

Chapter 2 Background of System Reference

In this chapter, we introduce the background of our application on multimedia content guard based on IPMP-X MPEG-4. The contents include IM1 system and MPEG-4 system. We will introduce what IM1 is and overview of MPEG-4 system briefly.

2.1 IM1

IM1 is synonymous with the AHG on Systems Reference Software Implementation. Its mandate is to develop, integrate and demonstrate Systems software with the help of the committed partners, that means in particular to support the creation of the MPEG-4 reference code and to provide for software and test streams for demonstrating MPEG-4 capabilities before it becomes an international standard.

The IM1 software contains an implementation of all the normative part of MPEG-4 Systems. It also includes a complete integrated MPEG-4 player, a DMIF implementation for local files, and a few authoring tools. Although IM1 has been developed as much as possible to be platform independent, it is still mostly used on Windows platform. IPMP-X software reference code will be described in Chapter 4.

2.2 MPEG-4

2.2.1 Development and Architecture

The architecture of MPEG-4 system is illustrated in figure 2-1. The detailed description is explained in the later section.

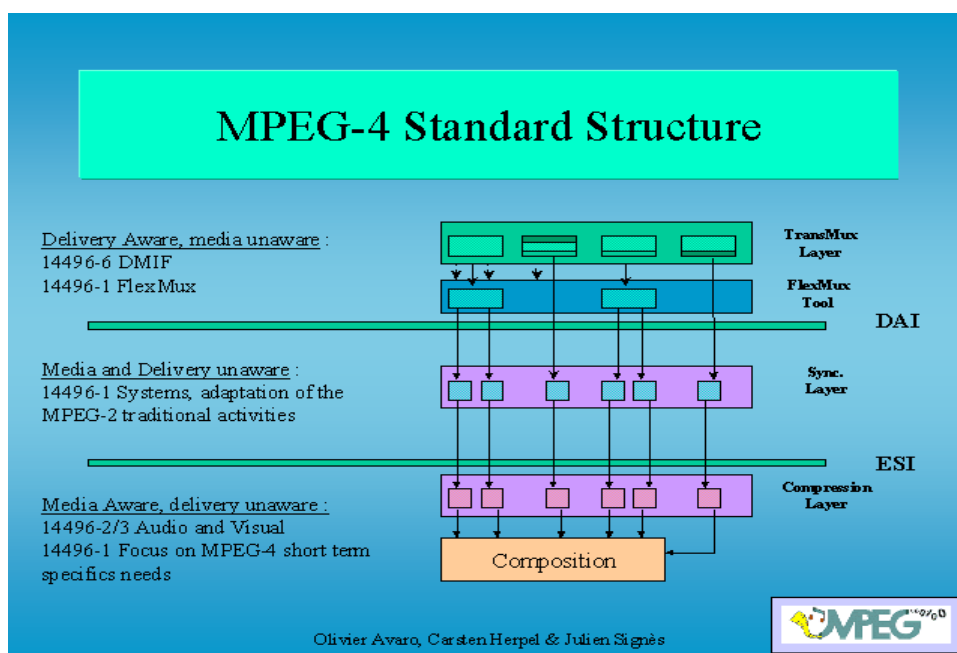


Figure 2-1 MPEG-4 Standard Structure,[31]

2.2.2 The streaming framework

We will briefly discuss the streaming framework of MPEG-4 system. This section focus on System Decoder Model and Sync Layer and describe two descriptor including Object Descriptor Stream, Elementary Stream Descriptor.

(1) System Decoder Model and Sync Layer

The system decoder model is illustrated in figure 2-2. It predicts how the decoder will behave when decoding the various elementary data streams that form an MPEG-4 session, MPEG-4 Systems provide a Systems Decoder Model. This model helps to provide a well defined framework in which the receiver's behavior can be unambiguously characterized. Use of this model enables the encoder to monitor the buffer resources that are used to decode the session and ensure that they are not exceeded. The required buffer resources are conveyed to the decoder at the beginning of a session, so that the decoder can decide whether it is capable to provide them.

