



ATIS-0500037

ATIS Standard on -

**Overview of how an IMS Originating Network
Interfaces to an E9-1-1 or NG9-1-1 System**



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Overview of how an IMS Originating Network Interfaces to an E9-1-1 or NG9-1-1 System

Alliance for Telecommunications Industry Solutions

Approved June 2018

Abstract

This Technical Report provides an overview of ATIS-0700015.v003, *Implementation of 3GPP Common IMS Emergency Procedures for IMS Origination and ESInet/Legacy Selective Router Termination*, that may aid Public Safety in understanding the application of this standard as it relates to the migration to NG9-1-1.

Foreword

The Alliance for Telecommunications Industry Solutions (ATIS) serves the public through improved understanding between carriers, customers, and manufacturers. The Emergency Services Interconnection Forum (ESIF) provides a forum to facilitate the identification and resolution of technical and/or operational issues related to the interconnection of wireline, wireless, cable, satellites, Internet, and emergency services networks.

The mandatory requirements are designated by the word *shall* and recommendations by the word *should*. Where both a mandatory requirement and a recommendation are specified for the same criterion, the recommendation represents a goal currently identifiable as having distinct compatibility or performance advantages. The word *may* denotes an optional capability that could augment the standard. The standard is fully functional without the incorporation of this optional capability.

Suggestions for improvement of this document are welcome. They should be sent to the Alliance for Telecommunications Industry Solutions, Emergency Services Interconnection Forum (ESIF), 1200 G Street NW, Suite 500, Washington, DC 20005.

At the time of consensus on this document, ESIF, which was responsible for its development, had the following leadership:

- R. Hixson, ESIF Chair (NENA)
- R. Marshall, ESIF 1st Vice-Chair (Comtech)
- J. Green, ESIF 2nd Vice-Chair (Sprint)
- C. Militeau, ESIF NGENS Co-Chair (West Safety Service)
- T. Reese, ESIF NGENS Co-Chair (Ericsson)

The Next Generation Emergency Services (NGES) Subcommittee was responsible for the development of this document.

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ATIS Standard on –

Overview of how an IMS Originating Network Interfaces to an E9-1-1 or NG9-1-1 System

1 Scope, Purpose, & Application

This Technical Report provides an overview of interfaces between IP Multimedia Subsystem (IMS)-based carriers and Public Safety 9-1-1 service systems (as described in ATIS-0700015).

ATIS-0700015, Implementation of 3GPP Common IMS Emergency Procedures for IMS Origination and ESInet/Legacy Selective Router Termination, identifies and adapts as necessary 3GPP common IMS emergency procedures for applicability in North America. IMS is a global telecommunications standard developed by 3GPP that supports emergency communications originating from an IMS subscriber (fixed, nomadic, or mobile) and delivered to an E9-1-1 system or to an NG9-1-1 Emergency Services IP network (ESInet). The first version of this standard was limited to voice and Global Text Telephony (GTT¹) communication. A subsequent version of ATIS-0700015 included procedures for addressing additional media (i.e., text, pictures, video) in support of Multimedia Emergency Services (MMES).

For calls destined to legacy emergency services networks, ATIS-0700015 results in the same signaling when delivering emergency calls from IMS-based originating networks as for emergency calls from legacy originating networks. Therefore, operators of those networks and the Public Safety Answering Points (PSAPs) behind them should expect no changes in their processes.

For calls destined to NG9-1-1 ESInets, ATIS-0700015 results in the same signaling when delivering emergency calls from an IMS-based originating network as is defined for delivering calls from IP-based originating networks toward NG9-1-1 PSAPs. Therefore, operators of ESInets and the PSAPs behind them should anticipate similar processes as with other IP-originating networks.

2 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

[Ref 1]: ATIS-0700015.v003, *Implementation of 3GPP Common IMS Emergency Procedures for IMS Origination and ESInet/Legacy Selective Router Termination*.²

[Ref 2]: ATIS-0500026, *Operational Impacts on Public Safety of ATIS-0700015, Implementation of 3GPP Common IMS Emergency Procedures for IMS Origination and ESInet/Legacy Selective Router Termination*.²

3 Informative References

[Ref 100]: NENA-STA-010.2-2016 (originally 08-003), *NENA Detailed Functional and Interface Standards for the NENA i3 Solution*, Version 2.³

¹ In North America GTT is referred to as Real Time Text (RTT).

