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Next-Generation Vehicle-Initiated Emergency Calls

Abstract

This document describes how to use IP-based emergency services mechanisms to support the next generation of emergency calls placed by vehicles (automatically in the event of a crash or serious incident, or manually invoked by a vehicle occupant) and conveying vehicle, sensor, and location data related to the crash or incident. Such calls are often referred to as "Automatic Crash Notification" (ACN), or "Advanced Automatic Crash Notification" (AACN), even in the case of manual trigger. The "Advanced" qualifier refers to the ability to carry a richer set of data.

This document also registers a MIME media type and Emergency Call Data Type for the vehicle, sensor, and location data (often referred to as "crash data" even though there is not necessarily a crash) and an INFO package to enable carrying this and related data in SIP INFO requests. An external specification for the data format, contents, and structure is referenced in this document.

This document reuses the technical aspects of next-generation Pan-European eCall (a mandated and standardized system for emergency calls by in-vehicle systems (IVSs) within Europe and other regions). However, this document specifies use of a different set of vehicle (crash) data, specifically, the Vehicle Emergency Data Set (VEDS) rather than the eCall Minimum Set of Data (MSD). This document is an extension of the IETF eCall document, with the primary differences being that this document makes the MSD data set optional and VEDS mandatory, and it adds attribute values to the metadata/control object to permit greater functionality. This document registers a new INFO package (identical to that registered for eCall but with the addition of the VEDS MIME type). This document also describes legacy (circuit-switched) ACN systems and their migration to next-generation emergency calling, to provide background information and context.

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 7841.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at http://www.rfc-editor.org/info/rfc8148.

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1. Introduction

Emergency calls made by in-vehicle systems (e.g., automatically in the event of a crash or serious incident or manually by a vehicle occupant) assist in significantly reducing road deaths and injuries by allowing emergency services to respond quickly and appropriately to the specifics of the incident, often with better location accuracy.

Drivers often have a poor location awareness, especially outside of major cities, at night, and when away from home (especially abroad). In the most crucial cases, the victim(s) might not be able to call because they have been injured or trapped.

For more than two decades, some vehicles have been equipped with telematics systems that, among other features, place an emergency call automatically in the event of a crash or manually in response to an emergency call button. Such systems generally have on-board location determination systems that make use of satellite-based positioning technology, inertial sensors, gyroscopes, etc., which can provide an accurate position for the vehicle. Such built-in systems can take advantage of the benefits of being integrated into a vehicle, such as more power capacity, ability to have larger or specialized antenna, ability to be engineered to avoid or minimize degradation by vehicle glass coatings, interference from other vehicle systems, etc. Thus, the Public Safety Answering Point (PSAP) can be provided with a good estimate of where the vehicle is during an emergency. Vehicle manufacturers are increasingly adopting such systems, both for the safety benefits and for the additional features and services they enable (e.g., remote engine diagnostics, remote door unlock, stolen vehicle tracking and disabling, etc.).

A common term for such systems is Automatic Crash Notification (ACN) or Advanced Automatic Crash Notification (AACN). Sometimes the word "Collision" is used instead of "Crash." In this document, "ACN" is used as a general term. ACN systems transmit some amount of data specific to the incident, referred to generally as "crash data" (the term is commonly used even though there might not have been a crash). While different systems transmit different amounts of crash data, standardized formats, structures, and mechanisms are needed to provide interoperability among systems and PSAPs.

As of the date of this document, currently deployed in-vehicle telematics systems are circuit-switched and lack a standards-based ability to convey crash data directly to the PSAP (generally relying on either a human advisor or an automated text-to-speech system to provide the PSAP call taker with some crash data orally, or in some cases via a proprietary mechanism). In most cases, the PSAP call taker needs to first realize that the call is related to a vehicle incident, and then listen to the data and transcribe it. Circuit-switched ACN systems are referred to here as "CS-ACN".

The transition to next-generation emergency calling provides an opportunity to vastly improve the scope, breadth, reliability, and usefulness of crash data by transmitting a standardized set during call setup; the data can be processed by the PSAP in an integrated, automated way and made available to the call taker at call presentation. It also provides the ability for the call taker to request that a vehicle take certain actions, such as flashing lights or unlocking doors. In addition, vehicle manufacturers are provided an opportunity to take advantage of the same standardized mechanisms for data transmission and request processing for internal use if they wish (such as telemetry between the vehicle and a service center for both emergency and non-emergency uses, including location-based services, multimedia entertainment systems, remote door unlocking, remote diagnostics, and roadside assistance applications).

Next-generation ACN provides an opportunity for such calls to be recognized and processed as such during call setup, and routed to an equipped PSAP where the vehicle data is available to assist the call taker in assessing and responding to the situation. Next-generation (IP-based) ACN systems are referred to here as NG-ACN.

An ACN call can be initiated by a vehicle occupant or automatically initiated by vehicle systems in the event of a serious incident. (The "A" in "ACN" does stand for "Automatic", but the term is broadly used to refer to the class of calls that are placed by an in-vehicle system (IVS) or by Telematics Service Providers (TSPs) and that carry incident-related data as well as voice.) Automatically triggered calls indicate a car crash or some other serious incident (e.g., a fire). Manually triggered calls include reports of observed crashes or serious hazards (such as impaired drivers or roadway debris), requests for medical assistance, etc.

The Association of Public-Safety Communications Officials (APCO) and the National Emergency Number Association (NENA) have jointly developed a standardized set of incident-related vehicle data for ACN use, called the Vehicle Emergency Data Set (VEDS) [VEDS]. Such data is often referred to as crash data although it is applicable in incidents other than crashes.

This document describes how the IETF mechanisms for IP-based emergency calls are used to provide the realization of next-generation ACN. Although this specification is designed with the requirements for North America ACN in mind (and both APCO and NENA are based in the U.S.), it is specified generically such that the technology can be reused or extended to suit requirements in other regions.

This document reuses the technical aspects of next-generation Pan-European eCall (a mandated and standardized system for emergency calls by in-vehicle systems within Europe), as described in [RFC8147]. However, this document specifies use of a different set of vehicle (crash) data, specifically, VEDS rather than the eCall Minimum Set of Data (MSD). This document is an extension of [RFC8147], with the differences being that this document makes the MSD data set optional and VEDS mandatory, and it adds new attribute values to the metadata/control object defined in that document. This document also registers a new INFO package (identical to that defined in [RFC8147] with the addition of the VEDS MIME type).

This document registers the application/EmergencyCallData.VEDS+xml MIME media type, the VEDS Emergency Call Data Type, and the EmergencyCallData.VEDS INFO package to enable carrying this and related data in SIP INFO requests.

Section 6 introduces VEDS. Section 7 describes how VEDS data and metadata/control blocks are transported within NG-ACN calls. Section 8 describes how such calls are placed.

These mechanisms are used to place emergency calls that are identifiable as ACN calls and that carry standardized crash data in an interoperable way.

Calls by in-vehicle systems are placed using cellular networks, which might ignore location information sent by an originating device in an emergency call INVITE, instead substituting their own location information (although often determined in cooperation with the originating device). Standardized crash data structures typically include location as determined by the IVS. A benefit of this is that it allows the PSAP to see both the location as determined by the cellular network and the location as determined by the IVS.

This specification inherits the ability to utilize test call functionality from Section 15 of [RFC6881].

