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Chapter 1: Overview

1 Introduction

1.1 Objective

This standard defines the messaging required to support information transfer to identify and locate wireless emergency services callers.

1.2 Scope

This standard provides a solution for the handling of Wireless Enhanced Emergency Calls.

Carrier position reporting to emergency services systems, as mandated by the Federal Communication Commission (FCC) under docket 94-102 (including orders 96-264, 99-96 and 99-245) has been addressed by this Interim Standard without considering position reporting privacy restrictions that may be desirable for other position reporting services. For this reason, this standard does not preclude these other service restrictions. Position reporting privacy restrictions are beyond the scope of this standard, and are not addressed here.

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IS-801	TIA/EIA/IS-801-1: Position Determination Service Standard for Dual-Mode Spread Spectrum Systems, 2000.
J-STD-034	TIA/EIA J-STD-034: Wireless Enhanced Emergency Services; 1997.
SAMPS	TDMA ANSI/TIA/EIA-136-740 TDMA Cellular/PCS System Assisted Mobile Positioning through Satellite (SAMPS), 2000.
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Q.763 ITU-T Recommendation Q.763, Signalling System

No. 7 - ISDN user part formats and codes, 2000.

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TCP	RFC 793: Transmission Control Protocol, IETF, September 1981.
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3 Definitions and Acronyms

AOA: Angle of Arrival

AFLT: Advanced Forward Link Trilateration.

AGPS: Assisted GPS.

ALI: Automatic Location Identification.

ANI: Automatic Number Identification.

BSC: Base Station Controller.

BSS: Base Station Subsystem.

BSSMAP: Base Station System Management Application Part.

BTS: Base Transceiver Station.

Callback#: A dialable number that may be used to call back an MS that has recently placed an emergency call.

CAMA: Centralized Automatic Message Accounting.

CAS: Call Associated Signaling.

CGL: Calling Geodetic Location.

CgPN: Calling Party Number.

CM: Connection Management.

CPE: Customer Premises Equipment.

CPSMC: CDMAPSMMCount Parameter.

CPSML: CDMAPSMMList Parameter.

CRDB: Coordinate Routing Database.

CTRPT: CallTerminationReport INVOKE.

ctrpt: CallTerminationReport RETURN RESULT.

CTRT: Call Termination Report Timer.

EFLT: Enhanced Forward Link Trilateration.

ELID: Emergency Location Information Delivery.

Emergency Services Call (ESC): A call requiring connection to a Public Safety Answering Point (PSAP). The digits 9-1-1 require this treatment in the United States.

Emergency Services Message Entity (ESME): An entity in the emergency services network which serves as the point of interface to an MSC for common channel emergency services messaging.

Emergency Services Network Entity (ESNE): An entity in the emergency services network which serves as the point of interface to an MSC for voice or Telecommunications Device for the Deaf (TDD)/Teletypewriter (TTY) services.

Emergency Services Routing Digits (ESRD): A digit string that uniquely identifies a base station, cell site, or sector that may be used to route emergency calls through the network.

Emergency Services Routing Key (ESRK): A digit string that uniquely identifies an ongoing Emergency Services Call and it is used to correlate the Emergency Services Call with the associated data messages. It may also identify an Emergency Services Zone and it may be used to route the call through the network.

E-OTD: Enhanced Observed Time Difference.

ESC: Emergency Services Call.

ESME: Emergency Services Message Entity.

ESN: Electronic Serial Number.

ESNE: Emergency Services Network Entity.

ESP: Emergency Services Protocol.

ESPOSREQ: EmergencyServicesPositionRequest INVOKE.

esposreq: EmergencyServicesPositionRequest RETURN RESULT.

ESPRT: Emergency Services Position Request Timer.

ESRD: Emergency Services Routing Digits.

ESRK: Emergency Services Routing Key.

ESZ: Emergency Services Zone.

ETSI: European Telecommunications Standards Institute.

FCC: US Federal Communications Commission.

FLASHREQ: FlashRequest INVOKE.

flashreq: FlashRequest RETURN RESULT.

FR: Full Rate.

FRT: Flash Request Timer.

GDP: Generic Digits Parameter.

GMLC: Gateway Mobile Location Center.

GPDT: Geo Position Directive Timer.

GPOSDIR: GeoPositionDirective INVOKE.

gposdir: GeoPositionDirective RETURN RESULT.

GPOSREQ: GeoPositionRequest INVOKE.

gposreq: GeoPositionRequest RETURN RESULT.

GPRT: Geo Position Request Timer.

GPS: Global Positioning System.

GSM: Global System for Mobile communications.

HR: Half Rate.

IAM: Initial Address Message.

IMEI: International Mobile Station Equipment Identity.

IMSI: International Mobile Subscriber Identity.

Initial Position: The position result obtained at the beginning of an emergency services call.

INITREQT: Initial Request Timer.

IP: Internet Protocol.

IPFT: Intersystem Position Request Forward Timer.

IPRT: Intersystem Position Request Timer.

ISPOSREQ: IntersystemPositionRequest INVOKE.

isposreq: IntersystemPositionRequest RETURN RESULT.

ISPOSREQFWD: IntersystemPositionRequestForward INVOKE.

isposreqfwd: IntersystemPositionRequestForward RETURN RESULT.

ISUP: Integrated Services digital network User Part.

LCS: Location Service.

LCSCID: LCS_Client_ID parameter.

LMSI: Local Mobile Subscriber Identity.

LMU: Location Measurement Unit.

LPDE: Local Position Determining Entity.

LSB: Least Significant Bit.

LSP: Location Services Protocol.

M: Mandatory.

M3UA: MTP3 User Adaptation Layer.

MAHO: Mobile Assisted Handoff.

MAP: Mobile Application Part.

MDN: Mobile Directory Number.

ME: Mobile Equipment.

MIN: Mobile Identification Number.

MIPLI: Mobile Initiated Position Location Indicator. See *CDMA* MS_INIT_POS_LOC_IND parameter. Transmitted by an MS that intends to initiate a position determination session associated with an emergency call.

MIPLSI: Mobile Initiated Position Location Support Indicator. See *CDMA* MS_INIT_POS_LOC_SUP_IND parameter.Broadcast by a base station to indicate whether it supports MS-initiated position determination.

Mobile Position Center (MPC): The MPC serves as the point of interface to the wireless network for the location network. The MPC serves as the entity which retrieves, forwards, stores and controls position data within the location network. It can select the PDE(s) to use in position determination and forwards the position to the requesting entity or stores it for subsequent retrieval. In the case of a PDE with autonomous determination capability, the MPC receives and stores the position estimation for subsequent retrieval. The MPC may restrict access to position information (e.g. require that the MS be engaged in an emergency services call or only release position information to authorized nodes).

MOBINFO: Information regarding the MS radio access - MobInfo_AMPS, MobInfo_CDMA, MobInfo_NAMPS or MobInfo_TDMA.

MOPD: Mobile Originated Position Determination.

MPC: Mobile Position Center.

MPCAP: Mobile Position Capability.

MS: Mobile Station.

MS-Assisted Positioning: The network requires positioning assistance information from the MS in order to calculate position information.

MS-Based Positioning: The MS is capable of detecting a navigation signal without any help from the base station. The mobile station is capable of autonomously calculating its own position.

MSB: Most Significant Bit.

MSC: Mobile Switching Center.

MSID: Mobile Station Identifier (e.g., MIN or IMSI).

MSISDN: Mobile Station International ISDN Number.

MTP1: MTP Layer 1.

MTP2: MTP Layer 2.

MTP3: MTP Layer 3.

NCAS: Non Call Associated Signaling.

Network-Assisted Positioning: The MS requires positioning assistance information from the network in order to calculate position information.

Network-Based Positioning: The Network is capable of determining position of the MS based on normal RF emissions without any additional navigational information from the MS.

O: Optional.

ORREQ: OriginationRequest INVOKE.

orreq: OriginationRequest RETURN RESULT.

PCS: Personal Communications Services.

PDE: Position Determining Entity.

Phase I Location: The cellsite or sector currently serving a mobile.

Phase II Position Information: Position available for the mobile in accordance with the US FCC mandate.

PLMN: Public Land Mobile Network.

POI: Point of Interface.

PosFailure: Information regarding a failed position request.

PosInfo: Information regarding an MS's precise position.

Position Determining Entity (PDE): The PDE determines the precise position or geographic location of a wireless terminal when the MS starts a call or while the MS is engaged in a call. Each PDE supports one or more position determining technologies. Multiple PDEs may serve the coverage area of an MPC and multiple PDEs may serve the same coverage area of an MPC utilizing different position determining technologies.

POSROUTREQ: PositionRouteRequest INVOKE.

posroutreq: PositionRouteRequest RETURN RESULT.

POST: Position Timer.

PRRT: Position Route Request Timer.

PSAP: Public Safety Answering Point.

PSMM: PilotStrengthMeasurement Message

PSTN: Public Switched Telephone Network.

Public Safety Answering Point: A PSAP is an emergency services network element that is responsible for answering emergency calls.

pull: Request of information from an emergency service network.

push: The autonomous sending of information toward the emergency service network.

QoS: Quality of Service.

R: Required.

RFC: Request for Comment (IETF Standard).

SAMPS: System Assisted Mobile Positioning through Satellite.

SCCP: Signaling Connection Control Part.

SDCCH: Standalone Dedicated Control Channel.

Selective Router: A Selective Router is an emergency services network element that is responsible for routing incoming emergency calls to the appropriate PSAP, and may be responsible for other functions, such as redirecting calls from a primary PSAP to a secondary PSAP. The specification of Selective Router functionality is outside the scope of this document.

SMDPP: SMSDeliveryPointToPoint INVOKE.

smdpp: SMSDeliveryPointToPoint RETURN RESULT.

SMLC: Serving Mobile Location Center.

SMT: Short Message Delivery Timer.

S/R: Selective Router.

TA: Timing Advance.

tandem: An intermediate switch (e.g., Access Tandem) that has normal PSTN routing capabilities, but does not have selective routing capability.

TCAP: Transaction Capabilities Application Part.

TCH-FR: Traffic Channel - Full Rate.

TCH-HR: Traffic Channel - Half Rate.

TCP: Transmission Control Protocol.

TDOA: Time Difference of Arrival.

TMSI: Temporary Mobile Subscriber Identity.

TPRIO: Teleservice_Priority Parameter.

TOA: Time of Arrival.

UTC: Coordinated Universal Time.

VLR: Visitor Location Register.

VMSC: Visited MSC.

WGS-84: World Geodetic System 1984.

WZ1: World Zone 1.

Chapter 2: Stage 1 Emergency Services Service Descriptions

1 Introduction

This chapter describes emergency services from the perspective of a user. Normally the MS subscriber is the user, but for the most part the emergency services are provided transparently to the subscriber. Most of the services are network services that deliver information about an emergency call or caller. The user of these services is normally some device, although the ultimate user is the PSAP call taker. This description focuses on the network services apart from the devices and the humans that use them.

"Wireless" as used in this standard refers to cellular, Personal Communication Services, satellite and other commercial mobile radio services. "Wireless" does not apply to cordless telephones or to private radio systems.

1.1 Emergency Location Information Delivery (ELID)

Emergency Location Information Delivery (ELID) delivers the position (e.g., latitude and longitude) of an emergency services caller to the Emergency Services Provider. The position is delivered in addition to the identification of the caller's base station, cell site, or sector.

ELID may optionally deliver position after an emergency services provider request during an emergency services call (ESC).

2 Assumptions

2.1 Common Assumptions

The following are common assumptions that are applicable both for ANSI-41 and PCS1900 systems:

a. Phase II position information can be delivered to the Emergency Services Provider by two methods:

   i. Initial position may be reported during call setup signaling using Call Associated Signaling (CAS) if:

      1. ISUP signaling is being used, and
      2. Position information is available in time.

   ii. Initial or updated position may be obtained during an Emergency Services Call (ESC) using non-call associated signaling (NCAS):

      1. by the Emergency Services Provider pulling the information as it is required.

b. The maximum period of time that an ESC can be delayed while position information is being obtained is a local configuration option.

c. This standard will support providing updated mobile position upon request from an emergency services network.

d. An ESNE is closely associated with an ESME. If an ESNE requires additional information it can get that information from its associated ESME. The interface between an ESNE and ESME is outside the scope of this standard, but is necessary for the ESNE to act upon information in the ESME.

e. The mapping of ESNE and ESME onto the physical elements of a network is outside the scope of this standard.

f. ESRD or ESRK shall be used to route a call to an ESNE.

g. The method defined in this document for conveying position information to the Emergency Services Provider is intended to support all positioning technologies.

h. ESCs and data are correlated using either a callback number or a ESRK.

i. MSID translation to TMSI may have to be in the VLR/MSC.

j. NCAS Pull of updated or last known position after call release is not a requirement.

k. For NCAS Pull, the ESME routes the position request to the correct MPC/GMLC based on the ESRK or ESRD provided by the wireless network during the emergency call setup.

l. NCAS Pull may be supported to enable an emergency services provider to request the initial, the updated or the last known position of an MS that has originated an emergency services call.

m. Pull of position between an MPC or GMLC and the ESME is supported.

2.2 ANSI-41 Assumptions

The following items are basic understandings used during the development of these recommendations:

a. Both push and pull are supported between Position Determining Entity (PDE) and Mobile Position Center (MPC).

b. Interconnections to the PDE other than the MPC or MSC are beyond the scope of this standard.

c. MDN to MSID translation may have to be in the HLR. It may be done in the MSC for currently registered MSs. It may be done in the MPC for currently cached records.

d. The MPC caches information associated with an emergency services call (ESC). The information can be associated using the ESRK, Callback number or BillingId as a key.

e. PDEs may determine the position of an ESC caller autonomously and forward that information with associated mobile information to the MPC.

f. The IntersystemPositionRequest operation is a chained transaction rather than a serialized transaction.

g. The ESRK has the following requirements:

   i. Each ESRK is unique within each MPC.

   ii. Each ESRK identifies an MPC at a minimum resolution within a wireless network (although it may identify a cell site, base station, or cell or portion thereof).

   iii. Each ESRK may identify a PSAP, an Emergency Services Zone (ESZ), or both.

h. Selection of an Emergency Services Zone based on Phase II geographic position information is optional. Therefore, Emergency Services Call Routing using CRDB is optional. If used, the CRDB database may reside in the wireless network or in the emergency services network.

i. The MSC is responsible for providing current mobile information (i.e., MobInfo), not initial.

j. The ANSI-41 Sections of this Standard only show solutions involving a centralized or network based PDE. However, as an alternative the PDE may be co-located with the Serving BS. In this case the MPC communicates with the LPDE based on the call flows outlined in Annex B.

2.3 PCS1900 Assumptions

a. The GMLC interface to an ESME may be provided from a different PCS1900 network than the one in which a particular emergency call has originated. This depends on the existence of a suitable agreement between the PSAP and the operators of the two PCS1900 networks. The availability of such an arrangement provides additional interconnection flexibility to both PCS1900 network operators and emergency services providers.

b. The details of positioning methods used in PCS1900 networks are outside the scope of this standard.

c. The detailed content and encoding of signaling messages used inside a PCS1900 network to obtain the position of an MS and convey this to an emergency services provider are defined in the specific ETSI GSM standards referenced in this standard. The detailed content and encoding of the signaling messages exchanged between a PCS1900 network and an emergency services provider (or its surrogate) to convey location and related information are defined in this standard.

d. For NCAS only solutions (i.e., CAS push is not used or attempted), a PCS1900 network shall support conveying an ESRK to an ESNE in order to support CAMA trunk signaling to the S/R and/or to the PSAP. Any ESRK so provided has the following properties:

- The ESRK is unique to the specific PCS1900 network.
- The ESRK is assigned by the visited MSC from which the Emergency Services Call originated.
- The ESRK uniquely identifies the emergency services call and its associated MS within the PCS1900 network for at least the duration of the call.
- The ESRK shall identify the GMLC used by the network for communicating with the ESME.
- The ESRK may identify an Emergency Services Zone (ESZ).

e. In a PCS1900 network, the callback number sent to the ESNE is normally the MSISDN of the ESC calling MS. However, a PCS1900 network may substitute a non-dialable callback number for an MSISDN if the MSISDN is not available (e.g., unregistered MS) or cannot be passed to the ESNE in the call setup (e.g., MSISDN not in WZ1). The non-dialable callback number shall identify the calling ME and is derived from the IMEI.

f. In order to support the option of latitude/longitude based routing to both the correct ESNE and the correct ESME serving an ESC calling MS's initial geographic location, a unique ESRD for each ESZ within a cell site may be assigned at the Serving MSC. A serving MSC will thus possess a set of unique ESRDs identifying all ESZs to which an ESC in its serving geographical area could be directed. Latitude/longitude based

routing can then be supported by assigning the ESRD belonging to the serving MSC that identifies the serving cell and the ESZ associated with the initial position of an ESC calling MS. Note: this assumption implies that there may be more than one ESRD per cell.

g. For NCAS scenarios, the VMSC shall push the initial MS position data to the GMLC when it becomes known. The GMLC shall store the initial position along with other call related information. The VMSC shall then notify the GMLC when the emergency services call has ended. For CAS scenarios, this entire procedure is optional.

h. When NCAS Pull is supported during an emergency services call, a GMLC identifies the VMSC for the emergency services call by the MSC address previously stored for that call in the GMLC. For NCAS Pull, the ESME will route to the correct GMLC based on the ESRK or ESRD provided by the PCS1900 network.

i. For NCAS scenarios, the authentication of the GMLC or ESME need not be supported.

j. The maximum period of time that a GMLC waits for initial position information after reception of an NCAS Pull request is a local configuration option (INITREQT).

k. An MSC may be connected to more than one ESNE and the mechanism used to provide the emergency caller's initial position (i.e., CAS Push, NCAS Pull or both) may be the same or different for each ESNE. For each emergency call, the MSC needs to determine which ESNE is to be contacted and which mechanism is to be used to provide the emergency caller's initial position.

Chapter 3: Functional Overview, *ANSI-41*

1 Introduction

This chapter describes emergency services from a network perspective. A network reference model is developed to define a set of network entities and interfaces between them. A set of messages is defined to transfer information and requests between the network entities.

For this document, position means a point on earth that can be described by coordinates, such as latitude and longitude. Location in this document is an area. Location may be the area served by a VLR, the area served by an MSC, a paging or location area, the area covered by a given cell site or sector, the area served by a particular emergency services agency, or the area associated with a particular street address. This definition may be at odds with other forum, but it is consistent with the usage of terms used in wireless mobility management protocols such as TIA/EIA-41 and GSM.

Phase I emergency services requires the passing of the location of base station, cell site or sector serving an emergency services caller. This information was passed as Emergency Services Routing Digits (ESRD) during call setup as the called number, as an ISUP Generic Digits Parameter, or both.

Position may be used in emergency services networks for two basic purposes: to route the Emergency Services Call (ESC) for proper handling and to aid in resolving the emergency situation. How emergency services use the position information is beyond the scope of this standard, however some basic understanding is useful.

ESC routing can select a Selective Router (S/R) or a particular PSAP. In general, a geographic area is divided into Emergency Services Zones (ESZs). Each zone has assigned to it a primary PSAP, a secondary PSAP, and a set of emergency response agencies (e.g., fire, police, ambulance). The ESZs are non-overlapping and every point in the emergency services area is within one ESZ.

In resolving an emergency, the position information may be used by the emergency services network in a variety of ways. For example, it may be used to plot a point on a map, to provide the nearest known street address, or as input to navigation equipment in the emergency response vehicle (e.g., helicopter ambulance).

The position information may be delivered to the emergency services network in two basic ways: with the call as part of the call setup information or through a separate data service. The former is known as Call Associated Signaling (CAS) since the position information is delivered in the call signaling. The latter is Non Call Associated Signaling (NCAS) and the messages delivered by the data service must be correlated with the call by parameters carried in the message.

With CAS, the wireless network pushes the position information to an Emergency Services Network Entity (ESNE). With NCAS, an Emergency Services Message Entity (ESME) pulls the position information from the wireless network.

Call setup may be delayed while position information is being determined if it will be sent in a CAS push or used for routing. The maximum period of time that a call will be held up is provisionable on a per system basis.

2 Methodology

Stage 2 describes the emergency call support services from the network perspective. Basically this involves moving information from one system to another. Information is generated, stored, or processed on one system, but the data is used by another system to perform some function.

A network reference model is developed to describe the functional partitioning of a system. The functions are divided among several functional entities. This division is based on traditional functional separations plus some separation to allow the services to be built and deployed in a variety of configurations. Communication paths or reference points between the network entities are also defined to indicate where information can be exchanged. These network reference points allow specific interfaces to be discussed and defined.

Once the network reference model is developed, the next step is to define the information that must be passed from one network entity to another. Information that can be passed at the same time is collected together to form messages. This standard has messaging that occurs between wireless network entities; between wireless network entities and emergency services network entities; and between MSs and wireless network entities.

3 Network Reference Model

A network reference model for emergency services for wireless subscribers is shown in Figure 3-1.

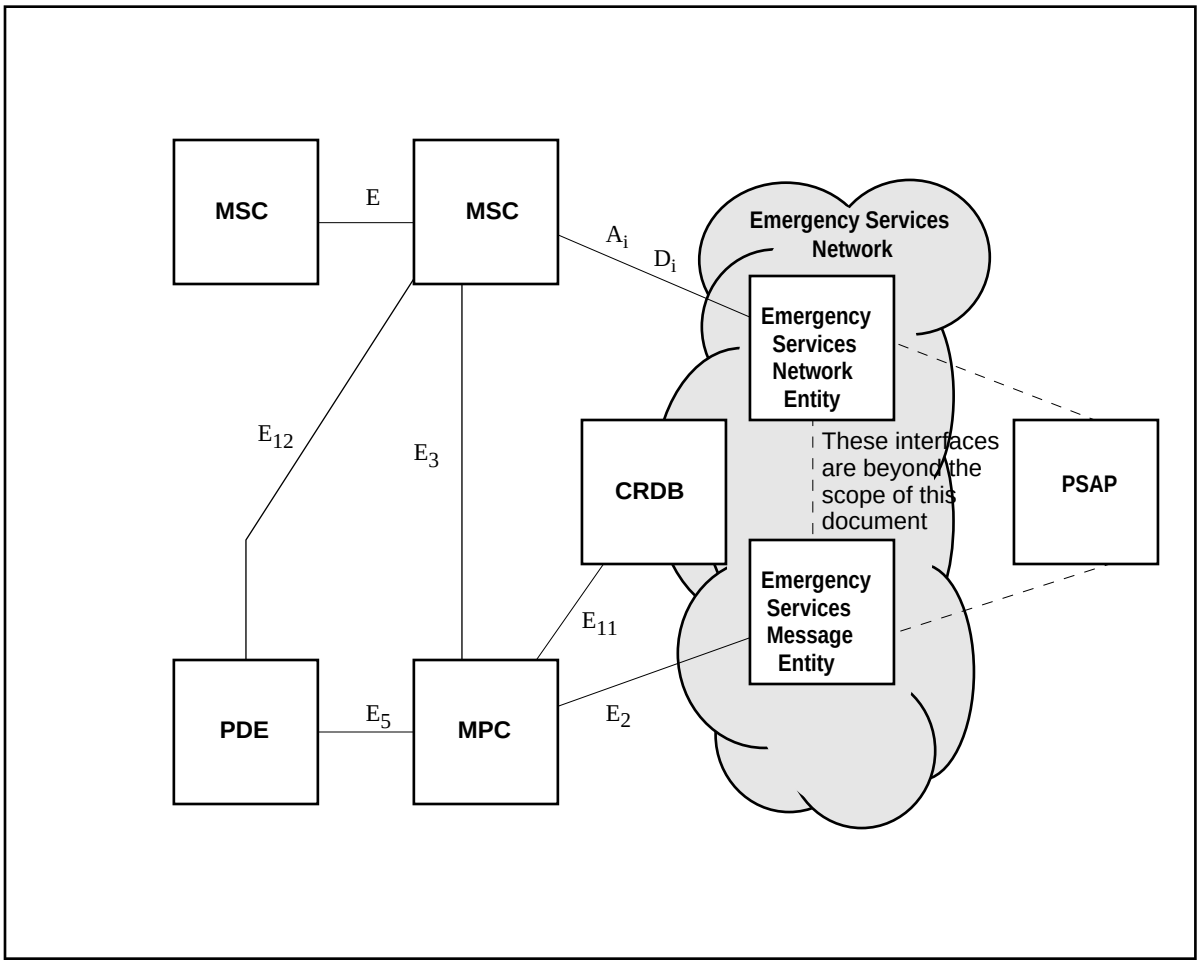

Figure 3-1: **Network Reference Model**

4 Network Entities

This section describes the functionality of the network entities of the network reference model. Message routing and transmission facilities are considered to be outside of the network reference model, even though they provide essential services.

4.1 Coordinate Routing Database (CRDB)

The CRDB provides a translation between a given position expressed as a latitude and longitude and a string of digits identifying an Emergency Services Zone (ESZ).

4.2 Emergency Services Message Entity (ESME)

The ESME routes and processes the out-of-band messages related to emergency calls. This may be incorporated into selective routers (also known as Routing, Bridging and Transfer switches) and Automatic Location Information (ALI) database engines. The structure of the Emergency Services Network is beyond the scope of this standard, although some insight may be gained from Annex A.

4.3 Emergency Services Network Entity (ESNE)

The ESNE routes and processes the voice band portion of the emergency call. This is composed of selective routers (also known as Routing, Bridging and Transfer switches). The structure of the Emergency Services Network is beyond the scope of this standard, although some insight may be gained from Annex A.

4.4 Mobile Position Center (MPC)

The MPC selects a PDE to determine the position of a MS. The MPC may restrict access to position information (e.g., require that the MS be engaged in an emergency services call or only release position information to authorized nodes).

4.5 Mobile Switching Center (MSC)

The MSC provides radio contact with MSs making emergency calls. The MSC may hand off the radio control to another MSC, but the emergency call remains anchored with the MSC establishing the first radio contact.

4.6 Position Determining Entity (PDE)

The PDE determines the position of a wireless terminal when the MS starts a call or while the MS is engaged in a call. Each PDE supports one or more position determining technologies. Multiple PDEs using the same technology may serve the coverage area of an MPC and multiple PDEs each using a different technology may serve the same coverage area of an MPC.

4.7 Public Safety Answering Point (PSAP)

A PSAP is the terminating end-point of an emergency services call responsible for answering to emergency services calls.

5 Messages Across Network Interfaces

This section describes the protocols and messages used on the network interfaces for Emergency Location Information Delivery.

Interface	Functional Entities	Protocol	Message (s)
A_iD_i	MSC - ESNE	ISUP	IAM
E	MSC - MSC	ANSI-41	InterSystemPositionRequestForward FlashRequest SMSDeliveryForward SMSDeliveryBackward
E_2	MPC - ESME	ESP	EmergencyServicesPositionRequest
E_3	MSC - MPC	ANSI-41	InterSystemPositionRequest OriginationRequest CallTerminationReport SMSDeliveryPointToPoint
E_5	PDE - MPC	LSP or ANSI-41	GeoPositionRequest GeoPositionDirective InterSystemPositionRequest SMSDeliveryPointToPoint CallTerminationReport
E_{11}	CRDB - MPC	LSP	PositionRouteRequest
E_{12}	MSC-PDE	ANSI-41	SMSDeliveryPointToPoint InterSystemPositionRequest

6 Network Entity Relationships

Each MSC is associated with only one MPC, but each MPC may be associated with multiple MSCs. PDEs are associated with only one MPC, but each MPC may have multiple PDEs associated with it.

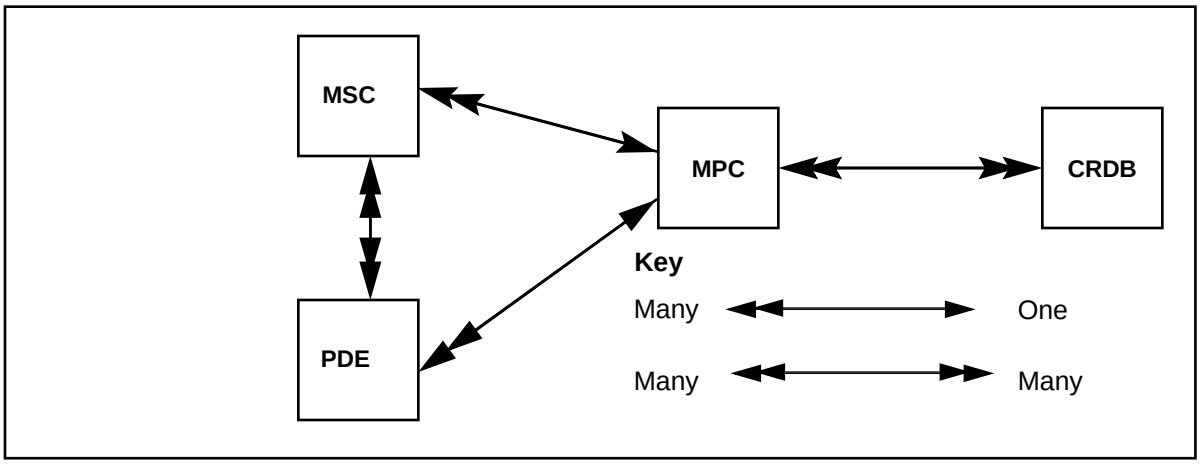

Figure 3-2: **Entity Relationship Diagram**

Chapter 4: Stage 2 Emergency Services Network Description, *ANSI-41.3*

The scenarios in this chapter show only the parameters that are relevant to a particular scenario and do not show all of the parameters that are needed for the transaction. Consult Stage 3 documentation for specific parameter requirements.

For PDEs using network based location technology, the SMDPP operations are not necessary. These PDEs are not required to support SMS capabilities or the E12 (MSC-PDE) interface.

For PDEs supporting handset based or handset assisted position determination, SMDPP operations are used to communicate between the PDE and MS. This communication may occur after the MPC originated GPOSREQ and prior to the PDE gposreq. This applies to each scenario that includes an MPC originated GPOSREQ to the PDE. See Section 3 “PDE to MS Scenarios for Handset-Based PDE” on page 4-30.

1 Modifications to *ANSI-41.3* Table 1

(*ANSI-41-D* Chapter-3, pages 3-3 and 3-4)

Table 4-1: **Operation Component and Timer Acronyms**

Operation Name	INVOKE Component Acronym	RETURN RESULT Component Acronym	Operation Timer Acronym
…	…	…	…
CallTerminationReport	CTRPT	ctrpt	CTRT
IntersystemPositionRequest	ISPOSREQ	isposreq	IPRT
IntersystemPositionRequestForward	ISPOSREQFWD	isposreqfwd	IPFT
GeoPositionRequest	GPOSREQ	gposreq	GPRT
GeoPositionDirective	GPOSDIR	gposdir	GPDT
…	…	…	…

2 Emergency Location Information Delivery (ELID) Scenarios

(New for *ANSI-41.3)*

2.1 ELID Using CAS Push

2.1.1 PDE Queried for Position

This scenario shows a position request and delivery of position information with a CAS push during call setup.

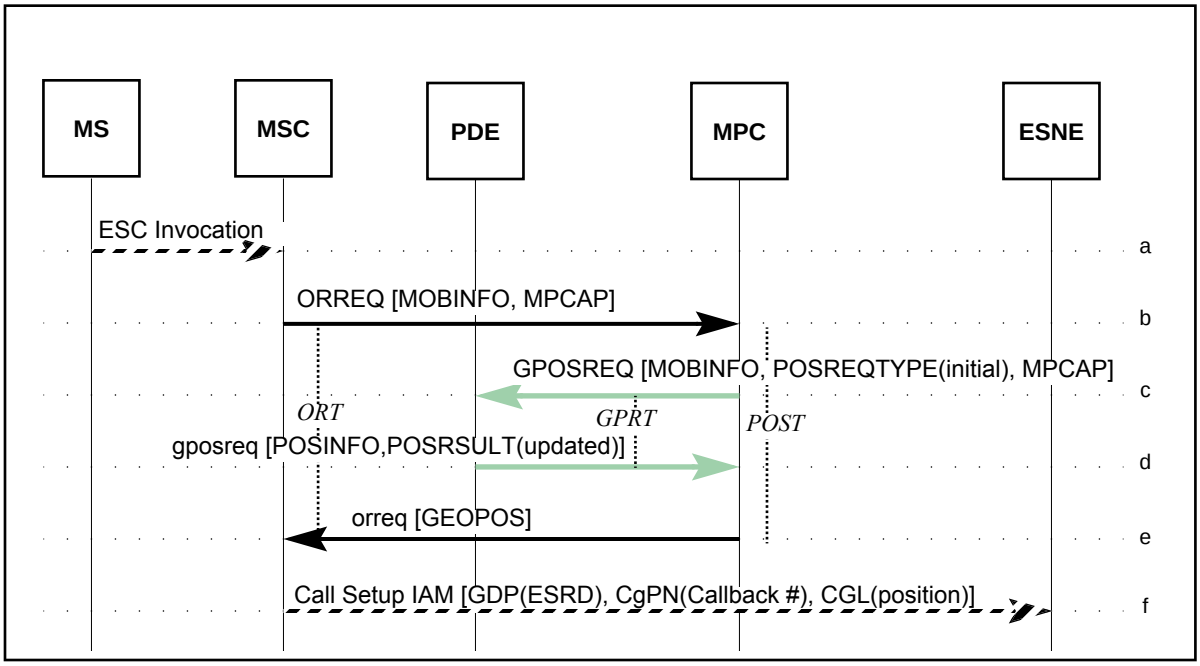

Figure 4-1: **PDE Queried for Position**

a. The MS invokes an Emergency Services Call.

b. The MSC requests the position of the MS with an ORREQ. The MPC starts the POST timer.

c. The MPC relays the position request to the appropriate PDE with a GPOSREQ.

   Optionally, a handset-based solution may have PDE to MS communication. See Section 3 “PDE to MS Scenarios for Handset-Based PDE” on page 4-30.

d. In this case, the PDE has not previously acquired the initial position of the MS. The PDE determines the current position of the MS and returns the position information in a gposreq with the PositionResult parameter set to *Updated Position Returned*.

e. The MPC cancels the POST timer and acknowledges the request in an orreq.

f. The MSC sets the call up toward the ESNE using an IAM including the received geographic position.

2.1.2 PDE Autonomous Delivery of Position

This scenario shows the case where the PDE autonomously detects an Emergency Services Call and pushes that information to the MPC to speed delivery of data for CAS delivery.

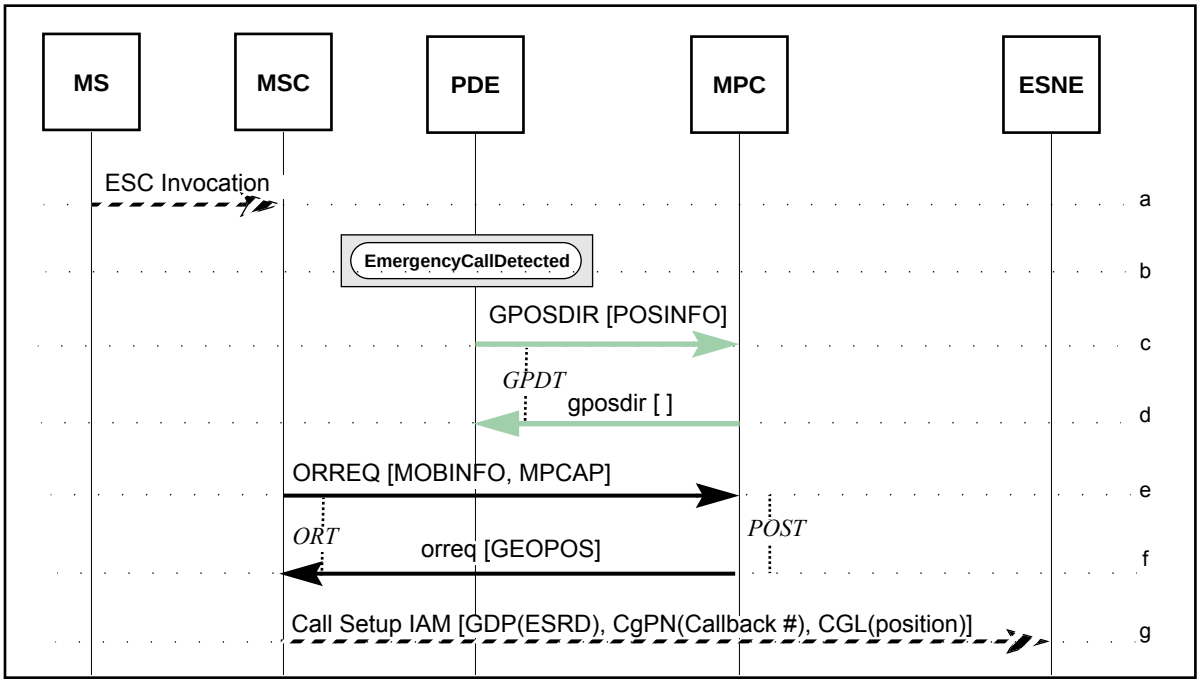

Figure 4-2: **PDE Autonomous Delivery of Position**

a. The MS invokes an Emergency Services Call.

b. The PDE autonomously determines an Emergency Services Call has originated and computes the position of the handset.

c. The PDE forwards the position to the MPC using a GPOSDIR.

d. The MPC acknowledges receipt of the pushed position using a gposdir.

e. The MSC requests the position of the MS with an ORREQ.

f. The MPC replies to the position request in an orreq containing the cached position.

g. The MSC sets the call up toward the ESNE using an IAM including the received geographic position.

2.1.3 Timeout Waiting for Position

This scenario shows a position request that does not complete in time for delivery of position information with a CAS push during call setup.

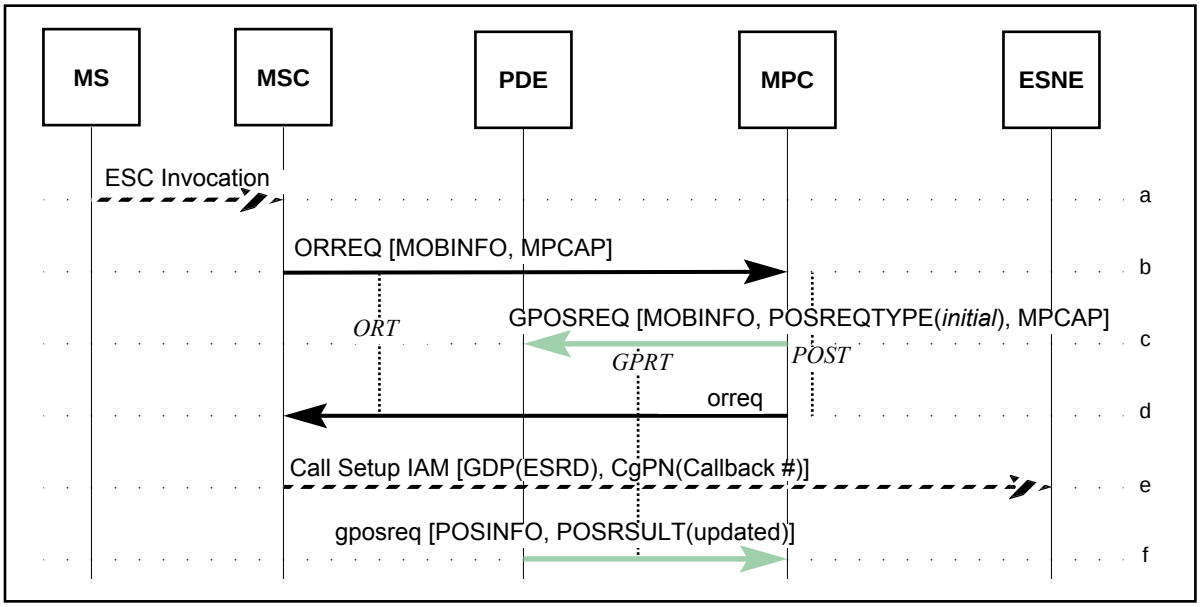

Figure 4-3: **Timeout Waiting for Position**

a. The MS invokes an Emergency Services Call.

b. The MSC requests the position of the MS with an ORREQ. Upon receipt of the ORREQ, the MPC starts the POST timer.

c. The MPC relays the position request to the appropriate PDE with a GPOSREQ.

   Optionally, a handset-based solution may have PDE to MS communication. See Section 3 “PDE to MS Scenarios for Handset-Based PDE” on page 4-30.

d. When the POST timer expires, the MPC returns the orreq.

e. The MSC sets the call up to the ESNE using an IAM, without the geographic position.

f. In this case, the PDE has not previously acquired the initial position of the MS. The PDE determines the current position of the MS and returns the position information in a gposreq with the PositionResult parameter set to *Updated Position Returned* where it is cached as ‘initial position’ by the MPC.

2.1.4 Three-Way Call to PSAP After Intersystem Handoff

This scenario illustrates a a CAS push of position for a three-way emergency services call initiated after intersystem handoff.

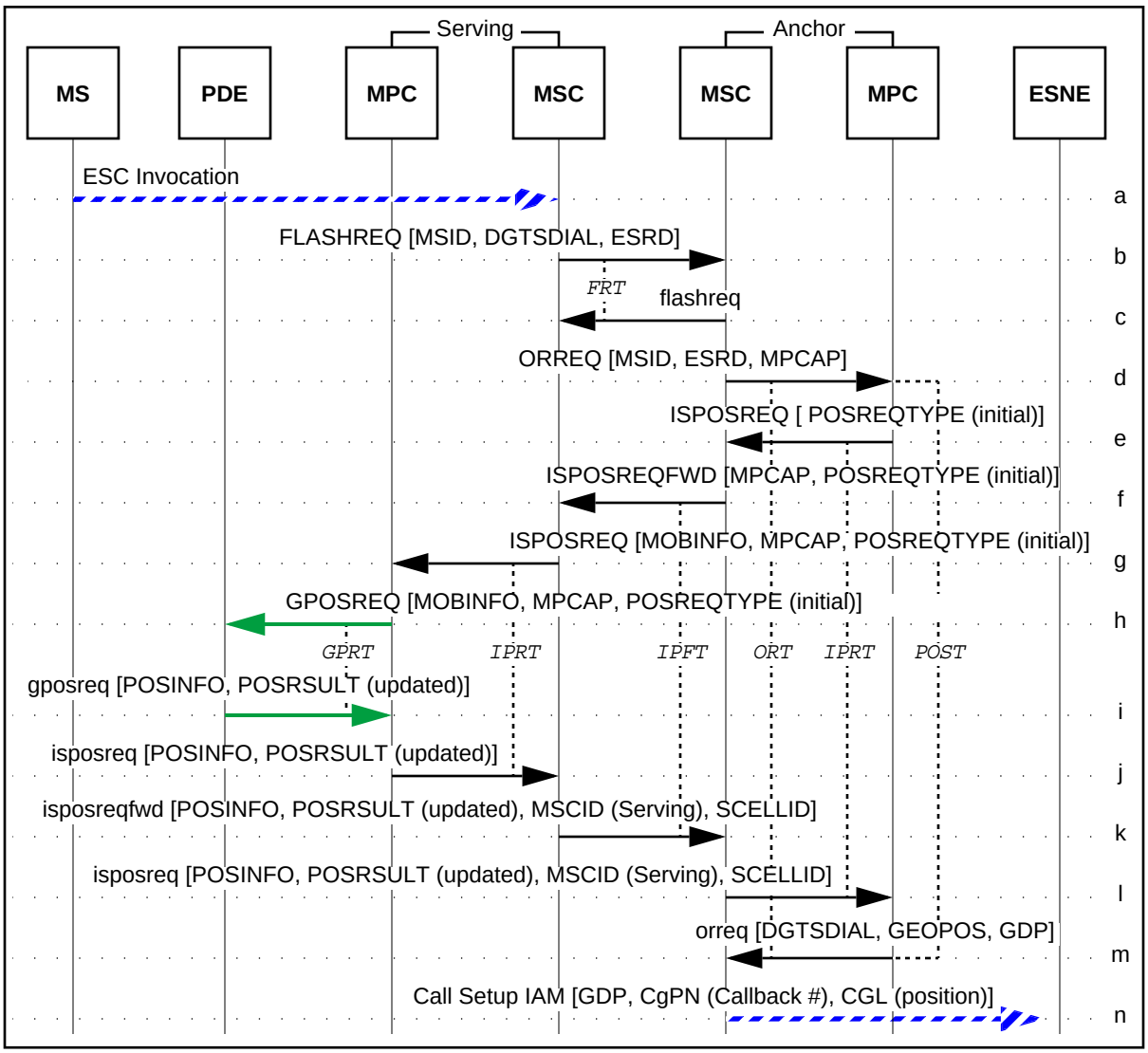

Figure 4-4: **Three-Way Call to PSAP After Intersystem Handoff**

a. The MS originates an Emergency Services Call via 3-way calling while another call is in progress.

b. The Serving MSC sends a `FLASHREQ` toward the Anchor MSC.

c. The Anchor MSC acknowledges the event with a `flashreq`.

d. The Anchor MSC sends an `ORREQ` to the MPC associated with the Anchor MSC, the Anchor MPC, and relays the ESRD parameter value received from the Serving MSC. The MPCAP parameter is set to indicate the positioning capability of the MS.

e. The Anchor MPC sends an `ISPOSREQ` to the Anchor MSC to request MS position information.

f. The Anchor MSC sends an `ISPOSREQFWD` toward the Serving MSC.

g. The Serving MSC sends an ISPOSREQ to the MPC associated with the Serving MSC, the Serving MPC. The MobInfo information is set appropriately for the served MS.

h. In this scenario, there is no current position information available for the MS (e.g., GPOSDIR was not received). The Serving MPC sends a GPOSREQ to the PDE selected for position determination and includes the MS information received from the Serving MSC.

i. In this scenario, the PDE determines the current MS position and returns the position information to the Serving MPC in the gposreq. The POSRSULT parameter is set to indicate *Updated position returned*.

   Optionally, handset based geoposition determination may have PDE to MS communications. See Section 3, “PDE to MS Scenarios for Handset Based PDE.”

j. The Serving MPC sends an isposreq to the Serving MSC and relays the POSINFO and POSRSULT parameters received from the PDE.

k. The Serving MSC sends and isposreqfwd toward the Anchor MSC and relays the POSINFO and POSRSULT parameters received from the Serving MPC.

l. The Anchor MSC sends an isposreq to the Anchor MPC and relays the POSINFO and POSRSULT parameters received from the Anchor MPC

m. The Anchor MPC stores the received position information and sends an orreq to the Anchor MSC. The DGTSDIAL parameter is set to digits for the call to the PSAP. In determining the parameter values for the orreq, the MPC uses information received in the isposreq.

n. The Anchor MSC sets the call up toward the ESNE. The IAM includes the GDP and position information received from the Anchor MPC. This may result in routing to a PSAP not associated to the geographical area of the cell/sector in which the call originated

2.2 ELID Using NCAS Pull

2.2.1 PDE Queried For Position

This scenario shows how the ESME retrieves a position from a wireless system. The MPC is configured to immediately respond to the ORREQ. It is irrelevant whether the MS has subsequently handed off or not since the responsibility for retrieving the position remains in the anchor system for Emergency Services Calls originated in the anchor system.

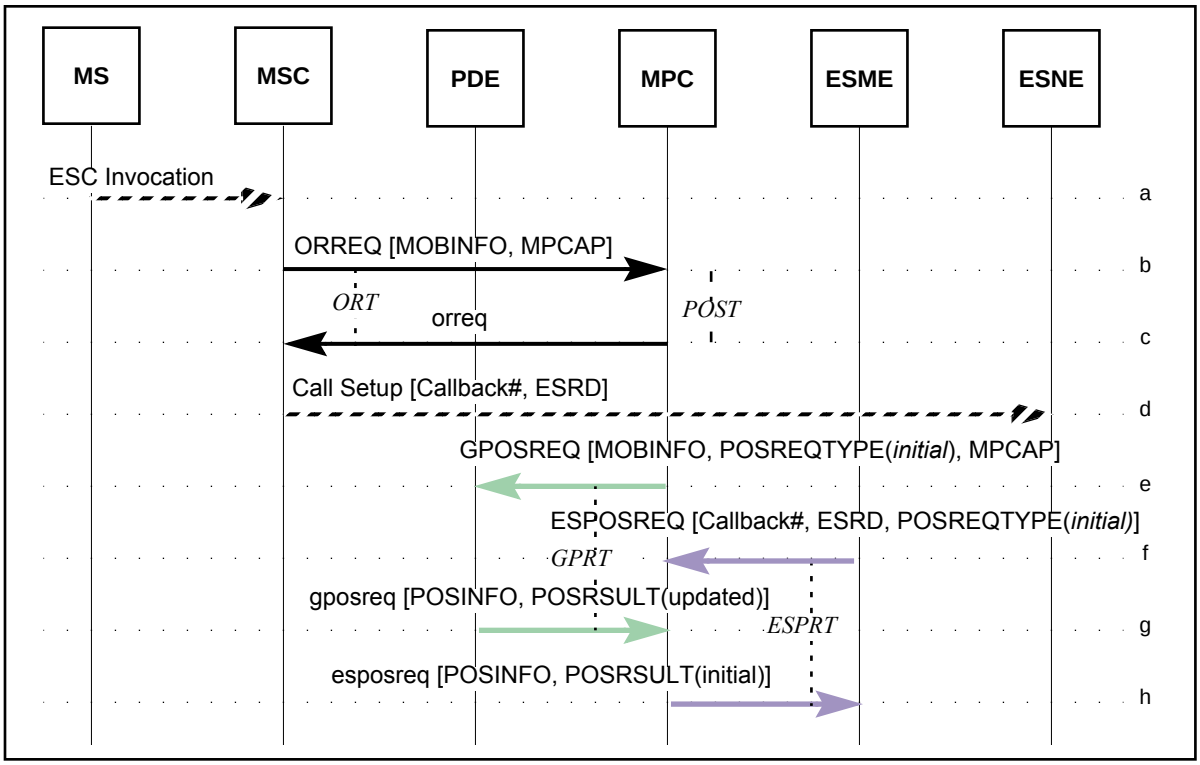

Figure 4-5: **PDE Queried For Position**

a. The MS invokes an Emergency Services Call.

b. The MSC initiates an ORREQ providing Mobile Information and MSID to the MPC.

c. The MPC returns a response immediately, but stores the MSID/Mobile Information.

d. The MSC routes the call toward the ESNE selected by the ESRD. See Annex D for call setup signaling formats.

e. The MPC uses the information received in the ORREQ to request the PDE for initial position of the MS.

   Optionally, a handset-based solution may have PDE to MS communication. See Section 3 “PDE to MS Scenarios for Handset-Based PDE” on page 4-30.

f. The ESME autonomously requests the position of an MS with an ESPOSREQ toward the MPC determined from the incoming trunk group, the known ESRD, or other means. This request is asynchronous and is due to the arrival of the Emergency Services Call at the ESNE.

g. In this case, the PDE has not previously acquired the initial position of the MS. The PDE determines the current position of the MS and returns the position information in a gposreq with the PositionResult parameter set to *Updated Position Returned*.

h. The MPC caches the position as ‘initial position’ and returns the position in an esposreq to the ESME.

2.2.2 PDE Autonomous Delivery of Position

This scenario shows the case where the PDE autonomously detects an Emergency Services Call and pushes the information to the MPC to be later retrieved by the ESME. The MPC is configured to immediately respond to the ORREQ. It is irrelevant whether the MS has subsequently handed off or not since the responsibility for retrieving the position remains in the anchor system for Emergency Services Calls originated in the anchor system.

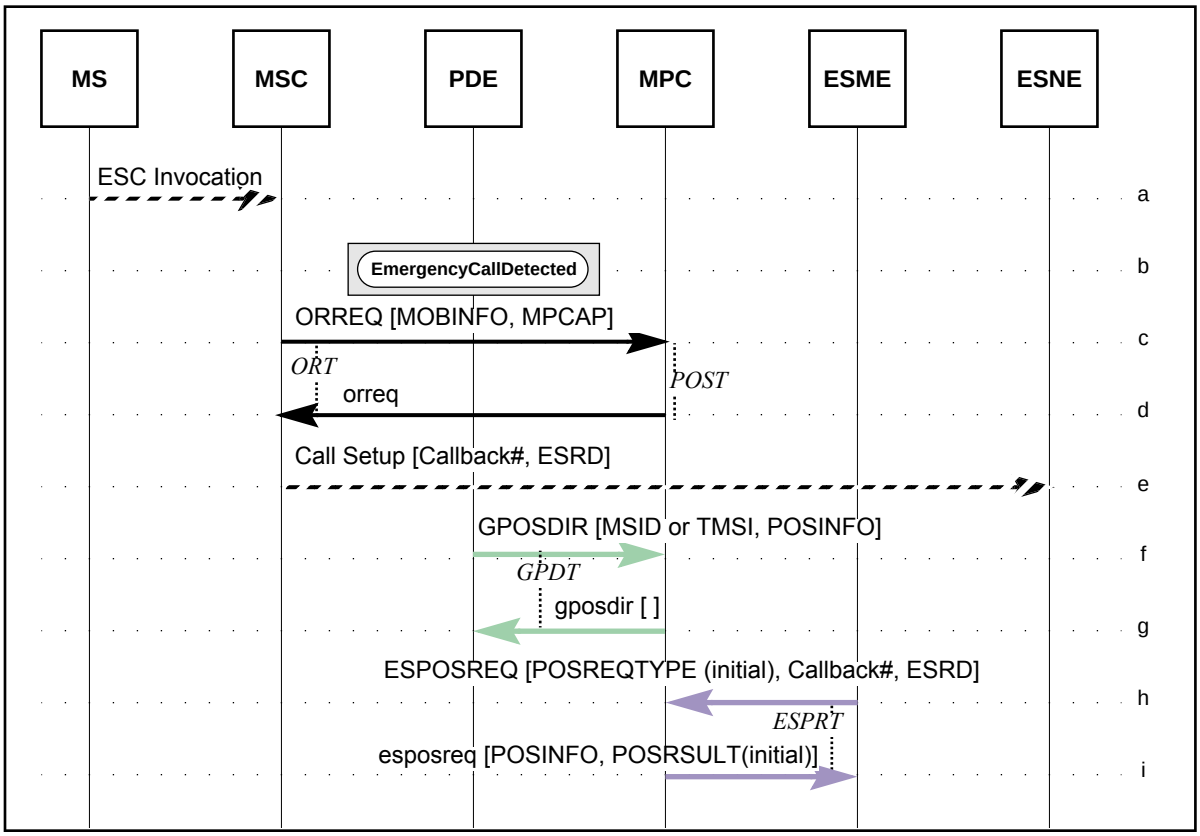

Figure 4-6: **PDE Autonomous Delivery of Position**

a. The MS invokes an Emergency Services Call.

b. The PDE autonomously determines an Emergency Services Call has originated and computes the position of the handset.

c. The MSC initiates an ORREQ to providing Mobile Information and MSID to the MPC.

d. The MPC returns a response immediately, but stores the MSID/Mobile Information for future use.

e. The MSC routes the Emergency Services Call toward the ESNE selected by the ESRD. See Annex D for call setup signaling formats.

f. The PDE has been autonomously collecting position for the mobile, and now provides it in a GPOSDIR.

g. The MPC stores position as initial position and acknowledges this message.

h. The ESME requests the position information for an MS identified by its callback number in an ESPOSREQ.

i. The MPC returns the position in the esposreq.

2.2.3 Test Message

This scenario shows the sending of ESPOSREQ with a type ‘test’ as a mechanism for the Emergency Services Network to check that the ESME and MPC applications are communicating.

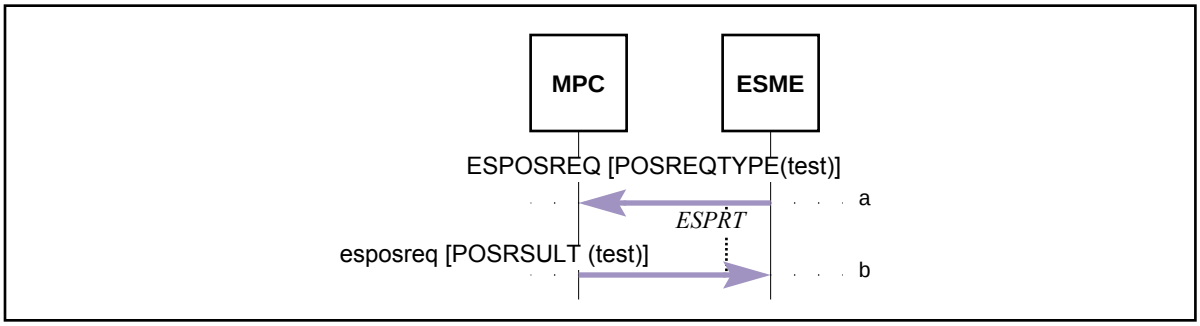

Figure 4-7: **Test Message**

a. The ESME sends an ESPOSREQ indicating test purposes.

b. The MPC responds immediately with a successful test response. No further processing is required by the MPC.

2.3 Emergency Services Call Routing and ELID

2.3.1 Routing Based on Position

This scenario shows the MPC, and optionally, the CRDB using position information from the PDE to determine appropriate routing to the ESNE.

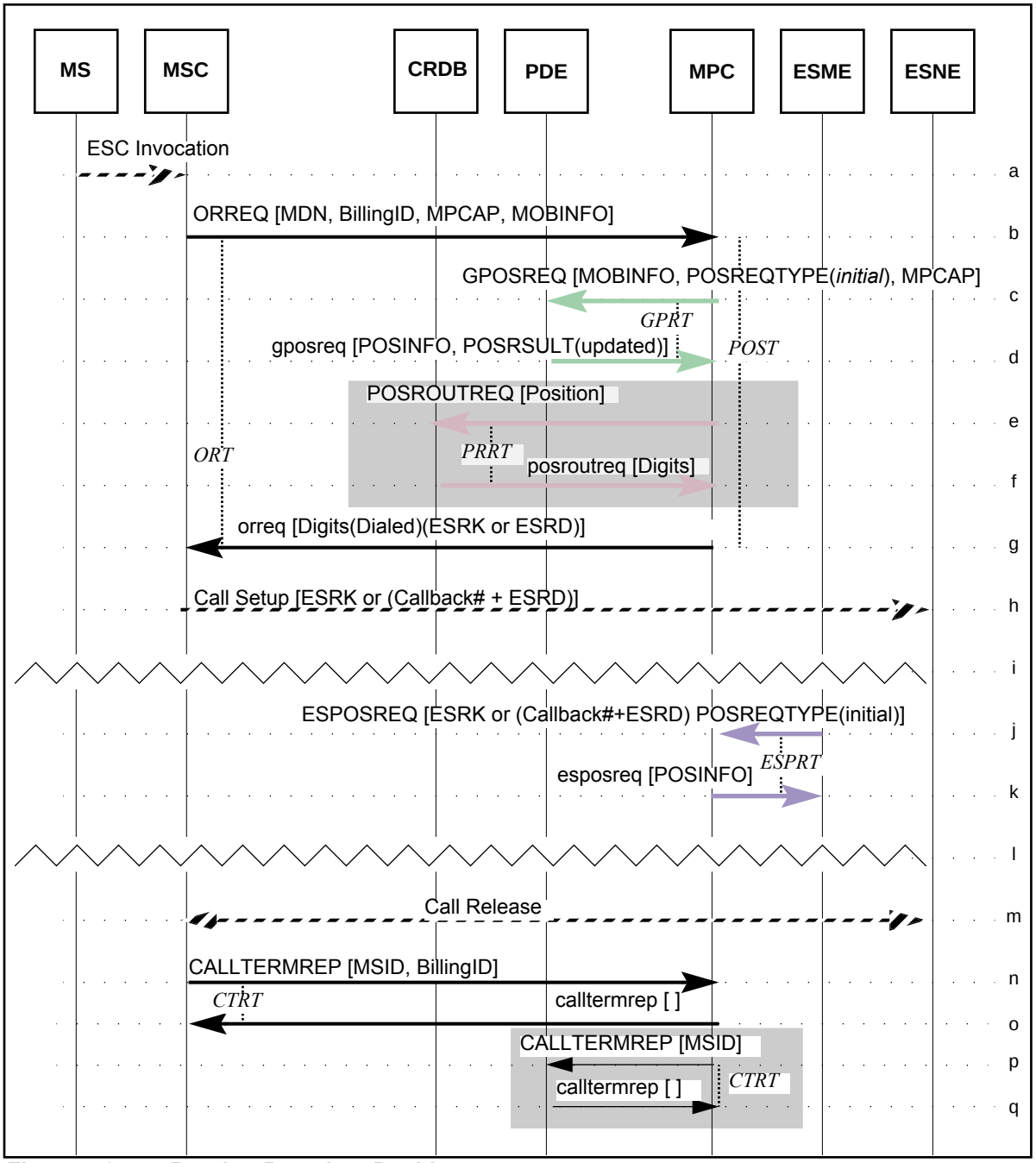

Figure 4-8: **Routing Based on Position**

a. The MS invokes an Emergency Services Call.

b. The MSC analyzes the digits dialed by the MS and sends an ORREQ to the MPC. MDN is provided to include a callback number. The BillingID is provided to uniquely identify the call.

c. Since the MPC has mobile information, it can query the proper PDE directly with a GPOSREQ.

   Optionally, a handset-based solution may have PDE to MS communication. See Section 3 “PDE to MS Scenarios for Handset-Based PDE” on page 4-30.

d. In this case, the PDE has not previously acquired the initial position of the MS. The PDE determines the current position of the MS and returns the position information in a gposreq with the PositionResult parameter set to *Updated Position Returned* where it is cached as ‘initial position’ by the MPC.

e. Optionally, the MPC may decide that the route must be determined from the MS’s current latitude-longitude position. The MPC uses the position to request a routing translation for an emergency services zone from the CRDB with a POSROUTREQ.

f. The CRDB returns the digits representing an emergency services zone (ESZ) to the MPC with a posroutreq.

g. The MPC selects a PSAP based on the emergency services zone from the CRDB or from the latitude and longitude of the mobile based on local procedures. The MPC then assigns and returns a unique routable call identifier (ESRK) for the particular PSAP selected or an ESRD in the orreq. See Chapter 8 and Annex D for the population of signaling parameters.

h. The MSC routes the Emergency Services Call toward the PSAP selected by the ESRK or ESRD. See Annex D for call setup signaling formats.

i. …some time later…

j. The ESME requests initial position.

k. The MPC returns the cached position.

l. …some time later…

m. The call is released.

n. The MSC notifies the MPC that resources assigned to the call (such as an ESRK) can be released, by sending a CALLTERMREP.

o. The MPC acknowledges by sending a calltermrep.

p. Optionally, the MPC may notify the PDE, by sending a CALLTERMREP , that resources assigned to the call can be released.

q. The PDE acknowledges by sending a calltermrep.

2.3.2 Inter-MSC Routing Based on Position

This scenario shows the holding up of an Emergency Services Call originated as the second leg of a 3-way call after a handoff to obtain instructions for routing the call to the appropiate ESNE. An ESRK is assigned by the MPC that is associated with the Anchor MSC.

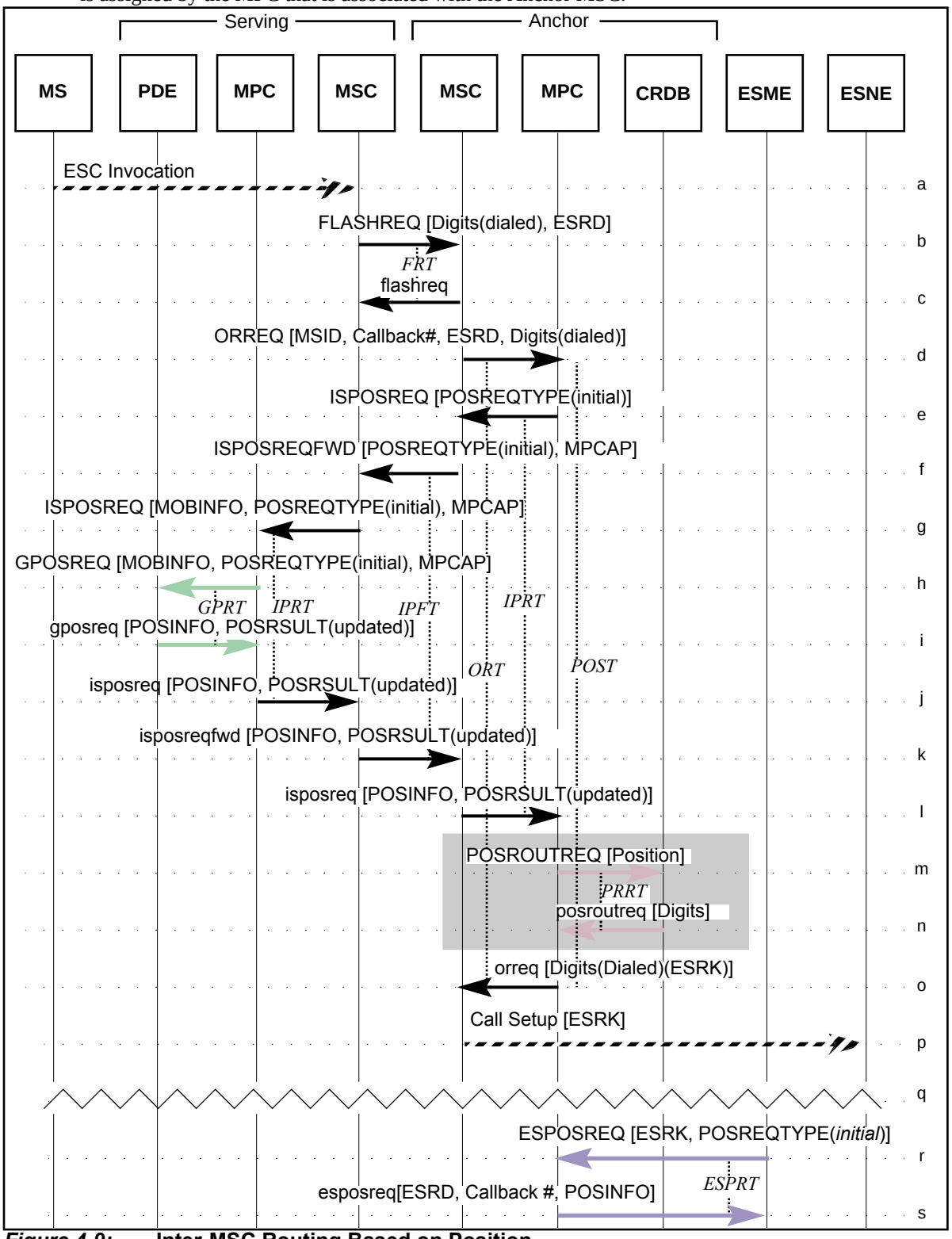

Figure 4-9: **Inter-MSC Routing Based on Position**

a. A call that has been handed-off from the Anchor MSC to the Serving MSC is in progress. The MS invokes an Emergency Services Call.

b. The Serving MSC notifies the Anchor MSC of the event with a FLASHREQ.

c. The Anchor MSC acknowledges the event with a flashreq.

d. The MSC analyzes the digits dialed by the MS and sends an ORREQ to the MPC.

e. The Anchor MPC, having not received the mobile information in the ORREQ, requests position or mobile identification from the Anchor MSC with an ISPOSREQ.

f. The Anchor MSC, knowing the MS is handed off, forwards the request in an ISPOSREQFWD.

g. The Serving MSC forwards the request for position to its MPC with an ISPOSREQ including the mobile information.

h. Since the MPC has mobile information, it can query the proper PDE directly with a GPOSREQ.

   Optionally, a handset-based solution may have PDE to MS communication. See Section 3 “PDE to MS Scenarios for Handset-Based PDE” on page 4-30.

i. In this case, the PDE has not previously acquired the initial position of the MS. The PDE determines the current position of the MS and returns the position information in a gposreq with the PositionResult parameter set to *Updated Position Returned*.

j. The Serving MPC returns the position for the MS with an isposreq.

k. The Serving MSC returns the position with an isposreqfwd.

l. The Anchor MSC returns the position with an isposreq, which is cached by the MPC as ‘initial position’.

m. Optionally, the MPC may use the MS’s current position to request a routing translation for an emergency services zone from the CRDB with a POSROUTREQ.

n. The CRDB returns the digits representing an emergency services zone (ESZ) to the MPC with a posroutreq.

o. The MPC selects a PSAP based on the emergency services zone from the CRDB or from the latitude and longitude of the mobile based on local procedures. The MPC then assigns and returns a unique routable call identifier (ESRK) for the particular PSAP selected in the orreq. See Chapter 8 and Annex D for the population of signaling parameters.

p. The MSC routes the Emergency Services Call toward the PSAP selected by the ESRK. See Annex D for call setup signaling formats.

q. Some time later…

r. The ESME requests the initial position.

s. The MPC returns the cached position.

2.3.3 Routing Based on Cell/Sector

This scenario shows call routing based on cell/sector information, with acquisition of more accurate location information occurring after call routing.

