

NENA Standard for Enhanced 9-1-1 (E9-1-1) Default Routing Assignments and Functions



NENA Standard for E9-1-1 Default Assignment and Call Routing Functions
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National Emergency Number Association (NENA) Technical Committee Chairs

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1 Executive Overview

1.1 Purpose and Scope of Document

This “NENA Recommended Standard for E9-1-1 Default Assignment and Call Routing Functions” document provides an overview of various database and network specifications and requirements related to Default Routing of 9-1-1 calls. It is intended to help local authority; database and/or network administrators select a model in the development of standard default routing arrangements. It identifies and defines methods used to assign defaults and route 9-1-1 calls when circumstances prevent normal selective routing. Each approach is used during a specific set of circumstances; similarly a specific set of circumstances shall determine which approach is most appropriate.

1.2 Reason to Implement

While default routing schemes are critical to an E9-1-1 compliant set of database and network design, throughout much of the 9-1-1 community, there is misunderstanding from time to time about the methods used to route 9-1-1 calls when circumstances prevent typical routing. This document aims at describing such circumstances and the method(s) used in such circumstances which shall give the community a common foundation for discussing default call routing schemes.

It shall be recognized that the rationale for default management within database and network components and for default call routing is in an evolution with the advent of new communication mechanisms generating the end of local rate center number assignment restriction and the introduction of geographic number portability.

1.3 Benefits

Use of this “NENA E9-1-1 Default Assignment and Call Routing Functions” Standard will:

- foster a common understanding of terms used in the assessment, determination and deployment of default call routing for emergency services;
- foster fundamental default management rationale for databases;
- explain default call routing ;
- foster increased communication regarding default call routing selections in the planning of E9-1-1 deployments;
- provide alternatives to switch/network vendors regarding desired operational attributes; and
- foster a common set of standards to complete 9-1-1 calls to designated PSAPs when normal selective routing cannot be invoked.

1.4 Operational Impacts Summary

Default-routed calls arrive at the PSAP much like any other call, but may have originated from a neighboring area outside the PSAP’s jurisdiction. If a PSAP is designated to receive default-routed calls, provisions must be made in advance for transferring those calls to the appropriate PSAP(s). This will require PSAPs to work with their 9-1-1 System Service Provider and governing authority to

negotiate default routing assignments that are the best possible choices for the specific circumstances, recognizing that those assignments may vary based on the footprints and technologies of the originating Communications Service Providers. If possible, it should also include the creation of “speed-dial” or “one button” transfer programming in the PSAP CPE, to facilitate the transfer as quickly as possible and eliminate human dialing errors.

1.5 Document Terminology

The terms "shall", "must" and "required" are used throughout this document to indicate required parameters and to differentiate from those parameters that are recommendations. Recommendations are identified by the words "desirable" or "preferably".

1.6 Reason for Issue/Reissue

This document details the processes and procedures to be followed by all NENA Technical Committee leaders and members. NENA reserves the right to modify this document. Whenever it is reissued, the reason(s) will be provided in this table.

Issue #	Date	Reason For Changes
Original	01/19/2008	Initial Document

1.7 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.

1.8 Anticipated Timeline

The assessment, determination, deployment or implementation of default management shall take place as required.

1.9 Costs Factors

This document provides standards regarding default assignment and call routing. Compliance with the standards will be dependent upon the associated database, local and 9-1-1 Control Office switch capabilities. Cost factors will be associated with these system components to the degrees that database and switch upgrades or changes are required. Cost factors associated with other alternate

routing procedures will have potential impact to the local service provider, local 9-1-1 System Service Provider (SSP) and the PSAP – to the degree that the procedures are fully deployed.

1.10 Cost Recovery Considerations

Cost recovery will be dependent upon legislative and regulatory cost recovery mechanisms for E9-1-1 deployment in each state or province.

