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Executive summary

Public service broadcasters have a particular duty in providing services to the whole community; people from minorities and those with sensory disabilities are an important part of our audience.

The demand for access services is growing, especially since its provision is increasingly required by national legislation. Broadcasters seeking to provide these services face questions related to their costs, as well as to the technological choices for production and delivery. Digital technology for example makes it easier to provide services that can be selectively turned on/off by the consumers. This report provides an overview and recommendations to help answer the above questions and minimize the costs by sharing Members' experiences.

It is stressed, however, that the provision of access services does not solely depend on broadcasters. The availability of these services depends on the whole end-to-end chain (authoring, exchange/distribution, delivery and presentation). Therefore, where relevant, this report also advises on issues related to Consumer Electronics (CE) platforms and provides recommendations to the industry.

The P/AS Group¹ was established by the EBU Production Management Committee (PMC) in summer 2003² to study the deployment of access services in digital television broadcasting environments and to create guidelines for sharing best practices³. The main access services discussed in this report are: subtitling, spoken subtitling, audio description and signing. New and future services, such as 'talking EPGs', are addressed briefly as well.

A special thank you goes to those various interest groups that helped clarify issues and provided feedback via a questionnaire, supplied by their national public broadcaster.

AUTHORING	EXCHANGE/DISTRIBUTION	DELIVERY	PRESENTATION	
SUBTITLING				
-Prepared subtitling	-VHS-tape	+Teletext in VBI fixed/spread	+Receiver with Teletext	
-Semi-live subtitling	-VBI, DVD	*DVB subtitling (EN 300 743)	*DVB subtitling receiver	
-Live subtitling	-File-based (floppy/network)	*DVB Teletext (EN 300 472)	*DVB Teletext receiver	
SPOKEN SUBTITLING				
-Subtitles turned into	+Synthesized speech (audio)	+Teletext packet 31 data	+Receiver + special receiver	
synthesized speech (autom.)	*Synthesized speech with	*Pre-mixed DVB audio	*Non-mixing DVB receiver	
	fade information	*DVB audio with fade info	*Mixing DVB receiver	
AUDIO DESCRIPTION				
-Script and fade information	+Audio with description signal	+One half of a stereo pair	+Second audio channel	
turned into additional audio	*Description signal and control	+AM-radio	+AM radio receiver	
	track, synchronised with video	*Pre-mixed DVB audio	*Non-mixing DVB receiver	
		*DVB audio with fade info	*Mixing DVB receiver	
SIGNING				
-Signer interprets speech and	+Signer on tape, server or live	+Signer superimposed	+Analogue receiver	
action in vision	*Closed signing in research	*Additional vision component	*Digital receiver	
			*Digital receiver with mixing	
	▼		capability or avatar-animation	

Access services overview

Special characters indicate area of applicability: - analogue & digital, + analogue only, * digital only

¹ EBU members who participated in the P/AS work: BBC, CyBC, IRT, ITV, NPB, RAI, SVT

² 2003 also was the European Year of People with Disabilities.

³ For details, please see the P/AS Group Terms of Reference in [1].

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1 Context

1.1 Background

As the expectations of our audiences for social inclusion increase, the demand for accessibility to television is growing. This report deals primarily with access services⁴ for digital television broadcasts, in the form that those services currently exist, are planned or under development.

DEFINITION	- a service component provided with broadcasts, to improve accessibility for people with
Access service	significant hearing and/or sight loss.
Authoring	= the process of creating and editing content for a programme or access service example: typing in the subtitles
Exchange/ distribution	= the process of moving the created programme/service within or between broadcast parties ⁵ example: moving a signed programme on a videocassette to the play-out centre
Delivery	= the process of conveying the programme/service to the audience
	example: broadcasting the subtitles in the DVB Subtitling format
Presentation	= the process of presenting the programme/service to the audience example: a decoder box makes audible the audio description of a programme

The provision of access services depends on the whole end-to-end chain; from authoring, via exchange and delivery to presentation.



A programme and its associated access service(s) pass through a chain of processes before being consumed by the audience. The dotted lines indicate where access services may be elective, e.g. turned on/off by the audience when desired.

The focus of this report is on the authoring, exchange/distribution and delivery, although it touches on presentation as well.

Broadcasters face questions related to choices for the services' production and delivery, as well as to their costs. This report provides recommendations to answer such questions and it helps minimize costs by sharing Members' best practices.

1.2 Access services

1.2.1 Technology

Technology advances allow for different types of access services to be combined with the television programme. The most common ones are:

- Subtitling
- Spoken subtitling
- Audio description

⁴ A magnifying glass is an example of an improvement of accessibility that is not an access service.

⁵ Note that in some documents the word *distribution* is used for what is here called *delivery*.

- Signing

DEFINITIONS Subtitling	= provision of overlaid text representing the spoken audio of the programme
Spoken subtitling	= provision of synthesized speech, to make subtitles audible
Audio description	e = provision of additional speech, describing what is happening on the screen
Signing	= provision of a sign language interpretation of the spoken audio of the programme
Open	= the access service is presented to the whole audience, the user cannot turn it on or off
Closed / elective	= the access service is available to the audience, but the user can to turn it on or off

Access services can be provided as either open services or closed services. Closed services are *elective services*, as the audience can elect to turn them on or off. Digital technology offers opportunities to provide such services in a closed fashion.

There are differences between delivery systems as well. Satellite broadcasting for example offers what appears to be virtually limitless bandwidth, while the available capacity for DTT (Digital Terrestrial Television) services may be rather limited. A solution suitable for one delivery platform may not be optimal for another.

1.2.2 Audience

Access services do not have a single audience. Requirements and preferences may differ widely between groups with different abilities and even within groups. For example: the preferred size of the subtitles varies amongst different interest groups. Furthermore people who are not users frequently dislike the use of open services, such as open signing.

The use of modern technology, such as synthesized speech and virtual signers, may not be acceptable to some parts of the target audience. Thus it is a considerable challenge to please everybody.

Interest groups have different requirements

Broadcasters face many different interest groups, which often do not share the same opinion. This makes it necessary to balance conflicting requirements.

To those who rely on them, the access-service components of a television service (e.g. subtitles, audio description, signing etc.) complement vision and programme sound and have comparable importance. There is therefore a need for appropriate synchronisation between access-service components and the vision and programme sound to which they refer and this must be maintained.

Access-service components and the signals (or data-structures) from which they are derived should always therefore be considered and treated as *essence* rather than *metadata*⁶.

Creating access services is of the same nature as creating programmes, which means quality is important. Audience feedback related to subtitling and audio description indicated that users would rather have fewer programmes with higher quality access services, instead of more hours with lesser quality access services

Quality may be more important than quantity

This judgement of the audience probably involves a threshold, in the sense that in the absence of access services, any service provision is appreciated, while, where services are common, quality becomes a stronger part of the equation. This brings us to another observation reported by members:

Limited awareness of service functionality

Disabled viewers may be unaware of the existence of relevant assistive technology and access services⁷.

⁶ For a more detailed understanding of the difference see the EBU/SMPTE Task Force report [9].

There also is a lack of consistency (between and within countries) in announcing programmes with access services. For subtitling for example the following methods are frequently used:

- Superimposing the characters S, T, t888, etc.
- 'Ear' type logo in screen corner
- A ticker during the programme
- Text in small print in programme guides

1.3 Regulation

Access services are regulated at the national or even regional level. Regulation varies widely from country to country⁸. In several countries there is a move in law to protect disabled people from discrimination⁹.

EXAMPLES

Regulation in Cyprus

In Cyprus the regulation on access services is actively being pursued. Currently there are no requirements on access services, however, draft requirements will probably be published later in 2004. CyBC expects to be required to subtitle at least 20% of its programmes. Private broadcasters will likely face a 10% requirement.

Regional legislation in Germany

Because of the federal structure of Germany there is no authoritative law from Berlin. Members of the federation may have their own regional law (Bavaria differs from Hessen, etc.) or none.

Demanding UK regulation

The UK arguably has the most demanding regulations on Access Services¹⁰. By the 10th anniversary of the launch of each relevant digital service major broadcasters face requirements to subtitle at least 80%, audio describe at least 10% and sign a minimum of 5% of their programme output.

Unclear plans in Sweden

The Swedish 'Committee of Inquiry into Legislation governing Radio and Television' recently suggested that a commercial *operator* would be granted its own capacity in the digital terrestrial network and would then make that available to other broadcasters, as well as supply television programmes and other services in return for payment. The operator's willingness to provide access services would be taken into account. It is not clear what kind of services, other than those provided by programme companies, are expected¹¹. The Inquiry publishes its final report in the end of 2004.

Although disability organisations are lobbying for change, there is currently no Europe-wide regulation on the provision of access services¹². The spirit seems to be that the market should decide what services are provided. This means that access service reception equipment is not widely available, because the potential individual markets may be regarded as too small by manufacturers and standards are not mandated.

In contrast, "must carry" is partly regulated at the European level. This requires distribution parties (such as cable distributors) to transport the complete broadcast content, including any access services. Without such a requirement, distributors may choose to 'strip out' some service components (e.g. the subtitle stream) to free bandwidth for other services or to fit the reduced service in available bit-rate. There is one caveat: the European legislation is currently optional. Broadcasters therefore are encouraged to lobby¹³ for mandatory legislation on 'must-carry' in their own countries¹⁴.

¹²Note that are many good intentions, such as [5], [6], [7] and [8], but these have not resulted in European-wide mandatory legislation for access services.

⁷ This was the case for a blind community, for whom audio description was a new concept.

⁸ See appendix A for an overview of the situation in the P/AS Members' countries.

⁹ In the UK for example there is a Disability Discrimination Act and in Sweden there is a Government Proposal in the Government Bill of 1999/2000 "A more accessible Sweden".

¹⁰ See www.ofcom.org.uk for details.

¹¹ Today only public service broadcasters and the only commercial broadcaster in the Swedish analogue terrestrial network are obliged to provide access services. It is anticipated that all broadcasters in the future have to provide such services. Also see appendix A.

¹³ For more information and assistance see http://www.ebu.ch/en/legal/index.php.

¹⁴ Note that *must carry* is not limited to access services and is in the general interest of broadcasters.

There is no point in broadcasting access services if consumer reception equipment cannot support them. Regulating access service provision by broadcasters may thus not be enough, as long as the necessary functionality in reception equipment is not also mandated.

Where regulation is present, it may include requirements on access service monitoring. This is discussed in section 7.1.

1.4 Economics

Access services require skills, technology and money to provide them and they also occupy capacity (bit-rate/bandwidth) in the delivery medium. This means that broadcasters sometimes find it difficult to give access services enough attention. Many broadcasters in Europe face financial challenges from increased competition and falling/stagnant revenues. Cost-effective ways of providing access services are thus an absolute requirement.

In general broadcasters with a public service charter are more likely to provide access services than purely commercial broadcasters. Nevertheless, many elements influence the attractiveness for them to provide access services. Amongst these are:

- Scale of the operation: larger broadcasters may profit from economies of scale to provide access services in a more cost-effective manner. As the costs for access services become disproportionately higher for smaller audiences, cost reduction of the authoring of access services is vital.

- **Size of the audience**: larger countries may make it easier to justify costs in terms of costs per user. Note that repeating of programmes has a positive effect on the per hour costs.

- **Language**: access services for multi-lingual or minority-language areas may be more expensive to create and virtually unavailable in exchange with other parties.

With given costs, technology allows for trade-offs to be made. An example is the bandwidth of the delivery mechanism used: shall it be used for, say, multi-channel audio or should it be used for an access service¹⁵?

The cost of access services is typically not dealt with as an integral part of the programme budget and is therefore always questioned. It might perhaps help if the cost of access services were taken into consideration earlier in the television production and budgeting process.

1.5 Social

The number of disabled people in the European Union is growing; Currently 10% of the population are estimated to have a disability¹⁶, including a large number of people with sensory disabilities. By the year 2020 it is estimated that 25% of the people will be over 60¹⁷, with the largest increase in the 75+ band, where disability is most prevalent.

Public service broadcasters have a particular duty in providing services to the whole community - people from minorities and those with sensory disabilities are an important part of our audience.

We live in a more inclusive world, with greater understanding and celebration of diversity. We have the potential to attract wider audiences if we provide access services with our programmes. This may also encourage the transition to digital.

¹⁵ Note that such trade-offs are not new. In Germany for example, half a stereo audio channel is used to provide an audio description service, requiring the original programme sound to be restricted to be broadcast in mono. ¹⁶ Anna Diamantopoulou, European Commissioner for Employment and Social affairs, interviewed in

Brussels, 30 May 2001, IP/01/762

¹⁷ Source: www.eeurope-standards.org/e_accessibility.htm

1.6 The 'TV for All' initiative

After the workshop 'TV Broadcasting for All' in Seville, June 2002, CENELEC set up a Virtual Working Group to look at particular standardisation requirements in order to further access to digital TV and interactive services by people with disabilities. The group consisted of representatives from a variety of organisations which had an interest in furthering access to digital television by people with disabilities.

In November 2003, the 'TV for All' Group published its final report titled 'Standardisation Requirements for Access to Digital TV and Interactive Services by Disabled People' [2]. The report includes a wide range of recommendations and suggested deliverables, aimed at standardisation organisations, broadcasters, manufacturers and others organisations.

In its work, the P/AS Group has addressed a number of recommendations made by 'TV for All', especially those related to broadcasters.

1.7 Recommendations¹⁸

Access service components shall be considered as essence

Consider access services as an opportunity

The provision of access services can be a tool to increase audience share and audience appreciation, both for public service and commercial broadcasters.

Listen carefully to your audience

Investigate your audience's specific requirements, taking into account the level of access service they require. Be prepared to balance sometimes conflicting requirements.

