

# **NagraVision**

**Set-Top Box & Multimedia Unit** 

**Conditional Access OpenTV** 

**Application Programming Interface** 

V 1.8.0

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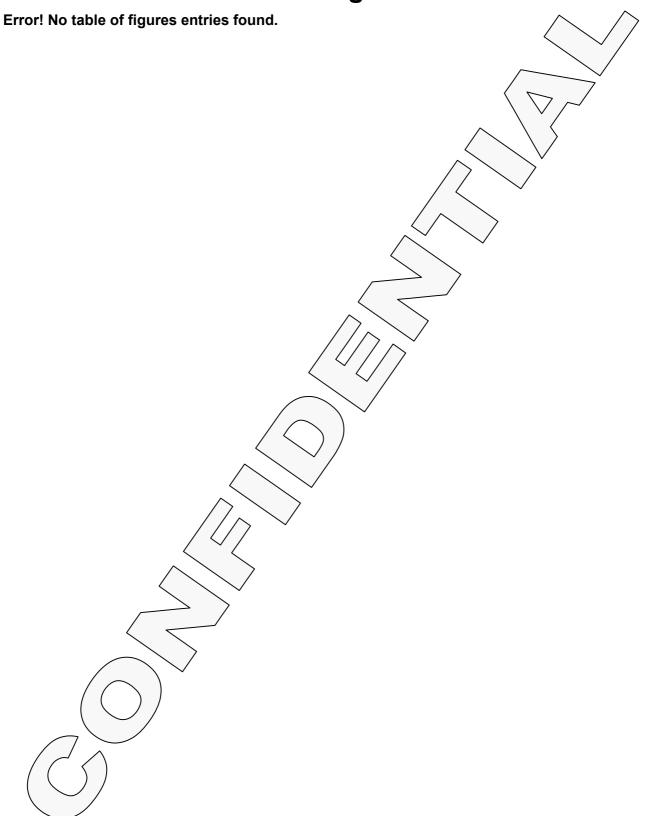
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# 1 Introduction

# 1.1 Purpose

This document provides the reader with the specification of the NagraVision Conditional Access Application Programming Interface for OpenTV. This API describes three blocks of functionalities: the alarms, the notifications and the functions.

# 1.2 Document History

Version	Date	Author	Description
1.8.0	20-Oct-2000	Bernard Krummenacher/	New template.
		Patrick Schyrr	Added new function caGetMoreSystemInfo giving the CAO version and smart card operator ID (caGetSystemInfo remains backward-compatible).  Added new data types and data types manipulation
1.7.0	Oct-2000	Marc Uldry	tunctions.  updated document revision for a new module release.
1.6.0	Nov-1999	Marc Uldry	Added specifications for the function caGetSmartcardStatus and revision after internal comments.
1.5.0	Aug-1998	Christian Bullat	Specified the audience of the document.
1.4.1	Jul-1998	Christian Bullat	Completed specifications for the function caRegisterClient.
1.4.0	Jun-1998	Christian Bullat	Revision after internal comments, improved comments, new template.
1.3.1	Apr-1998	Maxime Goeke	Revision after internal comments.
1.3.0	Mar-1998 /	Maxime Goeke	Revision after comments from customer.
1.2.0	Mar-1998	Maxime Goeke	Revision after comments from partner and decoder manufacturer.
1.1.0	Feb-1998	Maxime Goeke	Revision after comments from OpenTV and partner.
1.0.0	Jan-1998	Maxime Goeke	First issue

**Table 1 - Document History** 

# 1.3 Definitions, Acronyms, and Abbreviations

Acronym	Definition
---------	------------



Abbreviation	
API	Application Programming Interface
ASCIIZ	Zero-terminated ASCII characters array
CA	Conditional Access
CAK	Conditional Access Kernel
DVB	Digital Video Broadcasting
EBNF	Extended Backus-Naur Form
EPG	Electronic Program Guide
EIT	Event Information Table
EMM	Entitlement Management Message
IPPV	Impulse Pay Per View
NASP	Nagra Advanced Security Processor
NIT	Network Information Table
PPV	Pay Per View
SDT	Service Description Table
SI	Service Information
STB	Set Top Box
UTC	Universal Time Co-ordinated

Table 2 - Definitions, Acronyms, and Abbreviations

# 1.4 Notational Conventions

- Source code/ configuration file entries are in Courier font.
- · Directories and filenames are in italic type.

# 1.5 References

- [1] NagraVision, "Digital Pay-TV System, System Overview", V 1.1, February 1997.
- [2] NagraVision, "Set Top Box, Conditional Access Task, Overview", V 1.1, December 1999.
- [3] NagraVision, "Set Top Box, Conditional Access Kernel, Application Programming Interface", V2.3.0, October 2000.
- [4] NagraVision, "DVB-SI Descriptors", V 2.3.
- [5] OpenTV, "Software Developer's Kit 1.1, Getting started", April 1997.
- [6] OpenTV, Software Developer's Kit 1.1, Programmer's guide", April 1997.

# 1.6 Trademarks

Any/company's or product name(s) found herein may be the trademarks or registered trademarks of their respective companies.





# 1.7 Accompanying files

Four files, providing code and definitions for this API, come with this document:

The first one, *calib.h*, describes the three blocks of functionalities of the CA, the alarms, the notifications and the functions, at the o-code level (OpenTV applicative level).

caotools.h and caotools.c provide functions that can be used to manipulate the cao data types at OpenTV applicative level and at native level; they are provided for developers' comfort and as such it is not mandatory to use them.

The last one, *calibx.h*, describes just one block of the functionalities of the CA, the alarms, at the native level (Control Task level). It includes *opentvx.h*, which shall be provided by the set-top box manufacturer.

### 1.8 Audience

This document is intended for both the OpenTV application developers and the STB Control Task developers.

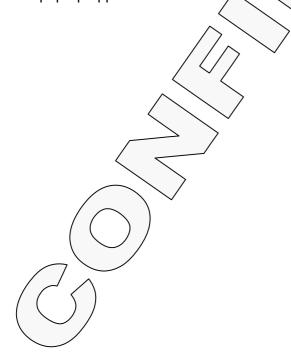
# 1.8.1 OpenTV application developers

OpenTV applications developers will use the complete CAO API. They shall include the *calib.h* and optionally *caotools.h* files in their sources.

Pop-up applications developers will use the Ch alarms, at the o-code level. They shall include the calib.h and optionally caotools.h files in their sources.

STB Control Task developers will use the CA alarms at the native level. They shall include the *calibx.h* file in their sources.

Besides the processing of the alarm messages at the native level, the Control Task is very likely to launch pop-up applications to warn the user that something is going wrong with the CA.





# 2 Application programming interface

In this section appears the Conditional Access Application Programming Interface for OpenTV applications as specified today, based on the currently available features of the NagraVision CA system.

# 2.1 Jump table

The manufacturer has to create a header file named *calibnb.h*. This file, that will be included in the Nagravision header files *calib.h* and *calibx.h*, must define the constant calib\_number. The value of this constant is defined by the operator. The following example shows the definition of the constant calib\_number as it should appear in the *calibnb.h*. In this example, its value is set to 8:

#ifndef	CALIBNB_H
#define	CALIBNB_H
#define	calib_number
#endif	

# 2.2 Symbolic constants

The symbolic constants shown here below are defined in the file *calib.h.* Their use is presented and explained throughout the following paragraphs.

8

# Message class

MSG\_CLASS\_CA Already defined by OpenTV in file opentv.h (o-code level).

OPTV\_CA\_CLASS Already defined by OpenTV in file opentvx.h (native level).

#### Message types

MSG\_TYPE\_CA\_ALARM
MSG\_TYPE\_CA\_COMMAND
MSG\_TYPE\_CA\_NOTIFICATION

### Message fields

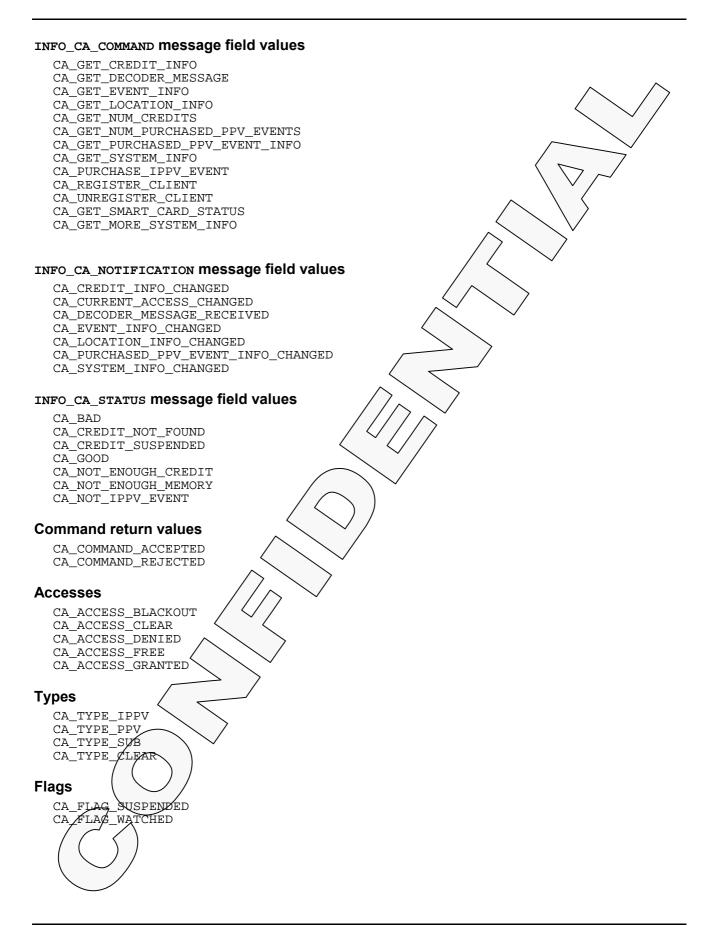
INFO\_CA\_ALARM
INFO\_CA\_COMMAND
INFO\_CA\_NOTIFICATION
INFO\_CA\_RESULT
INFO\_CA\_STATUS

