

What does the future hold for Computer-based technology in broadcasting?

A discussion on the future of radio and television – in a computer-based technology environment – was held at Telewizja Polska S.A. on the 18th June 2002. The event was organized by the editor's office of the quarterly journal *Przegląd Techniki – Radio i Telewizja* (RTV Technical Review) on the occasion of the 50th anniversary of television in Poland. The resulting report was published in the Annex to edition No. 3 (121) of that journal and forms the basis for this article.

The members of the discussion panel are listed in the text box below.

The last decade of the 20th century saw the accelerating overlapping of three domains:

- radio and television;
- telecommunications;
- computer-based technology.

The latter technology seems to be the binding element of the three domains and, most recently, it has become fundamental to this development.

It is worthwhile giving some thought to the reasons for, and the direction of, that process: *“Is it being caused only by the metamorphosis of society with its access to information and its need of universal access to media content ... or perhaps by the accomplishments of science?”*. We are observing technological progress, both in terms of pure performance (as determined by processor clock frequencies, transmission bitrates and the growing bit density of stored information) and as a result of fundamental scientific advancement. Bitrate compres-

Members of the discussion panel

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| Wladyslaw Brateus | Technical Director of <i>Radio Koszalin S.A.</i> – Polish Radio Regional Broadcasting Station. |
| Marek Holynski, Prof. | Strategic Development Director of the firm ATM |
| Stanislaw Jdrzejewski, PhD | Expert of the European Council and Member of the EBU Radio Committee |
| Krzysztof Lemiech | Chairman of DVB-T Technical Group of the Polish DVB Forum |
| Krystyna Roslan-Kuhn | Director of the President's Cabinet of the Telecommunication and Post Regulation Office. |
| Wieslaw Saldan | Technical Director of Digital Canal + |
| Wanda Trzebunia-Siwicka | Lecturer in Technical Training at the Television Academy |
| Leszek Zardecki | Technical Director of Eurozet Group. |

The panel was chaired by Ryszard Lindner – Director of the Technology and Investment Division of Telewizja Polska S.A.

sion algorithms, for example, use very advanced mathematics. And finally, what is the role being played by the product manufacturers and distributors in their pursuit of profits from this process of domain overlapping?

We have had some stagnation in the domain of radio and television during the course of many decades. The era of analogue television lasted 50 years. Then the digital era commenced. At first, digitalization was simply another form of presentation of otherwise analogue signals. It simplified some production processes, such as editing and the introduction of effects and subtitles, but it did not cause a revolution. The real revolution will be instigated by the packetizing of digital programme signals and the distribution of these packets in the form of data streams. The packets of programme material distributed by internal and external networks will have a tremendous impact on radio and television and will entirely change their future form.

One of the fundamental questions is: *at which point do our signals and digital networks end ... and computer technology begin? Are streams of data already a computer technology or simply a slightly different presentation of analogue signals, cut into pieces?*

Information and Communication Technology

We no longer talk of *Information Technology* (IT) alone. Since the advent of the Internet, we talk instead of *Information and Communication Technology* (ICT). It is no longer simply a case of dealing with traditional data and database processing. Today, we are dealing with the transfer and distribution of formatted data.

The most important developments in ICT are:

- Mobile and wireless devices.
- Multimedia in computer networks, i.e. the permissible bitrates over networks, the bitrate on the last mile and the types of connection to the end users. Data files can now be compressed up to 80 times. This means that common networks may transmit compressed multimedia files that may be stored on any PC.
- Abandoning of the hitherto prevailing paradigm of the stand-alone PC.

Over the last 20 years, broadcasters have been thrust into the same environment: there is a screen and there is a keyboard to be punched. But now there are other new ideas; for example, the tablet PC with its flat screen on which one can write by hand.

Two main convergence tendencies have appeared in this area:

- 1) The union of Personal Digital Assistants (PDAs) and mobile telephone sets

Mobile telephone sets are starting to function as computers – and handheld computers are beginning to communicate like mobile phones. These new communication techniques are not only aggressive but also very useful, so they are penetrating our lives very deeply.

- 2) The fusion of PC and TV receivers

Nobody knows how this will come about but everyone has been talking about this issue. The tests carried out hitherto have not been fully successful. We all know that television programmes may be watched by means of the Internet. Furthermore, we know that TV sets may be used to communicate with the Internet. But no one knows – as yet – what will emerge from these trials and what kind of hybrid device will finally appear.

The future is hardly foreseeable, because the pace of progress is simply so great. However, the mobile phone set will almost certainly take over many functions of our lives, including all banking operations.

Mr Philip Laven, Director of the EBU Technical Department, often quotes the words of President Pompidou: *“There are three roads leading us to ruin – women, gambling and technology. Women are the most pleasant way, gambling is the most effective way and technology is the most speedy way”*.

Let us now discuss separately the domains of radio and television.