2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

This document reuses terminology defined in Section 3 of [RFC5012]. Additionally, we use the following abbreviations:

3GPP: 3rd Generation Partnership Project

AACN: Advanced Automatic Crash Notification

ACN: Automatic Crash Notification

APCO: Association of Public-Safety Communications Officials

EENA: European Emergency Number Association

ESInet: Emergency Services IP network

GNSS: Global Navigation Satellite System (which includes various systems such as the Global Positioning System or GPS)

IVS: In-Vehicle System

MNO: Mobile Network Operator

MSD: Minimum Set of Data

NENA: National Emergency Number Association

NG: Next Generation

POTS: Plain Old Telephone Service (normal, circuit-switched voice calls)

PSAP: Public Safety Answering Point

TSP: Telematics Service Provider

VEDS: Vehicle Emergency Data Set

Because the endpoints of a next-generation ACN call are a PSAP and either an IVS or a TSP, to avoid repetitively writing "IVS or TSP", the term "IVS" is used to represent either an IVS or a TSP when discussing signaling behavior (e.g., sending VEDS data, sending a SIP INVITE request, receiving a SIP INFO request, etc.).

3. Document Scope

This document is focused on how an ACN emergency call is set up and incident-related data (including vehicle, sensor, and location data) is transmitted to the PSAP using IETF specifications. For the direct model, this is the end-to-end description (between the vehicle and the PSAP). For the TSP model, this describes the call leg between the TSP and the PSAP, leaving the call leg between the vehicle and the TSP up to the entities involved (i.e., IVS and TSP vendors) who are free to use the same mechanism for both legs, or not.

Note that Europe has a mandated and standardized system for emergency calls by in-vehicle systems. This Pan-European system is known as "eCall" and is the subject of a separate document, [RFC8147], which this document builds on. Vehicles designed to operate in multiple regions might need to support eCall as well as NG-ACN as described here. A vehicle IVS might determine whether to use eCall or ACN by first determining the region or country in which it is located (e.g., from a GNSS location estimate and/or identity of or information from an MNO). If other regions adopt other data formats, a multi-region vehicle might need to support those as well. This document adopts the call setup and other technical aspects of [RFC8147], which uses [RFC7852]; this makes it straightforward to use a different data set while keeping other technical aspects unchanged. Hence, both next-generation eCall (NG-eCall) and the NG-ACN mechanism described here are compatible, differing primarily in the specific data block that is sent (the eCall MSD in the case of NG-eCall and VEDS in this document) and some additions to the metadata/control data block. If other regions adopt their own vehicle data sets, this can be similarly accommodated without changing other technical aspects. Note that any additional data formats require a new INFO package to permit transport within SIP INFO requests.

4. Overview of Legacy Deployment Models

Legacy (circuit-switched) systems for placing emergency calls by in-vehicle systems generally have some ability to convey at least location and in some cases telematics data to the PSAP. Most such systems use one of three architectural models, which are described here as: "TSP", "direct", and "paired". These three models are illustrated below.

In the TSP model, both emergency and routine TSP service calls are placed to a TSP; a proprietary technique (e.g., a proprietary in-band modem) is used for data transfer between the TSP and the vehicle.

In an emergency, typically a TSP agent verifies the emergency, bridges in the PSAP, and communicates location, crash data (such as impact severity and trauma prediction), and other data (such as the vehicle description) to the PSAP call taker orally (in some cases, a proprietary out-of-band interface is used). Since the TSP knows the location of the vehicle (from on-board GNSS and sensors), location-based routing is usually used to route to the appropriate PSAP. In some cases, the TSP is able to transmit location automatically, using similar techniques as for wireless calls. A three-way voice call is generally established between the vehicle, the TSP, and the PSAP, allowing communication between the PSAP call taker, the TSP agent, and the vehicle occupants (who might be unconscious).

```
   ///----\\\  proprietary  +-----+  911 trunk or POTS   +------+
  ||| IVS |||-------------->| TSP |--------------------->| PSAP |
   \\\----///  crash data   +-----+  location via trunk  +------+
```

Figure 1: Legacy TSP Model

In the paired model, the IVS uses a local link (typically Bluetooth [Bluetooth]) with a previously paired handset to establish an emergency call with the PSAP (by dialing a standard emergency number; 9-1-1 in North America) and then communicates location data to the PSAP via text-to-speech; crash data might or might not be conveyed also using text-to-speech. Some such systems use an automated voice prompt menu for the PSAP call taker (e.g., "this is an automatic emergency call from a vehicle; press 1 to open a voice path to the vehicle; press 2 to hear the location read out") to allow the call taker to request location data via text-to-speech.

```
   ///----\\\   +----+   911/etc. voice call via handset  +------+
  ||| IVS |||-->| HS |----------------------------------->| PSAP |
   \\\----///   +----+   location via text-to-speech      +------+
```

(Note: "HS" is handset.)

Figure 2: Legacy Paired Model

In the direct model, the IVS directly places an emergency call with the PSAP by dialing a standard emergency number (9-1-1 in North America). Such systems might communicate location data to the PSAP via text-to-speech; crash data might or might not be conveyed using text-to-speech. Some such systems use an automated voice prompt menu (e.g., "this is an automatic emergency call from a vehicle; press 1 to open a voice path to the vehicle; press 2 to hear the location read out") to allow the call taker to request location data via text-to-speech.

```
  ///----\\\      911/etc. voice call via IVS        +------+
 ||| IVS  |||---------------------------------------->| PSAP |
  \\\----///    location via text-to-speech         +------+
```

Figure 3: Legacy Direct Model

5. Migration to Next Generation

The migration of emergency calls placed by in-vehicle systems to next-generation (all-IP) technology per this document provides a standardized mechanism to identify such calls and to convey crash data with the call setup, as well as enabling additional communications modalities and enhanced functionality. This allows ACN calls and crash data to be automatically processed by the PSAP and made available to the call taker in an integrated, automated way. Because the crash data is carried in the initial SIP INVITE (per [RFC7852]) the PSAP can present it to the call taker simultaneously with the appearance of the call. The PSAP can also process the data to take other actions (e.g., if multiple calls from the same location arrive when the PSAP is busy and a subset of them are NG-ACN calls, a PSAP might choose to store the information and reject the calls, since the IVS will receive confirmation that the information has been successfully received; a PSAP could also choose to include a message stating that it is aware of the incident and responders are on the way, and a PSAP could call the vehicle back when a call taker is available).

The migration of origination devices and networks, PSAPs, emergency services networks, and other telephony environments to next generation technology provides enhanced interoperability and functionality, especially for emergency calls carrying additional data such as vehicle crash data. (In the U.S., a network specifically for emergency responders is being developed. This network, FirstNet, will be next generation from the start, enhancing the ability for data exchange between PSAPs and responders.)

NG-ACN calls can be recognized as such during call set-up; they can be routed to a PSAP that is prepared both technically and operationally to handle such calls, and the vehicle-determined location and crash data can be processed automatically by the PSAP and made available to the call taker simultaneously with the call appearance. Enhanced functionality includes the ability for the PSAP call taker to request the vehicle to take an action, such as sending an updated set of data, conveying a message to the occupants, flashing lights, unlocking doors, etc.

Vehicle manufacturers using the TSP model can choose to take advantage of the same mechanism to carry telematics data and requests and responses between the vehicle and the TSP for both emergency and non-emergency calls as are used for the interface with the PSAP.

An IVS establishes a next-generation emergency call (see [RFC6443] and [RFC6881]) with an initial INVITE containing a Request-URI indicating an ACN emergency call and Call-Info header fields indicating that both vehicle crash and capabilities data are included; the IVS typically does not perform routing or location queries (relying on the MNO for this).

