

Interface Specification License Agreement

1. Intrado Inc. ("Intrado") is willing to license certain proprietary interface specifications ("Interface Specification") to you only upon the condition that you accept all of the terms contained in this License Agreement ("Agreement"). Please read the terms and conditions of this Agreement carefully. By clicking "Accept" below, opening the electronic file, viewing the Interface Specification, copying or downloading the Interface Specification, or using the Interface Specification, you agree and promise to accept the terms and conditions of this Agreement. If you are not willing to be bound by its terms, select the "Do Not Accept" button at the bottom of this page and the process of accessing the Interface Specification will not continue.

2. Licensed Interface Specification.

"Licensed Interface Specification" means any of those Interface Specifications to which access is provided to you by Intrado under this Agreement.

3. Grant.

Intrado grants to you a non-exclusive, non-transferable and limited license to download and use the Licensed Interface Specification for the purpose of interconnection to Intrado's systems, exchanging data with Intrado's systems, and utilizing transactions identified within a Licensed Interface Specification in the course of doing business with Intrado. No license is granted to you for any other purpose. You may not sell, rent, loan or otherwise encumber or transfer the Licensed Interface Specification in whole or in part, to any third party.

3.1 The Licensed Interface Specification is confidential, proprietary, and copyrighted. You must take appropriate steps to protect the Licensed Interface Specification from unauthorized disclosure or use. Title to the Licensed Interface Specification and all associated intellectual property rights is retained exclusively by Intrado.

3.2 Except as specifically authorized in this Agreement or any supplemental license terms, you may not make copies of the Licensed Interface Specification, other than a single copy of the Licensed Interface Specification for archival purposes. You agree to reproduce any copyright and other proprietary right notices on any such copy.

3.3 Except as otherwise provided by law, you may not modify or create derivative works of the Licensed Interface Specification.

3.5 You may not publish or provide the results of any benchmark or comparison tests run on the Licensed Interface Specification to any third party without the prior written consent of Intrado.

3.6 No right, title or interest in or to the Licensed Interface Specification, any trademark, service mark, logo, or trade name of Intrado or its licensors is granted under this Agreement. Intrado and the Intrado logo are trademarks or registered trademarks of Intrado Inc.

4. Limited Warranty.

THE LICENSED INTERFACE SPECIFICATION IS PROVIDED "AS IS," AND UNLESS OTHERWISE SPECIFIED IN THIS AGREEMENT, ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS AND WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT, ARE DISCLAIMED, EXCEPT TO THE EXTENT THAT THESE DISCLAIMERS ARE HELD TO BE LEGALLY INVALID.

5. Limitation of Liability.

TO THE EXTENT NOT PROHIBITED BY APPLICABLE LAW, IN NO EVENT WILL INTRADO OR ITS LICENSORS BE LIABLE FOR ANY LOST REVENUE, PROFIT OR DATA, OR FOR SPECIAL, INDIRECT, CONSEQUENTIAL, INCIDENTAL OR PUNITIVE DAMAGES, HOWEVER CAUSED AND REGARDLESS OF THE THEORY OF LIABILITY, ARISING OUT OF OR RELATED TO THE USE OF OR INABILITY TO USE THE LICENSED INTERFACE SPECIFICATION, EVEN IF INTRADO HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT WILL INTRADO'S LIABILITY TO YOU, WHETHER IN CONTRACT, TORT (INCLUDING NEGLIGENCE), OR OTHERWISE, EXCEED THE AMOUNT OF ONE HUNDRED DOLLARS. THE FOREGOING LIMITATIONS WILL APPLY EVEN IF THE ABOVE STATED WARRANTY FAILS OF ITS ESSENTIAL PURPOSE.

6. Termination.

This Agreement is effective until terminated. You may terminate this Agreement at any time by destroying all copies of the Licensed Interface Specification. This Agreement will terminate immediately without notice from Intrado if you fail to comply with any provision of this Agreement. Upon termination, you must destroy all copies of the Licensed Interface Specification. Rights and obligations under this Agreement that by their nature should survive, will remain in effect after termination or expiration of this Agreement.

7. Export Regulations.

The Licensed Interface Specification and technical data delivered under this Agreement may be subject to U.S. export control laws and may be subject to export or import regulations in other countries. You agree to comply strictly with all such laws and regulations and acknowledge that you have the responsibility to obtain such licenses to export, re-export, or import as may be required after access to the Licensed Interface Specification is provided to you.

8. Governing Law.

This Agreement will be governed by Colorado law and controlling U.S. federal law. Any dispute relating to or arising out of this Agreement shall be resolved solely by an action filed in the state of Colorado.

9. Severability.

If any provision of this Agreement is held to be unenforceable, this Agreement will remain in effect with the provision omitted, unless omission of the provision would frustrate the intent of the parties, in which case this Agreement will immediately terminate.

10. Integration.

This Agreement is the entire agreement between you and Intrado relating to its subject matter. It supersedes all prior or contemporaneous oral or written communications, proposals, representations and warranties and prevails over any conflicting or additional terms of any quote, order, acknowledgment, or other communication between the parties relating to its subject matter during the term of this Agreement. No modification of this Agreement will be binding, unless in writing and signed by an authorized representative of each party.

11. Remedies.

It is understood and agreed that, notwithstanding any other provision of this Agreement, your breach of the provisions of Section 3 of this Agreement will cause Intrado irreparable damage for which recovery of money damages would be inadequate, and that Intrado will therefore be entitled to seek timely injunctive relief to protect Intrado's rights under this Agreement in addition to any and all remedies available at law.

Neither party may assign or otherwise transfer any of its rights or obligations under this Agreement without the prior written consent of the other party, except that Intrado may assign this Agreement to an affiliated company.

IS Supplemental License Terms

These supplemental license terms ("Supplement") add to or modify the terms of the License Agreement (collectively "the Agreement"). Capitalized terms not defined in this Supplement shall have the same meanings ascribed to them in the Agreement. These Supplement terms shall supersede any inconsistent or conflicting terms in the Agreement.

1. License to Distribute. Intrado grants to Licensee a non-exclusive, non-transferable, royalty-free limited license to reproduce and distribute the Licensed Interface Specification provided that Licensee:

(A) distributes the Licensed Interface Specification complete and unmodified only and for the sole purpose of interconnection to Intrado's systems, exchanging data with Intrado's systems, and utilizing transactions identified within a Licensed Interface Specification in the course of doing business with Intrado;

(B) does not distribute additional software or APIs intended to replace any component(s) of the Licensed Interface Specification;

(C) agrees to incorporate the most current version of the Licensed Interface Specification;

(D) does not remove or alter any proprietary legends or notices contained in the Licensed Interface Specification;

(E) agrees to indemnify, hold harmless, and defend Intrado and its licensors from and against any claims or lawsuits, including attorneys' fees, that arise or result from the use or distribution of the Licensed Interface Specification.

(F) does not modify, or authorize its licensees to modify, the Licensed Interface Specification; and

(G) only distributes the Licensed Interface Specification pursuant to a license agreement that protects Intrade's interests consistent with the terms contained in the Agreement.

2. Trademarks and Logos. This Agreement does not authorize Licensee to use any Intrade name, trademark or logo.



*Qwest Detailed SR/ALI to
MPC/GMLC Interface Specification
For TCP/IP Implementation of
TIA/EIA/J-STD-036 E₂ with
Phase I Location Description
Addition*

Intrado Inc.
Longmont, Colorado USA

Issue 1.11
April 2004

License Notice

The information presented herein is the exclusive property of Intrado Inc. Only those persons licensed by Intrado Inc. are permitted to use such information and only in accordance with the terms and conditions of the applicable license agreement.

Copyright

This material is protected by the copyright laws of the United States and other countries. It may not be reproduced distributed or altered in any fashion by any entity (either internal or external to Intrado Inc.) except in accordance with applicable agreements, contracts or licensing, or with the express written consent of Intrado Inc.

Trademarks

Intrado, triangle beacon design, Informed Response, IntelliVector, and the logo forms of the foregoing, are trademarks and/or service marks of Intrado Inc. in the United States, other countries, or both and may be registered therein.

Disclaimer

Every effort was made to ensure that the information in this document was complete and accurate at the time of publication. However, information is subject to change, and Intrado Inc. makes no representations or warranties as to the accuracy of the information or its suitability for any intended purpose.

Prerequisites for Use

To take advantage of the interface described herein, software developers and their customers must establish an appropriate business relationship with Intrado Inc. Please see our web site for further details (<http://www.Intrado.com>).

Acknowledgements

This specification was developed by the System Engineering Group at Intrado.

Organization

This interface specification is organized as follows:

- Section 1, “Scope and Content”
Defines the purpose of this document and gives an overview of the interface specification.
- Section 2, “System and Network Overview”
Describes the ALI system and MPC/GMLC – ALI network.
- Section 3, “Message Flow Diagrams”
Describes how messages flow between the ALI and MPC/GMLC
- Section 4, “Emergency Services Protocol (ESP) Message Formats”
Describes the data elements that are available for each of the Emergency Services Protocol (ESP) messages.
- Section 5, “Emergency Services Protocol (ESP) Message Element Descriptions”
Describes each of the Emergency Services Protocol (ESP) Message Elements.
- Appendix A, “Acronyms and Definitions”
Defines the acronyms and definitions used in this document.

- Appendix B, “Qwest Enhanced 9-1-1 ALI Overview”
Details of the Qwest E9-1-1 ALI Overview.

Table of Contents

1.0 SCOPE AND CONTENT 5

1.1 INTRODUCTION 5

1.2 INTRADO INC. 6

1.3 REFERENCES 6

2.0 SYSTEM AND NETWORK OVERVIEW 8

2.1 SYSTEM OVERVIEW 8

2.2 SYSTEM DATE AND TIME 8

2.3 ERROR RECOVERY 8

2.4 NETWORK CONNECTIVITY 9

2.5 NETWORK SECURITY 9

3.0 MESSAGE FLOW DIAGRAMS 10

3.1 TCP/IP CONNECTION ESTABLISHMENT PROTOCOL 10

3.2 TCP/IP CONNECTION TEARDOWN PROTOCOL 11

3.3 EMERGENCY SERVICES POSITION REQUEST SCENARIOS 12

3.4 TEST ESRK IN THE EMERGENCY SERVICES POSITION REQUEST 25

3.5 APPLICATION HEARTBEAT PROTOCOL 27

4.0 EMERGENCY SERVICES PROTOCOL (ESP) MESSAGE FORMATS 28

4.1 EMERGENCY SERVICES POSITION REQUEST 28

4.2 EMERGENCY SERVICES POSITION REQUEST RESPONSE 29

4.3 EMERGENCY SERVICES POSITION REQUEST RESPONSE RETURN ERROR 29

4.4 EMERGENCY SERVICES POSITION REQUEST RESPONSE REJECT 30

5.0 EMERGENCY SERVICES PROTOCOL (ESP) MESSAGE ELEMENT DEFINITIONS . 31

5.1 TRANSACTION PORTION INFORMATION ELEMENTS 31

5.2 COMPONENT PORTION INFORMATION ELEMENTS 32

5.3 EMERGENCY SERVICES PROTOCOL(ESP) PARAMETERS 35

APPENDIX A: ACRONYMS AND DEFINITIONS 52

APPENDIX B: QWEST ENHANCED 9-1-1 ALI OVERVIEW 55

B.1 INTERCONNECTION OVERVIEW 56

1.0 Scope and Content

1.1 Introduction

This specification defines the interface requirements for the wireless Phase II E₂ interface between an Intrado's Selective Routing/Automatic Location Identification (SR/ALI) and a Mobile Positioning Center (MPC)/Gateway Mobile Location Center (GMLC). The E₂ interface is described in TIA/EIA/J-STD-036-A as the real-time interface between an Emergency Services Message Entity (ESME), or ALI database, and the MPC/GMLC used in determining the geographic location of a mobile caller during an emergency services call.

Using the existing E9-1-1 network, the PSAP's connectivity to ALI can be used to retrieve initial and updated geographic location data for a wireless 9-1-1 call. When a PSAP receives a wireless 9-1-1 call, or it determines a need for an updated geographic location for a mobile caller, the PSAP sends a bid to ALI for the location information. The ALI determines it must bid an external system for this data and sends an Emergency Services Position Request (ESPOSREQ) to an MPC/GMLC. When the MPC/GMLC receives the position request, it retrieves the updated geographic location from the Position Determining Entity (PDE) or Serving Mobile Location Center (SMLC) and sends it to the ALI host within the Emergency Services Position Request Response (esposreq). The ALI host responds to the PSAP with the updated mobile caller's location.

This interface specification defines requirements for queries and responses of the Emergency Services Protocol (ESP) over TCP/IP. TR45.2 defined the Emergency Services Protocol in J-STD-036-A, which specifies the interface for retrieving the initial and updated mobile caller's location. Refer to TIA/EIA/J-STD-036-A for information regarding the ESP elements used in the E₂ interface.

For the E₂ labeled interface (see Figure 1), Intrado supports a TCP/IP based network for data exchange between MPC/GMLCs and Intrado's ALI. Messages are exchanged between these two entities by encapsulating them within TCP/IP packets without additional layers of encoding. TCP/IP transports the message to the correct application on the ALI system replacing the need for the Signaling Connection Control Part (SCCP) portion of the standard SS7 message.

This document contains the network connectivity requirements and standards required by Intrado. Because the emergency services network will consist of many MPC/GMLCs connected to many ALI hosts, each entity in the network, including each set of E₂ interconnections, must be able to be referenced by a unique TCP/IP address. Intrado requires that only registered IP addresses be used so that no TCP/IP addressing conflicts occur. Customers may then make use of Network Address Translation (NAT) within their networks at their discretion to allow internal use of non-registered addresses.

Please refer to Appendix B for details on the ILEC's ALI database and E2 connectivity between the ALI database and MPC/GMLC. Correct operation of the E2 interface cannot be expected unless E2 connectivity to the ILEC's ALI database is configured as specified in Appendix B.