1.11 Acronyms/Abbreviations/Definitions

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

The following Acronyms are used in this document:	
<i>Acronym</i>	<i>Description</i>
<i>ALI</i>	Automatic Location Identification
<i>ANI</i>	Automatic Number Identification
<i>ATIS</i>	Alliance for Telecommunications Industry Solutions
<i>CSP</i>	Communications Services Provider
<i>ESRD</i>	Emergency Services Routing Digit
<i>ESRK</i>	Emergency Services Routing Key
<i>ESQK</i>	Emergency Services Query Key
<i>MSC</i>	Mobile Switching Center
<i>pANI</i>	Pseudo-ANI
<i>PSAP</i>	Public Safety Answering Point
<i>SR</i>	Selective Router

1.12 Intellectual Property Rights Policy

1.12.1 General Policy Statement

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2 Introduction

This document is a complement to NENA 03-001 and 03-501 documents regarding NENA recommendations for Network Quality Assurance and as deemed applicable to other NENA standards and technical information documents addressing directly or partially the subject of default routing.

The major distinguishing feature of Enhanced 9-1-1 (E9-1-1) is the ability to selectively route a 9-1-1 call to a designated Public Safety Answering Point (PSAP) based upon the caller's location. However, there are times when, even in an Enhanced 9-1-1 network, a call cannot be routed to the designated Primary PSAP. Unique and specific terminology is used to describe each set of circumstances when such call cannot be properly routed.

This document will try to depict such circumstances and to offer potential solutions to help lessen the impact on call taking and dispatch activities. It shall address both the default assignment rationale within the databases and call routing determination in the network environment.

2.1 Call Routing Facts

9-1-1 call routing accuracy may be affected by various factors ranging from lack of up-to-date identification of the subscriber's service address/calling location; delay in service order processing; default call routing rules used to support the subscriber's NPA NXX, the serving area or the network elements; the manner in which a carrier provides local end office trunking to the designated E9-1-1 Control Office; the 9-1-1 network infrastructure or even the way a reseller offers its local service.

It must be recognized that "default call routing" by definition may result in having some emergency calls reach a PSAP not directly responsible for the subscriber's location. Local authorities, E9-1-1 System Service Providers and carriers should ensure that default call routing impacts are minimized through the appropriate association of trunk groups with defined geographic areas. Further, unless using Enhanced MF (EMF), Signaling System 7 (SS7), Internet Protocol (IP) type trunking, all carriers must provide NPA-specific MF E9-1-1 trunk groups within those exchanges served by more than one NPA.

It must also be recognized that "default" call routing is not the same as a "misroute". Misrouted calls are generally caused by incorrect information associated with the caller due to a human or mechanical failure, whereas default routed calls are caused by a lack of selective routing information.

By following the basic provisioning specifications outlined herein, carriers and service providers should be able to provide for an efficient delivery of E9-1-1 calls to a designated authority, even when normal routing cannot be accomplished, thereby helping to prevent extreme situations that delay a life-saving response.

It is assumed that the use of Signaling System 7 (SS7) and SIP (Session Initiated Protocol, used in VoIP) will eliminate the occurrence of ANI failures. Their deployment will not, however, eliminate instances where data associated with the ANI has not been loaded into the appropriate 9-1-1 databases used to route and deliver the call. Therefore, the ability to default route a call remains a necessary function in all types of signaling protocols.

2.1.1 Assumptions

To achieve call routing functions, the critical and complex nature of the E9-1-1 network may utilize some of the following design provisions:

- LEC end office coverage areas will not coincide with municipal or county boundaries;
- E9-1-1 interconnection trunks must conform to E9-1-1 features as determined by applicable standards and protocols. At a minimum, it must be capable of providing the caller's ANI;
- E9-1-1 trunk groups should be dedicated and diversely routed, where applicable and available;
- E9-1-1 trunk groups should be provisioned to support a P.01 grade of service as outlined in NENA 03-001 and 03-501.
- Alternate/Competitive LEC NXX application may not mirror ILEC end office coverage areas, and therefore may not mirror ILEC trunk groups or ILEC trunk group default assignments;
- A minimum of two 9-1-1 interconnection trunks per trunk group are prescribed for survivability;
- E9-1-1 calls must be routed to the E9-1-1 Control Office switch(es) (also called Selective Routers or SRs) designated for the caller's geographic area;
- When Multi Frequency (MF) protocol is used, a 9-1-1 trunk group is required for each NPA in the end office; and
- Current E9-1-1 design defines ANI default on per trunk group basis. Migration to more flexible designs may rely on future Intelligent Network capabilities.

