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Information Security

ID Module Software Development Kit (SDK)

User's Guide

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1 Introduction

This manual describes the installation, usage and deinstallation of the ID Module SDK *Software Package* V1.05. The ID Module *Software Package* consists of the ID Module SDK which allows the integration of the SIEMENS biometric fingerprint recognition into any application, as well as a compilable example code which exhibits the usage of the ID Module SDK for the integration of biometric fingerprint recognition into any application as well as a precompiled demo program. The biometric fingerprint recognition as well as the archive are integrated in the ID Module.

The manual contains:

- Installation instructions
- Deinstallation instructions
- Overview of the functions
- Description of the usage of the demo program

1.1 Validity of the Manual

This manual was written for the ID Module *Software Package* V1.05, and is valid only for this product and its components, the ID Module SDK and the ID Module demo program.

1.2 Relationship to Other Documents

This User's Guide is intended to provide the user with an overview and broad understanding of the ID Module *Software Package* V1.05. Special attention is given to the description of the demo program and an overview of the functions available in the ID Module SDK. An exact definition of each function's behavior is given in the ID Module SDK P*rogrammer's Guide*. The ID Module interface is described in the ID Module Interface Description - ID Module Firmware V1.05.

1.3 Target Group

The ID Module SDK *Software Package User's Guide* addresses all users of the ID Module SDK *Software Package* as well as developers of biometric systems and integrators of such. Familiarity with the operating systems Windows 95, Windows 98, Windows NT 4.0 and Windows 2000 Release Candidate 2 is assumed, whereas no special knowledge of biometric algorithms is needed.

1.4 Structure of the Manual

Chapter 2 gives an overview of the ID Module SDK *Software Package* and its components as well as an overview of the SIEMENS biometric algorithms. Chapter 3 explains the installation and startup of the product in which system requirements as well as a step-by-step installation procedure are given. Chapter 4 represents the main part of this User's Guide by giving a thorough introduction

to the components of the ID Module SDK *Software Package:* the ID Module SDK, a functional demo program and an example code. Therein section 4.2 provides detailed guidelines for usage and working with the demo program – this might be of special interest for all the users who want to concentrate on the demo first. In chapter 5 more detailed technical data about the product is given. Chapter 6, 7, 8 and 9 contain a list of related documents, definitions of terms and abbreviations as well as an index respectively.

2 Overview of the ID Module SDK Software Package

2.1 Purpose of the Product

The ID Module SDK, the most important part of the ID Module SDK *Software Package,* is designed to support the integration of biometric ID Module SDK recognition into various applications. It contains the standard biometric functions to implement biometric security into any application, especially the enrollment of a person in the system, the adaptation of reference data, the verification of a user, as well as database functions. Therefore, the ID Module SDK is a powerful tool for component manufacturers as well as application programmers of high-level biometric applications. There are different ways of using the ID Module SDK. First, there are system integrators, who integrate functions of the ID Module SDK into their own applications. These are typically Windows C/C++ programmers, who do not need any specific knowledge of biometric systems. On the other hand there might be biometric integrators, who wish to use the sensor with or without the SIEMENS biometric algorithms implemented by the ID Module SDK to create high-level security applications which include biometrics. Finally, there is the end user, who uses these systems generated by third party (e.g. system integrators). They do not need any particular knowledge of computer applications and especially not on biometrics. The modular set in which SIEMENS biometric hardware and software is implemented enables to serve all those customers.

In addition to the integration of the SIEMENS biometric algorithms, the ID Module SDK also enables the use of the Infineon Technologies capacitive sensor alone by only using the driver functions with individual proprietary biometric functions. However, for most users it is helpful to open the biometric functions of the ID Module SDK without worrying about their complex algorithms and their implementation. This is as easy as opening a standard Microsoft function, only different file headers have been included and different LIBs must be integrated.

The product ID Module SDK V1.05 is a SW component which provides a Fingerprint API for host applications to:

- communicate with the ID Module via a serial interface (RS232).
- obtain access to functionality provided by the ID Module

2.2 Volume of the Product

In this document the complete philosophy of the ID Module SDK is outlined. To facilitate the development of security applications using biometrics with the ID Module SDK, this philosophy is packaged as a bundle of software called the ID Module SDK. Together with the ID Module SDK a compact example program consisting of various source code files is given to enable a fast user to start developing his own biometric applications by simply following the example code. This example code is well inline commented. The example program comes with a graphical user interface (GUI) to give the user an impression of what the developer software can be used for. The GUI is easy to use and virtually self-explanatory. Furthermore, to explain the functioning of a complete biometric system and its implementation through the ID Module SDK, a demo system is also part of the ID Module SDK *Software Package*.

The three parts of the ID Module SDK *Software Package* will be discussed thoroughly in this ID Module SDK *Software Package User's Guide*. In the remainder of this introductory chapter an overview of biometrics and the SIEMENS biometric algorithms, the structure of the ID Module SDK *Software Package* as well as the ID Module SDK will be given. The ID Module SDK *Software Package* and its components will be described in detail in chapter 4.

2.3 Biometrics and the ID Module SDK's Biometric Algorithms

The SIEMENS ID Module SDK provides the ability to enhance existing applications with biometric security. Generally speaking, biometrics means the verification of a person's identity by using an unique characteristic that is inherently attached to the respective person. Such personal characteristics can be either physiological (e.g. fingerprints, face features) or behavioral (e.g. dynamic signatures or voice samples). In contrast to identification tokens such as keys or ID cards, biometric characteristics cannot be lost or stolen and thus cannot be used by unauthorized individuals.

In any biometric system there are serveral general processes. The first is the so-called *enrollment* phase to create the *reference data* of the respective user. This reference data serves as the basic description of the user's specific biometric features. During any subsequent usage of the biometric system this initially acquired piece of reference data – in this case a description of the user's fingerprint – will be used for the comparison with a current feature set. This second process can either be *verification* or *identification*.

Adaptation of reference data denotes the process of enhancing existing reference data during subsequent usage of the system.

Verification means that the system checks whether a person is who he or she claims to be. This implies that the identity of the respective person has been provided to the system prior to the verification. This could, for example, be done by entering the user's name or a chip card with the respective details. Identification on the other hand means that the system is not provided with the identity of the respective person. Identification thus implies that the system checks whether you are a known and authorized person by comparing your biometric features to those of all persons that are known to the system.

The SIEMENS ID Module SDK implements the basic biometric algorithms except the verification in an easy-to-use collection of SDK functions with C interface. The flow chart diagram in **Figure 2-1** shows the software flow that is present in the SIEMENS fingerprint recognition algorithms. Also, if the flow chart is simplified, it shows the principles of the underlying signal processing performed on a processor engine. The major software blocks are the *Encoder* – the module that extracts the relevant fingerprint characteristics, and the *Matcher* module – for the comparison of reference and actual fingerprint characteristics.

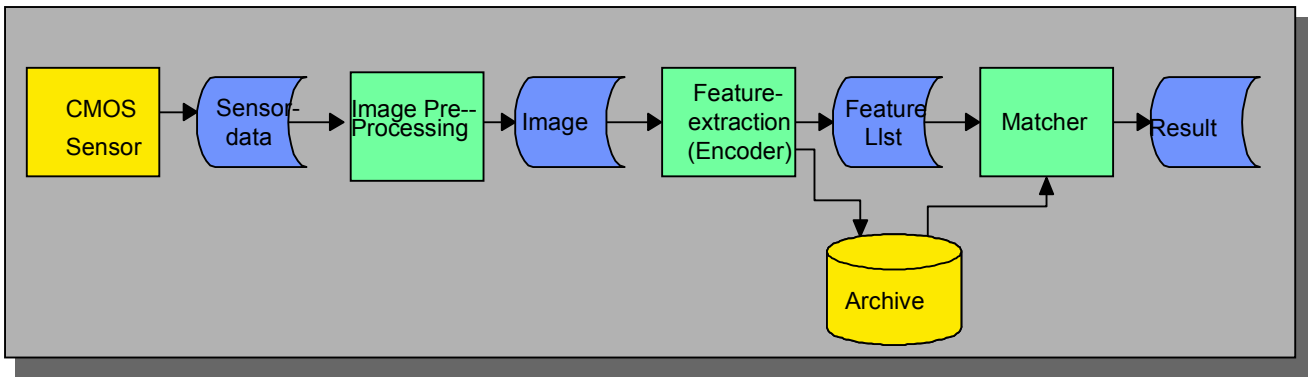

Figure 2-1: Principle Software Data Flow

2.4 Structure of the ID Module SDK Software Package

The ID Module SDK *Software Package* consists of the ID Module SDK, as well as a demo program and example code explaining its use.

The user of the ID Module SDK uses the functionality of the whole SDK software package within their proprietary applications that integrate biometrics as a security mechanism. The ID Module SDK does not provide a graphical user-interface (GUI). The ID Module SDK's functions are usable only by using the defined interface of a static DLL. The ID Module SDK structure is illustrated in Figure 2-2.

All three blocks in the body of the ID Module SDK are single libraries. The whole ID Module SDK is a static DLL.

