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**Železniške telekomunikacije (RT) - Prihodnji sistem radijskih komunikacij za železnice (FRMCS) - Gradniki in funkcionalnosti - 1. del: Transportna raven**

Rail Telecommunications (RT) - Future Railway Mobile Communication System (FRMCS) - Building Blocks and Functions - Part 1: Transport Stratum

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TECHNICAL SPECIFICATION

## Rail Telecommunications (RT);
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## Building Blocks and Functions;
## Part 1: Transport Stratum

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Reference
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Keywords
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# Foreword

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This Technical Specification (TS) has been produced by ETSI Technical Committee Railway Telecommunications (RT).

The present document is part 1 of a multi-part deliverable covering Building Blocks and Functions for the Future Railway Mobile Communication System (FRMCS), as identified below:

**Part 1: "Transport Stratum";**

Part 2: "Service Stratum";

Part 3: "Train On-Board functions and interfaces";

Part 4: "Trackside functions and interfaces";

Part 5: "User Equipment (UE) capabilities".

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# 1 Scope

The present document specifies the FRMCS Transport Stratum for the Future Railway Mobile Communications System (FRMCS). In general, the FRMCS Transport Stratum provides data connectivity and the related services.

The present document covers:

- 3GPP terrestrial access.
- Transport stratum interconnection scenarios in all aspects.
- 3GPP access sharing, mobility within transport stratum.
- QoS and policy control.
- Authentication and authorization for the use of the transport stratum.
- Transport stratum common features.

# 2 References

## 2.1 Normative references

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[1] ETSI TS 123 501 (V18.9.0): "5G; System architecture for the 5G System (5GS) (3GPP TS 23.501 version 18.9.0 Release 18)".

[2] ETSI TS 127 001 (V18.0.0): "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS) (3GPP TS 27.001 version 18.0.0 Release 18)".

[3] ETSI TS 127 007 (V18.8.0): "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; 5G; AT command set for User Equipment (UE) (3GPP TS 27.007 version 18.8.0 Release 18)".

[4] ETSI TS 138 201 (V18.0.0): "5G; NR; Physical layer; General description (3GPP TS 38.201 version 18.0.0 Release 18)".

[5] ETSI TS 138 300 (V18.5.0): "5G; NR; NR and NG-RAN Overall description; Stage-2 (3GPP TS 38.300 version 18.5.0 Release 18)".

[6] ETSI TS 103 765-2: "Rail Telecommunications (RT); Future Railway Mobile Communication System (FRMCS); Building Blocks and Functions; Part 2: Service Stratum".

[7] ETSI TS 103 765-3: "Rail Telecommunications (RT); Future Railway Mobile Communication System (FRMCS); Building Blocks and Functions; Part 3: Train On-Board functions and interfaces".

[8] FRMCS FFFIS-7950: "FRMCS FFFIS - Form Fit Functional Interface Specification", V2.1.0.



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[9] ETSI TS 124 501 (V18.10.0): "5G; Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3 (3GPP TS 24.501 version 18.10.0 Release 18)".

[10] ETSI TS 123 502 (V18.9.0): "5G; Procedures for the 5G System (5GS) (3GPP TS 23.502 version 18.9.0 Release 18)".

[11] ETSI TS 138 211 (V18.6.0): "5G; NR; Physical channels and modulation (3GPP TS 38.211 version 18.6.0 Release 18)".

[12] ETSI TS 138 212 (V18.6.0): "5G; NR; Multiplexing and channel coding (3GPP TS 38.212 version 18.6.0 Release 18)".

[13] ETSI TS 138 213 (V18.6.0): "5G; NR; Physical layer procedures for control (3GPP TS 38.213 version 18.6.0 Release 18)".

[14] ETSI TS 138 214 (V18.6.0): "5G; NR; Physical layer procedures for data (3GPP TS 38.214 version 18.6.0 Release 18)".

[15] ETSI TS 138 321 (V18.5.0): "5G; NR; Medium Access Control (MAC) protocol specification (3GPP TS 38.321 version 18.5.0 Release 18)".

[16] ETSI TS 138 322 (V18.2.0): "5G; NR; Radio Link Control (RLC) protocol specification (3GPP TS 38.322 version 18.2.0 Release 18)".

[17] ETSI TS 138 323 (V18.5.0): "5G; NR; Packet Data Convergence Protocol (PDCP) specification (3GPP TS 38.323 version 18.5.0 Release 18)".

[18] ETSI TS 138 331 (V18.5.1): "5G; NR; Radio Resource Control (RRC); Protocol specification (3GPP TS 38.331 version 18.5.1 Release 18)".

[19] ETSI TS 129 522 (V18.9.0): "5G; 5G System; Network Exposure Function Northbound APIs; Stage 3 (3GPP TS 29.522 version 18.9.0 Release 18)".

