



DCM Fact Sheet

Complementary information document to Description of the Digital Capacity Management Concept

Version 1.0



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Version history

VERSION	RESPONSIBLE	DATE	CHANGES
0.1	Aleksandar Markelić Mario Toma	2022-05-06	Creation of the initial version based on the: <ul style="list-style-type: none">• Fact Sheet “Digital Capacity Management”• Fact Sheet “TCR Tool”
0.2	Philipp Koiser	2022-06-15	Updates based on input from TTR Core Team, Process, Implementation and DCM Team
0.3	Philipp Koiser	2022-07-26	Updates based on feedback from TTR Team
0.4	Philipp Koiser	2022-08-18	Updates based on feedback from TTR Team
0.5	Aleksandar Markelić	2022-09-19	Updates based on feedback from FTE
1.0	Philipp Koiser	2022-12-06	Presented to the RNE General Assembly

1. Preliminary Note

This document is intended as a complementary information document to the description of the Timetabling and Capacity Redesign Process (TTR) as provided by Rail Net Europe (RNE) and Forum Train Europe (FTE). The present document aims to provide short, and easily understandable overviews of the Digital Capacity Management (DCM) features concept in its full implementation. Intermediate steps are not considered.

It is important to note that the full descriptions can be found in the:

- TTR IT Landscape technical specification
- Specification of the TCR interfaces to import data into the central TCR Tool

2. Summary

TTR aims to increase the competitiveness of railways in the modal split. The newly designed processes require an underlying, modern IT landscape for:

- Good quality of rail infrastructure capacity with easy access for applicants
- Acceleration of processes
- Improved connection between all stakeholders with raised quality of information between stakeholders and synchronized information between
- Increased harmonization of processes between stakeholders and countries (combination of domestic and international transport in Europe)
- Optimization of resources with improved process efficiency – including higher feasibility of automatization

To achieve these goals, domestic systems handling capacity planning and allocation must be connected via central IT. These systems are covered by functions provided in tools:

- Temporary Capacity Restrictions Tool (TCR Tool)
 - To manage the creation¹, permanent synchronization with the national tool, coordination, and publication of TCRs.
- European Capacity Management Tool (ECMT)
 - To collect and display the capacity volumes (capacity model) and capacity needs announcements by potential Applicants.
 - To centrally store parts of the pre-planned capacity as capacity products and make them available for booking.
 - TCRs (“negative capacity”) will be compared with maximum volumes (both capacity model and capacity supply) They shall be imported from the TCR Tool on a daily basis. This will support the identification of capacity available for Applicants to book (“positive capacity”).
 - To visualize the already booked paths as a placeholder in the time diagram, without showing any confidential information. This data will be imported from the PCS-CB.
- Path Coordination System and Capacity Broker (PCS-CB)
 - To request capacity products by Applicants for all request types (annual, ad-hoc and rolling planning requests as well as changes and cancellations by IMs or Applicants).
 - To coordinate the paths by IMs and provide harmonised offers to the Applicants.
 - For Applicants’ requests on short notice, the PCS-CB will also be able to handle automated answers by IMs within minutes

A Messaging Module will enable communication between all national and central systems of the DCM enabling interfaces between systems and access to central databases. Such interfaces can

¹ Either taking over TCRs via API from national application into TCR Tool, or end user could create TCRs directly via web access inside TCR Tool (manually or via Excel import)

be built and used by all stakeholders. In addition to technical interfaces accessibility via web applications will be ensured to secure easy access for all stakeholders.

The Railway Infrastructure System (RIS) will be the main database to provide common infrastructure data for all DCM systems. All communication between systems will follow the mandatory standards of TAF and TAP TSI.

