ATIS-1000628.2000(R2015)

Emergency Calling Service

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for Telecommunications –

Emergency Calling Service

Secretariat

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Contents

Foreword (This foreword is not part of American National Standard T1.628-2000.)

This standard specifies the protocol and procedures applicable for the support of Emergency Calling Service in an Integrated Services Digital Network (ISDN).

This standard was developed by Working Group T1S1.3 and T1S1.7 of Accredited Standards Committee T1 - Telecommunications.

Suggestions for improvement of this standard will be welcome. They should be sent to the Alliance for Telecommunications Industry Solutions, T1 Secretariat, 1200 G Street NW, Suite 500, Washington, DC, 20005.

This standard was processed and approved for submittal to ANSI by Accredited Standards Committee T1 - Telecommunications. Committee approval of the standard does not imply that all committee members voted for its approval. At the time it approved this standard, Accredited Standards Committee T1 had the following members:

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American National Standard
for Telecommunications -

Emergency Calling Service

1 Scope, purpose, and application

1.1 Scope and purpose

This standard specifies the capabilities required to support the passing of location and callback information associated with the calling user to a Public Safety Answering Point (PSAP) attendant, to provide network routing and transfer features associated with emergency service calls, and to deliver control indications (e.g., flashing display) to the PSAP attendant. Emergency Calling Service (ECS) allows emergency service calls to be completed through the network to an appropriate emergency service attendant, and to provide the PSAP attendant with location information (if available) regarding the calling user.

ECS also provides for priority routing of the call within the network so that even in times of network congestion, emergency calls should be able to complete to a PSAP attendant. It also allows for the transport and identification of emergency service calls without the use of dedicated facilities. In addition, the network provides additional capabilities (e.g. the transfer of location information) when the attendant conferences with, or transfers the call to, any other attendant in the emergency serving area.

Capabilities needed for supporting E9-1-1 Call Hold and Ringback are described in Clauses 4 and 5. However, there is no DSS1 or SS7 support for these capabilities at this time.

Finally, this document provides for the delivery of location information to a PSAP over a DSS1 interface. In addition, receipt of location information for calls originating from a DSS1 interface is addressed. An ECS call may originate from a wireline or wireless user.

1.2 Application

This standard is intended to supplement the basic call procedures described in:

- *American National Standard for Telecommunications - Signalling System no. 7 (SS7) - Integrated Services Digital Network (ISDN) user part*, T1.113.
- *American National Standard for Telecommunications - Integrated Services Digital Networks (ISDN) - Layer 3 Signaling Specification for Circuit Switched Bearer Services for Digital Subscriber Signaling System Number 1 (DSS1)*, T1.607.

ECS is applicable only to the speech and 3.1-kHz audio information transfer capabilities identified in T1.113 and T1.607.

2 Normative references

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

T1.113-1995, *Telecommunications - Signalling system no. 7 (SS7) - Integrated Services Digital Network (ISDN) user part* [1),2)]

[1)] This standard is currently undergoing the revision process. Please contact the secretariat for more information.

[2)] For electronic copies of some standards, visit ANSI's Electronic Standards Store (ESS) at www.ansi.org. For printed versions of all these standards, contact Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112-5704, (800) 854-7179.

T1.607-1998, *Telecommunications - Integrated Services Digital Networks (ISDN) - Layer 3 Signaling Specification for Circuit Switched Bearer Services for Digital Subscriber Signaling System Number 1 (DSS1)*

T1.609-1999, *Telecommunications - Interworking Between the ISDN User-Network Interface Protocol and the Signaling System No. 7 ISDN User Part*[2)]

T1.610-1998, *Telecommunications - DSS1 - Generic Procedures for the Control of ISDN Supplementary Services*[2)]

T1.625-1993 (R1999), *Telecommunications - Integrated Services Digital Network (ISDN) - Calling Line Identification Presentation and Restriction Supplementary Services*[2)]

T1.643-1998, *Telecommunications - Integrated Services Digital Network (ISDN) - Explicit Call Transfer Supplementary Service*[2)]

T1.647-1995, *Telecommunications - Integrated Services Digital Network (ISDN) - Conference Calling Supplementary Service*[2)]

T1.647a-1998, *Telecommunications - Integrated Services Digital Network (ISDN) - Conference Calling Supplementary Service - Operation Across Multiple Interfaces*[2)]

3 Definitions

3.1 altitude: Information that indicates the geodetic location of the calling party in terms of distance above or below the WGS-84 ellipsoid surface.

3.2 altitude sign: Information that indicates the geodetic location of the calling party in terms of above or below the WGS-84 ellipsoid surface.

3.3 altitude uncertainty code: Information indicating the level of uncertainty inherent to the associated altitude information.

3.4 callback number: Number used to place a return call from the PSAP attendant to the caller.

3.5 calling geodetic location: Information that indicates the geodetic location of the calling party. The reference system for the coding is the World Geodetic System 1984, (WGS-84). The origin of the WGS-84 co-ordinate system is the geometric center of the WGS-84 ellipsoid. The ellipsoid is constructed by the rotation of an ellipse around the minor axis that is oriented in the North-South direction. The rotation axis is the polar axis of the ellipsoid, and the plane orthogonal to it, and including the center of symmetry, is the equatorial plane.

The relevant dimensions are as follows:

Major Axis (a) = 6378137m

Minor Axis (b) = 6356752.314m

Co-ordinates are then expressed in terms of longitude and latitude relevant to this ellipsoid. The range of longitude is - 180° to +180°, and the range of latitude is -90° to +90°. 0° longitude corresponds to the Greenwich Meridian, and positive angles are to the East, while negative angles are to the West. 0° latitude corresponds to the equator, and positive angles are to the North, while negative angles are to the South. Altitudes are defined as the distance between the ellipsoid and the point, along a line orthogonal to the ellipsoid.

3.6 caller: Person placing the emergency service call. This is typically accomplished by dialing a special access sequence (i.e., ‘911’).

3.7 caller location information: Information that may aid in retrieving location information for the caller from a database. Examples of caller location information include calling party number, charge number, cell site/sector identification, and geographic location information (e.g., latitude and longitude).

3.8 confidence: Information identifying the confidence by which it is known that the calling party lies within the associated shape description.

3.9 degrees of latitude: Information that indicates the geodetic location of the calling party in terms of degrees of latitude north or south of the equator.

3.10 degrees of longitude: Information that indicates the geodetic location of the calling party in terms of degrees of longitude east or west of the Greenwich Meridian.

3.11 ellipsoid point: Information that describes a point on the surface of the WGS-84 ellipsoid that consists of latitude and longitude. In practice, such a description can be used to refer to a point on Earth's surface, or close to Earth's surface, with the same longitude and latitude. Figure 1 illustrates a point on the surface of the ellipsoid and its co-ordinates.

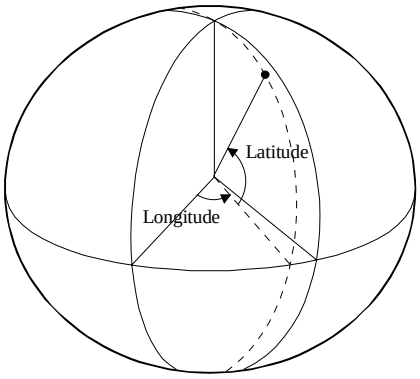

Figure 1 - Description of an ellipsoid point as two co-ordinates

The latitude is the angle between the equatorial plane and the perpendicular to the plane, tangent to the ellipsoid surface at the point. Positive latitudes correspond to the Northern hemisphere. The longitude is the angle between the half-plane, determined by the Greenwich meridian, and the half-plane defined by the point and the polar axis, measured Eastward. Positive longitudes correspond to east of the Greenwich meridian.

3.12 ellipsoid point with uncertainty: Information that describes a point that is characterized by the co-ordinates of an ellipsoid point (the origin) and a distance *r*. It describes the set of points on the ellipsoid which are at a distance from the origin less than or equal to *r*, the distance being the geodesic distance over the ellipsoid, i.e., the minimum length of a path staying on the ellipsoid and joining the two points, as shown in Figure 2. Similar to the ellipsoid point, this can be used to indicate points on the Earth's surface, or near the Earth's surface, of same latitude and longitude. The typical use of this shape is to indicate a point when its position is known only with a limited accuracy.

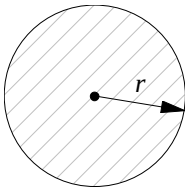

Figure 2 - Description of uncertainty

3.13 Emergency Calling Service (ECS): Service described by this standard.

3.14 Emergency Service Call (ESC): Call identified as receiving emergency service treatment.

3.15 emergency service PSAP exchange: Local exchange that serves the PSAP.

3.16 Emergency Service Number (ESN): Three to five digit number representing a unique combination of emergency service agencies (e.g. law enforcement, fire, and emergency medical service), designated to serve a specific range of addresses within a particular geographical area or emergency service zone (ESZ). The ESN facilitates selective routing and selective transfer, if required, to the appropriate PSAP and to the dispatching of the proper service agency(ies).

3.17 emergency service routing exchange: First exchange in the call connection capable of invoking the routing portion of the ECS service. This may be a local exchange or a transit exchange. It recognizes the emergency call and determines the caller's ESZ.

3.18 Emergency Service Zone (ESZ): Geographical area within the emergency service serving area in which all callers are served by the same set of emergency service agencies.

3.19 latitude sign: Information that indicates the geodetic location of the calling party in terms of Northern or Southern Hemisphere.

3.20 Location Identification Number (LIN): Number used to identify the location of the calling terminal within the context of the emergency service call.

3.21 location presentation restricted indicator: Information that indicates that the geodetic location information is not to be presented to a public network user, but can be passed to another public network. It may also be used to indicate that the geodetic location cannot be ascertained.

3.22 network: In this description, network refers to all telecommunications equipment that has any part in processing a call or a supplementary service for the user. It may include local exchanges, transit exchanges, and NT2s, but does not include the ISDN terminal and is not limited to the "Public" network or any other particular set of equipment.

3.23 point with altitude and uncertainty shape description: Information that describes a point that is characterized by the co-ordinates of an ellipsoid point, an uncertainty distance *r*, an altitude *a* and an altitude uncertainty *h*. It describes the set of points which are at a vertical distance *h*, or less, from the origin. The origin is a point at altitude *a* above an ellipsoid point with uncertainty (see 3.11) as shown in Figure 3.

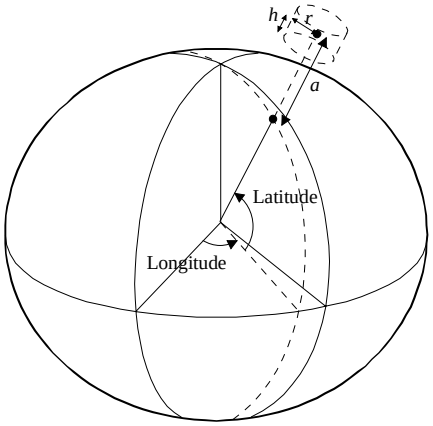

Figure 3 - Description of a point with altitude and uncertainty

3.24 preferred call back number: Calling party number or charge number to be used by the ESC as selected by the service provider.

3.25 Public Safety Answering Point (PSAP): Facility equipped and staffed to receive 911 calls. A primary PSAP receives the calls directly. If the call is conferenced with, or transferred to, the next receiving party is designated as a secondary PSAP.

