

Emergency Call Answering Service.

**Mobile Location
Information**

**Provided in association
with
an Emergency Call**

Part I – Transfer

Issue 5.2

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1 Purpose of this Specification

This document describes the method of transferring mobile location information from a mobile network to the Emergency Call Answering Service (ECAS) in Ireland, for the purpose of handling an Emergency Call.

Where appropriate, mobile location information may be further transferred from the ECAS to the Emergency Services in association with an Emergency Call.

The mobile location information transferred is the Cell Global Identification for 2/3G, and LTE mobile Cells. In addition, a specific reserved Cell Identifier to be used where the mobile emergency call is being carried over VoIP/Wi-Fi is also described.

Part 2 of this specification (the "Conversion" specification) addresses the information required for the conversion of Cell Global Identification (CGI) to geo-coordinates which is provided to the ECAS by the mobile network operator for all possible mobile cells which could be used to originate an emergency call.

2 Scope of this Specification

As the network identification elements of the Cell Global Identification may also be used by a transit operator (eg. eir) for the identification of the network originating an Emergency Call, these elements will replace the current network suffixes specified in eir's Reference Interconnect Offer¹. See Section 5.

This specification shall cover all Emergency Calls from mobile networks.

Mobile operators shall implement this specification whether or not they provide mobile caller location information or any other techniques or methods to identifying a callers location.

3 Originating Cell Identification

The originating Cell ID for the emergency call must be provided to the ECAS with the call when connected to the ECAS.

For emergency calls originated on 2/3G networks the Cell ID is appended to the B-Number or destination such that it can be transported in either SS7 or SIP signalling to the ECAS.

For Emergency calls originated on 4G using VoLTE the Cell ID is included in the SIP PANI header as described in TS 24.229.

Note: Inclusion of CellID for VoLTE originated calls is supported for end-to-end SIP carried calls only as TDM signalling does not support the alphanumeric characters required to represent E-UTRAN hexadecimal Cell IDs.

3.1 Cell ID for 2/3G Originated calls

The Cell Global Identification shall comply with relevant ETSI standards.

3.1.1 2/3G Mobile Cells

The 2/3G Mobile location information structure is as follows:

¹ See Section 5.3 of Eir – OAO Interconnect Network Plan

MCC-MNC-LAC-CI where:

- MCC is the Mobile Country Code (272 for Ireland)
- MNC is the Mobile Network Code
- LAC is the Location Area Code
- CI is the Cell Identity

3.2 Cell ID for VoLTE originated Emergency calls.

VoLTE Originated Emergency calls should have the E-UTRAN Cell ID included in the PANI Header information presented to the ECAS for the Emergency call.

The PANI Header should be formatted as described in TS 24.229 and will include a "utran-cell-id-3gpp" parameter set to a concatenation of the MCC (3 decimal digits), MNC (2 or 3 decimal digits depending on MCC value) which should be obtained from the E-UTRAN Cell Global Identifier (ECGI), Tracking Area Code (4 hexadecimal digits when accessing to EPC and 6 hexadecimal digits when accessing to 5GCN) as described in 3GPP TS 23.003 [3] and the E-UTRAN Cell Identity (ECI) (7 hexadecimal digits) as described in 3GPP TS 23.003 [3]. The "utran-cell-id-3gpp" parameter is encoded in ASCII as defined in RFC 20 [12];

e.g. 272091a2b1f2e3d4

The included E-UTRAN should match a complete, concatenated CellID provided to the ECAS in advance as described in the ECAS Mobile Location Conversion Specification so as to enable the ECAS to identify an approximate geographic location for the origin or the emergency call.

It is noted that in making provision for both 4G and 5G (or VoNR) cell IDs this introduces a variation in length of the complete CellID and indeed also differs from the fixed length specified for 2/3G cell IDs.

It is also noted that while the specified 2/3G cell ID format required zero-padding of the LAC and CellID fields to ensure a fixed length cell ID of 15 digits, Zero-Padding is not required for 4/5G CellIDs.

Service Providers should ensure that there is no duplicate Cell ID values possible or introduced through the use of variable length Cell IDs e.g. a variable length 4/5G cell ID does not produce the same value as a 2/3G CellID.

The use of hex digits in the E-UTRAN Cell ID and TAC components mean that such Cell IDs cannot be communicated using SS7 signalling and an end-to-end SIP signalling patch between the Mobile network operator and the ECAS is required to transport and communicate these Cell ID values. Mobile network operators should ensure that the call routing and transit arrangements for VoLTE originated emergency calls on their network will utilise only SIP Signalling for the entire routing path to the ECAS.

