EBU Village at Montreux '99

Montreux, 10 - 15 June 1999

The EBU Village at Montreux this year had as co-exhibitors:

⇨ Institut für Rundfunktechnik (IRT);

⇨ TéléDiffusion de France (TDF) and its sister organization, the Centre Commun d'Etudes de Télédiffusion et Télécommunications (CCETT);

⇨ the Centro Ricerche of the Italian national broadcaster RAI;

⇨ BBC Research and Development;

⇨ the OCTALIS Project and, last but not least;

⇨ EBU Eurovision Network Services and EBU Publications.

In what was probably the calmest Montreux exhibition for several years, the EBU Village was respectably busy ("quality not quantity") and it had a lot of very relevant technology to show off.

EBU Technical Director, Phil Laven, giving a presentation at Montreux '99.

The **IRT** had two quite different applications of technology to promote. In a small but impressively equipped viewing room, the delights of **MPEG-2 multi-channel surround sound** were being demonstrated to great effect. The coding of surround-sound channels in this fashion effectively presents the viewer with five discrete audio channels – front left, front centre, front right, rear left and rear right channels - plus the so-called 0.1 channel which provides a limited bandwidth bass channel to obtain the appropriate sensations when a Tyrannosaurus Rex trots past you on the screen.

The system is both DVB- and DVD-friendly, and the only depressing thing is that current-generation DVB receivers equipped with an MPEG-1 layer II audio decoder can decode only the stereo signal that is inherently transmitted in the MPEG-2 Audio multi-channel signal. To make some sense of the surround-information, this stereo signal may then be passed through a Dolby® Prologic® surround-sound de-coder, although the end result is not nearly as good as decoding the MPEG-2 MC directly – early adopters of DVB beware!

The IRT's **Webcasting** demonstration provided a fascinating insight into the world of broadcasting via the Web. In the intervening months between Webcasting's last outing at an EBU

Village (IBC'98), several advances in the efficiencies of audio codecs for Webcasting were in evidence, and you can sample some of these at first hand at:

http://www.rnw.nl/ebu/ebutest.htm

It must be appreciated that in an environment where software codecs rather than hardware codecs are employed, a webcaster will probably switch between different audio coders optimized for the different types of programme content (e.g. male voice, female voice, popular music, classical music) being transmitted during its broadcast, and listeners' browsers will invoke the appropriate software decoder "plug-in" to make sense of the stream being received. In this way, coding efficiencies are maximized at all times, with the smallest number of bits required to convey the programme over the WWW. There was no cheating at the Webcasting demo – an ordinary dial-up 64 kbit/s ISDN connection was used to demonstrate both audio and video Webcasting – though it must be said that there was little entertainment value in the video quality being streamed through this data pipe.

The **TDF** and **CCETT** had a small and extremely bustling portion of the village. Three of their newest products were presented: **IRD-Pro**, **TOCADE** and **Info*cast***

IRD-Pro – a professional DVB-T measurement receiver-decoder – was pretty much a wolf in sheep's clothing, as nothing identified it as anything other than a domestic set-top box except for the "Pro" label on the front panel. There are, however, one or two crucial extra lines of menu in the diagnostic section, and it was from these that the product really comes clean and growls, exposing a plethora of information about the MPEG-2 transport stream passing through its innards. More than this, the IRD-Pro can also measure and analyze the terrestrial RF channel characteristics, and can provide a constellation display before and after the channel correction. All this, coupled with the ability to talk to an external PC for logging operations, makes it a very attractive DVB-T tool. Its cost effectiveness is partly explained by the fact that no unnecessary expenditure has gone into making a 19"-rack product – it benefits from the same economies of mass production as the domestic product.

TOCADE is a combination of a dedicated real-time audio acquisition and control board in conjunction with audio quality analyzis software running on a Windows® NT machine. The system enables the automatic real-time monitoring of programme audio quality, and it can operate in conjunction with a professional IRD to analyze DVB-delivered programmes, or as a stand-alone audio monitor operating on AES/EBU inputs. The cleverness in the system is that it monitors sound alterations linked to digital compression or transmission in real-time, and without a reference signal. The unit at Montreux was being fed with DVB-S transport streams from the Astra satellite system, and it duly flagged what defects it encountered. Companion software is available for creating a graphical display of quality-level results, and for creating an alarm log. The GUI presentation is atypical of Windows applications, and bears more than a passing resemblance to the dashboard of a Renault Twingo!