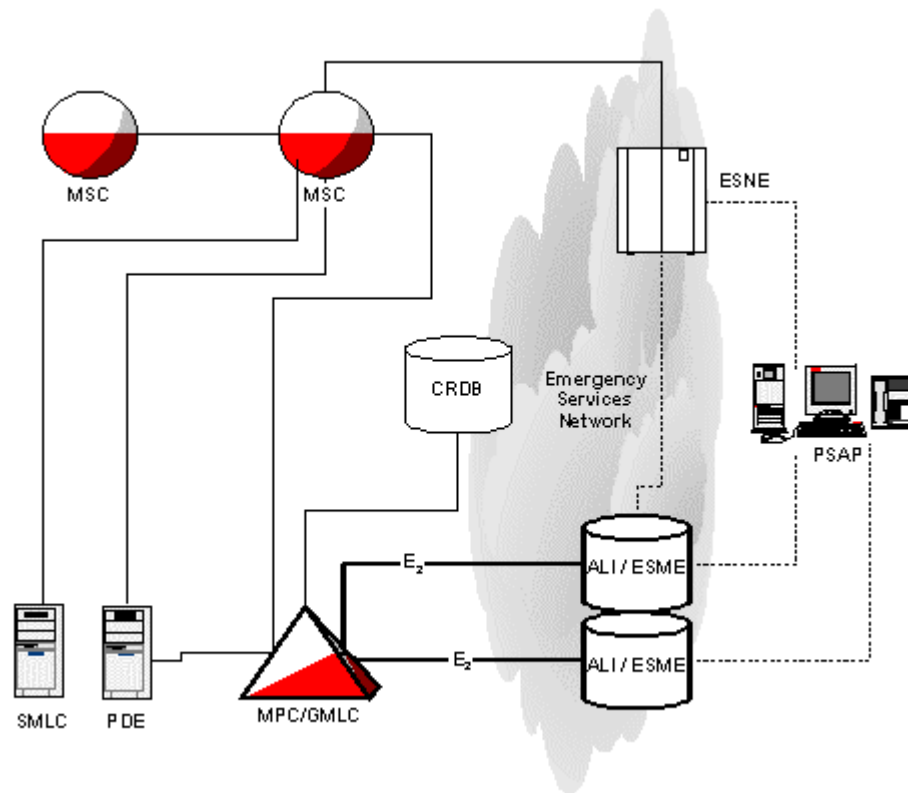


Figure 1: E₂ Network Reference Model

1.2 Intrado Inc.

Intrado Inc., now in its 25th year, has been a pioneer in emergency communications since 1979, providing the core of the nation's 9-1-1 infrastructure and delivering innovative solutions to telecommunications companies and public safety organizations.

Intrado excels in systems engineering of complex, integrated data and telephony environments and in critical operations management. The Company's unparalleled industry knowledge reduces the effort, cost, and time associated with providing reliable information for 9-1-1, safety and commercial applications.

Intrado recently received International Organization for Standardization (ISO) 9001-2000 certification.

1.3 References

01-002 - Master Glossary Standard of 9-1-1 Terminology, October 2002, National Emergency Number Association's Web Site.

02-010 – Standards for Recommended Formats & Protocols For Data Exchange – Exhibit 23, January 2002, National Emergency Number Association's Web Site.

American National Standard for Telecommunications – Signaling System Number 7 (SS7) – Transaction Capabilities Transaction Part (TCAP), T1.114-1996, Standards Committee T1 – Telecommunications

ANSI T1.628-2000 for Telecommunications – Emergency Calling

TIA/EIA-41-D – Cellular Radiotelecommunications Intersystem Operations, December 1997.

TIA/EIA/J-STD-036-A, Rev. A v7, Telecommunications Industry Association, August 2001

2.0 System and Network Overview

This section describes the MPC/GMLC and ALI network connectivity requirements and standards. The figure below represents the network supported by Intrado's ALI system. Many MPC/GMLCs may be connected to many ALI systems.

Please refer to Appendix B for details on the ILEC's ALI database and E2 connectivity between the ALI database and MPC/GMLC. Correct operation of the E2 interface cannot be expected unless E2 connectivity to the ILEC's ALI database is configured as specified in Appendix B.

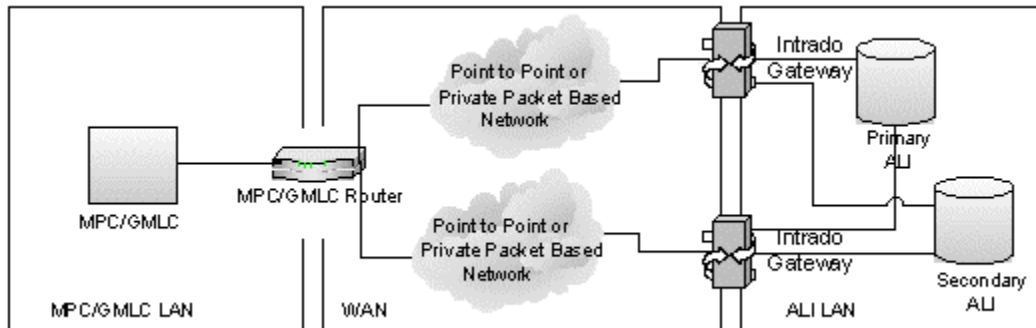


Figure 2: ALI - MPC/GMLC Network Overview

2.1 System Overview

Intrado's ALI is a highly available, secure, fault-tolerant system. Because providing 9-1-1 data quickly can mean the difference between life and death, the ALI system typically provides sub-second response time (~400 ms) for queries where the data is resident in the local ALI database. As in any distributed system, network latency may adversely affect the customer's perceived response time, and the customer should adjust their system timeouts appropriately. Each interconnection will be designed and designated a maximum transaction load. System failures or loading that exceeds designated maximum loads may be subject to disconnection. Each client's Service Level Agreement (SLA) will detail these parameters.

2.2 System Date and Time

All date and time elements within this interface will be represented using Coordinated Universal Time (UTC) to provide a common reference point regardless of location of the sending or receiving system. Systems operated by Intrado are referenced to the National Institute of Standards and Technology (NIST) atomic clock by radio.

2.3 Error Recovery

Should the MPC/GMLC fail to respond to five consecutive requests (number configurable on a system wide basis), the previously established connection may no longer be in place and the ALI system will follow the TCP/IP Connection Teardown protocol as it is defined in this document. The MPC/GMLC should detect the TCP/IP socket connection is no longer in place, either by receiving an error or after a heartbeat timeout, and the MPC/GMLC should follow the TCP/IP Connection Establishment protocol, also defined in this document, to reestablish the ALI connection.

If an excessive number of consecutive invalid messages are received from the MPC/GMLC, the ALI will teardown the MPC/GMLC's connection. Denial of Service (DOS) signature traffic arriving at Intrado will result in immediate disconnection from the ALI system until the cause of the anomalous traffic is identified and resolved.

2.4 Network Connectivity

The MPC/GMLC and ALI systems use TCP/IP routers and private networking transport to create a secure and predictive network. These routers will make use of the IP protocol for node addressing. The physical connectivity between the ALI and the MPC/GMLC is through either a private packet-based network or a dedicated point-to-point environment. Because ALI systems are always deployed in pairs, each MPC/GMLC needs physical connectivity to both ALI hosts.

Each entity in the network including the ALI and the MPC/GMLC must be able to be referenced by a unique TCP/IP address such that no TCP/IP address conflicts result in the network.

Given the number of systems and system nodes likely to be interconnected when supplying wireless 9-1-1 service in a given area, Intrado requires that only registered IP addresses be used for WAN-facing ports to ensure uniqueness unless specific alternative arrangements are negotiated. Customers may then make use of Network Address Translation (NAT) within clients' networks at their discretion to allow internal use of non-registered addresses.

For each set of E₂ interconnections, coordination between the MPC/GMLC and ALI operator is required to assure that IP addresses are appropriately assigned to all inward and outward facing ports on each node component.

2.5 Network Security

MPC/GMLC to ALI system connectivity is accomplished through private network facilities. These facilities may be dedicated point-to-point or packet based (frame relay) networks as long as the implementation results in a closed private network.

Intrado's network engineering and network security groups will evaluate and approve all proposed network topologies prior to implementation.

For security purposes, every on-line connect request received by the ALI server is interrogated for the connector's IP address to determine who the connector is, and if the connector is valid and authorized to connect to the ALI server.

3.0 Message Flow Diagrams

Please refer to Appendix B for details on the ILEC’s ALI database and E₂ connectivity between the ALI database and MPC/GMLC. Correct operation of the E₂ interface cannot be expected unless E₂ connectivity to the ILEC’s ALI database is configured as specified in Appendix B.

3.1 TCP/IP Connection Establishment Protocol

This section outlines the protocol used to establish a connection between the MPC/GMLC and the ALI so that Emergency Services Protocol messages can be exchanged between the client and server.

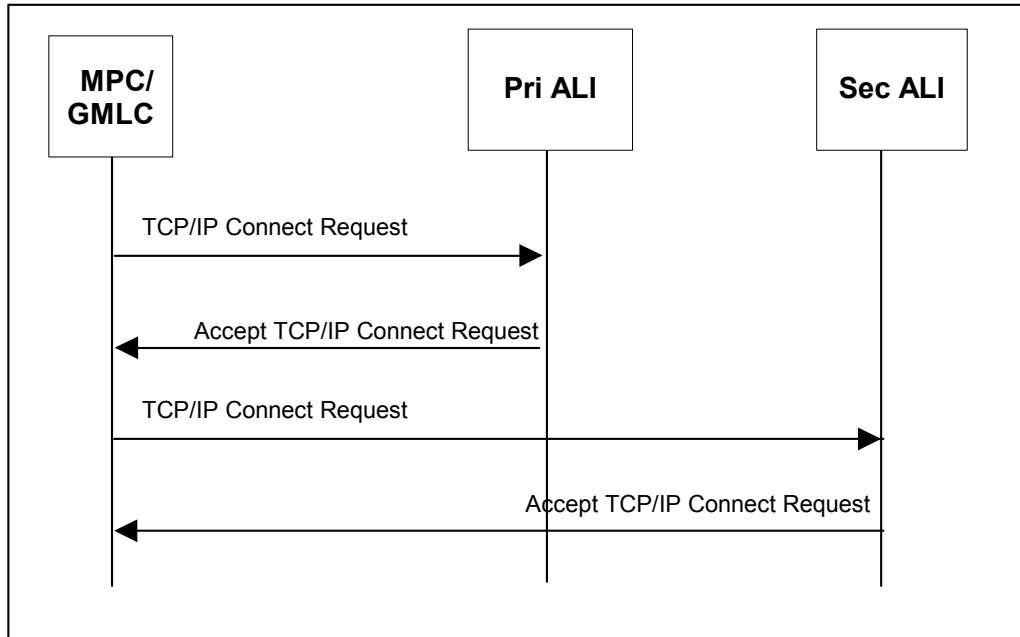


Figure 3: MPC/GMLC to ALI Connection Protocol

The MPC/GMLC acts as the client and establishes a connection to both the primary and secondary ALI. Conversely, the ALI is the server and is listening for connect requests from the MPC/GMLC. A private Domain Name System (DNS) system contains an entry corresponding to the IP addresses of the ALI. The MPC/GMLC will use this DNS entry instead of a specific TCP/IP address to connect to the ALI. The MPC/GMLC uses a well-known port to connect to the ALI and the ALI servers are listening for connect requests on the same well-known TCP/IP port. Intrado will register this port with Network Solutions as the standard port number for MPC/GMLC-to-ALI E₂ connectivity. Intrado will provide this information to each customer during implementation.

If the socket connection cannot be established or the socket connection is torn down, the MPC/GMLC is responsible for attempting to reestablish the connection. An attempt to reconnect should occur every 30 seconds.

Note: SR/ALI will only accept one connection per IP address. Subsequent connect requests are torn down. SR/ALI will accept multiple connections per listen port as long as the foreign IP addresses are unique.

3.2 TCP/IP Connection Teardown Protocol

This section outlines the protocol used to close a previously established MPC/GMLC/ALI connection.

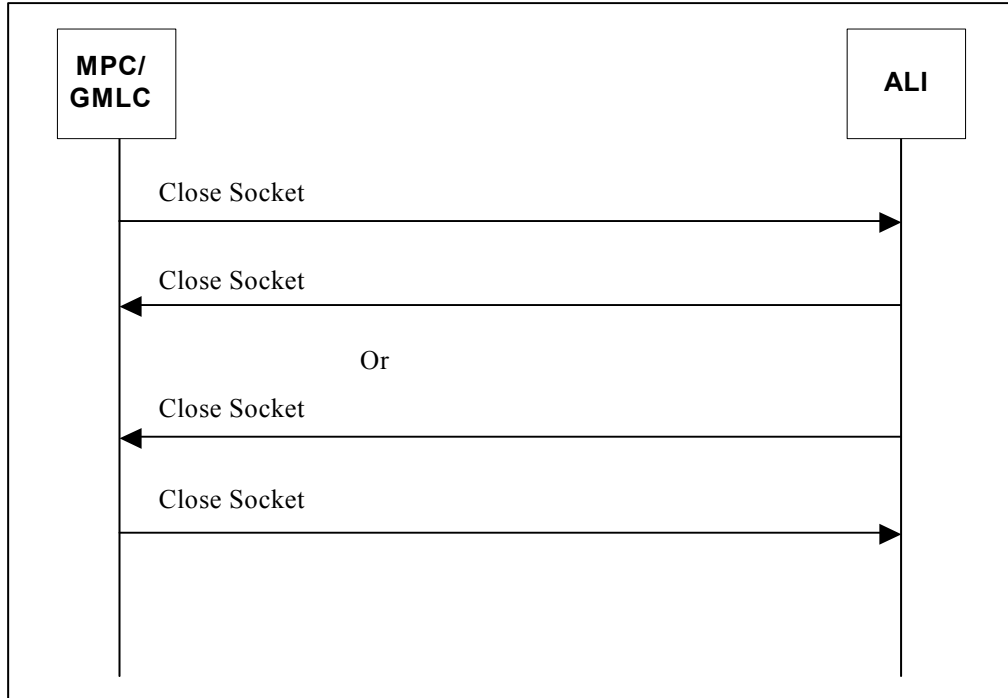


Figure 4: TCP/IP Connection Teardown Protocol

If the MPC/GMLC or ALI is known to be going out of service, the entity going out of service closes the TCP/IP socket.

The other side gets an error on the TCP/IP socket and responds by closing the TCP/IP socket.

The TCP/IP Connection Establishment Protocol is followed until the TCP/IP socket connection is reestablished.

3.3 Emergency Services Position Request Scenarios

Because wireless 9-1-1 callers are inherently mobile, the Emergency Services Position Request (ESPOSREQ) message is used to send a query from the ALI to the MPC/GMLC to retrieve geographic location data for a wireless 9-1-1 call for delivery to the PSAP. The MPC/GMLC responds to the request with an Emergency Services Position Request Response (esposreq), Emergency Services Position Request Response Reject (esposreq reject), or an Emergency Services Position Request Response Return Error (esposreq error). This section outlines the scenarios used to send an Emergency Services Position Request from SR/ALI to the MPC/GMLC.

3.3.1 Table of Variables Used in Scenarios

Table 1: Variables used in Scenarios

Variable	Valid Values	Nominal Value
E2 Response Timer	1-120 seconds	10 seconds
E ₂ Accept Timer	1-9999 seconds	15 seconds
ALI Response Confirmation Timer	1-120 seconds	5 seconds
E2 Rebid Time Threshold	1-59 seconds	15 seconds
Heartbeat Interval	1-9999 seconds	60 seconds
Missed Heartbeat Threshold	1-9999 heartbeats	5 heartbeats

3.3.2 E2 Query Triggered by Bid from PSAP

This section describes SR/ALI processing when an E2 query is triggered by a request from a PSAP and the ALI systems are directly connected to the MPC/GMLC.

