EENA Next Generation 112 Transition Documents

NG112 Transition Models

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1 Introduction

Voice over Internet Protocol (VoIP) and packet-based devices and applications have become commonplace. Citizens use them to conveniently communicate sending and receiving text, instant messages, voice, images and video information. At the time of writing this document, most European emergency services can only be reached through the public switched telephone or mobile networks; this limits how citizens can reach emergency services when they are needed. This legacy circuit-switched infrastructure is unable to embed or convey information required for the enhanced services and technology which citizens are increasingly using as common-place forms of communication.

European citizens have clear expectations about the availability of 112 emergency services with the enhanced capabilities of technologies being used in daily life. Consequently, any device suitably connected to the Internet that can reasonably be expected to make an emergency communication should be allowed to do so, and citizens that use next generation communications should be allowed to do so without hindrance. Furthermore, citizens with a disability need to be able to make emergency calls in a manner that "natural" for them without requiring special relay services that can introduce significant delay in call handling and the receiving of assistance. NG112 provides an IP-network communication infrastructure with standard interfaces from call and message services allowing all citizens to request emergency services using the techniques that they use every day.

The upgrade of the Public Safety Answering Points (PSAPs) to Next Generation 112 (NG112) technology will be a challenge and will most likely be done in phases over a period of time. This phased approach helps to reduce risks for migration while providing increased benefits to citizens and emergency providers at each step. The aim of the NG112 transition documents is to define in non-technical terms, how to migrate from existing E112 implementations to an NG112 network architecture[1] able to support all citizens with a range of communication needs and functions.

The challenge of the transition is to ensure that all these communications can be achieved in a reliable fashion as fast as possible, with minimal delay, as delays have potentially disastrous consequences. This document presents a clear plan and way to migrate to NG112 while providing maximum benefit to citizens and authorities with each step.

[1] Long Term Definition Document: http://www.eena.org/view/en/Committees/NG112/NG112docs.html

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2 NG112 Transition Models Description

The EENA NG112 Technical Committee has created the transition models to explain how to make the transition from each of the identified emergency organisation-types in Europe[2] to NG112. This chapter provides a general overview of the ways to achieve this transition using schematic drawings.

2.1 TM1: One national PSAP handles NG112 calls and routes to the most appropriate PSAP

This first transition model (TM1) is based on the same principle used by some countries for implementing eCall; i.e. a centralised PSAP handles all eCalls[3] and then routes the emergency calls to the most appropriate PSAP. The centralised PSAP has access to a database with information necessary to forward the call and/or the data from the emergency situation to the stage 2 PSAPs if required.

Following the same principles of the centralised PSAP model in place for eCall, it is possible to introduce a centralised IP-based PSAP model to deliver emergency calls natively from IP-based access networks and providers.

A centralised emergency IP network, known as the Emergency Services IP network (ESInet) is protected from the external networks by gateways and border controllers. These sit between the external networks and the ESInet. This is shown in Figure 1.

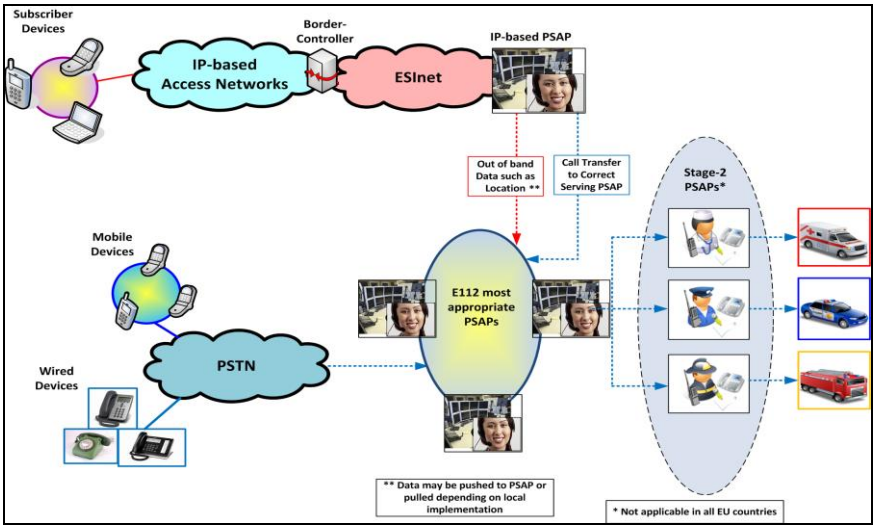

Figure 1 Centralised ESInet - TM1

In this model, the country from which the call originated must be known in order to route the call to the centralised PSAP. For fixed services the location and destination can be configured at the voice service provider (VSP). In the case of mobile calls, the mobile country code component of the cell-id provides the needed information. For WiFi, geolocation of the access point provided by third-party services can be used as location information and subsequently be used to determine the country of origin.