3.3 VoIP/Wi-Fi originated Emergency calls

In the case where an emergency call is carried over a Wi-Fi or other IP network and does not use a traditional mobile cell (with a fixed, known location) it is not possible to convey any information on the caller's approximate location to the ECAS.

Mobile network operators should ensure that where Emergency calls are enabled over VoIP/Wi-Fi networks that an alternate means of providing caller location is enabled or can be expected to function on the handset – e.g. AML.

It is important to indicate to the ECAS and the Emergency Services at the time of the Emergency call that the conventional mobile cell location information is not expected to be available. This fact should be indicated to the ECAS by including a specific reserved Cell ID string as described below with the Mobile emergency call as connected to the ECAS.

Field	Emergency Shortcode	MCC	MNC	Wi-Fi Call identifier
Digits	3	3	2	10
Example	112 999 997 991 992	272	07	65533 65534
B-Number	112272076553565534			

Mobile network operators should include this special cell identifier in the Cell details provided to ECAS as described in the Mobile Location Conversion Specification (v5.1) so as to ensure that emergency calls received by the ECAS which utilise VoWiFi are correctly identified and associated with that mobile network operator. Due to the process used for the upload of mobile cell details to the ECAS which involves the replacement of existing cell records for a given operator (as described in the Data Transfer Specification) it is not possible for ECAS to add this special cell to the database separately and it needs to be included with the full upload by each mobile network operator.

3.4 Emergency calls using Wi-Fi calling

With the introduction of Voice over WiFi capabilities on mobile networks and devices in Ireland, this introduces further capability and options for carrying an emergency call. It is important to make the distinction between the WiFi Calling service offered by a given mobile network operator to its customers on supported mobile devices and other Over The Top (OTT) VoIP services which may be used on a mobile device through a Third party VoIP app or client.

Wi-Fi calling services can be considered to be fully managed and approved as a reliable means of communication by the mobile network operator and are only enabled by the Mobile network operator for its individual subscribers on supported devices. Wi-Fi Calling can be considered as an alternate transport or carrier layer for the customers calls when the cellular network is not available. As a result, Wi-Fi calling can be assumed to be a reliable and verified calling method similar to the traditional transport of a mobile call on the operators cellular network. Wi-Fi Calling is fully integrated with the dialler or OS calling functions on the supported mobile device and the call is carried by the Mobile network operators voice switch infrastructure. The calling number used is the customers allocated mobile number which distinguishes the service from OTT VoIP services which may utilise any telephone number from a third party VoIP provider.

The mobile network operator is responsible for the transport of emergency calls made using VoWiFi in the same way as a traditional radio mobile call up to the point where they are routed to the ECAS or an intermediary carrier (Transit).

The Mobile network operator has no responsibility or indeed capability for the provision of location information for OTT VoIP originated emergency calls.

4 Transfer of Mobile location (CellID) with the Emergency calls.

4.1 Cell ID sent where mobile location information is available from a 2/3G Cell

When connecting a 2/3G Emergency Call to the ECAS, Cell ID must be supplied with the call by means of appending the Cell ID and LAC digits to the B-Number, or called number of the Emergency Call.

In appending the Cell ID information to the B-Number for the Emergency call, operators should ensure that the required digits are appended to the number *directly following* the 112 or 999 shortcode.

Any extra digits dialled by the caller following the 112 or 999 shortcode should be stripped from the B-Number by the mobile network operator prior to appending the Cell ID digits. This means that B-Number for all Emergency calls presented to the ECAS should be exactly 18 digits as described in this specification.

The following B-number shall be sent from a mobile network to the ECAS when an Emergency Call is being made using a 2/3G Cell and location information is available:

V	V	V	W	W	W	X	X	Y	Y	Y	Y	Y	Z	Z	Z	Z	Z
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Where the digits have the following meaning:

	Meaning	Digits	Coding	Value	Notes
VVV	Emergency Number	3	decimal	112	Fixed
WWW	Mobile Country Code	3	decimal	272	Fixed
XX	Mobile Network Code	2	decimal	01 - Vodafone, 02 - O2 03 - Meteor 05 - H3GI	Or other values assigned by ComReg.
YYYYY	Location Area Code	5	decimal	1 to 65532 Set by mobile operator	
ZZZZZ	Cell Identity	5	decimal	1 to 65533 Set by mobile operator	
	Total	18			

Note 1: Decimal fields should be padded with zeros from the left, if necessary.

Table 1: B-Number where mobile location information is available from 2/3G Cell

Example

112 272 01 03011 32400 (spaces are included for clarity)

4.2 Cell ID sent where mobile location information is available from an 4/5G Cell

In the case where an emergency call originates on a 4/5G cell and is routed to the ECAS using end-to-end SIP signalling, the variable length E-UTRAN CellID should be included in the SIP PANI (P-Access Network Information) header as described in TS 24.229.

e.g.

