

“I want clips”

— an introduction to the JIBS scheme for the exchange of educational video clips



Nadège Boinnard

EBU Television Department

The exchange of programme material in a digital world involves not only satellite distribution channels, but also important decisions over the best video compression format to use and, of course, the development of meaningful metadata to accompany the content material.

This article provides an introduction to the JIBS platform that has been developed to enable the buying, selling and exchange of educational video clips among broadcasters and educational establishments.

Do you have any idea of what broadcasters in the educational field are going through? In an increasingly constrained budgetary situation, they have a mission to provide educational institutions with more and more audiovisual content, in the form of short programmes (1 - 3 minutes duration) which are suitable for national curricula as an additional pedagogical tool for teachers. And because times are changing, technology is evolving: the Internet has now become such a common tool, and schools, teachers and students want content available on demand.

With more constraints and more demands, television broadcasters are being urged to find a way to streamline the supply of educational content in the most cost- and time-effective way possible. That is a challenge in itself.

It's too expensive!

But let's add another challenge to this. Indeed, it is also extremely difficult for educational television broadcasters to acquire such short programmes because of the high administrative costs (catalogue, contracts, etc.). Every mini-transaction is too costly relative to the programme's short length. So what do they do? Well, they either acquire packages of clips – and run the risk of owning great amounts of content they do not need and will not use – or they produce them in-house. The latter is increasingly what they choose to do.

Digitizing archives is a priority

But that's not all. Another great issue has been arising on a much wider level than the mere educational branch of PSB: preservation, accessibility and optimization of archive use. Thousands of tapes, film and other formats are sitting underground, while slowly but inevitably deteriorating. Yet

archives are worth billions! They represent one of the main assets a broadcaster has. Waiting is not an option. **Digitization is a priority.** It was by far the most agreed-upon statement among the ninety people present at the Digital Archives workshop which took place in Geneva in February this year.

However, apart from having workflows to design, people to train and equipment to acquire, broadcasters are, more often than not, lacking money to digitize their archives. This is where **JIBS**, or any other similar online catalogue, could be an economic (indeed, free) starting point for this digitization process: broadcasters or archive owners could use the money generated by such platforms to digitize the content they are selling.

JIBS provides some solutions

Here is a brief history of how JIBS came to life. In 2000, during a meeting in Prague, the EBU Education Group (a workgroup coordinated by the EBU Television Department) clearly decided to prioritise one of the Group's main and most strategic objectives: to develop a European **Joint Inserts Bank for Schools**. Why? Because teachers cover the same topics regardless of the country. They therefore might have the same needs in terms of audiovisual content.

