

# ETSI TS 103 756 V1.1.1 (2021-11)



TECHNICAL SPECIFICATION

## **Emergency Communications (EMTEL); PEMEA Instant Message Extension**

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**Reference**

DTS/EMTEL-00053

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**Keywords**

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**ETSI**

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# Contents

Intellectual Property Rights .....	5
Foreword.....	5
Modal verbs terminology.....	5
Executive summary .....	5
Introduction .....	6
1 Scope .....	7
2 References .....	7
2.1 Normative references .....	7
2.2 Informative references.....	7
3 Definition of terms, symbols and abbreviations.....	8
3.1 Terms.....	8
3.2 Symbols.....	8
3.3 Abbreviations .....	8
4 PEMEA capability extensions.....	9
4.1 Overview of extension in PEMEA .....	9
4.2 Service support indication and response .....	9
4.2.1 Service definition.....	9
4.2.2 Service support indication .....	9
4.2.3 Service support response .....	10
5 Security.....	10
5.1 Transport security.....	10
5.2 Security token usage.....	10
6 Procedures and signalling.....	10
6.1 Service invocation .....	10
6.1.1 Service invocation procedures .....	10
6.1.2 Service invocation object.....	11
6.2 Chat-room creation and deletion .....	12
6.3 Chat-room creation, JOIN, and ERROR signalling.....	12
6.3.1 Semantics.....	12
6.3.2 IM service invocation .....	13
6.3.3 JOIN message flow .....	14
6.3.4 ERROR message flow .....	14
6.4 TEXT_MESSAGE flow .....	16
6.5 REPLY message signalling .....	16
6.6 Message translations and signalling .....	17
6.6.1 Overview of the translation functionality .....	17
6.6.2 TEXT_MESSAGE translation example .....	19
6.6.3 REPLY message translation example .....	20
6.7 Disconnects and reconnects.....	20
7 IM PEMEA message and type definitions .....	21
7.1 Overview .....	21
7.2 Data types.....	22
7.2.1 languageList.....	22
7.2.2 room.....	22
7.2.3 timestamp.....	22
7.2.4 user.....	22
7.2.5 userInfo .....	23
7.2.6 message.....	23
7.3 JOIN message.....	24
7.3.1 Message overview .....	24
7.3.2 Examples .....	24

7.4	ERROR message .....	24
7.4.1	Message overview .....	24
7.4.2	Examples .....	25
7.5	USER_LIST message.....	25
7.6	TEXT_MESSAGE message.....	26
7.7	REPLY message.....	26
7.8	TRANSLATION message .....	27
<b>Annex A (normative):    IM/PEMEA JSON schema.....</b>		<b>29</b>
A.1	General .....	29
A.2	IM invocation schema .....	29
A.3	IM Definitions schema .....	29
A.4	IM JOIN schema .....	30
A.5	IM ERROR schema.....	31
A.6	IM REPLY schema .....	31
A.7	IM TEXT_MESSAGE schema .....	32
A.8	IM TRANSLATION schema .....	33
A.9	IM USER_LIST schema .....	33
<b>Annex B (informative):    Recommended TLS cipher suits.....</b>		<b>35</b>
History .....		36

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# Foreword

This Technical Specification (TS) has been produced by ETSI Special Committee Emergency Communications (EMTEL).

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# Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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# Executive summary

The Pan-European Mobile Emergency Application (PEMEA) architecture provides a framework to enable applications supporting emergency calling functionality to contact emergency services while roaming. PEMEA caters for a range of extension capabilities, including Instant Messaging (IM) which provides a text-based chat capability between the App user and the PSAP. The present document provides a specification for an IM capability for PEMEA.

---

# Introduction

Instant Message (IM) is commonly referred to as chat and the two terms are used interchangeably in the present document.

The document assumes a working knowledge of PEMEA and familiarity with the PEMEA specification ETSI TS 103 478 [1]. Terms common to the PEMEA specification are not redefined or explained in detail in the present document.

---

# 1 Scope

The present document describes the PEMEA Instant Message capability for PEMEA and the need for this functionality. The required entities and actors are identified along with the protocol, specifying message exchanges between entities. The message formats are specified and procedural descriptions of expected behaviours under different conditions are detailed.

---

## 2 References

### 2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

[1] ETSI TS 103 478 (V1.2.1): "Emergency Communications (EMTEL); Pan-European Mobile Emergency Application".

[2] IANA language subtag registry.

NOTE: Available at <http://www.iana.org/assignments/language-subtag-registry/language-subtag-registry>.

[3] IETF RFC 2617: "HTTP Authentication Basic Digest Access Authentication", June 1999.

[4] IETF RFC 6750: "The Oauth 2.0 Authorization Framework: Bearer Token Usage", October 2012.

[5] PEMEA Instant Message JSON Schema forge repository.

NOTE: Available at <https://forge.etsi.org/rep/emtel/ts-103-756/json-schema>.

### 2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] IETF RFC 6753: "A Location Dereference Protocol Using HTTP-Enabled Location Delivery (HELD)", October 2012.

[i.2] Open Mobile Alliance OMA-TS-MLP-V3-2-20110719-A: "Mobile Location Protocol 3.2" July 2011.

[i.3] Open Mobile Alliance OMA-TS-MLP-V3-3-1-20111117-A: "Mobile Location Protocol 3.3.1", November 2011.

- [i.4] Open Mobile Alliance OMA-TS-MLP-V3-4-20150512-A: "Mobile Location Protocol 3.4", May 2015.
- [i.5] IETF RFC 7519: "JSON Web Token (JWT)", May 2015.

## 3 Definition of terms, symbols and abbreviations

### 3.1 Terms

For the purposes of the present document, the following terms apply:

**security:** techniques and methods used to ensure:

- **authentication** of entities accessing resources or data;
- **authorization** of authenticated entities prior to accessing or obtaining resources and/or data;
- **privacy** of user data ensuring access only to authenticated and authorized entities;
- **secrecy** of information transferred between two authenticated and authorized entities.

**trusted:** identity of entity assured through an approved authentication mechanism and the entity authorized to perform the action

### 3.2 Symbols

Void.

### 3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AP	Application Provider
App	Application
EDS	Emergency Data Send (message)
ETSI	European Telecommunications Standards Institute
HELD	HTTP-Enabled Location Delivery
HTTP	Hyper-Text Transfer Protocol
IETF	Internet Engineering Task Force
IM	Instant Messenger
JSON	JavaScript Object Notation
MLP	Mobile Location Protocol
Pa	PEMEA Application to AP interface
PEMEA	Pan-European Mobile Emergency Application
PIM	PSAP Interface Module
PSAP	Public Safety Answering Point
PSP	PSAP Service Provider
SIP	Session Initiation Protocol
SIPS	SIP Secure
TLS	Transport Layer Security
tPSP	terminating PSP
URI	Uniform Resource Identifier
UTC	Coordinated Universal Time



## 4 PEMEA capability extensions

### 4.1 Overview of extension in PEMEA

PEMEA extension capabilities are defined in ETSI TS 103 478 [1] and are implemented through the use of "reach-back" URIs. The Application Provider (AP) node advertises capabilities as part of the initial forward message through the network, the Emergency Data Send (EDS) message, and the terminating PSAP Service Provider (PSP) or PSAP responds with a the subset of capabilities that it supports, thus binding the emergency session between the AP and the terminating emergency node.

Specifically, the capabilities are sent as information elements in the apMoreInformation element of the EDS message. The information element and apMoreInformation structures are defined in clauses 10.3.11 and 10.3.12 of ETSI TS 103 478 [1]. An information element in a PEMEA EDS message identifies a capability and each capability is made up of three distinct parts:

- typeOfInfo: what function does the information element serve;
- protocol: the specific semantics for using the function;
- value: the URI through which the service is invoked.

Table 10 in ETSI TS 103 478 [1] identifies an initial set of "typeOfInfo" values used to specify a range of capability extensions for PEMEA. However, beyond the Location\_Update and SIP\_Request values described in Table 11 of ETSI TS 103 478 [1], protocols are left for further study and definition in subsequent specifications such as the present document.

### 4.2 Service support indication and response

#### 4.2.1 Service definition

ETSI TS 103 478 [1] defines the instant message, "IM", typeOfInfo in Table 10, but does not elaborate further on protocols in Table 11. The present document provides a concrete definition of the "IM" typeOfInfo in PEMEA through the specification of a protocol value.

**Table 1: Extended AP Information Type Protocol Registry**

Info type Value	Protocol Token	Description
<b>Location_Update</b>	HELD_Deref	Location requested using a HELD location request per the HELD de-reference specification [i.1].
	MLP_3.2	Mobile Location Protocol Version 3.2 [i.2]
	MLP_3.3	Mobile Location Protocol Version 3.3 [i.3].
	MLP_3.4	Mobile Location Protocol Version 3.4 [i.4].
<b>SIP_Request</b>	sip	Requesting a PSAP/PSP SIP URI to which the device can send an INVITE.
	sips	Requesting a PSAP/PSP SIPS URI to which the device can send an INVITE.
<b>IM</b>	PEMEA	Instant Messaging functionality is supported using the PEMEA message exchange protocol.

NOTE: The PEMEA message exchange protocol is specified in clause 6 of the present document.