[2] 112 Service Chain Description EENA Operations Document: http://www.eena.org/ressource/static/files/2011_06_10_1_1_1_servchain_v1.0.pdf
[3] eCall EENA Operations Document : http://www.eena.org/ressource/static/files/2012_04_04_3_1_5_ecall_v1.6.pdf

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2.2 TM2: One national point for reception of NG112 calls and automatically routing to the most appropriate PSAP

In the second NG112 transition model (TM2), all IP-based 112 calls are sent to a national Emergency Service Intranet (ESInet). Once the call is inside the ESInet policy routing rules are applied to the call to determine the most appropriate PSAP to direct the call to. There is no IP-based PSAP to triage the call and involve a call-taker in the PSAP selection process as there is in TM1. The call is then automatically directed through a gateway that provides a point of interconnection between the ESInet and the selected PSAP as shown in Figure 2.

The selected E112 PSAP handles the call using the national, regional or local procedures and is responsible for dispatching emergency personnel and equipment as required.

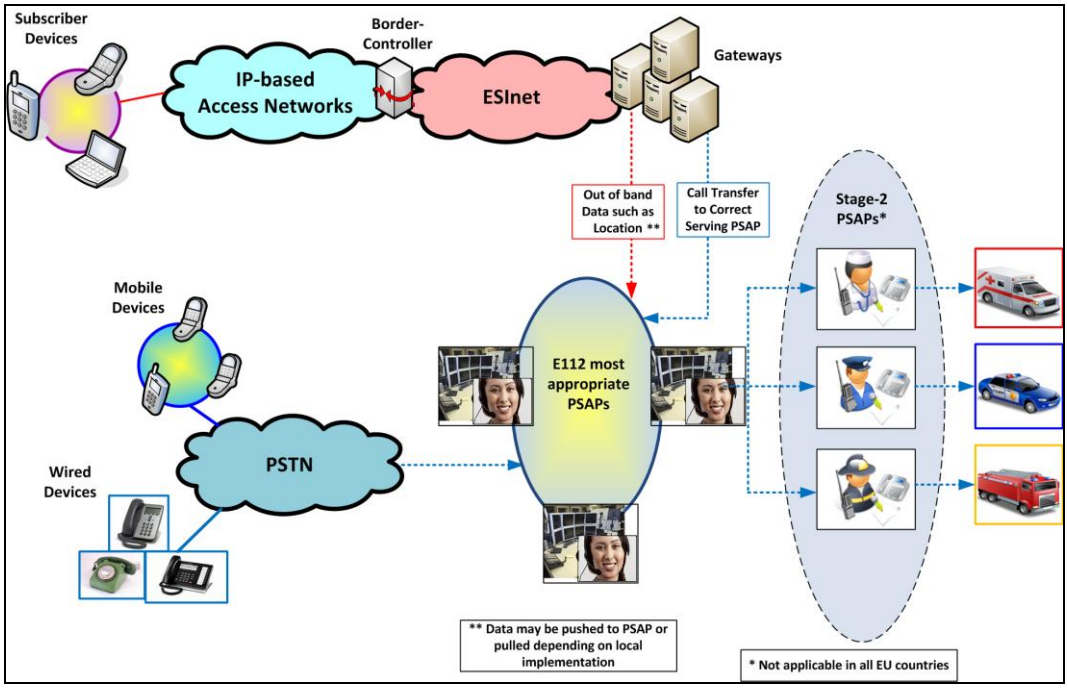

Figure 2 Centralised ESInet automatic routing to legacy 112 PSAP- TM2

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2.3 TM3: Upgrade different PSAPs depending on functionality

In this model (TM3), PSAPs are upgraded depending on the type of calls they are to handle. This is shown in Figure 3; examples of specialised PSAPs include a PSAP that can handle total conversation[4] calls or can use video and text to communicate with speech and hearing impaired people. Other call types continue to be handled by the most appropriate E112 PSAP.

