changes in the Ref TR impacting the routes, PCS links the PR to the correct route.



We link the PR to RO based on the PlannedTransportIdentifiers. If there is no RO mentioned in the PlannedTransportIdentifiers, then we link the PR by default to the first Route.

If more than one Route belongs to one VPR, then we send the Route with the most running days in the TrainInformation.

Mapping PCS CB fields to message elements chapter describes the use of the PlannedJourneyLocation element fields.

Path request split functionality

By default, the following cardinality is described in the JS Handbook:

- RO 1:n PR
- PR 1:n PA

However, there can be scenarios where a UI user would be overloaded with work due to numerous Route objects, while on his/her territory only one PR could cover all the running days.

To demonstrate the problem, let's imagine the following use case.

- There are two territories: DB InfraGO and Banedanmark
- Imagine a train that goes some days from Kiel to Aalborg and other days from Bremerhaven to Aalborg.
- This will result in two Route objects.
- However, the train can use the same path request in Denmark from Padborg graense to Aalborg.

That is why PCS CB has a feature to help the users. The request is one on the screen, but to respect the TAF/TAP TSI rules, PCS CB splits the requests in the background. It's barely visible to the user. It's shown only in the ID section and in Control.

IDs

Reference train level IDs

Reference train ID	TR 2143-KT4SEYIU1E-U-00-2026
Route ID 1	RO 2143-8E4BGILM*ZXW-01-2026 ⓘ
Route ID 2	RO 2143-AG-4HT-12YS2-01-2026 ⓘ

Territory level IDs

GYSEV CARGO / Banedanmark

Path Request [PR 2143-YRNIH7HUGZAJIS-01-2026](#) [PR 2143-KNGQKR4OY3I4-01-2026](#)

★ GYSEV CARGO / Banedanmark

Waiting for IMs ^

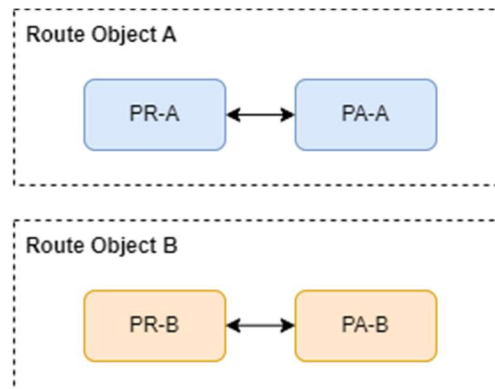
Path request	Path offer	Description
Path Request ⓘ	Path ⓘ	Waiting for IM to send the draft offer
<div> <div>Padborg - Aalborg (2 locations)</div> <div> 2143-YRNIH7HUGZAJIS-01-2026 2143-KNGQKR4OY3I4-01-2026 </div> </div>		

As you can see, there is one Path request on the UI, with two IDs in the application. The split is done based on the running days of the related Route objects.

The Path Request split functionality status (activated or deactivated) can be updated by RNE JO Support upon request (default status: deactivated). . In the above example, Banedanmark does require such split.

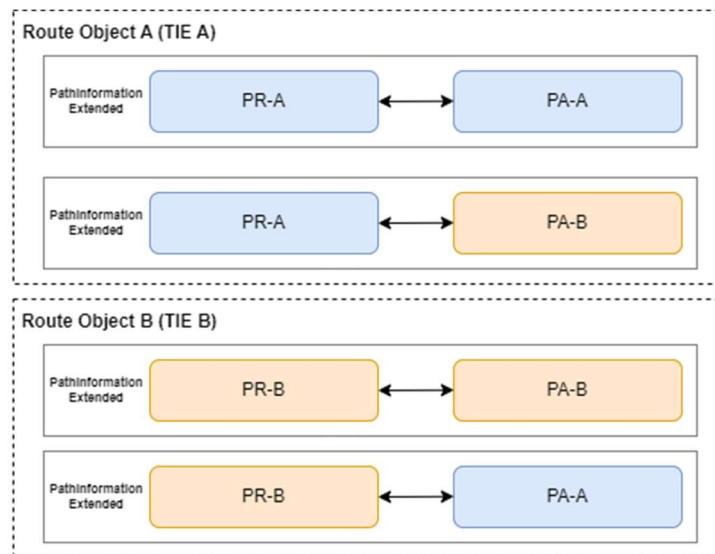
The aim of the following lines is not to fully describe this functionality, but to highlight its impact on the inbound/outbound messages.

- Outbound messaging (**Please note that this section describes the current behaviour, the behaviour will be altered with subsequent releases and these specs will be updated**)
 - PCoM: if a PCoM is sent for a request, PCS CB sends as many PCoMs as there are PR IDs. In the above example, there would be two PCoMs to Banedanmark.
 - PRM: If two or more PRIDs exist in a Path Request due to a path request split, the responsible IM will receive a PRM for each PRID. Each of the PRMs from the PRIDs created from the split will have unique PlannedCalendar elements.
 - OIM: Every PRID will be included in outbound OIMs. If no offers have yet been created in response to the requests, the PRIDs will appear in the PlannedTransportIdentifiers of the TrainInformationExtended element corresponding to the Route Object that the PR belongs to.
 - Consider the scenario where there is a split request in an RA's territory, these requests are called PR-A and PR-B. When the path request is submitted the Responsible IM receives a PRM for both PR-A and PR-B. The Responsible IM creates one offer in response to each of the PRs. In reality the PR-PA linkages are as follows:

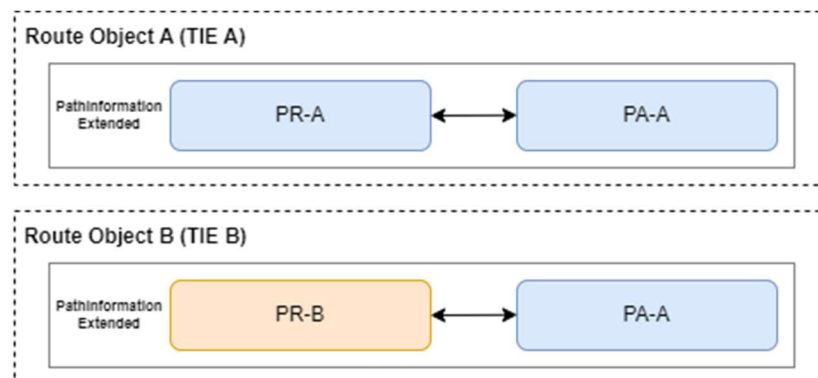


- However, in any outbound OIMs following their creation, both offers will be linked to both requests. This means each offer will have a PathInformationExtended element in both TrainInformationExtended elements, even if the PA object does

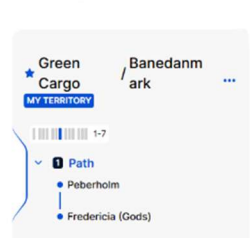
not belong to the TrainInformationExtended's route object. In this scenario, an outbound OIM would contain the following linkages:



- If only one offer is created for both of the PRIDs from the split path, then the outbound OIM would appear as follows:



- PDM: When the draft offers are submitted, one PDM per offer will be sent to the RA. If a PR split has occurred on the path request which is being responded to, each offer will be linked only to the first PRID which appears on the path request in the UI, this PRID is known as the 'initial request':



IDs

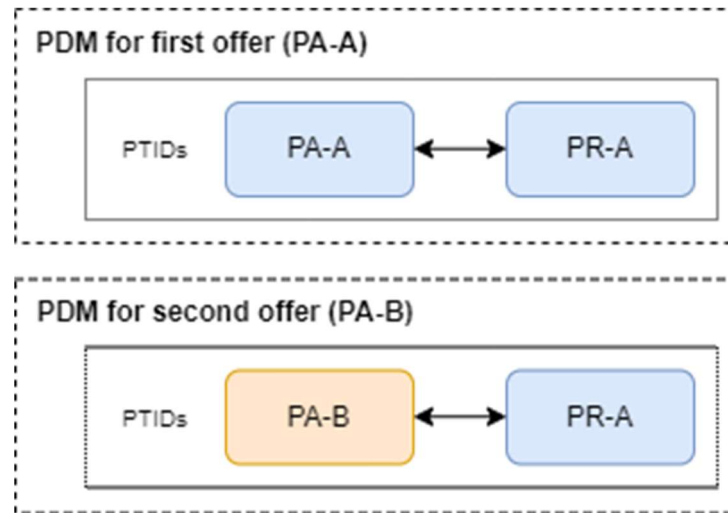
Reference train level IDs

Reference train ID	TR 2174-EO3BRT*JWUJ*-00-2026
Route ID 1	RO 2174-N0P3TZ4N6VT4-01-2026
Route ID 2	RO 2174-7WQ*UD8VUHB8-01-2026

Territory level IDs

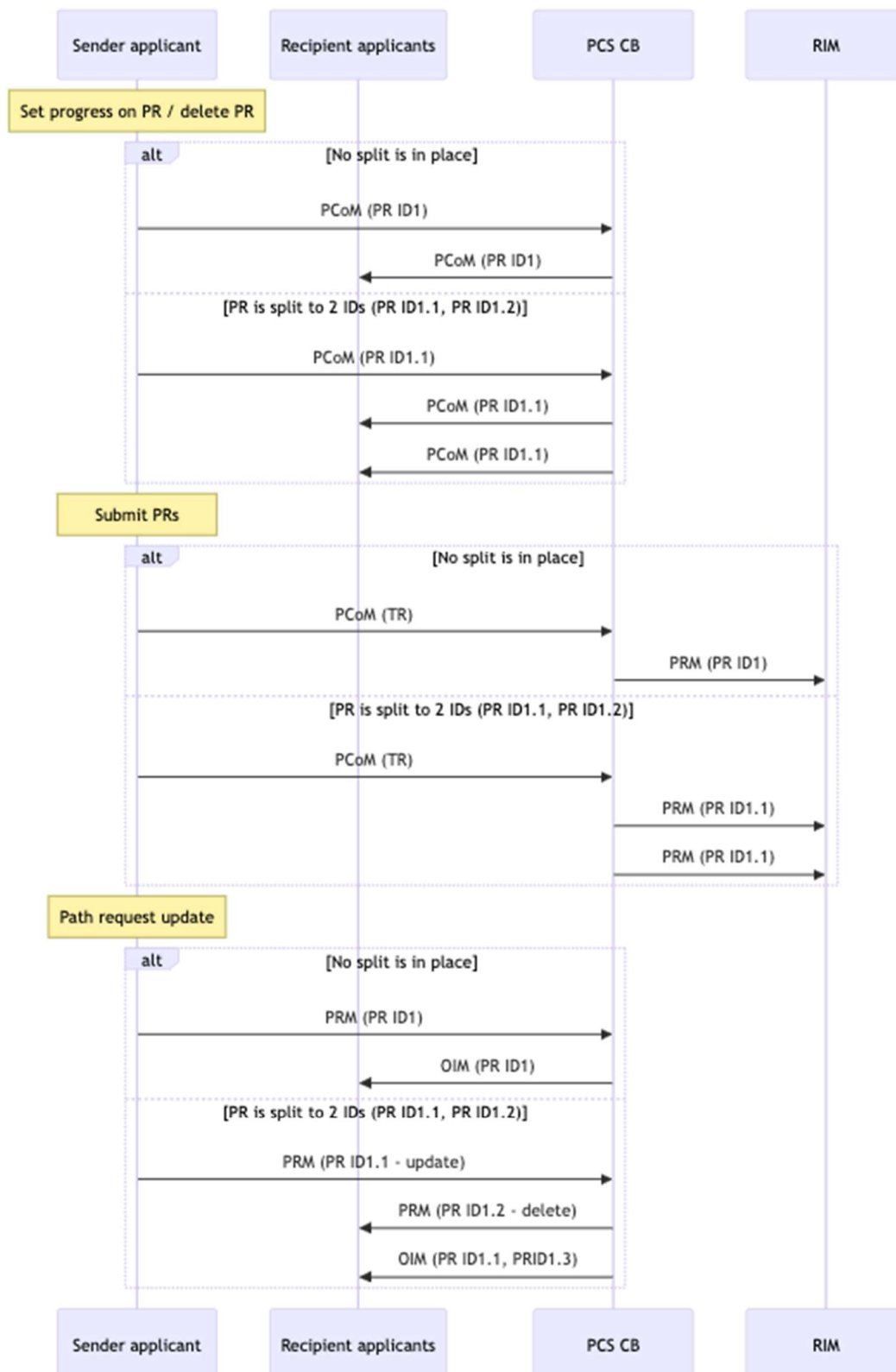
Green Cargo / Banedanmark	Path	<u>PR 2174-YMXE-0RQCZMC-01-2026</u>	PR 2174-JJDKSQXUJ2L-01-2026
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- All subsequent PRIDs created from the PR split will appear only in the RelatedPlannedTransportIdentifiers of the outbound PDMs. In this scenario, the PR-PA linkages in the outbound flow would be as follows:



- Inbound messaging
 - If an agency sets progress (light) for one ID, the update will be done for the Path request on the UI and with that for all other split requests. This will result in multiple outbound messages.
 - If an agency wants to delete a Path request, any of the IDs within the split PR can be sent, it will delete the PR from the application.
 - Path request update via PRM is handled as a new creation. It means that if the IM sends a PRM update for one of the IDs, PCS CB will communicate a deletion for the other IDs, update the PR based on the message, and if the split is required, new other IDs will be generated.

The following sequence diagrams try to describe the above written use cases.



3.2.3.16 PathInformation

The PathInformation element is used to deliver the Path Request object or the Path object depending on the message. It contains the following fields:

- PlannedJourneyLocation(s): every location (origin, waypoint, handover point, destination) that is under the IM's jurisdiction (where the IM is the responsible IM).
- PlannedCalendar: the most relevant calendar field of all.

The mapping PCS CB fields to message elements chapter describes the use of the PlannedJourneyLocation element fields.

3.2.3.17 TrainInformationExtended

Please note that there is a TrainInformationExtended (TIE) element that can contain PathInformationExtended elements, and there is a separate PathInformationExtended (PIE) element. The later one is excluded, that is why only the TrainInformationExtended element is documented.

It can contain multiple TrainInformationExtended elements. In PCS CB's case, an OIM will contain as many TrainInformationExtended elements as there are route objects in the reference train.

It contains the following fields:

- Identifiers: TR ID of the reference train and the RO ID of the particular route that is sent in this TIE
- TrainInformation: just like it's written for the TrainInformation, the content of the particular route is packed here
- PathInformationExtended: it's an array too. All the variation path requests will be packed here as separate PIEs for the PRs and for the PAs
 - Identifiers: the PR IDs or the PA IDs linked to this particular RO object
 - PathInformation: just like it's written for the PathInformation, the content of the variation path requests (PRs or PAs)

3.2.3.18 PathInformationExtended

As written above, the PathInformationExtended (PIE) element is added under the TIE. However, there are special cases, where the PIE(s) are sent alone. These are the path change processes (PM, PA, PC), where the variations function is not active and the routes are not recalculated. That is why, for these cases, the OIMs will be sent out only **with all the requests/offers that are part of the territory of agencies who joined the particular path change process**.

- Identifier: it will be still the TrainID
- PIE: it's an array. All the requests/offers will be packed here as separate PIEs for the PRs and PAs that are part of the path change process
 - Identifiers:
 - PM process: PR ID of the new request (related to the old offer), PA IDs of the old offers (related to the old requests)
 - PA process: PA IDs of the new offers (related to the old requests), PA IDs of the old offers (related to the old requests)
 - PC process: PA IDs of the old offers (related to the old requests)

- PathInformation: just like it's written for the PathInformation, the content of the requests (PRs or PAs)

3.2.3.19 NetworkSpecificParameter

Object level and location parameters can be defined by the IMs. Those parameters that are added to PCS as national particularity are packed in the messages as name - value pairs.

Due to the two levels, the field can be used on the object level and also on the PlannedJourneyLocation level.

On the UI the user can have a partially fulfilled NSP section, but via API, we expect fully prepared requests and offers. That is why, the **mandatory NSPs must be sent by the RAs or IMs**, otherwise error code is returned.

3.2.3.20 Parameters

The network specific parameters are handled slightly differently in the OIM. For location level parameters the same NetworkSpecificParameter can be used under the PlannedJourneyLocation element as described above.

Though, for territory level parameters, that are sent normally on the message level, the Parameters can be used in name – value pairs. In this case the parameters won't be related to any territory.

3.2.3.21 FreeTextField

It can be defined on the object level and on PlannedJourneyLocation level. For example, this will be the value to store comments that were made by Applicants during the Observation phase, mandatory comments for negative actions (e.g. withdrawal) or for user defined comments.

3.2.3.22 AffectedSection

Actions such as transitions, acceptance will happen on the object level. That is why, with this field the list of sections cannot be limited, all the sections of the object (PA) are included. The AffectedSection is only sent and accepted in the PathNotAvailable and the PathCancelledMessage.

Instead of PlannedJourneyLocation elements, this works with sections. PCS CB has the sections and those will be taken into account upon message generation.

When PCS CB generates and sends the message upon user action:

- The whole request/offer is packed to the AffectedSection between StartOfSection and EndOfSection elements. The following content is excluded:
 - Times
 - OTN
 - NSP
- Regarding the calendar, the start of the section's location's calendar is added to the message.

When PCS CB receives and processes the message:

- It's either used by Applicant or IM to remove days from the PA. No other use case is supported for PathCancelledMessage and PathNotAvailableMessage.

- The PlannedCalendar element of the first AffectedSection is taken into account for the action (removing running days). The rest of the elements are ignored.

3.2.3.23 InterruptionInformation

It's used only in PathNotAvailableMessage and it's a mandatory element, but it's a complex element and its children are all optional.

PCS CB will not send anything under this element, and if we get anything, PCS CB will ignore it.

3.2.3.24 RFCPaP

The PaP ID of the Pre-Arranged to which the location belongs is indicated in this element. Based on this ID, the PaP-specific information related to this PaP location can be retrieved (e.g., type of PaP, whether or not the location can be edited).

3.2.4 Mapping PCS CB fields to message elements

Reference train basic data

- Name: none. This field doesn't exist in the TSI messages. When we receive a new reference train, we shall generate this field. Rule: origin – destination & creation date
- International train number: this field doesn't exist in the TSI messages. We can take it from two places:
 - First option: the first location of the train information. If that is empty, then query for this in the subsequent locations
 - Second option: the first location of the path information. If that is empty, then query for this in the subsequent locations
- Process type: ProcessType
- Train type: TrainType. Please note that in TAF-TSI the train type is set on location level. If there are multiple train types, then we will send back an error.

Journey

Each variation path request object is either to a PR or a PA object. All of these fields are mapped to a field of the PlannedJourneyLocation element.

- Responsible Applicant: the ResponsibleApplicant field. Please note that it's on location level in the message, but territory level for us.
- Responsible RU: the ResponsibleRU field. Please note that it's on location level in the message, but variation path request level for us.
- Responsible IM: the ResponsibleIM field. Please note that it's on location level in the message, but territory level for us
- Location: the LocationIdent field and the following fields shall be populated
 - CountryCodeISO
 - LocationPrimaryCode
 - The rest is optional, no need to generate or process them.
- Actual arrival time: Time of the Timing element in the TimingAtLocation element with ALA TimerQualifierCode
- Actual departure time: Time of the Timing element in the TimingAtLocation element with ALD TimerQualifierCode

- Earliest arrival time: Time of the Timing element in the TimingAtLocation element with ELA TimerQualifierCode
- Earliest departure time: Time of the Timing element in the TimingAtLocation element with ELD TimerQualifierCode
- Latest arrival time: Time of the Timing element in the TimingAtLocation element with LLA TimerQualifierCode
- Latest departure time: Time of the Timing element in the TimingAtLocation element with LLD TimerQualifierCode
- Public arrival time: Time of the Timing element in the TimingAtLocation element with PLA TimerQualifierCode
- Public departure time: Time of the Timing element in the TimingAtLocation element with PLD TimerQualifierCode
- Run through time: Time of the Timing element in the TimingAtLocation element with ART TimerQualifierCode. We don't support the earliest and latest run through. If any other time is sent next to the run through that is treated as an error.
- Dwell time: DwellTime field of the TimingAtLocation element.
- Offset: Offset of the Timing element in the TimingAtLocation element. PCS CB handles the automatic and manual offsets separately, while there is only one offset field in the schema.
 - o Inbound: the received offset value needs to be split. First the automatic offsets are calculated, then if there is still remaining offset, that will be saved as manual.
 - o Outbound: the two offsets are combined (sum) and sent in one field.
- Operational Train Number: OperationalTrainNumber
- Path number: PreArrangedPath
- Activity type: TrainActivity
- Location type: JourneyLocationTypeCode
- Owner IM: not part of the messages, no need to generate or process this info.

Calendar

- Calendar of the origin point of a path request/path:
 - For reference train creation: PlannedCalendar of the TrainInformation element
 - For path requests creation and update: PlannedCalendar of the PathInformation element
 - OffsetToReference: if fulfilled, it's populated to the PlannedCalendar of the PathInformation element.
 - ReferenceTrainIdSubCalendar: PlannedCalendar adjusted with the OTR

NSPs

- Territory level NSP: NetworkSpecificParameter on the message level or the Parameters field (in case of OIM)
- Location level NSP: NetworkSpecificParameter on the PlannedJourneyLocation level

Train parameters

All of these fields are mapped to a field of the PlannedJourneyLocation element.

- Traffic type: TrafficType of PlannedTrainData

- Push-pull train: PushPullTrain of PlannedTrainData
- Type of service
 - Special service description code: SpecialServiceDescriptionCode
 - Facility type description code: FacilityTypeDescriptionCode
 - Characteristic description code: CharacteristicDescriptionCode
- Commercial traffic type: CommercialTrafficType of PlannedTrainData
- Exceptional gauging ident
 - IM partner: IM_Partner of ExceptionalGaugingIdent
 - Exceptional gauging code: ExceptionalGaugingCode of ExceptionalGaugingIdent
- Dangerous goods indication
 - Hazard identification number: HazardIdentificationNumber of DangerousGoodsIndication
 - UN number: UN_Number of DangerousGoodsIndication of DangerousGoodsIndication
 - Danger label: DangerLabel of DangerousGoodsIndication
 - RID class: RID_Class of DangerousGoodsIndication
 - Packing group: PackingGroup of DangerousGoodsIndication
 - Dangerous goods weight: DangerousGoodsWeight of DangerousGoodsIndication
 - Dangerous goods volume: DangerousGoodsVolume of DangerousGoodsIndication
 - Limited quantity indicator: LimitedQuantityIndicator of DangerousGoodsIndication
- Combined traffic profile
 - P1: P1 of CombinedTrafficLoadProfile
 - C1: C1 of CombinedTrafficLoadProfile
 - P2: P2 of CombinedTrafficLoadProfile
 - C2: C2 of CombinedTrafficLoadProfile
- Train weight: TrainWeight of PlannedTrainTechnicalData
- Train length: TrainLength of PlannedTrainTechnicalData
- Weight of set of cars: WeightOfSetOfCarriages of PlannedTrainTechnicalData -Field is mandatory on PCS CB GUI, but it's optional in the schema.
 - o Outbound logic: if the value is 0 on the UI and in the database → the field is not sent in the message
 - o Inbound logic: if the field is not sent in the message → 0 is set in the database and presented on the UI
- Length of set of cars: LengthOfSetOfCarriages of PlannedTrainTechnicalData - Field is mandatory on PCS CB GUI, but it's optional in the schema.
 - o Outbound logic: if the value is 0 on the UI and in the database → the field is not sent in the message
 - o Inbound logic: if the field is not sent in the message → 0 is set in the database and presented on the UI
- Traction details

- Loco type number: LocoTypeNumber of TractionDetails
- Type of used hybrid powerunit: TypeOfUsedHybridPowerunit of TractionDetails
- Traction mode: TractionMode of TractionDetails
- Traction weight: TractionWeight of TractionDetails
- Traction length: Length of TractionDetails
- Requested train max speed: TrainMaxSpeed of PlannedTrainTechnicalData
- Maximum infrastructure speed: HighestPlannedSpeed of PlannedTrainTechnicalData
- Speed planned by IM: PlannedSpeed of PlannedTrainTechnicalData
- Coasting: Coasting of PlannedTrainTechnicalData
- Max axle weight: MaxAxleWeight of PlannedTrainTechnicalData
- Route class: RouteClass of PlannedTrainTechnicalData
- Brake type: BrakeType of PlannedTrainTechnicalData
- Emergency brake override: EmergencyBrakeOverride of PlannedTrainTechnicalData
- Braking ratio: BrakingRatio of PlannedTrainTechnicalData
- Min braked weight percentage by IM: MinBrakedWeightPercent of PlannedTrainTechnicalData
- Brake weight: BrakeWeight of PlannedTrainTechnicalData
- Train control system: TrainCC_System of PlannedTrainTechnicalData
- Train radio system: TrainRadioSystem of PlannedTrainTechnicalData
- Tilting function: TiltingFunction of PlannedTrainTechnicalData
- Operational train coupling strength: OperationalTrainCouplingStrength of PlannedTrainTechnicalData
- Bogie wagons only: BogieWagonsOnly of PlannedTrainTechnicalData

IDs

- TR ID: TR ID
- RO ID: RO ID
- PR ID: PR ID
- PA ID: PA ID

Control

- Reference train status & path request/path progress: the combination of the TOR and TOI.

Comments

- Comments: FreeTextField on the message level. Please note that comments are only sent in special cases. For further information please check the message matrix (appendix A).
- Note: FreeTextField of the PlannedJourneyLocation. PCS CB supports only one note per location, while the XSD allows multiple comments per location. PCS CB will always take the first freetext for the note field and ignore the rest.

4. Process flows

The following process flows describe the implementation of TAF and TAP TSI compliant business processes, the actors and roles, and the transitions between the business phases and states of the objects used by the PCS CB application.

Diagrams in the document are drawn with Mermaid code. The source code of each diagram can be found in the annex. The source code can be visualised with any markdown-based tool that can interpret Mermaid (e.g. <https://mermaid.live/>).

TSI message matrix

In the Technical Specification there are several references to a document, called TSI message matrix. You can find the link to it in the Annex.

The goal of the message matrix is to avoid redundancy and to summarise all the supported actions. Each action is composed of sub-actions: inbound and/or outbound message(s):

- The message sequences and actions reference to the ID of the corresponding sub-action in the matrix.
- The process diagrams reference to the ID of the corresponding sub-actions in the matrix for the inbound communication.

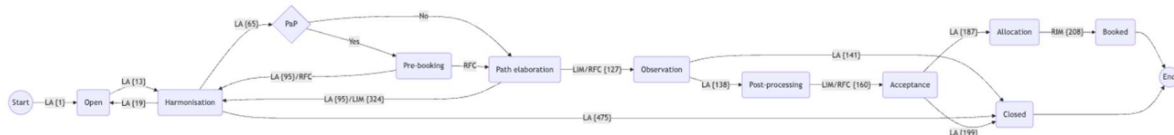
4.1 New Path Request (NPR) and allocation process - Process flow

The NPR is the base process to support path requests for annual timetables.

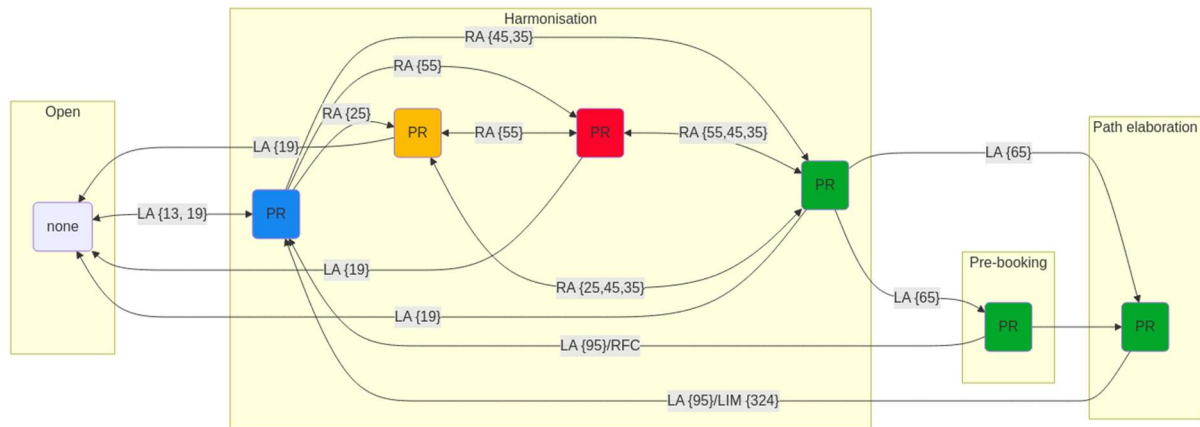
The following process flows represent the status of the Reference Train, the Path Request and Path (offer):

- NPR on reference train level
- NPR on request level
- NPR on offer level
- Prebooking subflow

NPR on reference train level



NPR on request level

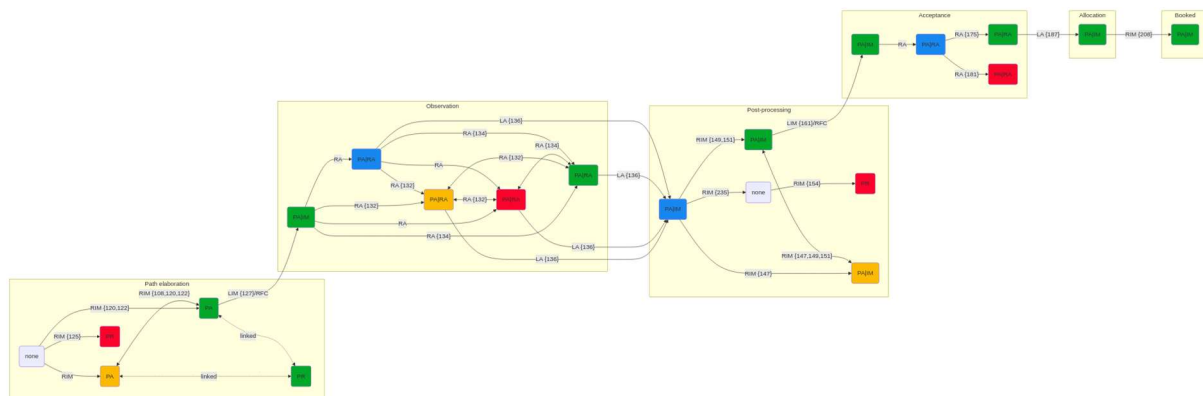


Each group represents a reference train status and below that, the progress of the path request is shown. The legend of the colours is the following:

- none - path request does not exist yet, or progress is not relevant and cannot be set.
- Blue - not yet processed
- Yellow - being processed
- Red - not accepted
- Green - accepted

The flow describes that the PR object's life cycle is from creation to Path elaboration.

NPR on offer level



Each group represents a reference train status and below that, the progress of the path is shown. The legend of the colours is the following:

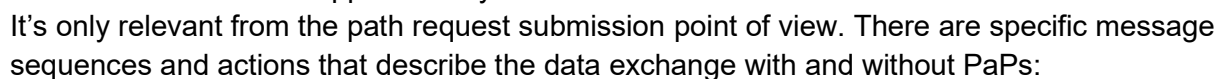
- none - path does not exist yet, or progress is not relevant and cannot be set.
- Blue - not yet processed
- Yellow - being processed
- Red - not accepted
- Green - accepted

The flow describes that the PA object's life cycle is from Path elaboration to Booked.

As you can see, the PA itself cannot be set to red by the IM. That would mean a rejection of the request, that is why it's shown with a red PR on the diagram.

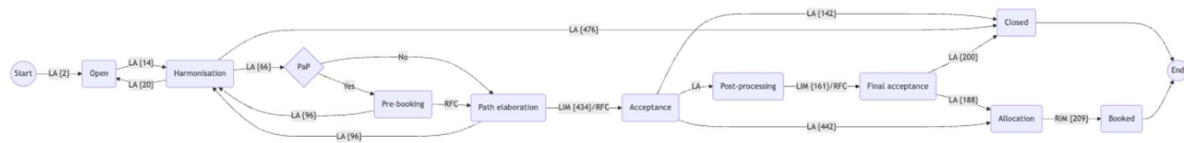
Please note that from draft offer, IMs and Applicants have their own progress on the offers, that is why the PA|IM and PA|RA description is used.

Those reference trains that have at least one path request that includes a Pre-arranged Path (PaP) are managed by the RFCs. In this case, instead of the LIM, the RFC is responsible for the reference train level promotion. Reference trains like these have further limitations (e.g. no partial offer support), but the aim of this chapter is to describe the pre-booking subflow. By default, after submission, the requests arrive at Pre-booking status. From here the RFC can forward the requests to Path elaboration, but they have an editing option. Any edit means creation of an alternative offer (a changed path request).



