ITU-T Recommendations for *IoT-based Automotive Emergency Response System*

[ITU-T Y.4119, Y.4467, Y.4468]

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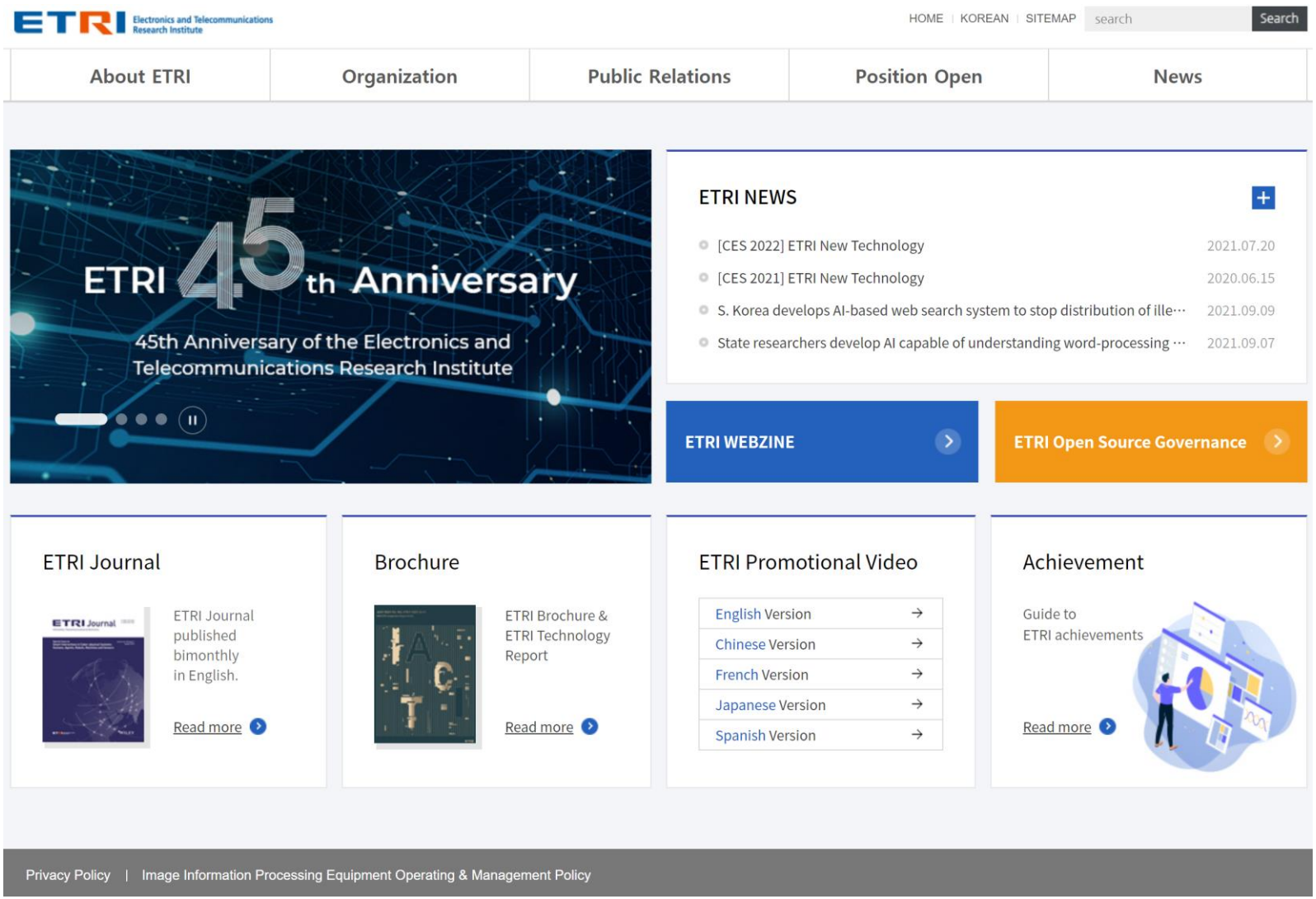
Outline

- ITU-T Y.4119
  - Requirements and capability framework for IoT-based automotive emergency response system
- ITU-T Y.4467
  - Minimum set of data structure for automotive emergency response system
- ITU-T Y.4468
  - Minimum set of data transfer protocol for automotive emergency response system

ETRI (https://etri.re.kr/eng/main/main.etri)



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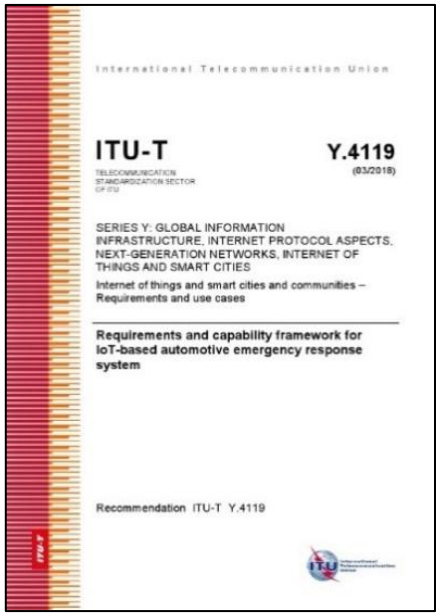
- Co-Editor (w/LEE, Jun Seob) of ITU-T Y.4119


International Telecommunication Union

ITU-T Y.4119

(03/2018)

SERIES Y: GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS, NEXT-GENERATION NETWORKS, INTERNET OF THINGS AND SMART CITIES

Internet of things and smart cities and communities – Requirements and use cases

Requirements and capability framework for IoT-based automotive emergency response system

Recommendation ITU-T Y.4119

[2017-2020] : [SG20] : [Q2/20]

[Declared patent(s)] - [Associated work] - [Publication]

Work item:	Y.4119 (ex Y.AERS-reqts)
Status:	Approved on 2018-03-01
Approval process:	AAP
Type of work item:	Recommendation
Version:	New
Provisional name:	Y.AERS-reqts
Equivalent number:	-
Timing:	-
Liaison:	ITU-T SG 16, CEN, 3GPP, ISO/TC 204, ETSI
Subject/title:	Requirements and capability framework for IoT-based automotive emergency response system
Summary:	Recommendation ITU-T Y.AERS-reqts provides an overview of an IoT-based automotive emergency response system (AERS), identifies requirements of the AERS for aftermarket devices, and provides a capability framework of the AERS.
Comment:	Editor: Taehyoung Shim (thshim@etri.re.kr), Jun Seob LEE (juns@etri.re.kr)
Base text(s):	[TD 186] [TD 589-R1-GEN]
Contact(s):	Jun Seob Lee, Editor Taehyoung Shim, Editor
ITU-T A.5 reference(s):	-
	[Submit new A.5 reference] See guidelines for creating & submitting ITU-T A.5 justifications

