EENA Operations Document

Advanced Mobile Location (AML)
Specifications & Requirements

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Note:
Most requirements were adopted during the EENA Members Workshop held on 19-20 October 2015 in Brussels. Some additional details were agreed between EENA and BT, taking into account the information received from the countries currently testing AML. Due to the many requests sent to EENA by the countries testing AML for the specifications and requirements, this document did not follow the regular EENA Operations Committee approval process.

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Table of contents

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1 Executive Summary

Despite the existence of legislation to mandate accuracy and reliability targets for locating emergency calls, no Member State in Europe has set any. In the absence of this, and in view of the fact that many handsets have had very precise location information for several years, the UK Stage 1 PSAP operator, BT, along with its partners EE, O2, Three and Vodafone (Mobile Network Operators), set out a project to resolve the impasse by designing and implementing its own solution. The project is known as the AML (Advanced Mobile Location) project and it uses existing handset technologies with an already available SMS solution to transport the information from the handset to the BT PSAP and match it with the voice call based on the Calling Line Identity (CLI) details. The aim is to supplement and enhance the location provided by the network wherever possible.

At the time of writing this document (February 2016), BT was handling approximately 4000 emergency calls per week using this solution, that has been implemented for handsets of HTC (since July 2014), Alcatel, Sony Mobile and Samsung in the UK. This has led to improved accuracy levels as handset technology can provide a location precision as good as 5 metres outdoors (and averaging to within circular areas of ~25m radius for indoor locations), a significant improvement on existing cell coverage provided by mobile networks, of which the average (across the UK) is about 1.75km radius. The solution doesn't ignore the Cell-ID information that already existed but rather supplements it with either GNSS information or Wifi information taken from the handset.

From the 4000 handset locations each week, approximately 40% use A-GNSS/GNSS location information, 34% use Wi-Fi location information, and 8% Cell location (for 18% of handset messages received there is no additional caller location information available from the handset). 91% of the handset locations are accepted after comparison with network location (to eliminate any cases where handset is unable to provide a reliable current location, for example if WiFi data has not been updated).

In 87% of accepted handset locations, location accuracy is given as approximately within 50 meters. 90% of locations arrive within 30 seconds of the network location being provided.

No significant investment was needed by the mobile networks or handset providers. The handset enhancement is invisible to handset users who simply call 112 as normal and do not need to download an App.

There are currently 10 European Countries testing or about to start testing Advanced Mobile Location in addition to the UK.

This document lays down the specifications and requirements of the Advanced Mobile Location service.

2 System overview

The objective of the AML product is to produce a simple, cost effective solution to the mobile location problem that makes use of the built-in location capabilities of modern handsets. Once the mobile handset knows its location it is sent to PSAPs using a simple, already available, Short Message Service (SMS) based protocol (which gives up to 160 characters of data). SMS offers the best geographic coverage, especially in remote areas, and additionally, Emergency SMS are usually not charged.

2.1 Process automation

The software must be integrated into all existing emergency call mechanisms available on the handset including manual dial of 112 (or any other national shortcode emergency number) or use of the Emergency Call button (as appropriate).

In an emergency callers are often stressed or panicking so it is important that the AML functionality and transmission of the SMS message is automatically triggered without any manual intervention by the user. The handset software must be invisible to the user so as not to confuse them when they are trying to get help. No record of the SMS message should be available to the user either during or after the emergency call. The SMS message should be sent to one shortcode per country (e.g. 112), irrespective of the method used to initiate the

emergency call.

2.2 Enabling AML

As an important development consideration, AML was designed so that it does not interfere with the voice emergency call so if this solution is replicated in other EU countries, developers should confirm that both the handset and mobile network can simultaneously support a standard GSM emergency voice call, establishment of GNSS/Wifi location and SMS transmission to the PSAP over the GSM network during the emergency call.

2.3 SMS invisibility

The AML SMS should not be seen by the caller and therefore should not appear in the SMS "sentbox" of the smartphone. This is to avoid any customer confusion and to avoid making the format of the message widely known. In addition, there is also a potential privacy concern in storing the location of an emergency call on the handset, which could be seen by others.

2.4 Battery life

When a caller initiates an emergency call it is essential that the voice call is protected even at the expense of location data. The AML solution first checks the mobile handset battery life before switching on any location devices likely to consume appreciable battery life. Because the safety threshold for battery life will vary between handsets, the handset manufacturer will be best able to give this type of advice.

If the remaining battery life is a barrier to using GNSS or Wifi location methods, the AML solution states that a cell based method should be used. Most PSAPs already receives cell based location directly from the MNOs, however cell data from handsets can sometimes return a smaller area.

2.5 International roaming

For international roaming, there are challenges since an SMS is returned to the home country's SMS Centre for routing. A number of options are being considered to allow the AML message to be routed to the visited country's PSAP - these will be tested in the HELP112 project during 2016.[1]

Until a recommended solution is agreed, the AML functionality should be turned off when roaming.

2.6 Positioning method

GNSS normally offers the best location information but is slower than other methods. At the other end of the spectrum cell based location is quick but typically returns a larger location area. The general rule is that PSAPs need the best data as long as it doesn't take too long to determine so a 'send us what you have now' timeout was introduced.

It is good practice to make timeouts configurable so here we will refer to T1 as the timeout period – see Figure 1 below. This timeout is the maximum time between the emergency call being initiated and the location SMS being sent. T1 should be changeable with an 'over the air' update and as it currently stands, a timeout period of 20 seconds should be used.

