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Foreword

This ETSI Guide (EG) has been produced by ETSI Technical Committee Human Factors (HF).

It is a contribution to the implementation of ETSI's Accessibility Strategy as endorsed by ETSI's General Assembly #81. The Accessibility Strategy calls for four projects to be carried out with the aim of making ETSI's products, environment, and meetings accessible to users and participants with a wide range of characteristics.

The objectives of these projects are to:

1) Review the accessibility of ETSI infrastructure (buildings, facilities); Define baseline requirements and guidelines.

2) Make ETSI published deliverables accessible, including improvement of their development process.

3) Make ETSI meetings accessible on demand, including online and hybrid meetings.

4) Make IT processes and tools accessible, possibly starting with an audit and recommendations for the future.

The present document reports the results of the third of the four projects, providing solutions that enable ETSI to make meetings accessible on demand, including online and hybrid meetings.

The work carried out for the creation of the present document has been conducted in an open collaboration with ETSI members, user and accessibility representatives, and other relevant stakeholders. The present document is based upon desk research (documents and online sources), best practices, expert knowledge, as well as stakeholder (DPOs) and ETSI member consultation.

Intended readers of the present document include, but are not limited to:

- ETSI Technical Committee chairs.
- External meeting hosts (ETSI members hosting committee meetings in their premises).

- ETSI staff that support meeting planning and/or are in charge of ETSI infrastructures.

Modal verbs terminology

In the present document "**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).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Executive summary

The present document gives guidelines for hosting accessible ETSI meetings on ETSI premises, those of ETSI members or in public environments (e.g. conference centres). It proposes changes to the meeting registration procedure on the ETSI portal allowing participants to indicate their accessibility requirements during the registration process.

It provides a resource collection that links to the most pertinent existing sign language interpreter databases and additionally includes a collection of recommended tools for speech-to-text tools and services, to help make meetings accessible for deaf and hard-of-hearing participants.

It further includes a comparison of accessibility features of available meeting tools, recommendations for tool selection, an evaluation of the accessibility of joint editing and presentation tools and related recommendations for meeting hosts.

The present document is accompanied by a number of annexes, including:

- the detailed specification for the modification of the ETSI meeting registration tool;
- a first version of an informal accessibility guide document for meeting hosts;
- a proposal for the ETSI accessibility statement (applicable to content published on the domain: https://www.etsi.org/); and
- the results of the detailed analysis of videoconferencing tools, joint editing tools, and presentation tools.

Introduction

Currently, hosts of ETSI meetings on ETSI premises or those of ETSI members cannot ensure that the meeting will meet the accessibility requirements of potential participants. So far, there is no mechanism for allowing participants to register individual accessibility-related requirements and informing the host thereof. In addition, hosts need guidance on how to address those requirements.

The present document proposes measures that aim at improving the accessibility of ETSI meetings by:

- adapting the registration process to ETSI meetings so that participants can indicate individual access needs;
- providing an online resource collection for speech-to-text tools & services (captioning) and sign language interpreters;
- analysing online meeting tools and providing guidance on the accessibility of these tools;
- providing guidance on accessible online collaboration tools, particularly important for joint editing of documents in hybrid meetings; and
- providing recommendations on improving the necessary ICT equipment in ETSI meeting rooms.

1 Scope

The present document gives guidelines for hosting accessible ETSI meetings on ETSI premises, those of ETSI members, or in public environments (e.g. conference centres). It proposes changes to the meeting registration procedure on the ETSI portal allowing participants to register accessibility requirements.

It provides a resource collection that links to the most pertinent existing sign language interpreter databases and additionally includes a collection of recommended tools for speech-to-text tools and services, to help make meetings accessible for deaf and hard-of-hearing participants.

It further includes a comparison of accessibility features of available meeting tools, recommendations for tool selection, an evaluation of the accessibility of joint editing and presentation tools and related recommendations for ETSI and for meeting hosts.

2 References

2.1 Normative references

Normative references are not applicable in the present document.

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] ETSI EG 201 013: "Human Factors (HF); Definitions, abbreviations and symbols".

[i.2] ISO 26800:2011: "Ergonomics — General approach, principles and concepts".

[i.3] W3C® Recommendation (11 December 2008)/ISO/IEC 40500:2012: "Web Content Accessibility Guidelines (WCAG) 2.0".

[i.4] W3C® Working Group Note 5 September 2013: "Guidance on Applying WCAG 2.0 to Non-Web Information and Communications Technologies (WCAG2ICT)".

[i.5] Yale University: "Usability & Web Accessibility".

[i.6] ISO 9241-110:2020: "Ergonomics of human-system interaction — Part 110: Interaction principles".

[i.7] ISO/IEC 27001:2022: "Information security, cybersecurity and privacy protection — Information security management systems — Requirements".

[i.8] ETSI EG 204 061: "Human Factors (HF); ETSI Accessibility Strategy; Accessibility of ETSI Deliverables and Improvement of the Development Process of Deliverables".

[i.9] Web Accessibility Initiative (WAI): "Web Content Accessibility Guidelines (WCAG) 2 - Level AA Conformance".

[i.10] EN 301 549: "Accessibility requirements suitable for public procurement of ICT products and services in Europe" (jointly produced by ETSI/CEN/CENELEC).

[i.11] U.S. Access Board Information and Communication Technology (ICT): "Section 508 of the Rehabilitation Act".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI EG 201 013 [i.1] and the following apply:

accessibility: extent to which products, systems, services, environments and facilities can be used by people from a population with the widest range of characteristics and capabilities, to achieve a specified goal in a specified context of use

NOTE 1: Context of use includes direct use or use supported by assistive technologies.

NOTE 2: The context in which the ICT is used may affect its overall accessibility. This context could include other products and services with which the ICT may interact.

NOTE 3: Definition from ISO 26800 [i.2].

assistive technology: hardware or software added to or connected to a system that increases accessibility for an individual

NOTE 1: Examples are Braille displays, screen readers, screen magnification software and eye tracking devices that are added to the ICT.

NOTE 2: Where ICT does not support directly connected assistive technology, but which can be operated by a system connected over a network or other remote connection, such a separate system (with any included assistive technology) can also be considered assistive technology.

audio description: additional audible narrative, interleaved with the dialogue, which describes the significant aspects of the visual content of audio-visual media that cannot be understood from the main soundtrack alone

NOTE: This is also variously described using terms such as "video description" or variants such as "descriptive narration".

caption: synchronized visual and/or text alternative for both speech and non-speech audio information needed to understand the media content

NOTE 1: This is also variously described using terms such as "subtitles" or variants such as "subtitles for the deaf and hard-of-hearing".

NOTE 2: Definition after WCAG 2.0 [i.3].

content: information and sensory experience to be communicated to the user by means of software, including code or markup that defines the content's structure, presentation, and interactions

NOTE 1: Content occurs in three places: web pages, documents and software. When content occurs in a web page or a document, a user agent is needed in order to communicate the content's information and sensory experience to the user. When content occurs in software, a separate user agent is not needed in order to communicate the content's information and sensory experience to the user - the software itself performs that function.

NOTE 2: Definition after WCAG2ICT [i.4].

document: logically distinct assembly of content (such as a file, set of files, or streamed media) that functions as a single entity rather than a collection, that is not part of software and that does not include its own user agent

NOTE 1: Letters, email messages, spreadsheets, books, pictures, presentations, and movies are examples of documents.

NOTE 2: A single document may be composed of multiple files such as the video content, closed caption text etc. This fact is not usually apparent to the end-user consuming the document/content.

NOTE 3: Definition after WCAG2ICT [i.4].

user interface: all components of an interactive system (software or hardware) that provide information and/or controls for the user to accomplish specific tasks with the interactive system

NOTE: Definition from ISO 9241-110 [i.6].

web content: content that belongs to a web page, and that is used in the rendering or that is intended to be used in the rendering of the web page

web page: non-embedded resource obtained from a single URI using HTTP plus any other resources that are used in the rendering or intended to be rendered together with it by a user agent

NOTE: Definition after WCAG 2.0 [i.3].

3.2 Symbols

Void.

3.3 Abbreviations

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

2FA	Two-Factor Authentication
ABILS	Association Belge des Interprètes en Langue des Signes
ADHD	Attention Deficit Hyperactivity Disorder
AES	Advanced Encryption Standard
AI	Artificial Intelligence
AIIC	International Association of Conference Interpreters
ALD	Assistive Listening Devices
Animu	Associazione nazionale interpreti di lingua dei segni
Anios	Associazione interpreti di lingua dei segni
API	Application Programming Interface
ASL	American Sign Language
ATILGP	Association of Translators and Interpreters of Portuguese Sign Language
AWS	Amazon Web Services
BSL	British Sign Language
BVGT	Beroepsvereniging Vlaamse GebarentaalTolke

NOTE: Professional Association of Flemish Sign Language Interpreters.

CART	Communication Access Real Time
CRM	Customer Relationship Management
CVD	Coordinated Vulnerability Disclosure
DBI	DeafBlind Interpreting national training and resource center
DLP	Data Loss Prevention
DPO	Disabled Persons Organization
DTLS	Datagram Transport Layer Security
E2EE	End-to-end Encryption
EKM	Enterprise Key Management
FILSE	Federación Española de Intérpretes de Lengua de Signos y Guías-Intérpretes

NOTE: Spanish Federation of Sign Language Interpreters and Interpreter-Guides.

FTT	Foreningen af Tegnsprogstolke

NOTE: Association of Sign Language Interpreters.

GDPR	General Data Protection Regulation
HD	High Definition
HIPAA	Health Insurance Portability and Accountability Act
HTML	Hyper Text Markup Language

ICT	Information and Communication Technologies
IGF-DCAD	Internet Governance Forum Dynamic Coalition on Accessibility and Disability
IS	International Sign (language)
ISO	International Standards Organization
IT	Information Technologies
KMS	Key Management Service
LMS	Learning Management System
MFA	Multi-Factor Authentication
OCR	Optical Character Recognition
RBAC	Role-Based Access Control
SAML	Security Assertion Markup Language
SDO	Standards Development Organization
SL	Sign Language
SLA	Service Level Agreement
SMS	Short Message Service
SRTP	Secure Real-Time Transport Protocol
SSL	Secure Sockets Layer
SSO	Single Sign-On
STTF	Sveriges Teckenspråkstolkars Förening

NOTE: Swedish Sign Language Interpreters Association.

STTR	Speech-To-Text Reporting
TC	Technical Committee
TLS	Transport Layer Security
UI	User Interface
UN	United Nations
URL	Uniform Resource Locator
VPAT	Voluntary Product Accessibility Template
W3C	World Wide Web Consortium
WASLI	World Association for Sign Language Interpreters
WCAG	Web Content Accessibility Guidelines
WFD	World Federation of the Deaf

4 General

4.1 Basic assumptions about meeting participants

For the purpose of the present document, the following assumptions are being made on the characteristics of participants in ETSI meetings.

Participants in ETSI meetings may have any individual or any combination of the following human impairments (classification from World Wide Web Consortium (W3C) Diversity in Web Use ([i.5])):

- visual impairments: including any form of colour blindness, low vision, and blindness (substantial loss of vision in both eyes);
- auditory impairments: including mild to moderate hearing impairments in at least one ear up to deafness (hearing impairment that is substantial and non-correctable in both ears);
- physical impairments: including amputation (e.g. missing digits or limbs), arthritis (inflammation and damage to joints), paralysis (loss of control over a limb or other part of the body), and Repetitive Stress Injury;
- speech impairments: including muteness (the inability to speak due to a multitude of reasons), dysarthria (weakness or paralysis of the muscles required to speak), and stuttering; and
- cognitive, learning, and neurological impairments: including Attention Deficit Hyperactivity Disorder (ADHD), autism spectrum disorder, perceptual disabilities (also called "learning disabilities" such as dyslexia and dyscalculia), and seizure disorders.

In all cases, it is assumed that the participants of ETSI meetings may use their individual assistive technology (e.g. personal computers with Braille displays, or individual hearing aids) for compensating for their impairments.

NOTE 1: People with the following human impairments may be challenged to an extent that does not allow them to effectively participate in ETSI meetings:

- mental health disabilities, including delirium and schizophrenia, which may go along with difficulties in focusing, processing, and understanding information; and
- memory impairments, in particular limitations in short-term memory, long-term memory, or the ability to recall language.

NOTE 2: Participants in ETSI meetings are expected to be able to understand written language.

NOTE 3: ETSI meetings are conducted in English language. Participants are expected to either have a sufficient command of the English language and/or have access to tools that represent the content of ETSI deliverables and the content of what is being said in a meeting in a language they understand.

NOTE 4: Participants in ETSI meetings are expected to have proper understanding of the meeting objectives, e.g. in the specific engineering domain addressed in a given technical committee.

4.2 Basic assumptions about meeting types

In the present document several meeting types are distinguished (see also Table 4.1):

- Meetings organized at ETSI premises with on-site participation only.
- Meetings organized at ETSI premises with on-site and online participation (hybrid).
- Meetings organized by an external host on premises outside ETSI with on-site participation only.
- Meetings organized by an external host on premises outside ETSI with onsite and online participation (hybrid).
- Meetings organized at ETSI premises or elsewhere with only online participation.

Table 4.1: Types of ETSI meetings

ETSI Premises	On site	On site & online (hybrid)	Online
Elsewhere	On site	On site & online (hybrid)	Online

For meetings organized at ETSI premises, the host can rely on ETSI being compliant with the legal requirements for accessibility in France.

For meetings organized outside of the ETSI premises, the host and/or technical officer should request a confirmation that access to the meeting is possible for people with disabilities. Also, the availability of sufficient Internet access and of appropriate audio-support should be confirmed by the Technical Officer or the host.

On ETSI premises, the availability of audio systems is ensured, although their connection to the Internet and to participants outside of ETSI may be difficult requires expert support in advance of a meeting.

For meetings with only online participation obviously many access-related requirements are irrelevant as the participants are able to attend the meeting form their own premises.

5 Accessibility guidelines for meeting hosts

5.1 General

5.1.1 Sources of the accessibility guidelines

The guidelines presented in this clause are based on research (e.g. of national and international organizations representing the interests of people with disabilities) and on interviews with individuals with disabilities who regularly participate in formal events and meetings and/or are involved in international standardization.

5.1.2 Meeting registration and declaration of accessibility requirements

Hosts of ETSI meetings (both on ETSI premises as well as those outside of ETSI) will be informed by means of an electronic message about the accessibility requirements registered by a meeting participant (see clause 6 for the details of the updated registration procedure).

Hosts are encouraged to contact the participants with accessibility requirements to clarify any open questions and to ensure that the requirements can be met. This includes the question of whether a briefing of the meeting participants on the needs of the person requesting accessibility support is desired.

5.1.3 Accessibility support for on-site and online participation

Participants' accessibility requirements differ depending on whether they participate in an ETSI meeting on site or online. Certain requirements may be fulfilled more easily if a participant with sensory or mobility impairments joins the meeting on site, while in other cases the online participation will offer advantages.

EXAMPLE: A support animal such as a guiding dog for blind persons needs a place during an on-site meeting whereas it does not put a requirement on the host if the owner joins the meeting online from their customary location.

NOTE: Meetings outside of ETSI premises ("external meetings") may take place at ETSI members' premises or elsewhere (e.g. in SDO offices or rented conference facilities).

5.1.4 Essential and desirable accessibility support

In the remainder of this clause, accessibility support is listed as being either essential or desirable.

Essential accessibility support is a prerequisite for the effective participation of a person with specific accessibility requirements in an ETSI meeting. Meeting desirable support requirements further facilitates the person's participation in the meeting but the lack thereof does not prevent them from participating.

EXAMPLE: A blind person needs detailed information about the meeting venue and/or a guided tour as an essential requirement for actively participating in a meeting. A tactile map with labels in Braille letters may be desirable but may be difficult for the host to provide.

5.2 Accessibility support for blind participants and those with low vision

5.2.1 Meeting venue layout and navigation

Blind participants or those with low vision need assistance in getting to the meeting venue and for finding their way around the premises.

Essential accessibility support:

- Hosts should contact the participants well in advance of the meeting in order to learn which kind of assistance may be required. They may be able to advise on local transport to the meeting venue and provide support for getting to know the layout of the building the meeting is held in.
- Persons with low vision may benefit from a printable document with the layout of the building or floor so that they can familiarize themselves with the premises before arriving there.

NOTE: Blind participants and those with low vision may benefit from a pre-meeting orientation or guided tour to familiarize themselves with the venue layout. This support should be offered prior to the beginning of the meeting.

- Hosts should verify that the paths participants will have to use are clear of obstacles and that any temporary barriers are marked or announced.

Desirable accessibility support:

- If at all possible, hosts could make available a venue map in an accessible format, such as tactile maps of the venue or digital maps compatible with screen readers, on the website or in a designated Smartphone-App.
- Meeting hosts should ensure that the venue is designed to facilitate easy navigation for blind participants or those with low vision. This may include the use of tactile floor indicators, such as tactile strips or raised guide paths, leading to key areas like entrances, exits, meeting rooms, and restrooms. Braille indicators in lifts are also helpful.
- Accessible mapping for blind participants or those with low vision includes tactile, audio-tactile, and digital technologies. Tactile maps use raised surfaces, often produced via 3D printing, for spatial navigation. Audio-tactile maps combine touch with auditory feedback to enhance understanding. Digital tools like Waymap provide step-by-step guidance using haptic and audio cues. Availability of accessible maps is a valuable service to support independent participation by blind participants and those with low vision.

5.2.2 Pre-meeting preparations

Blind participants or those with low vision require all documents related to the meeting to be in formats that are compatible with screen readers and other accessibility technologies used by blind people.

Essential accessibility support:

- In particular, agendas, minutes, and other documents prepared by the host and/or committee secretary should be accessible and should be made available well before the meeting.

NOTE 1: The majority of documents being dealt with during an ETSI meeting are contributions provided by committee members or guests to the meeting (i.e. they do not originate from the host). If necessary, authors of documents should be made aware if their contributions fail to conform with accessibility standards.

NOTE 2: The accessibility requirements on ETSI deliverables are addressed in ETSI EG 204 061 [i.8]. There is no reason why any contribution to an ETSI meeting should be excluded from complying with the requirements in that ETSI Guide.

- It is crucial to recognize the individuality of blind users and those with low vision, and consult them on their preferred formats. No request for accessibility is unreasonable, as everyone has a right to access information equally.

- To ensure accessibility in meetings, formats like Microsoft Word, HTML or plain text emails for invitations should be used to make them compatible with screen readers and other assistive technology for persons with visual disabilities.

NOTE 3: Further guidance on accessible text formats can be found in clause C.1.

5.2.3 Provision of Assistive Technology

Blind participants or those with low vision may use assistive technologies such as screen readers and Braille displays for reading documents.

Essential accessibility support:

- If participants bring their own assistive devices, hosts should verify that the venue provides necessary connectivity (e.g. power outlets and Wi-Fi®) and technical support and Wi-Fi/data connectivity for these devices, as needed.

- Any digital content shared during the meeting, like slides or documents, should be compliant to the current rules for digital accessibility like the WCAG 2.x AA [i.9] and/or EN 301 549 [i.10]. As most of that content will be provided by participants other than the host, the chair or the committee secretary, participants of the meeting should be made aware of those requirements if blind participants or those with low vision register to the meeting.

Desirable accessibility support:

- Meeting hosts should check that the meeting room includes the possibility for audio descriptions or other aids that blind participants or those with low vision may require.

NOTE: An audio guidance system is a technology-based solution that provides spoken instructions, information, or feedback to users through audio output. It is commonly used in various contexts to enhance accessibility, navigation, and user experience.

5.2.4 Accessible Presentation Materials

Essential accessibility support:

- Any digital content shared during the meeting, like slides or documents, should be compliant to the current rules for digital accessibility such as WCAG 2.x AA [i.9], EN 301 549 [i.10], and ETSI EG 204 061 [i.8]. Wherever possible, this should also apply to any plugins for videoconferencing that support collaboration, such as polls or whiteboards.

- Slides presented during the meeting should be made available (i.e. uploaded to the meeting files area) prior to the meeting so that blind participants or those with low vision may read them in real time using their own assistive technologies.

NOTE 1: If participants are aware of the presence of blind participants or those with low vision, they may refrain from making references to contents on the slides that cannot be understood by a blind person (i.e. visual elements should be described verbally and key information should not solely be reliant on visual aids).

Persons with low vision are challenged by slides that are formatted in such a way as to make it difficult to capture the information with less than perfect vision. Those challenges include:

- Fonts and typeface: Arial and Helvetica are sans-serif typefaces that can be better perceived in presentations. Italics, underlying and excessive capitalization should be avoided.

- Design and layout: Information presented should have a clear and consistent design. Text should be left-aligned to aid readability, with sufficient spacing between words and lines. Most importantly, text should be presented in a sufficiently large font size to be also recognizable from a distance or with low vision. Large quantities of text can be distributed across several slides.

- Colour and contrast: Sharp contrasts, such as black text on white or yellow backgrounds, are the most effective for readers with low vision. Switching frequently between light-on-dark and dark-on-light text should be avoided as it can strain the eyes. Reversed type (light text on a dark background) requires bolder and larger font sizes.

NOTE 2: Participants should be encouraged to employ the ETSI Microsoft PowerPoint template for presentations, bearing the above recommendations in mind.

NOTE 3: Tactile and High-Contrast Signage may be helpful, too. See clause C.2 for details.

Generally, it is important to recognize the individuality of blind people and of people with low vision and to consult them on their preferred formats. No request for accessibility is unreasonable, and hosts should clarify in advance what is needed and what kind of support is possible during the meeting.

NOTE 4: Participants should be informed in advance if accessible formats will be provided on-site, or if they need to request specific formats during registration. This approach helps hosts plan accordingly.

5.2.5 Onsite Support for Blind Participants or those with Low Vision

Blind participants or those with low vision need support for navigation and accessing meeting resources.