Consider including access services as part of the programme budget

The cost of access services typically is not an integrated part of the programme planning and budgeting process. It might help if the cost and requirements access services were taken into account earlier in the process.

Prioritise service provisioning

In dialogues with the audience, determine the programmes which are regarded most desirable to be supplied with access services, e.g. the programme genre.

Trade carefully between quality and quantity

Do not assume that the quantity of hours of access services provided is more important than the quality of the provision. This is very much the same as with the television programmes themselves.

Lobby for mandatory 'must carry' regulation

Particularly to safeguard the delivery of access services Members are encouraged to lobby for mandatory *must carry* legislation at their national level. The EBU Legal Department may be able to assist in this [4].

Discuss with interest groups how to improve awareness

An improved awareness of services provided is in the interest of the users as well as the broadcaster. Stimulate an audience, by increasing awareness of access services (e.g. via interstitials, promo's, listings magazines, etc.).

Provide consistent access service identification

Consider how to consistently indicate the presence of access services (e.g. using a specific logo).

¹⁸ To prevent confusion with the recommendations referred to in chapter 1.6: please note that the recommendations made at the end of each chapter are recommendations from the P/AS Group.

2 Subtitling

2.1 Target audience

2.1.1 Description of the audience

Subtitling covers a wide audience, with at least two particular goals:

Same-language subtitling. A significant proportion of the target audience is formed by people with hearing impairments: the hard of hearing and the deaf. It is estimated that 6% of the European population has a hearing impairment [21]. Equally, many hearing viewers appreciate subtitles, for example, in a noisy environment, or when watching programmes in a language in which they are not fluent.

Translation subtitling. This is a cost effective alternative to dubbing¹⁹, lectoring²⁰ or voice-overs²¹. Its main target audience are people who are not able to understand the spoken language of the programme audio, but it also serves the deaf and hard of hearing.

Subtitling is thus an attractive service that has the potential of adding a significant number of viewers to a channel or a programme.

In the remainder of this chapter we focus on same-language subtitling.

2.1.2 User requirements

Television subtitling has now been around for more than 25 years and is used by many millions of people around the world. Subtitling replaces, or is at least crucial for the understanding of, the spoken word and therefore must convey its full meaning. Experience amongst the audience and broadcasters has shown that subtitling should also:

- be as accurately timed to speech as practicable
- provide good readability
- ideally identify speakers by different colours
- indicate sound effects

Guidelines for good subtitling practice have been issued by broadcasters, regulators, subtitling companies and educational bodies [2, 23, 24, 27]. They include recommendations on synchronisation, duration, logic, the identification of speakers, text position, font, colours and contrast that are generally accepted by major European user groups.

2.2 Service

2.2.1 Description

Subtitles provide a written representation of the spoken audio. This needs to take into account that reading can be slower than listening and that on-screen reading can be substantially slower than reading printed text [19, 20]. Therefore it may well be necessary to edit the subtitles. The extent of the editing is dependent on the nature of the programme, the intended audience and the subtitling tradition in each country.

Same-language subtitles are provided as a closed service, while translation subtitles usually are provided as an open service. Same-language subtitles often carry extra information to aid comprehension, in the form of colours or special positioning of the text to identify different speakers and sound effects.

¹⁹ Lip-synchronised multi-voice translation

²⁰ Single-voice translation, with limited expression

²¹ Single-voice translation used for news and documentaries

2.2.2 Implementation

2.2.2.1 Authoring

There are three methods for creating subtitles:

1. Prepared subtitling: a list of subtitles is created with precise *in* and *out timecodes*, based on the speech in each time period. There can be 500-600 titles in a 60-minute programme.

2. Semi-live subtitling²²: this method is typically used for live programmes which are heavily scripted and have pre-recorded inserts. The subtitler creates a list of subtitles, without time-codes, and during transmission cues these manually in sync with the programme. This minimizes the risk of errors that can occur with live subtitling, but accuracy for the whole programme depends, of course, on the amount of pre-prepared material in the programme.

3. Live subtitling: the most ambitious type of authoring. The work of a subtitler is similar to that of a simultaneous interpreter. There are three kinds of live subtitler: a stenographer who writes phonetic shorthand at a special keyboard, a velotypist who types words at a special keyboard, and a respeaker who uses speech recognition to generate subtitles.

The live subtitler seeks to understand the context of the programme in advance. Then on transmission (s)he creates the subtitles in real-time. This is typically used for sports, live discussions, parliamentary proceedings and news programmes.

Live subtitling represents information delivered by one or more speakers at speeds of up to 200 words per minute and is performed simultaneously with the programme speech. Consideration should be given as to whether to edit the subtitle before transmitting it. Some broadcasters opt for full real-time subtitling where any editing takes place as the subtitles are created, others introduce an editing process between capturing the text and transmission. It should be noted that this latter editing process will result in a significant delay in the subtitles.

Live subtitling should:

- be limited to occasions when there is insufficient time to prepare subtitles using other methods
- be displayed either word-by-word or as block text.²³

People & training

Subtitling is a labour-intensive business, so having and developing the right people and skills is essential. Most subtitlers have a university degree and some have a journalistic or publishing background. Many European universities offer courses in subtitling and screen translation, but the most common practice is that broadcasters and subtitling companies provide in-house training opportunities. Live subtitlers, such as court reporters or interpreters, will tend to be recruited with some relevant experience, but they must also undergo special training in subtitling live television programmes.

Live subtitling by speech recognition requires a controlled acoustic environment, such as separate booths and low noise computers. Subtitlers working on pre-recorded programmes do not need to work in separate booths, but they do need to wear headphones and so do need a quiet environment.

Given advances in technology there are now more options for subtitlers (on both live and pre-recorded programmes) to work remotely from the broadcaster, e.g. from home.

There are quite a number of companies offering hardware and software to meet each stage of the subtitling process and the different types of authoring²⁴.

²² Also known as 'as-live' subtitling

²³ Research indicates both methods are accepted by approximately equal proportions of viewers [24]

²⁴ See appendix D for a list of manufacturers.

2.2.2.2 Exchange/distribution

Close liaison with the programme planning and scheduling teams at the broadcaster is desirable so that programmes to be subtitled can be delivered for subtitling as early as possible before transmission.

The increasing flexibility of scheduling forms a challenge here. Ideally such flexibility should only apply to programmes that have been subtitled in advance. Live subtitling of pre-produced programmes is a quick-fix that is unlikely to provide adequate quality.

For live programmes subtitlers will gather as much advance information about the programme as available, including video inserts.

Many subtitling operations are still using VHS tapes with vertical interval time-code (VITC) and/or burntin time-code (BITC) but increasingly there is a move towards digitized or digital video, made available to the subtitler either on DVD or distributed over a network.

Subtitlers on pre-recorded programmes typically create a file for each programme they subtitle, which is delivered to the transmission operation for play-out. There are several file formats for the authoring and play-out of subtitling files. Each broadcaster, or the subtitle supplier, will archive the subtitle files for retrieval in the future for repeats. Another method of distributing subtitling data is using a video signal.

New file-based subtitle distribution emerging, but not yet ready

There are many options for distributing subtitle information within and between facilities. For new operations a filebased solution seems most appropriate. The EBU STL format is limited in its capabilities to meet all current requirements. New initiatives are underway²⁵, but not completed yet.

Where subtitling for a programme is obtained from a third party, problems may arise when those subtitles are burnt in to the programme video. For example some Members reported acquired programme material sometimes comes with burnt-in subtitles containing errors/indecent wording and bad readability, which cannot be changed. Separation of programmes and subtitle data is preferred, however it may be more costly.

²⁵ See section 2.2.5 for more information.

EXAMPLE

How ITV distributes subtitles in their facilities

Data formats

Within ITV, subtitle data is carried within the vertical blanking interval on line 335. The data may come from one of three sources:

1. For live programmes, the subtitler's workstation generates a blank video signal containing the data only. 2. For recorded material the subtitle data may be either already included in the video signal on the video tape or server file, or

3. be supplied in a data file in EBU subtitle exchange format. In this case, a subtitle file reader will generate a video signal, as in 1 above, which contains only the data.



For 1 and 3 above, the video signal carrying the data is then merged with the signal carrying the picture (and audio). This is achieved by means of a databridge, or similar device.

Any programme may take data from one or more of these sources and some means of routing the data correctly is required. For example, a live programme using live subtitling may have some pre-recorded inserts where the subtitles are provided on a subtitle file. Additionally, commercials within the programme may have subtitle data already included, typically on line 335, with the video.

Routing

Where the signal is sent out for encoding at a remote site it will depart and arrive in its baseband form. In between, any compression should be arranged to have negligible impact on the signal quality. This is termed a contribution link. Other processes are normally applied to the signal prior to final encoding to DVB subtitles, for example the signal could be recorded for later transmission or it may pass through a presentation mixer.

When subtitles are carried on line 355, they are passed to the DVB subtitle encoder at the point where the video is encoded. This method also allows subtitles to be inserted at the 'encoding point' if the delivered version is damaged or missing. The remote site would need a copy of the subtitle file and the signal would need to include timecode for this to work.

Play-out

For Digital Terrestrial Television, the combined signal is passed to a DVB subtitle encoder which strips the data from the video signal and converts the ASCII representation of the subtitle into a bit-map. The bit-map is packetised according to the DVB subtitle specification for inclusion in the final multiplex. For transmission by satellite, the subtitle data is encoded as DVB Teletext data and placed in the final multiplex. The packetised data includes timing information to enable correct timing to be achieved.

2.2.2.3 Delivery

Delivery of closed subtitles can use one of the following techniques:

1. Analogue Teletext²⁶

Analogue TV services deliver Teletext subtitles in the vertical blanking interval using one or more of lines 7..21 and 320..335 of the 625/50/2:1 raster. Teletext is an asynchronous multiplex and has various modes for transmitting subtitles and magazine data carousels. Some broadcasters choose to use a fixed set of VBI lines for subtitle data (e.g. line 335 only, lines 20 & 333, etc.) whilst others may use a range of lines in which subtitles and magazine data are co-mingled; in this latter case subtitles are not guaranteed to be conveyed on any particular VBI line. The receiver generates the display, and so determines the timing and image quality of the subtitles seen by the user.

2. DVB Teletext²⁷

This carries the analogue Teletext information in a digital signal for presentation by the set-top box or TV. Digital services which use Teletext as the transport mechanism for subtitles encapsulate the Teletext data. This provides an end-to-end mechanism for delivering Teletext over DVB which maintains the temporal relationship between Teletext subtitles and vision/programme sound.

Subtitles delivered to the receiver as Teletext may then be treated in one of two ways.

- In analogue and some digital platforms the Teletext is decoded using existing Teletext technology (e.g. a set-top box may pass analogue Teletext via the SCART connection to the attached Teletextcapable TV).
- 2. The subtitle text, colour and approximate position is extracted by the decoder from the Teletext component of the service and used to render a bit-mapped image using a font and rendering engine, which is resident in the decoder. This technique is used for example in the BSkyB digital satellite platform.

Both of these approaches deliver subtitles which are inherently restricted to the Teletext character sets (script languages are not supported) and the visual result is entirely dependent on the receiver implementation (font, legibility, size, position etc.).

3. DVB Subtitling²⁸

This carries the subtitles as images, which are presented by the set-top box.

Subtitles delivered by the DVB subtitling standard are rendered as bit-mapped images at the broadcaster head-end, run-length coded and encapsulated for transmission to the receiver, again using the standard MPEG timing mechanism. At the receiver the stream is decoded and rendered directly into the on-screen display at the appropriate time.

DVB subtitling therefore allows the broadcaster to determine the font (style & size) and position, to use proportional spacing and to use anti-aliased fonts to ensure that all compliant receivers deliver the same subtitling image and that legibility can be ensured. Special characters, scripts and icons can also be supported without concern about receiver legacy issues, character sets supported etc..

Other methods

In principle it may be possible to use other methods for delivery and presentation of subtitling as well, e.g. via MHEG and DVB-MHP applications or MPEG-4. However, these have yet to be demonstrated to be suitable for subtitling.

EBU recommends the use of DVB Subtitling for new digital services [12].

²⁶ ITU-R System B Teletext subtitles as defined in EN 300 706

²⁷ Subtitles encapsulated as Teletext data in ISO/IEC 13818-1 PES-packets in accordance with EN 300 472

²⁸ DVB Subtitling according to EN 300 743

Tackling the bit-rate myth

Whilst at first sight DVB subtitling might appear to require a higher delivery bit-rate than Teletext subtitles in digital broadcasting various factors make bit-rate comparisons more favourable:

1. Teletext implementations usually require a constant transmission of Teletext data on each service to keep analogue Teletext decoders working reliably (2 VBI lines per picture requiring a minimum of 37.6 kbits/s of DVB Teletext).

2. DVB subtitles only require data transmission when there is something to send. BBC R&D measurements over extended periods of transmission demonstrate that for a 4 service DTT multiplex with subtitling on each service, the bit-rate used in any one second for DVB subtitling never exceeds 100 kbits/s (i.e. an effective peak rate of 25 kb/s per service). For a single service with prepared subtitles the average subtitle bit-rate over any 5 seconds has been shown to be less than 10 kbits/s.

3. With DVB subtitling unused bit-rate can be applied using opportunistic multiplexing techniques, for example to enhance time-non-critical services like EPG data, receiver software downloads, data carousels, etc.

2.2.2.4 Presentation

As remarked in the section on delivery (section 2.2.2.3), the presentation of subtitles may be dependent on the receiver. This is mostly an issue with DVB Teletext Subtitling, while DVB Subtitling sends the subtitles as images, whose appearance will be consistent on DVB compliant boxes from different manufacturers²⁹.