- LPR on reference train level
- LPR on request level
- LPR on offer level

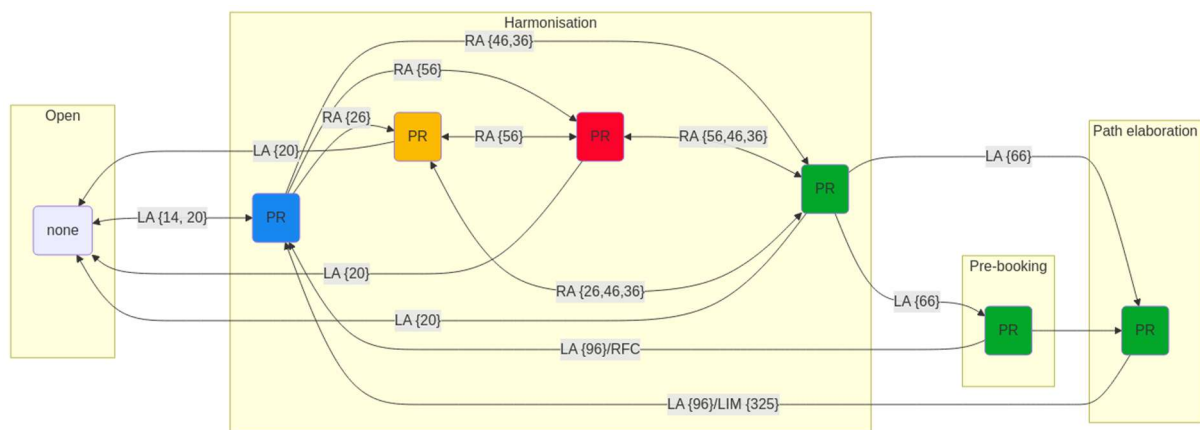
LPR on reference train level



Please note the following differences compared to the NPR process:

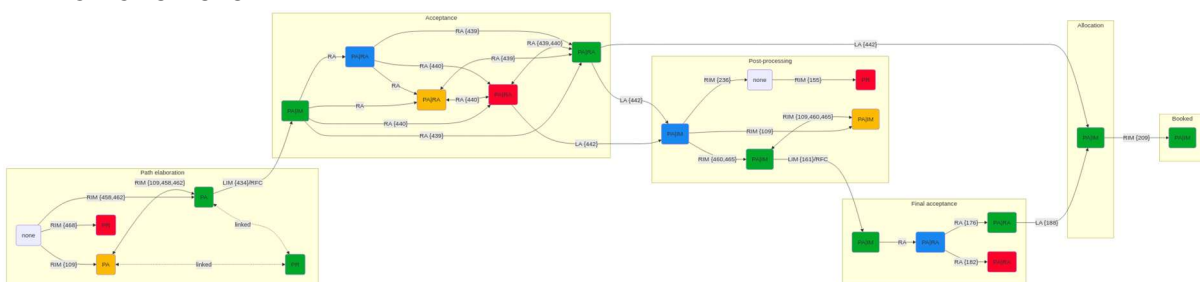
- There is no Observation status, where applicants can place standardised observations
- With certain conditions (if all offers are accepted), the LA can promote the reference train directly from Acceptance to Allocation
- With certain conditions (if all offers are determined but not all accepted), the LA can still promote the reference train to Post-processing and that is followed by a Final acceptance status.

LPR on request level



The request level flow for the LPR process is the same as for the NPR.

LPR on offer level



The differences compared to the NPR flow are presented also on the offer level flow.

4.3 Ad hoc Path Request (AHPR) and allocation process - Process flow

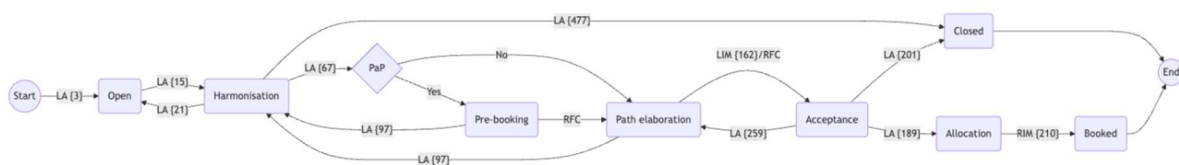
The AHPR process is used for path requests during the timetable year on an ad-hoc basis from X-2 to X+12, but at least 30 days before the train runs. Most of the process steps for the AHPR are the same as for the LPR, except the following differences.

- The deadlines are as defined for the AHPR process:
 - Path request deadline X-2 to X+12.
 - Final offer deadline X-2 to X+12.

The following process flows represent the status of the Reference Train, the Path Request and Path (offer):

- AHPR on reference train level
- AHPR on request level
- AHPR on offer level

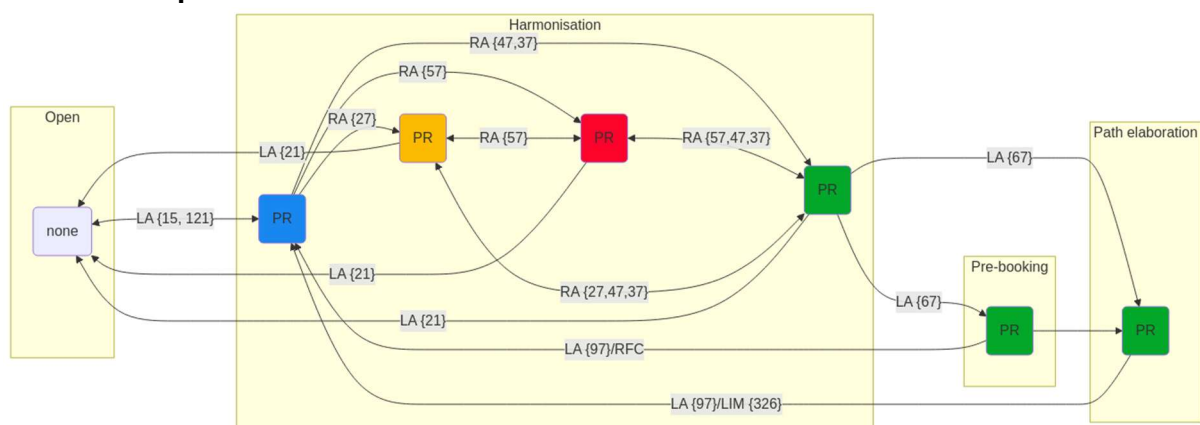
AHPR on reference train level



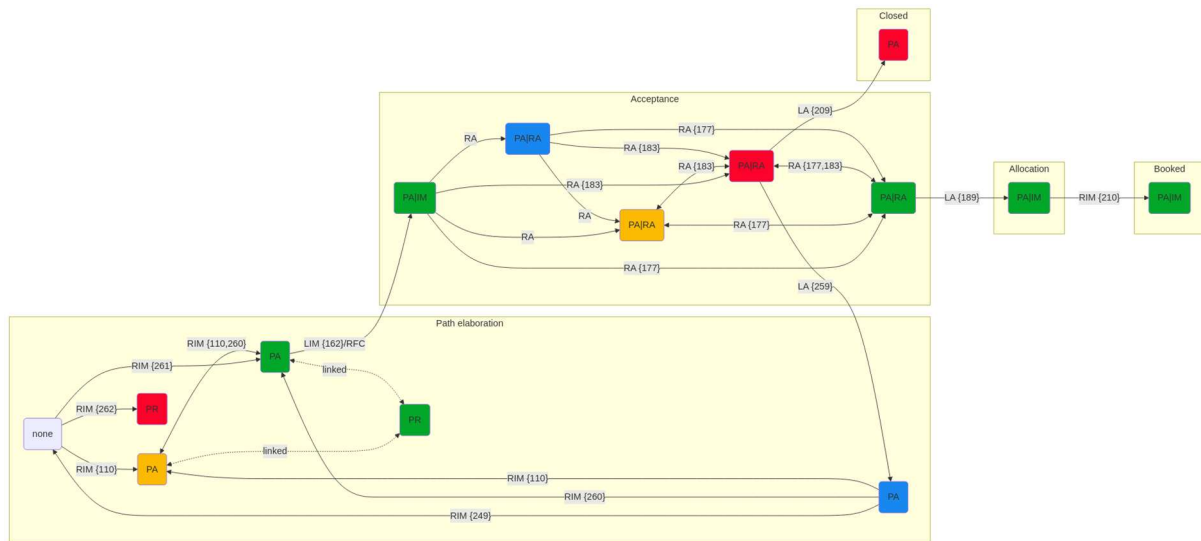
Please note the following differences compared to the LPR process:

- Applicants must decide the first and final offer in Acceptance status
- Apart from rejecting or accepting the final offer, the LA can promote the reference train back to Path elaboration (reject with revision). This action can be done as many times as LA wants.

AHPR on request level



AHPR on offer level



4.4 Feasibility study (FS) process - Process flow

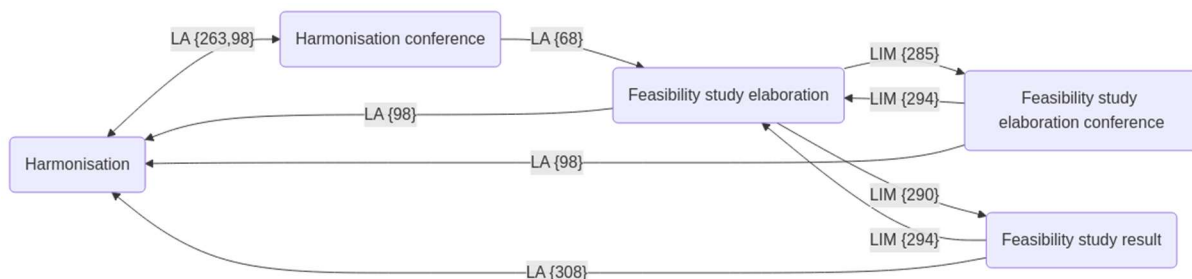
The Feasibility Study process allows the Applicants to get support from the IMs for planning a train service before placing a path request.

The process flow follows the status of the relevant objects on different levels of the object model, namely the Reference Train, the Path Request and Path Offer. Linked PR and PA objects are grouped and their status is aggregated to show a single status information to the user.

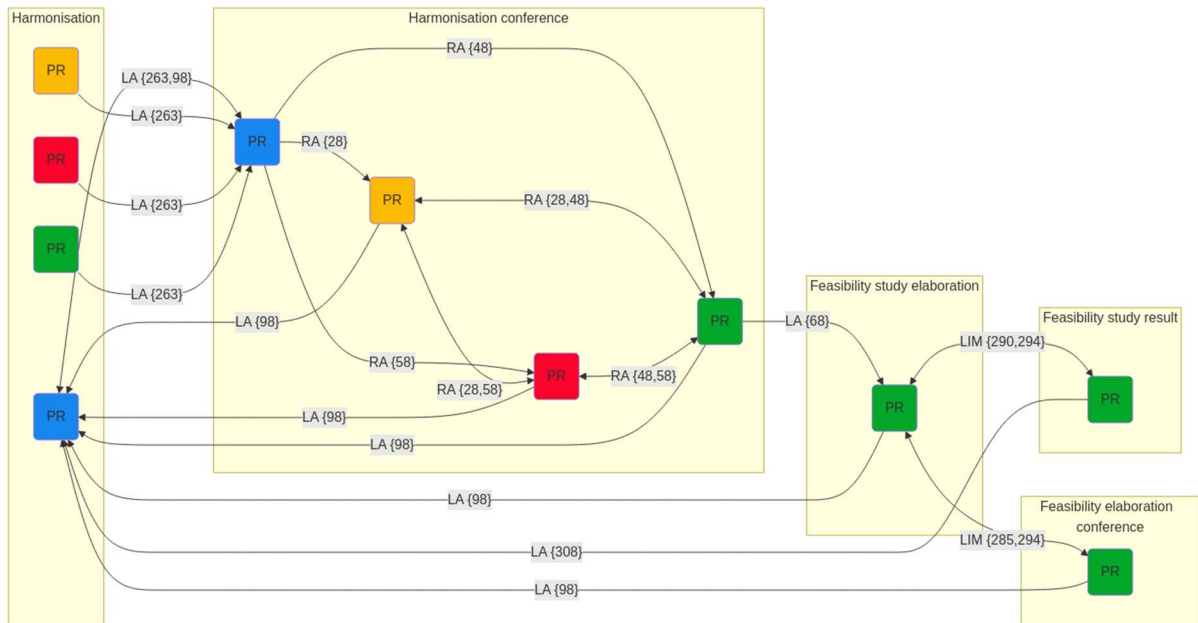
The following process flows represent the status of the Reference Train, the Path Request and Path (offer):

- FS on reference train level
- FS on request level
- FS on offer level

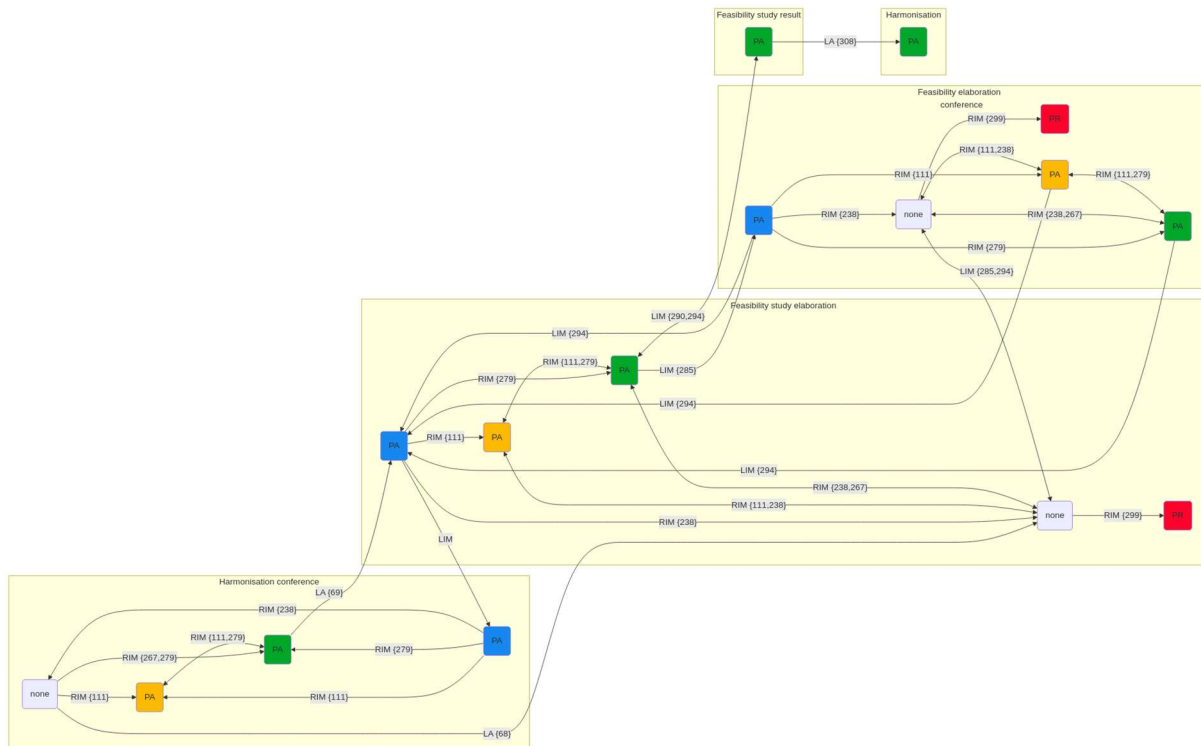
FS on reference train level



FS on request level



FS on offer level



4.5 Path change processes

PCS CB supports the following path changes processes:

- Path Modification
- Path Cancellation
- Path Alteration

The chapters below are describing the processes and workflows of each particular one, but there are a few general rules.

Pending invitations

If an agency has a pending invitation (request to join a path change process), it's not possible for the agency to start a new, own path change process. The only supported options in this case:

- Join the other process
- Ignore the other process

In any other case, PCS CB will reply with an error message.

The sender shall include a request or an offer from the territory where the sender would like to join the path change process. This shall be done using the RelatedPlannedTransportIdentifier, otherwise a new path change process will be opened.

Restrictions in Allocation phase

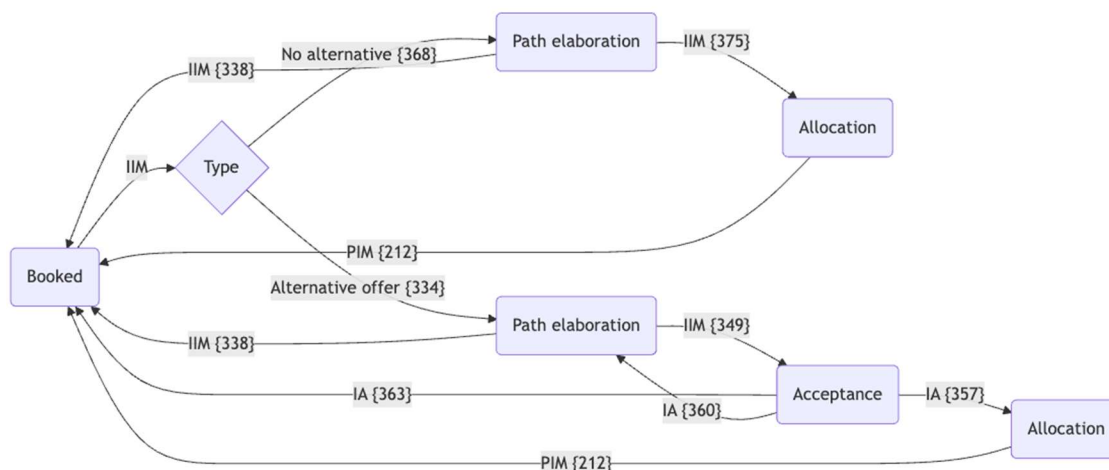
If the path change process is still in allocation, PCS CB does not allow the applicants to start Path Cancellation or Path Modification process. If they attempt, PCS CB will reply with an error message.

4.5.1 Path alteration (PA) process – Process flow

The following process flows represent the status of the Reference Train, the Path Request and Path (offer):

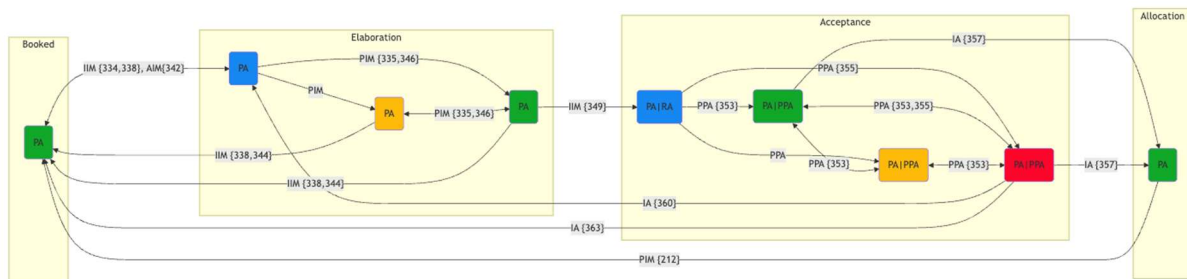
- PA on reference train level
- PA on offer level

Path alteration on reference train level

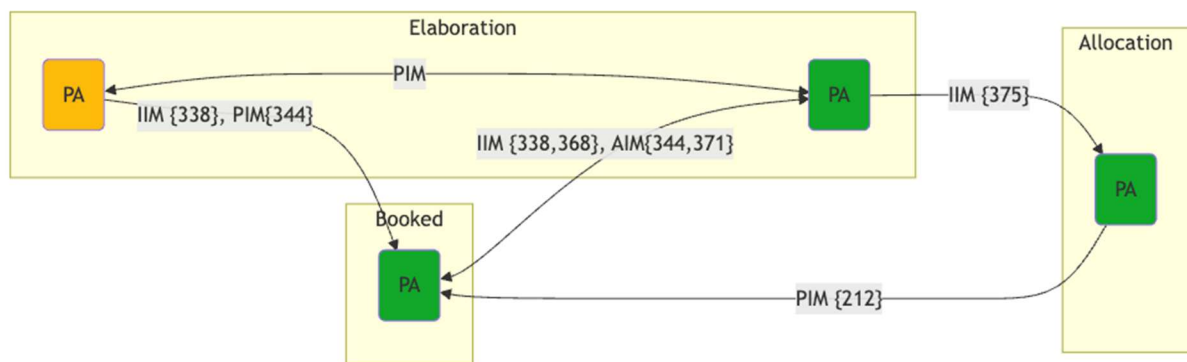


The Path alteration is one process in the TAF/TAP TSI, however, it has two main streams inside. It depends on the existence of the alternative offer. When the IM starts with a TOI 21 (no alternative available), it's practically a cancellation and the not available paths will not be replaced with an alternative offer. When the IM starts with a TOI 23 (preparation of draft alternative offer is in progress), there will be an alternative offer which requires an acceptance step.

Path alteration on offer level with alternative offer



Path alteration on offer level with cancel running days

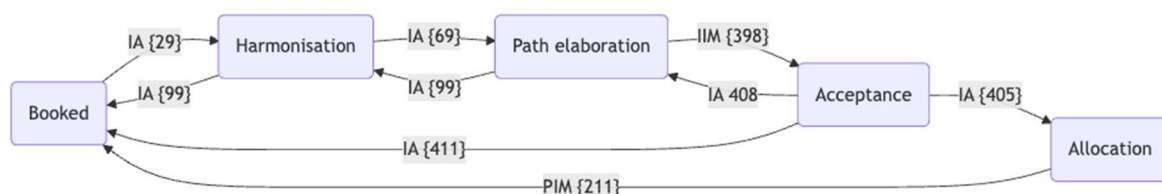


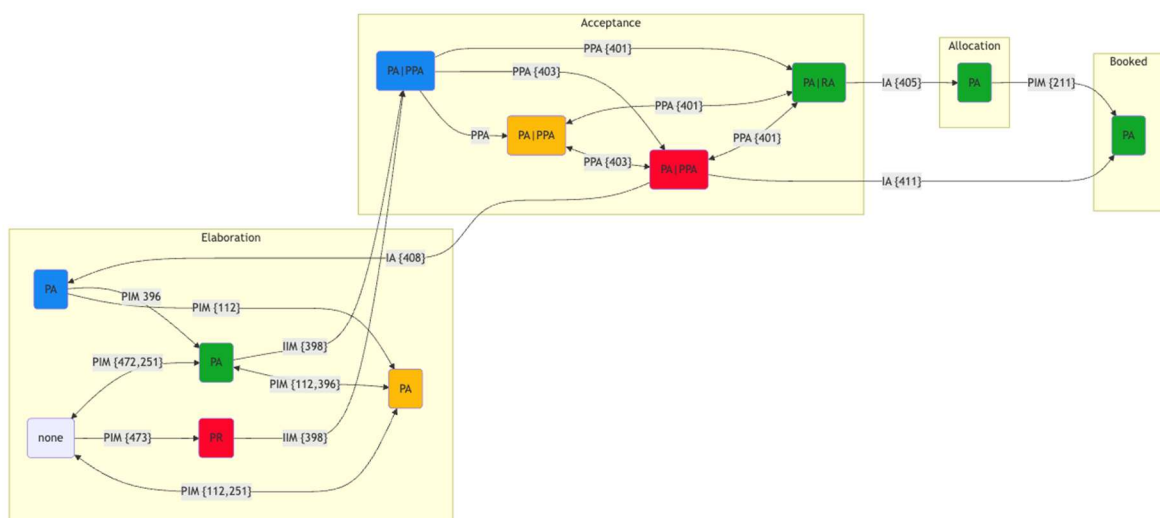
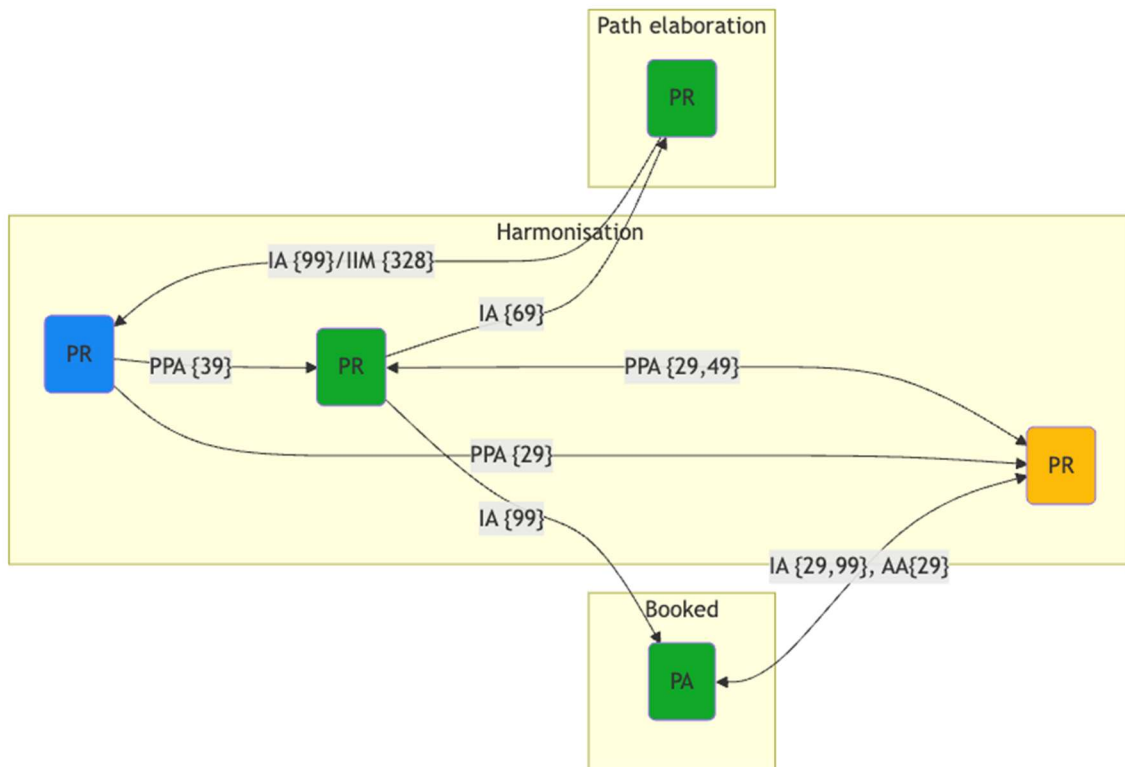
4.5.2 Path modification (PM) process - Process flow

The following process flows represent the status of the Reference Train, the Path Request and Path (offer):

- PM on reference train level
- PM on request level
- PM on offer level

Path modification on reference train level



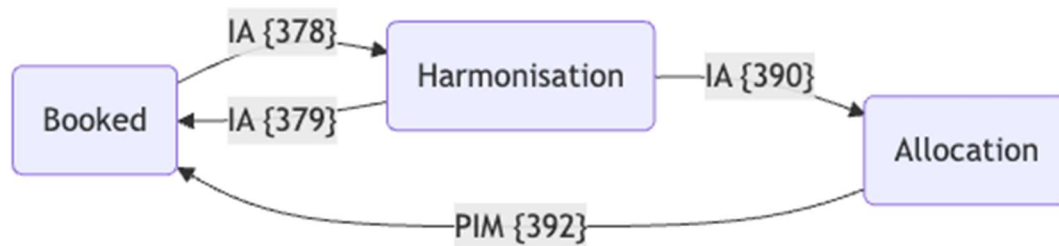


4.5.3 Path cancellation process - Process flow

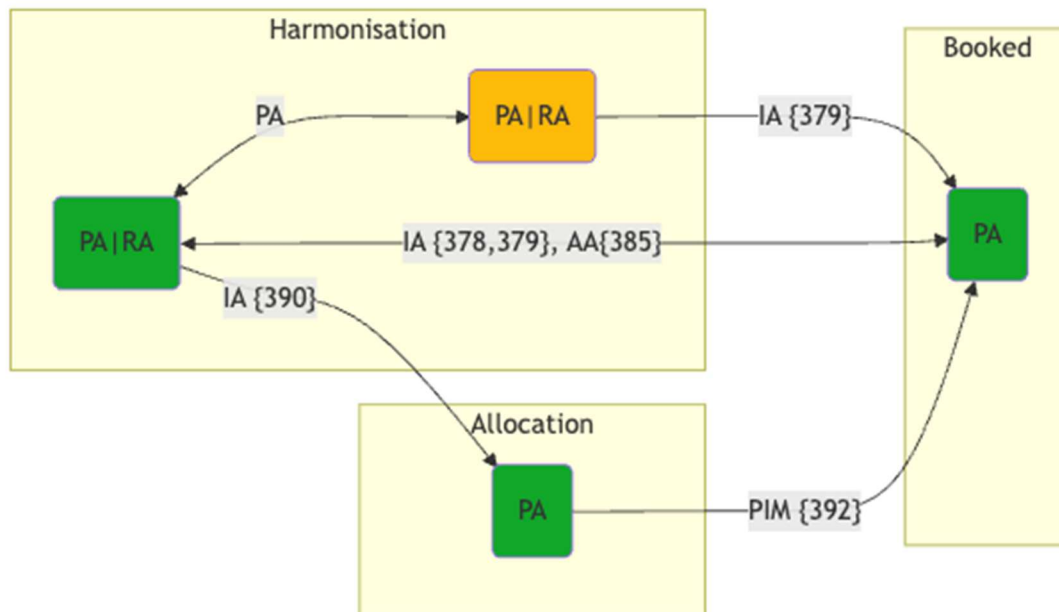
The following process flows represent the status of the Reference Train, the Path Request and Path (offer):

- PC on reference train level
- PC on offer level

Path cancellation reference train level



Path cancellation on offer level



5. Message sequences and actions

Activities in PCS CB API are broken down into actions composed of at least one sub-action. Each action is described by one message sequence.

The actions

The TSI message matrix contains all the supported sub-actions. This matrix is the basis of the inbound message validation and it also includes the main meta data of every handled message:

- Message type
- Direction
- MessageStatus (MS)
- TypeOfInformation (TOI)
- TypeOfRequest (TOR)
- ObjectInfoType (OIT)
- ProcessType (PT)
- Sender
- Recipient
- Included PlannedTransportIdentifiers
- Included TrainInformation
- Included TrainInformationExtended
- Included PathInformation
- Included PathInformationExtended under the TrainInformationExtended
- Included FreeTextField
- Applicable reference train phases
- TypeOfHarmonisation (TOH)
- Related TR
- Related RO
- Related PR
- Related PA

The matrix has its own enumerations as the following:

- M: Mandatory. Mandatory by the schema and PCS also expects it. If it's missing, PCS replies with error message. E.g., TR ID for reference train creation.
- O: Optional. If not provided, PCS still accepts the message. If provided, the field will be validated, but not processed. E.g., RO ID.
- MI: Mandatory Ignored. The element is mandatory in the schema, but ignored during message processing. E.g., TrainInformation element for any inbound message except for the reference train creation.
- NI: Not Included.
- OMO: Own Mandatory One. One of my objects must be placed. E.g. PA ID as an IM when I work in a partial process. This is to help detect the relevant territory.
- OOA: Own Optional All. All the objects belonging to me in the given process. E.g. OOA PR IDs as RPTID means that all PRs of my territory (excluding the one in PTID) shall be sent out, if exists.
- IMO: Initiator's Mandatory One. One of the initiator's object must be placed. E.g. PA ID as RPTID when the IM wants to ignore or join a path alteration process.

- OMS: Own Mandatory Split. This is used only for PRMs, where the split IDs are sent as RPTID.

Please note that if a sub-action is performed by a user directly on the UI, then PCS CB still generates the outbound messages. For such cases, the inbound messages can be ignored from the diagrams.

The actions are grouped later as the following:

- o Common message sequences and actions: actions that can be applied for both NPR, LPR and AHPR
- o Process type specific sequences and actions: actions that are specific to a particular process type, e.g. Feasibility Study

The message sequence

The message contains the message flows composing one action. Each message flow corresponds to one sub-action. How to read the message sequence diagrams:

- Agency types:
 - o In the diagrams for non-path changes actions, a set of 5 agencies is shown:
 - **Leading Applicant** – The Leading Applicant in the reference train
 - **Involved Applicant(s)** – All applicants which are included in the reference train (including the Leading Applicant)
 - **PCS CB**
 - **Involved IM(s)** – All IMs which are included in the reference train (including the Leading IM)
 - **Leading IM** – the Leading IM in the reference train
 - o In path changes processes, there are 7 possible agency types:
 - **Initiating Applicant / Pair Applicant of the Initiating IM**: The Applicant who starts the process or the applicant that shares a territory with the IM which started the process
 - **Affected Applicant** – Any applicant whose request is affected by change in a neighbouring territory, but has not yet joined the process
 - **Participating Applicant** – Any applicant whose request is affected by a change in a neighbouring territory, and has already joined the process (includes the Initiating Applicant / Pair Applicant of the Initiating IM)
 - **PCS CB**
 - **Participating IM** – Any IM whose offer is affected by a change in a neighbouring territory, and has already joined the process (includes the Initiating IM / Pair IM of the Initiating Applicant)
 - **Affected IM(s)** – Any IM whose offer is affected by a change in a neighbouring territory, and has already joined the process
 - **Initiating IM / Pair IM of the Initiating Applicant** – The IM who starts the process or the IM who shares a territory with the Applicant which started the process


- Actions, sub-actions, and IDs:

These diagrams indicate the expected inbound and outbound messages which are expected to be sent and received for every action in PCS. Each diagram represents a single action, which is made up of sub actions (the inbound and outbound messages)

Associated with each arrow (sub-action) is one message type and one or multiple IDs. Each ID corresponds to a row in Appendix A of these technical specifications, where the full details for the indicated message can be found.


