NENA

PSAP Call Back to All 9-1-1 Callers, Combating Wireless E911 Fraud And Mobile Emergency Service (E911M) Technical Information Document (TID)

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PSAP Call Back to All 9-1-1 Callers, Combating Wireless E911 Fraud and Mobile Emergency Service (E911M)

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National Emergency Number Association (NENA) Mobile Emergency Service (E911M) Joint Working Group of the Wireless Technical Committee and the Network Technical Committee

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1. Executive Overview

This document contains standards requirements for providing the PSAP with a working callback number to all wireless phones that call 9-1-1. It brings with it the solution to a number of other open issues.

E911M transforms E911 from a fixed network service to a mobile network service. It opens the door to the delivery new mobile emergency services through new access technologies such as voice over IP, 3G wireless, WiFI/WiMax and NGN Convergence. E911M also provides new capabilities for the PSAP and wireless service provider to deal pro-actively with fraudulent 9-1-1 calling behavior. While these benefits are difficult to quantify at this stage of development, they can't be overlooked.

The document is organized to show how one E911M capability is built upon another like building blocks. There are three separate towers of blocks to build. One tower is for call path associated signaling. It is least complex and most useful for standards supporting end-to-end VoIP (i3) and SS7/ISUP implementations. Another tower is for 20-digit non-call path associated signaling (e.g.,

ESRD+CBN) to the PSAP. It is potentially the most complex but is fully backward compatible to phase 0 and phase 1 wireless E911.

The third tower of E911M building blocks is for 10-digit wireline compatibility signaling to the PSAP (i.e., ESRK or ESQK). It may also be useful for VoIP implementations with non-call path associated signaling to the PSAP.

These towers of E911M building block are not total solutions. They are avenues to be explored through the development of new business models for providing E911M service to an increasingly mobile communicating society and thought the development of new technical standards based on E911M technology. Only then can a total solution be designed and fully quantified.

1.1 Purpose and Scope of Document

This document contains standards requirements for the following capabilities.

- Enable a PSAP to call back all phones, including wired, wireless, mobile or fixed phones, used to originate a 9-1-1 call.
- Combat fraudulent 9-1-1 calling from wireless and mobile phones.
- Manage mobility for all mobile phones used to call 9-1-1 or invoke any emergency service.
- Introduce new services to improve mobile emergency communication between a PSAP and other PSAPs, the public, responders and other agencies.

These capabilities are applicable for all access networks, wireless or landline. They are independent of access network technology and should be forward migrate able as they are applied to evolving technical standards.

The scope of these requirements is end-to-end: from the 9-1-1 calling (or called) phone to a primary or secondary PSAP and any other agency, private or public, on or connected to the public network or an Emergency Services Network. This includes private or remote emergency service providers which may relay emergency calls to a PSAP, such as an ACN or Telematics Service Provider, as well as State or Federal Government agencies. It includes emergency voice and data communications as well as mobility management and 9-1-1 fraud management functions in support of public safety and emergency response.

1.2 Reason for Issue

This document is issued in response to a number of issues raised within the NENA Technical and Operations Committees and the Emergency Services Interconnection Forum (ESIF) related to providing the equivalent and most effective 9-1-1 service for fixed, mobile, wireless and landline phones [1, 23]. These concerns, in general, are for the following.

1. Service to phones with a mobile, portable, international, private or no callback number.
2. Reduce the potential for 9-1-1 fraud from wireless and mobile phones.
3. Take fullest advantage of existing standards, as well as the new network elements and interfaces recommended in this TID for callback and to combat fraud, by introducing new mobile emergency services.

These concerns are described more fully in the references listed in Section 3. References in Section 3 are identified in this TID by the numbers shown in [brackets].

a. PSAP callback capability to all wireless phones [3] including non-subscriber initialized (NSI) phones [9, 22], international roamer phones [12], Telematics Units [8], VoIP phones [16, 17] and all phones in the future with geographic number portability [18].

b. PSAP outbound calling and callback capability to bypass "previously activated call termination features (e.g. Call Forwarding Unconditional, Call Forwarding Busy, Do Not Disturb) that will be activated by the switching systems upon receipt of the call." ([4] vol. 2, p.6)

c. Avoid the use of a non-dialable callback number, as prescribed in standards, with 9-1-1 calling from "…non-initialized mobiles, mobile phones whose subscription has expired, mobile phones without a subscriber identity module inserted, mobile phones from certain other countries, mobile phones from a service provider that does not have a roaming agreement with the current service provider, mobile phones donated by charitable organizations with the sole purpose of 9-1-1 access and other mobile stations referred to as '9-1-1 Only' devices." [5], p.C-1; [11]

d. Overcome PSAP callback limitations associated with inter-modal and inadvertent number porting. [6]

e. Combat wireless and mobile E911 fraud. [7,21] Identify its source and implement new call handling policies, procedures and systems consistent with FCC 02-296.

"The Commission's determination to require the forwarding of all wireless 9-1-1 calls without regard to the caller's service subscription status was intended to enable authentic emergency calls, not fraudulent or abusive calls. Where a PSAP has identified a handset that is transmitting fraudulent 9-1-1 calls and makes a request to a wireless carrier to block 9-1-1 calls from that handset in accordance with applicable state and local law enforcement procedures, the carrier's compliance does not constitute a violation of Section 20.18(b)." [24]

f. Allow a Telematics/ACN Call Center to place a Wireless E911 Phase II call for a Telematics Unit (TU) to the appropriate PSAP and provide the PSAP with a callback capability directly to the TU. [20]

g. Manage mobility for mobile phones used to report or respond to an emergency incident; support Emergency Service Network Convergence requirements for mobility management. [9, 19]

h. Introduce any related new services and network capabilities to gain the most benefit from an investment in E911M [22].

1.3 Reason for Reissue

NENA reserves the right to modify this document. Whenever it is reissued, the reason(s) will be provided in this paragraph.

1.4 Recommendation for Standards Development Work

Update all relevant landline and wireless emergency service standards and all NENA Operations and Technical standards to implement the capabilities described in this TID. Some specific recommendations for standards are shown in bold type within a paragraph.

1.5 Costs Factors

Reduced cost factors include the following.

- 9-1-1 call handling improvements in call center productivity, caller and call taker satisfaction through more consistent and complete call-related information and more timely information availability.
- More reliable, complete and uniform call information automatically available with the call to the primary, secondary or any subsequent PSAP or agency that may be involved with the call or call back.
- Automatic call data maintenance, sharing and reconciliation within and between PSAPs and serving systems.
- Reduced fraudulent wireless and mobile 9-1-1 calling.

Increased cost factors relate to providing more consistent, effective and reliable service on a call-by-call basis at the PSAP in a more timely, consistent and efficient manner. Costs may include new or upgraded network and computer equipment, signaling software, CPE, data systems and training to implement the standards and procedural modifications resulting from the recommendations in this TID.

1.6 Acronyms/Abbreviations

This is not a glossary! See NENA Master Glossary of 9-1-1 Terminology located on the NENA web site for a complete listing of terms used in NENA documents.

The following Acronyms are used in this document:	
ACN	Automatic Collision Notification
CBN	Call Back Number
CdPN	Called Party Number
CgPN	Calling Party Number
dMSID	Default Mobile Station Identity
DID	Direct Inward Dial Number
DN	Directory Number
E911M	Mobile E911, Mobile Emergency Service
ECR	Emergency Call Register
ESIF	Emergency Services Interconnection Forum
ESME	Emergency Service Messaging Entity
ESN	Electronic Serial Number, Emergency Service Number, Emergency Service Network
ESNE	Emergency Services Network Element
ESQK	Emergency Service Query Key
ESRD	Emergency Service Routing Digits
ESRK	Emergency Service Routing Key
GAP	Global Address Parameter
GMLC	Gateway Mobile Location Center
HID	Hardware Identity
HLR	Home Location Register
IAM	Initial Address Message
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Station Identity
ISUP	Integrated Services User Part
LPN	Local Public Safety Number
MDN	Mobile Directory Number
MEID	Mobile Equipment Identity

MIN	Mobile Identification Number
MP	Mobile Phone
MPC	Mobile Positioning Center
MSC	Mobile Switching Center
MSID	Mobile Station Identity
MSISDN	Mobile Station ISDN Number
MSRN	Mobile Station Routing Number
MTID	Mobile Terminal Identity
NANP	North American Numbering Plan
NCAS	Non-call Path Associated Signaling
NPA	Numbering Plan Area
NSI	Non-Subscriber Initialized (as in phones)
pESN	Pseudo Electronic Serial Number
P-CBN	PSAP Call Back Number
PCSC	Personal Communications Switching Center
PGID	Paging Identity
PSAP	Public Safety Answering Point
PSAP-ECR	Public Safety Answering Point – Emergency Call Register
PSTN	Public Switched Telephone Network
RCC	Remote Call Center
SR	Selective Router
SS	Serving System
SS7	Signaling System 7
SS-ECR	Serving System- Emergency Call Register
TLDN	Temporary Long Distance Number
TMSI	Temporary Mobile Station Number
TU	Telematics Unit
UIM	User Identity Model
uLPN	Unique Local Public Safety Number
VLR	Visitor Location Register
VoIP	Voice over Internet Protocols
WSP	Wireless Service Provider

2 Technical Description

There are five parts to this Technical Description.

(1) **E911M Building Blocks**. Describes basic technical components needed to identify, store and communicate the identities of the serving system and the caller's equipment.

(2) **Unique Local Public Safety Number (uLPN) as Call Back Number**. Introduces a working callback number (CBN) for the PSAP to call every 9-1-1 caller or any other party to an emergency situation at any time or place and in any access network. The capability is suitable for every PSAP and access network.

a. Message flow diagrams illustrate the use of a uLPN as a CBN for 20-digit or non-call path associated signaling (NCAS) of a CBN plus ESRD to the PSAP based on existing standards. PSAP use of a uLPN as a CBN with wire line compatible or 10-digit signaling of an ESRK or ESQK to the PSAP is also introduced.

b. Message flow diagrams in Section 4 – Exhibits show the same services and intersystem scenarios presented in this Section 2 of this TID except Section 4 assumes Call Path Associated Signaling (CAS) to the PSAP such as over SS7/ISUP or IP. Message flow diagrams are less complex since the use of a uLPN is not required with CAS.

(3) **Combat E911 Fraud.** Introduces the E911M Network to support a coordinated effort between PSAPs and Wireless or Mobile Service Providers to combat 9-1-1 fraud.

(4) **Mobility Management**. Expands the use of the E911M network to perform mobility management functions for emergency communicators through standard intersystem operations. E911 Mobile Phone Service enables 9-1-1 calling from any location, through any access network, to all 9-1-1 callers as well as emergency responders or any authorized party at a fixed or mobile phone.

(5) **Mobile Emergency Services**. Describes new emergency services for the PSAP, emergency callers, responders or any authorized agency through a Mobile Public Safety Network.

2.1 E911M Building Blocks

Building blocks are the essential elements of any E911M implementation. One is a **Local Public Safety Number (LPN)**. The LPN is a network address needed to route a PSAP call to the terminating network element. Another is a **Page Identity (PGID)**. The PGID is needed at the terminating network element to deliver the call at the correct terminal. The Page Identity is usually not a network address. Third is an **Emergency Call Registration (ECR) database**. The ECR is needed to associate the Page Identity with the address of the network where the call from the PSAP is to terminate and the permanent identity of the phone or fixed line used to call 9-1-1.

2.1.1 Page Identity (PGID)

1. To complete an emergency call from a PSAP to a mobile wireless phone, the phone is paged over the air by a serving system. A unique paging identity (PGID) is used. The particular identifier used as PGID depends upon the standards to which the phone and serving system are built. The PGID is negotiated between the serving system and the mobile phone when it enters the serving system.
2. A mobile wireless phone presents a unique PGID for itself to the serving system when it is used to originate a 9-1-1 call. It is usually one of the following. The PGID depends upon the relevant standard.
    a. The PGID may be the mobile subscription identity (MSID) in the mobile phone. The MSID may be an International Mobile Subscription Identity (IMSI) or a Mobile Identification Number (MIN) programmed into the phone by a service provider.
    b. A PGID may also be a temporary mobile station identity (TMSI) assigned by the serving system.
    c. A default mobile station identity (dMSID) is used to page a new mobile phone without a MSID programmed by a service provider. It is used for over-the-air activation of a new phone.
    d. A dMSID is not a complete MSID. As a result, it may not be unique within a serving system. In Section 2.2, *Figure 2 – Callback to a Non-Subscriber Initialized (NSI) Phone* shows the use of dMSID to successfully deliver a callback to the correct non-subscriber initialized phone where the dMSID is not unique in the serving system.
    e. The PGID may also be the mobile terminal identity (MTID) programmed into the phone by the manufacturer. The MTID may be an International Mobile Equipment Identity (IMEI), an Electronic Serial Number (ESN), a Mobile Equipment Identity (MEID) or other standard phone equipment identifier.
    f. There is a permanent MTID in every mobile phone. A complete MTID may be up to 56 bits. The MTID may be the only phone identifier available for a non-subscriber initialized (NSI) mobile phone, a phone without a Subscriber Identification Module (SIM) card or a phone without a removable User Identity Module (UIM). For this reason, it is recommended that standards be modified to include the following.
        i. Signal the MTID to the serving system either with or soon after the origination of a mobile 9-1-1 call.
        ii. Use the MTID to page a mobile phone for the delivery of mobile emergency services such as a PSAP call back.
3. A landline switch has a similar problem to reconnect the PSAP to a landline phone for an emergency call that was interrupted by the disconnection of the calling party. An end office translates the called directory number (DN) to the Hardware Identity (HID) assigned within

the switch to the line serving the phone in order to ring it. As such, **the HID may be considered the PGID for a landline phone.**

a. There may be cases where a phone is connected to the switch and draws dial tone, but may not have a DN assigned. One such case may be a pre-provision line where the service has been disconnected or the number ported for the prior subscriber and the next subscriber has not yet requested service. For such calls to 9-1-1, the switch could retain the HID to identify the origin of the 9-1-1 call so that callback could occur as requested by the PSAP.

4. Please note that a Mobile Directory Number (MDN), Mobile Station ISDN (MSISDN) number or any other number used for intersystem call delivery, such as a Mobile Station routing Number (MSRN) or Temporary Long Distance Number (TLDN), are not used to register or page a mobile phone.

a. A directory number (DN) is used to deliver an inbound call to the home system. The home system finds the identities of the mobile phone associated with the DN and the current serving system in a Home Location Register (HLR). This information, not the DN, is used to deliver a call to a roaming mobile phone through the serving system.

b. The serving system keeps a record of all registered phones it is currently serving with a service profile in a Visitor Location Register (VLR).

2.1.2 Local Public Safety Number (LPN)

1. A Local Public Safety Number (LPN) assigned to the switch in the serving system is used to uniquely identify the serving system. The LPN of the serving system is stored in the ECR.

2. The LPN is a network name and address. It may be a dialable 10-digit NANP number or any other network address.

3. In the PSTN, the leading 6-digits of an LPN from the NANP format (i.e., NPA-NXX) are uniquely assigned to the serving system MSC.

4. Use of a wireless or wired PGID with a LPN for PSAP callback is illustrated in Figure 1. In this message flow diagram, call path associated signaling (CAS) such as over SS7 (or through an IP core network) with ISUP is used between the originating network and the PSAP/SR. Diagrams with non-call path associated signaling (NCAS) are shown later in this document.

2.1.2.1 Mixed Service or Inadvertent Local Number Portability

1. Assume a scenario where a portable number has been ported from one subscriber to another. The number was ported from a landline to a wireless network.

2. The wired phone from which the number was ported is used to originate a 9-1-1 call. The portable directory number (DN) is signaled as the calling party number (CgPN) with the 9-1-1 call from the originating network to the PSAP. After the call drops, the PSAP uses the CdPN to call back the phone.

3. Since this is a portable DN, a number portability query occurs at the N-1 switch (i.e, the last node before the callback arrives at the original access network switch).

    a. If the number was ported in error, the callback cannot be routed to the original phone on the donor network. It will be routed to a recipient MSC in the wrong access network.

    b. If the number has been recently ported correctly from a wired to a wireless phone, the callback may be routed to the wireless phone rather than to the original wired phone. This would happen if the recipient network and the LPN database is updated with the ported number before the donor network is updated.

4. If the 9-1-1 call originated with VoIP over a wired or wireless access network, a dialable DN may not have been sent as a CBN to the PSAP. The PSAP may not have received a local callback number with the call.