First registration in the WP: 2017-03-30 15:08:13

Last update: 2018-03-20 14:55:18

- Co-Editor (w/LEE, Jun Seob) of ITU-T Y.4468

[2017-2020] : [SG20] : [Q3/20]

[Declared patent(s)] - [Associated work] - [Publication]

Work item:	Y.4468 (ex Y.AERS-mtp)
Status:	Approved on 2020-01-13
Approval process:	AAP
Type of work item:	Recommendation
Version:	New
Provisional name:	Y.AERS-mtp
Equivalent number:	-
Timing:	-
Liaison:	ITU-T SG 11, SG 16, SG 17, ETSI
Subject/title:	Minimum set of data transfer protocol for automotive emergency response system
Summary:	An automotive emergency response system (AERS) for aftermarket devices defined in the Recommendation ITU-T Y.4119 is designed to bring rapid assistance to driver and/or passengers involved in accidents. For a normal operation purpose of the AERS, an accident related data (so-called minimum set of data, MSD) needs to be sent from an automotive emergency detection device (AEDD) to an automotive emergency response center (AERC). This Recommendation specifies an MSD transfer protocol to provide the rules of an MSD transfer operations between an AEDD and an AERC in an AERS.
Comment:	-
Base text(s):	[TD 1479-GEN (A5 TD)] [TD 1495-GEN]
Contact(s):	Jun Seob Lee, Editor Taehyoung Shim, Editor
ITU-T A.5 reference(s):	[IETF RFC 7252 (2014)]
	[Submit new A.5 reference] See guidelines for creating & submitting ITU-T A.5 justifications

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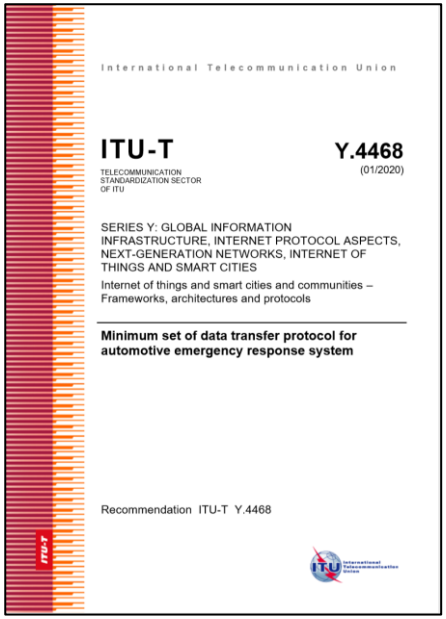

International Telecommunication Union

ITU-T
TELECOMMUNICATION STANDARDIZATION SECTOR OF ITU

Y.4468
(01/2020)

SERIES Y: GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS, NEXT-GENERATION NETWORKS, INTERNET OF THINGS AND SMART CITIES

Internet of things and smart cities and communities – Frameworks, architectures and protocols

Minimum set of data transfer protocol for automotive emergency response system

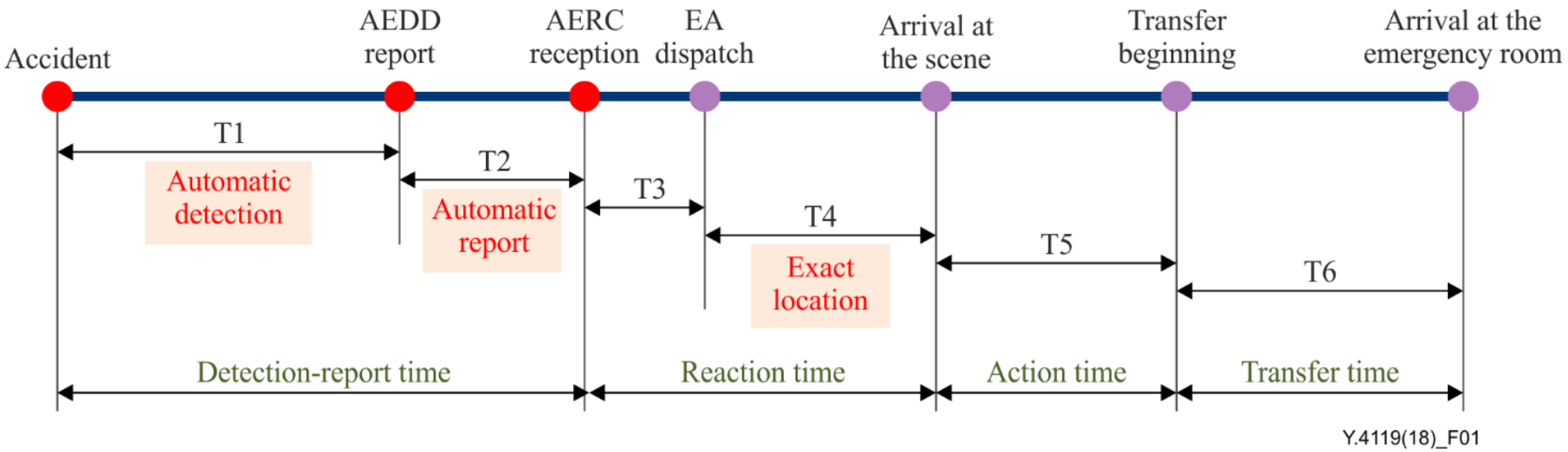
Recommendation ITU-T Y.4468

ITU-T Y.4119

Requirements and capability framework for IoT-based automotive emergency response system

Advantage of AERS

- Employing the AERS is expected to **reduce automobile accident detection (T1)** and **report (T2)** time using automatic accident detection-report procedures.
- Furthermore, since sensor assisted geographical positioning allows the emergency authority (EA) to **pinpoint the exact location** of an accident, **the arrival time** at the scene will be **shortened significantly (T4).**

