NENA

SS7 Guidelines for Wireline and VoIP Emergency Services Gateway Interconnection to 9-1-1 Selective Routers

Technical Information Document (TID)

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NENA SS7 Guidelines for Wireline and VoIP Emergency Services Gateway Interconnection to 9-1-1 Selective Routers

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NENA's Technical Committee has developed this document. Recommendations for change to this document may be submitted to:

National Emergency Number Association
4350 North Fairfax Drive, Suite 750
Arlington, Virginia, 22203-1695
800-332-3911

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Members:	**Company**
Roger Hixson – Technical Issues Director	NENA
Tom Breen – NTC Vice Chair	Bell South
Bob Gojanovich – NTC Chair	iXP Corp
Selena MacArthur-Work Group Co-Chair	Time Warner Cable
Dick Dickinson-Work Group Co-Chair	TCS
Russ Russell	911 SME Consulting
Guy Caron	Bell-Canada
Ken Wilson	BellSouth
Ron Whitehurst	Cbeyond Communications
Tom Browne	HBF Group
Patti McCalmont	Intrado
Doug Rollender	Lucent
Jim Formuziewich	MTS Communication
Jim Winegarden	Qwest
Berta Barbe	SBC
Paul Stoffels	SBC
Tom Hinkelman	SBC
Ric Atkins	Tarrant County 911 District
Terry Reese	Telcordia
Steve Thunstedt	Time Warner Telecom
George Bachinski	Verizon
Joseph Marino	Verizon
Gregory Cusumano	Verizon
Sam Keys	VITA

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1 Executive Overview

1.1 Purpose and Scope of Document

This document is a guide to orient the SS7 translation engineer/technician on the nature of translations required in the SS7 messaging between the E9-1-1 Selective Router and the various network elements that seek to connect to the router. These elements can include both wireline end offices and VoIP Emergency Services Gateways (ESGW) owned or operated by local exchange carriers (ILECs and CLECs), VoIP Service Providers (VSPs) and/or the E9-1-1 Service System Providers (SSPs). It is not in the scope of this document to explain exact details of any particular 9-1-1 SR, but to act as a way to understand the dynamics of these types of translations. This document is secondary to any network disclosure or other translation policy guides from any 9-1-1 Service System Provider. The reader of this document is encouraged to contact the 9-1-1 Service System Provider for any detailed questions on SS7 translations or policy details.

The purpose of this Technical Information Document (TID) is to identify and reflect current trends, not to catalog every SS7 translation requirement for every 9-1-1 Service System Provider. The SS7 Implementation Improvement Working Group seeks to give the reader the knowledge required to better understand and implement service, using supported interconnection methods that exist in the field today.

1.2 Reason to Implement

Implementation of this TID will provide a consistent set of guidelines for local exchange carriers (ILECs and CLECs),VoIP Service Providers (VSPs) and the E9-1-1 Service System Providers (SSPs) in the SS7 interconnection between an originating switch or Emergency Services Gateway (ESGW) and E9-1-1 Selective Router (SR) to support the delivery of customer-originated emergency calls

1.3 Benefits

This TID is intended, in conjunction with other NENA Standards, to support the provision of fully functional E9-1-1 service for the growing number of Voice over IP/Voice over Internet subscribers. It provides information and suggested methods to accomplish the required interconnection in a standardized and reliable manner.

1.4 Operational Impacts Summary

The purpose of this document is to facilitate the interconnection of CLEC and VoIP callers with the 9-1-1 network in a manner with which the telecommunicator should already be familiar. Some training of telecommunicators will be required; but the recommendations proposed in this document should pose no significant operational impact to the PSAP.

1.5 Document Terminology

The terminology used in this document has been aligned to designate definitions used within the American National Standard for Telecommunications technical standard T1.628 Emergency Calling Service, issued by the Alliance for Telecommunications Industry Solutions (ATIS).

1.6 Reason for Issue

This document is issued to serve as a NENA Technical Information Document to address the need for guidance on SS7 translations between a node functioning as an ESGW and the SR. This document presents a broad view of the SS7 translations that exist today, and any possible future translations. See Sections1.2 and 1.3.