3.26 PSAP attendant: Emergency service attendant who has control of the emergency service call. This includes the primary emergency service attendant to whom the call is originally routed as well as any secondary emergency service attendants to whom the call is subsequently transferred. The PSAP attendant may invoke the conferencing and transfer capability to transfer the caller to a secondary attendant using telephone numbers associated with the caller's emergency service zone.

3.27 screening indicator: Information sent in association with a number/location indicating whether the number/location was network or user provided, and if user provided, whether the network views the number/location as correctly identifying the user.

3.28 service provider: Company, organization, administration, business, etc., that sells, administers, maintains, charges for, etc., the service. The service provider may or may not be the provider of the network.

3.29 Selective Routing Function (SRF): Function used by the network to route the emergency service call to a PSAP using routing information obtained from the selective routing database (SRDB).

3.30 Selective Routing Database (SRDB): SRDB provides routing information for emergency services for an E9-1-1 call based on location information associated with the caller. The selective routing database also contains ESN - Telephone number associations (e.g., PSAP telephone number) to provide for the proper routing of E9-1-1 calls. The SRDB may be implemented in the exchange or external to the exchange.

3.31 shape description: Information that describes the geodetic location of the calling party.

3.32 transfer numbers: Network addresses of emergency service agencies, which are specific to the caller's ESZ. The transfer numbers may be used during the course of the call by the emergency service attendant to bridge and possibly transfer the call to another agency that is better equipped to handle this caller's emergency.

3.33 type of shape: Information that indicates the format of the geodetic location information held in the associated shape description.

3.34 uncertainty code: Information that indicates the level of uncertainty inherent to the associated longitude/latitude information.

4 Description of Emergency Calling Service

Emergency Calling Service (ECS) allows emergency service calls to be completed to, and transferred/conferenced between, PSAPs across the emergency service network area while delivering the caller location information, if available. Emergency service calls may also require ECS to access other emergency agencies outside the caller's emergency service network area.

This clause defines ECS in terms of procedures and other aspects visible to the user or users without regard to the means of implementation. This clause also provides a prose description of ECS. A diagrammatic description of ECS in the form of a Specification and Description Language (SDL) diagram is provided in Figure 5.

4.1 Description

4.1.1 Caller location information

In the course of an E9-1-1 call, the phone number, Location Identification Number (LIN), or the calling geodetic location information of the caller is used to determine the location from which the call is coming. Knowing the location of the user is important both for determining the correct PSAP serving the user's location and for assisting the responding agency in physically locating the caller. For non-ISDN phones such as residence and coin telephones, the service provider is able to associate a single or main phone number with each physical line, and therefore knows the caller's location. For ISDN phones, the TE may provide the calling party number or LIN, or both. But when the network exchange receives a call on a trunk (ISDN access, for the sake of this standard) from a Private Branch Exchange (PBX) or Key Telephone System (KTS), it does not know which phone connected to the PBX or KTS (both of which henceforth referred to as a Network Termination 2 [NT2]) made the call. As a default, the service provider assumes that the call was placed from the main telephone, which is the one that rings when the directory-listed telephone number of the NT2 is dialed. In reality, the caller's phone could be far away (or otherwise difficult to locate) from the main telephone. Therefore, the NT2 shall provide the caller's phone number, or at least the call back number of a phone near the caller, and the caller's LIN to the service provider.

In addition, the rapid growth in wireless communications, both cellular and Personal Communication Service (PCS), has prompted the Federal Communication Commission (FCC) to issue rules on E9-1-1 interoperability in Docket No. 94-102. Phase 1 requires the delivery of two 10-digit numbers to the PSAP. One set of digits would provide the calling station's number and the other would provide the cell site/sector to support locating wireless callers by helping to define the area for dispatch. These two pieces of information will be supported in the ISDN access signaling for the E9-1-1 tandem to PSAP interface described in this standard. Other information may also need to be passed, such as the calling party's caller location information, and this also is addressed.

For both the phase 1 public network wireless requirements and the NT2 case, the calling system needs to provide two numbers to the network for transmission to the E9-1-1 system: the calling station's number, so that the caller can be called back, and some caller location information (e.g., cell site/sector for wireless public networks). The ISDN interface serving the calling system can provide the calling station's number as the calling party number.

Phase 2, for wireless communications, requires that an emergency service caller be locatable to within a small area (e.g., within 125 meters). Cell site/sector information is insufficient to achieve this level of accuracy, so other information will be required to be transmitted through the network. Latitude and longitude, together with altitude and an accuracy indication, are expected to be needed.

4.1.2 Routing

The routing component of ECS is applicable when a caller places an emergency service call. The network determines the correct primary PSAP attendant to whom to route the call, and the routing component of ECS is used to complete the call through the network and to provide the necessary emergency service information to the selected PSAP attendant.

4.1.3 Conferencing and transfer

The conferencing and transfer component of ECS is applicable when a primary PSAP attendant wants to connect an emergency service caller to another attendant. The primary PSAP attendant indicates to the network which secondary attendant to involve on the call through dialing or other action (for example, choosing the Transfer Number) at the CPE. The conferencing and transfer component of ECS is used to conference the caller, the primary attendant, and the secondary attendant, and subsequently, to transfer the caller to the secondary attendant.

4.1.4 E9-1-1 Call Hold

E9-1-1 Call hold is an optional network feature provided to a PSAP which prevents a caller from disconnecting an ESC.

Capabilities needed for supporting E9-1-1 Call Hold are described in Clauses 4 and 5. However, there is no DSS1 or SS7 support for this capability at this time.

4.1.5 Ringback

Ringback is an optional network feature which allows the PSAP to alert the originator of the ESC (e.g. by providing a ringing condition to a terminal that is returned to an on-hook condition or a receiver off-hook tone to a terminal which is not in the on-hook condition).

Capabilities needed for supporting Ringback are described in Clauses 4 and 5. However, there is no DSS1 or SS7 support for this capability at this time.

4.1.6 Call Back

Call Back is a call that is originated from a PSAP to the originator of a previous ESC. There is no special handling for this call.

4.2 Procedures

4.2.1 Provision/withdrawal

ECS is provided at the option of the service provider for all emergency service calls within a served area. The caller or attendant will not have to subscribe to ECS.

4.2.2 Normal procedures

4.2.2.1 Activation/deactivation

Activation and deactivation of ECS shall be handled by the network.

4.2.2.2 Invocation and operation

4.2.2.2.1 User access

A typical emergency service call begins with the caller dialing the emergency service phone number, e.g., '911'. For non-ISDN phones, the network serving that phone recognizes this as an emergency service call and routes the

call to the appropriate emergency service routing exchange and to the appropriate PSAP. For ISDN terminals, the network also recognizes this as an emergency service call and routes the call to the appropriate emergency service routing exchange and to the appropriate PSAP. However, in the latter case, the ISDN terminal may also provide LIN to the network. In the following scenario, the caller shall be considered a station behind a PBX. For a wireless telephone user, it is assumed that the same scenario can arise, although perhaps with a different set of dialed digits to reach the emergency service system. The PBX recognizes this as an emergency service call, and sends the call into the public switched telephone network (PSTN), to the network exchange serving that PBX. Included in the call request is a callback number and information that can be used to locate the caller.

Scenario:

This scenario (depicted in figure 4) presents just one way that the location information can be used by the Emergency Service System to determine an appropriate PSAP. It assumes that the location information must be transmitted over an ISDN interface. From the calling user's perspective, their only action is to dial the emergency service call. After the call is answered at the PSAP, the PSAP operator can verify the location information provided both from the caller's NT2 and from the Emergency Service database.

a) A caller behind an NT2 places an emergency service call.

b) The NT2 recognizes the call as an emergency service call, and initiates an emergency service call to the Network, including the callback number and location information (e.g. caller's phone number, LIN) in the call setup.

c) The Network transports the caller's information, including the caller's callback number and location information, to an appropriate PSAP. The PSAP can use the caller's callback number and location information in determining the appropriate emergency service agency to address the caller's need. [The PSAP's use of this information is not covered in this standard.]

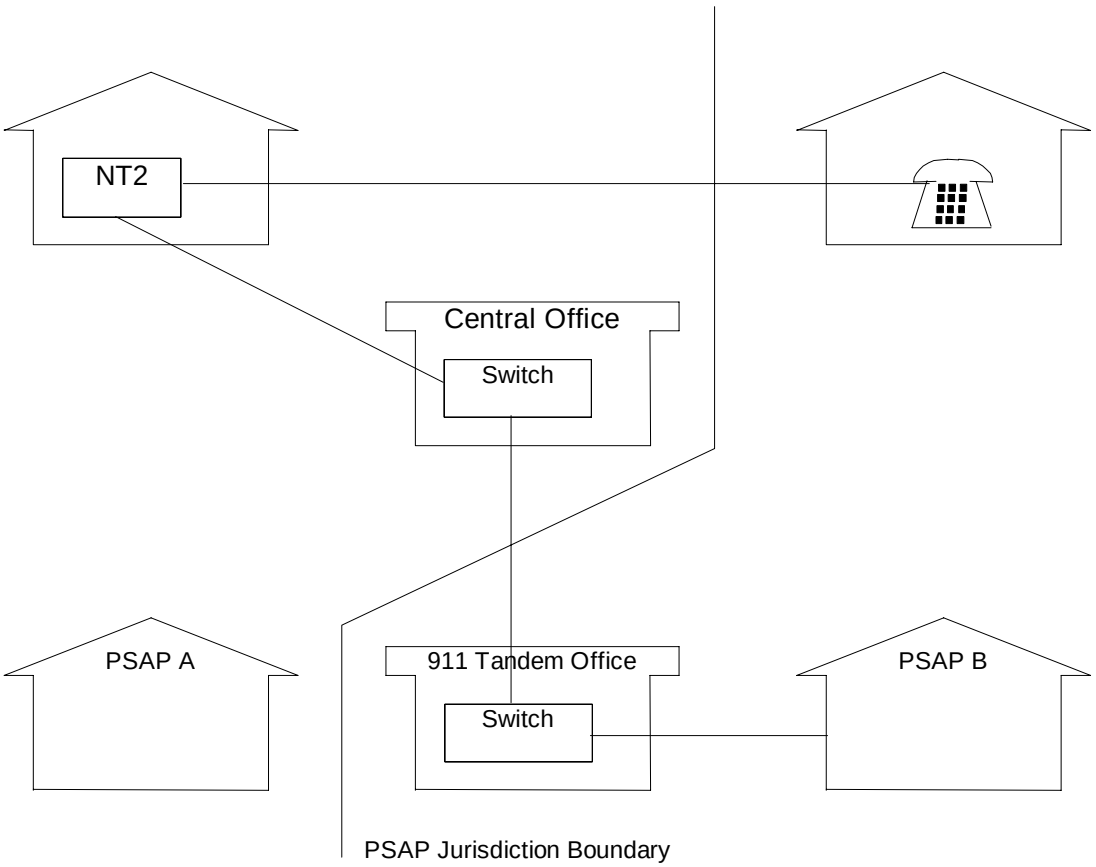

Figure 4 - Example of an ESC from a phone served by a different PSAP than the NT2

Functionally, the model for ISDN access to ECS is very simple. An entity serving the end user communicates with the network, sending location information to the network in a call request. There is no response returned from the network. If the call is not recognized by the network as an ESC, then the LIN shall be discarded.