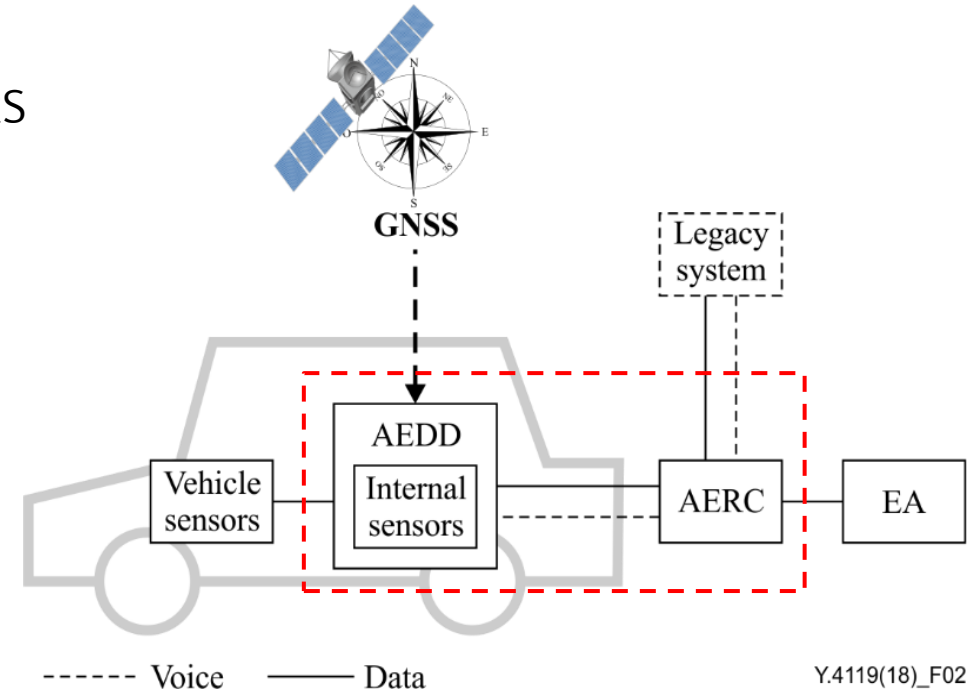


Timing diagram of an IoT-based automotive emergency response system

ITU-T Y.4119

- ITU-T Y.4119 is to identify requirements of an Internet of things (IoT)-based **automotive emergency response system (AERS) for aftermarket devices** and to provide a capability framework of the AERS.
- Scope of this Recommendation:
  - Overview of the AERS
  - Requirements of the AERS
  - Capability framework of the AERS

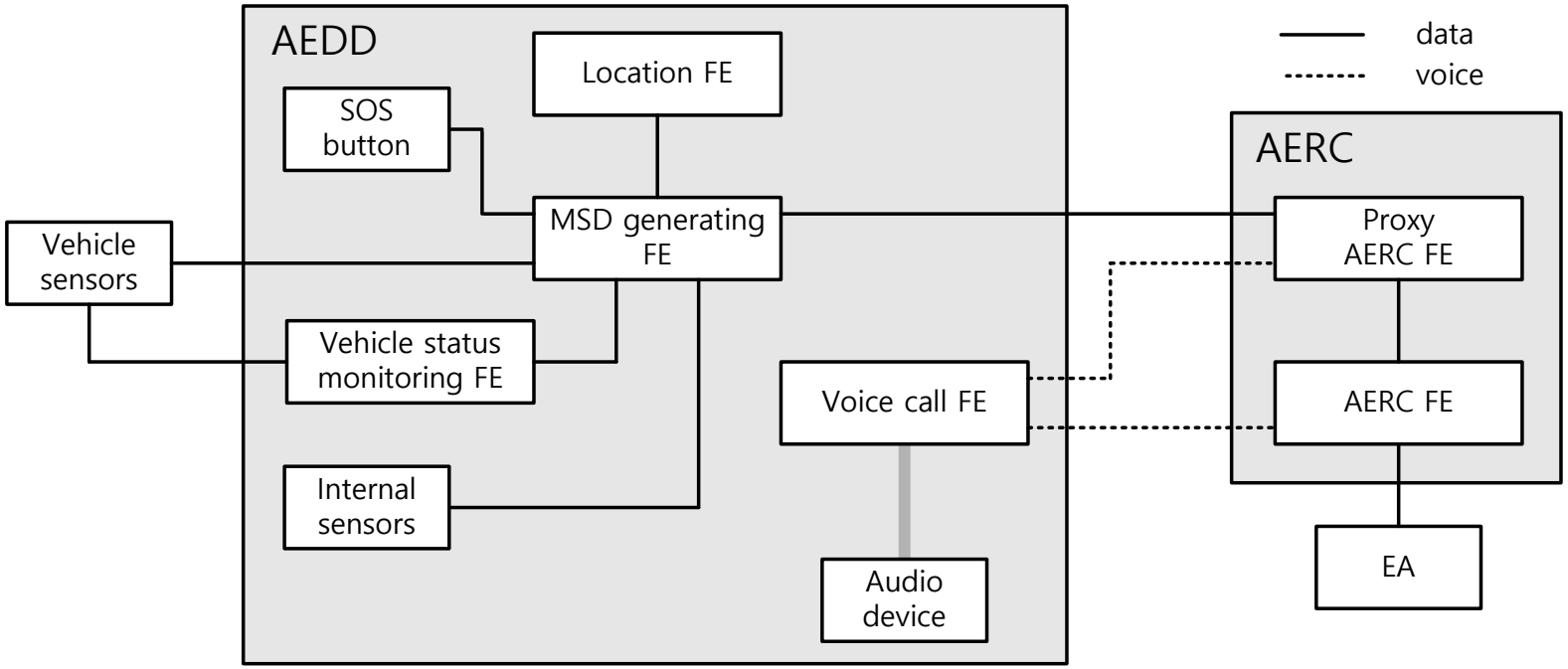
- AERS: Automotive Emergency Response System
- AEDD: Automotive Emergency Detection Device
- AERC: Automotive Emergency Response Center
- EA: Emergency Authority
- GNSS: Global Navigation Satellite System



