MPEG-2 표준의 진화

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Backgrounds

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- ISO/IEC 13818-1 was published at 1996
- 6 Amendments until 2000
- 2nd edition at December 2000
- 4 Amendments after new edition
- MPEG-2 System can carry
  - MPEG-4 contents
  - MPEG-7 descriptions
  - IPMP Extenstion
  - AVC bytestreams
  - MPEG-21 (future)

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Contents

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- ISO/IEC 13818-1 AMD 7
  - Transport of ISO/IEC 14496 data over ISO/IEC 13818-1
  - Finalized at December 2000
- ISO/IEC 13818-1:2000 AMD1
  - Transport of Metadata
  - Finalized at July 2002
- ISO/IEC 13818-1:2000 AMD2
  - IPMP on MPEG-2 System
  - Will be finalized by December 2002
- ISO/IEC 13818-1:2000 AMD3
  - Carriage of AVC contents
  - Will be finalized by March 2003

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Carriage of ISO/IEC 14496 Data

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- IOS/IEC 13818-1:1996 AMD 7
- Using MPEG-4 contents in MPEG-2 System
- Done in early 2000.
- Latest reference : N3050 (FDAM)
- Real experiment by
  - AICi (Advanced Interactive Content Initiative)
  - NexTV project

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Two possible scenarios

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- Carriage of individual ISO/IEC 14496-2/3 ES.
  - Simple synchronized delivery of MPEG-4 contents over TS
  - No major features of MPEG-4
- Carriage of audio visual scene and associated ES contained in SL packetized streams or FlexMuxed streams.
  - MPEG-4 System is required.
  - Interactive rich-media over TS in one architecture.
  - Adding flexibility and extensibility of MPEG-4 to MPEG-2.

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MPEG-4 ES in PES packets

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- MPEG-4 Visual
  - Stream_type = 0x10
  - Stream_Id = 0b1110 XXXX
  - PTS/DTS refer the first VOP start code.
  - VOSH, VOH, VOLH.
- MPEG-4 Audio
  - Stream_type = 0x11
  - Stream_Id = 0b110X XXXX
  - LATM (Low-overhead MPEG-4 Audio Transport Multiplex)
  - PTS refer the first audio frame after the first syncword

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MPEG-4 Architecture

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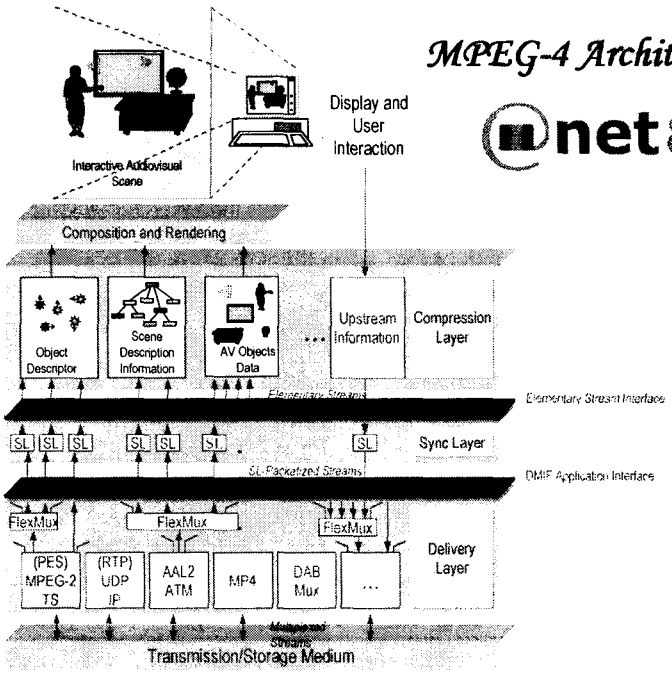