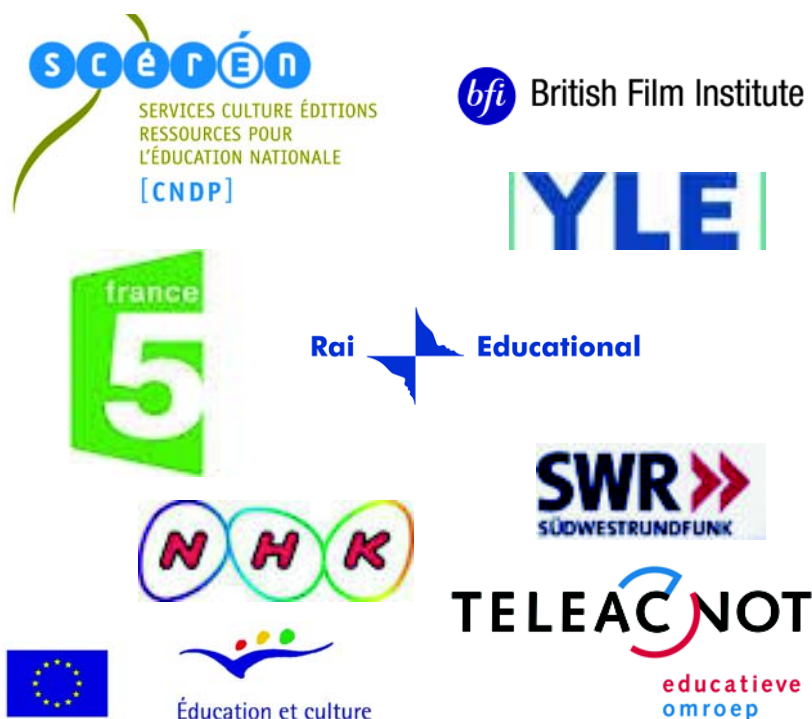


This is how JIBS was born. The concept is simple: develop an online database of clips to be used in an educational context, enable content providers to populate the database, and provide an interface enabling buyers to search/browse, select and buy clips online. Once ordered, the clips are delivered to the buyer in broadcast quality (MPEG-2@30 Mbit/s, 4:2:2, 12-GoP).

Huge challenges behind a simple concept

With SWR, TeleacNOT (NOS), France 5, CNDP, RAI Educational, YLE, the British Film Institute and NHK on board, the JIBS team ran a 2-year race. The reason for racing was due in great part to the European Commission which was partly funding the project and demanding delivery on time. Among the challenges, the greatest ones were:

- building the database with the right metadata (including education-oriented metadata fields);
- defining a common legal framework, the conditions of purchase, exploring potential fiscal issues and price modelling, defining sets of rights;
- finding a cost- and time-effective delivery system;
- choosing the right technical standards for the digitization of clips;
- securing the European Commission's money by delivering what we promised, and proving what we had done.



Metadata or "oops, we forgot a field!"

Everyone involved with digital video agrees that **metadata** is as important as the **essence** itself: if you define **content** as being the combination of essence and metadata then, without metadata, "the essence is worthless because you won't be able to find it" and "content without copyright information is worthless because you won't be able to use it." ¹

Descriptive metadata

When organizations decide to create a common platform, they need to have a commonly-agreed **metadata format and model** ². This is the process we went through with JIBS. It required analysis and exchange of information between all partners. The approach to metadata for the JIBS project has been very much "hands-on", analysing the specific requirements of JIBS' niche market: education. We dropped quite rapidly the possibility of exchanging metadata simply because existing metadata among JIBS partners was in their original language. Because people who browse the catalogue need to understand the content, we decided that the whole JIBS website – and therefore all the metadata – should be in English only. Some other projects investigated multilingual search engines, but it proved extremely difficult to achieve satisfactory results.

The JIBS database fields (March 2005)

SERIES DATA

Series Title
No. of episodes produced
Subjects (drop-down box)

Interactivity (y/n)
Colour system and image speed
TV display ratio
Technical comment
Other comment
Intended end user

CLIP DATA

Title
Internal Ref. No.
Subject (drop-down box)
Genres (select multiple items if necessary)
Production company (max. 200 characters)
Producer credits (max. 200 characters)
Year of production (format: YYYY)
Contributing company (auto)
Duration
Audio
Languages
Comments regarding language

Typical target age
Content (max. 200 characters)
Dubbed script in English (.doc)
Music cue sheet (.doc or .xls)
Learning outcome (max. 200 characters)
Difficulty
Rights (select multiple items if necessary)
Unit price (drop-down box, select among up to 5 basic prices)
Order notification emails
Submitted by (auto)
Submit date (auto)

After we dropped the concept of digitally exchanging metadata between the various partners' databases, we also decided to define ourselves what database fields were relevant for our platform; e.g. "Intended end user", "Typical target age" and "Difficulty". These fields are listed in the box above. This field list was completed, changed and amended several times before taking its current form. For example, we added the "Series Data" concept at a second stage. Technical metadata such as the "Colour system and image speed" and "TV display ratio" were added at a third stage.

We are aware that we will have to improve on it further, as the system grows and possibly diversifies, thus making the metadata modelling an ever-evolving process.

1. Archives in Digital Broadcasting - A Report from the Interdisciplinary Archive Group, EBU 2003.
2. The metadata format and model is the list of optional and required fields set to define the content of the clips (descriptive metadata, technical metadata, the rights available, target audience...) and which are needed to insert in the application.