#### 4.2.2 Service support indication

AP needing to indicate that the Application it is serving can support instant messaging using the PEMEA protocol would include the following information element in the apMoreInformation element of the EDS associated with the emergency session:

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

### 4.2.3 Service support response

A terminating node that can support the "IM" "PEMEA" capability includes this capability in the apMoreInformation element returned to the AP in the onCapSupportPost. This is described in clause 11.1.4 of ETSI TS 103 478 [1] with the value for "IM" "PEMEA" provided in the example below.

```
<apMoreInformation xmlns="urn:pemea:apps:xml:ns:pemea:base">
  <information typeOfInfo="IM" protocol="PEMEA"/>
</apMoreInformation>
```

---

## 5 Security

### 5.1 Transport security

The chat-room service is identified to potential room participants as an HTTPS URI. The connection is made using TLS 1.3 but may be made using TLS 1.2 but shall not fallback below TLS 1.2. The connecting participant shall authenticate to the chat-room service using domain certificates and a Bearer token [4]. Once the connecting entity is authenticated and authorization granted the connection is upgraded to a websocket. The websocket is expected to remain open while the entity is "online". The protocol is resilient to connections being dropped, so an entity may reconnect as long as the EDS session remains active in the PSAP.

The lists for the TLS 1.3 and TLS 1.2 acceptable cipher suites are included in annex B. These lists are informative and are based on best information at the time of writing. Older cipher suites not included in either of these lists shall not be used.

### 5.2 Security token usage

The HTTP Authorization header field is defined in IETF RFC 2617 [3] and it specifies that the usage is a scheme followed by a value, where the value may have a structure, as is the case for the digest authentication scheme.

Security token usage in the HTTP Authorization header field was originally specified for use with OAuth and is defined in IETF RFC 6750 [4]. Here the use of the OAuth "Bearer token" is specified so the scheme of the Authorization header field is Bearer, following the scheme a token is placed. The token is a base64 encoded string.

Token usage in the IM PEMEA specification follows the Bearer scheme defined in IETF RFC 6750 [4].

Tokens issued by entities in the IM PEMEA architecture are expected also to be the validating entities, or to have ties to the validating entities, consequently, whether the tokens are opaque or follow a convention such as JSON Web Token (JWT) [i.5] is not considered relevant to usage and is not specified further.

IETF RFC 6750 [4] mandates the usage of TLS for use with Bearer tokens, this usage is further defined in clause 5.1 of the present document.

---

## 6 Procedures and signalling

### 6.1 Service invocation

#### 6.1.1 Service invocation procedures

Once the terminating PSP or PSAP has responded to the AP that it can support the PEMEA IM service then the AP shall be capable of accepting a service invocation on the provided URI at any time. The AP shall only accept an IM service invocation from the PIM or tPSP that sent the onCapSupportPost message.

The PSAP invokes the IM service by:

- a) The call-taker initiating their willingness to chat to the PSAP Interface Module (PIM) in the PSAP or the tPSP.
- b) The PIM/tPSP requesting the chat server create a chat-room.
- c) The chat server creating a chat-room and return a URI to the PIM/tPSP.
- d) The PIM/tPSP obtains Bearer token for the call-taker and AP.
- e) The PIM/tPSP returns the URI and Bearer token to the PSAP call-taker.
- f) The call-taker connects to the chat-room authenticating using the Bearer token.
- g) The PIM/tPSP calling the URI provided by the AP for the IM-PEMEA service and including the URI for the chat-room and a Bearer token in this invocation. Note that the URI is the same for the call-taker and the caller, but the Bearer tokens are different.
- h) The AP indicates to the App that the PSAP wishes to chat with the user.
- i) The user indicates their willingness to chat with the PSAP to AP.
- j) The AP initiates a connection to the chat-room authenticating using the Bearer token.

It is important to note that it is always the AP that authenticates to the chat room and consequently all messages from the App shall traverse the AP. The present document only defines the protocol between the AP and other trusted entities e.g. PSAP call-taker or First Responder, and the chat-room in the PSAP, it does not define the chat Pa messaging between the App and the AP.

## 6.1.2 Service invocation object

The PIM/tPSP invokes the IM service in the AP by posting to the URI provided in the IM information element included in the apMoreInformation contained in the EDS. The POST message includes a body containing a JSON object. The JSON object provides the chat room URI as well as indicates how the AP should authenticate itself to the chat room.

**Table 2: Invocation object fields**

Element Name	Presence	Description
uri	Mandatory	The URI of the chat room.
token	Mandatory	A security token used to authenticate the AP to the chat room. The AP shall include the token in the HTTP Authorization header using the Bearer token scheme. The AP shall use the token each time it needs to establish or re-establish a connection to the chat room for the duration of the App emergency session. The AP shall not provide the token to the App.
expiry	Mandatory	Specifies the expiry time of the security token. expiry is an integer specifying the number of second since UTC epoch, 00:00:00 1 <sup>st</sup> of January 1970.

Invocation example:

```
{
  "uri": "https://chat-server.example.com/room/534wafds21s21fdf",
  "token": "Pptzs5zzG5Pkf61KPz51",
  "expiry": "1590563357576"
}
```

## 6.2 Chat-room creation and deletion

The chat-room is created by the chat-server under direction of the PSAP call-taker via the PIM or tPSP. When the chat-room is created, a logging function shall be created with it to scribe all messages into and out of the chat-room. The chat-room may also contain a chat-bot that is used to invoke services, such as translation services when required. The chat-bot does appear as a user in the USER\_LIST as its role is indicated as TRANSLATOR. This flow is shown in Figure 1.

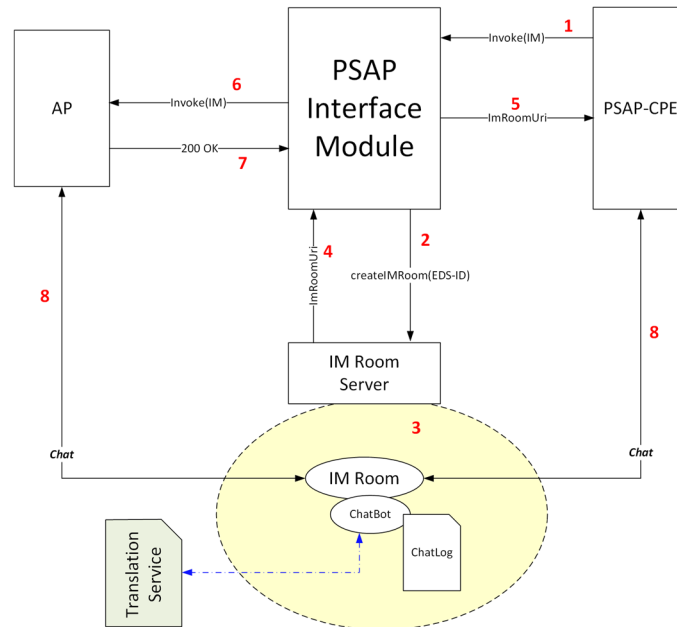


Figure 1: Chat initiation

Once the chat-room is created it remains active as long as the PIM or tPSP maintains a context for the EDS. When EDS context is deleted the chat-room is also destroyed.

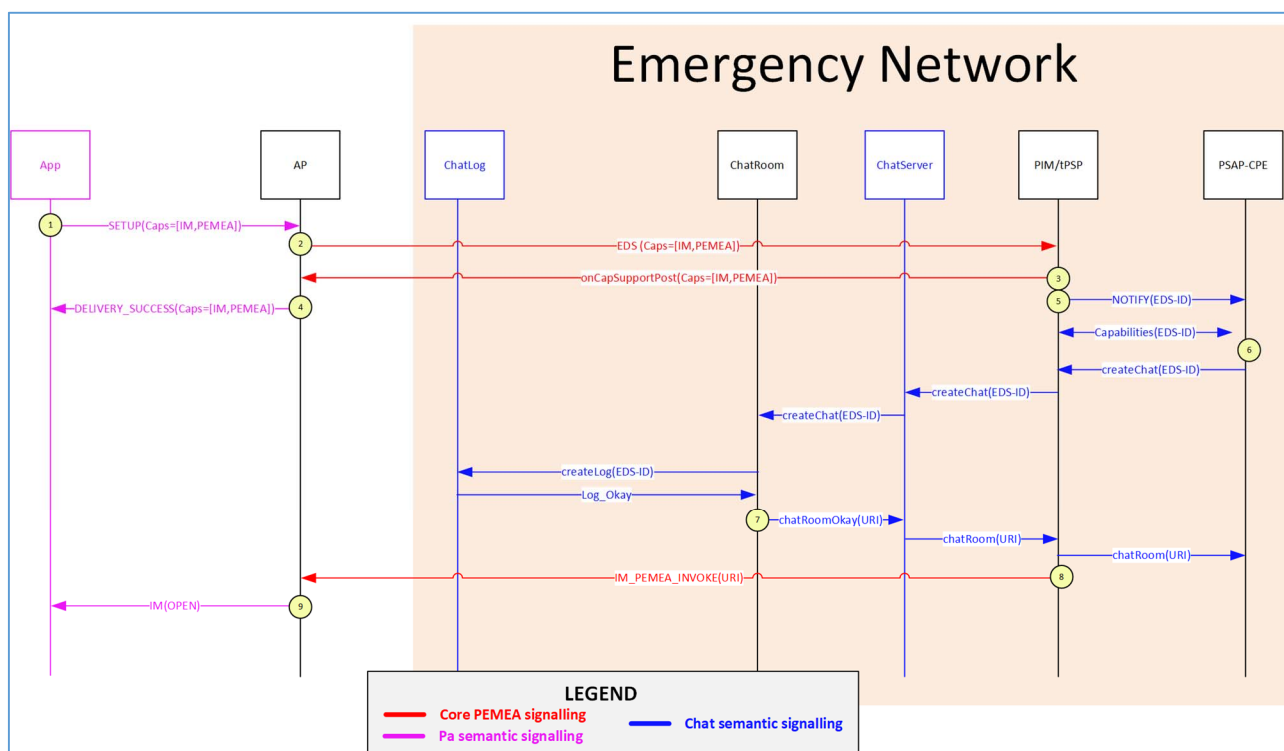
## 6.3 Chat-room creation, JOIN, and ERROR signalling