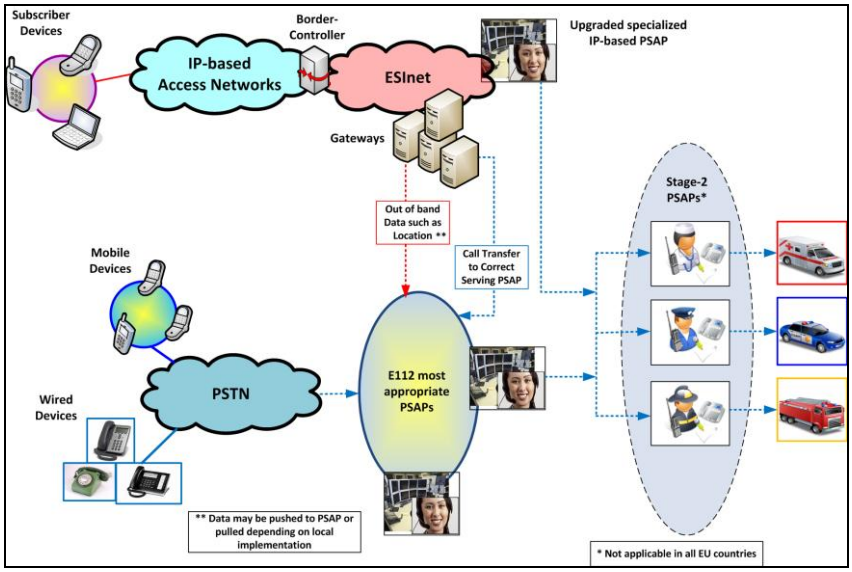


Figure 3 Centralised ESInet upgrade specialised PSAPs

3 Match between 112 Model and Transition models

3.1 Introduction

The intention of the 112 models developed by EENA is to present the major concepts of the organisation of 112 emergency services in Europe in a deliberately simplified way. In this document, the different 112 models are briefly described. Subsequently, a transition model is assigned to each 112 model after considering the characteristics of each of the 112 models.

[4] Total Conversation means a standardised concept where you can use video, text and speech at the same time in a call. It can be seen as an extension of the videophone concept by consistent addition of the real-time text medium.

Total Conversation fits people with disabilities as well as all. Deaf, hearing impaired, deafened and deafblind persons have especially great usage of Total Conversation because of its opportunity to allow any mix of sign language, speech and typing that suits the participants in each call.

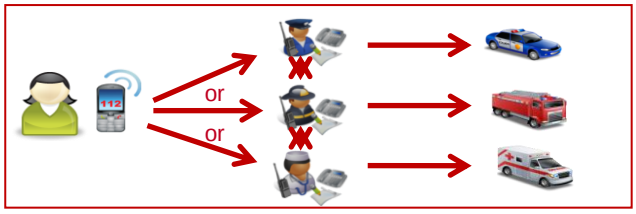
The Total Conversation service concept was first described by the international Telecommunications Union ITU (http://www.itu.int).

It has been picked up for technical implementation descriptions by e.g. the 3G-mobile world organization 3GPP (http://www.3gpp.org). It is also standardised in the world of Internet standard organisation IETF (http://www.ietf.org). The 3GPP standard has also been acknowledged by ETSI.

3.2 EROs handling emergency calls (Model 1)

The main characteristics of this model are:

