

## HSL Traffic Management Concept

(working version as of 17 February 2025)

## ANNOTATION

This paper sets out the division of the entire future network of high-speed lines in the Czech Republic into individual traffic control areas. It describes the method and principle of how to control the operation of these areas, including any other relevant circumstances.

## ABBREVIATIONS AND SYMBOLS

The following Czech-English list contains abbreviations and symbols used in this paper. The list does not include any legal abbreviations, acronyms or signs that are commonly known, established by legislation, provided in the figures, examples or tables.

AD.....	Active directory (a tool for verifying employee access permissions)
ASVC.....	Automatic train route setting
ComposT.....	Central information system for train composition monitoring
CR.....	Czech Republic
DA.....	Traffic control apparatus
DDTS.....	Remote diagnostics of technological systems
DOMIN.....	Infrastructure constraints database
DOSTI .....	Data on the state of technical infrastructure
DOZ .....	Remote control of signalling devices
DŘT.....	Traffic control systems
DŽDC. ....	Railway infrastructure controller
eDAP .....	Electronic library of documents and regulations
EC.....	European Commission
EOV.....	Electric turnout heating
ERTMS .....	European Rail Traffic Management System
ETCS .....	European Train Control System
ETD .....	Electronic Timetable Display
EU.....	European Union
EULYNX.....	Standardised interface for signalling and communication systems on railways. It is defined by a European initiative consisting of a consortium of railway infrastructure managers.
FRMCS.....	Future Railway Mobile Communication System
DG .....	Directorate General
HSL .....	High-speed line
HZS.....	Fire Rescue Service
IDM.....	Identity manager (employee access authorisation verification tool)
IRN .....	Infrastructure restrictions notice database prescribed in the TAF TSI. Includes all rail infrastructure restrictions.
ISC.....	Passenger information systems
ISOŘ .....	Operational Traffic Management Information System

JDK .....	Single Railway Transport Office
JISC .....	Single Passenger Information System
JOP .....	Single Service Point
KADR.....	Railway infrastructure capacity
KODOS .....	Continuous transport network
MIMOZA.....	Information system – transport of extraordinary consignments
OBU .....	ECTS on-board unit
OHS .....	Occupational health and safety
PA .....	Operation application
PoN .....	Axle counter
PDŽCD.....	Railway infrastructure controller’s workplace
PED .....	Electric system controller's workplace
POT .....	Auxiliary service terminal
PPP.....	Public Private Partnership
PTD .....	Line controller's workplace
RAMS .....	Reliability, Availability, Maintainability, Safety
RBC.....	Radioblock centre
REVOZ.....	Vehicle registry
SCI – CC.....	One of the interfaces in the EULYNX system
SCWS .....	Signal Controlled Warning System
SFDI.....	Státní fond dopravní infrastruktury (State Fund for Transport Infrastructure)
SNCF .....	French Transport Company (Société nationale des chemins de fer français)
SŽ.....	Správa železnic, státní organizace (or Správa železnic) (Czech railway infrastructure manager)
SŽDC.....	Správa železniční dopravní cesty, státní organizace (former name of Správa železnic)
TAF .....	Telematics Applications for Freight Services
TCC.....	Traffic control centre
TMS.....	Traffic management system
TNS .....	Traction substation
TSI.....	Technical specifications for interoperability
TSI CCS .....	Technical specifications for interoperability for the control, command and signalling subsystem
TSI LOC&PAS	Technical specifications for interoperability for locomotives and passenger rolling stock
TSI SRT .....	Technical specifications for interoperability for safety in railway tunnels
UIC .....	International Union of Railways (Union Internationale des Chemins de fer)
VN.....	High Voltage
VRT .....	High-speed line (HSL)
ZZ.....	Signalling system

ŽDC..... Railway infrastructure

## Introduction

### HSL Conceptual Framework

The construction of the HSL network proceeds on the basis of Government Resolution No. 389/2017, by which the Government of the Czech Republic approved the basic conceptual material of the Ministry of Transport called "*Programme for the Development of High-Speed Rail Connections in the Czech Republic*". This document sets out the strategic objectives for the construction and development of high-speed lines in the Czech Republic.

