MMT Library

Revision History

Revision	Date	Change Description
0.1	11/03/2017	First draft

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Overview

In Japan, 4K and 8K broadcasting will be done only using MMT standard. MPEG Media Transport (MMT) specification is developed by MPEG-H committee (MPEG-H Part-1) for delivery of Audio/Visual information. For now, MMT is targeted only for BCM7278 based STBs.

Following figure shows simplified layer model of the audio/video data encapsulation using MMT standard for transmitting it via IP (broadband networks), Satellite and Cable Broadcast systems in Japan.
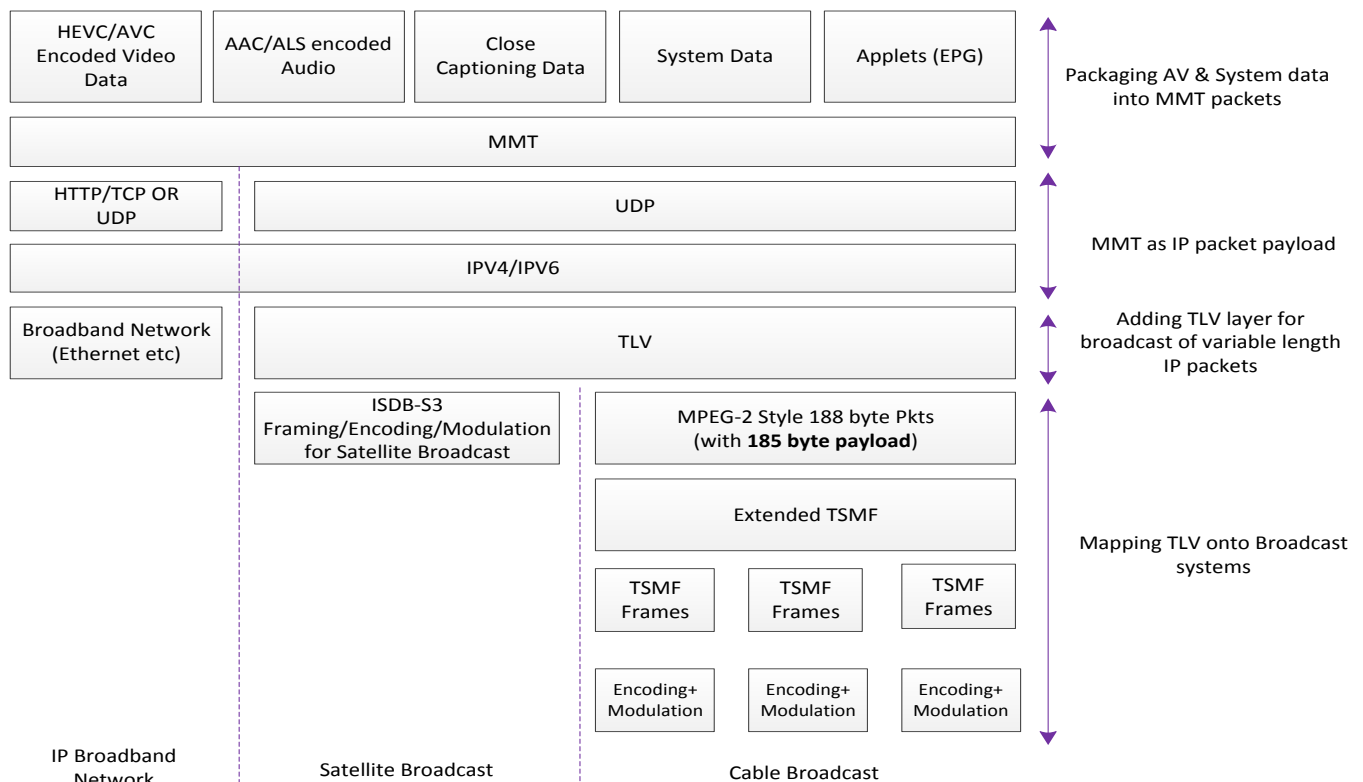
Figure 1 : MMT Layered Model for IP/Satellite/Cable systems

As shown in the above figure, TLV (Type Length & Value) layer is added while broadcasting variable length IP packets via Satellite or Cable networks.
In Satellite broadcast delivery network, high bit rate TLV streams are transmitted by using framing/encoding and modulation defined by ISDB-S3. ISDB-S3 enables satellite link speeds up to 100 Mbps and hence high bit rate requirements of 4K or 8K streams can be met using ISDB-S3.