Audiovisual MPEG-4 scene

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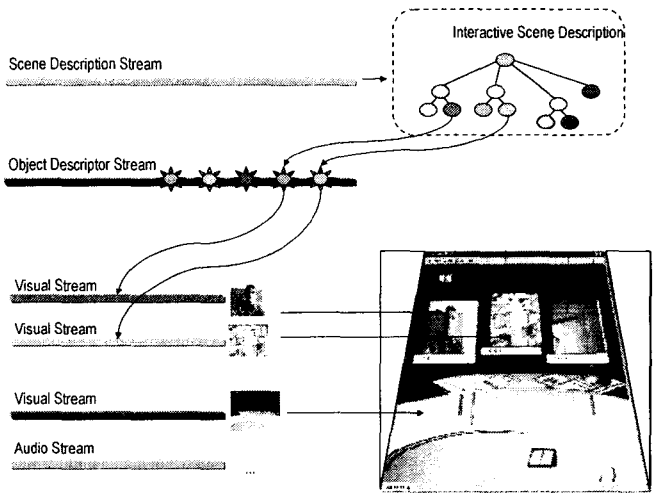

MPEG-4 SL packetized stream

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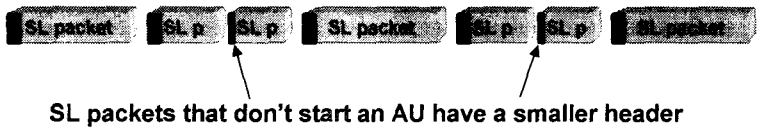
- Synchronization layer (short: sync layer or SL)
  - SL packet = one packet of data
  - consists of configurable header and payload
  - Contains one AU or AU fragements.
- Indicates boundaries of access units
- Provides consistency checking for lost packets
- Carries object clock reference (OCR) stamps
- Carries decoding and composition time stamps (DTS, CTS)



SL packets that don't start an AU have a smaller header

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How is the sync layer designed?

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- As flexible as possible to be suitable for
  - a wide range of data rates
  - a wide range of different media streams
- Time stamps have
  - variable length
  - variable resolution
- Same for clock reference (OCR) values
  - OCR may come via another stream
- Alternative to time stamps exists for lower bitrate
  - Indication of start time and
  - duration of units (accessUnitDuration, compositionUnitDuration)

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Wrap SL packets in a suitable layer!

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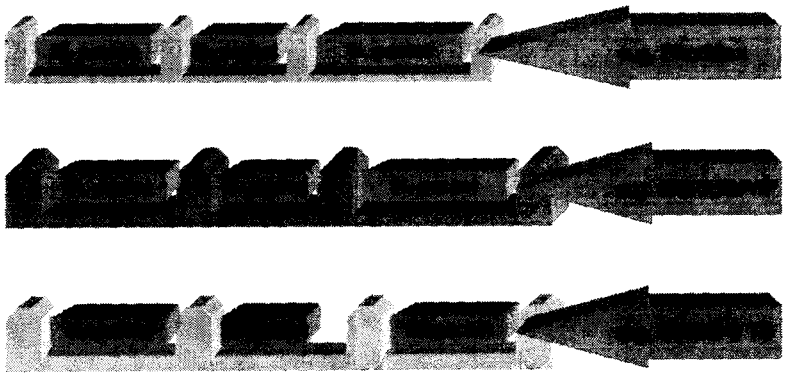

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Multiplex of elementary streams

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- Not a core MPEG task
- Just respond to specific needs for MPEG-4 content transmission
  - Low delay
  - Low overhead
  - Low complexity
- This prompted the design of the "FlexMux" tool

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Modes of FlexMux

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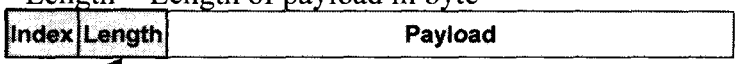
- Simple Mode **(if Index < 240)**

  Index = FlexMux Channel number

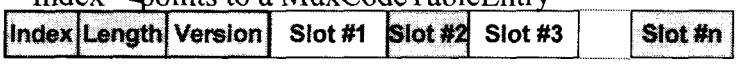
  Length = Length of payload in byte



FlexMux packet header

- MuxCode Mode **(if Index ≥ 240)**

  Index = points to a MuxCodeTableEntry



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How to configure MuxCode mode?

