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| ToR STF 605 (TC HF) |
| Version: 1.6 |
| Author: Matthias Schneider – Date: 2021-05-21 |
| Last updated by ETSI Secretariat – Date: 2021-06-15 |
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Terms of Reference – Specialist Task Force Proposal

STF 605 (TC HF)

RTT Conference Calling

Summary information

|  |  |  |  |
| --- | --- | --- | --- |
| Approval status | Approved by Ref. Body HF (2021-06-15) | | **YES** |
| Approved by Board#133 (2021-06-09) | | **YES** |
| Reference Body | TC HF | | |
| ETSI Funding | **Maximum budget: 50 880 EUR** | | |
| Minimum of 4 ETSI Members Support | **YES** | | |
| Time scale | **From** | 2021-08-09 | |
| **To** | 2022-02-09 | |
| Work Items | DTR/HF-00103708  TB Adoption 2019-10-17 | | |
| Board priority | [ETSI STF funding criteria](https://portal.etsi.org/STF/STFs/Funding/ETSIbudget.aspx)   |  |  | | --- | --- | | **Priority Criteria** |  | | Maintenance of standards in mature domains |  | | Innovation in mature domains | X | | Emerging domains for ETSI |  | | Horizontal activities (quality, security, etc.) | X | | Societal good / environmental | X | | | |

Part I – STF Technical Proposal

# Rationale & Objectives

## Rationale

EN 301 549 specifies that Real-time Text should be possible for telephony and voice conferencing systems that allow two-way communication between parties, including communication to emergency services dispatch operators and first responders.

However, there is an absence of standardisation in regard to how RTT sessions involving multiple parties, comprising a mix of speaking and typing participants, should behave. This further extends into emergency calling, in cases where multiple parties are required to engage in urgent communications.

The information that is required to provide a completely accessible experience needs to be formalized at a user interface layer and a protocol layer.

## Objectives of the work to be executed

The proposed project proposes the following work item:

Development a draft version of a Technical Report: Produce a first draft of Technical Reference document that defines how user inter-faces should display, present and communicate conference calls that involve RTT and voice participants. This is called the “user interface” layer.

In a follow-up project, this Technical Report will be amended by three Annexes, which will be used as liaison documents for 3GPP, GSMA, and EMTEL.

1. **Annex A:** 3GPP Liaison document: Produce a document of direction for 3GPP that out-lines new requirements for data to be passed between originator, carrier and termination endpoint of a VoIP session that allows Objective 1 to be satisfied. In addition, this document should provide information for 3GPP to create a reference that specifically address-es how RTT should be handled in conference calls. This is called the “protocol” layer.
2. **Annex B:** GSMA Liaison document: A liaison document will also be provided by the STF to GSMA, indicating that amendment of specifications IR92 and IR94 are required for inclusion of multi-party RTT in products once 3GPP work is completed. This document will be made available to all interested parties in a suitable format to be defined during the project.
3. **Annex C:** ETSI EMTEL Liaison document: A liaison request regarding NG-112 technical standards. Since emergency services are an important application of the proposed functionality, it will be required to add the decided technical multi-party functionality to the standards for emergency services. The actions to add participants to the call will in that case often be performed by technical components in the emergency service network.

## Previous funded activities in the same domain

ETSI has not funded previous work in this specific field. RTT is part of the recommendations covered by EN 301 549. Development of EN 301549 was funded by the European Commission through various STFs.

## Previous work to be taken into account

Real-time texting between individual participants has been well described both from a protocol standpoint (RFC 5194[[1]](#footnote-2), RFC 4103[[2]](#footnote-3), T.140[[3]](#footnote-4), ATIS-1000068[[4]](#footnote-5)) and a user design standpoint (EN 301 549[[5]](#footnote-6), ATIS-0700029[[6]](#footnote-7), ATIS-0700030[[7]](#footnote-8)). We aim to ensure that multi-party RTT is compatible with these existing standards, as they are well-established and underpin existing two-party RTT communication.

3GPP has many specifications related to RTT. E.g., on codec level in TS 126 114[[8]](#footnote-9), on service level in TS 122 101[[9]](#footnote-10) and TS 122 173[[10]](#footnote-11) and for emergency services in TS 123 167[[11]](#footnote-12).

