NENA Standard for

NG9-1-1 Policy Routing Rules

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Prepared by:
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1 Executive Overview

An important feature of NG9-1-1 is the ability of the system to adapt to outages, excessive call volumes, emergencies and normal scheduled PSAP outages. The Policy Routing Function (PRF) described in 08-003 is the function that handles the diversion of calls. To support the PRF, Policy Routing Rules (PRRs) must be developed. These PRRs define to where calls are diverted if the target PSAP is unreachable. This Working Group's charter was to define a template to guide the development of these PRRs. To that end, the committee developed templates to facilitate the PRRs that a 9-1-1 Authority must develop for any new NG9-1-1 System. The minimum set of rules developed must address all call diversion capabilities present in the current E911 system. A 9-1-1 Authority may choose to implement additional and/or enhanced PRRs to divert calls in a manner that takes advantage of capabilities available in a NG9-1-1 system that are not available in E9-1-1 systems.

The template developed is intended to facilitate a discussion between a 9-1-1 Authority and its Emergency Service Routing Proxy (ESRP) vendor. By utilizing the template, PRRs can be described in a way that is understandable by the 9-1-1 Authority and specific enough to be implemented by the vendor.

Without the creation of PRRs, a NG9-1-1 system will not be able to divert calls to an alternative PSAP when the target PSAP is unavailable. Implementation of the PRRs is a necessary step in the deployment of a NG9-1-1 system.

2 Introduction

2.1 Operational Impacts Summary

The implementation of PRRs in a NG9-1-1 system allows a 9-1-1 Authority to replicate and, in many cases, enhance the diversion of calls to an alternative endpoint as they do today.

2.2 Technical Impacts Summary

The implementation of PRRs is a necessary step in the deployment of a NG9-1-1 system.

2.3 Security Impacts Summary

PRRs are held within a NG9-1-1 system. Except for the tool used to create the PRRs and provision them in the system, there is no external interface to them. The Policy Routing Rules created by a 9-1-1 Authority and must be classified as sensitive (restricted) as defined in NG-Sec.

2.4 Document Terminology

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

2.5 Reason for Issue/Reissue

NENA reserves the right to modify this document. Upon revision, the reason(s) will be provided in the table below.

Version	Approval Date	Reason For Changes
NENA-STA-003.1-2013	08/05/2013	Initial Document
NENA-STA-003.1.1-2014	12/01/2014	Editorial corrections • 3.4.2.1.1.1 Standard – numbering sequence in Routing Instructions table • 3.4.2.3.2.1 Enhanced - numbering sequence in Routing Instructions and Routing Instructions (call queues) tables

2.6 Recommendation for Additional Development Work

2.6.1 The templates created provide a number of "case studies" that parallel situations encountered in today's E9-1-1 environment and provide examples of how these situations can be dealt with using PRRs in a NG9-1-1 environment. PRRs must be established by 9-1-1 Authorities for this initial set of situations. The Working Group recommends that a repository of PRRs be created to host other scenarios and examples of PRRs developed by 9-1- 1 Authorities. This will build a library for other authorities to draw upon as they implement NG9-1-1 systems

2.6.2 To minimize PSAP staff training and to facilitate addressing diversion of calls in a disaster situation, it has been suggested that a common user interface standard for defining and changing Policy Routing Rules be developed. While the WG agrees this concept has merit, the WG believes that this work should not be undertaken soon. With more real-world experience and experience gained by the PSAPs through use of multiple interfaces, the industry will be ready to tackle this work.

2.6.3 As referenced in a variety of places in this standard, the location, ownership, and management of call queues could use further definition. 08-003 provides some definition in this area but could use further work.

2.7 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 applications, 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.

2.8 Anticipated Timeline

The development of the PRRs is a component of the deployment of a NG9-1-1 System. Using the template, PRRs can be developed by a 9-1-1 Authority in a timely manner. 9-1-1 Authorities must define PRRs and implement them prior to any NG9-1-1 going live. 9-1-1 Authorities should develop the PRRs early in the planning process of a NG9-1-1 system so their ESRP vendor(s) can include them in the implementation plan.

2.9 Cost Factors

The creation of PRRs should be included in any contract for the delivery of a NG9-1-1 system. Other than this cost, the direct costs to the 9-1-1 Authority are minimal.

2.10 Cost Recovery Considerations

There are no specific cost recovery considerations for PRRs. Any cost recovery or other sources of funds for a NG9-1-1 system will also cover the PRRs

2.11 Additional Impacts (not cost-related)

The information or requirements contained in this NENA document are not expected to have 9-1-1 technical impacts, based on the analysis of the authoring group.

2.12 Intellectual Property Rights Policy

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2.13 Acronyms/Abbreviations, Terms and Definitions

Some acronyms/abbreviations, terms and definitions used in this document may not have yet been included in the master glossary. After initial approval of this document, they will be included. See NENA 00-001 - NENA Master Glossary of 9-1-1 Terminology located on the NENA web site for a

complete listing of terms used in NENA documents. All acronyms used in this document are listed below, along with any new or updated terms and definitions.

