OCORA

Beta - Architecture

Presentation Overview

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➢ Components

➢ Scope

➢ Interfaces

➢ Building Blocks (1st and final Iteration)

Functional / Logical View

➢ Components

➢ Scope

➢ Interfaces

➢ Building Blocks (1st and final Iteration)

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➢ High-Level Architecture

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➢ ATPM

➢ VS

➢ NTC-APPs

➢ AV

➢ APV

➢ VL

➢ TIS

➢ FVA

Hardware / Physical View

Hardware – Components

Data Centres (Infrastructure Management & Operations Control Centres) from IMs and RU

| Mobile Object Transactor (APS-MOT) | Movement Authority Transactor (APS-MT) | ATO Transactor (ATO-AT) | Diagnostics & Monitoring (DM) | Device & Configuration Management (DCM) | Identity & Access Management (IAM) | RBC, DAS, Remote Control, etc. |

Train

Mobile & Fixed Connectivity Infrastructure (GSM-R / FRMCS)

Vehicle Control Systems

CCU n   CCU 2

Universal Vital Control and Command Bus (UVCCB)

OCORA Gateway

Train Control Network

Passenger Info Network

CCU 1

Passenger Information Systems

Peripheral Devices:
- UIDR
- CVDs
- DMI (1 – n)
- MT (1 – n)
- JRU (1 – n)
- TRU (1 – n)
- DRU (1 – n)
- VLSs / VL-Sensors
- LTM / LT-Antenna
- BTM / BT-Antenna
- STM (0 – n) / NTC (0 – n) / NTCs-Antenna
- PS / P-Sensors
- I/O Ports / EB / TCO / others

Connectivity Devices:
- GSM-R EDOR Radio 1 - 2
- GSM-R Voice Radio
- Public Radio (1 – n)
- FRMCS-GW*
- FRMCS Radio (1 – n)

*may not be a dedicated HW

Trackside
- Driver
- Technician
- Evaluator
- Loc. Tag
- EURO Loop
- EURO Balise
- Nat. Systems

Hardware – Scope

Data Centres (Infrastructure Management & Operations Control Centres) from IMs and RU

| Mobile Object Transactor (APS-MOT) | Movement Authority Transactor (APS-MT) | ATO Transactor (ATO-AT) | Diagnostics & Monitoring (DM) | Device & Configuration Management (DCM) | Identity & Access Management (IAM) | RBC, DAS, Remote Control, etc. |

Train

CCS On-Board

OCORA Core

CCU n   CCU 2

Universal Vital Control and Command Bus (UVCCB)   OCORA Gateway

CCU 1

Train Control Network

Passenger Info Network

Vehicle Control Systems

Passenger Information Systems

Mobile & Fixed Connectivity Infrastructure (GSM-R / FRMCS)

| UIDR | CVDs | DMI (1 – n) | MT (1 – n) | JRU (1 – n) | TRU (1 – n) | DRU (1 – n) | VLSs | LTM | BTM | STM (0 – n) / NTC (0 – n) | PS | I/O Ports | GSM-R EDOR Radio 1 - 2 | GSM-R Voice Radio | Public Radio (1 – n) | FRMCS-GW* / FRMCS Radio (1 – n) |

VL-Sensors | LT-Antenna | BT-Antenna | NTCs-Antenna | P-Sensors | EB / TCO / others