The emergency service aspects are covered in a number of ETSI documents from ETSI EMTEL (TS 101 470[[12]](#footnote-13), TR 103 170[[13]](#footnote-14), TR 103 201[[14]](#footnote-15), TS 103 478[[15]](#footnote-16),TS 103 479[[16]](#footnote-17)).

Emergency service aspects are also covered in the North American specification NENA NG‑9‑1‑1 NENA-STA-010[[17]](#footnote-18), where the latest approved but not yet published version STA 010.3, includes multiparty RTT calling.

Relay service aspects are covered in ES 202 975[[18]](#footnote-19).

RTT is included in GSMA IR.92[[19]](#footnote-20) product specification.

Multi-party RTT is required by the adoption of EN 301 549, but its user interface layer and protocol implementations are not well described in one place with normative references.

Some user requirements are well known and may be possible to support with existing protocols (such as the need to identify senders of text messages). However, this information is not gathered in a single normative reference.

Other user requirements have not been fully explored, and thus do not have an existing way to support (such as informing users which speaker is currently speaking).

There have been draft proposals created in the past within the IETF[[20]](#footnote-21) to address various aspects of RTT multi-party calling but were not approved and do not discuss the entire scope of required changes. They however provide a useful basis to start the standardisation work. The IETF mmusic (multiparty multimedia session control) and avtcore (audio video transport core maintenance) groups[[21]](#footnote-22) [[22]](#footnote-23) have recently completed work on this topic and it will be useful to study the documents from these groups to ensure efficient work and completeness.

## Market impact

## This work, if completed by a follow-up project, will enable industry to satisfy a requirement of EN 301 549 that is not currently fully defined. In addition, it will allow Deaf, hard of hearing, and deaf-blind users or those with speech disorders to participate fully in conference calling for the first time. Additionally, these users will be able to have access to features of emergency services previously inaccessible. The European Federation of Hard of Hearing People estimated that in 2015 there were 51 million people living within the European Union with hearing loss.

## Beyond benefits to persons with disabilities, multi-party RTT will allow benefit to all users of ICT. For example, the ability to inter-operably and quickly share a link during a multi-party audio conference call using the chat-functionality of the multi-party RTT system.

## Consequences if not agreed

The substantial effort to develop iterations of EN 301 549 has previously only been possible once the European Commission has initiated a Standardization Mandate. For the Mandate related to the European Accessibility Act to be ready in time, the work proposed here needs to be well in progress once the European Commission will publish their Mandate related to the European Accessibility Act.

The European Commission has already announced that they intend to publish a new Mandate related to the EAA in the summer of 2021. After accepting Mandates M/376 and M/554 refusing to accept this new Mandate will not be an option for ETSI. For the standard revision needed to respond to the upcoming Mandate the work proposed in this document is an eminently important input. Absent the result of the proposed work at an early stage in the Mandate work, ETSI will not be able to fulfil the scheduling requirements of the European Accessibility Act.

# Relation with ETSI strategy and priorities

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| --- | --- |
| **Priority Criteria** | **Rationale** |
| Maintenance of standards in mature domains |  |
| Innovation in mature domains | The proposed work standardizes the UI aspects of a new and enhanced implementation of RTT allowing multi-party RTT calls. |
| Emerging domains for ETSI |  |
| Horizontal activities (quality, security, etc.) | Accessibility is a horizontal activity that is applicable across the widest range of ICT products and services. Multi-party RTT is an important part of accessible communication. |
| Societal good / environmental | Allowing multi-party RTT will enable a large number of people with special requirements (in particular the Deaf and hard-of-hearing community) to participate in multi-party conversations. The proposed work is on important next step on the way to an inclusive society using ICT services. |

# ETSI Members Support

|  |  |  |
| --- | --- | --- |
| **#** | **ETSI Member** | **Supporting delegate** |
| 1 | Apple (UK) Ltd. | Chris Fleizach |
| 2 | BMWi | Martin Böcker |
| 3 | Hillebrand GmbH | Mike Pluke |
| 4 | Audi | Matthias Schneider |

