

MPEG-TS stream analysis with smd 0.2 (part of GigaTools)



Introduction

`smd(1)` is an MPEG-TS (live) stream processing and analysis tool within [GigaTools](#). A single instance handles a single stream: scans data for anomalies, gathers statistics and issues reports in both human-readable and/or computer-friendly formats. `smd(1)` can also take *snapshots* of the stream (i.e. save a relevant stream portion into a file).

`smd(1)` uses *sensors* to identify alert situations; a sensor represents the logic to match stream data to a condition. When a *sensor* satisfies the required condition, an *alert* is recorded in the appropriate *alert log*. `ftsa(1)` tool allows to run the same analysis on MPEG-TS files (snapshots) that `smd(1)` does on a live stream.

`dbsink(1)` tool continuously reads data from an alert log (or `stdin`) and updates a target database.

Module	What it does
<code>smd</code>	analyzes live MPEG-TS stream , issues <i>alerts</i> on N sensors, takes <i>snapshots</i> ; logs statistics and alerts in an easily-parsable file.
<code>ftsa</code>	performs analysis on MPEG-TS files , issues the same <i>alerts</i> as <code>smd(1)</code> .
<code>dbsink</code>	relays data from <code>smd(1)</code> 's alert log to a database (supported: InfluxDB).

Sensors and alerts

We'll begin with a summary of *sensors* and associated *alerts* and then go into the details of each of the sensors/alerts.

Supported sensors/alerts:

Name	Alert when
AV-DELTA+	delta between a video and audio track's PTS/DTS > N ms
PCR-DELTA	delta between a PCR and a PTS/DTS of any track > N ms
PCR-FREQ	delta between two consecutive PCR timestamps > N ms
LOST-SYNC	cannot identify a packet as MPEG-TS (0x47)
CC-BRK	continuity counter sequence is broken
CC-RST	continuity counter becomes zero out of order
CC-MLR	all CC counters go out of sequence within a single segment (possible packet loss)
PAT-DIFF	new PAT differs from the last one
PMT-DIFF	new PMT differs from the last one
PID-NDAT	no data received for a track

AV-DELTA+: audio/video time discrepancy

This alert fires when (PTS/DTS) timestamps in an audio track of a stream become too 'distant' from the timestamps in the reference stream, which is video. In playback, up to a certain delta, the player compensates for the (allowable) difference; if the delta, however, gets too big, the playback will visibly have audio out of sync with video.

$$\Delta = |PTS(V) - PTS(A)| \text{ or}$$

$$\Delta = |DTS(V) - DTS(A)|$$

Sometimes, a stream would start with a an allowable delta and then at some point develop the A/V sync issues. The alert was designed to catch such occurrences.

PCR-DELTA: PTS/DTS vs PCR timestamps

PCR timestamps may serve as reference points to detect if there is a problem with PTS/DTS timestamps on the tracks within a single stream. This alert is fired when a difference (delta) between a PTS/DTS timer and the last known PCR exceeds a (user-defined) maximum value. The content type of the track is irrelevant in this case.

$$\Delta = |PCR - PTS(x)| \text{ or}$$

$$\Delta = |PCR - DTS(x)|$$

PCR-FREQ: how far between two consecutive PCRs?

This alert will fire if PCRs do not appear within a stream with the specified frequency. Time difference (delta) will be measured as the difference between two actual PCR values: the last known PCR and the newly-received one. Wall-clock time is disregarded.

$$\Delta = |PCR(t1) - PCR(t0)|$$

LOST-SYNC: garbage in the stream

This alert catches the moment when a portion of the stream ceases to be a sequence of MPEG-TS packets. This is determined by probing for the MPEG-TS sync-byte (0x47) at the beginning of each TS packet.

CC-BRK: broken continuity-counter sequence

The alert is fired when a CC value in a packet does not match the expected value (as per increment from 0x00 to 0x0f). The alert is suppressed if CC-RST (see below) is to be fired instead.

CC-RST: continuity-counter reset

A continuity counter may go to zero, out of sequence, when data for a new/different stream starts flowing. It will go to 0 and then should follow the CC sequence. Such cases should not be alerted on. However, the events as such are rare. If another zero comes out of sequence within a preset time, the alert is fired.

CC-MLR: CC broken, possible data loss

Continuity counters in **all** tracks may become broken within a short period. Instead issuing multiple CC-BRK alerts, a single CC-MLR alert will go out. It may indicate that network data loss has happened.

PAT-DIFF: program changes

This indicates that a newly-received PAT differs from the last one. Differences in the counts of PMT-related PIDs are included in the alert.

PMT-DIFF: track changes

This alert fires when changes happen in the track layout of a program. A newly-received PMT would then differ from the last one. Difference in the track counts is included in the alert.