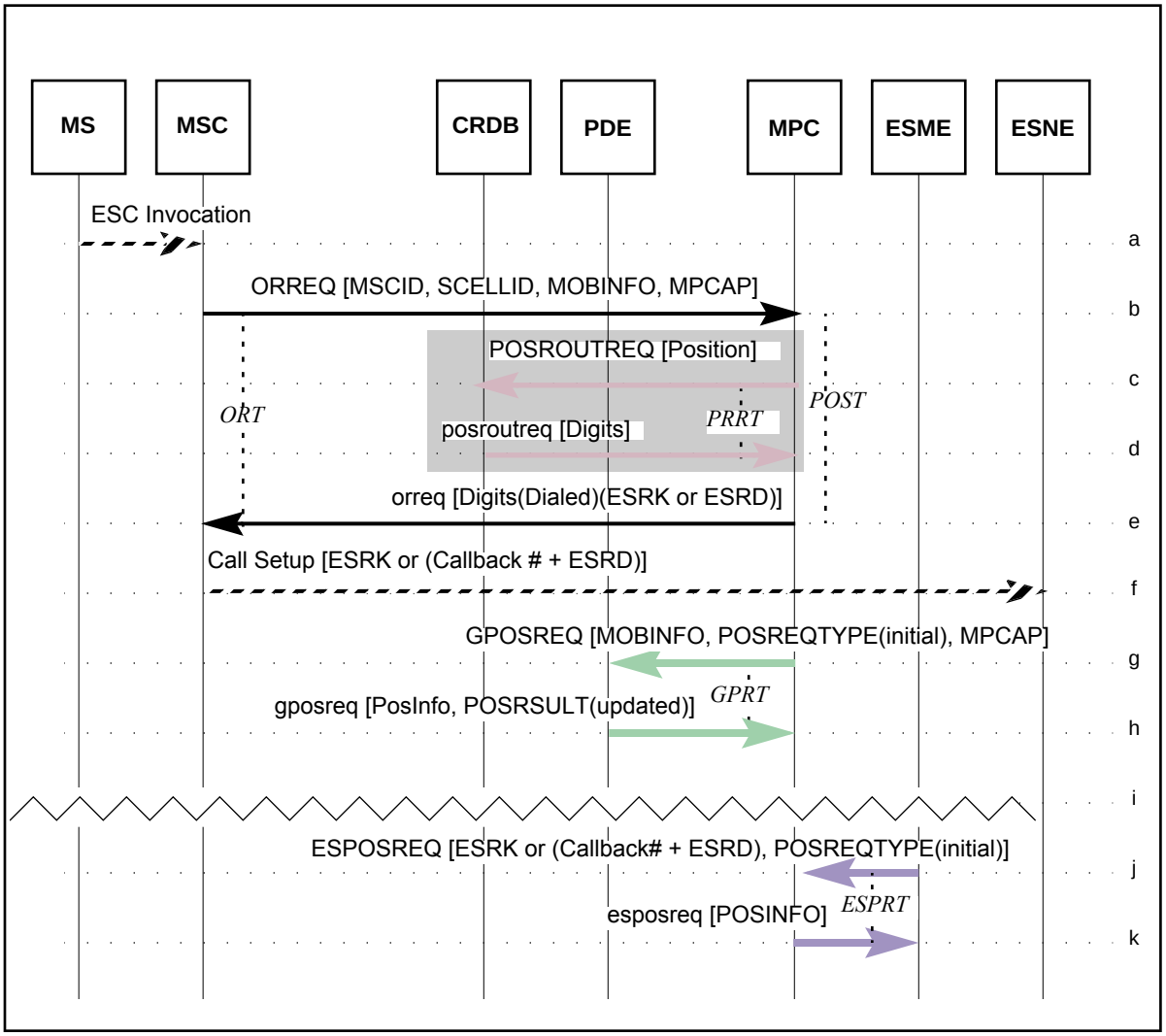

Figure 4-10: **Routing Based on Cell/Sector**

a. The MS invokes an Emergency Services Call.

b. The MSC analyzes the digits dialed by the MS and sends an ORREQ to the MPC. The identification of the serving MSC and cellsite is provided.

c. The MPC determines that a routing decision can be made using the default latitude and longitude for the cell and sector based on local procedures. Optionally, when the MPC requires to translate the latitude-longitude of the cellsite to an emergency services zone (ESZ), it sends a POSROUTREQ to the CRDB.

d. The CRDB returns the digits representing an ESZ to the MPC with a posroutreq.

e. The MPC includes either an ESRD or an unique routable call identifier (ESRK), determined from the latitude-longitude of the cellsite or from the ESZ returned by the CRDB, in the orreq. See Chapter 8, OriginationRequest RETURN RESULT, and Annex D for additional information.

f. The MSC routes the Emergency Services Call toward the PSAP selected by the ESRK or ESRD. See Annex D for call setup signaling formats.

g. Since the MPC has mobile information, it can query the proper PDE directly with a GPOSREQ.

   Optionally, a handset-based solution may have PDE to MS communication. See Section 3 “PDE to MS Scenarios for Handset-Based PDE” on page 4-30.

h. In this case, the PDE has not previously acquired the initial position of the MS. The PDE determines the current position of the MS and returns the position information in a gposreq with the PositionResult parameter set to *Updated Position Returned* where it is cached as ‘initial position’ by the MPC.

i. ...some time later...

j. The ESME requests initial position.

k. The MPC returns the cached initial position.

2.4 Position Update Using NCAS Pull

2.4.1 ESME Request for Position Update

This scenario shows an ESME requesting updated position for an Emergency Services Call.

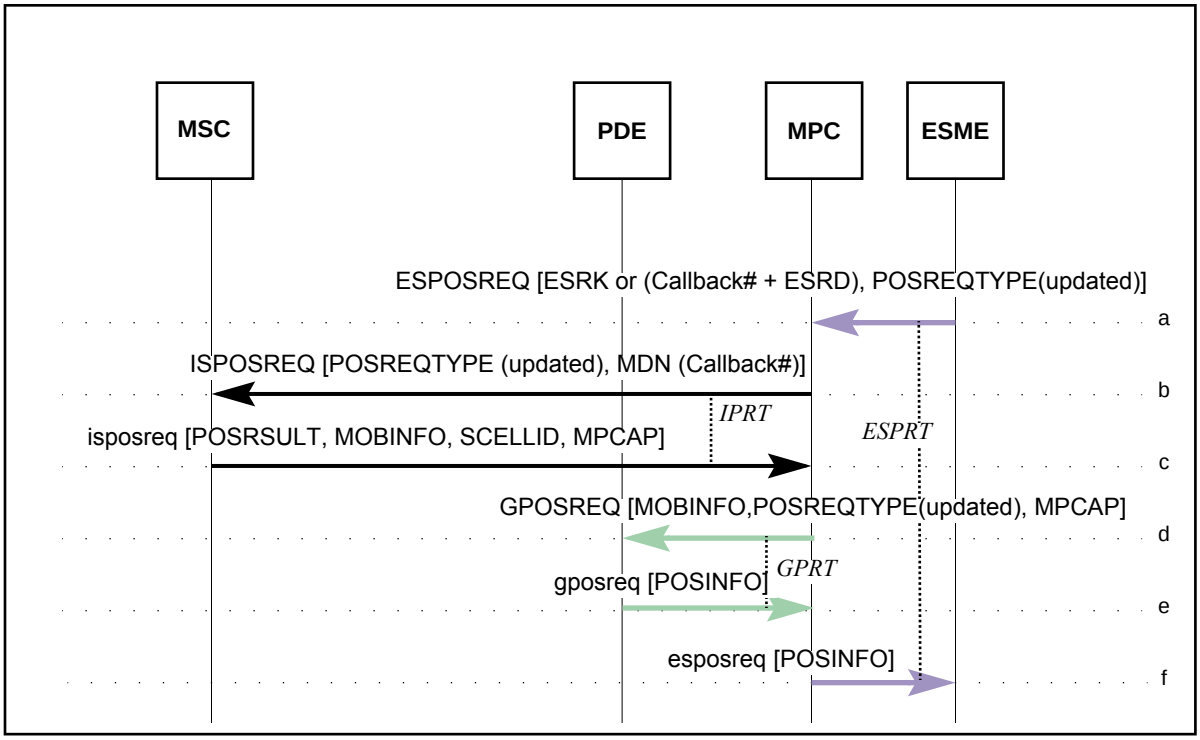

Figure 4-11: **ESME Request for Position Update**

This scenario begins after the successful establishment of an Emergency Services Call:

a. The ESME requests updated position from the MPC with an ESPOSREQ.

b. The MPC queries the MSC for updated position with an ISPOSREQ.

c. The MSC, knowing the MS is not handed off, returns the mobile information with an isposreq.

d. The MPC queries the proper PDE for the updated MS position with a GPOSREQ.

   Optionally, a handset-based solution may have PDE to MS communication. See Section 3 “PDE to MS Scenarios for Handset-Based PDE” on page 4-30.

e. The PDE returns the requested updated MS position with a gposreq.

f. The MPC returns the requested information to the ESME with an esposreq.

2.4.2 Inter-MSC Request for Updated Position

This scenario shows an NCAS pull of position after a handoff has occurred.

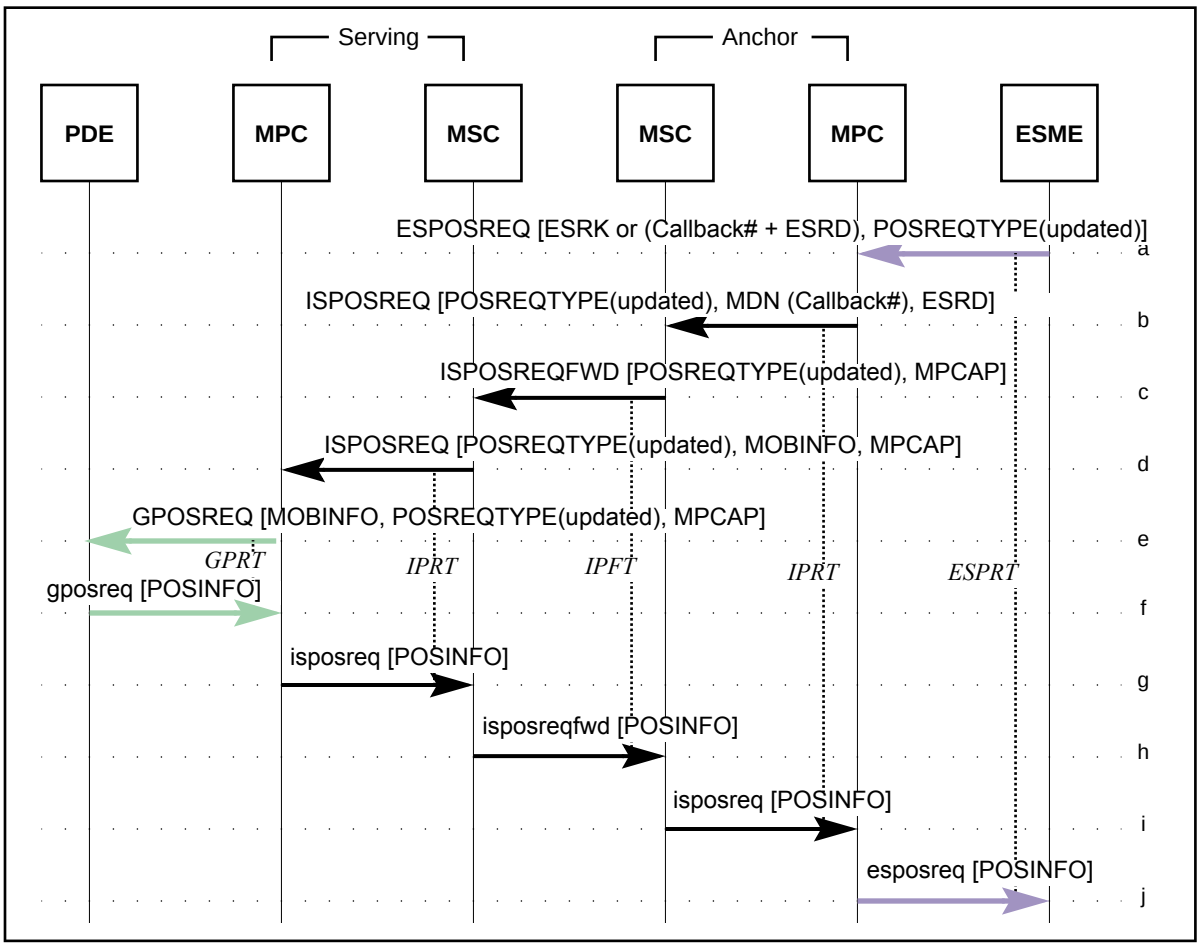

Figure 4-12: **Inter-MSC Request for Updated Position**

a. The ESME, using the ESPOSREQ, requests the updated position of the MS, using either the ESRK or the callback number. The ESME may use the incoming trunk group, ESRD, ESRK or other means to determine the appropriate MPC.

b. The MPC, not knowing the location of the MS, requests position from the MSC with an ISPOSREQ.

c. The Anchor MSC, knowing the callback number is handed off, forwards the request in an ISPOSREQFWD.

d. The Serving MSC, knowing that a position has been requested, requests the position with an ISPOSREQ including the mobile information.

e. The Serving MPC forwards the request to the appropriate PDE with a GPOSREQ.

   Optionally, a handset-based solution may have PDE to MSC communication. See Section 3 “PDE to MS Scenarios for Handset-Based PDE” on page 4-30.

f. The Serving PDE returns the position in the gposreq.

g. The Serving MPC returns the position for the MS with an isposreq.

h. The Serving MSC returns the position with an isposreqfwd.

i. The Anchor MSC returns the position with an isposreq.

j. The Anchor MPC returns the position with an esposreq.

2.4.3 Failed Position Update Due to MSC Failure

This scenario depicts a failed fetching of updated position information using an NCAS pull after the call is delivered to the ESNE.

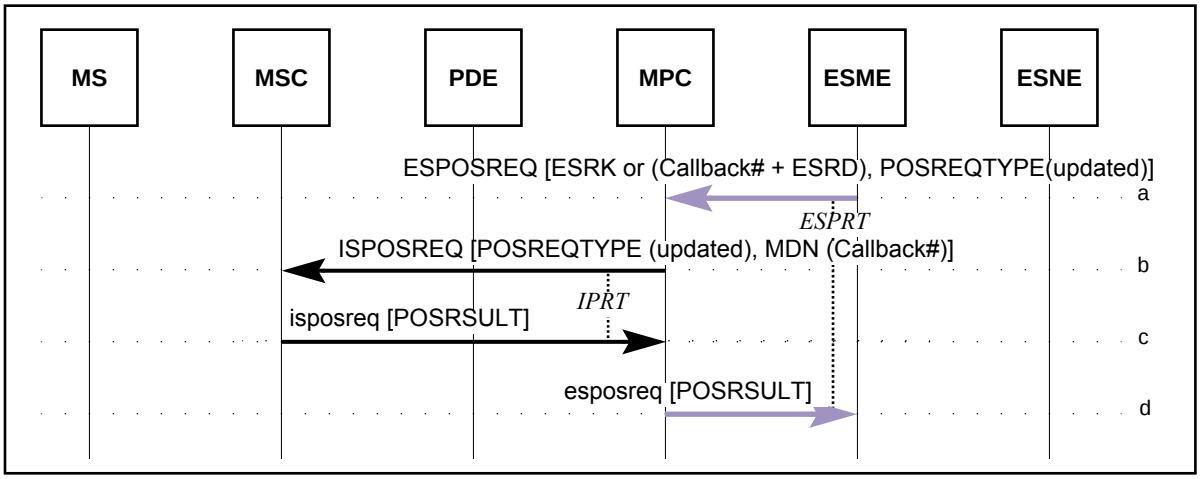

Figure 4-13: **Failed Position Update Due to MSC Failure**

This scenario begins after the successful establishment of an Emergency Services Call.

a. The ESME requests the updated position for an MS identified by its ESRK or callback number in an ESPOSREQ toward the MPC determined from the incoming trunk group, the known ESRD, or other means.

b. The MPC, not knowing the location of the MS, requests updated position from the MSC with an ISPOSREQ.

c. The MSC knowing that it cannot honor the request (e.g., the MS has handed off to a system that does not support positioning), returns a failure indication with an isposreq.

d. The MPC returns the position failure indication with an esposreq.

2.5 Failure Cases

2.5.1 MPC Failure on Call Origination

This scenario shows a failed query to an MPC.

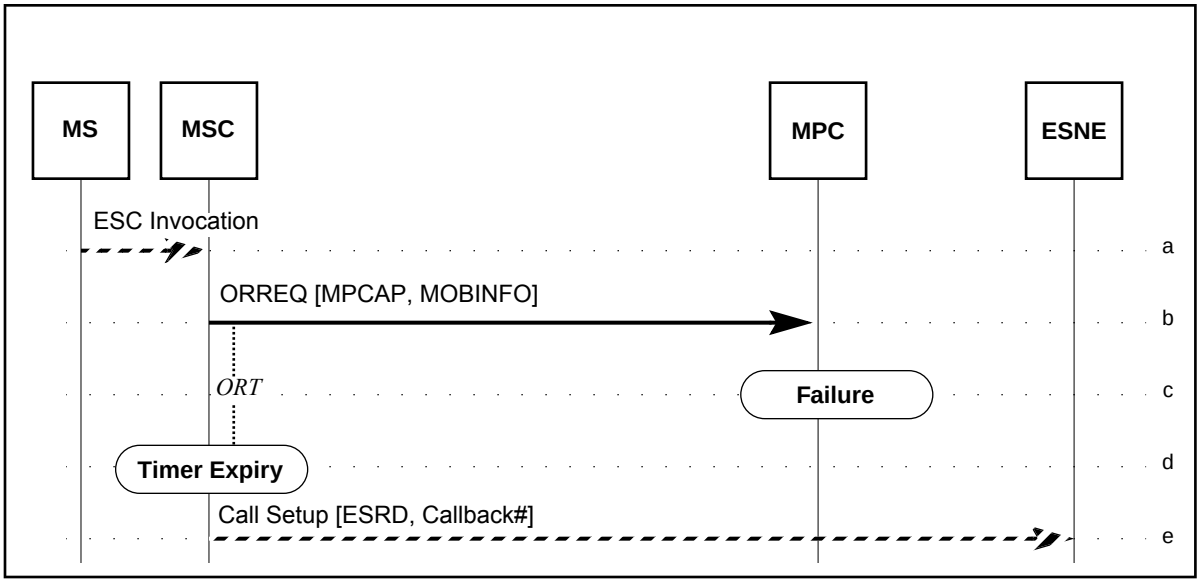

Figure 4-14: **MPC Failure on Call Origination**

a. The MS invokes an Emergency Services Call.

b. The MSC analyzes the digits dialed by the MS and sends an ORREQ to the MPC.

c. An error occurs in the communication with the MPC or in the MPC processing.

d. The ORT timer expires.

e. The MSC routes the Emergency Services Call toward the PSAP selected by the ESRD. See Annex D for call setup signaling formats.

2.5.2 Call Disconnect During Positioning

This scenario shows a call being disconnected while a PDE is in the process of obtaining position information.

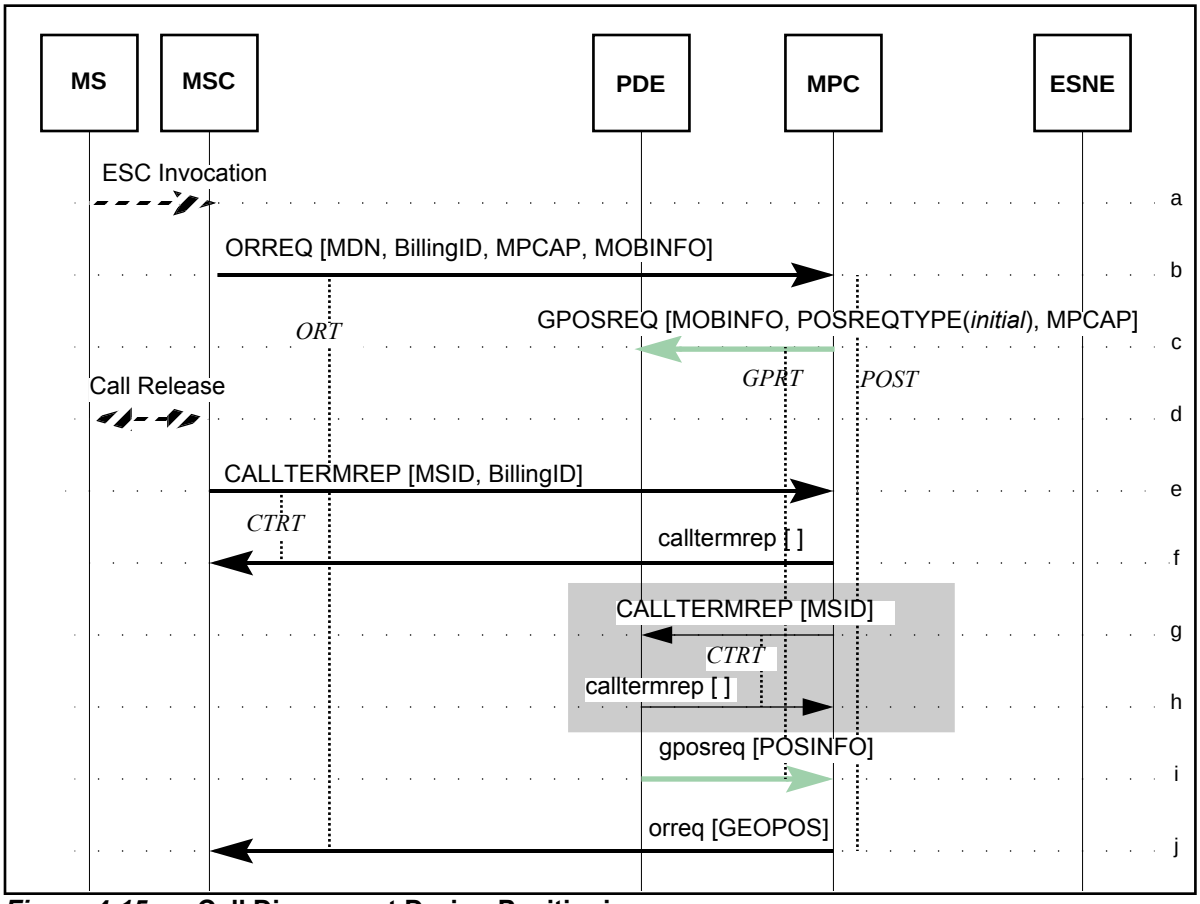

Figure 4-15: **Call Disconnect During Positioning**

a. The MS invokes an Emergency Services Call.

b. The MSC analyzes the digits dialed by the MS and sends an ORREQ to the MPC. MDN is provided to include a callback number. The BillingID is provided to uniquely identify the call.

c. Since the MPC has mobile information, it can query the proper PDE directly with a GPOSREQ.

   Optionally, a handset-based solution may have PDE to MS communication. See Section 3 “PDE to MS Scenarios for Handset-Based PDE” on page 4-30.

d. The call is released while positioning is still underway.

e. The MSC notifies the MPC that resources assigned to the call (such as an ESRK) can be released, by sending a CALLTERMREP.

f. The MPC acknowledges by sending a calltermrep.

g. Optionally, the MPC may notify the PDE, by sending a CALLTERMREP, that resources assigned to the call can be released.

h. The PDE acknowledges by sending a calltermrep.

i. The PDE returns any position information that it might currently have in a gposreq. Alternatively, it might return a PositionResult indicating that position information was not available.

j. The MPC responds back to the MSC with an orreq containing any position information that is available.

2.6 Call Termination

2.6.1 Call Termination Reporting

When an Emergency Services Call (ESC) is released, the call termination event is reported by the anchor MSC to the MPC. Regardless of the reason for the call release, the event is reported.

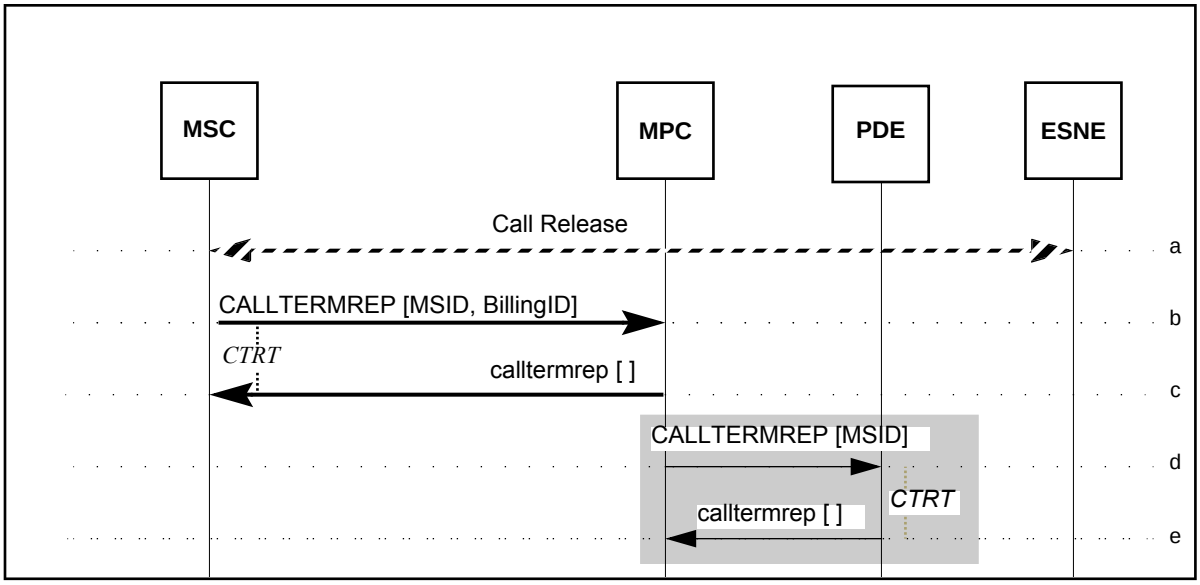

Figure 4-16: **Call Termination Reporting**

a. An Emergency Services Call is released.

b. The MSC notifies the MPC that resources assigned to the call (such as an ESRK) can be released, by sending a CALLTERMREP.

c. The MPC acknowledges by sending a calltermrep.

d. Optionally, the MPC may notifiy the PDE, by sending a CALLTERMREP, that resources assigned to the call can be released.

e. The PDE acknowledges by sending a calltermrep.

2.7 PDE Use of Network Data

2.7.1 PDE Request for CDMA Pilot Strength Measurements

The PDE receives a position request (GPOSREQ) from the MPC and determines additional network data must be obtained from the MSC. The PDE initiates a request towards the MSC requesting CDMA Pilot Strength Measurement Message (PSMM) data. The PDE uses the newly received information to determine the position of the MS and returns the response to the MPC (gposreq). Alternatively, any PDE to MSC communications could be via the MPC (i.e. E_3/E_5 interfaces).

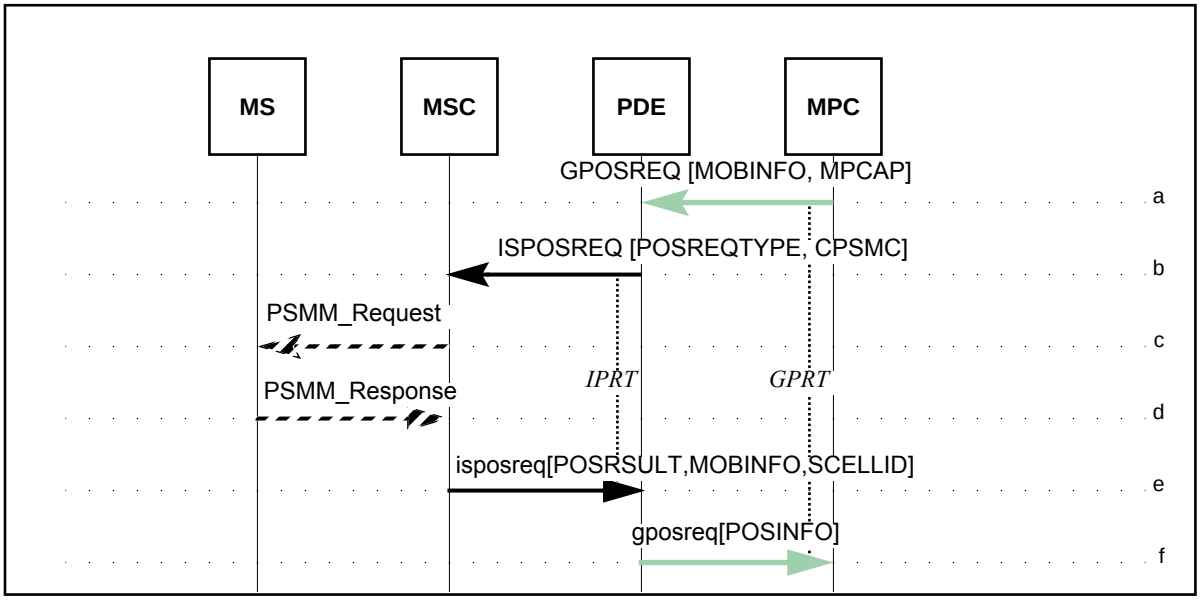

Figure 4-17: **PDE Request for CDMA Pilot Strength Measurements**

a. The PDE receives a position request (GPOSREQ) from the MPC. Either the request did not include the mobile position capabilities (MPCAP) or the mobile position capabilities indicated the mobile did not have any position capabilities, therefore the PDE will need the MSC to collect additional mobile data.

b. The PDE sends the ISPOSREQ to the MSC with the count of PSMMs to collect.

c. The MSC sends a CDMA Pilot Strength Measurement Message (PSMM) request to the MS.

d. The MS returns the PSMM response to the MSC.

Note: Steps c and d may be repeated over the air interface up to CDMAPSMMcount times.

e. The MSC sends the newly collected Pilot Strength Measurement results in the CDMAPSMMList of MOBINFO.

Note: Steps b-e may be repeated if the PDE needs to request additional information.

f. The PDE uses the received information, along with the initial MOBINFO from step a, to determine the position of the MS and sends the response to the MPC (gposreq).

2.7.2 TDMA MAHO Obtained After Call Setup

This scenario shows an emergency call setup with MAHO information obtained after initial call setup.

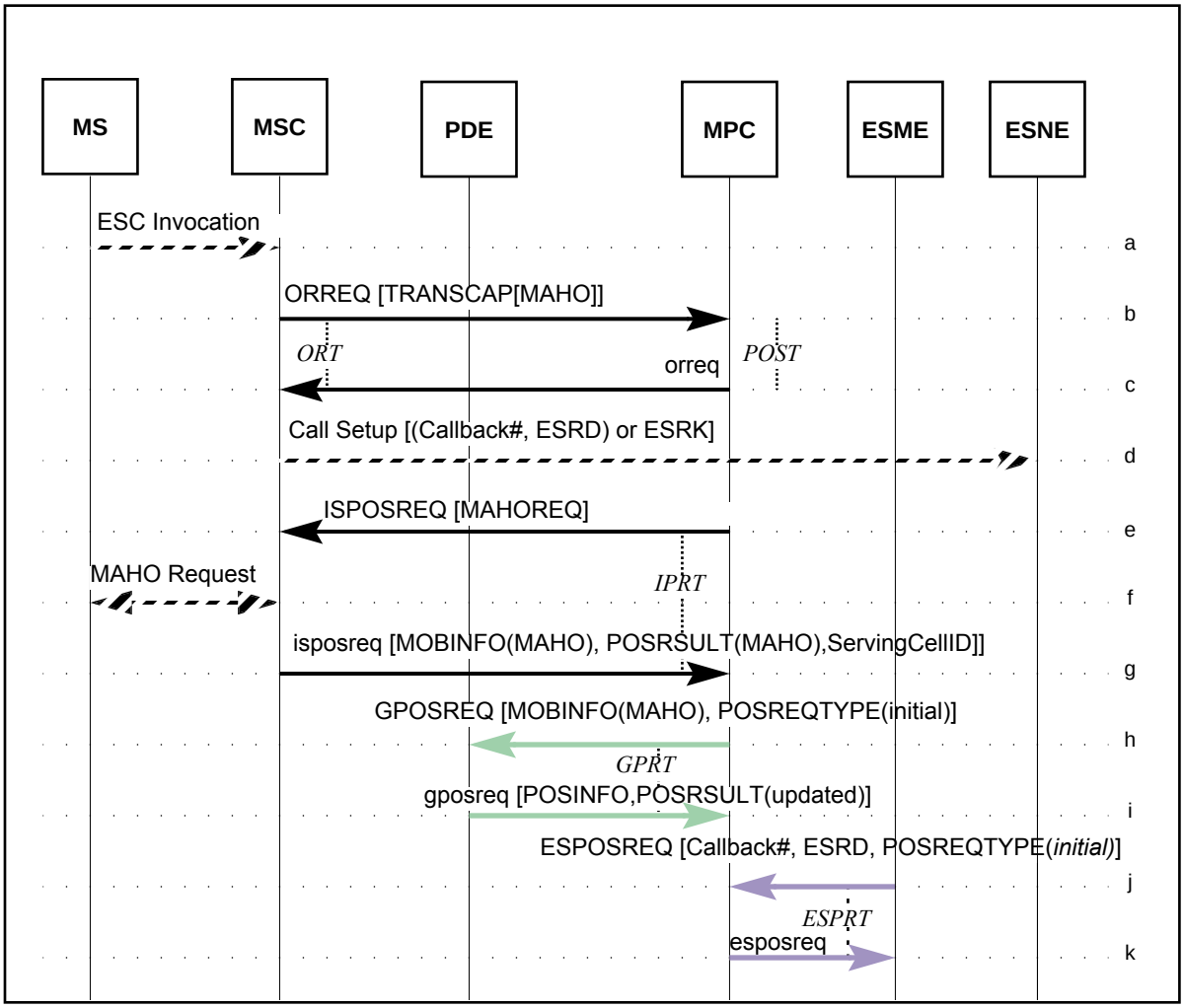

Figure 4-18: **TDMA MAHO Obtained After Call Setup**

a. The MS invokes an Emergency Services Call.

b. The MSC requests the position of the MS with an ORREQ, indicating that MAHO information is available upon request (in the TRANSCAP parameter). The MPC starts the POST timer.

c. The MPC cancels the POST timer and acknowledges the request in an orreq.

d. The MSC sets the call up toward the ESNE using an IAM including the received geographic position.

e. The MPC requests MAHO information from the MSC.

f. The MSC, recognizing that it is the Serving MSC, requests MAHO information from the MS (alternatively, the MSC may initiate the collection of MAHO information autonomously, but there is no guarantee that it will always be requested).

g. The MSC replies to the MPC with MOBINFO, including the MAHO information and the ServingCellID (in case an intra-MSC handoff has occurred since the initation of the call).

h. The MPC relays the position request to the appropriate PDE with a GPOSREQ, including the MAHO information.

   Optionally, a handset-based solution may have PDE to MS communication. See Section 3 “PDE to MS Scenarios for Handset-Based PDE” on page 4-30.

i. In this case, the PDE has not previously acquired the initial position of the MS. The PDE determines the current position of the MS and returns the position information in a gposreq with the PositionResult parameter set to *Updated Position Returned*.

j. The ESME autonomously requests the position of an MS with an ESPOSREQ toward the MPC determined from the incoming trunk group, the known ESRD, or other means. This request is asynchronous and is due to the arrival of the Emergency Services Call at the ESNE.

k. The MPC returns the cached position in an esposreq to the ESME.

2.7.3 TDMA MAHO obtained after Inter-System Handoff

This scenario shows an emergency call with MAHO information obtained after an intersystem handoff has occurred.

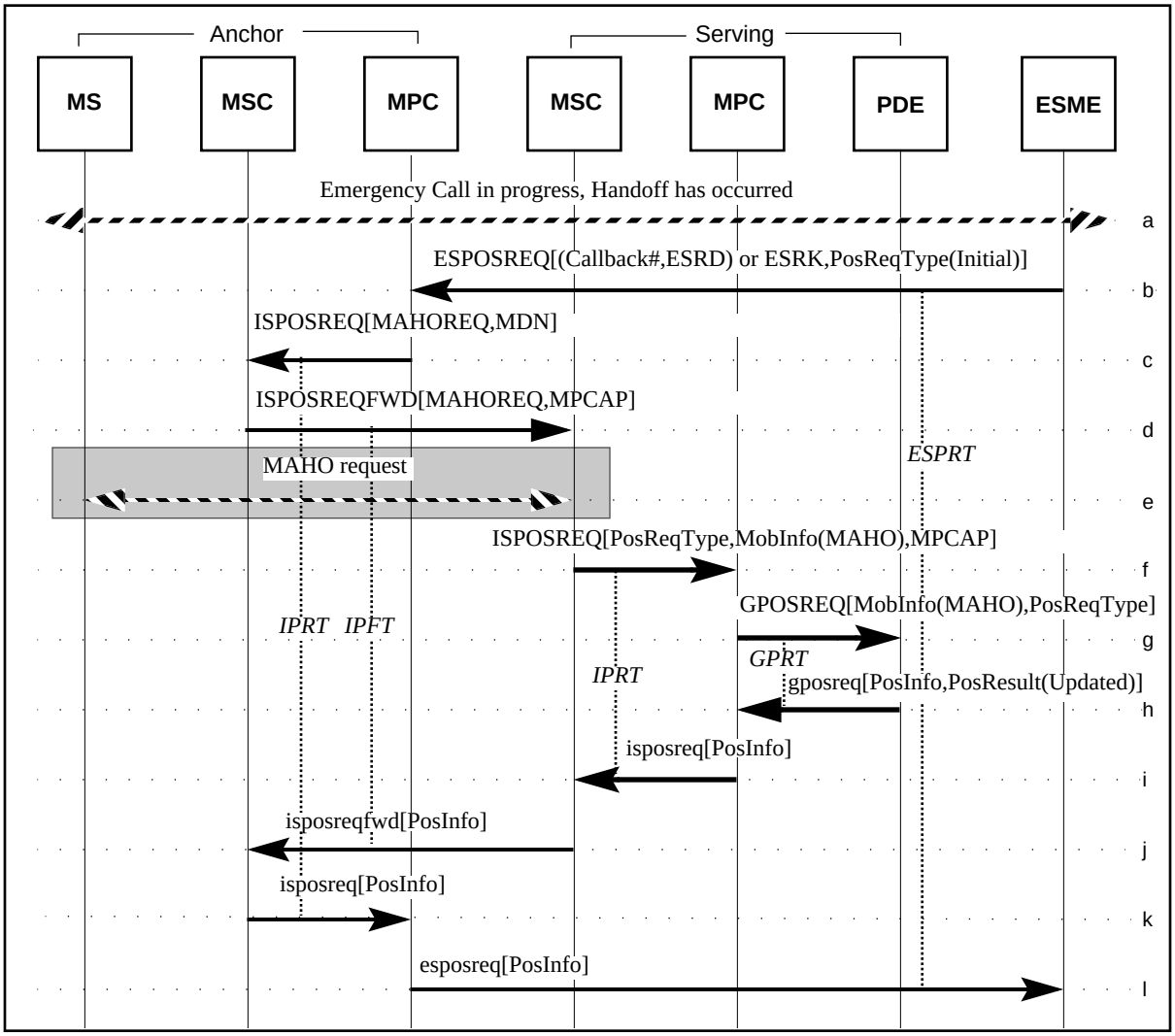

Figure 4-19: **TDMA MAHO obtained after Inter-System Handoff**

a. An MS has been handed off while engaged in an emergency call.

b. The ESME autonomously requests the anchor MPC for the position of an MS with a ESPOSREQ. This request is triggered in the arrival of the emergency service call at the ESNE.

c. The Anchor MPC requests MAHO information from the Anchor MSC.

d. The Anchor MSC, knowing the MS has been handed off, forwards the request to the Serving MSC using an ISPOSREQFWD.

e. Optionally, the MSC, recognizing that it is the Serving MSC, may elect, based on internal algorithms, to request MAHO information from the MS (alternatively, the MSC may initiate the collection of MAHO information autonomously (e.g. at detection of an emergency call being handed off), but there is no guarantee that it will always be requested).

The MSC may also elect not to collect MAHO information at this point, and wait until a specific indication is received from its associated MPC (i.e. Serving MPC) to do so.

f. If the Serving MSC was able to collect MAHO information (i.e. it is MAHO-Capable), it relays the MAHO information to the Serving MPC, including it in MOBINFO, and sending an ISPOSREQ. Otherwise, the Serving MSC will send the ISPOSREQ with the received PositionRequestType parameter.

g. The Serving MPC relays the request to the appropriate PDE with a GPOSREQ, including the MAHO information, if it is received in the ISPOSREQ from the Serving MSC.

Optionally, a handset-based solution may have PDE to MS communication. See Section 3 “PDE to MS Scenarios for Handset-Based PDE” on page 4-24.

h. In this case, the PDE has not previously acquired the initial position of the MS. The PDE determines the current position of the MS and returns the position information in the gposreq with the PositionResult parameter set to UpdatedPositionReturned.

i. The Serving MPC relays the position information to the Serving MSC with an isposreq.

j. The Serving MSC relays the position information to the Anchor MSC with an isposreqfwd.

k. The Anchor MSC relays the position information to the Anchor MPC with an isposreq.

l. The MPC returns the cached position information to the ESME in an esposreq.

3 PDE to MS Scenarios for Handset-Based PDE

Scenarios highlighting the PDE to MS communication for PDEs supporting handset based position assistance are within this section. One of these scenarios applies to each ELID scenario in "Emergency Location Information Delivery (ELID) Scenarios" where a GPOSREQ is sent from the MPC to the PDE. Databursts (i.e., SMDPP) that are sent directly PDE – MSC are over the E_{12} interface. Bearer data sent via PDE – MPC – MSC uses the E_5 and E_3 interfaces.

3.1 CDMA

3.1.1 PDE to MS Communication via E_{12} Interface

This scenario shows a request for position information from the MPC to the PDE followed by the SMDPP and Databurst message exchanges. The PDE initiates an SMDPP to the MSC based on the parameters contained in the GPOSREQ (i.e., MPCAP) and the procedures defined in *IS-801*.

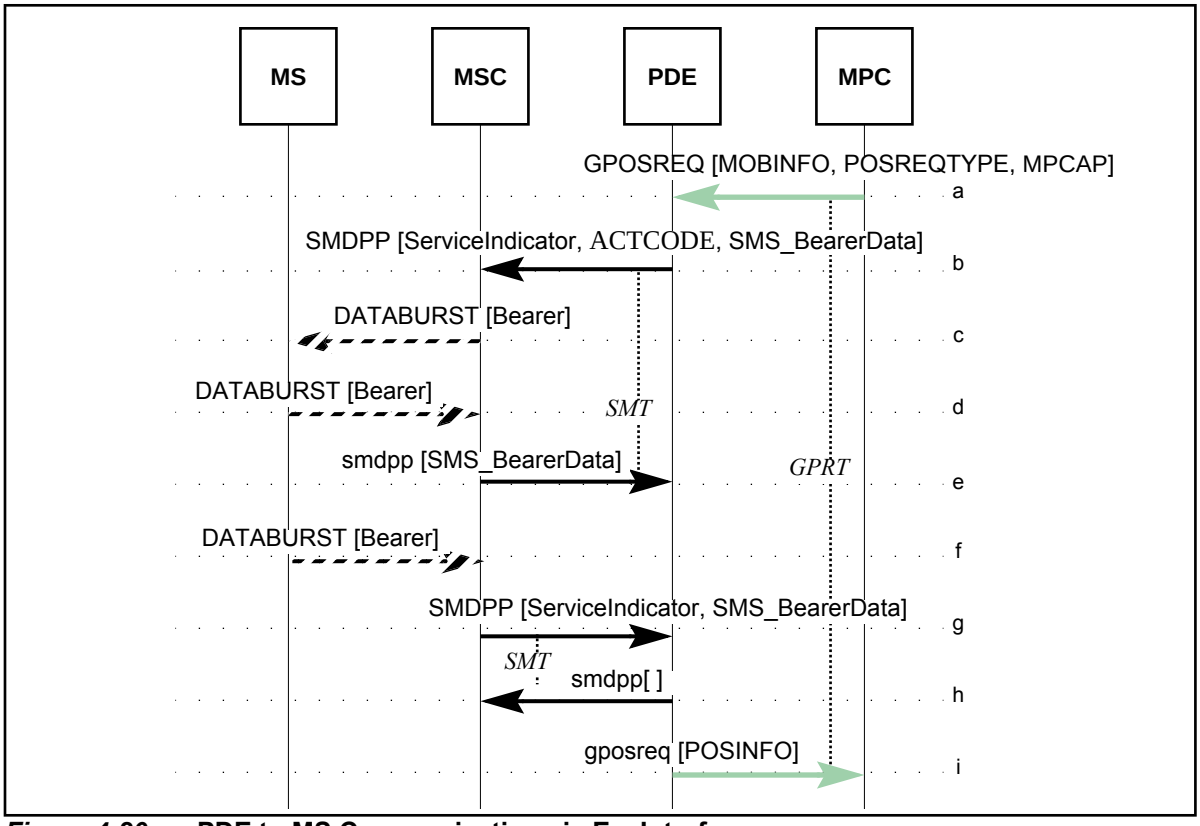

Figure 4-20: **PDE to MS Communication via E_{12} Interface**

a. The PDE receives a position request (GPOSREQ) from the MPC indicating the MS's position capabilities. (Shown only for clarity.)

b. The PDE must obtain/provide positioning information and initiates an SMDPP, encapsulating in the SMS_BearerData parameter an action according to the value of the MPCAP parameter and the procedures defined in *IS-801*. The ServiceIndicator parameter identifies this as handset assisted position information. The length of the TeleserviceId parameter is set to 0.

Note: If the ACTCODE is set to *Do Not Wait for MS User Level Response*, the MSC should return an smdpp immediately.

c. The MSC sends a databurst message to the MS containing the bearer data from the SMDPP containing the positioning related information.

d. The MS returns a response containing the positioning related information (e.g., *IS-801*) in a databurst message to the MSC.

e. The MSC sends the MS-provided positioning related information in an smdpp to the PDE.

Note: Steps b - e may be repeated if the PDE must obtain or provide additional positioning related information.

f. In this case, the MS initiates the exchange of positioning related information. A databurst message is sent to the MSC containing this information.

g. The MSC forwards the information to the PDE in an SMDPP.

h. The PDE acknowledges the received information in an smdpp.

Note: Steps f - h may be repeated if the MS needs to obtain or provide additional positioning related information.

i. The PDE uses the received information to determine the MS's position and sends the response to the MPC (gposreq). In the case where the MS computes its position the PDE relays the position to the MPC. (Shown only for clarity.)

3.1.2 Communication via E_5 and E_3 Interfaces

This scenario shows a request for position information from the MPC to the PDE followed by the SMDPP and Databurst message exchanges. The PDE initiates an SMDPP to the MPC/MSC based on the parameters contained in the GPOSREQ (i.e., MPCAP) and the procedures defined in *IS-801*.

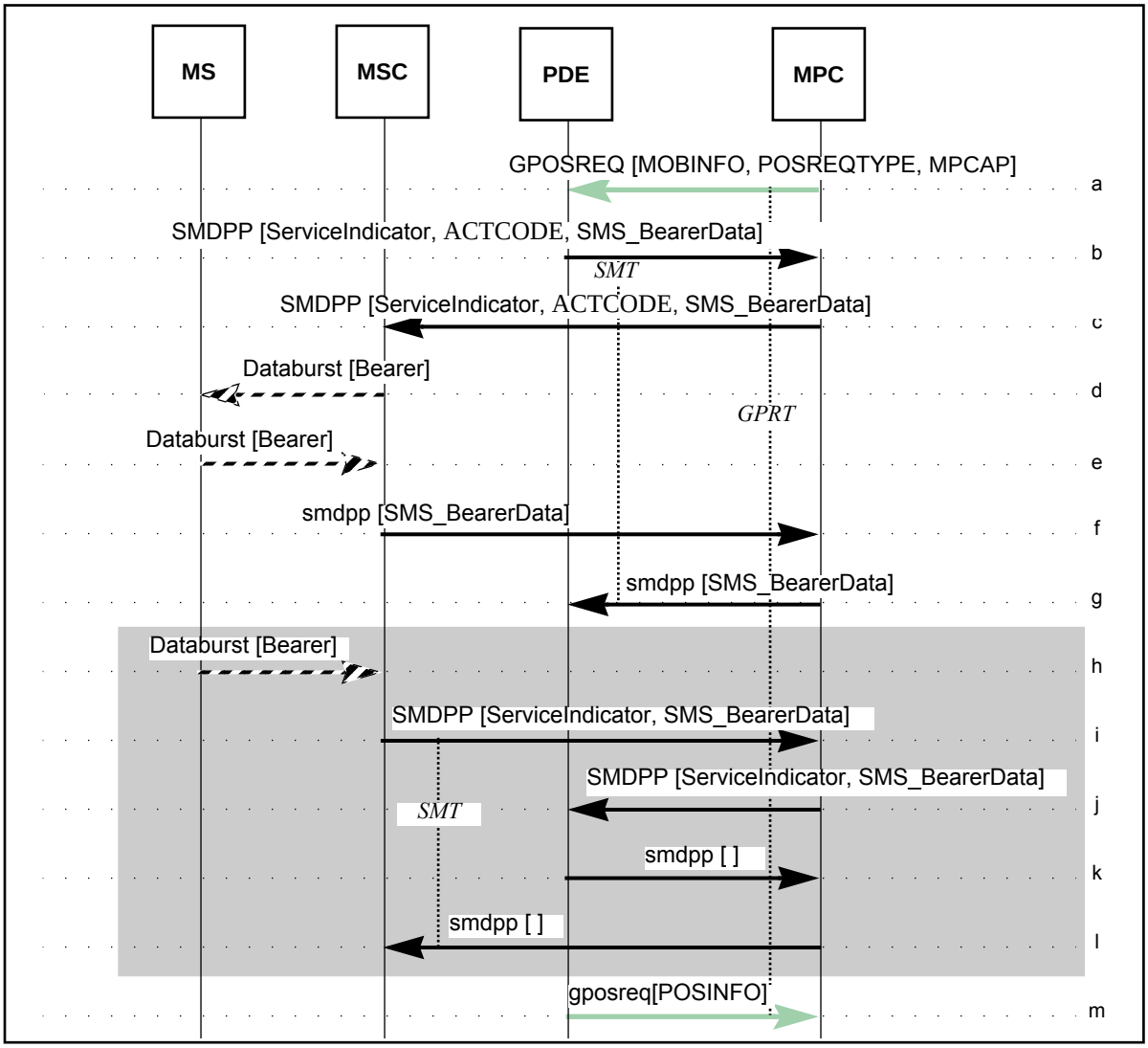

Figure 4-21: **Communication via E_5 and E_3 Interfaces**

a. The PDE receives a position request (GPOSREQ) from the MPC indicating the MS's position capabilities. (Shown only for clarity.)

b. The PDE must obtain or provide positioning related information and initiates an SMDPP via the MPC, encapsulating in the SMS_BearerData parameter an action according to the value of the MPCAP parameter and the procedures defined in *IS-801*. The ServiceIndicator parameter identifies this as handset assisted position information. The length of the TeleserviceId parameter is set to 0.

c. The MPC forwards the SMDPP to the MSC.

d. The MSC sends a databurst message to the MS containing the bearer data from the SMDPP containing the positioning related information.

Note: If the ACTCODE is set to *Do Not Wait for MS User Level Response*, the MSC should return an smdpp immediately.

e. The MS returns a response containing the positioning related information (e.g., *IS-801*) in a databurst message to the MSC.

f. The MSC sends the MS-provided positioning related information in an smdpp to the PDE via the MPC.

g. The MPC forwards the smdpp containing the positioning related information to the PDE.

Note: Steps b - g may be repeated if the PDE must obtain or provide additional positioning related information.

h. Optionally, the MS may require additional exchanges of positioning information with the PDE. In this case the MS initiates the exchange of positioning related information in a databurst message sent to the MSC.

i. The MSC sends the information to the MPC with an SMDPP.

j. The MPC forwards the SMDPP to the PDE.

k. The PDE provides an smdpp to the MSC via the MPC.

l. The MPC forwards the smdpp to the MSC.

Note: Steps h - l may be repeated if the MS needs to obtain or provide additional positioning related information.

m. The PDE uses the received information to determine the MS's position and sends the response to the MPC (gposreq). In the case where the MS computes its position the PDE relays the position to the MPC. (Shown only for clarity.)

3.1.3 Position Determination after Handoff

This scenario describes position determination of an Emergency Services call that has been handed off to another system using handset based PDE. Alternatively, any PDE to MSC communications could be direct using the E_{12} interface.

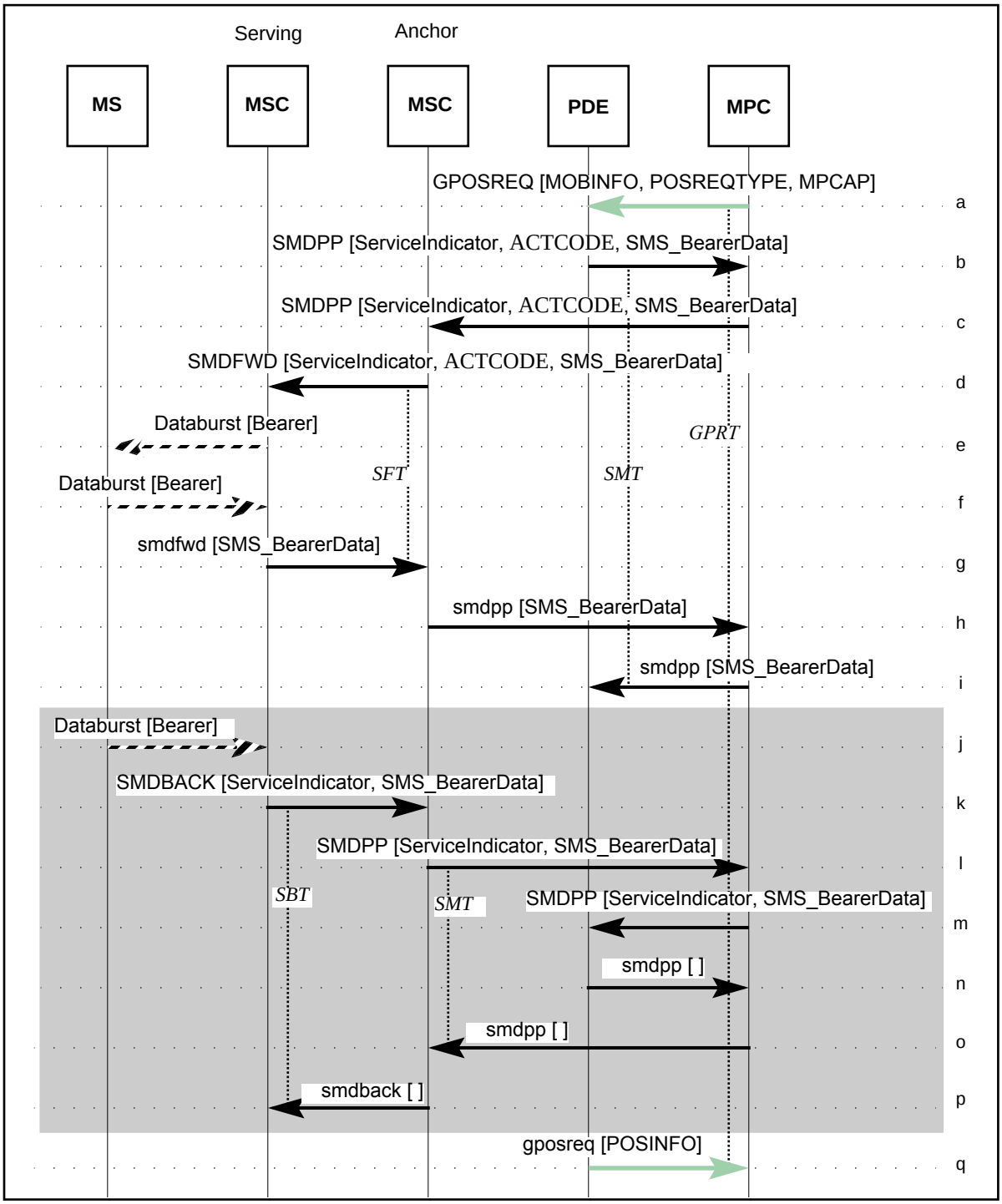

Figure 4-22: **Position Determination after Handoff**

a. The PDE receives a position request (GPOSREQ) from the MPC indicating the MS's

position capabilities.

b. The PDE must obtain or provide positioning related information and initiates an SMDPP via the MPC, encapsulating in the SMS_BearerData parameter an action according to the value of the MPCAP parameter and the procedures defined in *IS-801*. The ServiceIndicator parameter identifies this as handset assisted position information. The length of the TeleserviceId parameter is set to 0.

c. The MPC forwards the SMDPP to the Anchor MSC.

d. Since the MS has been handed off the Anchor MSC sends an SMDFWD to the Serving MSC.

e. The Serving MSC sends a databurst message to the MS containing the bearer data from the SMDPP containing the positioning related information.

Note: If the ACTCODE is set to *Do Not Wait for MS User Level Response*, the Serving MSC should return an smdpp immediately.

f. The MS returns a response containing the positioning related information (e.g., *IS-801*) in a databurst message to the Serving MSC.

g. The Serving MSC sends the smdfwd containing the positioning related information to the Anchor MSC.

h. The Anchor MSC sends the MS-provided positioning related information in an smdpp to the PDE via the MPC.

i. The MPC forwards the smdpp containing the positioning related information to the PDE.

Note: Steps b - i may be repeated if the PDE must obtain or provide additional positioning related information.

j. Optionally, the MS may require additional exchanges of positioning information with the PDE. In this case the MS initiates the exchange of positioning related information in a databurst message sent to the Serving MSC.

k. The Serving MSC sends the SMDBACK containing the positioning related information to the Anchor MSC.

l. The Anchor MSC sends the information to the MPC with an SMDPP.

m. The MPC forwards the SMDPP to the PDE.

n. The PDE provides an smdpp to the Anchor MSC via the MPC.

o. The MPC forwards the smdpp to the Anchor MSC.

p. The Anchor MSC sends an smdback to the Serving MSC.

Note: Steps j - p may be repeated if the MS needs to obtain or provide additional positioning related information.

q. The PDE uses the received information to determine the MS's position and sends the response to the MPC (gposreq). In the case where the MS computes its position the PDE relays the position to the MPC.

3.2 TDMA SAMPS

3.2.1 PDE to MS Communication via E_{12} Interface

This scenario shows the call flows associated with the E_{12} interface. The scenario shows a request for position information from the MPC to the PDE followed by the SMDPP/R-DATA message exchanges. The PDE initiates an SMDPP to the MSC based on the parameters contained in the GPOSREQ (i.e., MPCAP) and the procedures as defined in *SAMPS*.

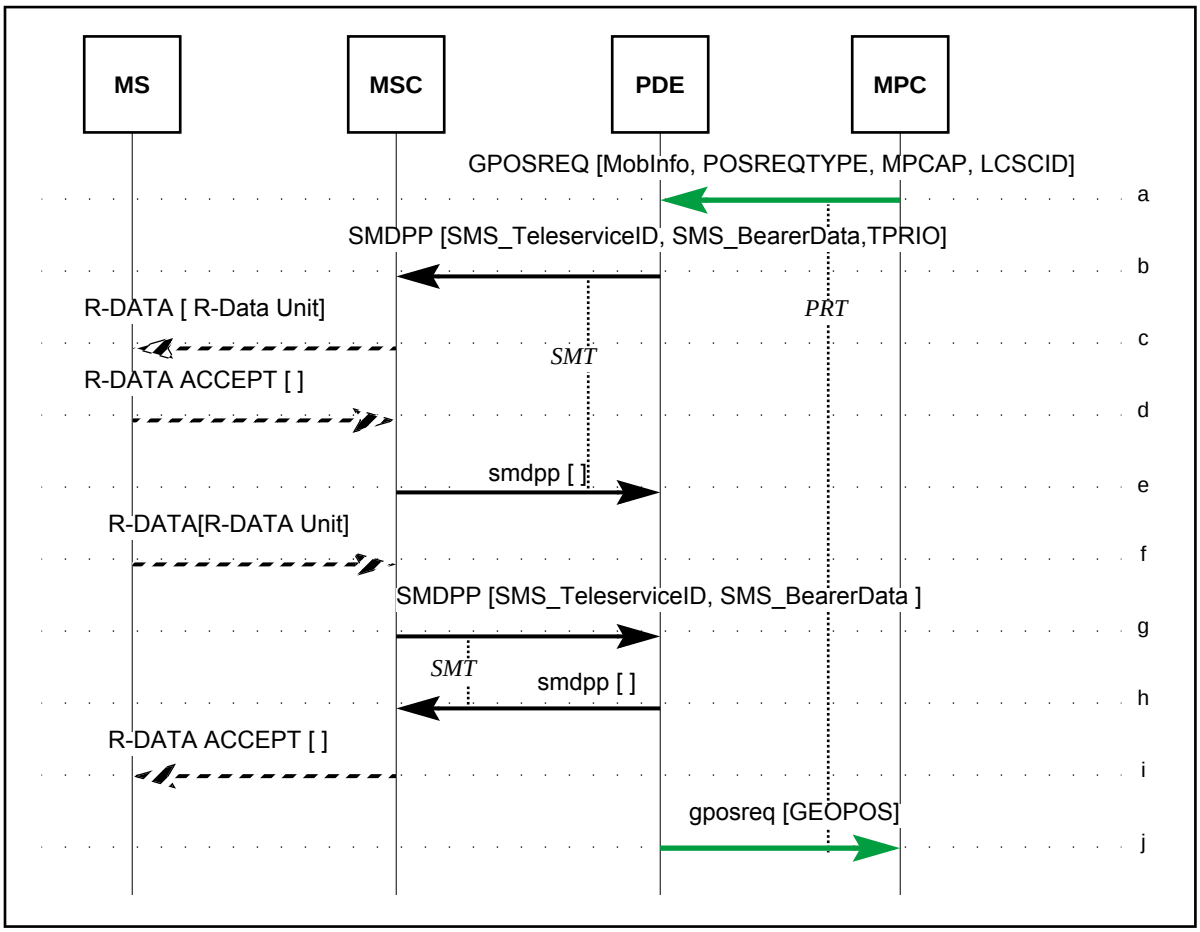

Figure 4-23: **PDE to MS Communication via E_{12} Interface**

a. The PDE receives a position request (GPOSREQ) from the MPC indicating the MS's capabilities. The MPC, based on the fact that it received an ORREQ indicating an Emergency Call, includes the LCS Client ID (This step is shown only for clarity).

b. The PDE must obtain or provide positioning related information and initiates an SMDPP, encapsulating in the SMS_BearerData parameter the LCS Client ID information, and an action according to the value of the MPCAP parameter and the procedures defined in SAMPS. The TeleserviceID is set to SAMPS to indicate this is an Emergency Services Call utilizing System Assisted Mobile Positioning (SAMPS) through Satellite. The Teleservice_Priority parameter is set to *Emergency.*

c. The MSC sends an R-DATA message to the MS containing the bearer data from the SMDPP.

d. The MS returns an R-DATA ACCEPT to the MSC indicating the MS has accepted the request.

e. The MSC returns an smdpp to the PDE.

Note: Sequence in steps b through e can be repeated several times.

f. The MS initiates an R-DATA to the MSC. This message is used to provide or obtain positioning related information.

g. The MSC forwards the information received from the MS in an SMDPP to the PDE.

h. The PDE acknowledges with an smdpp to the MSC.

i. The MSC responds with an R-DATA ACCEPT to the MS.

Note: If the R-DATA in step f was a request to obtain or provide positioning related data, steps f through i are repeated.

j. The PDE sends the position information to the MPC in gposreq.

3.2.2 Communication via E_5 and E_3 Interfaces

This scenario shows the call flows associated with the E_5/E_3 interface. The scenario shows a request for position information from the MPC to the PDE followed by the SMDPP/R-DATA UNIT message exchanges. The PDE initiates an SMDPP to the MSC through the MPC based on the parameters contained in the GPOSREQ (i.e., MPCAP) and the procedures defined in *SAMPS*

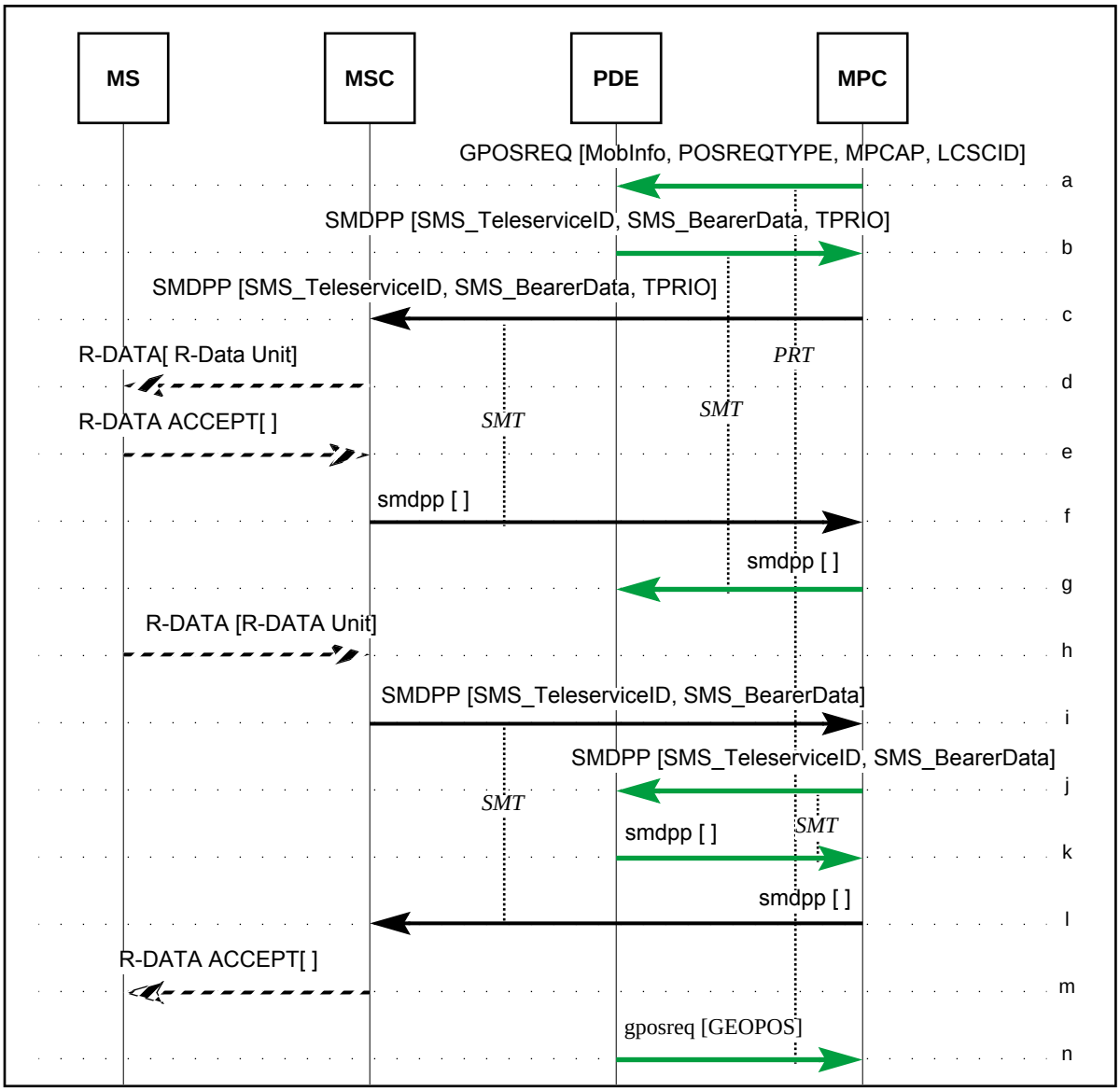

Figure 4-24: **Communication via E_5 and E_3 Interfaces**

a. The PDE receives a position request (GPOSREQ) from the MPC indicating the MS's capabilities. The MPC, based on the fact that it received an ORREQ indicating an Emergency Call, includes the LCS Client ID. (Shown only for clarity).

b. The PDE must obtain or provide positioning related information and initiates an SMDPP to the MSC through the MPC, encapsulating in the SMS_BearerData parameter the LCS Client ID information, and an action according to the value of the MPCAP parameter and the procedures defined in SAMPS. The TeleserviceID is set to

SAMPS to indicate this is an Emergency Services Call utilizing System Assisted Mobile Positioning (SAMPS) through Satellite. The Teleservice_Priority parameter is set to *Emergency.*

c. The MPC forwards the received information to the MSC in an SMDPP.

d. The MSC sends an R-DATA message to the MS containing the bearer data from the SMDPP.

e. The MS returns an R-DATA ACCEPT to the MSC indicating the MS has accepted the request.

f. The MSC returns an smdpp to the PDE.

g. The MPC forwards the smdpp to the PDE.

Note: Sequence from step b to g can be repeated several times.

h. The MS initiates an R-DATA to the MSC. This message is used to request or to provide positioning related information.

i. The MSC initiates an SMDPP to the MPC including the Bearer Data received from the MS.

j. The MPC forwards the information received to the PDE in an SMDPP.

k. The PDE returns an smdpp to the MPC.

l. The MPC sends an smdpp to the MSC.

m. The MSC sends an R-DATA ACCEPT to the MS.

Note: Sequence from step h to step m can be repeated several times.

n. The PDE sends the position information to the MPC in gposreq.

3.2.3 Position Update after Handoff

This scenario describes an Emergency Services call that has been handed off to another system and the call taker has sent a position update request.