The following Acronyms are used in this document:		
Acronym/Abbreviations	Description	(N)ew (U)pdate
PRR	Policy Routing Rules	[N]
IMR	Interactive Multimedia Response	[N]

The following Terms and Definitions are used in this document:		
Term	Definition	(N)ew (U)pdate
Call Diversion:	General term meant to encompass the routing of a call to any endpoint other than the one determined by caller location. Calls may be diverted for conditions that are scheduled (i.e. maintenance, hours the PSAP is not staffed, etc.), or for events that cannot be scheduled (i.e. equipment or network failure, disasters, etc.)	[N]
Fast busy	This term indicated the tones a caller would hear if the call could not be completed because of the lack of network resources. In NG9-1-1 the functional equivalent is "600 Busy Everywhere"	[N]
Interactive Multimedia Response (IMR):	A computer system accessible by registered users used to identify the Service Provider and 24 X 7 access number for telephone numbers which have been ported or pooled.	[N]

3 Suggested Template and Examples

9-1-1 Authorities must define the minimum set of PRRs required in a NG9-1-1 system. 9-1-1 Authorities should consider taking advantage of the capabilities of the NG9-1-1 end-state architecture as defined in NENA 08-003. 9-1-1 Authorities should use this document as a tool to assist in developing Policy Routing Rules when deploying NG9-1-1 Systems. It contains the background information, terms and definitions, and examples for use by an Authority in the development of the rules required. The use of this tool assumes that all inter-agency mutual aid agreements have been memorialized. (See NENA 53-002 for assistance in developing Mutual Aid Agreements)

To prepare for using this tool, the 9-1-1 Authority should consider the following:

1. Of the current situations that require call diversion, are there any situations that can't be handled cleanly by simply sending calls to an alternative PSAP? In other words, if you weren't limited to the options available in the current E9-1-1 environment, how would you divert calls?
2. Are there any unique characteristics of your PSAP(s) that impact how you divert calls today? For example:
    a. Does the size of your PSAP (large or small) impact how you divert calls?
    b. Does the size of your PSAP impact your decision to handle the volume or types of calls diverted from another PSAP?
    c. Are there capabilities of your PSAP that make it difficult for you to divert calls to another PSAP or to take calls diverted to you? Skill sets? Equipment limitations?
    d. Are there any characteristics of the geographic territory you cover that impacts your ability to divert calls to another PSAP or take calls diverted to you? State lines? Terrain? LATAs, maybe?
    e. Are there any important demographics of the citizen population you serve that impacts (positively or negatively) your ability to divert calls elsewhere or accept diverted calls?
    f. Are there any businesses or organizations in your coverage area that impact how and when you divert calls to another agency? HAZMAT issues? Special needs?
    g. Are there any state or local regulations that impact if, how, or where you are able to divert calls to another agency or another agency's ability to divert calls to you?
    h. Are there any policies or practices that influence if, where, or how you divert calls to another agency or accept diverted calls?
    i. Have you had any events (natural disasters, large gatherings, sporting events, concerts, etc.) that have caused you to think about how and where you would divert calls if you have an outage?
    j. Are there any reasons to think about diverting calls based on the type of call (wireless vs. wire line, multiple calls coming from the same scene/event, etc.)?

3.1 What This Document Does Not Cover

This document does not fully address the following topics related to NG9-1-1 Policy Routing Rules:

1. Policy Routing Function and Policy Store. NENA 08-003 clearly defines the Policy Routing Function (PRF). The PRF draws upon a Policy Store that contains the Policy Routing Rules for a terminating endpoint. This document is focused on the Policy Routing Rules.
2. NENA 08-003 supports Policy Routing Rules for originating, intermediate and terminating Emergency Service Routing Proxies (ESRPs). For example, rules can be created that address the receipt of calls coming in from another ESRP and for calls going to a particular PSAP. The templates in this document are for "termination" policies only. However, to divert calls when the caller location is not available, a.k.a. "Default routing", one rule for incoming calls has been established.
3. NG9-1-1 allows for the notification of entities in a NG9-1-1 system. For example, emergency rooms can be notified automatically by the system if a large scale emergency event occurs. This document does not address notification of entities except as part of the diversion of a call.
   This document does not attempt to dictate vendor implementations. There are many ways to implement Policy Routing Rules. Vendors have some latitude in their implementations; however, NENA standards must be adhered to so as to insure interoperability.

3.2 The Use of Call Queues to Facilitate the Diversion of Calls in NG9-1-1 System

The templates included in this Section describe the 9-1-1 Authority's intent to divert calls in a NG9-1-1 System when the target PSAP, "A" is unable to take calls. This section clarifies the use of call queues to facilitate the diversion of calls. Note that while the templates below focus on routing and delivery of calls to a PSAP, the concepts and templates are equally applicable to address the routing of calls between other functional elements.

