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Deutsche Welle - AMIC
Seminar on
RADIO PROGRAMMING
IN A MULTIMEDIA AGE

jointly organised by

Deutsche Welle Radio Training Centre
Köln, Germany

and

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River View Hotel, Singapore
EBU INTERNET RADIO GROUP

Radio via Internet

Status: July 1997

Part A:
Introduction, Analysis and the Implications for European Radio Stations
Report of the EBU Internet Radio Group: Part A

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This document was edited and compiled by Diana Janssen of Radio Netherlands, Hilversum, The Netherlands.
Executive Summary

Eighteen months ago most radio listeners in Europe had never heard of the Internet. Now, for many, it's a part of their daily lives. Web sites and e-mail addresses are on business cards, just like fax machine numbers were the year before. Commercials on television, feature programmes on radio, even a cinema trailer for the next Hollywood special effects epic, many of these now feature the Uniform Resource Locator (URL) for a web page.

In the last twelve months, the EBU Radio Internet Group has conducted practical software tests and analysed several progress reports compiled by European broadcasters. This has been combined with general interviews conducted at recent EBU gatherings in Switzerland, Ireland and Spain. The results are presented in a document consisting of two parts. In Part A, we focus on the introduction, analysis and implications of audio via Internet for traditional radio stations. In Part B we give an overview of the audio quality performance of several Internet Radio systems.

The results of the Internet Radio Group show that most radio and TV networks in Europe now have some form of "home page". But the level of Internet awareness amongst professionals in the radio industry varies from enthusiasm to a belief that in time the "threat will go away". This, in turn, means that European broadcasters lead their North American counterparts in some fields of creative presence on the Internet, whilst others offer an on-line version of brochures that were originally printed on paper.

But should those broadcasters that don't yet have a site believe the hype surrounding the net? What sort of investment are colleagues making? And to what extent are the existing sites really successful?

Electronic access to information is destined to become one of the main factors of competition. It is already affecting economic growth, job creation and, increasingly, the quality of life.

Across the Atlantic, the Gore Project in the United States includes the linking of classrooms, libraries, public hospitals and clinics to the infrastructures of national and global information. All this will happen within the next five years. For its part, the European Union is encouraging the development of the Information Society not only at the level of the Union itself (in particular by means of the DG 3, DG 10 and DG13, the departments occupied with the media and communication), but also within the G7 (now G8).

Such radical changes in our society are having profound effects on those who work in the broadcasting business. They are being forced to break down the barriers between the different media. Despite an obvious hype about the Internet, it should
not be seen as a gimmick. Technology is merging several industries so that the future lies in being able to supply content to fit the new and traditional media.

It is important though to distinguish between two types of Internet usage, since "being on the Internet" is such a vague expression.

1. Access to the Internet for programme production and distribution purposes. This is clearly "business to business" communications. Programme makers use Internet for production both at the studio centre and/or at remote locations.

2. On-line "publishing" of a station's output or archive in order to reach consumers, directly or indirectly.

1. Internet for Programme Production

Giving journalists and programme makers access to the Internet only happens once. If granted, you can't take it back. The most common use of the Internet is for e-mail, which is far more efficient than a fax machine. Text sent from a correspondent in Madrid can be "cut-and-paste" straight into a script without the need to re-type. Many e-mail packages allow the user to send an attached file. This can be in the form of an audio clip or an interview. BBC, Radio Netherlands and Deutsche Welle are some of the stations experimenting with Internet as a contribution medium.

Internet is also part of the production process. At the International Broadcasting Convention in Amsterdam in September 1996, early forms of video transfer were demonstrated. A TV correspondent in Israel was able to download a file and see a postage-stamp size version of her piece as edited in Cologne. This allowed her to write continuity text which fitted the pictures and send the audio from Jerusalem to Cologne via the Internet. Even in mid-1997, bandwidth limitations mean that video is not practical, but audio is improving quite rapidly. It is certainly cheaper than ISDN which is not as widespread as the "Plain Old Telephone Service". In the meantime, some electronic news room systems (such as those developed by the BBC together with AP) now embrace the Internet protocol, so that you can search both internal and external databases for sound clips, relevant texts and, in some cases, video.

A growing number of European stations which serve foreign audiences via partner stations find that the Internet is a useful alternative to courier services for business to business distribution. Stations with suitable Internet connections are able to download news and audio clips from the host station. In this case, the main station avoids postage and handling costs.

2. Internet to the Home: By Phone, Cable and Satellite?

Early in 1997, Jupiter Communications of New York (http://www.iup.com) estimated that 60 million people have an e-mail account. At present only around 45% of Internet users have access to the World-Wide Web. Although Europe is one of the fastest growing areas of the world for Web access, USA and Canada are further ahead, mainly because of the telephone pricing structure and the higher level of PC penetration in the home. In one study, released in June 1997, Gartner's Group European Research Office says that by the year 2000, the US lead may be larger.
Telecom regulation has a direct impact on Internet usage, and de-regulation leads to lower prices for Internet access. In the US, a (local) call to an Internet Provider is free. In Europe, it is still charged by the minute or second. This is one of the reasons that Asia and parts of Latin America are catching up quite quickly in terms of Internet usage.

In some countries, such as The Netherlands and Belgium, experiments are currently being conducted with Internet access via cable. These are either hybrid systems involving the telephone to provide a return path, or full two way service. Prices are around 20 - 40% higher than monthly access charges from dial-up providers, but there are no dial-up charges. This favours heavy Internet users.

**Internet via the Sky**

In areas outside the highly cabled countries, some satellite-television operators see potential for Internet delivery via the sky. Astra ([www.astra.lu](http://www.astra.lu)) has already announced plans for a business to business service to start in the second half of 1997. Direct-to-Home (DTH) consumers will follow later. Eutelsat ([http://www.eutelsat.org](http://www.eutelsat.org)), on the other hand, is targeting consumers in the summer of 1997 and will be commercialised by Telecom Italia. The equipment required to receive the service consists of a DVB-MPEG2 card for the PC at the user’s premises and a 60 cm antenna which can be the same as the one already used to receive television services. On the transmission side a normal modem and a telephone line are all that are required. Satellite channel capacity is typically in the order of 40 Mbit/s, some or all of which can be devoted to Internet data.

Both Astra and Eutelsat claim the service will enable more efficient access to multimedia services via the Internet and will therefore provide a solution to the bottleneck problems increasingly encountered by Internet users.

The most ambitious plan comes from Teledesic (a company backed by Craig McCaw and Microsoft chairman Bill Gates). They are planning to launch as many as 288 Low Earth Orbit (LEO) satellites around the globe to set up a system of broadband service for video conferencing, Internet applications and other high bandwidth applications. The first satellite will be launched in 2001. Service is targeted to begin in 2002.

The use of the service will be based on a bandwidth-on-demand model. Customers will be able to use the equivalent of a 16 kbit/s voice channel for a few cents per minute and by paying more they could increase the bandwidth up to 2 Mbit/s for applications that need more speed.

The Teledesic Network should allow local Service Providers to extend their networks in both the scope of services and geographic reach. It will be a local service provided through a global network. The advantage of LEO is that a signal needs less time to make its trip from earth to satellite or back. But the lower the orbit, the greater the number of satellites necessary for global coverage. Everyone agrees that this project, also known as "Internet in the Sky", is very visionary although some are sceptical about the commercial viability. [http://www.teledesic.com/](http://www.teledesic.com/)

Orion Atlantic is another company offering an alternative to terrestrial Intranets although they are mainly aimed at multinational corporations. The Orion Atlantic satellite will enable companies to connect multiple sites using Internet protocols and draw on the link’s high bandwidth for multimedia connection.
Motorola has also recently announced plans for a satellite network, combining geostationary and LEO satellites to provide interactive data access.

**Other Interactive Carriers**

Audio and video streaming technologies via the Internet are only one way for European broadcasters to boost their image with the public. At present, most stations are offering services which are strongly based on their existing radio or television programming. Only a few stations have the time (and money) needed to develop interactive material where text, audio and (perhaps) video interact into a new form of programme. Much of the interactive programming being developed is similar to software sold on CD-ROM. But bear in mind that the average full-motion CD-ROM costs anywhere up to US$400,000 to produce and even top titles only sell in the region of 50,000 copies. Specialist CD-ROMS have much smaller markets, between 500-5000 customers. It is interesting that some of the larger broadcaster/webcaster organisations (CNN Interactive, Disney, ABC etc.) are scaling down their CD-ROM production in favour of active Web sites. Many Internet sites run by broadcasters are based on the philosophy that users keep checking sites for new material rather than fancy, elaborate graphics. New forms of off-line interactivity may re-emerge when higher capacity discs such as Digital Video Disc (DVD) appear in Europe in the course of 1997-1998. Recordable DVD Discs will be available later.

Because of the development cycle of the major software players, things are constantly changing. An "Internet year" is currently equivalent to around three months in the real world. That means roughly every three months software makers such as Microsoft and Netscape are introducing new products and features. As browsers and servers add new functions, the features supported change. What looked great on a web page three months ago, just isn’t good enough today to please a growing number of discerning users.

**Internet: the Impact on Traditional Radio Programme Making**

Public-service broadcasters are now faced with the need to understand and analyse the market potential of their programmes. No longer can programmes be made with a single means of delivery in mind: the alternative distribution channels have to be considered even at the planning stage of programme production. The different means of delivery have different merits and drawbacks but each form of delivery can be used to enhance the overall programme product by complementing each other.

Below is a brief look at the delivery mechanisms and receiving equipment, that is already available and what is just on the horizon. The range of multimedia applications is explained.

**Delivery mechanisms may be classified as follows.**

**Analogue TV and Radio:** is in widespread use throughout the world using terrestrial distribution networks. The capacity is limited and insufficient to support the growing demand for services. The broadcast bands are crowded, resulting in interference problems. AM radio via long- or medium-wave gives relatively poor quality but has a place in serving the existing receiver base, particularly portables. UHF TV and VHF FM radio were designed for fixed receivers with highly directional aerials, but service is generally acceptable on portable and mobile receivers. Reception on mobile FM radio receivers suffers from multi-path on transmission but the Radio Data System (RDS) has gone some way towards improving the situation by enabling automatic re-
tuning to track the best reception possibilities. Teletext is available on many television services.

*Digital TV and Radio (DVB and DAB)*: are new digital broadcasting standards which are being implemented world-wide. They each offer spectrum and power efficiency, a flexible service multiplex and an inherent ability to exploit multi-path conditions. They offer a balance between the number of services supported and protection against transmission distortions. DAB delivers audio in high quality and data reliably to mobile and portable receivers. Digital systems are likely to replace analogue systems within twenty years. The success of DAB will depend on the range of existing and new software that becomes available in the forthcoming years, and on receiver price and availability.

*Internet*: can no longer be ignored as a delivery medium. New services such as Webcasting, Web-TV, Netgem are now available. There has been an explosion in development with on-line recipients in Europe. It is estimated to grow to more than 200 million within three years. The distribution channel capacity, compression algorithms and associated hardware are constantly improving. Streaming sound and video quality is improving. The Internet is the only currently implemented delivery means that has an in-built return communication link, which is needed to support interactive services.

Receivers. There is a huge receiver base of AM radio receivers. FM/AM hi-fis, portables and mobile radio receivers are widespread. UHF TV is widely available through terrestrial reception but cable and satellite are beginning to make a significant impact. Digital TV and radio receivers are still in the pre-mass production stage but the market is likely to take off from 1998/9 onwards. Receivers are expected to begin with add-on boxes in order to exploit the existing receiver base but will gradually be replaced by unified designs, combining digital and analogue systems. Some TV sets have already appeared with Internet capability and built-in browsers (delivering Web pages via the vertical blanking interval).

In the US Microsoft has purchased Web TV, who provides the software for set-top boxes manufactured by Philips and Sony. Web TV uses a built in 33.6k modem connected to a phone line to surf the web. A keyboard is available for an additional fee for e-mail and by September 1997 a printer will be available. Support for scripting languages, Java and Real Audio and Video are also planned and will be downloaded to STUs. Web-TV says it plans a UK launch in January 1998. Other European markets are uncertain.

In the next few years, a wide range of receivers is expected to be available, each receiver designed to operate with one or more means of delivery and each able to support as much of the complete programme package that the receiver’s hardware and software allows.

