

# NENA Recommendation for an E9-1-1 Functional Entity Model

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Recommendation for an E9-1-1 Functional Entity Model

Prepared by:  
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## NENA TECHNICAL REFERENCE

### Disclaimer

The National Emergency Number Association (NENA) as a guide and recommendation publishes this Technical Reference as a basis for defining 9-1-1 service functionality. It may support work in standards bodies, as well as the definition of additional 9-1-1 service functionality, and it may support 9-1-1 service-provider network designers and manufacturers of Enhanced 9-1-1 equipment. It is not intended to provide complete design specifications or parameters, or to assure the quality of performance of networks or equipment.

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The NENA Network Technical Committee has developed this document. The NENA executive board has recommended this document for industry acceptance. Recommendations for change to this document may be submitted to:

National Emergency Number Association  
P.O. Box 360960  
Columbus Ohio, 43236  
Tel: 800-332-3911  
Fax: 614-933-0911

## 1. INTRODUCTION

### *1.1. Purpose*

Recent changes in the regulatory environment with respect to E9-1-1 Service are impacting the service architectures being defined within wireless networks. Support of Phase II requirements will make enhancements to existing E9-1-1 functionality necessary. The definition of service architectures to support new Phase II functionality will impact both wireless and wireline networks. Since both wireless and wireline networks will play a role in processing an increasing number of Emergency Calls, it is critical that the interconnection of these networks be based on a common understanding of the functions and interfaces supported by each network. A clear definition of E9-1-1 Service at a functional level is needed to facilitate the definition of meaningful and consistent standards which support existing and enhanced E9-1-1 Service functionality, and to facilitate network interconnection for the purpose of processing Emergency Calls.

This NENA document will serve as a reference document on E9-1-1 Service and its associated functionality for use by standards bodies, such as T1S1 and ANSI TR45.2. This document is meant to be a living document that is updated as new architectures, new technologies and E9-1-1 Service functionalities are created.

### *1.2. Overview and Benefits*

This document contains a set of Functional Entities (FEs) that address a portion of the Functional Entity Model for E9-1-1 Service. The FEs defined in this document address the functionality applied by a wireline network and a PSAP to an incoming Emergency Call. These FEs are applicable to Emergency Calls originating in a variety of networks including wireless networks under Phase I and Phase II, wireline networks, and Voice Over IP (VoIP) networks. It is expected that the Functional Entity Model will be refined and updated as new functions, technologies, and architectures with respect to E9-1-1 Service evolve. This document is intended to provide input to the T1S1 Committee and the TR45.2 Ad Hoc Committee on Emergency Services to assist them in the definition of standards that support existing and enhanced E9-1-1 functionality in a consistent manner.

## 2. Reason for Reissue

NENA reserves the right to modify the Technical Reference. Whenever it is reissued, the reason(s) will be provided in this paragraph. This is the first issue of this document.

## 3. Copyright and Responsibility

This practice was written by the NENA Network Technical Committee. The NENA Executive Board has recommended this practice for industry acceptance and use. For more information about this practice, contact:

Billy Ragsdale  
NENA Technical Liaison  
770-207-9512

Or

Bob Gojanovich  
NENA Network Technical Committee Chair  
908-835-8505

## 4. Acronyms and Terms

The [NENA Master Glossary of 9-1-1 Terminology](#) may be accessed at:

<ftp://ftp.nena9-1-1.org/pub/Standards/NENAMG.PDF>

## 5. Emergency Services Functional Entities

### ***5.1 Functional Entity Model***

This section describes a functional entity model to realize E9-1-1 Service. A functional entity (FE) is a group of functions that cannot be split across multiple nodes. Multiple functional entities can be implemented in a single node. A functional entity may be implemented in more than one node. Thus each functional entity could be implemented in more than one kind of telecommunications equipment (e.g., in terminal equipment, or in a switching machine) or in more than one telecommunications network. Functional entities may be combined in a single piece of telecommunications equipment. Figure 1 shows the functional entity model associated with E9-1-1 Service.

### Description of Functional Entity (FE 1) – Detection

FE 1 is a functional entity which, when invoked, determines that Emergency Services processing should be applied to a call, based on incoming trunk group and/or signaled information associated with an incoming call.

### Description of Functional Entity (FE 2) - E9-1-1 Call Processing

FE 2 is a functional entity which, when invoked by FE 1, will apply E9-1-1 call processing to an incoming call. E9-1-1 call processing includes delivery/routing of an Emergency Services call to/toward a PSAP based on the routing information collected from FE 3 and/or FE 4, along with call identification, whenever such information is available, as well as transfer of Emergency Calls when invoked by FE 6.