Peripheral Devices   Connectivity Devices   *may not be a dedicated HW

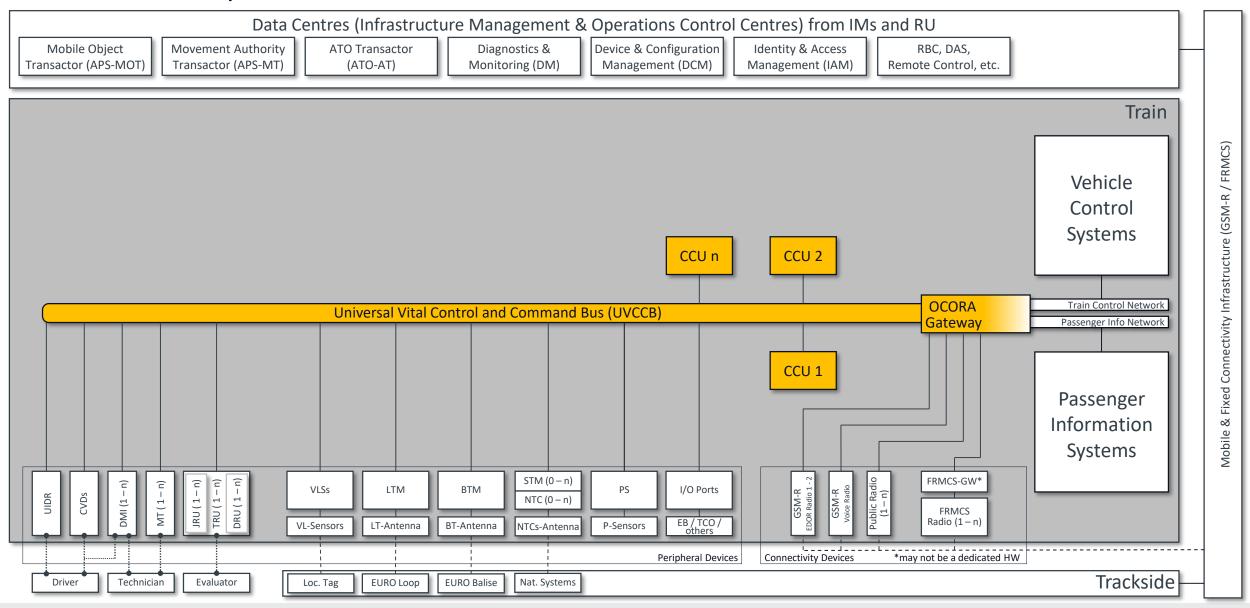| Driver | Technician | Evaluator | Loc. Tag | EURO Loop | EURO Balise | Nat. Systems |

Trackside

Hardware – Interfaces

Building Blocks – Hardware – Initial Iteration

Data Centres (Infrastructure Management & Operations Control Centres) from IMs and RU

Mobile Object Transactor (APS-MOT)	Movement Authority Transactor (APS-MT)	ATO Transactor (ATO-AT)	Diagnostics & Monitoring (DM)	Device & Configuration Management (DCM)	Identity & Access Management (IAM)	RBC, DAS, Remote Control, etc.

Train

EVC

ETCS On-board Hardware

Peripheral Devices:
- CVDs
- DMI (1 – n)
- JRU (1 – n)
- TRU (1 – n)
- DRU (1 – n)
- VLSs
  - VL-Sensors
- LTM
  - LT-Antenna
- BTM
  - BT-Antenna
- STM (0 – n)
- NTC (0 – n)
  - NTCs-Antenna
- I/O Ports
  - EB / TCO / others

ATO Hardware

Gateway

Train Control Network (TCN)

Passenger Info Network (PIN)

Vehicle Control Systems

Passenger Information Systems

Connectivity Devices:
- **GSM-R**
  - GSM-R EDOR (1 - 2)
  - GSM-R Voice Radio
- **FRMCS**
  - FRMCS-GW*
  - FRMCS Radio (1 – n)

Mobile & Fixed Connectivity Infrastructure (GSM-R / FRMCS)

Trackside

- Driver
- Technician
- Evaluator
- Loc. Tag
- EURO Loop
- EURO Balise
- Nat. Systems

Data Centres (Infrastructure Management & Operations Control Centres) from IMs and RU

Mobile Object Transactor (APS-MOT)	Movement Authority Transactor (APS-MT)	ATO Transactor (ATO-AT)	Diagnostics & Monitoring (DM)	Device & Configuration Management (DCM)	Identity & Access Management (IAM)	RBC, DAS, Remote Control, etc.

Train

CCU n

CCU 2

Universal Vital Control and Command Bus (UVCCB)

OCORA Gateway

CCU 1

Train Control Network

Passenger Info Network

Vehicle Control Systems

Passenger Information Systems

Mobile & Fixed Connectivity Infrastructure (GSM-R / FRMCS)

Peripheral Devices

UIDR	CVDs	DMI (1 – n)	MT (1 – n)	JRU (1 – n)	TRU (1 – n)	DRU (1 – n)	VLSs	LTM	BTM	STM (0 – n)	PS	I/O Ports

NTC (0 – n)

| | | | VL-Sensors | LT-Antenna | BT-Antenna | NTCs-Antenna | P-Sensors | EB / TCO / others |

Connectivity Devices *may not be a dedicated HW

GSM-R EDOR Radio 1 - 2	GSM-R Voice Radio	Public Radio (1 – n)	FRMCS-GW*

FRMCS Radio (1 – n)

