



Security System Compliant with MPEG-4 IPMPX



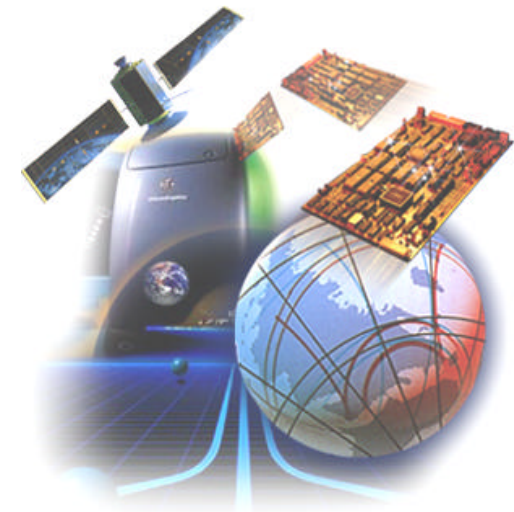
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1. Motivation & Background

 Needs of copy right protection and management

 Participation in MOSES project

 MPEG standardization

 MPEG-4 IPMPX

2. System Architecture

MPEG-4 system decoder

- Ⓢ Consume MPEG-4 contents (mp4/trif)
 - IOD/OD decoder
 - MPEG-4 A/V decoder
 - BIFS decoder

Tool manager(TM)

- Ⓢ Tool list description parsing
- Ⓢ Downloading missing tools
- Ⓢ Connecting terminal with IPMP tools

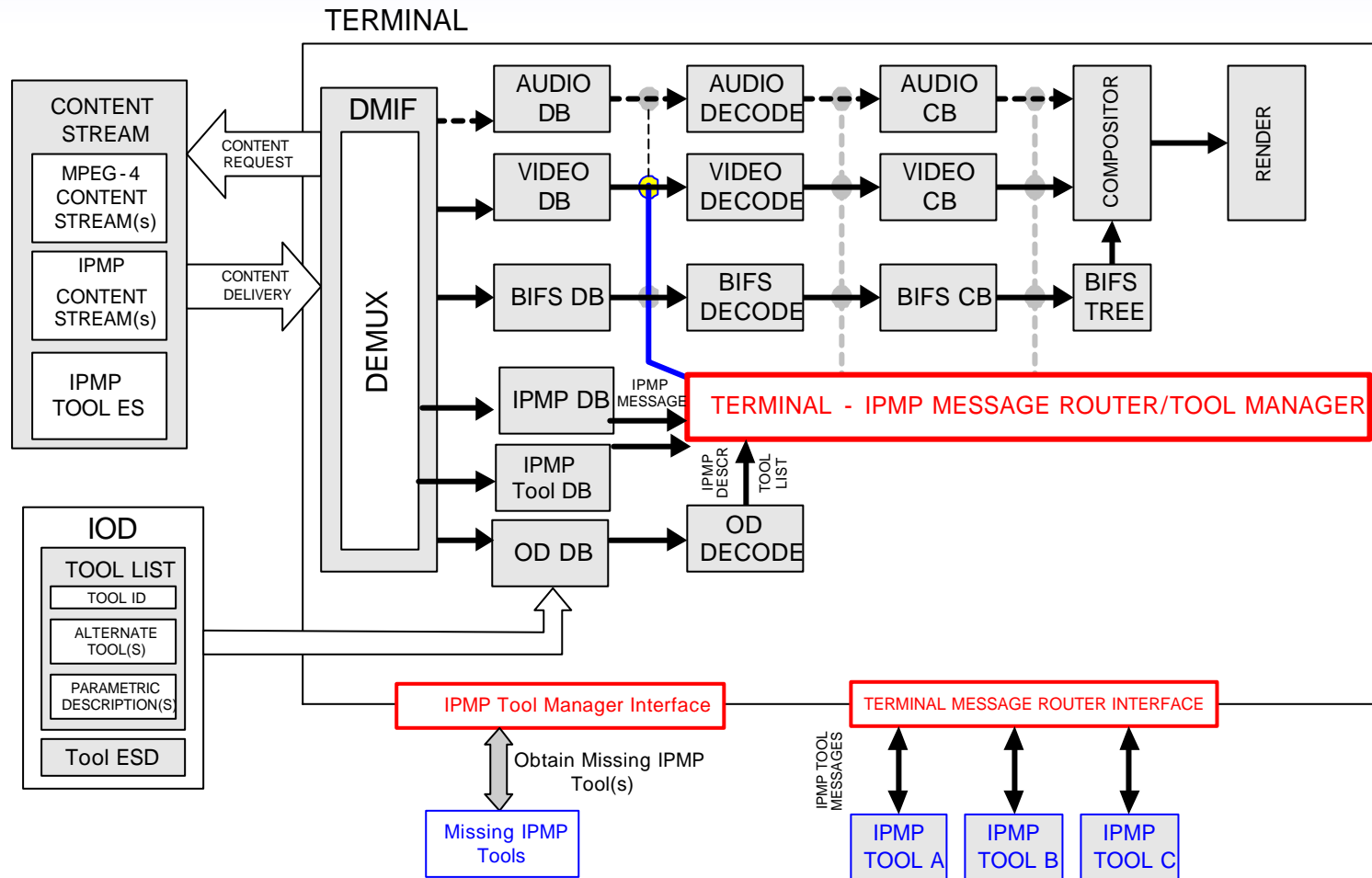
Message router(MR)