#### INFO\_CA\_ALARM message field values

CA\_SMART\_CARD\_RLACKLISTED
CA\_SMART\_CARD\_COMMUNICATION
CA\_SMART\_CARD\_GOOD
CA\_SMART\_CARD\_MUTE
CA\_SMART\_CARD\_NEVER\_PAIRED
CA\_SMART\_CARD\_NOT\_INSERTED
CA\_SMART\_CARD\_NOT\_PAIRED
CA\_SMART\_CARD\_NOT\_PAIRED
CA\_SMART\_CARD\_NOT\_RECOGNIZED
CA\_SMART\_CARD\_SUSPENDED











#### **Smartcard statuses**

CA\_SMART\_CARD\_BLACKLISTED
CA\_SMART\_CARD\_COMMUNICATION
CA\_SMART\_CARD\_GOOD
CA\_SMART\_CARD\_MUTE
CA\_SMART\_CARD\_NEVER\_PAIRED
CA\_SMART\_CARD\_NOT\_INSERTED
CA\_SMART\_CARD\_NOT\_PAIRED
CA\_SMART\_CARD\_NOT\_PAIRED
CA\_SMART\_CARD\_NOT\_RECOGNIZED
CA\_SMART\_CARD\_SUSPENDED

#### **Sizes**

CA_COMPONENT_VERSION_SIZE	(Value=50)
CA_DECODER_MESSAGE_SIZE	(Value=50)
CA_EVENT_NAME_SIZE	(Value=17)
CA_PROJECT_NAME_SIZE	(Value =10)
CA_SERIAL_NUMBER_SIZE	(Value=15)
CA_SERVICE_NAME_SIZE	(Value=10)
CA_SOFTWARE_VERSION_SIZE	(Value=20)

# 2.3 Alarms

This functionality is intended for STB Control Task developers. They will use the CA alarms at the native level and then include the *calibx.h* file in their sources.

The alarm messages are not sent directly to the application but rather to the control task, to warn it that something is going wrong with regard to the smart card. It is then up to the control task to decide what to do with the received alarm messages. Very likely, the control task should launch pop-up applications and forward the alarm messages to them, so as to display banners on the screen inviting the user to cancel the error conditions. In this case, pop-up applications developers will use the CA alarms at the o-code level, and then include the *calib.h* file in their sources.

The software layer that implements this API is not involved in any way in the forwarding of the alarm messages to the pop-up applications. Still it provides these applications with all the necessary symbolic constants so as to correctly identify the alarm messages. Each alarm message is described in the next paragraphs.

## 2.3.1 Smart card blacklisted

When the smart card that is inserted in the decoder is detected as a blacklisted smart card, the control task receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_ALARM. The message field INFO\_CA\_ARARM is set to CA\_SMART\_CARD\_BLACKLISTED.

A blacklisted smart card is irremediably disabled. A smart card might typically be blacklisted for instance in case of irregular use of the smart card.

# 2.3.2 Smart card communication

When the smart eard that is inserted in the decoder does not allow an error-free communication, the control task receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_ALARM. The message field INFO\_CA\_ALARM is set to CA\_SMART\_CARD\_COMMUNICATION.

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# 2.3.3 Smart card good

When all error conditions are cancelled and everything is going fine again with regard to the smart card, the control task receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_ALARM. The message field INFO\_CA\_ALARM is set to CA\_SMART\_CARD\_GOOD.

#### 2.3.4 Smart card mute

When the smart card that is inserted in the decoder does not allow any communication at all, the control task receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_ALARM. The message field INFO\_CA\_ALARM is set to CA\_SMART\_CARD\_MUTE.

This alarm message is typically generated when the smart card is inserted upside down.

# 2.3.5 Smart card never paired

When the smart card that is inserted in the decoder has never been paired with any decoder, the control task receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_ALARM. The message field INFO\_CA\_ALARM is set to CA\_SMART\_CARD\_NEVER\_PAIRED.

#### 2.3.6 Smart card not inserted

When the smart card is extracted from the decoder, the control task receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_ALARM The message field INFO\_CA\_ALARM is set to CA\_SMART\_CARD\_NOT\_INSERTED.

# 2.3.7 Smart card not paired

When the smart card that is inserted in the decoder is not paired with that decoder but with another one, the control task receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_ALARM. The message field INFO\_CA\_ALARM is set to CA\_SMART\_CARD\_NOT\_PAIRED.

## 2.3.8 Smart card not recognized

When the smart card that is inserted in the decoder is not recognized as a NagraVision smart card, the control task receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_ALARM. The message field INFO\_CA\_ALARM is set to CA\_SMART\_CARD\_NOT\_RECOGNIZED.

## 2.3.9 Smart card suspended

When the smart card that is inserted in the decoder is detected as a suspended smart card, the control task receives a message of class <code>msg\_class\_ca</code> and type <code>msg\_type\_ca\_alarm</code>. The message field <code>info\_ca\_alarm</code> is set to <code>ca\_smart\_card\_suspended</code>.

Unlike a blacklisted smart card, a suspended smart card is not irremediably disabled. It might recover from suspension thanks to an appropriate EMM. A smart card might typically be suspended if the user is a bad payer.

## 2.3.10 Example of an alarm sequence

Assume that a Nagra Vision smart card is inserted in the decoder and that everything is going fine.





Suppose that the user performs the following actions: First, he extracts his smart card from the decoder; Second, he inserts his smart card upside-down into the decoder; Third he extracts his smart card from the decoder again; Fourth he finally inserts his smart card into the decoder correctly. Here are the successive alarm messages the control task will reseive: First, CA\_SMART\_CARD\_NOT\_INSERTED; Second CA\_SMART\_CARD\_MUTE, Third, CA\_SMART\_CARD\_NOT\_INSERTED; Fourth, CA\_SMART\_CARD\_GOOD.

# 2.3.11 Structure of an alarm message

The description below is given as a guide. It represents the fields found in an alarm message structure:

For more details, please refer to [6] "§2.2.1.5.Icon Gadget Message Handler", p2-10, and to [6] "§2.5.Messages and Message Handlers", p2-37.

```
optv_message Message;
Message.class;
Message.type;
Message.INFO_CA_ALARM;
```

# 2.3.12 Treatment of an alarm message

The description below is given as a guide:

An alarm message is received and treated by the control task. See the instruction "case MSG TYPE CA ALARM:"

```
optv_message Message;
for(;;){
 /*the Control Task is waiting
                                   for the next message: */
  user_queue_wait_message(&Message);
  switch(Message.class){
  case OPTV_CA_CLASS /{
    switch(Message.type){
    case MSG_TYPE_CA_ALARM: {
      switch(Message.INFO/CA_ALARM) {
case CA/SMART_CARD_BLACKLISTED: {
        processCaSmartCardBlacklisted();
         break; }
      case CA_SMART CARD_COMMUNICATION: {
         processCaSmartCardCommunication();
         break;
            CA_SMART_CARD_SUSPENDED: {
        processCaSmartCardSuspended();
        break; }
         *end switch*/
       break; }
```