Abbreviations

DOP	(EBU) Department of Operations	PSB	Public Service Broadcasting
GoP	Group of Pictures	SDTV	Standard-Definition Television
JIBS	Joint Inserts Bank for Schools	SMPTE	Society of Motion Picture and Television Engineers (USA)
MXF	Material eXchange Format		

Copyright information (legal metadata)

Rights acquired for a specific programme are always based on the territories reached, the duration of rights granted, the number of times the programme is broadcast and the possible audience reached. Most of these parameters are completely different from one country to the next, but it was essential to be able to reach a common agreement. It took us more than 6 months to agree on this issue and the legal framework now includes the several types of rights identified and defined by the founders: standard television rights, dedicated channels, niche channels, open Internet streaming, closed Internet streaming, closed Internet download, sublicensing rights, VHS/DVD rights, etc.

Financially speaking ...

Price modelling

Originally, JIBS was meant to be a free exchange platform but the idea was soon abandoned. JIBS is now therefore a platform where actual transactions take place, meaning clear and fixed rules have to be set and agreed among the different parties involved. Two documents bind any organizations wishing to join JIBS: the legal framework and the conditions of purchase which rule all the different aspects of the JIBS marketplace. Prices are not negotiable between buyers and sellers but are calculated with a formula based on various criteria including territory size (in terms of TV households) as well as the set of rights acquired.

Because JIBS is not a commercial initiative, clips are sold for a low price, on a non-exclusive basis, for educational use only. Such a state of mind had consequences which facilitated our pricing structure. For example, clips are sold by the unit, not by the minute.

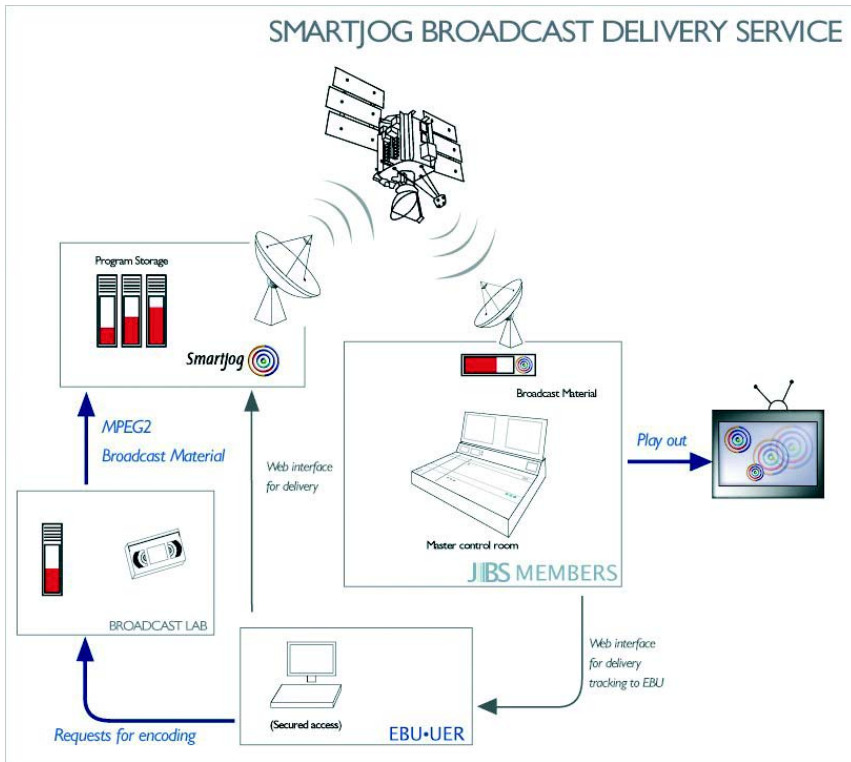
Running costs

The EBU Television Department is running the JIBS operations. It is financed by taking a commission on sales (from the seller) and applying a handling fee (to the buyer). Maximizing the amount of transactions on JIBS is therefore the way to make the platform sustainable and to continuously improve it. Of course, with JIBS being a not-for-profit platform, the more transactions that take place, the less JIBS will have to charge each party on each transaction to reach break-even point.