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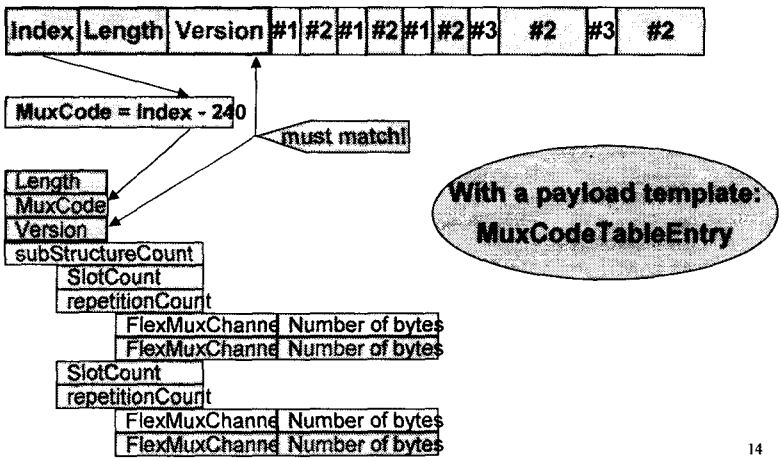

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Audiovisual MPEG-4 scene over TS

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- A scene may also refer streams carried by other means.
- Timing relationship
  - MPEG-4 OTB (Object Time Base) is locked to the MPEG-2 STC (System Time Clock)
  - Number of restrictions are applied to MPEG-4 OTB
- SL-packetized streams in PES packets
  - Stream_id = 0xFA
  - A single SL-packetized stream may be mapped into a single PES
  - One and only one SL packet shall consist the payload of PES packet
- FlexMux streams in PES packets
  - Stream_id = 0xFB
  - An integer number of FlexMux packets per PES packet
- ObjectDescriptorStream or SceneDescriptionStream in sections

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Content Access Procedure

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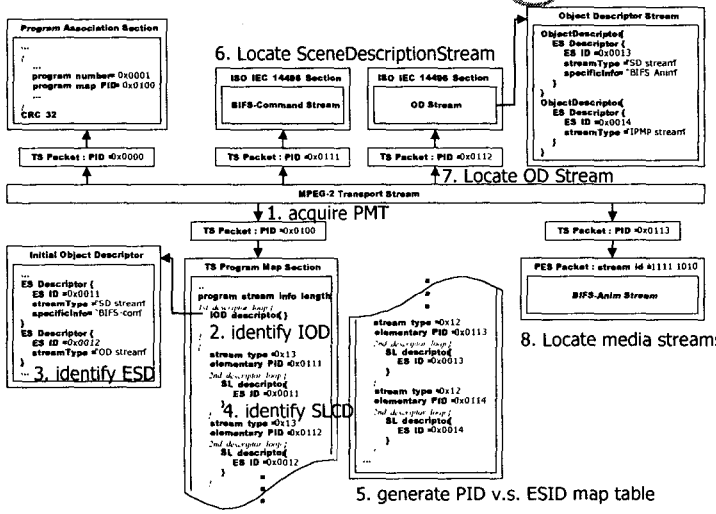

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Carriage of Metadata

- Using general metadata in MPEG-2 System architecture
- Latest reference : N5059 (Study of FPDAM)

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New IDs

- Stream_id = 0b1111 1100 (descriptive data stream)
- table_id = 0x06 (Metadata Section)
- Stream type
  - 0x15 : Metadata carried in PES packets
  - 0x16 : Metadata carried in metadata_sections
  - 0x17 : Metadata carried in ISO/IEC 13818-6 Data Carousel
  - 0x18 : Metadata carried in ISO/IEC 13818-6 Object Carousel
  - 0x19 : Metadata carried in ISO/IEC 13818-6 Synchronized Download Protocol
- Program descriptor tag
  - 36 : Content_labelling_descriptor
  - 37 : Metadata_pointer_descriptor
  - 38 : Metadata_descriptor
  - 39 : Metadata_STD_descriptor

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Timing model

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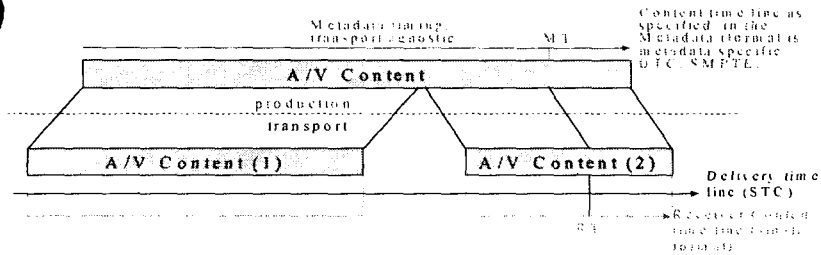

