eCall Specification

AirPrime eCall

SIERRA WIRELESS®

4115556
13.0
March 20, 2014

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Document History

Version	Date	Updates
1	10/06/2011	Creation
2	13/10/2011	
3	17/10/2011	eCall Access, eCall Manager State Diagrams
4	26/10/2011	eCall Access state diagram and requirements update
5	07/11/2011	2 New AT commands required
6	10/11/2011	AT commands requirements change
7	29/11/2011	Updated eCall Manager. Added eCall Access requirement
8	13/12/2011	Added UML Activity diagrams in System Workflows, Chapter 6
9	15/12/2011	Added eCall Manager states and transition events Tables
10	16/12/2011	Introduction revised
11	12/01/2012	Introduction revised, minor changes
12	21/02/2012	External eCall Manager: On “Start” msg, wait for eCallManager config for 2 second.
13	March 20, 2014	Sierra Wireless reformatting. Legal boilerplate updated per Sierra Wireless requirements.

Contents

List of Figures

1. Overview

1.1. Scope of the document

This document is an early version of requirements specification for Sierra Wireless NADs (Network Access Devices) products providing eCall functions.

eCall key normative figures are depicted in Chapter 2.

The native network access capabilities of Sierra Wireless NADs have been extended to cover eCall service access functionnalities. NAD products are designed to be integrated into an IVS.

The following types of Sierra Wireless NAD are addressed in this document and allow 3 different architectures:

1. Sierra Wireless NAD without built-in GNSS
2. Sierra Wireless NAD with built-in GNSS
3. Sierra Wireless Standalone NAD

An external processor running eCall high level application is required to drive “Sierra Wireless NAD without built-in GNSS” and “Sierra Wireless NAD without built-in GNSS” as a modem through serial lines and AT commands. eCall management logic, named as eCall Manager, is implemented in the high level IVS application. Sierra Wireless Standalone NAD provides further features as the eCall Manager is embedded into the NAD. In both cases, network access and eCall service access burdens are undertaken by the NAD. Car Equipement Supplier integrating Sierra Wireless NAD products can therefore reduce the risk exposure and time to market.

Chapter 3 describes the functional architecture. The entire eCall system workflow covering from eCall trigger initiated on CAN Bus, setting up eCall, sending MSD to PSAP, providing visual feedback to passengers, clearing down the call, handling PSAP callback, and finally to terminating the call, have been taken into consideration to propose this functional architecture. The aforementioned eCall functions splitting between high level IVS application and the first 2 solutions of Sierra Wireless NAD is described in §3.2. Functional components are described in §3.3.

Requirements for Sierra Wireless NADs are provided in chapter 4.

Requirements specific to Sierra Wireless Standalone NAD are being drafted in chapter 5. Requirements defined in chapter 4 are applicable to Standalone NAD which encapsulates the eCall Manager functional entity to handle the entire eCall procedure. Hence, an external processor running eCall high level application is no longer required in the IVS. GPIO and serial interfaces are used to trigger eCall and to provision vehicle related information onto the NAD.

eCall normative timer values and NAD parameters are listed in Annexe.

The eCall reuses and adapts the same procedures as for a normal emergency call. Everything that applies to emergency calls applies to eCall and eCall relies on features normally provided by a cellular product. These features, such as SIM/USIM access, cell search procedure, emergency call setup, etc, are out of the scope of this specification.

1.2. Limitations

Sierra Wireless NAD is not an eCall-only product and normative requirements for an eCall-only IVS (e.g. do not perform localization updating procedure) do not apply to it. Normative documents do not mandate the IVS be eCall-only. On the contrary, they specify eCall-only and non-eCall-only IVS.

1.3. Reference documents

[1] ISO EN 15722; Road transport and traffic telematics, eSafety, 'eCall' minimum set of data

[2] ISO EN 16062; Intelligent transport systems - ESafety - ECall high level application requirements (HLAP)

[3] ISO EN 16072; Intelligent transport systems, eSafety, Pan European eCall - Operating requirements

[4] prEN 2782442; Intelligent transport systems, eSafety, Third party support for eCall – Operating requirements

[5] ETSI TS 122 101; Universal Mobile Telecommunications System (UMTS); LTE; Service aspects; Service principles [Release 8]

[6] ETSI TS 124 008; Universal Mobile Telecommunications System (UMTS); LTE; Mobile radio interface Layer 3 specification; Core network protocols; Stage 3 [Release 8]

[7] ETSI TS 126 267; eCall data transfer - in-band modem solution; general description [Release 8]

[8] ETSI TS 126 268; eCall data transfer - in-band modem solution; ANSI-C reference code [Release 8]

[9] ETSI TS 126 269; eCall data transfer - in-band modem solution; conformance testing [Release 8]

[10] ETSI TS 122 003; Universal Mobile Telecommunications System (UMTS); LTE; Circuit Teleservices supported by a Public Land Mobile Network (PLMN). (Teleservice 12/TC12) /E12) [Release 8]

[11] ETSI TS 122 011; Universal mobile telecommunications system (UMTS); LTE; Service accessibility [Release 8]

[12] ETSI TS 127 007; Universal mobile telecommunications system (UMTS); AT command set for user equipment [Release 8]

[13] ETSI TS 102 164; Telecommunications and internet converged services and protocols for advanced networking (TISPAN); Emergency location protocols [version 1.3.1]

[14] ETSI TS 151 010-1; Mobile Station (MS) conformance specification; Part 1: Conformance specification, version 9.3.0 [Release 9]

[15] ETSI TS 124 123; Universal Mobile Telecommunications System (UMTS);User Equipment (UE) conformance specification; Part 1: Protocol conformance specification, version 8.6.0 [Release 8]

[16] ETSI TS 121 133; Universal Mobile Telecommunications System (UMTS); 3G security; Security threats and requirements; version 4.1.0 [Release 4]

[17] ETSI TS 122 071; Universal mobile telecommunications system (UMTS); LTE; Location services (LCS); Service description; Stage 1 [Release 8]

[18] ISO/IEC 9646; Information technology - Open Systems Interconnection - Conformance testing methodology and framework

[19] ETSI TS 123 122; Universal mobile telecommunications system (UMTS); NAS Functions related to Mobile Station (MS) in idle mode [Release 99]

[20] ETSI TS 131 102; Universal Mobile Telecommunications System (UMTS); LTE; Characteristics of the Universal Subscriber Identity Module (USIM) application [Release 8]

[21] ETSI TR 102 937; eCall communications equipment; Conformance to EU vehicle regulations, R&TTE, EMC & LV Directives, and EU regulations for eCall implementation; verion 1.1.1

1.4. Abbreviations & Definitions

External eCall Manager : eCall Manager functional entity located outside of Sierra Wireless NADs: NAD without built-in GNSS (§3.2.1) and NAD with Built-in GNSS (§3.2.2)

GNSS : Global Navigation Satellite Systems

Internal eCall Manager : eCall Manager functional entity implemented inside Sierra Wireless Standalone NAD (§1)

IVS : In-Vehicule System, embeds intelligent applications interacting with the vehicle and remote services. IVS comprises NAD and a set of functional components.

MSD : Minimum Set of Data

NAD : Network Access Device, hardware component providing access to GSM/GPRS/3G network. NAD may embed additional software components to extend the NAD capabilities.

URC : Unsollicited Result Code

VIN : Vehicle Identification Number

2. eCall Overview

The following figures come from [2] and explain the general principles of eCall.