² This document is available from ATIS, 1200 G Street N.W., Suite 500, Washington, DC 20005 at: < <https://www.atis.org/docstore/default.aspx> >.

³ This document is available from the National Emergency Number Association (NENA). < <http://www.nena.org/> >.

- [Ref 101]: NENA-STA-005.1-2017, *NENA Standards for the Provisioning and Maintenance of GIS data to ECRF and LVFs*.³
- [Ref 102]: NENA-ADM-000.21.1-2018, *NENA Master Glossary of 9-1-1 Terminology*.⁴
- [Ref 103]: Task Force on Optimal Public Safety Answering Point Architecture (TFOPA) Final Report and Supplements.⁵
- [Ref 104]: 3GPP 22.226, *Global Text Telephony (GTT), Stage 1*.⁶
- [Ref 105]: 3GPP 23.167, *IP Multimedia Subsystem (IMS) emergency sessions*.⁶

4 Definitions, Acronyms, & Abbreviations

For a list of common communications terms and definitions, please visit the *ATIS Telecom Glossary*, which is located at < <http://www.atis.org/glossary> >.

4.1 Definitions

Term	Description
3GPP	3rd Generation Partnership Project. A collaboration agreement that was established in December 1998. The collaboration agreement brings together a number of telecommunications standards bodies which are known as "Organizational Partners".
9-1-1 Authority	A State, County, Regional or other governmental entity responsible for 9-1-1 service operations. For example, this could be a county/parish or city government, a special 9-1-1 or Emergency Communications District, a Council of Governments, or other similar body. Note that various types of responsibilities may apply, such as funding, planning, management, and/or operations of certain service components.
Additional Data	Data that further describes the nature of how the call was placed, the person(s) associated with the device placing the call, or the location the call was placed from.
ALI	Automatic Location Identification. The automatic display at the PSAP of the caller's telephone number, the address/location of the telephone, and supplementary emergency services information of the location from which a call originates. Working with Automatic Number Identification, the use of a database to associate a physical location with a telephone number. ALI is a feature of Enhanced 9-1-1 (E9-1-1) systems. ALI is provided to agents answering E9-1-1 calls. It may include information such as name, phone number, address, nearest cross street, and special pre-existing conditions. On some systems, it may also provide the appropriate emergency service address for the particular address. ALI is retrieved from a computer database that may be held on site or at a remote location.
ANI	Automatic Number Identification. Telephone number associated with the access line from which a call originates.
Associated Location	A location (civic, geodetic, or polygon) within the designated PSAP jurisdiction that may be used in wireless call scenarios to route a call toward the designated PSAP. The Associated Location is determined via a static mapping from the cell/sector ID received in incoming signaling to a routing location which, when used to query the routing database, will return routing instructions that will cause the call to be directed toward the designated PSAP.
BCF	Border Control Function. Provides a secure entry into the ESInet for emergency calls presented to the network. The BCF incorporates firewall, admission control, and may include anchoring of session and media as well as other security mechanisms to prevent deliberate or malicious attacks on PSAPs or other entities connected to the ESInet.
By-Reference	An identifier that when used in the correct manner by an authenticated and authorized entity to query for information will yield the requested information (e.g., location-by-reference or additional data-by-reference).
By-Value	Information included in the body of the call setup message (e.g., location-by-value or additional data-by-value).

⁴ Available from the National Emergency Number Administration (NENA) at: < [NENA Master Glossary](#) >.

⁵ See < <https://www.fcc.gov/about-fcc/advisory-committees/general/task-force-optimal-public-safety-answering-point> >.

⁶ This document is available from the 3rd Generation Partnership Project (3GPP). < www.3gpp.org >.