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```
}/*end switch*/
break;}
.
.
.
}/*end switch*/
}/*end for*/
```

### 2.4 Notifications

This functionality is intended for OpenTV application developers. They will use the CA notifications at the o-code level and then include the *calib.h* file in their sources.

Notification messages are sent asynchronously to the application to warn it that something happened with regard to the NagraVision CA system. The sending of most of the notification messages is triggered by the effect of an EMM on some records of the NagraVision smart card. Nevertheless, notifications might be generated even if information did not actually change. In most cases, when the application receives a notification message, it should call some of the functions provided in this API to update its internal information according to the latest modifications of the data base in the NagraVision smart card.

#### 2.4.1 Credit

When the NagraVision smart card makes a change in the credit records, the application can get notified. It then receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_NOTIFICATION. The message field INFO\_CA\_NOTIFICATION is set to CA\_CREDIT\_INFO\_CHANGED.

This notification message is generated when PPV events are purchased, when the user asks for more credit, or when any other operation that affects the credit records occurs (for example a new smart card insertion). The application should then use the functions <code>caGetCreditInfo</code> and <code>caGetNumCredits</code> to update its internal information.

#### 2.4.2 Current access

There are two categories of accesses. The accesses <code>CA\_ACCESS\_CLEAR</code>, <code>CA\_ACCESS\_FREE</code> and <code>CA\_ACCESS\_GRANTED</code> make up the first category, the one that grants access. The accesses <code>CA\_ACCESS\_BLACKOUT</code> and <code>CA\_ACCESS\_DENIED</code> make up the second category, the one that denies access.

When the current access to the currently watched event changes from one category to the other, according to the access records of the NagraVision smart card, the application can get notified. It then receives a message of class <code>msg\_class\_ca</code> and type <code>msg\_type\_ca\_notification</code>. The message field <code>info\_ca\_notification</code> is set to <code>ca\_current\_access\_changed</code>.

For example, if the user charges from a channel where he has access to a channel where he does not have access, this notification message is generated. If the user goes back to the channel where he has access, then this notification message is generated again.

As another example, if the user is watching a service that goes through a transition from a free access event to a PPV event to which the user does not have access, this notification message is generated. In the particular case where this PPV event has a free access preview time at its beginning, this notification message is generated only at the end of the preview time. In the same situation, but if the user has paid to watch this PPV event, then this notification message is not generated, since a change from a free access to a granted access does not involve a change from an access category to the other.





# 2.4.3 Decoder message

When the NagraVision CA system receives an EMM that contains a message intended for the decoder, the application can get notified. It then receives a message of class MSC\_CDASS\_OA and type MSC\_TYPE\_CA\_NOTIFICATION. The message field INFO\_CA\_NOTIFICATION is set to CA\_DECODER\_MESSAGE\_RECEIVED.

The NagraVision CA system does not impose any semantics for these messages, but rather only provides the application with the transport mechanism that allows it to receive secured, and possibly addressed, messages.

Decoder messages are internally queued into a first-in-first-out structure, so as to allow several messages to be received. Upon reception of this notification message, the application should call the function <code>caGetDecoderMessage</code> to retrieve the decoder message from the queue. As long as the queue is not empty, this notification message is generated again, after each successive call to <code>caGetDecoderMessage</code>. Whenever the queue gets full, the incoming messages are simply discarded. The default queue size is 10, but it can be adapted to the network's requirements.

#### 2.4.4 **Event**

When the NagraVision smart card makes a change in the access records, the application can get notified. It then receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_NOTIFICATION. The message field INFO\_CA\_NOTIFICATION is set to CA\_EVENT\_INFO\_CHANGED.

This notification message is generated when PPV events or subscriptions are purchased, or when any other operation that affects the access records occurs (for example a new smart card insertion). The application should then use the function <code>cagetEventInfo</code> to update its internal information.

#### 2.4.5 Location

When the NagraVision smart card makes a snange in the ZIP code record or in the delta time record, or when any other operation that affects the ZIP code record or the delta time record occurs (for example a new smart card insertion) the application can get notified. It then receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_NOTIFICATION. The message field INFO\_CA\_NOTIFICATION is set to CA\_LOCATION\_INFO\_CHANGED.

The application should then use the function cagetLocationInfo to update its internal information.

# 2.4.6 Purchased PPV event

When the NagraVision smart card makes a change in the PPV records, the application can get notified. It then receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_NOTIFICATION. The message field INFO\_CA\_NOTIFICATION is set to CA\_PURCHASED\_PPV\_EVENT\_INFO\_CHANGED.

This notification message is generated when PPV events are purchased or collected for billing, or when any other operation that affects the PPV records occurs (for example a new smart card insertion). The application should then use the functions <code>caGetNumPurchasedPpvEvents</code> and <code>caGetPurchasedPpvEventInfo</code> to update its internal information.

# 2.4.7 System

When a Nagravision smart card is inserted into the decoder, the application can get notified. It then receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_NOTIFICATION. The message field INFO\_CA\_NOTIFICATION is set to CA\_SYSTEM\_INFO\_CHANGED.





This notification message is generated when the smart card that is inserted into the decoder is different from the one that was previously extracted from it. It is not generated if the smart card that is inserted into the decoder is the same as the one that was previously extracted from it.

The application should then use the function cagetSystemInfo to update its internal information,

In addition to the CA\_SYSTEM\_INFO\_CHANGED notification message, the application right as well receive some other notification messages, like CA\_CREDIT\_INFO\_CHANGED or CA\_EVENT\_INFO\_CHANGED for instance. This is due to the fact that when a smart card replaces another one in the decoder, their data bases are very likely to be different as well.

# 2.4.8 Structure of a notification message

The description below is given as a guide. It represents the fields found in a notification message structure:

For more details, please refer to [6] "§2.2.1.5.Icon Gadget Message Handler", p2-10, and to [6] "§2.5.Messages and Message Handlers", p2-37.

```
o_message Message;
Message.msg_class;
Message.type;
Message.INFO_CA_NOTIFICATION;
```

# 2.4.9 Treatment of a notification message

The description below is given as a guide:

A notification message is received and treated by an OpenTV application. See the instruction "case MSG\_TYPE\_CA\_NOTIFICATION:"

```
o_message Message;
for(;;){
  /*the OpenTV application is waiting for the next message:*/
O_ui_get_event_wait(&Message);
  switch(O_msg_class(&Message))
  case MSG_CLASS_CA: {
    switch(O_msg_type(&Meseage)){
    case MSG_TYPE_CA_NOTIFICATION: {
   switch(Message.INFO_CA_NOTIFICATION) {
      case CA_CREDIT_INFO_CHANGED: {
         processCaCreditInfoChanged();
         break;/
       case CA CURRENT_ACCESS_CHANGED: {
         processCaCurrentAccessChanged();
         break;
            CA_$Y$TEM_INFO_CHANGED:{
         process@aSystemInfoChanged();
         breaki
       break; }
    case) M$G_TYPE_CA_COMMAND: {
       break; }
```

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```
}/*end switch*/
break;}
case :{
    .
    break;}
case :{
    .
    break;}
/*end switch*/
}/*end for*/
```

## 2.5 Functions

This functionality is intended for OpenTV application developers. They will use the CA functions at the o-code level and then include the *calib.h* file in their sources.

As already explained (please refer "§2.1 Jump table"), the calib.h file includes the calibnb.h that must be created by the manufacturer. This calibnb.h file must define the constant calib\_number.

These functions are used either to get informations about the CA status or to react to the reception of a notification message, indicating a change in the CA status

A function call has two consequences:

The first consequence is the immediate returned value that indicates whether the function call could successfully be initiated or not.

The second consequence is a command message, sent by the CA and received asynchronously by the application. This message will be sent, first if the initiation of the function call succeeds, and then after the complete execution of the function call. This command message contains, among others, the requested data and a boolean indicating the validity of this data.

A new call to the same function can only be performed after the reception of the message of the previous call to that function. In other words, the OpenTV application's developer has to wait for the returned message after a function sall, to call the same function again.

On the other hand, a burst call of different functions is possible.

Memory allocation is not performed by this API. Typically an OpenTV application calls a function of this API, passing a pointer as parameter. The memory shall be allocated by the calling application (example: see prototype of function eagetDecoderMessage).

# 2.5.1 Structure of a command message

The description below is given as a guide. It represents the fields found in a command message structure:

For more details, please refer to [6] "§2.2.1.5.Icon Gadget Message Handler", p2-10, and to [6] "§2.5.Messages and Message Handlers", p2-37.

```
o_message Message;

Message.msg_class;
Message.type;
Message.INFO_CA_COMMAND;
Message.INFO_CA_STATUS;
Message.INFO_CA_RESULT;
```



# 2.5.2 Treatment of a command message

The description below is given as a guide:

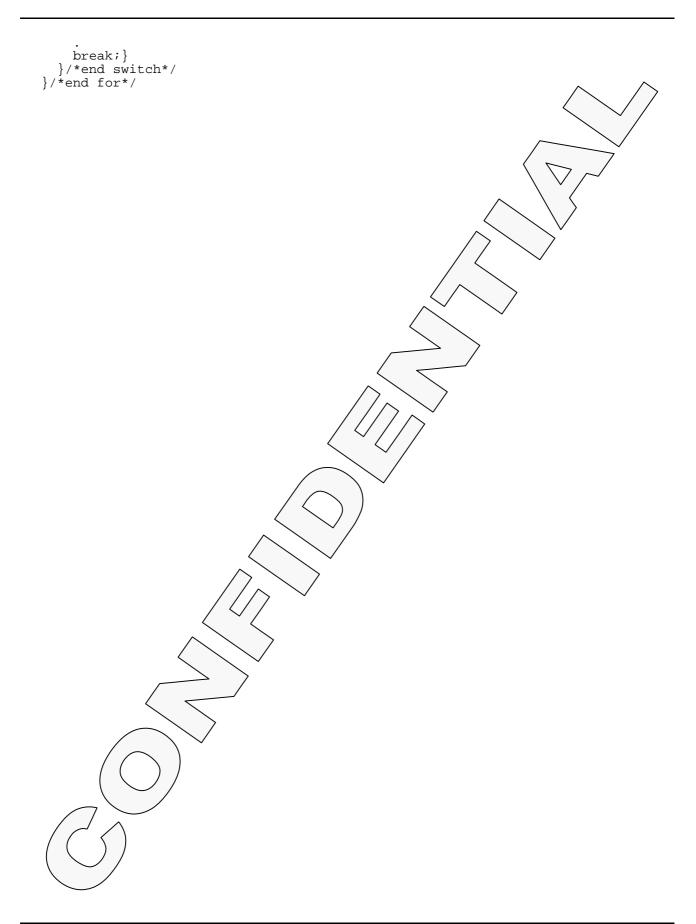
For more details, please refer to [5] "§1.4.3.Main Message Loop", p1-6, and to [5] "§1.6.2.Shared Message Handler", p1-10.