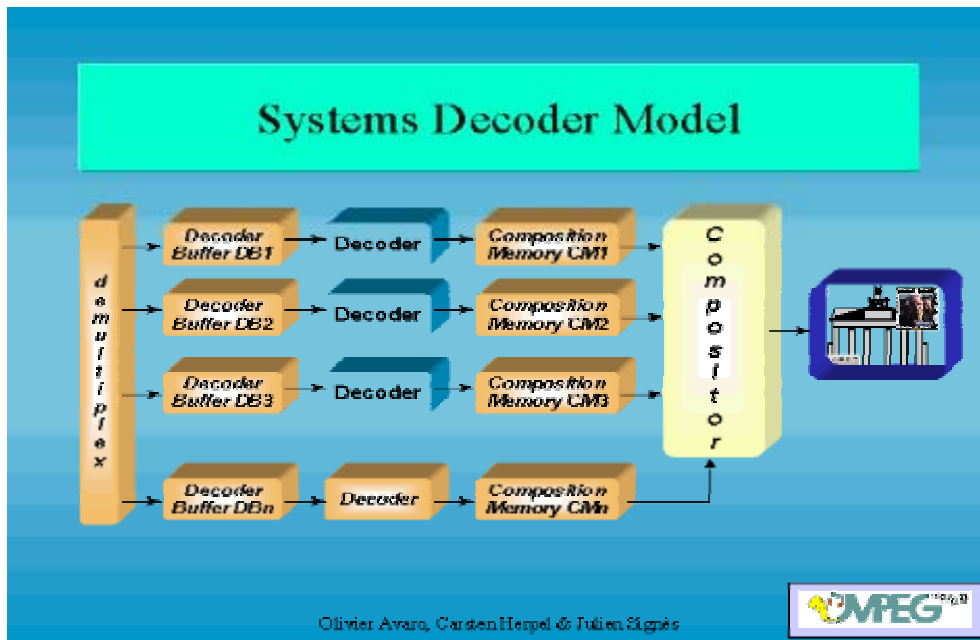


Figure 2-2 MPEG-4 System Decoder Model,[31]

The synchronization layer(SL) is illustrated in figure 2-3. The sync layer defines some syntax (the SL packet headers) that permits to carry timing information, i.e., time stamps and clock references. This data allows a receiver to determine which portions of different streams are to be composed and, hence, presented at the same time.

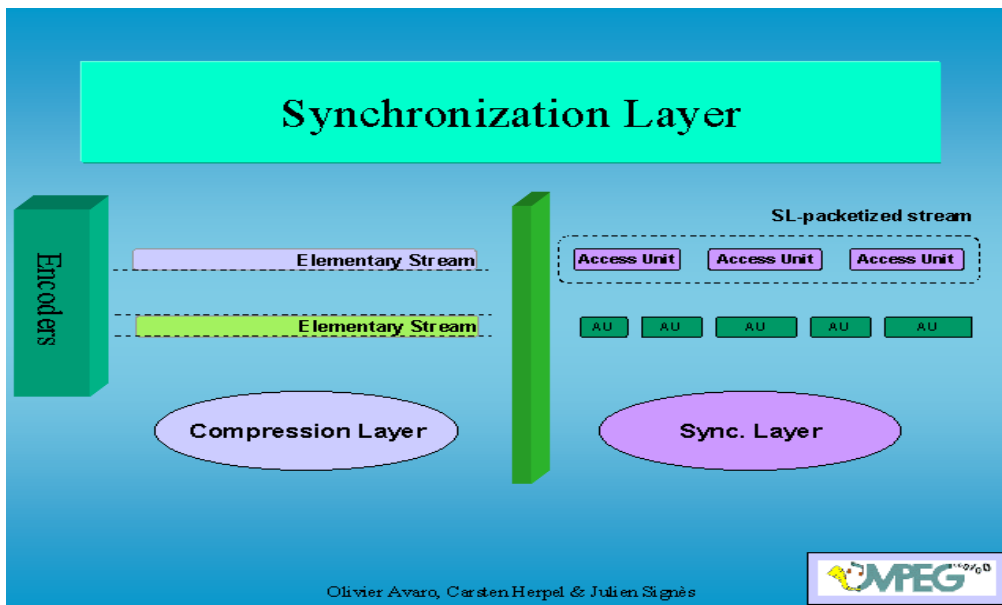
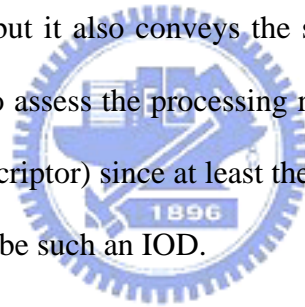