# Deliverables

## Base documents

|  |  |  |
| --- | --- | --- |
| **Document** | **Title** | **Status** |
| EN 301 549 | Includes some section on RTT but is incomplete |  |

## New deliverables

|  |  |  |  |
| --- | --- | --- | --- |
| **Deliv.** | **Work Item code**  **Standard number** | **Working title**  **Scope** | **Expected date for publication of an initial draft** |
| D2 | DTR/HF-00103708 | RTT Multi-party conference calling Specification supporting RTT over multi-party telephony VoIP calling.  (Initial draft only)  The document will establish user interface guidelines for RTT conference call interfaces and will identifying technical support needed to implement the guidelines. | 6 months after start of the STF |

# Maximum budget

## Task summary/Manpower Budget

|  |  |
| --- | --- |
| **Task short description** | Budget (EUR) |
|
| Task 1: Establish STF Team, STF Organization & STF Management and Coordination. | 6 000 |
| Task 2: Development of Draft #1 | 39 600 |
| Task 3: Accessibility Advocacy Workshop #1 | 5 280 |
| **TOTAL COST** | **50 880** |

Further details on the project tasks can be found below in section 7.1.

## Travel budget

Any travel cos is included in the budget for the proposed tasks.

Part II – Details on STF Technical Proposal

# Tasks, Technical Bodies and other stakeholders

## Organization of the work

ETSI will perform this work through the creation of an ETSI STF that will include representatives of persons with disabilities, reporting the milestones to the ETSI Human Factors Group, according to the planned TC and WG meeting agenda (as described in clause 7) and additional dates agreed by the TB chairperson. ETSI HF will lead an active role in steering and contributing to this work. The number of experts required in the STF will likely be 4 to 6, subject to availability of experts.

Once stakeholders have been identified and the STF has been formed, the STF members will:

* Research existing methods and proposals for communicating real time text
* Research user requirements for multi-party real time texting
* Meet with users and advocacy groups to ensure relevant use cases are covered across the spectrum of needs associated with communication and telephony
* Develop proposals and guidelines for how to deploy multi-party real-time text in relevant mobile and desktop applications
* Provide guidance to 3GPP SA4, other relevant 3GPP groups and ETSI EMTEL, for the technical requirements needed at the protocol layer to support multi-party real-time texting

The ETSI HF working group will monitor and evaluate success by requiring scheduled progress reports from the rapporteur. Further oversight will be provided by evaluation of the STF schedule of meetings and deliverables.

## Public comments

Stakeholders, including members of the public and any companies implementing solutions developed by the STF, will be encouraged to provide comments on drafts, either as members of an Industry Reference Group, at meetings and events or by e-mails. The drafts will therefore be made publicly available at the STF portal page at a number of stages throughout its development when agreed by ETSI HF.

* Each of these stakeholders may contribute important insights into the standardisation process.
* Disability-related representative organizations, such as ANEC, the EDF and other European disability advocacy rights groups, will be able to enumerate the concerns and issues that their constituents face with existing technology, while expressing current unmet needs in the marketplace.
* Industry partners responsible for making software and hardware, such as Apple, Google, or Microsoft, will contribute their experience implementing existing RTT solutions while also discussing feasibility of technical solutions.
* Carriers and telecommunications operators will note feasibility and practicality of specific user requirements, as well as contributing expertise on how best to implement transport level changes.
* There are also experts who have worked in the field of RTT standardisation that can share their thoughts on how to achieve adoption and standardisation.

## Tasks for which the STF support is necessary

The specific tasks are described in detail below (section 7.1) The STF is necessary as the required expertise (see section 8.1) is not available in the reference body TC HF

## Other interested ETSI Technical Bodies

TC EMTEL will be approached for consultation.

## Other stakeholders

Technical content will be developed through consultation, online meetings, remote workshops, and an ongoing distributed drafting process. Consultation with stakeholders from the accessibility community is of major importance (see section 7 for further details).

Obvious stakeholder candidates are:

* Accessibility communities focused on issues for the Deaf, hard of hearing, deaf-blind and users with speech disorders
* Persons with disabilities
* Older persons
* Consumer associations
* Industry partners and market leaders involved in ICT systems that deploy messaging and voice communications applications
* Industry partners in telephony, involving carriers and equipment manufacturers
* Interested researchers, accessibility advocates and contributors to other RTT standardisation efforts.