Typical Cable delivery modulators provide ability to transmit up to 40 Mbps. In order to transmit 8K content via such cable network, TLV streams are chopped and packetized into MPEG style packets

(with 185 bytes as the packet payload). The high bit rate MPEG-2 style bit stream is then distributed over multiple cable transponders using Extended TSMF layer (defined by JCTEA **STD-007-6.1**). The Extended TSMF layer makes use of the existing TSMF frame structure for providing bonding parameters of the distributed TLV streams.

Usage cases

MMT via Cable Broadcast
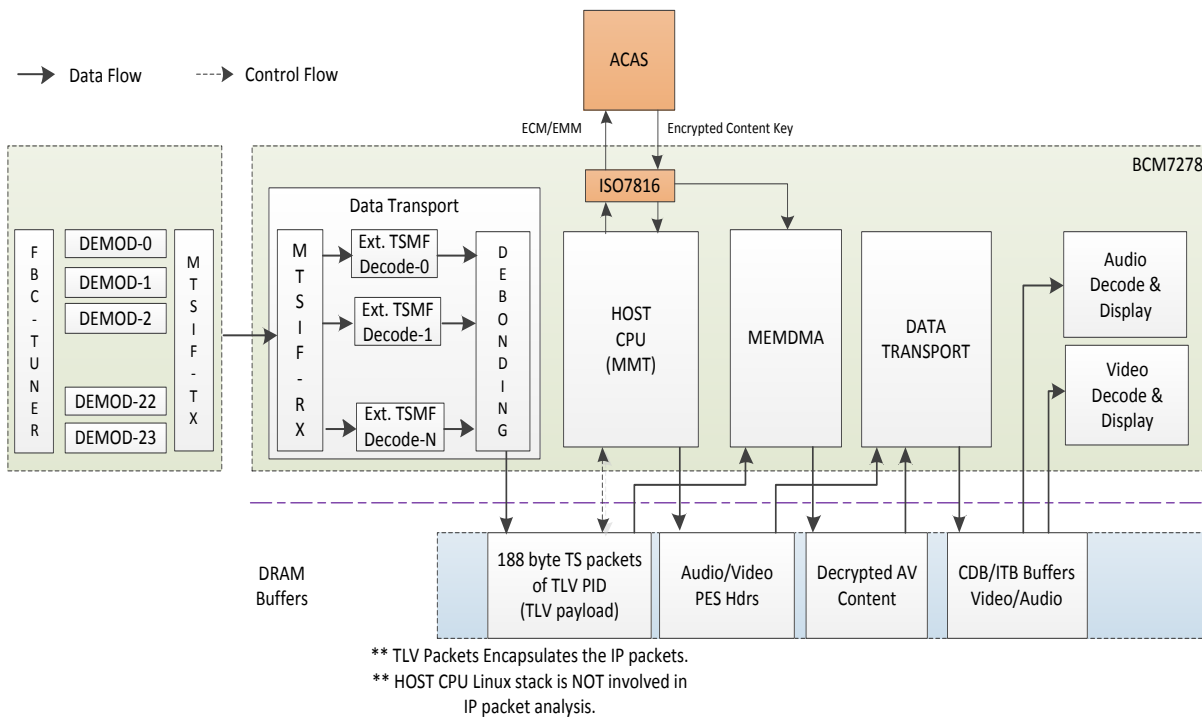
Figure 2: MMT Support over Cable Broadcast Systems

In Cable Settop Box systems, the single fat TLV stream (containing 4K or 8K content) is distributed over multiple modulators using Extended TSMF. At receiver, the stream data from multiple demodulators are required to be de-bonded into a single fat TLV stream before decoding. The packet re-sequencing from multiple transponders with Extended TSMF frames has to done at every 188 byte boundary. BCM7278 performs such task using Extended TSMF Decoding h/w for reconstructing the distributed streams.

The MMT SW running on Host CPU extracts the MMTP packets from the reconstructed stream (by analyzing MPEG-2 TS, TLV, IP headers). The MMT SW generates PES headers based on the information received in MMTP packets. It feeds AV data to MEMDMA for descrambling. The decrypted AV content is then stitched by MMT SW with the PES headers and fed to Data Transport. Data transport generates CDB/ITB data for video and audio decoder & display pipe.