The demo program provides a graphical user-interface. The example code is available as C source code.

Thus the components of the ID Module SDK Software Package are:

- **Component "Demo Program"**
  This component demonstrates all functions of the ID Module SDK V1.05. The basic functions of the demo program of ID Module SDK aid visualization and show the usage of the biometric algorithms as well as the sensor guiding.

- **Component "Example Code"**
  The basic functions of the example code show example of calling up the functions of the ID Module SDK in C source-code.

- **Component "Setup"**
  This component installs all product components of the ID Module SDK on the PC.

- **The ID Module SDK V1.05**
  This component is used to integrate biometric security into an user application.

- **CallBack**
  For the function "FAPIEnrollment an application programmer must define functions for the interaction with the end user (message boxes for example). The implementation of these functions is completely left to the application programmer. The implementation, however, must be compliant with the function parameters defined in the ID Module SDK V1.05.

2.5 Structure of the ID Module SDK

The basic functions of the ID Module SDK are discussed for each of the blocks given in Figure 2-2.

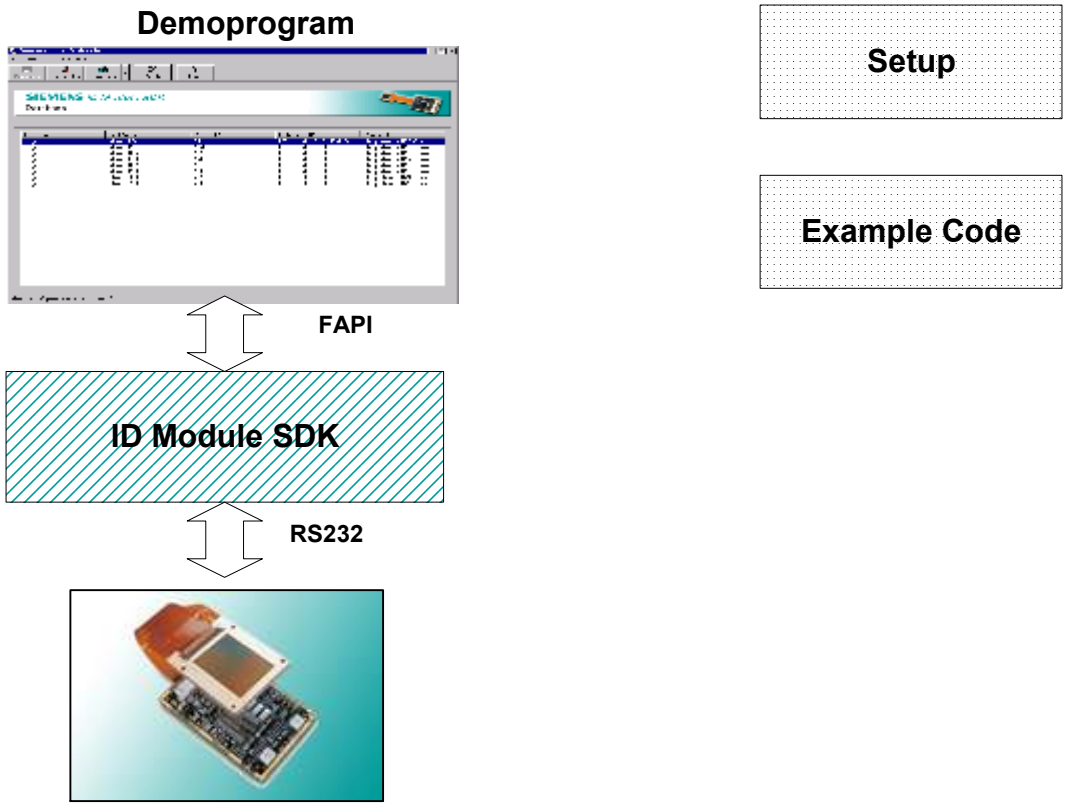

Figure 2-2: Block Level View of ID Module SDK

3 Installation and Startup

3.1 System Requirements

The following resources are necessary in order to use the ID Module SDK Software Package, the development of biometric applications with the ID Module SDK, as well as the ID Module SDK demo software:

Hardware requirements:

- PC, Intel Pentium Processor, min. 133 MHz, monitor with minimal resolution 800*600, main storage min. 32 MB
- RS 232 interface
- ID Module Device

Software requirements:

- Operating system Windows 95, Windows 98, Windows NT 4.0 SP5, Windows 2000 Release Candidate 2
- Microsoft Visual C++ 6.0 as development tool

3.2 Installation Instructions

- A resolution of 800x600 is required for the demo program.
- From the *ID Module SDK Software Package* CD start the program setup.exe. Follow the instructions of the setup program. This setup will install the *ID Module SDK Software Package* in the directory selected at the beginning of the installation.
- Following this, the PC must be rebooted to save the changes. All *ID Module SDK Software Package* applications can now easily be started.
- Connect the ID Module to the RS232 port of your PC **after** finishing the aforementioned steps of the setup.

After initiating setup program important information concerning the recent version of the *ID Module SDK Software Package* is displayed. Then the installation location can be chosen. Setup proposes the location C:\Programs\IDModuleSDK. In the start menu of your computer a new program folder IDModuleSDK is created.

Please read the information in the Readme file carefully. After successfully installing the ID Module SDK *Software Package*, the Readme file displayed at the beginning of the installation can be found in the root directory of your ID Module SDK *Software Package* for your reference. Follow

the instructions of the Readme file carefully.

In the case that the software should not work properly, despite complete and proper installation, please contact the manufacturer:

Important:	For further information please contact: SIEMENS ICM CD IS FT Tel.: +49 - (0)89 - 722 – 49403 Fax: +49 – (0)89 – 722 – 23071 e-mail: gerhard.sobotzki@mch.siemens.de

When reporting an error, please always specify the version number of your *ID Module SDK Software Package* and a short description of the error. The *error sheet* on CD and on your hard disk after the installation process can be used to report any problems within your ID Module SDK application. Please fill in this document and send it to us by fax or e-mail.

3.3 Startup

Assuming the ID Module SDK *Software Package* was installed in C:\Programs\IDModuleSDK, Setup installs the following files in four directories:

- Demo: from here the idmodule_demo.exe (with the example GUI) can be called
- Sample: here the idmodule_bsp.c example code and an example Visual Basic header file (idmodule.bas) can be found
- SDK: here the ID Module SDK can be found (*.dll, *.h, *.lib)
- Doc: documentation (*User's Guide*, *Programmer's Guide*)

Following this, Setup asks you to reboot your computer, which is necessary for the proper functioning of all components of the ID Module SDK *Software Package*. Then the demo program can be started by either double clicking on the file idmodule_demo.exe or selecting it from the respective *Programs* section in the computers *start menu*. The example code could be compiled by using Microsoft Visual C++ 6.0, and the ID Module SDK can be used as described in the ID Module SDK *Software Package User's Guide* and the ID Module SDK *Programmer's Guide*.

3.4 Deinstallation

All components of the ID Module SDK *Software Package* can be deleted from your computer by using your computers *Uninstall* function.

4 Detailed Description of the ID Module SDK Software Package

In this chapter a detailed description of the modules belonging to the ID Module SDK *Software Package* is given. The structure of the ID Module SDK *Software Package* is as given in Figure 4-1. First all callable ID Module SDK functions will be enumerated in Chapter 4.1 together with a description of their behavior. A detailed description of the demo program and its user interface follows, demonstrating typical biometric procedures and how a system developed with the ID Module SDK looks like. Finally, the example code is reviewed shortly.

