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Method and Apparatus for controlling several smart cards

The present invention relates to a method and to an apparatus for controlling several smart cards.

Background

Currently a pay TV decoder is only working with one smart card and does therefore use only one card reader. If the user owns several smart cards each one dedicated to a specific broadcaster, each time he switches from one channel to another the user has to exchange the smart cards in order to be able to descramble the new channel.

Invention

It is one object of the invention to disclose a method for allowing a processor or a pay TV decoder to control more than one card reader. This object is reached by the inventive method disclosed in claim 1.

In principle the inventive method consists in controlling two or more smart cards (11, 21, 31), whereby said smart cards (11, 21, 31) can be inserted in a respective number of card readers (1, 2, 3) which are supplied from a power supply unit (4) with the required supply voltages, whereby said card readers (1, 2, 3) and said power supply unit (4) are controlled by a processor (5), which receives authorization management data (6) and which selects one of said smart cards which is suited for access to main data related to said authorization management data (6), whereby the power for the other card readers is switched off by said power supply unit (4) under the control of said processor (5).

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Advantageous additional embodiments of the inventive method are resulting from the respective dependent claims.

It is a further object of the invention to disclose an apparatus which utilizes the inventive method. This object is reached by the inventive apparatus disclosed in claim 8.

In principle the inventive apparatus comprises two or more card readers (1, 2, 3) which are supplied from a power supply unit (4) with the required supply voltages, whereby said card readers (1, 2, 3) are connected with data lines (D I/O, RST, CLK) to a processor (5) and said card readers (1, 2, 3) and said power supply unit (4) are controlled by said processor (5), which receives authorization management data (6) and which selects one of said smart cards which is suited for access to main data related to said authorization management data (6), whereby the power for the other card readers is switched off by said power supply unit (4) under the control of said processor (5).

Advantageous additional embodiments of the inventive apparatus are resulting from the respective dependent claim.

In the last few years almost every new pay TV system introduced in the market has a control access with its security relying on smart cards. The satellite diffusion has brought in every home the possibility to watch or to listen to different channels encrypted with the same scrambling system, but managed by different program providers. With one standard decoder and a bunch of right smart cards, the user has access to a lot of pay TV, data or audio programs. But with the standard decoders, the user will have to change manually his smart cards in order to feed into the decoder the smart card corresponding to the tuned channel. In a period where zapping is a main component of the TV watcher's or radio listener's behaviour this constraint is archaic.

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The invention enhances the ease of use of such conditional access systems. Several card readers are connected and controlled by a single processor. A special power supply unit which is controlled by the processor supplies the card readers with appropriate voltages.

Drawing

Preferred embodiments of the invention are described with reference to the accompanying drawing:

Fig. 1 shows a pay TV decoder working with several smart cards.

Preferred embodiments

In Fig. 1 a processor 5, which can be controlled by software, is connected to each of three card readers 1, 2 and 3 via a bi-directional data line D I/O, a reset line RST and a clock line CLK. These card readers are physical connectors in each of which a smart card 11, 21 and/or 31 can be inserted. In order to comply to the ISO 7816 standard, the following signals are provided for the card readers:

- power supply V_{pp} and V_{cc} (in lines 12, 22, 32);
- ground voltage (not depicted in Fig. 1);
- reset signal (RST);
- clock signal (CLK)
- bidirectional data line (D I/O)
- a mechanical switch provides an electrical signal in order to detect the presence of the smart card in the card reader (DETECT, in lines 12, 22, 32).

Processor 5 receives authorization management data 6 from e.g. a TV, data or audio signal (i.e. main data), treats them and transfers them to the right smart card which will

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return, if authorized, the right information for processor 5 to descramble the received signal.
processor 5 controls the generation of the power supply voltages V_{pp} and V_{cc} for the smart cards and the communication with the smart cards. A power supply unit 4 generates the voltages V_{cc} and V_{pp} complying to the standard ISO 7816-3 and is connected via lines 12, 22 and 32 to the respective card readers 1, 2 and 3. Power supply unit 4 is also connected with a command line 7 and with an interrupt line 8 to processor 5.
Due to the fact that processor 5 handles at one moment only one channel, only one smart card has to be active at any moment. Therefore the power supply unit 4 delivers at any moment the voltages V_{cc} and V_{pp} only to one card reader and the voltages of the other card readers are tied to ground.
In the block diagram of Fig. 1 processor 5 has one dedicated line for the signals D I/O, CLK and RST to each card reader. If the number of card readers is greater, advantageously a multiplexer can be used for these lines. This solution simplifies the software and reduces the number of pins needed on processor 5. For instance, in the case of 4 card readers instead of 12 pins only 5 would be requested.