Term	Description
Cell Centroid	A point within and at the center of the physical coverage area of a cell tower sector, as represented in a Geographic Information System (GIS).
E9-1-1	Enhanced 9-1-1. A telephone system which includes network switching, database, and PSAP premise elements capable of providing automatic location identification data, selective routing, selective transfer, fixed transfer, and a call back number. The term also includes any enhanced 9-1-1 service so designated by the Federal Communications Commission in its Report and Order in WC Docket Nos. 04-36 and 05-196, or any successor proceeding.
ECRF	Emergency Call Routing Function. A functional element in an ESInet which is a LoST protocol server where location information (either civic address or geo-coordinates) and a Service URN serve as input to a mapping function that returns a URI used to route an emergency call toward the appropriate PSAP for the caller's location or towards a responder agency. <ul style="list-style-type: none"> • External ECRF: An ECRF instance that resides outside of an ESInet instance. • Internal ECRF: An ECRF instance that resides within and is only accessible from an ESInet instance.
E-CSCF	Emergency Call Session Control Function. The entity in the IMS core network that handles certain aspects of emergency sessions – e.g. routing of emergency requests toward the correct emergency center or PSAP.
ESInet	Emergency Services Internet Protocol (based) Network. An ESInet is a managed IP network used for emergency services communications that can be shared by all public safety agencies. It provides the IP transport infrastructure upon which independent application platforms and core services can be deployed, including, but not restricted to, those necessary for providing NG9-1-1 services. ESInets may be constructed from a mix of dedicated and shared facilities. ESInets may be interconnected at local, regional, state, federal, national, and international levels to form an IP-based inter-network (network of networks). The term ESInet designates the network, not the services that ride on the network.
ESRP	Emergency Service Routing Proxy. A functional element which is a SIP proxy server that selects the next hop routing within the ESInet based on location and policy. There is an ESRP on the edge of the ESInet. There is usually an ESRP at the entrance to an NG9-1-1 PSAP. There may be one or more intermediate ESRPs between them. <ul style="list-style-type: none"> • Originating ESRP: The first routing element within the Next Generation Core Services (NGCS). It receives calls from the BCF at the edge of the ESInet. • Terminating ESRP: The last ESRP for a call in NGCS.
GTT	Global Text Telephony. The feature that add real time text conversation to any 3GPP conversational environment [Ref 104].
IBCF	Interconnect Border Control Function. The IBCF is a Session Initiation Protocol (SIP) Application Level Gateway (ALG) designed to facilitate interconnection between two service provider domains. Similar in role to a Session Border Controller (SBC), the IBCF performs functions such as IPv4 to IPv6 interworking, network topology hiding, SIP message screening, and transport plane control via the Transition Gateway (TrGW).
IMS	Internet Protocol Multimedia Subsystem. The IP Multimedia Subsystem comprises all 3GPP/3GPP2 core network elements providing IP multimedia services that support audio, video, text, and pictures alone or in combination delivered over a packet-switched domain.
LRF	Location Retrieval Function. The IMS associated functional entity that handles the retrieval of location information for the emergency caller including, where required, interim location information, initial location information and updated location information. The LRF may interact with a separate RDF or contain an integrated RDF in order to obtain routing information for an emergency call.
LS	Location Server. The general term for the entity responsible for obtaining the location of the User Equipment [Ref 105].
MGCF	Media Gateway Control Function. A system used in certain Voice over IP telephony architectures. An MGCF controls a number of Media Gateways or Media Servers. The MGCF receives signaling information (like dialed digits) from the Media Gateway and can be instructed to alert the called party, send and receive voice data, etc.
MMES	Multimedia Emergency Services. Next generation emergency services utilizing real-time session-based text and other multimedia, including voice, that are based on trusted applications in support of non-voice communications between citizens and Public Safety.
NG9-1-1	Next Generation 9-1-1. NG9-1-1 is an Internet Protocol (IP)-based system comprised of managed Emergency Services IP networks (ESInets), functional elements (applications), and databases that

Term	Description
	replicate traditional E9-1-1 features and functions and provides additional capabilities. NG9-1-1 is designed to provide access to emergency services from all connected communications sources and provide multimedia data capabilities for PSAPs and other emergency service organizations.
Nomadic	The nomadic user may move from one network connection to another but cannot maintain a communications session during that move. If the user is able to move over the course of the call without losing network connection then the user is considered to be mobile, not nomadic.
Originating IMS Network	An Originating IMS Network provides the ability for fixed nomadic or mobile users to make calls using IP signaling. In the context of this document, it is focused on the ability to make IP-based 9-1-1 calls. It is the originating IMS network's responsibility to forward 9-1-1 calls toward the serving emergency services network.
pANI	Pseudo Automatic Number Identification (routing number). A telephone number used to support routing of wireless 9-1-1 calls. It may identify a wireless cell, cell sector, or PSAP to which the call should be routed.
P-CSCF	Proxy Call Session Control Function. The P-CSCF is the first contact point for the user equipment within the IMS core network. For an IMS-based emergency call, the P-CSCF detects the emergency call and forwards it to an E-CSCF.
RDF	Routing Determination Function. The IMS-associated functional entity, which may be integrated in a Location Server (e.g., GMLC) or in an LRF and provides the proper outgoing address via the LRF to the E-CSCF for routing the emergency request towards a PSAP.
RTT	Real Time Text. Text transmitted instantly as it is typed or created. In North America, an RTT call will have a voice and a text media component.
SRDB	Selective Routing Database. The routing table that contains telephone number to ESN relationships which determines the routing of 9-1-1 calls.
User Equipment	A device allowing a user access to network services.