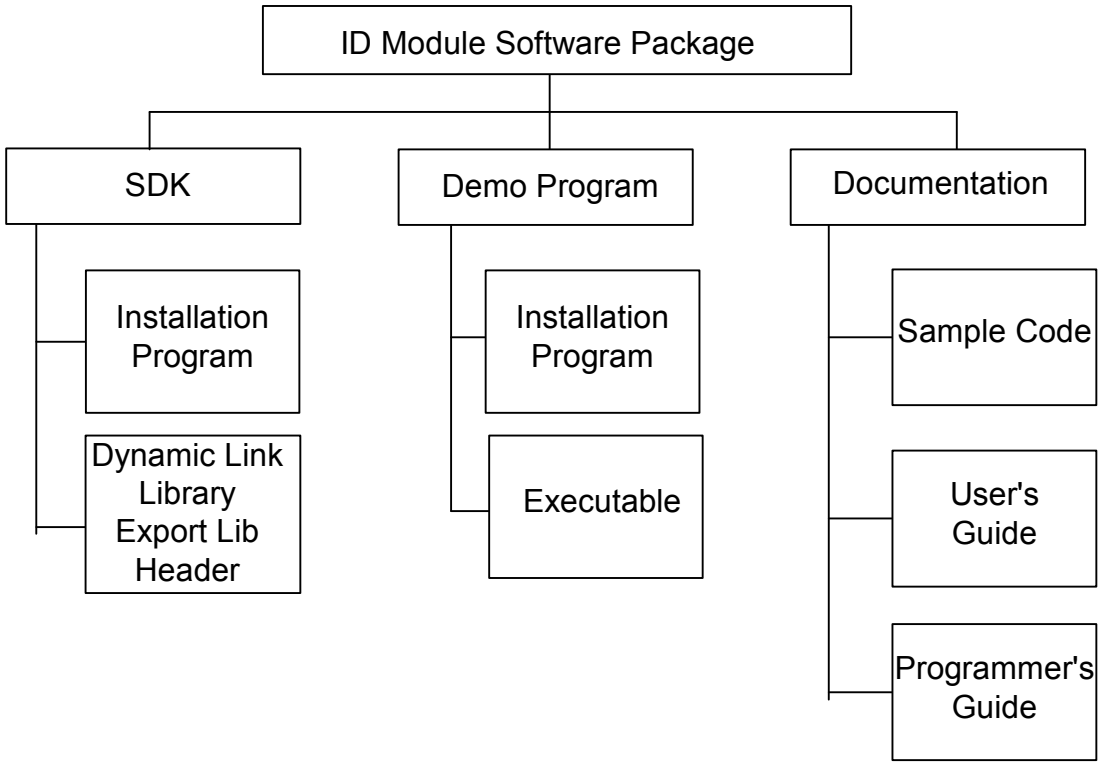

Figure 4-1: ID Module SDK Volume

4.1 The ID Module SDK

The ID Module SDK is universal and can thus be integrated into any proprietary systems and applications. It was designed to meet the following requirements:

- Simple integration of the ID Module SDK in customized applications

- Universal (integration into any application)

In what follows a short description of the functions of the ID Module SDK will be given

For a more thorough description of the ID Module SDK functions with respect to their input and output parameters, error codes, etc., please refer to the ID Module SDK Pr*ogrammer's Guide*.

Function overview	**Short description**
FAPIAcquireDevice	Initializes and connects to the ID Module via the given serial port and returns a so-called Device Handle, which is used by most of the functions to identify the desired ID Module
FAPIReleaseDevice	Frees all resources allocated by Device Handle.
FAPIFree	Frees allocated memory which were previously allocated by the SDK
FAPIAcquireArchive	Initializes the Archive Handle. This handle is required for all archive management functions.
FAPIReleaseArchive	Frees all resources allocated by Archive Handle
FAPIGetErrorText	Returns an error text for a given error number

FAPIAppendPerson	A person is added to the ID Module archive
FAPIChangePersonData	Changes the person specific data of a person stored in the ID Module archive
FAPIChangeIDModuleOperationMode	Configures the ID Module's module operation mode (module security data)
FAPIChangeIDModulePassword	Changes the ID Module's module password (module security data)
FAPIConfigIDModule	The host application can configure the ID Module archive
FAPIDeleteArchive	Deletes the ID Module archive
FAPIDeletePerson	Deletes a person from the ID Module archive
FAPIDeleteReferenceFromPerson	Deletes a reference from a person stored in the ID Module archive
FAPIEnrollment	Enrolls a new person or a new reference of an existing person to the ID Module archive
FAPIEnumPerson	Returns a person (person specific data and biometric data) stored in the ID Module archive. Subsequent

	calls return all persons from the ID Module archive
FAPIEnumPersonData	Returns person specific data from a person stored in the ID Module archive. Subsequent calls return all person specific data from the ID Module archive
FAPIEnumReferenceFromPerson	Returns person specific data and one reference from a person. Subsequent call returns all references of the given person
FAPIExtractBioData	Returns the encoded fingerprint of the finger put on integrated sensor of the ID Module
FAPIGetPerson	Returns a person (person specific data and biometric data) stored in the ID Module archive
FAPIGetPersonData	Returns person specific data from a person stored in the ID Module archive
FAPIGetPersonID	Returns the next free PersonID in the ID Module archive
FAPIGetReferenceFromPerson	Returns person specific data and one reference from a person
FAPILiveIdentifyPerson	Identifies a person; This function includes image acquisition, generation of biometric data and identification
FAPILoadFirmware	Loads the ID Module Firmware
FAPIReadConfigIDModule	Returns the current configuration of the ID Module
FAPISelfTest	Performs self-test
FAPIStateIDModule	Returns current state of the ID Module
FAPIStateIDModuleFlash	Returns current state of the ID Module flash

FAPICreateDeviceConfiguration	Creates all necessary registry entries for an ID Module
FAPIDeleteDeviceConfiguration	Deletes all necessary registry entries for an ID Module
FAPIUpdateConfigurationFromModule	Stores current configuration of an ID Module in the corresponding registry entries.

FAPISerialize	Converts particular memory structures into a byte block representation according to definitions of [3]
FAPIDeserialize	Converts particular byte block representations of person related data according to definitions of [3] into the corresponding memory structures.

FAPIFreeSerialized	Frees memory allocated by a call of FAPISerialize.

4.2 Sequences (scenarios) of interactions with the environment

- **Scenario "Identification"**

  The host application starts the process of identification via the active host interface. The ID Module firmware reads raw image data from the FingerTIP™ sensor. The biometric data will be extracted and compared to the corresponding data stored in the ID Module archive. After finishing the process, the ID Module signals the host application one of the following results:

  Person identified successfully

  Person identification failed

  Error

- **Scenario "Enrollment"**
  This process enrolls references/persons authorized for access. The number of references to be taken is configurable. The process of enrollment is started via the active host interface .The person specific data including PersonID will be sent to the ID Module. ID Module signals the host application to ask the end user to put the finger on the FingerTIP™ sensor. Depending on the user input, the host application signals the ID Module to continue or cancel the enrollment process. The ID Module firmware reads raw image data from the FingerTIP™ sensor. The biometric data is extracted. If it is able to record a certain number of valid references, these references and the person specific data are stored in the ID Module archive. After finishing the process the ID Module returns the result of the enrollment process to the host application. The possible results are:

  Enrollment successful

  Error

- **Scenario "Archive management"**

This process enables a host application to manipulate the ID Module archive using the functions depicted in detail in the corresponding specification of the Archive management functions (eg. delete person, append person).

4.3 Working with the ID Module "Demo Program"

A demo program is delivered with the ID Module SDK *Software Package* to explain the use of all ID Module SDK functions and the embedding of their external interfaces in a graphical user

interface. All interactions between ID Module SDK functions work via function interfaces. The processes in the demo program show how the user can call basic functions of the ID Module SDK from a graphical user-interface, and raw as well as processed biometric data for verification respective identification are explained. For the application programmer as well as the end user, the demo program presents the possibility to acquaint him- or herself with the system as well as to check the functionality of the sensor. The demo program offers a simple examination of the sensor functionality as well as initial trials the complete biometric system.

The ID Module SDK *Software Package* Component "Demo Program" demonstrates the functionality of the following external interfaces of the ID Module SDK by a graphical user-interface:

- FAPIEnrollment for the enrollment of a person or a new reference for a pre-existing person into the system
- FAPILiveIdentify for image acquisition, generation of biometric data and identification of a person in small ID Module archives
- Data Management Functions

4.3.1 Main Window of the Demo Program

The main window of the demo program – as shown in Figure 4-2 - is divided into the following areas:

- Menu bar
- Symbol bar
- Dialog area
- Status area

Menu and symbol bar represent interaction with the user via menus and symbol buttons respectively. The main biometric procedures, such as enrollment or verification, as well as mode options chosen by the user can be found here. The dialog is reserved for detailed communication with the user depending on the special action chosen. The status bar always gives an overview of the process running.

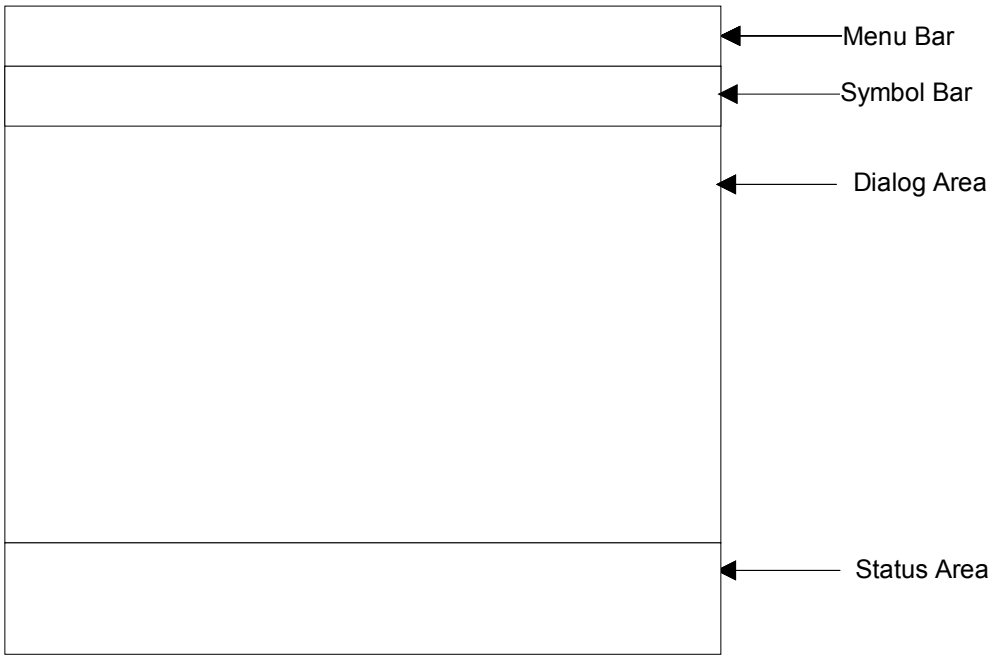

Figure 4-2: Main window of the demo program

4.3.2 Initial State of the Demo Program

After the initialization of the Demo Program, the "Database Dialog" in Figure 4-3 is shown. In the case of existing entries (e.g. pre-enrolled persons) in the ID Module archive, those are displayed as a list. The first entry in the list is pre-selected. In the case of an error (error in the Registry, ...) a message box with the respective error codes and the respective error messages are displayed.

