

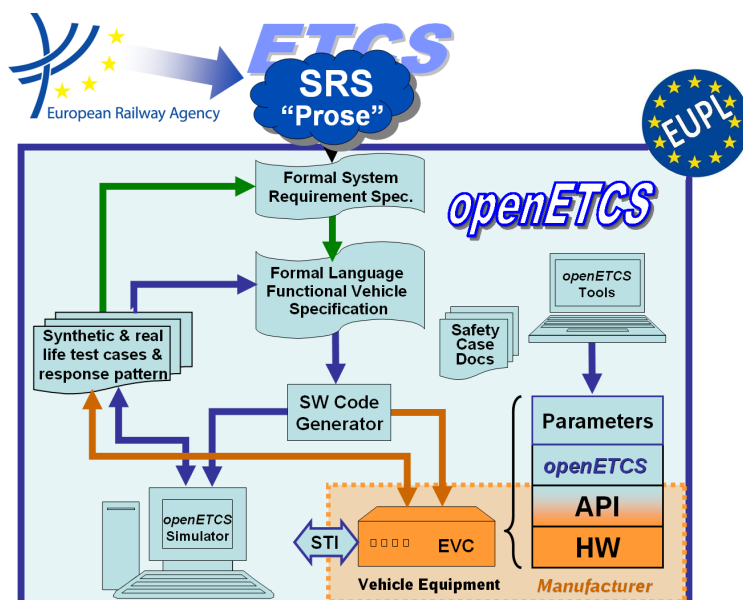
Work-Package 5: “openETCS Demonstrator”

EVC external interface

EVC API and scope definition.

Didier Weckmann

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Work-Package 5: “openETCS Demonstrator”

**OETCS/WP5/D01
September 2013**

EVC external interface

EVC API and scope definition.

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Modification History

Version	Section	Modification / Description	Author

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1 Introduction

This document describes the external interface between the baseline 3 implementation of an EVC provided by ERSA and the other On-Board peripherals.

As the kernel is a strict subset 26 implementation, this document will not cover specific proprietary components such as Odometer, Train Interface Unit, Balise Transmission Module, Loop Transmission Module, Specific Transmission Module, EURORADIO or Juridical recording unit.

Each section of the document describes the interface between the EVC and one sub-system.

This is a preliminary work, so this document may need to be completed during the course of the project.

2 Maintenance

2.1 Exchanged data

While not explicitly referenced in the SRS, for each sub-system interface, the EVC should have one output function that allows the initialization of the sub-system and a input function to control the status.

2.2 Input functions

- `read_xxx_status()`
"xxx" can be "tiu", "btm", "dmi", ...

2.3 output functions

- `write_xxx_maintenance_data()`
"xxx" can be "tiu", "btm", "dmi", ...

3 Odometer

3.1 Exchanged data

Some references can be found in subset 35 - §12.

The input data shall include:

- Time
- Direction
- Position
- Position accuracy
- Speed

- Speed accuracy
- Acceleration

The EVC shall also send calibration data back to the Odometer sub-system.

3.2 Input functions

- read_odo_data

3.3 output functions

- write_odo_calibration()

4 Train Interface Unit - Brake Interface Unit

4.1 Exchanged data

TIU and BIU functions are described in the subset 34.

The data read by the EVC shall include:

- ETCS Main Switch status
- Cab status
- Direction controller
- Train Integrity status
- Sleeping
- Non Leading
- Passive Shunting
- Regenerative Brake status
- Magnetic Shoe Brake status
- Eddy Current Brake status
- Electro Pneumatic (EP) status
- Additional brake status
- Train data information
- Type of train data entry
- Traction status
- National System Isolation status

- Brake pressure

The command sent by the EVC shall include:

- Service Brake command
- Emergency Brake command
- Traction Cut-Off command
- Regenerative Brake inhibition
- Magnetic Shoe Brake inhibition
- Eddy Current Brake for SB inhibition
- Eddy Current Brake for EB inhibition
- Change of traction system
- Pantograph command
- Air Tightness command
- Main Power Switch command
- Isolation status
- Station platform positions
- Allowed current consumption

4.2 Input functions

- read_tiu_sleeping()
subset 34 - §2.2.1, subset 26 - §4.4.6 / §4.6.3
- read_tiu_passive_shunting()
subset 34 - §2.2.2, subset 26 - §4.4.20 / §4.6.3
- read_tiu_non-leading()
subset 34 - §2.2.3, subset 26 - §4.4.15 / §4.6.3
- read_biu_brake_pressure()
subset 34 - §2.3.2, subset 26 - §3.13.2.2.7 / §a.3.10
- read_biu_special_brake_status()
subset 34 - §2.3.6, subset 26 - §3.13
- read_biu_additional_brake_status()
subset 34 - §2.3.7, subset 26 - §3.13
- read_tiu_cab_status()
subset 34 - §2.5.1, subset 26 - §4.6.3, subset 35 - §5.2.4.4