Domestic displays will often have overscan, which means that care must be taken in composing subtitles within a graphic safe area³⁰ (as with any other on-screen graphics). Equally it is sometimes desirable for programme material shown letter-boxed on 4:3 displays, to reduce the area of the picture covered by subtitles.



Figure 2.2

One practice is to position subtitles (partly) outside the main picture area.

'Clever solutions' in consumer equipment (such as automatic zoom settings and non-linear stretching) introduce an extra level of uncertainty in ensuring correct display of subtitles. This again illustrates that access services depend on the whole end-to-end chain to be provided as intended³¹.

²⁹ This doesn't mean broadcasters use the same font; some broadcasters use it to distinguish themselves.

³⁰ EBU Recommendation R95-2000 specifies safe areas for 4:3 and 16:9 productions, see [11]

³¹ For an interesting discussion on the history and consequences of the different picture formats see [31]

2.2.3 Deployment

Although subtitling is the most common access service, the amount of subtitling and the technological choices amongst EBU Members vary widely. Some Members are aiming for 100% subtitling in 2008, while others are just starting to plan a first deployment of closed subtitling³². Those starting new services could benefit from sharing experiences from other EBU Members.

2.2.4 Costs

2.2.4.1 Cost components

There are costs to the broadcaster at each stage of the subtitling process: authoring, exchange/distribution and delivery. The main cost drivers in subtitling are currently estimated as:

- 1. Staff
 60%

 2. Technology
 20%
 (capital charges, support, licences, connectivity, etc.)

 2. Declaration
 20%
 (capital charges, support, licences, connectivity, etc.)
- 3. Overheads 20% (includes accommodation)

The main drivers of cost are different at each stage.

For authoring the majority of cost currently comes from the staff, with the technology and overheads sharing the rest. Subtitle authoring is still very much a labour-intensive business, but new processes and new technologies offer great savings and increased productivity (see section 2.2.5) – even some automation -- in coming years.

For distribution and delivery most of the cost is in the technology and there is also staff cost in implementing and supporting that technology.

2.2.4.2 Scalable costs:

There are some benefits of scale, for example:

- As the number of hours increases the overhead costs can be spread over more hours of programme output.

- The cost of labour: a larger group of staff can more easily handle sick leave, vacation time,

unpredictable and late delivery of programme material and seasonal fluctuations in output volumes. - The cost of equipment and of maintenance: non-individual workstations can be shared by a greater number of subtitlers.

2.2.4.3 Quantitative example

Table 2.1 gives an indication of the costs of subtitling one hour of pre-recorded programme material, providing a 'low' and 'high' indication. The technical costs cover costs for PCs, network infrastructure, software licences and technical support. The overhead costs include management, line management, programme selection, delivery to transmission, managing the subtitle archive, handling correspondence and feedback, accommodation and facilities, and finance / human resources management.

³² See appendix B for an overview collected by the P/AS Members.

Cost category	Comments	Low	High	Unit
Labour				
Base hours to create subtitles		3	3	man-hours
availability of post-production script	pp-script = 1, no script = 2	1	2	man-hours
level of editing	light = 1, heavy = 2	1	2	man-hours
subtitling equipment	helpful = 1, unhelpful = 2	1	2	man-hours
complexity of programme content	simple = 0, complex = 2	0	3	man-hours
subtitler's skill level	beginner = 3, expert = 1	1	3	man-hours
proportion of programme needing subtitles	< 50% = 0, > 90% = 3	0	3	man-hours
Total hours		7	18	man-hours
Salary costs	tv researcher, editorial grade	25	25	euro/man-hour
Total		175	450	euro
Technical costs		20	20	% of total costs
Total		58	150	euro
Overheads		20	20	% of total costs
Total		58	150	euro
TOTAL COSTS		291	750	euro

Table 2.1

Indication of the costs of subtitling one programme hour

The figures in 2.1 are based on Member experiences. Of course this should be seen as an indicative example, as the costs differ for the different countries, broadcaster's size, etc.

UK Ofcom estimate

UK Ofcom, in a current industry consultation suggested that the prices were in the following ballparks³³:

- Pre-recorded subtitling £440³⁴ an hour
- Live subtitling £500 an hour

2.2.4.4 Cost reduction: outsourcing?

Subtitling is becoming an increasingly competitive arena, which leads broadcasters to ask whether they should (continue to) subtitle programmes themselves, outsource the work, or choose a combination of both practices.

EXAMPLE

Competition driving down prices

Regulatory demands influence the price of subtitling production, as they can raise the expected demands for subtitling production. In the United Kingdom there is a dynamic and competitive market for subtitling and other access services, with the result that unit costs to the broadcaster have been falling up to 50 % in recent years.

Commercial channels usually sub-contract their Access Services production to a subsidiary company or put out tenders to the subtitling industry. Public service broadcasters often run in-house operations, combining permanently employed coordinators and subtitlers with freelancers and sometimes also with sub contracting. This meets the needs of public service broadcasting with its greater variety in programme genres and methods of production.

1. In-house production

Coordination and planning is by its nature an in-house activity, whereas authoring can be carried out by in-house or freelance subtitlers. A combination of the two guarantees maximum stability and flexibility to the operation. Subtitlers working mainly on assignments and on pre-produced programmes may work from home, whereas real time subtitlers usually work in shifts, often within the newsroom environment.

³³ For more information go to: www.ofcom.org.uk/consultations/current/prov_tv_access

³⁴ With a GBP rate of approx. 0,67 this compares to ca. 650 euro.

2. Subcontracting

The subtitling industry is a well-established market that has served broadcasters and videocassete / DVD distributors with both translation and same-language subtitling for more than two decades. Subcontracting is an option especially suitable for pre-recorded programmes, although in many countries live subtitling is also offered on the market.

3. Mixed operations

An in-house operation can easily be combined with subcontracting and acquisition of subtitles from other parties. Such a 'mixed operation' will also act as a competent purchaser, who can define the broadcaster's quality requirements, and verify the quality of the acquired product.

Issues to consider with regard to outsourcing subtitling and setting up an in-house operation are:

Quality

The quality of a subtitling service is highly dependent on the skills of the individual subtitlers. There might be a risk that a too competitive market fails to attract and keep the right people and skills.

Confidentiality

The subtitlers are sometimes entrusted with confidential material. It might be the names of people taking part in a programme anonymously or information that should not be revealed before the programme is televised. This has to be regulated when contracting a freelancer or a subcontractor.

If you are reluctant to give your subcontractor full access to the details of your programme scheduling, you might want to do some in-house planning before you hand over the assignment to the subcontractor.

Costs

The distribution of costs between in-house staff, freelancers and subcontractors is dependent on the level of salaries and freelance fees, as well as on the labour legislation and the current market situation, which differ country by country.

An in-house operation is likely to draw more benefits from the technical developments on the production side, such as network-based production, (see section 2.2.5.1) than a subcontracted one.

Reselling of subtitles

Subtitles are subject to copyright. Reselling can be done either by the broadcaster or by the subcontractor or the subtitler him/herself, depending on who is holding the rights to the subtitles. If a broadcaster has a sales organisation, they may include subtitles in their catalogue.

Note that reselling of subtitles requires the consent of the party that is holding the rights of the programme that has been subtitled.

Food for thought

Outsourcing subtitling

- Should take the problem away
- No need for capital expenditure or accommodation or staff
- Will it be cheaper, in the short and longer term?
- Is there any company suitable to do the work?
- Will they deliver the quality?
- Confidentiality

Setting up an in-house operation

- Greater control over quality
- No issues with confidentiality of broadcaster's programming
- May be more expensive
- Need to invest in capital infrastructure
- Need to recruit and train suitable staff adds to headcount
- Management overhead is this a core activity for the broadcaster?

2.2.4.5 Cost reduction: other methods

Costs can be reduced at all stages in the production chain by using new production technology and related workflows, see section 2.2.5 for an introduction and section 2.3 for recommendations. An apparently simple way of achieving cheaper subtitling is to minimize the number of times subtitles are re-authored, e.g. author once - broadcast many times. This has been proposed as a method for EBU Members to save costs and is already practised within & between some countries (although often

There are two main obstacles to this scenario being applied at a European level:

- 1. Language barriers: the common language areas are limited in their sizes³⁵.
- 2. Quality issues: Members may differ in the quality standards used (e.g. in- & outpoint accuracy).

In spite of the above drawbacks, P/AS recommends EBU to carry out a feasibility study for setting up a central 'subtitling information database'. Such a service would for example list all subtitled programmes that Members are offering to their colleagues. For each entry the service would point to a contact person at the offering Member³⁶.

Even when the 'native language' is different, it may still be very useful for a subtitler to have access to the subtitling print-out as this could greatly speed up the translation process and mean that the translator/subtitler does not need the audio track. Also Members may be able to provide additional notes for help in subsequent translations (e.g. background information or clarifications).

2.2.5 What is coming up?

on a limited scale).

2.2.5.1 Network-based subtitling production

Just like other parts of programme production, subtitling will make more and more use of integrated, file-based production systems.



Figure 2.3 Schematic overview of the way SVT plans to produce subtitling from 2005.

³⁵ 'Language' in this case may be better called 'dialect'. Subtitle exchanges between the US and the UK are often deemed impossible because of the different 'languages' in use. A positive example is the occasional exchange of subtitles between the Netherlands and Belgium (essentially using different dialects of the same language).
³⁶ Note that a similar service is already provided via the ITFC website, see www.itfc.com

Importing scripts from Newsroom systems

There are technical solutions on the market for importing script dialogue directly from the newsroom system and aligning it with the appropriate video content. However, the duration of the subtitles does not always allow for enough reading time, and the language in the scripts is meant to serve as a well tuned spoken language, and is therefore not always well suited for reading³⁷. Also, live reports and other non-scripted items cannot be captioned this way. Nevertheless, scripts imported into the subtitling system are a very useful tool for facilitating the subtitler's work.

Reuse of subtitles for other platforms

SVT is currently investigating the possibility to re-use news subtitling as plain text on additional platforms; on the web and as Teletext pages. News agency material and newsroom scripts are normally edited a second time, before being published on the web and as Teletext pages. Since the subtitlers are in fact already editing the same content and presenting it as semi-live subtitling, it might be a good idea to use the text created by the subtitlers, formatted into running text, for the web and on Teletext as well ("author once, publish many times"). Such a practice would not simplify the subtitling process, but would make to the whole newsroom workflow more efficient. Live subtitling could be presented this way as well, if the subtitling equipment allows for saving, but the output must then of course be carefully reedited.

Since formatted subtitles cannot be seen as an access service by themselves, it might be appropriate to have a journalist do the editing or to revise the text before it is published on additional platforms.

2.2.5.2 New subtitle file formats

Several organisations are currently working on the support of subtitling in new file formats. These include ProMPEG, SMPTE and W3C. The work is partly overlapping and some activities may decide to change their scope / aims, but a brief classification of the current situation is:

W3C Timed Text	an extensive authoring and web format for subtitling and related purposes
SMPTE D27- SDE	focussing on the distribution of subtitling information (in XML) in facilities
SMPTE DC28	working on a subtitling format for digital cinema
ProMPEG/SMPTE	working on generalised exchange of XML in MXF ³⁸
AAF Forum	working on the support for subtitling in AAF ³⁹ , core area is post-production

The EBU Subtitling Data Exchange Format [10] in the longer term will probably be replaced by some or all of the above.

P/AS has welcomed the work of W3C on Timed Text and has input general requirements on access services to ProMPEG and SMPTE, with the aim that these will lead to the inclusion of adequate functionality in the future formats and consideration to easy migration from current formats in use.

2.2.5.3 Remote subtitling & speech recognition

The BBC has started to make extensive use of speech-recognition to author live subtitles. Suitably trained subtitlers listen to the programme sound and simultaneously re-speak the words to be subtitled into a PC-based workstation. The use of re-speaking under controlled acoustic conditions takes away most of the problems caused by background noise and vocal intelligibility which can reduce the effectiveness of speech-recognition of live programme sound.

The subtitler's workstation runs special software designed by BBC Research and Development and based around a commercial speech-recognition package. It can work with a mixed-economy of re-speaking and of stenographic input and allows new or specialised vocabularies (e.g. for a sports event) to be called up as required at transmission time. The system operates over standard IT networks, provides additional resilience in the event of network congestion and supports the

³⁷ In the US the direct use of newsroom information as closed captions (Electronic Newsroom Technique, ENT) is restricted under FCC rules. See [28] for an introduction and references.

³⁸ A simple (but incomplete) way of classifying MXF, would be to see this as the file-based replacement of videotape, with the added benefit of storing much more (meta)data with the video.

³⁹ A simple (but incomplete) way of classifying AAF, would be to see this as the file-based replacement of videotape for post-production.

necessary protocols for selecting a channel to subtitle and for managing handover between subtitlers for example during a long programme. It is therefore possible to subtitle a live programme from diverse locations - e.g. both studio and home working via ISDN.

The complete system, which includes distributed system management and monitoring, provides a costeffective and scalable platform for live subtitling on an increasing number of TV channels.

The BBC's experience is that training a subtitler to re-speak using this system takes a couple of months; by comparison, training a stenographic subtitler from scratch can take 3-4 years. In practice re-spoken subtitling can be as accurate as those produced by a stenographer with a delay to broadcast which is broadly comparable.

2.2.5.4 Sponsored subtitling?

Beyond the advantage of enhanced graphic characters, DVB subtitling allows the inclusion of logos and even short advertisements. One application for this could be the use of targeted messages to hearing-impaired people in countries where this group makes up the majority of the subtitling audience. This may help to find sponsors for subtitling services⁴⁰, e.g. hearing aid manufacturers may like to target their users.