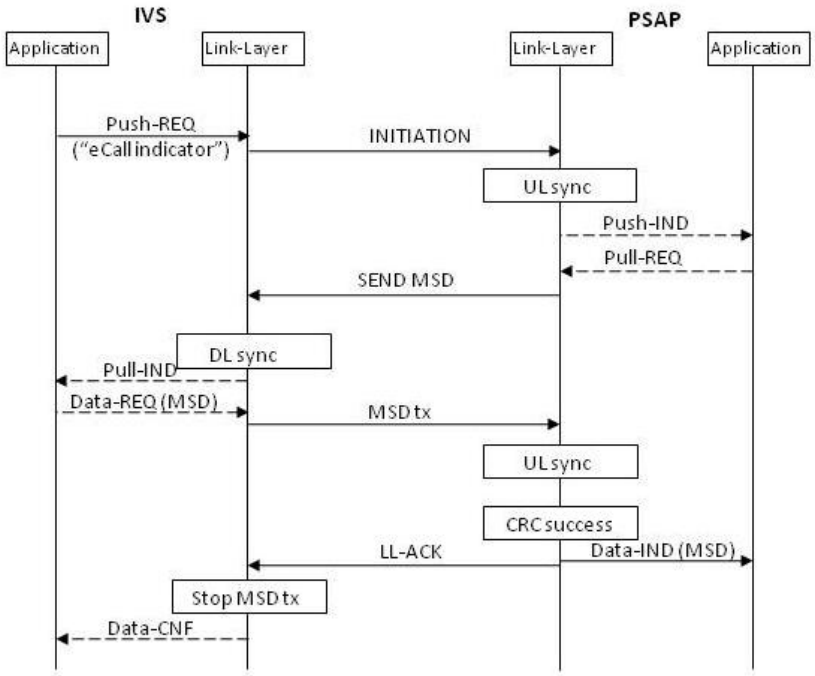


Figure 1: MSD Transfert

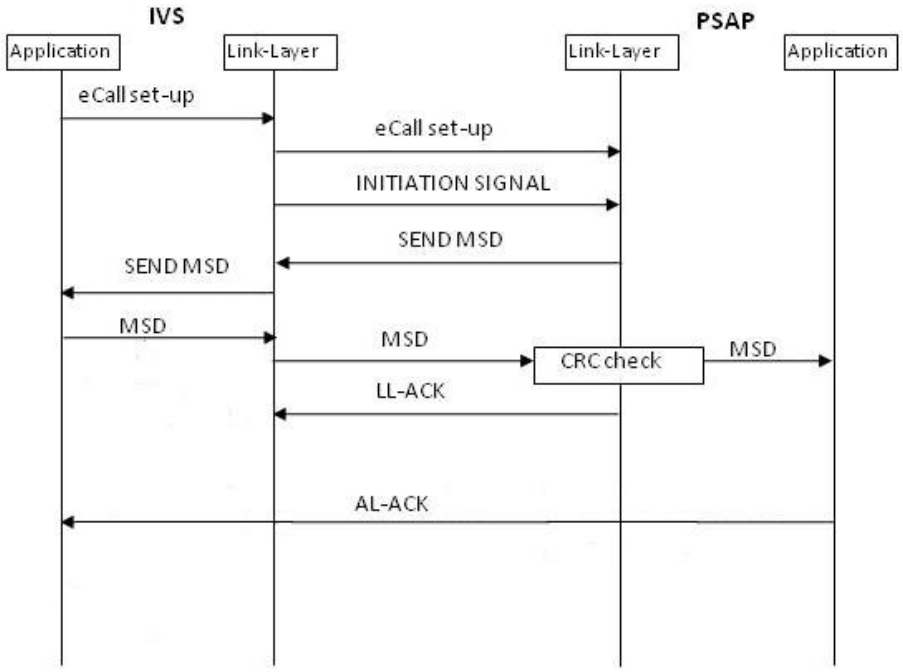


Figure 2: AL-ACK Transmission Sequence for SEND MSD Request

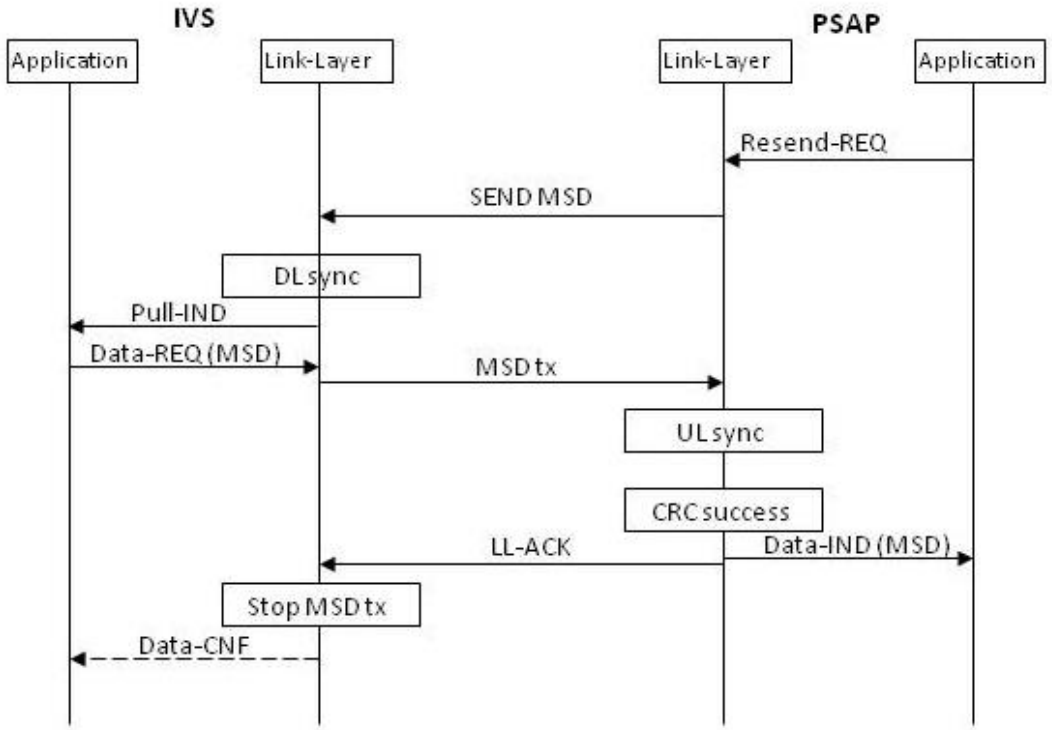


Figure 3: Request to Resend the MSD

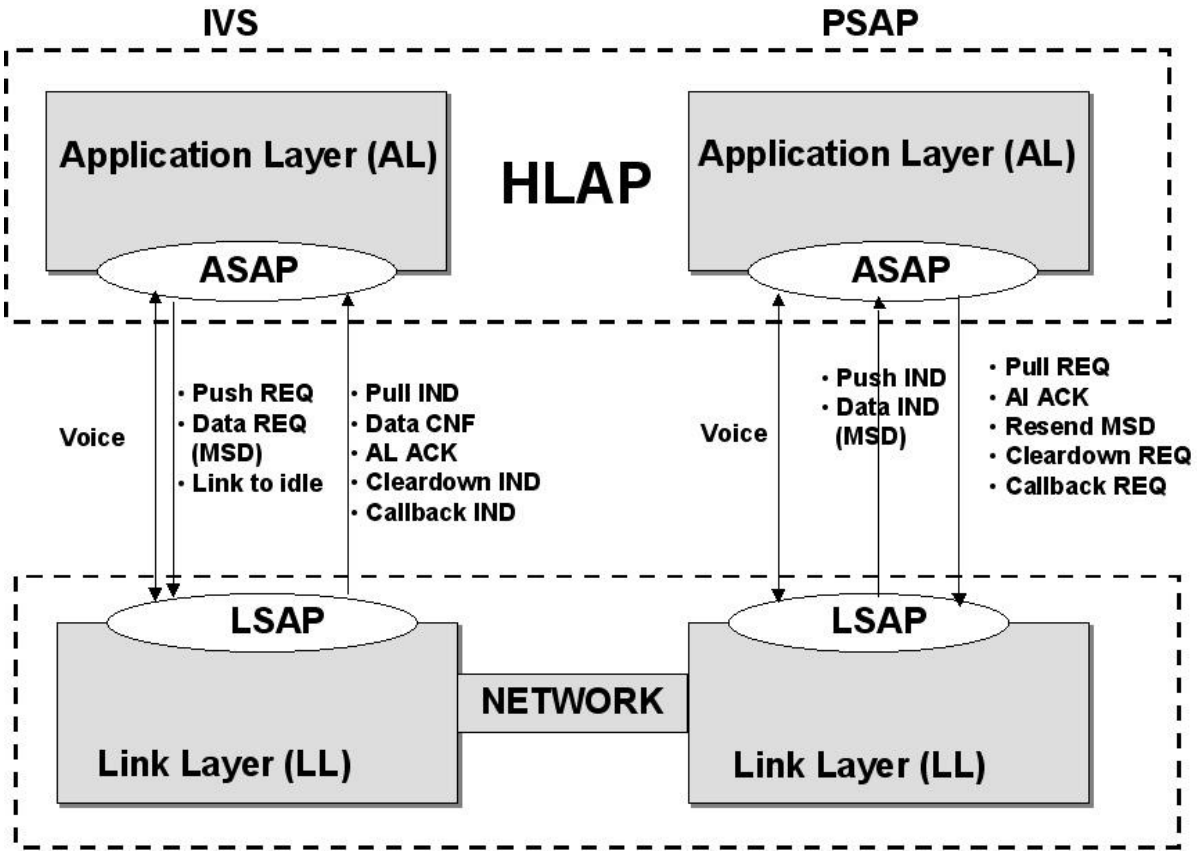


Figure 4: Interactions between Application Layer and Link Layer

3. Functional Architecture

This chapter first describes the key functional components and their interactions to handle the entire eCall system workflow.

Sierra Wireless NAD product design architectures are presented in §3.2. This section outlines the IVS development scope to be untaken by Car Equipment Supplier (e.g. OEM Tier1) in order to integrate Sierra Wireless NAD.

Requirements for key functional components are specified in §3.3.

Functional requirements outside of Sierra Wireless NAD scope are proposed to assess the end-to-end eCall system workflow.

Further NAD requirements are drafted in chapter 4.

3.1. System description

This section describes the system workflow to make an eCall. The key functional components of the system are depicted in Figure 5.

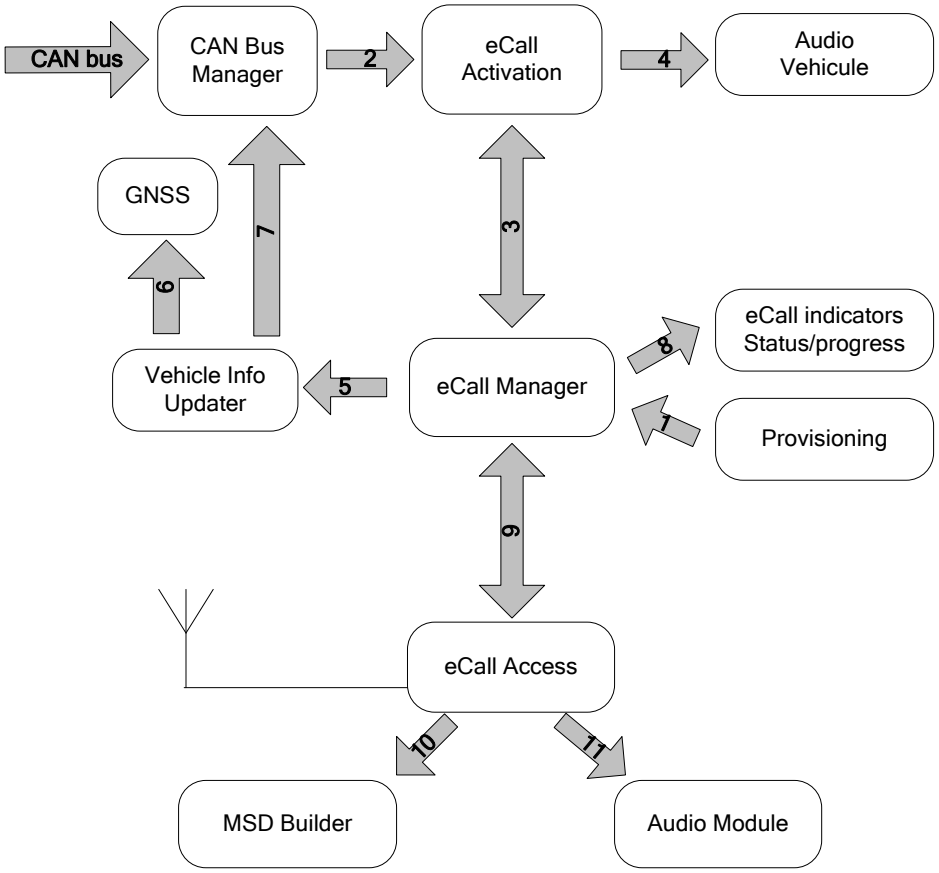


Figure 5: Functional Architecture of eCall IVS

Provisioning component contains static information about the vehicle and eCall configuration parameters. **Provisioning** component provides this set of data onto the **eCall Manager** component (interface 1). For instance, this action could be realized when the vehicle engine is started.

Automatic eCall (i.e. Air Bag ignition due to car crash) or manual eCall (i.e. driver/passenger needs emergency assistance) trigger event is fired on the CAN bus. This event is preprocessed by the **CAN Bus Manager** which then dispatches it to **eCall Activation** component via interface 2.

eCall Activation controls the **Audio Vehicle** in order to prepare vehicle loudspeaker and microphone for eCall usage (interface 4). For instance, disconnect the loudspeaker from the multimedia player, then connect it to the audio output of the **Audio Module. eCall Activation** then starts the emergency call process by invoking **eCall Manager** component (interface 3).

eCall Manager keeps track of the eCall states to manage the emergency call workflow:

Preparing to start eCall:

- **eCall Manager** terminates all pending actions in eCall Access (e.g. file system access with KFSFILE), except circuit-switched calls.
- **eCall Manager** initiates the **eCall Indicators** component on interface 8, to provide eCall progress indication to passengers (e.g. LED indicator or display message to indicate that an eCall is being activated).

  This interaction is not available for Internal eCall Manager (i.e. Sierra Wireless Standalone NAD as depicted in §1)
- **eCall Manager** has been provisioned with static information of the vehicle, such as vehicle type, VIN, propulsion type. eCall settings have also been provisioned previously by the **Provisioning** component (interface 1). Static information and settings (e.g. timers) are then passed to eCall Access.

Starting eCall:

- **eCall Manager** sends an AT command to **eCall Access** to actually start an emergency call (interface 9).
- **eCall Access** controls the **Audio Module** via interface 11. **Audio Module** provides the audio source for the call with PSAP

Controling eCall progress:

- **eCall Manager** updates the eCall state based on the URC sent by **eCall Access** (interface 9)
- Depending on the eCall state change, **eCall Manager** can update **eCall Indicators** (not available for Sierra Wireless Standalone NAD) on interface 8 to provide visual eCall progress to passengers.
- **eCall Manager** handles retries in case of communication error or call setup failure. The retry policy is defined by the eCall parameters as provided by the **Provisioning** component on interface 1 (if available).
- Upon receiving a “Start” message from PSAP
  - **External eCall Manager** interacts with **Vehicle Info Updater** to retrieve updated information regarding the number of passenger in the vehicle and the location of the vehicle (if available). This information is then passed to **eCall Access**
  - **eCall Access** calls **MSD Builder** (interface 10) to build the MSD using the information provided by **eCall Manager**
    - if **eCall Manager** has not provided location data and the NAD has a built-in GNSS then **eCall Access** shall retrieve the location data from the internal GNSS module

        - if **eCall Manager** has provided location data and the NAD has a built-in GNSS then **eCall Access** shall not use the internal GNSS data to build the MSD
    - eCall Access sends the MSD to PSAP
- Depending on the call progress, **eCall Access** interfaces with NAD's Audio Module to connect/disconnect audio input/output

Clearing down eCall:

- **eCall Manager** clears down the call on specific conditions :
    - PSAP operator hangs up
    - Clear down request received : "AL-ACK" with transaction status set to "transaction ended"

  eCall Access issues URC to notify this normal call clear down event

Receiving PSAP callback:

- After normal call clear down the eCall state is set to standby mode. During this period, **eCall Manager** is subject to receive PSAP callback.
- Upon receiving a notification about an incoming call, **eCall Manager** gets **eCall Access** to pick up the call. Hence, PSAP has voice contact with vehicle occupant(s).
- Upon receiving a "Start" message from PSAP
    - **External eCall Manager** interacts with **Vehicle Info Updater** to retrieve updated information regarding the number of passenger in the vehicle and the location of the vehicle (if available). This information is then passed to **eCall Access**
    - **eCall Access** calls **MSD Builder** (interface 10) to build the MSD using the information provided by **eCall Manager**
        - if **eCall Manager** has not provided location data and the NAD has a built-in GNSS then **eCall Access** shall retrieve the location data from the internal GNSS module
        - if **eCall Manager** has provided location data and the NAD has a built-in GNSS then **eCall Access** shall not use the internal GNSS data to build the MSD
- eCall Access sends the MSD to PSAP

Terminating eCall process:

- **eCall Manager** controls the period of the standby mode using a fallback timer, which is provided by **Provisioning (if available)**. This fallback timer is started when the initial call has been cleared down.
- **eCall Manager** terminates the eCall process upon the expiration of the standby mode fallback timer.
- **eCall Manager** informs **eCall Activation** about the end of the eCall process. **eCall Activation** restores the vehicle loudspeaker and microphone for normal usage.

