Webcasting
– the broadcasters' perspective

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This article is based on the work carried out by the former EBU Webcasting Group [1]. It provides an update on the extremely fast developments in the area of webcasting that have occurred since the publication of the Group's document, "BPN 022 – Practical Webcasting". It also outlines some of the opportunities and challenges provided by webcasting and gives some indication of the future prospects.

In particular, the article explores the impact of the Internet on the broadcasting sector. We are witnessing the process of convergence between the Internet and the emerging digital terrestrial and satellite broadcast systems. The convergence of the PC and digital broadcast terminals is bringing about the delivery of new services as part of the multi-channel offerings from digital radio and television broadcasters.

1. Introduction

The World Wide Web (WWW or Web) is the multimedia dimension of the Internet and allows audio-visual material to be accessed using a standard web browser. In recent years, many radio and television broadcasters have created websites and have established themselves on the Internet. In parallel, as radio and television chains are being digitized, these new infrastructures are being used to carry web content at high speed to DAB and DVB receivers. For the broadcasters, web technology is becoming an interesting tool to produce, contribute, distribute and broadcast radio and television programmes.

Since the beginning of the 90s, EBU members have been introducing new digital technologies in their studio production facilities, and developing new digital transmission

technologies for DAB, DVB and, more recently, Digital Radio Mondiale (DRM). Conventional broadcasting – using traditional delivery mechanisms (satellite, cable and terrestrial networks) – reaches hundreds of millions of people, and provides nearly complete country-wide coverage: furthermore, the technical quality of the audio and video signals, as received at home and on the move, is largely seen to be satisfactory. Radio and TV receivers are widely available and are relatively non-expensive.

Abbreviations

64-QAM	64-state quadrature amplitude modulation
ADSL	Asynchronous digital subscriber line
API	Application programming interface
ASF	(Microsoft) Advanced Streaming Format
CSS	Cascaded style sheets
DAB	Digital Audio Broadcasting
DRM	Digital Radio Mondiale
DSL	Digital subscriber line
DSM-CC	Digital storage media – command and control
DVB	Digital Video Broadcasting
DVB-C	DVB - Cable
DVB-S	DVB - Satellite
DVB-SI	DVB - Service Information
DVB-T	DVB - Terrestrial
FTP	File transfer protocol
HTML	Hypertext markup language
HTTP	Hypertext transfer protocol
IEEE	Institute of Electrical and Electronics Engineers (USA)
IETF	Internet Engineering Task Force
IP	Internet protocol
ISDN	Integrated services digital network
ISP	Internet service provider
MPEG	Moving Picture Experts Group
MVDS	Multipoint video distribution system
PDF	(Adobe) portable document format
PNG	Portable network graphics
PSTN	Public switched telephone network
RRMP	Restricted reliable multicast protocol
RTCP	Real-time control protocol
RTP	Real-time protocol
RTSP	Real-time streaming protocol
SIP	Session initiation protocol
SMATV	Satellite master antenna TV
SVG	Scalable vector graphics
TCP	Transmission control protocol
TDC	(DAB) transparent data channel
UDP	User datagram protocol
URL	Uniform resource locator
USB	Universal serial bus
W3C	World Wide Web Consortium
WAP	Wireless application protocol
WML	Wireless markup language
WWW	World Wide Web
XML	Extensible markup language

The Internet, on the other hand, is a very convenient and successful means for sending e-mails, and for e-commerce, e-banking and other forms of electronic communication. However, at the present time, it is a very poor mechanism for carrying audio and, in particular, video broadcast signals. It is far from being able to offer the high quality of reception that the new digital broadcasting systems readily provide. Compared to relatively cheap radio and television receivers, the Internet requires more expensive PCs and – of great significance – only several hundred (or thousand) computer receivers can be on-line at any given moment, depending on the capacity of the web server. And, as the use of the Internet for broadcasting is not very cheap either, it is not surprising that it is being considered by many broadcasters as purely a secondary medium.

So why bother with such a "poor" delivery medium at all?

Not only does the Internet have an enormous potential for quality improvement, but it also seems to have two important and far-reaching features that conventional broadcast systems seem to lack:

- it is inherently "global";
- it is truly "interactive".

The term "global" means that any computer connected to the Internet is able to communicate to any other computer. The Internet is a *de facto* worldwide network: national borders present no obstacles when accessing it. In other words, a listener can select not just tens, but thousands and thousands of new radio stations from all over the world, in all possible languages.

The term "interactive" means that any user can receive information from, and send it to, anybody else. This feature opens the door to a host of new broadcast applications and expands the very notion of broadcasting. The Internet may in principle allow any individual, or a group of people, to become a publisher or a "content provider". The Internet may effectively blur the difference between the big and the small, the poor and the rich. It may even bring all broadcasters onto an equal footing. Since the geographical location of the Internet-user has become irrelevant, and the time of access is becoming less important, this may lead to a cultural and linguistic blend.