A command message is received and treated by an OpenTV application. See the instruction "case MSG TYPE CA COMMAND:"

```
o_message Message;
for(;;){
  /*the OpenTV application is waiting for the next message:*
  O_ui_get_event_wait(&Message);
  switch(O_msg_class(&Message)){
  case MSG_CLASS_CA: {
    switch(O_msg_type(&Message)){
    case MSG_TYPE_CA_NOTIFICATION: {
      break; }
    case MSG_TYPE_CA_COMMAND: {
      switch(Message.INFO_CA_COMMAND){
      case CA GET CREDIT INFO: {
        switch(Message.INFO_CA_STATUS
        case CA_GOOD:
          processCreditInfo(Message.INFO_CA_RESULT);
          break;}
        case CA_BAD:{
          processCreditInfo(NULL);
          break;}
        }/*end switch*/
        break; }
      case CA_GET_DECODER_MESSAGE:
        switch(Message.INF/CA_STATUS) {
        case CA GOOD: {
          processDecoder Message (Message.INFO_CA_RESULT);
          break;
        case CA_BAD:{
          processDecoderMessage(NULL);
          break; }
        }/*end switch*
        break; }
      case CA UNREGISTER CLIENT: {
        switch (Message.INFO_CA_STATUS) {
        case CA_GOOD:
          processUnregisterClient(CA_GOOD);
          break; }
         case CA_BAD:{
          processUnregisterClient(CA_BAD);
          break:/
          /*end/switch*/
        break; }
       / *end switch*/
      break; }
      *end/switch*/
    break/; }
   ase
```









#### 2.5.3 caGetCreditInfo

### **Description**

Gives information about the ith credit record.

#### **Prototype**

```
typedef struct
{
  unsigned long int providerId;
  unsigned long int credit;
  unsigned long int flags;
} TCaCreditInfo;

Int caGetCreditInfo
(
  unsigned long int xIndex,
  TCaCreditInfo* pxInfo
);
```

#### **Arguments**

xIndex

pxInfo

In: An index in the list of credit records.

In: A pointer where to store the information.

#### Return value

CA\_COMMAND\_ACCEPTED

If the command could successfully be initiated, that is to say, whether the status of the smart card is equivalent to CA\_SMART\_CARD\_GOOD or to CA\_SMART\_CARD\_NOT\_PAIRED or to CA\_SMART\_CARD\_SUSPENDED.

CA COMMAND REJECTED

Otherwise, that is to say, whether the status of the smart card is equivalent to ca\_smart\_card\_blacklisted or to ca\_smart\_card\_communication or to ca\_smart\_card\_mute or to ca\_smart\_card\_not\_- regognized.

CA\_COMMAND\_REJECTED

Also if the call of caGetCreditInfo is prior to the one of the function caGetNumCredits.

#### Side effects

None.

## Comments

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated. If so the application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_COMMAND upon completion of the command. The message field INFO\_CA\_COMMAND is set to CA\_GET\_CREDIT\_INFO. The message field INFO\_CA\_TATUS is set either to CA\_GOOD or to CA\_BAD depending on whether the retrieval of the information about the credit record could complete successfully or not, respectively. The



# CONFIDENTIAL

message field INFO\_CA\_STATUS is also set to CA\_BAD if the index xIndex is out of range. Upon successful completion of the command, the message field INFO\_CA\_RESULT is set to a copy of the pointer pxInfo to a TCaCreditInfo structure.

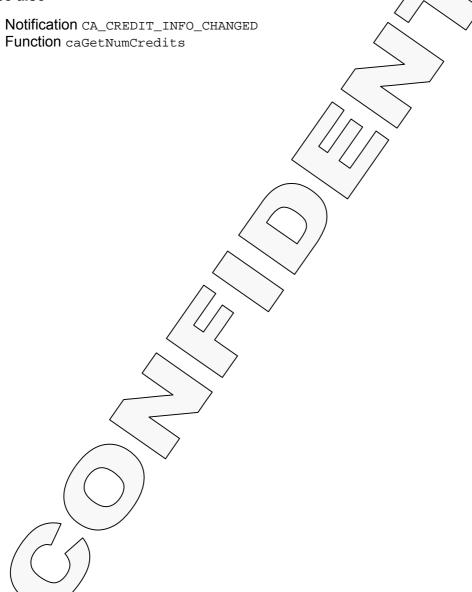
In this structure, the field providerId gives the ID of the service provider, the field credit gives the amount of credit available for that service provider, and the field flags gives some complementary information about the credit record.

The field flags is implemented as a bitmap. To test for the presence of a flag, use bit wise operators with the following possible values:

CA\_FLAG\_SUSPENDED The credit record is suspended.

The range of the index xIndex is 0 to N-1, where N is the number of credit records given by the function cagetNumCredits, otherwise the message field INFO\_CA\_STATUS is set to CA\_BAD, even if the call is accepted. This function has to be called at least once prior to any call to the cagetCreditInfo function.

# See also





# 2.5.4 caGetDecoderMessage

### **Description**

Gives the next available decoder message.

# **Prototype**

```
int caGetDecoderMessage
(
  unsigned char* pxMessage
);
```

### **Arguments**

pxMessage

In: A pointer where to store the message.

#### Return value

CA\_COMMAND\_ACCEPTED

If the command could successfully be initiated, that is to say, whether the status of the smart card is equivalent to CA\_SMART\_CARD\_GOOD OR tO CA\_SMART\_CARD\_NEVER\_PAIRED OR tO CA\_SMART\_CARD\_SUSPENDED.

CA COMMAND REJECTED

Otherwise, that is to say, whether the status of the smart card is equivalent to Ca\_smart\_Card\_blackListed or to Ca\_smart\_Card\_communication or to Ca\_smart\_Card\_mute or to Ca\_smart\_card\_not\_inserted or to Ca\_smart\_card\_not\_-recognized.

#### Side effects

None.

#### **Comments**

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated. If so the application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_COMMAND upon completion of the command. The message field INFO\_CA\_COMMAND is set to CA\_GET\_DECODER\_MESSAGE. The message field INFO\_CA\_STATUS is set either to CA\_GOOD or to CA\_BAD depending on whether the retrieval of the next available decoder message could complete successfully or not, respectively. The message field INFO\_CA\_STATUS is also set to CA\_BAD if there is no message in queue. Upon successful completion of the command, the message field INFO\_CA\_RESULT is set to a copy of the pointer pxMessage. Decoder messages have a size of CA\_DECODER\_MESSAGE\_SIZE bytes.

## See also

Notification CA DECODER MESSAGE RECEIVED



#### 2.5.5 caGetEventInfo

#### **Description**

Gives information about an event.

### **Prototype**

```
typedef struct
{
  unsigned long int access;
  unsigned long int type;
  unsigned long int flags;
  unsigned long int price;
  o_time_in previewTime;
} TCaEventInfo;

int caGetEventInfo
(
  const o_time* pxStartTime,
  const unsigned char* pxCaDesc,
  const unsigned char* pxPpvDesc,
  const unsigned char* pxBlackoutDesc,
  TCaEventInfo* pxInfo
);
```

#### **Arguments**

pxStartTime

In: The UTC start time of the event.

pxCaDesc

In: A pointer to the NagraVision private CA descriptor of the event.

pxPpvDesc

In: A pointer to the MagraVision private PPV descriptor of the event.

pxBlackoutDesc

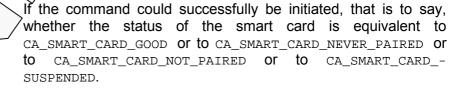
In: A pointer to the NagraVision private blackout descriptor of the event.

pxInfo

In: A pointer where to store the information.

#### Return value

CA\_COMMAND\_ACCEPTED





Otherwise, that is to say, whether the status of the smart card is equivalent to CA\_SMART\_CARD\_BLACKLISTED or to CA\_SMART\_CARD\_COMMUNICATION or to CA\_SMART\_CARD\_MUTE or to CA\_SMART\_CARD\_NOT\_INSERTED or to CA\_SMART\_CARD\_NOT\_RECOGNIZED.