The mechanism that is actually used to "deliver" NG9-1-1 calls and, in particular, diverted calls: When an NG9-1-1 System delivers calls intended for a particular endpoint, it actually delivers them (or enqueues them) to a call queue that has been designated for that particular endpoint. The NG9-1-1 endpoint attaches to the queue and takes calls out of the queue (dequeues the call). The importance of this distinction is that many queues can exist. Multiple sources can enqueue a call and multiple endpoints can dequeue a call from any queue given the appropriate authority. This methodology provides significant flexibility for routing calls however, as always, with flexibility comes complexity

Types and "location" of queues: Call queues can be set up at any time. Most call queues will be established when an NG9-1-1 system is deployed while other call queues will be established on an ad hoc basis to address unplanned circumstances. Most call queues will be permanent while others will be transitory. All call queues have names which should reflect the purpose of the queue.

The "location" of a call queue is dependent on what endpoints need to dequeue calls from it. If a call queue is established for a single PSAP and no other endpoint needs to dequeue calls from it, the queue can be hosted in the call handling system. If however, multiple endpoints need to dequeue from the

queue, then the queue must be hosted in the network such that it is accessible to all necessary endpoints. In the special case of a hosted call handling system that supports multiple endpoints, any call queue that the system hosts is available to all endpoints it serves.

The entity that "owns" a queue is responsible for establishing and maintaining it. In the case of a normal queue, the PSAP is the owner. In the case of a diversion queue, the PSAP to which the call is diverted is the owner. Where there are regional, state or national disaster queues, some organization (regional, state, national) would own them. Note that the rules for the PSAP or Agency that is having calls diverted apply; not the rules of the owner of the diversion queue

Suggested Queue naming conventions. *Call queues should be named for their specific use. For example, a queue established for normal operations at a particular PSAP might be named "San Francisco_consolidated_PSAP_Normal_Operations_Emergency_Call_Queue". A queue established to be used during a major hurricane in the gulf coast of Alabama may be named "Alabama_Gulf_Coast Hurricane_Queue" or "AL_LA,_&_MS_Regional_Hurricane_Queue". From a technical prospective, long queue names cause formatting challenges in reports. The value of complete queue names should be balanced with challenges created with long queue names. Queues should be established at the time a NG9-1-1 system is implemented wherever possible. Note that queue names mentioned above are not required to be used in the SIP URI of the queue but should be used in the display name portion.*

Examples of the use of call queues:

Example 1, Normal call queue: During normal business hours, calls destined to PSAP A are routed to the PSAP A Normal Call Queue.

Example 2: Anticipated outages

There are a number of events that are part of normal operations that could require calls to be diverted to a PSAP other than the one that should get the call based on subscriber location. To handle these scenarios, every PSAP must establish mutual aide agreements that guide the NG9-1-1 system in the diversion of calls to the desired PSAP. Call queues to handle these occurrences can be set up at the time the NG9-1-1 system is implemented. Call queus should be named for the event and the PSAPs that are involved. For example, the purpose of "PSAP_A_ Call_ Queue for calls routed-to PSAP_B should be obvious.

Example 3, Major disaster

All 9-1-1 jurisdictions should plan for a major disaster when implementing a NG9-1-1 system; however, until the disaster occurs it is impossible to know what PSAPs will be affected and in what way. To address this situation, a call queue could be created at the time the NG9-1-1 system is established. For example, the queue "Major_disaster_call_Queue" could be used by any PSAPs in the region. Even in this case, mutual aid agreements must be in place.

Note: The creation of new call queues allows for special treatment of the calls in that queue. If no special handling of the calls is required, the standard call queue can be used.

3.3 Example Scenario

The templates in a subsequent section show examples of how a PRR may be constructed for a specific PSAP (A). Example PRR are found later in this document. All of these rules assume the following situation:

ESRP: There are two ESRPs; A and B. ESRP A serves PSAPs A through G and ESRP B serves PSAPs H through J

Endpoints: There are a wide variety of endpoints for call delivery. This list has a subset of possible options.

Please note that the use of all queues will be established in the routing rules following the table.

ESRP	Endpoint	Queues created for the benefit of the endpoint
A	Serves PSAPs A through G	Default_Route_Call_Queue
A	PSAP A	PSAP_A_Standard_Operations_Call_Queue PSAP_A_Scheduled_Maintenance_Call_Queue PSAP_A_Make_Busy_Call_Queue PSAP_A_Service_Disruption_Call_Queue PSAP_A_Unmanned_Call Queue Shared_Default_call_queue
A	PSAP B	PSAP_B_Standard_Operations_Call_Queue PSAP_B_Default_Route_Call_Queue Shared_Default_call_queue PSAP_B_After_Hours_Call_Queue_For_PSAP_A PSAP_B_Maintenance_Call_Queue_For_PSAP_A PSAP_B_Make_Busy_Call_Queue_For_PSAP_A PSAP_B_Unmanned_Call_Queue_For_PSAP_A
A	PSAP C	PSAP_C_Standard_Operations_Call_Queue PSAP_C_Default_Route_Call_Queue Shared_Default_call_queue