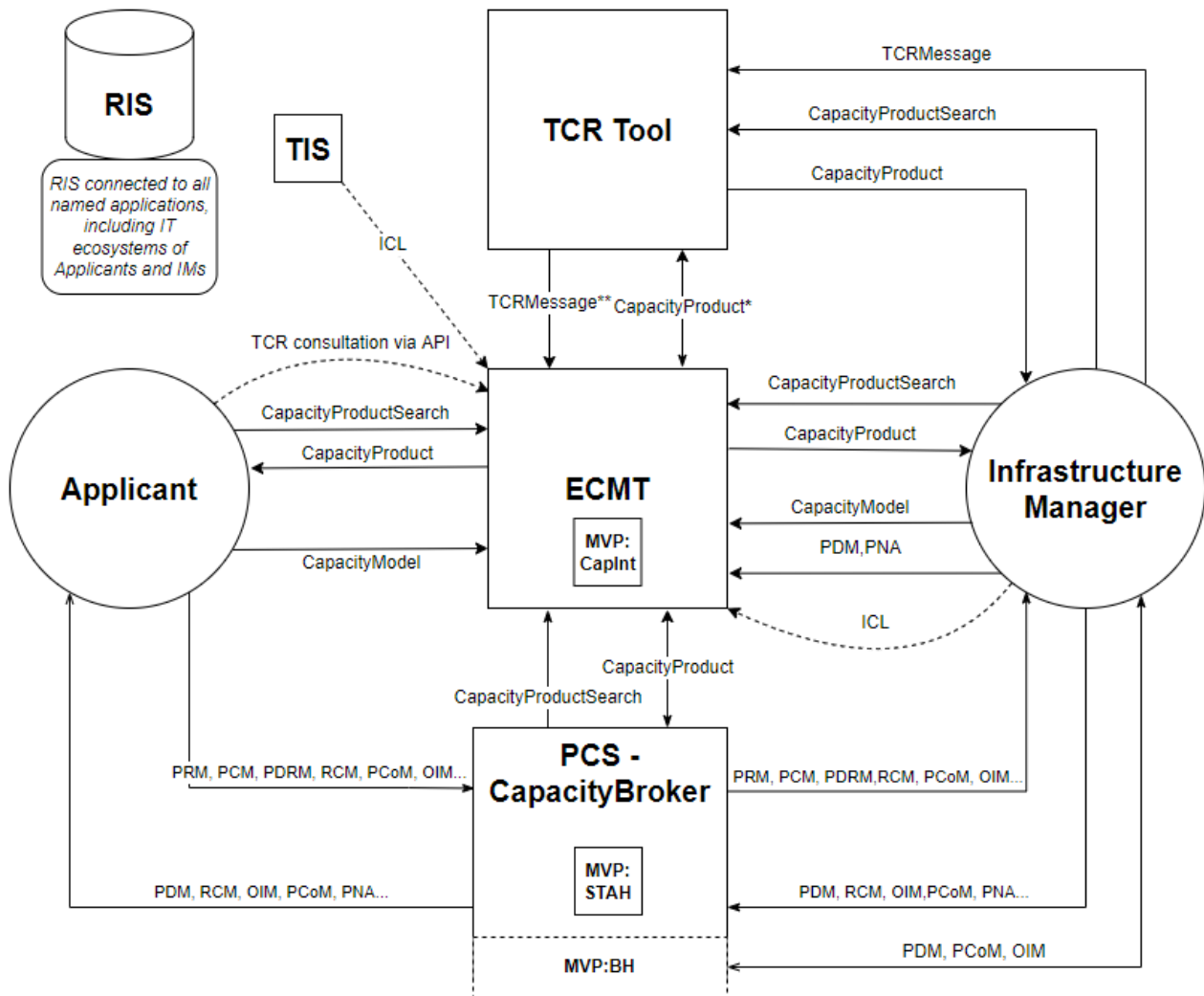


Figure 1 - TTR Target IT Architecture v1.7 (data flow on the international level)

3. Digital Capacity Management (DCM)

3.1 Short Description

DCM consists of a central international platform where multiple central systems, which support common rail capacity management processes, coexist and communicate. National systems handling capacity planning and allocation are connected to and via this central platform with interfaces.

The aims of the DCM are the following:

- raise the quality of information exchanged between all stakeholders and thus raise the quality of rail capacity products
- support the complete and harmonized capacity planning process from long-term capacity planning to last-minute path requests

- accelerate process steps by allowing for a certain extent of automation
- provide easy access to all stakeholders, either via API (machine to machine) or via web browsers

The basis of the central platform is the TTR IT Landscape technical specification, which defines three layers

- Applicant layer - for the Applicants (RU and Non-RU) to express their capacity needs in advance and place harmonized requests from origin to destination
- IM layer - for IMs/ABs to publish their capacities (available and unavailable), coordinate all capacity products and provide harmonized offers
- Common layer – for all stakeholders to use the common TAF/TAP TSI communication standard and central data repository (databases for reference data)

Each of these layers contains pre-defined functions following the respective business needs of the capacity management process. These functions are implemented in various tools.