### 6.3.1 Semantics

The figure in the following sub clauses show the signalling involved in establishing and subsequently joining a PEMEA chat session. By necessity the diagrams show four distinctive types of signalling:

- Semantic signalling across the Pa interface between the App and the AP is explicitly not defined in PEMEA. So, while the message names and contents may not align with any specific implementation, the semantics of what the messages convey should be understood.
- Core PEMEA signalling are explicit messages defined in the PEMEA technical specification ETSI TS 103 478 [1].
- Chat semantic signalling is messaging that needs to occur between the PSAP call-taker equipment, the PIM/tPSP and the software entities and components required to establish the chat service. These messages are intended to provide an idea of what needs to occur, not how it should be implement. Consequently, they are informative only and not normative.
- IM (chat) normative signalling messages and semantics explicitly defined in the present document.

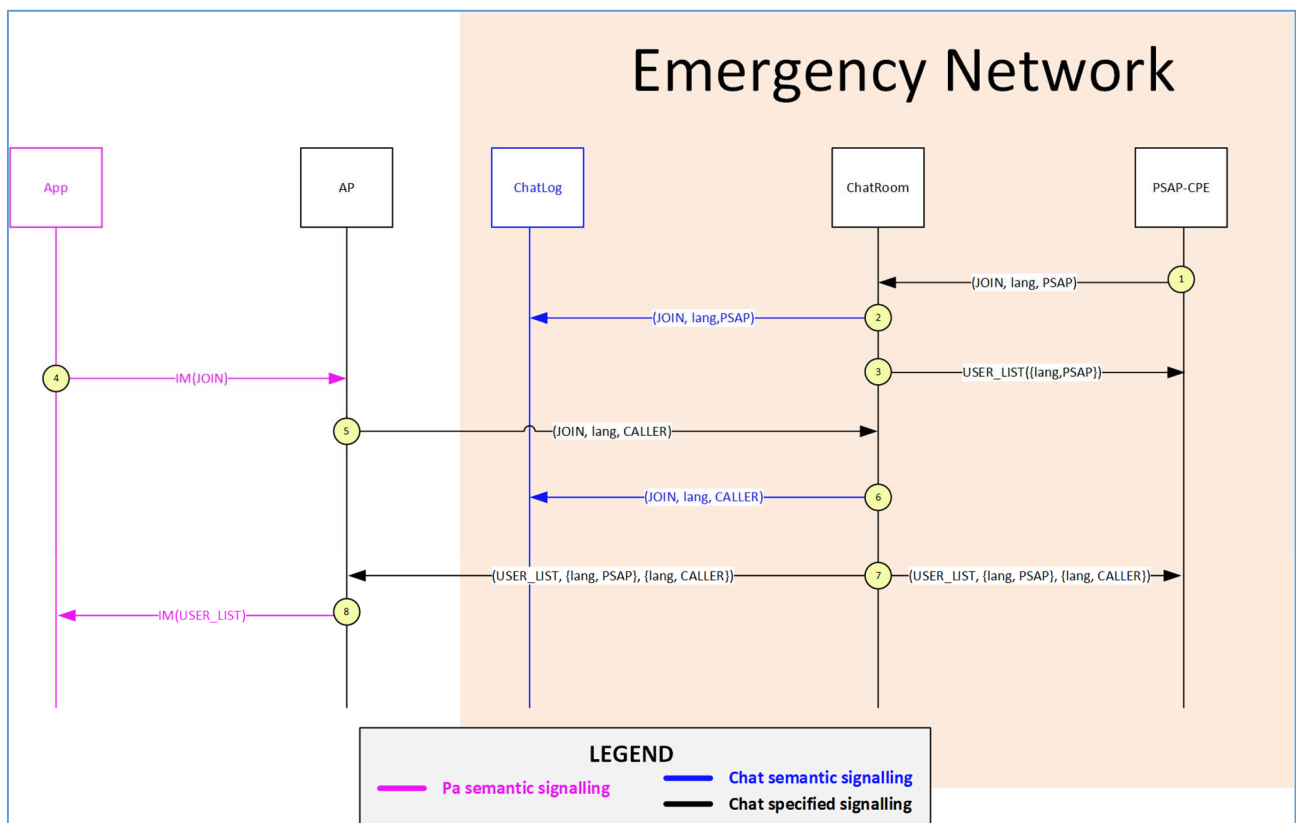
## 6.3.2 IM service invocation



**Figure 2: IM service invocation**

- 1) App initiates and emergency session with the AP over the Pa interface indicating that it can support the Instant messaging.
- 2) The AP creates an EDS message from the data provided by the App and includes the PEMEA instant messaging protocol capability. The AP then sends the EDS into the PEMEA network.
- 3) The EDS arrives at the PIM/tPSP. The PIM supports the PEMEA IM capability and includes this option in the onCapSupportPost back to the AP.
- 4) The AP binds the emergency session to the PIM that sent the onCapSupportPost message and then signals to the App over the Pa interface that the PSAP can support the PEMEA IM functionality.
- 5) The PIM notifies the PSAP-CPE that a new EDS has arrived.
- 6) The PSAP call-taker via the PSAP-CPE requests the capabilities agreed with the AP, sees the PEMEA IM capability and request the PIM to initiate the creation of a chat-room.  
The PIM request that the chat server create a chat-room  
The chat server creates a chat-room which in turn creates a chat-log.
- 7) The chat-room returns its URI to the chat server.  
The chat server returns the chat-room URI to the PIM.  
The PIM obtains Bearer tokens for the call-taker and the AP.  
The PIM returns the chat-room URI and a Bearer token and its expiry time to the call-taker via the PSAP-CPE.
- 8) The PIM invokes the PEMEA IM capability in the AP using the URI provided in the capability sent in the EDS. The PIM includes the chat-room URI, a Bearer token and its expiry time in the body of the HTTP POST used to invoke the capability in the AP.
- 9) The AP signals to the App over the Pa interface that the PSAP has invoked the instant message capability.

### 6.3.3 JOIN message flow



**Figure 3: IM JOIN flow**

Once the IM service has been invoked in the AP, then the PSAP call-taker and Caller join the chat-room:

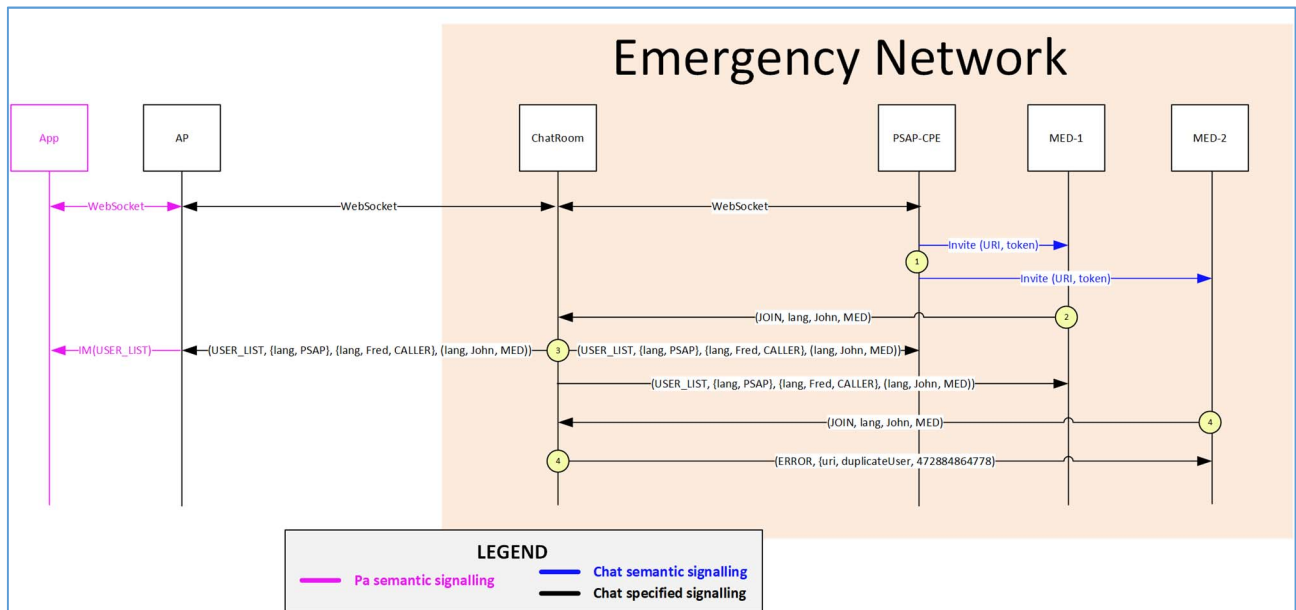
- 1) The PSAP call-taker joins the chat-room.
- 2) The chat-room writes a log to the chat-log indicating that the PSAP has joined the chat-room.
- 3) The chat-room responds to the PSAP with the current USER\_LIST, which only contains the PSAP.
- 4) The App signals to the AP over the Pa interface that it wishes to join the chat.
- 5) The AP connects to the chat-room and is authenticated using the token and the connection is promoted to a websocket.  
The AP then sends a JOIN message to the chat-room indicating that the connecting entity username and that the role is a CALLER. The combination of username and role shall be unique for the room.
- 6) The chat-room accepts the JOIN message and writes it to the chat-log.
- 7) The chat-room then sends a USER\_LIST message to both the PSAP and the AP containing the PSAP and CALLER information.
- 8) The AP relays the USER\_LIST to the App over the Pa interface.