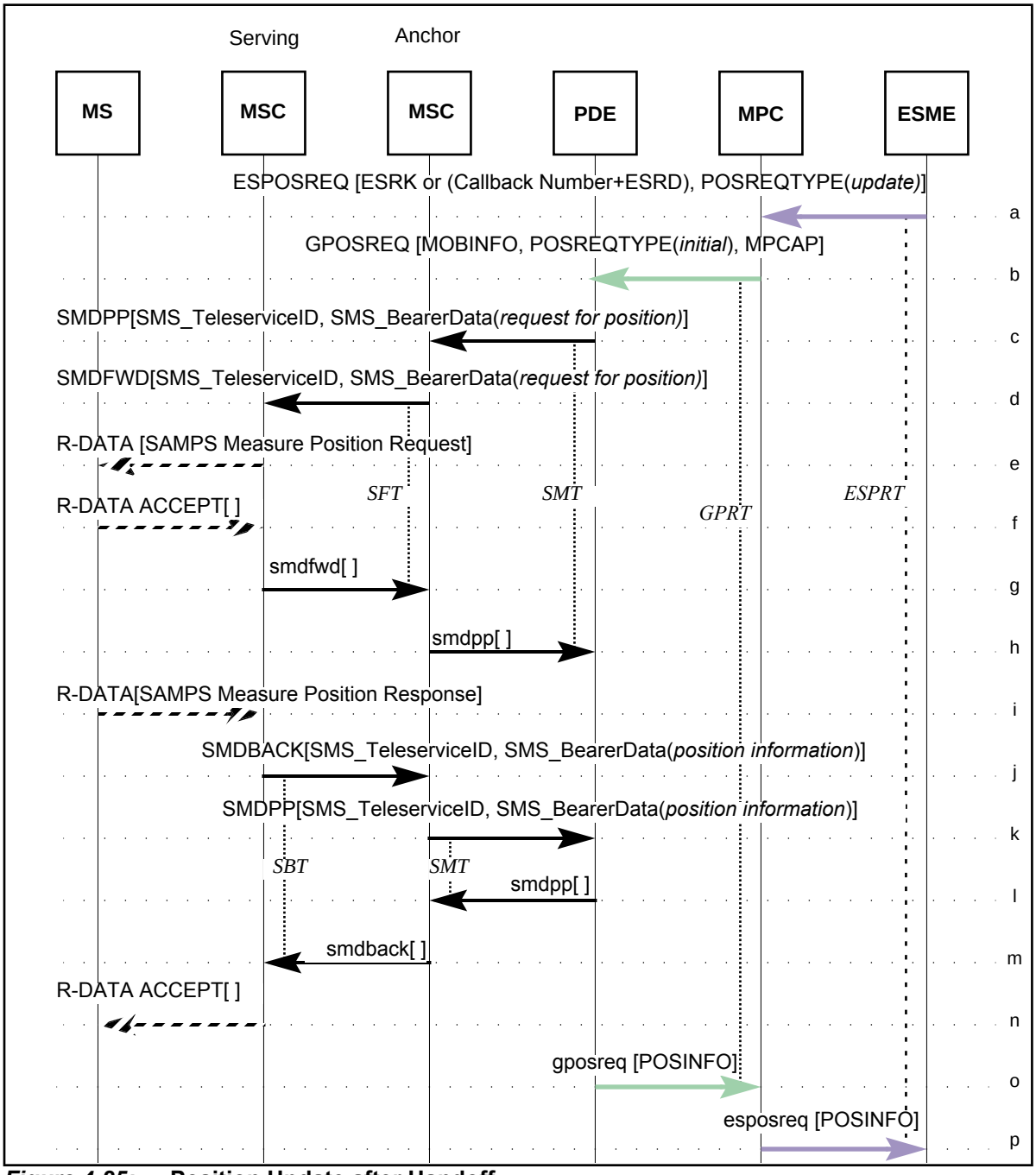

Figure 4-25: **Position Update after Handoff**

a. The Emergency Services Call Taker requests a position update. The ESME sends an ESPOSREQ to the MPC of the Anchor System.

b. Based on MPCAP indicating that the MS has GPS capability, the MPC sends the GPOSREQ to the PDE requesting a position update.

c. The PDE, based on the MPCAP, sends an SMDPP to the Anchor MSC requesting a position.

d. Since the MS has been handed off the Anchor MSC sends an SMDFWD to the Serving MSC.

e. The Serving System sends an R-DATA to the MS requesting a position.

f. The MS acknowledges the request by sending an R-DATA Accept to the Serving MSC.

g. The Serving MSC sends the smdfwd to the Anchor MSC.

h. The Anchor MSC sends the smdpp to the Anchor PDE.

Note: Should the mobile require assistance data a SAMPS Positioning Assistance Request message may be sent to the PDE (Designated SAMPS TS Address).

i. The MS determines its position and sends an R-DATA with the position information to the Serving MSC.

j. The Serving MSC sends an SMDBACK to the Anchor MSC with the information.

k. The Anchor MSC sends an SMDPP to the Anchor PDE with the position information.

l. The PDE sends an smdpp to the Anchor MSC.

m. The Anchor MSC sends an smdback to the Serving MSC.

n. The Serving MSC sends the R-DATA Accept to the MS.

o. The PDE sends a gposreq with the position information to the MPC.

p. The MPC sends the esposreq with the position information to the ESME.

4 Mobile Initiated Positioning

4.1 MS Originated Position Determination for Emergency Services Call (Successful CAS Push - E_5/E_3 Interfaces)

This scenario illustrates MS originated position determination for an emergency services call. When the Serving System indicates that this is supported, the MS initiates an *IS-801* data burst to obtain position related information from the PDE when the MS is assigned to a traffic channel. Communication between the Serving MSC and the MPC-selected PDE takes place over the E_5/E_3 interfaces.

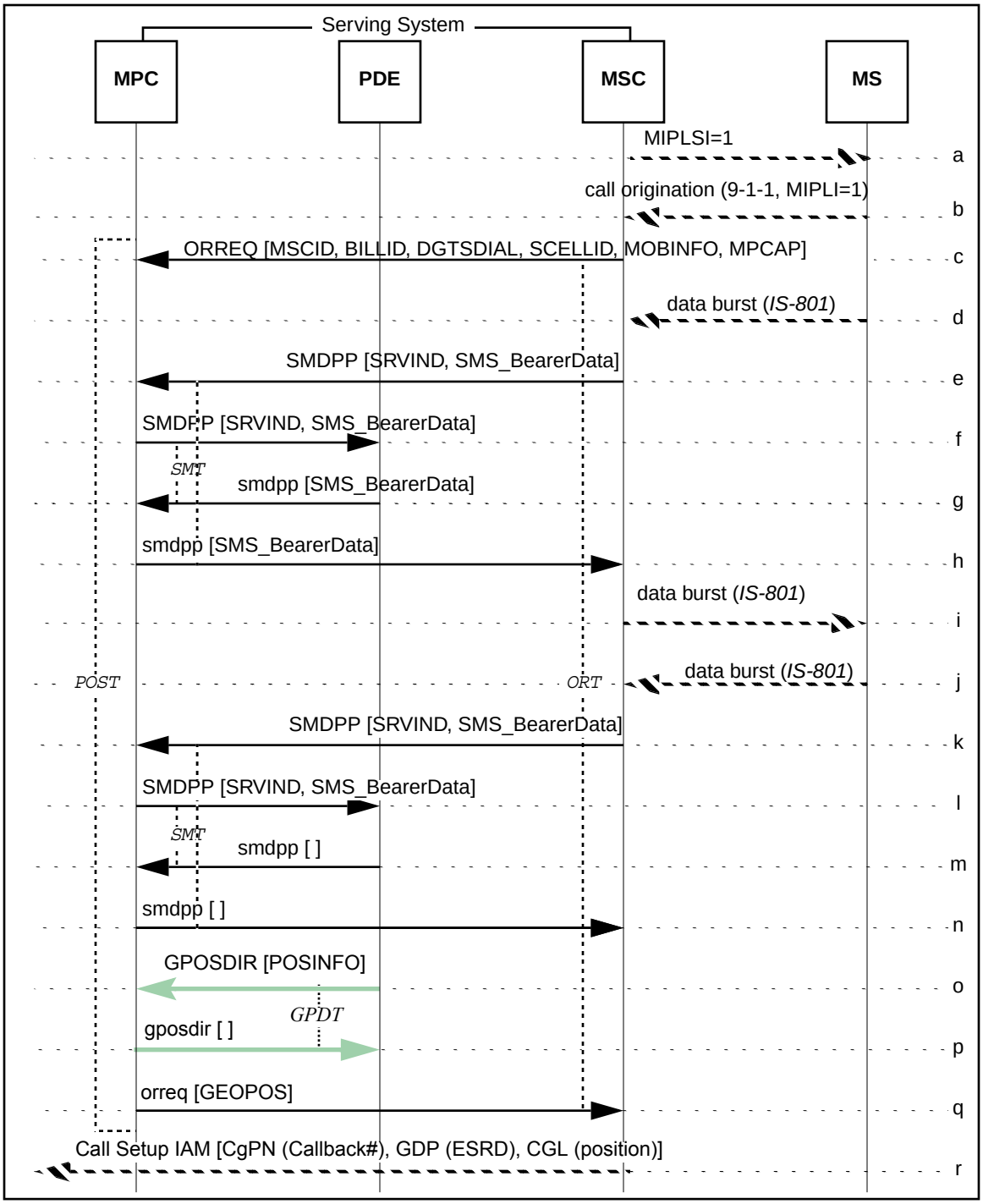

Figure 4-26: **MS Originated Position Determination for Emergency Services Call (Successful CAS Push - E_5/E_3 Interfaces)**

a. The BS indicates support of MS originated position determination.

b. The MS originates an Emergency Services call indicating it will initiate position determination (MS_INIT_POS_LOC_IND=1).

c. The Serving MSC sends an ORREQ to the Serving MPC. The MOBINFO parameter includes the MIPLI set to indicate MS originated position determination. The MPC starts the POST timer and waits for a GPOSDIR instead of initiating a GPOSREQ.

d. The MS sends an *IS-95* Data Burst message (Type = PLD) containing an encapsulated *IS-801* message in order to provide or obtain positioning related information from the PDE. Note that step d. may occur as soon as the MS is placed on a traffic channel.

e. Upon receipt of the Data Burst message for MS originated position determination, the MSC encapsulates the application layer content (*IS-801*) in an SMDPP and sends the SMDPP to the Serving MPC.

f. The MPC relays the received SMDPP to an appropriate PDE. Note: PDE selection by the MPC may be determined by Session Tags contained in the SMS_BearerData. The mechanism used by the MPC for routing SMDPP messages is beyond the scope of this Standard.

g. The PDE examines the contents of the *IS-801* message encapsulated in the SMDPP, and encapsulates the appropriate *IS-801* response to the MS in an smdpp. The PDE sends the smdpp to the MPC; the smdpp in this scenario contains bearer data intended for transmission to the MS. This scenario shows a single variant of *IS-801* message exchange. The 2-way exchange of *IS-801* information between the PDE and MS may occur in various iterations of SMS transport INVOKEs and responses.

h. The MPC relays the smdpp to the MSC.

i.-j. Same as section 3.1.1, steps c-d.

k.-n. Same as steps e-h., except that the smdpp sent by the PDE contains no bearer data. By step n., the PDE has received adequate information to determine the MS' position.

o. The PDE uses the received information to determine the MS' position. The PDE sends the POSINFO to the MPC in the GPOSDIR.

p. The MPC cancels the POST timer and acknowledges receipt of the GPOSDIR with gposdir sent to the PDE.

q. The MPC cancels the POST timer and sends the GEOPOS in the orreq to the MSC.

r. The MSC sets the call up toward the ESNE; the call setup signaling includes the received geographic position.

4.2 MS Originated Position Determination for Emergency Services Call (POST Timer Expiry)

This scenario illustrates MS originated position determination for an emergency services call. When the Serving System indicates that this is supported, the MS initiates an *IS-801* data burst to obtain position related information from the PDE when the MS is assigned to a traffic channel. In this scenario the MPC times out awaiting the arrival of the `GPOSDIR` (POST timer expiry) and sends an `orreq` without the geoposition of the MS. The PDE is later able to compute the geoposition of the MS and pushes the information to the MPC to be later retrieved by the ESME.

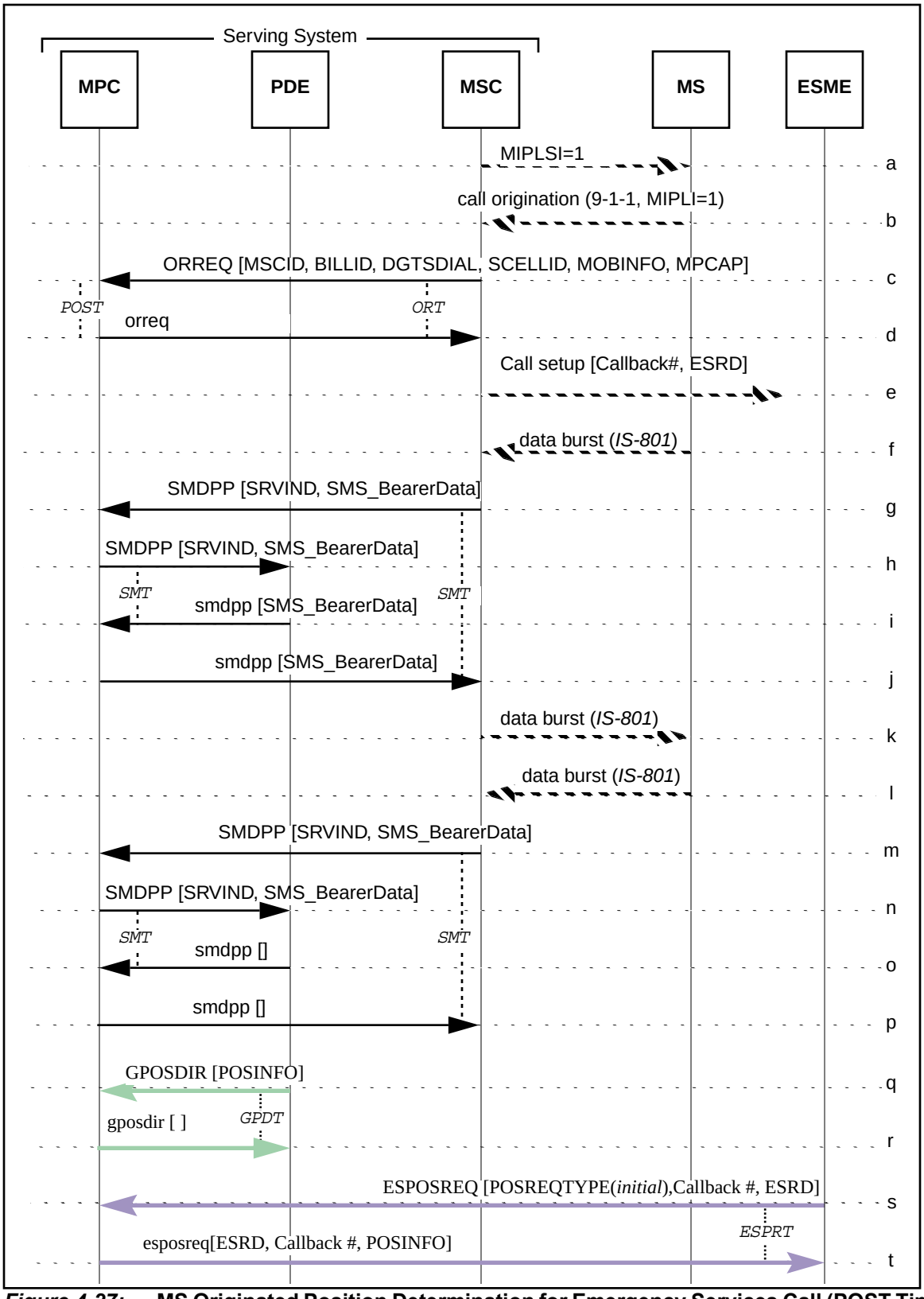

Figure 4-27: **MS Originated Position Determination for Emergency Services Call (POST Timer Expiry)**

a. The BS indicates support of MS originated position determination.

b. The MS originates an Emergency Services call indicating it will initiate position determination (MS_INIT_POS_LOC_IND=1).

c. The Serving MSC sends an ORREQ to the Serving MPC. The MOBINFO parameter includes the MIPLI set to indicate MS originated position determination. The MPC starts the POST timer and waits for a GPOSDIR instead of initiating a GPOSREQ.

d. The POST Timer expires before a GPOSDIR for this MS is received from a PDE. The MPC sends an orreq without the geoposition of the MS and stores the MSID and mobile information for future use.

e. The MSC routes the Emergency Services Call toward the ESNE selected by the ESRD. See Annex D for call setup signaling formats.

f.-r. Same as section 4.1, steps d.-p.

s.-t. Same as section 2.2.2, steps h.-i.

4.3 TDMA SAMPS Emergency Position Report

This scenario shows the delivery of Position Information or GPS Measurement Data using the SAMPS Emergency Position Report procedure following an ESC invocation.

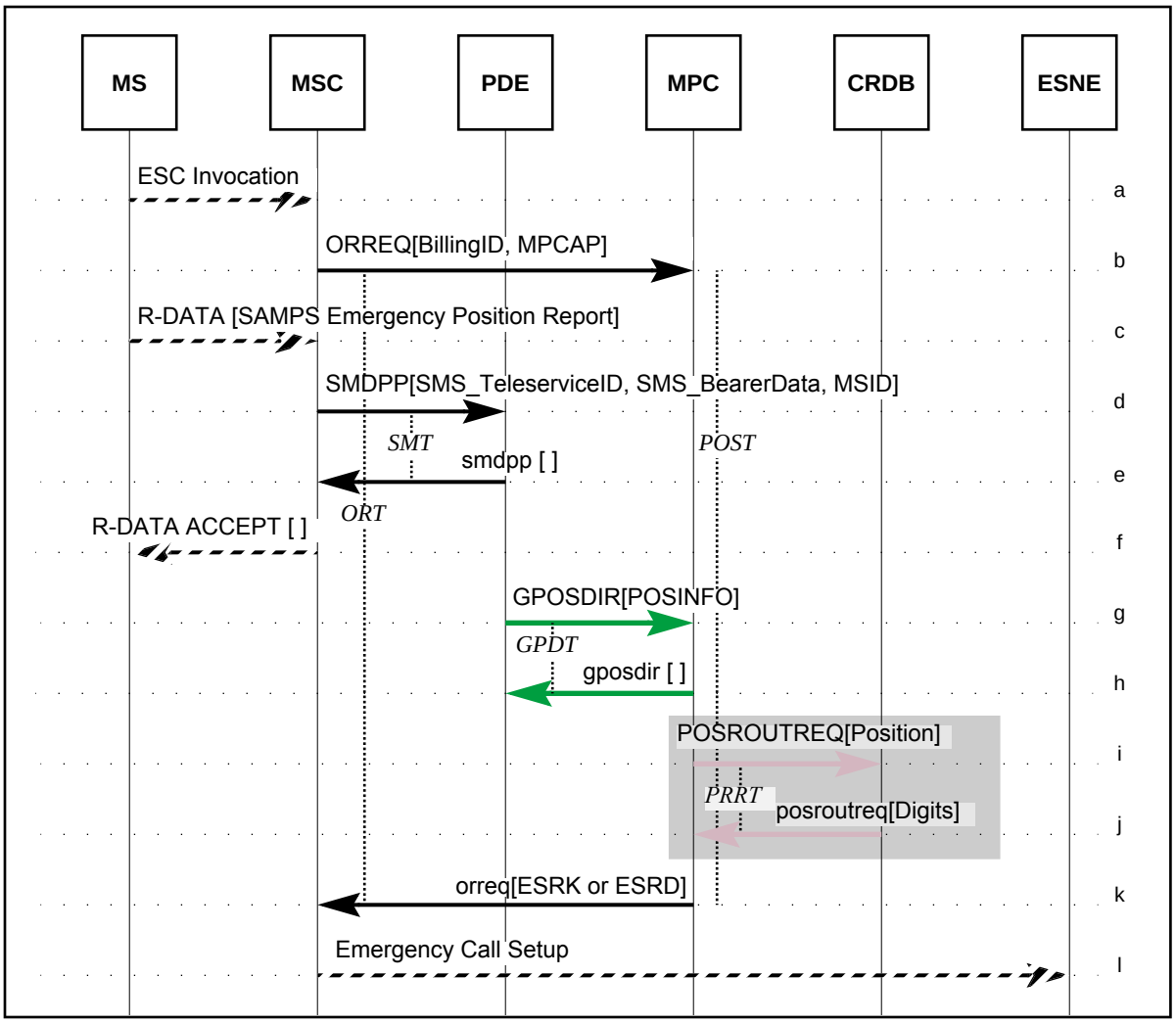

Figure 4-28: **TDMA SAMPS Emergency Position Report**

a. The MS invokes an Emergency Services Call.

b. The MSC initiates the ORREQ procedure indicating in the MPCAP parameter the type of handset positioning that is supported.

   Note: Should the mobile require assistance data a SAMPS Positioning Assistance Request message may be sent to the PDE (Designated SAMPS TS Address).

c. The MS sends an R-DATA message containing a SAMPS Emergency Position Report message on the Digital Traffic Channel to the PDE.

d. The MSC forwards the information received from the MS in the SMDPP to the PDE.

e. The PDE acknowledges the request with an smdpp.

f. The MSC acknowledges the request with an R-DATA Accept.

g. The PDE sends a GPOSDIR containing the position information to the MPC.

h. The MPC acknowledges the request with a gposdir.

i. Optionally, the MPC may decide that the route must be determined from the MS's current latitude and longitude. The MPC uses the position to request a routing translations for an emergency services zone from the CRDB with the POSROUTREQ.

j. The CRDB returns the digits representing an emergency service zone (ESZ) to the MPC with a posroutreq.

k. The MPC selects a PSAP based on the emergency service zone from the CRDB or from the latitude and longitude of the mobile based on local procedures. The MPC then assigns and returns a unique routable call identifier (ESRK) for the particular PSAP selected or an ESRD in the orreq. See Chapter 8 and Annex D for the population of the signaling parameters.

l. The MSC routes the Emergency Services Call toward the PSAP selected by the ESRK or ESRD. See Annex D for the call setup signaling formats.

4.4 TDMA Inter-MSC Three-Way Call to PSAP using SAMPS

This scenario shows the delivery of Position Information to the PSAP after an inter-MSC call has been handed off. The ESRK method is used for routing to the PSAP and for identification of the ESC.

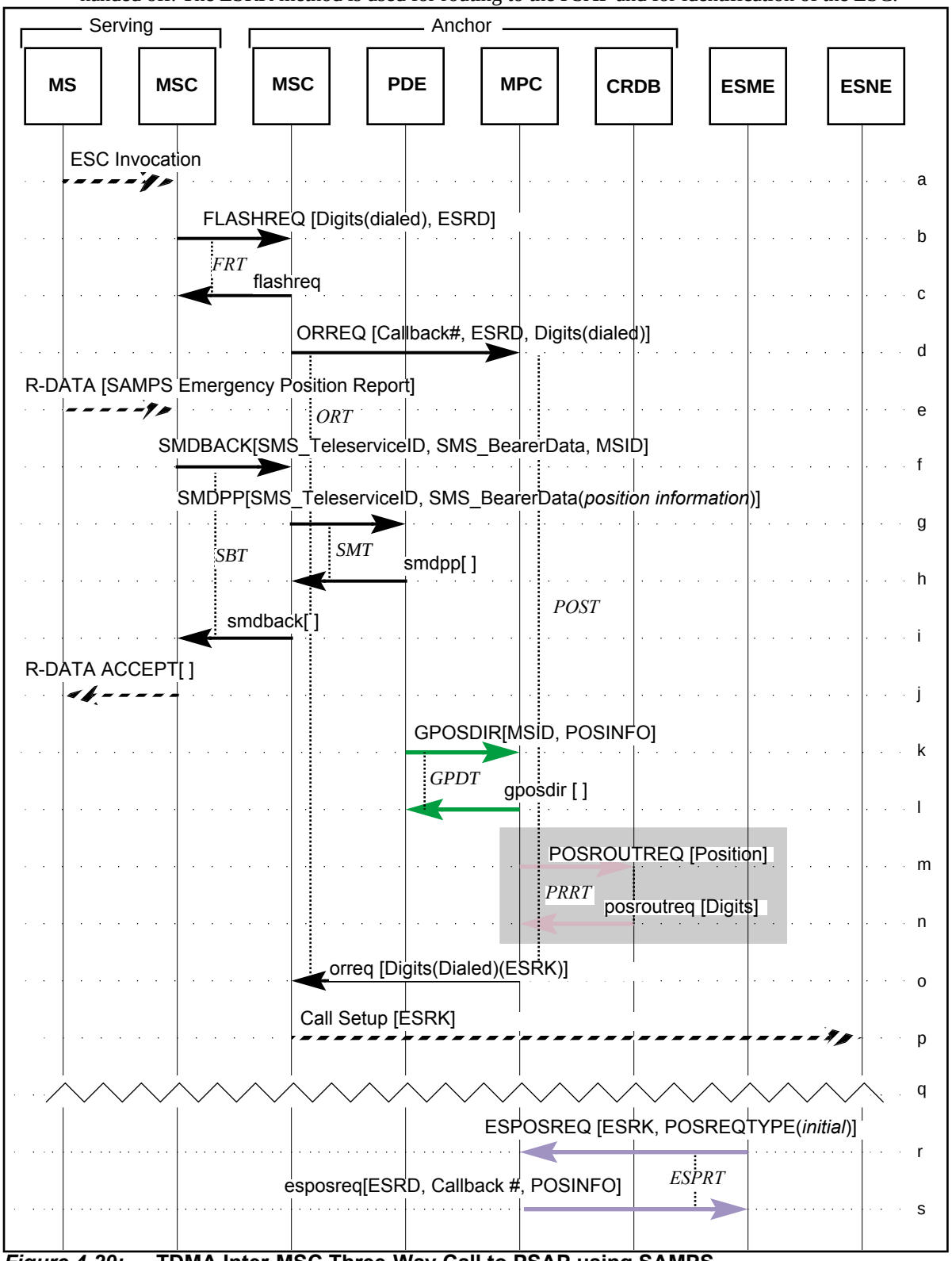

Figure 4-29: **TDMA Inter-MSC Three-Way Call to PSAP using SAMPS**

a. The MS invokes an Emergency Service Call via 3-way calling while another call is in progress.

b. The Serving MSC notifies the next switch in the handoff chain of the event with a FLASHREQ.

c. The Anchor MSC acknowledges the event with a flashreq.

d. The Anchor MSC initiates the ORREQ procedure indicating in the MPCAP parameter the type of handset positioning that is supported.

e. The MS sends an Emergency Position Report message on the Digital Traffic Channel.

Note: Should the mobile require assistance data a SAMPS Position Assistance Request message may be sent to the PDE (Designated SAMPS TS Address).

f. The Serving MSC sends an SMDBACK to the Anchor MSC containing the position information.

g. The Anchor MSC sends an SMDPP to the Anchor PDE with the position information.

h. The Anchor PDE sends an smdpp to the Anchor MSC.

i. The Anchor MSC sends an smdback to the Serving MSC.

j. The Serving MSC sends the R-DATA Accept to the MS.

k. The Anchor PDE sends a GPOSDIR containing the position information to the Anchor MPC.

l. The Anchor MPC sends a gposdir to the Anchor PDE.

m. Optionally, the Anchor MPC may decide that the route must be determined from the MS's current latitude and longitude. The MPC uses the position to request routing translations for an emergency service zone from the CRDB with the POSROUTEREQ.

n. The CRDB returns the digits representing an emergency service zone (ESZ) to the MPC with a posroutreq.

o. The Anchor MPC selects a PSAP based on the emergency service zone from the CRDB or from the latitude and longitude of the mobile based on local procedures. The Anchor MPC then assigns and returns a unique routable call identifier (ESRK) for the particular PSAP selected or an ESRD in the orreq. See Chapter 8 and Annex D for the population of the signaling parameters.

p. The Anchor MSC routes the Emergency Service Call toward the PSAP selected by the ESRK or ESRD. See Annex for call setup signaling formats.

q. Some time later…

r. The ESME requests the initial position.

s. The MPC returns the cached position.

Chapter 5: Functional Overview, PCS1900

1 Introduction

See Chapter 3: Functional Overview, ANSI-41 Section 1.

2 Methodology

See Chapter 3: Functional Overview, ANSI-41, Section 2.

3 Condensed PCS1900 Network Reference Model

The network reference model applicable to support of Emergency Services calls by PCS1900 networks is shown in Figure 5-1.

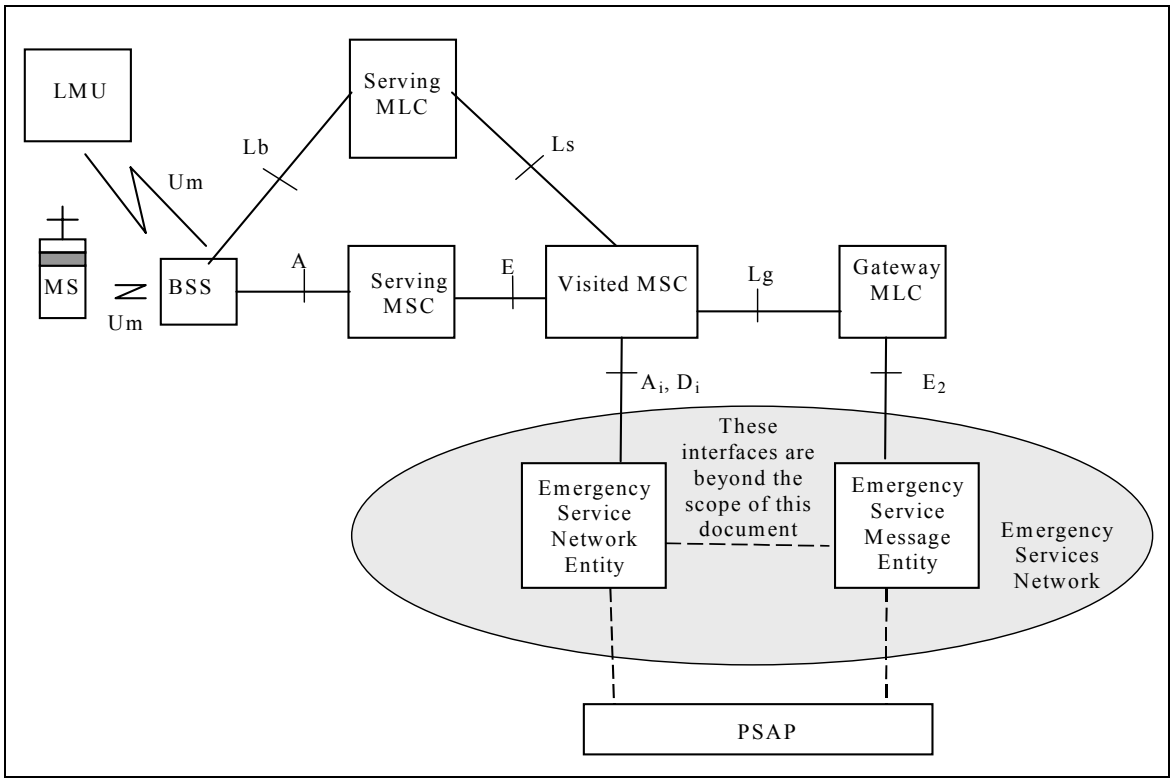

Figure 5-1: **Condensed PCS1900 Network Reference Model**

4 Network Entities

4.1 Base Station System (BSS)

The Base Station Subsystem (BSS) receives the emergency call from the MS and notifies the VMSC. The BSS is also involved in the handling of certain positioning procedures. As a generic handling procedure, the BSS provides Cell-id and Timing Advance (TA) to the anchor MSC to assist in obtaining a position estimate. Specific BSS functionality in positioning procedures is specified in GSM 03.71.

4.2 Emergency Services Message Entity (ESME)

The ESME routes and processes the out-of-band messages related to emergency calls. This may be incorporated into selective routers (also known as Routing, Bridging and Transfer switches) and Automatic Location Information (ALI) database engines. The structure of the Emergency Services Network is beyond the scope of the Interim Standard, although some insight may be gained from Annex A.

4.3 Emergency Services Network Entity (ESNE)

The ESNE routes and processes the voice band portion of the emergency call. This is composed of selective routers (also known as Routing, Bridging and Transfer switches). The structure of the Emergency Servieces Network is beyond the scope of thie Interim Standard, although some insight may be gained from Annex A.

4.4 Gateway Mobile Location Center (GMLC)

The Gateway Mobile Location Center (GMLC) contains functionality required to support delivery of a mobile's position to the ESME. The GMLC handles requests for a mobile's initial, updated (current), or last known position from the ESME. In one PLMN, there may be more than one GMLC.

The GMLC sends positioning requests to and receives final position estimates from the visited MSC via the Lg interface. The GMLC stores the initial position estimate to support NCAS Pull.

4.5 Location Measurement Unit (LMU)

A Location Measurement Unit (LMU) makes radio measurements to support the determination of a mobile's position. All position and assistance measurements obtained by an LMU are supplied to a particular SMLC associated with the LMU. Signaling to an LMU may be performed over the PCS1900 air interface (Um interface).

4.6 Mobile Station (MS)

The Mobile Station (MS) initiates the emergency call and may be involved in determining its position.

4.7 Mobile services Switching Center (MSC)

For emergency call origination, a PCS1900 MS interacts with a local serving MSC and, in some cases, with a separate visited (anchor) MSC. Only a single MSC is involved (visited and serving MSC) for an emergency call that is not in MSC-MSC handover state. Two separate MSCs are involved, serving MSC and visited (or anchor) MSC, for an emergency call in MSC-MSC handover state.

The Visited (Anchor) Mobile Switching Center (VMSC) sets up the emergency call to the emergency service network and initiates requests to the SMLC for a mobile's position. If NCAS is supported, the VMSC pushes the mobile's initial position to the GMLC when it becomes known.
The serving MSC, when this is distinct, relays all emergency call signaling messages between the BSS and visited MSC using the PCS1900 E interface.

4.8 Serving Mobile Location Center (SMLC)

The Serving Mobile Location Center (SMLC) manages the overall coordination and scheduling of resources required to determine a mobile's position. For some position methods, it also calculates the final position estimate and accuracy. In one PLMN, there may be more than one SMLC.

5 PCS1900 Network Interfaces and Reference Points

5.1 A Interface

The A interface is between the BSS and serving MSC. Aspects relevant to supporting Emergency Services calls are defined in GSM 08.08 and GSM 09.31

5.2 A_i Reference Point

The A_i Reference Point is between the visited MSC and a selective router, PSTN tandem or, as shown in Figure 5-1, the ESNE. It supports analog (e.g. MF) signaling.

5.3 D_i Reference Point

The D_i Reference Point is between the visited MSC and a selective router, PSTN tandem or, as shown in Figure 5-1, the ESNE. It supports a digital interface and is based on ANSI T1.113 when SS7 ISUP signaling is used.

5.4 E Interface

The E interface exists between a serving MSC and visited MSC for an MS with an established call in a state of MSC-MSC handover. It is defined in GSM 09.02 and GSM 09.08.

5.5 E_2 Reference Point

The E_2 Reference Point exists between the GMLC and ESME.

5.6 Lg Interface

The Lg Interface exists between the GMLC and visited MSC. The protocol to be used on this interface is defined in GSM 03.71 and GSM 09.02.

5.7 Ls Interface

The Ls interface exists between the SMLC and visited MSC. It is defined in GSM 03.71 and GSM 09.31.

5.8 Lb Interface

The Lb interface exists between the SMLC and serving BSS. It is defined in GSM 03.71 and GSM 09.31.

5.9 Um Interface

The Um interface exists between the BSS and LMU and between the BSS and MS. It is defined in GSM 03.71, GSM 04.08, GSM 04.31 and GSM 04.71.

6 Emergency Services Messages Applicable to PCS1900

The messages used between PCS1900 network entities and between PCS1900 network entities and emergency services network entities to support provision of geographic position include the following:

EmergencyServicesPositionRequest (ESPOSREQ, esposreq)
MAP Subscriber Location Report (ETSI GSM MAP)
MAP Provide Subscriber Location (ETSI GSM MAP)

6.1 Messages between a PCS1900 GMLC and ESME – E_2 Reference Point

6.1.1 EmergencyServicesPositionRequest

The EmergencyServicesPositionRequest message is used to request the initial, updated or last known position of an MS. It is sent over the E_2 Reference Point from an ESME to a GMLC to support NCAS Pull.

The EmergencyServicesPositionRequest message may be triggered from an emergency service provider when:

The position of an MS engaged in an Emergency Services call is required.

6.2 Messages between a PCS1900 GMLC and MSC – Lg Interface

6.2.1 MAP Subscriber Location Report

The MAP Subscriber Location Report message is used by a VMSC to provide the position of an MS to a GMLC over the Lg interface. This message is used to send the mobile's initial position to the GMLC and to notify the GMLC when the emergency services call is ended. The MAP Subscriber Location Report message may be triggered when:

- The initial position for an emergency call becomes available
- An emergency call is released

The MAP Subscriber Location Report message and its acknowledgment, for the Emergency Services Application, contain the parameters shown in the following tables. The detailed content and encoding of these parameters are defined in GSM 09.02. In case of inconsistency, the definition in GSM 09.02 has precedence over the definition here.

Table 5-1: **MAP Subscriber Location Report Invoke parameters**

Parameter	MOC	Usage
LCS Event	M	This parameter indicates the event that triggered the MAP subscriber location report. For an emergency services call, this parameter indicates either an emergency call origination or emergency call release.
LCS Client ID	M	This parameter provides information to identify the type and the identity of the LCS client to which the position information should be forwarded. For emergency services, only the client type is identified.
MSC Number	M	Gives the E.164 address of the VMSC.
IMSI	C	Identifies a mobile subscriber. To be included if available.
MSISDN	C	Provides a dialable or non-dialable callback number identifying a mobile subscriber. To be included if available.
ESRD	C	Normally, identifies the initial base station, cell site or sector of an emergency services call and it may also identify the ESZ corresponding to the initial geographic position of the ESC calling MS. To be included if available.
ESRK	C	Identifies both an ongoing Emergency Services call and its associated MS in a particular system and the GMLC used for communicating with the ESME. The ESRK may optionally identify the visited MSC at which the call originated. The ESRK shall be provided when it is included in the emergency services call setup.
IMEI	O	Identifies the mobile equipment used to originate an Emergency Services call. This parameter need not be supported.
Location Estimate	C	Identifies the caller's geographic position and the accuracy of this position. To be included if available. If not included, positioning failure is implied if the LCS event indicates ESC origination.
Age of Location Estimate	C	Indicates how long ago the location estimate was obtained. To be included if a location estimate is included.
LMSI	O	A local identifier for the target MS in the VLR.

Table 5-2: **MAP Subscriber Location Report Return Error parameters**

Parameter	MOC	Usage
User Error	C	Indicates some error in the Invoke message or in the GMLC that prevents the location related information from being accepted. The following error types are allowed: • System Failure • Data Missing • Unexpected Data Value • Resource Limitation • Unknown Subscriber • Unauthorized Requesting network • Unknown or Unreachable LCS Client

6.2.2 MAP Provide Subscriber Location

The MAP Provide Subscriber Location message is used by a GMLC to request the position of a target MS from the visited MSC over the Lg interface. This message is used to support NCAS Pull of the updated or last known position. The MAP Provide Subscriber Location message may be triggered when:

The updated or last known position of an MS is requested from a GMLC by an ESME

The MAP Provide Subscriber Location message and its response, for the Emergency Services Application, contain the parameters shown in the following tables. The detailed content and encoding of these parameters are defined in GSM 09.02. In case of inconsistency, the definition in GSM 09.02 has precedence over the definition here.

Table 5-3: **MAP Provide Subscriber Location Invoke parameters**

Parameter	MOC	Usage
Location Type	M	Identifies the type of location requested from among the following alternatives: updated location updated or last known location
MLC Number	M	Provides the E.164 address of the requesting GMLC
LCS Client ID	M	Provides information identifying the client (e.g. ESME) requesting location. For emergency service requests, this parameter shall indicate a location request from an emergency services provider. Additional client identification information (e.g. client address or name) is not required.
Privacy Override	O	This parameter indicates if MS privacy is overridden by the client requesting location. For emergency service requests, this parameter shall not be included.
IMSI	C	Identifies the target MS. Either IMSI or MSISDN shall be provided.
MSISDN	C	Contains a dialable or non-dialable callback number that identifies the target MS. Either IMSI or MSISDN shall be provided.
LMSI	C	A local identifier for the target MS in the VLR. To be included if available and if the IMSI is included.
LCS Priority	C	Indicates the priority of the location request. For emergency service related requests, the highest priority shall be requested.
LCS QoS	C	Indicates the required Quality of Service in terms of accuracy and response time. For emergency service related requests, the accuracy shall be consistent with prevailing local and national regulatory requirements. Response time shall be set according to agreements with the requesting emergency service provider to indicate one of: low delay (minimizing delay takes precedence over accuracy) delay tolerant (accuracy takes precedence over minimizing delay)
IMEI	O	Identifies the mobile equipment used to originate an Emergency Services call. This parameter need not be supported.

***Table 5-4*: MAP Provide Subscriber Location Return Result parameters**

Parameter	MOC	Usage
Location Estimate	M	Identifies the caller's geographic position and the accuracy of this position. This parameter is mandatory: if not available, a Return Error response rather than Return Result shall be sent.
Age of Location Estimate	M	Indicates how long ago the location estimate was obtained.

***Table 5-5:* MAP Provide Subscriber Location Return Error parameters**

Parameter	MOC	Usage
User Error	C	Indicates some error in the Invoke message or in the serving network that prevents a location estimate being returned. The following error types are allowed: • System Failure • Data Missing • Unexpected Data Value • Facility Not Supported • Unidentified Subscriber • Illegal Subscriber • Illegal Equipment • Absent Subscriber (diagnostic information may also be provided) • Unauthorized requesting network • Unauthorized LCS Client with detailed reason • Position method failure with detailed reason

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Chapter 6: Stage 2 Emergency Services Network Description, PCS1900

The following scenarios show several methods for delivering the position of a mobile that originates an emergency call to the emergency service network. These methods include the following:

Call Associated Signalling (CAS) Push
Non-Call Associated Signalling (NCAS) Pull

Scenarios are also shown to cover handovers and position determination failures. Emergency call routing by the VMSC to the PSAP using a mobile's initial position is also supported in some of the scenarios.

In all scenarios, the visited MSC is shown to obtain a position estimate via a direct request to an SMLC. This is valid for an SMLC accessible over the Ls (MSC to SMLC) interface. For an SMLC accessible over the Lb (BSS to SMLC) interface, the position request from the visited MSC is sent instead (via the serving MSC in the case of MSC to MSC handover) to the BSC serving the MS being positioned. The BSC then determines the SMLC and forwards to it the position request; the position response from the SMLC is likewise returned to the visited MSC via the BSC (and via the serving MSC in the case of MSC to MSC handover).

Note that these scenarios show only the parameters that are relevant to a particular scenario and do not show all of the parameters that are needed for the transaction. Refer to Stage 3 documentation for specific parameter requirements.

1 Emergency Location Information Delivery (ELID) Scenarios

CAS and NCAS solutions are not mutually exclusive (i.e. both solutions may be supported).

1.1 ELID Using CAS Push

The ELID CAS push scenarios provide the initial position of the emergency caller at call setup. Provision of the emergency caller's initial position once the emergency services call is setup is not supported with a CAS push mechanism. Provision of the emergency caller's updated position during the emergency services call is not supported with a CAS push mechanism.

For the ELID CAS push scenarios, routing based on the initial lat/long information may be performed by the VMSC.

In The CAS push scenarios described here may be followed by an NCAS Pull as described in section 2.

In each of the CAS push scenarios shown here, the emergency calling MS sends an EMERGENCY SETUP message (as defined in GSM 04.08) after the CM Service Request. This message is not shown here and does not affect the positioning procedure for the MS, which may start before or after the message is received by the visited MSC.

1.1.1 ELID with Successful CAS Push

This scenario shows delivery of position information (i.e. initial lat/long) with CAS push during call setup.

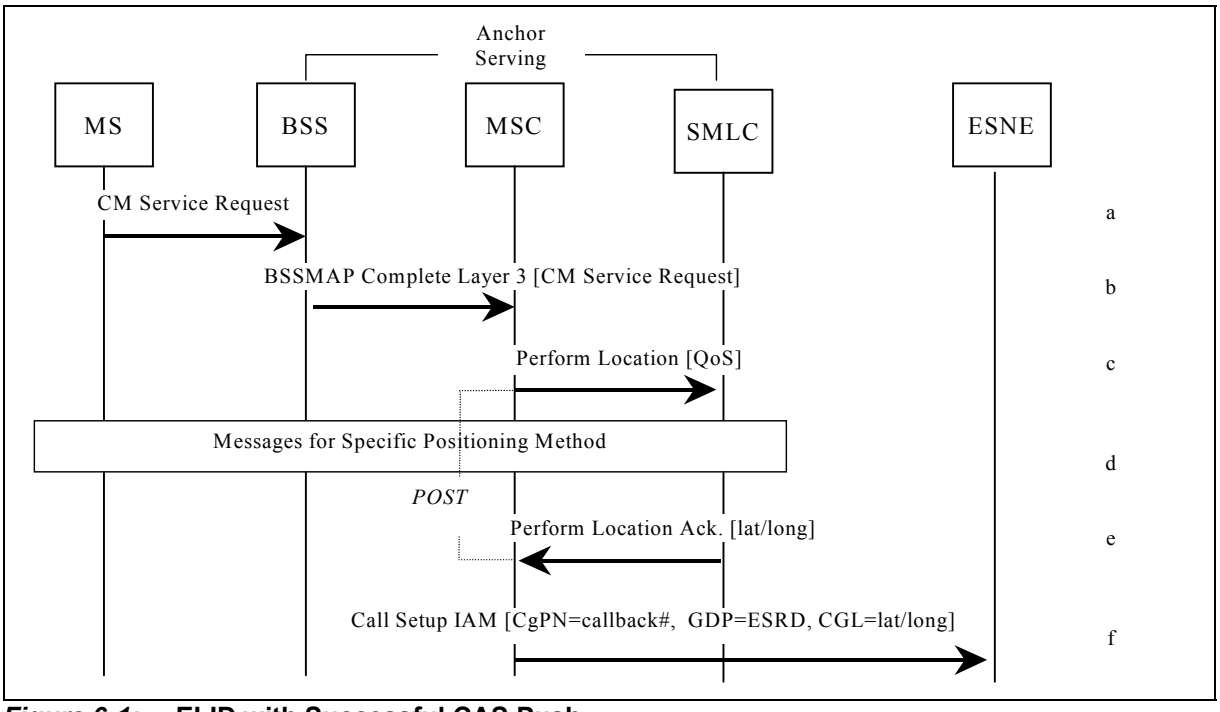

Figure 6-1: **ELID with Successful CAS Push**

a. An initially idle MS requests an SDCCH and sends a DTAP CM Service Request indicating a request for an Emergency Services call to the BSS. The MS may identify itself using a TMSI, IMSI or IMEI.

b. The BSS includes the current cell ID and possibly other measurement information within the BSSMAP Complete Layer 3 Information message used to convey the CM service request across the A-interface to the visited MSC.

c. The visited MSC starts a POST timer and sends a request to perform location to the SMLC associated with the MS's current cell location. This request includes the MS's location capabilities and currently assigned radio channel type (SDCCH, TCH-FR or TCH-HR), the QoS required for an emergency call and the current Cell ID and possibly other measurement information.

d. The SMLC instigates a suitable position method. The messages for the specific positioning method are internal to the PCS1900 network and are described in GSM 03.71.

e. The SMLC returns the MS position estimate to the VMSC.

f. The VMSC may use an internal Coordinate Routing Database (CRDB) to determine the ESZ corresponding to the MS's initial position. The VMSC can then select an ESRD that identifies the serving cell and the ESZ serving the MS's initial position. The MSC extends the call to the ESNE associated with either the ESRD selected based on the ESZ or the default ESRD for the originating cell. The IAM CgPN contains a dialable callback number (i.e. MSISDN) or a non-dialable callback number derived from the IMEI. The IAM includes the MS position estimate (lat/long) and the Cell ID (ESRD).

1.1.2 ELID with Timed-Out CAS Push

This scenario shows the handling of the Emergency Services call when the initial lat/long information is not obtained in time for delivery with the call setup (i.e. the E911 positioning timer value is set to zero or the timer expires before the lat/long information is obtained). While a position estimate is not then provided to the ESNE, the identity of the cell ID and MSISDN for the originating MS may be provided.

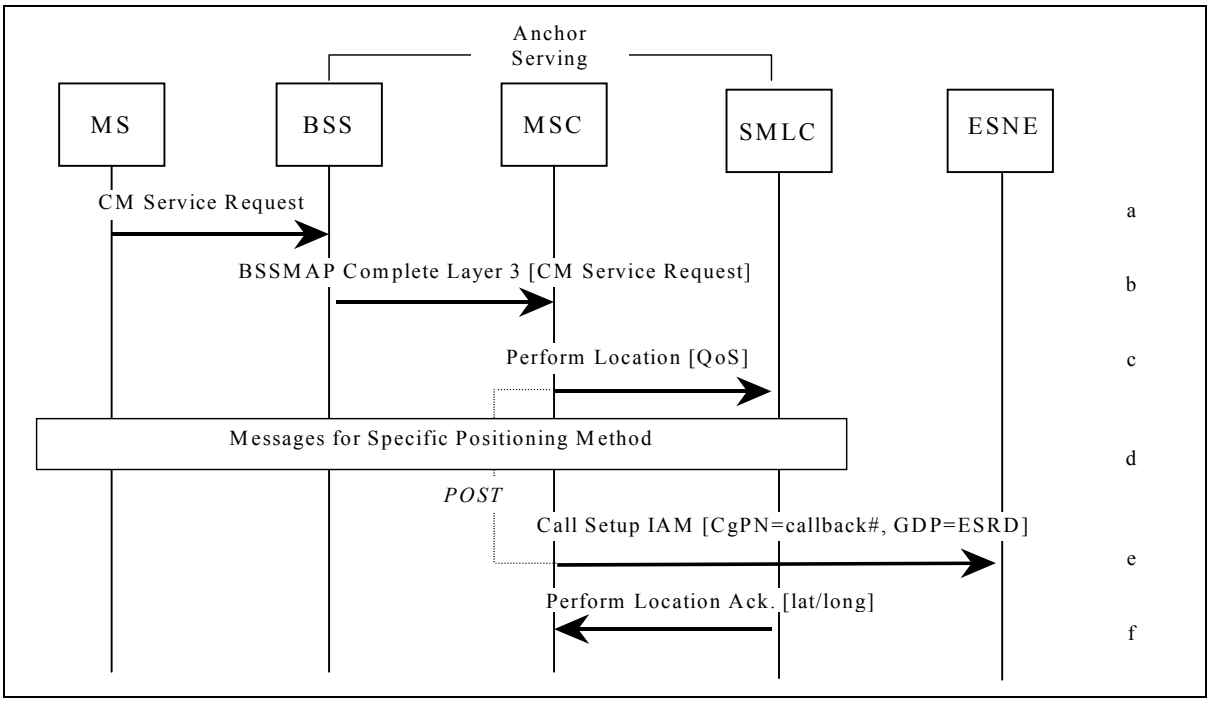

Figure 6.2: **ELID with Timed-Out CAS Push**

a. An initially idle MS requests an SDCCH and sends a DTAP CM Service Request indicating a request for an Emergency Services call to the BSS. The MS may identify itself using a TMSI, IMSI or IMEI.

b. The BSS includes the current cell ID and possibly other measurement information within the BSSMAP Complete Layer 3 Information message used to convey the CM service request across the A-interface to the visited MSC.

c. The visited MSC starts a POST timer and sends a request to perform location to the SMLC associated with the MS's current cell location. This request includes the MS's location capabilities and currently assigned radio channel type (SDCCH, TCH-FR or TCH-HR), the QoS required for an emergency call and the current Cell ID and possibly other measurement information.

d. The SMLC instigates a suitable position method. The messages for the specific positioning method are internal to the PCS1900 network and are described in GSM 03.71.

e. When the POST timer expires, the VMSC sets up the call by sending an Initial Address Message (IAM) to the ESNE. The IAM CgPN contains a dialable callback number (i.e. MSISDN) or a non-dialable callback number derived from the IMEI. The IAM includes the Cell ID (ESRD).

f. The SMLC returns the MS position estimate to the VMSC. The VMSC may then push the position estimate to a GMLC to support NCAS Pull of the initial position (see section on NCAS).

1.1.3 ELID with Successful CAS Push with MSC-MSC Handover

This scenario shows delivery of position information (i.e. initial lat/long) with CAS push during call setup for an emergency call that originated after handoff (e.g. original call is in handoff state and the subscriber puts the call on hold and initiates an Emergency Services call).

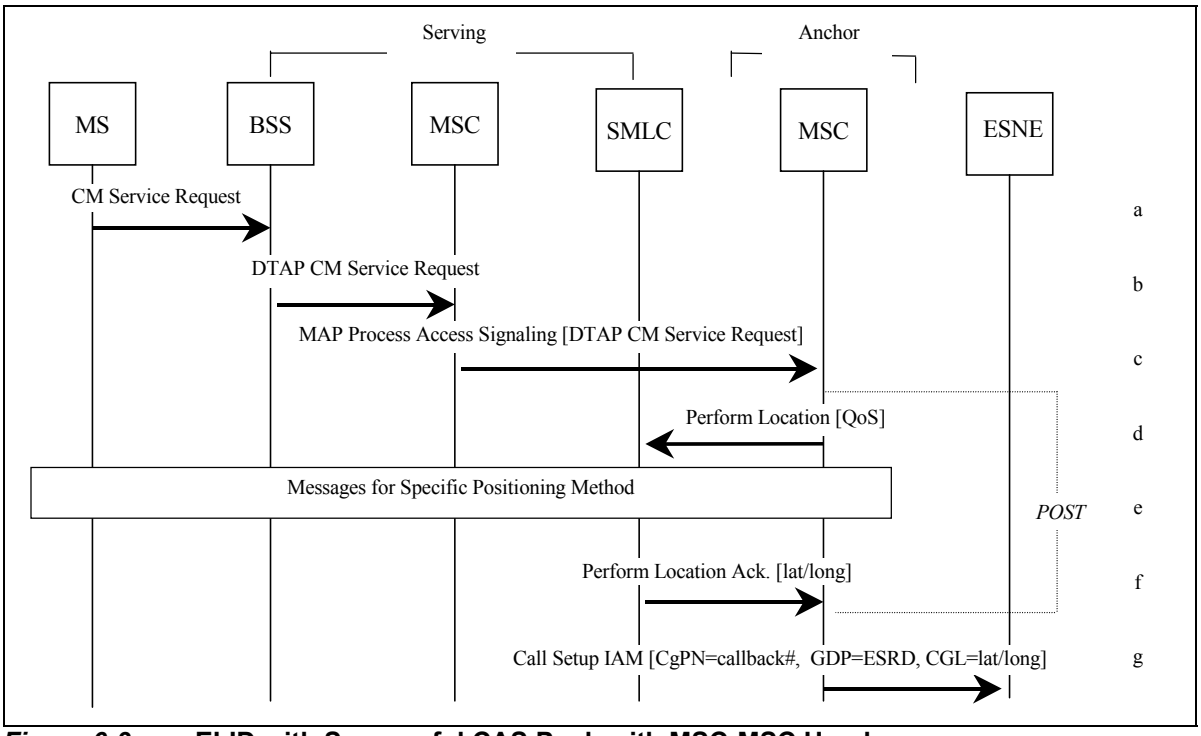

Figure 6-3: **ELID with Successful CAS Push with MSC-MSC Handover**

a. An MS places an existing call on hold and sends a DTAP CM Service Request indicating a request for an Emergency Services call to the BSC.

b. The BSC sends on the DTAP CM Service Request to the serving MSC.

c. The serving MSC forwards the CM service request to the visited (anchor) MSC inside a MAP Process Access Signaling message.

d. The visited MSC starts a POST timer and sends a request to perform location to the SMLC associated with the MS's current cell location. This request includes the MS's location capabilities and currently assigned radio channel type (TCH-FR or TCH-HR), the QoS required for an emergency call and the current Cell ID.

e. The SMLC instigates a suitable position method. The messages for the specific positioning method are internal to the PCS1900 network and are described in GSM 03.71.

f. The SMLC returns the MS position estimate to the VMSC.

g. The VMSC sets up the call by sending an Initial Address Message (IAM) to the ESNE. The IAM CgPN contains a dialable callback number (i.e. MSISDN) or a non-dialable callback number derived from the IMEI. The IAM includes the MS position estimate (latitude/longitude) and an ESRD that identifies the VMSC and, if NCAS is supported for this ESC, the GMLC.

2 Emergency Location Information Delivery Using NCAS Pull

2.1 ELID using NCAS Pull

For the ELID NCAS pull scenarios, routing based on the initial lat/long information may be performed by the VMSC before call setup.

2.1.1 Successful ELID NCAS Pull of Initial Position During an Emergency Call (Initial Position already Available in GMLC)

This scenario shows delivery of the initial position information (i.e. initial lat/long) with NCAS Pull when the initial position is already available in the GMLC at the time of the request.

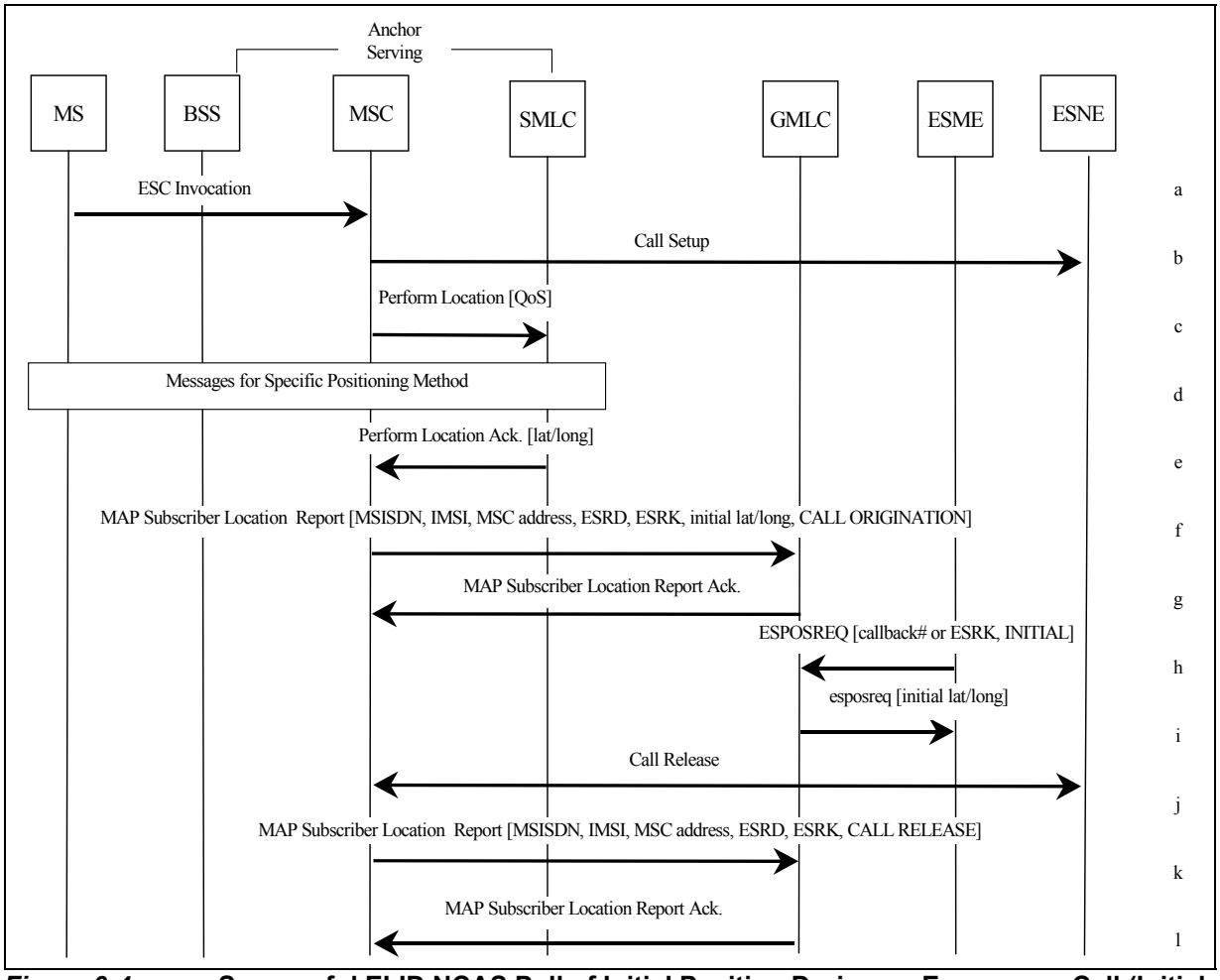

Figure 6-4: **Successful ELID NCAS Pull of Initial Position During an Emergency Call (Initial Position already Available in GMLC)**

a. The MS invokes an Emergency Services call – for details, refer to the scenarios for CAS. The MS may identify itself using a TMSI, IMSI or IMEI.

b. The MSC extends the call to the ESNE associated with the MS's current cell location without further delay. The call setup should include at a minimum either a callback number (dialable or non-dialable) plus the ESRD or an ESRK.

c. The MSC sends a request to perform location to the SMLC associated with the MS's current cell location. This request includes the MS's location capabilities and currently assigned radio channel type (SDCCH, TCH-FR or TCH-HR), the requested QoS and the current cell ID and possibly other measurement information.

d. Messages for individual positioning methods are transferred as described in GSM 03.71.

e. The SMLC returns the position estimate to the MSC.

f. The MSC sends a MAP Subscriber Location Report to the GMLC associated with the ESNE chosen in step b. The message includes the MSISDN (or non-dialable callback number), IMSI, MSC address, ESRD, ESRK (if assigned) and the position estimate. The GMLC stores the initial position information and other relevant information about the E911 call in order to support an NCAS Pull request from the ESME.

g. The GMLC acknowledges receipt of the location information.

h. The ESME requests the initial position of the emergency caller. The request contains either the callback number and ESRD or the ESRK. The ESME determines which GMLC to contact based on the ESRK or ESRD provided during call setup (translation from ESRK or ESRD to GMLC address).

i. The GMLC provides the initial position estimate to the ESME.

j. Some time later, the emergency call is released.

k. The MSC sends a MAP Subscriber Location Report to the GMLC associated with the ESNE chosen in step b. The message includes the MSISDN, IMSI, ESRK (if assigned), an indication of call release, the MSC address and the ESRD.

l. The GMLC acknowledges receipt of the location related information and may release any call information previously stored.

2.1.2 Successful ELID NCAS Pull of Initial Position During an Emergency Call (Initial Position not already Available in GMLC)

This scenario shows delivery of the initial position information (i.e. initial lat/long) with NCAS Pull when the initial position is not already available in the GMLC at the time of the request.

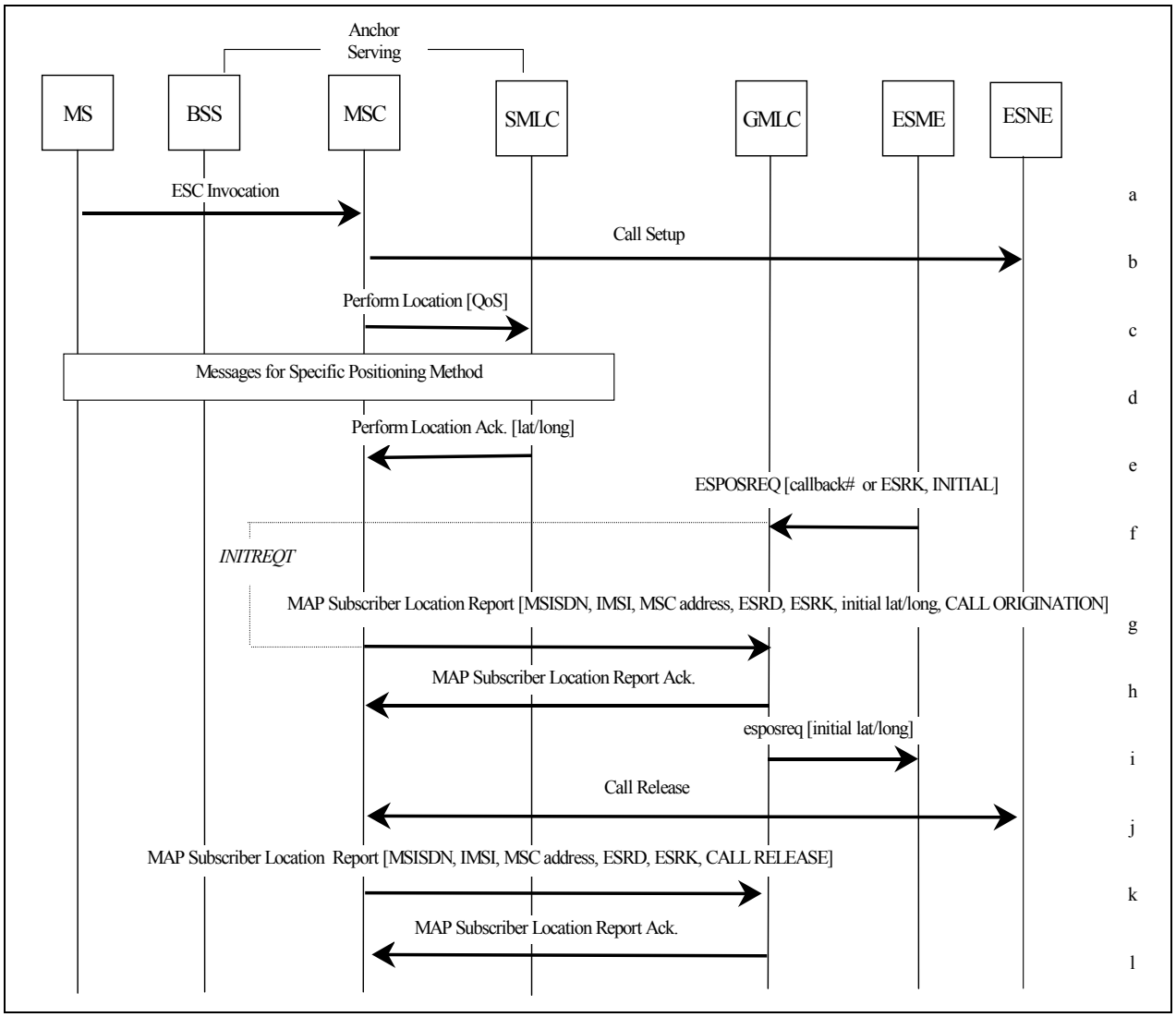

Figure 6-5: **Successful ELID NCAS Pull of Initial Position During an Emergency Call (Initial Position not already Available in GMLC)**

a. The MS invokes an Emergency Services call – for details, refer to the scenarios for CAS. The MS may identify itself using a TMSI, IMSI or IMEI.

b. The MSC extends the call to the ESNE associated with the MS's current cell location without further delay. The call setup should include at a minimum either a callback number (dialable or non-dialable) plus the ESRD or an ESRK.

c. The MSC sends a request to perform location to the SMLC associated with the MS's current cell location. This request includes the MS's location capabilities and currently assigned radio channel type (SDCCH, TCH-FR or TCH-HR), the requested QoS and the current cell ID and possibly other measurement information.

d. Messages for individual positioning methods are transferred as described in GSM 03.71.

e. Sometime before step g and possibly after step f, the SMLC returns the position estimate to the MSC.

f. The ESME requests the initial position of the emergency caller. The request contains either the callback number and ESRD or the ESRK. The ESME determines which GMLC to contact based on the ESRK or ESRD provided during call setup (translation from ESRK or ESRD to GMLC address). If a valid ESRD or ESRK is not provided, the GMLC returns the error 'Unrecognized Key' to the ESME Otherwise, since the GMLC has no record for the emergency call, the GMLC starts an INITREQT timer for the pending initial position request.

g. The MSC sends a MAP Subscriber Location Report to the GMLC associated with the ESNE chosen in step b. The message includes the MSISDN (or non-dialable callback number), IMSI, MSC address, ESRD, ESRK (if assigned) and the position estimate. The GMLC stops the INITREQT timer and stores the initial position information and other relevant information about the E911 call in order to support a subsequent NCAS Pull request from the ESME.

h. The GMLC acknowledges receipt of the location information.

i. The GMLC then provides the initial position estimate to the ESME.

j. Some time later, the emergency call is released.

k. The MSC sends a MAP Subscriber Location Report to the GMLC associated with the ESNE chosen in step b. The message includes the MSISDN, IMSI, ESRK (if assigned), an indication of call release, the MSC address and the ESRD.

l. The GMLC acknowledges receipt of the location related information and may release any call information previously stored

2.1.3 Failed ELID NCAS Pull of Initial Position During an Emergency Call (Initial Position Information not Available in GMLC)

This scenario shows the handling of an initial position request when initial position information is not available in the GMLC at the time of the request and the information is not received in the allotted time (i.e. the initial position request timer expires).