There are different views about what is really meant by multimedia. One widely-held view is that multimedia represents a range of "applications", each of which effectively describes the substance or content of what the service provider or broadcaster wishes to provide. This content may comprise a mixture of sound, image, video, graphics, text and data. Some applications may involve an element of interactivity: this may be purely for local control, for example selecting components that are on offer or browsing through a database. Alternatively the level of interaction may extend back to the content provider so as to feedback user-information or to affect what is delivered.
The Table on page 8 lists categories of multimedia applications which could lead to a range of service possibilities. Against each application there is an indication (using an asterisk) about its suitability for the different means of delivery and for different receiver types. The delivery mechanisms are divided into conventional FM/AM terrestrial radio, conventional analogue television, digital radio and television and the Internet. Receivers are classified as home (meaning fixed and with good directional aerials), personal computer (PC) with appropriate sound cards, portables and mobile receiver in vehicles.

Analogue delivery can provide some multimedia support with feedback through "phone-ins", letters, faxes and even e-mail. Digital delivery opens up the service possibilities with all the advantages that the flexible digital multiplex can offer. There are already technical discussions about the best way to provide feedback channels for broadcasting services using GSM and the Web. The Internet stands out as being one form of delivery that has built-in feedback, which may be used in conjunction with the other forms of delivery. The Internet is potentially able to provide a "one-to-one" or "service-on-demand" requirement.

Programme content productions. The availability of different broadcast delivery means, the supply of multimedia material for home PCs and the emergence of new receiver products is bound to impact on the way broadcasters approach programme production. Increasingly, programme makers will need to consider a range of programme elements that can be co-ordinated under the umbrella of a single programme. The different elements are capable of being delivered by different means to a wide range of different receivers with different levels of audio, video, data-handling and memory capabilities and different user-interfaces. Some, but not all, receivers will be capable of interacting with the sender.

Whilst being aware of the new opportunities, programme producers will clearly prefer not to be encumbered with managing additional programme output in different formats and different levels of technical quality: the programme output should be provided to the "highest common" standard and additional versions derived automatically as required. Video can be converted as necessary to provide an appropriate hierarchical level of transmission and video "clips" can be supplied to a video library store. Still pictures can be "grabbed" off video to create stills for delivery over the Net or Picture radio. Additional and supplementary information can be established in a database for delivery via teletext or the net. Some material for Internet or other delivery can be extracted from conventional radio and television output. For example, audio can be relayed directly to streaming equipment or fed into an audio library store.

As more and more of the audience acquire "on-line" capability, the broadcasting scenario will need to handle more "one-to-one" situations which is effectively "service on demand"
Multimedia applications and their suitability for different delivery methods and receivers

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<tr>
<th>Application</th>
<th>Delivery</th>
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<td><strong>Application</strong></td>
<td><strong>FM/AM</strong></td>
<td><strong>Anlg TV</strong></td>
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<tr>
<td>1 Radio (conventional audio)</td>
<td></td>
<td></td>
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<tr>
<td>2 Television (conventional video)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Text/graphics: General information (e.g. news, weather, sports, road works, financial) could incorporate electronic links within database. Electronic newspaper.</td>
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<tr>
<td>4 Text/graphics: Programme-service related, relatively static (e.g. Electronic Programme Guides).</td>
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<tr>
<td>5 Text/graphics: Programme-related, dynamic (e.g. subtitles, &quot;story so far&quot;)</td>
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<tr>
<td>6 Picture radio (still pictures added to radio)</td>
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<tr>
<td>7 Additional audio/video (e.g. simultaneous sports or different language commentaries)</td>
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<tr>
<td>8 Multi-channel audio (beyond stereo)</td>
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<tr>
<td>9 Downloading (data files, software, etc.)</td>
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<tr>
<td>10 Interactive, free access, programme-service related (e.g. user queries, complaints)</td>
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<tr>
<td>11 Interactive, free access, programme-related, static (e.g. user questions, requests)</td>
<td>Phone</td>
<td>Phone</td>
</tr>
<tr>
<td>12 Interactive, free access, programme-related, dynamic (e.g. &quot;phone-ins&quot;, competitions, games show, voting, betting)</td>
<td>Phone</td>
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<tr>
<td>13 Shopping, interactive, payment involved, not related to programmes (e.g. TV licence, general merchandise, promotion material)</td>
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<tr>
<td>15 Shopping, interactive, payment involved, programme-related, dynamic (e.g. further programme components - audio, video, data)</td>
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<tr>
<td>16 Advertisements</td>
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Section 1: Streaming Audio: What it is Now and in the Near Future.

The EBU Internet Radio working group B/IR has surveyed more than 3000 current radio sites, we’ve analysed how stations in Europe are using audio on the Internet, we’ve made a note of their concerns and we’ve almost completed a comprehensive series of listening tests to evaluate how existing software “sounds”. Through cooperation between EBU members, we’ve developed a reference audio CD with male and female voices speaking several languages and different types of music. Many of the demonstrations of audio on the Internet use synthesised music which sounds fine on many computer systems. Classical and traditional music sound very different in our findings so far. Most of the audio systems have been evaluated in the United States using English as the test language. Our tests have used other major European languages to see whether lower bit rates have the same effect on the degradation of intelligibility.

Many EBU members are reporting that their web-sites are a useful tool for publicising programmes and allowing listeners to time-shift, picking up programmes when they want to listen to them. On the other hand, the number of simultaneous listeners per site is very small. If the Internet site becomes very popular, users are not able to log on to it. In the course of 1996-97, many European users (36%) have upgraded to 28.8 kbit/s modems. Faster speeds are also possible via standard phone lines, although not all Internet providers are investing in higher speed connections. While this is fine for text, such speeds are painfully slow for graphics and only deliver “less than medium-wave quality” audio. Even at double the 28.8 kbit/s download speed, moving pictures look like the early space missions to the moon, rather than standard broadcast television. Even at ISDN capacity (at least 4 times 28.8 kbit/s), video presentations at 15 frames per second are more like a slide show.

The Internet Grinds to a Halt?

In the last few months there have been more dire predictions of an Internet Meltdown. There’s now too much at stake for a complete global “gridlock”, but there will be major traffic jams on the Information Superhighway before backbones are upgraded to high bandwidth. Work is in progress in areas of major congestion. Private high bandwidth Internet connections are currently offered at a premium price, well beyond what the consumer can afford. Right now, at peak times such as on a Friday afternoon in Europe, the Internet users sometimes feel like they are on a country lane, with the scenery taking sometime to appear. The best time to check out the web is on a European Sunday morning.

Another alternative to the Internet traffic jam is the idea of servers in different countries mirroring or copying content. Look at Microsoft’s or Netscape’s download pages for software. You can download from mirrored sites closer to the users home or you can usefully look up a server where it’s the middle of the night. You will often be able to connect and download the program quickly.

Much the same technique is currently being used by Radio TV Hong Kong as it provides Chinese language radio and TV clips to consumers in Europe and the United States. They believe that a network of broadcast servers could be used to mirror web sites with streaming audio content. Eventually it will work without the listener really being aware of what’s going on. If you try to connect to a website that’s busy you’ll be effortlessly transferred to a mirrored site with the same content. It should be like when you’re driving and listening to a networked radio programme and you change transmitters or pick up the signal from a repeater. Radio France.
Internationale has done a research into mirror sites and concluded that originating material from servers in the USA is considerably cheaper than in Europe. As a result, their audio signals are satellite fed to the USA and then put onto the Internet.

Streaming and Downloading Audio

Internet Radio needs streaming audio technology, be it live or on demand. Streaming allows that the audio is heard at the intended pace. Many listeners, typically up to thousands need to be able to listen at the same time to the same programme. To do this requires special streaming software, including adequate transfer protocols and server software at the transmitting site, as well as player software at the receiving site. Compared with downloading of audio, streaming audio is the much more critical case due to the real-time aspects of transmitting and receiving the audio information.

A standard download of an audio file (such as in the .wav format) is less critical. You need a suitable audio encoder which reduces the amount of information to such an extent that the transmission costs are reasonable. This encoder has to encode the audio information and to provide a file format of the compressed audio which can be handled by the decoder. The transmission protocol is chosen for a maximum error correction, because the whole audio file has to be downloaded before playing. The main advantages of downloading audio information are the error correction of the transport protocol and the lack of restriction to certain bit-rates of the coded audio. Even with a 14.4 kbit/s modem, a high quality audio file with sufficient bit-rate can be used for contributions to a radio programme. The only drawback is that it may take a long time to upload and download the material, or if the file corrupts during download, the operator has to start again.

However, typical Internet Radio applications allow the broadcasting of live events and thus require streaming audio technology. If the bandwidth of the network is not restricted too much due to traffic overload and if the listener is willing to accept less than CD-quality, the streaming audio programmes work quite well. Nevertheless, the reliability of streaming audio is still rather poor because of the high variance of the information traffic over the Internet. Most streaming-audio programmes are at least functional at 28.8 kbit/s and 14.4 kbit/s. The audio quality performance may not be all that pleasing to listen to (especially at 14.4 kbit/s), but at least speech signals are intelligible.

Streaming Audio Software: Requirements on the Transmitting side

Streaming programmes are available free of charge, at least for the moment. Other companies charge only for the audio encoder or the server software, but they give away the "player" or decoder (or at least the basic version of the player) for free. The user has only to pay for a more advanced version of the player, offering more features, such as a recording capability. This model works, because the website managers need the most technical support.
How the Audio Streamers Work

All audio streaming programmes use encoders for the compression of the audio signal to discard huge amounts of data and to create compact audio files. Audio compression invariably involves some irrecoverable loss of quality, particularly if the compression is high. During playback, the player software decodes and decompresses the audio files on the fly. In the Internet a high data-reduction is necessary, because to stream the audio on a Compact Disc, a bandwidth of 1.5 Mbit/s is required. Since the speed of a 28.8 kbit/s modem is about 50 times lower, a data compression of about 50 is required by the audio encoder. Furthermore, analogue-modem lines never achieve their theoretical performance, because of noise and other distortion. Thus the streaming-audio encoders have compression rates that exceed 50:1 or 100:1 which is the compression factor required for a 14.4 kbit/s modem. The compression ratio which is needed for ISDN is either 24:1, if only one B-channel is used, or 12:1, if both B-channels which are provided by one ISDN-line, are used. Of course, the Internet radio listener can access a 28.8 kbit/s file with an ISDN, i.e. fast-bandwidth connection, but without the benefit of the ISDN line.

Streaming audio encoders are most widely available for PC with Windows (3.x, 95 and NT). Some companies also offer Macintosh (mostly PowerPC with Mac OS 7.5) and Unix versions for workstations. Some of the streaming audio encoders can be handled in a relatively simple way: You launch the encoder, pick a compatible audio source file, name the encoded file and hit the start button.

Some of the settings on, for example RealAudio, can only be used by the advanced (and not free) player version. The programme provider should remember that only a minority of the audience will pay for a player, if others are available for free.

Most of the tested audio encoders run the operator through a series of operations and settings and thus offer the ability to tailor the encoded files to suit the target audience. They have special optimisations either for 14.4 kbit/s, 28.8 kbit/s or even ISDN. Some of the encoders already have specially defined defaults, e.g. different sampling frequencies, well suited to the different available bandwidths. Progressive Network's RealAudio, Xing's StreamWorks, Macromedia's Shockwave, Fraunhofer's L3ENC and Vivo's VivoActive allow for an optimisation of the encoded files for ISDN transmission.

Server for Streaming Audio

Some of the software requires a specific A/V-server. Examples are RealAudio, StreamWorks and VDOnet. This special server software has to be installed on the programme provider's Web server computer. The software allows the broadcaster to tailor the quality and number of streams and it provides detailed information about the number of hits and who requested which stream.

Other streaming-audio programmes, e.g. Shockwave, QDesign, VivoActive do not require any special A/V server software in addition to the ordinary Web server software. With these programmes, a coded audio file can easily be linked to the Web page. If somebody hits the link, the audio file just starts to play from the hard-disk. The disadvantage is that no special reporting-capabilities software about the hits exists. In addition, problems may occur, if simultaneous streams need to be supported, because of the lack of both, stream- and bandwidth-management features.
If a Radio Station has to manage simultaneously hundreds of streams, a server-based audio-streaming software is preferable. But if the needs are more modest, a server-less program might be the better choice. The installation of the software is much easier and the costs for the streaming software are lower. In this case, the maximum number of streams that can be handled simultaneously are limited by the Web server's overhead and the backbone connection to the Internet. However, no number of simultaneous streams can be specified.

Network Protocols for Streaming Audio

Currently, two protocols are widely used for Internet Radio applications: UDP (User Data Protocol) and TCP (Transmission Control Protocol). They differ in that both protocols address error situations differently and thus show different results for streaming audio. The new RTP protocol (Realtime Transport Protocol), a quite new standard, initially designed for video over high bandwidth line (1.5 Mbit/s and higher), promises more efficient multi-media streaming. However, none of the popular streaming audio programmes use this protocol yet.