### 6.3.4 ERROR message flow

The error message is sent from the chat-room to a participant in two circumstance:

- 1) When the username and role received in a JOIN message are already in use by an active user in the chat-room. In this case, the user of the App is informed by the AP and selects a new username before attempting to re-join the room.

- 2) The message received by the chat-room is not understood or is badly formed. The AP should notify the App that the message could not be delivered. This condition allows the App to take actions, but it cannot be rectified by the user. The AP shall discard the erroneous message. The App shall not attempt to resend the same message.

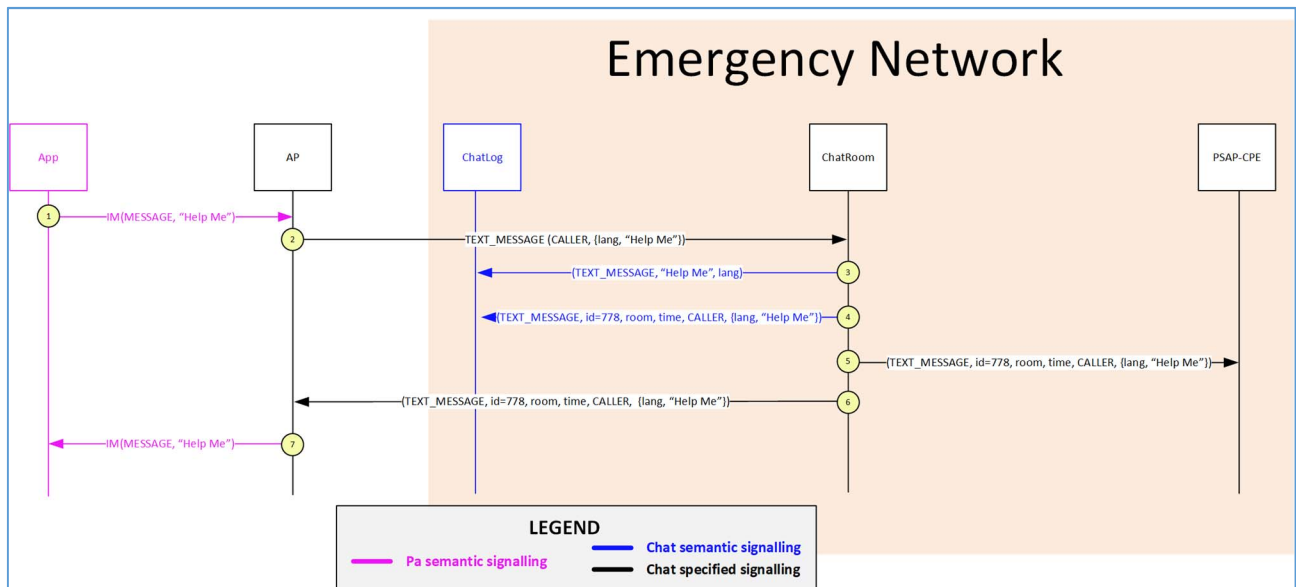


**Figure 4: ERROR message flow**

The PSAP are and the caller have already joined the chat room:

- 1) PSAP feels the need to invite to Medical first responders to the chat to assist with the call. How this happens is a matter of implementation but the first responder terminals need to receive the room URI as well as access security tokens.
- 2) MED-1 receives the invitation and sends a JOIN message to the chat-room indicating that his name is John and that he has the role of MED.
- 3) The chat-room receives this information logs it and sends the updated USER\_LIST including John the MED's details to the Caller, the PSAP and to John.
- 4) MED-2 receives the invitation and sends a JOIN message to the chat-room indicating that his name is John and that he has the role of MED.
- 5) Since MED-1 is called John and is already active in the room, the chat-room sends an ERROR message to John MED-2 indicating that his username is a duplicate.

## 6.4 TEXT\_MESSAGE flow



**Figure 5: TEXT\_MESSAGE signalling flow**

Once the AP has joined the chat-room it is able to send text messages to the other participants in the room:

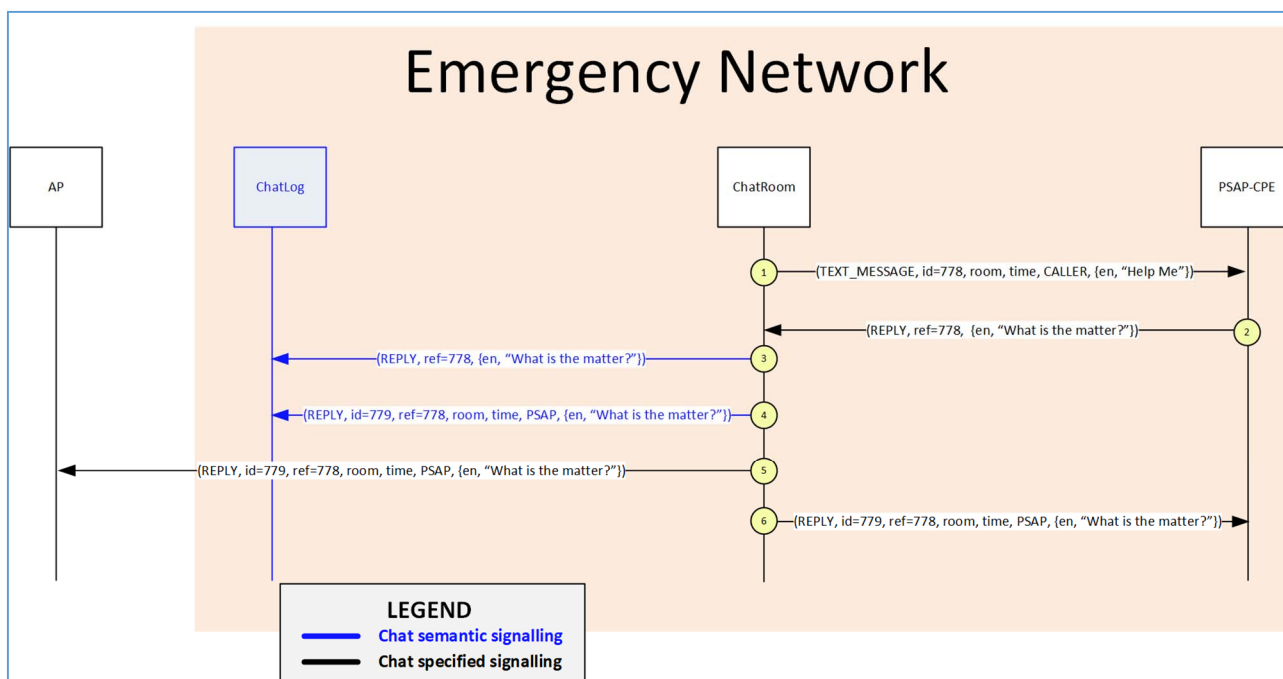
- 1) The App user sends the test message (e.g. "Help Me") to the AP over the Pa interface.
- 2) The AP takes the user's message and creates a TEXT\_MESSAGE for transmission to the chat-room and sends the TEXT\_MESSAGE to the chat-room.
- 3) The chat-room receives the message and writes it to the chat-log.
- 4) The chat-room adds a unique chat-room message id to the message, along with the room identifier and a time stamp and sends this to the chat-log.
- 5) The chat-room sends the new TEXT\_MESSAGE to the PSAP call-taker.
- 6) The chat-room sends the new TEXT\_MESSAGE to the AP.
- 7) The AP relays the message to the App, indicating its message is now in the chat-room.

## 6.5 REPLY message signalling

The REPLY message allows a user to respond to a specific message. This ensures that the context of the response is maintained in the event that subsequent text messages have been exchanged. A REPLY may be sent in reference to a TEXT\_MESSAGE or another REPLY message.

The REPLY message is similar to the TEXT\_MESSAGE but includes a reference to the unique identifier of the message to which it is replying. The flow follows the TEXT\_MESSAGE flow described in clause 6.4.