4.3.2.1 Menu bar

The menu bar is divided into several drop-down menus that represent the functionality of the Demo Program. In the following sections, the menu items and their functions are described.

Menu Item "File"

"File" is the first (left most) item on the menu bar. The menu item "File" offers the following options and function respectively:

Menu Entry	Function	Short Cut
Exit	Exit from the program	ALT - F X

Menu "Mode"

"Mode" is the second item on the menu bar. The menu item "Mode" offers the following options and function:

Menu Entry	Function	Short Cut
Identification	Display of dialog “Identification”	ALT – M I
Enrollment - New Person	Start of the enrollment process of an new person.	ALT – M E N
Enrollment - Change Person	Change an existing person, add or delete references from an existing person	ALT – M E C

Menu „Options“

"Options" is the third item on the menu bar. The menu item "Options" offers the following functions:

Menu Entry	Function	Short Cut
Capture	Mode of image acquisition can be selected, either single mode (acquisition of single images) and trigger mode (continuous reading of images by the sensor, until timeout or acceptance of the image)	ALT – O C S .. single mode ALT – O C T .. trigger mode

Menu "Help"

"Help" is the fourth item on the menu bar. The menu item "Help" offers the following options and function:

Menu Entry	Function	Short Cut
About	Short information on the ID Module SDK (dialog "About")	ALT – H A

4.3.2.2 Symbol Bar

The symbol bar offers all menu items as buttons. Thus, the respective procedure (for instance, basic biometric processes of identification and enrollment) can be started by simply clicking the button. The following buttons are always visible:

Button	Functionality
	Display of dialog “Database”
	Display of dialog "Identification"
	Display of dialog "Enrollment – New Person"
	Display of dialog "Enrollment – Change Person"
	Delete current selected person and displays notification dialog “Delete”
	Information on the ID Module SDK (dialog "About")

4.3.2.3 Status Area

This area, covering one row, is used by the system to the display status messages.

4.3.2.4 Dialog Area

Depending on the function selected in the Demo Program, the following dialogs are displayed in the dialog area:

- Dialog "Database" maintenance of the ID Module archive
- Dialog "Enrollment – New Person" enrollment of a person into the ID Module archive
- Dialog "Enrollment – Change Person" enrollment of a reference for an existing person into the ID Module archive
- Dialog "Identification" identification

4.3.3 Dialog "Database"

This dialog as shown in Figure 4-3 serves to maintain the ID Module archive as the internal biometric database which stores the reference data of the persons enrolled in the system. It offers the following functions:

- Insertion of a person into the ID Module archive
- Deletion of a person
- Display of all Persons present in the ID Module archive

The dialog "Database" is shown,

- in the initial state of the Demo Program (see Section 4.3.2);
- if the button "Database" was chosen in one of the following dialogs.

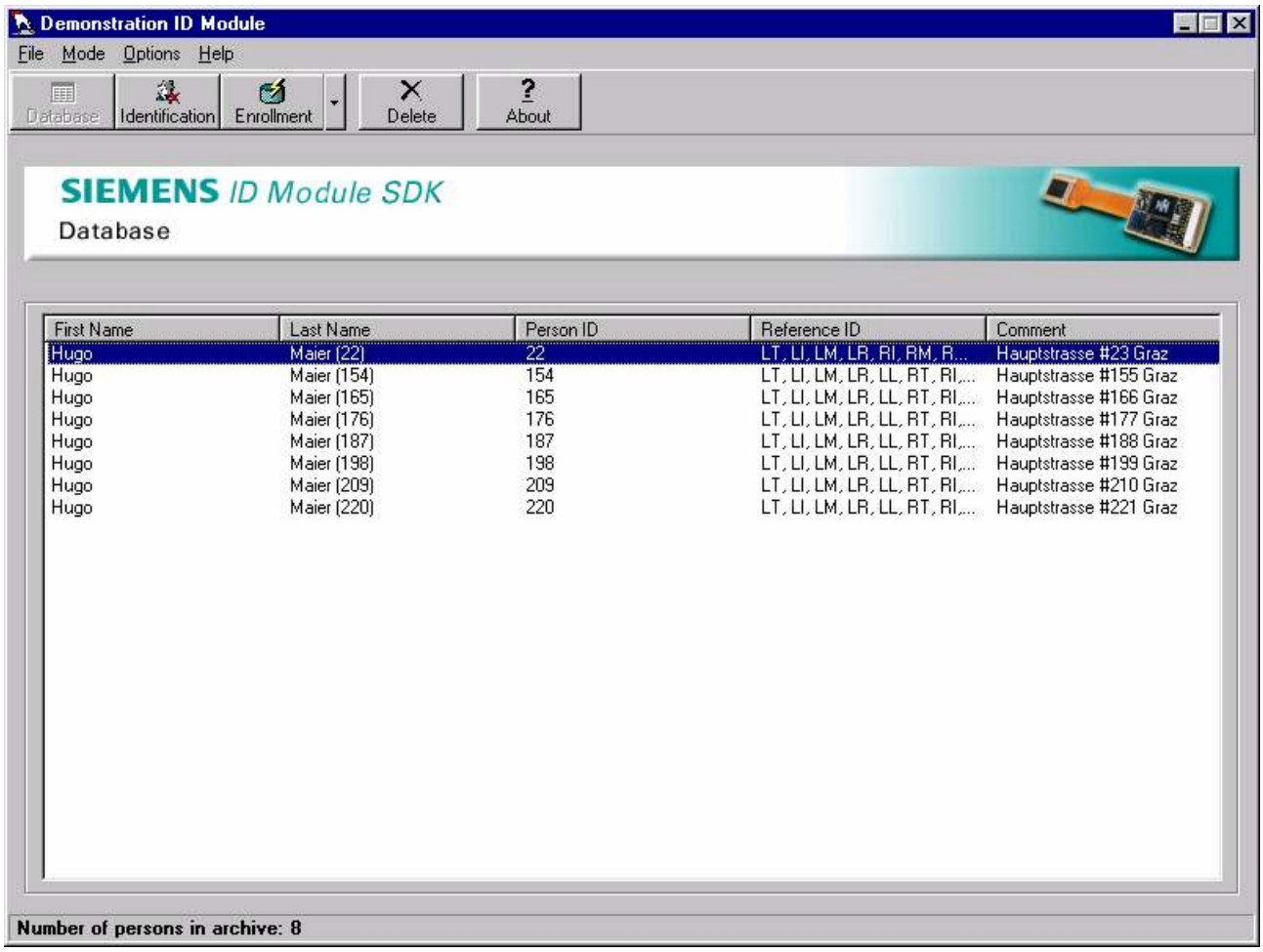

Figure 4-3: Dialog "Database"

Initial state of the dialog:

The dialog area of the dialog gives a summary of the enrolled persons of the desired ID Module. The first entry in an existing ID Module archive list is pre-selected. The following tables give an overview of the states represented in the dialog area of the database dialog:

Area	
Symbol bar area	The button “Database” is disabled. If no persons are enrolled, the button “Delete” and the menu entry “Enroll – Change Person” are disabled.
Dialog area	If present, the list of the Persons, stored in the ID Module archive, is displayed and the first entry is marked.
Status area	Displays the amount of currently enrolled persons

Field	Action	Description
Listbox "persons"	Selectable	Used for the selection of a person

Use of the dialog:

The database dialog allows one to perform database actions to an existing ID Module archive, e.g. new person can be added or deleted from the ID Module archive. To perform an action with the “Delete” or “Enroll – Change Person” buttons, a person must be selected from the list.

The following actions can be selected in the database dialog by clicking the respective buttons:

Button	Action
Selection of Button "Minimize"	Shrink Demo Program to symbol size
Selection of Button "Close"	Quit the Demo Program

4.3.4 Dialog "Enrollment – New Person"

Enrollment in a biometric system is the process of initially acquiring biometric reference data to be used in subsequent identification of a special person. The dialog "Enrollment – New Person" serves the initial input of person specific information into the biometric system. In our case the reference data consists of personal information in conjunction with an encoding of fingerprint specific data. The fingerprint is, for example, characterized by its minutiae. The personal information including the selection of the special finger to be enrolled has to be specified in this dialog, before the actual enrollment process, the calculation of reference fingerprint features that describe the respective finger selected can be started by clicking the button “Enroll”.