1.7 Reason for Reissue

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

1.8 Date Compliance

All systems that are associated with the 9-1-1 process shall be designed and engineered to ensure that no detrimental, or other noticeable impact of any kind, will occur as a result of a date/time change up to 30 years subsequent to the manufacture of the system. This shall include embedded application, computer based or any other type application.

To ensure true compliance the manufacturer shall upon request provide verifiable test results to an industry acceptable test plan such as Telcordia GR-2945 or equivalent.

1.9 Anticipated Timeline

The services described in this document are available now for wireline central office interconnection, subject to each E911SSP's interconnection guidelines. The availability of VoIP interconnection via Emergency Services Gateways is subject to the availability of the gateway itself. All SS7 connectivity described in this document is available today.

1.10 Costs Factors

There are no PSAP CPE cost factors associated with the services described herein. The costs associated with the deployment of SS7 trunks should be no different than for any other use of SS7, although there may be different tariffs or interconnection procedures associated with the interconnection of VSP's.

1.11 Cost Recovery Considerations

Normal business practices are expected to be used in the recovery of costs. This document suggests no new or extraordinary practices.

1.12 Acronyms/Abbreviations

This is not a glossary! See NENA 01-002 - NENA Master Glossary of 9-1-1 Terminology located on the NENA web site for a complete listing of terms used in NENA documents.

The following Acronyms are used in this document:	
CHGN	Charge Number parameter
CpCAT	Calling party Category
CPE	Customer Premises Equipment
CPN	Calling Party Number parameter
E9-1-1	Enhanced 9-1-1
ESN	Emergency Service Number
ESP	Emergency Service Protocol
ESRN	Emergency Service Routing Number
ESQK	Emergency Service Query Key
ESGW	Emergency Services Gateway
FCC	Federal Communications Commission
FG-D	Feature Group D
GDP	Generic Digit Parameter
IAM	Initial Address Message
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
LEC	Local Exchange Carrier
MF	Multi-Frequency
MSC	Mobile Switching Center
MTP	Message Transfer Part
NCAS	Non-Callpath Associated Signaling
NPA	Numbering Plan Area
OLI	Originating Line Identification parameter
PAM	PSAP to ALI Message specification
PSAP	Public Safety Answering Point
PSTN	Public Switched Telephone Network
SIF	Signaling Information Field
SIO	Service Information Octet
SS7	Signaling System Number 7
TIA	Telecommunications Industry Association
TID	Technical Information Document
VSP	VoIP Service Provider
ALI	Automatic Location Identification
ANI	Automatic Number Identification
ATIS	Alliance for Telecommunications Industry Solutions

2 General Description

This NENA Technical Information Document (TID) provides a reference for wireline LECs and VoIP Service Providers (VSPs) on the basics of 9-1-1 SS7 translations to the Selective Router (SR). This document is subject to any network disclosure or configuration documents published by any company that provides interconnection to a SR. This document is intended as a reference to orient the translations resources of a VSP on the nature of 9-1-1 Signaling System Number 7 (SS7) translations.

3 VoIP E9-1-1 Solutions Defined

3.1 Deployment Phases

NENA has defined three phases of VoIP deployment for E9-1-1: i1, i2, and i3. This TID applies to the i2 solutions only.

3.1.1 Static E9-1-1 Solution

This document will specify SS7 translations for connectivity between the originating switch and the SR for static VoIP solutions that support the routing of emergency calls via a selective router or a conforming emergency services network. In static solutions, the VoIP 9-1-1 call directly emulates a traditional wireline call. For those solutions that include a SR, the Callback Number (CBN) that is associated with a Rate Center within the SR serving area [1] is transmitted from the originating switch to the E9-1-1 SR via SS7/ Integrated Services Digital Network User Part (ISUP), Centralized Automatic Message Accounting (CAMA) or Feature Group D (FG-D) trunks. The CBN is the input to the selective routing process and is transmitted to the PSAP via traditional router-to-PSAP MF signaling schemes or Integrated Services Digital Network (ISDN) trunks or other signaling arrangements. It is not the intention of this document to impact these interfaces between the SR and the PSAP. The CBN is subsequently used by the PSAP to retrieve the Automatic Location Identification (ALI) information from the ALI database. Typically, there are NPA and porting restrictions that must be taken into consideration when using a CBN as the key to the ALI data. As with wireline, the ALI database is pre-provisioned at the time of VoIP service establishment with the subscriber's address. In static solutions, the CBN travels from the originating switch to the PSAP. All of the ALI data is retrieved directly from the ALI database using the CBN as the query key. There is no ALI steering.