Part III: Execution of Work

# Work plan, time scale and resources

## Task description

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| --- | --- |
| **Task 1** | **Establish STF Team, STF Organization & STF Management and Coordination** |
| **Objectives** | Experts will be recruited to participate in the STF through the ETSI community. Following the expert selection, the allocation of resources provided, and tasks laid down in the contract will be agreed and the necessary reference documents obtained. A kick-off meeting will be held, where all electronic and web-based communication will be set up to facilitate communication within the STF, with the STF administration, with TC HF and with stakeholders in general through an open communication channel via the STF’s website.  As a second result of this task a complete meeting schedule will be established for both STF face-to-face and/or online meetings for the STF. In addition, a schedule for outreach to advocacy groups interested in disability rights for the users affected by telephony and communication barriers will be established in accordance with the schedule from section 7.2.  A report will be provided to ETSI HF after the conclusion of the first advocacy workshop (Task 3). This will discuss the status of the draft, along with a summarization of the outreach efforts to the communities most impacted by the work item. It will inform ETSI HF about the remaining tasks required for successful completion of the production of the TR final report. |
| **Input** | - |
| **Output** | Complete project plan, reports to TC HF |
| **Interactions** | Report to TC HF for approval |
| **Resources required** | see section 8.1 |

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| --- | --- |
| **Task 2** | **Development of Draft #1** |
| **Objectives** | The first face-to-face and/or online meeting with the STF group will take place. At this session, we will enumerate the feature set that users will expect to be able to interact with, along with other technical requirements. We will discuss possible UI proposals that can express these features. Existing limitations, technical challenges and user interface designs will be discussed. At the end, the goal will be to have a strong sense of recommendations needed both for 3GPP and the technical report. This will form the basis of our presentation and interaction with advocacy workshop #1, as well as the basis for the creation of the first Draft report.  The Draft version of the TR will be produced by the rapporteur and STF leader alongside ongoing online feedback from the STF. The Draft version will enumerate all known requirements.. |
| **Input** | STF Team selected and complete |
| **Output** | The resulting TR draft will be submitted to ETSI HF for feedback and then posted on the STF website |
| **Interactions** | Draft TR to TC HF for approval |
| **Resources required** | see section 8.1 |

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| --- | --- |
| **Task 3** | **Accessibility Advocacy Workshop** |
| **Objectives** | The first face-to-face and/or online meeting with accessibility advocates will take place at a location convenient for advocates. Sign language interpreters will be present. The ability to participate through a remote interaction will be offered to maximize the ability for interested parties to attend. We will present the current draft and recommendations therein and solicit feedback. The goal is to amend the draft with unforeseen details and supplement it with new user modalities and features that were not yet considered. Obtaining real-world feedback from users of existing RTT and text over telephony technology solutions will ensure we create a standardisation that is grounded in pragmatic solutions. |
| **Input** | Draft TR available |
| **Output** | Results of Advocacy Workshop will be reported to TC HF |
| **Interactions** | Results report to TC HF for approval |
| **Resources required** | see section 8.1 |

## Milestones

Milestone A – Initial Draft available

|  |  |  |
| --- | --- | --- |
| **Milestone** | **Description** | **Cut-Off Date** |
| **A** | Draft#1 submitted to TC HF | 2021-01-09 |
| TC HF | Early Draft approved by TC HF |
| ETSI Deliverable | Progress Report approved by Reference Body |

Milestone B – Advocacy Workshop and Final Report

|  |  |  |
| --- | --- | --- |
| **Milestone** | **Description** | **Cut-Off Date** |
| **B** | Results of Advocacy Workshop are available. | 2022-02-09 |
| TC HF | Early Draft approved by TC HF |
| ETSI Deliverable | Final Report to TC HF approved by TC HF |