3.2. Product Design Architectures

The functional components presented in the previous section can be packaged using two different NAD product design approaches:

- NAD without built-in GNSS
- NAD with built-in GNSS

They outline the IVS development scope to be untaken by Car Equipment Supplier in order to integrate the NAD.

3.2.1. NAD without built-in GNSS

Sierra Wireless NAD comprises the following functional components: eCall Access, MSD Builder and Audio Module. The system workflow is the same as described in 3.1.

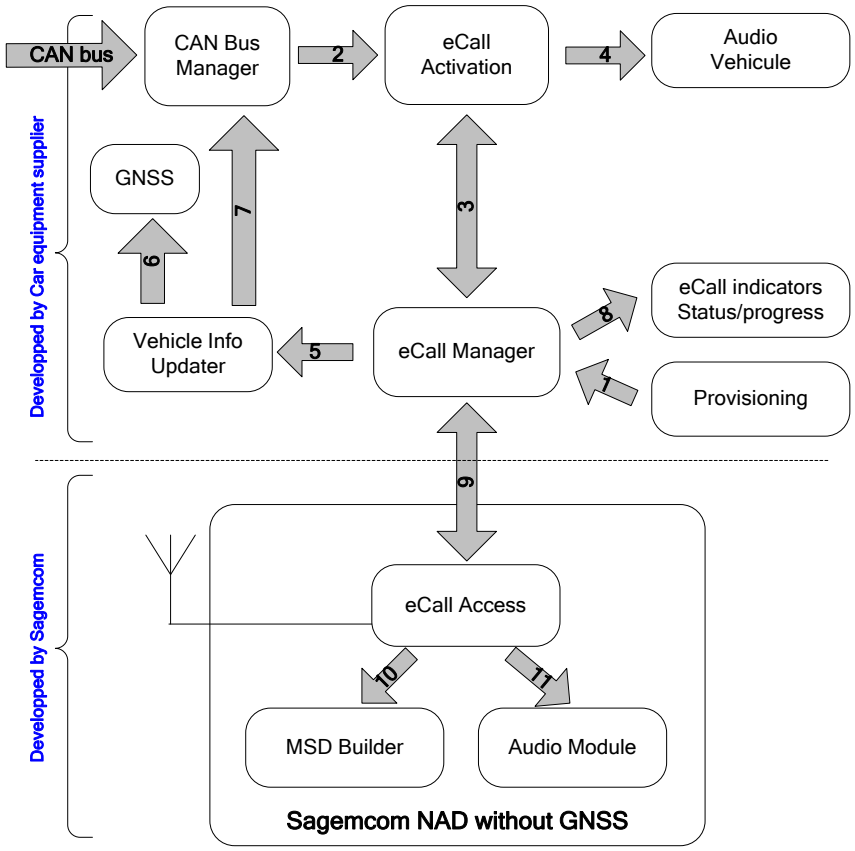


Figure 6 : NAD product design architecture – NAD without built-in GNSS

3.2.2. NAD with built-in GNSS

Sierra Wireless NAD comprises the following functional components: eCall Access, MSD Builder, GNSS and Audio Module.

The **Vehicle Info Updater**, located outside of the NAD, no longer interacts with the GNSS via interface 6.

eCall Access has a new interface 12 to retrieve the location data from the built-in GNSS. This action is triggered upon receiving ”Send MSD” or “Start” message from

PSAP. Having collected vehicle information from **eCall Manager** and location data from GNSS, **eCall Access** calls **MSD Builder** to create or update the MSD.

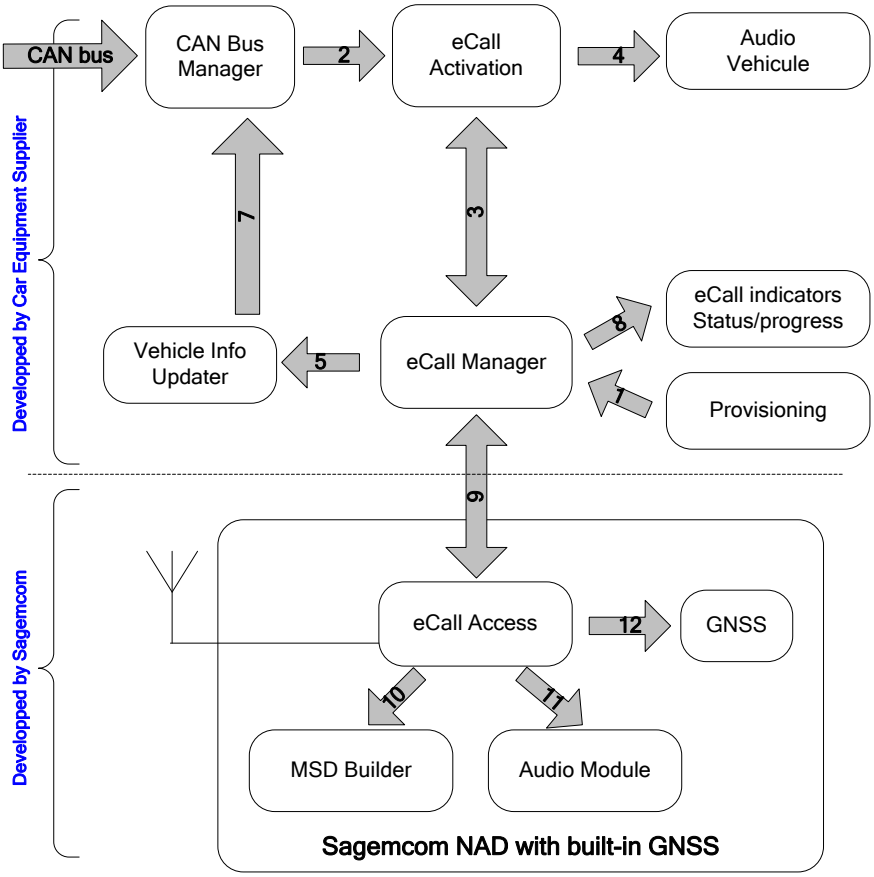


Figure 7 : NAD product design architecture – NAD with built-in GNSS

3.3. Functional Requirements

This section describes the functional requirements to be fulfilled by the aforementioned key functional components.

Functional components outside of Sierra Wireless NAD scope :

- Provisioning
- CAN Bus Manager
- eCall Activation
- Audio Vehicle
- eCall indicators
- Vehicle Info Updater
- eCall Manager

Functional requirements outside of Sierra Wireless NAD scope are proposed to assess the end-to-end eCall system workflow.

Functional components included in Sierra Wireless NAD scope :

- eCall Access

- MSD Builder
- GNSS
- Audio Module

Further technical specifications for the NAD is drafted in chapter 4.

3.3.1. Provisioning

Functionalities not provided by NAD

Functions:

- Provide permanent persistency of vehicle information as provided by Car Equipement Supplier.
- Provide permanent persistency of eCall configuration parameters as provided by Car Equipment Supplier.
- Provide vehicle information and eCall configuration parameters to **eCall Manager**

Interfaces:

- Inbound: TBD by Car Equipment Supplier. Specifc process to set permanent vehicle information and eCall settings into this **Provisioning** component
- Outbound: Function exposed by **eCall Manager**. Call this function to pass vehicle information and eCall settings to **eCall Manager**.

Data:

- Vehicle information : vehicle type, VIN, vehicle propulsion type
- eCall configuration settings :
  - Retry settings: retry duration, timeout for every identified failure
  - Fall back timers. Refer to Annexe §7.1

3.3.2. CAN Bus Manager

Functionalities not provided by NAD

Functions :

- Capture all information on the CAN Bus.
- Identify eCall request : automatic call, manual call, test call, reconfiguration call
- Identify Manual eCall cancellation request
- Trigger eCall process
- Return the number of passenger in the vehicle

Interfaces and Data flows:

- Inbound :
  - CAN Bus. Defined by Car Equipement Supplier.
  - **Vehicle Info Updater**, interface 7: Expose a function to return the number of passenger (extracted from CAN Bus)

- Outbound :
  - **eCall Activation**. Invoke **eCall Activation** to start eCall. The invocation method is TBD by Car Equipement Manufacturer

    eCall data (extracted from CAN Bus) :

    - Automatic call request
    - Manual call request
    - Test call request
    - Reconfiguration call request

3.3.3. eCall Activation

Functionalities not provided by NAD

Functions :

- Relay the eCall request (coming from CAN Bus manager) to **eCall Manager**
- Relay the manual eCall cancellation request to **eCall Manager**
- Notify **Audio Vehicle** to start configuring the audio (loudspeaker and microphone) for eCall usage, or to restore the vehicle audio configuration for normal usage

Interfaces :

- Inbound :
  - **CAN Bus Manager**, interface 2, defined by Car Equipement Supplier. Receive eCall and manual call cancellation requests.
- Outbound :
  - **Audio Vehicle**, interface 4, defined by Car Equipement Supplier. Configure loudspeaker and microphone for eCall usage or for normal usage
  - **eCall Manager**, interface 3 : Function call to start a new eCall process. Function call to cancel an ongoing Manual eCall process.

    eCall parameters :

    - Automatic call request
    - Manual call request
    - Test call request
    - Reconfiguration call request

3.3.4. Audio Vehicle

Functionalities not provided by NAD

Functions :

- Set audio to eCall mode:
  - Switch loudspeaker input to audio output of the Audio Module
  - Switch microphone output to audio input of the Audio Module
- Set audio to non-eCall mode (normal usage):

- For instance, connect the loudspeaker to multimedia player
- For instance, connect the microphone to multimedia player, smarphone

Interfaces :

- Inbound :
  - **eCall Activation**, interface 4, defined by Car Equipement Supplier.
    - Set audio to eCall mode
    - Restore audio to non-eCall mode
- Outbound :
  - Vehicle loudspeaker and microphone links defined by Car Equipement Supplier

3.3.5. eCall Indicators

Functionalities not provided by NAD

Functions:

- Provide feedback (e.g. visual) on the eCall status and progress to passengers
- LEDs or displayed message can be used to reflect the eCall status/progress, defined by Car Equipment Supplier.

Interfaces and Data Flows:

- Inbound :
  - **eCall Manager**, interface 8. Expose function call to change the eCall status :
    - Setting up eCall
    - Sending vehicle information to PSAP
    - Online with PSAP
    - Call cleared down
    - No eCall in progress (no light on)
- Outbound :
  - Link to LED indicators or message display defined by Car Equipement Supplier.

3.3.6. Vehicle Info Updater

Functionalities not provided by NAD

Functions :

- Retrieve dynamic vehicle information (e.g. the number of passenger, GNSS data) if available

Interfaces and Data flows:

- Inbound :

- **eCall Manager**, interface 5: Expose a function call to return the number of passenger and location data (if available)

- Outbound :
  - **GNSS**, interface 6 if available : Request to retrieve the location information
    - GNSS data: Longitude, Latitude, direction, confidence level
  - **CAN Bus Manager**, interface 7 : Request to retrieve the number of passenger, defined by Car Equipement Supplier

3.3.7. GNSS

Functionalities not provided by NAD (without built-in GNSS)

Functions :

- Return NMEA frame containing vehicle location information

Interfaces and Data flows:

- Inbound :
  - **Vehicle Info Updater**, interface 6 if available, defined by Car Equipement Supplier.