Most Internet file transfers, such as e-mail together with attachments, use TCP to ensure that the receiver gets all the transmitted data. TCP works bi-directionally. It checks whether the data-packets are sent to the destination correctly and in the right order. However, in the case of real-time broadcasting, such a protocol may cause some problems, in particular if data-packets are delayed or distorted. In this case the TCP protocol will interrupt the traffic until either the original data-packets or corrected data-packets arrive. If the playback cache is already empty before these late delivered packets arrive, the sound will be stopped. But if the playback cache is sufficient enough, the whole audio sequence can be decoded without any errors.

Most of the streaming audio software packages use UDP as the transport protocol. Examples are RealAudio, StreamWorks and VDOLive. In the case of RealAudio, the user can choose between TCP and UDP, but RealAudio recommends the use of UDP. Note that UDP does not provide the error correction facility of TCP and allows data-packets to drop-out if they arrive too late or are distorted. In such cases, the sound drops out for a moment, but the stream continues and the player still keeps playing. Despite the possibility of drop-outs and disrupted audio, this protocol has certain advantages for streaming audio, because each user gets the same information simultaneously and the player keeps playing.

A certain disadvantage of UDP is that many firewalls block information sent by the UDP protocol. Whilst Progressive Networks, Xing and VDOnet offer special software to overcome the problems with the firewalls for the client sites, some users, in particular in companies with their own Intranet, simply may not be able to access files transmitted by the UDP protocol.

Receiving end: Players for Streaming Audio

The Internet Radio listener needs an IBM-compatible PC or Macintosh (PowerPC) together with a SoundBlaster-style sound board, an analogue modem running as fast as possible (or an ISDN-connection) and access to the Internet. In addition he or she has to download the software-player which in most cases can be done free of charge. Most players are available for Windows 3.x, NT or Windows 95, as well as for Macintosh and Unix platforms. Most of them will be installed automatically by the browser software, because they work as helper applications which are launched.
automatically when the browser detects an incoming encoded audio file of the appropriate format.

Many players can work as browser plug-ins, which allows a Web master to configure when and how a player launches. For instance, the player interface can be built into the Web page so that nothing additional needs to be launched. Similarly, the player interface can be bypassed so that the audio starts playing as soon as someone opens the file.

The typical streaming audio software packages, available presently are:

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<tr>
<th>Manufacturer</th>
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<td>DSP Group</td>
<td>TrueSpeech</td>
<td>Dspg.com</td>
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<td>Eurodat:</td>
<td>AudioSoft</td>
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<td>Macromedia</td>
<td>Shockwave</td>
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<td>Progressive Networks</td>
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This rather large number of different audio streaming software packages makes it difficult for the broadcaster to choose the appropriate audio system. It is also difficult for the user because he or she has to download and to install several players which is very time consuming. Fortunately, both Netscape and Microsoft have announced special a audio player software. In the case of Netscape this software is installed in the browser software. Microsoft will install it in the operating system. For example, Microsoft will use the world-wide MPEG-1 and MPEG-2 Audio Standard with Layer II and Layer III. But for the time being we have the choice between several audio streaming packages, each with their benefits and drawbacks.

Market Survey in June 1997

After a revised survey in June 1997, here's a quick look at where the technology is heading. Netscape Communications, makers of the market leading Navigator browser, has released Navigator 4. The product is now a suite of tools for using the Internet, called Communicator. The product seamlessly allows you to play audio applications you encounter on the Internet, from Shockwave and Lucent Technologies (a spin off company of American Telephone & Telegraph). You don't
have to download a so called "plug-in" to add the capability of hearing an audio stream. Navigator 4 supports improved page layout, cascading style sheets, HTML, style formatted mail and other cosmetic features that are beyond the scope of this report.

All this is designed to counter the Internet Strategy of Microsoft whose Internet Explorer 4 is now in its second beta or preview version as you read this report goes to press. Internet Explorer 4 will be the Windows Operating System desktop. The new software allows you to browse your computer desktop like you would an Internet Website. Within 45 days Microsoft intends to have beta's for multi platforms, (Windows 3.x, Mac and Unix).

Both companies have also announced servers that will deliver streaming audio and video. Netscape and its partner Lucent, along with Progressive Networks creators of Real Audio will support a standard called RTSP (Real Time Streaming Protocol).
Section 2: What's on the Immediate Horizon?

It is fascinating to dig through life-style magazines written in the mid 1950's by authors living in Europe or North America. Television is becoming a viable medium and the outlook for "old fashioned radio" is bleak. 40 Years later there have never been so many radio stations. In many countries there is still a shortage of spectrum space to satisfy the demand from entrepreneurs.

Radio adapted to the threat of television. It switched from being an object in the living room to a portable and personal device. The "wireless" is still the best medium for stimulating three-dimensional ideas. Good radio programmes involve listeners in a way that is impossible once the camera intrudes.

Now, radio is about to adapt again. Gradually, there are digital routes to pump information into the home. Concepts for the telephone, Personal Computer and Television are broadening. Because the "pipelines" just carry numbers, the identity and form of the message is no longer discrete. The numbers could be parts of a fax, or a radio programme, or a television documentary. The new word is "convergence". In fact though, on both the production and consumer sides of the digital pipeline, there is divergence.

When radio started, listeners were enticed to tune around by the mysterious names on the dial; Daventry, Cairo, Hilversum, Moscow, Peking, Johannesburg. The names were often the transmitter sites. The revolution with FM saw the on-air promotion of dial-position switch to frequency. Jingles scream "one-hundred-point-one-f-m" and hope that listeners remember it. Some do, most don't. With the advent of DAB, listeners will be able to tune a radio based on content.

Every hour of the day the airwaves are full of fascinating material. Yet, whereas we have video recorders with timers to time-shift TV programmes we want to see later, the number of listeners that store radio programmes on cassette tape is very small. Radio is the "now" medium. Cassette decks don't usually have a timer facility. But that may change. Flash memory capacity is such that you can now build a portable "Walkman-style" radio that can store 60 minutes of a favourite show and market it for less than 150 CHF. No tape is involved. Technology just compresses the audio onto a memory chip. Portability is preserved, with the added bonus that you can catch your favourite show when you want to listen. There is one company which is marketing the idea in the USA.

Who's on the Air?

There are now around 3000 radio stations on the Internet. External broadcasters, such as Radio Netherlands, Radio France Internationale and Deutsche Welle, are starting to provide a whole new range of services. It could be the text of a news bulletin, a picture to illustrate a radio programme, or the ability to find material by subject rather than frequency.

Suppose you're interested in maritime developments. In a world of growing choice of channels, you'd prefer to search for "news about the high seas" rather than zapping through dozens of radio channels in the hope that somewhere there is a programme about shipping.
Newspaper listings for radio have been reduced to programme titles, if they are there at all. Radio via the Internet allows consumers to pick and choose information in a much more efficient way. But, unless you live in the US or Canada, you pay by the minute to be connected to the Internet. That means, in effect, that pay-radio has already been developed. Shows via the airwaves are still free and you can still carry them around.

The intelligent portable radio is on the way. In September 1997, Digital Audio Broadcasting will be officially launched in Berlin. Specialists are already pointing out that the radio-plus-data features of DAB could spark a revolution. If programmers grasp the power, then the future looks bright. The history books give two definitions for radio. It either came from the Latin word meaning "to radiate" or it stood for "reception and detection in order". In other words, it described how signals got from transmitter to a receiver and not what was said.

But radio waves can do more than carry radio programmes. They connect people on a one-to-one basis and the telecommunications business is spending 10 to 15 times more on developing new services than the broadcasters. The boundaries between radio, TV, telephone and the Internet are starting to blur already. If paging devices can deliver news headlines or you can listen to radio programmes via a PC, perhaps we need some new definitions of radio.

Broadcasting may be the knowledge-sharing business. As information brokers, broadcasters are using audio, video and text. The creative and successful stations of tomorrow will find new combinations of all three to achieve their goal. It is vital that programme makers realise that the sound medium must stimulate the imagination; radio is not a broken TV. But it is also important that radio stations in the future will dream up other ways to present information than the "and now for something completely different" system we know now.

Traditional radio stations are going to be challenged by the digital revolution. But, given the fact that making radio digitally is now cheaper than storing shows on analogue tape, the successful stations will find themselves technically equipped to respond. In areas where Internet is just a dream, the radio is becoming more practical than before in the fight against ignorance.

In short, the future of relevant and successful radio lies between traditional "wireless" and the World-Wide Web. There's a whole new challenge unfolding. Let's look in more detail at the options.

Personal Internetworked Broadcasting Systems. The browser acts as the receiver. Commercial Networks such as Pointcast, CNN Interactive or MSNBC (the Microsoft-NBC joint cable and Internet venture), are now "pushing" content to consumers automatically. Consumers don't have to go out and pull it off a Website. They can also specify what type of information they want, and when they want it to be delivered. Other emerging companies in this area include Marimba, Infusion Comma, Tibia and Intermind. These firms can not (and will not) wait for thorny copyright issues to be resolved. In the USA, New Media research firm Forrester Research predicts that this technology will explode later in 1997 and perhaps break the technological and economic barriers needed to create a mass online market.

With software channel changes as easy to use as a TV remote control, finding your favourite net content will be easier than scanning the FM dial. But these push networks won't kill web sites as we know them. Expect to see a world of many flavours of Internet, active and passive, open and closed, free and pay per view. In fact this kind of Internet sounds an awful lot like modern radio doesn't it?
Finally in this section, a word about CDF (Channel Definition Format). Microsoft is proposing this standard to enable push content. CDF will enable web page authors to tell a browser (in this case Microsoft) when to download the latest version of your web page. This can be done when the Internet is not busy, say the middle of the night. In the preview release of Internet Explorer 4 this is called *subscribing*. Just like a newspaper or magazine comes into your home or office, so can a web page. Microsoft has announced it will propose standards in CDF that can be used with Netscape's Netcaster push technology.

*Synchronised Multimedia* and Beyond

The inevitable trend for the World Wide Web is towards delivery of ever more sophisticated multimedia. Generally, the more sophisticated the multimedia to be delivered, the greater the data rate needed into the home PC. The evolution of the Web is thus probably one of step by step increases in multimedia sophistication, and consequent demand-led step by step increases in delivered data rates.

Current domestic modems operate at 14.4 kbit/s, 28.8 kbit/s, 33.6 kbit/s or (recently) 56 kbit/s. The ISDN connections that are gradually becoming more widespread, will allow 64 kbit/s or 128 kbit/s. The T1 (US) and E1 (Europe) connections allow 1.5 Mbit/s and 2 Mbit/s, respectively. These may be provided on cable television networks, or possibly via telephone lines using the so-called ADSL or VDSL technology. Digital satellite delivery is already available in the United States and Europe.

In addition to standard telephone, and cable network connections, digital television or radio broadcasting may provide a high capacity forward path for Web delivery on demand.

Developing New Tools

In the area of services and content, two major current developments in Web systems are PICS (Platform for Independent Content Selection) and JEPI (Joint Electronic Payment Interactive).

PICS is a set of tools to define content ratings for Web services, in terms of suitability for children or other criteria. The concept is that "rating services" will arise, which can use the tools to create classifications for Web sites. Consumers can choose a ratings service which corresponds to their own ethical perspective. PICS is a so called Meta tag within HTML. At present PICS is only supported by Microsoft's Internet Explorer 3 and 4.

JEPI is developing ways to allow electronic payment for Web services.

A new and patent free graphics format PNG (Portable Network Graphics) is being developed as an alternative and more efficient equivalent of the GIF format. HTML continues to evolve. The latest version is version 3.2. Proposals are currently being circulated for the next version of HTML called "Cougar". A new layout system CSS (Cascading Style Sheets) has been developed, which allows you to create HTML pages with the look of printed documents. Those familiar with Desktop publishing will find Style Sheets easy to use.
But if 1996 was the beginning of the age of modest audio and poor video on the
Web, 1997 has really seen the beginning of the age of Synchronised Multimedia
(SM). This will be the key new development for the Web. SM is the mechanism for
giving the user multimedia elements in sequence, so that the Web page has a
"script" which runs when the Web page is called up. A page may begin with graphics
only, then move on to audio after a short time, then move on to something else.
Scripting languages like Javascript and VB Script connected to databases on the
server will generate content on the fly. Microsoft’s active server pages (ASP) can
personalise a visitor’s experience at your web site.

The first generation synchronised multimedia products, already being used, are
termed “server push” products, and they include “Pointcast”. Beta 2.0 using
Microsoft’s CDF format is not available.

The second generation synchronised multimedia will include audio and video, and
will include mechanisms for efficient distribution to large audiences. The result will
be something like "interactive television" (e.g. karaoke-via-TV), in the sense that the
user is presented with a show, but which also contains elements which are
hypermedia links. In addition, expect to see refinements of the VRML, to add sound
and interactivity to virtual reality environments.