MMT via Satellite Broadcast
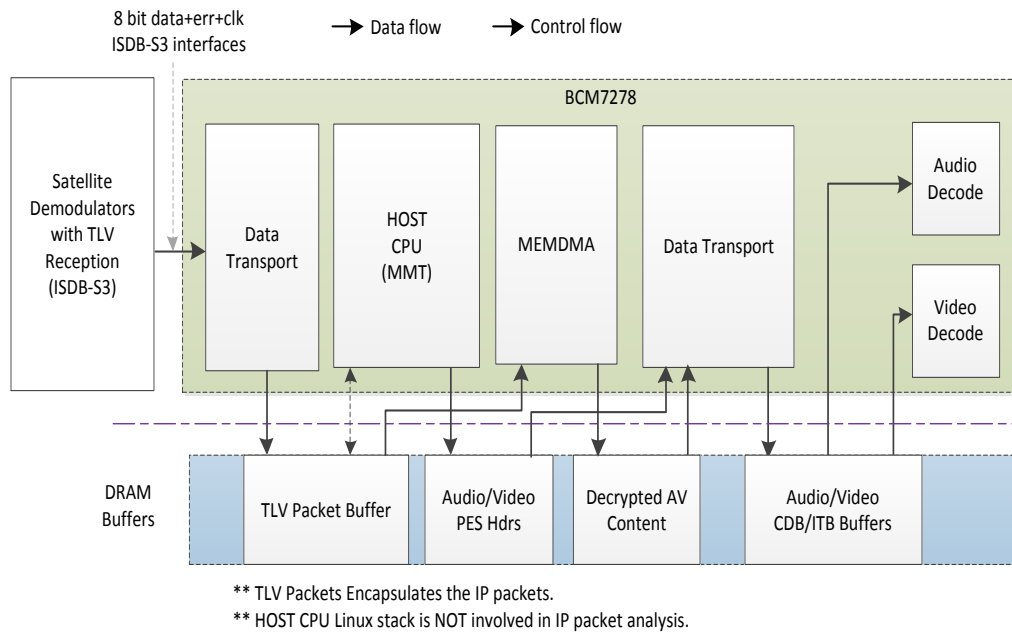
Figure 3: MMT Support in Satellite Broadcast Systems

BCM7278 supports 8 bit data/err/clk interface to ISDB-S3 TLV receivers. Data Transport module routes all the TLV packets to the TLV Packet Buffer maintained in DRAM. MMT SW on Host CPU analyzes TLV headers, IP headers and extracts MMTP packets. It generates PES headers by analyzing the MMTP packets and feeds the AV network encrypted content to MEMDMA. The MMT SW then stitches the PES headers and AV data and feeds it to Data Transport. Data Transport provides CDB and ITB information to audio/video decoders & display pipe. Security data flows of Satellite systems will be mapped on BCM7278 architecture based on the requirements.

MMT SW Library

MMT SW library is a nexus application library that uses CPU to parse mpeg2ts (3 bytes header) or TLV data stream from a file source, QAM source or ISBD-S3 source and generate control information and mpeg2ts AV streams to be used for live decoding, message extraction, recording and transcoding. Applications can mix nexus and MMT APIs to get desired functionality for MMT/TLV based products. Most of the testing is done specifically on BCM7278 based reference platforms.
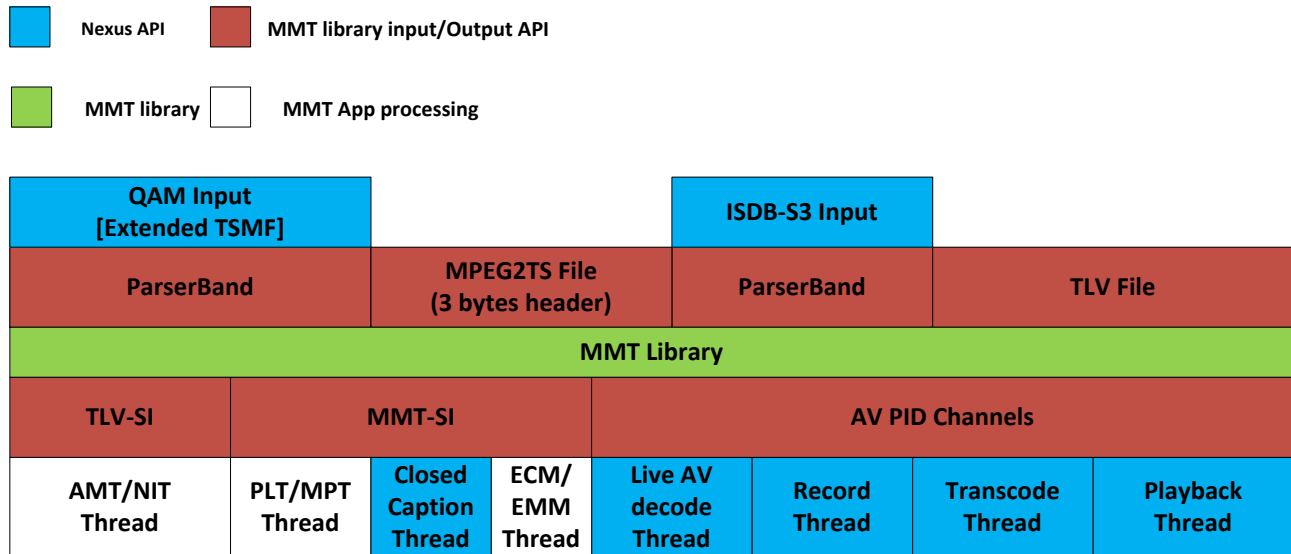
	Nexus API		MMT library input/Output API