Federally mandated services and local competition affecting 9-1-1 may not follow the same outline assumptions as were true when E9-1-1 was originally designed. Some previously standard capabilities such as default call assignment and routing may not work the same way for new services or service providers.

2.2 Default Call Routing at Failure Points

Technically, default routing happens at specific places, as a result of specific events (or lack of them). During the process of a call, the following text starts at the first place it could be default routed and works its way through to the last place.

2.2.1 Wireline end office

- Primary trunk route
- Secondary trunk route
- Default route(s)
 - 10 digit number
 - O-
 - Call Diverter (INB) unit

2.2.2 Wireless MSC

- Primary trunk route
- Secondary trunk route
- Default route(s)
 - MSC default assignment
 - 10 digit number(s)

2.2.3 VSP via ESGW

- Primary trunk route
- Secondary trunk route
- Default route(s)
 - Contingency Routing Number (CRN)

2.2.4 9-1-1 SR

- Default Routing Reasons:
 - No ANI (in form of ANI, ESRD, ESRK, ESQK)
 - Garbled/Partial ANI
 - Unrecognized ANI
- Routing based on incoming TG
- Routing based on NPA-NXX or NPA-NXX-X

2.3 Default Assignment Model

Default ESN assignment is required to allow the processing of E9-1-1 calls by the E9-1-1 Control Office to the pre-determined PSAP for call handling in the event of certain hardware and software failures for routing E9-1-1 calls or when no information is populated in the E9-1-1 SRDB that prevents the delivery of the routing information.

The E9-1-1 Control Office switch uses various call routing keys and default values. The assignment process used for E9-1-1 service usually are:

1. The E9-1-1 DBMS uploads **all** validated wireline telephone number, wireless cell site/sector specific Emergency Service Routing Digit (ESRD) or destination PSAP specific Emergency Service Routing Key (ESRK) (e.g., NPA-511-XXXX), Private Branch eXchange (PBX) Emergency Line Identification Number records to the designated E9-1-1 SRDB table(s), using an embedded process. These 10-digit Directory Numbers (DN) are identified as **TN exception routing** keys.
2. For **traditional wireline services**, the **NPA-NXX default ESN** routing scheme takes place when the wireline TN is not available in the E9-1-1 Selective Routing Database.
3. There shall be **no NPA NXX default ESN** assigned to any **wireless NXX** codes used for ESRD or ESRK records. This is distinct from wireline services where an NPA-NXX is usually associated with only one or very few Municipalities. The wireless-specific NPA-NXX code used for ESRD numbers is used across the NPA that covers multiple Municipalities and 9-1-1 agencies. Never set a default ESN to wireless ESRD's or ESRK's NXX, as it CANNOT relate to a most appropriate Primary PSAP.
4. Likewise, a **default ESN** shall **not be assigned to NPA NXX** to any NXX codes used for VoIP Emergency Services Query Keys (ESQK). The reason is that while the NPA-NXX , may initially be usually associated with only one or very few Municipalities, when the device migrates, the IP-specific NPA-NXX code used for ESQK numbers may be used outside an area that covers multiple Municipalities and 9-1-1 agencies. Never set a default ESN to IP ESQK's NXX, as it CANNOT relate to a most appropriate Primary PSAP.
5. A wireline **incoming Trunk Group default ESN** is required when the TN and the NPA-NXX are not present in the E9-1-1 Selective Routing Database.
6. As well, for wireless E9-1-1 Service, the most likely default will be using the **wireless trunk group's Default ESN**. All incoming wireless E9-1-1 trunk groups shall be assigned a default ESN associated with the Municipalities / Primary PSAP it serves. That default is to be used to appropriately route wireless E9-1-1 calls when no ESRD or ESRK is received or the ESRD or ESRK is not available in the E9-1-1 Selective Routing Database. To achieve this process, the Wireless Service Provider (WSP) shall be requested to implement a dedicated E9-1-1 trunk group per Municipality / Primary PSAP. Where the WSP interconnects to dual E9-1-1 Control Office switches serving the designated Primary PSAP, a default ESN must be set for each trunk group.
7. The calls using the **inter-tandem trunk group default ESN**, that need to be default routed when they reach the 9-1-1 Control Office switch, should be pointing to the most appropriate Primary PSAP for that switch. This will require negotiation with the E9-1-1 Authorities in the switch serving area, because calls could have originated anywhere in the 9-1-1 Control Office area.