Essential accessibility support:

- Hosts ensure that help is provided when needed (e.g. this can be a meeting participant accompanying a blind participant to the restrooms).

Desirable accessibility support:

- Meeting hosts should consider arranging trained staff or volunteers who can assist blind participants or those with low vision with navigation and accessing meeting resources. These assistants should be available at key points such as registration desks, break areas, and session rooms to offer guidance as needed.

NOTE: Assistants need to understand the specific needs of blind participants and those with low vision, and respect their independence, only offering assistance when requested.

5.2.6 Break and Lunch Arrangements

Hosts should ensure that break and lunch areas are accessible to blind participants and those with low vision. This includes having clearly marked paths to these areas and arranging seating in a way that minimizes obstacles. It may also involve providing assistance with food selection or tray transportation upon request.

Essential accessibility support:

- Hosts should clarify with the blind participants or those with low vision which particular assistance may be required for breaks, lunch and social events. Personal assistance should be planned and provided if required.

Desirable accessibility support:

- When planning break and lunch arrangements for blind attendees and those with low vision, it is important to create an accessible and inclusive environment. Spaces should be arranged to allow easy navigation by keeping pathways clear and maintaining a consistent setup of tables and chairs. Providing tactile markers or clear verbal directions helps attendees locate key areas such as seating, buffet stations, or restrooms. Assigning volunteers or guides for orientation and mobility can further enhance accessibility.

- Communication plays a vital role, so a verbal overview of the food layout should be offered, describing the location of items like sandwiches or drinks. Signage for dietary labels should include tactile or audio descriptions where possible. Individually plated meals or pre-packaged items can simplify access to food, while buffet arrangements should have staff or volunteers available to assist with selecting and serving items. High-contrast labels or Braille menus can assist blind participants and those with low vision.

- Table setups should be predictable, with utensils, plates, and glasses arranged in standard positions, such as the knife on the right, fork on the left, and glass at the top. Using non-slip mats can prevent items from sliding on the table, enhancing usability. Social inclusion is essential; facilitating introductions at shared tables can encourage conversation and a sense of belonging. Avoid seating blind individuals or those with low vision near noisy areas to support effective communication.

- Assistance should be offered discreetly, respecting the attendee's preference for independence, and ensure servers communicate clearly by announcing their presence and describing their actions. Dietary restrictions or preferences should be accommodated, making these details clear to participants. Providing drinking straws, easy-grip cups, or adapted utensils, when necessary, can further support their comfort.

NOTE: It is beneficial to assign specific staff members to assist blind participants and those with low vision during mealtimes, allowing them to fully participate in social aspects of the meeting.

5.2.7 Post-Meeting Follow-Up

Some documents are provided after the meeting.

Essential accessibility support:

- Meeting minutes and recordings should be shared in accessible formats.

Desirable accessibility support:

- Feedback mechanisms should be provided that allow participants to share their experiences and suggest improvements. This feedback should be used to continuously enhance the accessibility of future meetings.

5.3 Accessibility support for deaf and hard-of-hearing participants

5.3.1 Sign-language interpreter support

Deaf participants and those with hearing impairments may request that one or several sign-language interpreters be present during the meeting to enable them to follow what is being said, depending on the length of the meeting and in order to respect the necessary break times for interpreters.

Essential accessibility support:

- For the purpose of identifying suitable interpreters, hosts may consult ETSI's online resource collection with links to sign language interpreter databases (see clause 7 for the details on how to access the resource collection).

- Hosts need to clarify with the deaf participants or those with hearing impairments how many interpreters are required (this may be more than one), and if the interpreters should be present on site or can offer their services online.

- In addition, the required interpreter skills need to be identified: those may be American or British Sign Language (ASL or BSL), the national sign language used by the participant if the participant does not understand (spoken/signed) English, or International Sign (IS).

- Participants may know interpreters with the required skills that can be hired for the meeting or have preferred interpreters.

- The renumeration for the interpreters should be addressed and clarified before the meeting (unless a general solution is offered by ETSI).

- Meeting documents should be provided to the interpreter in advance to prepare the necessary vocabulary.

NOTE: Effective inclusion of sign-language interpretation requires meeting participants to follow the meeting etiquette as explained in clause 5.6.1.

5.3.2 Provision of speech-to-text functionalities (captioning)

Speech-to-text or captioning is the real-time synchronized provision of spoken content, in audio-visual formats as well as in live meetings. Initially developed for deaf and hard-of-hearing people to make spoken content accessible, captions (sometimes called subtitles) have become popular with a wide range of users for various reasons: noisy environments, non-native speakers and non-native listeners, people with mild to moderate to severe hearing-loss, and, of course, deaf and hard-of-hearing people.

The meeting host should include in the housekeeping information in the beginning of the meeting information on whether captions are available, how to activate them in the online meeting platform and if a link to stream text is available. Meeting participants should follow the accessible meeting etiquette, such as announcing their name when they start speaking, keeping a proper pace, and explaining acronyms used (see clause 5.6.1).

Essential accessibility support:

- Where deaf participants or participants with severe hearing impairments are present human-supported captioning should be provided to ensure the accuracy of the caption. A non-exhaustive list of such services can be found in ETSI's online resource collection as well as a list of quality criteria for the selection of text-to-speech/captioning tools and services.
- Meeting documents should be provided to the captioners in advance for the necessary preparations.

Desirable accessibility support:

- Most of today's online meeting platforms provide automated captioning, which might be sufficient where captions are not the only means for following the spoken content. As the quality of automated captioning solutions differ, the host should consult the participant requiring the service on which of the available services to use for the meeting.

NOTE: In case participants bring their own technology and speech-to-text solution, hosts should clarify in advance if there are any technical requirements the participant needs support with.

5.3.3 Technical support for deaf and hard-of-hearing participants

Deaf participants or those with hearing impairments may require the provision of dedicated on-site audio systems with speakers and microphones that interface with their assistive technology (e.g. hearing aids).

NOTE: High-quality microphones that ensure that every person in the meeting room can be adequately captured, benefit not only participants with hearing impairments, but everybody online including those with perfect hearing.

Essential accessibility support:

- Participants may require the provision of T-coils. Hosts should clarify whether mobile T-coils can be borrowed for the meeting from ETSI. If an on-site T-coil system is available, technical support should be available to help with the connection.
- Going forward, Auracast™ may be a technology that complements and over time replaces T-coils.

5.3.4 Support for participants' assistive listening devices

Hearing-impaired participants may bring with them assistive technology to support them in interacting with others and following in what is being said.

Assistive Listening Devices (ALDs) are devices that enhance sound clarity and volume for individuals with hearing loss, especially in noisy environments or over long distances. These devices minimize background noise and distortion by capturing sound from a source and transmitting it directly to the user's hearing aid, cochlear implant, or headphones. Examples of ALDs include FM systems, induction loop systems, infrared systems, or Bluetooth® devices.

Essential accessibility support:

- Meeting hosts should ensure that ALDs, compatible with hearing aids, are available for deaf and hard-of-hearing participants (e.g. they should clarify whether an ALD system can be borrowed for the meeting from ETSI).
- Hosts should confirm in advance whether the venue is equipped with ALDs and inform participants of their availability for use as needed.
- Hosts should provide a point of contact for addressing any technical requirements or specific needs.
- It is recommended that hosts provide an opportunity for participants to test these devices before the start of the event to ensure they are functional and meet their needs.
- Hosts should provide technical support staff on hand to assist with setup and troubleshooting.

NOTE 1: The use of assistive listening devices is essential for the inclusion of deaf participants and those with hearing impairments, particularly at large events or in spaces with significant background noise, as it improves sound clarity and enhances the ability to follow presentations.

NOTE 2: In case participants bring their own ALDs, hosts should clarify in advance if there are any technical requirements the participant needs support with.

5.4 Accessibility support for participants with mobility disabilities

5.4.1 Access to the meeting venue

The meeting venue should be accessible from the location of participant's arrival (e.g. by taxi or public transport) at the meeting building to their arrival in the meeting room itself.

Essential accessibility support:

Hosts should ensure that accessible access to the building and meeting rooms is available including potentially necessary ramps and elevators available (ideally also automatically opening doors).

In addition:

- Information about logistics should be provided in advance (e.g. where to arrive, which entrance to take, and the routes to the meeting rooms and facilities).
- Hosts should ensure that the routes are accessible and available at the time of the meeting/event (e.g. making sure that elevators or stair lifts are operable as well as unlocked and that they are available throughout the expected duration of the meeting).

Desirable accessibility support:

- Support should be provided for finding suitable transportation (e.g. accessible taxi services and information about public transportation accessibility) and accommodation (i.e. hotels with accessible rooms).
- Wherever possible, separate routes for participants with and without mobility disabilities should be avoided (it hinders communication, mingling, and cohesion).
- Overly long walking distances for people who have difficulty walking should be avoided (e.g. a convention centre with a meeting room at the far end of the reception).
- Venues with thin carpets or soft floors should be preferred (some people have pain walking on hard floors, and deep carpets can be difficult for wheelchair users).
- Sufficient space for manoeuvring with and stowing mobility aids should be ensured (e.g. walkers, wheelchairs, or crutches) in meeting rooms and areas for breaks.

5.4.2 Access to facilities at the meeting venue

The facilities meeting participants will be expected to be using during the meetings (e.g. toilets, cafeterias in which beverages and meals may be served and consumed, and any other location the participants may frequent during the meeting) should be accessible by participants in a wheelchair or those who are otherwise impaired in their mobility.

Essential accessibility support:

- Any device that participants may have to access and use (e.g. electricity sockets and coffee machines) should be within arm-reach of a person in a wheelchair, as should be the handles of doors.
- Sufficient time should be planned for breaks and for changing meeting rooms (some people need longer time to get from one place to another or for using the toilet).

5.4.3 Access to social events during a meeting

If social events (like common dinner events) are planned in the context of a meeting, the host should ensure that the event venue is accessible for people with mobility disabilities and choose the venue accordingly.

5.5 Accessibility support for participants with cognitive or intellectual disabilities

5.5.1 General

People with cognitive or intellectual disabilities encounter a wide range of challenges and needs. These may include conditions such as dyslexia and autism as well as lack of short or long-term memory as a result of head injury or other trauma. This does not mean they cannot contribute meaningfully to the meeting; many cognitive conditions do not indicate low intelligence but rather translate into difficulties in interacting with groups or presenting and sharing ideas.

5.5.2 Physical environment and meeting planning

Essential accessibility support:

- Meetings should be planned to allow for breaks (participants with cognitive disabilities may require longer or more frequent breaks than what is usual in ETSI meetings).
- Some people with autism may need nonverbal communication methods, such as text communication aids or tablets. In these cases, it may take individuals longer to share thoughts and additional time should be allowed in the meeting.

Desirable accessibility support:

- In creating an inclusive meeting location, sensory differences should be considered: For instance, people with autism may be sensitive to strong smells, bright lights, or loud noises. If participants indicate specific requirements in those areas, hosts should clarify with them how those requirements can be met.
- Written instructions, including meeting times, locations, and durations, should be offered for all meetings. Similarly, it is important to give advance notice of meetings and communicate any schedule or content changes well in advance.
- During the meeting, it may be useful to "park" a topic being discussed to be resumed at a later time. This approach allows the host to address topics that do not have time to be covered during the meeting. Rather than overwhelming people with autism or similar needs during the meeting, ensuring there is a discreet means for a person to ask for further support during the meeting will build self-confidence and allow the participant to ask for help. This helps the facilitator to recognize when someone is overwhelmed and needs a break.

NOTE: A facilitator is a person, tool, or process that helps individuals with disabilities overcome barriers to participation, communication, or engagement in various environments. Facilitators ensure that everyone has equitable access to information, resources, and experiences.

- Some people with cognitive disabilities express a strong preference for signage within a building to be accompanied with symbols especially where the text is not in their first language.

5.5.3 Interacting with people with autism or other cognitive disabilities

As a facilitator, there are several approaches and techniques to ensure that people with cognitive disabilities are fully welcomed and included in the meeting.

Essential accessibility support:

- It is crucial for both the chair and other participants to be patient while having conversations, giving the person time to answer and contribute. Some people with cognitive disabilities may have specific interests and areas in which they focus. It may be valuable to prepare for these and ensure that they can be considered at the most appropriate time.

- There may be a tendency to speak at length about these topics, which may require some gentle prompting or redirection. Equally, sustaining conversation can be challenging. Support can be given by offering choices, suggesting topics, bridging the conversation to a related topic they may be expected to engage with, and reducing anxiety.

- The participants of the meeting should not be offended by a lack of eye contact, motor tics or understanding of personal boundaries. These are common challenges for an autistic person. Equally, it is useful to appreciate that many people with cognitive disabilities need good structure in meetings and will prepare for the specific sequence outlined in the agenda. The schedule should only be changed after considering any impact this might have.

NOTE 1: This is potentially not directed just at the host, but at all meeting participants, online and face-to-face. So the cognitively-disabled participant and the host may decide to brief the other participants before the meeting.

It is also worth remembering that many people with conditions such as autism tend to think literally, so it is best to avoid idioms and slang.

NOTE 2: For the participants of a meeting to react appropriately to the specific requirements and behaviours of a participant with cognitive disabilities, they should be informed before or at the onset of the meeting of those requirements. This requires that the participant and the chair of the meeting clarify the desired code of conduct in advance.

5.5.4 Use of assistive and enabling technology

People with cognitive disabilities use a wide range of assistive technologies, including those built into consumer technologies such as phones or smartwatches. It is important to recognize that such devices may be a critical scaffold supporting the individual and may be referred to constantly. This should not be interpreted as a lack of attention in the meeting or topic being discussed.

Essential accessibility support:

- Meeting chairs should clarify beforehand which assistive and enabling technology may be brought to the meeting by participants with cognitive disabilities.

- Key examples of assistive technology for cognitive needs include cognitive aid software, assistive listening systems, adaptive computer access, visual cues and reminders, time management apps, and graphic thought organizers.

NOTE: While the use of these assistive and enabling technologies may be key to allowing participants an equitable participation in the meeting, their presence and use may confuse some of the meeting participants. It may, therefore, be helpful to explain their presence and purpose at the beginning of the meeting.

5.6 Further accessibility support

5.6.1 Meeting etiquette in support of accessibility

Essential accessibility support:

- ETSI's code of conduct for meetings already calls for decent and respectful behaviour towards all participants. However, some additional etiquette applies that is related to participants' accessibility requirements.
- Informing the participants of a meeting about the presence of a participant with accessibility requirements may be helpful provided that the participant in question agrees with or asks for such a briefing. This may include the need for speaking clearly and facing the camera or refraining from making visual references during a presentation that prevents a blind person from understanding the points being made.
- Other behaviours expected from participants include only one person speaking at a time, no interrupting, and turning on the camera in online participation (either throughout the meeting or at least when speaking).
- If (sign language) interpreters and/or captioners are employed, regular breaks need to be factored in. Participants and speakers need to be reminded to speak clearly and at a regular pace, not too fast. Depending on the length of the meeting, more than one interpreter per language might be required. All materials need to be provided to interpreters and captioners in advance.

5.6.2 Accessibility support for meeting logistics

Essential accessibility support:

- Participants may require support for travel to and from the meeting venue, for finding suitable accommodations (e.g. a hotel with accessible rooms), and for reaching and participating in the non-technical programme of the meeting (e.g. lunch, dinner, or demonstrations).
- Hosts should clarify with participants with accessibility requirements whether human technical support for audio and video issues is required or should at least be standing by.

5.6.3 Support for participants with multiple disabilities

Participants with multiple disabilities (e.g. hearing and mobility impaired participants) may require additional support. Hosts should contact participants indicating diverse requirements at the earliest possible time in order to discuss the support needed.

5.7 Additional guidance for hosts of external meetings

Hosting a meeting with participants with specific accessibility requirements may be challenging. The key is to reach out to the participants as soon as their requirements have been registered and to clarify what is needed. If after talking to the participants individual questions are still open, hosts should contact the ETSI Accessibility Ombudsperson, the chair of Technical Committee (TC) HF, or the technical staff, depending on the nature of the open question.

NOTE: Some of the assistive technology required by a participant (e.g. a portable induction loop or an ALD) may not be available to the host, but may be made borrowed temporarily from ETSI. The ETSI Accessibility Ombudsperson, the TC HF chair and the ETSI technical staff may be able to advise.

5.8 Additional guidance for hosts of meetings on ETSI premises

ETSI should be well prepared to host meetings for participants with a wide variety of requirements. If after having clarified with a participant needing accessibility support individual questions are still open, hosts should contact the ETSI Accessibility Ombudsperson, the chair of TC HF, or the technical staff, depending on the nature of the open question.

NOTE 1: It is recommended that ETSI buy portable induction loops and ALD systems (two sets of each as a minimum) to be deployed on request in ETSI meeting rooms or to be lent on request to hosts of ETSI meetings held outside of ETSI premises.

NOTE 2: While most ETSI meeting rooms are equipped with communications technology that support a range of accessibility requirements, some equipment (e.g. a portable induction loop or an ALD) may need to be installed prior to the meeting. For this reason, it is advisable for the host to ensure that what is needed is in place before the meeting begins.

NOTE 3: Some rooms may be particularly well suited for hosting meetings with disabled participants. The ETSI Accessibility Ombudsperson and the chair of TC HF may advise on these.

6 Specification of necessary updates to the meeting registration tool in the ETSI portal

6.1 General

The meeting registration tool in the ETSI portal needs to be updated in order to allow participants to register accessibility requirements. The complete specification of the proposed updates can be found in Annex A.

6.2 The current meeting registration procedure

Currently, participants cannot register accessibility requirements in the registration process. The only option is to reach out to ETSI and/or the host to inform them about accessibility support to be provided during the meeting.

6.3 Proposed update to the meeting registration procedure

The proposed update to the registration procedure allows participants to register their accessibility needs.

The revised procedure will include the following steps:

1) Just as in the current implementation, participants will indicate their options for the forthcoming meeting: "Face to face" vs. "Online", and the role in which they will attend the meeting (e.g. "Delegate").

2) A further, new, option will be offered to express whether the participant has any accessibility requirements (yes/no).

3) Selecting "yes" will lead to the display of a list of options (representing accessibility requirements) several of which can be selected. Note that the list of options depends on whether the participant selected "Face to face" or "Online" in the first option.

4) If accessibility requirements are being registered, the TC chair, the host (if meeting is external) and the ETSI Accessibility Ombudsperson will be informed.

5) In case of need for clarification, the TC chair and/or the host will (optionally) contact the participant to discuss details.

6.4 Proposed changes to the ETSI members portal

6.4.1 General

The following changes to the registration tool in the ETSI portal are proposed.

6.4.2 Location of new controls

The change in the user dialogue concerns "Step 2 - Meetings registration". A new control will be added to the available dialogue "Set options for <meeting>", currently consisting of a selection of "Face to face" or "Online", and a drop-down control for selecting on role for attending the meeting (e.g. "Delegate"), see Figure 6.1.

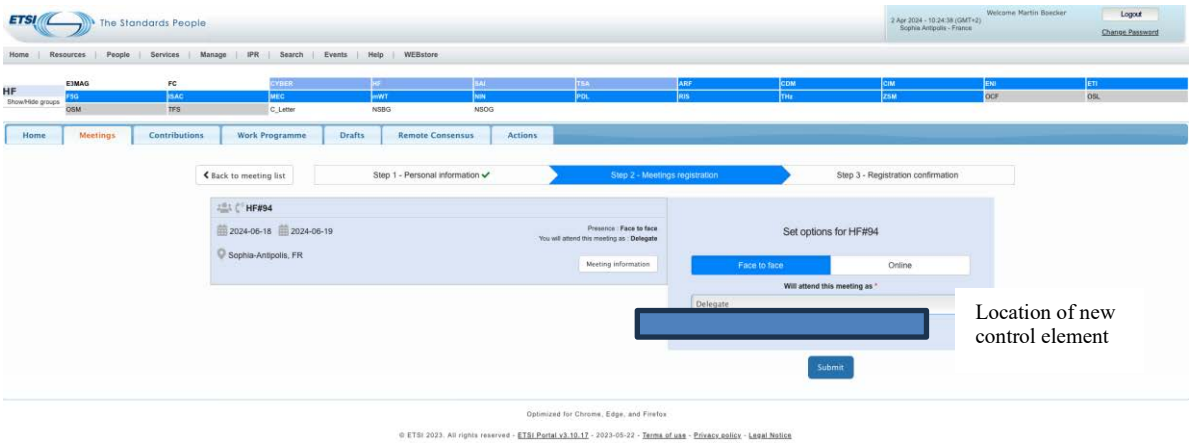

Figure 6.1: Location of new control element for the registration of accessibility requirements

6.4.3 Control for registration of accessibility requirements

The control will be a yes/no drop-down list for indicating need for support. The default will be "no", see Figure 6.2.

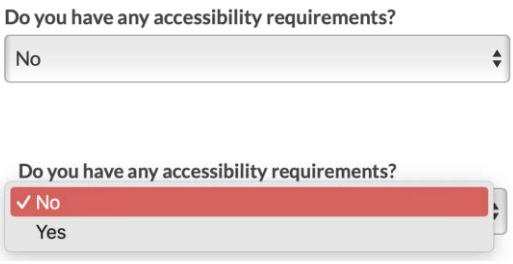

Figure 6.2: New control element for the registration of accessibility requirements

6.4.4 Selection of accessibility requirements

Selecting "yes" will lead to the display of a list of options several of which can be selected, and an "Other" option for entering text, see Figure 6.3. The control for completing the selection (currently "Submit") should be replaced with an appropriate one following the style guide for the ETSI portal.