4.2.2.2.2 Routing and Delivery

The emergency service caller dials the emergency service access number (i.e., 911), and is routed to a PSAP attendant based on the caller's emergency service zone using the ESN. The SRF will provide the ESN of the PSAP to which the call should be routed. Further routing of the call will be based on the ESN for the identified PSAP.

An ISDN calling user may provide the network with caller location information (e.g., calling number). For non-ISDN users, the network must determine/generate the caller location information (e.g., calling number). The network delivers the caller location information and any applicable flashing display indication for the call, as appropriate and if possible for the interface to the PSAP. (The caller location information can be used at the PSAP as an aid in retrieving location information stored in external databases. This capability is outside of the scope of this standard.) The caller can then describe the emergency to the PSAP attendant.

When an emergency service call reaches a primary PSAP and the call cannot be offered to the PSAP, or is not answered by the PSAP, the network may provide alternate routing of the call to a secondary PSAP in a manner similar to call forwarding. The primary attendant may have invoked an assigned feature to effect this case (e.g., night service). When an ESC is alternately routed to a secondary PSAP, the network provides the caller location information (if available) to the secondary PSAP.

This standard does not limit the number of times that an ESC may be alternately routed using this capability.

4.2.2.2.3 Conferencing and transfer

When an emergency service call reaches a primary PSAP attendant, the PSAP attendant queries the caller about the nature of the emergency. The primary PSAP attendant may decide that the call should be transferred to another agency that is better equipped to handle such emergencies. The PSAP attendant can use the PSAP equipment to indicate to the network the destination of the appropriate secondary agency (e.g., fire, police, ambulance) to which the call should be conferenced or transferred. The secondary attendant may be indicated by a number dialed by the PSAP attendant or by a dialed code (e.g., *11). The secondary attendant may be a PSAP attendant or a generic agency (e.g., ambulance service). In the case of a generic agency, the network uses the transfer numbers to select the agency that is appropriate for the caller (e.g., the number of the ambulance service that serves the caller's emergency service zone).

The conferencing and transfer operation is accomplished by first conferencing the caller to both attendants. This guarantees that if the caller is transferred to an inappropriate attendant, or if there are any problems with the operation, the caller will always be able to talk to a PSAP attendant who is trained to handle emergencies. When the primary PSAP attendant is satisfied that the secondary attendant can properly handle the emergency, the primary PSAP attendant may choose to drop off the call. The primary PSAP attendant leaves the conference, leaving a two-party connection (a transfer) between the caller and the secondary attendant.

There is no limit to the number of times that an emergency service call may be transferred using this capability. Limitations may occur when the calls are transferred to entities that do not support this capability.

4.2.3 Exceptional procedures

4.2.3.1 Activation/deactivation

Not applicable.

4.2.3.2 Invocation and operation

4.2.3.2.1 Routing to a busy primary PSAP attendant

If the emergency service call is routed through the network and the intended primary PSAP attendant is busy, the network will release the call back to the switch performing the emergency service routing function. The network will then initiate the appropriate procedures.

4.2.3.2.2 Primary attendant selects wrong secondary attendant

If the primary PSAP attendant conferences the emergency service call to an inappropriate secondary attendant, the primary attendant may drop the secondary attendant from the conference and fall back to a two-party configuration with the caller by indicating a drop request to the network.

4.2.3.2.3 Secondary attendant busy

If the primary PSAP attendant conferences the emergency service call to a busy secondary attendant, the primary attendant may drop the added leg that is delivering the busy indication from the conference and fall back to a two-party configuration with the caller by indicating a drop request to the network.

4.2.3.2.4 Transfer to nonexistent secondary attendant

If the primary PSAP attendant requests a transfer to a nonexistent secondary attendant (i.e., no transfer number exists for the one requested), the primary attendant shall be given an indication of this situation.

4.2.4 Alternate procedures

The primary PSAP attendant may invoke the conferencing and transfer capability for the purpose of consulting with a secondary emergency service attendant. The primary PSAP attendant, the caller, and the secondary attendant remain conferenced during the consultation period. When the consultation is complete, the primary PSAP attendant may drop the secondary attendant from the conference and fall back to a two-party configuration with the caller by indicating a drop request to the network.

4.3 Interworking considerations

If the call enters a network not capable of transporting the information required for this capability, the call can still be completed to the PSAP attendant, but the caller location information and indication of an emergency service call may not be available to that attendant.

4.4 Capabilities for charging

It shall be possible for the service provider to charge accurately for this service.

4.5 Interactions with supplementary services

4.5.1 Call waiting

It is desirable not to apply the call waiting tone on the ECS caller's line, if the caller is engaged in an ECS call. If call waiting tone is not provided, busy treatment shall be applied to the calling party.

While engaged in an ECS call, the ECS caller shall not be allowed to accept a waiting call if accepting the waiting call would cause the ECS call to be placed on hold.

4.5.2 Calling line identification presentation and restriction

This supplementary service has no impact on the operation of ECS. In cases where a calling party has an arrangement that presentation of their number is not allowed, for an ESC, the network and the PSAP are allowed to override these restrictions. Refer to 4.1.2.3.2 of T1.625.

4.5.3 Call hold service

A request for hold on an ECS call from the ECS caller shall be rejected by the network.

4.5.4 Multi-level precedence and preemption

This supplementary service has no impact on the operation of ECS.

4.5.5 User-to-user signaling

This supplementary service has no impact on the operation of ECS.

4.6 SDL for routing, conferencing, and transfer of emergency service calls

The SDL for ECS is shown in Figure 5.

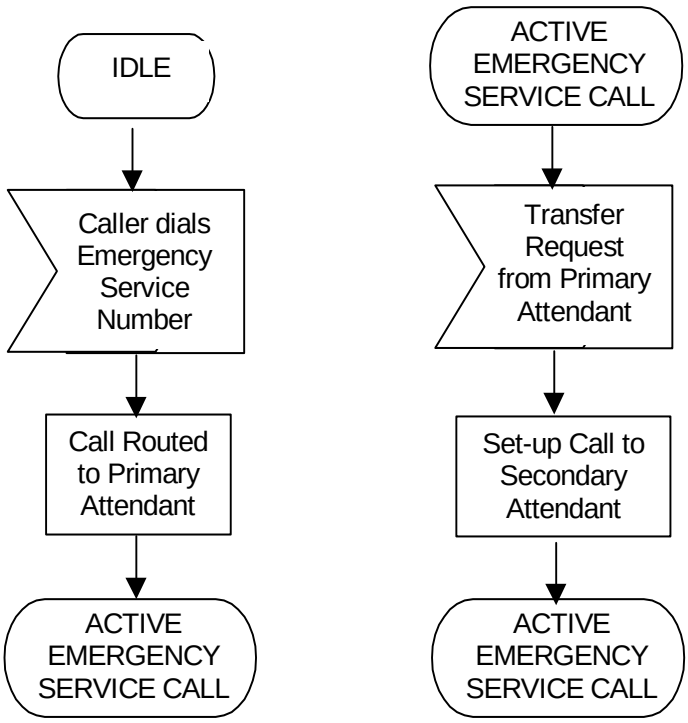

Figure 5 - SDL for Emergency Calling Service (ECS)

5 Functional capabilities and information flows

This clause identifies a way of dividing the overall functionality for ECS into functional units, each of which could be placed in one location. The overall functionality results from communication between the functional units (called entities) using information flows, which are also identified in this clause. An information flow is an abstraction that is subsequently realized in clauses 6 through 8 by means of additions to existing signaling system messages or by new messages. Finally, this clause identifies one or more specific ways in which the functional entities of this capability can be located in specific user or network equipment.

5.1 Functional entity model for ECS

Each functional (see figure 6) entity is an abstract representation that could be implemented in more than one kind of telecommunication equipment or network (e.g., in terminal equipment, or in a switching machine). Functional entities may be combined in a single piece of telecommunication equipment.

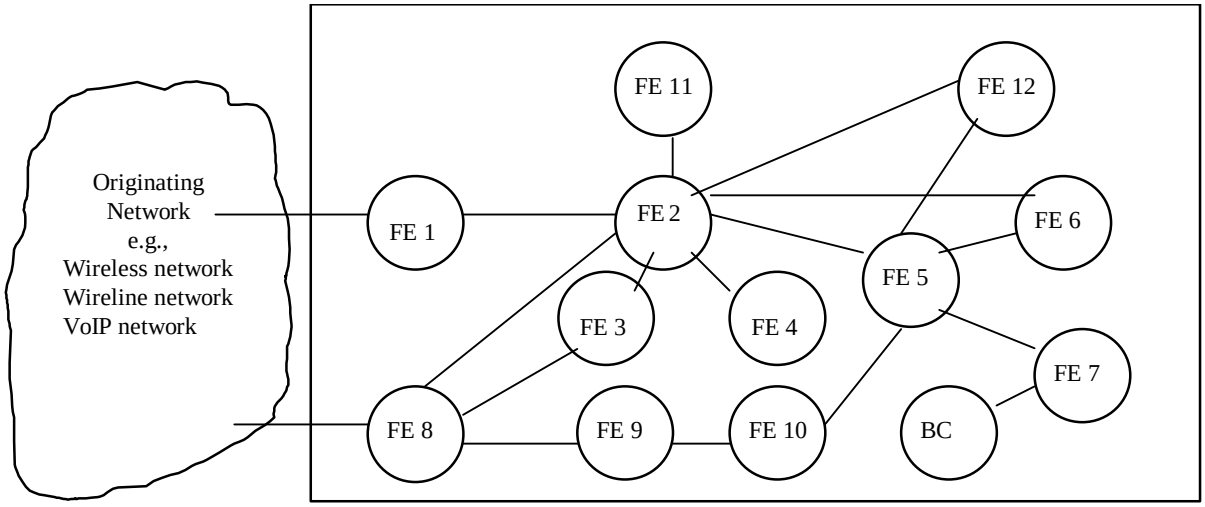

Figure 6 - FE Model for E9-1-1 Service

5.1.1 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.

5.1.2 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.

5.1.3 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.

5.1.4 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.

5.1.5 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.

5.1.6 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.

5.1.7 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.

5.1.8 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.

5.1.9 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.

5.1.10 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.

5.1.11 Description of Functional Entity (FE 11) - E9-1-1 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.

Capabilities needed for supporting E9-1-1 Call Hold are described in Clauses 4 and 5. However, there is no DSS1 or SS7 support for this capability at this time.

5.1.12 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.

Capabilities needed for supporting Ringback are described in Clauses 4 and 5. However, there is no DSS1 or SS7 support for this capability at this time.

5.2 Information Flow Model

Figure 6 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 E9-1-1 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 Switching and signaling specification for ECS at the user-network interface

This clause contains the detailed specifications of DSS1 switching and signaling capabilities for ECS. It builds upon the switching and signaling specifications that are defined in T1.607, expanding the capabilities of ISDN signaling protocol and procedures to send location information from the originating user equipment (TE or NT2) to the network, and from the network to an ISDN Public Safety Answering Point (PSAP).

The protocol described in this clause has been designed with the intent of alignment with certain ISUP parameters (e.g., the Generic Digits Parameter) described in clause 7 of this standard.