Overview of the AERS

Capability Framework

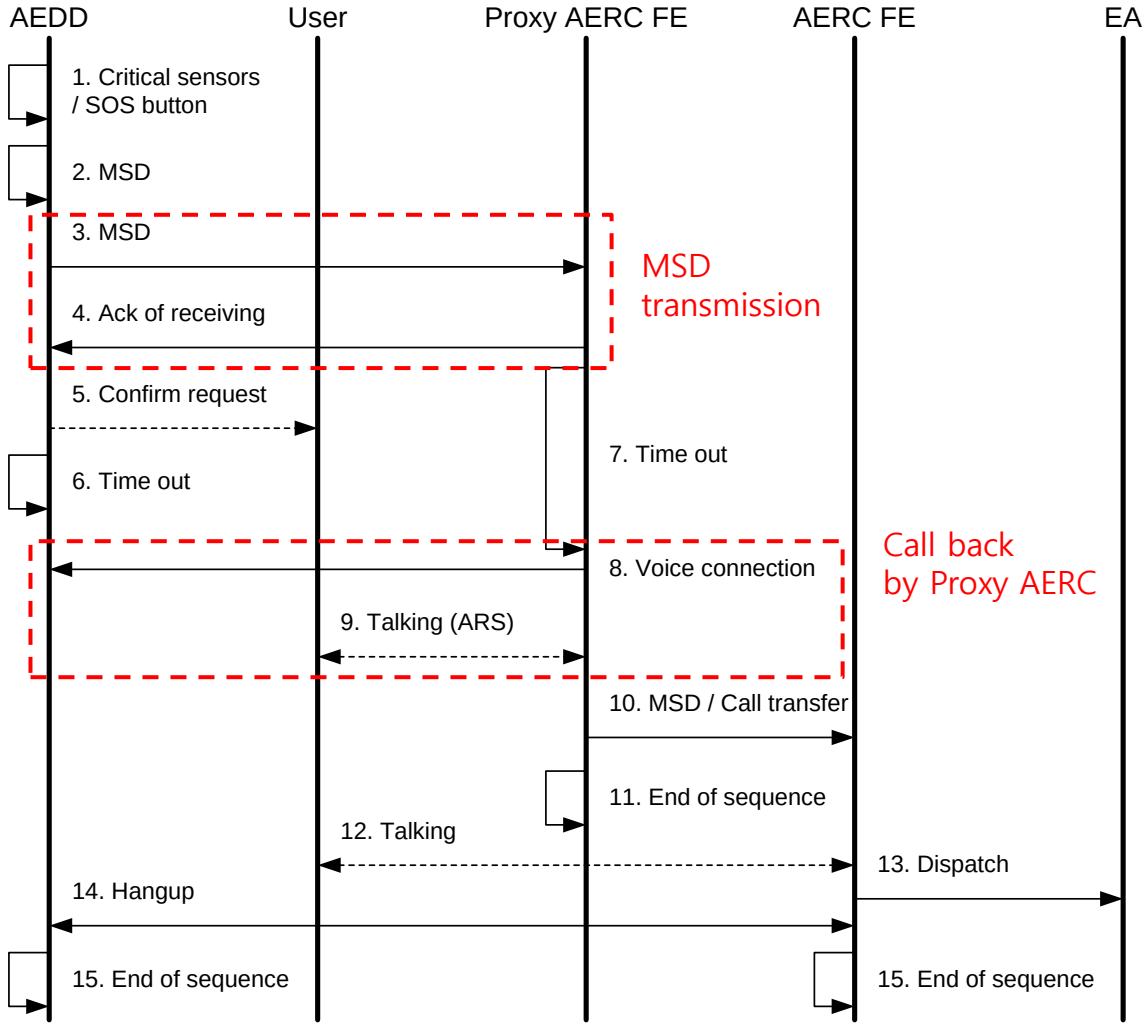
Capability framework of the AERS



- **AEDD**
  - receiving sensing data, determining the accident, receiving location information, and sending minimum set of data (MSD)
- **AERC**
  - answering each automotive emergency request, confirming the accident occurred, and notifying the EA

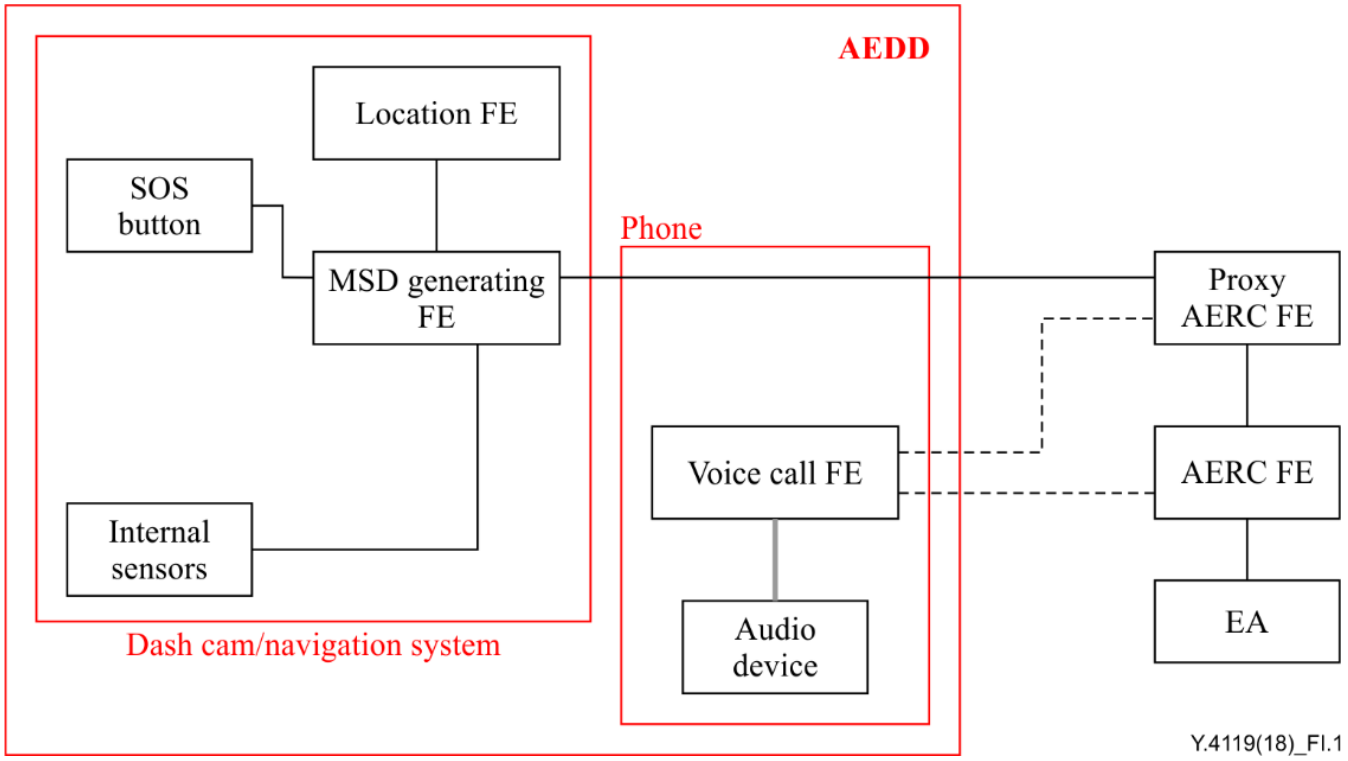
AERS Workflow – EA Dispatch Request

- **AERS workflow in case of EA dispatch request**
  - (Step 8, 9) Proxy AERC FE initiates call back using an automated system. If the call is not answer ed within the time out period, it confirms the accident.