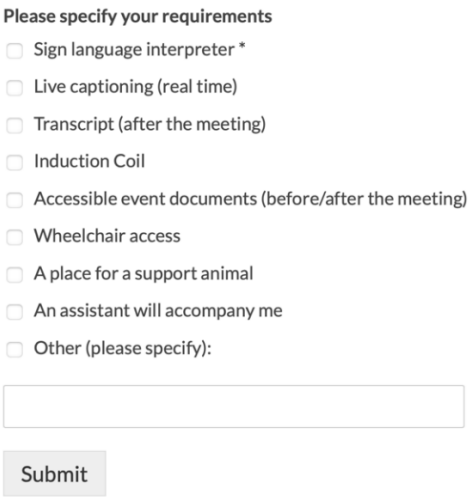

Figure 6.3: Dialogue for the selection of accessibility requirements

7 Specification of and data collection for a database for sign language interpreters

7.1 Databases for sign language interpreters

Based on stakeholder feedback and desktop research, a list of databases for sign language interpreters has been compiled. These databases are maintained by either international or national associations (presented in Annex E).

The list starts with the link to the WFD-WASLI Database for Accredited International Sign Interpreters. The World Federation of the Deaf (WFD) and the World Association for Sign Language Interpreters (WASLI) have joint forces in creating "an accreditation scheme aiming to set and maintain standards in International Sign Interpretation, promote a quality-assurance system for credentialing practitioners and maintain this database". When interpreters for International Sign are employed, it is recommended to look for WASLI accreditation.

The International Association of Conference Interpreters (AIIC) also includes interpreters for International Sign and several national sign languages, with experience in conference interpreting in international settings.

In Europe, the European Federation of Sign Language Interpreters can help identify and contact sign language interpreters, while the European Disability Forum maintains a database of sign language interpreters they regularly work with.

With regard to interpretation for deafblind participants, it is recommended to contact the European Deafblind Network who can help identify an interpreter with the appropriate skillset, since deaf-blindness encompasses a wide spectrum.

The list is completed with links to databases for national sign language interpreters in all EU Members States, plus Norway, Serbia, Turkey, the UK and US. All links are included in Annex E.

In addition and based on stakeholder feedback from DPOs and other standardization bodies, a list of recommended tools and services (status January 2025) was compiled for making ETSI meetings - in presence, online and hybrid, accessible for deaf and hard-of-hearing participants. This list includes information on STTR/CART captioning providers, automated captioning & transcription systems as well as sign language interpreter bureaus, and is found in Annex F.

7.2 Methodology for tool & resources & service selection

Based on the stakeholder feedback, a list of recommendations and quality criteria was formulated that should be considered in both the selection of sign language interpreters and speech-to-text tools and services, as well help prepare the integration of those in the meetings. This list of recommendations and quality criteria can be found in Annex D together with a checklist for future tool and service selection in Annex G.

It is recommended to integrate a feedback mechanism for ETSI members to report back their experience, their individual reasons for tool selection or exclusion as well as possibly encountered difficulties. This feedback should be confidential and only visible to the person maintaining the resource collection, and after vetting be included in the list of recommended tools and services. The ETSI website already contains a feedback mechanism for reporting vulnerabilities (Coordinated Vulnerability Disclosure (CVD)) that can be adapted for this purpose. Given the rapid pace of technological development in this area, the ongoing stakeholder and user feedback will help keep the recommendations up to date.

The stakeholders strongly emphasize the importance of pre-meeting preparations, the technical set-up, as well as the briefing of meeting hosts and participants on the proper meeting setup and etiquette to follow. This is necessary so that interpretation and tools can work effectively for the participants. The concrete recommendations have been fed into the present document.

7.3 Implementation of Form & Format

It is suggested that ETSI's public accessibility pages include the list of databases for sign language interpreters, which are not commercial in themselves, and provide a concise overview and links to the resources developed by ETSI for making meetings (in presence, online and hybrid) accessible. Interested parties might have to log into the ETSI portal to access some of the documents.

In the accessibility resources listed on the public ETSI website, it is recommended to include links to the present document, and the list of sign language interpreters. Again, it is advised to also include in the accessibility page a feedback button, for which the existing system for reporting vulnerabilities (Coordinated Vulnerability Disclosure (CVD)) can be adapted. The recommendations for the public ETSI accessibility page can be found in Annex H.

7.4 Update mechanism

To ensure that the resource collection is kept up to date and relevant, ETSI needs to officially assign a role as responsible for this task. This person needs to follow a pre-defined update schedule, which includes the testing of all provided links, the integration of feedback on the listed tools and services as well as newly proposed tools and services, if they fulfil the quality criteria. This person should also serve as the accessibility liaison for other standardization bodies.

In addition, it is recommended to use the above-mentioned feedback mechanism on both the publicly available accessibility resources page and on the listing of tools and services available via the ETSI portal so that ETSI members can provided feedback on the tools and services listed and provide additional suggestions. The person assigned to update and maintain the resource collection needs to be notified about such submissions and include them in the maintenance schedule. The ETSI portal would need to send automatic reminders for the maintenance of the accessibility pages on a quarterly basis.

8 Comparison of accessibility features of available videoconferencing, joint editing, and presentation tools and recommendations for tool selection

8.1 Evaluation of Videoconferencing tools

8.1.1 Expected Outcome and Methodology

Since the experience of the Covid-19 Pandemic there has been a rapid growth of videoconferencing tools to support both small and large meetings. This has been implemented both as 100 % remote meetings with attendees spread across multiple locations and as part of a hybrid approach with a mixture of attendees in one physical location, but with others attending online. Common features of such tools include audio and videoconferencing, text chat, the capacity to share files and the ability to record and save video and transcripts from a meeting. Such tools have become integral to the work of teams across the public, private and not-for-profit sectors. This is the case in the field of standardization where the joint development of electronic documents has become the usual way of working in the overwhelming majority of Technical Committees.

A wide range of products has been developed to meet the need for remote and hybrid working. Each has a range of functionality (multi-purpose platforms versus domain-specific tools) or market adoption (de facto leaders with big market shares versus niche products). They also have different maturity levels regarding their usability (easy deployment, interoperability, online support, etc.) or the level of integration and support in the IT departments of the Standards Development Organizations (SDOs). This clause focusses on the core features of products that directly support remote and hybrid meetings.

In the context of the specific aspect of the ETSI Accessibility strategy regarding "Making ETSI meetings accessible on demand, including online and hybrid meetings", the accessibility features of the currently available meeting tools require careful evaluation. This analysis has also to include important aspects such as privacy or security. The objective is to provide a prioritized list of tools with an indication of their strengths and shortcomings.

The analysis relies on identifying the most widely used tools used by Disabled Persons Organization (DPOs). This is considering the tools used by ETSI and the stakeholders of ETSI. The following criteria for the evaluation of the tools have been selected:

- Major Features.
- Accessibility Featuresprioritized.
- Security and Privacy support.
- Support by the IT departments of ETSI.

The methodology adopted for the review of meeting tools is fundamentally an iterative one. Initial desk research was undertaken to identify the main candidate products and their features via direct review of vendor websites, analysis of vendor Voluntary Product Accessibility Template (VPATs) where available, prior research identified (e.g. through Google® Scholar), and reviews of the candidate products undertaken on the web or personal blogs.

This data was collated and reviewed to provide an initial dataset. The findings were validated and refined through short-form interviews with DPOs, Individuals with a disability, ETSI, and SDOs. This additional data led to a second iteration with the additional information integrated.

8.1.2 Scope and major features

An initial list of candidate tools was selected from the most significant tools/platforms available on the market and, as much as possible, supported by one or more Standards Development Organizations or Disabled Persons Organizations.

Table 8.1 summarizes the list of tools identified, presented in alphabetic order, with details of the major features.

Table 8.1: Scope and major features of videoconferencing tools

Tool	Scope and Major Features
Big Blue Button	Big Blue Button is an open-source web conferencing system for online learning, offering video, audio, screen sharing, and interactive whiteboards to create engaging virtual classrooms: • Open-source tool tailored for online learning and education. • Built-in whiteboard for collaboration. • Screen sharing, webcam, and audio for live lectures. • Breakout rooms for group activities. • Polling, chat, and emoji-based reactions. • Record and playback feature for lessons. • Real-time closed captions and live notetaking. • Integrates with Learning Management Systems (LMS) like Moodle™ and Canva®.
Cisco WebEx	Cisco WebEx offers robust, enterprise-grade videoconferencing and meeting solutions with advanced security, interactive features, screen sharing, and integrated collaboration tools for global business communication: • HD video, audio, and content sharing. • Real-time polling and Q&A. • AI-powered meeting assistance (notetaking, transcription). • Integrates with Microsoft® 365, Google® Workspace, Salesforce, and more. • End-to-End Encryption (E2EE). • Cloud meeting recording and storage. • Breakout rooms for smaller discussions. • Up to 100 000 participants in Webex Events.
GoToMeeting	GoToMeeting is a versatile meeting platform offering videoconferencing, screen sharing, and integrated collaboration tools designed for effortless scheduling and seamless, efficient remote team communication: • HD video and audio conferencing for up to 250 participants. • Screen sharing, drawing tools, and note-taking. • Cloud recording, transcripts, and automatic meeting reminders. • Custom backgrounds and meeting lock for security. • Integrates with Google® Calendar and Microsoft® Outlook. • Call me feature to dial into meetings with one click. • SSL encryption and password-protected meetings.
Jitsi Meet	Jitsi Meet is an open-source videoconferencing solution offering secure, browser-based meetings with screen sharing, chat, and collaborative tools for casual and professional effective interactions: • 100 % open-source and free to use. • No need for an account; meetings can be started instantly. • Unlimited participants (practical limit based on bandwidth). • End-to-end encryption (with Jitsi's deployment options). • HD audio and video. • Screen sharing and real-time collaboration. • Works on browsers without downloads. • Integrated with Slack, Google® Calendar, and Microsoft® Outlook.
Microsoft Teams	Microsoft® Teams integrates chat, videoconferencing, file collaboration, and productivity applications into a unified workspace, fostering seamless teamwork, remote education, and enterprise communication across organizations. • Seamless integration with Microsoft® 365 suite (Word, Excel, PowerPoint, etc.) • Channels for organizing discussions and projects • File sharing and real-time collaboration on documents • Screen sharing, background blur, and custom backgrounds • Up to 1 000 participants per meeting • Breakout rooms • Meeting recording and transcripts • Advanced security with Microsoft® 365 compliance

Tool	Scope and Major Features
Slack	Slack is a dynamic team communication platform integrating instant messaging, file sharing, and collaboration channels to streamline workflow, project coordination, and remote organizational connectivity. • Instant video/audio calls directly in Slack channels. • Screen sharing. • Integrates with Google® Drive, Zoom®, Microsoft® Office 365, and others. • Persistent chat with threaded conversations. • Real-time collaboration with file sharing. • Up to 15 people on video calls (Zoom® can be integrated for larger meetings). • Slack Connect for external collaboration. • Simple interface for small, impromptu meetings.
Whereby	Whereby provides a user-friendly, browser-based video meeting experience without downloads, enabling quick virtual collaboration, screen sharing, and secure communication for remote teams and small businesses: • No app or software download is required (browser-based). • Up to 50 participants (depending on the plan). • Easy screen sharing. • Customisable meeting rooms (personal URLs). • Integration with Google® Calendar and Slack. • Live chat during meetings. • Locked meeting rooms for privacy and security. • Breakout groups for smaller discussions.
Zoom®	Zoom provides an intuitive, high-definition videoconferencing solution that supports virtual meetings, webinars, and collaborative sessions, enabling remote work, education, and large-scale global communication: • HD video and audio for up to 1 000 participants in paid plans. • Screen sharing and co-annotation. • Breakout rooms for group discussions. • Separate sign language support. • Virtual backgrounds. • Meeting recording with cloud storage. • Webinar hosting. • Integrated with calendar platforms (Google® Calendar, Microsoft® Outlook). • End-to-End Encryption (E2EE) for secure communications.

Summary

The above list has been created based on available tools without consideration of their possible pros and cons regarding their accessibility or the support they (can) have from ETSI. Each tool has a range of features that cater to different user needs, from corporate meetings and webinars (Microsoft® Teams, Webex, Zoom) to education and collaboration-focused platforms (BigBlueButton, Jitsi Meet). The choice often depends on the scale of participants, integration with other tools, ease of use, and security requirements.

8.1.3 Accessibility features of videoconferencing tools

Amongst the accessibility features deemed important are the following ones:

- Screen reader compatibility.
- Keyboard navigation and shortcuts.
- High contrast mode and customisable UI.
- Voice dictation or voice control support.
- Alternative text for images and embedded objects.
- Live captions for comments or discussions.
- Accessibility checker.
- AI generate summaries of meetings with transcripts and recordings.

The detailed analysis of the accessibility features can be found in clause I.1.2.

Summary of findings

All of the tools reviewed offered some or all the features outlined above. However, the usability and quality of these features varied across the tools, and this is reflected in the expressed preferences of persons with disabilities in the rapid interviews undertaken (see clause 8.2.6) Importantly, the tools that are most widely used, with the largest market share, feature some of most developed features and the features offered by Microsoft® Teams, Zoom and Google® Meet were all highlighted as being of value, with high levels of flexibility in their use allowing the user with a disability to customize the tool and choose the form of the supporting feature. This flexibility is exemplified by the ability to choose between manual and automated captions in meetings.

Table 8.2: Accessibility features of videoconferencing tools

Tool	Accessibility Features
Big Blue Button	• Built-in closed captioning functionality • Screen reader support for blind users and those with low vision • Keyboard navigation shortcuts • High-contrast mode for users with low vision • Real-time transcription and translation features for accessibility in multiple languages
Cisco WebEx	• Live captioning and transcription features • Keyboard shortcuts for faster meeting navigation • Screen reader support, compatible with JAWS®, NVDA, VoiceOver, and TalkBack • High-contrast colour options for improved visibility • Sign language interpreter video spotlighting • Third-party captioning and transcription integration
Google® Meet	• Automatic live captions in real-time (English only) • Screen reader support • High-contrast colour schemes for better visibility • Keyboard shortcuts to control functions • Compatible with accessibility tools in Google® Workspace, such as ChromeVox screen reader
GoToMeeting®	• Closed captioning and live transcription during meetings • Screen reader support on web and mobile platforms • Keyboard shortcuts for navigating the meeting interface • High-contrast mode and customisable interface colours for improved visibility • Voice guidance and voice command features for enhanced accessibility
Jitsi Meet	• Screen reader support on web and mobile apps • Keyboard shortcuts for meeting controls • Supports live captioning via third-party services • High-contrast mode and text scaling for better visibility • Open source, which allows the community to contribute and improve accessibility features
Microsoft® Teams	• Live captions and subtitles in multiple languages • Screen reader support and high-contrast mode for blind users and those with low vision • Keyboard shortcuts for easier navigation • Immersive reader for text-to-speech, translation, and other reading aids • Background blur for minimizing distractions during video calls • Microsoft® Teams on mobile supports TalkBack (Android®) and VoiceOver (iOS®) (see note)
Slack	• Keyboard navigation shortcuts and screen reader compatibility • VoiceOver (iOS®) and TalkBack (Android®) support on mobile apps • Slack Huddles has live captioning powered by AWS Transcribe • Customizable themes for colour blind users • Accessible messages with Markdown for easier reading
Whereby	• Compatible with screen readers and keyboard navigation • No downloads are required, making it easy for users with disabilities to join meetings • Closed captioning support via third-party integrations • High-contrast display modes to support blind users and those with low vision

Tool	Accessibility Features
Zoom®	• Keyboard shortcuts for easy navigation • Closed captioning support (manual or using third-party tools) • Integration with transcription services • Screen reader support for blind users and those with low vision • Automatic live transcription (available in certain paid plans) • Support for sign language interpreters via multi-spotlight feature • Customisable font size for chat
NOTE: iOS is a trademark or registered trademark of Cisco in the U.S. and other countries and is used by Apple® under license.	

8.1.4 Privacy and Security

Summary of findings

Each application combines security features with ongoing updates and best practices to help protect against potential cyber threats and maintain a secure operational environment.

The detailed analysis of the privacy and security features can be found in clause I.1.1.

8.1.5 ETSI Support

The level of support provided by ETSI is largely based on the tool usage within the ETSI community (e.g. Technical Committees, Open-Source projects), as seen by the ETSI IT team. The data gathered was collated into four broad categories:

- There is no known usage of the tool within the ETSI community.
- Some members of the ETSI community use the tool, but no specific support has been required to the ETSI IT team.
- Some members of the ETSI community use the tool, and specific support has been asked to the ETSI IT team.
- The tool is largely used within the ETSI community and fully supported by the ETSI IT team (e.g. license price negotiation, installation, debugging, maintenance).

It should be noted that ETSI prefers a limited number of fully supported tools. If a new tool becomes a candidate for full support, the current situation could likely evolve. This might possibly require information and a decision from the General Assembly.

In gathering the evidence, other SDOs were also contacted to discover the systems they preferred and used. However, many of these were undertaking reviews or had no clear policy on the matter so this data is not reported here.

8.1.6 Selection of videoconferencing tools by DPOs

Ten DPOs from within Europe were contacted and asked which conferencing tools they supported and/or used for meetings that included disabled persons. Feedback was taken from a survey and short interviews by phone or at conferences.

A classification of the ten DPOs consulted according to the main needs they address can be seen in Table 8.3.

Table 8.3: Categories of DPOs contacted

Main addressed needs	Number of DPOs contacted
Blind/Low Vision	2
Deaf/Hearing Impaired	1
Cognitive or Intellectual	1
Neurodiversity	1
Pan/Cross disability	4
Physical	1

Summary of findings

The rationale for the selection of tools varied. Key issues in selection included:

- Familiarity and ease of implementation.
- Cost (including packaged with other licenses).
- Accessibility Features.
- Ease of Use.

Zoom® and Microsoft® Teams scored highly on each of these selection criteria. In most cases, those who scored at 0 % were unknown to the respondent, so they had never been considered. Some respondents did reference other products that they used for meetings in the past, such as WhatsApp® and Skype®.

The responses as the percentage of DPOs that currently used or supported these tools or had found them satisfactory in the past and the nature of the disabilities or user needs that they addressed are shown in clause I.1.3.

8.1.7 User Experience

Feedback was taken from a diverse group of 20 people with a disability. The experience of the products varied significantly, so an approach was adopted from traditional user experience towards "customer satisfaction." This allowed refining the findings based on the reality of the use of the products by people with disabilities to affirm the findings.

Summary of findings

The approval rating was broadly based on the actual usage of tools by the respondents. A high approval rating reflected the regular usage of a tool by persons with a disability. Whilst accessibility was a major factor in that regular use in all cases, the products were also given a greater approval rating based on their ease of use and usability. In over 90 % of cases, such usability was closer relate to familiarity. The more familiar users were with products, because of their widespread use combined with accessible design, the greater the approval rating for the product. This would suggest that introducing new products with a different design, including keyboard shortcuts, would disadvantage users with a disability more than the wider population at ETSI.

8.1.8 Support for Innovation

An overview of the current status of innovation within each product was taken. Such innovation has had significant value for persons with a disability, making notetaking, curation of reports and summary documents faster and easier to prepare. Products which innovated on a regular basis were perceived to be the most likely to innovate to increase accessibility and ease of use for persons with disabilities.

Summary of findings

Each platform leverages AI in unique ways to enhance usability, improve communication clarity, and streamline meeting workflows. These innovations improve the quality of virtual interactions and increase overall productivity by reducing manual overhead and delivering actionable insights in real-time.

8.1.9 Cost

Table I.6 in clause I.1.5 summarizing each application's approximate pricing tiers and key features.

NOTE: Prices are approximate, typically based on monthly, per-user/host billing when applicable, and are subject to change. Some tiers are available only via annual plans or enterprise agreements.

The details represent a snapshot of typical offerings as of early 2025. Each provider's website should be consulted for the most accurate and up-to-date pricing and feature information.

8.1.10 Joint Meeting Tools: Preferred solutions

Table 8.4 presents a short list of tools and outlines the main reasons for their presence in the list.

Table 8.4: Preferred solutions for videoconferencing tools

Tool	Main reasons for selection
Zoom®	• Scope of Features • Accessibility Features • Privacy and security • Ease of Use • Support for Innovation • ETSI Support
Microsoft® Teams	• Scope of Features • Accessibility Features • Privacy and security • Ease of Use • Support for Innovation • ETSI Support
Google® Meet	• Accessibility Features • Privacy and security • Ease of Use
GoToMeeting®	• Privacy and security • Ease of Use • ETSI Support

Of the preferred solutions listed above the overwhelming preference of users based on the feedback received was for Zoom® or Microsoft® Teams. Where people with a disability were asked to name one preferred product 72 % opted for Zoom®.

8.1.11 Joint Meeting Tools: Best Practices

Including people with disabilities in remote meetings requires thoughtful planning, accessible technology, and inclusive practices. Meeting organizers should seek to recognize that each participant's needs are unique and require individualized accommodations. The following guidelines provide practical steps to ensure that remote meetings are welcoming, effective, and accessible for everyone.

First, choose accessible technology. Use videoconferencing platforms that comply with recognized accessibility standards. Ensure the platform supports screen readers, closed captioning, and compatibility with assistive devices. Test the technology well in advance to confirm that it works smoothly for all participants.

Next, prepare meeting materials in accessible formats. Distribute agendas, presentations, and supporting documents ahead of time. Provide documents in formats compatible with screen readers and include alternative text for images. Clear, easy-to-read fonts and properly structured documents help all participants understand and follow along.

Effective communication is essential. Speak clearly and at a moderate pace, ensuring each point is conveyed without unnecessary complexity. Encourage participants to ask for clarification when needed. Repeat key information and summarize major points periodically. Allow participants to engage using multiple communication channels, such as chat, email, or voice.

Providing captioning and sign language interpretation can make a significant difference. For participants with hearing impairments, offer real-time closed captioning during the meeting. Where possible, arrange for a sign language interpreter. These accommodations enhance clarity and help bridge communication gaps for many attendees.

Establish and communicate clear meeting norms to create an inclusive environment. Encourage respect and patience during discussions. Set expectations that only one person speaks at a time and remind everyone to minimize background noise and distractions. This ensures that participants with auditory processing challenges or attention difficulties can participate fully.