Driver	Technician	Evaluator

Loc. Tag	EURO Loop	EURO Balise	Nat. Systems

Trackside

Computing Platform

Computing Platform – High Level Architecture

Functional / Logical View

Functional – Components

Data Centres (Infrastructure Management & Operations Control Centres) from IMs and RU

Mobile Object Transactor (APS-MOT)	Movement Authority Transactor (APS-MT)	ATO Transactor (ATO-AT)	Diagnostics & Monitoring (DM)	Device & Configuration Management (DCM)	Identity & Access Management (IAM)	RBC, DAS, Remote Control, etc.

Applications

ATP Manager (ATPM)	Vehicle Supervisor (VS)	NTC Applications (NTC-APPs)	ATO Vehicle Perception (APV)	Driver Advisory Vehicle (DAV)		Cabin Voice over IP (CVoIP)
			ATO Vehicle (AV)			

SW Abstraction

Location and Train Integrity Services | **Basic Services (BS)** | **Connectivity Services**

	Train Integrity Status (TIS)	Operational Data (ODS)	Vehicle Diagnostics & Monitoring (VDM)	Vehicle Device & Config. Mngt. (VDCM)	
Vehicle Locator (VL)	Digital Map Services (DMS)	Configuration Data (CDS)	Time Synch Services (TSS)	Vehicle Identity & Access Mngt. (VIAM)	EURO Radio (ER)	FRMCS Gateway Function (FRMCS GWF)

HW Abstraction

Adapter for Peripheral Devices (APD) | **Vehicle Adapters**

UIDR Adapter (UIDRA)	DMI Adapter (DMIA)	TRU Adapter (TRUA)	LTM Adapter (LTMA) BTM Adapter (BTMA)	PS Adapter (PSA)	
CVD Adapter (CVDA)	MT Adapter (MTA)	VLS Adapter (VLSA)	STM Adapters (STMAs)	IO Adapter (IOA)	Functional Passenger Info Adapter (FPIA)	Functional Vehicle Adapter (FVA)

Vehicle Control Systems

- Remote Control
- Energy Meter
- Diagnostic Recording Unit (DRU)
- Braking System
- Traction Control System
- Train Integrity Monitoring System (TIMS)
- Train Control and Mngt. System (TCMS)

Peripheral Devices

UIDR	CVDs	DMI (1 – n)	MT (1 – n)	JRU (1 – n)	TRU (1 – n)	DRU (1 – n)	VLSs	LTM	BTM	STM (0 – n) / NTC (0 – n)	PS	I/O Ports
							VL-Sensors	LT-Antenna	BT-Antenna	NTCs-Antenna	P-Sensors	EB / TCO / others

Driver	Technician	Evaluator	Loc. Tag	EURO Loop	EURO Balise	Nat. Systems

Connectivity Devices

GSM-R EDOR Radio 1 - 2	GSM-R Voice Radio	Public Radio (1 – n)	FRMCS GW*
			FRMCS Radio (1 – n)

*may not be a dedicated HW

Passenger Information Systems

Functional – Scope

Data Centres (Infrastructure Management & Operations Control Centres) from IMs and RU

Mobile Object Transactor (APS-MOT)	Movement Authority Transactor (APS-MT)	ATO Transactor (ATO-AT)	Diagnostics & Monitoring (DM)	Device & Configuration Management (DCM)	Identity & Access Management (IAM)	RBC, DAS, Remote Control, etc.

Applications

ATP Manager (ATPM)	Vehicle Supervisor (VS)	NTC Applications (NTC-APPs)	ATO Vehicle Perception (APV)	Driver Advisory Vehicle (DAV)		Cabin Voice over IP (CVoIP)
			ATO Vehicle (AV)			

SW Abstraction — OCORA Core / CCS On-Board

Location and Train Integrity Services
- Train Integrity Status (TIS)
- Vehicle Locator (VL)
- Digital Map Services (DMS)

Basic Services (BS)
- Operational Data (ODS)
- Vehicle Diagnostics & Monitoring (VDM)
- Vehicle Device & Config. Mngt. (VDCM)
- Configuration Data (CDS)
- Time Synch Services (TSS)
- Vehicle Identity & Access Mngt. (VIAM)

Connectivity Services
- EURO Radio (ER)
- FRMCS Gateway Function (FRMCS GWF)