AEDD Implementation Example

- AEDD without data and voice communication capabilities
- AEDD with data communication capability
- AEDD with data and voice communication capabilities



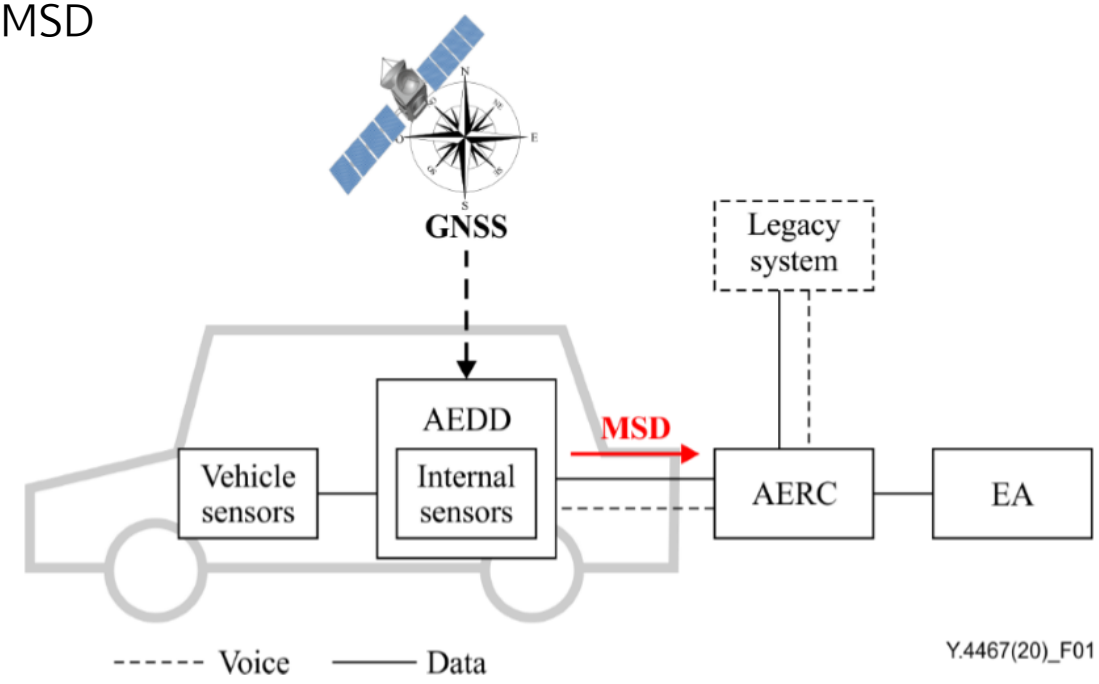
AEDD without data and voice communication capabilities

ITU-T Y.4467

Minimum set of data structure for automotive emergency response system

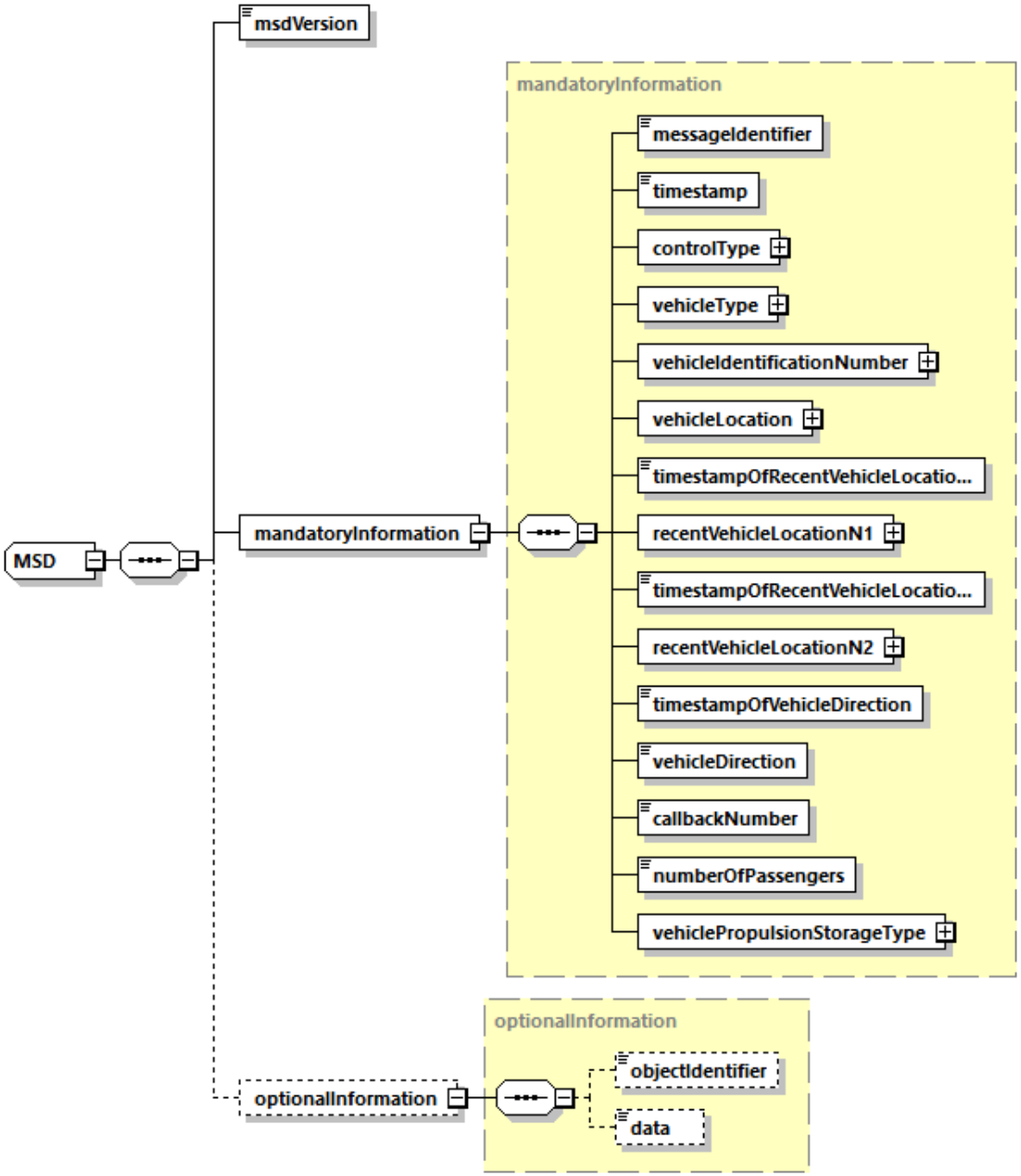
ITU-T Y.4467

- ITU-T Y.4467 is to specify **the minimum set of data (MSD) structure** for an automotive emergency response system (AERS).
- Scope of this Recommendation:
  - Overview of MSD for AERS
  - Mandatory information of MSD
  - Optional information of MSD
  - Encoding rule for MSD



Scope of ITU-T Y.4467 (the MSD structure)