5. The message flow diagram below (Figure 1) shows how a PSAP callback may be completed to the correct phone using an LPN and MTID (or HID) as the callback numbers rather than a DN.

    a. A standards requirement with E911M is that **a permanent phone identifier, the MTID, or a permanent fixed line identifier like the HID, is provided to the PSAP with every 9-1-1 call along with a network address to the access network where the 9-1-1 call originated.**

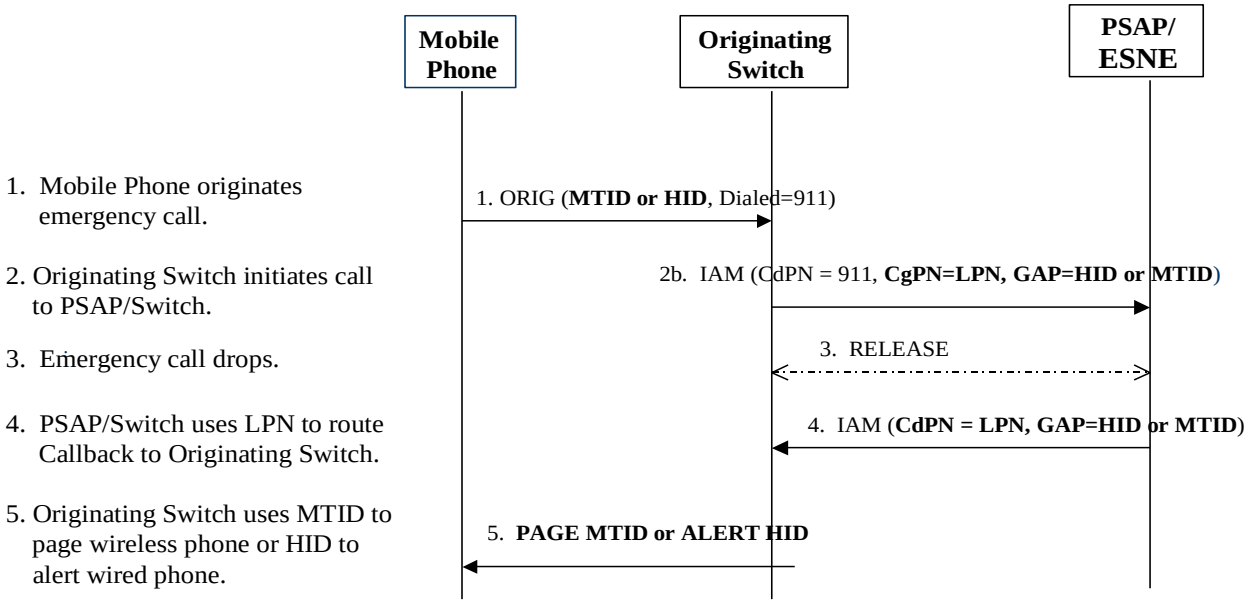

Figure 1 – PSAP Callback with LPN+MTID

2.1.3 Emergency Call Registration

Mobile phone registration occurs at the serving system with the origination of a mobile emergency call. An Emergency Call Register (ECR) is a database like a VLR. There is an ECR recommended for every access network used to originate a 9-1-1 call. The ECR database stores information about each and every emergency call such as the following.

1. Identity of the fixed line or mobile terminal equipment (e.g., its MTID or HID) to be called from the PSAP or any other authorized mobile emergency service agency.

2. PGID of the phone to be called.

3. Serving system identity as network address.

4. Call back number (CBN).

5. Initial and most recent or updated location of the mobile phone.

6. Recent 9-1-1 call history data and historical data retention timer.

7. Warning flags, criteria for assigning warning flags to individual callers and special call handling instructions for individual callers from the serving system.

8. Other information or instructions for any phone previously used or expected to be used for emergency service.

9. The ECR database is keyed on the MTID (or HID), ESRK or CBN signaled to a PSAP with every 9-1-1 call.

2.2 A Callback Number for All Phones – The Unique Local Public Safety Number (uLPN)

The uLPN is a working call back number to a fixed or mobile phone that serves to both address the serving system and uniquely identify the mobile phone. For the PSTN, the uLPN is a 10-digit NANP number. As with any LPN, the serving system is identified by the leading six digits. The last four digits uniquely identify the phone to be paged.

a. **A uLPN is assigned to a mobile phone by the MSC with every emergency call origination and signaled to the ECR with the MTID and other information about the phone**.

b. **For a wireless 9-1-1 call, the uLPN is signaled as a CBN according to existing standard 9-1-1 call origination procedures (from the MSC) to the MPC, and, based on the type of call setup, may also be delivered to the selective router (SR) and PSAP.** This is illustrated in the message flow diagram below, Figure 2 - Callback to a Non-Subscriber Initialized (NSI) Phone. In this scenario, the call setup follows conventional rules and delivers an ESRK through the Emergency Services Network Element (ESNE) also know as the Selective Router to the PSAP, (which the PSAP uses to obtain the uLPN from the PSAP ECR).

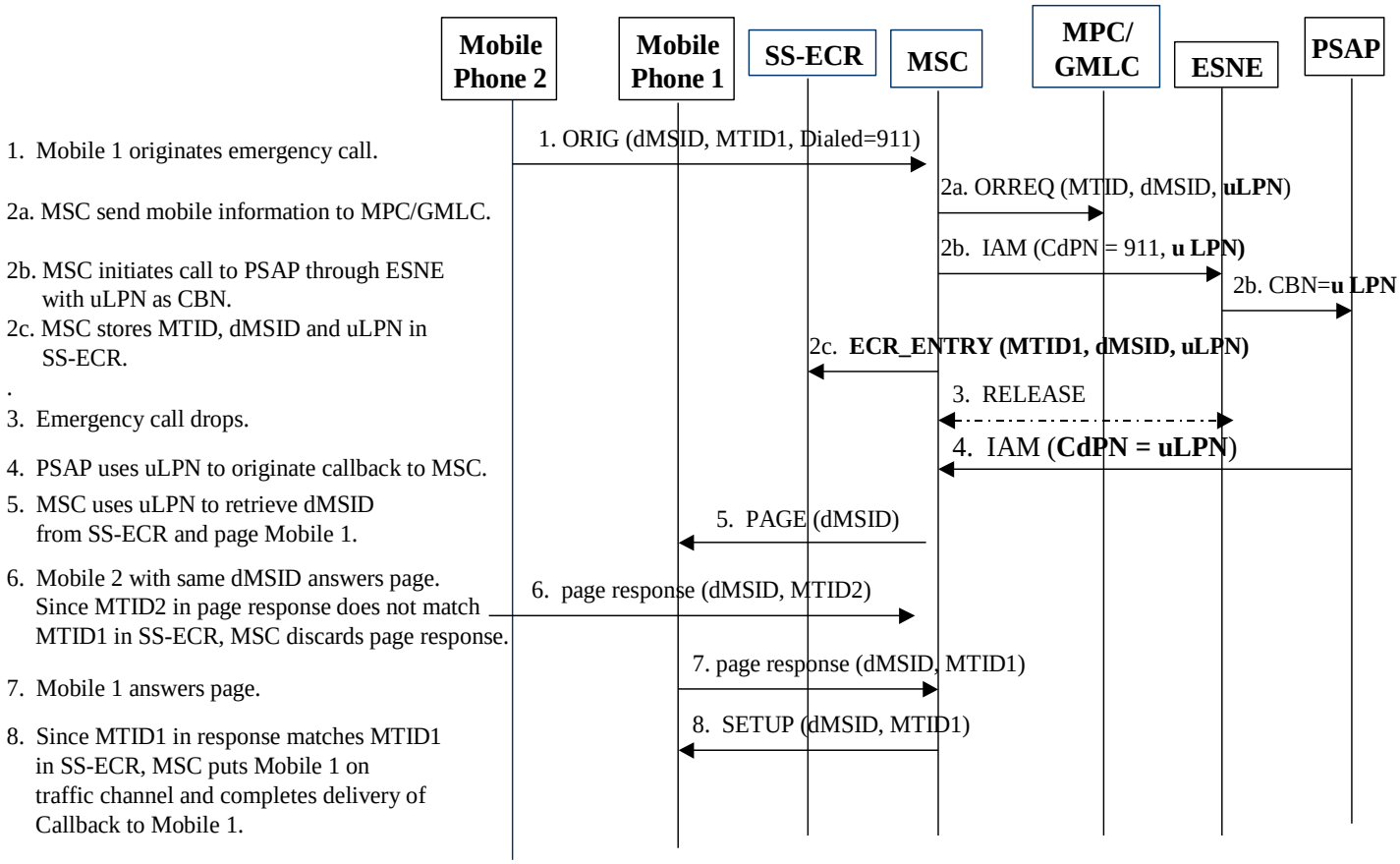

Figure 2 - Emergency Callback to Non-Subscriber Initialized (NSI) Phone (with another non-coded mobile with same dMSID in same MSC)

c. **Within the emergency service network (ESN), the uLPN may be signaled to the PSAP over the call path from the ESNE with CAS or with an ESRD. It may also be retrieved over a data path from ESME using the ESRK.**

- The ESRK is a unique call identifier but not a dialable number. Standard procedures exist to signal an ESRK to the PSAP. Under heavy traffic conditions, the ESRK may be quickly re-used for another Wireless E911 call after the initial call drops. As a result, a PSAP query to the ESME for a uLPN based on ESRK after the initial call drops may produce a uLPN for the wrong phone. A more reliable method is described below.

d. **For mobility management, the uLPN is updated through modifications to existing intersystem operation standards in order to call back the phone with a**

new uLPN from the new serving system. These modifications to intersystem operation standards are illustrated in the Mobility Management section of this TID.

e. Priority queuing at the MSC may be assigned to an LPN or uLPN to allow for a more timely and reliable call delivery than if the MDN or MSISDN were used.

f. A call to an LPN or uLPN is routed directly to the local serving system, not to a distant home system. There are no call termination restrictions, such as call forwarding or selective call acceptance, on an LPN or uLPN as may be activated for a MDN or MSISDN at the home system.

g. When a call is received at the MSC to a uLPN, the MSC may check the calling party number against a known list of authorized callers to the LPN in order to avoid theft of service.

2.3 Combat Wireless E911 Fraud

To combat wireless E911 fraud, an ECR is needed at both the serving system and at the PSAP plus a network to connect them. As such, ECR data communications and an E911M Network Reference Model are presented followed by consideration of specific scenarios to combat fraud.

- The Serving System ECR (SS-ECR) is responsible for the mobile phones being served by a serving system through interfaces to the MSC and other ECRs.
    a. As Mobile Emergency Service is applicable for both wired and wireless phones, a wired network end office may have an SS-ECR like the SS-ECR at an MSC.
- The PSAP-ECR is responsible for all mobile phones being served by a PSAP. The PSAP-ECR interfaces to the SS-ECR in each serving system where 9-1-1 calls originate to the PSAP and to adjacent PSAP-ECRs.

2.3.1 ECR Networking

A network of ECRs can be envisioned like the pyramid shown below in Figure3.

All 9-1-1call origination and serving system information is collected upward from the SS-ECR toward the PSAP-ECR. This information may be collected further upward toward a more centralized agency ECR such as for law enforcement.

Call routing or call blocking instructions for a particular mobile phone are circulated downward from the PSAP-ECR toward the SS-ECR.

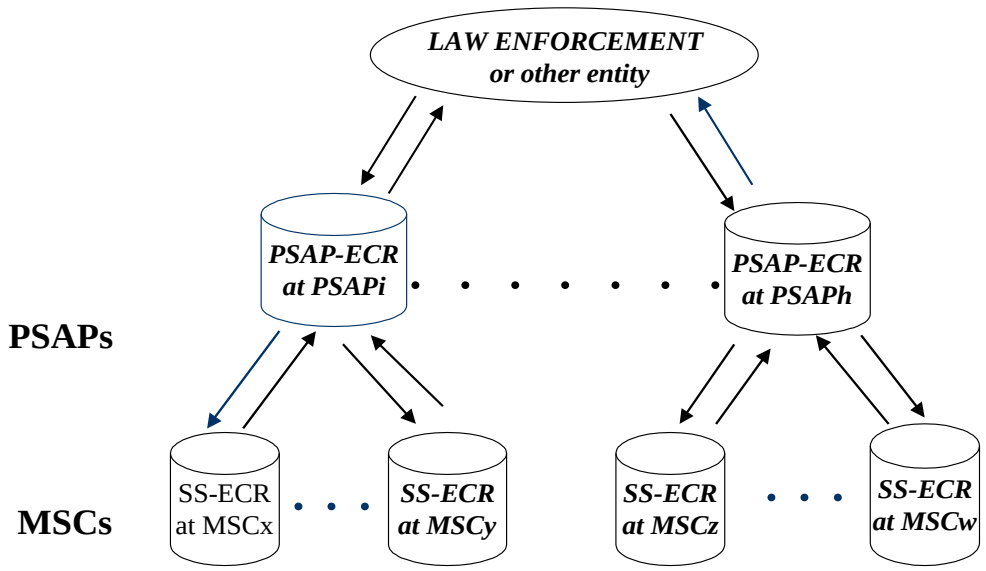

Figure 3 - ECR Data Pooling and Reconciliation

Through ECR networking, a PSAP-ECR is notified by a SS-ECR about the new uLPN assigned by a new serving system to a roaming mobile phone for callback.

a. Call routing instructions for any 9-1-1 call from a particular mobile phone (identified by its MTID) may be sent through the network from any one PSAP-ECR to other PSAP-ECRs and their subordinate SS-ECRs.

b. There may be instructions that all 9-1-1 calls from a particular roaming mobile phone are to be routed to a specialized fraud prevention PSAP or even blocked. Should the PSAP identify a particular mobile phone as the source of a potentially fraudulent 9-1-1 call, the PSAP-ECR may be used to send a flag to the SS-ECR with special instructions for how to handle future calls from a particular mobile phone. *A message flow diagram for this scenario is shown in section 2.3.3- PSAP-ECR Flags Mobile as Fraudulent at SS-ECR.*

A potentially fraudulent 9-1-1 call from a mobile phone may appear from any one of many serving systems covering the area. It may be routed to any one of many surrounding PSAPs. As such, the warning flag may be sent by the originating PSAP-ECR to all subordinate SS-ECRs as well as all adjacent PSAP-ECRs. A *message flow scenario is shown in Section 2.3.4 – PSAP-ECR Flags a MP as a Source of 9-1-1 Fraud at Another PSAP-ECR.*

A previously flagged mobile may prove to be the source of a legitimate 9-1-1 emergency call. The PSAP-ECR may then be used by a PSAP to remove the warning flag associated with a particular

mobile phone. *The message flow diagram for this scenario is shown in Section 2.3.5 - PSAP Removes an ECR Entry at the SS-ECR.*

2.3.2 E911M Network

ECR networking and relevant portions of the J-STD-036-A network reference model are shown below in Figure 4 as the E911M network reference model.

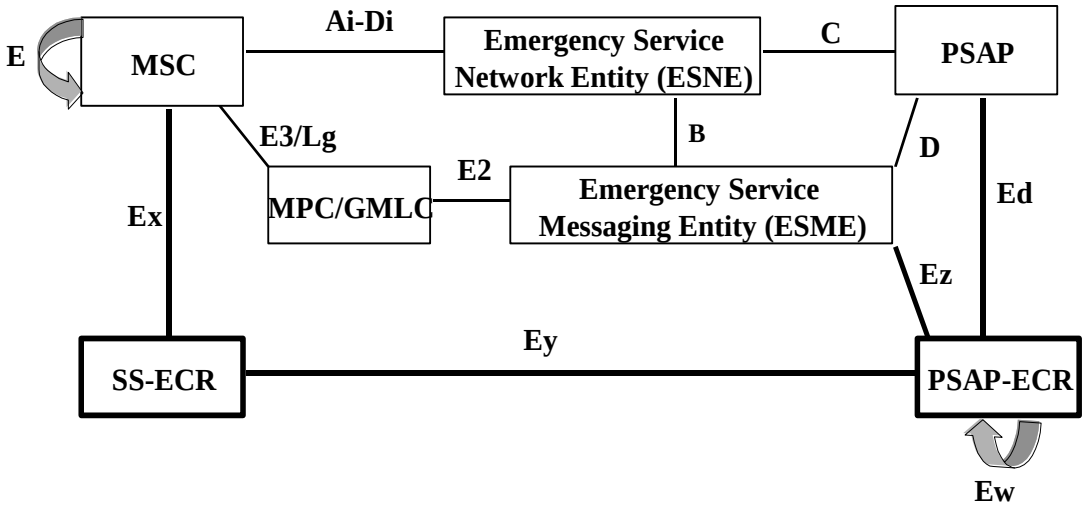

Figure 4 – E911M Network Reference Model

1. The upper portion of the model (i.e., from the MSC to PSAP over AiDi and E3/Lg interfaces) is based on J-STD-036-A and existing NENA standards. E911M takes advantage of these existing standard interfaces to signal callback information such as a uLPN to the PSAP. **The uLPN is signaled with the call from the MSC, over the Ai-Di and C or D interfaces to the PSAP as a CBN.**

2. A PSAP-ECR can be viewed like an HLR. It provides much of the same information found in the SS-ECR as well as unique mobility management and

service request functions. This information includes the mobile phone identity and serving system address for every phone and system served by a PSAP. **The PSAP-ECR provides instructions to an SS-ECR to manage mobility and emergency service delivery for each mobile phone and requests service from the serving system for the PSAP.**

3. E x, y, z and d interfaces are new and proposed for standardization with E911M. They are used to signal emergency call data, call handling instructions and emergency service requests through the Mobile Emergency Service network between the MSC and PSAP.