[20] ETSI TS 133 501 (V18.9.0): "5G; Security architecture and procedures for 5G System (3GPP TS 33.501 version 18.9.0 Release 18)".

[21] IETF RFC 9113: "HTTP/2".

[22] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".

[23] ETSI TS 123 289 (V18.10.0): "5G; Mission Critical services over 5G System; Stage 2 (3GPP TS 23.289 version 18.10.0 Release 18)".

[24] ETSI TS 129 513 (V18.9.0): "5G; 5G System; Policy and Charging Control signalling flows and QoS parameter mapping; Stage 3 (3GPP TS 29.513 version 18.9.0 Release 18)".

[25] ETSI TS 129 512 (V18.9.0): "5G; 5G System; Session Management Policy Control Service; Stage 3 (3GPP TS 29.512 version 18.9.0 Release 18)".

[26] ETSI TS 129 511 (V18.3.0): "5G; 5G System; Equipment Identity Register Services; Stage 3 (3GPP TS 29.511 version 18.3.0 Release 18)".

[27] IETF RFC 8684: "TCP Extensions for Multipath Operation with Multiple Addresses".

[28] ETSI TS 124 193 (V18.8.0): "5G; 5G System; Access Traffic Steering, Switching and Splitting (ATSSS); Stage 3 (3GPP TS 24.193 version 18.8.0 Release 18)".

[29] ETSI TS 129 514 (V18.9.0): "5G; 5G System; Policy Authorization Service; Stage 3 (3GPP TS 29.514 version 18.9.0 Release 18)".

[30] ETSI TS 129 214 (V18.4.0): "Universal Mobile Telecommunications System (UMTS); LTE; 5G; Policy and charging control over Rx reference point (3GPP TS 29.214 version 18.4.0 Release 18)".

[31] ETSI TS 138 104 (V18.9.0): "5G; NR; Base Station (BS) radio transmission and reception (3GPP TS 38.104 version 18.9.0 Release 18)".

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[32] ETSI TS 138 133 (V18.9.0): "5G; NR; Requirements for support of radio resource management (3GPP TS 38.133 version 18.9.0 Release 18)".

[33] Recommendation ITU-T G.8271.1: "Network limits for time synchronization in packet networks with full timing support from the network".

[34] Recommendation ITU-T G.8271.2: "Network limits for time synchronization in packet networks with partial timing support from the network".

[35] ETSI TS 103 793: "Rail Telecommunications (RT); Future Railway Mobile Communication System (FRMCS); Radio Characteristics".

[36] ETSI TS 103 765-5: "Rail Telecommunications (RT); Future Railway Mobile Communication System (FRMCS); Building Blocks and Functions; Part 5: User Equipment (UE) capabilities".

[37] ETSI TS 129 591 (V18.9.0): "5G; 5G System; Network Exposure Function Southbound Services; Stage 3 (3GPP TS 29.591 version 18.9.0 Release 18)".

[38] ETSI TS 123 122 (V18.10.0): "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; 5G; Non-Access-Stratum (NAS) functions related to Mobile Station (MS) in idle mode (3GPP TS 23.122 version 18.10.0 Release 18)".

[39] IETF RFC 8200: "Internet Protocol, Version 6 (IPv6) Specification".

## 2.2 Informative references

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[i.1] ETSI TR 103 791: "Rail Telecommunications (RT); Future Railway Mobile Communication System (FRMCS); Terminology for FRMCS specifications".

[i.2] IETF RFC 5905: "Network Time Protocol Version 4: Protocol and Algorithms Specification".

[i.3] IETF RFC 8915: "Network Time Security for the Network Time Protocol".

[i.4] ETSI TS 138 413 (V18.5.0): "5G; NG-RAN; NG Application Protocol (NGAP) (3GPP TS 38.413 version 18.5.0 Release 18)".

[i.5] ETSI TS 138 423 (V18.5.0): "5G; NG-RAN; Xn Application Protocol (XnAP) (3GPP TS 38.423 version 18.5.0 Release 18)".

[i.6] ETSI TS 138 463 (V18.0.0): "5G; NG-RAN; E1 Application Protocol (E1AP) (3GPP TS 38.463 version 18.0.0 Release 18)".

[i.7] ETSI TS 138 473 (V18.5.0): "5G; NG-RAN; F1 Application Protocol (F1AP) (3GPP TS 38.473 version 18.5.0 Release 18)".

[i.8] ETSI TS 136 423 (V18.4.0): "LTE; Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 Application Protocol (X2AP) (3GPP TS 36.423 version 18.4.0 Release 18)".