### Description of Functional Entity (FE 3) – Initial Selective Routing Information Determination

FE 3 is a functional entity which, when invoked by FE 2, uses received call identification or location information to determine the correct primary PSAP toward which to route the call, along with other Emergency Service Number (ESN) information (e.g., whether a “flashing display” should be used when calls are delivered to that PSAP). This determination may be influenced by the time of day at which the Emergency Services call is detected.

### Description of Functional Entity (FE 4) – Alternate/Default Routing Determination

FE 4 is a functional entity which, when invoked by FE 2, will determine an alternate PSAP to which to route the Emergency Services call under conditions of failure or traffic busy, along with related ESN information.

### Description of Functional Entity (FE 5) – PSAP End User

FE 5 is a functional entity which, when invoked by FE 2, will process an Emergency Call that is delivered to it.

### Description of Functional Entity (FE 6) – Call Transfer

FE 6 is a functional entity which, when invoked by FE 5, will determine the PSAP to which the call should be transferred, and will invoke FE 2 to effect the transfer of the Emergency Call to the new PSAP.

### Description of Functional Entity (FE 7) – Callback

FE 7 is a functional entity which, when invoked by FE 5, will use the callback number received from FE 5 to invoke the Basic Call (BC) Functional Entity to initiate a call to the party that originated a previously received Emergency Services call.

### Description of Functional Entity (FE 8) – Receipt of Call Information

FE 8 is a functional entity which, when invoked, is capable of receiving “real time” call information (e.g., caller location, caller identification, subscriber information) from the network user that generates the caller information.

### Description of Functional Entity (FE 9) – Storage/Maintenance of Call Information

FE 9 is a functional entity which, when invoked, will maintain and store/buffer call information received from FE 8 and/or provisioning, and associate it with other stored call information, for an implementation-dependent period of time.

### Description of Functional Entity (FE 10) – Obtain Call Information

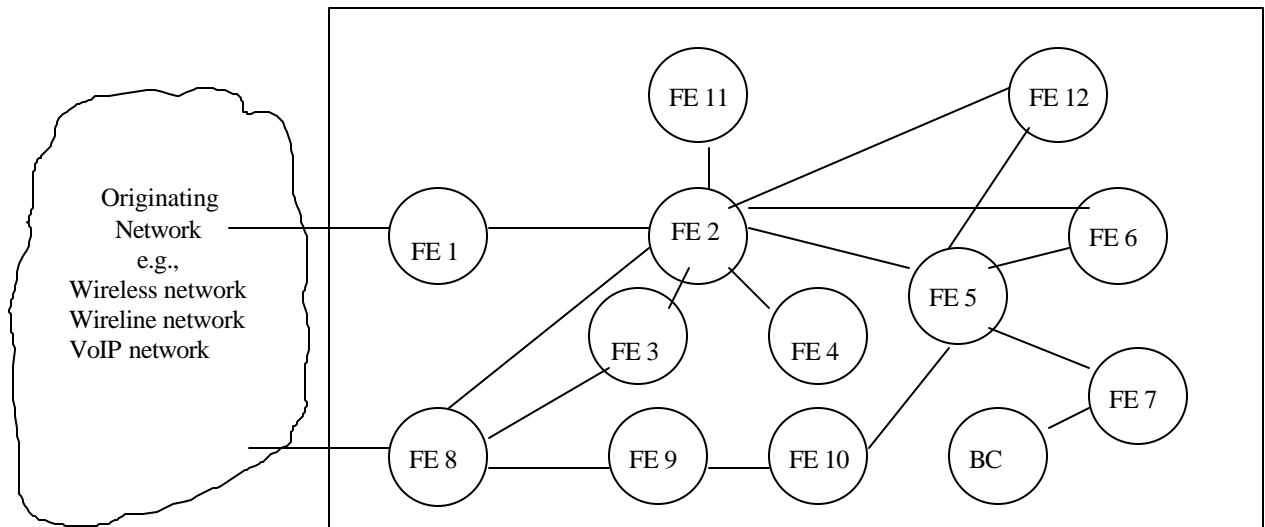
FE 10 is a functional entity which, when invoked by FE 5, is capable of requesting call information from FE 9. This information may include caller location information, caller identification information, and/or subscriber information.

### Description of Functional Entity (FE 11) – 9-1-1 Call Hold

FE 11 is a functional entity which, when invoked by FE 2, will hold, or maintain as a call, the connection associated with an Emergency Call between the caller and the PSAP call-taker even if the caller attempts to disconnect or hang up. This functionality is optional within some wireline networks and is necessary to support invocation of FE 12 by FE 5.