HW Abstraction

Adapter for Peripheral Devices (APD)
- UIDR Adapter (UIDRA)
- DMI Adapter (DMIA)
- TRU Adapter (TRUA)
- LTM Adapter (LTMA) / BTM Adapter (BTMA)
- PS Adapter (PSA)
- CVD Adapter (CVDA)
- MT Adapter (MTA)
- VLS Adapter (VLSA)
- STM Adapters (STMAs)
- IO Adapter (IOA)

Vehicle Adapters
- Functional Passenger Info Adapter (FPIA)
- Functional Vehicle Adapter (FVA)

Vehicle Control Systems
- Remote Control
- Energy Meter
- Diagnostic Recording Unit (DRU)
- Braking System
- Traction Control System
- Train Integrity Monitoring System (TIMS)
- Train Control and Mngt. System (TCMS)

Peripheral Devices: UIDR, CVDs, DMI (1−n), MT (1−n), JRU (1−n), TRU (1−n), DRU (1−n), VLSs, LTM, BTM, STM (0−n) / NTC (0−n), PS, I/O Ports, VL-Sensors, LT-Antenna, BT-Antenna, NTCs-Antenna, P-Sensors, EB / TCO / others

Connectivity Devices: GSM-R EDOR Radio 1-2, GSM-R Voice Radio, Public Radio (1−n), FRMCS GW*, FRMCS Radio (1−n) *may not be a dedicated HW

Passenger Information Systems

Driver, Technician, Evaluator, Loc. Tag, EURO Loop, EURO Balise, Nat. Systems

Functional – Interfaces

NS · SNCF · SBB CFF FFS · ÖBB · DB

Data Centres (Infrastructure Management & Operations Control Centres) from IMs and RU

| Mobile Object Transactor (APS-MOT) | Movement Authority Transactor (APS-MT) | ATO Transactor (ATO-AT) | Diagnostics & Monitoring (DM) | Device & Configuration Management (DCM) | Identity & Access Management (IAM) | RBC, DAS, Remote Control, etc. |

Vehicle Control Systems

- Remote Control
- Energy Meter
- Diagnostic Recording Unit (DRU)
- Braking System
- Traction Control System
- Train Integrity Monitoring System (TIMS)
- Train Control and Mngt. System (TCMS)

RCA-5 · RCA-6 · RCA-8 · RCA-41 · 541 · RCA-42 · 542 · RCA-43 · 543 · SFERA

Applications

- ATP Manager (ATPM)
- Vehicle Supervisor (VS)
- NTC Applications (NTC-APPs)
- ATO Vehicle Perception (APV)
- Driver Advisory Vehicle (DAV)
- Cabin Voice over IP (CVoIP)
- ATO Vehicle (AV)

SW Abstraction — OCORA Core

Location and Train Integrity Services
- Train Integrity Status (TIS)
- Vehicle Locator (VL)
- Digital Map Services (DMS)

Basic Services (BS)
- Operational Data (ODS)
- Vehicle Diagnostics & Monitoring (VDM)
- Vehicle Device & Config. Mngt. (VDCM)
- Configuration Data (CDS)
- Time Synch Services (TSS)
- Vehicle Identity & Access Mngt. (VIAM)

Connectivity Services
- EURO Radio (ER)
- FRMCS Gateway Function (FRMCS GWF)

HW Abstraction — CCS On-Board

Adapter for Peripheral Devices (APD)
- UIDR Adapter (UIDRA)
- DMI Adapter (DMIA)
- TRU Adapter (TRUA)
- LTM Adapter (LTMA) BTM Adapter (BTMA)
- PS Adapter (PSA)
- CVD Adapter (CVDA)
- MT Adapter (MTA)
- VLS Adapter (VLSA)
- STM Adapters (STMAs)
- IO Adapter (IOA)

Vehicle Adapters
- Functional Passenger Info Adapter (FPIA)
- Functional Vehicle Adapter (FVA) · 490 / 190 · 495 / 195

401 · 402 · 403 · 404 · 410 · 420 · 430 · 431 · 432 · 440 · 450 · 481 · 482 · 483 · 484

| UIDR | CVDs | DMI (1 – n) | MT (1 – n) | JRU (1 – n) TRU (1 – n) DRU (1 – n) | VLSs / VL-Sensors | LTM / LT-Antenna | BTM / BT-Antenna | STM (0 – n) NTC (0 – n) / NTCs-Antenna | PS / P-Sensors | I/O Ports / EB / TCO / others | GSM-R EDOR Radio 1 - 2 | GSM-R Voice Radio | Public Radio (1 – n) | FRMCS GW* / FRMCS Radio (1 – n) |

