Errors in the time displayed by DTV receivers

Eng. Laura Quesada Del Busto
laura@lacetel.cu

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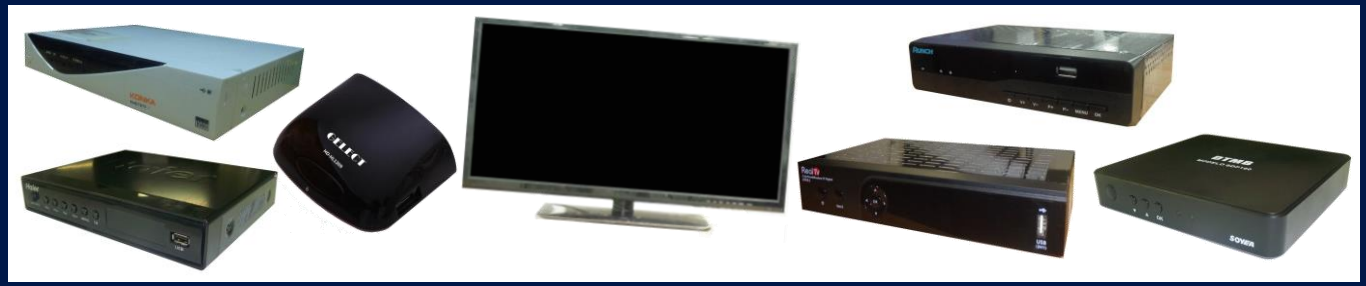
Introduction

E-mail to assistance DTV users
tvdigital@lacetel.cu

- From November, 2015, DTV users began to complain that some of their receivers showed an hour late while receiving DTV broadcasted.
- The Service Provider informed the problem was in those specific receivers, given that not all DTV receivers showed this offset in time.
- In ***LACETEL***'s DTV Lab, we proposed to find the origin of the problem with a scientific methodology.

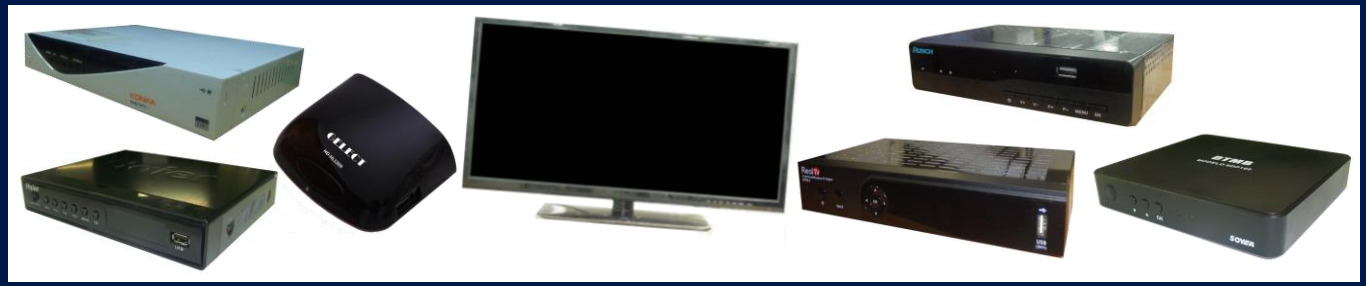
Problem

- Why receivers show differences in time, if they receive same broadcasted transport stream?



Goal

- Identify the causes of differences in the time shown by DTV receivers, and find solutions to this problem.



Previous Knowledge

Where is date and time information located in Transport Stream?

- The **Service Information** defined in **ETSI Standard EN 300 468** specifies that the date and time information is transmitted in the **TDT** (Time and Date Table) and **TOT** (Time Offset Table) tables.

Main Tasks

- Study the structure of TDT and TOT tables from that indicated in ETSI EN 300 468 standard.
- Analyze the content of TDT and TOT tables in the broadcasted transport stream.
- Check if receivers correctly update date and time information.

TDT- Time and Date Table

- Provides the current date and time in UTC zone.
- Packets with PID = 0x14 and table_id = 0x70.

TOT- Time Offset Table

- Provides the time offset relative to UTC applied to each time zones.
- Packets with PID = 0x14 and table_id = 0x73.

TOT- Time Offset Table

Transport Stream

Table_id = 0x073 → **TOT**

UTC_time
local_time_offset_descriptor 0
local_time_offset_descriptor 1
:
local_time_offset_descriptor n

- Country Code
- Region Identifier
- Offset time from UTC in the area which is indicated by country and region

TOT- Time Offset Table

Main fields in local_time_offset_descriptor:

local_time_offset_polarity: indicates if time is behind or ahead of UTC.

time_of_change: date and time when the time change takes place.

local_time_offset: offset time when it is early to time_of_change.

next_time_offset: offset time when it is equal to or after time_of_change.

Content of TDT and TOT tables in broadcasted transport stream

***Test conditions*:**

- Analysis of a TS file recorded from broadcasted DTV on December 30, 2015, at 8:17 am.
- Software tools :
  - MPEG-2 TS Packet Analyzer 2.4.5.0 
  - 4T2 Content Analyzer 

Content of TDT and TOT tables in broadcasted transport stream

Test results:

- PID = 0x14, table_id = 0x70 **TDT**
- PID = 0x14, table_id = 0x73 **TOT**
- UTC_time = 2015/12/30, 13:17:15
- Country code: Cuba
- Polarity: negative
- Time_of_change: 2015/10/10 05:00
- ✗ Local_time_offset: 05:00
- ✗ Next_time_offset: 06:00

Automatic update of date and time in DTV receivers

Receiver	Result
STB KONKA KSDT863-M	✗
STB KONKA KHDT875-A	✗
STB SOYEA SDP160	✗
STB RUNCH DTT1513	✓
STB RUNCH DTT 1900	✗
STB RealTV HMA1	✗
STB GELECT SD-HL215	✗

Receiver	Result
STB GELECT HD-HL1209	✓
STB MiCO DT46-N03	✗
STB MiCO DT25-2080	✗
STB HAIER HDMB-6000T	✗
STB HAIER HDMB-2000T	✗
iDTV ATEC 32L14D	✓
iDTV KONKA KDL32KT627	✗

Main achievements

- Services Provider was notified about the errors in the TOT table transmitted transport stream.
- Since 23 January 2016 the information transmitted is correct.
  - Time_of_change: 2016/04/10 05:00:00
  - Local_time_offset: 05:00
  - Next_time_offset: 04:00
- The automatic update of date and time in DTV receivers evaluation process of Digital TV receivers was optimized.

Main achievements

- Manufacturers of receivers that failed were notified.

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STB KONKA KSDT863-M	✗
STB KONKA KHDT875-A	✗
STB SOYEA SDP160	✗
STB RUNCH DTT1513	✓
STB RUNCH DTT 1900	✗
STB RealTV HMA1	✗
STB GELECT SD-HL215	✗

Receiver	Result
STB GELECT HD-HL1209	✓
STB MiCO DT46-N03	✗
STB MiCO DT25-2080	✗
STB HAIER HDMB-6000T	✗
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Conclusions

- The causes of differences in the time shown by digital TV receivers were:

  - errors in the information contained in the TOT table

  - some receivers did not update date and time information from TOT table

Recommendations

- Update from server the information in **local_time_offset**, **time_of_change** and **next_time_offset** fields, before the occurrence of next time change.

DIGITAL TELEVISION LABORATORY

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