Schedule meetings with accessibility in mind. Avoid planning meetings during times that conflict with personal or support routines for participants with disabilities. Provide regular breaks during longer sessions to prevent fatigue. Consider time zones and individual schedules to maximize participation.

Offer technical support before and during the meeting. Identify a dedicated contact who can address any accessibility or technical issues promptly. A brief orientation session on using the meeting platform's accessibility features can be beneficial.

Finally, solicit feedback from all participants, particularly those with disabilities. Ask for input on what worked well and what could be improved in future meetings. Use this feedback to continuously refine your approach and adopt new technologies or practices that enhance accessibility.

By implementing these guidelines, organizers can create a remote meeting environment that respects the diverse needs of individuals with disabilities. This approach fosters inclusion and enriches discussions by ensuring every voice is heard and valued.

It is essential to continually update remote meeting practices, integrating feedback from participants with disabilities. Meeting hosts can build more inclusive, productive sessions by investing time in training, technology, and communication strategies. Such efforts benefit not only individuals with disabilities but also create a culture of respect and shared understanding throughout the organization, bringing value to all.

8.2 Evaluation of Joint Editing Tools

8.2.1 Expected Outcome and Methodology

Many actors in the Information and Communication Technologies (ICT) have been developing a vast range of tools and toolsets in support of the daily work of ICT users. Amongst those tools, joint editing and presentation tools are playing a very important role because they are now used massively in the collaborative development of products and solutions. This is the case in the field of standardization where the joint development of electronic documents has become the usual way of working in the overwhelming majority of Technical Committees.

A vast range of products has been developed by the ICT industry. They have various degrees of functionality (multi-purpose platforms versus domain specific tools) or market adoption (de facto leaders with big market shares versus niche products). They also have different levels of maturity regarding their usability (easy deployment, interoperability, on-line support, etc.), their acquisition and maintenance cost.

In the context of the specific aspect of the ETSI Accessibility strategy regarding "Making ETSI meetings accessible on demand, including online and hybrid meetings", the accessibility features of the currently available joint editing and presentation tools require carefully evaluation. This analysis has also to include important aspects such as privacy or security. The objective is to provide a list of preferred tools with an indication of their strengths and shortcomings.

The analysis relies on the identification of the most widely used tools used by Disabled Persons Organizations (DPOs). The tools used by ETSI and the stakeholders of ETSI are of particular interest. The main categories of criteria selected for the evaluation of the tools are listed below:

- Major Features.
- Usability.
- Accessibility Features.
- Security and Privacy support.
- Support by the IT departments of the Standards Development Organizations.
- Cost.

The analysis is also taking advantage of the findings of clause 8 (on videoconferencing tools), in particular regarding the accessibility features.

8.2.2 Evaluation criteria

Joint editing refers to the process of development of a document or other media by several authors communicating by computer networks (e.g. the internet) with a variety of devices (e.g. computers, tablets, smartphones):

- The jointly-edited document assembles in a structured manner a variety of input:
  - texts;
  - images;

- videos;
- spreadsheets;
- etc.

- The editing can be done synchronously (with participants gathering in a common meeting) and asynchronously (with individuals contributing separately to the jointly-edited document).
- The editing process should guaranty the integrity of the jointly-edited document despite the potentially large number of proposed changes and revisions.
- Moreover, and most importantly, the editing process should support accessibility together with usability.

The first criteria for the evaluation of the joint editing tools are major features, such as:

- Real-time collaborative editing.
- Multi-user document control.
- Version history and rollback.
- Offline editing support.
- File format compatibility (DOCX, PDF, EPUB, etc.).
- Market share.

In addition, usability criteria are part of the evaluation, such as:

- Easy-to-use toolbar and formatting options.
- Clear differentiation between collaborators' changes.
- Minimal learning curve.
- Track changes and history log.
- Ability to revert to previous versions.
- Commenting and suggestion modes.
- Clear indication of edits (who edited what and when).
- Reliable syncing across devices and users.
- Adjustable UI settings (themes, layouts).
- Custom templates and automation.

8.2.3 Scope and major features

An initial list of candidate tools has been selected from the most significant tools/platforms available on the market and potentially used - and even supported - by ETSI (and possibly by other SDOs). The list has been mostly established on the basis of the perceived common usage (and "market share") of the presentation tools, on their known usage in the DPO community, and on the known usage in some SDOs (in particular ETSI).

The list has been created based on available tools without prior consideration of their possible pros and cons regarding accessibility, security, privacy or the support they (may) have within the SDOs. These aspects are evaluated in the subsequent clauses.

The list of tools identified and further analysed is summarized in Table 8.5.

Table 8.5: Scope and major features of joint editing tools

Tool	Scope and Major Features
Apple® Pages	Pages is a document creation tool that comes included with most Apple devices and is part of the iWork suite. With real-time collaboration, one can work together on Mac, PC, iPad, or iPhone (including with Apple pencil): • Collaborative editing with changes appearing in real-time. • Offline changes are automatically uploaded to iCloud and synced when the device reconnects to the internet. • Import/export for Microsoft Word (with limitations on complex documents) and export in various formats (including PDF, EPUB). • User-friendly interface with accessible formatting tools, customization, built-in templates, and minimal learning curve. • Access Permissions, Version History, Track Changes. • Seamless integration with Apple® iWork and iCloud. • Commenting and Suggestion Modes. • Pages is primarily designed for macOS and iOS. Performance and features are limited on other platforms (e.g. Microsoft Windows®).
Dropbox® Paper	Dropbox Paper is a collaborative document-editing tool that enables users to create, edit, and manage documents in a team-oriented environment. It is free for the owners of a Dropbox account: • Collaborative editing with changes appearing in real-time. • Multi-User Document Control with specific permissions. • Version History and Rollback. • Offline Editing Support and Syncing Across & Users (offline editing is not available on the web version). • Import/export in various formats (including DOCX, PDF). • Change tracking and audit logs. • Commenting and suggestion modes.
Evernote	Evernote provide users with tools for taking notes, transitioning from the early stages of brainstorming into full-fledged documents developed in collaborative projects: • Notes can include text, images, audio recordings, and files. • Notes can be organized into notebooks and tagged. • Powerful search capabilities, including for text within images (Optical Character Recognition - OCR) and handwritten notes. • Various platforms support (Microsoft Windows, macOS, iOS, Android, and web browsers), with automatic syncing across devices. • Privacy concerns (user data stored on Evernote's servers).
Google® Workspace	Google® Workspace is a suite of cloud computing, productivity and collaboration tools, software and products. It consists of the Google® Docs Editors suite for content creation, Drive for storage, Gmail, Contacts, Calendar, Meet, Keep and Chat for communication: • Collaborative Editing with changes appearing in real-time. • Import/export in various formats (e.g. DOCX, PDF, EPUB). • Multi-User Document Control, Version History and Rollback. • Seamless integration with Google® services (e.g. Drive, Calendar, Gmail) and many third-party applications. • Security features including 2FA, and data encryption. • Seamless integration with Google® Drive. • Off-line editing with automatic syncing on reconnection. • Privacy concerns about data privacy and Google's® data handling policies, especially for sensitive information.
Microsoft® 365	Microsoft 365 is a family of products covering a large range of purpose (e.g. editing, presentation, spreadsheet creation). It is associated with Microsoft Teams, a cloud-based collaboration software (web interface or stand-alone application) offering real-time joint editing, videoconferencing, workspace chat (though it is unbundled from Microsoft 365 in the EU): • Collaborative Editing with changes appearing in real-time. • Instant messaging, video and audio calls, and meetings. • Seamless integration with OneDrive and SharePoint. • Import/export in various formats (e.g. DOCX, XLSX, PPTX, PDF, EPUB) with compatibility across different platforms. • Multi-User Document Control, Version History and Rollback. • Custom Templates supporting automation through macros and offering integration with Power Automate. • Offline Editing Support for desktop applications (e.g. Microsoft Word, Microsoft Excel) with changes syncing once reconnected.

Tool	Scope and Major Features
ONLYOFFICE	Open-source desktop office suite for document editing and collaboration which allows to create, view and edit documents of any size and complexity, provides a flexible working environment for businesses and teams, and integration with existing tools: • Collaborative Editing with changes appearing in real-time. • Multi-platforms availability (web, desktop, mobile devices). • Import/export in various formats (e.g. DOCX, XLSX, PPTX). • Version control; sharing and permissions management. • Possibility to choose self-hosting for security and data control. • Possibility to integrate with third-party applications (e.g. CRM) and cloud services via Application Programming Interfaces. • Open-source code that users can modify.
Zoho Docs	Zoho Docs is a cloud-based document management solution designed to facilitate the creation, storage, sharing, and collaboration of documents within teams and organizations. It integrates with other Zoho apps (e.g. Zoho CRM, Zoho Projects): • Collaborative Editing with changes appearing in real-time. • Track changes; Version History and Rollback. • Supports 160+ file types (e.g. document, image, and spreadsheet). • Off-line editing with automatic syncing on reconnection. • Syncing Across Devices and Users (PC and mobile devices).
Zoom® Docs	Zoom® Docs is a cloud-based document editing software. It is integrated with Zoom® Meetings and can be used for joint editing. • Collaborative Editing with changes appearing in real-time. • Export in PDF format. • Version control; sharing and permissions management. • Limited features set compared to Google® Docs or Microsoft® Word.

8.2.4 Accessibility features

Amongst the accessibility features deemed important are the following ones:

- Screen reader compatibility.
- Keyboard navigation and shortcuts.
- High contrast mode and customisable UI.
- Voice dictation or voice control support.
- Alternative text for images and embedded objects.
- Live captions for comments or discussions.
- Accessibility checker.

The detailed analysis of the accessibility features can be found in Table 8.6.

Table 8.6: Accessibility features of joint editing tools

Tool	Accessibility Features
Apple Pages	• Supports Apple's VoiceOver screen reader, providing spoken descriptions of text, formatting, and UI elements (specially in the Apple environment). • Provides full keyboard accessibility. • Supports full keyboard navigation, allowing users to navigate and format documents without relying on a mouse. • Does not offer a specific high contrast mode, but supports macOS's system-wide display adjustments, including increased contrast and reduced transparency. • Integrates with macOS's dictation feature, enabling users to input text using voice commands. • Accessibility descriptions can be added to images, image galleries, movies, audio, and drawings. • Currently no built-in live captioning for comments or discussions.

Tool	Accessibility Features
Dropbox® Paper	• Support keyboard navigation, enhancing accessibility for those who prefer or require keyboard interactions. • No compatibility with screen readers. • Does not offer a specific high contrast mode, but users can adjust their system settings to improve contrast and visibility. • No built-in voice dictation features. However, users can utilize external dictation tools in conjunction with the platform. • Support for Alternative Text for Images and Embedded Objects. • Does not currently offer live captioning features.
Evernote	• Provides screen reader support for popular tools like JAWS, VoiceOver, and NVDA. • Includes a wide range of keyboard shortcuts, allowing users to navigate and perform actions without relying on a mouse. • Provides options for high contrast mode. Users can also customize their note formatting to enhance readability. • Allows users to adjust text size and zoom in on notes. • Clear Navigation and User Interface that aids users in finding features and accessing their notes. • Supports voice input for creating and editing notes.
Google® Workspace	• Compatibility of Google Workspace apps with popular screen readers, such as JAWS and NVDA. • Most Google Workspace apps support keyboard shortcuts. • Google Docs includes a voice typing feature allowing users to dictate text. • Users can adjust their display settings to high contrast or modify colours in Google Docs, Sheets, and Slides. • Apps are designed to work well with system magnification tools, enabling users to zoom in for better visibility. • Users can add alt text descriptions to images in Google Docs, Slides, and Sheets. • Google Meet provides live captioning during video calls. • Google Slides and Docs offer templates that are designed with accessibility in mind, helping users create easier to navigate documents and presentations. • Google Forms allows users to create accessible forms and surveys, which includes features like screen reader compatibility and adaptable layouts.
Microsoft® 365	• Provides extensive keyboard shortcuts, enabling users to navigate and perform actions without a mouse. • Compatible with screen readers on Microsoft Windows and macOS, offering support for users who rely on assistive technologies. • Users can enable high contrast settings to enhance visual clarity, making text and interface elements more distinguishable. • Does not have built-in voice dictation, but it integrates seamlessly with Windows' speech recognition features. • Allows users to add alternative text to images and other embedded objects, aiding those utilizing screen readers. • Offers live captioning during meetings, providing real-time transcription of spoken words to text
ONLYOFFICE	• Extensive keyboard shortcuts are available across ONLYOFFICE applications, enabling users to navigate and execute commands efficiently without a mouse. • ONLYOFFICE Docs provides compatibility with screen readers in beta mode. • Provides various UI themes to enhance visual clarity. Chart elements can be displayed in high-contrast mode or with geometrical patterns for better distinguishability. • The Speech Input plugin allows users to convert spoken words into text, facilitating hands-free content creation. • Users can specify titles and descriptions for images and other graphic objects, aiding those utilizing assistive technology. • Currently, ONLYOFFICE does not offer built-in live captioning features for comments or discussions.

Tool	Accessibility Features
Zoho Docs	• Provides keyboard shortcuts to facilitate navigation and document editing without the need for a mouse. • Screen Reader support is limited. However, screen reader support is provided in applications like Zoho CRM. • Does not offer a dedicated high contrast mode. Users can adjust display settings within their operating system or browser. • Does not have built-in voice dictation features. However, users can utilize external dictation tools associated with the platform. • Users can add alternative text to images and embedded objects. • Currently, Zoho Docs does not offer live captioning features for comments or discussions.
Zoom® Docs	• Provides screen reader support for popular tools like JAWS, VoiceOver, and NVDA. • Provides keyboard shortcuts to facilitate navigation and document editing without the need for a mouse. • Hosts can designate specific participants as sign language interpreters, allowing them to sign during meetings. • Closed captioning support (manual or using third-party tools).

8.2.5 Privacy, Security

Amongst the privacy and security features deemed important are the following ones:

- End-to-End Encryption (E2EE) for documents.
- Access control and user permissions.
- Secure authentication (MFA, SSO).
- Compliance with privacy regulations (GDPR, etc.).
- Data retention policies and compliance (GDPR, ISO/IEC 27001 [i.7]).
- Protection against unauthorized content changes.

The detailed analysis of the privacy and security features can be found in clause I.2.1.

8.2.6 Standards Development Organizations Support

Joint editing tools have become an essential part of information creation within the Information and Communication Technologies (ICT) sector emphasizing the importance of flexible, efficient, and inclusive communication methods.

The adoption of these tools within the Standards Development Organizations (SDOs) ecosystem reflects this broader trend, allowing multiple stakeholders, including industry experts, practitioners, and regulatory authorities, work together to create, review, and finalize standards.

Consequently, the SDOs have organized themselves (and their IT department in particular) to support the usage of digital platforms that facilitate joint editing, and more precisely those that are most used by their stakeholders.

In ETSI, the level of support provided is largely based on the tool usage within the ETSI community (e.g. Technical Committees, Open-Source projects) as seen from the ETSI IT team with a growing level of involvement:

- There is no known usage of the tool within the ETSI community.
- The tool is used by some members of the ETSI community, but no specific support has been required to the ETSI IT team.
- The tool is used by some members of the ETSI community, and a specific support has been asked to the ETSI IT team.
- The tool is largely used within the ETSI community and fully supported by the ETSI IT team (e.g. license price negotiation, installation, debugging, maintenance).

Table 8.7 outlines the level of support of each candidate tool by ETSI, evaluated based on feedback and information gained in a specific meeting with the ETSI IT team.

Table 8.7: ETSI support for joint editing tools

Tool	ETSI Support
Apple® Pages	• No known usage.
Dropbox® Paper	• No known usage.
Evernote	• The tool is used in some members of the ETSI community as a means to support the definition of the content of the jointly-edited document (in parallel to the joint editing itself). No specific support has been required.
Google® Workspace	• No known usage.
Microsoft® 365	• The suite of products is largely used in the ETSI community. In particular, Microsoft Teams is supported by the ETSI IT team with a significant number of licences that are negotiated and updated on a regular basis.
ONLYOFFICE	• ETSI has initiated (under the Board supervision) a project to analyse, experiment (and ultimately implement) new working methods in ETSI and 3GPP. The tool is considered in this context.
Zoho Docs	• No known usage.
Zoom® Docs	• No known usage.

8.2.7 Cost

Costs are an important selection criterion. The most common model chosen by the providers is based on subscription (versus licensing fees with one-time payment), typically based on monthly, per-user/host billing when applicable. In some cases, several tiers are available, ranging from free to annual plans or enterprise agreements.

The detailed analysis of the costs can be found in clause I.2.2.

NOTE: Other costs (e.g. hardware, integration, technical support, training) also require consideration.

8.2.8 Preferred solutions

Table 8.8 presents a shorter list of tools and outlines the main reasons for their presence in the list.

Table 8.8: Preferred joint editing tools

Tool	Main reasons for selection
Microsoft® 365	Microsoft 365 includes some of the most widely used productivity tools used globally and includes Office software such as Word and PowerPoint® which has become synonymous with presentations at events and in meetings. The software is interoperable on platforms including mobile and portable devices and integrates well with other collaborations tools for screen sharing and joint editing. Microsoft® has a long history in ensuring that Microsoft® 365 is usable by persons with disabilities and this is reflected in the high level of use by those with disabilities. The inclusion of a high-quality accessibility checker in Microsoft Word and Microsoft PowerPoint helps ensure that shared content can be accessed by anyone with a disability.
Google® workspace	Google® workspace is also widely used by many people with disabilities and is fully compatible with Microsoft® 365. As a predominantly cloud based solution it has some limitations when compared to the installable applications but offers a simple-to-use collaboration tool via Google® drive and the specific applications. Importantly the tools are available and usable on all platforms including phones and tablets. Many of the applications can be downloaded for free onto devices meaning that those unable to purchase other products can still participate in shared editing.
Dropbox®	Dropbox® is one of the long-standing file sharing systems that has introduced collaborative functions in recent years. Unlike Microsoft® 365 and workspace, Dropbox® can allow editing of files using whatever compatible software that the user has as the storage is independent of the editor. Files can be downloaded locally or kept in the cloud to support those with limited storage space on local machines.
Zoom® Docs	Zoom® docs is the most recent addition to the collaboration tools outlined. It is included as a preferred option due to its seamless integration with Zoom® videoconferencing tools allowing easy of transition from discussion to online collaboration and review during a meeting.

8.2.9 Best practices

Including people with disabilities in joint editing requires accessible technology, and inclusive practices to support each participant's specific needs. The following guidelines provide practical steps to ensure that joint editing is effective, and accessible for everyone.

The choice of a supporting technology should be made on platforms that comply with recognized accessibility standards such as the Web Content Accessibility Guidelines (WCAG) [i.3] and Section 508 [i.11] in the U.S.

Some key features should be evaluated carefully. Collaborative features like comments and chat functionalities should be accessible to screen readers and provide visual cues. Other features such as keyboard navigation, colour contrast and text size, Alt text for images should also be taken into consideration.

Additional features of the tool are important for improving the user experience, such as:

- Real-time editing, version control, and comment threading.
- Responsive Design to ensure that the tool works well on different devices, including mobile and tablet interfaces, so that users can edit documents in various environments.
- Personalized settings that allow users to modify aspects of the interface, such as colour schemes and text size, to suit their individual needs.
- Accessible documentation and training materials relating to accessibility.
- Consistent user interface layout and design throughout the tool to provide predictability, which helps all users navigate more comfortably.

During the joint edition of the jointly-edited document, it is also important to define a document structure to create a logical content hierarchy that assists users in navigating the jointly-edited document (e.g. by using headings). Similarly, it is useful to avoid time constraints (as much as possible) to allow users to complete tasks without time limits or provide the option to extend time as needed.

Once a tool has been selected, it is useful to conduct regular accessibility audits using automated tools and manual testing with actual users to identify and fix accessibility issues, with the help of a diverse group of users in usability testing to cover different types of disabilities.

Moreover, it is essential to provide feedback mechanisms to all participants, particularly those with disabilities, with simple, accessible way for users to report accessibility issues or suggest improvements to the platform.

8.3 Evaluation of Presentation tools

8.3.1 Presentation and the collaboration meetings context

Nowadays, presentation mostly occurs in the context of online or hybrid collaborative meetings for which a videoconferencing tool is used. This conferencing tool offers a transparent support for the presentation tool used by each participant. Some of these tools have a strong focus on interactivity (e.g. with polls or voting) but, considering the context in which the selected presentation tools will be used (i.e. standards document development), they have not been integrated in the evaluation.

Considering this, the candidate tools can be general purpose or specific to a given platform (e.g. macOS) and are evaluated on their merits as standalone software, with a particular focus on their accessibility features and the support they have from the SDOs.

8.3.2 Evaluation criteria

The main criteria addressed for the evaluation and selection of the tools are:

- Major Features.
- Accessibility Features.

In addition, some Security and Privacy criteria (not analysed here) can be of interest for an individual or organization choice:

- Encryption of stored and shared presentations.
- Control over presentation access (view, edit, share).
- Secure links for external sharing.
- Data compliance with industry standards.
- Protection of confidential slides and speaker notes.

8.3.3 Identification of candidate tools

An initial list of candidate tools has been selected from the most significant tools/platforms available on the market and, as much as possible supported by one or more SDOs or DPOs.

Amongst the criteria to evaluate the major features are the following ones:

- Multi-user collaboration on slides.
- Offline access and synchronization.
- Export options (PPTX, PDF, EPUB, HTML).
- Slide-based presentation structure.
- Integration with videoconferencing tools.

The list of tools identified, presented in alphabetic order, and further analysed is summarized in Table 8.9.