- Ⓢ Tool descriptors parsing and sending the information to TM
- Ⓢ Message Interface handling

IPMP tools

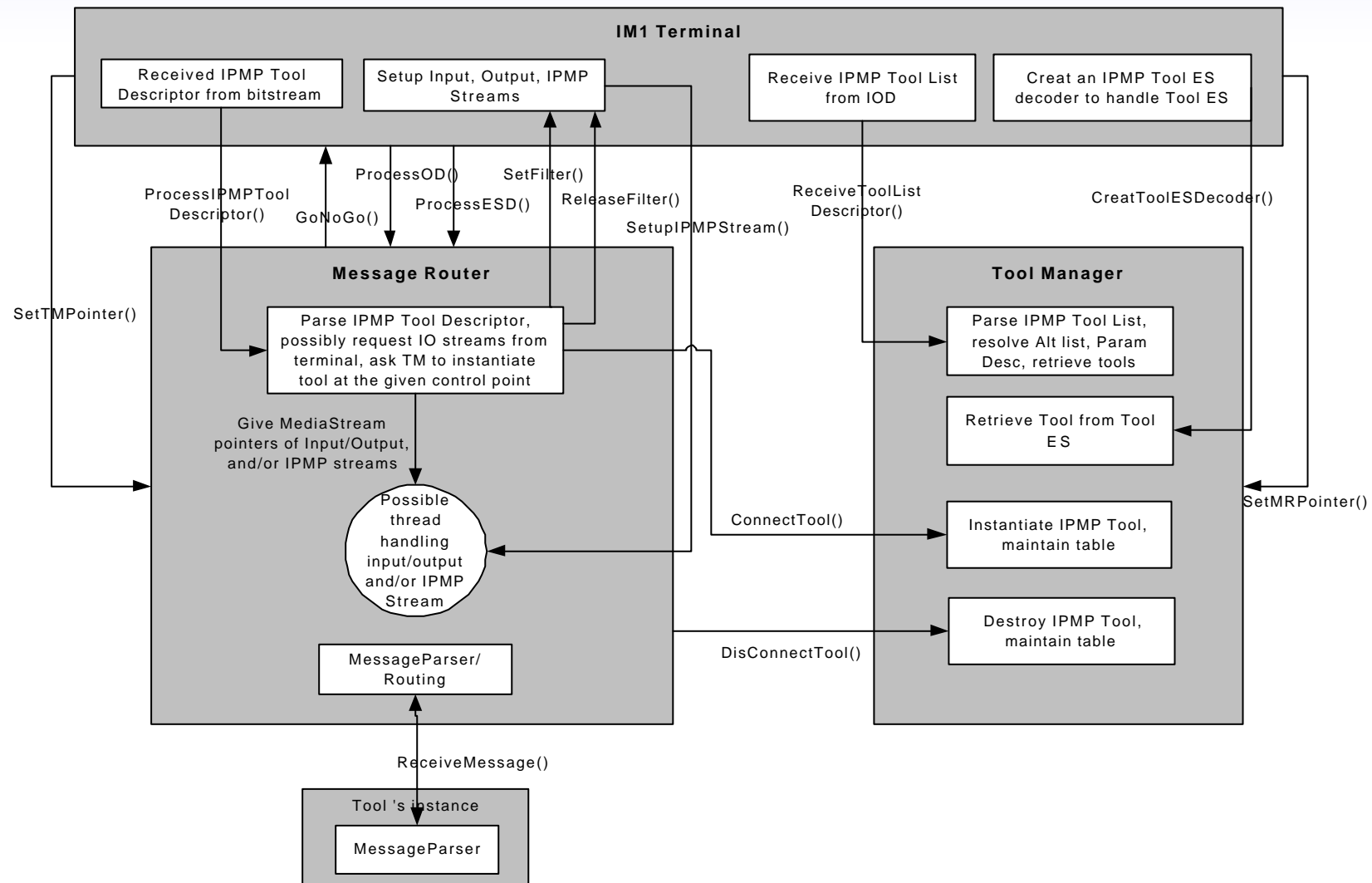
- Ⓢ Watermarking tool
- Ⓢ Encryption tool