**Figure 6: PEMA IM REPLY message signalling flow**

- 1) Caller has the AP send a TEXT\_MESSAGE (e.g. with the message "help me") to the chat-room, and the chat-room adds its id and time stamp to the message before sending it out to the AP and the PSAP.
- 2) The PSAP call-taker types a reply to the message asking what the matter is. The REPLY message from the PSAP includes a reference to the original TEXT\_MESSAGE.
- 3) The chat-room logs the incoming message from the PSAP.
- 4) The chat-room appends a new message-id, room identifier and timestamp to the REPLY message and sends this to the chat-log.
- 5) The chat-room sends the new REPLY message to the AP.
- 6) The chat-room sends the new REPLY message to the PSAP call-taker.

## 6.6 Message translations and signalling

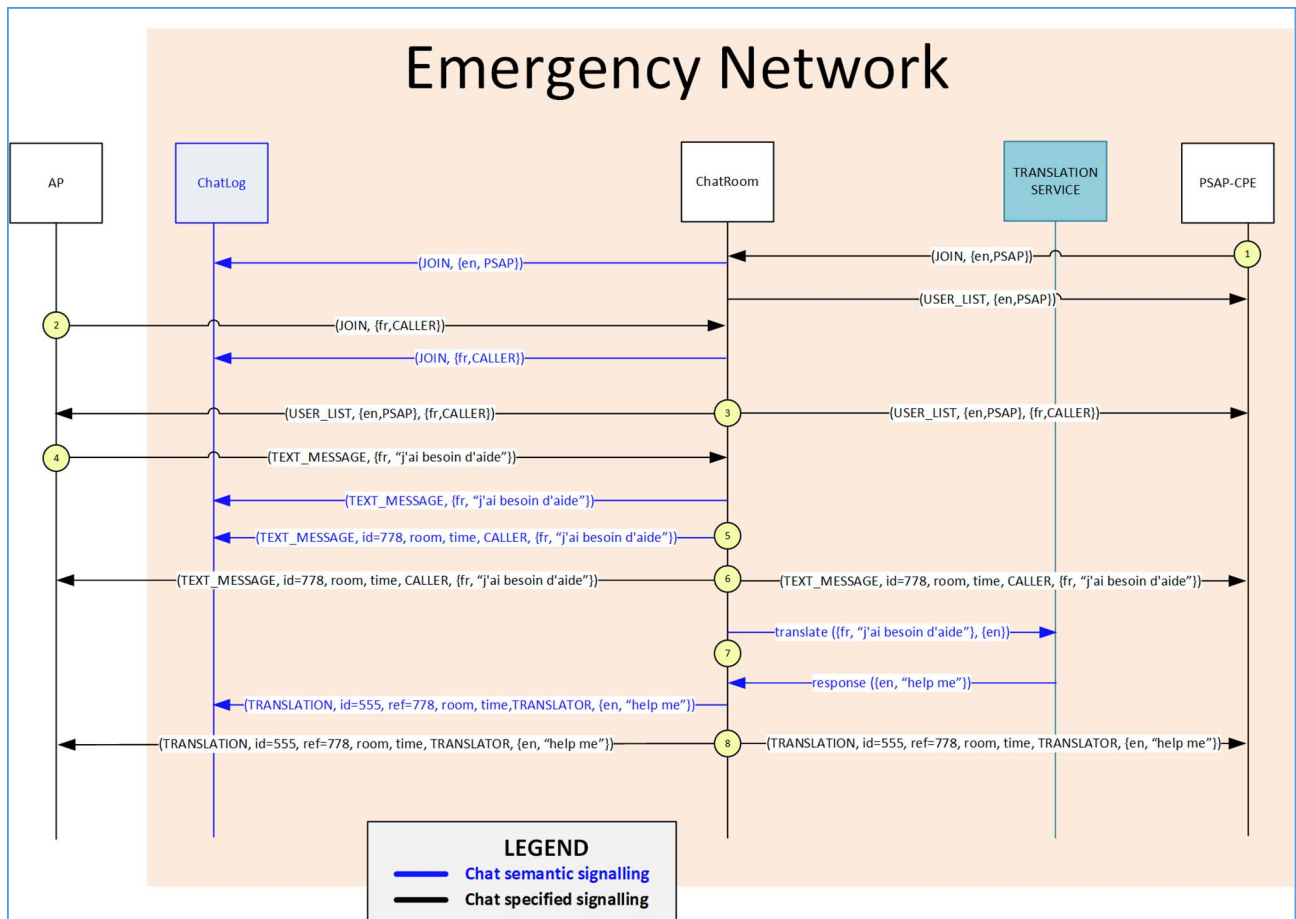
### 6.6.1 Overview of the translation functionality

Language translation is an optional function of the chat-room. However, support of the capability is recommended given the primary function of PEMA is to support application roaming which may result in the call-taker and caller conversing in different languages. IM functions in the AP shall accept any translation messages but may choose to ignore them.

Message translations are controlled by the chat-room. It maintains a list of languages that are used by chat-room participants. It generates this list from the languages provided in the JOIN messages for each participant (see clause 6.3.3). The list will always have at least one language in it.

When the chat-room receives a TEXT\_MESSAGE or a REPLY message, it invokes a third-party translation service requesting a translation for the message into each of the languages maintained in the chat-room's supported languages list. The text translations are then returned to the chat-room for sending to the room participants and the chat-log.

The general flow for the above is shown in Figure 7, with the invocation from clause 6.1 having already been performed.



**Figure 7: PEMA IM message translation**

- 1) The PSAP call-taker joins the chat-room and indicates that they would like to converse in English.  
The chat-room adds English to its list of languages in use.  
The chat-room writes to the chat-log that the PSAP call-taker has joined the room.  
The chat-room sends a USER\_LIST message to the PSAP call-taker consisting only of the PSAP.
- 2) The AP sends a JOIN message to the chat-room with the role of CALLER and indicates that the user wishes to converse in French.
- 3) The chat-room adds French to its list of languages in use.  
The chat-room writes to the chat-log that the caller has joined the chat-room.  
The chat-room sends USER\_LIST messages to both the AP and the PSAP call-taker. The message contains the caller and call-taker information.
- 4) The App user sends a message in French saying "j'ai besoin d'aide" to the AP over the Pa interface.  
The AP creates a TEXT\_MESSAGE packet, with the text sent by the user and indicates that the message is written in French.  
The AP then sends the TEXT\_MESSAGE to the chat-room.
- 5) The chat-room writes the TEXT\_MESSAGE to the chat-log.  
The chat-room adds the unique id, room id and timestamp to the TEXT\_MESSAGE and writes the new message to the chat-log.
- 6) The chat-room sends the new TEXT\_MESSAGE to the AP and the call-taker.
- 7) The chat-room invokes a third-party translation service, sending the users' message in French and requesting it be translated into all other languages that the chat-room has in its list of in-use languages, in this case only English.  
The translation server returns the English translation for "j'ai besoin d'aide", which is "help me".

- 8) The chat-room takes the translations and creates a TRANSLATION message.  
The TRANSLATION message contains a unique message id, a reference to the TEXT\_MESSAGE or REPLY message, a timestamp, and all of the translations.  
The chat-room sends the TRANSLATION message to the chat-log.
- 9) The chat-room sends the TRANSLATION message to the AP and the PSAP call-taker.

The reference field allows the end-points to link the translated message back to the source message. This enables the user to display the originally provided text if the translation does not appear to make sense.

## 6.6.2 TEXT\_MESSAGE translation example

Suppose that there are three languages in use in the chat-room, English (en), Spanish (es) and French (fr), and it received the following TEXT\_MESSAGE:

```
{
  "id": "5dd2bd8ba5568000079fa11c",
  "type": "TEXT_MESSAGE",
  "message": {
    "language": "es",
    "text": "hola"
  },
  "room": "ttRRkzORz",
  "user": {
    "name": "PSAP-XqwFbQ-A",
    "role": "PSAP"
  },
  "timestamp": 1574092171988
}
```

The chat-room would request from its translation service that the message be translated from Spanish (es) to English (en) and French (fr). Once it got back the translations it would construct the following TRANSLATION message, write it to the chat-log and return it to the room participants.

```
{
  "type": "TRANSLATION",
  "reference": "5dd2bd8ba5568000079fa11c",
  "translations": [
    {
      "language": "en",
      "text": "hello"
    },
    {
      "language": "fr",
      "text": "bonjour"
    }
  ]
}
```

The chat-server will echo to all the participants including all the fields that identify this message.

```
{
  "id": "5dd2bdfaa5568000079fa127",
  "type": "TRANSLATION",
  "reference": "5dd2bd8ba5568000079fa11c",
  "translations": [
    {
      "language": "en",
      "text": "hello"
    },
    {
      "language": "fr",
      "text": "bonjour"
    }
  ],
  "room": "ttRRkzORz",
  "user": {
    "name": "ChatBot",
    "role": "TRANSLATOR"
  },
  "timestamp": 1574092282440
}
```

### 6.6.3 REPLY message translation example

Suppose that there are three languages in use in the chat-room, English (en), Spanish (es) and French (fr), and it received the following REPLY.

```
{
  "id": "5dd2bd8ba5568000079fa1kkc",
  "reference": "5dd2bd8ba5568000079fa11c",
  "type": "REPLY",
  "message": {
    "language": "en",
    "text": "I need help"
  },
  "room": "ttRRkzORz",
  "user": {
    "name": "George Hurtman",
    "role": "CALLER"
  },
  "timestamp": 1574092171988
}
```

The chat-room would request from its translation service that the message be translated from English (en) to Spanish (es) and French (fr). Once it got back the translations it would construct the following TRANSLATION message, write it chat-log and send it to the room participants. It is important to note that the "reference" in the received REPLY message is not used in the TRANSLATION message. Instead, the "id" from the REPLY message is used as the "reference" in the TRANSLATION message.

```
{
  "id": "5dhjwopx45PG8jL32",
  "type": "TRANSLATION",
  "reference": "5dd2bd8ba5568000079fa1kkc",
  "translations": [
    {
      "language": "es",
      "text": "necesito ayuda"
    },
    {
      "language": "fr",
      "text": "j'ai besoin d'aide"
    }
  ]
  "room": "ttRRkzORz",
  "user": {
    "name": "ChatBot",
    "role": "TRANSLATOR"
  },
  "timestamp": 1574092282440
}
```

## 6.7 Disconnects and reconnects

Despite communications network being reliable, accidental disconnects owing to temporary issues do still occur. PEMEA does not define how the AP and the App communicate, though some high-level semantics for IM are described in the present document. The present document describes communication between the authorized entities and the chat-room, most commonly the AP and the PSAP-CPE.