A description of a static solution that includes an SR has been included here for completeness. At this time, this solution is already supported by a number of E9-1-1 service providers using existing landline trunk specifications. This TID will document traditional circuit switched SS7 specifications, and will specify SS7 specifications for static VoIP solutions using the traditional wireline model in which selective routing is supported and ALI steering does not occur.

[1]Rate Center refers to a CBN that has an appropriate NPA-NXX served by the SR, e.g., a 303 NPA in Chicago is not within the Rate Center guidelines so this solution is not applicable to those type of VoIP Subscribers

3.1.2 Migratory Solution

The NENA i2 Migratory Solution has been designed to accommodate emergency calls originated by static and nomadic VoIP customers, with very few if any modifications to the existing E9-1-1 infrastructure. In addition, there may be non-standard solutions that can accomplish this goal. This document will specify SS7 message content for connectivity between the originating network and the SR for the following variations:

- Delivery of a single 10-digit number (i.e., the Emergency Services Query Key [ESQK]) between the ESGW and the Selective Router. (The equivalent of an interface arrangement defined as "Wireline Compatibility Mode" in J-STD-036.)
- Delivery of two 10-digit numbers (i.e., the ESQK and the CBN) between the ESGW and the Selective Router. (The equivalent to an interface arrangement defined as "NCAS" mode in J-STD-036.)
- Delivery of the emergency call to the SR via the PSTN.
- Delivery of geo location information (i.e., latitude and longitude coordinates), along with the ESQK and/or the CBN between the ESGW and the SR.

Note: This document may define or imply delivery of one or more telephone numbers to the PSAP and how they should be used to acquire ALI, but this document does not specify the method by which these numbers are delivered. For example, the use of Enhanced MF, ISDN or VoIP to the PSAP is outside the scope of this document.

3.1.2.1 Delivery of a single 10-digit number

In the initial NENA VoIP i2 Migratory Solution, only the ESQK is sent to the SR. The other ALI data is delivered via a separate data link to the ALI database. The SR then accepts the call as it would any E9-1-1 call and uses the ESQK to query the SRDB (which may be an ALI-SRDB) for PSAP routing information then sends the ESQK on to the PSAP with the call. The PSAP uses the ESQK to query the ALI database for the ALI data. The ALI database will obtain the location information from the VoIP Positioning Center (VPC) and will transmit it back to the PSAP. The i2 NENA Standard is predicated upon existing wireless "Wireline Compatibility Mode" concepts described in J-STD-036. In order to provide some or all of the service options described in this document, some components of the E9-1-1 infrastructure (selective routers and/or ALI database) may need to be equipped with Wireless E9-1-1 features.

3.1.2.2 Delivery of two 10-digit numbers

Many E9-1-1 Service Providers have upgraded the Selective Routers to allow for the delivery of two 10-digit numbers to the Selective Router, thus allowing the CBN to be delivered with the call and passed onto the PSAP. The existing NENA Migratory i2 Standard does not include provisions for the delivery of the CBN to the SR. Nevertheless, this TID includes recommended provisioning parameters in the event that E9-1-1 providers choose to support options that allow for the delivery of two 10-digit numbers to the Selective Router. This will require that the ESGW support the delivery of two 10-digit numbers (i.e., the CBN plus the ESQK) to the SR, based on the outgoing trunk group.

When the Selective Router has the Wireless features enabled that allow for the delivery of two 10-digit numbers, the Selective Router will use the ESQK to determine routing. The SR can typically be configured to forward the ESQK only, the CBN only, or the CBN and ESQK to the PSAP, based on local implementations. Therefore the following variations exist on how the PSAP may query the ALI for a VoIP location record.