2.4 Routing and Default Parameters Summary

The following is a brief description of the steps taken by the E9-1-1 System Service Provider to define an E9-1-1 serving area and the E9-1-1 routing implemented at time of cutover: (may vary from SSP to SSP):

1. In conjunction with the appropriate 9-1-1 Authority representative, the E911SSP shall map all involved emergency dispatch boundaries.
2. Emergency Service Zones (ESZ) are defined for each area that contains the same emergency dispatch agencies. (ESZ defines the 9-1-1 PSAP and emergency dispatch agencies for 9-1-1 calls originating within that zone).
3. An Emergency Service Number (ESN) is assigned to each ESZ.
4. All addresses within an ESZ are assigned the corresponding ESN number.
5. A default ESN may be assigned to each NXX based on the most appropriate serving PSAPs. See number 7 below.
6. A default ESN is assigned to each incoming 9-1-1 trunk group.
7. Each ANI / telephone number in the SRDB is assigned an ESN based on the validated service address. Although in many cases not all numbers are actually entered in the SRDB. If there is commonality between individual TNs in any given NPA-NXX range, a “wild card” entry technique may be employed by the E911SSP, whereby all TNs within a given range would be considered to be assigned the same ESN.

2.4.1 Default ESN assigned to NPA-NXX

Regulatory and traditional network specifications dictate that LECs provision at least one NXX per exchange. In most E9-1-1 Systems, the E9-1-1 Database Management Systems (DBMS) and E9-1-1 Control Office establishes a “Predominant ESN” at the 10,000 block level (i.e., NPA-NXX level). The assignment of the Predominant ESN for that NPA-NXX may be set using the Default ESN assigned to the incoming E9-1-1 trunk group that supports the NPA-NXX. The Default ESN in the SRDB is replaced at the line level (NPA-NXX-XXXX) with an ESN assigned to the individual number based on the service location of the number upon completion of a service order. In this scenario, any call arriving at the E9-1-1 Control Office using an ANI that has not been loaded using the service order process will Default Route using the Default ESN assigned to the incoming trunk group.

It should be noted that most E9-1-1 systems do not change ESN assignments in the switch based SRDB for individual telephone numbers when service is disconnected – only when new service is provisioned or when the service location changes. A disconnected number will retain its last ESN assignment until changed by a subsequent provisioning service order that reassigns the number. This is one of the reasons that service orders must be processed by the E9-1-1 system either before or immediately after service is provisioned, so as to prevent misrouting of calls based on a previous

ESN assignment that is no longer valid. Systems that use an SRDB residing in the ALI database do not have this issue.

2.4.2 Default ESN assigned to NPA-NXX-X (Predominant ESN)

Some E9-1-1 Database Management Systems (DBMS) and E9-1-1 Control Offices utilize a method of managing ALI and SRDB records that does not require an ALI record to be in the ALI database in order for the SRDB to return an ESN to the E9-1-1 Control Office. When the E9-1-1 Control Office queries the SRDB using an ANI for which no ALI record currently exists, the SRDB returns the ESN that occurs most frequently among the ALI records that have been processed for telephone numbers out of the same range of 1,000 numbers (i.e. NPA-NXX-Y000 thru NPA-NXX-Y999). This Predominant ESN is then used to route the 9-1-1 call, rather than having to use the default ESN of the incoming trunk group.