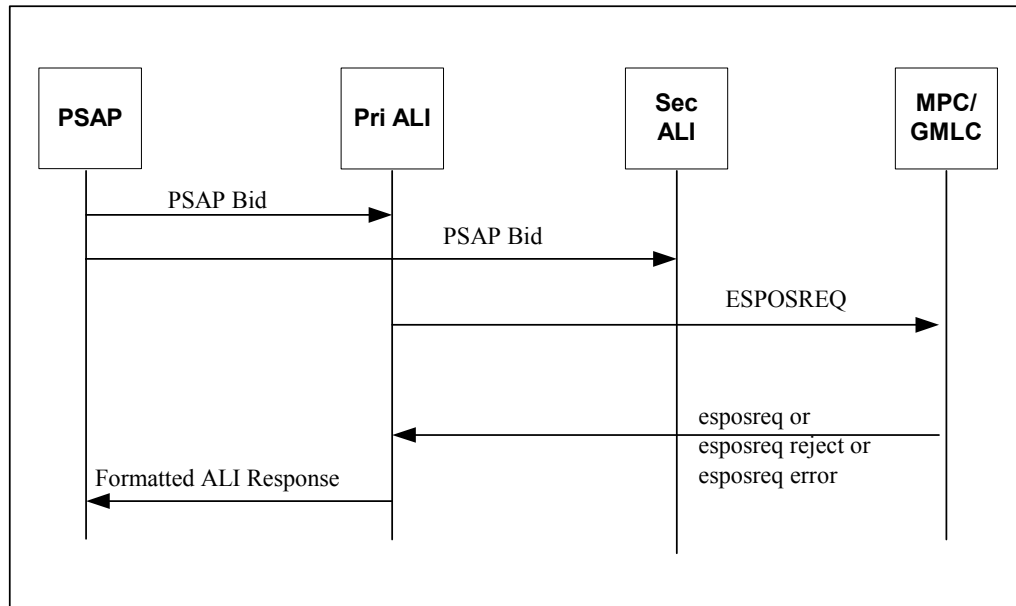


Figure 5: E2 Query Triggered by Bid from PSAP

The PSAP bids the primary and secondary ALI with an Emergency Services Routing Key (ESRK) or Call Back Number (CBN).

The primary and secondary ALIs determine which system is going to send the response to the PSAP. The nonresponding ALI puts the bid into a table, sets the ALI Response Confirmation Timer (valid values 1-120 seconds, nominal value is 5), and waits for notification from the responding ALI system that it has handled the bid.

Note: If SR/ALI is the primary and secondary ALI, under normal conditions, the primary and secondary alternate querying the MPC/GMLC and sending the response to the PSAP.

If the bid is for a Wireless Phase II call, the responding ALI checks the last update time of the ALI record. If the bid time and last update time is within the E2 Rebid Time Threshold (valid values 1-59 seconds, nominal value is 15), ALI returns the previous data retrieved for the wireless call to the PSAP. Otherwise, ALI sends the ESPOSREQ to the MPC/GMLC with the ESRK (or CBN and ESRD) and Position Request Type. If this is the first query for this wireless call to the MPC/GMLC, the Position Request Type parameter is set to “initial,” otherwise that parameter is set to “updated (2)” or “updated or last known (3)” (details on how the Position Request Type Parameter is set can be found in Section 5.3.2). The ESPOSREQ message format is defined in detail in Section 4. ALI then sets the E2 Response Timer (valid values 1-120 seconds, nominal value is 10) and E2 Accept Timer (valid values 1-9999 seconds, nominal value is 15) and waits for a response from the MPC/GMLC.

If there are no processing errors, the MPC/GMLC retrieves the updated geographic location data from the PDE/SMLC and returns the esposreq to the responding ALI with the position result set to initialPosition, updatedPosition, or lastKnownPosition; and the latitude, longitude, confidence, and uncertainty are populated in the Position Information parameter. The esposreq message format is

defined in Section 4. When the responding ALI receives the response, it cancels the E2 Response and E2 Accept Timers and uses the data in the database and the updated latitude, longitude, confidence, and uncertainty of the mobile caller to format the PSAP response and sends the response to the PSAP.

Note: The PSAP response format may or may not include the latitude, longitude, confidence, and uncertainty fields.

If there is an error in the component portion of the ESPOSREQ message, the MPC/GMLC returns an esposreq reject to the ALI. If there is an error with the data received in the ESPOSREQ message or data is not available for this request, the MPC/GMLC returns an esposreq error message to the ALI. When an error is received, ALI uses existing data in the ALI database and sends the response to the PSAP. Optionally, a parameter can be set to put “NO COOR DATA-REBID” in characters 11-26 of the customer name field. The NO COOR DATA-REBID parameter is set on a per ALI basis. Error conditions and associated messages are defined in Section 4.

Once the responding ALI has sent a response to the PSAP, it notifies the nonresponding ALI that it has responded to the bid and the nonresponding ALI cancels the ALI Response Confirmation Timer and removes the bid from its table.

3.3.3 PSAP Bid - E2 Query Timeout

This section describes SR/ALI processing when an MPC/GMLC timeout occurs on an E2 query that was triggered by a request from a PSAP.

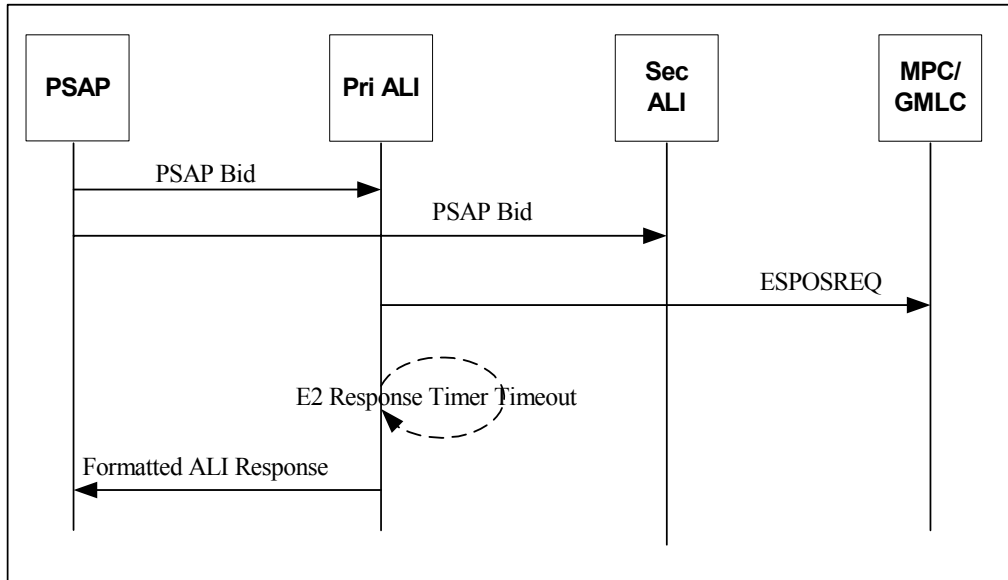


Figure 6: PSAP Bid - E2 Query Timeout

The PSAP bids the primary and secondary ALI with an Emergency Services Routing Key (ESRK) or Call Back Number (CBN).

The primary and secondary ALIs determine which system is going to send the response to the PSAP. The nonresponding ALI puts the bid into a table, sets the ALI Response Confirmation Timer (valid values 1-120 seconds, nominal value is 5) and waits for notification from the responding ALI system that it has handled the bid.

Note: If SR/ALI is the primary and secondary ALI, under normal conditions, the primary and secondary alternate querying the MPC/GMLC and sending the response to the PSAP.

If the bid is for a wireless Phase II call, the responding ALI checks the last update time of the ALI record. If the bid time and last update time is within the E2 Rebid Time Threshold (valid values 1-59 seconds, nominal value is 15), ALI returns the previous data retrieved for the wireless call to the PSAP. Otherwise, ALI sends the ESPOSREQ to the MPC/GMLC with the ESRK (or CBN and ESRD) and Position Request Type. If this is the first query for this wireless call to the MPC/GMLC, the Position Request Type parameter is set to “initial,” otherwise that parameter is set to “updated (2)” or “updated or last known (3)” (details on how the Position Request Type Parameter is set can be found in Section 5.3.2). ALI then sets the E2 Response Timer (valid values 1-120 seconds, nominal value is 10) and E2 Accept Timer (valid values 1-9999 seconds, nominal value is 15) and waits for response from the MPC/GMLC.

When the E2 Response Timer expires, the responding ALI uses the data in the database to format the PSAP response and sends the response to the PSAP. Optionally, a parameter can be set to put “NO COOR DATA-REBID” in characters 11-26 of the customer name field. The NO COOR DATA-REBID parameter is set on a per ALI basis. Error conditions and associated messages are defined in Section 4. If a response is received from the MPC/GMLC after the E2 Response Timer expires, but the E2 Accept Timer is still active, the database is updated and the data is available in

case there is a rebid from the PSAP. If a response is received from the MPC/GMLC after the E2 Accept Timer expires, the response from the MPC/GMLC is discarded.

Once the responding ALI has sent a response to the PSAP, it notifies the nonresponding ALI that it has responded to the bid and the nonresponding ALI cancels the ALI Response Confirmation Timer and removes the bid from its table.

3.3.4 PSAP Bid – Timeout on Mate ALI Waiting for a Response Confirmation

This section describes SR/ALI processing when there is a timeout by the nonresponding process waiting for the responding ALI to notify it that it has processed the PSAP bid.

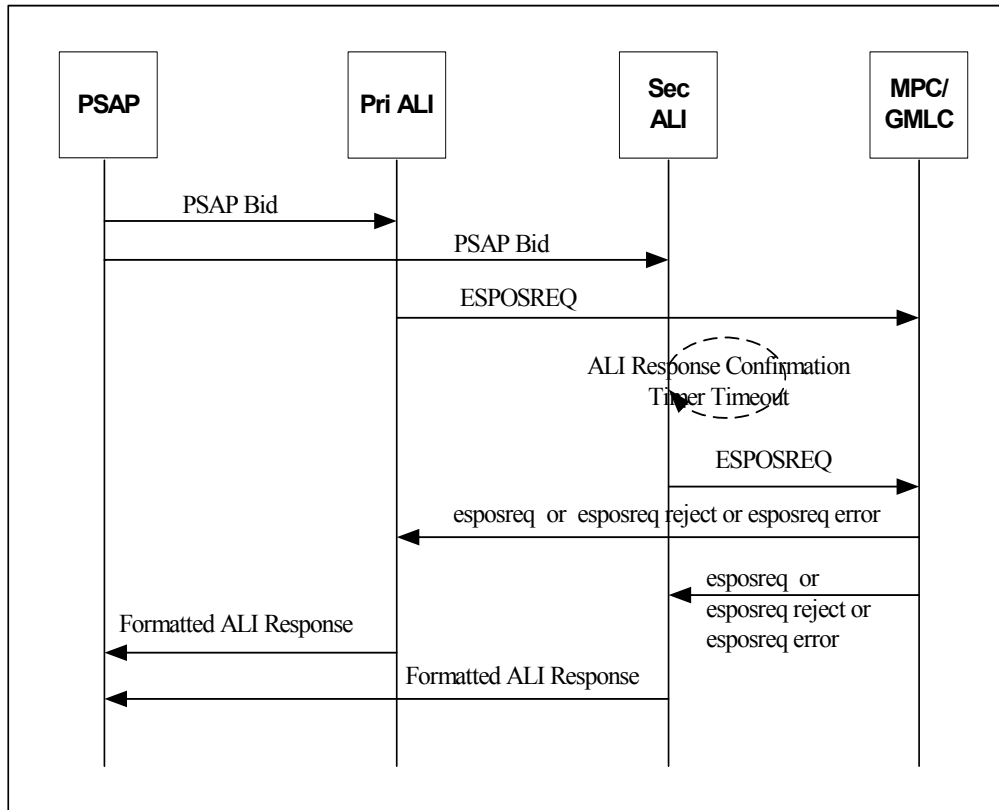


Figure 7: Timeout on Mate ALI Waiting for Response Confirmation

The PSAP bids the primary and secondary ALI with an Emergency Services Routing Key (ESRK) or Call Back Number (CBN).

The primary and secondary ALIs determine which system is going to send the response to the PSAP. The nonresponding ALI puts the bid into a table, sets the ALI Response Confirmation Timer (valid values 1-120 seconds, nominal value is 5), and waits for notification from the responding ALI system that it has handled the bid.

Note: If SR/ALI is the primary and secondary ALI, under normal conditions, the primary and secondary alternate querying the MPC/GMLC and sending the response to the PSAP.

If the bid is for a wireless Phase II call, the responding ALI checks the last update time of the ALI record. If the bid time and last update time is within the E2 Rebid Time Threshold (valid values 1-59 seconds, nominal value is 15), ALI returns the previous data retrieved for the wireless call to the PSAP. Otherwise, ALI sends the ESPOSREQ to the MPC/GMLC with the ESRK (or CBN and ESRD) and Position Request Type. If this is the first query for this wireless call to the MPC/GMLC, the Position Request Type parameter is set to “initial,” otherwise that parameter is set to “updated (2)” or “updated or last known (3)” (details on how the Position Request Type Parameter is set can be found in Section 5.3.2). ALI then sets the E2 Response Timer (valid values

1-120 seconds, nominal value is 10) and E2 Accept Timer (valid values 1-9999 seconds, nominal value is 15) and waits for response from the MPC/GMLC.

While the responding ALI is waiting for a response from the MPC/GMLC, the nonresponding ALI system has a timeout waiting for notification of a response from the responding ALI. The nonresponding ALI becomes a responding ALI and sends an ESPOSREQ, with the Position Request Type set as described above, to the MPC/GMLC, sets the E2 Response Timer (valid values 1-120 seconds, nominal value is 10) and E2 Accept Timer (valid values 1-9999 seconds, nominal value is 15) and waits for a response from the MPC/GMLC.

If there are no processing errors, the MPC/GMLC retrieves the updated geographic location data from the PDE/SMLC and returns the esposreq to each ALI with the position result set to initialPosition, updatedPosition, or lastKnownPosition; and the latitude, longitude, confidence, and uncertainty are populated in the Position Information parameter. When an ALI receives the esposreq response, it cancels the E2 Response and E2 Accept Timers and uses the data in the database and the updated latitude, longitude, confidence, and uncertainty of the mobile caller to format the PSAP response. Each ALI sends a response to the PSAP.

