PEMEA Discovery Capability

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1. Introduction

PEMEA was originally designed to allow mobile emergency applications to roam across Europe. Deployment of PEMEA is not yet ubiquitous and not all regions where it is deployed offer all of the available PEMEA services. TS 103 478 [R.1] does not define a mechanism to determine if the region that a caller is in supports PEMEA or what services of PEMEA it does support. The present document describes an extension capability for PEMEA for determining if PEMEA is supported in a region and what capabilities the PEMEA deployment provides. It may also be used to in association with future non-call capabilities, such as alerting or public warning functions.

2. Terms and Definitions

The following terms and definitions are used in this document:

App	Application
AP	Application Provider
BCP	Best Current Practice
ECRF	Emergency Call Routing Function
EDS	Emergency Data Send
EMTEL	Emergency Communications
ETSI	European Telecommunications Standards Institute
IETF	Internet Engineering Task Force
LoST	Location to Service Translation
NG	Next Generation
PEMEA	Pan-European Mobile Emergency Application
PIM	PSAP Interface Module
PRF	Policy Routing Function
PSAP	Public Safety Answering Point
PSP	PSAP Service Provider
tPSP	Terminating PSP
TS	Technical Specification
URI	Universal Resource Identifier
XML	eXtensible Markup Language
XSD	XML Schema Definition

3. Background

The LoST protocol, RFC-5222 [1], define a protocol that is used to translate location and service to destination URIs. This protocol and its capabilities are used by the Emergency Call Routing Function (ECRF) as defined in NG-112 specification [2], as well as the IETF emergency calling Framework described in RFC 6443 [3]. The IETF PhoneBCP specification RFC 6881 [4], also defines use of this protocol for a "softphone" to determine the local PSAP address. Phone BCP went on to state the importance of knowing whether the local PSAP could even be reached using the user's softphone or not, and defined a series of test calls and capabilities, including a set of "test services" that can be provisioned into the LoST server. For example, urn:service:test.sos. The problem with this approach is that it requires separate service provisioning within the ECRF and this may result in different destination addresses being provided if services are not kept in synch.

In addition to the issues around using test service domains in the ECRF to determine if services are available for a certain area, it cannot provide an indication of whether the correct "type" of service available. This later component is of extreme importance when providing equal access services. NG-112 provides a policy routing function (PRF) that can provide some support for this functionality but it does not provide and indication of all of possible services.

To avoid the issues of mis-provisioning and to gain a view of all service types available in a given area, discovery functionality is introduced into PEMEA as a new capability. This ensures delivery, or not, of the EDS to the tPSP/PIM and a corresponding onCapSupportPost message detailing all services that the PSAP supports. The initiating AP will still obtain this information even if the receiving tPSP/PIM does not support the dsicovery capability making the mechanism semi-backwards compatible.

4. Approach

4.1 Overview

The apMoreInformation object in an EDS is used by the AP to indicate what capability extensions it can provide to the terminating PSAP. Inclusion of the apMoreInformation object in an EDS message mandates that the initiating node, the AP, provide an onCapSupportPost URI so that the terminating node can acknowledge receipt of the EDS and indicate which of the proffered capabilities it can support. This allows the AP to inform the App, and its user, what type of communications and services the PSAP call-taker may use to manage the call. This allows the AP to free up certain resources if some capabilities are not going to be used and allows the caller to make informed decisions around whether continuing with a PEMEA call is the best approach to resolving their emergency.

The above mechanism provides exactly the capabilities required for the discovery capability and, the supported capabilities come from the final destination node, so anything reported back from the PSAP is an assured service type. However, it is intended to be used at call time which adds to calling delays if an alternative approach to PEMEA is required. Knowing in advance of an emergency call if PEMEA is supported and if so what services, allows the App or user to make decisions at call time. Indeed, the App may be able to pre-empt the call type based on its knowledge of the supported services for the region in which the call is.

The present document defines a new "Discovery" *typeOfInfo* capability to be used in an *information* element in the *apMoreInformation* object sent in an EDS. If a termination entity understands this capability, then it simply responds with an onCapSupportPost message including all capabilities from the EDS that the PSAP is able to support. If the receiving PSAP doesn't understand the capability, it will respond with an onCapSupportPost including any of the capabilities from the EDS that it does support. In either case, the AP is able to notify the App of which capabilities are supported by the local PSAP. The normative procedural details required of each node are defined in subsequent sections.

4.2 Capability

4.2.1 Definition

TS 103 478 [R.1] defines the initial service extensions, *typeOfInfo*, in Table 10. This list is initial not exhaustive and the intent was always that additional service types would be developed. The present document defines a new and concrete definition of the "Discovery" capability and associated protocol element.

Table 1: PEMEA Discovery service definition

Info Type Value	Protocol Token	Description
Discovery	Basic	An AP is performing the PEMEA Basic Discovery to determine if there is a PEMEA PSAP serving the local area and what capabilities it supports.

The protocol token value of "Basic" is selected as this is the first and most rudimentary PEMEA service discovery mechanism. It is imagined that more sophisticated or elaborate discovery techniques may be devised in the future.

An *information* element in TS 103 478 [R.1] requires a URI value so that the receiving PIM can "Reach-Back" to invoke the service, and this requirement is enforced in the PEMEA XML schema. Since the Basic Discovery capability is never intended to be invoked the value of this URI is largely immaterial. However, to avoid any confusion, the value of the URI to be used for this capability shall be the same as the URI placed in the onCapSupportPost element in the EDS message conveying this capability to the PIM.