    - **The SS-ECR updates the PSAP-ECR over the Ey interface. It provides the LPN or uLPN, the ESRK, MTID and all other information it has about the call, the phone and the serving system.**
    - **Call handling instructions from the PSAP for a particular mobile phone are communicated from the PSAP to the PSAP-ECR over the Ed interface, on to the appropriate SS-ECR through the Ey interface and from the SS-ECR to the MSC through the Ex interface**.
    - **Upon receipt of 9-1-1 call origination information or on request from an SS-ECR, the MSC returns a uLPN to the SS-ECR over the Ex interface**.
    - **At the PSAP, an ESRK may be used to obtain a uLPN and MTID directly from the PSAP-ESR over the Ed interface or indirectly through the ALI database over the D interface**.

4. **The PSAP may communicate with the PSAP-ECR either directly over the Ed interface using the MTID, ESRK or uLPN signaled with the 9-1-1 call or, as an implementation alternative, indirectly through the ALI database over the D and Ez interfaces.**

5. The SS-ECR and the PSAP-ECR may be implemented separately or as a single entity. They are shown here separately to allow consideration for one SS-ECR to serve one or many MSCs and one SS-ECR may interface with one or many PSAP-ECRs.

    - One PSAP-ECR may serve one or many PSAPs.
    - With multiple PSAP-ECRs, one PSAP needs only to interface with one PSAP-ECR if real-time PSAP-ECR data pooling and reconciliation is implemented.

- A PSAP may access information from many PSAP-ECRs directly through an Ed interface to each PSAP-ECR or through PSAP-ECR data pooling and reconciliation over the Ew interface.

2.3.3 PSAP Flags a Mobile Phone as a Source of 9-1-1 Fraud at an SS-ECR

In the message flow Figure 5 below, the PSAP-ECR notifies two SS-ECRs that a particular mobile phone is expected to place a fraudulent 9-1-1 call. A service code indicates how the call is to be handled by the MSC. For example, one code could indicate instructions to block the call. Another code could indicate instructions to route the call to a special fraud detection PSAP. Another code could indicate normal call handling for a phone, which had been given special treatment.

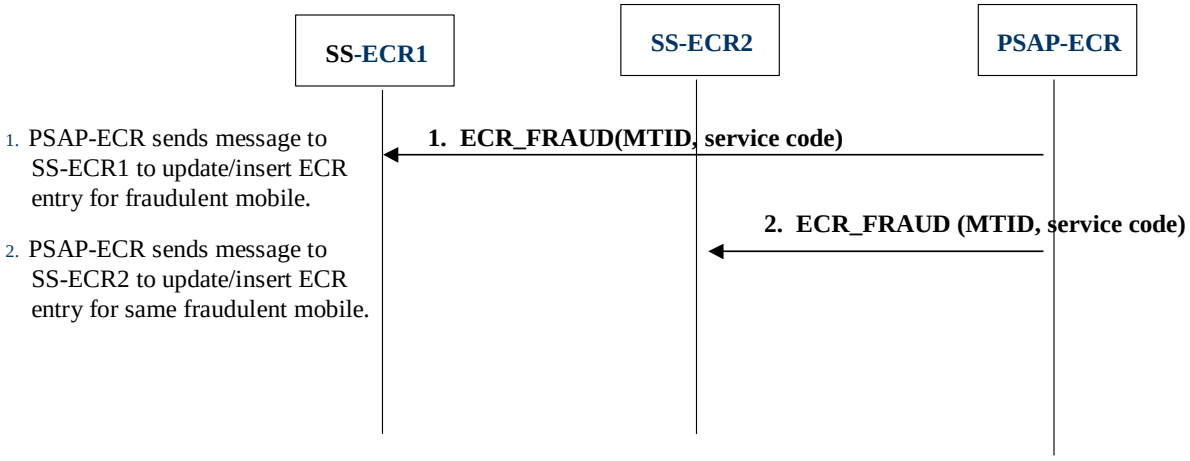

Figure 5 - PSAP-ECR flags mobile as a source of 9-1-1 fraud at an SS-ECR

2.3.4 PSAP-ECR Flags a Mobile Phone as a Source of 9-1-1 Fraud at Another PSAP-ECR.

In the message flow Figure 6 below, one PSAP-ECR notifies another about a mobile phone suspected of originating fraudulent 9-1-1 calls and the service code for how future 9-1-1 calls from this phone are to be handled.

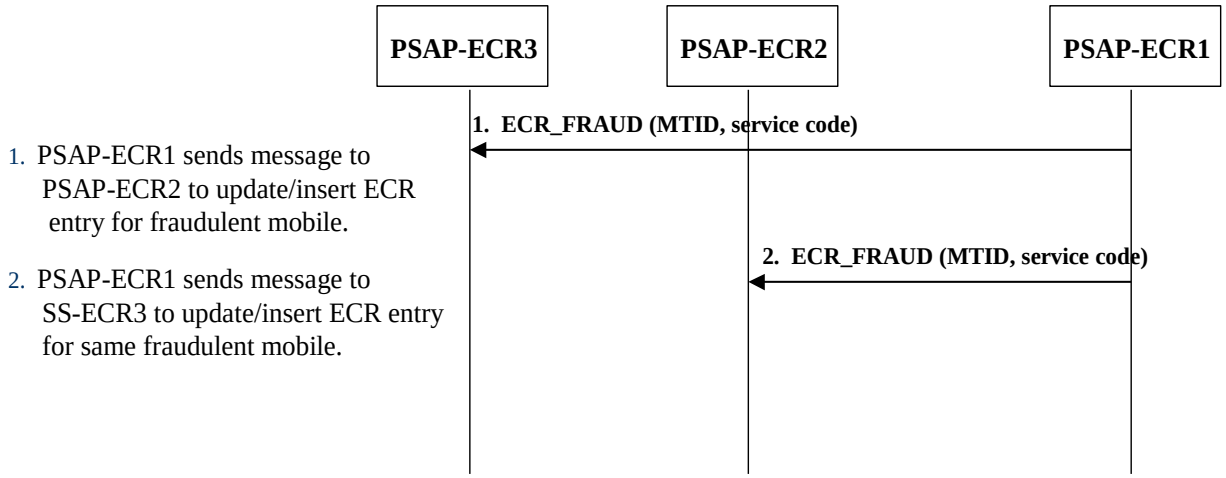

Figure 6 - PSAP-ECR flags mobile as a source of 9-1-1 fraud at other PSAP-ECRs

2.3.5 PSAP Removes an ECR Entry at the SS-ECR.

There may be accessions where a PSAP wants the record of a particular phone deleted from the SS-ECR. The following message flow Figure 7 shows how it is done.

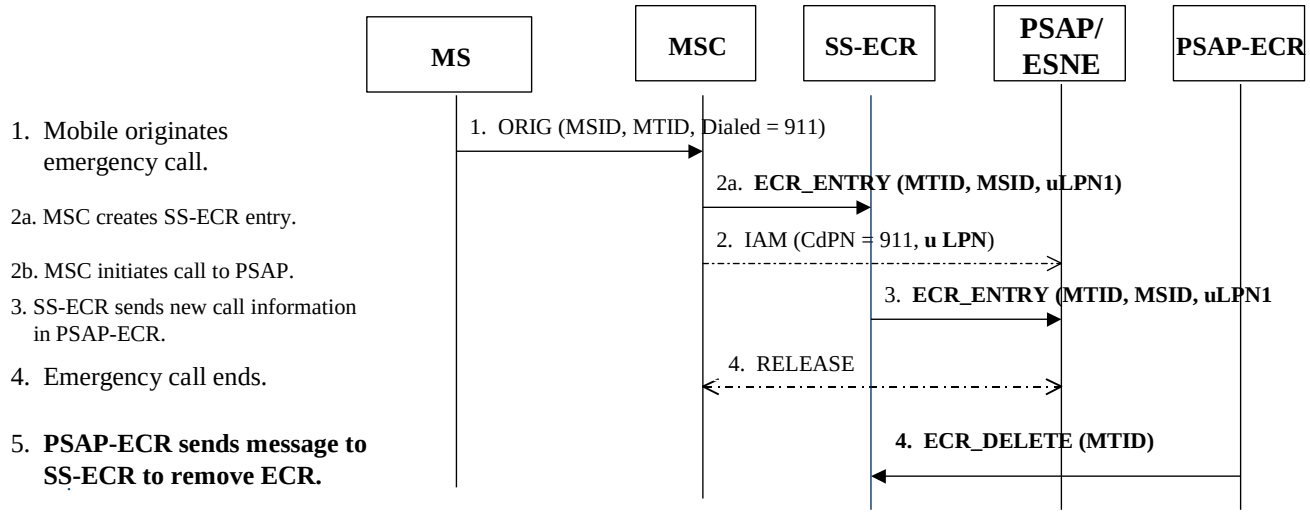

Figure 7 - PSAP-ECR removes ECR entry at SS-ECR

2.4 Mobility Management for Emergency Callers

2.4.1 E911M Call Origination

1. Mobile Emergency Service is built upon existing 9-1-1 call origination messages in J-STD-036-A. That is, with a 9-1-1 call origination, either ESRK, (ESRD + CBN) are signaled in the Call Setup message from the MSC to the ESNE. With VoIP, ESQK is signaled to the ESNE.

    a. **The uLPN is signaled from the originating network as the CBN when a 9-1-1 call is delivered with an ESRD.**

b. **If an ESRK is signaled over the call path to the PSAP without a CBN, the uLPN as a CBN is associated with the ESRK in the MPC/GMLC, PSAP-ECR and ESME. The CBN may be provided to the PSAP over the D or Ed interface**.

2. In addition to existing standard call origination procedures, **E911M requires the MSC to signal the MTID, ESRK and uLPN to the ECR at the serving system (SS-ECR) and the MPC**.

   a. The MSC also provides the SS-ECR with the PGID and other locally determined information about the call such as the ESRK and position information. The MSC provides the SS-ECR with a uLPN for the phone as the SS-ECR may be serving more than one MSC and needs to know the origin of the ECR entry.

3. The SS-ECR may respond to an entry from the MSC with special call handling instructions. These instructions are entered from external sources or generated within the ECR based on pre-determined criteria such as by receiving X number of calls from a particular phone within some time period such a Y hours or days. These instructions are stored in the ECR database in association with the MTID.

   a. For example, there may be instructions in the ECR for the MSC to take one of the following actions whenever a particular phone originates a 9-1-1 call.

      - Route all 9-1-1 calls to a special fraud detection PSAP.
      - Block all 9-1-1 calls from a particular phone.
      - Notify or flag another ECR at another agency whenever a 9-1-1 call is originated from a particular phone or location.
      - These instructions may be entered from an external source or internally generated by the ECR after more than three 9-1-1 calls are originated from the same phone within an hour from any pre-determined grouping of MSCs or PSAP serving areas.

4. With the origination of a 9-1-1 call, either ESRK, ESQK or ESRD+uLPN are signaled with the call.

   - When an ESRK or uLPN is signaled with a call to the PSAP without a MTID, that ESRK or uLPN is used at the PSAP to obtain the MTID from the PSAP-ECR.
   - The MTID is the only permanent 9-1-1 call identifier always available to the PSAP. The ESRK may be quickly reused for another 9-1-1 call. The uLPN may have a limited time retention window assigned at the serving system beyond which it may be re-used. But a MTID can not be re-used by any phone. Also, a HID cannot be duplicated inside any single access network switch. As such, a HID is unique when associated with a particular LPN.

- **As soon as a PSAP receives an ESRK or uLPN, the MTID should be obtained immediately from the PSAP-ECR for all subsequent interactions between the PSAP and PSAP-ECR related to the call.**
- When the CBN is used by the PSAP to originate a callback, the switch in the serving system uses the CBN to query the SS-ECR to obtain the PGID or HID and complete the call to the appropriate phone.
  - **If ESRD+uLPN is signaled, the PSAP immediately obtains the MTID or HID from the PSAP-ECR.** This is shown in Figure 8 below. These steps are a general requirement with the origination of a 9-1-1call. As such, they are assumed to take place at the beginning of all other figures in Section 2.

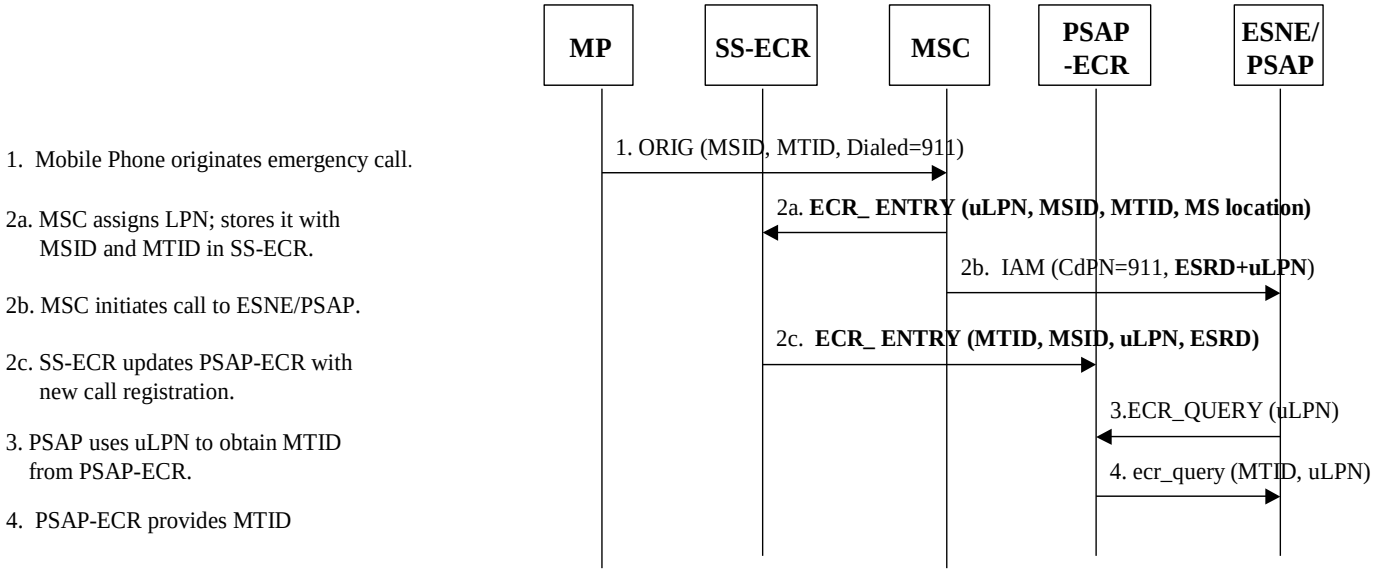

Figure 8 – E911M Call Origination with ESRD+uLPN

- **If ESRK or ESQK are signaled, the PSAP immediately obtains the uLPN and the MTID or HID+LPN from the PSAP-ECR.** This is shown in Figure 9 below. These steps are understood to be a general requirement to accompany the origination of all 9-1-1 calls. As such, they assumed rather than repeated in every other message flow diagram through the rest of this Section 2.