		PSAP_C_After_Hours_Call_Queue_For PSAP_A PSAP_C_Maintenance_Call_Queue_For_PSAP_A PSAP_C_Make_Busy_Call_Queue_For_PSAP_A PSAP_C_Unmanned_Call_Queue_For_PSAP_A
A	PSAP D	PSAP_D_Standard_Operations_Call_Queue PSAP_D_After_Hours_Call_Queue_For PSAP_A PSAP_D_Maintenance_Call_Queue_For_PSAP_A PSAP_D_Make_Busy_Call_Queue_For_PSAP_A PSAP_B_Unmanned_Call_Queue_For_PSAP_A
A	PSAP E	PSAP_E_Standard_Operations_Call_Queue
A	PSAP F	PSAP_F_Standard_Operations_Call_Queue
A	PSAP G	PSAP_G_Standard_Operations_Call_Queue
A	Interactive Multimedia Reponse (IMR)	IMR_Standard_Call_Queue IMR_Default_Route_Call_Queue IMR_After_Hours_Call_Queue_For PSAP_A IMR_Maintenance_Call_Queue_For_PSAP_A IMR_Make_Busy_Call_Queue_For_PSAP_A IMR_Unmanned_Call_Queue_For_PSAP_A IMR_Disaster_Call_Queue
A	PSAPs A, B, C, D, E, F, and G	Regional_Disaster_Call_Queue
A	PSAPs A, B, C, D, E, F, and G	State_Disaster_Call_Queue
B	Serves PSAPs H, I, J, and K	
B	PSAPs H, I, J, and K	National_Disaster_Call_Queue

Note: Queues are created to provide different treatment of calls, not to identify them as diverted.

3.4 Policy Routing Rules Templates

Each Policy Routing Rule below is described using a standard template. The numbering scheme used is intended to group the rules. The numbering scheme is arbitrary but helps the reader to understand the Policy Routing Rules and their relationship to one another. Note that the format used below facilitates a discussion between vendors and 9-1-1 Authorities. Vendors should strive to provide an intuitive graphical interface for creating and displaying rules.

3.4.1 Incoming (Origination) Rule

3.4.1.1 ESRP Default Routing

3.4.1.1.1 Standard

Category: ESRP-wide Policies
Sub-Category: ESRP Default Routing
Sub-Sub-Category: Standard (E9-1-1-like) Routing
PUC Rules affecting policy: None

Short situation description: Calls diverted when caller location is not delivered or is corrupted. This rule applies to the incoming or originating call queue. It is the only such rule of this type defined. All other rules are for terminating call queues

Situation Description: This rule applies if and only if a call is delivered to the default incoming queue of the ESRP. This will always require the ESRP to query the ECRF. When the ESRP queries the ECRF for location information, it is possible that the ECRF cannot return a valid response. If this occurs, then the ESRP does not have the necessary routing information requiring the ESRP to select a default target. This is akin in today's system where a Default Route is used.

Situation Characteristics:
Criteria to use to determine if situation exists:

	Data to Use	Data Value
X	ECRF does not provide a valid response to the ESRP query	
X	Service State	If Service State is not "Normal"

Entities agreeing to take calls (based on inter-agency agreements):

Used in this Policy	Agreements in place?	Alternative Destination
Y	Y	PSAP A
Y	Y	PSAP B

Y	Y	PSAP C
Y	Y	IMR

Routing instructions (end points):

Sequence Number	Call Routing
1	If location information is unavailable or corrupted, divert the call to PSAP A
2	If PSAP A is unavailable, divert the call to PSAP B
3	If PSAP B is unavailable, divert the call to PSAP C
4	If PSAP C is unavailable, divert the call to the IMR
5	If the IMR is unavailable, provide a “fast busy”

Routing instructions (call queues):

Rule Priority	Call Routing
1	If (ECRF does not return valid target URI) and (QueueState PSAP_A_DEFAULT ROUTE_QUEUE=”Active”) then route to PSAP_A_Default_Route_Call_Queue
2	If (QueueState PSAP_B_DEFAULT ROUTE_QUEUE=”Active”) then route to PSAP_B_Default_Route_Call_Queue
3	If (QueueState PSAP_C_DEFAULT ROUTE_QUEUE=”Active”) then route to PSAP_C_Default_Route_Call_Queue Default_Route_Call_Queue,
4	If (QueueState IMR_DEFAULT ROUTE_QUEUE=”Active”) then route to IMR_Default_Route_Call_Queue
5	If (true) then Busy

3.4.1.1.2 Enhanced

Category: ESRP-wide Policies
Sub-Category: Default Routing
Sub-Sub-Category: Enhanced NG9-1-1Routing
PUC Rules affecting policy: None

Short situation description: Calls diverted when caller location is not delivered or is corrupted

Situation Description: If a call is delivered to the ESRP without location in the header or if the location information is corrupted, the destination PSAP cannot be determined. A PRR must be established to provide the ESRP with routing instructions. This rule takes advantage of the ability to have multiple PSAPs answer calls rather than assigning one PSAP as the default destination for all calls.