- `read_tiu_direction_controller()`
subset 34 - §2.5.2, subset 26 - §3.14.2 / 5.13.1.4, subset 35 - §5.2.4.4
- `read_tiu_train_integrity()`
subset 34 - §2.5.3, subset 26 - §3.6.5.2.1
- `read_tiu_train_data_information()`
subset 34 - §2.6.2, subset 26 - §3.18.3 / §5.17
- `read_tiu_type_of_train_data_entry()`
subset 34 - §2.6.1, era_ertms_015560 - §10.3.9.6
- `read_tiu_traction_status()`
subset 34 - §2.5.4, subset 35 - §5.2.4.4
- `read_tiu_national_system_isolation()`
subset 34 - §2.7, subset 35 - §10.3.3.5 / §10.3.3.6 / §10.14.1.2

4.3 Output functions

- `write_tiu_isolation()`
subset 34 - §2.2.4, subset 26 - §4.4.3.1.1
- `write_biu_service_brake_command()`
subset 34 - §2.3.1, subset 26 - §3.13.2.2.7, subset 35 - §5.2.5
- `write_biu_emergency_brake_command()`
subset 34 - §2.3.3, subset 26 - §3.13.10 / §3.14.1 / §4.4.4 / §4.4.5 / §4.4.13, subset 35 - §5.2.5
- `write_biu_special_brake_inhibit()`
subset 34 - §2.3.4, subset 26 - §3.12.1, subset 35 - §5.2.4.3, subset 35 - §5.2.4.3
- `write_tiu_change_of_traction_system()`
subset 34 - §2.4.1, subset 26 - §3.12.1
- `write_tiu_pantograph()`
subset 34 - §2.4.2, subset 26 - §3.12.1, subset 35 - §5.2.4.3
- `write_tiu_air_tightness()`
subset 34 - §2.4.4, subset 26 - §3.12.1, subset 35 - §5.2.4.3
- `write_tiu_passenger_door()`
subset 34 - §2.4.6, subset 26 - §3.12.1
- `write_tiu_main_power_switch()`
subset 34 - §2.4.7, subset 26 - §3.12.1, subset 35 - §5.2.4.3
- `write_tiu_traction_cut_off()`
subset 34 - §2.4.9, subset 26 - §3.13.2.2.8, subset 35 - §5.2.4.3
- `write_tiu_change_of_allowed_current_consumption()`
subset 34 - §2.4.10, subset 26 - §3.12.1

5 Balise Transmission Module

5.1 Exchanged data

The BTM sends "message" defined in the subset 26 - §8.4.2 to the EVC. The language used is defined in the subset 26 - §7.

Data read from a balise shall also include:

- Odometer stamp of the centre of the balise and accuracy
- Time stamp of reception
- Status information
- Failure, alarm

5.2 Input functions

- `read_btm_message()`

5.3 Output functions

According to SRS, even if theoretically possible (See subset 26 - §8.4.2.1: Q_UPDOWN) there are no "message" sent from the EVC to the BTM sub-system.

6 Loop Transmission Module

6.1 Exchanged data

The LTM sends "message" defined in the subset 26 - §8.4.3 to the EVC. The language used is defined in the subset 26 - §7.

Data read from a loop shall also include:

- Time stamp of reception
- Status information
- Failure, alarm

6.2 Input functions

- `read_ltm_message()`

6.3 Output functions

According to SRS, even if theoretically possible (See subset 26 - §8.4.3.1: Q_UPDOWN) there are no "message" sent from the EVC to the LTM sub-system.

However, Packet 134 as defined in subset 26 - §7.4.2.30 can contain a "Q_SSCODE" variable that need to be sent back once read to the device to configure the Spread Spectrum Code for Euroloop as defined in subset 26 §7.5.1.133.

- write_ltm_sscore()

7 EURORADIO module

7.1 Exchanged data

The EURORADIO module communicate with the EVC trough "message" defined in the subset 26 - §8.4.4, §8.5, §8.6, §8.7. The language used is defined in the subset 26 - §7.

Low level function to manage radio network, safe connection and exchange of message (as defined in subset 37 - §7) shall also be included.