Figure 2-3 MPEG-4 Synchronization Layer,[31]

(2) Object Descriptor Stream

The ESM(Elementary Stream Management) part of Systems also specifies means to identify and name elementary streams so that they can be referred to in a scene description and be attached to individual objects. This association is performed in object descriptors that are transmitted in their own elementary streams. Object descriptors are separate from the scene description itself, thus simplifying editing and remultiplexing of MPEG-4 content. The descriptors associate audio-visual objects, nodes in the scene to elementary stream identifiers.

The IOD(initial object descriptor) is an object descriptor that does not only describe a set of elementary streams, but it also conveys the set of profile and level information that is needed by a receiver to assess the processing resources needed for that content. It is called initial OD(object descriptor) since at least the very first OD that is used to access the MPEG-4 content needs to be such an IOD.



(3) Elementary Stream Descriptor

Elementary Stream Descriptor contains pointers to scalable coded content streams, alternate quality content streams, object content information and IPR information.

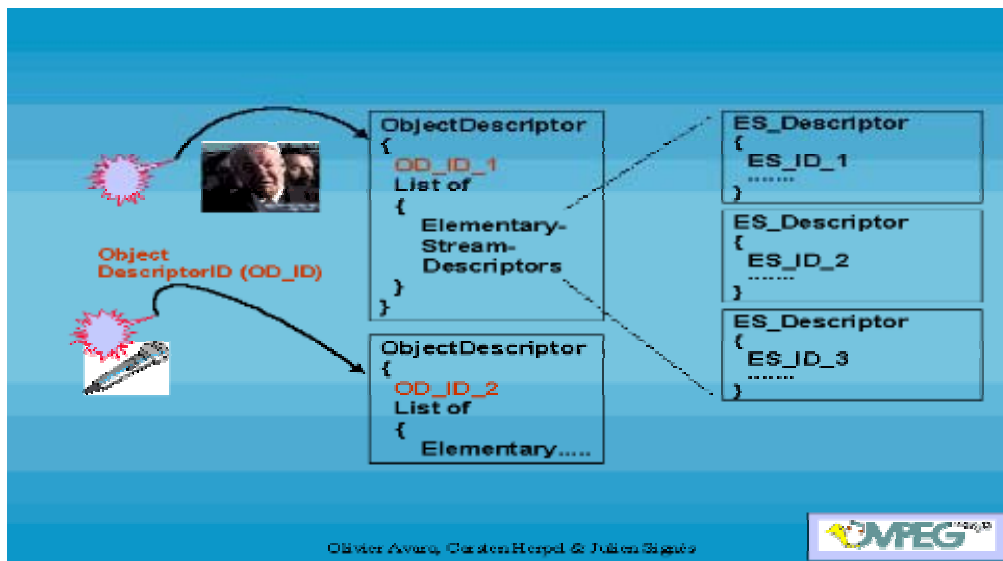


Figure 2-4 MPEG-4 Object Descriptor and Elementary Stream Descriptor,[31]

2.2.3 Delivery of MPEG-4 Content

This section, we will introduce delivery of MPEG-4 content. The figure 2-5 The relationship of delivery of MPEG-4 content is illustrated in figure 2-5. That will contain two parts, one is Flex Mux and the other is Trans Mux.

