TERMINAL TESTING SUITE

Validation tool for CALYPSO terminals *

The **Terminal Testing Suite** allows to validate a terminal that runs a teleticketing CALYPSO application.

It contains two modules :

- The **Calypso Card Simulator (CCS)** behaves like a CALYPSO card for the terminal to be tested and records all exchanges.

- The **Programming Tool** configures the CCS through a contactless interface and allows trace visualisation.

COMPATIBILITY AND INTEROPERABILITY

CALYPSO focuses on the ticketing transaction between the card and the terminal and relies on the ISO/IEC 14443 standard that is made of four parts :
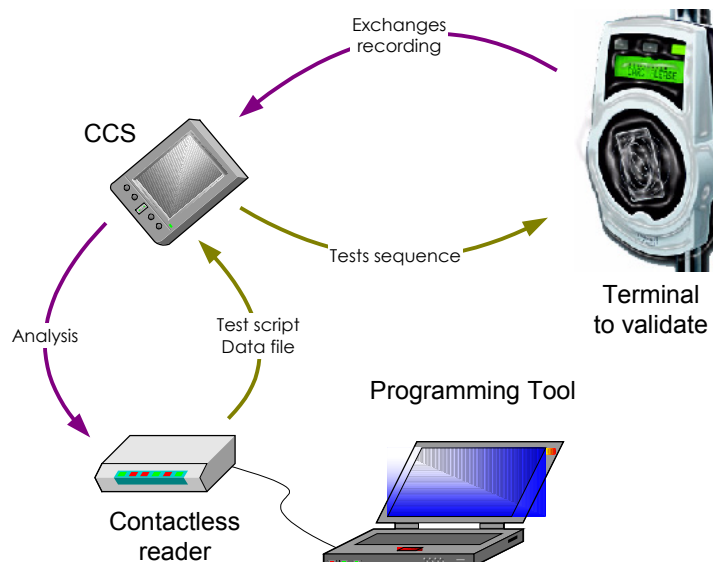
- The two first deal with the radio interface.
- The third one is devoted to frames format and anti-collision.
- The fourth one specifies the protocol.

Most of the normative works has been focused on the card. The ISO/IEC 10373-6 standards shows an informative test method to validate the terminal compliance to ISO 14443B standard.

The **Terminal Testing Suite** tests the terminal management of the parts 3 and 4 of the ISO/IEC 14443B standard.

To ensure a good level of interoperability, it is necessary to go beyond the protocol layer and to validate that the application in the terminal runs as expected.

The **Terminal Testing Suite** also allows to define cards conforming to your data model and helps analyzing the exchanges between the CALYPSO card simulator and the terminal.

CCS — Exchanges recording — Terminal to validate — Tests sequence — Analysis — Test script Data file — Programming Tool — Contactless reader

The CALYPSO Card Simulator (CCS)

- Behaves like a contactless CALYPSO card (revision 1 or 2).
- Performs the tests scripts defined in the Console Application.
- Records the exchanges with the terminal.

The Programming Tool

- Defines test scripts.
- Builds sets of application data.
- Loads test scripts and application data in the CCS.
- Analyses the trace of the exchanges.

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Sequence of an elementary test

- The operator defines a test script with the Programming Tool.
- He loads the script in the CCS.
- The operator uses the CCS as a contactless card facing the terminal that need to be validated. The terminal is equipped with a test SAM.
- Once in the field of the contactless antenna of the terminal, the CCS indicates to the operator the exchange of data with the coupler. The CCS records these data in its memory.
- The operator downloads the data related to the test from the CCS memory for analysis.

Characteristics of the CALYPSO Card Simulator (CCS)

FUNCTIONS

- Behaviour similar to a CALYPSO revision 1 or 2.
- Management of a test script.
- Recording of the exchanges with the terminal.
- Time stamp of the exchanges with the terminal.
- Autonomous on batteries.

CALYPSO COMMANDS

- Get ATR
- Select
- Verify Pin
- Get Challenge
- Open Session
- Close Session
- Read Record
- Write Record
- Update Record
- Append Record
- Change Key/Change Pin
- Decrease/Increase (Multiple)
- Invalidate/Rehabilitate

HARDWARE FEATURES

- Size : 110 x 63 x 23 mm
- Powered by 2 batteries 1,5V AA LR6.
- Memory : 4 Mo.
- Time resolution: 100 µs
- Three-coloured led.
- Reset button.

Functionalities of the Programming Tool

PROTOCOL LEVEL

The Programming Tool allows to program one or several errors to be triggered during a typical transaction.

The following card behaviors can be simulated:

- *CRCError* — Wrong CRC.
- *ResponseDelay* — Answer to a command with an incorrect timing (TR0, TR1).
- *MuteCard* — The CCS stays mute to a command.
- *ResponseInterruption* — Interruption of the answer after a given number of bytes.
- *CertificateIncorrect* — Wrong certificate.
- *StatusWord* — Answer with a given Status Word.
- *NumberOfData Bytes* — Answer with a given number of bytes of data.

These behaviors can be triggered upon the following preconditions (associated to the behavior)

- *AfterNFrames* — Trigger the behavior after a given number of frames.
- *ForNFrames* — Apply the behavior during a given number of frames.
- *Filter* — Trigger the behavior if the command matches a pattern.
- *ContentReset* — Reset the CCS memory to its initial state (last configuration).

APPLICATION LEVEL

Beyond the protocol level, the **Terminal Testing Suite** allows to verify the behaviour of the terminal with a specific data model.

It simulates any kind of contactless card that complies with this data model.

An adaptation to the transport network data model is necessary to allow to test the terminal behaviour in normal cases and error cases.

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