Info*cast* is a set of tools which facilitates the creation of thematic multi-media channels for delivery as Push Internet (Webcasting) services across broadcasting networks. There are two main elements in the Info*cast* system: the "Data Centre" and the "Info*cast* Surfer". The former collects content from the Web, sorts it into thematic channels and administers these channels for broadcasting on different networks towards user PCs equipped with the Info*cast* Surfer. The protocol used for transmission is network-independent, ensuring that any kind of broadcasting network – for example, DVB, DAB, analogue TV or FM radio – can be used. The Info*cast* Surfer can be configured for off-line navigation, as a pager to display urgent messages, or as a banner where titles of the received contents are displayed.

Information on any of these products can be sought at http://www.ccett.fr.

The **RAI** Research Centre was demonstrating two satellite-based technologies and a DVB-T enhancement.

TAVS is the acronym for **T**ransfer of **A**udio and **V**ideo files by **S**atellite, and that is just what the system does. The demonstration running at the Village used a transponder on Eutelsat Hotbird-1, sharing bandwidth with the analogue PAL RAI UNO carrier and a DVB-S carrier of 6 Mbit/s. The system uplink was at the RAI Research Centre in Turin, and MPEG-2 A/V files were transferred using FTP (file transfer protocol) at a data rate of about 4 Mbit/s.

The demonstration system has a Video/Audio archive of MPEG-2 encoded material, an HTML-based Multimedia Catalogue containing a description of the archive in text, key-frames and audio, and a Multicast Server managing the whole delivery process. One possible application of the system is the mirroring of A/V contents from a central archive to local archives located at remote production centres – *Eurovision* should be taking a close note of this!

A remote user locates the material he/she is interested in, using a powerful contextual search engine associated with the Multimedia Catalogue. Next, the user fills in a request via the WWW, using HTML forms, where he/she can specify where and when the files are to be sent. At the appointed hour, the Multicast Server cuts the appropriate piece of MPEG-2 out of the A/V archive, conforms it as a file and delivers it through the satellite link. The system is secure, all A/V transfers are encrypted, the transmission system is prioritized to manage transmission capacity, and not least, the system is actually independent of the encoding method adopted in the A/V archive.

Slot*Fill* has nothing to do with Las Vegas, but it is a money-maker as it enables audio-visual archives to be accessed through otherwise-idle SNG transponders.

In order to guarantee the availability of transmission capacity to transportable SNG (Satellite News Gathering) earth-stations, broadcasters very often lease bandwidth on satellites on a monthly or annual basis. However, on average, the actual satellite resource exploitation is less than 50%. Slot*Fill* automatically manages this excess capacity and deploys it usefully for the transfer of A/V files using the DVB data broadcasting protocol. The system prioritizes SNG transmissions, and will not uplink A/V data until the bandwidth is vacated by News. When another SNG signal is up-linked, collision detection takes place and Slot*Fill* ceases transmitting the A/V data until the bandwidth is once more available, when corrupted or missing IP packets from the end of the previous A/V transmission are resent upon request by the remote terminal.

The system makes use of a return path via the Internet, through which remote control and monitoring can be effected. The system is also expandable to automatically search for an empty transmission slot from among several slots.

CD3-OFDM is an enhanced channel equalization algorithm for DVB-T. The explanation of the technology is intensely technical, but its advantages are easy to appreciate, as it makes an already good transmission system even better in terms of fixed and portable reception in wide single-frequency networks (SFNs). Its adoption would mean that fewer transmitters would be needed for the same coverage in a single-frequency network than would be needed for conventional DVB-T channel equalization.

Multipath reception in analogue transmission systems results in picture ghosting and unstable pictures, whereas the COFDM used in the DVB-T system positively relishes echoes and delayed signals, and turns them to advantage – up to a point. That point is when the echo exceeds the guard interval between channels, and the system can no longer decide which channel is which. The CD3-OFDM algor-ithm developed by the RAI enables the echo to exceed twice the guard interval before troubles begin, and furthermore, the performance degradation in the presence of long echoes is more gradual, as in the DAB system, and this significantly improves reception proba-bility in wide SFNs.

CD3-OFDM does not rely on the pilot tones that are inserted in the OFDM spectrum of the DVB-T system to sense where a channel begins and ends. Thus an added advantage in the use of CD3-OFDM for non-DVB-T OFDM applications is that these pilot tones could be omitted, allowing increased transmission capacity per channel.