MSD Structure



Mandatory Information

Mandatory information for the MSD

Name	Description	Data size
messageIdentifier	Message sequence of MSD	1 byte
timestamp	The time stamp of accident detection	4 bytes
controlType	Type of control	4 bits
vehicleType	Type of vehicle	5 bits
vehicleIdentificationNumber	Vehicle identification number (VIN)	17 bytes
vehicleLocation	Location of vehicle	8 bytes
timestampOfRecentVehicleLocationN1	The time stamp of recent vehicle location N1	4 bytes
recentVehiclelocation N1	Recent vehicle location N1	8 bytes
timestampOfRecentVehicleLocationN2	The time stamp of recent vehicle location N2	4 bytes
recentVehicleLocationN2	Recent vehicle location N2	8 bytes
timestampOfVehicleDirection	The time stamp of vehicle direction	4 bytes
vehicleDirection	Direction of vehicle	4 bits
callbackNumber	Callback number	15 bytes
numberOfPassengers	The number of passengers	1 byte
vehiclePropulsionStorageType	Fuel type of vehicle	7 bits

Mandatory Information

- controlType
  - *controlType* is a set of control types for MSD which consists of automaticActivation, testCall, positionTrusted, and cancelRequest information.
    - automaticActivation is ''true'' if an MSD is created automatically generated or ''false'' if it is manually generated via the SOS button.
    - testCall is set to ''true'' if an MSD sent is for service testing purposes.
    - positionTrusted is ''true'' if GNSS is used to obtain location information.
    - cancelRequest is ''true'' if the MSD is used to cancel previously sent accident report MSD.

Control type information in the MSD

Type	SEQUENCE [ITU-T X.680]
Length	4 bits

Children	*controlType*::= SEQUENCE{
	automaticActivation BOOLEAN DEFAULT FALSE,
	testCall BOOLEAN DEFAULT FALSE,
	positionTrusted BOOLEAN DEFAULT FALSE,
	cancelRequest BOOLEAN DEFAULT FALSE
	}

Mandatory Information

- vehicleLocation
  - *vehicleLocation* represents the vehicle location information **at the time of the accident detection** as defined in [ISO 6709]. The vehicleLocation value consists of *positionLatitude* and *positionLongitude*, with the latitude and longitude values of the vehicle respectively.

Vehicle location information in the MSD

Type	SEQUENCE [ITU-T X.680]
Constraints	Latitude: −90(−324000000) ~ +90(+324000000) Longitude: −180(−648000000) ~ +180(+648000000)
Length	8 bytes

Children	*vehicleLocation*::= SEQUENCE {
	positionLatitude INTEGER(−2147483648..2147483647),
	positionLongitude INTEGER(−2147483648..2147483647)
	}

Encoding Rule

- The encoding rule of MSD shall comply with **concise binary object representation (CBOR)** defined in [IETF RFC 7049].

The result of encoding the above diagnostic notation using [IETF RFC 7049] is as follows and the total data size is 106 Bytes:

```
82                                      # array(2)
   01                                   # unsigned(1)
   98 18                                # array(24)
      01                                # unsigned(1)
      1A 5CAC650D                       # unsigned(1554801933)
      F5                                # primitive(21)
      F4                                # primitive(20)
      F5                                # primitive(21)
      F4                                # primitive(20)
      02                                # unsigned(2)
      71                                # text(17)
         574D395644534453505941313233343536 # "WM9VDSDSPYA123456"
      82                                # array(2)
         1A 07CEA0D4                    # unsigned(130982100)
         1A 1B547EBC                    # unsigned(458522300)
      1A 5CAC6508                       # unsigned(1554801928)
      82                                # array(2)
         1A 07CEA264                    # unsigned(130982500)
```

Optional Information

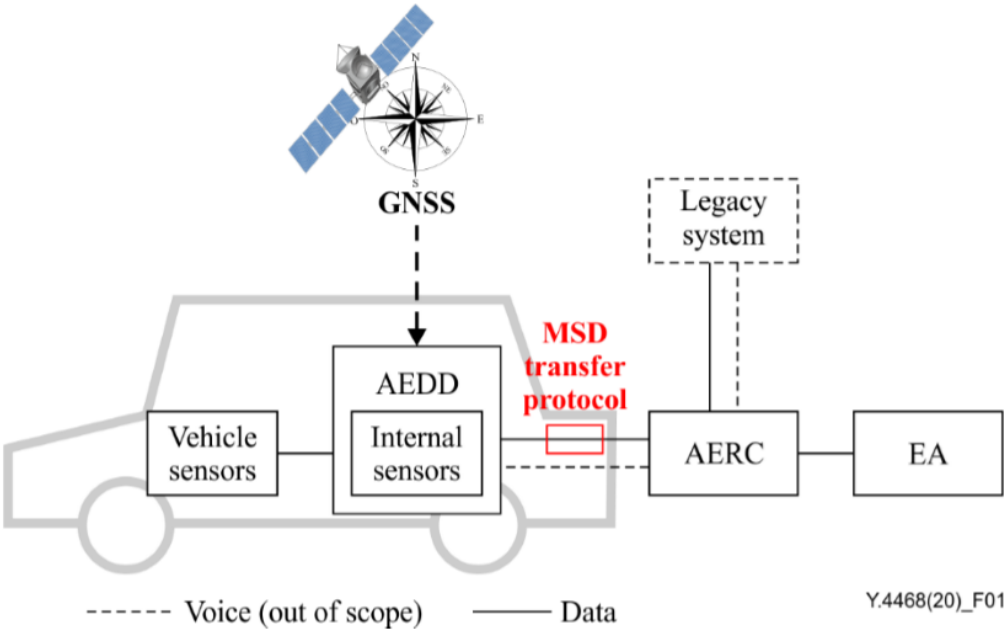
- Optional information is additional data that an AEDD can send to an AERC for **additional functions** such as information to **determine the severity of an accident**. The optional information is expressed as **a pair of object identifier and data**.
  - objectIdentifier: an object identifier (OID) assigned to identify data and records a relative object identifier.
  - data: the additional data that an AEDD sends to an AERC.

ITU-T Y.4468

Minimum set of data transfer protocol for automotive emergency response system

ITU-T Y.4468

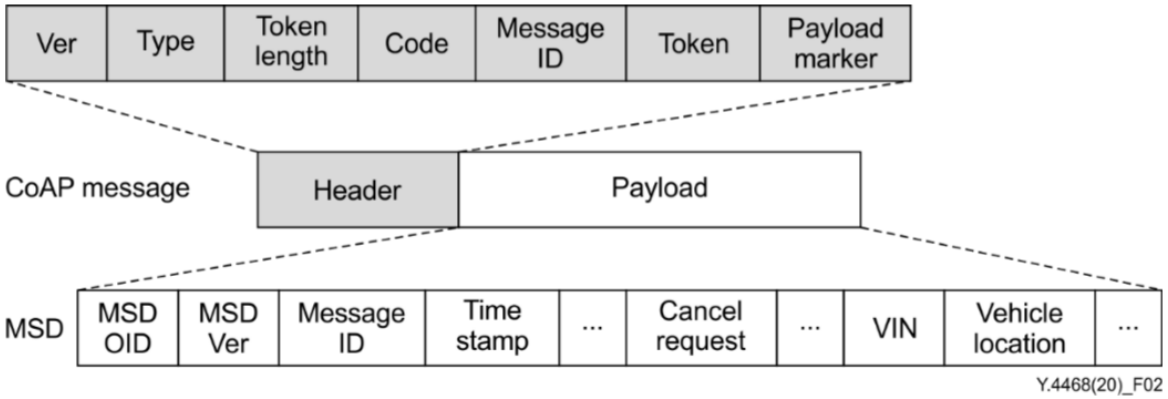
- ITU-T Y.4468 specifies a **minimum set of data (MSD) transfer protocol** for automotive emergency response system (AERS).
- Scope of this Recommendation:
  - MSD transfer protocol **parameters**
  - **Message types** of MSD transfer protocol
  - **Sequence** of MSD transfer protocol operation