It is worth noting that the call of this function will always be accepted on a clear access channel, whatever the state of the smart card. In fact, in such an access type channel, the status of the smart card will always be considered as CA\_SMART\_CARD\_GOOD.





#### Side effects

None.

#### **Comments**

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated. If so the application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_COMMAND upon completion of the command.

The message field INFO\_CA\_COMMAND is set to CA\_GET\_EVENT\_INFO. The message field INFO\_CA\_STATUS is set either to CA\_GOOD or to CA\_BAD depending on whether the retrieval of the information about the event could complete successfully or not, respectively. Upon successful completion of the command, the message field INFO\_CA\_RESULT is set to a copy of the pointer pxInfo to a TCaEventInfo structure.

In this structure, the field access gives the access condition to the event, the field type gives the type of the event, the field flags gives some complementary information about the event, the field price gives the price of the event and the field preview time gives the preview time of the event.

The possible values for the field access are:

CA\_ACCESS\_BLACKOUT The smart card is in a blackout area.

CA\_ACCESS\_CLEAR The event is not scrambled.

CA\_ACCESS\_DENIED

CA\_ACCESS\_FREE

CA\_ACCESS\_GRANTED

The access to the event is denied.

The access to the event is free.

The access to the event is granted.

The possible values for the field type are:

CA\_TYPE\_IPPV The event is an IPPV event.

The event is a PPV event.

The event is a PPV event.

CA\_TYPE\_SUB The event is part of a subscription.

CA\_TYPE\_CLEAR The event is a clear event.

The field flags is implemented as a bitmap. To test for the presence of a flag, use bitwise operators with the following possible values.

CA\_FLAG\_SUSPENDED The access to the event is suspended.

If the event is an IPPV or a PPV event, the fields price and previewTime are relevant. If the event is part of a subscription, the fields price and previewTime are irrelevant.

The field pxstartTime is mandatory; otherwise the call will be rejected

(CA COMMAND REJECTED).

#### **Private descriptors**

The function <code>caGetEventInFo</code> expects three private descriptors: the CA descriptor, the PPV descriptor and the blackout descriptor. They give the characteristics of an event and are retrieved from the SDT and EIT tables.

If any of these descriptors is present in these tables, it must be passed to the function caGetEventInfo

If the function caget EventInfo is called without any descriptor, this means that no descriptor was available in the SDT or in the EIT tables.

The descriptors PPV descriptor and blackout descriptor are optional. None, or only one, or both can be present in the call to the function <code>caGetEventInfo</code>. If one descriptor is present, it must come with the CA descriptor in the call to the function <code>caGetEventInfo</code>. If both are present, they must come with the CA descriptor in the call to the function <code>caGetEventInfo</code>.

If the CA descriptor is missing, then the returned field access is set to CA\_ACCESS\_CLEAR even it the call is accepted (CA\_COMMAND\_ACCEPTED).

If a Nagra Vision private descriptor is not available for the event, then the corresponding pointer shall be set to NULL.





## See also





#### 2.5.6 caGetLocationInfo

### **Description**

Gives information about the location of the decoder.

### **Prototype**

```
typedef struct
{
  unsigned long int zipCode;
  o_time_in deltaTime;
} TCaLocationInfo;
int caGetLocationInfo
(
  TCaLocationInfo* pxInfo
);
```

#### **Arguments**

pxInfo

In: A pointer where to store the information.

#### Return value

CA\_COMMAND\_ACCEPTED

If the command could successfully be initiated, that is to say, whether the status of the smart card is equivalent to CA\_SMART\_CARD\_GOOD or to CA\_SMART\_CARD\_NEVER\_PAIRED or to CA\_SMART\_CARD\_SUSPENDED.

CA\_COMMAND\_REJECTED

Otherwise, that is to say, whether the status of the smart card is equivalent to Ca\_SMART\_CARD\_BLACKLISTED or to Sa\_SMART\_CARD\_COMMUNICATION or to Ca\_SMART\_CARD\_MUTE or to Ca\_SMART\_CARD\_NOT\_INSERTED or to Ca\_SMART\_CARD\_NOT\_FECOGNIZED.

#### Side effects

None.

#### **Comments**

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated. If so the application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_COMMAND\_upon completion of the command.

The message field IMFO\_CA\_COMMAND is set to CA\_GET\_LOCATION\_INFO. The message field INFO\_CA\_STATUS is set either to CA\_GOOD or to CA\_BAD depending on whether the retrieval of the information about the location of the decoder could complete successfully or not, respectively. Upon successful completion of the command, the message field INFO\_CA\_RESULT is set to a copy of the pointer pxInfo to a TCalocationInfo structure.

In this structure, the field <code>zipCode</code> gives the ZIP code, and the field <code>deltaTime</code> gives the delta time between the local time and the GMT time.





## See also





#### 2.5.7 caGetNumCredits

#### **Description**

Gives the number of credit records.

#### **Prototype**

```
int caGetNumCredits
(
  unsigned long int* pxNum
);
```

### **Arguments**

pxNum

In: A pointer where to store the number.

#### Return value

CA\_COMMAND\_ACCEPTED

If the command could successfully be initiated, that is to say, whether the status of the smart card is equivalent to Ca\_SMART\_CARD\_GOOD or to Ca\_SMART\_CARD\_NOT\_PAIRED or to Ca\_SMART\_CARD\_SUSPENDED.

CA\_COMMAND\_REJECTED

Otherwise, that is to say, whether the status of the smart card is equivalent to Ca\_smart\_Card\_blackListed or to Ca\_smart\_Card\_communication or to Ca\_smart\_Card\_mute or to Ca\_smart\_Card\_mot\_inserted or to Ca\_smart\_card\_not\_-RECOGNIZED.

#### Side effects

None.

#### **Comments**

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated. If so the application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_COMMAND upon completion of the command. The message field INFO\_CA\_COMMAND is set to CA\_GET\_NUM\_CREDITS. The message field INFO\_CA\_STATUS is set either to CA\_GOOD or to CA\_BAD depending on whether the retrieval of the number of credit records could complete successfully or not, respectively. Upon successful completion of the command, the message field INFO\_CA\_RESULT is set to a copy of the pointer pxNum.

This function has to be called at least once prior to any call to the function cagetCreditInfo.

#### See also

Notification ca\_credit\_info\_changed Function cagetCreditInfo



### 2.5.8 caGetNumPurchasedPpvEvents

### **Description**

Gives the number of purchased PPV events.

### **Prototype**

```
int caGetNumPurchasedPpvEvents
(
  unsigned long int* pxNum
);
```

### **Arguments**

pxNum

In: A pointer where to store the number.

#### Return value

CA\_COMMAND\_ACCEPTED

If the command could successfully be initiated, that is to say, whether the status of the smart card is equivalent to CA\_SMART\_CARD\_GOOD OF tO CA\_SMART\_CARD\_NEVER\_PAIRED OF tO CA\_SMART\_CARD\_SUSPENDED.

CA COMMAND REJECTED

Otherwise, that is to say, whether the status of the smart card is equivalent to Ca\_smart\_Card\_blackListed or to Ca\_smart\_Card\_communication or to Ca\_smart\_Card\_mute or to Ca\_smart\_Card\_not\_inserted or to Ca\_smart\_Card\_not\_recognized.

#### Side effects

None.

#### **Comments**

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated. If so the application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE/CA\_COMMAND upon completion of the command.

The message field INFO\_CA\_COMMAND is set to CA\_GET\_NUM\_PURCHASED\_PPV\_EVENTS. The message field INFO\_CA\_STATUS is set either to CA\_GOOD or to CA\_BAD depending on whether the retrieval of the number of purchased PPV events could complete successfully or not, respectively. Upon successful completion of the command, the message field INFO\_CA\_RESULT is set to a copy of the pointer pxNum.

This function has to be called at least once prior to any call to the function caGetPurchasedRpvEventInfo.

#### See also

Notification CA\_PURCHASED\_PPV\_EVENT\_INFO\_CHANGED Function capetPurchasedPpvEventInfo Function capurchaseIppvEvent



# 2.5.9 caGetPurchasedPpvEventInfo

#### **Description**

Gives information about the Ith purchased PPV event.

## **Prototype**

```
typedef struct
{
   o_time startTime;
   char serviceName[CA_SERVICE_NAME_SIZE+1];
   char eventName[CA_EVENT_NAME_SIZE+1];
   unsigned long int providerId;
   unsigned long int type;
   unsigned long int flags;
   unsigned long int price;
} TCaPurchasedPpvEventInfo;

int caGetPurchasedPpvEventInfo
(
   unsigned long int xIndex,
   TCaPurchasedPpvEventInfo * pxInfo
);
```

## **Arguments**

xIndex

pxInfo

In: An index in the list of purchased PPV events.

In: A pointer where to store the information.

### Return value

CA\_COMMAND\_ACCEPTED

If the command could successfully be initiated, that is to say, whether the status of the smart card is equivalent to CA\_SMART\_CARD\_GOOD or to CA\_SMART\_CARD\_NEVER\_PAIRED or to CA\_SMART\_CARD\_SUSPENDED.