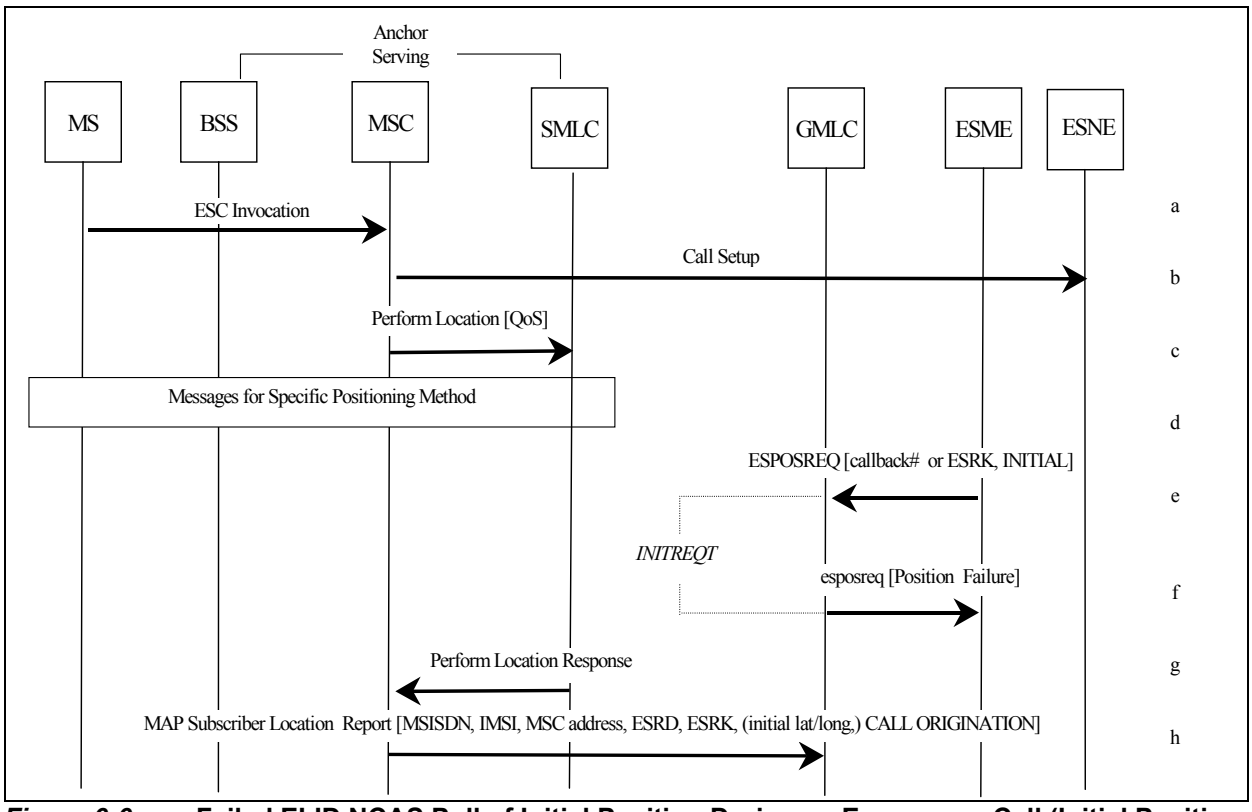

Figure 6-6: **Failed ELID NCAS Pull of Initial Position During an Emergency Call (Initial Position Information not Available in GMLC)**

a. The MS invokes an Emergency Services call – for details, refer to the scenarios for CAS. The MS may identify itself using a TMSI, IMSI or IMEI.

b. The MSC extends the call to the ESNE associated with the MS's current cell location without further delay. The call setup should include at a minimum either a callback number (dialable or non-dialable) plus the ESRD or an ESRK.

c. The MSC sends a request to perform location to the SMLC associated with the MS's current cell location. This request includes the MS's location capabilities and currently assigned radio channel type (SDCCH, TCH-FR or TCH-HR), the requested QoS and the current cell ID and possibly other measurement information.

d. Messages for individual positioning methods are transferred as described in GSM 03.71.

e. The ESME requests the initial position of the emergency caller. The request contains either the callback number and ESRD or the ESRK. The ESME determines which GMLC to contact based on the ESRK or ESRD provided during call setup (translation from ESRK or ESRD to GMLC address). If a valid ESRD or ESRK is not provided, the GMLC returns the error 'Unrecognized Key' to the ESME. Otherwise, since the GMLC has no record for the emergency call, the GMLC starts an INITREQT timer for the pending initial position request.

f. When the INITREQT timer expires, the GMLC returns the position failure result 'Requested Position Not Available' to the ESME in an Emergency Services Position Request Result.

g. The SMLC may return either a successful initial position estimate or a position failure indication to the MSC.

h. The MSC forwards any information received in step g to the GMLC for storage and possible delivery to the ESME via a subsequent NCAS Pull. But in this scenario, the information arrives too late to be sent to the GMLC before step f.

2.1.4 Failed ELID NCAS Pull of Initial Position During an Emergency Call due to Position Failure

This scenario shows a request by an ESME for the initial position of an MS engaged in an emergency services call when positioning fails. It is assumed that the GMLC stores the emergency call information sent by the ESME including the failure to obtain an initial position. This enables the GMLC to respond to a subsequent NCAS Pull request from the ESME.

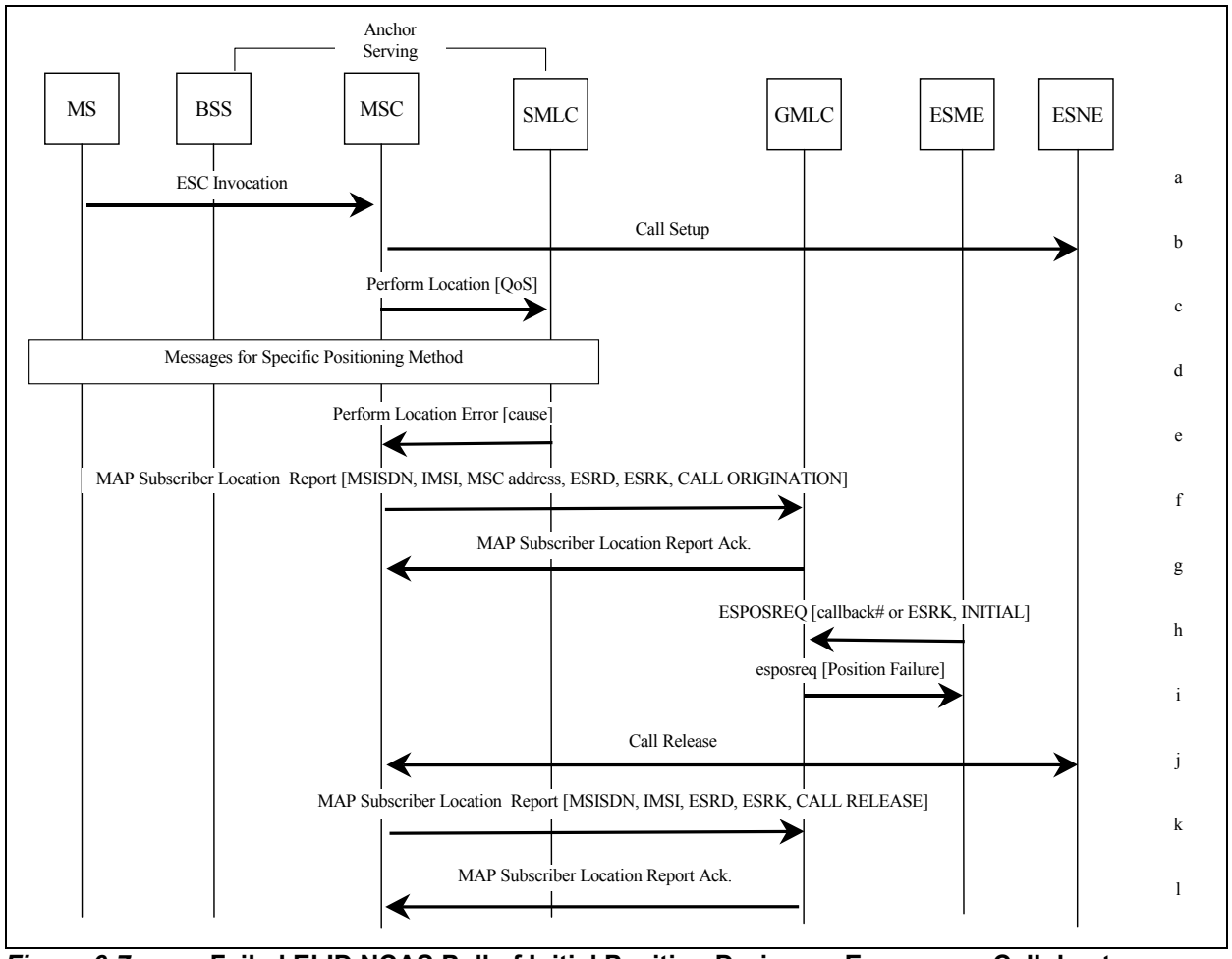

Figure 6-7: **Failed ELID NCAS Pull of Initial Position During an Emergency Call due to Position Failure**

a. The MS invokes an Emergency Services call – for details, refer to the scenarios for CAS. The MS may identify itself using a TMSI, IMSI or IMEI.

b. The MSC extends the call to the ESNE associated with the MS's current cell location without further delay. The call setup should include at a minimum either a callback number (dialable or non-dialable) plus the ESRD or an ESRK.

c. The MSC sends a request to perform location to the SMLC associated with the MS's current cell location. This request includes the MS's location capabilities and currently assigned radio channel type (SDCCH, TCH-FR or TCH-HR), the requested QoS and the current cell ID and possibly other measurement information.

d. Messages for individual positioning methods are transferred as described in GSM 03.71.

e. The SMLC returns an indication that the positioning attempt failed and includes the cause.

f. The visited MSC sends a MAP Subscriber Location report to a GMLC associated with the ESNE to which the emergency call was sent. This message contains a callback number (e.g. MSISDN), IMSI, the MSC address, the ESRK (if assigned) and the cell Id (ESRD). The absence of a position estimate in this message implies failure to perform positioning. The GMLC stores the emergency call information including the failure to obtain an initial position.

g. The GMLC acknowledges receipt of the location information.

h. The ESME requests the initial position of the emergency caller. The request contains either the callback number and ESRD or the ESRK. The ESME determines which GMLC to contact based on the ESRK or ESRD provided during call setup (translation from ESRK or ESRD to GMLC address).

i. Because the GMLC has stored information on the initial position failure, the GMLC returns the position failure result 'Requested Position Not Available' to the ESME in a Emergency Services Position Request Return Result.

j. Some time later, the emergency call is released.

k. The MSC sends a MAP Subscriber Location Report to the GMLC associated with the ESNE chosen in step b. The message includes the MSISDN, IMSI, ESRK (if assigned), an indication of call release, the MSC address and the ESRD.

l. The GMLC acknowledges receipt of the location related information and may release any call information previously stored.

2.1.5 Successful ELID NCAS Pull of Updated Position during an Emergency Services Call (Initial Position Information already Available in GMLC)

This scenario shows how the ESME can retrieve the updated position of an Emergency Services calling MS by identifying the MS to a GMLC using the callback number (dialable or non-dialable) or ESRK. The GMLC identifies the VMSC for the emergency services call by the MSC address previously stored for that call in the GMLC. It is assumed in this scenario that initial position information is already available in the GMLC when the NCAS Pull request is received.

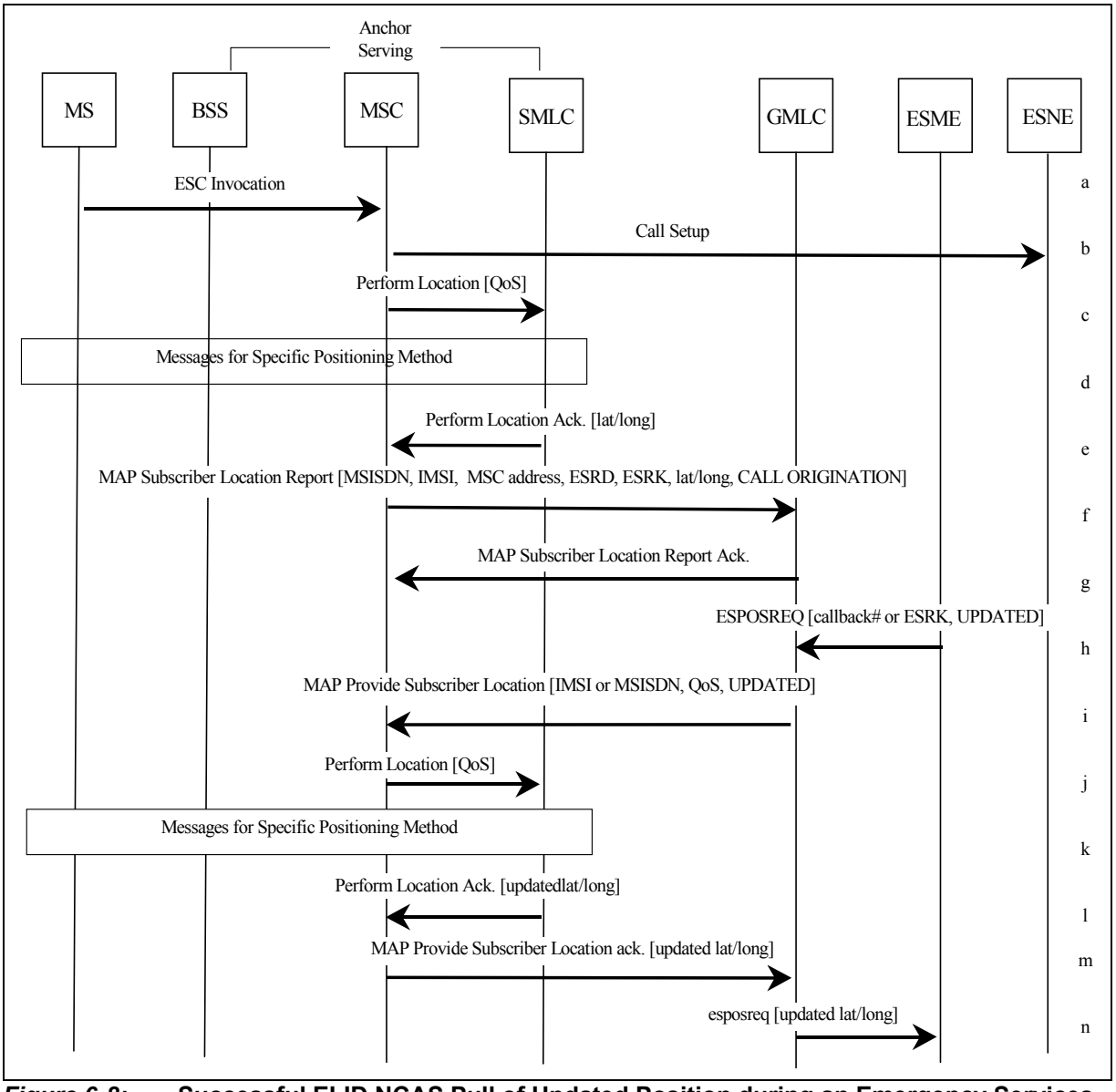

Figure 6-8: **Successful ELID NCAS Pull of Updated Position during an Emergency Services Call (Initial Position Information Already Available in the GMLC)**

a. The MS invokes an Emergency Services call – for details, refer to the scenarios for CAS. The MS may identify itself using a TMSI, IMSI or IMEI.

b. The MSC extends the call to the ESNE associated with the MS's current cell location. The call setup should include at a minimum either a callback number (dialable or non-dialable) plus the ESRD or an ESRK.

c. The visited MSC sends a request to perform location to the SMLC associated with the MS's current cell location. This request includes the MS's location capabilities and currently assigned radio channel type (SDCCH, TCH-FR or TCH-HR), the QoS required for an emergency call and the current Cell ID and possibly other measurement information.

d. The SMLC instigates a suitable position method. The messages for the specific positioning method are internal to the PCS1900 network and are described in GSM 03.71.

e. The SMLC returns the MS position estimate to the VMSC.

f. The MSC sends a MAP Subscriber Location report to a GMLC associated with the emergency services provider to which the emergency call was sent. This message contains the MS position estimate, the MSISDN (or non-dialable callback number), IMSI, the cell Id (ESRD), the MSC address and (if available) ESRK.

g. The GMLC acknowledges receipt of the location information sent in step f. The GMLC then stores the initial position information and other relevant information about the E911 call in order to support a later NCAS pull request from the ESME.

h. At some later time (e.g. after delivery of the initial position to the ESME via NCAS Pull), the ESME requests the updated position of the MS, identified by its callback number (dialable or non-dialable) or ESRK, in a Position Request Invoke sent to the GMLC. The ESME determines which GMLC to contact based on the ESRK or ESRD provided during call setup (translation from ESRK or ESRD to GMLC address).

i. The GMLC identifies the VMSC from the call information stored in step g. The GMLC sends a MAP Provide Subscriber Location message to the VMSC. This message contains the IMSI or MSISDN (dialable or non-dialable callback number), the LCS QoS information (e.g., accuracy, response time), an indication that an updated emergency call position is required and an indication of a location request from an emergency services provider.

j. The visited MSC identifies the emergency call and its associated MS using the IMSI or MSISDN. The MSC verifies that MS privacy for the updated MS position is overridden by the emergency services provider. If a location attempt is already ongoing, the VMSC waits for the position result in step l and omits the remainder of this step and step k. Otherwise, the MSC sends a request to perform location to the SMLC associated with the MS's current cell location. This request includes the MS's location capabilities and currently assigned radio channel type (SDCCH, TCH-FR or TCH-HR), the QoS received from the GMLC and the current Cell ID.

k. The SMLC instigates a suitable position method. The messages for the specific positioning method are internal to the PCS1900 network and are described in GSM 03.71.

l. The SMLC returns the updated MS position estimate to the MSC.

m. The MSC returns the updated position estimate for the MS to the GMLC

n. The GMLC returns the updated position estimate to the ESME in an Emergency Services Position Request Return Result.

2.1.6 Successful ELID NCAS Pull of Updated Position during an Emergency Services Call (Initial Position Information not already Available in GMLC)

This scenario shows how the ESME can retrieve the updated position of an Emergency Services calling MS by identifying the MS to a GMLC using the callback number (dialable or non-dialable) or ESRK. It is assumed in this scenario that initial position information is not available in the GMLC at the time that the NCAS Pull request is first received.

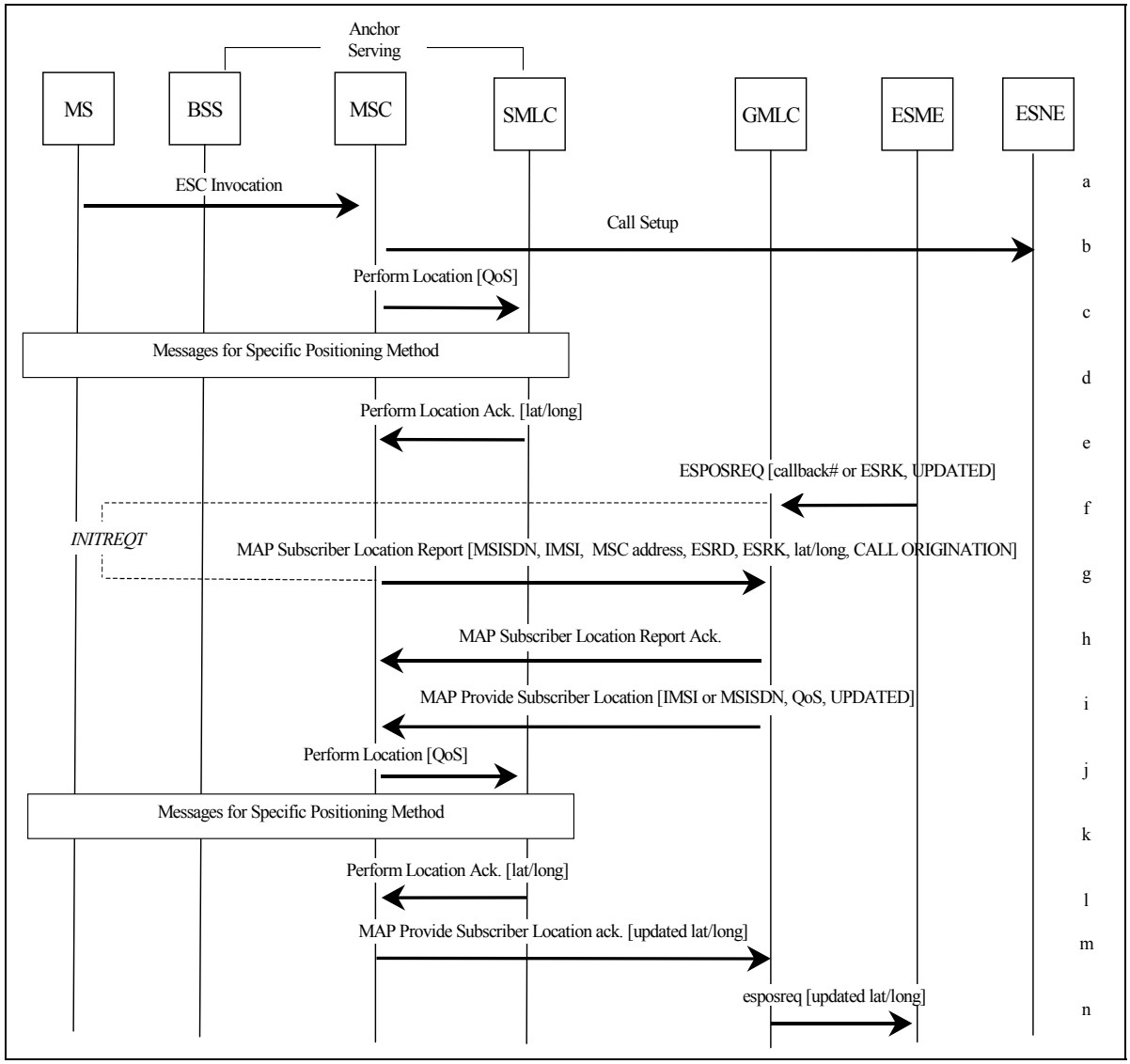

Figure 6-9: **Successful ELID NCAS Pull of Updated Position during an Emergency Services Call (Initial Position Information not Already Available in the GMLC)**

a. The MS invokes an Emergency Services call – for details, refer to the scenarios for CAS. The MS may identify itself using a TMSI, IMSI or IMEI.

b. The MSC extends the call to the ESNE associated with the MS's current cell location. The call setup should include at a minimum either a callback number (dialable or non-dialable) plus the ESRD or an ESRK.

c. The visited MSC sends a request to perform location to the SMLC associated with the MS's current cell location. This request includes the MS's location capabilities and currently assigned radio channel type (SDCCH, TCH-FR or TCH-HR), the QoS required for an emergency call and the current Cell ID and possibly other measurement information.

d. The SMLC instigates a suitable position method. The messages for the specific positioning method are internal to the PCS1900 network and are described in GSM 03.71.

e. Sometime before step g and possibly after step f, the SMLC returns the position estimate to the MSC.

f. The ESME requests the updated position of the MS, identified by its callback number (dialable or non-dialable) or ESRK, in a Position Request Invoke sent to the GMLC. The ESME determines which GMLC to contact based on the ESRK or ESRD provided during call setup (translation from ESRK or ESRD to GMLC address). If a valid ESRD or ESRK is not provided, the GMLC returns the error 'Unrecognized Key' to the ESME. Otherwise, since the GMLC has no record for the emergency call, the GMLC starts an INITREQT timer for the pending updated position request.

g. The MSC sends a MAP Subscriber Location report to the GMLC associated with the emergency services provider to which the emergency call was sent. This message contains the MS position estimate, the MSISDN (or non-dialable callback number), IMSI, the cell Id (ESRD), the MSC address and (if available) ESRK.

h. The GMLC acknowledges receipt of the location information sent in step g. The GMLC stops the INITREQT timer and stores the initial position information and other relevant information about the E911 call in order to support a subsequent NCAS Pull request from the ESME. The GMLC may either omit steps i to m and use the initial position estimate as the updated position in step n or perform steps i to m to obtain a more recent position estimate.

i. The GMLC identifies the VMSC for the pending request for the updated position in step f from the call information stored in step g. The GMLC sends a MAP Provide Subscriber Location message to the VMSC. This message contains the IMSI or MSISDN (dialable or non-dialable callback number), the LCS QoS information (e.g., accuracy, response time), an indication that an updated emergency call position is required and an indication of a location request from an emergency services provider.

j. The visited MSC identifies the emergency call and its associated MS using the IMSI or MSISDN. The MSC verifies that MS privacy for the updated MS position is overridden by the emergency services provider. If a location attempt is already ongoing, the VMSC waits for the position result in step l and omits the remainder of this step and step k. Otherwise, the MSC sends a request to perform location to the SMLC associated with the MS's current cell location. This request includes the MS's location capabilities and currently assigned radio channel type (SDCCH, TCH-FR or TCH-HR), the QoS received from the GMLC and the current Cell ID.

k. The SMLC instigates a suitable position method. The messages for the specific positioning method are internal to the PCS1900 network and are described in GSM 03.71.

l. The SMLC returns the updated MS position estimate to the MSC.

m. The MSC returns the updated position estimate for the MS to the GMLC

n. The GMLC returns the updated position estimate to the ESME in an Emergency Services Position Request Return Result.

2.1.7 Failed ELID NCAS Pull of Updated Position during an Emergency Call (Initial Position Information not Available in GMLC)

This scenario shows the handling of a request for the updated position when initial position information is not available in the GMLC at the time of the request and the information is not received in the allotted time (i.e. the initial position request timer expires).

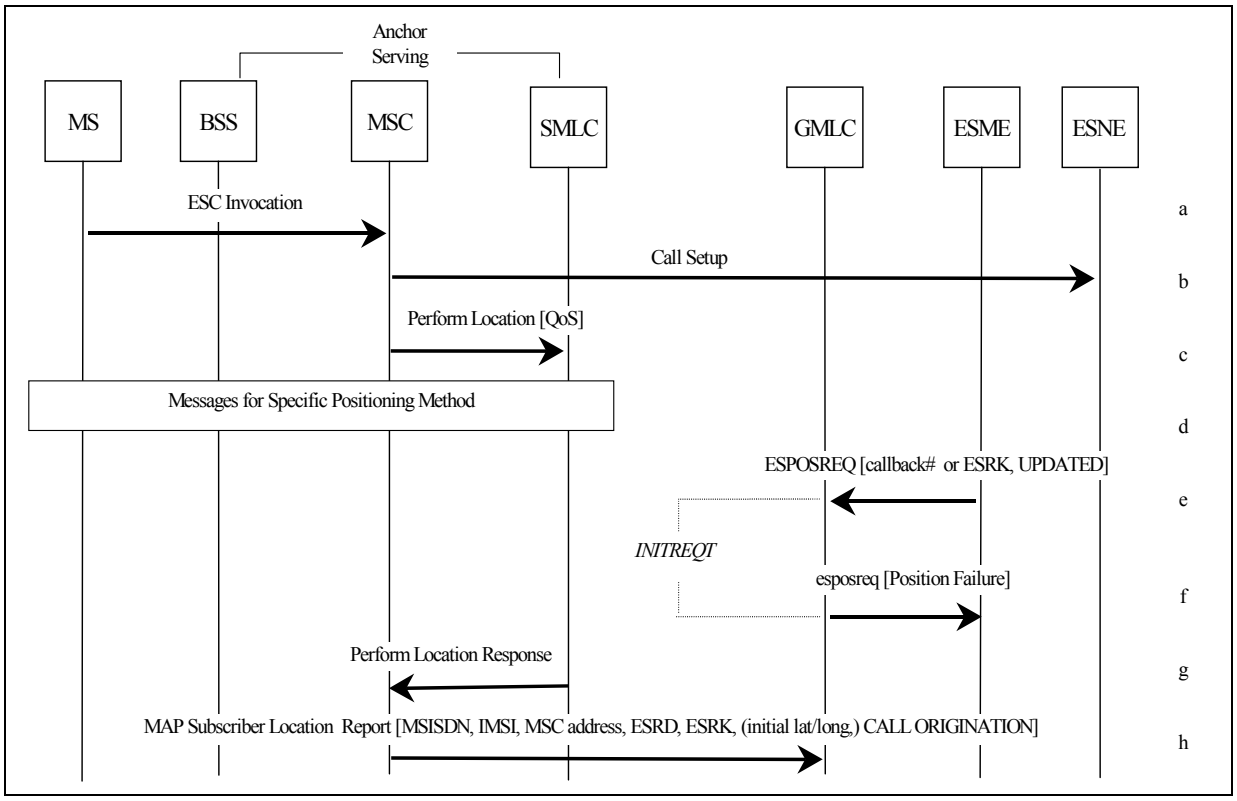

Figure 6-10: Failed ELID NCAS Pull of Updated Position during an Emergency Call (Initial Position Information not Available in GMLC)

a. The MS invokes an Emergency Services call – for details, refer to the scenarios for CAS. The MS may identify itself using a TMSI, IMSI or IMEI.

b. The MSC extends the call to the ESNE associated with the MS's current cell location without further delay. The call setup should include at a minimum either a callback number (dialable or non-dialable) plus the ESRD or an ESRK.

c. The MSC sends a request to perform location to the SMLC associated with the MS's current cell location. This request includes the MS's location capabilities and currently assigned radio channel type (SDCCH, TCH-FR or TCH-HR), the requested QoS and the current cell ID and possibly other measurement information.

d. Messages for individual positioning methods are transferred as described in GSM 03.71.

e. The ESME requests the updated position of the emergency caller. The request contains either the callback number and ESRD or the ESRK. The ESME determines which GMLC to contact based on the ESRK or ESRD provided during call setup (translation from ESRK or ESRD to GMLC address). If a valid ESRD or ESRK is not provided, the GMLC returns the error 'Unrecognized Key' to the ESME Otherwise, since the GMLC has no record for the emergency call, the GMLC starts an INITREQT timer for the pending initial position request.

f. When the INITREQT timer expires, the GMLC returns the position failure result 'Requested Position Not Available' to the ESME in an Emergency Services Position Request Result.

g. The SMLC may return either a successful initial position estimate or a position failure indication to the MSC.

h. The MSC forwards any information received in step g to the GMLC for storage and possible delivery to the ESME via a subsequent NCAS Pull. But in this scenario, the information arrives too late to be sent to the GMLC before step f.

2.1.8 Successful ELID NCAS Pull of Updated Position following MSC-MSC Handover of an Emergency Call

This scenario shows successful NCAS Pull for the updated position of an MS engaged in an Emergency Services call following MSC-MSC handover of an emergency call.

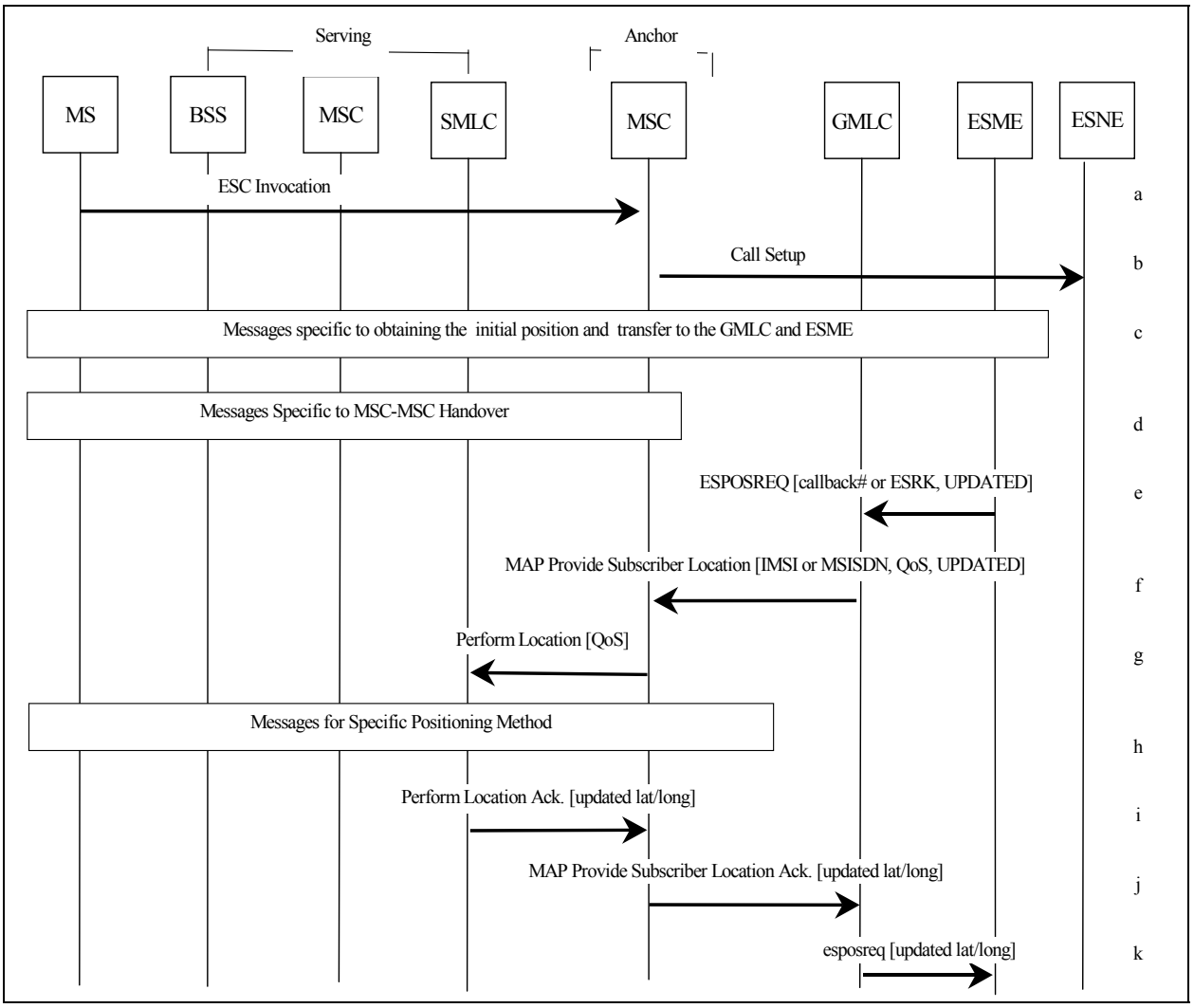

Figure 6-11: **Successful ELID NCAS Pull of Updated Position following MSC-MSC Handover of an Emergency Call**

a. An initially idle MS invokes an Emergency Services call at the visited MSC – for details, refer to the scenarios for CAS. The MS may identify itself using a TMSI, IMSI or IMEI.

b. The MSC extends the call to the ESNE associated with the MS's current cell location. The call setup should include at a minimum either a callback number (dialable or non-dialable) plus an ESRD, that identifies the VMSC and GMLC, or an ESRK.

c. The VMSC initiates procedures to obtain the initial position of the MS and sends the initial position to the GMLC for storage and possible delivery to the ESME via NCAS Pull.

d. The emergency call is handed over to a new serving MSC (for details, refer to GSM 04.08, 08.08 and 09.02).

e. The ESME requests the updated position of the MS, identified by the callback number (dialable or non-dialable) or ESRK, in an Emergency Services Position Request Invoke sent to the GMLC. The ESME determines which GMLC to contact based on the ESRK or ESRD provided during call setup (translation from ESRK or ESRD to GMLC address).

f. The GMLC identifies the visited MSC from the call information previously stored for the emergency services call in step c. The GMLC sends a MAP Provide Subscriber Location message to the VMSC. This message contains the MS subscriber's IMSI or MSISDN (dialable or non-dialable callback number), the LCS QoS information (e.g., accuracy, response time), an indication that the updated MS position is required and an indication of a location request from an emergency services provider.

g. The visited MSC identifies the target MS using the IMSI or MSISDN. The visited MSC verifies that MS privacy for the updated MS position is overridden by the emergency services provider. If a location attempt is already ongoing, the VMSC waits for the position result in step i and omits the remainder of this step and step h. Otherwise, the visited MSC sends a request to perform location to the SMLC associated with the MS's current cell location. This request includes the MS's location capabilities and currently assigned radio channel type (TCH-FR or TCH-HR), the QoS received from the GMLC and the current Cell ID.

h. The SMLC instigates a suitable position method. The messages for the specific positioning method are internal to the PCS1900 network and are described in GSM 03.71.

i. The SMLC returns the updated MS position estimate to the MSC.

j. The MSC returns the updated position estimate for the MS to the GMLC.

k. The GMLC returns the updated position estimate to the ESME in an Emergency Services Position Request Return Result.

2.1.9 Failed ELID NCAS Pull of Updated Position during an Emergency Call

This scenario shows a request by an ESME for the updated position of an MS engaged in an emergency services call when positioning fails.

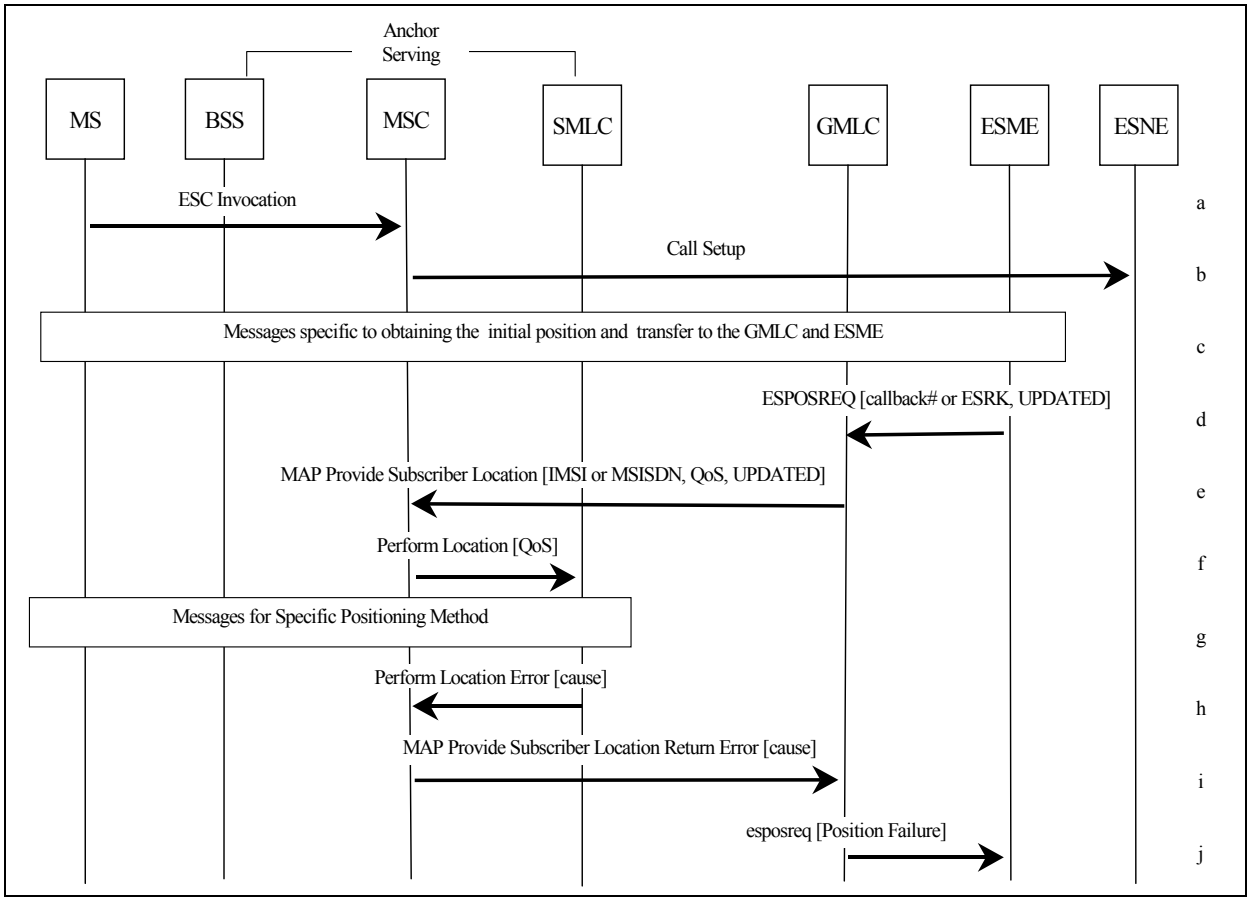

Figure 6-12 : **Failed ELID NCAS Pull of Updated Position during an Emergency Call**

a. The MS invokes an Emergency Services call – for details, refer to the scenarios for CAS. The MS may identify itself using a TMSI, IMSI or IMEI.

b. The MSC extends the call to the ESNE associated with the MS's current cell location. The call setup should include at a minimum either a callback number (dialable or non-dialable) plus the ESRD or an ESRK.

c. The VMSC initiates procedures to obtain the initial position of the MS and sends the initial position to the GMLC for storage and possible delivery to the ESME via NCAS Pull.

d. The ESME requests the updated position of the MS, identified by the callback number (dialable or non-dialable) or ESRK, in a Position Request Invoke sent to the GMLC. The ESME determines which GMLC to contact based on the ESRK or ESRD provided during call setup (translation from ESRK or ESRD to GMLC address).

e. The GMLC identifies the visited MSC from the call information previously stored for the emergency services call in step c. The GMLC sends a MAP Provide Subscriber Location message to the VMSC. This message contains the MS subscriber's IMSI or MSISDN (dialable or non-dialable callback number), the LCS QoS information (e.g., accuracy, response time), an indication that the updated MS position is required and an indication of a location request from an emergency services provider.

f. The visited MSC identifies the target MS using the IMSI or MSISDN.. The visited MSC verifies that MS privacy for the updated MS position is overridden by the emergency services provider. If a location attempt is already ongoing, the VMSC waits for the position result in step h and omits the remainder of this step and step g. Otherwise, the MSC sends a request to perform location to the SMLC associated with the MS's current cell location. This request includes the MS's location capabilities and currently assigned radio channel type (TCH-FR or TCH-HR), the QoS provided by the GMLC and the current Cell ID.

g. The SMLC instigates a suitable position method. The messages for the specific positioning method are internal to the PCS1900 network and are described in GSM 03.71.

h. The SMLC returns an indication that the positioning attempt failed and includes the cause.

i. The MSC returns a MAP Provide Subscriber Location Return Error to the GMLC with the cause of the location attempt failure.

j. The GMLC returns the position failure indication 'Requested Position Not Available' to the ESME in an Emergency Services Position Request Return Result.

2.1.10 ELID NCAS Pull of Last Known Position during an Emergency Call (Updated Position Unavailable and Last Known Position Available in VMSC)

This scenario shows how the ESME can retrieve the last known position of an Emergency Services calling MS in the event that the updated position is not available but the last known position is available in the VMSC.

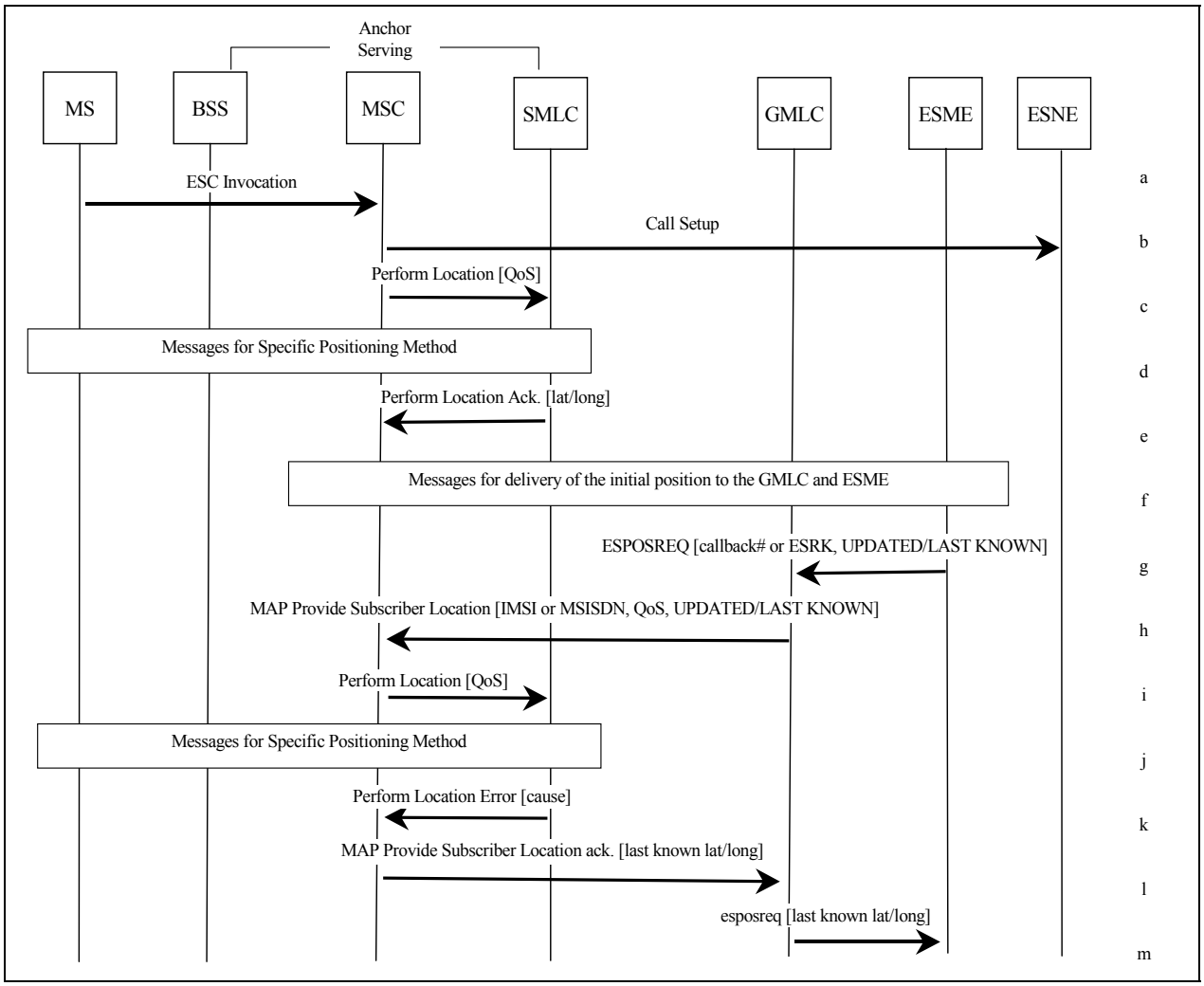

Figure 6-13: **ELID NCAS Pull of Last Known Position during an Emergency Call (Updated Position Unavailable and Last Known Position Available in VMSC)**

a. The MS invokes an Emergency Services call – for details, refer to the scenarios for CAS. The MS may identify itself using a TMSI, IMSI or IMEI.

b. The MSC extends the call to the ESNE associated with the MS's current cell location. The call setup should include at a minimum either a callback number (dialable or non-dialable) plus the ESRD or an ESRK.

c. The visited MSC sends a request to perform location to the SMLC associated with the MS's current cell location. This request includes the MS's location capabilities and currently assigned radio channel type (SDCCH, TCH-FR or TCH-HR), the QoS required for an emergency call and the current Cell ID.

d. The SMLC instigates a suitable position method. The messages for the specific positioning method are internal to the PCS1900 network and are described in GSM 03.71.

e. The SMLC returns the MS position estimate to the MSC.

f. The VMSC sends the initial position to the GMLC for storage and possible delivery to the ESME via NCAS Pull.

g. The ESME requests the updated or, if not available, the last known position of the MS, identified by the callback number (dialable or non-dialable) or ESRK, in a Position Request Invoke sent to the GMLC. The ESME determines which GMLC to contact based on the ESRD or ESRK provided during call setup (translation from ESRD or ESRK to GMLC address).

h. The GMLC identifies the visited MSC from the call information previously stored for the emergency services call in step f. The GMLC sends a MAP Provide Subscriber Location message to the VMSC. This message contains the MS subscriber's IMSI or MSISDN (dialable or non-dialable callback number), the LCS QoS information (e.g., accuracy, response time), an indication that the updated or, if not available, the last known MS position is required and an indication of a location request from an emergency services provider.

i. The visited MSC identifies the target MS using the IMSI or MSISDN. The visited MSC verifies that MS privacy for the updated or last known position is overridden by the Emergency Services provider. If a location attempt is already ongoing, the VMSC waits for the position result in step k and omits the remainder of this step and step j. Otherwise, the MSC sends a request to perform location to the SMLC associated with the MS's current cell location. This request includes the MS's location capabilities and currently assigned radio channel type (TCH-FR or TCH-HR), the QoS provided by the GMLC and the current Cell ID.

j. The SMLC instigates a suitable position method. The messages for the specific positioning method are internal to the PCS1900 network and are described in GSM 03.71.

k. The SMLC returns an indication that the positioning attempt failed and includes the cause.

l. Because the GMLC requested the last known position if the updated position was not available, the MSC returns a MAP Provide Subscriber Location response to the GMLC containing the last known position estimate stored in the VMSC and the age of this location estimate.

m. The GMLC returns this position estimate to the ESME.

2.1.11 ELID NCAS Pull of Last Known Position during an Emergency Call (Updated Position Unavailable and Last Known Position not Available in VMSC)

This scenario shows how the ESME can retrieve the last known position of an Emergency Services calling MS in the event that the updated position is not available and the last known position is not available in the VMSC.

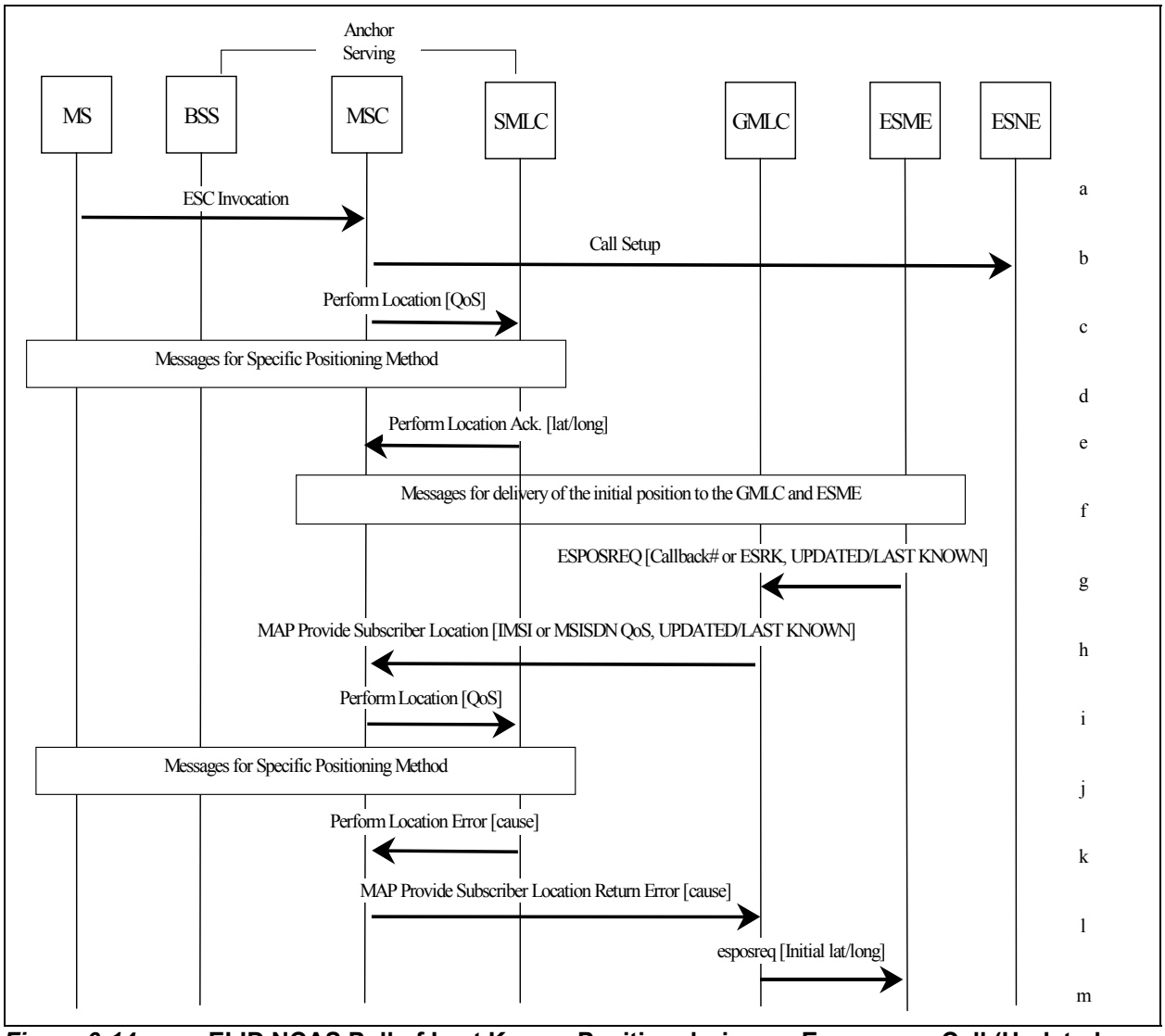

Figure 6-14: **ELID NCAS Pull of Last Known Position during an Emergency Call (Updated Position Unavailable and Last Known Position not Available in VMSC)**

a. The MS invokes an Emergency Services call – for details, refer to the scenarios for CAS. The MS may identify itself using a TMSI, IMSI or IMEI.

b. The MSC extends the call to the ESNE associated with the MS's current cell location. The call setup should include at a minimum either a callback number (dialable or non-dialable) plus the ESRD or an ESRK.

c. Either when the call is originated or some time later, the visited MSC sends a request to perform location to the SMLC associated with the MS's current cell location. This request includes the MS's location capabilities and currently assigned radio channel type (SDCCH, TCH-FR or TCH-HR), the QoS required for an emergency call and the current Cell ID.

d. The SMLC instigates a suitable position method. The messages for the specific positioning method are internal to the PCS1900 network and are described in GSM 03.71.

e. The SMLC returns the MS position estimate to the MSC.

f. The VMSC sends the initial position to the GMLC for storage and possible delivery to the ESME via NCAS Pull.

g. The ESME requests the updated or, if not available, the last known position of the MS, identified by the callback number (dialable or non-dialable) or ESRK, in a Position Request Invoke sent to the GMLC. The ESME determines which GMLC to contact based on the ESRD or ESRK provided during call setup (translation from ESRD or ESRK to GMLC address).

h. The GMLC identifies the visited MSC from the call information previously stored for the emergency services call in step f. The GMLC sends a MAP Provide Subscriber Location message to the VMSC. This message contains the MS subscriber's IMSI or MSISDN (dialable or non-dialable callback number), the LCS QoS information (e.g., accuracy, response time), an indication that the updated or, if not available, the last known MS position is required and an indication of a location request from an emergency services provider.

i. The visited MSC identifies the target MS using the IMSI or MSISDN. The visited MSC verifies that MS privacy for the updated or last known position is overridden by the Emergency Services provider. If a location attempt is already ongoing, the VMSC waits for the position result in step k and omits the remainder of this step and step j. Otherwise, the MSC sends a request to perform location to the SMLC associated with the MS's current cell location. This request includes the MS's location capabilities and currently assigned radio channel type (TCH-FR or TCH-HR), the QoS provided by the GMLC and the current Cell ID.

j. The SMLC instigates a suitable position method. The messages for the specific positioning method are internal to the PCS1900 network and are described in GSM 03.71.

k. The SMLC returns an indication that the positioning attempt failed and includes the cause.

l. Since the VMSC has neither an updated nor last known position for the MS, the VMSC returns a MAP Provide Subscriber Location Return Error to the GMLC with the cause of the location attempt failure.

m. Since the GMLC has the initial position in this scenario, the GMLC returns this initial position estimate to the ESME. If positioning had instead failed in step d, the GMLC call record in step f would not contain an initial position estimate: in that case, the GMLC would return the positioning failure indication 'Requested Position Not Available' to the ESME.

2.1.12 Test Message between the ESME and GMLC

This scenario shows the mechanism used by the Emergency Services Network to test the communication between the ESME application and the GMLC application.

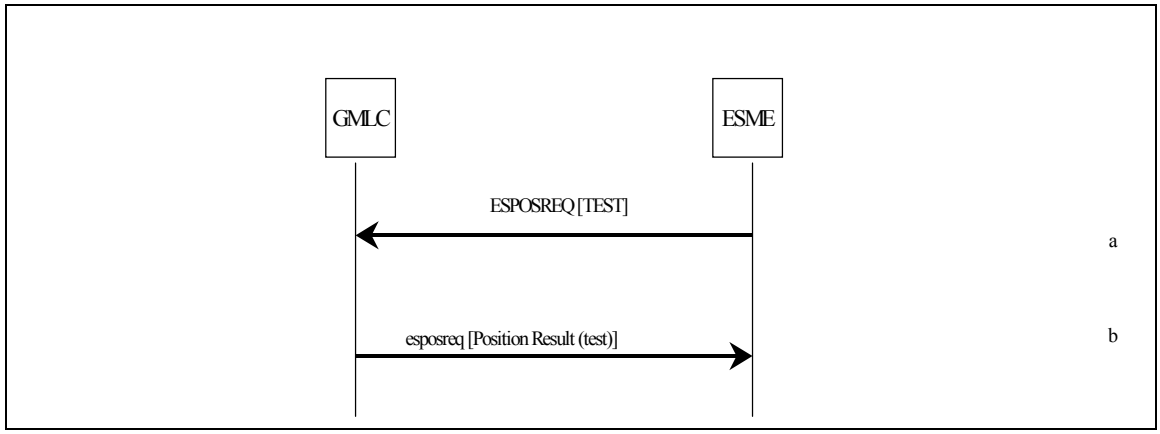

Figure 6-15: **Test Message between the ESME and GMLC**

a. The ESME sends a test request.

b. The GMLC responds immediately with a successful test response. No further processing is required by the GMLC.

Chapter 7: Stage 3 Implementation Perspective: Emergency Services Protocol (ESP)

1 Introduction

This section specifies the Abstract Syntax for the Emergency Services Protocol using the Abstract Syntax Notation One (ASN.1), defined in ITU-T Recommendations X.680 (1994) and X.680 Amendment 1 (1995) and the OPERATION and ERROR external MACROs, defined in ANSI T1.114-1996.

The encoding rules applicable to the defined Abstract Syntax are the ASN.1 Basic Encoding Rules defined in ITU-T Recommendation X.690 (1994). Implicit tagging is used for all context specific parameters.

The Emergency Services Protocol (ESP) supports the following interfaces via the EmergencyServicesPositionRequest:

a. Figure 3-1 “Network Reference Model” interface: MPC to ESME (Reference Point “E_2”).

b. Figure 5-1 “Network Reference Model for PCS1900” interface: GMLC to ESME (Reference Point “E_2”).

Parameter contents imported from other specifications (e.g. T1.114 and ANSI-41) are imported without length and identifier octets.

1.1 Transaction Portion

The Emergency Services Protocol employs the Query with Permission and Response TCAP Package Types defined in ANSI T1.114-1996.

1.2 Component Portion

The Emergency Services Protocol employs the Invoke (Last), Return Result (Last), Return Error and Reject TCAP Component Types defined in ANSI T1.114-1996 with the following exceptions and limitations:

a. The Operation Code Identifier is coded as Private TCAP.

b. The Operation Code is partitioned into an Operation Family followed by a Specifier associated with each Operation Family member. For the Emergency Services Protocol, the Operation Family is coded as decimal 1. Bit H of the Operation Family is always coded as 0.

c. A TCAP INVOKE component shall contain a Component ID Length greater than zero.

d. A TCAP RETURN RESULT component shall only be transmitted in response to an INVOKE Component.

e. A TCAP RETURN ERROR component shall only be sent in response to an INVOKE component, not a RETURN RESULT component.

f. The Error Code Identifier is coded as Private TCAP.

g. If a problem is detected by TCAP (i.e. the received message does not conform to ANSI T1.114.3), a TCAP REJECT component with one of the following Problem Specifiers shall be sent:

    i. Problem Type General: all defined Problem Specifiers are applicable.

    ii. Problem Type Transaction Portion: all defined Problem Specifiers are applicable.

h. If a problem is detected by the Emergency Services TC-user (i.e. the received message does not conform to the Emergency Services Protocol), a TCAP REJECT component with one of the following TCAP Problem Specifiers shall be sent:

    i. Problem Type INVOKE: Duplicate Invoke ID, Unrecognized Operation Code or Incorrect Parameter.

i. The Parameter Set Identifier is coded per ANSI T1.114 (national, constructor with Identifier code 18).

2 Emergency Services Protocol Abstract Syntax

The Emergency Services Protocol is composed of one ASN.1 module dealing with operations, errors and data types.

```
EmergencyServicesProtocol { iso (1) memberbody (2) usa (840) emergencyServicesProtocol (1) }
DEFINITIONS

::=

BEGIN

EXPORTS
        Digits,
        GeographicPosition,
        IMSI,
        MobileIdentificationNumber,
        PositionInformation,
        PositionRequestType;

IMPORTS
        ERROR,
        OPERATION
FROM TCAPPackage { iso (1) memberbody (2) usa (840) T1.114 (10013) } ;

-- Operations Definitions

-- The Emergency Services Position Request operation is used to request the initial,
-- updated or last known position of an MS. The default value of the Emergency Services Position Request
-- Timer (ESPRT) is beyond the scope of this standard.
EmergencyServicesPositionRequest ::= OPERATION  -- Timer ESPRT
PARAMETER
        esprArg         EmergencyServicesPositionRequestArgument
RESULT
        esprRes         EmergencyServicesPositionRequestResponse
ERRORS {
        SystemFailure,
        UnauthorizedRequest,
        UnexpectedDataValue,
        UnrecognizedKey }

-- Emergency Services Position Request operation code family and specifier
emergencyServicesPositionRequest  EmergencyServicesPositionRequest ::= localValue {1, 1}
```

```
-- Emergency Services errors and error codes
SystemFailure ::= ERROR
systemFailure           SystemFailure ::= localValue 1

UnauthorizedRequest ::= ERROR
unauthorizedRequest     UnauthorizedRequest ::= localValue 2

UnexpectedDataValue ::= ERROR
unexpectedDataValue     UnexpectedDataValue ::= localValue 3

UnrecognizedKey ::= ERROR
unrecognizedKey         UnrecognizedKey ::= localValue 4



-- Emergency Services data types
EmergencyServicesPositionRequestArgument ::= SEQUENCE {
esprSysId       [0] ESMEIdentification,
                -- Identifies the system initiating the request (i.e., ESME).
esprReqType     [1] PositionRequestType,
                -- If set to “test”, then esprKey should be set to a zero-length EmergencyServicesRoutingKey
                -- for a heartbeat or keep-alive message, or test digits EmergencyServicesRoutingKey for a test
                -- position request.
esprKey         CHOICE {
                        [2] EmergencyServicesRoutingKey,
                        SEQUENCE {
                            [3] CallbackNumber,
                            [4] EmergencyServicesRoutingDigits OPTIONAL -- Provide if available
                        }
                }
...
}

EmergencyServicesPositionRequestResponse ::= SEQUENCE {
esprPosRes              [0] PositionResult,
esprPosInfo             [1] PositionInformation OPTIONAL,
                        -- Shall be present as indicated in the esprPosRes parameter.
esprCallback            [2] CallbackNumber OPTIONAL,
                        -- Shall be provided, if available, if the esprKey was the ESRK.
esprESRD                [3] EmergencyServicesRoutingDigits OPTIONAL,
                        -- Shall be provided, if available, if the initial position was requested
esprESRKTime            [4] GeneralizedTime OPTIONAL,
                        -- Time of ESRK assignment. Shall be provided, if available, when the
                        -- the esprKey was the ESRK.
esprMIN                 [5] MobileIdentificationNumber   OPTIONAL,
esprIMSI                [6] IMSI OPTIONAL,
esprMCallStatus         [7] MobileCallStatus   OPTIONAL,
esprCompID              [8] CompanyID   OPTIONAL,
                        -- In the US and Canada it shall be provided when available.
```

```
…
}

-- Emergency Services Parameter Definitions

-- The MDN, MSISDN or non-dialable callback number that identifies the emergency services caller.
CallbackNumber ::= Digits
                -- Type of digits = Calling Party Number
                -- Nature of number = National/International, no presentation restrictions
                -- Encoding = BCD
                -- Numbering Plan = Telephony Numbering Plan (E.164)

-- The CompanyID parameter carries a unique identifier for the wireless service
-- provider. In the US and Canada the identifiers are managed and assigned by NENA.
CompanyID ::= VisibleString (SIZE (1..15))

-- The Digits parameter is a generic parameter that carries digits and provides additional
-- information related to those digits (i.e. type of digits, nature of number, and numbering plan).
Digits ::= OCTET STRING -- See T1.114.5 Digits parameter for encoding

-- The EmergencyServicesRoutingDigits parameter uniquely identifies a base station, cell site or sector.
EmergencyServicesRoutingDigits ::= Digits
                -- Type of digits = Routing Number
                -- Nature of number = National/International, no presentation restrictions
                -- Encoding = BCD
                -- Numbering Plan = Telephony Numbering Plan (E.164)

-- The EmergencyServicesRoutingKey parameter uniquely identifies an ongoing Emergency Services Call.
EmergencyServicesRoutingKey ::=  Digits
                -- Type of digits = Routing Number
                -- Nature of number = National/International, no presentation restrictions
                -- Encoding = BCD
                -- Numbering Plan = Telephony Numbering Plan (E.164)

-- The ESMEIdentification parameter uniquely identifies the ESME sending a particular message.
-- In the US and Canada the identifiers are managed and assigned by NENA
ESMEIdentification ::= VisibleString (SIZE (1..15))

-- GeneralizedTime is a UNIVERSAL type defined in X.680. This is always specified in UTC.

-- The GeographicPosition parameter specifies a location in latitude and longitude
-- coordinates, reference WGS-84 data.
GeographicPosition ::= OCTET STRING  -- See CallingGeodeticLocation in T1.628 for encoding. At a mini-
```

mum, in order to provide the required fields, the *Type of shape* field values recommended to be supported are *Ellipsoid point* and *Ellipsoid point with uncertainty.*

```
IMSI ::= Digits
                -- The overall number of digits in IMSI shall not exceed 15 digits.
                -- Type of digits = Not used
                -- Nature of number = International, no presentation restrictions
                -- Encoding = BCD
                -- Numbering Plan = Land Mobile Numbering Plan (E.212)

-- The MobileCallStatus parameter indicates the validation status of the mobile in ANSI-41 systems.
MobileCallStatus ::= OCTET STRING -- See Chapter 8 for encoding

MobileIdentificationNumber ::= Digits
                -- Type of digits = Not used
                -- Nature of number = International, no presentation restrictions
                -- Encoding = BCD
                -- Numbering Plan = Not applicable

-- The PositionInformation parameter contains the geographic position estimate of the
-- mobile and the time of the position determination. The PositionInformation parameter
-- may also contain information regarding the method used to obtain the geographic
-- position.
PositionInformation ::= SEQUENCE {
posTime             [0] GeneralizedTime, -- Time of position determination.
geoPos              [1] GeographicPosition,
positionSource      [2] PositionSource   OPTIONAL,
…
}

-- The PositionRequestType parameter indicates the type of position requested.
PositionRequestType ::= ENUMERATED {
initial             (1),        -- In LSP, return updated position only if
                                -- initial position is unavailable
updated             (2),
updatedorLastKnown  (3),
test                (4)         -- This value is only applicable for ESP
…
}
```

```
-- Exception handling: Undefined values are treated as value 1 (initial)


-- The PositionResult parameter indicates the type of position returned or the reason for
-- not providing position information.
PositionResult ::= ENUMERATED {
                        initialPositionReturned         (1),
                        updatedPositionReturned         (2),
                        lastKnownPositionReturned       (3),

                        -- The following codes indicate that position was not returned.
                        requestedPositionNotAvailable (4),
                        callerDisconnected              (5),
                        -- No call in progress for caller identified.
                        callerHandedOff                 (6),
                        -- Caller has handed-off (e.g. to a position incapable system).
                        inactive                        (7),
                        -- Identified mobile is inactive or has roamed to another system.
                        unresponsive                    (8),
                        -- Identified mobile is active, but does not respond to position request.
                        refused                         (9),
                        -- Identified mobile is responsive, but refused position request.
                        test                            (10),
                        -- Indicates successful test.
…
}
-- Exception handling:
-- If undefined values are received they are treated as if value 4 (requestedPositionNotAvailable)
-- was received.
```

```
-- The PositionSource parameter specifies how a particular position information was
-- obtained to help assess its credibility.
PositionSource ::= ENUMERATED {
                        unknown (0),
                                -- Network Position Sources
                        networkUnspecified (1),
                        networkAOA (2),
                        networkTOA (3),
                        networkTDOA (4),
                        networkRFFingerprinting (5),
                        networkCellSector (6),
                        networkCellSectorWithTiming (7),

                                -- Handset Position Sources
                        handsetUnspecified (16),
                        handsetGPS (17),
                        handsetAGPS (18),
                        handsetEOTD (19),
                        handsetAFLT (20),
                        handsetEFLT (21)

…
}
-- Exception handling:
-- Undefined values in the range 1-15 are treated as if value 1 (networkUnspecified)
-- Undefined values in the range 16-31 are treated as if value 16 (handsetUnspecified)
-- Other undefined values are treated as if value 0 (unknown)
END
```

Chapter 8: Stage 3 Implementation Perspective: *ANSI-41.5* Enhancements

1 Introduction

The ANSI TIA/EIA-41 protocol enhancements support Figure 3-1 “Network Reference Model” interfaces:

a. MSC – MSC (Reference Point “E”) via operations:
   i. IntersystemPositionRequestForward, and
   ii. FlashRequest.
   iii. SMSDeliveryBackward
   iv. SMSDeliveryForward

b. MSC – MPC (Reference Point “E_3”) via operations:
   i. CallTerminationReport,
   ii. IntersystemPositionRequest, and
   iii. OriginationRequest.
   iv. SMSDeliveryPointToPoint

c. PDE – MPC (Reference Point “E_5”) via operations:
   i. CallTerminationReport
   ii. GeoPositionRequest,
   iii. GeoPositionDirective,
   iv. InterSystemPositionRequest, and
   v. SMSDeliveryPointToPoint.

d. MSC – PDE (Reference Point “E_{12}”) via operation:
   i. SMSDeliveryPointToPoint.
   ii. IntersystemPositionRequest.