4.2.2   Service support indication

An AP needing to indicate that the App it is serving wants information about local PEMEA services would include the following information element in the *apMoreInformation* element of an EDS message:

```
<information typeOfInfo="Discovery" protocol="Basic">
    https://ap.example.pemea.help/48sne8aopaop
</information>
```

4.2.3   App and AP requirements and procedures

The AP shall provide the App a means over the Pa interface to signal the App's desire to send a Discovery message to determine what local PEMEA services are available should an emergency call need to be place.
The App shall include, in its request for Discovery message from the AP:
- the device or user identifier
- the device location
- user information
- all capabilities and extensions that the App supports.

If the App supports ServiceTags as specified in TS 103 755, and provides a Service indicator in the Discovery message request over Pa then the AP shall use the Service indicator provided by the App. If no Service indicator is provided then the AP shall not include a ServiceTag in the outbound EDS.

The AP shall construct an EDS in the normal manner and send the relevant information by reference or by value through the PEMEA network. The *apMoreInformation* object in the EDS shall contain the Discovery->Basic capability with the URI value being the same as the onCapSupportPost URI.

The AP shall invalidate all Reach-Back URIs provided in the *information* elements prior to sending the EDS, unless a capability specification explicitly calls for the Reach-Back URI to remain valid when used injunction with the Discovery->Basic capability. The onErrorPost and onCapSupportPost URIs shall remain active and reachable.

On receipt of an error message from the PEMEA network indicating that the EDS cannot be delivered because there is no PEMEA service at the user's location, the AP shall notify the App over the Pa interface that no service is available.

On receipt of an onCapSupportPost message from the terminating node, the AP shall:

- accept the data and respond to the tPSP/PIM with a 410 "Gone" response, indicating that the service is no longer available.
- notify the App of all capabilities supported by the terminating PSAP.
- delete the discovery call context and invalidate all remaining URIs associated with the context. This directive may be over-ridden by future capability specifications should the capability require the long-term use of its Reach-Back URIs out side the context of a call.
- drop any connections that may exist with the App over Pa associated with the Discovery->Basic call

The App should take appropriate action regarding call methods based on the information provided in the Discovery->Basic response.

4.2.4   tPSP/PIM requirements and procedures to support Discovery->Basic

A tPSP/PIM implementing this capability shall immediately on receipt of an EDS containing the Discovery->Basic capability, construct an onCapSupportPost message containing all capabilities that it supports from the set of capabilities provided in the EDS, INCLUDING the Discovery->Basic capability.

The tPSP/PIM shall send the onCapSupportPost message to the URI included in the onCapSupportPost URI of the EDS.

The tPSP/PIM shall expect a 410 "Gone" response from the AP, however, it shall not try to resend the onCapSupportPost regardless of the code returned by the AP.

The tPSP/PIM shall not create a context for the call and shall not notify the PSAP or PSAP call-taker of the EDS arrival.

Once the onCapSupportPost message for the EDS containing the Discovery->Basic capability has been sent, then no further processing of the call by the tPSP/PIM is required.

4.2.5   tPSP/PIM procedures when Discovery->Basic is not supported

If the tPSP/PIM does not support or understand this capability then the Discovery->Basic capability shall not be included in the onCapSupportPost message sent to the AP.

The tPSP/PIM shall respond to the AP with an onCapSupport post message in the usual fashion. If the tPSP/PIM is awaiting a voice-call before sending the onCapSupportPost to ensure that data has been sent to the correct PSAP then it shall continue to do this.

If the tPSP/PIM sends the onCapSupportPost message to the AP prior to notifying the PSAP-CPE or PSAP call-take of the EDS arrival, then the tPSP/PIM should not notify the PSAP-CPE or PSAP call-taker if it receives the 410 "Gone" response from the AP. This is expected PEMEA behaviour

The tPSP/PIM should notify the PSAP-CPE or PSAP call-taker of the arrival of the EDS message in the usual fashion unless the EDS was auto-answered by the tPSP/PIM and the 410 "Gone" error was received.

On receipt of the 410 "Gone" error from the AP when the onCapSupportPost message is sent, the tPSP/PIM shall delete any context associated with the EDS context.

5. References

5.1 Normative References

[R.1] "Emergency Communications (EMTEL); Pan-European Mobile Emergency Application", ETSI TS 103 478 V1.1.1 (2018-03).

5.2 Informative References

[1] "LoST: A Location-to-Service Translation Protocol", RFC-5222, August 2008.

[2] "Emergency Communications (EMTEL); Core elements for network independent access to emergency services", ETSI TS 103 479 V1.1.1 (2019-12)

[3] "Framework for Emergency Calling Using Internet Multimedia", RFC-6443, December 2011.

[4] "Best Current Practice for Communications Services in Support of Emergency Calling", RFC-6881, March 2013.

6. HISTORY

Document history		
V0.1	30 August 2021	Initial Draft
V0.2	2 September 2021	Changed name of capability from Test to Discovery. Changed the behaviour associated with ServiceTags, so that if the app specifies a service directive then the AP shall set the corresponding ServiceTag in the EDS. Add some text to allow Reach-Back URIs in the future to be valid and remain valid if a capability needs this functionality to operate.
V1.0	28 September	Released