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Delivery of metadata in PES packets

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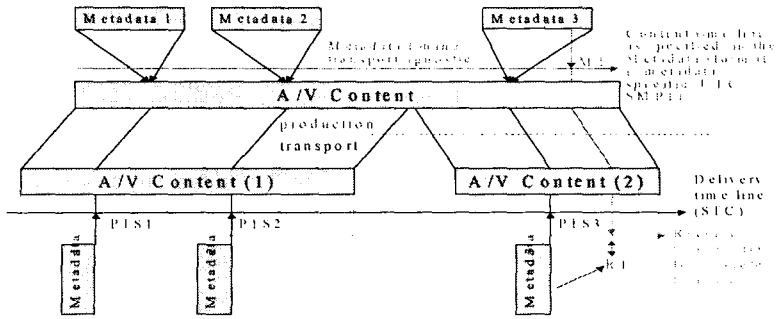

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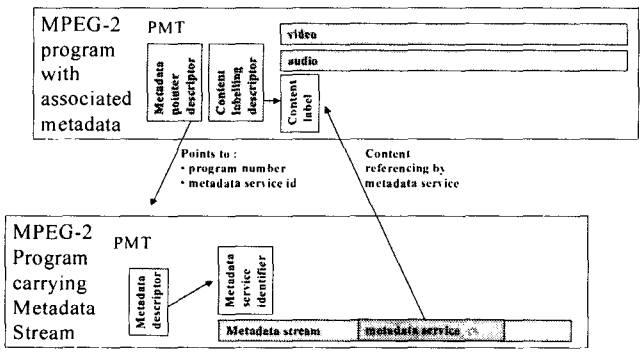
Metadata signaling and referencing



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Two parts for MPEG-2 IPMP

- ISO/IEC 13818-1:2000 Amendment 2
  - MPEG-2 specific extensions
  - Latest reference : N4986 (FPDAM)
- ISO/IEC 13818-11
  - MPEG-2 IPMP framework
  - Latest reference : N5063 (FCD)

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MPEG-2 Extensions for IPMP support

- PID = 0x03 (IPMP Control Information Table)
  - IPMP Tool List
  - Rights Container
  - Tool Container
- table_id = 0x07 (IPMP Control Information Section)
- stream_id = 0b1111 1101 (IPMP Control Information Stream)
- Program descriptor tag : 41 (IPMP Descriptor)
- Stream type = 0x1A (IPMP stream)

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Compatibility with CA

- Backward compatibility
  - No changes to CA_descriptor
  - In transport stream, a CA_PID value of 0x03 indicates that there is IPMP protection within the system.
  - In program stream, a CA_PID value of 0xFD indicates that there is IPMP protection within the system.
  - If the IPMP protection is signaled by use of CA_PID, the value of CA_System_ID should only be set to 0xFFFF
- Forward compatilbility
  - If a CA system wants to work in MPEG-2 IPMP, it should register a IPMP Tool ID
  - There should be an IPMP Descriptor
  - The control point should be set to 0x01

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Architecture

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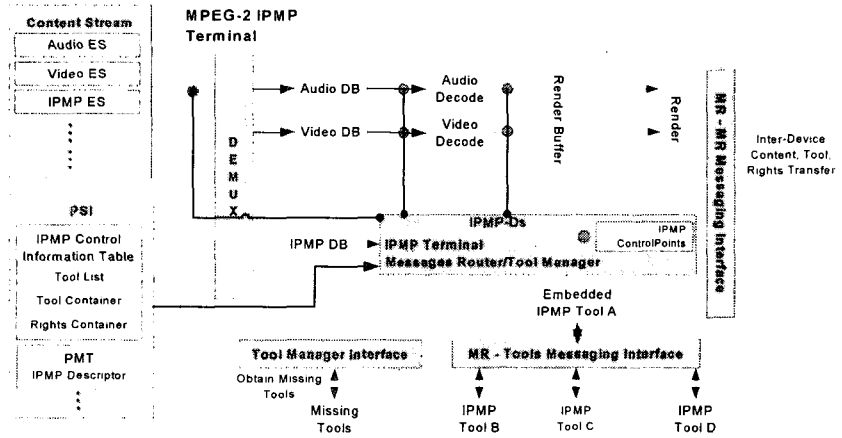