Peripheral Devices · Connectivity Devices · *may not be a dedicated HW

101 · 102 · 103 · 104 · 110 · 120 · 130 · 131 · 132 · 140 · 150 · 181 · 182 · 183 · 184

Driver · Technician · Evaluator · Loc. Tag · EURO Loop · EURO Balise · Nat. Systems

Passenger Information Systems

Building Blocks – Functional – Initial Iteration

Data Centres (Infrastructure Management & Operations Control Centres) from IMs and RU

| Mobile Object Transactor (APS-MOT) | Movement Authority Transactor (APS-MT) | ATO Transactor (ATO-AT) | Diagnostics & Monitoring (DM) | Device & Configuration Management (DCM) | Identity & Access Management (IAM) | RBC, DAS, Remote Control, etc. |

Vehicle Control Systems

- Remote Control
- Energy Meter
- Diagnostic Recording Unit (DRU)
- Braking System
- Traction Control System
- Train Integrity Monitoring System (TIMS)
- Train Control and Mngt. System (TCMS)

Applications

ETCS Kernel   **ATO**

SW Abstraction

Communication Services (ComS)
- Data Communication
- Non-Safe Radio Data Com. (NSRDC)
- Cab Voice over IP (CVoIP)

Basic Services (BS)
- Operational Data (OD)
- Vehicle Diagnostics & Monitoring (VDM)
- Vehicle Device & Config. Mngt. (VDCM)
- Configuration Data (CD)
- Time Synch Services (TSS)

Connectivity Services (ConS)
- EURO Radio
- FRMCS

Basic Software

HW Abstraction

Adapter for Peripheral Devices (APD)
- DMI Adapter (DMIA)
- JRU Adapter (JRUA)
- ODO Adapter (ODOA)
- BTM Adapter (BTMA)
- BIU Adapter (BIUA)

Vehicle Adapter
- Functional Vehicle Adapter

Peripheral Devices

| CVDs | DMI (1 – n) | JRU (1 – n) | TRU (1 – n) | DRU (1 – n) | VLSs | LTM | BTM | STM (0 – n) / NTC (0 – n) | I/O Ports |
| VL-Sensors | LT-Antenna | BT-Antenna | NTCs-Antenna | | | | | | EB / TCO / others |

Connectivity Devices

| GSM-R EDOR Radio 1 - 2 | GSM-R Voice Radio | FRMCS GW* / FRMCS Radio (1 – n) |

Passenger Information Systems

| Driver | Technician | Evaluator | Loc. Tag | EURO Loop | EURO Balise | Nat. Systems |

Data Centres (Infrastructure Management & Operations Control Centres) from IMs and RU

| Mobile Object Transactor (APS-MOT) | Movement Authority Transactor (APS-MT) | ATO Transactor (ATO-AT) | Diagnostics & Monitoring (DM) | Device & Configuration Management (DCM) | Identity & Access Management (IAM) | RBC, DAS, Remote Control, etc. |

Applications

| ATP Manager (ATPM) | Vehicle Supervisor (VS) | NTC Applications (NTC-APPs) | ATO Vehicle Perception (APV) | Driver Advisory Vehicle (DAV) | | Cabin Voice over IP (CVoIP) |

| | | | ATO Vehicle (AV) | | | |

SW Abstraction

Location and Train Integrity Services

| Train Integrity Status (TIS) |
| Vehicle Locator (VL) | Digital Map Services (DMS) |

Basic Services (BS)

| Operational Data (ODS) | Vehicle Diagnostics & Monitoring (VDM) | Vehicle Device & Config. Mngt. (VDCM) |
| Configuration Data (CDS) | Time Synch Services (TSS) | Vehicle Identity & Access Mngt. (VIAM) |

Connectivity Services

| EURO Radio (ER) | FRMCS Gateway Function (FRMCS GWF) |

HW Abstraction

Adapter for Peripheral Devices (APD)

| UIDR Adapter (UIDRA) | DMI Adapter (DMIA) | TRU Adapter (TRUA) | LTM Adapter (LTMA) BTM Adapter (BTMA) | PS Adapter (PSA) |
| CVD Adapter (CVDA) | MT Adapter (MTA) | VLS Adapter (VLSA) | STM Adapters (STMAs) | IO Adapter (IOA) |