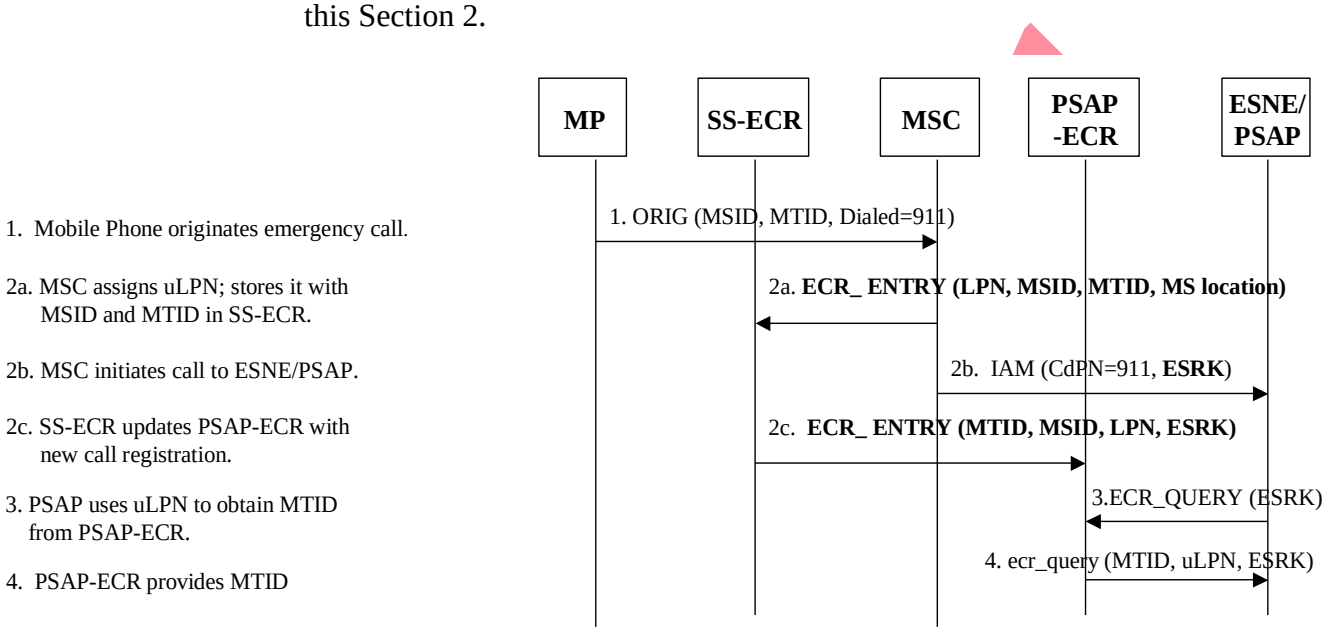

Figure 9 – E911M Call Origination with ESRK

- Also not shown in Section 2 message flow diagrams is how the ESME receives the uLPN as the CBN from the MPC/GMLC. This capability is based on existing standards.

2.4.2 Intersystem Roaming and uLPN Update

When any mobile phone used to call 9-1-1 is handed over to a new serving system either while the 9-1-1 call is in progress or after the call drops, the uLPN of the new serving system is updated in all ECRs by any one of a number of alternative methods described in this section.

In order to call a mobile phone that has not originated a 9-1-1 call, the PSAP may enter the MTID and/or PGID of the phone(s) to be called in the PSAP-ECR along with an LPN and request the assignment of a uLPN from the SS-ECR. With an automatic LPN Update feature in the SS-ECR, the LPN may not need to be entered by the PSAP.

Existing standards for intersystem operations may be modified to provide mobility management for emergency services. The following figures are message flow diagrams to show these additions or modifications.

2.4.2.1 SS-ECR Provides a uLPN Update to a PSAP-ECR after an Intersystem Handover

In this scenario, Figure 10, a 9-1-1 call is placed. An ECR entry is created in the originating system and a CBN is assigned by the serving system. Then the caller roams into a new serving system. Through the handoff, an ECR entry is created at the new serving system. A new CBN is assigned to the mobile phone by the new serving system and the PSAP-ECR is notified. After the call drops, the PSAP uses the new CBN to call back the mobile phone in the new serving system.

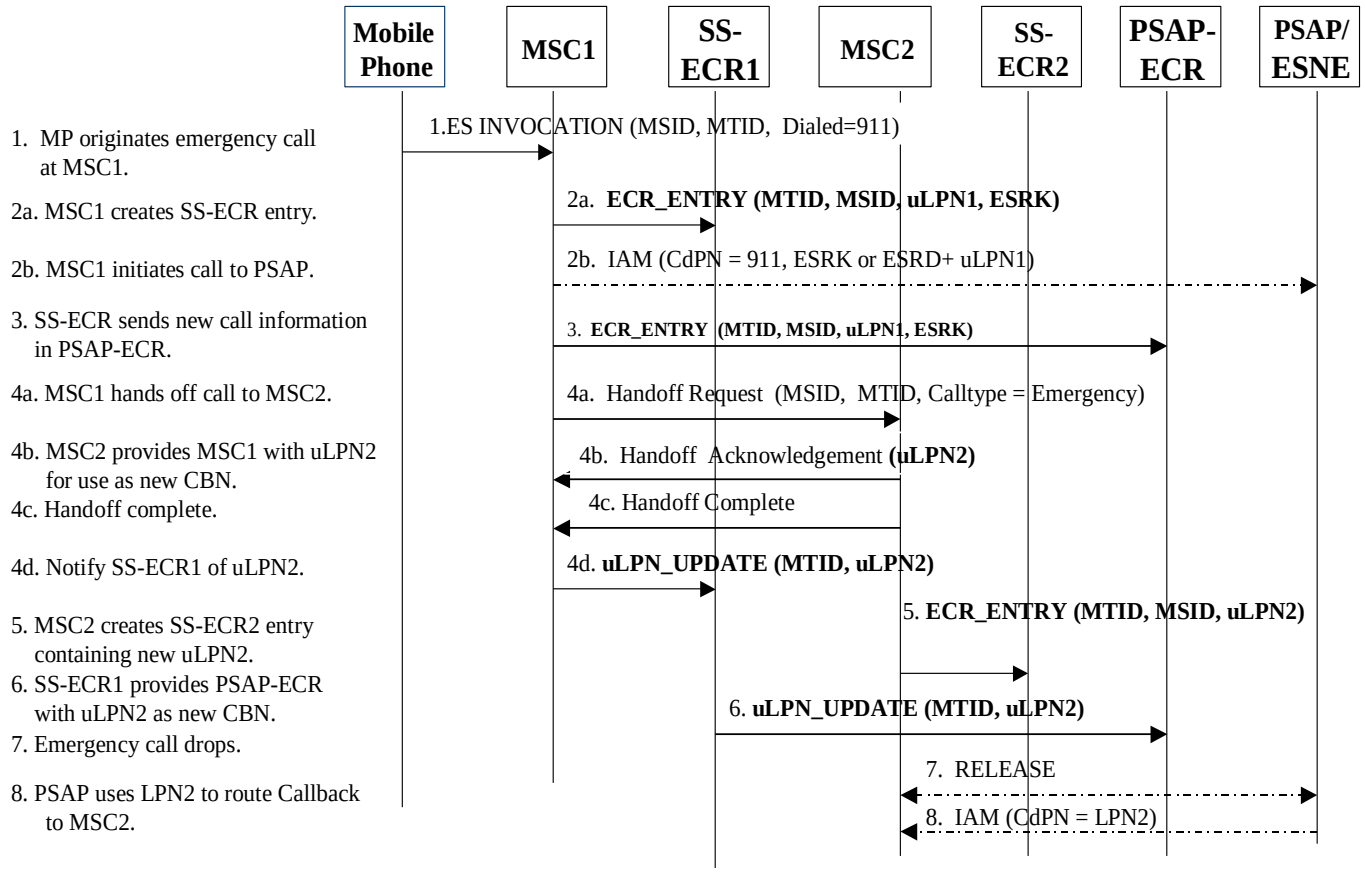

Figure 10 - SS-ECR provides uLPN Update to PSAP-ECR after an Intersystem Handover

2.4.2.2 SS-ECR Provides a uLPN Update to a PSAP-ECR after an Intersystem Handback.

In this scenario, Figure 11, the mobile phone is handed back to a previous serving system that provides a new callback number for the PSAP.

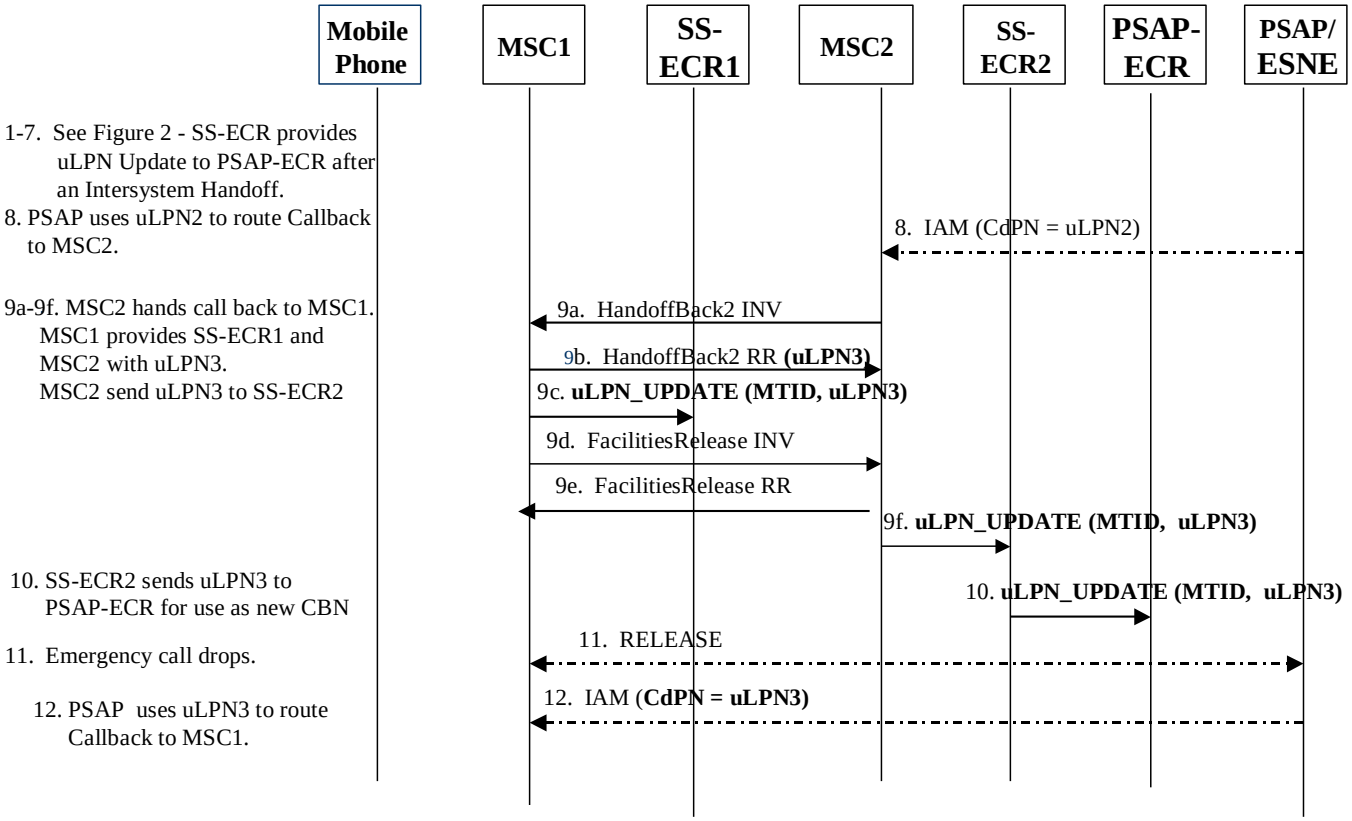

Figure 11 - SS-ECR provides uLPN update to PSAP-ECR after an intersystem hand*back*

2.4.2.3 SS-ECR Provides PSAP with Alternate uLPN.

The scenario for this message flow diagram, Figure 12, is similar to the scenario on section 2.4.2.1 except the emergency call drops before the handoff is complete and before the new uLPN2 can be provided to the new serving system as in Figure 7 step 4b. Since the handoff is never completed before the call drops, the new serving system does not create an ECR entry for serving an emergency call as in step 5 of Figure 7. As a result, an ECR entry is created at step 6 of Figure 9 at the request of SS-ECR1.

Please note that after step 4 of Figure 9, the PSAP-ECR is also notified of the new serving system. With this information, the PSAP could use the PSAP-ECR to request a new uLPN from SS-ECR2 in order to originate a callback.

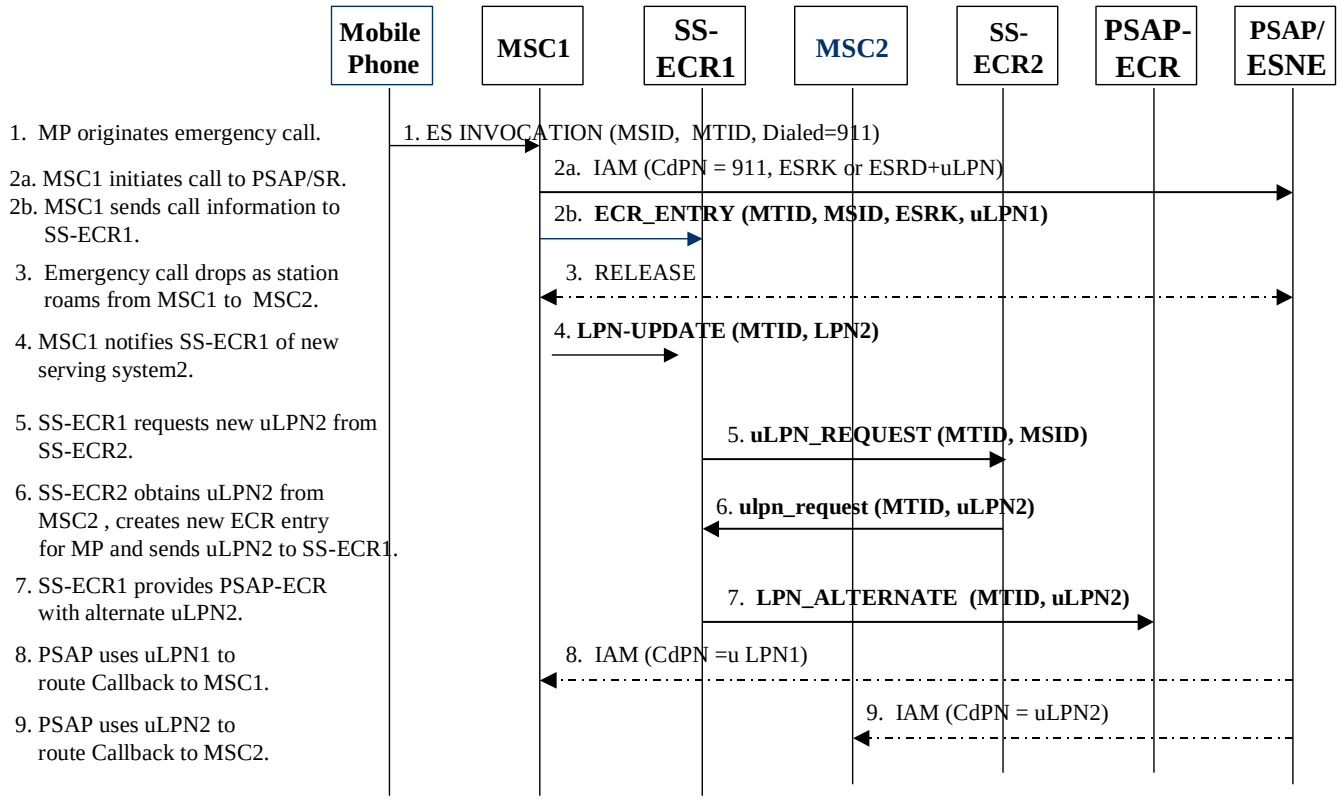

Figure 12 - SS-ECR provides PSAP with Alternate uLPN

2.4.3 PSAP Communicates Through ECRs to Another PSAP to Provide Callback

In this scenario, Figure 13, the mobile phone roams to a new serving system and into an emergency service zone served by another PSAP. After the call drops, the original PSAP use the PSAP-ECR to notify the new serving PSAP to call back the mobile phone in the new serving system with the newest CBN. As the phone is mobile and may be bouncing back and forth between serving systems, the original PSAP also places a callback through the original serving system with the original CBN.