Digital delivery

Initially, the delivery means envisaged was pretty much "analogue": express mail. However, after some thoughts and analysis, the automatic delivery via satellite turned out to be the most interesting solution, in a financial and workflow sense. This is in great part due to the short duration of the clips to be delivered (average 3 minutes). Because clips are short, the delivery is cost-effective as they represent a small volume of data (compared to a full-length feature film for example).

Satellite delivery is a solution that we started exploring in early April 2003. We first approached the existing Eurovision network within the EBU Operations Department (DOP) because it interconnects all EBU Members. Moreover, they had been working on an extranet technology aiming at delivering files via the Eurovision network overnight. However, in early June that year, we found



out that this system would not be available on time for the JIBS tight deadlines. We then approached several potential partners, to evaluate solutions, costs and resources involved – with significant help from the EBU's Technical and IT departments. We finally followed the DOP recommendation and signed a contract with **SmartJog** – a French-based company offering to digitize, securely store and digitally deliver the requested clips to the clients, via the company's closed satellite network.

For those who wish to use this technology, they must install a cheap SmartJog receiver on their premises. For those who don't, an express mail delivery service is still also available

(digital betacam only). Today, there is a human link between the JIBS system and the SmartJog interface: when an order is placed on JIBS, the administrator uses the SmartJog interface to actually choose what clips are delivered where. In future stages, this human link should be removed.

Choosing a high-resolution SDTV standard – a nightmare for rookies ³

To start with, if choosing such a standard might sound easy for broadcast engineers, the people in charge of JIBS, whether EBU-side or Member-side, are content-oriented people and are not at all familiar with the technical issues.

So, we found out that we would have to digitize in two formats: a low-resolution format to preview clips online on the JIBS website, and a high-resolution format for delivery and post-production.

Post-production is a key issue here. Programmes are meant to be post-produced: buyers need to make a national version of the clips (with the exception of programmes to be used as language-learning tools).

The low resolution format was the easy part. Since JIBS is hosted on the www.ebu.ch web servers, the RealNetworks format (.rm) was chosen. We only had to define the bitrate. 128 kbit/s was judged to offer good enough quality for previewing the clips.

The difficult part was deciding on what high-resolution format we should use. MPEG-2 was always being mentioned by JIBS partners, and it is therefore what we decided to use for the video compression format. However we, **as non-engineers**, thought the mere mention of "MPEG-2" was enough to make everyone happy, and only a bitrate had to be chosen. Well, we quickly found out that it is much more complex than this. Like students, we discovered there are many different kinds of MPEG-2. MPEG-2 files can be viewed on a PC and can be encoded for streaming purposes. This is not suitable for broadcast-quality files. There are several parameters to consider and set.

3. For more information, please refer to EBU recommendations : D84, D85, D89 and D94, available via <http://www.ebu.ch/en/technical/publications/ott/index.php>

Bitrate

It is possible to encode video into MPEG-2 files at basically any bitrate. However, to obtain what is called "broadcast quality" restricts the choices. Some JIBS partners had already digitized their content at 12 Mbit/s. After several tests and discussions between JIBS members, it was agreed not to go below 25 Mbit/s. The EBU Technical Department, on the other hand, recommended that, in order to maintain the quality, the bitrate should not go below 50 Mbit/s.

We should mention that, at that stage, we did not even know the existence of things called "I-frames" and "long GoP"). The problem with using such a high bitrate was that it then became too expensive to deliver via satellite, since transport is invoiced according to the volume of data transmitted. We had to find a compromise. If possible, we wanted to find a "good future-proof" standard. Then, with the help and time of the EBU Technical Department, we discovered **SMPTE 386M** (D10@30 Mbit/s)⁴. It seemed perfect. But you will see later how the real world caught up with us.

Chrominance

Here again, the help of the EBU Technical Department was pivotal in making us understand how such criteria can make or destroy such a project. Without getting into too much detail, we were told how the 4:1:1 (and 4:2:0) chrominance ratio is a play-out ratio, which is not suitable for editing – because this ratio reduces the colour quality in post-production manipulations. The **4:2:2** ratio is the now standard ratio for professional encoding of video with good-quality post-production phases after encoding. This is of course the ratio we chose.