	MMT library		MMT App processing

QAM Input [Extended TSMF]			ISDB-S3 Input		
ParserBand	MPEG2TS File (3 bytes header)		ParserBand	TLV File	
MMT Library					
TLV-SI	MMT-SI		AV PID Channels		
AMT/NIT Thread	PLT/MPT Thread	Closed Caption Thread	ECM/ EMM Thread	Live AV decode Thread	Record Thread	Transcode Thread	Playback Thread

Figure 4: nexus app with MMT library

As of now, the following is supported
- Live non bonded mpeg2ts (3 bytes header) AV decode
- Message extraction
- Playback of TLV and mpeg2ts (3 bytes header) files
- Recording of TLV file/mpeg2ts (3 bytes header) file as an mpeg2ts (4 bytes header) stream
- Recording of live mpeg2ts (3 bytes header) as an mpeg2ts (4 bytes header) stream

Software build & test instructions

In URSR releases, MMT library sources are located at BSEAV/lib/mmt. Sample apps are located at BSEAV/app/mmt. Set environment variables as mentioned in the URSR release notes for BCM7278 based platform.

Build

 # cd nexus/build
 # make
 # cd BSEAV/app/mmt
*# make*
All mmt sample apps should be copied over to obj.$(NEXUS_PLATFORM)/nexus/bin