The basic assumptions of the "*HSL Traffic Management Concept*" are based on the Programme for the development of high-speed rail connections, approved Instruction SŽ PO-16/2020-GŘ (High-Speed Line Design Guide for the Documentation for Zoning Decision Level or "Guide"), the findings of workshops organised by SNCF Réseau, internal consultations across the specialist departments of Správa železnic's Directorate General, the Technical and Operation Study – Technical Solutions for HSL and applicable legislation.

### HSL operation

High-speed lines (HSL) are a specific part of the network-based railway infrastructure and will constitute the backbone system of the railway network in the Czech Republic. The operation concepts that are under preparation assume that high-speed trains on the individual routes will operate on both conventional and high-speed lines. This will be necessary because of construction phasing and the gradual commissioning and HSL development as well as due to line composition. Terminals will be built to ensure fast and efficient transfer of passengers who need to use other modes of transport. In selected control points the so-called "exits" will be built to enable trains running on HSL to change for the conventional network without the need for stopping. A list of terminals being prepared, including the exits connected to the conventional network, is provided in the appendices to this paper.

The traffic models prepared so far show that HSL will be very popular among passengers. It is assumed that a multiple of current passenger numbers on conventional lines will be transported every day: tens of thousands of daily commuting passengers.

For long-distance passenger transport, a significant part of the service will use HSL. International long-distance trains meeting the TSI parameters for HSL operation will be run on high-speed lines to the highest degree possible and will have priority.

In contrast to the practice on the conventional network, it will be necessary to modify existing systems or to develop and implement new systems that enable precise train location in a way ensuring that the requirements for safe and smooth operation of automated systems, ready for deployment in real operation on HSL in the future, will be met. These new requirements will have a major impact on the construction of journey times at given time positions and will refine the journey time to tenths of minutes compared to the current situation where only whole minutes and half minutes are counted.

### Reliability, safety and resilience

With regard to the high operating speeds (up to 320 km/h) and the expected passenger loads, very strict demands will be placed on the reliability and safety of all infrastructure elements. The same requirements will apply to vehicles of railway undertakings operating on this railway infrastructure. A separate chapter, the RAMS requirements, is devoted to this.

The individual systems to be set up on HSL must be prepared for emergencies and situations caused by natural disasters and have the ability to face security threats resulting from illegal activity.

High operating speeds entail high requirements on the reliability of the entire traffic control system. Any slowing or stopping of a train will mean a higher time loss and energy loss when

compared to operations on a conventional network. For this reason, it is necessary to automate the HSL control and command processes to maximum possible degree.

### Traffic management

Although the basic principles of rail traffic management remain the same, the operation of high-speed trains will require new working practices for traffic management – practices that differ from those on the conventional network and conventional control methods. Compared to the conventional network, the distance between operating control points with a junction or branch-off (exits from HSL) is significantly greater. Also, no planned shunting is foreseen for operating control points, i.e. no vehicles will be coupled or uncoupled. The operation will be simpler, but the demands placed on the speed of decision-making processes will be a major change compared to the current situation, because at high speed the position of high-speed trains will be changing very rapidly. Position tracking or procedural control of high-speed train movements must be supported by appropriate systems collecting reliable data from multiple sources, which will be evaluated and used either to control traffic in an automated manner or to provide the human traffic controller with information relevant to the management and maintenance of traffic flows.

A HSL training hall, with appropriate equipment, will need to be set up for teaching, training, and drilling staff to simulate – as realistically as possible – both normal operational and emergency situations arising in real operation with the aim of maintaining the professional skills and operational capabilities of the traffic controller.

### Relationship of HSL with the conventional network

The setting up of the interface between the controlled sections on HSL and the conventional network is an important conceptual issue, including the requirements on the location of the HSL traffic control centres. These workplaces will be located in separate control rooms in the new buildings of traffic control centres in Prague and Přerov. The railway operation control for HSL will always be provided by Správa železnic and its employees regardless of the tendering method chosen for HSL planning, construction, operation and maintenance (Design & Build & Maintain) and also regardless of the financing method (Public Private Partnership, SFDI, etc.).