Table 8.9: Scope and major features of presentation tools

Tool	Scope and Key Features
Apache® OpenOffice Impress	Impress is the presentation component of the Apache OpenOffice suite, an open-source and free alternative to commercial office software: • Free with no licensing fees. • Limited online collaboration features. • Available on Windows, Linux, and macOS. • Supports various file formats (e.g. PPTX). • User interface familiar with traditional presentation software. • Offers templates, animations, and multimedia integration options.
Apple® Keynote	Keynote is a presentation software application, part of the Apple iWork suite, primarily dedicated for macOS and iOS devices: • intuitive and visually appealing interface. • Seamless syncing across Apple devices via iCloud. • Exports presentations in multiple formats (e.g. PDF, PPTX). • Offers high-quality templates, themes and cinematic transitions. • Supports Apple Pencil for precise drawing and annotation. • Less commonly used in corporate environments than Microsoft PowerPoint. • Limitations and compatibility issues in cross-platform collaboration.
Canva	Initially known as a graphic design tool, Canva has become a versatile presentation platform: • User-friendly interface accessible without graphic design experience. • Supports real-time collaborate on design projects. • Drag-and-Drop Interface simplifying the design process. • Large library of templates, free/paid photos, icons and illustrations. • Some issues with export quality or version control.

Tool	Scope and Key Features
Google® Slides	Slides is a web-based presentation tool emphasizing ease of use and real-time collaboration: • Multi-users collaboration with changes updated in real-time. • Automatically saves presentations in Google® Drive. • User-Friendly Interface adapted to all skill levels. • Integration with Google® Workspace tools (e.g. Docs, Sheets, Gmail). • Various export formats (with a few compatibility issues). • Free for a user with a Google account. • Less feature-rich than Microsoft PowerPoint.
Haiku Deck	Presentation tool focusing on visual storytelling and simplicity, making creating slides with strong imagery without extensive training: • Minimalist design encouraging clear and concise messaging. • User-friendly interface supporting quick presentations design. • Emphasis on images with a large library of high-resolution images. • Limited options for exporting in different formats (e.g. PPTX, PDF). • Access and edit from any device with internet connectivity.
Microsoft® PowerPoint	A classic presentation tool that has been largely used in professional environments for decades: • Real-time collaboration with cloud support (e.g. Microsoft® OneDrive). • Works seamlessly with other Microsoft® Office 365 applications. • User-friendly interface accessible without graphic design experience. • Easy Integration of multimedia (images, videos, audio, animations). • Includes templates, slide transitions, animations, presenter notes, etc. • Fewer customizing options for templates and designs than other tools.
Prezi	Prezi has opted for a non-linear presentation style, which enables users to create dynamic storytelling experiences: • Multi-users collaboration with changes updated in real-time. • Zooming in and out instead of traditional slide-to-slide transitions. • Non-linear navigation, jumping between topics and ideas for presentations aiming to tell a story or present interconnected ideas. • Integration with other software and platforms, such as Google Drive.
Visme	A versatile design tool for creating presentations involving the integration of various multimedia elements: • Multi-users collaboration with changes updated in real-time. • User-Friendly Interface adapted to all skill levels. • Rich Visual Library with a wide range of icons, charts, and images. • Analytics features to track engagement and performance metrics. • Branded templates and assets creation for brand consistency. • Limited export options, particularly in the free and lower-tier plans.
Zoho Show	Part of the Zoho Office Suite, Zoho Show is a cloud-based presentation software. It offers features for online creation and collaboration: • Multi-users collaboration with changes updated in real-time. • Integrates with other Zoho apps and various third-party services. • Works on various devices (desktops, tablets, and smartphones). • Exports presentations in multiple formats (e.g. PDF, PPTX). • Intuitive and user-friendly interface, accessible at all skill levels.

8.3.4 Accessibility features

Amongst the accessibility features deemed important are the following ones:

- Screen reader support for slide content.
- Automatic and manual captions for presentations.
- Keyboard navigation and shortcuts.
- Support for sign language interpretation overlays.
- Colour contrast and font size customization.
- Audio descriptions for visual elements.

The detailed analysis of the privacy and security features can be found in Table 8.10.

Table 8.10: Accessibility features of presentation tools

Tool	Accessibility Features
Apache OpenOffice Impress	• Slide Navigation using keyboard shortcuts, which can assist those who may have difficulty using a mouse. • Alternative text to describe visual elements in support those who rely on screen readers to understand the content of a presentation. • Slide show options to customize how slides are presented, allowing for more control over pacing and delivery. • Export presentations to PDF which can be more accessible in some contexts and include bookmarks and searchable text. • Accessible Fonts and high-contrast colour schemes. • No built-in screen reader but compatibility with external screen readers and accessibility tools on various operating systems.
Apple Keynote	• Apple's screen reader (VoiceOver) reads aloud the screen content, allowing blind users and those with low vision to navigate through presentations. • Supports a variety of keyboard shortcuts for navigating and editing presentations, making it easier for users who cannot use a mouse. • Customization of text size and font styles to ensure legible content. • Selection of colour schemes and themes with high contrast, ensuring that text is easily readable against the background. • Screen zoom on parts of the screen for better visibility. • Alternative text for images that can be read by screen readers. • Closed Captions can be added to videos in presentations. • Support of live caption during presentations. • Support of various pointer devices, and gestures customization. • Accessibility Inspector usage to check accessibility standards.
Canva	• Compatibility with screen readers to have access to text descriptions, menus, and other elements on the platform. • Keyboard shortcuts to facilitate navigation and editing without requiring a mouse. • Customisable text size, font style, and colour. • Colour contrast suggestions and tools to help create visually accessible designs. • Alternative text descriptions for images. • Pre-designed templates and accessible design tools. • Captioning can be added to videos. • Accessibility Checker allowing to check designs for accessibility.
Google Slides	• Compatible with screen readers like ChromeVox, JAWS, and NVDA. • Users can navigate through presentations using keyboard shortcuts. • Users can add alt text to images which enables screen readers. • No built-in high contrast mode, but high contrast settings in the underlying operating system can be used. • Keyboard shortcuts for various actions, enabling users who may not use a mouse to navigate easily. • No dedicated accessibility checker but built-in capabilities to help identify and resolve accessibility issues. • Closed Captioning in Presentations.
Haiku Deck	• Compatibility with screen readers. • Keyboard shortcuts navigation. • Alt Text for Images. • High contrast themes providing high contrast options. • Customisable text size for better readability. • Simple and clean layouts emphasizing clarity and simplicity.
Microsoft PowerPoint	• Built-in accessibility checker to evaluate accessibility issues and provide suggestions for improvement. • Alt Text for Images. • Predefined slide layouts ensuring that content is structured in a way that is easier for screen readers to interpret. • Customisable fonts and colours to improve readability. • Keyboard shortcuts to navigate the application without a mouse. • Compatibility with screen readers. • Closed captions or subtitles added to embedded videos. • Accessible hyperlinks to improve navigation. • Accessible fonts improving readability and adjustable font sizes for better visibility.

Tool	Accessibility Features
Prezi	• Screen reader compatibility. • Keyboard shortcuts to allow users to navigate without a mouse. • Adjustable text size. • Alt text for images. • Customisable colour schemes for better text and background contrast. • No native support of closed captioning, but users can embed videos with captioning or provide text alternatives for audio content. • Options for creating accessible layouts and designs.
Visme	• Screen reader compatibility. • Keyboard shortcuts improving access without using a mouse. • Alt text for images and graphics. • Colour schemes maintaining sufficient contrast between text and background. • Customisable fonts with clear readability and adjustable text sizes. • Support of closed captions and transcripts for multimedia content. • Templates are designed with intended accessibility support. Users can modify them to enhance their accessibility features.
Zoho Show	• Screen reader compatibility. • Keyboard shortcuts allowing navigation without using a mouse. • High contrast mode or customisable colour themes to enhance readability by improving colour differentiation. • Alt Text for images. • Accessible templates with some accessibility, ensuring text is legible.

8.3.5 ETSI Support

Presentation tools are essential for sharing ideas and proposals, making updates on the team progress, and are routinely used during the meetings where industry experts, practitioners, and regulatory authorities, work together to create, review, and finalize standards.

As already mentioned in clause 8.3.1, the presentation tools are used on an individual device (based on a user or company choice) and the presentations are channelled through the videoconferencing tool used during the meeting where the presentation takes place. Consequently, the SDOs have essentially organized themselves (and their IT department in particular) to make sure that the usage of a specific presentation tool is coherent with the way the videoconferencing tools supported are working.

The level of support provided by ETSI is largely based on the tool usage within the ETSI community (e.g. Technical Committees, Open-Source projects) as seen from the ETSI IT team:

- There is no known usage of the tool within the ETSI community.
- The tool is used by some members of the ETSI community.
- The tool is largely used within the ETSI community.

Table 8.11 outlines the level of support of each candidate tool by ETSI, evaluated based on feedback and information gained in a specific meeting with the ETSI IT team.

Table 8.11: ETSI support for presentation tools

Tool	ETSI Support
Apache OpenOffice Impress	No known usage.
Apple Keynote	No known usage.
Canva	The tool is used in the ETSI secretariat for presentation in events.
Google Slides	No known usage.
Haiku Deck	No known usage.
Microsoft PowerPoint	The tool is overwhelmingly used in the ETSI community on a variety of devices (computers, tablets) with several operating systems.
Prezi	No known usage.
Visme	No known usage.
Zoho Show	No known usage.

8.3.6 Cost

Costs are an important selection criterion. The most common model chosen by the providers is based on subscription (versus licensing fees with one-time payment), typically based on monthly, per-user/host billing when applicable. In some cases, several tiers are available, ranging from free to annual plans or enterprise agreements.

The detailed analysis of the costs can be found in clause I.3.1.

NOTE: Other costs (e.g. hardware, integration, technical support, training) also require consideration.

8.3.7 Preferred tools

Table 8.12 presents a shorter list of tools and outlines the main reasons for their presence in the list.

Table 8.12: Cost considerations for presentation tools

Tool	Main reasons for selection
Microsoft PowerPoint	Microsoft PowerPoint in a part of the Microsoft office suite and Office 365. Each element of the suite integrates well allowing users to draft parts of presentations in one tool and import that content into a presentation. PowerPoint has become synonymous with presentations at events and in meetings. The software is interoperable on platforms including mobile and portable devices and integrates well with other collaborations tools for screen sharing and joint editing. Microsoft has a long history in ensuring that Microsoft PowerPoint is usable by persons with disabilities, and this is reflected in the high level of use by those with disabilities. The inclusion of a high-quality accessibility checker helps ensure that presentations made by any participant are open to access by anyone with a disability.
Google Slides	Google slides offer a low-cost option for presentations that is compatible with decks developed in Microsoft PowerPoint. It works well with most videoconferencing solutions and the content created in Google slides can be downloaded as a Microsoft PowerPoint deck for use on a local machine. Google slides offer most accessibility features that are required and allows those unable to purchase subscriptions to Microsoft Office 365 or PowerPoint to prepare and share presentations with other participants.
Canva	Canva is popular for creating digital content for a range of purposes and offers a wide range of customizable templates that can be edited collaboratively and used with both Microsoft PowerPoint and Google slides. Canva should not be used to replace those applications but instead offers additional features and functions that can be helpful in making meetings and presentations more engaging for participants. Other enhancements such as Mentimeter can also be helpful for promoting interactive presentations.

8.3.8 Best practices

In delivering presentations in meetings that are inclusive of people with a disability the following factors should be considered regardless of the specific technical solution that is chosen:

1) Accessible Content:

- Clear fonts should be used: Sans-serif fonts like Arial, Calibri, or Verdana are easier to read. The text size should be large enough (at least 24 pt).
- High contrast: Good contrast should be ensured between text and background (e.g. black text on a white background). Using colour alone to convey meaning should be avoided.
- Plain language: Simple, clear language should be used, avoiding jargon wherever possible.
- Describe visuals: When charts, images, or videos are shown, they should be verbally described so people who are blind or have low vision can understand.

2) Accessible Delivery:

- Presenters should speak clearly and at a steady pace. It helps people who process information differently or are using interpreters or captioning.
- Presenters should face the audience when speaking, so people who lip-read can see them.

- Sign language interpreters should be provided if requested.
- Microphones should be used even if they do not appear to be required - some people rely on assistive listening devices.

3) Accessible Materials:

- Slides and handouts should be provided in advance, if possible, in accessible formats (Word documents, tagged PDFs).
- Alt text should be used on digital materials for images.
- Videos should be captioned and ideally have audio descriptions.

4) Inclusive Interaction:

- Audience questions should be repeated before answering so everyone hears them.
- Different ways to participate should be allowed (e.g. verbally, in writing, or using digital chat).
- Timing is important: Extra time should be planned for Q&A or for people who may need more time to process and respond.

5) Ask and Listen:

- The accommodations required by participants should be clarified in advance, and feedback about the accommodations provided should be invited after the meeting.

6) Accessible Environment:

- Seating areas, ailes, bathrooms, and stage areas should be accessible with a wheelchair.
- Reserved seating: Spaces should be offered for wheelchair users and for people who need to sit close for hearing or vision reasons.
- Lighting: Strobe effects or flashing lights should be avoided. If they have to be used, a warning in should be provided in advance.

Annex A: Specification of necessary updates to the meeting registration tool in the ETSI portal

A.1 Introduction

This annex describes in detail the necessary changes to be made to the ETSI Portal in order to allow meeting participants to register accessibility requirements.

A.2 Overview

Participants registering for an ETSI meeting will be able to indicate their specific accessibility requirements (if any). The following overview lists the changes to be made to the registration process:

1) The request for accessibility support will be indicated in the context of "Set options for (meeting)" (see clause A.3.1).

2) There will be a yes/no drop-down list for indicating need for support. The default will be "no" (see clause A.3.2).

3) Selecting "yes" will lead to the display of a list of options several of which can be selected (see clause A.3.3).

4) If accessibility requirements have been selected, the TC chair, the host (if meeting is external) and the ETSI accessibility ombudsperson will be informed (see clause A.3.4).

5) In case of need for clarification, the TC chair and/or the host will (optionally) contact the participant to discuss details.

NOTE: It will be important for the organizer of the meeting to open up the registration early enough for participants being able to register requirements that may take some lead time (e.g. organizing sign language translation or a human captioner).

A.3 Changes to the registration process

A.3.1 Location of the new UI controls for the registration of accessibility requirements

The request for accessibility support will be indicated in the context of "Set options for (meeting)" of the registration dialog (page Meetings registration), see Figure A.1.

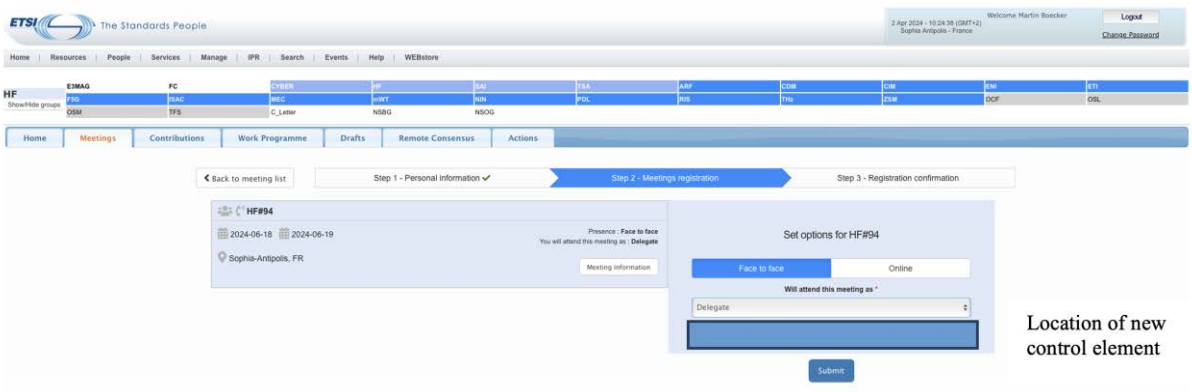

Figure A.1: Location of new UI elements

A.3.2 Yes/no selection for registering accessibility requirements

A yes/no drop-down list will be offered for indicating need for support. The default will be "no".

Figure A.2: Yes/no drop-down list, as appearing when first displayed

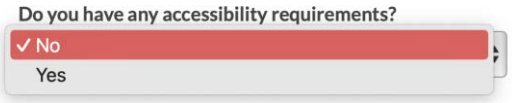

Figure A.3: Yes/no drop-down list, as appearing when selected

The three possible cases of the interaction with that UI element are listed in Table A.1 with their consequences for the dialog flow.

Table A.1: Interaction with Yes/no UI drop-down list

Case	User interaction	System Response	Next step
Case 1	User ignores yes/no drop-down list	Default option "no" applies	Upon selecting "Submit" the user is taken to the next regular step of the registration process
Case 2	User selects "no"	Default option "no" applies	Upon selecting "Submit" the user is taken to the next regular step of the registration process
Case 3	User selects "yes"	Dialog for specifying requirements opens	Next step described in clause A.3.3

A.3.3 Selecting "yes"

Selecting "yes" will lead to the display of a list of options several of which can be selected.

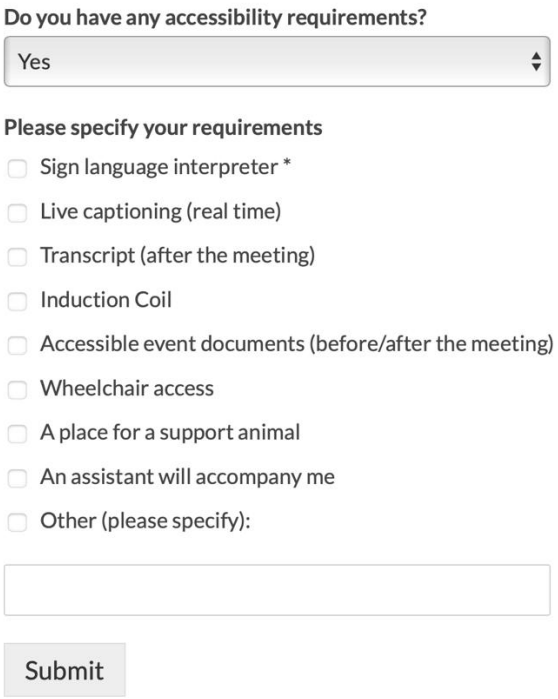

Figure A.4: Options (checkboxes *n* of *m* and "other"), displayed once "yes" is selected

1) Users may select one or several of the checkboxes, and, optionally, "Other", allowing them to enter text (e.g. up to 256 characters).

2) The step is concluded by pressing the "Submit" button.

3) Entering text in the "Other" text field will automatically select "Other (please specify)".

4) If "Submit" is pressed without any checkbox being selected and without an entry in the "Other" text field, the "regular" registration process continues, i.e. the message to the host/committee chair will not be sent.

5) If "Submit" is pressed and at least on checkbox has been selected, the committee chair, the host (if meeting is external), and the ETSI Accessibility Ombudsperson will be informed by a text message (see clause A.3.4).

6) The registered participant will receive an information (by email) that his requirements have been registered and that he will be contacted by the meeting host in case of any necessary clarifications.

NOTE: If possible, the options could be implemented such that more information can be displayed if requested (e.g. in the form of a tooltip or an icon ⓘ).

A.3.4 Message to host/committee chair

If the registration process is successfully completed and the participant has chosen to register one or several accessibility requirements, an automated message (e.g. an email) will be sent to:

1) The chairman of the committee organizing the meeting.

2) The Technical Officer of the Technical Body organizing the meeting.

3) The external host (if the meeting is taking place outside of ETSI premises).

4) The ETSI Accessibility Ombudsperson (once nominated).

The text of the message will be:

"This is a message that has been automatically generated in order to inform you that participant <participant name> has registered for <meeting> and has indicated the following accessibility requirements:

1) <Accessibility requirement 1>

2) <Further requirements, if any>

3) <Text of "Other field", if any>

Please ensure that these requirements be met.

If you have any need for clarification, please contact the participant: < email address of participant>".

Annex B: Informal guidance for meeting hosts

B.1 Introduction

The purpose of this annex is to provide the text for a more informal guide to meeting hosts, addressing them directly and making the information of clause 5 available in a more direct and hands-on way. A version of the text could be prepared in the form of a brochure to be delivered to meeting organizers (e.g. on request or as part of the message informing them about participants indicating accessibility requirements.

B.2 Proposed text for informal guidance document

So you are planning to host an ETSI meeting…

As you know, the revised registration procedure for ETSI meetings allows participants to indicate accessibility requirements whereupon the host (and the TC chair) are informed by email about this request.

If you have received such an email and are unsure what to do, this brochure is for you.

The first and most important advice we would like to give you is to reach out to the participant and discuss their requirements with them. This way, you ensure that you understand what is needed. This may not just be technical or organizational support, but also touch on questions related to meeting etiquette.

What follows is concrete advice on specific requirements participants may have, depending on their type of sensory or cognitive needs. The advice applies to both meetings on the ETSI premises and to meetings outside of ETSI, and it covers on-site and online participation with accessibility requirements. You find more detailed information about all the topics raised in clause 5 of ETSI EG 204 076, and we encourage you to have a look at that ETSI Guide.

One of your participants is blind or has low vision

People who cannot see at all or have limited eye sight may need assistance in various phases of the meeting. Here is how you can help them.

Getting to the meeting venue:

- Check with the participant whether they need information on or help with getting to the meeting venue. This includes options for local transport from an airport or train station to the meeting venue and any information they may find useful for getting around the building (e.g. a floorplan, printable or, if at all possible, in 3D print). Guests with limited sight may also benefit from a guided tour of the meeting floor allowing them to become familiar with the venue layout.

- Make sure that the paths participants will have to use are clear of obstacles and that any temporary barriers are marked or announced. Tactile floor indicators, such as tactile strips or raised guide paths, leading to key areas like entrances, exits, meeting rooms, and restrooms may be appreciated, as may be Braille indicators in lifts.

Before the meeting:

- Make sure that blind participants or those with low vision can download all documents related to the meeting (agendas, minutes, documents to be discussed and/or approved) in formats that are compatible with screen readers and other accessibility technologies used by blind people. In most ETSI meetings, those will be Microsoft Word, PDF and Microsoft PowerPoint files. It helps people with limited sight to have a chance to study those documents before the meeting using the tools they prefer (e.g. screen readers).