Frame structure

Along the way, we also learnt that there are two main types of frame structures: **long GoP** and **intra-frame only**. A frame is an image. In the European television system, a video has 25 images or frames per second. When a video is digitized, it stays at 25 frames per second. However, the structure of these frames can be different: long GoP structure means that these frames can be intra-frames (I-frames), bi-directional frames (B-frames) or predictive frames (P-frames). In this case, the only frames containing all the data are I-frames. The B- and P-frames provide information on what changes between two I-frames. A GoP is therefore anything between two I-frames.

Intra-frame structure means that the video file only contains I-frames. This distinction is extremely important for various reasons: on the one hand, the "logical" frame structure for editing suites is I-frame, as in the traditional tape-based structure (1 image = 1 frame). It is therefore the most likely frame structure to be understood by a digital editor. On the other hand, because long GoP does not reproduce all the information in each frame, a long GOP file will be smaller in terms of size than the same video encoded in I-frame. In other words, a file at 30 Mbit/s long GOP will have a better image quality than a file at 30 Mbit/s I-frame. We had learnt the hard way, around December 2003, that digital editing suites were not capable of ingesting any file-based MPEG video – whether I-frame or long GOP. Even in May 2004, it still was not the case.

In an ideal world, the configuration would be as shown in *Fig. 1*. However, this is not going to be possible until editing suites can ingest file-based MPEG-2. The temporary configuration is therefore as shown in *Fig. 2*.

4. SMPTE 286M-2004: **Material Exchange Format (MXF) - Mapping Type D-10 Essence Data to the MXF Generic Container**
<http://www.smppte.org/>

This solution is slightly more costly since there is a copying process from file to tape. This extra step should be avoided within a year or two from now.

Container or file format

Choosing the right video compression format is only part of the story. We also have to specify how to exchange the information as files. This is where **MXF**, the Material eXchange Format, is most appropriate. It fully supports the carriage of “MPEG-2 30 Mbit/s I-frame only” (as discussed above).

The EBU Technical Department is, and has been, strongly involved in the development of metadata models for programme exchanges between broadcasters, and has published documents such as **Tech 3293** (Metadata for Radio Archives) and **Tech 3295** (P_META v1.0) on this topic.

The SMPTE is also involved in the standardization of MXF metadata ⁵.

All major broadcast manufacturers have committed themselves to supporting MXF. Our ideal decision would therefore have been:

- **MPEG-2@30 Mbit/s** I-frame only (D10) for the essence, and;
- **MXF** as the file format.

When the real world catches up ...

However, we quickly found out that this solution could not work. Indeed, the D10 standard is very recent. Machines which can encode in D10 only started being released in April 2004. Therefore most post-houses are not equipped to deliver file-based D10 (whereas IMX tapes are not a problem but it is not what we wanted). So, in order not to halt the JIBS project for technical reasons, we modified our requirements, using MPEG-2@30 Mbit/s, 4:2:2, 12-GoP. Post-houses can encode this essence format together with the MXF file format and it is to be hoped that this combination will be future-proof.