Situation Characteristics:

Criteria to use to determine if situation exists:

	Data to Use	Data Value
X	The location used for routing, expressed as PIDF.<element name>	Blank or corrupted
X	Service State	If Service State is not "Normal"

Entities agreeing to take calls (based on inter-agency agreements):

Used in this Policy	Agreements in place?	Alternative Destination
Y	Y	PSAP A
Y	Y	PSAP B
Y	Y	PSAP C
Y	Y	IMR

Routing instructions (end points):

Sequence Number	Call Routing
1	If location information is unavailable or corrupted, divert the call to PSAP A, PSAP B and PSAP C if available
2	If PSAP A, B, and C are all unavailable, divert the call to an IMR

Routing instructions (call queues):

Sequence Number	Call Routing
1	If (ECRF does not return valid target URI) and (QueueState Shared_DEFAULT ROUTE_QUEUE=”Active”) then route to shared_Default_Route_Call_Queue
2	If (QueueState SIMR_DEFAULT ROUTE_call_QUEUE=”Active”) then route to IMR_Default_Route_Call_Queue
3	If (true) then busy

3.4.2 9-1-1 Authority Policies

3.4.2.1 PSAP Scheduled Outages

3.4.2.1.1 After Hours

3.4.2.1.1.1 Standard

Category: 9-1-1 Authority Policies
Sub-Category: Scheduled Outages
Sub-Sub-Category: After Hours
Sub-Sub-Sub-Category: Standard (E9-1-1-like) Routing
PUC Rules affecting policy: None

Short situation description: Calls diverted when the PSAP closes during the week.

Situation Description: PSAP A is scheduled to take calls Monday through Sunday from 9:00 am to midnight. Beginning at midnight, all calls destined for PSAP A are sent to other PSAPs. At 9:00 am the following morning, calls initiated from PSAP A's coverage area are again sent to PSAP A.

Situation Characteristics:

Criteria to use to determine if situation exists:

	Data to Use	Data Value
X	Time of Day, expressed as TimeOfDay or DayOfWeek, where TimeOfDay is wall clock time (0000 to 2359) and DayOfWeek is Mon, Tue, Wed, Thu, Fri, Sat, Sun.	09:00 to 23:59
X	Service State	If Service State is "Normal"

Entities agreeing to take calls (based on inter-agency agreements):

Used in this Policy	Agreements in place?	Alternative Destination
Y	Y	PSAP A
Y	Y	PSAP B
Y	Y	PSAP C
Y	Y	PSAP D
Y	Y	IMR

Routing instructions:

Sequence Number	Call Routing
1	If PSAP A is closed, divert calls to PSAP B
2	If PSAP B is unavailable, divert calls to PSAP C
3	If PSAP C is unavailable, divert calls to the PSAP D
4	If PSAP D is unavailable, divert calls to the IMR
5	If the IMR is unavailable, provide a “fast busy”

Routing instructions (call queues):

Sequence Number	Call Routing
1	IF ((timestart=”000001”) and (timeend=”090000”) and (byweekday=”MO,TU,WE,TH,FR”) and (QueueState(PSAP_B_After_Hours_Call_Queue_For_PSAP_A)=”Active”)) THEN route PSAP_B_After_Hours_Call_Queue_For_PSAP_A
2	IF (QueueState(PSAP_C_After_Hours_Call_Queue_For_PSAP_A)=”Active” THEN route PSAP_C_After_Hours_Call_Queue_For_PSAP_A
3	IF (QueueState(PSAP_D_After_Hours_Call_Queue_For_PSAP_A)=”Active” THEN route PSAP_D_After_Hours_Call_Queue_For_PSAP_A
4	IF (QueueState(IMR_After_Hours_Call_Queue_For_PSAP_A=”Active” THEN route IMR_After_Hours_Call_Queue_For_PSAP_A
5	IF (true) THEN Busy

3.4.2.1.2 Maintenance

3.4.2.1.2.1 Standard

Category: 9-1-1 Authority Policies
Sub-Category: PSAP Scheduled Outages
Sub-Sub-Category: Maintenance
Sub-Sub-Sub-Category: Standard (E9-1-1-like) Routing
PUC Rules affecting policy: None

Short situation description: Calls diverted when the PSAP has scheduled maintenance

Situation Description: PSAP A is scheduled for maintenance every Tuesday from 0900 to 1000. All calls destined for PSAP A are diverted during the maintenance window

Situation Characteristics:

Criteria to use to determine if situation exists:

	Data to Use	Data Value
X	Service State	Service State is Scheduled Maintenance

Entities agreeing to take calls (based on inter-agency agreements):

Used in this Policy	Agreements in place?	Alternative Destination
Y	Y	PSAP A
Y	Y	PSAP B
Y	Y	PSAP C
Y	Y	PSAP D
Y	Y	IMR

Routing instructions:

Sequence Number	Call Routing
1	If PSAP A is closed for maintenance, divert calls to PSAP B
2	If PSAP B is unavailable, divert calls to PSAP C
3	If PSAP C is unavailable, divert calls to PSAP D
4	If PSAP D is unavailable, divert calls to the IMR
5	If the IMR is unavailable, provide a “fast busy”

Routing instructions (call queues):