⁴⁰ US experience indicates that this is a viable business model (CNN).

⁴¹ For example: it is often illegal to have advertisements continuously running in programmes.

2.3 Recommendations

Consider the need for thorough editing of subtitles

Research shows that reading on a computer screen may be 20-30 % slower than reading printed text. On a TV screen, reading might be even slower. The 'safe area', the lower resolution and longer viewing distance makes the image size on the retina much smaller than when looking at a computer or at the cinema. In watching TV there is also a lot more for the brain to absorb than just the subtitles. The image is just as important, or more important, than the dialogue. Therefore it is crucial that subtitles are displayed for a sufficient length of time for viewers to read them.

However, it does seem that as some of the audience has become more accustomed to subtitles, they have learned to cope with shorter display times.

The recommendations for the duration of each subtitle varies between broadcasters. Typical display times are between 2 and 3,5 seconds per single row or not more than 140 words/minute. Note that this generally depends on the programme genre. In live subtitling, subtitles may change much faster – up to 200 words a minute.

Methods for improving readability of subtitles Ideally:

- The subtitle text should be distributed over the rows in grammatical units.
- Each subtitle should be semantically self-contained.
- The maximum subtitle length should be two rows.
- The subtitles should be positioned consistently.
- Readability should be enhanced by the use of sans-serif fonts (e.g. Arial, Tiresias, Univers).
- A light text on a dark background, with good contrast, should be used.
- A black outline should be used.
- A black or semitransparent box should be used for good readability against bright or blurred backgrounds
- Sufficient text height⁴² should be provided.
- Sufficient inter-character spacing should be used.
- Proportionately spaced characters should be used for best readability
- More information can be found in [19, 20, 22, 23, 24, 25, 26, 27]

Think about the user interface

With the advent of set-top boxes and related 'superTeletext', the use of page numbers often is abandoned. Be aware that this may be confusing to audience members very used to e.g. page '777'. Make sure your audience is informed with maximum clarity.

Share understanding of graphic safe areas

Especially with the current mixed-economy of 4:3 and 16:9 receivers in homes, sharing understanding of the graphic safe area used is vital to make sure subtitling reaches the audience as intended. See [11] for a good starting point.

Watch and contribute to new subtitle (file) formats

To make sure the new solutions work as required, involvement in its development is essential. Several Members are already involved⁴³. EBU could help coordinate where needed, as has started already in P/AS⁴⁴.

Use DVB Subtitling for new digital services

There are multiple choices for the delivery of subtitles in digital broadcasting. EBU recommends DVB Subtitling [12].

Learn from EBU Member colleagues

When setting up a new subtitling service, see if you can learn from other EBU Members' experiences.

Repurpose subtitling for DVD publications

The provision of subtitling with DVDs will make them more accessible and more attractive. Reusing the subtitling which has been created for broadcast for DVD authoring may be beneficial for economical reasons as well (author once - publish many times).

⁴² A text height of 24 lines high on the capital 'V'

⁴³ BBC, IRT and NOB are actively working on subtitling information in D27, MXF and Timed Text.

⁴⁴ P/AS Members gathered requirements to help EBU, ProMPEG and SMPTE align their work.

Reducing costs in subtitling production planning and logistics

- First subtitle programmes which will be repeated and programmes which are easy to subtitle.
- Substitute VHS tapes with digital video (this will reduce costs for recording, storage, manual handling and for the VHS tapes themselves)

- Use adequate systems for production planning, directly linked up to the broadcaster's system for programming and scheduling.

- Consider using web-based communication with staff, working from home, and subtitling subcontractors.
- Distribute programme material to home workers and subcontractors through the Internet

Reducing costs in subtitling authoring

- Consider outsourcing your subtitling work.

- Use authoring equipment that works with digital video files, this increases the subtitler's productivity by up to 20 %, compared to the traditional PC and home video recorder combination.

- Introduce teleworking (working from home), as it may increase productivity, reduce staff turnover and costs for premises and overhead⁴⁵

- Early access to programme material reduces the costs for overtime and unsocial hours bonuses <u>and</u> will enhance the quality of the output.

-Investigate the possibilities for importing script dialogue directly from the newsroom system.

Reducing costs in subtitle distribution and play-out

- Integrated IT systems allow for the re-use of subtitle files for repeats, including the automatic re-use of real time subtitling.

- Automatic monitoring of subtitle play-out and fewer dropouts reduces time spent on fault-tracing and handling viewers' complaints.

Consider using speech recognition to save costs

Experiences from several broadcasters show that the use of speech recognition can lead to cost savings (30-40% of total costs has been claimed). Members are encouraged to evaluate if this applies to their situation as well⁴⁶ (also see section 2.2.5.3).

Exchange subtitles as a separate component rather than burnt into the programme video

This allows for changes to be made to the subtitles (e.g. correction of errors, dates, etc.). Note that 'separate' does not imply 'separate files'; e.g. a single file could contain the video and subtitles as separate components.

EBU to investigate setting up a subtitling database

To facilitate easy sharing of access services produced by EBU Members, P/AS recommends EBU to investigate in more detail the establishment of a central registry on programmes with subtitles.

Skills to look for in subtitlers

In recruiting subtitlers one has to look for the right talents, skills and types of personality. This should include endurance and motivation, a good sense of hearing and the ability to work to some exceptionally tight deadlines.

Offer your subtitlers variety

It is important to consider offering a subtitler on live programmes variety so that some work involves a keyboard and some, for example, a microphone.

Provide a separate area for broadcasting work

For live programmes, subtitlers can prepare for the broadcast in open-plan offices, but they do need a separate area for broadcasting to provide the necessary concentration and peace and quiet.

Consider having your subtitlers work from home

Current network technology makes this possible, allowing for benefits in terms of flexibility, costs and motivation. Cost savings might be around 5 % annually, based on lower costs for premises and technical equipment, and less overhead costs. The savings could be higher, if you consider that working from home may increase productivity.

Make sure subtitlers have early access to programme material

For pre-recorded programmes it is vital that the subtitling team has access to programmes as soon as possible, so that maximum time is available to schedule and carry out the work. It was noted that with modern (more efficient) production techniques, programmes are delivered closer to the broadcast moment than ever.

⁴⁵ Source: Telework, Business Benefit and the Decentralized Enterprise, AT&T, 2002

⁴⁶ For smaller language areas development of suitable speech-recognition may need to be encouraged at the national level.

3 Spoken subtitling

3.1 Target audience

3.1.1 Description of the audience

In some countries⁴⁷ where a substantial part of the programming is in a foreign language (e.g. 30%) synthetic speech is generated automatically from translation subtitles. This makes the material accessible for people who have difficulty reading the subtitles (e.g. visually impaired and dyslectics). This service is commonly called 'Spoken subtitling' or 'Audio subtitling'.

The potential audience in Sweden for example, is estimated at 10% of the population (1 million people), while in The Netherlands about 5-10% of the population could benefit from this service (0.8 - 1.6 million persons). Similar potential audiences may apply in other countries.

3.1.2 User requirements

For people who cannot see or read the subtitles, a spoken version is necessary. However, spoken subtitling is a relatively new service proposition and user requirements are still developing.

Current findings suggest that to improve the quality of the spoken subtitling, users want to be able to control the mix and the volume settings of the programme sound and the audio subtitles by themselves.

In addition users prefer neutral voices which are not heavily accented and where emotion is not displayed.

Usability studies

In 2003 SVT conducted a usability study of the spoken subtitling system. Sixteen visually impaired people, aged 22 to 85, volunteered to test the system. The primary goals were to examine how the group reacted to the synthetic speech, and to determine whether the spoken subtitling should be mixed with the programme sound at source, or if the users preferred to control the mixing themselves.

The study showed that people adapt to a synthetic voice fairly quickly. The most important elements for the majority of subjects were a uniform voice quality, a high degree of intelligibility and that the voice is as neutral as possible. The test subjects' response to mixing was unanimous:

- They wanted to be able to mix the spoken subtitling and programme sound themselves.
- They wanted to be able to adjust the mixing for different situations

The volume levels they selected were both personal and age-related. Viewers who spoke the original language wanted to hear the original dialogue and use the spoken subtitling only as an aid. For those who did not know the original language, the original dialogue was secondary; the important thing to be able to hear the spoken subtitle.

In 2001 similar research was performed in the Netherlands with 100 test persons. The test results were about the same as in Sweden.

3.2 Service

3.2.1 Description

Spoken subtitling consists of providing synthesized speech to the audience, based on textual subtitles. In principle the synthesizer could be either at the broadcaster's side or with the consumer. In practice the broadcaster's side is preferred (see 3.2.2.1).

At the broadcaster subtitles are automatically converted to computer-spoken text and then sent as audio (possibly encoded for technical reasons, for example as 'mp3') to the 'viewer'. The 'viewer' uses a decoder to recreate the synthesized speech and listens to it via a headphone, speaker, etc.

⁴⁷ See annex B for the available services in P/AS Members' countries.



Spoken subtitling

3.2.2 Implementation

3.2.2.1 Authoring

The authoring of spoken subtitling is automatic, as it uses software to create synthetic speech from the available subtitles. The speech is generated at the broadcaster to keep the extra costs for the consumer low (licensing), to allow regular software updates (easier at a single location) and to prevent legacy problems as more sophisticated synthesizers become available. The software updates are necessary to teach the system new words and names. This is the only manual task involved.

The product range of speech synthesis software for less-common European languages (like Dutch and Swedish) is not as large as that for major languages. This is a potential problem for some countries.

Problems with externally produced material

The spoken subtitling systems currently only work correctly when subtitles are delivered as separate data, because to date burnt-in subtitles cannot be fed into the speech-synthesis computer. There is a trend for broadcasters to insert the subtitles in the picture as part of post-production. In that case spoken subtitling currently is not possible.

3.2.2.2 Exchange/distribution

In practice there is virtually no physical exchange/distribution as the speech synthesizer can be close to the subtitle source. Subtitles may be provided as files via a network.

At play-out the subtitles are mixed in-vision or provided to DVB-encoders as normal, but they are also provided to a computer with the speech-synthesis software. The speech is output as digital information and compressed. It is now ready to be delivered.

3.2.2.3 Delivery

There are three main solutions for the delivery of spoken subtitling:

1. Teletext

The traditional Teletext service can be used to transport the (compressed) speech. In The Netherlands for example two free lines (fixed to 22 and 335) in the vertical blanking interval of the tv-signal are used to carry the information. For digital distribution (e.g. satellite), the same information is carried as DVB Teletext⁴⁸.

The Teletext solution provides a good service using current technology. It is used in the Netherlands, because digital television is not widespread there yet. For the digital future, the system will not be applicable. The use of DVB Teletext is expected to decline and there are more attractive solutions using DVB audio (options 2 or 3).

Note that migration to digital does not have to involve too much costs at the broadcaster's side, as the synthesized speech can be fed as audio into a DVB encoder using standard interfaces.

2. DVB pre-mixed extra audio channel

Another solution would be to generate spoken subtitling as a standard extra audio channel, sending the audio either pre-mixed or unmixed.

The drawback of a pre-mixed solution is that it in general costs more bandwidth (the high-quality programme audio requires more bits than the synthesized speech) and the user cannot decide on the mixing himself. The benefit is that users can use a relatively standard DVB receiver to listen to the audio. Of course with most receivers this means all people in the room would hear the spoken subtitling.

3. DVB receiver-mix audio⁴⁹

DVB allows audio for access services to be sent using the system for 'receiver-mix audio description (AD) and other supplementary audio services', as described in the annex to [13]. This sends the audio unmixed and allows for fade & pan information to be sent, to help steer the receiver mix.

This solution is the most elegant one from an access service perspective, as it allows the user to make the desired mixing settings (although predefined default settings can be transmitted from the broadcaster) and it is relatively bandwidth efficient. The DVB Project has recently approved the specification and it has been submitted to ETSI for standardisation. One manufacturer⁵⁰ already offers the compliant product in the market and there are signs that the technology could be included in further products without major cost penalties.

D/A conversion problems at distributors

If digital broadcasts are received for analogue distribution by cable, some specific digital functions could undeliberately disappear, such as spoken subtitling. This is not according to the must-carry principle, which has caused much concern.

3.2.2.4 Presentation

Depending on the delivery method chosen, different types of receivers are needed:

- 1. Teletext: a special decoder⁵¹ (+ a DVB Teletext capable receiver for digital)
- 2. An (extra) DVB receiver
- 3. A receiver-mix capable DVB receiver

The special decoder currently used in the Netherlands, does not allow mixing of the main programme audio with the spoken subtitling. The user typically uses a speaker or headphones to listen to the spoken subtitling. A new model has been announced that will offer this functionality.

⁴⁸ See section 2.2.2.3

⁴⁹ See section 4.2.2.3

⁵⁰ Netgem issued a press release on this on 13th January 2004.

⁵¹ The *KomFox*, see www.komfa.nl (Dutch site)

For special receivers the number of manufacturers could be restricted to one. In this case it is a risk to provide a system, as the users and broadcaster are tied into a single party. Examples include the special decoder currently used in the Netherlands and the current UK situation with the NetGem box for audio description.

Member experience reported an issue related to channel naming. When using an extra audio channel (option 3), you have to set an extra language name for the second channel. Current boxes cannot always recognise special names (only standard language ones).

3.2.3 Deployment

Both NPB and SVT have experimented with spoken subtitling. Since December 2001, 75% of foreign language programmes of the public broadcasters in The Netherlands carries spoken subtitles. Over 2,000 people have a special receiver to use the service. Sweden started experimenting in 2002 and will start (test) transmissions in summer 2004, aiming at a regular service before the end of the year.