- If the PSAP receives only the ESQK from the Selective Router during call setup, the PSAP will query the ALI with the ESQK. The ALI will identify the VPC associated with the ESQK and forward a request to the VPC using the ESQK. The ESQK shall be placed into the ESRK field of the V-E2 request.

- If the PSAP receives CBN and ESQK from the Selective Router during call setup the PSAP may query the ALI with the ESQK only. The ALI will identify the VPC associated with the ESQK and forward a request to the VPC using the ESQK only. The ESQK shall be placed into the ESRK field of the V-E2 request.

- If the PSAP receives CBN and ESQK from the Selective Router during call setup, the PSAP may query the ALI with the CBN only. Alternatively the PSAP may receive just the CBN from the Selective Router and query the ALI with the CBN only. When this occurs it is necessary for the ALI to associate the CBN with the ESQK. The ALI must have the association of the CBN and ESQK stored internally from a previous interaction with the Selective Router. For instance the Selective Router may have sent the CBN and ESQK to the ALI prior to routing the call to the PSAP. Once the ALI identifies the ESQK related to the CBN it will identify the VPC associated with the ESQK and forward a request to the VPC using the CBN and ESQK. The CBN shall be placed into the CBN field and ESQK shall be placed into the pANI (equivalent of wireless ESRD/ESRK) field of the V-E2 request.[2]

3.1.2.3 Delivery of the Emergency call from the ESGW to the SR via the PSTN.

Trials have validated the technical capability of routing calls from the ESGW to the SR over shared PSTN trunk groups without dedicated circuits, but much debate exists regarding the advisability of accessing the SR in this manner.

The following potential scenarios exist when using the PSTN for access to the Selective Router. They include:

- Sending an ESQK to the SR and use of ALI steering to query the VPC for location data

In the case of ESQK, the ESGW will use a designated 10-digit ESRN to get through the PSTN to the desired SR. The ESRN resides in the Called Party Number field of the SS7 IAM. The SR will either invoke a Virtual or Simulated Facility Group (a software version of an old fashioned loop-around trunk group) to redirect the inbound call to make it simulate an inbound dedicated E9-1-1 trunk from the central office, or translate the ESRN into an emergency call type. The SR then accepts the call as

[2] Note that the selective router must be capable of accepting and forwarding 20 digits, and the PSAP must be capable of accepting 10 or 20 digits.

it would any E9-1-1 call and uses the ESQK to query the SRDB (which may be an ALI-SRDB) for PSAP routing information then sends the ESQK on to the PSAP with the call. The PSAP uses the ESQK to query the ALI database for the ALI data.

- Sending the CBN to the SR **and use of the static ALI record** to return location data

In the case of CBN, the ESGW will use a designated 10-digit ESRN to get through the PSTN to the desired SR. The SR will invoke loop-around trunks to redirect the inbound call to an inbound dedicated E9-1-1 trunk from the central office. The SR then accepts the call as it would any E9-1-1 call routed through the CO and routes the call to the appropriate PSAP based upon translations tables in the SR. The SR sends the CBN to the PSAP. This scenario does not require the use of an ESQK because of the existence of a static ALI record for the CBN.

Another scenario that has not been trialed would involve sending an ESRN, CBN and ESQK from the ESGW to the SR via the PSTN. The SR would send the ESQK and/or the CBN to the PSAP per agreements between the PSAP and the E9-1-1 Service Provider. This option is also dependent on support of 20-digit delivery to the SR (refer to Section 3.1.2.2.)

Concerns over the implementation of any PSTN–based access to the SR focus on the following issues:

- Misdialed numbers can be routed to the PSAP, which may result in undesirable effects on public safety; e.g. non-911 calls may appear as emergency calls to the dispatcher.
- The PSAP could be vulnerable to issues related to congestion control, lack of prioritization, and/or intentional misuse of the 911 network
- Lack of dedicated circuits makes tracing calls to an ESGW provider more difficult.
- Granularity of default routing is compromised.
- Emergency calls could be delivered to a PSAP from a non-sanctioned entity or without authorization from Public Safety.
- Reduced ability to quickly coordinate network changes with authorized users and complete inability to notify unauthorized users of the change.
- Call volumes generated by mass alerting systems, disasters, ticket sales, or notification blasts of any type may invoke network congestions controls by a PSTN network provider to restrict calling traffic on the PTSN, which would inherently include restricting this type of E9-1-1 traffic.