## Inputs

### Input requirements

Input requirements are set out in the following documents.

- **Regulation (EU) 2024/1679 of the European Parliament and of the Council** of 13 June 2024 on Union guidelines for the development of the trans-European transport network, amending Regulations (EU) 2021/1153 and (EU) No 913/2010 and repealing Regulation (EU) No 1315/2013.
- **Resolution of the Government of the Czech Republic of 22 May 2017 No. 389/2017** on the Programme for the Development of Fast Rail Connections in the Czech Republic. The aim of the document is the construction of new HSL, modernisation of important existing lines, acquisition of appropriate rolling stock and creation of a new operational concept, especially for long-distance passenger rail transport.
- **Act No. 266/1994 coll.** on Railways, as amended.
- **Decree No. 173/1995 Coll.**, Decree of the Ministry of Transport, through which the Railway Transport Regulations are issued.
- **Decree No. 177/1995 Coll.**, through which the Construction and Technical Regulations of Railways (§24b) are issued.
- **Act No. 240/2000 Coll.** on Crisis management, as amended.

- **Government Regulation No. 432/2010 Coll.** on the Criteria for the designation of critical infrastructure elements, as amended by Government Regulation No. 315/2014 Coll. and Government Regulation No. 61/2022 Coll.
- **Act No. 181/2014 Coll.** on Cyber security, as amended.
- Network Statement on Nationwide and Regional Railways.
- Applicable European and Czech technical standards.
- Instruction of SŽ PO-16/2020-GŘ, full version of Appendix A “High-Speed Line Design Guide for the Documentation for Zoning Decision Level” (updated document).

### Infrastructure requirements

- The maximum line speed is set at 320 km/h.
- The minimum line speed will correspond to proposed parameters in the given line section.
- The proposed structure speed of HSL is set at a maximum of 350 km/h.
- The connecting sections enable smooth and safe entry and exit of passenger and maintenance trains from the existing railway infrastructure onto HSL while meeting the requirements defined in the Guide.
- The maximum axle load in mixed operation for speeds up to 230 km/h is 22.5 t and 18 t for operation of only passenger trains for speeds of 230-320 km/h.
- The topological HSL elements are designed with a view of having a minimum number of turnouts.
- The topology of the line and the km marks along the line will comply with applicable regulations of Správa železnic (SŽDC M21).
- The infrastructure and its elements are designed in such a way that basic maintenance during daytime hours minimises the need for traffic restrictions. Preference will be given to using night operational breaks for lines and catenary maintenance.
- The use of a unified ISC (Passenger Information System) is envisaged, which will also be used on conventional lines after the optimisation planned. The proposed solution should not only take into account the provision of information for passengers using HSL trains, but also provide open and machine-readable data to third parties for the provision of European information services on the current status and conditions of travel by public passenger transport in accordance with the obligations arising from the legal regulations<sup>1</sup> of the EU and the Czech Republic. This area needs to be coordinated for both the conventional network and HSL.

---

<sup>1</sup> Act No. 266/1994 Coll. on railways, as amended, EU Regulation 454/2011 (TAP TSI), Commission Delegated Regulation (EU) [2017/1926](#) of 31 May 2017 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to the provision of EU-wide multimodal travel information services (OJ L 272, 21.10.2017, p. 1) and Commission Delegated Regulation (EU) [2024/490](#) of 29 November 2023 amending Delegated Regulation (EU) 2017/1926 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to the provision of EU-wide multimodal travel information services (OJ L, 13.2.2024).