But with growing data loads - audio and especially video demanding lots of
bandwidth - there is an increasing risk of congestion. The cable nets are being built
with fibre-optic cables while new modulation/coding techniques squeeze more data
through "old" copper lines than ever before. At the same time a number of satellite
projects have been announced as an alternative to terrestrial networks.
Section 3: Who is on Line?

As a communications medium, the Internet stands somewhere between publishing and broadcasting. The possibilities for transmitting pictures, sounds and data all over the world are in theory virtually unlimited. So it is natural that more and more broadcasters around the world are starting Internet services. This document is prepared for the public service broadcasting organisations which make up the bulk of the membership of the EBU.

General User Profile of the Internet at This Moment

As of January 1997, an estimated 60 million people world-wide had access to the Internet. The majority of them are male, 20-35 years old, and with a university level education. A large proportion live in North America and northern Europe, and there is a wide spread of income. However, this profile is not static. The proportion of females on the Internet, currently estimated at 20%, is on the increase. Also on the increase is the proportion of users aged 35+. In the past few years the Internet has become a major source of information in business, and the majority of large companies in Europe and North America, especially those with an international and/or technology emphasis, have their own Web sites. The total number of Internet users continues to increase rapidly and there is now significant growth in Asia and Latin America.

How People Use the Internet

During the first year or so, the typical Internet user "surfs" the Web out of curiosity to learn and get acquainted with it. He (or she) is impressed by graphics, and makes heavy use of hypertext links to get from one place to another on the Web. The information obtained from this "Web surfing" is for private use. After this initial period, the user no longer relies so much on surfing and using the links provided by someone else. He starts to make use of search engines such as Yahoo, Alta Vista and Hot Bot, to look for specific information which will often be more business related. Sites of particular interest will be saved as bookmarks or in a hot-list, and the user gradually builds up a personal portfolio of Web sites which he consults on a regular basis. The aim of any Web site operator is, therefore, to try and get into as many bookmark or hot-list files as possible. To stay there requires the information provider to keep the site "alive" with frequent updates, news services etc. A site which is rarely, or never, updated can actually do more harm than good to the image of its operator.

The Internet Radio Listener

Very little data has so far been gathered to create a clear profile of the typical Internet radio listener. Most of the broadcasters currently on the Net are themselves still in the learning process. Through feedback they are just starting to get an idea of who is out there and what services they require. Nevertheless, some general observations can be made as to the various ways people are making use of radio on the Internet.
Expatriates can listen to radio from their home country, often for news, but sometimes just for entertainment, and to enjoy hearing something in their native language. Traditionally, this has been the role of the international broadcasters, but gradually more and more people are using Internet either in addition to, or even as a replacement for, listening to these services on the radio. In the case of some countries (such as RTE Ireland), there is no short-wave radio alternative.

Business people can make use of news and financial information. But it’s important that such services are updated on a timely basis. CNN Financial Network deliberately delays material by 20 minutes. In the US the stock exchanges supply real time data to brokerages and to subscription services, allowing them to make their money.

People interested in particular countries or subjects can listen to on-demand news and background reports.

Music can be broadcast on the Internet, either through a live feed from one of the radio networks, or through an on-demand service. Note that copyright issues are involved here, as many record companies and performers expect to receive some form of royalties for use of their work on the Internet. Many browsers support a text stream, allowing a box on the screen to display the name of the song, artist and other important details. But that rarely happens on radio sites.

It seems inevitable that copyright laws will be updated to reflect Internet usage of musical works once the number of Internet listeners reaches critical mass. However, the theoretical audio quality claimed by the various manufacturers is rarely attained in practice, and the received sound is often very disappointing. The bandwidth needed for “CD-quality” is well beyond the capability of phone or even most ISDN lines. Even CD-like quality is rather optimistic at present.

The Enthusiast Factor

Despite the introduction of graphic driven interfaces, the world of home computing is still a daunting and therefore a limiting factor for most people. It is now easier to set up an Internet account than a few years ago, but help-lines are still dealing with hundreds of thousands of calls a day from people who don’t know and don’t really wish to know about protocol problems. The situation is improving, with major online services providing user-friendlier software that automates many of the more arcane procedures. But to get the most out of a multimedia PC system, the user still has to spend time and effort seeking relevant information and fiddling with settings. This, of course, explains the relatively young, male and well-educated profile of Internet users. Certainly, the Internet community is far from being a cross-section of the whole of society. Broadcasters should bear this in mind when planning on-line services and analysing feedback.

Why Enter the Internet Market Now?

Although the Internet market today it rather like the experimental days of radio in the 1920’s, taking part can act as a tremendous stimulus both inside and outside the broadcast building. The BBC, for instance, feels that Internet activities make the corporation better able to face up to competition from new service providers (publishers, retailers, etc.) who are in the business of putting entertainment and information services on the Net.
They also recognise that there is a large and increasing number of people who expect the BBC to be active in this area. These people generally have little or no computer knowledge and yet gain experience of multimedia packages through the purchase of home-computer packages.

Being involved allows the broadcaster to explore ways in which it can retain audience reach and share by trying to understand the kind of services that consumers want. Likewise, with the impact posed from a "wired" society, an Internet presence allows broadcasters to develop the necessary infrastructure to support new services. There is a wide range of customer equipment capable of being connected to the Net (low- to high-capacity channels, different software, etc.) and all users expect some level of service.

A Case for Splitting Commercial and Public Interests?

Since many public service broadcasters are funded primarily from radio/television licence revenue some, such as the BBC, feel it is not appropriate to make large investments in the provision of new services on the Internet whilst they are available only to a small proportion of the public. Consequently, the BBC's publicly-funded web site will concentrate on education and news/information, supplemented by information about the BBC and its broadcasting services. The investment in such services is likely to increase with the growth in demand for on-line services.

But alongside this, a new commercial service, known as BBC OnLine, has been launched in conjunction with a commercial company. This has a much broader range of content than that available from the BBC's publicly-funded web site. Further mirror sites are planned in the USA (lower overheads than in Europe) and at BBC premises at White City (West London).
Section 4: EBU Members On-line; the Survey Results

In order to establish the actual status of Internet use in broadcasting organisations, the EBU sent out a questionnaire to approx. 80 EBU members, affiliates and friends. To date, 67 replies have been received, sometimes more than 4 per organisation. Almost everyone reports some activity on the Internet (for an overview of the URL's please refer to Appendix 1); only five mentioned not yet having Internet access (e.g. Libya, Albania).

Infrastructure

The management of Internet activities within a broadcasting organisation does not seem to have a consistent place within the infrastructure. Some companies have established multimedia units within their Corporate Information Technology Department, but the majority manage their Internet activities through one of the following departments:

Engineering, News, Marketing, Programming, or Computing.

As a result, it has been quite a challenge to identify and contact the persons in each organisation responsible for Internet broadcasting.

However, there are some common Internet activities among these organisations:

1. Public Relations - This is a common goal of each organisation, i.e. sending out information concerning the networks, programme schedules, special events etc. with a view to increasing audience figures. Most broadcasters report that their Web Pages are very successful, even if keeping them up to date is rather expensive.

Even relatively small stations in the Northern European countries seem to have the largest number of hits a day - 8-9,000 in the winter, 4-5,000 in the summer. The cold winter weather seems to keep more people in front of the computer. For stations aiming at a world-wide audience the number of hits is higher - 15,000 in the case of RTE, Ireland. During a national crisis, major national sporting events, or elections, this number can easily rise to 500,000 hits or more a day, providing the site is updated regularly and well publicised.

To handle half a million hits a day obviously requires extra capacity and mirrored sites. This is usually best handled by hiring capacity, because installing such equipment at the broadcasting station is not only expensive, it could mean a very heavy investment, similar to the purchase of a high-power medium-wave transmitter. The BBC reports that more than 150 programme content providers (BBC departments) are contributing to more than 15,000 Web pages, all of which must conform to BBC Editorial Policy guidelines. The BBC Multimedia centre (located at White City, West London) currently has responsibility for managing, maintaining and developing the public-access website with a view to preserving a brand image and reputation.

There are two public-access servers located at the BBC R&D site at Kingswood Warren and another at a mirror site located at Docklands (East London). The link capacity from the R&D site to the Internet is currently 2 Mbit/s but the mirror site link can support a further 10 Mbit/s, although only 2 Mbit/s of this is funded at present. In
January 1997, almost 100 GB of data was transferred to the public in more than 11 million transactions. The daily peak is estimated to be around half-a-million transactions. Internet services delivered to the public servers are currently funded from individual programme makers' budgets.

2. Technical information about transmitters, frequencies, satellite channels etc. is much appreciated by Internet users, as it can make them aware of new listening possibilities. With the introduction of digital distribution in Europe via Eutelsat and Astra, as well as DAB, on-line consumer guides are already reporting heavy usage.

3. Programme Content Information: More and more broadcasters use the Internet to give their viewers or listeners complementary content to specific programmes, or to promote upcoming shows and features.

Interactive Web sites are another form of communication between broadcaster and listener, and interaction on an individual basis using e-mail is a much appreciated option.

As many broadcasters operate on a national or regional basis, they can use the Internet to provide additional information which it is not practical to broadcast on their traditional radio & TV services. Fact sheets with names and addresses allow listeners to follow-up on what they have heard.

**Extra Activities**

The following additional activities are either under way or under evaluation in some of the organisations that responded:

1. Advertising - on the surface this looks like an area worth investigating, but as yet there is no easy way to measure the impact. Currently, advertising and sponsorship are probably the only sources of revenue for a broadcaster on the Internet. Up to now this market has been extremely small but is now starting to grow around the Web Browsers and on certain broadcast sites in Europe. Advertising can be either related to the broadcasting industry or for an entirely different category of product. Ads can use audio as well as text and still pictures. The impact of the advertising can be enhanced by the use of hyperlinks to the advertiser's own Web site or other relevant information. Unfortunately, many public broadcasters are restricted by the terms of their charter from direct advertising of commercial products and anyone thinking of going down this route is advised to seek an early meeting with their legal department to avoid costly mistakes.

2. On-line Feedback from the audience is an additional source of audience research. The use of on-line forms linked to a database can provide (near) real-time analysis of reaction and opinion.

3. Links between a radio show and the Internet. Many programmes now have an e-mail address which is announced on air. Questions and comments can be included from Internet users while the show is in progress. This augments the traditional "phone-in" and relieves the frustration of getting continuously engaged phone lines. Also, comments about a particular broadcast can be sent by e-mail, and used in a subsequent programme.
Many stations offer a news service in text form via the Internet. This is either the text as read by the announcer, or a special bulletin prepared for Internet readers. In the area of audio news delivery, there are two trends:

1. Distribution of the latest news in real time from 0600 to midnight (e.g. YLE radio news) and news on demand (e.g. Icelandic National Radio, Radio Prague, Radio Netherlands).

2. Distribution of both the above (RTBF).

The most successful services are those which address world-wide audiences of expatriates (e.g. Ireland, Germany and The Netherlands). This is simply because the Internet offers a lot of listening convenience which is often not the case with a short 30/60 minute short-wave broadcast.

A radio news service, if updated hourly, is a real plus...BUT it is quite expensive and unless it is automated, requires a full professional staff on-site to keep everything updated. There is now capture software which automatically records the bulletin off the air, compresses it using one of the audio encoding programmes, and posts it up on the Web with the appropriate HTML code.

Another option, and one which is quite popular in many countries, is the linking of an existing teletext service to a Web site. Interfaces vary; the most intuitive is the simulation of an actual TV set whereby the user selects a particular teletext page from a menu. This is not especially fast, but can approximate the results obtained on a real TV set. The advantage to the broadcaster is that no additional staff are required to prepare the pages. The advantage to the user is that pages can be printed out for reference. There are, however, legal implications in many countries regarding any material which is licensed for use specifically on a teletext service. It is recommended that discussions be held with suppliers of such information to determine whether there is any problem with making the material available on the Internet. In many countries, the Press Agencies actively demand extra money for services posted via the Internet.

It is advisable to check the fine print in contracts with freelance journalists. In some countries, notably the Netherlands, journalist unions are now campaigning for extra payments for material which is simply taken from a radio programme and posted on the web. This follows incidents where newspaper journalists have worked on special projects and later the material has been used for CD-ROM productions. There should be some mention of "electronic distribution by any means".
Section 5: Other Uses for Internet Broadcasting

Access to Archives - a lot of effort is being deployed to make radio archives available on line. Some broadcasters, such as the Canadian Broadcasting Corporation and the World Radio Network of London already provide on-demand archive programming, others such as Radio Sweden are already using it to supplement the information given in a specific broadcast radio programme. Again copyright may well come up as an issue since it is unclear what constitutes a repeat.