Note: The PSAP response format may or may not include the latitude, longitude, confidence, and uncertainty fields.

If there is an error in the component portion of the ESPOSREQ message, the MPC/GMLC returns an esposreq reject to each ALI. If there is an error with the data received in the ESPOSREQ message or data is not available for this request, the MPC/GMLC returns an esposreq error message to the ALI. When an error is received, the ALI uses existing data in the ALI database and sends the response to the PSAP. Optionally, a parameter can be set to put "NO COOR DATA-REBID" in characters 11-26 of the customer name field. The NO COOR DATA-REBID parameter is set on a per ALI basis. Error conditions and associated messages are defined in Section 4.

3.3.5 PSAP Bid - Communication Link Between Mated ALI Systems is Down

This section describes SR/ALI processing when the communication link is down between the mated ALI systems.

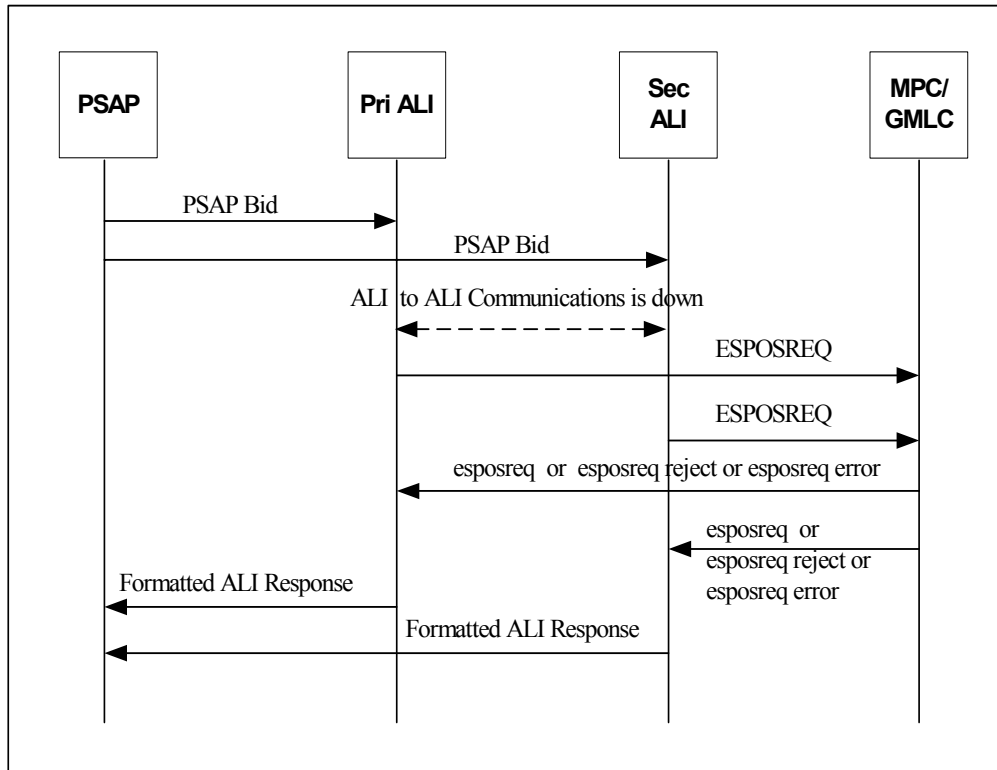


Figure 8: Communication Link Between Mated ALI Systems is Down

The PSAP bids the primary and secondary ALI with an Emergency Services Routing Key (ESRK) or Call Back Number (CBN).

The link between primary and secondary ALIs is down so both ALI systems are responding ALI systems.

If the bid is for a wireless Phase II call, each ALI checks the last update time of the ALI record. If the bid time and last update time is within the E2 Rebid Time Threshold (valid values 1-59 seconds, nominal value is 15), ALI returns the previous data retrieved for the wireless call to the PSAP. Otherwise, each ALI sends the ESPOSREQ to the MPC/GMLC with the ESRK (or CBN and ESRD) and Position Request Type. If this is the first query for this wireless call to the MPC/GMLC, the Position Request Type parameter is set to “initial,” otherwise that parameter is set to “updated (2)” or “updated or last known (3)” (details on how the Position Request Type Parameter is set can be found in Section 5.3.2). Each ALI then sets the E2 Response Timer (valid values 1-120 seconds, nominal value is 10) and E2 Accept Timer (valid values 1-9999 seconds, nominal value is 15) and waits for response from the MPC/GMLC.

If there are no processing errors, the MPC/GMLC retrieves the updated geographic location data from the PDE/SMLC and returns the esposreq to ALI with the position result set to initialPosition, updatedPosition, or lastKnownPosition; and the latitude, longitude, confidence, and uncertainty are populated in the Position Information parameter. When the ALI receives the response, it

cancels the E2 Response and E2 Accept Timers, uses the data in the database and the updated latitude, longitude, confidence, and uncertainty of the mobile caller to format the PSAP response, and each ALI sends the response to the PSAP.

Note: The PSAP response format may or may not include the latitude, longitude, confidence, and uncertainty fields.

If there is an error in the component portion of the ESPOSREQ message, the MPC/GMLC returns an esposreq reject to the ALI. If there is an error with the data received in the ESPOSREQ message or data is not available for this request, the MPC/GMLC returns an esposreq error message to the ALI. When an error is received, each ALI uses existing data in the ALI database and each ALI system sends the response to the PSAP. Optionally, a parameter can be set to put "NO COOR DATA-REBID" in characters 11-26 of the customer name field. The NO COOR DATA-REBID parameter is set on a per ALI basis. Error conditions and associated messages are defined in Section 4.

3.3.6 Primary Communication Link to MPC/GMLC is Down

This section describes SR/ALI processing when the primary communication link is down to the MPC/GMLC and how it will use the secondary connection to the MPC/GMLC.

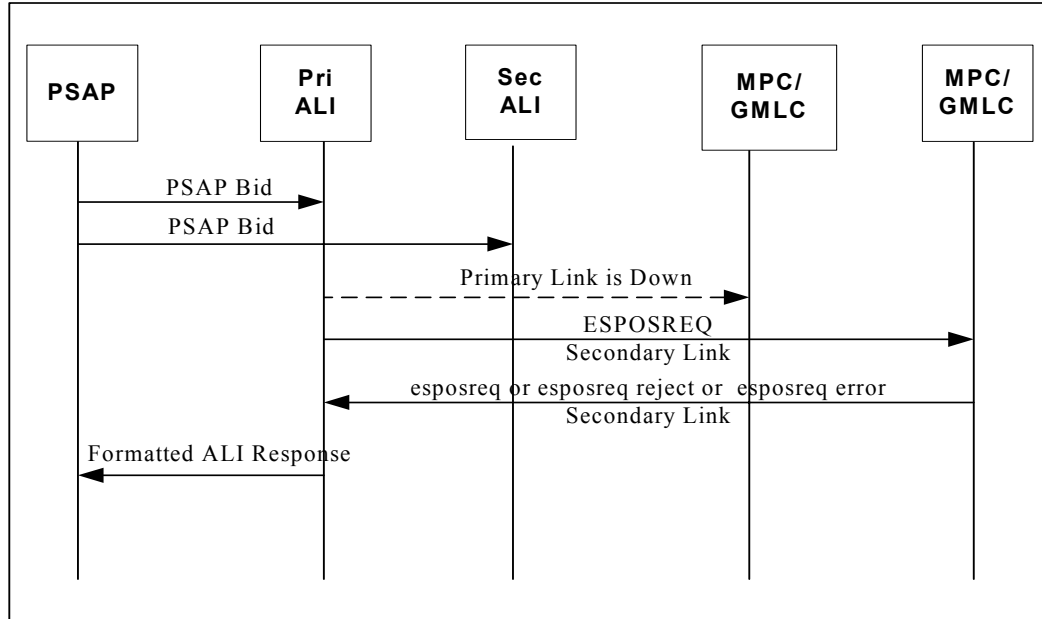


Figure 9: Primary Communication Link to MPC/GMLC is Down

Note: The Primary and Secondary Communication Links are configurable. They may go to the same or different MPC/GMLC servers or server clusters. Sending a query down either connection must be able to retrieve the data for wireless calls.

The PSAP submits bid to the primary and secondary ALI with an Emergency Services Routing Key (ESRK) or Call Back Number (CBN).

The primary and secondary ALIs determine which system is going to send the response to the PSAP. The nonresponding ALI puts the bid into a table, sets the ALI Response Confirmation Timer (valid values 1-120 seconds, nominal value is 5), and waits for notification from the responding ALI system that it has handled the bid.

Note: If SR/ALI is the primary and secondary ALI, under normal conditions, the primary and secondary alternate querying the MPC/GMLC and sending the response to the PSAP.

If the bid is for a wireless Phase II call, the responding ALI checks the last update time of the ALI record. If the bid time and last update time is within the E2 Rebid Time Threshold (valid values 1-59 seconds, nominal value is 15), ALI returns the previous data retrieved for the wireless call to the PSAP. Otherwise, ALI sends the ESPOSREQ to the MPC/GMLC over the secondary link, because the primary link is down, with the ESRK (or CBN and ESRD) and Position Request Type to the MPC/GMLC. If this is the first query for this wireless call to the MPC/GMLC, the Position Request Type parameter is set to “initial,” otherwise that parameter is set to “updated (2)” or “updated or last known (3)” (details on how the Position Request Type Parameter is set can be found in Section 5.3.2). ALI then sets the E2 Response Timer (valid values 1-120 seconds, nominal value is 10) and E2 Accept Timer (valid values 1-9999 seconds, nominal value is 15) and waits for a response from the MPC/GMLC.

If there are no processing errors, the MPC/GMLC retrieves the updated geographic location data from the PDE/SMLC and returns the esposreq, over the secondary link, to the responding ALI with the position result set to initialPosition, updatedPosition, or lastKnownPosition; and the latitude, longitude, confidence, and uncertainty are populated in the Position Information parameter. When the responding ALI gets the response, it cancels the E2 Response and E2 Accept Timers; uses the data in the database and the updated latitude, longitude, confidence, and uncertainty of the mobile caller to format the ALI response; and sends the response to the PSAP.

If there is an error in the component portion of the ESPOSREQ message, the MPC/GMLC returns an esposreq reject to the ALI over the secondary link. If there is an error with the data received in the ESPOSREQ message or data is not available for this request, the MPC/GMLC returns an esposreq error message to the ALI over the secondary link. When an error is received, ALI uses existing data in the ALI database and sends the response to the PSAP. Optionally, a parameter can be set to put "NO COOR DATA-REBID" in characters 11-26 of the customer name field. The NO COOR DATA-REBID parameter is set on a per ALI basis. Error conditions and associated messages are defined in Section 4.

Once the responding ALI has sent a response to the PSAP, it notifies the nonresponding ALI that it has responded to the bid and the nonresponding ALI cancels the ALI Response Confirmation Timer and removes the bid from its table.

3.3.7 E₂ Redundancy

This section describes SR/ALI processing when there is a network failure between the responding ALI and both of the MPC/GMLCs. SR/ALI can be configured on a per ALI system basis to send the query to the nonresponding ALI system and the nonresponding ALI system will send the E₂ query to the MPC/GMLC.

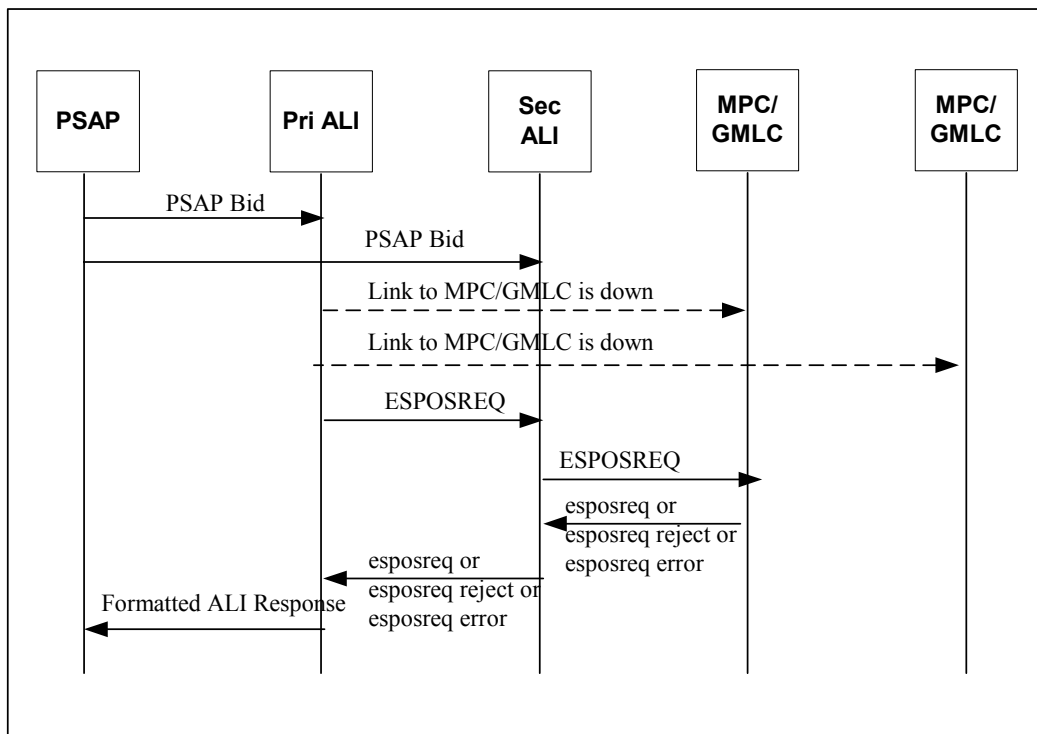


Figure 10: E₂ Redundancy

The PSAP bids the primary and secondary ALI with an Emergency Services Routing Key (ESRK) or Call Back Number (CBN).

The primary and secondary ALIs determine which system is going to send the response to the PSAP. The nonresponding ALI puts the bid into a table, sets the ALI Response Confirmation Timer (valid values 1-120 seconds, nominal value is 5), and waits for notification from the responding ALI system that it has handled the bid.

Note: If SR/ALI is the primary and secondary ALI, under normal conditions, the primary and secondary alternate querying the MPC/GMLC and sending the response to the PSAP.