Sequence Number	Call Routing
1	If PSAP A Service Status = “Scheduled Maintenance” and (QueueState(PSAP_B_Maintenance_Call_Queue_For_PSAP_A)=”Active”)) THEN route PSAP_B_Maintenance_Call_Queue_For_PSAP_A
2	If (QueueState(PSAP_C_Maintenance_Call_Queue_For_PSAP_A =”Active” THEN route PSAP_C_Maintenance_Call_Queue_For_PSAP_A
3	If (QueueState(PSAP_D_Maintenance_Call_Queue_For_PSAP_A =”Active” THEN route PSAP_D_Maintenance_Call_Queue_For_PSAP_A
4	If (QueueState(IMR_Maintenance_Call_Queue_For_PSAP_A =”Active” THEN route IMR_Maintenance_Call_Queue_For_PSAP_A
5	If (true) THEN Busy

3.4.2.2 Unscheduled Outages

3.4.2.2.1 Make busy

3.4.2.2.1.1 Standard

Category: 9-1-1 Authority Policies
Sub-Category: PSAP Unscheduled Outages
Sub-Sub-Category: Make Busy
Sub-Sub-Sub-Category: Standard (E9-1-1-like) Routing
PUC Rules affecting policy: None

Short situation description: Calls diverted when PSAP is unavailable due to "Make Busy"

Situation Description: If a condition at a PSAP requires call takers to stop taking calls, the PSAP activates the "make busy" switch which diverts calls to an alternate PSAP

Situation Characteristics:

Criteria to use to determine if situation exists:

	Data to Use	Data Value
X	Service State	"unmanned"

Entities agreeing to take calls (based on inter-agency agreements):

Used in this Policy	Agreements in place?	Alternative Destination
Y	Y	PSAP A
Y	Y	PSAP B
Y	Y	PSAP C
Y	Y	PSAP D
Y	Y	IMR

Routing instructions:

Sequence Number	Call Routing
1	If PSAP A is unavailable, divert calls to PSAP B
2	If PSAP B is unavailable, divert the call to PSAP C
3	If PSAP C is unavailable, divert the call to PSAP D
4	If PSAP D is unavailable, divert the call to the IMR
5	If the IMR is unavailable, provide a “fast busy”

Routing instructions (call queues):

Sequence Number	Call Routing
1	If PSAP A Service State = “Unmanned” and (QueueState(PSAP_B_Make_Busy_Call_Queue_For_PSAP_A)=”Active”)) THEN route PSAP_B_Make_Busy_Call_Queue_For_PSAP_A
2	If (QueueState(PSAP_C_Make_Busy_Call_Queue_For_PSAP_A)= ”Active”) THEN route PSAP_C_Make_Busy_Call_Queue_For_PSAP_A
3	If (QueueState(PSAP_D_Make_Busy_Call_Queue_For_PSAP_A) =”Active”) THEN route PSAP_D_Make_Busy_Call_Queue_For_PSAP_A
4	If (QueueState(IMR_Make_Busy_Call_Queue_For_PSAP_A) =”Active”) THEN route IMR_Make_Busy_Call_Queue_For_PSAP_A
5	If (true) THEN Busy

3.4.2.3 Unscheduled Outages

3.4.2.3.1 Unreachable

3.4.2.3.1.1 Standard

Category: 9-1-1 Authority Policies
Sub-Category: PSAP Unscheduled Outages
Sub-Sub-Category: PSAP Unreachable
Sub-Sub-Sub-Category: Standard (E9-1-1-like) Routing
PUC Rules affecting policy: None

Short situation description: Calls diverted when PSAP is unavailable due to equipment failure

Situation Description: When PSAP A is unreachable due to equipment failure, pre-established mutual-aid agreements describe to where calls are diverted.

Situation Characteristics:

Criteria to use to determine if situation exists:

	Data to Use	Data Value
X	Service State	"Service Disruption"

Entities agreeing to take calls (based on inter-agency agreements):

Used in this Policy	Agreements in place?	Alternative Destination
Y	Y	PSAP A
Y	Y	PSAP B
Y	Y	PSAP C
Y	Y	IMR

Routing instructions:

Sequence Number	Call Routing
1	If PSAP A is unavailable, divert calls to PSAP B
2	If PSAP B is unavailable, divert calls to PSAP C

3	If PSAP C is unavailable, divert calls to the IMR
4	If the IMR is unavailable, provide a “fast busy”

Routing instructions (call queues):

Sequence Number	Call Routing
1	If PSAP A Service State= “Unmanned” and (QueueState(PSAP_B_Unmanned_Call_Queue_For_PSAP_A)=”Active”)) THEN route PSAP_B_Unmanned_Call_Queue_For_PSAP_A
2	If (QueueState(PSAP_C_Unmanned_Call_Queue_For_PSAP_A)=”Active” THEN route PSAP_C_Unmanned_Call_Queue_For_PSAP_A
3	If (QueueState(IMR_Unmanned_Call_Queue_For_PSAP_A)= ”Active” THEN route IMR_Unmanned_Call_Queue_For_PSAP_A
4	If (true) THEN Busy

3.4.2.3.1.2 Enhanced

Category: 9-1-1 Authority Policies
Sub-Category: PSAP Unscheduled Outages
Sub-Sub-Category: PSAP Unreachable
Sub-Sub-Sub-Category: Enhanced NG9-1-1 Routing
PUC Rules affecting policy: None

Short situation description: Calls diverted when PSAP is unavailable due to equipment failure

Situation Description: When PSAP A is unreachable due to equipment failure, pre-established mutual-aid agreements describe to where calls are diverted.