The radio domain

The future of radio broadcasting is a broad problem. Today, progress is not stimulated by human needs; rather, human needs are stimulated by technological progress. Sometimes our needs do not keep up with this progress. A classic example is the different preferences within a family: who should be the addressee of the programme offer – the middle generation, the youngest or the elder generation? All of them of course, but how should this be reconciled? This may be resolved through sociological research. Persistence of the traditional form of radio is grounded by its role as a service provider. We mainly listen to the radio in cars to make the driving more pleasant, or to hear the current news and traffic or weather forecasts. Today, radio does not have a culture-creation role as it once did. There is no pressure, either from broadcasters or listeners, to develop radio programming much further.

Convergence may be lethal for radio. When radio enters into any of the convergence platforms – e.g. UMTS, digital terrestrial or satellite television – it will only play a marginal role. Its future may have to depend on additional services connected with, for example, traffic information. But this would be an ancillary role only.

The television domain

There is talk of “personalised television”, whereby a person at home will receive programmes chosen by his/her computer, which will know his/her viewing habits. And this will not only be in real time but during the night as well – when networks may be more accessible and may offer cheaper tariffs.

There will also be TV-on-Demand, i.e. not a linear schedule of programmes chosen by the TV stations, but programmes chosen by ourselves according to our own viewing preferences. Of course this will be an interactive television service, combined with multimedia. Interactive television will blur, to some extent, the difference between the broadcaster and the viewer. The viewer (and the radio listener too) will become an active participant of broadcasting: nothing will happen without his/her making some choices.

One has to be aware that new ideas may offer too much. What they promise may not exist in people as a conscious need and even the best ideas do not always find takers – particularly if they precede people’s needs. On the other hand, if something is useful and eases our lives, if it is economically efficient and gives us an edge over our competitors, then there will be no need to promote it heavily: everybody will want one.

Due to the increasing variety of delivery platforms – satellite, terrestrial, cable, broadband, wireless, cellular, etc. – a question arises: *Is it necessary to redefine the term “broadcasting”, because it may mean something rather different in the future?*

Regulatory issues

New Directives concerning the approach to networks and electronic communication services have been published by the European Union. Moreover, an interpretation of these Directives – as they might affect radio and television broadcasting – has been prepared by the European Commission. In general, these Directives deal with freeing up the market, and resolving the problem of licensing the terrestrial multiplex operators. As a result of the new Directives, telecommunication networks and service activity will not be subjected to licensing constraints. Broadcasting multiplex networks are regarded as telecommunication networks, for this purpose.

These Directives also cover the area of spectrum usage and management. They state that spectrum allocation should not be done through licensing, although some kind of authorisation may be useful. Spectrum is a scarce and precious resource and we believe it should be properly shared out.

From a content distribution viewpoint, broadcasting holds a distinguished position – solely on an historical basis. Movie production and distribution – whether in cinemas, on cassettes obtained through rental outlets or on the direct market – are, no doubt, a kind of broadcasting also. But these distribution methods are not subjected to the same kind of government regulations as “true” broadcasting. Perhaps this is because there is a lot of space on shelves to accommodate video cassettes. Alas, there is not so much available space in the ether!

It is worthwhile noting that it will not take much time before movies are directly distributed to cinemas by means of satellites or the Internet. Again, is this not “broadcasting”?

One of the hottest current issues in our domain are the so-called *content delivery networks*, i.e. WWW networks that not only deliver raw content and cache it on a server, but also mirror sites which reflect content that is as close as possible to the user’s requirements. These mirror servers analyze the user’s viewing habits, they control the rules of access (because there is a charge for Video-on-Demand), and they manage the intellectual property rights, the billing and so on.

Production and post-production

Computer-based tools are causing a revolution in the production and post-production environments. Today, we can store our programme material as files on hard disks or solid-state memories. Some years ago, an Ikegami camera that was equipped with the possibility of recording on a hard disk appeared on the market. It seemed likely to become a hit, because it offered the possibility of direct transfer with non-linear access. It meant that one could remove the disk, put it into a computer and immediately start editing. This device was not accepted, however, because the need for it was not clearly explained. Cameramen, too, were reluctant to use it because they do not like the idea of having an OB van on their shoulders. Indeed, such a camera offered all possibilities: editing, subtitling, voice-over, etc. This meant that a final signal could be produced from it, just as from an OB van.

Today, totally tapeless production is becoming commonplace. This is due to commercial and financial factors. Such a production option is possible and all involved in it have access to the same programme material. Journalists at their work area – with access to preview-quality material – are able to edit the programme, insert subtitles and create the complete dialogue list. Then the journalist can send the completed clip to the editor-in-chief who, after acceptance, can transfer it to the server in a similar way that it is done in radio. Thus a different model of the journalist’s job is being created.

The use of computer-based technology in newsrooms is the need of the moment, and is an irrevocable process. In this environment, computer technology offers new possibilities everyday – it transfers the whole gamut of television equipment from a hardware to a software platform. The trend is to keep the hardware tools unchanged, i.e. the computers, but to vary the relevant software according to creative and practical needs. Nothing has to be multi-copied any more. Previously, each consecutive recording from one VTR to another needed monitoring, before broadcasting. Now there is nothing to monitor – the network protects itself by means of QoS.