If the bid is for a Wireless Phase II Call, the responding ALI checks the last update time of the ALI record. If the bid time and last update time is within the E₂ Rebid Time Threshold (valid values 1-59 seconds, nominal value is 15), ALI returns the previous data retrieved for the wireless call to the PSAP. Otherwise, ALI attempts to send the ESPOSREQ to the MPC/GMLC with the ESRK (or CBN and ESRD) and Position Request Type. If this is the first query for this wireless call to the MPC/GMLC, the Position Request Type parameter is set to “initial,” otherwise that parameter is set to “updated (2)” or “updated or last known (3).” (Details on how the Position Request Type Parameter is set can be found in Section 5.3.2.) The ESPOSREQ message format is defined in detail in Section 4. ALI then sets the E₂ Response Timer (valid values 1-120 seconds,

nominal value is 10) and E2 Accept Timer (valid values 1-9999 seconds, nominal value is 15) and waits for response from the MPC/GMLC. If connectivity is not established to the primary and secondary MPC/GMLCs, ALI can be configured to send the ESPOSREQ to the nonresponding ALI system to determine if connectivity exists to the MPC/GMLC pair on that system. If connectivity exists, then the nonresponding ALI system sends the ESPOSREQ to the MPC/GMLC. If connectivity does not exist, the nonresponding ALI system returns an error to the responding ALI and the responding ALI uses existing data in the ALI database and sends the response to the PSAP. Optionally, a parameter can be set to put "NO COOR DATA-REBID" in characters 11-26 of the customer name field. The NO COOR DATA-REBID parameter is set on a per ALI basis. Error conditions and associated messages are defined in Section 4.

If there are no processing errors, the MPC/GMLC retrieves the updated geographic location data from the PDE/SMLC and returns the esposreq to the nonresponding ALI with the position result set to initialPosition, updatedPosition, or lastKnownPosition; and the latitude, longitude, confidence, and uncertainty are populated in the Position Information parameter. The esposreq message format is defined in Section 4. The nonresponding ALI forwards the esposreq to the responding ALI. When the responding ALI receives the response, it cancels the E₂ Response and E2 Accept Timers and uses the data in the database and the updated latitude, longitude, confidence, and uncertainty of the mobile caller to format the PSAP response and sends the response to the PSAP.

Note: The PSAP response format may or may not include the latitude, longitude, confidence, and uncertainty fields.

If there is an error in the component portion of the ESPOSREQ message, the MPC/GMLC returns an esposreq reject to the nonresponding ALI. If there is an error with the data received in the ESPOSREQ message or data is not available for this request, the MPC/GMLC returns an esposreq error message to the nonresponding ALI. The nonresponding ALI forwards the esposreq reject or esposreq error message to the responding ALI. When an error response is received, the responding ALI uses existing data in the ALI database and sends the response to the PSAP. Optionally, a parameter can be set to put "NO COOR DATA-REBID" in characters 11-26 of the customer name field. The NO COOR DATA-REBID parameter is set on a per ALI basis. Error conditions and associated messages are defined in Section 4.

Once the responding ALI has sent a response to the PSAP, it notifies the nonresponding ALI that it has responded to the bid and the nonresponding ALI cancels the ALI Response Confirmation Timer and removes the bid from its table.

3.4 Test ESRK in the Emergency Services Position Request

The ability to include a test ESRK in the Emergency Services Position Request from the ALI to the MPC/GMLC would allow integration testing of the overall system with data received from the ALI and MPC/GMLC. This capability would be useful both during initial system setup as well as for end-to-end operation verification and troubleshooting. This section outlines the protocol used to send the “test” Emergency Services Position Request from the ALI to the MPC/GMLC.

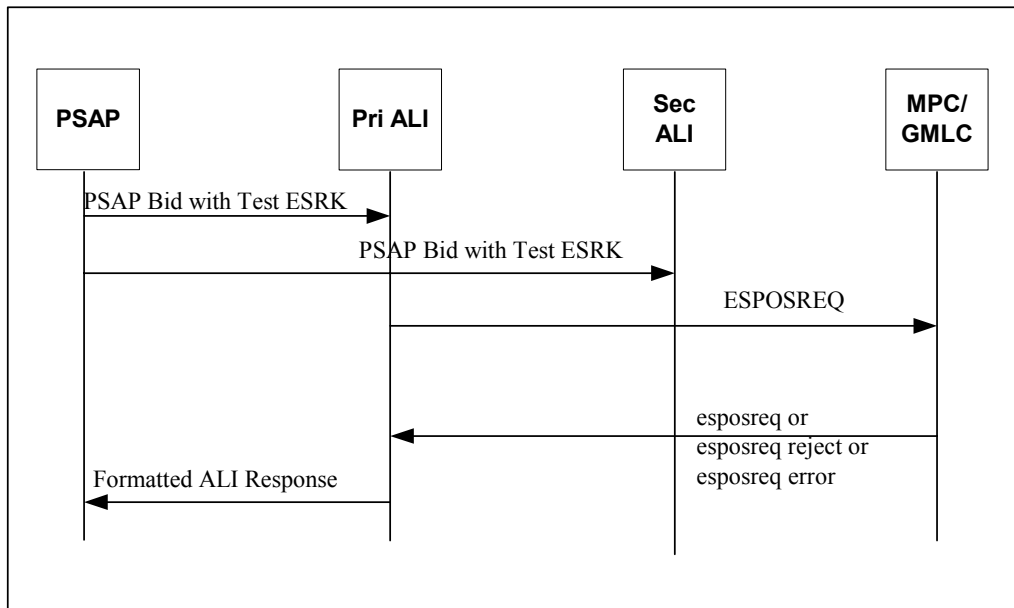


Figure 11: Test ESRK in the Emergency Services Position Request

The test ESRK is configured uniquely for each PSAP at the MPC/GMLC so that it does not query the PDE/SMLC for the latitude/longitude data and instead returns a pre-defined and coordinated default latitude/longitude that will be displayed within the boundaries of the PSAP’s jurisdiction.

The PSAP bids the primary and secondary ALI with the test ESRK. The primary and secondary ALIs determine which system is going to send the response to the PSAP. The nonresponding ALI puts the bid into a table, sets the ALI Response Confirmation Timer (valid values 1-120 seconds, nominal value is 5), and waits for notification from the responding ALI system that it has handled the bid.

Note: If SR/ALI is the primary and secondary ALI, under normal conditions, the primary and secondary ALI alternate querying the MPC/GMLC and sending the response to the PSAP.

If the bid is for a wireless Phase II call, the responding ALI checks the last update time of the ALI record. If the bid time and last update time is within the E2 Rebid Time Threshold (valid values 1-59 seconds, nominal value is 15), ALI returns the previous data retrieved for the wireless call to the PSAP. Otherwise, ALI sends the ESPOSREQ to the MPC/GMLC with the ESRK (or CBN and ESRD) and Position Request Type set to “test.” The ESPOSREQ message format is defined in detail in Section 4. ALI then sets the E2 Response Timer (valid values 1-120 seconds, nominal value is 10) and E2 Accept Timer (valid values 1-9999 seconds, nominal value is 15) and waits for a response from the MPC/GMLC.

If there are no processing errors, the MPC/GMLC detects that this is a test ESRK and returns the esposreq to the responding ALI with the position result set to initialPosition, updatedPosition, or lastKnownPosition; and the test latitude, test longitude, test confidence, and test uncertainty are populated in the Position Information parameter. The esposreq message format is defined in Section 4. When the responding ALI receives the response, it cancels the E2 Response and E2 Accept Timers; uses the data in the database and the updated latitude, longitude, confidence, and uncertainty of the mobile caller to format the PSAP response; and sends the response to the PSAP.

Note: The PSAP response format may or may not include the latitude, longitude, confidence, and uncertainty fields.

If there is an error in the component portion of the ESPOSREQ message, the MPC/GMLC returns an esposreq reject message to the ALI. If there is an error with the data received in the ESPOSREQ message or data is not available for this request, the MPC/GMLC returns an esposreq error message to the ALI. When an error is received, ALI uses existing data in the ALI database and sends the response to the PSAP. Optionally, a parameter can be set to put “NO COOR DATA-REBID” in characters 11-26 of the customer name field. The NO COOR DATA-REBID parameter is set on a per ALI basis. Error conditions and associated messages are defined in Section 4.

Once the responding ALI has sent a response to the PSAP, it notifies the nonresponding ALI that it has responded to the bid and the nonresponding ALI cancels the ALI Response Confirmation Timer and removes the bid from its table.

3.5 Application Heartbeat Protocol

During periods of inactivity, an application layer *heartbeat* is sent from the ALI to the MPC/GMLC. The absence of this periodic messaging will result in the networking hardware closing the connection. This section outlines the protocol used to send the heartbeat Emergency Services Position Request from the ALI to the MPC/GMLC.

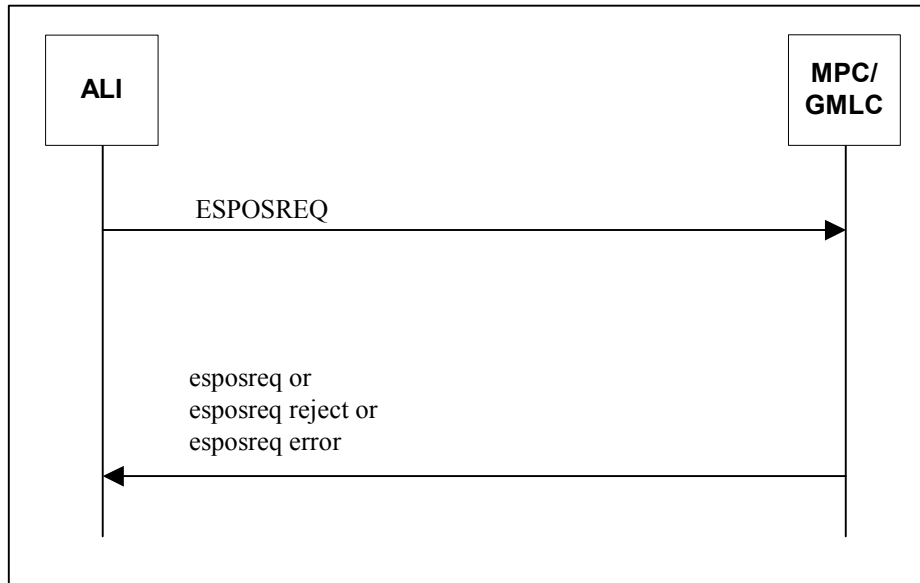


Figure 12: Application Heartbeat Protocol

The heartbeat message is the ESPOSREQ with the Position Request Type set to “test” and ESRK length set to zero. This particular set of field values indicates that this is an ALI to MPC/GMLC heartbeat message. Section 4 on page 28 contains descriptions of these fields.

If there is an error in the component portion of the ESPOSREQ message, the MPC/GMLC returns an *esposreq reject* message to the ALI. If there is an error with the data received in the ESPOSREQ message or data is not available for this request, the MPC/GMLC returns an *esposreq error* message to the ALI. Otherwise, the MPC/GMLC sends an acknowledgement of the heartbeat to the ALI using the *esposreq* with the Position Result field set to “test.” Section 4 contains descriptions of these fields.

If the MPC/GMLC does not receive the heartbeat, or the ALI does not receive the acknowledgement to the heartbeat, after a configurable number of failures (valid values 1-9999 seconds, nominal value 5), the communication path between the MPC/GMLC and ALI is torn down by closing the TCP/IP socket. The ALI will generate an alarm alerting the Intrado Public SafetyNet Operations Center of the failure. To reestablish the connectivity between the MPC/GMLC and ALI, the MPC/GMLC will follow the TCP/IP Connection Establishment Protocol described on page 10. A heartbeat failure can indicate there is a problem with the physical connectivity or it could also indicate there is a problem with the client or server applications.

The heartbeat interval is configurable and this parameter will be set on an implementation basis. ALI sends a heartbeat after every heartbeat interval expires. The valid values for the heartbeat interval are 1-9999 seconds. The nominal setting for this interval is 60 seconds.

4.0 Emergency Services Protocol (ESP) Message Formats

Each message is formatted according to the message formatting rules of TCAP (NSI T1.114). The tables below define the sequence of TCAP message elements and parameters within each message type.

Note: The parameters in the Parameter Set may occur in any order. Other element ordering is mandatory. The “Length” elements defined below only include data following the length octet, and do not include the length octet or the parameter element identifier (before the length). In some cases, the encoding of the length may occupy more than a single octet. Refer to ANSI T1.114.3 section 2.2, “Length Of Contents” for a complete reference on length encoding. To represent a length greater than 127 and less than 256, two octets would be required. The H bit with a value of 1 indicates that one or more octets follow. The remaining bits indicate the number of octets following. The octets following (usually one or two octets) would be treated as a binary number indicating the true length. If the H bit is 0, then the length is interpreted as a one-octet value. For example, a length of 150 would be encoded with two octets with hexadecimal values 0x81 0x96. A length of 300 would be encoded using three octets with hexadecimal values 0x82 0x01 0x2C.

4.1 Emergency Services Position Request

This message is sent from the ALI to MPC/GMLC to request the initial or updated Mobile Station (MS).

Element/Parameter	Reference	Type*
Package Type = Query With Permission	5.1.1	M
Transaction ID	5.1.2	M
Component Sequence	5.2.1	M
Component Type = Invoke(Last)	5.2.2	M
Component ID	5.2.3	M
Operation Code = Private TCAP	5.2.4	M
Parameter Set	0	M
ESMEIdentification	5.3.1	M
PostionRequestType	5.3.2	M
CHOICE		
{		
EmergencyServiceRoutingKey	5.3.3	M
}		
{		
CallbackNumber	5.3.4	M
EmergencyServiceRoutingDigits	5.3.6	O
}		

*M=Mandatory and O=Optional

Note: SR/ALI has a range table set up by ESRK/ESRD ranges that determine if the ESRK or CBN/ESRD query will be sent to the MPC/GMLC.

4.2 Emergency Services Position Request Response

This message is sent from the MPC/GMLC to the ALI to inform the MPC/GMLC-ALI interface of the MS.

Element/Parameter	Reference	Type*
Package Type = Response	5.1.1	M
Transaction ID	5.1.2	M
Component Sequence	5.2.1	M
Component Type = Return Result(Last)	5.2.2	M
Component ID	5.2.3	M
Parameter Set	0	M
PositionResult	5.3.8	M
PositionInformation	5.3.9	M
CallbackNumber	5.3.5	O
EmergencyServiceRoutingDigits	5.3.7	O
GeneralizedTime	5.3.10	O
MobileIdentificationNumber	5.3.11	O
InternationalMobileSubscriberIdentity	5.3.12	O
MobileCallStatus	5.3.13	O
CompanyID	5.3.14	O
LocationDescription	5.3.15	O

*M=Mandatory and O=Optional

4.3 Emergency Services Position Request Response Return Error

This message is sent from the MPC/GMLC to the ALI to inform the ALI that the requested action was not performed. The error code contains the reason for the failure.