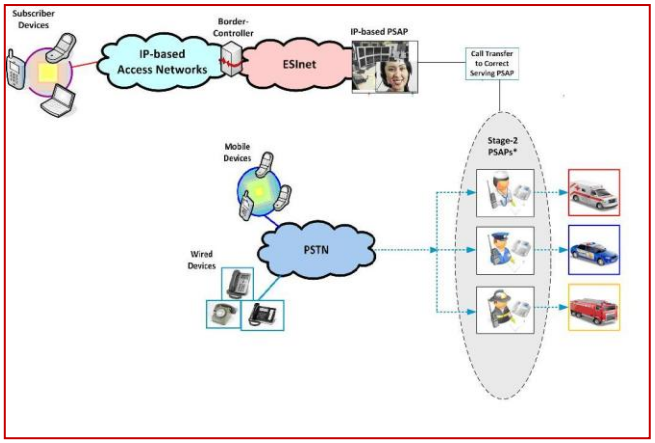
- Calls to national numbers and 112 calls are redirected to Emergency Response Organisations (EROs).
- If the intervention of a different ERO is required, the call and/or the data about the emergency situation are forwarded to the most appropriate ERO.
- The dispatch of the intervention resources is done by the ERO operators.



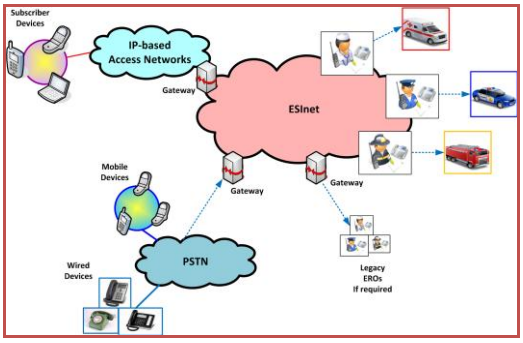
e.g. Austria, France, Germany, Italy, Norway

In most cases, the number of PSAPs in the country is significant and they use a heterogeneous technology, but the access and voice services are tightly coupled making routing at the local level relatively easy. When the Internet is involved, this tight coupling cannot be assured making access to routing information for arbitrary voice providers difficult. Providing a centralized IP-based PSAP simplifies the amount of public routing information required whilst still allowing call to be ultimately handled by the most appropriate PSAP. As a consequence, a centralised national IP-based PSAP is the recommended transition model.

All IP-based calls are received in the centralised national IP-based PSAP and the call-taker forwards the call to the most appropriate ERO.



Once the migration is completed, the EROs are integrated inside the ESInet. In some circumstances it may be desirable to maintain TDM connectivity to one or more EROs for an extended time. In this case a gateway is used to bridge between the ESInet and the legacy ERO equipment.



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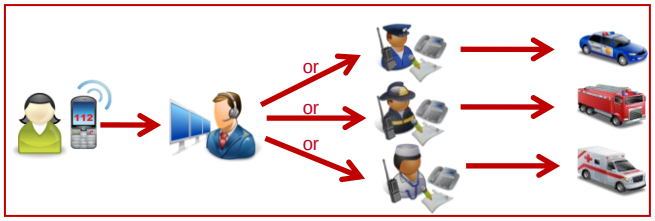
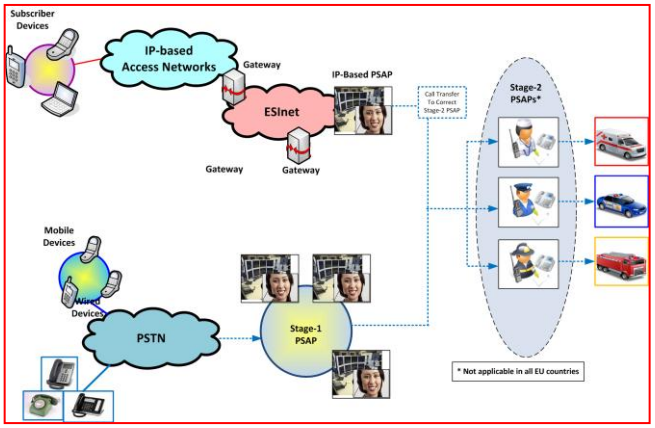
3.3 Filtering stage 1 PSAP and resource dispatching stage 2 PSAPs (Model 2)

In this model an independent Stage 1 PSAP receives all emergency calls and then forwards them to a local ERO. Call-takers of the stage 1 PSAP ask the caller which emergency service he/she wants to be connected to, the call is then handed-off to the desired ERO. The detailed data gathering and dispatch of the intervention resources are done by the emergency response organisation.