- Specific technologies for infrastructure not built on the conventional line will now be set up and will provide data to the signalling equipment or to designated staff (according to the Guide).
- The whole length of the lines will be secured on both sides by fencing against intrusion of unauthorised persons, livestock or forest animals, or equipped with perimeter detection systems in security risk areas based on the results of the risk analysis.
- Based on the results of the risk analysis and data analysis, selected structures will be monitored by camera systems, detectors or other technological systems.
- Backup of systems will be performed based on the results of risk analyses. This applies to both the traffic control centre systems for HSL and to systems that will connect HSL with the conventional network.
- The operability of infrastructure within defined parameters, including the necessary technical, material and personnel capacities, is determined independently by the supplier of these services (e.g. the selected concessionaire), who will ensure the financing, construction, efficient operation and maintenance of the infrastructure in accordance with the contract.

#### **Train operation requirements**

- With regard to the line parameters, not only the maximum operating speed (320 km/h) but also the minimum operating speed (above 200 km/h) is defined.
- The rail vehicles must meet the basic access conditions of TSI, as set out in the **Network Statement on Nationwide and Regional Railways**:
  - minimum speed,
  - maximum axle pressure relative to maximum speed,
  - pressure resistance of the train casing in a pressure situation when meeting another train going in the opposite direction on an open line and in tunnels according to TSI LOC&PAS,
  - fire category "B" according to TSI SRT,
  - compatibility requirements for communication and safety systems.
- Other parameters required for the failure-free technical condition of the trains listed in the Guide (e.g. wheels, bearings, pantograph, gauge) will be defined.

#### **OHS rules for HSL**

Uniform OHS rules for all HSL will apply for the maintenance staff as well as for traffic control staff. All provisions on occupational health and safety will be regulated by SŽ Bp series regulations. HSL infrastructure maintenance, including the catenary, will be carried out mainly at night. A line warning system SCWS will be additionally installed on HSL to ensure workplace safety. A POT, connected via TMS to the RBC, ensuring correct operation of the warning system, will allow its connection.

#### **Operating requirements and RAMS**

High-speed lines as a complex system must meet very strict reliability, availability, maintainability and safety (RAMS) criteria specified in the norm ČSN EN 50126-1 ED.2.

The combination of the high travelling speeds, the braking distance of the train and the height profile of the line does not allow the driver to stop the train at a distance the driver can see (visibility). The operating speed of the train must be independent of weather conditions (fog,

snow, rain). For these reasons, it will not be possible to use physical signals with fixed colour light signals, as used on the conventional network. The European train protection system ERTMS/ETCS Level 2, Baseline 3 specification (or higher levels, according to new specifications) will be installed on HSL according to applicable TSIs CCS.

Any disruption to the timetable will have a significant impact on reliability rating. For this reason, it will be necessary to pay great attention to traffic management and use automated systems and processes to the maximum degree possible. The regularity and reliability of HSL operations according to established criteria must be achieved at all times, except in case of crises and large-scale emergencies caused by extreme climatic phenomena or other emergencies. The regularity of service is important not only for passengers but also for railway undertakings. It has an impact on potential financial compensation in passenger transport. Any slowdown or disruption on HSL has an immediate impact on connections, train turnarounds and generates delays for connecting trains in terminals or stations.

Restrictive operating conditions (slow rides, shutdowns, operational diversions or train cancellations) may only apply for very short periods of time to make sure that RAMS parameters are not exceeded.

### **HSL traffic control**

- Traffic control will be ensured by the respective organisational units of Správa železnic: the Prague-based and the Přeřov-based Traffic Control Centres.
- The principles of work with TMS signalling equipment will be based on applicable Správa železnic regulations.
- Any deviation from usual technological procedures or the use of more recent technologies will be subject to approval by Správa železnic's expert departments and subsequently reflected in Správa železnic's internal documents and regulations, especially in the HSL Guide.
- The handling of emergencies and extraordinary events will have specific impacts on HSL and will be implemented in the internal regulations of Správa železnic (SŽDC D7 and SŽ D17).
- The organisation of shutdowns on HSL will be implemented through the Správa železnic regulation SŽ D7/2.

### **HSL maintenance**

- Maintenance of HSL including the catenary shall be performed during the night operational break.
- The related document "HSL Maintenance Concept" deals with maintenance in detail.