3.2 Content of the DCM

3.2.1 Central tools

The content of the DCM can be viewed through the three main central tools with auxiliary systems as the foundation:

1) Temporary Capacity Restrictions (TCR) Tool

The TCR Tool collects all available information on planned TCRs and TCR windows. It provides IMs functions to coordinate TCRs on the international level and decrease the negative influence of TCRs on train operation. Applicants will find information about all published TCRs in one place and can check their impact on the planned traffic.

2) European Capacity Management Tool (ECMT)

The ECMT collects all data from the IMs/ABs (traffic volumes) and Applicants (Capacity Needs Announcements/CNAs) and provides an overview of available capacity and TCRs already in an early stage of planning. The TCRs are imported (synchronized) from the TCR Tool – no additional data import for TCRs is required from IMs. All this data together first forms the Capacity Model (.e.g. harmonized traffic volumes to identify and mitigate potential future bottlenecks) and in a later stage the Capacity Supply (i.e. pre-constructed capacity available for booking).

3) Path Coordination System - Capacity Broker (PCS – CB)

The PCS-CB will be the next step in the evolution of the already available PCS-EC. It collects capacity requests from Applicants and builds harmonized offers from national capacity. In case of cooperation between several Applicants for one capacity request, PCS-CB will enable coordination of requests upfront.

It does this in four steps:

1. Checking in ECMT if TCRs are scheduled in the requested period and on the requested lines
2. Checking in ECMT if matching pre-constructed products are available on the requested national lines
3. In case of ECMT either contains TCRs on the requested date and national line or couldn't identify matching pre-constructed products the PCS-CB asks national systems for national paths. In this case, IMs may use national capacity supplies, automated construction or create tailor-made solutions
4. Combining all national capacity products into one harmonized offer

To operate these steps, the PCS-CB will contain intelligent algorithms for splitting data into involved IMs and collecting and combining their answers, checking the offers for consistency and providing the whole information back to the requesting Applicant.

The PCS-CB will support all types of requests and their respective answering times (annual, ad-hoc and rolling planning requests as well as changes and cancellations by IMs or Applicants). Since the answering time will depend on the availability of national capacity, answering times within minutes can be achieved for ad-hoc requests if IMs' capacity is pre-constructed or the construction is automated (or giving a negative answer instantly if the given request is blocked by existing TCR).

