Applying the NG112 Framework to support European legislative requirements

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1. Executive summary

The Next Generation 112 (NG112) framework marks a major step forward in the modernisation of Europe's emergency communication systems, aligning them with the objectives set out in European Union legislation such as the European Electronic Communications Code (EECC) and the EU Accessibility Act.

Traditional Public Switched Telephone Networks, built for voice-only calls, are no longer suited to today's communication environment, which relies on real-time data, multimedia exchange and cross-border connectivity. NG112 introduces an all-IP, packet-switched approach that supports audio, text, video and location data, creating a more flexible, interoperable and resilient foundation for emergency services across Europe.

Developed within ETSI, NG112 provides a secure, interconnected architecture linking citizens with Public Safety Answering Points. It enables dynamic routing of calls, accurate delivery of handset-derived location information and the handling of multimedia communication. These capabilities respond directly to the EECC's emphasis on IP-based communications, accurate caller location and multimedia communication, while also supporting the EU Accessibility Act's goal of equal access through features such as real-time text, audio and video or a combination thereof, known as Total Conversation.

Overall, NG112 offers a coherent and future-oriented framework for enhancing Europe's emergency communications. By fostering interoperability, accessibility and technological progress, it contributes to a more connected and inclusive public safety ecosystem, improving coordination and outcomes for citizens across the European Union.

Purpose of the document

- To **outline how the NG112 framework supports European legislative objectives**, particularly the EECC and the EU Accessibility Act, by advancing modern, inclusive emergency communications.
- To **provide guidance for policymakers, emergency services and communication providers** on implementing an interoperable, IP-based approach for emergency response.
- To **demonstrate how NG112 enables accessibility, cross-border cooperation and accurate location delivery**, contributing to a more resilient and citizen-centred emergency communication system across Europe.

2. List of acronyms

BCF – *Border Control Function*: A security component in the NG112 architecture that acts as an application-level firewall to protect core systems.

EECC – *European Electronic Communications Code*: EU legislation establishing requirements for electronic communications, including emergency services.

ECRF – *Emergency Call Routing Function*: Determines which Public Safety Answering Point (PSAP) should receive an emergency communication based on location and service type.

ESInet – *Emergency Services IP Network*: An IP-based packet-switched network designed to support emergency communications.

ESRP – *Emergency Services Routing Proxy*: Provides policy-based routing within the NG112 framework, directing emergency communications to the correct PSAP.

HELD – *HTTP-Enabled Location Delivery*: A protocol for requesting location information at a LIS.

IP – *Internet Protocol*: The standard communication method used for sending data across packet-switched networks.

LIS – *Location Information Server*: Manages location information of the caller or device during an emergency communication.

LoST – *Location-to-Service Translation*: A protocol used to request mapping information (i.e. which PSAP is responsible for a particular geographic area or service) at an ECRF.

NG112 – *Next Generation 112*: The IP-based framework for modernising emergency communications in Europe as defined in ETSI TS 103 479.

NGCS – *Next Generation Core Services*: The set of essential routing, discovery and security services that operate within the ESInet.

PIDF-LO – *Presence Information Data Format – Location Object*: A data format used to convey geographical location in emergency communications.

PSAP – *Public Safety Answering Point*: A control room or call centre where emergency communications are received and managed.

PSTN – *Public Switched Telephone Network*: The traditional telephone system based on circuit-switched technology.

RTT – *Real-Time Text*: A text communication method where characters are transmitted instantly as they are typed.

SIP – *Session Initiation Protocol*: A standard protocol for initiating and managing multimedia communication sessions including audio, video and real-time text.

TC – *Total Conversation*: A combination of audio, video and real-time text in a single communication session.

TS – *Technical Specification*: A formal standard document produced by ETSI.

3. Introduction

The foundational infrastructure for emergency communication has been built upon public switched telephone networks (PSTN). A circuit-switched approach, while historically reliable for basic voice calls, is not ready to handle mobile multimedia communication we use daily. The immediate transmission of highly accurate location information and new communication methods like text messaging and video calls have created a need for a more sophisticated and resilient emergency communication. This necessary transformation is not only a technological consideration but also driven by the European Union legislation, most notably the European Electronic Communications Code (EECC). This document examines how the Next-Generation 112 (NG112) framework serves as a solution to bridge this technological gap and provides a framework that aligns with EU legal requirements related to emergency communications, thereby safeguarding the future of public safety across the continent.

The primary purpose of this document is to serve as a comprehensive guide for stakeholders, including national policymakers, telecommunications providers, and emergency service organisations. It aims to highlight how the NG112 framework, as defined by ETSI, provides a robust technical and operational blueprint that supports Member States in addressing the legislative objectives set by the European Union. Providing a unified, packet-switched platform with enhanced data capabilities, NG112 ensures a more effective, resilient, and accessible emergency communication.