2 Operations and Parameter Definitions

2.1 DATA TRANSFER SERVICES

2.1.1 SS-7 BASED DATA TRANSFER SERVICES

2.1.1.1 Message Transfer Part

Table 8-1: **MTP Message Priority Values for TIA/EIA-41 Operations**

TIA/EIA-41 Operation	Operation Specifier
CallTerminationReport	0
GeoPositionDirective	0
GeoPositionRequest	0
IntersystemPositionRequest	0
IntersystemPositionRequestForward	0

2.2 MAP Operations

2.2.1 General

2.2.1.1 Operation Specifiers

(*ANSI-41-D* Chapter 5, page 5-25)

The following table lists the *ANSI-41* MAP Operation Specifiers.

Table 8-2: **TIA/EIA-41 MAP Operation Specifiers**

Operation Name	Operation Specifier	
	H G F E D C B A	Decimal
• • •	• • •	• • •
CallTerminationReport	0 1 0 1 1 1 0 0	92
GeoPositionDirective	0 1 0 1 1 1 0 1	93
GeoPositionRequest	0 1 0 1 1 1 1 0	94
IntersystemPositionRequest	0 1 0 1 1 1 1 1	95
IntersystemPositionRequestForward	0 1 1 0 0 0 0 0	96

2.2.1.2 Operation Definitions

(*ANSI-41-D* Chapter 5, page 5-27)

The following table summarizes the operations defined for the *ANSI-41* MAP:

Table 8-3: **Summary of MAP Operations**

Operation	Reference
• • •	• • •
CallTerminationReport	2.2.1.3
GeoPositionDirective	2.2.1.4
GeoPositionRequest	2.2.1.5
IntersystemPositionRequest	2.2.1.6
IntersystemPositionRequestForward	2.2.1.7
• • •	• • •

2.2.1.3 CallTerminationReport

(new for *ANSI-41-D* Chapter 5, page 5-40)

The CallTerminationReport (CTRPT) operation is used by an MSC to report to an MPC that a call has been released and all resources (e.g., ESRK) assigned to the call may be released. The MPC upon receiving this message from the MSC may use it to inform the PDE that a call has been released.

The following table lists the possible combinations of invoking and responding FEs.

Table 8-4: **FE Combinations for CTRPT**

	INVOKING FE	RESPONDING FE	INTERFACE
Case 1	MSC	MPC	E3
Case 2	MPC	PDE	E5

The CallTerminationReport operation is initiated with a TCAP INVOKE (LAST). This is carried by a TCAP QUERY WITH PERMISSION package. The Parameter Set is encoded as follows:

Table 8-5: **CallTerminationReport INVOKE Parameters**

CallTerminationReport INVOKE Parameters				**Timer: CTRT**
Field	**Value**	**Type**	**Reference**	**Notes**
Identifier	SET [NATIONAL 18]	M	6.3.2.1	
Length	variable octets	M	6.3.2.1	
Contents				
BillingID		M	6.5.2.16	a
ElectronicSerial Number		O	6.5.2.63	c
MSID		O	6.5.2.bv	b
NetworkTMSI		O	6.5.2.117	c

Notes:

a. Include to identify the call.

b. Include the identifier with which the MS last accessed the system, unless that identifier was a MIN-based IMSI, in which case the MobileIdentificationNumber (populated with the MIN derived from that IMSI) should be included.

c. Include if applicable.

The CallTerminationReport operation success is reported with a TCAP RETURN RESULT (LAST). This is carried by a TCAP RESPONSE package. The Parameter Set is encoded as follows:

Table 8-6: **CallTerminationReport RETURN RESULT Parameters**

CallTerminationReport RETURN RESULT Parameters

Field	Value	Type	Reference	Notes
Identifier	SET [NATIONAL 18]	M	6.3.2.2	
Length	zero octets	M	6.3.2.2	
Contents				

2.2.1.4 GeoPositionDirective

(new for *ANSI-41-D* Chapter 5, page 5-75)

The GeoPositionDirective (GPOSDIR) operation is used to push an MS's position from the PDE to the MPC.

The following table lists the possible combinations of invoking and responding FEs.

Table 8-7: **FE Combinations for GPOSDIR**

	INVOKING FE	RESPONDING FE	INTERFACE
Case 1	PDE	MPC	E5

The GeoPositionDirective operation is initiated with a TCAP INVOKE (LAST). This is carried by a TCAP QUERY WITH PERMISSION package. The Parameter Set is encoded as follows:

Table 8-8: **GeoPositionDirective INVOKE Parameters**

GeoPositionDirective INVOKE Parameters				**Timer: GPDT**
Field	**Value**	**Type**	**Reference**	**Notes**
Identifier	SET [NATIONAL 18]	M	6.3.2.1	
Length	variable octets	M	6.3.2.1	
Contents				
PositionInformation		M	6.5.2.fr	
IMSI		O	6.5.2.bu	a
ElectronicSerialNumber		O	6.5.2.63	a
MobileIdentificationNumber		O	6.5.2.81	a
NetworkTMSI		O	6.5.2.bl	a

Notes:

a. Include if known.

The GeoPositionDirective operation success is reported with a TCAP RETURN RESULT (LAST). This is carried by a TCAP RESPONSE package. The Parameter Set is encoded as follows:

Table 8-9: **GeoPositionDirective RETURN RESULT Parameters**

GeoPositionDirective RETURN RESULT Parameters				
Field	**Value**	**Type**	**Reference**	**Notes**
Identifier	SET [NATIONAL 18]	M	6.3.2.2	
Length	variable octets	M	6.3.2.2	
Contents				
BillingID		O	6.5.2.16	a

a. Include if applicable, to allow correlation.

2.2.1.5 GeoPositionRequest

(new for *ANSI-41-D* Chapter 5, page 5-75)

The GeoPositionRequest (GPOSREQ) operation is used to request the MS position from the PDE.

The following table lists the possible combinations of invoking and responding FEs.

Table 8-10: **FE Combinations for GPOSREQ**

	INVOKING FE	RESPONDING FE	INTERFACE
Case 1	MPC	PDE	E5

There are several possible results returned, as:

a. Requested position information.

b. Reason for the requested information not being returned.

The GeoPositionRequest operation is initiated with a TCAP INVOKE (LAST). This is carried by a TCAP QUERY WITH PERMISSION package. The Parameter Set is encoded as follows:

Table 8-11: **GeoPositionRequest INVOKE Parameters**

GeoPositionRequest INVOKE Parameters				Timer: GPRT
Field	**Value**	**Type**	**Reference**	**Notes**
Identifier	SET [NATIONAL 18]	M	6.3.2.1	
Length	variable octets	M	6.3.2.1	
Contents				
PositionRequestType		M	6.5.2.fs	
BillingID		O	6.5.2.16	h
ElectronicSerialNumber		O	6.5.2.63	b
IMSI		O	6.5.2.bu	b
LCS_Client_ID		O	2.3.2.11	b
MobileIdentificationNumber		O	6.5.2.81	b
MobilePositionCapability		O	6.5.2.fm	a
Mobinfo_AMPS **Macro**		O	6.5.2.fp	f
Mobinfo_CDMA **Macro**		O	6.5.2.fq	g
Mobinfo_NAMPS **Macro**		O	6.5.2.fo	e
Mobinfo_TDMA**Macro**		O	6.5.2.fn	d
MSCID (Serving)		O	6.5.2.82	b
NetworkTMSI		O	6.5.2.bl	b
ServingCellID		O	6.5.2.117	b
Teleservice_Priority		O	6.5.2.dt	c

Notes:

a. Include if known, to identify the MS's position capabilities.

b. Include if known.

c. If TDMA, include to specify priority for message processing. In the absence of this parameter, treat as the lowest priority.

d. Include if a TDMA channel is in use.

e. Include if an NAMPS channel is in use.

f. Include if an AMPS channel is in use.

g. Include if an CDMA channel is in use.

h. Include if applicable.

The GeoPositionRequest operation success is reported with a TCAP RETURN RESULT (LAST). This is carried by a TCAP RESPONSE package. The Parameter Set is encoded as follows:

Table 8-12: **GeoPositionRequest RETURN RESULT Parameters**

GeoPositionRequest RETURN RESULT Parameters				
Field	**Value**	**Type**	**Reference**	**Notes**
Identifier	SET [NATIONAL 18]	M	6.3.2.2	
Length	variable octets	M	6.3.2.2	
Contents				
PositionInformation		O	6.5.2.fr	b
PositionResult		M	6.5.2.ft	a

Notes:

a. Include to identify the position results.

b. Include if position information was obtained.

2.2.1.6 InterSystemPositionRequest

(new for *ANSI-41-D* Chapter 5, page 5-75)

The InterSystemPositionRequest (ISPOSREQ) operation is used to request MS position information between network elements. This message may also be used to ascertain an MS's cell, sector, channel and TMSI information.

The following table lists the possible combinations of invoking and responding FEs.

Table 8-13: **FE Combinations for ISPOSREQ**

	INVOKING FE	RESPONDING FE	INTERFACE
Case 1	MPC	MSC	E_3
Case 2	MSC	MPC	E_3
Case 3	PDE	MSC	E_{12}
Case 4	PDE	MPC	E_5

There are several possible results returned, as:

a. Requested position information (e.g., initial, current, last).

b. Mobile channel information is returned, when the responding MSC is serving the MS.

c. Reason for the requested information not being returned.

The InterSystemPositionRequest operation is initiated with a TCAP INVOKE (LAST). This is carried by a TCAP QUERY WITH PERMISSION package. The Parameter Set is encoded as follows:

Table 8-14: **InterSystemPositionRequest INVOKE Parameters**

InterSystemPositionRequest INVOKE Parameters				Timer: IPRT
Field	**Value**	**Type**	**Reference**	**Notes**
Identifier	SET [NATIONAL 18]	M	6.3.2.1	
Length	variable octets	M	6.3.2.1	
Contents				
PositionRequestType		M	6.5.2.fs	
CDMAPSMMCount		O	6.5.2.gb	h
ElectronicSerialNumber		O	6.5.2.63	d
EmergencyServicesRoutingDigits		O	6.5.2.bs *J-STD-034*	d, f
IMSI		O	6.5.2.bu	d
LCS_Client_ID		O	2.3.2.11	d
MobileDirectoryNumber		O	6.5.2.80	d
MobileIdentificationNumber		O	6.5.2.81	d
MobInfo_AMPS **Macro**		O	6.5.2.fn	b, f
MobInfo_CDMA **Macro**		O	6.5.2.fo	a, f
MobInfo_NAMPS **Macro**		O	6.5.2.fp	c, f
MobInfo_TDMA **Macro**		O	6.5.2.fq	g, f
MobilePositionCapability		O	6.5.2.fm	e, f
MSCID (Serving)		O	6.5.2.82	f
NetworkTMSI		O	6.5.2.bl	d
ServingCellID		O	6.5.2.117	f
TDMA_MAHORequest		O	2.3.2.28	i

Notes:

a. Include if an CDMA channel is in use.

b. Include if an AMPS channel is in use.

c. Include if an NAMPS channel is in use.

d. Include if known.

e. Include if known, to identify the MS's position capabilities.

f. Only include when initiating entity is an MSC.

g. Include if a TDMA channel is in use.

h. Include if the MSC should collect Pilot Strength Measurements from the MS.

i. Include if the MSC should collect MAHO Measurements from the MS

The InterSystemPositionRequest operation success is reported with a TCAP RETURN RESULT (LAST). This is carried by a TCAP RESPONSE package. The Parameter Set is encoded as follows:

Table 8-15: **InterSystemPositionRequest RETURN RESULT Parameters**

InterSystemPositionRequest RETURN RESULT Parameters				
Field	**Value**	**Type**	**Reference**	**Notes**
Identifier	SET [NATIONAL 18]	M	6.3.2.2	
Length	variable octets	M	6.3.2.2	
Contents				
PositionResult		M	6.5.2.ft	
MobilePositionCapability		O	6.5.2.fm	e
MobInfo_AMPS **Macro**		O	6.5.2.fn	c,e
MobInfo_CDMA **Macro**		O	6.5.2.fo	b,e
MobInfo_NAMPS **Macro**		O	6.5.2.fp	g,e
MobInfo_TDMA **Macro**		O	6.5.2.fq	a,e
MSCID (Serving)		O	6.5.2.82	f
PositionInformation		O	6.5.2.fr	h
ServingCellID		O	6.5.2.117	d

Notes:

a. Include if a TDMA channel is in use.

b. Include if a CDMA channel is in use.

c. Include if an AMPS channel is in use.

d. Include if known when the responding entity is an MSC.

e. Include when the responding entity is the Serving MSC.

f. Include to identify the Serving MSC.

g. Include if an NAMPS channel is in use.

h. Include if known.

2.2.1.7 InterSystemPositionRequestForward

(new for *ANSI-41-D* Chapter 5, page 5-75)

The IntersystemPositionRequestForward (ISPOSREQFWD) operation is used from the Anchor MSC toward the Serving MSC to request MS position information.

The following table lists the possible combinations of invoking and responding FEs.

Table 8-16: **FE Combinations for ISPOSREQFWD**

	INVOKING FE	RESPONDING FE	INTERFACE
Case 1	Anchor MSC	Serving MSC	E
Case 2	Anchor MSC	Tandem MSC	E
Case 3	Tandem MSC	Tandem MSC	E
Case 4	Tandem MSC	Serving MSC	E

There are several possible results returned, as:

a. Requested position information (e.g., initial, current, last).

b. Reason for the requested information not being returned.

The IntersystemPositionRequestForward operation is initiated with a TCAP INVOKE (LAST). This is carried by a TCAP QUERY WITH PERMISSION package. The Parameter Set is encoded as follows:

Table 8-17: **InterSystemPositionRequestForward INVOKE Parameters**

InterSystemPositionRequestForward INVOKE Parameters				Timer: IPFT
Field	**Value**	**Type**	**Reference**	**Notes**
Identifier	SET [NATIONAL 18]	M	6.3.2.1	
Length	variable octets	M	6.3.2.1	
Contents				
ElectronicSerialNumber		M	6.5.2.63	
InterMSCCircuitID		M	6.5.2.72	
PositionRequestType		M	6.5.2.fs	
IMSI		O	6.5.2.bu	a
LCS_Client_ID		O	2.3.2.11	a
MobileIdentificationNumber		O	6.5.1.1	a
MobilePositionCapability		O	6.5.2.fm	b
TDMA_MAHORequest		O	2.3.2.28	c

Notes:

a. Include if known.

b. Include if known, to identify the MS's position capabilities.

c. Include if the MSC should collect MAHO Measurements from the MS.

The InterSystemPositionRequestForward operation success is reported with a TCAP RETURN RESULT (LAST). This is carried by a TCAP RESPONSE package. The Parameter Set is encoded as follows:

Table 8-18: **InterSystemPositionRequestForward RETURN RESULT Parameters**

InterSystemPositionRequestForward RETURN RESULT Parameters				
Field	**Value**	**Type**	**Reference**	**Notes**
Identifier	SET [NATIONAL 18]	M	6.3.2.2	
Length	variable octets	M	6.3.2.2	
Contents				
MSCID (Serving)		M	6.5.2.82	
PositionResult		M	6.5.2.ft	
PositionInformation		O	6.5.2.fr	a
ServingCellID		O	6.5.2.117	a

Notes:

a. Include if known.

2.2.1.8 OriginationRequest

(*ANSI-41-D* Chapter 5, page 5-81)
(*TIA/EIA IS-751*, page 29)

The OriginationRequest operation is used to request call origination treatment on behalf of a registered MS. The ORREQ operation is also used to request the position or emergency services call routing information for an MS from the MPC, when an emergency services call is initiated by the MS.

The following table lists the possible combinations of invoking and responding FEs.

Table 8-19: **Combinations for `ORREQ`**

	INVOKING FE	RESPONDING FE	INTERFACE
Case 1	Serving MSC	HLR	C
Case 2	MSC	MPC	E_3

There are several possible results returned, as:

a. Notification that the origination request was successful with routing instructions.

b. Notification that the origination request was unsuccessful with an (optional) indication of the treatment to provide the served MS.

c. Return of position or routing information for an emergency services call.

The OriginationRequest operation is initiated with a TCAP INVOKE (LAST). This is carried by a TCAP QUERY WITH PERMISSION package. The Parameter Set is encoded as follows:

Table 8-20: **OriginationRequest INVOKE Parameters**

OriginationRequest INVOKE Parameters				**Timer: ORT**
Field	**Value**	**Type**	**Reference**	**Notes**
Identifier	SET [NATIONAL 18]	M	6.3.2.1	
Length	variable octets	M	6.3.2.1	
Contents				
BillingID (originating)		M	6.5.2.16	
Digits (Dialed)		M	6.5.2.58	
ElectronicSerialNumber		M	6.5.2.63	
MSID		M	6.5.2.bv	h, q, r
MSCID		M	6.5.2.82	
OriginationTriggers		M	6.5.2.90	
TransactionCapability		M	6.5.2.160	
CallingPartyNumberDigits1		O	6.5.2.21	a
CallingPartyNumberDigits2		O	6.5.2.22	a
CallingPartySubaddress		O	6.5.2.25	a

EmergencyServicesRoutingDigits	O	6.5.2.bs *J-STD-034*	l
MobileCallStatus	O	6.5.2.fl	l
MobileDirectoryNumber	O	6.5.2.80	b, g
MobilePositionCapability	O	6.5.2.fm	o
MobInfo_AMPS **Macro**	O	6.5.2.fn	i, p, l
MobInfo_CDMA **Macro**	O	6.5.2.fo	j, p, l
MobInfo_NAMPS **Macro**	O	6.5.2.fq	k, p, l
MobInfo_TDMA **Macro**	O	6.5.2.fp	n, p, l
MSCIdentificationNumber	O	6.5.2.83	c
NetworkTMSI	O	6.5.2.bl	l
OneTimeFeatureIndicator	O	6.5.2.88	d
OriginationIndicator	O	6.5.2.89	l
PC_SSN (Originating MSC)	O	6.5.2.93	e
SenderIdentificationNumber	O	6.5.2.116	f
ServingCellID	O	6.5.2.117	m
TerminationRestrictionCode	O	6.5.2.157	l

Notes:

a. Include if applicable.

b. Include if available for recording purposes (see *DMH)*.

c. Include to identify the MSC initiating the message.

d. Include if any OneTimeFeatureIndicator status bits are set (i.e., have value of *1*).

e. Include if SS7 may be used for subsequent call redirection.

f. Include to identify intermediate message sender if different from the MSCIdentificationNumber.

g. For an emergency services call, include as the callback number or the non-dialable callback number.

h. Include the identifier with which the MS last accessed the system, unless that identifier was a MIN-based IMSI, in which case the MobileIdentificationNumber (populated with the MIN derived from that IMSI) should be included.

i. Include if an AMPS channel is in use.

j. Include if a CDMA channel is in use.

k. Include if a NAMPS channel is in use.

l. Include if applicable for an Emergency Services call.

m. Include if known, if applicable.

n. Include if a TDMA channel is in use.

o. Include if known, to identify the MS's position capabilities. Value from the MS takes precedence over the value from the profile, if both are available.

p. Include when the invoking entity is the Serving MSC.

q. For an emergency services call, include an IMSI or MIN of length 0 as MSID if the MS does not have an MSID.

r. If the MS has used TMSI each time it has accessed the system, use the MIN form of the MSID, if known.For an emergency services call,

The OriginationRequest operation success is reported with a TCAP RETURN RESULT (LAST). This is carried by a TCAP RESPONSE package. The Parameter Set is encoded as follows:

Table 8-21: **OriginationRequest RETURN RESULT Parameters**

OriginationRequest RETURN RESULT Parameters				
Field	**Value**	**Type**	**Reference**	**Notes**
Identifier	SET [NATIONAL 18]	M	6.3.2.2	
Length	variable octets	M	6.3.2.2	
Contents				
AccessDeniedReason		O	6.5.2.1	a
ActionCode		O	6.5.2.2	b
AnnouncementList		O	6.5.2.6	c
CallingPartyNumberString1		O	6.5.2.23	d, e
CallingPartyNumberString2		O	6.5.2.24	d, e
CallingPartySubaddress		O	6.5.2.25	d, e, f
CarrierDigits		O	6.5.2.28	g
Digits (Dialed)		O	6.5.2.58	h, x
DMH_AccountCodeDigits		O	6.5.2.59	i
DMH_AlternateBillingDigits		O	6.5.2.60	i
DMH_BillingDigits		O	6.5.2.61	i, v
DMH_RedirectionIndicator		O	6.5.2.62	i, j
GenericDigits		O	6.5.2.fj	t
GeographicPosition		O	6.5.2.fk	w
GroupInformation		O	6.5.2.69	k
MobileDirectoryNumber		O	6.5.2.80	i, u
NoAnswerTime		O	6.5.2.87	l
OneTimeFeatureIndicator		O	6.5.2.88	m
PilotNumber		O	6.5.2.95	k
RedirectingNumberDigits		O	6.5.2.107	f
RedirectingNumberString		O	6.5.2.108	d
RedirectingSubaddress		O	6.5.2.109	d, e
RoutingDigits		O	6.5.2.114	g
TerminationList		O	6.5.2.156	n, x
TerminationTriggers		O	6.5.2.57	o

Notes:

a. Include if access is denied. If included, no other optional parameters shall be included (with the exception of the AnnouncementList parameter).

b. Include if action to be performed is not implied through presence of other parameters.

c. Include if one or more tones or announcements are to be applied to the MS.

d. Include if a LocalTermination parameter is included in the TerminationList parameter.

e. Include if the related feature is active.

f. Include if a PSTNTermination parameter or an IntersystemTermination parameter is included within the TerminationList parameter.

g. Include if applicable.

h. Include if digits remain to be translated by the MSC.

i. Include if available for recording purposes (see *DMH*).

j. Include if redirection may apply.

k. Include for multileg calls.

l. Include to request an override of the Serving MSC's default No Answer Time value.

m. Include if modification to normal feature processing is required for the call in progress.

n. Include if call routing is required.

o. Include to indicate processing in the Originating MSC for failed call attempts.

Note: the omitted text is retained without modification.

t. Include if the Generic Digits parameter in an outgoing ISUP IAM message should be populated by this value with the Type of Digits set to Location Identification Number.

u. Include if the Calling Party Number parameter in an outgoing ISUP IAM message should be populated by this value.

v. Include if the Charge Number parameter in an outgoing ISUP IAM message or the ANI in an outgoing MF trunk should be populated by this value.

w. Include if geographic position information should be included in an outgoing ISUP IAM message.

x. This parameter may contain an ESRK or ESRD for Emergency Services Calls. See Annex D.

2.2.1.9 SMSDeliveryBackward

The SMSDeliveryBackward operation is a general purpose operation that is used to convey an MS-originated short message or in general any other information or encapsulated data to the Anchor MSC after handoff.

The SMSDeliveryBackward operation is initiated with a TCAP INVOKE (LAST). This is carried by a TCAP QUERY WITH PERMISSION package. The Parameter Set is encoded as follows:

Table 8-22: **SMSDeliveryBackward INVOKE Parameters**

SMSDeliveryBackward INVOKE Parameters				**Timer: SBT**
Field	**Value**	**Type**	**Reference**	**Notes**
Identifier	SET [NATIONAL 18]	M	6.3.2.1	
Length	variable octets	M	6.3.2.1	
Contents				
InterMSCCircuitID		M	6.5.2.72	
MSID *(IS-751)*		M	6.5.2.bv	a, k
SMS_BearerData		M	6.5.2.124	
SMS_TeleserviceIdentifier		M	6.5.2.137	
CDMAServingOneWayDelay2		O	6.5.2.gd	l
ElectronicSerialNumber		O	6.5.2.63	~~b~~a
MSCID (Serving)		O	6.5.2.82	i
ServiceIndicator		O	6.5.2.wB	l
ServingCellID		O	6.5.2.117	i
SMS_ChargeIndicator		O	6.5.2.126	c
SMS_DestinationAddress		O	6.5.2.127	d
SMS_OriginalDestinationAddress		O	6.5.2.131	e
SMS_OriginalDestinationSubaddress		O	6.5.2.132	b
SMS_OriginalOriginatingAddress		O	6.5.2.133	f
SMS_OriginalOriginatingSubaddress		O	6.5.2.134	b
SMS_OriginatingAddress		O	6.5.2.135	g
SMS_TransactionID *(PN-3590)*		O	6.5.2.ee	h

Notes:

a. Include to identify the originating MS.

b. Include if applicable.

c. Include if applicable. If not received, charge message originator.

d. Include if not carried by the underlying data transport. May require an interconnection agreement to facilitate interworking between network types.

e. Include if different than the destination address (SMS_DestinationAddress or underlying data transport destination address).

f. Include if different than the originating address (SMS_OriginatingAddress or underlying data transport originating address).

g. Include if different than the MobileIdentificationNumber, or if not carried by the underlying data transport. May require an interconnection agreement to facilitate interworking between network types.

h. Include for TDMA to identify an MS-based SMS originating SME.

i. Include for CDMA Position Determination, if required for the position technology.

j. Include for CDMA or AMPS Position Determination. When ServiceIndicator is included, the length of the SMS_TeleserviceIdentifier is set to 0.

k. When used to support position determination for an emergency services call, include a MIN or IMSI of length 0 as MSID if the MS does not have an MSID.

The SMSDeliveryBackward operation success is reported with a TCAP RETURN RESULT (LAST). This is carried by a TCAP RESPONSE package. The Parameter Set is encoded as follows:

Table 8-23: **SMSDeliveryBackward RETURN RESULT Parameters**

SMSDeliveryBackward RETURN RESULT Parameters				
Field	**Value**	**Type**	**Reference**	**Notes**
Identifier	SET [NATIONAL 18]	M	6.3.2.1	
Length	variable octets	M	6.3.2.1	
Contents				
SMS_BearerData		O	6.5.2.124	a
SMS_CauseCode		O	6.5.2.125	b
Teleservice_Priority		O	6.5.2.dt	c

Notes:

a. Include for positive acknowledgments, when applicable.

b. Include for all negative acknowledgments.

c. If TDMA, include to specify priority for message processing. In the absence of this parameter, treat as the lowest priority.

2.2.1.10 SMSDeliveryForward

The SMSDeliveryForward operation is a general purpose operation that is used to convey an MS-terminated short message or in general any other information or encapsulated data to the Serving MSC after handoff.

The SMSDeliveryForward operation is initiated with a TCAP INVOKE (LAST). This is carried by a TCAP QUERY WITH PERMISSION package. The Parameter Set is encoded as follows:

Table 8-24: **SMSDeliveryForward INVOKE Parameters**

SMSDeliveryForward INVOKE Parameters				**Timer: SFT**
Field	**Value**	**Type**	**Reference**	**Notes**
Identifier	SET [NATIONAL 18]	M	6.3.2.1	
Length	variable octets	M	6.3.2.1	
Contents				
InterMSCCircuitID		M	6.5.2.72	
SMS_BearerData		M	6.5.2.124	
SMS_TeleserviceIdentifier		M	6.5.2.137	
ActionCode		O	6.5.2.2	k
ElectronicSerialNumber		O	6.5.2.63	~~b~~h
IMSI *(IS-751)*		O	6.5.2.bu	h
MobileIdentificationNumber *(IS-751)*		O	6.5.2.81	~~a,~~ h
ServiceIndicator		O	6.5.2.wB	i
SMS_ChargeIndicator		O	6.5.2.126	c
SMS_DestinationAddress		O	6.5.2.127	d
SMS_OriginalDestinationAddress		O	6.5.2.131	e
SMS_OriginalDestinationSubaddress		O	6.5.2.132	b
SMS_OriginalOriginatingAddress		O	6.5.2.133	f
SMS_OriginalOriginatingSubaddress		O	6.5.2.134	b
SMS_OriginatingAddress		O	6.5.2.135	g
Teleservice_Priority		O	6.5.2.dt	j

Notes:

~~a.~~ *Deleted*~~Include to identify the destination MS.~~

b. Include if applicable.

c. Include if applicable. If not received, charge message originator.

d. Include if different than the destination address (MobileIdentificationNumber or underlying data transport destination address). May require an interconnection agree-

ment to facilitate interworking between network types.

e. Include if different than the destination address (MobileIdentificationNumber, SMS_DestinationAddress, or underlying data transport destination address).

f. Include if different than the originating address (SMS_OriginatingAddress or underlying data transport originating address).

g. Include if different than the MobileIdentificationNumber, or if not carried by the underlying data transport. May require an interconnection agreement to facilitate interworking between network types.

h. Include if available. At least one of these parameters should be present. *(IS-751)*

i. Include for CDMA or AMPS Position Determination. When ServiceIndicator is included, the length of the SMS_TeleserviceIdentifier is set to 0.

j. If TDMA, include to specify priority for message processing. In the absence of this parameter, treat as the lowest priority.

k. Include for Position Determination, if required for the position technology.

The SMSDeliveryForward operation success is reported with a TCAP RETURN RESULT (LAST). This is carried by a TCAP RESPONSE package. The Parameter Set is encoded as follows:

Table 8-25: **SMSDeliveryForward RETURN RESULT Parameters**

SMSDeliveryForward RETURN RESULT Parameters				
Field	**Value**	**Type**	**Reference**	**Notes**
Identifier	SET [NATIONAL 18]	M	6.3.2.2	
Length	variable octets	M	6.3.2.2	
Contents				
CDMAServingOneWayDelay2		O	6.5.2.gd	c
MSCID (Serving)		O	6.5.2.82	c
ServingCellID		O	6.5.2.117	c
SMS_BearerData		O	6.5.2.124	a
SMS_CauseCode		O	6.5.2.125	b

Notes:

a. Include for positive acknowledgments, when applicable.

b. Include for all negative acknowledgments.

c. Include for CDMA Position Determination if required for the position technology.

2.2.1.11 SMSDeliveryPointToPoint

(*ANSI-41.5-D*, page 5-106; Modified in IS-725-A)

The SMSDeliveryPointToPoint operation is a general purpose operation that is used to convey a short message or in general any other information or encapsulated data from one point to another point and report on the success or failure of that transfer (for example, as used in SMS, CDMA OTASP, or Position Determination).

The SMSDeliveryPointToPoint operation is initiated with a TCAP INVOKE (LAST). This is carried by a TCAP QUERY WITH PERMISSION package. The Parameter Set is encoded as follows:

Table 8-26: **SMSDeliveryPointToPoint INVOKE Parameters**

SMSDeliveryPointToPoint INVOKE Parameters				**Timer: SMT**
Field	**Value**	**Type**	**Reference**	**Notes**
Identifier	SET [NATIONAL 18]	M	6.3.2.1	
Length	variable octets	M	6.3.2.1	
Contents				
SMS_BearerData		M	6.5.2.124	
SMS_TeleserviceIdentifier		M	6.5.2.137	
ActionCode		O	6.5.2.2	i
CDMAServingOneWayDelay2		O	6.5.2.gd	n
ElectronicSerialNumber		O	6.5.2.63	a
MSCID (Serving)		O	6.5.2.82	n
MSID		O	6.5.2.bv ~~*IS-751*~~	a, m, p, q
NewlyAssignedIMSI		O	6.5.2.dqB ~~*IS-725-A*~~	j
NewlyAssignedMIN		O	6.5.2.rB ~~*IS-725-A*~~	j
ServiceIndicator		O	6.5.2.wB ~~*IS-725-A*~~	k
ServingCellID		O	6.5.2.117	o
SMS_ChargeIndicator		O	6.5.2.126	b
SMS_DestinationAddress		O	6.5.2.127	c
SMS_MessageCount		O	6.5.2.128	d
SMS_NotificationIndicator		O	6.5.2.130	e
SMS_OriginalDestinationAddress		O	6.5.2.131	f
SMS_OriginalDestinationSubaddress		O	6.5.2.132	g
SMS_OriginalOriginatingAddress		O	6.5.2.133	h
SMS_OriginalOriginatingSubaddress		O	6.5.2.134	g
SMS_OriginatingAddress		O	6.5.2.135	c
Teleservice_Priority		O	6.5.2.dt ~~*IS-824*~~	d

	TemporaryReferenceNumber	O	6.5.2.yC ~~*IS-725-A*~~	I

Notes:

a. Include if known and either the destination is an MS-based SME or the operation is used for CDMA OTASP or CDMA OTAPA or MS-based Position Determination.

b. Include if applicable. If not received, charge the message originator.

c. May be included if not carried by the underlying data transport. May require an inter-connection agreement to facilitate interworking between network types.

d. Include if applicable. If not received, assume value 0.

e. Include if no notification is necessary. If not received, assume notification is requested.

f. Include if different than the destination address (SMS_DestinationAddress, MobileIdentificationNumber, or the underlying data transport destination).

g. Include if applicable.

h. Include if not the same as the originating address (SMS_OriginatingAddress or the underlying data transport originating address).

i. Include for Position Determination, CDMA OTASP or CDMA OTAPA if action to be performed is not implied through presence of other parameters.

j. Include for CDMA OTASP or CDMA OTAPA in requests to initiate MSC procedures[1] if a value has been assigned for the MS during the current OTASP or OTAPA session.

k. Include for CDMA Position Determination, CDMA OTASP or CDMA OTAPA. When ServiceIndicator is included, the length of the SMS_TeleserviceIdentifier is set to 0.

l. Include for CDMA OTASP when requesting MSC attachment to the OTAF to provide a correlation between the OTASP voice and data connections.

m. For CDMA OTASP, contains the Activation_MIN. For CDMA OTAPA, contains the MS's MSID at the start of the OTAPA session. When the MS has both the MIN & the IMSI at the start of the OTAPA session then the MIN form of the MSID is used. (See *IS-751* for additional information).

n. Include for CDMA Position Determination, if required for the position technology, when the invoking entity is the MSC or when the message is being relayed.

o. Include for Position Determination, if required for the position technology, when the invoking entity is the MSC or when the message is being relayed.

p. If the MS has used TMSI each time it has accessed the system, use the MIN form of the MSID, if known.

q. When used to support position determination for an emergency services call, include a MIN or IMSI of length 0 as MSID if the MS does not have an MSID.

1. The MSC procedures are "Registration Following Successful OTASP or OTAPA" and "Notification of Newly Assigned MIN MSID Following Successful OTASP or OTAPA" in Section 7 C.

The SMSDeliveryPointToPoint operation success is reported with a TCAP RETURN RESULT (LAST). This is carried by a TCAP RESPONSE package. The Parameter Set is encoded as follows:

Table 8-27: **SMSDeliveryPointToPoint RETURN RESULT Parameters**

SMSDeliveryPointToPoint RETURN RESULT Parameters				
Field	**Value**	**Type**	**Reference**	**Notes**
Identifier	SET [NATIONAL 18]	M	6.3.2.2	
Length	variable octets	M	6.3.2.2	
Contents				
AuthorizationDenied		O	6.5.2.13	h
CDMAServingOneWayDelay2		O	6.5.2.gd	i
DenyAccess		O	6.5.2.54	c
ElectronicSerialNumber		O	6.5.2.63	d
MobileStationMSID		O	6.5.2.ad ~~*IS-725-A*~~	e
MSCID		O	6.5.2.82	f
ServingCellID		O	6.5.2.117	j
SMS_BearerData		O	6.5.2.124	a
SMS_CauseCode		O	6.5.2.125	b
SystemCapabilities		O	6.5.2.146	g

Notes:

a. Include for positive acknowledgments, when applicable.

b. Include for all negative acknowledgments.

c. Include for CDMA OTASP in the response to an attachment request if the AC has denied service to this MS.

d. Include in response to an attachment request, for CDMA OTASP.

e. Include for CDMA OTASP in the response to an attachment request to indicate the MIN or IMSI value currently in the MS's permanent memory.

f. Include for CDMA OTASP in the response to an attachment request to identify the Serving System. Include for CDMA Position Determination, if required for the position technology employed.

g. Include for CDMA OTASP in the response to an attachment request to identify the serving system's authentication capabilities.

h. Include for CDMA OTASP in the response to an attachment request if the HLR had previously denied authorization to this MS or the registration attempt was unsuccessful.

i. Include for CDMA Position Determination, if required for the position technology employed, when the responding entity is the MSC or when the message is being relayed.

j. Include for Position Determination, if required for the position technology employed, when the responding entity is the MSC or when the message is being relayed.

2.3 MAP Parameters

2.3.1 General

2.3.1.1 Parameter Format

(*ANSI-41-D* Chapter 5, page 5-119)

TIA/EIA-41 MAP uses the TCAP parameter format defined in ANSI T1.114.

All parameters are encoded in binary, with the rightmost bit of the last octet (or portion thereof) as the LSB, and the leftmost bit of the first octet (or portion thereof) as the MSB, unless otherwise specified.

2.3.1.2 Parameter Identifiers

(*ANSI-41-D* Chapter 5, page 5-126)

The following table lists the *TIA/EIA-41* MAP Parameter Identifiers.

***Table 8-28: TIA/EIA-41* MAP Parameter Identifiers (continued)**

Parameter Identifier Name	Parameter Identifier Code H G F E D C B A	Reference
Teleservice_Priority	1 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 0 1 0 0 0 1 0	2.3.2.30 (ANSI-41 6.5.2.dt)
• • •	• • •	• • •
DTXIndication	1 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 0 0 1 0 0 1	2.3.2.7 (ANSI-41 6.5.2.fg)
CDMAMobileCapabilities	1 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 0 0 1 0 1 0	2.3.2.2 (ANSI-41 6.5.2.fh)
GeneralizedTime	1 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 0 0 1 0 1 1	2.3.2.8 (ANSI-41 6.5.2.fi)
GenericDigits	1 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 0 0 1 1 0 0	2.3.2.9 (ANSI-41 6.5.2.fj)
GeographicPosition	1 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 0 0 1 1 0 1	2.3.2.10 (ANSI-41 6.5.2.fk)
MobileCallStatus	1 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 0 0 1 1 1 0	2.3.2.12 (ANSI-41 6.5.2.fl)
MobilePositionCapability	1 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 0 0 1 1 1 1	2.3.2.13 (ANSI-41 6.5.2.fm)

Table 8-28: ***TIA/EIA-41* MAP Parameter Identifiers (continued)**

PositionInformation	1 0 1 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 0 1 0 0 0 0	2.3.2.19 (ANSI-41 6.5.2.fr)
PositionRequestType	1 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 0 1 0 0 0 1	2.3.2.20 (ANSI-41 6.5.2.fs)
PositionResult	1 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 0 1 0 0 1 0	2.3.2.20 (ANSI-41 6.5.2.ft)
PositionSource	1 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 0 1 0 0 1 1	2.3.2.22 (ANSI-41 6.5.2.fu)
CDMAPSMMCount	1 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 0 1 1 0 0 1	2.3.2.3 (ANSI-41 6.5.2.gb)
CDMAPSMMList	1 0 1 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 0 1 1 0 1 0	2.3.2.4 (ANSI-41 6.5.2.gc)
CDMAServingOneWayDelay2	1 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 0 1 1 0 1 1	2.3.2.5 (ANSI-41 6.5.2.gd)
LCS_CLIENT_ID	1 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 1 0 0 1 1 0	2.3.2.11
TDMA_MAHO_CELLID	1 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 1 0 0 1 1 1	2.3.2.26
TDMA_MAHO_CHANNEL	1 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 1 0 1 0 0 0	2.3.2.27
TDMA_TimeAlignment	1 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 1 0 1 0 1 0	2.3.2.29
TDMA_MAHORequest	1 0 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 1 1 0 1 1 0 0	2.3.2.28
TDMAVoiceMode	1 0 0 1 1 1 1 1 1 0 0 0 0 0 0 1 0 1 0 1 1 1 1 1	ANSI-41-E

2.3.2 Parameter Definitions

2.3.2.1 ActionCode

(*ANSI-41.5-D*, page 5-129)
(Modified in IS-725-A)

The ActionCode (ACTCODE) parameter specifies the nature of the action (e.g., disconnect the call) to be performed by the designated functional entity.

Table 8-29: **ActionCode parameter**

Field	Value	Type	Reference	Notes
Identifier	ActionCode IMPLICIT OCTET STRING	M	6.5.1.2	
Length	variable octets	M	6.5.1.1	
Contents				

H	G	F	E	D	C	B	A	octet	Notes
Action								1	
• • •								*n*	a

Notes:

a. Ignore extra octets, if received. Send only defined (or significant) octets.

Table 8-30: **ActionCode value**

Action (octet 1)	
Decimal value	**Meaning**
…	
21	Do Not Wait For MS User Level Response.
…	

2.3.2.2 CDMAMobileCapabilities

The CDMAMobileCapabilities (CDMAMC) parameter identifies the general capabilities of a CDMA mobile.

Table 8-31: **CDMAMobileCapabilities**

Field	Value	Type	Reference	Notes
Identifier	CDMAMobileCapabilities IMPLICIT OCTET STRING	M	6.5.1.2	
Length	variable octets	M	6.5.1.1	
Contents				

H	G	F	E	D	C	B	A	octet	Notes
Reserved							MIPLI	1	a
• • •								• • •	b

Notes:

a. Reserved bits shall be ignored on receipt and set to zero on sending.

b. Ignore extra octets, if received. Send only defined (or significant) octets.

Table 8-32: **CDMAMobileCapabilities value**

Mobile Initiated Position Location Indicator (MIPLI) (octet 1, bit A)	
Decimal value	**Meaning**
0	No MS-initiated position determination.
1	MS-initiated position determination.

2.3.2.3 CDMAPSMMCount (CPSMC)

The CDMAPSMMCount parameter indicates how many CDMA Pilot Strength Measurements to collect.

Table 8-33: **CDMAPSMMCount parameter**

Field	Value	Type	Reference	Notes
Identifier	CDMAPSMMCount IMPLICIT INTEGER	M	6.5.1.2	
Length	1 octet	M	6.5.1.1	
Contents				

H	G	F	E	D	C	B	A	octet	Notes
PSMMCount								1	a

Notes:

a. Include the number of CDMA Pilot Strength Measurements to return.

2.3.2.4 CDMAPSMMList (CPSML)

The CDMAPSMMList parameter contains a list of pilot strength measurements.

Table 8-34: **CDMAPSMMList parameter**

Field	Value	Type	Reference	Notes
Identifier	CDMAPSMMList IMPLICIT SET OF	M	6.5.1.2	
Length	variable octets	M	6.5.1.1	
Contents				
CDMAServingOneWayDelay2		M	6.5.2.gd	
CDMATargetMAHOList		M	6.5.2.43	
CDMATargetMAHOList		O	6.5.2.43	a
	• • •			

Notes:

a. Optionally include additional CDMATargetMAHOList parameters, in order of arrival.

2.3.2.5 CDMAServingOneWayDelay2

The CDMAServingOneWayDelay2 (CDMASOWD2) parameter specifies the estimated one-way delay from the MS to a serving base station. The estimated delay can be converted to the estimated distance. The estimate can be used to minimize the search and acquisition times for the MS or for other positioning applications. The estimated one way delay between the MS and the associated base station is specified in units of 100 ns unless otherwise specified by the 'Resolution' field. The valid values for CDMA Serving One Way Delay field are 0 through 65535.

The One Way Delay Time Stamp is a 16-bit binary number that contains the 16 least significant bits of the 36-bit SYS_TIME at the time that the One Way Delay was measured. The SYS_TIME is counted at the BS in units of 80ms.

Table 8-35: **CDMAServingOneWayDelay2 parameter**

Field								Value	Type	Reference	Notes
Identifier								CDMAServingOneWayDelay2 IMPLICIT OCTET STRING	M	6.5.1.2	
Length								variable octets	M	6.5.1.1	a
Contents											
H	G	F	E	D	C	B	A	octet			Notes
MSB								CDMA Serving One Way Delay		1	
							LSB			2	
Reserved									Resolution	3	b, c
MSB								ServingOneWayDelayTimeStamp		4	d
							LSB			5	
• • •										*n*	e

Notes:

a. The minimum length is two octets.

b. Reserved bits shall be ignored on receipt and set to zero on sending.

c. Include for positioning applications (e.g., *J-STD-036*).

d. Include if required for the position technology. See CDMA (SYS_TIME) for encoding of the ServingOneWayDelayTimeStamp.

e. Ignore extra octets, if received. Send only defined (or significant) octets.

Resolution (octet 3, bits A-B)

Decimal Value	Meaning
0	**100 nsec.**
1	**50 nsec.**
2	$^1/_{16}$ ~~*TIA/EIA-95*~~*CDMA* **PN Chip.**
3	**Reserved.**

2.3.2.6 CDMATargetMAHOInformation

The CDMATargetMAHOInformation (CDMAMAHO) parameter specifies CDMA target cell information which is used in the handoff process. This parameter is also used for position determination to report the pilot measurements visible to the MS.

Table 8-36: **CDMATargetMAHOInformation parameter**

Field	Value	Type	Reference	Notes
Identifier	CDMATargetMAHOInformation IMPLICIT SEQUENCE	M	6.5.1.2	
Length	variable octets	M	6.5.1.1	
Contents				
TargetCellID		M	6.5.2.148	
CDMAPilotStrength		M	6.5.2.35	
CDMATargetOneWayDelay		M	6.5.2.46	
MSCID(Target)		O	6.5.2.82	a
• • •				b

Notes:

a. For position determination, include if target cell is not in serving MSC.

b. Ignore unexpected parameters, if received.

2.3.2.7 DTXIndication

(new for *ANSI-41*-D Chapter 5)

The DTXIndication (DTXIND) parameter specifies if an MS is currently operating in the discontinuous transmission (DTX) mode.

Table 8-37: **DTXIndication parameter**

Field	Value	Type	Reference	Notes
Identifier	DTXIndication IMPLICIT OCTET STRING	M	6.5.1.2	
Length	variable octets	M	6.5.1.1	
Contents				
H G F E D C B A			**octet**	**Notes**
	Reserved		DTX	1	a
	• • •			• • •	b

Notes:

a. Reserved bits shall be ignored on receipt and set to zero on sending.

b. Ignore extra octets, if received. Send only defined (or significant) octets.

Table 8-38: **DTXIndication value**

Discontinuous Transmission (DTX) (octet 1, bit A)	
Decimal value	**Meaning**
0	Discontinuous Transmission mode is not active
1	Discontinuous Transmission mode is active

2.3.2.8 GeneralizedTime

(new for *ANSI-41-D* Chapter 5)

The GeneralizedTime (GTIME) parameter specifies a time-of-day, day-of-month, month and year for identification purposes. It is always specified in UTC (Coordinated Universal Time).

Table 8-39: **GeneralizedTime parameter**

Field	Value	Type	Reference	Notes
Identifier	GeneralizedTime IMPLICIT OCTET STRING	M	6.5.1.2	
Length	variable octets	M	6.5.1.1	
Contents				

H	G	F	E	D	C	B	A	octet	Notes
Year-2000								1	
Month								2	
Day of Month								3	
MSB								4	
Time of Day								5	a
							LSB	6	
• • •								n	b

Notes:

a. The Time of Day field specifies time as a number of tenths of seconds past midnight Coordinated Universal Time (UTC). The range of this field is 0 to 863,999 (24 hours times 60 minutes per hour times 60 seconds per minute times 10 tenths per second minus 1).

b. Ignore extra octets, if received. Send only defined (or significant) octets.

Table 8-40: **GeneralizedTime value**

Year (octet 1)	
Decimal value	**Meaning**
0 through 255	**Year-2000** Calculated as (current year - 2000) modulus 256 (e.g., year 2002 will be represented as (2002-2000) mod 256 = 2 and year 2260 as 4).
Month (octet 2)	
Decimal value	**Meaning**
1 through 12	**Month** (e.g., January = 1; December = 12).
Day of Month (octet 3)	
Decimal value	**Meaning**
1 through 31	**Day of Month** (e.g.,1st day of month = 1).
Time of Day (octets 4 through 6)	
Decimal value	**Meaning**
0 through 863,999	**Time of Day** (time expressed in tenths of seconds minus 1).

2.3.2.9 GenericDigits

(new for *ANSI-41-D* Chapter 5)

The GenericDigits (GDP) carries routing digits to be included into the Generic Digits parameter of the outgoing trunk.

Table 8-41: **GenericDigits parameter**

Field	Value	Type	Reference	Notes
Identifier	GenericDigits IMPLICIT DigitsType	M	6.5.1.2	a
Length	variable octets	M	6.5.1.1	
Contents				

H	G	F	E	D	C	B	A	octet	Notes
Type of Digits								1	b
Nature of Number								2	c
Numbering Plan				Encoding				3	d, e
Number of Digits								4	f
2nd BCD Digit				1st BCD Digit				5	
4th BCD Digit				3rd BCD Digit				6	
• • •				• • •				• • •	
*n*th BCD Digit				*n*-1st BCD Digit				m	

Notes:

a. Refer to the DigitsType parameter type (see 6.5.3.2) for notes and field encoding.

b. The Type of Digits field is set as applicable.

c. The Nature of Number field is set as applicable.

d. The Numbering Plan field is set to *Telephony Numbering*.

e. The Encoding field is set to *BCD*.

f. The Number of Digits is between 0 and at least 15.

2.3.2.10 GeographicPosition

(new for *TIA/EIA-41-D* Chapter 5)

The GeographicPosition (GEOPOS) parameter specifies position in latitude and longitude coordinates (e.g., reference WGS-84).

The FCC mandate (Docket 94-102) requires the MS latitude and longitude. In addition, confidence level (including uncertainty) of the geodetic position is required per agreement with Public Safety. At a minimum, in order to provide the required fields the "Type of shape" field values recommended to be supported are:

a. *Ellipsoid point*: meets minimum requirement of FCC Docket 94-102.

b. *Ellipsoid point with uncertainty*: meets minimum requirement of FCC Docket 94-102, plus the minimum requirement of the Public Safety confidence agreement.

Table 8-42: **Geographic Position parameter**

Field						Value		Type	Reference	Notes
Identifier						GeographicPosition IMPLICIT OCTET STRING		M	6.5.1.2	
Length						variable octets		M	6.5.1.1	
Contents										
H	G	F	E	D	C	B	A	octet	Notes	
Calling Geodetic Location (CGL)								1	a	
								• • •		
								M	b	

Notes:

a. See *T1.628* CallingGeodeticLocation TCAP parameter for encoding.

b. Ignore extra octets, if received. Send only defined (or significant) octets.

2.3.2.11 LCS_Client_ID

The LCS_Client_ID (LCSCID) identifies an LCS Client. The following variant is used for SAMPS.

Table 8-43: **LCS_Client_ID Parameter**

Field	Value	Type	Reference	Notes
Identifier	LCS_Client_ID IMPLICT Digits Type	M	6.5.1.2	a
Length	Variable Octets	M	6.5.1.1	
Contents				

H	G	F	E	D	C	B	A	octet	Notes
Type of Digits								1	a,b
Nature of Number								2	c
Numbering Plan				Encoding				3	d,e
Number of Digits								4	f
1st IA5 Character								5	g
2nd IA5 Character								6	
…								…	
Last IA5 Character								m	

Notes:

a. See the DigitsType parameter Type (see 6.5.3.2) for notes and field encoding.

b. Type of Digits is ignored on receipt

c. The Nature of Number field may be *National* or *International*.

d. Numbering Plan shall be *not applicable* for this parameter variant (i.e. SAMPS).

e. The encoding field is set to *IA5* for this parameter variant (i.e. SAMPS).

f. The Number of Digits ranges from 0 to 129.

g. A PSAP LCS Client ID shall always start with the characters “E911”

2.3.2.12 MobileCallStatus

(new for *ANSI-41-D* Chapter 5)

The MobileCallStatus (MCALSTAT) parameter identifies the validation status of the MS's subscription or the access status of an MS for a particular call origination.

Table 8-44: **MobileCallStatus parameter**

Field	Value	Type	Reference	Notes
Identifier	MobileCallStatus IMPLICIT OCTET STRING	M	6.5.1.2	
Length	variable octets	M	6.5.1.1	
Contents				

H	G	F	E	D	C	B	A	octet	Notes
Authorization				Authentication				1	
			• • •					n	a

Notes:

a. Ignore extra octets, if received. Send only defined (or significant) octets.

Table 8-45: **MobileCallStatus value**

Authentication (octet 1, bits A-D)	
Decimal Value	**Meaning**
0	**Authentication not performed**. Authentication has not yet occurred or the MS is not capable of authentication.
1	**Authentication successful**. Authentication has successfully occurred on the MS.
2	**Authentication failure**. An authentication failure has occurred on the MS.
3 through 15	Reserved. Treat the same as value 0, *Authentication not performed.*
Authorization (octet 1, bits E-H)	
Decimal Value	**Meaning**
0	**Authorization not performed.**
1	**Authorization successful.**
2	**Invalid Electronic Serial Number (ESN)**. See 6.5.2.13.
3	**Unassigned Directory Number (DN)**. See 6.5.2.13.
4	**Duplicate Unit**. See 6.5.2.13.
5	**Delinquent Account**. See 6.5.2.13.
6	**Stolen Unit**. See 6.5.2.13.
7	**Not authorized for MSC**. See 6.5.2.13.
8	**Unspecified**. If any other value of AuthorizationDenied is received.
9 through 15	Reserved. Treat the same as value 0, *Authorization not performed*.

2.3.2.13 MobilePositionCapability

The MobilePositionCapability (MPCAP) parameter indicates the type of geographic position information the MS can provide to the network.

Table 8-46: **MobilePositionCapability parameter**

Field	Value	Type	Reference	Notes
Identifier	MobilePositionCapability IMPLICIT OCTET STRING	M	6.5.1.2	
Length	variable octets	M	6.5.1.1	
Contents				

H	G	F	E	D	C	B	A	octet	Notes
Mobile Position Capability								1	
Mobile Position Capability								• • •	a
• • •								*n*	b

Notes:

a. Include additional Mobile Position Capability values when a complete set of positioning capabilities is required to be specified.

b. Ignore extra octets, if received. Send only defined (or significant) octets.

Table 8-47: **MobilePositionCapability value**

Mobile Position Capability (octet 1)	
Decimal value	**Meaning**
0	**Undefined Mobile Position Capabilities.**
1	**CDMA None.**
2	**CDMA Pilot Phase + GPS** - MS shall be capable of supporting A-FLT and GPS for position determination.
3	**CDMA Pilot Phase Only** - MS shall be capable of supporting A-FLT only for position determination.
4	**CDMA GPS Only** - MS shall be capable of supporting GPS only for position determination.
5 through 50	Reserved for CDMA. Treat the same as value 1, *CDMA None*.
51	**TDMA None**. See TIA/EIA-136-740.
52	**TDMA MS-Based with Network Assistance SAMPS Supported**. See TIA/EIA-136-740.
53	**TDMA MS-Assisted SAMPS Supported**. See TIA/EIA-136-740.
54	**TDMA SAMPS Time Measurement Capability Supported.** See TIA/EIA-136-740**.**
55	**TDMA MS-Based Stand-alone SAMPS Supported**. See TIA/EIA-136-740.
unassigned values through 100	Reserved for TDMA. Treat the same as value 51, *TDMA None.*
101	**AMPS None.**
102	**AMPS MS-based** - MS shall be capable of autonomously determining the position without assistance from the network.

Table 8-47: **MobilePositionCapability value**

Mobile Position Capability (octet 1)	
103	**AMPS assisted GPS** - MS shall be capable of utilizing network assistance in providing GPS satellite measurements for position determination in the network or of utilizing network assistance in position determination in the MS.
104 through 150	Reserved for AMPS. Treat the same as value 101, *AMPS None*.
151 through 223	Reserved. Treat the same as value 0, *Undefined.*
224 through 255	Reserved for TIA/EIA-41 protocol extension. If unknown, treat the same as value 0, Undefined.

2.3.2.14 MobInfo_AMPS

(new for *ANSI-41-D* Chapter 5, page 5-132)

The MobInfo_AMPS (AMPS Analog Mobile Information) is a collection of information needed to determine the position of an MS that is currently operating in the AMPS analog mode. The MobInfo_AMPS macro has been defined solely for editorial convenience, and does not affect the encoding in any way.

Table 8-48: **MobInfo_AMPS Macro**

MobInfo_AMPS	Type	Reference	Notes
Contents			
ChannelData (Serving)	M	6.5.2.47	
DTXIndication	O	6.5.2.fg	a
ReceivedSignalQuality	O	6.5.2.106	a

Notes:

a. Include if known and applicable.

2.3.2.15 MobInfo_CDMA

(new for *ANSI-41-D* Chapter 5, page 5-167)

The MobInfo_CDMA (CDMA Mobile Information) is a collection of information needed to determine the position of an MS that is currently operating in the CDMA mode. The MobInfo_CDMA macro has been defined solely for editorial convenience, and does not affect the encoding in any way.

Table 8-49: **MobInfo_CDMA Macro**

MobInfo_CDMA			
	Type	**Reference**	**Notes**
Contents			
CDMAChannelData (Serving)	M	6.5.2.30	
CDMACodeChannel	O	6.5.2.31	a
CDMAMobileCapabilities	O	6.5.2.xx	a
CDMAPrivateLongCodeMask	O	6.5.2.36	a
CDMAServingOneWayDelay2	O	6.5.2.gd	a
CDMAServiceOption	O	6.5.2.f	a
CDMATargetMAHOList	O	6.5.2.43	a
CDMAPSMMList	O	6.5.2.gc	a

Notes:

a. Include if known and applicable.

2.3.2.16 MobInfo_NAMPS

(new for *ANSI-41-D* Chapter 5, page 5-218)

The MobInfo_NAMPS (NAMPS Mobile Information) is a collection of information needed to determine the position of an MS that is currently operating in the NAMPS mode. The MobInfo_NAMPS macro has been defined solely for editorial convenience, and does not affect the encoding in any way.

Table 8-50: **MobInfo_NAMPS Macro**

MobInfo_NAMPS			
	Type	**Reference**	**Notes**
Contents			
ChannelData (Serving)	M	6.5.2.47	
NAMPSChannelData (Serving)	M	6.5.2.86	
DTXIndication	O	6.5.2.fg	a
ReceivedSignalQuality	O	6.5.2.106	a

Notes:

a. Include if known and applicable.

2.3.2.17 MobInfo_TDMA

(new for *ANSI-41-D* Chapter 5, page 5-306)

The MobInfo_TDMA (TDMA Mobile Information) is a collection of information needed to determine the position of an MS that is currently operating in the TDMA mode. The MobInfo_TDMA macro has been defined solely for editorial convenience, and does not affect the encoding in any way.

Table 8-51: **MobInfo_TDMA Macro**

MobInfo_TDMA			
	Type	**Reference**	**Notes**
Contents			
TDMAChannelData	M	6.5.2.153	
DTXIndication	O	6.5.2.fg	a
ReceivedSignalQuality	O	6.5.2.106	a
TargetMeasurementList	O	6.5.2.150	a
TDMA_MAHO_CELLID	O	2.3.2.26	b
TDMA_MAHO_CHANNEL	O	2.3.2.27	c
TDMA_TimeAlignment	O	2.3.2.29	d
TDMAVoiceMode	O	ANSI-41-E	a
VoicePrivacyMask	O	6.5.2.166	a

Notes:

a. Include if known and applicable.

2.3.2.18 NetworkTMSI

(from *TIA/EIA/IS-735*, page 135)

The NetworkTMSI (NETMSI) consists of the TMSI_CODE and the TMSI_ZONE fields. TMSI_CODE defines a 32-bit MS temporary identification in one TMSI Zone. The TMSI_ZONE is associated with a group of cell sites (e.g., cell sites associated with a single MSC) such that all TMSI_CODEs assigned to MS's within the TMSI_ZONE are unique. TMSI_CODEs may be re-used in different TMSI zones.

The minimum length of this parameter is 4 octets.

Table 8-52: **NetworkTMSI parameter**

Field	Value	Type	Reference	Notes
Identifier	NetworkTMSI IMPLICITOCTET STRING	M	6.5.1.2	
Length	variable octets	M	6.5.1.1	
Contents				

H	G	F	E	D	C	B	A	octet	Notes
MSB TMSI_CODE LSB								1 2 3 4	a
1st Digit of TMSI_ZONE				Type of Addressing				5	b
3rd Digit of TMSI_ZONE				2nd Digit of TMSI_ZONE				6	b
5th Digit of TMSI_ZONE				4th Digit of TMSI_ZONE				7	b
• • •				• • •				• • •	b
nth Digit of TMSI_ZONE				nth-1 Digit of TMSI_ZONE				*n*	b, c

Notes:

a. See *CDMA* and *TDMA* for the encoding details of this field.

b. The encoding scheme of the address digits is BCD encoding.

c. Where there is an odd number of digits, the nth digit is set to *filler*.

Table 8-53: **NetworkTMSI value**

Type of Addressing (octet 5, bits A-D)	
Decimal value	**Meaning**
0	Not used
1	**E.212 based routing.**
2	**20-bit TDMA TMSI.** TMSI_ZONE contains a single digit 0. Most significant 12 bits of TMSI_CODE are set to zero.
3	**24-bit TDMA TMSI.** TMSI_ZONE contains a single digit 0. Most significant 8 bits of TMSI_CODE are set to zero.
4 through 15	Reserved for [ANSI-41] protocol extension. If unknown, treat the same as value 0, *Not used*.

2.3.2.19 PositionInformation

(new for *ANSI-41-D* Chapter 5)

The PositionInformation (POSINFO) parameter is used to carry the time–position pair used to locate an MS.

Table 8-54: **PositionInformation**

Field	Value	Type	Reference	Notes
Identifier	PositionInformation IMPLICIT SET	M	6.5.1.2	
Length	variable	M	6.5.1.1	
Contents				
GeneralizedTime		M	6.5.2.fi	
GeographicPosition		M	6.5.2.fk	
PositionSource		O	6.5.2.fu	
...				a

a. Ignore unexpected parameters, if received.

2.3.2.20 PositionRequestType

(new for *ANSI-41-D* Chapter 5)

The PositionRequestType (POSREQTYPE) parameter indicates whether the initial or recent position information for the MS is being requested.

Table 8-55: **PositionRequestType parameter**

Field							Value	Type	Reference	Notes
Identifier							PositionRequestType IMPLICIT OCTET STRING	M	6.5.1.2	
Length							variable octets	M	6.5.1.1	
Contents										
H	**G**	**F**	**E**	**D**	**C**	**B**	**A**	**octet**		**Notes**
Position Request Type								1		
• • •								n		a

Notes:

a. Ignore extra octets, if received. Send only defined (or significant) octets.

Table 8-56: **PositionRequestType value**

Position Request Type (octet 1, bits A through H)	
Decimal Value	**Meaning**
0	Not used.
1	**Initial position.** Return updated position only if initial position is unavailable.
2	**Return the updated position.**
3	**Return the updated or last known position.**
4	Reserved for LSP interface. Treat the same as value 0, *Not used.*
values through 95	Reserved. Treat the same as value 1, *Initial position.*
96 through 255	Reserved for *ANSI-41* protocol extension. If unknown, treat the same as value 1, *Initial position*.

2.3.2.21 PositionResult

(new for *ANSI-41-D* Chapter 5)

The PositionResult (POSRSULT) parameter indicates the results (e.g., type of success or failure) of an associated position request.

Table 8-57: **PositionResult parameter**

Field	Value	Type	Reference	Notes
Identifier	PositionResult IMPLICIT OCTET STRING	M	6.5.1.2	
Length	variable octets	M	6.5.1.1	
Contents				

H	G	F	E	D	C	B	A	octet	Notes
Position Result								1	
• • •								n	a

Notes:

a. Ignore extra octets, if received. Send only defined (or significant) octets.

Table 8-58: **PositionResult value**

Position Result (octet 1)	
Decimal Value	**Meaning**
0	Not used.
1	**Initial position returned.**
2	**Updated position returned.**
3	**Last known position returned.**
4	**Requested position is not available.**
5	**Caller disconnected.** No call in progress for caller identified.
6	**Caller has handed-off**. Position is unavailable due to a hand-off (e.g. handoff to a position incapable system).
7	**Identified MS is inactive or has roamed to another system.**
8	**Unresponsive.**
9	**Identified MS is responsive, but refused position request.**
10	**System Failure.**
11	**MSID is not known.**
12	**Callback number is not known.**
13	**Improper request** (e.g. invalid channel information, invalid ESN).
14	**Mobile channel information returned.**
15	**Signal not detected.**
16	**PDE Timeout.**
17	**Position pending.**
18	**TDMA MAHO Information Returned**.

Table 8-58: **PositionResult value**

Position Result (octet 1)	
19	**TDMA MAHO Information is not available**.
values through 223	Reserved. Treat the same as value 0, Not used.
224 through 255	Reserved for *ANSI-41* protocol extension. If unknown, treat the same as value 0, *Not used*.

2.3.2.22 PositionSource

(new for *ANSI-41-D* Chapter 5)

The PositionSource (POSOUR) parameter specifies how the geographic position information was obtained.

Table 8-59: **PositionSource parameter**

Field	Value	Type	Reference	Notes
Identifier	PositionSource IMPLICIT OCTET STRING	M	6.5.1.2	
Length	variable	M	6.5.1.1	
Contents				

H	G	F	E	D	C	B	A	octet	Notes
Position Source								1	

Table 8-60: **PositionSource value**

Position Source (octet 1)	
Decimal value	**Meaning**
0	Not used
1	**Network Unspecified**
2	**Network AOA** (Angle of Arrival)
3	**Network TOA** (Time of Arrival)
4	**Network TDOA** (Time Difference of Arrival)
5	**Network RF Fingerprinting**
6	**Network Cell/Sector**
7	**Network Cell/Sector with Timing**
values up to 15	Undefined. Treat as value 1 (Network Unspecified)
16	**Handset Unspecified**
17	**Handset GPS**
18	**Handset AGPS** (Assisted GPS)
19	**Handset EOTD** (Enhanced Observed Time Difference)
20	**Handset AFLT** (Advanced Forward Link Trilateration)
21	**Handset EFLT** (Enhanced Forward Link Trilateration)
values up to 31	Undefined. Treat as value 16 (Handset Unspecified)
Other values	Treat as value 0 (Not used)

2.3.2.23 Profile

(from *ANSI-41-D* Chapter 5, 6.5.2.97)

The Profile is a collection of the subscriber's calling profile information. This information is a list of optional parameters. The Profile macro has been defined solely for editorial convenience, and does not affect the encoding in any way.

Table 8-61: **Profile Macro**

PROFILE			
	Type	**Reference**	**Notes**
Contents			
AuthenticationCapability	O	6.5.2.8	a
CallingFeaturesIndicator	O	6.5.2.20	b
CarrierDigits	O	6.5.2.28	c
DMH_AccountCodeDigits	O	6.5.2.59	d
DMH_AlternateBillingDigits	O	6.5.2.60	d
DMH_BillingDigits	O	6.5.2.61	d
GeographicAuthorization	O	6.5.2.68	e
MessageWaitingNotificationCount	O	6.5.2.78	f
MessageWaitingNotificationType	O	6.5.2.79	g
MobileDirectoryNumber	O	6.5.2.80	d
MobilePositionCapability	O	6.5.2.fm	t
OriginationIndicator	O	6.5.2.89	h
OriginationTriggers	O	6.5.2.90	i
PACAIndicator	O	6.5.2.91	j
PreferredLanguageIndicator	O	6.5.2.96	k
RestrictionDigits	O	6.5.2.113	l
RoutingDigits	O	6.5.2.114	m
SMS_OriginationRestrictions	O	6.5.2.136	n
SMS_TerminationRestrictions	O	6.5.2.138	o
SPINIPIN	O	6.5.2.139	p
SPINITriggers	O	6.5.2.140	q
TerminationRestrictionCode	O	6.5.2.157	r
TerminationTriggers	O	6.5.2.159	s

Notes:

a. Include on *IS-41-C* or later.

b. Include to identify feature authorization and activity.

c. Include if preferred carrier is applicable and TransactionCapability supported.

d. Include if available for recording purposes (see *DMH*).

e. Include if available for certain authorization restricted areas.

f. Include if MessageWaitingNotificationType is MessageWaitingNotificationType: Message Waiting Indication and number of messages waiting is authorized.

g. Include if Message Waiting Notification feature is active and a message is waiting.

h. Include to indicate the type of calls allowed for origination service.

i. Include to indicate OriginationRequest triggers.

j. Include to identify the PACA feature.

k. Include to identify the Preferred Language feature.

l. Include if originations are restricted to NPA-NXX or NPA-NXX-XXXX and TransactionCapability supported.

m. Include for special routing information.

n. Include for MS originated Short Message Service.

o. Include for MS terminated Short Message Service.

p. Include if local SPINI operation supported.

q. Include to indicate Subscriber PIN Intercept triggers.

r. Include to indicate the type of call termination service.

s. Include to indicate the RedirectionRequest or TransferToNumberRequest triggers.

t. Include to identify MS position capabilities, if applicable.