4.2 Acronyms & Abbreviations

APCO	Association of Public-Safety Communications Officers
ATIS	Alliance for Telecommunications Industry Solutions
ESIF	Emergency Services Interconnection Forum (an ATIS Committee)
GIS	Geographic Information System
IP	Internet Protocol
LVF	Location Validation Function
NENA	National Emergency Number Association
NGES	Next Generation Emergency Services (an ATIS subcommittee)
NGIIF	Next Generation Interconnection Interoperability Forum
PSAP	Public Safety Answering Point
PTSC	The Packet Technologies and Systems Committee (an ATIS Committee)
SIP	Session Initiation Protocol
SR	Selective Router or Selective Routing (depending on context)
URI	Uniform Reference Identifier
VPC	Voice (over Internet Protocol) Positioning Center
WTSC	Wireless Technology and Systems Committee (an ATIS Committee)

5 Assumptions

The following assumptions provide background information and/or were used in developing ATIS-0700015.v003:

1. A 9-1-1 Public Safety service system means the central call⁷ routing and data handling functions that connect to PSAPs. This does not include PSAP-specific equipment (i.e., CPE, CAD). For the purposes of this document, the 9-1-1 Public Safety service system consists of services and capabilities that provide location validation, Class of Service, and acquisition of additional data as needed for a call for service, policy routing controls, etc.
2. The capabilities of 9-1-1 services (E9-1-1, NG9-1-1) have to be considered when handling an emergency call due to differing levels of functionality among the systems.
3. This standard [ATIS-0700015.v003] supports fixed, nomadic, and mobile callers.
4. This standard [ATIS-0700015.v003] is aligned with 3rd Generation Partnership Project (3GPP) Release 12, with North American extensions/restrictions.
5. Emergency calls are sent to either an E9-1-1 or an NG9-1-1 System.
6. The Originating IMS network (i.e., the network initiating 9-1-1 calls) will determine the appropriate emergency services network (e.g., an NG9-1-1 ESInet).
7. ESInets are not the same as and are not exclusive to NG9-1-1 systems. The term ESInet designates the network, not the services that ride on the network.
8. A user's device may or may not be capable of independently determining its location (i.e., location services may not be enabled on the device).
9. Methods of location determination are outside the scope of this standard [ATIS-0700015.v003].
10. A civic address associated with the user equipment, if present, is validated and the validation process is out of the scope of this standard [ATIS-0700015.v003].
11. A pre-assigned Associated Location is used in some wireless routing scenarios where the cell address/sector or cell centroid cannot be used to route a call to the NG9-1-1 ESInet or the E9-1-1 Selective Router.
12. An originating network and user equipment may support some or all media types.
13. The process used to negotiate the user's preferred language(s) is out of the scope of this standard [ATIS-0700015.v003].
14. This standard [ATIS-0700015.v003] only addresses emergency service use of IMS in the originating network. It does not address use of legacy services (e.g., SMS to 9-1-1) in an emergency or the interworking of legacy services with IMS.

6 Conceptual Architecture

Figure 6.1 illustrates a conceptual architecture for ATIS-0700015. The boxes shown in the Originating IMS Network are functions required to accept the call from the access network, process it, and deliver it to the appropriate 9-1-1 network. This standard is based upon 3rd Generation Partnership Project standards and extends them as necessary for introduction in North America. An example of an extension is the need to support interconnection with both legacy and NG9-1-1 emergency services networks. The Originating IMS network defined in ATIS-0700015 supports calls from fixed, nomadic, and mobile users. This standard supports multimedia emergency services. For a detailed description of the functional elements within this architecture please see ATIS-0700015 [Ref 1] and ATIS-0500026 [Ref 2].