The dialog "Enrollment – New Person" – as pictured in Figure 4-4 - is shown,

- when the menu item "Enrollment - New Person" is chosen from the menu "Mode".
- when the button "Enrollment - New Person" is chosen from the symbol bar.
- shortcut "ALT- M E N".

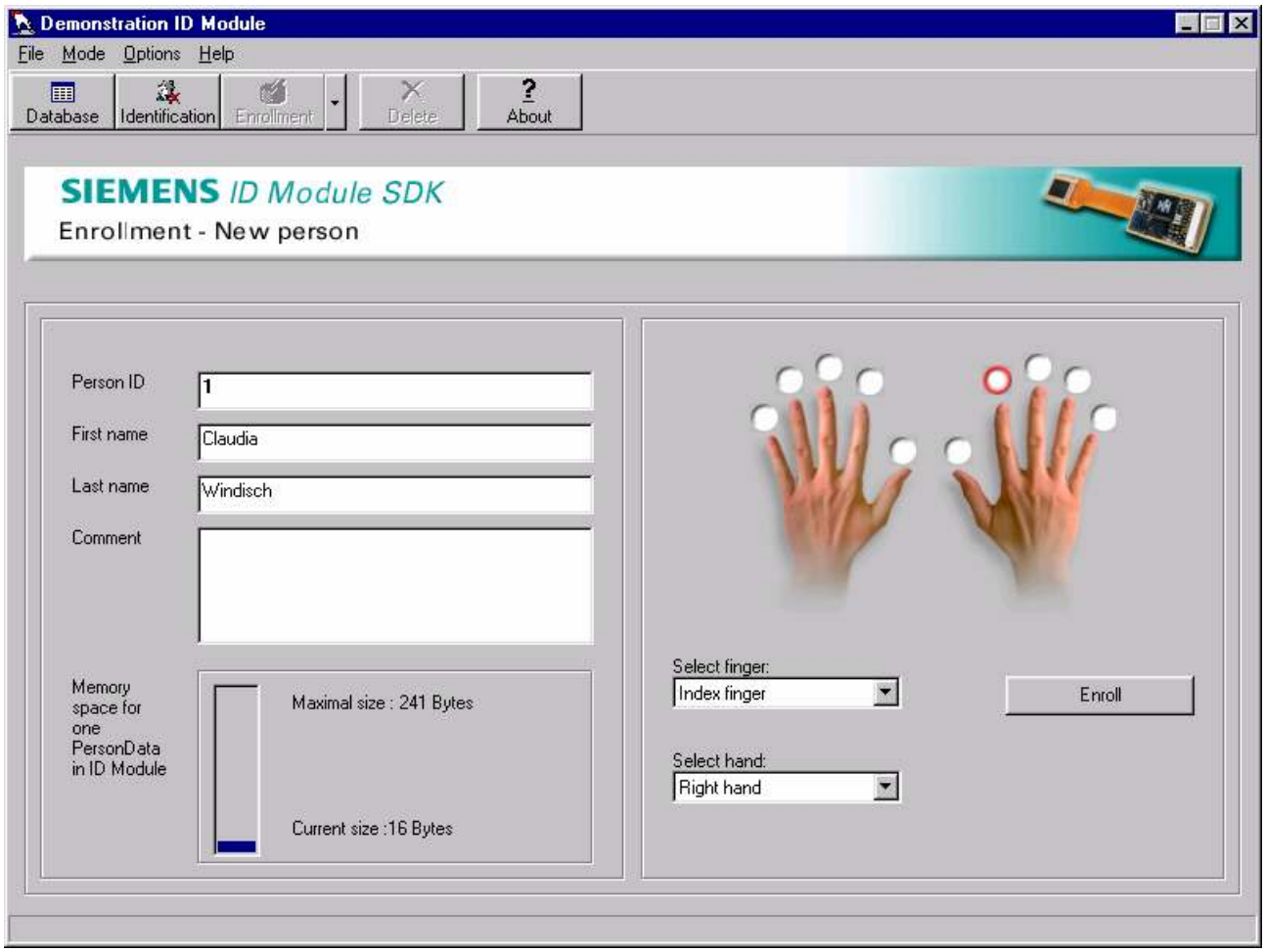

Figure 4-4: Dialog "Enrollment – New Person"

Initial state of the dialog:

Initially, all fields that can be filled in the dialog "Enrollment – New Person" are empty, and the cursor is in the field "PersonID". Thus, the user must start filling in the required fields before starting the enrollment process.

The communication area of the dialog is summarized as follows:

Area	
Symbol bar area	Buttons “Delete” and “Enrollment” are disabled
Dialog area	Display of the dialog "Enrollment – New Person"
Status area	Empty

Usage of the dialog:

The fields in the dialog must be filled in before starting the enrollment process, because they specify the additional person specific data that are attached to the specific finger of the respective person to be enrolled. In an end-user system, this data will be used to achieve a coded person identifier (since for legal and privacy reasons fingerprints will not be attached to "real names"). Choosing the button “Enroll” will start the biometric reference construction.

The dialog "Enrollment – New Person" with a description of the mandatory fields to be filled in as well as the actions, triggered from this menu, is summarized by the following tables:

Field	**Property**	**Description**
Field "PersonID"	Number	Unique identifier, Range: 1 – 65000
Field "First Name"	Alphanumeric input	First name of the person, required input
Field "Last Name"	Alphanumeric input	Last name of the person, required input
Field "Comment"	Alphanumeric input	Short description of the person, optional input
Combo box “Select hand” / “Select finger”	Clickable	These combo boxes are used to select the hand and finger, respectively. Upon changing the hand or finger, the corresponding circle above the finger is also selected automatically.
Circles above the fingers	Clickable	Each of the 10 fingers has a circle above it that shows the status of the finger: *Green*: The finger has been saved in the ID Module archive. *White*: The finger is not yet in the archive. The selected finger is indicated by a circle with a *red* border.

		You can select a finger by clicking one of the circles. The values displayed in the “Select Hand” and “Select Finger” fields (combo boxes) are automatically set accordingly.
Progressbar “Memory space”		Displays the available memory space for the person specific data.

The possible actions in the dialog "Enrollment – New Person" are as follows:

Button	**Action**
Selection of Button "Enroll"	If all required fields are filled, the enrollment is started. Otherwise the notification dialog "Person Data" is displayed. If the finger is not yet in the archive, you are requested to place the appropriate finger on the sensor three times. If you do not place the finger on the sensor in time, you are asked whether the capture should be repeated. If the quality of the captured image is poor, the capture must be repeated. After the fingerprint has been captured successfully, the added finger is highlighted in green and the dialog “Enrollment – Change Person” will be displayed.
Selection of Button "Minimize"	Shrink Demo Program to symbol size
Selection of Button "Close"	Quit the Demo Program

4.3.5 Dialog "Enrollment – Change Person"

The dialog "Enrollment – Change Person" serves for adding references to or deleting references from an existing person in the biometric system.

The dialog "Enrollment – Change Person" is shown as pictured in Figure 4-5,

- when the menu item "Enrollment - Change Person" is chosen from the menu "Mode".
- when the button "Enrollment - Change Person" is selected from the symbol bar.
- after successful enrollment of the first reference for a person.
- as shortcut "ALT- M E C".