### **Requirements for control centres**

There are currently two so-called Traffic Control Centres in the Czech Republic: one in Prague and one in Přeřov. In the following years, Správa železnic will invest significant amounts of money and extend the Přeřov-based as well as the Prague-based control centre in their existing locations. Their new buildings will accommodate the workplaces of HSL traffic control apparatus, with an interface to the conventional network, which will organise and control the operation on high-speed lines.

Basic control and operative control are concentrated in the control centres and will always be provided by Správa železnic. The administration of the operative control for HSL will be divided into HSL West and HSL East.

The interface between traffic control workplaces for connections of HSL and the conventional network will usually be designed in the interconnecting section or at the entry to/exit from the new HSL infrastructure.

## Objectives of the concept

The aim of this paper is to provide a framework of rules for traffic control and management on high-speed lines. The different areas are mentioned in the clauses of this chapter.

### Traffic control organisation

#### Make-up of operative traffic control on lines operated by Správa železnic

The organisation of traffic control is based on uniform operative traffic control rules throughout the entire Správa železnic network.

After HSL integration, operative traffic control structure of Správa železnic will consist of two levels:

#### Traffic control at Directorate General located in the Situation Centre (Prague):

- central controller,
- chief controller,
- chief infrastructure controller,
- central controller of Správa železnic Fire Rescue Corps (HZS SŽ).

#### Traffic control at the Traffic Control Centres (Prague, Přeřov):

- Operative control
  - chief controller (shift leader),
  - operational controllers.
- Basic control
  - line controllers.

## Technical part

### Technical solution of HSL telecommunication and signalling

The TMS system will be used for traffic control on HSL, as selected and approved by the Správa železnic management in several scenarios. This system is generally designed so that any manufacturer of the relevant technology can participate in its construction.

At the same time, this system is ready for the arrival of another HSL Manager, which is a major difference from the conventional part of the Správa železnic network. The system is based on the principle that the HSL Manager can choose the supplier for its part of the TMS (level 2 and 3).

The basic principle of TMS on HSL is fully automatic operation of the entire HSL in the Czech Republic.

The TMS for HSL described here fully respects all laws, decrees, standards and directives related to the operation of the railway infrastructure, but it either refines or extends them for speeds above 200 km/h.

The proposed concept of TMS on HSL allows for free tender for TMS suppliers at all levels described below using FRMCS and EULYNX (or similar) rules while respecting cyber security requirements.

The supplier of each TMS level and the railway undertakings on the HSL are obliged to respect applicable TSIs issued by the European Commission.