Scope of ITU-T Y.4468 (MSD transfer protocol)

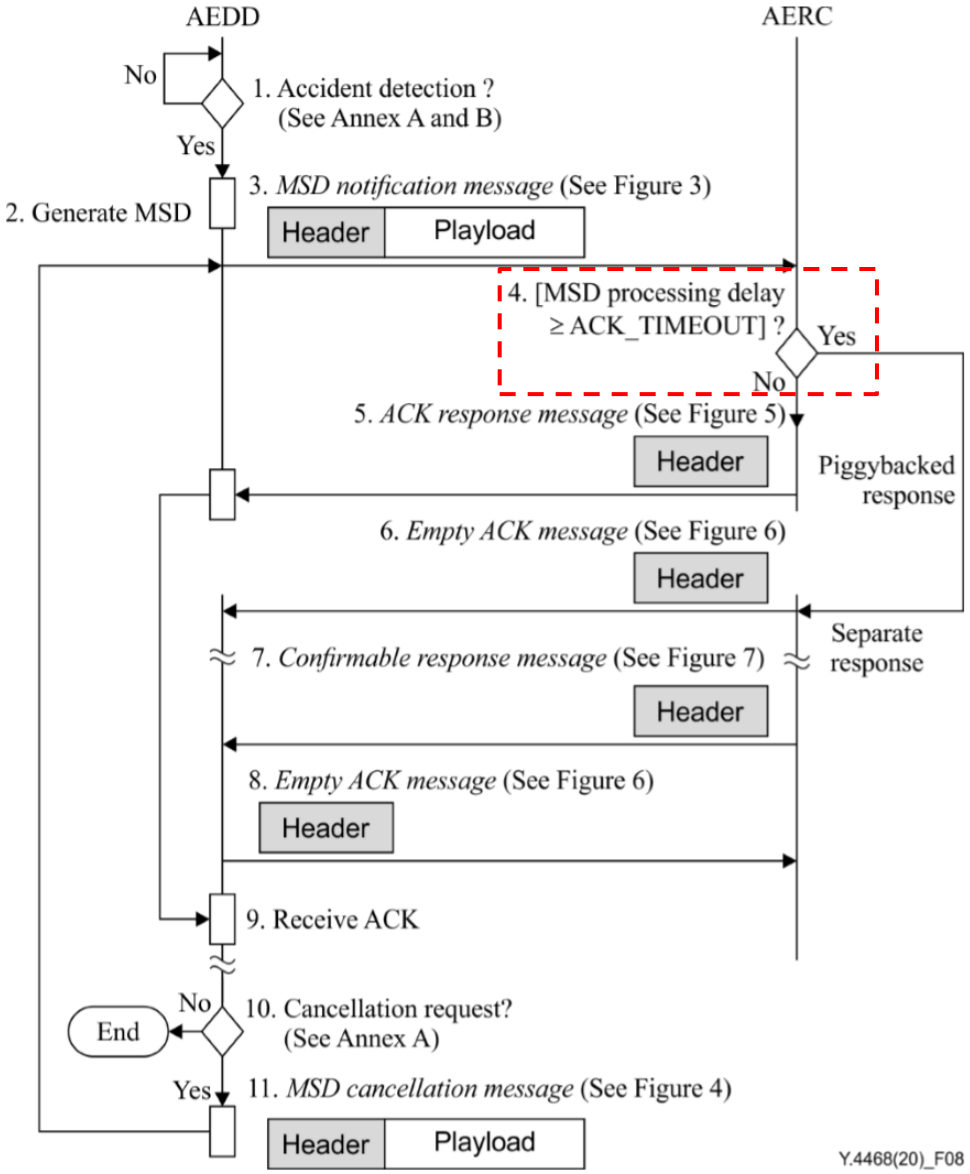
CoAP for MSD Transfer

- MSD transfer operates over the constrained application layer protocol (CoAP) [IETF RFC 7252].
  - a **request-response interaction** between an AEDD and an AERC
  - **support constrained devices** with relatively small amounts of header size and low power consumption
    - **suitable for AEDD operations such as the navigation system, dash cam, etc.**