Some actions can apply to more than one process type. For such examples, multiple IDs will be listed for each sub-action, with the process type indicated before the ID. For example, the inbound sub-action for 'Reference Train Creation' are indicated as follows:

PRM (NPR:1, LPR:2, AHP:3)



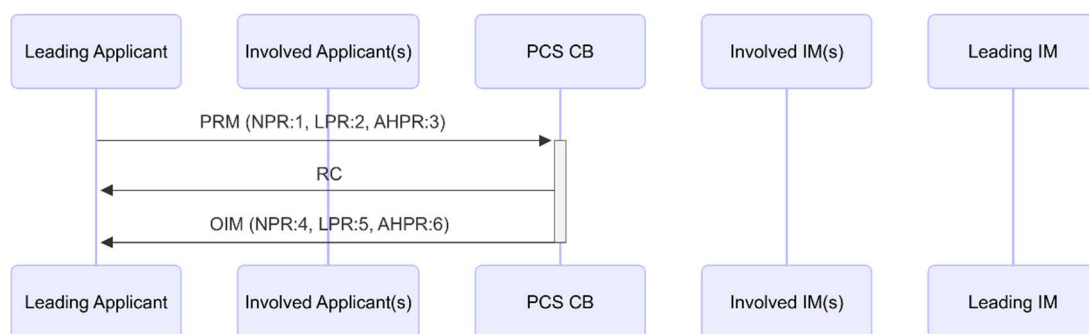
Some actions can apply to a single process type but in different phases. For such examples, each unique ID for each phase is shown and divided with a '/'. For example: the inbound sub-action for 'final offer creation/update' in late path request can be done in path elaboration (ID 109) or post-processing (483), and is indicated as follows:

PDM (NPR:147, LPR:109/483, AHP:110)



5.1 Common message sequences and actions

5.1.1 Reference train creation / NPR, LPR, AHP



TSI message matrix IDs:

- NPR: 1, 4
- LPR: 2, 5
- AHP: 3, 6

As this the first step of the process, there are special restrictions on the TrainInformation element content.

TrainInformation:

- List of PlannedJourneyLocations:
 - Mandatory locations: first and last PlannedJourneyLocation from the PathInformation
 - Optional other locations composing the first route of the Reference Train. At least two locations with the same RA-RIM pair
- PlannedJourneyLocation content:
 - TimingAtLocation: Actual Location Departure (ALD) for the first PlannedJourneyLocation of a territory (territory: sequence of PlannedJourneyLocation composed of the same RA-RIM pair)
 - RA
 - RIM

PathInformation:

- Mandatory:
 - PlannedJourneyLocation-level Network-Specific-Parameters
 - PR level Network-Specific-Parameters

After this actions is successfully finished, we have the following objects, updates:

- Reference train is created (TRID from the PRM)
- Route is created (ROID from the PRM or generated by PCS)
- Path requests composing the reference train are created:
 - The path request for which the LA is the RA (PRID from the PRM)
 - Other path requests based on the TrainInformation from the PRM ("ghost" PR)

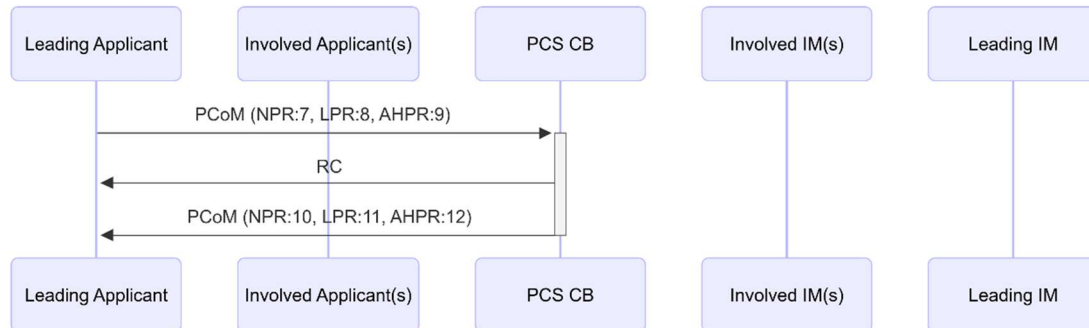
Definition of "ghost" PR

A path requests without a PR ID is named "ghost" PRs and can be created in the following ways:

- LA sends a PRM to create a Reference Train. "Ghost" PRs are generated by PCS based on the TrainInformation. The locations in TrainInformation are grouped per territory based on the ResponsibleApplicant and ResponsibleIM pairs. Apart from the journey, no other information can be fulfilled: calendar, NSP, train parameters are empty. As missing of certain timing information means a blocker issue, the following times must be provided by the LA:
 - Departure time on the first location of the TrainInformation (ALD)
 - Departure time (ALD) or run-through time (ART) on every other location that is a start of a territory.
- On the GUI: the LA creates reference train
 - LA is set as responsible applicant for all territories at the moment of the ID generation → all path requests are there with IDs using the LA's company code. No "ghost" PR exists in the reference train. When the LA edits the responsible agencies afterwards and releases the reference train to Harmonisation, the responsible applicant will get an ID for its PR with the LA's company code.
 - LA updates the responsible applicant during the creation (or any time before the ID generation) → only the LA's path requests get an ID. "Ghost" PRs are created.

“Ghost” PRs are excluded from the outbound messages.

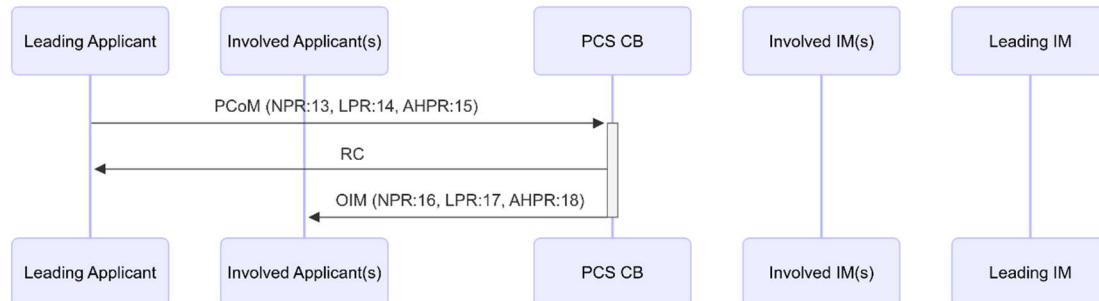
5.1.2 Reference train deletion / NPR, LPR, AHPR



TSI message matrix IDs:

- NPR: 7, 10
- LPR: 8, 11
- AHPR: 9, 12

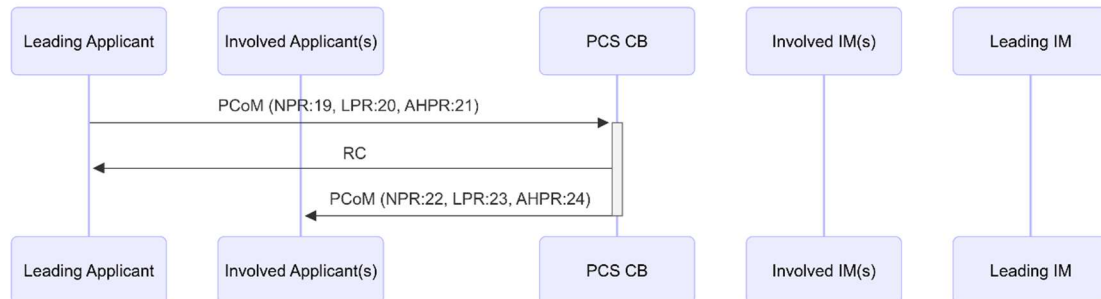
5.1.3 Reference train promotion to Harmonisation by the Leading Applicant



TSI message matrix IDs:

NPR: 13, 16
 LPR: 14, 17
 AHPR: 15, 18

5.1.4 Reference train withdrawal from Harmonisation by the Leading Applicant / NPR, LPR, AHPR



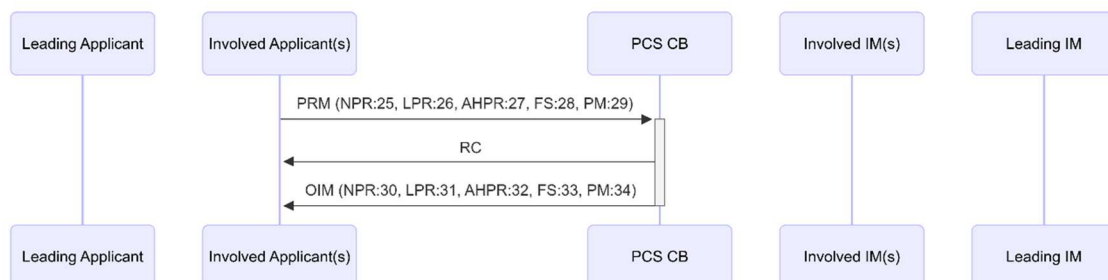
TSI message matrix IDs:

NPR: 19, 22

LPR: 20, 23

AHPR: 21, 24

5.1.5 Path request creation/update by an Involved Applicant / NPR, LPR, AHPR, FS, PM



TSI message matrix IDs:

- NPR in Harmonisation: 25, 30
- LPR in Harmonisation: 26, 31
- AHPR in Harmonisation: 27, 32
- FS in Harmonisation Conference, Feasibility Elaboration Conference: 28, 33
- PM in Harmonisation: 29, 34

Clarification regarding a similar use case from the Sector Handbook:

- TypeOfInformation: "1" instead of "4". Reason: the Sector Handbook describes the sending of a PR in its final version and not the exchange of PR information with other involved RA(s) for harmonisation purposes. The preparation of the PR is in progress.

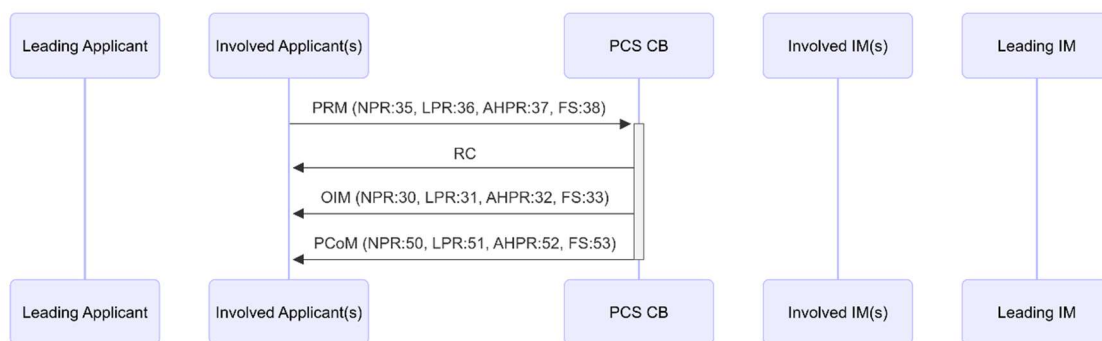
Regarding "ghost" PRs, the following scenarios exist:

- Only a "ghost" PR exists in the RA's territory
- A real PR exists in the RA's territory

The following rules shall be applied depending on the use case:

- The PRM contains a first and last location and the received PR ID already exists in the Reference Train (example: the object was created via the GUI): the **existing object is updated** in the GUI according to the content of the message sent by the RA.
- The PRM contains a first and last location but the received PR ID does not exist in the Reference Train: a **new object is created** in the territory and calendar switch applies.
- No "real" PR object exists in the Reference Train (only a "ghost" PR without ID) but the received PR can be inserted (without calendar switch) to a territory if:
 - There is only one territory with the RA-IM pair included in the message
 - Or the first and last location of the "ghost" PR matches the received PR.
- All other use cases: an **error** message is sent back

5.1.6 Path request creation/update and finalisation by an Involved Applicant / NPR, LPR, AHPR, FS



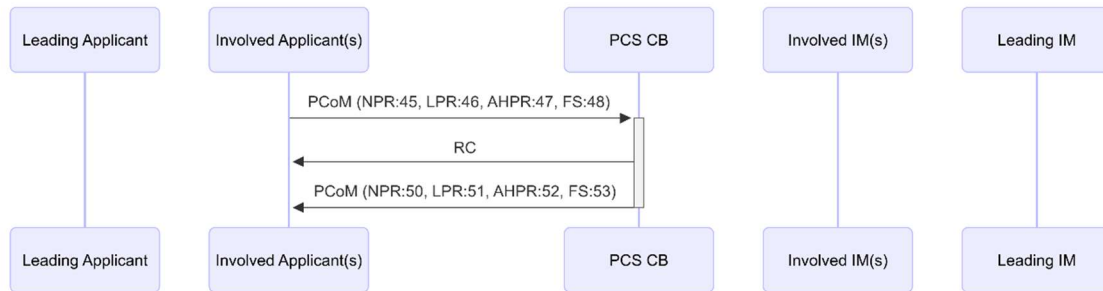
TSI message matrix IDs:

- NPR in Harmonisation: 35, 30, 50
- LPR in Harmonisation: 36, 31, 51
- AHPR in Harmonisation: 37, 32, 52
- FS in Harmonisation Conference: 38, 33, 53

Clarification regarding a similar use case from the Sector Handbook:

- TypeOfInformation: "2" instead of "4". Reason: the Sector Handbook describes the sending of a PR in its final version and not the exchange of PR information with other involved RA(s) for harmonisation purposes. The preparation is finalised by the RA but may still be affected by border location changes done by neighbouring RA(s) in their own PR(s).

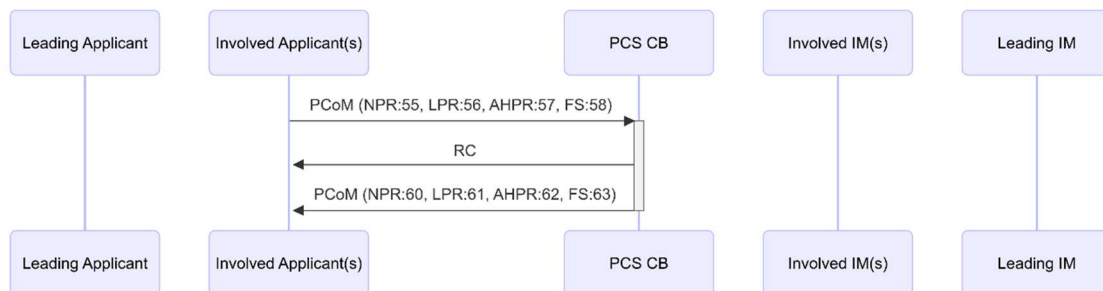
5.1.7 Path request finalisation by an Involved Applicant / NPR, LPR, AHPR, FS



TSI message matrix IDs:

- NPR in Harmonisation: 45, 50
- LPR in Harmonisation: 46, 51
- AHPR in Harmonisation: 47, 52
- FS in Harmonisation Conference: 48, 53

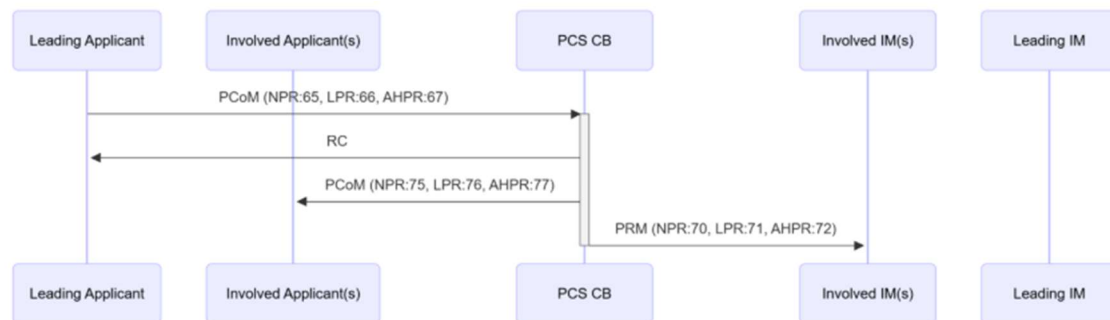
5.1.8 Path request preparation rejection by an Involved Applicant / NPR, LPR, AHPR, FS



TSI message matrix IDs:

- NPR in Harmonisation: 55, 60
- LPR in Harmonisation: 56, 61
- AHPR in Harmonisation: 57, 62
- FS in Harmonisation Conference: 58, 63

5.1.9 Path request submission by the Leading Applicant (no PaPs included in the reference train) / NPR, LPR, AHPR

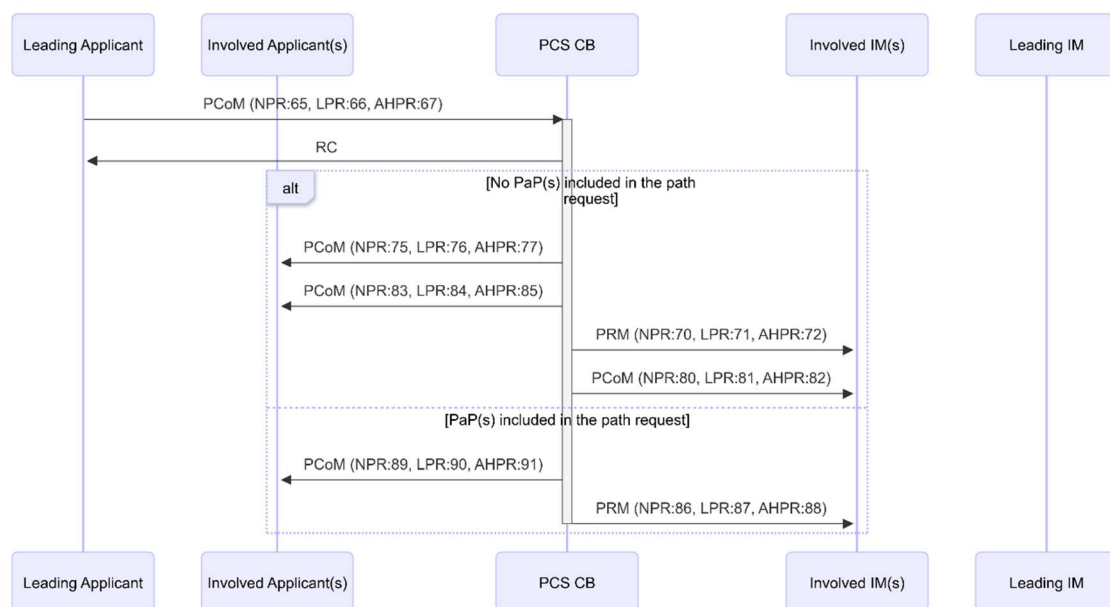


TSI message matrix IDs:

- NPR: 65, 70, 75
- LPR: 66, 71, 76
- AHPR: 67, 72, 77

Path requests of a reference train can be submitted only if all of them are accepted (green). The requests can be submitted either by the LA or by the tool. The tool submits the requests when the automatic promotion deadline is reached and all submission criteria are met (as written before).

5.1.10 Path request submission by the Leading Applicant (PaPs included in the reference train) / NPR, LPR, AHPR



TSI message matrix IDs:

- NPR: 65, 70, 75, 80, 83, 86, 89

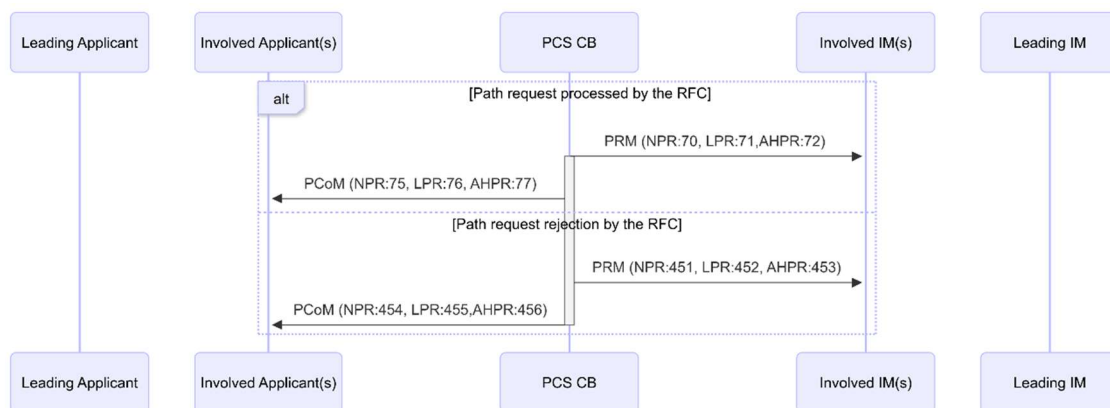
- LPR: 66, 71, 76, 81, 84, 87, 90
- AHPR: 67, 72, 77, 82, 85, 88, 91

Path requests of a reference train can be submitted only if all of them are accepted (green). The requests can be submitted either by the LA or by the tool. The tool submits the requests when the automatic promotion deadline is reached and all submission criteria are met (as written before).

Please note the PaPs are not considered anymore after booking, that is why this action is not applicable for Path Modification.

Regarding the Feasibility Study, whether or not PaPs are included in the request, it does not have any influence on the messages.

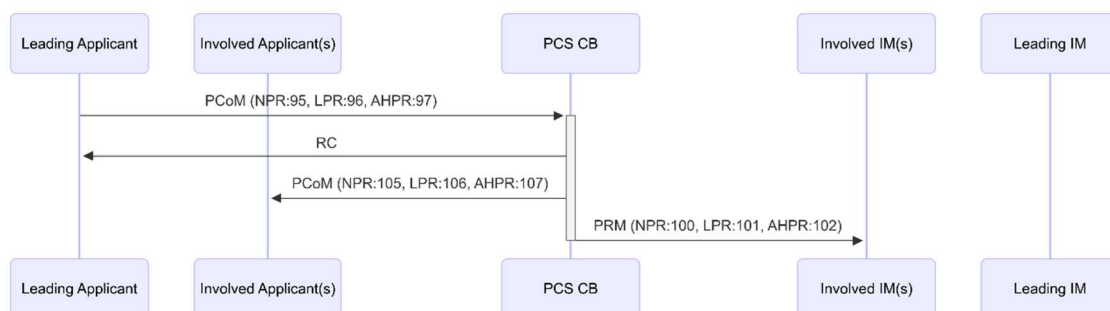
5.1.11 Pre-booking completion by the RFC / NPR, LPR, AHPR



TSI message matrix IDs:

- NPR: 70, 75, 451, 454
- LPR: 71, 76, 452, 455
- AHPR: 72, 77, 453, 456

5.1.12 Reference Train withdrawal from Path Elaboration by the Leading Applicant / NPR, LPR, AHPR



TSI message matrix IDs:

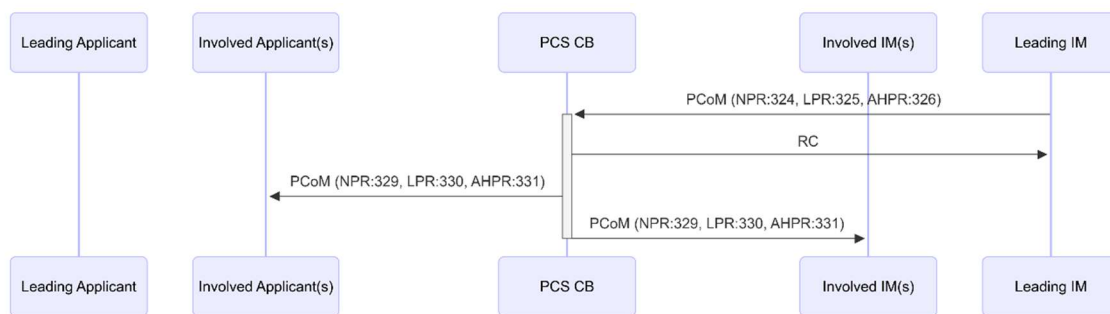
- NPR from Path elaboration: 95, 100, 105
- LPR from Path elaboration: 96, 101, 106

- AHPR from Path elaboration: 97, 102, 107

Clarification regarding a similar use case from the Sector Handbook:

- MessageType: "PathCoordinationMessage" instead of "PathRequestMessage". Reason: the Sector Handbook describes the trigger for the withdrawal of a PR. The trigger in PCS is for the withdrawal of the entire Reference Train.

5.1.13 Reference Train rejection by the Leading IM from Path Elaboration / NPR, LPR, AHPR



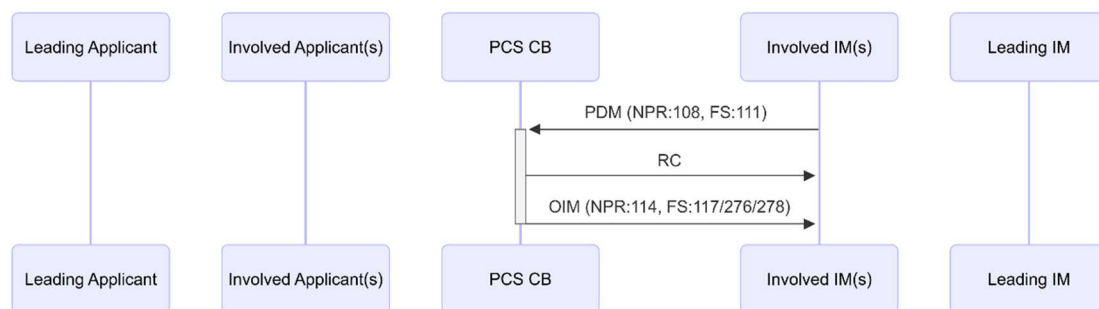
TSI message matrix IDs:

NPR: 324, 329

LPR: 325, 330

AHPR: 326, 331

5.1.14 Draft offer creation/update by an Involved IM / NPR, FS



TSI message matrix IDs:

NPR: 108, 114

LPR: 109, 115

AHPR: 110, 116

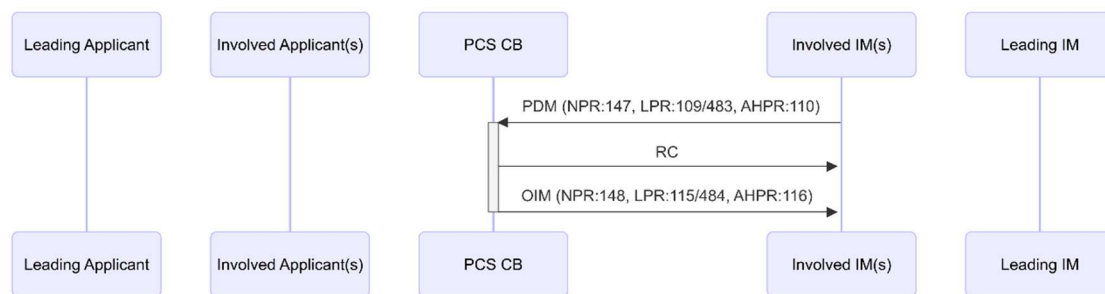
FS: 111, 117, 276, 278

Clarification regarding a similar use case from the Sector Handbook:

- TypeOfInformation: “8” instead of “9”. Reason: The Sector Handbook describes the sending of a PA in its final version and not the exchange of PA information with other involved IM(s) for coordination purposes. The preparation of the PA is in progress.

If an update is sent in which a different PRID is included in the PlannedTransportIdentifiers than that which was already linked to the PA, this PRID will be linked to the PA and original PRID will become unlinked.

5.1.15 Final offer creation/update by an Involved IM / NPR, LPR, AHPR



TSI message matrix IDs:

NPR: 147, 148

LPR: 109, 483, 115, 484

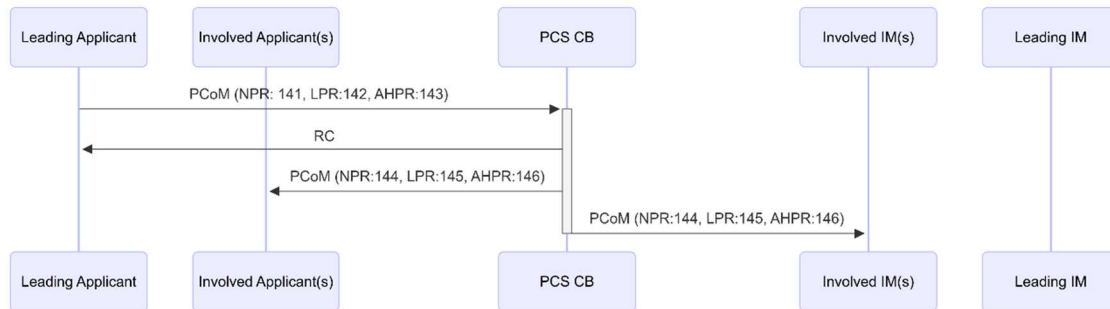
AHPR: 110, 116

If an update is sent in which a different PRID is included in the PlannedTransportIdentifiers than that which was already linked to the PA, this PRID will be linked to the PA and original PRID will become unlinked.

Clarification regarding a similar use case from the Sector Handbook:

- TypeOfInformation: “13” instead of “9”. Reason: the Sector Handbook describes the sending of a PA in its final version and not the exchange of PA information with other involved IM(s) for coordination purposes. The preparation is finalised by the IM but may still be affected by border location changes done by neighbouring IM(s) in their own PA(s).

5.1.16 Reference train closure by Leading Applicant / NPR, LPR, AHPR



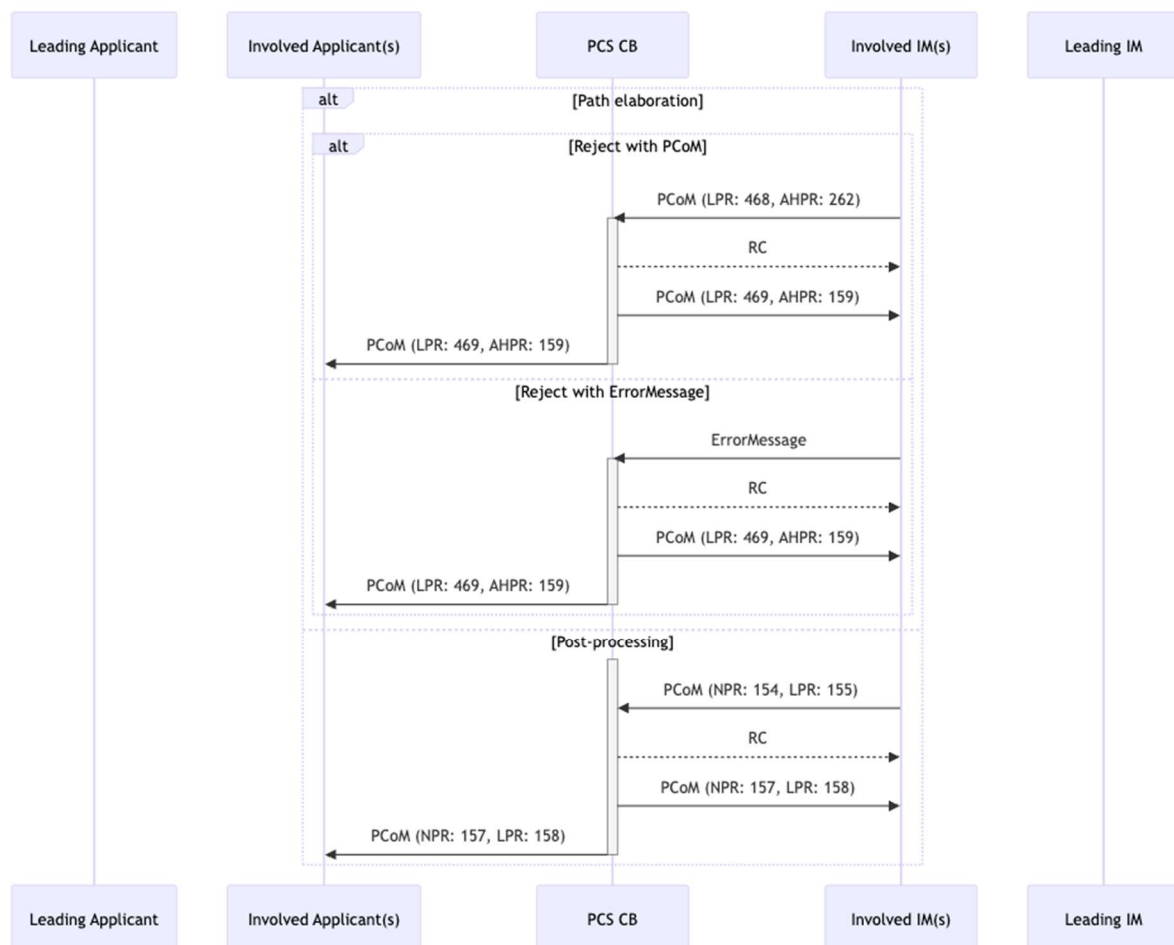
TSI message matrix IDs:

NPR in Observations: 141, 144

LPR in Acceptance: 142, 145

AHPR in Acceptance: 143, 146

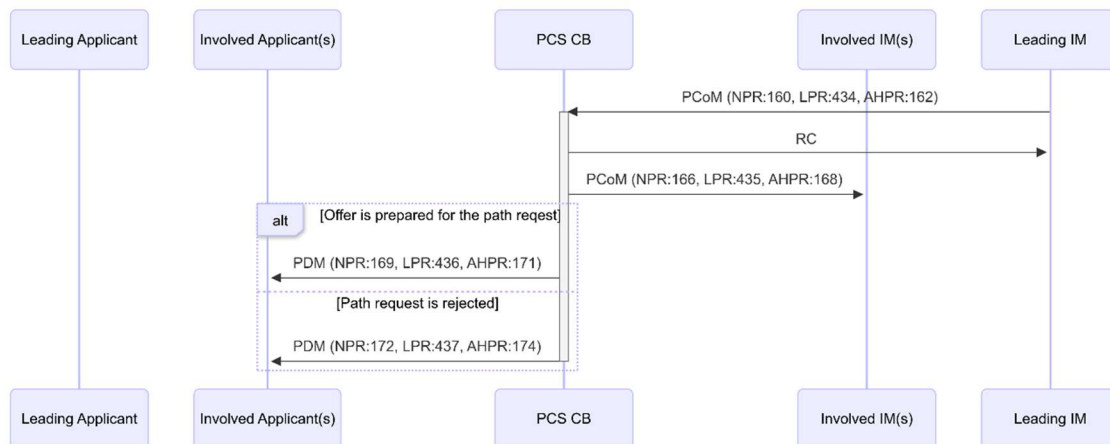
5.1.17 Final offer preparation rejection by an Involved IM(no final offer to be submitted) / NPR, LPR, AHPR



TSI message matrix IDs:

- NPR in Post-processing: 154, 157
- LPR
 - In Path elaboration: 468, 469
 - In Post-processing: 155, 158
- AHPR in Path elaboration: 262, 159

5.1.18 Final offer submission by the Leading IM / NPR, LPR, AHPR

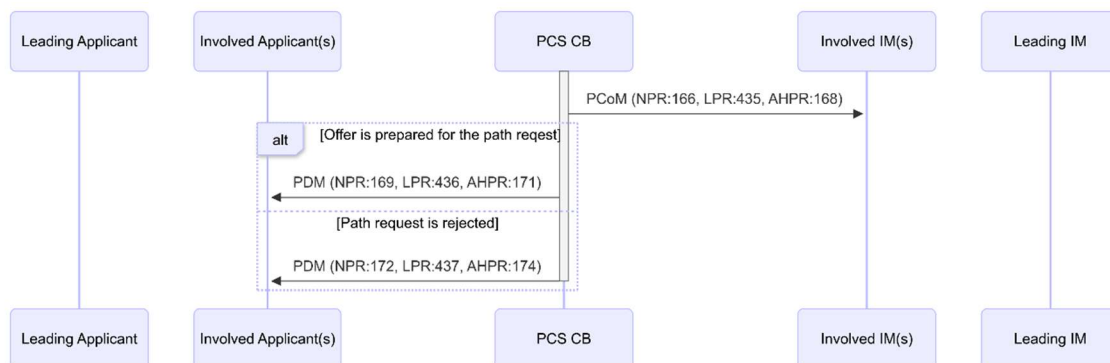


TSI message matrix IDs:

- NPR from Post-processing: 160, 166, 169, 172
- LPR from Path elaboration: 434, 435, 436, 437
- AHPR from Path elaboration: 162, 168, 171, 174

By default, the first offer of the LPR is also a final offer, sent from Path elaboration. In the Acceptance phase, Applicants have the option to accept it and go directly to Allocation. However, there is an option to ask for adaptation of the offer. They can proceed to Post-processing and that is followed again with a final offer, but now in the Final acceptance phase.