3.2.4 Costs

Spoken subtitling is an interesting option for broadcasters with a substantial amount of subtitled foreign language material. Spoken subtitling is a relatively cost-effective solution, as:

- The technical system needed at broadcast side is relatively small and inexpensive.
- The authoring is completely automated.

The main costs lie in the software licences.

The Dutch Spoken subtitling service costs \in 140,000 a year to operate. This includes yearly depreciation of equipment, licence fee, hard- and software⁵² maintenance and support. The special receiver has to be bought by the consumer and costs around \in 200.-.

SVT is not running the service yet, but expects the speech synthesis software licence to be the main cost component. The licence cost could be a fixed price or a cost per user. The latter requires a good estimate of the number of users.

3.2.5 What is coming up?

3.2.5.1 More receiver-mix boxes?

There are indications that the provision of receiver-mix set-top boxes may take up relatively soon. Recently a retail model set-top box has been introduced for audio description in the UK, which would also be applicable for spoken subtitling.

3.2.5.2 OCR software to use burnt-in subtitles

OCR (Optical Character Recognition) software may be used to extract subtitle data from programmes with burnt-in subtitles. Currently those programmes cannot be used for spoken subtitling directly. Also note that with the arrival of file-formats like MXF, the need for burnt-in subtitles in preproduction may ultimately disappear, resulting in the permanent separation of video and subtitles from authoring to display. OCR-equipment is currently not available for this application. A problem that could arise for actual implementations, is too great a delay caused by the processing time needed.

3.2.5.3 Optimal balance study

NPB is investigating how to optimally balance the spoken subtitling with regard to the main programme audio.

⁵² Note that there is a continuous maintenance cost for upgrading the speech synthesis pronunciation lexicon with new words and names.

3.3 Recommendations

Study the possibility of identifying different speakers

Improvements to the user-friendliness of the spoken subtitling service could be made if different voices for dialogues were used. This of course also asks for extra metadata to identify different speakers.

Investigate the use of OCR for spoken subtitling

The use of Optical Character Recognition (OCR) software to recognise burnt-in subtitles should be investigated, as it promises to widen the range of programmes suitable for automatic spoken subtitling generation.

Involve commercial broadcasters

Commercial broadcasters should be involved, to make spoken subtitling really successful.

Study the transition path for analogue spoken subtitling

When migrating from analogue to digital delivery, the spoken subtitling authoring system could still be useable, as the spoken subtitle signal may be easily fed into a separate audio channel. Investigation is needed to see if special requirements apply.

For example:

- Should the signal be mixed with the original sound and with what (adjustable) level?

- Is automatic suppression of the foreign language needed, when local and foreign spoken text interchange rapidly?

Use of Receiver-mix AD

Where bit-rate is at a premium and/or where user control is important the EBU recommends the use of receivermix AD for digital spoken subtitling applications.

Choose open standards

When providing a new service, open standards are better because they encourage multiple manufacturers to create capable products and minimise the risk of becoming dependent on a single manufacturer

Creative licensing

Broadcasters should investigate if the software licence in their case should be audience-size dependent or not. For example: try to opt for a 'one-of fee' instead of an amount per user.

4 Audio description

4.1 Target audience

4.1.1 Audience description

People with visual impairments (which includes blind people) can still enjoy television, particularly when the visual elements are described for them, and communicated through an additional audio track using 'audio description'.

Audio description has other applications, too, for fully sighted people who want to 'watch' television without looking at the screen – for example, when ironing a shirt during your favourite programme.

4.1.2 User requirements

Blind and visually impaired people want to be able to understand and enjoy television programmes fully. This means that they need to be informed, via an additional sound track or "Audio description", of all the key visual information contained in the programme which is not conveyed clearly in the dialogue/main programme sound.

The concept of audio description has been around for more than a decade and is available to a limited extent in several European countries and the USA. Guidelines for the authoring of audio description have been written by regulators and broadcasters and include recommendations on scripting and voicing.

Audience groups have stated that ideally users would wish to set the mixing parameters themselves, and be able to adjust the relative level of programme sound and description in the mix which they hear. It is also reported that blind people would wish to be able to adjust the relative level between programme sound and audio description on a passage-by-passage basis. However, what is of paramount importance is that the interface between the audio description user and the service is simple and easy for a visually impaired person to use.

As there may be long periods between description passages, an audio description user might also want a means of confirming that absence of description does not necessarily imply failure in delivery of the service or in the receiving equipment.

4.2 Service

4.2.1 Description

To quote from the UK Audetel Project⁵³, "Audio Description is a way of describing as clearly, vividly and succinctly as possible what is happening <u>on the screen</u> in the silent intervals between the dialogue or the programme commentary."

Most television programmes rely on visual content and pictorial composition to help to tell their story. Audio description (AD) is an ancillary component associated with a TV service which delivers a verbal description of the scene or of the action as an aid to understanding and enjoyment particularly (but not exclusively) for viewers who have visual impairments.

The service provides explanations and descriptions of the setting, characters, their moods (joy, fear, etc.) and the action taking place in a scene. When done well, it is a modern descendent of the art form of scene description practiced during the radio era, and employed today by radio sports announcers.

⁵³ The Audetel Project was an EU funded project led by the ITC and with partners from many European countries. Its aim was to study the viability and value of providing an audio description service on television. It culminated in a four month broadcast trial in the UK in 1994 with both BBC and ITV taking part.

Audio description has two functions: primarily to provide the necessary information to understand a programme, but also, where time allows, to allow the visually impaired to appreciate subtle particularities of a scene, making it as interesting as if they were fully sighted,

Note the difference with spoken subtitling, which basically provides audible translation subtitles only and no scene descriptions, etc. It is in theory possible to combine the two services but there is not yet evidence that this is feasible and appreciated by the target groups.

Programme types

To avoid overlaying the normal programme sounds of spoken dialogues and narrations, description is usually restricted to occupying the remaining gaps between these sounds. The opportunities for description are therefore dependent on the programme types.

For example, news programmes provide little opportunity for description and tend to be selfdocumenting, and similarly, the presenters of some cookery programmes already provide a seamless uninterrupted description of what they are doing on screen. This makes the need for description less, although there may be few gaps into which description could be fitted.

Other programmes, such as science and informative programmes, often include long gaps in the narrative associated with significant visual content; in such cases the gaps provide ample opportunity to describe the accompanying visual images.

At the other extreme, action drama and "soaps" are edited more tightly and typically may provide at times only brief windows in the dialogue, which allow similarly brief description. However drama and soaps also often include periods of purely visual imagery for dramatic purposes, in which case the possibly brief times available for description are nevertheless particularly beneficial.

4.2.2 Implementation

4.2.2.1 Authoring

Authoring a programme consists of watching the programme and noting the dialogue gaps which could be used for description. Each description is written to fit comfortably within the available space. Once a script is complete it can then be recorded. This is a simplification of the process, which in reality can take more than 10 times the programme duration.

Assisting technology

Technology can assist in the process and workstations have been developed which control servers carrying the programmes and allow the timecode of each description section to be logged. Description segments can then be written and the timecode used to calculate the gap length and indicate whether the suggested description will fit the available space. The use of servers allows the describer to move backwards and forwards through the programme very quickly. The workstation can also be used to automate the recording process by providing countdown cues and controlling the muting of the microphone.

The description passage fits in gaps within the dialogue, however the programme may not be silent at this point. It is quite likely that there are effects or music, some of which can be loud. For this reason the system currently in use for UK DTT allows for control information to be carried which can be used by the receiver to reduce the programme sound level during the description passage to assist audibility. The level of the programme sound reduction is variable and is set during the authoring process. Pan information can also be supplied which positions the describer within the stereo image.

The output of the recording process is a mono track containing the description plus a second audio track containing an encoded version of the fade and pan control track. This can be recorded on tracks 3 & 4 of the programme tape or be provided on a separate digital audio tape (DAT) or other media as specified by the end broadcaster.

For the authoring process It is important to be familiar with the video that is being described. The describer needs to recognize what information is available only by visual means and is also necessary to understand the content. The describer also needs to be aware of when in the media space exists for description, since audio descriptions should not be playing at the same time as dialogue or other important sounds.

The art of silence

A good audio description can be expensive, due to the time needed and the skilled professional people involved. For example, in audio description language and emphasis is very important. Since it is impossible (and undesirable) to describe everything, the ability to select the high-priority things to describe is essential. The speaker has to describe what he/she is observing, keeping it in mind when the scene changes, even while he is observing something else. Sometimes this process can make the speaker appear to say things impersonally, like a simultaneous translator in an international meeting. Instead, it is vital to keep a vocal style that fits seamlessly into the main audio track.

When time permits, the speaker can describe action in detail like setting, atmosphere or the appearance of characters. Descriptions are usually delivered during pauses or quiet moments. It is permissible to let pauses or quiet moments pass without a description. Conversely, it is acceptable to describe over dialogue and other audio when necessary, since it is more important that the scene is understandable than to preserve every detail of the original soundtrack.

It is also important to describe only obvious emotional states. To describe what is invisible, such as a mental state, reasoning or motivation, is always ineffective – the listener must have the opportunity to interpret things his/her way.

4.2.2.2 Exchange/distribution

If the signal is distributed at baseband level, it important to maintain synchronisation between the programme and the description track. All signals should ideally be carried on the same bearer. If the signal is carried as part of a multiplex then it can be moved from one multiplex to another by standard re-multiplexing techniques.

If the description and control track are recorded on the same tape or server then synchronisation will be preserved when the programme is played out. If the description and control track are held on separate media then timecode or an equivalent mechanism will be required to synchronise the programme and description play-out devices.

The description and control tracks are fed to an audio encoder where the description track is converted to an audio stream. The control track is decoded and for receiver-mix AD the fade and pan data is inserted into the MPEG headers for the description audio.





4.2.2.3 Delivery

There are two basic methods of delivering audio description in a digital environment:

1. Pre-mixed

In the first, a pre-mix of programme sound and description is made at the broadcasting centre or coding headend.

For analogue delivery the pre-mix is modulated on an additional carrier or may be transmitted as one channel of a stereo pair⁵⁴. For digital delivery the pre-mix is coded as an additional service component; at the decoder the user has to select this pre-mix rather than the programme sound. In either case no additional decoding equipment is required but there is no means by which the user can adjust the relative volume of description passages, nor of confirming the presence of description during the current programme.

The bandwidth/bit-rate requirements for these additional components are similar to those of the programme sound without description.

Bandwidth consumption

The pre-mixed solution typically uses 192 - 256 kbit/s rather than the 64 kbit/s used for the mono description channel, to maintain the audio clarity of the programme sound. This makes it unpopular for use in DTT which has greater bandwidth limitations than DSAT. Also it may be traded of against other services (e.g. the capacity of multiple AD channels may instead be used to enhance/add a video channel).

2. Receiver-mix

The second technique delivers the description signal with embedded fade and pan information as a stream component to suitably-equipped receivers. At the receiver a mix of decoded programme sound and decoded description is made, the programme sound is modulated by the fade information and the description by user controls.

Receiver-mix AD requires only the bit-rate appropriate for a mono speech signal and allows the user both to adjust description volume and to confirm that the current programme is described. Whilst it does require additional functionality in the decoder, this method is in use for UK DTT services and the technique has been standardised in DVB as one approach to delivering AD.

Another option: AM radio broadcasts

Since April 2001 RAI have been using AM radio⁵⁵ to provide audio description with TV programmes, as AM is not really popular for regular radio broadcasts. Note that this solution may pose problems for digital (variable delay) broadcasts.



⁵⁴ This is currently used in Germany for example.

⁵⁵ Note that in some countries AM is abandoned as broadcast system.

4.2.2.4 Reception



 Figure illustrating the two type mixed audio (2).

The pre-mix solution is in use by some service providers on the BSkyB DSAT platform and should in principle be capable of being received by most common set-top boxes if they provide a means for selecting that particular audio stream. One disadvantage of this solution is that it is not easy to turn on the AD audio-channel, as the menu options required are difficult to find for many people.

The receiver-mix solution is in use in the UK for DTT services. It is currently supported by only two consumer receiver products but other manufacturers are developing suitable products.

AM radio broadcasts can be received by virtually all radios.

4.2.3 What is coming up?

4.2.3.1 Larger audience for receiver-mix expected

The receiver-mix Audio Description service in the UK has been running for some time now but to only a *very* limited audience. Now that there is a commercially available set-top box the audience should grow. Some modifications of the description style may happen in response to greater user feedback.

4.2.4 Deployment

Analogue pre-mixed AD is available for some services in Germany and digital pre-mixed AD on some services within the BSkyB digital satellite platform.

Receiver-mix AD is available on the BBC's UK DTT services.

Simultaneous AM Radio broadcasting is used in Italy, by RAI. RAI currently provides audio description mainly for movies & fiction series. The service uses human speakers.

Synthesized AD

RAI's experience (based on interviews with visual impaired people) says synthesized AD (the human voice replaced by a synthesized one) is certainly appreciated. In this case quantity would be more appreciated than quality; better three programmes with synthesized speech than one with a human speaker. A neutral voice is preferred, as it allows the listener to interpret for him/herself.

4.2.5 Costs

4.2.5.1 Cost components

There are costs to the broadcaster at each stage of the audio description process: authoring, exchange/distribution and delivery. The main cost drivers in audio description are currently estimated as:

1. Staff	- 50%	
2. Technology	- 30%	(capital charges, support, licences, connectivity, etc.)
3. Overheads	- 20%	(includes accommodation)

The main drivers of cost are different at each stage. For authoring the majority of cost currently comes from the staff, with the technology and overheads sharing the rest.