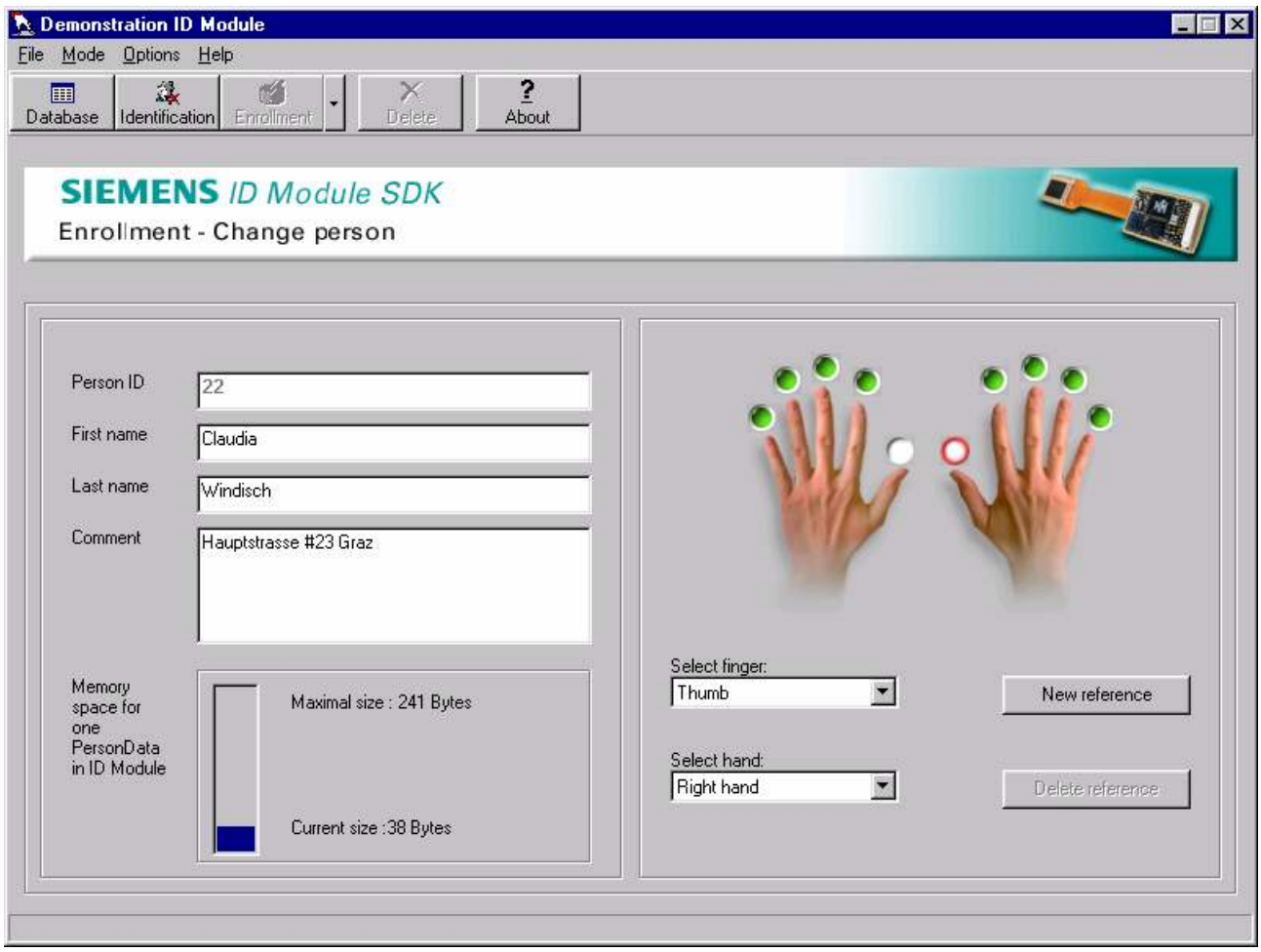

Figure 4-5: Dialog "Enrollment – Change Person"

Initial state of the dialog:

Initially, all fields to be filled in the dialog "Enrollment – Change Person" are filled with the data of the selected person, and the cursor is in the field "First Name". Thus, the user must start filling out the required fields before starting the biometric enrollment. The filled “PersonID” is not editable.

The communication area of the dialog is summarized as follows:

Area	
Symbol bar area	Buttons “Delete” and “Enrollment” are disabled
Dialog area	Display of the dialog "Enrollment – Change Person"
Status area	Empty

Usage of the dialog:

The fields in the dialog are filled with the data of the selected person. The dialog "Enrollment – Change Person" with a description of the mandatory fields to be filled in as well as the actions, that can be triggered from here, is summarized by the following tables:

Field	Property	Description
Field "PersonID"	Number	Unique identifier, Range: 1 – 65000 Not editable
Field "First Name"	Alphanumeric input	First name of the person, required input
Field "Last Name"	Alphanumeric input	Last name of the person, required input
Field "Comment"	Alphanumeric input	Short description of the person, optional input
Combo box "Select hand" / "Select finger"	Clickable	These combo boxes are used to select the hand and finger, respectively. On changing the hand or finger, the corresponding circle above the finger is also selected automatically.
Circles above the fingers	Clickable	Each of the 10 fingers has a circle above it that shows the status of the finger: *Green*: The finger has been saved in the ID Module archive. *White*: The finger is not yet in the archive. The selected finger is indicated by a circle with a *red* border. You can select a finger by clicking one of the circles. The values displayed in the "Select Hand" and "Select Finger" fields (combo boxes) are automatically set accordingly.
Progressbar "Memory space"		Displays the available memory space for the person specific data.

The possible actions in the dialog "Enrollment – Change Person" are as follows:

Button	Action
Selection of Button "New reference"	If all required fields are filled, the enrollment is started. Otherwise the notification dialog "Person Data" is displayed. Only enabled if a new reference is selected.
Selection of Button "Delete reference"	Deletes the selected reference Only enabled if an existing reference is selected.
Selection of Button "Minimize"	Shrink Demo Program to symbol size
Selection of Button "Close"	Quit the Demo Program

4.3.6 Dialog "Identification"

This dialog serves to identify a person. After finishing the identification, the respective result is displayed.

Identification means that the system is not provided with the identity of the respective person. Identification implies that the system checks whether you are a known and authorized person by comparing your biometric features to those of all persons that are known to the system. This is achieved by comparing the recent fingerprint of the person to be identified with all fingerprints in the ID Module archive, in order to find the fingerprint that is the most similar to the one of the person to be recognized. The person is identified as being either the person in the ID Module archive with the most similar reference, or as not being in the database if a sufficiently similar reference does not exist.

The dialog "Identification" is shown (see Figure 4-6),

- when the menu item "Identification" is chosen from the menu "Mode".
- when the button "Identification" is selected from the symbol bar.
- short cut "ALT – M I" .

Initial state of the dialog:

Since identification does not demand any other information from the user than the fingerprint to be used for identification, there are no fields to be filled in by the user before he or she can start identification. Thus, when the dialog is started, the button "Identify" contains the cursor to start the identification process.

The communication area of the dialog is summarized as follows:

Area	
Symbol bar area	Buttons “Delete”, “Identification” and “Enrollment – Change Person” are disabled.
Dialog area	Display of the dialog "Identification"
Status area	Empty

Field	**Property**
Picture "PictureBox"	Some advertising will be shown
Field "PersonID"	Not editable
Field "First Name"	Not visible
Field "Last Name"	Not visible
Field "Comment"	Not visible
Field "ReferenceID”	Not visible
Field "Result"	Not visible

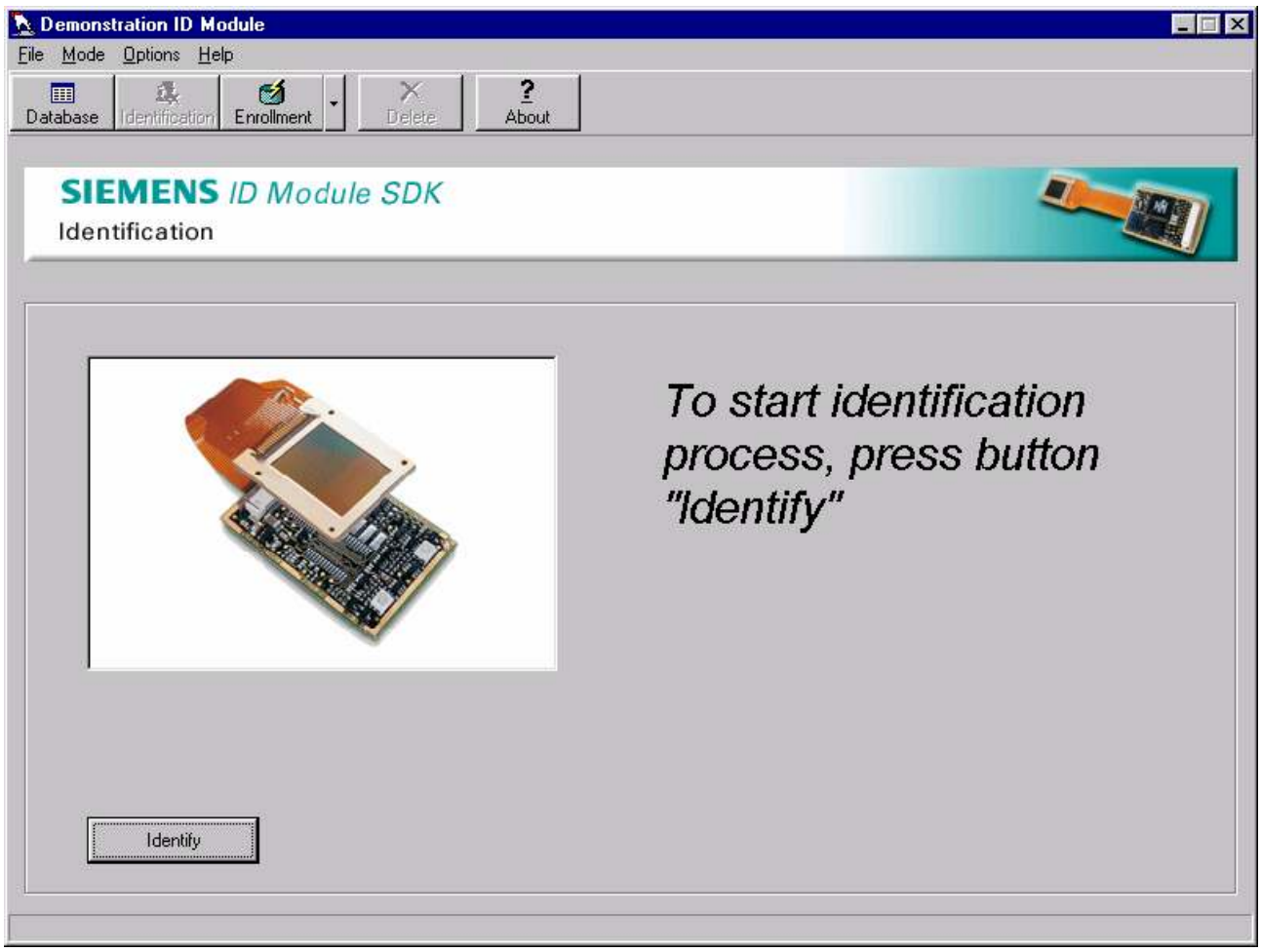

Figure 4-6: Dialog "Identification"