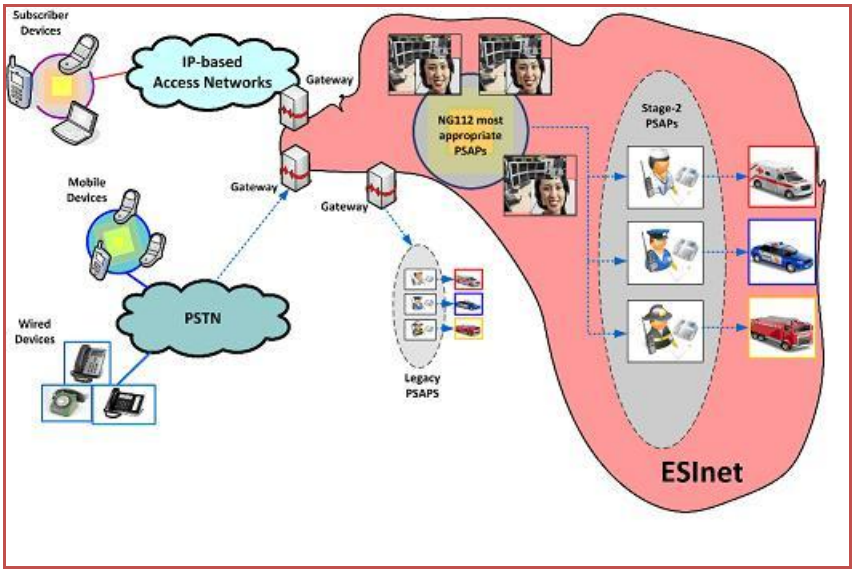


e.g. UK, Ireland

In this model the number of PSAPs is low. This model is already using a national centralised PSAP approach, so the creation of a centralised national IP-based PSAP is the best way to transition to NG112.



Once the migration is completed, the stage 1 and stage 2 PSAPs are integrated inside the ESInet. In some circumstances it may be desirable to maintain TDM connectivity to one or more PSAPs for an extended time. In this case a gateway is used to bridge between the ESInet and the legacy PSAP equipment.



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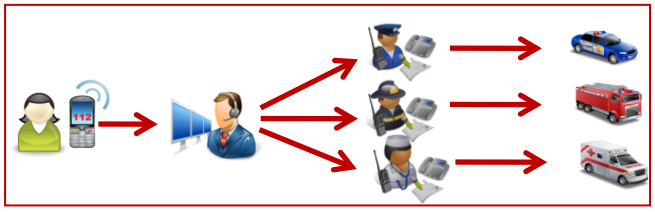
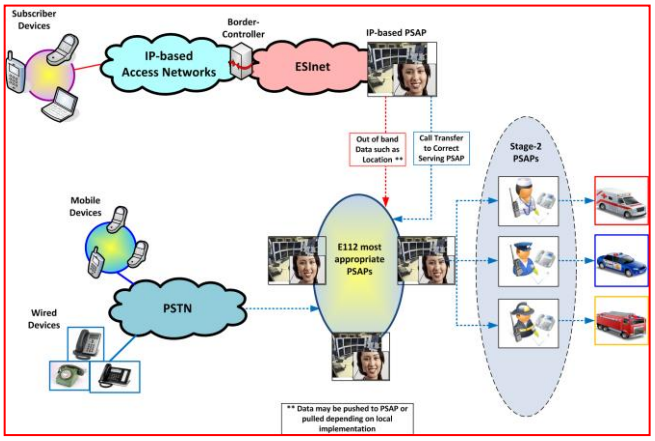
3.4 Data gathering by stage 1, resource dispatching by stage 2 (Model 3)

This model is also organised in two levels. The main difference from the previous model is the role played by the independent organisation. In this case, the civilian call-takers classify the calls and make parallel hand-offs to the EROs. Afterwards, the dispatch of the intervention resources is done by the EROs.

