



**Recommendation ITU-R BT.1888-1**  
(09/2011)

**Basic elements of file-based  
broadcasting systems**

**BT Series**  
**Broadcasting service**  
**(television)**



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## Foreword

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### Series of ITU-R Recommendations

(Also available online at <http://www.itu.int/publ/R-REC/en>)

| Series     | Title                                                                                |
|------------|--------------------------------------------------------------------------------------|
| <b>BO</b>  | Satellite delivery                                                                   |
| <b>BR</b>  | Recording for production, archival and play-out; film for television                 |
| <b>BS</b>  | Broadcasting service (sound)                                                         |
| <b>BT</b>  | <b>Broadcasting service (television)</b>                                             |
| <b>F</b>   | Fixed service                                                                        |
| <b>M</b>   | Mobile, radiodetermination, amateur and related satellite services                   |
| <b>P</b>   | Radiowave propagation                                                                |
| <b>RA</b>  | Radio astronomy                                                                      |
| <b>RS</b>  | Remote sensing systems                                                               |
| <b>S</b>   | Fixed-satellite service                                                              |
| <b>SA</b>  | Space applications and meteorology                                                   |
| <b>SF</b>  | Frequency sharing and coordination between fixed-satellite and fixed service systems |
| <b>SM</b>  | Spectrum management                                                                  |
| <b>SNG</b> | Satellite news gathering                                                             |
| <b>TF</b>  | Time signals and frequency standards emissions                                       |
| <b>V</b>   | Vocabulary and related subjects                                                      |

**Note:** This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.

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## RECOMMENDATION ITU-R BT. 1888-1

**Basic elements of file-based broadcasting systems**

(3/2011-9/2011)

**Scope**

This Recommendation describes basic elements of file-based broadcasting systems to facilitate the transfer of files from a content provider to an end user. The files transferred in both real-time and non real-time are stored in a receiver to be played at a time convenient to the end user. The Recommendation provides some basic implementation characteristics of a receiver.

The ITU Radiocommunication Assembly,

*considering*

- a) that there is a growing consumer demand for the capability to view TV programmes at their convenience;
- b) that there is growing consumer interest in viewing all types of content including audio/video and multi-media content;
- c) that large-capacity storage devices have become available for a receiver;
- d) that file-based systems are capable of delivering any kind of content including audio/video as well as multimedia data in non-real-time transfer;
- e) that high-quality content encoded at higher bit rate than that in real-time broadcasting can be delivered using non real-time transfers;
- f) that services using file-based content delivery have already been introduced using telecommunication networks;
- g) that it is desirable to provide interoperability between different systems,

*recommends*

- 1 that the basic elements described in Annex 1 should be used for development of file-based broadcasting systems;
- 2 that NOTE 1 is considered to be part of the Recommendation.

NOTE 1 – Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g. interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words “shall” or some other obligatory language such as “must” and the negative equivalents are used to express requirements. The use of such words shall in no way be construed to imply partial or total compliance with this Recommendation.

NOTE 2 – Example of practical implementation of a file-based broadcasting system is given in Appendix 1 and Appendix 2 for information.

## Annex 1

### Basic elements for file-based broadcasting systems

#### 1 Introduction

File-based broadcasting systems have the capability to be independent of the content to be delivered, end user storage devices are also independent of the content being stored. This results in huge flexibility in what a content provider may deliver to the end user. Content can be delivered in shorter or longer periods than the real-time duration. High-quality content can be delivered by encoding the content at higher bit rates than the maximum bit rate of the delivery channel. In the case of mobile reception, while reception errors often occur, errors may be corrected through various techniques in the case of non real-time transmission.

The basic elements described in this annex apply to requirements for file-based broadcasting systems, receiver configuration for the systems, metadata, and a file transport method over a broadcast channel.

#### 2 Abbreviations

|       |                                             |
|-------|---------------------------------------------|
| BML   | Broadcast markup language                   |
| CID   | Context identification                      |
| DLC   | Download control                            |
| DRM   | Digital rights management                   |
| ECG   | Electronic content guide                    |
| FEC   | Forward error correction                    |
| FLUTE | File delivery over unidirectional transport |
| HCfB  | Header compression for broadcasting         |
| IANA  | Internet assigned numbers authority         |
| IP    | Internet protocol                           |
| LLI   | Licence link information                    |
| RMT   | Reliable multicast transport                |
| ROHC  | Robust header compression                   |
| TLV   | Type length value                           |
| ULE   | Unidirectional lightweight encapsulation    |
| URI   | Uniform resource identifier                 |
| URL   | Uniform resource locator                    |