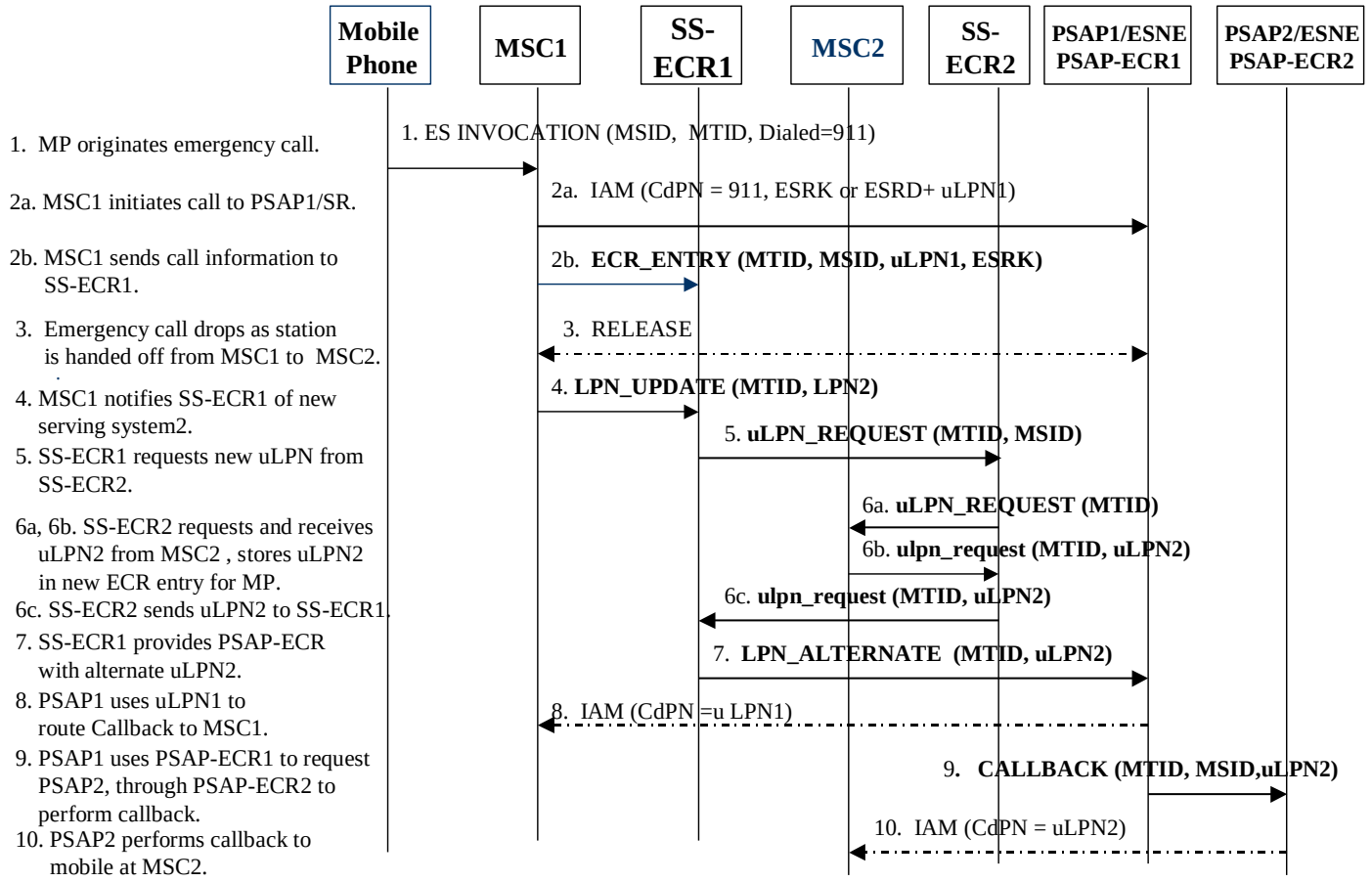

Figure 13 - PSAP-ECR communicates with another PSAP-ECR to provide Callback

2.4.4 Callback to a Mobile Phone Through a Border System (with Location Update and Secondary PSAP Call Transfer or Conference)

This is a special case for completing a callback to mobile phone that has roamed to another serving system. In this case, Figure 14, the new serving system is a border system known to the original serving system. A border system may or may not serve an area immediately adjacent to the original serving system. A network of border systems may look like a network of networks over a very large area. Unique signaling capabilities exist between border systems to improve both intersystem operating efficiency and customer service.

The mobile phone places a 9-1-1 call in the original serving system, the call drops and the phone roams into a border system as the PSAP originates a callback to the original serving system.

The mobile phone does not answer the page from the original system since it has roamed to a border system. Rather than require a new callback number from the new system as in previous figures, the originating system sends the paging identity of the phone to a list of border systems with a request for each to page the phone. When the phone answers the page in a border system, the original system is notified and the callback is completed through to the border system using existing standard intersystem procedures.

As this is a new emergency call in the border system, information on the location of the phone is automatically requested for the PSAP. However, this is an inbound call, not a 9-1-1 call. As such, location information is sent back to the PASP through the ECR network.

The nature of the incident and the new phone location may lead the PSAP to request the involvement of a second PSAP. While the callback discussion is in progress, the PSAP may use the ECR network to request a conference call with another PSAP. This can be done through the border MSC by providing either a direct dial number to the second PSAP or by providing 9-1-1 as the called party number.

If the called party number is 9-1-1, the border MSC uses existing wireless E911 phase 2 procedures to place a new 9-1-1 call to the second PSAP. That call is then bridged into the existing call between the mobile phone and the original PSAP (see the message flow for this service in figure 14).

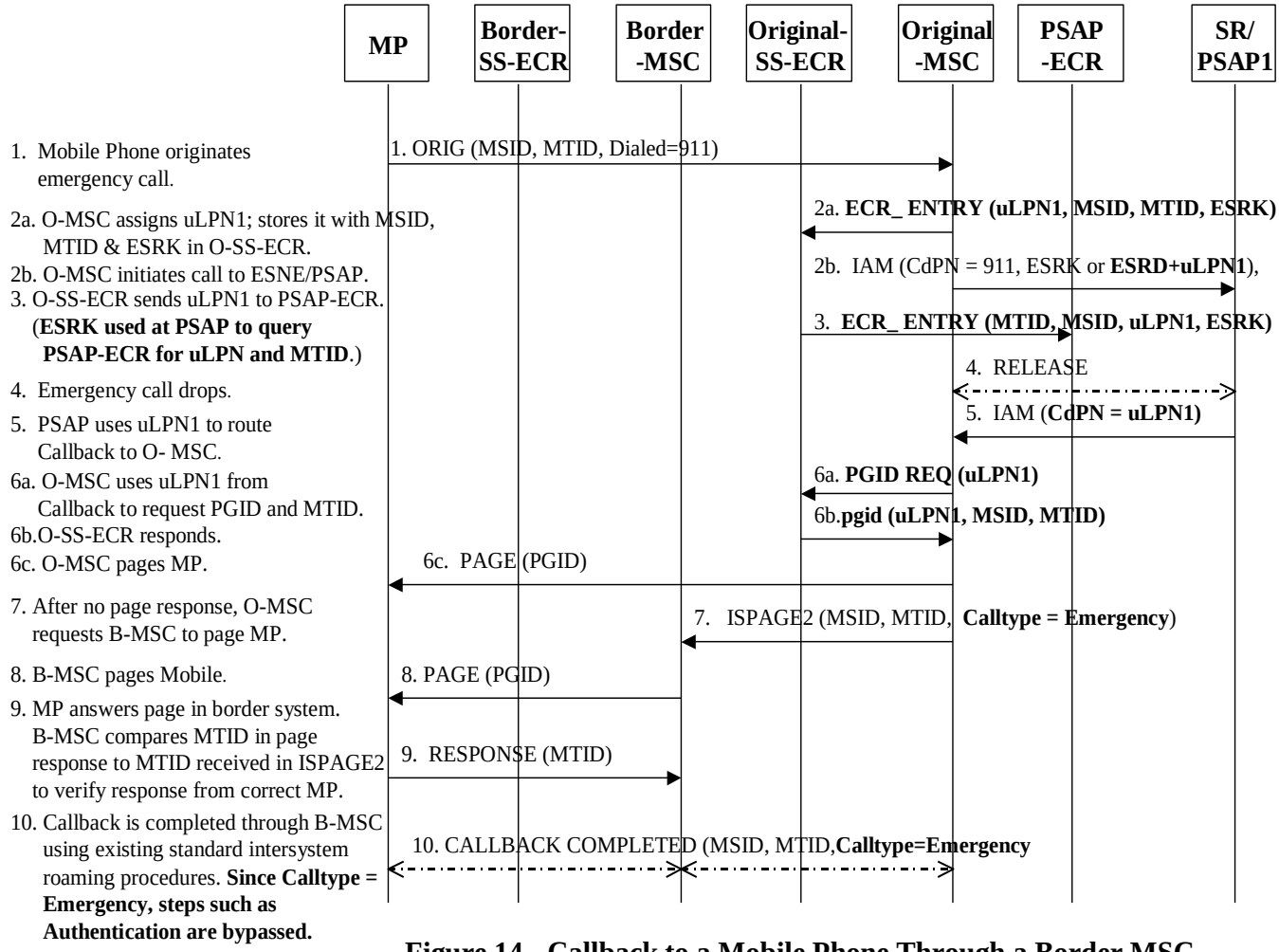

Figure 14 - Callback to a Mobile Phone Through a Border MSC

This figure is continued on the next page.

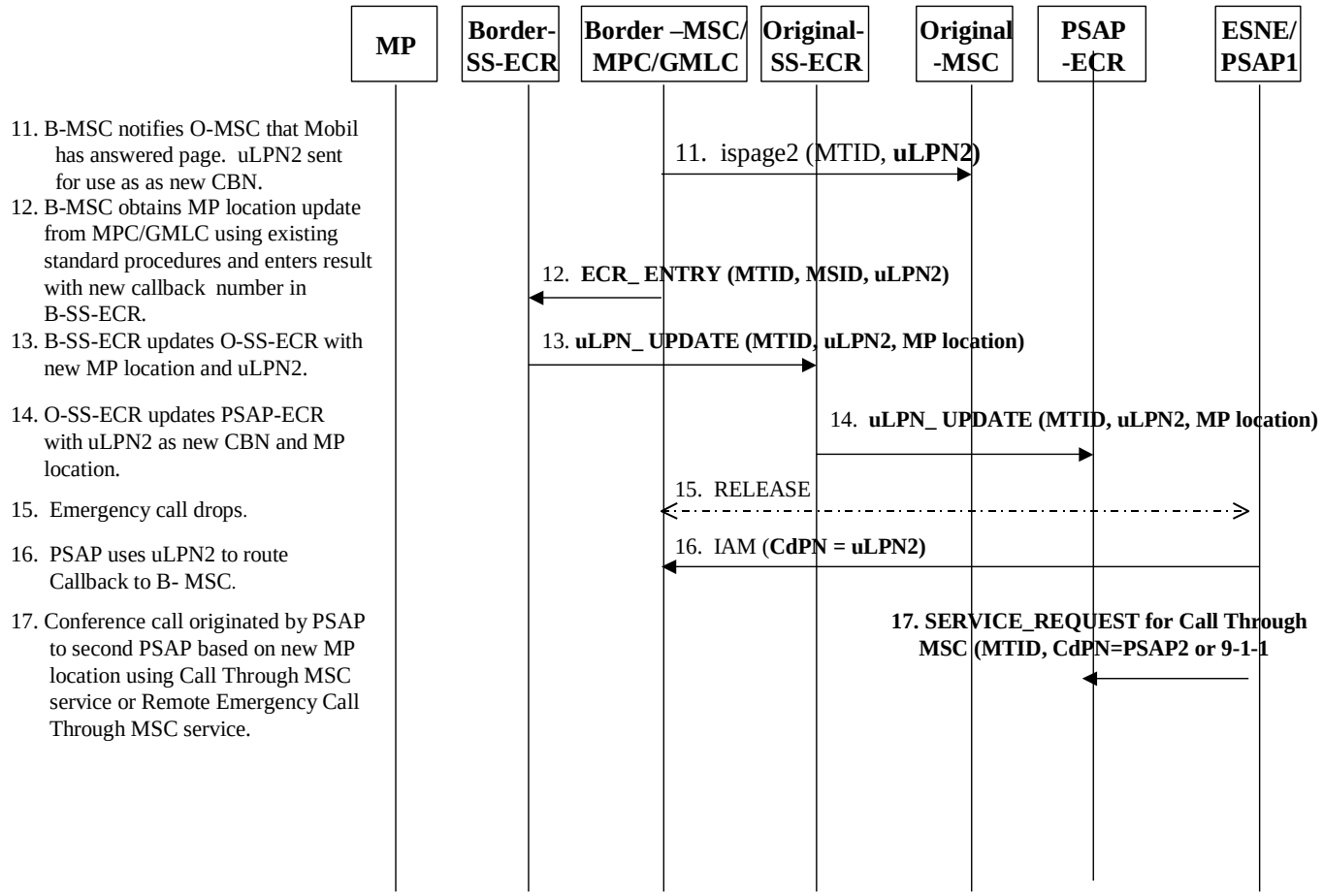

Figure 14 (cont'd) - Callback to a Mobile Phone Through a Border MSC

2.4.5 Callback with uLPN or MTID+LPN

1. Either the MTID+LPN or uLPN may be used to request a callback or any other mobile emergency service through the PSAP-ECR. In this Section 2, Figures 2, 5, 6, 7 and 10 through 15 illustrate the use of uLPN with NCAS. In Section 4 Exhibits, Figures 17 through 24 plus Figure 1 in Section 2 illustrate the use of MTID+LPN with CAS.

2. Note that it is likely that development work will be required in the ESNEs in order for the ESNE to receive, and process, MTID and LPN items in the call setup message (IAM) from the MSC as in Figures 1 and 17 through 24. Similar standards and development work will be required for the PSAP to receive and process MTID and LPN information in the call setup from the ESNE.

3. Mobile emergency services requested by the PSAP through a PSAP-ECR may be directed to the original mobile phone after a 9-1-1 call has dropped or to any mobile phone entered into the ECR database. Such ECR phone entries may be made in the following ways.
    a. Automatically with a 9-1-1 call origination by the switch in the access network.
    b. Through an interface with another ECR or other database.
    c. Manually by an ECR administrator.
4. If an MTID+LPN pair is recorded for a call when it is registered in an ECR, the use of the MTID + LPN may / will be able to be used to recall the caller using one of the mobility management operations described above. This could even be performed after the call has dropped, and even after the uLPN has been reused by another emergency call – allowing public safety personnel to locate a caller days (or longer) after the call incident. Further, the PSAP-ECR can be used to provide a location update to the PSAP after the callback is completed through a new serving system. This is shown in the Callback through a Border System message flow diagram Figure 14.
5. Considerations for using either uLPN or MTID+LPN for callback are as follows.
    a. MTID and uLPN are stored in the ECR as a database key. MTID may also be used as the PGID.
    b. MTID+LPN may be signaled over SS7/ISUP or IP with the call to the PSAP.
    c. When MTID is signaled to the PSAP, the LPN of the serving system is available either from the PSAP-ECR or it may be delivered with CAS an ISUP/IAM/GAP .
    d. After a 9-1-1 call has dropped, the ESRK may be re-used. If the ESRK was used to obtain the MTID from the PSAP-ECR as soon as the call arrived at the PSAP, the MTID may be used to obtain additional or updated phone information from the PSAP-ECR or to request any Mobile Emergency Service such as:
        - Call Through The MSC
        - Callback to Another PSAP
        - Mobile Phone Location Update with Callback
        - Phone Fraud Detection or Call Handling Policy Update
        - Emergency Three-Way or Conference Calling,
        - Emergency Call Default Routing Policy and Thresholds or 9-1-1 Call Forward
        - Deliver an emergency warning message or call to one or more mobile phones.

2.5 Mobile Emergency Services

2.5.1 Emergency Call Through the MSC

1. A PSAP uses the MTID to prompt the PSAP-ECR to signal a message to the SS-ECR requesting a call to a mobile phone through the MSC. Figure 15 is a message flow diagram showing a process to originate a PSAP Call Through The MSC.
2. The PSAP-ECR signals the MTID to the SS-ECR where a PGID is found in association with the MTID. The SS-ECR provides the MSC with (1) the PGID of the mobile phone to be paged and (2) the uLPN previously assigned to the phone for use as the calling party number and (3) the telephone number to the PSAP requesting the call. This PSAP telephone number could be 9-1-1 or the direct inward dial (DID) number of a particular station at the PSAP.
5. When the PSAP answers the call and the mobile phone answers the page, an emergency call is completed through the MSC.