**Basic description of TMS on HSL**

# HSL automatic operation concept

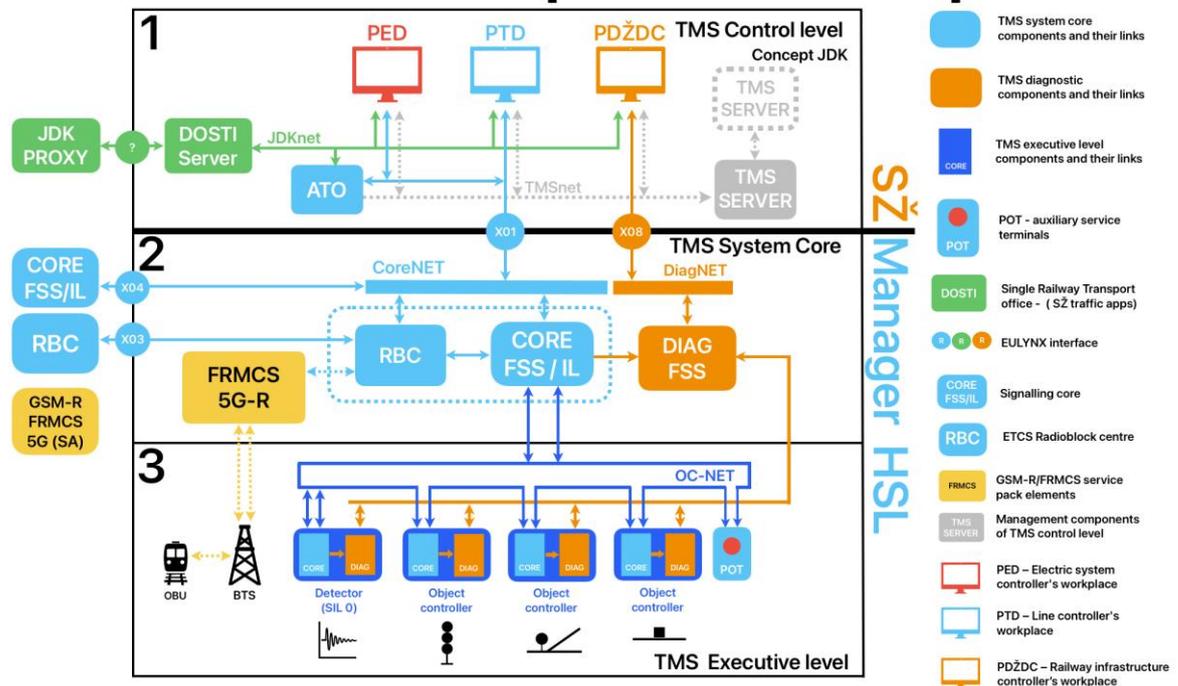


Figure: The concept of automatic HSL operation is based on the concept of JDK (single railway transport office), site controllers and EULYNX rules, with a division between Správa železnic and another possible HSL Manager.

The TMS on HSL is divided into three basic layers with regard to HSL construction through PPP (see figure):

1. TMS Control Level,
2. TMS System Core,
3. TMS Executive Level.

All these three levels can be built independently of each other while respecting the rules of EULYNX (or an interface based on a similar principle).

The scenario shows that the Control Level (1) will be built by Správa železnic in a separate contract, while the System Core (2) and the Executive Level (3) will be built by the HSL Manager.

**TMS Control Level**

HSL operations are controlled via the TMS control level from two HSL operation halls. One hall is located at the Prague and the other at the Přerov Traffic Control Centres.

The TMS Control Level is under the full control of Správa železnic. It will be built in advance as part of a separate contract and will allow the selection of any supplier of additional TMS layers through the EULYNX interface (or another one on a similar principle; only EULYNX is described below).

Each Level 2 (System Core) of any HSL Manager is connected via the EULYNX interface, by interfacing to the System Core and to the diagnostic layer. Both of these interfaces are necessary for fulfilling all the necessary functions required by the TMS Control Level.

The TMS Control Level is based on the JDK (single railway transport office) concept, where all the necessary information is obtained via the DOSTI server and where all the necessary PAs (operation applications) for HSL are concentrated, also with future developments in mind. Communication with the conventional part of Správa železnic is ensured for all PAs via JDK PROXY (it is part of the TMS contract) and is bidirectional due uninterrupted entries and exits of trains from/to HSL.

The HSL traffic management system is fully automated. Train routes are built automatically according to time slots for individual trains. Traffic controllers are not required to monitor the TMS at all times. The system will itself actively request attention of the appropriate human controller. The controllers have full control over the entire HSL network, including all TMS levels.

The TMS Control Level is built as a redundant level. One control centre is located at CDP (TCC) Prague and the other at CDP (TCC) Přeřov. The full 1:1 redundancy also means that the entire HSL network in the Czech Republic can be controlled from a single HSL traffic control hall: either from Přeřov or Prague. The failure of one hall will not endanger the HSL operation in any part of the Czech Republic.

The logic of the individual control workplaces is provided by the TMS server, which has its own backup (second TMS server) at the second traffic control centre. The failure of one TMS server must not cause the HSL operation to stop. Both TMS servers are linked in a logical manner. The specific solution is subject to the procurement.

It is not desirable for the TMS to require permanent attention of a human traffic controller. When a failure or change in the state of elements occurs that the TMS cannot resolve itself, it will request attention automatically.

As part of the contract for the control part of the TMS, a training hall will be built at the Prague traffic control centre to train all professions necessary for traffic control. This room will be equipped with all types of workplaces and workstations and will be operated in simulation mode until the first HSL has been activated.

Note: The trial operation of each new line is set for one year. During this time, the line has been built and is being tested.