Audio description is a new service and with small volumes costs per unit can be very high. However, audio description has much to learn from the subtitling authoring process and efficiencies in the current very labour-intensive processes will certainly come about over the next few years.

For distribution and delivery most of the cost is in the technology and there is also staff cost in implementing and supporting that technology.

4.2.5.2 Scalable costs

Currently there are no high-volume audio description producers so savings from scalable costs are not yet being realised.

4.2.5.3 Quantitative example

The table below gives an indication of the costs of audio describing one hour of pre-recorded programme material, providing a 'low' and 'high' indication. The technical costs cover costs for PCs, network infrastructure, software licences, recording booth and technical support. The overhead costs include management, line management, programme selection, delivery to transmission, managing the subtitle archive, handling correspondence and feedback, accommodation and facilities, and finance / human resources management.

Cost category	Comments	Low	High	Unit
Labour				
Base hours to create AD script		3	3	man-hours
Availability of post-production script	pp-script = 1, no script = 2	1	2	man-hours
AD scripting and recording equipment	helpful = 1, unhelpful = 2	1	2	man-hours
describer's skill level	beginner = 3, expert = 1	1	3	man-hours
proportion of programme needing AD	< 10% = 0, > 30% = 3	1	3	man-hours
Total hours		7	13	man-hours
Salary costs	tv researcher, editorial grade	25	25	euro/man-hour
Total		175	325	euro
Technical costs		30	30	% of total costs
Total		105	195	euro
Overheads		20	20	% of total costs
Total		70	130	euro
TOTAL COSTS		350	650	euro

The figures in table 4.1 are indicative and intended to illustrate how costs may be spread.

Table 4.1

Indication of the costs of AD for one programme hour

UK Ofcom costs estimate

UK Ofcom, in a current industry consultation suggested that the price for relatively small volumes of broadcast audio description is around: $\pounds 640$ per hour⁵⁶.

German experience in providing AD for 12 productions a year (each of about 90 minutes) estimates total costs to be about 80,000 euro, which equals 6,000 euro per production.

Some broadcasters are beginning to sell DVDs or VHS with audio description. It is to be expected that the distribution of AD on DVD will become an additional source of income for the broadcasters, which can offset the costs..

For the consumer the costs of the receiver-mix set-top box is currently not higher than that for the standard model⁵⁷, around £120.-. It is expected that audio description implemented in silicon decoders will not add additional manufacturing costs to decoders.

4.3 Recommendations

Produce Audio Description during production

RAI experience recommends the creation of Audio Descriptions during programme production, instead of as an add on later. This allows for a more efficient process, as it can make use of ongoing work on scripts for dialogues and dubbing. Also the quality of the output is thought to better. In practice, tight production planning often means that this cannot happen.

Use of Receiver-mix AD

Where bit-rate is at a premium and/or where user control is important the EBU recommends the use of receivermix AD.

Repurpose AD for DVD publications

The provision of Audio Description with DVDs will make them more accessible and more attractive. Reusing the AD which has been created for broadcast for DVD authoring may be beneficial for economic reasons as well (author once publish many).

⁵⁶ For more information go to: http://www.ofcom.org.uk/consultations/current/prov_tv_access.

⁵⁷ It is even slightly cheaper, but lacks a keyboard, which is supplied with the standard model.

5 Signing

5.1 Target audience

5.1.1 Audience description

Sign language is typically the first language of those who were born deaf or who became deaf at a very early age. The audience for sign language on television is small, but demands for greater access are high since the sign language community's preference is to communicate, and be communicated with, through their own language.

Deafness in young children is a significant obstacle to learning the local (spoken) language; those who have been deaf from early childhood therefore frequently have a lower reading ability and reading speed than the wider population. For them subtitling cannot adequately convey the depth of information within a television programme that can be expressed using sign language.

5.1.2 User requirements

There have been programmes presented and interpreted in sign language in many countries over the last 25 years. While subtitling meets many requirements of the deaf viewers, signing offers a greater involvement and understanding of television, particularly news and information programmes.

Full sign-language combines body, hand and arm movements with facial expressions, and is typically used by deaf people to communicate face-to-face between two people ("one-to-one") or in a small group ("one-to-few"). Signing a television programme or a theatre performance is somewhat different as it clearly lacks the potential interactivity inherent in a face-to-face conversation. This makes it very important to ensure that for "one-to-many" signing applications sign-language delivery mechanisms are transparent to the signing being conveyed.

Sign languages differ between nations. Furthermore, within one nation there may be marked regional sign-language "dialects". Sign languages are generally incompletely documented and, as with most spoken languages, "living" in the sense that new concepts frequently generate new signs or sign combinations. The structure of sign language is unlike most written languages so that direct translation (e.g. from written or spoken English to British Sign Language) is not feasible and interpretation is usually appropriate.

EXAMPLE Sign language dialects

In the UK there is one predominant sign language: BSL (British Sign Language) with regional dialects. In Italy however there is no such thing as *the* Italian sign language. Instead there are many regional dialects. This makes it difficult for RAI to provide a national service.

Signed broadcasting has a strong normative impact on the language of the deaf, since there are very few other media using sign-language. Therefore, extra attention should be paid to the linguistic quality of the signers and of the service.

Because facial features are so important in conveying meaning it is very important that any technical mechanism for delivering signing via television or the Internet reproduces the relevant facial details with sufficient accuracy to convey the full gamut of these 'non-manual features'. Additionally, as with the spoken voice, any emotional colouration (conveyed by posture and facial expression) should also survive the delivery process. You can easily imagine that sombre news or verbatim reporting, for example from a political party conference, needs to be conveyed with much less emotion than that appropriate for signing an exciting children's programme.

5.2 Service

5.2.1 Description

Programmes with signing typically fall into three categories – programmes made especially for deaf people, programmes re-versioned to add sign language interpretation and live programmes with sign language interpretation. Deaf people are frequently involved in the production of the first two types of programming.

Current technology only provides for in-vision signing for which the broadcaster transmits a composited image of the signer/sign-language interpreter superimposed (e.g. using chroma-key techniques) on the main programme vision signal. To reduce the chance of the signer occluding important detail in the picture the main vision signal may be reduced in size and moved using digital video effects before the signer image is overlaid on the final video component.

IPR

Shrinking and superimposing of the original picture can also be seen as a breach of IPR.

Unlike subtitling and audio description, sign language on television is only comprehensible to the small proportion of the viewing audience who sign. Open signing is generally not well received by people who are not deaf or who have no contact with deaf people. The display of a signing person as part of the main image is regarded as distracting. Also people dislike the idea of the picture being partly obscured and/or shrunk. Programmes re-versioned with added sign language interpretation are therefore often scheduled for broadcasting outside the hours of peak-time viewing; the deaf viewer is then expected to view these signed programmes late at night and/or to record them for later viewing.

Unsocial scheduling of signed programmes

Most current signed broadcasts are not popular with the signing community as the signed programmes are transmitted outside prime time and frequently in the middle of the night

There is therefore a strong need to provide deaf signing as a closed (elective) service component on digital TV channels. Being non-intrusive to all non-signing viewers, this will allow sign-interpreted programmes to be scheduled with much greater freedom than at present. It will also obviate most of the re-versioning which current in-vision interpretation requires.

5.2.2 Implementation

5.2.2.1 Authoring

Generally the signer will start by reviewing the programme to establish its content and to prepare any difficult sections where the language is difficult and dense, where new signs are necessary or where interpretation requires rehearsal. Where a deaf signer is interpreting the programme he/she will require a full transcript or the subtitles for the programme. Then the signer/interpreter performs the signing programme, which is recorded against a chroma-key background. For a deaf signer, the script is fed into an autocue. Breaks in the signing can be removed in an editing process.

The finished signing tape is then played in synchronism with the programme tape and the two images are combined to give a composite image. To minimise the amount of picture which is obscured, the main programme picture size is often shrunk and moved to the left side of the screen and the signer image is placed over the gap on the right side.

People and training

Training programmes for sign-language interpreters range from 2 to 4 years and include language studies as well as interpretation methodology.

A sign language interpreter can apply for an authorization. In the UK such licenses are issued by the Council for the Advancement of Communication with Deaf People (CACDP) and The Scottish Sign Language Interpreters. In Sweden it is issued by the same authority that issues foreign language interpreters' licenses.



Figure 5.1

Signed BBC children's programme

5.2.2.2 Exchange/distribution

As the resultant signal is no different from the standard programme signal, there are no special requirements for distribution.

Whilst it is possible to play out the two tapes or server files and combine the two on transmission, some broadcaster prefer to build the composite tape prior to transmission so there is only one tape or server file to handle. Live signing is obviously an exception and the combining must be carried out on transmission.

5.2.2.3 Delivery

As the resultant signal is no different from the standard programme signal, there are no special requirements for distribution.

5.2.2.4 Presentation

As the signal with the signer is no different from the standard programme signal, there are no special requirements for reception.

5.2.3 What is coming up?

5.2.3.1 Elective signing under development

As noted before, there is a need to provide deaf signing as an elective service component. BBC R&D has a programme of work aimed at delivering an elective signing component.

There are two possible approaches. One involves coding the camera image of the interpreter as an additional vision component. This additional component would then be decoded and composited with the normal programme vision in the receiver. Using the latest vision coding techniques and applying our growing understanding of what parts of the signing image are most important this should allow a signing component of between 200 and 400 kbits/s per service⁵⁸.

The second approach involves capturing the movements and facial expressions of a signer/interpreter and transmitting these as data to animate an avatar (virtual human figure) rendered in the receiver/home terminal.

The facial expressiveness of practicable avatars has greatly increased recently and development work is being undertaken on the motion capture techniques required to deliver lexically unconstrained sign language together with the necessary emotional colouration. Using the avatar approach bit-rate estimates for the necessary transmitted data of 50 kbits/s or less have been reported. This bit-rate, if achievable, could restore scheduling freedom in a multi-channel world and provide the deaf-signing

⁵⁸ Note that this could make it unlikely for more than one service to be signed per multiplex at any one time and thus not solve some of the constraints on scheduling signed programmes.

viewer with a substantially greater choice of programmes. It should also make it possible for the broadcaster to fulfil any level of obligatory quota for signing.



Figure 5.2

Signed BBC programme, using an avatar.

Both approaches will need to be tested against their ability to deliver unconstrained sign language which is transparent to the user.

5.2.3.2 Signing, voice-over and subtitling all combined

Programmes originated in sign-language are accessible for deaf viewers, but not for hearing audience members. SVT is providing these programmes with a voice-over.

To create the speaker script, the material is translated from sign language to Swedish. The translators read the sign language and write their translation in Swedish, adding in cue times, using subtitling equipment. The scripts are corrected by the producers and also during the recording of the voice-over.

The corrected text is stored on a server, where it is available for verification. The voice-over is read from a computer screen. Two screens are used, one for the voice-over speaker and one for the person verifying the voice-over. Both can scroll the text on the screens. The person checking the voice-overs makes the necessary corrections to the text.

Results

- Faster processing throughout the process.
- No more papers rustling in the voice-over.
- Clearer script corrections and better accessibility for all involved parties.

Future aims

The Swedish voice-over allows hearing viewers who do not understand sign language to understand the programmes. However, the hearing-impaired are still shut out. To make the programming accessible to them as well, the programmes should also be subtitled. The subtitling should be a closed service, to ensure that the subtitles are not a hindrance to speakers of sign language.

It ought to be possible to simply edit down the speaker script into subtitles. However, this will require analysis and testing.

5.2.4 Deployment

At present in the UK, there is a requirement for 3% of programmes to be signed. As no method of delivering elective signing has yet been deployed, signed programmes tend to be transmitted out of peak hours. The programmes which are signed are either specialist programmes or repeats of popular programmes which have previously been transmitted without signing. In other countries (e.g. Cyprus and The Netherlands) signing is limited to some news broadcasts and special events only⁵⁹.

⁵⁹ See appendix B for an overview

EXAMPLE

Programmes originated in sign language

Beside interpreting programmes in sign-language, SVT also originates news, magazines and children's programmes in sign language, which is the first language of the deaf.

Children's programming in sign language is a crucial part of deaf children's linguistic development. Many deaf children live in hearing families that have not fully learnt sign language. Children's programming meets a crucial need for such children: fairytales, stories, humour and information conveyed in a language that deaf children can understand and appreciate.

The BBC has a long-running weekly magazine programme for deaf people, presented in British Sign Language with subtitles and voice-over, called See Hear⁶⁰. There is also an interactive, signed website for deaf children.

5.2.5 Costs

EXAMPLE	UK Ofcom costs estimate	
UK Ofcom, in a current inc	lustry consultation suggested that the costs for signing is around: £810 per hour ⁶¹ .	

The main cost drivers in the production of sign-interpreted programmes are:

- Studio costs, including any technical effort required for the recording
- Sign-language interpreters (who are hearing but bi-lingual in sign language) or deaf signers, who will need script support during the preparation stage
- Overheads and management.

Costs will, of course, be much higher if only very small volumes of programming are signed, or if the signed programmes are very short and at different ends of the day.

To keep costs low aim for pre-recorded programmes which are available some time in advance so that you can optimise the use of the studio and the signing staff. On the other hand, live subtitling can also be low cost because there is not the opportunity to prepare beforehand or edit afterwards.

5.3 Recommendations

Share understanding of graphic safe areas

Especially with the current mixed-economy of 4:3 and 16:9 receivers in homes, sharing understanding of the graphic safe area used is vital to make sure signing reaches the audience as intended. See [11] for a good starting point.

Understand the cultural background of signing

Take time to meet with deaf groups and representatives of the deaf community to understand the relevance and importance of sign language.