In Switzerland - a country in which four languages are used - Internet is used inside the SSR/SRG organisation to exchange technical information in the 4 national languages in addition to disseminating extra information related to different shows being broadcast on radio and/or TV.

Nearly everybody who took part in the EBU survey is satisfied with the Internet experience and plans to continue. It builds a strong audience and attracts a lot of young people.

Main Problems Mentioned by Respondents

1. Excessive cost in keeping a Web site updated. A website of several thousand pages needs at least two full-time staff to avoid it turning into a text museum. What starts as a hobby will give the wrong corporate image unless quickly supported in the short-term. Many stations work with a team of around 5 people. More elaborate sites, which also include internal WWW pages demand much more manpower. Some of the larger broadcast sites have up to 100 staff, of which around 15% are technical support people, solving the inevitable software crashes.

2. Limited professional editorial tools. Software is getting better by the week. But it is also more complex.

3. Lack of specialised editorial and/or technical staff. There are few Internet training courses and artistic design standards vary widely. Some Internet producers are starting to realise they have a market value. In the United States the premium is 20% over the current radio salary.

4. Security. The use of a so-called firewall is essential if the Internet site is somehow connected to an internal computer network at the radio station. Downloading software from the Internet is not without risks and whole networks can be "infected" if proper precautions are not taken. There are hackers around! Weekly checks of your server logs and monthly security audits are essential if you don't want to wake up one morning and find pornographic pictures on your web site.

5. Problems getting streaming technology to work the first time.

6. Long waiting times, poor access. Bandwidth is the issue here. WWW should not stand for World-Wide Wait.
Future Plans Mentioned by Respondents

24 hour radio-on-demand
Access to video and audio Internet archives
Radio and TV on-line
Exchange of programme material with listeners outside the target area.
More interactivity with radio and TV productions.
On-line services together with new CD-ROM.
Radio play releases on demand (YLE, Finland)
Multimedia content via cable TV network produced by "on-line News Division" - a nation-wide access provider (ORF).

Conclusions from the Survey

Running an Internet site is a fine balance between an active site and keeping within a limited budget. In most cases stations are devoting 1 or 2% of their programme or operating budget to Internet activities. Compared with the commercial competition, this is not much. In Atlanta USA CNN Interactive has access to all the radio and TV output of the CNN News Centre, but still needs 200 journalists working round the clock to provide the service that they do. It is a similar story at MSNBC.

Many EBU members have asked for advice on how to run a better site. The next section of this document is a first step towards providing such advice.
Section 6: Starting a Web Site...the Do's and Don'ts

Make Sure Your Objectives are Clear

Broadcasters need to have a clear idea of whom they are trying to reach, what type of material is appropriate, and whether this is best provided in text & graphics format, real time audio, or on an audio-on-demand basis. The profile of the Internet user differs considerably from the traditional radio audience, so the service needs to be customised accordingly. Simply "being on the Internet" is no great advantage if the material is inappropriate. It is easy to fill a Web site with dull corporate information such as annual financial accounts and lists of members of governing bodies, but who is going to read it? On the other hand, lists of contact names and phone numbers of people who actually deal with the public are very useful.

Staffing Considerations

Although in the early stages it may not be practical to set up a dedicated Internet department, it is recommended that at least one specific individual be appointed as Internet co-ordinator. This person could also act as the contact for all Internet-related projects and should be included in the list of key contacts for each organisation.

The importance of Internet is increasing all the time, therefore it is essential that a clear strategy is worked out at senior level and allowance is made for sufficient staff and budget to develop new services. This is particularly important since a Web site is, in effect, a "shop window" for the broadcaster. A poorly maintained Web site will create a poor impression of the organisation.

Technical Considerations

While the number of people involved in Internet projects will vary, one common factor is the need for sufficient hardware to ensure a high level of service. The number of people receiving audio on the Internet is rising rapidly. In the course of the coming months, European public service broadcasters should expect a rise in the number of 'hits'. Therefore, thought needs to be given to the practical requirements, as too many people trying to access a Web server will cause serious degradation in quality. Audio (and especially video) services require much greater bandwidth. Performance will deteriorate rapidly as the number of simultaneous users increases.

A fast, dedicated server needs to be allocated to the Web service. This should be a separate server from the one used for internal corporate purposes, otherwise performance can be seriously degraded during local "office hours" which is also the time at which most professional Web users want to access the site. This also answers many of the concerns about security. User tests should be carried out using a range of modems and browsers. Many corporate users are still using 14.4 kbit/s modems and older browsers. The majority however use 28.8 kbit/s modems and only a small proportion have access to high speed ISDN lines. If performance is not acceptable at slower line speeds, potential users will be discouraged from making regular visits to the site, and it may not get on their hotlist. One way to make sure is...
to check your web servers logs. You will find a wealth of information including "user
agent" what browser viewed your pages. You can also find out what pages are the
most popular, which are not and track any problems the server had. You can also
work out where the visitor to your web site came from. (Visitors using America On
Line, and other online services use a proxy server that caches the most popular
pages, so you may not be able to identify the actual user).

Browser Types Visiting one Dutch broadcast site in June/July 1997:

<table>
<thead>
<tr>
<th>Name of Browser</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Netscape Navigator</td>
<td>65.30%</td>
</tr>
<tr>
<td>Microsoft Internet Explorer</td>
<td>28.40%</td>
</tr>
<tr>
<td>Cyberdog</td>
<td>1.40%</td>
</tr>
<tr>
<td>Lynx</td>
<td>1.07%</td>
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<tr>
<td>Ibrowse</td>
<td>0.63%</td>
</tr>
<tr>
<td>AOL (For Windows)</td>
<td>0.58%</td>
</tr>
<tr>
<td>IBM WebExplorer</td>
<td>0.50%</td>
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</tbody>
</table>

It is essential to promote your web site. Make sure it's listed in the popular search
engines and keep checking back to see whether the entry is accurate. A full
explanation of how they work is beyond the scope of this document, but the EBU
"Radio On the Internet" group has obtained resources that could help.

Options for Web Site Management

Although large organisations have the manpower, expertise and budget to operate
strictly in-house, other organisations have found it more practical to work with an
external company who provide Web hosting services. Options vary: the site may be
designed and maintained in-house with an external company merely providing Web
space and high speed access. Alternatively, smaller organisations unable to find the
necessary expertise within their own staff can make use of external Web design
services. Such companies work closely with the client so that the site is tailored
exactly to the client's needs, while the client simply provides the raw material (text,
logos, sound files etc.). In this scenario, the broadcaster does not need to have any
dedicated Internet programmers on staff. For a small site, working this way can be
cheaper than hiring someone to do the job in-house. The hosting service does not
even have to be in the same country. On the Internet, physical location is very much
less important than performance and efficiency.

Tools for Creating Web Pages

There are literally dozens of programs for the creation of Web pages. These pages
use a special system of codes known as Hypertext Mark-up Language (HTML). This
is an evolving standard, which is gradually being extended to add more action on
pages (dynamic HTML) as more add-on options become available from companies
such as Microsoft and Netscape. It is possible to create a simple Web page using
any text editor, typing in the HTML codes which tell the Web browser how the pages
should look. But realistically, a professional user needs a more sophisticated
program, which not only allows the pages to be built up gradually on screen without
typing in all the codes, but may also have built-in site management capabilities. This
is very important; if it is necessary to change the layout of the Web site, such as
moving a page, references to it elsewhere have to be changed, otherwise the browser will give the message "object not found" to the user. High-end programs such as Microsoft Front Page do this automatically, keeping everything in order and ensuring that all the hypertext links work.

What are Hypertext Links?

Despite the rather intimidating name, hypertext links are simply pieces of text which tell the Web browser where to find another page, or an object such as a document, graphic, sound or video file. The link is normally shown in the browser as blue underlined text: this text can be anything at all, but should indicate what is going to happen when the user clicks the mouse. When the page is created, you have to tell the software the actual physical location of the page or object the link refers to. This can be as close as the same directory on the server, or can be a file located on another computer halfway across the world. The browser reads this information (unseen on the user's screen) and acts on it, and the user does not have to do anything other than click the mouse and wait. Therefore, a broadcaster with regional or international offices has the option of creating Web pages on different servers and linking them all together from the main Web site.

Presentation of Web Pages

Although the natural instinct of professional broadcasters is to use the design talent at their disposal to create extremely attractive but graphics-intensive pages, this urge is best restricted. Especially if the main purpose of a particular Web page is to provide access to audio files, the graphics should be minimised to reduce bandwidth consumption and improve the speed of downloads. There are various ways in which the size of graphics files can be reduced. One of the simplest is reducing the number of colours to 256. This can be achieved with any modern graphics tool such as Adobe Photoshop or the excellent shareware program Paint Shop Pro. Also, using a standard page design means that graphical elements, once downloaded, can be reused on subsequent pages.

There is a tendency to design a Web site based on the corporate structure of the organisation. While this makes sense to people working in the organisation, it may not be the best way of presenting information for the end user. Careful thought needs to be given to the basic layout of the site. Many EBU members have programme magazines and the way in which the various networks and services are listed in these magazines can be used as a model for the Web site. The user will therefore find it easy to navigate around the site, because the layout is familiar. Although individual pages should be updated often, the underlying structure and the names of key sub-pages should not be changed unless absolutely essential, as users find it frustrating when pages in their hotlist suddenly vanish. The content, of course, can and should be changed frequently, but not the page titles.

Hypertext links can be used to take the user to a different part of the same page (e.g. in a list with several sub-headings). However, this is sometimes overdone. A single Web page should never be more than 30-40k in size, otherwise the user has to wait ages to load a lot of information which he probably doesn't need. Placing key contact information at the top of a page rather than the bottom, or better still a hypertext link to a separate page containing this information, will make you popular with users.
Technical Limitations at the "Receiving End"

Broadcasters need to understand that many Internet users still only have modest equipment. For many people, therefore, a technically sophisticated Web page with large graphics and audio files, or one requiring a so-called "plug-in" (helper application) to function, can actually be quite a nuisance. If it is desired to have such pages on a Web site, they should not be main pages, but sub-pages. A warning should be given next to the hypertext link so that the user knows what to expect. If the information on such pages is important, it should also be provided in a simplified form on a different page for those who prefer it.

The same applies to pages with frames...not every user likes these, and many Web sites offer a choice of a frame or non-frame format. Web site managers should check how the page looks in the most popular browsers - Netscape Navigator and Microsoft Internet Explorer. If it doesn't work properly or look attractive in either of these browsers, the page needs to be modified. If the station expects a lot of traffic from the USA, then being able to check both the Windows and Macintosh platforms is useful.

Javascript, one of the more popular web scripting languages allows you to identify the browser and create content directed toward a specific browser. To see who currently has the most market share check [http://browserwatch.internet.com](http://browserwatch.internet.com). Javascripting techniques also allow you to duplicate a lot of the CGI scripting functions, with less security issues and faster loading to the browser.

Getting User Feedback

Modern Web authoring software includes the facility to create on-line forms, often in the form of "guestbooks". This is a very useful way of gathering data about the users, their needs and interests. The data received from the user can automatically go into a database, to provide a constantly updated statistical analysis of who is using the Web site and how.

If the questions are carefully thought out, and the data properly analysed on a regular basis, this information can prove invaluable in planning development of the site.

Broadcasters should consider setting up an Internet Advisory Group involving ordinary end users. Such an advisory group should meet once every 3-6 months to review progress with the Web site, discuss problems and shortcomings which have been identified during actual usage, and make proposals and suggestions for future implementation. Meetings can be organised on-line. Suitable users can be identified and selected by means of information provided through an online application form.

Firewalls

A company that wants to connect its local network to the Internet has to take some security precautions. Usually one of them is to set up a firewall between the Internet and the Local Net.

A firewall is simply a device which prevents unauthorised access to the company's server from the outside. The most common form of firewall is a piece of software installed on a PC.
In short the firewall will examine all data that is coming from the outside and determine if they are allowed to pass through to the inside. (The firewall can also determine what kind of services on the Internet the Local Net users are allowed to access.)

Two methods are used: "packet filtering" and "proxy services". The transmission of data is done by breaking up the data into packets with a receiving and a return address.

In "packet filtering" the firewall software just examines the return address of each packet and rejects those from unauthorised senders. This will not affect "normal" use of the Internet since connecting to a site is just a request for data. The transmission of data is activated by the user site and not the host site, which is passive.

However when it comes to streaming audio the host site needs to actively communicate with the user's computer and therefore "packet filtering" will prevent the host site from sending an audio stream. Furthermore "packet filtering" is not very safe as hackers can easily falsify return addresses and thus get access to a local net.