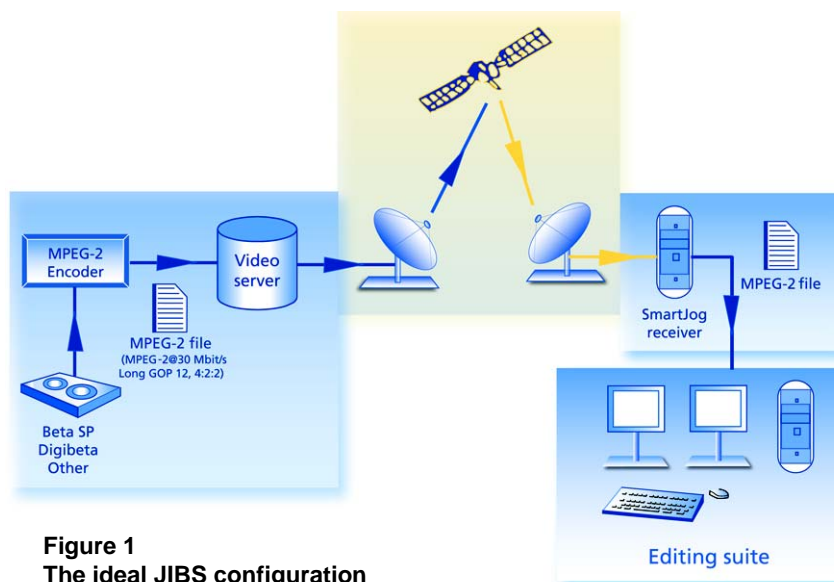


Figure 1
The ideal JIBS configuration

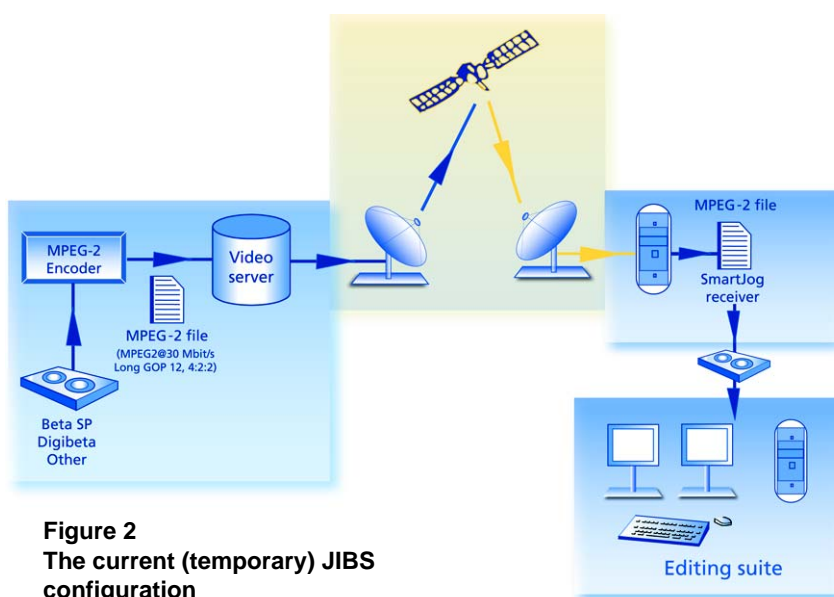


Figure 2
The current (temporary) JIBS configuration

5. SMPTE 380M-2004: **Television – Material Exchange Format (MXF) – Descriptive Metadata Scheme-1 (Standard, Dynamic)**
<http://www.smpite.org/>

Advantages and drawbacks linked to this choice

On the positive side, the project was able to go ahead (meaning that money from the European Commission was made available) and also, a 30 Mbit/s MPEG-2 12-GoP file is more or less equivalent in quality to a 50 Mbit/s MPEG-2 I-frame file. Therefore, the strong wish of the EBU Technical Department to maintain the quality has been fulfilled. It also complies with another SMPTE standard: **SMPTE 381M**⁶. On the less positive side, it seems that digital editing suites that can ingest file-based MPEG-2 in long GoP will take longer to arrive on the market than systems that can ingest I-frame only.

Other issues

Some other technical aspects were raised, such as soundtracks. How should the soundtracks appear on the original tape before encoding them into MPEG-2 files? Is **Surround Sound** important? Do we need to consider other technologies such as Flash animations tailored to the requirements of JIBS? If so, how are we going to change the metadata format to suit the introduction of such types of content? How do we deal with the 525/625-lines issue?

This particular topic leads to another one: broadcasters interested in joining JIBS will certainly not accept digitizing in our chosen format if they already digitize their content in another format. We will therefore more than probably have to deal with a multi-standards environment (and here comes another metadata field to add). This also has implications in the delivery process: we negotiated a flat fee for 30 Mbit/s file deliveries. What if tomorrow some new JIBS sellers own files digitized at 50 or 25 or 5 Mbit/s (news items for example)? Re-negotiate, probably.