As HSL brings major differences during operation and operational breaks, all control stations are substitutable within individual disciplines as well.

The workplace of every controller remembers the last setting for a particular controller. This applies to ergonomics and local air conditioning settings.

After inserting the identification card, the controller's workplace is automatically set to the specific discipline and the address designation of the section for the controller's work.

All terminals and control services have identical equipment and offer intuitive operation.

All means of communication must be set up to serve the corresponding discipline and HSL area after the respective controller has logged on at each workplace.

The failure of one workplace must not stop operation on the HSL currently controlled (supervised).

The controller's intervention in the automatic HSL operation is automatically displayed to all other controllers on duty in both halls of the HSL traffic control centres. This shall prevent the controller from making a mistake. Especially when introducing and cancelling unplanned

shutdowns. This means all shutdowns interfering with automatic operation. This further means track closures, voltage closures and ETCS closures.

The TMS Control Level contains the following three (depending on type) basic workplaces:

- PTD – line controller's workplace,
- PDŽDC – workplace of the railway infrastructure controller,
- PED – electric system controller's workplace.

#### **Line controller's workplace**

The line controller supervises or controls traffic not only of high-speed train sets and trains, but also coordinates work machines during the night operational break. The number of workplaces is determined by the Traffic Management Section and depends on the length and complexity of the HSL section in question.

The control part of the TMS at line controller's workplace in the HSL operating control points will enable only basic functionalities (train routes, train routes according to sight aspect and train routes with extended protection route). Emergency functions are not set up.

In the event of a failure on the TMS executive level that would affect the safety of railway operation, HSL operation on the relevant track will be stopped until the failure has been rectified. Note: The TMS is deliberately built so that a failure on one line track does not stop traffic on the second line track. However, depending on the nature of the failure, the TMS (or the line dispatcher) may restrict the operation on the side track.

#### **Railway infrastructure controller's workplace (DŽDC)**

The railway infrastructure controller supports the operability of the railway infrastructure. He/she provides technical support to line controllers and participates in the organisation of maintenance and failure elimination.

#### **Electric system controller's workplace**

Unlike with the conventional network, electric system controller's workplaces are set up in the traffic control room for HSL operations to oversee all power supply systems required for HSL operation.

Each such workplace contains terminals for monitoring the high and low voltage systems of HSL, monitoring the substations and monitoring the power supply of all necessary subsystems used for HSL.

The electric system controller's workplace shall allow for sharing of CCTV systems at substations and outdoor lighting locations if they are related to the operation of the necessary subsystems used for HSL.

The make-up of the electric system controller's workplace is well defined, and each such workplace supervises the entire HSL network.

All changes in the power configuration are time-stamped.

#### **TMS System Core**

The core of the TMS is located at the maintenance base of the respective HSL manager. It contains all the resources and services that guarantee the security of the entire TMS system. These are mainly:

- 1) the actual core of TMS,
- 2) RBC,
- 3) TMS diagnostics,

## 4) FRMCS elements,

and/or more. The HSL manager is fully responsible for the security of the TMS core site.

The TMS core must communicate with the higher level (1) and surrounding systems (2, possibly even 3) using EULYNX rules. It must be fully compatible with all surrounding systems and allow two-way communication for automatic train operation.

The same applies to exits from HSL and to connecting one HSL to another HSL (of another HSL manager). Each exit or connection to another part of HSL has a precisely defined interface point.

Using FRMCS, the HSL manager will also build the HSL coverage to enable RBC handover during smooth train operation while allowing selected data to be passed to/from the OBU from/to the train. FRMCS traffic control is always managed by Správa železnic.

Possible maintenance and shutdowns of the TMS core are planned in advance in an annual plan (four days per one calendar year are assumed).

The HSL manager is fully responsible for any failure or malfunction of the TMS core. The HSL manager can only hand over a fully functional device, that does not require the intervention of any controller, to the Traffic Management Section.