A "proxy server" is much safer as the firewall software not only checks the packet return address but also opens the envelopes and puts the packets together to see if the message is genuine. If it is, the software makes a copy (a proxy) of the message, breaks it down to new packets and then sends it to the final destination.

To allow data to pass through, several "proxy servers" have to be installed in the firewall. The basic software will include proxy services for e.g. HTTP, SMTP and FTP which are the standard protocols for Hyper Text, Mail and File transfer.

There is still no standard protocol for streaming audio. Microsoft is pushing for one, but at press time no firm decisions have been reached. Indeed, the trend seems to be towards open-style browsers that can work with several standards.

This means that a company must add a "proxy server" for each audio player that they want to make available to their users. The "proxy server" makes it possible for the host site to actively communicate with the user's computer.

Since the number of audio players on the market is quite high, it is likely that a company will only include "proxy servers" for one or two of them, most probably the market leaders. Some companies don't issue "proxy servers" for audio players, either because they don't want it or because they are still not aware that they are needed. They are now losing market share as a result.

To solve the problem of the need for a "proxy server" for each audio player, 40 companies including RealAudio, Shockwave and Streamworks amongst others, are now working on a new protocol: Real Time Streaming Protocol (RTSP). This is a protocol for streaming audio and once it is finished, a company will only need one "proxy server" to make use of all audio players that support the protocol.

Please note that private individuals (or companies) who are connected to the Internet via modem and a Service Provider, are not usually behind a firewall. They can access all the services they want including streaming audio without any problems.

More information about firewalls can be found on the web by checking: http://www.real.com/help/firewall/vendors
This is a thorny and complex subject and the lack of a uniform legal policy across Europe is a problem at the moment. The copyright specialists in EBU and the member organisations are continuing their vigorous lobbying activities to achieve regulation geared to the balance of interests of right owners, users and the public, and to enable them still to fulfil their public remit in the information society. For example, one particular issue under discussion is the importance of ensuring the appropriate legal framework to enable broadcasters to revive for the public the rich cultural heritage of their own past archive productions through the channels opened up by the information society. Attention is drawn below to certain other aspects.

Musical material

Broadcasters in all countries are used to dealing with (at least) two major collecting societies regarding music rights: one represents the composers and the authors, and the other looks after the interests of the performers (artists) and the recording companies. Most stations regard broadcasting on the Internet as another form of distribution, alongside an AM or FM transmitter. The basis for negotiations is therefore the existing broadcast contract.

As regards on-demand services, some record companies are reluctant to commit to anything, saying that collecting societies do not have the mandate to negotiate any kind of agreement concerning audio on the Internet. Alternatively, the position is that music produced by the record companies should only be made available by them as a product for purchase. Downloading music is seen as a threat to CD distribution. High bandwidth and better audio may reinforce that position.

In the US, the record industry group RIAA has hired a company to surf the web, sniffing out copyright violations. The RIAA then sues the Internet Service Provider and the content provider (or website owner) to remove the copyrighted material. In June 1997, three major sites distributing copyrighted music on the Web were closed down.

The EBU's proposal is that legislation should distinguish between two non-competing on-demand businesses: on the one hand, the sale of CD music from an online record shop and, on the other hand, use in on-demand services of radio productions which (happen to) include phonograms as an integrated part of the production. The situation right now is that Denmark Radio, for example, is limited to providing programmes or parts of programmes that do not include music. EBU is also seeking legislative clarification that reproduction rights may not be unduly exercised in an accumulative way to restrict or prevent the normal operation of activities already authorised by the author or permitted by law. Such cases include not only the countless transient or incidental reproductions taking place during transmissions via on-line computer networks but also preparatory technical steps leading to licensed acts of broadcasting (e.g. transfer of commercial phonograms to tape) or analogous technical steps leading to licensed on-demand delivery.
Freelance contributions

It is wise to discuss Internet distribution with the organisations representing freelance contributors. Check that agreements signed now also allow for repeats via any electronic media in the future. We may get radio programmes out of pager systems one day.

Some countries such as the Netherlands report that as of mid-1997, provisional agreement has been reached with freelance contributors and a permanent agreement is being negotiated.

In Denmark, DR has concluded agreements with some unions, whereby DR acquires the rights for use of its productions in all forms of exploitation in return for agreed remuneration. Some initial uses including audio-on-demand are covered by the production fee, followed by supplementary fees or royalties when the production is further used.

The Copyright Group of the EBU Legal Committee has drawn up model clauses on acquisition of rights of both freelancers and employees.
Section 8: Which Audio Code Software is on the Market as of July 1997?

As usual, the actual sound of a product is only one of the factors. Marketing and availability are important too. It is no good having the best sounding software in the world if it is not available and no one is using it.

In the course of writing this report, the market is shaking out. At the same time, other companies linked to giant corporations are announcing their own audio coding and decoding software, better known as codecs.

As an independent organisation, the EBU doesn't favour a particular brand of codec. Instead we've examined the commercial market and compared products side by side to see if there is any noticeable difference in audio quality and performance. When this edition of the report went to press, not all the technical tests had been completed. The results of the additional tests will be added later to the on-line version of this Handbook.

The Codec Market

Progressive Networks Real Audio has been around since 1995 and with the current version of its software 3.0 currently holds a commanding technical lead. It also has a solid image in the mind of most Internet users. For example, the US company of Net radio, an Internet-only radio station with several formats switched to competing Xing technology "Streamworks" in September 1996. They felt that Xing offered a product that sounded better. In late December 1996, Net Radio switched back to Real Audio. Consumers had stopped visiting and listening to their web site, even though they believe their new audio system was superior.

Real Audio 3 the currently shipped version of the product, that consumers can download for free (www.realaudio.com). It allows web sites to scale the quality of their broadcasts so users can get stereo sound at 28.8 kbit/s via a dial up phone line. If you are lucky enough to have an ISDN line or greater you'll hear even better audio, approaching that of FM radio. As of June 1997, Real Audio and Video is now in its 2nd beta version. Video streaming is being used by Fox News and ABC News as well as C-Span. The change in the audio product is the addition of Dolby noise reduction, plus better accessibility behind corporate firewalls.

The other players in the streaming audio game include: Xing’s Streamworks (www.streamworks.com) which offers a comparable technology to Real Audio. It’s not as easy to install with a browser. You have to set it up and tweak the browser to make it work. It appears consumers don’t want to do that. Streamworks is not (yet) incorporated into the fourth generation of the leading browsers. Although Streamworks sounds better in some cases, the user has to do some fiddling around. In July ’97 the Streamworks codec had not yet been tested in the Munich test centre for the EBU evaluation programme. This was due to delivery problems by the manufacturer.

Macromedia’s Shockwave (www.shockwave.com) streaming audio requires only server software, but also demands an expensive investment in technology and software. Both 4th generations of browsers will support Shockwave without a plug in. That means when you encounter a Shockwave page it will automatically play in the web browser. The audio quality is good and it’s in stereo. The higher the bandwidth
(speed of your connection), the better it sounds. Macromedia has recently shipped Version 6 of its Director Software that supports an enhanced version of this technology.

Netscape has partnered with Lucent Technologies (a split off company of Telecom giant AT&T), to create a media streaming system that sounds like Real Audio 3. It's called Netscape Media Player and can be downloaded from www.netscape.com. According to our initial tests, the Lucent product sounds very similar to Shockwave, though the technology behind the products is not similar.

With the Introduction of Internet Explorer 4.0 Microsoft introduced a product called “Netshow” (www.microsoft.com/netshow). At this time Net Show only works with Microsoft's NT Server platforms. It’s an audio and video solution that is very impressive over dial up access. As of July 1997, the server software is free as is the audio editing tools needed to create the Netshow streams. It supports stereo and colour video. Net Show can be built into the home page (via HTML code) or any page you desire. A novel approach at the 1997 Broadway Tony awards in the US was the inclusion of streaming audio and video in the top half of a framed page, with a chat server in the bottom of the frame. Viewers of the webcast could then interact and comment on what they were seeing. The next beta version of Netshow will include support for vivo steaming video. (Check www.russiatoday.com to see how vivo works)

These are but a few examples of the audio or multimedia players presently on the market. For a more complete overview, check out the URL's listed on page 12 of this report. Less well known, but certainly worth a try are LiveUpdate's Crescendo (www.liveupdate.com), the Astound Web Player (www.astound.com) or Duplexx's Net Toob Stream (www.duplexx.com).

**Video: Lots of Work Still to do**

On the video side only four companies are really worth attention. Vdo Live (www.vdonet.com) which Microsoft has invested in and Vossaic (a video enhanced browser. Cu-See Me (www.cuseeme.com) a video conferencing system in use at universities and by hobbyists is worth a look. Microsoft has a product called NetMeeting and Netscape also allows you to set up a video conference. Video conferencing and the use of so called- white boards are beyond the scope of this document. Real Audio has recently extended its player to including streaming video. What you will see, depends on the speed of your connection. Slower speed connections will show slow, jerky movements. True broadcast quality TV pictures on the Internet haven't happened yet and are probably years away.

Several other companies have released streaming audio products into the bitstream. These however tend to be favoured only by hobbyists. They are first or second generation audio products, that while acceptable in sound quality for voice they've not taken off in the broadcast market. True Speech (www.dspg.com), which is a plug-in for Netscape but not Microsoft's Intselecternet Explorer browser, is the leader in this group. Iwave (www.vocaltec.com) from Vocal-Tec is the other player here. Vocal-Tec an Israeli company pioneered the technology for telephone communications using the Internet. That's now a very crowded arena with Intel, Microsoft, Netscape, Quarterdeck and Vocal Tec providing these services. Audio codecs in use by these phone systems as they become more advanced and as users demand better quality audio may turn into an streaming audio product.
Section 9: Publicity for Web Sites

Since many of the potential users of Internet audio are physically located outside the service area of the conventional broadcasts, they need to be informed of the existence of the service. Currently, publicity for Internet services is very much ad-hoc.

Within individual organisations, on-air staff and TV caption writers should be briefed on the meaning of the URL's (Internet addresses) mentioned in programmes, and encouraged to refer to Internet services wherever appropriate. As so many individual programmes now have linked Internet resources, EBU members may consider providing written guidelines and explanations of Internet basics for the use of producers and presenters. Ideally, these people should be given some hands-on training of using the Internet, so they feel comfortable talking about it on the air.

Internet services should be billed as natural extensions of the broadcast rather than something esoteric.

Sources of Help

The Internet is still an emerging technology. The tools that can be used to prepare Web pages today will be obsolete in a year's time, replaced by something better. There is a clear need for information about what is out there and how it can be used to make a better Web site.

There is no substitute for hands-on experience. EBU members are encouraged to actively look at other Web sites, try them out and learn what is good and bad about them. This will help build a better site; regular Internet users can easily tell whether the person who designed a Web site really understands what it's like to be "on the receiving end". Don't get caught out and make serious design errors in public. Try out your site off-line and make sure everything works as intended. Remember, it's your image and your reputation which suffer when things go wrong.

An earlier version of this report included a list of more than 700 Internet sites being run by public broadcasters in Europe and their commercial competitors. It is not being re-printed in this version because it is out of date by the time it is printed. A much better resource is the Web itself.

An up-to-date interactive version of this list, with hypertext links to the Web sites, is available at http://wmbr.mit.edu/stations/euro.html. Our research in early July 1997 shows that this list has some duplications, but it is a good starting point in the search for who is on-line.

Radio Netherlands web site at http://www.mw.nl/en/pub/hitlist.html has an extensive list of links to other broadcasters around the world. There may be others by the time you read this. http://isleuth.com is another good place to look. It combines all the search engines into one and returns the top twenty links from each one.