Storage

Storage is also an issue. Today, high-resolution clips are stored on SmartJog's video servers. Will broadcasters accept delocalising of their content? Will they accept storing it twice (at their premises and on SmartJog)? If storage costs are involved – and they are – it is most likely that they won't like this idea.

So what should we do? Store the content at the EBU? Such common storage systems – centralised within the EBU – were mentioned at the Digital Archives workshop in Geneva in February. Could JIBS be the triggering project?

Metadata ... again

Many problems remain unsolved and questions unanswered at the moment, and there probably are other issues we have not even thought of yet, but their time will come. One step at a time. For now, the "issue of the month" is most definitely to find a solution to the main drawback of the JIBS system: the manual treatment of metadata.

Presently, we have very few clips on JIBS (several hundred). Each clip's metadata is manually entered via the JIBS web interface. When we approach big content owners and propose a manual upload, we expect them to laugh out loud. We are therefore investigating the creation of tools (parsers) to help bulk extraction and communication between the sellers' and JIBS' databases. We are aware that we will probably have to create a specific parser for each new seller and will need, on each side, database experts to talk to each other. This goes beyond the TV department's skills and

6. SMPTE 381M: **Material Exchange Format (MXF) Mapping MPEG streams into the MXF Generic Container (Dynamic)**
<http://www.smpte.org/>



Nadège Boinnard joined the EBU in 2002 and is the JIBS project coordinator within the Television Department. Prior to this, she was a consultant in the field of digital interactive television for clients such as Lagardère Active, CanalSatellite, NPTV and ICTV. During a two-year period, she launched and ran iTVindustry.com, a web portal dedicated to the interactive television industry.

Ms Bonniard has been working in the broadcasting industry for the last six years, specialising in business development and strategic advisory services, with a strong focus on digital television technologies.

resources. However, as it has always been the case with this project, we have high hopes of finding the right person within the EBU to help us with this.

JIBS: a typical EBU "core business" cross-disciplinary project

All these questions exemplify how it is important for broadcasters to co-operate on these issues and how the EBU can help standardize all aspects of the production for facilitated exchange.

The JIBS project is typically what an EBU project should be. Its complexity and its cross-disciplinary dimensions make it a beautiful case study on how new technologies affect and concern numerous different professionals. As an EBU-led project, JIBS solicited legal, fiscal, commercial, technical (IT, broadcast and telecom) and editorial advice at all stages. The physical presence, dedication and patience of talented experts within the EBU premises made possible the development of this unique platform through a series of difficult choices, huge questionmarks and doubts. The collaboration between all the different departments of the EBU – the input, questions, best practice information from JIBS partners (EBU Members or not) – is the very essence of our success.

Now that we have reached our first goal, we are concentrating all our efforts on the second and most important one – to reach critical mass. JIBS members have agreed to open the system to other partners, namely broadcasters, archive owners and production houses, offering them the possibility to be first-movers in the very promising digital era.

For more information, visit www.ebu.ch/jibs or contact Nadège Boinnard via boinnard@ebu.ch.

Finally, the author wishes to thank warmly Frans de Jong and Hans Hoffmann from the EBU Technical Department for their help in the writing of this article, as well as during the whole JIBS project.

The screenshot shows the JIBS website interface. At the top, it displays the EBU logo and the text 'European Broadcasting Union / Union Européenne de Radio-Télévision'. Below this is a navigation menu with options like 'Clip management', 'Search', 'Browse', 'My clips', and 'My transactions'. The main content area shows search results for 'Results'. The first result is titled 'SEA ANGEL floating in the sea' with a subject of 'Nature/Environment', a duration of 00:02:30, and a date of 2003-02-18. The second result is titled 'the growth of cauliflower' with a subject of 'Nature/Environment', a duration of 00:02:31, and a date of 2003-02-18. The content for the second result includes a description: 'If a cauliflower is not harvested but let to grow, it will grow many flowers. That is why it is named that way. This growing of its flowers takes a while, in this clip though you can see how it is done'. The interface also includes a sidebar with a list of categories and a footer with 'Displaying: 1 - 3'.