Follow the developments BUT keep an open mind on delivery

Broadcasters should follow the developments in signing technology, but keep an open mind on the delivery means. It is simply too early to decide on the right way of delivering (elective) signing using new technology.

We have to note it is not unlikely the delivery means will ultimately diverge across Europe anyway, while: - With new compression technologies appearing, depending on the starting time of services different choices may be made (e.g. current services may use MPEG-2, but later deployment may start with MPEG AVC, etc.). - A 'mixed economy' of open and closed signing may be desirable from the audience perspective, as people with disabilities may not like to be 'ghettoised'.

Stimulate development of signing delivery mechanisms

Quota for levels of required signing are rising and channel controllers generally don't want to increase the amount of channels allocated to signing. The availability of convenient delivery mechanisms with an elective character is thus desirable. EBU may wish to start by performing a survey on what development work is currently being done.

⁶⁰ See http://www.bbc.co.uk/seehear

⁶¹ For more information go to: www.ofcom.org.uk/consultations/current/prov_tv_access

6 Other services

6.1 Streaming video

Broadcasters today publish their content on many platforms and it is natural that they face demands for accessibility on each of those platforms, including their web sites.

Accessibility on the Internet is part of the general concept of e-accessibility⁶² and has been addressed by various standardization bodies, including CEN, CENELEC, ETSI and W3C⁶³, together with representatives of disabled groups.

The accessibility of websites can be accomplished at many different levels, from improving readability to providing easy-to-handle interfaces and a clear layout. Streaming video on the web can be made accessible through subtitling and signing.

The efforts for creating technical solutions for subtitles in streaming video are also driven by the desire of the film industry to distribute movies with translated subtitles on the web. Additionally, subtitling is considered useful for the indexing of streamed material.

EXAMPLE SVT's streaming video with subtitles SVT's website⁶⁴ offers major news broadcasts, news in sign language and other programmes in streaming video format. Background material may be published exclusively on the web, in streaming video. Sveriges Television - Microsoft Internet Explorer provided by SVT (0.50) rapport Måndag 1 mars • Finland sänkte idag alkoholskatten med 40 procent och från Sverige kom en ström av kunder över gränsen. • Allt fler unga dör i trafiken på grund av Liisa Hyssälä (c) alkoholen och nu kräver expert alkolås i alla bilar. • Ny vikingaskatt funnen på Gotland. Nästan 300 silvermynt hittades i trädgård. 🛏 rapport 19.30 måndag Tisdag 2 mars Antalet spädbarn med alkoholskador riskerar att öka mycket kraftigt eftersom alltfler gravida kvinnor dricker alkohol under graviditeten. Men jag tror nog Karlstad stift stoppar synskadad från att fortsätta sin prästutbildning. att Sverige kommer att följa efter oss På söndag körs Vasaloppet. Rapport har träffat en 100-årig kranskulla som var med redan 1924. 0 — D b n e | - |-🛏 rapport 19.30 tisdag © svt.se 2004 Ansvarig utgivare: Per Yng Figure 6.1 Screenshot of SVT's main news programme, streamed with subtitles.

Translated subtitles are burnt into the streamed broadcasts, if the original subtitles were burnt into the video at a point before the signal was captured. Subtitles for the deaf and hearing impaired are not yet provided.

The work on subtitles in MXF and Timed Text is partly aimed at creating solutions for web publishing of video material.

⁶² http://www.eeurope-standards.org/e_accessibility.htm

⁶³ For example: WAI, the Web Accessibility Initiative

⁶⁴ www.svt.se

There are already some solutions available, among them one created for the CPB/WGBH National Center for Accessible Media⁶⁵, which is relatively frequently implemented on US websites.

There are two basic ways of adding a subtitle file to streamed programme material on the web:

- If the subtitles were burnt into the video at a point before the signal was captured, the subtitles will appear as open subtitles in the streamed broadcast. This is mainly an option for translated subtitles.
- The subtitles can be captured directly from a subtitle generator to allow streaming video with subtitles. The text can be placed at the bottom of the picture like a standard subtitle, below the picture, or in a separate window.

It is essential that the streamed picture can be enlarged, to allow for good readability of the subtitles.

6.2 Services for mobile phones

Text messaging has become a revolutionary form of communication for deaf people. Using moving pictures via mobile phones has even more benefits for those who were born deaf, since it enables them to communicate over distance in their first language; sign language.



Figure 6.2

3G phones could facilitate communication with the audience and between deaf members of staff working on location or in different regions.

SVT in Sweden has identified text messaging as a significant means for communicating with their deaf viewers and now plans to boost deaf audience influence in television programming and on the web using web-cameras and moving pictures via 3Gmobile phones.

6.3 Future developments

6.3.1 Streaming access services

In general the Internet offers opportunities to provide the access service components over IP as separate services, either combined with traditional television or as extra channels, for example streaming audio with audio description.

There are many aspects to this, ranging from (technical) synchronisation issues to the recent financial pressure on broadcasters leading to decrease, or at least not increase, of their internet services^{66 67}.

⁶⁵ http://ncam.wgbh.org/webaccess/magpie/

⁶⁶ Mandated by budget decreases from the government, currently for example in Austria and Germany.

⁶⁷ For a discussion of reasons why public service broadcasters should continue to consider new services, see 'Media with a Purpose', [30].

6.3.2 Electronic Programme Guides (EPGs)

With the spread of Digital TV, EPGs are becoming more and more common. There is currently no standard on EPG design, however, which means the presentation of EPGs varies widely. For people with disabilities the increasing use of graphics, combined with the lack of a common approach, is bad news.



Figure 6.2 Two EPGs for the same morning, taken from two makes of UK DTT set-top-box.

The positive is that the information in principle should be easy to parse, as it typically is really sent as text (contrary to textual information broadcast as video). This leads to the concept of the 'talking EPG' [29], which basically would require a text-to-speech converter (synthesizer) at the user's end, plus an agreed data format from the broadcaster. This requires active involvement from both broadcasters and CE manufacturers.

EXAMPLE UK's seven day EPG on DTT

The UK has recently launched a seven day EPG on the digital terrestrial service. The text for this service is carried as simple ASCII data making a 'talking Teletext' approach a real possibility should a CE manufacturer identify a sufficiently large market for such a device. There is already one set-top box on the market which will announce the channel selected using the ASCII text of the service name.

6.3.3 Access to new digital text services

There are specialist consumer products available which take the textual data from traditional Teletext magazine information services and generate a synthesised audio for visually impaired users.

Digital television offers new opportunities for delivering such information services but often through new, more creative and flexible technologies (e.g. OpenTV, MHEG-5 and MHP) rather than Teletext.

In principle new commercial products can be designed to perform with digital text a similar function to the Teletext "readers". The major challenge will be for the designers of new text services to ensure that the navigational structure for any new digital text service (which is now typically menu-driven rather than accessible by page number) will not preclude easy and user-friendly access to information of specific interest to the visually impaired user⁶⁸.

EXAMPLE Teletext readers stop working

In the UK, the switch from Teletext to a more powerful data service based on DTV, together with the Teletext reader devices not being updated, led to complaints from the audience who suddenly experienced their system stop working. Although the solution (adapting the Teletext reader) was technically relatively trivial, without the involvement of the CE party this was not possible. For the end-user the switch to a more powerful service was thus experienced as a negative (!).

6.3.4 Access services at different delivery resolutions

This report has focussed on the processes and technology involved in improving accessibility to standard definition digital television services.

Services delivered to display devices with different display resolutions are under development within Europe (e.g. DVB-H and HD) but it is not clear what capabilities for access services these will have. For example it may be difficult to read subtitles on low resolution portable displays; similarly the current DVB subtitle specification does not yet directly support HDTV display image sizes.

Steps will need to be taken by the EBU and its members to ensure that accessibility is considered early in the development of these new services or platforms. However, the provision of access services is already a significant expense so it will be very important to ensure that existing investment in access service authoring processes and equipment can be used in any new applications.

6.4 Recommendations

Access services should be included early in services development In developing new services, access services should be taken into account access services from the beginning, and not as a later add-on. This is called 'inclusive design'.

⁶⁸ A simple example of related functionality is audible information when switching channels, including the name of the programme switched to.

7 General considerations

7.1 Service monitoring

For viewers or listeners who rely on any of the access services to understand and enjoy a television programme, reliable delivery to the home receiver is particularly important. Any unexpected absence of an access service therefore significantly reduces the enjoyment of the viewer/listener, leading to dissatisfaction and to complaints to the broadcaster or service provider⁶⁹.

Frequently the relevant access service is provided only for a small proportion of programmes, in which case a failure affecting just only one programme has an even greater impact. If the intended proportion represents a regulatory quota then that one failure can cause considerable embarrassment to the broadcaster/service-provider.

When there are regulatory requirements to carry an access service the regulator may also require the broadcaster/service-provider to take steps to reduce the incidence of delivery failure.

Responding to customer and/or to regulatory complaints⁷⁰ is an expensive and non-productive overhead. Executive monitoring of access services – particularly where it leads to prompt action to rectify a fault – is therefore a better long-term investment. As a useful by-product reliable monitoring could also provide statistics on the volume of access services delivered.

Unfortunately, whilst techniques exist to automatically identify significant faults in the vision and programme sound elements of a digital television signal (e.g. detect a frozen-frame or silence), little effort has yet been invested in monitoring access service components. The problem is compounded by the increase in the number of services that digital television platforms can deliver. Operational monitoring areas now frequently have to deal with all the services in several multiplexes and it is not practicable to expect these areas to constantly monitor subtitles, spoken subtitling, audio description and signing.

To date there are very few commercial products available⁷¹ which allow, for example, monitoring of DVB subtitles. Some experimental work is underway and there appears to be some merit in using inferential rather than explicit techniques. For example useful metrics can be inferred from the bit-rate usage of DVB subtitles (successfully distinguishing between no subtitles, apology pages, live and prepared subtitles) [17]. It seems likely that such an inferential approach will provide monitoring information as helpful as if using more elaborate and/or explicit techniques.

Cost-effective means of "unattended" executive monitoring of each type of access service are urgently required and the EBU should try to find ways of sharing knowledge in this field and stimulating commercial development of suitable techniques.

Note that a related topic is the efficient and accurate recording of programmes with access services, as may be required by regulators and/or internal procedures as well.

7.2 Archiving

One Member reported to have subtitles for around 4.000 archived programmes and 170 feature films on HD floppy disks. The floppy-based system is starting to become less and less reliable, while at the same time being the key to unlock the archive. Replacement hardware for the system is not available anymore.

This example underlines the importance of including access services in your overall archiving strategy.

⁶⁹ Such an absence might be caused by a failure to meet a deadline to deliver (e.g. the master tape arrives too close to the transmission time to allow subtitles to be authored) or by equipment failure in the broadcast signal distribution infrastructure.

⁷⁰ Members remarked that for the audience, broadcasters are the 'obvious' point to contact in case of problems with using access services, even if the problems are caused by e.g. incompatible set-top boxes.

⁷¹ New products were announced for NAB 2004.

7.3 IPR

As our information society grows, so do concerns about IPR. From an Access Services point of view there are at least two issues to consider:

1. The provision of an access services may lead to IPR problems

The relationship between access services and original content in general seems to depend on the type of access service. For subtitling it can be claimed that the subtitles belong to the content owner, while audio description and signing arguably are much more creative and thus do not.

American film companies tend to disagree on this with (European) broadcasters. An example was already given in the section on signing: open signing may be seen as a breach of IPR by the programme rights holders.

An extreme example of IPR issues was a feature film where cast & crew lists as well as small print disclaimers were required to be audio described – thus making the description not only very boring but also extending the audio description beyond the end of the pictures by several minutes (!). Note that these type of demands may even be in non-compliance with European law.

The provision of song lyrics for broadcast music is not always allowed by the rights holders, also grand events, such as operas and musicals, are notorious problematic events to arrange.

2. Who owns the output?

Republication costs may be a driver for defining access services as extra components of an existing programme, instead of calling them a service by themselves.

7.4 Accessibility of access services

User interfaces, such as the menus of a digital set-top box, often are complicated for the consumer to use. For access services this situation can be even worse, as the user has fewer means of observing and changing settings.

For example: the selection of audio description on some receivers requires a relatively complicated setup procedure. For a blind user this may prove very difficult. Also broadcasters are known to be called with questions on how to turn on the subtitles, while there is no standardised button on set-top box remote controls.

The CE industry should aim to design its products for very easy use by consumers, especially were access services are concerned.

7.5 Recommendations

Make access services part of your archiving strategy

EBU to watch over and contribute to new file formats

To make sure the new solutions work as required, involvement in its development is essential. Currently the envisioned support for access services sometimes is limited to subtitling. EBU could play a role in providing requirements for other access services as well⁷² and should support initiatives which seek to standardise relevant exchange formats.

EBU should investigate access services monitoring

The monitoring of access services often is an afterthought. There seems room to study this topic together with manufacturers. EBU is advised to consider starting a group on this topic.

Ask manufacturers for PDRs which record access services

Note that this issue has been triggered by the EBU in its meetings with EICTA already.

Access services should be available under a single button

Note that Sky is already going in the direction of a single button for AD, this should be encouraged, but requires participation of the CE manufacturers.

Learn about any IPR issues with your services

Providing access services may lead to questions related to who owns the rights to the material and the access service components. Be sure to know your legal position and what you can(not) do.

⁷² Such an effort was undertaken as part of P/AS already.

8 List of all recommendations

This chapter lists all recommendations presented in this document.