6.1 Formats and coding

This clause describes the messages, information elements within these messages, and coding required for ECS.

6.1.1 Messages

6.1.1.1 SETUP

ECS uses the SETUP message to send location information from an originating user (TE or NT2) to the network and from the network to an ISDN PSAP. The SETUP message content for an Emergency Service call is shown in Table 1. Differences between a SETUP message used for a basic (i.e., non-Emergency Service) call and an Emergency Service call are shown in **bold text**.

Table 1 - SETUP message content

Type: SETUP
Significance: global
Direction: both

Information Element	Reference	Direction	Type	Length (Octets)
Protocol discriminator	4.2 / T1.607	both	M	1
Call reference	4.3 / T1.607	both	M	2-*
Message type	4.4 / T1.607	both	M	1
(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)
Facility	**8.2.3 / T1.610**	**both**	**O (Note 6)**	**2-***
Locking shift	4.5.3 / T1.607	both	O (Note 3)	1
Emergency call control	**6.1.3.2**	**n -> u**	**O (Note 4)**	**2-3**
Generic information	**6.1.3.1**	**both**	**O (Note 5)**	**2-***
(Note 2)	(Note 2)	(Note 2)	(Note 2)	(Note 2)

"*" Denotes that the maximum length is network-dependent.

NOTES

1 Other codeset "0" information elements may be included as described in T1.607.

2 Other information elements that follow a locking shift are as described in T1.607.

3 Included when the Emergency call control, Generic information, or another Locking shift information element as described in T1.607, follows. If included for the Emergency call control or Generic information, the Locking shift information element identifies codeset 5.

4 Included when the network wants to provide an indication that a “flashing display” should be provided to the PSAP (or at the PSAP by the PSAP equipment) for an Emergency Service call. Alternatively, a display mechanism may be used. (See 6.2.4.2).

5 Included in the user-to-network direction when the calling user wants to pass generic information to the network, e.g., caller location information for an Emergency Service call (see 6.2.4.1). Included in the network-to-user direction when the network wants to pass generic information to the user, e.g., caller location information for an Emergency Service call to a Public Safety Answering Point (PSAP) (see 6.2.4.2). The Generic information information element may be repeated; the maximum number of occurrences is network dependent.

6 Included when the PSAP is invoking E9-1-1 call linking capability.

6.1.1.2 FACILITY

See T1.610.

6.1.2 Codesets

The Facility information element is defined in T1.610 to be in codeset 0. In addition, the Generic Information information element and the Emergency call control information element are in codeset “5”.

6.1.3 Information elements

The following information elements are applicable to the operation of ECS: Generic information, Emergency call control, and Facility.

6.1.3.1 Generic information

The purpose of the Generic information (GI) information element is to allow the transmittal of generic information across an ISDN interface.

The GI information element is coded as shown in Figure 7.

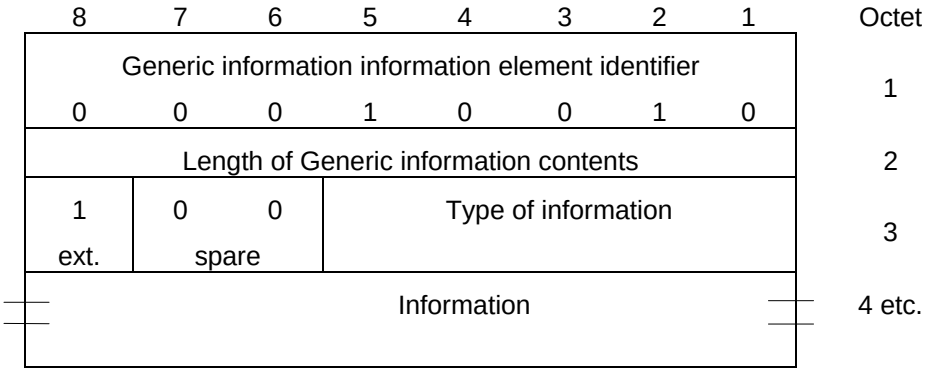

Figure 7 - Generic information information element

Type of information (octet 3)

Bits 5 4 3 2 1	
0 0 0 0 1	Calling Geodetic Location information (Note)
0 1 1 0 1	Location identification number

All other values are reserved

NOTE - The Type of Information coding value of Calling Geodetic Location information is currently only applicable in the network to user direction.

Information (octets 4 etc.)

By default, this field is coded with IA5 characters.

The detailed encoding of the *Information* field is dependent on the value in the *Type of information* field, as follows:

Calling Geodetic Location information

When the “Type of Information” field is coded to “Calling Geodetic Location information”, the “Information” field (i.e., octet 4 etc.) shall be coded identically to the coding of Octet 1 - n of the SS7 Calling Geodetic Location information parameter. Refer to 7.1.2.3 for detailed coding of these octets.

Location Identification Number

When the “Type of information” field is coded to “Location Identification Number”, the “Information” field shall contain one or more digits of this identifier. The actual number sent by the ISDN user to the network shall consist of a 10 digit number conformant to the North American Numbering Plan. Typically, this Location Identification Number value is one of the NANP numbers assigned to the ISDN interface.

Octet 4 etc., shall be coded as ASCII characters as shown below.

8	7	6	5	4	3	2	1	
0	Number digits (ASCII characters)							4 etc.

6.1.3.2 Emergency call control

The purpose of the Emergency call control information element is to convey emergency call control information across an ISDN interface.

The Emergency call control information element is coded as shown in Figure 8.

8	7	6	5	4	3	2	1	Octet
Emergency call control information element identifier								1
0	0	0	1	0	0	0	1	
Length of Emergency call control information contents								2
1 ext.	Coding Standard			Control				3

Figure 8 - Emergency call control information element

Coding standard (octet 3)

Bits 7 6	
1 0	National Standard
1 1	Standard defined for the network present at the network side of the interface (see Note)

All other values are reserved

NOTE - This coding standard should be used only when the desired Emergency call control information element cannot be represented with national standardized coding.

Control (octet 3) (see Note)

Bits 5 4 3 2 1	
0 0 0 0 0	Normal/Steady display
0 0 0 0 1	Flashing display

All other values are reserved

NOTE - These are the American national codepoints that apply only when the coding standard field specifies national standard “1 0”.

6.1.3.3 Facility

The Facility information element is defined in T1.610. The protocol profile shall be coded to “Networking Extensions”. The Network Protocol profile shall be omitted. The Interpretation component may be excluded.

6.1.3.3.1 ASN.1

```
DEFINITIONS::=
BEGIN
EXPORTS e911CallTransferLink
IMPORTS OPERATION, ERROR FROM Remote-Operation-Notation
{joint-iso-ccitt remote-operations(4) notation(0)}

notAvailable, notSubscribed, invalidCallState
FROM General-Error-List {ccitt recommendation q 950 general-error-list(1)}

linkIDNotAssignedByNetwork FROM
{ccitt recommendation q 952 explicit-call-transfer (7) operations-and-errors (1)}

e911CallTransferLink::= OPERATION
        ARGUMENT IMPLICIT SEQUENCE {
                linkID,
                dChannelIdentifier OPTIONAL}

-- e911CallTransferLink is a Class 2 operation that provides a link between a call origination,
-- and another call that is to be transferred. Successful invocation of this operation results in
-- the use of stored calling station number information in setting up the new call.
-- linkID contains two octets coded with the call reference value and flag of the other call
```

```
-- to be transferred.
-- dChannelIdentifier contains a 1-to-4 octet value identifying the D-channel of the interface
-- serving the other call to be transferred, obtained from a previous dCIRequest. (Please refer
-- to the requirements for ECT in T1.643).
-- This argument is only included when the two calls are served by different ISDN interfaces.

RESULT
-- The return of a Return Result component is an acknowledgment of a
-- successful outcome of the e911 call transfer link operation.

ERRORS {notSubscribed, notAvailable, invalidCallState, linkIdNotAssignedByNetwork, dCINotAssignedByNetwork}

DClRequest :: =  OPERATION
                 RESULT dChannelIdentifier
                 ERRORS { notAvailable }

LinkIdNotAssignedByNetwork ::= ERROR
DCINotAssignedByNetwork ::= ERROR

linkID ::= INTEGER (-32,768 — 32,767)
dChannelIdentifier ::= OCTET STRING (SIZE (1 .. 4))

e911CallTransferLink E911CallTransferLink ::= {1 2 840 10005 0 12}
-- this operation value is an object identifier in number form which represents: ISO (1),
-- ansi (2), t1s1(840), ISDN-supplementary-services (10005), operations (0),
-- e911CallTransferLink (12)

dCIRequest DCIRequest ::= {1 2 840 10005 0 9}

linkIdNotAssignedByNetwork LinkIdNotAssignedByNetwork ::= 61
dCINotAssignedByNetwork DCINotAssignedByNetwork ::= {1 2 840 10005 1 1}
END
```

6.1.4 Codepoints

The codepoints defined in T1.607, T1.610, and in this standard, shall be used by ECS, as appropriate.

6.2 Procedures

This clause details the procedures that shall be supported between the two sides of an ISDN interface in order to support Emergency Calling Service signaling. The procedures describe the generation and transmission of location information and other typifying information between a TE or NT2 and the network, and between the network and a PSAP.

6.2.1 States and timers

6.2.1.1 States

ECS uses all of the same call states as defined in T1.607 for basic call control. There are no additional states beyond those defined in T1.607 for ECS.

6.2.1.2 Timers

ECS uses all of the same timers as defined in T1.607 for basic call control. There are no new timers associated with ECS.

6.2.2 Invocation

ECS is invoked when the called party number digits received by the network from the originating user are ’911’. The inclusion of location information in an originating SETUP message does not constitute the invocation of ECS.

Conversely, the exclusion of location information in an originating SETUP message does not preclude the invocation of ECS.

6.2.3 Notification

Notification of an ECS call including the delivery of caller location information is provided to the terminating PSAP as described in 6.2.4.2.

6.2.4 Normal Operation

6.2.4.1 Origination

A user (TE or NT2), when originating an Emergency Service call, may optionally send information about the location of the caller to the network during call establishment. Caller location information in the form of a LIN, if provided, shall be sent in a Generic information (GI) information element in a SETUP message, with the “Type of information” field of the GI information element coded to “01101” Location Identification Number.

The originating exchange may allow a service provider to provision whether a user-provided calling party number or the charge number associated with an originating ISDN interface shall be used as the calling party number for the ESC. If this capability is supported in an originating exchange and the user-provided calling party number is to be used, then the network shall follow the procedures of T1.625 for determining the calling party number for the call with the following clarification.

– The network shall perform screening on the user-provided calling party number;

– A number that fails screening shall not be sent towards the emergency service exchange. If the user provided calling party number fails screening, then the main (i.e., network provided) number shall be sent as the calling party number toward the emergency service exchange.

If the charge number is to be used, then the network shall utilize the charge number as the calling party number for the call. In either case, only a single calling party number shall be sent towards the emergency service exchange.

If a SETUP message is received at an exchange where the called number digits are ’911’ and the exchange supports access to an SRF, the ECS procedures shall be invoked. In this case, the exchange shall query the SRF to determine the appropriate PSAP to which the call shall be routed. As part of this query, the exchange shall provide the following caller location information to the SRF:

a) The Preferred call back number (Calling Party Number or the Charge number, at the option of the service provider);

b) The Location Identification Number (if available)

The SRF will provide the ESN of the PSAP to which the call should be routed.