5.1.19 Final offer submission by the RFC (PaPs included in the reference train) / NPR, LPR, AHPR



Final offer submission (PaPs included in the reference train) can only be triggered via the graphical user interface, and only by the responsible Rail Freight Corridor.

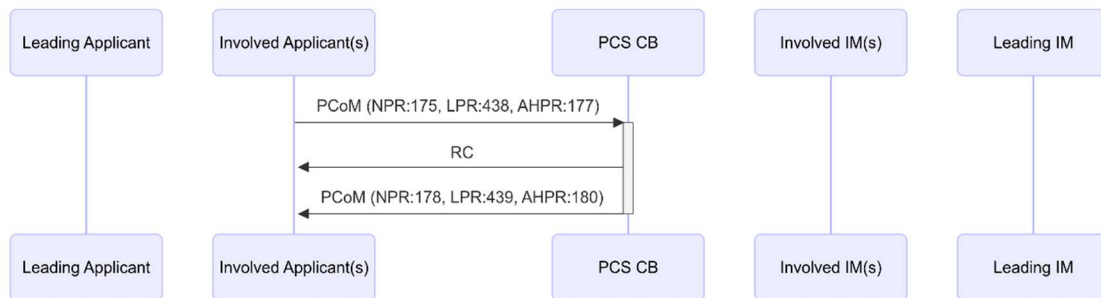
TSI message matrix IDs:

NPR: 166, 169, 172

LPR: 435, 436, 437

AHPR: 168, 171, 174

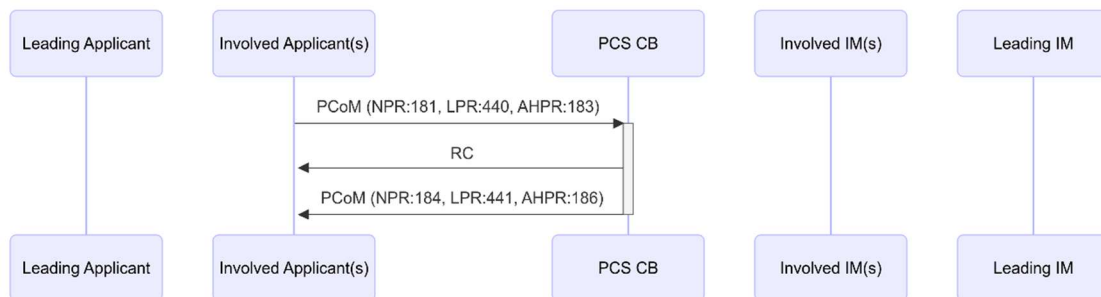
5.1.20 Final offer acceptance by an Involved Applicant / NPR, LPR, AHPR



TSI message matrix IDs:

- NPR: 175, 178
- LPR: 438, 439
- AHPR: 177, 180

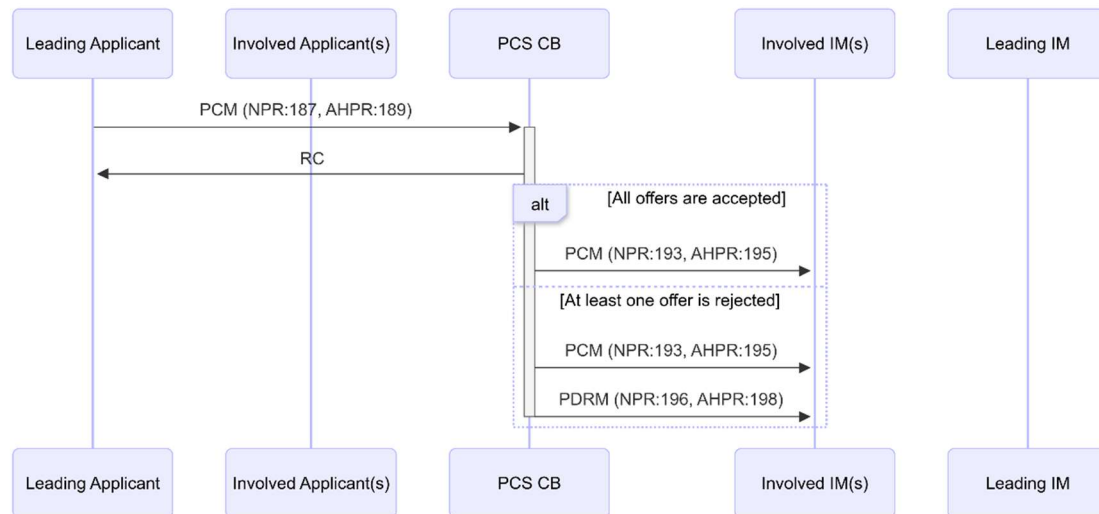
5.1.21 Final offer rejection by an Involved Applicant / NPR, LPR, AHPR



TSI message matrix IDs:

- NPR: 181, 184
- LPR: 440, 441
- AHPR: 183, 186

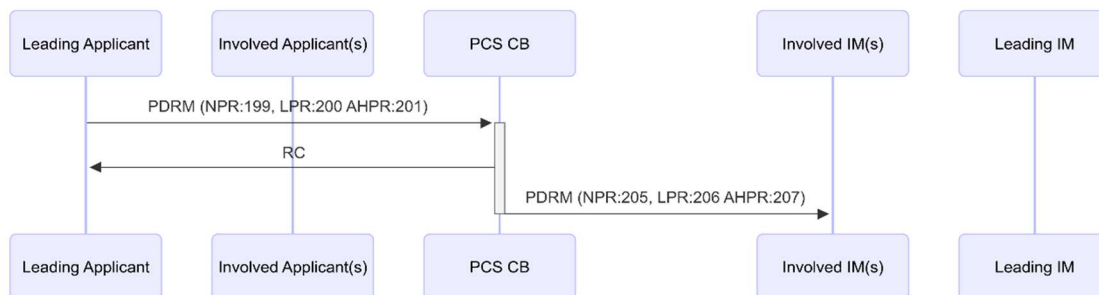
5.1.22 Final offer acceptance by the Leading Applicant / NPR, AHPR



TSI message matrix IDs:

- NPR: 187, 193, 196
- AHPR: 189, 195, 198

5.1.23 Final offer rejection by the Leading Applicant / NPR, LPR, AHPR



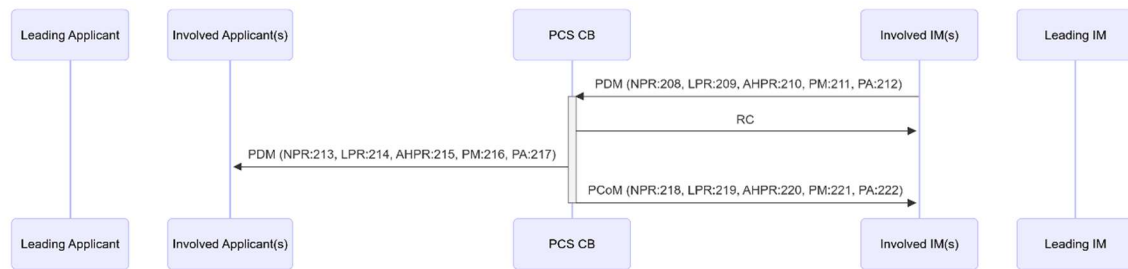
TSI message matrix IDs:

- NPR: 199, 205
- LPR: 200, 206
- AHPR: 201, 207

When all offers are rejected, the LA has the option to reject the whole reference train. Or after the final offer deadline, the tool promotes daily the reference trains.

It can happen when all the PAs in all territories are with red lights from the Applicants. For the rejection, the tool expects a mandatory comment (rejection reason). In such cases, when the system rejects the reference train, the following default reason is applied: "PCS CB on behalf of the Lead Applicant, because the reference train was rejected by all responsible applicants."

5.1.24 Path booking allocation by an Involved IM / NPR, LPR, AHPR, PM, PA



TSI message matrix IDs:

- NPR: 208, 213, 218
- LPR: 209, 214, 219
- AHPR: 210, 215, 220
- PM: 211, 216, 221
- PA: 212, 217, 222

5.1.25 Path request deletion by an Involved Applicant, Path offer deletion by an Involved IM / NPR, LPR, AHPR, FS, PM, PA



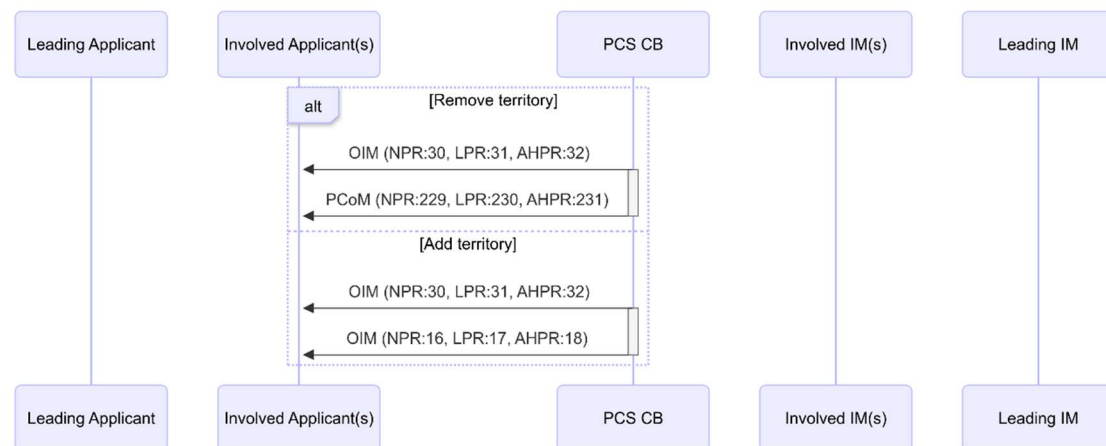
TSI message matrix IDs:

- Delete request
 - NPR
 - In Harmonisation: 223, 229
 - LPR
 - In Harmonisation: 224, 230
 - AHPR
 - In Harmonisation: 225, 231
 - FS

- In Harmonisation conference, Feasibility elaboration conference: 226, 232
- Delete offer
 - NPR
 - In Path elaboration: 247, 253
 - In Post-processing 235, 241
 - LPR
 - In Path elaboration: 236, 242
 - In Post-processing: 248, 254
 - AHPR
 - In Path elaboration: 249, 255
 - FS
 - In Feasibility study elaboration, Feasibility elaboration conference, Feasibility study result: 238, 244

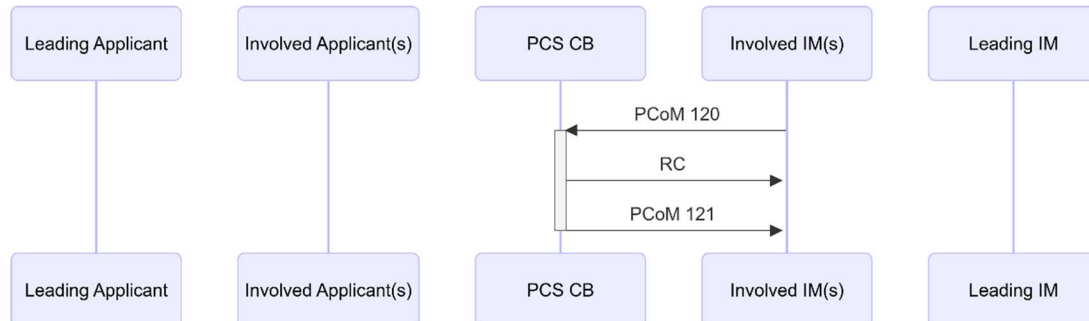
This is a general action when either the applicant or the IM deletes a PR or a PA from the reference train.

5.1.26 Add/remove territory / NPR, LPR, AHPR



5.2 NPR specific message sequences and actions

5.2.1 Draft offer finalisation by an Involved IM



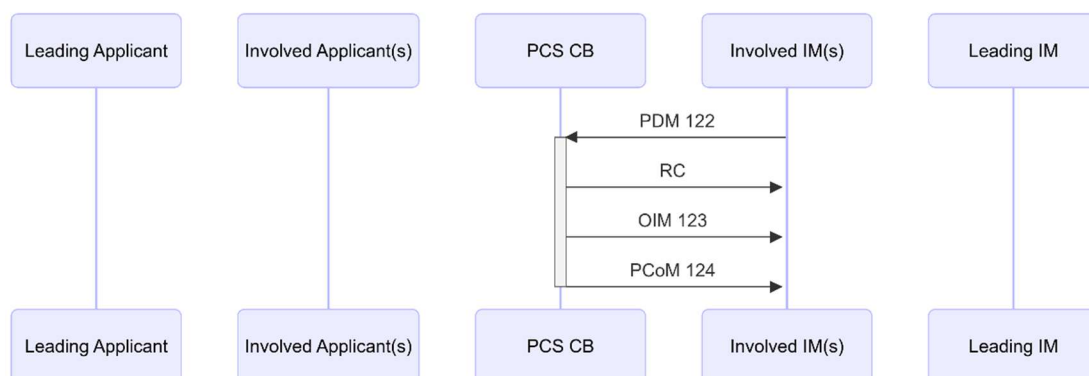
TSI message matrix IDs:

- NPR: 120, 121

Clarification regarding a similar use case from the Sector Handbook:

- TypeOfInformation: “42” instead of “9”. Reason: The Sector Handbook describes the sending of a PA in its final version and not the exchange of PA information with other involved IM(s) for coordination purposes. The preparation is finalised by the IM but may still be affected by border location changes done by neighbouring IM(s) in their own PA(s).

5.2.2 Draft offer creation/update and finalisation by an Involved IM



TSI message matrix IDs:

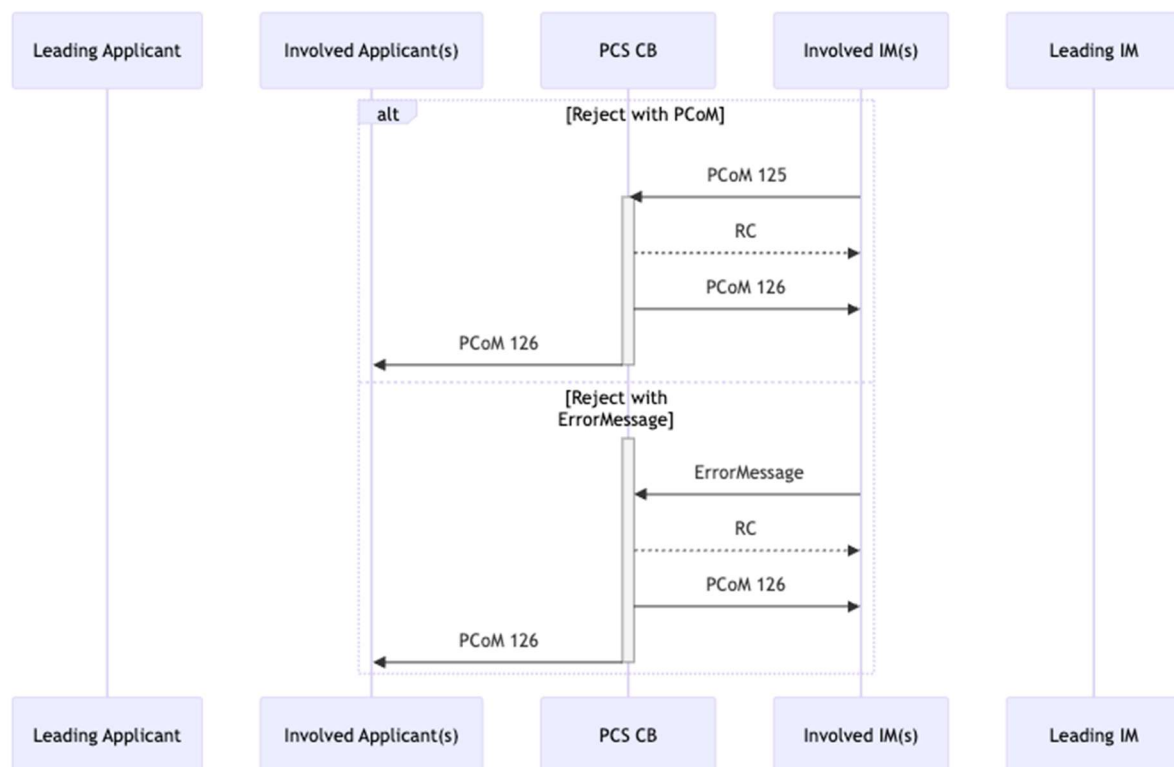
- NPR: 122, 123, 124

If an update is sent in which a different PRID is included in the PlannedTransportIdentifiers than that which was already linked to the PA, this PRID will be linked to the PA and original PRID will become unlinked.

Clarification regarding a similar use case from the Sector Handbook:

- TypeOfInformation: “42” instead of “9”. Reason: The Sector Handbook describes the sending of a PA in its final version and not the exchange of PA information with other involved IM(s) for coordination purposes. The preparation is finalised by the IM but may still be affected by border location changes done by neighbouring IM(s) in their own PA(s).

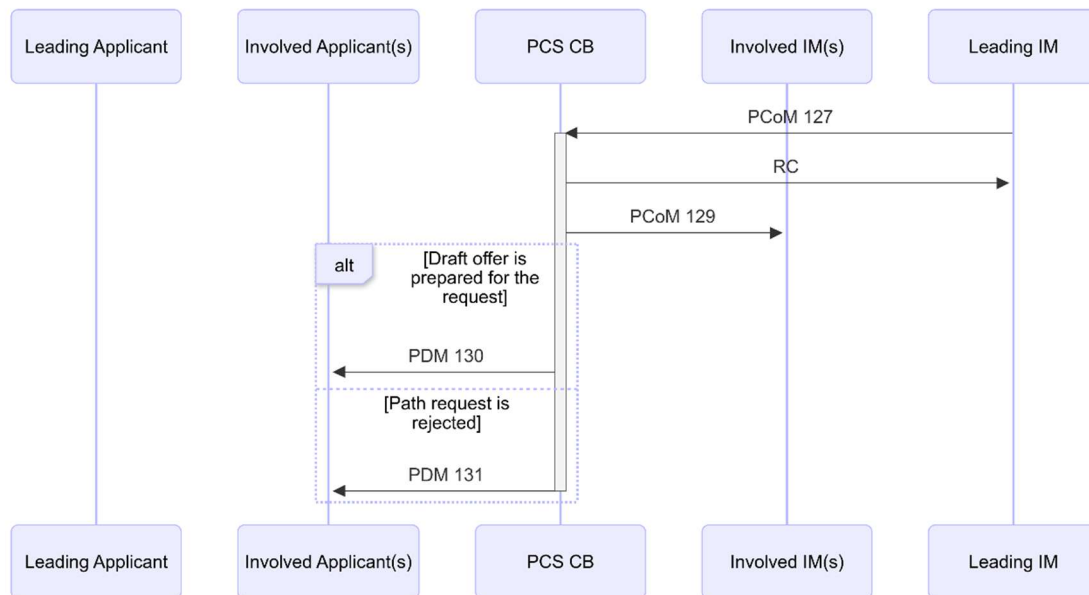
5.2.3 Draft offer preparation rejection by an Involved IM(path request rejection)



TSI message matrix IDs:

NPR: 125, 126

5.2.4 Draft offer submission by the Leading IM



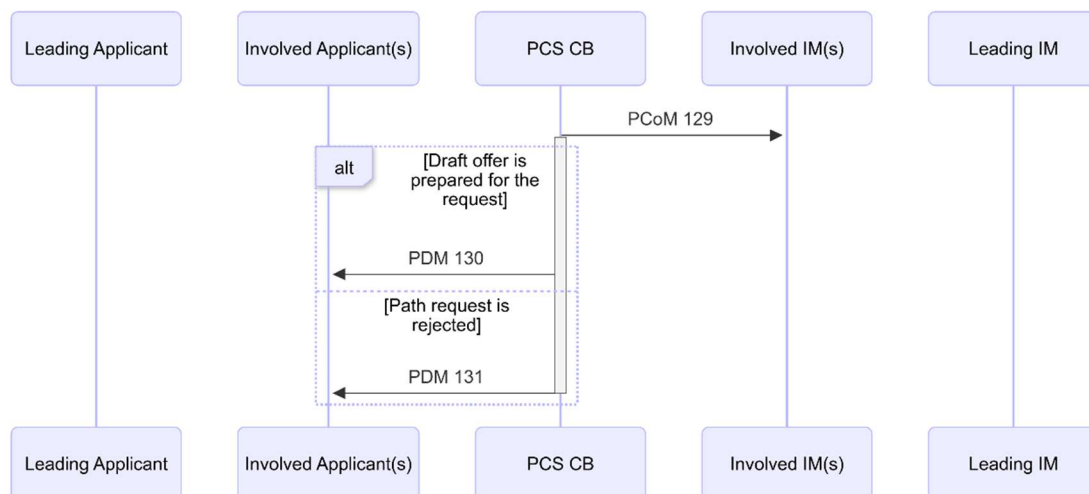
TSI message matrix IDs:

NPR: 127, 129, 130, 131

Clarification regarding a similar use case from the Sector Handbook:

- MessageType: "PathCoordinationMessage" instead of "PathRequestMessage". Reason: the Sector Handbook describes the trigger for the withdrawal of a PR. The trigger in PCS is for the withdrawal of the entire Reference Train.

5.2.5 Draft offer submission by the Leading IM (PaPs included in the reference train)



Draft offer submission (PaPs included in the reference train) is only possible via the graphical user interface and by the responsible RFC.

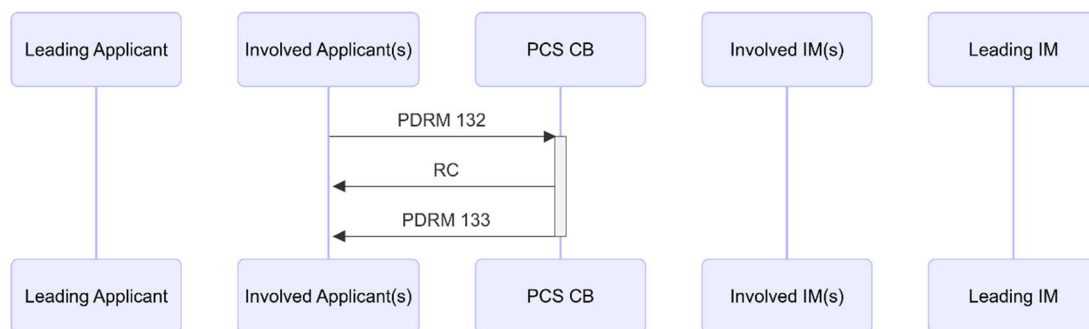
TSI message matrix IDs:

NPR: 129, 130, 131

Clarification regarding a similar use case from the Sector Handbook:

- MessageType: "PathCoordinationMessage" instead of "PathRequestMessage". Reason: the Sector Handbook describes the trigger for the withdrawal of a PR. The trigger in PCS is for the withdrawal of the entire Reference Train.

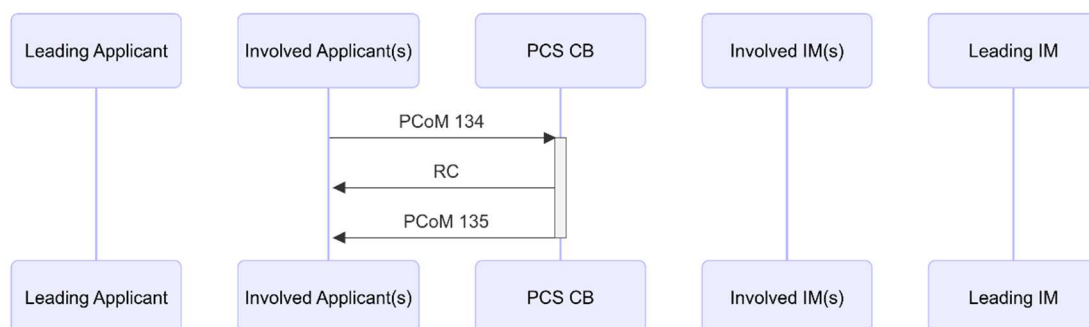
5.2.6 Comment creation to a draft offer by an Involved Applicant



TSI message matrix IDs:

NPR: 132, 133

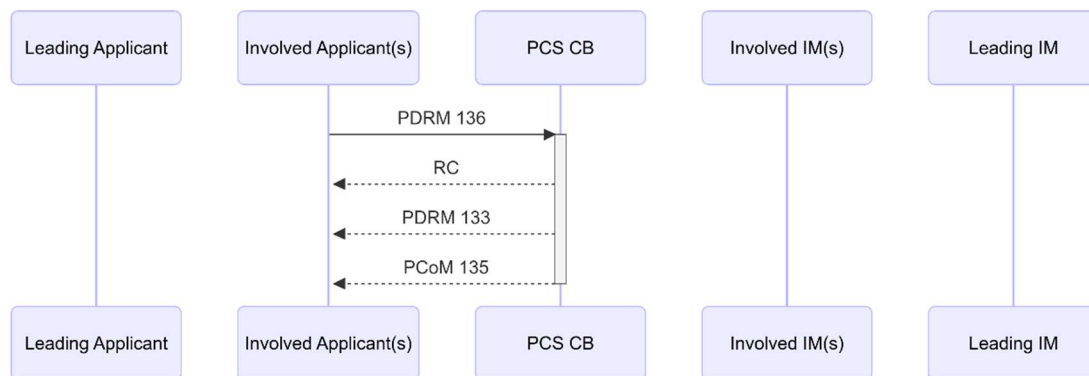
5.2.7 Observation completion by an Involved Applicant



TSI message matrix IDs:

- NPR: 134, 135

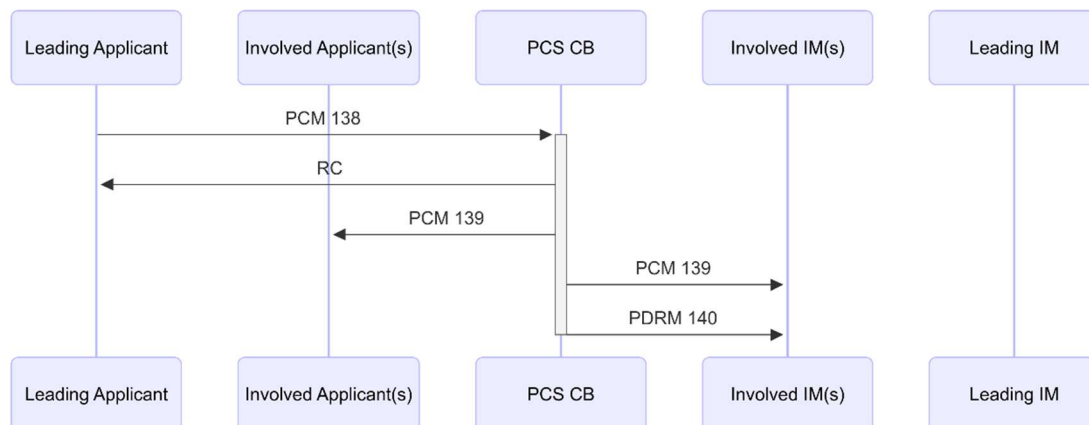
5.2.8 Comment creation and finalisation by an Involved Applicant in Observation



TSI message matrix IDs:

NPR: 136, 133, 135

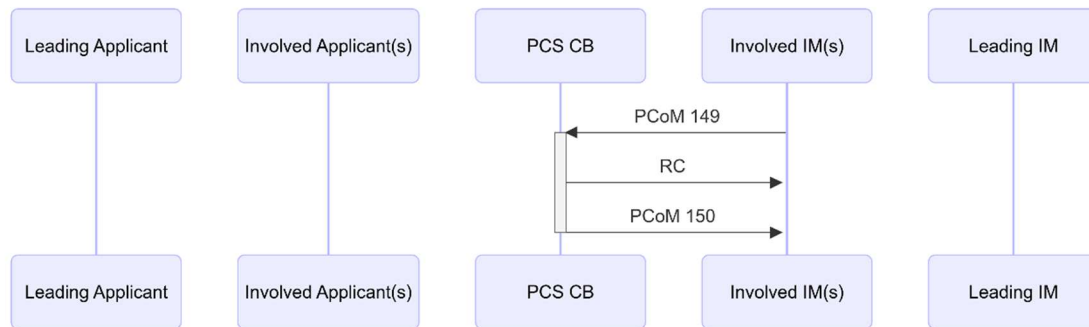
5.2.9 Promotion to Post-processing by the Leading Applicant



TSI message matrix IDs:

- NPR (fully harmonised): 138, 139, 140

5.2.10 Final offer finalisation by an Involved IM



TSI message matrix IDs:

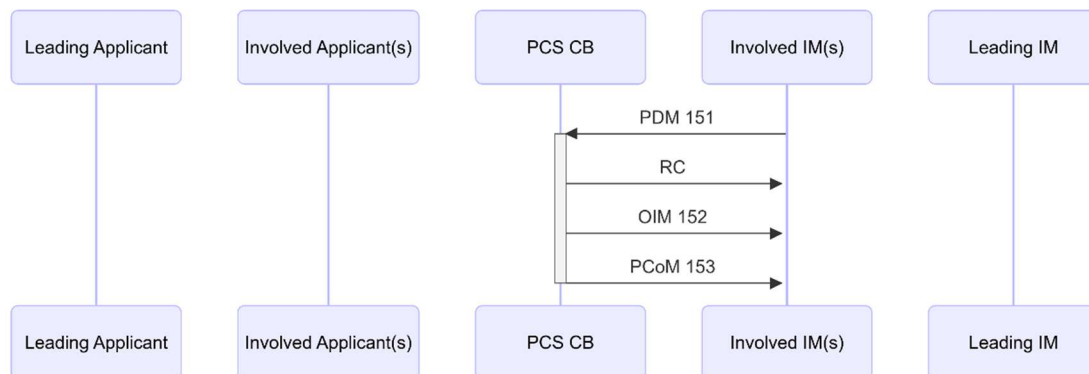
- NPR: 149, 150

IM sets green light on the PA just like in Path Elaboration, but now getting ready for the final offer. No timetable change happens.

Clarification regarding a similar use case from the Sector Handbook:

- TypeOfInformation: "14" instead of "16". Reason: The Sector Handbook describes the sending of a PA in its final version and not the exchange of PA information with other involved IM(s) for coordination purposes. The preparation is finalised by the RA but may still be affected by border location changes done by neighbouring IM(s) in their own PA(s).

5.2.11 Final offer creation/update and finalisation by an Involved IM



TSI message matrix IDs:

- NPR: 151, 152, 153

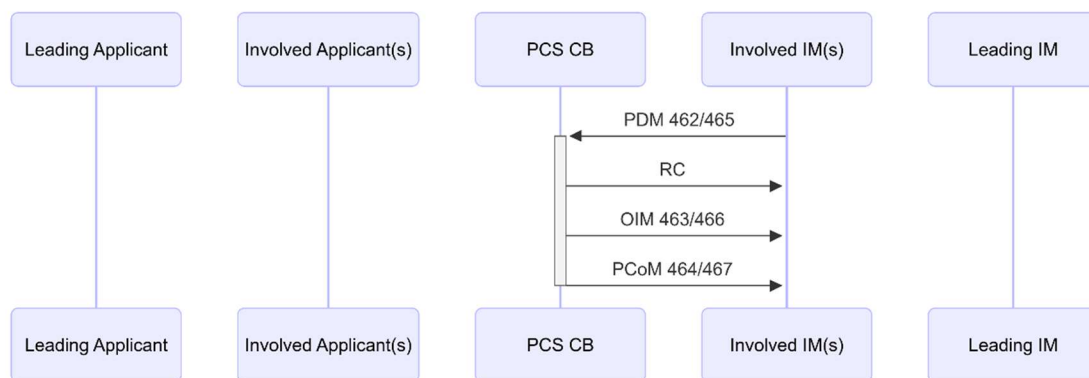
If an update is sent in which a different PRID is included in the PlannedTransportIdentifiers than that which was already linked to the PA, this PRID will be linked to the PA and original PRID will become unlinked.