[RFC8147] registers new service URN children within the "sos" subservice. These URNs request NG-ACN resources and differentiate between manually and automatically triggered NG-ACN calls (which might be subject to different treatment depending on policy). The two service URNs registered in [RFC8147] are "urn:service:sos.ecall.automatic" and "urn:service:sos.ecall.manual". The same service URNs are used for ACN as for eCall since in any region only one of these is supported, making a distinction unnecessary. (Further, PSAP equipment might support multiple data formats, allowing a PSAP to handle a vehicle that erroneously sent the wrong data object.)

Note that in North America, routing queries performed by clients outside of an ESInet typically treat all sub-services of "sos" identically to "sos" with no sub-service. However, the Request-URI header field retains the full sub-service; route and handling decisions within an ESInet or PSAP can take the sub-service into account. For example, in a region with multiple cooperating PSAPs, an NG-ACN call might be routed to a PSAP that is NG-ACN capable, or one that specializes in vehicle-related incidents.

Migration of the three architectural models to next generation (all-IP) is described below.

In the TSP model, the IVS transmits crash and location data to the TSP either by reusing the mechanisms and data objects described in this document or by using a proprietary mechanism. In an emergency, the TSP bridges in the PSAP, and the TSP transmits crash and other data to the PSAP using the mechanisms and data objects described in this document. There is a three-way call between the vehicle, the TSP, and the PSAP, allowing communication between the PSAP call taker, the TSP agent, and the vehicle occupants (who might be unconscious). The TSP relays PSAP requests and vehicle responses.

```
                  proprietary
  ///----\\\    or standard     +-----+     standard      +------+
 ||| IVS |||------------------->| TSP |------------------>| PSAP |
  \\\----///  crash+other data  +-----+  crash+other data  +------+
```

Figure 4: Next-Generation TSP Model

The vehicle manufacturer and the TSP can choose to use the same mechanisms and data objects on the left call leg in Figure 4 as on the right. (Note that the TSP model can be more difficult when the vehicle is in a different country than the TSP (e.g., a US resident driving in Canada) because of the additional complexity in choosing the correct PSAP based on vehicle location performed by a TSP in a different country.)

In the direct model, the IVS communicates crash data to the PSAP directly using the mechanisms and data objects described in this document.

```
  ///----\\\           NG emergency call             +------+
 ||| IVS |||--------------------------------------->| PSAP |
  \\\----///          crash + other data            +------+
```

Figure 5: Next-Generation Direct Model

In the paired model, the IVS uses a local link to a previously paired handset to establish an emergency call with the PSAP; it is unclear what facilities are or will be available for transmitting crash data through the link to the handset for inclusion in an NG emergency call and receiving additional data items from the response. Hence, manufacturers that use the paired model for legacy calls might choose to adopt either the direct or TSP model for next-generation calls.

```
   ///----\\\   (undefined)    +----+      standard       +------+
  ||| IVS |||----------------->| HS |-------------------->| PSAP |
   \\\----///   (undefined)    +----+  crash + other data  +------+
```

Figure 6: Next-Generation Paired Model

Regardless of model, if the call is routed to a PSAP that is not NG-ACN capable, the PSAP ignores (or does not receive) the vehicle data. This is detectable by the IVS or TSP when the status response to the INVITE (e.g., 200 OK) lacks a metadata/control structure acknowledging receipt of the data [RFC8147]. The IVS or TSP then proceeds as it would for a CS-ACN call (e.g., oral conveyance of data).

6. Vehicle Data

APCO and NENA have jointly developed a standardized set of incident-related vehicle data for ACN use, called the Vehicle Emergency Data Set (VEDS) [VEDS]. Such data is often referred to as crash data although it is applicable in incidents other than crashes.

VEDS provides a standard data set for the transmission, exchange, and interpretation of vehicle-related data. A standard data format allows the data to be generated by an IVS or TSP and interpreted by PSAPs, emergency responders, and medical facilities. It includes incident-related information such as airbag deployment, location and compass orientation of the vehicle, spatial orientation of the vehicle (e.g., upright, on a side, roof, or bumper), sensor data that can indicate the potential severity of the crash and the likelihood of severe injuries to the vehicle occupants, etc. This data better informs the PSAP and emergency responders as to the type of response that might be needed. Some of this information has been included in U.S. government guidelines for field triage of injured patients [triage-2008] [triage-2011]. These guidelines are designed to help responders identify the potential existence of severe internal injuries and to make critical decisions about how and where a patient needs to be transported.

VEDS is an XML structure (see [VEDS]) transported in SIP using the application/EmergencyCallData.VEDS+xml MIME media type.

If new data blocks are needed (e.g., in other regions or for enhanced data), the steps required during standardization are briefly summarized below:

- o A set of data is standardized by a Standards Development Organization (SDO) or appropriate organization.

- o A MIME media type for the crash data set is registered with IANA

  - * If the data is specifically for use in emergency calling, the MIME media type is normally under the application type with a subtype starting with EmergencyCallData.

  - * If the data format is XML, then by convention the name has a suffix of "+xml".

- o The item is registered in the "Emergency Call Data Types" registry, as defined in Section 11.1.9 of [RFC7852].

  * For emergency-call-specific formats, the registered name is the root of the MIME media type (not including the EmergencyCallData prefix and any suffix such as "+xml") as described in Section 4.1 of [RFC7852].

- o A new INFO package is registered that permits carrying the new media type, the metadata/control object (defined in [RFC8147]), and for compatibility, the MSD and VEDS objects, in SIP INFO requests.

7. Data Transport

[RFC7852] establishes a general mechanism for including blocks of data within a SIP emergency call. This document makes use of that mechanism. This document also registers an INFO package (in Section 14.7) to enable NG-ACN-related data blocks to be carried in SIP INFO requests (per [RFC6086], new SIP INFO method usages require the definition of an INFO package).

VEDS is an XML structure defined by APCO and NENA [VEDS]. It is carried in a body part with MIME media type application/EmergencyCallData.VEDS+xml.

An IVS transmits a VEDS data block (see [VEDS]) by including it as a body part of a SIP message per [RFC7852]. The body part is identified by its MIME media type (application/EmergencyCallData.VEDS+xml) in the Content-Type header field of the body part. The body part is assigned a unique identifier that is listed in a Content-ID header field in the body part. The SIP message is marked as containing the VEDS data by adding (or appending to) a Call-Info header field at the top level of the SIP message. This Call-Info header field contains a Content Identifier (CID) URL referencing the body part's unique identifier and a "purpose" parameter identifying the data as a VEDS data block per the "Emergency Call Data Types" registry entry; the "purpose" parameter's value is "EmergencyCallData.VEDS". A VEDS data block is carried in a SIP INFO request by using the INFO package defined in Section 14.7.

A PSAP or IVS transmits a metadata/control object (see [RFC8147]) by including it in a SIP message as a MIME body part per [RFC7852]. The body part is identified by its MIME media type (application/EmergencyCallData.Control+xml) in the Content-Type header field of the body part. The body part is assigned a unique identifier that is listed in a Content-ID header field in the body part. The SIP message is marked as containing the metadata/control block by adding (or appending to) a Call-Info header field at the top level of the SIP message. This Call-Info header field contains a CID URL referencing the body part's unique identifier and a "purpose" parameter identifying the data as a metadata/control block per the "Emergency Call Data Types" registry entry; the "purpose" parameter's value is "EmergencyCallData.Control". A metadata/control object is carried in a SIP INFO request by using the INFO package defined in Section 14.7.