4. Understanding the NG112 Framework

NG112 represents a paradigm shift in the architecture of emergency communications. It moves from the legacy circuit-switched environment to an all-IP, packet-switched network. The key principle of this framework is interoperability, which ensures that emergency communication is seamlessly available between different systems and countries. In addition, expandability and flexibility are crucial for emergency communications, as they enable rapid integration and adaptation. For example, new real-time applications that support operations and secure data transmission are essential for coordinating multiple authorities in crisis situations. The NG112 framework is designed and built on a set of standardised, interconnected components that provide a comprehensive solution for emergency communications and is described in more detail below.

The Emergency Services IP Network (**ESInet)** is a dedicated IP network specifically designed to securely connect individuals in emergency situations with PSAPs. It's a crucial component of the NG112 framework and serves as the platform for hosting the Next Generation Core Services (NGCS). In simple terms, the ESInet provides the transport architecture that enables delivery of emergency communications to PSAPs while the NGCS provide security, discovery and the routing functionalities needed to ensure the emergency communications are delivered to the most appropriate PSAP.

The **Border Control Function (BCF)** acts as a firewall and provides an additional security layer for protecting other core components. Emergency communications received at the BCF are forwarded to the ESRP.

The **Emergency Services Routing Proxy (ESRP)** with its policy routing functionality (PRF) provides dynamic routing capabilities. Multiple rules can be evaluated to determine the most appropriate PSAP or the next "hop" in route to the most appropriate PSAP. The ESRP interacts with the ECRF and the LIS.

The **Emergency Call Routing Function (ECRF)** is queried by the ESRP for information on which PSAP is responsible for a specific service type (e.g. police, fire or ambulance) at the caller's specific location. This query is performed using the Location-to-Service-Translation (LoST) protocol. Depending on the complexity of the call handling model deployed in each country, an ECRF may only be needed to interact with a Forest Guide for interconnectivity between different countries.

The **Location Information Service (LIS)** provides location information for a specific entity (e.g. an end-user's phone) using the HTTP-Enabled Location Delivery protocol (HELD).

The **Forest Guide** (FG) is a functional element that acts as a national, hierarchical routing database to enable interoperability between different ESInets.

Emergency communications originating on public networks (both mobile and fixed) are transited through an ESInet from different originating networks and are routed to the most appropriate PSAP using routing intelligence inside the ESInet provided by the NGCS. NG112 is built entirely on Internet Protocol (IP), which allows it to handle not only audio but also other forms of digital communication like text, photos, and video. By adhering to globally standardised protocols like SIP (Session Initiation Protocol), NG112 ensures that emergency communications can be exchanged seamlessly across different networks and even between different Member States.

5. Key European Legislative Requirements for Emergency Services

The EECC is the cornerstone of modern European telecommunications legislation, and it sets out clear and direct requirements on Member States regarding emergency services. For instance, it explicitly requires Member States to ensure that originating service providers (OSPs) and PSAPs are capable of handling multimedia emergency communications, not just traditional phone lines. This requirement directly challenges the legacy PSTN infrastructure and pushes Member States towards IP-based (packet-switched) solutions like NG112. Furthermore, and critical for public safety, it sets out requirements for Member States to provide accurate and reliable caller location information to PSAPs and gives preference to handset-derived location data, such as GNSS, for improved accuracy. This responds to the limitations of legacy systems, which often relied primarily on network-based methods that could offer only approximate location accuracy in most cases.

The EU Accessibility Act aims to improve the lives of people with disabilities by making key products and services, including electronic communications, more accessible. It

broadly promotes those services, including emergency services, be accessible to all citizens, regardless of their abilities. NG112's framework is designed to seamlessly integrate communication methods supporting individuals with hearing or speech impairments, such as Real-Time Text (RTT) and Total Conversation, thereby fulfilling a key requirement of the act. Moreover, NG112 systems shall support assistive technologies or services, such as sign language video interpreters to be included in emergency communications.

Legislation also requires that citizens traveling within the EU can access 112 services seamlessly. This includes for instance, the need to select a PSAP based on location, language and modality, which the NG112 framework facilitates through its policy routing capabilities. Additionally, adopting a common set of technical standards will ensure the exchange between different national PSAPs and emergency services, promoting cross-border collaboration and a harmonised response. This is particularly important in border regions or for major international incidents.