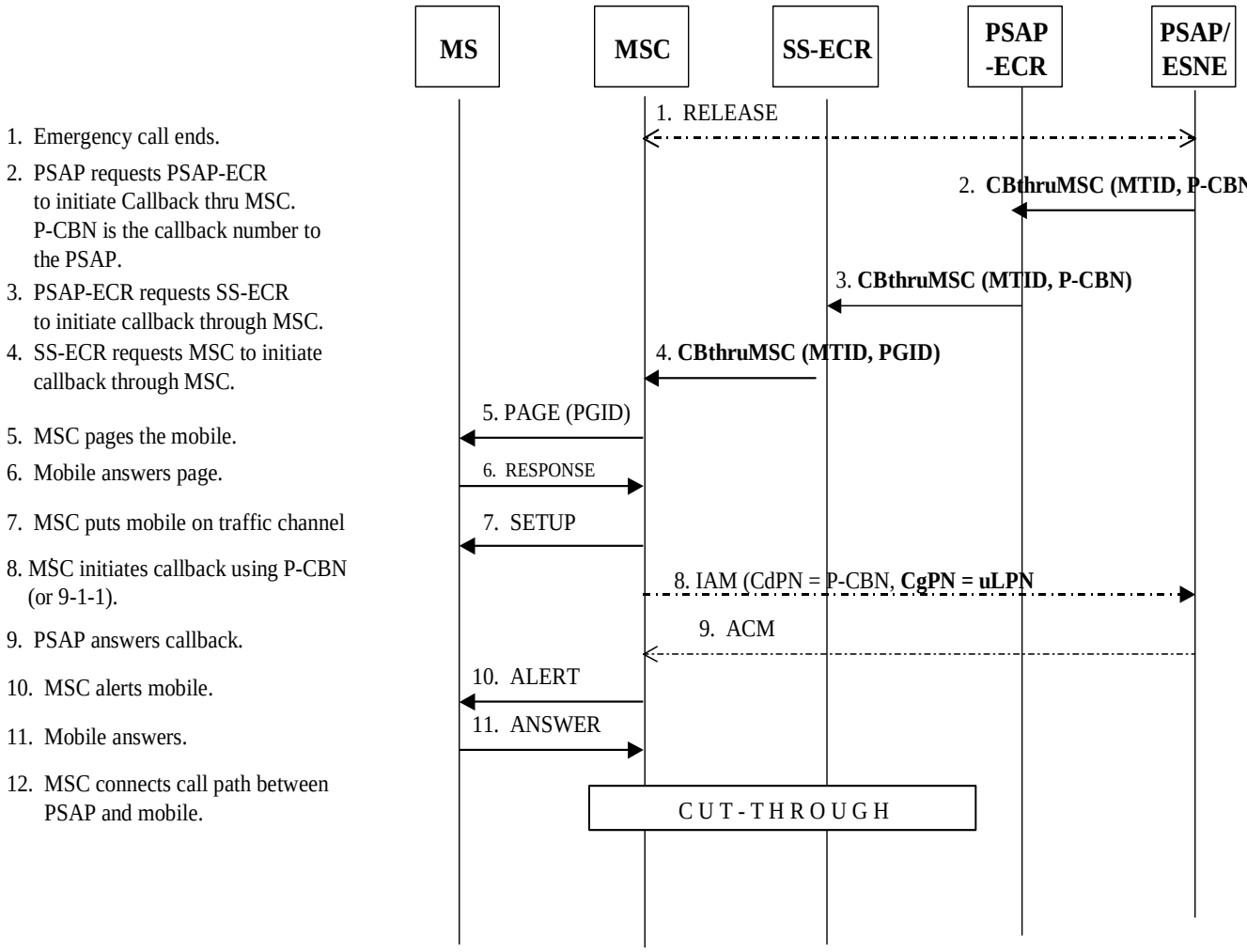

Figure 15 - Emergency Call Through MSC

2.5.2 PSAP Callback with Number Portability

1. Number portability makes a directory number (DN) non-geographic. The direct relationship between a DN and a known street address or a particular service provider no longer exists except through a well-maintained database. This can impact the routing of a 9-1-1 call to the appropriate PSAP as well as the ability of the PSAP to call back.

2. If there is an error in either a centralized or carrier-specific number portability database or if numbering data in an end office, HLR and mobile phone is not properly coordinated in a

timely manner, then a PSAP call back to a ported number may be routed to the wrong phone or not delivered at all.

3. Mobile Emergency Service and E911M call back does not depend upon a portable directory number. It depends upon fixed, unique identifiers for the serving system and the phone. Figure 1 shows a PSAP calling a phone after inter-modal or inadvertent porting of a DN.

2.5.3 Remote Emergency Call Through the MSC

1. Figure 16 shows how a Remote Call Center (RCC) such as a Telematics Service Provider's Call Center may originate a 3-way 9-1-1 call to the appropriate PSAP for a mobile phone through the MSC serving the phone. This is a 3-way call because another non-9-1-1 emergency call is already established between the client and the RCC. The RCC-ECR is used to originate the third call leg to the PSAP by requesting a Remote Emergency Call through the MSC.

2. This service is needed because the RCC may be located a substantial distance from the client and outside the domain of the serving MSC. The remote emergency call is originated from the phone's serving MSC rather then a RCC switch. This allows the serving MSC to take advantage of standard J-STD-036-A procedures for routing a wireless E9-1-1 phase 2 call to the appropriate PSAP based on mobile phone location.

3. The advantages of using E911M to place a Remote Emergency Call are as follows.

   a. Improved Service - There is no need for the phone user to put the original call for help on hold or loose contact with the RCC in any way in order to initiate a 3-way call to 9-1-1.
   b. Reliability - Standard Wireless E911 Phase II call origination procedures are used at the MSC to route the call to the appropriate PSAP based on mobile phone location. A separate database does not need to be maintained at the RCC to find the appropriate PSAP.
   c. Efficiency - No additional procedures or databases are needed at the RCC to locate the appropriate PSAP and dial a number other than "9-1-1".
   d. Backward Compatibility – No need to replace or upgrade existing phone equipment.
   e. Control – The remote emergency call is controlled through the MSC, not the mobile phone. Even if the mobile phone call leg drops, the call between the RCC and the PSAP may stay up while the E911M network is used by the PSAP or the RCC to signal for a Callback Through the MSC.
   f. Lower Expense - There is no need for the RCC to set up and bridge a separate call to the PSAP, for the PSAP to add an administrative line or for the PSAP to shut down a 9-1-1 call answering position and delay 9-1-1 calls in queue in order to handle the RCC call on an administrative line.
   g. Easy to Do – No need for the RCC call handler to query a database and bridge a new call to the PSAP with the existing call from the client. No need to depend on

signaling the mobile phone (which may have been damaged in a crash) to create a 3-way call to the PSAP. No need for the phone user to do anything but stay on the phone.

4. Figure 16 is a message flow diagram showing the origination of a Remote Emergency Call Through the MSC. This service is pre-authorized for the RCC and the mobile phone by the wireless service provider (WSP). The activation of the service for the mobile phone occurs as usual for all subscribed services. Registration of the phone in the SS-ECR occurs with the origination of an emergency call to the RCC in the same manner as if it were any other mobile emergency or 9-1-1call as shown in other figures. The only additional information in the SS-ECR is the number dialed to the RCC. If the original call is inbound from the RCC to the mobile phone, the RCC calling party number is entered in the SS-ECR along with information about the mobile phone that may come from the VLR.

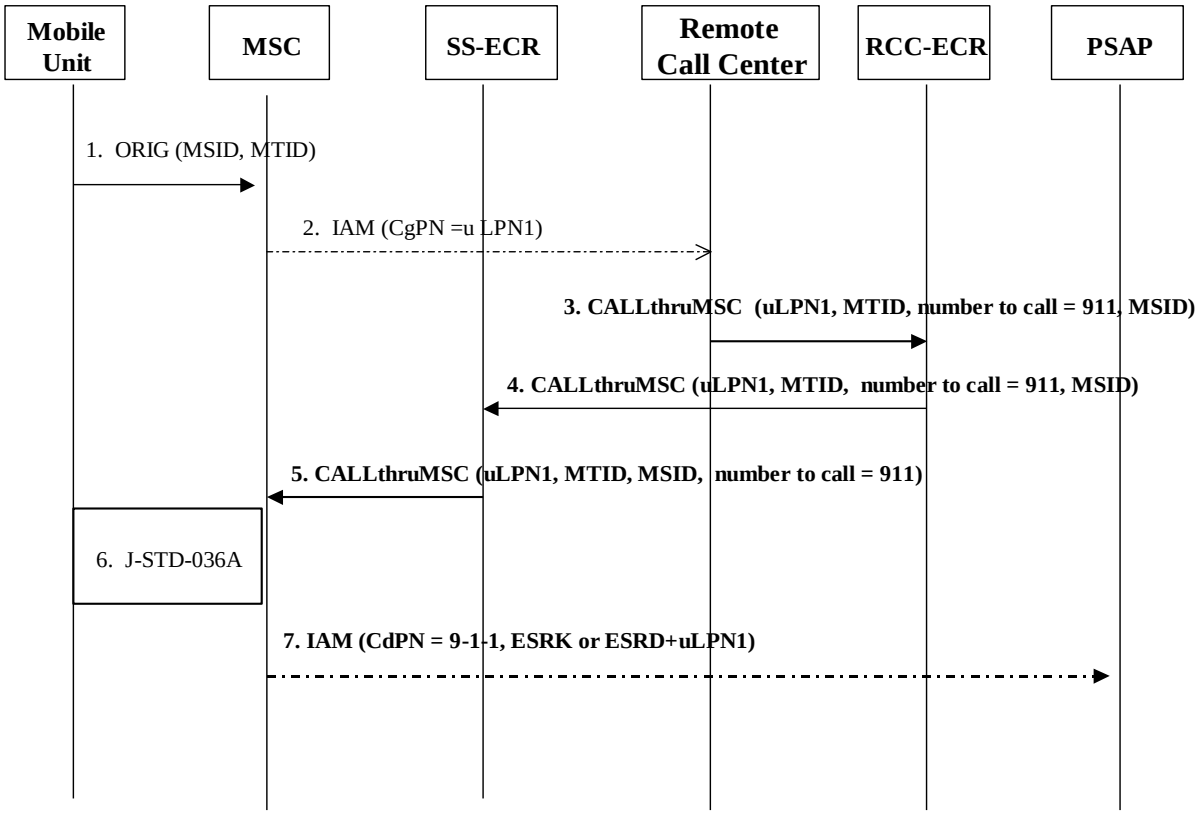

Figure 16 – Remote Emergency Call Through the MSC

Steps:

1. The mobile phone originates a call to the RCC through the MSC using usual procedures.

2. Through registration, this mobile phone is known to be authorized for this service. The call is treated like a Mobile Emergency Call. The SS-ECR is updated with the MTID of the phone and the DN of the RCC. The call is routed to the Remote Call Center. The uLPN assigned by the MSC is used as the calling party number. (The DN is already known at the RCC such as in the subscriber profile or HLR.) The MTID of the mobile phone is entered in the ISUP Global Address Parameter (GAP). When the call arrives at the RCC, the RCC-ECR is updated with the MTID and uLPN for the phone.

3. The RCC operator determines that a 9-1-1 call needs to be placed for the mobile phone. The operator enters a request for a Remote Emergency Call Through the MSC into the RCC-ECR. (Some number to call other than 9-1-1 could be entered if the RCC's client needs some other service such as towing.)

4. The RCC-ECR requests the SS-ECR to initiate a Three-Way Mobile Emergency Call for the phone. The MTID of the phone is included in the request.

5. The SS-ECR requests the MSC to initiate the three-way 9-1-1 call for the phone. The Serving MSC recognizes the MTID in the CallthruMSC message and adds the 9-1-1 call leg to the existing call between the mobile phone and the RCC.

6. The 9-1-1 portion of the call is routed to the appropriate PSAP using standard J-STD-036-A procedures based on mobile phone location information. The RCC operator continues as a party to the call thus creating a Three-Way Mobile Emergency Call.

7. The uLPN or the ESRK are used to uniquely identify the call. One of the two is signaled with the call to the PSAP. The PSAP obtains the MTID from the PSAP-ECR as soon as possible.

8. Not shown is the PSAP-ECR being updated by the SS-ECR with call registration information. This would normally occur after step 5. As a result of this ECR update and reconciliation process, all three parties have the ability to callback the other should the original call from the mobile phone drop.

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[3] ESIF **Issue – 027: PSAP's Callback Capability**

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[9] ESIF **Issue – 016: The Role of Validation in the Determination and Delivery of a Valid Callback Number**.

[10] ESIF **Issue – 014: Callback Capability to Donated and Prepaid Wireless Handsets**.

[11] ESIF **Issue - 14A: Transmission of a Surrogate Number when a Viable Callback Number Does Not Exist or Cannot Be Transmitted**.

[12] ESIF **Issue – 020: International Roamers Making 9-1-1 Calls**.

[13] NENA Technical Information Document 05-501 on **SS7 Guidelines for MSC to Selective Router Connectivity**. http://www.nena.org/?page=SS7_MSCtoSR

[14] NENA **Standard Generic Requirements for an Enhanced 9-1-1 Selective Routing Switch**: NENA 03-005. NENA 03-005 GenReq E911 SR STA_Archived 20140829 PDF

[15] NENA **Recommendation for the Implementation of Enhanced MF Signaling, E911 Tandem to PSAP**: NENA 03-002. NENA 03-002 EnhancedMF Signal_Archived 201408229_PDF

[16] **Network Interface to IP Capable PSAP 08-501**. NENA Technical Information Document. http://www.nena.org/?page=NtwkIntrface_IP_PSAP

[17] **VoIP Characteristics**. NENA 08-503. http://www.nena.org/?page=VoIP_Characteristics

[18] **2004 Technical Development Committee Data Track Notes, GNP Issues.**

[19] **040402ConvergenceDRAFT.**

[20] **Automatic Collision Notification and Telematics**. NENA 07-504 http://www.nena.org/?page=Telematics

[21] **ATIS/ESIF Ex-Parte Communication (FCC Docket No. 94-102)**

[22] **FCC News; "**FCC Takes Steps to Improve the Ability of Public Safety Agencies to Assist Wireless Callers Using Non-Service-Initialized Phones";
http://www.fcc.gov/Bureaus/Wireline_Competition/News_Releases/2002/nrwc0202.html

[23] **Scope-Goals and Updated Status Report**, International Wireless Roaming and E911M Working Groups

[24] FCC CLARIFIES THAT 9-1-1 CALL-FORWARDING RULE DOES NOT PRECLUDE WIRELESS CARRIERS FROM BLOCKING FRAUDULENT 9-1-1 CALLS FROM NON-SERVICE INITIALIZED PHONES PURSUANT TO STATE AND LOCAL LAW, CC Docket No. 94-102; https://apps.fcc.gov/edocs_public/attachmatch/FCC-02-296A2.pdf

4 Exhibits

4.1 LPN+MTID Callback to a Non-Subscriber Initialized Phone.

In this scenario, Figure 17, a non-coded mobile phone places a 9-1-1 call. The MTID+LPN is delivered with CAS from the originating network to the PSAP as the CBN. After the 9-1-1 call drops, the PSAP uses the MTID+LPN to place a callback. The phone is paged but two phones respond. The MTID of each phone is check against the MTID in the ISUP/GAP in order to determine which phone is to receive the callback.

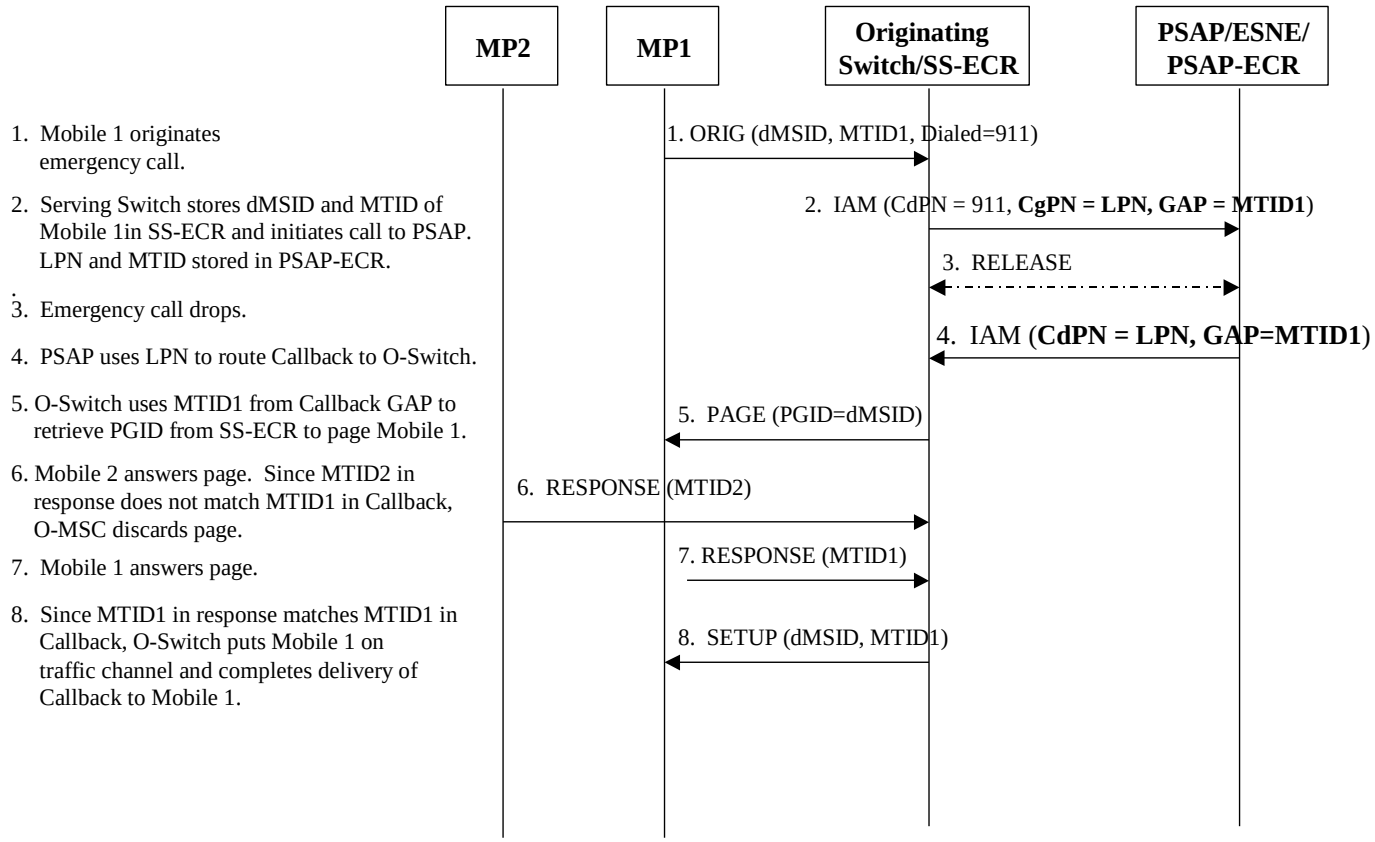

Figure 17 – LPN+MTID Callback to a NSI Phone
(while another non-coded mobile with same dMSID in same MSC)

4.2 SS-ECR Provides LPN Update to PSAP-ECR After Intersystem Handover

In this scenario, Figure 18, a 9-1-1 call is placed. An SS-ECR entry is created in the originating system that includes the MTID of the phone and the LPN of the serving system.