Vehicle Adapters

| Functional Passenger Info Adapter (FPIA) | Functional Vehicle Adapter (FVA) |

Vehicle Control Systems

- Remote Control
- Energy Meter
- Diagnostic Recording Unit (DRU)
- Braking System
- Traction Control System
- Train Integrity Monitoring System (TIMS)
- Train Control and Mngt. System (TCMS)

Peripheral Devices

| UIDR | CVDs | DMI (1 – n) | MT (1 – n) | JRU (1 – n) | TRU (1 – n) | DRU (1 – n) | VLSs | LTM | BTM | STM (0 – n) / NTC (0 – n) | PS | I/O Ports |
| | | | | | | | VL-Sensors | LT-Antenna | BT-Antenna | NTCs-Antenna | P-Sensors | EB / TCO / others |

Connectivity Devices

| GSM-R EDOR Radio 1 - 2 | GSM-R Voice Radio | Public Radio (1 – n) | FRMCS GW* / FRMCS Radio (1 – n) |

*may not be a dedicated HW

| Driver | Technician | Evaluator | Loc. Tag | EURO Loop | EURO Balise | Nat. Systems |

Passenger Information Systems

Functional Interfaces of Selected Components

Vehicle Supervisor (VS) – Functional IFs

National Train Controls (NTC-APPs) – Functional IFs

Data Centres (Infrastructure Management & Operations Control Centres) from IMs and RU

- Mobile Object Transactor (APS-MOT)
- Movement Authority Transactor (APS-MT)
- ATO Transactor (ATO-AT)
- Diagnostics & Monitoring (DM)
- Device & Configuration Management (DCM)
- Identity & Access Management (IAM)
- RBC, DAS, Remote Control, etc.

Vehicle Control Systems

- Remote Control
- Energy Meter
- Diagnostic Recording Unit (DRU)
- Braking System
- Traction Control System
- Train Integrity Monitoring System (TIMS)
- Train Control and Mngt. System (TCMS)

ATP Manager (ATPM)

ATO Vehicle (AV)

SS 130 — NTC_APP-AV

NTC_APP-ATPM

Vehicle Locator (VL) — NTC_APP-VL

NTC Applications (NTC-APPs)

NTC_APP-FVA

NTC_APP-APD

NTC_APP-PFS

Adapter for Peripheral Devices (APD)

Basic Services (BS)

Functional Vehicle Adapter (FVA) — 490 — SS 034 — SS 119

403 | **410** | **431** | **432** | **450**

Peripheral Devices:

| UIDR | CVDs | DMI (1 – n) | MT (1 – n) | JRU (1 – n) | TRU (1 – n) | DRU (1 – n) | VLSs | LTM | BTM | STM (0 – n) / NTC (0 – n) | PS | I/O Ports |

VL-Sensors | LT-Antenna | BT-Antenna | NTCs-Antenna | P-Sensors | EB / TCO / others

Driver | Technician | Evaluator | Loc. Tag | EURO Loop | EURO Balise | Nat. Systems

Passenger Information Systems

ATO Vehicle (AV) – Functional IFs

Data Centres (Infrastructure Management & Operations Control Centres) from IMs and RU

- Mobile Object Transactor (APS-MOT)
- Movement Authority Transactor (APS-MT)
- ATO Transactor (ATO-AT)
- Diagnostics & Monitoring (DM)
- Device & Configuration Management (DCM)
- Identity & Access Management (IAM)
- RBC, DAS, Remote Control, etc.

Vehicle Control Systems
- Remote Control
- Energy Meter
- Diagnostic Recording Unit (DRU)
- Braking System
- Traction Control System
- Train Integrity Monitoring System (TIMS)
- Train Control and Mngt. System (TCMS)

ATP Manager (ATPM)

Vehicle Supervisor (VS)

RCA-8 / SS 126

ATO Vehicle Perception (APV)

SFERA

NTC Applications (NTC-APPs)

AV-ATO_AT AV-APV AV-SFERA

AV-VS   SS 130   AV-NTC_APP

AV-ATPM

ATO Vehicle (AV)

Subset 125

Vehicle Locator (VL)   SS 130   AV-VL

AV-FVA

AV-APD   AV-TIS

AV-PFS

Adapter for Peripheral Devices (APD)