Compression issues

There have been some changes in our way of thinking about compression. European broadcasters associated with the EBU have agreed that the permissible bitrate for post-production use is 50 Mbit/s. Not long ago, the conviction prevailed that no compression should be used at all. However, ongoing progress in compression methods has caused this change of opinion. Much lower bitrates can now be used for transmission, especially at the end segment of the path. Even the EBU is now sending news over its networks at a rate of 12 Mbit/s. This means that all broadcasters in pursuit of savings are lowering their quality demands. The paradox is that, in the studio, we are improving the quality of the signal up to the *High Definition* level but, at the same time, we are agreeing that telecommunication networks can limit this quality and throw away 80% of the picture information – while we remain unconcerned.

Progress in the field of compression is now being marked by the new H.264 system. Comparison tests, by a panel of observers, between MPEG-2 transmission at a rate 4.5 Mbit/s and H.264 transmission at a rate of 1.5 Mbit/s (even of complicated pictures with high dynamics) gave very positive results. The panel declared that the picture quality was comparable in both cases. H.264 compression is really a new version of MPEG-2 – with every element optimized. The system has new algorithms for each element, either for the prediction of motion or for any other parameter.

The advantages of the H.264 system are obvious for *noiseless* signals. However, these advantages disappear with noisy signals. The efforts of many important manufacturers in the field are now concentrated on signal preparation before the compression stage – not on seeking ever further improvements in the compression algorithms. Experience has confirmed the importance of noise elimination from signals. Channels transmitting at 5.5 Mbit/s can produce very poor pictures if the signal is noisy. On the other hand, a 3.5 Mbit/s channel can provide perfect pictures if the signal is sent directly from a quality source, such as a studio.

Multimedia web services

With web pages now being written in the PHP or XML languages, they can deliver information not only on the content of the pages but also on the artistic composition, including layout, of these pages. Thus, it is now possible to “repurpose” the same basic web content for viewing on different computer platforms – for example, on full-size PC or TV screens, as well as on the smaller displays found on portable and, in particular, mobile devices. When viewing these web pages on a small display, the graphics are automatically reduced in size and resolution, and other content is similarly tailored to suit the viewing dimensions.

This offers exciting possibilities for broadcasters, who can now offer their multimedia web pages not only to users at home or in the office, but also to the growing band of users on the move.

Conclusions

Today, the management of a broadcast station is impossible without the use of computer-based technologies. At the onset, these technologies merged the worlds of radio, television and telecommunication. Now, they are creating new values, new possibilities and new services. This means that these new tools are contributing to the growth of an “information society”, in the broadest sense of the term.

The real revolution is being instigated by the *packetizing* of digital programme signals and the distribution of these packets – in the form of data streams – over internal and external networks. This will have a tremendous impact on radio and television and will entirely change their future form.

In the studio, new computer-based tools are allowing us to store our programme content on servers, and to access or distribute this content via IT-based networks. All cumbersome hardware equipment is now being replaced by software, i.e. by something that can easily be changed and updated over time. This aspect is extremely important. These mammoth changes are, of course, leading to completely new workflows, particularly in the news environment. It is thus very important that our staff are properly re-trained to work in these new environments: after all, they are our most important asset.

At the signal level, the onward march of bitrate reduction (compression) systems is allowing us to provide more and more programme services over our existing TV transmission channels – and the Internet as well. In particular, the H.264 compression scheme is eagerly anticipated, as preliminary tests on it have been very encouraging. However, attention is now turning away from finding ever-better compression algorithms – to finding the best means of reducing (or even eliminating) the noise in our programme signals, prior to the compression stage. Such programme noise has been found to adversely affect the performance of otherwise good compression systems.

At the user level, the merging of PDAs with mobile phones is seen as being very significant. These new mobile devices will penetrate the market rapidly and could have a profound affect on our lives. Another con-

Abbreviations

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| DVB | Digital Video Broadcasting | PHP | Hypertext Preprocessor |
| ICT | Information and Communication Technologies | QoS | Quality of Service |
| MPEG | Moving Picture Experts Group | UMTS | Universal Mobile Telecommunication System |
| OB | Outside Broadcast | VTR | Video Tape Recorder |
| PDA | Personal Digital Assistant | XML | Extensible Markup Language |

vergence tendency of great importance may be the fusion of PC and TV receivers. At this stage, we do not know what will emerge from the trials currently being carried out in this area, or what type of hybrid PC/TV device will eventually appear in our homes.

New internet tools, in the form of the PHP and XML languages, are today allowing us to send our multimedia web content more readily to these different computerized viewing platforms. In effect, the same basic web content can be “re-purposed” *automatically* to suit the different screen sizes in use today. In particular, this is opening up new opportunities for broadcasters who can now offer their web services to the growing ranks of mobile users.

There is no doubt that everyone engaged professionally in the fields of radio, television and telecommunication are now in the hands of “Information and Communication Technology” (ICT) specialists. As broadcasters, we must increase our recruitment of suitable ICT personnel – because our futures will depend on them!

24 July 2003