⁷ For the purposes of this document, the term "call" includes all emergency requests that include all voice and non-voice communication.

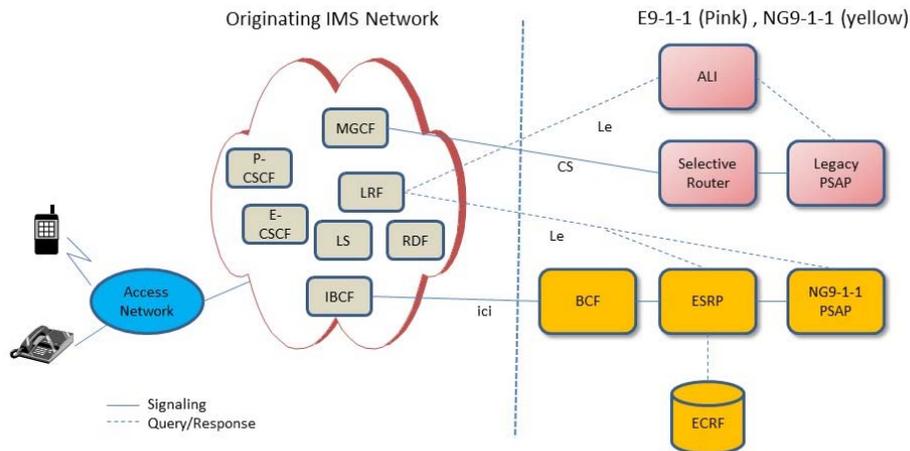


Figure 6.1: Simplified Conceptual Architecture

Calls enter the Originating IMS Network from fixed, nomadic, or mobile users. These differing call types impact how location is acquired. Call routing is determined based on location, and calls are delivered to the appropriate emergency services network. Calls may enter the IMS Network with the location of the user identified in terms of a civic address or estimated geo-coordinates (i.e., x, y coordinates). That location value may then be used to determine the appropriate emergency services network toward which to route the call. If location is not included along with the call, the IMS Network must acquire a location to determine the appropriate Emergency Services Network to which to route the call.

Calls are routed from the IMS Network to either a legacy or NG9-1-1 emergency services network. The type of network to which the call is being delivered dictates the type of information that can be conveyed. For example, a PSAP that is served by a legacy emergency services network must always query for location and potentially the callback number. If a call is delivered to an NG9-1-1 network there is more flexibility with regard to the information that can be delivered with the emergency call. For example, fixed and nomadic calls include a location value and callback information in the call setup message that is sent toward the PSAP. For mobile calls, initial and updated location information may be requested by an NG9-1-1 PSAP by utilizing information in a location server (LS). This is known as a dereference request.

“Additional data” about the call, caller, or location may also be provided to a PSAP that is served by an NG9-1-1 network. This data may be provided “by value”, meaning the data is provided to the PSAP with the call. Alternatively, the PSAP may be required to query for additional data (i.e., send a dereference request), which is the meaning of delivering additional data “by reference”.

See Section 7 of ATIS-0500026, *Operational Impacts on Public Safety of ATIS-0700015, Implementation of 3GPP Common IMS Emergency Procedures for IMS Origination and ESInet/Legacy Selective Router Termination*, for example call flows using the architecture illustrated in Figure 6.1.

7 Originating IMS Network Call Routing Criteria

If the call enters the Originating IMS Network with location-by-value, the Originating IMS Network uses that location to determine the appropriate emergency services network. If the Originating IMS Network determines that the call is destined for a legacy emergency services network, it will cache the location in anticipation of a query from the legacy ALI system. It will also create a Reference ID⁸ that may be used by the Selective Router to route the call to the PSAP, and by the ALI system to query for location. If the Originating IMS network determines that the call is

⁸ Reference ID is used in ATIS-0700015 as a routing and query key and its definition is dependent upon context. For example, for delivery to legacy emergency services networks, the Reference ID is similar to an ESRK, ESQK, or ESRD. For delivery to an NG9-1-1 network, it is similar to a location conveyance URI.

destined for an NG9-1-1 network, it obtains routing instructions and includes the location-by-value in the call request sent to the NG9-1-1 network. In turn, the NG9-1-1 network delivers the call to an NG9-1-1 PSAP with location-by-value.