As soon as the emergency call is initiated the handset should switch the following on (if not already switched on):

[1] http://www.help-112.eu/

- GNSS (subject to the battery check).
- Wifi (subject to a battery check).

In the AML, the handset immediately attempts to determine location via all methods in parallel, so as not to delay transmission of location after the T1 timeout. If it is possible to distinguish them, cached (stale) or existing locations should not be used.

If GNSS data becomes available before T1 seconds then that data is sent without waiting for the timeout.

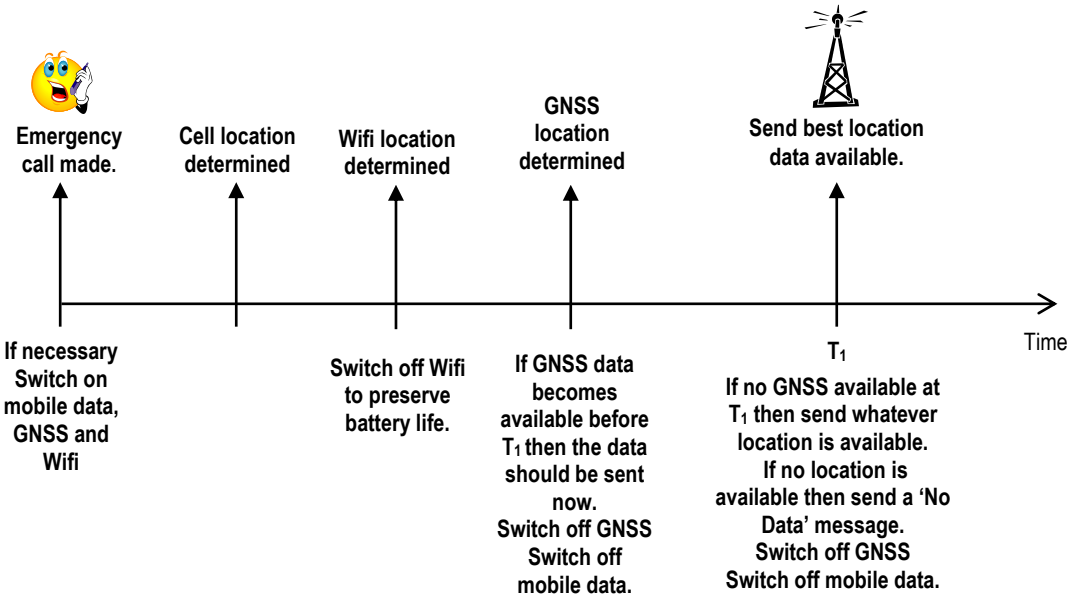
If at T1 seconds no GNSS data is available, but location is available based on Wifi SSIDs or MAC addresses of nearby access points, then the Wifi location is sent.

If no Wifi based location is available then the cell ID based location data is sent.

If GNSS or Wifi was switched on when the emergency call was initiated, then it should be then switched off as soon as it is no longer needed.

If it's not been possible to get a location from any method then an SMS is sent indicating that all positioning methods have failed (see section 2.8).

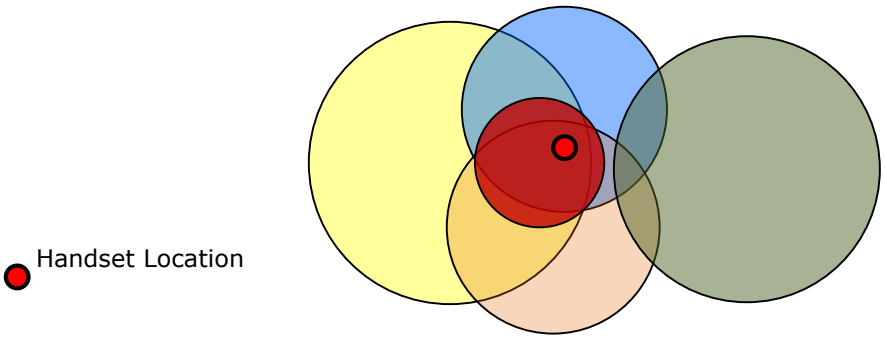
The following timeline shows the process.



[Source:BT]

When Wifi or Cell IDs are used to determine location, the handset should try to minimise the location area by using as much information as possible. Some 'Wifi to location' services require that multiple Wifi MAC addresses be supplied. This is important as it can help to eliminate situations where an incorrect location is given because a Wifi router has been moved and its location has not been updated on the location server. This approach should be adopted for all AML locations based on Wifi.

Similarly, multiple cell identifiers should be used to generate a smaller location circle by identifying the overlap areas for different cells shown with different colours below, and where red circle is the resulting location.



2.7 Repeat calls and Dropped calls

If the caller makes a repeat voice call within the T1 period, for example because initial voice connection is lost or dropped, or the call is deliberately terminated by the caller, and the handset is still trying to determine location, the handset should then continue based on the original call trigger. If the repeat call is made after location has been determined and the SMS sent or queued, then the handset should restart the location determination process.

2.8 'No location data' procedure

There are a few circumstances when the handset will be unable to determine its location. When this happens a 'no data' SMS message should be sent.

The contents of this 'no data' SMS is detailed in section 4.2.2.