3.3.8. eCall Manager

Functionalities not provided by NAD

Functions :

- On eCall request, terminate all pending action, except eCall and circuit-switched calls
- Start Automatic eCall, Manual eCall, Test eCall, Reconfiguration eCall through **eCall Access** (AT+KECALL)
- Listen to URC issued by **eCall Access**
- Retrieve Vehicle Info update data from **Vehicle Info Updater** upon Send MSD request from PSAP (applicable to External eCall Manager only)
- Provide Vehicle information to **eCall Access** (AT+KECALLCFG) upon Send MSD request from PSAP (applicable to External eCall Manager only)
- Handle eCall states
- Manage retries rules (on error, on failures)
- Fall back timers keeper
- Manage power cut or reboot
- Manage self diagnostic
- Control **eCall Indicators**, based on URC
- Notify eCall Activation about termination of eCall process
- Cancel an ongoing Manual eCall

Interfaces and Data Flows:

- Inbound :
  - **Provisioning**, interface 1. Exposes 2 functions :
    - Set Vehicle information : vehicle type, VIN, vehicle propulsion type
    - Set eCall configuration settings :
      - Retry settings: retry duration, timeout for every identified failure
      - Fall back timers. Refer to Annexe §7.1
  - **eCall Activation**, interface 3. Exposes 2 functions :
    - Start eCall, with parameter to indicate the type of call
      - Automatic eCall
      - Manual eCall
      - Test eCall
      - Reconfiguration Call
    - Cancel eCall, no parameter, to cancel an ongoing Manual eCall. Return code to indicate whether the request has been completed or denied.
  - **eCall Access**, interface 9, UART URC. **eCall Manager** must be listening to URC (Unsolicited Result Code) issued by **eCall Access**.
- Outbound :
  - **eCall Indicators**, interface 8. Function call to set the new eCall status.
  - **Vehicle Info Updater**, interface 5. Function call to retrieve the actual number of passenger and updated location information (if available).
  - **eCall Access**, interface 9, UART**.** AT commands to :
    - Set static parameters (vehicule information, timers) : AT+KECALLCFG(1, static params). Refer to AT command documentation for further detail on parameters.
    - Set dynamic parameters (number of passenger, location): AT+KECALLCFG(2, dynamic params). Refer to AT command documentation for further detail on parameters.
    - Start eCall: AT+KECALL. Refer to AT command documentation for further detail on parameters.
    - Pick up PSAP callback: AT+ATAKECALL. Refer to AT command documentation for further detail on parameters.
    - Cancel Manual eCall

3.3.9. eCall Access

Functionalities provided by NAD.

Functions :

- eCall configuration (static and dynamic parameters)
- Access to GSM network (search PLMN, register, setup call…)
- Cancel ongoing circuit-switched calls prior initiating eCall
- Retrieve calling numbers (Test Call, Reconfiguration call) from SIM/USIM

- Implement all eCall phases & protocol (setup, init, sync, listen to start, send msd, ACKs, clear down…)
- Issue URCs to notify all eCall status
- Invoke MSD builder to create MSD

Interfaces and Data flows:

- Inbound :
  - **eCall Manager**, interface 9, UART: Expose eCall specific AT Commands to configure, start or cancel eCall, and non-eCall specific AT commands. Refer to AT commands documentation for further details.
- Outbound :
  - **eCall Manager**, interface 9, UART : Issues eCall specific URC reflecting the actual eCall progress, and non-eCall specific URC. Refer to AT commands documentation for further details.
  - **MSD Builder**, interface 10. Function call to build MSD, following parameters are passed to **MSD Builder**:
    - Vehicle identification information: Vehicle Type, VIN, Vehicle propulsion type
    - Vehicle occupancy detection information: number of passenger
    - Vehicle location information: GNSS data
    - Type of eCall: Automatic, Manual or Test mode
  - **Audio Module**, interface 11. Functions call to :
    - Turn ON/OFF the audio output of the NAD
    - Turn ON/OFF the audio input of the NAD
  - **GNSS** if available in NAD, interface 12. Function call to retrieve NMEA frames from the built-in GNSS.

3.3.10. MSD Builder

Functionalities provided by NAD, not accessible by components outside of NAD.

Functions :

- Builder MSD (Minimum Set of Data)

Interfaces and Data flows:

- Inbound :
  - **eCall Access**, interface 10. Expose function to build MSD, following parameters are required:
    - Vehicle identification information: Vehicle Type, VIN, Vehicle propulsion type
    - Vehicle occupancy detection information: number of passenger
    - Vehicle location information: GNSS data
    - Type of eCall: Automatic, Manual or Test mode

    Return MSD to caller along with error code.

3.3.11. Audio Module

Functionalities provided by NAD.

Functions :

- Control the audio input/output of the NAD

Interfaces and Data flows:

- Inbound :
  - **eCall Access**, interface 11. Expose function to set the audio input/output of the NAD. eCall Access can enable/disable the audio input/output of NAD according to the actual eCall progress.

3.3.12. GNSS, built-in NAD

Functionalities are only provided by NAD with Built-in GNSS.

Functions:

- Start the GNSS engine for periodic fixes
- Start the GNSS engine with one fix
- Stop the GNSS engine
- Return NMEA frames
- Return GNSS fix data

Interfaces and Data flows:

- Inbound:
  - **eCall Access**, interface 12, I2C bus. Expose the aforementioned functions

    Control data:
    - GNSS engine control, enum types: start, start with periodic fix, stop
    - Periodic fix frequency : millisecond as the unit
    - Control the NMEA frame sending mode : activate sending, stop sending

      Once the GNSS engine is started, NMEA frames will automatically be sent to eCall Access based on the predefined periodic fix frequency
    - History
    - The position (last or next) of GNSS data to retrieve
- Outbound:
  - eCall Access, interface 12, I2C bus. Return GNSS data to **eCall Access**

    Return data:
    - GNSS is fixed or not
    - GNSS data (UTC date/time, latitude, North/South indicator, longitude, East/West indicator, speed over the ground in knots, direction, magnetic variation, altitude, number of satellite in use, number of satellite in view)

- Specified whether the aforementioned GNSS data corresponds to the last position or to the next position
- History data : list of last fixes (ordered from most recent to least recent fixes)

4. NAD Requirements

4.1. Introduction

The following requirements are derived from ISO and 3GPP specifications and are pertaining to the eCall Access. Whenever ISO and 3GPP specifications conflict each other, priority will be given to ISO, except when inapplicable. The reason is that 3GPP specifications are not technically a standard (although the language-abuse is frequent), while ISO has strong links with governemental decisions. Hence, ISO standards have usually precedence over other specifications.

4.2. General Requirements

RQT_SSW_ECALL-GEN_0001_v01

The eCall Access shall support the eCall function and protocol for

- Emergency calls (i.e. TS12) : automatic and manual calls
- Test calls (internal product testing), use an E.164 number (not a short number) instead of 112
- Reconfiguration calls (only call function, not reconfiguration)
- Test calls for agreement, use Service n°89.

See: [2], [5] §10.1 and 10.7, [14] §26.9.6a, [7] and [8].

RQT_END

Note: The purpose of reconfiguration calls is usually to reconfigure an eCall-only NAD into an eCall NAD supporting commercial services.

RQT_SSW_ECALL-GEN_0002_v01

The eCall Access shall handle “service n°89” in the SIM Service Table for the IC SIM/USIM and for the externally supplied SIM/USIM.

See: [2] §7.1.1, [5] §10.1 and [20] §5.3.40.

RQT_END

Note: GCF certification relies on [14], which mandates the use of USIM, not SIM, for eCall certification. See [14], §26.9.6a.

RQT_SSW_ECALL-GEN_0003_v01

When service n°89 is enabled in the SIM Service Table for the IC SIM/USIM or the externally supplied SIM/USIM, the eCall Access shall use the last two entries of EF_{SDN} when instructed to perform a test eCall or a reconfiguration eCall.

See: [20] §5.3.40.

RQT_END

RQT_SSW_ECALL-GEN_0004_v01

In the emergency call setup message, the eCall Access shall set the 'Service Category Request' message information element (IE).

In case of automatic eCall trigger, then the eCall Access shall set up a 112 call to the network with the eCall flag set to automatically initiated eCall (AIeC).

In case of manual eCall trigger, then the eCall Access shall set up a 112 call to the network with the eCall flag set to manually initiated eCall (MIeC).

See: [6] §10.5.4.33, [3] §7.3.2

RQT_END

This is known as the 'eCall Flag'. Document [6] provides a description of the 'eCall Flag' and specifies the mandatory inclusion of the manually initiated eCall (MIeC) and automatically initiated eCall (AIeC) identifiers in the call set-up message (this information is also provided in the MSD).

Below figure extracted from [6]: bit-6 & bit-7 need to be set accordingly

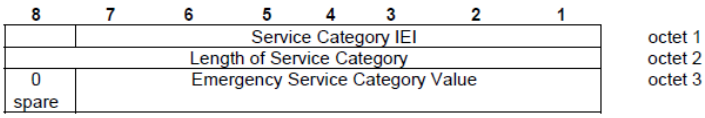


Figure 10.5.118d/3GPP TS 24.008 Service Category information element

Table 10.5.135d/3GPP TS 24.008: Service Category information element

Emergency Service Category Value (octet 3)
The meaning of the Emergency Category Value is derived from the following settings (see 3GPP TS 22.101 [8] clause 10):
Bit 1 Police
Bit 2 Ambulance
Bit 3 Fire Brigade
Bit 4 Marine Guard
Bit 5 Mountain Rescue
Bit 6 manually initiated eCall
Bit 7 automatically initiated eCall
Bit 8 is spare and set to "0"

Mobile station may set one or more bits to "1"
If more than one bit is set to "1", routing to a combined Emergency centre (e.g. ambulance and fire brigade in Japan) is required. If the MSC can not match the received service category to any of the emergency centres, it shall route the call to an operator defined default emergency centre.

If no bit is set to "1", the MSC shall route the Emergency call to an operator defined default emergency centre.
A mobile station initiating an eCall shall set either bit 6 or bit 7 to "1". The network may use the information indicated in bit 6 and bit 7 to route the manually or automatically initiated eCall to an operator defined emergency call centre.

Figure 6: eCall Flag in Setup Message

RQT_SSW_ECALL-GEN_005_v01

After initial eCall setup and when the PSAP has picked up the call, the eCall Access shall :

- Start T3 and T5 timers simulateneously
- Start and continue sending the PUSH message for at most T3 (2s).
- And simultaneously listen for the "Start" message for at most T5 (2s extended to 3s)
- Upon receiving the "Start" message eCall Access shall stop sending the PUSH message

See: [2] §7.4.1, [7], [8]

RQT_END

Message	Binary representation	BCH encoder output, b_i (hexadecimal)*
push (IVS initiation message)	0011	DBE 9397 9461 07EA

Figure 7: IVS Initiation PUSH Message

Note: the previous requirement does not mean that the eCall Access must not be able to process the PULL mode. Actually, there is further a requirement for PULL mode.

Note: [2] refers to PUSH message as INITIATION.

RQT_SSW_ECALL-GEN_006_v01

When the eCall Access is in the "voice" state (refer to eCall Access state diagram), the eCall Access shall :

- Start the timer T2 (60 min)
- Activate the audio input and output for the voice communication with PSAP operator
- And simultaneously continue listening for the "Start" message
- If T2 timer falls down then the eCall Access shall clear-down the call (transition to "eCall Idle" state)

RQT_END

RQT_SSW_ECALL-GEN_007_v01

After the AL-ACK (also known as HL-ACK in [7]) has been received to acknowledge the sending of the MSD, the eCall Access shall be continuously listening for "START" message.

See: [2] §7.5.1, [7] and [8].

RQT_END

Note: [2] refers to the "START" message as "SEND MSD".

RQT_SSW_ECALL-GEN_008_v01

The eCall Access shall support eCall termination order in AL-ACK message. In that case, AL-ACK contains a clear-down message (status = "transaction ended") instead of positive acknowledgment.

See: [2] §7.9

RQT_END

Note: at the time of the writing of the present document, the value of the previous message is not clearly specified.

The intent of the previous requirement is to give a clear indication to the IVS that the PSAP does not need anymore information.

RQT_SSW_ECALL-GEN_009_v01

The eCall Access shall support eCall termination by normal hang-up from the PSAP.

See: [2] §7.9

RQT_END

Note : eCall Access shall only clear down an eCall upon requirements GEN_008 & GEN_009

RQT_SSW_ECALL-GEN_0010_v01

The eCall Access shall support callback from the PSAP and be ready to send a new MSD if requested by the PSAP.

See: [2] §7.10, §7.6.2.

RQT_END

RQT_SSW_ECALL-GEN_0011_v01

After eCall setup and AL-ACK with positive acknowledge was received, if the eCall Access receives a new “SEND MSD”/”START” message, it shall re-send the MSD in accordance with [7].

See: [2] §7.5.1, [7].

RQT_END

RQT_SSW_ECALL-GEN_0012_v01

If the PSAP calls back, after the eCall Access has picked up the call, the eCall Access shall be continuously listening for “SEND MSD”/“START” message.

See: [2] §7.6.2.

RQT_END

RQT_SSW_ECALL-GEN_0013_v01

If the eCall Access is configured to use an external GNSS system, it shall allow the eCall Access to continuously update the position to put in the MSD in case the PSAP requires an update of the MSD.

