

# Telemeta : open web audio platform for sound archives in the use case of ethnomusicology

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## ABSTRACT

*Telemeta* is a fully-operational open-source web audio platform dedicated to digital sound archives secure storing, indexing and publishing. It focuses on the enhanced and collaborative user-experience in accessing audio items and their associated metadata and on the possibility for the expert users to further enrich those metadata.

Telemeta architecture relies on *TimeSide*, an open audio processing framework written in Python which provides decoding, encoding and streaming methods for various formats together with a smart embeddable HTML audio player. TimeSide also includes a set of audio analysis plugins and additionally wraps several audio features extraction libraries to provide automatic annotation, segmentation and musicological analysis. The demonstration presents the features of this platform in the context of ethnomusicological research.

## 1. INTRODUCTION

In the context of ethnomusicological research, the Research Center on Ethnomusicology (CREM) and Parisson, a company specialized in the management of audio databases, have been developing an innovative, collaborative and interdisciplinary open-source web-based multimedia platform since 2007. This platform, *Telemeta* is designed to fit the professional requirements from both sound archivists and researchers in ethnomusicology. The first prototype of this platform has been online<sup>1</sup> since 2008.

## 2. TELEMETA

### 2.1. Web audio content management features and architecture

Telemeta<sup>2</sup> is a free and open source<sup>3</sup> web audio platform which introduces efficient and secure methods for back-

upping, indexing, transcoding, analysing and publishing any digitalized audio file with its metadata.

Telemeta is ideal for professionals who wants to easily organize, backup, archive and publish documented sound collections of audio files, CDs, digitalized vinyls and magnetic tapes over a strong database, in accordance with open web standards. *Telemeta* architecture is flexible and can easily be adapted to particular database organization of a given sound archives.

The main features of *Telemeta* are:

- *Pure HTML* web user interface including high level *search engine*
- Smart *workflow management* with contextual user lists, profiles and rights
- Strong Structured Query Language (SQL) or Oracle backend
- Model-View-Controller (MVC) architecture

Beside database management, the audio support is mainly provided through an external component, TimeSide, which is described in Section 3.

### 2.2. Metadata

In addition to the audio data, an efficient and dynamic management of the associated metadata is also required. Dynamically handling metadata in a collaborative man-

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<sup>1</sup>Archives sonores du CNRS, Musée de l'Homme, <http://archives.crem-cnrs.fr>

<sup>2</sup><http://telemeta.org>

<sup>3</sup>Telemeta code is available under the CeCILL Free Software License Agreement [http://cecill.info/licences/Licence\\_CeCILL\\_V2-en.html](http://cecill.info/licences/Licence_CeCILL_V2-en.html)

ner optimises the continuous process of knowledge gathering and enrichment of the materials in the database. The compatibility with other systems is facilitated by the integration of the metadata standards protocols *Dublin Core* and *OAI-PMH* (Open Archives Initiative Protocol for Metadata Harvesting) [2, 4].

Metadata provide two different kinds of information about the audio item: contextual information and annotations.

**Contextual Information** In ethnomusicology, contextual information could be geographic, cultural and musical. It could also store archive related information and include related materials in any multimedia format.

**Annotations and segmentation** Metadata also consist in temporal information such as a list of *time-coded markers* associated with annotations and a list of *time-segments* associated with labels. The ontology for those labels is relevant for ethnomusicology (e.g. speech versus singing voice segment, chorus, ...). It should be noted that annotations and segmentation can be done either by a human expert or by some automatic signal processing analysis (see Section 3).

### 3. TIMESIDE

One specificity of the Telemeta architecture is to rely on an external component, *TimeSide*<sup>4</sup>, that offers audio player web integration together with audio signal processing analysis capabilities.

#### 3.1. Audio management

TimeSide provides the following main features:

- *Secure archiving, editing and publishing of audio files* over internet.
- *Smart audio player* with enhanced visualisation (waveform, spectrogram)
- *Multi-format support*: reads all available audio and video formats through Gstreamer, transcoding with smart streaming and caching methods
- *"On the fly" audio analyzing, transcoding and metadata embedding* based on an easy plugin architecture

#### 3.2. Audio features extraction

TimeSide incorporates some state-of-the-art audio feature extraction libraries such as Aubio<sup>5</sup>, Yaafe<sup>6</sup> and Vamp plugins<sup>7</sup> [1, 3, 5]. Given the extracted features,

<sup>4</sup><https://github.com/yomguy/TimeSide>

<sup>5</sup><http://aubio.org/>

<sup>6</sup><http://yaafe.sourceforge.net>

<sup>7</sup><http://www.vamp-plugins.org>

every sound item in a given collection can be automatically analyze. The results of this analysis can be stored in a scientific file format (*Numpy*, *HDF5*) and serialized to the web browser through commons markup languages (*xml*, *json*, *yaml*). Further works lead by the DIADEMS project will incorporate advance Music Information Retrieval methods in order to provide automatic annotation, segmentation and similarity analysis.

### 4. CONCLUSION - PURPOSE OF THE DEMONSTRATION

The demonstration presents the features offered by *Telemeta* as detailed in Section 2 in the context of ethnomusicological sound archiving. It focuses on the enhanced and collaborative user-experience when accessing audio items and their associated metadata, and on the possibility for the expert user to further enrich those metadata. Another goal of this demonstration is to present the integrated audio analysis tools described in Section 3.

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