### Description of Functional Entity (FE 12) – Ringback

FE 12 is a functional entity which, when invoked by FE 5, will result in the initiation of a ringback to the calling party that originated the Emergency Services call, invoking FE 2 to effect the ringback.



**Figure 1 – FE Model for E9-1-1 Service**

## 5.2 Information Flow Model

Figure 1 illustrates the information flow model between the functional entities associated with Emergency Services. FE 1 is invoked by the receipt of an incoming call or call request. If FE 1 detects the existence of an Emergency Call, it will pass call information that is received with the call to FE 2.

FE 2 may also receive caller information (e.g., caller location) from FE 8. FE 2 passes information received from FE 1 and/or FE 8 to FE 3. FE 3 may also receive caller information directly from FE 8. FE 3 uses received information to determine the primary PSAP for the call. FE 3 will return the identity of the primary PSAP to FE 2, which will attempt to route the Emergency Call to the primary PSAP. If FE 2 determines that the call must be routed to an alternate/default PSAP (e.g., due to failure or traffic busy), it will invoke FE 4. FE 4 will determine alternate/default PSAP(s) for the call based on the information provided by FE 2.

Once FE 2 determines the destination PSAP (using information provided by FE3 and/or FE 4), FE 2 progresses the call, causing FE 5 to be invoked. FE 2 will provide caller identification information, if available, to FE 5.

FE 2 may also invoke FE 11, if this option has been included as part of emergency service, as agreed to by the governing unit responsible for emergency services, e.g. state, county, municipality, or province, and the network provider.

FE 6 and FE 7 may be invoked by FE 5. If FE 5 determines that the Emergency Call must be transferred to another PSAP, it will invoke FE 6. FE 6 will determine the PSAP to which the call should be transferred based on information from FE 5, and will invoke FE 2 to effect the transfer of the Emergency Call to the new PSAP. If FE 5 determines that a callback is necessary, and it has obtained call identification information (i.e., from FE 2 or from FE 10), it will invoke FE 7. FE 7 will use the callback number received from FE 5 to invoke the Basic Call (BC) Functional Entity to initiate a call to the party that originated the Emergency Services call.

FE 8 will receive caller information from a network user that generates the information. FE 8 will provide information to FE 2 if caller information (e.g., caller location) is conveyed in call setup signaling, and may provide information to FE 3. FE 8 will provide information to FE 9, which will maintain and store or buffer the information. FE 10 may be invoked by FE 5 to obtain caller information (e.g., caller location) from FE 9 related to an Emergency Call that is being processed. FE 12 may be invoked by FE 5 if FE 5 determines that a ringback is necessary. FE 12 will invoke FE 2 to effect the ringback and requires the previous invocation of FE 11.

### ***5.3 Allocation of Functions to Equipment***

FE 1, which is responsible for detecting an Emergency Call, will reside in a switching system. FE 2, which is responsible for performing 9-1-1 call processing, will also reside in a switching system. FE 11, which allows the connection associated with an Emergency Call to be held, will reside in the same switching system as FE 2. Initial selective routing (FE 3) can either reside in the same switching system as FE 2 or at an external database that is queried by the switching system at which FE 2 resides. Likewise, FE 4 can be performed within the same switching system or in an external database queried by the switching system. The PSAP End User Functional Entity (FE 5) resides outside of the network. FE 6, FE 7, and FE 12 reside in the same node as FE 5, outside of the network.

FE 8 may reside at a switching system or a database. FE 9 will reside at a database (e.g., ALI, other network database, or external database) that supports storage and maintenance of call information. FE 10 will reside outside of the network, in the same node as FE 5.

## **6. Acknowledgements**



This Recommendation has been created through the cooperative efforts of:

**The 9-1-1 Functional Entity Model Study Group:**

Al Aldecocea - U S WEST  
Charles Bell - Sprint  
Bernard Brabant - Bell Canada  
Tom Breen - BellSouth  
Darryl Brown - SignalSoft  
Kirk Carlson - Synacom Technology  
Debbie Guyton - Telcordia Technologies, Inc. - Chair  
Andy Humphries - HBF Group  
Dick Khan - SBC/Pacific Bell  
Beth Ozanich - SCC Communications  
Terry Reese - Telcordia Technologies, Inc.  
Keith Ritchie - Stentor  
Eric Sorensen - SCC Communications  
Paul Stoffels - Ameritech  
Wesley Tilley - Nortel Networks  
Alain Tremblay - CML Technologies, Inc.  
Randy Wynn - GTE

which is part of

The NENA Network Technical Committee:

For a current roster of NTC members, please see:

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