The originating exchange, when it receives a SETUP message for an Emergency Service call that contains a GI information element encoded with caller location information, shall pass the caller location information toward the terminating exchange.

If the Generic Information (GI) information element is received for a non-emergency service call, then in the absence of any other applicable supplementary service requiring the GI information element, the network shall discard the GI information element, and return a STATUS message to the user containing cause 42 “access information discarded; diagnostic: GI information element identifier (location: public network serving the local user).” The call shall still be processed by the network.

6.2.4.2 Terminating

If the terminating exchange receives caller location information, the terminating exchange shall include a GI information element in the SETUP message used to offer the call to the terminating ISDN interface, i.e., the PSAP. The “Type of information” field shall be encoded with the same information that was received from the originating exchange.

When the network determines from its E9-1-1 translation data that it is necessary to provide an indication of “flashing display” to the PSAP, the network shall provide this indication to the PSAP using a display mechanism (e.g., Display Text information element) or in the Emergency call control information element in the SETUP message

used to offer the call. If the Emergency call control information element is used and an indication of “flashing display” is to be provided, the control field of the Emergency call control information element shall be coded with the value 1, “flashing display”.

When the network determines from its E9-1-1 translation data that a “normal display” is to be provided to the PSAP, the network may provide this indication to the PSAP using a display mechanism (e.g., Display Text information element) or in the Emergency call control information element in the SETUP message used to offer the call. If the Emergency call control information element is used the control field shall be encoded to 0, “normal display”. Omission of the Emergency call control information element results in the same treatment as for “normal display”.

On an ISDN interface that is shared between ECS and non-ECS calls, the Emergency call control information element shall be included in the SETUP message for a terminating ECS call. The Control field shall be coded to one of the allowed values as described earlier.

The network shall retain the following information, if available, in case of conferencing and transfer to an alternate PSAP:

– Preferred call back number (Calling Party Number or Charge Number)

– Location Identification Number.

For SS7 supported calls, refer to 7.3.3 for what information should be retained.

6.2.5 Conferencing and transfer procedures

6.2.5.1 Stimulus procedures

6.2.5.1.1 Requesting an emergency service conference call

To request an emergency service conference call for conferencing and transfer purposes, the ISDN PSAP shall send an INFORMATION message to the network with the Feature Activation information element coded with a feature identifier value of “invoke Emergency conference calling.” (Note that the exact feature identifier value assigned to ISDN PSAP is network dependent.) The call reference included in the INFORMATION message shall correspond to an incoming emergency service call. The called address information shall be a 7 or 10 digit North American Numbering Plan (NANP) number, an abbreviated number, or a dialed code (e.g., *11) encoded in the Called party number information element or Keypad facility information element as described in T1.607. A 7 or 10 digit NANP number shall be encoded in accordance with T1.607. An abbreviated number shall be included in the Keypad facility information element or in the Called party number information element with a Type of Number (TON)/Numbering Plan Identification (NPI) of “abbreviated number/private numbering plan” or “unknown number/unknown numbering plan”. A dialed code shall be included in the Keypad facility information element or in the Called party number information element with a TON/NPI of “unknown number/unknown numbering plan”.

If the conference request can be accepted, the network shall respond as follows:

– The network shall allocate resources for the conference request to the call and consider the associated call as the first call on the conference. The call reference of this first call on the conference shall henceforth be referred to as the conference ID.

– The network shall return an INFORMATION message (on the same call reference as received) to the ISDN PSAP with a Feature Indication information element coded with a feature identifier value of “invoke Emergency conference calling” and a status of “active”.

If the network determines that it cannot honor the conference request, the network shall return an INFORMATION message to the user including the following:

– The Cause information element shall be included and coded with a cause appropriate to the network problem.

– The Feature Indication information element shall be included with a feature identifier value of “invoke Emergency Service conference calling” and a status of “idle”.

6.2.5.1.2 Adding a call to an emergency service conference call

To request the initiation of a call to a secondary PSAP and bridging of that call to the original conference call, the ISDN PSAP shall send a SETUP message to the network in accordance with T1.607. In particular the ISDN PSAP

shall ensure that the Channel Identification information element is included and coded to identify the B-channel associated with the emergency service conference call. The exclusive/preferred field of the Channel Identification information element may be coded to “preferred” or “exclusive”.

On receiving a SETUP message as described above, the network shall connect the call associated with the SETUP message to the B-channel and to the conference. The network shall obtain the stored information for the first call and use it for establishing the call to the secondary PSAP. The network shall continue with normal call origination treatment for the new call up to the point where the ISDN PSAP is to be sent an ALERTING, PROGRESS, or CONNECT message as defined in T1.607. Any network-provided tone to be sent to the ISDN PSAP shall be sent to all the users on the conference call.

When an ALERTING, PROGRESS, or CONNECT message is to be sent to the ISDN PSAP, the network shall continue to process the call toward the called user (i.e., secondary PSAP), but instead of sending the ALERTING, PROGRESS, or CONNECT message to the controller, the network shall initiate clearing of the call reference for this call to the controller by a RELEASE message. This RELEASE message shall contain the call reference value associated with the call being added to the conference as well as cause value 16, “normal clearing (location: public network serving the local user).” Clearing of this call reference shall then proceed as defined in T1.607, except that no action shall be taken on any B-channel as a result of this clearing procedure, and the network shall not clear the call to the remote user.

If the network determines that the call associated with the SETUP message cannot be established, e.g., invalid address information has been received by the network or the call is rejected (by the remote user or network) or abandoned (by the ISDN PSAP) before an ALERTING, PROGRESS or CONNECT message is to be returned, the call reference value for this call shall not be merged with the conference ID. Instead, the network shall clear the call in both directions, as defined in T1.607. If a network-provided tone is to be provided to the controller for this call (as defined in T1.607), it shall be sent to all the users connected to the conference. After clearing the call, the conference shall remain connected as normal.

After the network bridges the call onto the conference and merges the call reference value with the conference ID, call treatment to the remote user shall proceed as defined in T1.607. The application of network-provided tones to the ISDN PSAP shall also apply (as defined in T1.607). However, no additional call control messages that contain the cleared call reference shall be sent to or acknowledged by the ISDN PSAP relating to this call, and any network-provided tone to be sent to the ISDN PSAP for this call shall be sent to all the users connected to the conference.

6.2.5.1.3 Dropping a call from an emergency service conference call

To drop the newly added call from a conference, the ISDN PSAP shall send an INFORMATION message to the network with the Feature Activation information element coded with a feature identifier value of “drop” using the call reference of an emergency service conference call.

After receiving the drop request, if all calls bridged to the conference are identified by the conference ID, the network shall release the facilities associated with the last call added to the conference and initiate clearing to the remote user, as defined in T1.607. If the call being cleared is end-to-end ISDN, the cause information sent to the remote user shall be coded to cause 16, "normal clearing (location: public network serving the local user)." The connections associated with the remaining conferees shall be retained.

If a drop request is received and (1) the call reference value associated with the drop request is not associated with a conference or (2) there is a call bridged to the conference whose call reference value has not been merged with the conference ID, the network shall reject the drop request as follows. The network shall send an INFORMATION message that contains the conference ID and national-standardized cause 53, "service operation violated (location: public network serving the local user)."

If there were to be only two parties remaining on the conference, if the received drop request is accepted, the network shall interpret this drop request as a request to release the conference facilities. In this case, the network shall release the conference facilities and convert the call to a normal two-way call. The network shall then return an INFORMATION message to the controller containing the same call reference value as the received INFORMATION message and Feature indication information element coded to "feature identifier = emergency service conference; status = idle."

NOTE - Some implementations may choose to keep the conference status active for the case described above where the drop request is accepted.

If there are only two parties on the conference when the drop request is received, the network shall release the conference facilities and clear the call in both directions. The network shall initiate clearing toward the controller with a DISCONNECT message and proceed as defined in T1.607. This DISCONNECT message shall include the Feature Indication information element coded to "feature identifier = emergency service conference; status = idle" and cause 16, "normal clearing (location: public network serving the local user)." In addition, the network shall initiate clearing toward the remote user as defined in T1.607. If the call is end-to-end ISDN, the Cause information element sent to the remote user shall contain cause 16, "normal clearing (location: public network serving the local user)."

6.2.5.1.4 Transferring an emergency service conference call

To request the transfer of the conference call, the ISDN PSAP may indicate this request via the sending of a DISCONNECT message to the network including the conference ID or via a feature key transfer request using the conference ID.

a) Transfer Request via Call Clearing

If the network receives a DISCONNECT message from the ISDN PSAP for an emergency service conference call and the network determines that the DISCONNECT message shall be interpreted as a transfer request, the network shall proceed as described below. If the network determines that the DISCONNECT message is not to be interpreted as a transfer request, then the network shall proceed as described in 6.2.5.1.5.

The network shall verify the following before permitting the transfer of the emergency service conference by the ISDN PSAP:

– There are at least two calls associated with the conference that are identified by the conference ID.

– At least one of the calls (that will remain after transfer) has been answered. In addition, at least one of the calls that will remain after transfer is an end-to-end ISDN call, to a non-ISDN line served by the network (providing emergency service conference calling), or on an incoming trunk to this network.

If the network determines that all these conditions exist, it shall transfer the conference. That is, the network shall retain the connection between all the established calls on the conference that are identified by the conference ID and continue to clear the call between the controller and the conference, as defined in T1.607. As part of clearing the call to the controller, the network shall include feature indication information coded to "feature identifier = emergency service conference; status = idle" in the first message sent to the controller after clearing the connection. If the controller sent a RELEASE COMPLETE message to clear the call, the network shall include this feature indication information in an INFORMATION message that contains the null call reference value.

After transfer is invoked, if the network receives a disconnect request from a conferee, the network shall release the facilities associated with that conferee. The connection between the remaining conferees shall be retained until one of the following conditions exists:

– Only one conferee remains on the conference.

– None of the remaining calls have been answered or none of the remaining conferees are on an end-to-end ISDN call, a non-ISDN line served by the network that provides emergency service conference calling, or an incoming trunk to this network.

If one or more of these conditions exist, the network shall release all facilities associated with the conference and initiate clearing of all calls associated with the conference. Release treatment to each remote user shall proceed as defined in T1.607. For the clearing of an end-to-end ISDN call, cause information shall be included and coded to cause 16, "normal clearing (location: public network serving the local user)." If the network has not yet released the conference facilities, the network shall release them at this time.

On the other hand, if none of these conditions exist, the network shall retain the bridged connection to the remaining conferees. If only two conferees remain, the network shall convert this call to a normal, two-way call and release the conference facilities.

b) Transfer Request Via Feature Key Management Signaling

If the transfer request is received within an INFORMATION message (in the form of a Feature Activation information element coded to “transfer”) that also contains a conference ID, the network shall determine if the following conditions exist:

– All the calls connected to the conference are identified by the conference ID;

– The network determines that there are at least two established calls associated with the conference, i.e., are identified by the conference ID;

– At least one of the calls (that will remain after transfer) has been answered. In addition, at least one of the calls that will remain after transfer is an end-to-end ISDN call, a non-ISDN line served by the network (providing emergency service conference calling), or on an incoming trunk to this network.