The caller roams into a new serving system. Through the handover, an SS-ECR entry is created at the new serving system. A new LPN for the new serving system is associated with the MTID and the PSAP-ECR is notified. After the call drops, the PSAP uses the new LPN to call back the mobile phone in the new serving system.

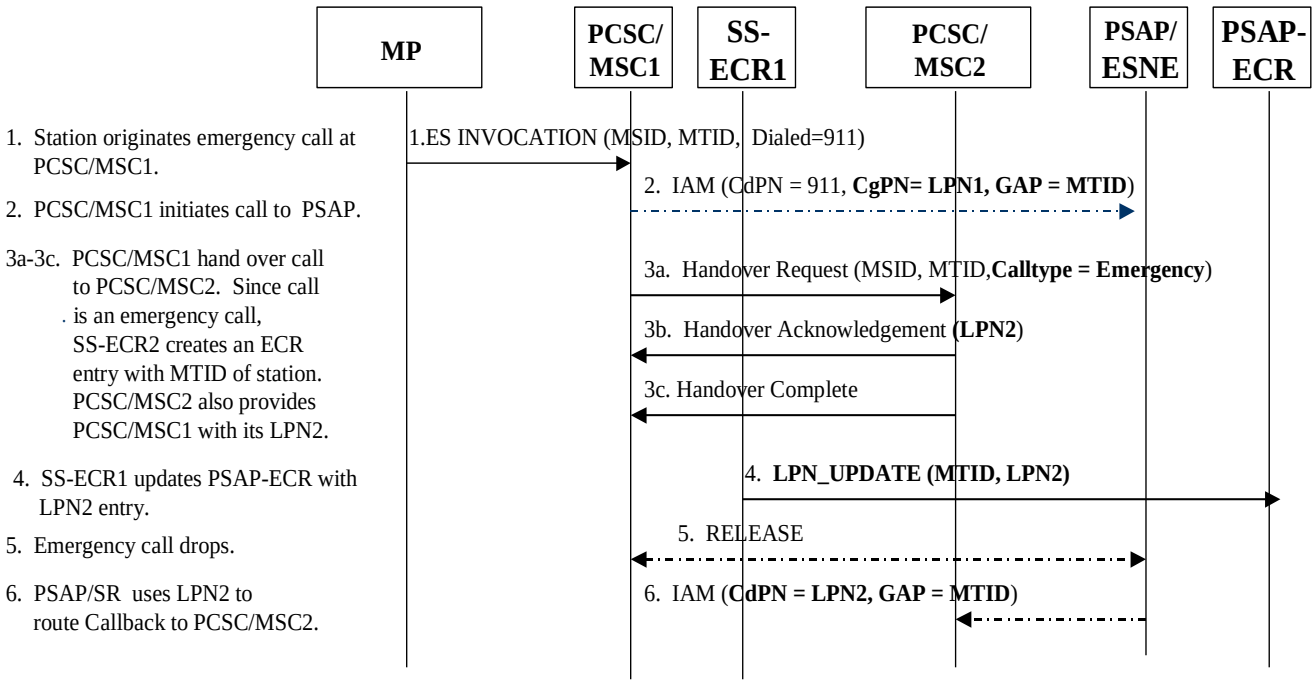

Figure 18 - SS-ECR provides LPN Update to PSAP-ECR after an Intersystem Handover

4.3 SS-ECR Provides an LPN Update to PSAP-ECR After an Intersystem Handback.

In this scenario, Figure 19, the mobile phone is handed back to a previous serving system that provides a new LPN for the PSAP.

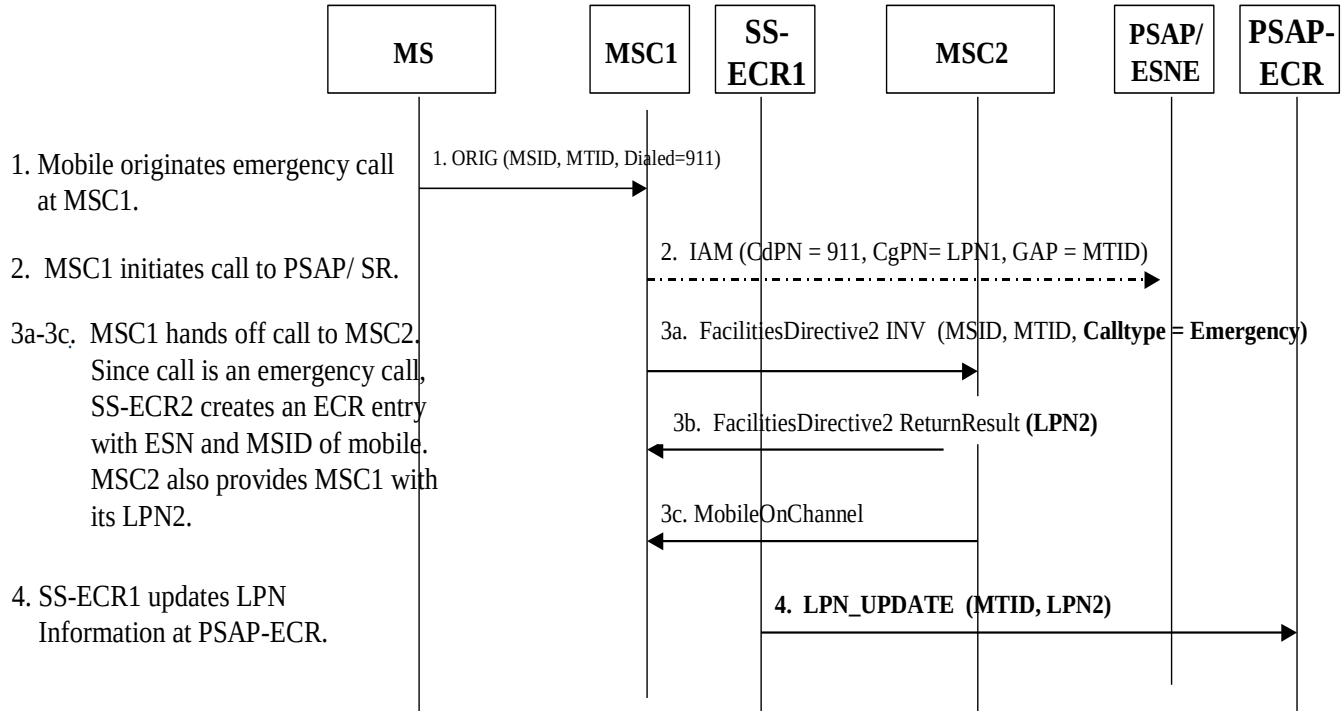

Figure 19 - SS-ECR provides LPN update to PSAP-ECR after an Intersystem Hand*back*

4.4 SS-ECR Provides PSAP with Alternate LPN

The scenario for this message flow diagram, Figure 20, is similar to the handover scenario for Figure 18 or is it 19?. The difference in figure 20 below is that the emergency call drops *before* the handover is complete and the new LPN2 is provided to the new serving system. In Figure 18 or is it 19? these occur *after* 9-1-1 call drops.

Since the handover is never completed before the call drops, the new serving system does not have an SS-ECR entry as would normally be created with the origination of a 9-1-1 call or after an active call is handed over. The new SS-ECR2 entry is created at the request of the PSAP-ECR.

As an exception, consider how PCSC/MSC1 may not know about LPN2 or not notify the PSAP-ECR in time before the callback is attempted. In this exception scenario, steps 4 and 5 do not occur. The PSAP places a callback with LPN1 and there is no answer. The PSAP may then as the PSAP-ECR for an LPN update for the MTID. The PSAP-ECR could poll all subordinate SS-ECRs for a response. If the phone had not been used to originate another 9-1-1 call, each SS-ECR could ask each VLR to determine if the phone had just registered for access to the system. With that information from a VLR, the SS-ECR could provide a new LPN for a new serving system.

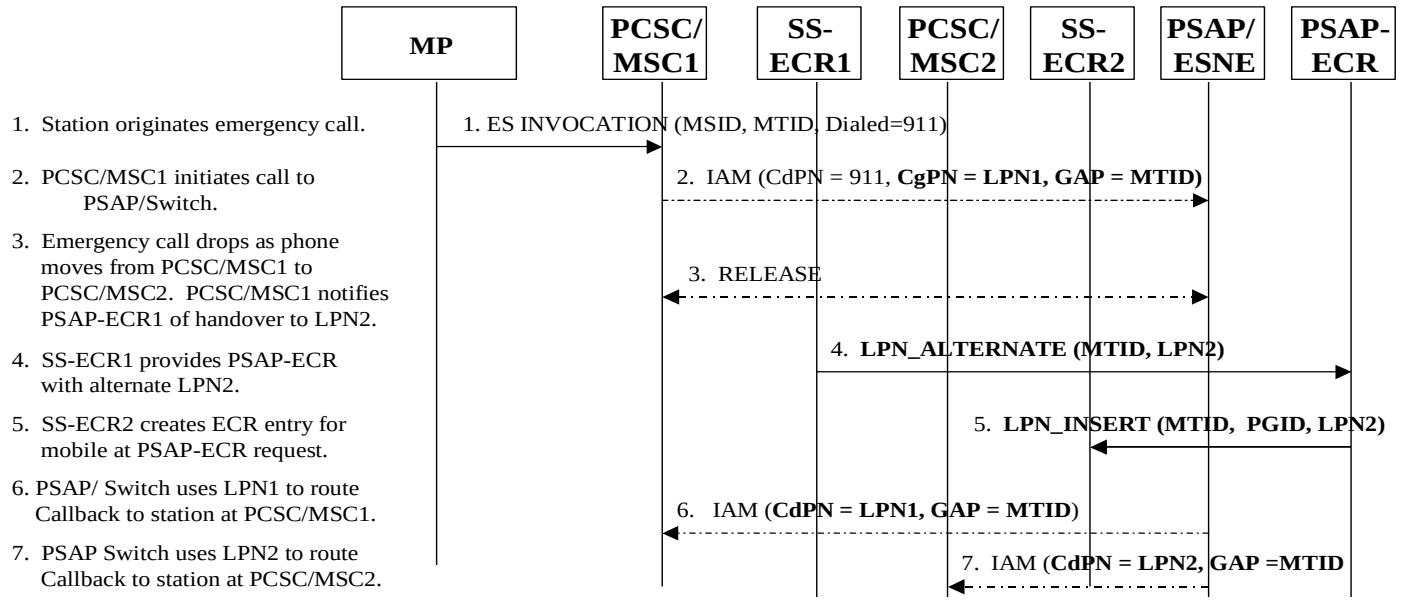

Figure 20 - SS-ECR provides PSAP with Alternate LPN

4.5 Callback From Another PSAP After Intersystem Roaming – "Forced Callback"

After a mobile call drops, the MT may move into the domain of a new serving system that may be served by another PSAP. There are a number of ways to handle this situation.

In Figure 21, the original PSAP uses the ECR network to send a request to the new PSAP to initiate the callback. The original PSAP enters the MTID and LPN into the SS-ECR of the new MSC (where a 9-1-1 call was not served) and another PSAP's ECR (where an original 9-1-1 call did not terminate).

This capability to "force" entries into other ECRs may be useful in special emergency situations. It would allow an emergency call or message from any PSAP to be sent to any one or many PSAPs or mobile phones (either public or responder) anywhere through the ECR network. This capability may be used to develop a wide-area or mobile incident event notification capability even though a 9-1-1 call may have never been originated.

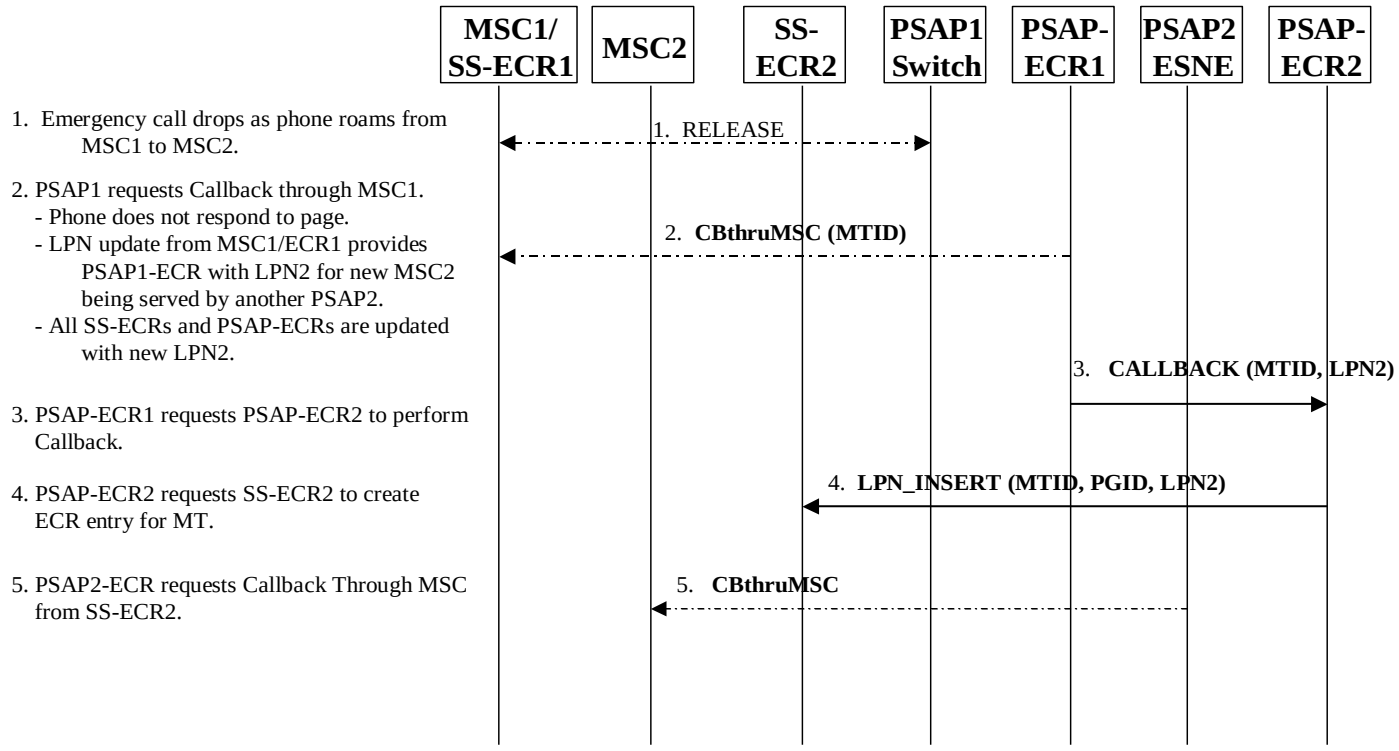

Figure 21 – Callback from Another PSAP after Intersystem Roaming

4.6 LPN+MTID Callback to a Border MSC

After a mobile emergency call drops, it may move into the domain of another serving system with its own LPN. The LPN may be updated for callback through the ECR network as described in Figures 18 though 21???. In this scenario, Figure 22, the serving systems have an existing standard capability to find the mobile phone by requesting known border systems to page the MT.

When the phone responds to a page in a border system, the call back is completed through the original serving system to the new border serving system. Existing standards call for the border system to authenticate the phone before completing the call. Standards need to be modified to bypass authentication for an emergency call back through a border system.