3 Advanced Mobile Location SMS

3.1 Description: content of location message

The handset should always communicate location using WGS84 decimal degrees. To save space in the SMS message an accuracy of no more than 5 decimal degrees is required which will equate to 1.1 metre accuracy on the ground.

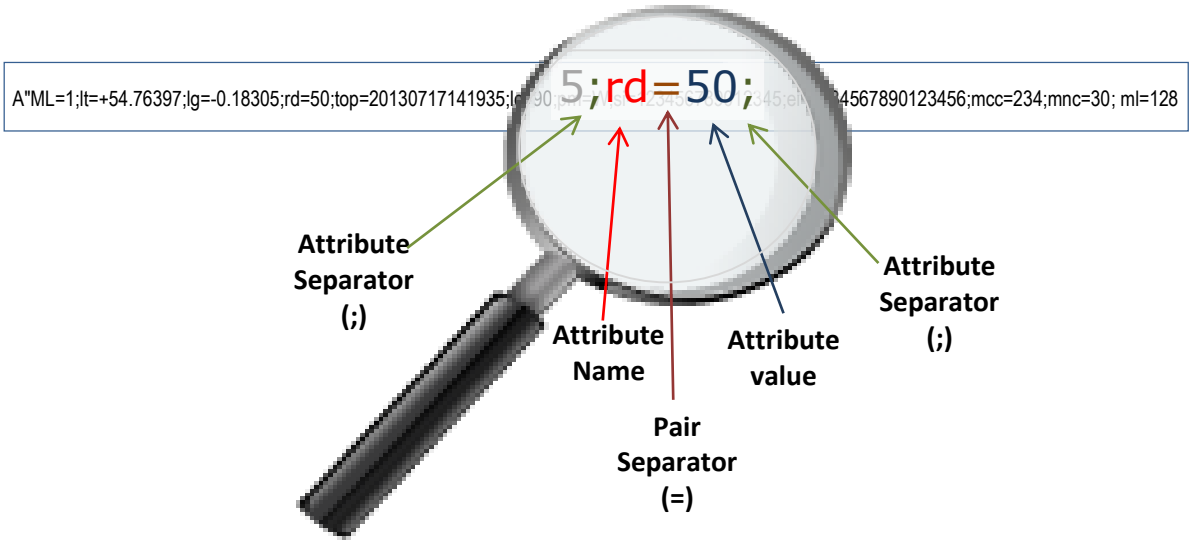
Location technologies all have a margin of error caused by various factors such as terrain, buildings or weather conditions. Communicating this margin of error is done by specifying a Level of Confidence (LoC) figure. A LoC is a percentage figure that describes the probability that the caller is within the location area described by the latitude, longitude and radius figures.

Time of Positioning (TOP) must also be sent with the location data. The TOP must use Greenwich Mean Time (UTC). The accuracy of this date and time is important to filter out any messages that appear to be too old or have a time in the future. The handset should first attempt to use an (Network Time Protocol) NTP server to establish the time and this should be possible if a network connection is available. If NTP is not available then GNSS can be used to give time.
If these two methods fail, then, as a last resort, the handset time and date can be used.

The AML interface protocol consists of a series of message attributes separated by a semi colon (;) character without spaces. Each attribute consists of a name/value pair where names and values are separated by an equals (=) character again without any spaces.

A header record must always appear at the start of the SMS, this is important as the Header will be used to route the SMS to the AML system. A message length attribute must always be the last attribute in the SMS message.

The diagram below gives an example of the SMS message used in the AML solution.



[Source: BT]

More important attributes (latitude, longitude, radius) will appear at the beginning of the SMS with less important towards the end. The following table gives a detailed description of each attribute with the ordering of attributes in the table below also how they should normally appear in the SMS.

To assist with compatibility, servers should be able to process the attributes in any order in which they are received, and recognise and process at least the previous AML header.

3.2 Attributable definitions

Unless explicitly stated in the description data, values should not include white space or zero padded values. Data should be passed using the ASCII[2] standard character set only.

Attribute	Attribute Name	Attribute Size (chars)			Attribute Description
		Name	Value (Max)	Total incl '='	
Header	A"ML	4	3	8	The header must appear at the beginning of the SMS message as it's used to differentiate AML messages from other emergency SMS messages The header must be in upper case and have a double quotes character (") in the character 2 position. The attribute value will indicate the interface version number. This is version 1 of the interface. No left padding with zeros is required. The field is a maximum of three characters allowing iterations of the interface if required. An example of the Header would be **A"ML=1;**lt=...

[2] American Standard Code for Information Exchange II

Attribute	Attribute Name	Attribute Size (chars)			Attribute Description
		Name	Value (Max)	Total incl '='	
Latitude	lt	2	9	12	The WGS84 latitude and longitude of the centre of the location area given in decimal degrees up to 5 decimal places giving resolution to 1.1 metres.
Longitude	lg	2	10	13	The format of the attribute value will be <sign><decimal degrees>where: **<sign>** This can either be a + or -. **<degrees>** This is a numeric value representing the latitude or longitude in terms of decimal degrees relative to the equator or meridian. This field consists of numeric and a single decimal point character (.) Latitude values fall in the range of +/-90 degrees (2 digits before the decimal point) character, whereas Longitudes fall in the range +/-180 degrees (3 digits), therefore Latitude is one character less than Longitude. Examples of the latitude and longitude are given below. Please note that a "." is used for the decimal marker separating the integer part from the fractional part. AML=1**;lt=+55.74317;lg=-4.26881;**rd=… If it is not possible to determine a location the SMS should still be sent with latitude and longitude set to +00.00000(lat), +000.00000 (long) and positioning method set to N.