CA COMMAND REJECTED

Otherwise, that is to say, whether the status of the smart card is equivalent to CA\_SMART\_CARD\_BLACKLISTED or to CA\_SMART\_CARD\_COMMUNICATION or to CA\_SMART\_CARD\_MUTE or to CA\_SMART\_CARD\_NOT\_INSERTED or to CA\_SMART\_CARD\_NOT\_RECOGNIZED.

CA\_COMMAND\_REJECTED

Also if the call of caPurchaseIppvEvent is prior to the one of the function caGetNumPurchasedPpvEvents.

# Side effects

None

### Comments

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated. If so the application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_COMMAND upon completion of the command.



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The message field INFO\_CA\_COMMAND is set to CA\_GET\_PURCHASED\_PPV\_EVENT\_INFO. The message field INFO\_CA\_STATUS is set either to CA\_GOOD or to CA\_BAD depending on whether the retrieval of the information about the purchased PPV event could complete successfully or not, respectively. The message field INFO\_CA\_STATUS is also set to CA\_BAD if the index xindex is out of range. Upon successful completion of the command, the message field INFO\_CA\_RESOUT is set to a copy of the pointer pxInfo to a TCaPurchasedPpvEventInfo structure. In this structure, the field startTime gives the event start time, the fields sexviceName and eventName give the service name and the event name, as ASCIIZ strings, respectively the field provider\_ID gives the ID of the service provider of the event, the field type gives the type of the event, the field flags gives some complementary information about the event, and the field price gives the price of the event.

The possible values for the field type are:

CA\_TYPE\_IPPV The event is an IPPV event.

CA\_TYPE\_PPV The event is a PPV event.

The field flags is implemented as a bitmap. To test for the presence of a flag, use bitwise operators with the following possible values:

CA\_FLAG\_SUSPENDED The access to the event is suspended.

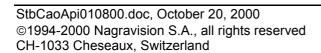
CA\_FLAG\_WATCHED The event is watched.

The range of the index xIndex is 0 to N-1, where N is the number of purchased PPV events given by the function CagetNumPurchasedPpvEvents As already written, if this index is out of range, the message field INFO\_CA\_STATUS will be set to CA\_BAD. This function has to be called at least once prior to any call to the cagetPurchasedPpvEventInfo function.

#### See also

Notification CA\_PURCHASED\_PPV\_EVENT\_INFO\_CHANGED Function caGetNumPurchasedPpvEvents

Function caPurchaseIppvEvent,





# 2.5.10 caGetSystemInfo

#### **Description**

Gives information about the NagraVision CA system.

#### **Prototype**

#### **Arguments**

pxInfo

In: A pointer where to store the information.

#### Return value

CA\_COMMAND\_ACCEPTED

If the command could successfully be initiated.

CA COMMAND REJECTED

If the command could not be issued (insufficient resources, invalid parameter, function busy...).

# Side effects

None

#### **Comments**

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated.

If so, the application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_COMMAND upon completion of the command.

The message field INFO\_CA\_COMMAND is set to CA\_GET\_SYSTEM\_INFO.

The message field INFO\_CA\_STATUS is set either to CA\_GOOD or to CA\_BAD depending on whether the retrieval of the information about the NagraVision CA system could complete successfully or not, respectively.

Upon successful completion of the command, the message field INFO\_CA\_RESULT points to the TCaSystemInfo structure given by the parameter pxInfo.

In this structure, the field systemId gives the system ID of the NagraVision CA system.





The decoderSerialNumber and decoderSoftwareVersion fields give the NagraVision serial number of the decoder and the version of the NagraVision software embedded in the decoder, respectively.

The smartCardSerialNumber and smartCardSoftwareVersion fields give the serial number and the version of the software of the NagraVision smart card, respectively. In case of smart card error, these fields will contain an empty string.

The decoderSerialNumber and smartCardSerialNumber fields are preformatted strings, ready to be displayed, containing the decimal coded serial numbers. The decoderSoftwareVersion and smartCardSoftwareVersion fields are preformatted strings, ready to be displayed.

The decoderSoftwareVersion contains the name of Nagravision CA project name and version, separated by a space character (for example "NICEBOX 1.3.12"). In older CAO versions, it was made of the CAK version and the project version, separated by a space character (for example "1.1.0 1.3.12").

TCaDecoderSwVersion can be printed as an ASCIIZ string.

#### See also

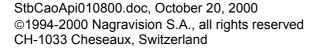
Notification CA\_LOCATION\_INFO\_CHANGED Notification CA SYSTEM INFO CHANGED

Function caGetLocationInfo

Function caGetMoreSystemInfo

Function caDecoderSwVersionGetPrjName

Function caDecoderSwVersionGetPriWersion





# 2.5.11 caGetMoreSystemInfo

### **Description**

Gives additional information about the NagraVision CA system. This function is provided to complement cagetSystemInfo while maintaining backward-compatibility. It is designed to be future-proof, by allowing addition of queries while maintaining the

compatibility.

### **Prototype**

```
typedef enum
 CA_GET_CAO_VERSION,
  CA_GET_SMART_CARD_OPERATOR_ID
} TCaMoreSystemInfoSpecifier;
                                                        VERSION_SIZE +1];
typedef unsigned char TCaComponentVersion[CA_COMPONENT_
typedef union
  TCaComponentVersion
                        caoVersion;
  unsigned long int
                        smartcardOperatorId;
} TCaMoreSystemInfoData;
typedef struct
  TCaMoreSystemInfoSpecifier
                              infoSpecifie
  TCaMoreSystemInfoData
} TCaMoreSystemInfoResponse;
int caGetMoreSystemInfo
                                xInfoŠpecifier,
  TCaMoreSystemInfoSpecifier
  TCaMoreSystemInfoRespons
                                pxľnfo
);
```

#### **Arguments**

xInfoSpecifier

In: The kind of requested system information.

A pointer to a user-allocated TCaMoreSystemInfoResp structure to receive the requested information.

# Return value

pxInfo

CA\_COMMAND\_ACCEPTED

CA\_COMMAND REJECTED

If the command could successfully be initiated.

If the command could not be issued (insufficient resources, invalid parameter, unknown specifier, function busy...).

Side/effects Mone





#### **Comments**

Several information types can be requested through this command; this is specified by the parameter xInfoSpecifier:

CA\_GET\_CAO\_VERSION

Requests the version of this component (CAO), it can be used to determine what functions are currently available. The version can be obtained from the conversion field of the response.

CA\_GET\_SMART\_CARD\_OPERATOR\_ID Requests the ID of the operator responsible for this smart card; the version can be obtained from the smartcardOperatorId field of the response.

Elements of the type TCaMoreSystemInfoSpecifier will never be removed to ensure backward-compatibility.

caGetMoreSystemInfo is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated.

If so, the application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_-COMMAND upon completion of the command.

The message field INFO\_CA\_COMMAND is set to CA\_GET\_MORE\_SYSTEM\_INFO.

The message field INFO\_CA\_STATUS is set either to CA\_GOOD or to CA\_BAD depending on whether the retrieval of the additional information about the system could complete successfully or not, respectively.

Upon successful completion of the command, the message field INFO\_CA\_RESULT points to the TCaMoreSystemInfoResponse structure given by the parameter pxInfo. The attribute infoSpecifier of the response will be set to xInfoSpecifier.

TCaComponentVersion can be printed as a string. Its format complies with the following rule (EBNF syntax):

TCaComponentVersion :: digit {digit} '.'digit {digit} '.'digit {digit} '\0' digit ::= '0' | '1' | 21 | 3' | '4' | '5' | '6' | '7' | '8' | '9'

For example: "1.3.25"

### See also

Function caGetSystemInfo

Function caComponent VersionIsLowerThan





# 2.5.12 caPurchaselppvEvent

### **Description**

Purchases an IPPV event.

### **Prototype**

```
int caPurchaseIppvEvent
(
  const o_time* pxStartTime,
  const char* pxServiceName,
  const char* pxEventName,
  const unsigned char* pxPpvDesc,
  const unsigned char* pxIemmDesc,
  unsigned long int* pxProviderId
);
```

### **Arguments**

pxStartTime

In: The start time of the event.

pxServiceName

In: An ASCIIZ string that gives the name of the service.

pxEventName

In: An ASCIIZ string that gives the name of the event.

pxPpvDesc

In: A pointer to the MagraVision private PPV descriptor of the

event.

pxIemmDesc

In: A pointer to the NagraVision private IEMM descriptor of the

event.

pxProviderId

In: A pointer where to store the ID of the service provider of the event.

#### Return value

CA\_COMMAND\_ACCEPTED

ff the command could successfully be initiated, that is to say, whether the status of the smart card is equivalent to CA\_SMART\_CARD\_GOOD or to CA\_SMART\_CARD\_NEVER\_PAIRED or to CA\_SMART\_CARD\_SUSPENDED.