RQT_END

RQT_SSW_ECALL-GEN_0014_v01

If the PSAP calls back and sends the “START” message, the eCall Access shall synchronize with the PSAP in accordance with [7] and [8]. This is the PULL mode.

See: [2] §7.4.2, [7] and [8].

RQT_END

RQT_SSW_ECALL-GEN_0015_v01

The eCall Access shall not attempt an automatic redial after a call clear-down in either of the two cases:

- receiving an AL-ACK with status = “transaction ended”
- normal hang-up by PSAP

See: [2] §7.9

RQT_END

RQT_SSW_ECALL-GEN_0018_v01

eCall Access shall provide AT commands to perform diagnostic on:

- GNSS autodiagnostic
- Check GNSS antenna
- Module autodiagnostic (valid SIM in place and unlocked, eCall service in SIM/USIM, UART, audio, key settings in place, memory, date/time, last operating mode, etc…)

See: [2] §7.1.4

These AT commands are only supported if the eCall Access state is “eCall Idle”

RQT_END

4.3. Requirements for Timers

This section describes the timers to be supported be the eCall Access.

RQT_SSW_ECALL-TIM_0001_v01

The eCall Access shall support Call T2-Clear-down Fallback Timer (CCFT), whose purpose is to ensure that the eCall Access clears-down the call correctly if an application layer acknowledgement clear-down instruction (AL-ACK) is not received, or if the eCall Access fails to receive a network clear-down message. Upon T2 expiration, the eCall Access shall terminate the call and issue URC to eCall Manager.

T2 duration is 1 hour.

See: [2] §7.12.17, Annex A.

RQT_END

RQT_SSW_ECALL-TIM_0002_v01

The eCall Access shall support T3-IVS INITIATION signal duration, i.e. send INITIATION message during 2 seconds.

T3 duration is 2 seconds.

See: [2] §7.4.1, Annex A.

RQT_END

RQT_SSW_ECALL-TIM_0003_v01

The eCall Access shall support T5-IVS wait for SEND MSD, whose purpose is to reconnect loudspeaker and microphone if the SEND MSD message is not received within this period. The call shall then continue as a normal emergency call.

Upon T5 expiry, the eCall Access shall:

- Issue URC to notify eCall Manager
- Activate the audio input and output of Audio Module

T5 duration is 2 seconds.

See: [2] §7.12.11, Annex A.

RQT_END

RQT_SSW_ECALL-TIM_0004_v01

The eCall Access shall support T6-IVS wait for AL-ACK, whose purpose is to reconnect loudspeaker and microphone to the car if the AL-ACK message is not received within this period after LL-ACK has been received. The call shall then continue as a normal emergency call.

Upon T6 expiry, the eCall Access shall :

- issue an URC to eCall Manager
- Activate the audio input and output of Audio Module

T6 duration is 2 seconds.

See: [2] §7.5.3, Annex A.

RQT_END

RQT_SSW_ECALL-TIM_0005_v01

The eCall Access shall support T7-IVS MSD maximum transmission time, whose purpose is to reconnect loudspeaker and microphone if the LL-ACK message is not received within this period. The call shall then continue as a normal emergency call.

Upon T7 expiry, the eCall Access shall :

- Issue an URC to eCall Manager
- Activate the audio input and output of Audio Module

T7 duration is 20 seconds.

See: [2] §7.12.11, Annex A.

RQT_END

4.4. Requirements for Audio Support

RQT_SSW_ECALL-AUDIO_0001_v01

When detecting the “START” message in the case of an eCall setup, a request for new MSD in the present eCall or in a PSAP callback, or if the PSAP requests a call clear-down, the eCall Access shall:

- Disable the audio input and output of Audio Module
- Deactivate audio treatment algorithms

See: [2] §7.5, §7.6, [7] §4.3.

RQT_END

RQT_SSW_ECALL-AUDIO_0002_v01

The eCall Access shall activate the audio input and output of Audio Module upon T5, T6 and T7 expiry.

See: [2] §7.12.11, §7.5.3

RQT_END

RQT_SSW_ECALL-AUDIO_0003_v01

The eCall Access shall activate the audio input and output of the Audio Module upon AL-ACK with positive acknowledgment reception.

See: [2] §7.5.1

RQT_END

4.5. Requirements for MSD Generation

RQT_SSW_ECALL-MSD_0001_v01

The eCall Access shall format the MSD in ASN.1 Packed encoding rules (PER unaligned) as defined in ISO 8825-2, using the ASN1 definitions described in [1], Annex A.

See: [1], §6.1.4.

RQT_END

RQT_SSW_ECALL-MSD_0002_v01

The eCall Access shall send the MSD in byte and bit order as defined in the ASN.1 definition

See: [1], §6.2.1.

RQT_END

RQT_SSW_ECALL-MSD_0003_v01

The eCall Access shall set the test bit in the MSD when performing a test eCall.

See: [1], §6.2.2.

RQT_END

RQT_SSW_ECALL-MSD_0004_v01

In case of automatic eCall trigger, the eCall Access shall set the activation bit to automatically initiated eCall (1) in the control field of the MSD.

In case of manual eCall trigger, the eCall Access shall set the activation bit to manually initiated eCall (0) in the control field of the MSD.

See: [1], §6.2.2.

RQT_END

RQT_SSW_ECALL-MSD_0005_v01

Read and Write accesses to MSD shall be synchronized and protected (e.g. Mutex).

AT+KECALLCFG command with dynamic parameters (e.g. GNSS data and number of passengers) will be triggering the MSD Builder to update the MSD. On the other hand, the eCall Access will be reading the MSD upon receiving a “Start” message from PSAP. Resource access protection prevents the eCall Access to grab a copy of the MSD while this latter is being updated by MSD Builder.

RQT_END

RQT_SSW_ECALL-MSD_0006_v01

Upon receiving “Start” message from PSAP, eCall Access shall apply the follow process :

1. Issue a URC “Start”/”Send MSD” message received
2. Retrieve the location data (positions N, N-1 and N-2) from the internal GNSS if this latter is integrated into the Sierra Wireless NAD
3. If Not Standalone NAD then **eCall Access** shall wait for the Vehicle Information (number of passenger, location data for positions N, N-1 and N-2) to be provided by the external **eCall Manager** by the way of an AT command (AT+KECALLCFG). The waiting time is bounded to 2 seconds T-EA1 (refer to §7.2). Beyond this limit, eCall Acess will be using former information to build the MSD in the next step.
4. Build MSD with the above vehicle information
5. Send MSD to PSAP

RQT_END

4.6. Requirements for AT Commands

RQT_SSW_ECALL-AT_0001_v01

The eCall Access shall provide an AT command (AT+KECALLCFG, static) to initialize the static values to build the MSD for eCall.

RQT_END

RQT_SSW_ECALL-AT_0002_v01

eCall Access shall provide AT commands to perform minimum self test (AT+CPIN, AT+KGSMAD, AT+KGNSSRUN, GNSS antenna detection)

See: [2] §7.1.4

RQT_END

RQT_SSW_ECALL-AT_0003_v01

AT+KECALL command shall be used for:

- Automatic and Manual eCall

  AT+KECALL with parameter <test_mode> set to 0, <activation_mode> set to 0 (manual) or to 1 (automatic)

- Test eCall

AT+KECALL with parameter <test_mode> set to 1

- Service eCall for interoperability test (certification)

  AT+KECALL with parameter <test_mode> set to 0, <number> set to certification center calling number

- Reconfiguration eCall

  Applicable to eCall Only eCall Access. TBD

See: [2], [5] §10.1 and 10.7, [14] §26.9.6a.

RQT_END

RQT_SSW_ECALL-AT_0004_v01

For eCall and Test Call, if the emergency number is omitted in the command, then the eCall Access shall dial the default emergency number 112

RQT_END

RQT_SSW_ECALL-AT_0005_v01

The eCall Access shall make an AT command available (AT+KECALLCFG, dynamic) for eCall Manager to continuously update the vehicle position and the number of passenger, in case the PSAP requests a new MSD.

If the eCall Access has a built-in GNSS and the vehicle position is provided by eCall Manager, then the built-in GNSS shall be bypassed, the MSD shall be created using the vehicle position as provided by eCall Manager

RQT_END

RQT_SSW_ECALL-AT_0006_v01

AT+KECALL command shall return ERROR (with an error code) when the eCall Access is not in “eCall idle” state.

RQT_END

RQT_SSW_ECALL-AT_0007_v01

If the call number is omitted in the command used for certification test or reconfiguration, then the eCall Access shall dial the corresponding number in the last 2 entry of the SIM/USIM (Service n°89).

The test bit in the MSD shall be set to 0.

See: [2] §7.2.2.

RQT_END

RQT_SSW_ECALL-AT_0008_v01

The eCall AT Commands (AT+KECALL) shall fire URC to notify eCall Manager about the eCall status.

The URC corresponding to the following events shall be implemented:

1. Calling PSAP

2. Call has been picked up (by PSAP)
3. PUSH message has been sent
4. “Send MSD”/”Start” message received
5. “Send MSD” message reception timed out: “Send MSD” message not received before T5 expiry
6. “LL-ACK” message has been received
7. “LL-ACK” message reception timed out: no “LL-ACK” received before T7 expiry
8. “AL-ACK” message received, issued by module when the “AL-ACK” has been received
9. “Clear down” request received: “AL-ACK” received with status=”transaction ended”
10. “AL-ACK” message reception timed out: no “AL-ACK” received before T6 expiry
11. Call Clear down timed out: triggered by the T2 expiry

See: [2] §7.4.6, §7.12.4.

RQT_END

RQT_SSW_ECALL-AT_0010_v01

eCall Access shall provide an AT command (AT+KAECALL) to pick up incoming call from PSAP.

When the incoming call has been picked up, the eCall Access shall transition to the “voice” state

RQT_END

RQT_SSW_ECALL-AT_0011_v01

AT+KAECALL command shall return ERROR (with error code) when the eCall Access is not in “eCall idle” state.

RQT_END

RQT_SSW_ECALL-AT_0012_v01

During an eCall process (AT+KECALL or AT+KAECALL), if the following errors occur :

- No Network
- Internal network error
- Call drop

The eCall Access shall issue URC and transition to “eCall Idle” state

RQT_END

RQT_SSW_ECALL-AT_0013_v01

eCall Access shall have an AT command to provide:

- the current MSD version
- the current version of the inband modem (3GPP)

RQT_END

RQT_SSW_ECALL-AT_0014_v01

eCall Access shall have an AT command to return the last available MSD (140bytes), through a selector:

- ASN.1 coded
- None coded. Displayed in hexadecimal

This command returns ERROR (with error code) if AT+KECALL has not being issued

RQT_END

RQT_SSW_ECALL-AT_0015_v01

The eCall Access shall provide an AT Command to cancel a manual ecall

To be confirmed : ATH can be used to :

- Cancel a manual eCall
- Terminate all ongoing communication

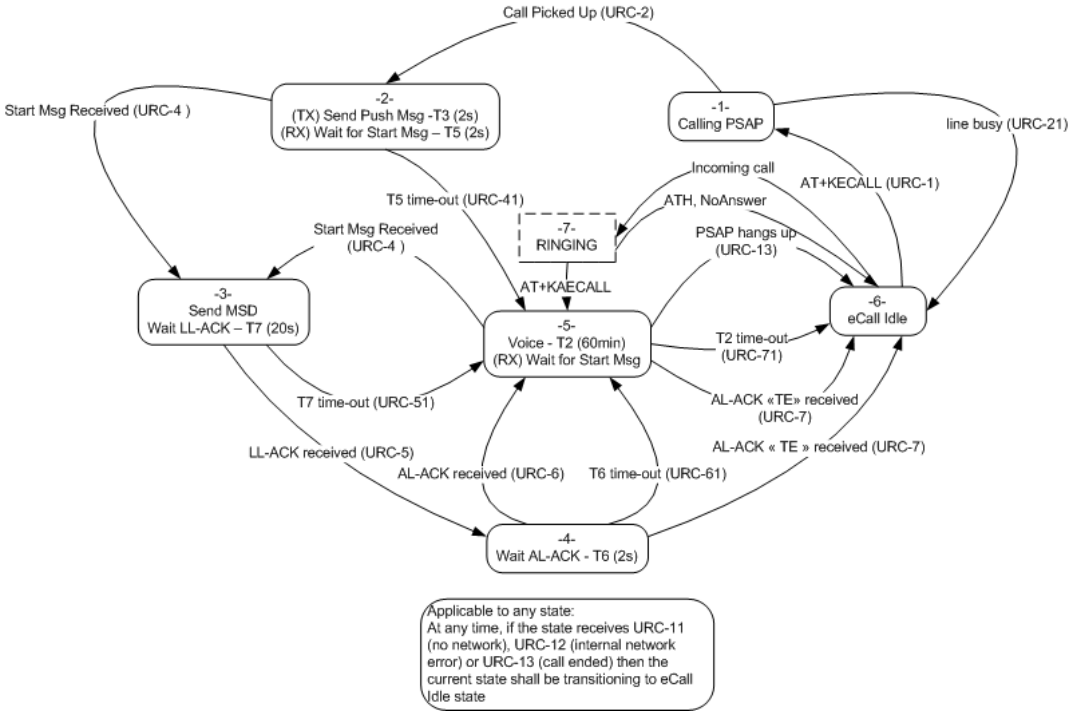
RQT_END

RQT_SSW_ECALL-AT_0016_v01

AT+KECALL shall terminate all ongoing circuit-switched calls prior setting up an eCall