2.4.3 Default Routing Based on incoming E9-1-1 Trunk Group

It is recommended that all CSPs provision such number of E9-1-1 trunk groups as required to ensure that in the event of ANI failure, E9-1-1 calls are default routed to the most appropriate primary PSAP.

2.4.4 Default ESN Acquisition

Default ESNs for a pre-determined service area are assigned by the E9-1-1 Database Management System after discussion and/or negotiation with the local authority (PSAP/municipality/county). It is recognized that discussions involving the local authority and the LEC may be required to determine if additional E9-1-1 trunk groups will be required in cases where more than one municipality or county is served by the same primary PSAP.

2.4.5 Default ESN Selection

The logic behind default ESN selection, as well as default assignment rationale, starts at the DBMS level and is, primarily, a manual process.

Most default Emergency Service Number (ESN) codes are created and assigned within the Database Management System (DBMS). This is usually the result of a meticulous relationship between the DBMS assignment and the Selective Routing Database (SRDB) routing table creation, population and management schemes.

While the SRDB acts on ESN triggers, the DBMS creates and assigns them to each applicable telephone and administrative routing number. In addition, some DBMS systems transfer only those “exception” records to the SRDB. An exception record has an ESN value assigned that is distinct from its NPA-NXX (or NPA-NXX-X) default ESN assigned within the DBMS. That data transfer concept was put in place to help support transfer link and low SRDB size capability, not to mention SRDB data recovery mechanisms.

With the advent and propagation of out-of-exchange (out-of-territory) NPA-NXX codes within an E9-1-1 serving area, it becomes more and more important to manage the default ESN at the municipality, county, state/province level, rather than at the NPA-NXX level. Some DBMS are assigning default ESNs at the municipality level. Where such practice is implemented, while NPA-NXX-based default ESNs may still exist at the DBMS level, they cannot be used at the SRDB level.

This means that a telephone or routing number located or assigned in Philadelphia, PA would have one ESN assigned to it by default unless a specific exception ESN is assigned to that specific number. One could assign a California-based number to a device located in Philadelphia, and providing that the service provider can route 9-1-1 calls to the E9-1-1 Control Office serving Philadelphia, AND having no NPA-NXX default assigned for the associated NPA-NXX in the local E9-1-1 SRDB, the 9-1-1 call would default route to the Philadelphia PSAP based on the incoming trunk group default ESN.

2.4.6 New NPA-NXX Assignment Notification

For each new NPA-NXX assignment, the E9-1-1 System Service Provider requires information to assign a specific default Emergency Service Number (Default ESN), in the E9-1-1 DBMS and the E9-1-1 SRDB, for emergency call routing purposes. Otherwise, a processing error / reject and call routing errors would occur. It is the responsibility of the LEC to notify the E9-1-1 System Service Provider of new or additional NPA-NXX assignments prior to the establishment of the E9-1-1 data exchange, to meet NPA-NXX to Default ESN routing assignment.

- When a LEC receives confirmation that a new NPA-NXX is to be opened in one of its switches, and it will service an E9-1-1 served area, the LEC must validate the new NPA-NXX coverage as compared to the 9-1-1 authority's coverage;
- The LEC must confirm Emergency Service Zone default routing for that NPA-NXX with the appropriate municipality if "wild card" default assignments are used;
- The LEC advises the E9-1-1 System Service Provider of the default routing agreement;
- The E9-1-1 System Service Provider assigns a default routing ESN for that new NPA-NXX if they use such routing schemes in their system;
- The E9-1-1 System Service Provider adds the information to the E9-1-1 databases as needed.

2.4.7 Area of Coverage for an Assigned Default ESN

Pre-determined default ESNs are specified by the 9-1-1 Database Management System operator and can be assigned to cover NPA(s), counties, rate centers or an individual municipality. These assignments are negotiated between the E9-1-1 SSP and the 9-1-1 authority(ies) served by the E9-1-1 Control Office.