If the chat-room terminates for an unexpected reason, then the websockets used for communication between the participants and the chat-room will close. Should this occur, then the participants should attempt to reconnect, with an ever-increasing exponential back-off. Failure to reconnect after a configurable period should result in the participant not attempting to continue to retry. When this occurs for the PSAP call-taker, the PSAP call-taker may request a new room be created and this will then follow the creation process described in clause 6.2.

When this occurs, the new room may have a new URI, so a new IM invocation is sent to the AP including the new chat-room URI. If token-based authentication is used, then the new invocation shall include a new token and expiry time.

Since the chat-log provides a transcript of what information has been exchanged between room participants, it should be persistent, so in the event of a new room creation due to a system failure of some kind, the same chat-log can continue to be used in the new chat-room.

On receipt of the new IM invocation, the AP shall auto join the newly provided chat-room URI and communication is re-established. The AP does not need to report to the App the loss of connectivity to the chat-room until it determines that the connectivity cannot be restored. A simplified version of this flow is provided in Figure 8.

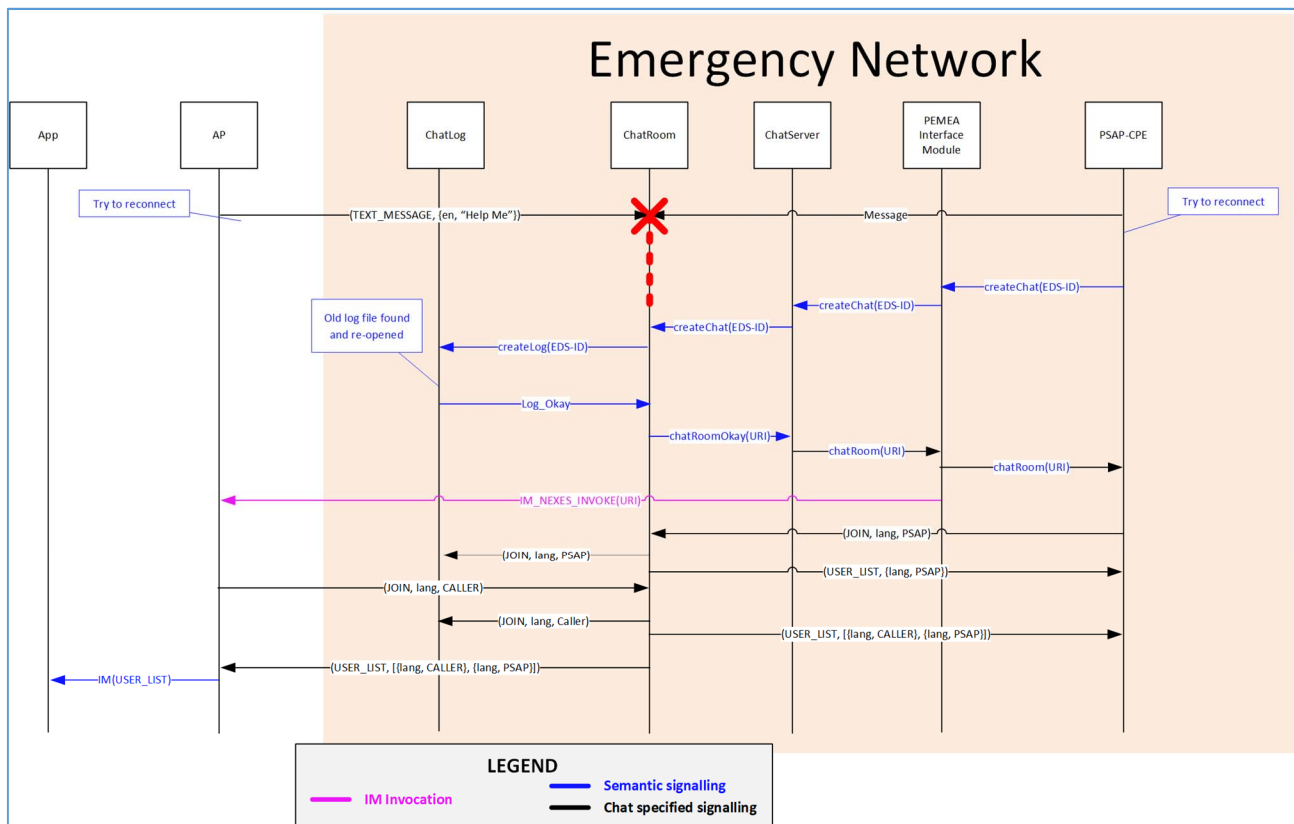


Figure 8: PEMA Chat reconnection signalling

## 7 IM PEMA message and type definitions

### 7.1 Overview

The IM PEMA protocol messages are defined as a series of JSON documents exchanged between the AP or PEMA terminating node and a "chat room" established inside the secure emergency network. The chat room is established solely for communications with a single emergency session. Each emergency session requiring the use of the IM PEMA service has its own chat room created. Service and message exchanges between the AP and the App are not defined in the present document and are left to application implementers.

The JSON specifications for the messages are provided in annex A and are also maintained in a repository outside of the present document and are available for download from ETSI Forge [5]. The subsequent sub-clauses in clause 7 of the present document describe each of the IM PEMA messages, its function, elements and any key constraints. Messages exchanges and procedures are specified in clause 6.

**Table 3: IM PEMEA messages**

Message type	Description
JOIN	Message sent from a potential participant to the chat-room when the user wants to join the chat.
USER_LIST	Message sent from the chat-room to participants containing all users whenever a user enters or leaves the chat-room.
TEXT_MESSAGE	Message sent either from a participant to the chat-room, or from the chat-room to the participants containing a user's message. Message history is transferred as text messages. History is sent when a user joins the chat-room.
REPLY	Message sent from a participant to the chat-room or from the chat-room to the participants indicating the content of the message is a direct reply to a specific message.
TRANSLATION	Message from the chat-room to the participants containing one or more translations for a specific message.
ERROR	Message from the chat-room to an entity that is unsuccessful in joining the room because the username and role is already active. Or it is sent to a participant when a message cannot be processed.

## 7.2 Data types

### 7.2.1 languageList

Is an array containing the list of languages that the user can read and write. The languages may be any of the pertinent languages from the IANA language subtag registry [2]. At least one language shall be defined. Where more than one language is provided they should be ordered based on preference with the most preferred being at the first in the list.

### 7.2.2 room

Is a unique string providing a name for the chat-room. This is usually the URI used to specify the room attachment provided when the chat service is invoked by the PSAP.

### 7.2.3 timestamp

All messages are sent with a timestamp and to avoid offsets, time zones, daylight savings changes etc, the time is always absolute. It is specified as an integer in milliseconds since the UTC epoch of 00:00:00 1<sup>st</sup> January 1970.

### 7.2.4 user

Defines a user in the chat-room. It consists of:

- name;
- role.

The name is a string that identifies a handle to which the user relates, this may be their name "George" for example, or their telephone number, tel: +34666554433 for example.

The role defines the type of user that is associated with the name. The recommended values are provided in Table 4.

**Table 4: Role values**

Role	Description
CALLER	The value sent by the AP to the chat-room and used to identify the user initiating the emergency communication to all other participants in the chat-room.
PSAP	The value sent by the PSAP Call-Taker to the chat-room and used to identify the Call-Taker to all other participants in the chat-room.
POLICE	If the police are linked into the chat-room then this value is sent by them to identify that police are in the chat to all other participants in the chat-room.
FIREFIGHTER	If the fire department are linked into the chat-room then this value is sent by them to identify that firefighters are in the chat to all other participants in the chat-room.
MED	If the ambulance or medical services are linked into the chat-room then this value is sent by them to identify that they are in the chat to all other participants in the chat-room.
TRANSLATOR	Indicates that a translator service is in the chat. This may be automatic, like a chat-bot, or it may be an actual person manually doing each translation.

## 7.2.5 userInfo

Is used to combine information about the user:

- user: defined in clause 7.2.4;
- languages: languageList defined in clause 7.2.1;
- status.

The status field is used to describe what the user is doing.