2.3.2.24 ServiceIndicator

The ServiceIndicator (SRVIND) parameter indicates a type of service.

Table 8-62: **ServiceIndicator parameter**

Field	Value	Type	Reference	Notes
Identifier	ServiceIndicator IMPLICIT OCTET STRING	M	6.5.1.2	
Length	variable octets	M	6.5.1.1	
Contents				

H	G	F	E	D	C	B	A	octet	Notes
Service								1	
• • •								*n*	a

Notes:

a. Ignore extra octets, if received. Send only defined (or significant) octets.

Table 8-63: **ServiceIndicator value**

Service (octet 1)	
Decimal value	**Meaning**
0	Undefined Service.
1	CDMA OTASP Service.
2	TDMA OTASP Service.
3	CDMA OTAPA Service.
4	CDMA Position Determination Service.
5	AMPS Position Determination Service.
6 through 223	Reserved. Treat the same as value 0, *Undefined Service.*
224 through 255	Reserved for *IS-41* protocol extension. If unknown, treat the same as value 0, *Undefined Service.*

2.3.2.25 SMS_TeleserviceIdentifier

This parameter is defined in ANSI-41-D.

Table 8-64: **SMS_TeleserviceIdentifier values**

SMS_TeleserviceIdentifier (octets 1 and 2)	
Decimal value	**Meaning**
…	…
32520	**TDMA System Assisted Mobile Positioning through Satellite (SAMPS).**
32584	**TDMA Segmented System Assisted Mobile Positioning Service.**
…	…

2.3.2.26 TDMA_MAHO_CELLID

Provides a list of TDMA MAHO measurements with each identified by the MSC and Cell from which it was obtained.

Table 8-65: **TDMA_MAHO_CELLID parameter**

Field	Value	Type	Reference	Notes
Identifier	TDMA_MAHO_CELLID IMPLICIT OCTET STRING	M	6.5.1.2	
Length	variable octets	M	6.5.1.1	
Contents				

H	G	F	E	D	C	B	A	octet	Notes
Serving Cell HYPER		RSVD	Serving Cell RSSI					1	a,b,c
Number of RSSI								2	d
HYPER		RSVD	RSSI					3	b,c,
MEASURED CELLID								4 5	e
• • •								x	f
Number of MSC								x+1	g
MSCID								x+2 x+3 x+4	h
Number of RSSI								x+5	i
HYPER		RSVD	RSSI					x+6	b,c
MEASURED CELLID								x+7 x+8	e
• • •								y	j
• • •								z	k

Notes:

a. RSSI information on octet 1 corresponds to the Serving Cell, as measured in the Digital Traffic Channel

b. RSSI is the signal strength value, encoded as for TDMA (TIA/EIA-136-133).

c. HYPER identifies the hyperband (00 for 800 MHz, 01 for 1900 MHz, other values reserved).

d. The number of RSSI measurements included for the Serving MSC

e. Encoded in the same way as the value of the ANSI-41 Target CellID and Serving-CellID parameters.

f. Octets 3 through x, inclusive, may be repeated as many times as necessary to convey the number of TDMA MAHO measurements from the serving MSC, identified by octet 2.

g. The number of MSCs from which RSSI information was obtained.

h. Encoded in the same way as the value of the *ANSI-41* MSCID parameter.

i. The number of RSSI measurements included for this MSCID.

j. Octets x+6 through x+8, inclusive, may be repeated as many times as necessary to convey the number of TDMA MAHO measurements identified in octet x+5, all from the same MSC identified by octets x+2 through x+4.

k. Octets x+2 through y, inclusive, may be repeated as many times as necessary to convey distinct sets of TDMA MAHO measurements from the number of MSCID's identified by octet x+1.

2.3.2.27 TDMA_MAHO_CHANNEL

Provides a list of TDMA MAHO measurements with each identified by the MSC and Channel Number from which it was obtained.

Table 8-66: **TDMA_MAHO_CHANNEL parameter**

Field	Value	Type	Reference	Notes
Identifier	TDMA_MAHO_CHANNEL IMPLICIT OCTET STRING	M	6.5.1.2	
Length	variable octets	M	6.5.1.1	
Contents				

H	G	F	E	D	C	B	A	octet	Notes
Serving Cell HYPER		RSVD	Serving Cell RSSI					1	a,b,c
Number of RSSI								2	d
HYPER		RSVD	RSSI					3	b,c,
MSB	MEASURED CHANNEL							4	e
LSB	RSVD							5	
• • •								n	f
Number of MSCID								n+1	g
MSCID								n+2	h
								n+3	
								n+4	
Number of RSSI								n+5	i
HYPER		RSVD	RSSI					n+6	b,c
MSB	MEASURED CHANNEL							n+7	e
LSB	RSVD							n+8	
• • •								m	j
• • •								o	k

Notes:

a. RSSI information in octet 1 corresponds to that for the serving Channel

b. RSSI is the signal strength value, encoded as for TDMA (TIA/EIA-136-133)

c. HYPER identifies the hyperband (00 for 800 MHz, 01 for 1900 MHz, other values reserved)

d. The number of RSSI measurements included for the Serving MSC.

e. Channel number encoding defined by TDMA

f. Octets 3 through 5, inclusive, may be repeated as many times as necessary to convey the number of TDMA MAHO measurements from the Serving MSC.

g. The number of MSCs from which RSSI information was obtained.

h. Encoded in the same way as the value of the *ANSI-41* MSCID parameter.

i. The number of RSSI measurements included for this MSCID.

j. Octets n+6 through n+8, inclusive, may be repeated as many times as necessary to convey the number of TDMA MAHO measurements from the same MSC identified by octet n+5.

k. Octets n+2 through o, inclusive, may be repeated as many times as necessary to convey distinct sets of TDMA MAHO measurements from the number of MSCID's identified by octet 1.

2.3.2.28 TDMA_MAHORequest

This parameter (MAHOREQ) is used by an MPC to indicate its request of TDMA MAHO information to an MSC.

Field	Value	Type	Reference	Notes
Identifier	MAHORequest IMPLICIT OCTET STRING	M	6.5.1.2	
Length	1 octet	M	6.5.1.1	
Contents				

H	G	F	E	D	C	B	A	octet	Notes
MAHO Request								1	

Table 8-67: **MAHO Request value**

MAHO Request (octet 1)	
Decimal Value	**Meaning**
0	**No MAHO information requested**.
1	**MAHO information requested**.
2 through 255	Reserved. Treat the same as value 0, No MAHO information requested.

2.3.2.29 TDMA_TimeAlignment parameter

This parameter represents the time advance/retard needed to synchronize the time slot burst transmission of a mobile, based on its distance from the base station.

Table 8-68: **TDMA_TimeAlignment parameter**

Field	Value	Type	Reference	Notes
Identifier	TDMA_TimeAlignment IMPLICIT OCTET STRING	M	6.5.1.2	
Length	variable octets	M	6.5.1.1	
Contents				

H	G	F	E	D	C	B	A	octet	Notes
Reserved			Time Alignment Offset (TA)					1	a,b

Notes:

a. The parameter is returned together with either TDMA_MAHO_CHANNEL or TDMA_MAHO_CELLID

b. See *TDMA* for encoding of the Time Alignment Offset field. Note: value “11111” should not be used.

2.3.2.30 Teleservice_Priority

The Teleservice_Priority (TPRIO) parameter provides an indication of the level of priority of the teleservice message. The values are given in an increasing order of priority.

Table 8-69: **Teleservice_Priority parameter**

Field	Value	Type	Reference	Notes
Identifier	Teleservice_Priority IMPLICIT OCTET STRING	M	6.5.1.2	
Length	variable octets	M	6.5.1.1	
Contents				

H	G	F	E	D	C	B	A	octet	Notes
Reserved						T_PRIO		1	a
• • •								• • •	b

Notes:

a. Reserved bits shall be ignored on receipt and set to zero on sending.

b. Ignore extra octets, if received. Send only defined (or significant) octets.

Table 8-70: **Teleservice_Priority value**

T_PRIO (octet 1, bits A and B)	
Decimal value	**Meaning**
0	**Normal** (lower priority)
1	**Interactive**
2	**Urgent**
3	**Emergency** (higher priority, e.g. E-911)

2.3.2.31 TransactionCapability

The TransactionCapability (TRANSCAP) parameter indicates a system's transaction capability at the current time (i.e., this capability may change over time).

Field	Value	Type	Reference	Notes
Identifier	TransactionCapability IMPLICIT OCTET STRING	M	6.5.1.2	
Length	variable octets	M	6.5.1.1	
Contents				

H	G	F	E	D	C	B	A	octet	Notes
NAMI	NDSS	UZCI	SPINI	RUI	ANN	BUSY	PROF	1	a
OTAPA	S&R	WADDR	TL	Multiple Terminations				2	a
Reserved					MAHO	Reserved		3	a
• • •								n	a, b

Notes:

a. Reserved bits shall be ignored on receipt and set to 0 on sending.

b. Ignore extra octets, if received. Send only defined (or significant) octets.

Profile (PROF) (octet 1, bit A)

Value	Meaning
0	The system is not capable of supporting the IS-41-C profile parameters.
1	The system is capable of supporting the IS-41-C profile parameters.

Busy Detection (BUSY) (octet 1, bit B)

Value	Meaning
0	The system is not capable of detecting a busy condition at the current time.
1	The system is capable of detecting a busy condition at the current time.

Announcements (ANN) (octet 1, bit C)

Value	Meaning
0	The system is not capable of honoring the AnnouncementList parameter at the current time.
1	The system is capable of honoring the AnnouncementList parameter at the current time.

Remote User Interaction (RUI) (octet 1, bit D)

Value	Meaning
0	The system is not capable of interacting with the user.
1	The system is capable of interacting with the user.

Subscriber PIN Intercept (SPINI) (octet 1, bit E)	
Value	Meaning
0	The system is not capable of supporting local SPINI operation at the current time.
1	The system is capable of supporting local SPINI operation.
UZCapabilityIndicator (UZCI) (octet 1, bit F)	
Value	Meaning
0	The system is not capable of supporting the TerminationList parameter at the current time.
1	The system is capable of supporting the TerminationList parameter at the current time.
NDSS Capability (NDSS) (octet 1 bit G)	
Value	Meaning
0	Serving System is not NDSS capable.
1	Serving System is NDSS capable.
NAME Capability Indicator (NAMI) (octet 1 bit H)	
Value	Meaning
0	The system is not CNAP/CNAR capable.
1	The system is CNAP/CNAR capable.
Multiple Terminations (octet 2, bits A-D)	
Value	Meaning
0	The system cannot accept a termination at this time (i.e., cannot accept routing information).
1 through 15	The system supports the number of call legs indicated.
TerminationList (TL) (octet 2, bit E)	
Value	Meaning
0	The system is not capable of supporting the TerminationList parameter at the current time.
1	The system is capable of supporting the TerminationList parameter at the current time.
WIN Addressing (WADDR) (octet 2, bit F)	
Value	Meaning
0	The system is not capable of supporting the TriggerAddressList parameter.
1	The system is capable of supporting the TriggerAddressList parameter.

MAHO (octet 3, bit C)

Value	Meaning
0	The system is not capable of supporting external MAHO requests.
1	The system is capable of supporting external MAHO requests (e.g. for positioning).

2.3.3 Parameter Type Definitions

2.3.3.1 Digits Type

Omitted text not changed.

Table 8-71: **Digits Type value**

Type of Digits (octet 1, bits A-H)	
Decimal value	**Meaning**
0	Not Used.
1	**Dialed Number or Called Party Number.**
2	**Calling Party Number.**
3	**Caller Interaction.**
4	**Routing Number.**
5	**Billing Number.**
6	**Destination Number.**
7	**LATA.**
8	**Carrier.**
13	**ESRD.**
all other values	Reserved.

3 *ANSI-41* Procedures

3.1 Modification of existing procedures

All changes made to the existing *ANSI-41* procedures are identified by change bars, additions are underlined and deletions are ~~struck-through~~.

3.1.1 MSC Analyze MS Dialed Number (ANSI-41.6-D 3.2.3, page 6-15)

Upon demand the Anchor MSC shall do the following:

1 IF flash privileges are suspended (by the *Flash Privileges* in the OneTimeFeatureIndicator parameter e.g., Call Transfer, Call Waiting, Three-Way Calling):

1-1 Include the TransactionCapability parameter with the number of multiple terminations set to 0.

2 ELSEIF Call Transfer, Three-Way Calling or similar feature is being invoked:

2-1 Include the TransactionCapability parameter with the number of multiple terminations set to 1.

3 ELSE:

3-1 Include the TransactionCapability parameter with the number of multiple terminations set appropriately.

4 ENDIF.

5 IF the call is an Emergency Services call (e.g., 9-1-1 or air interface indication):

5-1 Execute the “MSC Initiating an OriginationRequest for an Emergency Services Call” task (see 3.2.1).

6 ENDIF.

7 IF the TerminationList parameter was received:

7-1 Process the DestinationDigits of the TerminationList parameter locally, routing the call with the PSTNTermination as PointOfReturn..

8 ELSEIF the MS dialed a locally allowed number (e.g., 9-1-1, *-9-1-1, N11, *N11) OR the MSC received an air interface indication of an Emergency Services Call~~emergency call~~:

8-1 IF the MS dialed number is only routed locally, for instance, for numbers used for access to local emergency service providers:

8-1-1 Process the dialed number locally routing the call with the PreferredLanguage-Indicator to set the PointOfReturn.

8-2 ELSEIF the OriginationTriggers matches the *, # or the count of the dialed number digits:

8-2-1 Execute the “MSC Initiating an Origination Request” task (see 4.31.1) to set the PointOfReturn.

8-3 ELSE:

8-3-1 Process the dialed Service Code locally routing the call with the PreferredLan-guageIndicator to set the PointOfReturn.

8-4 ENDIF.

9 ELSEIF the OriginationTriggers *All* trigger is on:

9-1 Execute the “MSC Initiating an Origination Request” task (see 4.31.1) to set the PointOfReturn.

9-2 IF a Digits (Dialed) parameter is received:

9-2-1 IF the type of the Digits is *unknown*.

9-2-1-1 Process the dialed number locally to set the PointOfReturn.

9-2-2 ENDIF.

9-3 ENDIF.

The remainder of this procedure remains unchanged

3.1.2 Idle MS Origination (*ANSI-41*.6-D 3.2.1, page 6-12 and IS-778)

When the MS attempts to originate a call, the Serving MSC shall do the following:

1 IF an appropriate *idle* voice or traffic channel is available for the identified air interface control channel, the MSC may pre-seize the channel by:

1-1 Reserve the available voice or traffic channel.

1-2 Order the MS to acquire the reserved voice or traffic channel.

1-3 Verify the MS has properly tuned to this voice or traffic channel.

2 ENDIF.

3 IF the MS is not authenticated and authentication is active:

3-1 IF the MS has authentication capabilities and ~~the~~ the MS's AuthenticationCapability indicates that the MS shall be authenticated[1]:

3-1-1 Include the SystemAccessType parameter set to *Call origination*.

3-1-2 IF the MS is not registered OR the location of the MS has changed since the last registration (i.e., the MS has left the location for which it is geographically authorized):

3-1-2-1 Set a *pending registration* flag for the MS.

3-1-3 ENDIF.

3-1-4 IF a *pending registration* flag is set for the MS OR the MSC requires the MS's profile (e.g., per call authorization required or the profile is not present):

3-1-4-1 IF the MSC requests qualification and authentication in parallel when a system access is received from an MS for which it does not have a valid service profile:

3-1-4-1-1 Execute the "MSC Initiating an Authentication Request" task (see 4.4.1) and the "MSC Initiating Qualification Request" task (see 4.33.1) in parallel.

3-1-4-1-2 IF authentication fails:

3-1-4-1-2-1 Clear the *pending registration* flag for the MS.

1. In addition the MSC shall initiate authentication procedures if ~~the MS has authentication capabilities and~~ there is no AuthenticationCapability information for the MS.

3-1-4-1-2-2 IF the call is an Emergency Services call (e.g., 9-1-1 or air interface indication):

3-1-4-1-2-2-1 Execute the “MSC Initiating an OriginationRequest for an Emergency Services Call” task (see 3.2.1).

3-1-4-1-2-2-2 IF the TerminationList parameter was received:

3-1-4-1-2-2-2-1 Process the PSTNTermination (DestinationDigits) of the TerminationList parameter locally to route the call.

3-1-4-1-2-2-2-2 Exit this task.

3-1-4-1-2-2-3 ENDIF

3-1-4-1-2-3 ENDIF.

3-1-4-1-2-4 IF the MS dialed a locally allowed number (e.g., 9-1-1, *-9-1-1, N11, *N11) OR the MSC received an air interface indication of an emergency call:

3-1-4-1-2-4-1 Process the dialed number locally and route the call.

3-1-4-1-2-4-2 Exit this task.

3-1-4-1-2-5 ELSE:

3-1-4-1-2-5-1 Execute “Local Recovery Procedures” task (see 3.5.1).

3-1-4-1-2-5-2 Exit this task.

3-1-4-1-2-6 ENDIF.

3-1-4-1-3 ELSE (authentication successful):

3-1-4-1-3-1 GOTO Pre-screening completed.

3-1-4-1-4 ENDIF.

3-1-4-2 ELSE:

3-1-4-2-1 Execute the “MSC Initiating Qualification Request” task (see 4.33.1).

3-1-4-2-2 IF the MS’s AuthenticationCapability indicates that the MS shall be authenticated:

3-1-4-2-2-1 Execute the “MSC Initiating an Authentication Request” task (see 4.4.1).

3-1-4-2-3 ENDIF.

3-1-4-2-4 IF authentication fails:

3-1-4-2-4-1 Clear the *pending registration* flag for the MS.

3-1-4-2-4-2 IF the call is an Emergency Services call (e.g., 9-1-1 or air interface indication):

3-1-4-2-4-2-1 Execute the “MSC Initiating an OriginationRequest for an Emergency Services Call” task (see 3.2.1).

3-1-4-2-4-2-2 IF the TerminationList parameter was received:

3-1-4-2-4-2-2-1 Process the PSTNTermination (DestinationDigits) of the TerminationList parameter locally to route the call.

3-1-4-2-4-2-2-2 Exit this task.

3-1-4-2-4-2-3 ENDIF

3-1-4-2-4-3 ENDIF.

3-1-4-2-4-4 IF the MS dialed a locally allowed number (e.g., 9-1-1, *-9-1-1, N11, *N11) OR the MSC received an air interface indication of an emergency call:

3-1-4-2-4-4-1 Process the dialed number locally and route the call.

3-1-4-2-4-4-2 Exit this task.

3-1-4-2-4-5 ELSE:

3-1-4-2-4-5-1 Execute “Local Recovery Procedures” task (see 3.5.1).

3-1-4-2-4-5-2 Exit this task.

3-1-4-2-4-6 ENDIF.

3-1-4-2-5 ELSE (authentication successful):

3-1-4-2-5-1 GOTO Pre-screening completed.

3-1-4-2-6 ENDIF.

3-1-4-3 ENDIF.

3-1-5 ENDIF.

3-1-6 Execute the “MSC Initiating an Authentication Request” task (see 4.4.1).

3-1-7 IF authentication fails:

3-1-7-1 IF the call is an Emergency Services call (e.g., 9-1-1 or air interface indication):

3-1-7-1-1 Execute the “MSC Initiating an OriginationRequest for an Emergency Services Call” task (see 3.2.1).

3-1-7-1-2 IF the TerminationList parameter was received:

3-1-7-1-2-1 Process the PSTNTermination (DestinationDigits) of the TerminationList parameter locally to route the call.

3-1-7-1-2-2 Exit this task.

3-1-7-1-3 ENDIF

3-1-7-2 ENDIF.

3-1-7-3 IF the MS dialed a locally allowed number (e.g., 9-1-1, *-9-1-1, N11, *N11) OR the MSC received an air interface indication of an emergency call:

3-1-7-3-1 Process the dialed number locally and route the call.

3-1-7-3-2 Exit this task.

3-1-7-4 ELSE:

3-1-7-4-1 Execute “Local Recovery Procedures” task (see 3.5.1).

3-1-7-4-2 Exit this task.

3-1-7-5 ENDIF.

~~3-1-7-6 3-1-3-1 Execute “Local Recovery Procedures” task (see 3.5.1).~~

~~3-1-7-7 3-1-3-2 Exit this task.~~

3-1-8 ENDIF.

3-1-9 GOTO Pre-screening completed.

3-2 ENDIF.

4 ENDIF.

5 IF the MS is not registered OR IF the location of the MS has changed since the last registration:

5-1 Execute the “MSC Initiating MS Registration” task (see 4.38.1).

6 ELSEIF the MSC requires the MS’s service profile (e.g., per call authorization required or the service profile is not present):

6-1 Execute the “MSC Initiating Qualification Request” task (see 4.33.1).

7 ENDIF.

7-1 Pre-screening completed:

8 Execute “Initialize the OneTimeFeatureIndicator Parameter” task (see 3.2.8).

9 IF a *pending registration* flag is set for the MS:

9-1 Clear the *pending registration* flag for the MS.

9-2 Execute the “MSC Analyze MS Dialed Number” task (see 3.2.3) and spawn the “MSC Initiating MS Registration” task (see 4.38.1) in parallel.

10 ELSE:

10-1 Execute the “MSC Analyze MS Dialed Number” task (see 3.2.3).

11 ENDIF.

~~12~~ ~~9~~ ~~Execute “MSC Analyze MS Dialed Number” task (see 3.2.3).~~

13 IF the PointOfReturn is *ToneTermination*:

13-1 Execute “Apply Access Denial Treatment” task (see 3.4.5).

13-2 Exit this task.

14 ENDIF.

15 IF the MS is not authorized:

15-1 Execute “Apply Access Denial Treatment” task (see 3.4.5).

15-2 Exit this task.

16 ENDIF.

17 Execute the “MSC PACA Call Origination Invocation” task (see 5.17.2).

18 IF unsuccessful:

18-1 Execute “Apply Access Denial Treatment” task (see 3.4.5).

19 ELSE (seize the channel by):

19-1 Reserve the available voice or traffic channel.

19-2 Order the MS to acquire the reserved voice or traffic channel.

19-3 Verify the MS has properly tuned to this voice or traffic channel.

19-4 IF unsuccessful:

19-4-1 Execute “Apply Access Denial Treatment” task (see 3.4.5).

19-5 ENDIF.

20 ENDIF.

21 Execute the “MSC MWN Call Origination Invocation” task (see 5.13.7).

22 ENDIF.

23 IF the AnnouncementList parameter is received:

23-1 Execute the “Play All Announcements in the AnnouncementList” task (see 3.2.5).

24 ENDIF.

25 Execute the “MSC Routing Points Of Return” task (see 3.2.6).

26 Exit this task.

3.1.3 In Call MS Flash Attempt (*ANSI-41.6-D 3.2.2*, page 6-14)

When the MS attempts to signal during a call by pressing the (SEND) key, the Anchor MSC shall:

1 IF it is required to authenticate flash requests (e.g., signaling encryption is not supported):

1-1 Include the SystemAccessType parameter set to *Flash request*.

1-2 Execute the "MSC Initiating an Authentication Request" task (see 4.4.1).

1-3 IF authentication fails AND the feature request received was not a request to establish an emergency services call:

1-3-1 Execute "Local Recovery Procedures" task (see 3.5.1).

1-3-2 Exit this task.

1-4 ENDIF.

2 ENDIF.

3 IF *FlashPrivileges* are allowed by the OneTimeFeatureIndicator parameter:

3-1 IF CW has been invoked:

3-1-1 Put the current party on hold.

The remainder of this procedure remains unchanged

3.1.4 Serving MSC Initiating a Flash Request (*ANSI-41.6-D* 4.15.1, page 6-138)

When the Serving MSC receives a flash from an MS engaged in a voice call, it shall perform the following:

1 Include the InterMSCCircuitID parameter set to the trunk for this call.

2 Include the MobileIdentificationNumber parameter set to the requesting MS's MIN.

3 Include the ElectronicSerialNumber parameter set to the requesting MS's ESN.

4 Include the Digits: (Dialed) parameter set to the digits (non-encrypted) received from the MS.

5 Include the EmergencyServicesRoutingDigits (ESRD) parameter set to the appropriate value.

6 IF the SignalingMessageEncryptionKey (SMEKEY) parameter was provided for the MS:

6-1 Include the ConfidentialityModes: (CMODES-actual) parameter set to the current Signaling Message Encryption mode and Voice Privacy mode of the requesting MS.

7 ENDIF.

8 Send a FlashRequest INVOKE toward the Anchor MSC for this call.

9 Start the Flash Request Timer (FRT).

10 WAIT for a Flash Request response.

11 WHEN a RETURN RESULT is received:

11-1 Stop timer (FRT).

11-2 Exit this task.

12 WHEN a RETURN ERROR or REJECT is received:

12-1 Stop timer (FRT).

12-2 Execute the "Local Recovery Procedures" task (see 3.5.1).

12-3 Exit this task.

13 WHEN the timer (FRT) expires:

13-1 Execute the “Local Recovery Procedures” task (see 3.5.1).

14 ENDWAIT.

15 Exit this task.

3.1.5 Anchor MSC Receiving a FlashRequest INVOKE (*ANSI-41.6-D* 4.15.2, page 6-139)

When the Anchor MSC receives a FlashRequest INVOKE, it may perform the following:

1 IF the received message can be processed:

1-1 Send a RETURN RESULT toward the Serving MSC.

1-2 IF the requesting MS’s AuthenticationCapability status information indicates that authentication is required:

1-2-1 Include the SystemAccessType parameter set to indicate *Flash request*.

1-2-2 Include the Digits (Dialed) parameter set equal to the Digits in the received FlashRequest INVOKE message.

1-2-3 Include the ConfidentialityModes (CMODES-actual) parameter (if it was received in the FlashRequest INVOKE message).

1-2-4 Execute the “MSC Initiating an AuthenticationRequest” task (see 4.4.1).

1-2-5 IF authentication is successful OR the feature control request received was a request to establish an emergency call leg:

1-2-5-1 IF the feature control request received was a request to establish an emergency call leg:

1-2-5-1-1 Execute the “MSC Initiating an OriginationRequest for an Emergency Services Call” task (see 3.2.1).

1-2-5-2 ENDIF.

1-2-5-3 Effect the feature control requested by the MS flash (if applicable).

1-2-6 ELSE ~~(authentication fails)~~:

1-2-6-1 Execute recovery procedures according to the MSC’s internal algorithm.

1-2-7 ENDIF.

1-3 ELSE (the requesting MS is not capable of being authenticated):

1-3-1 IF the feature control request received was a request to establish an emergency call leg:

1-3-1-1 Execute the “MSC Initiating an OriginationRequest for an Emergency Services Call” task (see 3.2.1).

1-3-2 ENDIF.

1-3-3 Effect the feature control requested by the MS flash (if applicable).

1-4 ENDIF.

2 ELSE (the message cannot be processed):

2-1 Send a RETURN ERROR with the proper Error Code value (see the following table) toward the Serving MSC.

3 ENDIF.

4 Exit this task.

3.1.6 MSC Receiving an SMSDeliveryPointToPoint INVOKE (*ANSI-41.6-D* 4.46.4, page 6-273)

Upon receipt of an SMSDeliveryPointToPoint INVOKE for an intended MS, the receiving MSC shall do the following:

1 IF the message can be processed:

1-1 IF the ServiceIndicator parameter is set to CDMA Position Determination Service or AMPS Position Determination Service:

1-1-1 IF the SMS_BearerData parameter has a non-zero length:

1-1-1-1 Execute the "MSC Receiving an SMDPP INVOKE for Position Data Message Exchange" task (see 3.6.1).

1-1-2 ENDIF.

1-1-3 Exit this task.

1-2 ENDIF

1-3 IF the SMS_DestinationAddress parameter is received:

The remainder of this procedure remains unchanged

3.1.7 Anchor MSC Initiating SMS Delivery Point-To-Point (*ANSI-41.6-D* 4.46.5, page 6-277)

This task assumes that it is called by a higher function capable of acting upon returned SMS_CauseCode appropriately. Upon request, the Anchor MSC shall do the following:

1 IF the request can be processed:

1-1 IF routing to the network entity that initiated position determination is required:

1-1-1 Set the destination address to the network address of that network entity.

1-2 ELSEIF the ServiceIndicator parameter is present and has the value *CDMA Position Determination Service* (i.e., MS has initiated CDMA position determination for an emergency services call):

1-2-1 Set the destination address to the network address of the local MPC for this MSC.

1-2-2 Include the Teleservice_Priority parameter set to indicate *Emergency*.

1-3 ELSE:

1-3-1 IF indirect routing is required by the SMS_OriginationRestrictions set to *Force Message Center*:

1-3-1-1 Include the SMS_DestinationAddress parameter set to the SMS_OriginalOriginatingAddress.

1-3-2 ENDIF.

1-3-3 CASE SMS_OriginationRestrictions OF:

1-3-4 *Block All:*

1-3-4-1 Include the SMS_CauseCode parameter indicating *SMS Origination Restriction*.

1-3-4-2 Return to the calling task indicating *denied*.

1-3-5 Allow Specific:

1-3-5-1 IF the MS is not allowed to originate using direct addresses:

1-3-5-1-1 IF the SMS_DestinationAddress parameter is not equal to the SMS_OriginalOriginatingAddress (direct routing requested):

1-3-5-1-1-1 Include the SMS_CauseCode parameter indicating *SMS Origination Restriction*.

1-3-5-1-1-2 Return to the calling task indicating *denied*.

1-3-5-1-2 ENDIF.

1-3-5-2 ENDIF.

1-3-6 DEFAULT:

1-3-6-1 (Just allow it.)

1-3-7 ENDCASE.

1-4 ENDIF.

1-5 Relay all included parameters.

1-6 Execute the "Initiating SMS Delivery Point-To-Point" task (see 4.46.2).

1-7 Return to the calling task with the received parameters and the returned indication.

2 ELSE (request cannot be processed):

2-1 Include the SMS_CauseCode parameter indicating the appropriate value.

2-2 Return to the calling task indicating *denied*.

3 ENDIF.

4 Exit this task.

3.1.8 Serving MSC Receiving an SMD-REQUEST (*ANSI-41.6-D* D.5, page 6-416)

Upon receipt of an air interface SMD-REQUEST from an MS-based SME, the Serving MSC shall do the following:

1 IF the DestinationAddress parameter is received:

1-1 Set the destination address with the address in the received DestinationAddress parameter.

2 ELSE:

2-1 Set the destination address to the address of the Anchor MSC.

3 ENDIF.

4 IF the OriginalDestinationAddress parameter is received:

4-1 Set the original destination address with the address in the received OriginalDestinationAddress parameter.

5 ELSE:

5-1 Set the original destination address with the destination address.

6 ENDIF.

7 Set the originating address to the originating MIN.

8 IF the OriginalOriginatingAddress parameter is received:

8-1 Set the original originating address with the address in the received OriginalOriginatingAddress parameter.

9 ELSE:

9-1 Set the original originating address with the originating address.

10 ENDIF.

11 IF the OriginalDestinationSubaddress parameter is received:

11-1 Set the original destination subaddress to the OriginalDestinationSubaddress parameter.

12 ENDIF.

13 IF the OriginalOriginationSubaddress parameter is supplied:

13-1 Set the original origination subaddress to the OriginalOriginationSubaddress parameter.

14 ENDIF.

15 IF the SMD-REQUEST is a *Data Burst* message of type PLD:

15-1 Include the ServiceIndicator parameter set to value *CDMA Position Determination Service*.

16 ENDIF.

17 IF the MSC is the Anchor MSC for the indicated MS:

17-1 Execute the “Anchor MSC Initiating SMS Delivery Point-To-Point” task (see 4.46.5).

18 ELSE (the MSC is the Serving MSC):

18-1 Set the underlying data transport destination address to the Anchor MSC or the next MSC in the handoff chain.

18-2 Include the InterMSCCircuitID parameter set to the trunk used in the direction toward the Anchor MSC.

18-3 Execute the “MSC Initiating SMS Delivery Backward” task (see 4.44.1).

19 ENDIF.

(Get here after the message has been relayed and responded to.)

20 IF the MS is still being served:

20-1 IF the request was *accepted*:

20-1-1 Relay the indicated SMS_BearerData.

20-1-2 Send an SMD-ACK to the MS based SME.

20-2 ELSE (the request was *denied*):

20-2-1 Relay the indicated SMS_CauseCode.

20-2-2 Send an SMD-NAK to the MS based SME.

20-3 ENDIF.

21 ELSE (the MS is no longer being served):

21-1 Discard the message.

22 ENDIF.

23 Return to calling task .

3.2 (NEW) Origination Request Procedures

3.2.1 MSC Initiating an OriginationRequest for an Emergency Services Call

When the MSC determines that it requires information from the MPC for an emergency service call, it shall perform the following:

1 Include the OriginationTriggers parameter with length zero.

2 IF the Mobile Station Identity (MSID) is available:

2-1 Include the MSID parameter set to identify the originating MS.

3 ELSE (MSID unavailable):

3-1 Include the InternationalMobileSubscriberIdentity identifier type of MSID of length zero.

4 ENDIF.

5 IF the Mobile Directory Number (MDN) of the MS is available:

5-1 Include the MobileDirectoryNumber parameter set to the MDN of the MS.

6 ELSE (MDN unavailable):

6-1 Include the MobileDirectoryNumber parameter set to the pseudo-callback number.

7 ENDIF.

8 Include the TransactionCapability parameter set to identify the current capabilities.

9 Include the MobileCallStatus parameter set appropriately, if applicable.

10 Include the OriginationIndicator parameter set to identify the types of call the MS can originate, if applicable.

11 Include the TerminationRestrictionCode parameter set to identify the types of calls the MS is allowed to terminate, if applicable.

12 IF the MSC is currently serving the MS:

12-1 Include the applicable parameters defined in the technology-specific MobInfo macros (see 2.3.2.14, and following).

12-2 Include the ServingCellID parameter set to the cell currently serving the MS.

13 ENDIF.

14 IF known:

14-1 Include the MobilePositionCapability parameter set to identify the position determination capability of the MS.

15 ENDIF.

16 Send an OriginationRequest INVOKE to the MPC associated with the MSC.

17 Start the Origination Request Timer (ORT).

18 Await Result:

19 WAIT for Origination Request response:

20 WHEN a RETURN RESULT is received:

20-1 OriginationRequest RETURN RESULT received:

20-2 Stop timer (ORT).

20-3 IF the message can be processed:

20-3-1 IF the GeographicPosition parameter is received:

20-3-1-1 Relay the contents of the GeographicPosition parameter for use as the ISUP Calling Geodetic Location parameter for the call to the calling task.

20-3-2 ENDIF.

20-3-3 IF the DMH_BillingDigits parameter is received:

20-3-3-1 Relay the contents of the DMH_BillingDigits parameter for use as the ISUP Charge Number parameter or as MF ANI information to the calling task.

20-3-4 ENDIF.

20-3-5 IF the MobileDirectoryNumber parameter is received:

20-3-5-1 Relay the contents of the MobileDirectoryNumber parameter for use as the ISUP Calling Party Number parameter to the calling task.

20-3-6 ENDIF.

20-3-7 IF the GenericDigits parameter is received:

20-3-7-1 Relay the contents of the GenericDigits parameter for use as the ISUP Generic Digits Parameter to the calling task.

20-3-8 ENDIF.

20-3-9 Return to the Calling Task.

20-4 ELSE (message cannot be processed):

20-4-1 Return to calling task with a *Unsuccessful* indication.

20-5 ENDIF.

21 WHEN an InterSystemPositionRequest INVOKE is received:

21-1 Execute the “MSC Receiving an InterSystemPositionRequest INVOKE” task (see 3.3.1).

21-2 GOTO Await Result.

22 WHEN a RemoteUserInteractionDirective INVOKE is received:

22-1 Send a RETURN ERROR with Error Code set to indicate *OperationSequenceProblem*.

22-2 GOTO Await Result.

23 WHEN the MS disconnects:

23-1 Stop timer (ORT).

23-2 Return to the calling task with a *Call Abandoned* indication.

24 WHEN a RETURN ERROR or REJECT is received:

24-1 Stop timer (ORT).

24-2 Return to the calling task with a *Unsuccessful* indication.

25 WHEN timer (ORT) expires[1]:

25-1 Return to the calling task with a *Unsuccessful* indication.

26 ENDWAIT.

27 Return to calling task.

1. This will not normally occur since the MPC will send a response when a timer (POST) in the MPC which is shorter than ORT expires.

3.3 (NEW) InterSystem Position Request

(See InterSystemPositionRequest, section 2.2.1.6)

3.3.1 MSC Receiving an InterSystemPositionRequest INVOKE

When an MSC receives an InterSystemPositionRequest INVOKE, it shall perform the following:

1 IF the received message can be processed:

1-1 IF the MSC is currently serving the MS AND the MS is assigned to a traffic channel:

1-1-1 Include the PositionResult parameter set to indicate *Mobile channel information returned*.

1-1-2 IF the CDMAPSMMCount parameter is received:

1-1-2-1 Order the MS to receive pilot signal strength per the PSMMCount value.

1-1-2-2 Include the results in the CDMAPSMMList parameter or GeographicPosition parameter as appropriate.

1-1-3 ENDIF

1-1-4 IF the TDMA_MAHORequest is set to *Return TDMA MAHO information*:

1-1-4-1 Order the MS to return MAHO information (signal strengths of the adjacent cells).

1-1-4-2 Include the results in the Mobinfo_TDMA macro.

1-1-5 ENDIF

1-1-6 Include the applicable parameters defined in the technology-specific MobInfo macros (see 2.3.2.14, and following).

1-1-7 Include all appropriate parameters (see 2.2.1.6).

1-2 ELSEIF the MSC recognizes that it is an Anchor or a Tandem for a call involving the MS:

1-2-1 Relay the PositionRequestType parameter.

1-2-2 Include all appropriate parameters (see 2.2.1.6).

1-2-3 Send an InterSystemPositionRequestForward INVOKE to the next MSC in the handoff chain toward the Serving MSC.

1-2-4 Start Intersystem Position Request Forward Timer (IPFT).

1-2-5 WAIT for InterSystemPositionRequestForward response:

1-2-6 WHEN a RETURN RESULT is received:

1-2-6-1 Stop the timer (IPFT).

1-2-6-2 IF the message can be processed:

1-2-6-2-1 Relay all received parameters.

1-2-6-2-2 Include all appropriate parameters (see 2.2.1.6).

1-2-6-3 ELSE (message cannot be processed):

1-2-6-3-1 Include the PositionResult parameter set to indicate *System failure*.

1-2-6-4 ENDIF.

1-2-7 WHEN a REJECT is received:

1-2-7-1 Stop the timer (IPFT).

1-2-7-2 Include the PositionResult parameter set to indicate *System failure*.
1-2-8 WHEN the timer (IPFT) expires:
1-2-8-1 Include the PositionResult parameter set to indicate *System failure*.
1-2-9 ENDWAIT.
1-3 ELSE:
1-3-1 Include the PositionResult parameter set to identify the error appropriately.
1-4 ENDIF.
2 ELSE (the received message cannot be processed):
2-1 Include the PositionResult parameter set to identify the error appropriately.
3 ENDIF.
4 Send an InterSystemPositionRequest RETURN RESULT.
5 Exit this task.

3.4 (NEW) Intersystem Position Request Forward

3.4.1 MSC Receiving an InterSystemPositionRequestForward INVOKE

(see InterSystemPositionRequestForward, section 2.2.1.7)

When an MSC receives an InterSystemPositionRequestForward INVOKE, it shall perform the following:

1 IF the received message can be processed:
1-1 IF the MSC is a Tandem for a call involving the MS:
1-1-1 Replace the received InterMSCCircuitID parameter value with the ID of the trunk used in the direction toward the Serving MSC for the call.
1-1-2 Relay the other received parameters.
1-1-3 Send an InterSystemPositionRequestForward INVOKE toward the Serving MSC.
1-1-4 Start the Intersystem Position Request Forward Timer (IPFT).
1-1-5 WAIT for InterSystemPositionRequestForward response:
1-1-6 WHEN a RETURN RESULT is received:
1-1-6-1 Stop the timer (IPFT).
1-1-6-2 IF the message can be processed:
1-1-6-2-1 Relay the received parameters.
1-1-6-3 ELSE (message cannot be processed):
1-1-6-3-1 Include the PositionResult parameter set to indicate *System failure*.
1-1-6-4 ENDIF.
1-1-7 WHEN a REJECT is received:
1-1-7-1 Stop the timer (IPFT).
1-1-7-2 Include the PositionResult parameter set to indicate *System failure*.
1-1-8 WHEN the timer (IPFT) expires:
1-1-8-1 Include the PositionResult parameter set to indicate *System failure*.
1-1-9 ENDWAIT.

1-2 ELSEIF the MSC is currently serving the MS AND the MS is assigned to a traffic channel:

1-2-1 IF MAHO Information is requested by the Anchor System:

1-2-1-1 IF the Serving MSC is capable of providing MAHO data:

1-2-1-1-1 Order the MS to return MAHO information (signal strenghts of the adjacent cells).

1-2-1-1-2 Include the results in the Mobinfo TDMA macro.

1-2-1-2 ENDIF

1-2-2 ENDIF

1-2-3 Replace the received MSCID parameter value with the MSCID of the Serving MSC.

1-2-4 Relay the other received parameters.

1-2-5 Include the applicable parameters defined in the technology-specific MobInfo macros (see 2.3.2.14, and following).

1-2-6 Include all appropriate parameters (see 2.2.1.6).

1-2-7 Send an InterSystemPositionRequest INVOKE to the MPC associated with the MSC.

1-2-8 Start the Intersystem Position Request Timer (IPRT).

1-2-9 WAIT for InterSystemPositionRequest response:

1-2-10 WHEN a RETURN RESULT is received:

1-2-10-1 Stop the timer (IPRT).

1-2-10-2 IF the message can be processed:

1-2-10-2-1 Relay the received parameters.

1-2-10-2-2 Include all appropriate parameters (see 2.2.1.7).

1-2-10-3 ELSE (message cannot be processed):

1-2-10-3-1 Include the PositionResult parameter set to indicate *System failure*.

1-2-10-4 ENDIF.

1-2-11 WHEN a REJECT is received:

1-2-11-1 Stop the timer (IPRT).

1-2-11-2 Include the PositionResult parameter set to indicate *System failure*.

1-2-12 WHEN the timer (IPRT) expires:

1-2-12-1 Include the PositionResult parameter set to indicate *System failure*.

1-2-13 ENDWAIT.

1-3 ELSE:

1-3-1 Include the PositionResult parameter set to identify the error appropriately.

1-4 ENDIF.

2 ELSE (received message cannot be processed):

2-1 Include the PositionResult parameter set to identify the error appropriately.

3 ENDIF.

4 Send an InterSystemPositionRequestForward RETURN RESULT toward the Anchor MSC.

5 Exit this task.

3.5 (NEW) Call Termination Report

(See CallTerminationReport, section 2.2.1.3)

3.5.1 MSC Initiating a CallTerminationReport INVOKE

When an MSC determines that an emergency services call has been released it will initiate a call termination report to the MPC by doing the following:

1 Include all appropriate parameters (see 2.2.1.3)

2 Send a CallTerminationReport INVOKE to the MPC

3 Start the Call Termination Report Timer (CTRT).

4 WAIT for CallTerminationReport response:

5 WHEN a RETURN RESULT is received:

5-1 Stop the timer (CTRT).

6 WHEN a RETURN ERROR or REJECT is received:

6-1 Stop the timer (CTRT).

6-2 Execute “Local Recovery Procedures” task (see 3.5.1).

7 WHEN the timer (CTRT) expires:

7-1 Execute “Local Recovery Procedures” task (see 3.5.1).

8 ENDWAIT.

9 Exit this task.

3.6 (NEW) SMDPP for Position Data Message Exchange

3.6.1 MSC Receiving SMDPP INVOKE for Position Data Message Exchange

(See SMSDeliveryPointToPoint, section 2.2.1.11)
(This procedure uses some of the extended SMS_CauseCode values defined in IS-725-A OTA)

1 IF the received message can be processed:
1-1 IF the MS is operating in an unsupported mode:
1-1-1 Include the SMS_CauseCode parameter set to *Radio interface incompatibility*.
1-2 ELSE IF the MS has performed an intersystem handoff
1-2-1 Execute the "MSC Initiating SMSDeliveryForward" task (4.45.1)
1-3 ELSE:
1-3-1 Extract the *Position Data Message* from the SMS_BearerData parameter.
1-3-2 Send the Position Data Message to the MS.
1-3-3 IF the *Position Data Message* could not be sent:
1-3-3-1 Include the SMS_CauseCode parameter set to *Network failure*.
1-3-4 ELSEIF the received ActionCode parameter is not set to indicate *Do Not Wait for MS User Level Response*:
1-3-4-1 WAIT for response from the MS:
1-3-4-2 WHEN an Position Data Message response is received:
1-3-4-2-1 IF the *Position Data Message* exceeds *IS-41* message transport size limitations:
1-3-4-2-1-1 Include the SMS_CauseCode parameter set to *Encoding problem.*
1-3-4-2-2 ELSE:
1-3-4-2-2-1 Include the SMS_BearerData parameter set to the *Position Data Message*.
1-3-4-2-3 ENDIF.
1-3-4-3 ENDWAIT.
1-3-5 ENDIF.
1-4 ENDIF.
2 ELSE (message can not be processed):
2-1 Include the SMS_CauseCode parameter set to an appropriate value.
3 ENDIF.
4 Include all appropriate parameters (see 2.2.1.11)
5 Send an SMDPP RETURN RESULT to the requesting entity.
6 Exit this task.

4 Operation Timer Values

(*ANSI-41-D* Chapter 6, page 6-402)

Table 8-72: **Operation Timer Values (continued)**

Timer	Default (sec.)	Started when	Normally stopped when	Action when timer expires
• • •	• • •	• • •	• • •	• • •
CTRT Call Termination Report Timer	6	CallTermination Report INVOKE is sent.	CallTermination Report RETURN RESULT or RETURN ERROR is received.	Execute recovery procedures.
• • •	• • •	• • •	• • •	• • •
GPDT	6	GeoPositionDirective INVOKE is sent	GeoPositionDirective RETURN RESULT or RETURN ERROR is received	Execute recovery procedures.
GPRT	not specified by this standard	GeoPositionRequest INVOKE is sent	GeoPositionRequest RETURN RESULT or RETURN ERROR is received	Execute recovery procedures.
• • •	• • •	• • •	• • •	• • •
IPFT Intersystem Position Request Forward Timer	25	IntersystemPosition-RequestForward INVOKE is sent.	IntersystemPositionRe-questForward RETURN RESULT or RETURN ERROR is received.	see "MSC Receiving an Inter-SystemPositionRe-questForward INVOKE".
• • •	• • •	• • •	• • •	• • •
IPRT Intersystem Position Request Timer	30	InterSystemPosition-Request INVOKE is sent.	InterSystemPositionRe-quest RETURN RESULT or RETURN ERROR is received.	see "MSC Receiving an Inter-SystemPositionRe-quest INVOKE"
• • •	• • •	• • •	• • •	• • •
ORT Origination Request Timer	16 (see note a.)	OriginationRequest INVOKE (or a subse-quent RemoteUse-rInteractiveDirective INVOKE) is sent.	OriginationRequest RETURN RESULT, RETURN ERROR or a RemoteUserInteractionDi-rective INVOKE is received.	Execute recovery procedures (see note b.)
• • •	• • •	• • •	• • •	• • •
POST Position Timer	3 to 5	MPC Receives an OriginationRequest INVOKE.	MPC initiates an Origina-tionRequest RETURN RESULT.	MPC initiates an OriginationRe-quest RETURN RESULT.
• • •	• • •	• • •	• • •	• • •

Notes:

a. In the case of an emergency services call, the ORT timer can be less than 16 seconds but should be more than the POST timer.

b. In the case of an emergency services call, the call will be extended to the ESNE.

Chapter 9: Location Services Protocol (LSP)

1 Introduction

This section specifies the Abstract Syntax for the Location Services Protocol using the Abstract Syntax Notation One (ASN.1), defined in ITU-T Recommendations X.680 (1994) and X.680 Amendment 1 (1995) and the OPERATION and ERROR external MACROs, defined in ANSI T1.114-1996.

The encoding rules applicable to the defined Abstract Syntax are the ASN.1 Basic Encoding Rules defined in ITU-T Recommendation X.690 (1994). Implicit tagging is used for all context specific parameters.

The Location Services Protocol (LSP) consists of operations used on the MPC-PDE interface (E_5) and on the MPC-CRDB interface (E_{11}) and is applicable to AMPS, NAMPS, TDMA and CDMA air interface locations. LSP is based on TCAP, but the physical, transport and network layers are specifically undefined. As an alternative, some message and parameters have been defined for transport over ANSI-41 MAP.

The following operations are defined for the MPC-PDE interface:

- CallTerminationReport (CTRPT)
  This operation may be used to by the MPC to inform the PDE that an emergency services call has been disconnected.
- GeoPositionDirective (GPOSDIR)
  This operation is used to push an MS position from the PDE to the MPC.
- GeoPositionRequest (GPOSREQ)
  This operation is used to request the PDE for the initial, updated or last known position of an MS.
- SMSDeliveryPointToPoint (SMDPP)
  This operation is for conveying encapsulated data from one point to another point and reports the success or failure of that transfer.
- InterSystemPositionRequest (ISPOSREQ)
  This operation is used to request the PSMM results from the PDE to the MS.

The following operation is defined for the MPC-CRDB interface:

- PositionRouteRequest (POSROUTREQ)
  This operation is used to request a translation from a position expressed as latitude and longitude to a string of digits.

Parameter contents imported from other specifications (e.g. T1.114 and ANSI-41) are imported without length and identifier octets.

1.1 Transaction Portion

The Location Services Protocol employs the Query with Permission and Response TCAP Package Types defined in ANSI T1.114-1996.

1.2 Component Portion

The Location Services Protocol employs the Invoke (Last), Return Result (Last), Return Error and Reject TCAP Component Types defined in ANSI T1.114-1996 with the following exceptions and limitations:

- The Operation Code Identifier is coded as Private TCAP.
- The Operation Code is partitioned into an Operation Family followed by a Specifier associated with each Operation Family member. For the Location Services Protocol, the Operation Family is coded as decimal 2. Bit H of the Operation Family is always coded as 0.
- A TCAP INVOKE component shall contain a Component ID Length greater than zero.
- A TCAP RETURN RESULT component shall only be transmitted in response to an INVOKE Component.
- A TCAP RETURN ERROR component shall only be sent in response to an INVOKE component, not a RETURN RESULT component.
- The Error Code Identifier is coded as Private TCAP.
- If a problem is detected by TCAP (i.e. the received message does not conform to ANSI T1.114.3), a TCAP REJECT component with one of the following Problem Specifiers shall be sent:
  a. Problem Type General: all defined Problem Specifiers are applicable.
  b. Problem Type Transaction Portion: all defined Problem Specifiers are applicable.
- If a problem is detected by the Location Services TC-user (i.e. the received message does not conform to the Location Services Protocol), a TCAP REJECT component with one of the following TCAP Problem Specifiers shall be sent: : Duplicate Invoke ID, Unrecognized Operation Code or Incorrect Parameter.
- The Parameter SET Identifier is coded per ANSI T1.114 (national, constructor with Identifier code 18).
- The Parameter SEQUENCE Identifier is coded per ANSI T1.114 (universal, constructor with Identifier code 16).
- Generalized Time is included by reference to Chapter 7. The definition from X.680 that is referenced from Chapter 7 should be used, and not the definition from TIA/EIA-41-D.

2 Location Services Protocol Abstract Syntax

The Location Services Protocol is composed of an ASN.1 module dealing with operations, errors and data types.

```
LocationServicesProtocol { joint-iso-ccitt (4) memberbody (2) usa (840) LocationServicesProtocol (2) }
DEFINITIONS

::=

BEGIN

EXPORTS
IMPORTS
                    ERROR,
                    OPERATION
FROM TCAPPackage { iso (1) memberbody (2) usa (840) T1.114 (10013) } ;

                    Digits,
                    GeographicPosition,
                    IMSI,
                    MobileIdentificationNumber,
                    PositionInformation,
                    PositionRequestType
FROM EmergencyServicesProtocol { iso (1) memberbody (2) usa (840) emergencyServicesProtocol (1) }
;
-- Location Services errors and error codes
-- FaultyParameter parameter id is “1”
-- The following text defines the values of error codes (local values 1 through 4).
systemFailure       ERROR ::= localValue 1
unauthorizedRequest
                    ERROR PARAMETER FaultyParameter ::= localValue 2
unexpectedDataValue
                    ERROR PARAMETER FaultyParameter ::= localValue 3
unrecognizedKey
                    ERROR PARAMETER FaultyParameter ::= localValue 4


-- Operations Definitions


-- The CallTerminationReport operation may be used by the MPC to inform the PDE that an
-- emergency services call has been disconnected.
-- The MPC-based timer CTRT has a default value of 6 seconds.
CallTerminationReport ::= OPERATION -- Timer CTRT
PARAMETER
ctrArg              CallTerminationReportArgument
RESULT
```

```
ctrRes              CallTerminationReportResponse
ERRORS{
                    }
CallTerminationReport ::= localValue {2, 6}

CallTerminationReportArgument ::= SEQUENCE {
ctBILLID        [1] BillingID OPTIONAL -- Include if known
ctESN           [2] ESN OPTIONAL, -- Include if known
ctIMSI          [3] IMSI OPTIONAL, -- Include if known
ctMIN           [4] MobileIdentificationNumber OPTIONAL, -- Include if known
ctTMSI          [5] NetworkTMSI OPTIONAL, -- Include if known
}
CallTerminationReportResponse ::= SEQUENCE {
}



-- The GeoPositionDirective operation is used to deliver the position of a specific MS.
-- The PDE-based timer GPDT has a default value of 6 seconds.
GeoPositionDirective ::= OPERATION -- Timer GPDT
PARAMETER
lspdArg             PositionDirectiveArgument
RESULT
lspdRes             PositionDirectiveResponse
ERRORS{
                    SystemFailure,
                    UnauthorizedRequest,
                    UnexpectedDataValue,
                    UnrecognizedKey
}
GeoPositionDirective ::= localValue {2, 2 }

PositionDirectiveArgument ::= SEQUENCE {
pdKey               CHOICE {
                        [1] MobileIdentificationNumber,
                        [2] IMSI,
                        [3] NetworkTMSI
                    },
pdgeon              [4] PositionInformation,
pdesn               [5] ElectronicSerialNumber   OPTIONAL -- Include if known
}

PositionDirectiveResponse ::= SEQUENCE {
pdBILLID            [1] BillingID OPTIONAL -- Include if applicable
}
```

```
-- The GeoPositionRequest operation is used to request the
-- position of a specific MS. The MPC based timer GPRT has a default value which is a local
-- configuration option dependent on the PDE technology used.
GeoPositionRequest ::= OPERATION                -- Timer GPRT
PARAMETER
lsprArg             PositionRequestArgument
RESULT
lsprRes             PositionRequestResponse
ERRORS {
                    SystemFailure,
                    UnauthorizedRequest,
                    UnexpectedDataValue,
                    UnrecognizedKey
}
GeoPositionRequest ::= localValue {2, 1 }


PositionRequestArgument ::= SEQUENCE {
prReqType       [0] PositionRequestType,
prKey           CHOICE {
                        [1] MobileIdentificationNumber,
                        [2] IMSI,
                        [3] NetworkTMSI
                },
presn           [4] ElectronicSerialNumber   OPTIONAL,
                -- Include if known.
prMobInfo       [5] MobileInformation   OPTIONAL,
prMPCap         [6] MobilePositionCapability OPTIONAL,
                -- Mobile unit geo-position assistance capabilities.
prMSCID         [7] MSCID OPTIONAL, -- Serving MSC Id.
prServingCellID [8]ServingCellID OPTIONAL,
prPriority      [9] Teleservice_Priority OPTIONAL,
prBILLID        [10] BillingID OPTIONAL -- Include if known
}


PositionRequestResponse ::= SEQUENCE {
                [0] PositionInformation OPTIONAL,
                [1] PositionResult
}


-- The PositionRouteRequest operation is used to request
-- routing information based on the latitude and longitude of the MS.
-- The MPC-based timer PRRT has a default value of 2 seconds.
PositionRouteRequest ::= OPERATION   -- Timer PRRT
PARAMETER
                    lsprreqArg              PositionRouteRequestArgument
RESULT
                    lsprreqRes              PositionRouteRequestResponse
ERRORS{
```

```
                    SystemFailure,
                    UnauthorizedRequest,
                    UnexpectedDataValue,
                    UnrecognizedKey
}
PositionRouteRequest ::= localValue {2, 3 }

PositionRouteRequestArgument ::= SEQUENCE {
prRouteReqPosition                  [0] GeographicPosition
}

PositionRouteRequestResponse ::= SEQUENCE {
prRouteReqDigits                    [0] DestinationDigits   OPTIONAL
}



-- The SMSDeliveryPointToPoint operation is used for conveying encapsulated data from
-- one point to another point and reports the success or failure of that transfer.  This
-- operation is only used on the E5 Interface.
SMSDeliveryPointToPoint ::= OPERATION
PARAMETER
            smdppArg        SMSDeliveryPointToPointArgument
RESULT
            smdppRes        SMSDeliveryPointToPointResponse
-- Errors are reported as SMS_CauseCode values
SMSDeliveryPointToPoint ::= localValue {2, 4 }

SMSDeliveryPointToPointArgument ::= SEQUENCE {
msid                CHOICE {
                        [0] MobileIndentificationNumber,
                        [1] IMSI
                        },
smdppSrvcIndctr     [2] ServiceIndicator OPTIONAL,
smdppActCode        [3] ActionCode OPTIONAL,
smdppBearerData     [4] SMS_BearerData OPTIONAL,
smdppSOWD2          [5] CDMAServingOneWayDelay2 OPTIONAL,
            -- Include for CDMA when MPC is invoking entity
smdppServingCellID  [6] ServingCellID OPTIONAL,
            -- Include when MPC is invoking entity
smdppTeleserviceId  [7] SMS_TeleserviceIdentifier OPTIONAL,
smdppPriority       [8] Teleservice_Priority OPTIONAL,
smdppESN            [9] ElectronicSerialNumber OPTIONAL
}

SMSDeliveryPointToPointResponse ::= SEQUENCE {
smdppCauseCode      [0] SMS_CauseCode OPTIONAL,
```

```
smdppBearerData      [1] SMS_BearerData OPTIONAL,
smdppSOWD2           [2] CDMAServingOneWayDelay2 OPTIONAL,
                     -- Include for CDMA when MPC is responding entity
smdppServingCellID   [3] ServingCellID OPTIONAL,
                     -- Include when MPC is responding entity
}

-- The InterSystemPositionRequest operation is used to request the
-- PSMM results measured at a specific MS. The MPC based timer IPRT has a default value of 30 seconds.
InterSystemPositionRequest ::= OPERATION          -- Timer IPRT
PARAMETER
                     isprArg          InterSystemPositionRequestArgument
RESULT
                     isprRes          InterSystemPositionRequestResponse
ERRORS {
                          SystemFailure,
                          UnauthorizedRequest,
                          UnexpectedDataValue,
                          UnrecognizedKey
                          }
InterSystemPositionRequest ::= localValue {2, 5 }

InterSystemPositionRequestArgument ::= SEQUENCE {
                          isprReqType          [0] PositionRequestType,
                          mobileIdentificationNumber [1] MobileIdentificationNumber OPTIONAL,
                          iMSI                 [2] IMSI OPTIONAL,
                          networkTMSI          [3] NetworkTMSI OPTIONAL,
                                               -- Include at least one of MIN, IMSI, and NetworkTMSI
                          ispresn              [4] ElectronicSerialNumber   OPTIONAL,
                          -- Include if known.
                          isprMSCID            [5] MSCID OPTIONAL, -- Serving MSC Id.
                          IsprCDMAPSMMCnt [6] CDMAPSMMCount,
                          isprServingCellID    [7] ServingCellID OPTIONAL,
                          isprMAHORequest      [8] TDMA_MAHORequest OPTIONAL
                          }

InterSystemPositionRequestResponse ::= SEQUENCE {
                          isprPosResult        [0] PositionResult OPTIONAL,
                          isprMPCap            [1] MobilePositionCapability OPTIONAL,
                          -- Mobile unit geo-position assistance capabilities.
                          isprMobInfo          [2] MobileInformation ,
                          isprMSCID            [3] MSCID OPTIONAL, -- Serving MSC Id.
                          isprServingCellID    [4] ServingCellID,
                          positionInformation  [5] PositionInformation OPTIONAL
                          }
```

-- Location Services Parameter Definitions

ActionCode ::= OCTET STRING -- See Chapter 8, Section 2.3.2.1 for encoding

BillingID ::= OCTET STRING -- See ANSI-41-D, Section 6.5.2.16 for encoding

CDMAChannelData ::= OCTET STRING -- See ANSI-41-D, Section 6.5.2.30 for encoding

CDMACodeChannel ::= OCTET STRING -- See ANSI-41-D, Section 6.5.2.31 for encoding

CDMAMobileCapabilities ::= OCTET STRING -- See Chapter 8, Section 2.3.2.2 for encoding

CDMAPilotStrength ::= OCTET STRING -- See ANSI-41-D, Section 6.5.2.35 for encoding

CDMAPrivateLongCodeMask ::= OCTET STRING -- See ANSI-41-D, Section 6.5.2.36 for encoding.

CDMAPSMMCount ::= OCTET STRING -- See Chapter 8, Section 2.3.2.3 for encoding.

```
CDMAPSMMList ::= SET {
cdmaSOWD2          [0] CDMAServingOneWayDelay2,
cdmatlist1         [1] SEQUENCE OF CDMATargetMAHOList -- at least one must be included
}
```

CDMAServiceOption ::= OCTET STRING -- See IS-737, Section 6.5.2f for encoding.

CDMAServingOneWayDelay2 ::= OCTET STRING -- See Chapter 8, Section 2.3.2.5 for encoding.

```
CDMATargetMAHOInformation ::= SET {
tcellid            [0] TargetCellID,
cps                [1] CDMAPilotStrength,
ctowd              [2] CDMATargetOneWayDelay,
mscid              [3] MSCID OPTIONAL -- Target MSCID
}
```

CDMATargetMAHOList ::= SEQUENCE OF CDMATargetMAHOInformation -- at least one must be included

CDMATargetOneWayDelay ::= OCTET STRING -- See ANSI-41-D, Section 6.5.2.46 for encoding.

ChannelData ::= OCTET STRING -- See ANSI-41-D, Section 6.5.2.47 for encoding.

DestinationDigits ::= OCTET STRING -- See ANSI-41-D, Section 6.5.2.56 for encoding

DTXIndication ::= OCTET STRING -- See Chapter 8, Section 2.3.2.7 for encoding.

ElectronicSerialNumber ::= OCTET STRING -- See ANSI-41-D, Section 6.5.2.53 for encoding.

```
FaultyParameter ::= OCTET STRING                -- See ANSI-41-D, Section 6.5.2.66 for encoding

Hyperband ::= INTEGER                           -- 0 = 800 MHz, 1 = 1900 MHz

MeasuredCellID ::= OCTET STRING                 -- See ANSI-41-D, Section 6.5.242 for encoding.

MeasuredChannel ::= OCTET STRING                -- See TDMA for encoding of channel number

MobileInformation ::= CHOICE {
mobInfo_AMPS [0] SEQUENCE {
                        [1] ChannelData,
                        [2] DTXIndication OPTIONAL,
                        [3] ReceivedSignalQuality OPTIONAL
                        },
mobInfo_CDMA [1] SEQUENCE {
                        [1] CDMAChannelData,
                        [2] CDMACodeChannel OPTIONAL,
                        [3] CDMATargetMAHOList OPTIONAL,
                        [4] CDMAPrivateLongCodeMask OPTIONAL,
                        [5] CDMAServingOneWayDelay2 OPTIONAL
                        [6] CDMAPSMMList OPTIONAL,
                        [7] CDMAMobileCapabilities OPTIONAL,
                        [8] CDMASO OPTIONAL
                        },
mobInfo_NAMPS [2] SEQUENCE {
                        [1] ChannelData,
                        [2] NAMPSChannelData,
                        [3] DTXIndication OPTIONAL,
                        [4] ReceivedSignalQuality OPTIONAL
},
mobInfo_TDMA [3] SEQUENCE {
                        [1] TDMAChannelData,
                        [2] DTXIndication OPTIONAL,
                        [3] TargetMeasurementList OPTIONAL,
                        [4] ReceivedSignalQuality OPTIONAL,
                        [5] VoicePrivacyMask OPTIONAL
                        [6] TDMA_MAHO_CELLID OPTIONAL,
                                        -- Include if MAHO information was requested and
                                        -- cells can be identified
                        [7] TDMA_MAHO_CHANNEL OPTIONAL,
                                        -- Include if MAHO information was requested and
                                        -- cells cannot be identified.
                        [8] TDMA_TimeAlignment OPTIONAL,
                        [9] TDMAVoiceMode OPTIONAL -- Include if known
                        }
}
```

MobilePositionCapability ::= OCTET STRING -- See Chapter 8, Section 2.3.2.13 for encoding.

MSCID ::= OCTET STRING -- See ANSI-41-D, Section 6.5.2.82 for encoding.

NAMPSChannelData ::= OCTET STRING -- See ANSI-41-D, Section 6.5.2.86 for encoding.

NetworkTMSI ::= OCTET STRING -- See Chapter 8, Section 2.3.2.18 for encoding.

PositionInformation ::= OCTET STRING -- See Chapter 8, Section 2.3.2.19 for encoding.

PositionResult ::= OCTET STRING -- See Chapter 8, Section 2.3.2.21 for encoding.

ReceivedSignalQuality ::= OCTET STRING -- See ANSI-41-D, Section 6.5.2.106 for encoding.

ServiceIndicator ::= OCTET STRING -- See Chapter 8, Section 2.3.2.24 for encoding

ServingCellID ::= OCTET STRING -- See ANSI-41-D, Section 6.5.2.117 for encoding.

SMS_BearerData ::= OCTET STRING -- See ANSI-41-D, Section 6.5.2.124 for encoding

SMS_CauseCode ::= OCTET STRING -- See ANSI-41-D, Section 6.5.2.125 for encoding

SMS_TeleserviceIdentifier ::= OCTET STRING -- See Chapter 8, Section 2.3.2.25 for encoding

TargetCellID ::= OCTET STRING -- See ANSI-41-D, Section 6.5.242 for encoding.

TargetMeasurementList ::= OCTET STRING -- See ANSI-41-D, Section 6.5.2.150 for encoding.

TDMAChannelData ::= OCTET STRING -- See ANSI-41-D, Section 6.5.2.153 for encoding.

```
TDMA_MAHO_CELLID ::= SEQUENCE {
        [1] ReceivedSignalQuality, -- Obtained signal strength measurement from Serving Cell
        [2] Hyperband OPTIONAL, -- Default = 0 (800 MHz)
        INTEGER NRSSI,      -- Number of RSSI measurements included from the serving MSC
                            -- (other than the Serving Cell, above)
        SET OF SEQUENCE{ --Repeat SEQUENCE 'NRSSI' times
                [1] ReceivedSignalQuality,   -- Obtained signal strength measurement
                [2] Hyperband OPTIONAL, -- Default = 0 (800 MHz)
                [3] MeasuredCellID          -- Cell from which measurement was obtained
                }
        INTEGER NMSC,     -- Number of MSC's from which RSSI information was obtained
```

```
                    SET OF SEQUENCE{-- Repeat SEQUENCE‘NMSCID’ times
                        [1] MSCID,              -- MSC from which measurements were obtained
                        INTEGER NRSSI,          -- Number of RSSI measurements included from this MSC
                        SET OF SEQUENCE{        -- Repeat SEQUENCE ‘NRSSI’ times
                            [2] ReceivedSignalQuality, -- Obtained signal strength measurement
                            [3] Hyperband OPTIONAL,-- Default = 0 (800 MHz)
                            [4] MeasuredCellID  -- Cell from which measurement was obtained
                        }
                    }
}

TDMA_MAHO_CHANNEL ::= SEQUENCE {
                    INTEGER NMSC,     -- Number of MSC’s from which RSSI information was obtained
                    SET OF SEQUENCE{-- Repeat SEQUENCE‘NMSCID’ times
                        [1] MSCID,              -- MSC from which measurements were obtained
                        INTEGER NRSSI,          -- Number of RSSI measurements included from this MSC
                        SET OF SEQUENCE{        -- Repeat SEQUENCE ‘NRSSI’ times
                            [2] ReceivedSignalQuality, -- Obtained signal strength measurement
                            [3] Hyperband,      -- Default = 0 (800 MHz)
                            [4] MeasuredChannel -- Cell from which measurement was obtained
                        }
                    }
}

TDMA_MAHORequest ::= OCTET STRING          -- See See Chapter 8, Section 2.3.2.28 for encoding

TDMA_TimeAlignment ::= OCTET STRING -- See Chapter 8, Section 2.3.2.29 for encoding.

TDMAVoiceMode ::= OCTET STRING -- See ANSI/TIA/EIA-41 Revision E for encoding

Teleservice_Priority ::= OCTET STRING -- See Chapter 8, Section 2.3.2.30 for encoding.

VoicePrivacymask ::= OCTET STRING -- See ANSI-41-D, Section 6.5.2.166 for encoding.
```

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Annex A: Analysis of the Network Reference Model

This annex is informative and is not considered part of this standard.