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# 3 Definition of terms, symbols and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms given in ETSI TR 103 791 [i.1] and the following apply:

**gNodeB:** base station that provides NR radio access for 5G networks

**multipath dataflow:** application flow of IP packets processed by the FRMCS Multipath Function, characterized by its application-related attributes and identified via IP-5-tuples

**multipath data path:** network route within a Transport Domain

**multipath policy:** set of rules assessed by the FRMCS Multipath Function to determine the distribution of a Multipath Dataflow to one or more Multipath Datapaths

**multipath protocol:** protocol operating over an IP transport network supporting the use of multiple network interfaces (such as MP-TCP, MP-QUIC, etc.)

## 3.2 Symbols

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## 3.3 Abbreviations

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For the purposes of the present document, the following abbreviations apply:

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| | |
|---|---|
| 5G NR | 5G New Radio |
| 5GC | 5G Core Network |
| 5G-EIR | 5G-Equipment Identity Register |
| 5GS | 5G System |
| 5QI | 5G QoS Identifier |
| AF | Application Function |
| AKA | Authentication and Key Agreement |
| AMF | Access and Mobility Function |
| API | Application Programming Interface |
| APTS | Assisted Partial Timing Support |
| ARP | Allocation and Retention Priority |
| AUSF | Authentication Server Function |
| AVP | Attribute Value Pair |
| BSF | Binding Support Function |
| CP | Control Plane |
| CSC | Communication Session Category |
| DL | Downlink |
| DN | Data Network |
| DNS | Domain Name Server |
| DRB | Dara Radio Bearer |
| DSCP | Differentiated Service Code Point |
| EF | Expedited Forwarding |
| ESP | Encapsulating Security Payload |
| FFFIS | Form Fit Functional Interface Specification |
| FQDN | Fully Qualified Domain Name |
| FRMCS | Future Railway Mobile Communication System |
| GBR | Guaranteed Bit Rate |
| gNodeB | Next generation Node B |
| GNSS | Global Navigation Satellite System |
| GPSI | Generic Public Subscription Identifier |
| GSM-R | Global System for Mobile Communications - Railway |
| GW | Gateway |



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| | |
|---|---|
| HPLMN | Home PLMN |
| HR | Home Routed |
| HTTP | Hyper Text Transfer Protocol |
| ID | Identity |
| IKEv2 | Internet Key Exchange version 2 |
| IM | Infrastructure Manager |
| IMS | IP Multimedia Subsystem |
| IMSI | International Mobile Subscriber Identifier |
| IP | Internet Protocol |
| IPSec | Internet Protocol Security |
| IPv6 | IP version 6 |
| I-UPF | Intermediate UPF |
| JSON | JavaScript Object Notation |
| LBO | Local Breakout |
| LIF | Lawful Intercept Function |
| MAC | Medium Access Control |
| MC | Mission Critical |
| MCC | Mobile Country Code |
| MCPTT | Mission Critical Push To Talk |
| MCS | Mission Critical Services |
| MCX | Mission Critical Services |
| ME | Mobile Equipment (in the 3GPP context) |
| MIMO | Multi Input Multi Output |
| MNC | Mobile Network Code |
| MNO | Mobile Network Operator |
| MO | Mobile Originated |
| MOCN | Multi Operator Core Network |
| MP | Multipath Protocol |
| MPC | Multipath Client |
| MPF | Multipath Function |
| MPG | Multipath Gateway |
| MPLS | Multiprotocol Label Switching |
| MPM | Multipath Management |
| MP-QUIC | Multipath QUIC |
| MP-TCP | Multipath TCP |
| MPU | Multipath User plane |
| MT | Mobile Termination (in the 3GPP context) |
| N9HR | N9 Home Routing |
| NAI | Network Access Identifier |
| NAS | Non-Access Stratum |
| NEF | Network Exposure Function |
| NF | Network Function |
| NG-RAN | Next Generation - Radio Access Network |
| NR SA | NR Stand-Alone |
| NR | New Radio (In the context of 5G) |
| NRF | Network Repository Function |
| NTP | Network Time Protocol |
| O&M | Operation & Management |
| OB | On-Board |
| OTDOA | Observed Time Difference of Arrival |
| PCC | Policy and Charging Control |
| PCF | Policy Control Function |
| P-CSCF | Proxy Call Service Control Function |
| PDR | Packet Detection Rule |
| PDU | Protocol Data Unit |
| PFD | Packet Flow Description |
| PLMN | Public Land Mobile Network |
| PRTC-A | Primary Reference Time Clock - Class A |
| PTP | Precision Time Protocol |
| QFI | QoS Flow identifier |
| QoS | Quality of Service |
| QUIC | Quick UDP Internet Connection |

Sample Document
document from standards.iteh.ai



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