Usage of the dialog:

After pressing the button "Identify", the processing is started and in the case of successful identification the display fields are filled with the data of the respective person and the respective fingerprint is pictured in the picture area as given in the following table:

Field	**Property**
Picture "PictureBox"	Some advertising will be shown
Field "PersonID"	Not editable, visible in case of successful identification
Field "First Name"	Not editable, visible in case of successful identification
Field "Last Name"	Not editable, visible in case of successful identification
Field "Comment"	Not editable, visible in case of successful identification

Field "ReferenceID"	Not editable, visible in case of successful identification
Field "Result"	Not editable, display of the result of the identification

The possible actions in the dialog "Identification" are as follows:

Button	**Action**
Selection of Button "Identify"	If the Capture Mode "Single" is checked the notification dialog "Finger". Otherwise a box with the text "Please put finger on sensor" will be displayed
Selection of Button "Minimize"	Shrink Demo Program to symbol size
Selection of Button "Close"	Quits the Demo Program

4.3.7 Notification-Dialog "Person Data"

This modal dialog serves to notify the user that a mandatory field in "Enrollment – New Person" or "Enrollment – Change Person" is missing. The dialog reminds the user to type in the missing data that is needed before the biometric enrollment can be started. After selecting the "OK" button, the user is supposed to enter the required information.

Display of the dialog:

- Enrollment – New Person
- Enrollment – Change Person

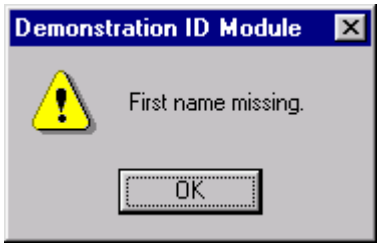

Figure 4-7: Notification-Dialog "Person Data"

Usage of the dialog:

Button	**Action**
Selection of Button "OK"	The cursor is set to the respective field

Selection of Button "Close"	Dialog is closed

4.3.8 Notification-Dialog "Finger"

This modal dialog is used in all dialogs where fingerprint images are acquired and serves to notify the user, to put the finger onto the sensor of the ID Module. (Actually it is not necessary to put the finger on the sensor of the ID Module before this message is displayed.)

Display of the dialog:

- Enrollment – New Person
- Enrollment – Change Person
- Identification

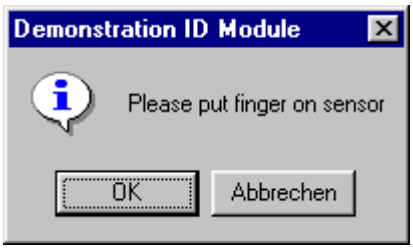

Figure 4-8: Notification-Dialog "Finger"

Usage of the dialog:

Button	**Action**
Selection of Button "OK"	If the dialog "Enrollment – New Person / Change Person" is active, the return value for the callback function FAPICallBackEnroll is set to FAPI_OK. Otherwise FAPILiveIdentifiy is called.
Selection of Button "Cancel"	If the dialog "Enrollment – New Person / Change Person " is active, the return value for the callback function FAPICallBackEnroll is set to FAPI_CALLBACK_CANCEL. Otherwise processing is aborted.
Selection of Button "Close"	Dialog is closed

4.3.9 Notification-Dialog "Quality"

This modal dialog serves for interaction with the user. In any biometric system the recognition performed is directly dependent on the quality of the enrollment process. Thus, in the case of fingerprint recognition, if the quality of the enrollment finger images is too poor, recognition

performance can be decreased. The modal dialog "Quality" thus notifies the user that a reference image with relatively low picture quality has been acquired, and gives the user an option to acquire a new image with better picture quality.

Display of the dialog:

- Enrollment – New Person
- Enrollment – Change Person

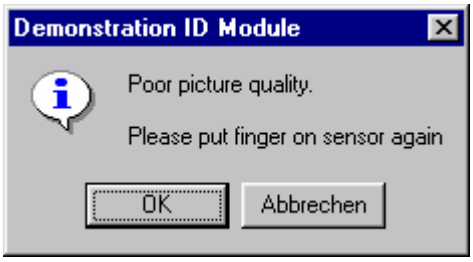

Figure 4-9: Notification-Dialog "Quality"

Usage of the dialog:

Button	**Action**
Selection of Button "OK"	If the dialog "Enrollment – New Person / Change Person" is active, the return value for the callback function FAPICallBackEnroll is set to FAPI_OK.
Selection of Button "Cancel"	If the dialog "Enrollment – New Person / Change Person " is active, the return value for the callback function FAPICallBackEnroll is set to FAPI_CALLBACK_CANCEL.
Selection of Button "Close"	Dialog is closed.

4.3.10 Notification-Dialog "Delete"

This modal dialog serves as a security notification that a person will be deleted from the ID Module archive.

Display of the dialog:

- Deletion of a person from the ID Module archive

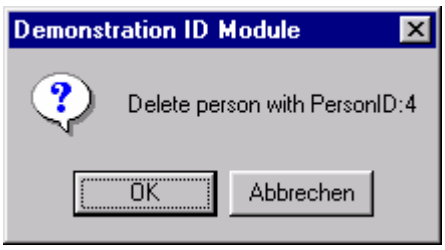

Figure 4-10: Notification-Dialog "Delete"

Usage of the dialog:

The dialog is displayed when the deletion of a person is selected in the dialog "Database". If the user selects "OK", the selected person is deleted. Otherwise the system returns to the dialog:

Button	**Action**
Selection of Button "OK"	Call of the function "FAPIDeletePerson"
Selection of Button "Cancel"	Display of the dialog "Database"
Selection of Button "Close"	Dialog is closed

4.3.11 Notification-Dialog "About"

This modal dialog serves to display information about the ID Module SDK.

Display of the dialog happens

- when the menu item "About" is chosen from the menu "Help".
- when the button "About" is chosen from the symbol bar.
- when short cut "ALT – H A" is used.

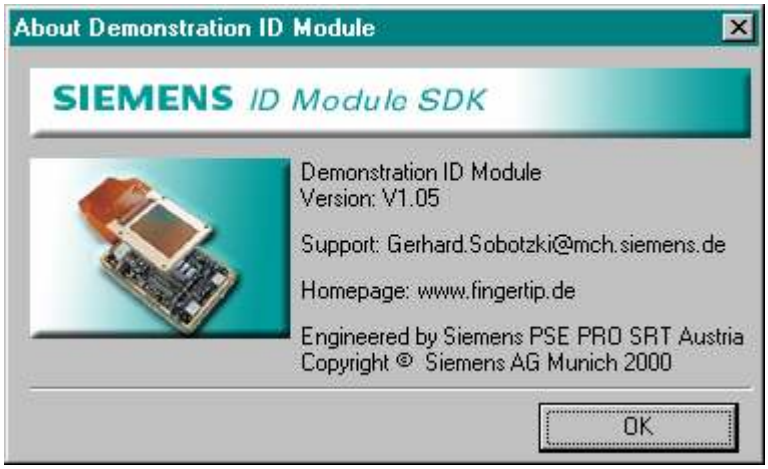

Figure 4-11: Dialog "About"

Usage of the dialog:

Button	Action
Selection of Button "OK"	Dialog is closed
Selection of Button "Close"	Dialog is closed

4.4 The ID Module SDK Software Package Component "Example Code"

The documentation of the ID Module SDK comes in the form of an easy-to-read and well inline documented example code. The example code serves as a

- Guideline for the usage of the ID Module SDK by system integrators;
- Exemplary and compilable enumeration of all ID Module SDK functions.

After the installation of the ID Module SDK *Software Package*, the ID Module SDK example code can be found in the directory section of the root directory of the installation.

5 Technical data and value constraints

5.1 Structure of the ID Module SDK Software Package

The Setup program installs the following directories and files them into the chosen installation directory (default: C:\Programs\IDModuleSDK). The files and the directory structure can be viewed in the following figure. Directories have been shaded, while files are white.