If the network determines that at least one of these conditions does not exist, the network shall reject the transfer request with an INFORMATION message that contains the conference ID; national-standardized cause 53, "service operation violated (location: public network serving the local user);" and the Feature Indication information element coded to "feature identifier = transfer; status = idle." After the network rejects the transfer request, the connection to the conference shall remain as is.

If the network determines that all these conditions are met, the network shall clear the connection between the controller and the conference, as defined in T1.607. The cause information sent to the controller shall be cause 16, "normal clearing (location: public network serving the local user)." The network shall then proceed with transferring the conference, as defined in item (a) above.

6.2.5.1.5 Disconnecting from an Emergency Service Conference Call

If, after receiving from the controller the call clearing message that contains the conference ID, the network determines that at least one of these conditions for invoking transfer (specified in 6.2.5.1.4) does not exist or the clearing request is not to be interpreted as a transfer request, it shall clear the entire conference call. The network shall clear the call on the controller's interface, as defined in T1.607. The first message sent to the controller in response shall contain feature indication information coded to "feature identifier = emergency service conference; status = idle." (If the controller disconnects from the conference with a RELEASE COMPLETE message, this feature indication information shall be included in an INFORMATION message that contains the null call reference.

In addition to clearing the connection to the controller, the network shall release the conference facilities and initiate clearing of each call on the conference, as defined in T1.607. For each call that is end-to-end ISDN, the Cause information element sent to the remote user during clearing shall contain the information identified by the network for the call clearing message received from the controller.

If, in addition to clearing the conference, the network determines that there is a call connected to the conference whose call reference value has not been merged with the conference ID, it shall initiate clearing of that call in both directions, as defined in T1.607. The cause information sent to the controller shall include national-standardized cause 53, "service operation violated (location: public network serving the local user)." The Cause information element sent to the remote user for this call (if the call is end-to-end ISDN) shall contain the same information identified by the network for the call clearing message received from the controller.

Any time after conference calling has been invoked, if the network receives a disconnect indication from the remote user or network serving the remote user, it shall release the facilities associated with the remote user or network serving the remote user and proceed with the clearing of that call (toward the remote user or network serving the remote user), as defined in T1.607. If the call was an outgoing (from the controller) call that has not reached the point of called party answer when the disconnect indication is received, the application of network-provided tones to the controller shall apply (as defined in T1.607) and shall be sent to all users on the conference until the network determines that the application of the tone has been completed or until the controller releases the call through the drop procedures defined in 6.2.5.1.3.

Any time after conference calling has been invoked, if the network receives a disconnect indication from the secondary PSAP, it shall release the facilities associated with the secondary PSAP and proceed with the clearing of that call (toward the secondary PSAP), as defined in T1.607. If the call was an outgoing (from the controller) call that has not reached the point of called party answer when the disconnect indication is received, the application of network-provided tones to the controller shall apply (as defined in T1.607) and shall be sent to all users on the conference until the network determines that the application of the tone has been completed or until the controller releases the call through the drop procedures defined in 6.2.5.1.3. In addition, the network shall:

- Release the conference facilities;
- Convert the call to a two-way call, and;
- Send an INFORMATION message to the primary PSAP containing the call reference of the call with the caller and the Feature Indication information element coded to “feature identifier = emergency services conference; status = idle.”

If one or more calls are still bridged onto the conference, the remaining conference connection shall be maintained and no call control messages shall be sent to the controller for this clearing procedure. If there is only one call on the conference when the disconnect indication is received, the network shall release the facilities associated with the conference and initiate clearing toward the controller by a DISCONNECT message. The cause information included in this DISCONNECT shall reflect the reason indicated by the remote user/network and feature indication information coded to "feature identifier = emergency service conference; status = idle." Call clearing shall proceed in both directions, as defined in T1.607.

6.2.5.2 Functional Procedures

The functional procedures defined in this clause include:

- E9-1-1 call linking - the ability to link emergency call information to an originating call from an NT2 facility;
- Network provided conference and transfer;
- PSAP provided conference and transfer.

E9-1-1 call linking procedures apply to both network provided and PSAP provided conference and transfer procedures.

6.2.5.2.1 E9-1-1 call linking

The ISDN PSAP needs to be able to signal to the network the relationship of the new call with an existing call so that the network can retrieve the stored information for the incoming call and use that in the new call request. This capability will be referred to as E9-1-1 Call linking.

Before an E9-1-1 Call Linking request can be issued, which involves calls on two different ISDN interfaces, the ISDN PSAP must have the D-channel identifier (DCI) associated with the original incoming emergency service call.

If the ISDN PSAP has not already obtained a DCI for the associated call, it shall request a DCI from the network by sending a Facility information element containing an Invoke component with the national-specific operation value 9 “dCIRequest” to the network. The coding of the operation value for “dCIRequest” uses object identifiers. The national-specific operation value for “dCIRequest” is defined with an ISO object identifier in numbers form as {1 2 840 10005 0 9}. In name form this object identifier can also be written as {iso member-body us ansi-t1-610 operations dCIRequest}. The Facility information element shall be sent in a call associated message as described in T1.610.

Upon receiving the dCIRequest Invoke component, the network shall send a Return Result Component including the DCI, if one is available for the interface. If the network does not have a DCI assigned to that ISDN interface, the network shall send a Return Error component with an error value of 3 “notAvailable”.

The ISDN PSAP shall include in the SETUP message used to initiate a call to the secondary PSAP a Facility information element as described in T1.610. The Facility information element shall contain the e911CallTransferLink Invoke component. The E9-1-1 tandem shall be able to recognize and accept a e911CallTransferLink Invoke component from the ISDN PSAP. In addition, the E9-1-1 tandem shall:

– obtain from the linkID argument the call reference of the first call and use this information to obtain the information stored for the first call;

– use the stored information in originating the call toward the destination DN identified in the Called Party Number parameter in the SETUP message, including a designation of emergency call, if appropriate.

If the E9-1-1 tandem receives a Facility information element in a SETUP message from the controlling (i.e., transferring) PSAP containing an e911CallTransferLink operation in an Invoke component and if the E9-1-1 tandem cannot identify another call from the information in the Invoke component, then the E9-1-1 tandem shall:

– follow the requirements for CLIP/CLIR described in T1.625 for determining Calling Party Number information;

– send a Return Error component to the PSAP to indicate that the other call information could not be found (i.e. notAvailable).

When the E9-1-1 tandem is able to successfully obtain and use stored call information to set up the second leg of the call, then the E9-1-1 tandem shall return a Return Result component in accordance with the procedures defined in T1.610

6.2.5.2.2 Network Provided Conference and Transfer

These procedures are based on the American National Standards for Explicit Call Transfer (ECT) and ISDN Conference Calling as defined in T1.643 and T1.647, respectively. In the case of ECT, the ISDN PSAP is expected to provide the bridging of the related calls until the transfer is effected. After the transfer, the network provides the bridging of the calls. With ISDN Conference Calling, the network provides the bridging of the calls.

The following capability defined in T1.643 shall be supported for this capability:

– Requesting a Transfer (on a single ISDN interface and across ISDN interfaces).

All other capabilities defined in T1.643 may optionally be supported, but will not be addressed in this standard.

The following capabilities defined in T1.647 shall be supported for this capability:

– Requesting Conference Calling;

– Adding a Call to a Conference (on a single ISDN interface and across ISDN interfaces);

– Dropping a call from the conference;

– Transferring the conference;

– Disconnecting from the conference.

It is expected that the type of conference circuits to be used for this application is a three-port conference circuit. All other capabilities defined in T1.647 may optionally be supported but will not be addressed in this standard.

To link the stored information of the original incoming ESC to the secondary PSAP call, the network and ISDN PSAP shall follow the procedures of 6.2.5.2.1.

The called address information contained within the SETUP message sent by the PSAP to the network for the secondary PSAP call shall be a 7 or 10 digit North American Numbering Plan (NANP) number, an abbreviated number, or a dialed code (e.g., *11) encoded in the Called party number information element as described in T1.607. A 7 or 10 digit NANP number shall be encoded in accordance with T1.607. An abbreviated number shall be included in the Called party number information element with a TON/NPI of “abbreviated number/private numbering plan” or “unknown number/unknown numbering plan”. A dialed code shall be included in the Called party number information element with a TON/NPI of “unknown number/unknown numbering plan”.

6.2.5.2.3 PSAP Provided Conference and Transfer

As an alternative to the network-provided conference and transfer capability described in 6.2.5.2.2, the PSAP equipment (e.g., an NT2) may provide the conference and transfer function. In this case, the conference circuit is provided by the PSAP equipment and the second leg of the conference call appears to the network as a basic call originated by the PSAP. When the conference connection is transferred (i.e., when the original PSAP attendant releases from the connection) the transferred call is maintained by the transferring PSAP equipment. The trans-

ferred call appears to the network as two independent calls, one being the original emergency service call and the second being the call originated by that PSAP to another PSAP.

To link the stored information of the original incoming ESC to the secondary PSAP call, the network and ISDN PSAP shall follow the procedures of 6.2.5.2.1.

The called address information contained within the SETUP message sent by the PSAP to the network for the secondary PSAP call shall be a 7 or 10 digit North American Numbering Plan (NANP) number, an abbreviated number, or a dialed code (e.g., *11) encoded in the Called party number information element as described in T1.607. A 7 or 10 digit NANP number shall be encoded in accordance with T1.607. An abbreviated number shall be included in the Called party number information element with a TON/NPI of “abbreviated number/private numbering plan” or “unknown number/unknown numbering plan”. A dialed code shall be included in the Called party number information element with a TON/NPI of “unknown number/unknown numbering plan”..

6.2.6 Error handling

If a protocol error is detected with a received GI information element, the network shall follow the procedures of T1.607 for the relevant procedures applicable to an optional information element.

If the E9-1-1 tandem cannot successfully invoke the e911CallTransferLink operation, then the E9-1-1 tandem shall use the appropriate error value for the error condition in Table 2.

Table 2 - Errors for e911CallTransferLink

Error Values	Error Condition
notSubscribed	The ISDN interface is not configured as an ECS PSAP interface.
invalidCallState	The e911CallTransferLink Invoke component is received in a message other than SETUP.
linkIdNotAssignedByNetwork	The linkID does not correspond to an allocated call reference on the indicated ISDN interface.
dCINotAssignedByNetwork	The dChannelIdentifier parameter is not assigned. (Not needed in the single ISDN interface configuration.)
notAvailable	No call information has been stored for the call identified by the linkID parameter or the call identified by the linkID parameter is not an emergency service call.

6.3 Interactions

6.3.1 Call waiting

There are no DSS1 interactions with this service.

6.3.2 Calling line identification presentation and restriction

For an ESC, the network shall include the calling party number digits, if available, even if the presentation restriction indicator of the calling party is set to presentation restricted. Refer to 6.2.7.1.1 of T1.625 for the coding of the Calling Party Number information element.

6.3.3 Call hold service

If the network receives a HOLD message from an ISDN ECS caller on the ECS, the network shall return a HOLD REJECT message with a Cause information element with cause 53, “service operation violated (location: public network serving the local user)” and a diagnostic of “short-term denial”.

6.3.4 Multi-level precedence and preemption

There are no DSS1 interactions with this service.