## Task summary

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Code** | **Task / Milestone** | **Target Date** | | **Estimated Cost (EUR)** |
| **From** | **To** |
| T1 | Establish STF Team, STF Organization & STF Management and Coordination | T0 | T0+6 | 6 000 |
| T2 | Development of Draft #1 | T0+3 | T0+5 | 39 600 |
| Milestone A | Draft#1 submitted to TC HF  Progress Report approved by TC HF |  | T0+5 |  |
| T3 | Accessibility Advocacy Workshop | T0+6 | T0+6 | 5 280 |
| Milestone B | Results of Advocacy Workshop are available  Final Report to TC HF to be approved by TC HF |  | T0+6 |  |
| **Total** | | | | **50 880** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Months after Project Start** | | | | | |
| **Task** | 1 | 2 | 3 | 4 | 5 | 6 |
| 1. Establish STF Team, STF Organization & STF Management and Coordination |  |  |  |  |  |  |
| 2. Development of Draft #1; STF Meeting #1 |  |  |  |  | MS  A |  |
| 3. Accessibility Advocacy Workshop |  |  |  |  |  | MS  B |

# Expertise required

## Team structure

The size of the STF is determined by the need to incorporate individuals from the following partners: Accessibility advocates, industry partners in software and hardware manufacture, telephony carriers and noted experts in Real-time Text standardisation. This will likely result in a STF comprising 4-6 individuals.

* STF members of these partners will contribute to the work of the STF, aligned with the insights listed in section 6.2 above:
* Disability-related representative organizations, such as ANEC, the EDF and other European disability advocacy rights groups.
* Industry partners responsible for making software and hardware, such as Apple or Microsoft.
* Carriers and telecommunications operators will note feasibility and practicality of specific user requirements and bring in their experience in transport-layer implementation.
* Individual experts who have worked in the field of RTT standardisation.

The STF leader must have expertise in technical aspects of software and protocol design, user interface design and a broad background in accessibility solutions for ICT systems as well as profound project management skills.

**4 to 6 participants to ensure the following mix of competences:**

|  |  |
| --- | --- |
| **Priority** | **Qualifications and competences** |
| High | Technical aspects of software and protocol design |
| High | User interface design |
| High | Accessibility solutions for ICT systems |
| High | Expertise in RTT technology |
| STF | Project management (for the sTF leader |

Part IV: STF performance evaluation criteria

# Performance Indicators

|  |  |
| --- | --- |
| **Select relevant Performance indicators applicable for these ToR (X)** | |
| Contribution from ETSI Members to STF work | |
| Direct financial contribution (co-funding) |  |
| Support to the STF work (e.g., provision of test–beds, organization of workshops, events) |  |
| Steering Group meetings (number of meetings / participants / duration) |  |
| Number of delegates directly involved in the review of the deliverables |  |
| Contributions/comments received from the reference Reference Bodies | X |
| Contributions/comments received from other Reference Bodies | X |
|  |  |
| **Contribution from the STF to ETSI work** | |
| Accessible web page set up on ETSI outlining goals, dates and meeting schedules | X |
| Contributions to other Reference Bodies | X |
| Presentations in workshops, conferences, stakeholder meetings |  |
|  |  |
| **Liaison with other stakeholders** | |
| Stakeholder participation in the project (category, business area) | X |
| Cooperation with other standardization bodies | X |
| Potential interest of new members to join ETSI |  |
| Liaison to identify requirements and raise awareness on ETSI deliverables | X |
| Comments received on drafts (e.g. on WEB site, mailing lists, etc.) |  |
|  |  |
| **Quality of deliverables** | |
| Approval of deliverables according to schedule | X |
| Respect of time scale, with reference to start/end dates in the approved ToR | X |
| Comments from Quality review by Reference Body | X |
| Comments from Quality review by ETSI Secretariat | X |
|  |  |

The success of this standardisation effort will be best measured in terms of engagement from industry and advocacy groups and the production of standards related to the user interface layer and the protocol layer in a timely manner. Keeping to the delivery schedule is critical to this effort, since there is mandated user functionality dependent on this work within the European Union, as well as other locations.

**Effectiveness and efficiency**

1. STF members are identified and engaged within first month

2. Two online and face-to-face (remote if necessary) STF meetings are scheduled.

3. One face-to-face (remote if necessary) workshops are scheduled with user groups

4. Status reports are produced monthly and sent to ETSI HF to document progress

5. One preliminary draft will be produced before the stable draft

6. Final report will be submitted to ETSI HF

7. All documents and communications will be published in an accessible format. Meetings will be organized to be accessible upon request/if required.