Clarification regarding a similar use case from the Sector Handbook:

- TypeOfInformation: “14” instead of “16”. Reason: The Sector Handbook describes the sending of a PA in its final version and not the exchange of PA information with other involved IM(s) for coordination purposes. The preparation is finalised by the RA but may still be affected by border location changes done by neighbouring IM(s) in their own PA(s).

5.3 LPR specific message sequences and actions

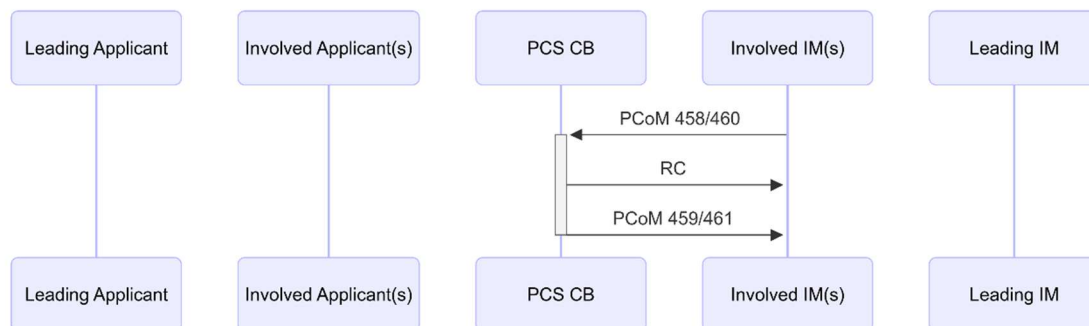
5.3.1 Final offer creation/update and finalisation by an Involved IM



TSI message matrix IDs:

- LPR: 462, 465, 463, 466, 464, 467

5.3.2 Final offer finalisation by an Involved IM



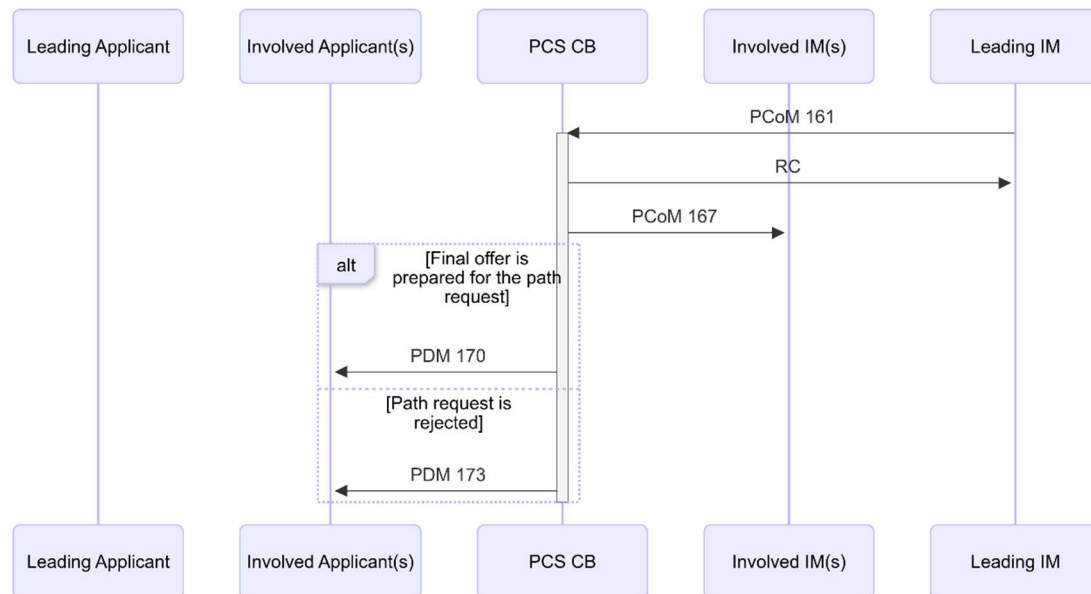
TSI message matrix IDs:

- LPR:
 - In Path elaboration: 458, 459,
 - In Post-processing: 460, 461

Clarification regarding a similar use case from the Sector Handbook:

- TypeOfInformation: “14” instead of “16”. Reason: The Sector Handbook describes the sending of a PA in its final version and not the exchange of PA information with other involved IM(s) for coordination purposes. The preparation is finalised by the RA but may still be affected by border location changes done by neighbouring IM(s) in their own PA(s).

5.3.3 Final offer submission by the Leading IM and promotion to Final Acceptance

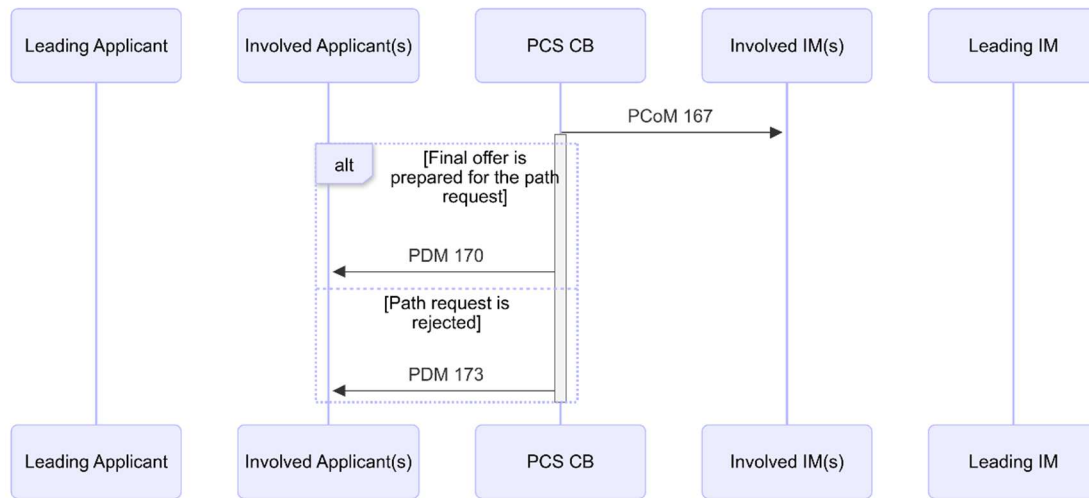


TSI message matrix IDs:

- LPR from Post-processing: 161, 167, 170, 173

By default, the first offer of the LPR is also a final offer, sent from Path elaboration. In the Acceptance phase, Applicants have the option to accept it and go directly to Allocation. However, there is an option to ask for adaptation of the offer. They can proceed to Post-processing and that is followed again with a final offer, but now in the Final acceptance phase.

5.3.4 Final offer submission and promotion to final acceptance (PaPs included in the reference train)

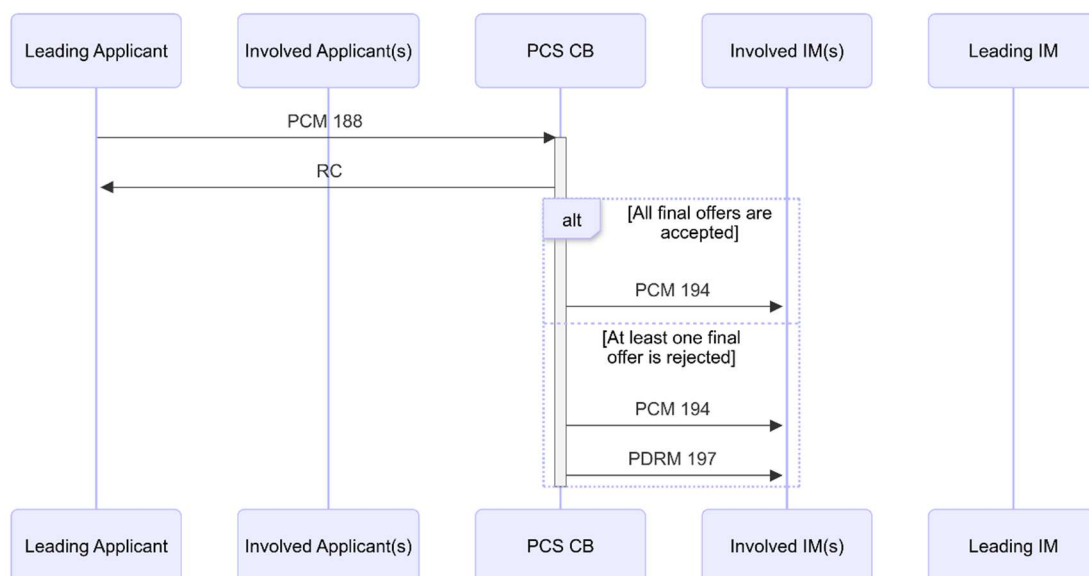


TSI message matrix IDs:

- LPR from Post-processing: 167, 170, 173

Final offer submission and promotion to final acceptance (PaPs included in the reference train) is only possible via the graphical user interface, and only by the responsible RFC.

5.3.5 Final offer acceptance by the Leading Applicant

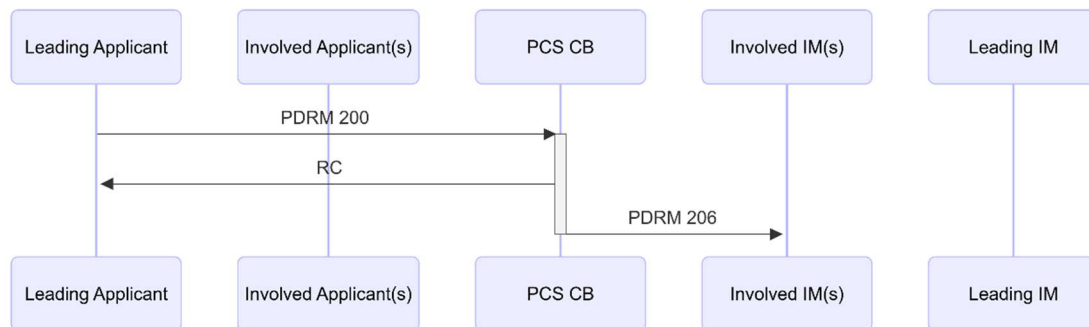


TSI message matrix IDs:

LPR in Final acceptance: 188, 194, 197

If all offers are accepted, the reference train will advance to the Allocation phase. If at least one offer has been rejected, the reference train advances to the Post Processing phase.

5.3.6 Final offer rejection by the Leading Applicant



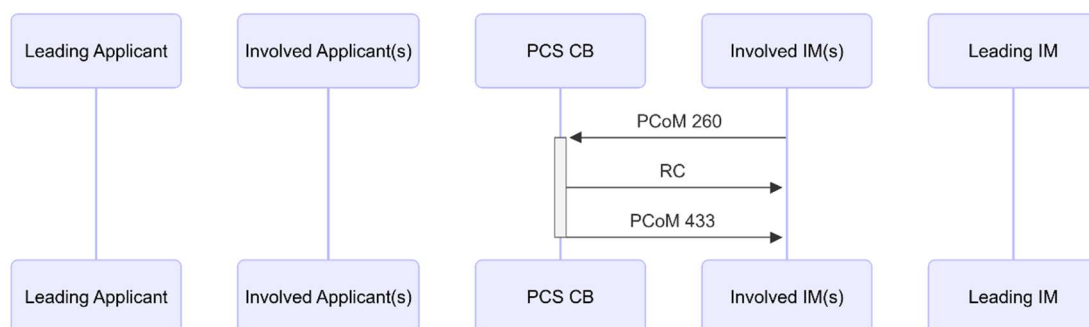
TSI message matrix IDs:

- LPR: 200, 206

5.4 AHPR specific message sequences and actions

The aim of this chapter is to group the actions that are applicable for the ad-hoc path request process. Please note that most of them are applicable for NPR and LPR too. In the case of AHPR, the difference is that the ProcessType field must be set to 2.

5.4.1 Final offer finalisation by an Involved IM



TSI message matrix IDs:

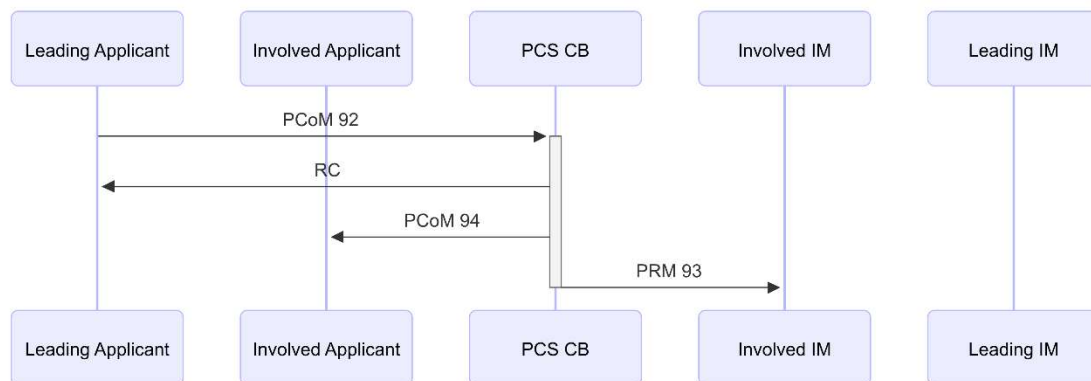
- AHPR: 260, 433

Clarification regarding a similar use case from the Sector Handbook:

- TypeOfInformation: "14" instead of "16". Reason: The Sector Handbook describes the sending of a PA in its final version and not the exchange of PA information with other

involved IM(s) for coordination purposes. The preparation is finalised by the RA but may still be affected by border location changes done by neighbouring IM(s) in their own PA(s).

5.4.2 Path Request submission with pre-accepted offer by the Leading Applicant (no PaPs included in the Reference Train)

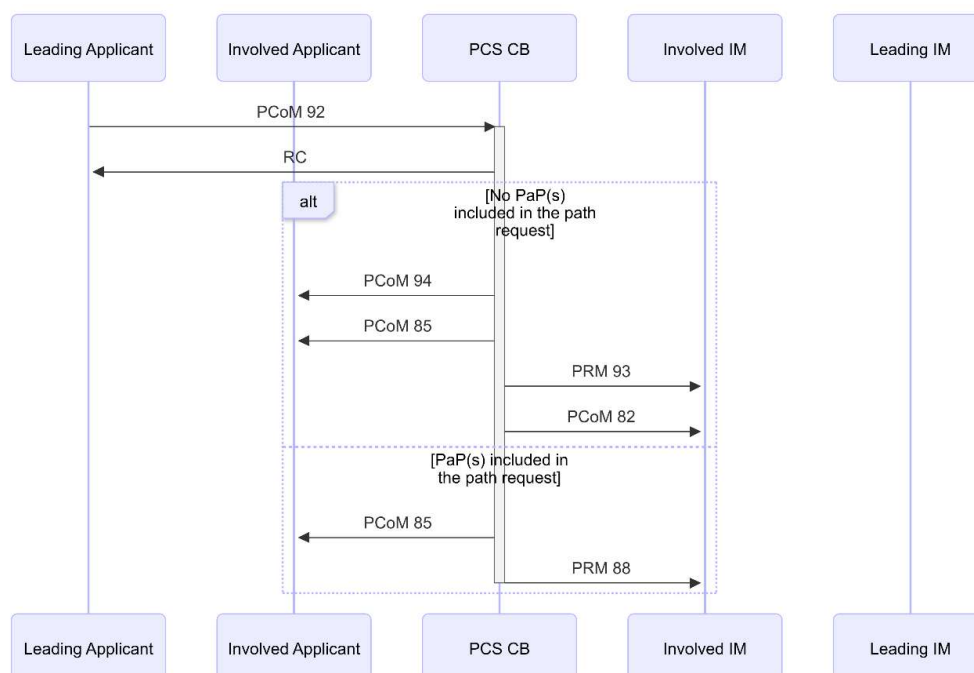


TSI message matrix IDs:

- AHPR: 92, 93, 94

Path requests of a reference train can be submitted only if all of them are finalised (green). The requests can be submitted with pre-accepted offer only by the LA.

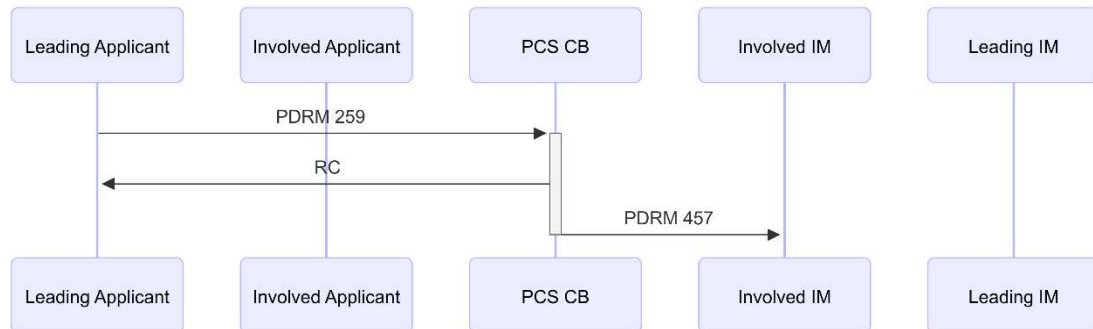
5.4.3 Path Request submission with pre-accepted offer by the Leading Applicant (PaPs included in the Reference Train)



TSI message matrix IDs:

- AHPR: 92, 94, 85, 93, 82, 85, 88

5.4.4 Final Offer rejection with revision by Leading Applicant



TSI message matrix IDs:

- AHPR: 259, 457

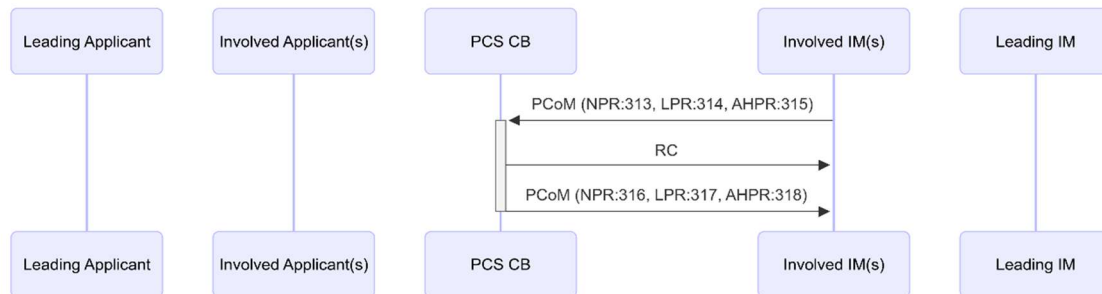
5.5 Partial offer and harmonisation message sequences and actions

The aim of this chapter is to summarise the partial related actions. Please note that there are partial specific cases (e.g. switch to partial) while general sub-actions can be applied here too (e.g. PR create/update by RA). That is why the related actions are listed and referenced, the specific actions are elaborated here.

The messages contain two fields related to full or partial harmonisation: TypeOfRUHarmonization, TypeOfIMHarmonization. In the outbound messages PCS CB does not differentiate between them. There is no mixed (full & part) outbound message. The relevance of those fields is that the RA can only set the train to partial state via TypeOfRUHarmonization and the RIM can do the same only via the TypeOfIMHarmonization. The TSI message matrix has been extended with an additional TOH (Type Of Harmonisation) column. If that column contains "Part" for a sub-action, it means that the sub-action is applicable for partial reference trains.

The use cases in this section are always triggered by the company which started the partial process or the company which shares its territory (here always 'Involved IM or Involved Applicant'.

5.5.1 Switch to partial by an Involved IM



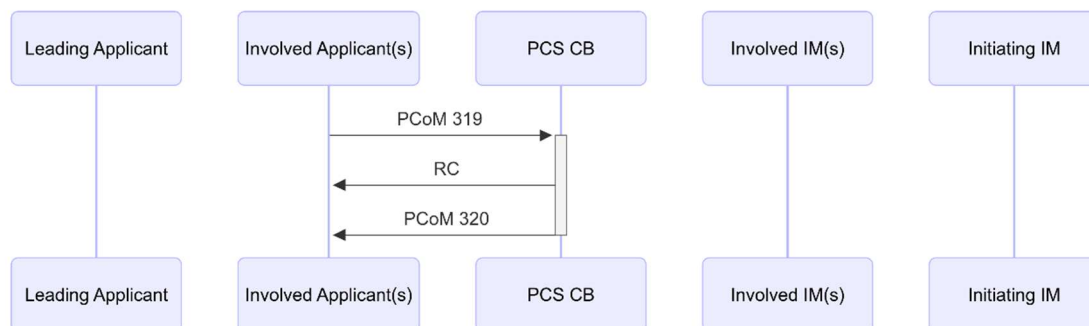
TSI message matrix IDs:

- NPR in Path elaboration, Post-processing: 313, 316
- LPR in Path elaboration, Post-processing: 314, 317
- AHPR in Path elaboration: 315, 318

When the draft offer deadline is reached (within one day), the RIM has the chance to break the workflow and switch the train into partial state, allowing it to send draft offers without waiting for all other IMs.

An IM can switch to partial offer by setting the TypeOfIMHarmonization field to “Part”. When IM decides to switch to partial, one of its Path IDs must be sent in the message.

5.5.2 Switch to partial harmonisation as an Involved Applicant



TSI message matrix IDs:

- AHPR in Harmonisation: 319, 320

For short-term path request and allocation process, applicants have the option to submit their requests partially harmonised.

RA can switch to partial harmonisation by setting the TypeOfRUHarmonization field to “Part”. When an RA decides to switch to partial, one of its Path Request IDs must be sent. in the message.

5.5.3 Merge reference train to Full

TSI message matrix IDs:

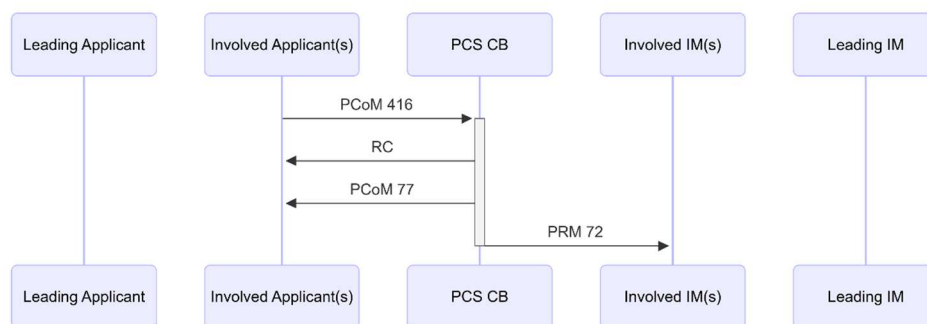
- NPR: 321
- LPR: 322
- AHPR: 323

It's a special use case, because it can have various triggers. Merging means that for a trigger, all territories are again in the same phase. Possible triggers:

- All RAs submitted the requests
- All IMs sent draft offer
- All RAs finished observations
- All IMs sent final offer
- All RAs accepted the final offer

In any of the cases, outbound PathCoordinationMessage is generated, so that everyone is aware of the correct TypeOfRUHarmonisation / TypeOfIMHarmonisation.

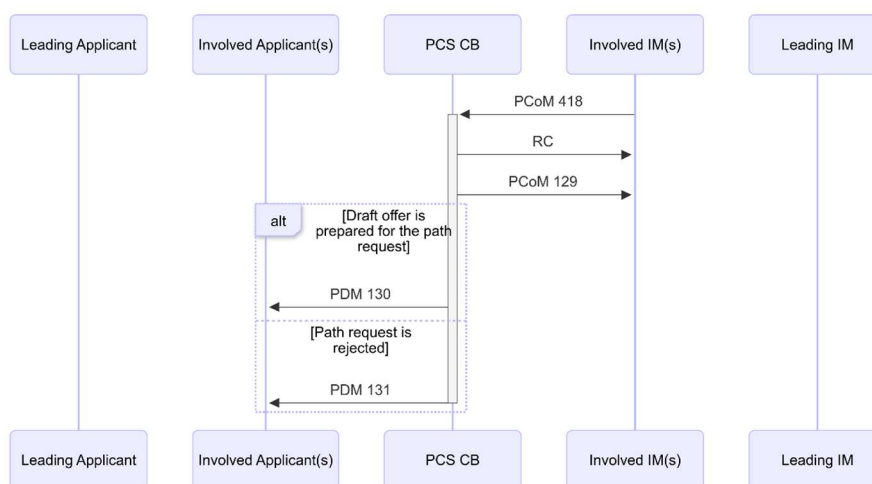
5.5.4 Path Request submission by an Involved Applicant (partial)



TSI message matrix IDs:

- AHPR: 416, 72, 77

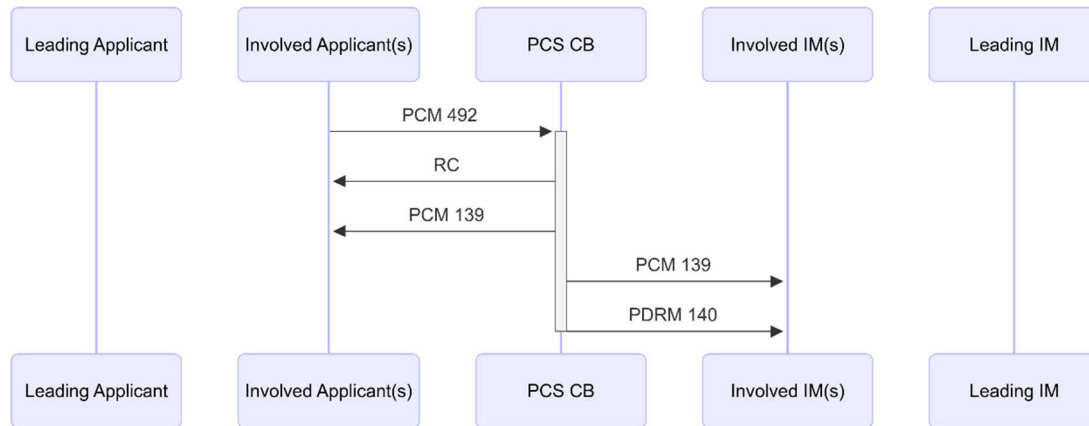
5.5.5 Draft offer submission by an Involved IM (partial)



TSI message matrix IDs:

- NPR: 418, 129, 130, 131

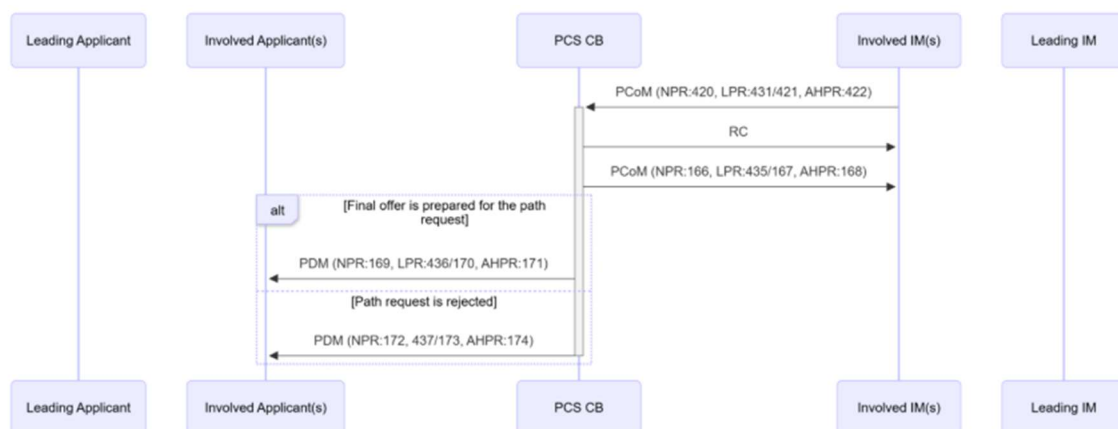
5.5.6 Promotion to Post-Processing by an Involved Applicant (partial)



TSI message matrix IDs:

- NPR: 492, 139, 140

5.5.7 Final offer submission by an Involved IM (partial)



TSI message matrix IDs:

NPR: 420, 166, 169, 172

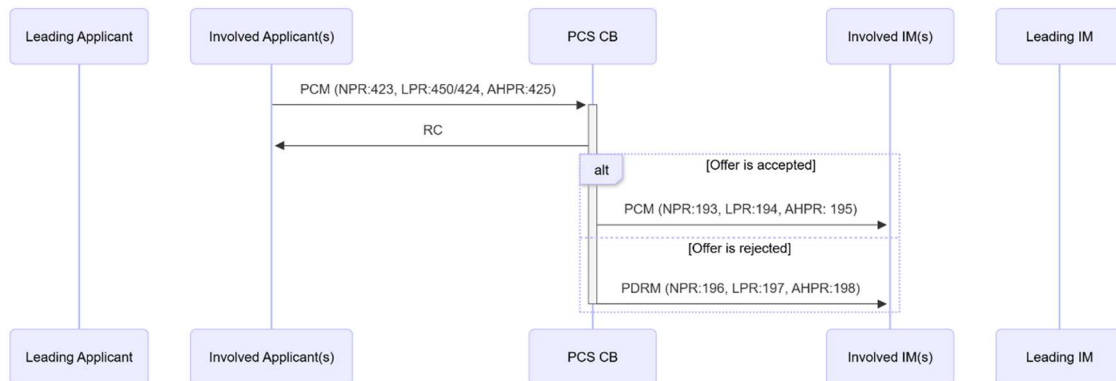
LPR:

From Path elaboration: 431, 435, 436, 437

From Post-processing: 421, 167, 170, 173

AHPR: 422, 168, 171, 174

5.5.8 Final offer acceptance by an Involved Applicant (partial)

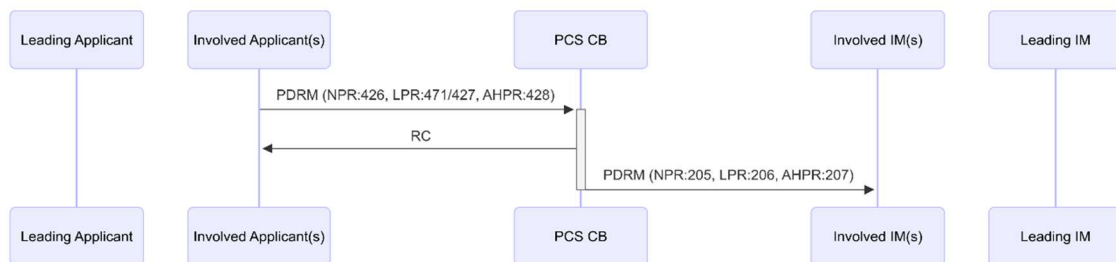


TSI message matrix IDs:

- NPR: 423, 193, 196
- LPR
 - In Acceptance: 450, 194, 197
 - In Final acceptance: 424, 194, 197
- AHP: 425, 195, 198

In case of partial harmonisation, when an Applicant is in the need of accepting its offer and it can't wait for the others, it has the chance to accept the offer on its own. It's not only setting the green light, but promoting the offers and communicating this to the IM too.

5.5.9 Final offer rejection by an Involved Applicant (partial)



TSI message matrix IDs:

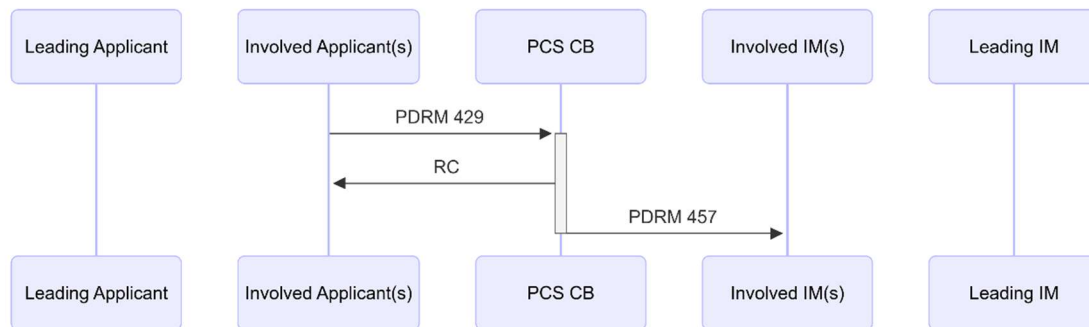
- NPR: 426, 205
- LPR:
 - In Acceptance: 471, 206
 - In Final acceptance: 427, 206
- AHP: 428, 207

In case of partial harmonisation, when an Applicant needs to reject its offer(s) and cannot wait for others before doing so, they have the chance to reject the offer(s) on its own.

This action rejects the offers and communicates this to the IM (territory is moved to acceptance phase).

If the RA wants to set only the progress to “not accepted” it can still send the PCoM (ID 183) and that won’t be communicated to the IMs.

5.5.10 Final offer rejection with revision by an Involved Applicant–(partial offer)



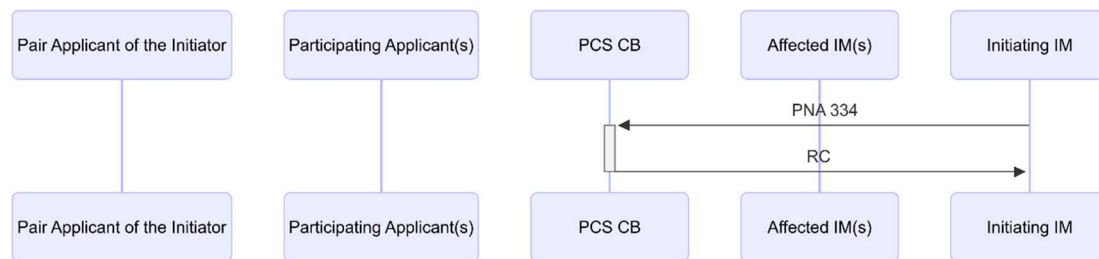
TSI message matrix IDs:

- AHP: 429, 457

5.6 Path alteration (alternative offer) message sequences and actions

'Affected IM'(s) become 'Participating IM'(s) after joining the alteration process. Applicants affected by the alteration automatically participate in the process, and as such are labelled 'participating applicant'(s).