**Table 5: UserInfo status values**

Status	Description
ONLINE	The user is connected to the chat-room. This may be a new user joining the chat-room, or maybe an existing user connected to the chat-room.
OFFLINE	The user was, but is no-longer, connected to the chat-room. The chat-room may only use this status as an indicator that a user has left the chat-room and then delete knowledge of the connection, or it may maintain a list of all users that have ever connected to the room.
TYPING	Is used to indicate that an entity is typing a message. Implementation of this status functionality is optional.

## 7.2.6 message

Is a container used to convey text and the associated language in which the text is written.

**Table 6: message container elements**

Element NAME	Description
text	The information to be conveyed.
language	The language abbreviation as specified by IANA in [2] in which the text is written.

## 7.3 JOIN message

### 7.3.1 Message overview

The JOIN message is the message sent from the participant to the chat-room when the user wants to join the chat. This may be the AP, the PSAP-CPE or another trusted user. The JOIN message is resent if for some reason the connection between the entity and the chat room is lost but the chat is not concluded.

The JOIN message consists of the following required fields.

**Table 7: JOIN message fields and description**

Element Name	Description	
type	"JOIN" The message being sent by the end-point to the chat-room.	
user	name	Name and role of entity joining the chat-room. The Name may be the user's name or their telephone number.
	role	The role will depend on the type of user joining the chat-room. In the case of the user initiating the emergency communication this will be "CALLER".
languages	Is a list the languages that the user can read and write. It is specified as a list of languages from the IANA language subtag registry [2].	
since	Send all messages after this time. The time is specified as milliseconds since epoch. A value of zero means send all messages. When a participant is connecting to the chat-room for the first time then it will send a "since" value of zero, indicating that it wants all messages. For example, an AP may do this in case the PSAP call-taker joined the chat-room before the caller did. This will ensure that when the history is sent from the chat-room to the AP that the AP receives all messages in chronological order.	

### 7.3.2 Examples

The JOIN message is also used to reconnect to the chat-room in the case that the connection terminated, AP or chat-server restarted. In this case, the AP will set the since value to be the time that the AP knew it last had a connection to the chat-room, often this will be last received message from the chat-room. On a successful connection, the chat-room will send all messages that have occurred "since" the specified time.

```
{
  "languages": [
    "es",
    "en"
  ],
  "since": 0,
  "type": "JOIN",
  "user": {
    "name": "PSAP-IXHJh219",
    "role": "PSAP"
  }
}
```

## 7.4 ERROR message

### 7.4.1 Message overview

The ERROR message is the message sent from the chat-room to a participant when the chat-room is not able to process the message sent by the participant. There are two cases identified and these are described in clause 6.3.4.

The ERROR message consists of the following required fields.



**Table 8: JOIN message fields and description**

Element Name	Description
type	"ERROR" The message being sent by the chat-room to the participant.
room	String identifying the chat-room, usually the URI of the chat-room.
reasonCode	A string representing a specific error. See Table 9 for valid reasonCodes.
reason	Optional field containing text describing the problem.
timestamp	Integer Number of milliseconds from epoch (00:00:00:00 1 <sup>st</sup> January 1970). See clause 7.2.3.

**Table 9: ERROR reasonCode values**

reasonCode	Description
duplicateName	There is a participant in the chat-room with the same name and role.
badMessage	The message sent by the participant to the chat-room was malformed.

## 7.4.2 Examples

```
{
  "type": "ERROR",
  "room": "https://chatroom.example.com:2040/djhuhuihuhbjkjbjhywe90ruj",
  "reasonCode": "duplicateName",
  "reason": "Username:John, Role:MED, already exists",
  "timestamp": 1574092280231
}
```

## 7.5 USER\_LIST message

The USER\_LIST message is sent to all participants in the chat room whenever a user enters and leaves the chat-room.

**Table 10: USER\_LIST message fields and description**

Element Name	Description
type	"USER_LIST" The message being sent by the chat-room to the participants.
room	String identifying the chat-room.
timestamp	Integer Number of milliseconds from epoch (00:00:00:00 1 <sup>st</sup> January 1970). See clause 7.2.3.
users	An array of userInfo containing the name, role and status of each user in the chat-room. See clause 7.2.4.

Each participant in the chat-room is required to keep a list of the participants so that it knows when participants join and leave the chat.

```
{
  "type": "USER_LIST",
  "room": "ttRRkzORz",
  "users": [
    {
      "languages": [ "en" ],
      "user": {
        "name": "Translator-Bot",
        "role": "TRANSLATOR"
      },
      "status": "ONLINE"
    },
    {
      "languages": [
        "es",
        "en"
      ],
      "user": {
        "name": "PSAP-XqwFbQ-A",

```

```

        "role": "PSAP"
      },
      "status": "OFFLINE"
    },
    {
      "languages": [
        "es",
        "en"
      ],
      "user": {
        "name": "PSAP-IXHJh219",
        "role": "PSAP"
      },
      "status": "ONLINE"
    }
  ],
  "timestamp": 1574092280231
}

```

## 7.6 TEXT\_MESSAGE message

The text message is used by a chat-room participant to contribute to the chat-room dialogue. Every message has an identifier associated with chat-room so that it can be uniquely identified. This is important to allow translations and replies to be linked to the original message to which they refer.

The text message is used by a chat-room participant to contribute to the chat-room dialogue. After the chat-room server receives a TEXT\_MESSAGE message from a chat-room user, it sends it to all the participants in the room, including the sender.

The text message consists of all of the fields in Table 11.

**Table 11: TEXT\_MESSAGE message fields and description**

Element Name	Description
id	Unique identifier for this message within the chat-room.
type	"TEXT_MESSAGE" refer to Table 3.
room	The identifier for the chat-room.
timestamp	The time that the message was sent. Refer to clause 7.2.3.
user	The user sending or that sent the text message. Refer to clause 7.2.4.
message	The details of the text being sent and the language in which the message is composed. Refer to clause 7.2.6.

```

{
  "id": "5dd2bd8ba556800079fallc",
  "type": "TEXT_MESSAGE",
  "message": {
    "language": "es",
    "text": "hola"
  },
  "room": "tRRkzORz",
  "user": {
    "name": "PSAP-XqwFbQ-A",
    "role": "PSAP"
  },
  "timestamp": 1574092171988
}

```

## 7.7 REPLY message

The reply message allows a participant in the chat-room to respond to a specific message sent by another user in the chat-room. This is important to ensure context between messages is maintained when there are lots of messages or more than two active participants in the chat-room.

After the chat-room server receives a REPLY message from a chat-room user, it sends it to all the participants in the room, including the sender.

REPLY message includes all fields from Table 12.

**Table 12: REPLY message fields and description**

Element Name	Description
id	Unique identifier for this message within the chat-room.
reference	The unique identifier of the message to which this reply message relates.
type	"REPLY" refer to Table 3.
room	The identifier for the chat-room.
timestamp	The time that the message was sent. Refer to clause 7.2.6.
user	The user sending or that sent the text message. Refer to clause 7.2.4.
message	The details of the text being sent and the language in which the message is composed. Refer to clause 7.2.6.

```
{
  "id": "5dd2bd8ba5568000079falkkc",
  "reference": "5dd2bd8ba5568000079fa11c",
  "type": "REPLY",
  "message": {
    "language": "en",
    "text": "I need help"
  },
  "room": "ttRRkzORz",
  "user": {
    "name": "PSAP-XqwFbQ-A",
    "role": "CALLER"
  },
  "timestamp": 1574092171988
}
```

## 7.8 TRANSLATION message

The translation message is sent when the chat-room supports a translation service (this may be an automatic service). The translation message indicates which message it is translating and then includes a list of each of the translations encoded as a "message" type.

The message is translated into the set of languages specified by the chat-room users when they join the chat-room. The list may grow as more users reading and writing different languages enter the chat-room, but the number of translations will not decrease as users leave the chat-room.

**Table 13: TRANSLATION message fields and description for translators**

Element Name	Description
id	Unique identifier for this message within the chat-room.
reference	The unique identifier of the message to which this reply message relates.
type	"TRANSLATION" refer to Table 3.
room	The identifier for the chat-room.
timestamp	The time that the message was sent. Refer to clause 7.2.6.
user	The user sending or that sent the text message that has been translated. Refer to clause 7.2.4.
translations	This is a unique array of messages. The uniqueness is based on the language specified in the message. The structure of the message is described in to clause 7.2.6.

Translated messages are sent to a user when they join chat-room and request message history. The present document leaves the option to the implementor to decide if they will further translate this history if the new participant adds a new language to the set of required languages in the chat-room.

```
{
  "id": "5dd2bdfaa5568000079fa127",
  "type": "TRANSLATION",
  "reference": "5dd2bd8ba5568000079fa11c",
  "translations": [
    {
      "language": "en",
      "text": "hello"
    }
  ]
}
```

```
],  
"room": "ttRRkzORz",  
"user": {  
  "name": "Translator-Bot",  
  "role": "TRANSLATOR"  
},  
"timestamp": 1574092282440  
}
```

---

## Annex A (normative): IM/PEMEA JSON schema

### A.1 General

This normative annex includes all of the JSON schema necessary to implement the present document.