MSD over CoAP message structure

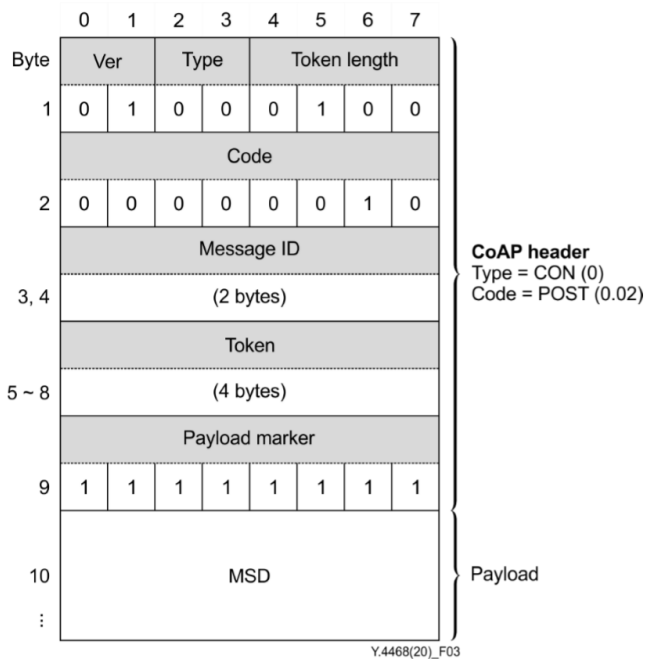
MSD Transfer Protocol



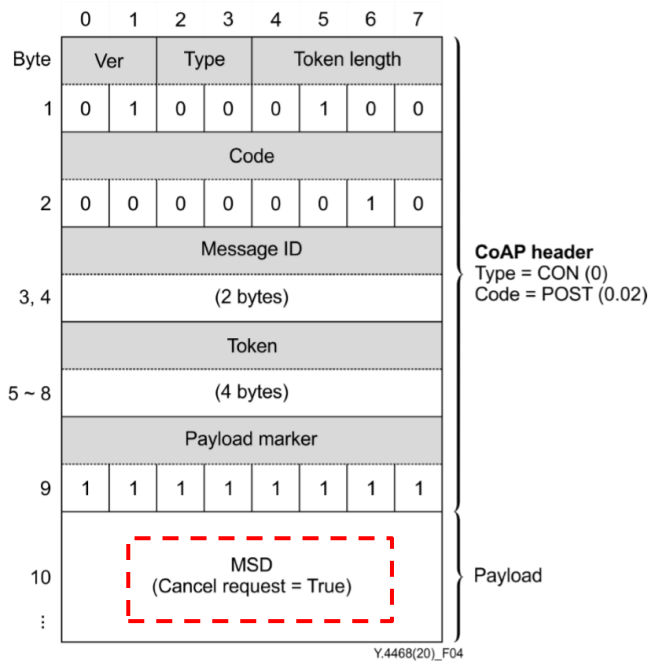
Sequence of request-response operation between an AEDD and AERC

Request Messages

- MSD notification message
  - **Confirmable (CON) message** type for transmission reliability
  - **POST code** for notification
  - **message ID** for detecting message duplication
  - **Token** used to match with response messages returned by AERC
- MSD cancellation message
  - **MSD with Cancel Request [ITU-T Y.4467]** changed to **True**



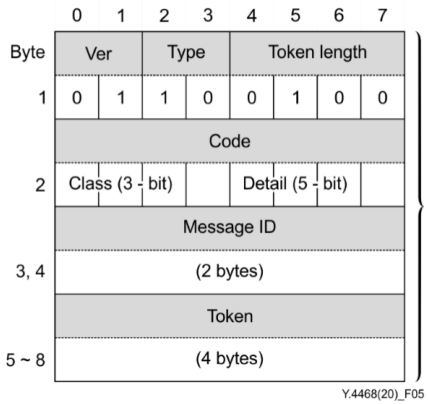
MSD notification message



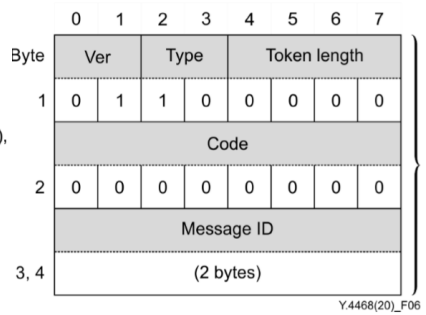
MSD cancellation message

Response Messages

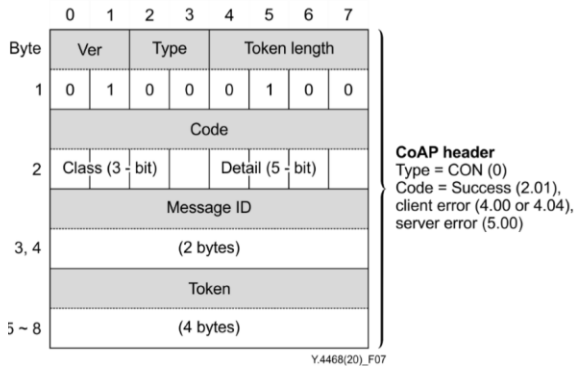
- **Acknowledgement (ACK) response message**
  - ACK type for notifying the successful reception of the message
  - **Response code** for indicating **success or failure of MSD processing result**
  - Token used to **match with request messages** from AEDD
- **Empty ACK message**
  - **ACK type for notifying the successful reception** of the message
  - an empty message code **without any token**
- **Confirmable response message**
  - **Response code for indicating success or failure of** MSD processing result
  - Token used to **match with request messages** from AEDD



ACK response message



Empty ACK message

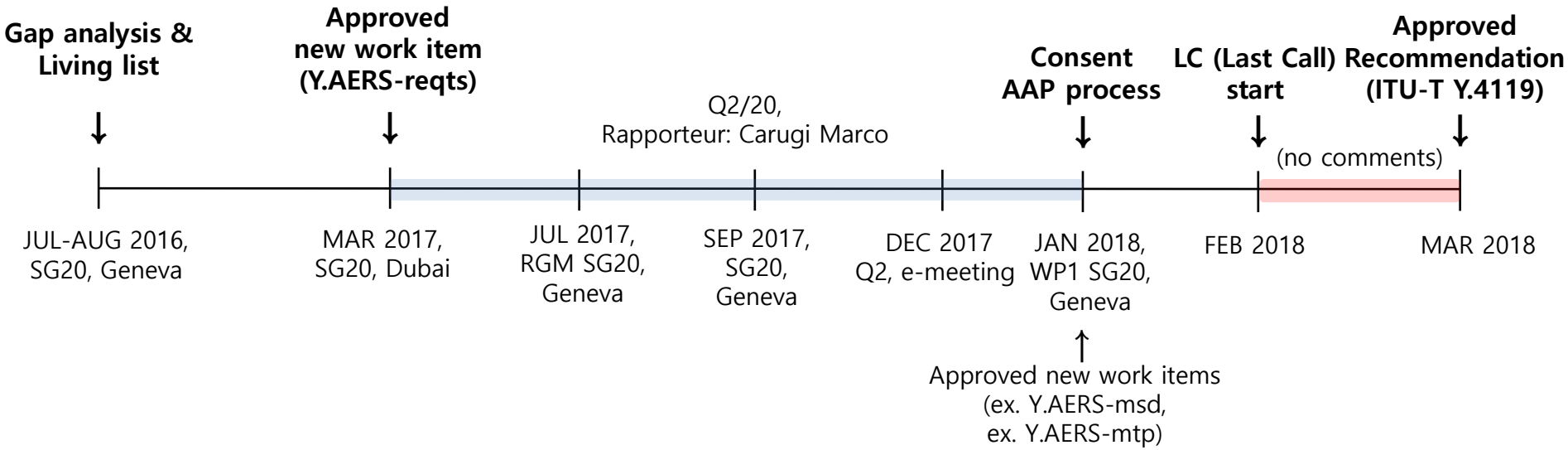


Confirmable response message

Q&A

ITU-T SG20 Q2

- **Q2/20 (WP1/20):** Requirements, capabilities, and use cases across verticals
  - **ITU-T Y.4119:** Requirements and capability framework for IoT-based automotive emergency response system (03/2018)



ITU-T SG20 Q3

- **Q3/20 (WP1/20):** Architectures, management, protocols and Quality of Service
  - **ITU-T Y.4467**: Minimum set of data structure for automotive emergency response system (01/2020)
  - **ITU-T Y.4468**: Minimum set of data transfer protocol for automotive emergency response system (01/2020)