If the call is from a fixed or nomadic user and the location is not provided in the call request, the Originating IMS network must obtain the location based on pre-established locational information in the Location Server. This information is then used to determine to which appropriate Emergency Services Network to route the call. If the Originating IMS network determines that the Emergency Services Network is a legacy network, it will cache the location in anticipation of a query from the ALI system. It will also create a Reference ID that will be used by the selective router to route the call, and by the ALI system to query for location. If the Originating IMS network determines that the call is destined for an NG9-1-1 ESInet, it obtains routing instructions and includes the location information (by value) in the call request sent toward the PSAP.

If the call is from a wireless user, the Originating IMS network must identify a routing location (in civic or geodetic format) that it can use to route the call, as well as obtain estimated caller location information that can be used to support the dispatch of emergency personnel. Typically, the location information provided with an emergency call from a wireless user will consist of a cell/sector identifier, which will be mapped into a routing location that is referred to as an *Associated Location*.

An Associated Location is a location (civic, geodetic, or polygon) within the designated PSAP jurisdiction that may be used in wireless call scenarios to route a call toward the designated PSAP. The Associated Location is determined via a static mapping from the cell/sector ID received in incoming signaling to a routing location which, when used to query the routing database, will return routing instructions that will cause the call to be directed toward the designated PSAP. In parallel, the Originating IMS network queries for the location of the caller. The Originating IMS network will create a Reference ID that may be used by the emergency services network to route the call and to query for location. The Originating IMS network will cache the caller location when it receives it in anticipation of a query from the ALI System (or NG9-1-1 PSAP as discussed below). Note that an Associated Location should never be returned to an NG9-1-1 PSAP (or ALI system) when it requests location information, because the Associated Location is used for routing purposes only.