RQT_END

4.7. eCall Access State Diagram



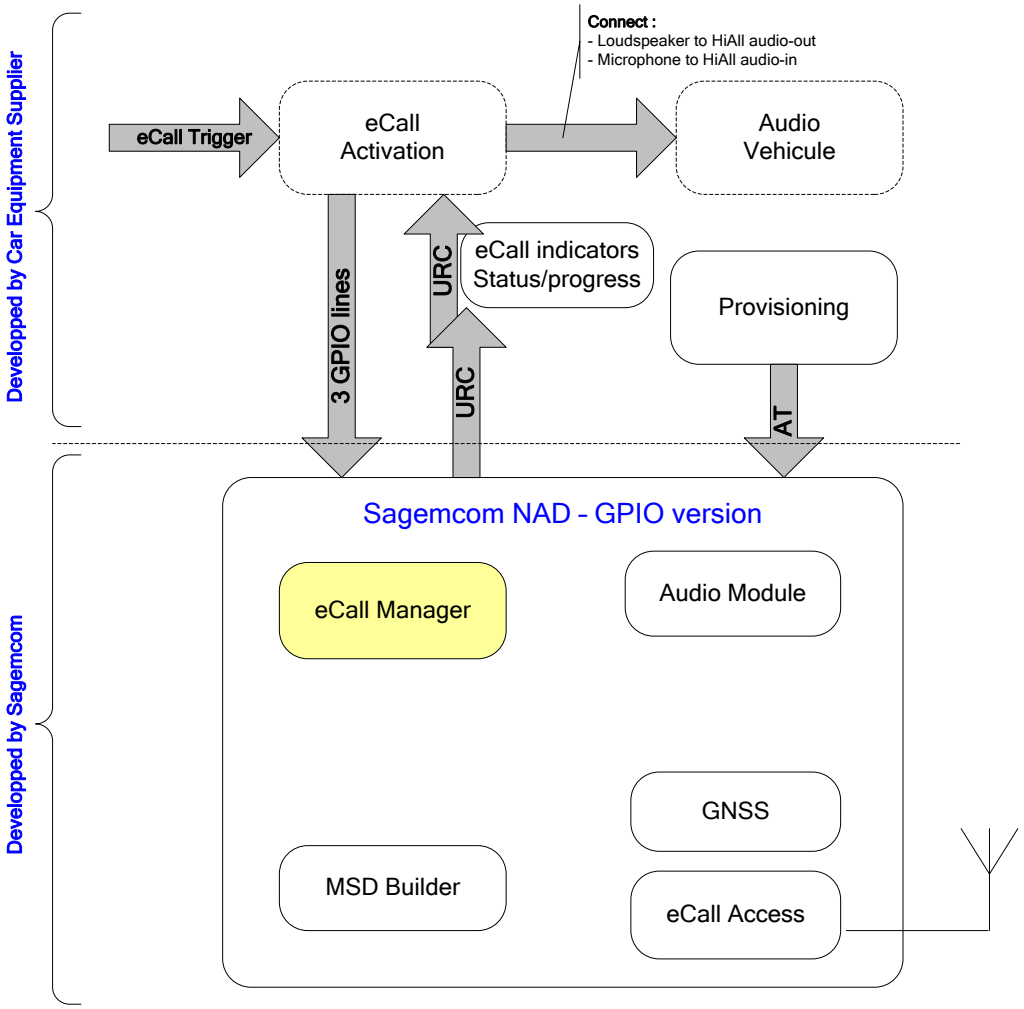
5. Standalone NAD Requirements (draft)

This is the third architecture proposed bv Sierra Wireless.
Standalone NAD encapsulates the eCall Manager functional entity to handle the entire eCall procedure. External processor running eCall high level application is no longer required in the IVS. GPIO and serial interfaces are used to trigger eCall and to provision vehicle related information onto the NAD

5.1. Scope

This chapter first describes the Sierra Wireless Standalone NAD functional architecture. NAD interfaces are described in §5.3. Known limitations are listed in §5.4. Requirements for eCall Manager that is integrated into the Standalone NAD are provided in §5.5.

5.2. Sierra Wireless Standalone NAD functional architecture



5.3. Interfaces

5.3.1. GPIO lines

There are 3 GPIO lines :

	GPIO 3	GPIO 4	GPIO 5
Automatic Call	1	X	X
eCall Idle	0	0	0
Manual Call	0	0	1
Reconfiguration Call	0	1	0
Test Call	0	1	1

GPIO signals sustain time shall be 500ms

GPIO lines defined above are not configurables

Manual Call cancellation can be achieved by resetting GPIO#5 back to 0

5.3.2. UART / USB

- AT commands for Provisioning (VIN, propulsion type…). Refer to AT+KECALLCFG
- NAD's URC are made available on UART

5.4. Limitations

- Number of Passengers is not available in the MSD
- eCall feedback and progress are only available through URCs

  Feedback to passengers (eCall in progress, MSD transfer, voice call with PSAP operator, incoming call, Testing eCall, Self-testing eCall, eCall malfunction indicator…)

  Module malfunction, self-test reported error

5.5. eCall Manager Requirements

The following requirements are derived from ISO and 3GPP specifications and are pertaining to eCall Manager.

RQT_SSW_ECALL-MANAGER_0001_v01

Prior establishing an eCall **eCall Manager** shall terminates all pending actions on eCall Access (e.g. file system access with KFSFILE), except circuit-switched call.

RQT_END

RQT_SSW_ECALL-MANAGER_0002_v01

eCall Manager shall not attempt an automatic redial after a call clear-down in either of the two cases:

- receiving an AL-ACK with status = “transaction ended”
- normal hang-up by PSAP

See: [2] §7.9

RQT_END

RQT_SSW_ECALL-MANAGER_0003_v01

If an eCall setup fails, then eCall Manager shall make automatic retries for 2 minutes.

See: [2] §7.12.4.

RQT_END

RQT_SSW_ECALL-MANAGER_0004_v01

After the PSAP cleared the call, eCall Manager shall allow manually initiated eCall attempts at any time.

See: [2] §7.12.14

RQT_END

RQT_SSW_ECALL-MANAGER_0005_v01

During eCall setup, if “BUSY” message is received, then the eCall Manager shall make automatic retries for 2 minutes.

See: [2] §7.12.4, §7.12.10.

RQT_END

RQT_SSW_ECALL-MANAGER_0006_v01

If the eCall is dropped, then eCall Manager shall make automatic retries for 2 minutes.

See: [2] §7.12.4.

RQT_END

RQT_SSW_ECALL-MANAGER_0007_v01

If the eCall is dropped, then eCall Manager shall allow PSAP callback for at least 3 minutes.

See: [2] §7.12.4, [3] §7.17.2.

Note: Current drafts of standard are unclear on this point. After call drop, the IVS must make automatic retries for 2 minutes but be ready for incoming PSAP call for 3 minutes at least. But the PSAP must wait for 2 minutes before trying to call back during the next minute.

RQT_END

RQT_SSW_ECALL-MANAGER_0008_v01

When the call is ringing, eCall Manager shall try to maintain the connection for at least 60 seconds to allow the PSAP to answer the call.

See: [2] §7.12.4.

Note: this requirement is subject to appropriate support by the network, that is, the network may abort the call before 60 seconds elapsed.

RQT_END

RQT_SSW_ECALL-MANAGER_0009_v01

For audit purpose, eCall Manager shall store the following elements of information:

- eCall set-up time
- PSAP picked-up time
- Initiation message sending time
- “SEND MSD”/“START” message reception time
- T5 expiry (“SEND MSD”/“START” not received)
- LL-ACK reception time
- T7 expiry (LL-ACK not received)
- AL-ACK reception time
- T6 expiry (AL-ACK/HL-ACK not received)
- Call Clear down time (Clear down request or PSAP operator hangs up)

One log file per eCall type (Manual, Automatic, test, reconfiguration). The log file is overwritten on every call. Log file to be defined.

2 Date-Time: module (from network or customer) date/time, GNSS date/time

date/time format : YY/MM/DD,HH:MM:SS+/-TimeZone

See: [2] §7.5.2.

Note: this requirement goes a bit beyond than what is required by [2] §7.5.2.

RQT_END

RQT_SSW_ECALL-MANAGER_0010_v01

eCall Manager shall trigger the eCall Access to perform minimum self test (AT+CPIN, AT+KGSMAD, AT+KGNSSRUN, AT+KGNSSDET antenna detection)

The self test shall be performed before entering PIN code.

See: [2] §7.1.4

RQT_END

RQT_SSW_ECALL-MANAGER_0011_v01

The IVS integrator shall design the IVS based on the NAD to perform the following steps required in section 7.2.1 of [2], i.e., when IVS is triggered to start an eCall:

- **eCall Manager** shall interrupt any ongoing circuit-switched call, except when this call is actually an eCall

- **eCall Activation** shall connect the loudspeaker to the audio output of the NAD
- **eCall Activation** shall connect the microphone to the audio input of the NAD
- **eCall Manager** shall Alert the vehicle occupants of an initiated eCall (by the way of **eCall Indicators**)

eCall Manager shall use URC fired by eCall Access as event to provide progress indication to in-vehicle occupant.

RQT_END

RQT_SSW_ECALL-MANAGER_0012_v01

eCall Manager shall handle the following errors and retries:

- Call drop (2 minutes of redial attempts elapsed).
- No answer, call not being picked up by PSAP. Shall be guarded by a fallback timer (60 seconds).
- Busy. The PSAP line is busy (2 minutes of redial attempts elapsed).

RQT_END

RQT_SSW_ECALL-MANAGER_0013_v01

When eCall Manager is in Standby State and is receiving RING URC, it shall use AT+KAECALL command to pick up the incoming call.

RQT_END

RQT_SSW_ECALL-MANAGER_0014_v01

Upon normal clear down process, eCall Manager shall be in Standby state. The duration of this state is guarded by a Callback Falldown timeout (usually 12 hours). Upon expiration of this timer (T10) eCall Manager shall transition to Idle state.

RQT_END

RQT_SSW_ECALL-MANAGER_0015_v01

When eCall Manager is in Standby state, all data exchanges (e.g. HTTP, HTTPS) and voice call (ATD) shall be suspended. During this state, incoming call from PSAP is expected.

RQT_END

RQT_SSW_ECALL-MANAGER_0016_v01

When an eCall has been launched by GPIO, it is forbidden to use an external eCall Manager

RQT_END

RQT_SSW_ECALL-MANAGER_0017_v01

Beyond the Callback falldown timer (12 hours), **eCall Manager** shall exit Standby state and transition to Idle state. From this point, all communication restrictions (no data) are deactivated. **eCall Manager** shall restore the vehicle audio to non-eCall mode (by the way of **eCall Activation** and **Audio Vehicle** components)

For GPIO, the only notification is URC. In this case, eCall Manager cannot restore the vehicle audio to non-eCall mode.

RQT_END

RQT_SSW_ECALL-MANAGER_0018_v01

Automatic eCall shall have priority over a manual eCall.

An on-going eCall operation (Call has been picked up by PSAP) shall not be preempted by any AT command. However parameters passed by AT+KECALLCFG shall be taken into consideration to build the MSD.

See: [2] §7.5.1

RQT_END

RQT_SSW_ECALL-MANAGER_0019_v01

GPIO and non-GPIO cases shall be mutually exclusives.

e.g. GPIO solution (within built-in eCall Manager) is not compatible with an external eCall Manager.