CA\_COMMAND\_REJECTED

Otherwise, that is to say, whether the status of the smart card is equivalent to CA\_SMART\_CARD\_BLACKLISTED or to CA\_SMART\_CARD\_COMMUNICATION or to CA\_SMART\_CARD\_MUTE or to CA\_SMART\_CARD\_NOT\_INSERTED or to CA\_SMART\_CARD\_NOT\_RECOGNIZED.

Side effects





### **Comments**

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated. If so the application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_COMMAND upon completion of the command.

The message field INFO\_CA\_COMMAND is set to CA\_PURCHASE\_IPPV\_EVENT. The message field INFO\_CA\_STATUS is set either to CA\_GOOD or to CA\_BAD depending on whether the purchase of the IPPV event could complete successfully or not, respectively. In the particular case where no credit record can be found in the NagraVision smart card, the message field INFO\_CA\_STATUS is set to CA\_CREDIT\_NOT\_FOUND. In the particular case where the credit record for the service provider of the event is suspended, the message field INFO\_CA\_STATUS is set to CA\_CREDIT\_SUSPENDED. In the particular case where the amount of credit available for the service provider of the event is too low, the message field INFO\_CA\_STATUS is set to CA\_NOT\_ENOUGH\_CREDIT. In the particular case where the memory in the NagraVision smart card is full, the message field INFO\_CA\_STATUS is set to CA\_NOT\_ENOUGH\_CREDIT. In the particular case where the memory. Finally, in the particular case where the event is not an IPPV event, the message field INFO\_CA\_STATUS is set to CA\_NOT\_IPPV\_EVENT.

If the command is accepted and the completion status of the sommand is different than CA\_CREDIT\_NOT\_FOUND, the message field INFO\_CA\_RESULT is set to a copy of the pointer pxProviderId where the ID of the service provider of the event is stored. In the case where there is not enough credit to buy the event, this information might be used for instance to filter the credit records so as to find the incriminated credit.

If the command is accepted and the completion status of the command is equal to CA\_CREDIT\_NOT\_FOUND, the message field INFO\_CA\_RESULT is irrelevant.

# **Private descriptors**

The function <code>caPurchaseIppvEvent</code> expects two private descriptors: the PPV descriptor and the IEMM descriptor. They give the characteristics of an IPPV event and are retrieved from the EIT table.

All the 6 parameters are mandatory.

If the function <code>caPurchaseIppvEy</code> ent is called and if one of the descriptors is missing, then the returned result is set to <code>CA\_COMMAND\_REJECTED</code>.

### See also

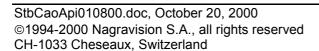
Notification CA\_EVENT\_INFO\_CHANGED

Notification Ca\_PURCHASED\_RPV\_EVENT\_INFO\_CHANGED

Function caGetEventInfo

Function caGetNumPurchasedRpvEvents

Function caGetPyrchasedPpyEventInfo





### 2.5.13 caGetSmartcardStatus

# **Description**

Gives the status of the smart card.

# **Prototype**

```
typedef struct
{
  unsigned long int status;
} TCaSmartcardStatus;
int caGetSmartcardStatus
(
  TCaSmartcardStatus* pxStatus
);
```

### **Arguments**

pxStatus

In: A pointer where to store the information.

### Return value

CA\_COMMAND\_ACCEPTED

If the command could successfully be initiated,

otherwise.

CA\_COMMAND\_REJECTED

# Side effects

None.

### **Comments**

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated. If so the application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_COMMAND upon completion of the command. The message field INFO\_CA\_COMMAND is set to CA\_GET\_SMARTCARD\_STATUS. The message field INFO\_CA\_STATUS is set either to CA\_GOOD or to CA\_BAD depending on whether the retrieval of the information of the command.

the information about the status of the smart card could complete successfully or not, respectively. Upon successful completion of the command, the message field INFO\_CA\_RESULT is set to a copy of the pointer pxStatus to a TCaSmartcardStatus structure.

The field pxStatus corresponds to one of the following values:

```
CA_SMART_CARD_BLACKLISTED
CA_SMART_CARD_COMMONICATION
CA_SMART_CARD_GOOD
CA_SMART_CARD_NUTE
CA_SMART_CARD_NEVER_PAIRED
CA_SMART_CARD_NOT_INSERTED
CA_SMART_CARD_NOT_PAIRED
CA_SMART_CARD_NOT_RECOGNIZED
CA_SMART_CARD_SUSPENDED
```

### See also

INFO\_ea\_ALARM message field values





# 2.5.14 caRegisterClient

# **Description**

Allows an application to indicate that it wants to receive the NagraVision CA system notification messages.

# **Prototype**

```
int caRegisterClient
(
   void
);
```

### **Arguments**

None.

### Return value

CA\_COMMAND\_ACCEPTED If the command could successfully be initiated ca\_command\_rejected otherwise.

### Side effects

None.

### **Comments**

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated. If so, the application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_COMMAND upon completion of the command. The message field INFO\_CA\_COMMAND is set to CA\_REGISTER\_CLIENT. The message field INFO\_CA\_STATUS is set either to SA\_GOOD or to CA\_BAD depending on whether the registering of the client could complete successfully or not, respectively. Upon successful completion of the command, the NagraVision CA system notification messages are routed to the application. This function is idempotent. It means that, even if this function is called several times in a row, the effect will not change. In other words, the actual registration occurs one time and can't be multiple.

#### See also

Function caUnresisterClient





# 2.5.15 caUnregisterClient

### **Description**

Allows an application to indicate that it does not want to receive the NagraVision CA system notification messages any more.

# **Prototype**

```
int caUnregisterClient
(
   void
);
```

### **Arguments**

None.

### Return value

CA\_COMMAND\_ACCEPTED If the command could successfully be initiated.

CA\_COMMAND\_REJECTED otherwise.

### Side effects

None.

### **Comments**

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated. The application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_COMMAND upon completion of the command.

The message field INFO\_CA\_COMMAND is set to CA\_UNREGISTER\_CLIENT. The message field INFO\_CA\_STATUS is set either to SA\_GOOD or to CA\_BAD depending on whether the registering of the client could complete successfully or not, respectively. Upon successful completion of the command, the NagraVision CA system notification messages are not routed to the application any more.

This function is idempotent. It means that, even if this function is called several times in a row, the effect will not change. In other words, the actual un-registration occurs one time and can't be multiple.

#### See also

Function caRegisterClient



# 2.6 Data type manipulation functions

This chapter gives information about data type manipulation functions to be used with the CAO. These functions are defined in *caotools.h*; they are implemented in *caotools.c*.

# 2.6.1 caDecoderSwVersionGetPrjVersion

# **Description**

Extracts the Nagravision CA project version from the decoder software version

# **Prototype**

# **Arguments**

xDecoderSwVersion in: decoder software version to be parsed

xProjectVersion out: resulting project/version

#### Return value

CA\_COMMAND\_ACCEPTED If the function succeeded.

CA\_COMMAND\_REJECTED otherwise

### Side effects

None.

### **Comments**

This function is synchronous.

#### See also

Function caDecoderSwVersionGetPrjName

Function caGetSystemInfo

Function caComponentVersionIsLowerThan



# 2.6.2 caDecoderSwVersionGetPrjName

# **Description**

Extracts the Nagravision CA project name from the decoder software version.

# **Prototype**

# **Arguments**

xDecoderSwVersion in: decoder software version to be parsed

xProjectVersion out: resulting project name

### Return value

CA\_COMMAND\_ACCEPTED If the function succeeded

CA\_COMMAND\_REJECTED otherwise

### Side effects

None.

# **Comments**

This function is synchronous.

TCaProjectName can be printed as an ASCIIZ string.

### See also

Function caGetSystemInfo

Function caDecoderSwVersionGetPrjVersion





# 2.6.3 caComponentVersionIsLower

# **Description**

Compares two component versions.

# **Prototype**

# **Arguments**

xVersion1 in: first version to be compared

xVersion2 in: second version to be compared

pxIsLower Out: xVersion1 < xVersion2

### Return value

CA\_COMMAND\_ACCEPTED If input parameters are correct

otherwise

CA\_COMMAND\_REJECTED

### Side effects

None.

### **Comments**

This function is synchronous

### See also

Function caGetMoreSystemInfo

Function caDecoderSwVersionGetPrjVersion



# 3 API's future extensions

In this section appear the future extensions to the CA API for OpenTV applications, based on the planned new features of the NagraVision CA system. Be aware of the fact that every information given in this section is subject to modification, without any notice.

# 3.1 Symbolic constants

The symbolic constants shown here below are planned to be defined for use in future extensions. Their use is presented and explained throughout the following paragraphs.

# INFO\_CA\_COMMAND message field values

CA\_CLOSE\_RETURN\_CHANNEL
CA\_DECRYPT\_BUFFER
CA\_ENCRYPT\_BUFFER
CA\_GET\_CURRENCY\_INFO
CA\_OPEN\_RETURN\_CHANNEL
CA\_READ\_RETURN\_CHANNEL
CA\_WRITE\_RETURN\_CHANNEL

#### **Sizes**

CA\_SYMBOL\_SIZE (Value=5)

# 3.2 Functions

### 3.2.1 caCloseReturnChannel

# **Description**

Closes a connection on the return channel.