Basic Services (BS)

Train Integrity Status (TIS)

Functional Vehicle Adapter (FVA)   490   SS 139

SS 121   SS 140   432   450

403   410

Peripheral Devices
- UIDR
- CVDs
- DMI (1 – n)
- MT (1 – n)
- JRU (1 – n)
- TRU (1 – n)
- DRU (1 – n)
- VLSs — VL-Sensors
- LTM — LT-Antenna
- BTM — BT-Antenna
- STM (0 – n) / NTC (0 – n) — NTCs-Antenna
- PS — P-Sensors
- I/O Ports — EB / TCO / others

Driver   Technician   Evaluator   Loc. Tag   EURO Loop   EURO Balise   Nat. Systems

Passenger Information Systems

ATO Perception Vehicle (APV) – Functional IFs

Data Centres (Infrastructure Management & Operations Control Centres) from IMs and RU

- Mobile Object Transactor (APS-MOT)
- Movement Authority Transactor (APS-MT)
- ATO Transactor (ATO-AT)
- Diagnostics & Monitoring (DM)
- Device & Configuration Management (DCM)
- Identity & Access Management (IAM)
- RBC, DAS, Remote Control, etc.

Vehicle Control Systems
- Remote Control
- Energy Meter
- Diagnostic Recording Unit (DRU)
- Braking System
- Traction Control System
- Train Integrity Monitoring System (TIMS)
- Train Control and Mngt. System (TCMS)

ATO Vehicle (AV)

APV-APVts

ATO Perception Vehicle (APV)

GoA 3 – 4

APV-AV

APV-VL

Vehicle Locator (VL)

APV-FVA

APV-DMS

APV-TIS

APV-APD

APV-PFS

Digital Map Services (DMS)

Adapter for Peripheral Devices (APD)

Basic Services (BS)

Train Integrity Status (TIS)

Functional Vehicle Adapter (FVA)

490 SS 139

SS 121

SS 140

403

410

440

450

Peripheral Devices

- UIDR
- CVDs
- DMI (1 – n)
- MT (1 – n)
- JRU (1 – n)
- TRU (1 – n)
- DRU (1 – n)
- VLSs — VL-Sensors
- LTM — LT-Antenna
- BTM — BT-Antenna
- STM (0 – n) / NTC (0 – n) — NTCs-Antenna
- PS — P-Sensors
- I/O Ports — EB / TCO / others

- Driver
- Technician
- Evaluator
- Loc. Tag
- EURO Loop
- EURO Balise
- Nat. Systems

Passenger Information Systems

Train Integrity Status (TIS) – Functional IFs

Data Centres (Infrastructure Management & Operations Control Centres) from IMs and RU

| Mobile Object Transactor (APS-MOT) | Movement Authority Transactor (APS-MT) | ATO Transactor (ATO-AT) | Diagnostics & Monitoring (DM) | Device & Configuration Management (DCM) | Identity & Access Management (IAM) | RBC, DAS, Remote Control, etc. |

Vehicle Control Systems

- Remote Control
- Energy Meter
- Diagnostic Recording Unit (DRU)
- Braking System
- Traction Control System
- Train Integrity Monitoring System (TIMS)
- Train Control and Mngt. System (TCMS)

ATP Manager (ATPM)

Vehicle Supervisor (VS)

ATO Vehicle (AV)

ATO Perception Vehicle (APV)

NTC Applications (NTC-APPs)

FVA-AV

FVA-APV

FVA-VS

FVA-NTC_APP

FVA-ATPM

Vehicle Locator (VL)

FVA-VL

Functional Vehicle Adapter (FVA)

FVA-APD

ATPM-TIS

FVA-PFS

Adapter for Peripheral Devices (APD)

Basic Services (BS)

Train Integrity Status (TIS)

490

SS 139 | SS 119
SS 034

450

Peripheral Devices

| UIDR | CVDs | DMI (1 − n) | MT (1 − n) | JRU (1 − n) | TRU (1 − n) | DRU (1 − n) | VLSs | LTM | BTM | STM (0 − n) / NTC (0 − n) | PS | I/O Ports |

VL-Sensors | LT-Antenna | BT-Antenna | NTCs-Antenna | P-Sensors | EB / TCO / others

Driver | Technician | Evaluator | Loc. Tag | EURO Loop | EURO Balise | Nat. Systems

Passenger Information Systems