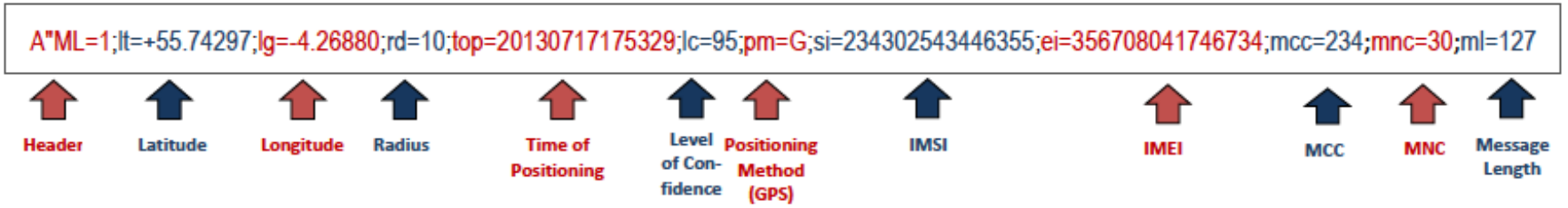
Attribute	Attribute Name	Attribute Size (chars)			Attribute Description
		Name	Value (Max)	Total incl '='	
Radius	rd	2	5	8	The radius of the location area in metres. This field is all numeric. An example of a radius attribute is given below …576**;rd=50;**top=… If it is not possible to determine a location the SMS should still be sent with a radius set to 'N' and a positioning method set to 'N'.
Time of Positioning (TOP)	top	3	14	18	The date and time that the handset determined the location area specified in GMT (UTC). This must be the time that location was determined and no other time. The field format is YYYYMMDDhhmmss Where: **YYYY** is the year. **MM** is the month in the range 01 to 12. **DD** is the month in the range 01 to 31 **hh** is the hour in the range 00 to 23 **mm** is the minute in the range 00 to 59 **ss** is the second in the range 00 to 59. An example of a Time of Position attribute is shown below: ……**;top=20130717175329;**…… When the handset is unable to determine its location the TOP should be the date and time that the location process was deemed to have failed.

Attribute	Attribute Name	Attribute Size (chars)			Attribute Description
		Name	Value (Max)	Total incl '='	
Level of Confidence (LOC)	lc	2	2	5	It is recognised that methods for determining mobile handset location are not infallible. Terrain and weather conditions introduce a margin of error into location calculations. Different methods will have different error factors that need to be communicated to the Emergency Services. The Level of Confidence is a percentage probability that the mobile handset is within the area being communicated, for example a 95% value tells the Emergency Services that there is a 5% probability that the caller is not within the location area specified by the lat, long and radius values. It is assumed that we will never have 100% certainty hence the two character field. An example of a Level of Confidence (LOC) message is shown below: ….=50**;lc=95;**pm=…. If it is not possible to determine the location the SMS should still be sent with a level of confidence set to 0 (zero).
Positioning Method	pm	2	1	4	The method used to determine the location area. A single upper case character that can be one of: **G** - GNSS. **W** - Wifi signal **C** – Cell **N** – It has not been possible to determine the location. An example of a Positioning Method attribute is shown below: ….lc=95**;pm=G;**si=….

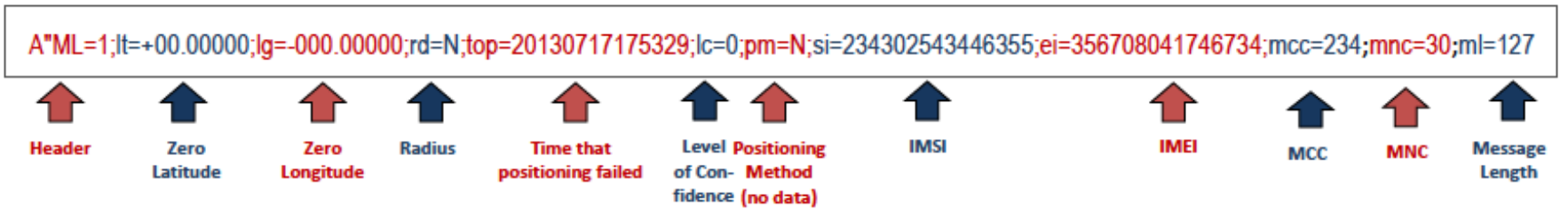
Attribute	Attribute Name	Attribute Size (chars)			Attribute Description
		Name	Value (Max)	Total incl '='	
International mobile subscriber identity (IMSI)	si	2	15	18	The SIM card identifier of the handset that has made the emergency call. ….=G**;si=234302543446355;**ei=….
International mobile equipment identity (IMEI)	ei	2	16	19	The identifier of the handset that made the emergency call. …55**;ei=356708041746734;**ml…
MCC	mcc	3	3	7	Mobile Country Code, used to determine the network country that the emergency call was made on. …..34**;mcc=234;**mnc…..
MNC	mnc	3	2	6	Mobile Network Code, used to determine the mobile network used to make the emergency call. In most cases this will be the home network MNC but in some cases will be another network code. **It is important that this field is filled in correctly as it will be used this to identify data relating to national roaming calls.** ...234**;mnc=30;**ml=…..
Message Length	ml	2	3	6	The length of the entire SMS message including the header and the length attribute. The message length name should be in lower case and the value should be all numeric. An example of the message length message would be ……**;ml=124**

3.3 Example AML messages

3.3.1 GNSS based location SMS message



3.3.2 Unable to Determine Location AML Message.



3.4 SMS transport format

It is important to note that 2 types of SMS may be used to provide the AML location information. Which type of SMS is used may depend on the options open to handset manufacturers or OS providers to suppress a record of sent AML location message on the handset.