If they bring their own assistive technology:

- Blind participants or those with low vision may use accessibility technologies such as screen readers and Braille displays for reading documents. If that is the case, make sure that the venue provides necessary connectivity (e.g. power outlets, Wi-Fi®) and technical support and Wi-Fi/data connectivity for these devices, as needed.

- Check that the meeting room includes the possibility for audio descriptions or other aids that visually impaired participants may require.

When participants make a presentation:

- Slides presented during the meeting should be made available (i.e. uploaded to the meeting files area) prior to the meeting so that blind participants or those with low vision may read them in real time using their own assistive technologies.

- If real-time collaboration or editing is carried out, if polls are made or whiteboard are being used (this so far is rare during ETSI meetings but may happen more frequently in the future), make sure that all participants can actively take part in the process, e.g. necessary plugins for videoconferencing support are available.

- If participants are aware of the presence of blind participants or those with low vision, they may refrain from making references to contents on the slides that cannot be understood by a blind person (i.e. visual elements should be described verbally and key information should not solely be reliant on visual aids).

- Participants with low vision benefit from documents and presentation files that are well designed. This includes the fonts and typeface (Arial and Helvetica are preferred), the design and layout (e.g. left-aligned text with sufficient space between words and lines, and, of course, a sufficiently large font size), and reasonable use of colour and contrast (sharp contrasts such as black text on white or yellow is ideal). Using the ETSI Microsoft PowerPoint templates for presentations takes care of most of these constraints.

Offering onsite support during the meeting:

- Blind participants or those with low vision need support for navigation and accessing meeting resources. Make sure that help is provided when needed (e.g. this can be a meeting participant accompanying a blind participant to the restrooms). If at all possible, trained staff or volunteers are available who can assist visually impaired participants with navigation and accessing meeting resources. These assistants should be available at key points such as registration desks, break areas, and session rooms to offer guidance as needed.

During breaks and lunch:

- Ensure that break and lunch areas are accessible to blind participants and those with low vision. This includes having clearly marked paths to these areas and arranging seating in a way that minimizes obstacles. It may also involve providing assistance with food selection or tray transportation upon requested.

- Communication plays a vital role, so a verbal overview of the food layout should be offered, describing the location of items like sandwiches or drinks. Individually plated meals or pre-packaged items can simplify access to food, while buffet arrangements should have staff or volunteers available to assist with selecting and serving items. High-contrast labels or Braille menus can assist attendees with partial vision or blindness.

After the meeting:

- Some documents such as minutes and recordings are provided after the meeting. Those, too, should be made available in accessible formats.

- Provide a feedback mechanism that allow participants to share their experiences and suggest improvements. This feedback should be used to continuously enhance the accessibility of future meetings.

One of your participants is deaf or hearing impaired

Deaf people or those with hearing impairments may need some support to be prepared prior to the meeting.

If sign-language support is needed:

- Clarify with the participant, what is needed. This includes questions such as what kind of sign-language needs to be provided (e.g. American or British Sign-language, International Sign), whether they know interpreters who can provide the service, whether more than one interpreter will be needed, and whether they will have to be present in person or can offer their services online.

- ETSI has online resources that help you choosing a qualified interpreter (ask the ETSI Accessibility Ombudsperson or the TC HF chairperson, if unsure). And make sure, there is no misunderstanding about who is going to pay for the service.

- Explain to the meeting participants, that when deaf participants or hearing impaired ones are present in the meeting, an appropriate etiquette should be applied, giving participants and/or sign-language interpreters a chance to follow what is being said. This includes turning on one's camera when speaking and speaking clearly.

If speech-to-text functionalities (captioning) are needed:

- Speech-to-text captioning is the real-time synchronized provision of spoken content. This is a great help for people with hearing impairments.
- Automatic captioning is a functionality of many electronic meeting platforms (e.g. Zoom) and may be sufficient. In some cases, human-supported real-time captioning may be required. Check with the participant what is needed.

If technical support is needed:

- Some assistive technology helps participants in interacting with others and in following in what is being said.
- High-quality microphones, T-coils (inductive loops) and Assistive Listening Devices (ALDs) interact with participants' hearing aids, improving their listening performance. Those devices can be borrowed from ETSI for meetings inside and outside of ETSI premises (contact the ETSI Accessibility Ombudsperson and/or the TC HF chairperson to learn more about how to borrow and use those devices).
- Ask the participants beforehand whether they need any additional technical support.

Offering support for participants with mobility disabilities

Participants with mobility disabilities require some consideration in planning the meeting - from their arrival in town to the social evening.

Accessing the meeting venue:

- Clarify with the participant, whether they need support getting to the venue (e.g. by taxi or public transport) and to the meeting room itself. Ramps and/or elevators (and ideally automatic doors) enable a participant in a wheelchair to move freely and getting to all places they need to reach throughout the meeting (e.g. restrooms and the places for meals and coffee breaks). And, of course, all items should be within arm-reach to a person in a wheelchair).
- It is a good idea to perform a "dry run" prior to the meeting checking that all routes participants will take are clear and that there are no obstacles in the way.
- All places for events during the meeting (e.g. lab visits or social evenings in restaurants) should be reachable by everybody without any complication. To exclude a participant with a mobility disability from those events is not acceptable.

One of your participants has indicated a cognitive or intellectual disability

If one of the participants of your meetings has registered indicating a cognitive or intellectual disability, bear in mind that people with cognitive or intellectual disabilities encounter a wide range of challenges and needs. These may include conditions such as dyslexia and autism as well as lack of short or long-term memory as a result of head injury or other trauma. This does not mean they cannot contribute meaningfully to the meeting; many cognitive conditions do not indicate low intelligence but rather translate into difficulties in interacting with groups or presenting and sharing ideas. You can support them in a variety of ways described below. At any rate it is a good idea to reach out to them and ask them how you can support them best. We recommend consulting the more detailed recommendations in ETSI EG 204 076.

The physical environment and meeting planning:

- Plan for additional breaks and be prepared to allow for giving the participant additional time for sharing their thoughts. They may also indicate that it would be best to let a topic rest for the moment and pick it up at a later time.
- Strong smells, bright lights, or loud noises may be difficult to endure for a participant with cognitive or intellectual disabilities and should, therefore, be avoided.

Interacting with participants with autism or other cognitive disabilities:

- The other participants should not feel offended by a participant's behaviour of avoiding eye contact or of consulting frequently their assistive technology (e.g. apps on smart phones). If the participant with cognitive or intellectual disabilities agrees (or even asks for it), the meeting can be informed about the participant's condition to avoid misunderstandings.
- Ask them whether they require additional support for participating in the non-technical programme of the meeting (e.g. lunch, dinner, or demonstrations).
- As in all other cases, a meeting etiquette ensuring mutual respect is key.

Meeting etiquette in support of accessibility

ETSI's code of conduct for meetings already calls for decent and respectful behaviour towards all participants. Informing the participants of a meeting about the presence of a participant with accessibility requirements may be helpful provided that the participant in question agrees with or asks for such a briefing. This may include the need for speaking clearly and facing the camera or refraining from making visual references during a presentation that prevents a blind person from understanding the points being made.

Other behaviours expected from participants include only one person speaking at a time, no interrupting, and turning on the camera in online participation (either throughout the meeting or at least when speaking).

In a nutshell

- It is your job to ensure that all participants of the meeting can contribute in an equitable way.
- A lot of guidance is available to help you with that task.
- ETSI (e.g. the ETSI Accessibility Ombudsperson and the TC HF chair) can help you with advice and concrete support (e.g. by lending you equipment such as T-coils (inductive loops) and Assistive Listening Devices (ALDs).
- Reach out to the participant with accessibility requirements to make sure you understand what is needed.

Annex C: Accessible written materials and tactile signage

C.1 Further recommendation to support the accessibility of written materials used during a meeting

For the larger group of persons with low vision, organizers should ensure that full access to all the information is ensured. Individuals with low vision require materials tailored to their specific conditions, many vision impairments cannot be corrected with glasses. Take into consideration the following points:

Clear Print Standards:

- To meet accessibility standards, documents should use a minimum font size of 14 for clear print and 16 to 22 for large print. Producing materials in multiple formats, such as audio, Braille, and digital, should be factored into production schedules and budgets to accommodate diverse preferences.

Fonts and Typeface:

- Sans-serif fonts like Arial, Helvetica or Tahoma are recommended for better readability, while handwriting should use thick lines and felt-tip pens. Avoid using italics, underlining, or excessive capitalization, as these can reduce legibility. Bold or semi-bold headings are appropriate, but emphasis in body text should be used sparingly.

Design and Layout:

- Printed materials should have a clear and consistent design. Text should be left-aligned to aid readability, with sufficient spacing between words and lines. Columns should be short and not too close together. Long paragraphs and hyphenation should be avoided. Content should never be placed near folds or printed over images to ensure clarity.

Colour and Contrast:

- Sharp contrasts, such as black text on white or yellow backgrounds, are the most effective for readers with low vision. Switching frequently between light-on-dark and dark-on-light text should be avoided as it can strain the eyes. Reversed type (light text on a dark background) requires bolder and larger font sizes.

Paper Stock:

- To minimize glare, a matte finish is preferred over glossy surfaces. Thin paper can cause print to show through from the reverse side, which can confuse readers. A paper weight of at least 100 gsm is recommended.

Numbers and Forms:

- Numbers should be distinct to prevent confusion. Writing numbers one through nine in full and using numerals for ten and above is advised. Forms should provide enough space for individuals with larger handwriting and ensure text labels are clearly associated with the input areas.

Braille and Audio Formats:

- Although only 3 % of blind persons or those with low vision read Braille, it remains an important medium for those who do. Braille materials require a thicker paper stock to prevent damage during use. Audio materials, such as MP3 files, should include clear indexing and concise, clear narration.

Digital Formats:

- Digital formats, such as text-only files on disks or CDs, are increasingly popular among users with low vision due to advancements in speech technology. These formats should be compatible with screen readers and other assistive technologies.

To ensure accessibility in meetings, formats like HTML or plain text emails for invitations should be used to make them compatible with screen readers and other assistive device for persons with low vision. Organizers should share agendas and materials in advance, using accessible formats such as Microsoft Word documents, HTML, or properly structured PDFs with features like headings, alt text for images, and tagged tables for data. Test the chosen meeting platform for screen reader compatibility, including tools like JAWS, NVDA, or VoiceOver. Additionally, organizers and facilitators should provide materials in Braille or large print upon request. This is important for blind attendees.

C.2 Tactile and High-Contrast Signage

Request information from hosts regarding the availability of tactile and high contrast signage. This is a highly desirable contribution to the engagement of blind and persons with low vision in ETSI meetings.

Meeting hosts are encouraged to use high-contrast, tactile signage to help blind participants and those with low vision locate important areas such as entrances, exits, restrooms, and emergency exits.

To create tactile and high-contrast signage for meetings, incorporate raised text or Braille for labels and instructions, ensuring tactile elements are at least 0,8 mm high for easy detection. Include simple shapes or symbols for universal understanding. Use sharply contrasting colours such as white text on a black background or yellow on dark blue, with a contrast ratio of at least 70 % to accommodate individuals with low vision. Choose sans-serif fonts like Arial in a sufficiently large size, avoiding italics or decorative fonts, and keep the text concise.

Place the signage at a height of 48 - 60 inches / 1,2 - 1,5 m from the floor to ensure it is easily reachable for touch and position it in well-lit areas without glare. Use durable, non-reflective materials for tactile elements to avoid visual and tactile interference. Braille should follow recognized standards, such as Grade 1 or Grade 2, to ensure accessibility. Combining these elements will ensure the signage is effective for visually impaired individuals in a meeting environment.

NOTE: Clear, high-contrast signage enhances wayfinding for blind participants and those with low vision and is especially helpful in large venues or unfamiliar locations.

Annex D: Recommendations and quality criteria for tool/service selection

D.1 General

Based on stakeholder and user feedback and informed by international guidelines, ETSI has compiled a concise list of quality criteria that should guide meeting hosts when selecting tools and/or services such as speech-to-text or sign language interpreting.

This list is not exhaustive but can be considered a set of minimum requirements as of January 2025. With the pace of technological development, this list will have to be updated at least on a yearly basis.

The list of minimum quality criteria for tool selection should be included in the guidance to ETSI meeting hosts and can be made available publicly via the accessibility page on the ETSI website.

D.2 Recommendations for selecting sign language interpreters

When hiring sign language interpreters for a meeting, the hosts/organizers should consider the following points:

- Determine whether interpretation into international sign or a national/regional Sign Language (SL) or a specific form of sign language (in case of deaf-blindness) is needed.
- WASLI certification is recommended for international sign.
- In case of national/regional sign language, ask the deaf participants if they have preferred interpreters.
- In case no preferred interpreters are named, consult the national database of SL interpreters (see list on ETSI website or contact national deaf association).
- In case of deaf-blindness, consult the European Deafblind Network and/or the national deafblind association (deaf-blindness will require that at least participant and interpreter are in the same room).
- Plan well ahead as there is a scarcity of qualified SL interpreters and they have limited availability.
- If sign language interpreters join remotely, make sure that the technical team is aware or supported by the remote SL service provider in configuring the conference platform for the SL interpretation experience (possibility to pin the SL interpreter window, etc.).

With regard to automated avatars and automated sign language interpretation, as of January 2025 these tools cannot replace human interpretation and are not accepted in the community. Given the speed of technological development and AI supported advancements, this statement should be reviewed on a yearly basis, and participants consulted on their real-life experience.

D.3 Quality criteria for selecting speech-to-text tools and/or services

Speech-to-text is a crucial tool for making meetings accessible to deaf participants and those with hearing impairments, but not sufficient for sign language users. It might be a minimum provision for deaf participants in webinars or broadcast-type events where participants are expected to passively follow. If it is an actual meeting with exchange and debate, sign language interpreters are obligatory for Deaf participation.

With regard to automatic speech-to-text tools, as of January 2025 these tools have improved but cannot replace human-supported captioning yet. They might help in spontaneous meetings for passive participation, but for meetings where interaction is required, human-support captioning is still necessary. Given the speed of technological development and AI supported advancements, this statement should be reviewed on at least a yearly basis, and participants consulted on their real-life experience.

When selecting tools and/or services for speech-to-text (also called captioning, also called subtitling) for a meeting, the hosts/organizers should consider the following points:

- Use human supported captioning (often called Speech-To-Text Reporting (STTR) in Europe and Communication Access Real Time (CART) service provider in the USA).
- Check their familiarity with the topic and vocabulary, and provide all meeting documents as well as the names of the participants in advance.
- Check if automatic captioning might be available for national languages if necessary (with the caution that automatic captioning has yet to improve).
- In case of online or hybrid meetings ensure that the used videoconferencing system offers an API for the integration of the captions.
- Ensure that the captioning service offers stream text in a separate browser window.
- Consider ability to access the captioning from the beginning of the session.
- Be aware that streaming text to the browser might be done via an open feed, which might be a security issue (that can be handled via a proxy URL requiring prior authentication, so only authorized participants can access the streamed text).
- Ensure that the captioning service provides a readable transcript.
- Check with captions provider if their transcription tool is compatible with screen readers and/or deaf-blindness requirements if necessary.
- When booking the captioning provider, ask for the training they provide to captioners.
- When booking the captioning provider include an agreement on follow-up procedures in case of underperformance.
- In case of deaf-blindness, additional options for the captions such as very large letters, different colours or simplified language might be needed.

D.4 Considerations for speech-to-text tools

Should automatic speech-to-text tools be used, the following should be considered:

- Accuracy (in spelling, punctuation, and grammar):
  - In English, the target should be one error per 2-3 minutes, or 0,1 % (accuracy 99,9 %), which is the level for a well-trained captioner.
- Quality of content (meaning and intention of the spoken material are faithfully reproduced in writing, providing equitable participation).
- Formatting (elements like font, text size and colour of captions can be personalized).
- Comprehensiveness (complete textual representation of the audio, including speaker identification and non-speech information).
- Readability (captions should be displayed long enough to be read completely, be in synchronization with the audio, and not be obscured by (nor do they obscure) the visual content).
- Captions should be displayed in 3 lines minimum and there should be the option to display on separate screen.
- Synchronicity (captions should not lag behind spoken content).
- Understanding of accents and dialects.
- Language and vocabulary coverage.

- Compatibility with widely used assistive devices like braille readers, screen readers, direct streaming devices (e.g. hearing-aids).
- Compliance with data protection regulations to safeguard sensitive meeting content, especially for proprietary or confidential discussions.
- Monitor advancements in AI-driven captioning tools, which could offer better performance for non-native speakers or accented speech, and evaluate annually with affected participants.

Annex E: List of sign language interpreter databases

ETSI has compiled a comprehensive list of databases for sign language interpreters. For international settings, it is advised to first consult the database of certified sign language interpreters by WASLI and WFD, as well as the database by AIIC, which also includes sign language interpreters.

For national sign language, reference should be made to the databases in the specific countries.

International:

- WFD-WASLI Accredited International Sign Interpreters
- International Association of Conference Interpreters (AIIC) (includes links to International Sign and National Sign Language interpreters)

Europe:

- European Disability Forum's sign language interpreter database
- European Forum of Sign Language Interpreters
- European Deafblind Network

EU Member States:

- Austria: Austrian Sign Language Interpreter Association
- Belgium: Association Belge des Interprètes en Langue des Signes (ABILS) & Professional Association of Flemish Sign Language Interpreters (BVGT)
- Bulgaria: List of sign language interpreters by Bulgarian Agency for Persons with Disabilities
- Croatia: Croatian Association of Sign Language Interpreters
- Cyprus: Cyprus Deaf Federation
- Czechia: Czech Chamber of Sign Language Interpreters
- Denmark: Association of Sign Language Interpreters (FTT) & Danish Interpretation Authority
- Estonia: Estonian Sign Language Interpreters' Association
- Finland: Finnish Association of the Deaf & Interpretation service for people with disabilities
- France: Association française des traductrices et interprètes en langue des signes (aftils)
- Germany: German Sign Language Interpreter Database
- Greece: Association of Greek Sign Language Interpreters
- Hungary: National Register of Sign Language Interpreters
- Ireland: Register of Irish Sign Language Interpreters (RISLI)
- Italy: Associazione interpreti di Lingua dei Segni (Anios) & Associazione Nazionale Interpreti di Lingua dei Segni (Animu)
- Latvia: List of sign language interpreters published by LNS Rehabilitācijas centrs
- Lithuania: Lithuanian Sign Language Interpreters Association
- Luxembourg: Sign language interpretation in Luxembourg
- Malta: Sign Language Interpreters

- Netherlands: Register of Sign Language Interpreters and Writing Interpreters Foundation
- Poland: Polish Sign Language Interpreters Association
- Portugal: Association of Translators and Interpreters of Portuguese Sign Language (ATILGP)
- Romania: National Authority for the Protection of the Rights of Persons with Disabilities
- Slovakia: Association of the Deaf of Slovakia
- Slovenia: Register of interpreters for Slovenian sign language
- Spain: Spanish Federation of Sign Language Interpreters and Interpreter-Guides (FILSE)
- Sweden: Swedish Sign Language Interpreters Association (STTF) & Interpretation centres in Sweden (including sign language)

European countries:

- Norway: National Register of Interpreters (including interpreters in Norwegian sign language, Norwegian written interpreters and interpreting for the deaf-blind) & Interpreting for the deaf, deafblind and hearing impaired
- Serbia: Association of Serbian Sign Language Interpreters
- Turkey: Association Of Turkish Sign Language Interpreters
- UK: RBSLI Qualified/Trainee and Registered British Sign Language Interpreters/Translators

US:

- NDA Deaf Interpreters Directory
- Registry of Interpreters for the Deaf, Inc.
- DeafBlind Interpreting National Training and Resource Center (DBI)

If you would like to comment or provide feedback on the information provided in the ETSI accessibility page, please use the feedback form: FEEDBACK (button).

Annex F: List of recommended tools and services, status January 2025

F.1 General

Based on the stakeholder feedback and stakeholder experiences, the following tools and services are recommended for making ETSI online, in person and hybrid meetings accessible as of January 2025.

F.2 STTR/CART captioning providers

Speech-To-Text Reporting (STTR) or Communication Access Real Time (CART) service providers are human-assisted real-time captioning services often used in live events, classrooms, and courts.

As of January 2025, the five STTR/CART providers foremost recommended by Disabled Persons Organizations (DPOs) are:

- Caption First (US based, real-time human CART)
  - https://www.captionfirst.com/
- 121 Captions (UK based, real-time human STTR)
  - https://www.121captions.com/
- MyClearText (UK based, real-time human STTR)
  - http://www.mycleartext.com/
- GRT Captioning (UK based, real-time human STTR)
  - https://globalrealtimecaptioning.com
- StreamText (Real-time text streaming for CART & transcription)
  - https://streamtext.net/ (accessible to screen readers)

Reasons for the high recommendations include: seamless integration in online meetings, good preparation and follow-up, contact person available during the event, stream-text available in separate window, edited transcript provided.

F.3 Automated Captioning & Transcription Systems

These tools generate automatic captions for live and recorded content using AI. As of January 2025, deaf and hard-of-hearing stakeholders expressed a strong preference for human-supported captioning. However, as technology evolves, the below listed tools might be worth monitoring.