2. System Architecture



Mapping of IPMP Extensions to MPEG-4 Systems Architecture

2. System Architecture



3. System Procedure (1)



Terminal and tool instantiation process

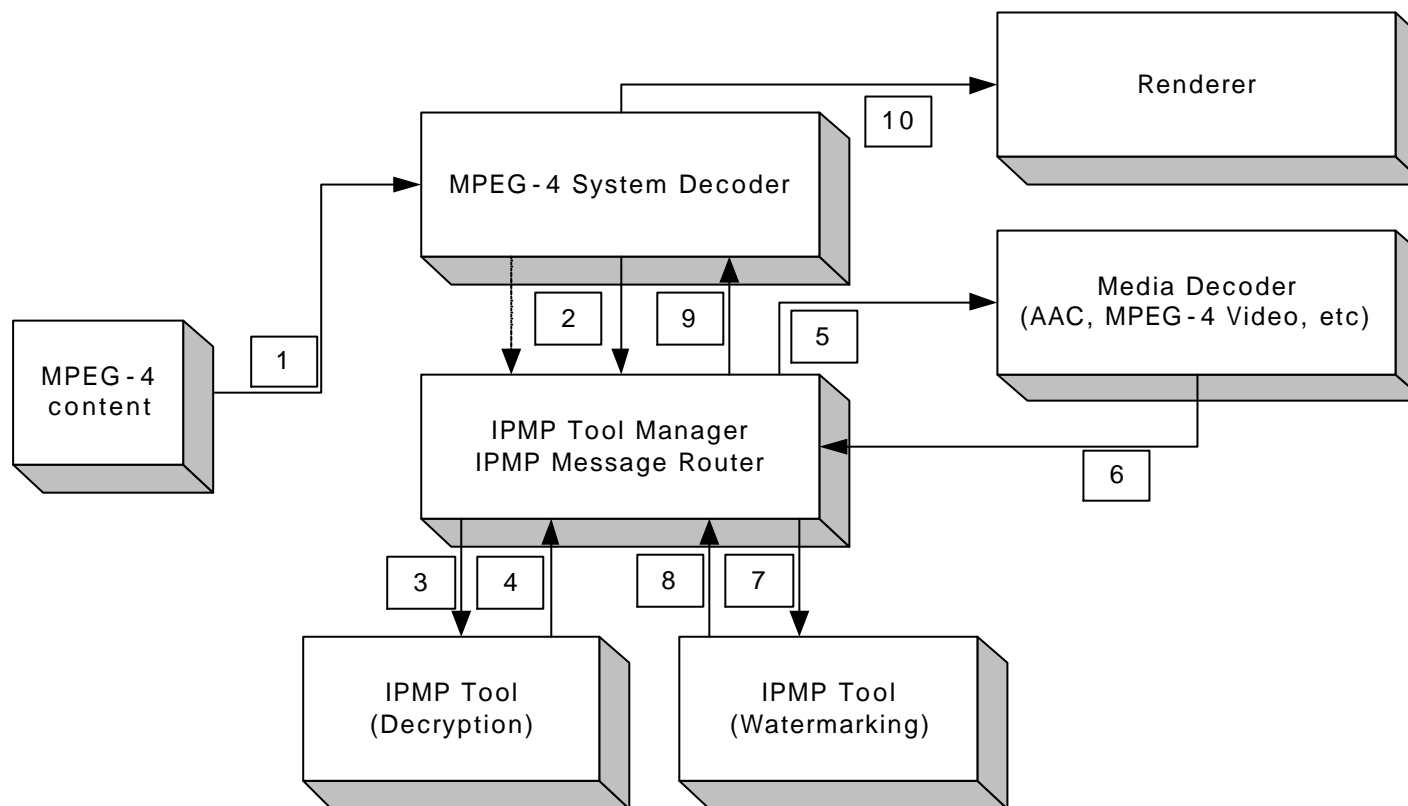
1. MPEG-4 content input
2. Decoding IOD and parsing Tool list descriptor
3. Instantiate TM/MR
4. TM instantiates the required IPMP tools
 - Ⓢ In case of missing tools, TM downloads them
5. MR parses tool descriptors and send the information(control point) to TM
6. TM connects IPMP tools to the defined control points
7. MR sends IPMP opaque data(initial information) to IPMP tools in the form of message

3. System Procedure (2)

IPMP process (in case of Audio encryption and watermarking tool applied)

1. MR sends Audio data to encryption tool
2. The encryption tool decrypts the data and sends the result to audio decoder via MR
3. Audio decoder decodes the data
4. MR sends the result to watermarking tool
5. The tool de-watermarks the data and sends the result to audio composition buffer
6. System decoder displays the contents

3. System Procedure (3)



Block diagram to describe the system procedure

5. Experiment

Test system

@ MPEG-4 compliant system

■ IM 2D Player

■ IPMPX modules

+ TM, MR, IPMP tools(encryption & watermarking)