**Stakeholder engagement**

1. Outreach and confirmation of engagement with advocacy and user groups (at least three organizations) done within three months.

2. Outreach and confirmation of engagement with a minimum of two European telephony carriers within first four months

3. Outreach and confirmation of engagement with a minimum of two industry partners

4. Identification and engagement of Real-time texting experts at the beginning of the entire project.

5. Mechanism for public to comment on standardisation is available

**Dissemination of Results**

1.

2. Drafts made available to ETSI HF. Draft versions are posted on website after ETSI HF approvals

3. Website allows for public comments to made on draft versions

**Impact**

1. Confirmation from at least two industry partners who intend to implement multi-party RTT features that the user interface layer standardisation will be implemented in a major handset within 3 years of publication. It should be noted that although the user interface layer implementation may be completed, availability to users will depend on protocol support by the network service providers.

Time recording

For reporting purposes, the STF experts shall fill in the time sheet provided by ETSI with the days spent for the performance of the services

During the activity, the STF Leader shall collect the relevant information, as necessary to measure the performance indicators. The result will be presented in the Final Report.

# Document history

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Date** | **Author** | **Status** | **Comments** |
| **1.6** | **2021-06-15** | **ETSI Secratariat** | **TB HF approved** | **Update start/end and milestones date before CL publication** |
| 1.5 | 2021-06-11 | TC HF Chair | Board#133 approved | Update before CL publication |
| 1.4 | 2021-06-10 | TC HF Chair |  |  |

1. <https://tools.ietf.org/html/rfc5194> [↑](#footnote-ref-2)
2. <https://tools.ietf.org/html/rfc4103> [↑](#footnote-ref-3)
3. <https://www.itu.int/rec/T-REC-T.140/en> [↑](#footnote-ref-4)
4. <https://www.atis.org/docstore/product.aspx?id=28244> [↑](#footnote-ref-5)
5. <http://mandate376.standards.eu/standard> [↑](#footnote-ref-6)
6. <https://www.atis.org/docstore/product.aspx?id=28300> [↑](#footnote-ref-7)
7. <https://www.atis.org/docstore/product.aspx?id=28392> [↑](#footnote-ref-8)
8. <https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=1404> [↑](#footnote-ref-9)
9. <https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=605> [↑](#footnote-ref-10)
10. <https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=620> [↑](#footnote-ref-11)
11. <https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=799> [↑](#footnote-ref-12)
12. <https://www.etsi.org/deliver/etsi_ts/101400_101499/101470/01.01.01_60/ts_101470v010101p.pdf> [↑](#footnote-ref-13)
13. <http://www.iessolutions.eu/wordpress/wp-content/uploads/tr_103170v010101p.pdf> [↑](#footnote-ref-14)
14. <https://www.etsi.org/deliver/etsi_tr/103200_103299/103201/01.01.01_60/tr_103201v010101p.pdf> [↑](#footnote-ref-15)
15. <https://www.etsi.org/deliver/etsi_ts/103400_103499/103478/01.02.01_60/ts_103478v010201p.pdf> [↑](#footnote-ref-16)
16. <https://www.etsi.org/deliver/etsi_ts/103400_103499/103479/01.01.01_60/ts_103479v010101p.pdf> [↑](#footnote-ref-17)
17. <https://cdn.ymaws.com/www.nena.org/resource/resmgr/standards/NENA-STA-010.2_i3_Architectu.pdf> [↑](#footnote-ref-18)
18. <https://www.etsi.org/deliver/etsi_es/202900_202999/202975/02.01.00_50/es_202975v020100m.pdf> [↑](#footnote-ref-19)
19. <https://www.gsma.com/newsroom/resources/ir-92-ims-profile-for-voice-and-sms-13-0/> [↑](#footnote-ref-20)
20. <https://datatracker.ietf.org/doc/html/draft-hellstrom-textpreview-08> [↑](#footnote-ref-21)
21. <https://datatracker.ietf.org/doc/draft-ietf-avtcore-multi-party-rtt-mix/> [↑](#footnote-ref-22)
22. <https://datatracker.ietf.org/doc/html/rfc8865> [↑](#footnote-ref-23)