This section analyzes the network reference model by applying it to possible real world configurations

A.1 Possible Emergency Services Network Configurations

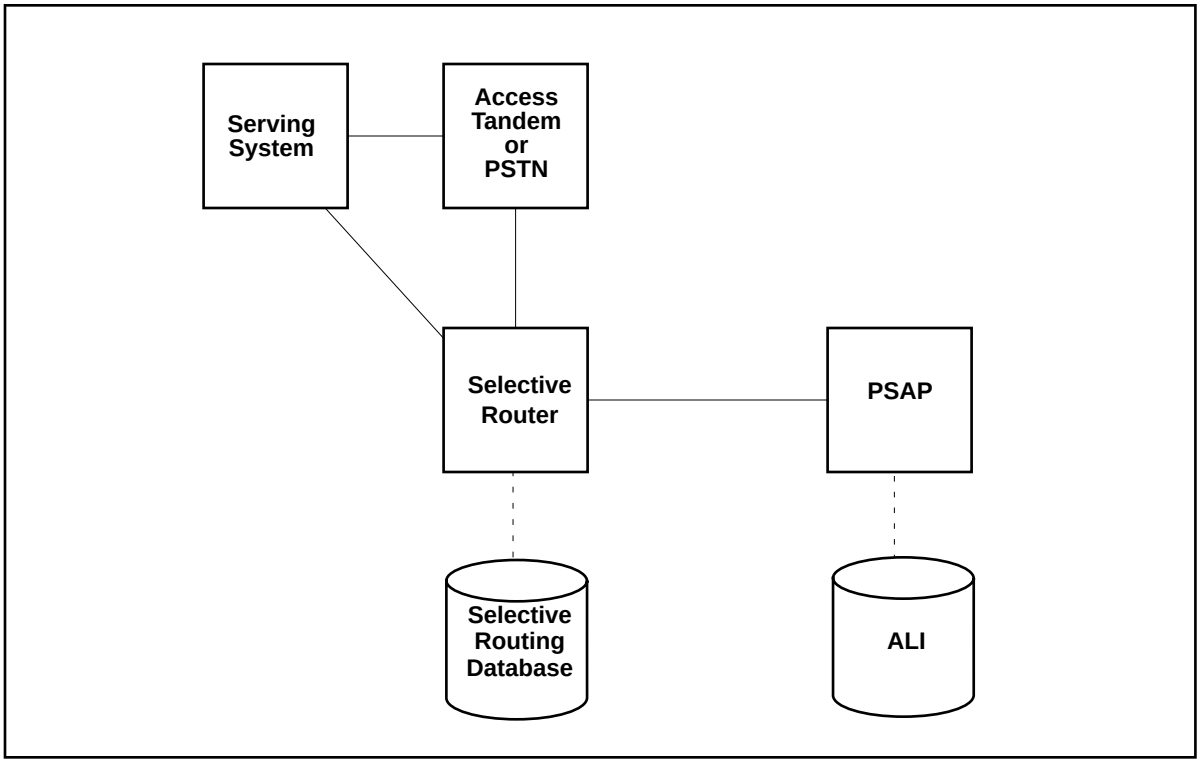

Figure A-1: **Basic Emergency Services Network Topology**

Interconnection through an Access Tandem or the PSTN is not recommended, but it is still possible for systems covering large geographic areas like satellites and maybe some PCS providers.

The ALI and Selective Routing Database may be physically collocated, but are shown as separate functions because the queries to them are quite different. The selective routing database converts a telephone number into an emergency services number representing an emergency services zone. Each zone is served by a primary and alternate PSAP and by a predetermined set of emergency response agencies, one for each type of emergency response required (e.g., fire, police, medical, poison control).

This network topology has served the wireline industry well for the last thirty years, but it is inadequate to meet the demands of the calltakers as expressed in two joint experts meetings in 1994. Crucial to these requirements was the ability to move location information between the serving system and the PSAP. This could be performed with either call associated signaling or with non-call associated signaling. With call associated signaling information is passed with the same messages used to setup and control a call. In non-call associated signaling, the messages containing information are passed separate from the call and the association between the message and the call must be established upon receipt. On short inspection, call associated signal appears to be easier to use since correlation of information and a call is so much easier. The down side is that 1) call associated signaling requires upgrades of all switches that handle the call between the serving system and the PSAP, and 2) PSAP to PSAP transfers will have to work out something else to avoid routing the call to the same primary PSAP.

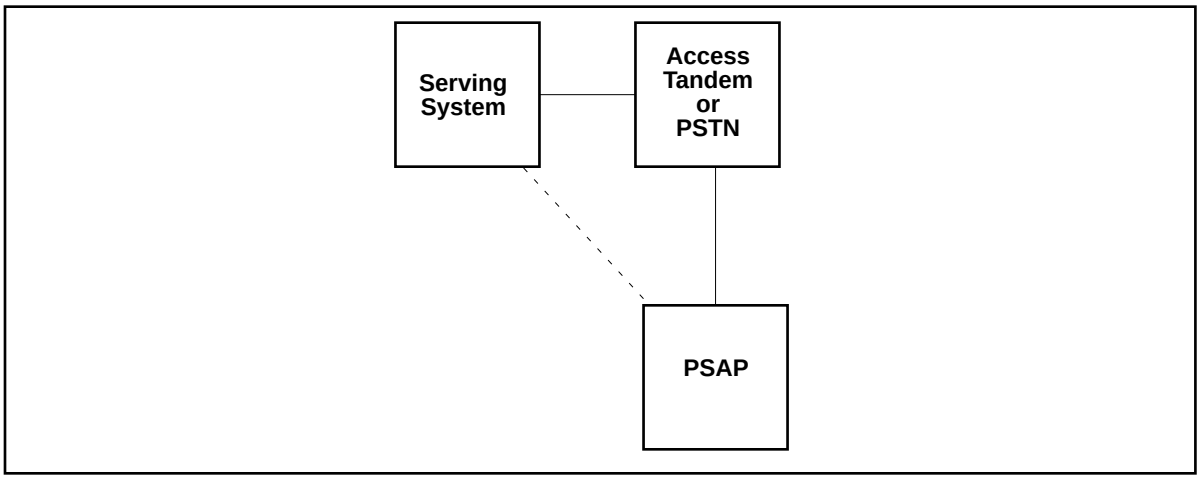

Figure A-2: **A World Without Selective Routers**

In a radical simplification of the emergency services network, the serving system can take over the routing functions of the selective router and selective routing database and route the call directly to a PSAP over the PSTN. The PSAP obtains information about the emergency calls from the serving system. If calls are to be re-routed to another PSAP or an emergency services agency, the call transfer feature provided by the switch serving the PSAP is used (although in some switches the feature may need to be modified to allow the PSAP to bridge the call before completing the transfer).

In such a network topology, the problems of call associated signaling are accentuated, because nearly every switch and STP in the country would have to be able to handle the special signaling for emergency services calls.

In defining the network reference models for the wireless network, it was noted that there need to be at least four functional entities. The MSC (Mobile Switching Center) is the basic switching entity in a

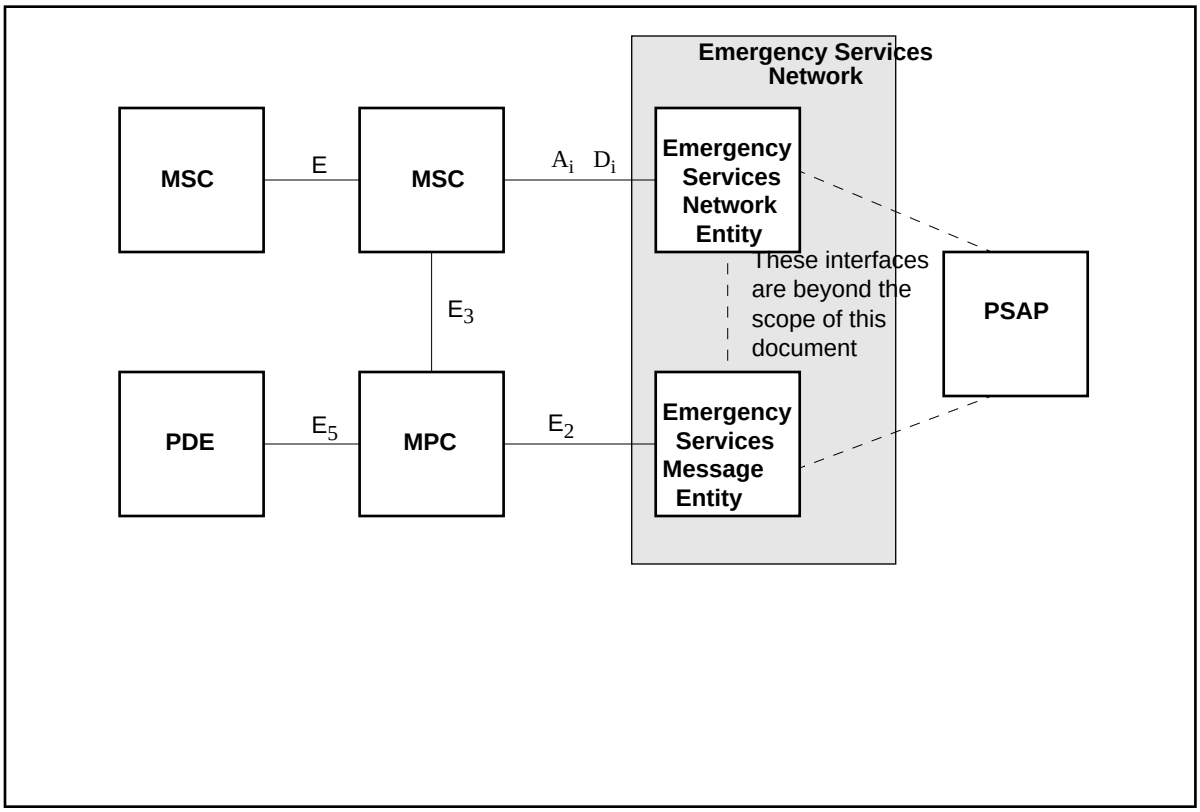

Figure A-3: **Network Reference Model for Wireless Networks**

wireless network and it provides a single point of interconnection for the wireless system side of emergency services calls.

The MPC (Mobile Position Center) provides a single point of interconnection for users of positioning information. It is envisioned that there will be many applications that can use position information, although the current standard is limiting its scope to just one such application for emergency services. Even within emergency services, there are two uses for position and these may use separate applications. The first use is routing the call to the appropriate PSAP. The second application is to aid the call taker and dispatcher in locating the caller geographically and sending assistance to the caller. This may be as simple as returning the nearest known street address to a given latitude and longitude or it may be plotting the caller's position on a map with other information like building names, business names, landmarks, etc.

The MPC also interconnects a set of PDE (Position Determining Entities) that cover a geographic area. It may require more than one PDE of a given technology to cover an area. A given area may elect to use PDEs of more than one technology (e.g., use a general network based solution for all phones while offering an enhanced mobile-based or mobile-assisted premium service to some subscribers). The MPC will have to query the HLR, VLR, and MSC to select the proper PDE and to provide the PDE with information regarding the particular mobile station in question.

The traditional ALI had two basic types of information: location information that provided a street address for a telephone number and subscriber information that provided a name and other information about a subscriber. In a wireless system, location information is within the domain of the serving system and subscriber information is in the domain of the home system. Since these are conceptually separate systems, the information is viewed as coming from separate functions with the MPC providing the raw position information that can be converted into location and the WSI (Wireless Subscriber Information)

providing subscriber information. Further since the WSI is outside of the scope of the FCC Report and Order, its implementation is entirely optional at the discretion of the wireless service provider and the PSAP community that it serves.

A.2 Possible Configurations of ESNEs

In the development of the network reference model it was clear that in an emergency services network, the entity that processed calls was not necessarily the same thing that processed the non-call associated messages, although there has to be communication between the two. For instance the entity processing the calls, an ESNE or emergency services network entity, may be a selective router, a direct interconnection, an access tandem, or an interworking device. The selective router will probably be the most common initial interconnection point on an emergency services network. Calls to PSAPs may be routed to over a PSTN when the wireless carrier is able to select the proper PSAP before the call leaves its switches. This connection directly to a PSAP is more likely to be a logical relationship than a physical relationship as it is unlikely that a wireless service provider will have direct physical interconnection to a PSAP. A more common physical interconnection to PSAPs will be through an intervening access tandem or local end office. Interworking devices may be used to convert enhanced MF signaling or MF to CAMA signaling commonly used by the installed base of selective router and PSAP equipment.

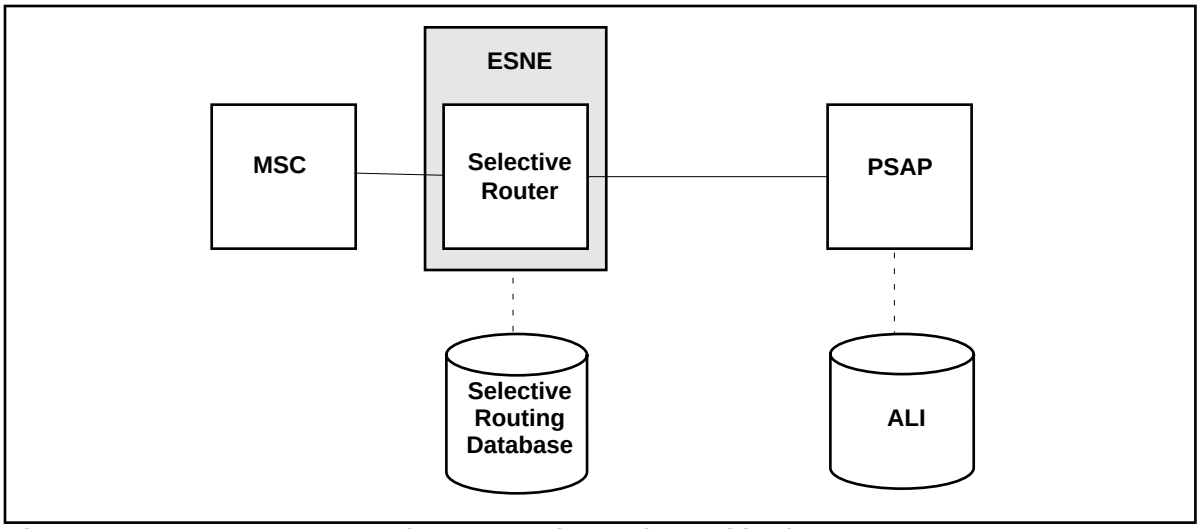

Figure A-4: **Emergency Services Network Topology with S/R as ESNE**

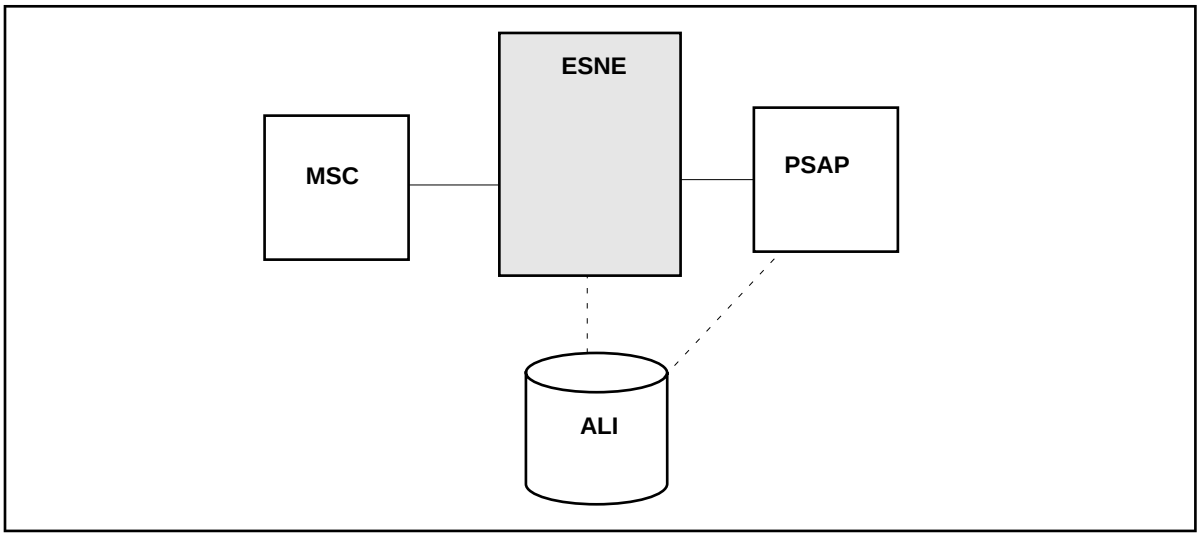

Figure A-5: **Emergency Services Network Topology with ESNE co-located with PSAP**

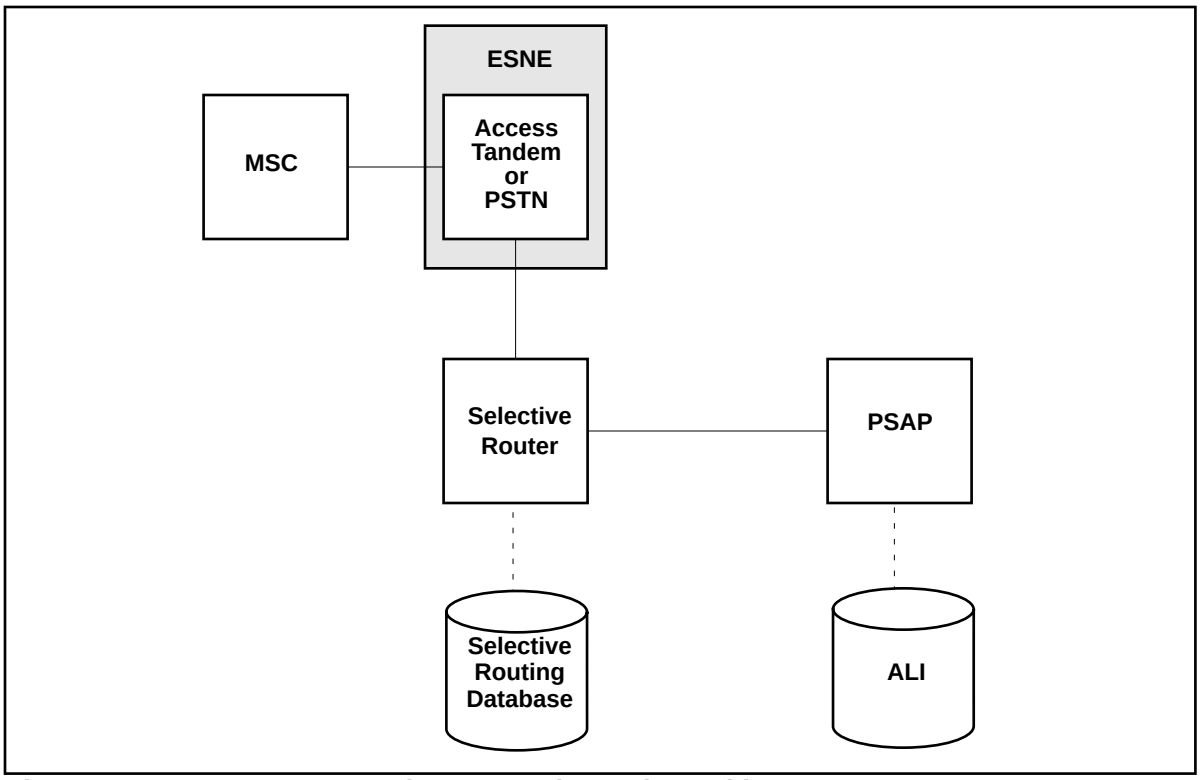

Figure A-6: **Emergency Services Network Topology with AT as ESNE**

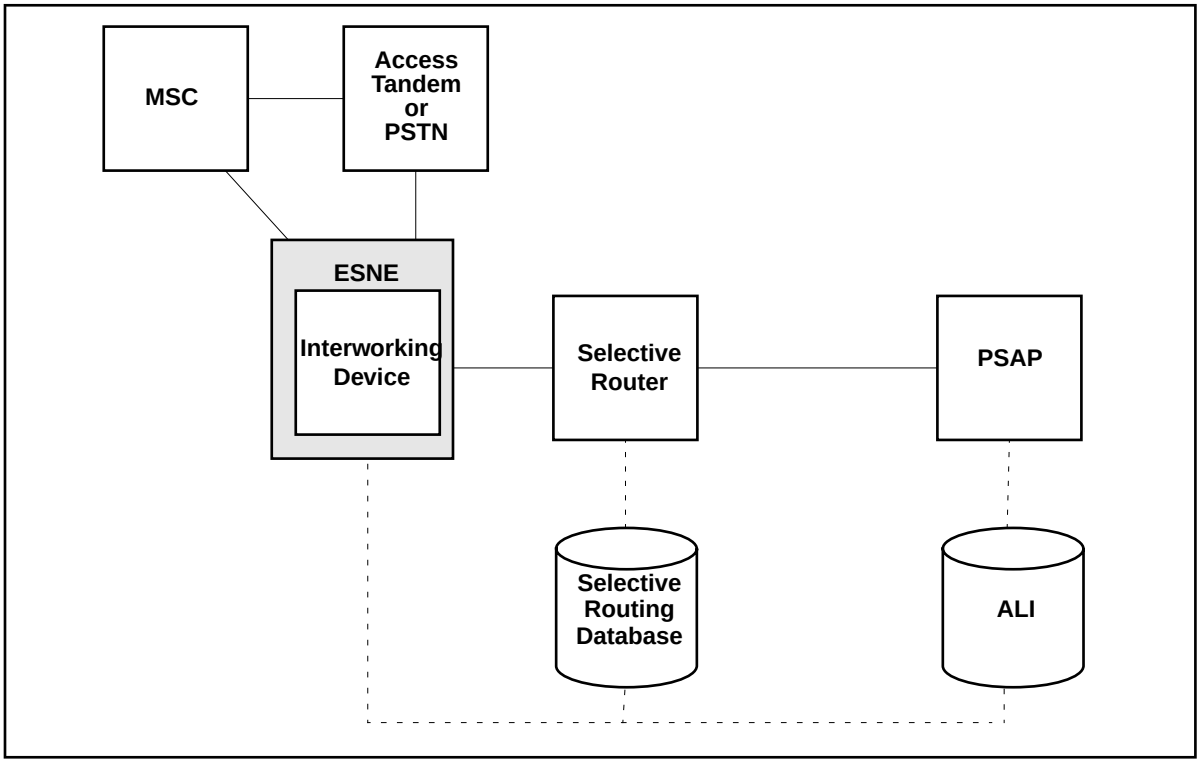

Figure A-7: **Emergency Services Network Topology with an interworking device as ESNE**

A.3 Possible Configurations of ESMEs

The emergency services user of messaging, an ESME or Emergency Services Message Entity, is less clear. It could be simply a feed into a traditional ALI, although that is fraught with problems. There is a liability issue for the accuracy of any information in the database if several different entities are allowed to insert data, even if only on a temporary basis. Since wireless calls would only need data in the database for a duration of an emergency call, there would have to be a mechanism to clean out the database of these temporary records. The records would use the range of all area codes to support roaming wireless subscriber, and that would require better access methods than some ALIs currently support.

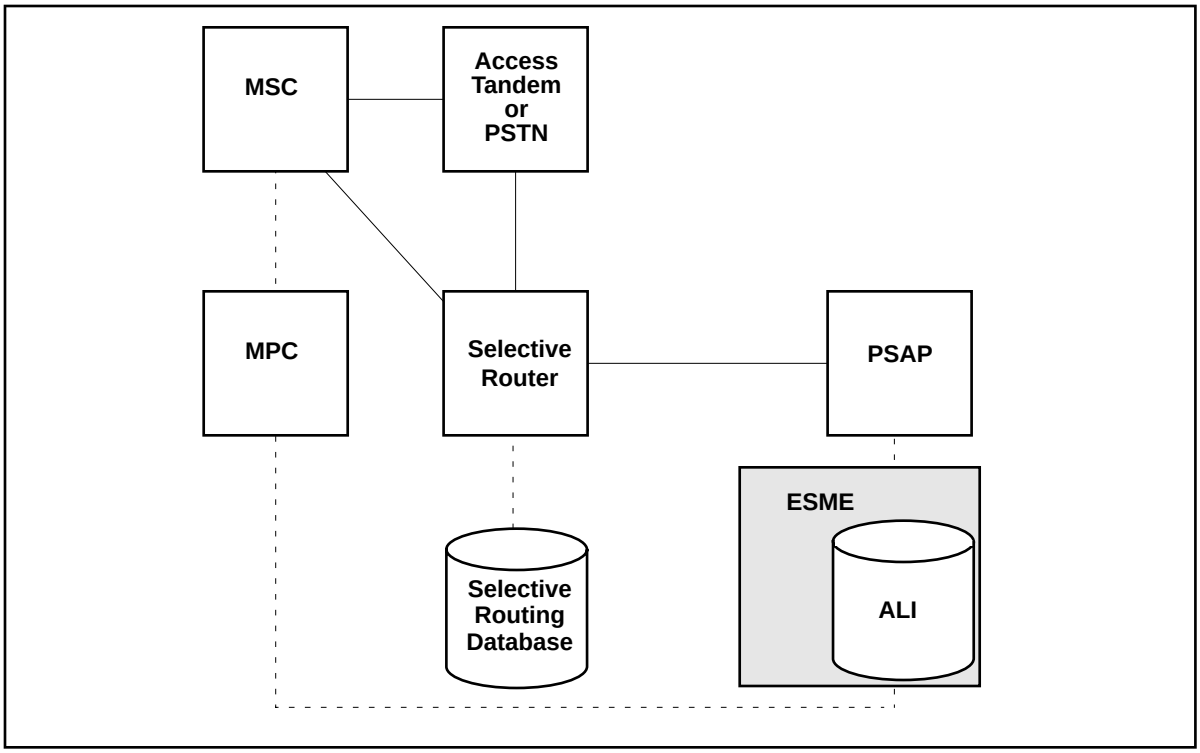

Figure A-8: **Emergency Services Network Topology with ALI as ESME**

The ESME could be a separate ALI when ALI steering is used between the PSAP and the ALI. The steering could recognize mobile directory numbers and route those queries to obtain the requested information. This separate ALI could preform the management of the temporary records, accommodate data pushes from the wireless carrier and formulate pull requests to the wireless carrier.

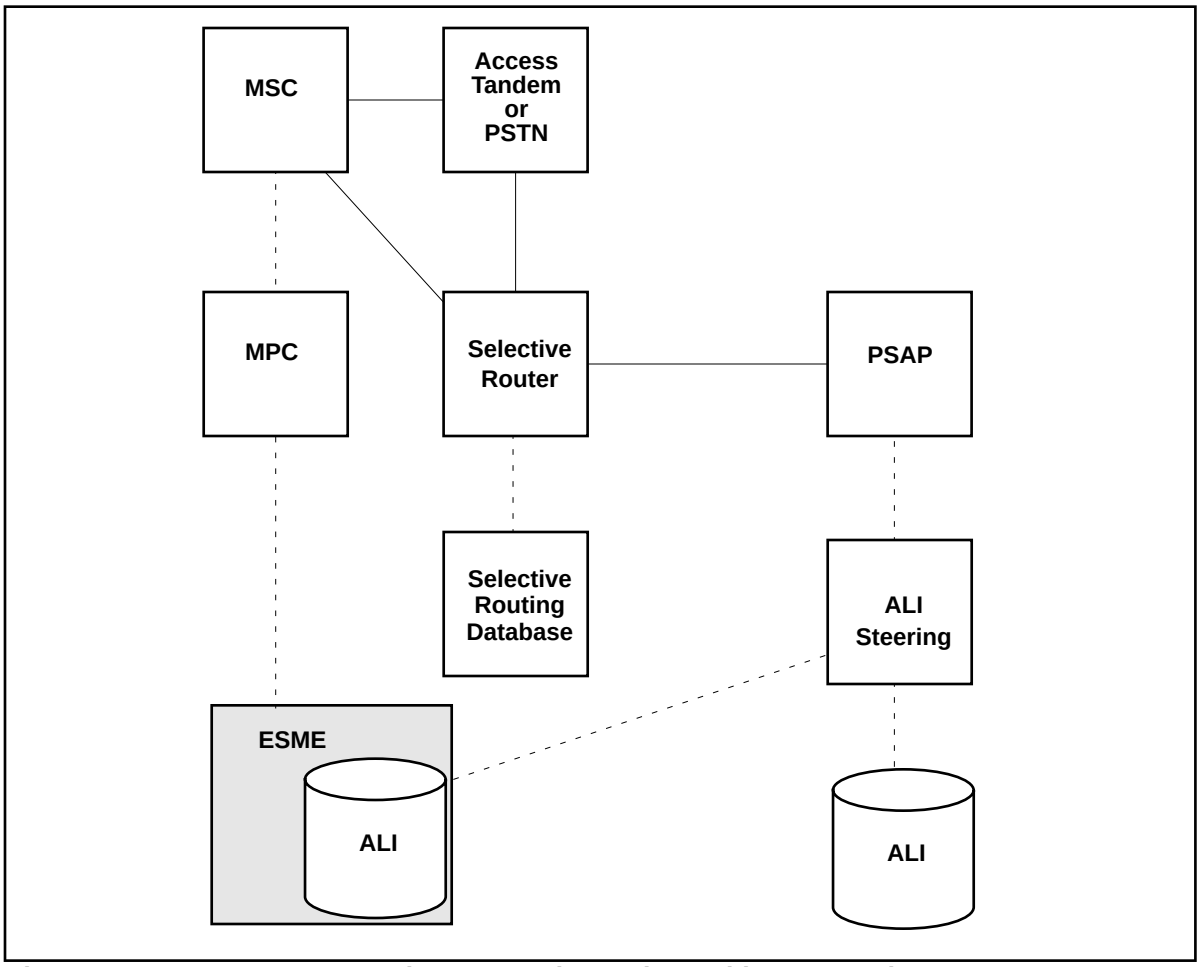

Figure A-9: **Emergency Services Network Topology with Separated ALI as ESME**

The ESME could be the ALI steering device that routes ALI queries using the ESRD associated with the wireless emergency services call to select the proper MPC and within the MPC the callback number can select the proper caller.

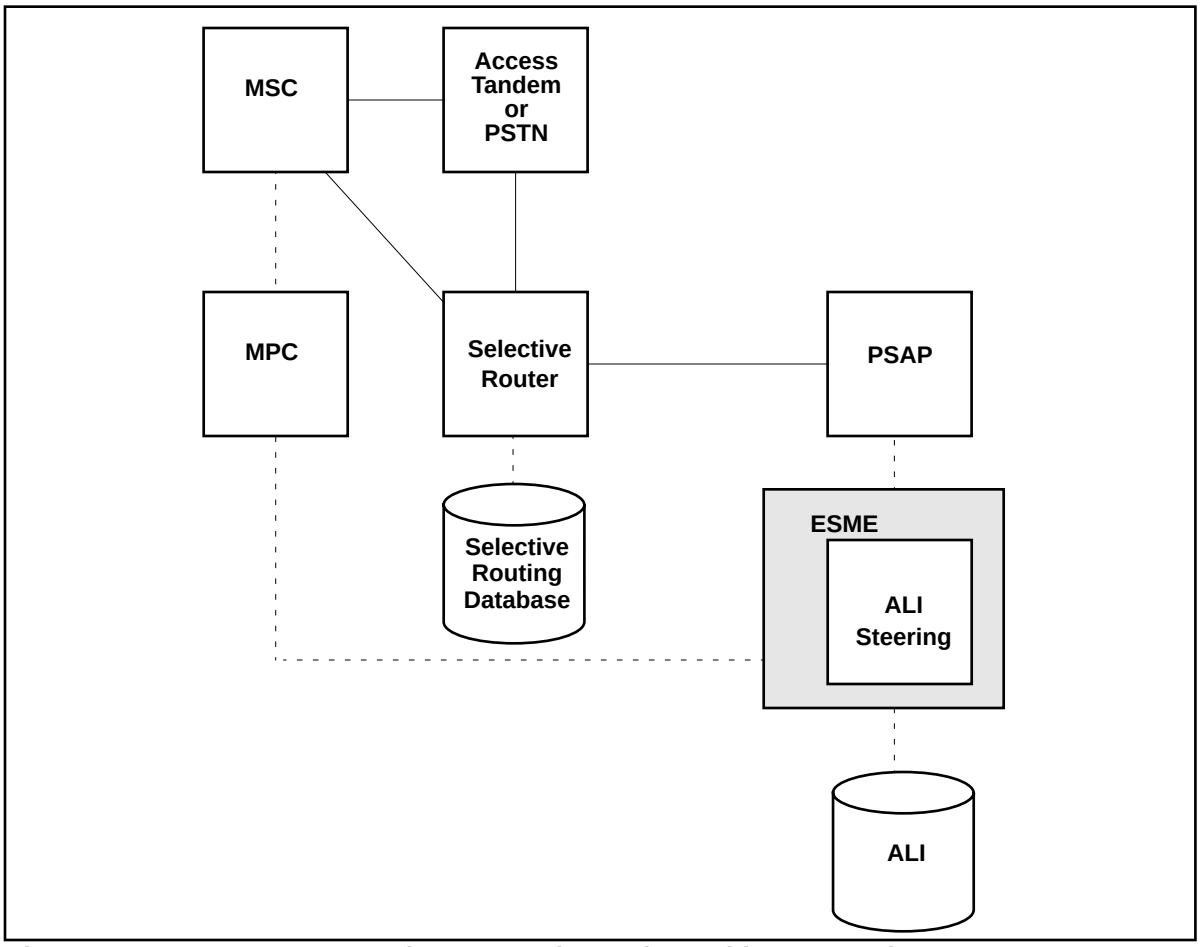

Figure A-10: **Emergency Services Network Topology with Separated ALI as ESME**

The ESME could be an interworking device so that each emergency services call could be associated with a special pseudo ANI. This pseudo ANI can then be used with existing equipment to query either selective routing databases or ALIs for the call routing, location, or subscriber information.

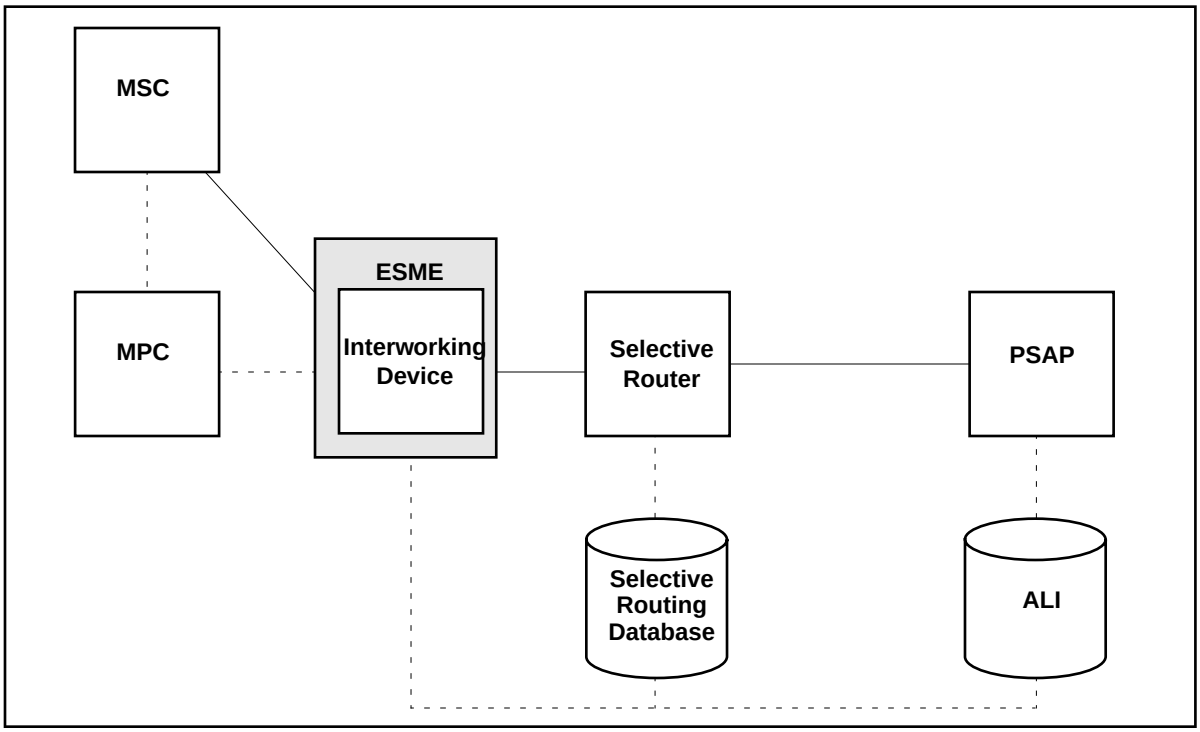

Figure A-11: **Emergency Services Network Topology with interworking device as a ESME**

The ESME could be a message routing function that routes messages using the same alghoritms used to route the emergency services calls to ensure that the messages are routed to the same place as the emergency services calls. The message routing function could simply broadcast messages to all interconnected PSAPs which would retain all messages and be able to associate incoming calls with the received messages.

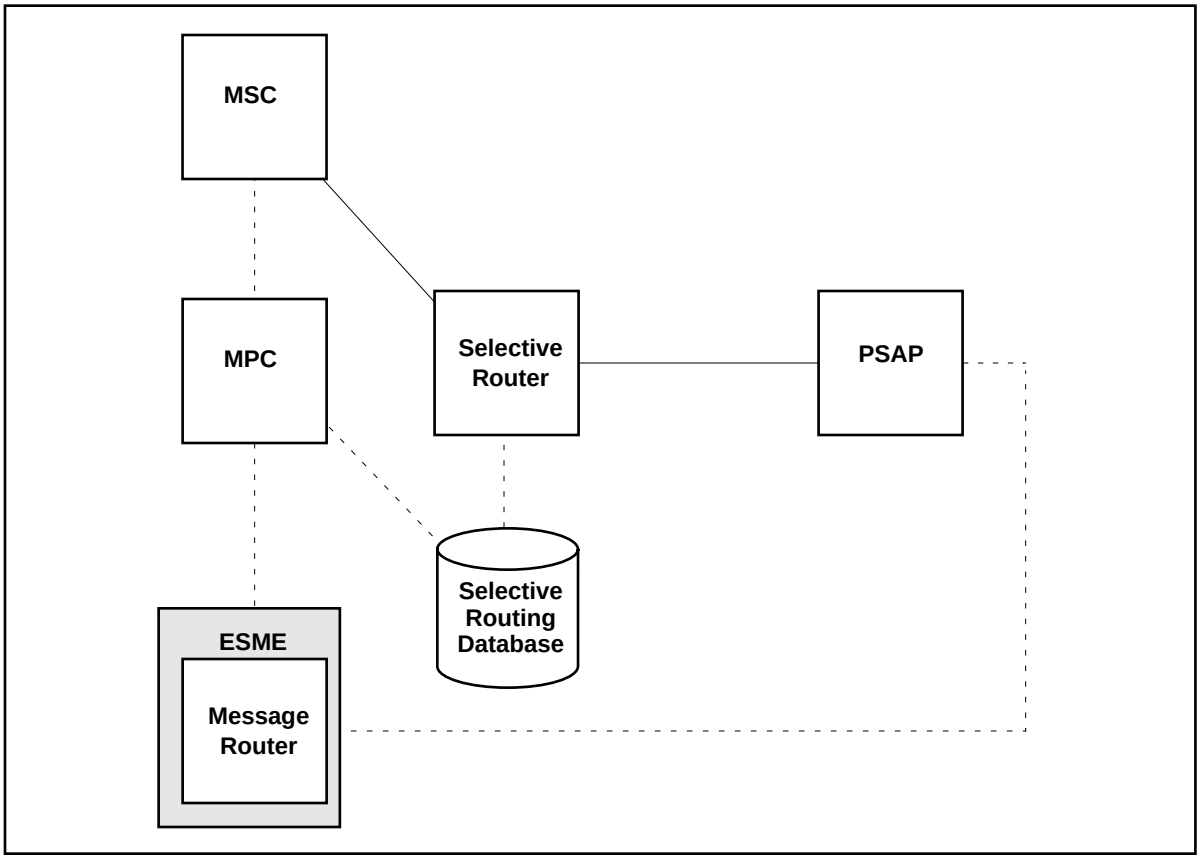

Figure A-12: **Emergency Services Network Topology with a message router as the ESME**

The PSAP could query other databases to convert the position information into the nearest known street address or the current emergency services zone for the list of selective transfer numbers. The ESME may be a geographic information system within the PSAP that requests position information about an emergency services call so that the position of a caller can be plotted on a map in relation to streets, businesses, buildings, landmarks, etc.

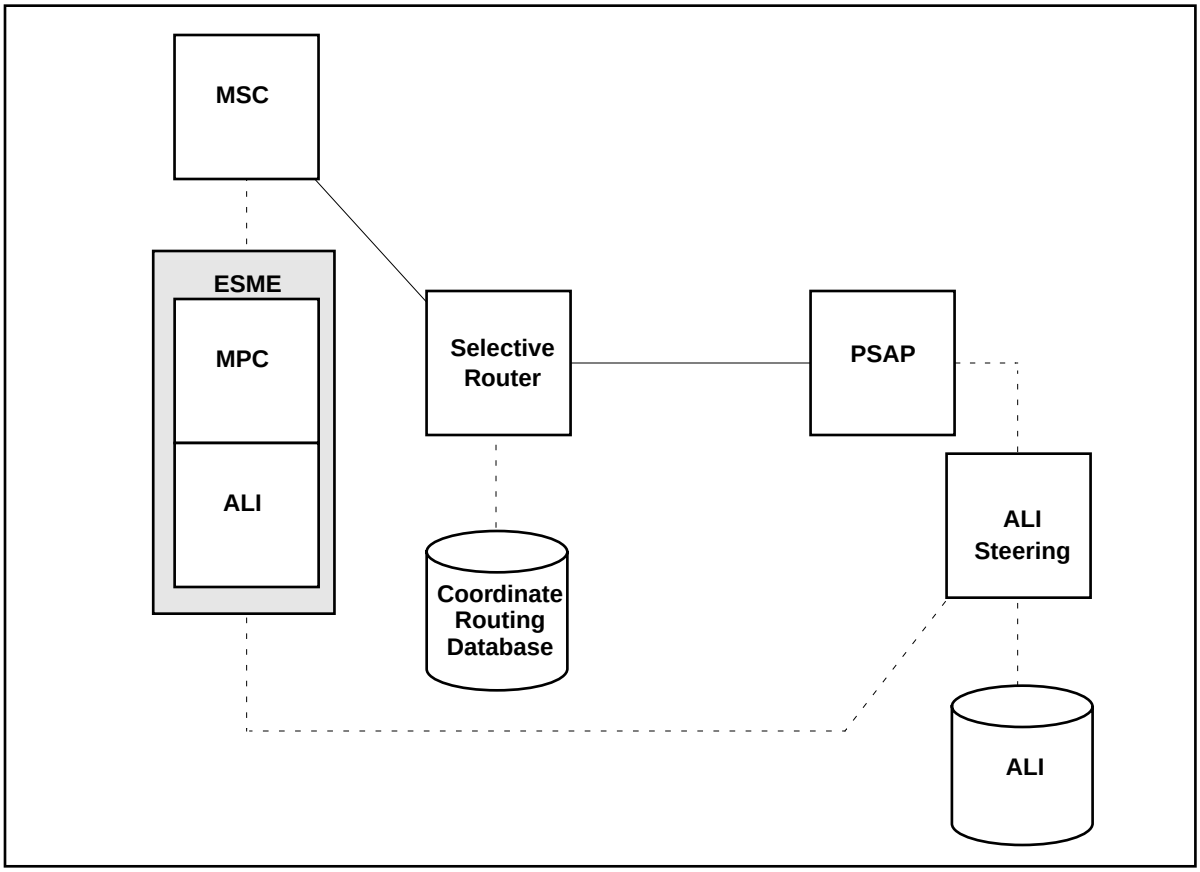

Figure A-13: **Emergency Services Network Topology with the MPC-ALI combination as the ESME**

The ESME could be an SCP application that is queried by the MSC to obtain instructions on how to route an emergency services call. The application would have or be able to get the position information associated with a call and be able to convert that position into a location such an emergency services zone and its associated routing and selective transfer information.

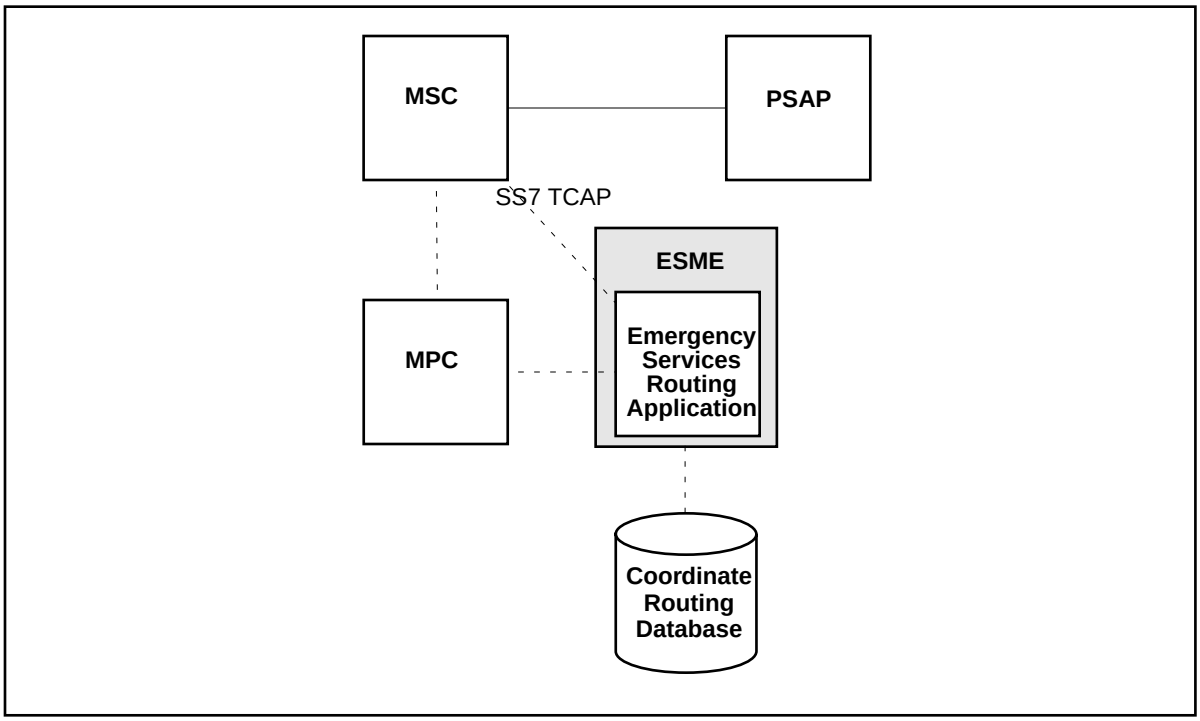

Figure A-14: **Emergency Services Network Topology with an SCP application as the ESME**

To show this example in a more physical realm (but still ignoring the required intervening networks and switching equipment), the following figure shows 1) a centralized coordinate routing database run by the 9-1-1 authority, 2) several service providers, 3) several PSAPs, 4) location applications used by a single service provider, and 5) location applications used by multiple several providers.

In reality the ESME is likely to be a combination of one or more of the above configurations or something else that hasn't been thought of yet. The point is, it doesn't matter. All that really matters is that there be a mechanism defined for moving information between two points.

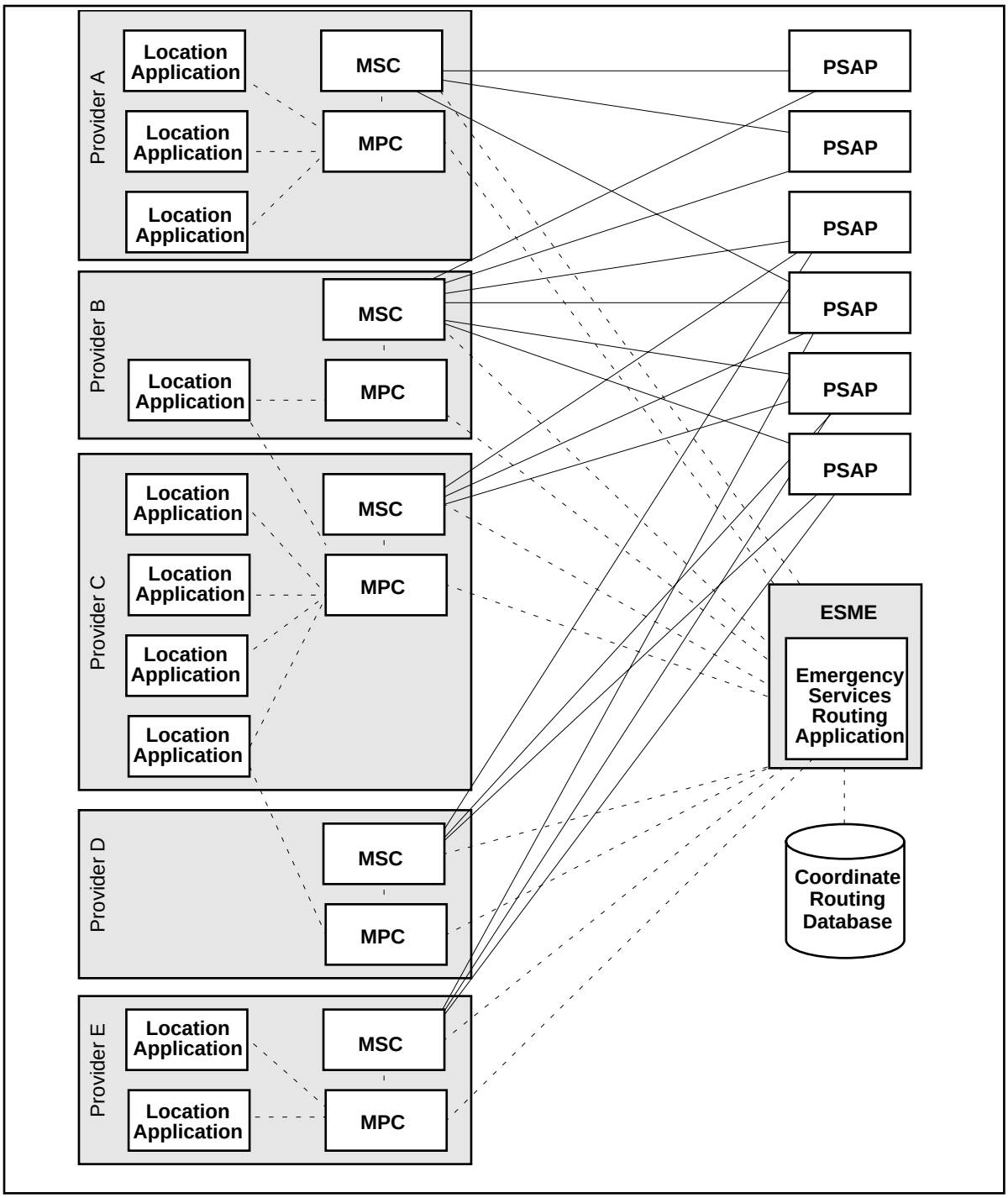

Figure A-15: **Emergency Services Network Topology with an SCP application as the ESME**

Annex B: Local Positioning Determining Entity

This annex is informative and not considered part of this standard.

This section describes the LPDE variant of the PDE including its relation to the MPC and BS within the E-911 Network Reference Model. Call flow scenarios show how the LPDE variant supports emergency services.

B.1 PDE Network Configuration

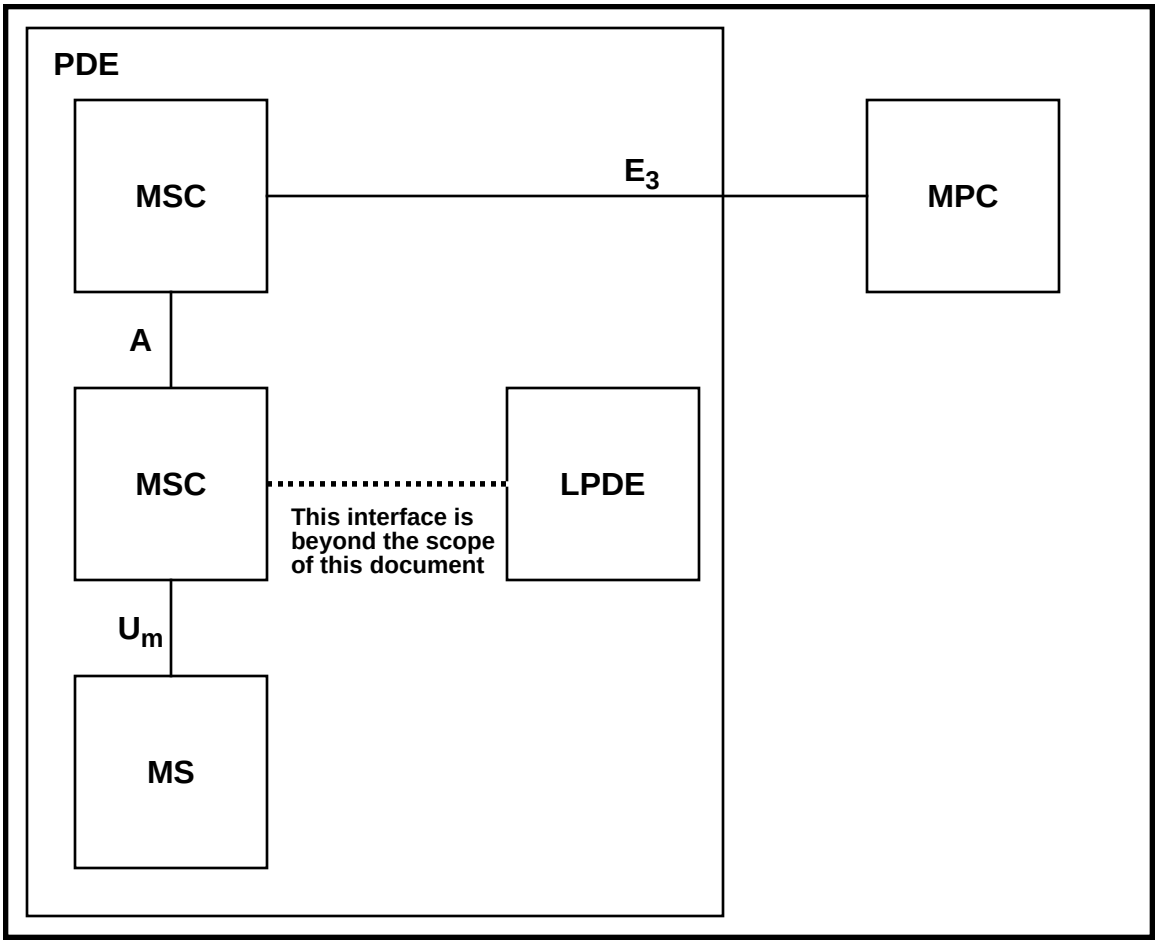

Figure B-1: **Local PDE Network Topology**

Figure B-1 shows a logical grouping of separate functional entities that define a composite NE (i.e., PDE). The Local PDE is physically connected (or integrated) with the BS. Its primary function is to calculate precise geographic position of the MS. Position calculation will be done while the MS is on the traffic channel. The LPDE uses special algorithms to calculate the mobile position based on signal measurements in the infrastructure, the MS, or both.

B.2 LPDE Position Scenarios

The following scenarios show MS positioning end-to-end call flows across the U_m and A interfaces as well as those specified in PN-3890.

B.2.1 ELID With Successful CAS Push

This scenario shows a simple position request and delivery of position information with a CAS push during call setup.

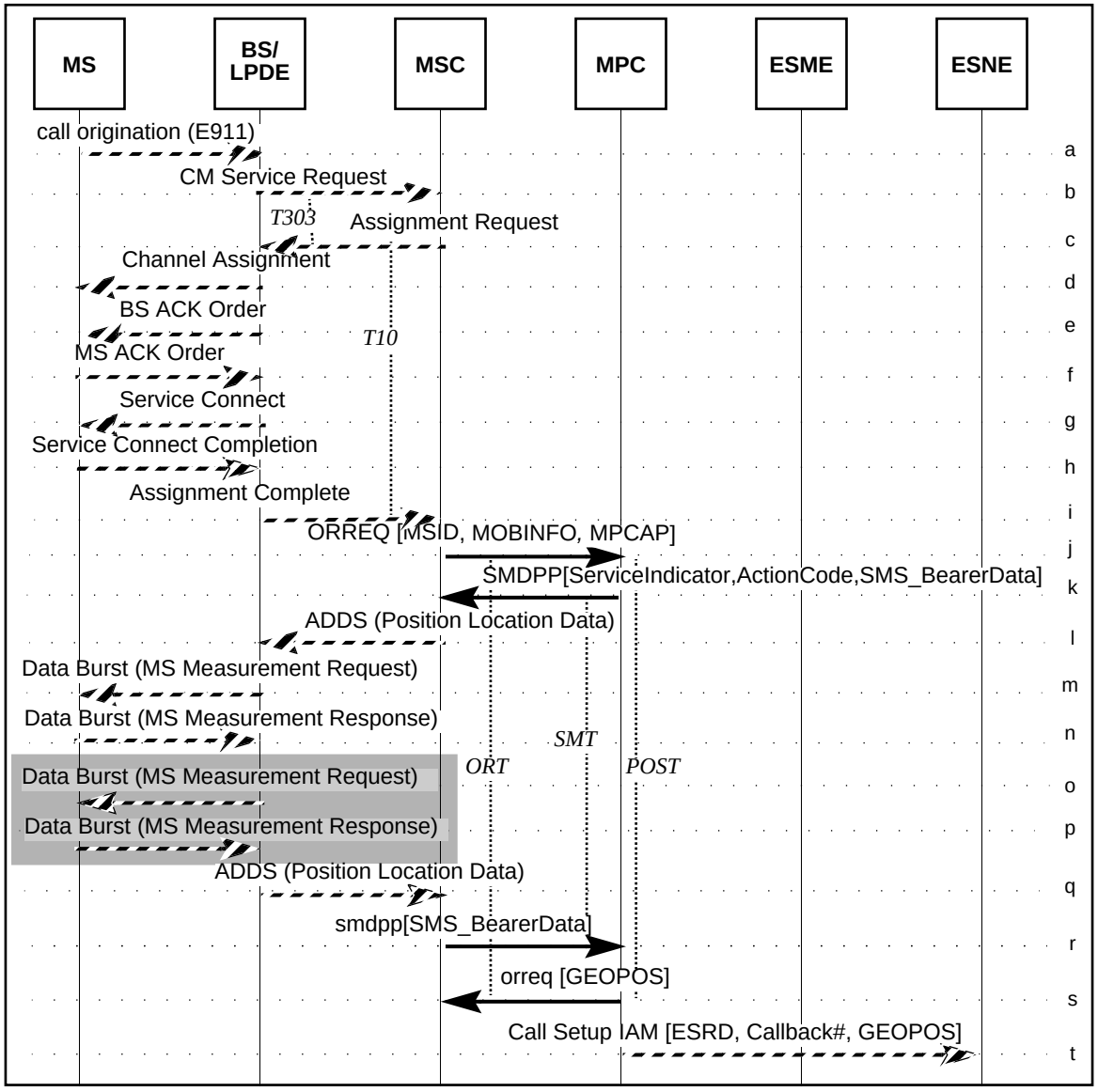

Figure B-2: **ELID With Successful CAS Push**

a. The MS originates an Emergency Services call across the air interface.

b. The BS sends the CM Service Request message to the MSC.

c. The MSC sends an Assignment Request message to the BS to request assignment of radio resources.

d. The BS sends a Channel Assignment message over the paging channel of the radio interface to initiate the establishment of a radio traffic channel.

e. Once the BS acquires the reverse traffic channel it sends the BS acknowledgment order.

f. The MS acknowledges the reception of the BS order by sending the MS acknowledgment order.

g. The BS sends the Service Connect Message to the MS specifying the service configuration for the call.

h. The MS sends the Service Connection Complete Message to the BS acknowledging the service configuration for the call.

i. The BS sends the Assignment Complete message to the MSC after the radio traffic channel and terrestrial circuit have been fully interconnected.

j. The MSC requests the position of the MS by sending an OrignationRequest INVOKE to the MPC.

k. The MPC sends an SMSDeliveryPointToPoint INVOKE with the IS-801 message encapsulated towards the appropriate PDE (in this case a LPDE connected to the BS).

l. The MSC sends the ADDS message encapsulating the Position Location Data to the BS/LPDE.

m. The BS/LPDE places the MS Measurement Request in a Data Burst Message and sends it to the MS.

n. The MS returns the MS Measurement Response message containing the MS's current information of its location in the Data Burst Message to the BS.

o-p Same as Step m-n if the LPDE requires additional information from the mobile. Note: Although only shown in Figure B2, Steps o.-p. may occur in other scenarios as well.

q. The BS/LPDE calculates the position of the MS based on MS Measurement information and the LPDE's measurement. The BS/LPDE sends the ADDS message encapsulating the Position Location Data to the MSC.

r. The MSC sends an SMSDeliveryPointToPoint RETURN RESULT to the MPC containing the positioning information (e.g., latitude/longitude) received from the BS/LPDE via the encapsulated IS-801 message. Note: In some cases (e.g., Request for MS Capabilities) Steps k.-r. could be repeated.

s. The MPC sends an OriginationRequest RETURN RESULT to the MSC.

t. The MSC extends the call to the ESNE without delay.

B.2.2 ELID with Successful CAS Push with Anchor MPC Interaction After Handoff

This scenario shows a position request and delivery of position information with a CAS push during call setup. The position is requested from the Serving MPC.

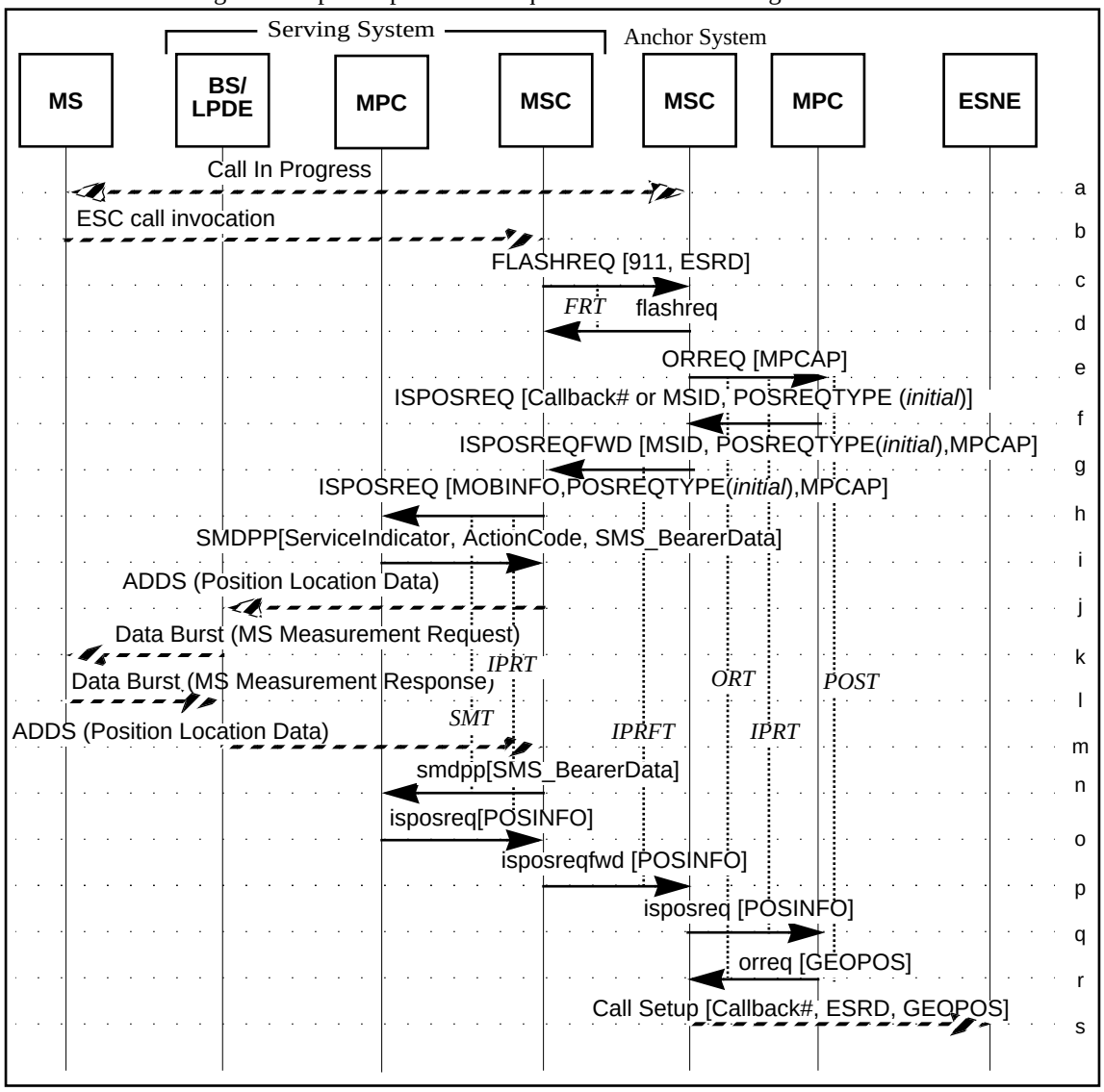

Figure B-3: **ELID with Successful CAS Push with Anchor MPC Interaction After Handoff**

a. A non-Emergency Services call is in progress between the MS and MSC(s).

b. The MS invokes an Emergency Services call origination via a Flash.

c. The Serving MSC notifies the next switch in the handoff chain of the event with a FlashRequest INVOKE.

d. The Anchor MSC acknowledges the event with a FlashRequest RETURN RESULT.

e. Same as Section B.2.1. Step j.

f. The MPC determines that the MS identified by the callback number has handed off to a different system and sends an IntersystemPositionRequest INVOKE to the Anchor MSC.

g. The Anchor MSC, knowing that the MS identified by the callback number is handed off, forwards the position request in an IntersystemPositionRequestForward INVOKE.

h. The Serving MSC, knowing that a position has been requested, sends an Intersystem-PositionRequest INVOKE to the Serving MPC including the mobile information.

i.-n. Same as Section B.2.1, Steps k-r.

o. The Serving MPC sends the position information in IntersystemPositionRequest RETURN RESULT to the Serving MSC.

p. The Serving MSC sends the position information in IntersystemPositionRequest-Forward RETURN RESULT to the Anchor MSC.

q. The Anchor MSC sends the position information in IntersystemPositionRequest RETURN RESULT to the Anchor MPC.

r-s Same as Section B.2.1, Steps s.-t.

B.2.3 ELID with Timed-Out CAS Push and NCAS Pull

This scenario shows a position request and delivery of position information using NCAS pull.

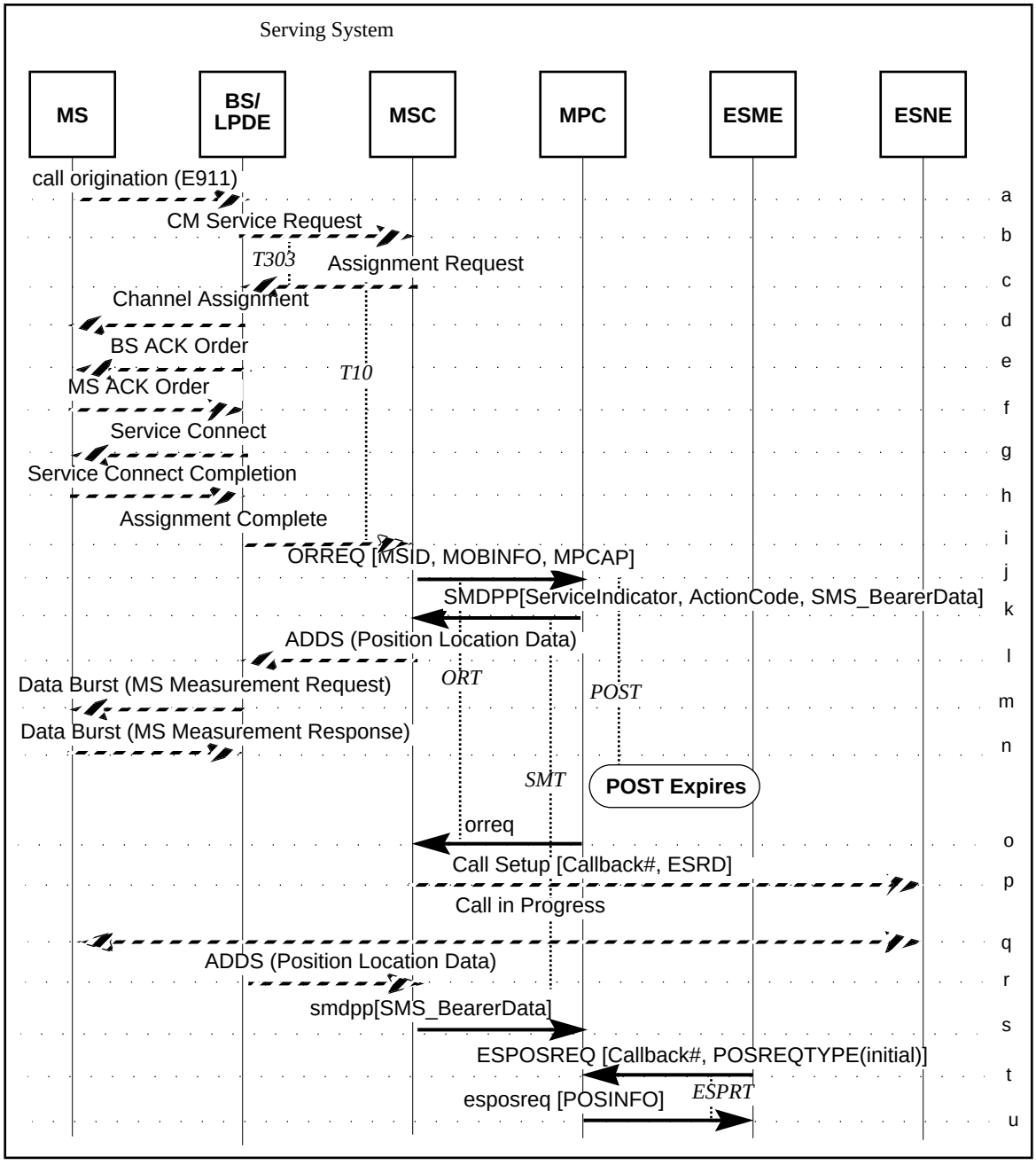

Figure B-4: **ELID with Timed-Out CAS Push and NCAS Pull**

a.-n. Same as Section B.2.1, Steps a.-n.

o. When the POST timer expires, the MPC sends the OriginationRequest RETURN RESULT to the MSC without the position information.

p. The MSC extends the call to the ESNE without further delay.

q. The Emergency Services call between the MS and the ESNE is in progress.

r-s Same as Section B.2.1 Steps q-r.

t. The ESME determines that updated positioning information on the MS is required and sends an EmergencyServicesPositionRequest INVOKE to the MPC.

u. The MPC sends the MS position in the EmergencyServicesPositionRequest RETURN RESULT.