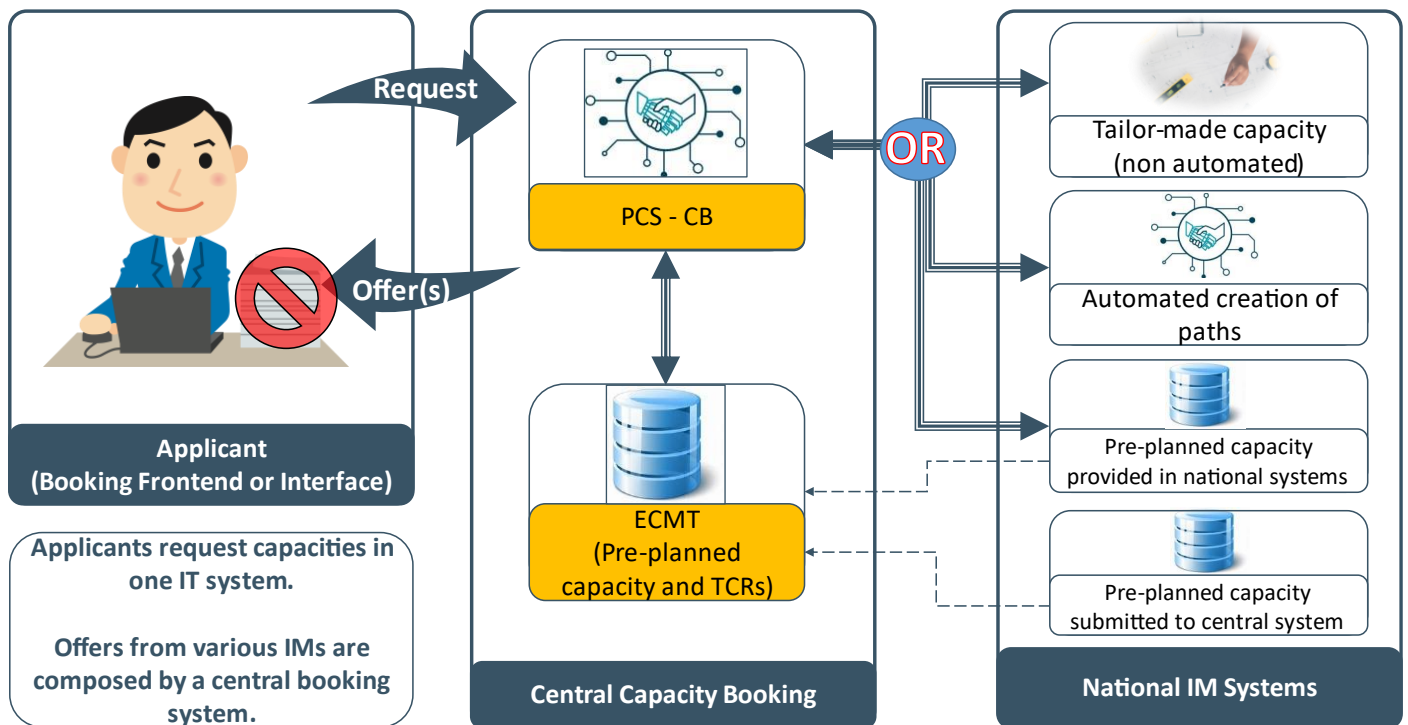


Figure 2 - Illustration of process workflow of PCS-CB

4) Foundations for DCM

In addition, to the central DCM tools, auxiliary tools are required, which together form the foundation for DCM:

- **Railway Infrastructure System (RIS)**
One of the main preconditions for DCM is the use of collected and maintained infrastructure data in the RNE RIS system (formerly BigData). IMs provide data to this system, which is updated regularly to reflect the current and planned infrastructure, to form this centrally used database.
- **TAF/TAP TSI**
The TAF and TAP TSI standards are used as a basis for the communication between systems. These standards are mandatory for all users. More information can be found at <https://taf-jsq.info/>

3.2.2 National systems

The main function of central IT is to combine information from national systems to enable quick and easy communication. Due to the investments, domestic companies made, already existing IT environments ("legacy systems") will not be replaced. However, to establish the envisioned communication, national systems must be adapted² to support the same formats and standards to

² To make them fully TAF/TAP TSI compatible

finally be able to participate in all processes and share information on traffic volumes, TCRs, available capacity and requests/offers.

In addition to the formats, process steps within systems must also be aligned to provide the same kind of information at the same time. This includes the acceleration of process steps.

Interfaces

3.2.3 Interfaces (machine-to-machine)

With central and national IT implemented and synchronized, communication between the systems must be established. For that purpose, interfaces between the systems shall be established based on common standards, i.e. TAF/TAP TSI via a Common Interface (CI). The communicated items are structured in messages (for example PathRequestMessage). This approach will allow stakeholders to reach a higher level of automated communication between systems and further enhance the quality and speed of processes and products.

For the sector, namely Applicants, this would also mean that machine-to-machine communication is happening in the same standard TAF/TAP TSI via CI (Applicant-to-IM or Applicant-to-DCM)

3.3 Process Timeline and Deliverables for DCM

The DCM platform and its modules shall be used from 3 years before the timetable change until the last day of the timetable period for the pre-planning and request/booking of capacity, including ad-hoc and short-term path requests during the timetable period.

It, therefore, delivers the:

- Capacity Models from 3 to 1,5 years before the timetable change
An overview of capacity volumes expected in a timetable period, which supports the identification of bottlenecks and the finding of potential solutions. Applicants can participate by placing their Capacity Need Announcements in this period. This deliverable is provided in the ECMT.
- Capacity Supplies from 1,5 years before the timetable change to the last day of the timetable
Catalogue of available capacity for booking, including detailed pre-constructed paths, capacity bands and unplanned capacity. The Capacity Supplies shall be updated to always reflect the available capacity at any time within the timetable period. This deliverable is provided in ECMT and complemented with information from national systems.
- Feasibility Studies, capacity requests and offers from 1.25 years before the timetable change to the last day of the timetable
All types of requests are to be tackled from feasibility study requests to request harmonization among Applicants to harmonized offers to Applicants (annual requests, ad-hoc and rolling planning requests, as well as changes to already allocated capacity or cancellation of it). These deliverables are provided via the PCS-CB.
- TCRs from 3 years before the timetable change to the last day of the timetable
The planning of TCRs is a constant process, which influences Capacity Models, Capacity Supplies and capacity requests/offers and already allocated capacity. Therefore, TCRs must be provided as early as possible for a) coordination and publication and b) consideration in Capacity Supply and Models for timely evaluation of their impact on these capacity deliverables. This deliverable is provided by the TCR Tool.