### 3 Requirements for file-based broadcasting systems

#### 3.1 System requirements

To develop a file-based broadcasting system, the following requirements should be met:

1. A receiver for the system shall be equipped with a storage device to store content and play the content. Play of content may be output from the storage device through a copy protected interface.
2. Information necessary for setting up a scheduled download should be delivered over the broadcast channel.
3. It should be possible to set up a scheduled download of additional content related to real-time broadcasting programme.
4. Receiver tuning shall be controlled by the specific information.
5. Any rescheduling of content shall be possible through the scheduling information.
6. Lost or corrupted file should be detected by a receiver prior to its use.
7. Large files should be delivered with a small overhead.
8. Delivered content can be protected to restrict the use by the end user.
9. An expiration date for the use of the content may be sent.
10. Stored content in a receiver may be deleted by the end user.

#### 3.2 Required files

In the system, the following files should be delivered:

1. Media file.  
Coded audio/video signals or other multimedia data.
2. License link information (LLI).  
Information on license and rights management for the content. It describes constraints on the use of content. It also provides information to obtain a license if required.
3. Metadata:
  - Metadata for establishing the download schedule.  
Information necessary for a receiver to obtain all files including a media file, LLI, and ECG metadata. It describes URLs of servers or URI and start/end times of the delivery session that carries these files. Details are described in § 5.
  - ECG metadata.  
Information on content such as title and genre. It is used by an end user to select content to store. It may also be used to select stored content to use. Details are described in § 6.

Figure 1 shows a protocol stack of general file-based broadcasting systems to transfer these files.

FIGURE 1

**Protocol stack of general file-based broadcasting systems**

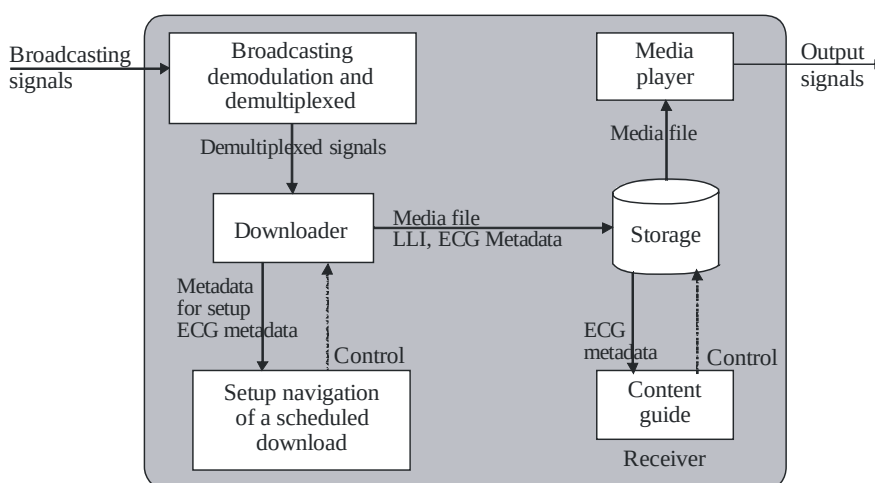
|                                        |      |              |                                         |
|----------------------------------------|------|--------------|-----------------------------------------|
| Audio/video or other multimedia data   | LLI  | ECG metadata | Metadata for setup a scheduled download |
| Media file                             | File |              |                                         |
| DRM                                    |      |              |                                         |
| File transport method                  |      |              |                                         |
| Channel coding and modulation          |      |              |                                         |
| Physical layer (terrestrial/satellite) |      |              |                                         |

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**4 Receiver configuration for a file-based broadcasting system****4.1 Main components in a receiver for the system**

A receiver for the system shall have storage to store the delivered content. The main components in a receiver are shown in Fig. 2.

FIGURE 2

**Main components in receiver for the system**

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The functions of each module in a receiver are listed below.