2.4.8 Default Assignment Procedures

The E9-1-1 System Service Provider establishes a Default ESN code for each incoming trunk group and each applicable NPA-NXX (if applicable), based on each CSP's specific coverage information.

- The originating LEC advises the E9-1-1 System Service Provider of the selected default routing specifications based on municipal ESZ for each of its NPA-specific E9-1-1 trunk groups and each NPA-NXX fully or partially serving an E9-1-1 service area;
- The E9-1-1 System Service Provider assigns a specific default routing ESN to each incoming trunk group and (if applicable) to the new NPA-NXX;
- The E9-1-1 System Service Provider populates the information in the 9-1-1 databases as needed.

2.4.8.1 Assigned by NPA

A default ESN should never be assigned by NPA, unless that entire NPA service area is covered by a single PSAP.

2.4.8.2 Assigned by County or Municipality

Where requested, every service provider should establish one end office (or equivalent) to E9-1-1 Control Office trunk group per County (or equivalent jurisdiction) so that ANI failure or No Record Found (NRF) default routed calls will be directed to a PSAP in that County (or equivalent jurisdiction). It is essential to negotiate a default PSAP agreement with the applicable 9-1-1 authority. An exception might be where the LEC service area is primarily in a metropolitan area which has a PSAP, which would also act as the county default until service expands to full county coverage.

2.4.8.3 Assigned by Local PSAP Serving Area

A Default ESN is often assigned by local PSAP serving area. A 9-1-1 authority may determine it is appropriate to set multiple default assignments to distribute default calls from wireline, wireless, VoIP (and etc.) sources. Such practice must be closely monitored to ensure equitable distribution to all participating PSAPs.

2.4.8.4 Assigned by Traditional Rate Center

A traditional Rate Center may overlap more than one E9-1-1 service area. The local authorities shall determine and agree with the most appropriate set of default assignments. A potential complicating factor would be if adjacent agencies within such assigned areas are not be served by the same E9-1-1 Control Office(s). In those cases, inter-tandem services may be required to address the issue.

2.4.8.5 Assigned by Consolidated Rate Center

Rate Center Consolidation (RCC) might be implemented over an extensive geographic territory. A good example is the Denver, CO area. The RCC covers seven counties surrounding the Denver-Boulder metro area. On top of that, the Colorado Public Utilities Commission agreed to an NPA Overlay of the 303 NPA. Compounding the problem of these number conservation schemes was the fact that at the time of deployment there were multiple E9-1-1 Control Offices the RCC area. RCC could further exacerbate the situation if the 9-1-1 authority boards affected by these conservation measures are not willing, or neglect to designate a single Default PSAP location for default routing. Thus, in order to accommodate all the various default route designations and the NPA Overlay, a LEC with a single EO serving the Denver rate center had to deploy multiple 9-1-1 trunk groups. The only alternative was to designate each of the default routes as a unique rate center (or you could use line class coding in the originating central office) and build the line level translations accordingly based on the location of the end user. NENA does not recommend the use of LCCs, unless the CSP has mechanized capabilities to ensure such end office level translations are kept up-to-date at least consistent with the way other typical DBMS/SRDB records are updated.

2.4.8.6 Assigned by Mobile Switching Center (used for Wireless)

Another condition may arise when wireless carriers bring up cell sites/sectors for testing without having the information entered in the appropriate 9-1-1 database(s). Wireless 9-1-1 calls may hit such cell sites/sectors and may need to be routed to a PSAP designated as default for the entire Mobile Switching Center (MSC) system (which may straddle state or provincial boundaries). It is often difficult to get one PSAP to agree to be such a default answering point. It is very important that a wireless carrier supply the necessary information for the appropriate E9-1-1 database(s) prior to such testing, even if the site/sector may only be up a very short testing time and then taken off line again for a long period of time.