We believe that an on-going study of multi-media developments is something that would directly benefit many EBU members. Judging from the phone calls, faxes and e-mails received, there is a clear need to have an independent source of information as to choices available. This document represents developments over a 12 month period, ending in July 1997. But development hasn't stopped; if anything the integration between audio, video and text is speeding up.
## Appendix 1: Respondents to EBU Questionnaire

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Internet Address</th>
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<td>Australian Broadcasting Co.</td>
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<td><a href="http://www.cbsnews.com">www.cbsnews.com</a></td>
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<td>Polish Radio</td>
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<tr>
<td>PRI/TVRI (Indonesia)</td>
<td><a href="http://www.cbsnews.com">www.cbsnews.com</a></td>
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<tr>
<td>Public Radio International</td>
<td><a href="http://www.cbsnews.com">www.cbsnews.com</a></td>
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<td>R C S (Radio Corporation of Singapore)</td>
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<td>R T E (Ireland)</td>
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<td>R T S I</td>
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<td>R U V (Icelandic National Br. Service)</td>
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<td>Radio Bremen</td>
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<td>Radio Fusao Portugueesa</td>
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<td>Radio Netherlands</td>
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<td>Radio Televisis (RTE)</td>
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<tr>
<td>Radio Television Hong Kong</td>
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<td>Reuters</td>
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Studio Brussel
Swedish Broadcasting Corp.
Swiss Radio International
TBS / CNN
TCS (TV Corporation of Singapore)
Tokyo Broadcasting System Inc.
TV Asahi
TV NZ
VOA
Vatican Radio
YLE - Radio Mafia
YLE - Radio News
YLE - Riksradion
YLE
ZDF TV

www.brtn.be/stubru
www.sr.se
www.srg-ssr.ch/sri
www.cnn.com
www.mediacity.com.sg
www.tbs.co.jp
www.tv-asahi.co.jp
www.tvnz.co.nz
www.voagov
www.wm.org/vatican-radio
www.yle.fi/radiomafia
radiouutiset@yle.fi
riksradion@riksradion.yle.fi
www.yle.fi
www.zdf.de
Appendix 2: Experiences

2.1 SUEDWESTFUNK

Suedwestfunk Launches the Kids On-line Network

In March 1997 Suedwestfunk Baden-Baden started a "Virtual Village" especially designed for kids on the Internet. And with about 150,000 page views in the first weeks it seems the Kids and their parents were waiting for it. The Kid's Online Network offers a variety of activities for children in cyberspace.

Entering the website kids can choose to go directly to the MARKETPLACE, where all the discussions take place. The topic in March was the Internet itself. What can I use the Internet for? - What organisations are on the net? - Why are there so many more boys in cyberspace than girls? These are just some of the questions raised in the online forum at the village MARKETPLACE.

For new kids on the net, the easiest way to get around is to take a guided tour with Dr. Bob, the KIK-Family's dog from Suedwestfunk's TV series "Kinder Info Kiste". It will explain the "Virtual Village" and the Internet for "Newbies". They can write to Dr. Bob who has its own webpage like all the other members of the KIK-Family.

Kids can also go to TOWN HALL to build their own homepage and invite others to their "Home in the virtual village". Each kid's homepage has it's own guest book so that they can write messages to one another. Building a homepage is made easy and doesn't require special knowledge about Web-Programming. More than 1500 boys and girls joined the Kids Network and built their own page in the first weeks since it was launched.

Lots of other activities are waiting for the Kids at the PLAYGROUND, the TRAVEL OFFICE, the LIBRARY or the RADIO STATION, where they can write their own radio dramas and add sound files to their story. In addition, they can get lots of information about Suedwestfunk's children's programmes as well as pictures of the main characters to print out and colour.

The idea behind the Kid's Online Network is to offer a safe space for children on the Internet and to give a guided introduction to the benefits and risks of new media and technology. The main point is to connect real and virtual life; e.g. children can collect sounds at home, in school and elsewhere on a tape recorder and add them to the virtual radio drama. Younger kids can print out the figures and colour them or draw their own pictures and send them in to be "hung" in the virtual town's ART GALLERY. They can meet other kids with the same interests, start projects in cyberspace and meet in "real life" later. Summer camps for the kids to continue the projects and friendships they started in the Online Network are planned.

The Kid's Online Network shows that the Internet is just a tool forgetting in touch and communicating with other kids world-wide. While playing with the computer they will also learn to use it for research and communication. The more the Internet grows and the more information we find in this global network, the more important it is to know how to find information and to assess its value. The Kid's Online Network recognizes this by giving lots of commented links to other sites and by inviting kids to send in addresses of websites they have found along with their comments and ratings.
Further plans include bringing the Kid's Online Network to children, parents and teachers by presenting it live. A truck equipped with computers and modems will soon be on its way, visiting schools all over the country. Schools with no connection to the Internet can ask for the truck to visit their school and get connected. The truck is scheduled to stay at each school for about a week. A media teacher will give an introduction to the Internet for the students, but also for parents and teachers.

We only give kids the chance to use this new tool. The most important thing in the "Virtual Village for Kids" will remain the participation of the children and their ideas of what they want and can get from the Internet.

Contact Suedwestfunk Kindemetz:

Web: [http://www.kindemetz.de](http://www.kindemetz.de)

E-mail: kindemetz@swf.de

Phone: +49 7221 926194

Fax: +49 7221 926305
2.2 How the BBC Uses the Internet

1. General Objectives

The British Broadcasting Corporation has a number of objectives in the field of New Media and the Internet. These include:

i) to remain at the forefront of the new technology, with its means to deliver newly-packaged material in a different way, by using in-house technical expertise in an innovative and cost-effective manner;

ii) to face up to competition from new service providers (publishers, retailers, etc.) who are in the business of putting entertainment and information services on the Net;

iii) to recognise that there is a large and increasing number of people who expect the BBC to be active in this area. These people generally have little or no computer knowledge and yet gain experience of multimedia packages through the purchase of home-computer packages.

2. BBC further objectives

i) to seek to retain audience reach and share by trying to understand the kind of services that consumers want;

ii) to continue to explore different means of programme delivery;

iii) to identify services that suit the BBC purpose and add value to or complement services delivered by other means;

iv) to seek to develop the necessary infrastructure to support new services;

v) to recognise that there is a wide range of customer equipment capable of being connected to the Net (low- to high-capacity channels, different software, etc.) and all would expect some level of service;

vi) to seek to establish standards where appropriate to adapt the technology into a viable mass market system.

2. Existing BBC Internet usage (1996-97):

More than 150 programme content providers (BBC departments) are contributing to more than 10'000 Web pages, all of which must conform to BBC Editorial Policy guidelines. The BBC Multimedia centre (located at White City) currently has responsibility for managing, maintaining and developing the public-access website with a view to preserving a brand image and guarding the BBC's reputation.

There are two public-access servers located at the BBC R&D site at Kingswood Warren and another at a mirror site located at Docklands (East London). The link capacity from the R&D site to the Internet is currently 2 Mbit/s but the mirror site link can support a further 10 Mbit/s, although only 2 Mbit/s of this is funded at present.

There has been a great deal of experimentation in preparing suitable programme material: for example, on-line news has been created for "Westminster On-line"; "The
Andrew Neil Show" and "Budget '96. BBC Education have also produced "The Big Byte".

Streaming audio (RealAudio™) has been used for several programmes, including "The Big Byte", the Olympics, political party conferences and a by-election. BBC Radio One (popular music) and the World Service have also been involved. A single streaming audio server is used and supports 100 concurrent audio streams (limited by distribution bandwidth).

In January 1997, almost 100 GB of data was transferred to the public in more than 11 million transactions. The daily peak is estimated to be around half-a-million transactions. For the Budget '96 programme this increased to almost two million.

Internet services delivered to the public servers are currently funded from individual programme makers' budgets.

3. Future BBC Internet Usage:

As the BBC is funded primarily from television licence revenue, it would not be appropriate for the BBC to make large investments in the provision of new services on the Internet whilst they are available only to a small proportion of the UK public. Consequently, the BBC's publicly-funded web site will concentrate on education and news/information, supplemented by information about the BBC and its broadcasting services. The BBC's investment in such services is likely to increase with the growth in demand for on-line services.

A new commercial service, known as BBC OnLine, is about to be launched in conjunction with ICL. It is expected that this service will have a much broader range of content than that available from the BBC's publicly-funded web site.

Streaming audio usage is expected to expand into two main growth areas - education and entertainment. In the immediate future there will be BBC Radio 5 Live (news and sport) and support for the forthcoming UK General Election. The streaming audio server is expected to be upgraded to support 1000 concurrent audio streams and the link capacity to the Internet increased still further. Customers can expect better audio quality as channel capacity restrictions are lifted through the use of improved modems or direct connections to high-capacity digital links. This makes entertainment services more viable and may help to offset the trend that the Internet seems to be setting in switching audience away from conventional TV viewing.

Further mirror sites are planned in the USA (lower overheads than in Europe) and at BBC premises at White City (West London). All the advantages that can be gained through multicasting will be explored.
2.3 Denmark Radio

On 1 November 1996 DR started offering Audio Streaming from their Online service. The programmes provided were News, Background Stories, Daily Excerpts from a Classical Music Competition plus different one hour programmes.

During the month of November daily visits rose from 10'000 to 20'000. Not all new visitors wanted to listen to audio - some were attracted by the publicity generated from the new feature.

Initially 5 listeners could get access to the audio server at the same time, but that had to be increased to 20 as interest got much bigger than anticipated.

Audio format for News started out as 28.8, but following complaints from would-be listeners was changed to 14.4. Listeners were asked to fill out a questionnaire concerning the audio offer: what programmes they would like to hear, what kind of equipment did they have etc.

Here are some of the results which are based on 144 questionnaires. It should be stressed that the survey is not based on normal scientific methods. The persons who answered the questions were not chosen, as is the rule in a representative survey - they chose themselves and they are few. Therefore the result only tells something about the 144 persons who filled out the questionnaire.

1. Who filled out the questionnaire?

Of the listeners who answered the questionnaire 94 % were men. 50 % lives in Denmark, 35 % in USA, 4 % in Australia and 11 % in other countries. 63 % say that they listen to radio from DR Online on their work/education institution, while 33 % listen from home.

2. The programmes

73 % say that they want to listen to the News, 21 % want background stories, 17 % want music, 2 % want something for children and teenagers. 49 % want other kinds of programmes. 33 % say that they do not need any additional information, 11 % say they do. 22 % say that a programme can be of any length, but it seems that most people want to be able to select parts of a programme.

Concerning general use of DR Online, 41 % use it in the evening and 33 % in the night (all local times). 22 % has experienced unacceptable waiting times, while 52 % say that waiting time is never unacceptable.

3. Technical questions

48 % use a 28.8 modem, 7 % a 14.4 modem, 8 % ISDN modem, and 25 % uses a constant link connection.

32 % inform that they are not behind a firewall, 9 % say that they are. 54 % don't answer this question (they may not know what a firewall is).
2.4 Radio France Internationale (RFI)

RFI has chosen to broadcast through a US based company Medianet which operates near Washington DC. This choice was made by Medianet abilities to provide quality services and by the costs of Internet network in the US. We also want to minimise our technical investments in such a moving field where technologies change every couple of months.

Broadcasting 24 hours radio re-transmission on the Internet for 50 permanent streams, costs seven times less in the US than in France. Prices are about the same when it comes to costs of hardware, software and engineering but network are cheaper.

For the same costs (around US$20,000 per year in 1996) you can afford a T1 in the US and only a 128 kbit/s line in France. A T1 allows 50 permanent streams, a 128 kbit/s only 12 permanent streams.

The Medianet general architecture is based on four audio servers (models Pentium 200MHz – 128 MO RAM, 8 Gigabytes using wide SCSI Raid system rough cost US$7000 each) and a reception centre dedicated to RFI for the encoding (six Pentium 166 MHz – 64 MO RAM, 2.5 Gigabytes and special components built by Medianet – rough costs : US$30,000).

The radio signals brought down from two satellites used by RFI to broadcast across the US (PanAMSat1 and Anick D2). A dual feed satellite dish is used in Washington DC. A T1 (1.5 Mbit/s) is dedicated for RFI internautes. In case response leads to saturation, three load balancing mirror sites are available in Chicago, San Francisco and Los Angeles. Connection times to and from Washington are among the fastest in the world. The RFI T1 is linked to MAE-EAST, the principal junction for all American backbones lines and the world’s largest Internet NAP (Network Access Point). These backbones generate transmission speeds in excess of 620 Mbit/s.

This architecture provides a service that operates 24 hours a day, 7 days per week. Visitors to RFI's audio website can find 48 news update each and every day as well as audio library access to all of RFI's other programmes which are automatically updated every 24 hours, shortly after they have been broadcast on Paris airwaves.

Today the French, English, Spanish, Portuguese, Portuguese and Mandarin language programmes are available on demand on the Net. RFI plans to extend our broadcasting on the Internet to all of our other languages.