5.6.1 Path alteration start by the Initiating IM

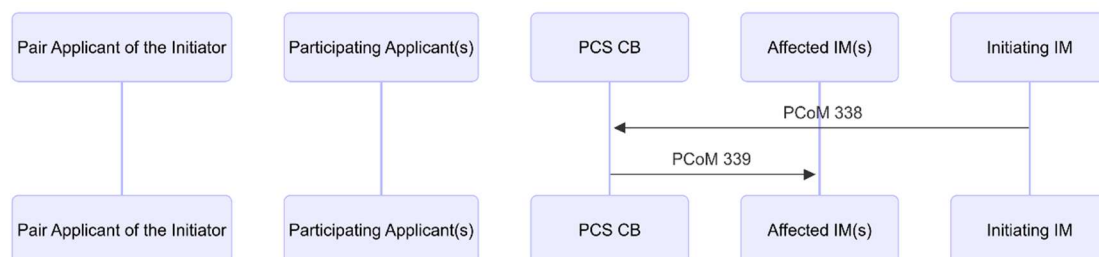


TSI message matrix IDs:

- PA: 334

With this the IM starts the process as an alternative offer and takes out the days from the referenced path.

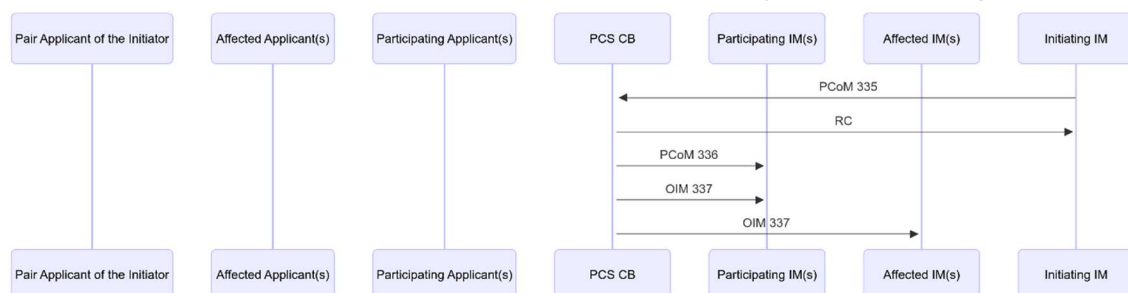
5.6.2 Path alteration process withdrawal by the Initiating IM



TSI message matrix IDs:

- PA: 338, 339

5.6.3 Alternative offer creation and finalisation by the Initiating IM

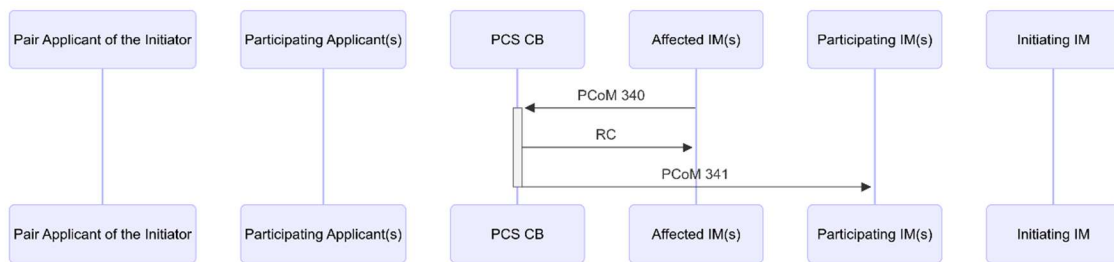


TSI message matrix IDs:

- PA: 335, 336, 337

This action creates a new offer (the alternative offer) and sets green light immediately. The Affected IM is notified in case of a border impact.

5.6.4 Decision by an Affected IM not to participate in the alteration process

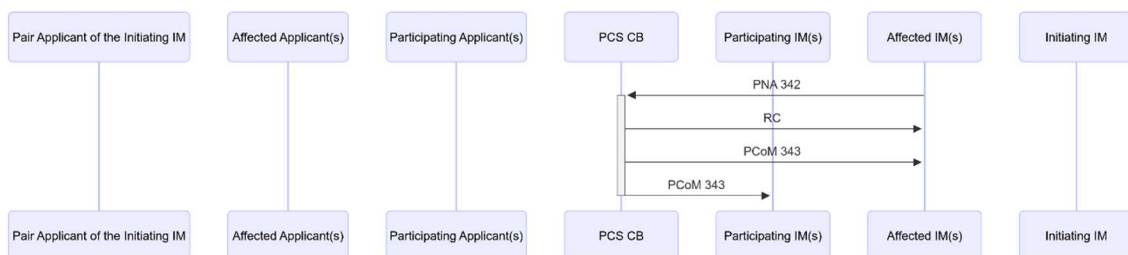


TSI message matrix IDs:

- PA: 340, 341

If the invitation expires, PCS CB will automatically send this outbound message to the recipients.

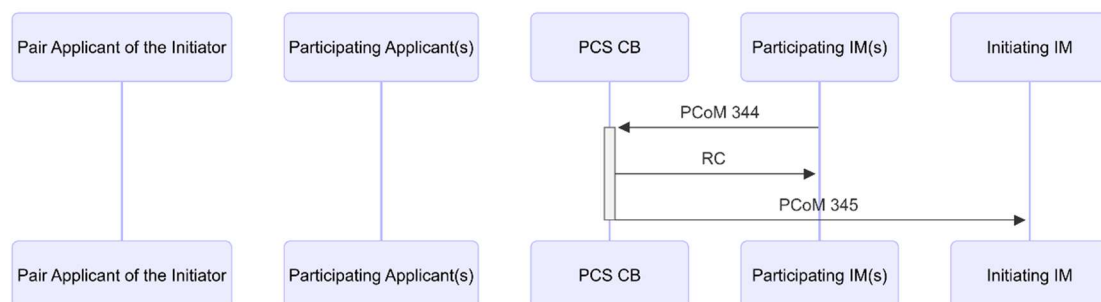
5.6.5 Decision by an Affected IM to participate in the alteration process



TSI message matrix IDs:

- PA: 342, 343

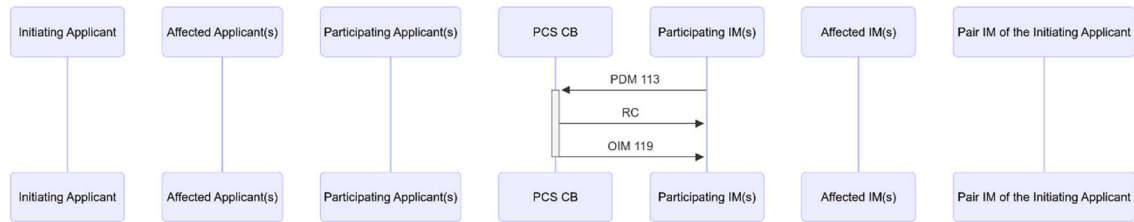
5.6.6 Decision by a Participating IM to leave the alteration process



TSI message matrix IDs:

- PA: 344, 345

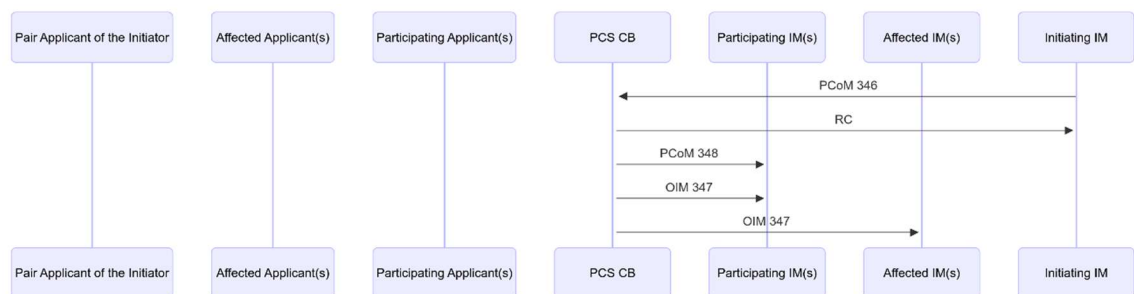
5.6.7 Alternative offer creation/update by a Participating IM



TSI message matrix IDs:

PA: 113, 119

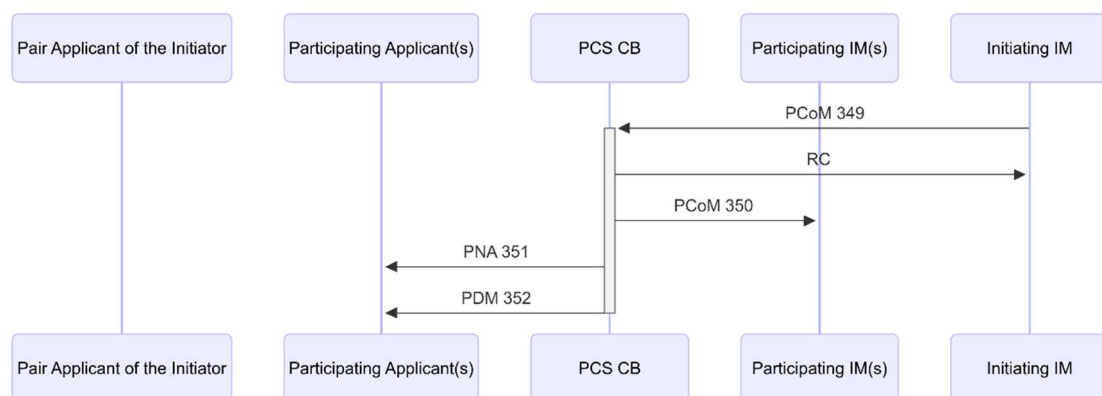
5.6.8 Alternative offer creation and finalisation by a Participating IM



TSI message matrix IDs:

- PA: 346, 347, 348

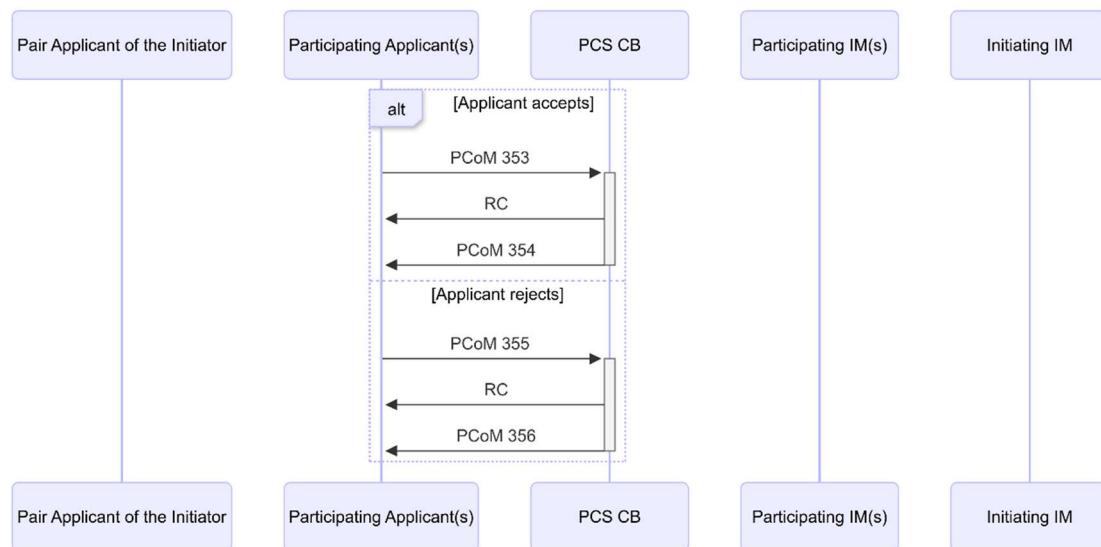
5.6.9 Alternative offer(s) submission by the Initiating IM



TSI message matrix IDs:

- PA: 349, 350, 351, 352

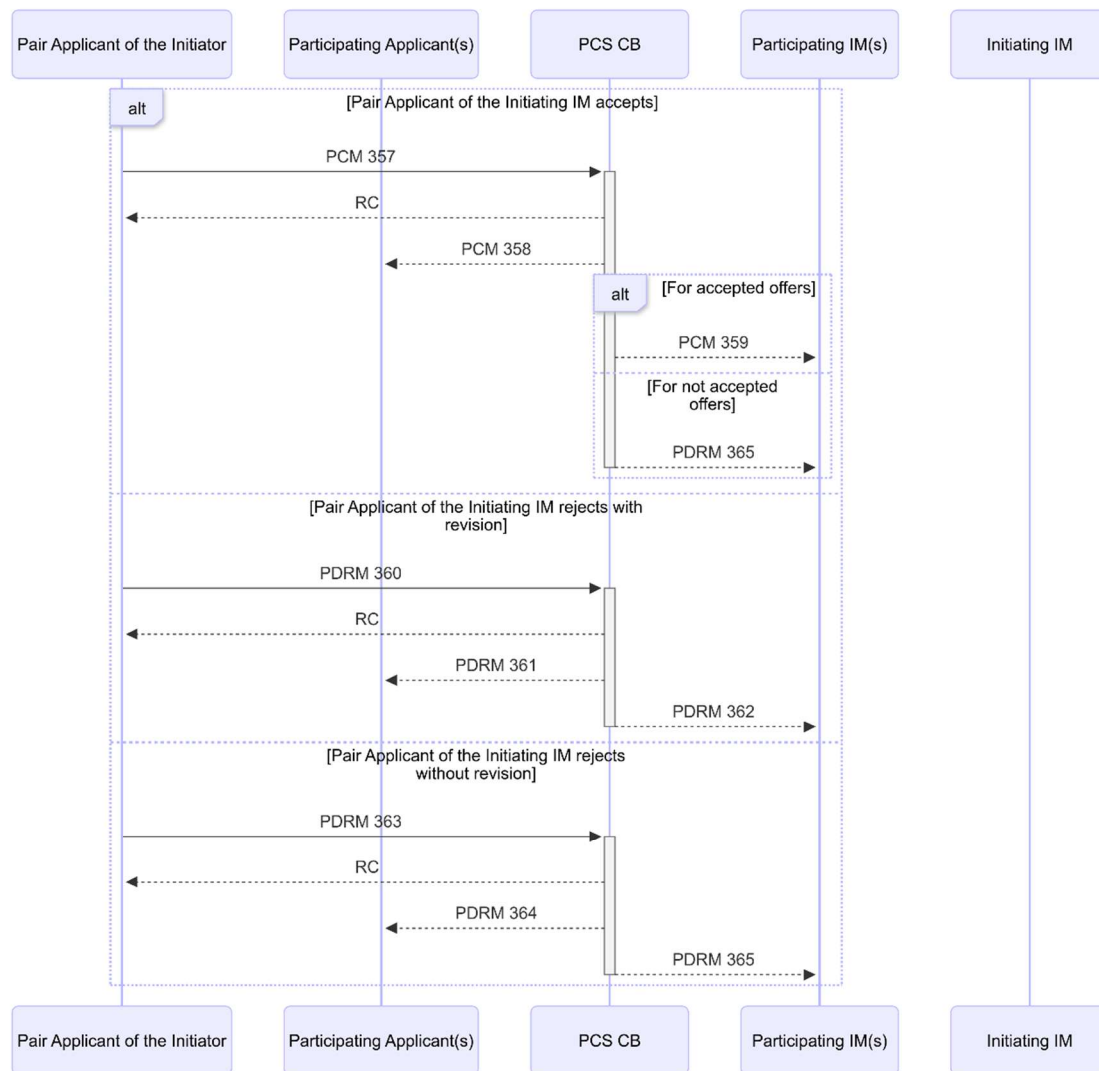
5.6.10 Response to a final offer by a Participating Applicant



TSI message matrix IDs:

- PA: 353, 354, 355, 356

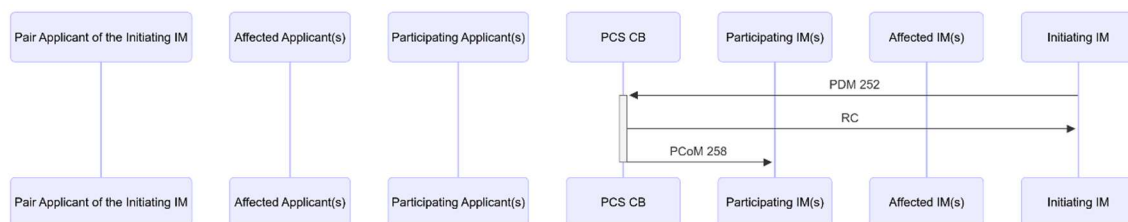
5.6.11 Submission by the Initiating Applicant of the responses to the alternative offer(s)



TSI message matrix IDs:

- PA: 357, 358, 359, 360, 361, 362, 363, 364, 365

5.6.12 Alternative offer deletion by a Participating IM



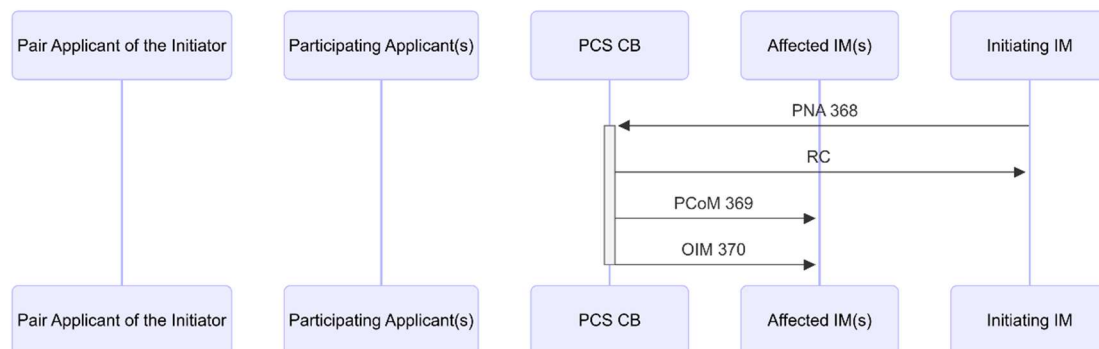
TSI message matrix IDs:

- PA: 252, 258

5.7 Path alteration (cancel running days) message sequences and actions

'Affected IM'(s) become 'Participating IM'(s) after joining the alteration process. Applicants affected by the alteration automatically participate in the process, and as such are labelled 'participating applicant'(s).

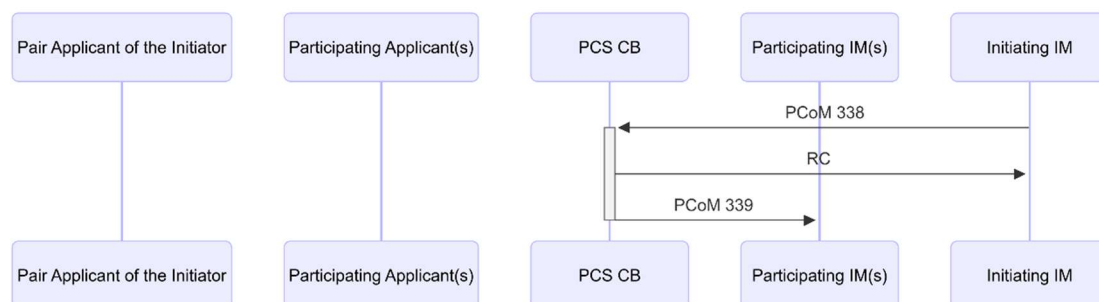
5.7.1 Alteration (cancellation) start by the Initiating IM



TSI message matrix IDs:

PA: 368, 369, 370 With this the IM starts the process, removes days from the referenced path, and sets the progress indicator to accepted.

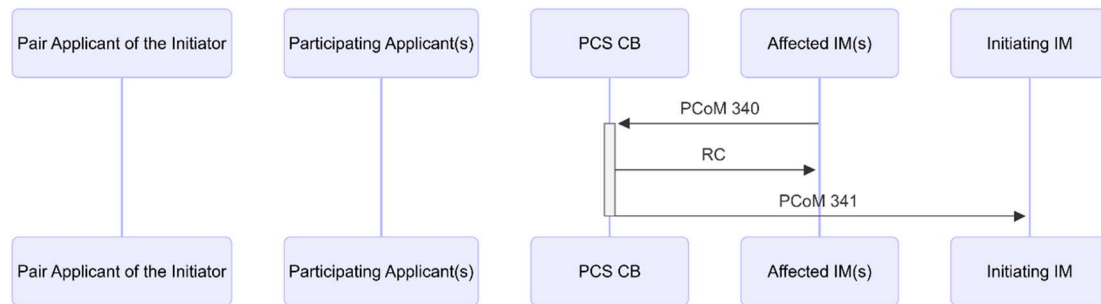
5.7.2 Path alteration process withdrawal by the Initiating IM (cancellation)



TSI message matrix IDs:

- PA: 338, 339

5.7.3 Decision by an Affected IM not to participate in the alteration process (cancellation)

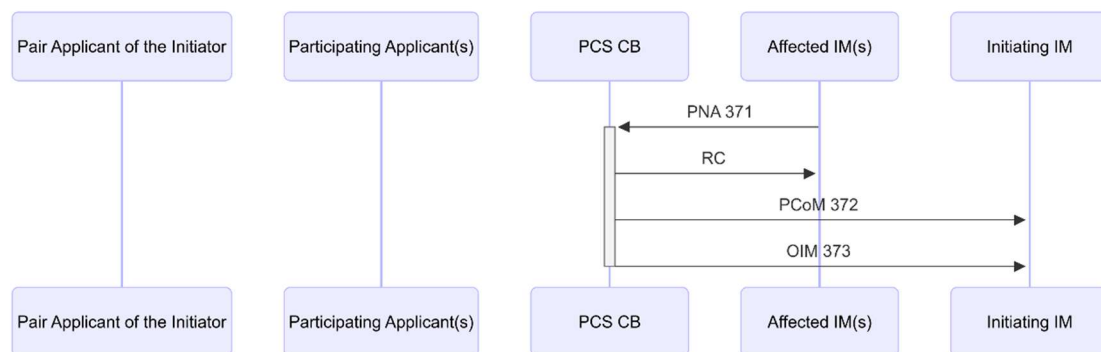


TSI message matrix IDs:

- PA: 340, 341

If the invitation expires, PCS CB will automatically send this outbound message to the recipients.

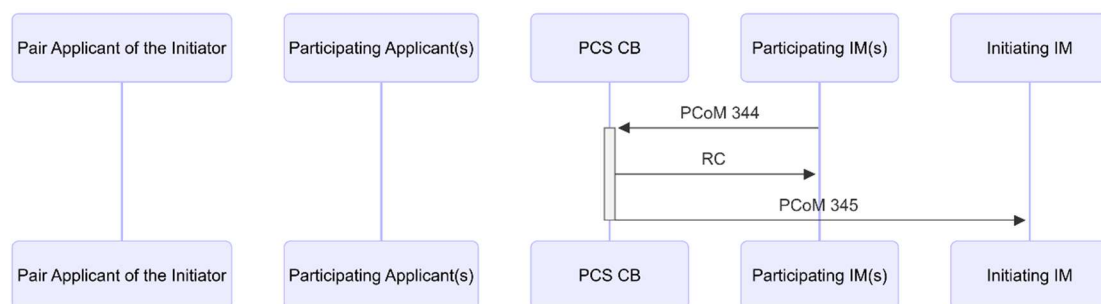
5.7.4 Decision by an Affected IM not to participate in the alteration process (cancellation)



TSI message matrix IDs:

- PA: 371, 372, 373

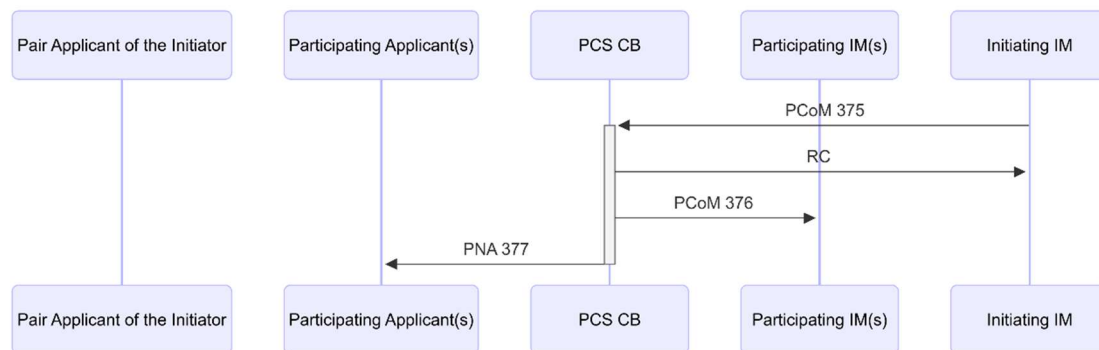
5.7.5 Decision by a Participating Applicant to leave the modification process (cancellation)



TSI message matrix IDs:

- PA: 344, 345

5.7.6 Initiating IM informs the Participating Applicants about the alteration (cancellation)



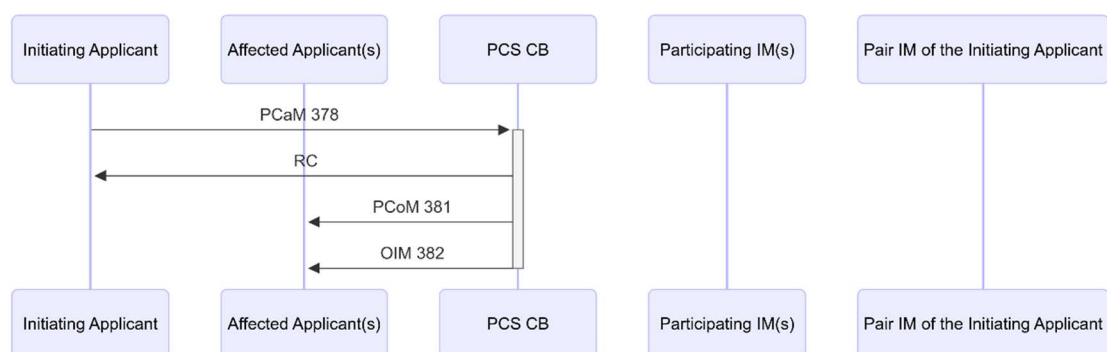
TSI message matrix IDs:

- PA: 375, 376, 377

5.8 Path cancellation by Applicants message sequences and actions

Applicants 'affected' by the cancellation become 'participating' applicants when they choose to join the process. IMs who have days cancelled from paths in their territory are automatically 'participating' IMs.

5.8.1 Path cancellation process start by the Initiating Applicant

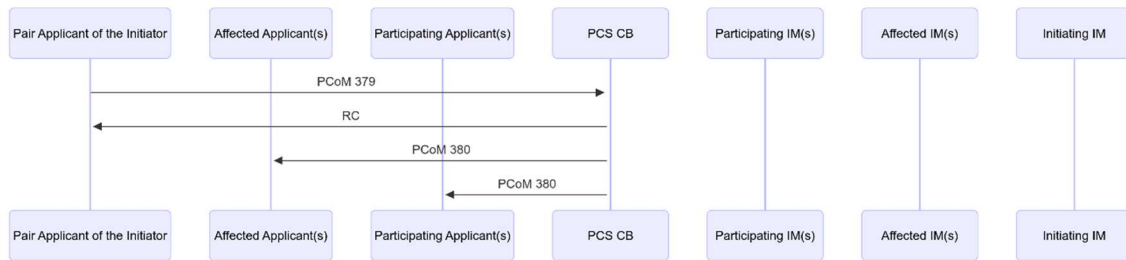


TSI message matrix IDs:

PC: 378, 381, 382

With this, the applicant starts the path cancellation process, takes out the days from the referenced path and sets green light. The affected applicant(s) are also notified of the path cancellation.

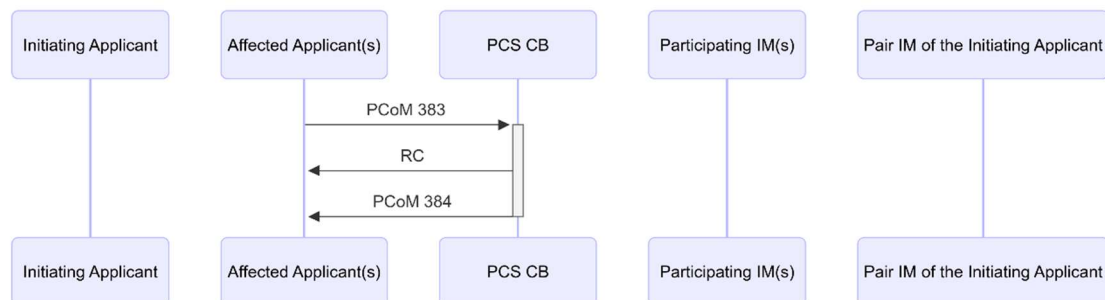
5.8.2 Path cancellation process withdrawal by the Initiating Applicant



TSI message matrix IDs:

- PC: 379, 380

5.8.3 Decision by an Affected Applicant not to participate in the alteration process

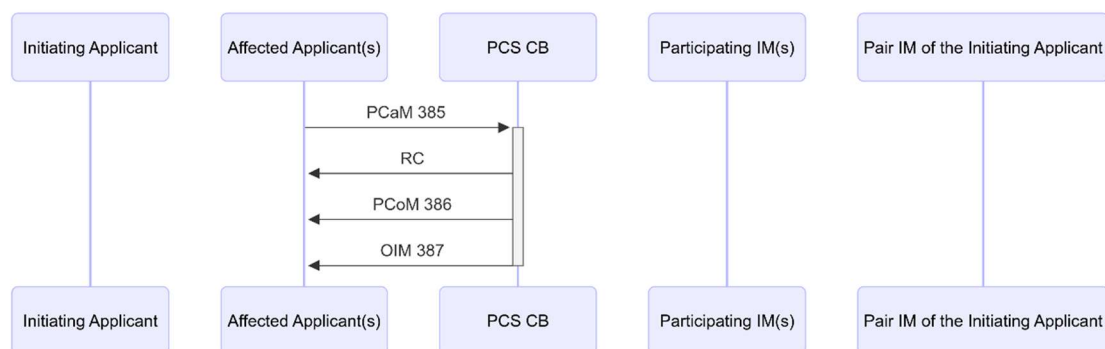


TSI message matrix IDs:

- PC: 383, 384

If the invitation expires, PCS CB will automatically send this outbound message to the recipients.

5.8.4 Decision by an Affected Applicant to participate in the cancellation process

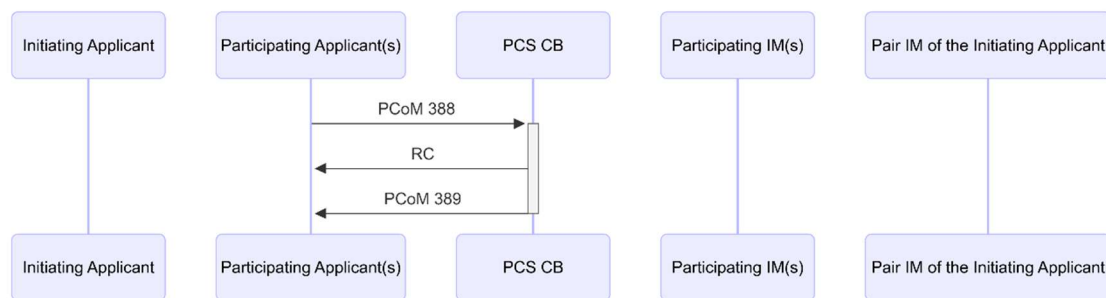


TSI message matrix IDs:

- PC: 385, 386, 387

With this, the affected applicant takes out the days from the referenced offer and sets the green light. Any affected applicant(s) are also notified of the path cancellation.

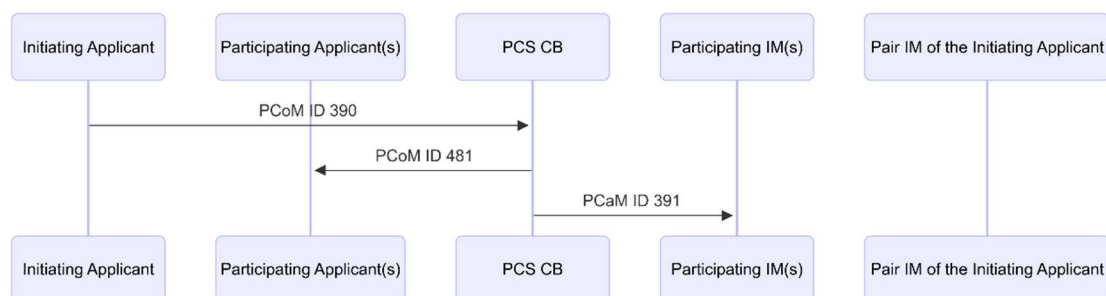
5.8.5 Decision by a Participating Applicant to leave the cancellation process



TSI message matrix IDs:

- PC: 388, 389

5.8.6 Submission of the cancellation request(s) by the Initiating Applicant



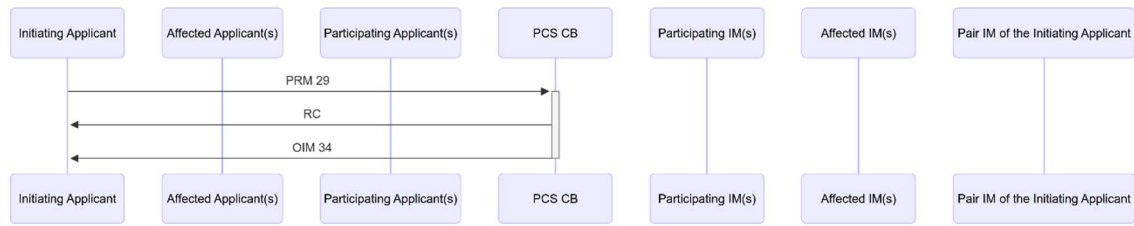
TSI message matrix IDs:

PC: 390, 381, 391

5.9 Path modification by Applicants message sequences and actions

'Affected' applicants become 'participating' applicants as soon as they choose to join the modification process. Any IM who receives a path modification request is automatically a 'participating' IM.