This TID makes no recommendation regarding whether or not E9-1-1 service providers should or should not implement options to allow access to the SR via the PSTN. E9-1-1 service providers are discouraged from implementing this option without approval from the affected PSAPs. If the E9-1-1 service provider elects to support this option, VSPs should contact their local service provider for details.

4 Interconnection Matrix

The interconnection matrix is a standard mechanism for circuit switched carriers, VSPs and E9-1-1 service providers to communicate the technical attributes of their E9-1-1 solutions. The matrix consists of the call signaling scenarios and database steering options used to support E9-1-1 calls. E9-1-1 service providers can use the matrix to identify the call signaling scenarios and database steering options supported in their service areas. Carriers can then use that information to order suitable capabilities from the E9-1-1 service provider.

This TID shall specify the SS7 signaling for the following call scenarios (CS):

CS1. Traditional circuit switched

CS2. VoIP i1 Static using traditional circuit switched signaling

CS3. VoIP i2 with delivery of ESQK only

CS4. VoIP i2 with delivery of ESQK and CBN

CS5. VoIP i2 with SR access via PSTN

CS6. VoIP i2 with delivery of CGL, CBN, ESQK

The call signaling scenarios identified above are used to describe various alternatives for the information sent by an originating network to an E9-1-1 SR along with the Emergency Call.

The database steering options define the interfaces that can be used by VSPs or their agents to convey information to the ALI database serving the PSAP. There are three steering options identified in this TID; (1) the V-E2 interface (per the NENA standards for VoIP/Packet Migration i2 Solutions), (2) the PSAP to ALI Message (PAM) protocol and (3) the interface to support stand-alone ALI databases (per NENA 02-010). Although not directly associated with the interconnection of the originating network to the E9-1-1 SR, these steering options may impact which interconnection scenarios can be supported in any given situation

4.1 Call Signaling Scenarios

The call signaling scenarios for successful traditional circuit switched and VoIP E9-1-1 calls are listed below:

4.1.1 Call Scenario 1 (Traditional Circuit Switched)

Table 4.1.1 (CBN Delivery) ISUP Parameter Option	OLI Wireless	CpCAT Emergency	CdPN	CPN	CHGN	GDP	Note(s)
A1	No	Yes	911	CBN	CBN	Blank	1, 2, 3
A2	No	Yes	911	CBN	Blank	Blank	1, 2, 3
A3	No	Yes	911	Blank -	CBN	Blank	1, 2, 3
B1	No	No	911	CBN	CBN	Blank	1, 2,3
B2	No	No	911	CBN	Blank	Blank	1, 2, 3
B3	No	No	911	Blank	CBN	Blank	1, 2, 3

Notes:

1. This ISUP parameter option is widely supported in the U.S. It is estimated that 95% of the E9-1-1 selective routers deployed in the U.S. support this option when the selective router has been equipped with E9-1-1 features.
2. “Blank”-- this parameter MUST NOT be populated.
3. OLI can be omitted or 00, but it cannot be a wireless value on some SRs.

4.1.2 Call Scenario 2 (VoIP i1 Static)

Table 4.1.2 (CBN Delivery) ISUP Parameter Option	OLI Wireless	CpCAT Emergency	CdPN	CPN	CHGN	GDP	Note(s)
A1	No	Yes	911	CBN	CBN	Blank	1, 2, 3
A2	No	Yes	911	CBN	Blank	Blank	1, 2, 3
A3	No	Yes	911	Blank -	CBN	Blank	1, 2, 3
B1	No	No	911	CBN	CBN	Blank	1, 2,3
B2	No	No	911	CBN	Blank	Blank	1, 2, 3
B3	No	No	911	Blank	CBN	Blank	1, 2, 3

Notes:

1. This ISUP parameter option is widely supported in the U.S It is estimated that 95% of the E9-1-1 selective routers deployed in the U.S. support this option when the selective router has been equipped with E9-1-1 features.
2. "Blank"-- this parameter MUST NOT be populated.
3. OLI can be omitted or 00, but it cannot be a wireless value on some SRs.