Situation Characteristics:

Criteria to use to determine if situation exists:

	Data to Use	Data Value
X	Service State	"Service Disruption"

Entities agreeing to take calls (based on mutual aide agreements):

Used in this Policy	Agreements in place?	Alternative Destination
Y	Y	PSAP A
Y	Y	PSAP B
Y	Y	PSAP C
Y	Y	IMR

Routing instructions:

Sequence Number	Call Routing
1	If PSAP A is unavailable, divert calls to PSAP B
2	If PSAP B is unavailable, divert calls to PSAP C
3	If PSAP C is unavailable, divert calls to the IMR
4	If the IMR is unavailable, provide a "fast busy"

Routing instructions (call queues):

Sequence Number	Call Routing
1	If PSAP A Service State= “Service Disruption” and (QueueState(PSAP_B_Service_disruption_Call_Queue_For_PSAP_A)=”Active”) THEN route PSAP_B_Service_disruption_Call_Queue_For_PSAP_A
2	If (QueueState(PSAP_C_Service Disruption_Call_Queue_For_PSAP_A)=”Active” THEN route PSAP_C_Service Disruption_Call_Queue_For_PSAP_A)
3	(QueueState(IMR_Service_Disruption_Call_Queue_For_PSAP_A)= ”Active” THEN route IMR_Service_Disruption_Call_Queue_For_PSAP_A
4	If (true) THEN Busy

3.4.2.3.2 Evacuation

3.4.2.3.2.1 Enhanced

Category: 9-1-1 Authority Policies
Sub-Category: PSAP Unscheduled Outages
Sub-Sub-Category: Evacuation
Sub-Sub-Sub-Category: Enhanced NG9-1-1 Routing
PUC Rules affecting policy: None

Short situation description: Calls diverted when the PSAP must evacuate the primary center

Situation Description: PSAP A must evacuate the primary center and must divert all calls for a period of time.

Situation Characteristics:

Criteria to use to determine if situation exists:

	Data to Use	Data Value
X	Service State	"Unmanned"

Entities agreeing to take calls (based on inter-agency agreements):

Used in this Policy	Agreements in place?	Alternative Destination
Y	Y	PSAP A
Y	Y	PSAP B
Y	Y	PSAP C
Y	Y	PSAP D
Y	Y	IMR

Routing instructions:

Sequence Number	Call Routing
1	If PSAP A is evacuated, divert calls to PSAP B
2	If PSAP B is unavailable, divert calls to PSAP C
3	If PSAP C is unavailable, divert calls to PSAP D
4	If PSAP D is unavailable, divert calls to the IMR
5	If the IMR is unavailable, provide a “fast busy”

Routing instructions (call queues):

Sequence Number	Call Routing
1	If PSAP A Service State= “Evacuation” and (QueueState(PSAP_B_Evacuation_Call_Queue_For_PSAP_A)=”Active”)) THEN route to (PSAP_B_Evacuation_Call_Queue_For_PSAP_A)
2	If (QueueState(PSAP_C_Evacuation_Call_Queue_For_PSAP_A)=”Active” THEN route to (PSAP_C_Evacuation_Call_Queue_For_PSAP_A)
3	If (QueueState(PSAP_D_Evacuation_Call_Queue_For_PSAP_A)=”Active” THEN route to (PSAP_D_Evacuation_Call_Queue_For_PSAP_A)
4	If (QueueState(IMR_Evacuation_Call_Queue_For_PSAP_A)=”Active” THEN route to (IMR_Evacuation_Call_Queue_For_PSAP_A)
5	If (true) THEN Busy

3.4.2.4 Large-Scale Outages

3.4.2.4.1 Regional Disaster

3.4.2.4.1.1 Enhanced

Category: 9-1-1 Authority Policies
Sub-Category: PSAP Unscheduled Outages
Sub-Sub-Category: Large-Scale Outages
Sub-Sub-Sub-Category: Enhanced NG9-1-1 Routing
PUC Rules affecting policy: None

Short situation description: Large-scale disaster

Situation Description: PSAPs in the same region agree to back each other up in case of a large-scale disaster. All PSAPs that are able to take calls have agreed to take them for all PSAPs that are not able to take calls.

Situation Characteristics:

Criteria to use to determine if situation exists:

	Data to Use	Data Value
X	Manual declaration	majorIncidentInProgress

Entities agreeing to take calls (based on inter-agency agreements):

Used in this Policy	Agreements in place?	Alternative Destination
Y	Y	PSAP A
Y	Y	PSAP B
Y	Y	PSAP C
Y	Y	PSAP D
Y	Y	PSAP E
Y	Y	PSAP F
Y	Y	PSAP G
Y	Y	IMR

Routing instructions:

Sequence Number	Call Routing
1	If a disaster is declared, and PSAP A is unavailable, send its calls to PSAPs B, C, D, E, F, and G
2	If PSAP B is unavailable, send its calls to PSAPs C, D, E, F, and G
3	If PSAP C is unavailable, send its calls to PSAPs D, E, F, and G
4	If PSAP D is unavailable, send its calls to PSAPs E, F, and G
5	If PSAP E is unavailable, send its calls to PSAPs F and G
6	If PSAP F is unavailable, send its calls to PSAPs G
7	If none of the PSAPs are available send all calls to the IMR

Routing instructions (call queues):

Sequence Number	Call Routing
1	If a disaster is declared and QueueState(PSAP_Standard_Operations_call_Queue)<>"active" and QueueState (Regional_Disaster_Call_Queue) = "active" then route to Regional_Disaster_Call_Queue
2	If QueueState (State_Disaster_Call_Queue) = "Active" then route to State_Disaster_Call_Queue

3	If QueueState (IMR_Disaster_Call_Queue) =“Active” then route to IMR_Disaster_Call_Queue
4	If (true) then Busy

3.4.2.5 Large-Scale Outages

3.4.2.5.1 Regional Disaster

3.4.2.5.1.1 Enhanced

Category: 9-1-1 Authority Policies
Sub-Category: PSAP Large-Scale Outages
Sub-Sub-Category: Regional Disasters
Sub-Sub-Sub-Category: Enhanced NG9-1-1 Routing
PUC Rules affecting policy: None

Short situation description: Large scale disaster with notifications to other stakeholders and delivery to another ESRP

Situation Description: PSAPs in the same region agree to back each other up in case of a large-scale disaster. All PSAPs that are able to take calls have agreed to take them for all PSAPs that are not able to take calls. In a large scale disaster, it is also useful to notify other stakeholders such as the Department of Public Works and Local Emergency Rooms. It is also possible that all PSAPs served by a single ESRP "A" may be unable to take calls; in this case, calls may be sent to a different ESRP "B" that services PSAPs that are in service.

Situation Characteristics:

Criteria to use to determine if situation exists:

	Data to Use	Data Value
X	ECRF query results (Normal-NextHop).	

Entities agreeing to take calls (based on inter-agency agreements):

Used in this Policy	Agreements in place?	Alternative Destination
Y	Y	PSAP A
Y	Y	PSAP B
Y	Y	PSAP C
Y	Y	PSAP D
Y	Y	PSAP E
Y	Y	PSAP F

Y	Y	PSAP G
Y	Y	ESRP B

Routing instructions:

Sequence Number	Call Routing
1	If PSAP A is unavailable due to the disaster, divert calls to PSAPs B, C, D, E, F, and G if they are available.
2	If PSAP B is unavailable, divert calls to PSAPs C, D, E, F, and G
3	If PSAP C is unavailable, divert calls to PSAPs D, E, F and G
4	If PSAP D is unavailable, divert calls to PSAP E, F and G
6	If PSAP E is unavailable, divert calls to PSAP F and G
7	If PSAP F is unavailable, divert calls to PSAP G
8	If PSAP G is unavailable, divert calls to ESRP B
9	If ESRP B is unavailable, provide a "fast busy"

Routing instructions (call queues):

Sequence Number	Call Routing
1	If a disaster is declared and QueueState(PSAP_Standard_Operations_call_Queue)<>"active" and QueueState (Regional_Disaster_Call_Queue) = "active" then route to Regional_Disaster_Call_Queue
2	If QueueState (State_Disaster_Call_Queue) = "Active" then route to State_Disaster_Call_Queue
3	If Service State (ESRP B) = "Available" then route to ESRP B
4	If (IMR_Disaster_Call_Queue) ="Active" then route to IMR_Disaster_Call_Queue
5	If (true) then Busy

Notes on examples above:

1. A PSAP may have a mutual aide agreement with other PSAPs that cover some or all of the situations outlined above. In that case, only one set of routing rules is required. Documenting a set of routing rules for each situation individually gives the PSAP the highest level of flexibility.

4 Prioritization of Rules

In the event that conditions for multiple PRRs are met, the following order should be used to determine which PRR to implement.

Priority	Rule number (all preceeded by 3.5)	Rule name
	2.3.1.1 or 2.3.1.2	Major Disaster
	2.2.4.1	PSAP evacuated the primary center
2	2.2.2.1 or 2.2.2.2	PSAP Unreachable
3	2.2.1.1	PSAP unreachable due to Make Busy
4	2.2.3.1	PSAP Call Queue Reached pre-established threshold
5	2.1.1.1	Scheduled after hours
6	2.1.2.1	Scheduled maintenance
10	1.1.1 or 1.1.2	Default routing

5 Review and Update

PSAPs and 9-1-1 Authorities should establish and enforce a periodic review process for routing rules that assures that the rules are reviewed:

1) On an annual basis as a group by all impacted PSAPs, and;

2) When a PSAP changes affiliations that may impact the rules, and;

3) When network changes are made that may impact the rules or the activation procedures for rules.

6 Recommended Reading and References

- NENA 71-502, v1, Overview of Policy Rules for Call Routing and Handling in NG9-1-1
- NENA 08-003, v1, Detailed Functional and Interface Standards for the NENA i3 Solution

7 Previous Acknowledgments

Not applicable. This is the initial standard.