Element/Parameter	Reference	Type*
Package Type = Response	5.1.1	M
Transaction ID	5.1.2	M
Component Sequence	5.2.1	M
Component Type = Return Error	5.2.2	M
Component ID	5.2.3	M
Error Code	5.2.5	M

Parameter Set	0	M
---------------	---	---

*M=Mandatory and O=Optional

Note: If a return error or reject response is received by SR/ALI, optionally a parameter can be set to put “NO COOR DATA-REBID” in characters 11-26 of the customer name field. The NO COOR DATA-REBID parameter is set on a per ALI basis.

4.4 Emergency Services Position Request Response Reject

This message is sent from the MPC/GMLC to the ALI to inform the ALI that the invoke message contains a Component Level error. The problem code contains the reason for the error.

Element/Parameter	Reference	Type*
Package Type = Response	5.1.1	M
Transaction ID	5.1.2	M
Component Sequence	5.2.1	M
Component Type = Reject	5.2.2	M
Component ID	5.2.3	M
Problem Code	5.2.6	M
Parameter Set	0	M

*M=Mandatory and O=Optional

5.0 Emergency Services Protocol (ESP) Message Element Definitions

5.1 Transaction Portion Information Elements

Please refer to Appendix B for details on the ILEC's ALI database and E₂ connectivity between the ALI database and MPC/GMLC. Correct operation of the E₂ interface cannot be expected unless E₂ connectivity to the ILEC's ALI database is configured as specified in Appendix B.

5.1.1 Package Type

The Package Type is used to control the state of the transaction.

Octet	H	G	F	E	D	C	B	A
1	Package Type Identifier							
2	Package Length							

The Package Type identifier is coded as defined in ANSI T1.114.3 – 1996 section 3.1. The subset of Package Types that will be supported are shown below.

H	G	F	E	D	C	B	A	Hex	Meaning
1	1	1	0	0	0	1	0	E2	Query With Permission
1	1	1	0	0	1	0	0	E4	Response

5.1.2 Transaction ID

The Transaction ID is used to identify messages that belong to the same transaction. It is unique for each transaction. The Transaction ID identifier is coded as defined in ANSI T1.114.3 – 1996 section 3.3. All TCAP messages require a Transaction ID field. The Transaction ID length is always 4 (exception- Unidirectional message) and there is only one Transaction ID, which is the Originating Transaction ID in Query with Permission packages, and the Responding Transaction ID (which reflects the Originating Transaction ID) in Response packages.

Octet	H	G	F	E	D	C	B	A
1(=C7)	1	1	0	0	0	1	1	1
2	Transaction ID Length = 4							
3	Transaction ID(most significant octet)							
4	Transaction ID(octet 2)							
5	Transaction ID(octet 3)							
6	Transaction ID(least significant octet)							

5.2 Component Portion Information Elements

5.2.1 Component Sequence

The Component Sequence indicates that a sequence of one or more components follows. The Component Sequence Identifier is coded as in ANSI T1.114.3 section 5.1. The Component Sequence length is the length of the entire component.

Octet	H	G	F	E	D	C	B	A
1(=E8)	1	1	1	0	1	0	0	0
2	Component Sequence Length							

5.2.2 Component Type

The Component Type indicates the type of component that follows.

Octet	H	G	F	E	D	C	B	A
1	Component Type Identifier							
2	Component Length							

The Component Type identifier is coded as defined in ANSI T1.114.3-1996 section 5.3. The subset of Component Types that will be supported are shown below.

H	G	F	E	D	C	B	A	Hex	Meaning
1	1	1	0	1	0	0	1	E9	Invoke(last)
1	1	1	0	1	0	1	0	EA	Return Result(last)
1	1	1	0	1	0	1	1	EB	Return Error
1	1	1	0	1	1	0	0	EC	Reject

5.2.3 Component ID

The Component ID is used to identify components within a transaction. The Component ID identifier is coded as defined in ANSI T1.114.3-1996 section 5.5. The Component ID length is always 1 and there is only one Component ID, which is the Invoke ID in Query With Permission packages, and the Correlation ID (which reflects the Invoke ID) in Response packages.

Octet	H	G	F	E	D	C	B	A
1(=CF)	1	1	0	0	1	1	1	1
2	Component ID Length = 1							
3	Component ID							

5.2.4 Operation Code

The Operation Code defines the operation to be invoked in an Invoke component. The Operation Code identifier is coded as defined in ANSI T1.114.3-1996 section 5.8, and is Private TCAP. The Operation Code consists of 2 octets: the Operational Code Family and the Operation Code Specifier.

Octet	H	G	F	E	D	C	B	A
1(=D1)	1	1	0	1	0	0	0	1
2	Operation Code Length = 2							
3	Operation Code Family(= 1 decimal)							
4	Operation Code Specifier (= 1)							

5.2.5 Error Code

The Error Code defines an Application Level error that occurred and is being returned in a Return Error component. The Error Code identifier is coded as defined in ANSI T1.114.2-1996 section 5.11, and is Private TCAP.

Octet	H	G	F	E	D	C	B	A
1(=D4)	1	1	0	1	0	1	0	0
2	Error Code Length = 1							
3	Error Code							

The following table lists the values for Error Code and their meanings.

H	G	F	E	D	C	B	A	Hex	Meaning
0	0	0	0	0	0	0	1	01	System Failure
0	0	0	0	0	0	1	0	02	Unauthorized Request
0	0	0	0	0	0	1	1	03	Unexpected Data Value
0	0	0	0	0	1	0	0	04	Unrecognized Key

5.2.6 Problem Code

The Problem Code defines a Component Level error that occurred and is in a Reject component. The Problem Code identifier is coded as defined in ANSI T1.114.3-1996 section 5.14.

Octet	H	G	F	E	D	C	B	A
1(=D5)	1	1	0	1	0	1	0	1
2	Problem Code Length = 2							
3	Problem Type							
4	Problem Specifier							

The Problem Type is coded as defined in ANSI T1.114.3-1996 section 5.16.1. The subset of Problem Types that will be supported are shown below.

H	G	F	E	D	C	B	A	Hex	Meaning
0	0	0	0	0	0	0	1	01	General
0	0	0	0	0	0	1	0	02	Invoke
0	0	0	0	0	1	0	1	05	Transaction Portion

The Problem Specifier is coded as defined in ANSI T1.114.3-1996 section 5.16.2. The subset of Problem Specifiers that will be supported are shown below. Note that each Problem Type value corresponds to a specific set of Problem Specifier values.

H	G	F	E	D	C	B	A	Hex	Meaning
0	0	0	0	0	0	0	1	01	General: Unrecognized Component Type
0	0	0	0	0	0	1	0	02	General: Incorrect Component Portion
0	0	0	0	0	0	1	1	03	General: Badly structured component portion
0	0	0	0	0	1	0	0	04	General: Incorrect component coding
0	0	0	0	0	0	0	1	01	Invoke: Duplicate Invoke Id
0	0	0	0	0	0	1	0	02	Invoke: Unrecognized Operation code
0	0	0	0	0	0	1	1	03	Invoke: Incorrect Parameter
0	0	0	0	0	0	0	1	01	Transaction Portion: Unrecognized Package Type
0	0	0	0	0	0	1	0	02	Transaction Portion: Incorrect Transaction Portion
0	0	0	0	0	0	1	1	03	Transaction Portion: Badly Structured Transaction Portion
0	0	0	0	0	1	0	0	04	Transaction Portion: Unassigned Responding Transaction ID
0	0	0	0	0	1	0	1	05	Transaction Portion: Permission to Release
0	0	0	0	0	1	1	0	06	Transaction Portion: Resource Unavailable

5.2.7 Parameter Set

The Parameter Set indicates that a set of zero or more parameters follows. The Parameter set identifier is coded as defined in ANSI T1.114.3-1996 section 5.17

Octet	H	G	F	E	D	C	B	A
1(=F2)	1	1	1	1	0	0	1	0
2	Parameter Set Length							

5.3 Emergency Services Protocol(ESP) Parameters

The order of the parameters within the Parameter Set is not significant. The Parameter identifiers are coded as defined in TIA/EIA/IS-J-STD-036-A Chapter 8.

5.3.1 ESME Identification

This parameter identifies the ALI system initiating the request (i.e., ESME).

Octet	H	G	F	E	D	C	B	A
1(=C0)	1	1	0	0	0	0	0	0
2	ESME Identification Length is variable							
3	ESME Identification String(most significant octet)							
4	ESME Identification String							
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17	ESME Identification String(least significant octet)							

Maximum 15 alpha/numeric characters that define the unique name of the ESME (ALI) that is originating the query. The agreement between TR45 and NENA is that NENA will maintain the nationwide list.

Note: SR/ALI uses “10” as its ESME ID.

5.3.2 Position Request Type

This parameter indicates the type of position requested.

Octet	H	G	F	E	D	C	B	A
1(=C1)	1	1	0	0	0	0	0	1
2	Position Request Type length=1							
3	Position Request Type							

This table identifies the legal values for Position Request Type and their meanings.

H	G	F	E	D	C	B	A	Hex	Meaning
0	0	0	0	0	0	0	1	01	Initial
0	0	0	0	0	0	1	0	02	Updated
0	0	0	0	0	0	1	1	03	Updated or Last known
0	0	0	0	0	1	0	0	04	Test

Note: Undefined values are treated as value 1(Initial).

The Position Request Type is set to Initial if this is the initial E2 request for the wireless call and a successful response has not been received to an E2 Query. If this is a Rebid for a wireless call, the request type is set to Updated (2) or Updated or Last Known (3). The rebid request type can be set at the ESRK/D range level.

5.3.3 Emergency Services Routing Key

This parameter uniquely identifies an ongoing Emergency Services Call.

Octet	H	G	F	E	D	C	B	A
1(=C2)	1	1	0	0	0	0	1	0
2	Emergency Service Routing Key Length = 9							
3	Type of Digits (Routing Number)							
4	Nature of Number (National/International, No Presentation Restrictions)							
5	Numbering Plan (Telephony Numbering)				Encoding (BCD)			
6	Number of Digits = 10							
7	Digit 2				Digit 1			
8	Digit 4				Digit 3			
9	Digit 6				Digit 5			
10	Digit 8				Digit 7			
11	Digit 10				Digit 9			

This table identifies the legal values for Type of Digits and their meanings.

H	G	F	E	D	C	B	A	Hex	Meaning
0	0	0	0	0	0	0	1	01	Called Party Number – Not Used
0	0	0	0	0	0	1	0	02	Calling Party Number
0	0	0	0	0	0	1	1	03	Caller Interaction – Not Used
0	0	0	0	0	1	0	0	04	Routing Number
0	0	0	0	0	1	0	1	05	Billing Number – Not Used
0	0	0	0	0	1	1	0	06	Destination Number – Not Used
0	0	0	0	0	1	1	1	07	LATA – Not Used
0	0	0	0	1	0	0	0	08	Carrier – Not Used
0	0	0	0	1	0	0	1	09	Last Calling Party – Not Used
0	0	0	0	1	0	1	0	0A	Last Party Called – Not Used
0	0	0	0	1	0	1	1	0B	Calling Directory Number – Not Used
0	0	0	0	1	1	0	0	0C	VMSR Identifier – Not Used
0	0	0	0	1	1	0	1	0D	Original Called Number – Not Used
0	0	0	0	1	1	1	0	0E	Redirecting Number – Not Used
0	0	0	0	1	1	1	1	0F	Connected Number – Not Used

This table identifies the legal values for Nature of Number and their meanings.

H	G	F	E	D	C	B	A	Hex	Meaning
0	0	0	0	0	0	0	0	00	National/No Presentation Restricted
0	0	0	0	0	0	0	1	01	International/No Presentation Restricted
0	0	0	0	0	0	1	0	02	National/Presentation Restricted – Not Used
0	0	0	0	0	0	1	1	03	International/Presentation Restricted – Not Used

This table identifies the legal values for Encoding Field and their meanings.

H	G	F	E	D	C	B	A	Hex	Meaning
0	0	0	0	0	0	0	1	01	BCD
0	0	0	0	0	0	1	0	02	IA5 – Not Used

This table identifies the legal values for Numbering Plan and their meanings.

H	G	F	E	D	C	B	A	Hex	Meaning
0	0	0	0	0	0	0	1	01	ISDN Numbering – Not Used
0	0	0	0	0	0	1	0	02	Telephony Numbering
0	0	0	0	0	0	1	1	03	Data Numbering – Not Used
0	0	0	0	0	1	0	0	04	Telex Numbering – Not Used
0	0	0	0	0	1	0	1	05	Maritime Mobile Numbering – Not Used
0	0	0	0	0	1	1	0	06	Land Mobile Numbering
0	0	0	0	0	1	1	1	07	Private Numbering Plan – Not Used

5.3.4 Callback Number – Request

This parameter is MDN/MSISDN, which identifies the emergency service caller.

Octet	H	G	F	E	D	C	B	A
1(=C3)	1	1	0	0	0	0	1	1
2	Callback Number Length = 9							
3	Type of Digits (Calling Party Number)							
4	Nature of Number (National/International, No Presentation Restrictions)							
5	Numbering Plan (Telephony Numbering)				Encoding (BCD)			
6	Number of Digits = 10							
7	Digit 2				Digit 1			
8	Digit 4				Digit 3			
9	Digit 6				Digit 5			
10	Digit 8				Digit 7			
11	Digit 10				Digit 9			

See Section 5.3.3 for how to encode Type of Digits, Nature of Number, Numbering Plan, and Encoding Parameters.

5.3.5 Callback Number – Request Response

This parameter is MDN/MSISDN, which identifies the emergency service caller.

Octet	H	G	F	E	D	C	B	A
1(=C2)	1	1	0	0	0	0	1	0
2	Callback Number Length = 9							
3	Type of Digits (Calling Party Number)							

4	Nature of Number (National/International, No Presentation Restrictions)	
5	Numbering Plan (Telephony Numbering)	Encoding (BCD)
6	Number of Digits = 10	
7	Digit 2	Digit 1
8	Digit 4	Digit 3
9	Digit 6	Digit 5
10	Digit 8	Digit 7
11	Digit 10	Digit 9

See Section 5.3.3 for how to encode Type of Digits, Nature of Number, Numbering Plan, and Encoding Parameters.

Note: If this parameter has a number of digits greater than 10, SR/ALI will truncate the parameter to 10 characters and drop the right most digits.

5.3.6 Emergency Services Routing Digits – Request

This parameter uniquely identifies a base station, cell site, or sector.

Octet	H	G	F	E	D	C	B	A
1(=C4)	1	1	0	0	0	1	0	0
2	Emergency Services Routing Digits Length = 9							
3	Type of Digits (Routing Number)							
4	Nature of Number (National/International, No Presentation Restrictions)							
5	Numbering Plan (Telephony Numbering)				Encoding (BCD)			
6	Number of Digits = 10							
7	Digit 2				Digit 1			
8	Digit 4				Digit 3			
9	Digit 6				Digit 5			
10	Digit 8				Digit 7			
11	Digit 10				Digit 9			

See Section 5.3.3 for how to encode Type of Digits, Nature of Number, Numbering Plan, and Encoding Parameters.