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MPEG-2 IPMP Architecture

Architecture for simple use case

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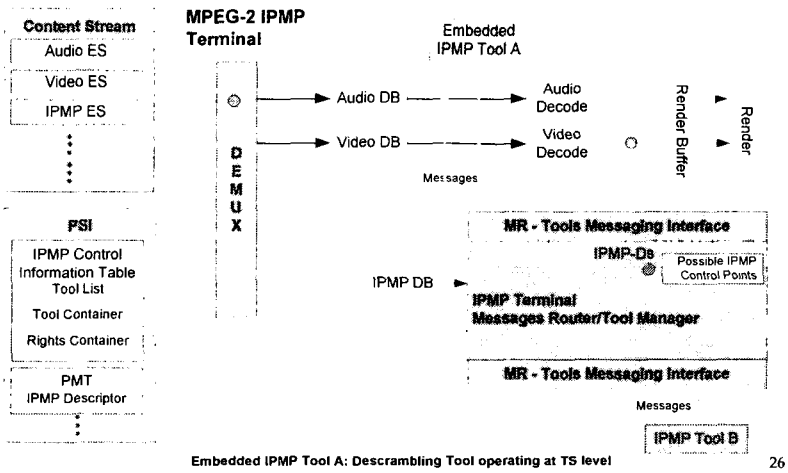

Embedded IPMP Tool A: Descrambling Tool operating at TS level

IPMP Tool B: Video Watermark retrieving tool operating after video decoder

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IPMP protected MPEG-2 Content

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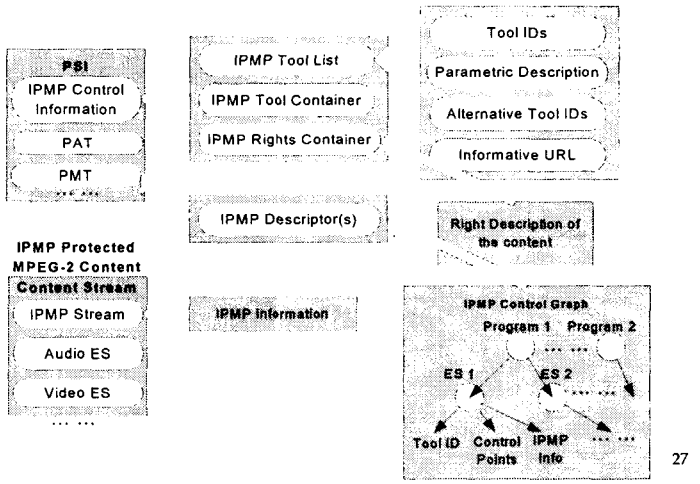

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STD model for IPMP stream

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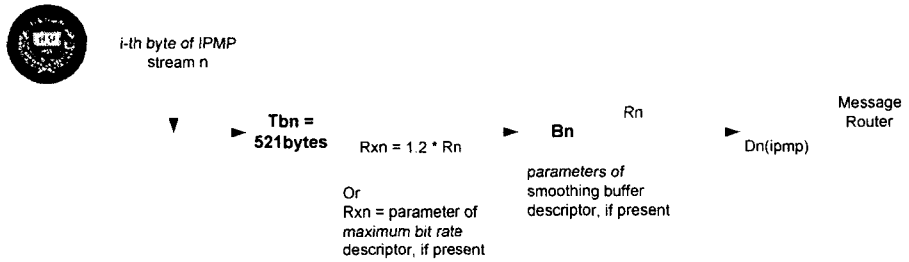

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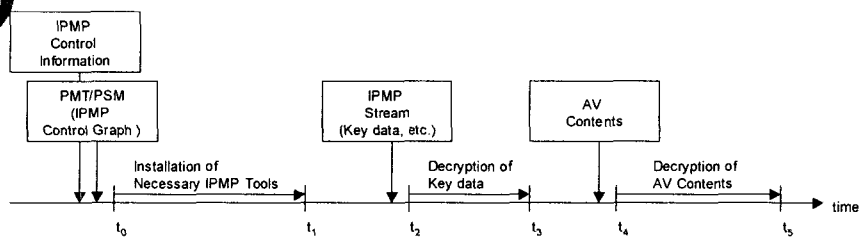
Timing of IPMP information routing



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Thank you!

Any Questions?