P-Access-Network-Info:

3GPP-E-UTRAN-FDD;utran-cell-id-3gpp=272 01 33C4 76B4321;network-provided

(line break and spaces added for readability)

4.3 Cell ID sent where the call is carried over VoIP/Wi-Fi

VoIP/VoWi-Fi originated emergency calls should include a CellID in the 2/3G format as described in 4.1 above with a specific Cell ID value to indicate that the call originated on VoIP/VoWi-Fi.

The following B-number shall be sent from a mobile network to the ECAS when an Emergency Call is being made, using Wi-Fi calling:

V	V	V	W	W	W	X	X	Y	Y	Y	Y	Y	Z	Z	Z	Z
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Where the digits have the following meaning:

	Meaning	Digits	Coding	Value	Notes
VVV	Emergency Number	3	decimal	112	Fixed
WWW	Mobile Country Code	3	decimal	272	Fixed
XX	Mobile Network Code	2	decimal	01 - Vodafone, 02 - O2 03 - Meteor 05 - H3GI	Or other values assigned by ComReg.
YYYYY	Location Area Code	5	decimal	65533	LAC not provided or unavailable.
ZZZZZ	Cell Identity	5	decimal	65534	CI not provided or unavailable.
	Total	18			

Note 1: Decimal fields should be padded with zeros from the left, if necessary.

Table 2: B-Number where Emergency call is made using Wi-Fi Calling

Example

112 272 01 65533 65534 (spaces are included for clarity)

4.3.1 Inclusion of the Wi-Fi node ID in PANI Header.

For VoWiFi originated emergency calls, service providers should (optionally) ensure that where possible the Wi-Fi Node ID is included in the PANI Header.

E.g.

P-Access-Network-Info: IEEE-802.11;i-wlan-node-id="b43052d4f5a0";country=IE [UPLI]

P-Access-Network-Info: untrusted-non-3GPP-VIRTUAL-EPC;UE-local-IP-address="1.2.3.4";UDP-source-port=32548;network-provided [NPLI]

This is valuable caller location information which and may be used in the future by the ECAS.

It is also noted that this information can only be communicated to the ECAS where SIP is used for the entire signalling path.

4.4 Cell ID sent where mobile location information is not provided or unavailable

The following B-number shall be sent from a mobile network to the ECAS when an Emergency Call is being made, and location information is not provided or unavailable:

V	V	V	W	W	W	X	X	Y	Y	Y	Y	Y	Z	Z	Z	Z	Z
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Where the digits have the following meaning:

	Meaning	Digits	Coding	Value	Notes
VVV	Emergency Number	3	decimal	112	Fixed
WWW	Mobile Country Code	3	decimal	272	Fixed
XX	Mobile Network Code	2	decimal	01 - Vodafone, 02 - O2 03 - Meteor 05 - H3GI	Or other values assigned by ComReg.
YYYYY	Location Area Code	5	decimal	00000	LAC not provided or unavailable.
ZZZZZ	Cell Identity	5	decimal	00000	CI not provided or unavailable.
	Total	18			

Note 1: Decimal fields should be padded with zeros from the left, if necessary.

Table 3: B-Number where mobile location information is not provided or unavailable

Example

112 272 01 00000 00000 (spaces are included for clarity)

4.5 Geolocation header on VoLTE or VoWiFi originated emergency calls

Devices which support packet switch call transport using SIP may include the device location in the SIP content as a PIDF-LO and referenced in the "Geolocation:" SIP header.

In the case where such headers (Geolocation:) are present with associated PIDF-LO Content these should be passed through unchanged for the ECAS.

The ECAS preferred method of passing Device location in SIP content is to Pass CIRCLE (point position with radius) coordinates by value with using the EPSG::4326 Coordinate

Reference System as PIDF-LO (RFC4119) and encapsulation in the SIP message as specified in RFC 6442. It is noted that this behaviour may be device dependent however if configuration options are available within the network, these are the preferred parameters.

4.6 Cell Handoff and Mobility

A normal feature of mobile communications is the ability of the mobile device to move from one serving cell to another for a variety of reasons. The use of multiple types of Radio Access or transport technologies including 2G,3G,LTE, and indeed Wi-Fi brings further complexity and considerations to the management of the emergency call. This activity is not visible to the ECAS during an emergency call and to all intents and purposes, the ECAS just sees an emergency call.