A body part containing a VEDS or metadata/control object has a Content-Disposition header field value containing "By-Reference" and is always enclosed in a multipart body part (even if it would otherwise be the only body part in the SIP message).

An IVS initiating an NG-ACN call includes in the initial INVITE a VEDS data block and a metadata/control object informing the PSAP of its capabilities. The VEDS and metadata/control body parts (and Presence Information Data Format Location Object (PIDF-LO)) have a Content-Disposition header field with the value "By-Reference; handling=optional". Specifying handling=optional prevents the INVITE from being rejected if it is processed by a legacy element (e.g., a gateway between SIP and circuit-switched environments) that does not understand the VEDS or metadata/control (or PIDF-LO) objects. The PSAP creates a metadata/control object acknowledging receipt of the VEDS data and includes it in the SIP final response to the INVITE. The metadata/control object is not included in provisional (e.g., 180) responses.

If the IVS receives an acknowledgment for a VEDS data object with received=false, this indicates that the PSAP was unable to properly decode or process the VEDS. The IVS action is not defined (e.g., it might only log an error). Since the PSAP is able to request an updated VEDS during the call, if an initial VEDS is unsatisfactory in any way, the PSAP can choose to request another one.

A PSAP can request that the vehicle send an updated VEDS data block during a call. To do so, the PSAP creates a metadata/control object requesting VEDS data and includes it as a body part of a SIP INFO request sent within the dialog. The IVS then includes an updated VEDS data object as a body part of a SIP INFO request and sends it within the dialog. If the IVS is unable to send the VEDS for any reason, it instead sends a metadata/control object containing an <ack> element acknowledging the request and containing an <actionResult> element with the "success" parameter set to "false" and a "reason" parameter (and optionally a "details" parameter) indicating why the request cannot be accomplished. Per [RFC6086], metadata/control objects and VEDS data are sent using the INFO package defined in Section 14.7. In addition, to align with the way a VEDS or metadata/control block is transmitted in a SIP message other than a SIP INFO request, one or more Call-Info header fields are included in the SIP INFO request referencing the VEDS or metadata/control block. See Section 14.7 for more information on the use of SIP INFO requests within NG-ACN calls.

Any metadata/control object sent by a PSAP can request that the vehicle perform an action (such as sending a data block, flashing lights, providing a camera feed, etc.). The IVS sends an acknowledgment for any request other than a successfully executed send-data action. Multiple requests with the same "action:" value MUST be sent in separate metadata/control body parts (to avoid any ambiguity in the acknowledgment). For each metadata/control block received containing one or more <request> elements (except for successfully executed send-data requests), the IVS sends a metadata/ control object containing an <ack> element acknowledging the received metadata/control block, containing an <actionResult> element per <request> element.

If the IVS is aware that VEDS data it sent previously has changed, it MAY send an unsolicited VEDS in any convenient SIP message, including a SIP INFO request during the call. The PSAP sends an acknowledgment for an unsolicited VEDS object; if the IVS sent the unsolicited VEDS in a SIP INFO request, the acknowledgment is sent in a new SIP INFO request; otherwise, it is sent in the reply to the SIP request containing the VEDS.

8. Call Setup

An IVS initiating an NG-ACN call sends a SIP INVITE request using one of the SOS sub-services "SOS.ecall.automatic" or "SOS.ecall.manual" in the Request-URI. This SIP INVITE request includes standard sets of both crash and capabilities data as described in Section 7.

Entities along the path between the vehicle and the PSAP are able to identify the call as an ACN call and handle it appropriately. The PSAP is able to identify the crash and capabilities data included in the SIP INVITE request by examining the Call-Info header fields for "purpose" parameters whose values start with EmergencyCallData. The PSAP is able to access the data it is capable of handling and is interested in by checking the "purpose" parameter values.

This document extends [RFC8147] by reusing the call setup and other normative requirements with the exception that in this document, support for the eCall MSD is OPTIONAL and support for VEDS is REQUIRED. This document also adds new attribute values to the metadata/control object defined in [RFC8147].

9. New Metadata/Control Values

This document adds new attribute values to the metadata/control structure defined in [RFC8147].

In addition to the base usage from the PSAP to the IVS to acknowledge receipt of crash data, the <ack> element is also contained in a metadata/control block sent by the IVS to the PSAP. This is used by the IVS to acknowledge receipt of a request by the PSAP and indicate if the request was carried out when that request would not otherwise be acknowledged (if the PSAP requests the vehicle to send data and the vehicle does so, the data serves as a success acknowledgment); see Section 8 for details.

The <capabilities> element is used in a metadata/control block sent from the IVS to the PSAP (e.g., in the initial INVITE) to inform the PSAP of the vehicle capabilities. Child elements contain all actions and data types supported by the vehicle and all available lamps (lights) and cameras.

New request values are added to the <request> element to enable the PSAP to request the vehicle to perform additional actions.

Mandatory Actions (the IVS and the PSAP MUST support):

- o Transmit data object (VEDS MUST be supported; MSD MAY be supported)

Optional Actions (the IVS and the PSAP MAY support):

- o Display and/or play static (pre-defined) message
- o Display and/or speak dynamic text (text supplied in action)
- o Flash or turn on or off a lamp (light)
- o Honk horn
- o Lock or unlock doors
- o Enable a camera

The <ack> element indicates the object being acknowledged (i.e., a data object or a metadata/control block containing <request> elements) and reports success or failure.

The <capabilities> element has child <request> elements indicating the actions (including data types, lamps (lights), and cameras) supported by the IVS.

The <request> element contains attributes to indicate the request and to supply any needed information, and it MAY contain a <text> child element to contain the text for a dynamic message. The "action" attribute is mandatory and indicates the specific action. [RFC8147] established an IANA registry to contain the allowed values; this document adds new values to that registry in Table 1.

9.1. New Values for the "action" Attribute

The following new "action" values are defined:

msg-static: displays or plays a pre-defined message (translated as appropriate for the language of the vehicle's interface). A registry is created in Section 14.4 for messages and their IDs. Vehicles include the highest registered message in their <capabilities> element to indicate support for all messages up to and including the indicated value. A registry of message identification values is defined in Section 14.4. There is only one static message initially defined (listed in Table 2). Because all compliant vehicles are expected to support all static messages translated into all languages supported by the vehicle, it is important to limit the number of such messages. Therefore, this registry operates under "Specification Required" rules as defined in [RFC5226], which requires a stable, public document and implies expert review of the publication.

msg-dynamic: displays or speaks (via text-to-speech) a message contained in a child <text> element within the request.

honk: sounds the horn.

lamp: flashes a lamp (light) or turns it on or off. The lamp is identified by a lamp ID token contained in an "element-id" attribute of the request. The desired state of the lamp is either "on", "off", or "flash" as indicated in a "requested-state" attribute. The duration of the lamp's requested state is specified in a "persistence" attribute. A registry of lamp identification values is defined in Section 14.5. The initial values (listed in Table 3) are head, interior, fog-front, fog-rear, brake, brake-center, position-front, position-rear, turn-left, turn-right, and hazard.

enable-camera: adds a one-way media stream (established via SIP re-INVITE sent by the vehicle) to enable the PSAP call taker to view a feed from a camera. A registry of camera identification values is defined in Section 14.6. The initial values (listed in Table 4) are backup, left-rear, right-rear, forward, rear-wide, lane, interior, night-front, night-rear, night-left, and night-right.

door-lock: locks or unlocks all door locks. A "requested-state" attribute contains either "locked" or "unlocked" to indicate if the doors are to be locked or unlocked.