Non exTsmf MMT Live testing

DekTec StreamXpress is used to stream mpeg2ts (3 byte header) stream from a windows PC to BCM3158 on BCM7278 based reference platform. StreamXpress version and modulation parameters are shown in the picture below. No Extended TSMF bonding/de-bonding tested using this method.
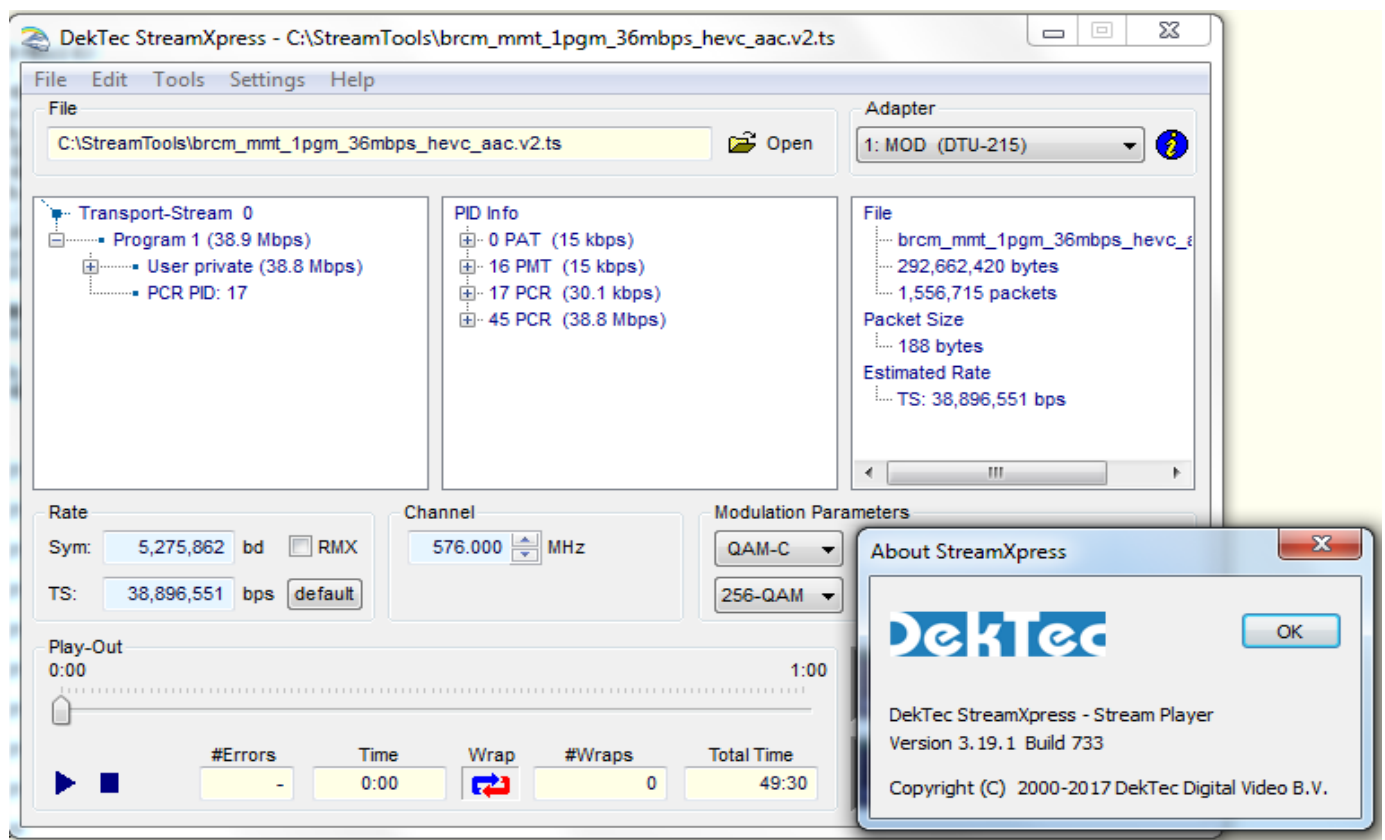
mmt_live app extracts MMT SI and TLV SI info using MMT library for live AV decode.

#./nexus mmt_live –freq 576 –tlv_pid 0x2d

exTsmf MMT Live testing

In the absence of exTsmf modulator, Broadcom tested exTsmf live mmt using Broadcom proprietary setup which requires an MTSIF feeder FPGA board that feeds exTsmf mmt stream in .mtsif format to BCM7278 reference board. For further details, please contact your FAE. Below is the app used to test exTsmf mmt live using Broadcom setup.

 #./nexus tsmf_mmt_live

Playback testing
#./nexus mmt_playback -input_format 1 -tlv_pid 0x2d APAB_4K_all.ts
 # ./nexus mmt_playback -input_format 2 Capture_20161206180200_20161206180500-bsc.tlv
#./nexus mmt_playback -input_format 1 -tlv_pid 0x2d APAB_4K_SONY_JUMBO_20170407_143421.ts
 # ./nexus mmt_playback -input_format 1 -tlv_pid 0x2d APAB_4K_WHITEBOX_20170407_143233.ts

Record Testing
 # ./nexus mmt_record -freq 576 -tlv_pid 0x2d /opt/mmt/record_live.ts
 # ./nexus playback /opt/mmt/record_live.ts

Miscellaneous Testing
#./nexus mmt_message_from_playback -input_format 1 -tlv_pid 0x2d APAB_4K_WHITEBOX_20170407_143233.ts

Tested Streams

Below is a list of streams that were used for testing.

APAB Streams
These streams need to be directly requested from APAB

mpeg2ts streams (3 bytes header)
- APAB_4K_all.ts
- APAB_4K_SONY_JUMBO_20170407_143421.ts
- APAB_4K_WHITEBOX_20170407_143233.ts

TLV streams
- Capture_20161206180200_20161206180500-bsc.tlv
- Capture_20161213180745_20161213181315-bsc.tlv

Broadcom Streams

These streams can be requested from Broadcom.
- brcm_mmt_1pgm_36mbps_hevc_aac.v2.ts (mpeg2ts [3 bytes header] stream)
- mmt_apab_40Mbps_4bands.mtsif (exTsmf mmt stream in .mtsif format)

TODO Items

1. Transcode
2. Security
3. Nxclient sample apps