It is a generic abstraction for delivery mechanisms (computer networks, etc.) able to store or transmit a number of multiplexed elementary streams or FlexMux streams. To allow for maximum flexibility for service creation and application design, it is not specified by MPEG-4. The interface, however, to the delivery layer is well defined, thus allowing transmission of MPEG-4 content over any type of transport layer facility (e.g., ITU-T Recommendations H.22x, MPEG-2 Transport Stream, IETF RTP). FlexMux and TransMux are the major contents for delivery of MPEG-4 content.

(1) FlexMux:

The FlexMux is a tool that provides a flexible way of interleaving packets of data. The FlexMux is fully defined by MPEG-4, but its use is optional: applications can operate directly on top of a traditional transport layer (formerly called "TransMux") if they so desire.

(2) TransMux:

TransMux is an abstraction to refer generically to any storage multiplex("file format") and any transmission multiplex.

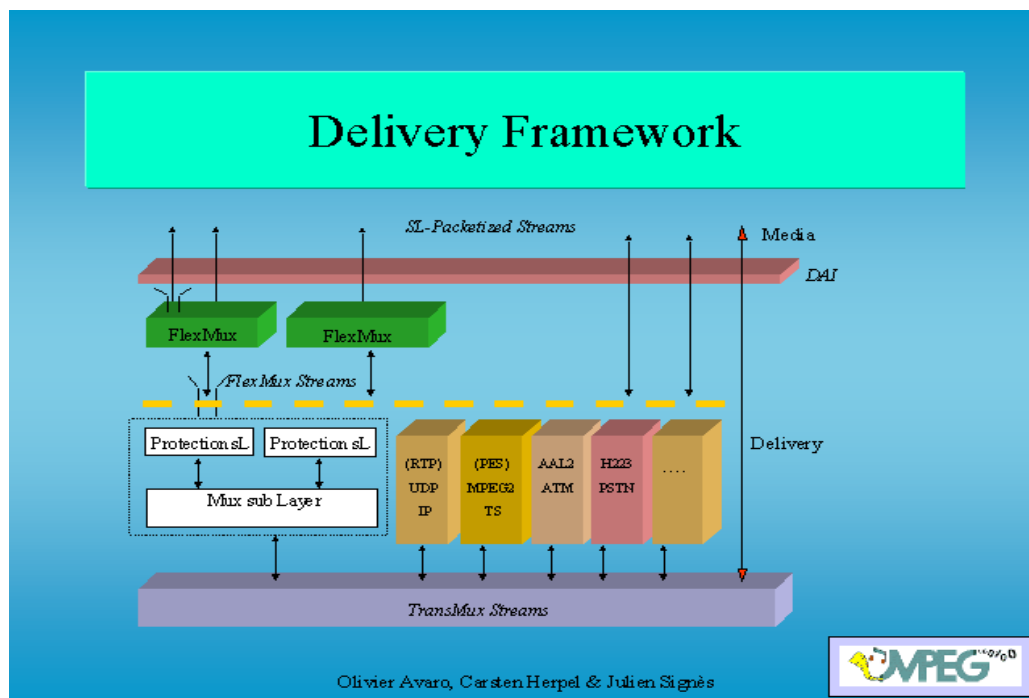


Figure 2-5 MPEG-4 Delivery Framework,[31]

2.2.4 MPEG-4 BIFS

BIFS is an abbreviation for "Binary Format for Scenes". BIFS provides a complete framework for the presentation engine of MPEG-4 terminals. BIFS enables

to mix various MPEG-4 media together with 2D and 3D graphics, handle interactivity, and deal with the local or remote changes of the scene over time. BIFS has been designed as an extension of the VRML 2.0 specification in a binary form.

BIFS is actually composed of 4 elements:

- (1) The operational elements of the scene, consisting of nodes and routes.
- (2) The binary syntax for compressing the node tree as well as the associated routes.
- (3) The BIFS-Command protocol, in order to stream scene changes, insert new scenes or objects, delete objects, etc.
- (4) The BIFS-Anim protocol, in order to stream animations of node parameters. This is used as a very low overhead mechanism to animate audio-visual objects.