Note that there is no "request" action to play dynamic media (such as an audio message). The PSAP can send a SIP re-INVITE to establish a one-way media stream for this purpose.

9.2. Example <request> Element

```
<?xml version="1.0" encoding="UTF-8"?>
<EmergencyCallData.Control
    xmlns="urn:ietf:params:xml:ns:EmergencyCallData:control"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

<request action="send-data" datatype="VEDS"/>
<request action="lamp" element-id="hazard"
         requested-state="flash" persistence="PT1H"/>
<request action="msg-static" int-id="1"/>
<request action="msg-dynamic">
    <text>Remain calm.  Help is on the way.</text>
</request>

</EmergencyCallData.Control>
```

Figure 7: <request> Example

9.3. The <ack> Element

The <ack> element is transmitted by the PSAP to acknowledge unsolicited data sent by the IVS and transmitted by the IVS to acknowledge receipt of a <request> element other than a successfully performed "send-data" request (e.g., a request to display a message to the vehicle occupants is acknowledged, but a request to transmit VEDS data is not, since the transmitted VEDS serves as acknowledgment). An <ack> element sent by an IVS references the unique ID of the metadata/control object containing the request(s), and for each request being acknowledged, it indicates whether the request was successfully performed, and if not, it indicates why not.

9.3.1. Examples of the <ack> Element

```
<?xml version="1.0" encoding="UTF-8"?>
<EmergencyCallData.Control
    xmlns="urn:ietf:params:xml:ns:EmergencyCallData:control"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

<ack ref="1234567890@atlanta.example.com">
    <actionResult action="msg-dynamic" success="true"/>
    <actionResult action="lamp" success="false" reason="unable"
                  details="The requested lamp is inoperable"/>
</ack>

</EmergencyCallData.Control>
```

Figure 8: Example <ack> from IVS to PSAP

9.4. The <capabilities> Element

The <capabilities> element [RFC8147] is transmitted by the IVS to indicate its capabilities to the PSAP.

The <capabilities> element contains a <request> child element per action supported by the vehicle. The vehicle MUST support sending the VEDS data object and so includes at a minimum a <request> child element with the "action" attribute set to "send-data" and the "supported-values" attribute containing all data blocks supported by the IVS, which MUST include "VEDS". All other actions are OPTIONAL.

If the "msg-static" action is supported, a <request> child element with the "action" attribute set to "msg-static" is included, with the "int-id" attribute set to the highest supported static message supported by the vehicle. A registry is created in Section 14.4 to map "int-id" values to static text messages. By sending the highest supported static message number in its <capabilities> element, the vehicle indicates its support for all static messages in the registry up to and including that value.

If the "lamp" action is supported, a <request> child element with the "action" attribute set to "lamp" is included, with the "supported-values" attribute set to all supported lamp IDs. A registry is created in Section 14.5 to contain lamp ID values.

If the "enable-camera" action is supported, a <request> child element with the "action" attribute set to "enable-camera" is included, with the "supported-values" attribute set to all supported camera IDs. A registry is created in Section 14.6 to contain camera ID values.

9.4.1. Example <capabilities> Element

```
<?xml version="1.0" encoding="UTF-8"?>
<EmergencyCallData.Control
    xmlns="urn:ietf:params:xml:ns:EmergencyCallData:control"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

<capabilities>
    <request action="send-data" supported-values="VEDS"/>
    <request action="lamp"
             supported-values="head;interior;fog-front;
             fog-rear;brake;position-front;position-rear;
             turn-left;turn-right;hazard"/>
    <request action="msg-static" int-id="3"/>
    <request action="msg-dynamic"/>
    <request action="honk"/>
    <request action="enable-camera"
             supported-values="backup; interior"/>
    <request action="door-lock"/>
</capabilities>

</EmergencyCallData.Control>
```

Figure 9: <capabilities> Example

10. Test Calls

An NG-ACN test call is a call that is recognized and treated to some extent as an NG-ACN call but is not given emergency call treatment nor handled by a PSAP call taker. The specific handling of test NG-ACN calls is outside the scope of this document; typically, the test call facility allows the IVS, user, or TSP to verify that an NG-ACN call can be successfully established with voice and/or other media communication. The IVS might also be able to verify that the crash data was successfully received.

This document builds on [RFC8147], which inherits the ability to utilize test call functionality from Section 15 of [RFC6881]. A service URN starting with "test." indicates a test call. Per [RFC8147], "urn:service:test.sos.ecall" is used for test NG-ACN calls.

MNOs, emergency authorities, ESInets, and PSAPs handle a vehicle call requesting the "test" service URN so that the desired functionality is tested, but this is outside the scope of this document. (One possibility is that MNOs route such calls as non-emergency calls to an ESInet, which routes them to a PSAP that supports NG-ACN calls; the PSAP accepts test calls, sends a crash data acknowledgment, and plays an audio clip (for example, saying that the call reached an appropriate PSAP and the vehicle data was successfully processed) in addition to supporting media loopback per [RFC6881].)

Note that since test calls are placed using "test" as the parent service URN and "sos" as a child, such calls are not treated as an emergency call, so some functionality might not apply (such as preemption or availability for devices lacking service ("non-service-initialized" (NSI) devices) if those are available for emergency calls).

11. Example Call Initiation

Figure 10 shows an NG-ACN call initiation. The vehicle initiates an NG-ACN call using an MNO. The MNO routes the call to an ESInet, as for any emergency call. The ESInet routes the call to an appropriate NG-ACN-capable PSAP (using location information and the fact that it is an NG-ACN call). The call is processed by the Emergency Services Routing Proxy (ESRP), as the entry point to the ESInet. The ESRP routes the call to an appropriate NG-ACN-capable PSAP, where the call is handled by a call taker. (In deployments where there is no ESInet, the MNO itself routes the call directly to an appropriate NG-ACN-capable PSAP.)

```
                            +----------------------------------------+
                            |                                        |
            +------------+  |                  +-------+             |
            |            |  |                  | PSAP2 |             |
            |            |  |                  +-------+             |
            | Originating|  |                                        |
            |   Mobile   |  |  +------+    +----------------------+  |
  Vehicle-->|   Network  |--|->| ESRP |--->| PSAP1 --> Call Taker |  |
            |            |  |  +------+    +----------------------+  |
            |            |  |                                        |
            +------------+  |                  +-------+             |
                            |                  | PSAP3 |             |
                            |                  +-------+             |
                            |                                        |
                            |                                        |
                            |                                        |
                            |                ESInet                  |
                            +----------------------------------------+
```

Figure 10: Example Call Initiation

Figure 11 illustrates an example SIP emergency call INVITE request as generated by the IVS. It includes a PIDF-LO with vehicle-determined location information, a VEDS block with crash data, and a metadata/

control block with capabilities data. The INVITE has a request URI containing the urn:service:sos.ecall.automatic service URN. For brevity, the example VEDS block does not show VEDS location information, although this is generally present.

The example VEDS data structure shows information about a crashed vehicle. The example communicates that the car is a model year 2015 Saab 9-5 (a car that does not exist). The front airbag deployed as a consequence of the crash. The <VehicleBodyCategoryCode> indicates that the crashed vehicle is a passenger car (the code is set to "101") and that it is not a convertible (the <ConvertibleIndicator> value is set to "false").