5.3.7 Emergency Services Routing Digits – Request Response

This parameter uniquely identifies a base station, cell site, or sector.

Octet	H	G	F	E	D	C	B	A
1(=C3)	1	1	0	0	0	0	1	1
2	Emergency Services Routing Digits Length = 9							
3	Type of Digits (Routing Number)							

4	Nature of Number (National/International, No Presentation Restrictions)	
5	Numbering Plan (Telephony Numbering)	Encoding (BCD)
6	Number of Digits = 10	
7	Digit 2	Digit 1
8	Digit 4	Digit 3
9	Digit 6	Digit 5
10	Digit 8	Digit 7
11	Digit 10	Digit 9

See Section 5.3.3 for how to encode Type of Digits, Nature of Number, Numbering Plan, and Encoding Parameters.

5.3.8 Position Result

This parameter indicates the type of position returned or the reason for not providing position information.

Octet	H	G	F	E	D	C	B	A
1(=C0)	1	1	0	0	0	0	0	0
2	Position Result length=1							
3	Position Result							

The table below identifies the legal values for Position Result and their meanings.

H	G	F	E	D	C	B	A	Hex	Meaning
0	0	0	0	0	0	0	1	01	Initial Position
0	0	0	0	0	0	1	0	02	Updated Position
0	0	0	0	0	0	1	1	03	Last known Position
0	0	0	0	0	1	0	0	04	Req Position Not Avail
0	0	0	0	0	1	0	1	05	Caller Disconnected
0	0	0	0	0	1	1	0	06	Caller Handed Off
0	0	0	0	0	1	1	1	07	Inactive
0	0	0	0	1	0	0	0	08	Unresponsive
0	0	0	0	1	0	0	1	09	Refused
0	0	0	0	1	0	1	0	0A	Test

Note: If undefined values are received, they are treated as if value 4 was received. If position result is not 1, 2, or 3, the data that is currently in the ALI database is sent to the PSAP.

5.3.9 Position Information

This parameter contains the geographic position estimate of the mobile caller and the time of the position determination. This parameter may also contain information regarding the method used to obtain the geographic position.

Octet	H	G	F	E	D	C	B	A
1(=E1)	1	1	1	0	0	0	0	1
2	Length of Position Information							
3	Position Information Parameters							

The following sections provide the position information parameters.

5.3.9.1 Generalized Time (Mandatory)

This parameter contains time of position determination.

Octet	H	G	F	E	D	C	B	A	
1(=C0)	1	1	0	0	0	0	0	0	
2	Length of Generalized Time = 6								
3	Year – 2000								
4	Month								
5	Day of Month								
6	MSB	Time of Day						LSB	
7									
8									

5.3.9.2 Geographic Position (Mandatory)

Latitude and longitude of the wireless caller's position are carried in this parameter. The format and coding of the elements in the shape description are described in the subclauses.

Note: For configured ESRK/D ranges, SR/ALI uses the Uncertainty to determine the Class of Service to return to the PSAP. If this parameter is greater than zero, SR/ALI returns a Wireless Phase II Service Class (H) to the PSAP. Alternatively, the software can be configured to return a Wireless Phase I Service Class (G) if the Uncertainty is equal to zero. An uncertainty value is provided in the shape type 1 (Ellipsoid point with uncertainty) and shape type 2 (Point with altitude and uncertainty) found in this section below.

Octet	H	G	F	E	D	C	B	A
1(=C1)	1	1	0	0	0	0	0	1
2	Length of Geographic Position							
3	Spare				LPRI		Screening	

4	Ext	Type of Shape
5		Shape description
6		
N		

The following codes are used in the sub fields of Geographic Position parameter:

Location Presentation Restricted Indicator (LPRI)

D	C	Hex	Meaning
0	0	00	Presentation Allowed
0	1	01	Presentation Restricted
1	0	02	Location not Available
1	1	03	Spare

Screening Indicator (Screening)

B	A	Hex	Meaning
0	0	00	User provided, not verified
0	1	01	User provided, verified and passed
1	0	02	User provided, verified and failed
1	1	03	Network provided

Extension Indicator (Ext)

H	Hex	Meaning
0	00	Info continues thru the next octet
1	01	Last octet

Type of Shape and Shape descriptions:

1. Ellipsoid Point

	H	G	F	E	D	C	B	A	
4		0	0	0	0	0	0	0	
5	Lat sign	MSB	Degrees of Latitude						LSB
6									
7									
8	MSB	Degrees of Longitude						LSB	
9									
10									

These values are further defined in ANSI T1.628-2000 as:

i) Lat Sign

- 0 North
- 1 South

ii) Degrees of latitude

The relation between the binary coded number N and the range of latitudes X ($0 \leq X < 90$), where X is in degrees but not necessarily an integral number of degrees it encodes, is described by the following equation:

$$N \leq \frac{2^{23}}{90} X < N + 1$$

except for $N=2^{23}-1$, for which the range is extended to include $N+1$

iii) Degrees of longitude

The longitude, expressed in the range (-180, +180) is coded as a number between -2^{23} and $2^{23}-1$, coded in 2's complement binary. The relation between the binary coded number N and the range of longitudes X ($-180 \leq X < 180$), where X is in degrees but not necessarily an integral number of degrees it encodes, is described by the following equation:

$$N \leq \frac{2^{24}}{360} X < N + 1$$

2. Ellipsoid point with uncertainty

	H	G	F	E	D	C	B	A
4		0	0	0	0	0	0	1
5	Lat sign	MSB						
6	Degrees of Latitude							
7	LSB							
8	MSB	Degrees of Longitude						
LSB								
11	Spare	Uncertainty code						
12	Spare	Confidence						

These values are further defined in ANSI T1.628-2000 as:

- i) Lat Sign
Same as above
- ii) Degrees of latitude
Same as above
- iii) Degrees of longitude
Same as above
- iv) Uncertainty code
The uncertainty r , expressed in meters (in the range 1m to 1800km), is mapped from the binary number K , with the following formula:

$$r = C((1+x)^K - 1)$$

with $C = 10$ and $x = 0.1$.

- v) Confidence
The confidence by which the location is known to be within the shape description, C (expressed as a percentage) is directly mapped from the binary number K , except for $K=0$ which is used to indicate 'no information,' and $100 < K \leq 127$ which are not used.

3. Point with altitude and uncertainty

	H	G	F	E	D	C	B	A	
4		0	0	0	0	0	1	0	
5	Lat sign	MSB							
6	Degrees of Latitude							LSB	
7									
8	MSB	Degrees of Longitude							LSB
11	Spare	Uncertainty code							
12	Alt sign	MSB			Altitude				LSB
13									
14	Spare	Altitude Uncertainty code							
15	Spare	Confidence							

These values are further defined in ANSI T1.628-2000 as:

- i) Lat Sign
Same as above
- ii) Degrees of latitude
Same as above
- iii) Degrees of longitude
Same as above
- iv) Uncertainty code
Same as above
- v) Confidence
Same as above
- vi) Alt Sign
0 Above the ellipsoid
1 Below the ellipsoid
- vii) Altitude
The relation between the binary coded number N and the range of altitudes *a* (in meters) it encodes is described by the following equation:

$$N \leq a < N + 1$$

except for $N=2^{15}$ for which the range is extended to include all greater values of *a*.

- viii) Altitude uncertainty code

Altitude uncertainty *h*, expressed in meters (in the range 0m to ≈1000m), is mapped from the binary number K, with the following formula:

$$h = C((1 + x)^K - 1)$$

with $C = 45$ and $x = 0.025$.

5.3.9.3 Position Source (Mandatory)

This parameter specifies how a particular position information was obtained to help assess its credibility.

Octet	H	G	F	E	D	C	B	A
1(=C2)	1	1	0	0	0	0	1	0
2	Length of Position Source=1							
3	Value of Position Source							

The table below identifies the legal values for Position Source and their meanings.

H	G	F	E	D	C	B	A	Hex	Meaning
0	0	0	0	0	0	0	0	00	Unknown
0	0	0	0	0	0	0	1	01	Network Unspecified
0	0	0	0	0	0	1	0	02	Network AOA
0	0	0	0	0	0	1	1	03	Network TOA
0	0	0	0	0	1	0	0	04	Network TDOA
0	0	0	0	0	1	0	1	05	Network RF Fingerprinting
0	0	0	0	0	1	1	0	06	Network Cell Sector
0	0	0	0	0	1	1	1	07	Network Cell Sector with Timing
0	0	0	1	0	0	0	0	10	Handset Unspecified
0	0	0	1	0	0	0	1	11	Handset GPS
0	0	0	1	0	0	1	0	12	Handset AGPS
0	0	0	1	0	0	1	1	13	Handset EOTD
0	0	0	1	0	1	0	0	14	Handset AFLT

Undefined values in the range 1-15 are treated as if value 1(Network Unspecified).

Undefined values in the range 16-31 are treated as if value 1(Handset Unspecified).

Other undefined values are treated as if value 0(Unknown).

Notes: For configured ESRK/D ranges, SR/ALI uses this parameter to determine the Class of Service to return to the PSAP. If this parameter is set to Network Cell Sector (6) or Network Cell Sector with Timing (7) the Service Class on the provisioned ESRK/ESRD record is returned to the PSAP. Alternatively, the software can be configured to return a wireless Phase I Service Class (G) if this parameter is set to Network Cell Sector (6) or Network Cell Sector with Timing (7). If this parameter is not set to Network Cell Sector or Network Cell Sector with Timing or the parameter is not received, SR/ALI returns a Wireless Phase II Service Class (H) to the PSAP. If the Uncertainty Class of Service determination method (see Section 5.3.9.2) is on for the ESRK/D range, it will take precedence over using the Position Source to determine the Class of Service.

This parameter is optional in the J-STD-036 specification, however this is a mandatory parameter in SR/ALI so the PSAP can receive an accurate Service Class from the ALI database.

5.3.10 Generalized Time

This parameter contains time of position determination.

Octet	H	G	F	E	D	C	B	A
1(=C4)	1	1	0	0	0	1	0	0
Length of Generalized Time = 6								
Year – 2000								

	Month
	Day of Month
MSB	Time of Day
	LSB

5.3.11 Mobile Identification Number

Octet	H	G	F	E	D	C	B	A
1(=C5)	1	1	0	0	0	1	0	1
2	Mobile Identification Number Length = 9							
3	Type of Digits (Not Used)							
4	Nature of Number (International, No Presentation Restrictions)							
5	Numbering Plan (Not Applicable)				Encoding (BCD)			
6	Number of Digits = 10							
7	Digit 2				Digit 1			
8	Digit 4				Digit 3			
9	Digit 6				Digit 5			
10	Digit 8				Digit 7			
11	Digit 10				Digit 9			

See Section 5.3.3 for how to encode Type of Digits, Nature of Number, Numbering Plan, and Encoding Parameters.

5.3.12 International Mobile Subscriber Identity

Octet	H	G	F	E	D	C	B	A
1(=C6)	1	1	0	0	0	1	1	0
2	IMSI Length = 12							
3	Type of Digits (Not Used)							
4	Nature of Number (International, No Presentation Restrictions)							
5	Numbering Plan (Land Mobile Numbering)				Encoding (BCD)			
6	Number of Digits							
7	Digit 2				Digit 1			
8	Digit 4				Digit 3			
9	Digit 6				Digit 5			
10	Digit 8				Digit 7			

11	Digit 10	Digit 9
12	Digit 12	Digit 11
13	Digit 14	Digit 13
14	Filler	Digit 15

See Section 5.3.3 for how to encode Type Of Digits, Nature Of Number, Numbering Plan, and Encoding Parameters.

5.3.13 Mobile Call Status

This parameter identifies the validation status of the subscription of the MS, or the access status of an MS for a particular call origination.

Octet	H	G	F	E	D	C	B	A
1(=C7)	1	1	0	0	0	1	1	1
2	Length of Mobile call status = 1							
3	←	Authorization	-	→	←	Authenti- cation	-	→

The table below identifies the legal values for Authentication and their meanings.

D	C	B	A	Hex	Meaning
0	0	0	0	00	Authentication not performed
0	0	0	1	01	Authentication successful
0	0	1	0	02	Authentication successful

The table below identifies the legal values for Authorization and their meanings.

H	G	F	E	Hex	Meaning
0	0	0	0	00	Authorization not performed
0	0	0	1	01	Authorization successful
0	0	1	0	02	Invalid Electronic Serial Number
0	0	1	1	03	Unassigned Directory Number
0	1	0	0	04	Duplicate Unit
0	1	0	1	05	Delinquent Account
0	1	1	0	06	Stolen Unit
0	1	1	1	07	Not Authorized for MSC
1	0	0	0	08	Unspecified
				09-15	Reserved. Treat the same as value 0. Authorization not performed.

5.3.14 Company ID

This parameter carries a unique identifier for the wireless service provider.

Octet	H	G	F	E	D	C	B	A
1(=C8)	1	1	0	0	1	0	0	0
2	Company ID Length is Variable (up to 15 octets)							
3	Company ID String(most significant octet)							
4								
							
n-1								
N	Company ID String(least significant octet)							

Note: The maximum number of characters for the company ID to display at the PSAP is 5. This company ID should be registered with NENA as the company ID to identify the wireless carrier.

5.3.15 Location Description

This parameter provides descriptive location information to the PSAP. This parameter will be used to provide general location information of the caller. It can also be used to deliver Phase I data if the Phase II information is not available.

Octet	H	G	F	E	D	C	B	A
1(=CE)	1	1	0	0	1	1	1	0
2	Location Description Length is Variable (up to 500 octets)							
3	Location Description (most significant octet)							
4								
							
n-1								
N	Location Description (least significant octet)							

The data in this field is tagged using the NENA version 4 data tags as defined in the NENA 02-010, Standards for Recommended Formats & Protocols For Data Exchange – Exhibit 23. All fields are optional. This field supports the tags shown in the following table (type values are: A=Alphabetic, N=Numeric, V=Variable Length).

Note: If a supported tag identified in the table is received in this field, but there are spaces in between the tags or it is an empty element (i.e.<STN></STN>), the data in the ALI database is returned to the PSAP. If a supported tag is not received, but there is existing data in the database, the data in the database is returned to the PSAP. If an unsupported tag is received, that tag is ignored.

Not all of these fields and full lengths are supported for display at each PSAP. The MPC/GMLC vendor needs to verify display capabilities for each PSAP.

If this parameter is not received, the street name field can be configured to be set to “NO LOCATION RECEIVED.”