Automatic Captioning Software:

- Rev.ai (AI-powered captions, supports multiple languages)
  - https://www.rev.ai/
- Verbit (Hybrid AI + human captioning for high accuracy)
  - https://verbit.ai/
- 3Play Media (Enterprise captioning with high accuracy)
  - https://www.3playmedia.com/
- Ava (AI-powered real-time captions with speaker identification)

  - https://www.ava.me/

- Otter.ai (AI-powered meeting transcription & note-taking)
  - https://otter.ai/

Live Captioning Tools:

- Web Captioner (Browser-based free live captioning tool)
  - https://www.webcaptioner.online/
- Google Meet Live Captions (Built-in AI captioning)
  - https://support.google.com/meet/answer/10964115?hl=en&co=GENIE.Platform%3DDesktop
- Microsoft Teams Captions (AI-powered automatic captions)
  - https://support.microsoft.com/en-us/office/use-live-captions-in-microsoft-teams-meetings-4be2d304-f675-4b57-8347-cbd000a21260
- Zoom AI Live Transcription (Built-in STT for meetings)
  - https://support.zoom.com/hc/en/article?id=zm_kb&sysparm_article=KB0058324

F.4 Sign language interpreter bureaus

- Overseas Interpreting
  - https://overseasinterpreting.com/team/

Annex G: Checklist for tool and service selection

Table G.1: Quality criteria for speech-to-text services

Quality criteria for speech-to-text services	Yes	No
Called human supported captioning: Speech To Text Reporting (STTR) or Communication Access Real Time (CART)		
Familiarity with topic and vocabulary, documents studies in advance		
Stream-text in browser window		
Edited/readable transcript provided		
API for Zoom and other video-conferencing platforms		
Display of cc configurable		
In case of deaf-blindness: additional options for captions, such as very large letters, different colours or simplified language might be needed		

Table G.2: Quality criteria for speech-to-text tools

Quality criteria for speech-to-text tools	Yes	No
Accuracy (in spelling, punctuation, and grammar)		
Equality of content (meaning and intention of the spoken material are faithfully reproduced in writing)		
Formatting (elements like font, text size and colour of captions can be personalized)		
Comprehensiveness (complete textual representation of the audio, including speaker identification and non-speech information)		
Readability (captions should be displayed long enough to be read completely, be in synchronization with the audio, and not be obscured by (nor do they obscure) the visual content)		
Synchronicity (captions should not lag behind spoken content)		
Understanding of accents and dialects Language and vocabulary coverage		
Compatibility with widely used assistive devices like braille readers, screen readers, and hearing aids		
Compliance with data protection regulations to safeguard sensitive meeting content, especially for proprietary or confidential discussions Monitor advancements in AI-driven captioning tools, which could offer better performance for non-native speakers or accented speech and evaluate annually as suggested in your document		

Table G.3: Preparation for sign language interpretation

Preparation for sign language interpretation	Yes	No
Interpretation into International Sign		
WASLI certification		
Interpretation into National Sign		
Interpretation for deaf-blindness		
Participants have preferred interpreters		
No recommendation for national SL interpreter provided (=> consult listing of SL interpreter DBs)		

Annex H: Recommended text for the public ETSI accessibility page

H.1 General

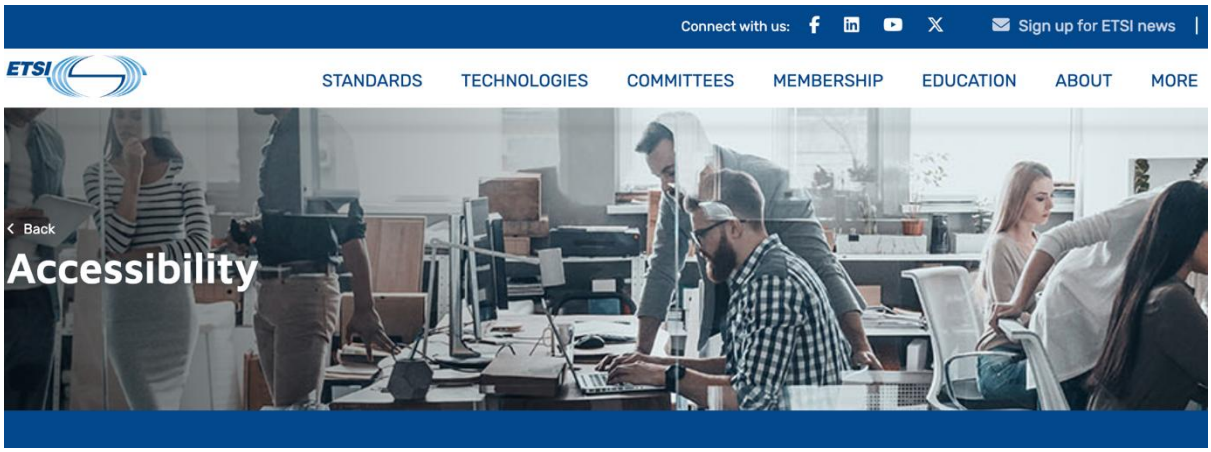

Figure H.1-1

H.2 Accessibility statement

This statement applies to content published on the domain: https://www.etsi.org/.

This website is managed by ETSI, the European Telecommunications Standards Institute.

Users should be able to:

- zoom up to 200 % without problems;
- navigate most of the website using just a keyboard;
- navigate most of the website using a modern screen reader and speech recognition software (on your computer or phone).

This website is designed to comply with EN 301 549 [i.10]. This closely follows level 'AA' of the Web Content Accessibility Guidelines (WCAG) 2.1 [i.9].

Compliance status

This website is partially compliant with EN 301 549 [i.10] and the Web Content Accessibility Guidelines (WCAG) 2.1 Level AA [i.9].

The website was last tested on day/month/year.

Preparation of this statement

This statement was prepared on day/month/year.

The statement is based on a review of a representative sample of web pages by an IAAP-qualified accessibility expert, using a combination of manual and automated testing.

Feedback

We welcome your feedback on the accessibility of the ETSI website. Please let us know if you encounter accessibility barriers:

- Phone: xxxxx
- Contact form: Write to us (link to form or email address)
  - (please refrain from providing sensitive information in the form, e.g. any information that would reveal personal financial information, information related to your health, or any other sensitive topic).

We try to respond to feedback within 15 business days from the date of receipt of the enquiry.

Compatibility with browsers and assistive technology

The ETSI website is designed to be compatible with the following most used assistive technologies:

- the latest version of Google Chrome, Microsoft Edge, Mozilla Firefox and Apple Safari browsers;
- in combination with the latest versions of NVDA, VoiceOver and TalkBack.

Technical specifications

The accessibility of the ETSI website relies on the following technologies to work with the particular combination of web browser and any assistive technologies or plugins installed on your computer: (to be adapted)

- HTML
- WAI-ARIA
- CSS
- JavaScript

Non-accessible content

Despite our best efforts to ensure the accessibility of the ETSI website, we are aware of some limitations, which we are working to fix. Below is a description of known limitations and potential solutions. Please contact us if you encounter an issue not listed below.

The following limitations for the ETSI website have been identified in March 2025:

1) **Video player - keyboard accessibility:** We are aware of some issues with the keyboard accessibility of our video player (when selecting the caption language from the menu, it is not possible to use the arrow keys to move between languages, this can only be done with the TAB key).
2) **Video captions:** Some of our videos do not have captions. We are continuously working on adding them to more videos.
3) **Audio description:** Videos on this website do not have audio description.
4) **Missing title in a frame for video:** When videos are embedded in a frame, the frame does not always have a title.
5) **Heading Hierarchy:** Some pages do not present content in a hierarchical heading organization.
6) **External links open without warning:** Some links open a new window (or tab) without warning.
7) **Links:** When a download link refers to another web page, it opens a new window or tab.
8) **Animations:** Some pages contain animations, such as animated graphs, that cannot be paused, stopped or hidden.

If you would like to comment or provide feedback on the information provided in the ETSI accessibility page, please use the feedback form: FEEDBACK (button).

H.3 Accessibility resources

ETSI is committed to making its work, meetings and documents accessible. For this reason, several Special Task Forces have worked on document and meeting accessibility. The output of their work is available via the ETSI portal.

In addition, you can consult several detailed and well researched toolkits on accessible meetings:

- EDF guide for accessible meetings for all
- Accessible Meeting and Conference - standard operating procedure by the UN
- ITU's Joint Coordination Activity on Accessibility and Human Factors (JCA-AHF)
- Internet Governance Forum Dynamic Coalition on Accessibility and Disability (IGF-DCAD)

If you would like to comment or provide feedback on the information provided in the ETSI accessibility page, please use the feedback form: FEEDBACK (button).

H.4 Meeting accessibility

ETSI is committed to making in-person, online and hybrid meetings accessible. For this reason, ETSI had developed a guidance on accessible meetings for hosts and moderators, a resource collection of tools and services such as sign language interpretation, speech to text, captioning and others, as well as quality criteria for tool and platform selection, which are available via the ETSI portal:

- ETSI EG 204 076: "ETSI Guide for Accessible Meetings" (link)
- Quality criteria for tool selection (link)
- Resource collection of tools and services to make meetings accessible (link)

ETSI has also compiled a comprehensive list of databases for sign language interpreters. For international settings, we advise to first consult that the database of certified sign language interpreters by WASLI and WFD, as well as the database by AIIC, which also includes sign language interpreters.

For national sign language, please refer to the databases in the specific countries.

International:

- WFD-WASLI Accredited International Sign Interpreters
- International Association of Conference Interpreters (AIIC) (includes links to International Sign and National Sign Language interpreters)

Europe:

- European Disability Forum's sign language interpreter database
- European Federation of Sign Language Interpreters
- European Deafblind Network

EU Member States:

- Austria: Austrian Sign Language Interpreter Association
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- Bulgaria: List of sign language interpreters by Bulgarian Agency for Persons with Disabilities

- Croatia: Croatian Association of Sign Language Interpreters
- Cyprus: Cyprus Deaf Federation
- Czechia: Czech Chamber of Sign Language Interpreters
- Denmark: Association of Sign Language Interpreters (FTT) & Danish Interpretation Authority
- Estonia: Estonian Sign Language Interpreters' Association
- Finland: Finnish Association of the Deaf & Interpretation service for people with disabilities
- France: Association française des traductrices et interprètes en langue des signes
- Germany: German Sign Language Interpreter Database
- Greece: Association of Greek Sign Language Interpreters
- Hungary: National Register of Sign Language Interpreters
- Ireland: Register of Irish Sign Language Interpreters
- Italy: Associazione interpreti di Lingua dei Segni (Anios) & Associazione Nazionale Interpreti di Lingua dei Segni (Animu)
- Latvia: List of sign language interpreters published by LNS Rehabilitācijas centrs
- Lithuania: Lithuanian Sign Language Interpreters Association
- Luxembourg: Sign language interpretation in Luxembourg
- Malta: Sign Language Interpreters
- Netherlands: Register of Sign Language Interpreters and Writing Interpreters Foundation
- Poland: Polish Sign Language Interpreters Association
- Portugal: Association of Translators and Interpreters of Portuguese Sign Language (ATILGP)
- Romania: National Authority for the Protection of the Rights of Persons with Disabilities
- Slovakia: Association of the Deaf of Slovakia
- Slovenia: Register of interpreters for Slovenian sign language
- Spain: Spanish Federation of Sign Language Interpreters and Interpreter-Guides (FILSE)
- Sweden: Swedish Sign Language Interpreters Association (STTF) & Interpretation centers in Sweden (including sign language)

European countries:

- Norway: National Register of Interpreters (including interpreters in Norwegian sign language, Norwegian written interpreters and interpreting for the deaf-blind) & Interpreting for the deaf, deafblind and hearing impaired
- Serbia: Association of Serbian Sign Language Interpreters
- Turkey: Association Of Turkish Sign Language Interpreters
- UK: RBSLI Qualified/Trainee and Registered British Sign Language Interpreters/Translators

USA:

- NDA Deaf Interpreters Directory

- Registry of Interpreters for the Deaf, Inc.
- DeafBlind Interpreting National Training and Resource Center (DBI)

If you would like to comment or provide feedback on the information provided in the ETSI accessibility page, please use the feedback form: FEEDBACK (button).

Annex I: Detailed features of videoconferencing, joint editing, and presentation tools

I.1 Videoconferencing tools

I.1.1 Privacy, Security

The privacy and security features have been addressed jointly and are summarized in Table I.1.

Table I.1: Privacy and security features of videoconferencing tools

Tool	Privacy Features	Security Features
Big Blue Button	Big Blue Button, an open-source virtual classroom platform, secures sessions with encrypted transmissions, password-protected meetings, and host controls; self-hosting allows institutions to manage data privacy.	Encryption: Employs TLS/SSL for secure client-server communications and SRTP for audio and video streams. Authentication: Uses token-based authentication and secure inter-module communication to prevent unauthorized access. Self-Hosting: Its open-source, self-hosted nature allows institutions to implement custom security hardening measures.
Cisco WebEx	Cisco WebEx secures meetings with end-to-end encryption, meeting passwords, waiting rooms, role-based access controls, and compliance certifications, ensuring overall consistently strong protection of user data.	Encryption: Employs AES encryption for content and TLS for secure data transmission. Authentication: Supports secure sign-on methods such as Single Sign-On (SSO) and MFA. Access Controls & Auditing: Uses role-based access controls, meeting locks, regular security audits, and compliance checks.
Google® Meet	Google Meet encrypts meeting data in transit, enforces two-factor authentication, integrates with Workspace security, and strictly adheres to privacy standards, robustly safeguarding user information proactively.	Encryption: Secures meeting data using TLS encryption for all communications. Authentication: Leverages Google account security, including enforced multi-factor authentication. Infrastructure Security: Benefits from Google Cloud's robust security measures, including continuous threat detection and automated updates.
GoToMeeting®	GoToMeeting provides encrypted communications with SSL/TLS protocols, meeting passwords, and host controls, ensuring secure meetings through compliance with privacy standards and protection of user data.	Encryption: Utilizes industry-standard SSL/TLS encryption for secure communication channels. Authentication & Controls: Enforces host authentication, meeting passwords, and meeting locks to control access. Maintenance: Employs regular security patches and monitoring within its enterprise-grade infrastructure.
Jitsi Meet	Jitsi Meet, an open-source solution, secures communications with transport layer encryption; though not end-to-end by default, its self-hosting option allows customisable privacy and data control.	Encryption: Uses DTLS and SRTP protocols to encrypt media streams during video conferences. Customization & Transparency: As an open-source solution, it allows for self-hosting and community-driven security audits. Authentication: Supports token-based authentication, enabling administrators to implement additional secure access measures.
Microsoft® Teams	Microsoft Teams leverages robust enterprise-grade encryption for data in transit and at rest, multi-factor authentication, strict role-based access controls, and compliance certifications, protecting sensitive communications.	Encryption: Applies enterprise-grade encryption for data both in transit and at rest. Authentication: Integrates Multi-Factor Authentication (MFA), secure identity management, and conditional access policies. Threat Protection: Includes advanced threat protection and continuous monitoring to mitigate security risks.

Tool	Privacy Features	Security Features
Slack	Slack encrypts data in transit and at rest, supports multi-factor authentication, and provides administrative controls and compliance certifications to maintain private, secure workspace communications effectively.	Encryption: Uses TLS encryption for data in transit and robust encryption for data at rest. Authentication: Incorporates token-based authentication, multi-factor authentication, and SSO integration. Security Management: Features Enterprise Key Management (EKM) and continuous vulnerability scanning to detect and address threats.
Whereby	Whereby offers browser-based meetings secured with TLS encryption, meeting passwords, and room locking; it avoids mandatory account creation and minimizes data collection, ensuring user privacy.	Encryption: Secures data transmission using TLS encryption in its browser-based platform. Access Controls: Offers meeting password protection and room locking features to ensure secure sessions. Design Benefits: Its browser-based approach minimizes installation vulnerabilities and reduces the overall attack surface, with regular updates addressing emerging threats.
Zoom®	Zoom provides meeting passwords, waiting rooms, and encryption for data in transit; optional end-to-end encryption, granular host controls, and robust GDPR compliance enhance meeting privacy.	Encryption: Offers optional end-to-end encryption for meetings and standard encryption (e.g. TLS, AES) for data in transit. Access Controls: Utilizes meeting passwords, waiting rooms, and role-based host controls to manage participant entry. Security Practices: Implements regular vulnerability assessments and security patches to address potential threats.

Summary

Each application combines security features with ongoing updates and best practices to help protect against potential cyber threats and maintain a secure operational environment.

I.1.2 ETSI Support for videoconferencing tools

The level of support provided by ETSI is largely based on the tool usage within the ETSI community (e.g. Technical Committees, Open-Source projects) as seen from the ETSI IT team:

- There is no known usage of the tool within the ETSI community.
- Some members of the ETSI community use the tool, but no specific support has been required to the ETSI IT team.
- Some members of the ETSI community use the tool, and specific support has been asked of the ETSI IT team.
- The tool is largely used within the ETSI community and fully supported by the ETSI IT team (e.g. license price negotiation, installation, debugging, maintenance).

Table I.2 outlines the level of support each candidate tool receives from ETSI, evaluated based on feedback and information gained in a specific meeting with the ETSI IT team.

Table I.2: ETSI support for videoconferencing tools

Tool	ETSI Support
Big Blue Button	No known usage.
Cisco WebEx	No known usage.
Google® Meet	No known usage.
GoToMeeting®	GoToMeeting is the "de facto" main tool used in ETSI and supported by the ETSI team. It has been endorsed by the ETSI General Assembly. It is used in a number of hybrid or fully online meetings. It is deployed with a significant number of licences that are negotiated and updated regularly.
Jitsi Meet	No known usage.

Tool	ETSI Support
Microsoft® Teams	The tool has started being used in some Technical Committees. A few issues have been encountered (and sometimes resolved), such as the need for the organizer to be present during the meeting and the absence of private chat. In some cases, some of the ETSI members may not allow the tool to be used (though the navigator version can be used).
Slack	The tool is used by some members of the ETSI community, but no specific support has been required.
Whereby	No known usage.
Zoom®	The tool is used by the Human Factors Technical Committee (TC HF) and some people in the ETSI secretariat. The ETSI team has required some support.

It should be noted that there is a preference within ETSI for a limited number of fully supported tools. The current situation could be likely to evolve if a new tool becomes a candidate for full support. This might possibly require information and possibly a decision from the General Assembly.

I.1.3 Selection of videoconferencing tools by DPOs

Ten DPOs from within Europe were contacted and asked which Conferencing tools they supported and/or used for meetings that included disabled persons. Feedback was taken from a survey and short interviews by phone or at conferences.

A classification of the ten DPOs consulted according to the main needs they address can be seen in Table I.3.

Table I.3: Classification of DPOs consulted

Main addressed needs	Number of DPOs contacted
Blind /Low Vision	2
Deaf/Hearing Impaired	1
Cognitive or Intellectual	1
Neurodiversity	1
Pan/Cross disability	4
Physical	1

The responses are shown in Table I.4 as the percentage of DPOs that currently used or supported these tools or had found them satisfactory in the past and the nature of the disabilities or user needs that they addressed.

Table I.4: Support of videoconferencing tools by DPOs

Tool	DPO support	Supported Needs
Big Blue Button	None	n/a
Cisco WebEx	None	n/a
Google® Meet	4 out of 10	Blind, deaf
GoToMeeting®	2 out of 10	Blind, deaf
Jitsi Meet	None	n/a
Microsoft® Teams	8 out of 10	Blind, deaf, intellectual, neurodiversity, pan disability, physical
Slack	None	n/a
Whereby	None	n/a
Zoom®	10 out of 10	Blind, deaf, intellectual, neurodiversity, pan disability, physical

Summary

The rationale for the selection of tools varied. Key issues in selection included:

- Familiarity and ease of implementation.
- Cost (including packaged with other licenses).
- Accessibility Features.
- Ease of Use.

Zoom and Microsoft Teams scored highly on each of these criteria for selection. In most cases, those who scored at 0 % were unknown to the respondent, so they had never been considered. Some respondents did reference other products that they used for meetings in the past, such as WhatsApp® and Skype®.

I.1.4 User Experience feedback by DPOs

Feedback was taken from a diverse group of 20 people with a disability. The experience of the products varied significantly, so the approach adopted was from traditional user experience towards "customer satisfaction." This allowed refining the findings based on the reality of the use of the products by people with disabilities to affirm the findings (see Table I.5).

Table I.5: User Experience feedback by DPOs

Tool	Approval Rating
Big Blue Button	No users
Cisco WebEx	No users
Google® Meet	35 %
GoToMeeting®	No users
Jitsi Meet	No users
Microsoft® Teams	73 %
Slack	No users
Whereby	No users
Zoom®	82 %

Summary

The approval rating given was broadly based upon the actual usage of tools by the respondents. A high approval rating reflected the regular usage of a tool by persons with a disability. Whilst accessibility was a major factor in that regular use in all cases, the products were also given a greater approval rating based on their ease of use and usability. In over 90 % of cases, such usability was closer relate to familiarity. The more familiar users were with products, because of their widespread use combined with accessible design the greater the approval rating for the product. This would suggest that introducing new products with a different design including keyboard shortcuts would disadvantage users with a disability more than the wider population at ETSI.

I.1.5 Support for innovation of videoconferencing tools

An overview of the current status of innovation within each product was taken. Such innovation has had significant value for persons with a disability, making note-taking, curation of reports and summary documents faster and easier to prepare. Products which innovated on a regular basis were perceived to be the most likely to innovate to increase accessibility and ease of use for persons with disabilities.