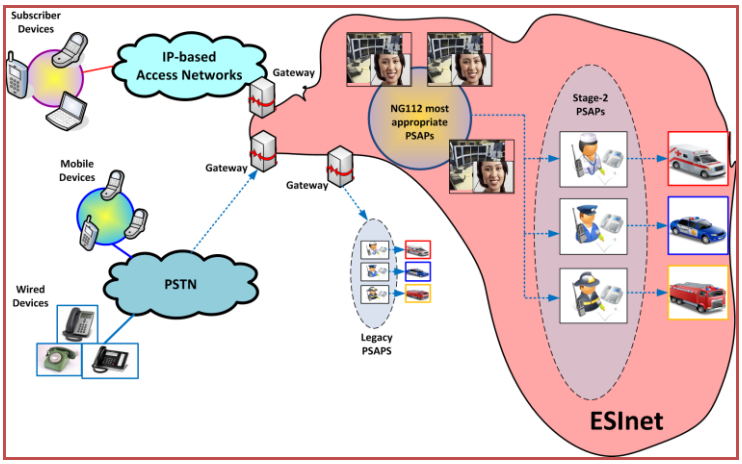


e.g. Romania

In this case, a centralised stage-1 PSAP is already exists, so the creation of a centralised national IP-based PSAP is the best way to make the transition to NG112. The call-taker forwards the call to the Stage 2 PSAPs.



Once the migration is completed, the stage 1 and stage 2 PSAPs are integrated inside the ESInet. In some circumstances it may be desirable to maintain TDM connectivity to one or more PSAPs for an extended time. In this case a gateway is used to bridge between the ESInet and the legacy PSAP equipment.



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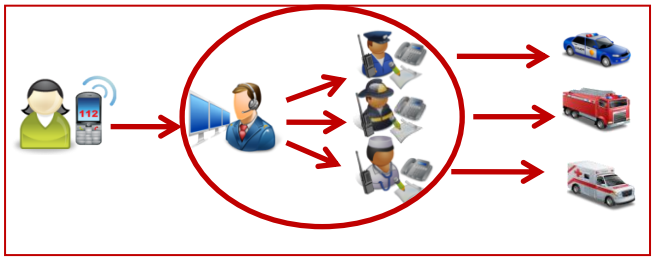
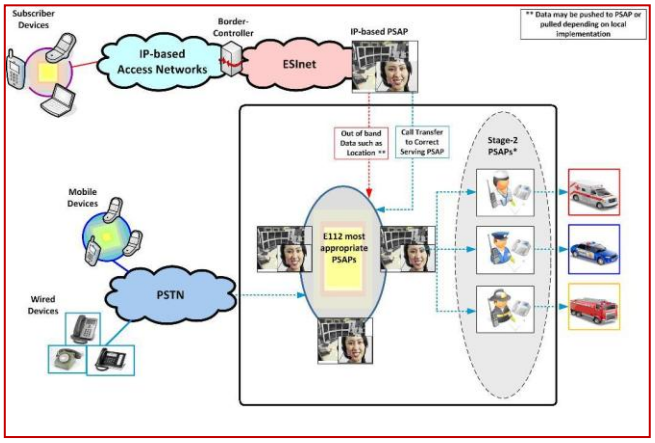
3.5 Data gathering by stage 1 PSAP, resource dispatching by stage 2 in an integrated control room (Model 4)

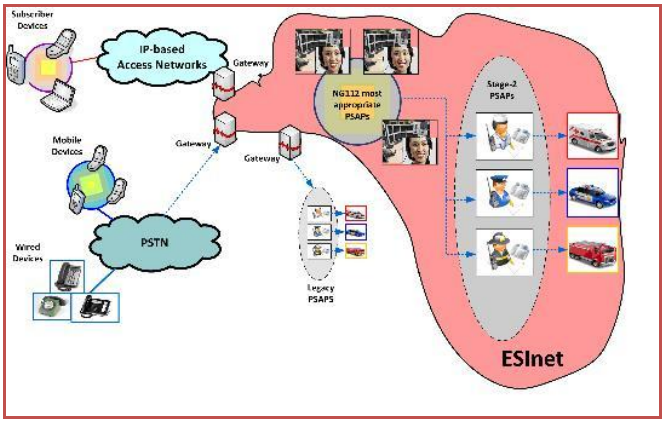
This model is also organised in two levels but civilian call-takers and EROs are in the same location. Civilian call-takers are in charge of classifying the call and make a parallel hand-off of calls to all the necessary EROs. In some cases, one or more ERO specialists are available to support call-takers. Dispatch of the intervention resources is done by EROs.



The this deployment model is already using a centralized PSAP configuration, so the creation of a centralised national IP-based PSAP is the obvious approach for migrating to NG112 for this model. The stage 1 call-taker forwards the call to the E112 most appropriate PSAP.