B.2.4 ELID With NCAS Pull of Position

This scenario shows the request of updated position information using an NCAS pull after the call has been delivered to the ESNE.

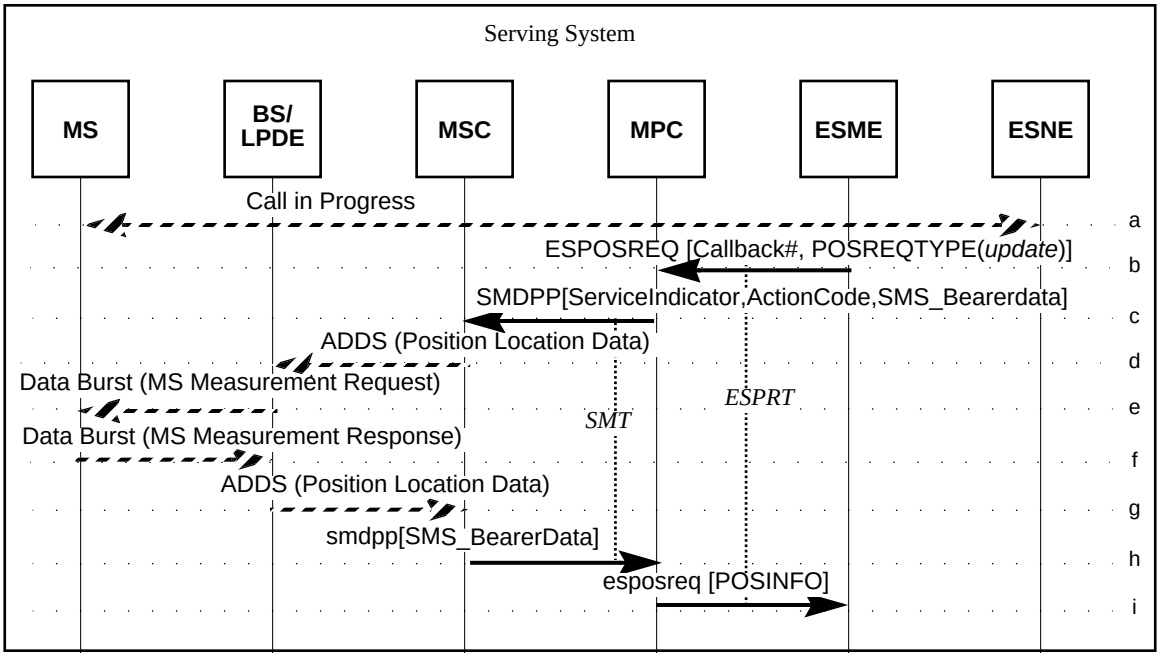

Figure B-5: **ELID With NCAS Pull of Position**

a. An Emergency Services call is in progress between the MS and ESNE.

b. The ESME determines that updated positioning information on the MS is required and sends an EmergencyServicesPositionRequest INVOKE to the MPC.

c. The MPC requests the position of the MS by sending an SMSDeliveryPointToPoint INVOKE to the MSC.

d-g Same as Section B.2.1, Steps l.-q.

h. The MSC sends the MS position in an SMSDeliveryPointToPoint RETURN RESULT to the MPC.

i. The MPC acknowledges the message with an EmergencyServicesPositionRequest RETURN RESULT.

B.2.5 Successful ELID Position Request After Handoff

This scenario shows the request of updated position information using an NCAS pull after the call has been delivered to the ESNE.

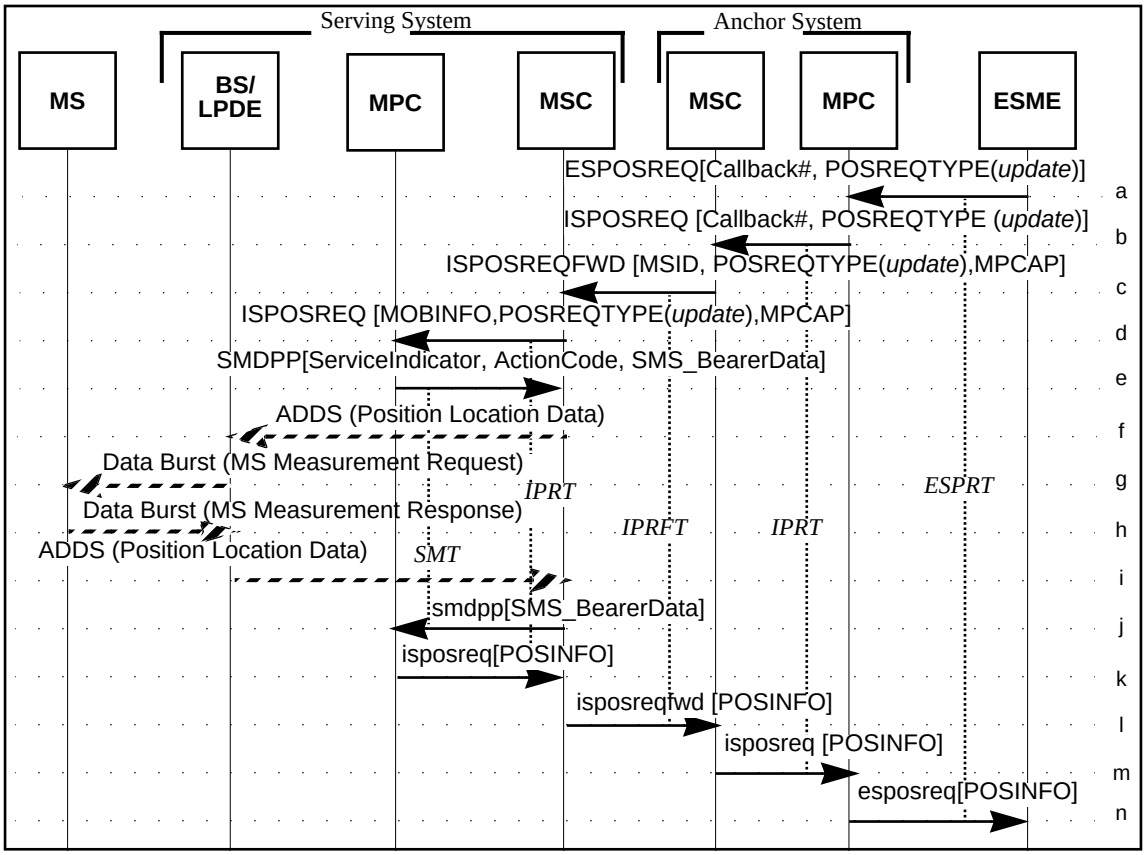

Figure B-6: **Successful ELID Position Request After Handoff**

a. The ESME determines that updated positioning information on the MS is required and sends an EmergencyServicesPositionRequest INVOKE to the MPC.

b. The MPC requests the position of the MS by sending an IntersystemPositionRequest INVOKE to the MSC.

c-m. Same as Section B.2.2, Steps g.-q.

n. The MPC acknowledges the message with an EmergencyServicesPositionRequest RETURN RESULT.

B.2.6 Autonomous PDE Push and ELID NCAS Pull

This scenario describes the ability of the LPDE to push position information to the MPC.

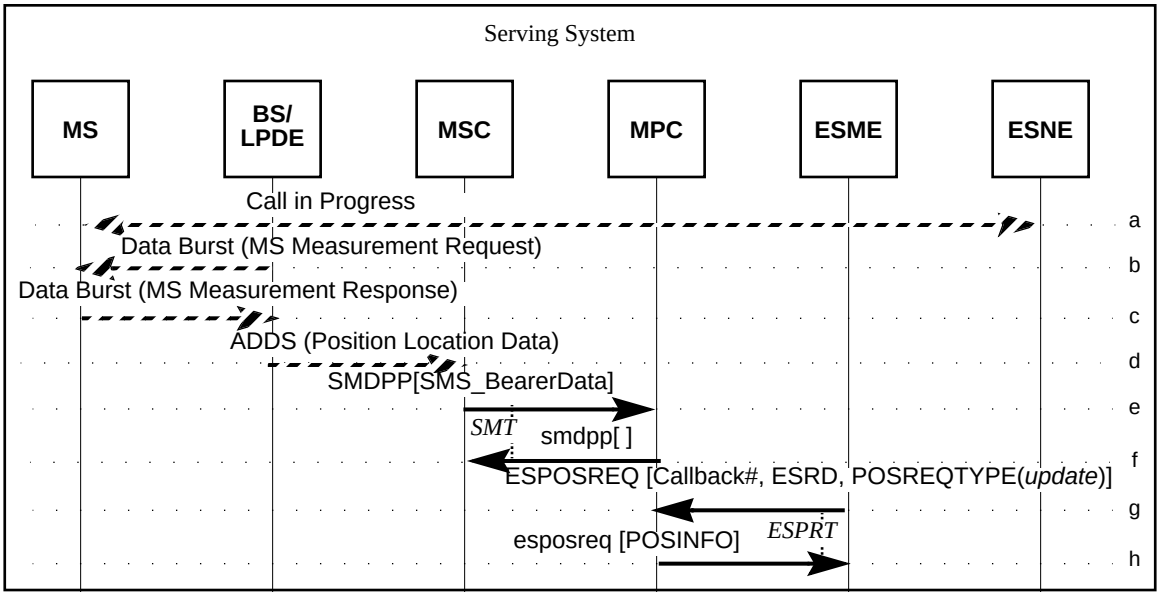

Figure B-7: **Autonomous PDE Push and ELID NCAS Pull**

a. An Emergency Services call is in progress between the MS and ESNE.

b. At some point in time during the call, the BS/LPDE sends the Data Burst message encapsulating the MS Measurement Request to the MS.

c.-d. Same as Section B.2.1, Steps n.-q.

e. The MSC relays the updated position information by sending an SMSDeliveryPoint-ToPoint INVOKE to the MPC.

f. The MPC acknowledges the receipt of the position information by sending an SMSDeliveryPointToPoint RETURN RESULT.

g. The ESME determines that updated positioning information on the MS is required and sends an EmergencyServicesPositionRequest INVOKE to the MPC.

h. The MPC sends the MS position in the EmergencyServicesPosition-Request RETURN RESULT.

B.2.7 MPC Request for CDMA Pilot Strength Measurements

This scenario shows a position request and delivery of position information using the PSMM method. This could occur during an ELID CAS push during call setup, or an NCAS pull when the MS is on the traffic channel. For this reason the scenario begins with a position request (i.e., ISPOSREQ) which would follow an ORREQ (for CAS push) or an ESPOSREQ (for NCAS pull).

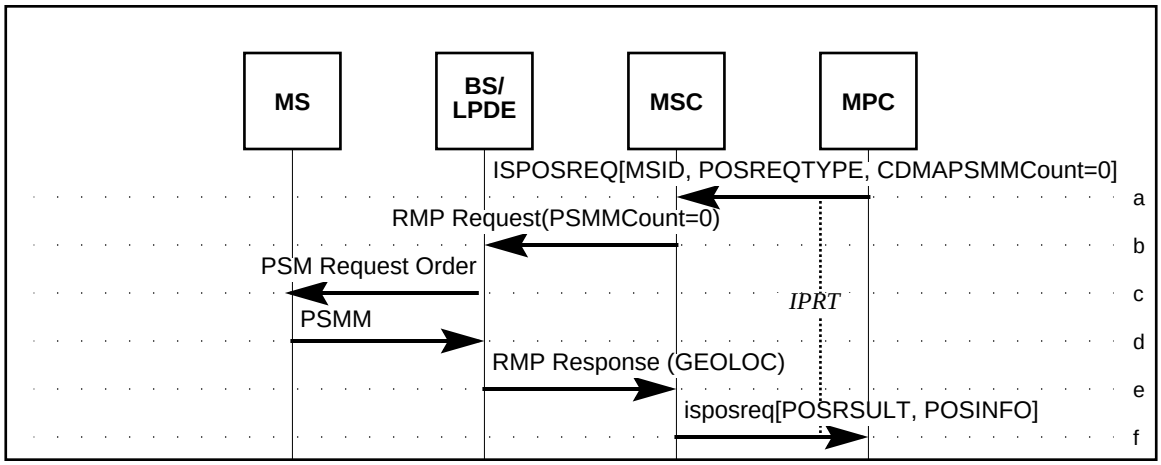

Figure B-8: **MPC Request for CDMA Pilot Strength Measurements**

a. The MPC examines the MPCAP parameter (previously received in the ORREQ or isposreq) and determines that the MS supports PSMM (e.g., MPCAP = 0 *Unknown*) and that the PDE is co-located at the BS (i.e., LPDE). The MPC sends an InterSystem-PositionRequest INVOKE with the CDMAPSMMCount parameter set to '0' indicating that the PDE located at the BS will determine the count of PSMMs to collect from the MS.

b. The MSC sends a Radio Measurement Position Request message relaying the PSMMCount to the BS/LPDE.

c. The BS/LPDE determines the number of PSMMs required to calculate the MS's position and sends the initial Pilot Strength Measurement Request Order to the MS.

d. The MS responds with a Pilot Strength Measurement message including pilots from the Active and Candidate Lists.

   Note: Steps c and d are repeated over the air interface based on the PSMMCount value received from the LPDE.

e. The BS sends a Radio Measurement Position Response message to the MSC with the Geographic Location information element containing the MS's position. For the failure case, the Cause information element is sent instead of the Geographic Location information element.

f. The MSC relays the contents of the Radio Measurement Position Response message to the MPC in the InterSystemPositionRequest RETURN RESULT. The Geographic Position is contained in the PositionInformation parameter for the successful case – the Cause information is contained in the PositionResult parameter for the failure case.

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Annex C: Non-dialable Callback Numbers

This annex is informative and is not considered part of this standard.

There are several situations when a mobile station does not have a valid callback number. This is the case for non-initialized mobiles, mobile phones whose subscription has expired, mobile phones without a subscriber identity module inserted, mobile phones from certain other countries and mobile phones from a service provider that does not have a roaming agreement with the current serving service provider. In these situations, a non-dialable callback number derived from the ESN or IMEI may be used to identify the emergency services caller.

	Non-dialable Callback number format
ESN known	911 + last 7 digits of ESN expressed as a decimal number
IMEI known	911 + last 7 digits of IMEI expressed as a decimal number

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Annex D: Parameter Mapping for Interconnection

This annex is normative and is considered part of this standard. It provides information for population of ISUP and MF signaling parameters depending on the various modes used to convey information to the PSAP.

D.1 ISUP Initial Address Message (IAM)

This section provides information for population of ISUP IAM signaling parameters.

D.1.1 ISUP Initial Address Message Parameter Contents for Wireline Compatibility Mode (ESRK)

In this mode only the ESRK is sent as the ANI over dedicated trunks to the Selective Router because the trunk between the Selective Router and the PSAP supports transport of only one 7/10 digit number.

orreq Parameters	ISUP Parameters	Value
n/a	Called party number	911, 11, or 1
Digits (Dialed)	n/a	See Note 1
TerminationList	n/a	See Note 3
MDN	Calling party number (see Note 2)	ESRK
DMH_BillingDigits	Charge Number (see Note 2)	ESRK
GenericDigits	Generic digits parameter	n/a
GeographicPosition	Calling geodetic location	n/a
n/a	Originating Line Information (OLI)	If included, use value 00 (POTS)

Notes:

1. For an ESC, the orreq Digits (Dialed) parameter may contain either the digits 911, 11, 1, the ESRD or the assigned ESRK for the call.
2. The Charge Number, Calling Party Number or both may be included in the IAM message.
3. For an ESC, the orreq TerminationList parameter, if present, may contain either the ESRD or the assigned ESRK for MSC routing as PSTNTermination(DestinationDigits).

D.1.2 ISUP Initial Address Message Parameter Contents for NCAS

In this mode both an ESRD and the MDN are sent in the IAM, assuming that the trunk between the Selective Router and the PSAP supports transport of at least two 7/10 digit numbers.

orreq Parameters	ISUP Parameters	Value
Digits(Dialed)	Called party number	(911, 11, 1) or PSAP DN or ESRD (see Note 1)
TerminationList	n/a	See Note 4
MDN	Calling party number (see Note 3)	MDN or the non-dialable callback number
DMH_BillingDigits	Charge Number (see Note 3)	MDN or the non-dialable callback number
GenericDigits	Generic digits parameter (see Note 2)	ESRD
GeographicPosition	Calling geodetic location	n/a
n/a	Originating Line Information (OLI)	If included, use values 61 or 62

Notes:

1. 911, 11, 1 is used as the Called party number if the MSC uses dedicated trunks to the Emergency Services Network Entity (ESNE) to route the Emergency Services Call (ESC). The directory number of the PSAP is used as the called party number if the MSC uses a shared trunk to route the ESC to the ESNE. The ESRD may be used on dedicated trunks that do not support the ISUP Generic Digits parameter.
2. The Type of Digits field within the Generic Digits Parameter should be set to indicate “Location Identification Number”.
3. The Charge Number, Calling Party Number or both may be included in the IAM message.
4. For an ESC, the orreq TerminationList parameter, if present, may contain either the ESRD (routed on a dedicated trunk group) or the PSAP DN (routed on a shared trunk group) as PSTNTermination(DestinationDigits).

D.1.3 ISUP Initial Address Message Parameter Contents for CAS

In this mode the initial position of the mobile is also sent in the IAM.

orreq Parameters	ISUP Parameters	Value
Digits(Dialed)	Called party number	(911, 11, 1) or PSAP DN or ESRD (see Note 1)
TerminationList	n/a	See Note 4
MDN	Calling party number (see Note 3)	MDN or the non-dialable callback number
DMH_BillingDigits	Charge Number (see Note 3)	MDN or the non-dialable callback number
GenericDigits	Generic digits parameter (see Note 2)	ESRD
GeographicPosition	Calling geodetic location	geographic position
n/a	Originating Line Information (OLI)	If included, use values 61 or 62

Notes:

1. 911, 11, 1 is used as the Called party number if the MSC uses dedicated trunks to the Emergency Services Network Entity (ESNE) to route the Emergency Services Call (ESC). The directory number of the PSAP is used as the called party number if the MSC uses a shared trunk to route the ESC to the ESNE. The ESRD may be used on dedicated trunks that do not support the ISUP Generic Digits parameter.
2. The Type of Digits field within the Generic Digits Parameter should be set to indicate “Location Identification Number”.
3. The Charge Number, Calling Party Number or both may be included in the IAM message.
4. For an ESC, the orreq TerminationList parameter, if present, may contain either the ESRD (routed on a dedicated trunk group) or the PSAP DN (routed on a shared trunk group) as PSTNTermination(DestinationDigits).

D.2 Feature Group D (FGD) MF Signaling

This section provides information for population of FGD MF signaling parameters.

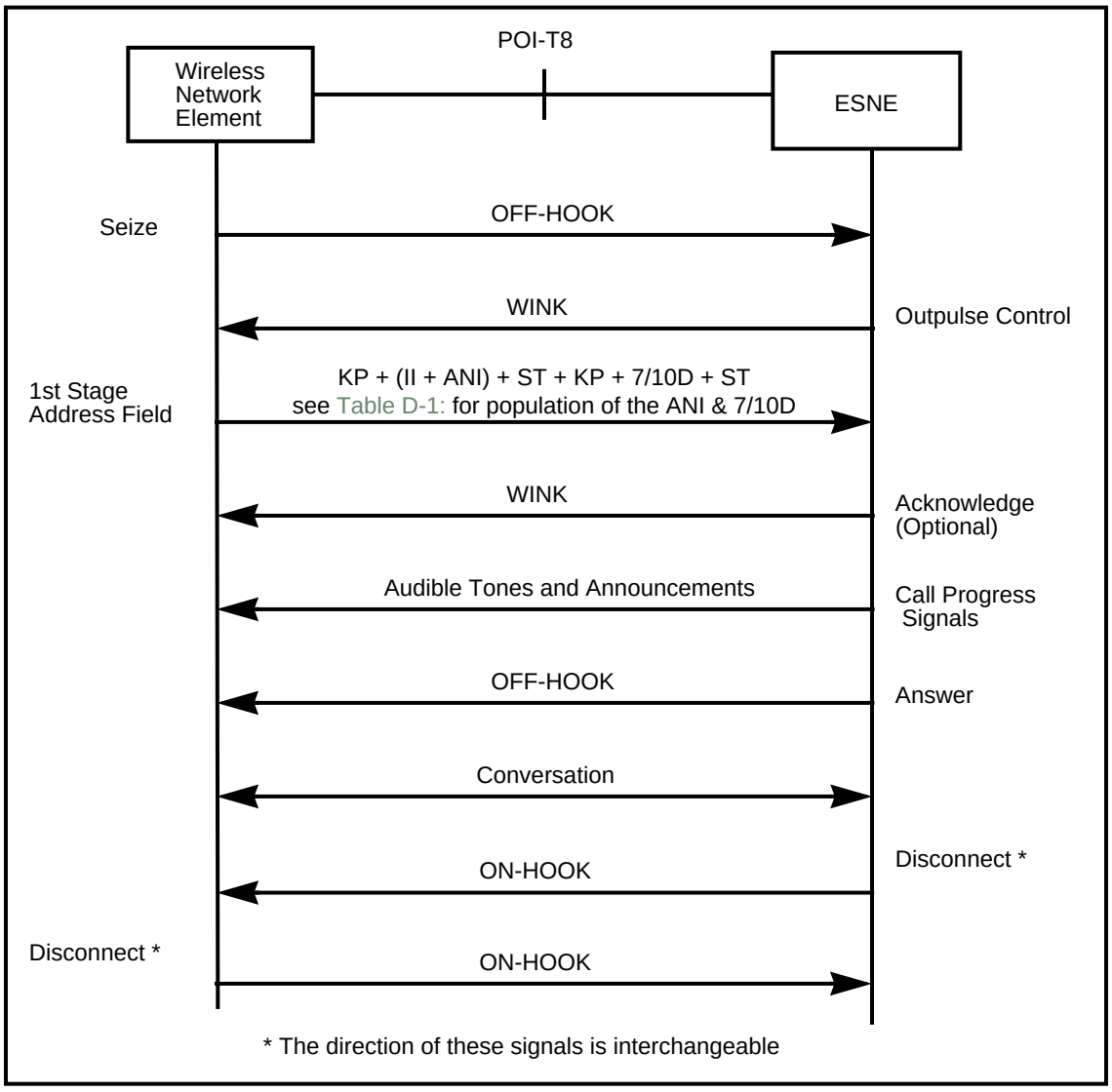

Figure D-1: **Wireless Network Origination (Direct Connection) MF Signaling Scenario over TIA/EIA-93 POI-T8 Interface**

Table D-1: **Feature Group D Parameter Contents for NCAS Signaling**

orreq Parameters	MF Parameters	Value
MDN or DMH_BillingDigits or both	ANI	MDN or the non-dialable callback number
Digits(Dialed)	7/10 Digits	ESRD

D.3 CAMA MF signaling

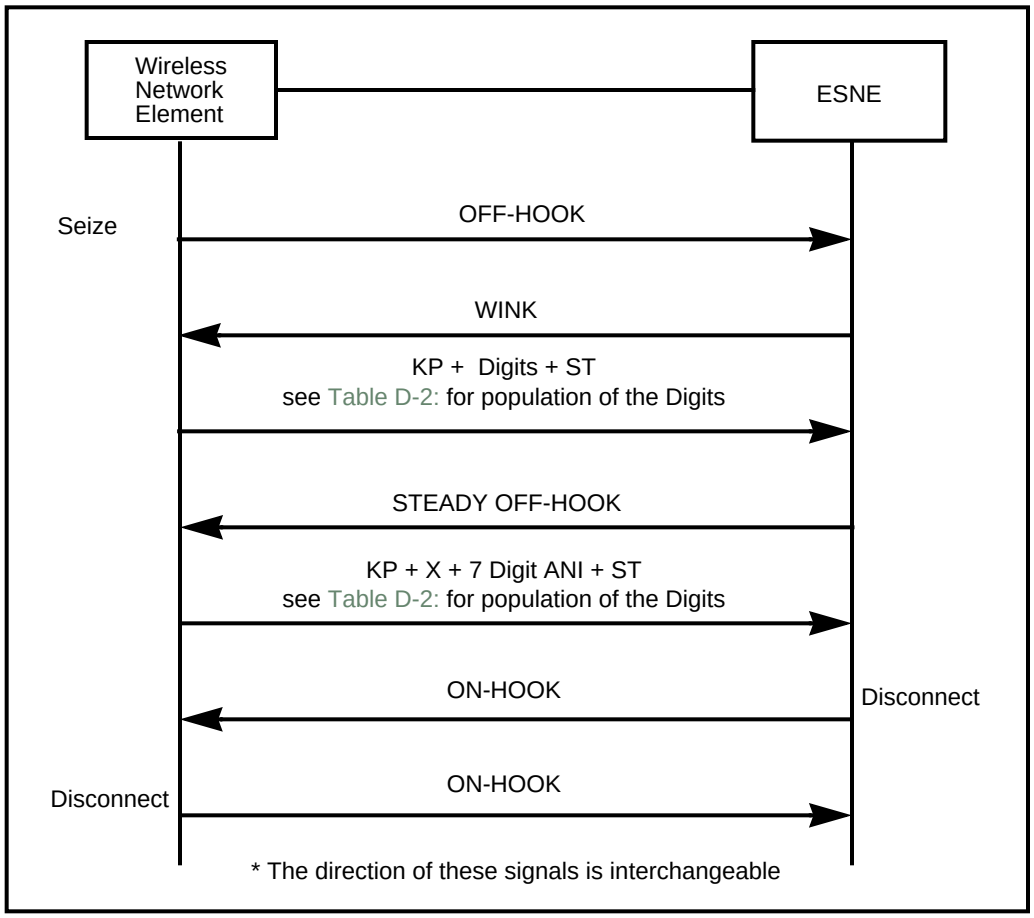

Figure D-2: **Wireless Network Origination using CAMA Signaling**

Table D-2: **CAMA Parameter Contents for NCAS Wireline Compatibility (see Note 1)**

orreq Parameters	**CAMA Parameters**	**Value**
MDN or DMH_BillingDigits or both	ANI	ESRK
Digits(Dialed)	Digits	911,1,11

Notes:

1. A mode in which only the ESRK is sent as the ANI to the Selective Router because the trunk between the Selective Router and the PSAP supports transport of only one 7/10 digit number.

D.4 Functionality of Parameters for ESME and ESN

	NCAS Wireline Compatibility (see Note 1)	**NCAS**	**CAS**
Parameter used by ESNE for routing	ESRK	ESRD	Position or ESRD
Parameter used by ESME for NCAS pull	ESRK	MDN or (non-dialable callback number plus ESRD)	MDN or non-dialable callback number
Parameter used by ESME to choose MPC	ESRK	ESRD	ESRD

Notes:

1. A mode in which only the ESRK is sent as the ANI to the Selective Router because the trunk between the Selective Router and the PSAP supports transport of only one 7/10 digit number.

Annex E: Mapping Between TIA/EIA-41 and ISUP Digit Parameters

This annex is informative and is not considered part of this this standard.

The following table shows the suggested mapping between the digit parameters in TIA/EIA-41 and ISUP.

TIA/EIA-41			ISUP		
Sub-field	**Name**	**Value**	**Sub-field**	**Name**	**Value**
Nature of Number	National	xxxxxxx0	Nature of Address	Unique national number	0000011
	International	xxxxxxx1		Unique International Number	0000100
	Presentation allowed	xxxxxx0x	Address presentation restricted indicator	Presentation allowed	00
	Presentation Restricted	xxxxxx1x		Presentation restricted	01
	User provided, not screened	xx00xxxx	Screening Indicator	user provided, not screened	00
	User provided, screening passed	xx01xxxx		user provided, screening passed	01
	User provided, screening failed	xx10xxxx		user provided, screening failed	10
	Network provided	xx11xxxx		Network provided	11
Encoding	BCD	1	n/a	n/a	n/a
Numbering Plan	Unknown	0000	Numbering Plan	unknown	000
	Telephony (E.164)	0010		ISDN Telephony (E.164)	001
	Data Numbering	0011		Data numbering	011
	Telex Numbering	0100		Telex Numbering	100
	Private	0111		Private	101
Digits	All	xxxx	Address signal	ALL	xxxx
Type of Digits	ESRD	13	Type of Digits	LocationIdentification-Number (LIN)	01101

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Annex F: MSC to Selective Router/PSAP Interconnection Scenarios

This annex is informative and is not considered part of this this standard.

The following table shows an example for the mappings between MSC to Selective Router interfaces and Selective Router to PSAP interfaces.

	MSC to Selective Router Interface	Selective Router to PSAP Interface	Scenario	Key Information Sent by the Selective Router to the PSAP (with call setup signaling)
1	CAMA	CAMA	Section D.1.1 “ISUP Initial Address Message Parameter Contents for Wireline Compatibility Mode (ESRK)”	ESRK
2	SS7 ISUP	CAMA	Section D.1.1 “ISUP Initial Address Message Parameter Contents for Wireline Compatibility Mode (ESRK)”	ESRK
3	Feature Group D	E-MF/ ISDN	Section D.1.2 “ISUP Initial Address Message Parameter Contents for NCAS”	Callback Number and ESRD
4	SS7 ISUP	E-MF/ ISDN	Section D.1.2 “ISUP Initial Address Message Parameter Contents for NCAS”	Callback Number and ESRD
5	SS7 ISUP	ISDN	Section D.1.3 “ISUP Initial Address Message Parameter Contents for CAS”	Callback Number, ESRD and Latitude/Longitude

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Annex G: Transport Protocols for Reference Point E_2 (Informative)

This annex is informative and is not considered part of this standard. It provides information on transport protocols that may be used for reference point E_2. The protocol stacks that may be used for reference point E_2 at shown in Figure G-1. Each protocol stack in Figure G-1 provides different capabilities in terms of performance and reliability.

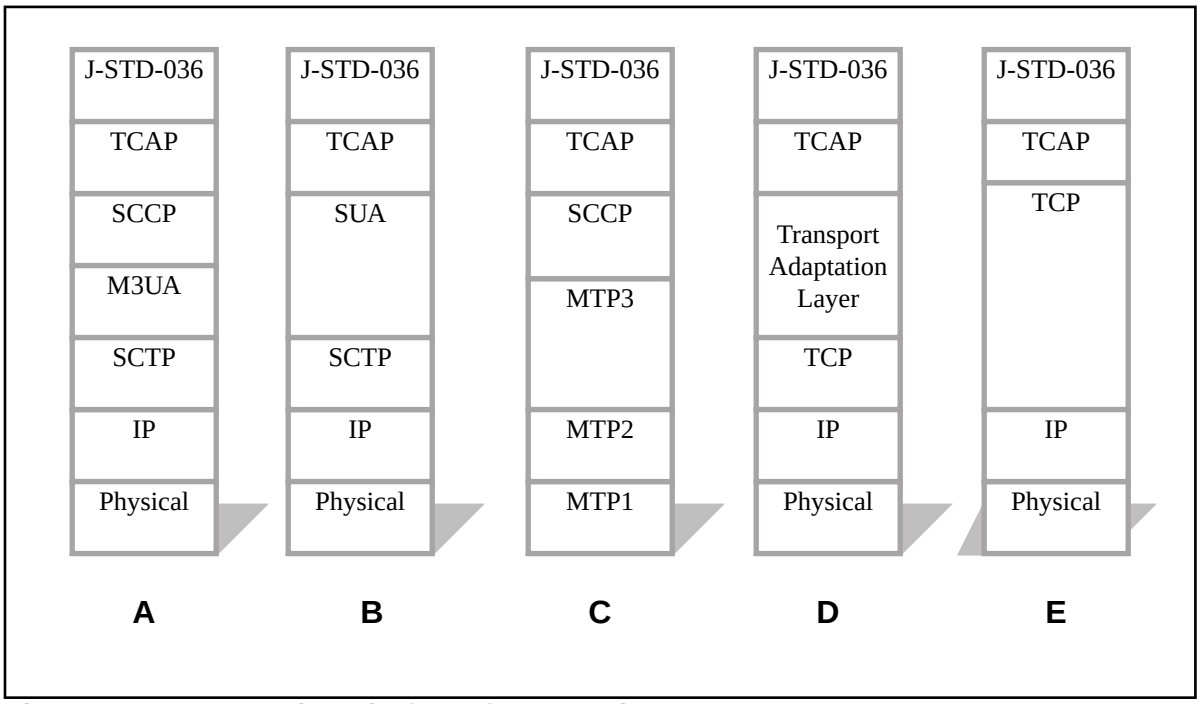

Figure G-1: **Protocol Stacks for Reference Point E_2**

G.1 TCP/IP Protocol Stack

The protocol stack used for the E2 interface is shown in figure G-2. The TCAP ASN.1 encoded message structure is directly encapsulated within TCP/IP packets without additional layers of encoding. IP provides the capability to route the message, which replaces the need for the Signal Connection Control Part (SCCP) portion of the standard SS7 message. The intervening network elements (e.g. routers and firewalls) need only use IP to correctly route the session set up message and subsequent packets.

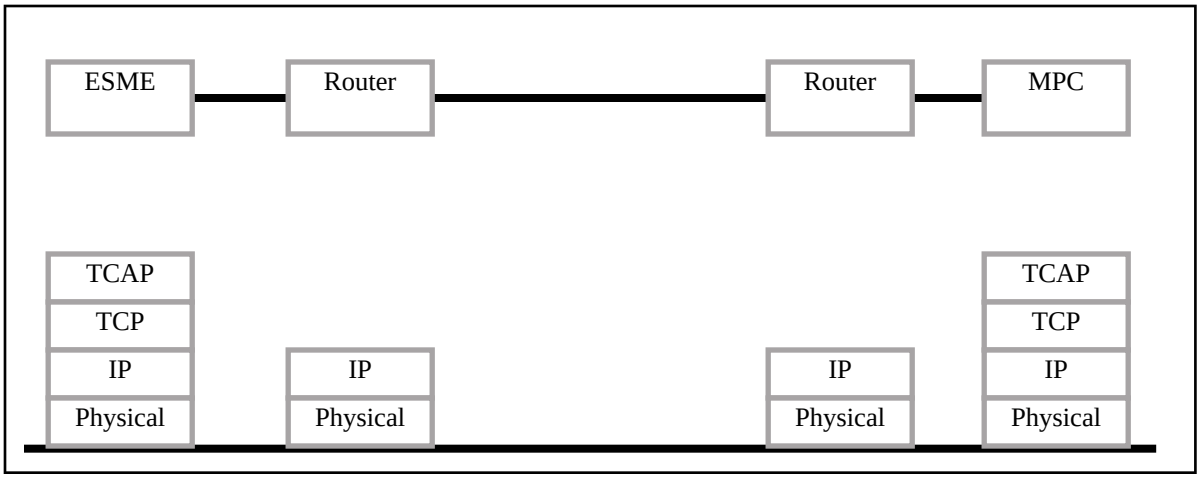

Figure G-2: **TCP/IP Protocol Stack for E2 Interface**

G.1.1 Network Architecture

Figure G-3 represents the data network architecture between the wireless network and the wireline network to allow the caller's location to be returned to the PSAP. Each PSAP has links to both of the mated, geographically distributed ESMEs. For the interconnection between the MPC and ESME, three different configurations are anticipated. The first is where the ESME connects to a MPC that is a Simplex Node (Links A, C). In this case a high availability MPC will be deployed in the wireless network. Both ESMEs will steer queries to this MPC. The second is a Redundant Node configuration. In this configuration each ESME will have a companion MPC with which it communicates (Links A, D). Each ESME will steer queries to its companion MPC. The third configuration is where the ESME complex and the MPC complex are fully connected. Therefore, each ESME has a logical TCP/IP connection to both MPCs. The network connection between the Emergency Service Provider and the Wireless Carrier is not expected to be a public network (e.g. the network may be a private packet-based network or dedicated point-to-point environment).

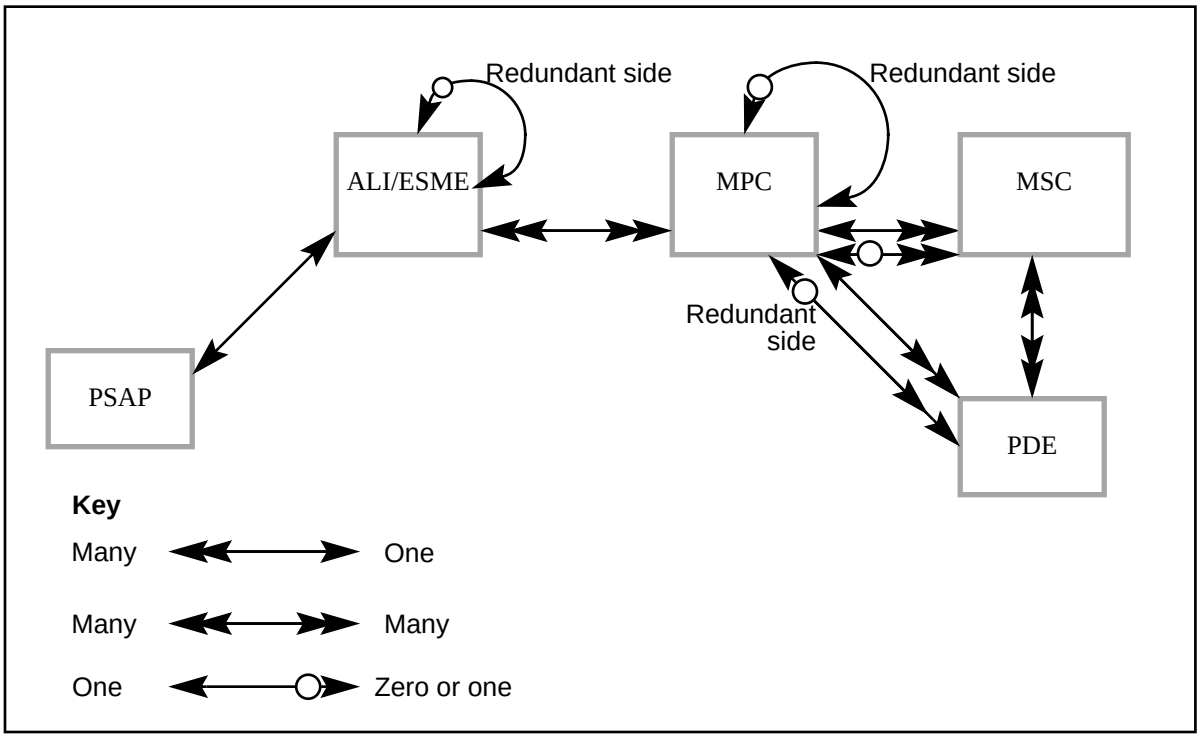

Figure G-3: **Wireless E911 Entity Relationship Diagram**

G.1.2 Session Establishment

In this configuration, the TCP/IP address and port are agreed upon between the owners of the ESME and the MPC. By convention, the ESME is the TCP/IP server and the MPC is the TCP/IP client. The sessions are established via sockets where the MPC establishes the connection to the ESME. Upon system start up, the ESME will listen to the designated port and the MPC will initiate session set up to the designated TCP/IP address and port. Once the socket session is established, the application may begin the query and response handshake.

G.1.3 Emergency Service Protocol (ESP) Messages

The ESP query has two formats, identified here as Format A and Format B. For Format A, the Emergency Service Routing Key (ESRK) is passed in the query. For a Format B message the Callback Number (CBN) and, optionally, the Emergency Service Routing Digits (ESRD) are passed. Parameters of ESME Identification and Position Request Type are sent for both formats of messages. For the ESP response, the salient parameters are the CBN, Latitude, and Longitude. Once the ESME receives these, it will format them with a local ALI record associated with the ESRK/ESRD and return the information to the PSAP.

In addition to query and response, there will be heartbeat messages between the ESME and the MPC to verify the integrity of the links. These will be initiated by the ESME and responded to by the MPC. The ESME will query with the PositionRequestType=4 (Test) and the EmergencyServiceRoutingKey=0. The MPC should respond with the PositionResult=0A (Test). These messages only will be sent during periods of inactivity of 60 seconds (a configurable parameter) on a link to verify the integrity of the application and socket connection.

Annex H: Use of ESRD in E911 Call Setup as 3-Way Call Following Inter-MSC Handoff (Informative)

This annex is informative and is not considered part of this standard. It shows various methods for using an ESRD solution for an E911 call setup as a 3-Way call following inter-MSC handoff. The fundamental problem is that the ESRD supplied by the Serving MSC in a TIA/EIA-41 FlashRequest INVOKE identifies the cellsite/sector correctly, but will lead the PSAP to query an MPC associated with the Serving MSC, instead of the Anchor MSC.

H.1 Inter-MSC Three-Way Call to PSAP

This scenario shows a CAS push of position after a handoff has occurred. This scenario applies to a call that handed off to another MSC and then initiated a 3-way call to the PSAP.

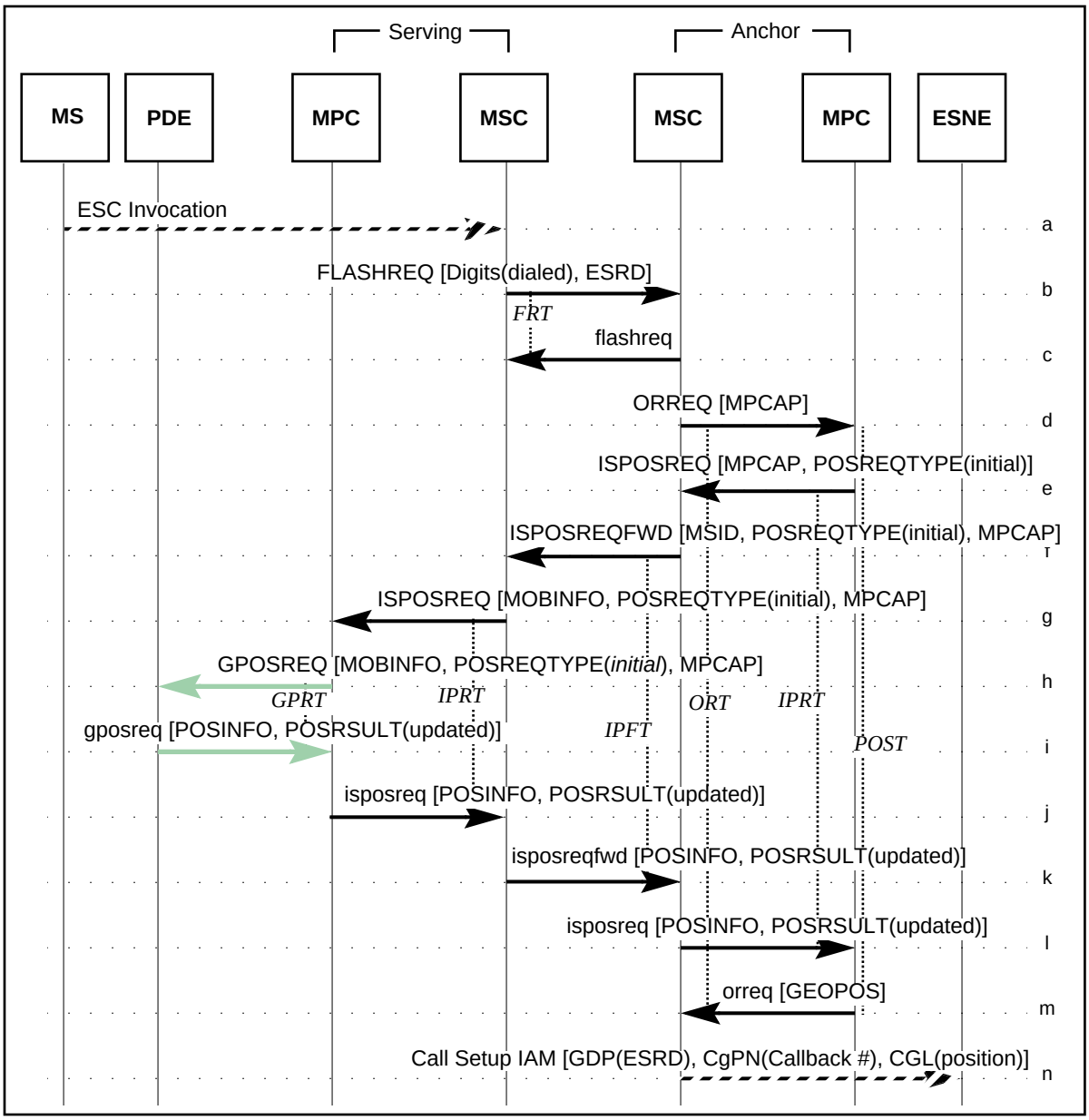

Figure H-1: **Inter-MSC Three-Way Call to PSAP**

a. The MS invokes an Emergency Services Call via 3-way calling while another call is in progress.

b. The Serving MSC notifies the next switch in the handoff chain of the event with a FLASHREQ.

c. The Anchor MSC acknowledges the event with a flashreq.

d. The Anchor MSC, knowing that anchor MPC interaction is required, requests position with an ORREQ to its MPC.

e. The Anchor MPC, requests position from the Anchor MSC with an ISPOSREQ.

f. The Anchor MSC, knowing the MS identified by the MSID is handed off, forwards the request in an ISPOSREQFWD.

g. The Serving MSC forwards the request for position to its MPC with an ISPOSREQ including the mobile information.

h. Since there is no cached position information (i.e., GPOSDIR not received), the MPC forwards the request for position to the appropriate PDE with a GPOSREQ including the mobile information.

   Optionally, a handset-based solution may have PDE to MS communication. See Section 3 “PDE to MS Scenarios for Handset-Based PDE” on page 4-30.

i. In this case, the PDE has not previously acquired the initial position of the MS. The PDE determines the current position of the MS and returns the position information in a gposreq with the PositionResult parameter set to *Updated Position Returned*.

j. The Serving MPC returns the position for the MS with an isposreq. Since the Serving MPC did not receive an ORREQ or GPOSDIR, the returned Position Result is set to *Updated Position Returned*.

k. The Serving MSC returns the position with an isposreqfwd.

l. The Anchor MSC returns the position with an isposreq.

m. The Anchor MPC returns the position with an orreq. The MPC caches the position received as an initial position.

n. The MSC sets the call up toward the ESNE using an IAM including the received geographic position.

H.2 Inter-MSC Three-Way Call to PSAP using SAMPS

This scenario shows the delivery of Position Information to the PSAP after an inter-MSC call has been handed off.

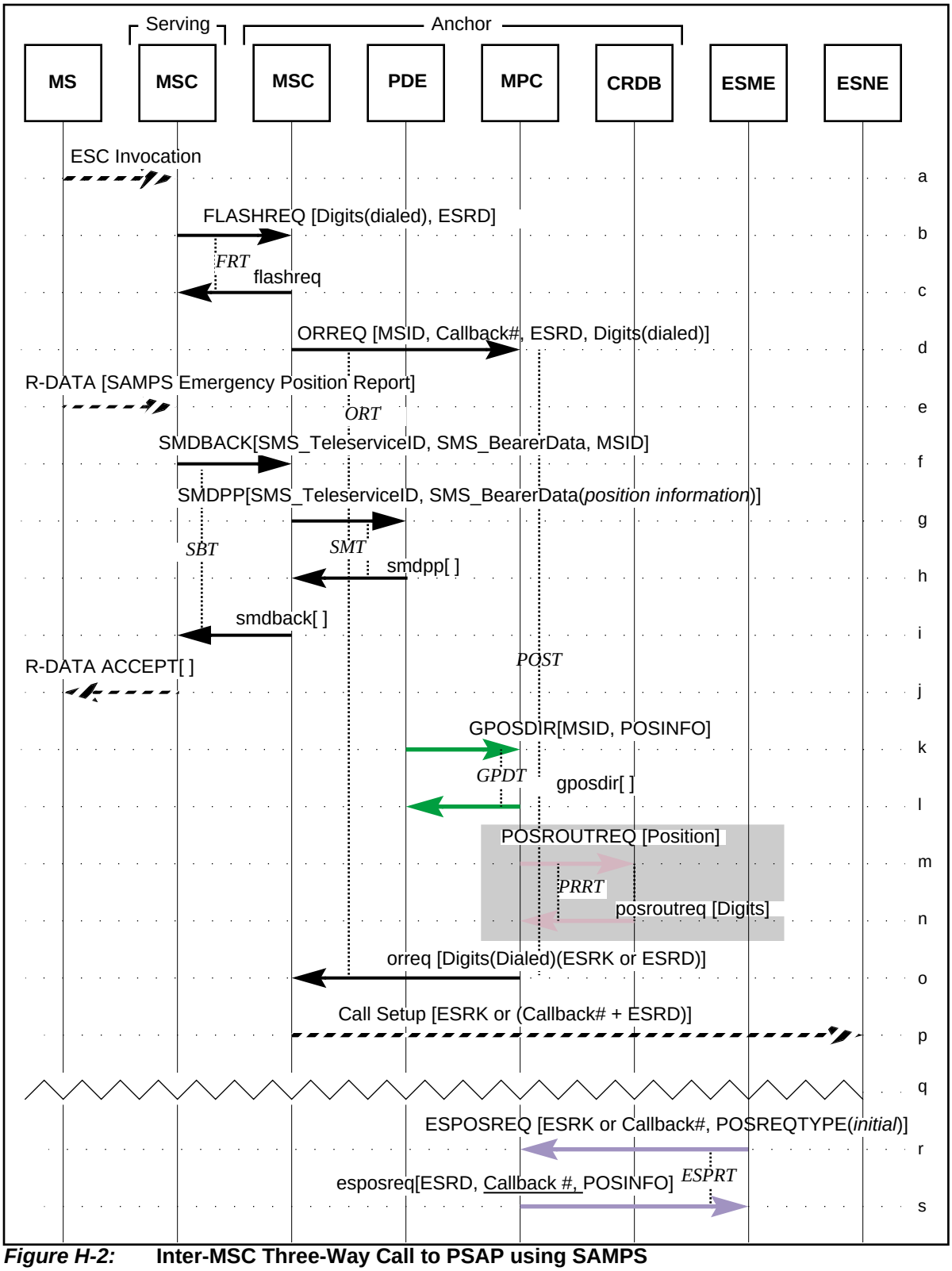

Figure H-2: **Inter-MSC Three-Way Call to PSAP using SAMPS**

a. The MS invokes an Emergency Service Call via 3-way calling while another call is in progress.

b. The Serving MSC notifies the next switch in the handoff chain of the event with a FLASHREQ.

c. The Anchor MSC acknowledges the event with a flashreq.

d. The Anchor MSC initiates the ORREQ procedure indicating in the MPCAP parameter the type of handset positioning that is supported.

e. The MS sends an Emergency Position Report message on the Digital Traffic Channel.

Note: Should the mobile require assistance data a SAMPS Position Assistance Request message may be sent to the PDE (Designated SAMPS TS Address).

f. The Serving MSC sends an SMDBACK to the Anchor MSC containing the position information.

g. The Anchor MSC sends an SMDPP to the Anchor PDE with the position information.

h. The Anchor PDE sends an smdpp to the Anchor MSC.

i. The Anchor MSC sends an smdback to the Serving MSC.

j. The Serving MSC sends the R-DATA Accept to the MS.

k. The Anchor PDE sends a GPOSDIR containing the position information to the Anchor MPC.

l. The Anchor MPC sends a gposdir to the Anchor PDE.

m. Optionally, the Anchor MPC may decide that the route must be determined from the MS's current latitude and longitude. The MPC uses the position to request routing translations for an emergency service zone from the CRDB with the POSROUTEREQ.

n. The CRDB returns the digits representing an emergency service zone (ESZ) to the MPC with a posroutreq.

o. The Anchor MPC selects a PSAP based on the emergency service zone from the CRDB or from the latitude and longitude of the mobile based on local procedures. The Anchor MPC then assigns and returns a unique routable call identifier (ESRK) for the particular PSAP selected or an ESRD in the orreq. See Chapter 8 and Annex D for the population of the signaling parameters.

p. The Anchor MSC routes the Emergency Service Call toward the PSAP selected by the ESRK or ESRD. See Annex for call setup signaling formats.

q. Some time later…

r. The ESME requests the initial position.

s. The MPC returns the cached position.

H.3 Inter-MSC Routing Based on Position Using Substitute ESRD for NCAS ESNE

This scenario shows an Emergency Services Call (ESC) originated as the second leg of a 3-way call after intersystem handoff. The MPC uses the mobile's current position to determine the appropriate ESNE. In this example, the selected ESNE requires NCAS as shown in Annex D.1.2 . Sometimes Routing Based on Position (e.g. latitude and longitude) leads to an ESNE that is not the same that a caller's serving cellsite/sector's ESRD (ESRD(SS)) would indicate to a selective router. When this happens and the ESNE requires NCAS, the MPC may optionally select an ESRD that is appropriate for this ESNE (ESRD (AS)), so that the selective router will select it, rather than the ESNE related to the ESRD(SS) that is related to the caller's serving cellsite/sector. Another problem that may arise is that the ESRD(SS) may route queries to the Serving System's MPC, rather than the MPC associated with the Anchor System.

Later, when an ESME requests initial position on an E2 data link, the MPC may optionally include the ESRD(SS) as well as the position information in the esposreq return result, similar to the information flow for wireline compatibility mode in the example shown for *Routing Based on Position* as in Chapter 4, Section 2.3.2.

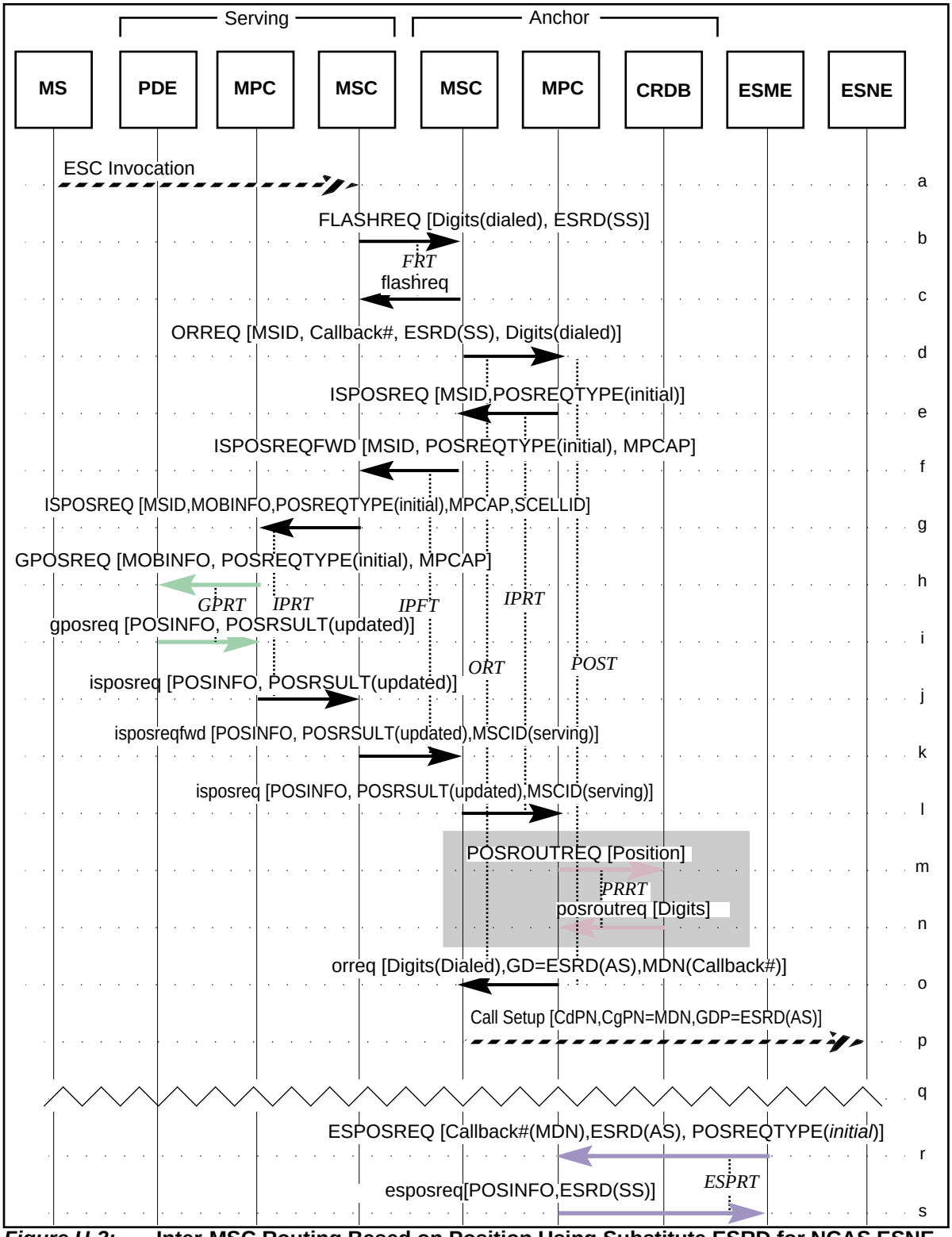

Figure H-3: **Inter-MSC Routing Based on Position Using Substitute ESRD for NCAS ESNE**

a. A call that has been handed-off from the Anchor MSC to the Serving MSC is in progress. The MS invokes an Emergency Services Call.

b. The Serving MSC notifies the Anchor MSC of the event with a FLASHREQ. The digits dialed and ESRD(SS) are included.

c. The Anchor MSC acknowledges the event with a flashreq.

d. The MSC analyses the digits dialed by the MS and sends an ORREQ to the Anchor MPC. The ORREQ includes the ESRD(SS) from the FLASHREQ, the MSID in the MIN or IMSI parameter and the MDN parameter. Since the MS's current radio information is unknown to the anchor MSC, the ORREQ does not include MOB_INFO.

e. The Anchor MPC examines the ESRD(SS) received in the ORREQ and conditionally determines that it is known to be associated with an ESZ that is marked as "Routing Based on Position". Since the ORREQ's MPCAP parameter does not indicate TDMA-SAMPS (see Inter-MSC Three-Way Call to PSAP using SAMPS in this Annex) and since the anchor MPC lacks the mobile's current radio information, the Anchor MPC sends an ISPOSREQ to the Anchor MSC.

f. The Anchor MSC, knowing the MS identified by the MSID is handed off, forwards the request in an ISPOSREQFWD.

g. The Serving MSC forwards the request for position to its MPC with an ISPOSREQ including the MS's current radio information.

h. Since there is no cached position information at the serving system MPC (i.e. GPOSDIR has not recently been received) and since the Serving MPC has the MS's current radio information, the Serving MPC forwards the request for position to the appropriate PDE with a GPOSREQ that includes the MS's radio information. Optionally, a handset-based solution may have PDE to MS communication. See Section 3 "PDE to MS Scenarios for Handset-Based PDE" on page 4-24.

i. In this scenario, the PDE has not previously acquired the initial position of the MS. The PDE determines the current position and returns the position information in a gposreq with the PositionResult parameter set to Updated Position Returned.

j. The Serving MPC returns the position for the MS with an isposreq. Since the Serving MPC did not receive an ORREQ or GPOSDIR, the returned Position Result is set to Updated Position Returned. The Serving MPC does not cache the position information since only the Anchor MPC will be able to reliably locate the mobile for subsequent location update requests, regardless of where the mobile travels during the 3-way E911 call.

k. The Serving MSC returns the position information with an isposreqfwd and includes MSCID(Serving).

l. The Anchor MSC returns the position information with an isposreq that includes the optional parameter MSCID(Serving), which is cached by the Anchor MPC as 'initial position'.

m. Optionally, the MPC may use the MS's current position to request a routing translation for an emergency services zone (ESZ) from the CRDB with a POSROUTREQ, i.e. Routing Based on Position.

n. The CRDB returns the digits representing an emergency services zone (ESZ) to the MPC with a posroutreq.

o. The Anchor MPC selects an ESNE based on the ESZ from the CRDB or from the latitude and longitude of the mobile based on local procedures. In this example, the Anchor MSC is able to route to the selected PSAP that requires NCAS call setup and further, this ESNE is not associated with the ESRD(SS) that was passed to the MPC via the FLASHREQ sent to the MSC. This means the MPC must assign a routable address, e.g. ESRD(AS). The MPC returns ESRD(AS), which a selective router may use to select the MPC-intended PSAP, to the Anchor MSC in the orreq GenericDigits

parameter. The selected ESME may use the ESRD(AS) received from call setup to route its subsequent ESPOSREQ back to the Anchor MPC that holds all the information about the ESC: the original ESRD(SS) that represents the MS's serving cellsite/sector information and the MS's initial position information.

p. The Anchor MSC routes the Emergency Services Call (ESC) towards the ESNE selected by the ESRD(AS).

q. Some time later …

r. The Anchor MPC receives an ESPOSREQ including the MS's callback#(MDN) because ESRD(AS) is associated with the Anchor MPC's E2 interface. This is a request for initial position.

s. The Anchor MPC returns the position information and the caller's serving cellsite/sector information.

H.4 Inter-MSC Routing Based on Cellsite/Sector for NCAS when Serving and Anchor MPC are the same.

This scenario shows an Emergency Services Call (ESC) originated as the second leg of a 3-way call after intersystem handoff. The MPC uses ESRD(SS) to select the appropriate ESNE. In this example, the selected ESNE requires NCAS for call setup using ESRD(SS) and the ESRD is also associated with the

MPC that serves the Anchor MSC.

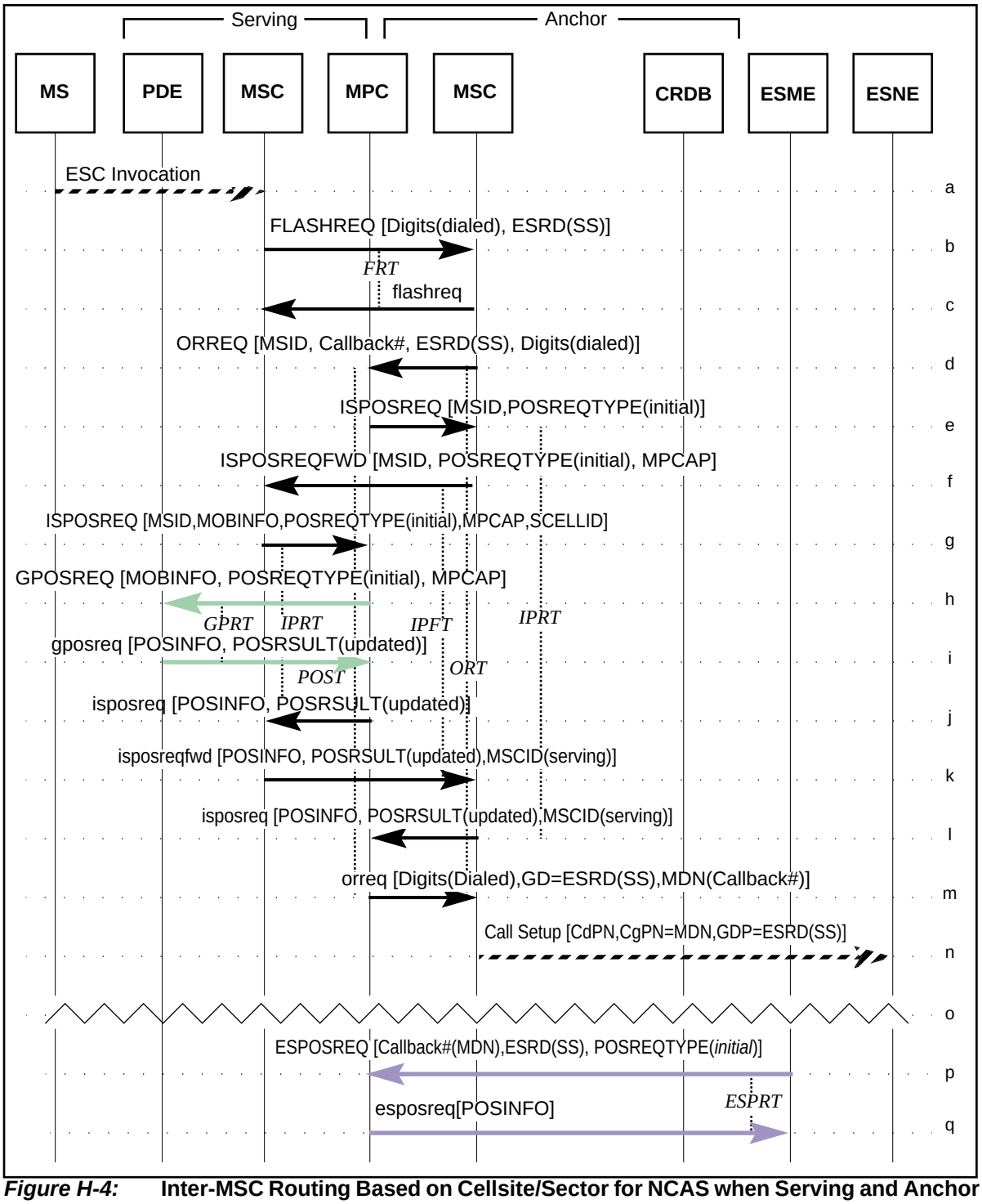

Figure H-4: **Inter-MSC Routing Based on Cellsite/Sector for NCAS when Serving and Anchor MPC are the same.**

a. A call that has been handed-off from the Anchor MSC to the Serving MSC is in progress. The MS invokes an Emergency Services Call.

b. The Serving MSC notifies the Anchor MSC of the event with a FLASHREQ. The digits dialed and ESRD(SS) are included.The ESRD(SS) is associated with an MPC that is associated with both the Serving and Anchor MSC's.

c. The Anchor MSC acknowledges the event with a flashreq.

d. The MSC analyses the digits dialed by the MS and sends an ORREQ to the Anchor MPC. The ORREQ includes the ESRD(SS) from the FLASHREQ, the MSID in the MIN or IMSI parameter and the MDN parameter. Since the MS's current radio information is unknown to the anchor MSC, the ORREQ does not include MOB_INFO.

e. The Anchor MPC examines the ESRD received in the ORREQ and conditionally determines that ESRD(SS) is known to be associated with an ESZ that is marked as "Routing Based on Serving Cellsite/Sector". To unconditionally determine the correct ESZ, the Anchor MPC sends an ISPOSREQ to the Anchor MSC in order to obtain the MSCID(serving) since ESRDs are known to not be unique within North America, yet ESRDs are known to be unique within an MSC.

f to k. are the same.

l. The Anchor MSC returns the position information with an isposreq that includes the optional parameter MSCID(Serving), which is cached by the Anchor MPC as 'initial position'.

m. The Anchor MPC selects an ESNE based on the caller's serving cellsite/sector represented by the ESRD(SS) passed in the FLASHREQ. In this example, the selected ESNE requires NCAS call setup and further, the Anchor MSC is able to route to the selected PSAP. This means the MPC must use a routable address, e.g. the ESRD(SS), and returns this information to the Anchor MSC in an orreq GenericDigits parameter. The selective router may use ESRD(SS) to select the MPC-intended PSAP. Later the ESME will use this same ESRD(SS) to route any of the ESME's subsequent ESPOSREQ messages back to the MPC that holds the MS's initial position information and to request location updates when initial position has been either pushed or pulled. Since the Anchor MPC is the same MPC as the Serving MPC, ESRD(SS) can be used for call setup. The MPC may include other optional parameters in the orreq: see Annex D.1.2 and D.1.3 for specific recommendations.

n. The Anchor MSC routes the Emergency Services Call (ESC) towards the ESNE selected by the ESRD(SS).

o. Some time later …

p. The Anchor MPC receives an ESPOSREQ including the MS's callback#(MDN) because ESRD(SS) is associated with the Anchor MPC's E2 interface (as well as the Serving MPC). This is a request for initial position.

q. The MPC need only include the position information.