8 Delivering Calls to a Legacy Emergency Services Network

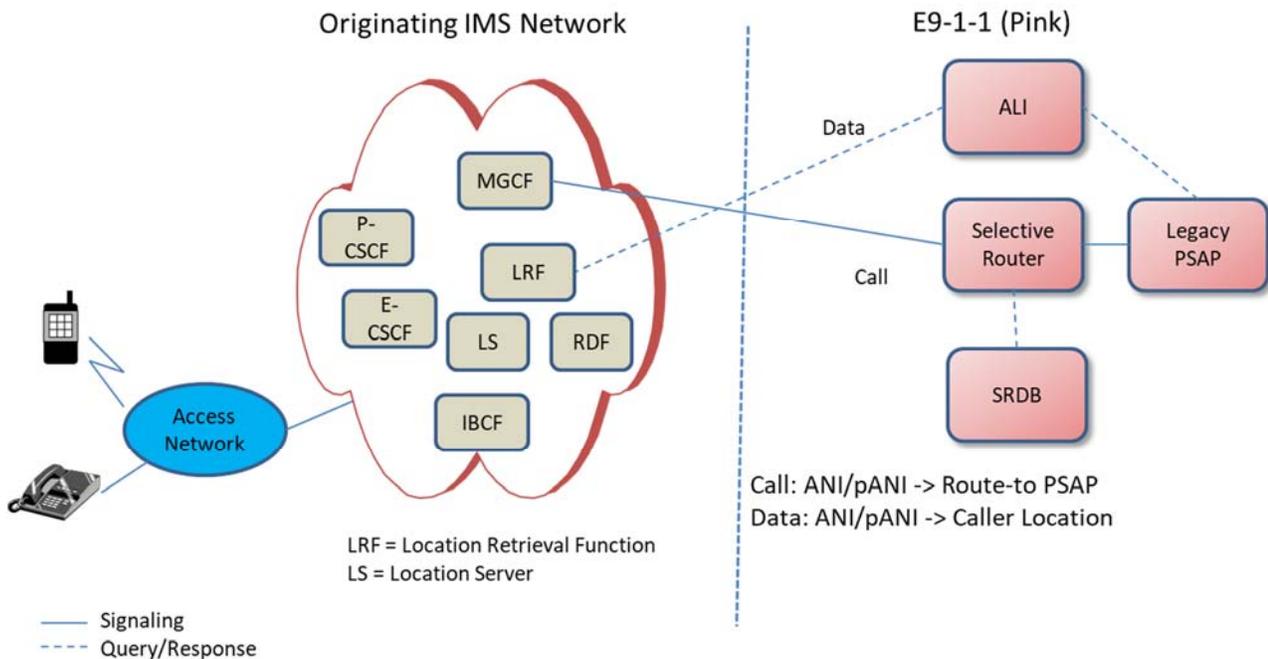


Figure 8.1: Simplified Conceptual Legacy Architecture

When the Originating IMS network has determined that the call is destined to a legacy emergency services network, it will assign a Reference Identifier (URI) and route the call (via a gateway system) to the Selective Router with the appropriate signaling. The gateway system will use the Reference ID to obtain the appropriate 10-digit pANI. The Selective Router will use the pANI to query a Selective Routing Database (SRDB) and will use the information returned by the Selective Routing Database to determine the destination PSAP. The Selective Router will then deliver the emergency call, along with the pANI, to the PSAP. Once the PSAP has received the call, it will query the Regional ALI with the pANI. The Regional ALI will query the Originating IMS network (i.e., LRF) which will return a caller location and a callback number. The Regional ALI will return this information to the PSAP.

For RTT calls, a gateway in the Originating IMS network will transcode the RTT text format to TTY format for delivery to the Selective Router and subsequently the PSAP.

9 Delivering Calls to an NG9-1-1 ESInet

When calls are delivered to an NG9-1-1 ESInet, there is more flexibility as to what can be passed from the Originating IMS network than when calls are delivered to a legacy emergency services network. For example, the callback number should always be passed to the NG9-1-1 ESInet with the call request.

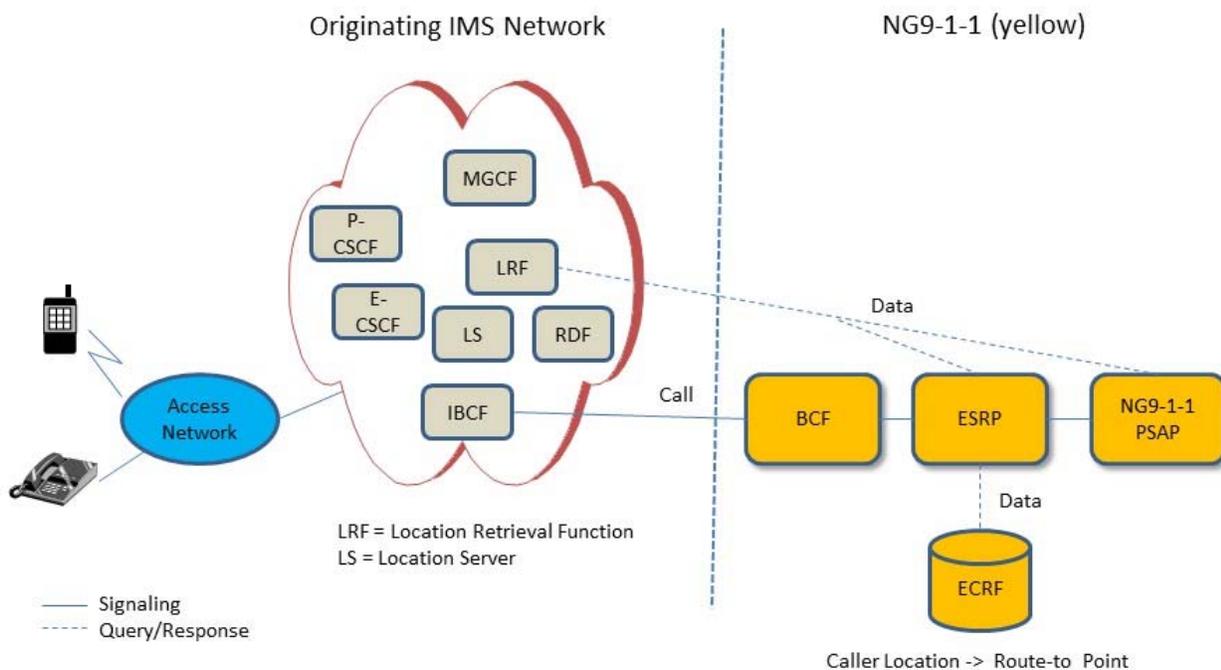


Figure 9.1: Simplified Conceptual NG9-1-1 Architecture

Location can be sent either “by value” or “by reference”. For fixed or nomadic calls, the location information may be delivered to the Originating IMS network in the call request, or the Originating IMS network may have to acquire it. In either case the Originating IMS network can deliver the location in the call request that it forwards to the NG9-1-1 ESInet. This is called delivering the location by value. For mobile calls there is the potential that the PSAP may