### **TMS Executive Level**

The TMS Executive Level is located directly in the HSL perimeter. It contains all the elements necessary for ensuring the safety of operation on HSL tracks, including the radio system (see below). All TMS peripherals are connected to the system core via site controllers. Their network is backed up, including the power supply. It is up to the HSL manager whether to choose communication via EULYNX here as well.

The following items are connected to site controllers:

- POT (auxiliary service terminals),
- PoN (axle counters with directional output),
- Point machines,
- Signals,
- Detectors with unconditional and conditional connection to the train.

The HSL manager is fully responsible for error-free operation of the TMS Executive Level (3). In case of a failure or fault, the operator is obliged to hand over control over the operation of TMS equipment without restrictive conditions.

Conceptually, each part of the Executive Level of the TMS (3) will be built in such a way that a failure on one track will not stop the operation on the other track at the same time. Speed reduction on the second track is allowed.

### **Operational applications on HSL**

TMS set up on the HSL network will be conceptually different from the signalling equipment on the conventional network. The system will be fully automated, because the reaction time of the line controller could lead to unwanted train delays. This results in higher requirements on operation applications (PA) where minute slots for HSL operation are insufficient.

The PA must also ensure network-wide availability and the possibility of standard operation of operative traffic control, capacity allocation and direct control of rail traffic.

A requirement analysis is currently being developed for a new PA called the Single Railway Transport Office (JKD), which will in the future replace all the PAs used so far for direct control.

A prerequisite for the traffic documentation application is that it uses the standardised EULYNX interface SCI-CC (or equivalent). The EULYNX system will communicate between TMS and PA bidirectionally for smooth train operation between HSL and conventional lines.

The PA must communicate with the on-board diagnostics system via the FRMCS network.

For correct PA functioning it is necessary to ensure the distribution of data including detailed traffic data description of the railway infrastructure.

As part of the contract for the TMS Control Level, a DOSTI server will be built to ensure two-way communication between the PA and the TMS. The DOSTI server will be connected bidirectionally to the JDK PROXY server (not part of the TMS procurement), which will be located in the Správa železnic database server room and turned into the data collection centre for all PAs.

Bidirectional PA transmission is also important for smooth train operation between HSL and the conventional part of the network.

## Final provisions

This document covers traffic control and management of future high-speed lines in only such detail as is currently known and predictable within the set outlines. The conceptual paper will be continuously updated on the basis of approved project documentation and according to new findings from the negotiations with all relevant departments of Správa železnic.

Strategic documents related to maintenance and diagnostics (HSL Maintenance Concept and HSL Diagnostics Concept) will be developed as an integral part of a comprehensive HSL implementation assessment. These documents will describe all future activities on the HSL infrastructure, summarising the current knowledge from HSL planning based also on the experience from the maintenance and diagnostics of the conventional railway network. The document will also describe the experience with planning, construction and maintenance of HSL in France (cooperation with SNCF Réseau).

As the Czech Republic is bracing for HSL construction, it will be necessary to apply the new knowledge to current internal Správa železnic regulations and to pay increased attention (early on) to the coordination of construction on the conventional network, which will be linked to subsequent HSL construction.

The basic principles of HSL traffic management set out in this Instruction need to be further clarified and further specified, so that a relevant HSL traffic management workplace can be established and obtain corresponding technical equipment. To this end, the following areas will be further developed, either by updating this Instruction or by creating related documentation:

- 1) determination of the impact on the organisational units of Správa železnic or external entities affected by the establishment of the relevant HSL traffic management workplace, including the impact on the management and organisation of work procedures;
- 2) identification of the cost of establishing the HSL traffic management workplace and related equipment, broken down into general items, indicating the sources of funding and indicating additional investments triggered in areas other than those addressed by this concept;
- 3) proposals for the modification of existing or creation of new relevant documents and internal regulations under which Správa železnic acts and makes decisions.

## QUOTED DOCUMENTS

The HSL Traffic Management Concept paper drew information from the following sources:

- International and national legislation, technical standards, as amended,
- Správa železnic Instruction SŽ PO-16/2020-GŘ, full version of Appendix A “High-Speed Line Design Guide for the Documentation for Zoning Decision Level” in the current version.