5.9.1 Path modification start by the Initiating Applicant

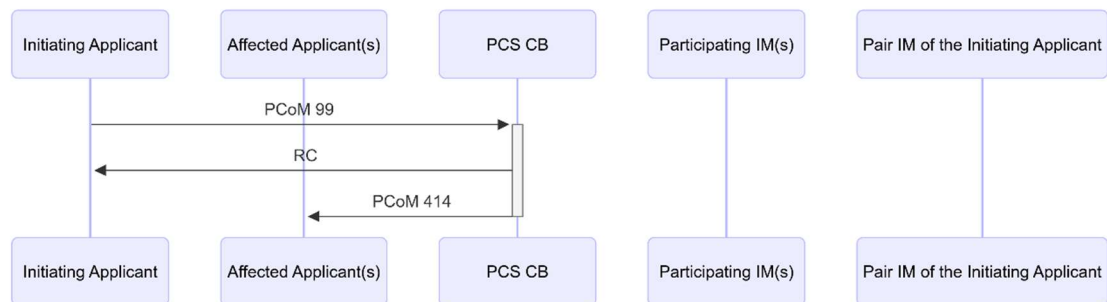


TSI message matrix IDs:

- PM: 29, 34

With this, the applicant starts the path modification process, and creates a new (modified) request, referencing the old path, and sets a yellow light.

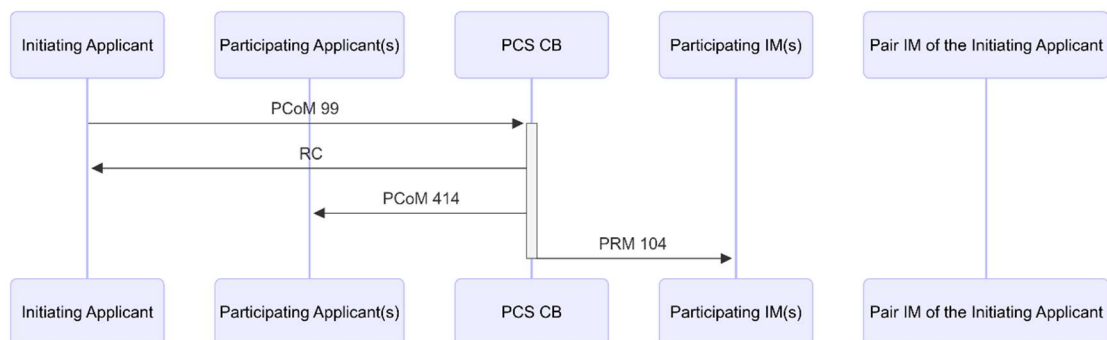
5.9.2 Path modification process withdrawal by the Initiating Applicant



TSI message matrix IDs:

- PM: 99, 414

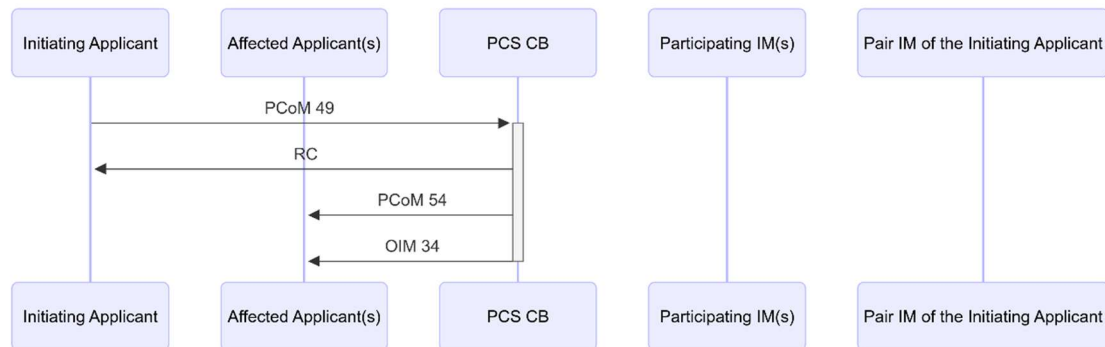
5.9.3 Path modification withdrawal (from path elaboration) by the Initiating Applicant



TSI message matrix IDs:

PM: 99, 104, 414

5.9.4 Path modification request finalisation by the Initiating Applicant

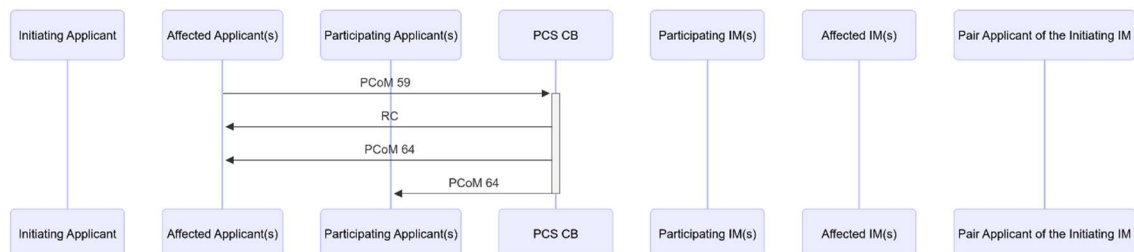


TSI message matrix IDs:

PM: 49, 54, 34

The PCoM about the green light and the OIM with the requests/offers included in the path change process are sent only to the affected companies and the ones that have been already part of the path change process.

5.9.5 Decision by an Affected Applicant not to participate to the modification process

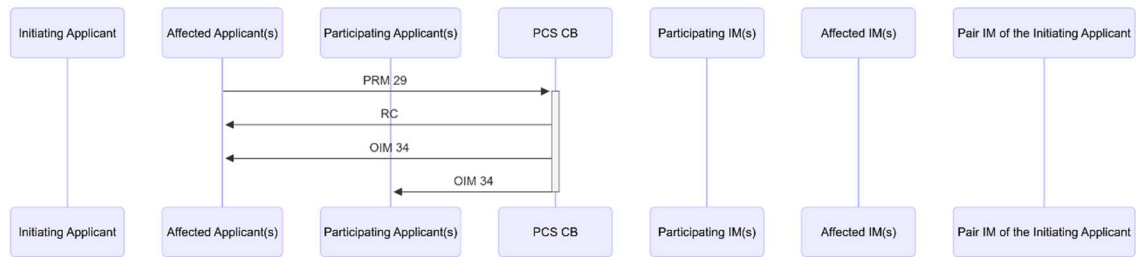


TSI message matrix IDs:

- PM: 59, 64

If the invitation expires, PCS CB will automatically send this outbound message to the recipients.

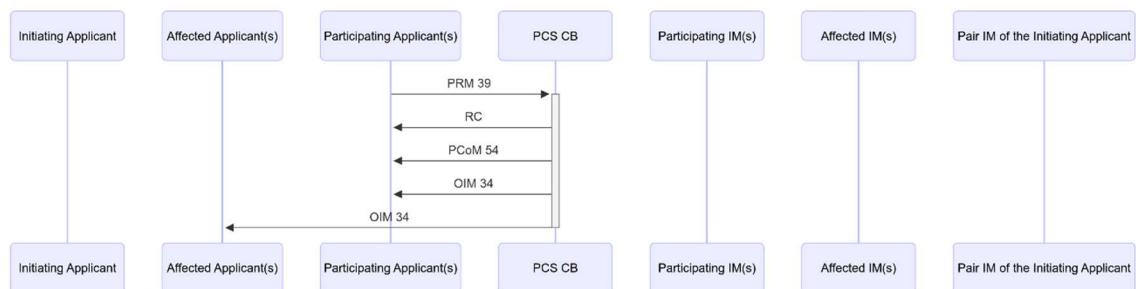
5.9.6 Decision by an Affected Applicant to participate to the modification process



TSI message matrix IDs:

- PM: 29, 34

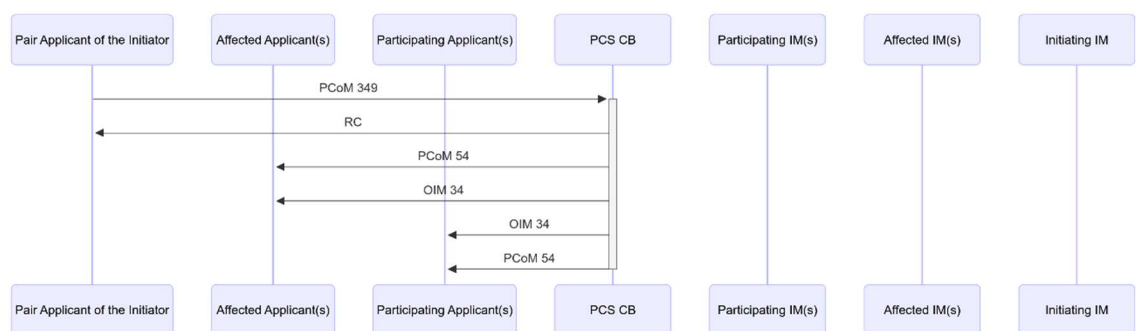
5.9.7 Modified path request creation/update and finalisation by a Participating Applicant



TSI message matrix IDs:

- PM: 39, 34, 54

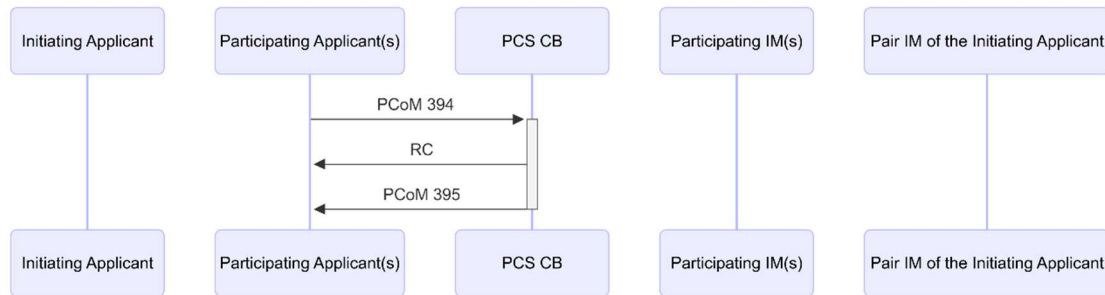
5.9.8 Path modification request finalisation by a Participating Applicant



TSI message matrix IDs:

PM: 49, 54, 349

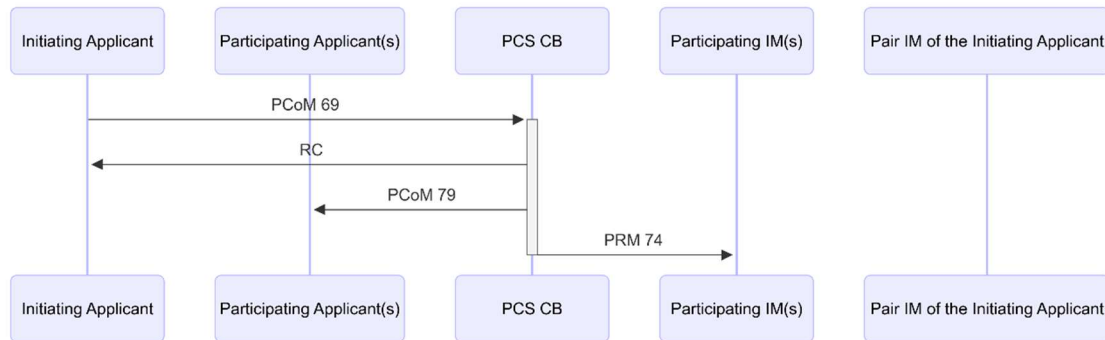
5.9.9 Decision by a Participating Applicant to leave the modification process



TSI message matrix IDs:

- PM: 394, 395

5.9.10 Path modification request(s) submission by the Initiating Applicant

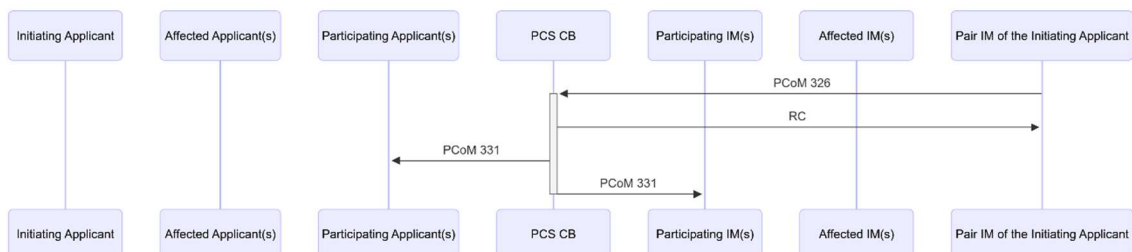


TSI message matrix IDs:

- PM: 69, 74, 79

The PRID in this request is not the same as what was in the original request. This is the PRID now for the modification. The applicant linked the new PR to the old PA.

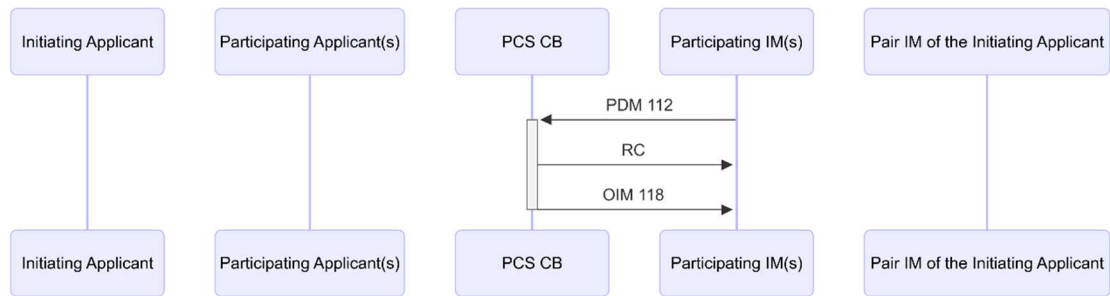
5.9.11 Path modification request rejection by the Pair IM of the Initiating Applicant



TSI matrix IDs:

- PM: 326, 331

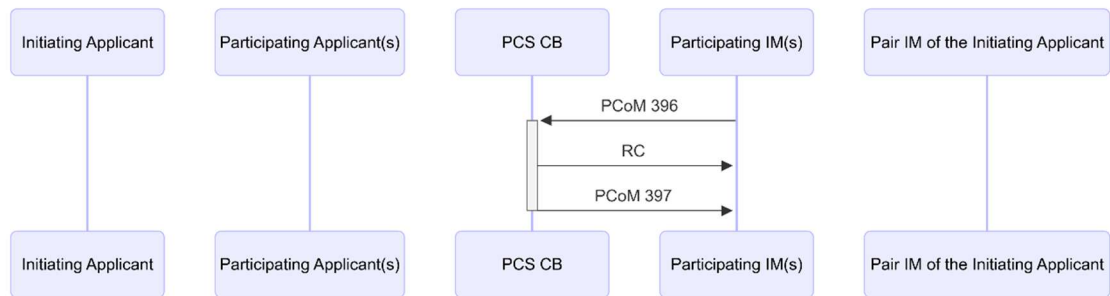
5.9.12 Final offer creation/update by a Participating IM



TSI message matrix IDs:

- PM: 112, 118

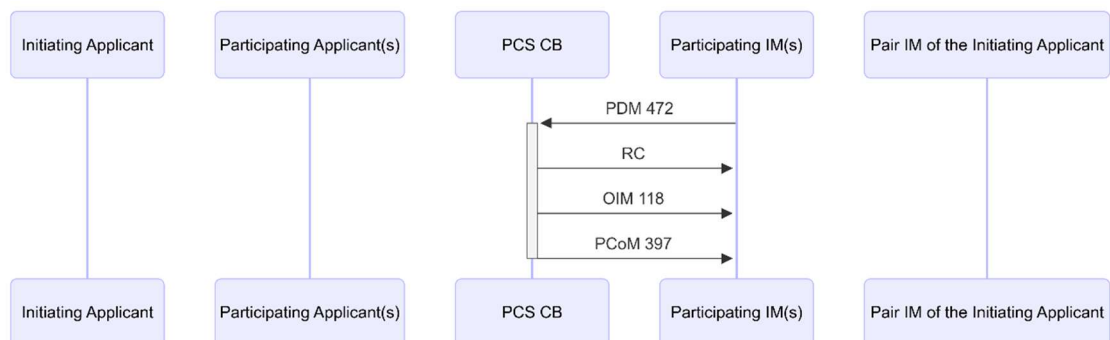
5.9.13 Final offer finalisation by a Participating IM



TSI message matrix IDs:

- PM: 396, 397

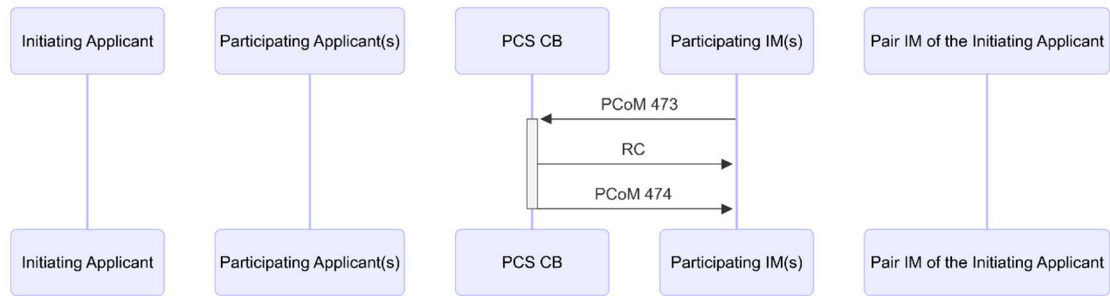
5.9.14 Final offer creation/update and finalisation by a Participating IM



TSI message matrix IDs:

PM: 472, 118, 397

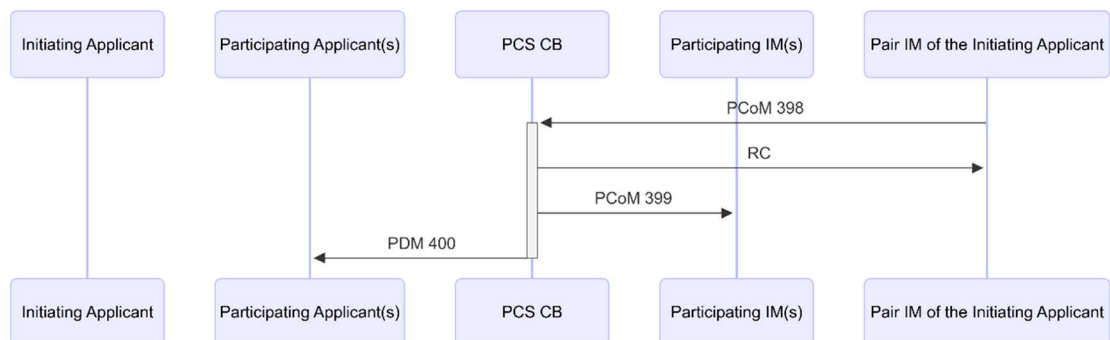
5.9.15 Path modification request rejection by a Participating IM



TSI message matrix IDs:

- PM: 473, 474

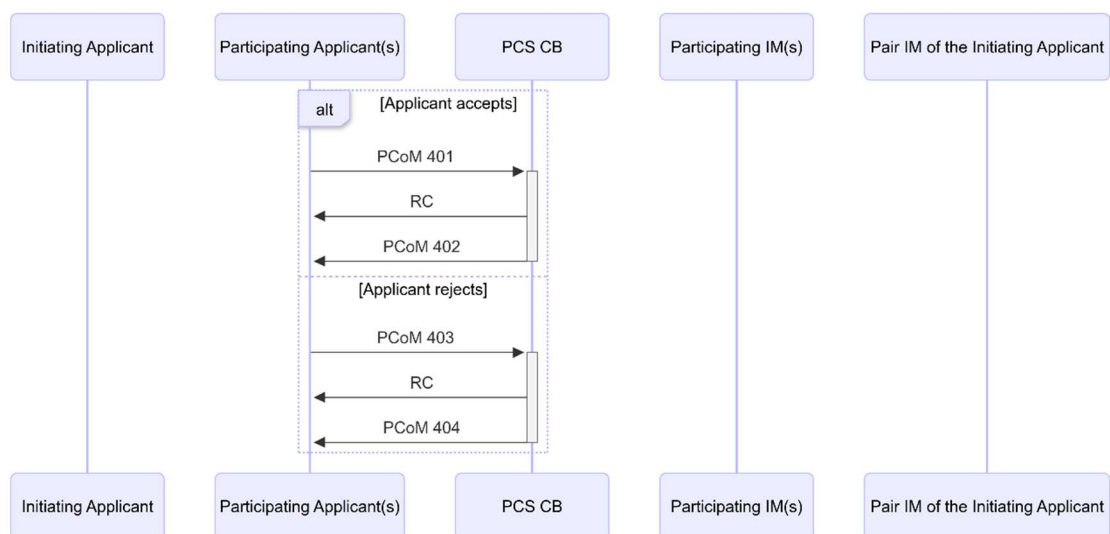
5.9.16 Final offer submission by the Pair IM of the Initiating Applicant



TSI message matrix IDs:

- 389, 399, 400

5.9.17 Response to a final offer by a Participating Applicant

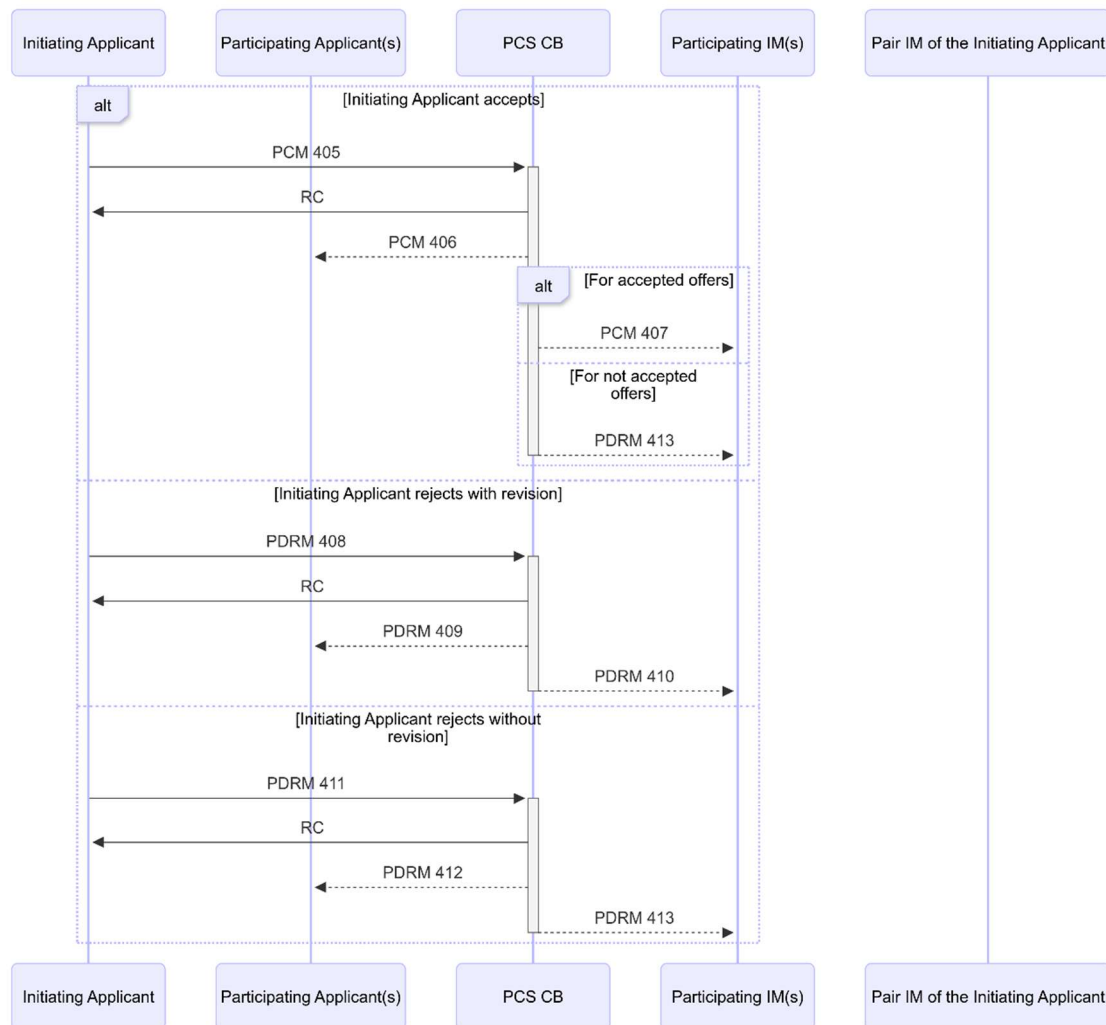


TSI message matrix IDs:

- PM: 401, 402, 403, 404

Please note that this is only setting the progress (light) on the final offer.

5.9.18 Submission of the responses to the final offer(s) by the Initiating Applicant



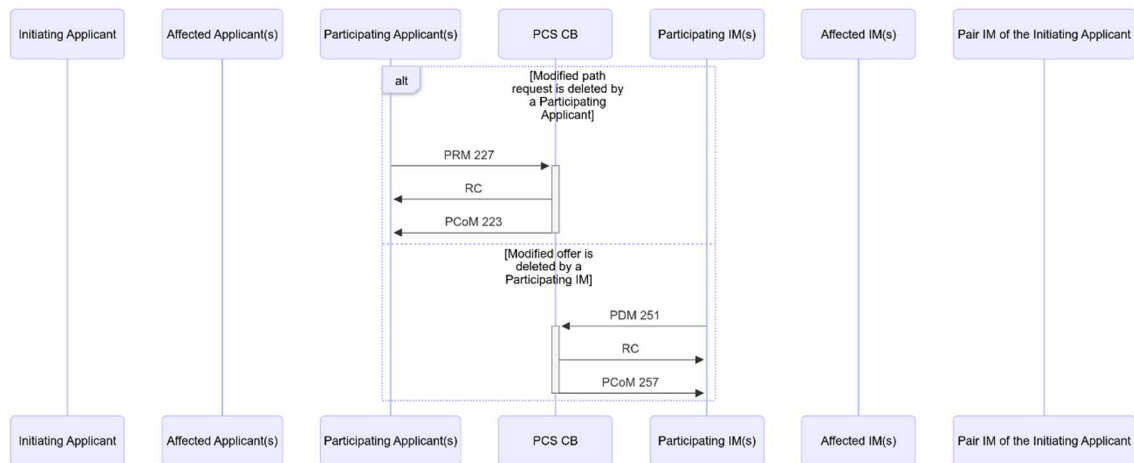
TSI message matrix IDs:

- PM: 405, 406, 407, 408, 409, 410, 411, 412, 413

The initiator applicant has three options for the acceptance. Precondition that all alternative offers are determined (accepted or rejected)

- Accept: there is an accepted offer
- Reject with revision: all offers are rejected
- Reject without revision: all offers are rejected

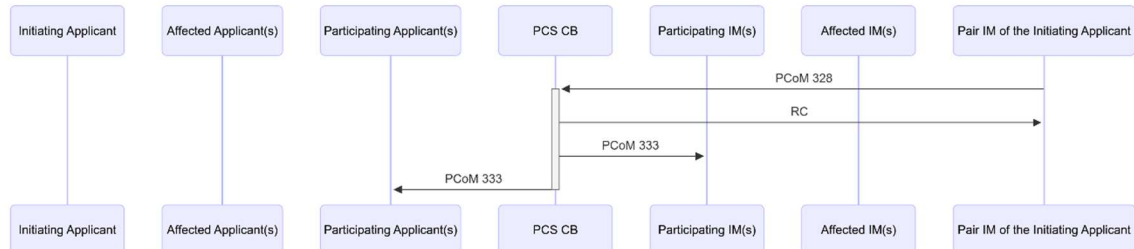
5.9.19 Modified path request deletion from the reference train by a Participating Applicant / Modified path offer deletion from the reference train by a Participating Applicant



TSI message matrix IDs:

- PM in Harmonisation: 227, 223
- PM in Path Elaboration: 251, 257

5.9.20 Reference Train rejection by the Initiating IM

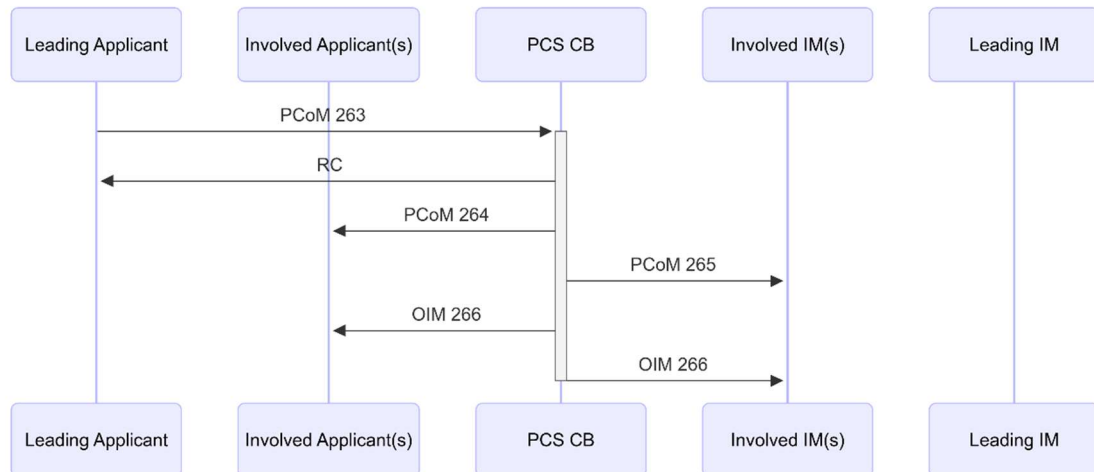


TSI message matrix IDs:

- PM in Harmonisation: 328, 333

5.10 Feasibility study message sequences and actions

5.10.1 Feasibility Study start by the Leading Applicant

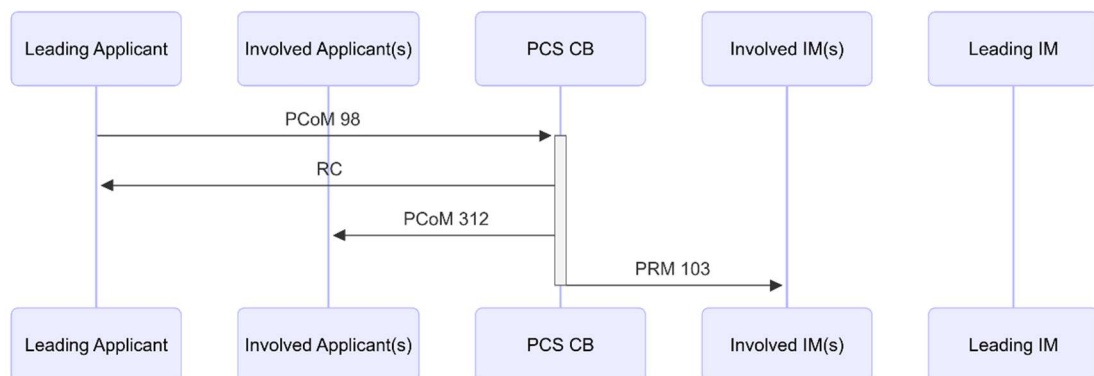


TSI message matrix IDs:

- FS: 263, 264, 265, 266

This action promotes the reference train to Feasibility Study Harmonisation Conference

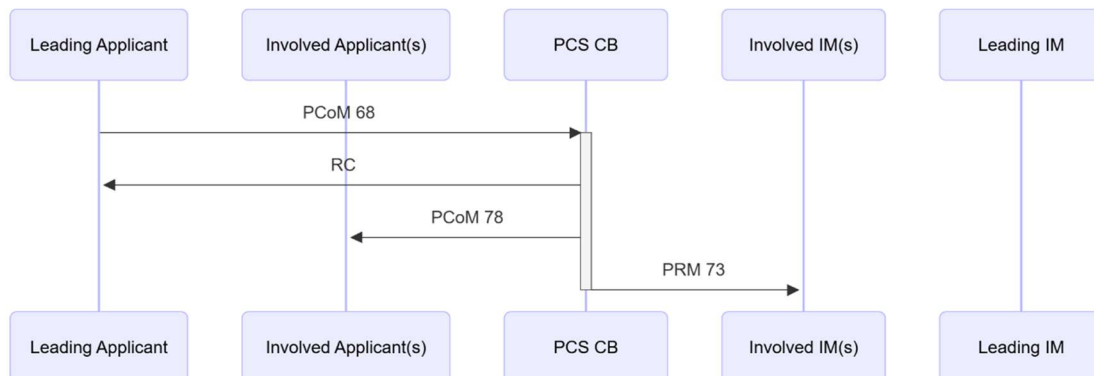
5.10.2 Feasibility Study withdrawal by the Leading Applicant