Test Content (trif file)

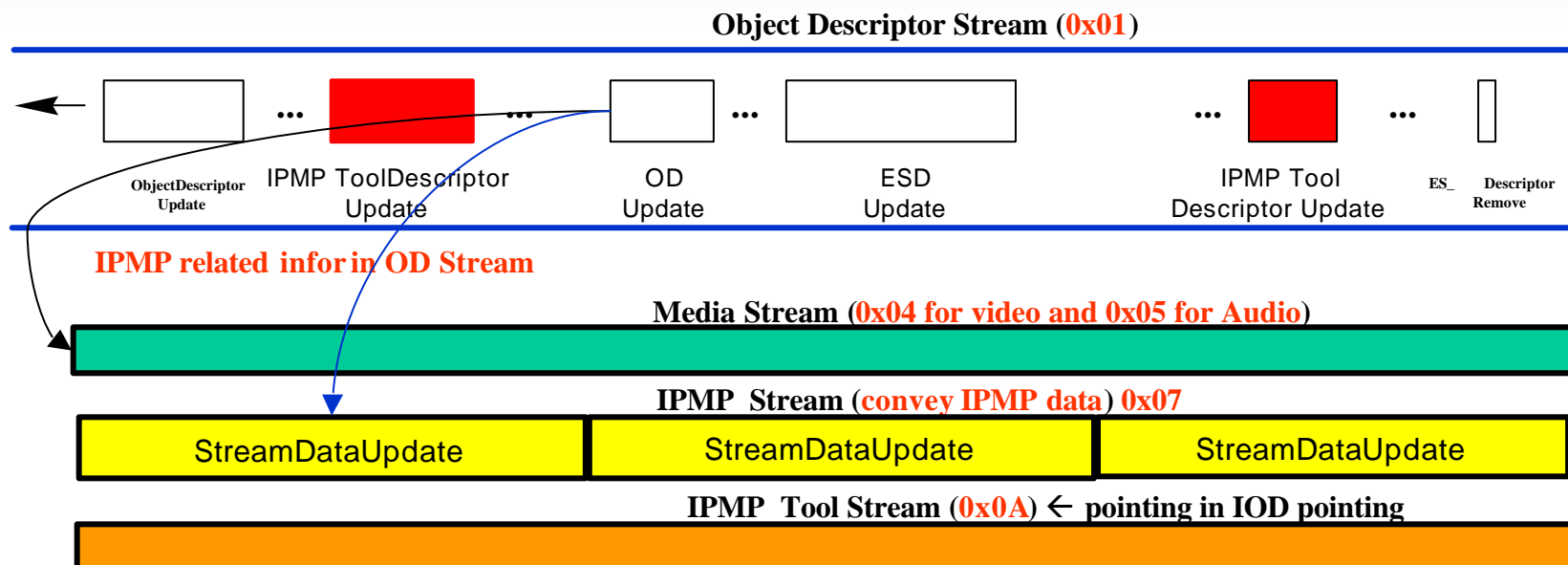
@ With AAC mono

@ Encryption

@ Watermarking with ASSERT and NMC bits (every 15 sec)

@ IPMP data (Tool list, tool initial information and opaque data-encryption key)

MPEG content structure



- IPMP_ToolDescriptorUpdate (one of IPMP commands) in OD Stream
- A IPMP command contains IPMP ToolDescriptors
- IPMP data or URL can be contained in Optional field in IPMP ToolDescriptor (URL points another IPMP_ToolDescriptor → exists in OD Stream)
- IPMP data is conveyed via IPMP Stream (another channel), IPMP ToolDescriptor is conveyed in OD Stream
- IPMP_ToolDescriptor is conveyed in IPMP_ToolDescriptorUpdate command or in IPMPDecoderConfiguration(combination of ToolDescriptor) in ESD
- IPMP_ToolES is referenced by IOD
- IPMP_StreamDataUpdate contains time -varying IPMP info (opaque data) in IPMP Stream




4. Result

- ❏ **The proposed system successfully executes content/copyright protection and management in the given environment**
 - Ⓢ AAC audio encryption & watermarking

Debug

Play

5. Conclusion

-  **Performed as expected**
-  **Proposed system can be a base model for any IPMP systems**
-  **Can be applied to many different applications**

6. Further R&D

Message Update

- @ 20 messages according to their functions
- @ MPEG still updates message structure
- @ 10 message have been implemented
- @ All message will be implemented (on progress)

IPMP Tool implementation

- @ Various A/V Watermarking and encryption tool to be applied

Research on relation with MPEG-21 IPMP/REL/RDD

- @ MPEG-21 IPMP/REL/RDD standard is on progress
 - MPEG-21 IPMP is based upon MPEG-4 IPMPX

Questions?