4.1.3 Call Scenario 3 (i2 Migratory using ESQK only)

Call Scenario 3 describes the mode where an ESGW uses ISDN User Part (ISUP) protocol to send an ESQK to an E9-1-1 selective router. This Call Scenario is consistent with the Wireline Compatibility Mode described in J-STD-036, Section D.1.1. J-STD-036 uses the term "Wireline Compatibility Mode" to describe scenarios where MSCs use the ISUP parameter mappings normally used by landline switches to signal E9-1-1 calls to E9-1-1 selective routers. This scenario meets the NENA i2 Migratory E9-1-1 Standard. Table 4.1.3 shows the possible alternatives for populating the parameters in the Initial Address Message (IAM).

Table 4.1.3 (ESQK Delivery) ISUP Parameter Option	OLI Wireless	CpCAT Emergency	CdPN	CPN	CHGN	GDP	Note(s)
A1	No	Yes	911	ESQK	ESQK	Blank	1, 2, 3
A2	No	Yes	911	ESQK	-	Blank	1, 2, 3
A3	No	Yes	911	-	ESQK	Blank	1, 2, 3
B1	No	No	911	ESQK	ESQK	Blank	1, 2, 3
B2	No	No	911	ESQK	-	Blank	1, 2, 3
B3	No	No	911	-	ESQK	Blank	1, 2, 3

Notes:

1. This ISUP parameter option is widely supported in the U.S. It is estimated that 95% of the E9-1-1 selective routers deployed in the U.S. support this option when the selective router has been equipped with E9-1-1 features.
2. "Blank"-- this parameter MUST NOT be populated.
3. OLI can be omitted or 00.

4.1.4 Call Scenario 4 (i2 Migratory using CBN and ESQK)

Call Scenario 4 describes the mode where an ESGW uses ISUP protocol to send the caller's CBN and ESQK to an E9-1-1 selective router.

Table 4.1.4 (CBN + ESQK Delivery) ISUP Parameter Option	OLI Wireless	CpCAT Emergency	CdPN	CPN	CHGN	GDP (see note 4)	Note(s)
A1	Yes	Yes	911	CBN	CBN	ESQK	1
A2	Yes	Yes	911	CBN	-	ESQK	1
A3	Yes	Yes	911	-	CBN	ESQK	1
B1	Yes	No	911	CBN	CBN	ESQK	3
B2	Yes	No	911	CBN	-	ESQK	3
B3	Yes	No	911	-	CBN	ESQK	3
C1	No	Yes	911	CBN	CBN	ESQK	3
C2	No	Yes	911	CBN	-	ESQK	3
C3	No	Yes	911	-	CBN	ESQK	3
D1	No	No	911	CBN	CBN	ESQK	3
D2	No	No	911	CBN	-	ESQK	3
D3	No	No	911	-	CBN	ESQK	3
E1	Yes	Yes	ESQK	CBN	CBN	Blank	1, 2
E2	Yes	Yes	ESQK	CBN	-	Blank	1, 2
F1	Yes	No	ESQK	CBN	CBN	Blank	2, 3
F2	Yes	No	ESQK	CBN	-	Blank	2, 3
G1	No	Yes	ESQK	CBN	CBN	Blank	2, 3
G2	No	Yes	ESQK	CBN	-	Blank	2, 3
H1	No	No	ESQK	CBN	CBN	Blank	2, 3
H2	No	No	ESQK	CBN	-	Blank	2, 3
I1	Yes	Yes	ESQK	CBN	CBN	ESQK	1
i2	Yes	Yes	ESQK	CBN	-	ESQK	1
I3	Yes	Yes	ESQK	-	CBN	ESQK	3
J1	Yes	No	ESQK	CBN	CBN	ESQK	3
J2	Yes	No	ESQK	CBN	-	ESQK	3
K1	No	Yes	ESQK	CBN	CBN	ESQK	3
K2	No	Yes	ESQK	CBN	-	ESQK	3
L1	No	No	ESQK	CBN	CBN	ESQK	3
L2	No	No	ESQK	CBN	-	ESQK	3

Notes:

1. This ISUP parameter option is widely supported in the U.S. It is estimated that 95% of the E9-1-1 selective routers deployed in the U.S. support this option when the selective router has been equipped with Wireless E9-1-1 features.
2. "Blank"-- this parameter MUST NOT be populated.
3. This ISUP parameter option is available in some areas. It is estimated that 50% of the E9-1-1 selective routers deployed in the U.S. support this option when the selective router has been equipped with Wireless E9-1-1 features.
4. GDP must be set to type 13

4.1.5 Call Scenario 5 (i2 Migratory PSTN access)

Per section 3.1.2.4, VSPs are urged to contact their local E9-1-1 Service Providers regarding the required protocols for access to the SR via the PSTN**.**

4.1.6 Call Scenario 6 (i2 Migratory using CGL Parameter)

No separate table is required to illustrate CGL options. Inclusion of geodetic location information is an enhancement to all above options. In any of the above options, if the SR is able to accept and utilize the CGL parameter, it may be included in the call setup along with the ESQK or ESQK/CBN. If the originating network can populate the CGL parameter, it may choose to do so. If the SR is not able to accept and utilize the information in the CGL parameter, the SR shall ignore the CGL parameter and no harm is done by sending it.

Although this may be an option in future deployments, SRs today typically do not have the capability to accept and utilize the CGL parameter for selective routing**.**

4.2 GDP Type

In all cases where a pANI is delivered in the GDP, the value of the "type of digits field" must equal "01101" (decimal value 13).

4.3 Using the Interconnection Matrix

The interconnection matrices provide a standard mechanism for Local Exchange carriers, VoIP service providers, and E9-1-1 service providers to communicate the technical attributes of their E9-1-1 solutions. The following example illustrates how carriers can use the interconnection matrices to communicate. Consider a hypothetical E9-1-1 service provider called LEC Telco Company. LEC Telco Company is an E9-1-1 Service Provider that offers VoIP service providers several capabilities to support VoIP E9-1-1. The capabilities supported by LEC Telco Company are identified in Tables 4-3. **NOTE: Individual companies may have region or city specific translation requirements.**

Table 4-3 Example of LEC Telco Company VoIP Call	**ISUP Parameter Options**	**Database Steering Options**

Scenarios		
CS1 (Circuit switched CBN Delivery only)Table 4.1.1	A1, A2, A3, B1, B2, B3	N/A
CS2 (Static i1 CBN Delivery only)Table 4.1.2	A1, A2, A3, B1, B2, B3	N/A
CS3 (i2 ESQK Delivery only) Table 4.1.3	A1, A2, A3, B1, B2, B3	V-E2
CS4 (i2 ESQK+CBN Delivery) Table 4.1.4	A1, A2,	V-E2
CS5 (SR access via PSTN)	Not supported	N/A
CS6 i2 CGL Delivery)	Not supported	N/A

5 Database Steering Options

5.1 Database Steering Option 1: V-E2 Interface)

In the i2 migratory Call Scenarios described in this document, the ALI DB will need to steer ESQK queries to the VoIP Provisioning Center (VPC) via the V-E2 interface. The V-E2 interface uses the E2+ protocol as defined in NENA Standards 05-001, with modifications required for support of i2. The ESQK is sent over the V-E2 interface, and the VPC in the i2 Solution architecture, responds with the emergency caller's location, callback number and VoIP Provider identifier/information.

There are four Request/Response messages defined in NENA 05-001 that are used by the V-E2 interface for requesting and responding to requests for emergency call information from the VPC in the context of the current i2 Solution. The VPC and the ALI DB must be able to support the messages and parameters defined in NENA 05-001, as modified in Section 5.8.2 of the NENA E9-1-1 i2 Solution Standards Document for use across the V-E2 interface.

It should be noted that inclusion of the callback number in the ESPOSREQ message of the V-E2 interface is not supported in the current version of the i2 Solution Standard. Callback Number is viewed as an optional parameter in NENA 05-001 for wireless call information provided to the ESME from the MPC. Enhancements to the V-E2 interface definition currently described in the NENA E9-1-1 i2 Solution Standards document will be required to support delivery of a Callback Number and ESQK to the VPC over the V-E2 interface, as described in Section 3.1.2.2 of this document.