3.4.1 Regular SMS

Regular SMSs are used by handset manufacturers currently providing the AML service in the UK (Sony Mobile, Samsung, HTC and Alcatel). Handset Manufacturers can readily suppress the AML messages from the "sent messages" section of the smartphone.

The processing of such regular SMSs is widely known and not discussed further in this document.

3.4.2 "Data SMS"

The reason for choosing this type of SMS is because the Operating System (OS) will not automatically store a data SMS into the user's "sent messages" section. "Data SMS" is a particular subset of the SMS standard. It is important to note that this is NOT an SMS message sent through a data connection, this is simply an SMS which contains a particular type of binary data format as a payload, and is addressed to a particular port on the receiving end (calling it a Data SMS is a bit of a misnomer for this reason). These types of SMS are not as familiar to end users but are in common use by mobile networks, for example in setting the Voice Mail waiting indicator on your phone (or other carrier services), or for over the air handset updates or changes to SIM card settings.

As these SMSs are less familiar we include more detail. Here we are only concerned with SMS from the handset to the mobile service centre (SMSC), ie, SMS-SUBMIT (mobile originated) type messages. SMSCs should be able to receive these messages without problems as they are part of the normal SMS standard (no problem was encountered in the countries where AML "Data SMS" was tested, with several MNOs). In the following, we consider an SMS-SUBMIT message from the handset to the SMSC, which follows normal SMS standards (GSM 3.40).

The fields within an SMS message include: the SMSC number, sending address (caller's MSISDN), the Protocol Data Unit type, a protocol identifier (00 - default short message), the DCS data coding scheme, a time stamp and user data length. This is then followed by the User Data which is the AML message in this case.

The "data SMS" is a subset of normal SMS that:

1. Has the User-Data-Header-Indicator flag set in the PDU type field of the SMS message (6th bit of the first octet of a GSM 03.40 or 3GPP 23.040 message)
2. Contains a User-Data-Header within the User-Data of the SMS
3. The User-Data-Header contains an application port address Information-Element-Identifier (IEI)

Note that we do not specify any particular Data-Coding-Scheme (DCS) here. The DCS is used to identify the encoding within the User-Data segment. There are three options currently for the DCS:

- GSM 7-bit default alphabet (which includes national language shift tables) and is used for regular text messages in Europe
- UCS-2 (for 16 bit characters)
- 8-bit data

If the selected DCS is 8-bit data, the standard does not make any particular guarantees about the details of the encoding. Given that the User-Data segment has a maximum of 140 bytes, and that the minimum size of a User-Data-Header that includes port information is 7 bytes (a length field plus 6 bytes to indicate the port

number), this leaves a maximum of 133 bytes to encode the actual AML emergency message. The port number will be fixed by each OS provider and made known to the PSAPs receiving AML messages.

In order to maximise the amount of information in the AML message, even if the 8-bit DCS flag is set, the encoding used by the OS will be the GSM 7-bit alphabet, with each 7-bit encoded element occupying only 7 bits, not 8 bits. So the AML information is packed using 7-bit characters, giving a maximum of 152 characters for the AML message, so the first 7 bits of the first byte make the first character, then the last bit of the first byte and the first 6 of the second make the second character and so on.

The PSAP receiving the AML SMS message forwarded by the SMSC may decode the AML payload found in the User Data segment of the SMS using the above knowledge of how the message is constructed.

Note: Handsets don't store a data SMS, because data SMS are addressed not only to a particular destination through the destination number, but to a particular port, and normally need particular data decoding. That port usually means a specific application of some sort on the receiver. It would therefore be inappropriate to store/show this as a regular SMS, as the data SMS may only have been intended for one particular application, not the handset in general.

3.4.3 Use of more than one AML application

It's possible that (at least in the short term) a handset may have both a version of AML provided by a handset manufacturer, and one provided by an OS provider. In this case the PSAP may receive 2 location SMSs.

4 Requirements and Recommendations

4.1 Requirements

The requirements for the deployment of AML are presented in the following table:

Item	Requirement
SMS transport format	• PSAPs/Public Authority should be able to receive and decode both "regular SMSs" and "Data SMSs" as defined in Section 3.4 of this document
AML message content	• The content attributes described in section 3 of this document should be used • Recipient of the SMS has to make sure that the attributes can be read regardless of the order
SMS invisibility	• Sending of the SMS should be invisible to the user on the handset and should not be stored on the handset
Shortcode	• AML message should be sent to a unique shortcode per country e.g. 112, 999, 101… etc. (but can be triggered by dialling any national shortcode emergency numbers)
International Roaming	• Until a recommended solution is agreed, the AML functionality should not be activated when roaming.
Consistency of AML location and network Cell-ID location	• Up to the public authority to provide guidance to PSAP call takers about how to manage cases where the location provided with the AML message and the location provided by Cell ID differ appreciably
Frequency of AML SMSs	• As a minimum and in order to receive the best possible location that is available at that time, one SMS should be sent no later than 20 seconds after the emergency call is initiated as described in section 2.6
Battery life	• Up to the handset manufacturers/OS provider to decide when the AML functionality should not be triggered because of the battery level to allow for a short (5 minute) voice call to be placed
User consent	• Not needed when making an emergency call.