RQT_END

RQT_SSW_ECALL-MANAGER_0020_v01

eCall manager shall not cancel automatic eCall neither manual ecall after PSAP has picked up the call

RQT_END

RQT_SSW_ECALL-MANAGER_0021_v01

When eCall is in progress, eCall Manager shall resume to last known state upon system reboot. Refer to the onReboot transition event in the diagram §5.7

RQT_END

RQT_SSW_ECALL-MANAGER_0022_v01

Upon receiving “Start”/”Send MSD” URC, **external eCall Manager** shall collect vehicle information (from **Vehicle Info Updater**) and launch AT+KECALLCFG to provide the updated vehicle information to **eCall Access**. This action shall be performed within 2 seconds T-EA1 (refer to §7.2). Beyond this limit, the provided information may not be packed into MSD**.**

This requirement only applies to **external eCall Manager**

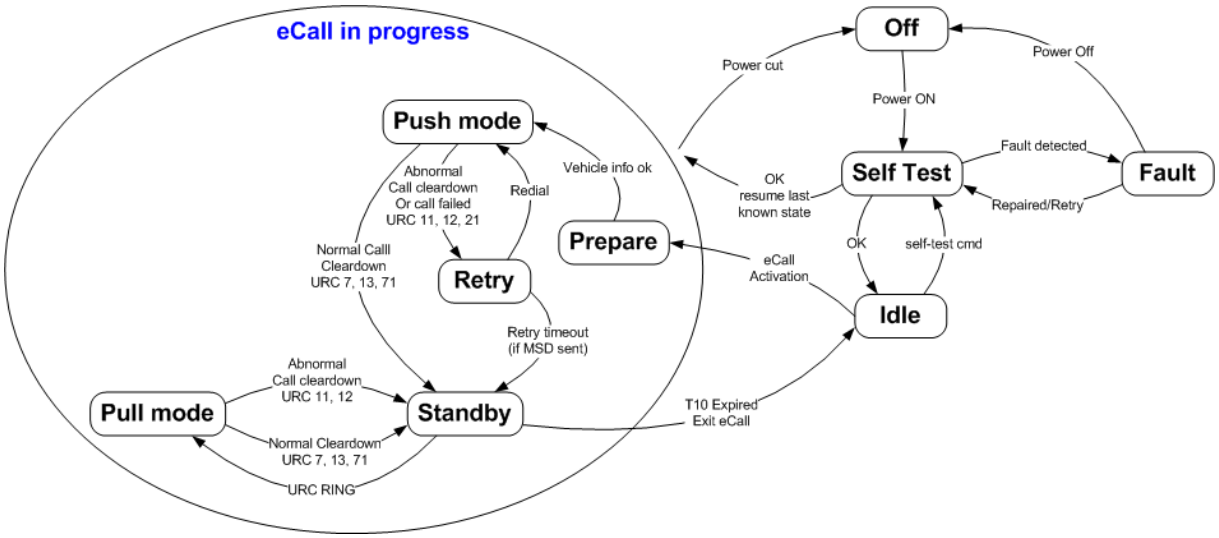
RQT_END

5.6. eCall Manager High Level State Diagram (Draft)

This chapter provides high level state diagrams for eCall Manager.

External eCall Manager shall be used to drive Sierra Wireless non-Standalone NADs, and shall not be used to drive Sierra Wireless Standalone NAD.

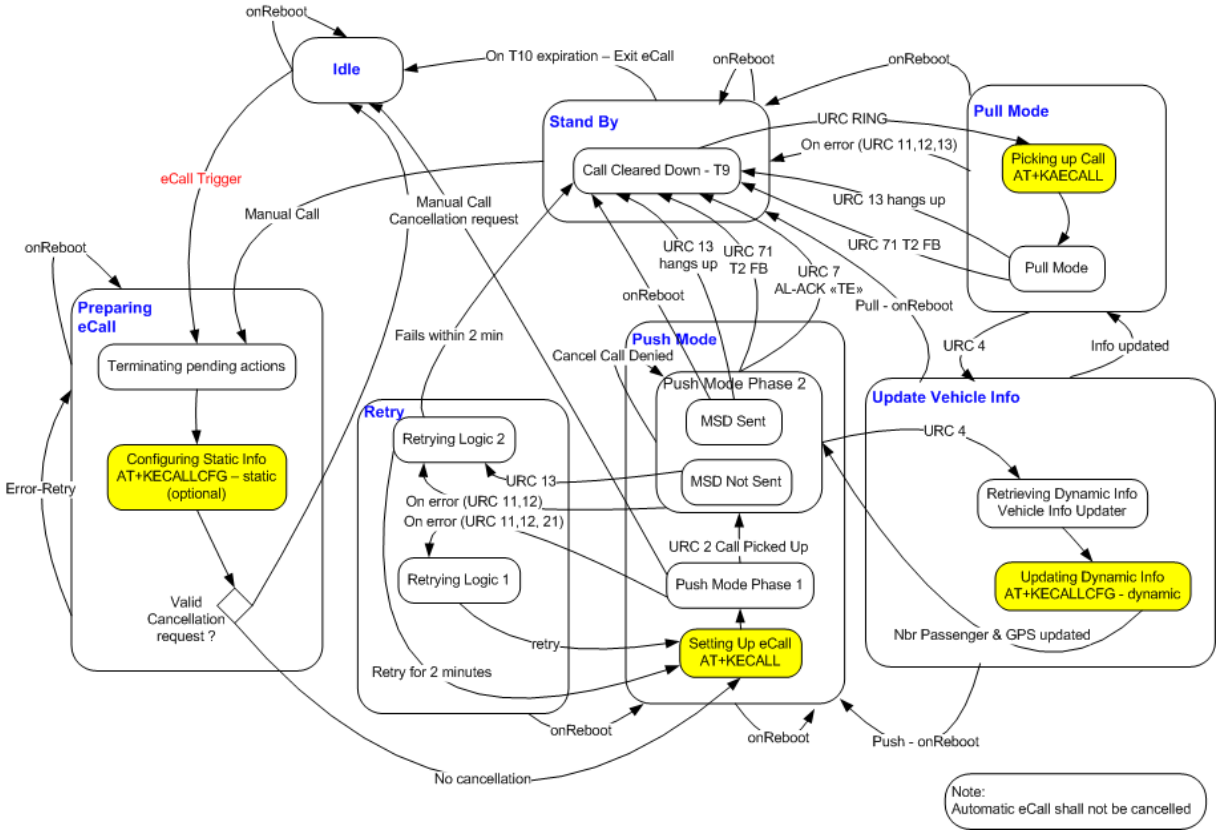
Internal eCall Manager is implemented inside Sierra Wireless Standalone NAD.



When eCall is in progress, eCall Manager shall resume to last known state upon system reboot. Refer to the onReboot transition events in the next diagram.

5.7. eCall Manager detailed State Diagram (Draft)

"eCall in progress" state described in §5.4 is detailed hereafter:



5.8. eCall Manager states and transition events (Sierra Wirelesscom internal use only)

eCall Manager states and transition events are summarized in the following tables:

STATE: **IDLE**	
Events	Next State
onReboot	IDLE
Ecall Activation – Start Ecall	PREPARING ECALL

STATE: **PREPARING ECALL**	
Events	Next State
onReboot	PREPARING ECALL
Manual Cancel	IDLE

Error-Retry	PREPARING ECALL
+KECALLCFG returns OK	PUSH MODE

STATE: **PUSH MODE**	
Events	Next State
onReboot	PUSH MODE
Manual Cancel	IDLE
URC-2 Call Picked up	PUSH MODE PHASE2 MSD NOT SENT
URC-11	RETRY LOGIC
URC-12	RETRY LOGIC
URC-21	RETRY LOGIC

STATE: **PUSH MODE PHASE2 MSD NOT SENT**	
Events	Next State
onReboot	PUSH MODE
Manual Cancel	IDLE
Call denied	PUSH MODE PHASE NOT SENT
URC-11	RETRY LOGIC2
URC-12	RETRY LOGIC2
URC-13	RETRY LOGIC2
URC-71	STAND BY
URC-7	STAND BY

STATE: **PUSH MODE PHASE2 MSD SENT**	
Events	Next State
onReboot	STAND BY
Manual Cancel	IDLE
URC-11	RETRY LOGIC2

URC-12	RETRY LOGIC2
URC-13	STAND BY
URC-71	STAND BY
URC-7	STAND BY

STATE: **RETRY LOGIC**	
Events	Next State
onReboot	PUSH MODE
Manual Cancel	IDLE
Retry	PUSH MODE

STATE: **RETRY LOGIC2**	
Events	Next State
onReboot	PUSH MODE
Manual Cancel	IDLE
Retry for 2 minutes	PUSH MODE
Retry Fail after 2 minutes	STAND BY

STATE: **STAND BY**	
Events	Next State
onReboot	STAND BY
Manual Cancel	IDLE
Manual Call	PREPARING ECALL
URC Ring	PULL MODE
T10 expiration	IDLE

STATE: **PULL MODE**	
Events	Next State

onReboot	STAND BY
URC-11	STAND BY
URC-12	STAND BY
URC-13	STAND BY
URC-71	STAND BY

6. System Workflows (Sierra Wireless Internal use only)

This chapter provides further detailed requirements on eCall Access and eCall Manager.

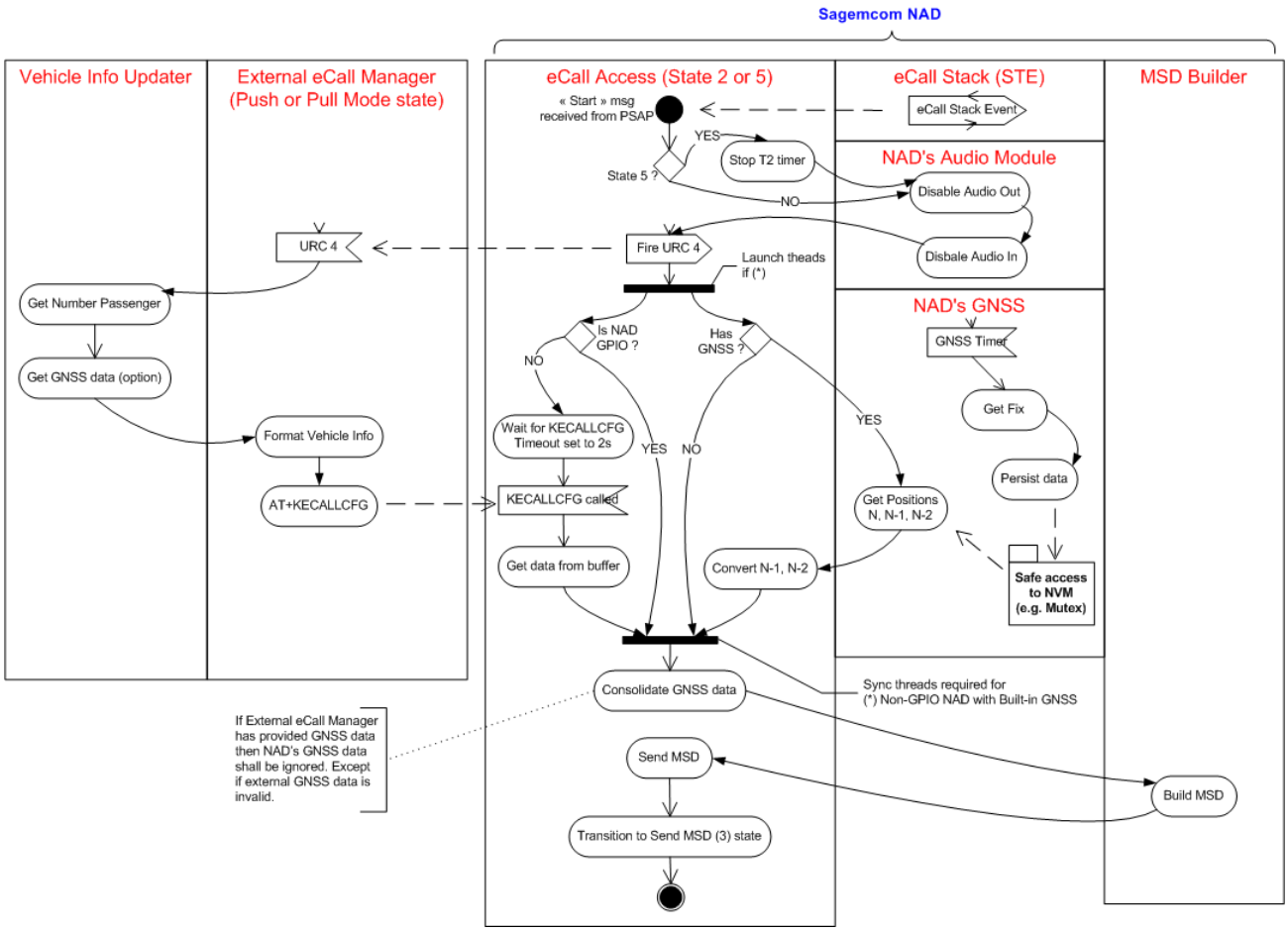
System behaviors of key functionalities are also described in this chapter using Activity Diagrams.