The <VehicleCrashPulse> element provides further information about the crash, namely that the force of impact based on the change in velocity over the duration of the crash pulse was 100 MPH. The principal direction of the force of the impact is set to "12" (which refers to 12 o'clock, corresponding to a frontal collision). This value is in the <CrashPulsePrincipalDirectionOfForceValue> element.

The <CrashPulseRolloverQuarterTurnsValue> indicates the number of quarter turns in concert with a rollover expressed as a number; in our case 1.

No roll bar was deployed, as indicated in <VehicleRollbarDeployedIndicator> being set to "false".

Next, there is information indicating seat belt and seat sensor data for individual seat positions in the vehicle. In our example, information from the driver seat is available (value "1" in the <VehicleSeatLocationCategoryCode> element) showing that the seat belt was monitored (<VehicleSeatbeltMonitoredIndicator> element), the seat belt was fastened (<VehicleSeatbeltFastenedIndicator> element), and the seat sensor determined that the seat was occupied (<VehicleSeatOccupiedIndicator> element).

The weight of the vehicle when empty is listed as 600 kilograms in our example.

The <SevereInjuryIndicator> element is set to "true", indicating a likelihood that a vehicle occupant has suffered a severe injury requiring immediate trauma care.

Additional information is provided, including the presence of fuel leakage (<FuelLeakingIndicator> element), an indication whether the vehicle was subjected to multiple impacts (<MultipleImpactsIndicator> element), the orientation of the vehicle at final rest (<VehicleFinalRestOrientationCategoryCode> element), and an indication that no parts of the vehicle are currently detected as being on fire (the <VehicleFireIndicator> element).

```
INVITE urn:service:sos.ecall.automatic SIP/2.0
To: urn:service:sos.ecall.automatic
From: <sip:+13145551111@example.com>;tag=9fxced76sl
Call-ID: 3848276298220188511@atlanta.example.com
Geolocation: <cid:target123@example.com>
Geolocation-Routing: no
Call-Info: <cid:1234567890@atlanta.example.com>;
           purpose=EmergencyCallData.VEDS
Call-Info: <cid:1234567892@atlanta.example.com>;
           purpose=EmergencyCallData.Control
Accept: application/sdp, application/pidf+xml,
        application/EmergencyCallData.Control+xml
Recv-Info: EmergencyCallData.eCall
Allow: INVITE, ACK, PRACK, INFO, OPTIONS, CANCEL, REFER, BYE,
       SUBSCRIBE, NOTIFY, UPDATE
CSeq: 31862 INVITE
Content-Type: multipart/mixed; boundary=boundary1
Content-Length: ...

--boundary1
Content-Type: application/sdp

...Session Description Protocol (SDP) goes here

--boundary1
 Content-Type: application/pidf+xml
 Content-ID: <target123@atlanta.example.com>
 Content-Disposition: by-reference;handling=optional

 <?xml version="1.0" encoding="UTF-8"?>
 <presence
    xmlns="urn:ietf:params:xml:ns:pidf"
    xmlns:dm="urn:ietf:params:xml:ns:pidf:data-model"
    xmlns:gp="urn:ietf:params:xml:ns:pidf:geopriv10"
    xmlns:dyn="urn:ietf:params:xml:ns:pidf:geopriv10:dynamic"
    xmlns:gml="http://www.opengis.net/gml"
    xmlns:gs="http://www.opengis.net/pidflo/1.0"
    entity="sip:+13145551111@example.com">
    <dm:device id="123">
        <gp:geopriv>
            <gp:location-info>
                <gml:Point srsName="urn:ogc:def:crs:EPSG::4326">
                   <gml:pos>-34.407 150.883</gml:pos>
                </gml:Point>
                 <dyn:Dynamic>
```

```
                         <dyn:heading>278</dyn:heading>
                         <dyn:direction></dyn:direction>
                      </dyn:Dynamic>
                 </gp:location-info>
                 <gp:usage-rules/>
                 <method>gps</method>
             </gp:geopriv>
             <timestamp>2012-04-5T10:18:29Z</timestamp>
             <dm:deviceID>1M8GDM9A_KP042788</dm:deviceID>
         </dm:device>
  </presence>

      --boundary1
      Content-Type: application/EmergencyCallData.VEDS+xml
      Content-ID: <1234567890@atlanta.example.com>
      Content-Disposition: by-reference;handling=optional

      <?xml version="1.0" encoding="UTF-8"?>
      <AutomatedCrashNotification xmlns="http://www.veds.org/acn/1.0"
          xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

      <Crash>
          <CrashVehicle>
              <ItemMakeName xmlns="http://niem.gov/niem/niem-core/2.0">
                  Saab
              </ItemMakeName>
              <ItemModelName xmlns="http://niem.gov/niem/niem-core/2.0">
                  9-5
              </ItemModelName>
              <ItemModelYearDate
                  xmlns="http://niem.gov/niem/niem-core/2.0">
                  2015
              </ItemModelYearDate>
              <Airbag>
                  <AirbagCategoryCode>FRONT</AirbagCategoryCode>
                  <AirbagDeployedIndicator>true
                  </AirbagDeployedIndicator>
              </Airbag>
              <ConvertibleIndicator>false</ConvertibleIndicator>
              <PowerSourceCategoryCode>MAIN</PowerSourceCategoryCode>
              <VehicleBodyCategoryCode
                  xmlns="http://niem.gov/niem/domains/jxdm/4.1">
                  101
              </VehicleBodyCategoryCode>
              <VehicleCrashPulse>
                  <CrashPulseChangeInVelocityMeasure>
                      <MeasurePointValue
                          xmlns="http://niem.gov/niem/niem-core/2.0">
```

```
                            100
                        </MeasurePointValue>
                        <MeasureUnitText
                            xmlns="http://niem.gov/niem/niem-core/2.0">
                            MPH</MeasureUnitText>
                     </CrashPulseChangeInVelocityMeasure>
                            <CrashPulsePrincipalDirectionOfForceValue>12
                            </CrashPulsePrincipalDirectionOfForceValue>
                    <CrashPulseRolloverQuarterTurnsValue>1
                    </CrashPulseRolloverQuarterTurnsValue>
                </VehicleCrashPulse>
                <VehicleRollbarDeployedIndicator>false
                </VehicleRollbarDeployedIndicator>
                <VehicleSeat>
                    <VehicleSeatLocationCategoryCode>1
                    </VehicleSeatLocationCategoryCode>
                    <VehicleSeatOccupiedIndicator>true
                    </VehicleSeatOccupiedIndicator>
                    <VehicleSeatbeltFastenedIndicator>true
                    </VehicleSeatbeltFastenedIndicator>
                    <VehicleSeatbeltMonitoredIndicator>true
                    </VehicleSeatbeltMonitoredIndicator>
                </VehicleSeat>
                <VehicleUnladenWeightMeasure
                    xmlns="http://niem.gov/niem/niem-core/2.0">
                    <MeasurePointValue
                        xmlns="http://niem.gov/niem/niem-core/2.0">
                        600
                        </MeasurePointValue>
                    <MeasureUnitText
                        xmlns="http://niem.gov/niem/niem-core/2.0">
                        kilogram
                    </MeasureUnitText>
                </VehicleUnladenWeightMeasure>
            </CrashVehicle>
            <FuelLeakingIndicator>true</FuelLeakingIndicator>
            <MultipleImpactsIndicator>false</MultipleImpactsIndicator>
            <SevereInjuryIndicator>true</SevereInjuryIndicator>
            <VehicleFinalRestOrientationCategoryCode>Driver
            </VehicleFinalRestOrientationCategoryCode>
            <VehicleFireIndicator>false</VehicleFireIndicator>
        </Crash>
    </AutomatedCrashNotification>
```


```
        --boundary1
        Content-Type: application/EmergencyCallData.Control+xml
        Content-ID: <1234567892@atlanta.example.com>
        Content-Disposition: by-reference;handling=optional
```

```
<?xml version="1.0" encoding="UTF-8"?>
<EmergencyCallData.Control
     xmlns="urn:ietf:params:xml:ns:EmergencyCallData:control"
     xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

 <capabilities>
     <request action="send-data" supported-datatypes="VEDS"/>
     <request action="lamp"
              supported-values="head;interior;fog-front;fog-rear;
              brake;position-front;position-rear;turn-left;
              turn-right;hazard"/>
     <request action="msg-static" int-id="3"/>
     <request action="msg-dynamic"/>
     <request action="honk"/>
     <request action="enable-camera"
              supported-values="backup;interior"/>
     <request action="door-lock"/>
 </capabilities>

</EmergencyCallData.Control>

--boundary1--
```