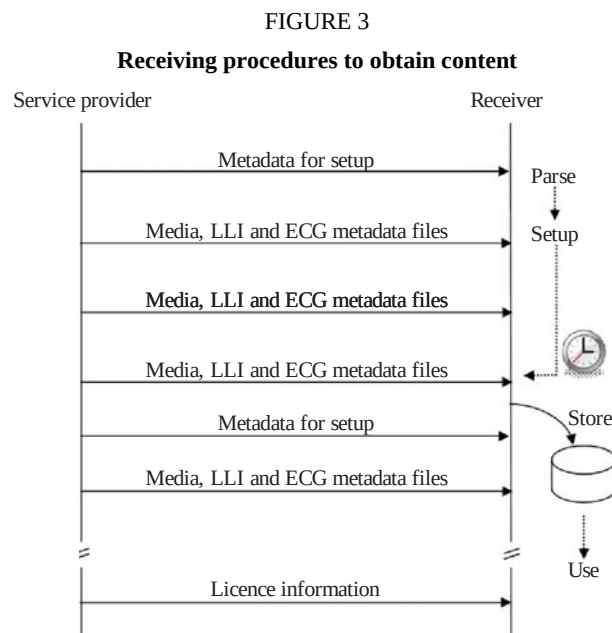
| Module                                   | Function                                                                                                           |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Broadcast demodulation and demultiplex   | Demodulates received broadcasting signals and outputs demultiplexed signals that carry files                       |
| Downloader                               | Manages schedules for downloading content. Reconstructs a file from the demultiplexed signals when recording       |
| Setup navigation of a scheduled download | Lets users set a scheduled download based on metadata for setup a scheduled download and ECG metadata              |
| Storage                                  | Stores reconstructed files by downloader                                                                           |
| Content guide                            | Presents a list of stored content and provides a user interface to select and delete content based on ECG metadata |
| Media player                             | Plays stored content and outputs audio/video signals                                                               |

## 4.2 Reference receiving procedures to obtain content

In a file-based broadcasting system, the following receiving procedures should be taken.

A receiver for the system needs metadata for setting up a scheduled download of the required content in advance. The metadata needs to be transferred by a service provider. Multiple files may make up one content. Therefore, metadata is important for the receiver to identify files of content and servers or sessions that provide those files. Based on this information, the receiver sets up a scheduled download.

At the scheduled time, the receiver tunes into the broadcast signal delivering the desired files, and stores the delivered files. These procedures are shown in Fig. 3.



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After the receiver stores the files, the content may be used at any time. As required the receiver shall obtain a valid license according to the LLI of the content.

## 5 Metadata

### 5.1 Metadata for setting up a scheduled download

Metadata describing all the information necessary for setting up a scheduled download should be transferred to the receiver prior to the content delivery. Metadata for setting up a scheduled download should include the following information:

1. Information on delivery schedules, namely start/end times.
2. Information on delivery session to identify the broadcast signal.
3. Information required to reconstruct files from transmitted data.
4. Information on file, namely the file name, file size, and file type.
5. Content identification.
6. Information on DRM server if required.

Prior to obtaining content, a receiver has to identify what content will be delivered and its delivery information on broadcast signal. All files comprising the content should also be identified.

Based on the metadata, a receiver stores the necessary files for the selected content at a specified time. The metadata may describe auxiliary information for a receiver to select the content.

## 5.2 ECG metadata

ECG metadata including the following information should be transferred to receivers:

1. Description of content title, abstraction, and genre. It may include thumbnail-size images of the content.
2. Properties of video/audio or other multimedia data.
3. Description of price and other information for billing.
4. Description of rights to use the content and other information to obtain the license.

ECG metadata is used for navigation to select. It is also used for navigation to select content to use from the stored content list.

## 6 File transport method over broadcast channel

All content and content related metadata, should be transferred by a reliable and efficient file transport method. Several files may be packaged into one file for a single transfer.

As in real-time broadcasting systems, it is important to minimize transfer delay in file-based broadcasting systems. However, delay variation has less impact in file-based broadcasting systems compared to real-time broadcasting systems. It is important to transfer and store a file without loss or corruption. A detection mechanism to detect lost or corrupted file fragments should be incorporated in file-based broadcasting systems. A system should be equipped with some mechanisms to repair lost or corrupted file fragments.

## Appendix 1 (informative)

### File-based broadcasting system for advanced-satellite broadcasting in Japan<sup>1</sup>

#### 1 Overview

Digital broadcasting provides content to many viewers at once via terrestrial or satellite broadcasting channels in a stable manner. All viewers can enjoy broadcast programmes at the same time. However, it is difficult to respond to individual requests from all viewers.

In contrast with broadcasting, telecommunication provides requested content via bi-directional channels. However, it is subject to certain problems, e.g. limitations in the network bandwidth and the equipment throughput may result in deteriorated service quality when a large number of viewers make requests.

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<sup>1</sup> This system is specified in Part 1 of ARIB STD-B45 v2.0 (2011): Content download system for broadcasting.