In a further step the Stage 1 and Stage 2 PSAPs are integrated in the ESInet. In some circumstances it may be desirable to maintain TDM connectivity to one or more PSAPs for an extended time. In this case a gateway is used to bridge between the ESInet and the legacy PSAP equipment.



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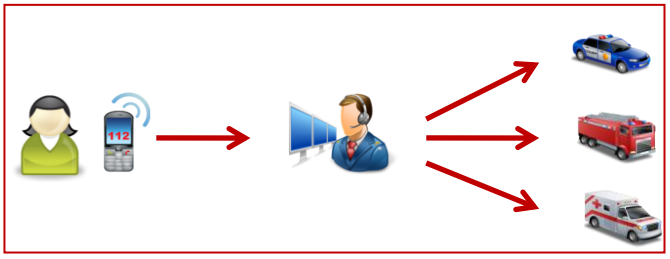
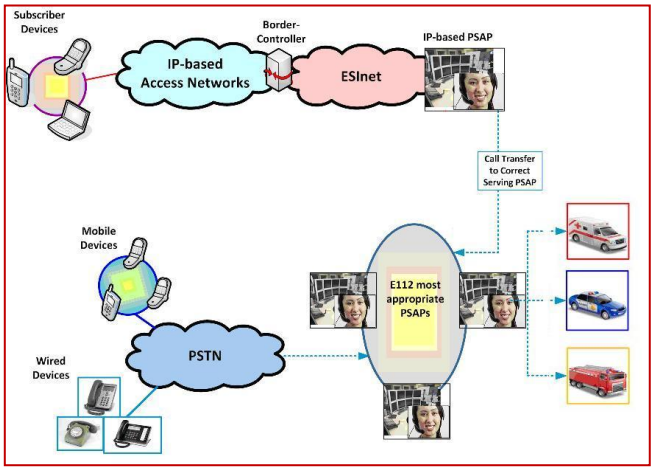
3.6 ERO independent PSAP (Model 5)

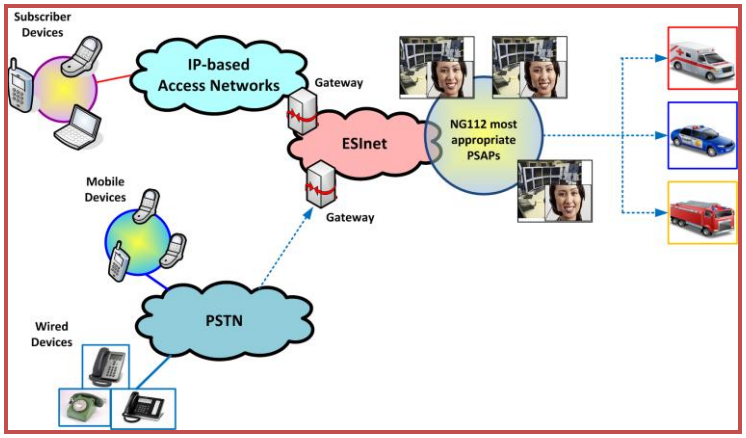
In this model, civilian call-takers handle both call-taking and dispatching the intervention resources. In some cases, one or more ERO specialists are available to support the call-takers. The same PSAP is in charge of classification of calls, data collection and dispatching the intervention resources to the incident.



This deployment model is already using a centralised call-taking model so migration to NG112 is best accomplished with the creation of a centralised national IP-based PSAP to handle VoIP and multi-media calls and dispatch resources as required. The call-taker forwards the call to the E112 most appropriate PSAP



In a further phase all the PSAPs are integrated in the ESInet. In some circumstances it may be desirable to maintain TDM connectivity to one or more ESRos for an extended time. In this case a gateway is used to bridge between the ESInet and the legacy PSAP equipment, this is not shown.



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4 Conclusion

This document provides an overview of how to transition from an existing 112 emergency architecture to NG112 using a number of different steps. The first transition step would be to centralise into one national centre the reception of all IP-based calls. Different transition models allow a solution to be selected based on specific implementation factors including transition time, budget and required functionality. The intent of this document is to assist implementers in planning the migration of their specific 112 deployments to NG112.