It is beyond any doubt that the Internet will have a dramatic impact on all future broadcasting activities. Therefore, it is vital for broadcasters to become aware of, and to understand, all the technological, legal, social, economic, cultural and commercial consequences that the Internet brings with it.

This article looks mainly at the technology-related aspects of webcasting. Other aspects – such as legal, regulatory, sociological and commercial – are, of course, equally important and even vital for the success of on-line services, but are not the subject of this article.

2. The WWW phenomenon

In order to understand how important the Internet is for broadcasters, it may be useful to describe it in some detail. The Internet may be characterized as a physical information network that logically connects together millions of computers by using a globally unique address space, based on the TCP/IP suite of protocols. The Internet has no single control centre, nor a hierarchical structure. It allows the connection of any kind of computers (PC, Mac, UNIX, etc) and is a global phenomenon.

The World Wide Web was first conceived in 1989 by Tim Berners-Lee as a project to improve collaboration at CERN (the European Laboratory for Particle Physics in Geneva) [2]. It was devised as a seamless model in which all the information on the Internet could be accessed in a simple and consistent manner – from any computer, in any country, by any authorized user. Anyone with a computer and the appropriate "extras" could connect to it, become part of the Web and use it to send and receive information in a variety of forms, with an easy-to-use interface.

Although the Web soon spread outside the CERN labs, it did not take off until late 1992. Its sudden success was due to the popularity of *Mosaic*, a graphical browser created by NCSA (National Centre for Supercomputing Applications). *Mosaic* later evolved into *Netscape Navigator/Communicator.* Today, the Web is the most popular and fastest growing information system deployed on the Internet.

The Internet offers many diverse resources, such as:

- e-mail, including the sending and receiving of attached files;
- Usenet (a vast system of discussion groups);
- Gopher (menu-based information) with the Veronica search engine;
- FTP (file transfer protocol) with the Archie search engine;
- Telnet (for connecting to and using a remote host);
- "Newsgroups" (where people can communicate on any subject);
- "Chat" programmes (which let people communicate with others in real-time – much like a written phonecall);
- E-commerce (which enables people to purchase books, software, CDs, travel tickets, etc.);
- On-line newspapers;
- Music downloads;
- Interactive games;
- Real-time radio (and even television) stations;
- Video teleconferencing;

- Long-distance telephony.

Over 80% of all Internet traffic now comprises applications based on HTTP, which allows navigators (browsers) to move easily from one document to another, via hyperlinks. Web pages – containing text, graphics, sounds, animations, audio, video and links to other web pages – can be created using HTML and these pages are referred to as HTM files.

HTML is a set of tags – i.e. text enclosed by the "lesser-than" (<) and "greater-than" (>) symbols – which identify the structure of the document. The essential characteristic of the Web is its hyperlinks. To the user, a hyperlink is either text (usually signified by being underlined and in a colour different from other text) or a graphic image that you can click on with your mouse to access the target resource (usually another document). The target resource can either be on your hard-drive or anywhere else in the world that is connected to the Internet. The address of a resource on the Internet (i.e. an Internet site) is given by its URL.

The Internet is spreading like wildfire. One striking illustration of how quickly the Internet is evolving, is the time it has taken for various communication technologies to reach a threshold level of 50 million users. While it took around 75 years for the telephone, 38 years for radio, 16 years for the PC and 13 years for TV to reach 50 million people, it is estimated that the WWW reached the 50 million mark in less than four years. In September 1999, the Web achieved more than 50% penetration in five major American cities [3].

Another development that reflects the booming growth of the Internet market is the number of ISPs. In the world of telephony, where monopolies have dominated the sector for several decades, the opening of the market has lead to a rapid growth in the number of service providers. The number of international *telephony carriers* worldwide has grown from less than five hundred in 1996 to more than a thousand in 1998. However, these figures are dwarfed by the growth in ISPs; some estimates suggest that more than twenty thousand ISPs are operating presently around the globe.

3. Webcasting

The Internet provides for some radically new models for delivering broadcast content, including audio and video programmes, to the end users. Webcasting is the term used to indicate the production, transmission and delivery of hyperlinked documents consisting of text, audio and visuals (i.e. video and graphics) – for presentation via a browser-like interface. Contrary to conventional broadcasting which is one-way only, webcasting allows the audience to interact with the originator, and to shape what is delivered. The simplest form of webcasting involves *streaming media* (audio, video and text) where the production centre determines the context. A more complex webcasting form is *audio-*

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