In the following a pseudo code software offering minimal features is listed. The reaction to four events is described:

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card insertion

IF processor is currently working with another card THEN
    new inserted card is ignored
ELSE
    processor connects this card reader
    processor analyzes the answer to reset
    IF the card is the card to be used with the program currently tuned THEN
        processor works with this card
    ELSE
        processor disconnects V_{cc} and V_{pp} from card reader
        processor waits for insertion of a new card
    ENDIF
ENDIF

card extraction

IF the card extracted is the card currently being used THEN
    processor disconnects V_{cc} and V_{pp} from power supply unit
    processor searches valid card
ELSE
    ignore card extraction
ENDIF

channel changed

IF processor was working with one card THEN
    IF the currently working card fits with the new channel THEN
        CONTINUE
    ELSE
        processor disconnects V_{cc} and V_{pp} from card reader
        processor searches valid card
    ENDIF
ELSE
    processor searches valid card
ENDIF

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search valid card

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IF there is at least one card inserted THEN
     WHILE NOT processing one card DO
          FOR each card inserted DO
               processor connects this card reader
               processor analyzes the answer to reset
               IF the card is the card to be used with the
               program currently tuned THEN
                    processor works with this card
               ELSE
                    processor disconnects Vcc and Vpp from
                    card reader
               ENDIF
          ENDDO
     ENDDO
ELSE
     wait for a card to be inserted
ENDIF
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Some enhancements can be added:
- Each time that the processor performs an answer to reset to a new card, it memorizes the parameter of the card specially for which program provider it works. By that mean during search valid card, it can switch directly to the right card reader instead of scanning each of them;
- When a channel is selected whose authorization management data can be evaluated by the smart card but for which the user is not entitled, the processor searches among all the cards inserted, if there is any other which is entitled for this program;
- Some pay TV transmissions (e.g. D2MAC) or radio programs have somewhere in the signal the description of broadcast programs of other channels. An improved decoder could then, according to the cards fitted in its card readers, indicate to the user which programs he is entitled to watch or to listen. This feature would greatly help the user, if he owns several cards.

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The circuit described for Fig. 1 can be part of a VIDEOCRYPT, EUROCRYPT or any other smart card based pay TV decoder.

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Claims

1. Method for controlling two or more smart cards (11, 21, 31), whereby said smart cards (11, 21, 31) can be inserted in a respective number of card readers (1, 2, 3) which are supplied from a power supply unit (4) with the required supply voltages, whereby said card readers (1, 2, 3) and said power supply unit (4) are controlled by a processor (5), which receives authorization management data (6) and which selects one of said smart cards which is suited for access to main data related to said authorization management data (6), whereby the power for the other card readers is switched off by said power supply unit (4) under the control of said processor (5).

2. Method according to claim 1, characterized in that said processor (5), power supply unit (4) and card readers (1, 2, 3) are part of a pay TV decoder or are part of a respective decoder for audio or other main data with conditional access.

3. Method according to claim 1 or 2, characterized in that said processor (5) selects automatically one of said smart cards which is suited for access to said main data.

4. Method according to any of claims 1 to 3, characterized in that said processor (5) determines all of said main data to which can be accessed with the smart card or smart cards inserted.

5. Method according to any of claims 1 to 4, characterized in that said processor (5) stores in memory means the related connection information already found between smart cards and allowed kind of main data and switches according to said stored connection information in case

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of choosing other main data instantly to that one of the card readers which is related to this main data without searching for other smart cards.

6. Method according to any of claims 1 to 5, characterized in that in case said authorization management data (6) can be evaluated by the actual smart card but for which respective main data an access is not allowed, said processor (5) searches among all the other smart cards inserted, if there is any other which is entitled for this main data.

7. Method according to any of claims 1 to 6, characterized in that said processor (5) determines from information data within the actual main data about other available main data, to which of said other available main data can be accessed with the smart card or smart cards inserted.

8. Apparatus for a method according to any of claims 1 to 7, comprising two or more card readers (1, 2, 3) which are supplied from a power supply unit (4) with the required supply voltages, whereby said card readers (1, 2, 3) are connected with data lines (D I/O, RST, CLK) to a processor (5) and said card readers (1, 2, 3) and said power supply unit (4) are controlled by said processor (5), which receives authorization management data (6) and which selects one of said smart cards which is suited for access to main data related to said authorization management data (6), whereby the power for the other card readers is switched off by said power supply unit (4) under the control of said processor (5).

9. Apparatus according to claim 8, characterized in that said data lines (D I/O, RST, CLK) are replaced by multiplexed data lines.

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