Medianet Investment details:

<table>
<thead>
<tr>
<th>Servers</th>
<th>US$58000 for encoding and serving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real Audio Software</td>
<td>US$6500 per CPU and 100 streams</td>
</tr>
<tr>
<td>Stream Works Software</td>
<td>US$6000 per CPU and 50 streams</td>
</tr>
<tr>
<td>Satellite Dish</td>
<td>US$3800</td>
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</tbody>
</table>
Example of Operating Costs – For Information Medianet commercial offer

Audio Services
All prices are in U.S. Dollars

<table>
<thead>
<tr>
<th>On demand service</th>
<th>Number of simultaneous users</th>
<th>Modem speed</th>
<th>Set-up charge</th>
<th>Monthly fee</th>
</tr>
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<tbody>
<tr>
<td><strong>Package 1</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>- Up to 10 minutes news update 6 times per day</td>
<td>20</td>
<td>14.4 or 28.8kbit/s</td>
<td>2000.00</td>
<td></td>
</tr>
<tr>
<td>b. 4 daily programmes of up to 6 minutes each</td>
<td>60</td>
<td>12, or 16kbit/s</td>
<td>3000.00</td>
<td></td>
</tr>
<tr>
<td>c. All files maintained on website during 24 hrs. and then updated on an on-going basis each day</td>
<td>100</td>
<td></td>
<td>4000.00</td>
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<tr>
<td><strong>Package 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Up to 10 minutes news updated 12 times per day</td>
<td>20</td>
<td>14.4 or 28.8kbits/ (12, or 16 kbit/s)</td>
<td>2500.00</td>
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<tr>
<td>b. 8 daily programmes of up to 60 minutes each</td>
<td>60</td>
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<td>3500.00</td>
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<tr>
<td>c. All files maintained on website for 24 hrs. and then updated on an on-going basis each day</td>
<td>100</td>
<td></td>
<td>4500.00</td>
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<td><strong>Package 3</strong></td>
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<tr>
<td>- Up to 10 minutes news updated 24 times per day</td>
<td>20</td>
<td></td>
<td>3000.00</td>
<td></td>
</tr>
<tr>
<td>b. 12 daily programmes of up to 60 minutes each</td>
<td>60</td>
<td>14.4 or 28.8 kbits/ (12, or 16 kbit/s)</td>
<td>4000.00</td>
<td></td>
</tr>
<tr>
<td>c. All files maintained on website during 24 hrs. and then updated on an on-going basis each day</td>
<td>100</td>
<td></td>
<td>5000.00</td>
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<tr>
<td><strong>Minimum contract length</strong></td>
<td></td>
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<td></td>
<td>One year</td>
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<tr>
<td><strong>Package 4</strong></td>
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<tr>
<td>The radio station’s 24 hour full programme is recorded on website and maintained on demand for 24 hours. News are updated up to 48 times daily (RFI’s system choice)</td>
<td>20</td>
<td>14.4 or 28/8kbit/s</td>
<td>4000.00</td>
<td></td>
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<tr>
<td></td>
<td>60</td>
<td>(12, or 16kbit/s)</td>
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2.5 Radio Netherlands

Radio Netherlands, Holland’s external public service broadcaster has built an international reputation for doing things differently. The aim is to complement efforts being made by
other European broadcasters rather than trying to compete. In 1992, Radio Netherlands added e-mail capability as a way to contact the station. At the same time, preparations were made to start a Web site with both audio and text. Five years later, we’ve a fully operational web site which complements our radio and television operations.

In the 50/60’s Radio Netherlands scored with foreign non-Dutch speaking radio listeners because it broadcast from The Netherlands. You could say the reason for listening was “geographically driven”. There was a certain curiosity value associated with a voice from a long way off. The cold-war era (especially the East-West divide in Europe) encouraged countries to project their own voice. At that time, Radio Netherlands was a programme source, mainly of light entertainment.

The globalisation of the media markets, means that only old relics from the cold war are still trying to build on the “geographical” strategy. In the case of Radio Netherlands, the programme makers conclude that only a handful of people listen to Radio Netherlands because it comes from that part of Northwest Europe. Listeners now listen to us or access material via the Internet because there is a topic being discussed on Radio Netherlands which interests them.

The magic of long distance communication has been diluted in the last 10 years by the march of global television. Even if listeners in Africa cannot afford to watch CNN or MTV, they know that this type of communication is a daily occurrence not a newly discovered miracle. Radio Netherlands is therefore “issue driven”.

This is best illustrated by the programme requests coming from foreign radio stations, many of whom are clients of our satellite and Internet services. Analysis of the programme and publicity literature of the early 60’s (including a company film) reveal a vast transcription service producing short items in up to “37 languages”. Domestic radio stations (e.g. NHK Japan) had weekly programmes which gave people a “window on world events”. Many European countries (but especially the UK, Germany, France & The Netherlands) produced short (5 minute) items to fit into these shows. The general “anything-goes” character of the items reflected the very general nature of the radio networks in other countries. Foreign radio producers in the 1960’s would telex us to ask if there was anything happening in The Netherlands to fill their “world-round-up”.

Thirty years later we get e-mail from a news producer at an EBU partner station suggesting a co-production on an item concerning the way the Dutch see French attitudes towards developments in the Congo. The issue is the reason for the producer to call Radio Netherlands. The fact that it has a Dutch angle is second.

Radio Netherlands believes that the growth of the Internet will not mean the end of existing radio and television services. There will always be a market for information packages that have been compiled and/or crafted by producers. But as bandwidth gets larger into the home, Internet may well modify the way we use radio and TV. To prepare for this, we have deliberately integrated radio and television operations, but only where it is possible. We recognise the differences between radio and TV programme production. One offers more depth, the other is more concerned with form. Radio is not a broken television, but is does benefit from having access to television's raw materials.

Digitalisation of the production process will certainly reduce the costs of television. Internet’s ability to push information on-demand is already turning into a powerful marketing tool. Being able to choose information by subject rather than having to remember a frequency will make it even easier for consumers to find the information they’re looking for.
Radio Netherlands is a public service broadcaster and is working with more than 1000 stations around the world, many of them associated with the EBU. We realise that our future lies in partnerships and finding subjects we can share with others. Co-operation on content is much harder than sharing technical facilities. But the effort is worth it. Our co-operation with others in the EBU Internet Radio Group has been very fruitful. We invite you to visit http://www.rnw.nl for the latest overview of what we're doing. May be there are ways of working on projects together? Or send e-mail to media@rnw.nl.
2.6 Vatican Radio

The New Electronic Media and the Profession of Journalism

Electronic access to information is destined to become one of the main factors of competition and, as many people hope, a ever increasing determining element in terms of economic growth, job creation and increasing the quality of life.

It’s enough to cite the Gore Project in the United States which has the objective, among others, of linking school rooms, libraries, public hospitals and clinics to the infrastructures of national and global information, all within the present decade. The European Union is encouraging the development of the Information Society not only at the level of the Union itself (in particular by means of the DGX, the department occupied with the media and communication), but also within the G7. Again there are the recent conclusions of negotiations in the field of telecommunications by the WTO, the World Trade Organization.

Such radical changes in our society, which have an impact on, and happen by means of, instruments of communication, primarily concern those who work in the information field. These people are called more and more to transcend the traditional divisions between the different media, at a time in which new information and telecommunication technologies push towards an increasingly global multimedia supply. The most eclectic of these being the development of the Internet, in which the telephone, the press, commercial companies, radio and television are basing themselves.

Above all these rapidly developing technological innovations mustn’t be seen just as gimmicks. In the rapid evolution towards the future global information market, the so-called Information Society, “the content of information is seen as an important (perhaps the most important) ingredient, with a widespread and low cost increase of products/systems that become consumer goods,” as the 2nd 1996 Report on “Information and Communication Technology in Italy”, prepared by the Forum for Information Technology under the auspices of the National Council for the Economy and Labour confirmed.

In the same Report another important element stands out for our consideration, i.e. the importance of the elaboration and manipulation of the contents: “We’re talking about something that’s still evolving, with contours still to be defined. Above all, even now it’s becoming clearer that the value of multimedia applications isn’t found so much in the programmes or the technology, but in the capacity to manipulate and use the contents, creating new systems for presenting and using information, based on the criteria of interactivity.”

Training And Up-Dating Workers

At this point it’s evident that to avoid being excluded from the changes that affect the world of journalism, including radio, we should focus on training and up-dating. On the one hand moving along already established guidelines of development, and on the other hand, always remaining open to changes, and, in some cases, trying to influence the process of change.
Therefore training and up-dating for journalists in response to the rapid evolution of communication and information technology shouldn't be focused so much on gaining a specific understanding that risks becoming outdated within a few months. The real objective must be to develop an informed understanding of the global nature of this sector, and a work methodology that consistently refers to other technical and information professionals. These people are able to operate not only to ensure the best possible use of the multimedia net as a source of outside documentation, but also in realising projects and experimental products that make use of the emerging potential of interactive educational and training programmes inside and outside of the journalistic structure.

Moreover, in this perspective, it will always be important to have in mind the situation of each country. That means a consideration for the level of development and diffusion of the telecommunication and communication infrastructure; i.e. what kind of telephone network each country has, to the number of PCs owned by public and private organisations and individual households.

Wanting at this point to outline in a general way a series of elements useful for a programme of training and up-dating for journalists, we're pointing out three levels of problems:

- the testing and evolution of new information and information technologies
- the realisation of products/systems and their distribution
- the study of the development of the behaviour and habit of users, not only radio.

Regarding the first point, it's necessary to rethink the way each section works. From the journalistic perspective, the development of the Internet means the possibility of accessing a huge amount of information. All kinds of companies and organisations contribute to the net: press agencies, newspapers, universities, research institutes, private and public international organisations, each with its own resources. Further, access to everything one discovers on the net is usually free. It's also important to remember that there's a lot of audio material on the net, even if the quality isn't that great.

The net is thus a source of information that's equal to that of traditional press agencies. There's also the possibility of direct access to interesting sources, for example local newspapers. A noteworthy example for all of us is the Chiapas revolution, put out on the Internet thanks to the on-line interviews given by Commander Marcos. Another example is the site established by the opposition movement in Belgrade during their recent street protests.

So, this new technology really changes the traditional approach to the same events. Already it's possible to produce reports and carry out research almost without moving from the office because of a new type of link between the correspondent, or what's eventually sent in and the editorial desk. The editorial desk takes on a determining role according to the ability/necessity to chose the items the come in or to sort them according to pre-established criteria, or again, to develop them further.

With regard to the above it's important to point out the concept of the "net" has two meanings:

The first, regarding the Internet, is about a mass of information that in one way or another already gets organised by the person sending it out according to set "links". These can be likened to a network or to the branches of a tree that moves the
information a long way from its source. We’re talking about a huge potential that needs exploring. This implies constant research and consultation. An authentic kind of “parallel” editing that adjusts the “weight” of information that comes in via the usual press agency channels.

The second focuses on the “internal net”. The Internet makes an Intranet possible. By Intranet we mean a direct link between the computers in each Programme to a complete editorial-journalistic-technical-information structure so that information can be shared by everyone. With reference to Vatican Radio, this is a new way of thinking about information and the different sectors that provide it. In the face of so much information and such a range of sources, we need an internal system of distribution so that, for example, the different Programmes or editorial desks have access to basic working texts already in electronic format (the Pope’s speeches, material from the various Vatican dicasteries, press releases etc.). An internal net also allows prepared texts to be used by Programmes of the same language. This reduces useless repetition, in some cases allowing joint production, it frees up resources and allows for greater depth.

Briefly we can point out a double usage. On the one hand, traditional radio, which in Vatican Radio’s case has a precise form, not withstanding the different geographical zones of the listeners. On the other hand, an Internet use emerges that’s aware of changes and requires electronic mail (so as to be capable of interacting with the central administration). It’s a form of listening that goes down different paths than those traditionally followed because on the net sound and images interact.

We’re still at an experimental stage; it’s a new area but we need to keep in mind that the future will be about an integrated development of communication strategies; with the combination of different languages increasing the possibility of interacting with the users themselves.

The new kind of multimedia journalism is founded on the above, but at the same time care has to be taken not to eliminate its fundamental nature.

Of course, it’s natural that in this new phase of development, in which even within the radio’s production digitalisation is taking place, that new professional profiles emerge. But this transformation needs to be closely watched so that the new style information workers are seen as adjunct to, and not a substitute for journalists who must maintain their role as “critical witnesses” to events; not just repeating news that’s decided by others. A journalist must be able to manage the different levels of “manipulated” data that comes via both the Internet and the Intranet. The journalist is thus a professional capable of interacting with both these in a significant way.

A journalist’s ability to sort through the mass of information that arrives “at a glance” thus becomes fundamental. So does the ability to put together everything that comes in. Refining the ability to synthesise and analyse can only happen “on the job” And this then requires training in the developments in information technology like the Internet and the Intranet.

From a theoretical point of view, it’s important to know the history of journalism and the theories of mass media and the “global village”. Also to have a sound general knowledge that’s open to the religious dimension so that one is enabled to make sense of a society that’s becoming more and more complex in its various aspects. But one also need to know how to use a computer; this includes basic programming skills, and using the modem and the net. For the rest, navigating the Internet is all about practice.
Precisely because of the above, it's hoped that the net can quickly become a source of information and not just a showcase in which one can display one's own work. Central editorial desks, especially set up for this "navigating" will become the core of a new way of operating. If this is going to happen there should be seminars, training courses and opportunities for interchange, not only to optimise the way material is distributed, but above all to begin a phase of constant analysis about where the net, and journalism, are going.