2.4.8.7 Recommended Actions to Reduce the Incidence of Default Routing

- Shorten the timeframe associated with updating the SRDB tables
- Require MSAG validation for order entry
- Require coordination for updating both the ALI & SR databases
- Shorten the timeframe associated with updating the DBMS;
- Speed up error correction processes
- Complete loading of pANI shell records for wireless and VoIP prior to service testing and activation

2.4.9 Impact of Large Serving Areas

When service providers serve large geographical areas that overlap numerous existing wire centers, using the same NXX as well as provide E9-1-1 service via a single E9-1-1 trunk group, the E9-1-1 default routing mechanisms fail to function effectively. That results in:

- 9-1-1 calls being directed to PSAPs that are geographically separated by great distances and not responsible or familiar with the caller's location and emergency dispatch agencies;
- delay in providing a response to a 9-1-1 emergency call
- In some cases PSAPs have advised the E9-1-1 System Service Provider that they do not want to receive 9-1-1 calls that do not originate in their territory, further exacerbating the ability of the E911SSP to deliver the call somewhere that can try to aid the caller
- Large serving areas may necessitate the use of class marking or a reduction in the number of rate centers in order to achieve default areas of manageable size.

2.5 ESIF – SG B Activities on Default Routing

The Alliance for Telecommunications Industry Solutions (ATIS) – Emergency Services Interconnection Forum (ESIF) has asked its sub-working group B (SG-B) to look at wireless default and alternate requirements. Various issues have been documented and are available at the ESIF web site, including:

ESIF-01	Default processes in the routing of wireless 911 calls
ESIF-03	Methodology for the monitoring of overflow conditions on PSAP trunks
ESIF-04	MSC overflow to 7/10 digit numbers when all 9-1-1 circuits are busy
ESIF 39	Post Deployment Cell Site Additions – Provisional Routing

2.6 Overflow Routing vs. Default Routing

Overflow routing is a method of assigning secondary trunk routes for transmission of E9-1-1 calls when the primary trunk route between the originating office and the E9-1-1 Control Office, or between two E9-1-1 Control Offices, is “traffic busy” (all trunk members are occupied with a call in progress) or temporarily out of service.

Overflow Routing is not a form of Default Routing and should not be confused with it. Overflow Routing takes place when a primary path is not available. Default Routing takes place when information required for routing is not available.

Not all 9-1-1 networks are designed with overflow trunk routes. It is a negotiation point between the E911SSP and the 9-1-1 administrative agency as to whether the originating network element (LEC end office, wireless MSC, etc) should be programmed to overflow 9-1-1 calls to a 7 or 10-digit number provided by the 9-1-1 agency.

3 Considerations and Recommendations

The relationship between municipal boundaries, NXX serving area and E9-1-1 trunk group serving areas is critical to the operation of the E9-1-1 system and must be maintained by all Communications Services Providers interconnecting to the E9-1-1 system. Any deviations from the established “norm” may result in operational problems and increased liabilities for PSAP operators, E9-1-1 System Service Providers and CSPs.

Should CSPs choose to serve a broad geographic area using a single switch/server they should provide multiple E9-1-1 trunk groups (associated with defined geographic areas) to mitigate the misrouting of 9-1-1 calls.

3.1 Assumptions:

- If the operational procedures are solid it is perfectly feasible to provide statistically perfect routing based on the traditional routing reference by telephone number.
- An SS7 environment anticipates this level of database quality.
- Extensive efforts to accommodate default routing are likely to exacerbate the potential for errors by adding increasingly hard-to-audit elements to the system. The “simple” approach generally has its advantages.
- Most rate centers are served by a PSAP that has the resources and knowledge base to answer non-routable calls and manage them effectively.
- Some E9-1-1 System Service Providers migrated to a centralized Off-Board Selective Routing (OBR) Interface. Depending upon the implementation, this has the potential to impact how default routing is handled by the SR.