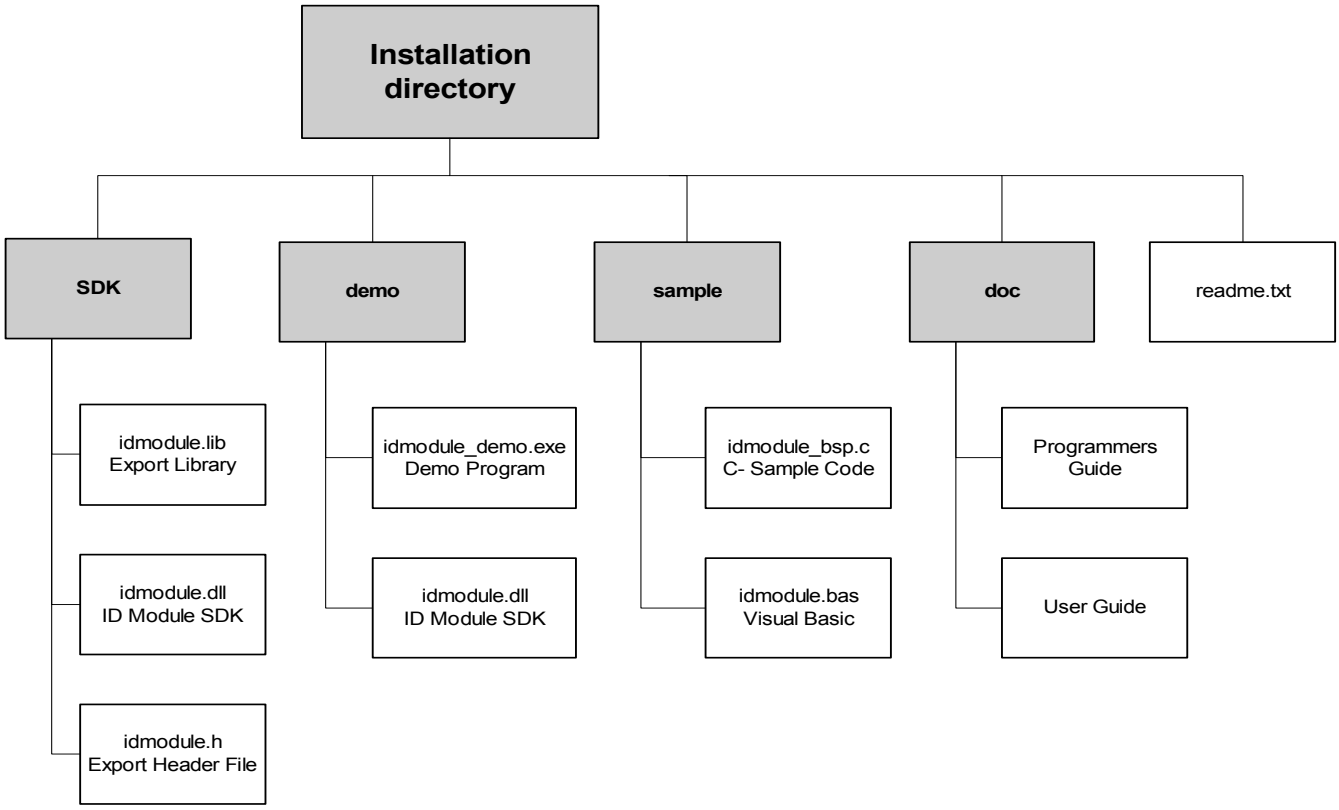

Figure 5-1: Structure of ID Module SDK Software Package installation

The file idmodule.bas in the sub-directory Sample is provided as an additional Visual Basic header file.

5.2 Data Sources

- **ID Module**
  Fingerprint Module with integrated biometric software and connection to FingerTIP™ sensor

- **Sensor**
  Infineon *FingerTIP*™ sensor. The characteristics of the Infineon *FingerTIP*™ sensor are defined

in the *Data Book FingerTIP™ CMOS Chip and System*.

- **Archive**
  Enrolled persons are stored within the integrated archive of the ID Module.

- **Registry**
  In the Registry system parameters of the SIEMENS ID Module SDK system are stored.Entries in the Windows registry are made in the path:

  HKEY_LOCAL_MACHINE\<configpath>\<key>\Name

  ID Module specific entries (one set of entries for each managed ID Module in subkeys of HKEY_LOCAL_MACHINE\<configpath>\<module>. <configpath> corresponds to FAPIConfigurationPath and <module> corresponds to FAPIModuleName. Both parameters are used as parameters of particular FAPI functions to denote a specific ID Module.

  The “Timeouts” section is an exception because it is a subdirectory positioned directly beneath the registry root.

  (path: HKEY_LOCAL_MACHINE\<configpath>\Timeouts)

  This section is valid for all modules belonging to this particular registry root.

5.3 Interfaces of the Product

5.3.1 User Interfaces

5.3.1.1 User Interface to the ID Module SDK

FAPI* Functions

Calling of the statically loadable DLL functions with C interfaces.

CallBack Functions

For the functions "FAPIEnrollment" an application programmer must define functions for interaction with the end user (message boxes for example). Implementation of these functions is completely left to the application programmer. However, implementation must be compliant with the function parameters defined in the ID Module SDK.

5.3.1.2 User Interface to the Demo Program

The graphical user interface is realized with a resolution of 800x600 pixels.

- A complete description of the demo program is given in Chapter 4.3.

5.3.1.3 User Interface to the Example Code

A special interface to the example code is not provided. The example code is a standard inline documented C code.

5.3.1.4 Notifications and Error Messages

Each function returns a return code indicating success or failure of the call. These return codes are unique numerical codes that are mapped to respective messages. A detailed description of these messages can be found in the ID Module SDK *Programmer's Guide*.

5.3.2 System Interfaces

- RS232 – Serial Interface

Communication with the ID Module is done via a serial interface (RS232)

6 Literature

[1] ID Module SDK *Programmer's Guide*

[2] Data Book FingerTIP™ CMOS Chip and System, Infineon Technologies AG

[3] ID Module Interface Description V1.99, ID Module Firmware V1.0, Siemens AG Munich

7 Terms

Term	Explanation
Application Programming Interface	A standardized programming interface such that application programmers do not need to know the intrinsic details of the software they want to integrate into their proprietary applications. Thus biometric solutions provided by different biometric software suppliers might easily be exchanged from the application's point of view.
Enrollment	A user is introduced into the system, which means that example data of his or her biometric features has to be acquired for subsequent use during verification or identification.
Identification	Determining a person's identity by comparing actual biometric features (e.g. fingerprint features) with the existing reference features of all persons in a given database

8 Abbreviations

API	Application Programming Interface
DLL	Dynamic Link Library
FAPI	(SIEMENS) Fingerprint API
FAR	False Acceptance Ratio
FingerTIP™	Trademark of fingerprint recognition for SDK and sensor from Infineon Technologies
FP	Fingerprint
GUI	Graphical User Interface
PDF	Portable Document Format
PC	Personal Computer
SDK	Software Development Kit
UART	Universal Asynchronous Receiver Transmitter

Person	Consists of person specific data and biometric data for a person identified by *PersonID*
Person specific data	*PersonID* and eg. lastname,firstname ...
Biometric data	Consists of 1-10 references per person
Rreference	Consists of 1-n (configurable) encoded fingerprints for (*PersonID/ReferenceID*) where *ReferenceID* identifies a particular finger of the person. Fingerprints are the raw image data of a finger.

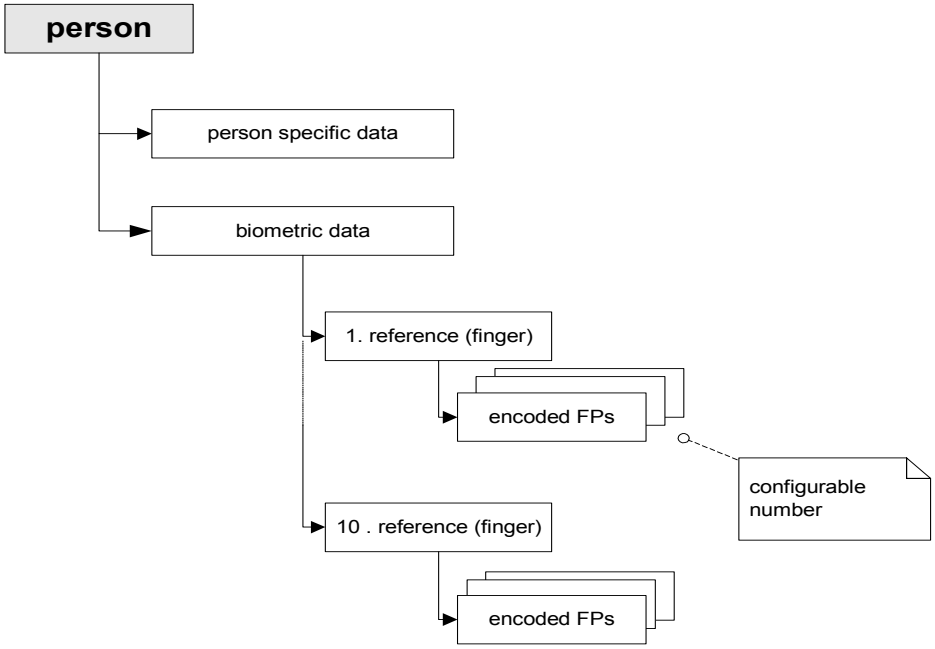

Figure 8-1: Structure of a person

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