6.3.5 User-to-user signaling

There are no DSS1 interactions with this service.

7 Switching and signaling specification for ECS at interexchange interfaces

7.1 Formats and codings for ECS

Only ISDNUP protocol has been identified in association with SS7 procedures supporting ECS. No TCAP procedures have been identified for ECS.

7.1.1 Messages

The format of the Initial Address Message (IAM) is found in chapter 3 of T1.113.

The following new parameter shall be added to the allowed set of parameters defined for the IAM.

Table 3 - IAM message additions

Parameter	Reference (§)	Type	Length (octets)
Calling Geodetic location	3.6A	O	3 - n

7.1.2 Parameters

The following is the name of a new parameter.

Table 4 - New Parameters

Parameter name	Reference (sub-clause)	Code
Calling Geodetic location	3.6A	10000001

7.1.2.1 Generic digits

The format of the Generic Digits Parameter (GDP) is shown in chapter 3 of T1.113. The coding for the type of digits field used for ECS is:

Type of digits

Bits

5 4 3 2 1

0 1 1 0 1 Location identification number

The encoding scheme sub-field shall be coded to BCD even “0 0 0” or BCD odd “0 0 1”. The digits sub-field shall contain one or more digits of the LIN value.

7.1.2.2 Calling party’s category

The format of the Calling Party’s Category parameter is shown in chapter of 3 T1.113. The coding used for ECS is the value 11100000 (emergency service call).

7.1.2.3 Calling geodetic location

The format of the Calling Geodetic Location Parameter (CGLP) is shown in Figure 9. Latitude and longitude of the wireless caller's position will be carried in the CGLP. The format and coding of the elements in the shape description are described in the subclauses.

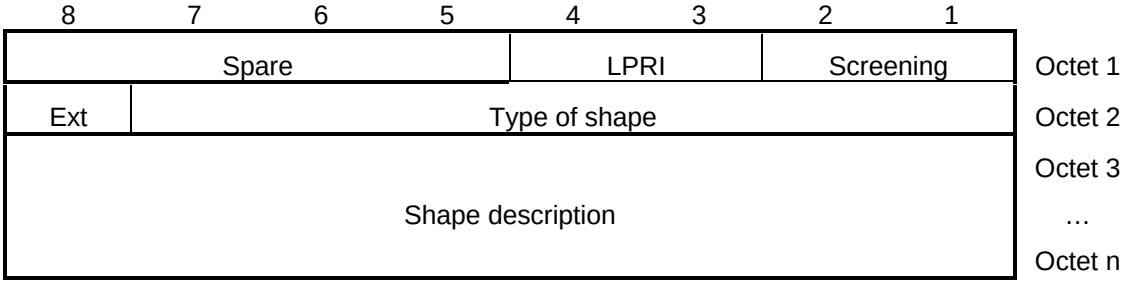

Figure 9 - Format of the CGLP

The following codes are used in the subfields of the Calling Geodetic Location parameter:

a) Location presentation restricted indicator (LPRI)

00	presentation allowed
01	presentation restricted
10	location not available (NOTE)
11	spare

NOTE - if the Calling Geodetic Location parameter is included and the LPRI indicates location not available, octets 2 to *n* are omitted, the screening indicator sub-field is coded 11 (network provided).

b) Screening indicator

00	user provided, not verified
01	user provided, verified and passed
10	user provided, verified and failed
11	network provided

c) Extension indicator

0	Information continues through the next octet
1	Last octet

d) Type of shape

0000000	ellipsoid point
0000001	ellipsoid point with uncertainty
0000010	point with altitude and uncertainty
0000011	ellipse on the ellipsoid (Not used for ECS)
0000100	ellipsoid circle sector (Not used for ECS)
0000101	polygon (Not used for ECS)
0000110 to 0111111	spare
1000000 to 1111110	Reserved for national use
1111111	Reserved for future expansion

e) Shape description

The coding of the shape description consists of different elements dependent on the type of shape as detailed in the 7.1.2.3.1 through 7.1.2.3.3.

7.1.2.3.1 Ellipsoid point shape description

The format of the Ellipsoid point shape description is shown in Figure 10.

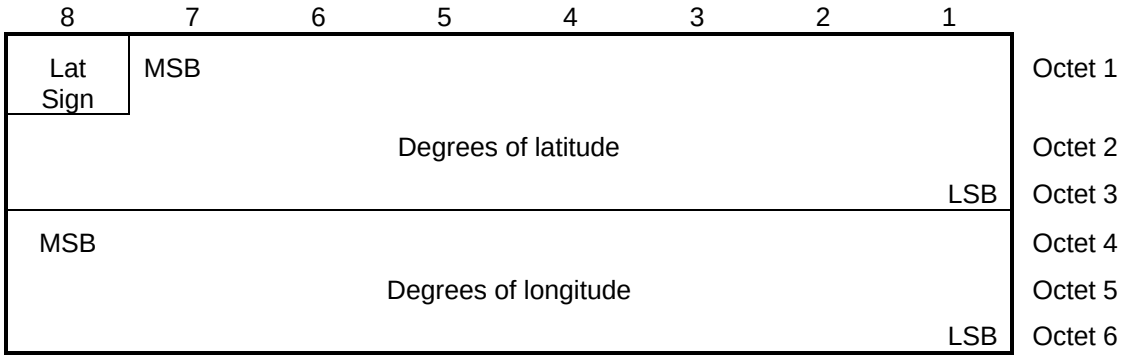

Figure 10 - Ellipsoid point shape description

a) Lat Sign

0 North
1 South

b) Degrees of latitude

The relation between the binary coded number N and the range of latitudes X ($0 \le X < 90$), where X is in degrees but not necessarily an integral number of degrees it encodes, is described by the following equation:

$$N \le \frac{2^{23}}{90} X < N + 1$$

except for $N=2^{23}-1$, for which the range is extended to include N+1

c) Degrees of longitude

The longitude, expressed in the range (-180, +180) is coded as a number between -2^{23} and $2^{23}-1$, coded in 2's complement binary. The relation between the binary coded number N and the range of longitudes X ($-180 \le X < 180$), where X is in degrees but not necessarily an integral number of degrees it encodes, is described by the following equation:

$$N \le \frac{2^{24}}{360} X < N + 1$$

7.1.2.3.2 Ellipsoid point with uncertainty shape description

The format of the Ellipsoid point with uncertainty shape description is shown in Figure 11 .

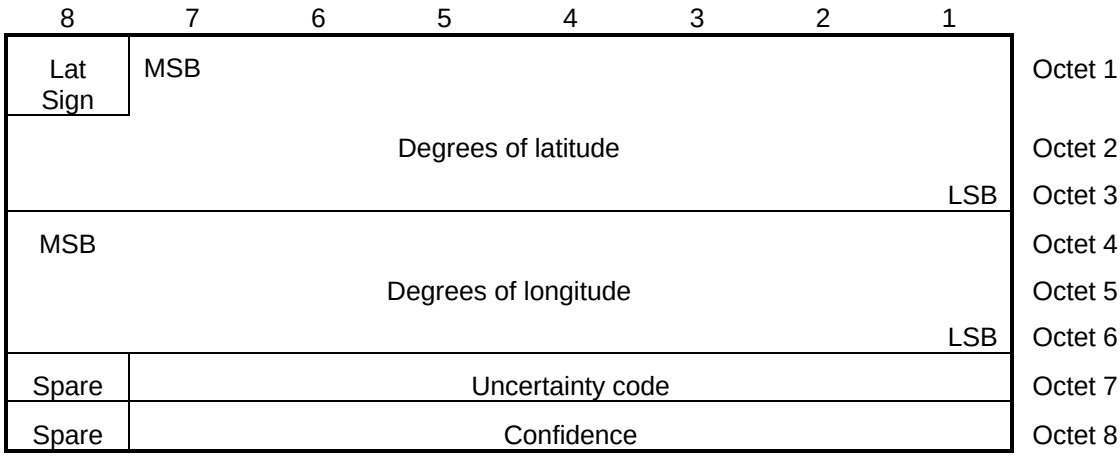

Figure 11 - Shape description of an ellipsoid with uncertainty

a) Lat Sign

In accordance with 7.1.2.3.1 a)

b) Degrees of latitude

In accordance with 7.1.2.3.1b)

c) Degrees of longitude

In accordance with 7.1.2.3.1c)

d) Uncertainty code

The uncertainty *r*, expressed in meters (in the range 1m to 1800km), is mapped from the binary number K, with the following formula:

$$r = C\left((1+x)^K - 1\right)$$

with C = 10 and x = 0.1.

f) Confidence

The confidence by which the location is known to be within the shape description, C (expressed as a percentage) is directly mapped from the binary number K, except for K=0 which is used to indicate ‘no information’, and 100 < K ≤127 which are not used.

7.1.2.3.3 Point with altitude and uncertainty shape description

The format of the point with altitude and uncertainty shape description is shown in Figure 12.

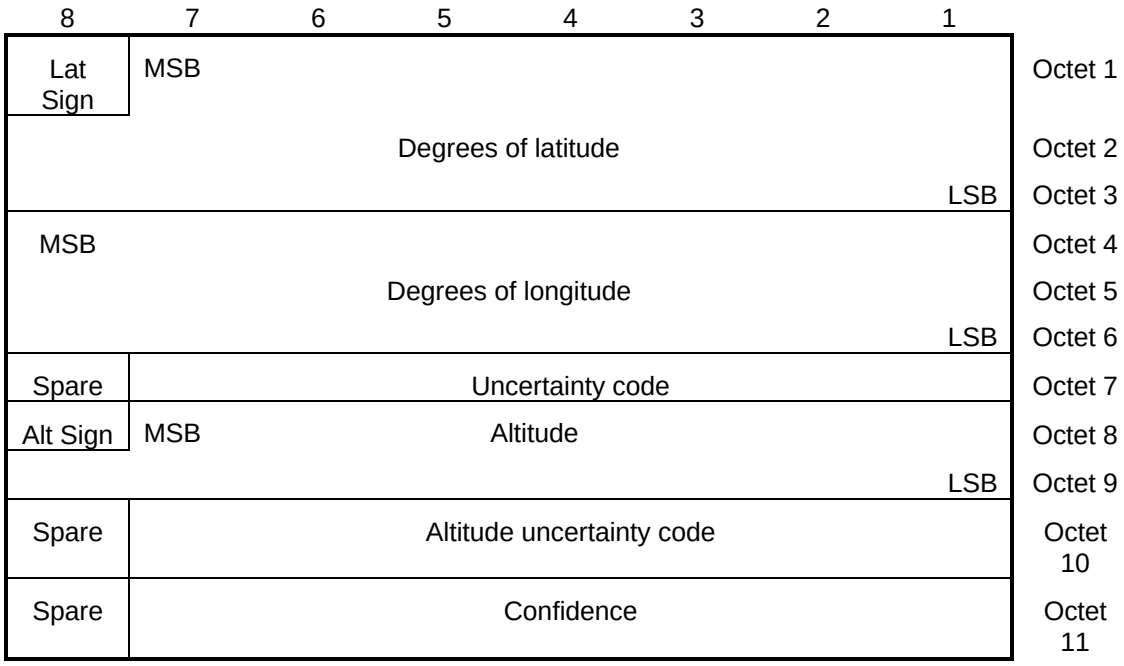

Figure 12 - Shape description of a point with altitude and uncertainty

a) Lat Sign

In accordance with 7.1.2.3.1a)

b) Degrees of latitude

In accordance with 7.1.2.3.1b)

c) Degrees of longitude

In accordance with 7.1.2.3.1c)

d) Uncertainty code

In accordance with 7.1.2.3.2d)

e) Alt Sign

0 Above the ellipsoid
1 Below the ellipsoid

f) Altitude

The relation between the binary coded number N and the range of altitudes *a* (in meters) it encodes is described by the following equation;

$$N \leq a < N + 1$$

except for $N=2^{15}$ for which the range is extended to include all greater values of *a.*

g) Altitude uncertainty code

The altitude uncertainty *h*, expressed in meters (in the range 0m to ≈1000m), is mapped from the binary number K, with the following formula:

$$h = C\left((1+x)^K - 1\right)$$

with C = 45 and x = 0.025.

h) Confidence

As per 7.1.2.3.1f)

7.2 Emergency Call Message Priority Assignment

IAMs for the emergency service calls shall be assigned a message priority of 1 to allow a higher probability of call completion during periods of signaling congestion.