In a pre-i2 environment or until appropriate ALI software modifications are completed to create a "VoIP" class of service, most ALI databases will display a wireless class of service to the PSAP. The E9-1-1 service provider and the PSAP and the VSP should coordinate the value of the POSSOURCE for VoIP and the corresponding wireless class of service to be displayed at the PSAP.

This document addresses issues related solely to the steering of ALI queries and does not address other variables related to the ALI display.

5.2 Database Steering Option 2: PAM Protocol

PAM Protocol is an existing interface method. This document addresses issues related solely to the steering of ALI queries and does not address other variables related to the ALI display. Contact the 9-1-1 Service System Provider for any detailed questions.

5.3 Database Steering Option 3: NENA Protocol

Some PSAPs employ stand-alone ALI (SALI) databases that connect directly to the VPC. Typically, SALI databases employ a NENA standard format defined in NENA 02-010 Similar to PAM, the VoIP Class of Service can be sent directly by the VPC to the ALI to be relayed to the PSAP. This document addresses issues related solely to the steering of ALI queries and does not address other variables related to the ALI display. Contact the 9-1-1 Service System Provider for any detailed questions.

6 MTP in Support of E9-1-1 Call Setup

When a switch generates an IAM associated with a 9-1-1 call, it is also expected to populate certain Message Transfer Part (MTP) parameters. (See ANSI T1.111.4 for details related to the encoding of MTP parameters.) Specifically, the switch will be responsible for generating information that will be populated in the Signaling Information Field (SIF) and the Service Information Octet (SIO).

The SIO contains a service indicator that identifies the MTP-user part involved in the message. In the case of an IAM, the service indicator will identify the ISDN User Part as the MTP-user. The sub-service field will indicate that the message is a national network message and will identify the MTP message priority. In the case of IAMs related to 9-1-1 calls, the message priority will be higher than for “normal” calls (i.e., message priority value of “1”, where normal calls have a message priority of “0”). Note that message priority does not determine which messages are processed first when received at a node, but is used instead to determine which messages should be discarded if a SS7 network experiences congestion.

The switch is expected to populate the SIF with the Originating and Destination Point Codes, the Signaling Link Selection value for the message, a Circuit Identification Code associated with the outgoing trunk selected for the call, a Message Type Code identifying the message as an IAM, and the content of the IAM itself.

In addition to the SIO and SIF, a switch generating an IAM related to an Emergency Call is expected to populate the following information in the MTP portion of the message: the Flag, Forward and Backward Sequence Numbers and Indicator Bits, Length Indicator, and Check Bits.

A switch that is responsible for generating an IAM related to an Emergency Call is expected to provide the MTP information described above, along with the ISUP information described in Section 3, to an E9-1-1 tandem in an SS7-based Emergency Services Network.

In the future, SS7-based Emergency Services Networks may interconnect with networks that utilize other signaling arrangements to transport call control information over different bearer technologies (e.g., Asynchronous Transfer Mode (ATM), IP). In fact, at some future time, such signaling schemes may be incorporated into Emergency Service Networks themselves. Regardless of the technology used, a network that is interconnecting with an Emergency Services Network must, at a minimum, support the transport of critical call setup information in a format that is expected by the receiving E9-1-1 tandem/Selective Router node. It is also important that call setup signaling related to Emergency Calls continue to be given higher priority than that related to normal calls, to give Emergency Calls a better chance of completing in cases of network congestion. While some of the protocol stacks being investigated to support call setup and narrow band services over different bearers already support these capabilities, it is critical that any network interconnecting with an SS7-based Emergency Services Network be able to generate an IAM that contains the expected ISUP and MTP information.

7 References

NENA 08-001 (DRAFT)	Interim VoIP Architecture for Enhanced 9-1-1 Services (i2)
TR-45 J-STD-036	Enhanced Wireless 9-1-1 Phase 2
NENA 02-010	NENA Standard Format and Protocols for ALI Data Exchange, ALI Response and GIS Mapping
ANSI T1.628	Emergency Calling Service
ANSI T1.111.4	Signaling System No.7 Message Transfer Part