TSI message matrix IDs:

- FS: 98, 103, 312

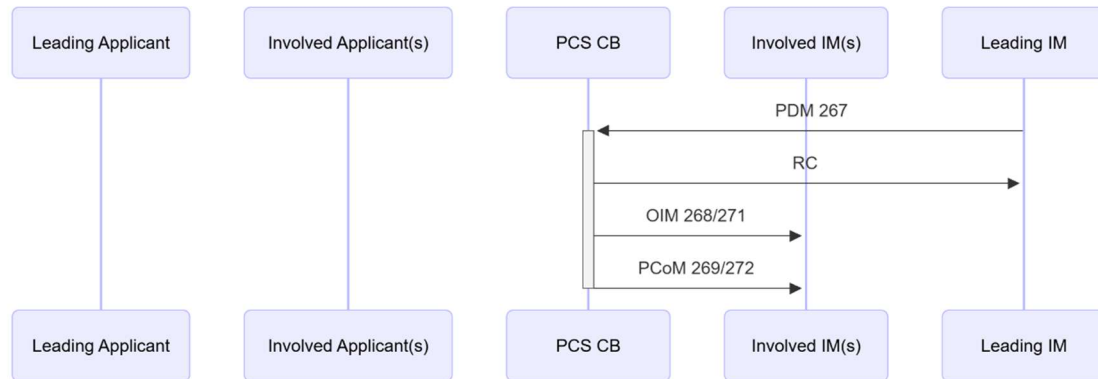
5.10.3 Feasibility Study request submission by the Leading Applicant



TSI message matrix IDs:

- FS: 68, 73, 78

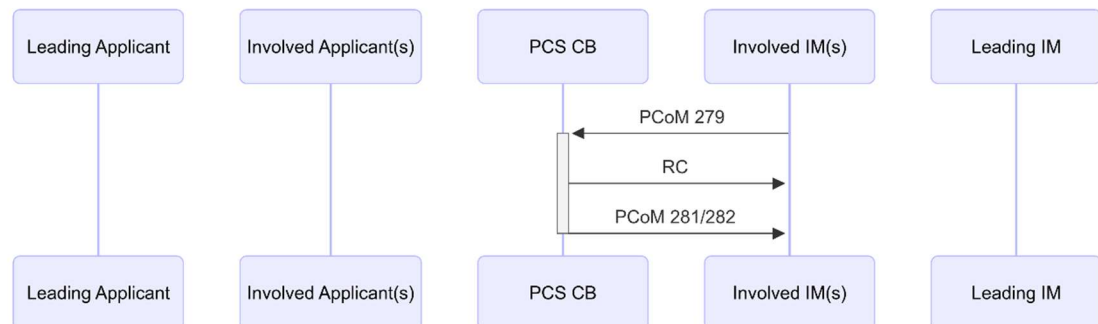
5.10.4 Study creation/update and finalisation by an Involved IM



TSI message matrix IDs:

- FS: 267, 268, 269, 271, 272

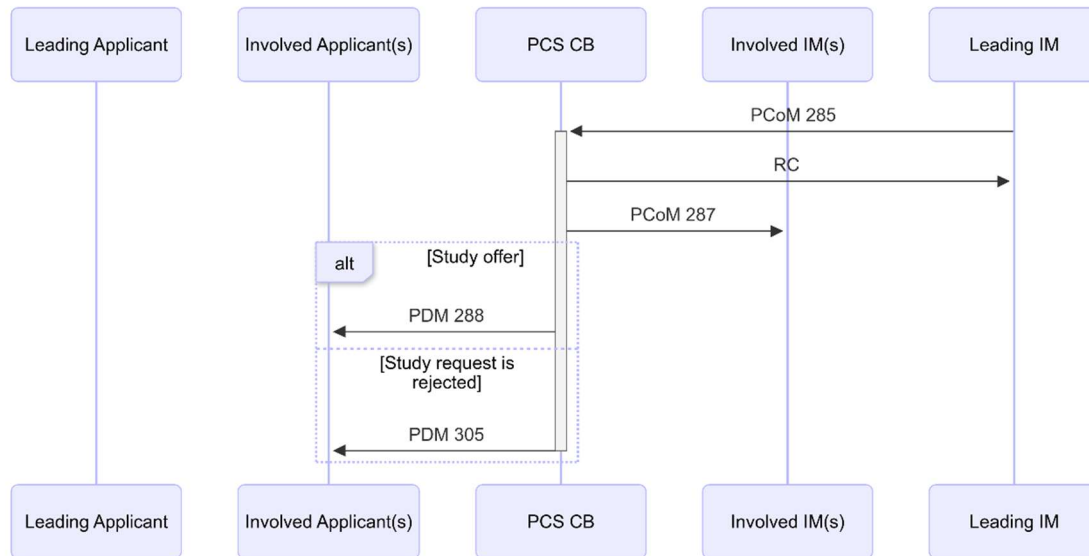
5.10.5 Study finalisation by an Involved IM



TSI message matrix IDs:

- FS: 279, 281, 282

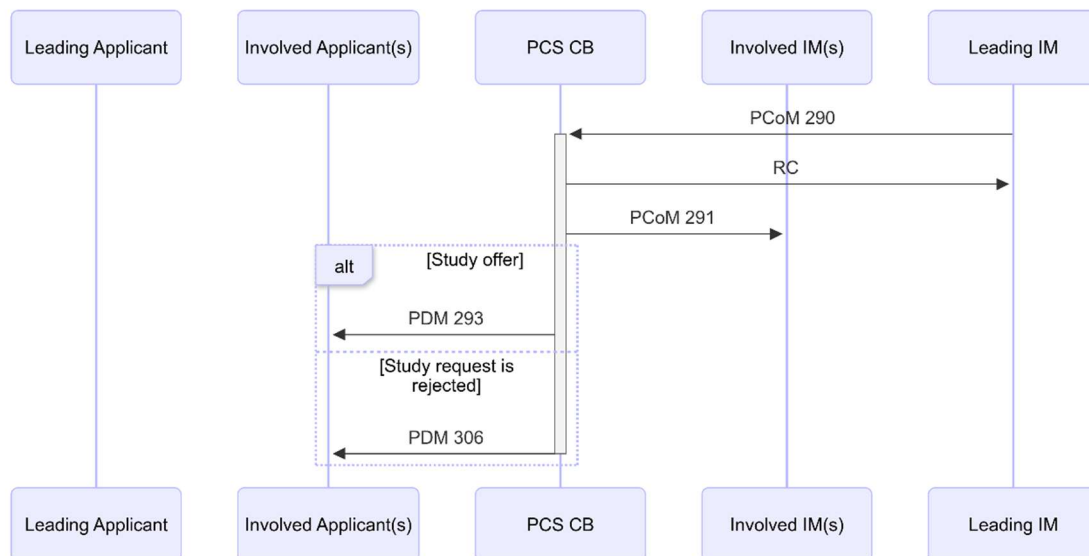
5.10.6 Promotion to Feasibility Study Elaboration Conference by the Leading IM



TSI message matrix IDs:

- FS: 285, 287, 288, 305

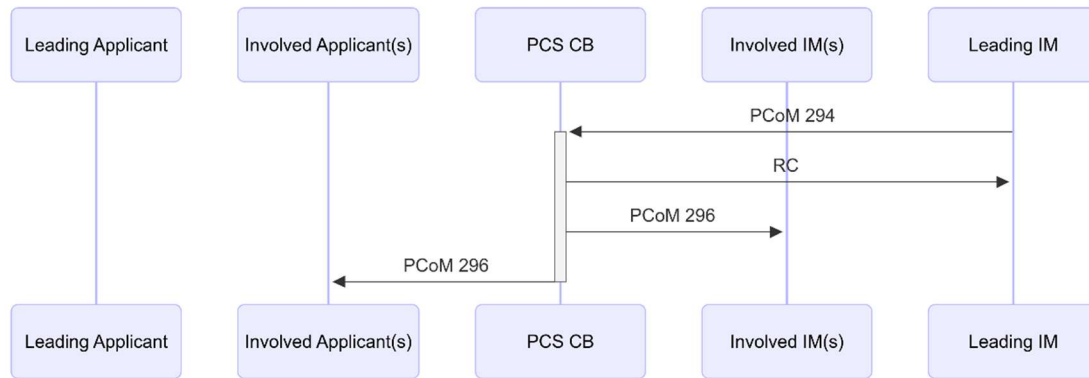
5.10.7 Promotion to Feasibility Study Result by the Leading IM



TSI message matrix IDs:

- FS: 290, 291, 293, 306

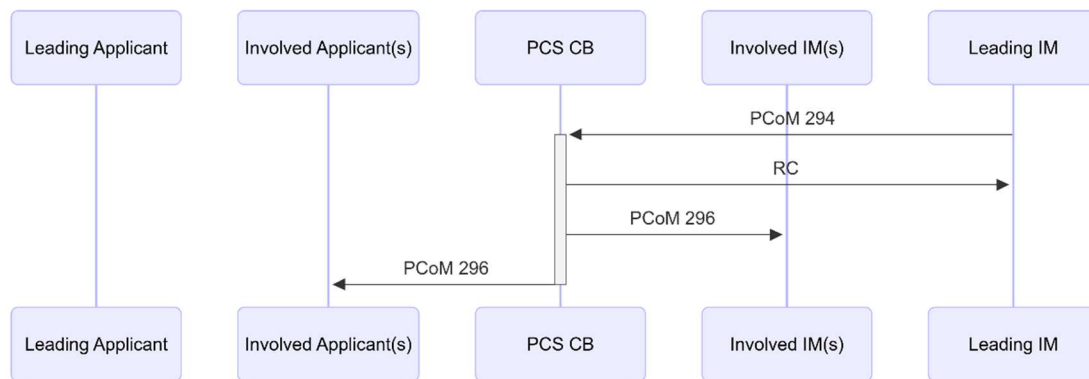
5.10.8 Withdrawal from Feasibility Study Elaboration Conference by the Leading IM



TSI message matrix IDs:

- FS: 294, 296

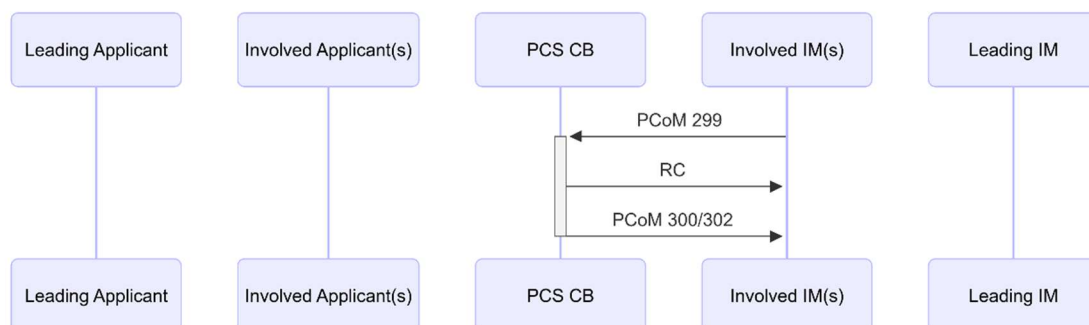
5.10.9 Withdrawal from Feasibility Study Result by the Leading IM



TSI message matrix IDs:

- FS: 294, 296

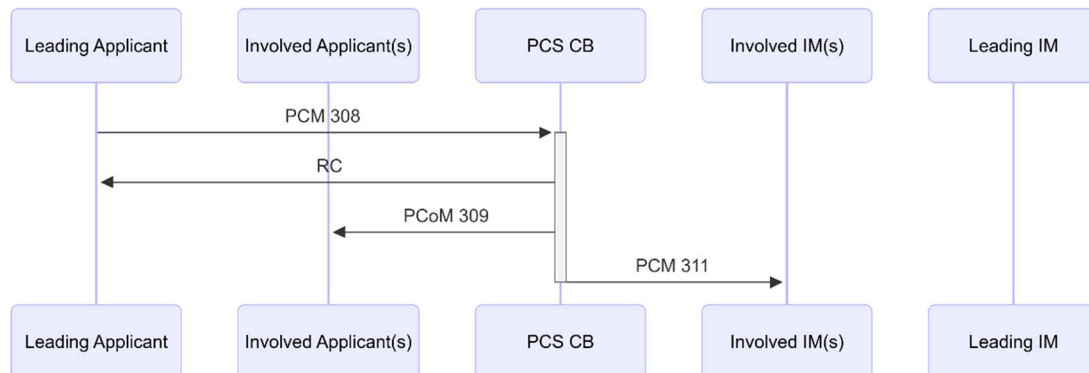
5.10.10 Feasibility Study request rejection by an Involved IM



TSI message matrix IDs:

- FS: 299, 300, 302

5.10.11 Feasibility Study result acknowledgement by the Leading Applicant



TSI message matrix IDs:

- FS: 308, 309, 311

5.11 Handling PaPs in inbound/outbound directions

5.11.1 PaPs in outbound messages

The XSD contains only one field in the PlannedJourneyLocation element that indicates if a location belongs to a PaP. It's valid for IMs and Applicants. Please note that Applicants and IMs have different permissions on the PaP. Those details are described in the Functional Specification and in the PCS documentation.

The field with the PaP information is called "RFCPPaP". It's there to contain the PaP ID of the PaP. Please note that the PaP ID is not a unique identifier of a PaP, but rather a grouping of them. It can happen that in one request two locations with the same PLC have the same PaP ID.

For outbound messages, PCS CB will generate the PaP ID into this field. It will check to which PaP the location belongs and what is the PaP ID of that PaP.

5.11.2 PaPs in inbound messages

PCS CB has a lot of support on the UI that has to be solved by integrators via the TAF/TAP TSI messages. The aim of this chapter is to summarise those limitations and advise for the proper integration.

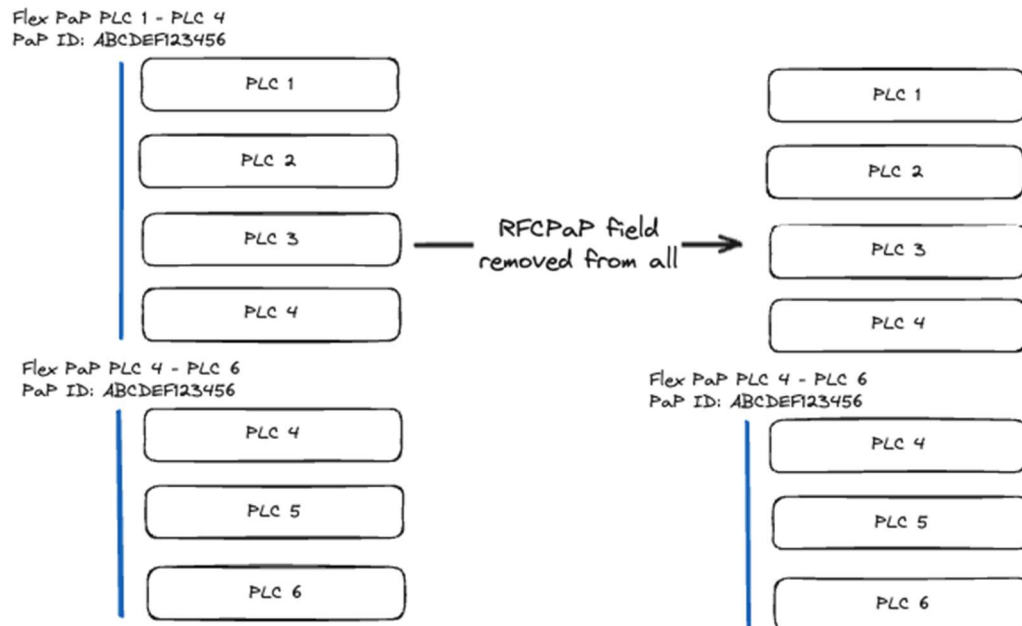
5.11.2.1 Available running days of the PaP

PCS CB supports both the Applicant and IM users, if they select running days for a PR or a PA that are not fully covered by the running days of the PaP. It opens an iteration with the user where it can be fixed. This iteration is not supported via interface. The integrator companies must send the message with properly set running days. If a sent PR or PA contains running days in the planned calendar that are not fully covered by the PaP, PCS CB will return an error message.

5.11.2.2 Clear PaP capacity

PCS CB has a feature available for both applicants and IMs called “Clear PaP capacity”. The result of this feature is that all the PaP references are removed from the location, but the timetable data, train parameters remain in the PR or in the PA. This option is available only for a whole PaP. Meaning, it cannot be that the capacity is cleared from the first location of a PaP, but it remains for the rest of the locations.

If integrator companies would like to use this feature, they shall remove the RFCPPaP field from all PlannedJourneyLocations of the PaP.

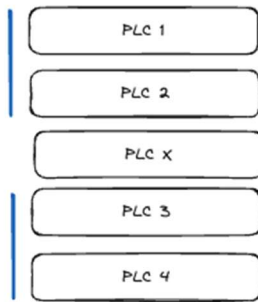


Once the capacity is cleared, the company is free to work with the tailor-made locations. Please note that it is only possible after the capacity is cleared. This action cannot be combined with another update that would not respect the PaP's limitation (e.g. deleting a location as an IM). For example, if an IM creates an offer (PA) for the first time, not using the RFCPPaP field for any of the locations, it will be treated as a clear capacity for the whole offer.

5.11.2.3 Add location inside the PaP

Both IMs and Applicants are allowed to add tailor-made locations between PaP locations in the PR or in the PA. They can do it by including a PlannedJourneyLocation without the RFCPPaP field. It would look like the following image with PLC X.

Flex PaP PLC 1 - PLC 4
PaP ID: ABCDEF123456

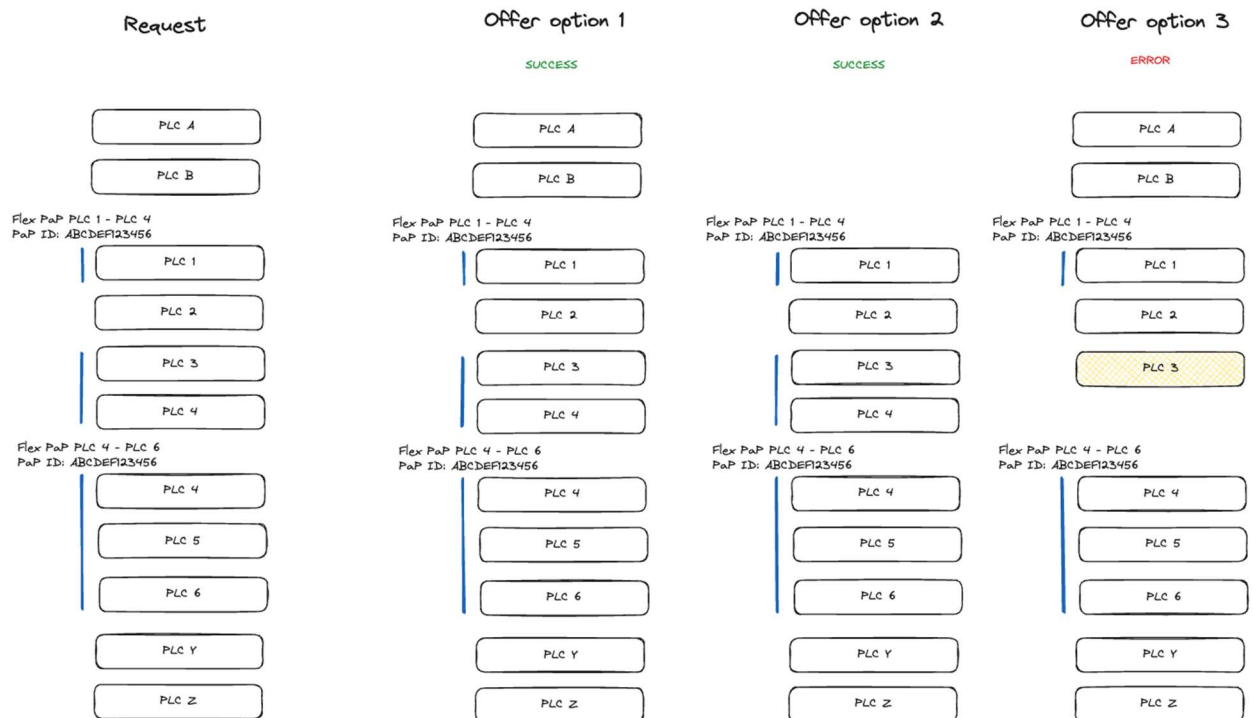


5.11.2.4 Add offer

In PCS EC, the IM timetable is automatically copied from the applicant timetable, or in case of PaPs from the C-OSS timetable. Please note that this is not like this in PCS CB and the IM is allowed to set-up its PAs from scratch. Though, the situation with the PaPs is special. IMs shall pay attention to create the offers respecting the PaPs or using the clear capacity. Please note that even if a clear capacity use case is applied (not sending back the RFCPaP field) certain actions cannot be combined.

The following image tries to explain the expected behaviour.

1. In the first option the IM sends back exactly the same content as the request. It can be considered as a successful action.
2. In the second option the IM removes tailor-made locations compared to the request. As tailor-made locations are free to be deleted, it can be considered as a successful action.
3. In the third option the IM removed PLC 4 which is a PaP location and turned PLC 3 to a tailor-made location. This has multiple issues. To have a successful import, the capacity should be cleared for the first PaP. Then in a follow up request, the tailor-made location can be deleted.



5.12 Handling RU appointment in inbound/outbound directions

For more information regarding the RU appointment feature in PCS CB, please refer to the particular chapter of the Functional Specifications. Without having here the whole content, please find here the most relevant functions of this feature:

- RA can appoint RU on object level (request or offer)
- RA can transfer editing rights to RU for the path modification process
- RU can accept/reject the appointment
- Appointment can be done as the following:

Object	Status
PR	Harmonisation
PA	Observation
PA	Post-processing
PA	Acceptance
PA	Final acceptance
PA	Allocation
PA	Booked

From the above written functionality, the following will be supported via inbound messaging:

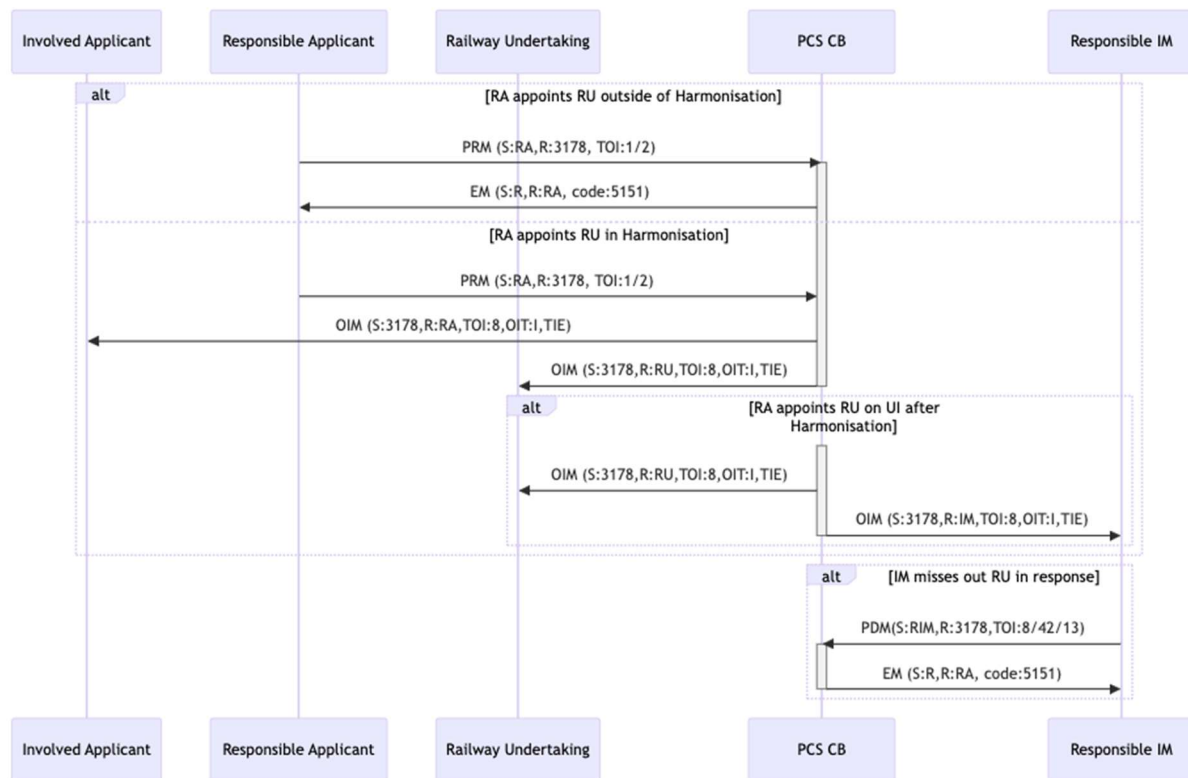
- RA can appoint RU on object level for requests, using PRM. If there is a change among the ResponsibleRUs inside a PathInformation, error is returned (code: 5151)
- By default, the transferring of editing rights is set to false and there is no support to change that value
- RU acceptance is considered automatically. No need for acceptance.
- RA can appoint RU only in Harmonisation. Because later on, the appointment would happen on offers and the RA can only send PRM.

How to include the ResponsibleRU field in the inbound messages?

- No appointed RU
 - The field is sent and it has the same value as before (the RA) → success, no new appointment
 - The field is sent and it has a different value than before → it means an appointment. Apart from the above-written phases, e.g. during the path change process it's not supported and an error will be sent.
 - The field is not sent → success, no new appointment
- RU is appointed
 - The field is sent and it has the same value as before (RU) → success, no new appointment.
 - The field is sent and it has a different value than before → it means an appointment. Apart from the above-written phases, e.g. during the path change process it's not supported and an error will be sent.
 - The field is not sent → apart from the above-written phases, e.g. during the path change process an error will be sent, because if appointed RU exists, this action would be interpreted as a delete.

What value is populated in the ResponsibleRU field in outbound messages?

- If there is no RU appointed, then it's the RA
- If there is an appointed RU via the UI and it's still in pending acceptance, then it's the RA
- If there is an appointed RU via the UI and it's accepted (equal when the RU is appointed via inbound message, then it's the RU



5.13 ObjectInfoMessage use cases

5.13.1 Retrieve all objects belonging to a Reference Train

Inbound message

- Type: OIM
- Message header:
 - o Sender: company code of the involved agency
 - o Recipient: 3178 (RNE)
- ObjectInfoType: R
- Identifier: TR ID

The outbound message depends on the state of the reference train.

- Reference train is not part of any path change process
 - Type: OIM
 - Message header:
 - o Sender: 3178 (RNE)
 - o Recipient: company code of OIM request sender
 - Identifier: TRID
 - ReferenceTrainIDSubCalendar
 - ObjectInfoType: I
 - Train Information Extended (note: repeated for each RO linked to the Reference Train):
 - o Identifiers
 - o TrainInformation: content of the RO

- o PathInformationExtended (PIE) (note: repeated for each PR and PA linked to RO listed as PTID in the TIE:
 - Path Information: content of the PR or PA listed as PTID
- Reference train is part path change process
 - o If the requester agency is not part of the process: PCS CB sends only the original state (the one it has access to via the GUI). In the standard format as written above.
 - o If the requester agency is part of the process: PCS CB sends the actual state (the one it has access via the GUI). In this case, the OIM is built as usual during the path change process, PIE only.
 - o Example:
 - Original state
 - PR1.1, PA 1.1
 - PR2.1, PA2,1
 - PR2.2, PA2.2
 - Path change process
 - PR1.1 impacted, PA1.1 impacted
 - PR1.1mod created, PA1.1mod created
 - PR2.1, PA2.1
 - PR2.2, PA2.2
 - In this case the second territory is not part of the path change process. If the agency from the second territory requests an OIM, the original state is sent back in TIE – PIE structure.
 - If the agency from the first territory requests an OIM, only PIEs are sent, but including PR2.1, PA2.1, PR2.2, PA2.2 as well. Even if they are not part of the path change process. This is valid only for the OIM requests. For the border impact outbound, only the objects included in the path change process are sent.

5.13.2 Notification about process type conversion by automation

PCS CB runs automations on specific dates or after specific periods. The X-8 and the X-2 deadlines are like this, when PCS CB converts the process type of the not yet submitted trains.

- At X-8: from NPR to LPR
- At X-2: from LPR to AHPR

Such conversion can only happen before path request submission, thus it only affects the applicants. Once the conversion happens, PCS CB sends out OIM as a notification to the involved applicants.

- Type: OIM
- Message header:
 - o Sender: 3178 (RNE)
 - o Recipient: company code of involved applicant
- Identifier: TRID
- ReferenceTrainIDSubCalendar

- ObjectInfoType: I
- TypeOfRequest:
 - 1 - if the train is still in Feasibility Study
 - 2 - if the train is in NPR, LPR or AHP
- TypeOfInformation: 8 - coordination update
- ProcessType:
 - 1 - if the train gets into LPR
 - 2 - if the train gets into AHP
 - 4 - if the train is still in Feasibility Study
- PathInformationExtended (PIE) without TIE:
 - Path Information: content of the PR listed as PTID

Please note that if the train is in Feasibility Study during the conversion, the notification will not contain any information about the new process type, because the TOR and PT values will be still according to the FS process.

5.14 Error handling, error messages

If a message is successfully processed, the recipient of the message PCS CB replies with a ReceiptConfirmationMessage (RC).

If a message cannot be processed due to a functional or technical error, the recipient of the message sends back an ErrorMessage (EM). The combination of RC and EM won't be supported.

The link from an RC or EM to its triggering message is based on the content of the SenderReference element in the triggering message. The content of the SenderReference element is included in the RelatedSenderReference (for the RC, as part of the RelatedReference element) as part of the MessageSenderReference element (for the EM, as part of the ErrorCauseReference).

Inbound ErrorMessage (sent to PCS CB)

The content of the FreeTextField element from ErrorMessage triggered by a PathRequestMessage is displayed to the RA in the Comments section on PCS GUI and the ErrorMessage is sent via the API. The information is shared with the RA even if the Reference Train is still in Path Elaboration, because the RA must be informed about the issue and may take an action (e.g., alignment with the LA to withdraw the Reference Train from Path Elaboration). This use case is supported only in Path Elaboration. The result is not only a comment from the ErrorMessage, but a red light will be set on the path request.

Outbound ErrorMessage flow (sent out by PCS CB)

In PCS CB, the validation of the triggering message consists of two steps:

- 1st step:
 - Sequential check of a predefined list of elements included in the triggering message. The check stops if a validation fails and an ErrorMessage referring to the identified error is sent. The validation does not continue and other

potential issues with the rest of the elements are not included in this ErrorMessage.

- List of elements:
 - ID
 - Sender
 - MessageStatus
 - TypeOfRequest
 - ProcessType
 - Timetable period
 - TypeOfRequest
 - TypeOfInformation
 - MessageStatus
- 2nd step:
 - Prerequisite: successful validation of the 1st step.
 - The remaining content of the message is checked. The issues are collected and packed into one ErrorMessage. Failure is registered and the message is checked in its remaining content

Error message due not found inbound rule in the TSI message matrix

For all the inbound messages, PCS CB first checks the combination of the following elements of the message:

- MessageStatus
- TypeOfRequest
- TypeOfInformation
- ProcessType

If the combination is unknown (does not exist in the matrix) an error message is returned, including error codes for

- 5035 Invalid or unknown Type of information
- 5028 Invalid or unknown Message Status
- 5030 Invalid Process trigger

The full list of error codes used by the application can be seen in the Appendix B.

5.15 Handling user defined comments

Commenting is supported in general by the application. There are quite a lot of actions where it's even required, e.g. a withdrawal. Those are named as mandatory comments. Apart from that, applicants can place observations using PDRM in the Observations status.

The goal of this chapter is to describe how users can place user defined comments using messages, and how those comments are communicated by the application in the outbound messages.

5.15.1 Inbound messages

ERA messages (PRM, PDM, PDRM, PCM, PNA) can be used to place a comment. The TSI matrix has been adjusted to the relevant actions and for those rows, the FTF column has been changed to "O" as optional.

The recipient of the comment in the will be the pair agency of the sender of the inbound message. The character limit is 250 for inbound messaging. If it's longer, then an error message is returned with code 5253.

5.15.2 Outbound messages

For transferring the Observation comments, PCoM and PDRM are used. For the user defined comments, all comments will be parsed into a message that is addressed to the recipient.

- Dedicated PCoM for every created user defined comment since the last reference train version. When the new reference train version is created, the dedicated PCoM is sent with the comment. Please note that mandatory comments are still delivered in their standard PCoM (e.g. a red light setting)
- ERA messages are used only for the phase promotions, including all comments (in an array) addressed to the recipient company

The structure of the dedicated PCoM is the following:

- MS = 1
- TOR = as the train
- PT = as the train
- TOI = 8
- One PCoM per comment.
- FTF content: in order to fit to one PCoM (and enable a possible implementation on the other side) we limit the PCS CB comment (UI, inbound message) length to 250 characters.
 - o Company code of the company to which the user that created the comment belongs to
 - o “.”
 - o Free text field comment
- If a comment is longer than that, the text is split to two FreeTextField elements like
 - o First FTF: 0074:1/2-Comment is written here ...
 - o Second FTF: 0074:2/2-The rest of the comment is written here ...

Appendix A - TSI message matrix

The TSI message matrix can be found in the referenced sheet.

Appendix B - Error codes

The overview of error codes can be found in the referenced sheet.

Appendix C - Mermaid diagram source codes

The source code of each diagram in the Technical Specification can be found in the referenced document and visualised with any markdown-based tool that can interpret Mermaid (e.g. <https://mermaid.live/>).

Appendix D - TAF TAP TSI message examples