<u>General</u>

Access service components shall be considered as essence Consider access services as an opportunity Listen carefully to your audience Consider including access services as part of the programme budget Prioritise service provisioning Trade carefully between quality and quantity Lobby for mandatory 'must carry' regulation Discuss with interest groups how to improve awareness Provide consistent access service identification Make access services part of your archiving strategy EBU to watch over and contribute to new file formats EBU should investigate access services monitoring Ask manufacturers for PDRs which record access services Access services should be available under a single button Learn about any IPR issues with your services

Subtitling

Consider the need for thorough editing of subtitles Methods for improving readability of subtitles Think about the user interface Share understanding of graphic safe areas Watch and contribute to new subtitle (file) formats Use DVB Subtitling for new digital services Learn from EBU Member colleagues **Repurpose subtitling for DVD publications** Reducing costs in subtitling production planning and logistics Reducing costs in subtitling authoring Reducing costs in subtitle distribution and play-out Consider using speech recognition to save costs Exchange subtitles as a separate component rather than burnt into the programme video EBU to investigate setting up a subtitling database Skills to look for in subtitlers Offer your subtitlers variety Provide a separate area for broadcasting work Consider having your subtitlers work from home Make sure subtitlers have early access to programme material

Spoken subtitling

Study the possibility of identifying different speakers Investigate the use of OCR for spoken subtitling Involve commercial broadcasters Study the transition path for analogue spoken subtitling Use of Receiver-mix AD Choose open standards Creative licensing

Audio description Produce Audio Description during production Use of Receiver-mix AD Repurpose AD for DVD publications

Signing

Share understanding of graphic safe areas Understand the cultural background of signing Follow the developments BUT keep an open mind on delivery Stimulate development of signing delivery mechanisms

Other services Access services should be included early in services development

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10 Terminology

Access service	= a service provided with broadcasts, to improve accessibility by people with disabilities.
AD	= Audio Description
Audio description	e = provision of recorded speech, describing what is visible in the video
Audio subtitling	= other name for 'spoken subtitling'
Authoring	= the process of creating a programme or service, for example: typing in the subtitles
Avatar	= virtual human figure
BITC	= Burnt In Time Code
BSL	= British Sign Language
CE	= Consumer Electronics
Closed service	= the access service is available to the audience, with the option to turn it on or off
Delivery	= the process of publishing and transporting the programme/service to the audience example: broadcasting the subtitles in the DVB Subtitling format
DTT	= Digital Terrestrial Television, broadcasting method using earth-based transmitters
EPG	= Electronic Programme Guide
Elective service	= see closed service
Exchange/ distribution	= the process of moving the created programme/service within or between broadcast parties example: moving a signed programme on a videocassette to the play-out centre
Hard of hearing	= people with a hearing disability, who are not deaf however
Hearing impaired	I = all people with a hearing disability, including deaf persons
HH	= Hard of Hearing
IDTV	= Interactive Digital TV, basically a 'television with built-in set-top box'
IPR	= Intellectual Property Rights
Monitoring	= verifying that the correct access service data is broadcast with the correct programme
Must carry	= legislation requiring distributors to carry broadcast programmes and related services
OCR	= Optical Character Recognition
Open service	= the access service is presented to the whole audience, it can not be turned off
PDR	= Personal Digital Recorder, tapeless videorecorder, also known as PVR
Presentation	= the process of presenting the programme/service to the audience example: a decoder box makes the audio description of a programme audible
Same-language subtitles	= subtitles providing a summary of the (spoken) audio (may include short audio descriptions)
Set-top box	= decoder used for the reception of digital TV transmissions and the presentation of those on a television, can contain many additional features (EPG, data services, hard-disk, etc.)
Signing	= provision of a sign language presentation of the spoken audio of the programme
Spoken subtitling	= provision of synthesized speech, based on standard subtitles. Also called 'audio subtitling'.
Subtitling	= provision of overlaid text summarising the (spoken) audio of the programme
Translation subtitles	= subtitles providing a translated summary of the spoken programme audio
TXT	= Teletext
VBI	= Vertical Blanking Interval, part of the picture which is normally invisible to the viewer, but can be used to transport data, such as subtitles and programme ID's.
VITC	= Vertical Interval Time Code
Visually impaired	= all people with a vision disability, including blind persons

Regulations Appendix A

This appendix provides an overview of the regulatory requirements for access services in a number of European countries. This is meant to illustrate the different contexts EBU Members are working in. The percentages are minimum percentages of programming. Rules for calculating the percentages may differ amongst the different countries.

	BBC	CYBC	IRT	ITV	NPB	RAI	SVT
Mandatory legislation	Yes – Communications Act 2003 and BBC's own governance	Not yet	No	Yes, but does not apply to commercials	Not yet	Yes, only RAI, via its contract	Yes
Status details	New UK Ofcom code expected in Q1/Q2 2004. BBC has its own targets in addition to UK Ofcom requirements	Subtitling in two languages: in process, audio description: later, signing: later	Public broadcasters must follow regional laws			Maintain current subtitling service, add subtitling to at least 1 prime time news programme, better AD, improve website access	New mandate from 2006
Subtitling	100% by 2008	Expected regulations: Public broadcasters: 20% Private broadcasters: 10%	-	80% for ITV1 ⁷³ 8 - 80% for ITV2 (80% in year 10)	-	Approx. 100 hours/week of which 20 hours in English	50 % of first time broadcasts in Swedish D&HH ⁷⁴ by 2006
Audio description	4% for DTT 10% (in year 10)	-		Digital services: 6 - 10% (10% in 2007)	-	No quantities specified	-
Signing	2% for DTT 5% (in year 10)	-		Digital services: 3 - 5% (5% in 2007)	-	-	Programming in sign language
Other	-			-	-	-	Spoken subtitling desired by 2006
Regulatory organisations	UK Ofcom, BBC Governors	Ministry of Interior Affairs	None	UK Ofcom	 Ministry of Education, Culture and Science Ministry of Health, Welfare and Sports 	Ministry of Communication	The Swedish Broadcasting Authority
Must-carry legislation for access services	Yes	No	Depends on regional law	Subtitles required on ITV1 simulcasts	General must-carry rules apply	No	Demand for must-carry for all SVT digital services New rules in 2005

⁷³ For programmes simulcast on analogue & digital.
 ⁷⁴ D&HH = subtitles for deaf and hard of hearing

Appendix B Current services

This appendix provides an overview of the current access services deployed by a number of EBU Members. The information is categorised by source, but sometimes includes other broadcasters as well.

	BBC	CYBC	IRT	ITV	NPB	RAI	SVT
General remarks	-	-	Figures in hrs/year for Bayerische Rundfunk (BR)		Commercial broadcasters do not provide any of the services below	-	Figures in hrs/year Year 2003 Main channels, national
Subtitling	Many thousands of hours per year Varying from 0 to 80% (small channels) of progs (main channels)	For translation from English to Greek (on both channels) only Txt subtitling under investigation	1000 ⁷⁵	ITV1, 2 and ITV News following rules from Appendix A	50% of all programmes are D&HH ⁷⁶ subtitled	In 2002: 2500 hours of subtitling in Italian, 520 hours in English and 400 hours live subtitling	SVT: 54,2 % 5331 hrs ⁷⁷
- Page # main language	888 DTV: via EPG	-	150	888 (analogue) DTV: STB dependent	888	777 (Italian)	199, 299 DTV: 791, 792
- Page # translations	-	-	777		-	778 (English)	DTV: 791, 792
Audio description	4%	None	110 (2003, until November)	ITV 1 & 2 following rules from Appendix A ITV News ⁷⁸ : none	None	27 hours of AD per month	-
- Technical solution	DTT solution (separate audio channel, local mix)		Dual Tone Pre-mixed	Mono audio track + control bytes, local mix	-	AM Radio	-
Signing	2%	Daily 5-minute Greek news-bulletin		ITV1, 2 and ITV News following rules from Appendix A	< 0,5% / day (max. 10 mins/day) as audience is only a x thousand people + very expensive	5,7 hours/month	0,80% = 78 hrs of programming in sign language Always accompanied by Swedish voice-over, which also is translated to Braille

⁷⁵ Includes re-runs.

 $^{^{76}}$ D&HH = subtitles for deaf and hard of hearing

⁷⁷ Includes translation

⁷⁸ As news is relatively self-descriptive and provides little room for descriptions

Current services (continued)

Other	-	-	-	-	Spoken subtitling (80% of foreign progs)	'Telesoftware', a text service	2 x 15 mins. signed streaming video (2003)
- Technical solution	-	-	-	-	Special receiver (2500 users)	Datacast to PCs via txt, special interface board in client PCs	-
Regional	BBC provides national & regional services	-	2 public national broadcasters: ARD & ZDF, ARD consists of 12 broadcasters	ITV has regional channels	In The Netherlands regional broadcasters are independent	There are 3 RAI channels, RAI 3 provide regional information	SVT provides 11 regional news services
- Regional service details	All news (also regional) is subtitled Up to 20 channels in parallel	-	All ARD broadcasters carry access services	No services, as the national channels fulfil the quota	No services	Televideo (Italian name for Txt) is regionalised using vai RAI 3	No regional Teletext
- Regional services background information	Very resource intensive as news is there always	-	-		Too expensive and only small broadcasters		Technical issues and costs under evaluation for digital television

Appencix C Future services

This appendix provides an overview of additional services currently being planned by the EBU Members participating in P/AS.

	BBC	CYBC	IRT	ITV	NPB	RAI	SVT
Future services and interests	Development is a continuous effort, targets are increasing	Investigating txt subtitling for both translation (2 languages) and D&HH (Greek only) services Very interested in SR for live subtitling	No plans ZDF is testing Speech recognition is used for special events	Development is a continuous effort, targets are increasing monotonically At a certain level, regional channels also have to start with access services	More subtitling Trialling Speech Recognition based subtitle production	-	New demands may occur in new mandate Investigating the use of SR for live subtitling
Subtitling	100% subtitling in 2008	bilingual TXT subtitling planned for 2004 + extra TV-channel planned, requiring its own subtitling		Comply to UK Ofcom targets	100% subtitling in 2008	10% subtitling increase per year	Subtitle all prime time programming and increase news subtitling
Audio description	Comply to UK Ofcom targets	-	-	Comply to UK Ofcom targets	-	-	-
Signing	Comply to UK Ofcom targets	-		Comply to UK Ofcom targets	-	-	More signed programming as streaming video on the web
Other	-				-	-	-

Appendix D Manufacturers

This appendix gives an **incomplete** list of access services system manufacturers. It is not meant as a recommendation, but as a reference to have an idea of the type of systems available. The list was gathered by the P/AS Members but does **certainly not** express an opinion on the manufacturers and their products.

D.1 Manufacturers of subtitling systems

Cavena	www.cavena.com
FAB	www.fab-online.com
Screen	www.screen.subtitling.com
Softel	www.softel.co.uk
Softni	www.softni.com
Sysmedia	www.sysmedia.com
Titlevision	www.titlevision.com

D.2 DVB subtitling receiver implementations

The following manufacturers (and/or brand names) are known to have digital receiver products in the European consumer market which can decode DVB subtitles :

Bush Daewoo, DigiFusion Echostar Ferguson Goodman, Grundig Hauppauge, Humax Labgear, LG Netgem, Nokia Pace, Packard Bell, Panasonic, Philips, Pioneer Sagem, Samsung, Sanyo, SetPal, Sony, Strong Techsan, Techview, Thomson, Toshiba

D.3 Manufacturers of equipment for spoken subtitling

Speech synthesizing hardware, software & receivers: Keeper Speech synthesizing software Ba

Komfa Babel Infovox

D.4 Manufacturers of equipment for encoding audio description

MPEG encoding: Pre-mix signal processing: Screen Subtitling Systems, Tandberg, Thomson/Nextream Eyeheight

Appendix E Access services matrix

AUTHORING	EXCHANGE/DISTRIBUTION	DELIVERY	PRESENTATION
SUBTITLING			
- Prepared subtitling	Video and subtitles:	+ Analogue Teletext: subtitles in VBI	+ Analogue receiver with Teletext
creating subtitles and timecodes	- on VHS-tape with VITC or BITC	fixed/spread (EN 300 706)	
- Semi-live subtitling	- in VBI lines		DVB Set-top Box or IDTV with:
live, but script is available	- on DVD	* DVB Teletext (EN 300 4/2)	* DVP subtitle decoder and/or
	- me-based via hoppy disks/network	DVB sublitling (EN 300 743)	
SPOKEN SUBTILING		Spoken sublities carried as.	
- ASCII-code from subtitle-generator into	+ Audio signal with synthesised speech	+ Teletext packet 31 data signal	+ Analogue receiver + special receiver
speech synthesiser results in spoken		Extra DV/R audia abannali	DV/B Set ten Boy er IDT//
sublities as an automatic process	* Audio signal with synthesised speech	* pro mixed with programme cound	* with reasiver mix conchility
	and fade information	* separate audio with fade information	* without receiver-mix capability
		Separate audio channel with description:	
- Script + fade and pap information is	+ Audio with description signal	+ as one half of a stereo pair	+ Second analogue audio channel
turned into two additional audio signals	· Addie with description signal	+ separate as AM-radio	+ AM radio receiver
with description and encoded fade			
and pan control track	* Description signal and control track	DVB audio channel:	DVB Set-top box or IDTV:
	synchronised with video on tape, on server	* pre-mixed	* with receiver-mix capability
	or via distribution network	* with fade & pan information embedded	* without receiver-mix capability
SIGNING			
- Signing interpreter interprets speech and	- Signer on separate medium: tape, server	- Programme with signer superimposed	+ Analogue receiver
action in vision	or live (separate video signal)		* Digital receiver
		* DVB: additional vision component or	* Set-top box or IDTV with mixing
	* Elective signing under development	encoded movements & expressions	capability or avatar-animation

Special characters indicate area of applicability: - analogue & digital, + analogue only, * digital only