Table I.6: Innovation and AI implementation of videoconferencing tools

Tool	Innovation and AI implementation
Big Blue Button	Emerging AI Integrations: • As an open-source platform focused on education, Big Blue Button is beginning to adopt community-developed AI modules for automated transcription and real-time captioning, enhancing accessibility. Enhanced Classroom Analytics: • AI-driven analytics are under development to help educators track engagement and participation patterns, extracting insights from chat and interaction data. Adaptive Audio & Video Processing: • Uses machine learning to improve audio clarity through noise suppression and to adjust video quality dynamically, ensuring a clear and responsive virtual classroom experience. Customisable AI Enhancements: • Its open-source framework enables institutions to develop or integrate tailored AI features (such as smart whiteboard interactions or automated lecture summarization) that address specific educational needs.
Cisco WebEx	Webex Assistant: • This AI-powered virtual assistant offers live transcription, automated note-taking, and meeting highlights, capturing critical discussion points and action items without manual intervention. Intelligent Noise Reduction: • Machine learning algorithms filter out background sounds and enhance audio clarity during meetings. Smart Scheduling & Analytics: • AI assists with scheduling optimizations and provides analytics on meeting engagement, aiding in effective follow-up and productivity tracking.
Google® Meet	Live Captions & Adaptive Video: • AI enables real-time captions and optimizes video quality dynamically by adjusting to lighting and bandwidth conditions. Smart Background Processing: • Features like background blur and auto-framing are powered by machine learning, ensuring that presenters remain the focus while reducing visual distractions. Dynamic Layouts: • AI-driven layouts intelligently adjust participant views, prioritizing speakers and content for improved meeting flow.
GoToMeeting®	Automated Transcription & Active Speaker Detection: • AI processes real-time meeting audio to create accurate transcripts and automatically detect active speakers, highlighting important contributions. Intelligent Noise Suppression: • Machine learning filters enhance audio quality, reducing disruptions from background noise. Meeting Analytics: • AI-powered analytics offer insights into attendee engagement and participation, providing data that can be used to optimize future meetings.
Jitsi Meet	Open-Source AI Integrations: • Jitsi Meet leverages open-source AI tools such as RNNoise for advanced noise suppression, enhancing audio quality without built-in proprietary solutions. Customisable AI Modules: • Its open-source architecture allows communities to integrate additional machine learning features - such as real-time transcription or speaker tracking - tailored to specific needs, fostering continuous innovation.
Microsoft® Teams	Real-Time Transcription & Captioning: • Leveraging Azure Cognitive Services, Microsoft Teams provides live captions and transcripts, making meetings more accessible and searchable. Together Mode & Contextual Insights: • AI-powered "Together mode" segments participants into a unified virtual setting, while machine learning algorithms highlight action items and generate follow-up suggestions based on meeting discussions. Smart Notifications: • AI helps prioritize notifications and suggest relevant documents or tasks, enhancing team productivity.

Tool	Innovation and AI implementation
Slack	Contextual Search & Recommendations: • Slack's AI enhances search relevance by analysing conversation context, ensuring users quickly locate important messages and files. Automated Workflows & Bots: • Integrated AI-driven bots help automate routine tasks, provide sentiment analysis, and even summarize long discussion threads, streamlining team communication. Smart Notifications: • Machine learning helps prioritize alerts and suggest optimal times for focus, reducing noise and improving overall productivity.
Whereby	Lightweight AI Enhancements: • Although a streamlined, browser-based tool, Whereby incorporates AI-driven background blur and noise suppression to improve call quality without heavy client-side software. Video Optimization: • AI helps adjust video settings dynamically for clarity and responsiveness, ensuring smooth interactions within a minimalistic framework.
Zoom®	AI Meeting Insights: • Zoom's "Zoom IQ" uses machine learning to generate real-time transcriptions, automated summaries, and actionable meeting insights, helping participants quickly review key points. Smart Video Enhancements: • AI drives features like virtual backgrounds, auto-framing, and background noise suppression, ensuring a distraction-free, professional meeting environment.

Summary

Each platform leverages AI in unique ways to enhance usability, improve communication clarity, and streamline meeting workflows. These innovations improve the quality of virtual interactions and increase overall productivity by reducing manual overhead and delivering actionable insights in real-time.

I.1.6 Cost of videoconferencing tools

Table I.7 is a consolidated table summarizing each application's approximate pricing tiers and key features.

NOTE: Prices are approximate, typically based on monthly, per-user/host billing when applicable, and are subject to change. Some tiers are available only via annual plans or enterprise agreements.

Table I.7: Cost of videoconferencing tools

Tool	Plan	Price	Key Features
Cisco WebEx	Free	$0	50-minute meetings, up to 100 participants, screen sharing, and basic meeting tools.
	Starter	~$14,95/host/month	Longer meeting durations, recording capability, additional collaboration tools, and basic administrative controls.
	Plus	~$19,95/host/month	Up to 200 participants, interactive features (like polls and Q&A), advanced host controls, and analytics/reporting features.
	Enterprise	Custom pricing	Enterprise-grade security and compliance, deep integrations, advanced analytics, dedicated support, and customisable meeting environments.
Google® Meet	Free	$0	60-minute meetings, up to 100 participants, screen sharing, and seamless integration with Google Calendar and other Google services.
	Workspace Business Starter	~$6,00/user/month	24-hour meetings, 100 participants, enhanced admin controls, and broader Google Workspace suite integration.
	Workspace Business Standard	~$12,00/user/month	24-hour meetings, up to 150 participants, meeting recording, and advanced scheduling/management features.
	Workspace Business Plus	~$18,00/user/month	Up to 250 participants, enhanced security and compliance features, recording with expanded storage, and advanced meeting controls.
	Enterprise	Custom pricing	Custom meeting capacities, advanced security & compliance options, premium support, and additional collaboration features tailored for large organizations.

Tool	Plan	Price	Key Features
GoToMeeting®	Professional	~$12/organizer/month	HD videoconferencing, screen sharing, meeting recording, and support for up to 150 participants.
	Business	~$16/organizer/month	Enhanced administrative controls, integrations with productivity tools, support for up to 250 participants, and unlimited meeting durations.
	Enterprise	Custom pricing	Advanced collaboration tools, comprehensive analytics, dedicated support, and higher participant capacity options for large-scale meetings.
Jitsi Meet	Free / Open Source	$0	Fully open-source with no set limits on meeting duration or participants; offers encrypted communications by default, with the option for self-hosting and customization.
Microsoft® Teams	Free	$0	Unlimited chat, 60-minute meetings, file sharing, 5GB cloud storage, and basic app integrations.
	Business Basic (via M365)	~$6,00/user/month	24-hour meetings, 1TB OneDrive storage, Office web apps, meeting recording, and team collaboration tools.
	Business Standard (via M365)	~$12,50/user/month	Full Office desktop apps, enhanced collaboration features, advanced meeting capabilities, and greater administrative control.
	Enterprise	Custom pricing	Enterprise-grade security and compliance, unlimited meeting durations, advanced identity/role management, and centralized IT controls.
Slack	Free	$0	Limited message history (10K messages), 1:1 voice/video calls, file sharing, and limited integrations with external apps.
	Standard	~$7,25/user/month	Unlimited message history, group voice/video calls and screen sharing, SSO integration, and extensive app integrations.
	Plus	~$11,50/user/month	Advanced identity management, uptime SLAs, enhanced administrative controls, and priority support for a larger, more regulated environment.
	Enterprise Grid	Custom pricing	Organization-wide collaboration, advanced security & compliance features, centralized administration, and scalable messaging for large enterprises.
Whereby	Free	$0	One meeting room, up to 4 participants, browser-based meetings with basic features, and no software installation required.
	Pro	~$9,99/month	Multiple meeting rooms, up to 12 participants per room, custom branding options, and meeting recording capabilities.
	Business	~$49,99/month	Larger meeting capacity, team collaboration tools, advanced integrations, priority support, and enhanced administrative controls for organizations.
Zoom®	Free	$0	40-minute group meetings, up to 100 participants, HD video, screen sharing, breakout rooms, and waiting room.
	Pro	~$14,99/host/month	Extended meeting durations (no 40-minute limit), up to 100 participants (expandable), 1GB cloud recording, detailed admin controls.
	Business	~$19,99/host/month	Up to 300 participants, custom branding, dedicated support, advanced administrative features, and integration with business tools.
	Enterprise	Custom pricing	Up to 500 participants, unlimited cloud recording, premium integrations, dedicated account management, and enhanced reporting/analytics.
NOTE: The above details represent a snapshot of typical offerings as of early 2025. Each provider's official website should be consulted for the most accurate and up-to-date pricing and feature information.			

I.2 Joint editing tools

I.2.1 Privacy, Security

The analysis of the identified tools regarding privacy is summarized in Table I.8.

Table I.8: Privacy features of joint editing tools

Tool	Privacy Features
Apple® Pages	• Encrypts documents stored in iCloud, helping protect user data from unauthorized access. • Users can manage their privacy settings through their Apple ID, to control what data is shared with Apple and other services. • Pages does not include tracking features that collect personal data for advertising purposes. • Specific compliance details (e.g. GDPR) are not explicitly stated.
Dropbox® Paper	• Data is encrypted both in transit and at rest, ensuring that the information shared is safeguarded against unauthorized access. • Users can control who can view or edit their documents, setting permissions for individuals or groups. • Possibility to set expiration dates for document sharing links, password protection, and choose the edit/view mode. • Maintains a version history of documents, allowing users to track changes over time and revert to previous versions if necessary. • Activity Logs detail who has accessed or modified a document. • Dropbox claims adherence to various compliance standards such as GDPR, ISO/IEC 27001 [i.7], seeking alignment with industry best practices.
Evernote	• Supports data encryption to protect user data in transit and at rest. • Allows users can adjust some privacy settings, such as controlling the visibility of shared notes and notebooks. • Allows users to share notes and notebooks with others while providing options to set permission levels (view-only or editable). • Detailed privacy policy that outlines how user data is collected, stored, and processed. • Users can manage their account settings, review connected apps, and devices currently logged to prevent unauthorized access. • In the European Union, Evernote complies with GDPR regulations, such as data access, data portability, and right to be forgotten.
Google® Workspace	• Encrypts data both in transit and at rest. User data is protected from unauthorized access in transmission or storage on Google's servers. • Support for access controls of user access to sensitive data (e.g. permissions for documents, restricted sharing, and user roles). • Users have control over their personal data, including managing their account information and adjusting privacy settings. • Incognito Mode allows users to view and share documents without leaving a trace on their Google Drive activity history. • Provides tools for managing compliance with regulations such as GDPR and HIPAA. This includes data retention policies, access logs, and the ability to delete data permanently. • Google is increasingly using AI tools to enhance security measures while complying with privacy standards.

Tool	Privacy Features
Microsoft® Teams	• Provides encryption for data both in transit and at rest. End-to-end encryption can be enabled for one-to-one calls. • Ability to customize users' privacy settings (e.g. who can contact them, who can see their presence status). • Support for meeting privacy controls (e.g. who can join meetings, and ensure that only participants can record meetings). • Integration with Microsoft Information Protection to prevent the sharing of sensitive information by setting rules and policies for data sharing and support Data Loss Prevention (DLP). • Organizations can define Data Residency Options complying with local regulations around data privacy. • Supports enterprise-grade compliance features like legal hold, eDiscovery, and auditing, which help organizations meet regulatory requirements. • Microsoft adheres to global compliance standards and frameworks (such as ISO 27001 [i.7], GDPR, HIPAA) and provides customers with compliance certifications and tools to manage their own compliance.
ONLYOFFICE	• ONLYOFFICE can be self-hosted, allowing organizations to keep their data on their own servers, gives users some control over their data and partly supporting compliance with privacy regulations. • Collaborative features allow users to work together in real-time while maintaining control over document access and editing rights. • ONLYOFFICE aims to be compliant with GDPR, which includes various privacy and data protection controls.
Zoho Docs	• Data documents stored in Zoho Docs are encrypted both in transit and at rest, so that data is protected from unauthorized access. • User Permissions can be set for users (who can view, edit, or share documents) by setting user roles. • Offers granular Sharing Options where users can share documents via links or directly with others while controlling access levels. • Supports expiration settings, users can set expiration dates for links. • Provides audit logs that track who accessed or modified documents. • Ensures that user data is backed up regularly, providing added security against data loss. • Adheres to various data protection regulations, such as GDPR and HIPAA.
Zoom® Docs	• Zoom Docs benefits from Zoom privacy support. • Meeting passwords and waiting rooms. • Some privacy settings (e.g. data sharing). • Precise information on user data collection and usage. • Robust GDPR compliance enhance meeting privacy.

The analysis of the identified tools regarding security is summarized in Table I.9.

Table I.9: Security features of joint editing tools

Tool	Security Features
Apple® Pages	• Password Protection to restrict access to documents. • File Encryption when password protection is used. • iCloud Security for documents that are stored in iCloud. • Restricted Access when sharing documents via collaboration tools. • Applications on macOS run in a sandbox environment. • Secure Sharing Options for documents shared via email or a link.
Dropbox® Paper	• Data is encrypted both in transit and at rest, as they move across the network and while they are stored in the cloud. • Enables Two-Factor Authentication (2FA). • Support for Secure Sharing Links that restrict access to specific individuals or require a password to access the document.
Evernote	• Encryption for data both in transit while being transmitted over the internet, and at rest when stored on their servers. • Users have the option to encrypt specific portions of their notes. • Users can set passwords for individual notes. • Support of Two-Factor Authentication (2FA). • Offers Data Breach Notification to users in the event of any data breaches, informing of potential threats and offering guidance. • Regular security updates to address vulnerabilities.

Tool	Security Features
Google® Workspace	• Organizations can manage their own encryption keys if they choose to using Google's Cloud Key Management Service (KMS). • Support for multiple forms of Two-Factor Authentication (2FA) (e.g. Google Authenticator, SMS, voice calls, and security keys). • Provides Data Loss Prevention (DLP) tools to help prevent the unintended sharing of information through email or Google Drive. • Security Center support for threat analysis, security health checks, and incident response. • Supports Single Sign-On (SSO) using SAML, and integration with third-party applications through OAuth. • Employs machine learning algorithms to detect and block phishing and malware. • Provides alerts for suspicious logins and account breaches. • Provides extensive audit logs and reports to monitor user activities, changes in settings, and potentially suspicious activities. • Provides alerts for suspicious logins and account breaches, as well as a robust incident response system to assist organizations in managing security threats effectively.
Microsoft® Teams	• All data in transit is encrypted using Transport Layer Security (TLS). All data at rest is encrypted using standards such as AES-256. • Support of Multi-Factor Authentication (MFA). • Integration with Microsoft Information Protection allows to classify, label, and protect documents and emails based on sensitivity. • Propose implementation of conditional access rules based on user's location, device compliance, and risk level. • Provides security settings management through the Microsoft 365 Compliance Center and Microsoft Endpoint Manager, ensuring consistent security policies across all users. • Provides advanced audit logs and reporting tools. • Enables continuous automated security updates.
ONLYOFFICE	• Data in Transit is encrypted through protocols like SSL/TLS. Data at rest stored on the server is encrypted to protect sensitive data. • Possibility to set permissions for documents with defined access roles (e.g. viewer, editor) limiting access to sensitive information. • Supports Two-Factor Authentication (2FA). • Provides regular security updates and patches to address vulnerabilities.
Zoho Docs	• Encryption of data at rest and data in transit using standard protocols (like AES-256). • Granular management of user permissions and Role-Based Access Control (RBAC) allows for the assignment of specific roles to users. • Support of Two-Factor Authentication (2FA). • Audit Logs and Activity Tracking for administrators. • Data Loss Prevention (DLP) features to help prevent unauthorized sharing or downloading of sensitive documents. • Integration with Single Sign-On (SSO) providers. • IP Whitelisting to restrict access from specific IP addresses.
Zoom® Docs	• Zoom Docs benefits from Zoom security support. • Standard encryption (e.g. TLS, AES) for data in transit. • Optional end-to-end encryption for meetings. • Access Control (meeting passwords, waiting rooms, and RBAC controls) to manage participant entry. • Regular vulnerability assessments and security patches to address potential threats.

I.2.2 Cost

The analysis of the identified tools regarding cost is summarized in Table I.10.

Table I.10: Cost considerations for joint editing tools

Tool	Plan	Price	Key Features
Apple Pages	Free	0 €	
Dropbox Paper	Plus	10 €/m	• One user.
(Dropbox pricing)	Essential	17 €/m	• One professional user.
	Business	12 €/u/m	• 3 users or more. • 9+ To for the team. • Unique collaboration space.
	Business Plus	18 €/u/m	• 3 users or more. • 15+ To for the team. • Unique collaboration space. • Team space organization.
Evernote	Personal	8+ €/m	• 150 000 notes. • Unlimited connected devices. • 10 GB monthly upload.
	Professional	10+ €/m	Everything in Personal plus: • AI Edit & AI-Powered search. • 20 GB monthly uploads.
	Teams	16+ €/u/m	Everything in Professional plus: • 500 000 notes. • Shared team spaces. • Company ownership of business data.
	Enterprise	Custom pricing	Everything in Teams plus: • Enhanced security and compliance. • SSO. • User provisioning.
Google Workspace	Business Starter	6+ €/u/m	• 30 GB common storage per user. • Secure email address. • 100 participants videoconferences. • Basic AI features.
	Business Standard	13+ €/u/m	• 2 TB common storage per user. • Secure email address. • 150 participants videoconferences with participation tracking, recording and noise management. • Full AI features.
	Plus	21+ €/u/m	• 5 TB common storage per user. • Secure email address. • 1 000 participants videoconferences with recording and noise management. • Full AI features.
	Enterprise	Custom pricing	
Microsoft Teams	Teams Essentials	4+ €/u/m	• Unlimited group meetings up to 30 hours and 300 participants. • 10 GB of cloud storage per user. • Real-time collaboration. • File sharing, tasks, and polling. • Data encryption. • Microsoft 365 Copilot add-on available.
	365 Business Basic	6+ €/u/m	Everything in Microsoft Teams essential plus: • Identity & access mgt. for 300 users. • Chat, call, meet. • 1 TB of cloud storage per user. • 10+ Microsoft 365 apps.
	365 Business Standard	12+ €/u/m	Everything 365 Business Basic plus: • Identity & access mgt. for 300 users. • Chat, call, meet and host webinars.

Tool	Plan	Price	Key Features
ONLYOFFICE	Enterprise	2,200 US$	• Lifetime license for one server. • 50 users. • 48 working hours first response time.
	Enterprise Plus	3,300 US$	• Lifetime license for one server. • 50 users. • 24 working hours first response time.
	Enterprise Premium	4,450 US$	• Lifetime license for one server. • 50 users. • 12 working hours first response time.
Zoho Docs	Free	0 €	• Teams up to 5 users.
	Standard	4+ €/u/m	• Enhanced security. • Better collaboration. • Organization-wide reporting and analytics.
	Premium	6+ €/u/m	• More storage. • Robust admin controls. • Active directory and single sign on.
Zoom Docs	Free	0 €	• 40-minute group meetings. • Up to 100 participants. • HD video, screen sharing. • Breakout rooms, and waiting room.
(Zoom pricing)	Pro	13+ € /h/m	• Everything from "Free". • Extended meeting durations. • Up to 100 participants (expandable). • 1 GB cloud recording, detailed admin controls.
	Business	18+ € /h/m	• Everything from "Free". • Up to 300 participants. • Custom branding, integration with business tools. • Advanced administrative features, dedicated support.
	Enterprise	Custom pricing	• Up to 500 participants. • Unlimited cloud recording. • Premium integrations, dedicated account management, and enhanced reporting/analytics.
NOTE: Formula for cost calculation: /m: per month; /u/m: per user, per month; /h/m: per host, per month; n+: between n and n+1.			

I.3 Presentation tools

I.3.1 Cost

The analysis of the identified tools regarding cost is summarized in Table I.11.

Table I.11: Cost considerations for presentation tools

Tool	Plan	Price	Key Features
Apache OpenOffice Impress	Free	0 €	
Apple® Keynote	Free	0 €	
Canva	Free	0 €	Large range of templates, design tools, and basic features.
	Pro	11+ €/m	Everything from "Free". Access to premium images, videos, elements, and templates. Possibility to create brand kits, and tools for content planning and scheduling.
	Teams	13+ €/m	Everything from "Pro". Collaboration among teams, brand management and workspace organization.
	Special		For nonprofit, students and teachers.
Google® Slides	Free		For individual users with a Google account. Basic Features and storage.

Tool	Plan	Price	Key Features
	Business Starter	5+ €/m	Everything from "Free". Additional storage and features.
	Business Standard	10+ /€m	Everything from "Starter". More storage and collaboration tools.
	Business Plus	16+ €/m	Everything from "Starter". More storage and enhanced security.
	Enterprise	Customized	
Haiku Deck	Pro	108+ € annually 18+ €/m	All the basic features (unlimited deck creation, privacy control, audio narration in videos, custom branding).
	Premium	324+ € annually 27+ €/m	Everything from "Pro". In-depth analytics, live web playback, priority support).
	Special		For nonprofit, students and teachers.
Microsoft® PowerPoint	Personal	99 € annually	One user, 1 TB secure storage, productivity applications with Microsoft Copilot.
	365 Business Basic	6+ €/u/m	Identity management personalized email; web and mobile Word, PowerPoint, Excel, Outlook; 1 TB storage /user.
	365 Business Standard	12+ €/u/m	Everything from "Basic". PC Microsoft Word, Microsoft PowerPoint, Microsoft Excel, Microsoft Outlook; collaborative space; video design tools.
	365 Business Premium	22+ €/u/m	Everything from "Standard". Advanced identity management, improved security.
Prezi	Standard	5 €/m	For personal usage. Basic presentation tools; online publishing; privacy management; minimal images and icons set.
	Plus	15 €/m	For visual communication experts. Unlimited Prezi AI usage; premium images; PowerPoint import; PDF export; off-line access.
	Premium	25 €/m	Everything from "Plus". Analytics; SQL connectors; support.
Visme	Basic	0 €	Individual usage. Test drive.
	Starter	13+ €/u/m	Export to JPG, PNG, or PDF; Templates and Assets; account storage.
	Pro	25+ €/u/m	Everything from "Starter". More export options; Brand Kit; Analytics; Integrations; privacy controls.
	Teams	Custom pricing	Multiple users within a workspace; security enhancement.
Zoho Show	Free	Free	Basic features; 1 000+ templates & images; 500 MB storage; real-time collaboration; 2FA authentication.
	Professional	2+ € /u/m	Everything from "Free". Zoho Office suite; 1 TB storage; Team spaces.
	Enterprise	Customized	
NOTE: Formula for cost calculation: /m: per month; /u/m: per user, per month; n+: between n and n+1.			

History

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