Table 2: NENA Version 4 Data Supported Tags for Location Descriptions

Name	Tag	Max Chars	Type	Description
Cell ID ₁	<CEL></CEL>	6	ANV	Identification number indicating a geographic region of wireless coverage. When Phase II location cannot be provided, Phase I information should be reported, that is, the cell site or sector where the call is received. Valid Values: 0 – 2047.
Company ID ₁	<CPF></CPF>	5	ANV	NENA registered Company Identification code for Service Provider providing wireline or wireless service to the customer.
County ID ₁	<COI></COI>	5	ANV	County Identification Code
Customer Name	<NAM></NAM>	32	ANV	Subscriber Name
Emergency Medical Service Responder ₁	<EMS></EMS>	25	ANV	Name of Emergency Medical Service Responder associated with the ESN of the caller.
Emergency Services Number	<ESN></ESN>	5	ANV	Emergency Service Number associated with the house number and street name and community name. <i>Note: The Service Provider providing the E9-1-1 Selective Routing will assign ESNs. To display telltales at the PSAP that are configured in the ALI database, this field must be five characters in length and zero filled on the left.</i>
Fire Department Service Responder ₁	<FIR></FIR>	25	ANV	Name of Fire Department Service Responder associated with the ESN of the caller.
House Number	<HNO></HNO>	10	ANV	House Number
House Number Suffix	<HNS></HNS>	4	ANV	House Number Extension (for example, ½).
Law Enforcement Service Responder ₁	<LAW></LAW>	25	ANV	Name of Law Enforcement Service Responder associated with the ESN of the caller.
Location	<LOC></LOC>	20	ANV	Additional location information (free formatted) describing the exact location of the Calling Party Number (for example, “Apt 718” or “cell sector A”). Emergency Response Location (ERL) - A

Name	Tag	Max Chars	Type	Description
				location to which a 9-1-1 emergency response team may be dispatched. The location should be specific enough to provide a reasonable opportunity for the emergency response team to quickly locate a caller anywhere within it. <i>Note: For some PSAPs, the call back number is provided to the PSAP in the Location field. Depending upon the PSAP, providing these tags may prevent the call back number from displaying at the PSAP.</i>
MSAG Community	<MCN></MCN>	32	AV	Valid service community name as identified by the MSAG.
Post Directional ₁	<POD></POD>	2	AV	Directional Trailing street direction suffix. Valid Entries: N S E W NE NW SE SW
Prefix Directional	<PRD></PRD>	2	AV	Directional Leading street direction prefix. Valid Entries: N S E W NE NW SE SW
Sector ID ₁	<SEC></SEC>	2	AN	Sub set/section of a cell. When Phase II location cannot be provided, Phase I information, <i>i.e.</i> , the cell site or sector where the call is received, should be reported. Valid Values: 1-15
State	<STA></STA>	2	A	Alpha U.S. state or Canadian province abbreviation; for example, TX (Texas), ON (Ontario).
Street Name	<STN></STN>	48	ANV	Valid service address of the Calling Party Number.
Street Name Suffix ₁	<STS></STS>	4	AV	Valid street abbreviation, as defined by the U.S. Postal Service Publication 28 (for example, AVE).

1 – These fields will be supported in a future release.

Appendix A: Acronyms and Definitions

ALI – Automatic Location Identification. The automatic display at the PSAP of the caller’s telephone number, the address/location of the telephone, and supplementary emergency services information. In this document, the ALI is equivalent to an ESME. Intrado has two ALI products: SR/ALI and ALISA.

ALI Steering – The sharing of address and position data between different ALI providers. When the ALI provider receives a bid from a PSAP that has been configured to retrieve from an alternate ALI, the ALI provider will steer that bid to the alternate ALI to retrieve the address and position data.

ALISA – ALI with Selective Routing Addition

ANI – Automatic Number Identification. Telephone number association with the access line from which a call originates.

ATM – Asynchronous Transfer Mode. A dedicated-connection switching technology that organizes digital data into 53-units and transmits them over a physical medium using digital signal technology.

CBN – Call Back Number. An emergency services call back number.

CPE – Customer Premise Equipment. Terminal equipment at a PSAP. The CPE is used to display the 9-1-1 caller’s ANI and ALI information.

Dynamic Routing Protocol – A set of protocols used to route messages through a network when there are multiple paths available between the source and destination entities.

ESME – Emergency Services Message Entity. An entity in the emergency services network that serves as the point of interface to an MSC for common channel emergency service messaging. In this document the ESME is an ALI.

ESP – Emergency Services Protocol

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

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

Frame Relay – A telecommunication service designed for cost-efficient data transmission for intermittent traffic between local area networks (LAN) and between end-points in a wide area network (WAN). This technology puts data in a variable-size unit called a frame and leaves any necessary error correction (retransmission of data) up to the end-points—which speeds up overall data transmission.

GMLC – Gateway Mobile Location Center

HCAS – Hybrid Call Associated Signaling.

LAN – Local Area Network. A local area network (LAN) is a group of computers and associated devices that share a common communications line and typically share the resources of a single processor or server within a small geographic area (for example, within an office building).

MPC – Mobile Position Center. The MPC serves as the point of interface to the wireless network for the location network. The MPC serves as the entity that 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 (for example, require that the MS engage in emergency service calls or only release position information to authorized nodes).

MS – Mobile Station

MSC – Mobile Switching Center

NAT – Network Address Translation. The translation of an Internet Protocol address used within one network to a different IP address known within another network. One network is designated the inside network and other is the outside. Typically, a company maps its inside network addresses to one or more outside IP addresses and unmaps the outside IP addresses on incoming packets back into the inside IP addresses.

Nonresponding ALI –The ALI system that does not have responsibility for returning an ALI response to the PSAP for that call. Under normal operating conditions, the ALI systems alternate being the responding and nonresponding ALI systems. For a wireless call using the E2 interface, the non-responding ALI system puts the PSAP bid into a table and expects the responding ALI to send a response to the PSAP. With the E2 Redundancy enhancement, if the nonresponding ALI does not receive a message from the responding ALI indicating it has handled the bid within the ALI Response Confirmation Timer time limit, the nonresponding ALI system will query the MPC/GMLC and send a response to the PSAP.

PDE – Position Determining Entity. 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 service the coverage area of an MPC and multiple PDEs may serve the same coverage area of an MPC using different position determining technologies.

PSAP – Public Safety Answering Point. A facility equipped and staffed to receive 9-1-1 calls.

PSAP ALI – The ALI database that the PSAP is directly connected to.

Registered Address – A registered address is an address that is registered with Network Solutions to reserve a group of TCP/IP addresses for use by your organization. This group of TCP/IP addresses will be used for addressing entities within your organization and for communicating with entities in other organizations over public and private networks.

Responding ALI –The ALI system that has the responsibility for returning an ALI response to the PSAP. Under normal operating conditions, the ALI systems alternate being the responding and nonresponding ALI systems. For a wireless call using the E2 interface, the responding ALI will send an E2 query to the MPC/GMLC. Once it receives an E2 response from the MPC/GMLC, it formats and sends the response to the PSAP with the data included in the E2 response. Once it successfully sends the response to the PSAP, it sends a message to the nonresponding ALI indicating that it has handled the PSAP bid.

Sockets – A method for communication between two applications in a network. The socket is defined as “the endpoint in a connection.”

SMLC – Serving Mobile Location Center

S/R – Selective Router

SR/ALI – Selective Routing/ALI

SS7 – Signaling System 7

TCAP – Transaction Capabilities Application Part

TCP/IP – Transmission Control Protocol/Internet Protocol. A layered set of protocols used to connect dissimilar computers together. The TCP part of this provides the transport service required by the application layer. TCP layers in the two host computers that are sending data will communicate with each other to ensure reliable data packet transport. The IP part of this provides the service to deliver the datagram to its destination. This layer provides the routing through the network and the error messages should the datagram be undeliverable.

Unregistered TCP/IP Address – TCP/IP addresses that are not reserved with the Network Solutions governing body. Using unregistered addresses can make it difficult to have entities within two different private networks send messages to each other, because the TCP/IP addresses may be duplicated within the two private networks.

WAN – Wide Area Network. A geographically dispersed telecommunications network. A WAN covers a broader telecommunication structure than a local area network (LAN).

Wireless Company ID – A company ID in the ALI database used to determine where the ALI can query for updated position data about the wireless 9-1-1 call.

Appendix B: Qwest Enhanced 9-1-1 ALI Overview

Qwest has deployed four redundant, geographically separated, ALI hosts to support E9-1-1 ALI data delivery to PSAPs. At any given time, any two of the hosts may be supporting a specific PSAP's 9-1-1 ALI delivery. However, each MPC/GMLC for the E2 interface must connect to all four ALI hosts because any of the four ALI hosts may launch an E2 query to the MPC/GMLC. These systems are Intrado SR/ALI hosts provisioned with TCAP over TCP/IP E2 capabilities.

In support of E2 based operations, each SR/ALI host includes a database that is pre-provisioned to support routing of a PSAP location request to the proper MPC/GMLC via the E2 interface based on which Emergency Services Routing Key (ESRK) or Emergency Services Routing Digits (ESRD) are queried by the PSAP.

Typically, a PSAP queries both SR/ALI hosts supporting the PSAP simultaneously when information is required. The SR/ALI hosts communicate with each other and one of the SR/ALI hosts returns the requested information to the PSAP. The system is designed with several "fail-soft" characteristics to allow the system to continue to operate in the face of data circuit or system component failures. It should be noted that the unique quad arrangement of the ALI hosts in the Qwest region requires E2 connectivity with all four hosts to assure proper operation for any given PSAP in all on-line host configurations.

When a PSAP queries the SR/ALI host pair with query digits representing a wireless Phase 2 call, the SR/ALI hosts recognize that an E2 based location query to an MPC/GMLC is required based on the digits residing in the SR/ALI host database. In a typical situation, the SR/ALI hosts coordinate with each other and one of them launches the E2 query over its TCP/IP session associated with the appropriate MPC/GMLC. The MPC/GMLC is expected to answer the query over the same session. Because each SR/ALI is expecting to have a connection to each MPC/GMLC, each MPC/GMLC must be able to retrieve the data for a wireless call.

In some ALI system/network soft-failure scenarios where the SR/ALI hosts are unable to communicate with each other, it is possible that both SR/ALI hosts will launch an E2 based query to an MPC/GMLC for the same PSAP query at virtually the same time. It is anticipated that in this situation, the MPC/GMLC rejects the second of these queries as out of sequence, and responds to the initial query appropriately. If the second query is rejected, the current data in the database is delivered to the PSAP and may overwrite the data provided with the initial query response.

Generally the SR/ALI system rotates between two primary hosts assigned to a specific PSAP to determine which ALI host launches E2 based queries on a PSAP-by-PSAP basis.

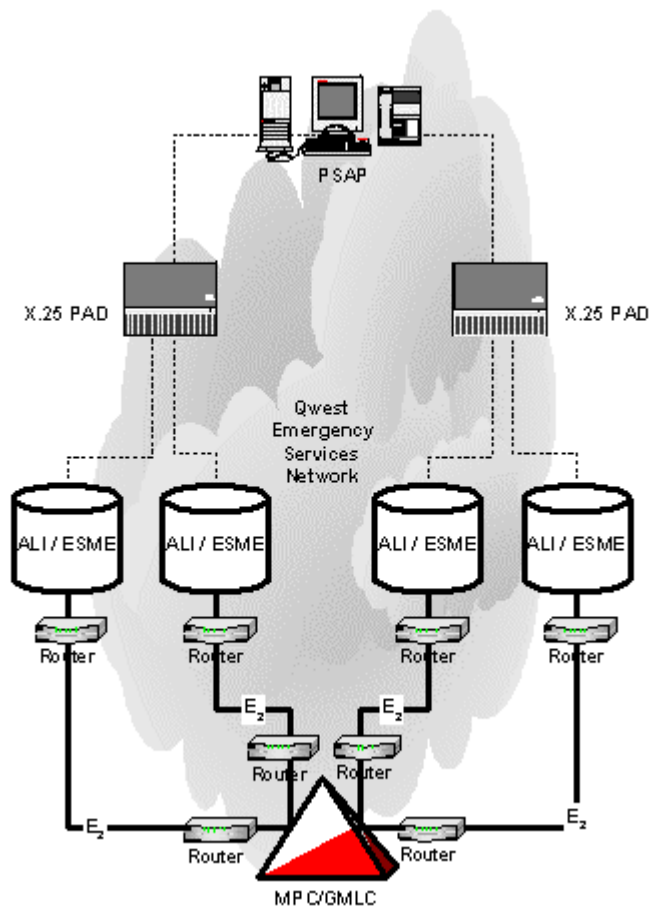


Figure 13: Qwest ALI and E₂ Network Reference Model

B.1 Interconnection Overview

Each wireless carrier (or their designated agent) must establish a method of assigning and communicating ESRK and/or ESRD information to the Qwest Enhanced 9-1-1 data provisioning system to facilitate proper E₂ system operation. Correct operation of the E₂ interface cannot be expected unless E₂ connectivity to the ILEC's ALI database is configured as specified in this appendix.

Each MPC/GMLC must establish separate, physical E₂ connectivity with each of the four ALI hosts serving a desired PSAP or PSAPs in the Qwest region. These links may be shared for all PSAPs served by the ALI host and must be sized appropriately to handle the anticipated data traffic load. It is the responsibility of the wireless carrier (or their designated agent) to determine their needs with respect to the capacity of these links.

The E₂ path between Qwest ALI hosts and a wireless carrier's (or designated agent's) MPC/GMLC is a socket based TCP/IP connection. The ALI host is configured as the TCP/IP server and the MPC/GMLC must be configured as the TCP/IP client. All IP addresses visible to the Qwest ALI environment must be registered IP addresses. Socket numbers will be coordinated on a case-by-case basis.

Implementation of an E2 interface involves the coordinated setting of several link, interface, and transaction timers. Coordination of timer settings is done on a case-by case basis. Wireless carriers (or their designated agents) are warned that timer settings, in some cases, are determined at the SR/ALI host level and the wireless carrier's (or their designated agent's) MPC/GMLC must have timer adjustment flexibility to assure the ability to implement a compatible interface.

At each ALI host, each MPC/GMLC link is connected to a separate physical TCP/IP WAN router port. The wireless carrier (or their designated agent) is responsible for providing a registered IP address for this router port. Wireless carriers (or their designated agents) must configure their systems so that only traffic destined for the ALI host is present on the link. The wireless carrier (or their designated agent) must firewall or add appropriate packet filters on the client side router as needed. Client in bound filters must allow sessions above 1024 as well as ping to the WAN interface and to the destination hosts. Client out bound filters must allow the destination IP address and port. The use of dynamic routing protocols such as OSPF or EGIRP are not supported for the WAN links supporting the E2 interface.

Wireless carrier links that exhibit behavior that places the 9-1-1 system at risk will be disconnected or deactivated until such conditions are rectified and the link is deemed appropriate for reintroduction to the 9-1-1 environment.