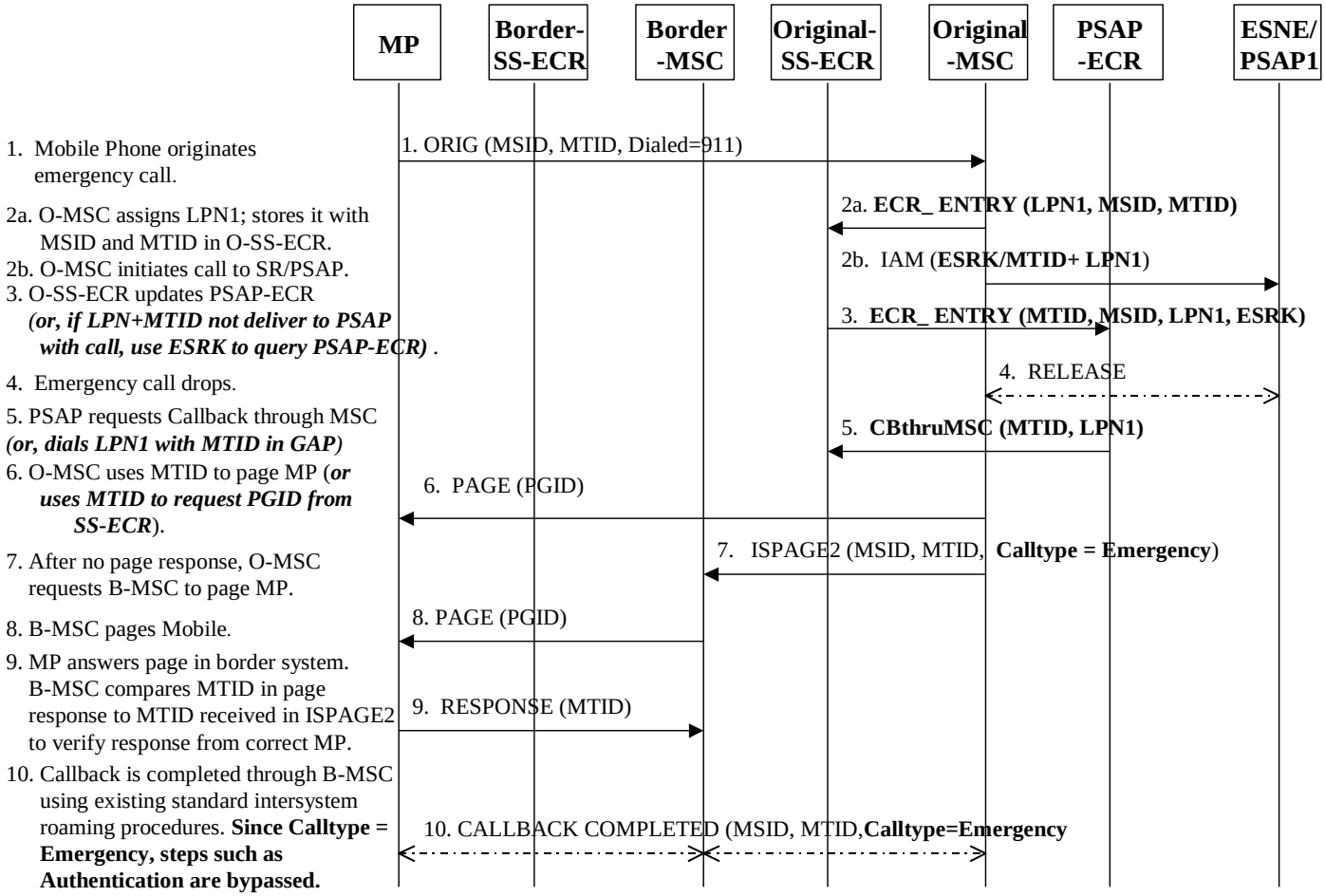

Figure 22 - Callback to a Border System

This figure is continued on the next page.

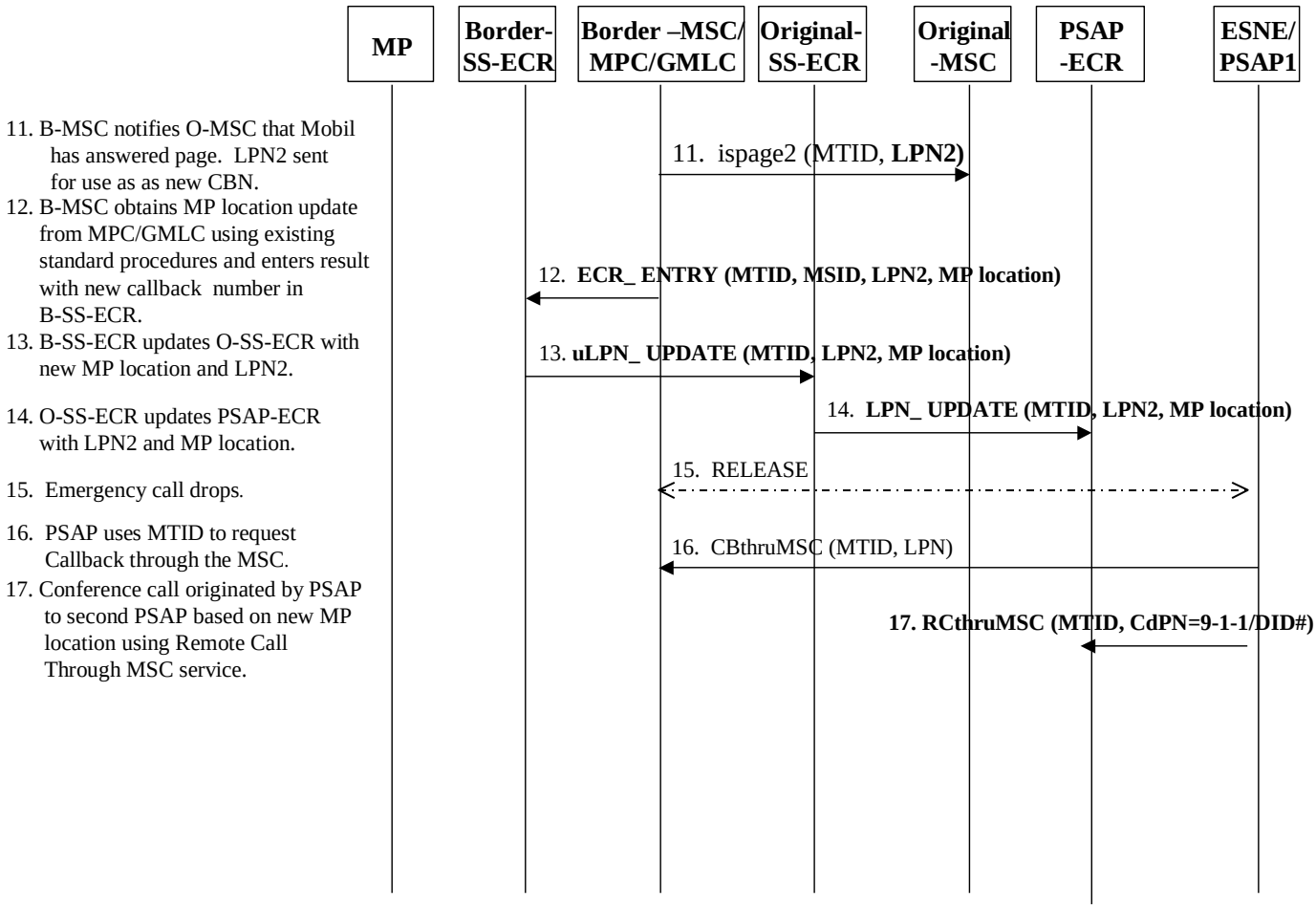

Figure 22 (cont'd) - Callback to a Border System

4.7 Emergency Call Through the MSC with LPN+MTID

In Figure 23, the MTID is signaled to the MSC in the ISUP IAM GAP. The PSAP may use the MTID to request a call back through the PSAP switch by sending the MTID of the target MT to the PSAP switch. The PSAP switch then uses the MTID to query the PSAP-ECR to obtain the LPN to be uses as the Called Party Number. The MTID is signaled to the MSC in the ISUP/IAM/GAP and uses it to page the mobile phone or to obtain the PGID from the SS-ECR and page the phone.

If the PSAP is not able to call back through the PSAP switch in this manner, then Call Back Through the MSC service may be invoked. The PSAP uses the PSAP-ECR to request the service through the SS-ECR from the serving MSC.

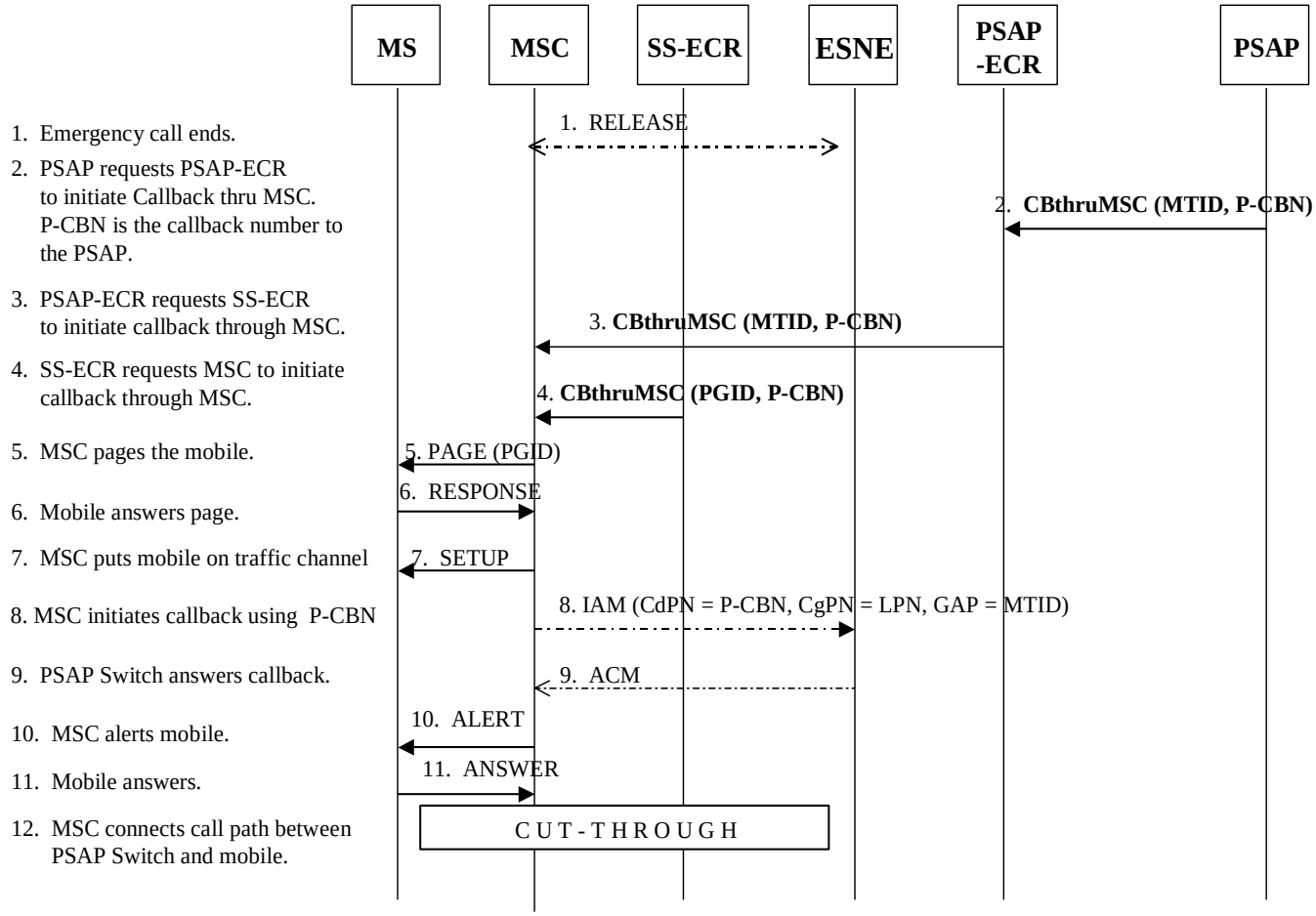

Figure 23 - Emergency Call through MSC with LPN+MTID

4.8 Remote Emergency Call Through the MSC with LPN+MTID

Figure 24 is a message flow diagram showing the origination of a Remote Emergency Call Through the MSC. This service is pre-authorized for the RCC and the mobile phone by the wireless service provider (WSP). The authorization of the mobile phone for the service occurs as usual for all pre-subscribed services. Registration of the phone in the SS-ECR occurs with the origination of an emergency call to the RCC in the same manner as if it were any other mobile emergency or 9-1-1call as shown in other figures.

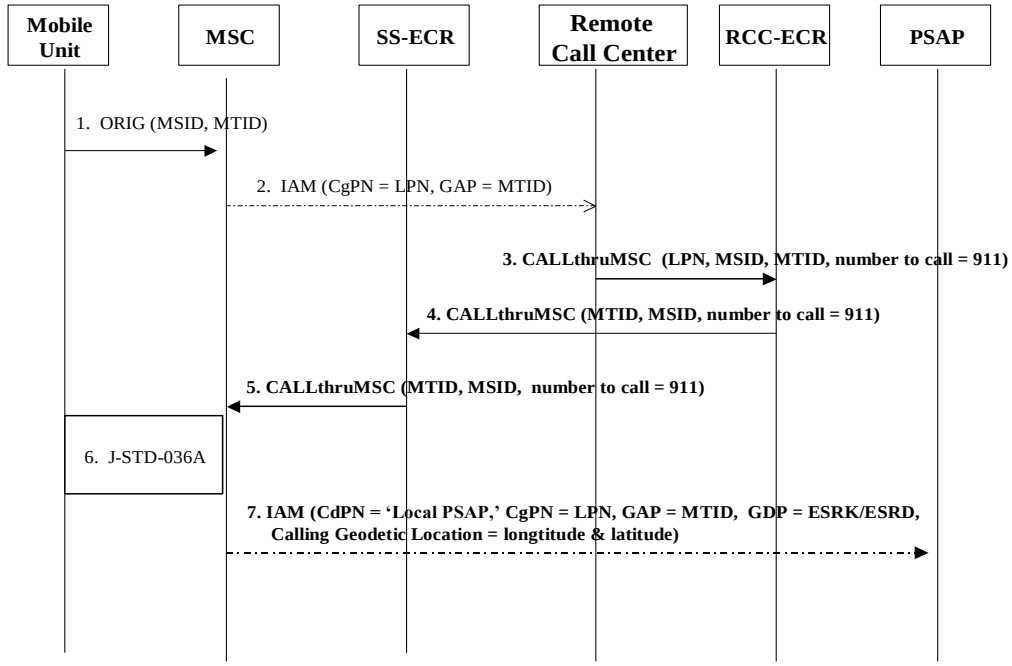

Figure 24 – Remote Mobile Emergency Call Service with LPN+MTID

Steps:

1. The mobile phone originates a call through the MSC using usual procedures.

2. Through registration, this phone known to subscribed to this service. The call is treated like a Mobile Emergency Call. The SS-ECR is updated with the MTID of the phone and the DN of the RCC. The call is routed to the RCC. The LPN of the MSC is used as the calling party number. The MTID of the phone is entered in the ISUP Global Address Parameter (GAP). When the call arrives at the RCC, the RCC-ECR is updated with the MTID of the phone and the LPN of the Serving MSC.

3. The RCC-CC operator determines that a 9-1-1 call needs to be placed for the mobile phone. The operator enters a request for a Remote Emergency Call into the RCC-ECR. (Some number to call other than 9-1-1 could be entered if the phone user needs some other service.)

4. The RCC-ECR requests the SS-ECR to initiate a Remote Emergency Call for the mobile phone. The MTID of the phone is included in the request. The destination SS-ECR is identified through a mapping of the LPN to the SS-ECR at the RCC-ECR.

5. The SS-ECR requests the MSC to initiate the 9-1-1 call for the mobile phone. The Serving MSC recognizes the MTID in the CallthruMSC message and adds the 9-1-1 call leg to the existing call between the phone and the RCC.

6. The 9-1-1 portion of the call is routed using standard procedures to the appropriate PSAP based on mobile phone location information. The RCC operator continues as a party to the call creating a 3-way Remote Mobile Emergency Call.

7. The CgPN for the 9-1-1 call to the PSAP is the LPN of the Serving MSC. The MTID of the phone signaled in the ISUP GAP or from the SS-ECR to the PSAP-ECR.

8. Not shown is the PSAP-ECR being updated with the MTID of the mobile phone and the LPN of the Serving MSC. The PSAP-ECR is also updated by the SS-ECR with the callback number for the RCC. As a result of this ECR update and reconciliation process, all three parties have the ability to callback the other should the original call from the TU drop.