Figure 11: SIP INVITE for a Vehicle-Initiated Emergency Call

12. Security Considerations

Since this document relies on [RFC8147] and [RFC7852], the security considerations described in those specifications apply here. The security considerations of [RFC5069] apply as well. Implementors are cautioned to read and understand the discussion in those documents.

In emergency service systems where location data is supplied or determined with the assistance of an end host, it is possible that the location is incorrect, either intentionally (e.g., in a denial-of-service attack against the emergency services infrastructure) or due to a malfunctioning device. The reader is referred to [RFC7378] for a discussion of some of these vulnerabilities.

In addition to the security considerations discussion specific to the metadata/control object in [RFC8147], note that vehicles MAY decline to carry out any requested action (e.g., if the vehicle requires but is unable to verify the certificate used to sign the request). The vehicle MAY use any value in the reason registry to indicate why it did not take an action (e.g., the generic "unable" or the more specific "security-failure"). Because some actions carry more potential risk than others (e.g., unlocking a door versus flashing lights), vehicle policy MAY decline to carry out some requests in some circumstances (e.g., decline a request to unlock doors, send an updated VEDS, or enable a camera received in a vehicle-terminated call while carrying out such requests received in a vehicle-initiated emergency call).

13. Privacy Considerations

Since this document builds on [RFC8147], which itself builds on [RFC7852], the data structures specified there, and the corresponding privacy considerations discussed there, apply here as well. The VEDS data structure contains optional elements that can carry identifying and personal information, both about the vehicle and about the owner, as well as location information, so it needs to be protected against unauthorized disclosure, as discussed in [RFC7852]. Local regulations may impose additional privacy protection requirements.

The additional functionality enabled by this document, such as access to vehicle camera streams, carries a burden of protection, so implementations need to be careful that access is only provided within the context of an emergency call or to an emergency services provider (e.g., by verifying that the request for camera access is signed by a certificate issued by an emergency services registrar).

14. IANA Considerations

This document registers the application/EmergencyCallData.VEDS+xml MIME media type and adds "VEDS" to the "Emergency Call Data Types" registry. This document adds to and creates sub-registries in the "Emergency Call Metadata/Control Data" registry created in [RFC8147]. In addition, this document registers a new INFO package.

14.1. MIME Media Type Registration for application/EmergencyCall.VEDS+xml

IANA has registered a new MIME media type according to the procedures of [RFC6838] and guidelines in [RFC7303].

MIME media type name: application

MIME subtype name: EmergencyCallData.VEDS+xml

Mandatory parameters: none

Optional parameters: charset
Indicates the character encoding of enclosed XML.

Encoding considerations:
Uses XML, which can employ 8-bit characters, depending on the character encoding used. See Section 3.2 of RFC 7303 [RFC7303].

Security considerations:
This media type is designed to carry vehicle crash data during an emergency call.

This data can contain personal information including vehicle VIN, location, direction, etc. Appropriate precautions need to be taken to limit unauthorized access, inappropriate disclosure to third parties, and eavesdropping of this information. Please refer to Sections 9 and 10 of [RFC7852] for more information.

When this media type is contained in a signed or encrypted body part, the enclosing multipart (e.g., multipart/signed or multipart/encrypted) has the same Content-ID as the data part. This allows an entity to identify and access the data blocks it is interested in without having to dive deeply into the message structure or decrypt parts it is not interested in. (The "purpose" parameter in a Call-Info header field identifies the data, and the CID URL points to the data block in the body, which has a matching Content-ID body part header field.)

Interoperability considerations: None

Published specification: [VEDS]

Applications which use this media type: Emergency Services

Additional information: None

Magic Number: None

File Extension: .xml

Macintosh file type code: TEXT

Persons and email addresses for further information:
Randall Gellens, rg+ietf@randy.pensive.org;
Hannes Tschofenig, Hannes.Tschofenig@gmx.net

Intended usage: LIMITED USE

Author:
This specification is a work item of the IETF ECRIT working group, with mailing list address <ecrit@ietf.org>.

Change controller: The IESG <ietf@ietf.org>

14.2. Registration of the "VEDS" Entry in the Emergency Call Data Types Registry

IANA has added "VEDS" to the "Emergency Call Data Types" registry, with a reference to this document; the "Data About" value is "The Call". The "Emergency Call Data Types" registry was established by [RFC7852].

14.3. New Action Values

This document adds new values for the "action" attribute of the <request> element in the "Emergency Call Action" registry created by [RFC8147].

Name	Description
msg-static	Section 9.1 of RFC 8148
msg-dynamic	Section 9.1 of RFC 8148
honk	Section 9.1 of RFC 8148
lamp	Section 9.1 of RFC 8148
enable-camera	Section 9.1 of RFC 8148
door-lock	Section 9.1 of RFC 8148

Table 1: Emergency Call Action Registry New Values

14.4. Emergency Call Static Messages Registry

This document creates a new sub-registry called "Emergency Call Static Messages" in the "Emergency Call Metadata/Control Data" registry established by [RFC8147]. Because compliant vehicles are expected to support all static messages translated into all languages supported by the vehicle, it is important to limit the number of such messages. As defined in [RFC5226], this registry operates under "Specification Required", which requires a stable, public document and implies expert review of the publication. The expert should determine that the document has been published by an appropriate emergency services organization (e.g., NENA, EENA, or APCO) or by the IETF with input from an emergency services organization, and that the proposed message is sufficiently distinguishable from other messages.

The contents of this registry are:

ID: An integer identifier to be used in the "int-id" attribute of a metadata/control <request> element.

Message: The text of the message. Messages are listed in the registry in English; vehicles are expected to implement translations into languages supported by the vehicle.

When new messages are added to the registry, the message text is determined by the registrant; IANA assigns the IDs. Each message is assigned a consecutive integer value as its ID. This allows an IVS to indicate by a single integer value that it supports all messages with that value or lower. The value 0 is reserved; usable messages start with 1.

The initial set of values is listed in Table 2.

ID	Message
0	Reserved
1	Emergency services has received your information and location but cannot speak with you right now. We will get help to you as soon as possible.