TOP (Time Of Positioning)	• The date and time that the handset determined the location area specified in GMT (UTC).

4.2 Recommendation to stakeholders

The set of actions recommended for each stakeholder is presented in the following table:

Stakeholders	Actions
Handset Manufacturer / OS provider	• Deploy AML • AML SMS message sent only in AML ready countries based on MCC/MNC to a short SMS number determined by MCC
Public Authority	• Be able to receive the AML SMSs (regular and "Data SMSs") • Ask MNOs to contact handset manufacturers so that they deploy AML • Decide guidance for call takers for comparing Cell ID and AML locations
MNO	• Contact handset manufacturers so that they deploy AML • Carry SMS free of charge • Test AML with handset manufacturers and PSAPs • Ensure with network equipment providers that the SMS can be sent during the emergency call (change this switch parameter if needed)
National Telecom Regulators	• Ask MNOs to contact handset manufacturers so that they deploy AML

5 Glossary of Terms

Acronym	Meaning
AML	Advanced Mobile Location
CLI	Calling Line Identifier
DCS	Data Coding Scheme
GNSS	Global Navigation Satellite System
A-GNSS	Assisted Global Navigation Satellite System
GSM	Global System for Mobile Communications
IMSI	International Mobile Subscriber Identity
IMEI	International Mobile Equipment Identity
LOC	Level of Confidence
MNOs	Mobile Network Operators (referred to as Carriers in some jurisdictions)
MCC	Mobile Country Code
MNC	Mobile Network Code
OS	Operating System
PSAP	Public Safety Answering Point

SMS	Short Message Service
SMSC	Short Message Service Center
TOP	Time of Positioning
UTC	Universal Coordinated Time (known as Greenwich Mean Time also)

6 How can I start testing AML?

If you wish to start testing AML in your country (in Europe or elsewhere), please contact EENA at aml@eena.org.

APPENDIX: BT trial guide and test results

Advanced Mobile Location (AML)

Trial Guide & Test Results (version for EENA)

Authors: John Medland, Stuart Goodman

Version: 2.2 Issued Nov 2015

Contents

1 Introduction

This document is designed to help test the effectiveness of using smartphones to locate emergency callers.

Once you have the smartphone handset we would like you to conduct the tests at the end of this document designed to exercise the handset's location functionality and ability to provide location to the emergency services during emergency calls.

The documentation for this Advanced Mobile Location functionality is listed in the reference section.

The tests consist of a voice call to 999 (or 112 may be used) and an automated SMS to 999 in the UK(not charged for), or the country specific emergency SMS number.

There is a script to be followed for speaking to the 999 call handling agent at the Stage 1 PSAP (see section 6) which is needed to avoid any confusion on the live service. Test calls need to be planned and agreed with the BT999/ Stage 1 PSAP call handling team – contact (insert local Stage 1 PSAP email address) using 'AML emergency test calls' as the subject.

The test results will be summarised by BT999/Stage 1 PSAP team providing confirmation that locations from the handset :-

- are provided in >80% of cases
- offer improved precision on network provided cell coverage
- are provided in a timely manner

2 Testing

2.1 General Testing

For each test try to ensure you have at least two bars of network signal

2.1.1 Handset settings

- Data settings – mobile data is to be enabled at all times
- Time settings – automatic (i.e. aligned with network time, not set by user)
- Network Settings – automatic (i.e. uses 4G, 3G or 2G)
- Battery Protection Settings – set as “on”
  Battery – battery is expected to have at least 15% battery charge

2.1.2 Wifi mode

Wifi can be enabled/disabled according to the individual tests described later.

2.1.3 “Typical User” settings for location functionality

3 sets of tests are defined in the different types of location (rural, city, inside, etc) in section 2.3 in order to test a handset’s ability to provide a location using Assisted GPS, Wifi, cell coverage or standalone GPS.

It’s helpful to use the three Google Location modes as our three “typical user” types:

(a) High Accuracy (the “use everything for best service” user that can use assisted GPS (AGPS), WiFi or Cell ID based locations

(b) Battery Saving (for the “careful user”, wifi and cell only),

(c) Device Sensors (privacy conscious setting, uses stand alone GPS).

For other handset operating systems, the nearest equivalent should be used

2.2 Location accuracy tests

For a major change – a new handset provider’s first implementation of the AML functionality, or first handset with a major OS upgrade - then all 7 tests listed below should be carried out sequentially (ie without switching “typical user” type between tests). Therefore, it is suggested that all the A tests are completed, then the B ones and lastly the C ones, which effectively means 3 ‘circuits’ of tests and 21 tests in total.

Conduct the tests for each type of location:

- Rural Countryside
- Rural Building
- Rural Car
- Urban
- Motorway or Dual Carriageway
- House Location
- Office Location

For regression testing, ie OS upgrades that are not expected to affect the location functions, or for testing of additional handsets with a particular OS version, then a reduced set of location tests can be used as described in table in section 8. This would be 6 test calls - two sets of tests for the three location modes that users can select – one set in presence of both GPS and WiFi (eg outside a building with clear line of sight to the sky and also near WiFi access points), and then another set where no GPS is present. This is to test the devices ability to position with Assisted GPS, GPS and WiFi information.