# **Prototype**

int caCloseReturnChannel
(
 unsigned long int xChannelId
);

# **Arguments**

xChannelId \

In: The ID of the channel.

# Return value

CA\_COMMAND\_ACCEPTED

COMMAND REJECTED

If the command could successfully be initiated,

otherwise.





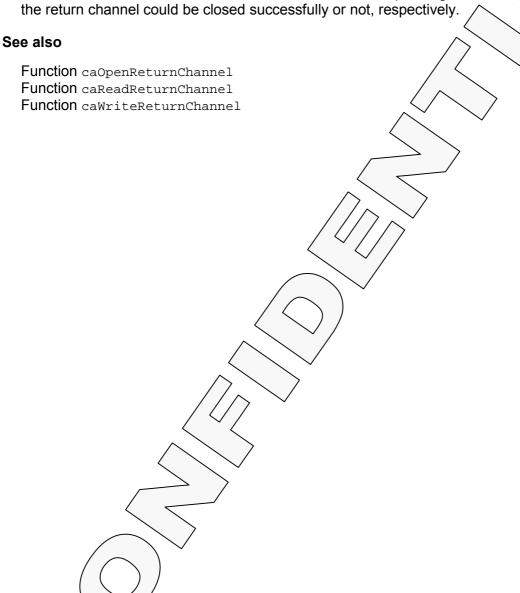
### Side effects

None.

#### **Comments**

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated. If so the application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_COMMAND upon completion of the command.

The message field INFO\_CA\_COMMAND is set to CA\_CLOSE\_RETURN\_CHANNED. The message field INFO\_CA\_STATUS is set either to CA\_GOOD or to CA\_BAD depending on whether the connection on the return of the connection of the





# 3.2.2 caDecryptBuffer

# **Description**

Decrypts a chunk of data.

# **Prototype**

```
int caDecryptBuffer
(
  unsigned long int xProviderId,
  unsigned long int xBufferLength,
  const unsigned char* pxSourceBuffer,
  unsigned char* pxTargetBuffer
);
```

# **Arguments**

xProviderId

In: The ID of the service provider.

xBufferLength

In: The length of the chunk of data to decrypt.

pxSourceBuffer

In: A pointer to the buffer that contains the data to decrypt.

pxTargetBuffer

In/Out: A pointer to the buffer where to store the decrypted data.

#### Return value

CA\_COMMAND\_ACCEPTED

If the command could successfully be initiated,

CA\_COMMAND\_REJECTED

Side effects

None.

### Comments

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated. If so the application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_COMMAND upon completion of the command.

otherwise.

The message field INFO\_CA\_COMMAND is set to CA\_DECRYPT\_BUFFER. The message field INFO\_CA\_STATUS is set either to CA\_GOOD or to CA\_BAD depending on whether the decryption of the chunk of data could complete successfully or not, respectively.

# See also

Function caknery pt suffer



# 3.2.3 caEncryptBuffer

# **Description**

Encrypts a chunk of data.

# **Prototype**

```
int caEncryptBuffer
(
  unsigned long int xProviderId,
  unsigned long int xBufferLength,
  const unsigned char* pxSourceBuffer,
  unsigned char* pxTargetBuffer
);
```

# **Arguments**

xProviderId

In: The ID of the service provider.

xBufferLength

In: The length of the chunk of data to encrypt.

pxSourceBuffer

In: A pointer to the buffer that contains the data to encrypt.

pxTargetBuffer

In/Out: A pointer to the buffer where to store the encrypted data.

#### Return value

CA\_COMMAND\_ACCEPTED

if the command could successfully be initiated

CA\_COMMAND\_REJECTED

# Side effects

None.

### Comments

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated. If so the application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_COMMAND upon completion of the command.

otherwise.

The message field INFO\_CA\_COMMAND is set to CA\_ENCRYPT\_BUFFER. The message field INFO\_CA\_STATUS is set either to CA\_GOOD or to CA\_BAD depending on whether the encryption of the chunk of data could complete successfully or not, respectively.

### See also

Function cabecrypt suffer



# 3.2.4 caGetCurrencyInfo

# **Description**

Gives information about the local currency.

# **Prototype**

```
typedef struct
{
  char symbol[CA_SYMBOL_SIZE+1];
  unsigned long int factor;
} TCaCurrencyInfo;
int caGetCurrencyInfo
(
  TCaCurrencyInfo* pxInfo
);
```

# **Arguments**

pxInfo

In: A pointer where to store the information.

### Return value

CA\_COMMAND\_ACCEPTED

if the command could successfully be initiated,

CA\_COMMAND\_REJECTED

### Side effects

None.

#### Comments

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated. If so the application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE CA\_COMMAND upon completion of the command.

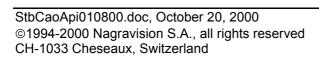
otherwise

The message field INFO\_CA\_COMMAND is set to CA\_GET\_CURRENCY\_INFO. The message field INFO\_CA\_STATUS is set either to CA\_GOOD or to CA\_BAD depending on whether the retrieval of the information about the local currency could complete successfully or not, respectively. Upon successful completion of the command, the message field INFO\_CA\_RESULT is set to a copy of the pointer pxInfo to a TeaCurrencyInfo structure.

In this structure, the field symbol gives the local currency symbol as an ASCIIZ string, and the field factor gives the local currency-scaling factor.

### See also

None







# 3.2.5 caOpenReturnChannel

# **Description**

Opens a connection on the return channel.

# **Prototype**

```
int caOpenReturnChannel
(
  unsigned long int xProviderId,
  unsigned long int* pxChannelId
);
```

# **Arguments**

xProviderId

In: The ID of the service provider:

pxChannelId

In/Out: A pointer where to store the ID of the channel.

### Return value

CA\_COMMAND\_ACCEPTED

if the command could successfully be initiated, CA\_COMMAND\_REJECTED otherwise.

# Side effects

None.

#### Comments

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated. If so the application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_COMMAND upon completion of the command. The message field INFO\_CA\_COMMAND is set to CA\_OPEN\_RETURN\_CHANNEL. The message field

The message field INFO\_CA\_COMMAND is set to CA\_OPEN\_RETURN\_CHANNEL. The message field INFO\_CA\_STATUS is set either to CA\_SOOD or to CA\_BAD depending on whether the connection on the return channel could be opened successfully or not, respectively.

### See also

Function caCloseReturnChannel Function caReadReturnChannel Function caWriteReturnChannel



### 3.2.6 caReadReturnChannel

# **Description**

Reads a chunk of data from a connection on the return channel.

# **Prototype**

```
int caReadReturnChannel
(
  unsigned long int xChannelId,
  unsigned long int xBufferLength,
  unsigned char* pxBuffer
);
```

# **Arguments**

xChannelId

In: The ID of the channel.

xBufferLength

In: The length of the chunk of data to read.

pxBuffer

In/Out: A pointer to the buffer where to store the read data.

### Return value

CA\_COMMAND\_ACCEPTED

if the command could successfully be initiated,

CA\_COMMAND\_REJECTED

otherwise.

# Side effects

None.

### **Comments**

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated. If so the application receives a message of class MSG\_CLASS\_CA and type MSG\_TYPE\_CA\_COMMAND upon completion of the command.

The message field INFA\_CA\_COMMAND is set to CA\_READ\_RETURN\_CHANNEL. The message field INFO\_CA\_STATUS is set either to CA\_GOOD or to CA\_BAD depending on whether the chunk of data could be read successfully from the connection on the return channel or not, respectively.

### See also

Function caCloseReturnChannel function cappenReturnChannel function caWriteReturnChannel





### 3.2.7 caWriteReturnChannel

### Description

Writes a chunk of data to a connection on the return channel.

# **Prototype**

```
int caWriteReturnChannel
(
  unsigned long int xChannelId,
  unsigned long int xBufferLength,
  const unsigned char* pxBuffer
);
```

# **Arguments**

xChannelId

In: The ID of the channel.

xBufferLength

In: The length of the churk of data to write.

pxBuffer

In/Out: A pointer to the buffer that contains the data to write.

### Return value

CA\_COMMAND\_ACCEPTED

if the command could successfully be initiated,

CA\_COMMAND\_REJECTED

otherwise.

### Side effects

None.

### **Comments**

This function is asynchronous and returns right away with a return value that indicates whether the command could successfully be initiated. If so the application receives a message of class MSG\_CLASS\_CA and type MSG\_TXPE\_CA\_COMMAND upon completion of the command.

The message field INFO\_CA\_COMMAND is set to CA\_WRITE\_RETURN\_CHANNEL. The message field INFO\_CA\_STATUS is set either to CA\_GOOD or to CA\_BAD depending on whether the chunk of data could be written successfully to the connection on the return channel or not, respectively.

#### See also

Function cacloseReturnChannel Function cacpenReturnChannel Function careadReturnChannel