ECAS will always use the first presented Cell-ID (either 2/3G, 4G, or Wi-Fi Fake CellID) to perform the initial call routing of the Emergency call to the correct Emergency Service. Once the initial Cell-ID based location has been used for routing, The Cell ID is not used by the ECAS for caller location purposes as a Cell-ID based location is not considered accurate or usable for any other purpose.

While a handoff to another cell will result in additional Cell-ID being available, in the case of a handoff to a 2/3G cell there is no mechanism to pass this information to the ECAS as this type of Cell-ID is only passed in the B-Number with the call invite. The implementation within the mobile network in this situation may result in an updated 2/3G cell id being incorporated in the P-ANI header of a SIP re-invite, this information if present will not be used by the ECAS but may be included.

The handoff to a 4G cell does present the opportunity to pass the new cell information to the ECAS in a P-ANI header, assuming SIP signalling is used, there is no call routing advantage to be gained by using the information in the ECAS.

The only mobility scenario where additional information may be used by the ECAS is in the case of handoff to a 4G cell allowing an updated Geolocation header containing a by-value PIDF-LO to be included. If this information is available, it should be passed to the ECAS using either a Reinvite or SIP Update message.

The following table summarises the mobility scenarios and recommendations.

From	To	Comments/Recommendation
2/3G	2/3G	No Update or Action. Updated Cell-ID is of little benefit to ECAS and Means of transport may not present opportunity to update it.
2/3G	4G	In general, Circuit switched to Packet Switched handoff is not expected to be a common or indeed valid handoff scenario and may be dependent on handset and mobile network support If SIP is used to transport the original 2/3G call to the ECAS, this scenario may present to opportunity to include both P-ANI header and Geolocation headers (if provided by the device or available from the network). Should such a handoff be supported and occur, then updated Cell-ID may be included in P-ANI header. An updated Cell-ID in a P-ANI header will not be used by the ECAS for caller location and may or may not be included. It is recommended that updated Geolocation header containing a PIDF-LO if available should be passed to the ECAS using a SIP Re-Invite or Update.
2/3G	WiFi	
4G	4G	Updated P-ANI header may be passed to the ECAS however this will not be used for caller location or call routing. IEEE ID (wifi network id) information may be present in the P-ANI header but will not be used by the ECAS. It is recommended that updated Geolocation headers should be passed whenever available using Re-Invite or Update. The provision of a re-invite or update in the event of handoff is not mandatory

		however it is recommended that this be passed to the ECAS if (updated) geolocation information is available.
4G	2/3G	This is not expected to be a valid handoff scenario however should it occur; no Additional or updated information will be available in this mobility scenario so there is no requirement to pass additional information to the ECAS.
4G	WiFi	Handover from VoLTE to VoWiFi may result in a change to CellID (change to the fake 2/3G formatted Wi-Fi CellID) however this will not be used by the ECAS. It is recommended that updated Geolocation headers should be passed whenever available.
WiFi	WiFi	No updated cell information will be available. If Call is carried using SIP, it is recommended that updated Geolocation headers where available should be passed at any stage during the call.
WiFi	2/3G	No Additional or updated information will be available in this mobility scenario.
WiFi	4G	Handover from VoWiFi to VoLTE may result in a change to CellID (change from the fake 2/3G formatted Wi-Fi CellID to real E-UTRAN CellID) however this will not be used by the ECAS. Updated P-ANI header may be passed to the ECAS however this will not be used for caller location or call routing. It is recommended that updated Geolocation headers should be passed whenever available using Re-Invite or Update. The provision of a re-invite or update in the event of handoff is not mandatory however it is recommended that this be passed to the ECAS if (updated) geolocation information is available.

5 Network Suffixes

The network suffix for an Emergency Call is given by digits WWXX of the B-number:

V	V	V	W	W	W	X	X	Y	Y	Y	Y	Z	Z	Z	Z
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

The implementation of this specification will result in the existing network suffixes used for Emergency Calls² from mobile networks being replaced by the suffixes given in the Table 3 below.

Suffix	Operator
WWXX	
27201	Vodafone,
27202	O2
27203	Eir

Table 4: Network suffixes for Emergency Calls from mobiles

6 Implementation issues

1. Mobile operators are unlikely to be using the LAC and CI values of 00000, 65533, 65534 or 65535, however if allocated, the values would need to be changed to comply with this specification.
2. Transport of 4/5G E-UTRAN Cell IDs requires end-to-end SIP transport of the Emergency call to the ECAS as the cell ID Hex digits can not be transported in SS7 signalling which supports numeric digits only. The end-to-end SIP transport requirement includes all intermediate and transit networks used to route the Emergency call to the ECAS.

End of Document

² Network suffixes are used by eir to determine the originating network for an emergency call.