2.3 Special Tests Needed

These would not be tested in a range of locations but probably only once or twice in a suitable location - see section 8.

- Test with Mobile Data disabled
- Test explicitly 2G, 3G and 4G separately with appropriate SIM
- Use of 999, 112 and any Emergency Call button in one specific location
- Use the battery saving modes deployed on handset in one specific location : can these restrict emergency location functionality?
- If appropriate, test a case where battery is low (<15%) : is functionality disabled as expected?

2.4 The Test Process

For each location type:

1. Print out the page from Section 5 of this document with the test description and form to fill in

2. Find a place as described in the test description, but choose a location that is near a landmark you can identify later on Google maps or other on-line mapping source, for instance a road junction.

3. Write down the date and your text description of your location onto the test form. This should be enough to help you find it later on a map, plus note anything that might affect GPS signals such as heavy rain or thick cloud cover.

4. Conduct each test for the location setting the GPS and WiFi as specified and noting down the time you initiated the call.

5. Make the emergency call following the steps outlined in Section 6

6. Once you are back at a PC, fill in the provided Microsoft Excel spreadsheet (see section on "Test Results") with the date you wrote down on the test forms. Enter one row per test. To get the longitude and latitude of your test location see the section on "Determining your Longitude and Latitude"

Once you have tested all of your location types, please email back the Excel spreadsheet to the Stage 1 PSAP Test contact point.

2.5 SMS validation (optional)

A web-based tool may be made available for the tester to check that the SMS messages are being sent correctly to Stage 1 PSAP managing the receipt of AML messages. The URL is (insert country specific details) and this will allow the tester to search for all messages received for their MSISDN telephone number. Numbers may first be registered with Stage 1 PSAP by sending an email to (insert country specific details) using 'AML Testing' as the subject.

For further information on how to use this tool check with your local Stage 1 PSAP.

For example to use the tool in the UK, type the test phone's telephone number (MSISDN) into the text box and click Search. You should be given a list of received messages from this number, with the most recent one first. For each message you can choose to view the position on a map, and also check the validity of the message format. The UK tool can also be used to try out message formats.

3 Determining the Longitude and Latitude values for your Test Position

In order to test the accuracy of the coordinates in the AML message, it is necessary to determine the actual position of where the test call is made. This can be done by using an agreed internet mapping tool that allows you to work out your location in appropriate coordinates. It can be useful to use reference landmarks for pinpointing your exact location (using satellite view on internet mapping tool).

Once your position is located, copy the Lat / Long (decimal WGS84) values into the test rows in your spreadsheet for this location. Example below:

	A	B	C	D	E	F	G	H	I
1		Telephone #	Location ID	Date	Time	Test #	Latitude	Longitude	Text Description of Location
2		07364 7326348	1	22/08/2011	14:28	1	52.049218	1.316643	This is an example row to show what is expected in each cell.
3	1	07348 8727427	1	25/08/2011	15:34	A	52.195455	1.405907	Near Hill Croft farm standing on the concrete area used to store farm equipment
4	2	07348 8727427	1	25/08/2011	15:37	B	52.195455	1.405907	Near Hill Croft farm standing on the concrete area used to store farm equipment
5	3	07348 8727427	1	25/08/2011	16:01	C	52.195455	1.405907	Near Hill Croft farm standing on the concrete area used to store farm equipment
6	4	07348 8727427	2	27/08/2011	10:21	A	52.387119	1.273282	Standing on the first road junction on the left from Blakes farm in the direction of the shops
7	5	07348 8727427	2	27/08/2011	10:23	B	52.387119	1.273282	Standing on the first road junction on the left from Blakes farm in the direction of the shops
8	6	07348 8727427	2	27/08/2011	10:25	C	52.387119	1.273282	Standing on the first road junction on the left from Blakes farm in the direction of the shops
9	7		3			A			
10	8		3			B			
11	9		3			C			
12	10		4			A			
13	11		4			B			
14	12		4			C			
15	13		5			A			
16	14		5			B			
17	15		5			C			
18	16		6			A			
19	17		6			B			
20	18		6			C			
21	19		7			A			
22	20		7			B			
23	21		7			C			

4 Summarising Test Results

The Stage 1 PSAP will normally provide a summary of the test results highlighting the following key measures:-

- average time for SMS with AML information to reach PSAP's Emergency Location Server
- accuracy and precision (radius) of AML location
- % of AML locations due to GPS, WiFi and Cell
- % AML failures
- comparison with network accuracy and precision obtained from query to mobile network's GMLC

5 Tests and Forms to Record the Results

5.1 Rural Countryside

Location	Instructions	
1	Please find a location in the open countryside far away from buildings or constructions that could block GPS.	
Date of Test	**Text Description of your Location**	
Test	**WiFi**	**Time of Test**
A **High Accuracy** **User**	**ON**	
B **Battery Saver**	**ON**	
C **No assisted** **data**	**OFF**	

5.2 Rural Building

Location	Instructions	
2	Please find an outside location out of town and over 3 metres away from buildings or constructions that could block GPS, but where WiFi signals **ARE** present. For example in a village within WiFi range of a house with a WIFi router.	
Date of Test	**Text Description of your Location**	
Test	**WiFi**	**Time of Test**
2A	**ON**	
2B	**ON**	
2C	**OFF**	