Table 2: Emergency Call Static Messages Registry Initial Values

14.5. Emergency Call Vehicle Lamp IDs Registry

This document creates a new sub-registry called "Emergency Call Vehicle Lamp IDs" in the "Emergency Call Metadata/Control Data" registry established by [RFC8147]. This new sub-registry uniquely identifies the names of automotive lamps (lights). As defined in [RFC5226], this registry operates under "Expert Review" rules. The expert should determine that the proposed lamp name is clearly understandable and is sufficiently distinguishable from other lamp names.

The contents of this registry are:

Name: The identifier to be used in the "element-id" attribute of a metadata/control <request> element.

Description: A description of the lamp (light).

The initial set of values is listed in Table 3.

Name	Description
head	The main lamps used to light the road ahead
interior	Interior lamp, often at the top center
fog-front	Front fog lamps
fog-rear	Rear fog lamps
brake	Brake indicator lamps
brake-center	Center high-mounted stop lamp
position-front	Front position/parking/standing lamps
position-rear	Rear position/parking/standing lamps
turn-left	Left turn/directional lamps
turn-right	Right turn/directional lamps
hazard	Hazard/four-way lamps

Table 3: Emergency Call Lamp ID Registry Initial Values

14.6. Emergency Call Vehicle Camera IDs Registry

This document creates a new sub-registry called "Emergency Call Vehicle Camera IDs" in the "Emergency Call Metadata/Control Data" registry established by [RFC8147]. This new sub-registry uniquely identifies automotive cameras. As defined in [RFC5226], this registry operates under "Expert Review" rules. The expert should determine that the proposed camera name is clearly understandable and is sufficiently distinguishable from other camera names.

The contents of this registry are:

Name: The identifier to be used in the "element-id" attribute of a control <request> element.

Description: A description of the camera.

The initial set of values is listed in Table 4.

Name	Description
backup	Shows what is behind the vehicle, e.g., often used for driver display when the vehicle is in reverse. Also known as rearview, reverse, rear visibility, etc.
left-rear	Shows view to the left and behind (e.g., left-side rearview mirror or blind spot view)
right-rear	Shows view to the right and behind (e.g., right-side rearview mirror or blind spot view)
forward	Shows what is in front of the vehicle
rear-wide	Shows what is behind the vehicle (e.g., used by rear-collision detection systems), separate from backup view
lane	Used by systems to identify road lane and/or monitor the vehicle's position within lane
interior	Shows the interior (e.g., driver)
night-front	Night-vision view of what is in front of the vehicle
night-rear	Night-vision view of what is behind the vehicle
night-left	Night-vision view of what is to the left of the vehicle
night-right	Night-vision view of what is to the right of the vehicle

Table 4: Emergency Call Vehicle Camera IDs Registry Initial Values

14.7. The EmergencyCallData.VEDS INFO Package

This document registers the EmergencyCallData.VEDS INFO package in the "Info Packages Registry".

Both endpoints (the IVS and the PSAP equipment) include "EmergencyCallData.VEDS" in a Recv-Info header field per [RFC6086] to indicate the ability to receive SIP INFO messages carrying data as described here.

Support for the EmergencyCallData.VEDS INFO package indicates the ability to receive NG-ACN-related body parts as specified in this document.

A SIP INFO request message carrying data related to an emergency call as described in this document has an Info-Package header field set to "EmergencyCallData.VEDS" per [RFC6086].

The requirements of Section 10 of [RFC6086] are addressed in the following sections.

14.7.1. Overall Description

This section describes what type of information is carried in INFO requests associated with the INFO package and for what types of applications and functionalities User Agents (UAs) can use the INFO package.

SIP INFO requests associated with the EmergencyCallData.VEDS INFO package carry data associated with emergency calls as defined in this document. The application is vehicle-initiated emergency calls established using SIP. The functionality is to carry vehicle data and metadata/control information between vehicles and PSAPs.

14.7.2. Applicability

This section describes why the INFO package mechanism, rather than some other mechanism, has been chosen for the specific use case.

The use of the SIP INFO method is based on an analysis of the requirements against the intent and effects of the INFO method versus other approaches (which included the SIP MESSAGE method, SIP OPTIONS method, SIP re-INVITE method, media-plane transport, and non-SIP protocols). In particular, the transport of emergency call data blocks occurs within a SIP emergency dialog, per Section 7, and is normally carried in the initial INVITE request and its response; the use of the INFO method only occurs when emergency-call-related data needs to be sent mid call. While the SIP MESSAGE method could be used, it is not tied to a SIP dialog as is the INFO method and thus might not be associated with the dialog. Both the SIP OPTIONS or re-INVITE methods could also be used, but they are seen as less clean than the INFO method. The SIP SUBSCRIBE/NOTIFY method could be coerced into service, but the semantics are not a good fit, e.g., the subscribe/notify mechanism provides one-way communication consisting of (often multiple) notifications from notifier to subscriber indicating that certain events in the notifier have occurred, whereas what's needed here is two-way communication of data related to the emergency dialog. Use of media-plane mechanisms was discounted because the number of messages needing to be exchanged in a dialog is normally zero or very few, and the size of the data is likewise very small. The overhead caused by user-plane setup (e.g., to use the Message Session Relay Protocol (MSRP) as transport) would be disproportionately large.

Based on the analyses, the SIP INFO method was chosen to provide for mid-call data transport.

14.7.3. INFO Package Name

The INFO package name is EmergencyCallData.VEDS.

14.7.4. INFO Package Parameters

None

14.7.5. SIP Option-Tags

None

14.7.6. INFO Request Body Parts

The body of an EmergencyCallData.VEDS INFO package is a multipart body containing zero or one application/EmergencyCallData.VEDS+xml parts (containing a VEDS data block), zero or more application/EmergencyCallData.Control+xml (containing a metadata/control object) parts, and zero or one application/EmergencyCallData.eCall.MSD parts (containing an MSD). At least one VEDS, MSD, or metadata/control body part is expected; the behavior upon receiving a SIP INFO request with none is undefined.

The body parts are sent per [RFC6086]; in addition, to align with how these body parts are sent in non-INFO messages, each associated body part is referenced by a Call-Info header field at the top level of the SIP message. The body part has a Content-Disposition header field set to "By-Reference".

A VEDS, metadata/control block, or MSD is always enclosed in a multipart body part (even if it would otherwise be the only body part in the SIP message). The outermost multipart that contains only body parts associated with the INFO package has a Content-Disposition value of "Info-Package".

Service providers in the call path are not expected to add Additional Data [RFC7852] to SIP INFO requests (as they would to an initial INVITE request).

14.7.7. INFO Package Usage Restrictions

Usage is limited to vehicle-initiated emergency calls as defined in this document.

14.7.8. Rate of INFO Requests

The SIP INFO request is used within an established emergency call dialog to send requests, updated data, or an acknowledgment. Because requests are normally sent only on manual action of the PSAP call taker (who suspects some aspect of the vehicle state has changed) and updated data is sent only when an aspect of previously sent data has changed, the rate of SIP INFO requests associated with the EmergencyCallData.VEDS INFO package is normally quite low (most dialogs are likely to contain zero SIP INFO requests, while others can be expected to carry an occasional request).

14.7.9. INFO Package Security Considerations

The MIME media type registrations for the data blocks that can be carried using this INFO package contains a discussion of the security and/or privacy considerations specific to that data block. See Sections 12 and 13 for information on the security and privacy considerations of the data carried in vehicle-initiated emergency calls.

14.7.10. Implementation Details

See Sections 7 and 8 for protocol details.

14.7.11. Examples

See Section 11 for protocol examples.

15. References

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