More detailed descriptions of the various TTR phases can be found in the process chapters of the TTR Fact Sheets.

4. Involved Stakeholders in DCM

The following stakeholders must be able to fulfil their tasks in DCM:

- Infrastructure Managers (IMs) and Allocation Bodies (ABs):
 - Provide coordinated Capacity Models and Supplies
 - Coordinate and publish TCRs
 - Consult Applicants on TCRs, Capacity Models and Supplies
 - Provide capacity offers based on requests
 - Request updates or cancellation of already allocated capacities
- Applicants (RU & Non-RU)
 - Announce market needs in early capacity management stages (for Capacity Models and Supply)
 - Provide feedback on TCR planning, particularly the impact on anticipated traffic
 - Request capacity
 - Request updates or cancellation of already allocated capacities
- International leading entity
 - Monitor all process steps to ensure the origin-destination aspect remains in focus
 - Trigger coordination processes in case of identified deviations
- Ministries of Transport and Regional/Local Governments, Transport Association, Industry
 - Receive feedback on capacity management in form of statistics, KPIs and reports
- Operators of Service Facilities
 - Provide information on the available capacity of service facilities

5. Glossary

-----	Dataflow displayed in the TTR target IT diagram, which does not have a definite state to be developed
—————	Dataflow displayed in TTR target IT diagram, which is planned/active
CapacityModel	Message used to create and update traffic volumes data of the Capacity Model. The same message is used to create and update Capacity Needs Announcements data by Applicants.
CapacityProduct	Message for exchange of Capacity Need Announcements (CNAs), Capacity Models and Temporary Capacity Restrictions (TCRs)
CNA	Capacity Needs Announcements: Applicants' information to IMs during the creation of Capacity Models on the expected traffic
ECMT	European Capacity Management Tool
ICL	Intended Capacity Line
MVP: BH	Minimum Viable Product Border Harmonization: Product to be introduced in advance by some IMs to increase the efficiency of systems in harmonizing capacity offers at borders
MVP: CapInt	Minimum Viable Product Capacity Intelligence: Product to be introduced by some IMs in advance to support the creation of Capacity Models with smart visualizations
MVP: STAH	Minimum Viable Product Short Term Ad-Hoc: Product to be introduced in advance by some IMs to provide automated national capacity for short-term capacity needs, internationally combined in the Capacity Broker
OIM	ObjectInfoMessage: This message serves to request information about the object, to update an information in an object and to inform about the content of the object
PCM	PathConfirmedMessage: This message is used by the Applicant to confirm the proposed path of the IM (PathDetailsMessage) in response to an Applicant's original request
PCoM	PathCoordinationMessage: This message is used for the exchange of information between RUs and between IMs for coordination and data synchronization purposes
PCS-CB	Path Coordination System and Capacity Broker
PDM	PathDetailsMessage: This message is used by the IM to the Applicant confirming details of the path in response to an Applicant's request
PDRM	PathDetailsRefusedMessage: This message is used by the Applicant to inform the IM that the path details (with changed values or to an earlier booked path) are not acceptable
PLC	Primary Location Codes
PNA	PathNotAvailableMessage: Path Not Available message according to Short Term Path Request specification (WG5)
PRM	PathRequestMessage: This message serves to request a train path. The message is sent from the Applicant to each IM.
RCM	ReceiptConfirmationMessage: This message is sent from the recipient of a message to the original sender of the message if the response cannot be made available within 5 minutes as defined by the TAF TSI chapter 4.4
RIS	Railway Infrastructure System: Referential database that holds locations (PLCs & SLCs), distances between locations, segments, lines, number of tracks, companies, catenary system, gradient, etc.
SearchCapacity	Message used to search Capacity Models, CNAs and TCRs
SLC	Subsidiary Location Code
TCR	Temporary Capacity Restrictions: Planned limitations of available capacity due to track works, speed restrictions or other plannable circumstances (note: Force Majeure is not tackled in this process)
TCR Tool	Temporary Capacity Restrictions Tool
TCRMessage	Message to request the import of a TCR into the TCR Tool. The message must define the import mode and the TCR which shall be imported
TIS	Train Information System