Integration of the CD3-OFDM functionality into a standard DVB-T chipset is unlikely to be problematic, as it is a superset of the classic channel correction system. A hardware implementation of CD3-OFDM has already been integrated into the *European dTTb Demonstrator* which confirmed computer simulations as to the performance of the system in the presence of long echoes. A better mousetrap awaits!

BBC Research and Development had a deceptively simple-looking stand in the Village, but it nonetheless had some heavyweight technology to promote.

Metadata – the bits about the bits. Traditionally, programmes are contained on films or tapes to which written labels can be attached for identification. The same goes for the material that the finished programmes are made from – shots, audio clips, graphics and so on. Other material about programmes and the material that goes to build them is currently recorded and stored in a variety of different formats.

In the digital world, this accompanying information is known as *metadata*. In the future, storage costs will be negligible and there will be no network constraints on the transfer of data (Moore's Law still looks infallible). It would be a great advantage, therefore, if the metadata is handled in a well-defined and agreed way, so that everyone in the programme chain – researchers, producers, schedulers, archivists and business managers – have access to the data they need in the form they need it. A unified data structure will safeguard vital information and eliminate labour-intensive re-entry of data into different systems at various points along the production chain. As the technology develops it should become possible to generate much of the metadata automatically. This will make it easier to identify material from the archive that is relevant to making new programmes, including the rights clearances that are needed for its re-use. Thus metadata will also enable broadcasters to reduce production costs by facilitating the "repurposing" of material.

SMEF™ is the acronym for Standard Media Exchange Framework, and it is the set of data tools that the BBC Media Data Group has developed in response to its brief to identify everything the broadcasting business ever needed to know about a media item and to understand how that information was passed between process stages and business units. SMEF™ defines the information changing hands at the interfaces: i.e. the required outputs and inputs going from from one process to another.

In parallel with the data and process study, the Media Data Group audited all current production and distribution systems in use for their information output/input and metadata capability. The results of the audit showed that although lots of information is generated, there's very little capacity for handling it at the moment, except in post-production and play-out, and most

of that is proprietary. There remains a lot of work to be done through the EBU and the SMPTE to persuade the industry to develop solutions that fit together, and SMEF™ seems a good starting point.

To show how metadata might be used, BBC Research and Development has built a **Radio Demonstrator**, which is not so much a physical system as a concept model that presents the sort of tool-set and "middleware" that could be developed with SMEF™ in place. Radio was chosen, as it is technically and economically easier than television, and because the EBU BWF (Broadcast Wave Format) is already a standard file format with metadata capability.

At the Village, the BBC had an explanatory video (in fact, rather an excellent quality domestic DV playback) of the Radio Demonstrator in action. It showed four process stages: research and archive retrieval; editing; scheduling and play-out, and DAB home reception. What was illustrated was the way in which information can be created and re-used for a number of different purposes throughout the programme lifecycle, as long as it is properly structured in a standard way at the time of creation.

BBC Research and Development may be found at: http://www.bbc.co.uk/rd.

The **ACTS OCTALIS** ("**O**ffer of **C**ontent through **T**rusted **A**ccess **LI**nk**S**") consortium has twelve participating partners, including the EBU, RTBF and the BBC. It aims at combining conditional access and watermarking technologies to protect a whole network from piracy. A demonstration of real-time watermarking was made at the EBU Village using both a local source of digital component signals and live feeds from the *Eurovision* satellite network.

Watermarking means that the television signal becomes indelibly, but at the same time invisibly, marked with a uniquely identifying message that can survive subsequent signal processing and transmission, and which can be reliably identified using the appropriate equipment. The OCTALIS method can be used on live television, as the demonstration clearly showed, and so its application extends beyond the securing of pre-recorded works such as VHS and DVD products.

The **EBU's** presence at its Village highlighted its **Eurovision Network Services** and **Publications** departments. Live *Eurovision* feeds were projected on a screen that was visible from much of the exhibition hall. At the time of the exhibition, many of the news items consisted of harrowing scenes from the Balkans which served to make the point that what was being seen really was raw news footage. One afternoon's feed consisted mainly of live ATP tennis from Germany which found a ready audience in the nearby Deutsche Telekom stand.

Publications staff were on hand to distribute copies of the ever-popular Technical Review, and to field orders for many of the EBU's technical and programme-related documents.

The Village's satellite "antenna farm" was amongst the most impressive at Montreux this year, and thanks must be extended to d'JAY JAY Enterprises of Geneva who very speedily and professionally installed the EBU's antennas and cabling.

Roger Miles
EBU Technical Department