7.3 Procedures for ECS

7.3.1 Procedures at an originating exchange

When an emergency service call is requested by a user (ISDN or non-ISDN), the originating exchange shall follow the procedures of T1.113 for call origination with the additions and exceptions provided in this subclause.

The IAM shall include a Called Party Number parameter that contains the digits “911” with the nature of address indicator coded “national (significant) number” and the numbering plan indicator coded “ISDN (Telephony numbering plan (E.164)”, if the call is routed over shared SS7 trunks towards the emergency service routing exchange. If the call is routed over dedicated facilities to the emergency service routing exchange, the Called Party Number parameter may instead contain the digits “11”, “1”, or no address digits.

The IAM shall also contain the Calling Party’s Category parameter. It is desirable that the Calling Party’s Category parameter contain the value 11100000 “emergency service call” in IAMs associated with ECS calls routed via SS7-supported dedicated trunk groups, or via SS7-supported shared trunk groups where the Called Party Number contains the digits “911”. If an ECS call is routed via a shared SS7-supported trunk group and the Called Party Number parameter in the IAM associated with the call contains a value other than “911”, the originating exchange shall code the Calling Party’s Category with the value 11100000 “emergency service call.”

The Calling Party Number (CPN) parameter shall be populated with the calling party number for the call as determined by T1.113 and T1.625 except for an originating ISDN interface. For an ISDN interface, the procedures of 6.2.4.1 shall be followed for determining the calling party number to be populated in the CPN parameter.

In general, the Charge Number (CN) parameter may be included in the IAM in accordance with T1.113. For the case of an originating ISDN interface, if the capability for determining the calling party number for an ECS call as described in 6.2.4.1 is supported in the originating exchange, then either the CN parameter shall be excluded from the IAM or if included shall contain the same value as the CPN parameter.

If an LIN is available, then the LIN shall be included within the GDP with the Type of Digits field coded as “Location Identification Number”.

If calling geodetic information (e.g., latitude and longitude) is available, then this information shall be included within the CGLP. The type of shape and other information shall be coded to reflect the information to be conveyed.

7.3.2 Procedures at an intermediate exchange

An intermediate exchange shall pass the Calling Party’s Category parameter, the GDP with LIN, and the CGLP unchanged.

7.3.3 Procedures at the emergency service routing exchange or the emergency service transfer exchange

From the SS7 perspective, the switch provides support for access to a PSAP to deliver, among other things, the caller location information.

In addition, when the primary PSAP attendant transfers the call to a secondary attendant, the inter-switch routing, conferencing, and transfer capabilities of ECS are provided.

7.3.3.1 Terminating the call to the Primary PSAP attendant

If an IAM is received at the destination exchange where the Called Party Number parameter contains only the digits “911”, the ECS procedures shall be invoked. In addition, if the call is incoming over dedicated facilities for handling emergency service calls and the Called Party Number parameter does not contain any digits or contains the digits “11” or “1”, the ECS procedures shall be invoked. In these cases, the exchange shall query the SRF to determine the appropriate PSAP to whom the call shall be routed. As part of this query, the exchange shall provide the caller location information to the SRF:

a) for wireline callers, the preferred call back number (Calling Party Number or the Charge Number at the option of the service provider), or the Location Identification Number

b) for wireless callers, the Location Identification Number and CGLP if available

The SRF will provide the ESN of the PSAP to which the call should be routed.

If the interface to the PSAP is an ISDN interface, the terminating exchange shall follow the procedures of Clause 6 to offer the call over the ISDN interface. If the interface is non ISDN and the called party indicated is idle, the call shall be offered to the destination as an ESC with the appropriate information. The destination exchange shall deliver the caller location information contained in the incoming IAM, as appropriate and if possible for the interface. In addition, the exchange shall retain, for the duration of the call, the following information in case of conferencing and transfer to an alternate PSAP:

- Preferred Callback Number;
- Generic Digits Parameter with LIN;
- Calling Geodetic Location Parameter;
- Originating Line Information .

7.3.3.2 Conferencing and Transfer of the call to the Secondary PSAP attendant

From the SS7 perspective, the procedures for inter-switch routing and inter-switch conferencing and transfer capabilities of ECS are the same. When either the routing or the conferencing and transfer capability of ECS is invoked and it is determined that the call is to be routed inter-switch, the emergency service routing or emergency service transfer exchange includes the ECS information in the outgoing Initial Address Message (IAM).

The IAM shall contain the Calling Party’s Category parameter coded “emergency service call”. The Called Party Number parameter contains the directory number or network address of the emergency service attendant to whom the call is being routed or conferenced.

The IAM shall contain the Calling Party Number parameter including the preferred callback number. The IAM shall contain the OLI parameter coded with the OLI information for the original incoming emergency service call.

The Caller Location Information, if available, shall always be included in the IAM.

If LIN was retained for the original ESC, the IAM shall include a GDP. The Type of Digits field of this GDP shall be coded “Location Identification Number.”

If geodetic location information (e.g., latitude and longitude), was retained for the original ESC, the IAM shall include the CGLP.

7.3.3.3 Procedures at an intermediate exchange (towards secondary attendant)

An intermediate exchange shall pass the Calling Party’s Category parameter, the GDP with LIN, and the CGLP unchanged.

7.3.3.4 Procedures at the destination exchange (serving secondary attendant)

If an IAM is received at the destination exchange containing both the number of a PSAP line in the Called Party Number parameter, and a Calling Party’s Category parameter coded “emergency service call”, ECS procedures shall be invoked. If the called party indicated is idle, the call shall be offered to the destination as an ECS call with the appropriate information. The destination exchange shall deliver the Caller Location Information contained in the incoming IAM.

If the ECS call cannot be completed to the called party indicated in the Called Party Number parameter (e.g., busy), then the exchange shall send a release message (REL) to the preceding exchange with an appropriate cause value and release the incoming circuit. The emergency service routing exchange will then initiate appropriate procedures.

7.3.4 Abnormal procedures

No abnormal procedures identified.

7.4 Interactions of ECS with supplementary services

7.4.1 Call waiting

This supplementary service has no impact on the operation of ECS.

7.4.2 Calling line identification presentation and restriction

This supplementary service has no impact on the operation of ECS.

7.4.3 Call hold service

This supplementary service has no impact on the operation of ECS.

7.4.4 Multi-level precedence and preemption

This supplementary service has no impact on the operation of ECS.

7.4.5 User-to-user signaling

This supplementary service has no impact on the operation of ECS.

8 Specification for protocol interworking

8.1 ISDN-SS7 Interworking

T1.609 shall apply for ISDN to SS7 interworking with the additions and exceptions identified in this clause.

8.1.1 Originating ISDN to SS7 interworking

In the case of originating ISDN interface to SS7 interworking for the handling of an ECS call, T1.609 and T1.625 shall apply with the exceptions and additions provided in Table 5. Note that it is possible for other ISDN/SS7 interworkings to occur such as:

- CPN information element to CPN parameter interworking in accordance with T1.609 and T1.625. The resultant set of CPN digits are also included within the Charge Number (CN) parameter;
- CPN parameter and the CN parameter both populated with a stored Charge Number.

Table 5 - DSS1 SETUP message to IAM interworking

DSS1 Information Element	ISUP Parameter	Notes
Generic Information (LIN)	Generic Digits (LIN)	
Called Party Number	Called Party Number	The digits ’911‘ are expected to be included.

8.1.2 SS7 to Terminating ISDN (at Primary PSAP)

In the case of SS7 to ISDN interworking for the termination of an ECS call to the Primary PSAP, T1.609 and T1.625 shall apply with the exceptions and additions provided in Table 6.

Table 6 - IAM to DSS1 SETUP message interworking at Primary PSAP

ISUP Parameter	DSS1 Information Element	Notes
Calling Party Number	Calling Party Number	If the preferred callback number is the ISUP calling party number, then CPN parameter to CPN information element interworking as specified in T1.609 and T1.625 shall apply with the exception that even when the presentation restriction indicator is set to “presentation restricted”, the calling party number digits shall be delivered to the ISDN PSAP.
Charge Number (CN)	Calling Party Number	If the preferred callback number is the ISUP charge number, then CN parameter to CPN information element interworking as specified in T1.609 and T1.625 shall apply.
Generic Digits (LIN)	Generic Information (LIN)	
Calling Geodetic Location	Generic Information (CGL)	
Called Party Number	Called Party Number	If the ISUP called party number is ’911‘ , ’11‘, or ’1‘, then the SRF generated PSAP number is included in the DSS1 Called Party Number information element. Otherwise, normal interworking as specified in T1.609 shall apply.
Calling Party’s Category Parameter	Emergency Call Control	If the Calling party’s category parameter is coded as “Emergency Service Call” or the call is otherwise determined to be an ESC, the Emergency Call Control information element will be included.

8.1.3 SS7 to Terminating ISDN (at Secondary PSAP)

In the case of SS7 to ISDN interworking for the termination of an ECS call to the Secondary PSAP, T1.609 and T1.625 shall apply with the exceptions and additions provided in Table 7.

Table 7 - IAM to DSS1 SETUP message interworking at Secondary PSAP

ISUP Parameter	DSS1 Information Element	Notes
Calling Party Number	Calling Party Number	If the preferred callback number is the ISUP calling party number, then CPN parameter to CPN information element interworking as specified in T1.609 and T1.625 shall apply with the exception that even when the presentation restriction indicator is set to "presentation restricted", the calling party number digits shall be delivered to the ISDN PSAP.
Charge Number (CN)	Calling Party Number	If the preferred callback number is the ISUP charge number, then CN parameter to CPN information element interworking as specified in T1.609 and T1.625 shall apply.
Generic Digits (LIN)	Generic Information (LIN)	
Calling Geodetic Location	Generic Information (CGL)	
Called Party Number	Called Party Number	
Calling Party's Category Parameter	Emergency Call Control	If the Calling party's category parameter is coded as "Emergency Service Call" or the call is otherwise determined to be an ESC, the Emergency Call Control information element will be included.

8.2 SS7-MF Interworking

If an ECS call encounters interworking with MF signaling, the call shall still be completed. The service-specific information may or may not be available at the destination exchange on such calls.