5.3 Rural Car

Location	Instructions	
3	Please find a location in the Open Countryside and conduct the test inside a parked car.	
Date of Test	**Text Description of your Location**	
Test	**WiFi**	**Time of Test**
3A	**ON**	
3B	**ON**	
3C	**OFF**	

5.4 Urban

Location	Instructions	
4	Please find an outside location in a town or city street where WiFi signals **ARE** present.	
Date of Test	**Text Description of your Location**	
Test	**WiFi**	**Time of Test**
4A	**ON**	
4B	**ON**	
4C	**OFF**	

5.5 Motorway or Dual Carriageway

Location	Instructions
5	Please find a service station car park next to a motorway or dual carriageway and make a test call sitting in a car. Locate a parking space as near to the road as possible to simulate being stopped on the side of the road itself. Alternatively, if two testers are available, test 5 should be carried out twice while driving down different sides of the carriageway.
Date of Test	**Text Description of your Location**

Test	WiFi	Time of Test
5A	**ON**	
5B	**ON**	
5C	**OFF**	

5.6 House Location

Location	Instructions	
6	Please find a location inside in a house that **HAS** WiFi.	
Date of Test	**Text Description of your Location**	
Test	**WiFi**	**Time of Test**
6A	**ON**	
6B	**ON**	
6C	**OFF**	

5.7 Office Location

Location	Instructions	
7	Please find a location inside an office, which itself is deep inside a building where GPS signals cannot reach, but WiFi **IS** present.	
Date of Test	**Text Description of your Location**	
Test	**WiFi**	**Time of Test**
7A	**ON**	
7B	**ON**	
7C	**OFF**	

6 Emergency call procedure

This is an example for the UK Stage 1 PSAP – each country will want to adjust to it's own PSAP call handling processes for test calls.

For each test, please follow the script below and copy the responses to the test sheets. Obtaining the coordinates (Northings & Eastings) is optional as Stage 1 PSAP will be able to retrieve these through their records.

NOTE: Please can you ensure that you clearly mark down the date and time of the tests you have made (this can normally be obtained from the mobile's phone log). For each test please can you note below the precise location of where the call was made from

Any questions on the script please contact (insert country specific Stage 1 PSAP contact point) using 'AML emergency test calls' as the subject

6.1 Voice script

Person	Dialog	Record response
Tester	**This is Mobile Network/Handset Provider with a test Call**	
Operator	May I have your initials please (this may be requested later in the call)	
Tester	**Please confirm the telephone number is - *(Read the telephone number, or MSISDN, of your mobile phone)***	
Operator	Will confirm yes or no.[1]	

[1] PSAP operators may not give this information but can confirm it.

Tester	**What is shown in the Service Type? (*This will be the mobile network name)***	
Operator	Will read back the information presented	*e.g. T-Mobile, Three.*
Tester	**What is the zone code or cell ID please**	
Operator	Operator will read out the zone code (4 digits) or cell ID (10 digits) presented	*e.g. 1234*
Tester	**Are Police Connect-to Numbers present?** **Which Police abbreviation please?**	
Operator	Will confirm yes or no and give the abbreviation	*e.g. NYKS*
Tester	Please can you type **AMLD** in the notes field	
Operator	Yes	
Tester	**Thank you, that completes the test**	

7 Test Results

Copy this template and record test results for returning to Stage 1 PSAP

AML Results Template -copy.xlsx

8 Test Schedule.

The following table provides a recommended test schedule.

Test Category	Test Case	Test Description	Notes	Introduction of Service	Regression Tests
Rural Countryside	1A	High Accuracy User		●	●
	1B	Battery Saver		●	●
	1C	No Assisted Data		●	●
Rural Building	2A	High Accuracy User		●	
	2B	Battery Saver		●	
	2C	No Assisted Data		●	
Rural Car	3A	High Accuracy User		●	
	3B	Battery Saver		●	
	3C	No Assisted Data		●	
Urban	4A	High Accuracy User		●	
	4B	Battery Saver		●	
	4C	No Assisted Data		●	
Motorway or Dual Carriageway	5A	High Accuracy User		●	
	5B	Battery Saver		●	
	5C	No Assisted Data		●	
House Location	6A	High Accuracy User		●	
	6B	Battery Saver		●	
	6C	No Assisted Data		●	
Office Location	7A	High Accuracy User		●	●
	7B	Battery Saver		●	●
	7C	No Assisted Data		●	●
Special Tests	8A	Mobile Data Disabled		●	●
	8B	2G Test		●	●

Test Category	Test Case	Test Description	Notes	Introduction of Service	Regression Tests
Special Tests C'ntd	8C	3G Test		•	•
	8D	4G Test		•	•
	8E	999 Dialled Test		•	•
	8F	112 Dialled test		•	•
	8G	Emergency Button Test		•	•
	8H	Low Battery test		•	•

9 References

1. Title: Emergency Service Location Enhancement - User Story for a “999 App” (Handset Requirements)
   Author: John Medland
   Code: N/A
   Version: 1.0 Issued
   Date: 9th Oct 2013

2. Title: AML SMS Interface Specification
   Author: Ian Johnston
   Code: N/A
   Version: version 1.1
   Date: 4th August 2014