7.1.1 Safe connection

- Sa-CONNECT request
- Sa-CONNECT indication
- Sa-CONNECT response
- Sa-CONNECT confirmation

7.1.2 Data transfer

- Sa-DATA request
- Sa-DATA indication

7.1.3 Safe disconnection

- Sa-DISCONNECT request
- Sa-DISCONNECT indication

7.1.4 Reporting

- Sa-REPORT indication

7.1.5 Train to track

- Validated Train Data
- Request for Shunting
- MA Request
- Train Position Report
- Request to shorten MA is granted
- Request to shorten MA is rejected
- Acknowledgment
- Acknowledgment of Emergency Stop
- Track Ahead Free Granted
- End of Mission
- Radio infill request
- No compatible version supported
- Initiation of a communication session
- Termination of a communication session
- SoM Position Report
- Text message acknowledged by driver
- Session Established

7.1.6 Track to train

- SR Authorization
- Movement Authority
- Recognition of exit from TRIP mode
- Acknowledgment of Train Data
- Request to Shorten MA
- Conditional Emergency Stop
- Unconditional Emergency Stop
- Revocation of Emergency Stop
- General message
- SH Refused

- SH Authorized
- MA with Shifted Location Reference
- Track Ahead Free Request
- Infill MA
- Train Rejected
- RBC/RIU System Version
- Initiation of a communication session
- Acknowledgment of termination of a communication session
- Train Accepted
- SoM position report confirmed by RBC
- Assignment of coordinate system

7.2 Input functions

- `read_radio_message()`

7.3 Output functions

- `write_radio_message()`

8 Specific Transmission Module

8.1 Exchanged data

Messages exchanged with the National Systems are described in subset 35 - §5 and subset 58.

The EVC shall read:

- Juridical data
subset 35 - §5.2.6
- Train status
subset 35 - §5.2.4
- Brake status
subset 35 - §5.2.5
- STM Control
subset 35 - §5.2.7

- DMI
subset 35 - §5.2.8

The EVC shall write:

- Reference time
subset 35 - §5.2.2
- Odometer data
subset 35 - §5.2.3 / §12
- Train command
subset 35 - §5.2.4
- Brake command
subset 35 - §5.2.5
- STM Control
subset 35 - §5.2.7
- DMI
subset 35 - §5.2.8

The EVC shall read/write:

- Train status
subset 35 - §5.2.4
- Brake interface
subset 35 - §5.2.5
- STM Control
subset 35 - §5.2.7
- DMI
subset 35 - §5.2.8

8.2 Input functions

- read_stm_message()

8.3 Output functions

- write_stm_message()

9 DMI

9.1 Exchanged data

The EVC shall read:

- Activity status of the DMI
- Driver Request or Acknowledgement (other than text)
- Text Message Acknowledgment
- Train Data Acknowledgment (Validation)
- Version information of the DMI
- Icon Acknowledgment
- Indication of audible information on DMI
- Set Virtual Balise Cover
- Remove Virtual Balise Cover
- Entered radio network
- VBC data (set) acknowledgement
- VBC data (remove) acknowledgement
- Output information related to NTC

The EVC shall write:

- Dynamic Data, like current train speed, target data. . .
- Request to enable/disable driver menus and buttons
- Request to input certain data (driver id, train data. . .)
- EVC Coded Train Data to be validated by EVC
- Predefined or Plain Text Message
- Description of track (speed and gradient profile. . .)
- Request for the DMI version information
- Request to display one or more icon(s) in any area.
- Display the EVC operated system version
- State of DMI display (cabin activation).
- List of available levels.
- List of available radio network

- List of VBCs stored on-board
- Coded VBC data (set) to be validated by driver
- Coded VBC data (remove) to be validated by driver
- Input information related to NTC
- Description of NTC data entry window

The EVC shall read/write:

- Default or Entered Driver Identifier
- Default or Entered Train Running Number
- Default or Entered Staff Responsible Data
- Default or Entered Train Data
- Default or Entered Adhesion Factor Data
- Default or entered ETCS Level
- Default or entered RBC contact info (RBC data and radio network ID)

10 Juridical Recording Information

10.1 Exchanged data

The communication to this sub-system is unidirectional: EVC sends "message" to the JRI sub-systems as defined in subset 27 in article 4.2.1.

Data sent to the On-board recording device shall include:

- General message
- Train data
- Emergency brake command state
- Service brake command state
- Message to radio infill unit
- Telegram from balise
- Message from euroloop
- Message from radio infill unit
- Message from RBC
- Message to RBC
- Driver's actions

- Balise group error
- Radio error
- STM information
- Information from cold movement detector
- Start displaying fixed text message
- Stop displaying fixed text message
- Start displaying plain text message
- Stop displaying plain text message
- Speed and distance monitoring information
- DMI symbol status
- DMI sound status
- DMI system status message
- Additional data
- SR speed/distance entered by the driver
- NTC selected
- Safety critical fault in mode SL, NL or PS
- Virtual balise cover set by the driver
- Virtual balise cover removed by the driver
- Sleeping input
- Passive shunting input
- Non leading input
- Regenerative brake status
- Magnetic shoe brake status
- Eddy current brake status
- Electro pneumatic brake status
- Additional brake status
- Cab status
- Direction controller position
- Traction status
- Type of train data
- National system isolation
- Traction cut off command state
- ETCS ON-Board proprietary juridical data

10.2 Input functions

According to SRS, there are no data sent from the JRI sub-system to the EVC.

10.3 Output functions

- `write_jri_message()`