need to query for a location – e.g., to get caller location or to get an updated location of a mobile that is moving. Therefore, location is provided to the PSAP “by reference” (e.g., Uniform Resource Identifier [URI]). The URI is sent to the NG9-1-1 PSAP and the NG9-1-1 PSAP uses that URI to query (dereference) for location. The NG9-1-1 PSAP may use this URI to query for updated location.

For RTT calls, the Originating IMS network does not need to transcode the RTT text format. It will pass the RTT directly to the NG9-1-1 ESInet.

10 Data Management

ATIS-0700015 does not directly describe how data management is handled. It assumed that legacy data management techniques and those defined for NG9-1-1 apply. For fixed and nomadic calls that do not provide location in the call request, location information must be provisioned into a Location Server. While out of scope for ATIS-0700015, one could assume that the NG9-1-1 procedures for supporting a Location Validation Function (LVF) could be utilized to meet the requirements for validation of civic location. All civic locations would be validated prior to being provisioned into an LS.

For wireless calls the procedures are more complex. In the Originating IMS network wireless calls are still routed based upon cell site information (going forward, it is anticipated that in many cases routing will be based on the caller location if caller location can be acquired prior to routing the call). As described in clause 7, an Associated Location must be created for routing if only cell site information is available. The Originating IMS network providers must work with the 9-1-1 Authorities to identify the associations between cell site sectors and PSAPs. That is, they must develop an agreement regarding to which PSAP calls from a given cell site sector will go. The 9-1-1 Authority then identifies the routing location that will be used to route calls from a given cell site sector toward the designated PSAP. The 9-1-1 Authority creates the Associated Location (i.e., cell site sector to routing location) mappings and provides them to the Originating IMS network provider. The Originating IMS network provider then provisions the Associated Location mappings into its system (i.e., Location Retrieval Function [LRF]). It is anticipated that NENA will create an Information Document that will define the process for creating Associated Locations and providing them to the Originating IMS network providers for provisioning into the LRF.

The 9-1-1 Authority or individual PSAPs, working with the Originating IMS network provider, must jointly ensure that the GIS data provisioned in the Originating IMS network provider's routing database (i.e., Routing Determination Function [RDF]) will provide the desired routing information in response to a routing query containing the Associated Location. This ensures that the Originating IMS network provider will deliver the emergency call to the appropriate emergency services network. While ATIS-0700015 does not address the provisioning of the Routing Determination Function, this could be accomplished by applying the mechanisms for provisioning NG9-1-1 Emergency Call Routing Function (ECRFs), as described in NENA-STA-005.1-2017 [101].

If the cell site sector is associated with a PSAP that is served by a legacy emergency services network, then the cell site sector will also be linked to a Reference Identifier pool (e.g., ESRKs) for that PSAP. Records are then created that can be sent to the regional Database Management System (DMS) to support the routing of the emergency call to the appropriate PSAP and create shell records in the regional ALI system. These shell records have the same function as currently used today for wireless calls. As with wireless originations today, emergency calls originated by wireless callers that are served by an IMS-based originating network will be delivered to PSAPs that are served by legacy emergency services network with a pANI and possibly callback information. All other data (including Phase I and Phase II location) will be provided in response to queries from the ALI system to the Originating IMS Network.

11 Future Considerations

Non-carrier methods are being developed for 9-1-1 calling using device-generated caller location. NG9-1-1 must be able to handle calls with embedded caller location, or access to caller location data sent “by reference”, at the onset of 9-1-1 calls and messages. As the inevitable day comes when device-generated caller location is part of the wireless location process using device-based hybrid technology for traditional carriers, the restriction to cell site/sector-based routing will be removed as other methods can be used to determine which NG9-1-1 system (often at state levels) should receive the call, enabling the NG9-1-1 call routing process to handle PSAP selection as designed. The objective ought to be that carriers send calls to the correct NG9-1-1 system, and the NG9-1-1 system

routes to PSAPs, returning the overall process to normal operation and enabling use of NG9-1-1 features to control call management within the NG9-1-1 system.