6.1. Send MSD

This activity diagram specifies the system workflow to update and to send the MSD.

The MSD Update process starts upon receiving a “Start” message sent by the PSAP.

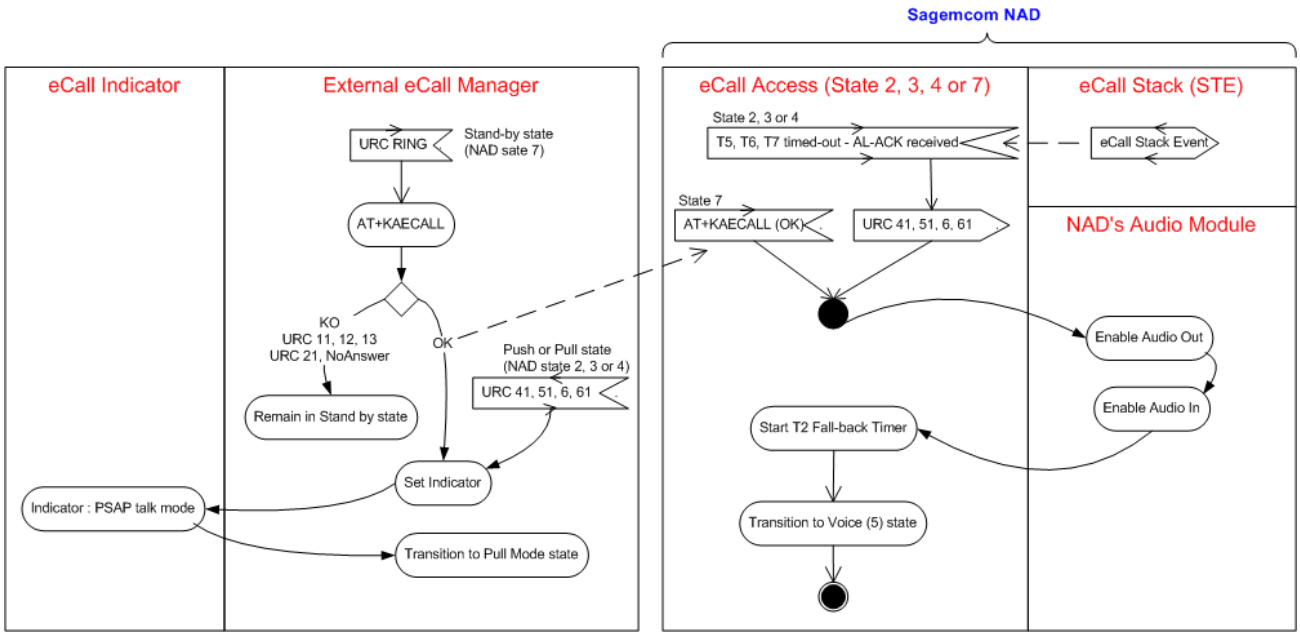
eCall Access (eCall Stack) is continuously listening for “Start” message in states 2 and 5 (“Push Message” state & “Voice” state).



6.2. Switch to Voice Mode

This activity diagram specifies the system workflow to switch to Voice state from state 2, 3, 4 or 7 :

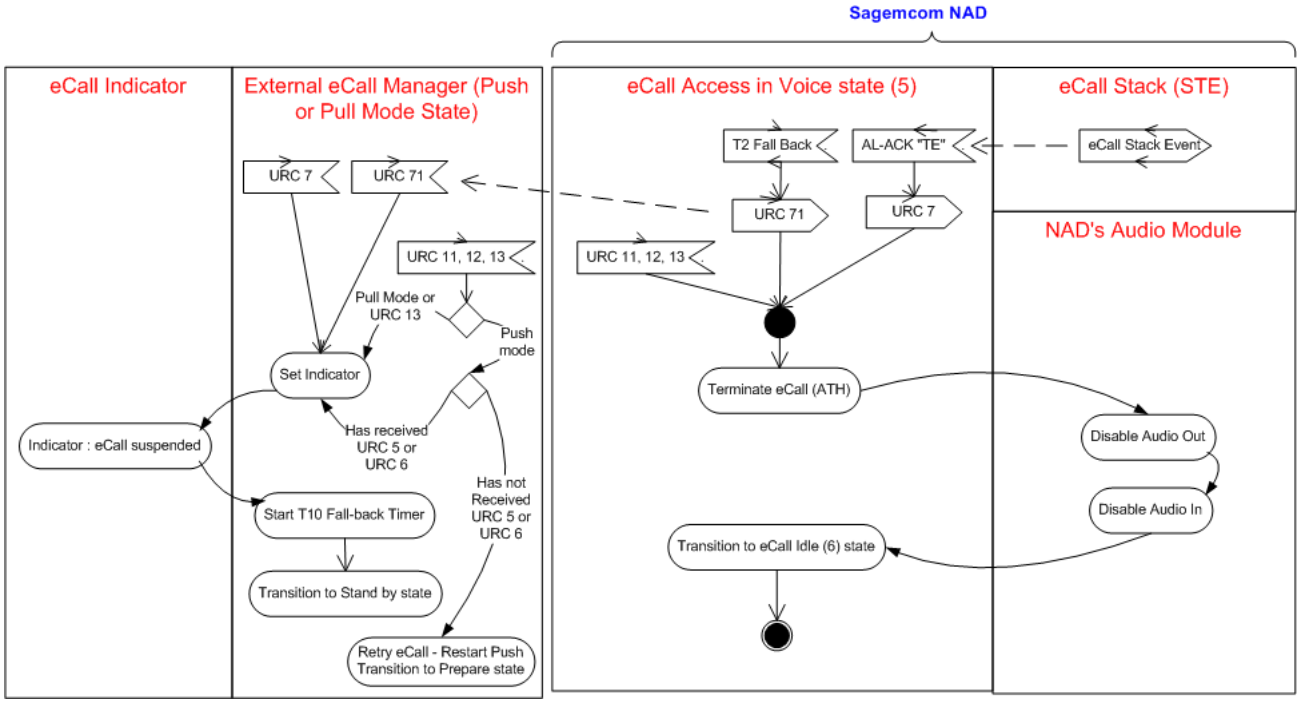
- In State 2 “Send Push message”, eCall Access is sending a Push message to PSAP and is expecting to receive “Start” message from PSAP. If the the “Start” message is not received within 3 seconds (T5) then eCall Access shall :
  - issue a URC-41 (T5 time-out)
  - Enable Audio IN and Audio OUT
  - Arm T2 Fall back timer (used to control the call duration in voice state)
  - Transition to Voice state
- In State 3 “Send MSD”, eCall Access has sent MSD to PSAP and is expecting to receive “LL-ACK” message from PSAP. If the the “LL-ACK” is not received within 20 seconds (T7) then eCall Access shall :
  - issue a URC-51 (T7 time-out)
  - Enable Audio IN and Audio OUT
  - Arm T2 Fall back timer (used to control the call duration in voice state)
  - Transition to Voice state
- In State 4 “Wait AL-ACK”, after receiving “LL-ACK”,
  - if eCall Access receive “AL-ACK” message from PSAP within 2 seconds (T6) then eCall Access shall :
    - issue a URC-6 (AL-ACK received)
    - Enable Audio IN and Audio OUT
    - Arm T2 Fall back timer (used to control the call duration in voice state)
    - Transition to Voice state
  - if eCall Access does not receive “AL-ACK” message from PSAP within 2 seconds (T6) then eCall Access shall :
    - issue a URC-61 (T6 time-out)
    - Enable Audio IN and Audio OUT
    - Arm T2 Fall back timer (used to control the call duration in voice state)
    - Transition to Voice state
- In State 7 “RINGING”, if eCall Manager has picked up the incoming call (AT+KAECALL) then eCall Access shall :
  - Enable Audio IN and Audio OUT
  - Arm T2 Fall back timer (used to control the call duration in voice state)
  - Transition to Voice state



6.3. eCall Access Transitioning from Voice State to Idle State

This activity diagram specifies the workflow when the system transition from a voice conversation with PSAP to clearing down the call.

ECall Access is therefore transitioning from “Voice” state to “Idle” state, while eCall Manager is transitioning from “Push mode” or “Pull mode” state to either “Stand-by” state or to “Preparing eCall” state. The latter implies a new attempt to contact PSAP, this occurs when the IVS is in Push mode and does not have a chance yet to transmit the MSD to PSAP.



7. Annexes

7.1. eCall Normative Timers

Description	Requirement	Value
T1 Manually Initiated eCall (MIeC) false triggering cancellation period	Vehicle occupants may cancel a false triggering of a manually initiated eCall before call set-up.	Specified by manufacturer. NOTE This value may be zero.
T2 IVS Call Clear-down Fallback Timer (CCFT)	If the IVS NAD does not receive a call clear-down indication from the mobile network, or an application layer call clear-down message from the PSAP and the call cleardown timer has reached 12 hours, the call shall be cleared down.	60 minutes
T3 IVS INITIATION signal duration	The IVS INITIATION signal shall not persist for longer than 2 seconds from when the UE receives notification that the call is first answered.	2 seconds
T4 PSAP wait for INITIATION signal Period	If a valid INITIATION message is not received by the PSAP modem within 2 seconds then the call shall be routed to a PSAP operator.	2 seconds
T5 IVS wait for SEND MSD period	If the IVS eCall modem, whilst sending the INITIATION message, does not receive or recognise a valid 'SEND MSD' message from the PSAP eCall modem within 2 seconds, from the time that the IVS receives an indication that the PSAP has answered the call, it shall reconnect the IVS loudspeaker and microphone in the vehicle.	2 seconds
T6 IVS wait for AL-ACK period	If an AL-ACK is not received within 2 seconds from receipt of the link layer ACK, the speaker and microphone in the vehicle shall be reconnected to the line in order to enable the call to revert to an e112 voice call.	2 seconds
T7 IVS MSD maximum transmission time	If the IVS does not receive a link layer ACK (LL-ACK) within 20 seconds from the start of MSD transmission, it shall cease transmission and the IVS audio system shall be re-connected.	20 seconds
T8 PSAP MSD maximum reception time	If the PSAP eCall modem does not send a link layer ACK (LL-ACK) within 20 seconds after having sent the ‘SEND MSD’ message to the IVS eCall modem, it shall route the voice call to a PSAP operator.	20 seconds

Description	Requirement	Value
T9 IVS NAD (eCall only configuration) minimum network registration period	Following call clear-down by the PSAP the IVS NAD shall remain registered on the serving network and available to receive calls from the PSAP and rescue workers for a minimum period as defined in prEN 278220 (under development).	[Ref 4]
T10 IVS NAD (eCall only configuration) network De-registration Fallback Timer (DFT)	An IVS NAD configured to make eCalls and test calls only shall, following call clear-down and expiration of the De-registration Fallback Timer (DFT) 12 hour period, de-register from the serving network.	[12 hours]

7.2. Parameters to be provisioned into the NAD

Parameters	Values	Provisioned	Used by
T2 - IVS Call Clear-down Fallback Timer (CCFT)	60 min	Fixed by std	eCall Access
T3 - IVS INITIATION signal duration	2 seconds	Fixed by std	eCall Access
T5 - IVS wait for SEND MSD period	3 seconds	Fixed by std	eCall Access
T6 - IVS wait for AL-ACK period	2 seconds	Fixed by std	eCall Access
T7 - IVS MSD maximum transmission time	20 seconds	Fixed by std	eCall Access
T10.1 - IVS network De-registration Fallback Timer (DFT) None eCall Only (transition to Idle state)	6h	Default value in NVM	eCall Manager
T10.2 - IVS DFT for eCall Only	12h	Fixed by std	eCall Manager
GPIO signal sustain duration time threshold	500 ms	Default value in NVM	eCall Manager
eCall Setup failure – Delay of redial attempt	2 minutes	Fixed by std	eCall Manager
T-EA1 On URC4, eCall Access wait for KECALLCFG period	2 seconds (by default)	Set by KECALLCFG.	eCall Access

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