6. NG112 and EU Legislative Needs alignment

The multimedia support provided by the NG112 framework is a direct response to the EU Accessibility Act, as audio, video and real-time text communication enable emergency communications for the deaf and hard of hearing. The use of globally recognised protocols facilitates the exchange of data and media between different national ESInets. This dynamic routing capability, based on the caller's location and preferred language, helps ensure access to proper services while abroad in line with the legislative requirement for cross-border collaboration. For instance, a German citizen having an emergency while on holiday in France will automatically have their call routed to the nearest French PSAP, but the system can also provide the operator with information on their home language, ensuring a smoother communication process.

The **ETSI Technical Specification (TS) 103 479 V1.3.1** is serving as the technical reference supporting the objectives of the **EU Accessibility Act**. This standard specifies the necessary protocols and requirements for providing access to emergency services using **Total Conversation (TC)**, which enables an equivalent communication experience for all persons, including those with hearing or speech impairments.

TS 103 479 provides the core architecture for media negotiation within the NG112 framework using **Session Initiation Protocol (SIP)** to establish and manage an emergency communication session. The SIP signalling ensures that the communication is not limited to a single medium, enabling the caller's device to offer multiple streams, including:

- **Voice:** traditional audio streams

- **Real-Time Text (RTT):** allowing character-by-character transmission for instantaneous, two-way text communication
- **Video:** video streams to provide critical visual context to the PSAP for assessment of an incident, or, for sign language interpretation

The specification supports **dynamic media switching**. This ensures that the user can seamlessly transition between modalities mid-call without disconnecting. For example, a voice call that becomes impossible due to a sudden speech impediment or high ambient noise can immediately switch to text using the same session.

A critical technical requirement defined by TS 103 479 is the robust delivery of location information derived from the handset and/or the network. This supports the objectives of **Article 109 of the EECC**, which emphasises the need for highly accurate caller location.

The standard ensures that the precise, geodetic location data formatted as a **Presence Information Data Format Location Object (PIDF-LO)**, is encapsulated within the initial request. The location data is delivered alongside the call initiation message, ensuring the PSAP receives dispatchable location information before the media streams are fully connected.

TS 103 479 also defines a mandatory mechanism for the **multimedia callback**. This feature is essential for maintaining service continuity, particularly for users of accessible media who are vulnerable to dropped connections. When an emergency session (SIP dialogue) terminates prematurely due to a network error, device failure, or accidental disconnection, the PSAP shall be able to re-establish communication. The specification mandates that the PSAP stores the initial SIP contact information, which includes the callback information and the negotiated media (audio, video and real-time text). This allows the PSAP to initiate a **callback request** that supports the same media types used in the original call, thereby upholding the principle of **equal access** and continuity for accessible emergency communication as required by the EU Accessibility Act.

Another important contribution of TS 103 479 lies in its mandate for **Policy-Based Routing**, which is essential for ensuring that emergency communication is routed not just by location, but by language and modality. The **Emergency Service Routing Proxy (ESRP)** and **Emergency Call Routing Function (ECRF)** leverage defined metadata carried within the SIP signalling to execute these complex routing policies. The specification requires the inclusion of mandatory parameters that indicate the user's preferences and device capabilities:

- **Language Parameters:** the language specified by the user is explicitly communicated so that the call is forwarded to PSAPs whose staff speak that language, thereby meeting cross-border language requirements.
- **Media Feature Tags:** the caller's device explicitly states its ability to handle RTT or other assistive technologies

Policy based routing mechanisms use this metadata to execute specific routing policies.

For instance, if an emergency call arrives with both an accurate geographical location and media feature tags indicating video and RTT and German as preferred language, it ensures the call is routed to:

1. a PSAP that serves the geographical region of the caller.
2. a PSAP whose equipment is confirmed to support audio, video and RTT (i.e Total Conversation (TC) compliant).
3. a PSAP that has staff available to speak German or is specialized in handling RTT.

This enhanced, policy-based routing is the technical mechanism that supports equal access to emergency services and translates the objectives of the EU Accessibility Act into verifiable operational capabilities.

7. Conclusion

The NG112 framework provides a technical specification that is consistent with the EU's legislative objectives for emergency services. Its core features – an IP-based architecture, enhanced location services, multimedia support, advanced routing policies and interoperability – directly address the requirements of the EECC and the EU Accessibility Act, thereby supporting alignment with European legislative objectives. By moving away from traditional voice calls and introducing a modern, packet-switched environment, NG112 ensures that emergency services can meet the changing demands of a digitally connected society.

The full implementation of NG112 across Europe will create a unified, resilient and future-proof emergency communications system. This transition will not only facilitate alignment with European legislation but will ultimately lead to more efficient emergency responses and better outcomes for all European citizens by leveraging the capabilities of modern digital communications.