---

### A.2 IM invocation schema

This schema is used by the PIM/tPSP to invoke the IM capability in the AP.

```
{
  "$schema": "http://json-schema.org/draft-07/schema",
  "type": "object",
  "title": "IM invocation schema",
  "properties": {
    "token": {
      "type": "string"
    },
    "expiry": {
      "type": "number"
    },
    "uri": {
      "type": "string",
      "format": "uri"
    }
  },
  "required": ["uri", "token", "expiry"]
}
```

---

### A.3 IM Definitions schema

This schema provides the general type definitions used by the rest of the sub-schemas.

```
{
  "$schema": "http://json-schema.org/draft-07/schema#",
  "$id": "https://pemea.help/schemas/im/definitions.json",
  "title": "Instant Message data format JSON Schema",
  "definitions": {
    "languageList": {
      "type": "array",
      "description": "The list of acceptable languages abbreviations. Abbreviations shall match IANA language subtag registry. http://www.iana.org/assignments/language-subtag-registry/language-subtag-registry",
      "uniqueItems": true,
      "items": {
        "type": "string"
      }
    },
    "type": {
      "type": "string",
      "title": "The name of the message type",
      "enum": [ "JOIN", "USER_LIST", "TEXT_MESSAGE", "REPLY", "TRANSLATION", "ERROR" ]
    },
    "room": {
      "type": "string",
      "title": "The name of the room",
      "minLength": 1
    },
    "timestamp": {
      "type": "integer",
      "title": "Number of milliseconds from the Epoch",
      "minimum": 0
    },
    "user": {
```

```

"type": "object",
"title": "The user identification",
"additionalProperties": false,
"required": [
  "name",
  "role"
],
"properties": {
  "name": {
    "type": "string",
    "title": "The user name",
    "minLength": 1,
    "examples": [
      "tel:+34666554433"
    ]
  },
  "role": {
    "type": "string",
    "title": "The user role"
  }
}
},
"userInfo": {
"type": "object",
"title": "User's additional information",
"additionalProperties": false,
"required": [
  "user",
  "languages",
  "status"
],
"properties": {
  "user": {
    "$ref": "#/definitions/user"
  },
  "languages": {
    "$ref": "#/definitions/languageList"
  },
  "status": {
    "type": "string",
    "enum": [ "ONLINE", "OFFLINE", "TYPING" ]
  }
}
},
"message": {
"type": "object",
"title": "The message to be sent",
"additionalProperties": false,
"required": [
  "text",
  "language"
],
"properties": {
  "text": {
    "type": "string",
    "description": "The text of the message"
  },
  "language": {
    "type": "string",
    "description": "Languages abbreviations. Abbreviations shall match IANA language subtag registry. http://www.iana.org/assignments/language-subtag-registry/language-subtag-registry"
  }
}
}
}
}

```

---

## A.4 IM JOIN schema

This schema specifies the JOIN message.

```

{
  "$schema": "http://json-schema.org/draft-07/schema#",
  "$id": "https://pemea.help/schemas/im/join.json",
  "title": "JOIN message",

```

```

"description": "JSON data format for JOIN message",
"type": "object",
"additionalProperties": false,
"required": [
  "type",
  "timestamp",
  "user",
  "languages",
  "since"
],
"properties": {
  "type": {
    "const": "JOIN"
  },
  "timestamp": {
    "$ref": "definitions.json#/definitions/timestamp"
  },
  "user": {
    "$ref": "definitions.json#/definitions/user"
  },
  "languages": {
    "$ref": "definitions.json#/definitions/languageList"
  },
  "since": {
    "$ref": "definitions.json#/definitions/timestamp",
    "title": "The timestamp (included) from which start sending the history messages, zero means all messages"
  }
}
}

```

---

## A.5 IM ERROR schema

```

{
  "$schema": "http://json-schema.org/draft-07/schema",
  "type": "object",
  "title": "IM Error Schema",
  "properties": {
    "type": {
      "const": "ERROR"
    },
    "room": {
      "type": "string"
    },
    "reasonCode": {
      "type": "string"
    },
    "reason": {
      "type": "string"
    },
    "timestamp": {
      "type": "number"
    }
  },
  "required": ["type", "room", "reasonCode", "timestamp"]
}

```

---

## A.6 IM REPLY schema

This schema specifies the REPLY message.

```

{
  "$schema": "http://json-schema.org/draft-07/schema#",
  "$id": "https://pemea.help/schemas/im/reply.json",
  "title": "Reply",
  "type": "object",
  "description": "The reply of the message",
  "additionalProperties": false,
  "required": [
    "reference",

```

```

    "type",
    "message"
  ],
  "properties": {
    "id": {
      "type": "string",
      "description": "The id of the reply message."
    },
    "reference": {
      "type": "string",
      "description": "The id of the message being replied to"
    },
    "type": {
      "const": "REPLY"
    },
    "room": {
      "type": "string",
      "description": "The chat room the user is in."
    },
    "timestamp": {
      "$ref": "definitions.json#/definitions/timestamp"
    },
    "user": {
      "$ref": "definitions.json#/definitions/user",
      "description": "The user identification."
    },
    "message": {
      "$ref": "definitions.json#/definitions/message"
    }
  }
}

```

---

## A.7 IM TEXT\_MESSAGE schema

This schema defines the TEXT message.

```

{
  "$schema": "http://json-schema.org/draft-07/schema#",
  "$id": "https://pemea.help/schemas/im/textMessage.json",
  "title": "Text Message",
  "type": "object",
  "description": "The text-message type for IM",
  "additionalProperties": false,
  "required": [
    "type",
    "message"
  ],
  "properties": {
    "id": {
      "type": "string",
      "description": "The id of the text message."
    },
    "type": {
      "const": "TEXT_MESSAGE"
    },
    "room": {
      "type": "string",
      "description": "The chat room the user is in."
    },
    "timestamp": {
      "$ref": "definitions.json#/definitions/timestamp"
    },
    "user": {
      "$ref": "definitions.json#/definitions/user",
      "description": "The user identification."
    },
    "message": {
      "$ref": "definitions.json#/definitions/message"
    }
  }
}

```



## A.8 IM TRANSLATION schema

This schema defines the TRANSLATION message.

```
{
  "$schema": "http://json-schema.org/draft-07/schema#",
  "$id": "https://pemea.help/schemas/im/translation.json",
  "title": "Translation",
  "type": "object",
  "description": "The translations of a message",
  "additionalProperties": false,
  "required": [
    "reference",
    "type",
    "translations"
  ],
  "properties": {
    "id": {
      "type": "string",
      "description": "Unique id of this message"
    },
    "reference": {
      "type": "string",
      "description": "The id of the message that has been translated"
    },
    "type": {
      "const": "TRANSLATION"
    },
    "room": {
      "type": "string",
      "description": "The chat room that the message was translated for."
    },
    "timestamp": {
      "$ref": "definitions.json#/definitions/timestamp"
    },
    "user": {
      "$ref": "definitions.json#/definitions/user",
      "description": "The user whose message was translated"
    },
    "translations": {
      "type": "array",
      "description": "List of user translations",
      "minItems": 1,
      "uniqueItems": true,
      "items": {
        "$ref": "definitions.json#/definitions/message"
      }
    }
  }
}
```

## A.9 IM USER\_LIST schema

This schema defines the USER\_LIST message.

```
{
  "$schema": "http://json-schema.org/draft-07/schema#",
  "$id": "https://pemea.help/schemas/im/userList.json",
  "title": "JOIN message",
  "description": "JSON data format for JOIN message",
  "type": "object",
  "additionalProperties": false,
  "required": [
    "type",
    "room",
    "timestamp",
    "users"
  ],
  "properties": {
    "type": {
      "const": "USER_LIST"
    },
    "room": {
```

```
    "$ref": "definitions.json#/definitions/room"
  },
  "timestamp": {
    "$ref": "definitions.json#/definitions/timestamp"
  },
  "users": {
    "type": "array",
    "description": "List of users",
    "minItems": 1,
    "uniqueItems": true,
    "items": {
      "$ref": "definitions.json#/definitions/userInfo"
    }
  }
}
}
```

## Annex B (informative): Recommended TLS cipher suites

This annex provide a recommended set of cipher suites for use with this protocol.

**Table B.1: Recommended TLS 1.3 cipher suites**

Cipher	TLS version	Encryption	MAC
TLS_AES_128_GCM_SHA256	1.3	AESGCM(128)	AEAD
TLS_AES_256_GCM_SHA384	1.3	AESGCM(256)	AEAD
TLS_CHACHA20_POLY1305_SHA256	1.3	CHACHA20/POLY1305(256)	AEAD

**Table B.2: Acceptable TLS 1.2 cipher suites**

Cipher	TLS version	Encryption	MAC
ECDHE-ECDSA-AES128-GCM-SHA256	1.2	AESGCM(128)	AEAD
ECDHE-RSA-AES128-GCM-SHA256	1.2	AESGCM(128)	AEAD
ECDHE-ECDSA-AES256-GCM-SHA384	1.2	AESGCM(256)	AEAD
ECDHE-RSA-AES256-GCM-SHA384	1.2	AESGCM(256)	AEAD
ECDHE-ECDSA-CHACHA20-POLY1305	1.2	CHACHA20/POLY1305(256)	AEAD
ECDHE-RSA-CHACHA20-POLY1305	1.2	CHACHA20/POLY1305(256)	AEAD
DHE-RSA-AES128-GCM-SHA256	1.2	AESGCM(128)	AEAD
DHE-RSA-AES256-GCM-SHA384	1.2	AESGCM(256)	AEAD

---

## History

<b>Document history</b>		
V1.1.1	November 2021	Publication