3.2 Suggestions:

- Note the technical difficulties in continuing the past practices of default routing code provisioning compared to other options and what may be available today;
- Recognize it as a largely operational problem that has been dealt with by PSAPs for as long as E9-1-1 service has existed. Default routing is nothing new;
- Apply a technical standard that can be easily implemented.

3.3 Benefits of following procedures recommend in this document:

- Reduce the amount of time and effort on a problem that happens in an extremely small percentage of calls. (As low as .2%)
- PSAPs will know what to expect and the technical limitations involved.

- Carriers will know where to put their efforts, namely database accuracy and timeliness of updates.
- These general principles should be applicable to future technologies, although specific steps &/or mechanisms may vary.

3.4 Political factors

PSAPs desire default call delivery to be as close as possible to previous ILEC handling, which was based on wireline end office. This is a much smaller footprint than service areas of CLECs, wireless carriers and VoIP service providers.

Extremes are:

- One trunk group for entire CSP service area to each E9-1-1 Control Office involved (therefore default to a single pre-defined PSAP for the entire SR area) and
- one trunk group to E9-1-1 Control Office per PSAP with line control class marking or coding.

3.5 Practicality aspects

In a “traditional” telephony environment, it is viewed that the number of defaulted calls is small (about two tenths of one percent) if all systems are working as designed.

Depending upon the process implemented, class marking may drive more misroutes (due to manual errors) than would occur for the occasional ANI failure default call.

Default routing based on NPA or NPA-NXX may be workable for now (as long as it is worked out with the PSAP authority), but the advent of Geographic Number Portability (in the wireline network) will break it. Wireless and VoIP telephone numbers already do not adhere to rate center boundaries. For that reason, basing default routing on the incoming dedicated trunk group (where applicable) may be a better choice than NPA-NXX level default routing.

3.5.1 Future Considerations

The size of the service areas associated with wireless and VoIP, and in particular, the nomadic capabilities of both, present the need to process TN-to-location relationships on the fly and to use that information in routing decisions. This creates a unique challenge for default routing. The good news is that the technologies used for call transmission (SS7 and IP) are theoretically immune to ANI failures.

Any long-term solutions need to address the wireline, wireless and IP network environments.

In addition to the ALI Database Manager, it is the responsibility of all carriers to optimize their service order provisioning processes. This may require significant changes to existing Operational Support Systems.

Where the SR does not allow automated delete function for disconnected numbers, it may be advisable for the ALI system to update the deleted TN with the NPA NXX default ESN in the E9-1-1 SRDB, in systems where such NPA-NXX level routing is used.

The removal of wild cards (default assignments based on NPA or NPA-NXX) doesn't correct the problem when there is old record information in the SR. Before deciding on the best way to go, a close look at the overall impact is warranted.

There are some instances in which the E9-1-1 System Service Providers do not populate the NPA-NXX default. This is the case for wireless Emergency Service Routing Digit/Key (ESRD/ESRK) routing numbers and VoIP Emergency Services Query Key (ESQK) routing numbers where the NPA-NXX assigned uses a TN with a universal pseudo NXX (i.e., 511 and 211) in all NPAs.

4 References

- NENA Operations Committee - Wireless Default, Overflow and Diverse Routing Working Group produced NENA 57-001 Wireless E9-1-1 Overflow, Default and Diverse Routing Operational Standard Document, November 18, 2004, Original is available at URL: <http://www.nena.org/?page=WirelessRoutingStd>
- Canadian Radio-television Telecommunications Commission (CRTC) -Interconnection Steering Committee (CISC) - Business Systems Industry Working Group - Emergency Services (9-1-1) Working Group (ESWG) issued a Trunk-side CLEC Interconnection Document - Release 3.1 - October 30, 1997. The CISC ESWG papers and activities are available at URL: <http://www.crtc.gc.ca/cisc/eng/cisf3e4.htm>
- ESIF Study Group B assessed the subjects of wireless overflow, default and contingency. Associated Issue papers are available at URL: <http://www.atis.org/ESIF/>

5 Exhibits

9-1-1 Default Routing - Emergency Service Number (Default ESN) Assignment Process

